1 EXECUTIVE SUMMARY

SMEC South Africa (Pty) Ltd was appointed on behalf of Elandsfontein Colliery (Pty) Ltd by Environmental Impact Management Services (EIMS) to provide a specialist report for transport, hereafter referred to as a Traffic Impact Assessment (TIA). Elandsfontein Colliery (Pty) Ltd is applying to consolidate two mining right areas into a single mining right with associated consolidated Environmental Management Program (EMPr).

The following impacts were assessed for the planning; construction; operational; decommissioning and rehabilitation and closure phases of the project, where relevant:

- Site Access;
- Intersection Capacity Analysis using SIDRA Intersection;
- Deterioration of road network condition (Effect of E80's on surfaced roads); and
- Increase in dust along site access road.

The existing site access creates a staggered intersection with Apex road. In order to improve safety, additional warning signage should be added to the site access intersection. The site access road could be realigned by the relevant road authorities to create one four-legged intersection rather than a staggered junction and a traffic safety audit should be conducted by the relevant road authorities to ensure the existing road layout does not cause safety concerns.

The intersection capacity analysis conducted indicated that 5 intersections require immediate interventions. The analysis further indicated that various intersections will not operate to satisfactory LOS and will require some mitigation measures. These mitigation measures are however required to mitigate against current and future background traffic before the development is operational, rather than mitigation measures required to accommodate the colliery's traffic.

The following mitigation measures by the colliery are recommended:

- Add warning signage to site access
- Gravel Access Road should be maintained to support heavy vehicle movement.
- Heavy vehicle trips for planning, construction, decommissioning and rehabilitation and closure phases should be limited to off-peak hours
- Limit heavy vehicle speed to 40km/h along site access road
- Water down access road on a regular basis to reduce dust

The combining of separate mining rights into a single mining right will have minimal impact on the road network surrounding the site. The mitigation measures proposed are easily implementable and should be able to address the capacity constraints identified. It is recommended that the applicant's request be approved from a traffic and transportation perspective.

2 INTRODUCTION

2.1 BACKGROUND

SMEC South Africa (Pty) Ltd was appointed on behalf of Elandsfontein Colliery (Pty) Ltd by Environmental Impact Management Services (EIMS) to provide a specialist report for transport, hereafter referred to as a Traffic Impact Assessment (TIA). Elandsfontein Colliery (Pty) Ltd is applying to consolidate two mining right areas into a single mining right with associated consolidated Environmental Management Program (EMPr). The purpose of this TIA is to investigate and assess the impact of traffic generated by the proposed consolidation on the surrounding road network in the immediate vicinity of the development site.

The Elandsfontein Colliery site is located within the Emalahleni Local Municipality, in the Nkangala District Municipality of the province of Mpumalanga approximately 16km west of Emalahleni formerly known as Witbank. The project site is located on the remaining extents of portions 1, 6, 7 and 8 as well as portions 14 and 44 of the Farm Elandsfontein 309 JS (See F).

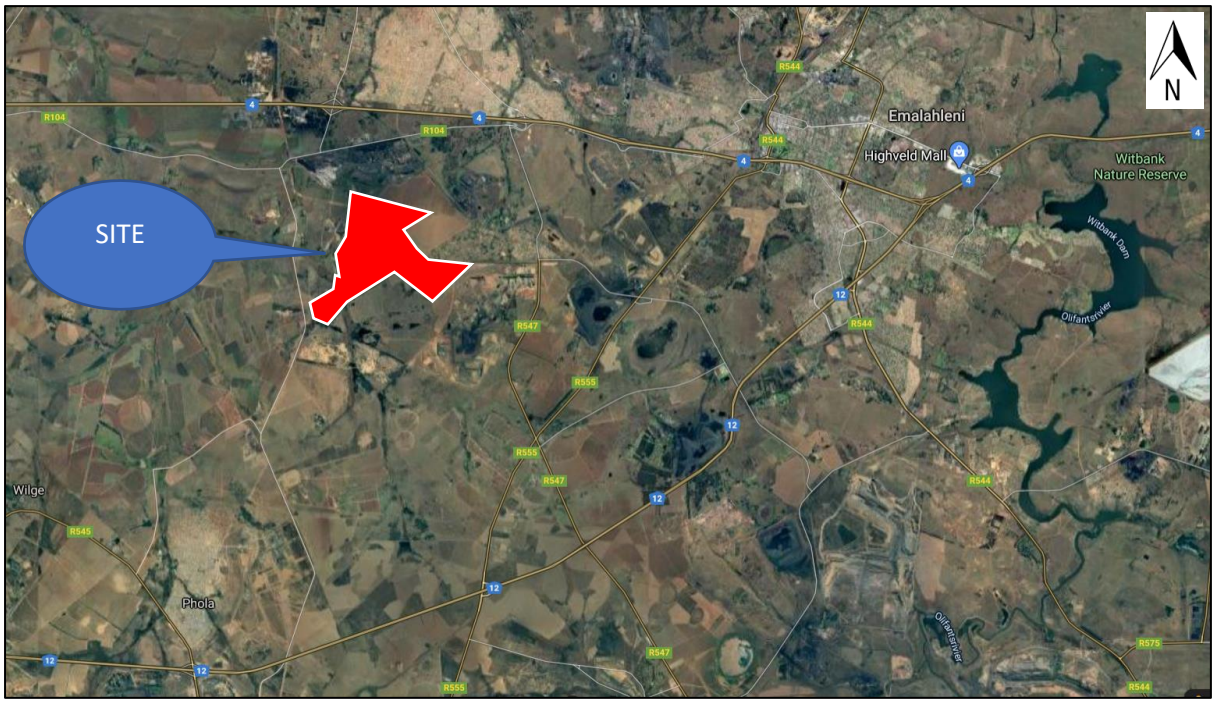


Figure 1: Locality Plan

2.2 OBJECTIVES

The objectives of this study are to:

- Evaluate the potential traffic impacts on the road network in the immediate vicinity of the development;
- Evaluate the impact of additional heavy vehicles on the public road network in the immediate vicinity of the development; and
- Evaluate other transport related implications on the surrounding environment.

3 DOCUMENT STRUCTURE

This report has been compiled in accordance with the EIA Regulations, 2014 (Government Notice (GN) R982). A summary of the report structure, and the specific sections that correspond to the applicable regulations, is provided in Table 1 below.

Table 1: Report Structure

Environmental Regulation	Description	Section in Report
NEMA EIA Regulations 2014 (as amended)		
Appendix 6 (1)(a):	Details of – (i) the specialist who prepared the report; and (ii) the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 4 Section 4 Appendix B
Appendix 6 (1)(b):	a declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix A
Appendix 6 (1)(c):	an indication of the scope of, and the purpose for which, the report was prepared;	Section 2.1
Appendix 6 (1)(cA):	an indication of the quality and age of base data used for the specialist report;	Section 8.1
Appendix 6 (1)(cB):	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 9
Appendix 6 (1)(d):	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	N/A
Appendix 6 (1)(e):	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 8
Appendix 6(1)(f):	details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	N/A
Appendix 6(1)(g):	an identification of any areas to be avoided, including buffers;	N/A

Environmental Regulation	Description	Section in Report
Appendix 6(1)(h):	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	N/A
Appendix 6(1)(i):	a description of any assumptions made and any uncertainties or gaps in knowledge;	Section 13
Appendix 6(1)(j):	a description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 10
Appendix 6(1)(k):	any mitigation measures for inclusion in the EMPr;	Section 11
Appendix 6(1)(l):	any conditions for inclusion in the environmental authorisation;	Section 11
Appendix 6(1)(m):	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 11
Appendix 6(1)(n):	a reasoned opinion- (i) whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and (ii) if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 12
Appendix 6(1)(o):	a description of any consultation process that was undertaken during the course of preparing the specialist report;	N/A
Appendix 6(1)(p):	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/A
Appendix 6(1)(q):	any other information requested by the competent authority.	N/A

4 SPECIALIST DETAILS

Naye Miya is a professionally registered Technologist with eleven (11) years of experience in both Traffic Engineering and Modelling. He obtained his B-Tech degree in Transportation Engineering Technology from the University of Johannesburg in 2013. He has vast array of experience, which spans the entire spectrum of traffic and transport engineering. His complete CV is included in Appendix B.

Naye is the current Section Manager of the Planning and Traffic Engineering unit at SMEC South Africa. His role includes technical modelling and reporting on all transport related projects such as traffic signal designs, transport masterplans, data collection projects and various traffic impact assessment studies. Naye has also been involved in various projects in countries like Rwanda, Kenya, Nigeria and Angola.

5 TERMS OF REFERENCE

Terms of Reference were defined in the project proposal in which the following needs for this report were identified:

- Evaluate the impacts of the proposed changes to the mines on existing road network and traffic volumes. The study must determine the specific traffic needs during the different phases of implementation;
- Evaluate the roadway capacity of the road network;
- Evaluate the site access;
- Confirm freight and transport requirements during construction, operation and maintenance;
- A high level transport plan for the transportation of equipment to site, if relevant;
- Determine (Abnormal) Permit requirements if any;
- Determine no. of E80's distributed to the road network
- Determine any Traffic Engineering Service Contributions according to relevant guidelines (e.g. TMH 15 South African Engineering Service Contribution Manual for Municipal Road Infrastructure); and
- Reporting.

6 PROJECT DESCRIPTION

6.1 BACKGROUND

The Elandsfontein Colliery (Pty) Ltd comprises of two distinct coal mining rights (MR314 and MR63) as shown in Figure 2. The applicant intends to consolidate its mining rights over Elandsfontein into a consolidated Mining Right by submitting a Section 102 Application. The mine operation will be named the Elandsfontein Colliery (Pty) Ltd. Approximately 938 ha of land is required for mining operations. The coal depth varies greatly and occurs at depths from approximately 6m below surface to more than 70m below surface.

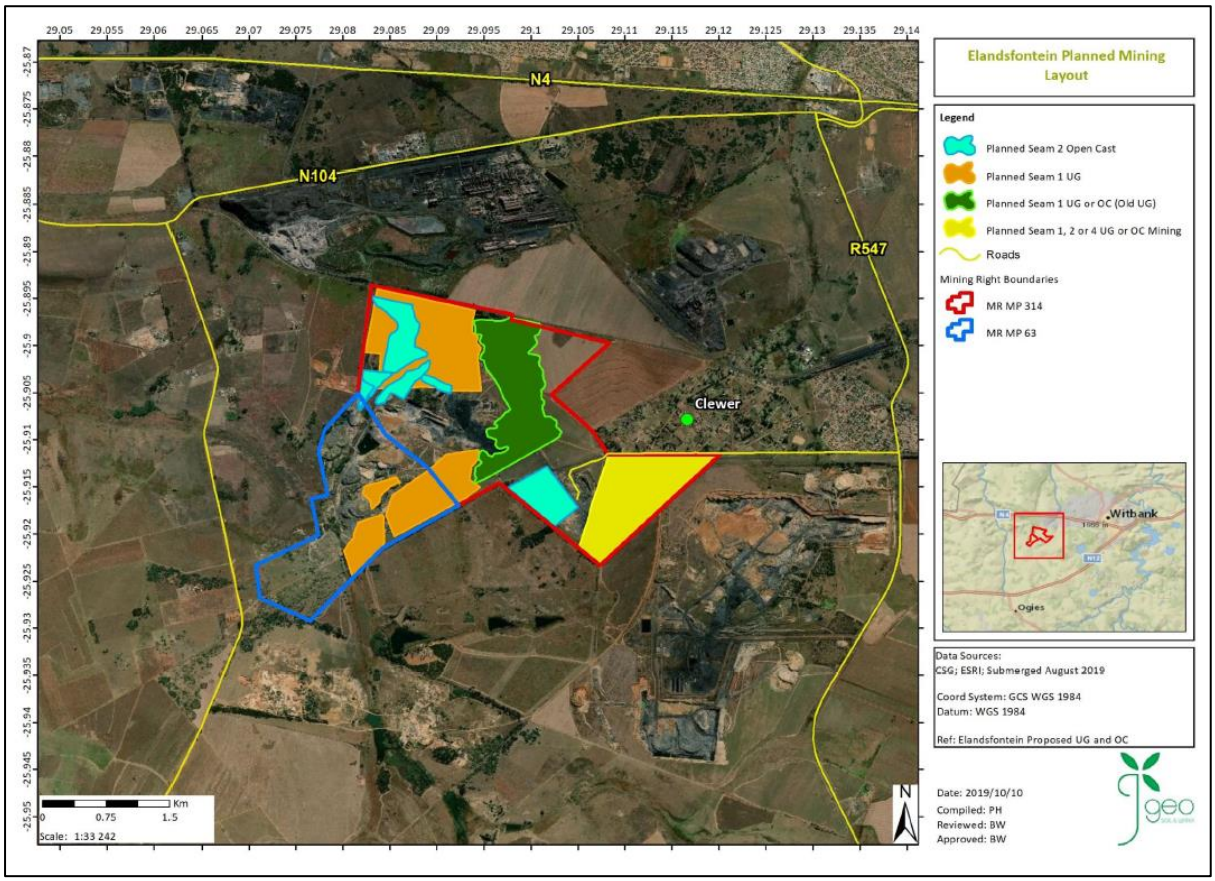


Figure 2: Location of Elandsfontein Colliery

Historically the coal deposits at Elandsfontein have been mined both by opencast and underground mining methods. The topography on Elandsfontein comprises of flat ground with the highest point 1564 m a.m.s.l. in the east. The land is situated on the watershed between the Grootspruit/Saalklapspruit/WilgeRiver- (in the west) and the Burgersspruit/Klipspruit drainage-system (in the east). Both river systems drain north. All Elandsfontein's operations are located on western and southern slopes, which drain into the Grootspruit. The elevations along the Grootspruit are of the order of 1485 m a.m.s.l. Slopes on the high ground are of the order of 1° and near the rivers 8°. Stream gradients are low, and wetlands are common.

The quality of the coal dictates that the coal will be used in the power generation sector as well as export coal. Elandsfontein will beneficiate the ROM coal from the underground No.1 resources to produce coal products with the split between the products being approximately 60 % for the export market and 40% for the domestic market. The underground coal resources from the No. 1 Seam will be washed and the primary product will be for the export market. The secondary product will be blended with the coal resources from the No. 2 Seams from the opencast pit that will be crushed and screened and sold as a domestic product to Eskom.

6.2 PROGRAMME

The planning, design and licencing requirements will take approximately two years to complete. The construction phase involves opening the box cut for the No. 2 Seam as well as the establishment of the adits to access the No. 1 Seam underground areas and the construction and refurbishment of the supporting surface infrastructure. The construction will take up to a year. The first coal from the new areas will be mined at the beginning of year 4 (Refer to Table 2). The operation will involve a 6 month ramp up period. Steady state mining will be achieved which will continue for 5 years. This will be followed by a ramp down and mine closure taking approximately 3 years.

Table 2: Elandsfontein Colliery Project Schedule (MWP, 2019)

Implementation Phases	**Financial Year Ending 30 June**											
Year	Y-2	Y-1	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y-7	Y-8	Y-9
Permitting (Mining), IWULA, NEMA)												
Construction												
Ramp up												
Steady State Production												
Ramp Down and Closure												

6.3 DEVELOPMENT ACCESS

The current access to the mine is shown in **Figure 3** below.

Figure 3: Elandsfontein Colliery Site Access Road

The access is located approximately 100m south of the Apex Road and R547 Road intersection. Road R547 is a class 3 provincial road intersecting with R555 to the south and R104 to the north. R547 operates as a class 4b residential collector in the Clewer area with accesses at spacing distances greater than 150m (TRH26 South African Road Classification and Access Management Manual).

The current location of the informal access provides for a staggered intersection. This is both unsafe and substandard, however there is a wetland to the north of the access road preventing the realignment of this road. It was further observed that trucks use the space between the current informal access point and the Apex Road and R547 road intersection as a holding area as seen in Figure 4. These vehicles are not vehicles associated with the Elandsfontein Coal Mine but vehicles waiting for loads from Umlalazi and other mines.

Figure 4: Trucks stopped opposite Intersection 4

Figure 5: Intersection 4 Informal Gravel Intersection Leg

It is proposed that the existing access to Elandsfontein Coal Mine continue to be used, however additional signage warning of the close proximity of the two intersections is advised.

It is recommended that the relevant road authority undertake a full safety audit of the two intersections to ensure that the existing intersection design does not result in accidents. There is potential for the intersection to be formalised and realigned to form a fourth leg (west approach) at the R547 and Apex Road intersection by relevant road authorities to improve safety at this intersection. In order to further improve safety at the revised intersection, a physical barrier in a form of 90 degree kerbs should be provided on the southern side of Apex Road in order to prevent private vehicles accessing and exiting the Clewer residential areas.

In case the access is not redesigned by local road authorities due to cost or alternative limiting factors, a SIDRA Intersection analysis of the existing access was completed to ensure the access road would have sufficient capacity in all stages of the development. The layout is shown in the following figure.

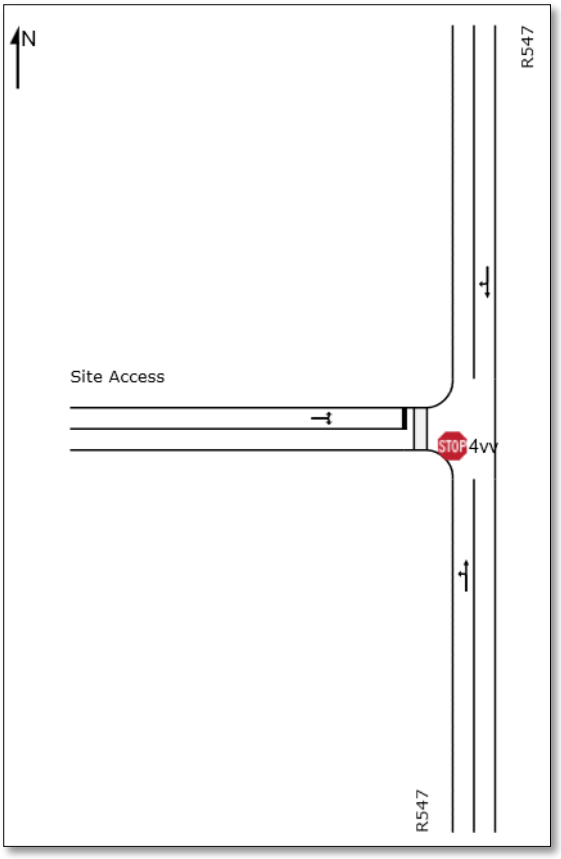


Figure 6: SIDRA Layout: Existing Development Access

The results in the following images indicate that during Construction and Operation the existing layout is sufficient to accommodate Elandfontein Colliery with the worst case Level of Service C.

MOVEMENT SUMMARY

Site: 4vv [2020 Construction AM - Conversion]

New Site
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: FS Access												
1	L2	1	0,0	0,111	5,6	LOS A	0,0	0,0	0,00	0,00	0,00	58,3
2	T1	189	6,7	0,111	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	59,9
Approach		191	6,6	0,111	0,0	NA	0,0	0,0	0,00	0,00	0,00	59,9
North: FS Access												
8	T1	100	26,3	0,120	0,4	LOS A	0,4	3,4	0,25	0,27	0,25	56,5
9	R2	79	0,0	0,120	6,1	LOS A	0,4	3,4	0,25	0,27	0,25	54,5
Approach		179	14,7	0,120	2,9	NA	0,4	3,4	0,25	0,27	0,25	55,6
West: RoadName												
10	L2	4	0,0	0,005	8,7	LOS A	0,0	0,1	0,30	0,84	0,30	51,6
12	R2	1	0,0	0,005	9,2	LOS A	0,0	0,1	0,30	0,84	0,30	51,1
Approach		5	0,0	0,005	8,8	LOS A	0,0	0,1	0,30	0,84	0,30	51,5
All Vehicles		375	10,4	0,120	1,5	NA	0,4	3,4	0,12	0,14	0,12	57,6

Figure 7: SIDRA Movement Summary Existing Development Access: AM Construction Phase

MOVEMENT SUMMARY

Site: 4vv [2020 Construction PM - Conversion]

New Site
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: R547												
1	L2	1	0,0	0,166	5,6	LOS A	0,0	0,0	0,00	0,00	0,00	58,3
2	T1	276	8,4	0,166	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	59,9
Approach		277	8,4	0,166	0,0	NA	0,0	0,0	0,00	0,00	0,00	59,9
North: R547												
8	T1	145	21,0	0,108	0,0	LOS A	0,0	0,3	0,02	0,02	0,02	59,7
9	R2	4	0,0	0,108	6,5	LOS A	0,0	0,3	0,02	0,02	0,02	57,5
Approach		149	20,4	0,108	0,2	NA	0,0	0,3	0,02	0,02	0,02	59,6
West: Site Access												
10	L2	79	0,0	0,075	9,3	LOS A	0,3	2,0	0,38	0,88	0,38	51,4
12	R2	1	0,0	0,075	9,9	LOS A	0,3	2,0	0,38	0,88	0,38	50,9
Approach		80	0,0	0,075	9,3	LOS A	0,3	2,0	0,38	0,88	0,38	51,4
All Vehicles		506	10,6	0,166	1,6	NA	0,3	2,0	0,07	0,14	0,07	58,3

Figure 8: SIDRA Movement Summary Existing Development Access: PM Construction Phase

MOVEMENT SUMMARY

Site: 4vv [2026 Operational AM - Conversion]

New Site
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: R547												
1	L2	33	0,0	0,148	5,6	LOS A	0,0	0,0	0,00	0,08	0,00	57,7
2	T1	225	6,5	0,148	0,0	LOS A	0,0	0,0	0,00	0,08	0,00	59,2
Approach		258	5,7	0,148	0,7	NA	0,0	0,0	0,00	0,08	0,00	59,0
North: R547												
8	T1	120	26,3	0,119	0,3	LOS A	0,3	2,5	0,21	0,18	0,21	57,4
9	R2	47	0,0	0,119	6,4	LOS A	0,3	2,5	0,21	0,18	0,21	55,3
Approach		167	18,9	0,119	2,1	NA	0,3	2,5	0,21	0,18	0,21	56,8
West: Site Access												
10	L2	5	0,0	0,089	9,0	LOS A	0,3	3,5	0,50	0,91	0,50	49,0
12	R2	34	96,9	0,089	17,1	LOS C	0,3	3,5	0,50	0,91	0,50	45,1
Approach		39	83,8	0,089	16,0	LOS C	0,3	3,5	0,50	0,91	0,50	45,6
All Vehicles		464	17,0	0,148	2,5	NA	0,3	3,5	0,12	0,18	0,12	56,8

Figure 9: SIDRA Movement Summary Existing Development Access: AM Operational Phase

MOVEMENT SUMMARY

Site: 4vv [2026 Operational PM - Conversion]

New Site
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: R547												
1	L2	33	0,0	0,216	5,6	LOS A	0,0	0,0	0,00	0,05	0,00	57,8
2	T1	329	8,6	0,216	0,0	LOS A	0,0	0,0	0,00	0,05	0,00	59,4
Approach		362	7,8	0,216	0,5	NA	0,0	0,0	0,00	0,05	0,00	59,3
North: R547												
8	T1	173	20,7	0,131	0,1	LOS A	0,1	0,5	0,04	0,02	0,04	59,6
9	R2	6	16,7	0,131	7,5	LOS A	0,1	0,5	0,04	0,02	0,04	56,5
Approach		179	20,6	0,131	0,3	NA	0,1	0,5	0,04	0,02	0,04	59,5
West: Site Access												
10	L2	47	0,0	0,155	9,6	LOS A	0,5	5,1	0,53	0,91	0,53	49,2
12	R2	34	96,9	0,155	20,5	LOS C	0,5	5,1	0,53	0,91	0,53	45,3
Approach		81	40,3	0,155	14,2	LOS B	0,5	5,1	0,53	0,91	0,53	47,5
All Vehicles		622	15,7	0,216	2,3	NA	0,5	5,1	0,08	0,16	0,08	57,5

Figure 10: SIDRA Movement Summary Existing Development Access: PM Operational Phase

7 LEGISLATIVE AND POLICY FRAMEWORK

7.1 LAND TRANSPORT REGULATIONS

The National Land Transport Act NLTA (Act No 5 of 2009) requires the integration of land transport planning with the land development process and the preparation of integrated transport plans which constitutes the transport component of the integrated development plans of municipalities. These integrated transport plans include the regulation and provision of transport infrastructure for all modes of transport. According to the National Land Transport Act, property developments within a transport area are subject to traffic impact and transport assessments. In light of the above, the following documents were used to guide the processes used in the compilation of this report:

- The Technical Methods for Highways (TMH) 16: Volume 1 and Volume 2 - South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual and Volume 2;
- The Technical Methods for Highways (TMH) 17: South African Trip Data Manual;
- The Technical Recommendations for Highways (TRH) 26: South African Road Classification and Access Management Manual; and
- The Technical Recommendations for Highways (TRH) 16: Traffic Loading for Pavement and Rehabilitation Design.

7.2 ENVIRONMENTAL REGULATIONS

In terms of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002), as amended (MPRDA), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of Regulation 16(3) (b) of the Environmental Impact Assessment Regulations 2014, as amended in 2017, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of Regulation 17 (1) (c) the Competent Authority must check whether the application has considered any minimum requirements applicable or instructions or guidance provided by the Competent Authority to the submission of applications.

In pursuit of this, SMEC utilised guidelines as outlined in the Government Gazette No. 43110 which was promulgated on 20 March 2020 in terms of section 24(5)(a) and (h) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and reporting requirements set out in Appendix 6 of the EIA Regulations, 2014 (as amended).

8 METHODOLOGY AND APPROACH

Additional traffic on the road network could result in changes to the operations of that road network. It is for this reason that the traffic impact has to be quantified for all major phases of a development. This traffic impact assessment was conducted according to the Technical Methods for Highways (TMH) 16: Volume 1 and Volume 2 - South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual. According to the guidelines, a fully-fledged traffic impact assessment was required to be carried out in order to quantify and determine the extent of the traffic impact to be generated by the proposed development. The methodology entailed the process shown in Figure 11.

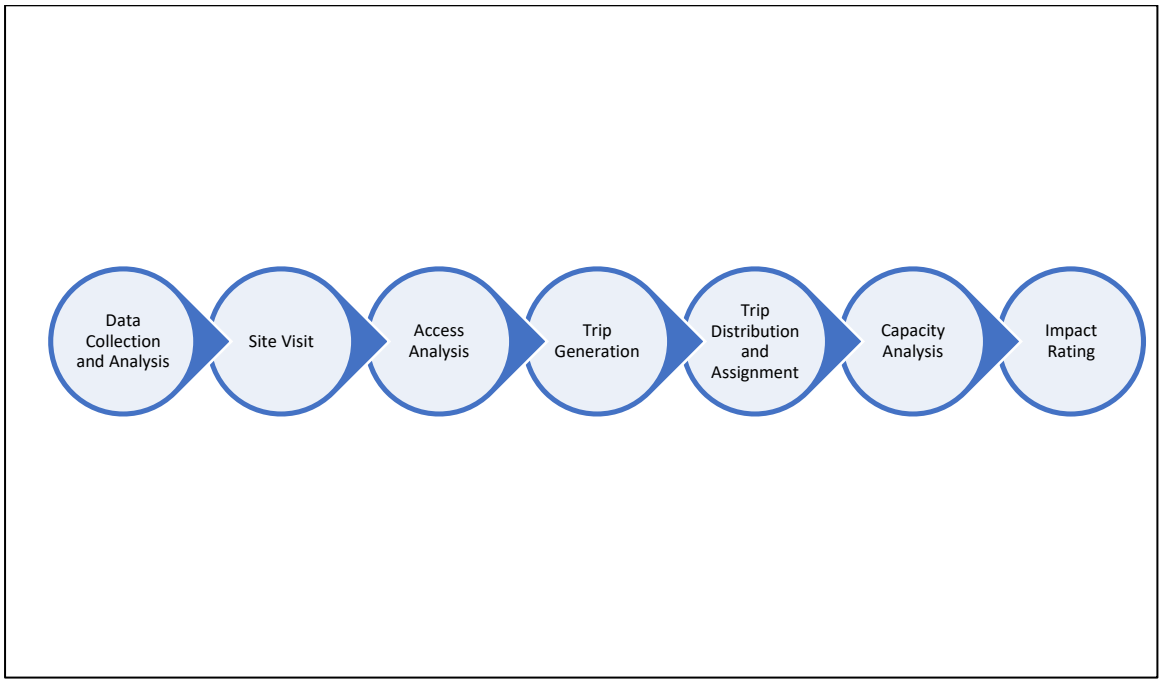


Figure 11: Methodology Process

The following scenarios were analysed to determine the traffic impacts on the surrounding road network configuration:

- Scenario 1: 2020 Base Traffic AM and PM Peak Hours (Refer to Section 9.2);
- Scenario 2: 2020 Base Traffic + Construction Traffic AM and PM Peak Hours (Refer to Section 10.5.3);
- Scenario 3: 2026 Background Traffic AM and PM Peak Hours (Refer to Section 9.4); and
- Scenario 4: 2026 Background Traffic + Development Volumes AM and PM Peak Hours (Refer to Section 10.6.3).

The traffic impact will be measured in this report by determining a level of service for each intersection within the study area. The performance of intersections on the urban road networks is defined by the level of service (LOS) for each approach to the intersection. These levels of service have been defined in the Highway Capacity Manual (HCM, 2010) as shown in Table 3. During the peak hours, the road infrastructure capacity provided should ensure that the intersection approach level of service should ideally not exceed LOS D.

Table 3: Level of Service for Intersections (HCM)

Level of Service	Average Approach Delay (d) for Signalised Intersections (seconds)	Average Approach Delay (d) for Priority Intersections (seconds)
A	$d \leq 10$	$d \leq 10$
B	$10 < d \leq 20$	$10 < d \leq 15$
C	$20 < d \leq 35$	$15 < d \leq 25$
D	$35 < d \leq 55$	$25 < d \leq 35$
E	$55 < d \leq 80$	$35 < d \leq 50$
F	$80 < d$	$50 < d$

The following definitions from the Highway Capacity Manual 2000 are applicable to this report:

Level of Service (LOS)

LOS is a measure of intersection performance determined based on the average delay at intersections. In most rural and urban areas an overall LOS of A to D is acceptable. LOS E or F are considered to be undesirable. In short, LOS is defined in terms of delay. Delay is a measure of intersection or roadway performance which is measured based on the driver discomfort, frustration, fuel consumption and lost travel time. Delay at intersections depends on various factors such as the type of signal control, the volume of traffic and volume/capacity ratio of each approach at an intersection (C A O'Flaherty, 1997). The intersection performance has been rated based on the average delay, i.e. the LOS of the intersections under investigation will be measured based on the intersection average delay.

Capacity

Capacity refers to the maximum hourly rate at which vehicles can reasonably be expected to traverse a lane or roadway during a given period under prevailing roadway, traffic and control conditions.

Volume

Volume refers to the hourly rate (vehicles/hour), the actual flow rate for an approach or lane.

Volume to Capacity ratio (V/C)

Volume/capacity ratio (v/c) is a measure of intersection or roadway performance. It is the ratio of a number of vehicles on the road to the available capacity of the roadway. The road link capacity in the study area was rated based on the volume/capacity ratio. According to the National Department of Transport Manual for Traffic Impact Study (2012), the intersection capacity should be evaluated as follows:

- $v/c<1$: the intersection operates under capacity,
- $v/c=1$: the intersection operates at capacity, and
- $v/c>1$: the intersection operates over capacity.

8.1 DATA COLLECTION AND ANALYSIS

The effects of the COVID-19 pandemic have been the felt and the contagious nature of COVID-19 resulted in different governments implementing lockdowns with strict restrictions on movement in efforts to slow down the spread. The lockdowns had severe impacts across all sectors of the economy resulting in drastic changes on traffic patterns. The restrictions on movement resulted in less traffic on the road network. The implemented lockdown restrictions opened the South African economy to the possibilities of remote working which reduces the need to travel. It is certain at this point that COVID-19 will remain reality for the long foreseeable future but certainties around traffic patterns returning the old normal are not so clear.

The SMEC appointment arrived around March 2020 at the height of the COVID-19 pandemic. Unfortunately due to the covid-19 pandemic and associated lockdown, conducting new traffic counts in the area would not have resulted in the accurate representation of traffic under normal operating conditions. In light of this, SMEC used historical traffic counts available in the study area. The investigation revealed that a combination of weekday 2014 (5 counts) and 2018 (8 counts) traffic count data was available in the study area. The locations of the 12 traffic counts is shown in Figure 12.

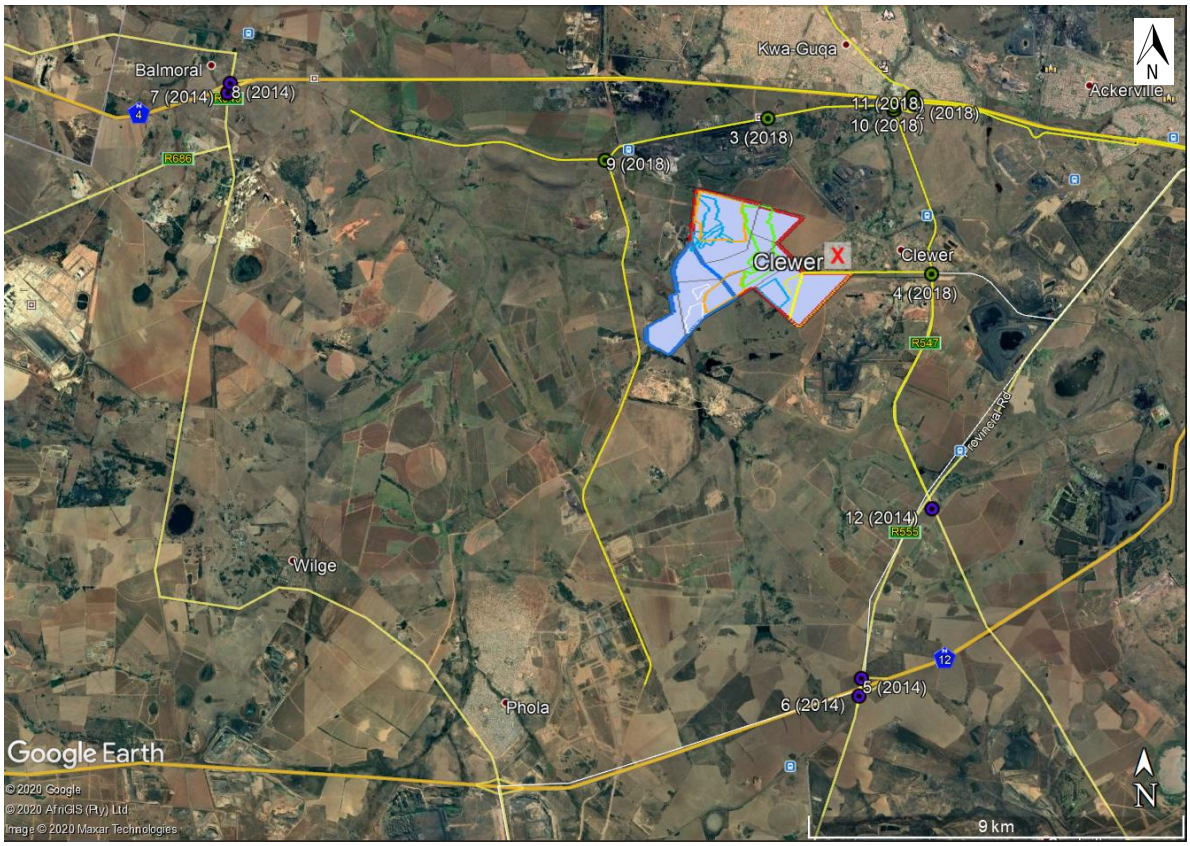


Figure 12: Historic Traffic Count Locations

The Emalahleni area is classified based as low growth area according to typical growth thresholds outlined in the COTO manual. The area is therefore expected to experience up to 3% per annum growth in traffic under normal conditions. The determined 3% pa growth rate was then applied to both the 2014 and 2018 traffic counts as a growth factor. Volumes for relevant intersections without historic data were estimated based on nearby surrounding available historic volumes. The factored up traffic is deemed to be the conservative true representation of the normal 2020 traffic conditions outside the COVID-19 pandemic period and was used as such.

A full list of intersections to be evaluated in this report are included in the following table. Intersections 3, 7, 8 and 9 are not directly affected by the development (Refer to Section 0: Trip Distribution) and further expansion on these intersections is not provided as the colliery effects on these intersections are minimal.

Table 4: List of Intersections

Intersection Number	Description
1	N4 Northern Interchange Terminal with R104
2	N4 Southern Interchange Terminal with R104
3	R104 with unnamed gravel road to Kwa-Guqa
4	Apex Road/ R547
5	N12 Northern Interchange Terminal with R555
6	N12 Southern Interchange Terminal with R555
7	N4 Southern Interchange Terminal with R545
8	N4 Northern Interchange Terminal with R545
9	R104 with unnamed gravel road towards N12
10	R104/ R547 Intersection
11	R547/ Collins Avenue Intersection
12	R547/ R555 Eastern Terminal
13	Provincial Road (R555)/ Apex Road Eastern Terminal
14	Provincial Road (R555)/ Apex Road Western Terminal
15	R547/ R555 Western Terminal

8.2 TRIP GENERATION

Trip generation rates are measured in units of trip ends, with either an origin or a destination at the development. It is the sum of traffic to or from a development. The Trip Generation Rates for Mining Operations are not provided for in the September 2013 TMH 17: South African Trip Data Manual. As such, the trip generation of the proposed mining activity was calculated based on first principles and the interpretation of data provided by the client.

The standard practices for studies such as this compels the author to quantify trip generation for the following stages:

- Planning Stage;
- Construction Stage;
- Operational Stage; and

- Decommissioning Stage.

The planning phase of the project entails compilation of various reports from various specialists located across the country and not necessarily based on site. There is negligible to no traffic generated during this stage and therefore will not be investigated in this report.

Similarly, the decommissioning phase will have negligible impact on the road network. The decommissioning phase is constituted by a 3 year period of steady ramp down of the mining activities. The two critical components of this study in terms of traffic and transportation are the construction and operation periods of this project.

8.2.1 CONSTRUCTION TRIPS

Elandsfontein Colliery is an existing mine with opencast and underground sections. The roads and operational infrastructure such as offices are already provided on site. The transportation of heavy construction equipment is expected to be minimal and it is recommended the transportation of heavy equipment only take place outside peak hours. The majority of the trips generated during the construction phase will primarily comprise of the construction labour personnel. The construction labour force will be shuttled to site by means of 15-seater minibuses to be provided by the contractor.

The total complement of staff during the operations of the colliery are 242 persons. Limited information is available on the construction labour requirements. It was therefore assumed that the maximum construction labour would be 30% higher than the operations labour rates. This means that the estimated maximum labour complement for the construction period would be 315 persons.

It was conservatively assumed that approximately 61 people will use their own vehicles to commute to and from site. The above will result in a total of **79 vehicles per hour** made up of 18 minibus taxis (shuttle service) and 61 private car vehicles as shown in Table 5.

Table 5: Estimated Construction Trip Generation

AM PEAK HOUR TRIP GENERATION				
TOTAL TRIPS	% IN	% OUT	IN	OUT
79	95%	5%	75	4
PM PEAK HOUR TRIP GENERATION				
79	5%	95%	9	80

8.2.2 OPERATIONAL TRIPS

The operational trips will occur once the mine is fully operational. These trips are split between:

- Labour trips; and
- Haul trips.

8.2.2.1 LABOUR TRIPS

The operational work force will work on three shifts over 24 hours. In order to estimate the trip generation of the labour force, a conservative approach of assuming the worst case scenario was adopted. The worst case scenario would be if the 24 hour shift was compressed into one with every member of the labour force arriving at the same time. The size and composition of the workforce is shown in the following table.

	Period							
Complement	**Year 1**	**Year 2**	***Year 3***	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Comment**
General Management	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*Own Vehicles*
Administration	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*Own Vehicles*
Mine Technical Services	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*Own Vehicles*
Mining Management	*1*	*6*	*6*	*7*	*7*	*7*	*3*	*Own Vehicles*
Mining Staff	83	138	*138*	76	76	76	30	Shuttle Service
Engineering Services	8	23	*23*	24	24	24	8	*Own Vehicles*
Stores	1	2	*2*	1	1	1	1	Shuttle Service
Plant and C&S Processing	12	28	*28*	28	28	28	28	Shuttle Service
Sub total	114	206	*206*	145	145	145	79	
Contractors								
Security	15	15	*15*	15	15	15	15	Shuttle Service
Transporter	16	16	*21*	21	21	21	21	Shuttle Service
Total Complement	**145**	**237**	***242***	**181**	**181**	**181**	**115**	

In order to estimate conservative trip generation for this period, the following assumptions were made:

- A shuttle service in a form of a 15 seater minibus will be provided by the mine;
- The general management of the mine, administrators, technical services, management and the engineering services personnel will all arrive in their own individual vehicles (35 individuals);
- The operational workforce will peak in year 3 with a total of 242 people; and
- 90% of trips would arrive in the peak hour while 10% would exit during the peak hour.

Based on the above, the worst case scenario will occur in year 3. A total of **50 vehicles per hour** will be generated by the labour force. The total will be made up of 35 private vehicles per hour and approximately 15 minibus taxis per hour as shown in Table 6.

Table 6: Operational Trip Generation (Labour)

AM PEAK HOUR TRIP GENERATION				
TOTAL TRIPS	% IN	% OUT	IN	OUT
50	90%	10%	45	5
PM PEAK HOUR TRIP GENERATION				
50	10%	90%	5	45

8.2.2.2 COAL TRANSPORTATION

The coal produced by the Elandsfontein mine will supply both the local and export markets. The local market coal will make up about 40% of the product and will be hauled from the mine to the Eskom Power Station located directly east of the mine. The offshore bound coal will be hauled by means of 32 ton trucks to the Oosbank Rail Siding located directly north ease of the site. The number of trucks to be used to haul coal from the mine to both the Eskom Power Plants and the rail siding were provided by the client. A maximum of 156 trucks per day annually are expected to transport the coal from the mine to the intended destination. A percentage of the total daily truck traffic will occur during the peak hour.

According to a paper published by J Simpson of TTT Africa in 2017, a study conducted in 2015 indicated that approximately 8.4% of the annual daily traffic occurs during the peak hours. For the purposes of this report, it was conservatively assumed that 15% of the daily truck trips (156) will occur during the peak hours as shown in Table 7.

Table 7: Operational Trip Generation (Haul)

AM PEAK HOUR TRIP GENERATION				
TOTAL TRIPS	% IN	% OUT	IN	OUT
23	10%	90%	2	21
PM PEAK HOUR TRIP GENERATION				
23	90%	10%	21	2

8.3 TRIP DISTRIBUTION

The trip generation trips were distributed onto the road network in the immediate vicinity of the development site. The sources of labour would most likely be the KwaGuqa townships on the north and the Emalahleni suburbs located directly north east. The distribution of the construction traffic is similar to the operational phase traffic in terms of labour. The truck traffic hauling coal to Eskom Power Stations is expected to travel south towards the N4. The trip distribution of the labour construction and operational traffic is depicted in Figure 13. Figure 14 depicts the estimated trip distribution of the haul operational traffic. Detailed Stick Diagrams indicating this distribution are included in Appendix C.

Figure 13: Labour Trip Distribution

Figure 14: Heavy Vehicle (Haul) Operational Trip Distribution

9 RECEIVING ENVIRONMENT

Emalahleni formerly known as Witbank is a coal mining town located in the province of Mpumalanga. The area is also known for the hosting some of the Eskom power generating fleet. The product mined in area is transported to various markets through both rail and road. The road transportation is by means of heavy trucks. This chapter deals with the road network in and around the study area.

9.1 SURROUNDING ROAD NETWORK

The site is bounded by two major regional connectors, the N4 and N12 providing direct connections to both Johannesburg and Pretoria. Emalahleni is located directly east with Kendal power station located approximately 39km south of the development site. The road network in the immediate vicinity of the development was classified according to the COTO South African Road Classification and Access Management Manual TRH26. The road network is shown in Figure 15 and hierarchy summarized below.

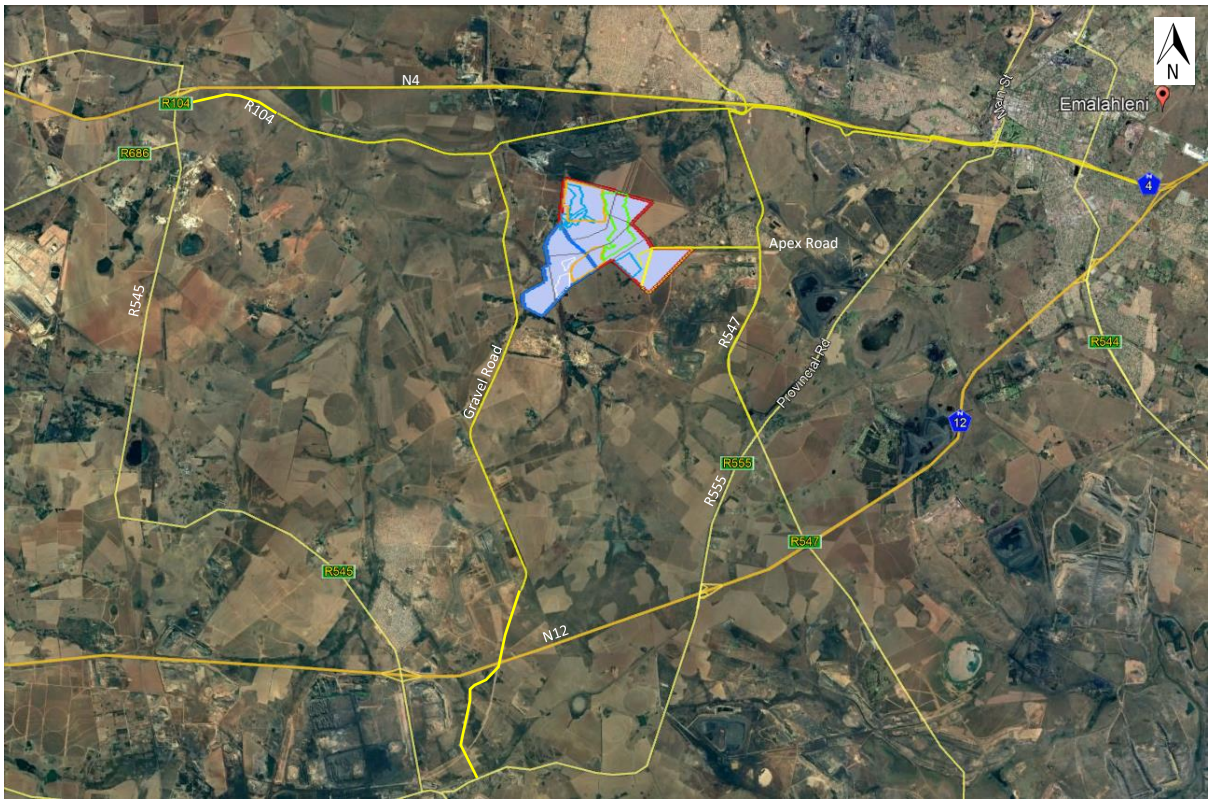


Figure 15: Road Hierarchy

- **N12 Highway:** A paved Class 1 national dual carriageway road traversing east west proving direct access to Pretoria to the west and Nelspruit to the east. It is located directly north of the development site and served by two lanes per direction. The condition of this road is good and carries high volumes of traffic during both AM and PM peak hours.
- **N4 Highway:** A paved Class 1 national dual carriageway road traversing east west proving direct access to Johannesburg to the west and Nelspruit to the east. It is located directly south of the development site and served by two lanes per direction. The condition of this road is good and carries high volumes of traffic during both AM and PM peak hours.

- **R555:** A paved Class 2 provincial road traversing north south providing direct access to both the N4 and the N12 national roads. It is located directly east of the development site and served by one lane per direction. The condition of this road is fair and carries low volumes of traffic during both AM and PM peak hours.
- **R104:** A paved Class 2/3 provincial road traversing north south providing direct access into the KwaGuqa Township. The portion located north of the N4 Highway is that of a class 3 road proving a minor arterial role to the township of KwaGuqa. It is located directly north of the development site and served by one lane per direction. The condition of this road is fair and carries average volumes of traffic during both AM and PM peak hours.
- **R547:** A paved Class 3 provincial road traversing north south providing a crucial north south linkage for both the proposed development and for the residences of the Clewer settlements. It is located directly east of the development site and served by one lane per direction. The condition of this road is fair and carries low volumes of traffic during both AM and PM peak hours.
- **Apex Road:** A paved Class 4 municipal road traversing east west providing a crucial east west linkage for both the proposed development and for the residences of the Clewer settlements. It is located directly east of the development site and served by one lane per direction. The condition of this road is fair and carries low volumes of traffic during both AM and PM peak hours.
- **Gravel Road**: A graveled Class 4 road traversing north south providing additional north-west linkage. It is located directly west of the development site. The condition of this road is poor and carries low volumes of traffic during both AM and PM peak hours.

9.2 EXISTING INTERSECTION CAPACITY ANALYSIS AND CONDITIONS

The estimated 2020 peak hour traffic volumes are depicted Figure 1 in Appendix C. The detailed capacity results for the 2020 existing conditions are shown in Appendix D.

9.2.1 INTERSECTION 1: N4 / R104 INTERCHANGE (NORTH TERMINAL)

The intersection is a priority controlled intersection. The north and south approaches are served by two lanes in each direction. The off ramp is currently served by a single lane. Figure 16 shows the intersection layout.

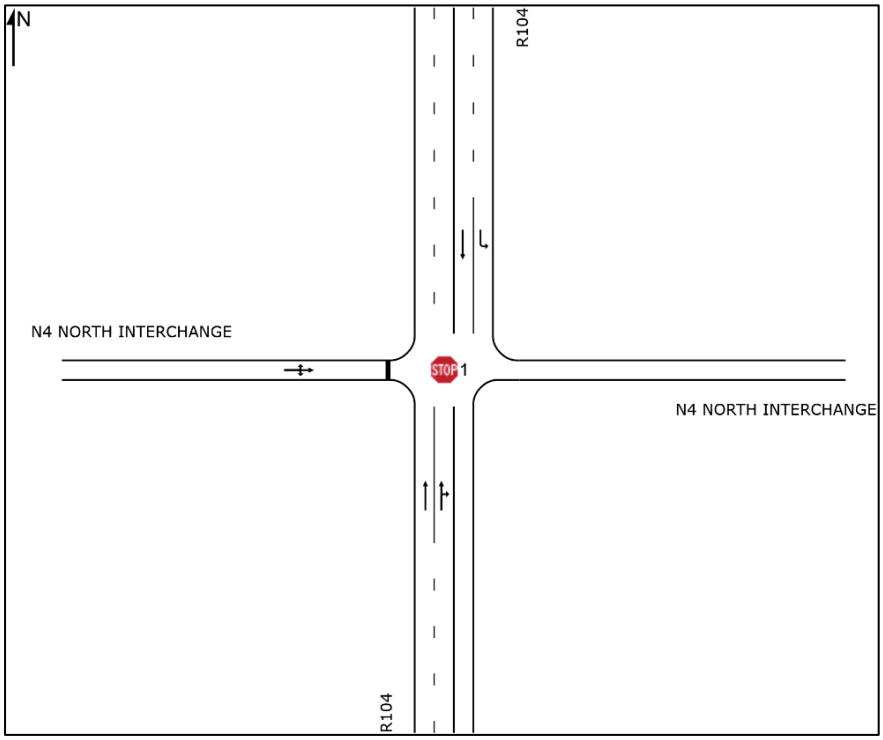


Figure 16: Intersection 1 Existing Layout

The west and south approaches are currently operating at poor LOS F during the AM Peak hour. The west approach (off ramp) is currently operating at poor LOS F during the PM Peak hour. A traffic signal is proposed to improve operations at this intersection. The traffic signal should be completed with a conversion of the left turning lane into a continuous left slip lane. The continuous slip lane should be complemented by a short 60m exit lane on the on ramp as shown in Figure 17.

The south and west approaches are expected to improve to LOS A and LOS C respectively as seen in the results table in Appendix D. The west approach is expected to improve to LOS D during the PM Peak hour as shown in the results table in Appendix D.

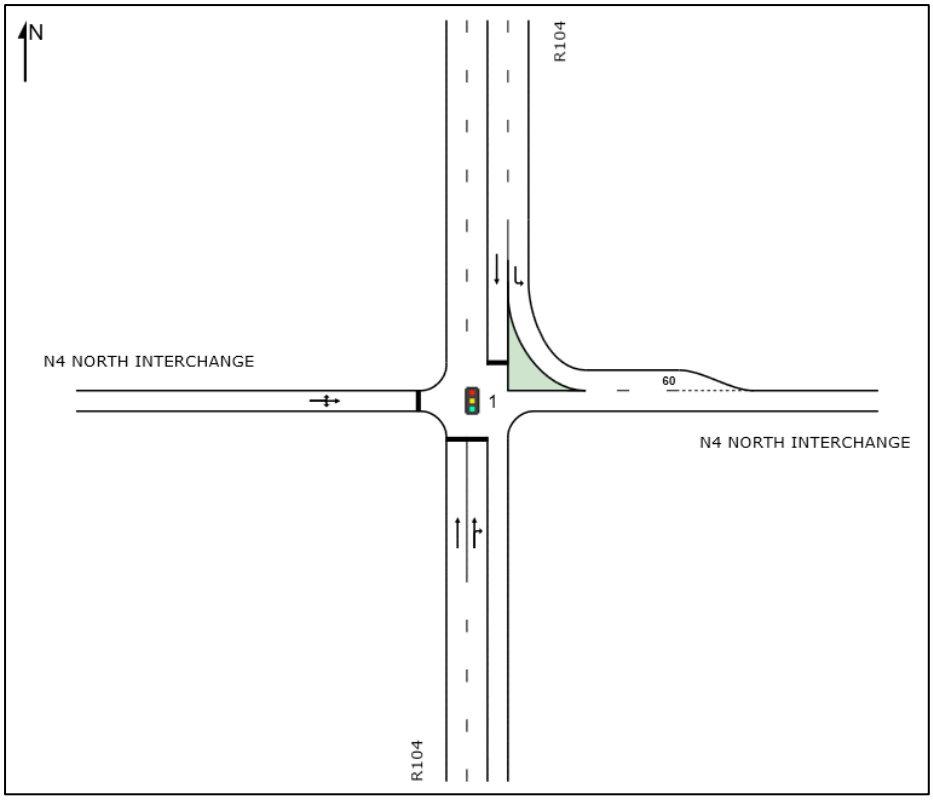


Figure 17: Intersection 1 Proposed Layout (Background Traffic)

9.2.2 **INTERSECTION 2: N4 / R104 INTERCHANGE (SOUTH TERMINAL)**

The intersection is a priority controlled intersection. The north and south approaches are served by a single lane per direction. The off ramp is currently served by a single lane. Figure 18 shows the intersection layout.

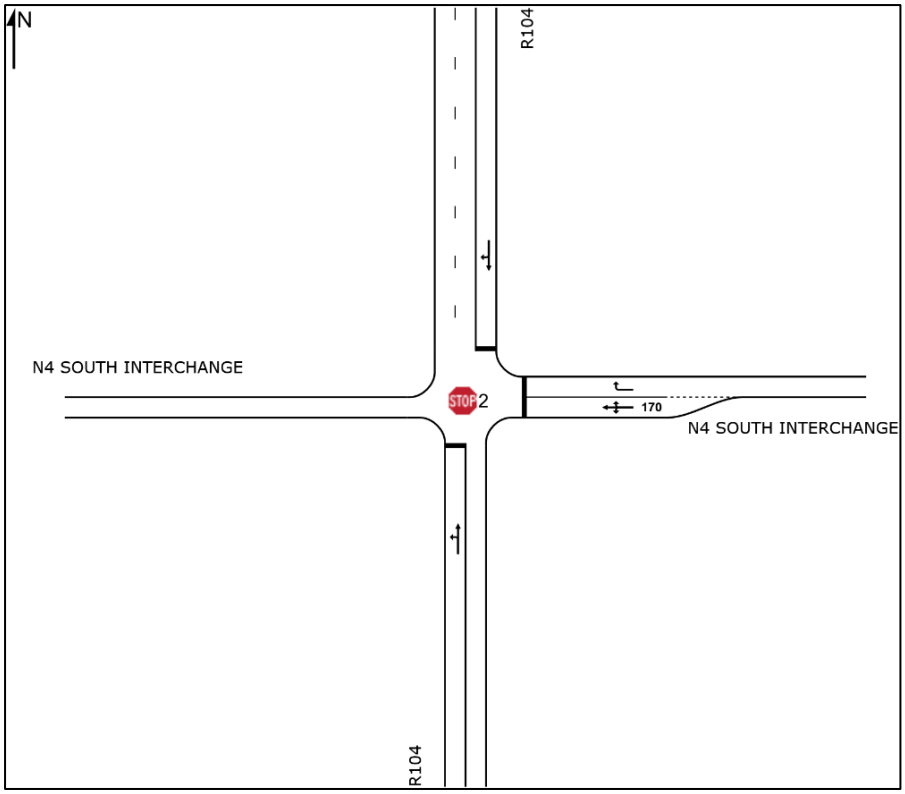


Figure 18: Intersection 2 Existing Layout

The intersection is currently operating at poor LOS F during both the AM and PM Peak hours. A traffic signal is proposed. The traffic signal should be completed with an exclusive short right turn lane on the north approach as shown in Figure 19. The proposed upgrade will improve the intersection operations to LOS A and LOS C during the AM and PM Peak hours respectively as shown in Appendix D.

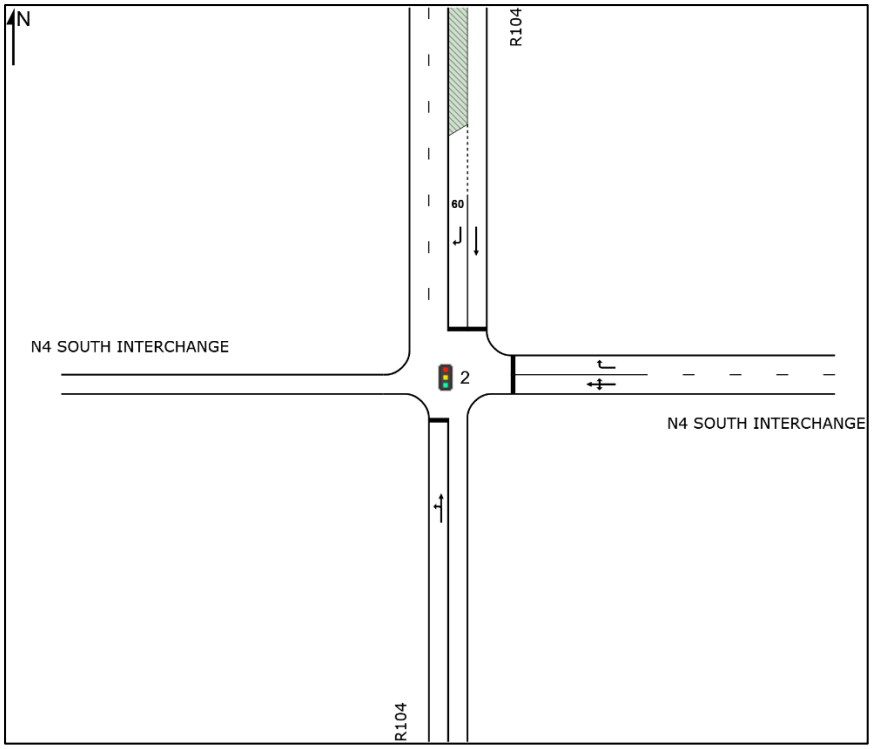


Figure 19: Intersection 2 Proposed Layout (Background Traffic)

9.2.3 INTERSECTION 3: R104 / UNNAMED GRAVEL ROAD TO KWA-GUQA

This informal intersection is a priority controlled intersection. The east and west approaches are served by a single lane per direction as shown in Figure 20.

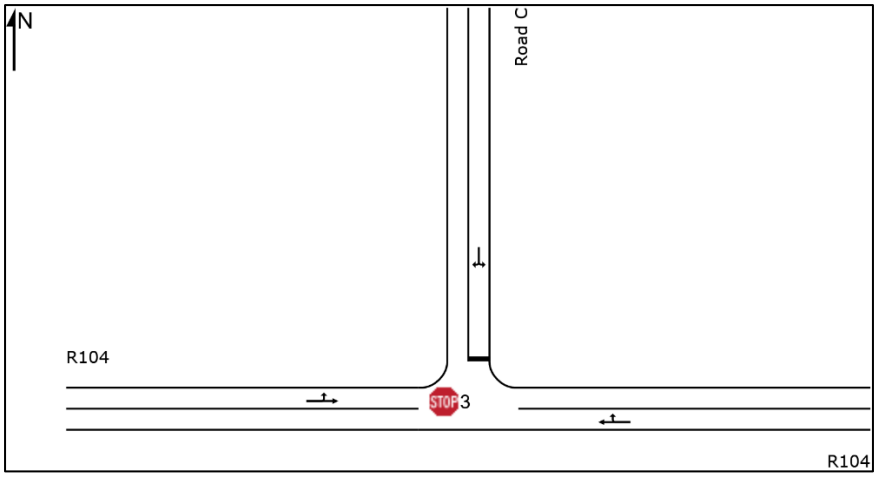


Figure 20: Intersection 3 Existing Layout

All approaches are currently operating acceptable LOS during both the AM and PM Peak Hours. No upgrades required.

9.2.4 INTERSECTION 4: R547 / APEX ROAD

The intersection is an all way stop junction served by a single lane from all directions. The north approach has a supplementary short left turn lane as shown in Figure 21.

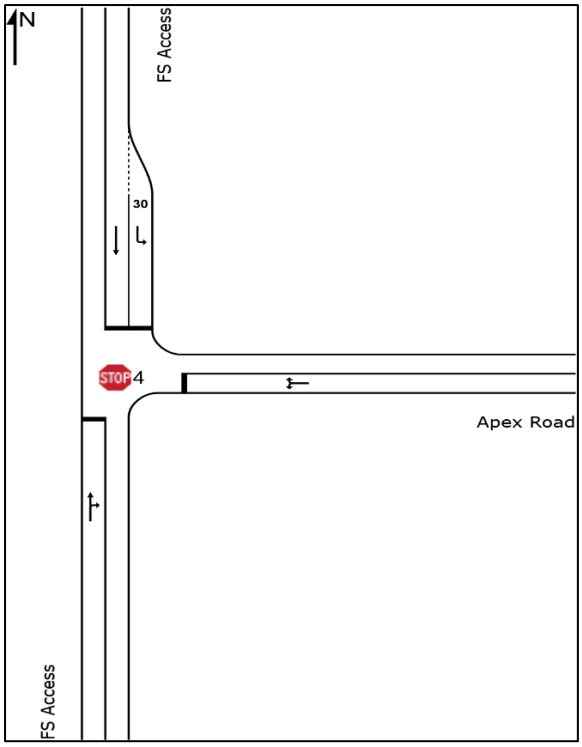


Figure 21: Intersection 4 Existing Layout

The south approach is currently operating at poor LOS F during the PM Peak hour. It is proposed that this intersection be converted to a traffic signal. The traffic signal should be complemented with a short right turn lane as shown in Figure 22. The south approach is expected to improve to LOS B during the PM Peak hour as seen in the analysis results in Appendix D.

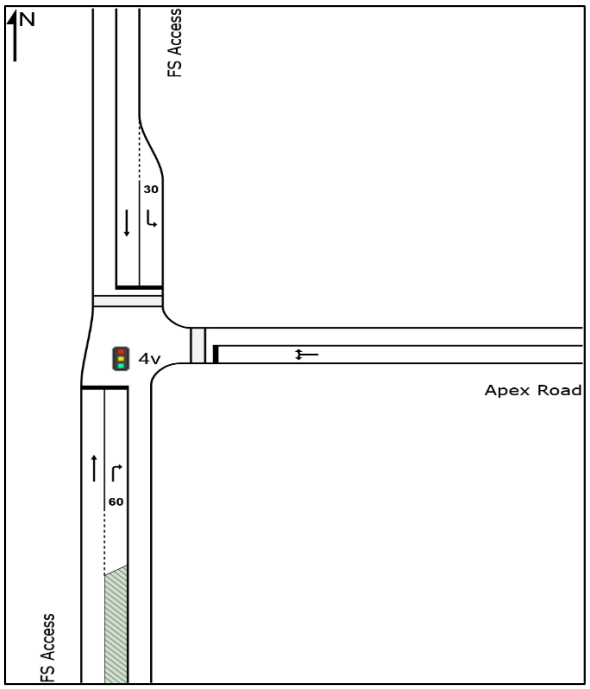


Figure 22: Intersection 4 Proposed Layout (Background Traffic)

9.2.5 INTERSECTION 5: N12 / R555 INTERCHANGE (NORTH TERMINAL)

The intersection is a priority controlled with the east approach (off ramp) forming a minor leg. The south approach is served by two full through lanes and a short right lane. The north approach is served by one full through lane, a short 180m additional through and a short 30m left turn lane. The off ramp or east approach is served by a single lane as shown in **Figure 23**.

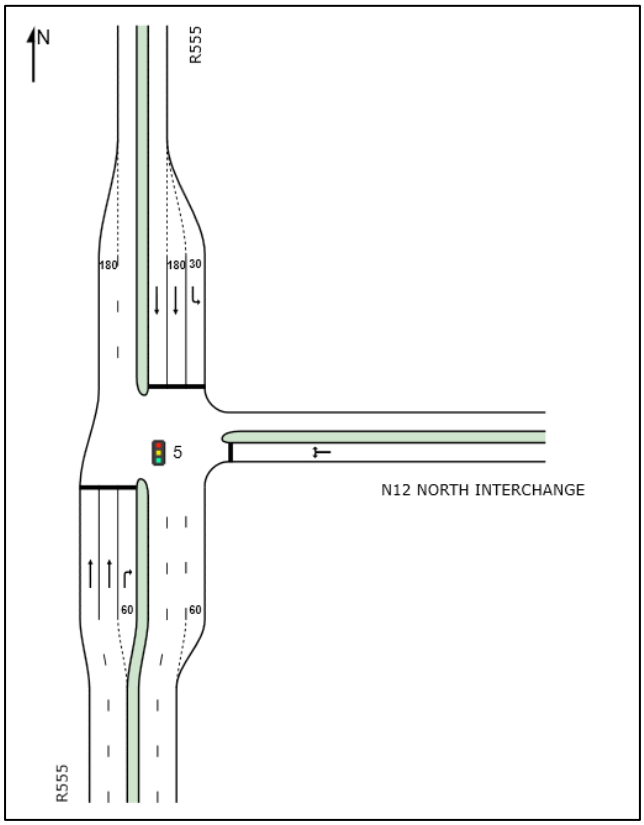


Figure 23: Intersection 5 Existing Layout

The east approach is currently operating at poor LOS F during both the AM and PM Peak hours. It is proposed that the intersection be converted to a signalised intersection. The east approach is expected to improve to LOS C and LOS D during the AM and PM Peak hours respectively as shown in the results table attached in Appendix D.

9.2.6 INTERSECTION 6: N12 / R555 INTERCHANGE (SOUTH TERMINAL)

The intersection is a priority controlled with the east approach (on ramp) forming a minor leg. The south approach is served by two full through lanes and a short right lane. The north approach is served by two through lanes and a short 30m left turn lane. The off ramp or east approach is served by a single lane as shown in **Figure 24**.

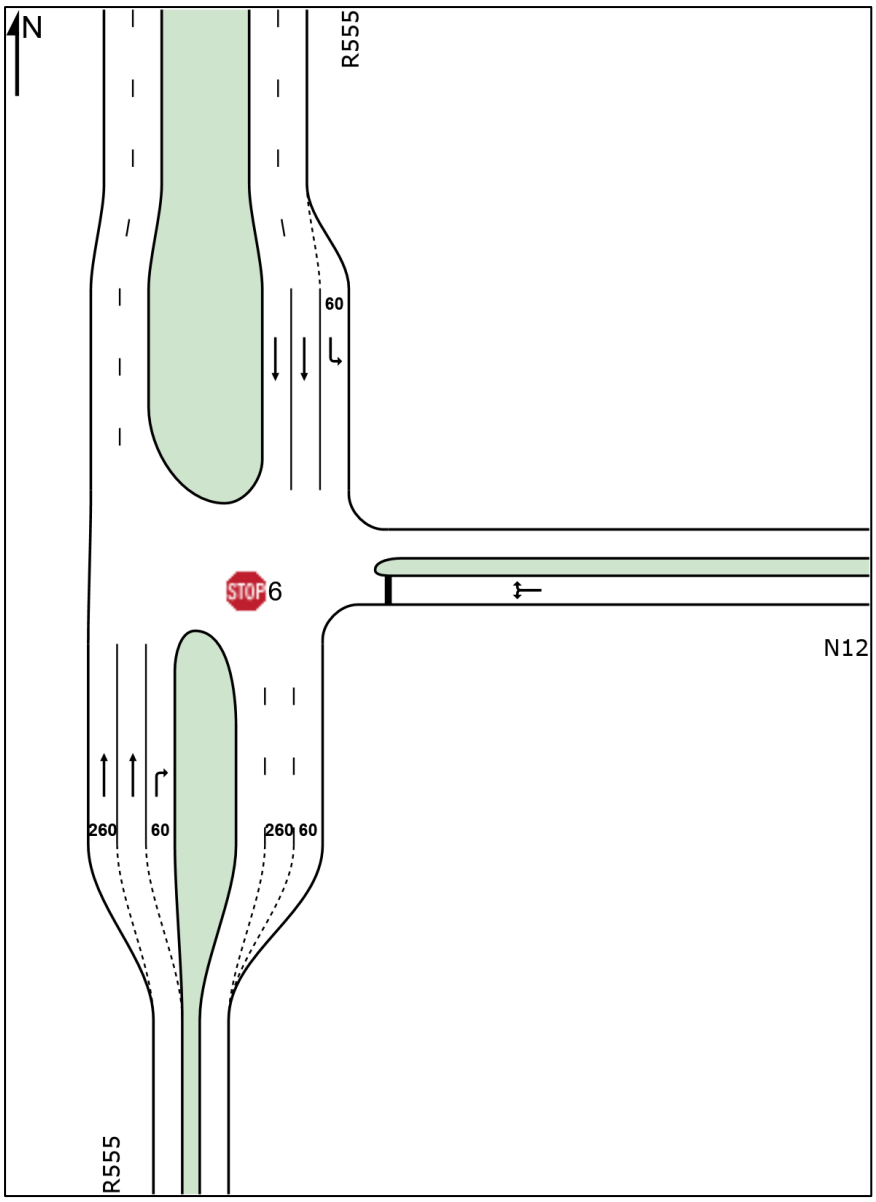


Figure 24: Intersection 6 Existing Layout

All approaches are currently operating at acceptable LOS ranging from A to D during both the AM and PM Peak hours.

9.2.7 INTERSECTION 7: N4 / R545 INTERCHANGE (SOUTH TERMINAL)

The intersection is a priority controlled with the east approach (off ramp) forming a minor leg. The south approach is served a single lane. The north approach is served by a single through lane and a short 60m right turn lane. The off ramp or east approach is served by a single lane as shown in **Figure 25**.

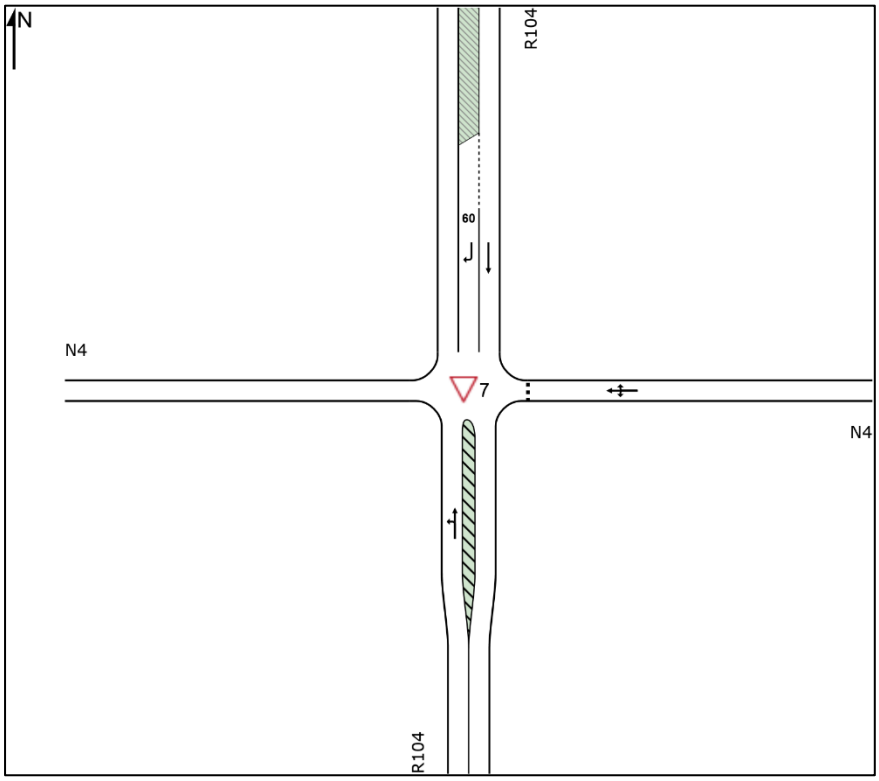


Figure 25: Intersection 7 Existing Layout

All approaches are currently operating at acceptable LOS ranging from A to D during both the AM and PM Peak hours.

9.2.8 INTERSECTION 8: N4 / R545 INTERCHANGE (NORTH TERMINAL)

The intersection is a priority controlled with the west approach (off ramp) forming a minor leg. The north approach is served a single lane. The south approach is served by a single through lane and a short 60m right turn lane. The off ramp or east approach is served by a single lane as shown in **Figure 26**.

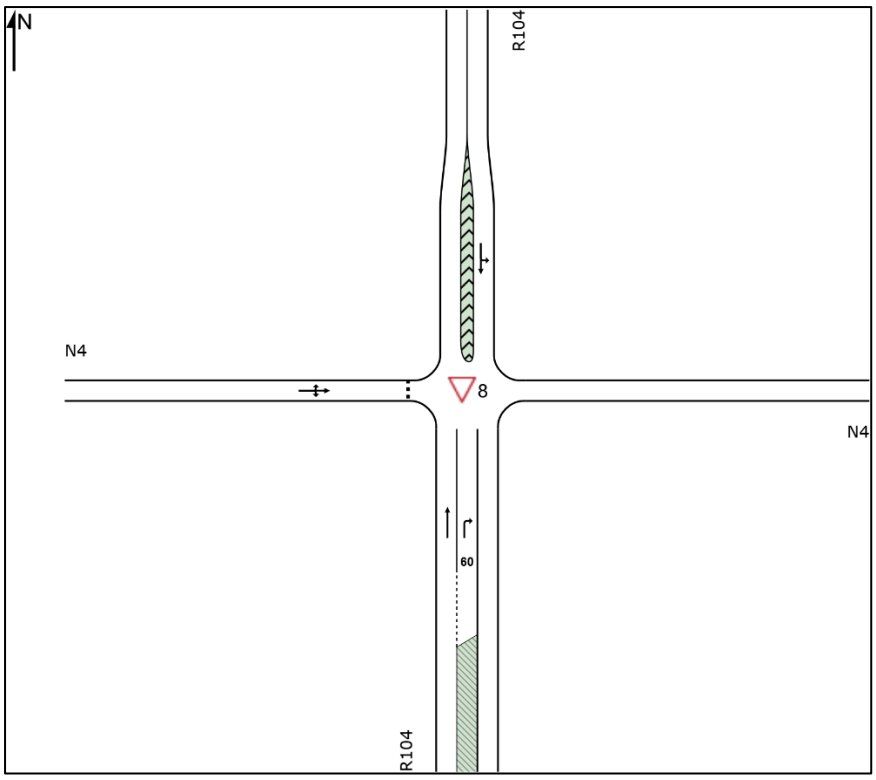


Figure 26: Intersection 8 Existing Layout

All approaches are currently operating at acceptable LOS ranging from A to B during both the AM and PM Peak hours.

9.2.9 INTERSECTION 9: R104 / GRAVEL ROAD

The intersection is a priority controlled with the south approach forming a minor leg. The east and west approaches are served by a single lane. The south approach is served by a single lane as shown in Figure 27.

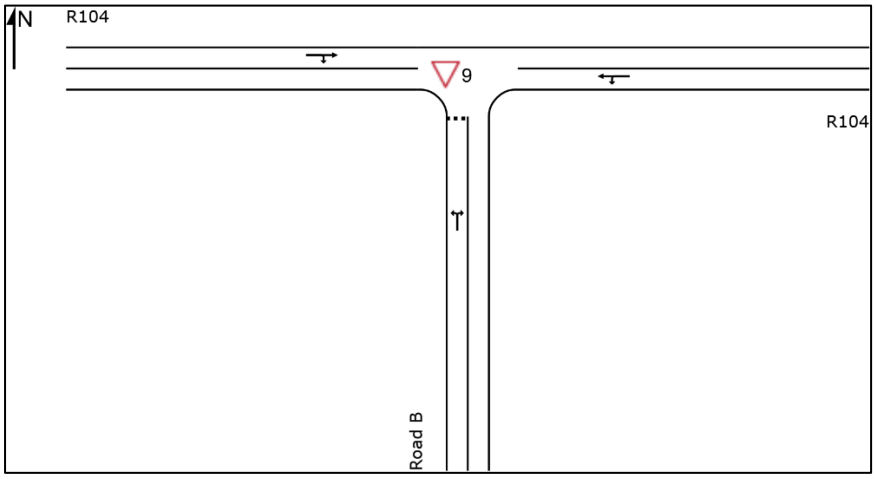


Figure 27: Intersection 9 Existing Layout

All approaches are currently operating at acceptable LOS A during both the AM and PM Peak hours.

9.2.10 **INTERSECTION 10: R104 / R547 / ENGEN FS ACCESS**

The intersection is an all way stop junction served by a single lane from on the north and south approaches. The east and west approaches are served by a single full shared through and left plus short shared through and right turn lanes as shown in Figure 28.

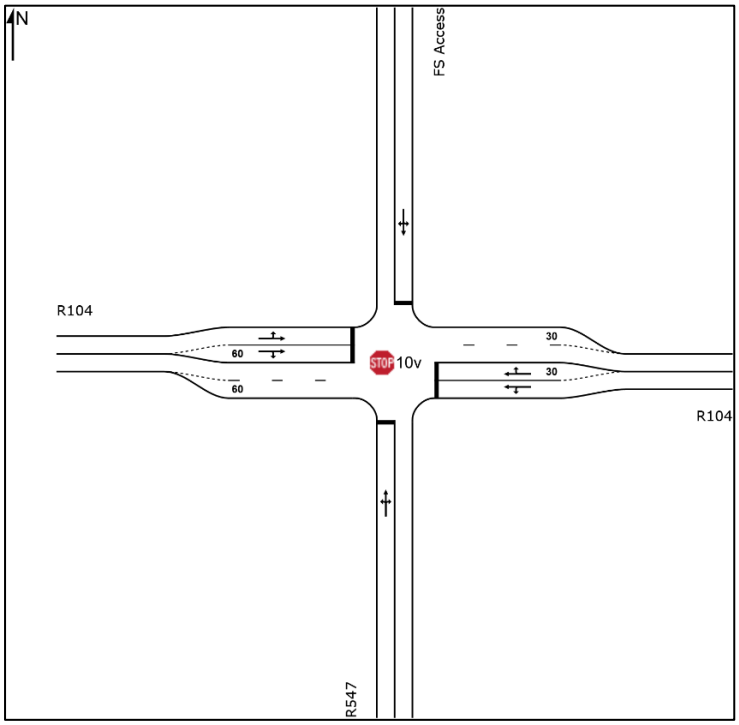


Figure 28: Intersection 10 Existing Layout

The south approach is currently operating at poor LOS F during the PM peak hour. It is proposed that this intersection be converted to a signalised junction with turning lanes as shown in **Figure 29**.

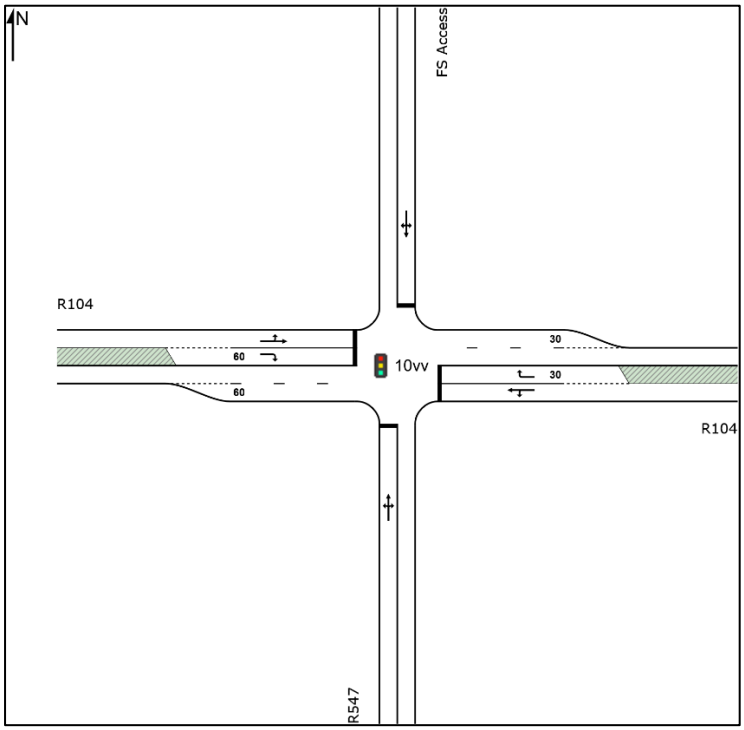


Figure 29: Intersection 10 Proposed Layout (Background Traffic)

The proposed upgrade will improve capacity operations at this intersection. The south approach is expected to operate at LOS C during the PM Peak hour once the upgrade is implemented as shown in the results table in Appendix D.

9.2.11 **INTERSECTION 11: R104 / GRAVEL ROAD**

The intersection is a priority controlled with the east approach forming a minor leg. The intersection is currently served by a single lane on all approaches as shown in **Figure 30**.

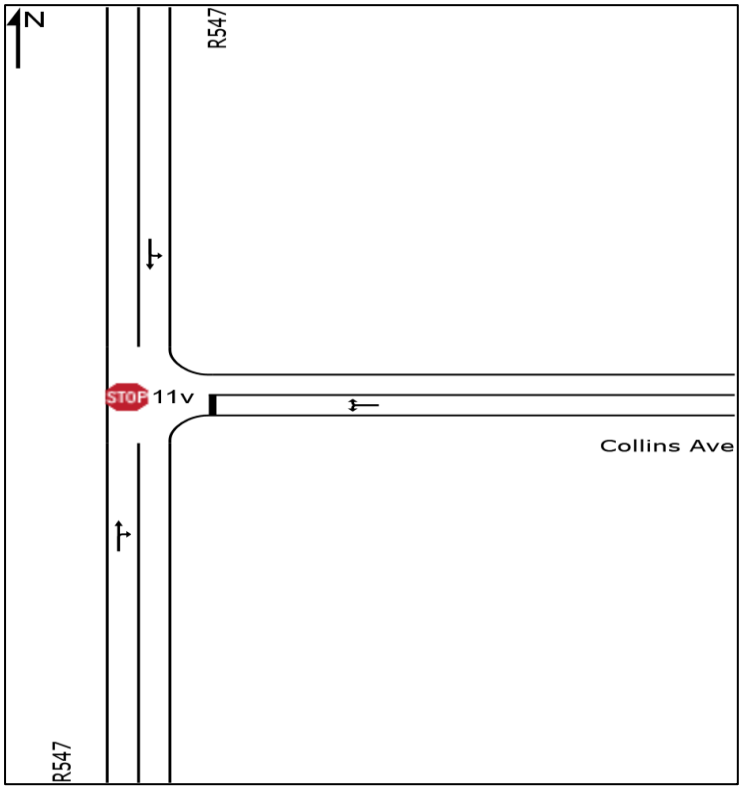


Figure 30: Intersection 11 Existing Layout

All approaches are currently operating at acceptable LOS ranging from A to C during both the AM and PM Peak hours.

9.2.12 **INTERSECTION 12: R547 / R555 QUARTER LINK (NORTH TERMINAL)**

This is a two way priority controlled intersection with the north and south approaches of R547 forming the major legs. The two major approaches are served by a full shared through and right turn lanes completed by short left turn lanes. The minor legs are served by a single lane as shown in **Figure 31**.

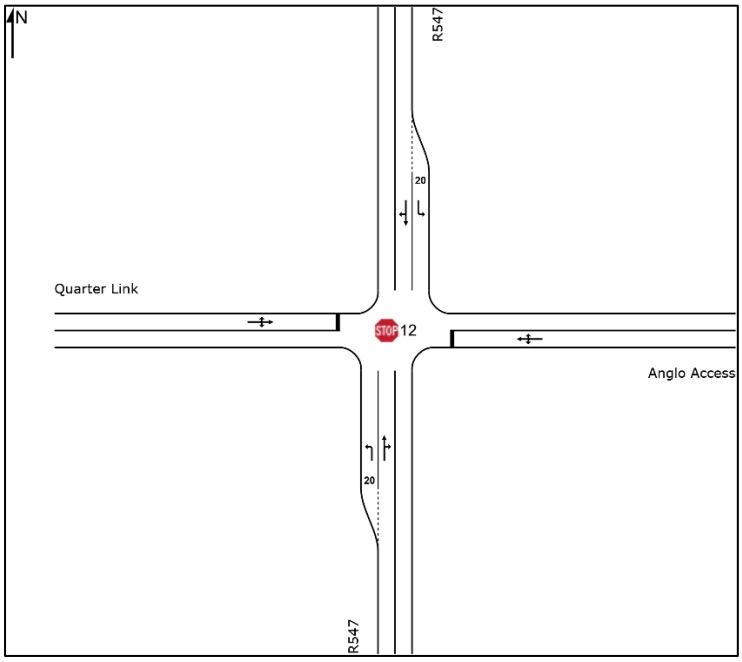


Figure 31: Intersection 12 Existing Layout

All approaches are currently operating at acceptable LOS ranging from A to B during both the AM and PM Peak hours.

9.2.13 INTERSECTION 13: R555 / R547 QUARTER LINK (SOUTH TERMINAL)

This is a two way priority controlled intersection with the east approach forming a minor leg. The south approach is served by one full shared through and right turn lane supported a short passing lane. The north approach is served by a full through lane and full left turn lane. The east approach is served by a single lane as shown in **Figure 32**.

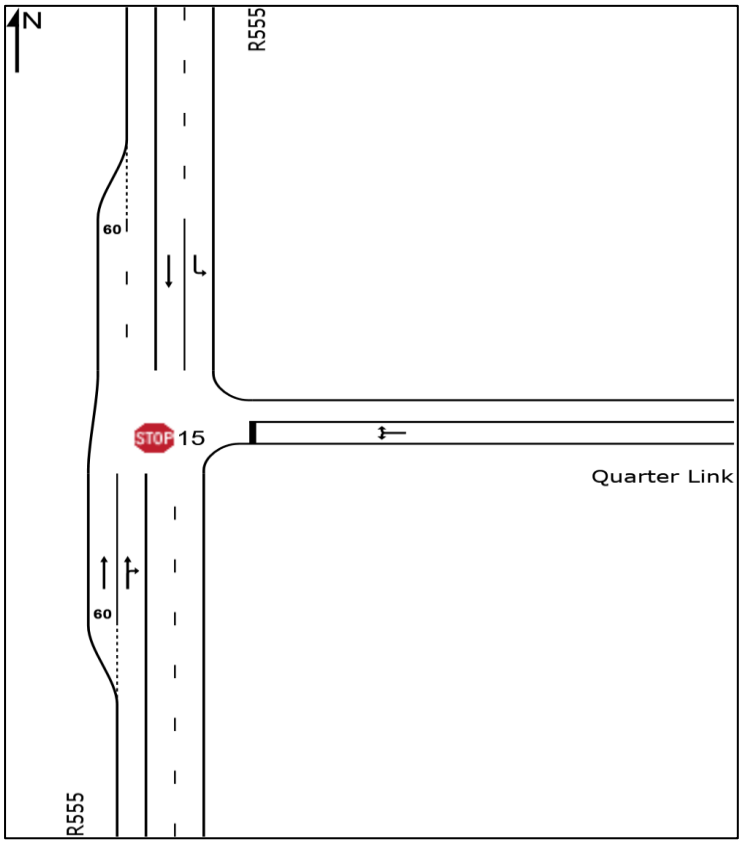


Figure 32: Intersection 13 Existing Layout

All approaches are currently operating at acceptable LOS ranging from A to B during both the AM and PM Peak hours.

9.2.14 INTERSECTION 14: APEX ROAD / R555 QUARTER LINK (NORTH TERMINAL)

This is a two way priority controlled intersection with the south approach forming a minor leg. The east and west approaches are served by a single lane per direction. The south approach is served by a single lane as shown in **Figure 33**.

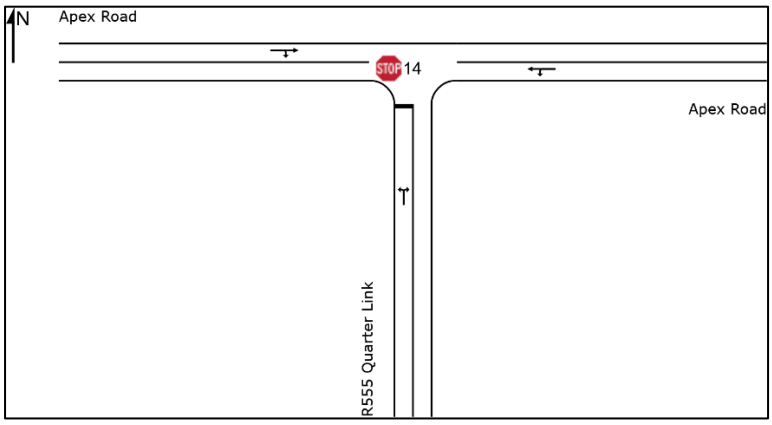


Figure 33: Intersection 14 Existing Layout

All approaches are currently operating at acceptable LOS A during both the AM and PM Peak hours.

9.2.15 INTERSECTION 15: R555 / R547 QUARTER LINK (SOUTH TERMINAL)

This is a two way priority controlled intersection with the east approach forming a minor leg. The south approach is served by two lanes. The north approach is served by a full through lane and full left turn lane. The east approach is served by a single lane as shown in **Figure 34**.

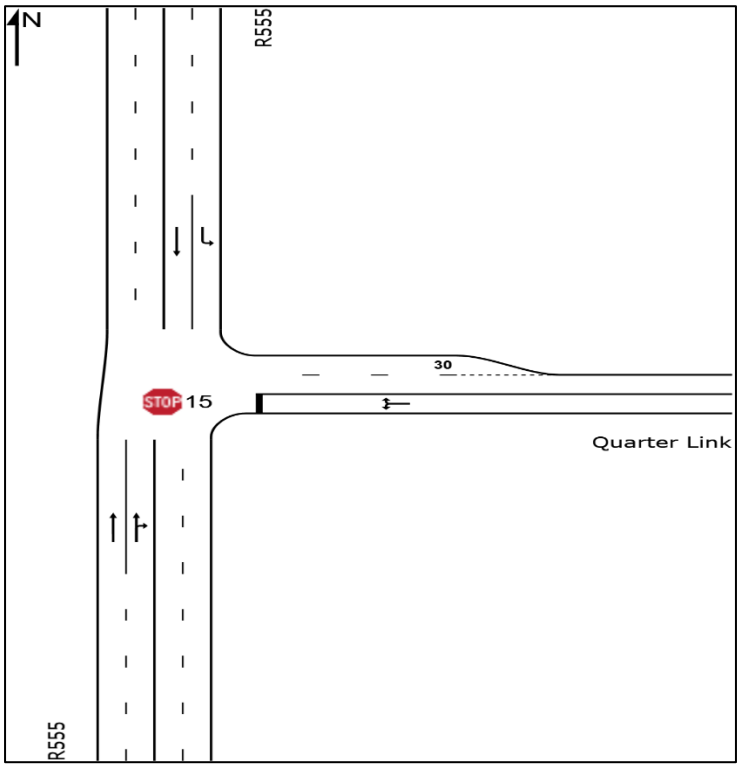


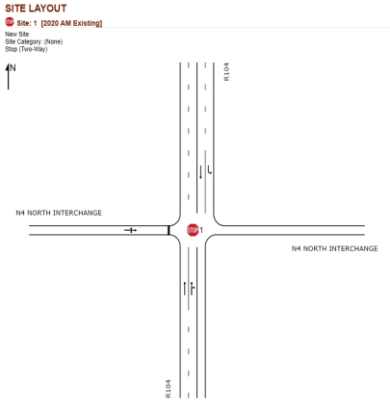
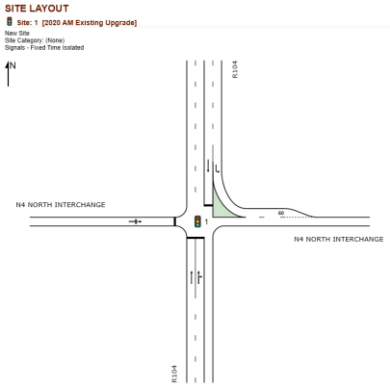
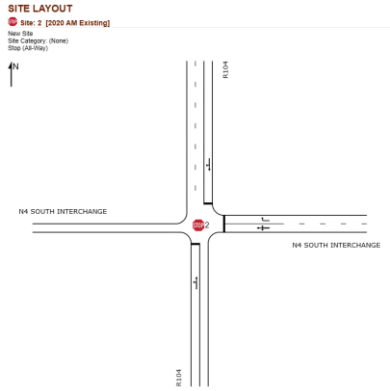
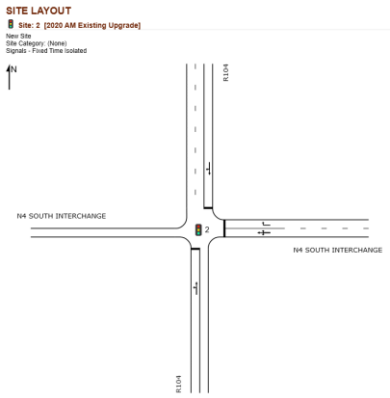
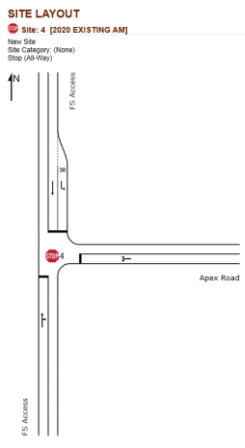
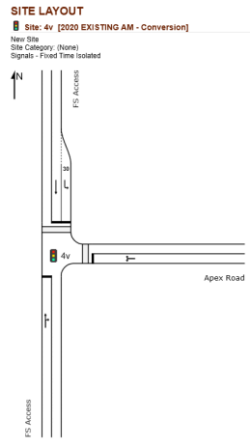
Figure 34: Intersection 15 Existing Layout

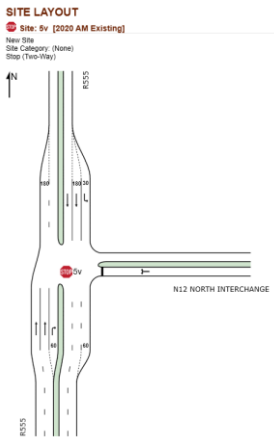
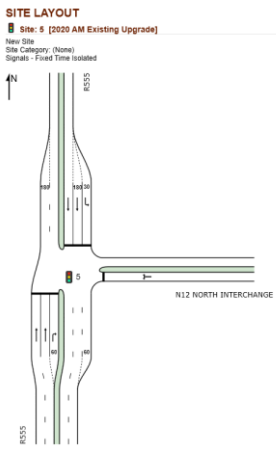
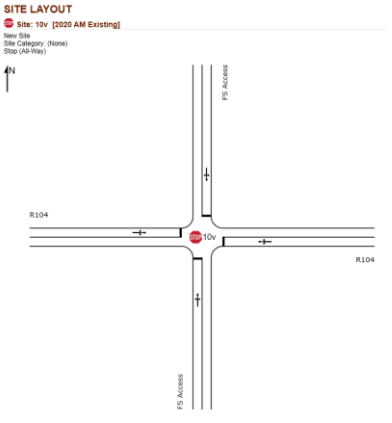
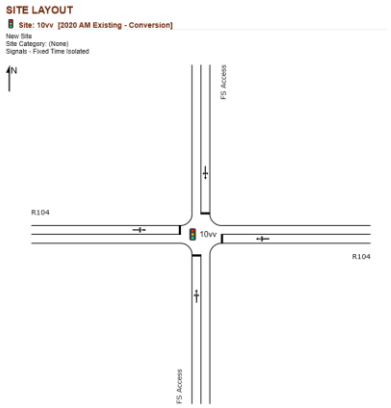
All approaches are currently operating at acceptable LOS ranging from A to C during both the AM and PM Peak hours.

9.3 SUMMARY OF EXISTING UPGRADES REQUIRED

The following table illustrates the mitigation measures required based on the analysis undertaken. The proposed mitigation measures are required to improve the existing intersection capacities. As no new development traffic was used in this analysis, upgrade costs are the responsibility of relevant road authorities.

Table 8: Intersection Upgrades required to meet 2020 Background Traffic Demand

Intersection	Required Upgrade	Existing Layout	Proposed Layout required to meet Background Demand
1	Signalise Intersection Convert left lane from northern approach to left turning slip lane Add short 60m exit lane on eastern leg		
2	Signalise Intersection		
4	Signalise Intersection		

5	Signalise Intersection		
10	Signalise Intersection		

9.4 2026 BACKGROUND TRAFFIC INTERSECTION CAPACITY ANALYSIS AND CONDITIONS

The estimated 2020 peak hour traffic volumes are depicted Figure 1 in Appendix C. The detailed capacity results for the 2020 existing conditions are shown in Appendix D.

9.4.1 INTERSECTION 1: N4 / R104 INTERCHANGE (NORTH TERMINAL)

The intersection layout required to meet the 2020 existing traffic demand is shown in the following figure. This layout is still expected to require additional upgrades by 2026 as the North approach reaches LOS E when the

2026 background traffic (excluding colliery) is imposed on the network. The detailed capacity results are shown in Appendix D.

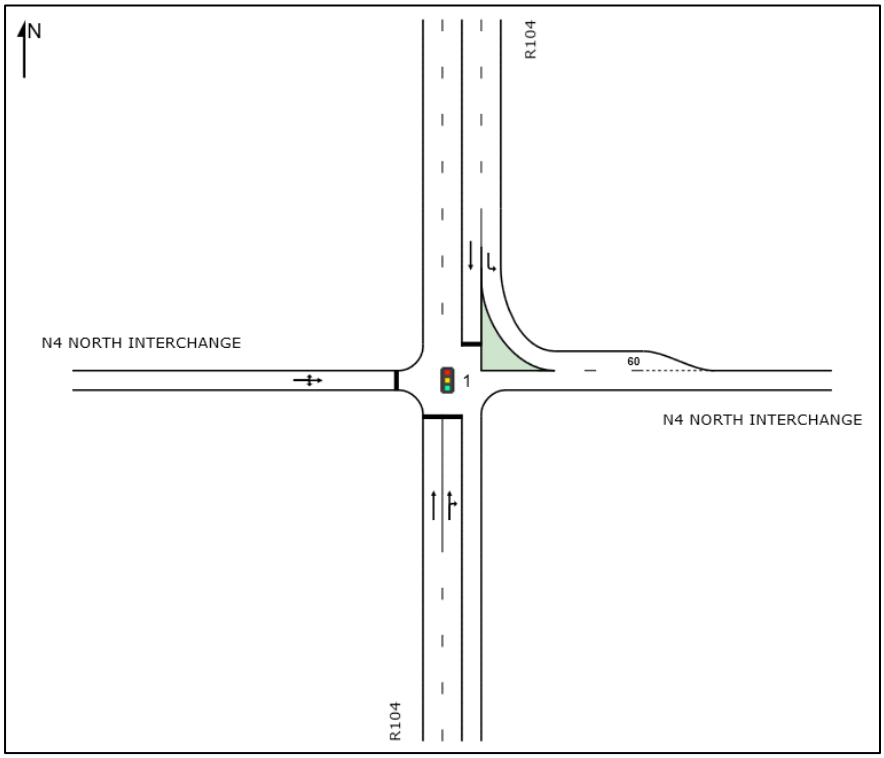


Figure 35: Intersection 1 Proposed Layout (Background Traffic)

In order to improve the level of service of this intersection to accommodate the 2026 background traffic, an additional short left turn lane on the north approach is recommended. This is shown in the following figure.

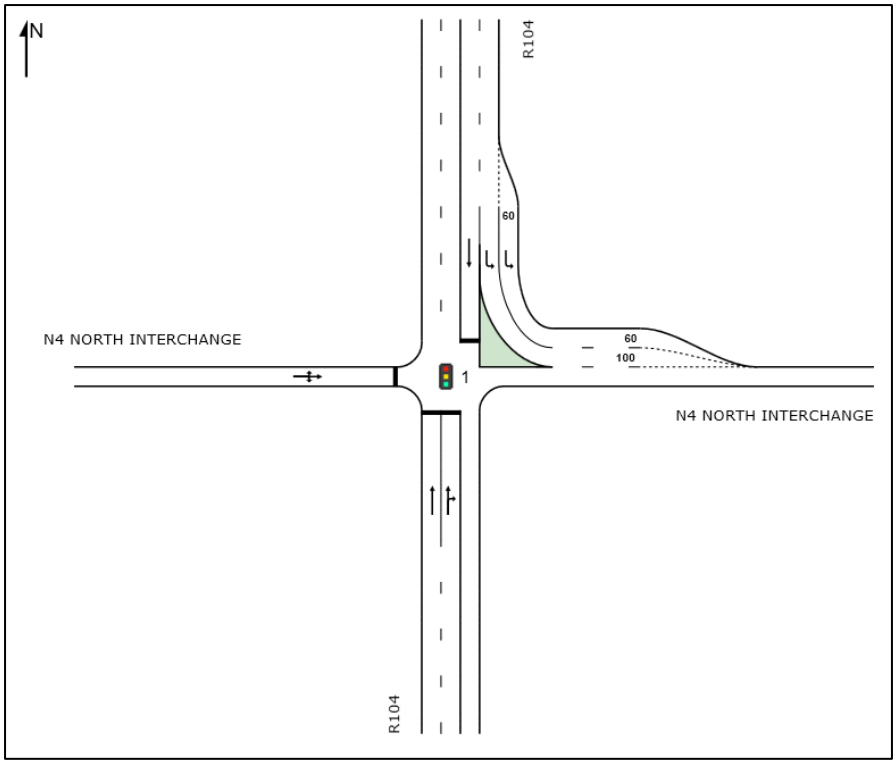


Figure 36: Intersection 1 Proposed Layout (2026 Background Traffic)

9.4.2 INTERSECTION 2: N4 / R104 INTERCHANGE (SOUTH TERMINAL)

The intersection layout required to meet the 2020 existing traffic demand is shown in the following figure. No further recommendations to upgrade the intersection are made for the 2026 background traffic scenario. Even though the East approach operates at an unacceptable LOS E during the PM peak hour for this scenario, redesign of the interchange is required to accommodate the background traffic.

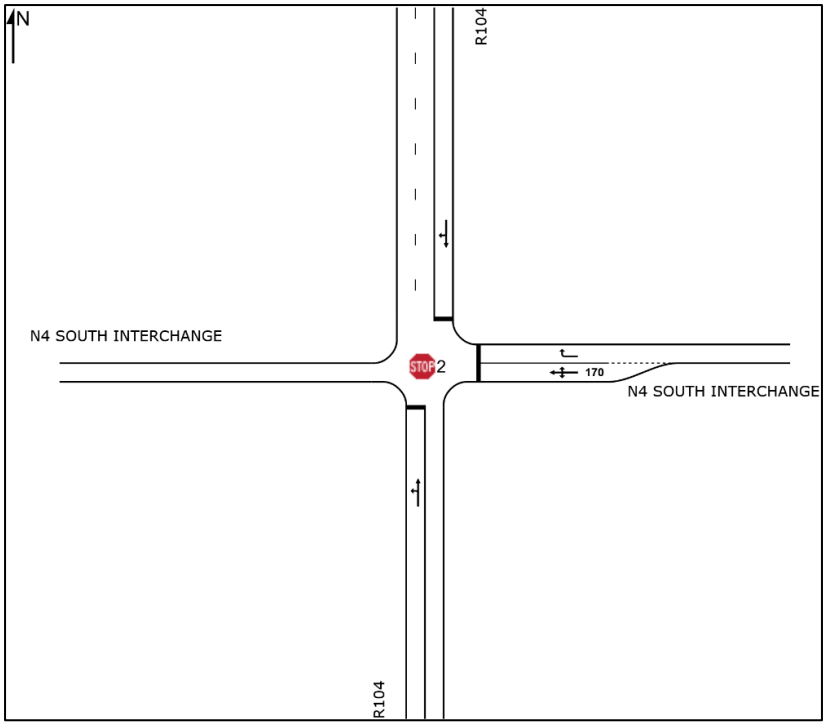


Figure 37: Intersection 2 Existing Layout

9.4.3 INTERSECTION 4: R547 / APEX ROAD

This intersection should be converted to a traffic signal to accommodate existing traffic. The traffic signal should be complemented with a short right turn lane as shown in the following figure. An extra western leg is required to accommodate the trucks (unrelated to Elandsfontein Colliery) stopping on this portion of road. Refer to Section 6.3 for development access information. The current staggered access is sufficient to support trucks accessing Elandsfontein Colliery, however potential redesign of these two intersections by local road authorities to address existing safety concerns is recommended following a road safety audit.

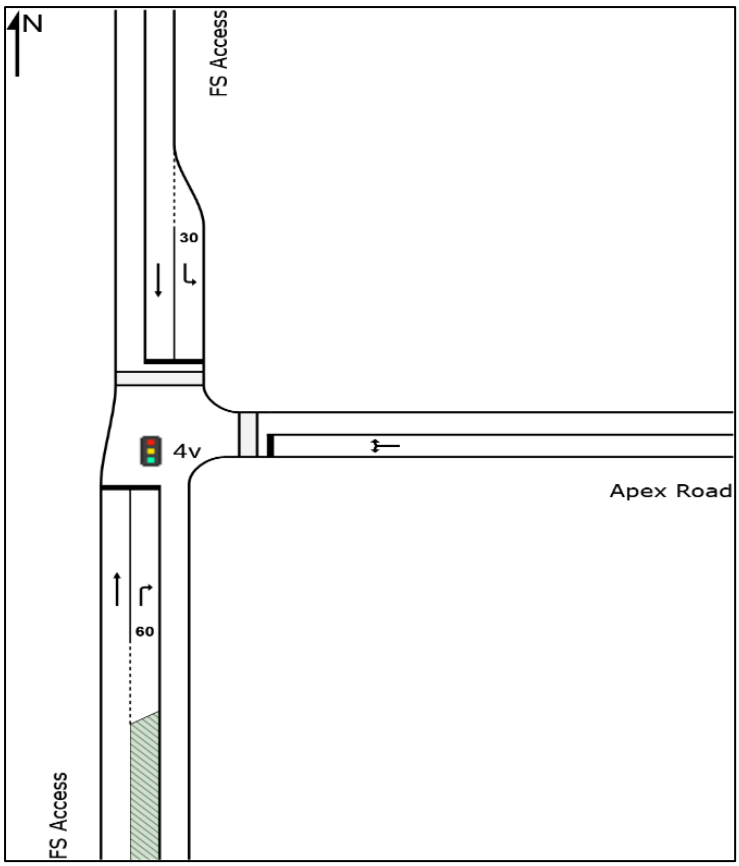


Figure 38: Intersection 4 Proposed Layout (Background Traffic)

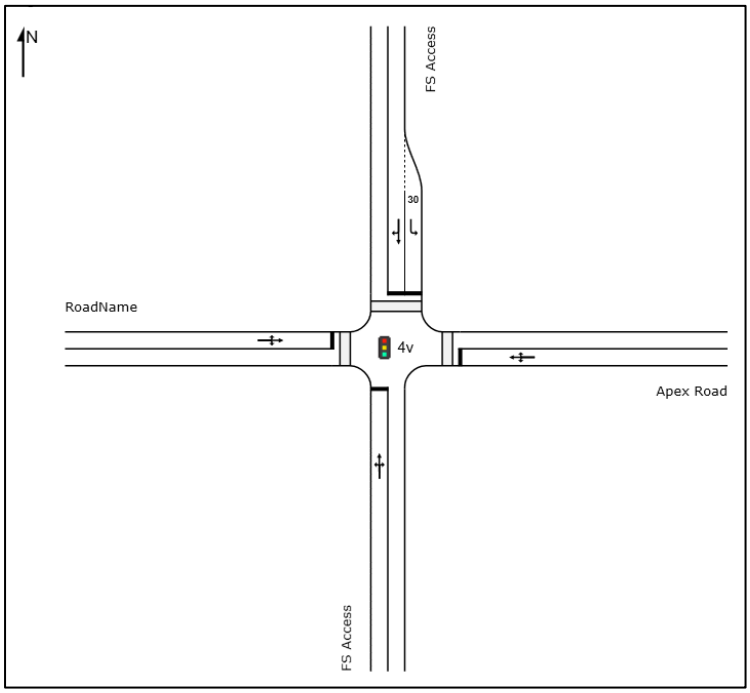


Figure 39: Intersection 4 Proposed Realigned Layout (2026 Background Traffic)

In case the road authorities do not realign and formalise this junction, the intersection of the Elandsfontein Colliery and the R547 can continue to be used as a staggered junction. The proposed layout for this junction remains as existing and will operate at an acceptable level of service (Refer to Section 6.3). The layout for this intersection is shown in the following image.

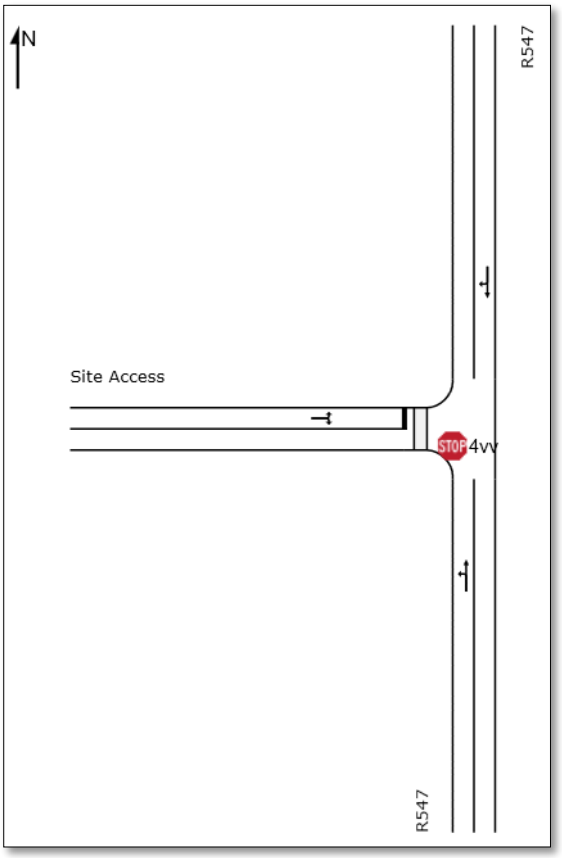


Figure 40: Site Access onto R547

9.4.4 INTERSECTION 5: N12 / R555 INTERCHANGE (NORTH TERMINAL)

The proposed intersection is signalised with the east approach (off ramp) forming a minor leg. The south approach is served by two full through lanes and a short right lane. The north approach is served by one full through lane, a short 180m additional through and a short 30m left turn lane. The off ramp or east approach is served by a single lane as shown in **Figure 23**.

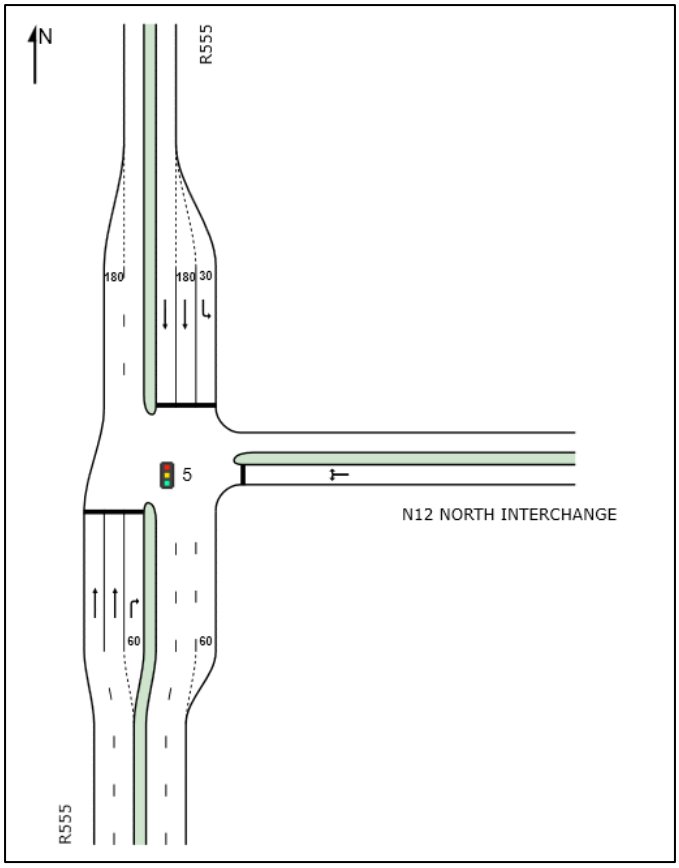


Figure 41: Intersection 5 2020 Proposed Layout

The east approach is expected to operate at a poor LOS F during the PM period in 2026. In order to accommodate the 2026 background traffic, a 60m short right turn lane is proposed for the east approach as shown in the following figure.

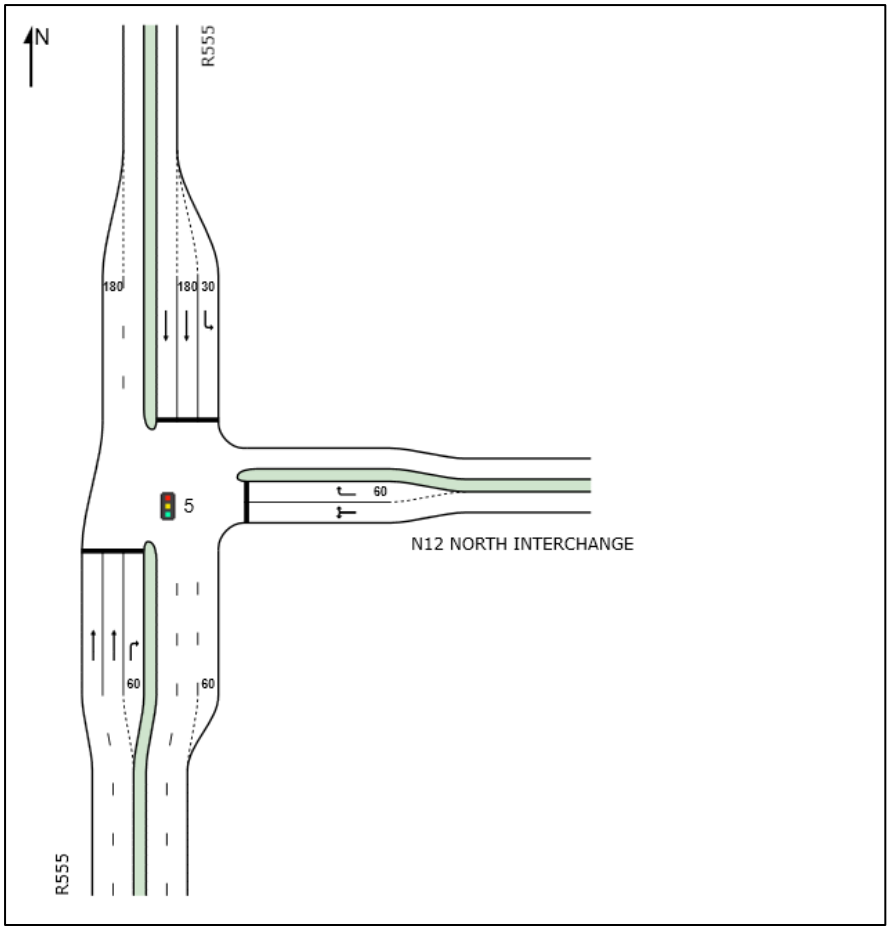


Figure 42: Intersection 5 Proposed Layout (2026 Background Traffic)

9.4.5 INTERSECTION 6: N12 / R555 INTERCHANGE (SOUTH TERMINAL)

The intersection is a priority controlled with the east approach (on ramp) forming a minor leg. The south approach is served by two full through lanes and a short right lane. The north approach is served by two through lanes and a short 30m left turn lane. The off ramp or east approach is served by a single lane as shown in **Figure 24**.

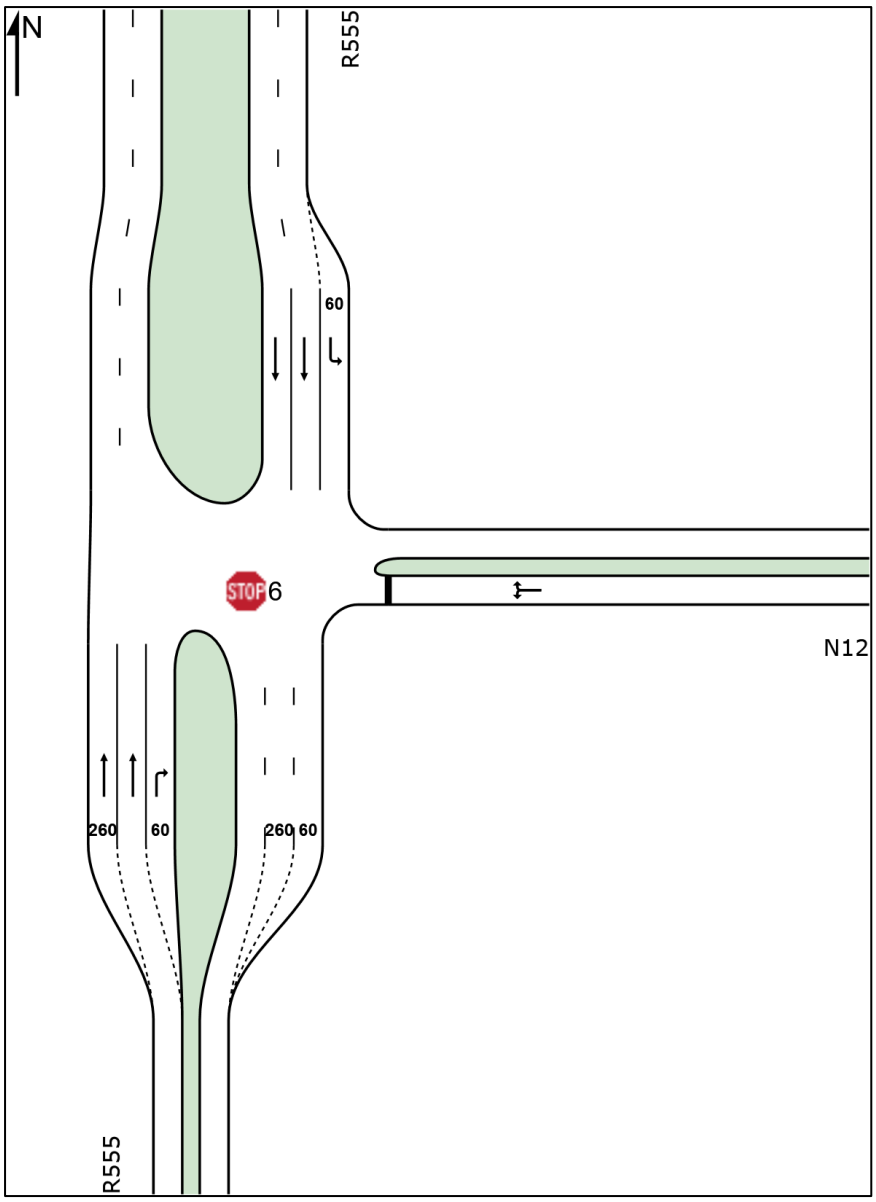


Figure 43: Intersection 6 Existing Layout

All approaches are currently operating at acceptable LOS ranging from A to D during both the AM and PM Peak hours in 2026.

9.4.6 INTERSECTION 10: R104 / R547 / ENGEN FS ACCESS

Previous upgrades and the layout required to accommodate the existing background traffic are shown in the following figure.

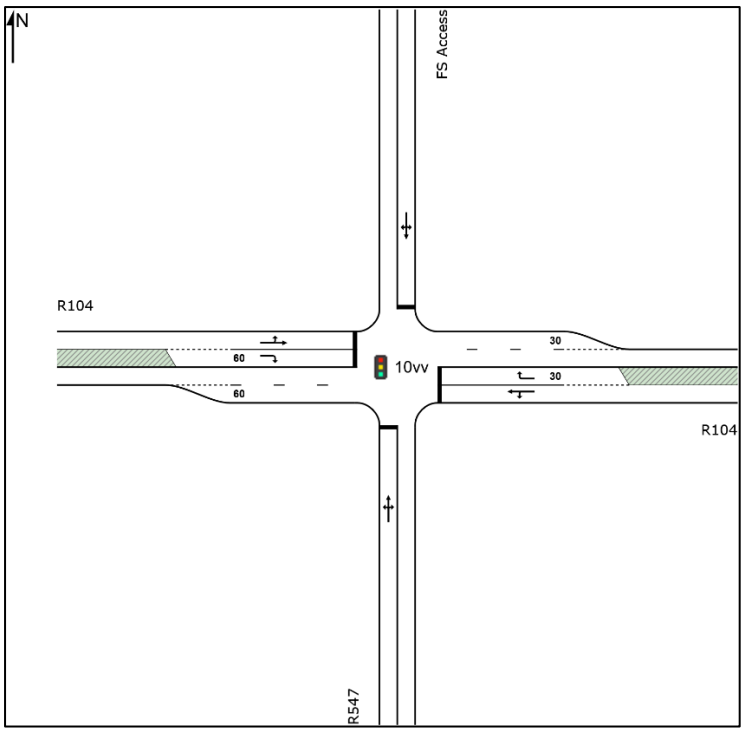


Figure 44: Intersection 10 Proposed Layout (Background Traffic)

Additional upgrades are required to accommodate the 2026 background traffic as the south, north and west approaches operate at LOS E to F for this scenario. These upgrades include a left slip lane to the east approach as well as signalisation of the intersection.

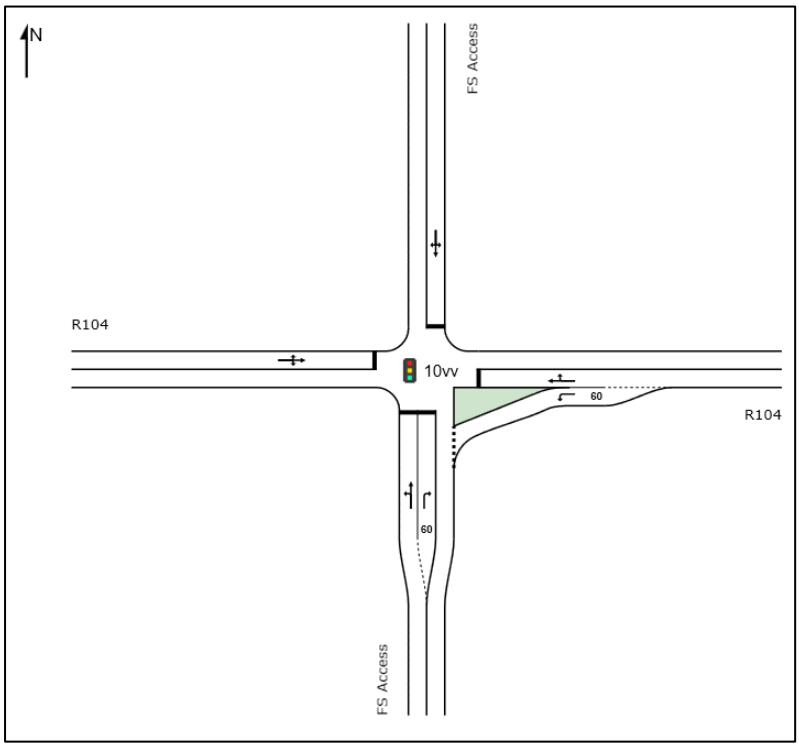


Figure 45: Intersection 10 Proposed Layout (2026 Background Traffic)

The proposed upgrade will improve capacity operations at this intersection.

9.4.7 INTERSECTION 11: R104 / GRAVEL ROAD

The intersection is a priority controlled with the east approach forming a minor leg. The intersection is currently served by a single lane on all approaches as shown in **Figure 30**. All approaches are currently operating at acceptable LOS ranging from A to C during both the AM and PM Peak hours, however for the 2026 background traffic scenario signalisation of the intersection is required.

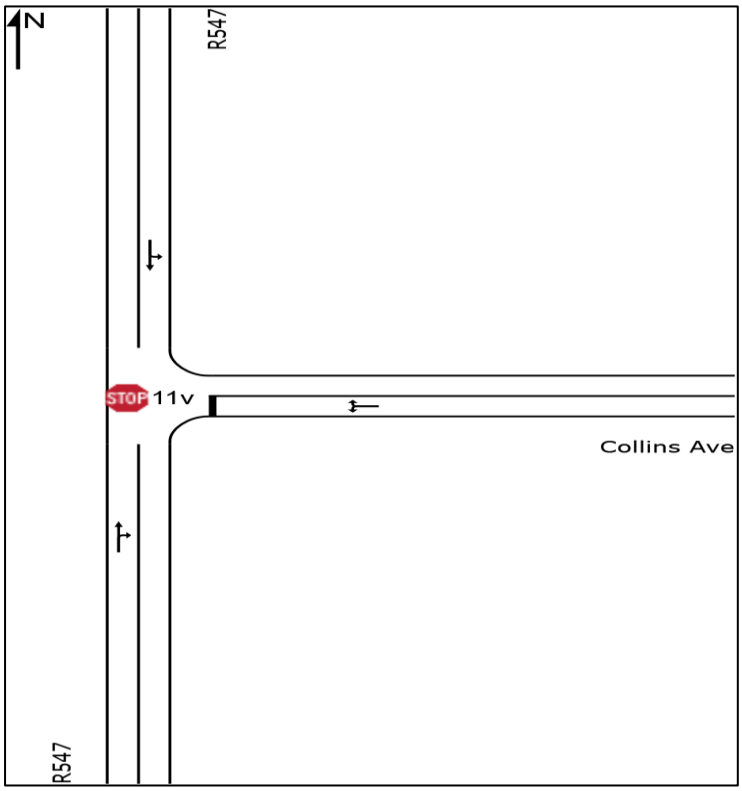


Figure 46: Intersection 11 Existing Layout

9.4.8 INTERSECTION 12: R547 / R555 QUARTER LINK (NORTH TERMINAL)

This is a two way priority controlled intersection with the north and south approaches of R547 forming the major legs. The two major approaches are served by a full shared through and right turn lanes completed by short left turn lanes. The minor legs are served by a single lane as shown in **Figure 31**.

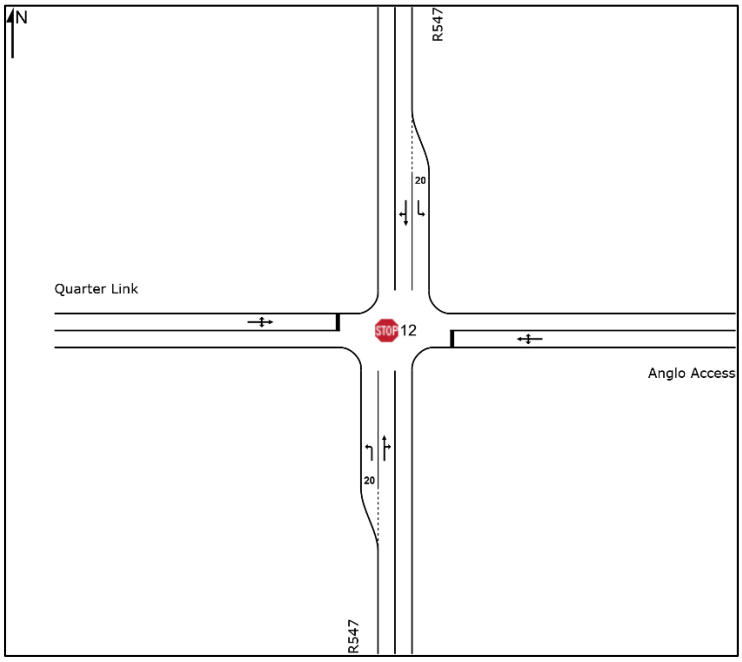


Figure 47: Intersection 12 Existing Layout

All approaches should continue operating at acceptable LOS ranging from A to B during both the AM and PM Peak hours for the 2026 background traffic scenario.

9.4.9 INTERSECTION 13: R555 / R547 QUARTER LINK (SOUTH TERMINAL)

This is a two way priority controlled intersection with the east approach forming a minor leg. The south approach is served by one full shared through and right turn lane supported a short passing lane. The north approach is served by a full through lane and full left turn lane. The east approach is served by a single lane as shown in **Figure 32**.

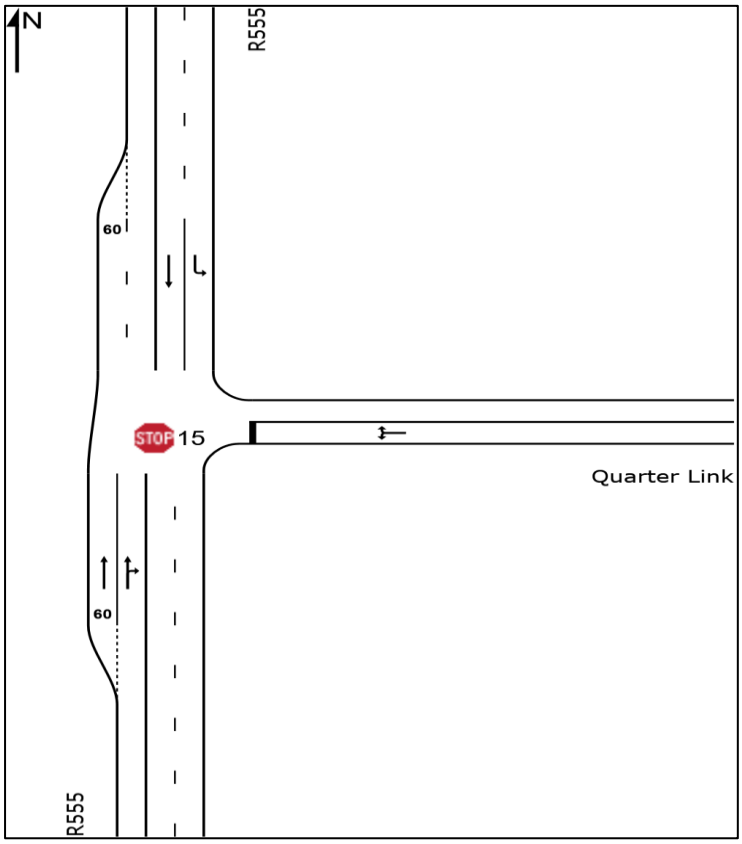


Figure 48: Intersection 13 Existing Layout

All approaches should continue operating at acceptable LOS ranging from A to C during both the AM and PM Peak hours for the 2026 background traffic scenario.

9.4.10 INTERSECTION 14: APEX ROAD / R555 QUARTER LINK (NORTH TERMINAL)

This is a two way priority controlled intersection with the south approach forming a minor leg. The east and west approaches are served by a single lane per direction. The south approach is served by a single lane as shown in **Figure 33**.

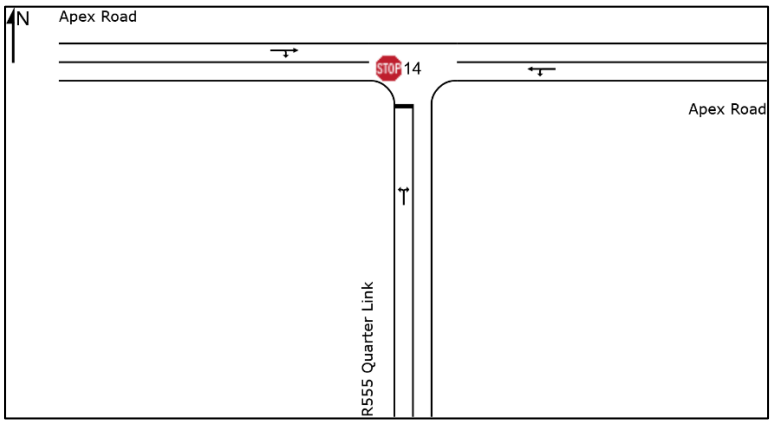


Figure 49: Intersection 14 Existing Layout

All approaches should continue operating at acceptable LOS ranging from A to C during both the AM and PM Peak hours for the 2026 background traffic scenario.

9.4.11 INTERSECTION 15: R555 / R547 QUARTER LINK (SOUTH TERMINAL)

This is a two way priority controlled intersection with the east approach forming a minor leg. The south approach is served by two lanes. The north approach is served by a full through lane and full left turn lane. The east approach is served by a single lane as shown in **Figure 34**.

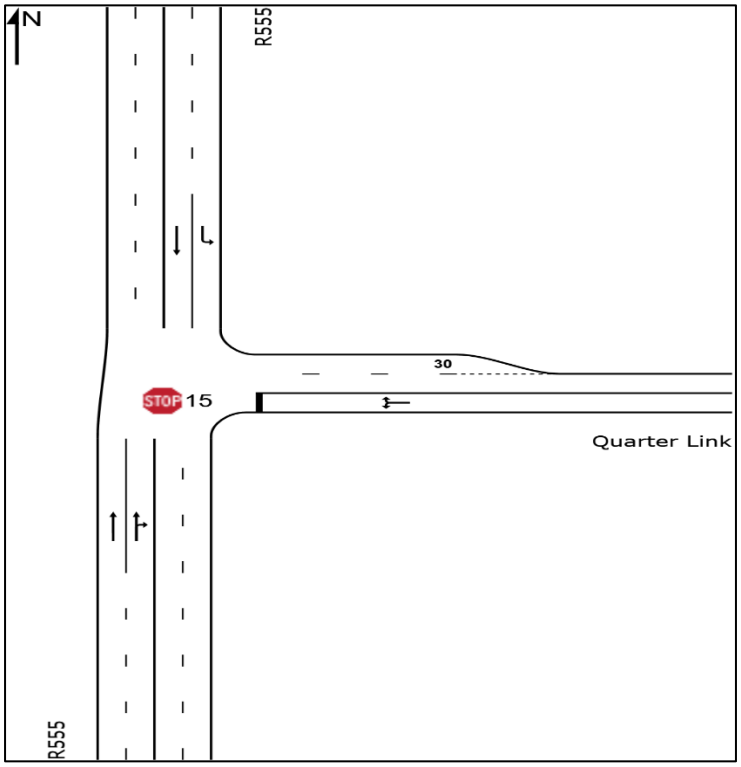


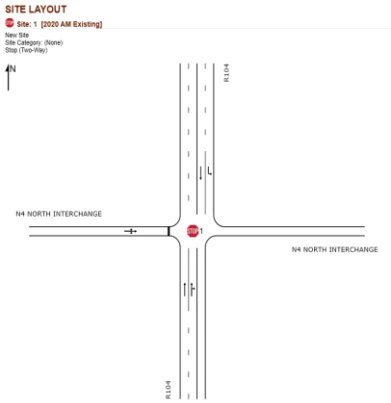
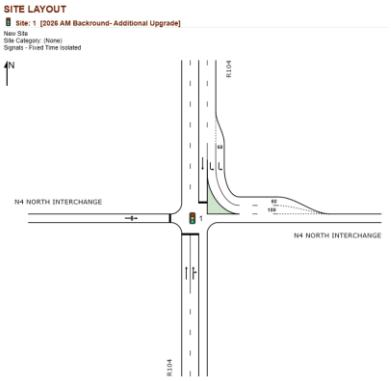
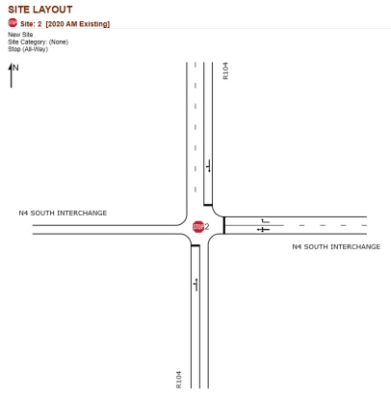
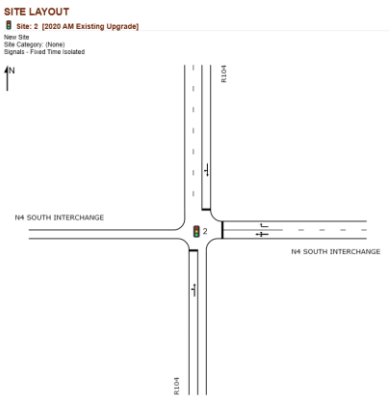
Figure 50: Intersection 15 Existing Layout

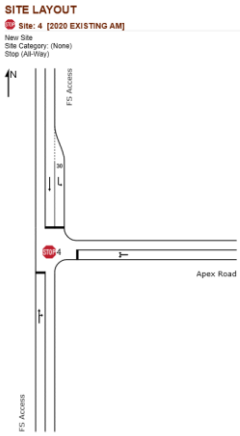
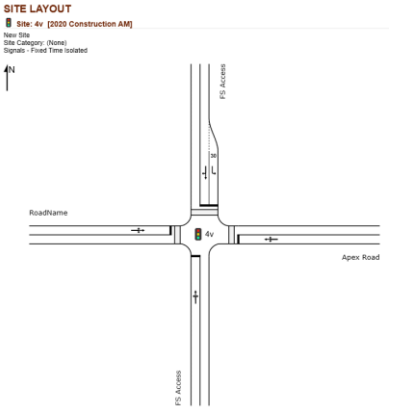
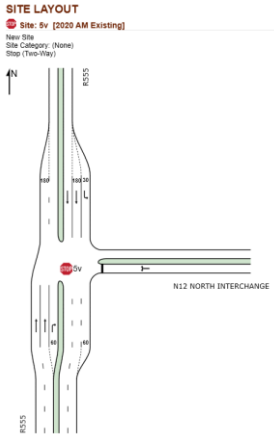
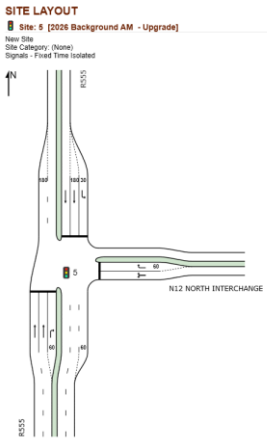
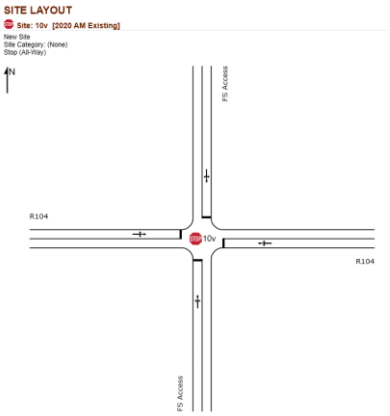
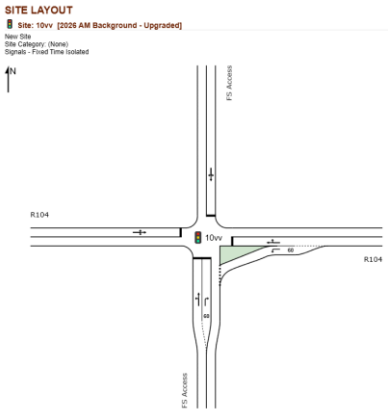
All approaches should continue operating at acceptable LOS ranging from A to C during both the AM and PM Peak hours for the 2026 background traffic scenario.

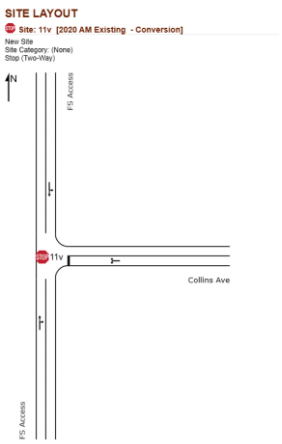
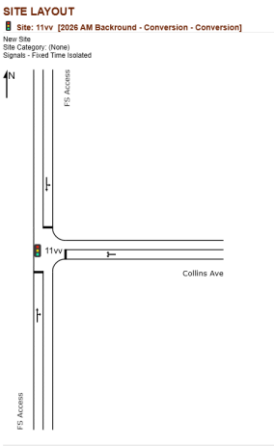
9.5 SUMMARY OF FUTURE UPGRADES REQUIRED WITHOUT COLLIERY (2026 BACKGROUND)

The following table illustrates the mitigation measures required based on the analysis undertaken. The proposed mitigation measures are required to improve the existing intersection capacities. As no new development traffic was used in this analysis, upgrade costs are the responsibility of relevant road authorities.

Table 9: Intersection Upgrades required to meet 2026 Background Traffic Demand

Intersection	Required Upgrade	Existing Layout	Proposed Layout required to meet 2026 Background Demand
1	Signalise Intersection Convert left lane from northern approach to left turning slip lane. Add new continuous left-turn slip lane. Add two short exit lanes on eastern leg (60m; 100m)		
2	Signalise Intersection		

4	Signalise Intersection Add formal west leg to junction (Optional for local road authorities to alleviate safety concerns- If no Western leg added, existing access intersection sufficient.)		
5	Signalise Intersection Add short 60m right turn lane on eastern approach		
10	Signalise Intersection Add short 60m right-turn lane on southern approach Add short left-turn slip lane on eastern approach *Signal timings for this intersection should be synchronised with Intersection 11 to ensure queues do not back up into intersection 11		

11	Signalise Intersection *Signal timings for this intersection should be synchronised with Intersection 10 to ensure queues do not back up into intersection 10		

10 IMPACT ASSESSMENT

10.1 INTERSECTION CAPACITY ANALYSIS

The potential traffic impact caused by additional traffic on the road network is identified and quantified in this section. Generally, the following phases are investigated for EIA purposes:

1. Planning Phase;
2. Construction Phase;
3. Operational Phase;
4. Decommissioning Phase; and
5. Rehabilitation and Closure Phase.

The potential impact is expected to be minimal or insignificant during the planning, and the rehabilitation phase. This is due to low volumes of traffic expected to be generated by the two phases. In light of this, only the Construction, Operational and Rehabilitation phases were investigated.

The full list of intersections to be evaluated in this report are included in the following table. Intersections where the effect of the colliery are negligible are excluded from impact assessment.

Table 10: List of Intersections Analysed for Intersection Capacity Analysis

Intersection Number	Description
1	N4 Northern Interchange Terminal with R104
2	N4 Southern Interchange Terminal with R104
3 (Not affected)	R104 with unnamed gravel road to Kwa-Guqa
4	Apex Road/ R547
5	N12 Northern Interchange Terminal with R555
6	N12 Southern Interchange Terminal with R555
7 (Not affected)	N4 Southern Interchange Terminal with R545
8 (Not affected)	N4 Northern Interchange Terminal with R545
9 (Not affected)	R104 with unnamed gravel road towards N12
10	R104/ R547 Intersection
11	R547/ Collins Avenue Intersection
12	R547/ R555 Eastern Terminal
13	Provincial Road (R555)/ Apex Road Eastern Terminal
14	Provincial Road (R555)/ Apex Road Western Terminal
15	R547/ R555 Western Terminal

10.2 **EFFECT OF E80'S ON SURFACED ROADS**

E80 is an 80kN equivalent axle load used to determine the required strength of a road pavement. The average E80's for different heavy vehicle configurations is shown in the following table as extracted from COTO TRH16.

Table 11: Average E80 per heavy vehicle (Source: COTO TRH16)

Vehicle Type	**Average E80's**	**Range in average E80's**
2-axle truck	0.7	0.3-1.1
3-axle truck	1.7	0.8-2.6
4-axle truck	1.8	0.8-3.0
5-axle truck	2.2	1.0-3.0

A minimum of 156 trucks enter and exit the facility on a daily basis. Using 200 truckloads per day (conservative estimate) which are empty inbound (assume 0.8 E80's/ heavy vehicle) and fully loaded outbound (assume 2.6 E80's/ heavy vehicle) the following table estimates the inbound and outbound development generated E80's over the 7 year period with no adjustments for holidays or weekends.

Table 12: Total E80

Direction	**7 Year Total E80's**
Inbound E80's	408 800
Outbound E80's	1 328 600

The heavy travel along Apex Road and then 60% of the trucks turn north towards the rail siding while the other 40% travel to Kendal Power Station. The total distance between the colliery and rail siding is approximately 16.45 km therefore the 8.23 km of the journey closest to the colliery was analysed. The total distance between the colliery and Kendal Power Station is 35.24 km therefor the 17.62 km closest to the colliery was analysed.

Table 13: Recommendations based on additional e80's on surrounding road network

Road	Length of Road Relevant to Analysis	No. of additional E80's generated by new mining rights over 7 years	Existing Average Daily Truck Traffic	Typical no. of E80's for design of road	Minimum Estimated Design E80's per lane over 20 years (Based on ADT without growth and confirmed with Design specifications for road class assuming average heavy vehicle = 2 E80's)	Result and Recommendation
Local Access Road (Intersects at Bailey Ave and Apex Road)	3.59 km	1 737 400 Total 1 328 600 Outbound 408 800 Inbound	N/A	N/A	N/A	Mine should repair and maintain this gravel road to support site access
Apex Road	3.39 km	1 042 440 Total 797 160 Outbound 245 280 Inbound	N/A	N/A	N/A	As there was no change in land-use rights, no development service contributions can be obtained from the client.
R555 Provincial Road (North of Apex Road)	1.25 km	1 042 440 Total 797 160 Outbound 245 280 Inbound	587 heavy vehicles from R555 to N12 589 heavy vehicles from N12 to R555 (SANRAL Count Data: 1 Jan 2019 to 31 Oct 2019)	0.3-10 million per lane (SAPEM Chapter 10: Road Class B)	8.5 million E80's per lane	Life-span of road likely to be decreased by approximately 2.5 years. As this is a provincial road, no development service contributions can be sourced from the client.
R547	5.84 km	694 960 Total 531 440 Outbound 163 520 Inbound		0.3-10 million per lane (SAPEM Chapter 10: Road Class B)	5 million E80's per lane	Life-span of road likely to be decreased by approximately 2 years. As this is a provincial road, no development

						service contributions can be sourced from the client.
R555 (South of Apex Road)	4.86 km	694 960 Total 531 440 Outbound 163 520 Inbound	587 heavy vehicles from R555 to N12 589 heavy vehicles from N12 to R555 (SANRAL Count Data: 1 Jan 2019 to 31 Oct 2019)	0.3-10 million per lane (SAPEM Chapter 10: Road Class B)	8.5 million E80's per lane	Life-span of road likely to be decreased by approximately 1.25 years. As this is a provincial road, no development service contributions can be sourced from the client.
N12	6.92 km	694 960	2 043 heavy vehicles towards Emalahleni 2 014 heavy vehicles towards Johannesburg (SANRAL Count Data: 1 Jan 2019 to 31 Oct 2019)	3-100 million over 20 years per lane (SAPEM Chapter 10: Road Class A)	15 million E80's per lane	Life-span of road likely to be decreased by approximately 1 year. As this is a SANRAL road, no development service contributions can be sourced from the client.

10.3 **IMPACT ASSESSMENT METHODOLOGY**

The impact significance rating methodology, as provided by EIMS, is guided by the requirements of the NEMA EIA Regulations 2014 (as amended). The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S). The impact assessment will be applied to all identified alternatives. Where possible, mitigation measures will be recommended for impacts identified.

10.4 **PLANNING PHASE IMPACTS**

This phase does not have significant traffic related impacts. No further impact analysis is required for this phase.

10.5 CONSTRUCTION PHASE IMPACTS

10.5.1 DETERIORATION OF ROAD NETWORK CONDITION

Heavy vehicle construction trips are expected to cause additional wear and tear on the surrounding road network. As most construction will take place on site with existing equipment, the expected effects of this short-term construction on the surrounding road network is minor as the surrounding national and provincial road network has been designed to carry heavy vehicles over long periods. The gravel access road to the site is expected to sustain damage during the construction

10.5.1.1 MITIGATION MEASURES

The following mitigation measures are proposed:

- Repair and maintenance of site gravel access road within during construction period

10.5.1.2 CUMULATIVE IMPACTS

Cumulative impacts of traffic loading will cause increasing deterioration of this road which may require additional repair and maintenance.

10.5.2 INCREASE IN DUST ALONG GRAVEL SITE ACCESS ROAD

Dust is generated along gravel roads due to heavy vehicles operating at high speeds. Dust may negatively affect nearby residential communities.

10.5.2.1 MITIGATION MEASURES

The following mitigation measures are proposed:

- Limit heavy vehicle speed to 40km/h along site access road
- Water down access road on a regular basis (daily or as required) to reduce dust

10.5.3 IMPACT OF ADDITIONAL TRAFFIC VOLUMES ON INTERSECTION CAPACITY

The following table highlights the SIDRA intersection capacity results for 2020 Background Traffic + Construction Traffic assuming that all upgrades required to meet the background 2020 demand have been implemented. As shown in the table, no further capacity upgrades are required to support construction trips.

Table 14: SIDRA Intersection Analysis Results: Construction Period

INTERSECTION APPROACH		Layout with Required Upgrade for Background Traffic							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (veh)	Delay (sec)	V/C (%)	LOS	95% queue (veh)
1.	South	5,5	0,453	LOS A	7,7	5,3	0,695	LOS A	15,1
	East								
	North	6,5	0,951	LOS A	3,9	4,9	0,39	LOS A	2,1
	West	32,2	0,404	LOS C	2,6	36,8	0,616	LOS D	3,1

OVERALL (LOS)		LOS A				LOS A			
2.	South	8,8	0,323	LOS A	5,2	23,1	0,837	LOS C	25,8
	East	6,3	0,307	LOS A	1,6	32,2	0,814	LOS C	19,1
	North	10,6	0,431	LOS B	6,8	28,6	0,644	LOS C	7,5
	West								
OVERALL (LOS)		LOS A				LOS C			
4.	South	7,4	0,222	LOS A	3	16,6	0,498	LOS B	6,8
	East	26,5	0,247	LOS C	2,2	19,5	0,522	LOS B	6,5
	North	11,5	0,264	LOS B	3	17,9	0,304	LOS B	3,3
	West	23,8	0,015	LOS C	0,1	16,4	0,101	LOS B	1,4
OVERALL (LOS)		LOS B				LOS B			
5.	South	18,1	0,344	LOS B	2,1	26,8	0,892	LOS C	16,4
	East	20,9	0,497	LOS C	5,5	49,3	0,919	LOS D	12,2
	North	14,6	0,504	LOS B	7,1	8,8	0,378	LOS A	4,7
	West								
OVERALL (LOS)		LOS B				LOS C			
6.	South	3	0,159	LOS A	0,5	1	0,211	LOS A	0,5
	East	9	0,27	LOS A	1,2	11,1	0,101	LOS B	0,3
	North	2,2	0,155	LOS A	0	3,5	0,18	LOS A	0
	West								
OVERALL (LOS)		LOS A				LOS A			
10.	South	20	0,557	LOS C	7,6	42	0,926	LOS D	42,9
	East	18,8	0,527	LOS B	8,8	34,9	0,535	LOS C	9,2
	North	12,6	0,062	LOS B	0,7	49	0,296	LOS D	1,3
	West	23,1	0,566	LOS C	5,9	51,1	0,849	LOS D	11,3
OVERALL (LOS)		LOS A				LOS D			
11.	South	1,3	0,213	LOS A	0,4	1,2	0,475	LOS A	1,3
	East	13	0,122	LOS B	0,4	31,5	0,715	LOS D	4
	North	0,5	0,253	LOS A	0	0,3	0,199	LOS A	0
	West								
OVERALL (LOS)		LOS A				LOS A			
12.	South	2,5	0,063	LOS A	0,1	2,5	0,133	LOS A	0
	East	10,2	0,035	LOS B	0,1	9,2	0,004	LOS A	0
	North	4,3	0,154	LOS A	0,7	4,1	0,002	LOS A	0
	West	9,9	0,216	LOS A	0,9	10,9	0,316	LOS B	1,6
OVERALL (LOS)		LOS A				LOS A			
13	South	8,8	0,127	LOS A	0,5	8,7	0,262	LOS A	1,2
	East	4,9	0,043	LOS A	0	3,7	0,056	LOS A	0
	North								
	West	5,3	0,135	LOS A	0,7	5,3	0,105	LOS A	0,5
OVERALL (LOS)		LOS A				LOS A			
14.	South	0,5	0,039	LOS A	0,1	1,3	0,044	LOS A	0,2
	East	13,9	0,444	LOS B	2,9	15,4	0,427	LOS C	2,5
	North	3	0,082	LOS A	0	4,1	0,196	LOS A	0

	West								
OVERALL (LOS)		LOS A				LOS A			
15.	South	3,9	0,167	LOS A	0,8	3,9	0,183	LOS A	0,8
	East	13,1	0,309	LOS B	1,4	13,1	0,333	LOS B	1,6
	North	0,7	0,101	LOS A	0	0,8	0,093	LOS A	0
	West								
OVERALL (LOS)		LOS A				LOS A			

10.5.3.1 MITIGATION MEASURES

The following mitigation measures are proposed:

- Limit construction heavy vehicle trips to off-peak hours

10.6 OPERATIONAL PHASE IMPACTS

10.6.1 DETERIORATION OF ROAD NETWORK CONDITION

Heavy vehicle trips are expected to cause additional wear and tear on the surrounding road network which will mean road maintenance of the surrounding road network will be required earlier than previously expected. Details on the number of additional E80's on the surrounding road network are indicated in Section 0. Apart from the site access roads, all roads affected by these heavy vehicles have been designed to carry heavy vehicles over long periods.

10.6.1.1 MITIGATION MEASURES

The following mitigation measures are proposed:

- Repair and maintenance of site gravel access road with during operational period

10.6.2 INCREASE IN DUST ALONG GRAVEL SITE ACCESS ROAD

Dust is generated along gravel roads due to heavy vehicles operating at high speeds. Dust may negatively affect nearby residential communities.

10.6.2.1 MITIGATION MEASURES

The following mitigation measures are proposed:

- Limit heavy vehicle speed to 40km/h along site access road
- Water down access road on a regular basis (daily or as required) to reduce dust

10.6.3 IMPACT OF ADDITIONAL TRAFFIC VOLUMES ON INTERSECTION CAPACITY

The following table highlights the SIDRA intersection capacity results for 2026 Background Traffic assuming that all upgrades required to meet the 2020 Background Traffic demand have been implemented. Background Traffic was estimated to grow at 3% per annum between 2020 and 2026. As shown in the table, Intersections 1, 2, 5, 10 and 11 require additional upgrades to meet this background traffic demand. No further upgrades have been recommended for Intersection 2 as redesign of the interchange with the N4 will be required to meet this

demand. The existing intersection configuration and space limitations of the bridge mean that even minor intersection layout upgrades will require large capital investment and the redesign of the interchange to support long term future demand will be more beneficial in the long term.

The following table shows the SIDRA Results summary for the upgraded intersections with 2026 Background Traffic only.

Table 15: SIDRA Intersection Results: 2026 Background Traffic- Additional Upgrades Implemented

INTERSECTION APPROACH		Further Upgrades Implemented							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (veh)	Delay (sec)	V/C (%)	LOS	95% queue (veh)
1.	South	5,9	0,509	LOS A	11,6	9,1	0,801	LOS A	23
	East								
	North	5,5	0,672	LOS A	4,5	4,9	0,275	LOS A	2,6
	West	41	0,496	LOS D	4,2	38,7	0,742	LOS D	3,9
OVERALL (LOS)		LOS A				LOS A			
2.	South	15,1	0,508	LOS B	8,3	31,1	0,886	LOS C	35,3
	East	21,3	0,694	LOS C	13,3	62,9	0,961	LOS E	37,2
	North	19,8	0,663	LOS B	9,8	50,9	0,905	LOS D	13,4
	West								
OVERALL (LOS)		LOS B				LOS D			
5.	South	11,7	0,309	LOS B	2	12,7	0,683	LOS B	9,8
	East	25,7	0,425	LOS C	3,8	47,2	0,863	LOS D	7,8
	North	8,6	0,434	LOS A	6,5	30,8	0,835	LOS C	12,3
	West								
OVERALL (LOS)		LOS B				LOS C			
10.	South	19,3	0,441	LOS B	5,6	13,8	0,708	LOS B	13,6
	East	8	0,231	LOS A	1,8	10,3	0,194	LOS B	1,5
	North	13,4	0,076	LOS B	0,9	37,3	0,274	LOS D	1,1
	West	16,3	0,432	LOS B	5,7	36,8	0,802	LOS D	10
OVERALL (LOS)		LOS B				LOS B			
11.	South	5,9	0,387	LOS A	5,5	16,2	0,816	LOS B	27,3
	East	31,7	0,398	LOS C	2,4	44,9	0,813	LOS D	10,6
	North	5,4	0,381	LOS A	5,9	7,2	0,363	LOS A	6,6
	West								
OVERALL (LOS)		LOS A				LOS B			

The operational trips were imposed on the intersections assuming all required upgrades to meet the 2026 background demand would be implemented. The following table shows the results summary for this scenario. As shown in the results, no additional upgrades are required to meet the operational demand. This is with the exception of Intersection 2 where interchange redesign is required to meet the 2026 background demand.

Table 16: SIDRA Intersection Results: 2026 Operational- Previously required upgrades Implemented

INTERSECTION APPROACH		Previous Upgrade							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (veh)	Delay (sec)	V/C (%)	LOS	95% queue (veh)
1.	South	5,9	0,516	LOS A	11,8	6,2	0,749	LOS A	18
	East								
	North	5,5	0,672	LOS A	5	5	0,275	LOS A	2,8
	West	41	0,496	LOS D	4,2	36	0,636	LOS D	3,7
OVERALL (LOS)		LOS A				LOS A			
2.	South	15,1	0,515	LOS B	8,4	34,5	0,907	LOS C	39,5
	East	21,4	0,7	LOS C	13,5	79,3	0,995	LOS E	42,2
	North	20,8	0,707	LOS C	11,2	72,5	0,981	LOS E	18,4
	West								
OVERALL (LOS)		LOS C				LOS E			
4.	South	15,4	0,426	LOS B	6	24,1	0,756	LOS C	11,2
	East	18,4	0,407	LOS B	3,4	26,5	0,791	LOS C	12,1
	North	18,8	0,398	LOS B	5,2	21	0,436	LOS C	4,3
	West	16,9	0,307	LOS B	1,9	14,2	0,295	LOS B	2,4
OVERALL (LOS)		LOS B				LOS C			
5.	South	13,1	0,359	LOS B	2,2	20,4	0,884	LOS C	13,8
	East	25,6	0,494	LOS C	4,2	40,3	0,848	LOS D	7
	North	9,6	0,517	LOS A	7,6	29,2	0,871	LOS C	12,5
	West								
OVERALL (LOS)		LOS B				LOS C			
6.	South	4	0,244	LOS A	0,9	1,2	0,251	LOS A	0,7
	East	9,4	0,34	LOS A	1,6	12,6	0,149	LOS B	0,5
	North	2,4	0,207	LOS A	0	3,7	0,27	LOS A	0
	West								
OVERALL (LOS)		LOS A				LOS A			
10.	South	19,4	0,45	LOS B	5,7	13,7	0,731	LOS B	14,7
	East	7,9	0,271	LOS A	1,9	10,4	0,196	LOS B	1,6
	North	13,4	0,076	LOS A	0,9	37,3	0,274	LOS D	1,1
	West	16,3	0,432	LOS B	5,7	41,6	0,857	LOS D	10,8
OVERALL (LOS)		LOS B				LOS B			
11.	South	5,9	0,397	LOS A	5,6	17,4	0,831	LOS B	32,2
	East	31,7	0,398	LOS C	2,4	49,9	0,824	LOS D	11,9
	North	5,5	0,418	LOS A	6,8	7,3	0,358	LOS A	7,2
	West								
OVERALL (LOS)		LOS A				LOS C			
12.	South	2,5	0,075	LOS A	0,1	2,6	0,159	LOS A	0,1
	East	11,6	0,051	LOS B	0,2	11,7	0,114	LOS B	0,4
	North	4,8	0,23	LOS A	1,2	5,7	0,183	LOS A	0,9
	West	11,1	0,327	LOS B	1,4	10,5	0,29	LOS B	1,3

OVERALL (LOS)		LOS A				LOS A			
13.	South	10	0,218	LOS B	0,9	9,5	0,381	LOS A	2
	East	4,9	0,051	LOS A	0	3,8	0,066	LOS A	0
	North								
	West	5,7	0,214	LOS A	1,1	5,9	0,182	LOS A	0,9
OVERALL (LOS)		LOS A				LOS A			
14.	South	0,6	0,047	LOS A	0,1	1,7	0,055	LOS A	0,2
	East	25,1	0,77	LOS D	9,1	33,9	0,826	LOS D	9,7
	North	3,5	0,181	LOS A	0	4,4	0,317	LOS A	0
	West								
OVERALL (LOS)		LOS A				LOS B			
15.	South	4,4	0,238	LOS A	1,1	4,4	0,259	LOS A	1,2
	East	17,7	0,497	LOS C	3,3	18,3	0,536	LOS C	3,8
	North	0,7	0,119	LOS A	0	0,8	0,111	LOS A	0
	West								
OVERALL (LOS)		LOS A				LOS A			

10.6.3.1 **MITIGATION MEASURES**

No mitigation measures are required to accommodate the mine trips on the surrounding road network. Upgrades to meet the background traffic demand for the area are the responsibility of the relevant road authorities and these will accommodate new demand generated by the mine.

10.7 **DECOMMISSIONING PHASE IMPACTS**

This phase does not have significant traffic related impacts. No further impact analysis is required for this phase.

10.8 **REHABILITATION AND CLOSURE PHASE IMPACTS**

10.8.1 **DETERIORATION OF ROAD NETWORK CONDITION**

Heavy vehicle rehabilitation and closure trips are expected to cause additional wear and tear on the surrounding road network. The expected effects of this short-term phase on the surrounding road network is minor as the surrounding national and provincial road network has been designed to carry heavy vehicles over long periods. The gravel access road to the site is expected to sustain damage during this period.

10.8.1.1 **MITIGATION MEASURES**

The following mitigation measures are proposed:

- Repair and maintenance of site gravel access road with during rehabilitation and closure period

10.8.1.2 **CUMULATIVE IMPACTS**

Cumulative impacts of traffic loading will cause increasing deterioration of this road which may require additional repair and maintenance.

10.8.2 INCREASE IN DUST ALONG GRAVEL SITE ACCESS ROAD

Dust is generated along gravel roads due to heavy vehicles operating at high speeds. Dust may negatively affect nearby residential communities.

10.8.2.1 MITIGATION MEASURES

The following mitigation measures are proposed:

- Limit heavy vehicle speed to 40km/h along site access road
- Water down access road on a regular basis (daily or as required) to reduce dust

10.8.3 IMPACT OF ADDITIONAL TRAFFIC VOLUMES ON INTERSECTION CAPACITY

Additional traffic volumes for this phase are short-term and are expected to be lower than in the operational phase. No further analysis of intersection capacity is required to meet this demand, however heavy vehicle trips should be limited to off-peak hours during this period to ensure larger vehicles do not negatively affect the surrounding intersections during peak periods.

10.8.3.1 MITIGATION MEASURES

The following mitigation measures are proposed:

- Limit construction heavy vehicle trips to off-peak hours

11 SPECIALIST MANAGEMENT PLAN

Please populate the **Error! Reference source not found. Error! Reference source not found.**. Ensure that the aspects and mitigation measures in the impact assessment section are adequately represented.

Table 17: Example of mitigation measures including requirements for timeframes, roles and responsibilities etc.

No.	Mitigation Measures	Phase	Timeframe	Responsible Party for Implementation	Monitoring Party (Frequency)	Target	Performance Indicators (Monitoring Tool)
			1. Site access, Security and Traffic Management				
A	Gravel Access Road should be maintained to support heavy vehicle movement.	Construction Operation Decommissioning Rehab and closure	Ongoing	Applicant Contractor	Contractors EO (Daily) Mine EO (Weekly) ECO (Monthly)	Safe access road to site	Visual Assessment
B	Heavy vehicle trips for planning, construction, decommissioning and rehabilitation and closure phases should be limited to off-peak hours	Construction Decommissioning Rehab and closure	Ongoing	Applicant Contractor	Contractors EO (Daily) Mine EO (Weekly) ECO (Monthly)	No heavy vehicle trips to surrounding road network during peak hours	Heavy vehicle arrival times
C	Limit heavy vehicle speed to 40km/h along site access road Water down access road on a regular basis to reduce dust	Construction Operation Decommissioning Rehab and closure	Ongoing	Applicant Contractor	Contractors EO (Daily) Mine EO (Weekly) ECO (Monthly)	No dust to affect nearby residential areas	Daily record-watering; Road accident statistics

12 CONCLUSION

SMEC South Africa (Pty) Ltd was appointed on behalf of Elandsfontein Colliery (Pty) Ltd by Environmental Impact Management Services (EIMS) to provide a specialist report for transport as Elandsfontein Colliery (Pty) Ltd is applying to consolidate two mining right areas into a single mining right with associated consolidated Environmental Management Program (EMPr).

The following impacts were assessed for the planning; construction; operational; decommissioning and rehabilitation and closure phases of the project, where relevant:

- Site Access
- Intersection Capacity Analysis using SIDRA Intersection
- Deterioration of road network condition (Effect of E80's on surfaced roads)
- Increase in dust along site access road

The existing site access creates a staggered intersection with Apex road. Although the access road intersection with Bailey Avenue is sufficient to provide access to the mine, the site access road should be investigated with a road safety audit and potentially be realigned by road authorities to create one four-legged intersection to alleviate existing safety concerns relating to the use of the road edge by trucks from other nearby mines. In case this does not happen due to cost or other constraints, the existing access road intersection is acceptable for use by Elandsfontein Colliery with a worst case Level of Service C anticipated at the existing intersection.

Various intersection capacity upgrades are recommended for the surrounding road network to accommodate the future traffic growth, however these are required irrespective of the mine operations and are the responsibility of the relevant road authority:

The following mitigation measures by the colliery are recommended:

- Add warning signage to site access
- Gravel Access Road should be maintained to support heavy vehicle movement.
- Heavy vehicle trips for planning, construction, decommissioning and rehabilitation and closure phases should be limited to off-peak hours
- Limit heavy vehicle speed to 40km/h along site access road
- Water down access road on a regular basis to reduce dust

The traffic and transport implications of the combining of separate mining rights into a single mining right are minimal and easily mitigated. It is recommended that the applicant's request be approved from a traffic and transportation perspective.

ASSUMPTIONS, UNCERTAINTIES AND GAPS IN KNOWLEDGE

SMEC South Africa (Pty) Ltd has attempted to source information on the cost implications for developers for the repair of roads damaged by E80's. Although some information on developer contributions was found, this did not apply to Environmental Impact Assessments and only to a change in land-use rights. The legal financial implications of wear and tear of the road network are unclear. If any additional information on this is made available, this report will be updated accordingly, however no additional information has been received from SANRAL when requested.

Details on assumptions have been included in detail where relevant in the report. As this study was conducted during the covid-19 pandemic, historic data was used as a basis for analysis. Future changes to trip patterns and the development rate of the surrounding area are likely to result in changes to typical traffic volumes in the area. Historic counts grown at 3% per annum provide a conservative estimate of the demand on the surrounding road network and required road authority upgrades are likely to be less extensive than estimated in this report. Conservative assumptions were made in terms of construction labour requirements, no. of labourers accessing the site at the same time and in the distribution of trips to the surrounding road network.

13 REFERENCES

- The Technical Methods for Highways (TMH) 16: Volume 1 and Volume 2 - South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual and Volume 2;
- The Technical Methods for Highways (TMH) 17: South African Trip Data Manual;
- The Technical Recommendations for Highways (TRH) 26: South African Road Classification and Access Management Manual; and
- The Technical Recommendations for Highways (TRH) 16: Traffic Loading for Pavement and Rehabilitation Design.
- Highway Capacity Manual, 2010, Transportation Research Board

14 APPENDICES

14.1 **APPENDIX A: SPECIALIST DECLARATION FORM**

14.2 **APPENDIX B: SPECIALIST CV**

14.1 **APPENDIX C: STICK DIAGRAMS**

14.2 **APPENDIX D: CAPACITY RESULTS**