Member of the Surbana Jurong Group

ARCUS

San Kraal Wind Energy Facility

Traffic Impact Assessment

Date: 22 January 2018 Ref. JT0038

AUSTRALIA | ASIA | MIDDLE EAST | AFRICA | PACIFIC

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Report for:	Arcus Consultancy Services

REVISIONS

Revision #	Date	Change Overview	Prepared by	Reviewed by
0	17/01/2018	Review	C.Xhobiso	G. Van Jaarsveld
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ABBREVIATIONS

IDZ	Industrial development Zone
TIA	Traffic Impact Assessment
WEF	Wind energy facility
WT	Wind Turbine
WTG	Wind Turbine Generator

APPENDICES

1. INTRODUCTION

SMEC South Africa (Pty) Ltd is appointed by Arcus Consultancy Services Ltd to provide a Traffic Impact Assessment (TIA) for the proposed San Kraal Wind Energy Facility (WEF), a development of InnoWind (Pty) Ltd spanning a total area of 10 511 hectares.

1.1 Background

The proposed San Kraal WEF properties are located in the Northern Cape with a small footprint in the Eastern Cape. The WEF is located near the town of Noupoort close to the intersection of the N9 National Road. The development site is adjacent the N9 and N10 national roads. The development will consist of 78 Wind Turbines (WT).

1.2 Objectives

The purpose of the assessment is to:

- Evaluate the impacts of the proposed development on existing road network and traffic volumes.
- Determine the specific traffic needs during the different phases of implementation, namely wind turbine construction and installation, decommissioning and operation (Deliverable 1);
- Evaluate the roadway capacity of the road network (Deliverable 1);
- Identify the position and suitability of the preferred access road alternative (Deliverable2);
- Confirm the associated clearances required for the necessary equipment to be transported from the point of delivery to the various sites (Deliverable 3);
- Confirm freight and transport requirements during construction, operation and maintenance (Deliverable 1);
- Propose origins and destinations of equipment (Deliverable 1); and
- Determine (Abnormal) Permit requirements if any (Deliverable 3).

2. SITE LOCALITY

The proposed San Kraal WEF project site is located approximately 4 km from Noupoort and falls within both the Northern Cape and Eastern Cape Province. It is also located adjacent the Noupoort Wind Farm.

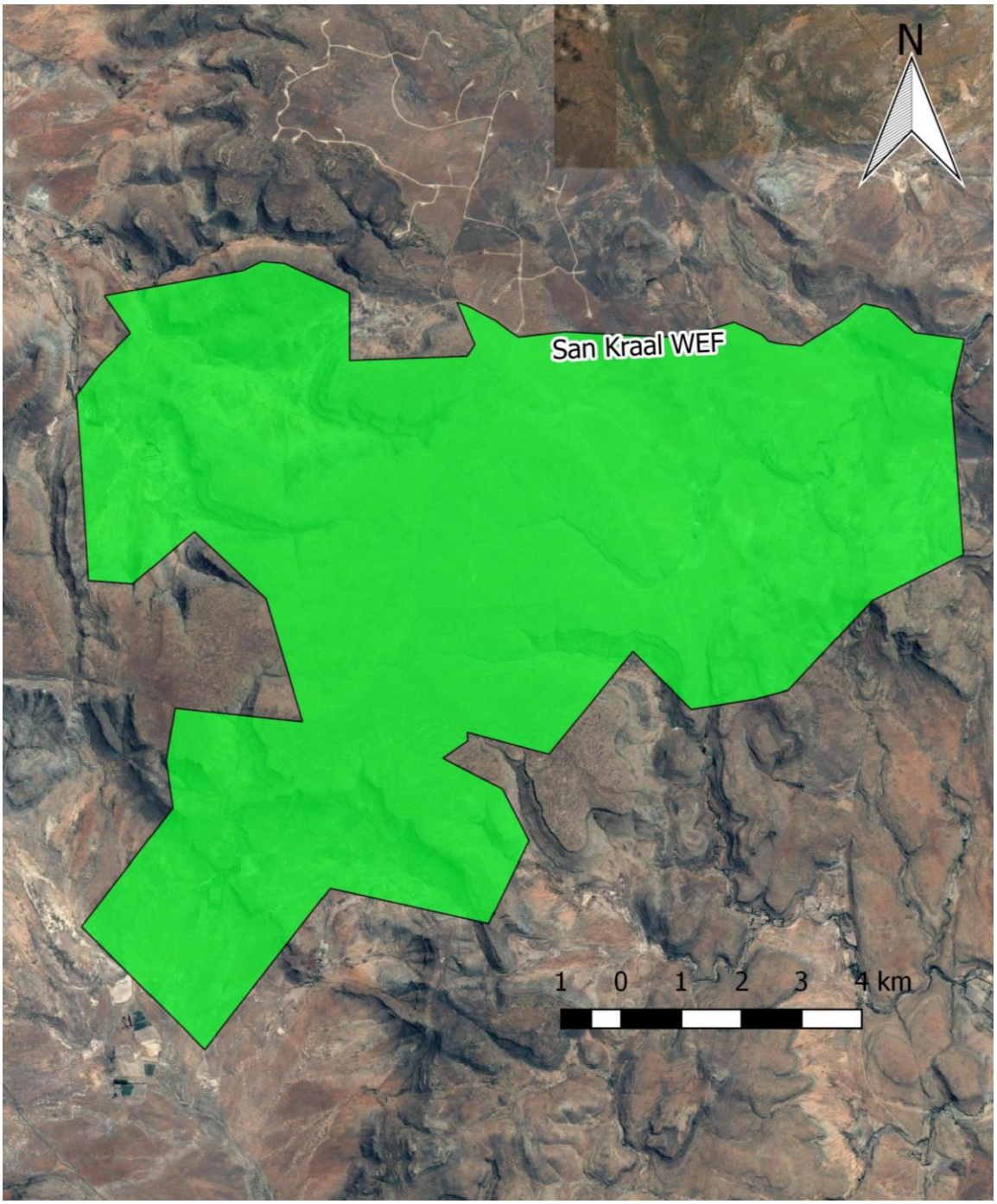
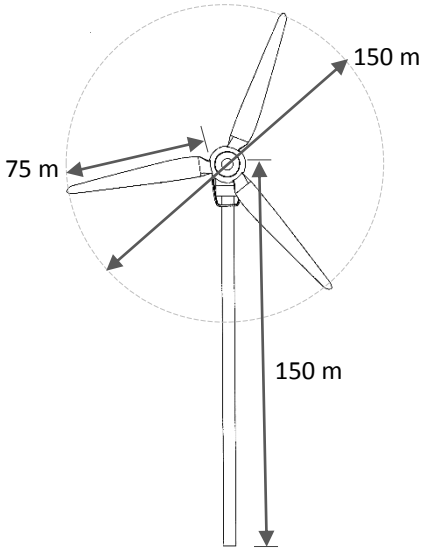


Figure 2-1: San Kraal Site Locality

2.1 Project Data

The following is a list of information provided by the client about the San Kraal Wind Facility construction:

- Up to 78 wind turbines with a generation capacity between 3 –5 MW and a rotor diameter of up to 150 m, a hub height of up to 150 m and blade length of up to 75 m;



- Foundations (up to 25 x 25 m) and hardstands associated with the wind turbines;
- Internal access roads of between 8 m (during operation) and 14 m (during construction) wide to each turbine;
- 33kV underground electrical cables will be laid to transmit electricity generated by the wind turbines to the onsite switching station;
- Overhead medium voltage cables between turbine rows where necessary;
- An on-site switching-station complex (15 000 m2) to facilitate stepping up the voltage from
- medium to high voltage (132 kV) to enable the connection of the WEF to the proposed
- Umsobomvu WEF 400kV Substation, and the generated power will be fed into the national grid;
- A 25 km 132kV high voltage overhead power line from the on-site switching station to the proposed 400 kV Umsobomvu substation to the national grid;
- A 7500 m2 operations and services workshop area/office building for control, maintenance and storage;
- Temporary infrastructure including a site camp; and
- A laydown area approximately 7500 m2 in extent, per turbine.

3. SURROUNDING AREA AND ROUTES TO SITE

In June 2016 a route assessment report was written by AECOM SA (Pty) Ltd for a proposed Umsobomvu WEF for InnoWind. The site is situated is approximately 5 km from the intersection of the N9 and N10, south of the proposed San Kraal WEF. The San Kraal site boundary is approximately 14 km north from the Umsobomvu site boundary as illustrated in Figure 3-1. In the route assessment, the WT components were expected to travel from Ngqura Habour habour at the Coega Industrial Development Zone (IDZ), north of Port Elizabeth (PE) to the WEF site.

The route assessment included the N10 (Coega IDZ to Middleburg), N9 & N10 (north of Middleburg towards Noupoort), R389 (from Middleburg to Hanover), N1 (from Richmond to Hanover) and the N10 (fo rm Hanover to the northern access road). The assessed routes to site are presented in Figure 3-1.

The following routes were assessed in the report:

1. Main route- From Coega up to interchange N9/N10 south of Middleburg.
2. Route A-Through Middleburg via Meintjies Street.
3. Route B- Around Middleburg via N9.
4. Route C- From Middleburg via N9 towards Noupoort.
5. Route D-From Middleburg via Richmond and Hanover.
6. Northern Access Route to site
7. Southern Access Route to site

Figure 3-1: Transportation Routes to Umsobomvu WEF

From the route determination assessment the following was concluded:

- The main route from Main route- From Coega up to interchange N9/N10 south of Middleburg was identified as being suitable for transportation of WT components using abnormal truck combinations, provided the abnormal loads is less than 4.8 m high.
- The route will require various physical modifications to ensure its suitability for abnormal load transportation.

For purposes of this report, the main route as identified by the route determination report as being suitable will be the transportation route for the San Kraal WEF. From Middleburg the vehicles will make use of the N9 heading north towards Noupoort and turn R389 towards the San Kraal Access (See Section 4). It is also recommended, that a formal Route assessment be carried out for the portion not surveyed by the Aecom report.

4. DELIVERABLE 2: SITE ACCESS

4.1 Site Access Options

One access point was identified to serve San Kraal WEF, referred to as Access E. A site visit was conducted on the 11th of January 2018 to assess Access E's suitability to serve the WEF. Figure 4-1 presents the site access option. Intersections 2 was also assessed for its suitability in terms of accessibility to main transportation route. Summary of site visit, site distance and accessibility is presented in Table 4-1. Pictures and comments of site visit to the San Kraal site access, referred to at Access E, are provided in Appendix B.

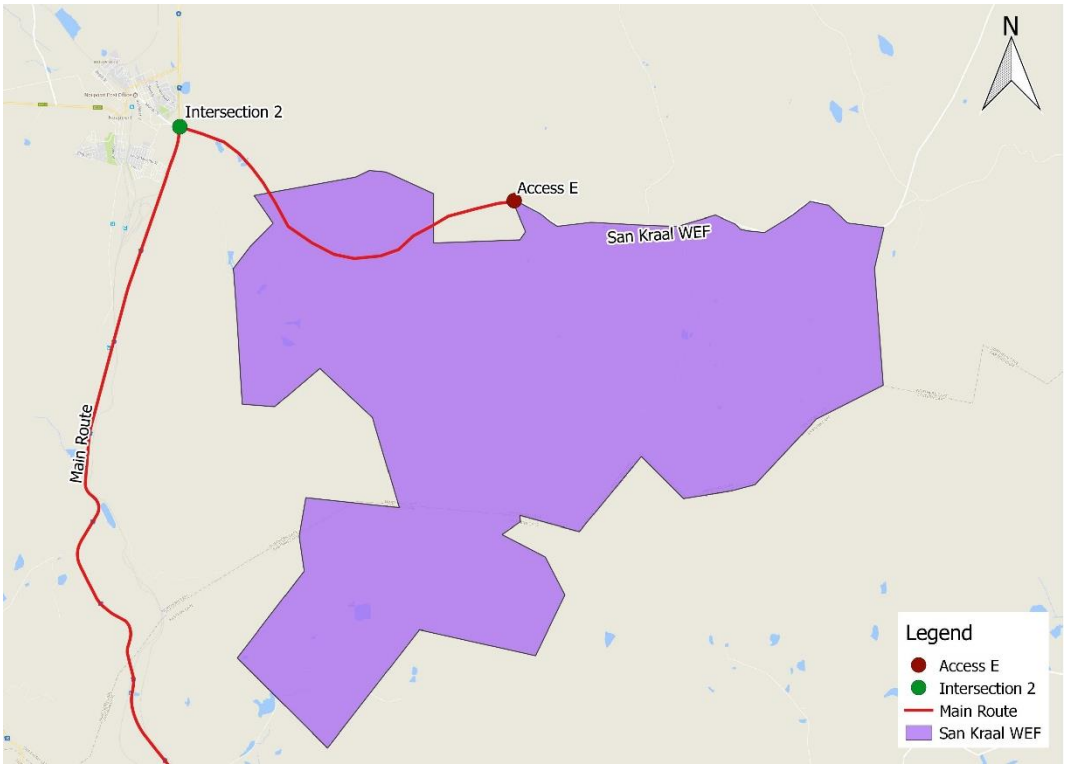


Figure 4-1: Site Access Options to San Kraal WEF

Table 4-1: Site Access Summary

Access	Site Distance	Accessibility to Route	Comments
San Kraal Access E	No Sight distance issues – sight extends for at least 500m.	Accessible from the N9	• Surfaced road in Good Condition

4.2 Recommendation

The San Kraal WEF must be accessible to Passengers cars, buses, trucks and multi vehicle combinations which will be delivering WT components. Access to site needs to be safe and practical to minimise risk of pedestrian and vehicle accidents with sufficient traffic control, clear visibility through sufficient stopping site distances, clear markings and warnings signs.

Based on the site visit, San Kraal access, as recommended by the client is sufficient to meet visibility, accessibility and safety requirements.

It is recommended that Access E be stop controlled and widened to allow for dedicated right turn and left turn lanes off the main road that will incorporate the turning circles of the expected abnormal vehicles, as illustrated in is illustrated in Figure 4-2.

In addition, allowance must be made for public transport vehicle lay byes on both sides of the access along the main road as well as safe pedestrian crossings on all 3 approaches of the access.

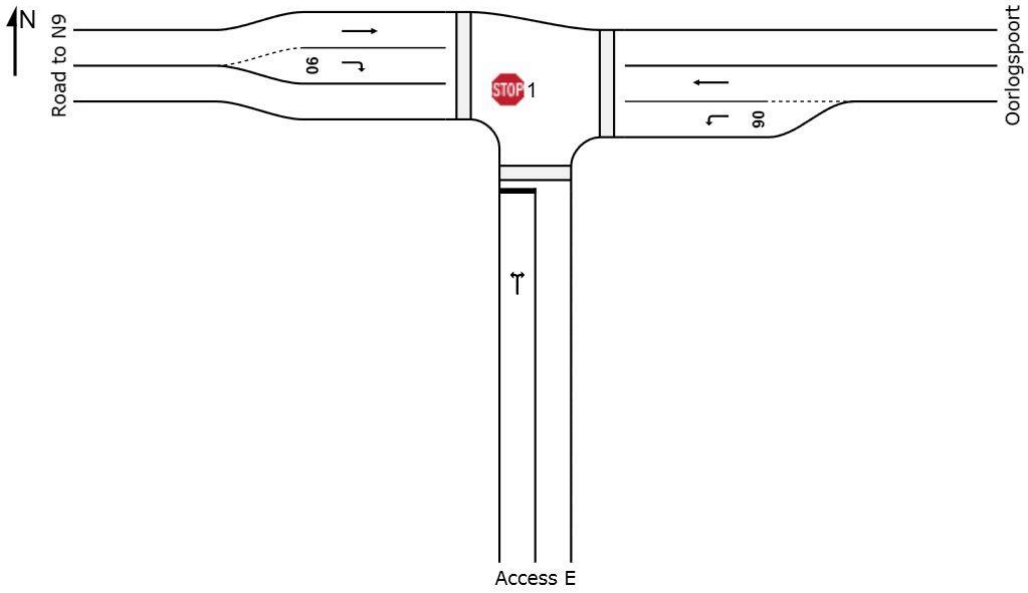


Figure 4-2: Site Access Option

5. DELIVERABLE 1: TRAFFIC ASSESSMENT

5.1 Traffic data Analysis

Intersection capacity analyses were undertaken to determine the anticipated operational performance of the site access roads and surrounding road network. The intersection capacity analysis was conducted using SIDRA Intersection 7.0 Intersection software. It should be noted that Intersection LOS and Major Road Approach LOS values are not applicable for two-way sign control since the average intersection delay is not a good LOS measure due to zero delays associated with major road movements however results will be able to give is an indication of delay and LOS of the minor road approaching the major road. The intersections analysed are listed below and presented in Figure 5-1:

- M1: N9 & Shaw St
- M2: N9 & Murray St
- M3: N9 & N10
- M4: R389 & road to N10
- 1477: N10
- 2733: N9
- 2741: N9

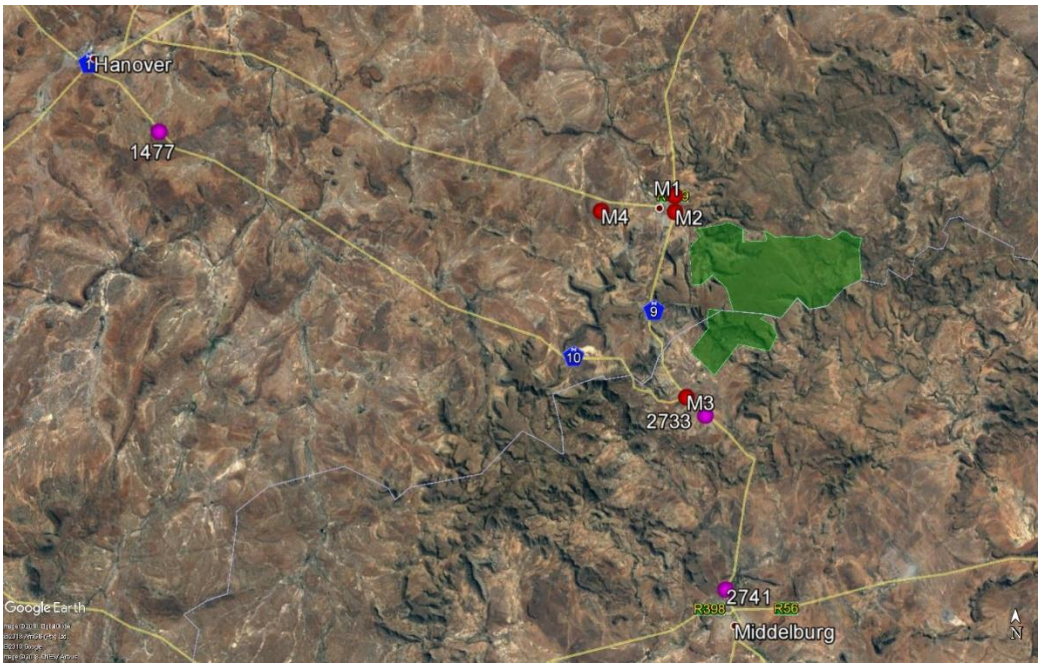


Figure 5-1: Intersections surveyed

5.1.1 SANRAL Traffic Data

The following is the summary of data sourced from SANRAL

Table 5-1: SANRAL Permanent stations data received

Station no.	Location	From	To	Comments
1477	Hanover East	2016-01-01	2017-12-07	Per direction Classified Typical Vol/hr for 2016-2017
2733	Between Noupoort and Middelburg	2013-08-26	2013-08-29	Per direction Not Classified Typical Vol/hr for 2013
2741	Middleburg	2014-01-21	2014-01-24	Per direction Not Classified Typical Vol/hr for 2014

5.1.2 12 hour all turning movements traffic counts

Surveys were undertaken at four count stations surrounding the site consisting of 12-hour manual traffic counts. The counts were done on Wednesday, 10 January 2018 from 06:00 to 18:00 at the following locations:

- Station M1: N9 and Shaw St
- Station M2: N9 and Murray St
- Station M3: N9 and N10
- Station M4: R389 and road to N10

The vehicles were classified as light, taxi, bus and heavy vehicles per direction in 15-minutes intervals. Outputs are attached in Appendix A. It should be noted that the majority of light vehicles were holiday traffic. A correction was applied to traffic volumes, as discussed below, using the regression analysis equations to normalise data.

5.1.3 Regression analysis

To estimate representative traffic volumes, on a normal Wednesday, the following methodology was applied:

- Correlation plot/regression analysis was used to determine the degree of relationship between two data sets, namely:
    - Data set 1: 2nd Wednesday of January (Abnormal)
    - Data set 2: 2nd Wednesday of October (Normal)

This was done to normalize January data using normal conditions for a normal day defined as a Wednesday in October.

- Scaling equations (Table 5-2) where derived from applying a regression model using SANRAL permanent station data and 24-hour traffic counts.

An example of how the regression analysis was derived and applied to traffic volumes of an intersection is attached in Appendix C.

Table 5-2: Regression/Correlation model scaling equations

Source	Type	Count Station	Data Type	Data Available	Scaling Equations		
Trafftrans	New Count	1	12 Hour	10 January 2018	y = 0.739x + 5.068		
Trafftrans	New Count	2	12 Hour	10 January 2018	y = 0.739x + 5.068		
Trafftrans	New Count	3	12 Hour	10 January 2018	y = 0.739x + 5.068		
Trafftrans	New Count	4	12 Hour	10 January 2018	y = 0.739x + 5.068		
SANRAL	Historical	1477	Yearly	2016 & 2017	y = 0.8666x + 3.0366		
SANRAL	Historical	2741	3 Day	21-24 Jan 2014	y = 0.2103x + 2.3938	y = 0.7841x + 2.0136	y = 0.8666x + 3.0366
SANRAL	Historical	2733	3 Day	26-29 August 2013	y = 0.917x - 9.5429	y =0.6642x+4.2617	y = 0.8666x + 3.0366

5.2 Trip Generation

As stated previously, the trips generated at the San Kraal WEF will vary during the different phases of the project implementation. Project phases will be defined as follows:

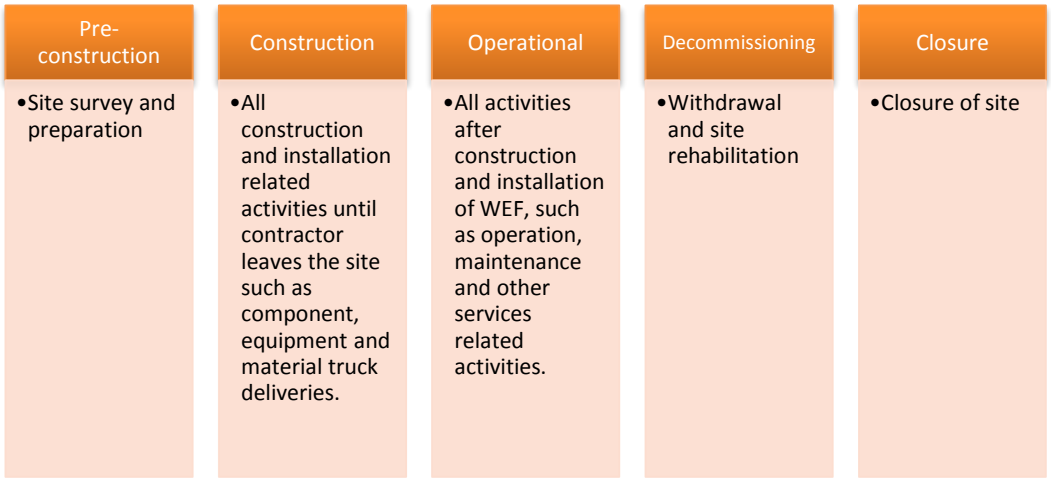


Figure 5-2: Project Phases

In order to evaluate the impacts and traffic needs of the development on the existing road network the following estimated vehicles trips are envisioned.

5.2.1 Pre-construction

The pre-construction phase of the wind facility is expected to generate negligible traffic to site as trips generated during pre-construction phase include planning activates, site survey and site preparation.

5.2.2 Construction

Trips generated during the construction phase will primarily comprise of transporting; equipment, turbine components, personnel, construction and other facility materials comprising of normal, heavy and abnormal load vehicles.

The following assumptions were made in order to calculate trips generated during the construction phase.

- It is estimated that the construction period will last approximately 2 years with a 5 day working week. Resulting in 480 working days over 24 months;
- The WEF will most likely be constructed from components that will need to be shipped to South Africa via the Port Elizabeth port and be transported to site via road transport using heavy and abnormal load vehicles. It is also assumed that that the turbine component delivery period will be over a course of a conservative 9 months,

- Different abnormal vehicle options, similar to the ones listed below, as found in the TRH11 (2009), may be selected depending on the service provider used to transport WT components. The remainder of the facility components and construction equipment will use standard transport vehicles and therefore will not require abnormal vehicles.

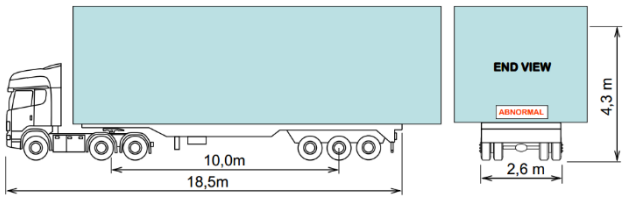


Figure 5-3: Abnormal Load on a Legal Combination

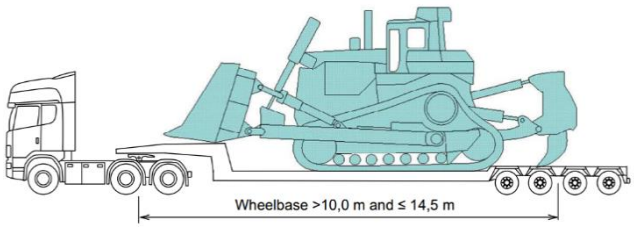


Figure 5-4: Abnormal Load on a Long Wheelbase Trailer

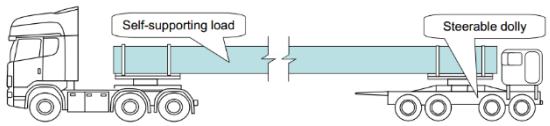


Figure 1.3: Self-Supporting Load on a Steerable Dolly

Figure 5-5: Self-Supporting Load on a Steerable Dolly

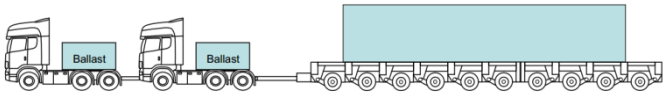


Figure 1.4: Heavy Loads on Multi-axle or Modular Trailers

Figure 5-6: Heavy Loads on Multi-axle or Modular Trailers

- The following WT components and associated details as provided by the client are presented in Table 5-3.

Table 5-3: WEF Components to be Transported

Component	Details	Comments and Assumptions
Tower	Length: 150 m	3 Tower sections/WT Abnormal vehicle required to transport component
Rotor	Blade Length: 75 m Hub	3 Blades/WT Connected to 1 Hub/WT Abnormal vehicle required to transport component
Nacelle	Weight: 67-85 tons	1 Nacelle/WT Abnormal vehicle required to transport component
Foundation	Area: 20 m × 25 m Depth: 5 m	Reinforced Concrete Heavy vehicle to transport materials
Hard Stand Areas	Area: 7500 m^2	Levelled and compacted Heavy vehicle to transport materials
Electrical Cabling	33 kV Electrical network Underground and Overhead	Concrete, steel or wood monopoles; Guy line supported steel structures; Free standing metal lattice towers; or Multi-pole structures such as H-towers or K-towers. Heavy vehicle to transport materials
Switching Station	15 000 m^2	Transformers Switch gear O&M building Parking Heavy vehicle to transport materials

- Average "component per turbine'' rate of 8 will be used (sum of abnormal components), therefore over the course of the turbine component delivery

period, approximately 624 abnormal vehicle loads to construct 78 WT, will be delivered to the project site.

- Route used to transport most of the heavy and abnormal loads will be from Coega up to interchange N9/N10 south of Middleburg. From Middleburg the vehicles will make use of the N9 heading north towards Noupoort, thereafter turning right onto R389 to enter site at the San Kraal Intersection.
- Water for construction purposes (e.g. mass earthworks, dust suppression and roads) will be transferred from the source to the point of use on the site via tanker. Assuming the 1 tanker will make one round trip per day at the start and end of the day.
- Some of the aggregate required for the construction of the on-site tracks may be sourced from cut and fill operations within the site with additional material be obtained from borrow pits or imported from quarries as required.

Another contributor to trips generated to the site will be daily commuters/workers expected during construction. The following assumptions, derived from project data as provided by the client, were made:

- Due to the site being close to the town of Noupoort, the construction labour force will be mostly local.
- It is assumed that approximately 300 workers will be on site. The envisioned construction workforce composition is presented in Figure 5-7.
- Based on the composition it was therefore assumed that 20% of the workers will make use of private or personal vehicles (cars and light duty trucks) travelling from their temporary or permanent place of residence to the site.
- Furthermore, it was assumed that the reminder of the 80% staff will be transported to site on 14 seater buses, whose quantities will fluctuate depending on number of labourers, costs, routes and shuttle hours.

- For assessment purposes, only the morning and afternoon trip generation was assessed.

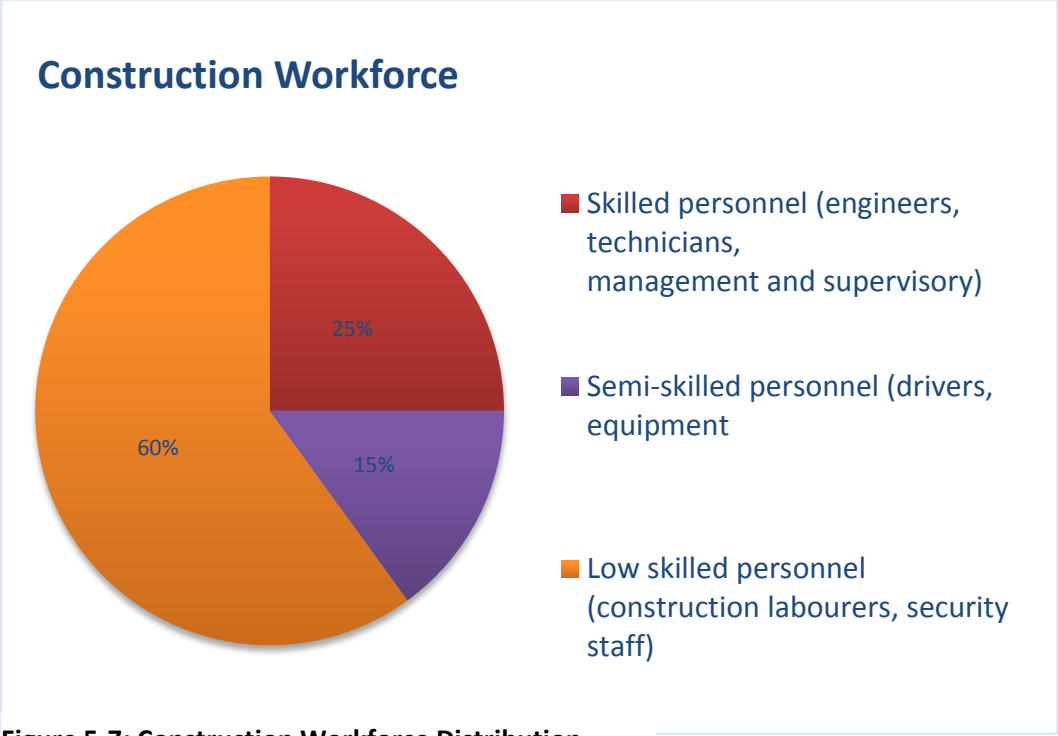


Figure 5-7: Construction Workforce Distribution

Based on the above assumptions the expected AM and PM peak trips comprise of 17 buses and 60 vehicles. A with a majority of them travelling from Noupoort to site in the AM and vice versa in the PM.

A summary of all construction trips generated is presented in Table 5-4.

Table 5-4: Generated Construction Trips

GTrip Generation: Construction Phase								
Transportation Type	Component	Duration (Days)	Quantity/WT	Quantity/Truck	Total Loads	Daily traffic	Peak time traffic	Peak time pcu
Abnormal Trucks	Tower	180	3	1	234	1	1	2
	Hub		1	1	78	0	0	1
	Blades		3	1	234	1	1	2
	Nacella		1	1	78	0	0	1
Truck	Foundation	480	1	133	8379	17	9	31
	Water Tanker		1	1	480	1	1	2
	Electrical Cabling		1	1	78	0	0	0
Passenger Vehicle	Staff	1	60	1	60	120	60	60
Bus	Staff	1	240	14	17	34	17	17
Total					9638	176	88	116

5.2.3 Operational

During the operational phase of the wind farm the following assumptions, derived from project data as provided by the client, were made:

- The wind farm will be in operation over a 20 year lifespan.
- Activities on the wind farm include maintenance on an ongoing basis.
- Approximately 40 permanent staff will be working on the site consisting of operational and maintenance technicians, rehabilitation of vegetation, bird and bat post construction monitoring. Figure 5-8 presents the envisioned permanent staff composition.
- Staff will likely make use of passenger vehicles and light duty trucks (i.e. Bakkie/4x4) to commute to site daily.
- There will be a possibility for excavations, planned and emergency maintenance, replacement or service of a WT components, requiring the use of the above mentioned heavy and abnormal vehicles travelling from PE. It is assumed that, in such a case, the staff's origin will be from Noupoort.
- It is assumed during a maintenance/service or repair event, at least 3 trucks will be expected on site: 1 abnormal vehicle and 2 Heavy vehicles (equipment trucks).
- Trip counts within the site were not estimated as they will affect the access onto the public road

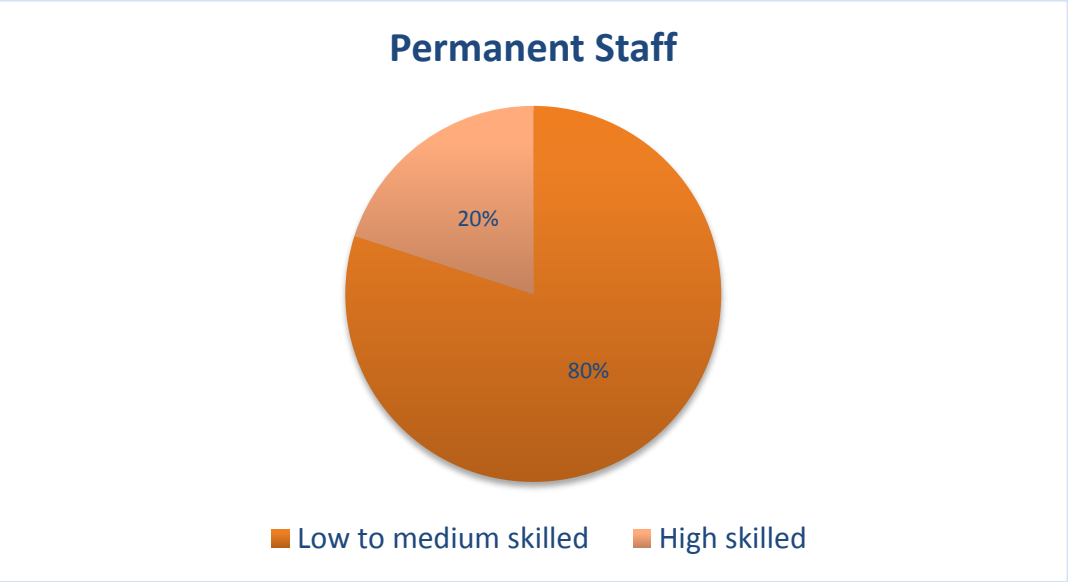


Figure 5-8: Permanent Staff Distribution

A summary of all operational trips generated is presented in Table 5-5.

Table 5-5: Generated Operational Trips

Trip Generation : Operational Phase								
Transportation Type	Component	Duration years	Quantity/WT	Quantity/Truck	Total Loads	Daily traffic	Peak time traffic	Peak time pcu
Abnormal Trucks	WT component to be repaired	20	1	1	9600	2	1	4
Truck	Foundation	20	2	1	19200	4	2	7
Passenger Vehicle	Staff	20	40	1	192000	80	40	40
Total					220800	86	43	51

5.2.1 Decommissioning

There are three possibilities for decommissioning phase of the project as listed below.

1. After the 20 year lifespan of the WEF, the need for continued generation of electricity through wind energy is still required and the WEF is renovated with new towers on the existing foundation in order to serve another 20 years. 50 people will be needed and components will be transported from PE.
2. The WEF is converted into another alternative renewable energy facility. The specifications around this are unknown.
3. There is no longer an economical / technical basis for an energy plant and the WEF is decommissioned and the land is rehabilitated.

For trip generation proposes, the third possibility was considered to be a conservative assumption. Therefore, the relevant assumption made in the construction phase was used here as it will take about 2 years to decommission and rehabilitate the site. About 300 people will be needed with similar transport in the construction phase. All parts will be either reused or recycled and would most likely make their way back to PE.

A summary of all decommissioning trips generated is presented in Table 5-6.

Table 5-6: Generated Decommissioning Trips

Trip Generation: Decommissioning								
Transportation Type	Component	Duration (Days)	Quantity/WT	Quantity/Truck	Total Loads	Daily traffic	Peak time traffic	Peak time pcu
Abnormal Trucks	Tower recycled	180	3	1	189	1	1	2
	Hub recycled		1	1	63	0	0	1
	Blades recycled		3	1	189	1	1	2
	Nacella recycled		1	1	63	0	0	1
Truck	Rubble removal	480	1	130	8190	17	9	30
	Water Tanker		1	1	480	1	1	2
			0	0	0	0	0	0
Passenger Vehicle	Staff	1	60	1	60	120	60	60
Bus	Staff	1	240	14	17	34	17	17
	Total				9251	175	87	114

5.2.2 Closure

The closure phase of the wind facility is expected to generate negligible traffic to site.

5.3 Trip distribution and assignment

A majority of WT components are assumed to be transported to San Kraal WEF on the N10 as discussed in earlier sections, using the San Kraal access as discussed in Section 4.

The trips generated were distributed onto the surrounding road network with:

- 100% of delivery trips traveling from the Coega PE Port along the N10 & N9
- 100% of daily commuter trips from Noupoort town via R389

Diagrams showing trip assignment are provided in Appendix D.

5.4 Road capacity and safety assessment

5.4.1 Capacity analysis scenarios

It is required to grow traffic flow to an acceptable horizon year to ensure that the future road network would be able to operate adequately. In the absence of historical data, the COTO, TMH17 Volume 1 Manual provides typical growth rates to be used for growth areas based on the existing/anticipated rate of growth. Typical traffic growth rates are illustrated in Table 5-7.

Table 5-7: Typical Traffic Growth Rates

DEVELOPMENT AREA	GROWTH RATE
Low Growth Areas	0% - 3%
Average Growth Areas	3% - 4%
Above Average Growth Areas	4% - 6%
Fast Growing Areas	6% - 8%
Exceptionally High Growth Areas	> 8%

The Noupoort area was considered to be a low growth area. Taking into account the additional WEF being developed in the area, a 3% per annum growth rate was assumed to represent the expected traffic growth.

To identify any shortcomings in the road based capacity in the short term, a base year assessment was undertaken. Furthermore, the traffic was grown to an acceptable horizon year to ensure that the proposed road network would be able to operate adequately once the development is constructed. If construction starts in 2019. The scenarios analysed are as follows:

Table 5-8: Analysed Scenarios

Phase	Senario	Year	
Base	1	2018	Existing Traffic
Pre-construction	2	2019	Background Traffic
	3		Background+ Development Traffic
Construction	4	2021	Background Traffic
	5		Background+ Development Traffic
Operation	6	2041	Background Traffic
	7		Background+ Development Traffic
Decommissioning	8	2043	Background Traffic
	9		Background+ Development Traffic

The operational performance of an intersection is defined by the level of service (LOS) for each approach to the intersection. These definitions, as defined in the Highway Capacity Manual (HCM) (Reference 5), relate average delays at intersections for individual turning movements, for each approach and for the overall intersection to a level of service ranging from A to F, as shown in Table 5-9. During the peak hours, the road infrastructure capacity provided should ensure that the intersection approach level of service should ideally not exceed LOS D.

Table 5-9: Intersection Based Level of Service Criteria

Level of Service	Control Delay per Vehicle in Seconds (d)	
	Signals and Roundabouts	Stop Signs and 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	80 < d	50 < d

(a) Scenario 1: AM and PM Existing 2018 Traffic;

Capacity analysis for 2018 traffic volumes is summarised in Table 5-10.

Table 5-10: Existing 2018 Traffic Results

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
1. N9 & Shaw St	South	0.9	3.9	A	0	0.7	6.9	A	0.0
	East	8.6	1.8	A	0.1	9.1	1.9	A	0.1
	North	1.7	2.3	A	0	1.5	3.3	A	0.0
	West	10	3.3	A	0.1	9.2	2.7	A	0.1
OVERALL (LOS)		A				A			
2.N9 & Murray St	South	1.3	4.3	A	0.0	0.9	7.3	A	0.0
	East	8.7	2.3	A	0.1	10.4	2.8	B	0.1
	North	1.4	2.6	A	0.0	1.1	3.4	A	0.0
	West	8.8	2.3	A	0.1	9.4	3.2	A	0.1
OVERALL (LOS)		A				A			
3. N9 & N10	South	0.9	4.5	A	0.0	0.6	6.7	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	1.0	2.3	A	0.0	0.6	3.9	A	0.0
	West	10.1	3.4	B	0.1	11.1	3.3	B	0.1
OVERALL (LOS)		A				A			
4. R389 & road to N10	South	2.5	7	A	0.0	3.0	0.6	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	5.5	7	A	0.0	5.5	0.9	A	0.0
	West	2.8	6	A	0.0	2.8	0.8	A	0.0
OVERALL (LOS)		A				A			
5. 2733	South	0.0	1.5	A	0.0	0.0	1.7	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.6	A	0.0	0.0	1.4	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
6. 2741	South	0.0	1.1	A	0.0	0.0	1.0	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.0	A	0.0	0.0	1.0	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
7. 1477	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	East	0.0	1.1	A	0.0	0.0	1.3	A	0.0
	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	West	0.0	1.0	A	0.0	0.0	1.4	A	0.0
OVERALL (LOS)		A				A			

(b) Scenario 2: AM and PM Background 2019 Traffic;

Capacity analysis for 2018 traffic volumes is summarised in Table 5-11.

Table 5-11: Background 2019 Traffic

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
1. N9 & Shaw St	South	0.9	4.0	A	0.0	1.5	4.0	A	0.0
	East	8.6	1.8	A	0.1	8.7	1.8	A	0.1
	North	1.6	2.4	A	0.0	1.6	2.4	A	0.0
	West	10.0	3.3	A	0.1	10.1	3.3	B	0.1
OVERALL (LOS)		A				A			
2.N9 & Murray St	South	1.3	4.5	A	0.0	0.9	7.5	A	0.0
	East	8.7	2.3	A	0.1	10.4	2.9	B	0.1
	North	1.4	2.7	A	0.0	1.0	3.5	A	0.0
	West	1.4	2.4	A	0.1	9.5	3.2	A	0.1
OVERALL (LOS)		A				A			
3. N9 & N10	South	0.9	4.7	A	0.0	0.6	6.9	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	1.0	2.4	A	0.0	0.7	4.1	A	0.0
	West	10.2	3.4	B	0.1	11.2	3.5	B	0.1
OVERALL (LOS)		A				A			
4. R389 & road to N10	South	2.5	0.7	A	0.0	3.0	0.6	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	5.5	0.7	A	0.0	5.5	1.0	A	0.0
	West	2.8	0.6	A	0.0	2.8	0.8	A	0.0
OVERALL (LOS)		A				A			
5. 2733	South	0.0	1.5	A	0.0	0.0	1.7	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.7	A	0.0	0.0	1.4	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
6. 2741	South	0.0	1.2	A	0.0	0.0	1.0	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.0	A	0.0	0.0	1.0	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
7. 1477	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	East	0.0	0.6	A	0.0	0.0	1.4	A	0.0
	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
	West	0.0	0.9	A	0.0	0.0	1.4	A	0.0
OVERALL (LOS)		A				A			

(c) Scenario 3: AM and PM Background 2019 + Development Traffic;

Capacity analysis for 2018 traffic volumes is summarised in Table 5-12.

Table 5-12: Background 2019 + Development Traffic

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
1. N9 & Shaw St	South	1.5	4.6	A	0.0	1.5	4.0	A	0.0
	East	8.7	1.8	A	0.1	8.7	1.8	A	0.1
	North	1.6	2.4	A	0.0	1.6	2.4	A	0.0
	West	10.0	3.3	B	0.1	10.2	3.5	B	0.1
OVERALL (LOS)		A				A			
2.N9 & Murray St	South	1.2	5.1	A	0.0	1.0	7.5	A	0.0
	East	8.8	2.3	A	0.1	10.6	3.0	B	0.1
	North	1.4	2.7	A	0.0	0.9	4.2	A	0.0
	West	8.9	2.4	A	0.1	9.6	3.3	A	0.1
OVERALL (LOS)		A				A			
3. N9 & N10	South	1.5	4.7	A	0.1	0.6	6.9	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	1.0	2.4	A	0.0	0.6	4.7	A	0.0
	West	10.2	3.4	B	0.1	11.3	3.6	B	0.1
OVERALL (LOS)		A				A			
4. R389 & road to N10	South	1.4	1.3	A	0.0	3.0	0.6	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	5.5	0.7	A	0.0	5.6	1.0	A	0.0
	West	2.8	0.6	A	0.0	1.6	1.4	A	0.0
OVERALL (LOS)		A				A			
5. 2733	South	0.0	2.2	A	0.0	0.0	1.7	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.7	A	0.0	0.0	2.1	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
6. 2741	South	0.0	1.8	A	0.0	0.0	1.0	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.0	A	0.0	0.0	1.0	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
7. 1477	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	East	0.0	0.6	A	0.0	0.0	1.4	A	0.0
	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	West	0.0	0.9	A	0.0	0.0	1.4	A	0.0
OVERALL (LOS)		A				A			

(d) Scenario 4: AM and PM Background 2021 Traffic;

Capacity analysis for 2018 traffic volumes is summarised in Table 5-13.

Table 5-13: Background 2021 Traffic

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
1. N9 & Shaw St	South	0.9	4.3	A	0.0	0.9	4.3	A	0.0
	East	8.7	2.2	A	0.1	8.7	2.2	A	0.1
	North	1.6	2.6	A	0.0	1.7	2.6	A	0.0
	West	10.1	3.3	A	0.1	10.1	3.3	B	0.1
OVERALL (LOS)		A				A			
2.N9 & Murray St	South	1.5	4.7	A	0.0	0.9	8.0	A	0.0
	East	8.8	2.6	A	0.1	10.5	3.1	B	0.1
	North	1.4	2.8	A	0.0	1.1	3.7	A	0.0
	West	8.9	2.5	A	0.1	9.6	3.5	A	0.1
OVERALL (LOS)		A				A			
3. N9 & N10	South	0.9	4.9	A	0.0	0.6	7.3	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.9	2.5	A	0.0	0.6	4.3	A	0.0
	West	10.3	3.6	B	0.1	11.4	3.8	B	0.1
OVERALL (LOS)		A				A			
4. R389 & road to N10	South	2.5	0.7	A	0.0	2.8	0.7	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
	North	5.5	0.9	A	0.0	5.5	1.1	A	0.0
	West	2.8	0.7	A	0.0	2.8	0.8	A	0.0
OVERALL (LOS)		A				A			
5. 2733	South	0.0	1.6	A	0.0	0.0	1.9	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.7	A	0.0	0.0	1.5	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
6. 2741	South	0.0	1.2	A	0.0	0.0	1.0	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.0	A	0.0	0.0	1.0	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
7. 1477	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	East	0.0	0.6	A	0.0	0.0	1.4	A	0.0
	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	West	0.0	0.9	A	0.0	0.0	1.5	A	0.0
OVERALL (LOS)		A				A			

(e) Scenario 5: AM and PM Background 2021+ Development Traffic;

Capacity analysis for 2018 traffic volumes is summarised in Table 5-14.

Table 5-14: Background 2021+ Development Traffic

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
1. N9 & Shaw St	South	3.5	10.1	A	0.0	3.5	6.6	A	0.3
	East	9.0	2.3	A	0.1	9.5	2.5	A	0.1
	North	1.6	2.6	A	0.0	1.7	2.6	A	0.0
	West	10.7	3.6	B	0.1	12.8	7.0	A	0.3
OVERALL (LOS)		A				A			
2.N9 & Murray St	South	0.7	10.7	A	0.0	0.9	8.0	A	0.0
	East	9.7	3.0	A	0.1	11.4	3.5	B	0.1
	North	1.5	2.8	A	0.0	0.5	7.9	A	0.0
	West	9.9	2.9	A	0.1	10.3	3.8	B	0.1

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
OVERALL (LOS)		A				A			
3. N9 & N10	South	3.6	9.3	A	0.4	0.6	7.3	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.9	2.5	A	0.0	0.3	11.0	A	0.0
	West	10.9	3.9	B	0.1	13.0	4.6	B	0.2
OVERALL (LOS)		A				A			
4. R389 & road to N10	South	0.3	6.9	A	0.0	3.0	0.7	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	5.7	0.9	A	0.0	5.9	1.2	A	0.0
	West	2.8	0.7	A	0.0	0.3	6.9	A	0.0
OVERALL (LOS)		A				A			
5. 2733	South	0.0	8.3	A	0.0	0.0	1.9	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.7	A	0.0	0.0	8.1	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
6. 2741	South	0.0	7.8	A	0.0	0.0	1.0	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.0	A	0.0	0.0	7.7	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
7. 1477	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	East	0.0	0.6	A	0.0	0.0	1.4	A	0.0
	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	West	0.0	0.9	A	0.0	0.0	1.5	A	0.0
OVERALL (LOS)		A				A			

(f) Scenario 6: AM and PM Background 2041Traffic;

Capacity analysis for 2018 traffic volumes is summarised in Table 5-15.

Table 5-15: Background 2041Traffic

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
	South	0.9	7.7	A	0	0.7	13.5	A	0.0

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
1. N9 & Shaw St	East	9.6	4.1	A	0.2	11.1	5.1	B	0.2
	North	1.7	4.6	A	0	1.6	6.6	A	0.1
	West	11.5	7.5	B	0.3	13.7	8.9	B	0.3
OVERALL (LOS)		A							
2.N9 & Murray St	South	1.3	8.5	A	0.0	1.0	14.4	A	0.0
	East	9.8	5.3	A	0.2	12.4	7.0	B	0.3
	North	1.5	5.1	A	0.0	1.1	6.8	A	0.0
	West	10.0	5.3	A	0.2	11.9	8.4	B	0.3
OVERALL (LOS)		A				A			
3. N9 & N10	South	1.0	8.9	A	0.1	0.6	13.2	A	0.1
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	1.0	4.5	A	0.0	0.6	7.8	A	0.0
	West	11.8	8.0	B	0.3	14.3	9.3	B	0.3
OVERALL (LOS)		A				A			
4. R389 & road to N10	South	2.5	1.4	A	0.1	2.9	1.2	A	0.1
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	5.6	1.5	A	0.1	5.6	1.8	A	0.1
	West	2.8	1.1	A	0.0	2.8	1.4	A	0.0
OVERALL (LOS)		A				A			
5. 2733	South	0.0	2.9	A	0.0	0.0	3.4	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	3.2	A	0.0	0.0	2.7	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
6. 2741	South	0.0	2.2	A	0.0	0.0	1.9	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.9	A	0.0	0.0	1.9	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)						A			
7. 1477	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	East	0.0	1.7	A	0.0	0.0	2.6	A	0.0
	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	West	0.0	1.1	A	0.0	0.0	2.7	A	0.0
OVERALL (LOS)		A				A			

(g) Scenario 7: AM and PM Background 2041+ Development Traffic;

Capacity analysis for 2018 traffic volumes is summarised in Table 5-16.

Table 5-16: Background 2041+ Development Traffic

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
1. N9 & Shaw St	South	2.0	10.3	A	0	2.1	7.7	A	0.2
1.	East	9.7	4.3	A	0.2	10.0	4.4	B	0.2
	North	1.7	4.6	A	0	1.7	4.6	A	0.0
	West	11.9	7.8	B	0.3	12.9	9.8	B	0.4
OVERALL (LOS)		A				A			
2.N9 & Murray St	South	1.0	11.2	A	0.0	1.0	14.4	A	0.0
10.	East	10.3	5.6	B	0.1	13.3	7.6	B	0.3
	North	1.5	5.1	A	0.0	0.8	9.7	A	0.0
	West	10.5	5.8	B	0.1	12.6	9.1	B	0.3
OVERALL (LOS)		B				A			
3. N9 & N10	South	2.0	8.9	A	0.2	0.6	13.2	A	0.1
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	1.0	4.5	A	0.0	0.5	10.7	A	0.0
	West	12.1	8.3	B	0.3	15.2	10.1	C	0.4
OVERALL (LOS)		A				A			
4. R389 & road to N10	South	0.8	4.1	A	0.1	3.0	1.2	A	0.1
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	5.7	1.5	A	0.1	5.7	1.9	A	0.1
	West	2.8	1.1	A	0.0	1.0	1.4	A	0.1
OVERALL (LOS)		A				A			
5. 2733	South	0.0	5.9	A	0.0	0.0	3.4	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	3.2	A	0.0	0.0	5.6	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
6. 2741	South	0.0	5.1	A	0.0	0.0	1.9	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.9	A	0.0	0.0	4.8	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
7. 1477	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	East	0.0	2.2	A	0.0	0.0	2.6	A	0.0
	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
	West	0.0	1.8	A	0.0	0.0	2.7	A	0.0
OVERALL (LOS)		A				A			

(h) Scenario 8: AM and PM Background 2043 Traffic;

Capacity analysis for 2018 traffic volumes is summarised in Table 5-17.

Table 5-17: Background 2043 Traffic

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
1. N9 & Shaw St	South	0.9	7.9	A	0	0.7	14.3	A	0.0
	East	9.6	4.2	A	0.2	11.4	5.9	B	0.2
	North	1.7	4.7	A	0	1.6	7.0	A	0.1
	West	11.7	7.8	B	0.3	14.2	10.1	B	0.4
OVERALL (LOS)		A				A			
2.N9 & Murray St	South	1.3	8.8	A	0.0	1.0	15.2	A	0.0
	East	9.8	5.4	A	0.2	12.8	7.8	B	0.3
	North	1.5	5.3	A	0.0	1.1	7.2	A	0.0
	West	10.1	5.4	B	0.2	12.3	9.3	B	0.4
OVERALL (LOS)		A				A			
3. N9 & N10	South	0.9	9.2	A	0.1	0.6	14.0	A	0.1
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	1.0	4.7	A	0.0	0.7	8.3	A	0.0
	West	11.9	8.4	B	0.3	14.8	10.4	B	0.4
OVERALL (LOS)		A				A			
4. R389 & road to N10	South	2.7	1.4	A	0.1	2.9	1.3	A	0.1
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	5.6	1.5	A	0.1	5.6	2.0	A	0.1
	West	2.8	1.1	A	0.0	2.8	1.5	A	0.0
OVERALL (LOS)		A				A			
	South	0.0	3.0	A	0.0	0.0	3.6	A	0.0

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
5. 2733	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	3.0	A	0.0	0.0	2.9	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
6. 2741	South	0.0	2.3	A	0.0	0.0	1.9	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.9	A	0.0	0.0	2.0	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
7. 1477	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	East	0.0	1.7	A	0.0	0.0	2.8	A	0.0
	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	West	0.0	1.2	A	0.0	0.0	2.8	A	0.0
OVERALL (LOS)		A				A			

(i) Scenario 9: AM and PM Background 2043+ Development Traffic;

Capacity analysis for 2018 traffic volumes is summarised in Table 5-18

Table 5-18: Background 2043+ Development Traffic

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
1. N9 & Shaw St	South	2.8	13.8	A	0	2.9	8.2	A	0.3
	East	10.1	4.5	**B**	0.2	10.7	5.4	B	0.2
	North	1.7	4.7	A	0	1.7	4.9	A	0.0
	West	12.6	8.6	B	0.3	14.9	14	B	0.5
OVERALL (LOS)		A							
2.N9 & Murray St	South	0.8	14.8	A	0.0	1.0	15.2	A	0.0
	East	11.0	6.3	B	0.2	14.8	9.6	B	0.4
	North	1.6	5.3	A	0.0	0.6	13.9	A	0.0
	West	11.5	6.5	B	0.2	14.1	11.2	B	0.4
OVERALL (LOS)		A				A			
3. N9 & N10	South	2.8	10.3	A	0.4	0.6	14.0	A	0.7
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	1.0	4.7	A	0.0	0.4	14.9	A	0.3

INTERSECTION APPROACH		San Kraal Energy Facility							
		Weekday AM				Weekday PM			
		Delay (sec)	V/C (%)	LOS	95% queue (m)	Delay (sec)	V/C (%)	LOS	95% queue (m)
	West	12.7	9.2	B	0.3	17.2	12.8	C	4.1
OVERALL (LOS)		A							
4. R389 & road to N10	South	0.5	7.6	A	0.1	3.2	1.4	A	0.1
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	5.8	1.6	A	0.1	6.0	2.2	A	0.1
	West	2.8	1.1	A	0.0	0.6	7.7	A	0.0
OVERALL (LOS)		A				A			
5. 2733	South	0.0	9.6	A	0.0	0.0	3.6	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	3.3	A	0.0	0.0	9.5	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
6. 2741	South	0.0	8.8	A	0.0	0.0	1.9	A	0.0
	East	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	North	0.0	1.9	A	0.0	0.0	8.6	A	0.0
	West	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OVERALL (LOS)		A				A			
7. 1477	South	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	East	0.0	1.7	A	0.0	0.0	2.8	A	0.0
	North	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	West	0.0	1.2	A	0.0	0.0	2.8	A	0.0
OVERALL (LOS)		A				A			

5.5 Potential impacts of the development on intersection

From the capacity analysis in Section 6.4 is can be seen that all assessed legs of the intersections operate at a LOS A or B. The following is a summary of results:

Intersection 1 – N9 & Shaw St: All approaches operate at acceptable LOS during both the AM and PM peak hours;

Intersection 2 – N9 & Murray St: All approaches operate at acceptable LOS during both the AM and PM peak hours;

Intersection 3 – N9 & N10: All approaches operate at acceptable LOS during both the AM and PM peak hours;

Intersection 4 – R389 & road to N10: All approaches operate at acceptable LOS during both the AM and PM peak hours;

Intersection 5 –2733: All approaches operate at acceptable LOS during both the AM and PM peak hours;

Intersection 6 –2741: All approaches operate at acceptable LOS during both the AM and PM peak hours; and

Intersection 7 –1477: All approaches operate at acceptable LOS during both the AM and PM peak hours.

6. DELIVERABLE 3: ABNORMAL WEIGHTS AND DIMENSIONS

6.1 Evaluation of Abnormal Weights and Dimensions

Transport requirements for the WEF project will require the use of abnormal load vehicles as stipulated in the TRH 11, especially in the construction phase of the project for the delivery of construction materials and turbine components. Very little to no special transport will be required during the remainder of the development phases as standard transport will be used.

All WT components are considered to be abnormal loads, either through length, weight or height, usually comprising of 3 tower sections, 1 hub, 1 nacelle and 3 blades. These require different truck / trailer combinations and configurations to be transported. These issues will be investigated at a later stage when the transporting contractor and the plant hire companies apply for the necessary permits from the permit issuing authorities. The heaviest component of a wind turbine is the nacelle (approximately 67 to 85 tons depending on manufacturer and design of the unit). Combined with road-based transport, it has a total vehicle mass of approximately 130 000 kg (for the 85 ton unit). Thus route clearances and permits will be required for transporting the nacelle by road based transport.

Blades are the longest component, ranging between 45 – 75 m, and need to be transported on a specially imported extendible blade transport trailer or in a rigid container with rear steerable dollies. The blades can be transported individually, in pairs or in three's although different manufacturers have different methods of packaging and transporting the blades. Where required, existing public roads may need to be upgraded along the proposed equipment transport route to allow for the transportation and delivery of wind turbine components and other associated infrastructure components. The national roads on the potential national access routes are generally of high standard and many of the structures have been assessed for load bearing capacity and height clearance in the past. Turbine supplier/s or the contractor selected for implementation would be responsible for the transportation of wind turbine components to site. A complete transportation management plan will be undertaken prior to construction, should the project be awarded preferred bidder status.

6.2 Permit requirements

In transportation of loads the following guidelines are available. According to the TRH 11, the expected load dimensions are classified as abnormal load, therefore an exemption permit for each province that the load has to transit is required.

Provision for the type of abnormal loads in this development is made in the National Road Transport Act (NRTA), and specifically in Section 81 of the NRTA, which reads as follows:

"Vehicle and load may be exempted from provisions of Act

An MEC may, subject to such conditions an upon payment of such fees or charges as he or she may determine, authorise in writing, either generally or specifically, the operation on a public road of a vehicle which does not comply with the provisions of this Act or the conveyance on a public road of passengers or any load otherwise that in accordance with the provisions of this Act."

When the movement of an abnormal load is considered to be in the economic and/or social interest of the country, an exemption permit may be issued to allow a vehicle(s) transporting such an abnormal load to operate on a public road for a limited period. The fundamental principles guiding this process are:

- An exemption permit for an abnormal load will only be considered for an indivisible load, abnormal in dimension and/or mass, where there is no possibility of transporting the load in a legal manner.
- The risks to other users must be reduced to a level equivalent to what it would be without the presence of the abnormal vehicle on the road; and
- The conditions imposed must take the economic and/or social interest of the country and public at large into account.

6.3 Types of Abnormalities

The WEF is anticipated to carry loads that are considered to be indivisible, can be abnormal either dimensionally or abnormal in mass or abnormal both dimensionally and in mass as mentioned in Table 5-3.

The following is the Legally Permissible Maximum Dimensions / Mass:

Length- Truck & Semi-trailer (Tri-Axle) Overall length of combination (Including load projections) -18.50m. Superlink (6m + 12m trailers) Overall length of combination (No load projections) –22.00m.

Width -2.60 m.

Height- 4.30 m measured from the ground. Height of conventional trailer is 1.60m from ground to trailer deck, therefore permissible height of load is 2.70m.

Weight 13.50m Tri-Axle 28 Ton / 15.00m Tri-Axle 30 Ton. Superlink 34 Ton gross (6.00m –10 / 12 Ton & 12m –24 / 22 Ton)

The WEF components are classified as an Abnormal Load and will necessitate the application to the Department of Transport and Public Works for a permit authorising the conveyance of said load.

With the required permits in place, the following escort vehicles (whether it is the clients own escort vehicles or provincial traffic officer) will be necessary to escort the transportation of abnormal loads. The anticipated escort vehicles are presented in Table 6-1.

It must be noted Loads with a height of 4.70m measured from the ground require –1 x Own Escort vehicle. For loads of 5.50m + high Telkom & Eskom Clearances are required for the lifting of overhead lines. Upon final selection of WT models to be used, the exact amount of escort vehicles can be determined.

Table 6-1: Escort Vehicles

Component	Details	Escort Vehicles
Tower	Length: 150 m	3 Tower sections/WT 2 x Provincial Traffic Escorts (subject to width of load)
Rotor	Blade Length: 75 m Hub	3 Blades/WT Connected to 1 Hub/WT 2 x Provincial Traffic Escorts (subject to width of load)

7. SANRAL CONSULTATION

Consultation took place with SANRAL on 9 January 2018. It was established that:

- Sanral's Western Region (head office in Cape Town, Western Cape) is responsible for the section of the N9 where the access is proposed (the access is located in the Northern Cape). The project manager of this section of the N9 is Mr. Deriek Wilson - 021 957 4600.
- The client needs to submit this TIA as well as a plan indicating existing intersections and layouts, as well as planned intersections and proposed layouts to SANRAL for approval should the project be awarded.
- This needs to be submitted to SANRAL's statutory control section – Ms. Colene Runkel (runkelc@nra.co.za)
- SANRAL may then request additional information as required.

- Sanral's Southern Region (head office in Port Elizabeth, Eastern Cape) will be responsible for the remainder of the N9 route to/from the site and Port Elizabeth and will have to be consulted for any route determination requirements, which are not included in this scope of works. The project manager for the N9 between Graaff-Reinet and Carlton Heights is Mr. Danford Adams - 041 398 3200.

8. CONCLUSION AND RECOMMENDATIONS

Based on the information detailed in this report, the following conclusions are drawn:

- The base year and forecast year road capacity has indicated that the proposed development will have no significant impact on the existing road network capacity.
- Given the findings of this report, it is recommended that the proposed construction be considered favourably from a traffic engineering point of view as the intended construction will have no negative impact on the surrounding road network.

The following recommendations are made:

- San Kraal Access point (E) is recommended as the access position, based on safety considerations.
- The preferred access road is recommended to be the N10 from PE to Middelburg, the N9 from Middelburg to Noupoort and the R389 to the San Kraal Access E.
- A comprehensive route assessment of the entire route is recommended should the project be awarded preferred bidder as part of the REIPPP process.
- It is recommended that Access point E be stop controlled and widened to allow for dedicated right turn and left turn lanes off the main road, which will incorporate the turning circles of the expected abnormal vehicles.
- In addition, allowance must be made for public transport vehicle lay byes on both sides of the access along the main road as well as safe pedestrian crossings on all 3 approaches of the access.
- Clearances will be required for the transport of the WT components.
- It is recommended that applications for Abnormal Permits be lodged to the Department of Transport and Public Works, Eskom and Telkom.

APPENDIX A TRAFFIC COUNTS
APPENDIX B SITE VIST
APPENDIX C REGRESSION ANALYSIS EXAMPLE
APPENDIX D STICK DIAGRAMS

Appendix A

SUMMARY OF TRAFFIC COUNTS

STATION: M1
LOCATION: **N/S** N9 **E/W** Shaw

LAT: 31° 10' 27.5" S **LONG:** 24° 57' 47.7" E

DATE: 10/01/2018 Wednesday

MOVEMENT FROM	NO	AM PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF	PM PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF
NORTH	1 R	2				2		7			1	8	
	2 T	14			17	31	0.71	37			19	56	0.77
	3 L												
EAST	4 R												
	5 T						n.a.						n.a.
	6 L												
SOUTH	7 R												
	8 T	65			10	75	0.86	99			31	131	0.57
	9 L	2				2		5				5	
WEST	10 R	6				6		3				3	
	11 T				1	1	0.67						0.50
	12 L	2				2		5				5	
TOTAL		**91**			**28**	**119**	**0.85**	**156**			**51**	**208**	**0.68**
VEH SPLIT		*76%*			*24%*	*100%*		*75%*			*25%*	*100%*	
		PERCENTAGE OF:			*12H*	*5.9%*		*PERCENTAGE OF:*			*12H*	*10.3%*	

MOVEMENT FROM	NO	MIDDAY PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF	12 HOUR COUNT LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL
NORTH	1 R	5				5		49			2	51
	2 T	49			16	65	0.62	349	7	1	198	555
	3 L											
EAST	4 R											
	5 T				1	1	n.a.				3	3
	6 L											
SOUTH	7 R											
	8 T	156			10	168	0.74	1061	5	1	170	1237
	9 L	6			1	7		55			2	57
WEST	10 R	4				4		44	1			45
	11 T				1	1	0.44				3	3
	12 L	11				11		61		1		62
TOTAL		**231**			**29**	**262**	**0.87**	**1619**	**13**	**3**	**378**	**2013**
VEH SPLIT		*88%*			*11%*	*100%*		*80%*	*1%*	*0%*	*19%*	*100%*
		PERCENTAGE OF:			*12H*	*13.0%*						

STARTING TIME OF PEAK HOUR — AM 08:00, MID 11:30, PM 15:00

NOTE: SEE ATTACHED SHETCH FOR LAYOUT OF STATION

PREPARED BY TRAFFTRANS (PTY) LTD

SUMMARY OF TRAFFIC COUNTS

STATION: M2
LOCATION: N/S N9 E/W Murray

LAT: 31° 11' 11.7" S **LONG:** 24° 57' 48.0" E **DATE:** 10/01/2018 **Wednesday**

MOVEMENT FROM	NO	AM PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF	PM PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF
NORTH	1 R							1				1	
	2 T	20			17	37	0.79	39			19	58	0.77
	3 L	1				1							
EAST	4 R												
	5 T	4				4	0.50	3				3	0.58
	6 L	1				1					2	2	
SOUTH	7 R	1			1	2		3				3	
	8 T	67			10	77	0.89	103			31	135	0.57
	9 L	5			2	7		12				12	
WEST	10 R	2				2		8				8	
	11 T	2				2	0.63	1				1	0.63
	12 L							1				1	
TOTAL		**103**			**30**	**133**	**0.90**	**171**			**52**	**224**	**0.67**
VEH SPLIT		*77%*			*23%*	*100%*		*76%*			*23%*	*100%*	
		PERCENTAGE OF:			*12H*	*6.2%*		*PERCENTAGE OF:*			*12H*	*10.4%*	

MOVEMENT FROM	NO	MIDDAY PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF	12 HOUR COUNT LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL
NORTH	1 R	1				1		7			1	8
	2 T	50			22	72	0.63	383	8	1	196	588
	3 L							10			1	11
EAST	4 R							7				7
	5 T	5				5	0.63	36			1	37
	6 L							14			2	16
SOUTH	7 R	3				3		20			1	21
	8 T	156			12	170	0.73	1096	5	1	172	1274
	9 L	12				12		77			4	81
WEST	10 R	8			1	9		60			4	64
	11 T	3				3	0.54	26			1	27
	12 L	1				1		20				20
TOTAL		**239**			**35**	**276**	**0.68**	**1756**	**13**	**2**	**383**	**2154**
VEH SPLIT		*87%*			*13%*	*100%*		*82%*	*1%*	*0%*	*18%*	*100%*
		PERCENTAGE OF:			*12H*	*12.8%*						

STARTING TIME OF PEAK HOUR AM 08:00 MID 11:15 PM 15:00

NOTE: SEE ATTACHED SHETCH FOR LAYOUT OF STATION

PREPARED BY TRAFFTRANS (PTY) LTD

SUMMARY OF TRAFFIC COUNTS

STATION: M3
LOCATION: **N/S** N9 **E/W** N10

LAT: 31° 19' 48.0" S **DATE:** 10/01/2018
LONG: 24° 58' 26.6" E **Wednesday**

MOVEMENT FROM	NO	AM PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF	PM PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF
NORTH	1 R	2				2		3				3	
	2 T	21			17	38	0.77	52	1		23	76	0.85
	3 L												
EAST	4 R												
	5 T						n.a.						n.a.
	6 L												
SOUTH	7 R												
	8 T	83			14	97	0.86	109			31	140	0.74
	9 L	7			5	12		6			3	9	
WEST	10 R	11			6	17		8			6	14	
	11 T						0.59						0.58
	12 L	1				1		1				1	
TOTAL		**125**			**42**	**167**	**0.89**	**179**	**1**		**63**	**243**	**0.82**
VEH SPLIT		*75%*			*25%*	*100%*		*74%*	*0%*		*26%*	*100%*	
		PERCENTAGE OF:			*12H*	*6.9%*		*PERCENTAGE OF:*			*12H*	*10.0%*	

MOVEMENT FROM	NO	MIDDAY PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF	12 HOUR COUNT LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL
NORTH	1 R				1	1		13	2		2	17
	2 T	49			23	72	0.68	429	7	1	197	634
	3 L											
EAST	4 R											
	5 T						n.a.					
	6 L											
SOUTH	7 R											
	8 T	171			11	184	0.74	1170	3	1	172	1346
	9 L	22			6	29		111	1		99	211
WEST	10 R	3			9	12		74	11		119	204
	11 T						0.75					
	12 L							7			1	8
TOTAL		**245**			**50**	**298**	**0.79**	**1804**	**24**	**2**	**590**	**2420**
VEH SPLIT		*82%*			*17%*	*100%*		*75%*	*1%*	*0%*	*24%*	*100%*
		PERCENTAGE OF:			*12H*	*12.3%*						

STARTING TIME OF PEAK HOUR **AM** 08:00 **MID** 11:15 **PM** 15:00

NOTE: SEE ATTACHED SHETCH FOR LAYOUT OF STATION

PREPARED BY TRAFFTRANS (PTY) LTD

SUMMARY OF TRAFFIC COUNTS

STATION: M4
LOCATION: **N/S** R389 **E/W** R389

LAT: 31° 11' 12.2" S **DATE:** 10/01/2018
LONG: 24° 53' 49.3" E **Wednesday**

MOVEMENT FROM	NO	AM PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF	PM PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF
NORTH	1 R						n.a.	3				3	0.38
	2 T												
	3 L												
EAST	4 R	1				1	0.38	1				1	0.25
	5 T	2				2							
	6 L												
SOUTH	7 R						n.a.						n.a.
	8 T												
	9 L												
WEST	10 R						n.a.						0.50
	11 T							2				2	
	12 L							2				2	
TOTAL		**3**				**3**	**0.38**	**8**				**8**	**0.67**
VEH SPLIT		***100%***				***100%***		***100%***				***100%***	
		PERCENTAGE OF: 12H				***7.0%***		***PERCENTAGE OF: 12H***				***18.6%***	

MOVEMENT FROM	NO	MIDDAY PEAK HOUR LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL	PHF	12 HOUR COUNT LIGHT VOL	TAXI VOL	BUS VOL	HEAVY VOL	TOTAL VOL
NORTH	1 R	1				1	n.a.	6				6
	2 T											
	3 L							3				3
EAST	4 R						0.38	3				3
	5 T	2			1	3		10			1	11
	6 L											
SOUTH	7 R						n.a.					
	8 T											
	9 L											
WEST	10 R						0.75					
	11 T	2				2		11				11
	12 L	4				4		9				9
TOTAL		**9**			**1**	**10**	**0.63**	**42**			**1**	**43**
VEH SPLIT		***90%***			***10%***	***100%***		***98%***			***2%***	***100%***
		PERCENTAGE OF: 12H				***23.3%***						

STARTING TIME OF PEAK HOUR **AM** 07:30 **MID** 09:00 **PM** 16:15

NOTE: SEE ATTACHED SHETCH FOR LAYOUT OF STATION

PREPARED BY TRAFFTRANS (PTY) LTD

Appendix B

ACCESS E

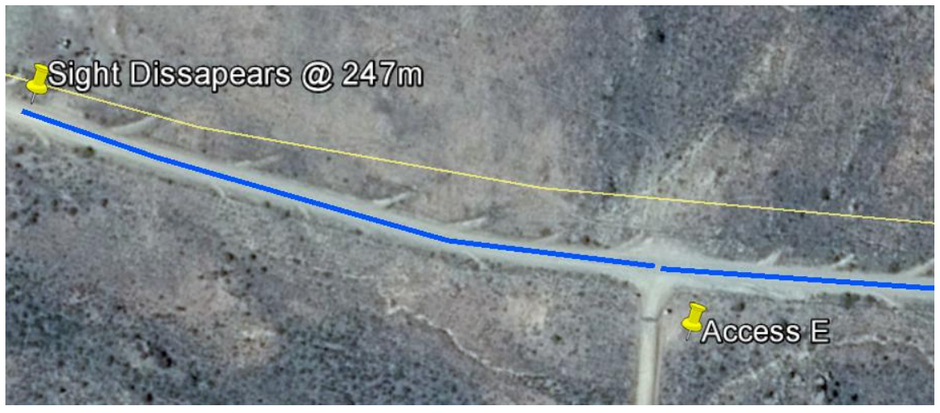
From N9 onto “Oorlogspoort”

Left Approach
No Sight distance issues – sight extends for at least 500m

Access Intersection

Right Approach
No Sight distance issues – sight extends for at least 500m

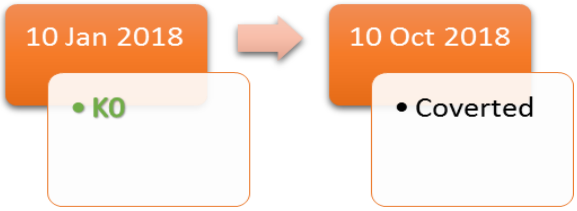
Left Approach	Access Intersection	Right Approach
At 247m sight disappears over crest curve		Slight tree / bush obstruction at 315m



Appendix C

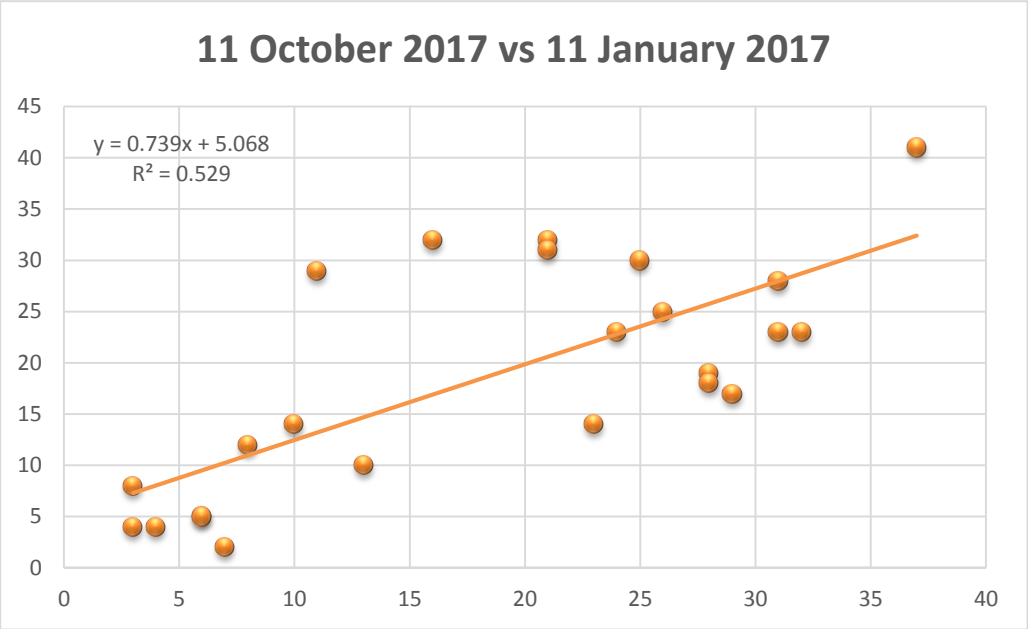
Appendix C: Regression Analysis Example

In statistics, linear regression is a linear approach for modelling the relationship between a scalar dependent variable y and one or more explanatory variables (or independent variables) denoted X. Our goal was to prediction, or forecasting, or error reduction between the historical traffic volumes of permanent station 1477 from which is located approximately 40km from the San Kraal WEF site. Using Regression Analysis, the correlation equations between two data sets (two months) was determined and thereafter applied to the new traffic counts. For example, the normalising of intersection 1 traffic volumes was as follows.



KO Factor applied

Time	11 January 2017	11 October 2017	Peak Hour SUM	Peak Hour AVG	y = 0.739x + 5.068
01:00:00	3	4	7	4	7
02:00:00	7	2	9	5	10
03:00:00	6	5	11	6	10
04:00:00	4	4	8	4	8
05:00:00	3	8	11	6	7
06:00:00	13	10	23	12	15
07:00:00	23	14	37	19	22
08:00:00	29	17	46	23	26
09:00:00	28	19	47	24	26
10:00:00	31	23	54	27	28
11:00:00	24	23	47	24	23
12:00:00	32	23	55	28	29
13:00:00	31	28	59	30	28
14:00:00	21	32	53	27	21
15:00:00	16	32	48	24	17
16:00:00	37	41	78	39	32
17:00:00	21	31	52	26	21
18:00:00	25	30	55	28	24
19:00:00	28	18	46	23	26
20:00:00	11	29	40	20	13
21:00:00	26	25	51	26	24
22:00:00	8	12	20	10	11
23:00:00	10	14	24	12	12
24:00:00	6	5	11	6	10

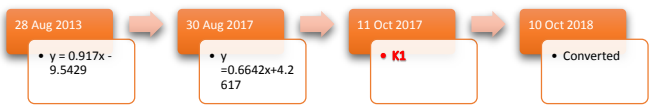


Resulting the following 2018 traffic volumes.

Intersection 1	AM Peak Hour		08:00-09:00	
Movement (approach)			Jan-18	Oct-18
From	No.		traffic	Y = 0.739x + 5.068
North	1	R	2	7
	2	T	31	28
	3	L	0	5
East	4	R	0	5
	5	T	0	5
	6	L	0	5
South	7	R	0	5
	8	T	75	60
	9	L	2	7
West	10	R	6	10
	11	T	1	6
	12	L	2	7
			119	**149**

To be consistent, all traffic volumes were normalised with is method. For example, the normalising of intersection 2733 traffic volumes was as follows.

2733



***K1 is the regression equation between October 2016 traffic volumes and October 2017.

After determining the regression equation of August 2013 & August 2017 and August 2017 and October 2017. The K1 equation was applied to convert traffic volumes to October 2018.

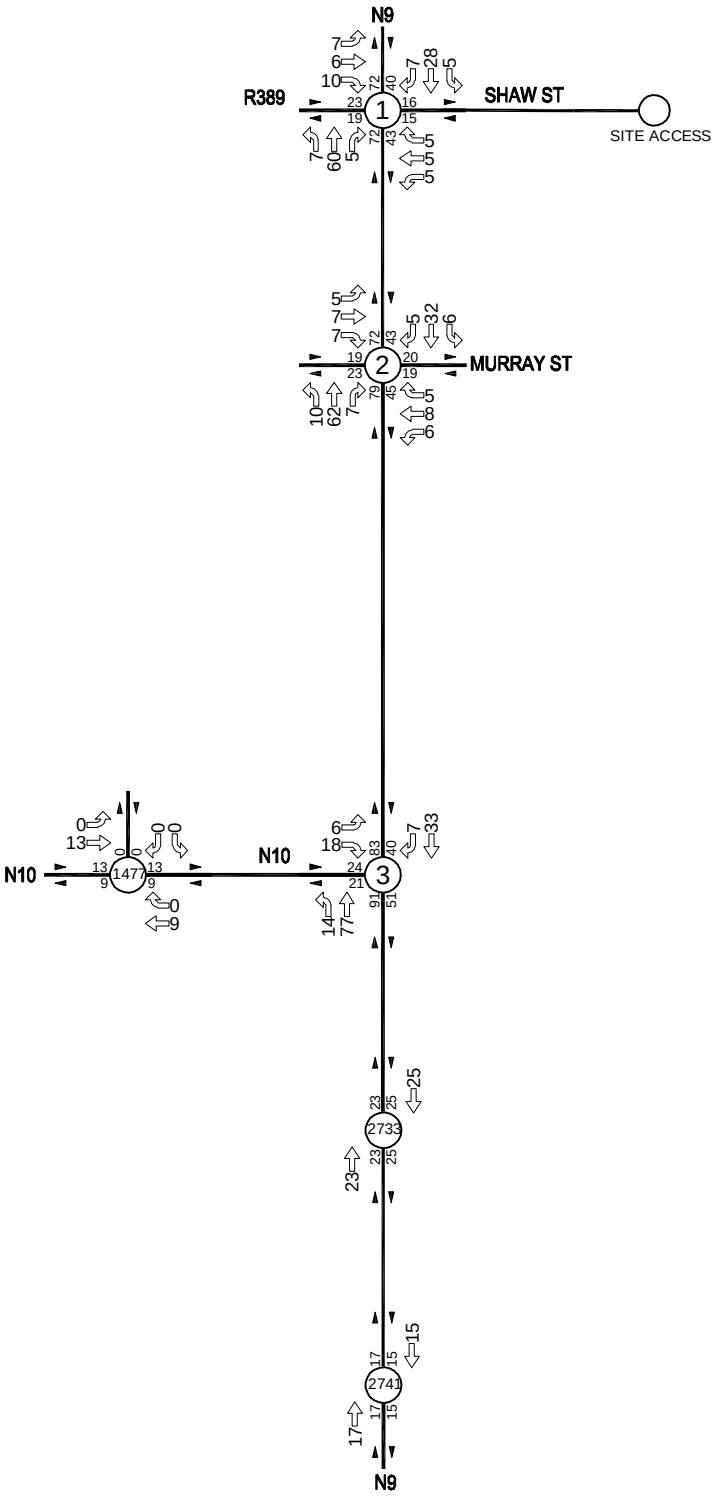
A summary of the regression equation applied to each intersection can be found in **Error! Reference source not found.**.

Resulting the following 2018 traffic volumes.

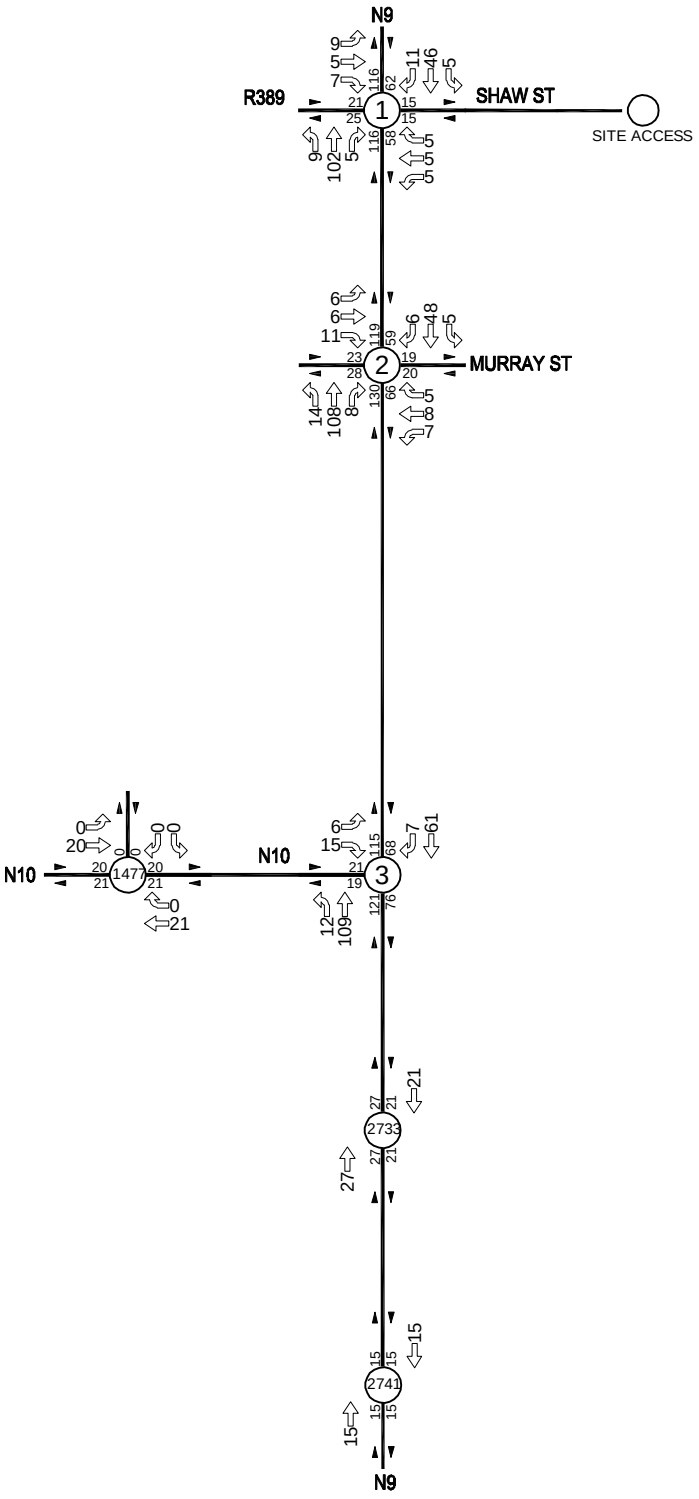
Intersection 2733	**AM Peak Hour**		**08:00-09:00**			
Movement (approach)			Aug 2013	Aug 2017	Oct 2017	Oct-18
From	No.		traffic	Y= 0.917x - 9.5429	y =0.6642x+4.2617	y = 0.8666x + 3.0366
North	1	R	0	0	0	0
	2	T	45	32	25	25
	3	L	0	0	0	0
East	4	R	0	0	0	0
	5	T	0	0	0	0
	6	L	0	0	0	0
South	7	R	0	0	0	0
	8	T	41	28	23	23
	9	L	0	0	0	0
West	10	R	0	0	0	0
	11	T	0	0	0	0
	12	L	0	0	0	0
			86	**60**	**48**	**48**

Appendix D

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

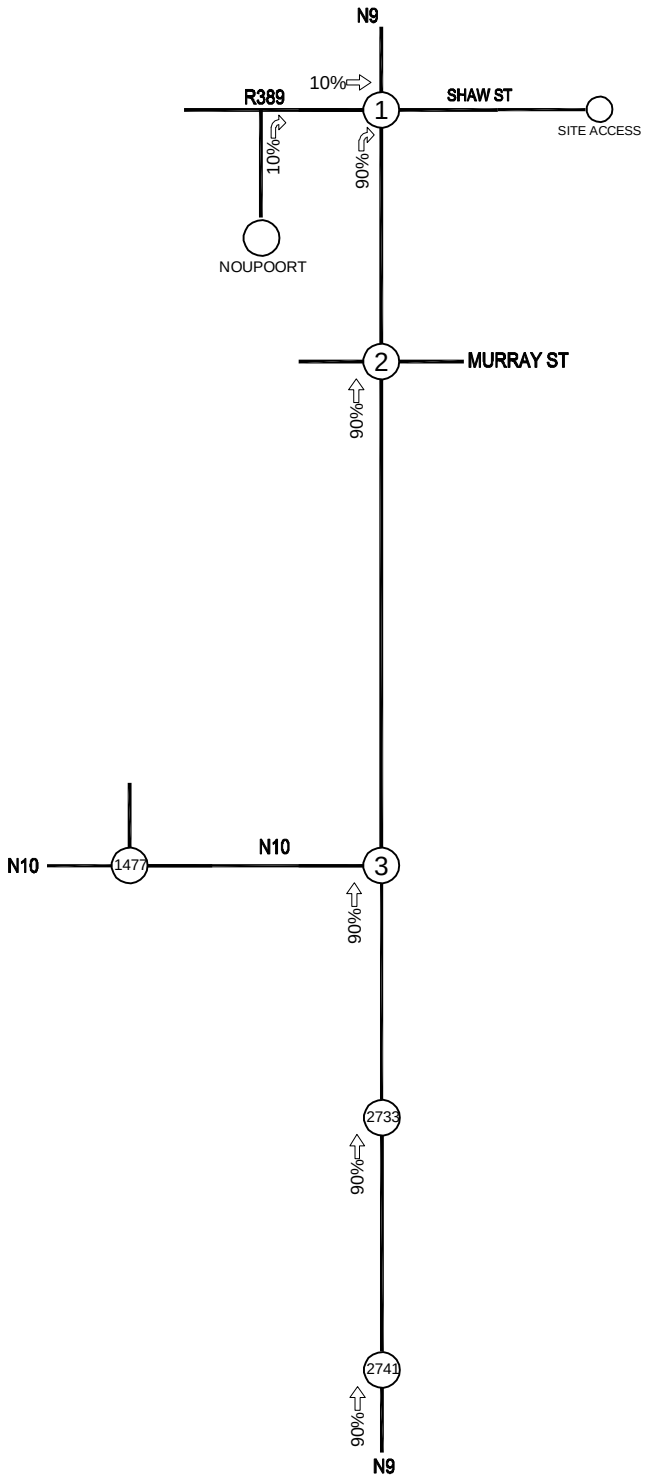


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

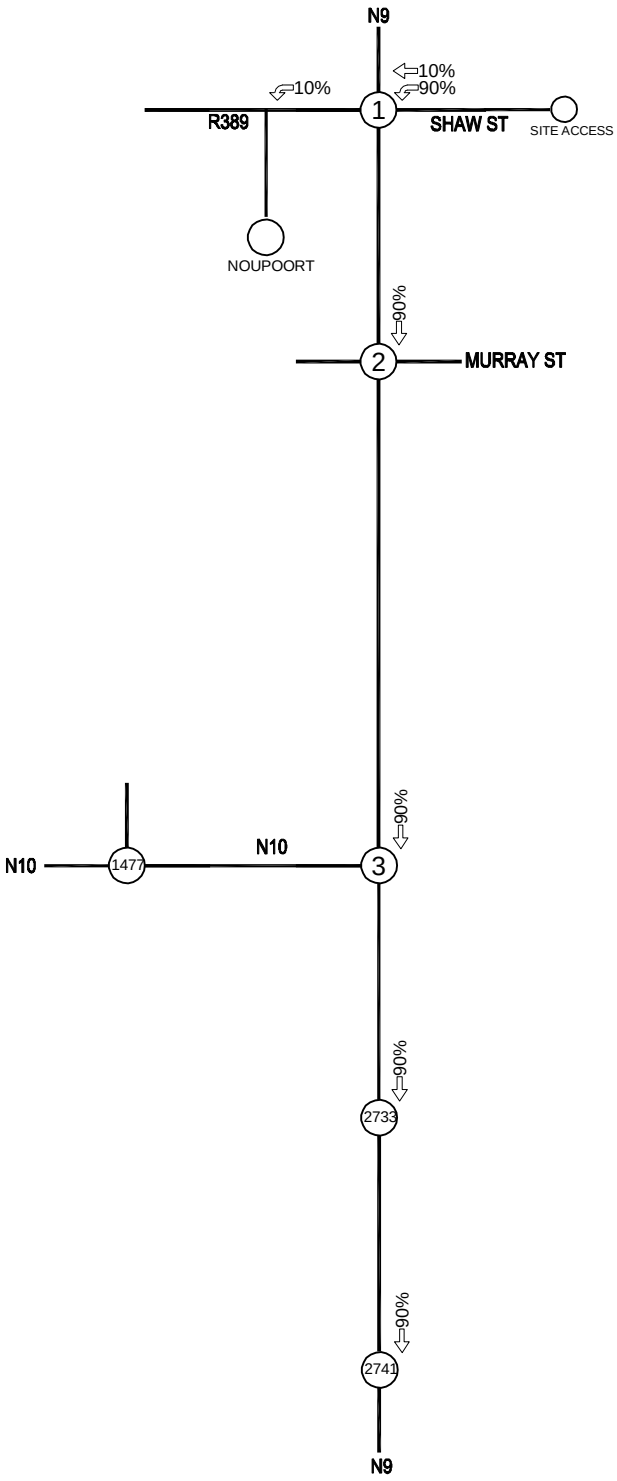


	PROJECT:	FIGURE:	Nr.
SMEC Member of the Surbana Jurong Group	SAN KRAAL WEF PROJECT	EXISTING 2018 WEEKDAY AM & PM PEAK HOURS	1

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

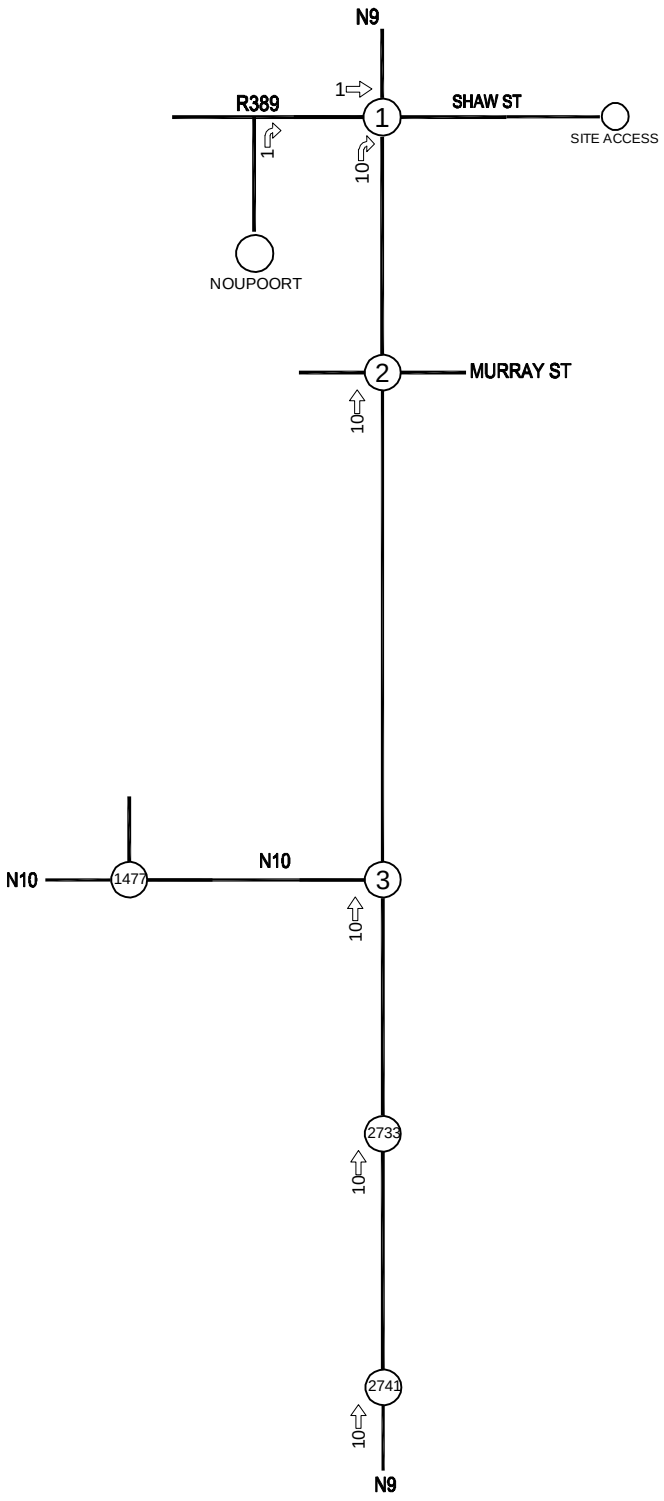


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

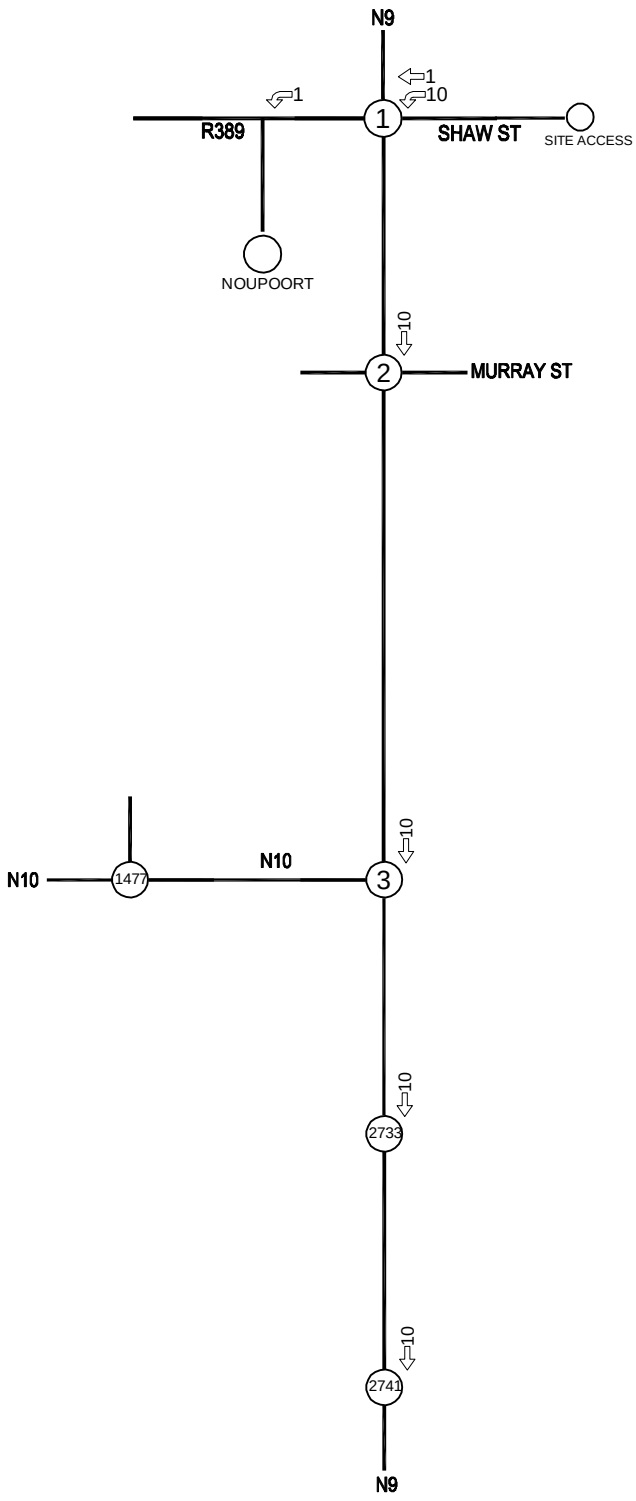


SMEC Member of the Surbana Jurong Group	PROJECT: SAN KRAAL WEF PROJECT	FIGURE: TRIP DISTRIBUTION WEEKDAY AM & PM PEAK HOURS	Nr. 2

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

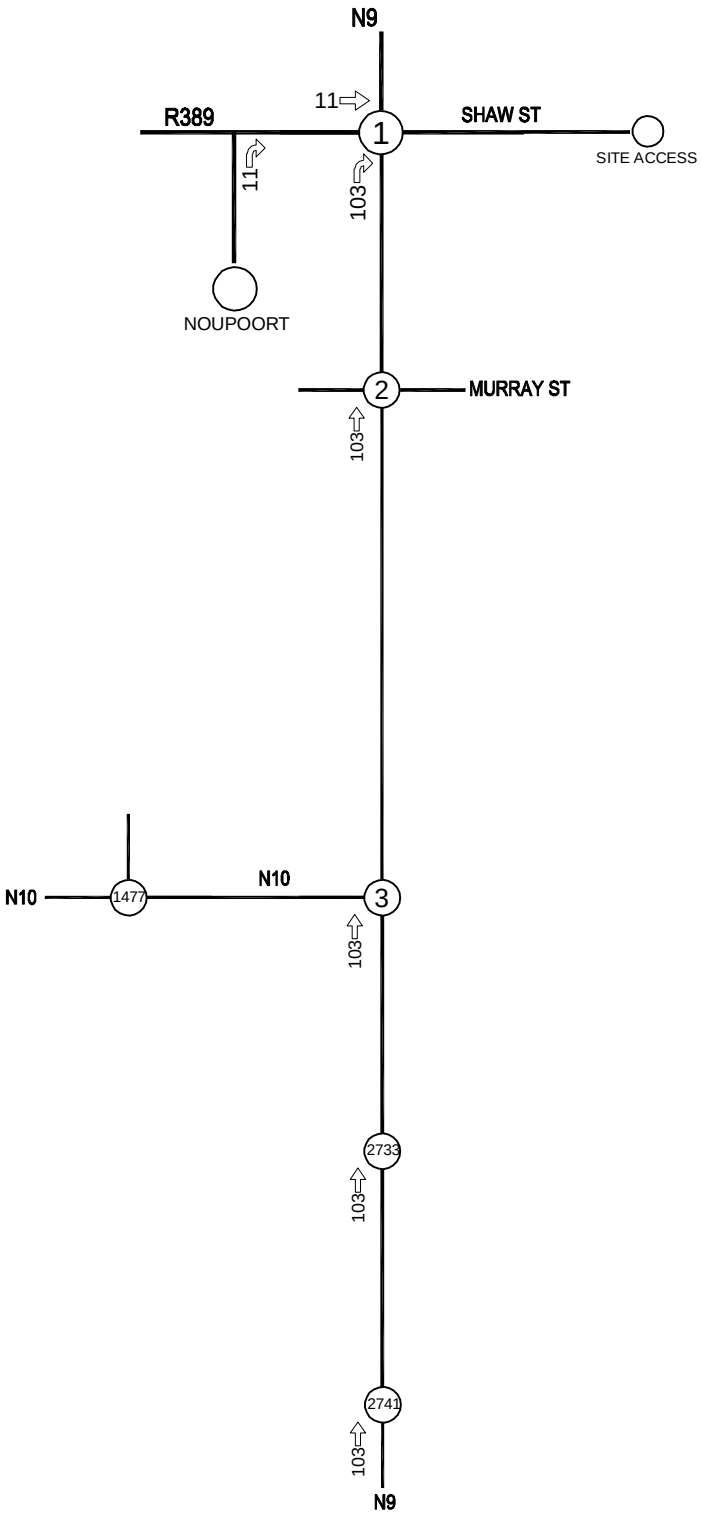


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

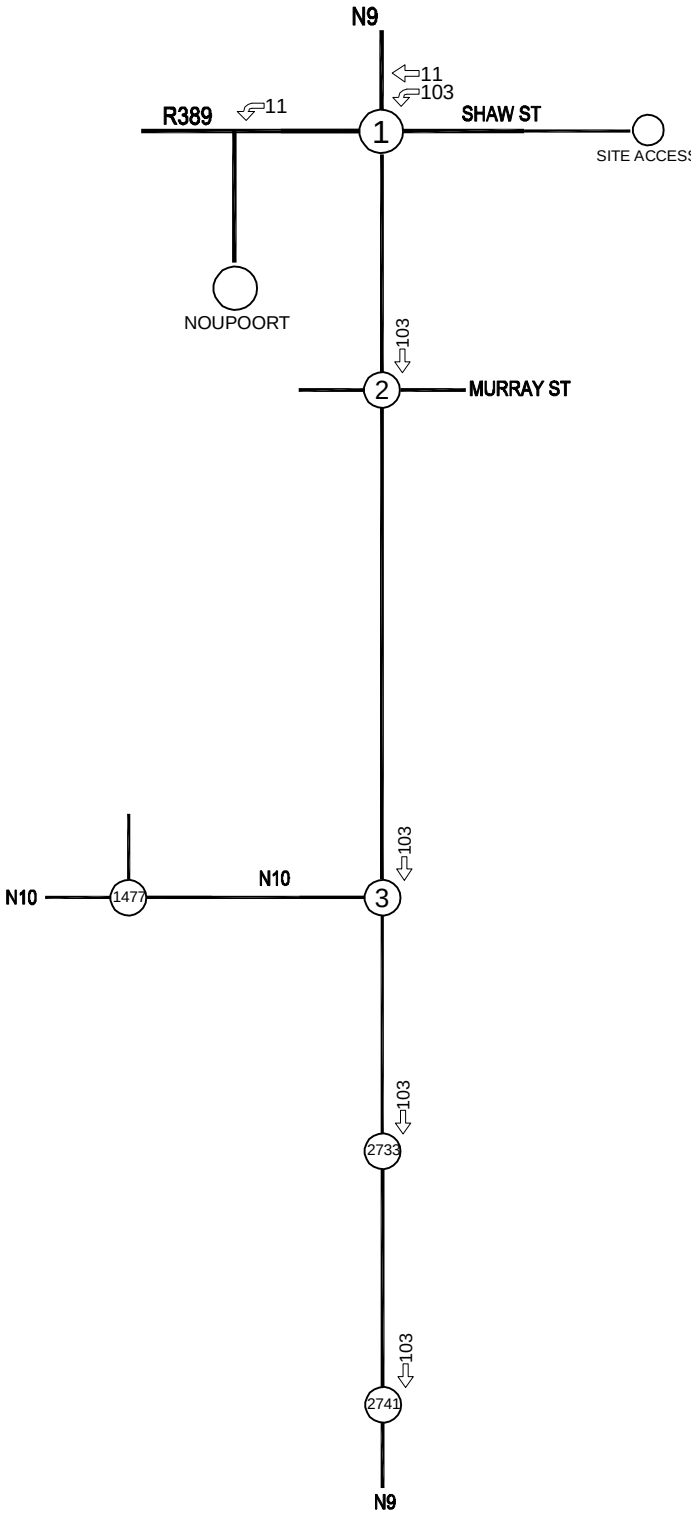


	PROJECT:	FIGURE:	Nr.
SMEC Member of the Surbana Jurong Group	SAN KRAAL WEF PROJECT	TRIP ASSIGNMENT PRECONSTRUCTION WEEKDAY AM & PM PEAK HOURS	3

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

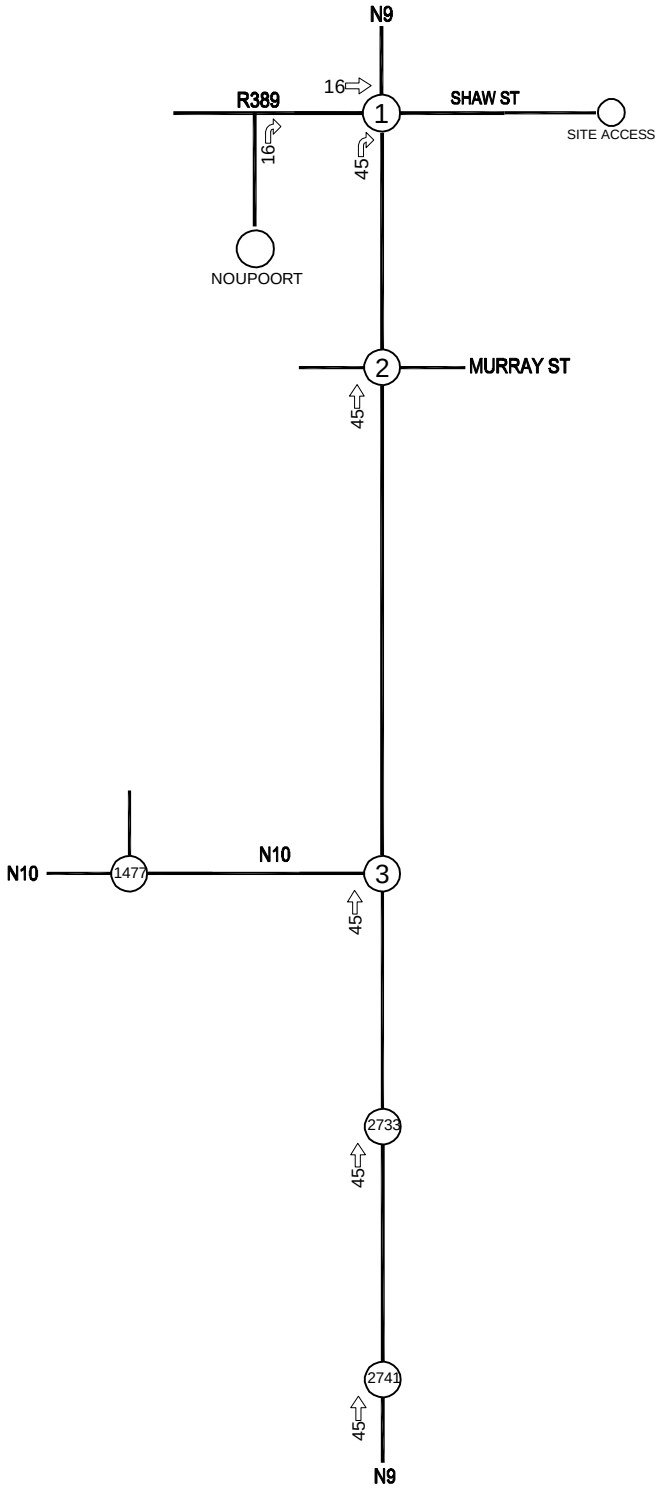


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

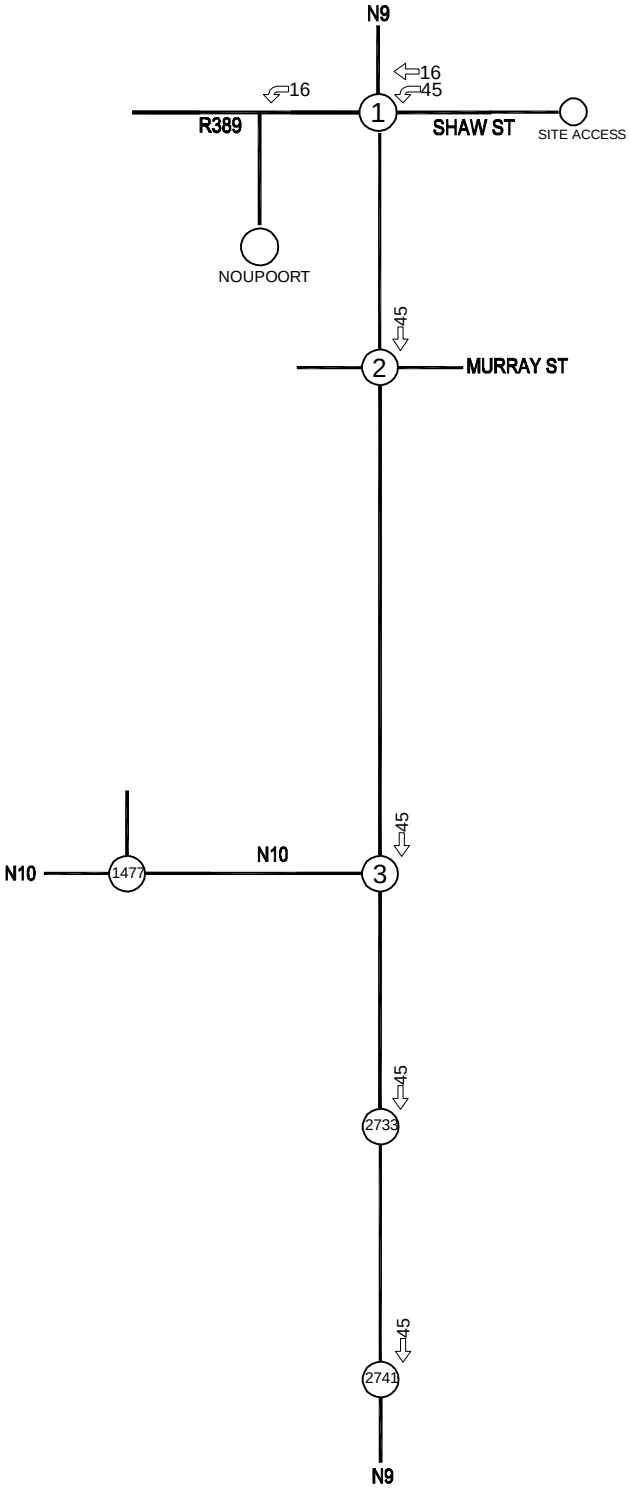


	PROJECT:	FIGURE:	Nr.
SMEC Member of the Surbana Jurong Group	SAN KRAAL WEF PROJECT	TRIP ASSIGNMENT CONSTRUCTION WEEKDAY AM & PM PEAK HOURS	4

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

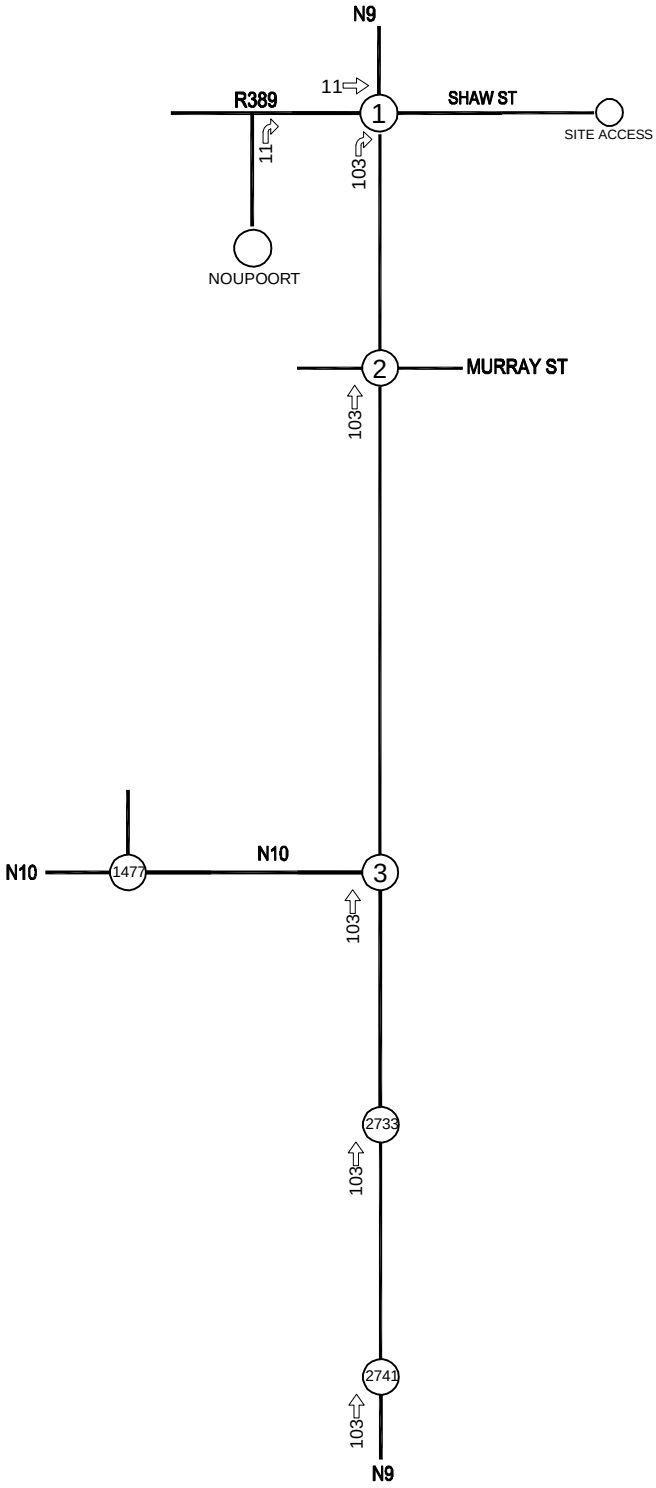


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

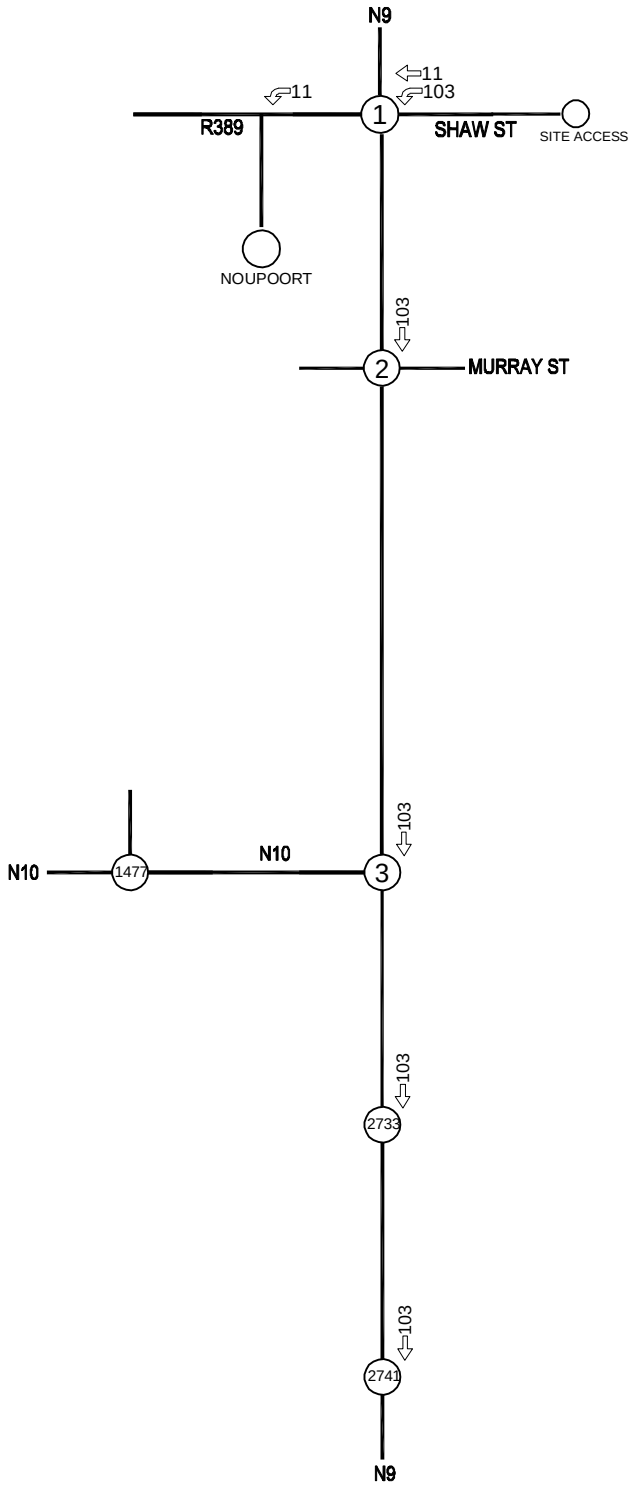


SMEC Member of the Surbana Jurong Group	PROJECT: SAN KRAAL WEF PROJECT	FIGURE: TRIP ASSIGNMENT OPERATION WEEKDAY AM & PM PEAK HOURS	Nr. 5

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

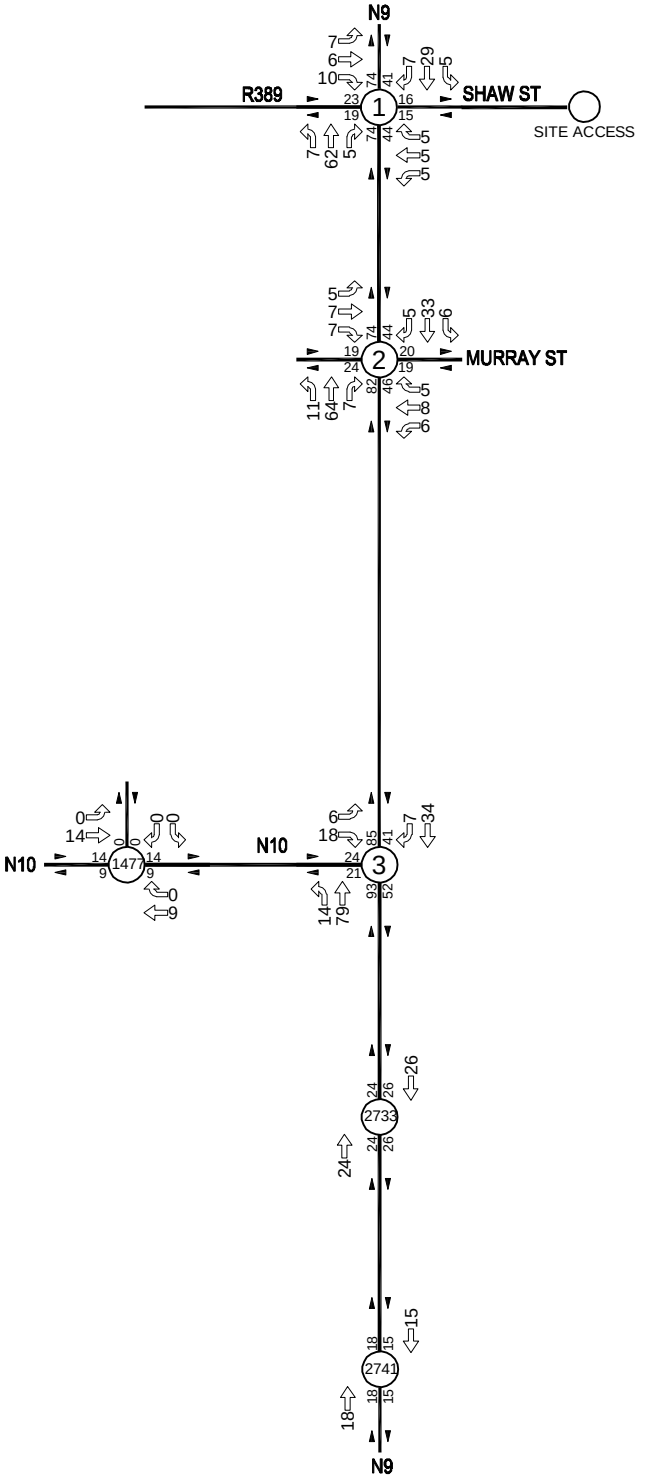


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

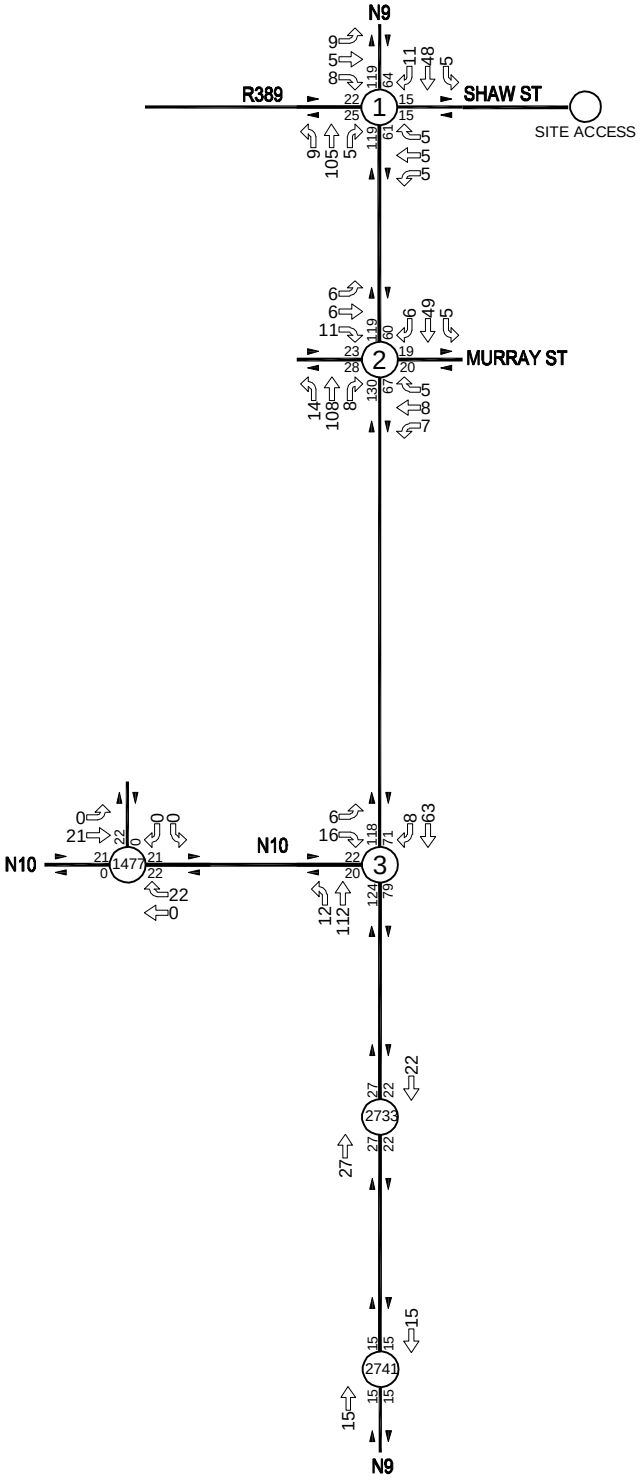


	PROJECT:	FIGURE:	Nr.
SMEC Member of the Surbana Jurong Group	SAN KRAAL WEF PROJECT	TRIP ASSIGNMENT DECOMMISSIONING WEEKDAY AM & PM PEAK HOURS	6

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

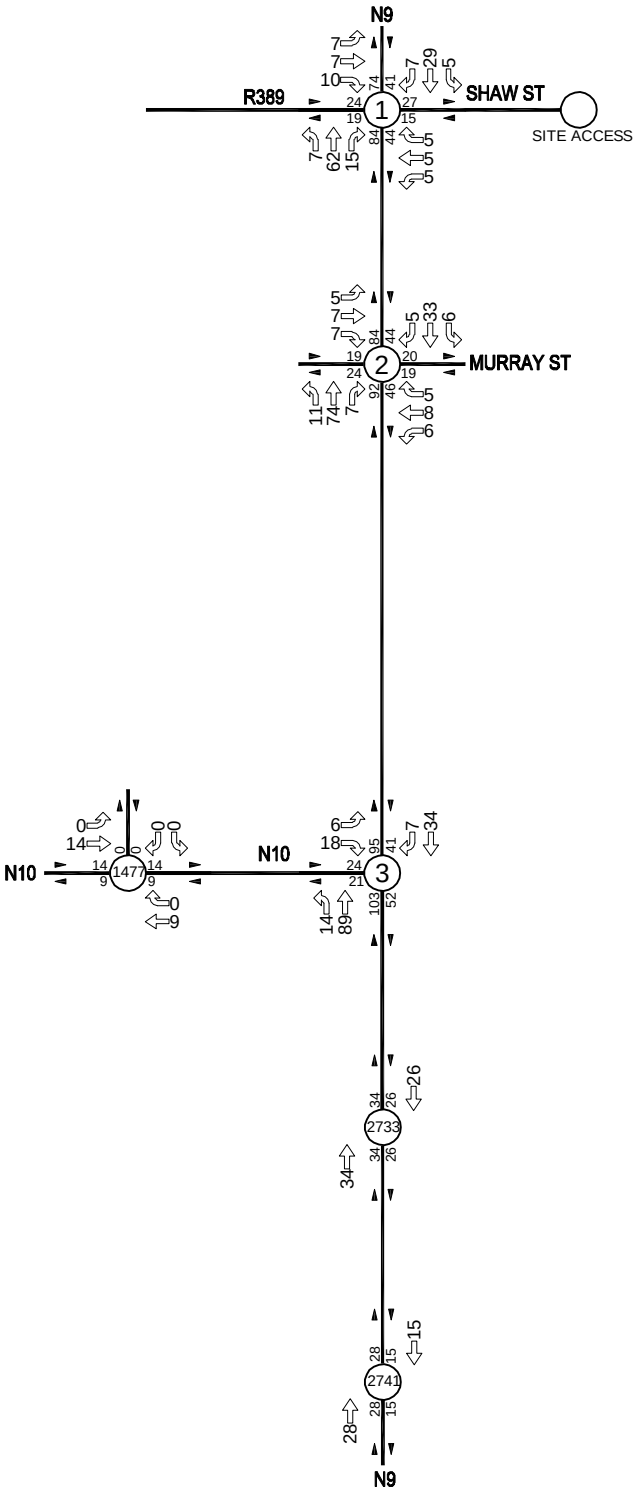


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

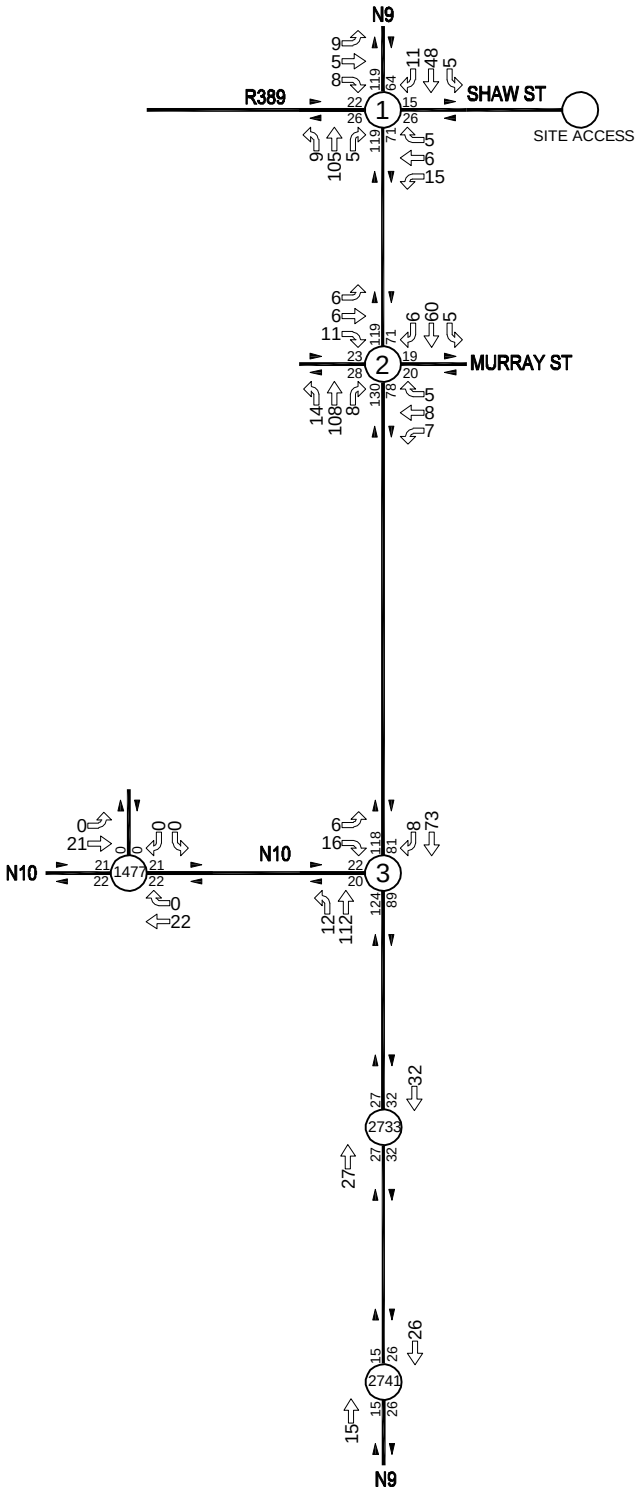


SMEC Member of the Surbana Jurong Group	PROJECT: SAN KRAAL WEF PROJECT	FIGURE: PRECONSTRUCTION 2019 WEEKDAY AM & PM PEAK HOURS	Nr. 7

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

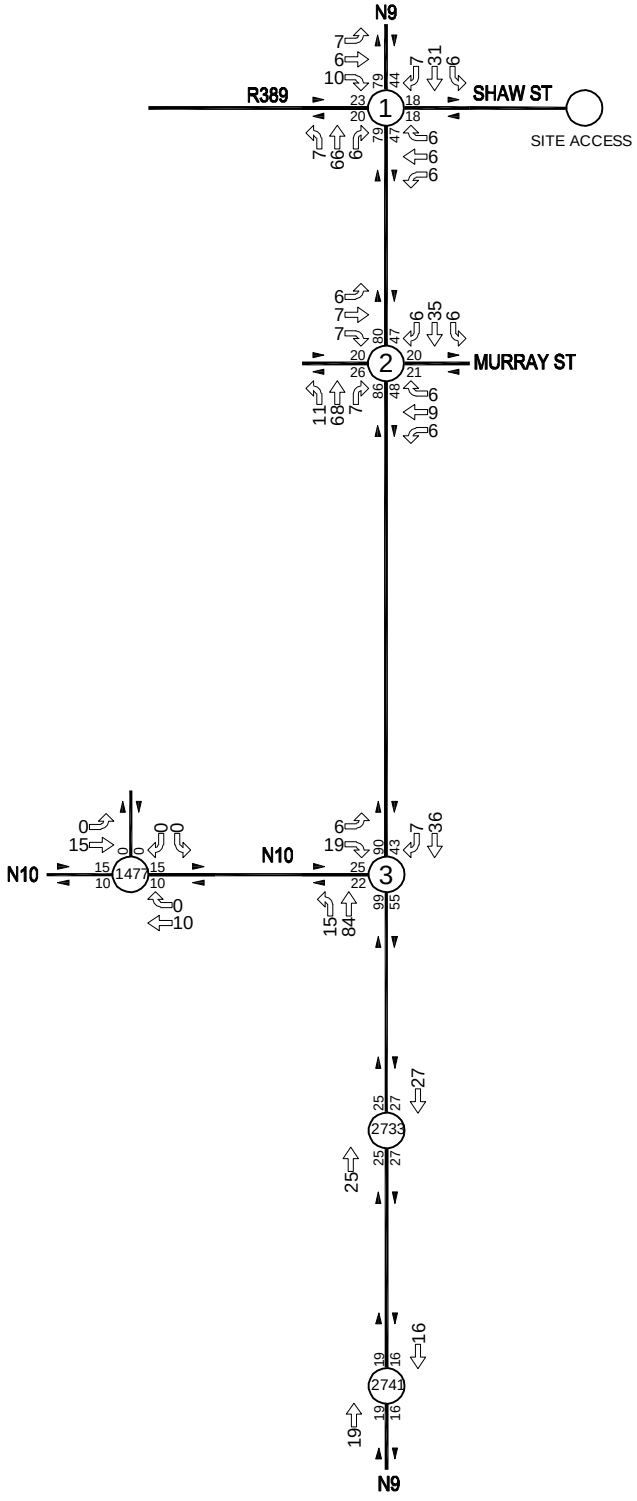


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

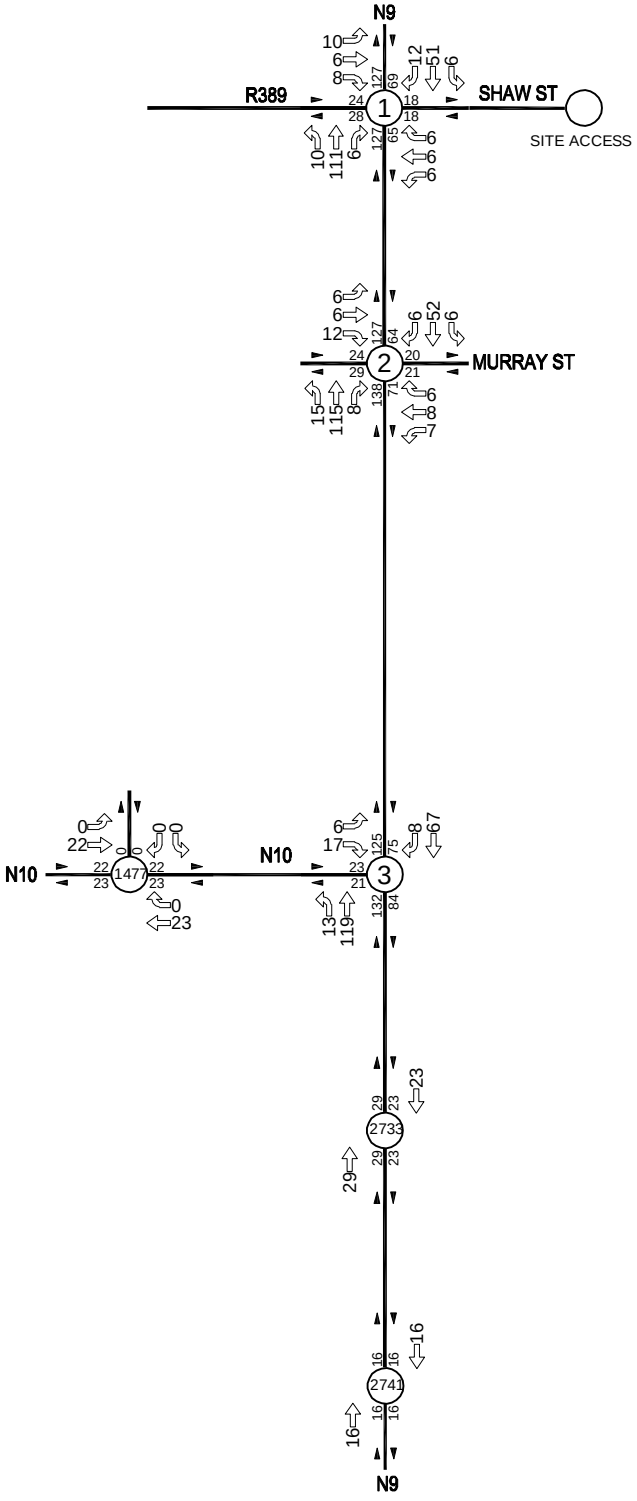


	PROJECT:	FIGURE:	Nr.
SMEC Member of the Surbana Jurong Group	SAN KRAAL WEF PROJECT	PRECONSTRUCTION + SITE 2019 WEEKDAY AM & PM PEAK HOURS	8

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

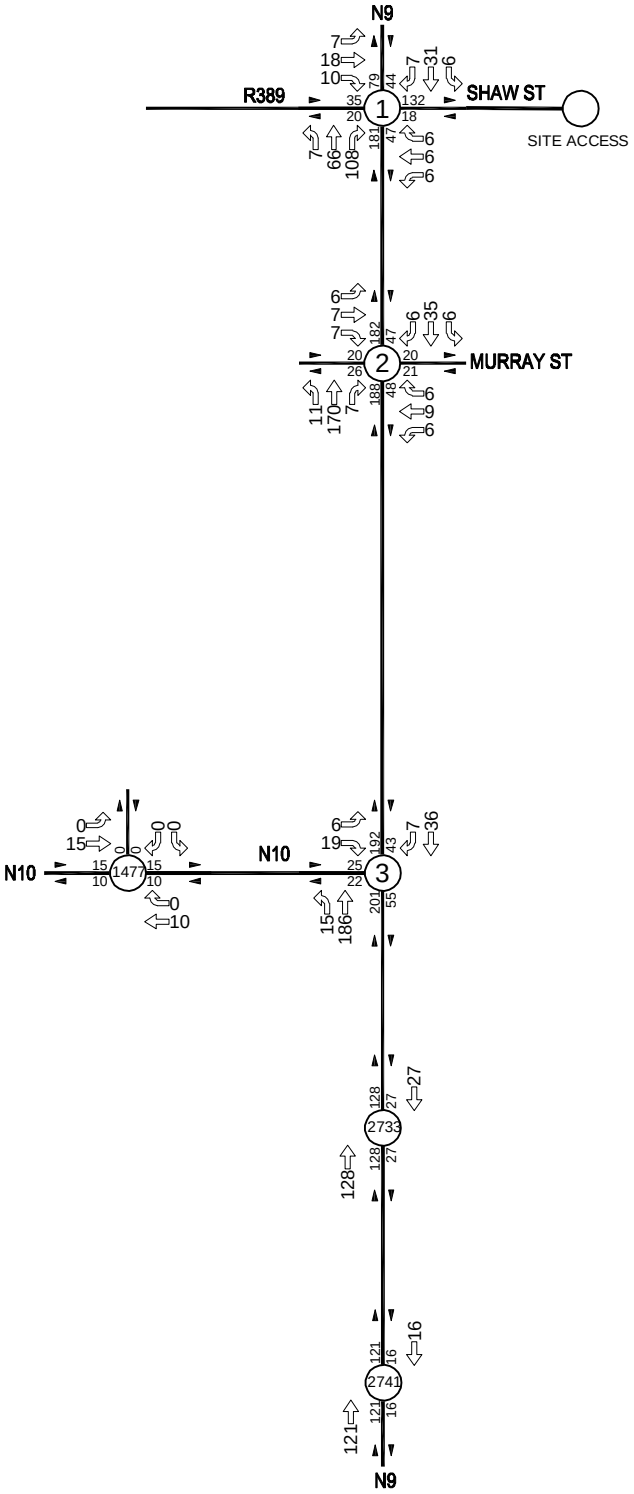


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

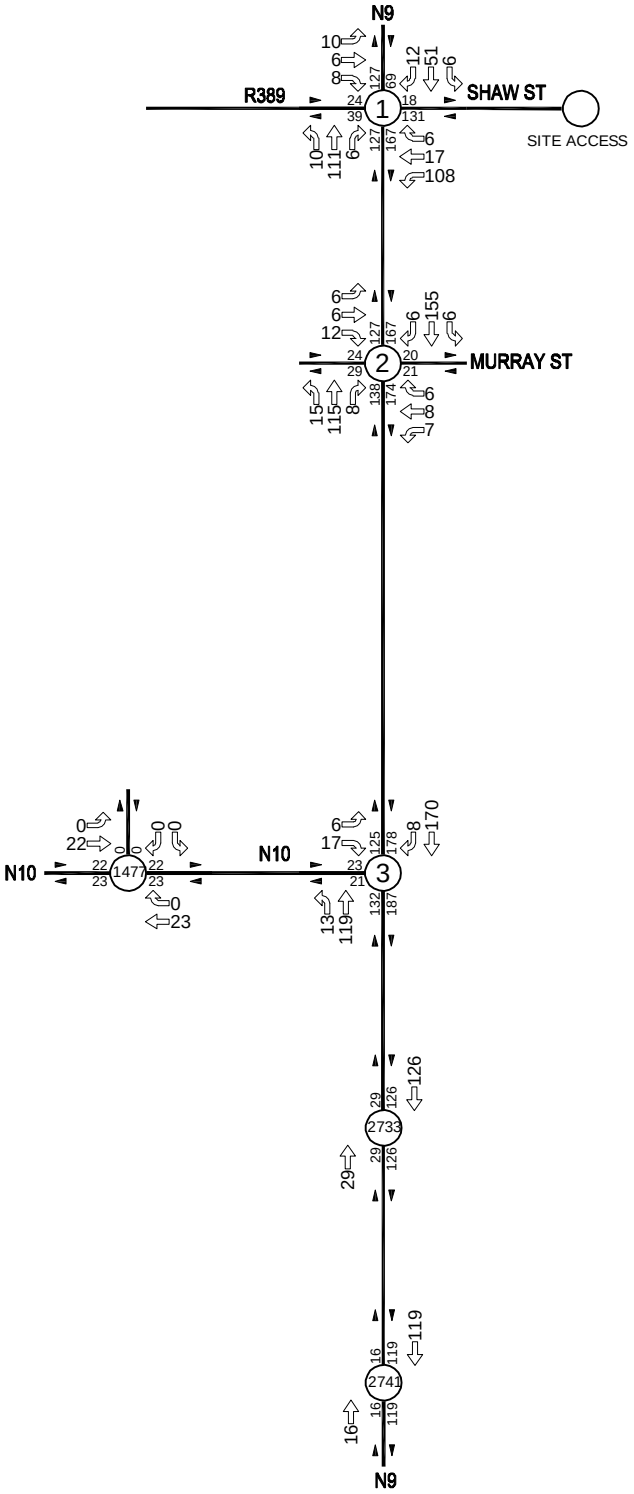


	PROJECT:	FIGURE:	Nr.
SMEC Member of the Surbana Jurong Group	SAN KRAAL WEF PROJECT	CONSTRUCTION 2021 WEEKDAY AM & PM PEAK HOURS	9

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

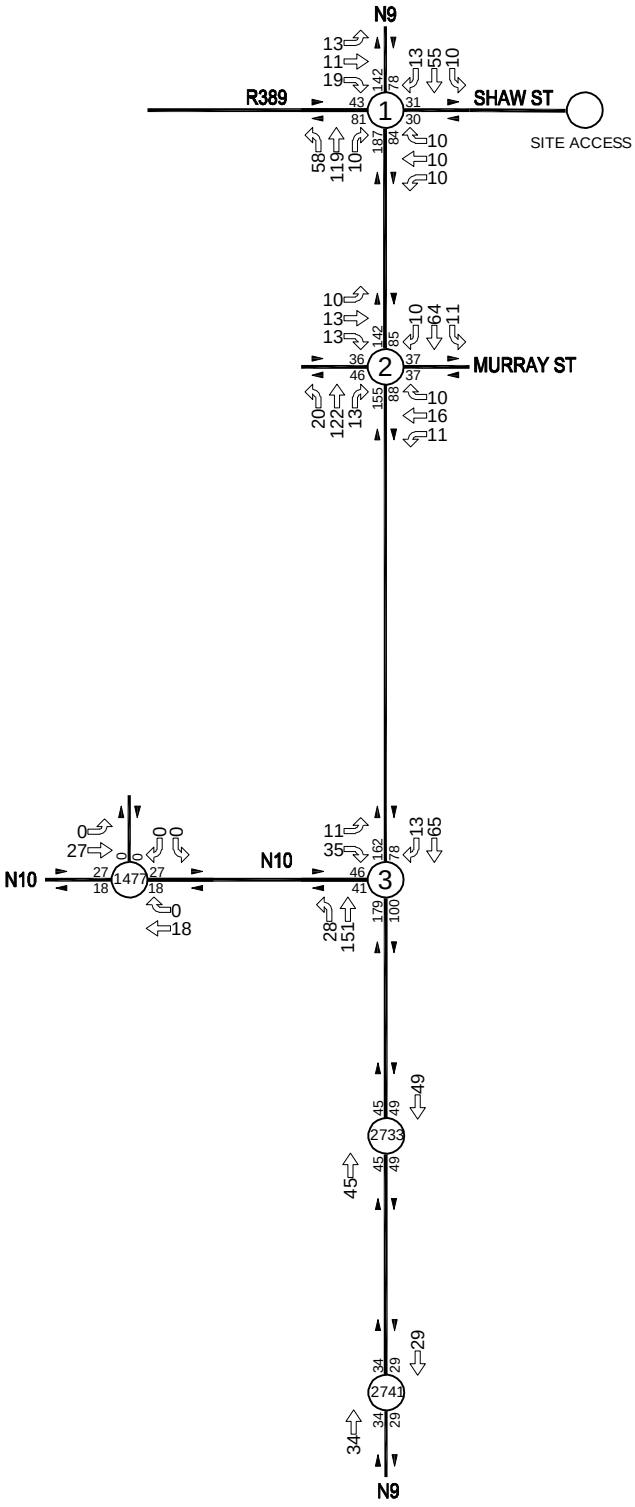


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

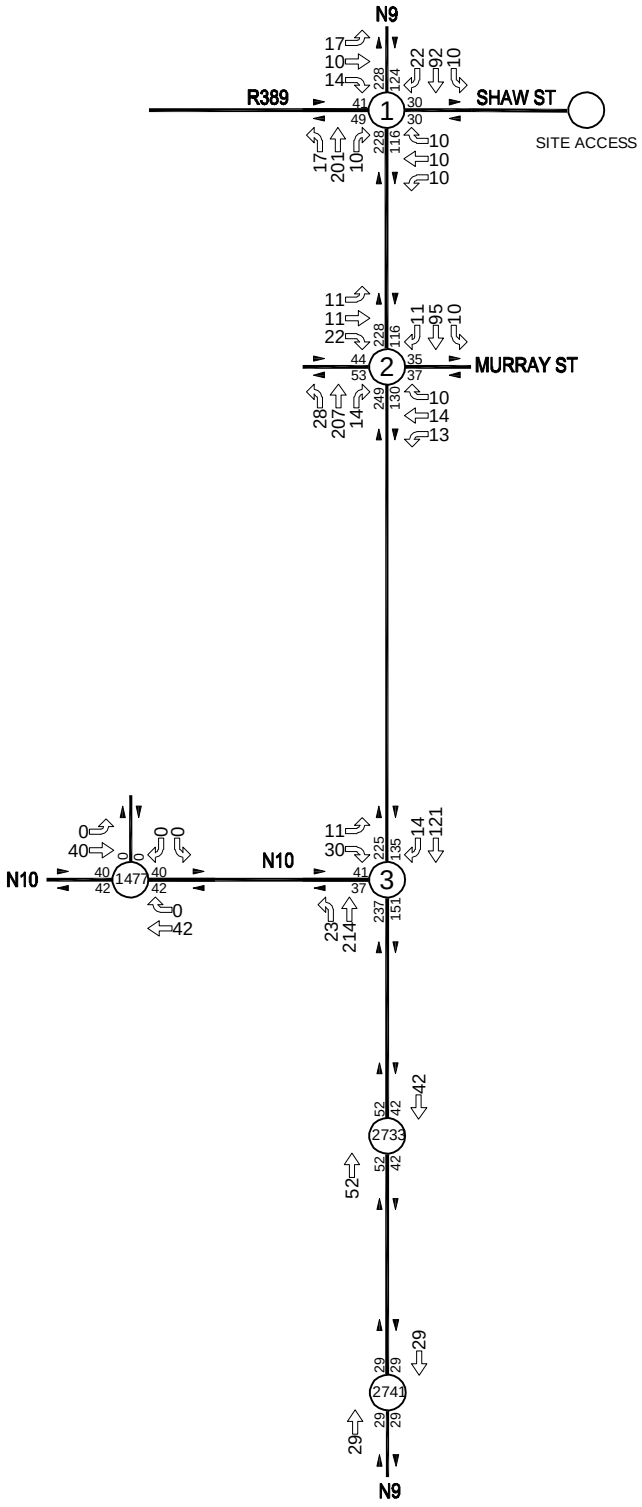


	PROJECT:	FIGURE:	Nr.
SMEC Member of the Surbana Jurong Group	SAN KRAAL WEF PROJECT	CONSTRUCTION + SITE 2021 WEEKDAY AM & PM PEAK HOURS	10

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

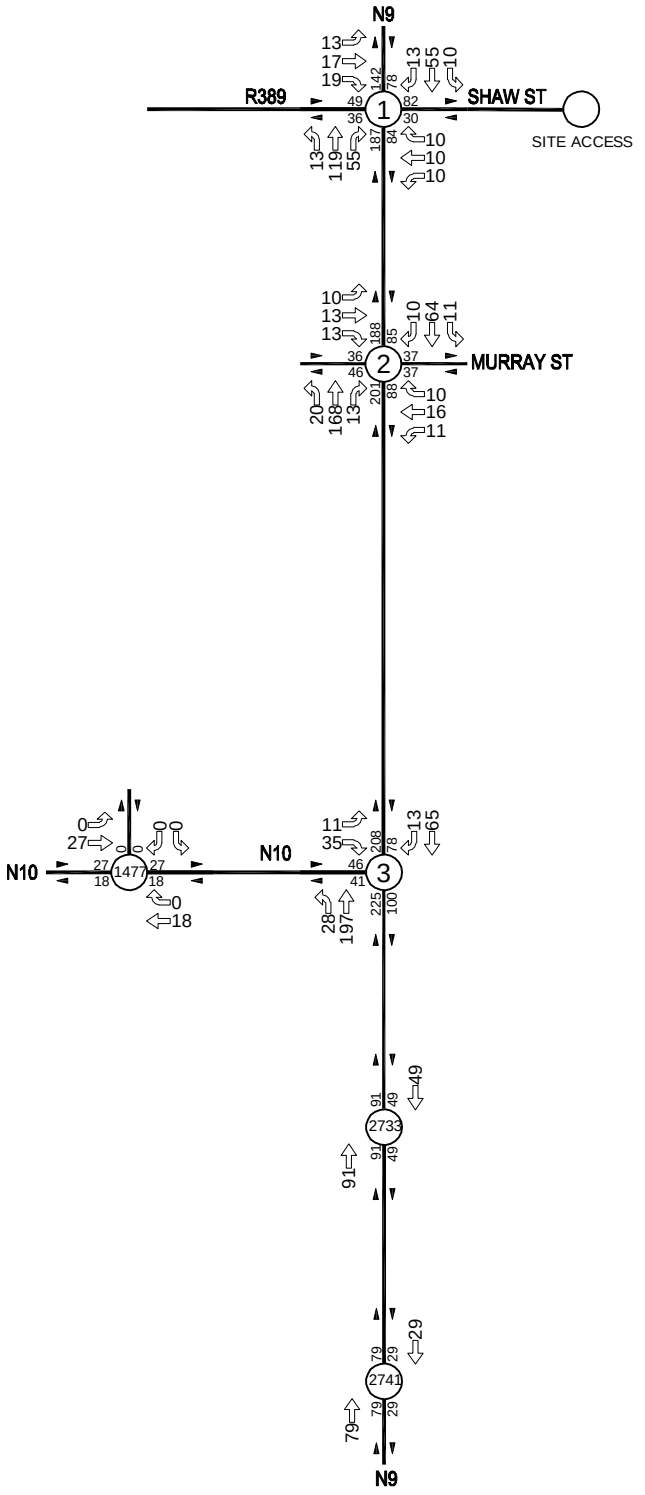


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

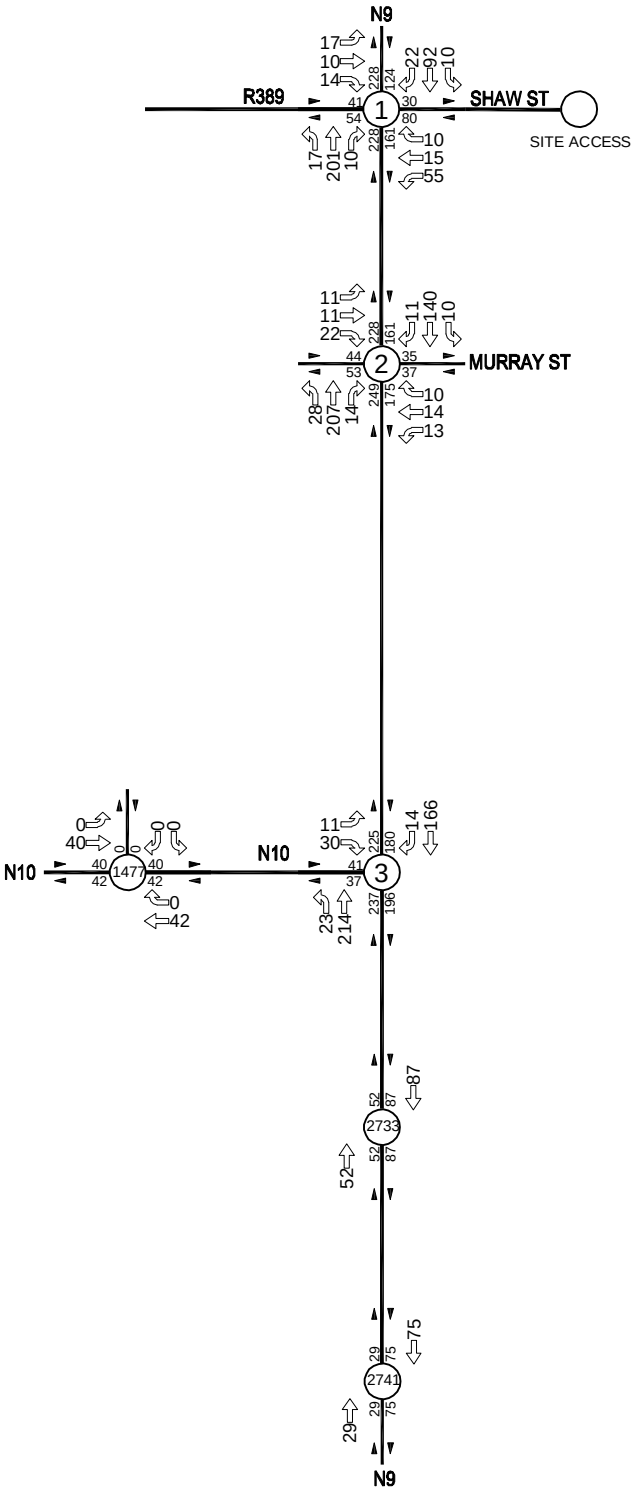


	PROJECT:	FIGURE:	Nr.
SMEC Member of the Surbana Jurong Group	SAN KRAAL WEF PROJECT	OPERATION 2041 WEEKDAY AM & PM PEAK HOURS	11

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

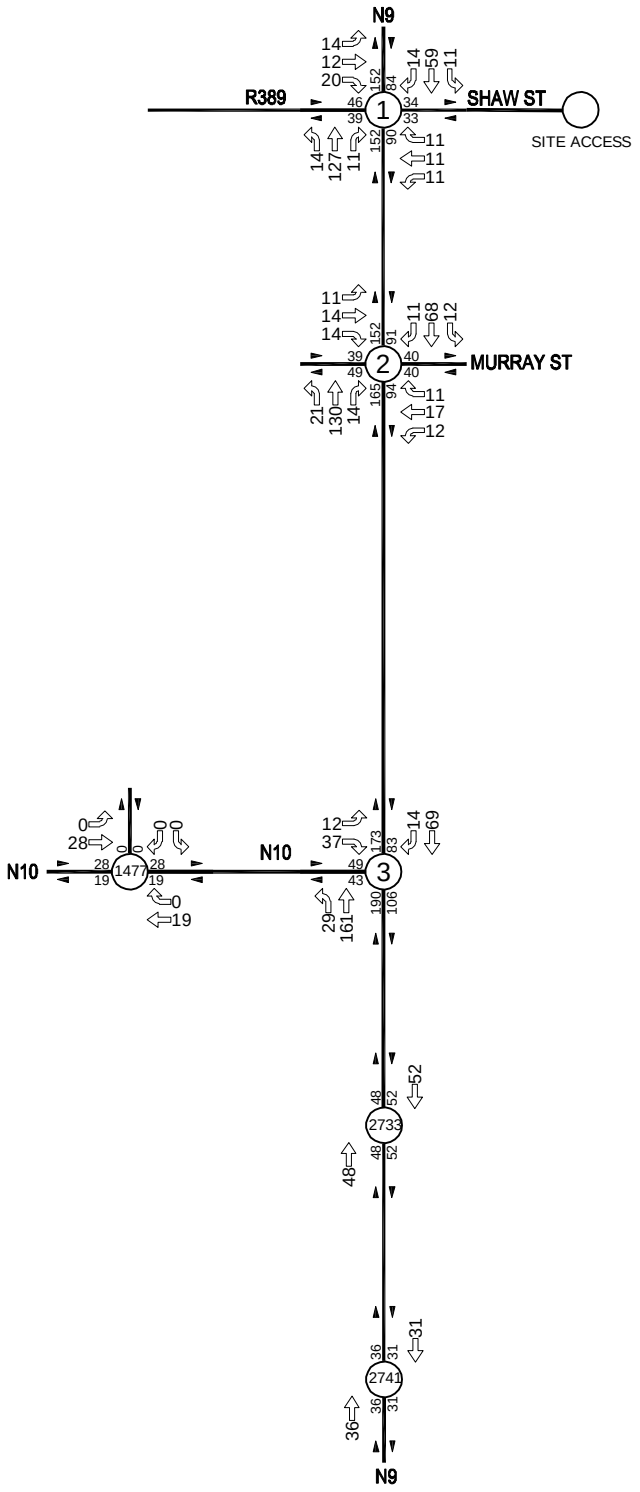


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

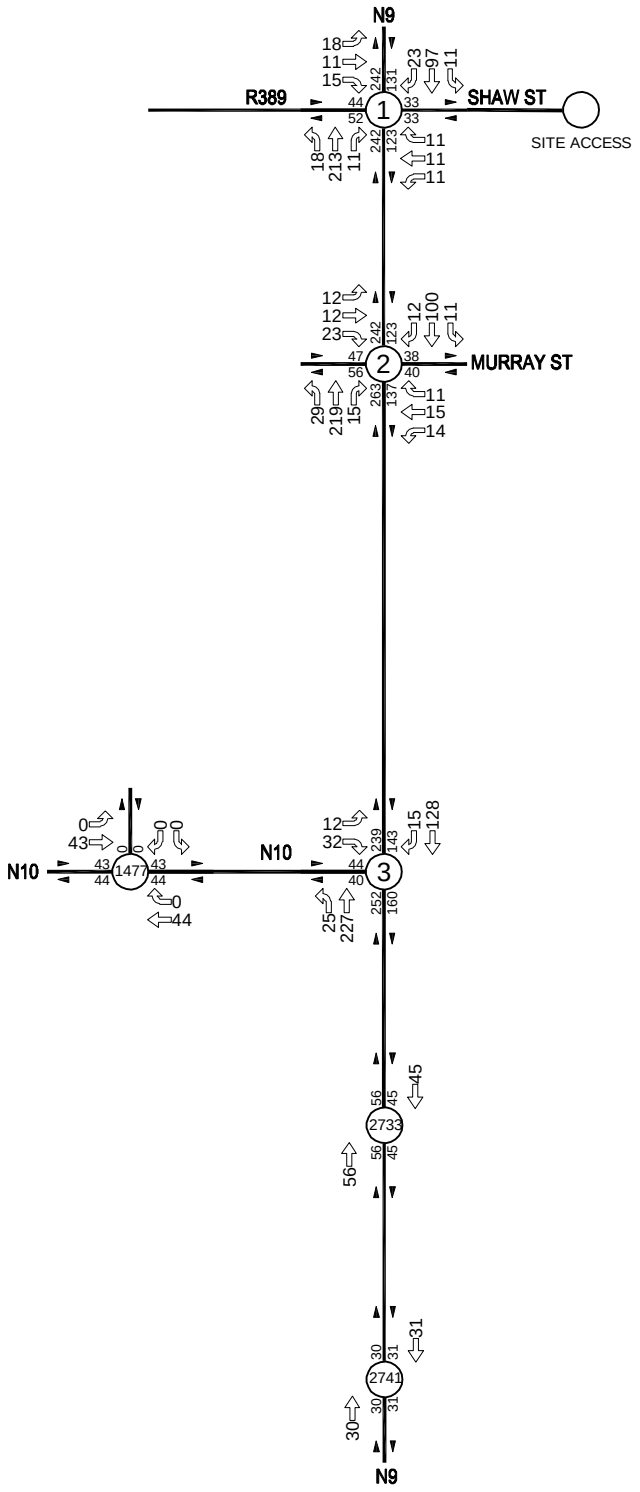


	PROJECT:	FIGURE:	Nr.
SMEC Member of the Surbana Jurong Group	SAN KRAAL WEF PROJECT	OPERATION + SITE 2041 WEEKDAY AM & PM PEAK HOURS	12

WEEKDAY AM PEAK HOUR (08H00 - 09H00)

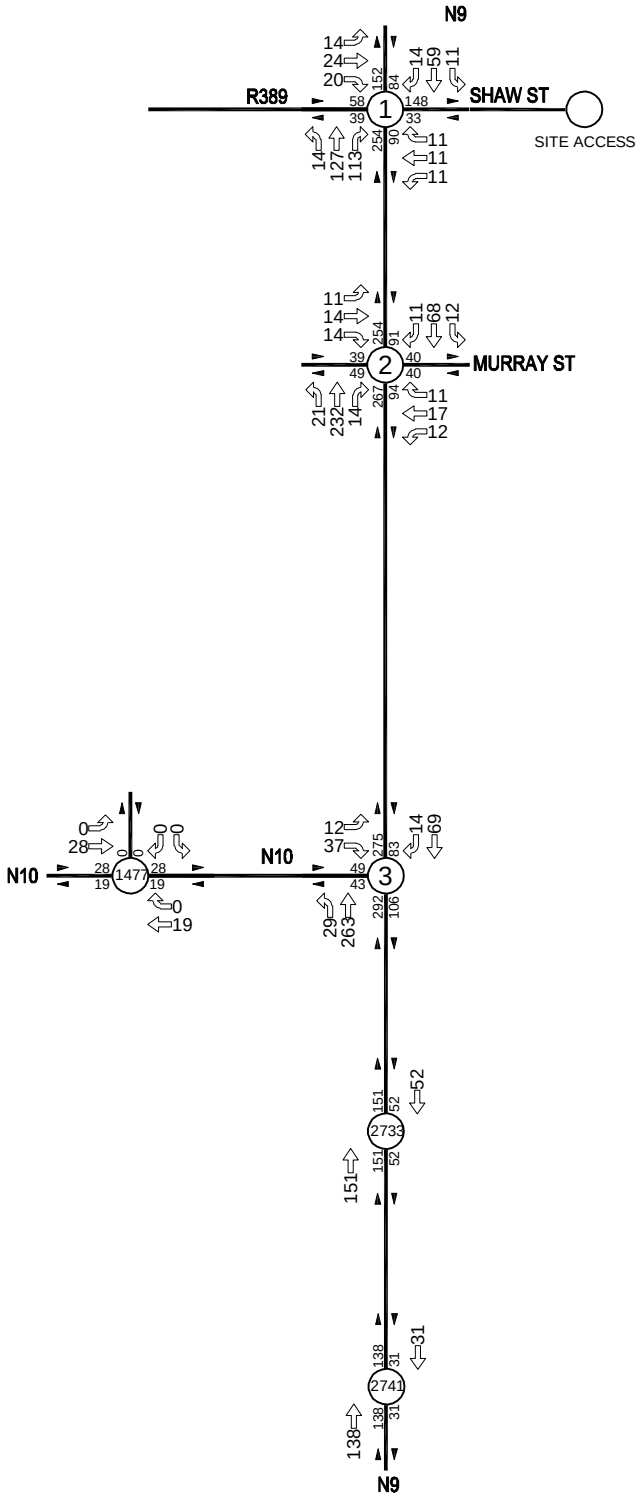


WEEKDAY PM PEAK HOUR (15H00 - 16H00)

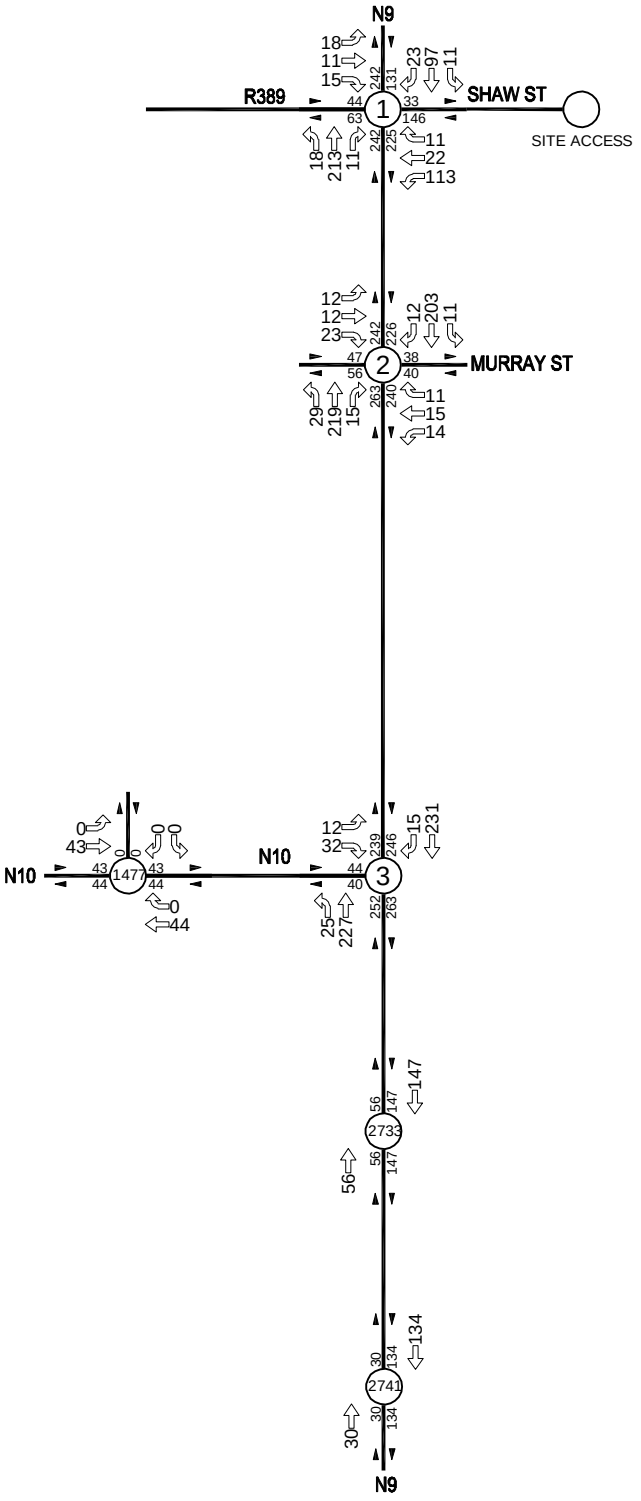


	PROJECT:	FIGURE:	Nr.
SMEC Member of the Surbana Jurong Group	SAN KRAAL WEF PROJECT	DE-COMMISSIONING 2042 WEEKDAY AM & PM PEAK HOURS	13

WEEKDAY AM PEAK HOUR (08H00 - 09H00)



WEEKDAY PM PEAK HOUR (15H00 - 16H00)



SMEC Member of the Surbana Jurong Group	PROJECT: SAN KRAAL WEF PROJECT	FIGURE: DECOMMISSIONING + SITE 2042 WEEKDAY AM & PM PEAK HOURS	Nr. 14