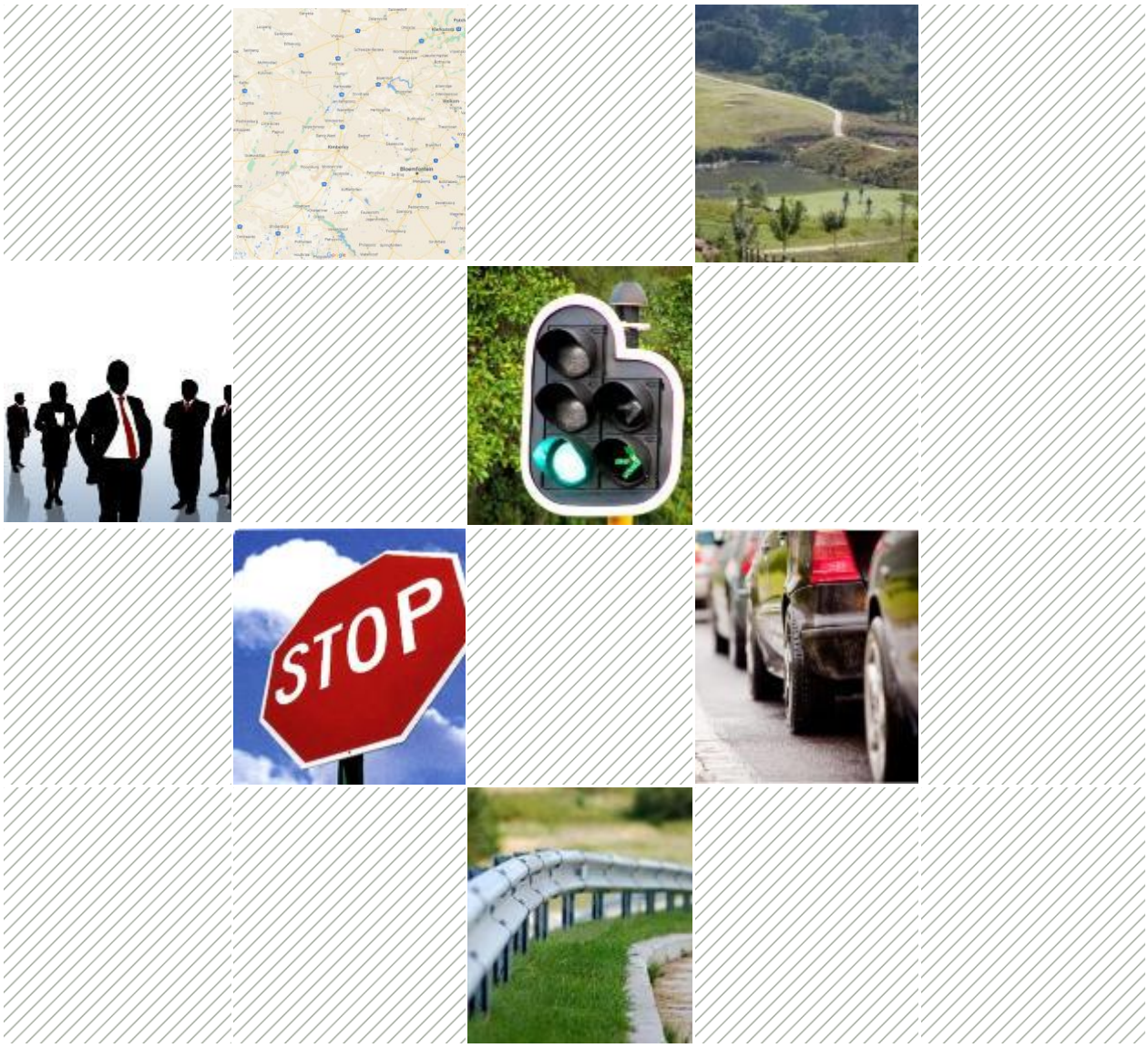

TRAFFIC IMPACT STUDY REPORT: FARM VILJOENSHOF 1655 DEVELOPMENT FOR DIAMOND KIMBERLITE (DK) AND DIAMOND GENERAL (DG) IN BOSHOF, FREE STATE, SOUTH AFRICA

Report Number: T23013_1

Revision: 0

Submitted by:
Letsunyane Investment (Pty) Ltd

Postnet Suite 85
Private Bag X1
Die Wilgers, 0041

Email: tokol@letsunyane.co.za

Submitted to:
Invest In Property 126 (Pty)Ltd
234 Alexandra Avenue
Midrand
Johannesburg, Gauteng
1685

Contact Person:
Name: Mr Tiyiselani Macebele
Tel: (+27) 68 321 4288
Email: tiyiselani@biomental.co.za

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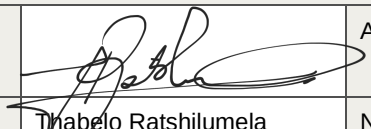
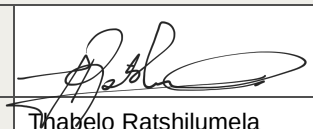
Author signature		Approver signature	
Name	Thabelo Ratshilumela Pr Tech. Eng	Name	Thabelo Ratshilumela Pr Tech. Eng

Client Approval			
Client signature **Mr Tiyiselani Macebele**		PM signature	
Date		Date	

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1. BACKGROUND

Gondo Engineering and Advisory Services (GEAS) under the subcontract of Letsunyane Investments (Pty) Ltd has been appointed to prepare a traffic impact study for a proposed mining development in Boshof, in the Free State province, South Africa.

The proposed mining development is proposed at Farm Viljoenshof 1655 in Boshof. The proposed mining activities are diamond kimberlite (DK) and diamond general (DG).

1.1 Study Area

The planned mining development will be developed Farm Viljoenshof as stated above. The Farm is located in Boshof, under the jurisdiction of Tokologo Local Municipality (TLM). Tokologo Local Municipality is located within Lejweleputswa District Municipality, specifically in the western Free State. The area covers 9 326 square kilometres and consists of three former Transitional Local Councils namely Boshof, Dealesville and Hertzogville, as well as a portion of a former Transitional Rural Council (Moddervaal), which consists of approximately 1 480 farms.

Boshof (the capital town) is situated in the centre; Dealesville is further east, and Hertzogville is situated in the north of the municipal area. The proposed mine development is located at the following coordinates, **-28.586102°: 25.110929°**.

Figure 1-1: Farm Viljoenshof 1655, Boshof Locality Map– Free State Province.

1.2 Planned Services

1.2.1 Diamond Kimberlite (DK) and Diamond General (DG) Mine Development

The planned diamond mine is an open cast mine with maximum depth of mining of 12 – 20 metres. The type of mineral is the diamond kimberlite and general. The farm is approximately 33,6 square kilometres, with activities on site inclusive of a;

- Plant site
- Soil storage
- Tailings
- Waste dump
- Water recycling and Slimes dam

The study will also cater for construction phase as well as operation phase, traffic impact as a result of the two activities will be discussed in this report. It is also noted that most of the activities are outdoor activities with limited permanent infrastructure such as a plant site for the staff.

1.2.2 Development Schedule of the Proposed Diamond Mine

Table 1-1: Proposed Development Schedule.

ITEMS	**DETAILS**
Type of mineral	Diamond Kimberlite; Diamond General.
Mining method	Open pit
Depth of mining	12 -20 m
Depth of mining	30 years

1.3 Scope of Works

The following road are relevant to this study – refer to Figure 1-3.

1.3.1 Our Understanding of Scope of Works

Phase 1: Traffic Impact Assessment

The Client requested Letsunyane Investments (Pty) Ltd to conduct a Traffic Impact Assessment (TIA) for the proposed mine in Boshof. The scope of works includes;

- Undertake planning, studies, investigation and assessment of traffic and transportation planning aspects of the proposed development.
- Collect classified traffic data in the vicinity of the proposed development in order to establish morning and afternoon peak hours.
- Establish traffic impact of the proposed mine and recommend and motivate for the appropriate geometrical upgrades and sustainable intersections traffic control measures.
- The scope will further include Non-motorised and public transport proposals within the vicinity of the proposed development.
- The team will prepare a technical report and submit to the relevant road authority in the Free State for approval.
- High level parking requirements

1.4 Adjacent Road Network

The following roads are relevant to this study – refer to Figure 1-2.

1.4.1 R64 – Provincial Road

This is a 170 km major provincial road that connects Kimberley with Bloemfontein via Boshof and Dealesville. The R64 road begins at an interchange with the N1 and the N8 national routes to the east, in Bloemfontein, just west of the city centre. It begins by traversing to the north-west for approximately 31 kilometres to cross the Modder River adjacent to the Krugersdrift Dam and Soetdoring Nature Reserve. It continues towards north-west for another 30 kilometres, exiting the Mangaung Metropolitan Municipality, to meet the western terminus of the R703 Road through the town of Dealesville. In Dealesville's ceity centre. It proceeds westwards for 36 kilometres towards Boshof town. From Boshof, the R64 traverses to the south-west direction for approximately 52 kilometres to cross into the Northern Cape and enter the city of Kimberley (Capital of the Northern Cape). It makes a left turn at the Hull Street junction and proceeds and terminates at an intersection with the N12 and N8 national routes in the Kimberley City Centre.

The R64 is an important transport link for the agricultural and mining industries in the region, as well as for tourism and local traffic.

This road is carrying a total of 61 vehicles per direction during the morning peak hour. The road surface is in good conditions, with gravel shoulder on either side of the road. The terrain is fairly flat for large parts of its stretch, providing clear visibility for motorists on either approach.

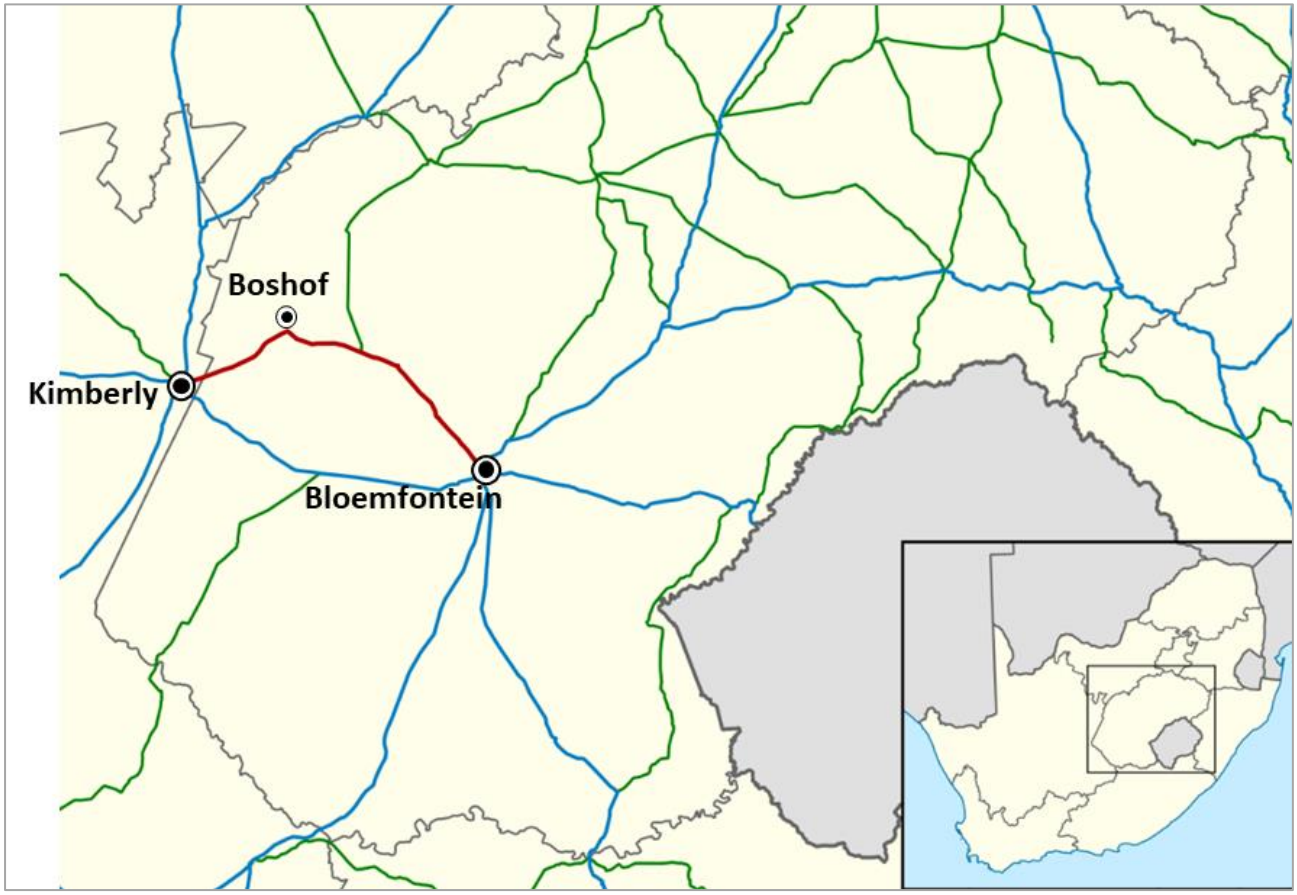


Figure 1-2: R64 Road between Kimberley and Bloemfontein.

Figure 1-3: R64 Road towards Boshof Town.

1.4.2 Farm Viljoenshof 1655 Access Gravel Road

Farm Viljoenshof 1655 is located to the north of R64 Road, 10km to the west of Boshof town. The access road intersects with R64 at the following coordinates; **-28.586127°: 25.148372°.**

The gravel is approximately 4 kilometres long, extending from R64 Road and terminating at Farm Viljoeshof 1655 property boundary.

Figure 1-4: Gravel Access Road to Farm Viljoenshof 1655.

2. ANALYSIS OF THE EXISTING TRAFFIC CONDITIONS

The existing traffic volumes on the road network surrounding the site were obtained from classified traffic counts undertaken on a weekday which was on the 02 March 2023. Traffic data was collected at the existing access to the subject Farm Viljoenshof 1655. The classified traffic counts were conducted in order to establish the AM and PM peak hour. All movements by vehicle types were recorded in 15-minute intervals. Traffic counts were conducted from 06:00 to 18:00. Total vehicles over a 12-hr were counted to be 740 vehicles.

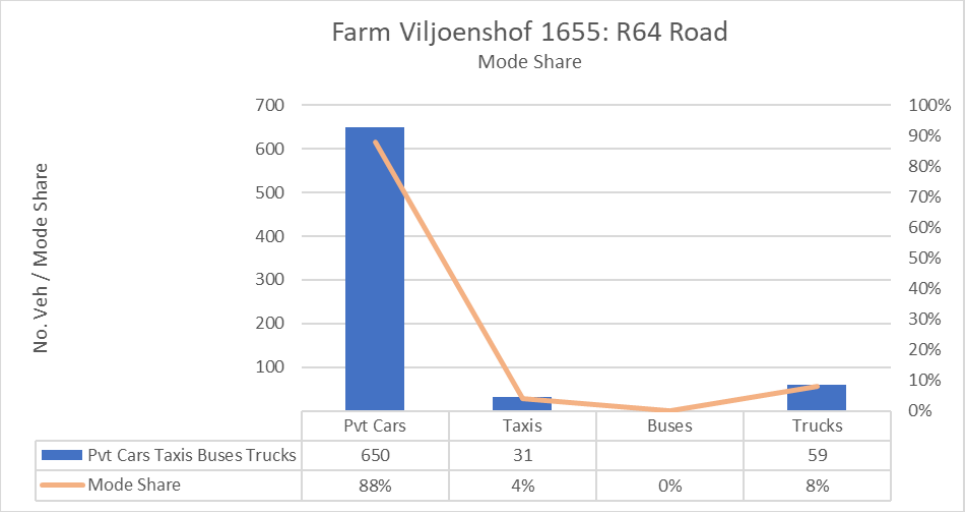


Figure 2-1: Traffic Volume Distribution Over 12-Hr Period at R64 Road – Boshof.

Figure 2-2 of below depicts the travel patterns and proportions in the vicinity of the proposed access to Farm Viljoenshof 1655, on R64 Road. The light vehicles, minibus taxis and trucks trips are prevalent in the area as shown below. There were no buses recorded past the traffic count location.

The AM and PM peak hours occurred from 07:00 to 08:00 and 16:00 to 17:00, respectively. The traffic counts were conducted during a normal working day in order to obtain a representative travel pattern.

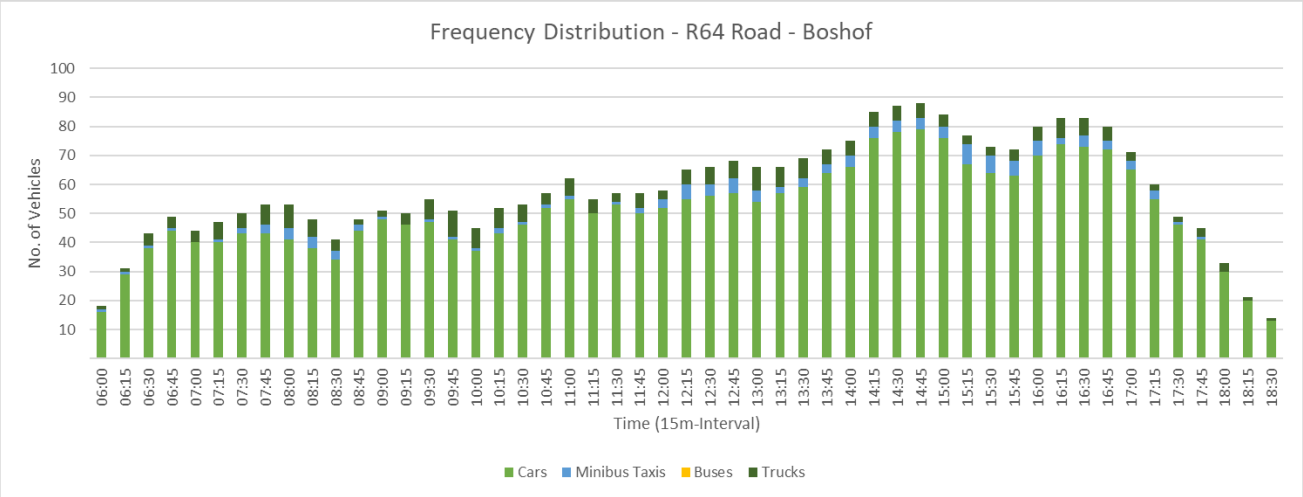
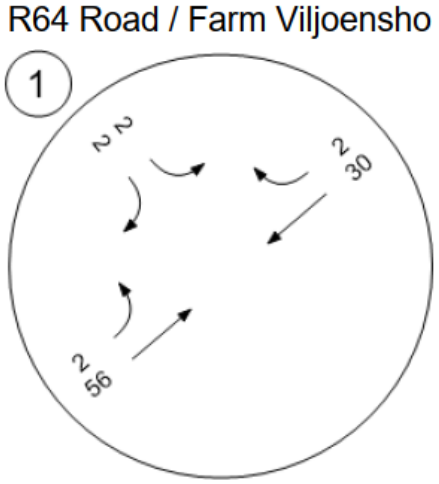


Figure 2-2: Traffic Volume Distribution Over 12-hr Period at R64 Road - Boshof.

The existing intersection within the study area is a stop-controlled, with minor road being a gravel road. The R64 Road is currently carrying an average of 61 and 80 vehicles during the AM and PM peak hour.

Diagram 2-1: Farm Viljoenshof 1655 Traffic Volume - AM Peak Hour

Existing AM Peak Hour Traffic



Existing PM Peak Hour Traffic

The computer program was used to analyse the existing traffic flows. The software output describes the Level of Service (LOS) which is a measure of the congestion and delay at an intersection, with

LOS A being the best (free-flow, no congestion) and LOS F being the worst (breakdown conditions with very high delays).

Table 2-1: Average LOS for Signalised and Un-Signalised Intersections, according to the Highway Capacity Manual.

Level of Service	Average Control Delay per Vehicle (seconds)	
	Signals and Roundabouts	Stop Signs and Give-Ways (Yield)Signs
A	≤ 10	≤10
B	10 – 20	10 - 15
C	20 – 35	15 – 25
D	35 – 55	25 – 35
E	55 – 80	35 – 50
F	>80	>50

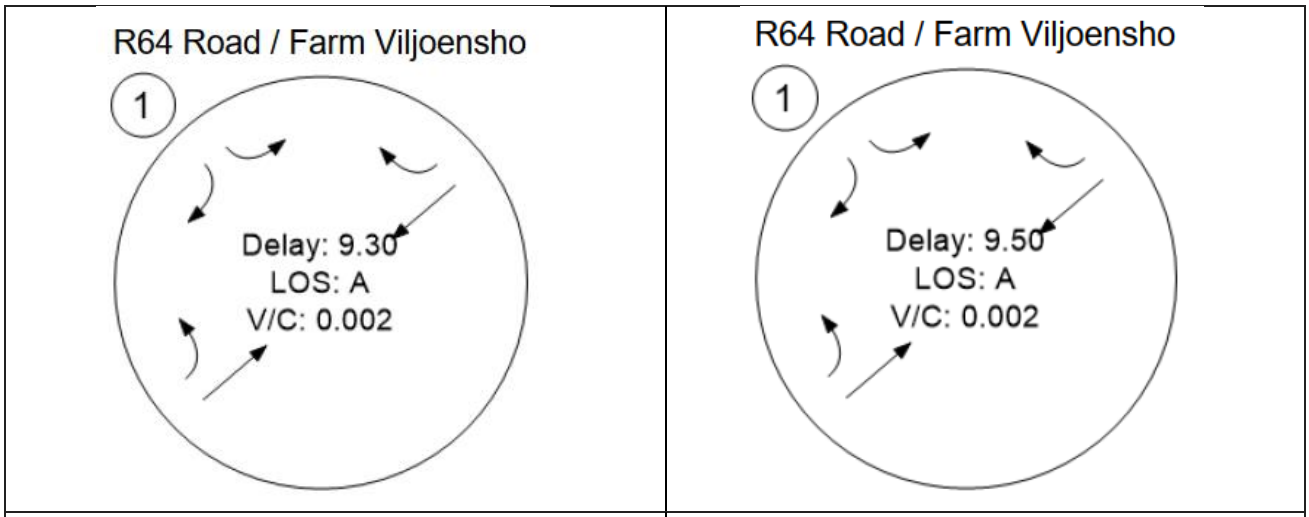
The traffic impact analysis of the proposed development was conducted based on the existing AM and PM peak hour traffic volumes on the surrounding road network. Furthermore, the methodology followed took into account the analysis of volume over capacity ratio as a measure of road network's capacity levels during the peak hours. The volume over capacity ratio (V/C ratio) is an important metric in traffic engineering that is used to evaluate the efficiency of a transportation network. The V/C ratio is the ratio of the volume of traffic on a road segment or intersection to its capacity, which is the maximum number of vehicles that can pass through the segment or intersection under ideal conditions. In general, a V/C ratio of less than 0.7 is considered acceptable, as it indicates that the traffic flow is well below capacity and there is little congestion. A V/C ratio between 0.7 and 0.9 suggests that the traffic flow is approaching capacity, and some congestion may be present.

Below is the discussion on traffic conditions at various intersections within the study area.

2.1 Exiting Traffic Conditions at R64 Road / Farm Viljoenshof Access Road

There is a single intersection which is currently operating at favourable traffic conditions and will be discussed below.

Diagram 2-2: Levels of Service (LOS) - R64 Road.



Existing AM Peak Hour LOS | Existing PM Peak Hour LOS

The existing traffic condition at the vicinity of the proposed development is acceptable. All approaches are currently experiencing LOS A during both peak hours. The V/C is also favourable as the intersection has more than 99% of spare capacity, adequate to accommodate future traffic growth and developments.

2.1.1 Public Transport

From the existing traffic condition analysis, it is evident that most of the commuter trips are conducted by private cars and minibus taxis. Over a 12-hr period, a total of 31 minibus taxis were observed traversing along the R64 Road, past the proposed development. thus, the proposed mine development will be accessible by public transport from nearby settlement such as Boshof town.

2.1.2 Non-Motorised Transport (NMT)

From the site visits and observations, there are limited walking activities in the area. The distance between R64 Road and the proposed development is approximately 5 kilometres. It is a distance which is walkable over a period of one-hour.

Thus, there will be a need for the company to provide carpooling for employees in a form of high-occupancy vehicles to and from the proposed mine.

3. THE PROPOSED DEVELOPMENT AND ACCESS PROPOSALS

The planned mine will be developed on Farm Viljoenshof 1665 and it will comprise of;

- Plant site
- Soil storage
- Tailings
- Waste dump
- Water recycling and Slimes dam

3.1.1 Traffic Generation

Trip generation is an important concept in traffic engineering that refers to the process of estimating the number of vehicle trips that will be generated by a specific land use or development. Trip generation is a critical aspect of traffic engineering that helps ensure that integrated transportation systems are designed to accommodate the expected traffic demand and promote safe and efficient travel.

In South African context, the Technical Methods for Highways (TMH) 16, (Volume 1, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual) of 2012 is utilised in establishing the applicable trip rates and their associated variables. For a mine development, the standards are silent in terms of trip generation rate. This is primarily due to a fact that mines are usually located away from human settlements. Furthermore, mine operations and their shifts are not usually aligned to normal traffic pattern in a rural or urban set-up. However, it is expected that the mine will generate trips during the construction, operations and decommissioning stages.

Focus will also be on the geometric characteristics of the access point, impact of heavy vehicles on sight distances during construction and operation phases.

1. Construction Phase

In calculating the peak hour trip generation during construction of the proposed mine, a number of assumptions were made. These include:

- Diamond mine has limited construction activities when compared with other mineral mining activities.
- Heavy equipment is expected to be delivered to site at the beginning of construction phases and removed at the end, and will not be transported to/from the site every day; and
- The operations phase is expected to generate more traffic than the construction phase. As such, the traffic analysis will take into account the operation phase of the mine development.

2. Operations Phase

Table 3 -1 of this report details the expected number of trips as a result of the proposed mine. The following assumptions were made regarding the proposed development;

- Top and senior management will generate a single trip each.
- Professionally qualified persons, experienced specialists and middle management will each generate a trip to and from the mine.
- A trip generation rate of 0,5 is used for skilled technical and academically qualified workers.
- A trip generation rate of 0,3 is used for semi-skilled workers.
- A trip generation rate of 0,1 is used for general workers.
- High-occupancy shuttle will be provided by the Employer, primarily for general workers. Thus, most of the semi-skilled and the general workers will use the provided transport to and from the mine.

The following employment numbers are expected to be generated by the proposed mine. A five-year employment statistic will be used to derive some mine induced trips.

Table 3-1: Development Schedule for the Proposed Farm Viljoenshof 1655 Mine Development.

Category	**Total No. Employees**	**Assumed Rate**	**Total Mine Trips**
Top and Senior Management	3	1 per Employee	3
Professionally qualified and Experienced specialists and mid- management	13	1 per Employee	13
Skilled technical and academically qualified workers, junior management, supervisors, foreman and superintendents	17	0,5 per Employee	9
Semi-skilled and discretionary decision making	52	0,3 per Employee	16
Permanent general laborer	59	0,1 per Employee	6
Total Number of Employees per Year	144		47 50*

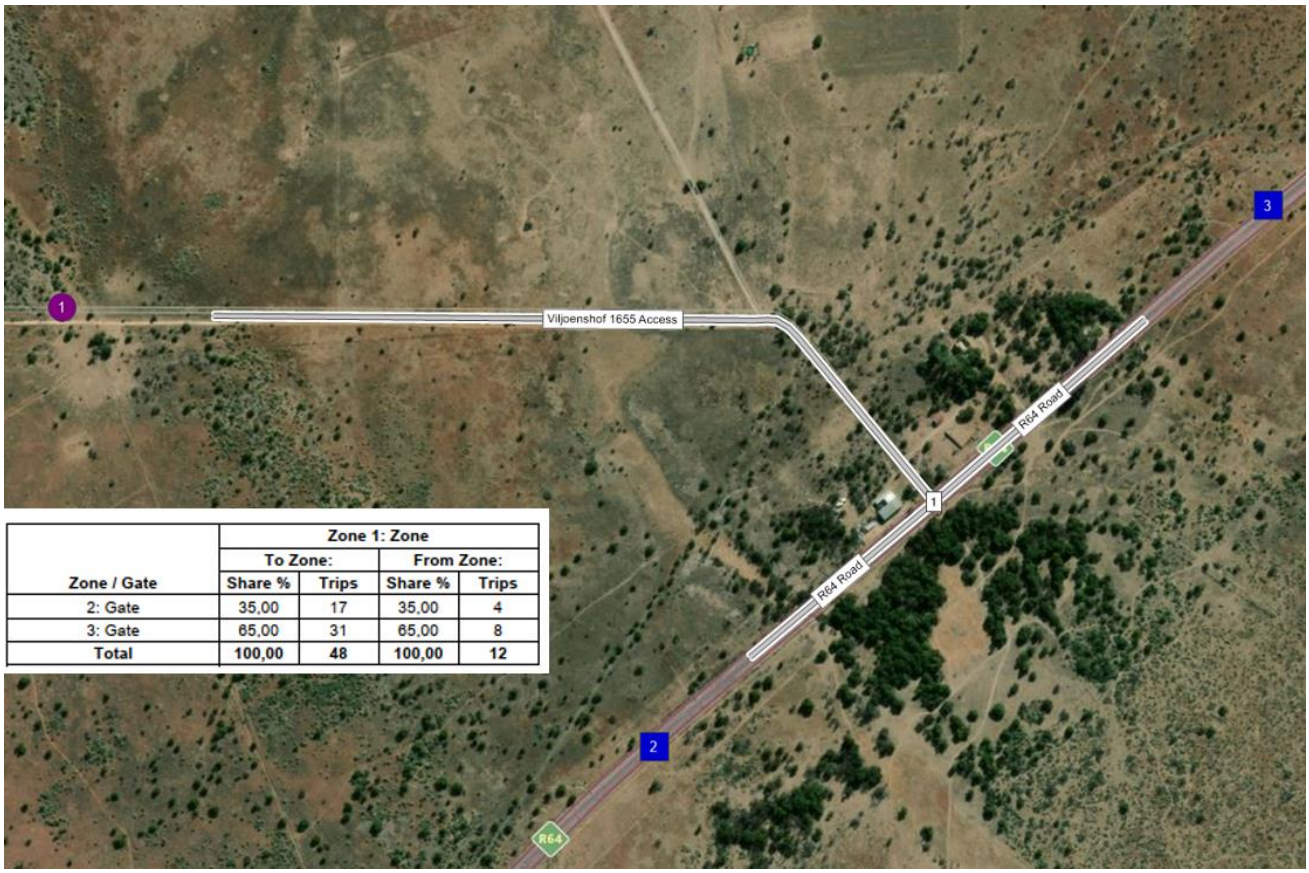
The proposed mine development is expected to generate a total of 50 trips during the peak hours. It is expected that a maximum of 3 buses will ferry employees to and from the mine. There is an expectation for mine vehicles (5 -10) to move in and out of the mine during peak hours.

Thus, a total number of trips in and out of the mine is a maximum of **60 trips** during peak hour, with a directional split of 80% and 20%, to and from the mine during the AM peak hour. The reverse of the morning peak will be realised during the PM peak hour.

3.1.2 Traffic Distribution

The development-generated traffic was distributed in the same proportions as the existing traffic volumes at the surrounding road network. Based on these distribution ratios, the development-generated traffic volumes have been assigned onto the surrounding road network as shown in Diagram 3-1 below.

Diagram 3-1: Trip Distribution – Proposed Farm Viljoenshof 1655 Mine Development.



Zone / Gate	Zone 1: Zone			
	To Zone:		From Zone:	
	Share %	Trips	Share %	Trips
2: Gate	35,00	17	35,00	4
3: Gate	65,00	31	65,00	8
Total	100,00	48	100,00	12

It is also noted that 80% and 20% of new trip will access and exit the proposed mine development using R64 Road during the AM peak hour. The reverse traffic distribution is expected during the PM peak hour. The expected new traffic will include 15% of heavy traffic.

4. ANALYSIS OF THE EXISTING TRAFFIC CONDITIONS PLUS DEVELOPMENT

The estimated AM and PM peak hour traffic volumes generated by the proposed development are shown in Diagram 4-1 of the report. The combined existing and development-generated AM and PM peak hour traffic volumes are also shown. The traffic analysis of the existing traffic plus development-generated traffic volumes for the AM and PM peak hours at various intersections within the study area are discussed in this chapter.

4.1 Expected Traffic Conditions at R64 Road / Farm Viljoenshof 1655 Access Road

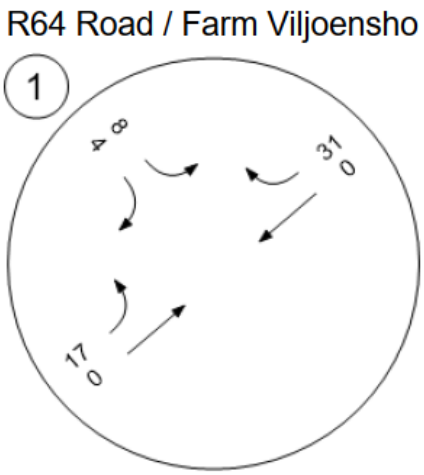
Findings are as follows;

Diagram below depicts the expected traffic conditions at the R64 Road / Farm VIljoenshof Access Road when development traffic is added onto the road network. It has since been establish that 65% of new trips will come from Boshof town, while the remainder of trips will be realised from R64 Road's eastbound approach from Kimberley.

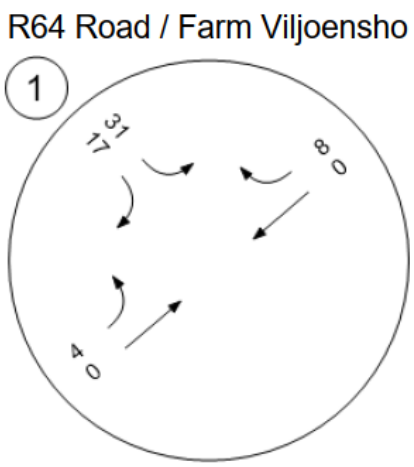
The expected traffic condition is as follows;

- Traffic on the road network will increase by 60 trips which will be the development trips to and from the proposed mine during peak hours.
- All approaches will continue to operate at a LOS A during both peak hours.
- The road will continue to have spare road capacity (V/C) of more than 0,9 during both peak hours. This can be translated as 90% of spare road capacity for future development and natural growth of traffic in the area.
- The expected traffic condition at this intersection is acceptable from the traffic analysis' point of view.

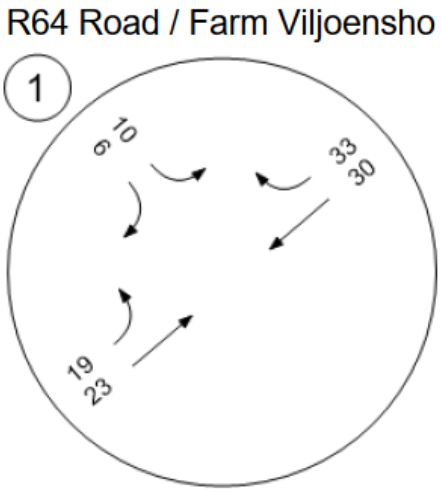
Diagram 4-1: Expected Levels of Service (LOS) - R64 Road.



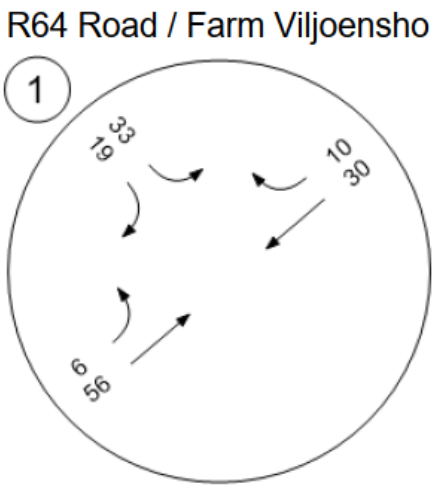
New Trips – AM Peak Hour



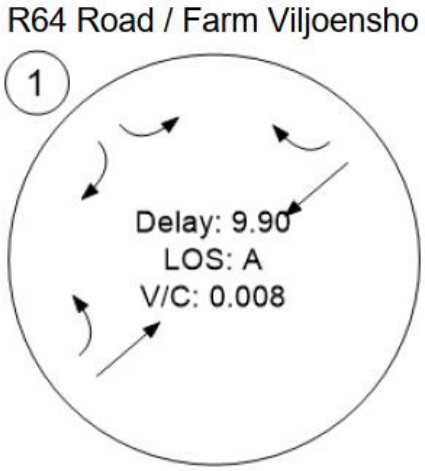
New Trips – PM Peak Hour



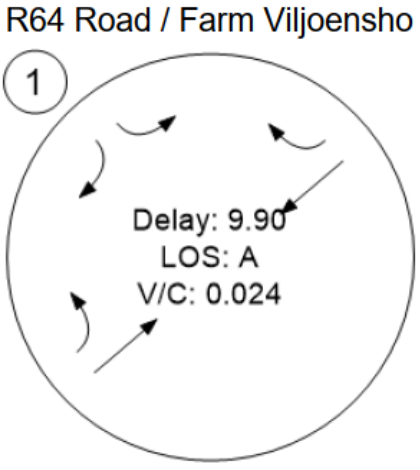
Total Trips – AM Peak Hour



Total Trips – PM Peak Hour



Expected AM Peak Hour LOS



Expected PM Peak Hour LOS

5. SITE DEVELOPMENT PLAN EVALUATION

5.1.1 Internal Traffic Circulation

The internal traffic circulation does not refer to vehicle circulation only but to pedestrians (patients, mine employees and visitors). Internal traffic circulation refers to movement of emergency vehicles as well as waste trucks.

5.1.2 Pedestrian access

All Mine buildings are to provide pedestrian access by linking adjacent sidewalks and multi-use path(s). It is also recommended that universal access should be implemented on ALL intersections and buildings accesses as per applicable regulations and where there are changes in intersection geometric characteristics. This intervention will assist persons with limited abilities to access all areas of the proposed mine.

5.1.3 Vehicular circulation

Vehicles are expected to enter the Mine through the existing R64 Road / Farm Viljoenshof 1655 Access Road intersection. The access to the proposed mine is located at the following coordintaes; **-28.586127°: 25.148372°.**

Circulation of vehicles within the mine areas should be planned to minimize conflict points between pedestrians, heavy vehicles, delivery vehicles and private vehicles. Dedicated drop-off zones should be clearly defined as well as last-mile walking paths to various sections of the mine.

5.1.4 Pedestrian circulation

Pedestrian walking spaces shall be directly linked to entrances and the internal circulation of the buildings or areas. The design of pedestrian crossings should be clearly visible to motorists. Pedestrian routes shall maintain a direct and shortest routes to various areas of the mine, provided it is safe to do so. It is also proposed that the traffic calming measure should be considered within parking areas as well as along the access road to the Mine. It is recommended that the streets around the Mine's precinct should have a 40 km/h speed limit.

5.1.5 Universal Access Design

The design criteria for Universal Access eases the mobility of humans in fulfilling their basic activities on a daily basis. Guaranteeing the ease of movement for all people including those who are sighted, blind, or partially sighted, those who use a wheelchair, pushchair or pram – is paramount. Thus, where there is a need to implement non-motorised transport (NMT) infrastructure, it should be;

- Equitable – promote equal access opportunities for people with diverse abilities.
- Flexible – accommodate wide range of users.
- Simple and Intuitive,
- Tolerant for Error – facilities should minimize hazards for the users.
- Low physical effort
- Appropriate size and space – consider the number of expected learners in the vicinity of the proposed Mine.

6. ACCESS AND SERVICING

6.1 Existing Farm Access

Access to the proposed mine will be at an existing location, depicted in Chapter 1.4.2 of the report. The nearest formal access is at approximately 10,5 kilometres to the east of the existing Farm Viljoen 1655 access which is acceptable.

Figure 6-1: Proposed Mine Access - R64 Road.

6.2 Design Vehicles

The requirements for access to the development are expected to vary between the construction and operational phases of the project.

During the construction phase, vehicles arriving on site will be a combination of workers in light vehicles, delivery and construction phase with heavy vehicles. It is expected that the design vehicle during the construction phase will be a 22m articulated Vehicle (AV).

During the operational phase of the project, there are approximately 60 vehicles expected to access the mine, with 15% of the vehicles expected to be heavy vehicles. Most of the vehicles will be those of senior management, technical and middle managed staff as well as carpooling for general workers by means of high-occupancy vehicles such as minibus taxis and buses.

6.3 Road Classification

To determine the appropriate access spacing, road classification needs to be determined. The TRH 26 South African Road Classification and Access Management Manual (10) uses a six-class rural and urban road classification system. The first three classes in the system consist of mobility roads while the second three classes are used for access/activity roads or streets.

A distinction is made between rural and urban areas. Roads in rural and urban areas have the same six functional classes but at different scales and standards. Rural roads have longer reaches of connectivity and therefore require higher levels of mobility than urban roads. It is therefore necessary that the classification system should differentiate between rural and urban areas.

Rural Classes		**Urban Classes**	
R1	Rural principal arterial*	U1	Urban principal arterial
R2	Rural major arterial*	U2	Urban major arterial
R3	Rural minor arterial*	U3	Urban minor arterial
R4	Rural collector road	U4	Urban collector street
R5	Rural local road	U5	Urban local street
R6	Rural walkway	U6	Urban Walkway

It is concluded that the R64 Road is a Class R3 (rural minor arterial). These routes are with typical length of between about 10 km and 100 km. These roads are not busy and traffic volumes between 100 and 2 000 per day are typical.

Rural minor arterials carry inter-district traffic between:

- Small towns, villages and larger rural settlements (population typically less than about 25 000);
- Smaller commercial areas and transport nodes of local importance that generate relatively high volumes of freight and other traffic in the district (public transport and freight terminals, railway sidings, small seaports and landing strips);
- Very small or minor border posts;
- Tourist destinations;
- Other Class 1, 2 and 3 routes.
- Smaller centres than the above when travel distances are relatively long (longer than 50 to 100 km).

6.4 Sight Distances

Stopping sight distance should at least at all times be maintained. This is the distance required to enable a driver to observe an obstruction and stop in time.

Ideally, adequate intersection sight distance must be provided at accesses to allow drivers to find a sufficiently large gap in the traffic stream to enter the road safely and with limited disruption to the traffic on the main road.

The National Guidelines prescribe the following as far as shoulder sight distance. (Gap Acceptance Sight Distance) is concerned:

Table 6-1: Minimum Gap Acceptance Sight Distance).

Vehicle type	Eye height	Design speed						
		40 km/h	50 km/h	60 km/h	70 km/h	80 km/h	100 km/h	120 km/h
Stop and yield control, 7.5m wide main road (X = 5m)								
Passenger cars	1.05m	80	100	120	140	160	200	240
Single unit	1.80m	120	150	180	210	240	300	360
Single unit & trailer	1.80m	150	190	225	265	305	380	455
Stop and yield control 22.5m wide main road (X = 5m)								
Passenger cars	1.05m	100	125	150	175	200	250	300
Single unit	1.80m	135	170	200	235	270	335	405
Single unit & trailer	1.80m	165	205	250	290	330	415	495
Yield control (X = 20m)								
Passenger cars	1.05m	65	80	95	110	125	155	190
Single unit	1.80m	75	95	115	135	150	190	230
Single unit & trailer	1.80m	95	115	140	165	185	235	280

Based on the speed limit of 100km/h and main road width of 7.5m and considering the fact that trucks will use the access, a minimum sight distances of 380m is applicable for this access. The measured sight distance is in excess of 850m from both approaches which is acceptable. Due to heavy vehicles expected to turn at this intersection, a speed limit of 80km/h is suggested at this intersection. The expected sight distance will be 305m from either approach.

7. PARKING REQUIREMENTS

There is a no actual site layout with clear indication of parking requirements or provision. In this case, it is assumed that the expected trips to the mine which amount to 60 trips during peak hours will likely require parking.

Thus, it is estimated that adequate parking should be provided within the mine development to cater for private and heavy vehicles. It is estimated that approximately 30 to 40 parking bays will be adequate to service the demand in the mine. The proposed mine is an open cast mine, meaning that the parking needs may be adjust upwards or downwards as and when required.

8. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions should be noted,

- **Invest In Property 126 (Pty) Ltd** plans to operate a diamond mine on Farm Viljoenshof 1655 in Boshof, Free state.
- The proposed mine development is located at the following coordinates, **-28.586102°: 25.110929°**.The planned diamond mine is an open cast mine with maximum depth of mining of 12 – 20 metres. The type of mineral is the diamond kimberlite (DK) and diamond general (DG).
- The road of interest is the R64 Road which traverses between Kimberley and Boshof to the east. The farm area is approximately 33,6 square kilometres.
- There is an existing access to Farm Viljoenshof 1655 and it is on R64 Road, 10km to the west of Boshof town. The access road intersects with R64 at the following coordinates; **-28.586127°: 25.148372°**.
- Traffic counts were conducted during a normal weekday (02 March 2023) from 06:00 to 18:00. Total vehicles over a 12-hr were counted to be 740 vehicles, with peak hour traffic amounting to 61 and 80 during the AM and PM peak hours, respectively.
- Maximum of 60 trips will be generate by the proposed mine development during the peak hours. A distribution of 80% and 20% in and out of the mine as used during the AM peak hour. A reverse of the morning peak distribution was used to distribute afternoon trips.
- The expected traffic impact post-development of the mine will be minimal. A levels of service (LOS) A during both peak hours will be realised. The volume over capacity (V/C) will be less than 0,03 over both peak hours, depicting a free-flowing traffic condition. Therefore, the road will still have more than 97% free capacity post the development of the mine.
- No intersection improvements are required from a capacity point of view.
- The existing gravel access road will require minor upgrades over its stretch. This will be to improve road safety.

In summary, it is concluded that from a traffic point of view, the intended development will not have a significant impact on the area, and in particular on communities in the area. It is therefore recommended that the proposed mine development should be approved at the identified location. It is further recommended that the existing access should be approved for the puporses of the planned diamond mine at Farm Viljoen 1655, in Boshof, Free State province.

9. REFERENCES

1. Department of Transport, “Manual for Traffic Impact Studies,” RR 93/635, October 1995
2. Department of Transport, “South African Trip Generation Rates”, RR 92/228, June 1995
3. Guidelines for Geometric Design of Urban Arterial Roads, 1986.
4. The Mining Right Application for the Proposed Mining Development for Diamond Kimberlite (DK) And Diamond General (DG) On Farm Viljoenshof 1655 In Boshof, Free State, South Africa, EIA & EMP Draft Report.
5. South African Road Traffic Signs Manual (SARTSM), Volume 2.
6. South African Road Traffic Signs Manual (SARTSM), Volume 3.
7. Transport and Land Development, 2nd Edition, Institute of Transportation Engineers, 2002.
8. Technical Methods for Highways (TMH) 16, (Volume 1, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual), 2012
9. Technical Methods for Highways (TMH) 17, (Volume 2, South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual), 2012
10. TRH 26, South African Road Classification and Access Management Manual, Version 1.0, COTO, 2012

ANNEXURE A – TRAFFIC COUNTS & ANALYSIS OUTPUT

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	R64 Road / Farm Viljoenshof 1655 Access	Two-way stop	HCM 7th Edition	SB Right	0,002	9,3	A

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: R64 Road / Farm Viljoenshof 1655 Access

Control Type:	Two-way stop	Delay (sec / veh):	9,3
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0,002

Intersection Setup

Name	Viljoenshof 1655 Access		R64 Road		R64 Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [m]	3,66	3,66	3,66	3,66	3,66	3,66
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [m]	30,48	30,48	30,48	30,48	30,48	30,48
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [m]	0,00	0,00	0,00	0,00	0,00	0,00
Speed [km/h]	48,28		48,28		48,28	
Grade [%]	0,00		0,00		0,00	
Crosswalk	Yes		No		No	

Volumes

Name	Viljoenshof 1655 Access		R64 Road		R64 Road	
Base Volume Input [veh/h]	2	2	2	23	30	2
Base Volume Adjustment Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Heavy Vehicles Percentage [%]	50,00	50,00	8,00	8,00	8,00	8,00
Growth Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2	2	2	23	30	2
Peak Hour Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Other Adjustment Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Total 15-Minute Volume [veh/h]	1	1	1	6	8	1
Total Analysis Volume [veh/h]	2	2	2	23	30	2
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0,00	0,00	0,00	0,00	0,00	0,00
d_M, Delay for Movement [s/veh]	8,89	9,30	0,00	0,00	0,00	7,32
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0,01	0,01	0,00	0,00	0,00	0,00
95th-Percentile Queue Length [m/ln]	0,10	0,10	0,00	0,00	0,03	0,03
d_A, Approach Delay [s/veh]	9,10		0,00		0,46	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0,84					
Intersection LOS	A					

Farm Viljoenshof Farm Mine Development

Vistro File: C:\...\Farm Viljoenshof 1655 Mine AM Peak Scenarios.vistro

Scenario: Base Scenario

Report File: C:\...\Existing Traffic Condition AM Peak Hour.pdf

2023/03/30

Turning Movement Volume: Summary

ID	Intersection Name	Southbound		Eastbound		Westbound		Total Volume
		Left	Right	Left	Thru	Thru	Right	
1	R64 Road / Farm Viljoenshof 1655 Access	2	2	2	23	30	2	61

Farm Viljoenshof Farm Mine Development

Vistro File: C:\...\Farm Viljoenshof 1655 Mine AM Peak Scenarios.vistro

Scenario: Base Scenario

Report File: C:\...\Existing Traffic Condition AM Peak Hour.pdf

2023/03/30

Turning Movement Volume: Detail

ID	Intersection Name	Volume Type	Southbound		Eastbound		Westbound		Total Volume
			Left	Right	Left	Thru	Thru	Right	
1	R64 Road / Farm Viljoenshof 1655 Access	Final Base	2	2	2	23	30	2	61
		Growth Factor	1,00	1,00	1,00	1,00	1,00	1,00	-
		In Process	0	0	0	0	0	0	0
		Net New Trips	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0
		Future Total	**2**	**2**	**2**	**23**	**30**	**2**	**61**

Signal Warrants Report For Intersection 1: R64 Road / Farm Viljoenshof 1655 Access

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	N
Speed > 40mph	Yes
Population < 10,000	No
Warrant Factor	70%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets
	E	W	N
1	32	25	4
2	31	24	4
3	30	24	4
4	28	22	4
5	25	20	3
6	25	20	3
7	25	19	3
8	22	18	3
9	22	17	3
10	22	17	3
11	19	15	2
12	18	14	2
13	17	14	2
14	13	10	2
15	13	10	2
16	9	7	1
17	5	4	1
18	5	4	1
19	3	2	0
20	2	1	0
21	1	1	0
22	0	0	0
23	0	0	0
24	0	0	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	1	57	1	4	No	No	No	No	No	No	No	No	No	No
2	1	55	1	4	No	No	No	No	No	No	No	No	No	No
3	1	54	1	4	No	No	No	No	No	No	No	No	No	No
4	1	50	1	4	No	No	No	No	No	No	No	No	No	No
5	1	45	1	3	No	No	No	No	No	No	No	No	No	No
6	1	45	1	3	No	No	No	No	No	No	No	No	No	No
7	1	44	1	3	No	No	No	No	No	No	No	No	No	No
8	1	40	1	3	No	No	No	No	No	No	No	No	No	No
9	1	39	1	3	No	No	No	No	No	No	No	No	No	No
10	1	39	1	3	No	No	No	No	No	No	No	No	No	No
11	1	34	1	2	No	No	No	No	No	No	No	No	No	No
12	1	32	1	2	No	No	No	No	No	No	No	No	No	No
13	1	31	1	2	No	No	No	No	No	No	No	No	No	No
14	1	23	1	2	No	No	No	No	No	No	No	No	No	No
15	1	23	1	2	No	No	No	No	No	No	No	No	No	No
16	1	16	1	1	No	No	No	No	No	No	No	No	No	No
17	1	9	1	1	No	No	No	No	No	No	No	No	No	No
18	1	9	1	1	No	No	No	No	No	No	No	No	No	No
19	1	5	1	0	No	No	No	No	No	No	No	No	No	No
20	1	3	1	0	No	No	No	No	No	No	No	No	No	No
21	1	2	1	0	No	No	No	No	No	No	No	No	No	No
22	1	0	1	0	No	No	No	No	No	No	No	No	No	No
23	1	0	1	0	No	No	No	No	No	No	No	No	No	No
24	1	0	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

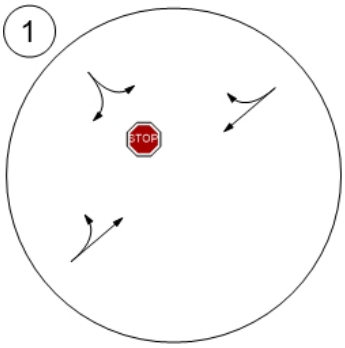
Warrant 3 Condition A

Orientation	N
Total Stopped Delay Per Vehicle on Minor Approach (s)	9,1
Number of Lanes on Minor Street Approach	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:00
Delay Condition Met	No
Volume on Minor Street Approach During Same Hour	4
High Minor Volume Condition Met	No
Total Entering Volume on All Approaches During Same Hour	61
Number of Approaches on Intersection	3
Total Volume Condition Met	No
Warrant Met for Approach	No
Warrant Met for Intersection	**No**

Report Figure 1: Study Intersections

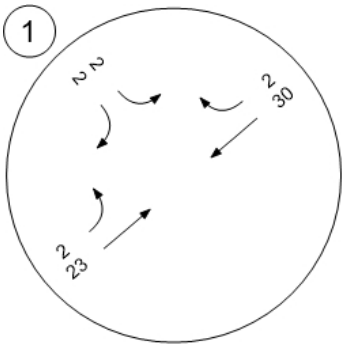
Report Figure 2: Lane Configuration and Traffic Control

R64 Road / Farm Viljoensho



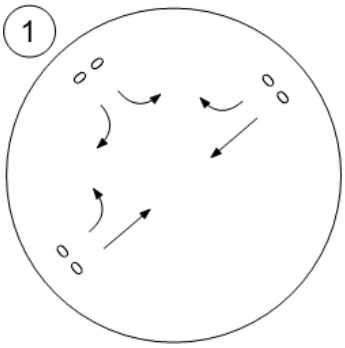
Report Figure 3a: Traffic Volume - Base Volume

R64 Road / Farm Viljoensho



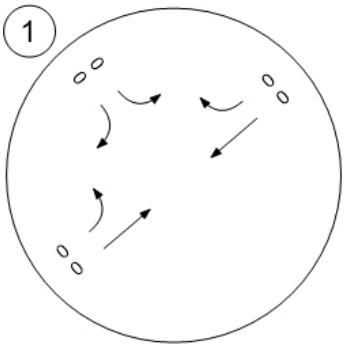
Report Figure 3b: Traffic Volume - In-Process Volume

R64 Road / Farm Viljoensho



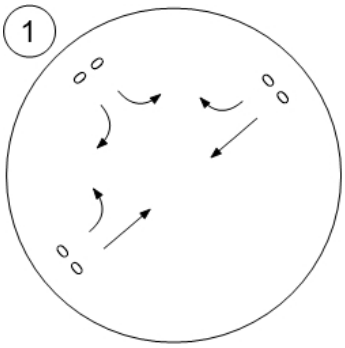
Report Figure 3d: Traffic Volume - Net New Site Trips

R64 Road / Farm Viljoensho



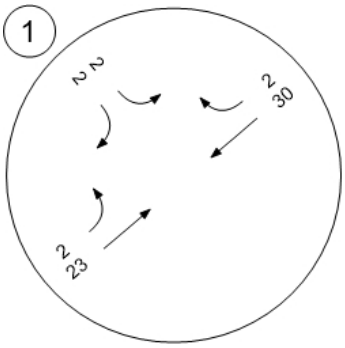
Report Figure 3e: Traffic Volume - Other Volume

R64 Road / Farm Viljoensho



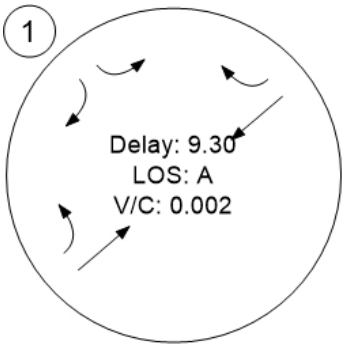
Report Figure 3f: Traffic Volume - Future Total Volume

R64 Road / Farm Viljoensho



Report Figure 4: Traffic Conditions

R64 Road / Farm Viljoensho



Farm Viljoenshof 1655 - Mine Development

Vistro File: C:\...\Farm Viljoenshof 1655 Mine PM Peak Scenarios.vistro

Scenario: Base Scenario

Report File: C:\...\Existing Traffic Condition PM Peak Hour.pdf

2023/03/30

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	R64 Road / Farm Viljoenshof 1655 Access	Two-way stop	HCM 7th Edition	SB Right	0,002	9,5	A

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: R64 Road / Farm Viljoenshof 1655 Access

Control Type:	Two-way stop	Delay (sec / veh):	9,5
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0,002

Intersection Setup

Name	Viljoenshof 1655 Access		R64 Road		R64 Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [m]	3,66	3,66	3,66	3,66	3,66	3,66
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [m]	30,48	30,48	30,48	30,48	30,48	30,48
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [m]	0,00	0,00	0,00	0,00	0,00	0,00
Speed [km/h]	48,28		48,28		48,28	
Grade [%]	0,00		0,00		0,00	
Crosswalk	Yes		No		No	

Volumes

Name	Viljoenshof 1655 Access		R64 Road		R64 Road	
Base Volume Input [veh/h]	2	2	2	56	30	2
Base Volume Adjustment Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Heavy Vehicles Percentage [%]	50,00	50,00	8,00	8,00	8,00	8,00
Growth Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	2	2	2	56	30	2
Peak Hour Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Other Adjustment Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Total 15-Minute Volume [veh/h]	1	1	1	14	8	1
Total Analysis Volume [veh/h]	2	2	2	56	30	2
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0,00	0,00	0,00	0,00	0,00	0,00
d_M, Delay for Movement [s/veh]	9,07	9,50	0,00	0,00	0,00	7,39
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0,01	0,01	0,00	0,00	0,00	0,00
95th-Percentile Queue Length [m/ln]	0,11	0,11	0,00	0,00	0,03	0,03
d_A, Approach Delay [s/veh]	9,29		0,00		0,46	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	0,55					
Intersection LOS	A					

Farm Viljoenshof 1655 - Mine Development

Vistro File: C:\...\Farm Viljoenshof 1655 Mine PM Peak Scenarios.vistro

Scenario: Base Scenario

Report File: C:\...\Existing Traffic Condition PM Peak Hour.pdf

2023/03/30

Turning Movement Volume: Summary

ID	Intersection Name	Southbound		Eastbound		Westbound		Total Volume
		Left	Right	Left	Thru	Thru	Right	
1	R64 Road / Farm Viljoenshof 1655 Access	2	2	2	56	30	2	94

Farm Viljoenshof 1655 - Mine Development

Vistro File: C:\...\Farm Viljoenshof 1655 Mine PM Peak Scenarios.vistro

Scenario: Base Scenario

Report File: C:\...\Existing Traffic Condition PM Peak Hour.pdf

2023/03/30

Turning Movement Volume: Detail

ID	Intersection Name	Volume Type	Southbound		Eastbound		Westbound		Total Volume
			Left	Right	Left	Thru	Thru	Right	
1	R64 Road / Farm Viljoenshof 1655 Access	Final Base	2	2	2	56	30	2	94
		Growth Factor	1,00	1,00	1,00	1,00	1,00	1,00	-
		In Process	0	0	0	0	0	0	0
		Net New Trips	0	0	0	0	0	0	0
		Other	0	0	0	0	0	0	0
		Future Total	**2**	**2**	**2**	**56**	**30**	**2**	**94**

Signal Warrants Report For Intersection 1: R64 Road / Farm Viljoenshof 1655 Access

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	N
Speed > 40mph	Yes
Population < 10,000	No
Warrant Factor	70%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets
	E	W	N
1	32	58	4
2	31	56	4
3	30	55	4
4	28	52	4
5	25	46	3
6	25	45	3
7	25	45	3
8	22	41	3
9	22	40	3
10	22	39	3
11	19	34	2
12	18	32	2
13	17	31	2
14	13	23	2
15	13	23	2
16	9	16	1
17	5	9	1
18	5	9	1
19	3	5	0
20	2	3	0
21	1	2	0
22	0	1	0
23	0	1	0
24	0	1	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	1	90	1	4	No	No	No	No	No	No	No	No	No	No
2	1	87	1	4	No	No	No	No	No	No	No	No	No	No
3	1	85	1	4	No	No	No	No	No	No	No	No	No	No
4	1	80	1	4	No	No	No	No	No	No	No	No	No	No
5	1	71	1	3	No	No	No	No	No	No	No	No	No	No
6	1	70	1	3	No	No	No	No	No	No	No	No	No	No
7	1	70	1	3	No	No	No	No	No	No	No	No	No	No
8	1	63	1	3	No	No	No	No	No	No	No	No	No	No
9	1	62	1	3	No	No	No	No	No	No	No	No	No	No
10	1	61	1	3	No	No	No	No	No	No	No	No	No	No
11	1	53	1	2	No	No	No	No	No	No	No	No	No	No
12	1	50	1	2	No	No	No	No	No	No	No	No	No	No
13	1	48	1	2	No	No	No	No	No	No	No	No	No	No
14	1	36	1	2	No	No	No	No	No	No	No	No	No	No
15	1	36	1	2	No	No	No	No	No	No	No	No	No	No
16	1	25	1	1	No	No	No	No	No	No	No	No	No	No
17	1	14	1	1	No	No	No	No	No	No	No	No	No	No
18	1	14	1	1	No	No	No	No	No	No	No	No	No	No
19	1	8	1	0	No	No	No	No	No	No	No	No	No	No
20	1	5	1	0	No	No	No	No	No	No	No	No	No	No
21	1	3	1	0	No	No	No	No	No	No	No	No	No	No
22	1	1	1	0	No	No	No	No	No	No	No	No	No	No
23	1	1	1	0	No	No	No	No	No	No	No	No	No	No
24	1	1	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

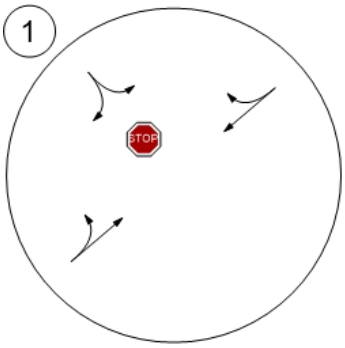
Warrant 3 Condition A

Orientation	N
Total Stopped Delay Per Vehicle on Minor Approach (s)	9,3
Number of Lanes on Minor Street Approach	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:00
Delay Condition Met	No
Volume on Minor Street Approach During Same Hour	4
High Minor Volume Condition Met	No
Total Entering Volume on All Approaches During Same Hour	94
Number of Approaches on Intersection	3
Total Volume Condition Met	No
Warrant Met for Approach	No
Warrant Met for Intersection	**No**

Report Figure 1: Study Intersections

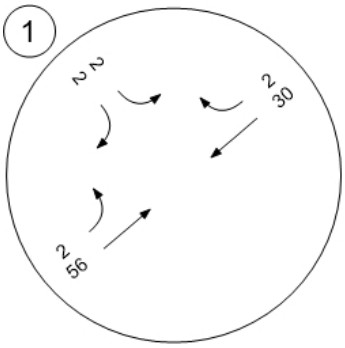
Report Figure 2: Lane Configuration and Traffic Control

R64 Road / Farm Viljoensho



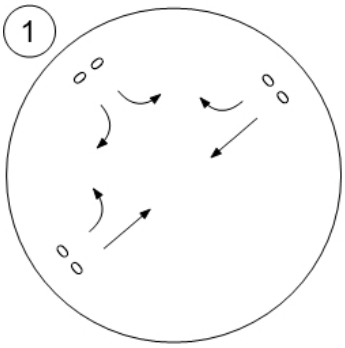
Report Figure 3a: Traffic Volume - Base Volume

R64 Road / Farm Viljoensho



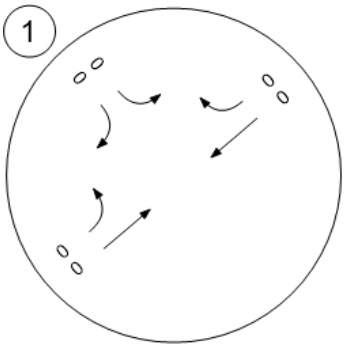
Report Figure 3b: Traffic Volume - In-Process Volume

R64 Road / Farm Viljoensho



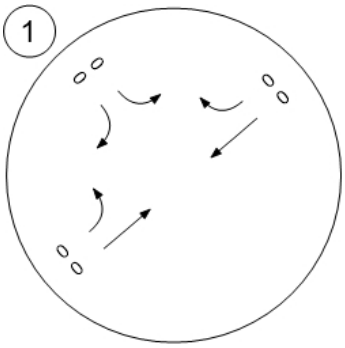
Report Figure 3d: Traffic Volume - Net New Site Trips

R64 Road / Farm Viljoensho



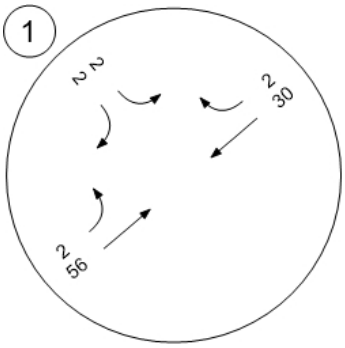
Report Figure 3e: Traffic Volume - Other Volume

R64 Road / Farm Viljoensho



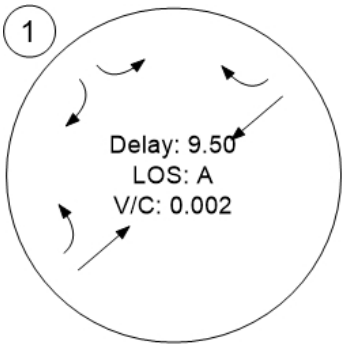
Report Figure 3f: Traffic Volume - Future Total Volume

R64 Road / Farm Viljoensho



Report Figure 4: Traffic Conditions

R64 Road / Farm Viljoensho



Farm Viljoenshof Farm Mine Development

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Scenario 1 Existing Plus Development AM Peak Traffic

Report File: C:\...\Existing Plus Development Traffic Condition AM Peak Hour.pdf

2023/03/30

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	R64 Road / Farm Viljoenshof 1655 Access	Two-way stop	HCM 7th Edition	SB Right	0,008	9,9	A

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: R64 Road / Farm Viljoenshof 1655 Access

Control Type:	Two-way stop	Delay (sec / veh):	9,9
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0,008

Intersection Setup

Name	Viljoenshof 1655 Access		R64 Road		R64 Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [m]	3,66	3,66	3,66	3,66	3,66	3,66
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [m]	30,48	30,48	30,48	30,48	30,48	30,48
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [m]	0,00	0,00	0,00	0,00	0,00	0,00
Speed [km/h]	48,28		48,28		48,28	
Grade [%]	0,00		0,00		0,00	
Crosswalk	Yes		No		No	

Volumes

Name	Viljoenshof 1655 Access		R64 Road		R64 Road	
Base Volume Input [veh/h]	2	2	2	23	30	2
Base Volume Adjustment Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Heavy Vehicles Percentage [%]	50,00	50,00	8,00	8,00	8,00	8,00
Growth Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	8	4	17	0	0	31
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	10	6	19	23	30	33
Peak Hour Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Other Adjustment Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Total 15-Minute Volume [veh/h]	3	2	5	6	8	8
Total Analysis Volume [veh/h]	10	6	19	23	30	33
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0,01	0,01	0,00	0,00	0,00	0,02
d_M, Delay for Movement [s/veh]	9,00	9,90	0,00	0,00	0,00	7,39
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0,06	0,06	0,00	0,00	0,06	0,06
95th-Percentile Queue Length [m/ln]	0,44	0,44	0,00	0,00	0,43	0,43
d_A, Approach Delay [s/veh]	9,34		0,00		3,87	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3,25					
Intersection LOS	A					

Farm Viljoenshof Farm Mine Development

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Scenario 1 Existing Plus Development AM Peak Traffic

Report File: C:\...\Existing Plus Development Traffic Condition AM Peak Hour.pdf

2023/03/30

Turning Movement Volume: Summary

ID	Intersection Name	Southbound		Eastbound		Westbound		Total Volume
		Left	Right	Left	Thru	Thru	Right	
1	R64 Road / Farm Viljoenshof 1655 Access	10	6	19	23	30	33	121

Farm Viljoenshof Farm Mine Development

Vistro File: C:\...\Farm Viljoenshof 1655 Mine AM Peak Scenarios.vistro

Scenario 1 Existing Plus Development AM Peak Traffic

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2023/03/30

Turning Movement Volume: Detail

ID	Intersection Name	Volume Type	Southbound		Eastbound		Westbound		Total Volume
			Left	Right	Left	Thru	Thru	Right	
1	R64 Road / Farm Viljoenshof 1655 Access	Final Base	2	2	2	23	30	2	61
		Growth Factor	1,00	1,00	1,00	1,00	1,00	1,00	-
		In Process	0	0	0	0	0	0	0
		Net New Trips	8	4	17	0	0	31	60
		Other	0	0	0	0	0	0	0
		Future Total	**10**	**6**	**19**	**23**	**30**	**33**	**121**

Fair Share Volumes

Intersection 1: R64 Road / Farm Viljoenshof 1655 Access							
Zone ID: Name	Southbound		Eastbound		Westbound		Total
	Left	Right	Left	Thru	Thru	Right	
1: Zone	8	4	17	0	0	31	60
Site-Generated Trips	8	4	17	0	0	31	
Future Total Volume	10	6	19	23	30	33	

Fair Share % of Net New Site

Intersection 1: R64 Road / Farm Viljoenshof 1655 Access							
Zone ID: Name	Southbound		Eastbound		Westbound		Total
	Left	Right	Left	Thru	Thru	Right	
1: Zone	100%	100%	100%	0%	0%	100%	100%
Total	100%	100%	100%	0%	0%	100%	

Fair Share % of Future Total

Intersection 1: R64 Road / Farm Viljoenshof 1655 Access							
Zone ID: Name	Southbound		Eastbound		Westbound		Total
	Left	Right	Left	Thru	Thru	Right	
1: Zone	80%	66,67%	89,47%	0%	0%	93,94%	49,59%
Total	80%	66,67%	89,47%	0%	0%	93,94%	

Signal Warrants Report For Intersection 1: R64 Road / Farm Viljoenshof 1655 Access

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	N
Speed > 40mph	Yes
Population < 10,000	No
Warrant Factor	70%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets
	E	W	N
1	63	42	16
2	61	41	16
3	60	40	15
4	56	37	14
5	50	33	13
6	49	33	12
7	49	32	12
8	44	29	11
9	43	29	11
10	43	29	11
11	37	25	9
12	35	23	9
13	34	23	9
14	25	17	6
15	25	17	6
16	18	12	4
17	10	7	3
18	10	7	3
19	6	4	1
20	3	2	1
21	2	1	0
22	1	0	0
23	1	0	0
24	1	0	0

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	1	105	1	16	No	No	No	No	No	No	No	No	No	No
2	1	102	1	16	No	No	No	No	No	No	No	No	No	No
3	1	100	1	15	No	No	No	No	No	No	No	No	No	No
4	1	93	1	14	No	No	No	No	No	No	No	No	No	No
5	1	83	1	13	No	No	No	No	No	No	No	No	No	No
6	1	82	1	12	No	No	No	No	No	No	No	No	No	No
7	1	81	1	12	No	No	No	No	No	No	No	No	No	No
8	1	73	1	11	No	No	No	No	No	No	No	No	No	No
9	1	72	1	11	No	No	No	No	No	No	No	No	No	No
10	1	72	1	11	No	No	No	No	No	No	No	No	No	No
11	1	62	1	9	No	No	No	No	No	No	No	No	No	No
12	1	58	1	9	No	No	No	No	No	No	No	No	No	No
13	1	57	1	9	No	No	No	No	No	No	No	No	No	No
14	1	42	1	6	No	No	No	No	No	No	No	No	No	No
15	1	42	1	6	No	No	No	No	No	No	No	No	No	No
16	1	30	1	4	No	No	No	No	No	No	No	No	No	No
17	1	17	1	3	No	No	No	No	No	No	No	No	No	No
18	1	17	1	3	No	No	No	No	No	No	No	No	No	No
19	1	10	1	1	No	No	No	No	No	No	No	No	No	No
20	1	5	1	1	No	No	No	No	No	No	No	No	No	No
21	1	3	1	0	No	No	No	No	No	No	No	No	No	No
22	1	1	1	0	No	No	No	No	No	No	No	No	No	No
23	1	1	1	0	No	No	No	No	No	No	No	No	No	No
24	1	1	1	0	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

Orientation	N
Total Stopped Delay Per Vehicle on Minor Approach (s)	9,3
Number of Lanes on Minor Street Approach	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:02
Delay Condition Met	No
Volume on Minor Street Approach During Same Hour	16
High Minor Volume Condition Met	No
Total Entering Volume on All Approaches During Same Hour	121
Number of Approaches on Intersection	3
Total Volume Condition Met	No
Warrant Met for Approach	No
Warrant Met for Intersection	**No**

Farm Viljoenshof Farm Mine Development

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Scenario 1 Existing Plus Development AM Peak Traffic

Report File: C:\...\Existing Plus Development Traffic Condition AM Peak Hour.pdf

2023/03/30

Trip Generation summary

Added Trips

Zone ID: Name	Land Use variables	Code	Ind. Var.	Rate	Quantity	% In	% Out	Trips In	Trips Out	Total Trips	% of Total Trips
1: Zone	Mine			1,000	0,000	50,00	50,00	48	12	60	100,00
					Added Trips Total			**48**	**12**	**60**	**100,00**

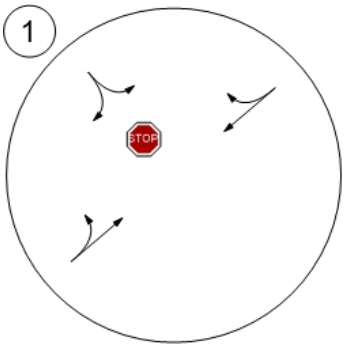
Trip Distribution summary

Zone / Gate	Zone 1: Zone			
	To Zone:		From Zone:	
	Share %	Trips	Share %	Trips
2: Gate	35,00	17	35,00	4
3: Gate	65,00	31	65,00	8
Total	**100,00**	**48**	**100,00**	**12**

Report Figure 1: Study Intersections

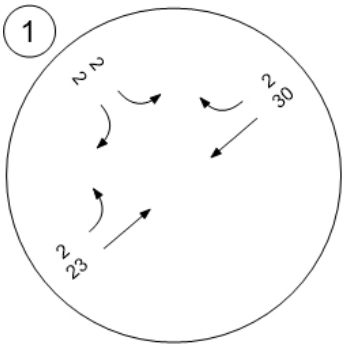
Report Figure 2: Lane Configuration and Traffic Control

R64 Road / Farm Viljoensho



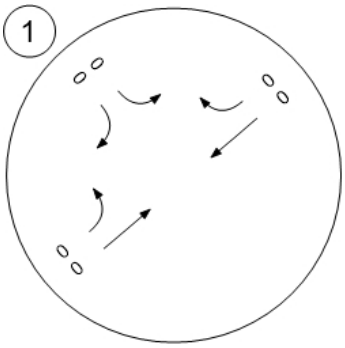
Report Figure 3a: Traffic Volume - Base Volume

R64 Road / Farm Viljoensho



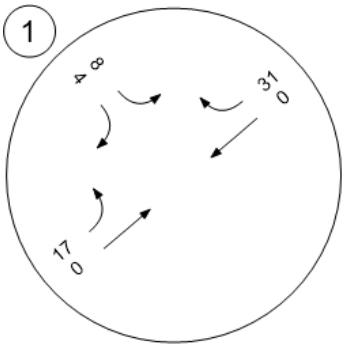
Report Figure 3b: Traffic Volume - In-Process Volume

R64 Road / Farm Viljoensho



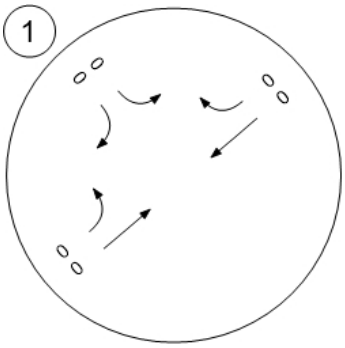
Report Figure 3d: Traffic Volume - Net New Site Trips

R64 Road / Farm Viljoensho



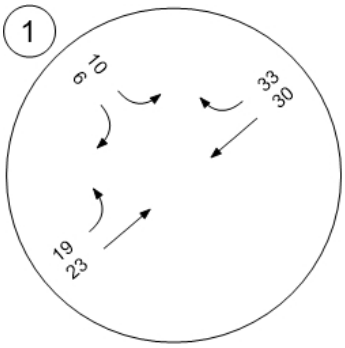
Report Figure 3e: Traffic Volume - Other Volume

R64 Road / Farm Viljoensho



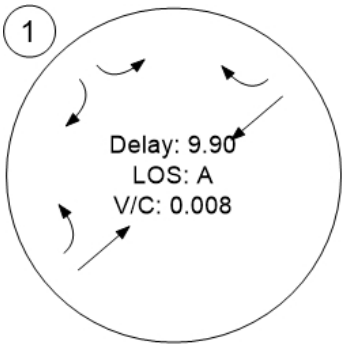
Report Figure 3f: Traffic Volume - Future Total Volume

R64 Road / Farm Viljoensho



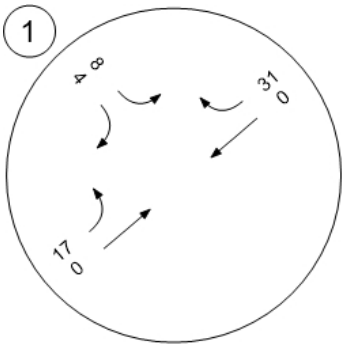
Report Figure 4: Traffic Conditions

R64 Road / Farm Viljoensho



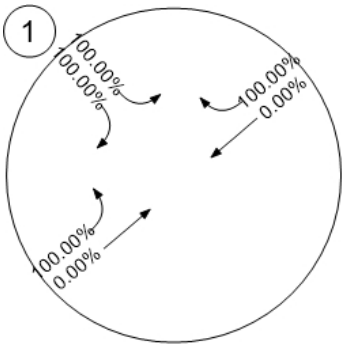
Report Figure 6a: Fair Share - Fair Share Volumes - Zone 1: Zone

R64 Road / Farm Viljoensho



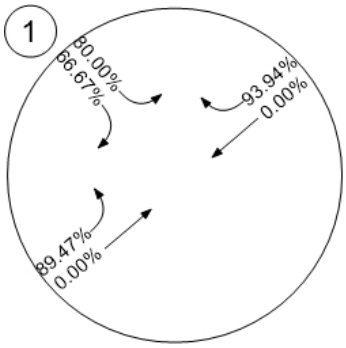
Report Figure 6b: Fair Share - Fair Share % of Net New Site - Zone 1: Zone

R64 Road / Farm Viljoensho



Report Figure 6c: Fair Share - Fair Share % of Future Total - Zone 1: Zone

R64 Road / Farm Viljoensho



Farm Viljoenshof 1655 - Mine Development

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Scenario 1 Existing PLus Development PM Peak Traffic

Report File: C:\...\Existing Plus Development Traffic Condition PM Peak Hour.pdf

2023/03/30

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	R64 Road / Farm Viljoenshof 1655 Access	Two-way stop	HCM 7th Edition	SB Right	0,024	9,9	A

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: R64 Road / Farm Viljoenshof 1655 Access

Control Type:	Two-way stop	Delay (sec / veh):	9,9
Analysis Method:	HCM 7th Edition	Level Of Service:	A
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0,024

Intersection Setup

Name	Viljoenshof 1655 Access		R64 Road		R64 Road	
Approach	Southbound		Eastbound		Westbound	
Lane Configuration						
Turning Movement	Left	Right	Left	Thru	Thru	Right
Lane Width [m]	3,66	3,66	3,66	3,66	3,66	3,66
No. of Lanes in Entry Pocket	0	0	0	0	0	0
Entry Pocket Length [m]	30,48	30,48	30,48	30,48	30,48	30,48
No. of Lanes in Exit Pocket	0	0	0	0	0	0
Exit Pocket Length [m]	0,00	0,00	0,00	0,00	0,00	0,00
Speed [km/h]	48,28		48,28		48,28	
Grade [%]	0,00		0,00		0,00	
Crosswalk	Yes		No		No	

Volumes

Name	Viljoenshof 1655 Access		R64 Road		R64 Road	
Base Volume Input [veh/h]	2	2	2	56	30	2
Base Volume Adjustment Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Heavy Vehicles Percentage [%]	50,00	50,00	8,00	8,00	8,00	8,00
Growth Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	31	17	4	0	0	8
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	33	19	6	56	30	10
Peak Hour Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Other Adjustment Factor	1,0000	1,0000	1,0000	1,0000	1,0000	1,0000
Total 15-Minute Volume [veh/h]	8	5	2	14	8	3
Total Analysis Volume [veh/h]	33	19	6	56	30	10
Pedestrian Volume [ped/h]	0		0		0	

Intersection Settings

Priority Scheme	Stop	Free	Free
Flared Lane	No		
Storage Area [veh]	0	0	0
Two-Stage Gap Acceptance	No		
Number of Storage Spaces in Median	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0,04	0,02	0,00	0,00	0,00	0,01
d_M, Delay for Movement [s/veh]	9,34	9,90	0,00	0,00	0,00	7,41
Movement LOS	A	A	A	A	A	A
95th-Percentile Queue Length [veh/ln]	0,20	0,20	0,00	0,00	0,02	0,02
95th-Percentile Queue Length [m/ln]	1,50	1,50	0,00	0,00	0,13	0,13
d_A, Approach Delay [s/veh]	9,54		0,00		1,85	
Approach LOS	A		A		A	
d_I, Intersection Delay [s/veh]	3,70					
Intersection LOS	A					

Farm Viljoenshof 1655 - Mine Development

Vistro File: C:\...\Farm Viljoenshof 1655 Mine PM Peak Scenarios.vistro

Scenario 1 Existing PLus Development PM Peak Traffic

Report File: C:\...\Existing Plus Development Traffic Condition PM Peak Hour.pdf

2023/03/30

Turning Movement Volume: Summary

ID	Intersection Name	Southbound		Eastbound		Westbound		Total Volume
		Left	Right	Left	Thru	Thru	Right	
1	R64 Road / Farm Viljoenshof 1655 Access	33	19	6	56	30	10	154

Farm Viljoenshof 1655 - Mine Development

Vistro File: C:\...\Farm Viljoenshof 1655 Mine PM Peak Scenarios.vistro

Scenario 1 Existing PLus Development PM Peak Traffic

Report File: C:\...\Existing Plus Development Traffic Condition PM Peak Hour.pdf

2023/03/30

Turning Movement Volume: Detail

ID	Intersection Name	Volume Type	Southbound		Eastbound		Westbound		Total Volume
			Left	Right	Left	Thru	Thru	Right	
1	R64 Road / Farm Viljoenshof 1655 Access	Final Base	2	2	2	56	30	2	94
		Growth Factor	1,00	1,00	1,00	1,00	1,00	1,00	-
		In Process	0	0	0	0	0	0	0
		Net New Trips	31	17	4	0	0	8	60
		Other	0	0	0	0	0	0	0
		Future Total	**33**	**19**	**6**	**56**	**30**	**10**	**154**

Farm Viljoenshof 1655 - Mine Development

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2023/03/30

Fair Share Volumes

Intersection 1: R64 Road / Farm Viljoenshof 1655 Access							
Zone ID: Name	Southbound		Eastbound		Westbound		Total
	Left	Right	Left	Thru	Thru	Right	
1: Zone	31	17	4	0	0	8	60
Site-Generated Trips	31	17	4	0	0	8	
Future Total Volume	33	19	6	56	30	10	

Farm Viljoenshof 1655 - Mine Development

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2023/03/30

Fair Share % of Net New Site

Intersection 1: R64 Road / Farm Viljoenshof 1655 Access							
Zone ID: Name	Southbound		Eastbound		Westbound		Total
	Left	Right	Left	Thru	Thru	Right	
1: Zone	100%	100%	100%	0%	0%	100%	100%
Total	100%	100%	100%	0%	0%	100%	

Farm Viljoenshof 1655 - Mine Development

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Scenario 1 Existing PLus Development PM Peak Traffic

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2023/03/30

Fair Share % of Future Total

Intersection 1: R64 Road / Farm Viljoenshof 1655 Access							
Zone ID: Name	Southbound		Eastbound		Westbound		Total
	Left	Right	Left	Thru	Thru	Right	
1: Zone	93,94%	89,47%	66,67%	0%	0%	80%	38,96%
Total	93,94%	89,47%	66,67%	0%	0%	80%	

Signal Warrants Report For Intersection 1: R64 Road / Farm Viljoenshof 1655 Access

Warrants Summary

Warrant	Name	Met?
#1	Eight Hour Vehicular Volume	No
#2	Four Hour Vehicular Volume	No
#3	Peak Hour	No

Intersection Warrants Parameters

Major Approaches	E, W
Minor Approaches	N
Speed > 40mph	Yes
Population < 10,000	No
Warrant Factor	70%

Warrant Analysis Traffic Volumes

Hour	Major Streets		Minor Streets
	E	W	N
1	40	62	52
2	39	60	50
3	38	59	49
4	36	55	46
5	32	49	41
6	31	48	41
7	31	48	40
8	28	43	36
9	28	43	36
10	27	42	35
11	24	37	31
12	22	34	29
13	22	33	28
14	16	25	21
15	16	25	21
16	11	17	15
17	6	10	8
18	6	10	8
19	4	6	5
20	2	3	3
21	1	2	2
22	0	1	1
23	0	1	1
24	0	1	1

Warrant Analysis by Hour

Hour	Major Streets		Minor Street		Warrant 1 Condition A				Warrant 1 Condition B				Warrant 2	Warrant 3
	Number	Volume	Number	Volume	100%	80%	70%	56%	100%	80%	70%	56%		Condition B
1	1	102	1	52	No	No	No	No	No	No	No	No	No	No
2	1	99	1	50	No	No	No	No	No	No	No	No	No	No
3	1	97	1	49	No	No	No	No	No	No	No	No	No	No
4	1	91	1	46	No	No	No	No	No	No	No	No	No	No
5	1	81	1	41	No	No	No	No	No	No	No	No	No	No
6	1	79	1	41	No	No	No	No	No	No	No	No	No	No
7	1	79	1	40	No	No	No	No	No	No	No	No	No	No
8	1	71	1	36	No	No	No	No	No	No	No	No	No	No
9	1	71	1	36	No	No	No	No	No	No	No	No	No	No
10	1	69	1	35	No	No	No	No	No	No	No	No	No	No
11	1	61	1	31	No	No	No	No	No	No	No	No	No	No
12	1	56	1	29	No	No	No	No	No	No	No	No	No	No
13	1	55	1	28	No	No	No	No	No	No	No	No	No	No
14	1	41	1	21	No	No	No	No	No	No	No	No	No	No
15	1	41	1	21	No	No	No	No	No	No	No	No	No	No
16	1	28	1	15	No	No	No	No	No	No	No	No	No	No
17	1	16	1	8	No	No	No	No	No	No	No	No	No	No
18	1	16	1	8	No	No	No	No	No	No	No	No	No	No
19	1	10	1	5	No	No	No	No	No	No	No	No	No	No
20	1	5	1	3	No	No	No	No	No	No	No	No	No	No
21	1	3	1	2	No	No	No	No	No	No	No	No	No	No
22	1	1	1	1	No	No	No	No	No	No	No	No	No	No
23	1	1	1	1	No	No	No	No	No	No	No	No	No	No
24	1	1	1	1	No	No	No	No	No	No	No	No	No	No
Hours Met					0	0	0	0	0	0	0	0	0	0

Warrant 3 Condition A

Orientation	N
Total Stopped Delay Per Vehicle on Minor Approach (s)	9,5
Number of Lanes on Minor Street Approach	1
VehicleHours of Stopped Delay on Minor Approach ([h]h:mm)	0:08
Delay Condition Met	No
Volume on Minor Street Approach During Same Hour	52
High Minor Volume Condition Met	No
Total Entering Volume on All Approaches During Same Hour	154
Number of Approaches on Intersection	3
Total Volume Condition Met	No
Warrant Met for Approach	No
Warrant Met for Intersection	**No**

Farm Viljoenshof 1655 - Mine Development

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Scenario 1 Existing PLus Development PM Peak Traffic

Report File: C:\...\Existing Plus Development Traffic Condition PM Peak Hour.pdf

2023/03/30

Trip Generation summary

Added Trips

Zone ID: Name	Land Use variables	Code	Ind. Var.	Rate	Quantity	% In	% Out	Trips In	Trips Out	Total Trips	% of Total Trips
1: Zone	Mine			1,000	0,000	50,00	50,00	12	48	60	100,00
					Added Trips Total			**12**	**48**	**60**	**100,00**

Farm Viljoenshof 1655 - Mine Development

Vistro File: C:\...\Farm Viljoenshof 1655 Mine PM Peak Scenarios.vistro

Scenario 1 Existing PLus Development PM Peak Traffic

Report File: C:\...\Existing Plus Development Traffic Condition PM Peak Hour.pdf

2023/03/30

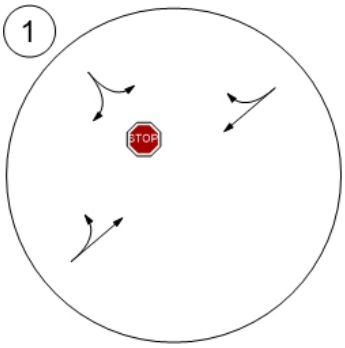
Trip Distribution summary

Zone / Gate	Zone 1: Zone			
	To Zone:		From Zone:	
	Share %	Trips	Share %	Trips
2: Gate	35,00	4	35,00	17
3: Gate	65,00	8	65,00	31
Total	**100,00**	**12**	**100,00**	**48**

Report Figure 1: Study Intersections

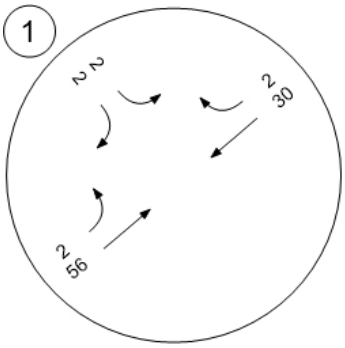
Report Figure 2: Lane Configuration and Traffic Control

R64 Road / Farm Viljoensho



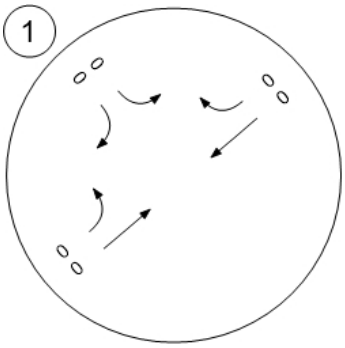
Report Figure 3a: Traffic Volume - Base Volume

R64 Road / Farm Viljoensho



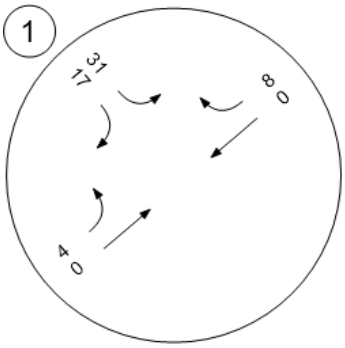
Report Figure 3b: Traffic Volume - In-Process Volume

R64 Road / Farm Viljoensho



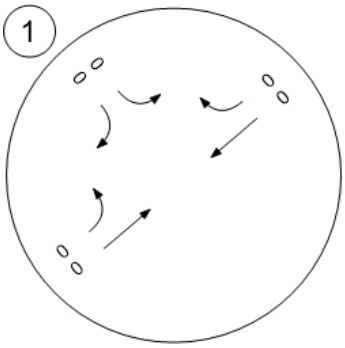
Report Figure 3d: Traffic Volume - Net New Site Trips

R64 Road / Farm Viljoensho



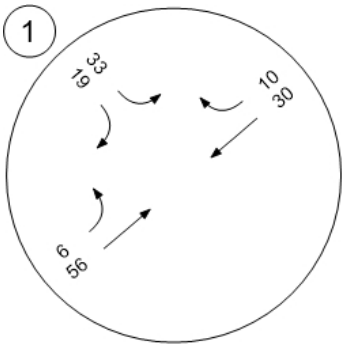
Report Figure 3e: Traffic Volume - Other Volume

R64 Road / Farm Viljoensho



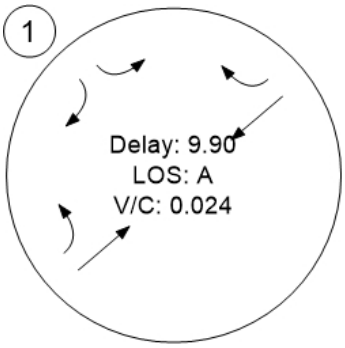
Report Figure 3f: Traffic Volume - Future Total Volume

R64 Road / Farm Viljoensho

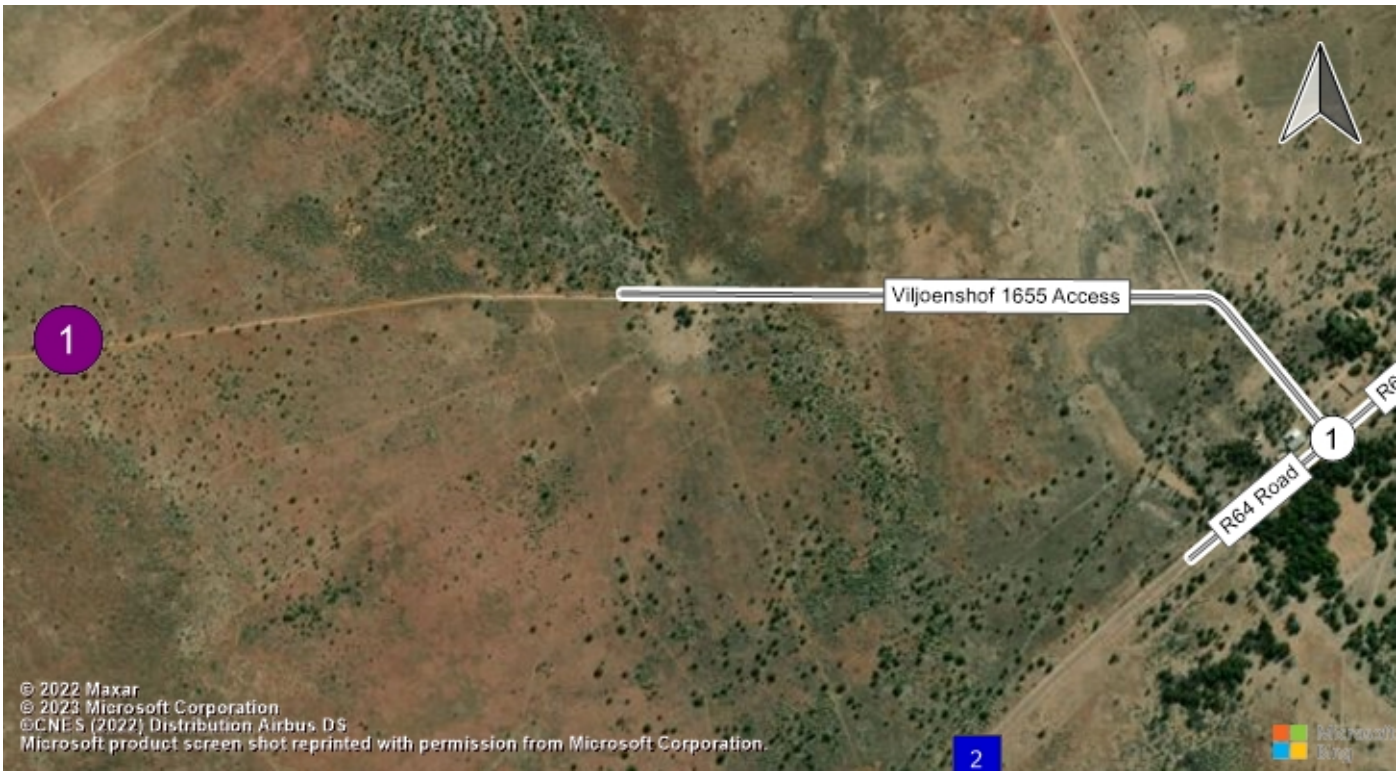


Report Figure 4: Traffic Conditions

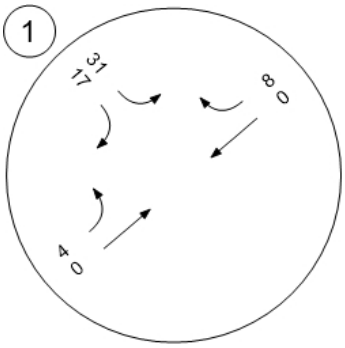
R64 Road / Farm Viljoensho



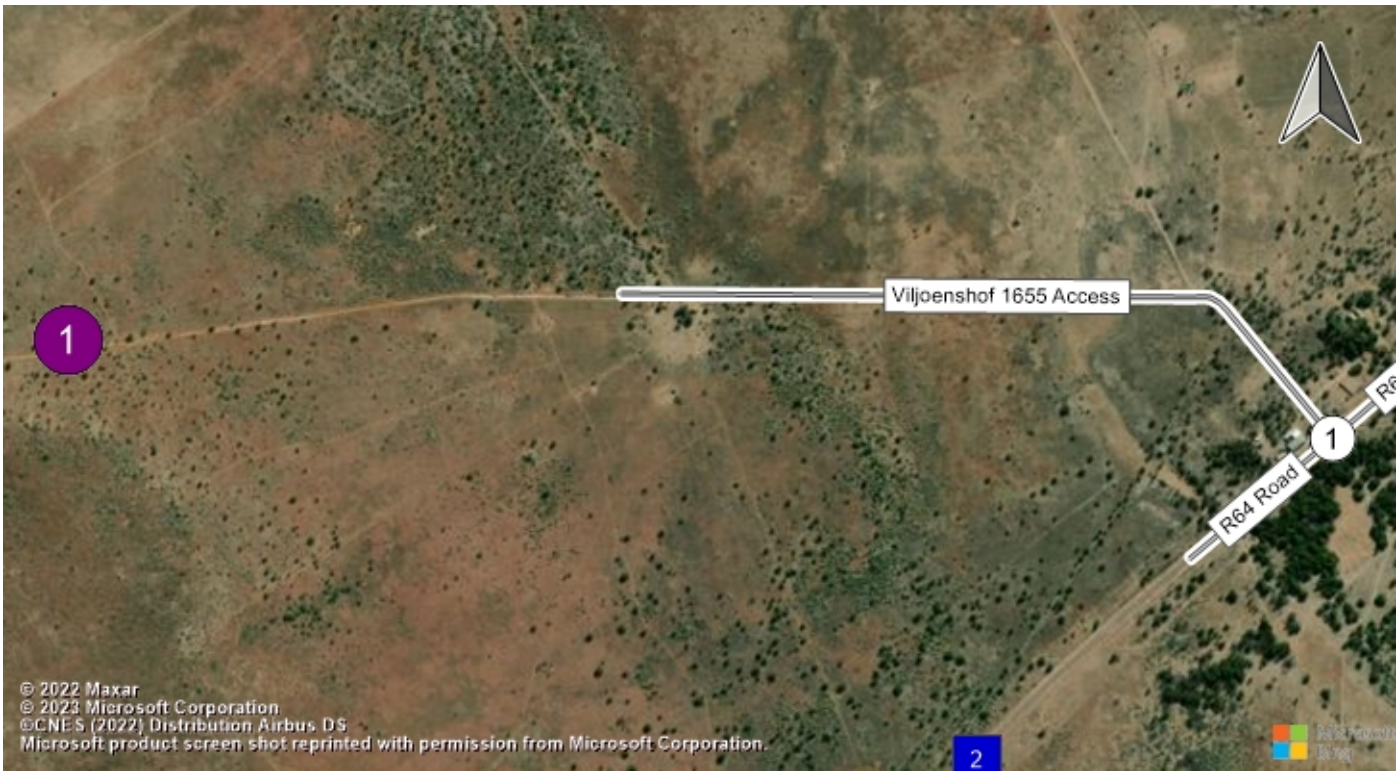
Report Figure 6a: Fair Share - Fair Share Volumes - Zone 1: Zone



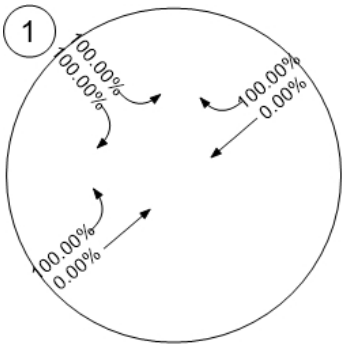
R64 Road / Farm Viljoensho



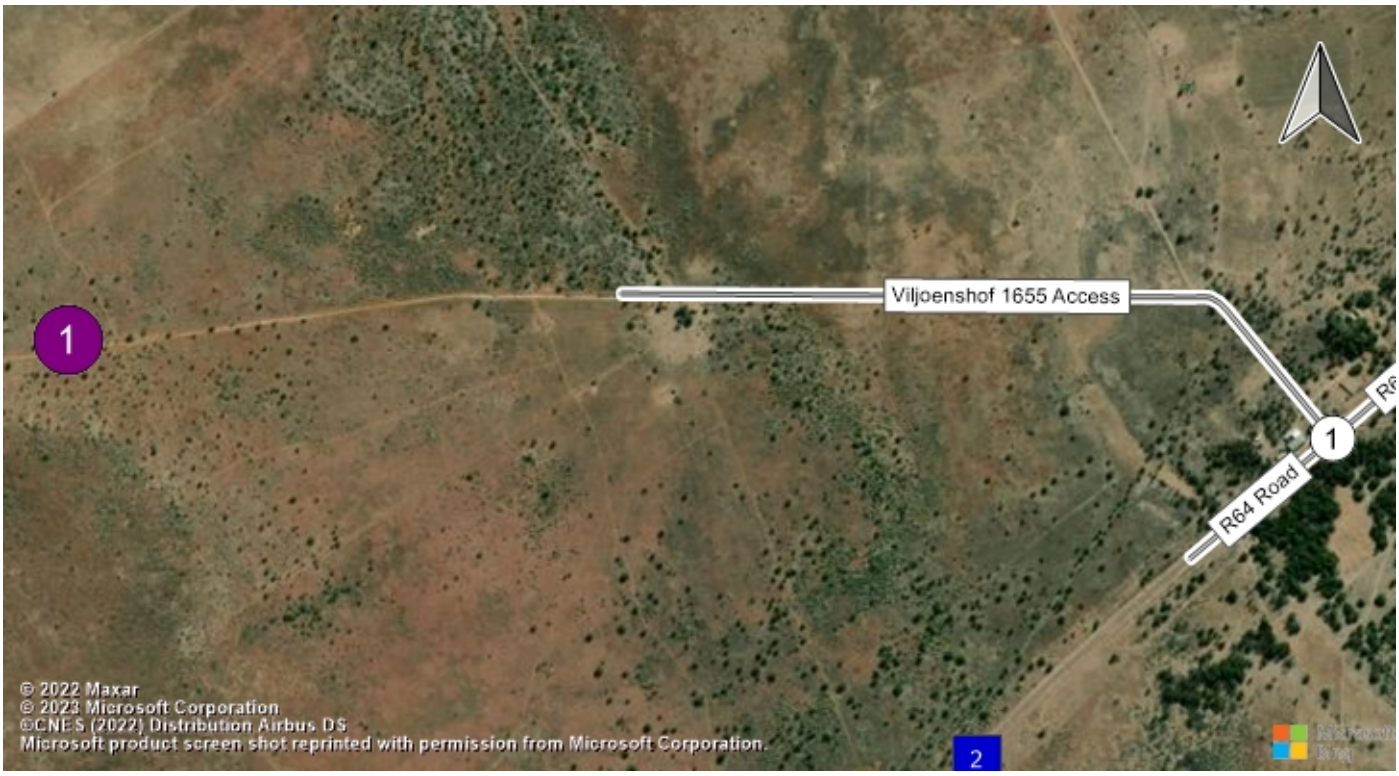
Report Figure 6b: Fair Share - Fair Share % of Net New Site - Zone 1: Zone



R64 Road / Farm Viljoensho



Report Figure 6c: Fair Share - Fair Share % of Future Total - Zone 1: Zone



R64 Road / Farm Viljoensho