Weltevreden Open Cast Mine

Traffic Impact Assessment

Xinovo Mining (a subsidiary Mbuyelo Group)

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1 Introduction

1.1 Project background

Xinovo Mining (Pty) Ltd (hereinafter referred to as Xinovo), a subsidiary of Mbuyelo Group (Pty) Ltd, is proposing to develop the Weltevreden Open Cast Mine, located along R33 approximately 8 km south of Belfast in Mpumalanga province. The mine will extract coal mostly for local markets. The location of the site is shown in Figure 1-1.

Aurecon was appointed by Digby Wells Environmental, on behalf of Xivono, to carry out a Traffic Impact Assessment (TIA) for the proposed mine development as part of the Environmental Impact Assessment (EIA) of the project.

The proposed project area is located within the Nkangala District Municipality (NDM), in Ward 1 of the Emakhazeni Local Municipality (ELM). The nearest large settlements to the site are the town of Belfast (11 km) and its township of Siyathuthuka (15km).

Xivono proposes to mine two pits, OC1 (162 ha footprint) and OC2 (200 ha footprint) through open pit mining (refer to the local setting plan attached in Appendix A).

There is an existing access along the R33, towards the southern boundary of the proposed development site (OC2). This access currently serve a neighbouring coal mine and is configured as a partial access (i.e. left-in, left-out and a southbound right-in). Existing (planning stage) traffic to the proposed Weltervreden Open Cast Mine is taken off this access.

This report provides a summary of the current road, traffic and transport conditions in the study area and analyses the traffic impact that the proposed development is expected to have on the surrounding road network and environment. It also recommends transport interventions required to support the development and to mitigate any impact.

1.2 Scope of the TIA

The scope of the traffic impact assessment included the following:

- Meeting with the project team and correspondences with the road authorities to discuss possible intersection/ road crossing solutions and the overall traffic impact assessment approach and methodology;
- Conducting literature review, site visit, and traffic count surveys to understand current and future traffic and transport (including public and non-motorised transport) conditions;
- Estimating trip generation potential of the proposed mine during construction and operation phases;
- Conducting capacity analysis and access assessment to determine the impact of additional traffic during construction and operation phases and to recommend road upgrades, if necessary, to mitigate the development impact;

Assessing impact on public transport, walking and cycling and to recommend necessary mitigation measures.

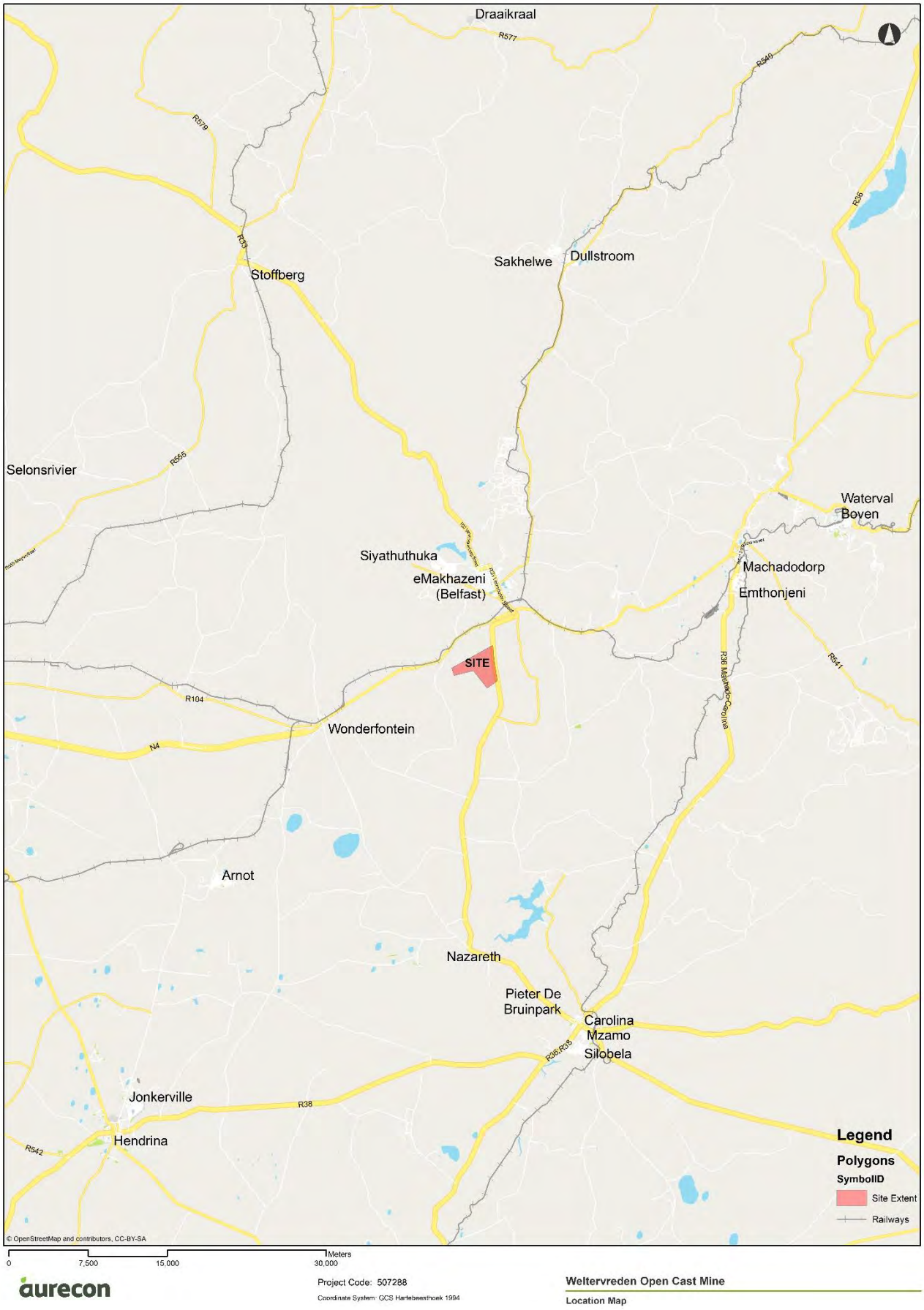


Figure 1-1: Location map

Figure 1-2: Aerial view of the site

2 Approach and methodology

2.1 Study area

The study area includes the four intersections along the R33 and the new proposed mine site. The impact of the development traffic is expected to be the highest at these locations. The intersections are indicated in Figure 1-2 and listed below:

- R33/N4 eastbound On- and Off-ramp (1);
- R33/N4 westbound On- and Off-ramp (2);
- R33/Vogelstruispoort road (3);
- R33/ Unknown access road (4); and
- R33/ Weltevreden Mine access road (5).

2.2 Assessment scenarios

The study assessed the following scenarios, based on expected phasing activities of the Weltevreden Open Cast Mine:

- Planning phase (2019);
- Construction phase (assumed to be from 2021 and 2022);
- ***Operational phase (assumed to be from 2022 to 2037);***
- Decommissioning (assumed to be from 2037 to 2038).

The operation phase is expected to generate the most traffic for the development.

2.3 Trip generation

Neither the TMH 17 South African Trip Data Manual[1] nor its predecessor the South African Trip Generation Rates Manual (SATGRM)[2] have trip generation rates for mining developments. Therefore, development traffic was generated from first principles using data on expected mine construction and operational activities as provided by the client.

2.4 Intersection capacity analysis

Traffic analysis was carried out using SIDRA Intersection analysis software and the intersection performance measurements were defined in accordance with the Highway Capacity Manual (HCM2010).

2.5 Access evaluation

The site is divided into the north (OC1) and the south (OC2) sections, west of the R33 road. There are several individual farm / private accesses located along the R33 (refer to images and descriptions of the existing transport environment in Section 3 below).

The current Weltevreden Open Cast mine traffic accesses the site from an existing access along the R33, near the southern boundary of the site. This access is shared with a neighbouring coal mine as mentioned above.

[1] Committee of Transport Officials (COTO), 2013. South African Trip Data Manual, Pretoria: Published by the South African National Roads Agency Limited (SANRAL).
[2] National Department of Dransport (NDoT), 1995. South African Trip Generation Manual, Pretoria.

Aurecon engaged the South African National Roads Agency SOC Limited (SANRAL) regarding the access options for the development, as part of the TIA scoping process. The following comments are relevant to the site's access strategy:

- The R33 is a national road, under the responsibility of SANRAL;
- SANRAL classifies the R33 as a Class 2 Road (as a rural road, the implied intersection spacing is 5km);
- Direct access on a Class 2 Road is not supported. However, intersections can be considered provided they are accessible to the public and meet minimum TRH26 (South Africa Road Classification and Access Management Manual)[3], safety and sight distance requirements;
- In case of a new intersection being proposed, all other existing accesses, which do not meet the intersection spacing requirements, will need to be closed.

Based on the initial SANRAL comments, Aurecon proposes that the development access be taken off the existing R33 intersection, near the southern boundary of the site (OC2). The rest of the assessment assumes this access strategy. An alternative is also proposed to move the intersection about 400m south of the existing location to improve intersection geometry.

The proposed access intersection as per above, is included in the traffic impact analyses.

Further analysis was carried out using queuing analysis theory, to estimate number of access gates and stacking space required at access gates for the two sections of the proposed mine (i.e. east and west site sections).

[3] Committee of Transport Officials (COTO), 2012, South African Road Classification and Access Management Manual: SANRAL, Pretoria.

3 Existing transport environment

The Traffic Impact Assessment (TIA) reviews the impact that the proposed mining development could have on all modes of transport and road network operation within the study area extent.

To better understand the local traffic environment, a manual classified traffic count survey was undertaken on Thursday 12th September 2019 between 06h00 and 18h00. A site visit was undertaken on 19 September 2019.

The traffic count data, as revealed from the survey, were used in the SIDRA intersection assessment software to assess the intersections' performance and the likely impact of the additional traffic due to the proposed development at key intersections within the study area as described above.

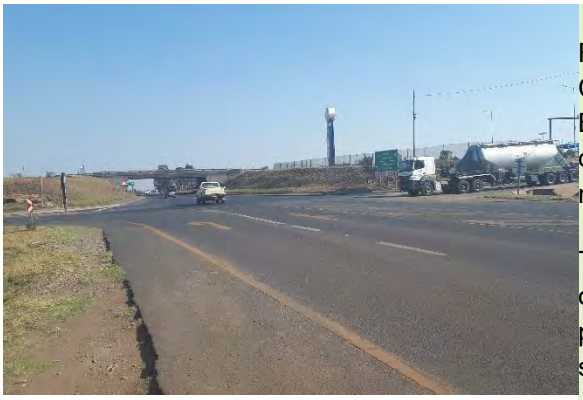
3.1 Existing road network

The N4 national road passes about 2 km to the north of the project area and the R33 regional road runs along the eastern boundary of the project area. The surrounding road network is further discussed below:

N4

The N4 is a national road connecting Gauteng and Mpumalanga provinces. The N4 off ramps and on ramps at Belfast connect with the R33 route to Weltevreden Mine. The N4 on/off ramp is in good surfacing condition.

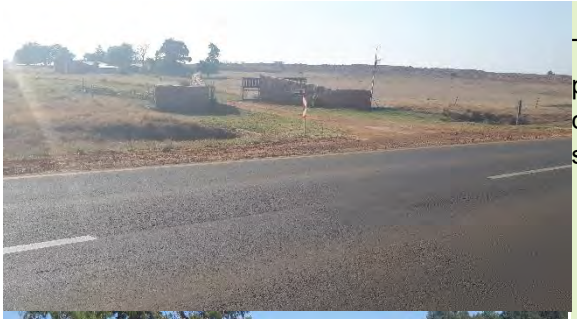
R33



R33 is a north-south major arterial, currently defined as a Class 2 road by SANRAL. The R33 is located in a rural area Belfast, in Mpumalanga Province. It is a paved road with one lane per direction. It facilitates access to the N4 in the north and N17 in the south.

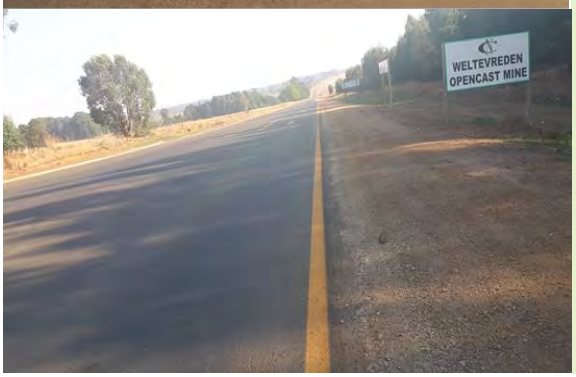
The R33 connects Belfast to Carolina and serves a number of coal mines located along the route. The current pavement condition in the vicinity of the site is in a good state while the rest of the route is in fair condition.

Accesses along R33



There are several accesses located along the R33, providing primary access to multiple farms and developments. Any changes to the accesses (especially closures) will require substantial consultation with the land owners and tenants.

Weltevreden Open Cast Mine Access



The access road to Weltevreden mine connects to the R33. The access to the mine has a left-in and left-out access (partial intersection) with the R33. This access will be shared with another, existing coal mine in the vicinity.

3.2 Existing traffic volumes

3.2.1 Site traffic observations

A site visit was conducted on 19 September 2019 to observe the current transport environment in the study area and to confirm locations for manual traffic count surveys. The following observations were made during the site visit:

- The R33 was found to have relatively low traffic volumes;
- Vehicle types observed along the R33 were mostly heavy vehicles (trucks), light vehicles and few minibus taxis;
- There are very few minibus taxis, which are mostly empty considering that the site visit was made during the morning peak;
- The R33 was in a fair surfacing condition and has several individual accesses located along the stretch of road, mostly serving farms and mines;
- The posted speed limit on R33 is 120 km/hr;
- There were no speed limit reduction signs observed near intersections, private accesses and sharp bends;
- There was no street lighting observed along the R33;
- Cyclist and pedestrian activity was observed along the R33 and yet there are no walking and cycling facilities provided;
- There were no evident traffic problems during the site visit.

3.2.2 Existing traffic volumes

Existing traffic volumes were derived from the traffic counts. Existing traffic volumes are shown in Figure 3-1 and 3-2. A full set of traffic flow diagrams are included in Appendix B.

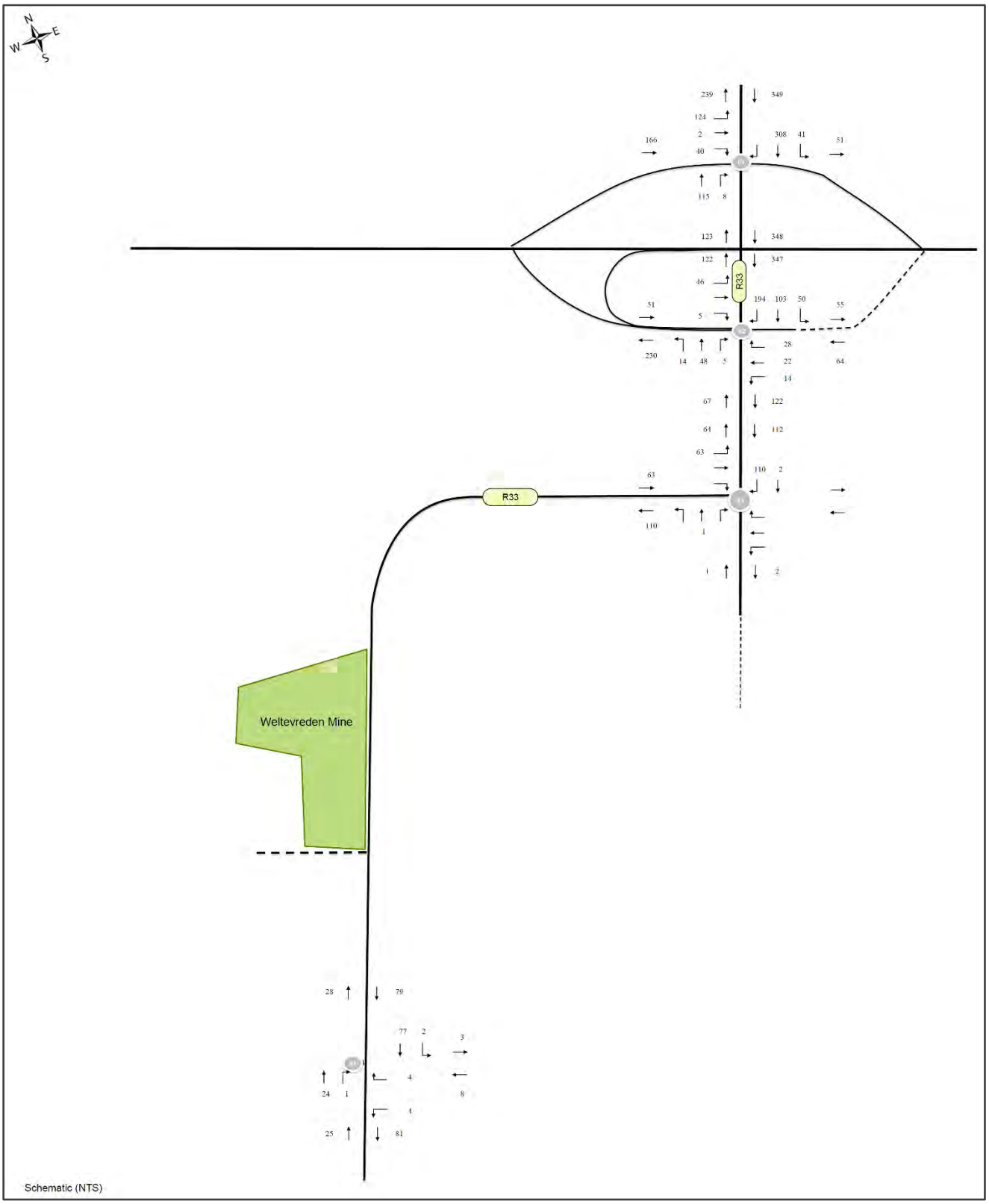


Figure 3-1: Existing traffic volumes AM peak hour (total traffic)

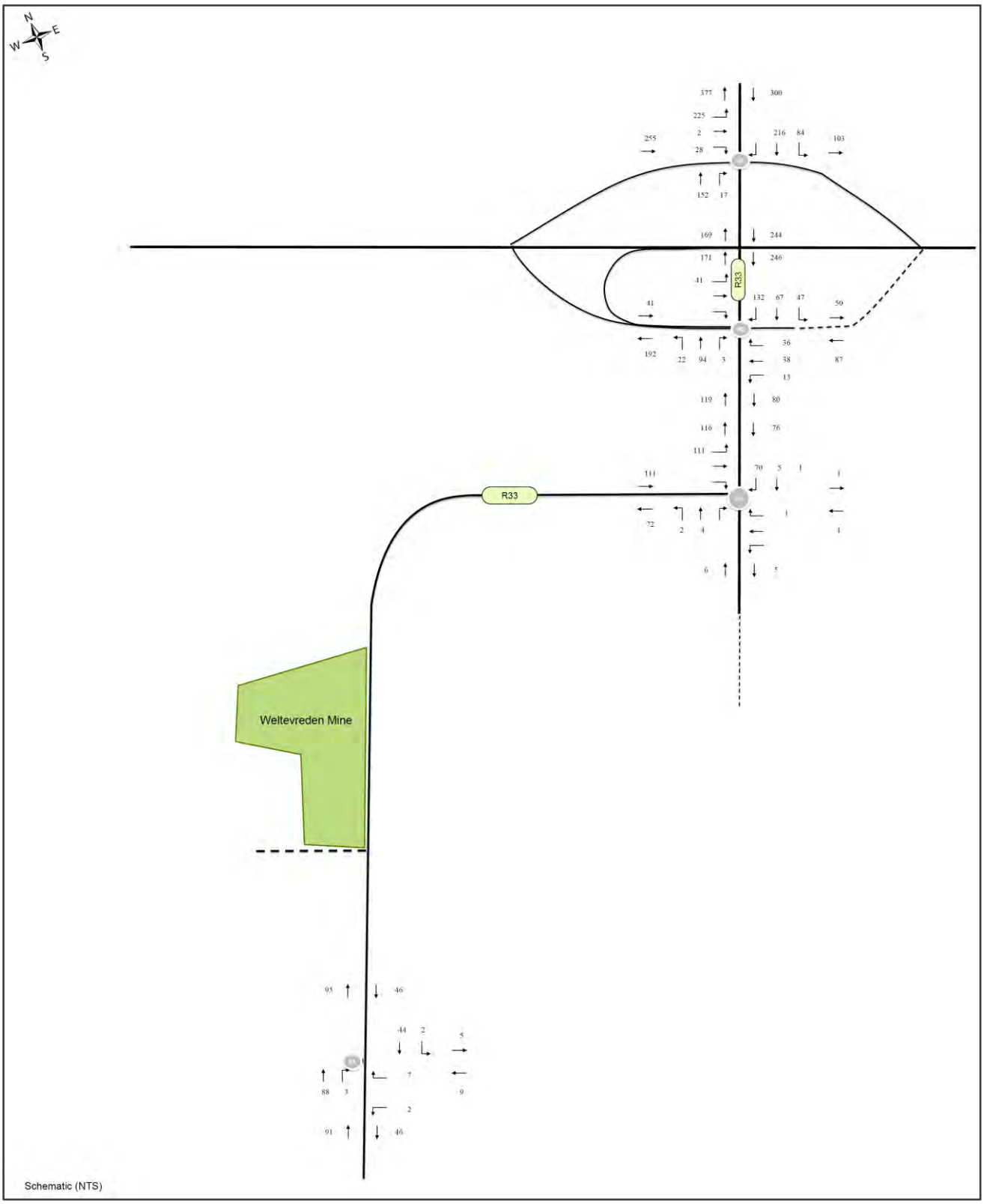


Figure 3-2: Existing traffic volumes PM peak hour (total traffic)

The R33 carries up to 680 vehicles during the peak hour (vph) (total for both directions) north of the N4, 190 vph between the site and the N4 and 140 vph south of the site. The counts further illustrate that about 50 vph (in total) enter and exit the R33 between survey locations 3 and 4 during the peak hours.

3.3 Existing road conditions

Based on site observations, the R33 is paved and appears to be in good condition in the immediate vicinity of the site and in a fair condition further south of the development site. The N4 on and off ramp joining the R33 appear to be good in condition. Local traffic includes light vehicles, heavy vehicles (trucks and buses) and minibus taxis.

3.4 Road safety

The horizontal alignment of the R33 is relatively straight near the site and as such visibility, sight distances and sight lines are within acceptable standards. However, the road does have a 90 degree turn about 300m south of the N14 interchange. The R33 has a posted speed limit of 120 km/hr throughout the study area.

The R33 has one lane per direction. No passing lanes were observed during site visits, therefore resulting in very limited overtaking opportunities along the road. The above conditions could lead to crashes caused by impatient motorists desiring to overtake slower moving vehicles. Heavy vehicles in the traffic stream generally add to driver anxiety for other road users, impact on pedestrian movements and therefore increase road safety risks. There is a significant proportion of heavy vehicles currently on the network, as discussed below.

3.5 Public transport

The R33, near the proposed site access is served by public transport, in the form of minibus taxis (about 6% to 8% of total traffic), and buses (about 4% to 9% of total traffic).

Buses and minibus taxis that service the area comprise of both private mine employee shuttles and public transport services. Although light vehicles make up about 60% of the vehicles on the road network, it can be expected that majority of people in the study area use public transport or employee shuttles since buses and taxis carry more people per vehicle.

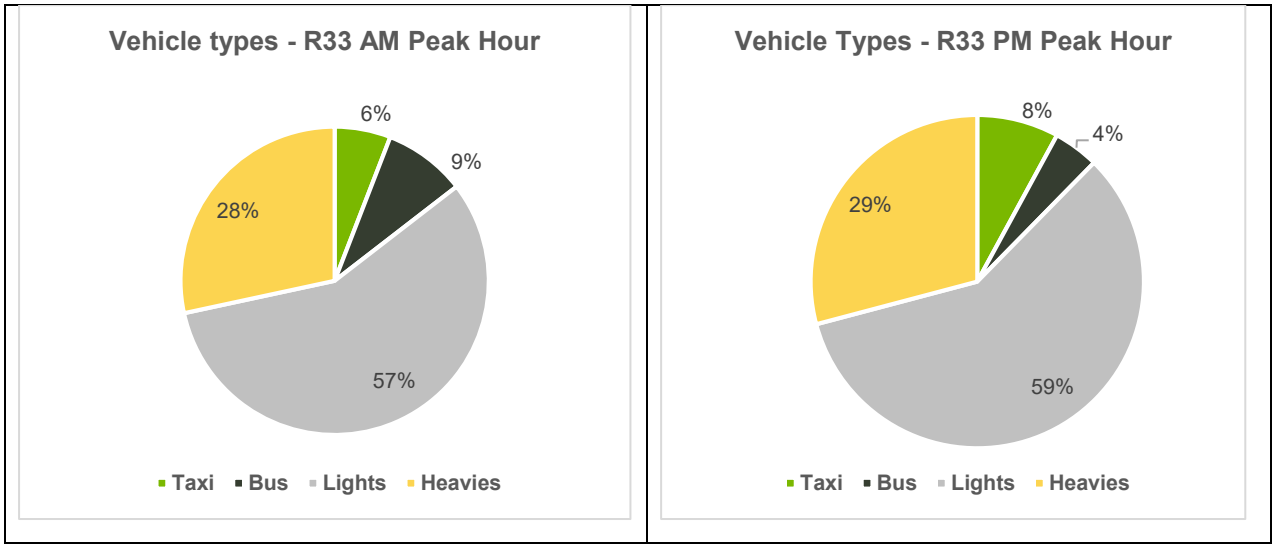


Figure 3-3: Vehicle type composition on R33 during the AM and PM peak hour

3.6 Heavy vehicles

Currently, about 29 % of the vehicles on the R33 are heavy vehicles, which is considered higher than the norm, but representative of typical areas with mining activities. The majority heavy vehicles (i.e. 73% and 59% in the AM and PM peak hours respectively) were recorded at the station 3 which is north of the Weltevreden Mine site and the remainder at station 4 south of the development. The results indicate that most heavy vehicles travel on the N4 to access regional centres, and a much smaller percentage use the R33 south of the proposed development site to access regional centres.

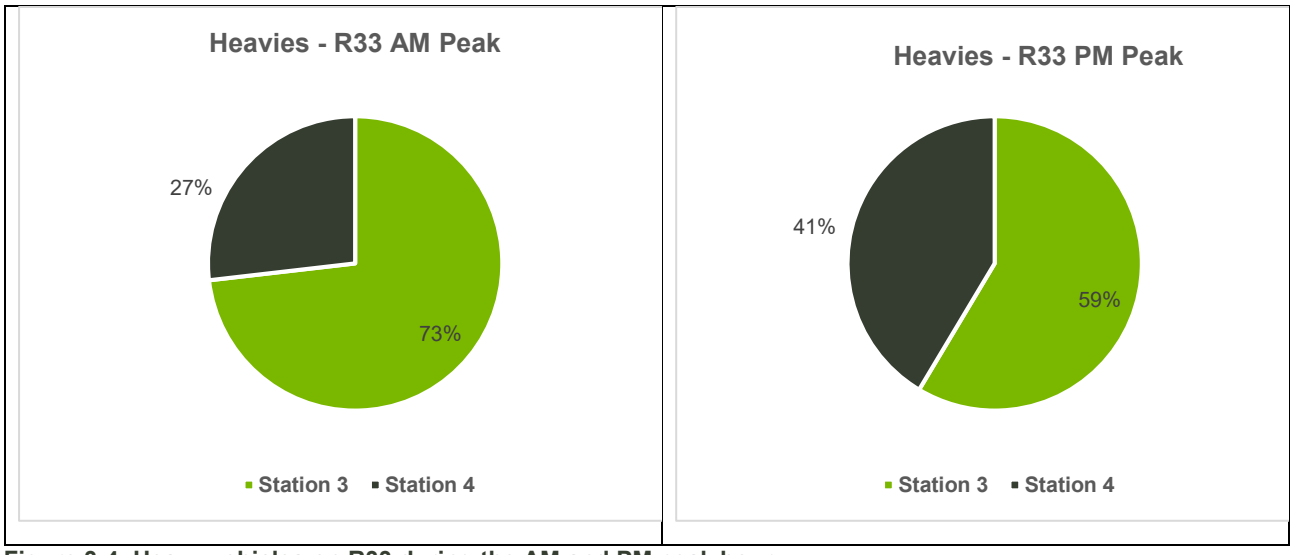


Figure 3-4: Heavy vehicles on R33 during the AM and PM peak hour

3.7 Walking and cycling

There were no dedicated walking and cycling paths and crossing facilities observed along the R33 and N4 ramps during the site visit. There was almost no walking and cycling activity observed within the study area, with the exception of the area around R33 and N4 interchange, where low volume walking and cycling activity was observed.

4 Trip generation

Traditionally, development traffic is estimated by applying trip generation rates from the South African Trip Data Manual (THM17) [4]and previously the South African Trip Generation Rates Manual (SATGRM) (NDoT, 1995). However, neither the SATGR manual nor TMH17 have recommended trip rates for mines and associated activities. As an alternative it was considered appropriate to estimate the mine's trip generation from first principles, using possible operational data as provided by the client.

4.1 Construction and operational data

A summary is provided below of the mine traffic generation indicators during the construction and operational phases. A questionnaire was sent to the client, where details on expected mine activities and transport demand was provided for both the construction and operational phases of the project. A copy of the full questionnaire is included in Appendix C.

Table 4-1: Employees by phase and shifts

Type	Construction		Operational	
	Shift 1	Shift 2	Shift 1	Shift 2
Shift times (Assumption)	**06:00 to 16h00**	**16h00 to 02h00**	**06:00 to 16h00**	**16h00 to 02h00**
General	20	10	100	100
Technical	10		20	10
Administrative	8		14	2
Management	2		4	
Total	**40**	**10**	**138**	**112**
	50		**250**	

The site is expected to have 50 and 250 employees during the construction and operational phase respectively.

Table 4-2: Service vehicles (regular site supplies and deliveries) (both construction and operation)

Type of goods	Light Delivery Vehicles	Heavy Vehicles	
	Total per day (per direction)	Description	Total per day (per direction)
Office supplies (Stationery, bottled water, food, etc.)	3	Ad-hoc Low-beds to deliver or collect yellow plant	1
Fuel	-	Fuel	1
Total	**3**		**2**

It is estimated that three light vehicles and two heavy vehicles will access the site per day, to ring in regular site supplies.

[4] Committee of Transport Officials (COTO), 2013. South African Trip Data Manual, Pretoria: Published by the South African National Roads Agency Limited (SANRAL).

Table 4-3: Haulage trucks

Description	Construction		Operation	
	Inbound	Outbound	Inbound	Outbound
Truck trips	2	2	60	60
Total	4		120	

Four heavy vehicles are expected to enter and leave the site during the construction stage and 120 heavy vehicles are expected during the operational phase.

Table 4-4: Mode share expectations

Mode	Construction phase	Operation phase
Walk / Cycle	0%	0%
Minibus Taxis (public)	0%	0%
Buses (Public)	0%	0%
Rail	0%	0%
Staff Transport (Minibuses)	80%	80%
Staff Transport (Buses)	0%	0%
Private Vehicles	20%	20%
Total	100%	100%

It is expected that 80% of the employees will make use of public transport and employee shuttle buses or minibuses. The remainder (20%) are expected to access the site using private cars.

4.2 Trip generation assumptions

Further assumptions that were made in estimating the potential trip generation of the proposed mining development included the following:

- Although the shift change time do no coincide with the peak hours observed from traffic counts, it was assumed for trip generation purposes that these shifts coincide with the background traffic peaks. This was to allow for more robust traffic analyses (using the worst-case scenario);
- 100% of shift 1 trips will enter the site during the AM peak and 100% trips of shift 2 will exit the site (worst-case shift overlap scenario);
- It was assumed that 100% of daily service traffic enters or leaves the site during the AM and PM peak hours;
- The directional distribution for service and haulage traffic was assumed to be 50% inbound and 50% outbound in both the AM and PM peaks;
- For haulage trucks, it was assumed that 10% of the daily demand will enter and leave the site during the AM and PM peak;
- In some instances where calculations resulted in fractional vehicle numbers, the results were rounded up to the nearest whole number.

4.3 Trip generation estimate

A summary of the estimated trip generation is provided in Table 4-5 and 4-6 below. Detailed trip generation calculations are included in Appendix D.

Table 4-5: Trip generation summary (construction phase)

Vehicle type	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Light vehicles	12	9	4	**13**	4	9
Minibuses	3	3	1	**4**	1	3
Heavy vehicles*	3	2	2	**4**	2	2
Total	**18**	**14**	**7**	**21**	**7**	**14**

*Include haul trucks and service / delivery heavy vehicles

Table 4-6: Trip generation summary (operational phase)

Vehicle type	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Light vehicles	45	25	21	46	21	25
Minibuses	15	8	7	15	7	8
Heavy vehicles	14	7	7	14	7	7
Total	**74**	**40**	**35**	**75**	**35**	**40**

The development is expected to generate approximately about 20 vehicles per hour during the construction phase AM and PM peaks. During the operation peak, the development is expected to generate about 75 vehicle trips during the AM and PM peak hours.

The operational phase is expected to generate significantly more traffic than the construction phase and is therefore considered to be a more critical phase of the mine development.

For the opening year, the construction traffic is used, and the operational phase is used for the 5 year design horizon, as discussed further in Section 6.

5 Trip distribution and assignment

Traffic distribution was based on the client feedback from the trip generation questionnaire and the peak hour traffic volumes from the traffic count surveys. Additional assumptions were made where gaps in the client-provided information were identified. Two traffic distribution were developed, i.e. general traffic distribution for employee traffic and service vehicles, and the site-specific distribution for haulage trucks. A summary of the traffic distribution assumptions is provided below:

- General distribution:
  - 60% to and from Siyathuthuka (north-west of Belfast town centre);
  - 20% to and from Belfast;
  - 18% to and from Machadodorp (eNtokozweni)*;
  - 1% to and from Middelburg*;
  - 1% to and from Carolina*.
- Haulage trucks:
  - 100% to use R33 going to Site, comprising of:
    - 99% northbound towards the N14 / R33 interchange*;
    - 1% southbound towards Carolina*.

*Additional Aurecon assumptions.

The distribution of the development traffic, for both the construction and operational phases is shown in Figure 5-1 to 5-4 below and in Appendix B.

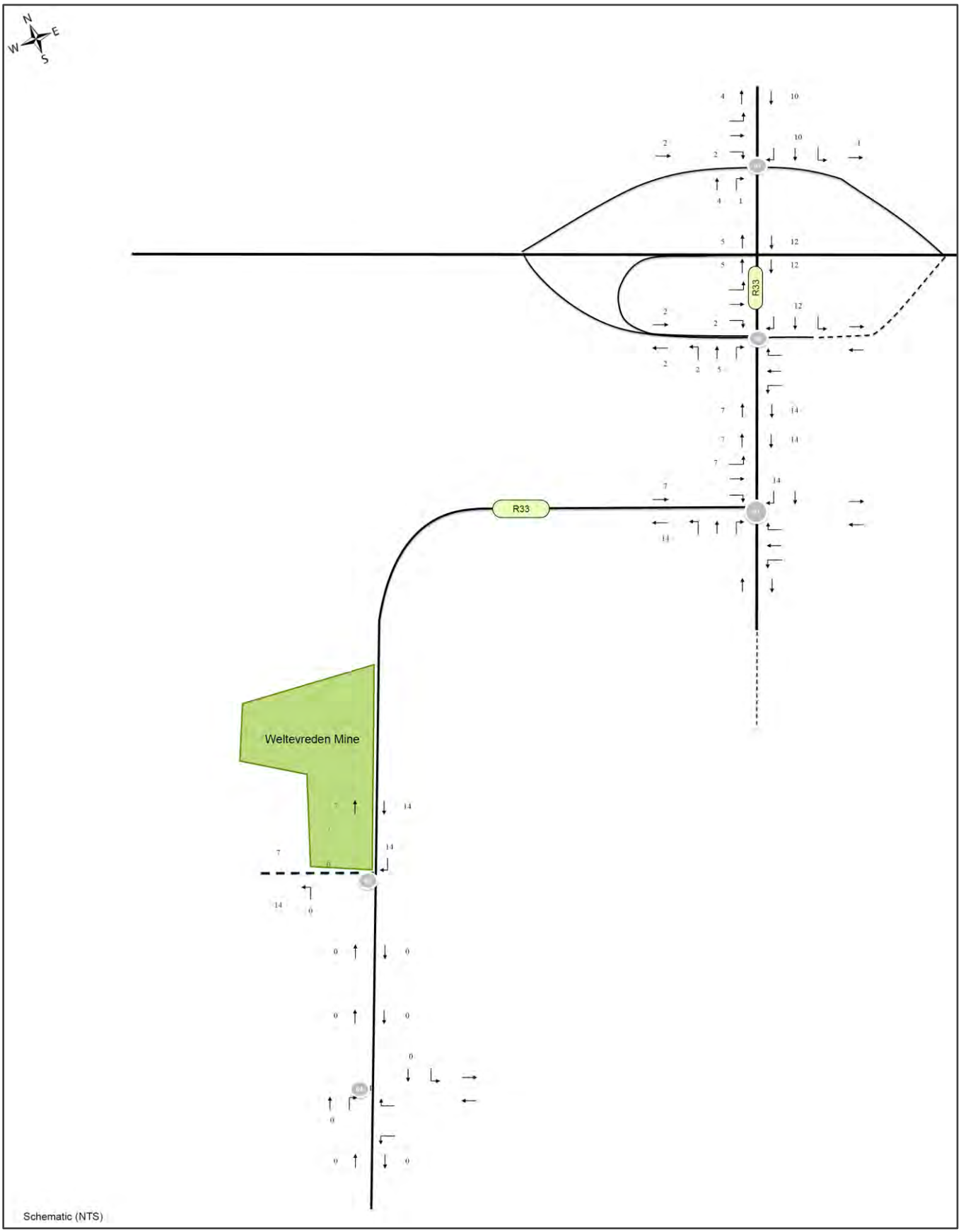


Figure 5-1: Development traffic AM peak hour (construction phase)

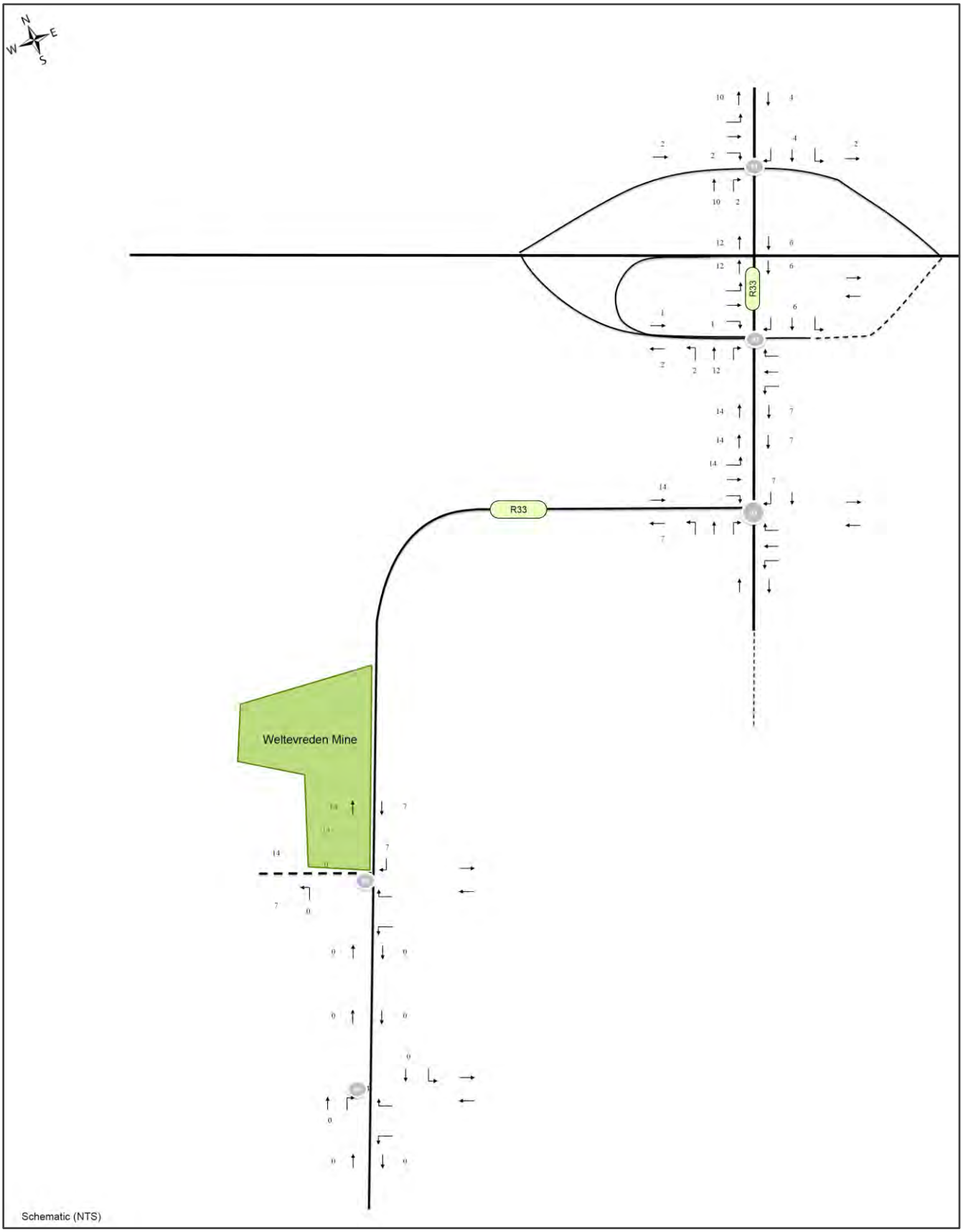


Figure 5-2: Development traffic PM peak hour (construction phase)

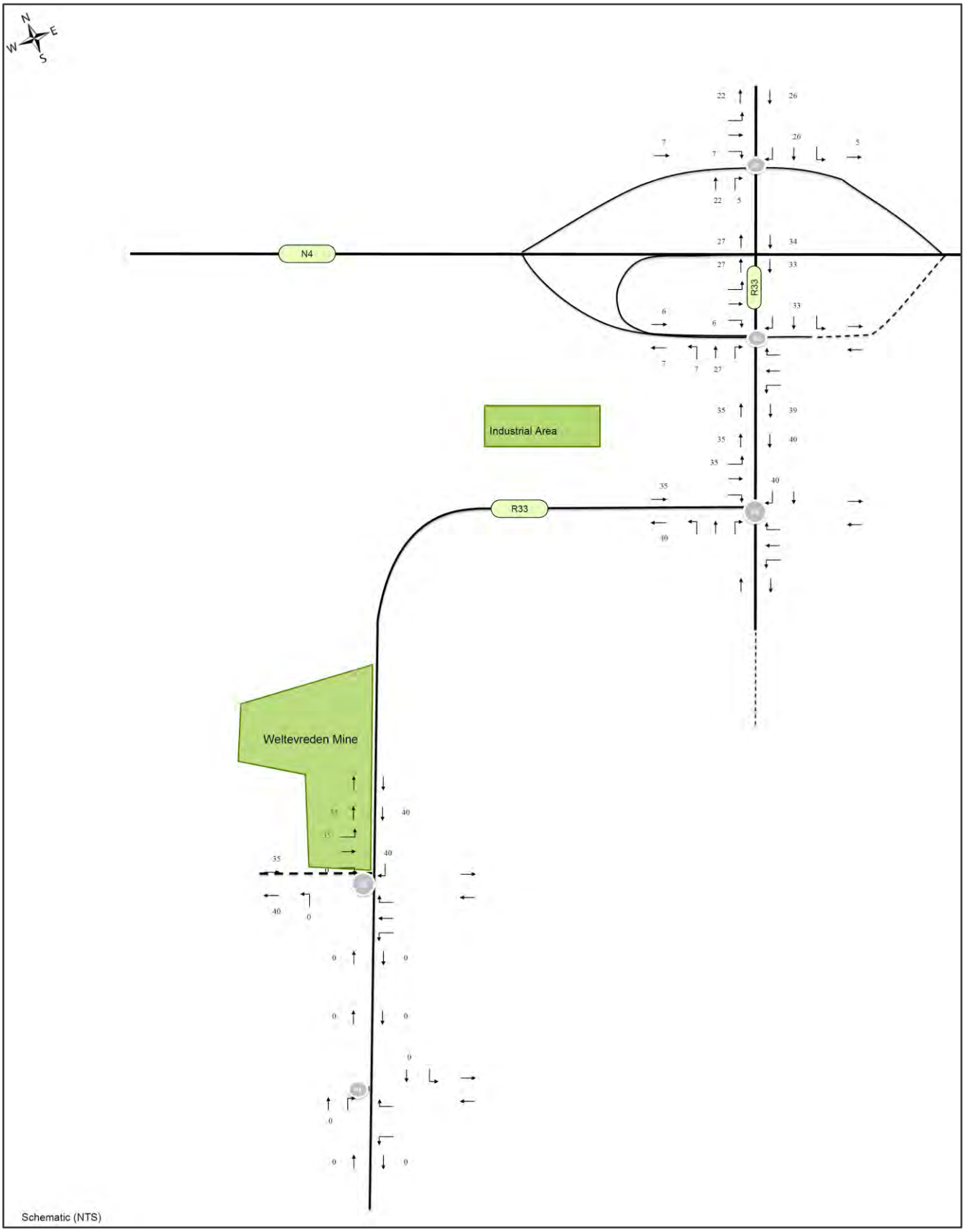


Figure 5-3: Development traffic AM peak hour (operational phase)

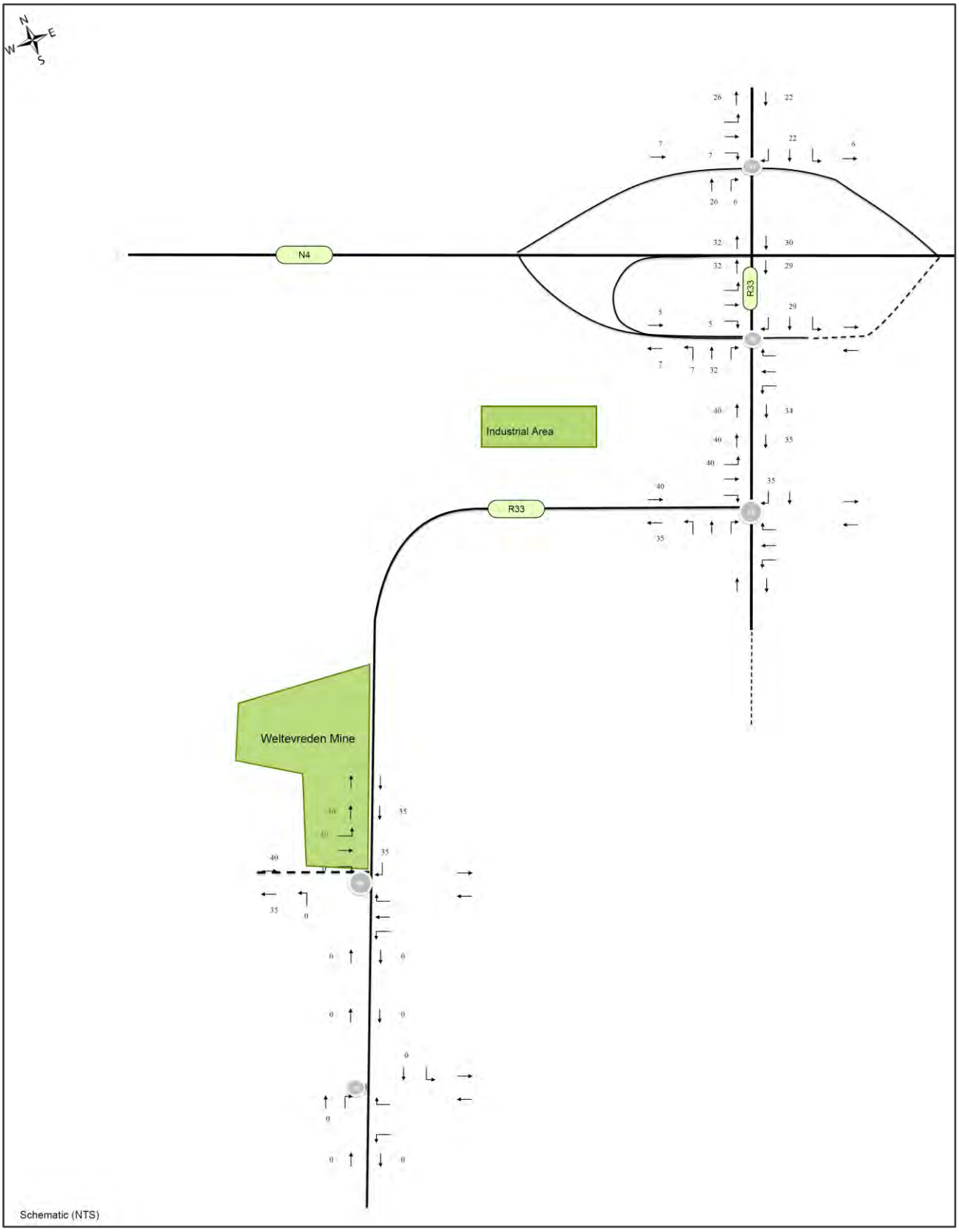


Figure 5-4: Development traffic PM peak hour (operational phase)

6 Intersection capacity analysis

6.1 Assessment criteria

The intersection and access capacity analyses were carried out using SIDRA Intersection software. The performance criteria used to determine an intersection's Level of Service (LOS) is provided in Table 6-1 below. The LOS, delay and volume/capacity (v/c) measurements are defined in accordance with the Highway Capacity Manual (HCM 2010) methodology.

Table 6-1: Level of Service Criteria

Level of Service Content	Performance measure – Average delay per vehicle (sec/veh)	
	Roundabouts and signals	Stop and Give Way/ Yield Signs
A	d ≤ 10	d ≤ 10
B	10 < d ≤ 20	10 < d ≤ 15
C	20 < d ≤ 35	15 < d ≤ 25
D	35 < d ≤ 55	25 < d ≤ 35
E	55 < d ≤ 80	35 < d ≤ 50
F	d > 80	d ≥ 50

The capacity analysis in this TIA used delay as the LOS measure for priority-controlled intersections. As illustrated in Table 6-1, LOS A to F are used, with LOS A indicating the best operating conditions and LOS F the worst. The LOS A to D were taken as acceptable for the purpose of this traffic impact assessment.

An additional performance measure that is also assessed is the Volume over Capacity (V/C) ratio, also referred to as the degree of saturation. V/C is defined as Volume of traffic divided by the capacity of the road element or an intersection. For design and planning purposes V/C ratios up to 0.95 (95%) are acceptable. Values between 0.95 to 1.0 indicates road network demand that is approaching capacity and delays can be expected on the road network. V/C values more than 1 indicate that the demand exceed the available capacity and the network may be prone to traffic jams and congestion.

6.2 Scenarios assessed

The 2019 baseline traffic was determined from traffic count survey data. For purposes of determining the future background traffic growth, the following sources were reviewed:

- Emakhazeni Local Municipality Spatial Development Framework (SDF);
- TMH17 (Table 1.1: Typical traffic growth rates).

The Emakhazeni local municipality Spatial Development Framework (SDF), 2015, highlights that population size in the municipality slightly increased by approximately 10% between 2001 and 2011, from about 43,000 to 47,200 people. This translates to an annual growth of 1% (pa). The SDF forecast the population to grow by about 1.1% pa, with the 2020 projected at about 52,300 people (assuming a normal growth scenario).

Typical traffic growth rates, provided in TMH17, allow for a growth rate of 0 to 3% pa in low growth areas and between 3 and 4% in average growth areas. Based on SDF projections, it was determined that the Emakhazeni could be categorised as either low growth or average growth area. Considering that the surrounding road network currently has low traffic volumes, the upper traffic growth rate threshold from TMH17 for average growth area (i.e. 4% pa) was selected for estimating future background traffic.

Two future horizon periods were assessed, i.e. 2-year horizon (opening year) (2021) and 5-year horizon (2024) as required by TMH16[5]. The construction traffic was added to the operational phase as the development traffic would not have fully ramped up on opening year. The operational phase development traffic was added to 5-year horizon background traffic to test the impact of the proposed development traffic. 5-year analysis was used to establish the impact of the additional traffic due to the proposed mining development.

The following traffic analysis scenarios were therefore analysed:

- 2019 Baseline (existing) traffic;
- 2022 Opening year background traffic, without proposed development;
- 2022 Opening year background traffic, with the proposed development traffic (construction phase);
- 2024 Operational year background traffic, without the proposed development traffic;
- 2024 Operational year background traffic, with the proposed development traffic (operational phase).

6.3 Intersection capacity analysis results

The results of the intersection capacity analysis area summarised below and detailed results are included in Appendix E.

6.3.1 2019 Baseline (existing) traffic

The 2019 baseline analysis results are summarised in Table 6-2 below.

Table 6-2: Intersection capacity results - 2019 baseline

Intersection	Type	Approach	AM			PM		
			V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
1 – R33/N4 IC (N4 On Ramp)	Priority	South: R33	0.086	0.5	A	0.096	0.8	A
		North: R33	0.216	0.7	A	0.183	1.6	A
		West: N4 On Ramp	0.182	9.9	A	0.160	7.7	A
		Overall	**0.216**	**3.1**	**A**	**0.183**	**3.6**	**A**
2 – R33/N4 IC (N4 On/Off Ramp)	Priority	South: R33	0.051	1.9	A	0.067	1.5	A
		East: Engen Garage Access Road	0.191	16.4	C	0.221	15.1	C
		North: R33	0.173	4.2	A	0.129	4.6	A
		N4 On/Off Ramp	0.065	9.2	A	0.048	9.2	A
		Overall	**0.191**	**5.9**	**A**	**0.221**	**6.1**	**A**
3 – R33/ Vogelstruispoort road	Priority	South:	0.004	9.2	A	0.009	9.5	A
		East:	0.002	3.7	A	0.002	3.7	A
		North: R33	0.164	9.6	A	0.126	10.7	B
		West: R33	0.079	6.0	A	0.105	5.8	A
		Overall	**0.164**	**8.2**	**A**	**0.126**	**7.8**	**A**

[5] Committee of Transport Officials (COTO), 2012, South African Traffic Impact and Site Traffic Assessment Manual, Published by the South African National Roads Agency Limited (SANRAL), Pretoria

Intersection	Type	Approach	AM			PM		
			V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
4 – R33/Unknown road	Priority	South: R33	0.030	**0.3**	A	0.082	0.2	A
		East: Unknown Access	0.009	**8.2**	A	0.012	8.8	A
		North: R33	0.065	**0.1**	A	0.056	0.3	A
		Overall	**0.065**	**0.7**	**A**	**0.082**	**0.7**	**A**

Analysis results indicate that the network currently operates at level of service (LOS) A, with virtually no delays.

6.3.2 2022 Opening year background traffic, without the proposed development

The opening year (2022) background traffic scenario was included to serve as a reference scenario, upon which the impact of the development traffic will be evaluated for the assumed opening year of the development. This scenario is also intended to evaluate the impact of background growth on the surrounding road network in 2022. The 2022 traffic volumes were estimated using a background growth of 4% as discussed earlier. Results for this scenario are summarised in Table 6-3.

Table 6-3: Intersection capacity results – 2022 background without proposed development traffic

Intersection	Type	Approach	AM			PM		
			V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
1 – R33/N4 IC (N4 On Ramp)	Priority	South: R33	0.097	0.6	A	0.108	0.8	A
		North: R33	0.243	0.7	A	0.205	1.6	A
		West: N4 On Ramp	0.239	11.0	B	0.205	8.0	A
		Overall	**0.243**	**3.3**	**A**	**0.205**	**3.7**	**A**
2 – R33/N4 IC (N4 On/Off Ramp)	Priority	South: R33	0.058	2.0	A	0.074	1.5	A
		East: Engen Garage Access Road	0.241	18.4	C	0.272	16.8	C
		North: R33	0.197	4.2	A	0.148	4.7	A
		N4 On/Off Ramp	0.077	9.4	A	0.054	9.3	A
		Overall	**0.241**	**6.2**	**A**	**0.272**	**6.4**	**A**
3 – R33/ Vogelstruispoort road	Priority	South:	0.004	9.3	A	0.009	9.6	A
		East:	0.002	3.7	A	0.002	3.7	A
		North: R33	0.185	9.7	A	0.145	10.9	B
		West: R33	0.089	6.0	A	0.118	5.8	A
		Overall	**0.185**	**8.3**	**A**	**0.145**	**7.8**	**A**
4 – R33/Unknown road	Priority	South: R33	0.033	**0.2**	A	0.092	0.2	A
		East: Unknown Access	0.009	**8.3**	A	0.013	8.9	A
		North: R33	0.073	**0.1**	A	0.063	0.2	A
		Overall	**0.073**	**0.7**	**A**	**0.092**	**0.7**	**A**

The increase in traffic due to background growth will have minimal impact on traffic operational performance of the surrounding road network.

6.3.3 2022 Opening year background traffic, with the proposed development traffic (construction phase)

The scenario was included to test the impact of the proposed Weltevreden Open Cast Mine development on the surrounding road network. To estimate demand for this scenario, the construction phase development traffic was added to the 2022 background traffic. The analysis results for the scenario are summarised in Table 6-4 below.

Table 6-4: Intersection capacity results – 2022 background traffic with the proposed development

Intersection	Type	Approach	AM			PM		
			V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
1 – R33/N4 IC (N4 On Ramp)	Priority	South: R33	0.100	0.6	A	0.115	0.9	A
		North: R33	0.250	0.7	A	0.209	1.6	A
		West: N4 On Ramp	0.261	11.5	B	0.186	8.3	A
		Overall	**0.261**	**3.5**	**A**	**0.209**	**3.8**	**A**
2 – R33/N4 IC (N4 On/Off Ramp)	Priority	South: R33	0.062	1.9	A	0.081	1.4	A
		East: Engen Garage Access Road	0.253	18.9	C	0.284	17.3	C
		North: R33	0.200	4.2	A	0.152	4.7	A
		N4 On/Off Ramp	0.086	9.8	A	0.055	9.4	A
		Overall	**0.253**	**6.2**	**A**	**0.284**	**6.4**	**A**
3 – R33/ Vogelstruispoort road	Priority	South:	0.004	9.3	A	0.009	9.7	A
		East:	0.002	3.7	A	0.002	3.7	A
		North: R33	0.207	9.8	A	0.159	11.0	B
		West: R33	0.098	6.0	A	0.131	5.8	A
		Overall	**0.207**	**8.3**	**A**	**0.159**	**7.8**	**A**
4 – R33/Unknown road	Priority	South: R33	0.033	**0.2**	A	0.092	0.2	A
		East: Unknown Access	0.009	**8.3**	A	0.013	8.9	A
		North: R33	0.073	**0.1**	A	0.064	0.2	A
		Overall	**0.073**	**0.7**	**A**	**0.092**	**0.7**	**A**
5- R33/Weltevreden access	Priority	South: R33	0.033	0.2	A	0.083	**0.1**	A
		North: R33	0.062	0.9	A	0.055	**0.9**	A
		West: Access Road to Weltevreden Mine	0.004	9.3	A	0.011	**9.4**	A
		Overall	**0.062**	**1.1**	**A**	**0.083**	**1.0**	**A**

The analysis indicates that the additional traffic, due to the proposed development, will have minimal impact on traffic operational conditions of the surrounding road network. All five intersections that were assessed will operate at LOS A, even with the additional traffic due to the proposed development.

6.3.4 2024 Future year background traffic, without the proposed development

In terms of the operational information received from Mbuyelo Group, the mine will operate for approximately 15 years. However as per the requirement of TMH16, a 5-year horizon is assessed. The future year (2024) background scenario was included to serve as a reference scenario, upon which the impact of the development traffic will be evaluated for the 5-year TIA horizon. This scenario is also intended to evaluate the impact of background growth on the surrounding road network up to 2024. The 2024 traffic volumes were estimated using a background growth of 4% as discussed earlier. Results for this scenario are summarised in Table 6-5.

Table 6-5: Intersection capacity results – 2024 background without proposed development traffic

Intersection	Type	Approach	AM			PM		
			V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
1 – R33/N4 IC (N4 On Ramp)	Priority	South: R33	0.105	0.6	A	0.117	0.9	A
		North: R33	0.263	0.7	A	0.222	1.6	A
		West: N4 On Ramp	0.294	0.6	B	0.222	8.4	A
		Overall	**0.294**	**3.6**	**A**	**0.222**	**3.8**	**A**
2 – R33/N4 IC (N4 On/Off Ramp)	Priority	South: R33	0.061	2.0	A	0.082	1.6	A
		East: Engen Garage Access Road	0.287	20.6	C	0.319	18.6	C
		North: R33	0.215	4.3	A	0.163	4.7	A
		N4 On/Off Ramp	0.084	9.6	A	0.060	9.3	A
		Overall	**0.287**	**6.5**	**A**	**0.319**	**6.8**	
3 – R33/ Vogelstruispoort road	Priority	South:	0.004	9.3	A	0.011	9.7	A
		East:	0.002	3.7	A	0.002	3.7	A
		North: R33	0.201	9.8	A	0.157	11.0	B
		West: R33	0.097	6.0	A	0.127	5.8	A
		Overall	**0.201**	**8.3**	**A**	**0.157**	**7.9**	**A**
4 – R33/Unknown road	Priority	South: R33	0.036	0.2	A	0.100	0.2	A
		East: Unknown Access	0.011	8.3	A	0.015	0.9	A
		North: R33	0.079	0.1	A	0.069	0.2	A
		Overall	**0.079**	**0.7**	**A**	**0.100**	**0.8**	**A**

The increase in traffic due to background growth will have minimal impact on traffic operational performance of the surrounding road network. All assessed intersections will continue operating at LOS A, with minimal delays.

6.3.5 2024 Opening year with the proposed development traffic (operational phase)

The scenario was included to test the impact of the proposed Weltevreden Open Cast Mine development on the surrounding road network in 2024 (5-year TIA horizon). To estimate demand for this scenario, the operational phase development traffic was added to the 2024 background traffic. This is also used as a critical scenario, through which the impact of the development traffic was assessed. The analysis results for the scenario are summarised in Table 6-6 below.

Table 6-6: Intersection capacity results – 2024 background plus proposed development traffic

Intersection	Type	Approach	AM			PM		
			V/C	Delay (s)	LOS	V/C	Delay (s)	LOS
1 – R33/N4 IC (N4 On Ramp)	Priority	South: R33	0.121	0.8	A	0.133	1.0	A
		North: R33	0.282	0.7	A	0.241	1.5	A
		West: N4 On Ramp	0.394	14.6	B	0.279	9.6	A
		Overall	**0.394**	**4.2**	**A**	**0.279**	**4.1**	**A**
2 – R33/N4 IC (N4 On/Off Ramp)	Priority	South: R33	0.088	1.5	A	0.103	1.3	A
		East: Engen Garage Access Road	0.343	23.2	C	0.373	21.1	C
		North: R33	0.230	4.2	A	0.177	4.6	A
		N4 On/Off Ramp	0.118	11.0	B	0.078	10.3	B
		Overall	**0.343**	**6.7**	**A**	**0.373**	**6.9**	**A**
3 – R33/ Vogelstruispoort road	Priority	South:	0.004	9.5	A	0.011	10.0	A
		East:	0.002	3.7	A	0.002	3.7	A
		North: R33	0.269	10.1	B	0.227	11.4	B
		West: R33	0.140	6.0	A	0.165	5.8	A
		Overall	**0.269**	**8.4**	**A**	**0.227**	**8.1**	**A**
4 – R33/Unknown road	Priority	South: R33	0.037	**0.2**	A	0.100	0.2	A
		East: Unknown Access	0.011	**8.3**	A	0.015	9.0	A
		North: R33	0.079	**0.1**	A	0.069	0.2	A
		Overall	**0.079**	**0.7**	**A**	**0.100**	**0.8**	**A**
5 - R33/Weltevreden access	Priority	South: R33	0.035	0.2	A	0.090	0.1	A
		North: R33	0.067	1.9	A	0.059	2.7	A
		West: Access Road to Weltevreden Mine	0.024	9.0	A	0.031	9.5	A
		Overall	**0.067**	**2.6**	**A**	**0.090**	**2.4**	**A**

The analysis indicates that the additional traffic, due to the proposed development, will have minimal impact on traffic operational conditions of the surrounding road network. All five intersections that were assessed will still operate at LOS even with the development traffic.

6.3.6 Summary of the intersection capacity analyses

The surrounding road network has enough capacity to accommodate additional traffic due to background traffic growth and the proposed Weltevreden Open Cast Mine development traffic. Minimal delays are expected in 2024 and all assessed intersections will operate at LOS A or better.

6.4 Development access

As mentioned earlier SANRAL discourages direct access off Class 1 to 3 roads. SANRAL could consider new intersections subject to TRH26 and safety requirements being met, and the intersections being for a public road that can be shared with neighbouring properties.

In case of a new intersection being proposed, it may be necessary to close other sub-optimal intersections (in terms of TRH26 intersection spacing requirements). Closure of intersection could be subject to a number of risks and legal challenges.

For the above reasons, it is recommended that access to the site be via a service road either to the existing partial access intersection off the R33 near the southern boundary of the proposed mining development (option 1), or to a new intersection approximately 400m south of the existing intersection (with the existing intersection having to be closed) (option 2). It is further proposed that sections of the service road be shared with nearby properties. A private road can then be provided north of the service road for controlled access to the development.

Sketches of the two proposed access strategies are provided below.

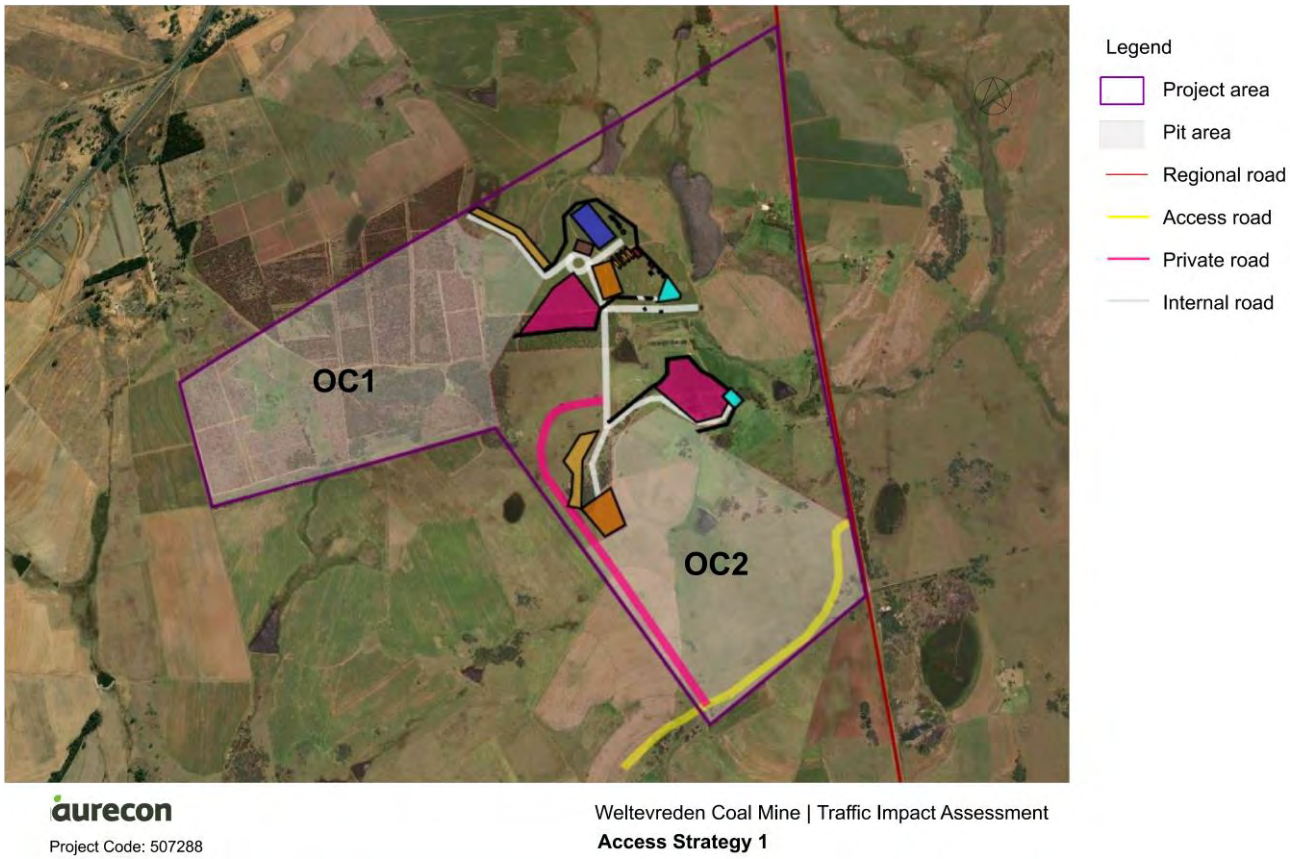


Figure 6-1: Proposed access strategy - option 1 (through the existing access)

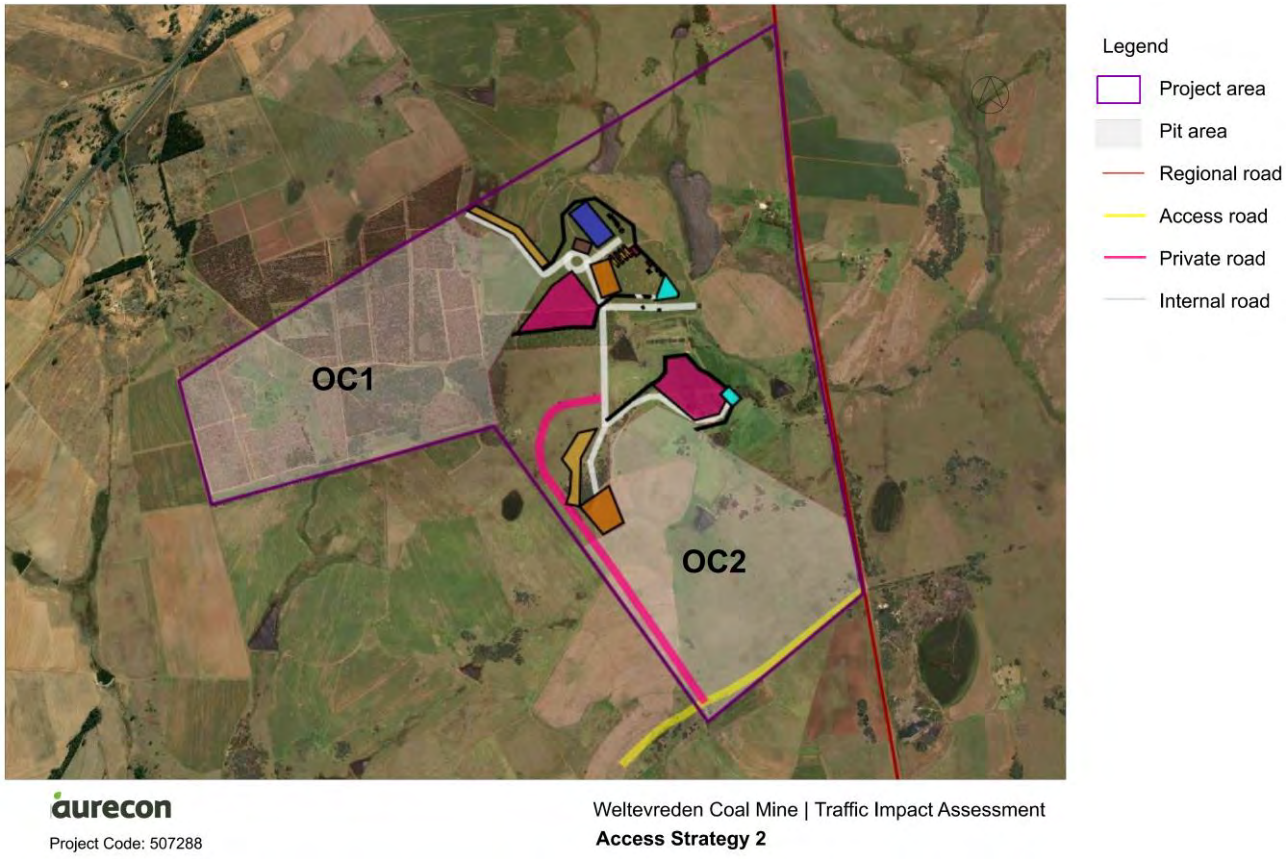


Figure 6-2: Proposed access strategy - option 2 (move existing intersection about 400m southward)

Advantages of the option 1 access strategy includes the following:

- Keeping an existing intersection that, based on aerial image history, was recently constructed;
- Minimal interruptions are expected to the R33 traffic during service road construction.

Advantages to option 2 access strategy includes the following:

- The same lane configurations will be provided at the new intersection;
- Traffic safety will be enhanced through the following:
  - The angle of the intersection will be improved to a near 90-degree intersection;
  - An existing sharp bend before the intersection will be removed.
- The service road will be aligned closer to the edge of the southern boundary of the site, maximising space available for mine operations and safety barrier requirements.

Either of the access strategy has unique advantages and addresses initial comments received from SANRAL. The service road will be a Class 4 road since it will function as a local collector road.

A queuing analysis was carried out for the critical inbound traffic flow into the development, during the AM peak (operational phase). For queuing analysis purposes, it was assumed that boom gates with a push button will be used to control access. The results of the queuing analysis area provided below.

Table 6-7: Queuing analysis variables

Description	Access
Peak Hour Inbound Traffic Volume (vph)	40
Average arrival rate at peak (vph)	50
Average service rate (sec/veh)	10
Average service rate (services/h)	360
Traffic Intensity	0.14
Number of channels (gates)	1
90th percentile queue length (<n vehicles)	2
Average number of vehicles in the system (veh)	0.2
Average Delay (sec)	11.6
Average vehicles per gate (veh)	0.2

The analysis demonstrated that a single gate, with enough stacking for two vehicles at a time would be required. However, from practicality perspective, it is recommended that two entrance gates be provided, where the additional gate will be used for visitors signing in. This will allow employee and authorised vehicles unimpeded access, thus reducing probability of queues building up at the entrance. It is further recommended that a minimum stacking of about 25 m be provided between the edge of the proposed service road and the location of the boom gates, as per the requirement of THM16 (for a class 4 road).

7 Public transport, walking and cycling

As per the trip generation calculations, refer to Appendix C, it is estimated that the proposed development will generate fourteen (i.e. eight inbound and six outbound) minibus taxi trips during both the AM and PM peak hours. It is expected that this demand will be accommodated by the mine's employee shuttles. It will therefore be necessary to accommodate for internal pick-up and drop-off. Minibus taxi laybys are therefore recommended within the development to facilitate pick-up and drop-offs for those using employer-arranged shuttle buses or minibuses.

There is currently no walking or cycling facilities in the immediate vicinity of the proposed development access. The development is also not expected to generate primary walking or cycling trips as employee shuttles are generally used in the area. However, it is recommended that adequate footpaths be provided along the mine access road, connecting to the internal road network. It is also recommended that adequate drop-off and pick up area be provided within the development to accommodate employee shuttle demand.

8 Environmental impact assessment

Transport of heavy goods has an impact on traffic operations and road safety. In terms of TMH16, the following aspects of heavy goods vehicles needs to be assessed:

- Capacity;
- Road safety;
- Road geometry standards;
- Road surfacing conditions;
- Dust;
- Road classification.

Heavy vehicles are expected to use the R33 and the N4, in the immediate study area. These roads are planned and designed to carry relatively high proportion of heavy vehicle traffic. The additional heavy vehicle trips, due to the proposed development, is therefore expected to have little impact on road geometry standards and classification of the local road network. With the exception of the proposed interventions to improve access to the site, no major geometric changes are expected.

The remainder of this section will focus on capacity, road safety and road surfacing conditions. A brief discussion of the development traffic on surrounding transport environment is provided below. The impact ratings are included in Appendix F.

8.1 Capacity assessment

Road capacity has been assessed as part of the capacity analysis in Section 6 of this report, and it was found that the additional traffic due to the proposed development will have minimal impact on the traffic operational conditions of the surrounding network.

8.2 Road safety

An increase in heavy vehicle trips in the study area will increase the road safety risk to other road users, including pedestrians and cyclists, especially through active nodes such as town centres, residential areas and near schools. Intersections may also be affected, where longer gaps will be required by heavy vehicle traffic as compared to light vehicles.

From the trip generation calculation, it was estimated that about two heavy vehicle trips will be generated by the development during the construction phase AM and PM peak hours. During the operational phase it is estimated that 14 heavy vehicle trips could be added on the surrounding road network in the AM and PM peak hours. Daily heavy vehicle volumes are estimated to be three and 120 vehicles during the construction and operational phases respectively. This includes haulage traffic and those vehicles bringing in regular supplies to the site, such as office supplies, fuel, water and on an ad-hoc basis to move mining or construction machinery.

With a combination of low external road network heavy traffic generation and short lifespan of the facilities, the impact of the proposed development on road safety is considered low. However, it is recommended that awareness be raised regularly on safe driving and on impact of heavy vehicles on other road users, pedestrians and cyclists, as part of regular safety awareness briefings and training of mine employees and suppliers.

It is also recommended that road markings and signage be reviewed near the access intersection with the R33, with a view to ensure that sufficient warning is provided to other road users on the expected heavy vehicle crossing activities at the intersection.

It is also recommended that, where alternatives exist, employees and partners operating heavy vehicles to and from the development site should be encouraged to avoid activity nodes, residential areas and activity areas such as schools and community facilities.

It is also recommended that lighting along R33 Route, particularly the proposed service road and R33 intersection be improved. This will ensure adequate night time visibility and can reduce probabilities of crashes due to poor lighting conditions.

8.3 Surfacing conditions

Heavy vehicles increase loads on the roads. As discussed above, there will be an increase in heavy vehicle volumes on the surrounding road network due to the proposed development. The existing surfacing condition of the R33, near the development access, is in good condition. It is expected that the additional heavy traffic volumes could result in the quality of the surface condition reducing over time, especially the intersection of the R33 with the mine service road.

If access strategy option 1 (i.e. service road connecting to the existing intersection) is accepted, the intersection surfacing conditions will need to be monitored and appropriate rehabilitation be carried out when conditions deteriorate and on decommissioning of the site.

If access strategy option 2 is accepted (i.e. moving the intersection about 400m south towards the site boundary), the new intersection should be designed to accommodate the estimated additional heavy vehicle volumes that could be generated by the development over the lifetime of the mine. There should also be regular observations of the surface conditions in the immediate vicinity of the site to determine the need for maintenance over the lifetime of the project. The developer (mine operator) should assume the maintenance responsibility of the service road / R33 during the life of the mine, including the decommissioning phase. It is noted that a memorandum of understanding may need to be agreed between the mine and SANRAL regarding maintenance and rehabilitation responsibilities of the R33 / service road intersection.

Table 8-1: Environmental impact rating of the additional development traffic

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Intensity	Consequence	Probability	Significance		Duration	Extent	Intensity	Consequence	Probability	Significance
25	Road network capacity	Short-term	Local	Negligible	Negligible	Very unlikely	Very low	No mitigation required.	Short-term	Local	Negligible	Negligible	Very unlikely	Very low
26	Road safety	Short-term	Regional	High - negative	Moderately detrimental	Very likely	Moderate - negative	Regular traffic safety awareness and training is recommended at part of on-site safety briefing for employees and suppliers or partners. Signage should be reviewed near the R33 / Weltevreden Mine access intersection to ensure sufficient warning of crossing heavy vehicles is provided to general road users. Improve lighting along R33 Route particularly the Weltevreden Mine Access and R33 intersection so as to improve visibility during the night and minimise heavy vehicle crashes. Where alternatives exist, employees and partners operating heavy vehicles to and from the development site, should be encouraged to avoid activity nodes, residential areas and activity areas such as schools and community facilities.	Short-term	Site specific	High - negative	Moderately detrimental	Fairly likely	Low - negative

Code	Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
		Duration	Extent	Intensity	Consequence	Probability	Significance		Duration	Extent	Intensity	Consequence	Probability	Significance
27	Intersection/Surfacing condition	Short-term	Site-specific	High - negative	Slightly detrimental	Certain	Moderate - negative	The Weltevreden Mine Access and R33 intersection should be improved a full intersection and accommodate for heavy vehicles making a right and left turn from the mine access road. Localised surface upgrade or rehabilitation is recommended at the intersection of the R33 with the proposed development access, to improve current conditions and to better accommodate the additional development traffic.	Short-term	Site-specific	Moderate - negative	Slightly detrimental	Fairly likely	Low - negative

9 Conclusions and recommendations

Xinovo Mining (Pty) Ltd, a subsidiary of Mbuyelo Group, is proposing to develop the Weltevreden Open Cast Mine, located along R33 in Belfast, Mpumalanga Province. The mine will extract coal, mostly for local markets. The site of the proposed Weltevreden Open Cast Mine is served by the R33 route in Belfast. Extracted coal is currently planned to be transported by trucks from the Weltevreden Open Cast Mine to Thuthuka Power Station.

Aurecon was appointed to carry out a Traffic Impact Assessment (TIA) for the proposed mine development. The TIA will form part of the Environmental Impact Assessment (EIA) of the project.

The additional traffic that can be generated by the proposed mining development was estimated from first principles, as suitable trip generation rates are not provided in the South African Trip Data Manual (TMH17) and its predecessor, the South African Trip Generation Rates Manual (SATGRM). Xivono provided typical construction and operational data that were used in estimating the trips. It is estimated that the proposed development can generate approximately 20 and 75 peak hour trips during the construction and operational phases respectively.

Intersection capacity analyses were carried out to assess the potential impact of the additional trips due to the proposed development on the surrounding local road network. The analysis results demonstrated that the impact of the proposed mining development on the road network will be minimal. The existing network will have sufficient capacity to accommodate background traffic growth and the additional development trips.

The proposed development is estimated to generate eight peak hour minibus taxi trips during the construction phase and 14 taxi trips during the operational phase. It is expected that these trips will mainly be in the form of employee shuttle minibuses. It is recommended that minibus taxi drip-off and pick-up areas be provided at suitable locations within the proposed development. Suitable footpaths should be provided along the mine access road, connecting with the mine's internal road network. This will facilitate access by people who are dropped or picked up outside the site access road from publicly operated bus and minibus services.

An increase in heavy vehicles generally affect traffic operations and increase road safety risks.

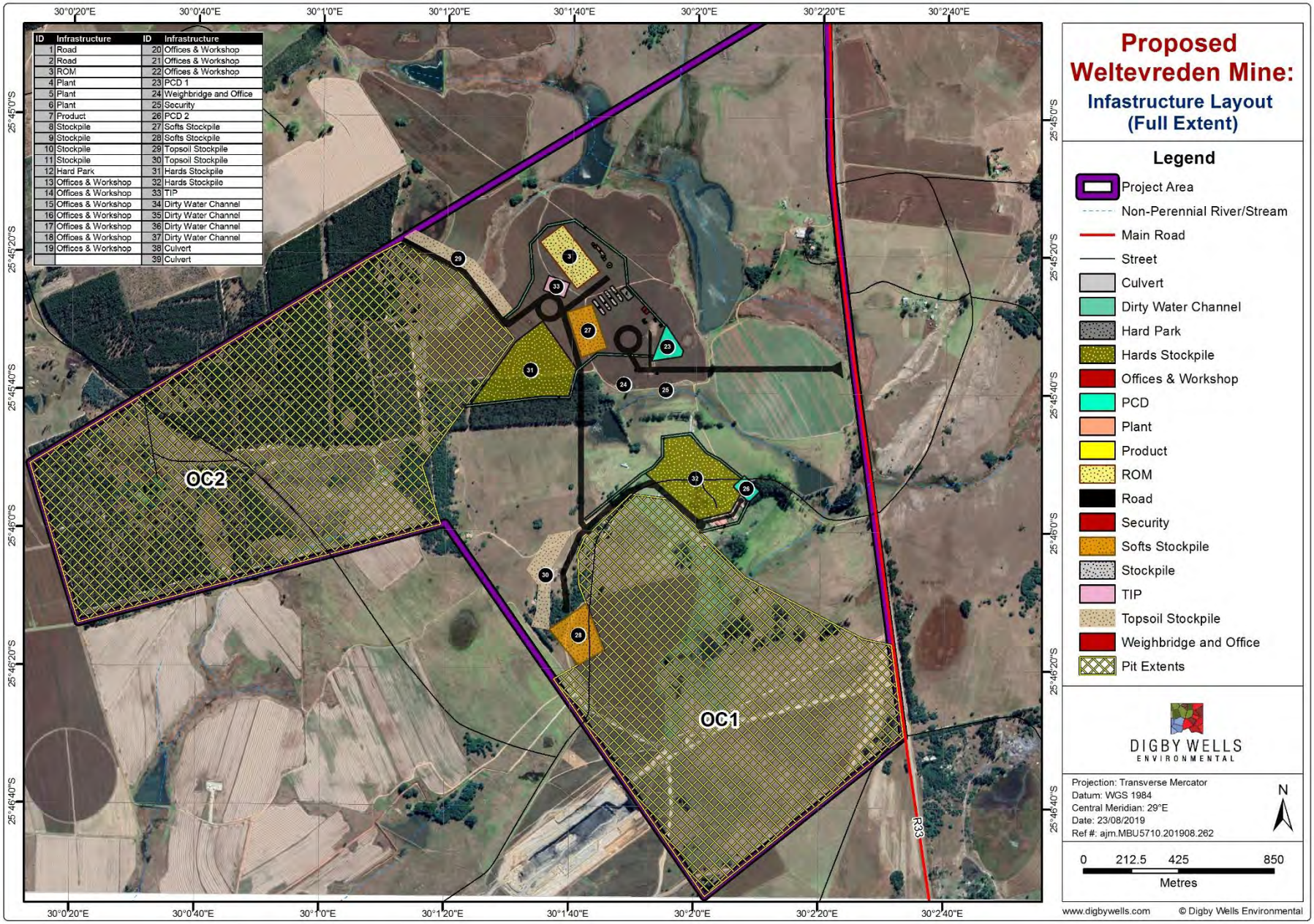
To mitigate the road safety impact, regular awareness and training is proposed for mine employees and supply partners to raise awareness of other road users, especially pedestrians and cyclist in the wider study area. Furthermore, lighting should be provided at the R33/Weltevreden Mine intersection to improve visibility and minimise heavy vehicle crashes

It is further recommended that signage be reviewed in the immediate vicinity of the proposed access to ensure sufficient warning to other road users of heavy vehicles turning into and crossing between the two sections of the proposed mine.

It is also recommended that, where alternatives exist, employees and partners operating heavy vehicles to and from the development site, should be encouraged to avoid activity nodes, residential areas and activity areas such as schools and community facilities.

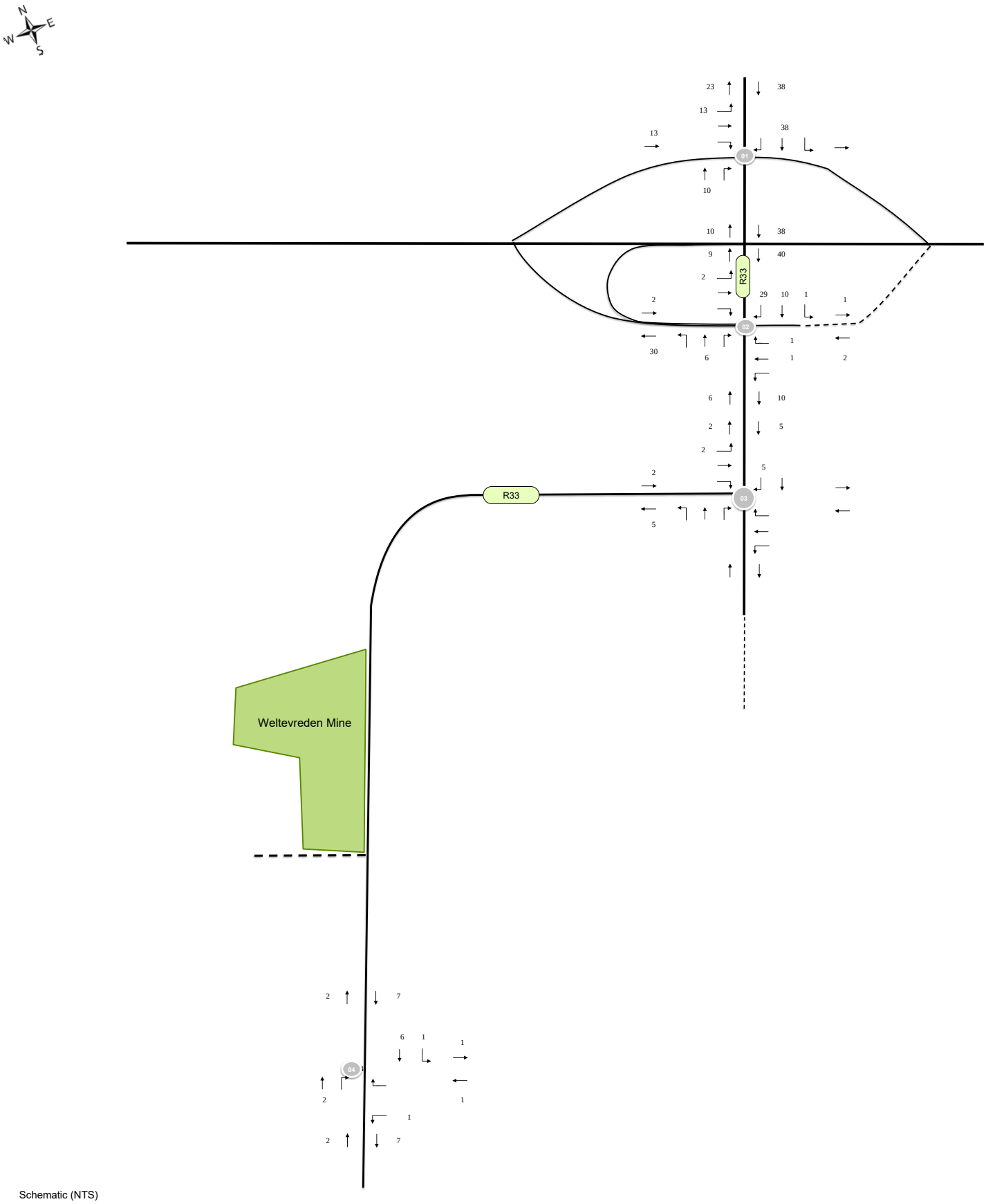
Provided that the above recommendations are accepted, the proposed Weltevreden Open Cast Mine is supported from transport planning and traffic engineering perspectives.

Appendix A
Site setting plan



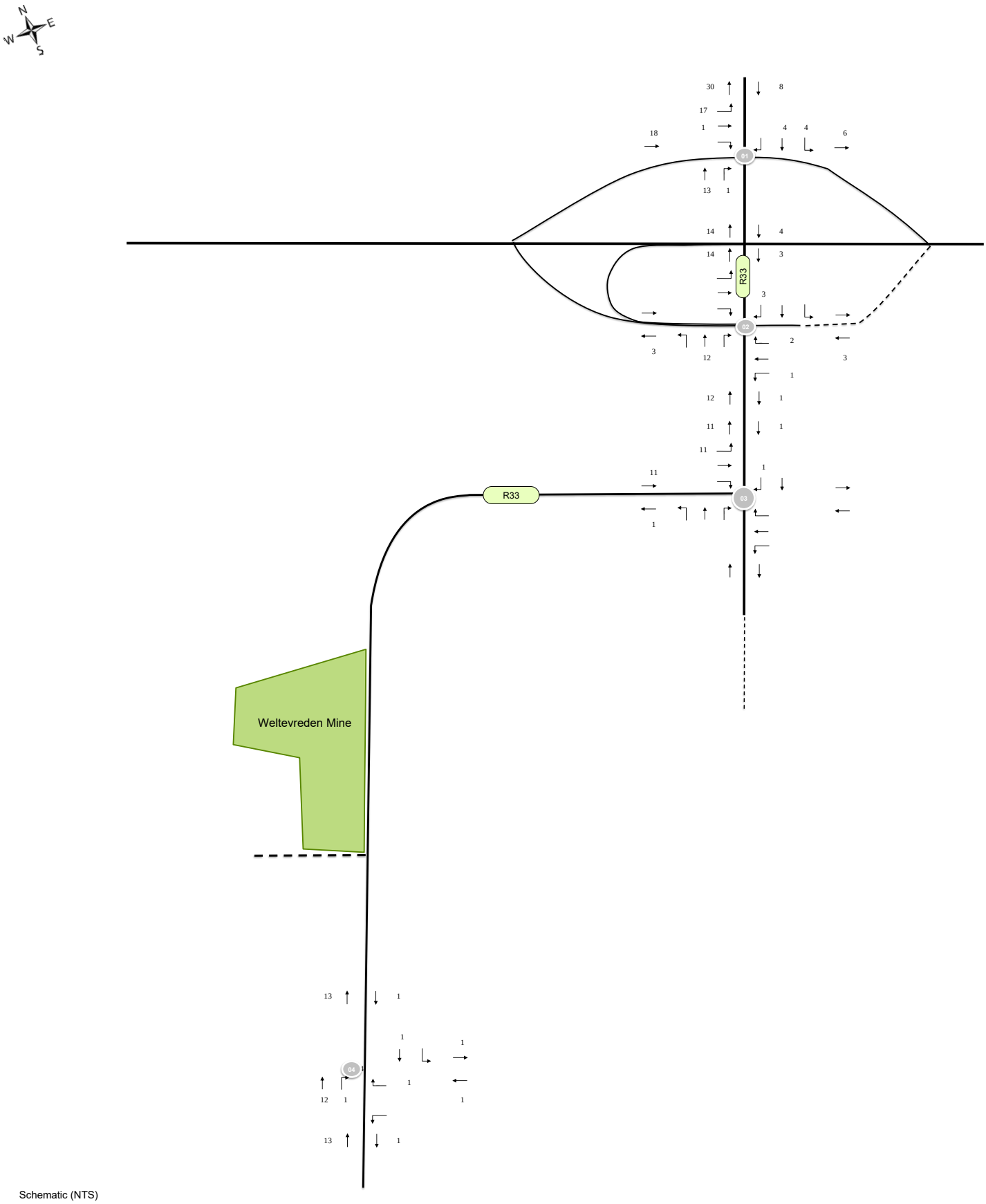
ID	Infrastructure	ID	Infrastructure
1	Road	20	Offices & Workshop
2	Road	21	Offices & Workshop
3	ROM	22	Offices & Workshop
4	Plant	23	PCD 1
5	Plant	24	Weighbridge and Office
6	Plant	25	Security
7	Product	26	PCD 2
8	Stockpile	27	Softs Stockpile
9	Stockpile	28	Softs Stockpile
10	Stockpile	29	Topsoil Stockpile
11	Stockpile	30	Topsoil Stockpile
12	Hard Park	31	Hards Stockpile
13	Offices & Workshop	32	Hards Stockpile
14	Offices & Workshop	33	TIP
15	Offices & Workshop	34	Dirty Water Channel
16	Offices & Workshop	35	Dirty Water Channel
17	Offices & Workshop	36	Dirty Water Channel
18	Offices & Workshop	37	Dirty Water Channel
19	Offices & Workshop	38	Culvert
		39	Culvert

Appendix B
Traffic flow diagrams



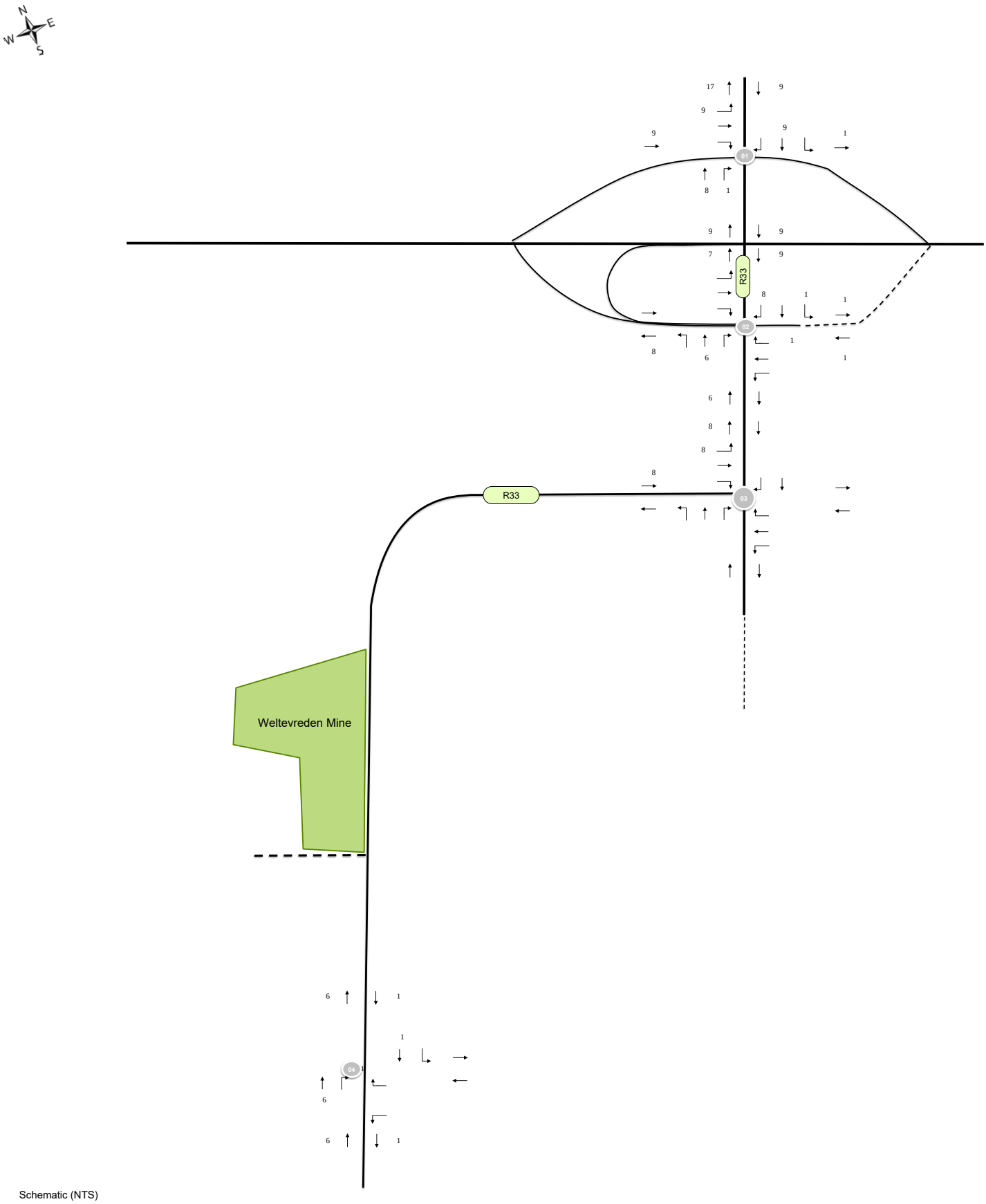
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2019 Baseline traffic - taxis (AM) - Taxis	Fig: A-7



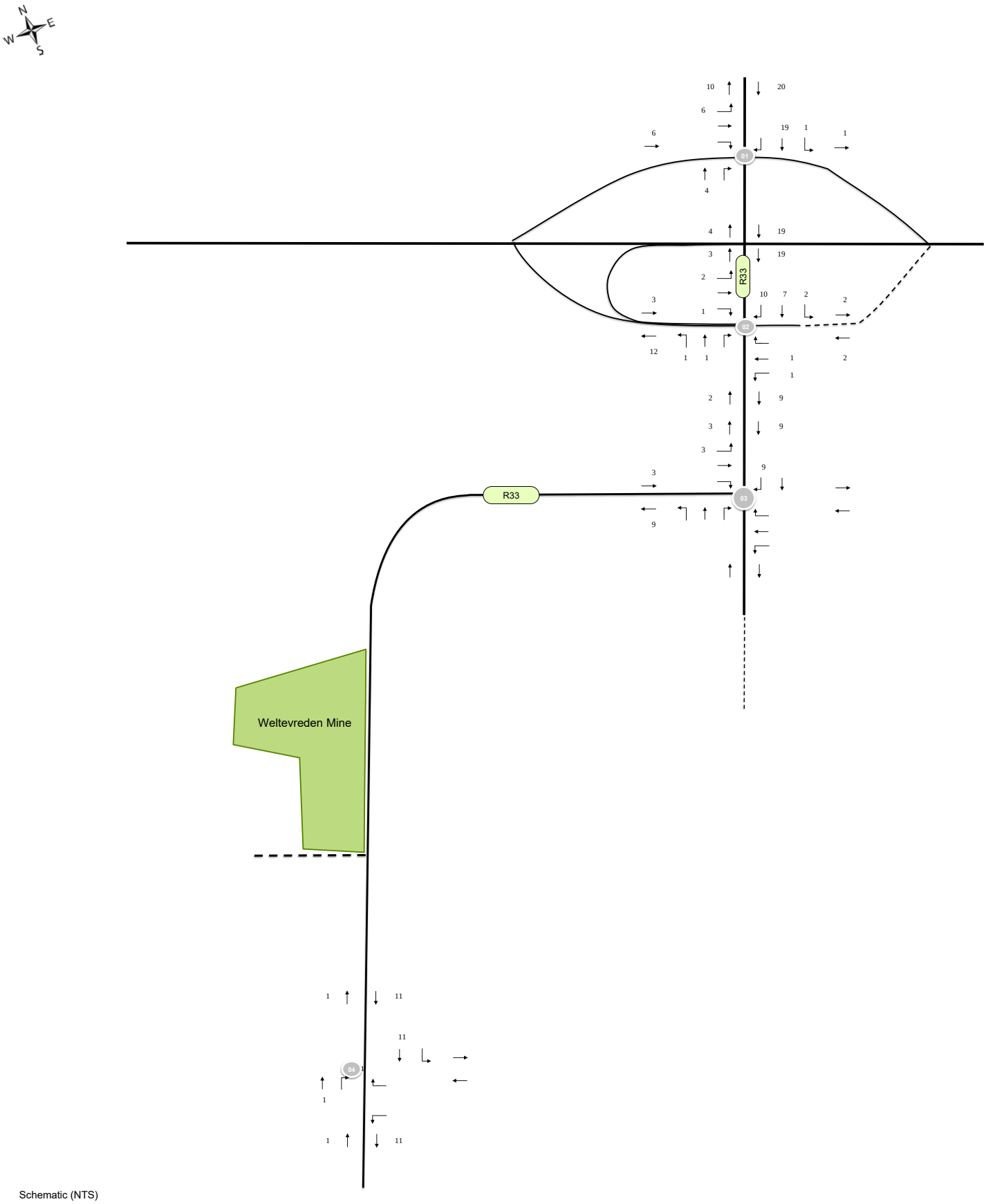
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2019 Baseline traffic - taxis (PM) - Taxis	Fig: A-8



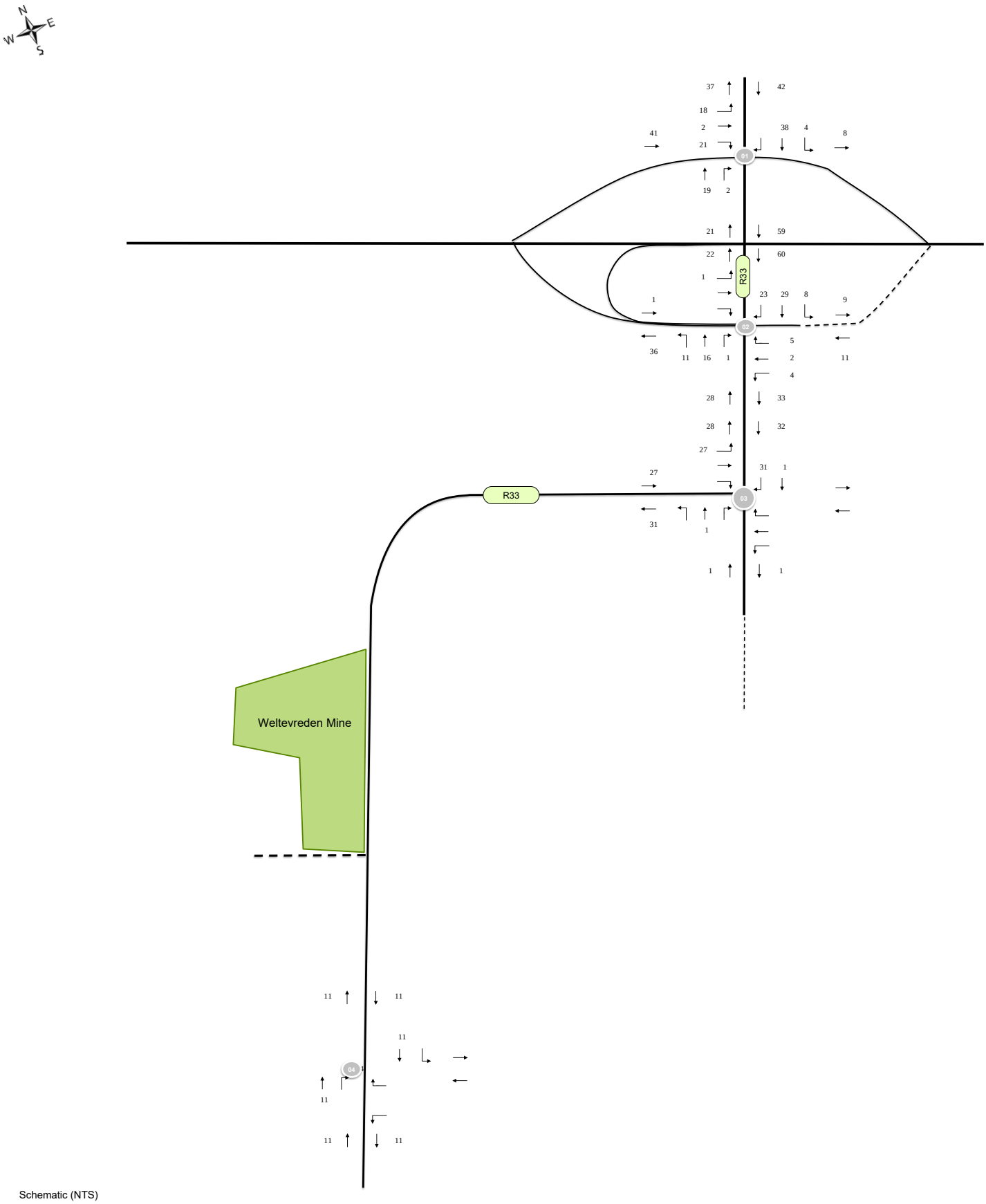
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2019 Baseline traffic - buses (PM)	Fig: A-6



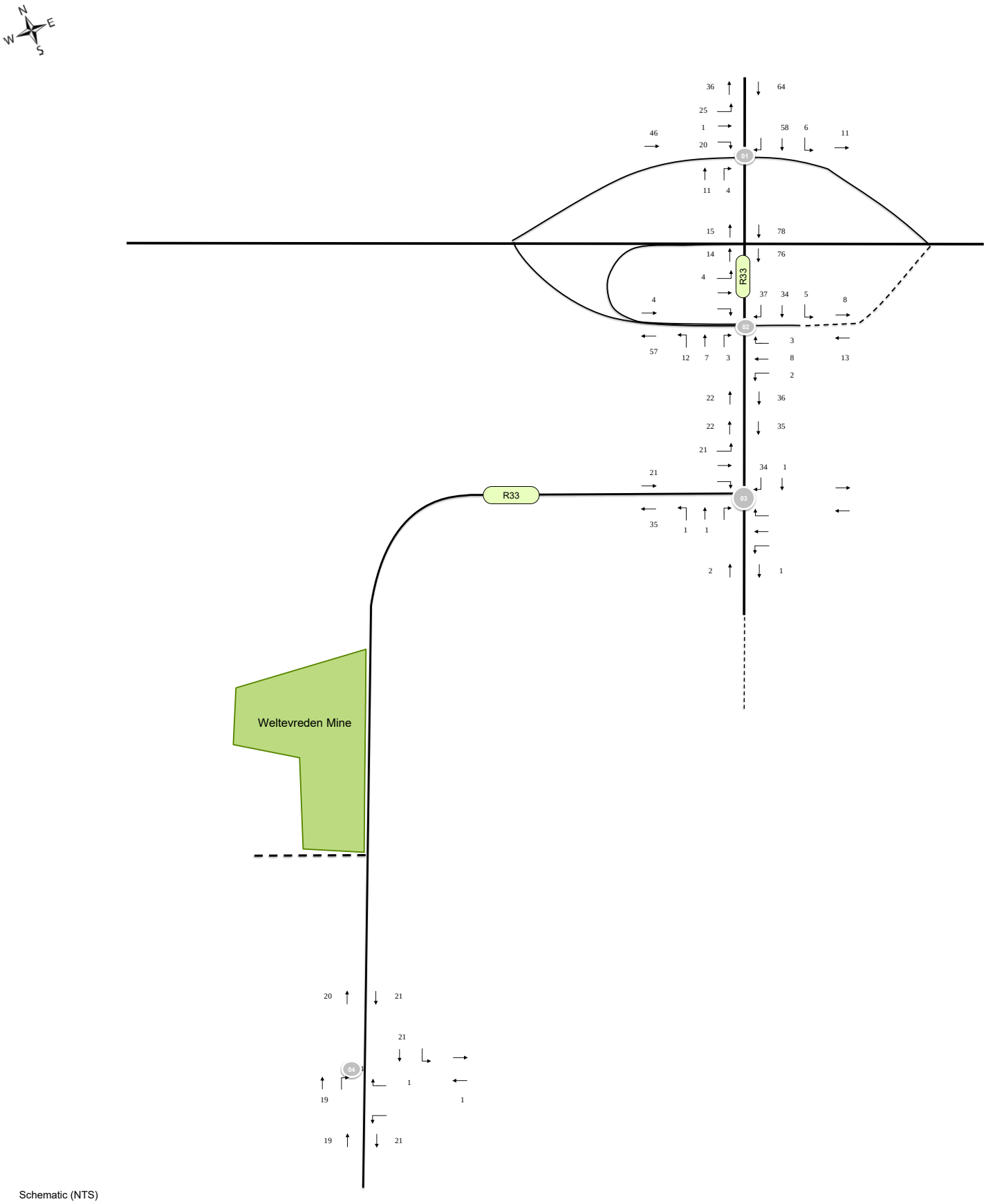
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2019 Baseline traffic - buses (AM)	Fig: A-5



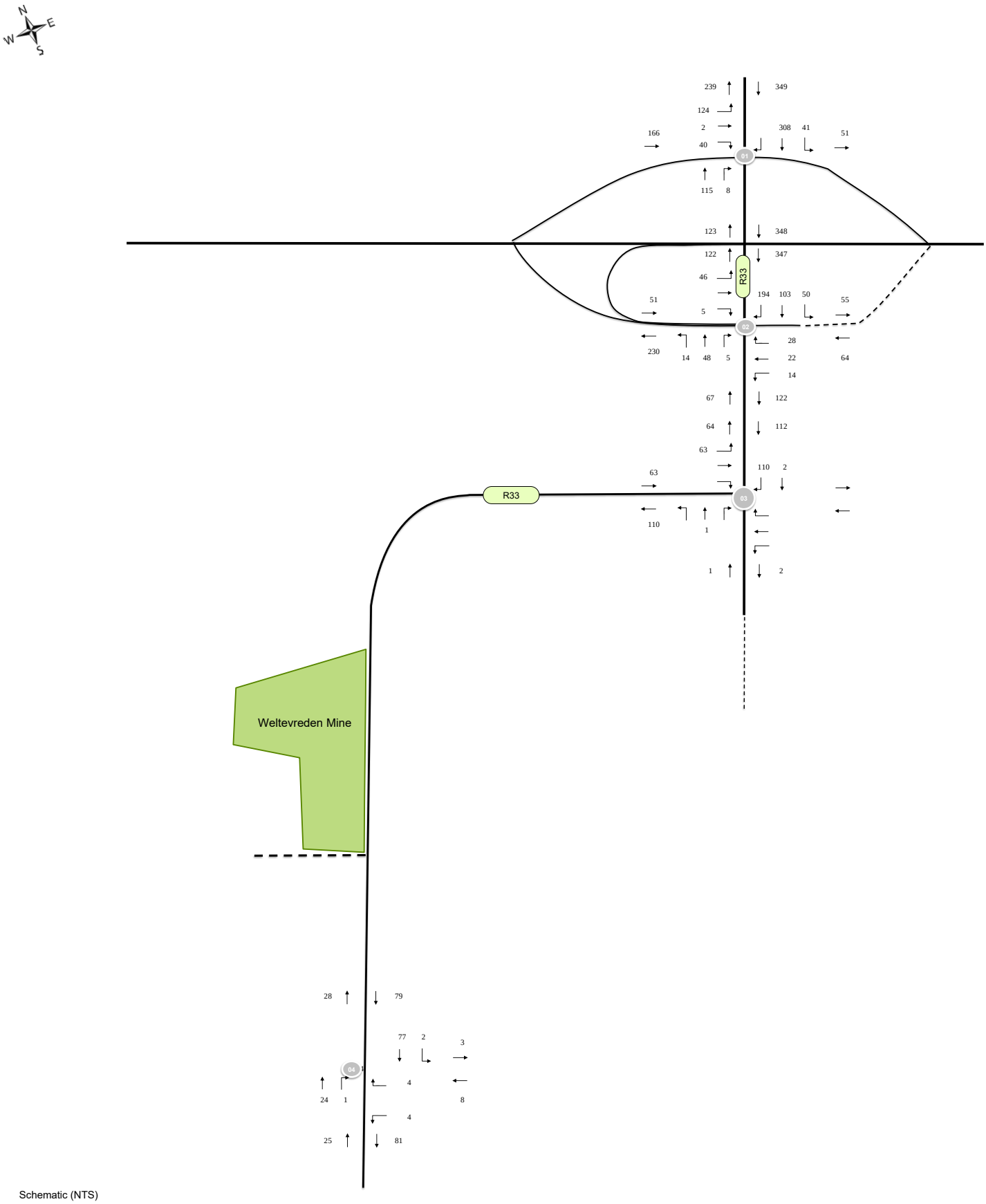
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2019 Baseline traffic - heavy vehicles (AM)	Fig: A-3



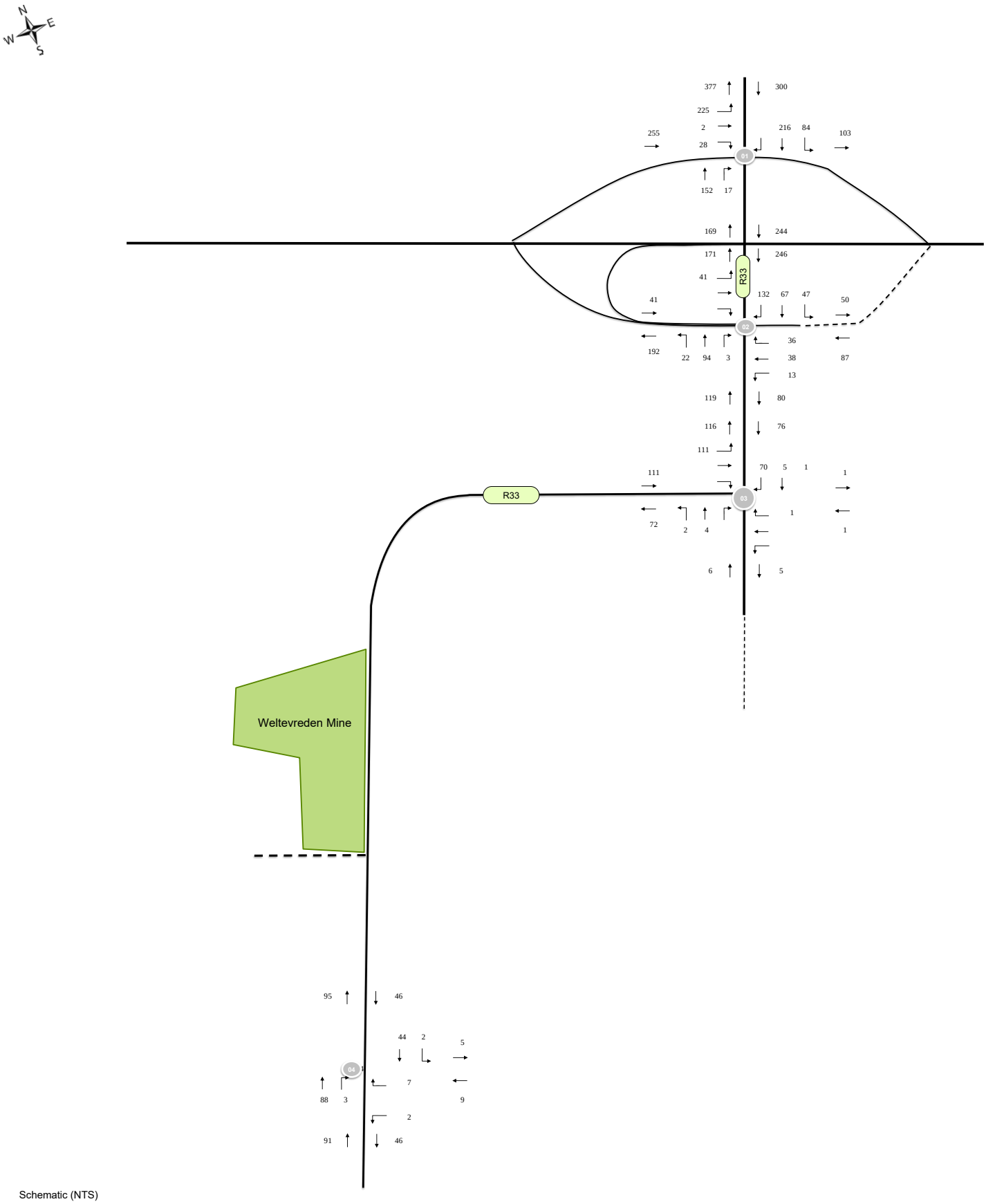
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2019 Baseline traffic - heavy vehicles(PM)	Fig: A-4



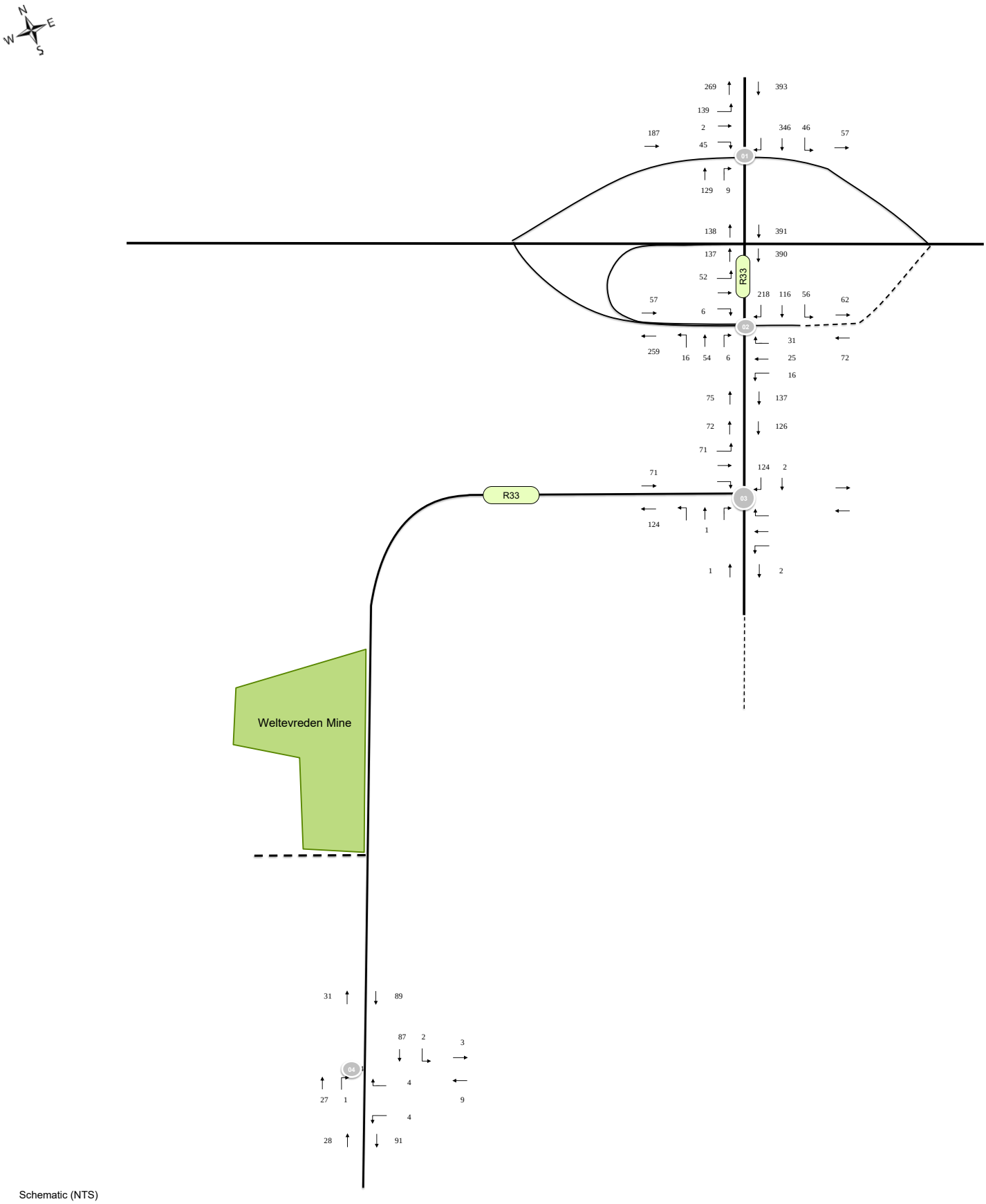
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2019 Baseline traffic (AM)	Fig: A-1



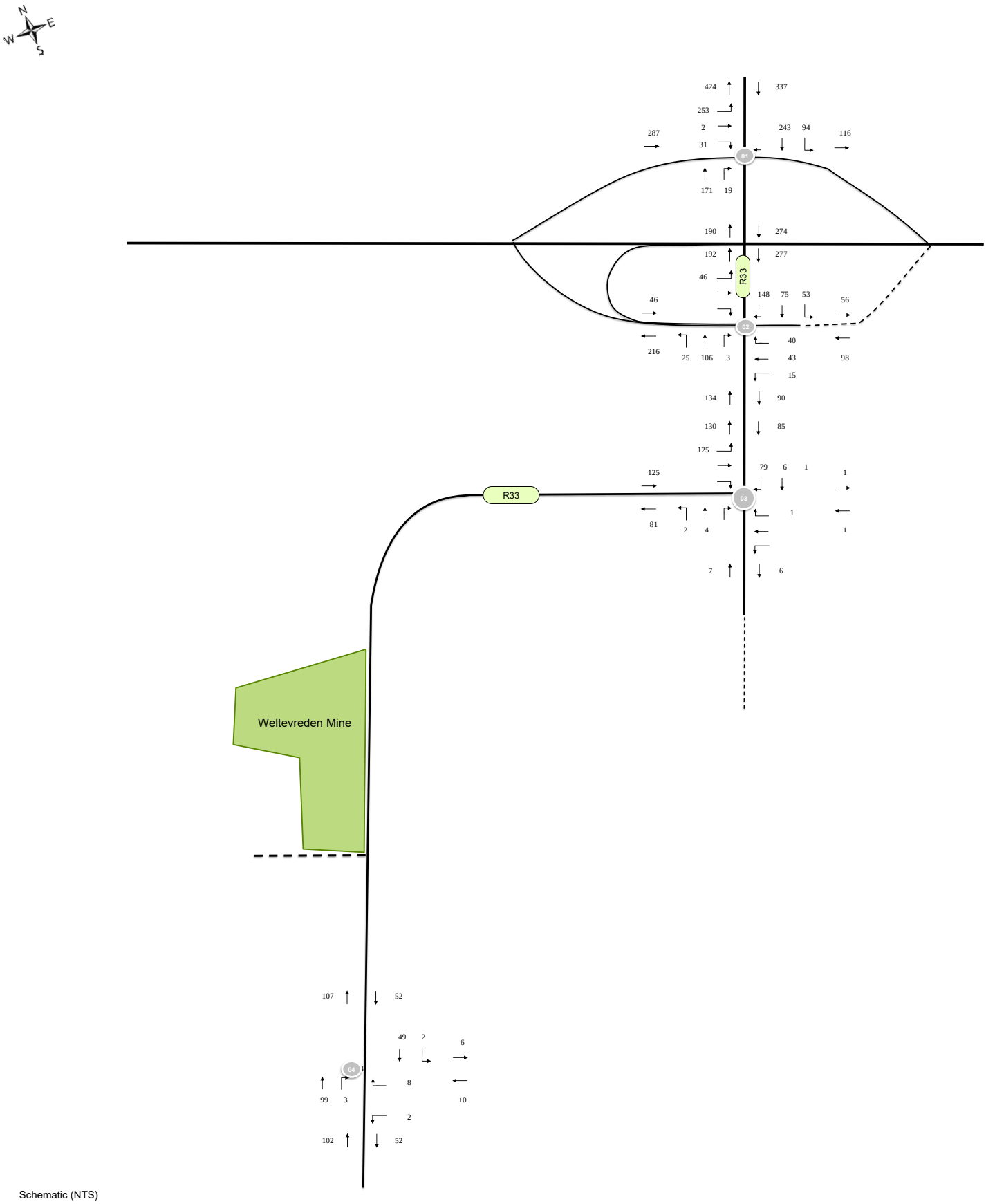
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2019 Baseline traffic (PM)	Fig: A-2



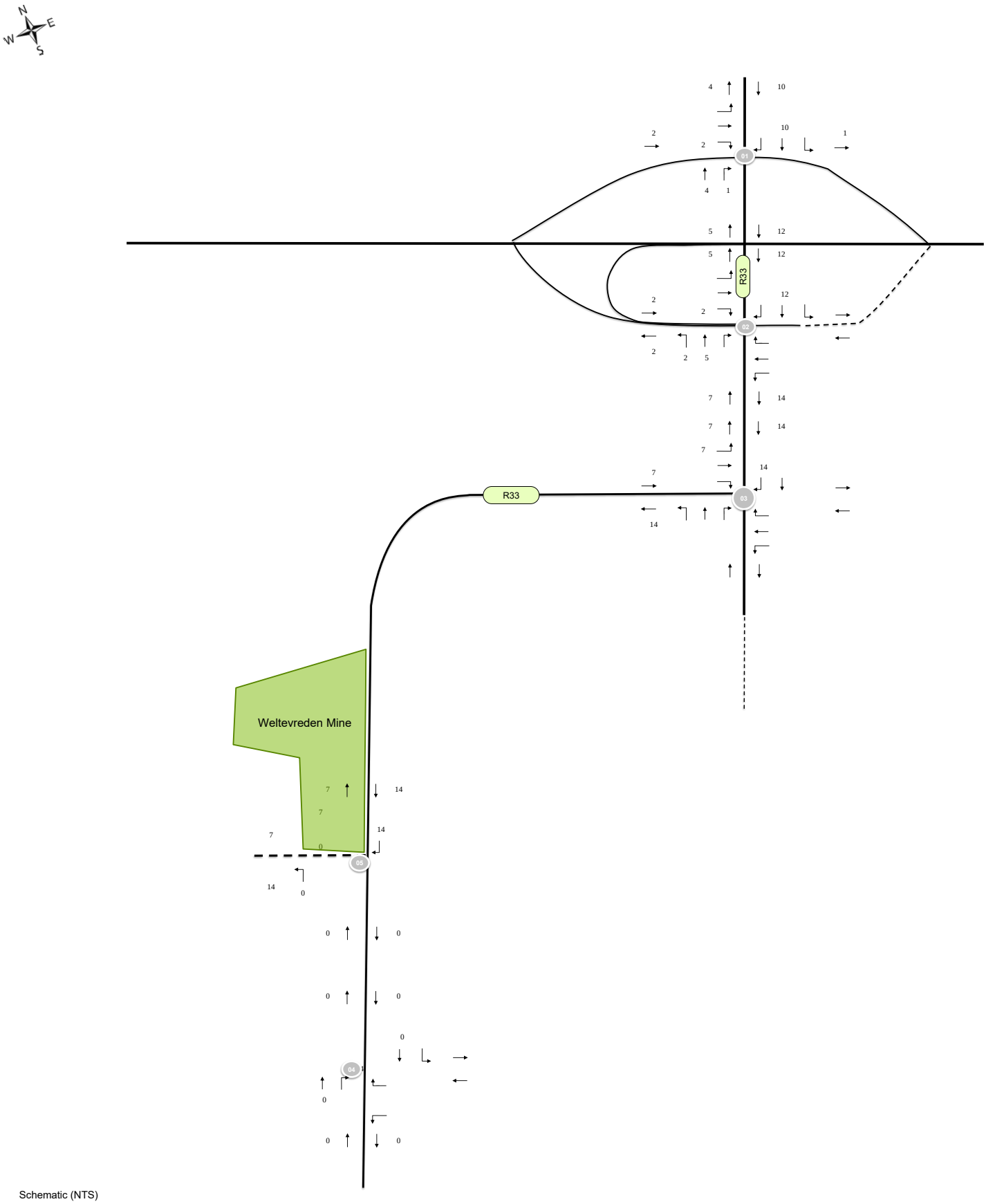
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2022 Opening year background traffic, without proposed development (AM)	Fig: A-13



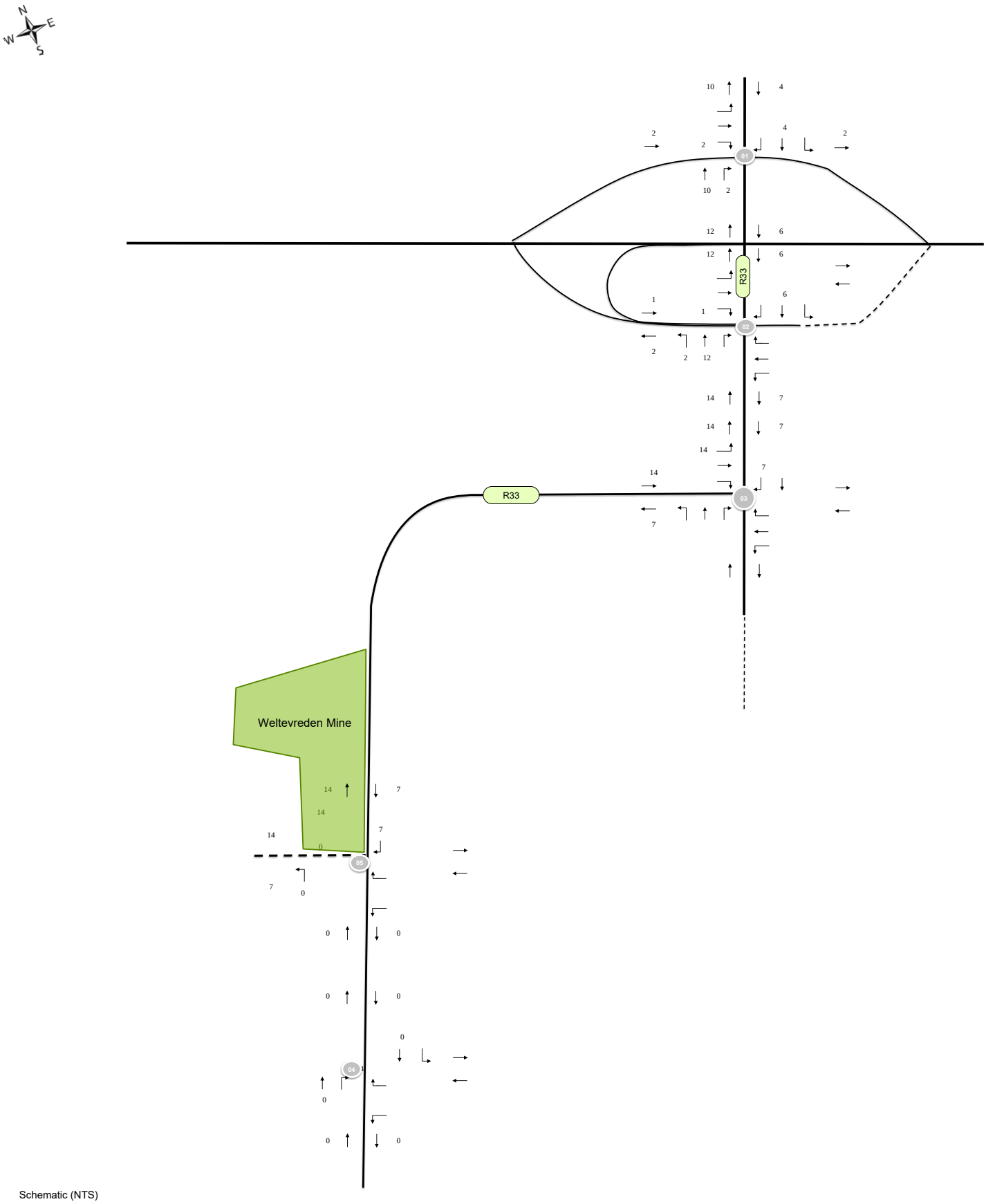
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2022 Opening year background traffic, without proposed development (PM)	Fig: A-14



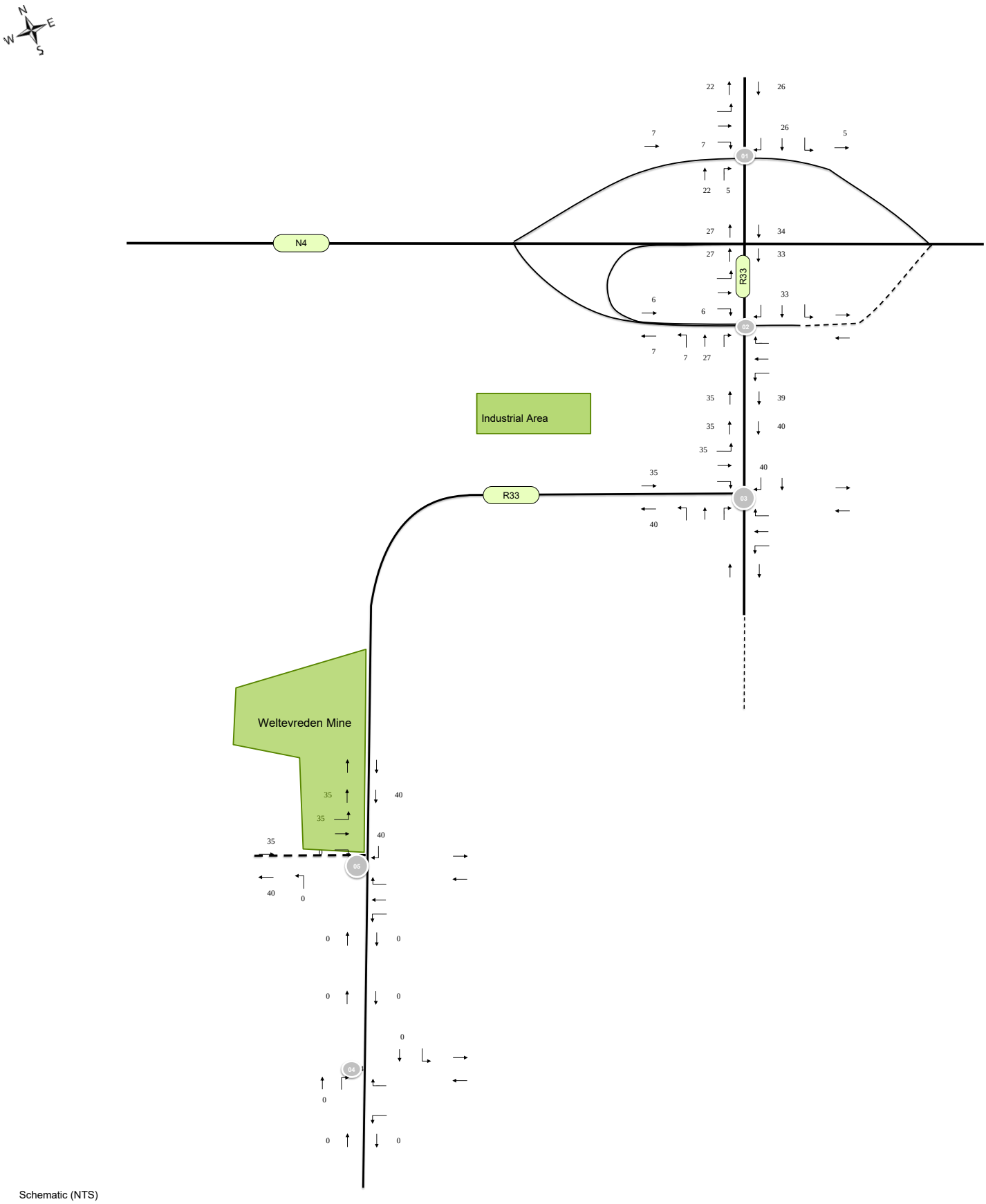
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	Development Traffic - construction phase (AM)	Fig: A-9



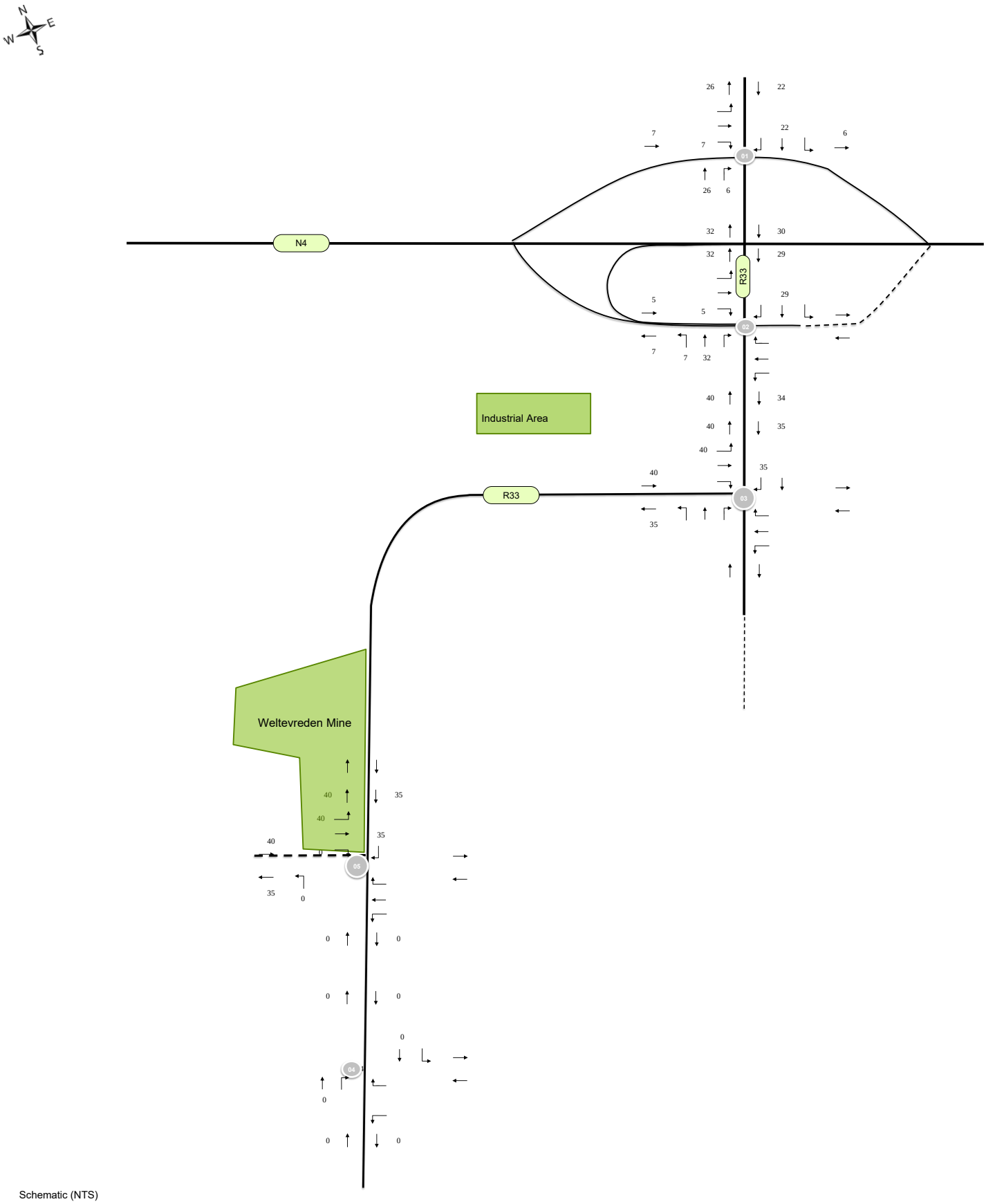
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	Development Traffic - construction phase (PM)	Fig: A-10



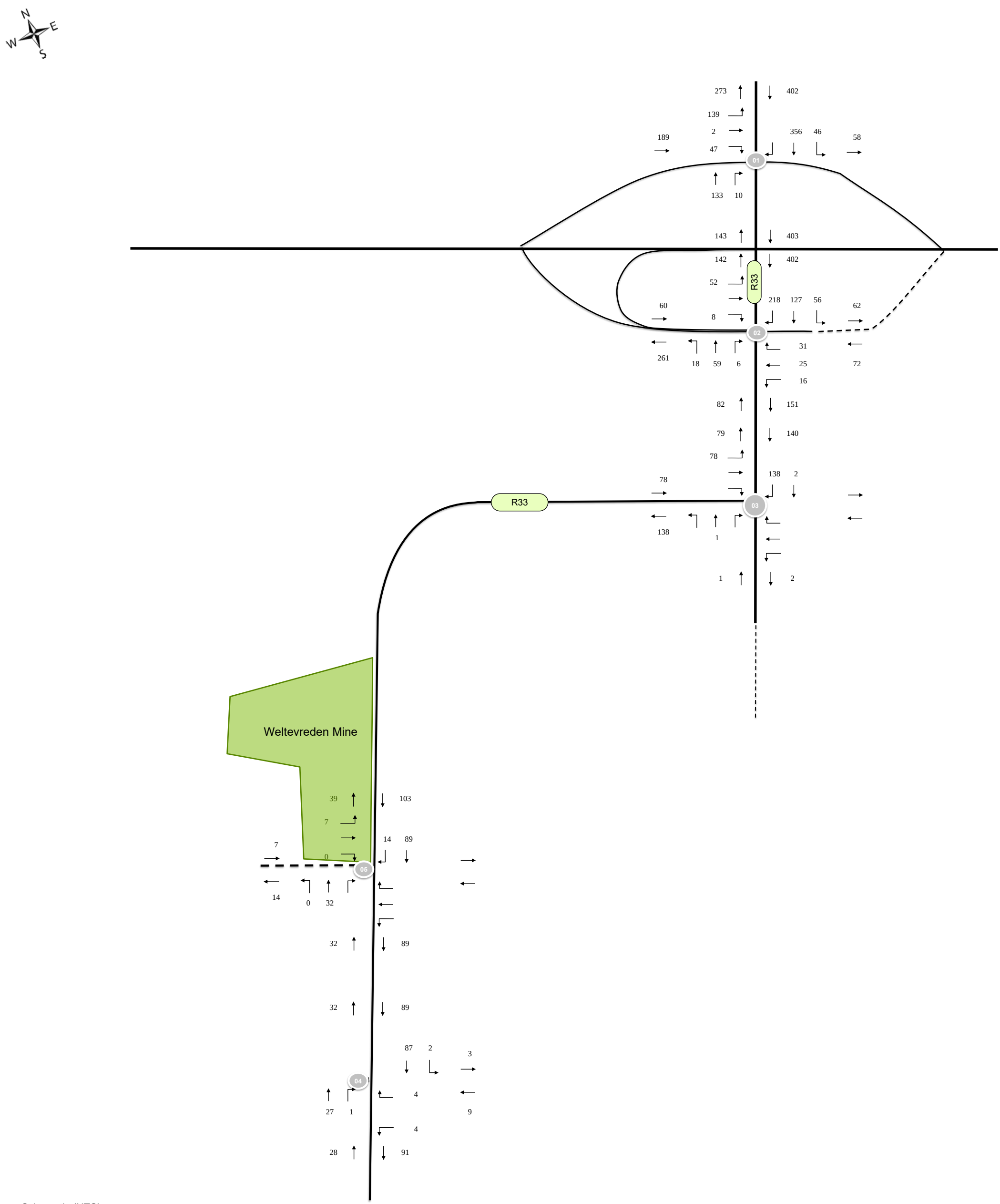
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	Development Traffic - operational phase (AM)	Fig: A-11



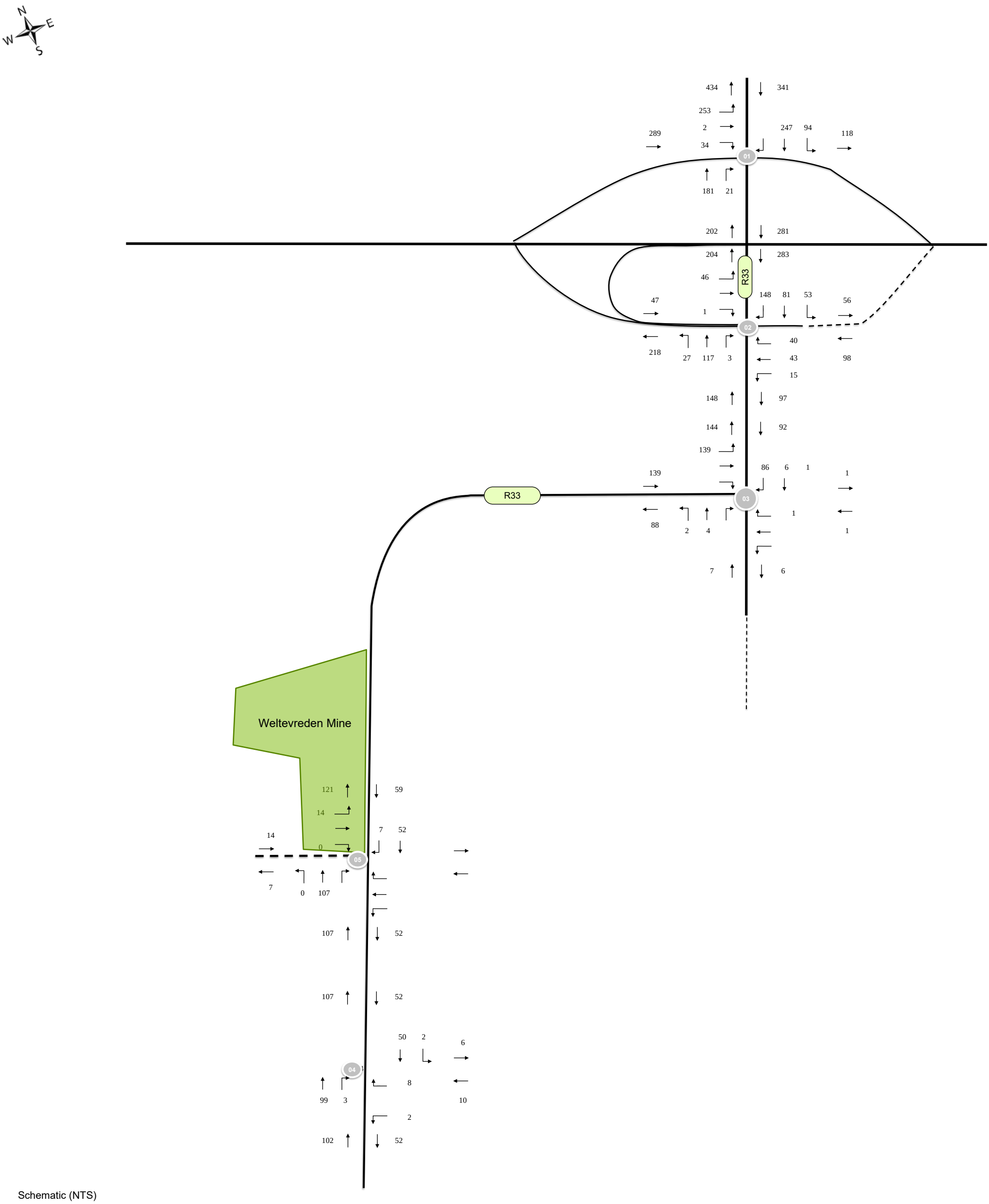
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	Development Traffic - operational phase (PM)	Fig: A-12



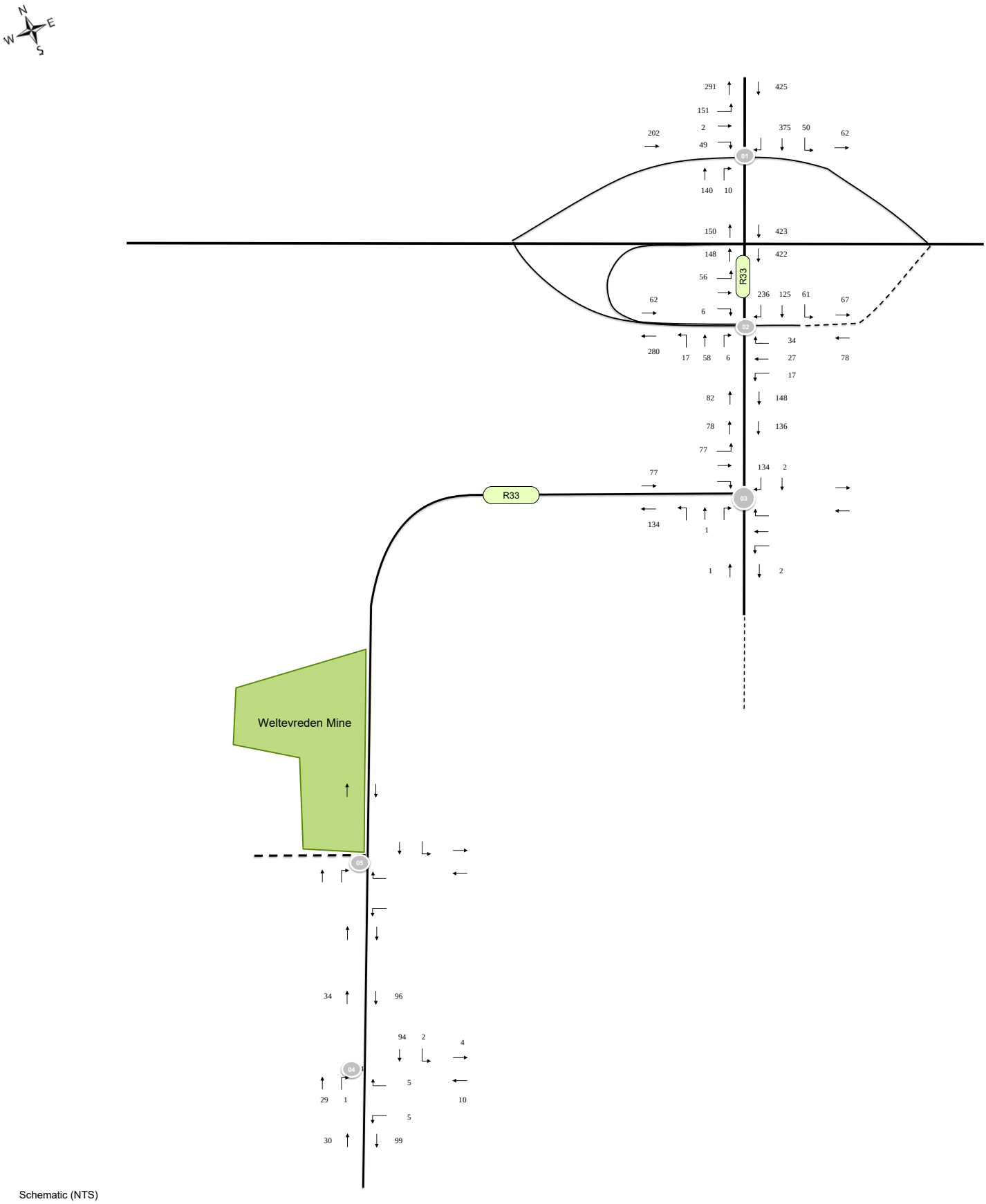
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2022 Opening Year background traffic, with proposed development (operational phase) (AM)	Fig: A-15



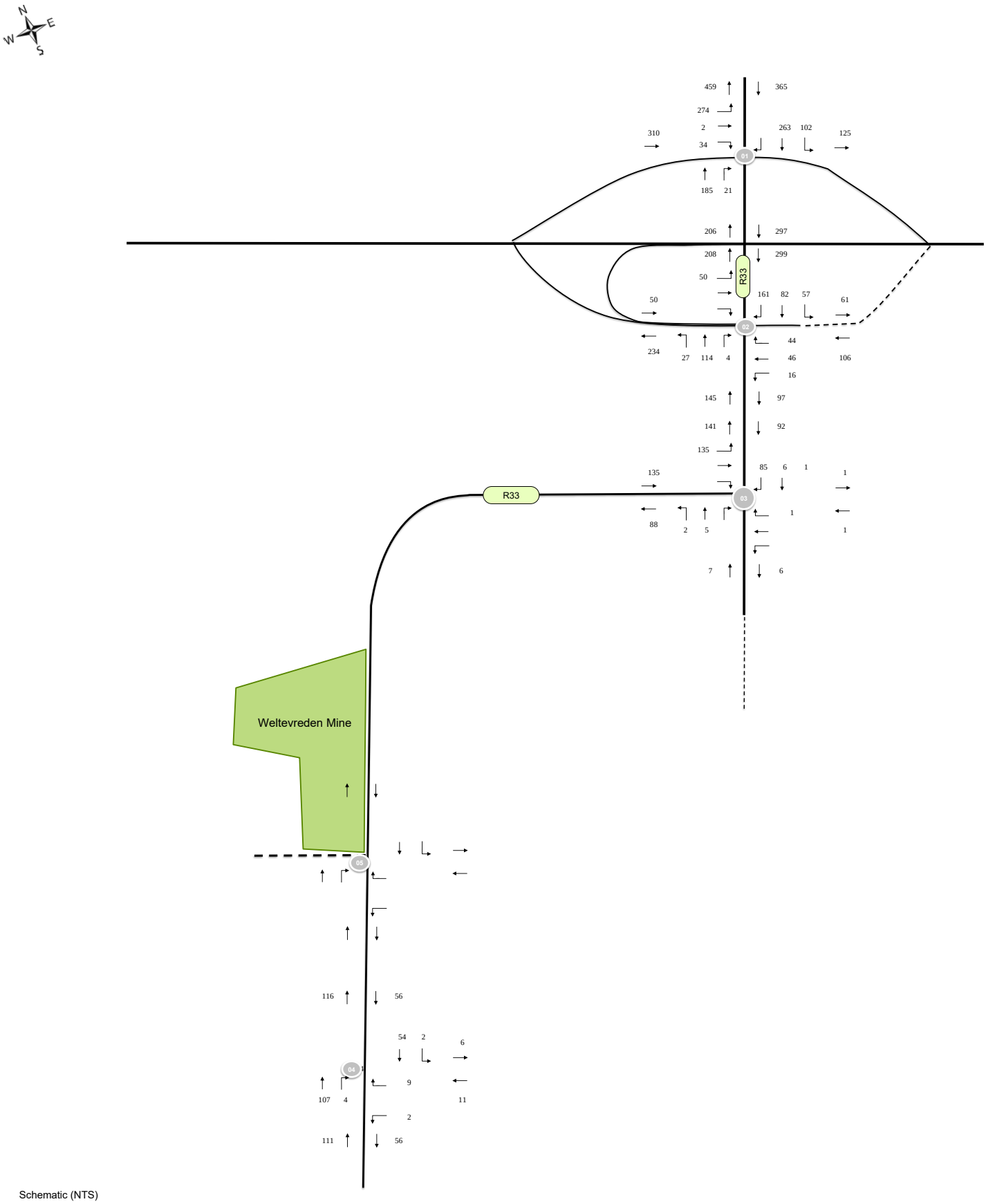
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2022 Opening Year background traffic, with proposed development (operational phase) (PM)	Fig: A-16



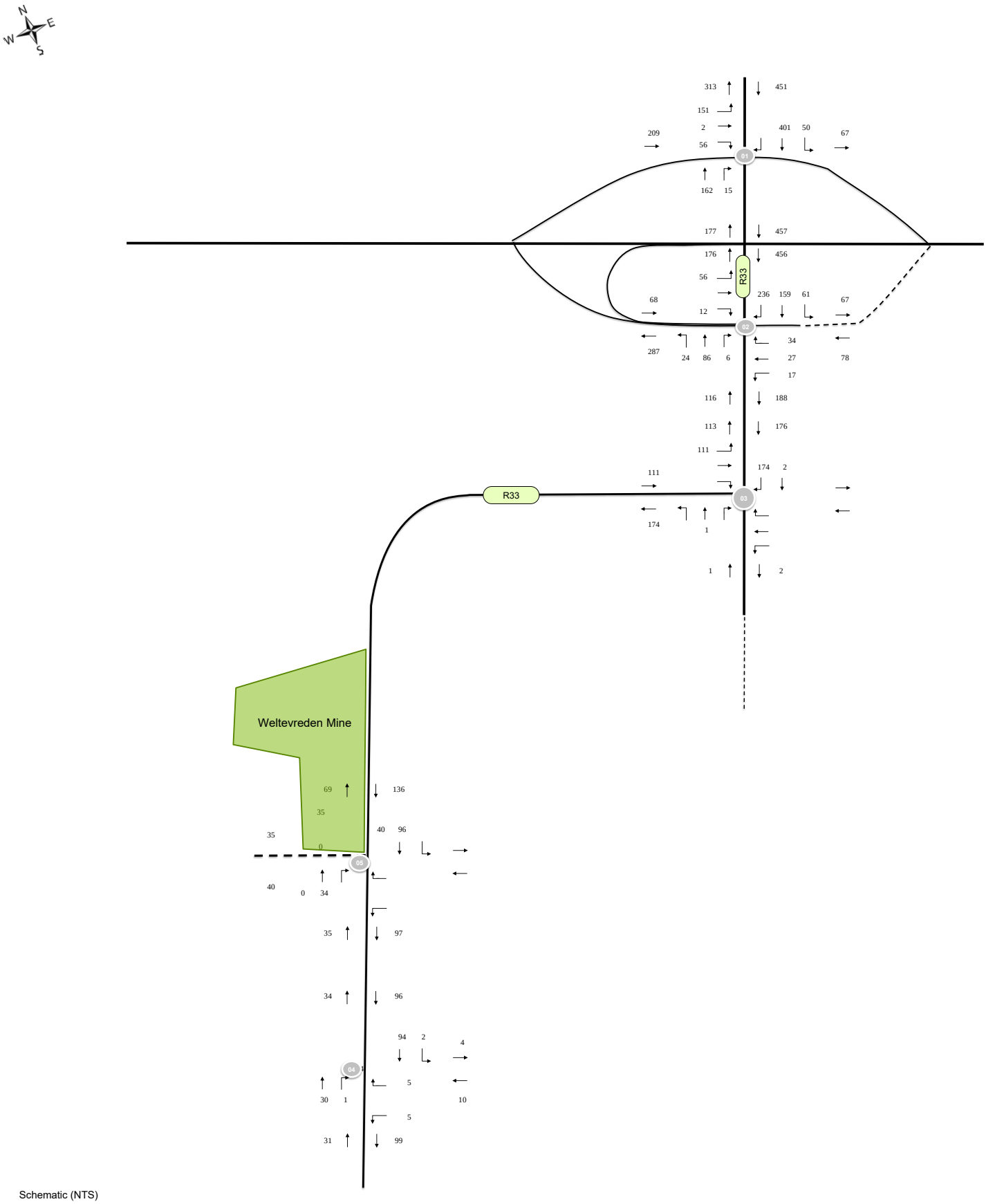
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2024 background traffic, without proposed development (AM)	Fig: A-17



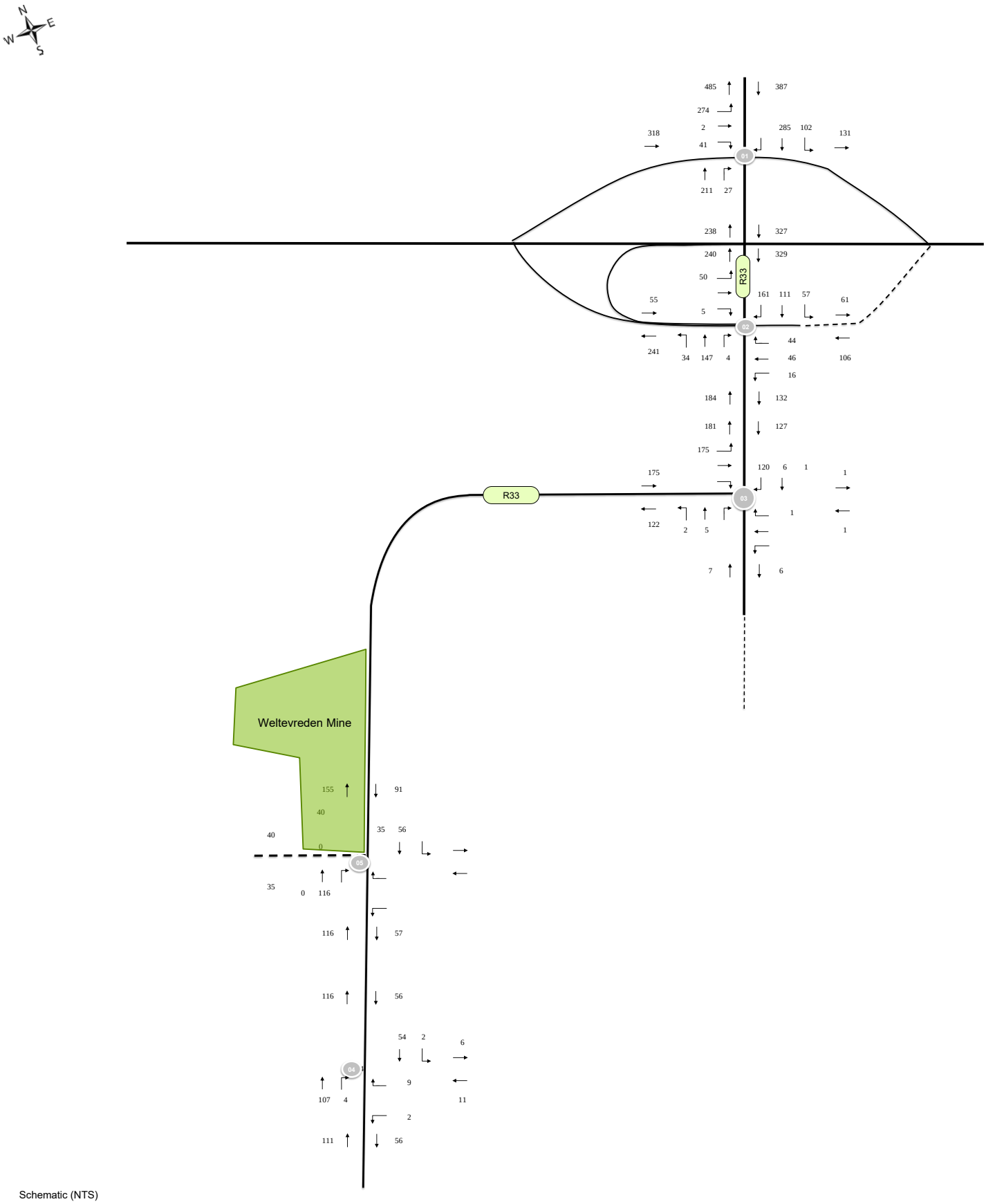
Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2024 background traffic, without proposed development (PM)	Fig: A-18



Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2024 opening year background traffic, with proposed development (operational phase) (AM)	Fig: A-19



Schematic (NTS)

aurecon	Weltevreden Open Cast Mine	Job Ref No: 505288
	2024 opening year background traffic, with proposed development (operational phase) (PM)	Fig: A-20

Appendix C
Mine construction and operational data questionnaire

Item	Question	Response
1	Is there a site plan and the size of the development / site? Y/ N *If yes please provide details and send a copy of the plans*	Yes – layout plan provided
2	How many people are likely to be employed at the facility, for each phase of the development?	Planning Design Phase: _____10_____ Construction Phase: _____50___ Operational Phase: _____250_____ Decommissioning Phase: __50_____

3 Please provide likely breakdown of staff.

Type	Planning	Construction	Operational	Decommissioning
General	0	30	200	30
Technical	6	10	30	10
Administrative	1	8	16	8
Management	3	2	4	2

4 Which are the most likely residential areas where staff will live, and what are the likely percentages of staff living in those areas?

No.	Description	% of staff likely of live there
1.	Siyathuthuka	60%
2.	Belfast	20%
3.		
4		
5.		

Item	Question	Response
5	5.1 When is construction expected to commence?	2021
	5.2 When is the expected opening year of the development:	2022
	5.3 How long is the facility expected to operate? (facility life span)	15 years

6

Will the staff work in shifts: Y/ N

If Yes, what time are these shifts and the approximate number of staff (for each development phase)

_____Y_____

Please provide shift details below

Type	Construction			Operational		
	Shift 1	**Shift 2**	**Shift 3**	**Shift 1**	**Shift 2**	**Shift 3**
General	06:00-16:00 (30 staff)	16:00-02:00 (20 staff)		06:00-16:00 (100 staff)	16:00-02:00 (20 staff)	
Technical	07:00-16:30 (10)			07:00-16:30 (20)	16:00-02:00 (10 staff)	
Administrative	07:00-16:30 (8)			07:00-16:30 (14)	16:00-02:00 (2 staff)	
Management	07:00-16:30 (2)			07:00-16:30 (4)		

7

How many heavy vehicles (and haul trucks) are expected to enter and leave the facility per day, during each phase of the development?

Phase	Inbound	Outbound	Total
Construction	2	2	4
Operational	60	60	120

Item	Question		Response
8	What are the likely origins or destinations of heavy vehicles and haul trucks		
	No.	**Description**	**% distribution**
	Origins	Middleburg	100%
	Destinations	Tutuka Powerstation	100%
9	What is the capacity of heavy vehicles transporting the haul material from the site? (in m^3)		___25m^3_____
10	Are the heavy vehicles going to be operating 24 hours a day or only during set time periods? *(Please confirm operational times if not 24hrs)*		24 hours_____
11	How many vehicles are likely to visit the site on regular basis to deliver and / or collect various goods (regular site supplies)?		

Type of goods	**Light Delivery Vehicles**	**Heavy Vehicles**	**Total**
Office supplies (Stationery, bottled water, food, etc.)	3	1	4
Fuel	0	0	1
Other			

Item	Question		Response
12	Where are the goods above likely to originate from?		Middleburg and Witbank
13	Will parking areas be provided on site? If so, how many parking bays are expected to be provided:		Parking will be provided - 20
14	How many access points are envisaged for the facility? *(Please indicate the accesses on the site plan or SDP)*		One access road from the R33
15	How are staff members expected to access the site? (Please indicate likely % by mode of transport		Xivono intends to provide employee transport to those who require it
	Mode	**Construction**	**Operation**
	Walk / Cycle		
	Minibus Taxis (public)		
	Buses (Public)		
	Rail		
	Staff Transport (Minibuses)	80%	80%
	Staff Transport (Buses)		
	Private cars	20%	20%

Appendix D
Trip generation calculations

1. Employees

Table 1: Number of employees

Type	Planning	Construction	Operational	Decommissioning
General	0	30	200	30
Technical	6	10	30	10
Administrative	1	8	16	8
Management	3	2	4	2
Total	**10**	**50**	**250**	**50**

Table 2: Number per shift

Type	Construction		Operational	
	Shift 1	Shift 2	Shift 1	Shift 2
Shift times (Assumption)	**06h00 to 16h00**	**16h00 to 02h00**	**06h00 to 16h00**	**16h00 to 02h00**
General	20	10	100	100
Technical	10		20	10
Administrative	8		14	2
Management	2		4	
Total	**40**	**10**	**138**	**112**
	50		**250**	

2. Haulage

Table 3: Number haullage trucks

Phase	Inbound	Outbound	Total
Construction	2	2	4
Operational	60	60	120

3. Deliveries and supplies

Table 4: Routine deliveries and supplies (construction and operational phase)

Type of goods	Light Delivery Vehicles			Heavy Vehicles			
	Total per day	AM Peak	PM Peak	Description	Total per day	AM Peak	PM Peak
	Peak / Day proportions	100%	100%	Peak / Day proportions		100%	100%
Office supplies (Stationery, bottled water, food, etc.)	3.0	3.0	3.0	Adhoc Lowbeds to deliver or collect yellow	1.0	1.0	1.0
Fuel	0.0	0.0	0.0	Fuel	1.0	1.0	1.0
Other	0.0	0.0	0.0		0.0	0.0	0.0
Total	**3**	**3.0**	**3.0**		**2**	**2**	**2**

4. Mode share inputs

Table 4: Expected mode share

Mode	Construction	Operation	Vehicle Occupancy Assumptions
Walk / Cycle	0%	0%	1.0
Minibus Taxis (public)	0%	0%	14.0
Buses (Public)	0%	0%	40.0
Rail	0%	0%	1500.0
Staff Transport (Minibuses)	80%	80%	14.0
Staff Transport (Buses)	0%	0%	40.0
Private Vehicles	20%	20%	1.2

5. Trip generation

5.1 Employee trips

Table 5: Employee person trips

Trip Type	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
	100%			100%		
Construction Phase	50	40	10	50	10	40
Operational Phase	250	138	112	250	112	138
Total employee person trips	**300**	**178**	**122**	**300**	**122**	**178**

5.1.2 Employee person trips (mode share)

Table 6: Employee person trips (mode share) | Construction Phase

Mode	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Walk / Cycle	0	0	0	0	0	0
Minibus Taxis (public)	0	0	0	0	0	0
Buses (Public)	0	0	0	0	0	0
Rail	0	0	0	0	0	0
Staff Transport (Minibuses)	40	32	8	40	8	32
Staff Transport (Buses)	0	0	0	0	0	0
Private Vehicles	10	8	2	10	2	8
Total	**50**	**40**	**10**	**50**	**10**	**40**

Table 7: Employee person trips (mode share) | Operational Phase

Mode	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Walk / Cycle	0	0	0	0	0	0
Minibus Taxis (public)	0	0	0	0	0	0
Buses (Public)	0	0	0	0	0	0
Rail	0	0	0	0	0	0
Staff Transport (Minibuses)	200	110	90	200	90	110
Staff Transport (Buses)	0	0	0	0	0	0
Private Vehicles	50	28	22	50	22	28
Total	**250**	**138**	**112**	**250**	**112**	**138**

Tble 8: Employee vehicle trips (mode share) | Construction Phase

Mode	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Walk / Cycle	0	0	0	0	0	0
Minibus Taxis (public)	0	0	0	0	0	0
Buses (Public)	0	0	0	0	0	0
Rail	0	0	0	0	0	0
Staff Transport (Minibuses)	3	2	1	3	1	2
Staff Transport (Buses)	0	0	0	0	0	0
Private Vehicles	8	7	2	8	2	7
Total	**12**	**9**	**3**	**12**	**3**	**9**

Table 9: Employee vehicle trips (mode share) |Operational Phase

Mode	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Walk / Cycle	0	0	0	0	0	0
Minibus Taxis (public)	0	0	0	0	0	0
Buses (Public)	0	0	0	0	0	0
Rail	0	0	0	0	0	0
Staff Transport (Minibuses)	14	8	6	14	6	8
Staff Transport (Buses)	0	0	0	0	0	0
Private Vehicles	42	23	19	42	19	23
Total	**56**	**31**	**26**	**56**	**26**	**31**

5.2 Heavy Vehicle (Haulage)

Table 10: Haulage traffic

% Peak (% of daily) 10%

Phase	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Directional Districution		50%	50%		50%	50%
Construction	1	1	1	1	1	1
Operations	12	6	6	12	6	6

5.3 Deliveries and regular supplies (Construction and Operational Phases)

Table: 11: Delivery and service vehicle traffic

Vehicle Type	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Directional Districution		50%	50%		50%	50%
Light Vehicles	3	1.5	2.0	3.0	1.5	1.5
Heavy Vehicles	2	1.0	1.0	2.0	1.0	1.0
Total	**5**	**3.0**	**3.0**	**5.0**	**3.0**	**3.0**

Table: 11: Delivery and service vehicle traffic (rounded)

Vehicle Type	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Light Vehicles	4	2	2	4	2	2
Heavy Vehicles	2	1	1	2	1	1
Total	**6**	**3**	**3**	**6**	**3**	**3**

6.0 Trip generation summary

Table 12: Trip generation summary | Construction Phase

Vehicle type	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Light vehicles	11	8	4	11	3	8
Minibuses	3	2	1	3	1	2
Heavy vehicles	3	2	2	3	2	2
Total	**17**	**12**	**6**	**17**	**6**	**12**

Table 13: Trip generation summary | Operational Phase

Vehicle type	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Light vehicles	**45**	**25**	**21**	45	**20**	**25**
Minibuses	**14**	8	6	14	6	8
Heavy vehicles	**14**	7	7	14	7	7
Total	**73**	**39**	**34**	73	**34**	**39**

6.0 Trip generation summary (rounded)

Table 14: Trip generation summary | Construction Phase

Vehicle type	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Light vehicles	12	9	4	**13**	4	9
Minibuses	3	3	1	**4**	1	3
Heavy vehicles	3	2	2	**4**	2	2
Total	**18**	**14**	**7**	**21**	**7**	**14**

Table 15: Trip generation summary | Operational Phase

Vehicle type	AM Total	AM Inbound	AM Outbound	PM Total	PM Inbound	PM Outbound
Light vehicles	**45**	**25**	**21**	**46**	**21**	**25**
Minibuses	**15**	8	7	**15**	7	8
Heavy vehicles	**14**	7	7	**14**	7	7
Total	**74**	**40**	**35**	**75**	**35**	**40**

Appendix E
Intersection analysis results

MOVEMENT SUMMARY

Site: 1 [Site 1_SC00_2019 BS_AM]

Site 1 _2019 Base Scenario_AM
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: R33												
2	T1	126	16.5	0.086	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	9	25.0	0.011	8.2	LOS A	0.0	0.3	0.46	0.64	0.46	50.0
Approach		135	17.1	0.086	0.5	NA	0.0	0.3	0.03	0.04	0.03	59.2
North: R33												
7	L2	45	9.8	0.029	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	338	12.3	0.216	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		384	12.0	0.216	0.7	NA	0.0	0.0	0.00	0.07	0.00	59.1
West: N4 On ramp												
10	L2	136	14.5	0.096	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.4
11	T1	2	0.0	0.182	15.0	LOS B	0.7	6.6	0.69	1.03	0.69	44.8
12	R2	44	52.5	0.182	22.7	LOS C	0.7	6.6	0.69	1.03	0.69	42.9
Approach		182	23.5	0.182	9.9	LOS A	0.7	6.6	0.18	0.65	0.18	51.0
All Vehicles		701	16.0	0.216	3.1	NA	0.7	6.6	0.05	0.21	0.05	56.7

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

MOVEMENT SUMMARY

Site: 1 [Site 1_SC00_2019 BS_PM]

Site 1_ 2019 Base Scenario_PM
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: R33												
2	T1	163	7.2	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	18	23.5	0.021	7.8	LOS A	0.1	0.7	0.43	0.64	0.43	50.4
Approach		181	8.8	0.096	0.8	NA	0.1	0.7	0.04	0.06	0.04	58.9
North: R33												
7	L2	90	7.1	0.056	5.6	LOS A	0.0	0.0	0.00	0.57	0.00	53.3
8	T1	232	26.9	0.183	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		322	21.4	0.183	1.6	NA	0.0	0.0	0.00	0.16	0.00	57.9
West: N4 On ramp												
10	L2	241	11.1	0.160	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
11	T1	2	50.0	0.128	21.1	LOS C	0.5	5.2	0.66	1.04	0.66	43.6
12	R2	30	71.4	0.128	22.7	LOS C	0.5	5.2	0.66	1.04	0.66	42.6
Approach		273	18.0	0.160	7.7	LOS A	0.5	5.2	0.08	0.58	0.08	52.8
All Vehicles		776	17.3	0.183	3.6	NA	0.5	5.2	0.04	0.29	0.04	56.2

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.

MOVEMENT SUMMARY

Site: 1 [Site 1_SC01_2022 OY_AM]

Site 1 _2022 Opening Year without Dev._AM
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: R33												
2	T1	142	16.5	0.097	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	10	25.0	0.013	8.7	LOS A	0.0	0.4	0.49	0.66	0.49	49.8
Approach		152	17.1	0.097	0.6	NA	0.0	0.4	0.03	0.04	0.03	59.2
North: R33												
7	L2	51	9.8	0.033	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	380	12.3	0.243	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		431	12.0	0.243	0.7	NA	0.0	0.0	0.00	0.07	0.00	59.1
West: N4 On ramp												
10	L2	153	14.5	0.107	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.4
11	T1	2	0.0	0.239	17.4	LOS C	0.9	9.1	0.75	1.05	0.83	42.7
12	R2	49	52.5	0.239	26.8	LOS D	0.9	9.1	0.75	1.05	0.83	41.0
Approach		204	23.5	0.239	11.0	LOS B	0.9	9.1	0.19	0.65	0.21	50.3
All Vehicles		787	16.0	0.243	3.3	NA	0.9	9.1	0.06	0.21	0.06	56.5

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.
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.

MOVEMENT SUMMARY

Site: 1 [Site 1_SC01_2022 OY_PM]

Site 1_ 2022 Opening Year without Dev._PM
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: R33												
2	T1	183	7.2	0.108	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	20	23.5	0.025	8.2	LOS A	0.1	0.8	0.46	0.66	0.46	50.2
Approach		204	8.8	0.108	0.8	NA	0.1	0.8	0.05	0.07	0.05	58.8
North: R33												
7	L2	101	7.1	0.062	5.6	LOS A	0.0	0.0	0.00	0.57	0.00	53.3
8	T1	260	26.9	0.205	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		361	21.4	0.205	1.6	NA	0.0	0.0	0.00	0.16	0.00	57.9
West: N4 On ramp												
10	L2	271	11.1	0.180	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
11	T1	2	50.0	0.163	23.7	LOS C	0.6	6.5	0.71	1.03	0.71	42.2
12	R2	33	71.4	0.163	25.6	LOS D	0.6	6.5	0.71	1.03	0.71	41.2
Approach		307	17.9	0.180	8.0	LOS A	0.6	6.5	0.08	0.58	0.08	52.6
All Vehicles		871	17.2	0.205	3.7	NA	0.6	6.5	0.04	0.29	0.04	56.1

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.

MOVEMENT SUMMARY

Site: 1 [Site 1_SC03_2024 BT_AM]

Site 1 _2024 Backgroud Traffic without Dev._AM
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: R33												
2	T1	154	16.5	0.105	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	11	25.0	0.016	9.0	LOS A	0.1	0.5	0.51	0.68	0.51	49.5
Approach		165	17.1	0.105	0.6	NA	0.1	0.5	0.03	0.05	0.03	59.1
North: R33												
7	L2	55	9.8	0.036	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	412	12.3	0.263	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		467	12.0	0.263	0.7	NA	0.0	0.0	0.00	0.07	0.00	59.0
West: N4 On ramp												
10	L2	166	14.5	0.117	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.4
11	T1	2	0.0	0.294	20.0	LOS C	1.2	11.6	0.80	1.06	0.94	40.8
12	R2	54	52.5	0.294	31.0	LOS D	1.2	11.6	0.80	1.06	0.94	39.2
Approach		222	23.6	0.294	12.0	LOS B	1.2	11.6	0.20	0.66	0.24	49.6
All Vehicles		854	16.0	0.294	3.6	NA	1.2	11.6	0.06	0.22	0.07	56.3

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.

MOVEMENT SUMMARY

Site: 1 [Site 1_SC03_2024 BT_PM]

Site 1_ 2024 Background Traffic without Dev._PM
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: R33												
2	T1	198	7.2	0.117	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	23	23.5	0.029	8.4	LOS A	0.1	0.9	0.48	0.68	0.48	50.0
Approach		221	8.9	0.117	0.9	NA	0.1	0.9	0.05	0.07	0.05	58.8
North: R33												
7	L2	109	7.1	0.068	5.6	LOS A	0.0	0.0	0.00	0.57	0.00	53.3
8	T1	282	26.9	0.222	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		391	21.4	0.222	1.6	NA	0.0	0.0	0.00	0.16	0.00	57.9
West: N4 On ramp												
10	L2	294	11.1	0.195	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
11	T1	2	50.0	0.199	26.4	LOS D	0.7	8.0	0.75	1.04	0.78	40.9
12	R2	36	71.4	0.199	28.4	LOS D	0.7	8.0	0.75	1.04	0.78	40.0
Approach		332	18.0	0.199	8.4	LOS A	0.7	8.0	0.09	0.58	0.09	52.4
All Vehicles		944	17.2	0.222	3.8	NA	0.7	8.0	0.04	0.29	0.04	56.0

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.

MOVEMENT SUMMARY

Site: 1 [Site 1_SC04_2024 BTWD_AM]

Site 1 _2024 Backgroud Traffic with Dev._AM
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: R33												
2	T1	178	16.5	0.121	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	16	25.0	0.025	9.3	LOS A	0.1	0.8	0.53	0.71	0.53	49.3
Approach		195	17.2	0.121	0.8	NA	0.1	0.8	0.04	0.06	0.04	58.9
North: R33												
7	L2	55	9.8	0.036	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	441	12.3	0.282	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		496	12.0	0.282	0.7	NA	0.0	0.0	0.00	0.06	0.00	59.1
West: N4 On ramp												
10	L2	166	14.5	0.117	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	54.4
11	T1	2	0.0	0.394	24.5	LOS C	1.6	16.2	0.85	1.09	1.10	37.8
12	R2	62	52.5	0.394	38.1	LOS E	1.6	16.2	0.85	1.09	1.10	36.4
Approach		230	24.5	0.394	14.6	LOS B	1.6	16.2	0.24	0.68	0.31	48.0
All Vehicles		920	16.2	0.394	4.2	NA	1.6	16.2	0.07	0.22	0.09	55.8

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

MOVEMENT SUMMARY

Site: 1 [Site 1_SC04_2024 BTWD_PM]

Site 1_ 2024 Background Traffic with Dev._PM
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: R33												
2	T1	226	7.2	0.133	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
3	R2	29	23.5	0.039	8.7	LOS A	0.1	1.2	0.49	0.70	0.49	49.8
Approach		255	9.0	0.133	1.0	NA	0.1	1.2	0.06	0.08	0.06	58.6
North: R33												
7	L2	109	7.1	0.068	5.6	LOS A	0.0	0.0	0.00	0.57	0.00	53.3
8	T1	305	26.9	0.241	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		415	21.7	0.241	1.5	NA	0.0	0.0	0.00	0.15	0.00	58.0
West: N4 On ramp												
10	L2	294	11.1	0.195	5.7	LOS A	0.0	0.0	0.00	0.52	0.00	54.5
11	T1	2	50.0	0.279	31.7	LOS D	1.1	12.0	0.81	1.06	0.93	38.3
12	R2	44	71.4	0.279	34.6	LOS D	1.1	12.0	0.81	1.06	0.93	37.5
Approach		340	19.1	0.279	9.6	LOS A	1.1	12.0	0.11	0.60	0.13	51.4
All Vehicles		1010	17.6	0.279	4.1	NA	1.1	12.0	0.05	0.28	0.06	55.7

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

MOVEMENT SUMMARY

Site: 2 [Site2_SC00_2019 BS_AM]

Site 2_2019 Base Scenario_AM
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: R33												
1	L2	16	78.6	0.022	6.4	LOS A	0.0	0.0	0.00	0.56	0.00	47.7
2	T1	54	33.3	0.051	0.1	LOS A	0.0	0.4	0.06	0.06	0.06	58.8
3	R2	6	20.0	0.051	6.7	LOS A	0.0	0.4	0.06	0.06	0.06	55.0
Approach		75	41.8	0.051	1.9	NA	0.0	0.4	0.05	0.16	0.05	55.8
East: Engen Garage Access Road												
4	L2	16	28.6	0.191	10.1	LOS B	0.7	5.7	0.52	0.97	0.52	41.3
5	T1	25	9.1	0.191	16.2	LOS C	0.7	5.7	0.52	0.97	0.52	47.2
6	R2	31	17.9	0.191	19.6	LOS C	0.7	5.7	0.52	0.97	0.52	46.8
Approach		72	17.2	0.191	16.4	LOS C	0.7	5.7	0.52	0.97	0.52	45.9
North: R33												
7	L2	56	16.0	0.040	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	52.9
8	T1	115	28.1	0.093	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	217	11.9	0.173	6.1	LOS A	0.8	6.0	0.21	0.56	0.21	52.3
Approach		388	17.3	0.173	4.2	NA	0.8	6.0	0.12	0.39	0.12	54.0
West: N4 On/Off Ramp												
10	L2	51	2.2	0.065	8.4	LOS A	0.2	1.7	0.16	0.92	0.16	51.1
11	T1	1	0.0	0.065	15.2	LOS C	0.2	1.7	0.16	0.92	0.16	51.4
12	R2	6	0.0	0.065	15.3	LOS C	0.2	1.7	0.16	0.92	0.16	48.4
Approach		58	1.9	0.065	9.2	LOS A	0.2	1.7	0.16	0.92	0.16	50.9
All Vehicles		593	18.9	0.191	5.9	NA	0.8	6.0	0.16	0.49	0.16	52.7

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

MOVEMENT SUMMARY

Site: 2 [Site2_SC00_2019 BS_PM]

Site 2_2019 Base Scenario_PM
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: R33												
1	L2	24	54.5	0.027	6.2	LOS A	0.0	0.0	0.00	0.57	0.00	48.9
2	T1	101	7.4	0.067	0.1	LOS A	0.0	0.4	0.03	0.04	0.03	59.6
3	R2	3	100.0	0.067	7.4	LOS A	0.0	0.4	0.03	0.04	0.03	53.8
Approach		127	18.4	0.067	1.5	NA	0.0	0.4	0.02	0.13	0.02	57.1
East: Engen Garage Access Road												
4	L2	14	15.4	0.221	9.2	LOS A	0.9	6.7	0.49	0.97	0.49	43.3
5	T1	41	21.1	0.221	16.2	LOS C	0.9	6.7	0.49	0.97	0.49	47.5
6	R2	39	8.3	0.221	16.0	LOS C	0.9	6.7	0.49	0.97	0.49	47.8
Approach		93	15.0	0.221	15.1	LOS C	0.9	6.7	0.49	0.97	0.49	47.1
North: R33												
7	L2	50	10.6	0.033	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	72	50.7	0.075	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	141	28.0	0.129	6.6	LOS A	0.6	4.8	0.28	0.57	0.28	51.4
Approach		263	30.9	0.129	4.6	NA	0.6	4.8	0.15	0.42	0.15	53.4
West: N4 On/Off Ramp												
10	L2	44	9.8	0.048	9.0	LOS A	0.2	1.3	0.22	0.90	0.22	51.1
11	T1	1	0.0	0.048	13.7	LOS B	0.2	1.3	0.22	0.90	0.22	51.7
12	R2	1	0.0	0.048	14.0	LOS B	0.2	1.3	0.22	0.90	0.22	48.8
Approach		46	9.3	0.048	9.2	LOS A	0.2	1.3	0.22	0.90	0.22	51.1
All Vehicles		530	23.2	0.221	6.1	NA	0.9	6.7	0.18	0.49	0.18	52.5

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.
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.

MOVEMENT SUMMARY

Site: 2 [Site2_SC01_2022 OY_AM]

Site 2_2022 Opening Year without Dev._AM
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: R33												
1	L2	18	78.6	0.026	6.4	LOS A	0.0	0.0	0.00	0.56	0.00	47.7
2	T1	60	33.3	0.058	0.1	LOS A	0.1	0.5	0.07	0.06	0.07	58.7
3	R2	7	20.0	0.058	6.8	LOS A	0.1	0.5	0.07	0.06	0.07	55.0
Approach		85	41.8	0.058	2.0	NA	0.1	0.5	0.06	0.17	0.06	55.7
East: Engen Garage Access Road												
4	L2	18	28.6	0.241	10.6	LOS B	0.9	7.4	0.56	0.98	0.60	40.1
5	T1	28	9.1	0.241	18.3	LOS C	0.9	7.4	0.56	0.98	0.60	46.0
6	R2	35	17.9	0.241	22.6	LOS C	0.9	7.4	0.56	0.98	0.60	45.7
Approach		81	17.2	0.241	18.4	LOS C	0.9	7.4	0.56	0.98	0.60	44.7
North: R33												
7	L2	63	16.0	0.045	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	52.9
8	T1	130	28.1	0.105	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	244	11.9	0.197	6.1	LOS A	0.9	7.0	0.23	0.56	0.23	52.2
Approach		436	17.3	0.197	4.2	NA	0.9	7.0	0.13	0.40	0.13	54.0
West: N4 On/Off Ramp												
10	L2	58	2.2	0.077	8.4	LOS A	0.3	2.0	0.18	0.91	0.18	51.0
11	T1	1	0.0	0.077	16.7	LOS C	0.3	2.0	0.18	0.91	0.18	51.2
12	R2	7	0.0	0.077	17.0	LOS C	0.3	2.0	0.18	0.91	0.18	48.2
Approach		66	1.9	0.077	9.4	LOS A	0.3	2.0	0.18	0.91	0.18	50.7
All Vehicles		668	18.9	0.241	6.2	NA	0.9	7.4	0.18	0.49	0.18	52.4

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.

MOVEMENT SUMMARY

Site: 2 [Site2_SC01_2022 OY_PM]

Site 2_2022 Opening Year without Dev_PM
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: R33												
1	L2	27	54.5	0.031	6.2	LOS A	0.0	0.0	0.00	0.57	0.00	48.9
2	T1	113	7.4	0.074	0.1	LOS A	0.0	0.4	0.03	0.03	0.03	59.6
3	R2	3	100.0	0.074	7.6	LOS A	0.0	0.4	0.03	0.03	0.03	53.8
Approach		143	18.3	0.074	1.5	NA	0.0	0.4	0.02	0.13	0.02	57.1
East: Engen Garage Access Road												
4	L2	16	15.4	0.272	9.7	LOS A	1.1	9.0	0.53	0.99	0.59	42.2
5	T1	46	21.1	0.272	18.2	LOS C	1.1	9.0	0.53	0.99	0.59	46.5
6	R2	43	8.3	0.272	18.1	LOS C	1.1	9.0	0.53	0.99	0.59	46.8
Approach		105	15.0	0.272	16.8	LOS C	1.1	9.0	0.53	0.99	0.59	46.1
North: R33												
7	L2	57	10.6	0.037	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	80	50.7	0.083	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	158	28.0	0.148	6.7	LOS A	0.6	5.5	0.30	0.58	0.30	51.3
Approach		296	30.8	0.148	4.7	NA	0.6	5.5	0.16	0.42	0.16	53.4
West: N4 On/Off Ramp												
10	L2	49	9.8	0.054	9.0	LOS A	0.2	1.5	0.24	0.90	0.24	51.1
11	T1	1	0.0	0.054	14.6	LOS B	0.2	1.5	0.24	0.90	0.24	51.6
12	R2	1	0.0	0.054	15.2	LOS C	0.2	1.5	0.24	0.90	0.24	48.8
Approach		51	9.4	0.054	9.3	LOS A	0.2	1.5	0.24	0.90	0.24	51.1
All Vehicles		595	23.2	0.272	6.4	NA	1.1	9.0	0.20	0.49	0.21	52.3

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.

MOVEMENT SUMMARY

Site: 2 [Site2_SC02_2022 BT_PM]

Site 2_2022 Background Traffic with Dev_PM
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: R33												
1	L2	27	54.5	0.031	6.2	LOS A	0.0	0.0	0.00	0.57	0.00	48.9
2	T1	125	7.4	0.081	0.1	LOS A	0.1	0.4	0.03	0.03	0.03	59.7
3	R2	3	100.0	0.081	7.7	LOS A	0.1	0.4	0.03	0.03	0.03	53.9
Approach		155	17.4	0.081	1.4	NA	0.1	0.4	0.02	0.12	0.02	57.3
East: Engen Garage Access Road												
4	L2	18	15.4	0.284	9.9	LOS A	1.2	9.5	0.54	0.99	0.61	41.9
5	T1	46	21.1	0.284	18.9	LOS C	1.2	9.5	0.54	0.99	0.61	46.2
6	R2	43	8.3	0.284	18.8	LOS C	1.2	9.5	0.54	0.99	0.61	46.5
Approach		107	15.0	0.284	17.3	LOS C	1.2	9.5	0.54	0.99	0.61	45.7
North: R33												
7	L2	57	10.6	0.037	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	85	50.7	0.088	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	161	28.0	0.152	6.8	LOS A	0.7	5.7	0.31	0.59	0.31	51.3
Approach		302	31.1	0.152	4.7	NA	0.7	5.7	0.17	0.42	0.17	53.4
West: N4 On/Off Ramp												
10	L2	49	9.8	0.055	9.1	LOS A	0.2	1.5	0.25	0.89	0.25	51.1
11	T1	1	0.0	0.055	15.0	LOS C	0.2	1.5	0.25	0.89	0.25	51.6
12	R2	1	0.0	0.055	15.7	LOS C	0.2	1.5	0.25	0.89	0.25	48.7
Approach		51	9.4	0.055	9.4	LOS A	0.2	1.5	0.25	0.89	0.25	51.0
All Vehicles		616	23.0	0.284	6.4	NA	1.2	9.5	0.20	0.48	0.21	52.3

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.

MOVEMENT SUMMARY

Site: 2 [Site2_SC03_2024 BT_AM]

Site 2_2024 Background Traffic without Dev._AM
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: R33												
1	L2	19	78.6	0.027	6.4	LOS A	0.0	0.0	0.00	0.56	0.00	47.7
2	T1	65	33.3	0.061	0.1	LOS A	0.1	0.5	0.07	0.06	0.07	58.8
3	R2	7	20.0	0.061	6.9	LOS A	0.1	0.5	0.07	0.06	0.07	55.0
Approach		91	41.8	0.061	2.0	NA	0.1	0.5	0.06	0.16	0.06	55.8
East: Engen Garage Access Road												
4	L2	19	28.6	0.287	11.3	LOS B	1.2	9.4	0.61	1.01	0.71	38.9
5	T1	30	9.1	0.287	20.3	LOS C	1.2	9.4	0.61	1.01	0.71	44.9
6	R2	38	17.9	0.287	25.4	LOS D	1.2	9.4	0.61	1.01	0.71	44.5
Approach		87	17.2	0.287	20.6	LOS C	1.2	9.4	0.61	1.01	0.71	43.6
North: R33												
7	L2	68	16.0	0.049	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	52.9
8	T1	140	28.1	0.113	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	264	11.9	0.215	6.2	LOS A	1.0	7.7	0.24	0.57	0.24	52.2
Approach		472	17.3	0.215	4.3	NA	1.0	7.7	0.14	0.40	0.14	53.9
West: N4 On/Off Ramp												
10	L2	63	2.2	0.084	8.5	LOS A	0.3	2.1	0.19	0.91	0.19	50.9
11	T1	1	0.0	0.084	17.9	LOS C	0.3	2.1	0.19	0.91	0.19	51.1
12	R2	7	0.0	0.084	18.3	LOS C	0.3	2.1	0.19	0.91	0.19	48.2
Approach		70	2.0	0.084	9.6	LOS A	0.3	2.1	0.19	0.91	0.19	50.7
All Vehicles		720	18.9	0.287	6.5	NA	1.2	9.4	0.19	0.49	0.20	52.2

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.

MOVEMENT SUMMARY

Site: 2 [Site2_SC03_2024 BT_PM]

Site 2_2024 Background Traffic without Dev_PM
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: R33												
1	L2	29	54.5	0.034	6.2	LOS A	0.0	0.0	0.00	0.57	0.00	48.9
2	T1	122	7.4	0.082	0.1	LOS A	0.1	0.5	0.04	0.04	0.04	59.5
3	R2	4	100.0	0.082	7.7	LOS A	0.1	0.5	0.04	0.04	0.04	53.7
Approach		155	18.7	0.082	1.6	NA	0.1	0.5	0.03	0.14	0.03	57.0
East: Engen Garage Access Road												
4	L2	17	15.4	0.319	10.4	LOS B	1.4	11.2	0.57	1.01	0.68	41.1
5	T1	49	21.1	0.319	20.1	LOS C	1.4	11.2	0.57	1.01	0.68	45.5
6	R2	47	8.3	0.319	20.1	LOS C	1.4	11.2	0.57	1.01	0.68	45.8
Approach		113	14.9	0.319	18.6	LOS C	1.4	11.2	0.57	1.01	0.68	45.1
North: R33												
7	L2	61	10.6	0.040	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	88	50.7	0.091	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	172	28.0	0.163	6.8	LOS A	0.7	6.2	0.32	0.59	0.32	51.3
Approach		321	30.9	0.163	4.7	NA	0.7	6.2	0.17	0.43	0.17	53.3
West: N4 On/Off Ramp												
10	L2	54	9.8	0.060	9.1	LOS A	0.2	1.6	0.25	0.90	0.25	51.1
11	T1	1	0.0	0.060	15.5	LOS C	0.2	1.6	0.25	0.90	0.25	51.6
12	R2	1	0.0	0.060	16.3	LOS C	0.2	1.6	0.25	0.90	0.25	48.7
Approach		56	9.4	0.060	9.3	LOS A	0.2	1.6	0.25	0.90	0.25	51.0
All Vehicles		646	23.3	0.319	6.8	NA	1.4	11.2	0.21	0.50	0.23	52.0

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.

MOVEMENT SUMMARY

Site: 2 [Site2_SC04_2024 BTWD_AM]

Site 2_2024 Background Traffic with Dev._AM
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: R33												
1	L2	19	78.6	0.027	6.4	LOS A	0.0	0.0	0.00	0.56	0.00	47.7
2	T1	96	33.3	0.088	0.1	LOS A	0.1	0.6	0.06	0.04	0.06	59.1
3	R2	7	20.0	0.088	7.2	LOS A	0.1	0.6	0.06	0.04	0.06	55.3
Approach		122	39.6	0.088	1.5	NA	0.1	0.6	0.05	0.12	0.05	56.8
East: Engen Garage Access Road												
4	L2	27	28.6	0.343	12.6	LOS B	1.5	11.8	0.65	1.02	0.83	37.6
5	T1	30	9.1	0.343	23.8	LOS C	1.5	11.8	0.65	1.02	0.83	43.5
6	R2	38	17.9	0.343	30.3	LOS D	1.5	11.8	0.65	1.02	0.83	43.2
Approach		95	18.1	0.343	23.2	LOS C	1.5	11.8	0.65	1.02	0.83	41.9
North: R33												
7	L2	68	16.0	0.049	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	52.9
8	T1	170	28.1	0.137	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	272	11.9	0.230	6.4	LOS A	1.1	8.3	0.29	0.58	0.29	52.0
Approach		510	17.8	0.230	4.2	NA	1.1	8.3	0.16	0.39	0.16	54.1
West: N4 On/Off Ramp												
10	L2	63	2.2	0.118	8.7	LOS A	0.4	3.0	0.28	0.89	0.28	50.0
11	T1	1	0.0	0.118	20.1	LOS C	0.4	3.0	0.28	0.89	0.28	50.2
12	R2	13	0.0	0.118	21.3	LOS C	0.4	3.0	0.28	0.89	0.28	47.1
Approach		77	1.8	0.118	11.0	LOS B	0.4	3.0	0.28	0.89	0.28	49.6
All Vehicles		804	19.6	0.343	6.7	NA	1.5	11.8	0.21	0.47	0.23	52.0

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.

MOVEMENT SUMMARY

Site: 2 [Site2_SC04_2024 BTWD_PM]

Site 2_2024 Background Traffic without Dev_PM
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: R33												
1	L2	29	54.5	0.034	6.2	LOS A	0.0	0.0	0.00	0.57	0.00	48.9
2	T1	157	7.4	0.103	0.1	LOS A	0.1	0.6	0.03	0.03	0.03	59.6
3	R2	4	100.0	0.103	8.1	LOS A	0.1	0.6	0.03	0.03	0.03	53.8
Approach		191	16.6	0.103	1.3	NA	0.1	0.6	0.03	0.11	0.03	57.5
East: Engen Garage Access Road												
4	L2	25	15.4	0.373	11.5	LOS B	1.7	13.8	0.61	1.02	0.80	39.7
5	T1	49	21.1	0.373	23.4	LOS C	1.7	13.8	0.61	1.02	0.80	44.2
6	R2	47	8.3	0.373	23.6	LOS C	1.7	13.8	0.61	1.02	0.80	44.5
Approach		121	15.0	0.373	21.1	LOS C	1.7	13.8	0.61	1.02	0.80	43.5
North: R33												
7	L2	61	10.6	0.040	5.7	LOS A	0.0	0.0	0.00	0.57	0.00	53.2
8	T1	111	50.7	0.116	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	180	28.0	0.177	7.0	LOS A	0.8	6.7	0.36	0.61	0.36	51.2
Approach		352	32.2	0.177	4.6	NA	0.8	6.7	0.18	0.41	0.18	53.5
West: N4 On/Off Ramp												
10	L2	54	9.8	0.078	9.3	LOS A	0.3	2.1	0.32	0.89	0.32	50.5
11	T1	1	0.0	0.078	17.2	LOS C	0.3	2.1	0.32	0.89	0.32	51.0
12	R2	5	0.0	0.078	18.6	LOS C	0.3	2.1	0.32	0.89	0.32	48.0
Approach		60	8.7	0.078	10.3	LOS B	0.3	2.1	0.32	0.89	0.32	50.3
All Vehicles		724	23.3	0.373	6.9	NA	1.7	13.8	0.22	0.48	0.26	51.9

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.

MOVEMENT SUMMARY

Site: 3 [Site 3_SC00_2019 BS_AM]

Site 3_2019 Base Scenario_AM
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: RoadName												
4	L2	1	0.0	0.004	8.0	LOS A	0.0	0.1	0.01	1.05	0.01	50.6
5	T1	1	100.0	0.004	11.0	LOS B	0.0	0.1	0.01	1.05	0.01	46.0
6	R2	1	0.0	0.004	7.5	LOS A	0.0	0.1	0.01	1.05	0.01	50.0
Approach		4	33.3	0.004	9.2	LOS A	0.0	0.1	0.01	1.05	0.01	49.0
East: RoadName												
7	L2	1	0.0	0.002	5.5	LOS A	0.0	0.0	0.01	0.39	0.01	54.4
8	T1	1	0.0	0.002	0.0	LOS A	0.0	0.0	0.01	0.39	0.01	56.6
9	R2	1	0.0	0.002	5.4	LOS A	0.0	0.0	0.01	0.39	0.01	53.5
Approach		4	0.0	0.002	3.7	NA	0.0	0.0	0.01	0.39	0.01	54.9
North: R33												
10	L2	1	0.0	0.164	8.0	LOS A	0.6	5.3	0.13	0.97	0.13	50.1
11	T1	2	50.0	0.164	10.5	LOS B	0.6	5.3	0.13	0.97	0.13	45.9
12	R2	135	28.2	0.164	9.6	LOS A	0.6	5.3	0.13	0.97	0.13	48.8
Approach		139	28.3	0.164	9.6	LOS A	0.6	5.3	0.13	0.97	0.13	48.8
West: R33												
1	L2	77	42.9	0.079	6.1	LOS A	0.0	0.0	0.00	0.50	0.00	52.2
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.30	0.02	57.4
3	R2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.02	0.30	0.02	54.6
Approach		80	41.6	0.079	6.0	NA	0.0	0.0	0.00	0.50	0.00	52.3
All Vehicles		226	32.6	0.164	8.2	NA	0.6	5.3	0.08	0.79	0.08	50.1

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.

MOVEMENT SUMMARY

Site: 3 [Site 3_SC00_2019 BS_PM]

Site 3_2019 Base Scenario_PM
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: RoadName												
4	L2	3	50.0	0.009	10.1	LOS B	0.0	0.3	0.01	1.05	0.01	48.3
5	T1	5	25.0	0.009	9.8	LOS A	0.0	0.3	0.01	1.05	0.01	47.0
6	R2	1	0.0	0.009	7.5	LOS A	0.0	0.3	0.01	1.05	0.01	49.9
Approach		9	28.6	0.009	9.5	LOS A	0.0	0.3	0.01	1.05	0.01	47.9
East: RoadName												
7	L2	1	0.0	0.002	5.5	LOS A	0.0	0.0	0.01	0.39	0.01	54.4
8	T1	1	0.0	0.002	0.0	LOS A	0.0	0.0	0.01	0.39	0.01	56.6
9	R2	1	0.0	0.002	5.4	LOS A	0.0	0.0	0.01	0.39	0.01	53.5
Approach		4	0.0	0.002	3.7	NA	0.0	0.0	0.01	0.39	0.01	54.9
North: R33												
10	L2	1	0.0	0.126	8.0	LOS A	0.5	4.5	0.13	1.00	0.13	49.8
11	T1	6	20.0	0.126	9.1	LOS A	0.5	4.5	0.13	1.00	0.13	47.0
12	R2	88	48.6	0.126	10.9	LOS B	0.5	4.5	0.13	1.00	0.13	47.7
Approach		95	46.1	0.126	10.7	LOS B	0.5	4.5	0.13	1.00	0.13	47.7
West: R33												
1	L2	139	18.9	0.105	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	53.2
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.30	0.02	57.4
3	R2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.02	0.30	0.02	54.6
Approach		141	18.6	0.105	5.8	NA	0.0	0.0	0.00	0.51	0.00	53.2
All Vehicles		249	29.1	0.126	7.8	NA	0.5	4.5	0.05	0.72	0.05	50.9

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.

MOVEMENT SUMMARY

Site: [Site _SC01_2022 OY_AM]

Site 3_2022 Opening Year without Dev._AM
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: RoadName												
4	L2	1	0.0	0.004	8.0	LOS A	0.0	0.1	0.01	1.05	0.01	50.6
5	T1	1	100.0	0.004	11.1	LOS B	0.0	0.1	0.01	1.05	0.01	46.0
6	R2	1	0.0	0.004	7.5	LOS A	0.0	0.1	0.01	1.05	0.01	50.0
Approach		4	33.3	0.004	9.3	LOS A	0.0	0.1	0.01	1.05	0.01	49.0
East: RoadName												
7	L2	1	0.0	0.002	5.5	LOS A	0.0	0.0	0.01	0.39	0.01	54.4
8	T1	1	0.0	0.002	0.0	LOS A	0.0	0.0	0.01	0.39	0.01	56.6
9	R2	1	0.0	0.002	5.4	LOS A	0.0	0.0	0.01	0.39	0.01	53.5
Approach		4	0.0	0.002	3.7	NA	0.0	0.0	0.01	0.39	0.01	54.9
North: R33												
10	L2	1	0.0	0.185	8.0	LOS A	0.7	6.2	0.14	0.97	0.14	50.1
11	T1	2	50.0	0.185	10.5	LOS B	0.7	6.2	0.14	0.97	0.14	45.9
12	R2	152	28.2	0.185	9.7	LOS A	0.7	6.2	0.14	0.97	0.14	48.8
Approach		156	28.3	0.185	9.7	LOS A	0.7	6.2	0.14	0.97	0.14	48.8
West: R33												
1	L2	87	42.9	0.089	6.1	LOS A	0.0	0.0	0.00	0.50	0.00	52.2
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.30	0.02	57.4
3	R2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.02	0.30	0.02	54.6
Approach		90	41.7	0.089	6.0	NA	0.0	0.0	0.00	0.50	0.00	52.3
All Vehicles		253	32.7	0.185	8.3	NA	0.7	6.2	0.09	0.79	0.09	50.1

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.

MOVEMENT SUMMARY

Site: [Site _SC01_2022 OY_PM]

Site 3_2022 Opening Year without Dev._PM
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: RoadName												
4	L2	3	50.0	0.009	10.1	LOS B	0.0	0.3	0.01	1.05	0.01	48.3
5	T1	5	25.0	0.009	9.9	LOS A	0.0	0.3	0.01	1.05	0.01	47.0
6	R2	1	0.0	0.009	7.5	LOS A	0.0	0.3	0.01	1.05	0.01	49.8
Approach		9	28.6	0.009	9.6	LOS A	0.0	0.3	0.01	1.05	0.01	47.8
East: RoadName												
7	L2	1	0.0	0.002	5.5	LOS A	0.0	0.0	0.01	0.39	0.01	54.4
8	T1	1	0.0	0.002	0.0	LOS A	0.0	0.0	0.01	0.39	0.01	56.6
9	R2	1	0.0	0.002	5.4	LOS A	0.0	0.0	0.01	0.39	0.01	53.5
Approach		4	0.0	0.002	3.7	NA	0.0	0.0	0.01	0.39	0.01	54.9
North: R33												
10	L2	1	0.0	0.145	8.0	LOS A	0.5	5.2	0.14	1.00	0.14	49.8
11	T1	8	20.0	0.145	9.2	LOS A	0.5	5.2	0.14	1.00	0.14	47.0
12	R2	99	48.6	0.145	11.0	LOS B	0.5	5.2	0.14	1.00	0.14	47.6
Approach		108	46.0	0.145	10.9	LOS B	0.5	5.2	0.14	1.00	0.14	47.6
West: R33												
1	L2	156	18.9	0.118	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	53.2
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.30	0.02	57.4
3	R2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.02	0.30	0.02	54.6
Approach		159	18.6	0.118	5.8	NA	0.0	0.0	0.00	0.51	0.00	53.2
All Vehicles		279	29.2	0.145	7.8	NA	0.5	5.2	0.05	0.72	0.05	50.8

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

MOVEMENT SUMMARY

Site: 3 [Site 3_SC02_2022 BT_AM]

Site 3_2022 Background Traffic with Dev._AM
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: RoadName												
4	L2	1	0.0	0.004	8.0	LOS A	0.0	0.1	0.01	1.05	0.01	50.5
5	T1	1	100.0	0.004	11.2	LOS B	0.0	0.1	0.01	1.05	0.01	45.9
6	R2	1	0.0	0.004	7.5	LOS A	0.0	0.1	0.01	1.05	0.01	50.0
Approach		4	33.3	0.004	9.3	LOS A	0.0	0.1	0.01	1.05	0.01	48.9
East: RoadName												
7	L2	1	0.0	0.002	5.5	LOS A	0.0	0.0	0.01	0.39	0.01	54.4
8	T1	1	0.0	0.002	0.0	LOS A	0.0	0.0	0.01	0.39	0.01	56.6
9	R2	1	0.0	0.002	5.4	LOS A	0.0	0.0	0.01	0.39	0.01	53.5
Approach		4	0.0	0.002	3.7	NA	0.0	0.0	0.01	0.39	0.01	54.9
North: R33												
10	L2	1	0.0	0.207	8.0	LOS A	0.8	7.1	0.15	0.96	0.15	50.1
11	T1	2	50.0	0.207	10.6	LOS B	0.8	7.1	0.15	0.96	0.15	45.9
12	R2	169	28.2	0.207	9.8	LOS A	0.8	7.1	0.15	0.96	0.15	48.8
Approach		173	28.3	0.207	9.8	LOS A	0.8	7.1	0.15	0.96	0.15	48.8
West: R33												
1	L2	96	42.9	0.098	6.1	LOS A	0.0	0.0	0.00	0.50	0.00	52.2
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.30	0.02	57.4
3	R2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.02	0.30	0.02	54.6
Approach		98	41.8	0.098	6.0	NA	0.0	0.0	0.00	0.50	0.00	52.3
All Vehicles		279	32.8	0.207	8.3	NA	0.8	7.1	0.09	0.79	0.09	50.1

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.

MOVEMENT SUMMARY

Site: 3 [Site 3_SC03_2024 BT_AM]

Site 3_2024 Background Traffic without Dev._AM
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: RoadName												
4	L2	1	0.0	0.004	8.0	LOS A	0.0	0.1	0.01	1.05	0.01	50.5
5	T1	1	100.0	0.004	11.2	LOS B	0.0	0.1	0.01	1.05	0.01	45.9
6	R2	1	0.0	0.004	7.5	LOS A	0.0	0.1	0.01	1.05	0.01	50.0
Approach		4	33.3	0.004	9.3	LOS A	0.0	0.1	0.01	1.05	0.01	48.9
East: RoadName												
7	L2	1	0.0	0.002	5.5	LOS A	0.0	0.0	0.01	0.39	0.01	54.4
8	T1	1	0.0	0.002	0.0	LOS A	0.0	0.0	0.01	0.39	0.01	56.6
9	R2	1	0.0	0.002	5.4	LOS A	0.0	0.0	0.01	0.39	0.01	53.5
Approach		4	0.0	0.002	3.7	NA	0.0	0.0	0.01	0.39	0.01	54.9
North: R33												
10	L2	1	0.0	0.201	8.0	LOS A	0.8	6.8	0.15	0.96	0.15	50.1
11	T1	2	50.0	0.201	10.6	LOS B	0.8	6.8	0.15	0.96	0.15	45.9
12	R2	164	28.2	0.201	9.8	LOS A	0.8	6.8	0.15	0.96	0.15	48.8
Approach		168	28.3	0.201	9.8	LOS A	0.8	6.8	0.15	0.96	0.15	48.8
West: R33												
1	L2	94	42.9	0.097	6.1	LOS A	0.0	0.0	0.00	0.50	0.00	52.2
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.30	0.02	57.4
3	R2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.02	0.30	0.02	54.6
Approach		97	41.8	0.097	6.0	NA	0.0	0.0	0.00	0.50	0.00	52.3
All Vehicles		272	32.8	0.201	8.3	NA	0.8	6.8	0.09	0.79	0.09	50.1

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.

MOVEMENT SUMMARY

Site: 3 [Site 3_SC03_2024 BT_PM]

Site 3_2024 Background Traffic without Dev._PM
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: RoadName												
4	L2	3	50.0	0.011	10.1	LOS B	0.0	0.3	0.01	1.05	0.01	48.2
5	T1	6	25.0	0.011	10.0	LOS A	0.0	0.3	0.01	1.05	0.01	46.9
6	R2	1	0.0	0.011	7.5	LOS A	0.0	0.3	0.01	1.05	0.01	49.8
Approach		10	28.1	0.011	9.7	LOS A	0.0	0.3	0.01	1.05	0.01	47.6
East: RoadName												
7	L2	1	0.0	0.002	5.5	LOS A	0.0	0.0	0.01	0.39	0.01	54.4
8	T1	1	0.0	0.002	0.0	LOS A	0.0	0.0	0.01	0.39	0.01	56.6
9	R2	1	0.0	0.002	5.4	LOS A	0.0	0.0	0.01	0.39	0.01	53.5
Approach		4	0.0	0.002	3.7	NA	0.0	0.0	0.01	0.39	0.01	54.9
North: R33												
10	L2	1	0.0	0.157	8.0	LOS A	0.6	5.7	0.15	1.00	0.15	49.7
11	T1	8	20.0	0.157	9.3	LOS A	0.6	5.7	0.15	1.00	0.15	46.9
12	R2	106	48.6	0.157	11.1	LOS B	0.6	5.7	0.15	1.00	0.15	47.6
Approach		115	46.2	0.157	11.0	LOS B	0.6	5.7	0.15	1.00	0.15	47.6
West: R33												
1	L2	169	18.9	0.127	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	53.2
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.30	0.02	57.4
3	R2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.02	0.30	0.02	54.6
Approach		171	18.6	0.127	5.8	NA	0.0	0.0	0.00	0.51	0.00	53.2
All Vehicles		300	29.3	0.157	7.9	NA	0.6	5.7	0.06	0.72	0.06	50.8

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

MOVEMENT SUMMARY

Site: 3 [Site 3_SC04_2024 BTWD_AM]

Site 3_2024 Background Traffic with Dev._AM
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: RoadName												
4	L2	1	0.0	0.004	8.0	LOS A	0.0	0.1	0.01	1.05	0.01	50.4
5	T1	1	100.0	0.004	11.8	LOS B	0.0	0.1	0.01	1.05	0.01	45.8
6	R2	1	0.0	0.004	7.5	LOS A	0.0	0.1	0.01	1.05	0.01	49.8
Approach		4	33.3	0.004	9.5	LOS A	0.0	0.1	0.01	1.05	0.01	48.8
East: RoadName												
7	L2	1	0.0	0.002	5.5	LOS A	0.0	0.0	0.01	0.39	0.01	54.4
8	T1	1	0.0	0.002	0.0	LOS A	0.0	0.0	0.01	0.39	0.01	56.6
9	R2	1	0.0	0.002	5.4	LOS A	0.0	0.0	0.01	0.39	0.01	53.5
Approach		4	0.0	0.002	3.7	NA	0.0	0.0	0.01	0.39	0.01	54.9
North: R33												
10	L2	1	0.0	0.269	8.0	LOS A	1.1	9.7	0.19	0.96	0.19	49.9
11	T1	2	50.0	0.269	10.9	LOS B	1.1	9.7	0.19	0.96	0.19	45.7
12	R2	213	28.2	0.269	10.1	LOS B	1.1	9.7	0.19	0.96	0.19	48.6
Approach		217	28.3	0.269	10.1	LOS B	1.1	9.7	0.19	0.96	0.19	48.6
West: R33												
1	L2	136	42.9	0.140	6.1	LOS A	0.0	0.0	0.00	0.50	0.00	52.2
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.30	0.02	57.4
3	R2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.02	0.30	0.02	54.6
Approach		139	42.1	0.140	6.0	NA	0.0	0.0	0.00	0.50	0.00	52.3
All Vehicles		363	33.3	0.269	8.4	NA	1.1	9.7	0.11	0.78	0.11	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.
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.

MOVEMENT SUMMARY

Site: 3 [Site 3_SC04_2024 BTWD_PM]

Site 3_2024 Background Traffic with Dev._PM
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: RoadName												
4	L2	3	50.0	0.011	10.1	LOS B	0.0	0.3	0.01	1.05	0.01	48.0
5	T1	6	25.0	0.011	10.4	LOS B	0.0	0.3	0.01	1.05	0.01	46.7
6	R2	1	0.0	0.011	7.5	LOS A	0.0	0.3	0.01	1.05	0.01	49.6
Approach		10	28.1	0.011	10.0	LOS A	0.0	0.3	0.01	1.05	0.01	47.4
East: RoadName												
7	L2	1	0.0	0.002	5.5	LOS A	0.0	0.0	0.01	0.39	0.01	54.4
8	T1	1	0.0	0.002	0.0	LOS A	0.0	0.0	0.01	0.39	0.01	56.6
9	R2	1	0.0	0.002	5.4	LOS A	0.0	0.0	0.01	0.39	0.01	53.5
Approach		4	0.0	0.002	3.7	NA	0.0	0.0	0.01	0.39	0.01	54.9
North: R33												
10	L2	1	0.0	0.227	8.0	LOS A	0.9	8.7	0.19	0.99	0.19	49.4
11	T1	8	20.0	0.227	9.5	LOS A	0.9	8.7	0.19	0.99	0.19	46.6
12	R2	150	48.6	0.227	11.5	LOS B	0.9	8.7	0.19	0.99	0.19	47.3
Approach		159	46.9	0.227	11.4	LOS B	0.9	8.7	0.19	0.99	0.19	47.3
West: R33												
1	L2	219	18.9	0.165	5.8	LOS A	0.0	0.0	0.00	0.52	0.00	53.2
2	T1	1	0.0	0.001	0.0	LOS A	0.0	0.0	0.02	0.30	0.02	57.4
3	R2	1	0.0	0.001	5.5	LOS A	0.0	0.0	0.02	0.30	0.02	54.6
Approach		221	18.7	0.165	5.8	NA	0.0	0.0	0.00	0.52	0.00	53.2
All Vehicles		394	30.1	0.227	8.1	NA	0.9	8.7	0.08	0.72	0.08	50.6

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

MOVEMENT SUMMARY

Site: 4 [Site 4_SC00_2019 BS_AM]

Site 4_ 2019 Base Scenario_AM
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: R33												
2	T1	30	45.8	0.030	0.0	LOS A	0.0	0.1	0.02	0.02	0.02	59.5
3	R2	1	0.0	0.030	5.7	LOS A	0.0	0.1	0.02	0.02	0.02	57.3
Approach		31	44.0	0.030	0.2	NA	0.0	0.1	0.02	0.02	0.02	59.5
East: Unknown Access Road												
4	L2	5	0.0	0.009	8.4	LOS A	0.0	0.2	0.21	0.87	0.21	51.9
6	R2	5	0.0	0.009	8.0	LOS A	0.0	0.2	0.21	0.87	0.21	51.4
Approach		10	0.0	0.009	8.2	LOS A	0.0	0.2	0.21	0.87	0.21	51.7
North: R33												
7	L2	3	0.0	0.065	5.5	LOS A	0.0	0.0	0.00	0.02	0.00	58.2
8	T1	96	14.2	0.065	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.8
Approach		99	13.8	0.065	0.1	NA	0.0	0.0	0.00	0.02	0.00	59.8
All Vehicles		140	19.6	0.065	0.7	NA	0.0	0.2	0.02	0.08	0.02	59.0

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.

MOVEMENT SUMMARY

Site: 4 [Site 4_SC00_2019 BS_PM]

Site 4_2019 Base Scenario_PM
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: R33												
2	T1	110	21.6	0.082	0.0	LOS A	0.0	0.2	0.01	0.02	0.01	59.7
3	R2	4	0.0	0.082	5.7	LOS A	0.0	0.2	0.01	0.02	0.01	57.5
Approach		114	20.9	0.082	0.2	NA	0.0	0.2	0.01	0.02	0.01	59.6
East: Unknown Access Road												
4	L2	3	0.0	0.012	8.2	LOS A	0.0	0.3	0.22	0.90	0.22	51.8
6	R2	9	14.3	0.012	9.0	LOS A	0.0	0.3	0.22	0.90	0.22	50.7
Approach		11	11.1	0.012	8.8	LOS A	0.0	0.3	0.22	0.90	0.22	50.9
North: R33												
7	L2	3	0.0	0.056	5.6	LOS A	0.0	0.0	0.00	0.03	0.00	57.9
8	T1	55	47.7	0.056	0.0	LOS A	0.0	0.0	0.00	0.03	0.00	59.5
Approach		58	45.6	0.056	0.3	NA	0.0	0.0	0.00	0.03	0.00	59.5
All Vehicles		183	28.1	0.082	0.7	NA	0.0	0.3	0.02	0.08	0.02	59.0

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.

MOVEMENT SUMMARY

Site: 4 [Site 4_SC01_2022 OY_AM]

Site 4_ 2022 Opening Year without Dev._AM
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: R33												
2	T1	34	45.8	0.033	0.0	LOS A	0.0	0.1	0.02	0.02	0.02	59.6
3	R2	1	0.0	0.033	5.8	LOS A	0.0	0.1	0.02	0.02	0.02	57.4
Approach		35	44.2	0.033	0.2	NA	0.0	0.1	0.02	0.02	0.02	59.5
East: Unknown Access Road												
4	L2	5	0.0	0.009	8.4	LOS A	0.0	0.2	0.22	0.87	0.22	51.9
6	R2	5	0.0	0.009	8.1	LOS A	0.0	0.2	0.22	0.87	0.22	51.4
Approach		10	0.0	0.009	8.3	LOS A	0.0	0.2	0.22	0.87	0.22	51.6
North: R33												
7	L2	3	0.0	0.073	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	58.2
8	T1	109	14.2	0.073	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.8
Approach		111	13.9	0.073	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		156	19.8	0.073	0.7	NA	0.0	0.2	0.02	0.07	0.02	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.
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.

MOVEMENT SUMMARY

Site: 4 [Site 4_SC01_2022 OY_PM]

Site 4_2022 Opening Year without Dev._PM
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: R33												
2	T1	124	21.6	0.092	0.0	LOS A	0.0	0.2	0.01	0.02	0.01	59.8
3	R2	4	0.0	0.092	5.7	LOS A	0.0	0.2	0.01	0.02	0.01	57.5
Approach		128	21.0	0.092	0.2	NA	0.0	0.2	0.01	0.02	0.01	59.7
East: Unknown Access Road												
4	L2	3	0.0	0.013	8.3	LOS A	0.0	0.3	0.24	0.90	0.24	51.7
6	R2	10	14.3	0.013	9.1	LOS A	0.0	0.3	0.24	0.90	0.24	50.6
Approach		13	11.4	0.013	8.9	LOS A	0.0	0.3	0.24	0.90	0.24	50.8
North: R33												
7	L2	3	0.0	0.063	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.0
8	T1	61	47.7	0.063	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.6
Approach		64	45.8	0.063	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.5
All Vehicles		204	28.2	0.092	0.7	NA	0.0	0.3	0.02	0.07	0.02	59.0

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.

MOVEMENT SUMMARY

Site: 4 [Site 4_SC02_2022 BT_AM]

Site 4_ 2022 Background Traffic with Dev._AM
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: R33												
2	T1	34	45.8	0.033	0.0	LOS A	0.0	0.1	0.02	0.02	0.02	59.6
3	R2	1	0.0	0.033	5.8	LOS A	0.0	0.1	0.02	0.02	0.02	57.4
Approach		35	44.2	0.033	0.2	NA	0.0	0.1	0.02	0.02	0.02	59.5
East: Unknown Access Road												
4	L2	5	0.0	0.009	8.4	LOS A	0.0	0.2	0.22	0.87	0.22	51.9
6	R2	5	0.0	0.009	8.1	LOS A	0.0	0.2	0.22	0.87	0.22	51.4
Approach		10	0.0	0.009	8.3	LOS A	0.0	0.2	0.22	0.87	0.22	51.6
North: R33												
7	L2	3	0.0	0.073	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	58.2
8	T1	109	14.2	0.073	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.8
Approach		111	13.9	0.073	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		156	19.8	0.073	0.7	NA	0.0	0.2	0.02	0.07	0.02	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.
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.

MOVEMENT SUMMARY

Site: 4 [Site 4_SC02_2022 OY_PM]

Site 4_2022 Background Traffic with Dev._PM
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: R33												
2	T1	124	21.6	0.092	0.0	LOS A	0.0	0.2	0.01	0.02	0.01	59.7
3	R2	4	0.0	0.092	5.7	LOS A	0.0	0.2	0.01	0.02	0.01	57.5
Approach		128	21.0	0.092	0.2	NA	0.0	0.2	0.01	0.02	0.01	59.7
East: Unknown Access Road												
4	L2	3	0.0	0.013	8.3	LOS A	0.0	0.3	0.24	0.90	0.24	51.7
6	R2	10	14.3	0.013	9.1	LOS A	0.0	0.3	0.24	0.90	0.24	50.6
Approach		13	11.4	0.013	8.9	LOS A	0.0	0.3	0.24	0.90	0.24	50.8
North: R33												
7	L2	3	0.0	0.064	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.0
8	T1	63	47.7	0.064	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.6
Approach		65	45.9	0.064	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.5
All Vehicles		205	28.3	0.092	0.7	NA	0.0	0.3	0.02	0.07	0.02	59.0

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.

MOVEMENT SUMMARY

Site: 4 [Site 4_SC03_2024 BT_AM]

Site 4_ 2024 Background Traffic without Dev._AM
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: R33												
2	T1	36	45.8	0.036	0.0	LOS A	0.0	0.1	0.02	0.02	0.02	59.6
3	R2	1	0.0	0.036	5.8	LOS A	0.0	0.1	0.02	0.02	0.02	57.4
Approach		38	44.3	0.036	0.2	NA	0.0	0.1	0.02	0.02	0.02	59.5
East: Unknown Access Road												
4	L2	6	0.0	0.011	8.5	LOS A	0.0	0.3	0.23	0.87	0.23	51.9
6	R2	6	0.0	0.011	8.2	LOS A	0.0	0.3	0.23	0.87	0.23	51.4
Approach		13	0.0	0.011	8.3	LOS A	0.0	0.3	0.23	0.87	0.23	51.6
North: R33												
7	L2	3	0.0	0.079	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	58.2
8	T1	118	14.2	0.079	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.8
Approach		120	13.9	0.079	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		170	19.6	0.079	0.7	NA	0.0	0.3	0.02	0.08	0.02	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.
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.

MOVEMENT SUMMARY

Site: 4 [Site 4_SC03_2024 BT_PM]

Site 4_2024 Background Traffic without Dev._PM
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: R33												
2	T1	134	21.6	0.100	0.0	LOS A	0.0	0.2	0.01	0.02	0.01	59.7
3	R2	5	0.0	0.100	5.7	LOS A	0.0	0.2	0.01	0.02	0.01	57.4
Approach		139	20.8	0.100	0.2	NA	0.0	0.2	0.01	0.02	0.01	59.6
East: Unknown Access Road												
4	L2	3	0.0	0.015	8.3	LOS A	0.0	0.4	0.26	0.90	0.26	51.7
6	R2	11	14.3	0.015	9.2	LOS A	0.0	0.4	0.26	0.90	0.26	50.6
Approach		14	11.7	0.015	9.0	LOS A	0.0	0.4	0.26	0.90	0.26	50.8
North: R33												
7	L2	3	0.0	0.069	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.0
8	T1	68	47.7	0.069	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.6
Approach		70	46.0	0.069	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.6
All Vehicles		223	28.2	0.100	0.8	NA	0.0	0.4	0.03	0.08	0.03	59.0

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.

MOVEMENT SUMMARY

Site: 4 [Site 4_SC04_2024 BTWD_AM]

Site 4_ 2024 Background Traffic with Dev._AM
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: R33												
2	T1	38	45.8	0.037	0.0	LOS A	0.0	0.1	0.01	0.02	0.01	59.6
3	R2	1	0.0	0.037	5.8	LOS A	0.0	0.1	0.01	0.02	0.01	57.4
Approach		39	44.3	0.037	0.2	NA	0.0	0.1	0.01	0.02	0.01	59.6
East: Unknown Access Road												
4	L2	6	0.0	0.011	8.5	LOS A	0.0	0.3	0.23	0.87	0.23	51.9
6	R2	6	0.0	0.011	8.2	LOS A	0.0	0.3	0.23	0.87	0.23	51.4
Approach		13	0.0	0.011	8.3	LOS A	0.0	0.3	0.23	0.87	0.23	51.6
North: R33												
7	L2	3	0.0	0.079	5.5	LOS A	0.0	0.0	0.00	0.01	0.00	58.2
8	T1	118	14.2	0.079	0.0	LOS A	0.0	0.0	0.00	0.01	0.00	59.8
Approach		120	13.9	0.079	0.1	NA	0.0	0.0	0.00	0.01	0.00	59.8
All Vehicles		171	19.8	0.079	0.7	NA	0.0	0.3	0.02	0.08	0.02	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.
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.

MOVEMENT SUMMARY

Site: 4 [Site 4_SC04_2024 BTWD_PM]

Site 4_2024 Background Traffic with Dev._PM
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: R33												
2	T1	134	21.6	0.100	0.0	LOS A	0.0	0.2	0.01	0.02	0.01	59.7
3	R2	5	0.0	0.100	5.7	LOS A	0.0	0.2	0.01	0.02	0.01	57.4
Approach		139	20.8	0.100	0.2	NA	0.0	0.2	0.01	0.02	0.01	59.6
East: Unknown Access Road												
4	L2	3	0.0	0.015	8.3	LOS A	0.0	0.4	0.26	0.90	0.26	51.7
6	R2	11	14.3	0.015	9.2	LOS A	0.0	0.4	0.26	0.90	0.26	50.6
Approach		14	11.7	0.015	9.0	LOS A	0.0	0.4	0.26	0.90	0.26	50.8
North: R33												
7	L2	3	0.0	0.069	5.6	LOS A	0.0	0.0	0.00	0.02	0.00	58.0
8	T1	68	47.7	0.069	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	59.6
Approach		70	46.0	0.069	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.6
All Vehicles		223	28.2	0.100	0.8	NA	0.0	0.4	0.03	0.08	0.03	59.0

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.

MOVEMENT SUMMARY

Site: 5 [Site5_SC02_2022 BTWD_PM]

Site 5_2022 Background Traffic with Dev._PM
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: R33												
1	L2	1	0.0	0.001	5.6	LOS A	0.0	0.0	0.00	0.53	0.00	54.9
2	T1	113	21.6	0.083	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		114	21.4	0.083	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: R33												
8	T1	55	47.7	0.055	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	9	20.0	0.007	6.1	LOS A	0.0	0.2	0.24	0.53	0.24	51.8
Approach		64	43.6	0.055	0.9	NA	0.0	0.2	0.04	0.08	0.04	58.6
West: Access Road to Weltevreden Mine												
10	L2	13	20.0	0.011	9.4	LOS A	0.0	0.3	0.24	0.89	0.24	50.9
12	R2	1	0.0	0.001	9.2	LOS A	0.0	0.0	0.33	0.81	0.33	51.4
Approach		14	18.5	0.011	9.4	LOS A	0.0	0.3	0.24	0.88	0.24	51.0
All Vehicles		192	28.6	0.083	1.0	NA	0.0	0.3	0.03	0.09	0.03	58.8

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

MOVEMENT SUMMARY

Site: 5 [Site5_SC02_2022 BTWD_PM]

Site 5_2022 Background Traffic with Dev._PM
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: R33												
1	L2	1	0.0	0.001	5.6	LOS A	0.0	0.0	0.00	0.53	0.00	54.9
2	T1	113	21.6	0.083	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		114	21.4	0.083	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: R33												
8	T1	55	47.7	0.055	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	9	20.0	0.007	6.1	LOS A	0.0	0.2	0.24	0.53	0.24	51.8
Approach		64	43.6	0.055	0.9	NA	0.0	0.2	0.04	0.08	0.04	58.6
West: Access Road to Weltevreden Mine												
10	L2	13	20.0	0.011	9.4	LOS A	0.0	0.3	0.24	0.89	0.24	50.9
12	R2	1	0.0	0.001	9.2	LOS A	0.0	0.0	0.33	0.81	0.33	51.4
Approach		14	18.5	0.011	9.4	LOS A	0.0	0.3	0.24	0.88	0.24	51.0
All Vehicles		192	28.6	0.083	1.0	NA	0.0	0.3	0.03	0.09	0.03	58.8

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

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MOVEMENT SUMMARY

Site: 5 [Site5_SC04_2024 BTWD_AM]

Site 5_2022 Background Traffic with Dev._AM
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: R33												
1	L2	1	0.0	0.001	5.6	LOS A	0.0	0.0	0.00	0.53	0.00	54.9
2	T1	36	45.8	0.035	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		37	44.5	0.035	0.2	NA	0.0	0.0	0.00	0.02	0.00	59.8
North: R33												
8	T1	101	14.2	0.067	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	49	17.5	0.031	5.9	LOS A	0.1	1.1	0.13	0.55	0.13	52.3
Approach		151	15.3	0.067	1.9	NA	0.1	1.1	0.04	0.18	0.04	57.2
West: Access Road to Weltevreden Mine												
10	L2	29	20.0	0.024	9.0	LOS A	0.1	0.8	0.13	0.94	0.13	51.0
12	R2	1	0.0	0.001	9.2	LOS A	0.0	0.0	0.33	0.81	0.33	51.4
Approach		31	19.3	0.024	9.0	LOS A	0.1	0.8	0.14	0.93	0.14	51.0
All Vehicles		218	20.8	0.067	2.6	NA	0.1	1.1	0.05	0.26	0.05	56.7

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

MOVEMENT SUMMARY

Site: 5 [Site5_SC04_2024 BTWD_PM]

Site 5_2024 Background Traffic with Dev._PM
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: R33												
1	L2	1	0.0	0.001	5.6	LOS A	0.0	0.0	0.00	0.53	0.00	54.9
2	T1	122	21.6	0.090	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		123	21.4	0.090	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
North: R33												
8	T1	59	47.7	0.059	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
9	R2	44	20.0	0.031	6.2	LOS A	0.1	1.1	0.25	0.55	0.25	51.8
Approach		103	35.8	0.059	2.7	NA	0.1	1.1	0.11	0.23	0.11	56.2
West: Access Road to Weltevreden Mine												
10	L2	35	20.0	0.031	9.5	LOS A	0.1	1.0	0.25	0.89	0.25	50.9
12	R2	1	0.0	0.001	9.6	LOS A	0.0	0.0	0.37	0.80	0.37	51.2
Approach		36	19.4	0.031	9.5	LOS A	0.1	1.0	0.26	0.89	0.26	50.9
All Vehicles		262	26.8	0.090	2.4	NA	0.1	1.1	0.08	0.22	0.08	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.

Appendix F
Environmental impact rating of proposed development traffic

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