


**PROPOSED COAL MINE DEVELOPMENT: FARM
TWYFELAAR 298-IT, ERMELO, MPUMALANGA**

TRAFFIC IMPACT ASSESSMENT REPORT

SEPTEMBER 2019



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1 Introduction

EDL Engineers (Pty) Ltd have been appointed by the client (Digby Wells) to conduct a Traffic Impact Assessment for the proposed Coal Mine development, located south east of Ermelo, Mpumalanga Province.

The purpose of this Traffic Impact Assessment Report is to investigate the existing and new traffic that will be generated by the proposed colliery, as well as to evaluate its impact on the existing road network and the road improvements thereof.

This study also evaluates the position of the proposed access and proposes an appropriate geometric layout of the access road proposed from the N2 freeway, along with the associated road widenings and new road markings.

Included in this report is the classification of the relevant roads and proposed key intersection, with their characteristics discussed in Chapter 2. Details on the proposed colliery development is set out in Chapter 3, **Table 1** and discussed in Chapter 3.1.

The appropriate trip generation is illustrated in **Table 2** which is based on information provided to EDL Engineers (Pty) Ltd by the client for the specific coal mine. Details of the existing and future traffic flows, with the trip distribution, is discussed in Chapter 5. Please refer to **Figures 2 to 6**.

As part of the impact evaluation, SIDRA 7 analyses were undertaken at the proposed T-Junction intersection of the access road for the existing and future 2024 (5-year horizon) scenarios.

Furthermore, the provision of non-motorised and public transport services and facilities at the proposed colliery development is also investigated, evaluated and discussed in Chapter 8 in this report.

The possible future road planning is illustrated on enclosed **Drawing No 19041/RP/01** in **Annexure B** at the back of this report to enable the determination of the spacing requirements of future interchanges on the N2 and their most probable positions. These interchange positions will dictate where the mine access onto the N2 should be located.

2 Site Location and Surrounding Road Network

2.1 Site Location

As shown in **Figure 1**, the site is proposed to be located on Portions 1, 2, 5 and the Remainder of the Farm Twyfelaar 298-IT, approx. 26km south east of Ermelo, just north of the N2 freeway, in the southern parts of Mpumalanga province. The project area is situated within the borders of the Msukaligwa Local Municipality.

The site is mainly surrounded by undeveloped farmlands and noticeable attractions near the project area include the small town of Sheepmoor, which is situated approx. 3km to the east of the proposed mine as well as the Maviristad Railway Siding located within the project area.

2.2 Surrounding Road Network

The following roads and streets are relevant to the study area.

N2 Freeway: This road, which is under the jurisdiction of SANRAL, functions as a Principle Arterial (Class 1). This is a surfaced single carriageway road with no median and one (1) lane per direction in the vicinity of the site and links Ermelo to the North west with Piet Retief (Mkhondo) to the south east. The N2 has a speed limit of 120km/h. The mine access is proposed to the mine project area by means of a proposed “T-Junction” type intersection with the N2 according to the relevant standards of SANRAL Drawing No. TD-R-JI-1300-V1 and as shown on **Drawing No. 19041/AL/01**.

At the proposed access location, the N2 freeway has a straight horizontal alignment for about 0.7km to the east of the proposed access position before changing into a large radius left curve / bend heading to the north east. To the west of the proposed access position, the N2 has a straight alignment for about 0.5km before changing into a large radius right curve / bend heading north west.

Regarding vertical alignment of the N2 in the vicinity of the site’s proposed access, the N2 has an average slope of about negative 4.4% heading to the east. Sight distance requirements will be discussed in more detail in Chapter 4 of this report.

Please see the photos below, taken at the position where the access road is proposed to intersect the N2 Freeway. Video / electronic traffic counts indicate that this road carries traffic volumes of between 95vph and 155vph per direction during the Weekday morning (AM) and Weekday afternoon (PM) peak hours.



N2 Freeway – Looking west.



N2 Freeway – Looking east.

2.3 Future Road Master Planning

Road Master Planning was done to determine the spacing requirements of future interchanges on the N2 and their most probable positions. These interchange positions will dictate where the mine access onto the N2 should be located. According to the Geometric Design Guide, a Systems to Access interchange configuration in rural areas has a minimum interchange spacing of 2.2km. We allowed for a minimum spacing of 2.4km between future interchanges as measured from Sheepmoor on the N2 Freeway.

Furthermore, according to TRH 26, the South African Road Classification and Access Management Manual, the minimum spacing requirements for full intersections on mobility roads (Class 1 to 3 roads) varies between $800\text{m} \pm 15\%$ and $600\text{m} \pm 20\%$ for intersections located on a Class 2 and Class 3 road respectively. For T-Junctions and one-way streets however, these values may be halved.

The abovementioned information / guidelines were applied. Please refer to **Drawing No. 19041/RP/01** in **Annexure B** at the back of this report.

3 Proposed Development & Trip Generation

With reference to **Figure 4**, the following sub-sections are relevant with respect to the proposed development’s trip generation.

3.1 Proposed Development

The proposed development situated on Portions 1, 2, 5 and the Remainder of the farm Twyfelaar 298-IT is proposed to be developed as an underground Coal Mine. The proposed project area measures a total of approx. 2063ha, and the extent is provided in **Table 1** below.

Table 1: Extent of the Proposed Development

Proposed Use	Area (ha)
Coal Mine (Underground)	2063
Total	2063ha

3.2 Trip Generation

The expected trip generation for the proposed land use is discussed below:

Coal Mine: According to the client, the proposed colliery is planned to have a maximum output of 40 kilotons per month. The mine will operate for 24 hours per day but will only be transporting the product for 12 hours per day. The trip generation of the proposed mine can then be calculated as follows:

Output: 40 000 t / month (Max)
 Assuming 26 working days / month
 Then: Tons per day = 40 000/26
 = 1538.46 tons / day

If one coal truck transports 32tons of coal:
 = 1538.46 / 32
 = 48 trucks per day (“OUT”) or 4 trucks per hour (“OUT”)

Using these parameters, it is estimated that the proposed colliery on Portions 1, 2, 5 and the Remainder of the Farm Twyfelaar 298-IT, will generate a combined total of approx. **8vph** during the critical **Weekday morning (AM)** and **8vph** during the critical **Weekday afternoon (PM)** peak hour. Please refer to **Table 2** below for a detailed breakdown of the estimated development traffic.

Table 2: Summary of the Estimated Development Traffic (Heavy Vehicles)

Land Use	Peak Hour	Trip Rate	Reduction Factors	Split %	TRIPS		
					In	Out	Total
Coal Mine (2063ha)	Weekday (AM)	8vph/ 1ha	-	50/50	4	4	8
	Weekday (PM)	8vph/ 1ha	-	50/50	4	4	8
Total Trips	Weekday (AM)				4	4	8
	Weekday (PM)				4	4	8

Personnel (Light Vehicles): For the employees, who is a combination of office bound engineering and site / operational staff, a trip rate of 0.5vph was calculated per employee, using an average occupancy of 2 people per vehicle. We have allowed for an estimated maximum of 100 employees. Using a trip rate of 0.5vph a total of 50 vph was calculated during the AM and PM peak hours. This is a worst case that allow for the vehicles travelling in the weekday peak hours and not before of after the peak hours. The details are provided in **Table 3** below:

Table 3: Summary of the Estimated Development Traffic (Light Vehicles)

Employees	Peak Hour	Trip Rate	Reduction Factors	Split %	TRIPS		
					In	Out	Total
100	Weekday (AM)	0.5vph / empl.	-	75/25	38	12	50
	Weekday (PM)	0.5vph / empl.	-	25/75	12	38	50
Total Trips	Weekday (AM)				38	12	50
	Weekday (PM)				12	38	50

Figures 3 to 6 show the estimated trip generation and distribution for the proposed development taking both the existing and future background traffic volumes into consideration.

4 Site Access

4.1 Proposed Site Access

The proposed colliery is proposed to have one access:

- A Full type access forming a T-Junction with the N2 Freeway is proposed for the colliery, at coordinates 26°44'0.27" S and 30°14'13.42" E, a position where a future interchange can be built, as per **Annexure B**.

The access road will consist of one entrance lane of 5.2m wide and one exit lane of 5m wide. A deceleration lane and taper of 120m long and 3.7m wide is proposed for the western approach. This deceleration lane will be accompanied by a large radius (45m) left turning slip lane of 5m wide. A kerbed island is also proposed at this left turning slip lane.

According to COTO TMH 16, the South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual, a road with a speed limit of 120km/h must have a Stopping Sight Distance between 235m and 265m on a road with an average slope of positive and negative 3% - 4% respectively (depending on the approach direction). During the site visit it was noted that more than 500m of Stopping Sight Distance is available to either side of where the access road / intersection to the coal mine is proposed. In addition, more than 400m of Shoulder / Barrier Sight Distance is available in both directions from the access position.

The access road must also be surfaced (dust free) for approx. 150m and must have road signage and markings complying with the relevant standards of the South African Road Traffic Signs Manual (SARTSM).

Please refer to **Drawing No 19041/AL/01** for the access layout as well as relevant road markings.

5 Traffic Flows & Trip Distribution

5.1 Existing Traffic Flows

Given the type and extent of the proposed coal mine development, the study area was defined to include only one traffic count on the N2 Freeway just south of where the coal mine is proposed, as required by COTO TMH 16. In addition, the proposed “access intersection” was also checked using SIDRA 7 Software. Weekday AM and Weekday (PM) Traffic Counts were therefore carried out during the Weekday AM and (PM) commuter peak periods on Thursday the 12th of September 2019, at the following identified locations:

- On the N2 Freeway where the access intersection is proposed.

The existing Weekday AM and (PM) peak hour traffic volumes at the above-mentioned location is summarised in **Figure 2**.

5.2 Total Future Traffic Flows

The erven on which the project area is located, is just north of the N2 Freeway and near Ermelo and Sheepmoor, traffic past the site will be influenced primarily by these towns. Furthermore, considering the fact that the vehicle ownership increases and the undeveloped land surrounding Ermelo and Sheepmoor is developed over time, a 3.5% per annum growth rate was adopted for the background traffic over a 5-year horizon period from 2019 to 2024 for this study.

Figure 5 shows the existing 2019 peak hour traffic plus estimated development traffic, which is the summation of **Figures 2** and **4**.

Figure 6 shows the future 2024 peak hour traffic plus estimated development traffic, which is the summation of **Figures 3** and **4**

5.3 Trip Distribution

Assumptions on the expected trip distribution for the trips generated / attracted by this coal mine development were based on the location of the proposed project area in relation to the surrounding road network, as well as the presence of numerous power stations located near Ermelo. The traffic was distributed onto the N2 Freeway as explained below:

At the site access (100% of traffic to be distributed):

- 95% of total generated traffic will be turning right, heading north west towards Camden and Ermelo whilst 5% will be turning left, heading east towards Sheepmoor and Piet Retief (Mkhondo).

6 Traffic Impact & Capacity Analyses

In order to determine the expected traffic impact of the proposed coal mine development on the existing road network, capacity analyses were carried out by using SIDRA 7, a well-known traffic engineering software package. The following intersection was analysed:

Access Intersection:

- Proposed access road forming a T-Junction intersection with the N2 Freeway

The following scenarios were analysed at the above-mentioned key intersection / access, namely:

- Existing 2019 Weekday AM and Weekday (PM) peak hour without the development traffic (as per **Figure 2**);
- Existing 2019 Weekday AM and Weekday (PM) peak hour with development traffic (as per **Figure 5**);
- Future 2024 Weekday AM and Weekday (PM) peak hour without development traffic (as per **Figure 3**);
- Future 2024 Weekday AM and Weekday (PM) peak hour with development traffic (as per **Figure 6**);

The next subsection illustrates the SIDRA 7 results in a table and briefly discusses the results and key conclusion at the analysed “intersection”, with the details of SIDRA 7 Intersection Capacity Analyses appended as **Annexure A**.

6.1 N2 Freeway & Access Road

Also see **Annexures A1.1 to A1.8**, as they have reference:

Table 4 – Results of SIDRA 7 Analyses (worst approach only)

Intersection		1. N2 Freeway & Access Road			
Scenario		Existing 2019	Exist 2019 + Dev	Future 2024	Future 2024 + Dev
Level of Service	Weekday AM Peak Hour	B	B	B	B
	Weekday (PM) Peak Hour	B	B	C	C
Average Delays (sec)	Weekday AM Peak Hour	10.8	11.7	11.8	12.9
	Weekday (PM) Peak Hour	13.6	14.9	15.7	17.4

SIDRA 7 Analyses were undertaken at the access location to establish whether this “intersection” will function acceptably. As shown in **Table 4** above, it can be concluded that the analysis results show acceptable LOS B or C during the peak hours in the worst scenarios being the future 2024 with development traffic added.

7 Road and/or Intersection Improvements

According to the SIDRA 7 analyses in Chapter 6, the proposed access road (T-Junction) intersection has acceptable Levels of Service and Average Delays during the Weekday AM and (PM) Peak Hours.

The following road improvements are however proposed regarding the N2 Freeway:

- It is proposed that the N2 Freeway be widened to accommodate the turning and deceleration / acceleration lanes necessary for the proposed access road. An additional auxiliary lane of 3.7m wide and approx. 520m long (climbing lane) is proposed (with a 148m taper) to allow for slow moving trucks exiting the proposed mine to accelerate and reach their cruise speed whilst heading to the west (uphill). This upgrade will promote traffic flow and safety on the N2 Freeway. Furthermore, the associated road markings must adhere to the standards of the most recent volume of the South African Road Traffic Signs Manual (SARTSM) and as shown on enclosed **Drawing No 19041/AL/01**.

The access road / T-Junction intersection as proposed in Chapter 4 on the N2 Freeway will have to be constructed with the associated road markings and signage, in accordance with SANRAL and as proposed on enclosed **Drawing No. 19041/AL/01**.

8 Public Transport Assessment and Latent Rights

8.1 Public Transport and Pedestrian Facilities

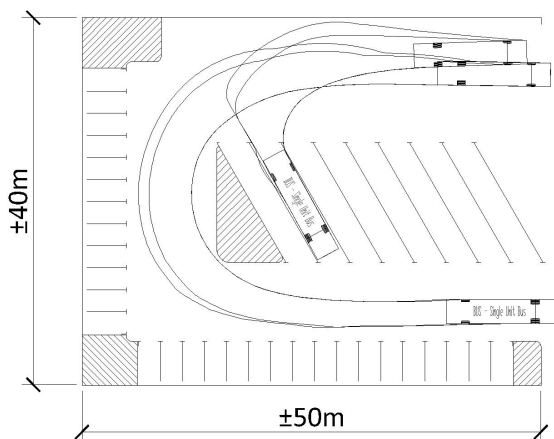
In terms of the National Land Transport Transition Act (NLTTA) 22 of 2000, Section 29, it is a requirement that an assessment of the public transport issues be included in the traffic impact assessments. The Act also requires that there be public transport facilities within 1km walking distance from a development in a built-up area.

During the site observation, it was observed that no public transport facilities exist within proximity of where the proposed coal mine is to be developed. It can be concluded however that since this proposed coal mine is not within comfortable / safe walking distance from any housing developments, nor in a built-up area, no public transport facilities or pedestrian facilities are proposed outside the project area boundary of the proposed colliery.

It is recommended however that space be made available on the premises to be used by public transport vehicles such as mini-bus taxi's and small to large busses. We do place great emphasis on the space to be given off for this specific use to ensure that large public transport vehicles have ample space to manoeuvre in a safe manner whilst on the premises and therefore an area for these pick-ups and drop-offs be made available of at least 50m x 40m.

It can therefore be concluded that, for the proposed coal mine development, no additional public transport facilities are proposed next to the N2 Freeway, **but that enough space (50m x 40m) must be made available on the premises to be used by public transport vehicles (drop off / parking facilities on site).** For a typical layout with a Bus Turning Circle using such a facility, please refer to the figure below:

Typical layout of an on-site parking / drop off facility:



8.2 Latent Rights

It should be noted that there are no Latent Rights developments near the proposed site to be developed and that we have allowed for 5 years of background traffic growth considering future developments further away.

9 Conclusions & Recommendations

Based on the content of this traffic impact report, the following key conclusions and recommendations are relevant:

- The coal mine development is proposed with a project area totalling approx. 2063ha and is located on Portions 1, 2, 5 and the Remainder of the Farm Twyfelaar 298-IT, south east of Ermelo, in Mpumalanga. Please refer to **Figure 1** for the locality.
- The proposed coal mine is estimated to have a maximum output of 40 kilotons per month and will be operating for 24 hours per day whereas the transportation of the product will take place for 12 hours per day, for 26 days per month.
- It is estimated that the proposed coal mine development will generate approx. 8 trips (total 'In' plus 'Out') during the Weekday AM and (PM) peak hours for heavy vehicles and 50 trips (total 'In' plus 'Out') during the Weekday AM and (PM) peak hours for employees (light vehicles).
- Video / electronic traffic counts were undertaken on Thursday the 12th of September 2019, at the location as mentioned in Chapter 5 with passing traffic being under 200vph / direction.
- SIDRA 7 Intersection Capacity Analyses were undertaken and were carried out for the peak periods at the location where the access road is proposed to intersect the N2 Freeway, and as per Chapter 6, this proposed intersection operates under acceptable Levels of Service and Average Delays.
- One (1) access road is proposed for the development on the N2 Freeway on KM 64.9, which will be located to the south of the proposed project area. For further details, please refer to **Drawing No. 19041/AL/01**.
- Road upgrades are proposed for the N2 Freeway at the access road intersection as per Chapter 7 in this report and as shown on **Drawing No. 19041/AL/01**.
- Regarding public transport, space (50m x 40m) must be provided for public transport vehicles on the premises of the proposed colliery with enough space for these vehicles to manoeuvre safely. Refer to the typical layout of such a facility in Chapter 8.

It is therefore recommended that the proposed coal mine development is supported from a traffic engineering perspective, provided that the road upgrades on the N2 Freeway and the construction of the access road / T-Junction intersection is implemented as proposed in this report (and **Drawing No. 19041/AL/01**) and to the relevant standards of SANRAL and the Msukaligwa Local Municipality.

Figures

Figure 1 Locality Plan

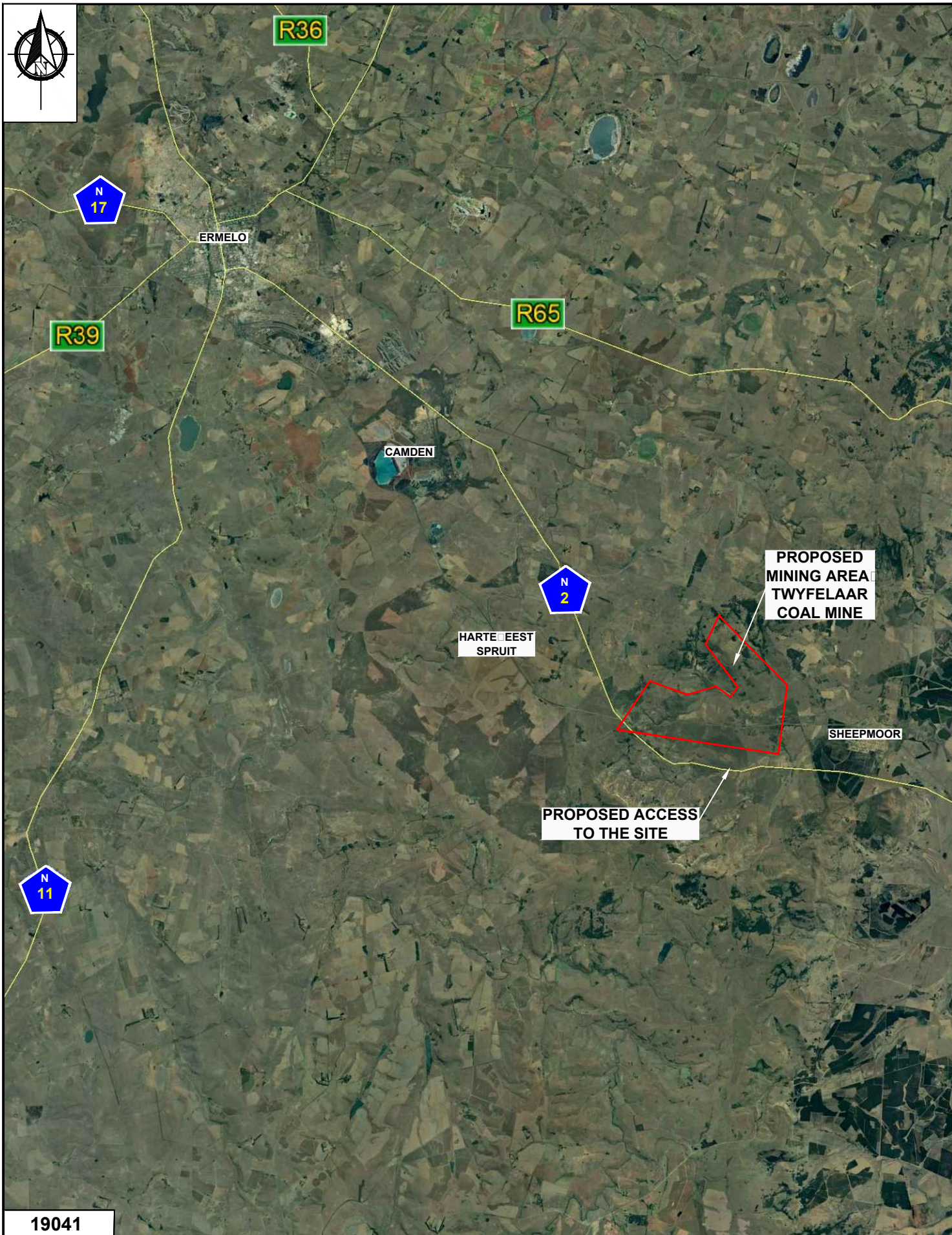
Figure 2 Existing 2019 Peak Hour Traffic

Figure 3 Total Development Peak Hour Traffic

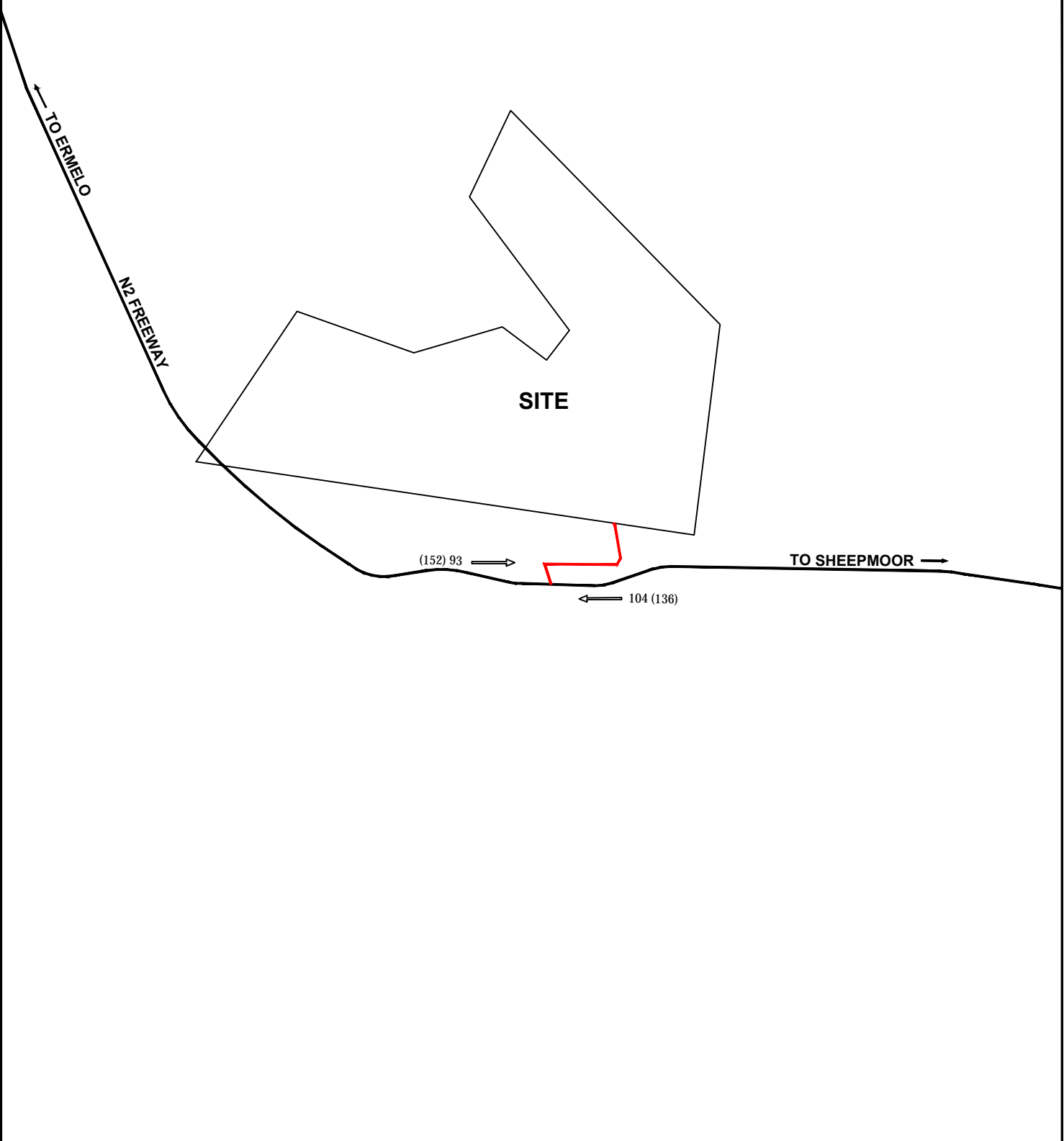
Figure 4 Existing 2019 + Development Peak Hour Traffic

Figure 5 Future 2024 Background Peak Hour Traffic

Figure 6 Future 2024 Background + Development Peak Hour Traffic



19041			
SITE: TWYFELAAR COAL MINE	TITLE: LOCALITY		FIG 1



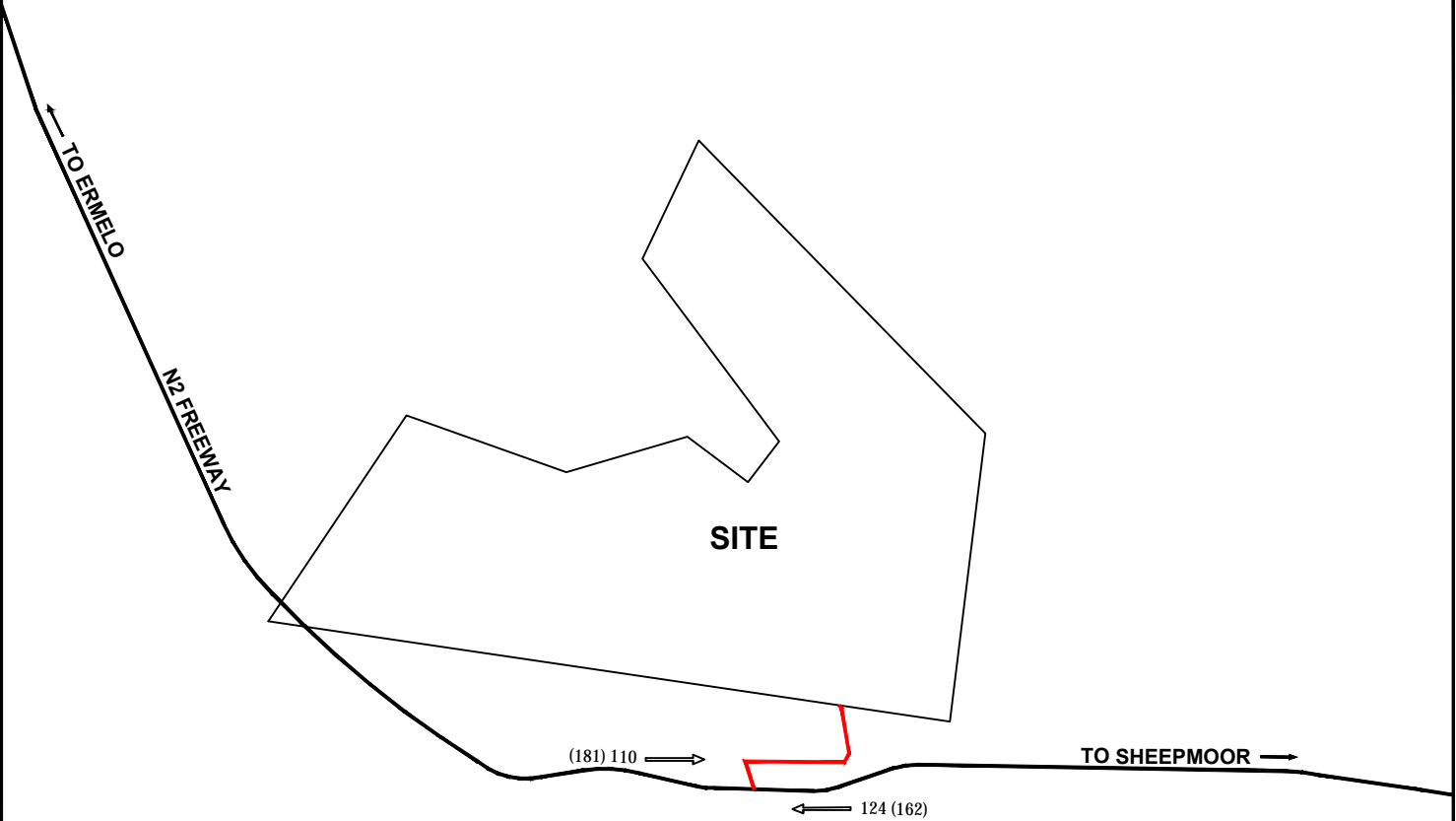
LEGEND
PEAK HOUR TRAFFIC
WEEKDAY AM / WEEKDAY (PM)

19041

SITE:
TWYFELAAR COAL MINE

TITLE:
EXISTING 2019 PEAK HOUR TRAFFIC

FIG 2



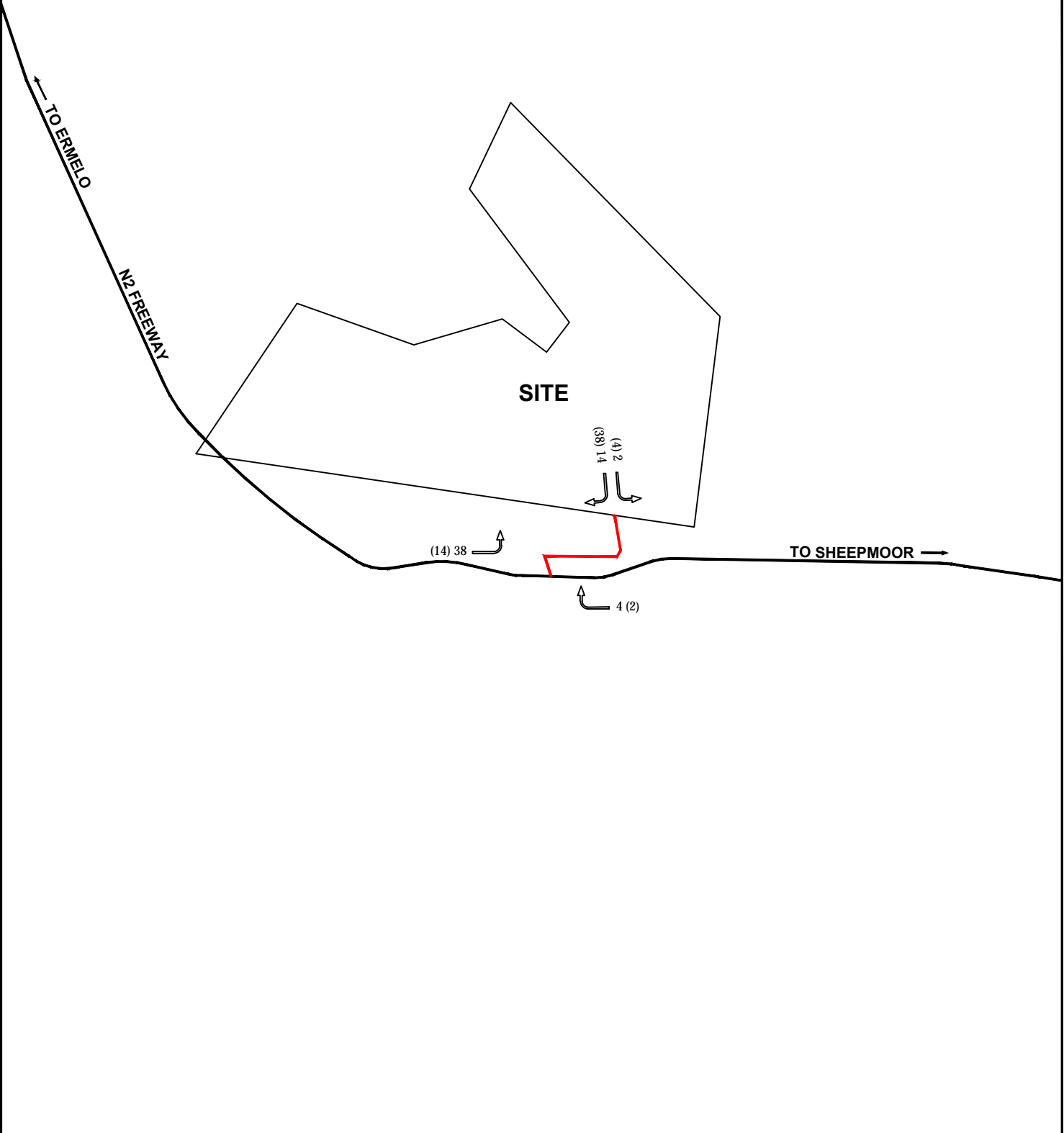
LEGEND
PEAK HOUR TRAFFIC
WEEKDAY AM / WEEKDAY (PM)

19041

SITE:
TWYFELAAR COAL MINE

TITLE:
FUTURE 2024 PEAK HOUR TRAFFIC

FIG 3



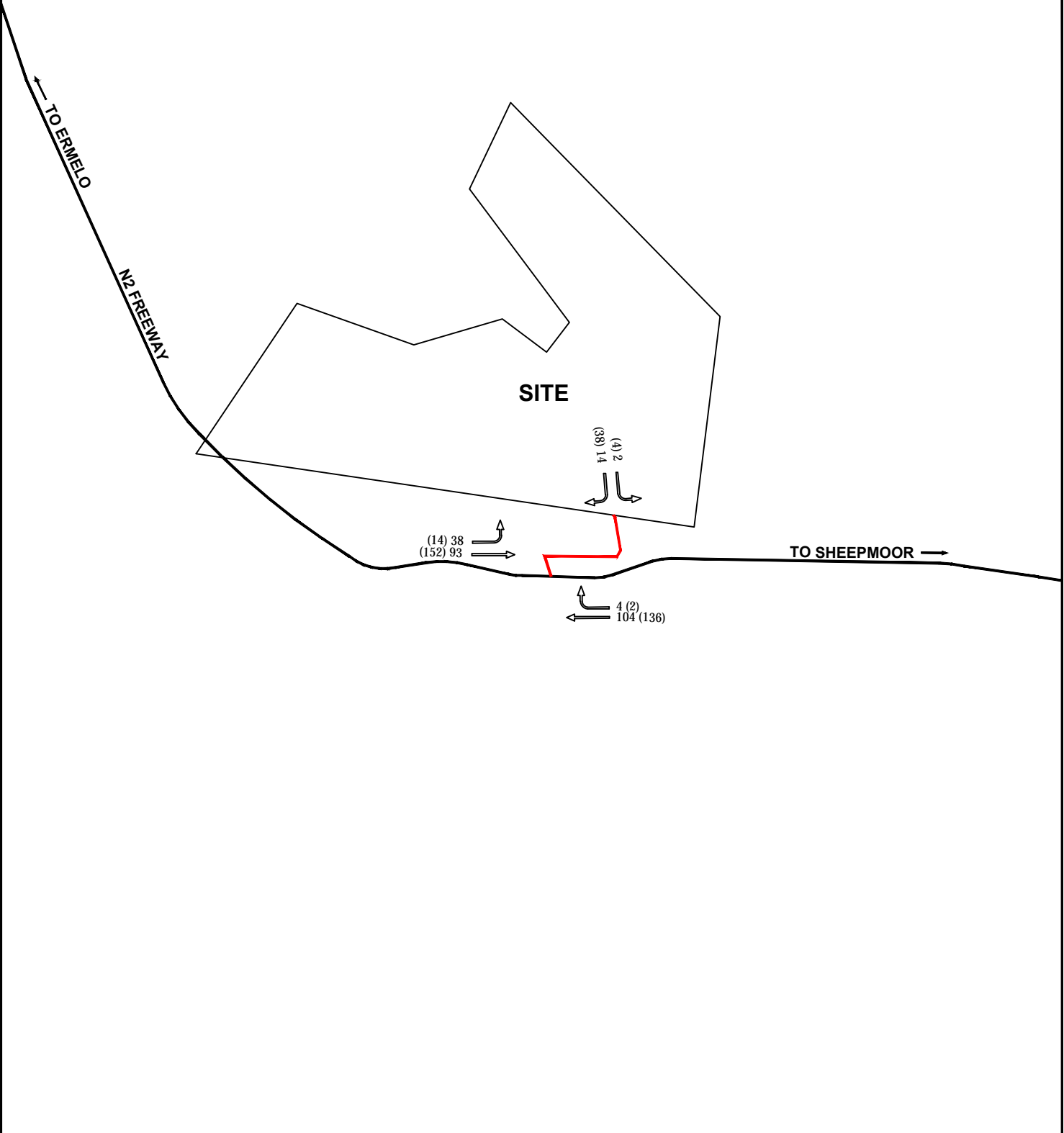
19041

LEGEND
PEAK HOUR TRAFFIC
WEEKDAY AM / WEEKDAY (PM)

SITE:
TWYFELAAR COAL MINE

TITLE:
DEVELOPMENT PEAK HOUR TRAFFIC

FIG 4



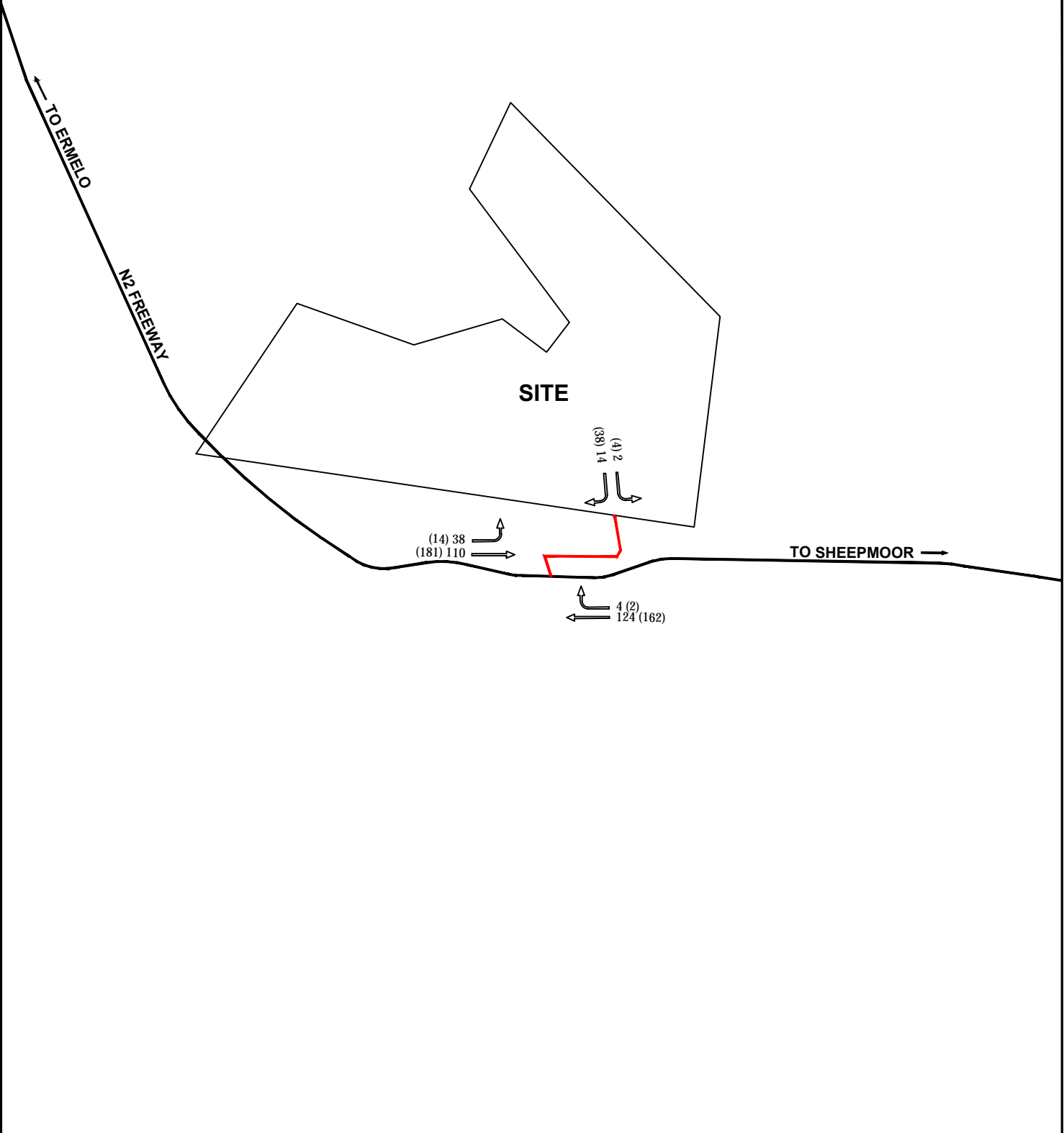
LEGEND
PEAK HOUR TRAFFIC
WEEKDAY AM / WEEKDAY (PM)

19041

SITE:
TWYFELAAR COAL MINE

TITLE:
EXISTING 2019 + DEVELOPMENT PEAK HOUR TRAFFIC

FIG 5



19041

LEGEND
PEAK HOUR TRAFFIC
WEEKDAY AM / WEEKDAY (PM)

SITE:
TWYFELAAR COAL MINE

TITLE:
FUTURE 2024 + DEVELOPMENT PEAK HOUR TRAFFIC

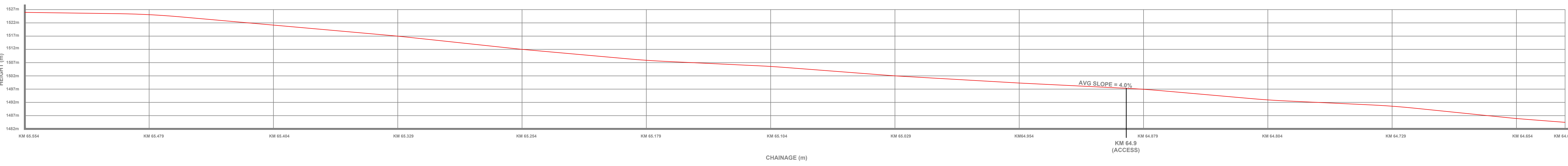
FIG 6

Drawings

Drawing no: 19041/AL/01 (Proposed Access Layouts)



ELEVATION PROFILE OF THE N2 IN THE PROXIMITY OF ACCESS AT KM 64.9



LEGEND	
	EXISTING ROAD SURFACE / ALIGNMENT OF THE N2 FREEWAY
	PROPOSED UPGRADES / WIDENING AND ACCESS ROAD TO THE PROPOSED MINE
	ROAD SHOULDER (GRAVEL)
	GRAVEL ROAD

REV	DATE	BY	DESCRIPTION	CHK	APP

FOR APPROVAL

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CLIENT:	DIGBY WELLS
PROJECT:	TWYFELAR COAL MINE
TITLE:	ACCESS LAYOUTS (CONCEPTS)
SCALE @ A1:	1 : 1250
DESIGNED BY:	ED KOTZE
APPROVED BY:	E.D. KOTZE
DRAWN BY:	HB SENEKAL
CHECKED BY:	HB SENEKAL
DATE:	SEPT'19
PROJECT NO:	19041
DRAWING NO:	19041AL/01
REV:	0

Annexure A

Relevant outputs of the SIDRA 7 intersection capacity analyses at the access intersection

- ▣ A1 – N2 Freeway & Access Road

Annexure A1: N2 Freeway & Access Road

- ▣ A1.1 – Existing 2019 Weekday AM Peak Hour Traffic
- ▣ A1.2 – Existing 2019 Weekday PM Peak Hour Traffic
- ▣ A1.3 – Existing 2019 Plus Development Weekday AM Peak Hour Traffic
- ▣ A1.4 – Existing 2019 Plus Development Weekday PM Peak Hour Traffic
- ▣ A1.5 – Future 2024 Weekday AM Peak Hour Traffic
- ▣ A1.6 – Future 2024 Weekday PM Peak Hour Traffic
- ▣ A1.7 – Future 2024 Plus Development Weekday AM Peak Hour Traffic
- ▣ A1.8 – Future 2024 Plus Development Weekday PM Peak Hour Traffic

Annexure A1.1

Sidra Output: N2 Freeway & Access Road

Existing 2019 Weekday AM Peak Hour Traffic

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: N2 Freeway											
5	T1	104	45.0	0.034	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	1	45.0	0.001	6.5	LOS A	0.0	0.0	0.24	0.50	51.1
Approach		105	45.0	0.034	0.1	NA	0.0	0.0	0.00	0.00	59.9
North: Access Road											
7	L2	1	95.0	0.004	7.5	LOS A	0.0	0.2	0.33	0.53	48.2
9	R2	1	95.0	0.004	10.8	LOS B	0.0	0.2	0.33	0.53	48.8
Approach		2	95.0	0.004	9.1	LOS A	0.0	0.2	0.33	0.53	48.5
West: N2 Freeway											
10	L2	1	45.0	0.001	6.1	LOS A	0.0	0.0	0.00	0.50	53.4
11	T1	93	45.0	0.060	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		94	45.0	0.060	0.1	NA	0.0	0.0	0.00	0.01	59.9
All Vehicles		201	45.5	0.060	0.2	NA	0.0	0.2	0.00	0.01	59.8

Annexure A1.2

Sidra Output: N2 Freeway & Access Road

Existing 2019 Weekday PM Peak Hour Traffic

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%				v/c	sec			
East: N2 Freeway											
5	T1	136	45.0	0.044	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	1	45.0	0.001	6.8	LOS A	0.0	0.0	0.32	0.50	50.9
Approach		137	45.0	0.044	0.1	NA	0.0	0.0	0.00	0.00	59.9
North: Access Road											
7	L2	1	95.0	0.005	8.1	LOS A	0.0	0.2	0.43	0.57	47.1
9	R2	1	95.0	0.005	13.6	LOS B	0.0	0.2	0.43	0.57	47.7
Approach		2	95.0	0.005	10.9	LOS B	0.0	0.2	0.43	0.57	47.4
West: N2 Freeway											
10	L2	1	45.0	0.001	6.1	LOS A	0.0	0.0	0.00	0.50	53.4
11	T1	152	45.0	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		153	45.0	0.099	0.1	NA	0.0	0.0	0.00	0.00	59.9
All Vehicles		292	45.3	0.099	0.1	NA	0.0	0.2	0.00	0.01	59.8

Annexure A1.3

Sidra Output: N2 Freeway & Access Road

Existing 2019 + Development Weekday AM Peak Hour Traffic

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: N2 Freeway											
5	T1	104	45.0	0.034	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	4	45.0	0.003	6.5	LOS A	0.0	0.1	0.24	0.51	51.1
Approach		108	45.0	0.034	0.2	NA	0.0	0.1	0.01	0.02	59.6
North: Access Road											
7	L2	2	95.0	0.039	7.5	LOS A	0.1	1.7	0.44	0.63	46.9
9	R2	14	95.0	0.039	11.7	LOS B	0.1	1.7	0.44	0.63	47.5
Approach		16	95.0	0.039	11.2	LOS B	0.1	1.7	0.44	0.63	47.4
West: N2 Freeway											
10	L2	38	45.0	0.026	6.1	LOS A	0.0	0.0	0.00	0.50	53.4
11	T1	93	45.0	0.060	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		131	45.0	0.060	1.8	NA	0.0	0.0	0.00	0.15	57.9
All Vehicles		255	48.1	0.060	1.7	NA	0.1	1.7	0.03	0.12	57.8

Annexure A1.4

Sidra Output: N2 Freeway & Access Road

Existing 2019 + Development Weekday PM Peak Hour Traffic

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: N2 Freeway											
5	T1	136	45.0	0.044	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	2	45.0	0.002	6.8	LOS A	0.0	0.1	0.32	0.51	50.9
Approach		138	45.0	0.044	0.1	NA	0.0	0.1	0.00	0.01	59.8
North: Access Road											
7	L2	4	95.0	0.129	8.4	LOS A	0.5	5.8	0.55	0.77	45.1
9	R2	38	95.0	0.129	14.9	LOS B	0.5	5.8	0.55	0.77	45.6
Approach		42	95.0	0.129	14.3	LOS B	0.5	5.8	0.55	0.77	45.6
West: N2 Freeway											
10	L2	14	45.0	0.010	6.1	LOS A	0.0	0.0	0.00	0.50	53.4
11	T1	152	45.0	0.099	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		166	45.0	0.099	0.5	NA	0.0	0.0	0.00	0.04	59.4
All Vehicles		346	51.1	0.129	2.0	NA	0.5	5.8	0.07	0.12	57.4

Annexure A1.5

Sidra Output: N2 Freeway & Access Road

Future 2024 Weekday AM Peak Hour Traffic

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%				v/c	sec			
East: N2 Freeway											
5	T1	124	45.0	0.040	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	1	45.0	0.001	6.6	LOS A	0.0	0.0	0.26	0.50	51.1
Approach		125	45.0	0.040	0.1	NA	0.0	0.0	0.00	0.00	59.9
North: Access Road											
7	L2	1	95.0	0.004	7.7	LOS A	0.0	0.2	0.37	0.55	47.8
9	R2	1	95.0	0.004	11.8	LOS B	0.0	0.2	0.37	0.55	48.4
Approach		2	95.0	0.004	9.8	LOS A	0.0	0.2	0.37	0.55	48.1
West: N2 Freeway											
10	L2	1	45.0	0.001	6.1	LOS A	0.0	0.0	0.00	0.50	53.4
11	T1	110	45.0	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		111	45.0	0.071	0.1	NA	0.0	0.0	0.00	0.00	59.9
All Vehicles		238	45.4	0.071	0.1	NA	0.0	0.2	0.00	0.01	59.8

Annexure A1.6

Sidra Output: N2 Freeway & Access Road

Future 2024 Weekday PM Peak Hour Traffic

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%				v/c	sec			
East: N2 Freeway											
5	T1	162	45.0	0.053	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	1	45.0	0.001	7.0	LOS A	0.0	0.0	0.35	0.50	50.8
Approach		163	45.0	0.053	0.0	NA	0.0	0.0	0.00	0.00	59.9
North: Access Road											
7	L2	1	95.0	0.005	8.5	LOS A	0.0	0.2	0.48	0.60	46.4
9	R2	1	95.0	0.005	15.7	LOS C	0.0	0.2	0.48	0.60	46.9
Approach		2	95.0	0.005	12.1	LOS B	0.0	0.2	0.48	0.60	46.6
West: N2 Freeway											
10	L2	1	45.0	0.001	6.1	LOS A	0.0	0.0	0.00	0.50	53.4
11	T1	181	45.0	0.118	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		182	45.0	0.118	0.0	NA	0.0	0.0	0.00	0.00	59.9
All Vehicles		347	45.3	0.118	0.1	NA	0.0	0.2	0.00	0.01	59.8

Annexure A1.7

Sidra Output: N2 Freeway & Access Road

Future 2024 + Development Weekday AM Peak Hour Traffic

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: N2 Freeway											
5	T1	124	45.0	0.040	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	4	45.0	0.003	6.6	LOS A	0.0	0.1	0.26	0.51	51.1
Approach		128	45.0	0.040	0.2	NA	0.0	0.1	0.01	0.02	59.7
North: Access Road											
7	L2	2	95.0	0.043	7.7	LOS A	0.1	1.9	0.47	0.66	46.3
9	R2	14	95.0	0.043	12.9	LOS B	0.1	1.9	0.47	0.66	46.8
Approach		16	95.0	0.043	12.3	LOS B	0.1	1.9	0.47	0.66	46.8
West: N2 Freeway											
10	L2	38	45.0	0.026	6.1	LOS A	0.0	0.0	0.00	0.50	53.4
11	T1	110	45.0	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		148	45.0	0.071	1.6	NA	0.0	0.0	0.00	0.13	58.1
All Vehicles		292	47.7	0.071	1.6	NA	0.1	1.9	0.03	0.11	58.0

Annexure A1.8

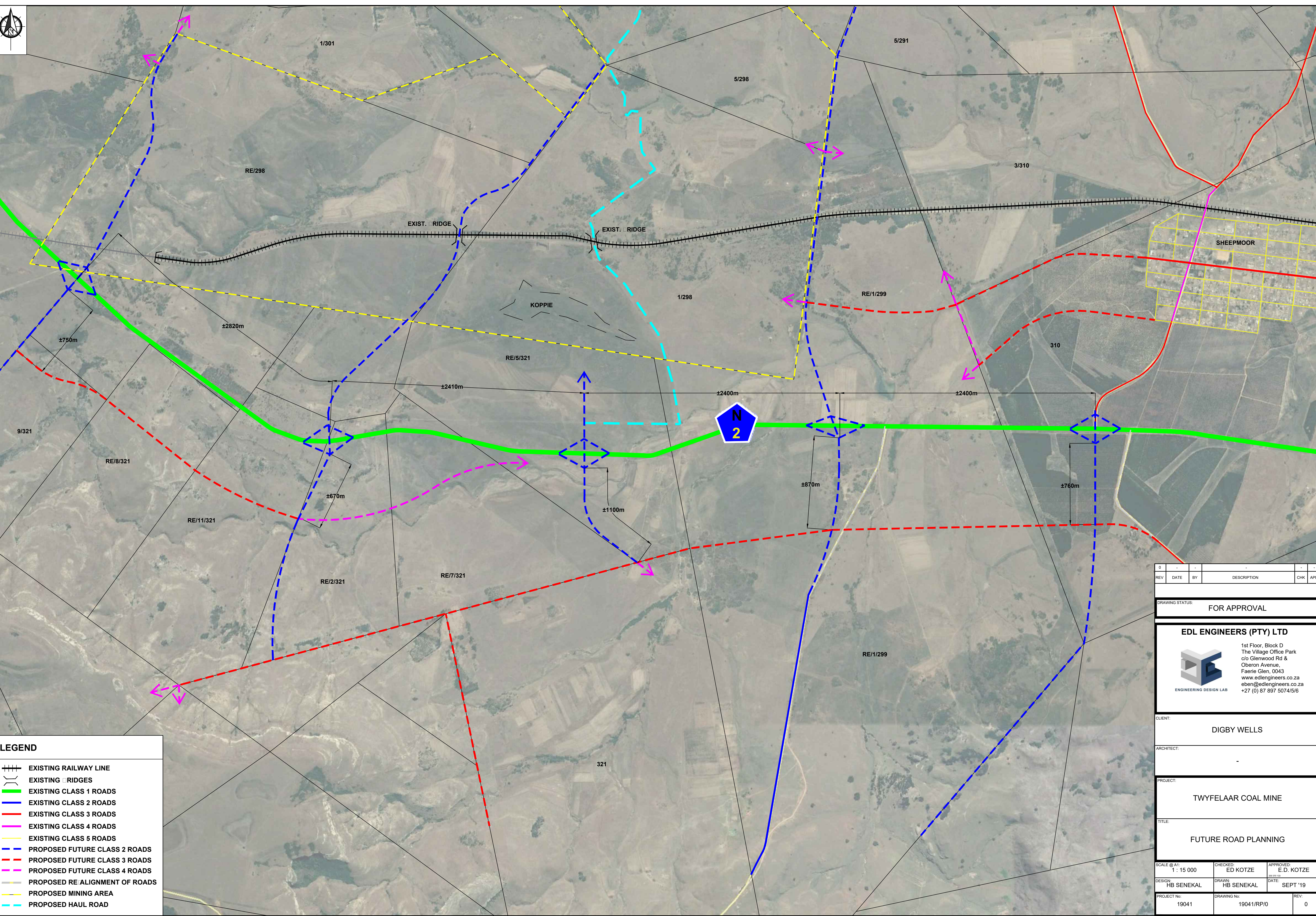
Sidra Output: N2 Freeway & Access Road

Future 2024 + Development Weekday PM Peak Hour Traffic

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows		Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
		Total	HV				Vehicles	Distance			
		veh/h	%	v/c	sec		veh	m		per veh	km/h
East: N2 Freeway											
5	T1	162	45.0	0.053	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R2	2	45.0	0.002	7.0	LOS A	0.0	0.1	0.35	0.51	50.8
Approach		164	45.0	0.053	0.1	NA	0.0	0.1	0.00	0.01	59.9
North: Access Road											
7	L2	4	95.0	0.150	8.8	LOS A	0.5	6.7	0.60	0.80	43.9
9	R2	38	95.0	0.150	17.4	LOS C	0.5	6.7	0.60	0.80	44.4
Approach		42	95.0	0.150	16.6	LOS C	0.5	6.7	0.60	0.80	44.3
West: N2 Freeway											
10	L2	14	45.0	0.010	6.1	LOS A	0.0	0.0	0.00	0.50	53.4
11	T1	181	45.0	0.118	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		195	45.0	0.118	0.4	NA	0.0	0.0	0.00	0.04	59.4
All Vehicles		401	50.2	0.150	2.0	NA	0.5	6.7	0.06	0.10	57.5

Annexure B

Road Master Planning



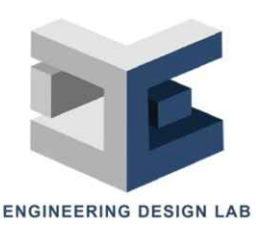
LEGEND

- EXISTING RAILWAY LINE
- EXISTING RIDGES
- EXISTING CLASS 1 ROADS
- EXISTING CLASS 2 ROADS
- EXISTING CLASS 3 ROADS
- EXISTING CLASS 4 ROADS
- EXISTING CLASS 5 ROADS
- PROPOSED FUTURE CLASS 2 ROADS
- PROPOSED FUTURE CLASS 3 ROADS
- PROPOSED FUTURE CLASS 4 ROADS
- PROPOSED RE ALIGNMENT OF ROADS
- PROPOSED MINING AREA
- PROPOSED HAUL ROAD

REV	DATE	BY	DESCRIPTION	CHK	APD
0	-	-	-	-	-

DRAWING STATUS: **FOR APPROVAL**

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CLIENT: **DIGBY WELLS**

ARCHITECT: -

PROJECT: **TWYFELAAR COAL MINE**

TITLE: **FUTURE ROAD PLANNING**

SCALE @ A1: 1 : 15 000	CHECKED: ED KOTZE	APPROVED: E.D. KOTZE
DESIGN: HB SENEKAL	DRAWN: HB SENEKAL	DATE: SEPT '19
PROJECT No: 19041	DRAWING No: 19041/RP/0	REV: 0