ENVIRONMENTAL & ENGINEERING

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TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

REPORT

BUSHVELD VAMETCO ALLOYS: PRODUCTION EXPANSION PROJECT

TRAFFIC IMPACT ASSESSMENT

REPORT REF: P-208

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EXECUTIVE SUMMARY

Bushveld Vametco Alloys (Pty) Ltd appointed Nsovo Environmental Consulting (Pty) Ltd to undertake environmental authorisations associated with the proposed production expansion of their current operations at their facility situated just east of Brits in the North West Province, South Africa. Nsovo appointed Eco-Elementum (Pty) Ltd, in association with Infratrans (Pty) Ltd, to undertake a Traffic Impact Assessment for the project.

The project proposal by Vametco Alloys is to expand their current operations at the facility to increase production capacity from 3 000 to 5 000 metric tons per month, and eventually 10 000 metric tons per month in the future. This expansion will include the following activities:

- Expansion of the existing slimes dam towards the east of the mine to cater for additional slimes waste;
- Expansion of the magnetite dump to the north and south of the mine;
- Construction of two Pollution Control Dams (PCDs) for the proposed magnetite dump expansion and existing plant to accommodate the return of polluted water;
- Development of a new Return Water Dam (RWD) to accommodate return/polluted water from the proposed and existing slimes dams as well as to accommodate stormwater within the mine;
- Construction of a Barren Dam (BD) to store barren and other liquid solution, and
- Development of a new Waste Rock Dump (WRD) to reduce load and haul distance and facilitate easy backfill.

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 Vametco Alloys;
- 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. Seeing as no traffic problems or congestion are expected as a result of the project activities, provided 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

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Table 2: Specialist Details

Specialist Company:	Eco Elementum (Pty) Ltd
Company Reg. No.:	2012/021578/07
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Postal Address:	Post net suite 252, Private bag X025 Lynnwood Ridge 0040
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Website:	www.ecoelementum.co.za

1. INTRODUCTION AND STUDY SCOPE

Bushveld Vametco Alloys (Pty) Ltd (Vametco Alloys) appointed Nsovo Environmental Consulting (Pty) Ltd (Nsovo) to undertake environmental authorisations associated with the proposed production expansion of their current operations at their facility situated just east of Brits in the North West 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 Bushveld Vametco Alloys;
- 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

Bushveld Vametco Alloys is situated to the east of Brits, directly north of the township of Mothutlung, located within the jurisdiction of the Madibeng Local Municipality in the North West Province, South Africa. Details of the study site is summarized in **Table 3** below, with the location indicated in **Figure 1**.

Table 3: Study Site Details

Site Name:	Bushveld Vametco Alloys
Application Area:	~ 1 080 ha
Magisterial District:	Bojanala Platinum District Municipality, North West Province South Africa
Local Municipality	Madibeng Local Municipality
Distance and direction from nearest town:	The Project Area is ~ 8 km north-east of Brits and ~ 9 km west of Ga-Rankuwa.

Project Name: Bushveld Vametco Alloys Production Expansion
Client Name: Bushveld Vametco Alloys
Project: P-208
Figure: 1

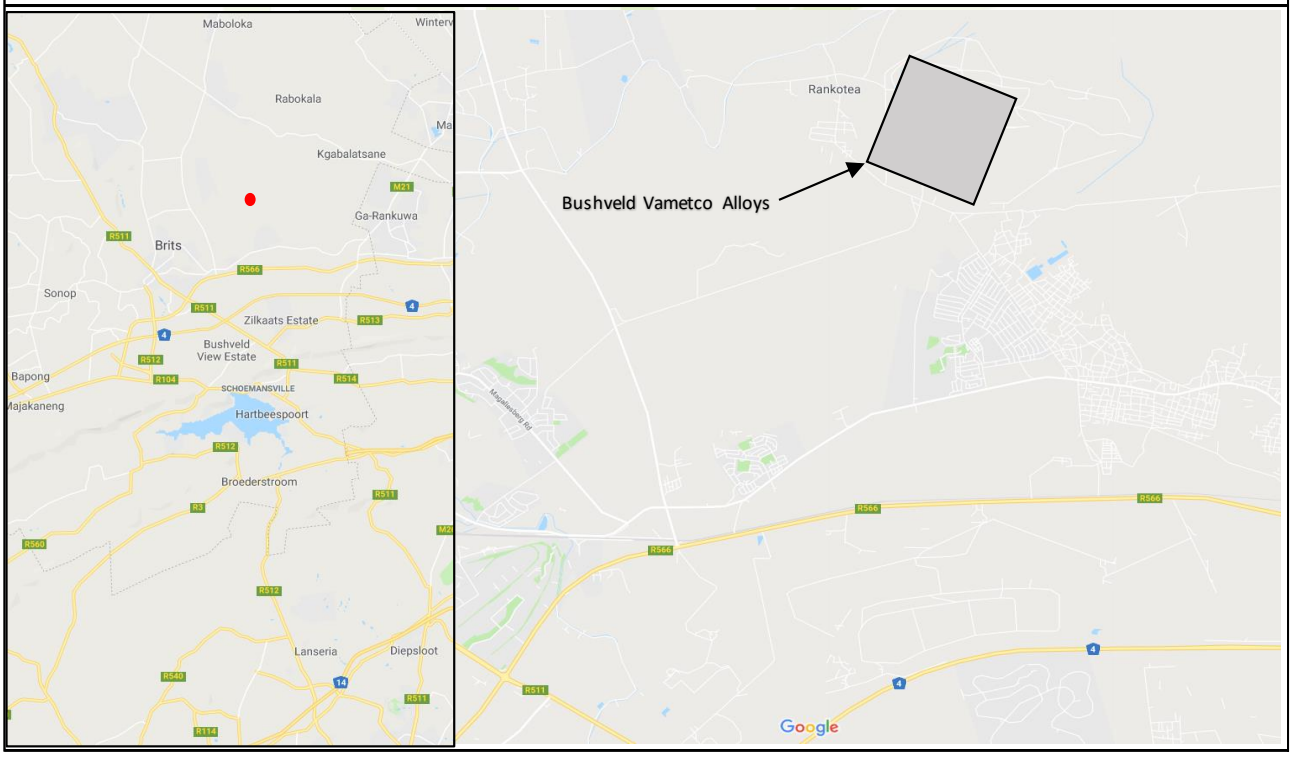


Figure 1: Location of the study site

2.2 PROJECT DESCRIPTION

The project proposal by Vametco Alloys is to expand their current operations at the facility to increase production capacity from 3 000 to 5 000 metric tons per month, and eventually 10 000 metric tons per month in the future. This expansion will include the following activities:

- Expansion of the existing slimes dam towards the east of the mine to cater for additional slimes waste;
- Expansion of the magnetite dump to the north and south of the mine;
- Construction of two Pollution Control Dams (PCDs) for the proposed magnetite dump expansion and existing plant to accommodate the return of polluted water;
- Development of a new Return Water Dam (RWD) to accommodate return/polluted water from the proposed and existing slimes dams as well as to accommodate stormwater within the mine;
- Construction of a Barren Dam (BD) to store barren and other liquid solution, and
- Development of a new Waste Rock Dump (WRD) to reduce load and haul distance and facilitate easy backfill.

Figure 2 overleaf shows the proposed new layout of Vametco Alloys.

Project Name: Bushveld Vametco Alloys Production Expansion
Client Name: Bushveld Vametco Alloys
Project: P-208
Figure: 2

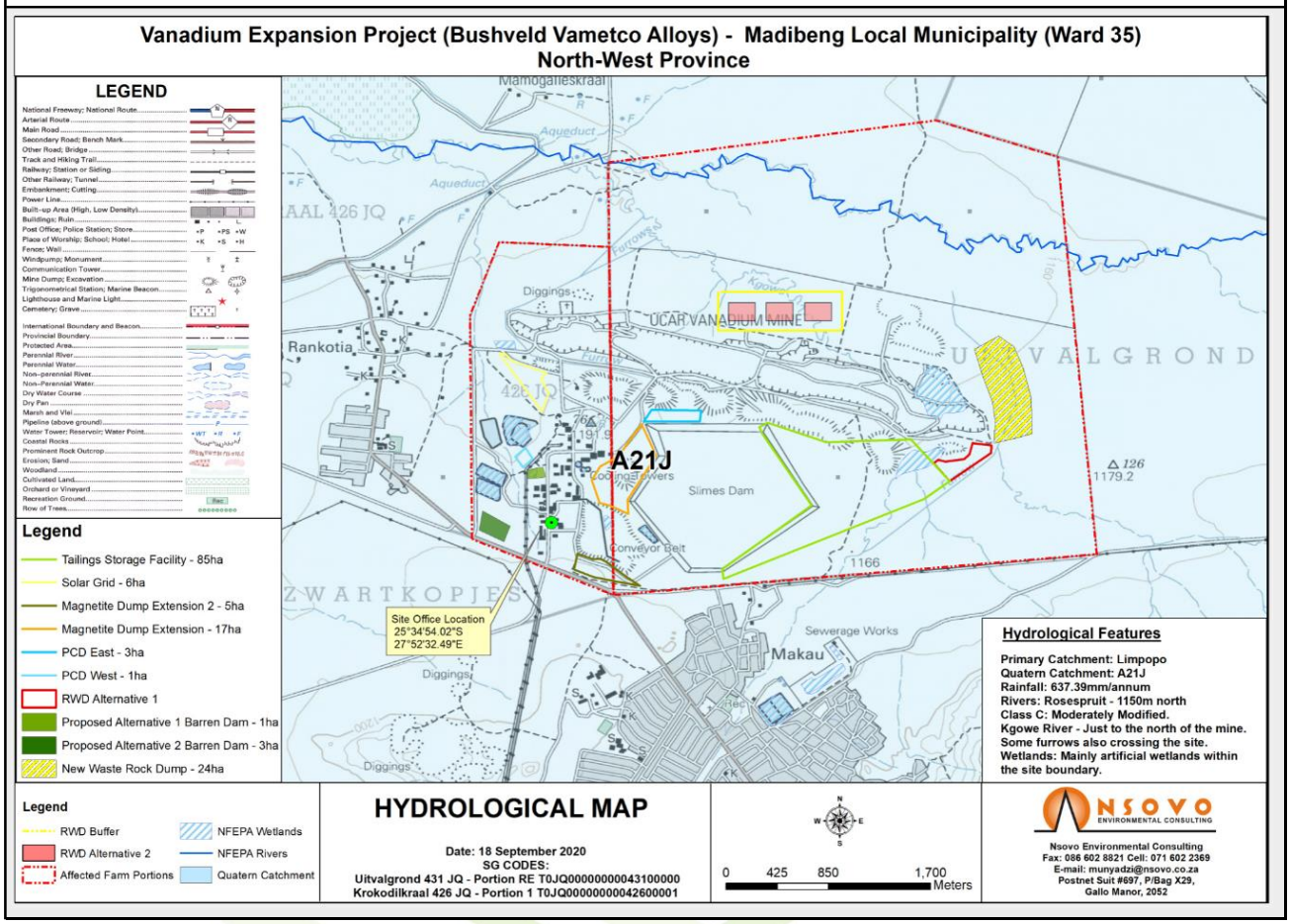


Figure 2: Proposed new layout of Vametco Alloys

3. OVERVIEW OF THE METHOD USED FOR ASSESSMENT

3.1 General Overview

The assessment method used can 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 activities 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 activities and the characteristics of the traffic expected to be generated as a result. 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*[1], 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 study area can be observed and a better understanding of the study area can be developed.

A site visit was conducted on Tuesday 6 August. 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 production expansion at Vametco Alloys (discussed in **Section 4.2**), as well as the expected distribution of these trips on the surrounding road network, the following existing roads were deemed relevant for the purpose of this study:

- Main Mothutlung Road: This road can be classified as a Class 4b road (commercial collector road) and is expected to fall under the jurisdiction of the local municipality. Access to Vametco Alloys is gained directly off this road. This road links the small settlement of Rankotea, located to the west of the study site, and Mothutlung, located to the south of the study site, with the main road leading to Damonsville and Moumong (discussed below), and

- Damonsville Road: This road can be classified as a Class 3 road (minor arterial road) and is also expected to fall under the jurisdiction of the local municipality. This road links Mothutlung with Damonsville and Brits to the west, and Moumong and Ga-Kwate to the east. It also links these and other smaller townships in the area with other provincial routes, such as the R566 and M21, which in turn provides access to the wider region and other provinces.

The classification of these roads is based on the *TRH 26, South African Road Classification and Access Management Manual*[2].

3.3.3 Intersections Investigated

As per the *TMH 16, Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual*[1], 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 Damonsville Road) 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**), the following intersections where deemed relevant for investigation:

- Main Mothutlung Road / Main Access Road to Vametco Alloys;
- Main Mothutlung Road / Heavy Vehicle Access Road to Vametco Alloys, and
- Main Mothutlung Road / Damonsville Road.

The boundaries of the study area are therefore limited to the location of these intersections.

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 existing mines located in and around the study area, the relevant road network 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 6 August 2019 at the key intersections 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 Vametco Alloys is provided directly off the main road to Mothutlung, with a separate access provided for heavy vehicles. The intersections between the Mothutlung Road and both these accesses are priority stop-controlled, with free-flow traffic conditions on the Mothutlung Road. The existing design layouts of these intersection are shown on **Drawing RUD001**, attached as **Appendix A** at the back of this document.

Access to the facility is controlled by means of security control points located approximately 65 m and 35 m from the above intersections for the main access and the heavy vehicle access, respectively. This allows for a stacking distance of 10 cars at the main access, and 2 15 m side tipper trucks (typically used at Vametco Alloys) at the access for heavy vehicles if a problem at the access control point is experienced. An informal stacking area is also available for heavy vehicles on the opposite side of the heavy vehicles access along the Mothutlung Road. Considering current traffic volumes generated by Vametco Alloys (discussed in **Section 4.2**), it can be concluded that the possibility of the traffic traveling along the main road to Mothutlung 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*[3], 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 Vametco Alloys were surveyed. The survey was conducted at the access intersections, as well as the additional key study intersection as previously identified in **Section 3.3.3**. The survey also provided traffic data to determine the current traffic demand in the study area.

From this survey it was determined that the peak traffic hours for Vametco Alloys occurred between 06h00-07h00 for the AM peak hour and between 16h15-17h15 for the PM peak hour, with the AM peak hour being the critical peak. The traffic volumes at the heavy vehicles access did not have notable peak traffic hours. Only a slight peak in traffic volumes were noted between 08h00-09h00, with little variation in volumes throughout the rest of the day.

The survey also indicated that the peak traffic hours at the study intersection in Mothutlung occurred between 06h30-07h30 for the AM peak hour and between 16h45-17h45 for the PM peak hour, with the PM peak hour being the critical peak.

The traffic currently generated by Vametco Alloys during the critical peak traffic hours is indicated in **Table 4** below, with the existing 2019 peak hour traffic volumes shown in **Figure 3** overleaf.

Table 4: Current traffic generated by Vametco Alloys

Peak Hour	Vehicle Trips Generated (Vehicles / hour)		
	In	Out	Total
Main Access			
AM (06h00 – 07h00)	112 (81%)	27 (19%)	139
PM (16h15 – 17h15)	19 (14%)	117 (86%)	136
Heavy Vehicle Access			
AM (08h00 – 09h00)	4 (57%)	3 (43%)	7
MD (13h30 – 14h30)	1 (14%)	6 (86%)	7

Note: (*) indicates IN:OUT split

The following can also be noted regarding the Vametco Alloys traffic presented above:

- A total of 10 taxis/shuttles and 3 busses per day entered the site.

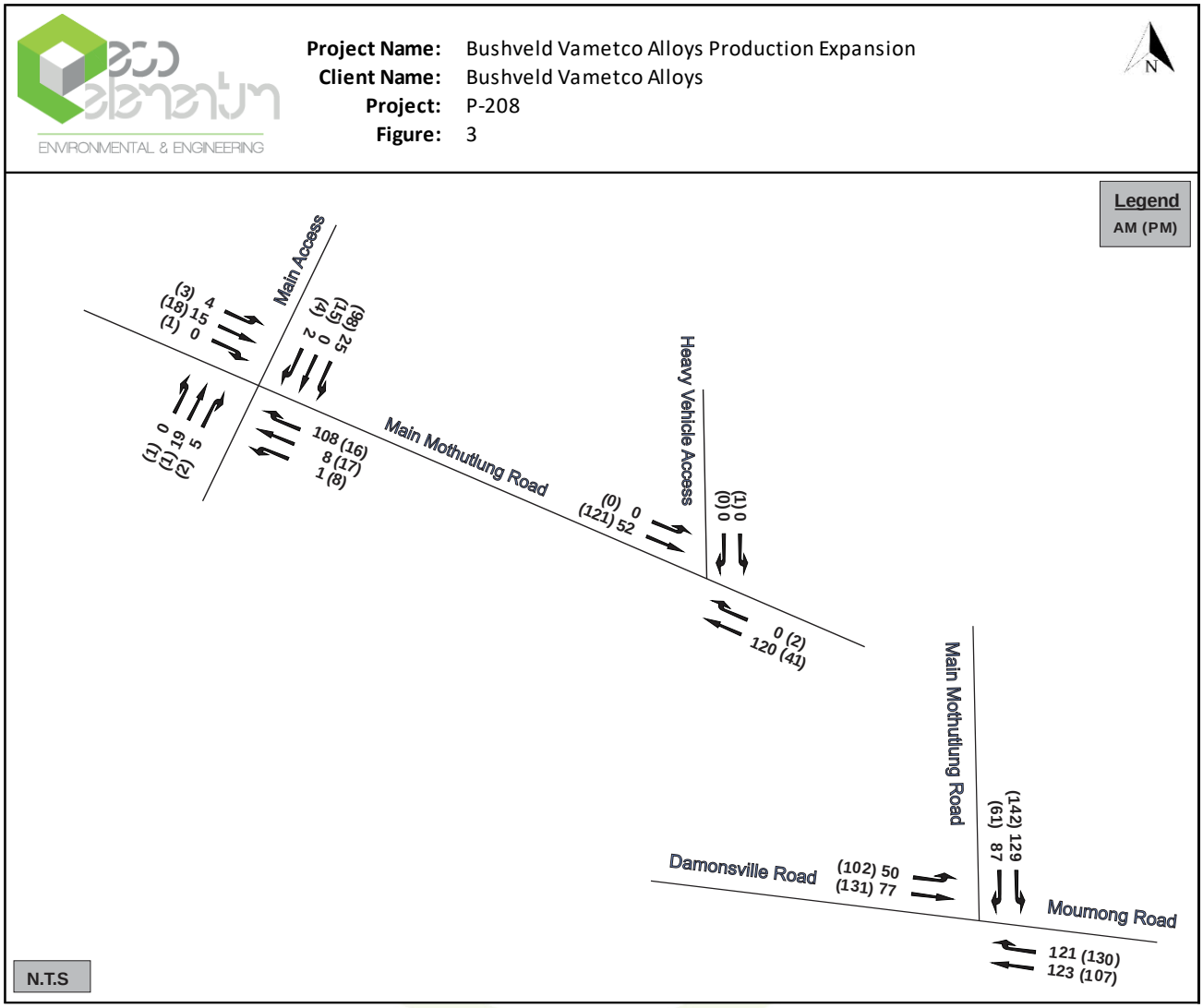


Figure 3: Existing 2019 Peak Hour Traffic Volumes

4.3 Baseline Operating Conditions

The baseline operating conditions for the key intersections are summarized in **Table 5** overleaf, with the detailed SIDRA outputs attached as **Appendix B**. These operating conditions are based on the existing 2019 peak hour traffic volumes as per **Figure 3**, as well as the existing intersections 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 para-meters	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
Main Vametco Alloys Access / Mothutlung Road App 1: Gravel Rd S App 2: Mot. Rd E App 3: Access N App 4: Mot. Rd W	**Week AM**	**V/C**	0.04	0.04	0.04	0.09	0.09	0.09	0.03	0.03	0.03	0.02	0.02	0.02
		Delay (s)	8	9	9	6	1	6	8	9	9	6	0	6
		LOS	A	A	A	A	A	A	A	A	A	A	A	A
	Week PM	**V/C**	0.01	0.01	0.01	0.03	0.03	0.03	0.12	0.12	0.12	0.02	0.02	0.02
		Delay (s)	8	8	9	6	1	6	8	8	8	6	0	6
		LOS	A	A	A	A	A	A	A	A	A	A	A	A
Heavy Vehicle Vametco Alloys Access / Mothutlung Road App 1: Mot. Rd E App 2: Access N App 3: Mot Rd W	**Week AM**	**V/C**	-	0.09	0.09	0.01	-	0.01	0.04	0.04	-	-	-	-
		Delay (s)	-	0	7	12	-	14	7	0	-	-	-	-
		LOS	-	A	A	B	-	B	A	A	-	-	-	-
	Week PM	**V/C**	-	0.04	0.04	0.01	-	0.01	0.10	0.10	-	-	-	-
		Delay (s)	-	1	8	13	-	14	7	0	-	-	-	-
		LOS	-	A	A	B	-	B	A	A	-	-	-	-
Mothutlung Road / Damonsville Road App 1: Mou. Rd E App 2: Mot. Rd N App 3: Dam. Rd W	**Week AM**	**V/C**	-	0.32	0.32	0.20	-	0.29	0.01	0.27	-	-	-	-
		Delay (s)	-	14	14	11	-	14	11	14	-	-	-	-
		LOS	-	B	B	B	-	B	B	B	-	-	-	-
	Week PM	**V/C**	-	0.26	0.26	0.21	-	0.20	0.15	0.36	-	-	-	-
		Delay (s)	-	12	12	11	-	12	11	14	-	-	-	-
		LOS	-	B	B	B	-	B	B	B	-	-	-	-

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 intersections. 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 both the Main Mothutlung Road and the Damonsville Road, as well as transporting passengers to and from Vametco Alloys.

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/shuttles and busses transporting passengers directly to and from the 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:

- Increasing the slimes waste capacity at the plant: This activity might increase the number of traffic during the construction of the slime dams;
- Increasing the magnetite dump capacity at the plant: This activity might increase the number of traffic during the construction of the dumps;
- Construction of the new pollution control dams: This activity will result in traffic to be generated during the construction of the pollution control dams;
- Development of the new return water dam: This activity will also result in traffic to be generated during the construction of the return water dams;
- Construction of the Barren Dam: This activity will also result in traffic to be generated during the construction of the dam;
- Development of a new waste rock dump: It is not expected that this activity will generate any new traffic during the construction or operational phases, and
- General expansion of production: This activity will increase the number of trucks entering and exiting the site during the operational phase. This actively might also result in a small number of additional employees working at the facility 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 1-5 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 300 construction workers will be on site;
- 80% of the construction workers will make use of public transport or transport provided by the contractor;
- The remaining 20% 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;
- An in:out traffic split of 80%:20%, and 20%:80% is assumed for the AM and PM peak traffic hours, respectively, and
- Construction traffic will only make use of the heavy vehicle access to Vametco Alloys.

Based on the assumptions above, the construction phase is expected to generate peak hour traffic volumes as per **Table 9** overleaf.

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

Peak Hour	Vehicle Trips Generated (Vehicles / hour)		
	In	Out	Total
AM	40	10	50
PM	10	40	50

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

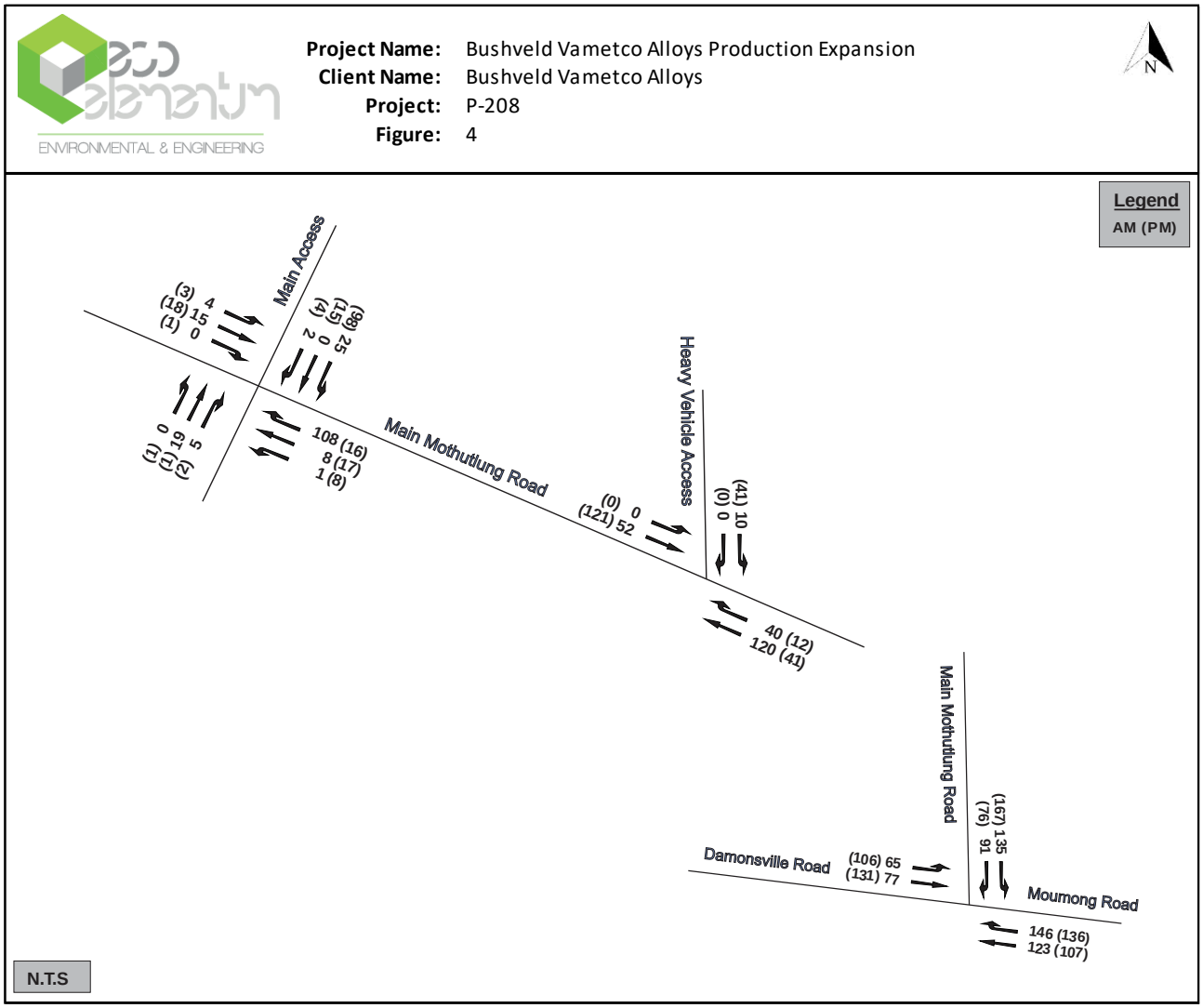


Figure 4: Expected peak hour traffic volumes at the key intersections during the construction phase

The operating conditions for the key intersections during the construction phase are summarized in **Table 10** 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 intersections layout design and traffic control as per **Drawing RUD001**.

Table 10: Construction phase operating conditions

Intersection & approach definitions	Peak hour	Analysis para-meters	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
Main Vametco Alloys Access / Mothutlung Road App 1: Gravel Rd S App 2: Mot. Rd E App 3: Access N App 4: Mot. Rd W	**Week AM**	**V/C**	0.04	0.04	0.04	0.09	0.09	0.09	0.03	0.03	0.03	0.02	0.02	0.02
		Delay (s)	8	9	9	6	1	6	8	9	9	6	0	6
		LOS	A	A	A	A	A	A	A	A	A	A	A	A
	Week PM	**V/C**	0.01	0.01	0.01	0.03	0.03	0.03	0.12	0.12	0.12	0.02	0.02	0.02
		Delay (s)	8	8	9	6	1	6	8	8	8	6	0	6
		LOS	A	A	A	A	A	A	A	A	A	A	A	A
Heavy Vehicle Vametco Alloys Access / Mothutlung Road App 1: Mot. Rd E App 2: Access N App 3: Mot Rd W	**Week AM**	**V/C**	-	0.12	0.12	0.02	-	0.02	0.04	0.04	-	-	-	-
		Delay (s)	-	1	6	9	-	15	7	0	-	-	-	-
		LOS	-	A	A	A	-	C	A	A	-	-	-	-
	Week PM	**V/C**	-	0.05	0.05	0.06	-	0.06	0.10	0.10	-	-	-	-
		Delay (s)	-	1	6	9	-	15	7	0	-	-	-	-
		LOS	-	A	A	A	-	C	A	A	-	-	-	-
Mothutlung Road / Damonsville Road App 1: Mou. Rd E App 2: Mot. Rd N App 3: Dam. Rd W	**Week AM**	**V/C**	-	0.35	0.35	0.21	-	0.31	0.13	0.27	-	-	-	-
		Delay (s)	-	14	14	11	-	15	11	14	-	-	-	-
		LOS	-	B	B	B	-	B	B	B	-	-	-	-
	Week PM	**V/C**	-	0.25	0.29	0.24	-	0.24	0.17	0.38	-	-	-	-
		Delay (s)	-	12	13	11	-	13	11	15	-	-	-	-
		LOS	-	B	B	B	-	B	B	C	-	-	-	-

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 number of employees at Vametco Alloys will increase by 15% as a result of the new future operations;
- A maximum of 140 tons per hour of vanadium rich slag waste material will be imported by road (i.e. a maximum of four 35-ton trucks per hour);
- The increase in production and export of vanadium by road will generate a maximum of 2 trucks per hour during a day;
- An in:out traffic split of 80%:20%, and 20%:80% is 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 11** overleaf.

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

Peak Hour	Vehicle Trips Generated (Vehicles / hour)		
	In	Out	Total
Main Access			
AM	17	4	21
PM	4	17	21
Heavy Vehicle Access			
AM	5	1	6
MD	1	5	6

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

Project Name: Bushveld Vametco Alloys Production Expansion
Client Name: Bushveld Vametco Alloys
Project: P-208
Figure: 5

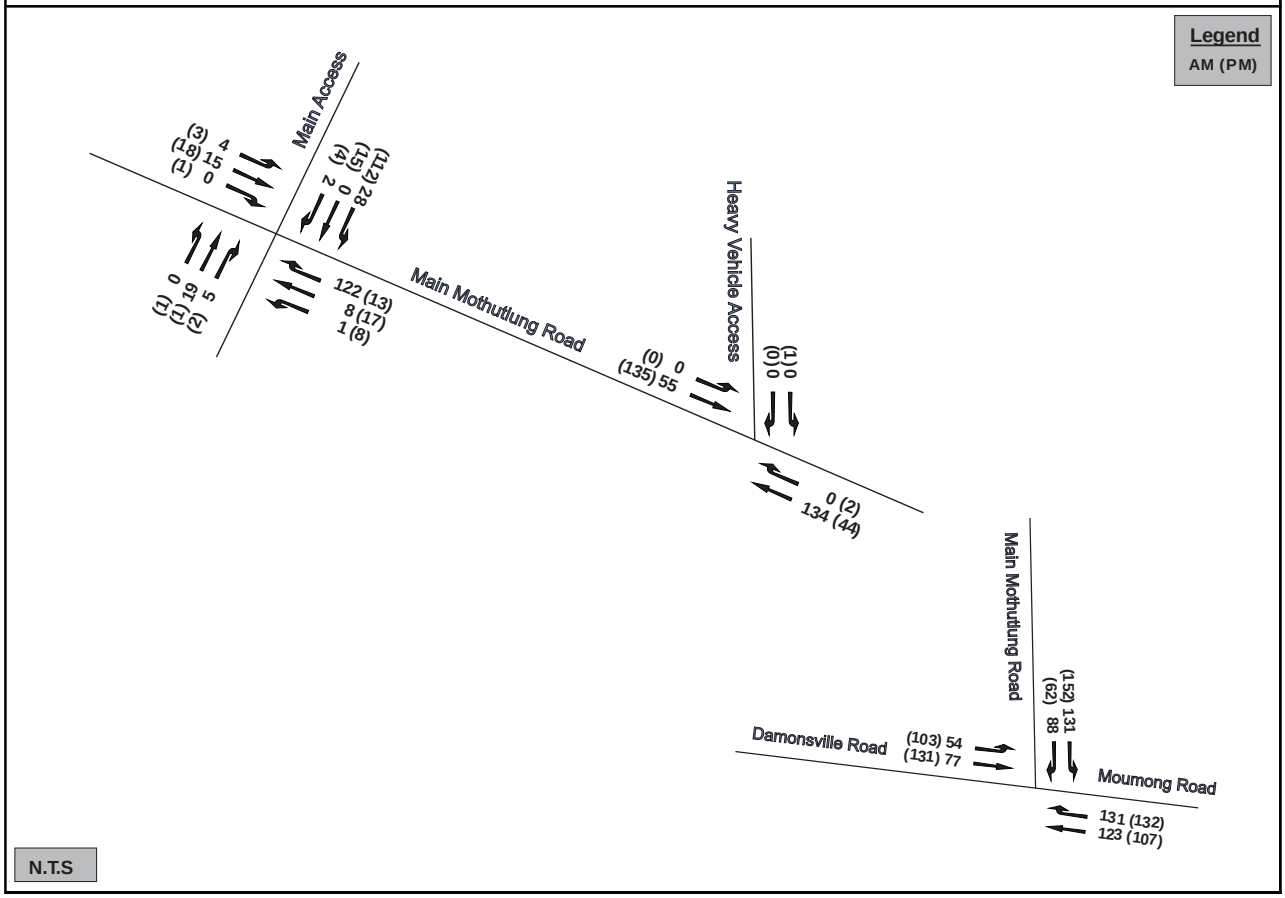


Figure 5: Expected peak hour traffic volumes at the key intersections during the future operational phase

The operating conditions for the key intersections during the future operational phase are summarized in **Table 12** below, with the detailed SIDRA outputs attached as **Appendix B**. These operating conditions are based on the expected peak hour traffic volumes during future operations as per **Figure 5**, as well as the existing intersections layout design and traffic control as per **Drawing RUD001**.

Table 12: Future operational phase operating conditions

Intersection & approach definitions	Peak hour	Analysis para-meters	Intersection capacity analysis results											
			Approach 1			Approach 2			Approach 3			Approach 4		
			L	T	R	L	T	R	L	T	R	L	T	R
Main Vametco Alloys Access / Mothutlung Road App 1: Gravel Rd S App 2: Mot. Rd E App 3: Access N App 4: Mot. Rd W	**Week AM**	**V/C**	0.04	0.04	0.04	0.10	0.10	0.10	0.03	0.03	0.03	0.02	0.02	0.02
		Delay (s)	8	9	9	6	1	6	8	9	9	6	0	6
		LOS	A	A	A	A	A	A	A	A	A	A	A	A
	Week PM	**V/C**	0.01	0.01	0.01	0.03	0.03	0.03	0.14	0.14	0.14	0.02	0.02	0.02
		Delay (s)	8	8	9	6	1	6	8	8	8	6	0	6
		LOS	A	A	A	A	A	A	A	A	A	A	A	A
Heavy Vehicle Vametco Alloys Access / Mothutlung Road App 1: Mot. Rd E App 2: Access N App 3: Mot Rd W	**Week AM**	**V/C**	-	0.10	0.10	0.01	-	0.01	0.04	0.04	-	-	-	-
		Delay (s)	-	0	7	12	-	15	7	0	-	-	-	-
		LOS	-	A	A	B	-	B	A	A	-	-	-	-
	Week PM	**V/C**	-	0.04	0.04	0.01	-	0.01	0.11	0.11	-	-	-	-
		Delay (s)	-	1	8	14	-	15	7	0	-	-	-	-
		LOS	-	A	A	B	-	B	A	A	-	-	-	-
Mothutlung Road / Damonsville Road App 1: Mou. Rd E App 2: Mot. Rd N App 3: Dam. Rd W	**Week AM**	**V/C**	-	0.33	0.33	0.20	-	0.30	0.11	0.27	-	-	-	-
		Delay (s)	-	14	14	11	-	14	11	14	-	-	-	-
		LOS	-	B	B	B	-	B	B	B	-	-	-	-
	Week PM	**V/C**	-	0.24	0.27	0.22	-	0.20	0.16	0.36	-	-	-	-
		Delay (s)	-	12	13	11	-	12	11	15	-	-	-	-
		LOS	-	B	B	B	-	B	B	B	-	-	-	-

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** overleaf, 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 these 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 regarding 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 regarding the proposed production expansion at Bushveld Vametco Alloys, situated just east of Brits in the North West 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 intersections:
    - Main Mothutlung Road / Main Access Road to Vametco Alloys;
    - Main Mothutlung Road / Heavy Vehicle Access Road to Vametco Alloys, and
    - Main Mothutlung Road / Damonsville Road.
- 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 6 August 2019 at the key study intersections;
- 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;
- Seeing 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. TRH 26, ***South African Road Classification and Access Management Manual. Version 1.0***, August 2012.
- 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.

Appendix A
Drawing RUD001

LEGEND:

EXISTING ROAD SURFACE
EXISTING GRAVEL ROAD

MAIN ENTRANCE ACCESS CONTROL

WEIGHBRIDGE

HEAVY VEHICLE ENTRANCE ACCESS CONTROL

INFORMAL TRUCK STACKING AREA

MAIN MOTHUTLUNG ROAD

Image © 2019 Maxar Technologies

Google

182 m

REV	DATE	BY	DESCRIPTION	CHK	APD
A	2019-08-31	RvW	FOR APPROVAL	PJ	RvW

ARCHITECT: -

CLIENT:

DRAWING STATUS: PRELIMINARY

INFRATRANS
TRAFFIC AND TRANSPORTATION ENGINEERING CONSULTING

PROJECT: BUSHVELD VAMETCO ALLOYS

TITLE: ACCESSES AND STUDY INTERSECTIONS LAYOUT

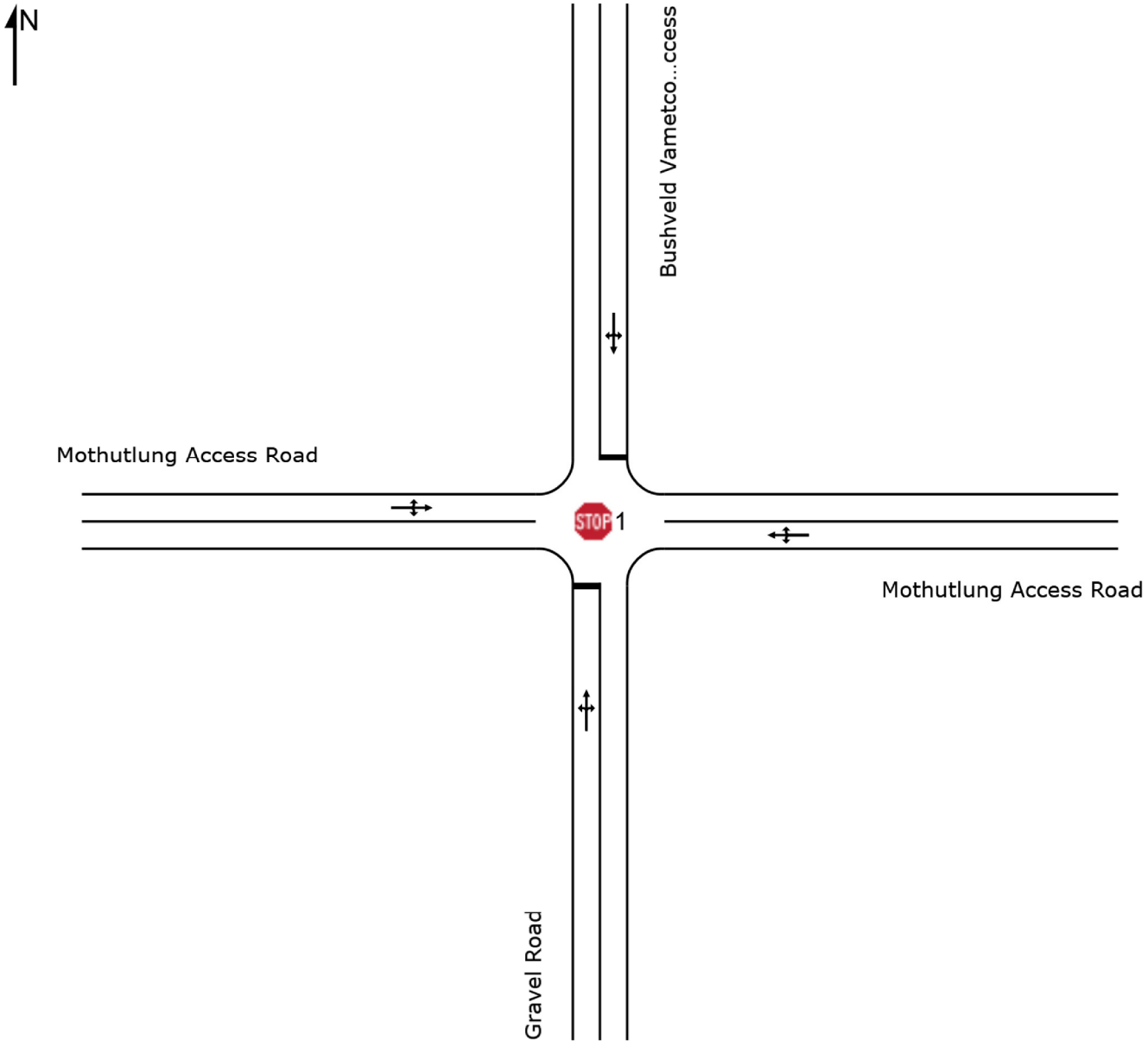
SCALE @ A3:	CHECKED:	APPROVED:
1:2000	RvW	RvW
DESIGN: PJ	DRAWN: PJ	DATE: 31/08/2019
PROJECT No: P-208	DRAWING No: RUD001	REV: A

Appendix B
SIDRA outputs

SITE LAYOUT

Site: 1 [2019 AM - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2019 AM - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

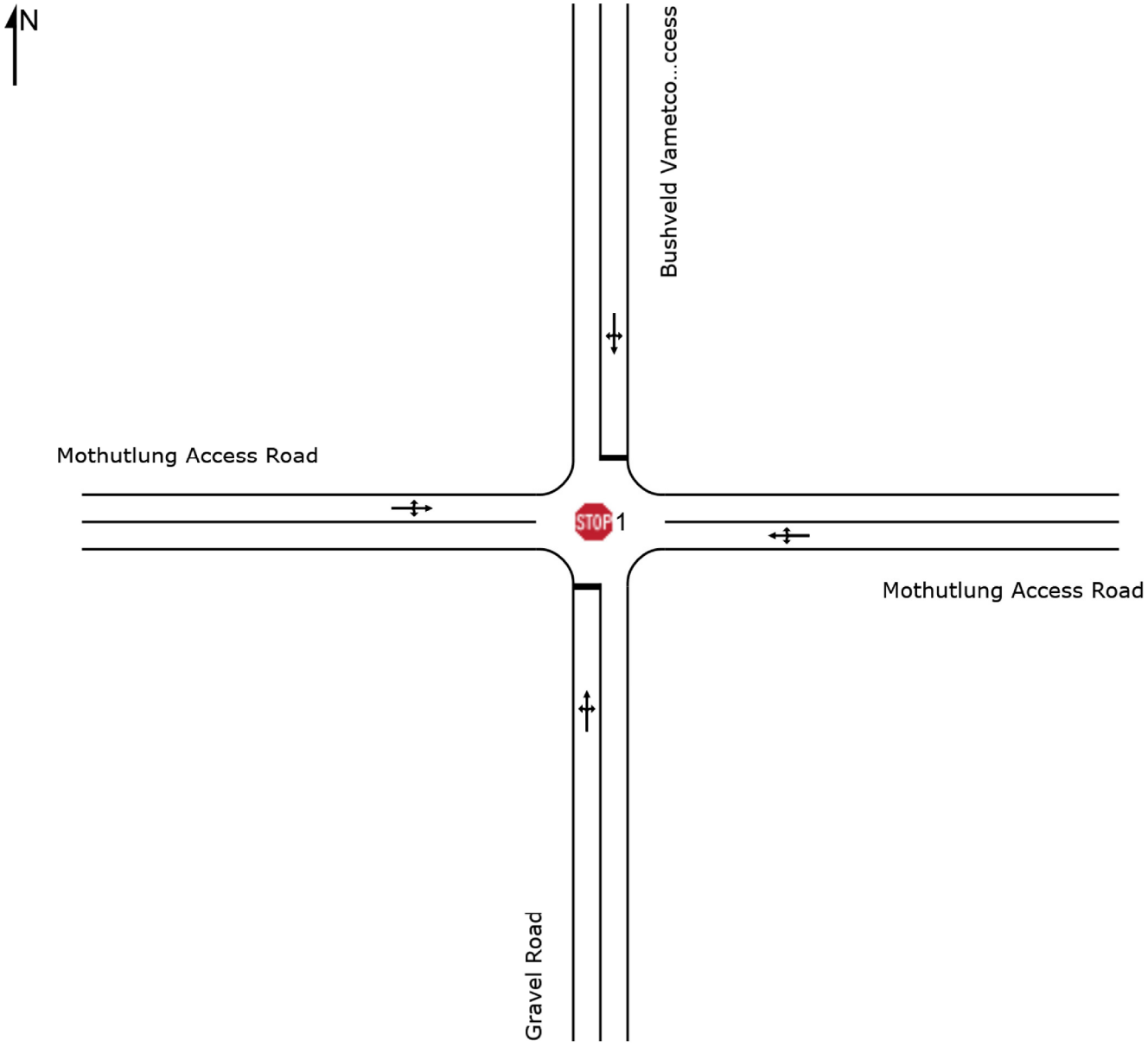
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	1	5.0	0.037	8.3	LOS A	0.1	0.9	0.20	0.98	0.20	51.4
2	T1	26	5.0	0.037	8.9	LOS A	0.1	0.9	0.20	0.98	0.20	51.1
3	R2	7	5.0	0.037	9.0	LOS A	0.1	0.9	0.20	0.98	0.20	50.9
Approach		34	5.0	0.037	8.9	LOS A	0.1	0.9	0.20	0.98	0.20	51.1
East: Mothutlung Access Road												
4	L2	1	5.0	0.093	5.7	LOS A	0.5	3.3	0.10	0.53	0.10	53.5
5	T1	11	10.0	0.093	0.1	LOS A	0.5	3.3	0.10	0.53	0.10	55.0
6	R2	148	5.0	0.093	5.6	LOS A	0.5	3.3	0.10	0.53	0.10	52.9
Approach		160	5.3	0.093	5.2	NA	0.5	3.3	0.10	0.53	0.10	53.1
North: Bushveld Vametco Alloys Access												
7	L2	34	5.0	0.030	8.3	LOS A	0.1	0.8	0.07	0.96	0.07	51.5
8	T1	1	5.0	0.030	8.9	LOS A	0.1	0.8	0.07	0.96	0.07	51.3
9	R2	3	5.0	0.030	9.0	LOS A	0.1	0.8	0.07	0.96	0.07	51.0
Approach		38	5.0	0.030	8.4	LOS A	0.1	0.8	0.07	0.96	0.07	51.5
West: Mothutlung Access Road												
10	L2	5	5.0	0.015	5.6	LOS A	0.0	0.1	0.01	0.15	0.01	56.8
11	T1	21	10.0	0.015	0.0	LOS A	0.0	0.1	0.01	0.15	0.01	58.6
12	R2	1	5.0	0.015	5.5	LOS A	0.0	0.1	0.01	0.15	0.01	56.2
Approach		27	8.7	0.015	1.4	NA	0.0	0.1	0.01	0.15	0.01	58.1
All Vehicles		260	5.6	0.093	5.8	NA	0.5	3.3	0.10	0.61	0.10	53.0

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 - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
Site Category: (None)
Stop (Two-Way)



Organisation: INFRATRANS CIVIL AND TRAFFIC ENGINEERING | Created: Monday, 02 September 2019 08:29:05
Project: C:\Users\piete\Dropbox\PROJECTS\P-208 Bushveld Vametco Allloys Brits EIA TIA\7 Analyses & Calculations\Site Access_Mothutlung Access.sip8

MOVEMENT SUMMARY

Site: 1 [2019 PM - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
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: Gravel Road												
1	L2	1	5.0	0.006	8.3	LOS A	0.0	0.1	0.12	0.96	0.12	51.4
2	T1	1	5.0	0.006	8.3	LOS A	0.0	0.1	0.12	0.96	0.12	51.1
3	R2	3	5.0	0.006	9.0	LOS A	0.0	0.1	0.12	0.96	0.12	50.9
Approach		5	5.0	0.006	8.6	LOS A	0.0	0.1	0.12	0.96	0.12	51.1
East: Mothutlung Access Road												
4	L2	11	5.0	0.031	5.7	LOS A	0.1	0.9	0.08	0.33	0.08	55.0
5	T1	23	10.0	0.031	0.1	LOS A	0.1	0.9	0.08	0.33	0.08	56.6
6	R2	21	5.0	0.031	5.6	LOS A	0.1	0.9	0.08	0.33	0.08	54.4
Approach		55	7.1	0.031	3.3	NA	0.1	0.9	0.08	0.33	0.08	55.4
North: Bushveld Vametco Alloys Access												
7	L2	131	5.0	0.120	8.3	LOS A	0.5	3.7	0.10	0.95	0.10	51.6
8	T1	20	5.0	0.120	8.4	LOS A	0.5	3.7	0.10	0.95	0.10	51.3
9	R2	5	5.0	0.120	8.1	LOS A	0.5	3.7	0.10	0.95	0.10	51.1
Approach		156	5.0	0.120	8.3	LOS A	0.5	3.7	0.10	0.95	0.10	51.5
West: Mothutlung Access Road												
10	L2	4	5.0	0.016	5.6	LOS A	0.0	0.1	0.01	0.11	0.01	57.1
11	T1	24	10.0	0.016	0.0	LOS A	0.0	0.1	0.01	0.11	0.01	58.9
12	R2	1	5.0	0.016	5.6	LOS A	0.0	0.1	0.01	0.11	0.01	56.5
Approach		29	9.1	0.016	1.0	NA	0.0	0.1	0.01	0.11	0.01	58.6
All Vehicles		245	6.0	0.120	6.3	NA	0.5	3.7	0.08	0.71	0.08	53.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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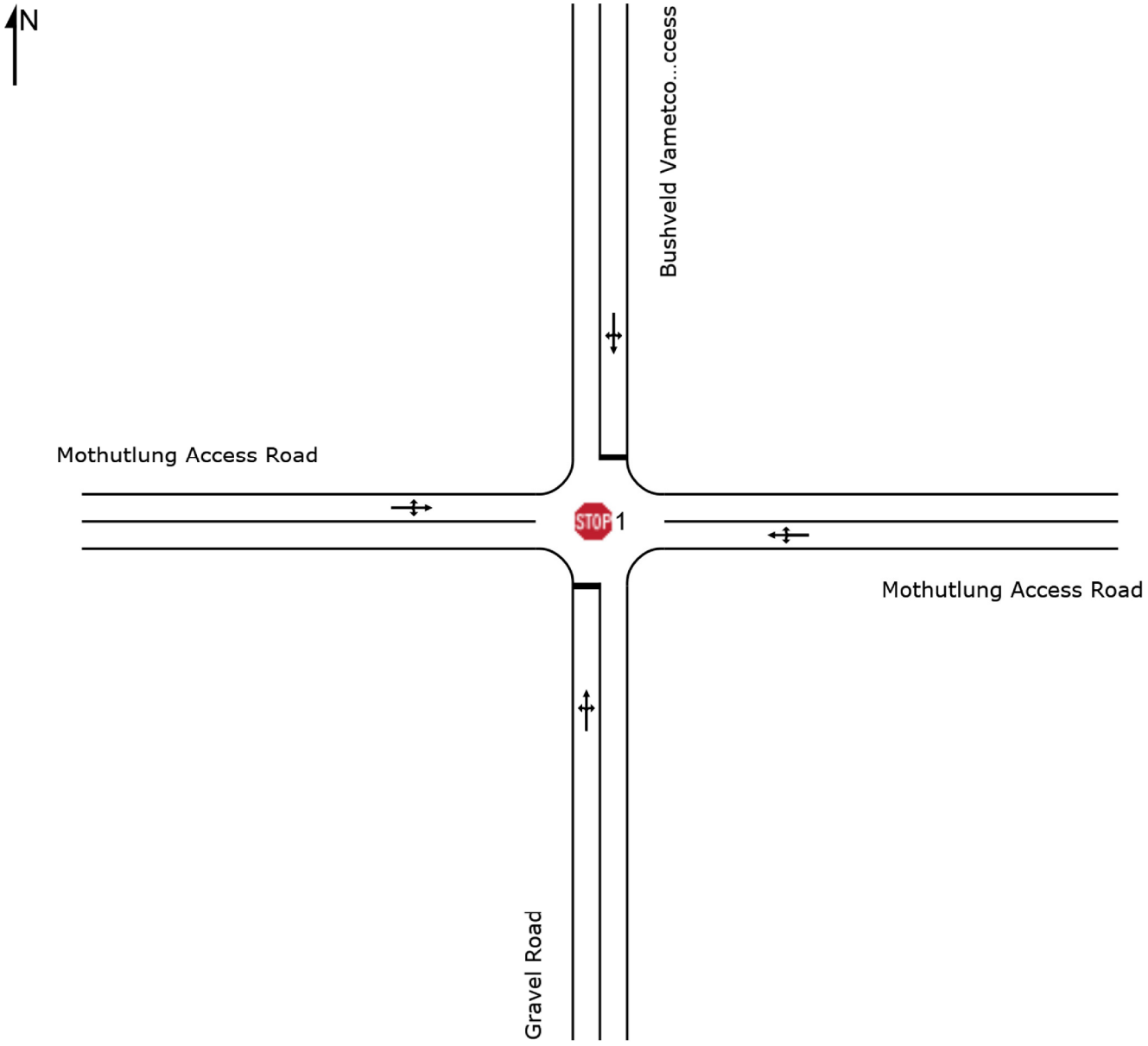
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2019 AM PLUS Construction - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
Site Category: (None)
Stop (Two-Way)



Organisation: INFRATRANS CIVIL AND TRAFFIC ENGINEERING | Created: Monday, 02 September 2019 08:29:07
Project: C:\Users\piete\Dropbox\PROJECTS\P-208 Bushveld Vametco Allloys Brits EIA TIA\7 Analyses & Calculations\Site Access_Mothutlung Access.sip8

MOVEMENT SUMMARY

Site: 1 [2019 AM PLUS Construction - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
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
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1	L2	1	5.0	0.037	8.3	LOS A	0.1	0.9	0.20	0.98	0.20	51.4
2	T1	26	5.0	0.037	8.9	LOS A	0.1	0.9	0.20	0.98	0.20	51.1
3	R2	7	5.0	0.037	9.0	LOS A	0.1	0.9	0.20	0.98	0.20	50.9
Approach		34	5.0	0.037	8.9	LOS A	0.1	0.9	0.20	0.98	0.20	51.1
East: Mothutlung Access Road												
4	L2	1	5.0	0.093	5.7	LOS A	0.5	3.3	0.10	0.53	0.10	53.5
5	T1	11	10.0	0.093	0.1	LOS A	0.5	3.3	0.10	0.53	0.10	55.0
6	R2	148	5.0	0.093	5.6	LOS A	0.5	3.3	0.10	0.53	0.10	52.9
Approach		160	5.3	0.093	5.2	NA	0.5	3.3	0.10	0.53	0.10	53.1
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7	L2	34	5.0	0.030	8.3	LOS A	0.1	0.8	0.07	0.96	0.07	51.5
8	T1	1	5.0	0.030	8.9	LOS A	0.1	0.8	0.07	0.96	0.07	51.3
9	R2	3	5.0	0.030	9.0	LOS A	0.1	0.8	0.07	0.96	0.07	51.0
Approach		38	5.0	0.030	8.4	LOS A	0.1	0.8	0.07	0.96	0.07	51.5
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10	L2	5	5.0	0.015	5.6	LOS A	0.0	0.1	0.01	0.15	0.01	56.8
11	T1	21	10.0	0.015	0.0	LOS A	0.0	0.1	0.01	0.15	0.01	58.6
12	R2	1	5.0	0.015	5.5	LOS A	0.0	0.1	0.01	0.15	0.01	56.2
Approach		27	8.7	0.015	1.4	NA	0.0	0.1	0.01	0.15	0.01	58.1
All Vehicles		260	5.6	0.093	5.8	NA	0.5	3.3	0.10	0.61	0.10	53.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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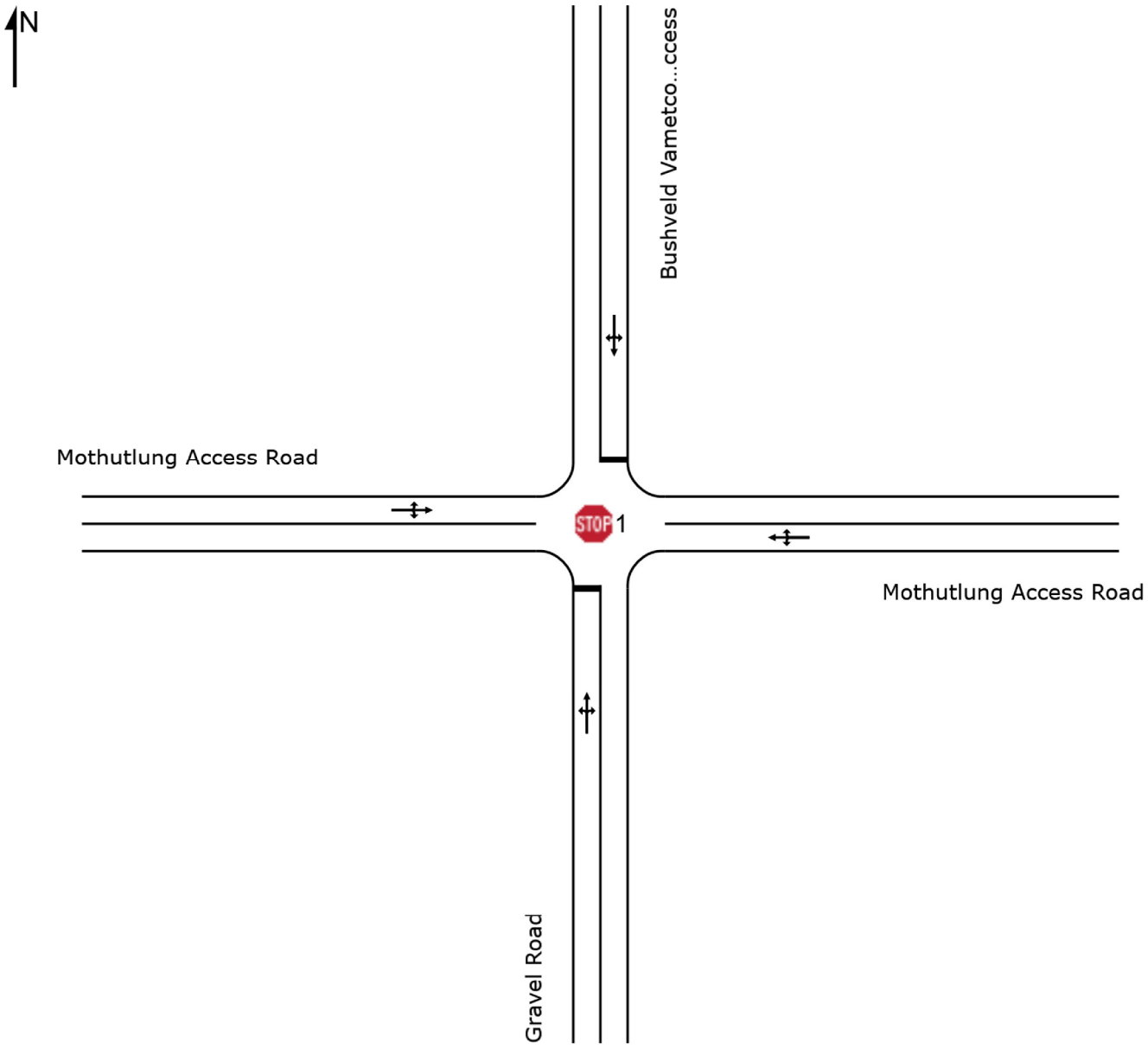
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 1 [2019 PM PUS Construction - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2019 PM PUS Construction - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

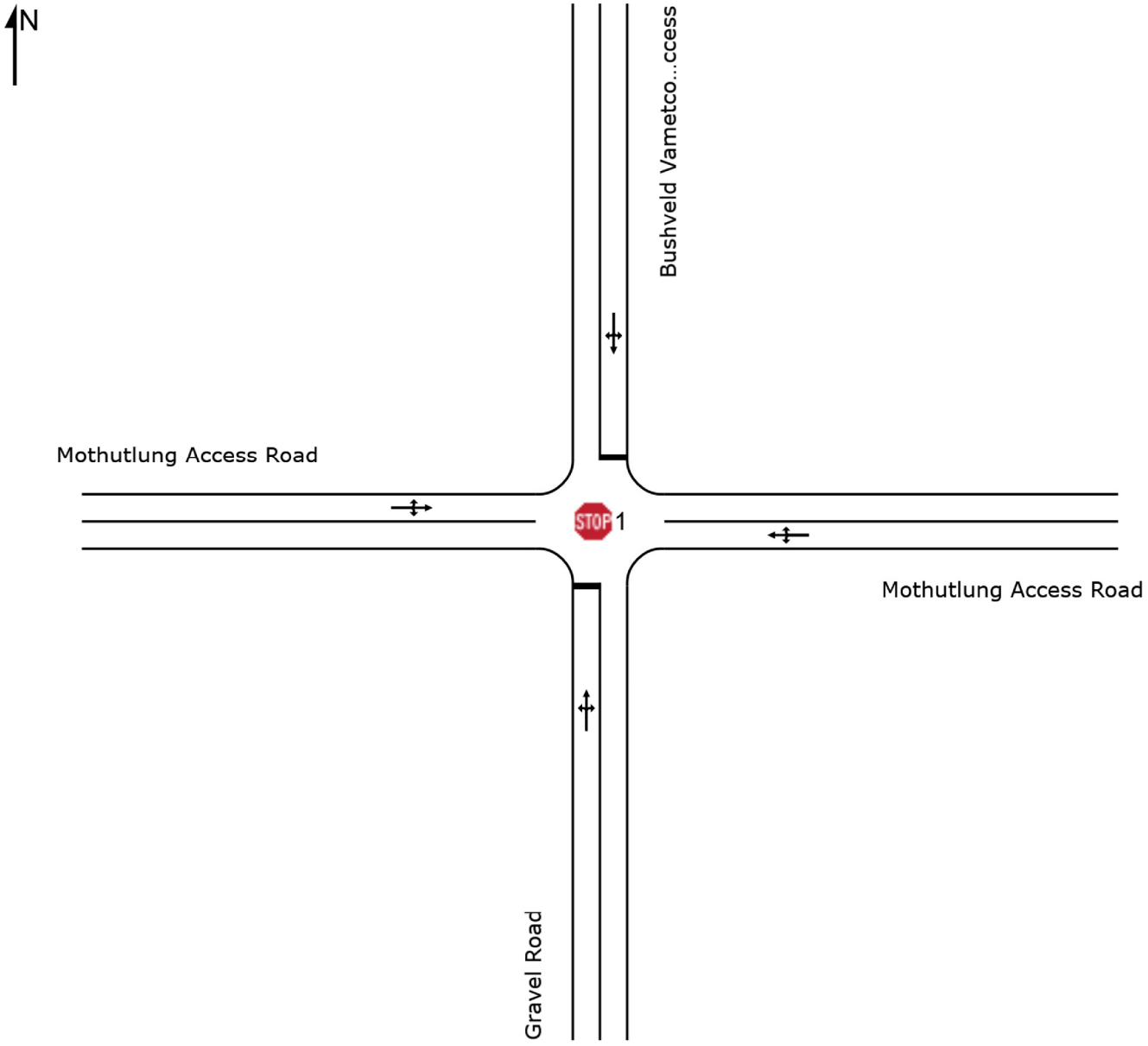
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	1	5.0	0.006	8.3	LOS A	0.0	0.1	0.12	0.96	0.12	51.4
2	T1	1	5.0	0.006	8.3	LOS A	0.0	0.1	0.12	0.96	0.12	51.1
3	R2	3	5.0	0.006	9.0	LOS A	0.0	0.1	0.12	0.96	0.12	50.9
Approach		5	5.0	0.006	8.6	LOS A	0.0	0.1	0.12	0.96	0.12	51.1
East: Mothutlung Access Road												
4	L2	11	5.0	0.031	5.7	LOS A	0.1	0.9	0.08	0.33	0.08	55.0
5	T1	23	10.0	0.031	0.1	LOS A	0.1	0.9	0.08	0.33	0.08	56.6
6	R2	21	5.0	0.031	5.6	LOS A	0.1	0.9	0.08	0.33	0.08	54.4
Approach		55	7.1	0.031	3.3	NA	0.1	0.9	0.08	0.33	0.08	55.4
North: Bushveld Vametco Alloys Access												
7	L2	131	5.0	0.120	8.3	LOS A	0.5	3.7	0.10	0.95	0.10	51.6
8	T1	20	5.0	0.120	8.4	LOS A	0.5	3.7	0.10	0.95	0.10	51.3
9	R2	5	5.0	0.120	8.1	LOS A	0.5	3.7	0.10	0.95	0.10	51.1
Approach		156	5.0	0.120	8.3	LOS A	0.5	3.7	0.10	0.95	0.10	51.5
West: Mothutlung Access Road												
10	L2	4	5.0	0.016	5.6	LOS A	0.0	0.1	0.01	0.11	0.01	57.1
11	T1	24	10.0	0.016	0.0	LOS A	0.0	0.1	0.01	0.11	0.01	58.9
12	R2	1	5.0	0.016	5.6	LOS A	0.0	0.1	0.01	0.11	0.01	56.5
Approach		29	9.1	0.016	1.0	NA	0.0	0.1	0.01	0.11	0.01	58.6
All Vehicles		245	6.0	0.120	6.3	NA	0.5	3.7	0.08	0.71	0.08	53.1

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 PLUS Future Operations - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
Site Category: (None)
Stop (Two-Way)



Organisation: INFRATRANS CIVIL AND TRAFFIC ENGINEERING | Created: Monday, 02 September 2019 08:29:11
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MOVEMENT SUMMARY

Site: 1 [2019 AM PLUS Future Operations - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
Site Category: (None)
Stop (Two-Way)

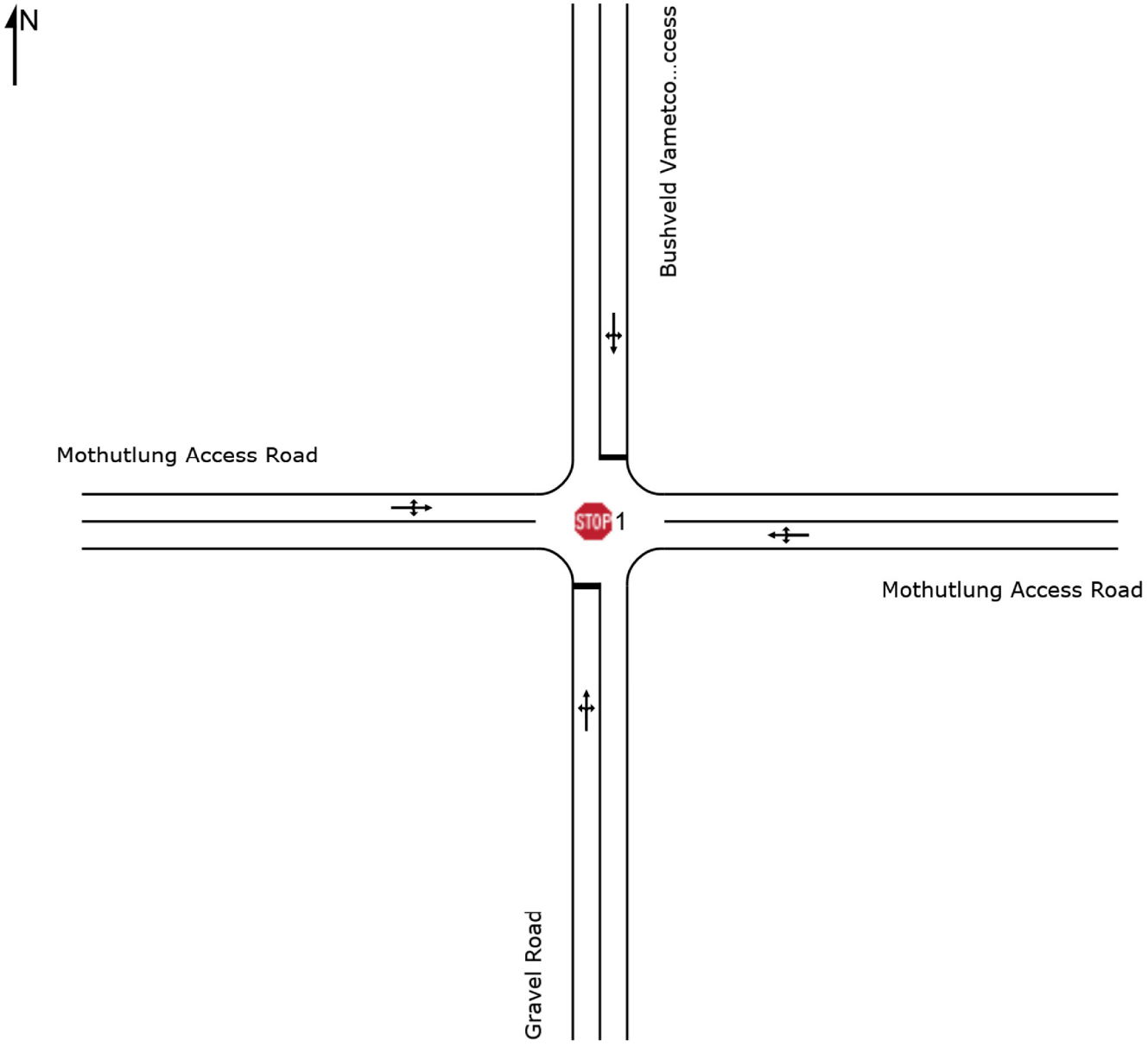
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	1	5.0	0.042	8.3	LOS A	0.1	1.1	0.22	0.98	0.22	51.3
2	T1	30	5.0	0.042	9.0	LOS A	0.1	1.1	0.22	0.98	0.22	51.1
3	R2	7	5.0	0.042	9.2	LOS A	0.1	1.1	0.22	0.98	0.22	50.8
Approach		38	5.0	0.042	9.0	LOS A	0.1	1.1	0.22	0.98	0.22	51.0
East: Mothutlung Access Road												
4	L2	1	5.0	0.104	5.7	LOS A	0.5	3.7	0.10	0.53	0.10	53.4
5	T1	11	10.0	0.104	0.1	LOS A	0.5	3.7	0.10	0.53	0.10	55.0
6	R2	167	5.0	0.104	5.6	LOS A	0.5	3.7	0.10	0.53	0.10	52.9
Approach		179	5.3	0.104	5.3	NA	0.5	3.7	0.10	0.53	0.10	53.0
North: Bushveld Vametco Alloys Access												
7	L2	38	5.0	0.034	8.3	LOS A	0.1	1.0	0.07	0.97	0.07	51.5
8	T1	3	5.0	0.034	9.0	LOS A	0.1	1.0	0.07	0.97	0.07	51.3
9	R2	3	5.0	0.034	9.2	LOS A	0.1	1.0	0.07	0.97	0.07	51.0
Approach		44	5.0	0.034	8.4	LOS A	0.1	1.0	0.07	0.97	0.07	51.5
West: Mothutlung Access Road												
10	L2	5	5.0	0.015	5.6	LOS A	0.0	0.1	0.01	0.15	0.01	56.8
11	T1	21	10.0	0.015	0.0	LOS A	0.0	0.1	0.01	0.15	0.01	58.6
12	R2	1	5.0	0.015	5.5	LOS A	0.0	0.1	0.01	0.15	0.01	56.2
Approach		27	8.7	0.015	1.4	NA	0.0	0.1	0.01	0.15	0.01	58.1
All Vehicles		289	5.5	0.104	5.9	NA	0.5	3.7	0.10	0.62	0.10	52.9

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 PUS Future Operations - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 1 [2019 PM PUS Future Operations - Existing Layout]

Bushveld Vametco Alloys Access Road / Mothutlung Access Road Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

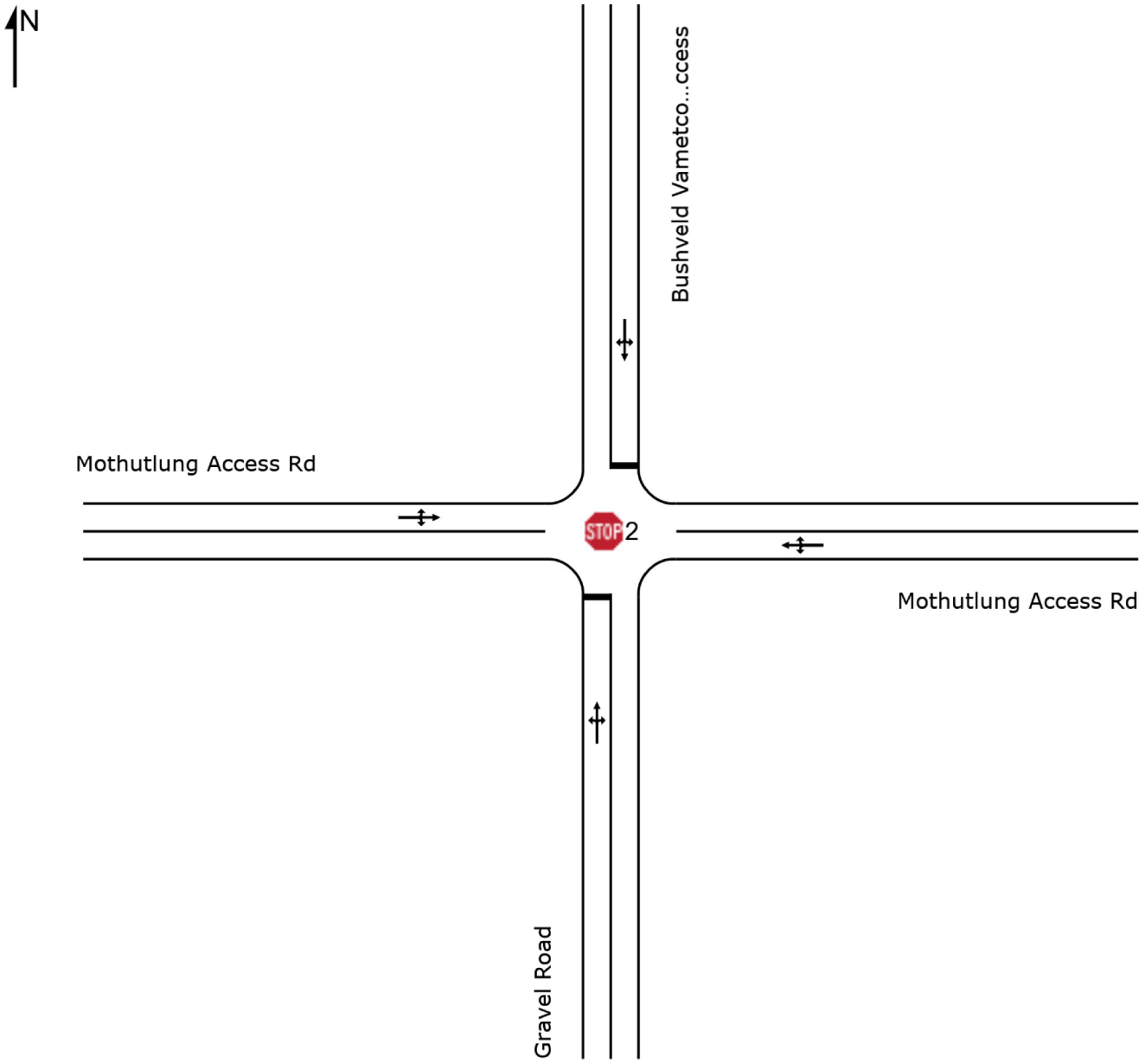
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	1	5.0	0.007	8.3	LOS A	0.0	0.2	0.13	0.97	0.13	51.4
2	T1	3	5.0	0.007	8.3	LOS A	0.0	0.2	0.13	0.97	0.13	51.1
3	R2	3	5.0	0.007	9.2	LOS A	0.0	0.2	0.13	0.97	0.13	50.9
Approach		7	5.0	0.007	8.7	LOS A	0.0	0.2	0.13	0.97	0.13	51.1
East: Mothutlung Access Road												
4	L2	11	5.0	0.033	5.7	LOS A	0.1	1.0	0.09	0.35	0.09	54.8
5	T1	23	10.0	0.033	0.1	LOS A	0.1	1.0	0.09	0.35	0.09	56.5
6	R2	25	5.0	0.033	5.6	LOS A	0.1	1.0	0.09	0.35	0.09	54.2
Approach		59	6.9	0.033	3.5	NA	0.1	1.0	0.09	0.35	0.09	55.2
North: Bushveld Vametco Alloys Access												
7	L2	149	5.0	0.137	8.3	LOS A	0.6	4.3	0.10	0.95	0.10	51.6
8	T1	24	5.0	0.137	8.4	LOS A	0.6	4.3	0.10	0.95	0.10	51.3
9	R2	5	5.0	0.137	8.2	LOS A	0.6	4.3	0.10	0.95	0.10	51.1
Approach		179	5.0	0.137	8.3	LOS A	0.6	4.3	0.10	0.95	0.10	51.5
West: Mothutlung Access Road												
10	L2	4	5.0	0.016	5.6	LOS A	0.0	0.1	0.01	0.11	0.01	57.1
11	T1	24	10.0	0.016	0.0	LOS A	0.0	0.1	0.01	0.11	0.01	58.9
12	R2	1	5.0	0.016	5.6	LOS A	0.0	0.1	0.01	0.11	0.01	56.5
Approach		29	9.1	0.016	1.0	NA	0.0	0.1	0.01	0.11	0.01	58.6
All Vehicles		273	5.9	0.137	6.5	NA	0.6	4.3	0.09	0.73	0.09	53.0

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: 2 [2019 AM - Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 2 [2019 AM - Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

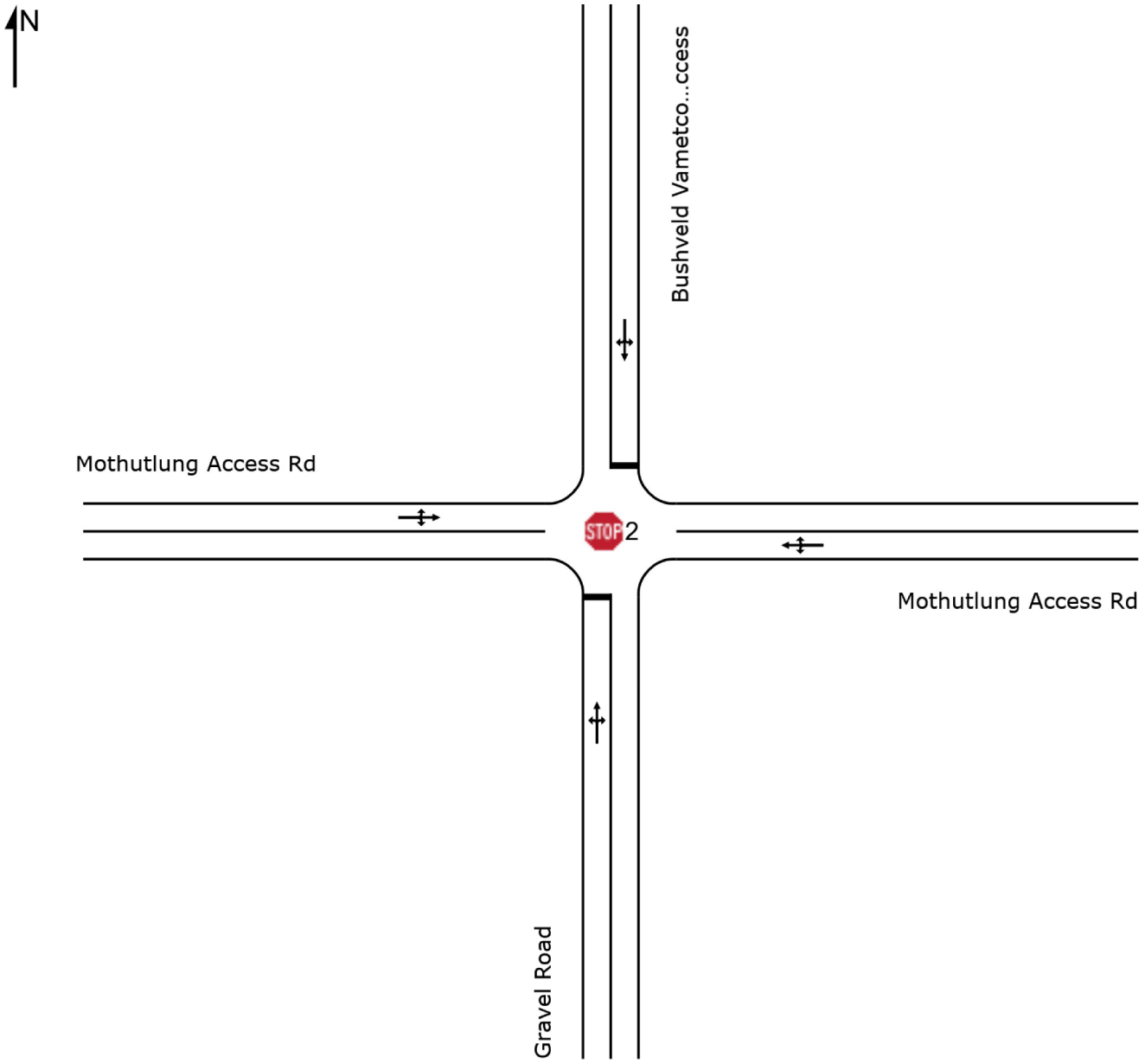
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	1	90.0	0.007	13.1	LOS B	0.0	0.3	0.36	0.97	0.36	47.6
2	T1	1	90.0	0.007	14.5	LOS B	0.0	0.3	0.36	0.97	0.36	47.4
3	R2	1	90.0	0.007	14.1	LOS B	0.0	0.3	0.36	0.97	0.36	47.0
Approach		4	90.0	0.007	13.9	LOS B	0.0	0.3	0.36	0.97	0.36	47.3
East: Mothutlung Access Rd												
4	L2	1	90.0	0.087	6.8	LOS A	0.0	0.1	0.01	0.01	0.01	54.1
5	T1	154	10.0	0.087	0.0	LOS A	0.0	0.1	0.01	0.01	0.01	60.0
6	R2	1	90.0	0.087	7.0	LOS A	0.0	0.1	0.01	0.01	0.01	53.2
Approach		156	11.3	0.087	0.1	NA	0.0	0.1	0.01	0.01	0.01	59.8
North: Bushveld Vametco Alloys HV Access												
7	L2	1	90.0	0.006	12.3	LOS B	0.0	0.3	0.27	1.02	0.27	47.6
8	T1	1	90.0	0.006	14.5	LOS B	0.0	0.3	0.27	1.02	0.27	47.4
9	R2	1	90.0	0.006	14.1	LOS B	0.0	0.3	0.27	1.02	0.27	47.0
Approach		4	90.0	0.006	13.6	LOS B	0.0	0.3	0.27	1.02	0.27	47.3
West: Mothutlung Access Rd												
10	L2	1	90.0	0.039	7.1	LOS A	0.0	0.1	0.02	0.02	0.02	54.0
11	T1	67	10.0	0.039	0.0	LOS A	0.0	0.1	0.02	0.02	0.02	59.9
12	R2	1	90.0	0.039	7.6	LOS A	0.0	0.1	0.02	0.02	0.02	53.1
Approach		69	13.0	0.039	0.3	NA	0.0	0.1	0.02	0.02	0.02	59.6
All Vehicles		233	14.4	0.087	0.6	NA	0.0	0.3	0.02	0.05	0.02	59.3

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: 2 [2019 PM - Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 2 [2019 PM - Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
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: Gravel Road												
1	L2	1	90.0	0.007	12.2	LOS B	0.0	0.3	0.26	1.03	0.26	47.5
2	T1	1	90.0	0.007	14.7	LOS B	0.0	0.3	0.26	1.03	0.26	47.3
3	R2	1	90.0	0.007	14.4	LOS B	0.0	0.3	0.26	1.03	0.26	46.9
Approach		4	90.0	0.007	13.8	LOS B	0.0	0.3	0.26	1.03	0.26	47.2
East: Mothutlung Access Rd												
4	L2	1	90.0	0.038	7.5	LOS A	0.0	0.3	0.05	0.04	0.05	53.9
5	T1	59	10.0	0.038	0.1	LOS A	0.0	0.3	0.05	0.04	0.05	59.7
6	R2	3	90.0	0.038	7.8	LOS A	0.0	0.3	0.05	0.04	0.05	53.0
Approach		64	15.5	0.038	0.6	NA	0.0	0.3	0.05	0.04	0.05	59.2
North: Bushveld Vametco Alloys HV Access												
7	L2	1	90.0	0.008	13.3	LOS B	0.0	0.3	0.39	0.97	0.39	47.5
8	T1	1	90.0	0.008	14.7	LOS B	0.0	0.3	0.39	0.97	0.39	47.2
9	R2	1	90.0	0.008	14.4	LOS B	0.0	0.3	0.39	0.97	0.39	46.8
Approach		4	90.0	0.008	14.1	LOS B	0.0	0.3	0.39	0.97	0.39	47.2
West: Mothutlung Access Rd												
10	L2	1	90.0	0.099	6.8	LOS A	0.0	0.1	0.01	0.01	0.01	54.1
11	T1	175	10.0	0.099	0.0	LOS A	0.0	0.1	0.01	0.01	0.01	60.0
12	R2	1	90.0	0.099	7.0	LOS A	0.0	0.1	0.01	0.01	0.01	53.2
Approach		178	11.3	0.099	0.1	NA	0.0	0.1	0.01	0.01	0.01	59.9
All Vehicles		251	15.1	0.099	0.7	NA	0.0	0.3	0.03	0.05	0.03	59.1

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.
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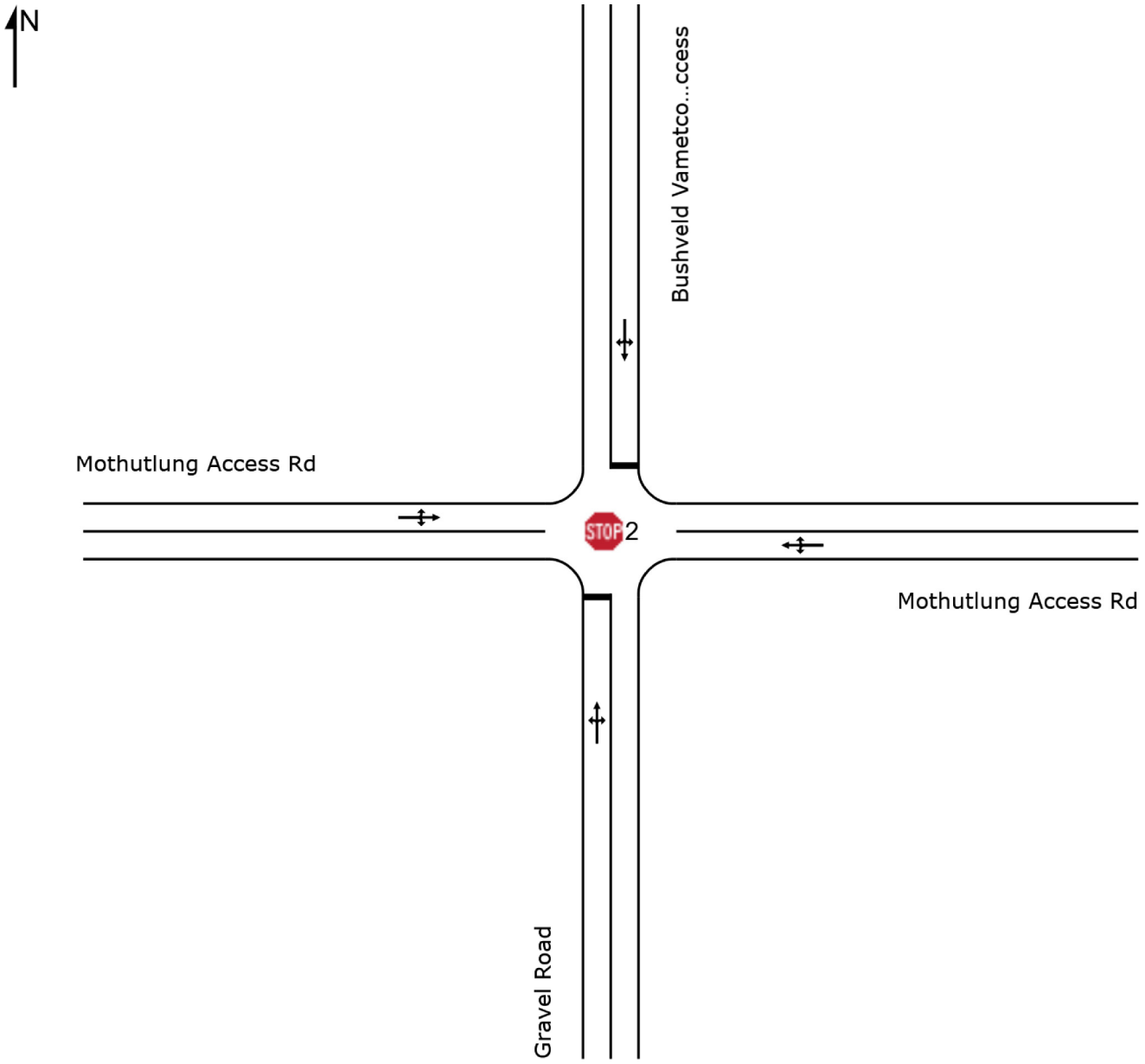
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 2 [2019 AM PLUS Construction - Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 2 [2019 AM PLUS Construction - Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

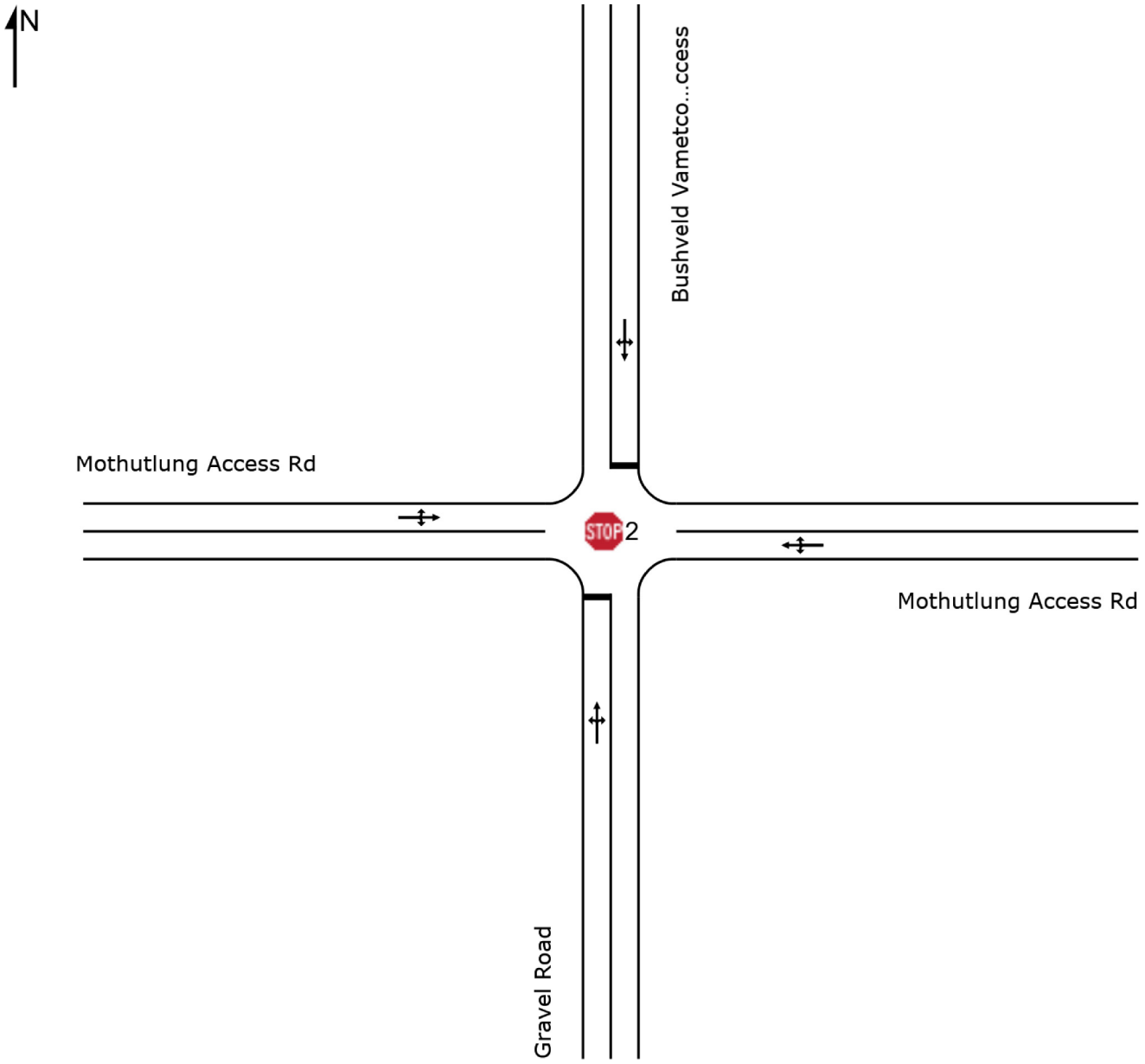
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	1	90.0	0.007	13.1	LOS B	0.0	0.3	0.39	0.97	0.39	47.3
2	T1	1	90.0	0.007	15.2	LOS C	0.0	0.3	0.39	0.97	0.39	47.0
3	R2	1	90.0	0.007	15.2	LOS C	0.0	0.3	0.39	0.97	0.39	46.6
Approach		4	90.0	0.007	14.5	LOS B	0.0	0.3	0.39	0.97	0.39	47.0
East: Mothutlung Access Rd												
4	L2	1	90.0	0.118	6.8	LOS A	0.3	2.5	0.10	0.15	0.10	52.7
5	T1	154	10.0	0.118	0.1	LOS A	0.3	2.5	0.10	0.15	0.10	58.3
6	R2	51	10.0	0.118	5.8	LOS A	0.3	2.5	0.10	0.15	0.10	55.6
Approach		206	10.5	0.118	1.6	NA	0.3	2.5	0.10	0.15	0.10	57.6
North: Bushveld Vametco Alloys HV Access												
7	L2	14	10.0	0.016	8.7	LOS A	0.1	0.5	0.17	0.93	0.17	51.1
8	T1	1	90.0	0.016	15.3	LOS C	0.1	0.5	0.17	0.93	0.17	47.9
9	R2	1	90.0	0.016	15.1	LOS C	0.1	0.5	0.17	0.93	0.17	47.4
Approach		17	22.3	0.016	9.7	LOS A	0.1	0.5	0.17	0.93	0.17	50.5
West: Mothutlung Access Rd												
10	L2	1	90.0	0.039	7.1	LOS A	0.0	0.1	0.02	0.02	0.02	54.0
11	T1	67	10.0	0.039	0.0	LOS A	0.0	0.1	0.02	0.02	0.02	59.9
12	R2	1	90.0	0.039	7.6	LOS A	0.0	0.1	0.02	0.02	0.02	53.1
Approach		69	13.0	0.039	0.3	NA	0.0	0.1	0.02	0.02	0.02	59.6
All Vehicles		296	12.8	0.118	1.9	NA	0.3	2.5	0.09	0.17	0.09	57.4

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: 2 [2019 PM PLUS Construction- Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 2 [2019 PM PLUS Construction- Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

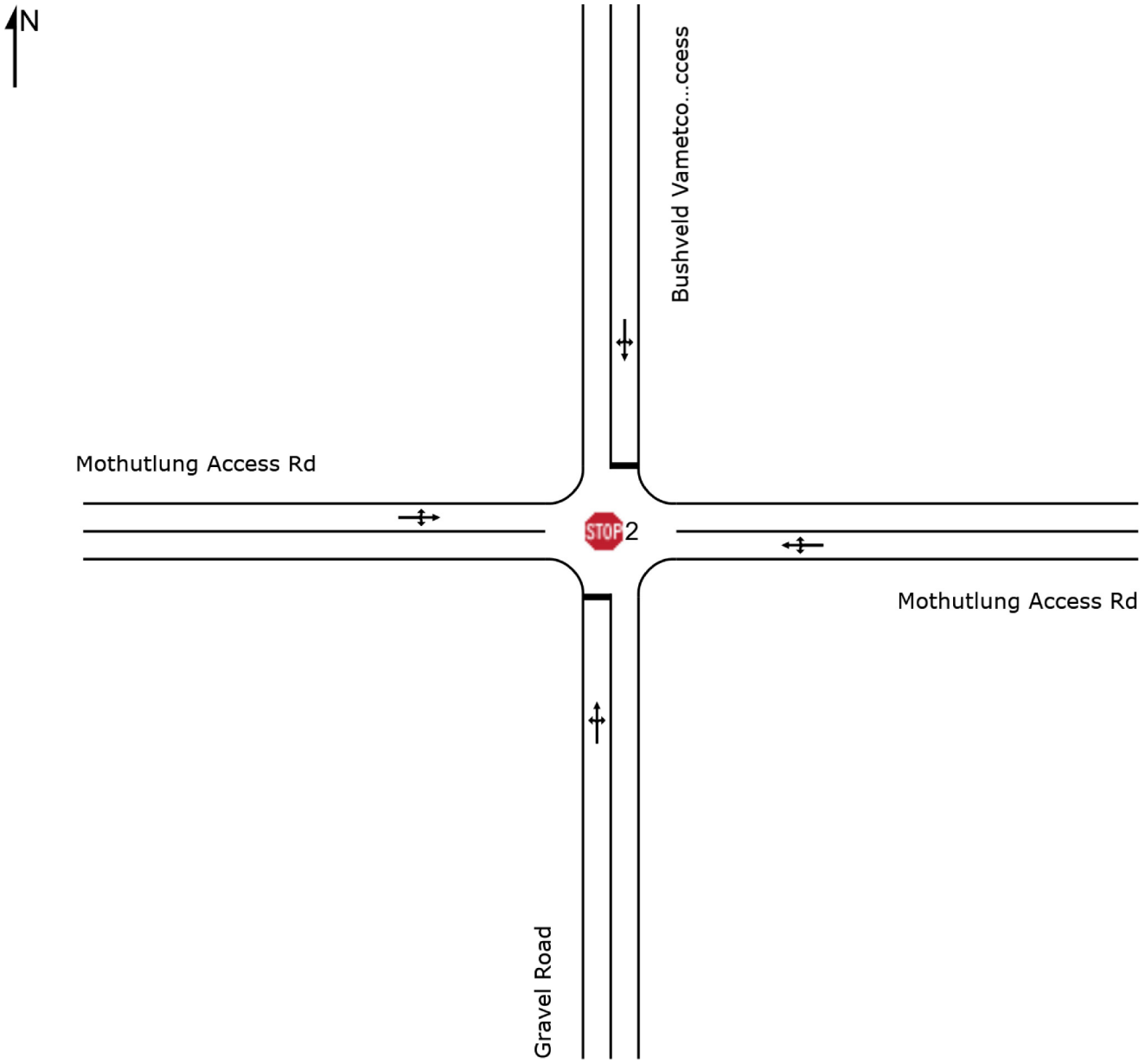
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	1	90.0	0.008	12.2	LOS B	0.0	0.3	0.27	1.03	0.27	47.2
2	T1	1	90.0	0.008	14.9	LOS B	0.0	0.3	0.27	1.03	0.27	47.0
3	R2	1	90.0	0.008	15.7	LOS C	0.0	0.3	0.27	1.03	0.27	46.6
Approach		4	90.0	0.008	14.3	LOS B	0.0	0.3	0.27	1.03	0.27	47.0
East: Mothutlung Access Rd												
4	L2	1	90.0	0.046	7.2	LOS A	0.1	0.9	0.15	0.14	0.15	52.6
5	T1	59	10.0	0.046	0.2	LOS A	0.1	0.9	0.15	0.14	0.15	58.2
6	R2	17	10.0	0.046	6.2	LOS A	0.1	0.9	0.15	0.14	0.15	55.6
Approach		78	11.5	0.046	1.7	NA	0.1	0.9	0.15	0.14	0.15	57.5
North: Bushveld Vametco Alloys HV Access												
7	L2	59	10.0	0.058	9.2	LOS A	0.2	1.8	0.31	0.88	0.31	51.1
8	T1	1	90.0	0.058	15.2	LOS C	0.2	1.8	0.31	0.88	0.31	47.9
9	R2	1	90.0	0.058	15.0	LOS C	0.2	1.8	0.31	0.88	0.31	47.5
Approach		62	13.7	0.058	9.5	LOS A	0.2	1.8	0.31	0.88	0.31	51.0
West: Mothutlung Access Rd												
10	L2	1	90.0	0.099	6.8	LOS A	0.0	0.1	0.01	0.01	0.01	54.1
11	T1	175	10.0	0.099	0.0	LOS A	0.0	0.1	0.01	0.01	0.01	60.0
12	R2	1	90.0	0.099	7.0	LOS A	0.0	0.1	0.01	0.01	0.01	53.2
Approach		178	11.3	0.099	0.1	NA	0.0	0.1	0.01	0.01	0.01	59.9
All Vehicles		323	12.9	0.099	2.5	NA	0.2	1.8	0.10	0.22	0.10	57.1

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: 2 [2019 AM PLUS Future Operations - Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 2 [2019 AM PLUS Future Operations - Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

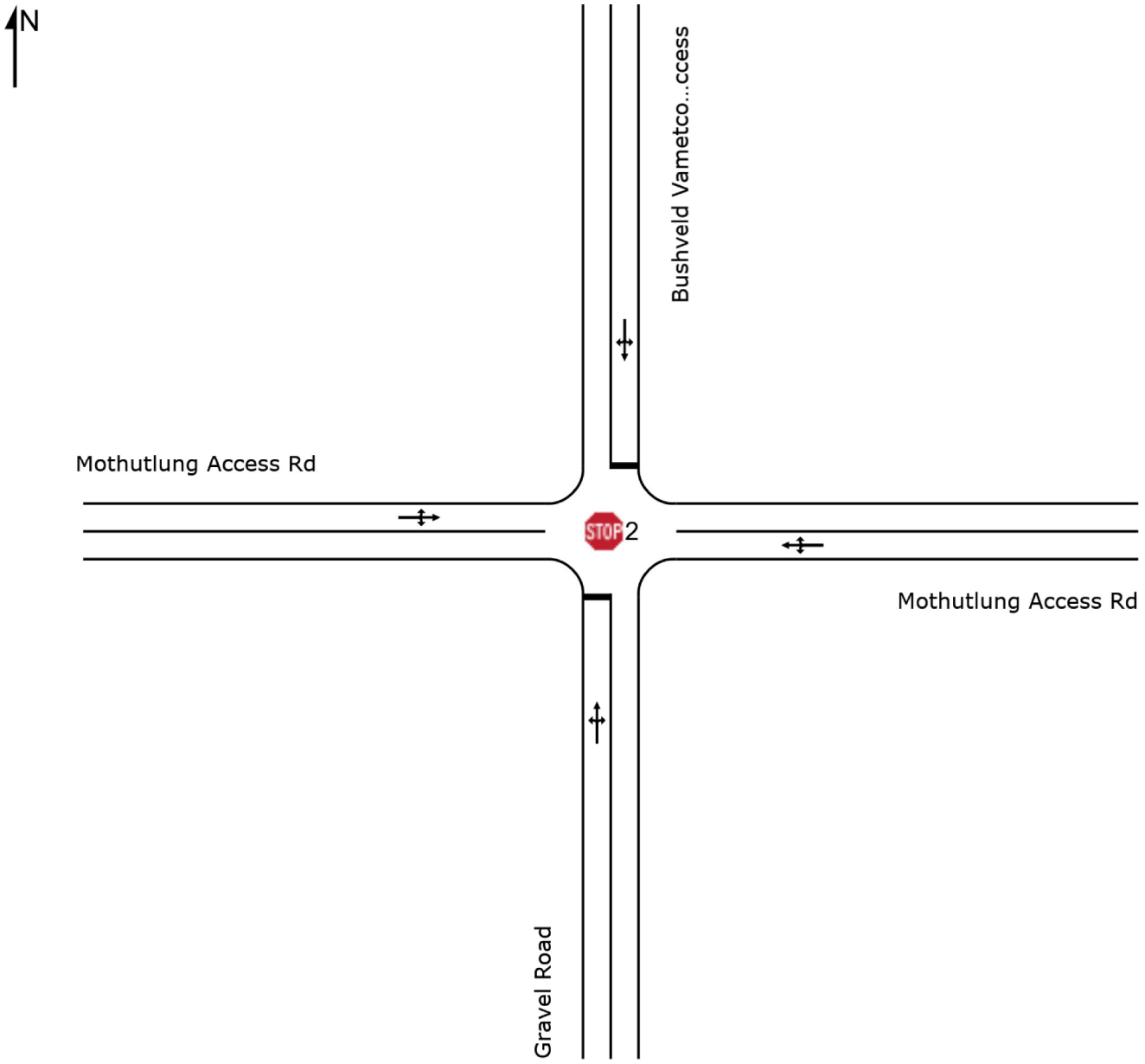
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	1	90.0	0.007	13.2	LOS B	0.0	0.3	0.39	0.96	0.39	47.5
2	T1	1	90.0	0.007	14.8	LOS B	0.0	0.3	0.39	0.96	0.39	47.2
3	R2	1	90.0	0.007	14.5	LOS B	0.0	0.3	0.39	0.96	0.39	46.8
Approach		4	90.0	0.007	14.2	LOS B	0.0	0.3	0.39	0.96	0.39	47.2
East: Mothutlung Access Rd												
4	L2	1	90.0	0.097	6.8	LOS A	0.0	0.1	0.01	0.01	0.01	54.1
5	T1	172	10.0	0.097	0.0	LOS A	0.0	0.1	0.01	0.01	0.01	60.0
6	R2	1	90.0	0.097	7.0	LOS A	0.0	0.1	0.01	0.01	0.01	53.2
Approach		174	11.2	0.097	0.1	NA	0.0	0.1	0.01	0.01	0.01	59.9
North: Bushveld Vametco Alloys HV Access												
7	L2	1	90.0	0.007	12.3	LOS B	0.0	0.3	0.28	1.01	0.28	47.5
8	T1	1	90.0	0.007	14.8	LOS B	0.0	0.3	0.28	1.01	0.28	47.3
9	R2	1	90.0	0.007	14.5	LOS B	0.0	0.3	0.28	1.01	0.28	46.9
Approach		4	90.0	0.007	13.9	LOS B	0.0	0.3	0.28	1.01	0.28	47.2
West: Mothutlung Access Rd												
10	L2	1	90.0	0.041	7.2	LOS A	0.0	0.2	0.02	0.02	0.02	54.0
11	T1	71	10.0	0.041	0.0	LOS A	0.0	0.2	0.02	0.02	0.02	59.9
12	R2	1	90.0	0.041	7.8	LOS A	0.0	0.2	0.02	0.02	0.02	53.1
Approach		73	12.8	0.041	0.3	NA	0.0	0.2	0.02	0.02	0.02	59.6
All Vehicles		255	14.0	0.097	0.6	NA	0.0	0.3	0.02	0.04	0.02	59.3

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: 2 [2019 PM PLUS Future Operations - Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 2 [2019 PM PLUS Future Operations - Existing Layout]

Bushveld Vametco Alloys HV Access / Mothutlung Access Rd Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

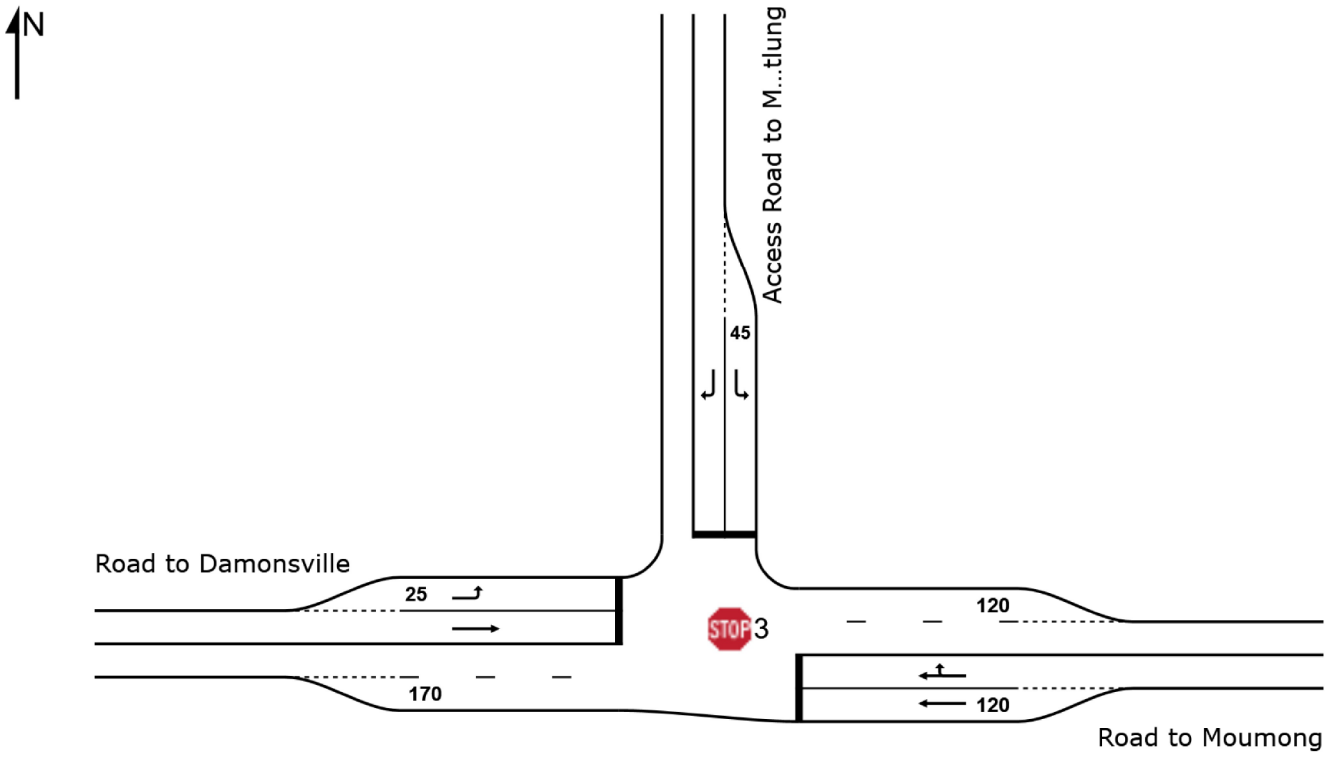
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Gravel Road												
1	L2	1	90.0	0.008	12.3	LOS B	0.0	0.3	0.28	1.02	0.28	47.4
2	T1	1	90.0	0.008	15.1	LOS C	0.0	0.3	0.28	1.02	0.28	47.1
3	R2	1	90.0	0.008	14.9	LOS B	0.0	0.3	0.28	1.02	0.28	46.7
Approach		4	90.0	0.008	14.1	LOS B	0.0	0.3	0.28	1.02	0.28	47.1
East: Mothutlung Access Rd												
4	L2	1	90.0	0.040	7.6	LOS A	0.0	0.3	0.05	0.04	0.05	53.9
5	T1	64	10.0	0.040	0.1	LOS A	0.0	0.3	0.05	0.04	0.05	59.7
6	R2	3	90.0	0.040	8.0	LOS A	0.0	0.3	0.05	0.04	0.05	53.0
Approach		68	15.1	0.040	0.6	NA	0.0	0.3	0.05	0.04	0.05	59.3
North: Bushveld Vametco Alloys HV Access												
7	L2	1	90.0	0.008	13.5	LOS B	0.0	0.3	0.41	0.96	0.41	47.3
8	T1	1	90.0	0.008	15.1	LOS C	0.0	0.3	0.41	0.96	0.41	47.1
9	R2	1	90.0	0.008	14.9	LOS B	0.0	0.3	0.41	0.96	0.41	46.7
Approach		4	90.0	0.008	14.5	LOS B	0.0	0.3	0.41	0.96	0.41	47.0
West: Mothutlung Access Rd												
10	L2	1	90.0	0.110	6.8	LOS A	0.0	0.1	0.00	0.01	0.00	54.1
11	T1	196	10.0	0.110	0.0	LOS A	0.0	0.1	0.00	0.01	0.00	60.0
12	R2	1	90.0	0.110	7.0	LOS A	0.0	0.1	0.00	0.01	0.00	53.2
Approach		199	11.2	0.110	0.1	NA	0.0	0.1	0.00	0.01	0.00	59.9
All Vehicles		275	14.6	0.110	0.7	NA	0.0	0.3	0.03	0.05	0.03	59.2

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: 3 [2019 AM - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)



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Project: C:\Users\piete\Dropbox\PROJECTS\P-208 Bushveld Vametco Allloys Brits EIA TIA\7 Analyses & Calculations\Mothutlung Access_Rd to Damonsville.sip8

MOVEMENT SUMMARY

Site: 3 [2019 AM - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)

Movement Performance - Vehicles

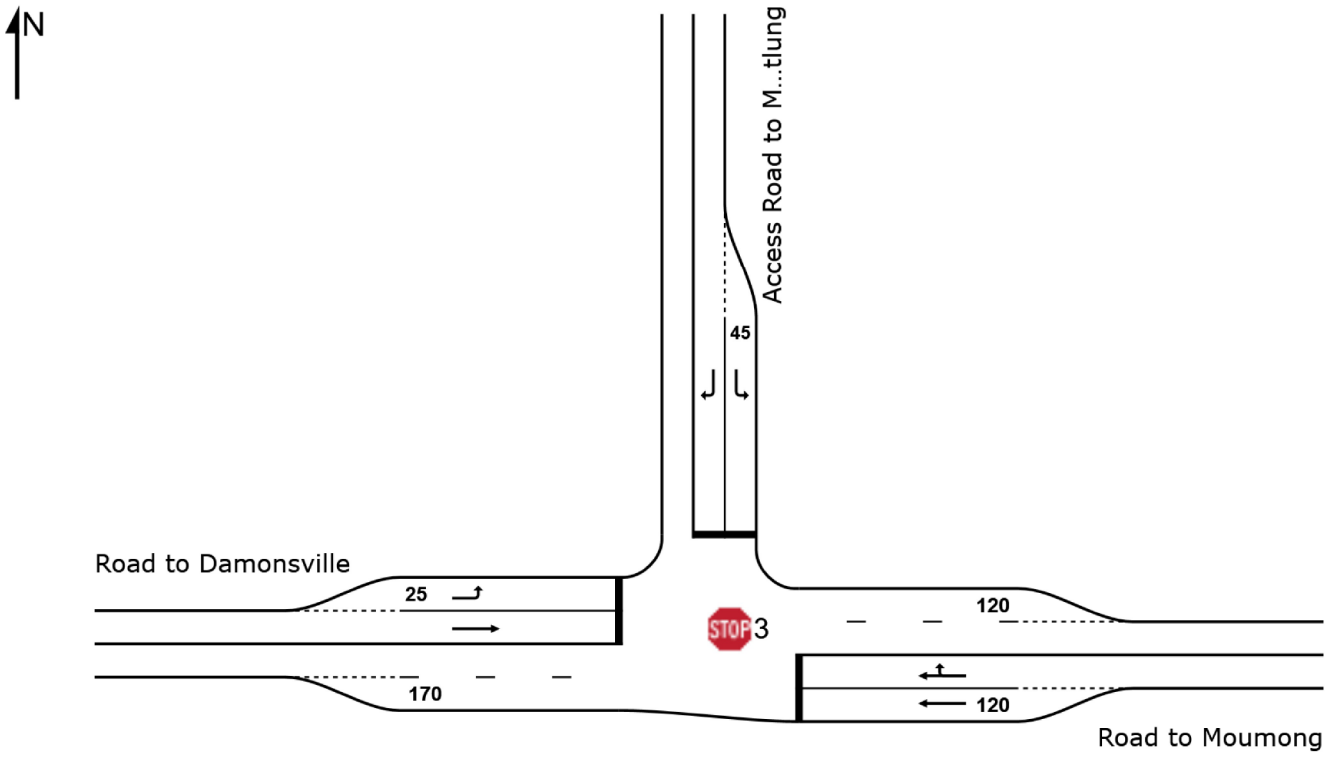
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Road to Moumong												
5	T1	137	5.0	0.322	13.6	LOS B	1.3	9.3	0.90	1.33	2.31	49.0
6	R2	134	5.0	0.322	14.0	LOS B	1.3	9.3	0.89	1.34	2.36	48.9
Approach		271	5.0	0.322	13.8	LOS B	1.3	9.3	0.90	1.33	2.34	49.0
North: Access Road to Mothutlung												
7	L2	143	5.0	0.197	10.8	LOS B	1.0	7.6	0.95	1.14	1.58	51.1
9	R2	97	5.0	0.293	14.0	LOS B	1.2	8.4	0.95	1.33	2.36	48.7
Approach		240	5.0	0.293	12.1	LOS B	1.2	8.4	0.95	1.22	1.89	50.1
West: Road to Damonsville												
10	L2	56	5.0	0.098	11.0	LOS B	0.5	3.6	0.96	1.13	1.51	51.0
11	T1	86	5.0	0.268	14.1	LOS B	1.0	7.5	0.95	1.31	2.31	48.7
Approach		141	5.0	0.268	12.9	LOS B	1.0	7.5	0.95	1.24	1.99	49.6
All Vehicles		652	5.0	0.322	13.0	LOS B	1.3	9.3	0.93	1.27	2.10	49.5

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.
Intersection and Approach LOS values are based on average delay for all vehicle 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: 3 [2019 PM - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)



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MOVEMENT SUMMARY

Site: 3 [2019 PM - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)

Movement Performance - Vehicles

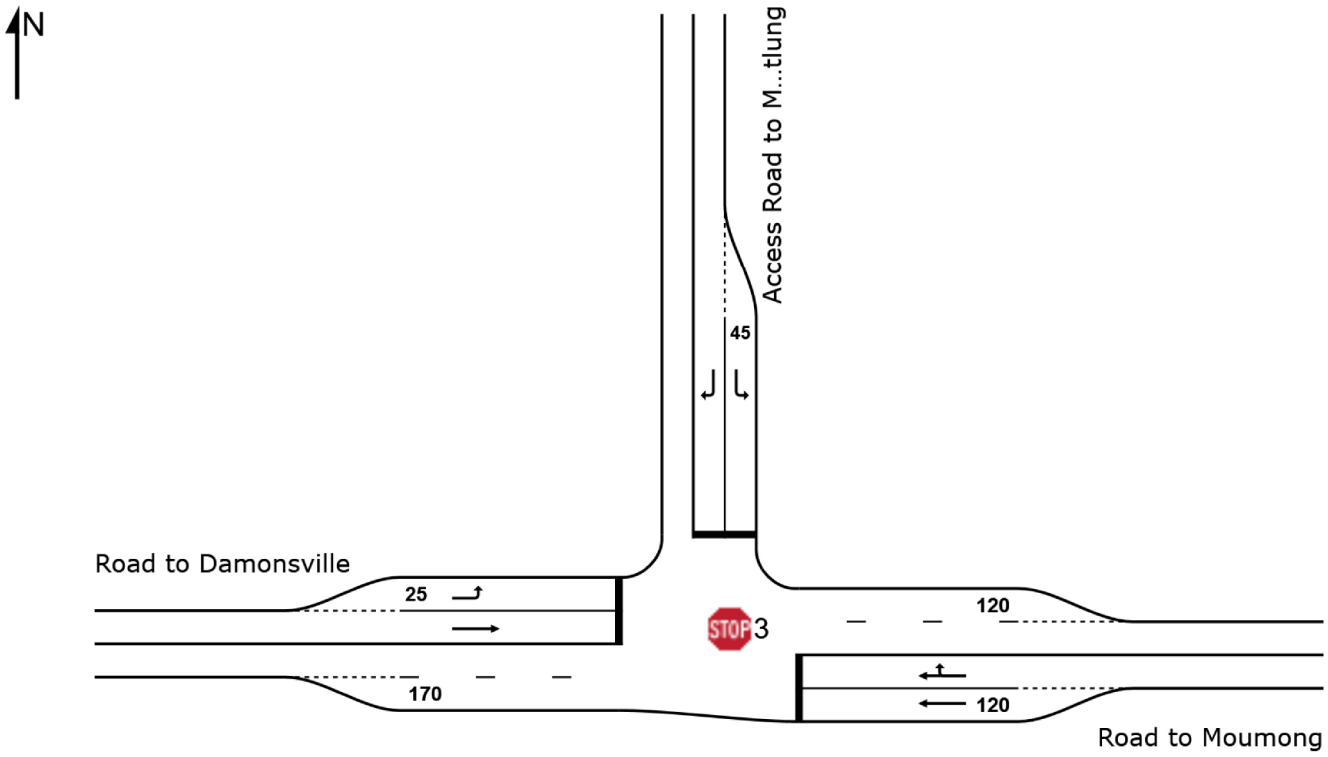
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Road to Moumong												
5	T1	111	5.0	0.264	12.1	LOS B	1.0	7.1	0.87	1.30	2.18	50.0
6	R2	135	5.0	0.264	12.4	LOS B	1.0	7.1	0.85	1.31	2.20	49.9
Approach		247	5.0	0.264	12.3	LOS B	1.0	7.1	0.86	1.31	2.19	49.9
North: Access Road to Mothutlung												
7	L2	148	5.0	0.210	11.1	LOS B	1.1	8.2	0.96	1.15	1.60	50.9
9	R2	64	5.0	0.202	12.4	LOS B	0.7	5.4	0.94	1.29	2.19	49.7
Approach		211	5.0	0.210	11.5	LOS B	1.1	8.2	0.96	1.19	1.77	50.6
West: Road to Damonsville												
10	L2	106	5.0	0.154	10.5	LOS B	0.8	5.8	0.94	1.14	1.53	51.3
11	T1	136	5.0	0.356	14.4	LOS B	1.5	10.7	0.94	1.36	2.48	48.5
Approach		243	5.0	0.356	12.7	LOS B	1.5	10.7	0.94	1.26	2.06	49.7
All Vehicles		701	5.0	0.356	12.2	LOS B	1.5	10.7	0.92	1.26	2.02	50.0

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.
Intersection and Approach LOS values are based on average delay for all vehicle 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: 3 [2019 AM PLUS Construction - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)



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MOVEMENT SUMMARY

Site: 3 [2019 AM PLUS Construction - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)

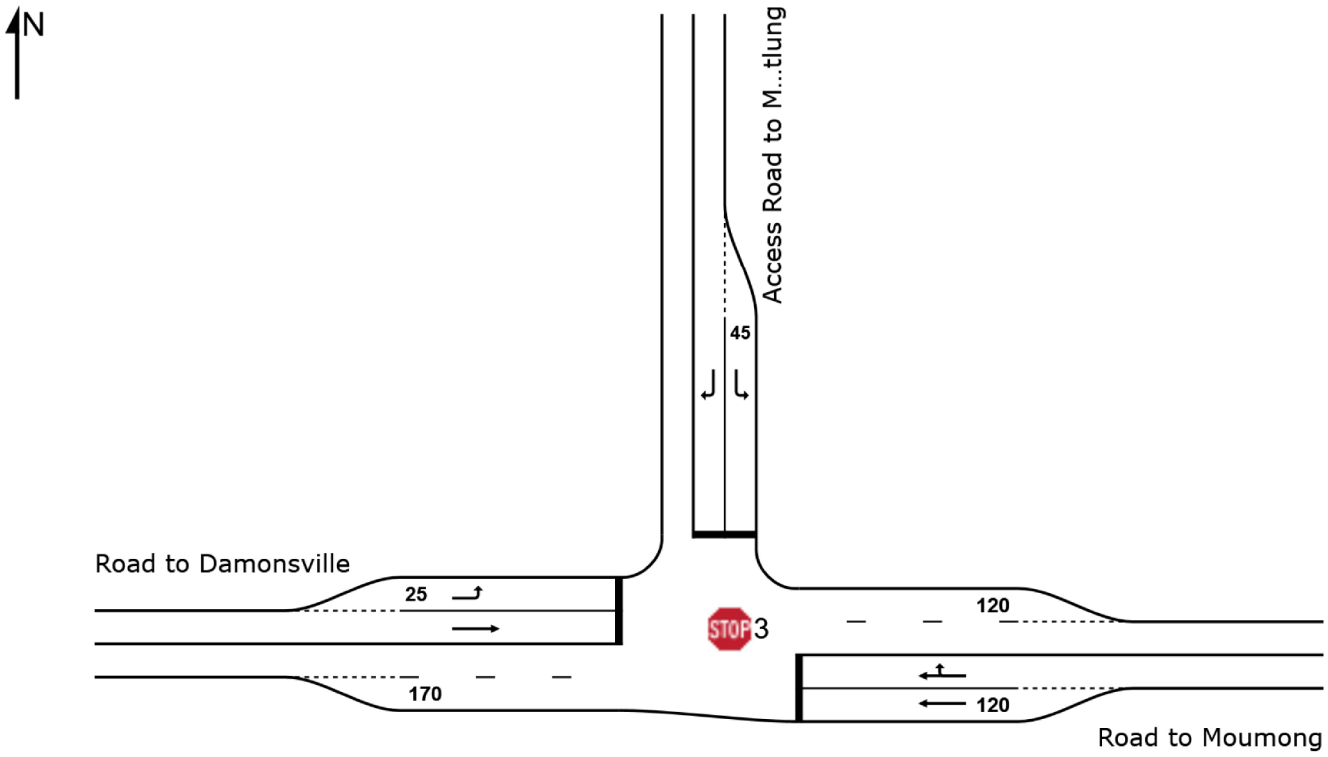
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Road to Moumong												
5	T1	137	5.0	0.346	13.7	LOS B	1.4	10.2	0.90	1.34	2.35	48.9
6	R2	162	5.0	0.346	14.2	LOS B	1.4	10.2	0.89	1.35	2.41	48.7
Approach		299	5.0	0.346	14.0	LOS B	1.4	10.2	0.90	1.34	2.38	48.8
North: Access Road to Mothutlung												
7	L2	150	5.0	0.210	11.0	LOS B	1.1	8.2	0.96	1.15	1.59	51.0
9	R2	101	5.0	0.314	14.6	LOS B	1.3	9.2	0.96	1.33	2.40	48.3
Approach		251	5.0	0.314	12.5	LOS B	1.3	9.2	0.96	1.22	1.92	49.9
West: Road to Damonsville												
10	L2	72	5.0	0.128	11.3	LOS B	0.7	4.8	0.97	1.13	1.54	50.8
11	T1	86	5.0	0.269	14.2	LOS B	1.0	7.6	0.95	1.32	2.31	48.7
Approach		158	5.0	0.269	12.8	LOS B	1.0	7.6	0.96	1.23	1.96	49.6
All Vehicles		708	5.0	0.346	13.2	LOS B	1.4	10.2	0.93	1.28	2.12	49.4

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.
Intersection and Approach LOS values are based on average delay for all vehicle 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: 3 [2019 PM PLUS Construction - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)



Organisation: INFRATRANS CIVIL AND TRAFFIC ENGINEERING | Created: Monday, 02 September 2019 08:35:42
Project: C:\Users\piete\Dropbox\PROJECTS\P-208 Bushveld Vametco Allloys Brits EIA TIA\7 Analyses & Calculations\Mothutlung Access_Rd to Damonsville.sip8

MOVEMENT SUMMARY

Site: 3 [2019 PM PLUS Construction - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)

Movement Performance - Vehicles

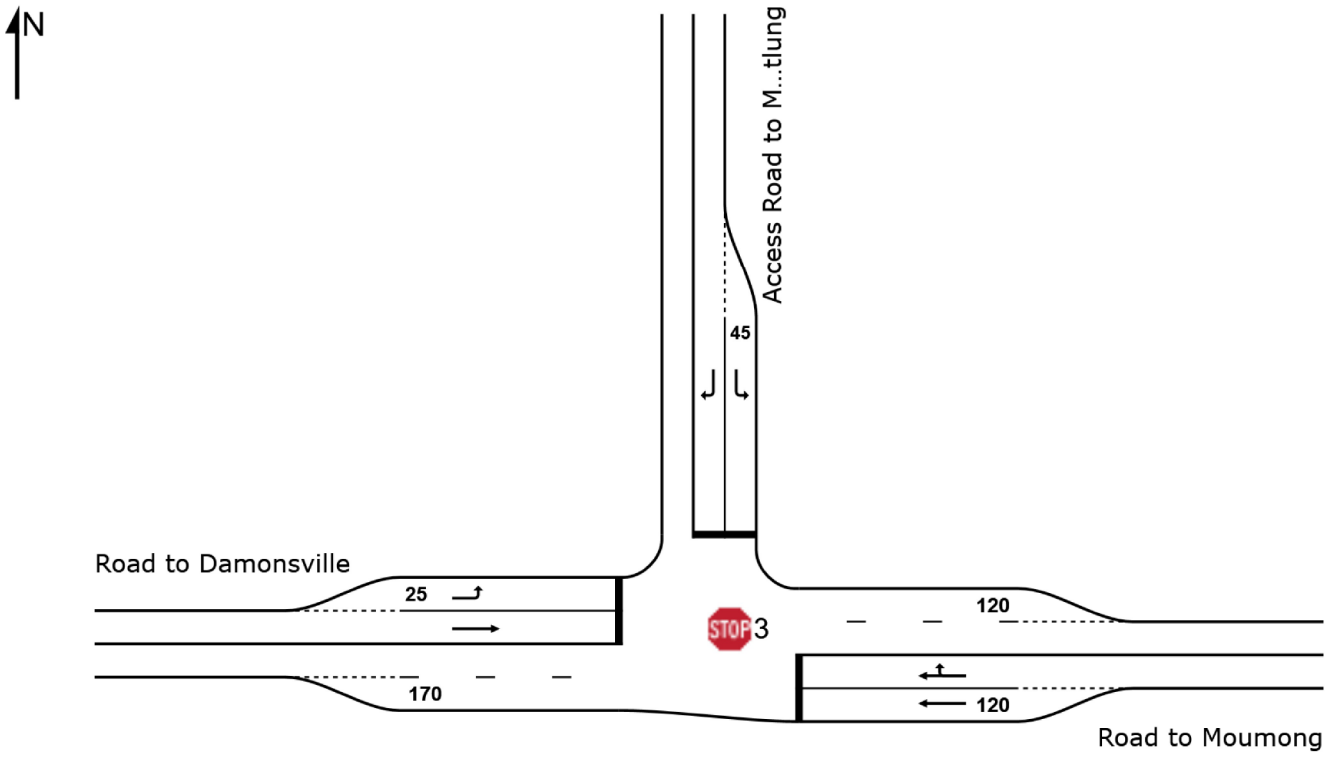
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Road to Moumong												
5	T1	111	5.0	0.249	12.4	LOS B	0.9	6.7	0.88	1.31	2.21	49.8
6	R2	142	5.0	0.285	13.0	LOS B	1.1	7.9	0.86	1.32	2.26	49.5
Approach		253	5.0	0.285	12.7	LOS B	1.1	7.9	0.87	1.32	2.24	49.6
North: Access Road to Mothutlung												
7	L2	174	5.0	0.236	11.1	LOS B	1.3	9.4	0.97	1.15	1.62	50.9
9	R2	79	5.0	0.239	12.8	LOS B	0.9	6.5	0.94	1.30	2.25	49.5
Approach		253	5.0	0.239	11.6	LOS B	1.3	9.4	0.96	1.20	1.82	50.5
West: Road to Damonsville												
10	L2	110	5.0	0.169	10.9	LOS B	0.9	6.4	0.96	1.14	1.56	51.1
11	T1	136	5.0	0.375	15.4	LOS C	1.6	11.6	0.95	1.37	2.53	47.9
Approach		247	5.0	0.375	13.4	LOS B	1.6	11.6	0.95	1.27	2.10	49.3
All Vehicles		753	5.0	0.375	12.6	LOS B	1.6	11.6	0.93	1.26	2.05	49.8

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.
Intersection and Approach LOS values are based on average delay for all vehicle 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: 3 [2019 AM PLUS Future Operations - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)



Organisation: INFRATRANS CIVIL AND TRAFFIC ENGINEERING | Created: Monday, 02 September 2019 08:35:46
Project: C:\Users\piete\Dropbox\PROJECTS\P-208 Bushveld Vametco Allloys Brits EIA TIA\7 Analyses & Calculations\Mothutlung Access_Rd to Damonsville.sip8

MOVEMENT SUMMARY

Site: 3 [2019 AM PLUS Future Operations - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)

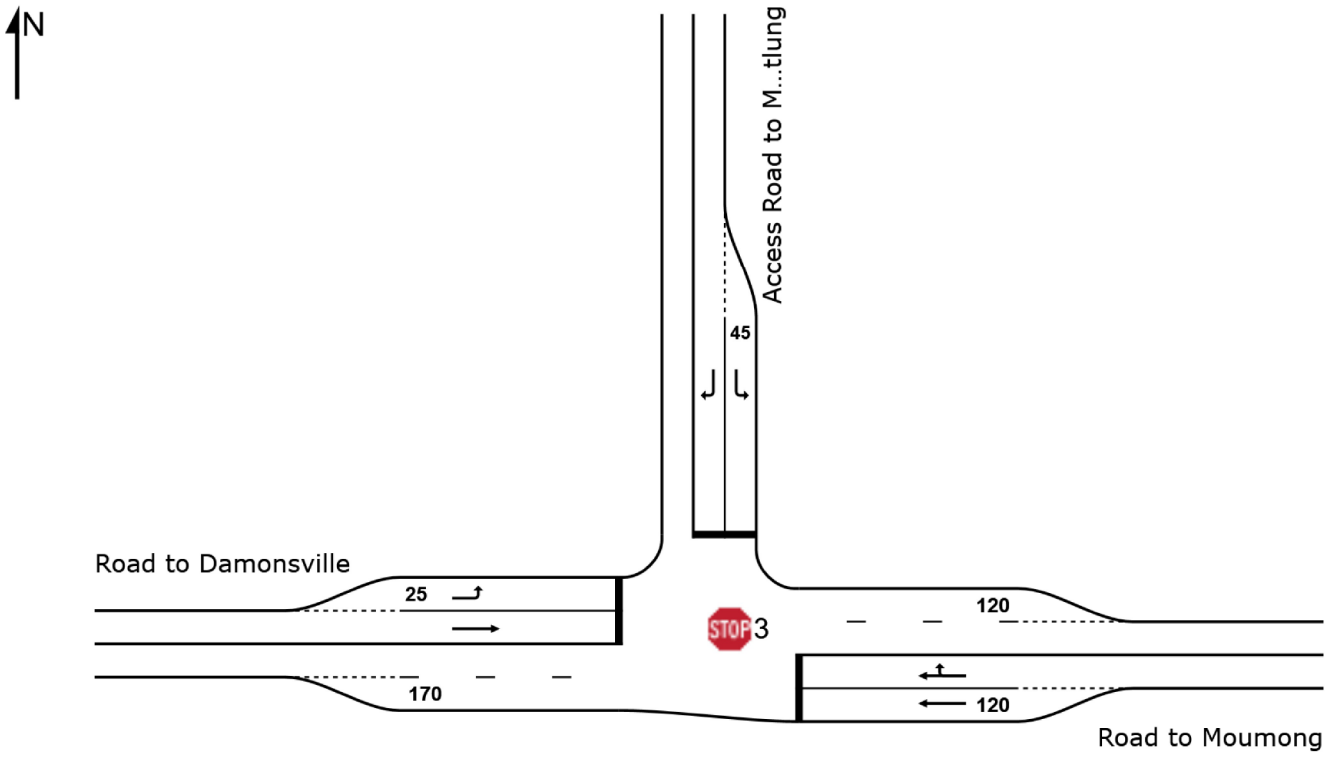
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
East: Road to Moumong												
5	T1	137	5.0	0.331	13.6	LOS B	1.3	9.6	0.90	1.33	2.33	49.0
6	R2	146	5.0	0.331	14.1	LOS B	1.3	9.6	0.89	1.34	2.38	48.8
Approach		282	5.0	0.331	13.9	LOS B	1.3	9.6	0.90	1.34	2.35	48.9
North: Access Road to Mothutlung												
7	L2	146	5.0	0.202	10.9	LOS B	1.1	7.8	0.96	1.15	1.58	51.0
9	R2	98	5.0	0.300	14.2	LOS B	1.2	8.7	0.95	1.33	2.37	48.6
Approach		243	5.0	0.300	12.2	LOS B	1.2	8.7	0.96	1.22	1.90	50.0
West: Road to Damonsville												
10	L2	60	5.0	0.107	11.1	LOS B	0.5	4.0	0.96	1.13	1.52	50.9
11	T1	86	5.0	0.268	14.1	LOS B	1.0	7.6	0.95	1.31	2.31	48.7
Approach		146	5.0	0.268	12.9	LOS B	1.0	7.6	0.95	1.24	1.98	49.6
All Vehicles		671	5.0	0.331	13.1	LOS B	1.3	9.6	0.93	1.27	2.11	49.5

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.
Intersection and Approach LOS values are based on average delay for all vehicle 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: 3 [2019 PM PLUS Future Operations - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-Way)



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Project: C:\Users\piete\Dropbox\PROJECTS\P-208 Bushveld Vametco Allloys Brits EIA TIA\7 Analyses & Calculations\Mothutlung Access_Rd to Damonsville.sip8

MOVEMENT SUMMARY

Site: 3 [2019 PM PLUS Future Operations - Existing Layout]

Mothutlung Access Rd / Road Damonsville Intersection
Site Category: (None)
Stop (All-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
East: Road to Moumong												
5	T1	111	5.0	0.241	12.1	LOS B	0.9	6.4	0.87	1.31	2.18	50.0
6	R2	138	5.0	0.268	12.5	LOS B	1.0	7.2	0.85	1.32	2.21	49.8
Approach		249	5.0	0.268	12.3	LOS B	1.0	7.2	0.86	1.31	2.20	49.9
North: Access Road to Mothutlung												
7	L2	158	5.0	0.222	11.2	LOS B	1.2	8.7	0.97	1.15	1.61	50.9
9	R2	65	5.0	0.202	12.4	LOS B	0.7	5.4	0.94	1.29	2.19	49.8
Approach		223	5.0	0.222	11.5	LOS B	1.2	8.7	0.96	1.19	1.78	50.6
West: Road to Damonsville												
10	L2	107	5.0	0.156	10.6	LOS B	0.8	5.8	0.95	1.14	1.54	51.3
11	T1	136	5.0	0.357	14.5	LOS B	1.5	10.8	0.94	1.36	2.48	48.5
Approach		244	5.0	0.357	12.8	LOS B	1.5	10.8	0.94	1.26	2.06	49.7
All Vehicles		716	5.0	0.357	12.2	LOS B	1.5	10.8	0.92	1.26	2.02	50.0

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.
Intersection and Approach LOS values are based on average delay for all vehicle 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.