ENVIRONMENTAL & ENGINEERING

IN ASSOCIATION WITH

INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

REPORT

EXXARO COAL CENTRAL (PTY) LTD: DORSTFONTEIN WEST COAL MINE

TRAFFIC IMPACT ASSESSMENT

REPORT REF: P-147

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DISCLAIMER:

EXPERTISE OF THE REVIEWER

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EXECUTIVE SUMMARY

Exxaro Coal Central (Pty) Ltd (Exxaro) appointed Nsovo Environmental Consulting (Pty) Ltd (Nsovo) to undertake environmental authorisations associated with the proposed expansion of their current operations at Dorstfontein West Mine also known as Dorstfontein Coal Mine (hereafter referred to as DCM West) situated just north of Kriel in the Mpumalanga Province, South Africa. Nsovo appointed Eco-Elementum (Pty) Ltd in association with Infratrans (Pty) Ltd to undertake a Traffic Impact Assessment (TIA) for the project.

The project proposal by Exxaro Coal Central (Pty) Ltd is to expand their current operations at Exxaro DCM West, which will include the following activities:

- The extension of the discard dump which has become necessary due to the life of the current discard dump coming to the end in 2022. The discard dump extension will cater for both Slurry and discard coal and is expected to cater for the life of mine;
- The construction of a conveyor belt from Exxaro DCM West to the existing conveyor systems at DCM East (located approximately 6 km to the northeast of DCM West), which transports seamless coal to the Richards Bay rail line, and
- The construction of a service road for the new conveyor belt.

The scope of this TIA includes:

- Conducting a traffic survey to determine current traffic conditions on the surrounding road network (within a defined study area), as well as to determine the volume of traffic currently generated by Exxaro DCM West;
- Quantify the impact the proposed project is expected to have on the surrounding road network;
- Determine whether it is necessary to mitigate the expected impact, and
- If required, recommend measures to mitigate such an impact.

SUMMARY OF FINDINGS

Traffic operating conditions were determined and compared for the following scenarios:

- Baseline;
- Project construction phase, and
- Project operational phase

By comparing the operating conditions for the different scenarios, it was concluded that the proposed project will have an insignificant traffic impact on the surrounding road network. Seen as no traffic problems or congestion are expected as a result of the project activities, providing that the issues discussed in **Section 7** of this report be considered, no mitigation measures are required.

Traffic impact significance scores of 18 and 24 were calculated for the construction and operational phases of the proposed project, respectively, which implies that the project can be authorized from a traffic engineering viewpoint.

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PROJECT INFORMATION

Table 1: EAP Details

EAP Company:	Nsovo Environmental Consulting (Pty) Ltd
Postal Address:	Postnet Suite 697, P/Bag X29, Gallo Manor, 2052
Contact Person:	Rejoice Aphane
Contact Number:	011 041 3689
Email:	rejoice@nsovo.co.za
Website:	www.nsovo.co.za

Table 2: Specialist Details

Specialist Company:	Eco Elementum (Pty) Ltd
Company Reg. No.:	2012/021578/07
Physical Address:	The World Bank Office Park Ground floor, Building B 442 Roderick's Road Lynnwood Pretoria 0181
Postal Address:	Post net suite 252, Private bag X025 Lynnwood Ridge 0040
Contact Person:	Henno Engelbrecht
Contact Number:	082 690 9105
Email:	henno@ecoelementum.co.za info@ecoelementum.co.za
Website:	www.ecoelementum.co.za

1. INTRODUCTION AND STUDY SCOPE

Exxaro Coal Central (Pty) Ltd (Exxaro) appointed Nsovo Environmental Consulting (Pty) Ltd (Nsovo) to undertake environmental authorisations associated with the proposed expansion of their current operations at Dorstfontein West Mine also known as Dorstfontein Coal Mine (hereafter referred to as DCM West) situated just north of Kriel in the Mpumalanga Province, South Africa. Nsovo appointed Eco-Elementum (Pty) Ltd in association with Infratrans (Pty) Ltd to undertake a Traffic Impact Assessment (TIA) for the project.

The scope of this TIA includes:

- Conducting a traffic survey to determine current traffic conditions on the surrounding road network (within a defined study area), as well as to determine the volume of traffic currently generated by Exxaro DCM West;
- Quantify the impact the proposed project is expected to have on the surrounding road network;
- Determine whether it is necessary to mitigate the expected impact, and
- If required, recommend measures to mitigate such an impact.

2. PROJECT OVERVIEW

2.1 LOCALITY

Exxaro DCM West is situated on an area of 3 202 ha on the following farm portions located in the Mpumalanga Province, South Africa:

- Portion 0 of the farm Rietkuil 57;
- Portion 2, 3 and 8 of the farm Dorstfontein 71;
- Portions 5, 11 and 13 of the farm Welstand 55, and
- Portion 0 of the farm Rietkuil 558

Details of the study site is summarized in **Table 3** below, with the location indicated in **Figure 1** overleaf.

Table 3: Study Site Details

Farm Name:	PORTION 0 OF THE FARM RIETKUIL 57, PORTIONS 2, 3, AND 8 OF THE FARM DORSTFONTEIN 71, PORTIONS 5, 11, AND 13 OF THE FARM WELSTAND 55 AND PORTION 0 OF THE FARM RIETKUIL 558 - MPUMALANGA PROVINCE
Application Area:	3 202 ha
Magisterial District:	Nkangala District Municipality, Mpumalanga Province South Africa
Local Municipality	Emalahleni Local Municipality
Distance and direction from nearest town:	The Project Area is ~ 4 km north-east of Kriel, ~ 40 km south-east of Witbank and ~ 48 km west of Hendrina.

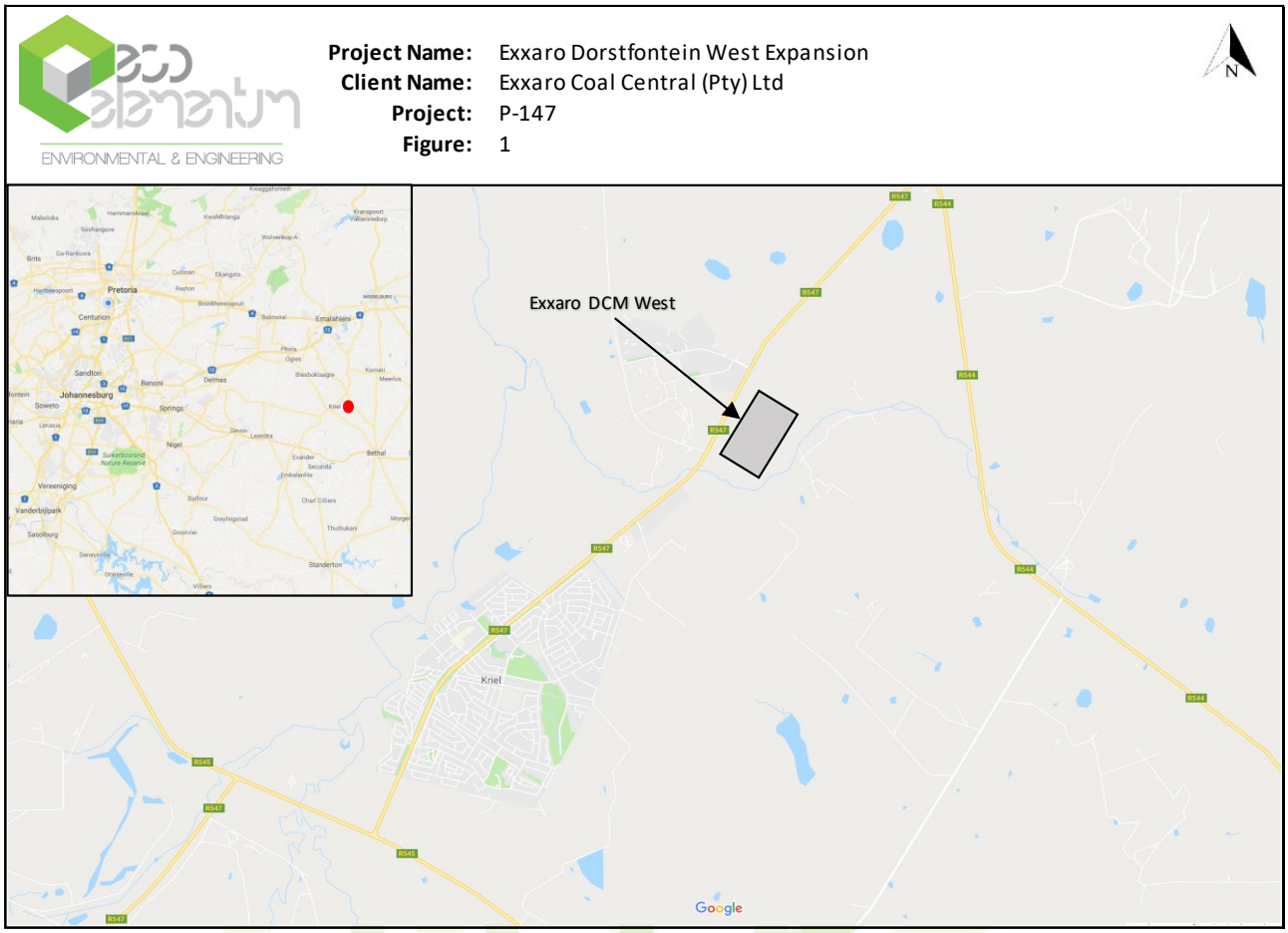


Figure 1: Location of the study site

2.2 PROJECT DESCRIPTION

DCM West is an underground mine operated by Exxaro with both 2- and 4-seams. Only 4-seam is currently mined via the bord and pillar underground mining method on the western portion of their mining right area. The proposal is to extend the life of mine to 2042 and to increase the Run of Mine (ROM) production to approximately 150 000 tons per month for the next 15 years. Further, a discard dump facility is required to accommodate the disposal of the discard and slurry for the next 15 years of Life of Mine (LOM). Subsequently, Exxaro proposes to undertake the following activities:

- The extension of the discard dump which has become necessary due to the life of the current discard dump coming to the end in 2022. The discard dump extension will cater for both Slurry and discard coal and is expected to cater for the life of the mine;
- The construction of a conveyor belt from Exxaro DCM West to the existing conveyor systems at DCM East (located approximately 6 km to the northeast of DCM West), which transports seamless coal to the Richards Bay rail line, and
- The construction of a service road parallel to the new conveyor belt.

Figure 2 overleaf shows the location of the existing discard dump to be extended and the possible routes of the proposed conveyor belt.

Project Name: Exxaro Dorstfontein West Expansion
Client Name: Exxaro Coal Central (Pty) Ltd
Project: P-147
Figure: 2

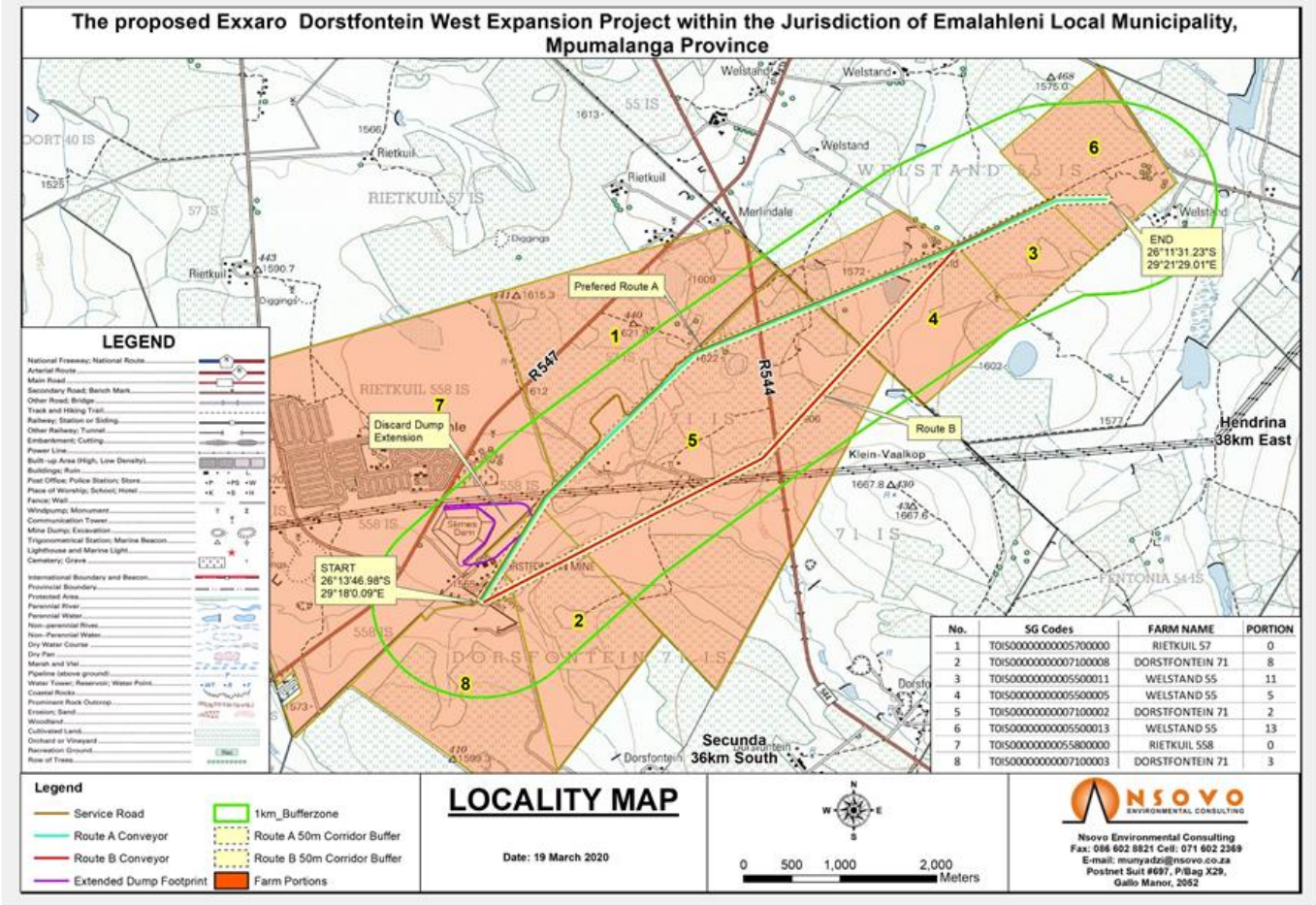


Figure 2: Location of the existing discard dump to be extended and possible conveyor routes

3. OVERVIEW OF THE METHOD USED FOR ASSESSMENT

3.1 General Overview

The assessment method used can generally be defined by the following steps:

1. Determining the traffic characteristics of the proposed project;
2. Defining the affected area (study area);
3. Collecting data to define the baseline operating conditions within the study area;
4. Determining the impact the proposed activity will have on the baseline operating conditions, and
5. Based on the expected impact, propose possible mitigation measures if necessary.

These steps are further discussed in the remainder of this chapter.

3.2 Traffic Characteristics

The type, volume and the expected travel paths are determined for the traffic to be generated by the proposed activity. This is done by analysing current traffic volumes and movement patterns in the study area, considering the type of activity and its location in relation to other developments / points of interests and by consulting various guidelines. The traffic characteristics of the proposed activity are further discussed in **Section 4.2**.

3.3 Study Area

The study area is defined based on the extent and type of activity and the characteristics of the traffic expected to be generated as a result of the proposed project. Although the traffic impact will most probably extend beyond a chosen study area, the area to be investigated should be large enough to ensure that the degree of impact outside its boundaries is insignificant and can be ignored. The study area is defined and described in the following subsections.

3.3.1 Site Visit

As per the *TMH 16, Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual*, it is a specific requirement to undertake a site visit when conducting a traffic study. During such a site visit all relevant aspects of the area can be recorded and a better understanding of the study area can be acquired.

A site visit was conducted on Thursday 31 January 2019. Photographs were taken of the surrounding areas and all relevant developments, points of interests, transport facilities, roads and road intersections were visited and recorded.

3.3.2 Surrounding Road Network

Considering the expected number of vehicle trips to be generated as a result of the proposed expansion of Exxaro DCM West (discussed in **Section 4.2**), as well as the expected distribution of these trips on the surrounding road network, only the following existing road was deemed relevant for the purpose of this study:

- Provincial Road R547: This is a regional route with a general north-south alignment stretching from Greylingstad, located near the south-western boundary of Mpumalanga, to a small town named Clewer, located just east of Emalahleni. The road

falls under the jurisdiction of the Mpumalanga Province's Department of Public Works, Roads and Transport. It is approximately 150 km long and connects a number of other provincial routes and towns. Within the study area, the road functions as a class R2 road (rural major arterial) as classified in the *TRH 26, South African Road Classification and Access Management Manual*. The function of such a road is to carry inter-regional traffic between:

- Smaller cities and medium to large towns (population typically greater than about 25 000);
- Smaller border posts;
- Class 1 and other Class 2 routes;
- Important regions, transport nodes and commercial areas that generate large volumes of freight and other traffic such as seaports and international airports, and
- Smaller centres than the above when travel distances are relatively long (longer than 200 km).

The alignment and route of this road can also be seen on **Figure 1**.

3.3.3 Intersections Investigated

As per the *TMH 16, Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual*, the study area should include all routes and intersections within a maximum distance of 1.5 km from the access to the site, measured along the shortest routes to the access. At least one intersection with an arterial route (in this case the R547) should also form part of the study area.

By considering these guidelines, as well as the expected number of vehicle trips to be generated as a result of the proposed activity (discussed in **Section 4.2**), only the following intersection where deemed relevant for investigation:

- Provincial Road R547 / Access Road to Exxaro DCM West

The boundaries of the study area are therefore limited to the location of this intersection.

The new conveyor belt proposed between DCM West and DCM East will have to cross provincial road R544, which is located between the two DCM sites. Once operational, this crossing must not affect traffic flow along road R544 and must therefore have a minimum vertical clearance of 4.5 m, if this crossing is done as an overpass. As confirmed by the client, a bridge will be constructed for the crossing of the conveyor belt and will have a vertical clearance exceeding the minimum requirement. The service road for the new conveyor belt, which will run parallel to the conveyor, will also not form an intersection with road R544. Once operational, this conveyor crossing will therefore not affect traffic flow along road R544 and can be excluded as a study intersection.

3.3.4 Vulnerabilities / Sensitivities

From a traffic engineering and transportation planning perspective, no vulnerabilities or sensitivities have been identified in the study area. Due to the large number of mines located in Mpumalanga, the provincial road network, which includes the R547, have been designed to cater for heavy vehicles.

3.4 Data Collection

To determine the existing traffic demand on the nearby road network, a classified (distinguishing between light vehicles, taxis, heavy vehicles and busses) 13-hour manual traffic survey was conducted on Tuesday 16 April 2019 at the key intersection previously discussed. A more detailed discussion follows in **Section 4.2**.

3.5 Impact and Mitigation

By using the data collected, traffic operating conditions were determined by means of traffic engineering software, namely SIDRA INTERSECTION 8. Operating conditions were determined and compared for the following three scenarios:

1. Existing conditions (baseline);
2. During the implementation of the proposed project (construction phase), and
3. After implementation of the proposed project (operational phase).

Based on the results obtained, the need for mitigation measures is discussed.

4. EXISTING TRAFFIC STATE (ENVIRONMENTAL BASELINE)

4.1 SITE ACCESS

Access to Exxaro DCM West is provided directly off road R547. The intersection between the access road and road R547 is priority stop-controlled, with free-flow traffic conditions on road R547. The existing layout design of this intersection is shown in **Drawing RUD001**, attached as **Appendix A** at the back of this document.

Access to the facility itself is controlled by means of a security control point located approximately 230 m from the above intersection. This allow for a stacking distance of more than 38 cars (or 21 trucks) if a problem at the access control point is experienced. Considering current traffic volumes generated by Exxaro DCM West (discussed in **Section 4.2**), it can be concluded that the possibility of the traffic traveling along road R547 being influence by access control problems at the site is very unlikely.

During the site visit, no access problems were also recorded.

4.2 TRIP GENERATIONS AND TRAFFIC FLOWS

According to the *TMH 17 Volume 1, South African Trip Data Manual South African Trip Data Manual*, mining activities generates an insignificant number of vehicle trips on the external (i.e. public) road network (a maximum of 1 trip per 100 employees during peak traffic hours). To obtain more site-specific data, current vehicle trips generated by Exxaro DCM West were surveyed. The survey was conducted at the key study intersection as previously identified in **Section 3.3.3**, which also provided traffic data to determine the current traffic demand in the study area.

From this survey it was determined that the common peak traffic hours occurred between 06h45-07h45 for the AM peak hour and between 16h00-17h00 for the PM peak hour, with the PM peak hour being the critical peak. These existing 2019 peak hour traffic volumes are shown in **Figure 3** overleaf. The survey also indicated the following relevant information:

- The study intersection is currently exposed to an estimated Average Daily Traffic (ADT) volume of approximately 8 850 vehicles per day, and
- Heavy vehicles accounts for 14.9% of the traffic, which is a high percentage for a public road.

According to this survey, the traffic currently generated by Exxaro DCM West during the critical peak traffic hours is indicated in **Table 4** below.

Table 4: Current traffic generated by Exxaro DCM West

Peak Hour	Vehicle Trips Generated (Vehicles / hour)		
	In	Out	Total
AM (06h45 – 07h45)	100 (77%)	30 (23%)	130
PM (16h00 – 17h00)	32 (17%)	156 (83%)	188

Note: (*) indicates IN:OUT split

The following can also be noted with regard to Exxaro DCM West traffic presented above:

- DCM West traffic accounts for 13.8% of the traffic traveling through the study intersection;
- Heavy vehicles accounts for 17.7% of the traffic entering and exiting the site, and
- A total of 13 taxis and 4 busses per day entered the site.

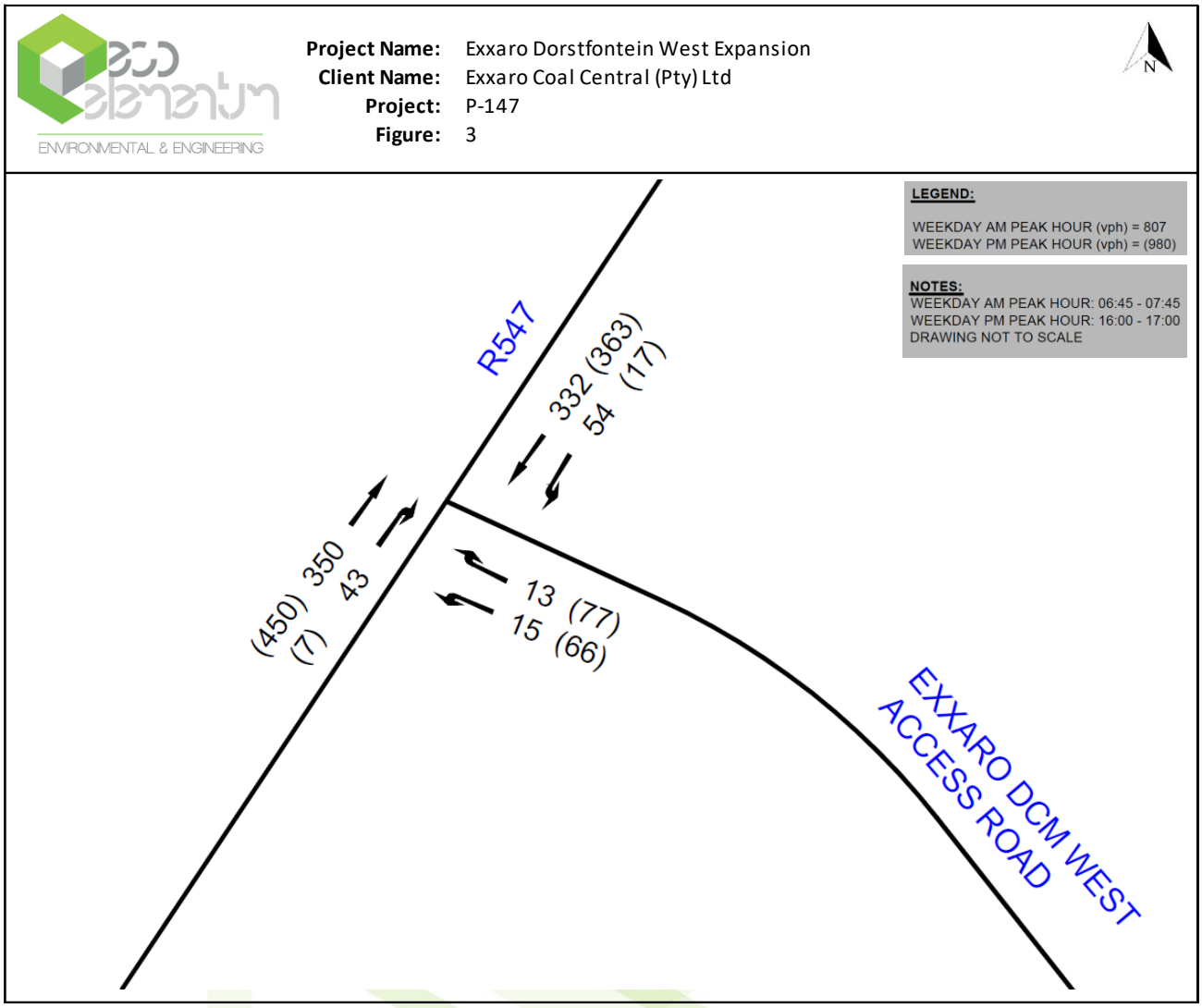


Figure 3: Existing 2019 Peak Hour Traffic Volumes

4.3 Baseline Operating Conditions

The baseline operating conditions for the key intersection are summarized in **Table 5** overleaf, with the detailed SIDRA outputs attached as **Appendix B**. These operation conditions are based on the existing 2019 peak hour traffic volumes as per **Figure 3**, as well as the existing intersection layout design and traffic control as per **Drawing RUD001**.

The Level of Service (LOS) parameter is determined by the V/C ratio (ratio between the traffic volume and traffic capacity per movement, both measured in veh/h) and delay (time delay experienced, measured in seconds) values. LOS values can vary between "A" and "F", with "F" being the worst operating condition. A LOS of "D" or better is deemed acceptable, with a LOS of "E" acceptable for right-turn traffic movements if adequate lengths of storage lanes are provided.

Table 5: Baseline operating conditions

Intersection & approach definitions	Peak hour	Analysis parameters	Intersection capacity analysis results					
			Approach 1		Approach 2		Approach 3	
			L	R	L	T	T	R
R547 / Exxaro DCM West Access Road Approach 1: Access Rd SE Approach 2: R547 NE Approach 3: R547 SW	**Week AM**	**V/C**	0.08	0.08	0.04	0.21	0.19	0.19
		Delay (s)	9	20	8	0	1	9
		LOS	A	C	A	A	A	A
	Week PM	**V/C**	0.42	0.42	0.01	0.24	0.18	0.18
		Delay (s)	12	27	8	0	1	10
		LOS	B	D	A	A	A	A

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

The baseline operating conditions tabulated in **Table 5** above indicate that good traffic operating conditions are currently experienced at the key study intersection. These conditions would be influenced by the following variables:

- Traffic volumes;
- Intersection geometry, and
- Intersection traffic control.

4.4 Non-Motorised and Public Transport

A public transportation and non-motorised transport assessment were carried out as part of this study.

Public transport in the study area is mainly provided by minibus taxis and busses. Taxis and busses were observed travelling along the provincial road R547, as well as transporting passengers to and from Exxaro DCM West.

Due to the remote location, no provision for non-motorised transport is made to and from the site. The need for such facilities is not deemed necessary due to taxis and busses transporting passengers directly to and from site.

5. TRAFFIC IMPACT DUE TO PROJECT ACTIVITIES

5.1 NATURE OF IMPACT

The impact of the project activities (discussed in **Section 2.2**) is investigated for the following project phases:

- Construction phase, and
- Operational phase.

The proposed project activities will have the following traffic characteristics:

- The extension of the discard dump facilities: This activity itself will not generate traffic on the external road network. Implementation of this future facility is however expected to generate construction traffic;
- The construction of the conveyor belt and service road: This activity is also expected to generate construction traffic. Once construction is completed it is expected that a number of additional vehicle trips will be generated for the maintenance of the conveyor belt and the service road during the operational phase.

Based on the traffic characteristics above, and considering **Table 6** below, the nature of the impact during both the project phases can be described as "negative".

Table 6: Listing of the descriptors for the nature of the impact

Impact nature descriptors	Definitions
Negative	Impact results in a "cost" to the environment
Positive	Impact results in a "benefit" to the environment
Neutral	Neutral effect on the environment

5.2 EXTENT OF IMPACT

Although some of traffic generated during the construction or operational phases will be destined regionally or even nationally, the impact, as determined by the defined study area, will be concentrated locally. The traffic influence outside the boundaries of the study area would be insignificant. As per **Table 7** overleaf, the extent of the impact can be described as "local" for both the project phases, and a rating of 2 can be adopted.

Table 7: Listing of the descriptors for the extent of the impact

Extent descriptors	Definitions	Rating
Site	The impact footprint remains within the cadastral boundary of the site	1
Local	The impact footprint extends beyond the cadastral boundary of the site, to include the immediately adjacent and surrounding areas	2
Regional	The impact footprint includes the greater surrounding area within which the site is located	3
National	The scale/ extent of the impact is applicable to the Republic of South Africa	4
International	The scale / extent of the impact is global (or world-wide)	5

5.3 Duration of Impact

The traffic impact due to the construction phase will only last for the duration of the activity, which is estimated to be 1-2 years. The traffic impact of the operational phase will however last for the entire operational life span of the project.

According to **Table 8** below, a duration rating of 2 can thus be adopted for the construction phase, and 4 for the operational phase.

Table 8: Listing of the descriptors for the duration of the impact

Duration descriptors	Definitions	Rating
Immediate	< 1 year	1
Short term	1 – 5 years	2
Medium term	5 – 15 years	3
Long term	Ceases after the operational life span of the project	4
Permanent	Permanent	5

5.4 Intensity of Impact

5.4.1 Impact during Construction Phase

To determine the traffic impact during construction, the following construction activity assumptions are made:

- A maximum of 150 construction workers will be on site;
- 60% of the construction workers will make use of public transport or transport provided by the contractor;
- The remaining 40% will make use of private transport, which is assumed to have a vehicle occupancy of 1.5 occupants per vehicle during the peak traffic hours, and
- An in:out traffic split of 80%:20%, and 20%:80% are assumed for the AM and PM peak traffic hours, respectively.

Based on the assumptions above, the construction phase is expected to generate peak hour traffic volumes as per **Table 10** overleaf.

Table 9: Expected traffic to be generated during the construction phase

Peak Hour	Vehicle Trips Generated (Vehicles / hour)		
	In	Out	Total
AM	37	9	46
PM	9	37	46

Figure 4 below presents the expected peak hour traffic volumes at the key study intersection during the construction phase.

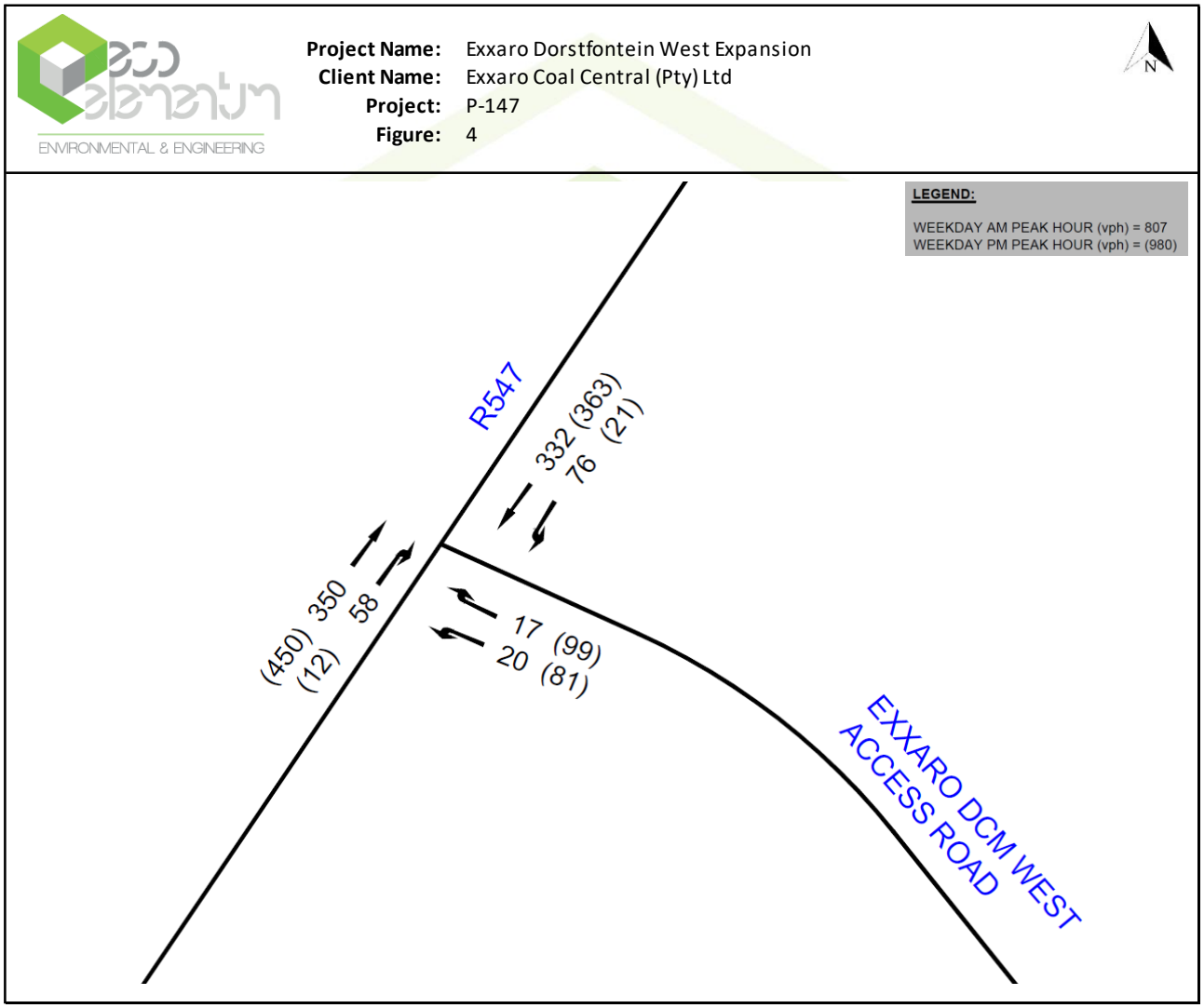


Figure 4: Expected peak hour traffic volumes at the key intersection during the construction phase

The operating conditions for the key intersection during the construction phase are summarized in **Table 11** overleaf, with the detailed SIDRA outputs attached as **Appendix B**. These operation conditions are based on the expected peak hour traffic volumes during construction as per **Figure 4**, as well as the existing intersection layout design and traffic control as per **Drawing RUD001**.

Table 10: Construction phase operating conditions

Intersection & approach definitions	Peak hour	Analysis parameters	Intersection capacity analysis results					
			Approach 1		Approach 2		Approach 3	
			L	R	L	T	T	R
R547 / Exxaro DCM West Access Road Approach 1: Access Rd SE Approach 2: R547 NE Approach 3: R547 SW	**Week AM**	**V/C**	0.11	0.11	0.06	0.21	0.20	0.20
		Delay (s)	9	22	8	0	1	9
		LOS	A	C	A	A	A	A
	Week PM	**V/C**	0.55	0.55	0.02	0.24	0.19	0.19
		Delay (s)	15	31	8	0	1	10
		LOS	C	D	A	A	A	A

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

5.4.2 Impact during Operational Phase

To determine the traffic impact during future operations, the following assumptions are made:

- The existing daily and peak hour traffic volumes at Exxaro DCM West will increase by 15% as a result of the new future operations, and
- An in:out traffic split of 80%:20%, and 20%:80% are assumed for the AM and PM peak traffic hours, respectively.

Based on the assumptions above, the future operational phase is expected to generate additional peak hour traffic volumes as per **Table 12** below.

Table 11: Expected additional traffic to be generated during the future operational phase

Peak Hour	Vehicle Trips Generated (Vehicles / hour)		
	In	Out	Total
AM	14	5	19
PM	3	21	24

Figure 5 overleaf presents the expected peak hour traffic volumes at the key study intersection during the future operational phase.

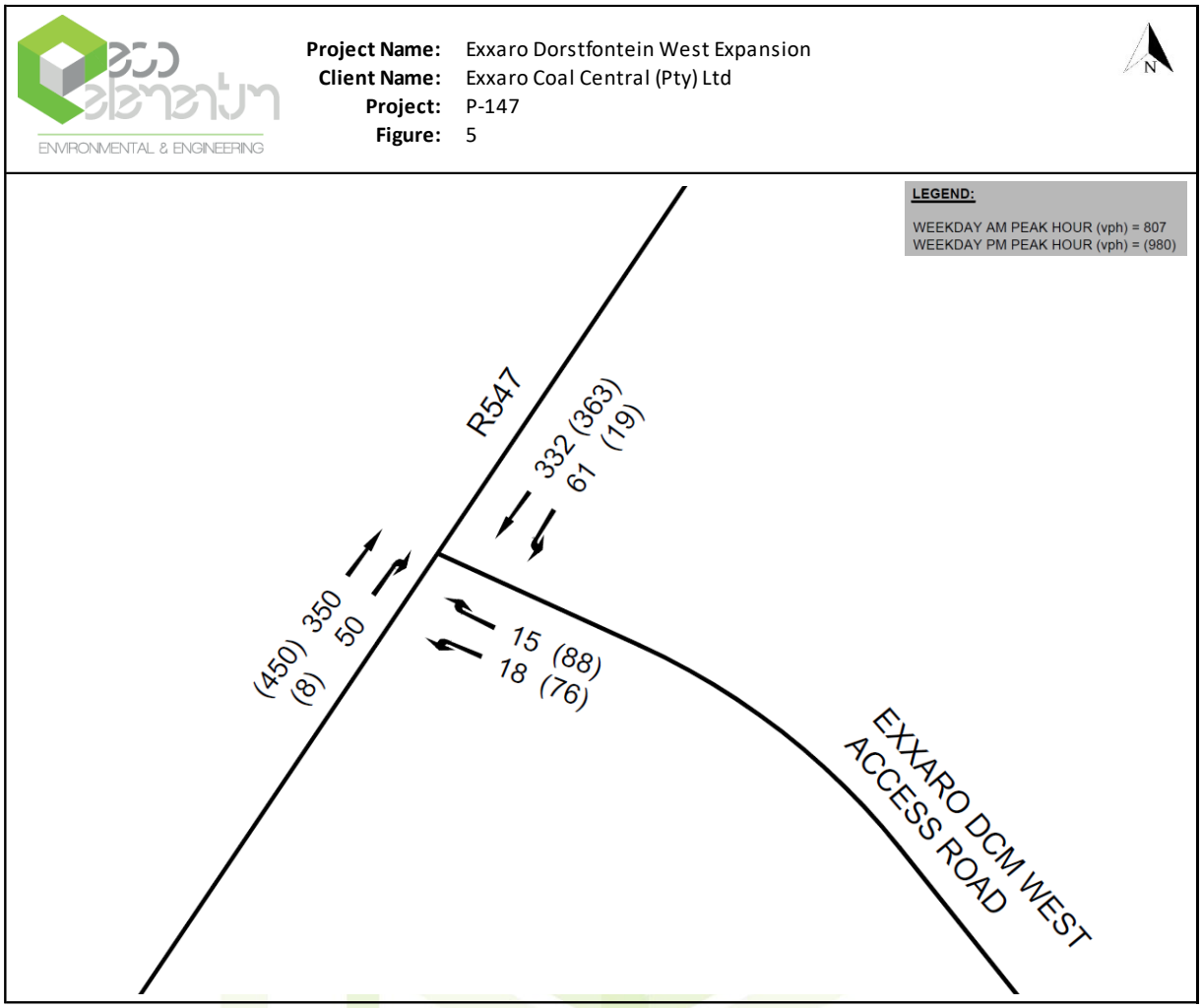


Figure 5: Expected peak hour traffic volumes at the key intersection during the future operational phase

The operating conditions for the key intersection during the future operational phase are summarized in **Table 13** below, with the detailed SIDRA outputs attached as **Appendix B**. These operation conditions are based on the expected peak hour traffic volumes during future operations as per **Figure 5**, as well as the existing intersection layout design and traffic control as per **Drawing RUD001**.

Table 12: Future operational phase operating conditions

Intersection & approach definitions	Peak hour	Analysis parameters	Intersection capacity analysis results					
			Approach 1		Approach 2		Approach 3	
			L	R	L	T	T	R
R547 / Exxaro DCM West Access Road Approach 1: Access Rd SE Approach 2: R547 NE Approach 3: R547 SW	**Week AM**	**V/C**	0.09	0.09	0.05	0.21	0.20	0.20
		Delay (s)	9	20	8	0	1	9
		LOS	A	C	A	A	A	A
	Week PM	**V/C**	0.49	0.49	0.01	0.24	0.18	0.18
		Delay (s)	14	29	8	0	1	10
		LOS	B	D	A	A	A	A

Notes: L=left, T=through, R=right, V/C=volume/capacity, LOS=Level of Service, red text indicates unacceptable performance

5.4.3 Comparing Operating Conditions with the Baseline

By comparing the expected operating conditions during the project's construction and operational phases with the baseline, it can be stated that an insignificant traffic impact is expected for both these project phases.

Based on the above, and considering **Table 13** below, the intensity of the traffic impact can be described as "minor" for both the project phases, and a rating of 2 can thus be adopted.

Table 13: Listing of the descriptors for the intensity of the impact

Intensity descriptors	Definitions	Rating
None	No effect on environment	0
Minor	Negative change, but with no consequences	2
Low	Nuisance to environment	4
Moderate	Environmental functions altered, but continue	6
High	Environmental functions temporary cease	8
Very high	Environmental functions permanently cease	10

5.5 Probability of Impact Occurring

Considering **Table 14** below, a rating of 3 can be allocated to the probability of the traffic impact during both the construction and operational phases.

Table 14: Listing of the descriptors for the probability of the impact

Probability descriptors	Definitions	Rating
None	The impact will not occur	0
Improbable	Probability very low due to design or experience	1
Low probability	Unlikely to occur	2
Medium probability	Distinct probability that the impact will occur	3
High probability	Most likely to occur	4
Definite	Will definitely occur	5

6. MITIGATION MEASURES

A significance rating can be allocated to the expected traffic impact, based on the following equation and the descriptors provided in **Table 15** below:

Significance = (Extent + Duration + Intensity) x Probability

Table 15: Listing of the descriptors for the significance score of the impact

Significance descriptors	Definitions	Rating
Low	The project can be authorised with a low risk to of environmental degradation	< 30
Medium	The project can be authorised, but with required mitigation measures	30 – 60
High	The project can be authorised but with strict conditions and high levels of compliance and enforcement in respect of the impact in question	> 60

The significant ratings for the project phases are presented in **Table 16** below.

Table 16: Impact assessment for the project phases considered

Project phase	Mitigation	Nature	Impact rating criteria				Significance
			Extent	Duration	Intensity	Probability	
Construction	No	Negative	2	2	2	3	18
Operations	No	Negative	2	4	2	3	24

Based on this significance scores, the project can be authorised in terms of the criteria as per **Table 16**, without the need to implement any mitigation measures.

7. LEGAL REQUIREMENTS AND OTHER CONSIDERATIONS

The following comments can be made with regard to legal requirements and other considerations during the proposed project:

- All legal authorisations and permits must be obtained for the transportation of abnormal loads and hazardous materials on public roads;
- Measures should be taken to ensure that all health and safety requirements regarding transportation activities are complied with. This may include dust covers for hauling vehicles and dust control on all gravel roads;
- It is proposed that flagmen and temporary warning signs be placed at all access points where heavy vehicles will access public roads during construction, and
- Controls should be in place to ensure that vehicles exiting the site are not overloaded.

8. SUMMARY AND CONCLUSIONS

In summary and based on the content of this document, the following key conclusions are made with regard to the expansion of operations at the Exxaro Dorstfontein Coal Mine West, situated just north of Kriel in the Mpumalanga Province, South Africa:

- This report forms part of the environmental authorisation process required for the proposed project;
- The purpose of this report is to investigate the traffic impact that the proposed project will have on the surrounding road network and, if necessary, propose possible measures to mitigate such impact;
- The study area (receiving environment) was defined based on the extent and type of the project activities, and the characteristics of the traffic expected to be generated as a result. Based on this, the boundaries of the study area are limited to the location of the following key intersection:
    - Provincial Road R547 / Access Road to Exxaro DCM West
- No vulnerabilities or sensitivities currently exists in the defined study area;
- To determine the existing traffic demand on the nearby road network, a classified 13-hour manual traffic survey was conducted on Tuesday 16 April 2019 at the key study intersection;
- By using the data collected, traffic operating conditions were determined by means of traffic engineer software, name SIDRA INERSECTION 8. Operating conditions were determined and compared for the following three scenarios:
    - Baseline;
    - Project construction phase; and
    - Project operational phase
- By comparing the operating conditions for the different scenarios, it is concluded that the proposed project will have an insignificant traffic impact on the surrounding road network;
- Seen as no traffic problems or congestion are expected as a result of the project activities, providing that the issues discussed in **Section 7** of this report be considered, no mitigation measures are required; and
- Traffic impact significance scores of 18 and 24 are calculated for the construction and operational phases of the proposed project, respectively, which implies that the project can be authorized from a traffic engineering viewpoint.

9. REFERENCES

- Committee of Transport Officials. TMH 16 Volume 2, ***South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual. Version 1.0***, August 2012.
- Committee of Transport Officials. TMH 17 Volume 1, ***South African Trip Data Manual. Version 1.0***, September 2012.
- Committee of Transport Officials. TRH 26, ***South African Road Classification and Access Management Manual. Version 1.0***, August 2012.

APPENDIX A – DRAWING RUD001

REV	DATE	BY	DESCRIPTION	CHK	APD
A	2019-04-23	RvW	FOR APPROVAL	RvW	RvW

ARCHITECT: -

CLIENT:

DRAWING STATUS: PRELIMINARY

INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT: EXXARO DCM WEST EXPANSION

TITLE: EXISTING INTERSECTION LAYOUT

SCALE @ A3:	CHECKED:	APPROVED:
1:1250	RvW	RvW
DESIGN: PJ	DRAWN: PJ	DATE: 23/04/2019
PROJECT No: P-147	DRAWING No: RUD001	REV: A

APPENDIX B – SIDRA OUTPUTS

MOVEMENT SUMMARY

Site: 1 [2019 AM]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

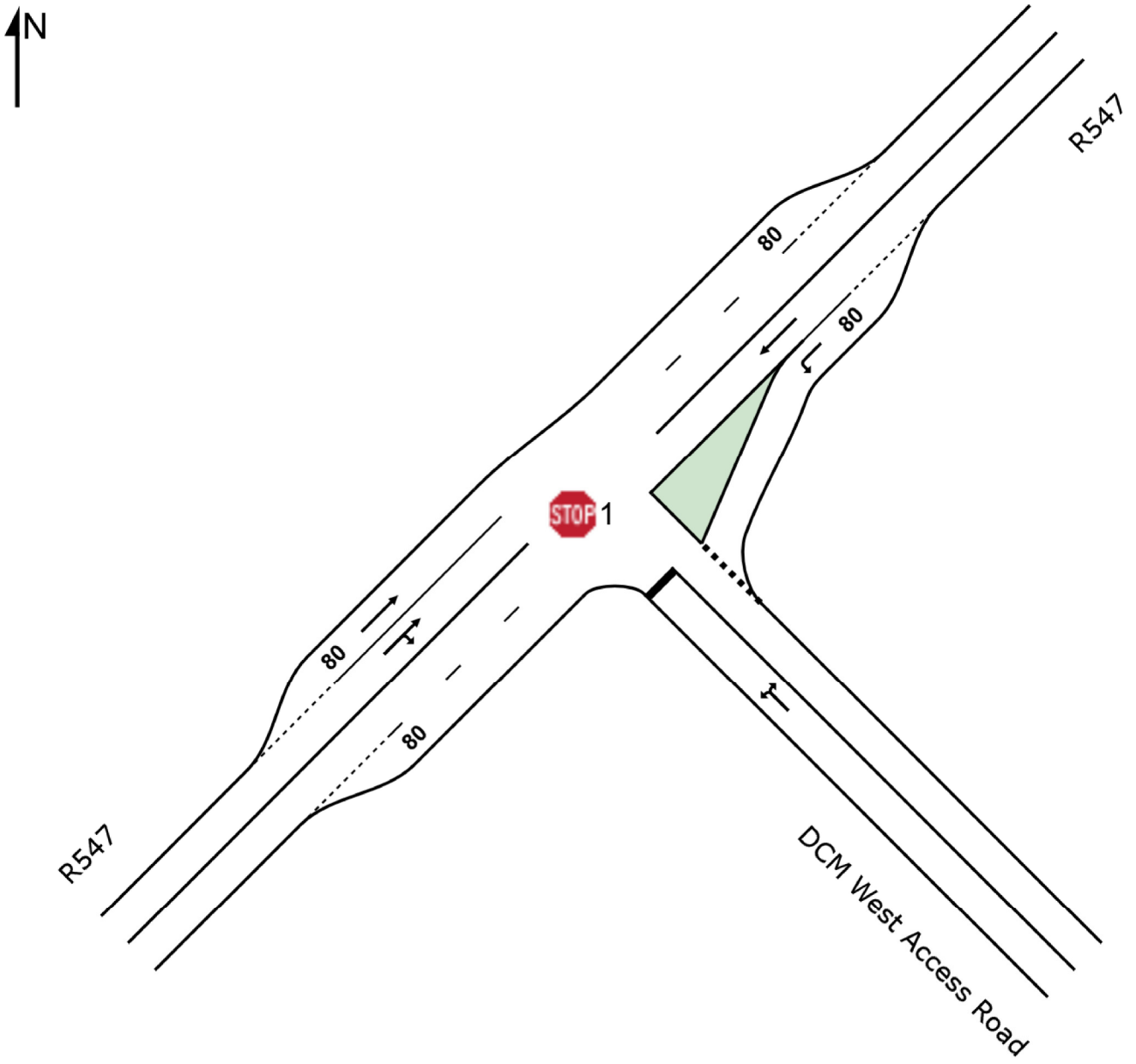
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: DCM West Access Road												
21	L2	18	6,3	0,078	8,9	LOS A	0,3	2,0	0,60	0,94	0,60	35,3
23	R2	15	7,7	0,078	19,8	LOS C	0,3	2,0	0,60	0,94	0,60	35,3
Approach		33	6,9	0,078	13,8	LOS B	0,3	2,0	0,60	0,94	0,60	35,3
NorthEast: R547												
24	L2	62	7,4	0,041	7,6	LOS A	0,2	1,2	0,13	0,57	0,13	49,0
25	T1	382	14,5	0,210	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	79,9
Approach		444	13,5	0,210	1,1	LOS A	0,2	1,2	0,02	0,08	0,02	73,4
SouthWest: R547												
31	T1	402	19,1	0,189	0,3	LOS A	0,5	4,0	0,13	0,07	0,13	77,6
32	R2	49	9,3	0,189	9,1	LOS A	0,5	4,0	0,20	0,11	0,20	52,0
Approach		452	18,1	0,189	1,3	NA	0,5	4,0	0,14	0,08	0,14	73,6
All Vehicles		929	15,5	0,210	1,6	NA	0,5	4,0	0,10	0,11	0,10	70,8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2019 AM]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)



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Project: C:\Users\piete\Desktop\P-147 DCM West Expansion Project\R547_Access Road.sip8

MOVEMENT SUMMARY

Site: 1 [2019 PM]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

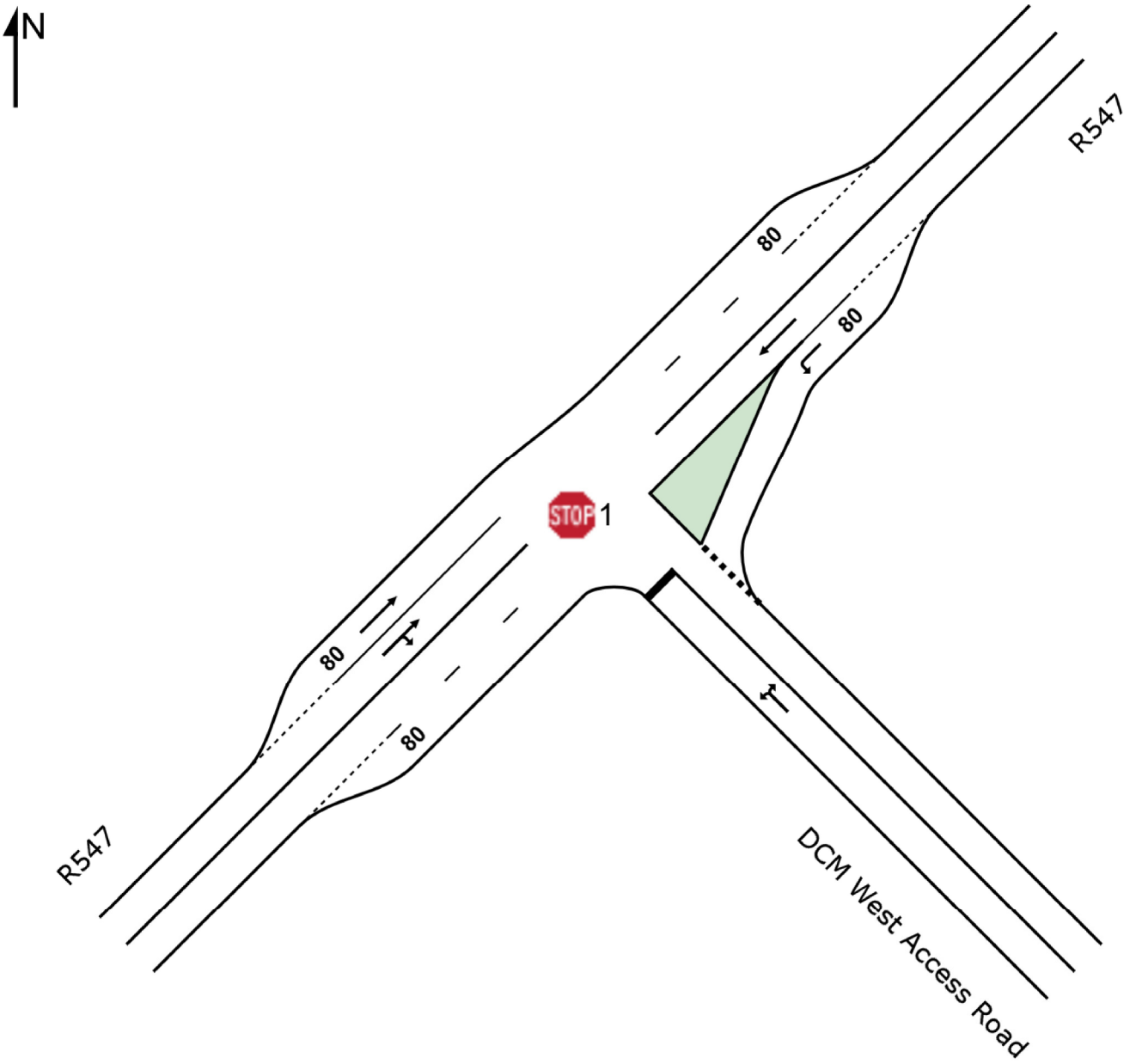
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: DCM West Access Road												
21	L2	68	1,5	0,416	12,1	LOS B	1,9	14,2	0,74	1,12	1,04	33,5
23	R2	78	9,2	0,416	26,8	LOS D	1,9	14,2	0,74	1,12	1,04	33,4
Approach		146	5,6	0,416	19,9	LOS C	1,9	14,2	0,74	1,12	1,04	33,4
NorthEast: R547												
24	L2	17	47,1	0,013	8,1	LOS A	0,1	0,5	0,05	0,58	0,05	49,1
25	T1	448	9,3	0,239	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	79,9
Approach		465	10,7	0,239	0,3	LOS A	0,1	0,5	0,00	0,02	0,00	78,1
SouthWest: R547												
31	T1	459	15,3	0,183	0,1	LOS A	0,1	0,8	0,03	0,01	0,03	79,6
32	R2	8	12,5	0,183	9,7	LOS A	0,1	0,8	0,04	0,02	0,04	53,3
Approach		467	15,3	0,183	0,2	NA	0,1	0,8	0,03	0,01	0,03	78,9
All Vehicles		1079	12,0	0,416	2,9	NA	1,9	14,2	0,11	0,17	0,15	66,3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2019 PM]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)



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Project: C:\Users\piete\Desktop\P-147 DCM West Expansion Project\R547_Access Road.sip8

MOVEMENT SUMMARY

Site: 1 [2019 AM + Construction]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

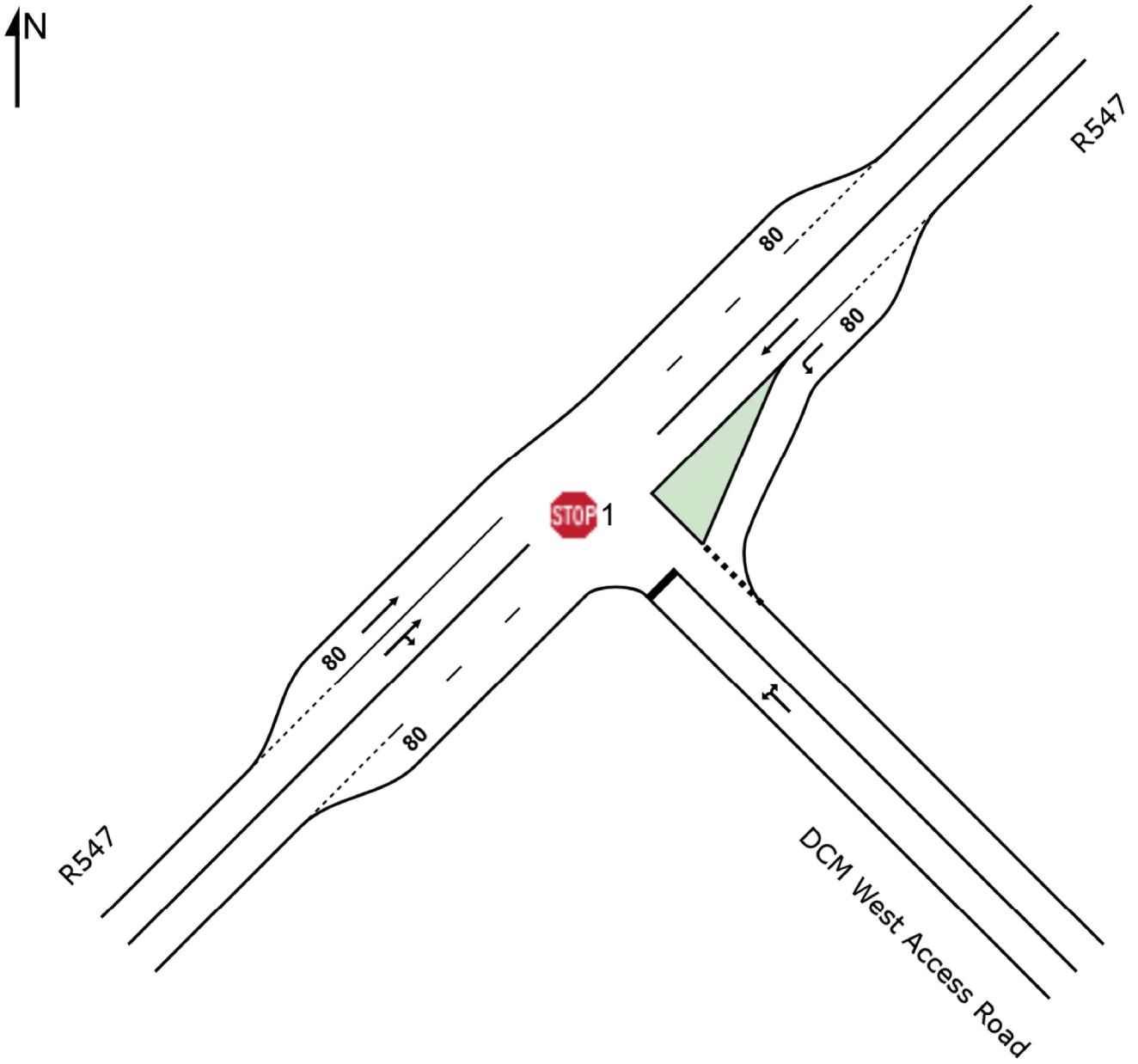
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: DCM West Access Road												
21	L2	23	10,0	0,110	9,2	LOS A	0,4	2,9	0,62	0,95	0,62	35,0
23	R2	20	11,8	0,110	21,9	LOS C	0,4	2,9	0,62	0,95	0,62	34,9
Approach		43	10,8	0,110	15,0	LOS B	0,4	2,9	0,62	0,95	0,62	35,0
NorthEast: R547												
24	L2	87	10,5	0,060	7,7	LOS A	0,2	1,9	0,16	0,57	0,16	48,9
25	T1	382	14,5	0,210	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	79,9
Approach		469	13,7	0,210	1,5	LOS A	0,2	1,9	0,03	0,11	0,03	71,4
SouthWest: R547												
31	T1	402	19,1	0,201	0,5	LOS A	0,7	5,6	0,16	0,09	0,16	77,1
32	R2	67	13,8	0,201	9,3	LOS A	0,7	5,6	0,26	0,15	0,26	51,5
Approach		469	18,4	0,201	1,7	NA	0,7	5,6	0,18	0,10	0,18	72,0
All Vehicles		980	15,8	0,210	2,2	NA	0,7	5,6	0,13	0,14	0,13	68,6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2019 AM + Construction]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)



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MOVEMENT SUMMARY

Site: 1 [2019 PM + Construction]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

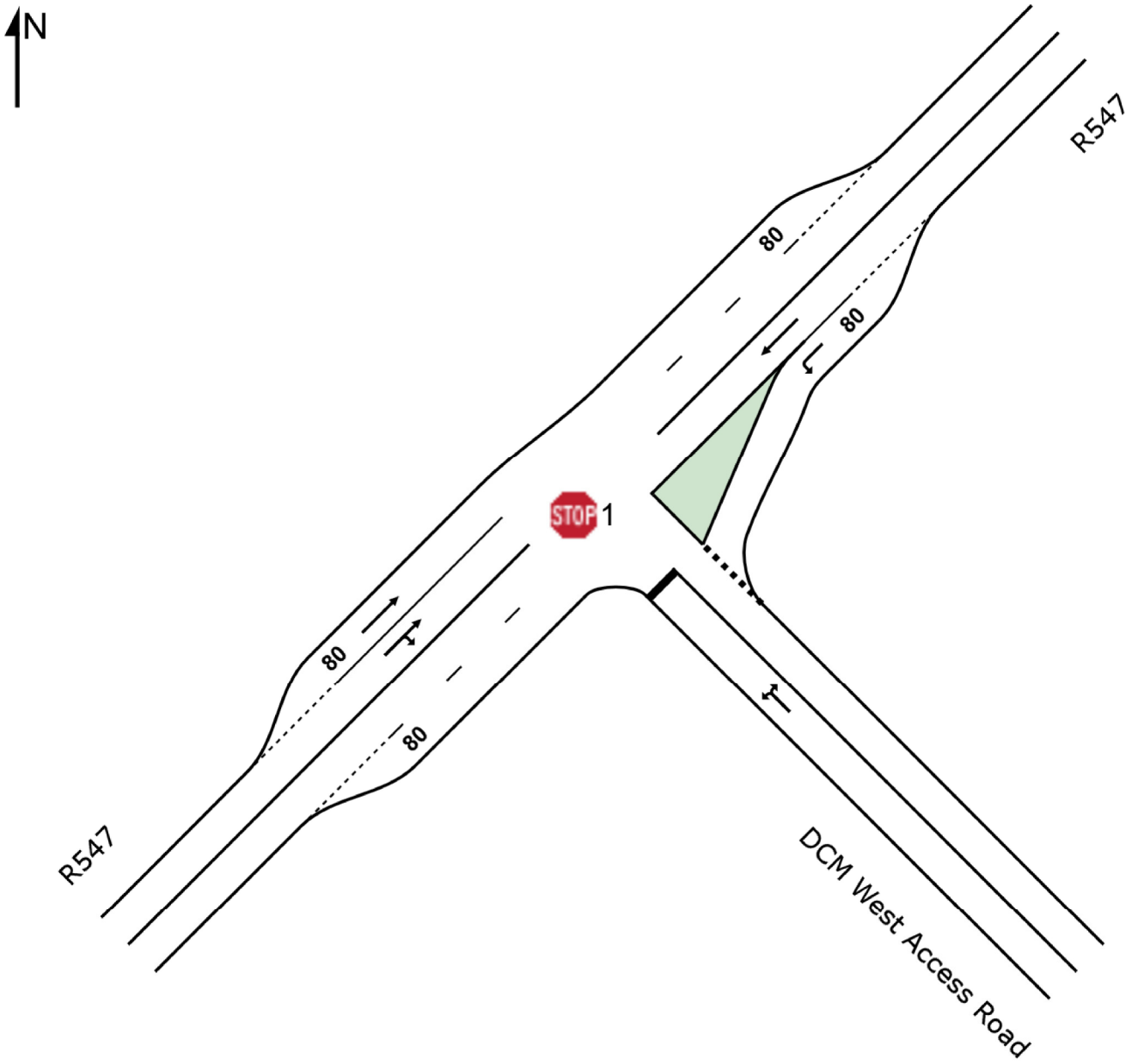
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: DCM West Access Road												
21	L2	83	6,2	0,554	15,1	LOS C	3,0	22,6	0,79	1,24	1,32	32,3
23	R2	101	11,1	0,554	31,0	LOS D	3,0	22,6	0,79	1,24	1,32	32,3
Approach		184	8,9	0,554	23,9	LOS C	3,0	22,6	0,79	1,24	1,32	32,3
NorthEast: R547												
24	L2	21	42,9	0,016	8,1	LOS A	0,1	0,6	0,06	0,57	0,06	49,1
25	T1	448	9,3	0,239	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	79,9
Approach		469	10,9	0,239	0,4	LOS A	0,1	0,6	0,00	0,03	0,00	77,7
SouthWest: R547												
31	T1	459	15,3	0,186	0,1	LOS A	0,2	1,3	0,04	0,02	0,04	79,4
32	R2	12	16,7	0,186	9,8	LOS A	0,2	1,3	0,06	0,02	0,06	53,2
Approach		471	15,4	0,186	0,4	NA	0,2	1,3	0,04	0,02	0,04	78,3
All Vehicles		1124	12,4	0,554	4,2	NA	3,0	22,6	0,15	0,22	0,23	63,3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2019 PM + Construction]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2019 AM + Operations]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

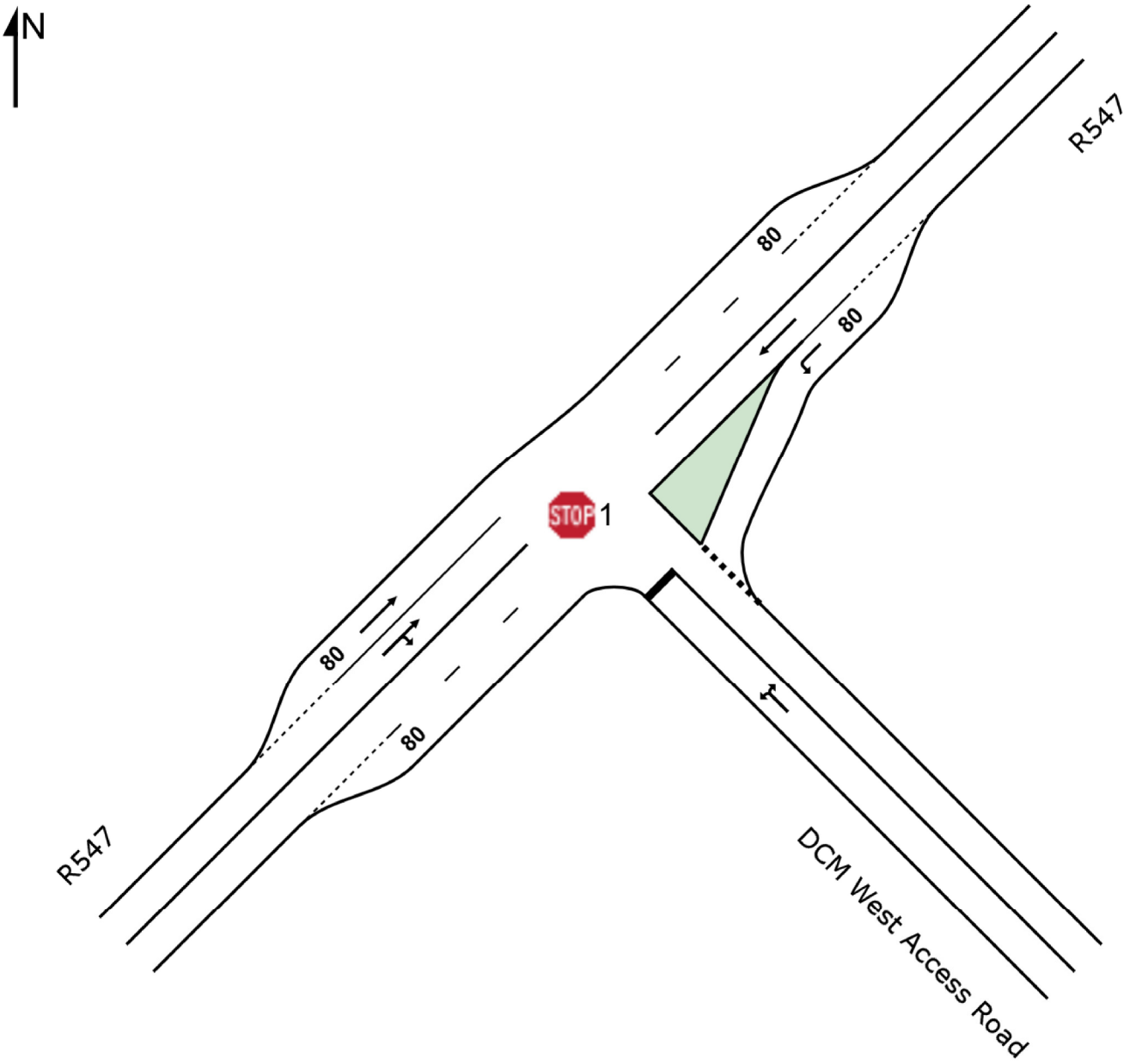
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: DCM West Access Road												
21	L2	21	5,6	0,090	8,9	LOS A	0,3	2,3	0,60	0,94	0,60	35,3
23	R2	17	6,7	0,090	20,0	LOS C	0,3	2,3	0,60	0,94	0,60	35,2
Approach		38	6,1	0,090	14,0	LOS B	0,3	2,3	0,60	0,94	0,60	35,3
NorthEast: R547												
24	L2	70	9,8	0,047	7,7	LOS A	0,2	1,5	0,15	0,57	0,15	49,0
25	T1	382	14,5	0,210	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	79,9
Approach		452	13,7	0,210	1,2	LOS A	0,2	1,5	0,02	0,09	0,02	72,7
SouthWest: R547												
31	T1	402	19,1	0,195	0,4	LOS A	0,6	4,8	0,15	0,08	0,15	77,4
32	R2	57	12,0	0,195	9,2	LOS A	0,6	4,8	0,23	0,13	0,23	51,8
Approach		460	18,3	0,195	1,5	NA	0,6	4,8	0,16	0,09	0,16	72,9
All Vehicles		949	15,6	0,210	1,9	NA	0,6	4,8	0,11	0,12	0,11	69,8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2019 AM + Operations]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)



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Project: C:\Users\piete\Desktop\P-147 DCM West Expansion Project\R547_Access Road.sip8

MOVEMENT SUMMARY

Site: 1 [2019 PM + Operations]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

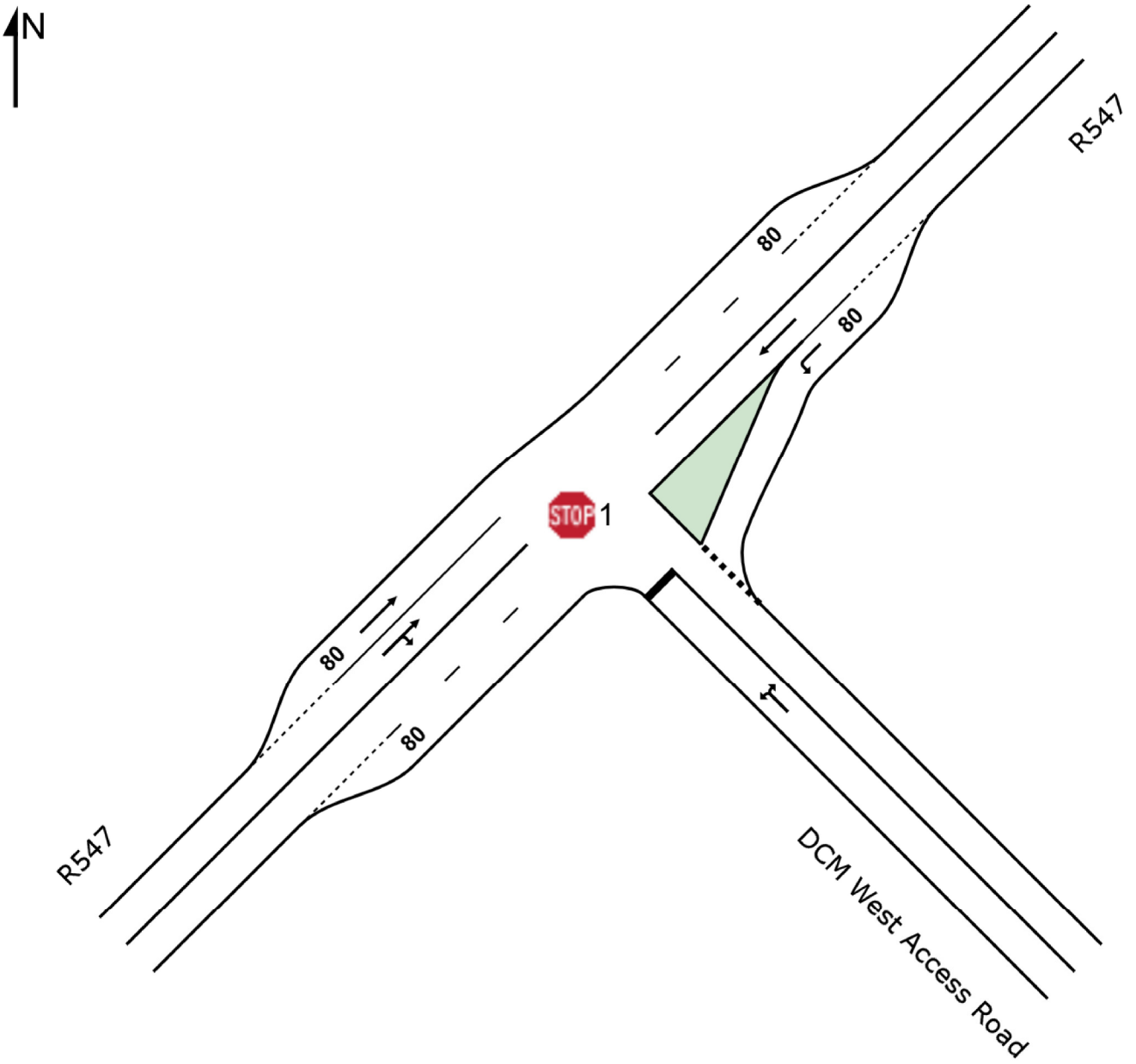
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
SouthEast: DCM West Access Road												
21	L2	78	3,9	0,493	13,6	LOS B	2,5	18,6	0,77	1,19	1,19	32,9
23	R2	90	11,4	0,493	29,2	LOS D	2,5	18,6	0,77	1,19	1,19	32,8
Approach		167	7,9	0,493	22,0	LOS C	2,5	18,6	0,77	1,19	1,19	32,8
NorthEast: R547												
24	L2	19	42,1	0,014	8,0	LOS A	0,1	0,5	0,05	0,58	0,05	49,2
25	T1	448	9,3	0,239	0,0	LOS A	0,0	0,0	0,00	0,00	0,00	79,9
Approach		467	10,7	0,239	0,4	LOS A	0,1	0,5	0,00	0,02	0,00	77,9
SouthWest: R547												
31	T1	459	15,3	0,183	0,1	LOS A	0,1	0,8	0,03	0,01	0,03	79,6
32	R2	8	12,5	0,183	9,7	LOS A	0,1	0,8	0,04	0,02	0,04	53,3
Approach		467	15,3	0,183	0,2	NA	0,1	0,8	0,03	0,01	0,03	78,9
All Vehicles		1102	12,2	0,493	3,6	NA	2,5	18,6	0,13	0,20	0,19	64,7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2019 PM + Operations]

R547 / Exxaro DCM West Access Road Intersection
Existing Intersection Control and Layout
Site Category: (None)
Stop (Two-Way)



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