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PROPOSED LANDFILL SITE

KOEDOESPOORT

LOCATED ON PTN 201 OF THE FARM HARTEBEESTPOORT 328-JR

CITY OF TSHWANE METROPOLITAN MUNICIPALITY AREA

GAUTENG PROVINCE

FINAL REPORT

TRAFFIC IMPACT ASSESSMENT

Report prepared by:

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TRAFFIC IMPACT ASSESSMENT

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PROPOSED LANDFILL SITE
KOEDOESPOORT

1. INTRODUCTION

We have been requested by ***E-Square*** *Engineering* to evaluate the development of a proposed Landfill Site located on Portion 201 of the Farm Hartebeestpoort 328-JR. This site is located on the "Koedoespoort" Transnet "campus" site as shown on **Figure 1** - see **Annexure A**.

The site will chiefly be used for the storage/dumping of hazardous waste that will originally be obtained from the current "campus". It will not be open to the public as dumping site. The possibility do however exists that hazardous waste may be dumped from other Transnet sites.

The purpose of this report is:

- To evaluate the impact of the development of the site on the surrounding roads network from a traffic impact point of view;
- To address the expected traffic generation by the development;
- To evaluate the effect that the traffic generated by the development might have on the road network; and
- To determine the access requirements for the site.

The analysis of all relevant aspects concerned with the proposed development, are approached in the following manner:

- Investigate the current situation and collection of all available information.
- Determine the impact of the development on the current road network and PWV routes, and
- Draw conclusions and submit recommendations regarding the effect that the development may have on the road network.

The current situation at this site and along the main roads and access road is graphically presented in a photo report attached as **Annexure B** hereto.

2. THE PROPOSED DEVELOPMENT

The site is located, as mentioned, within the existing Koedoespoort Transnet Campus area where chiefly heavy industrial development/activities occur. The proposed site is to consist of the following (see **Figure 2**):

TABLE 1: PROPOSED "LAND USE" ACTIVITIES ON SITE

AREA SCHEDULE

BLOCK	AREA	DESCRIPTION OF ALLOWED SPACES	BREAKDOWN OF ALLOWED SPACES	AREAS
A	ADMINISTRATION	• Where the administration of the landfill site takes place	• 2 Offices • Boardroom • Kitchen • Dining • Reception • Storage • Toilet facilities Male(x2) & Female(x3)	613.9 m²
	OPERATIONS	• Where the operational administration activities of the landfill site take place	• 2 Offices • Staff Eating Area • Kitchen • Storeroom • Male & Female change rooms	
B	SECURITY OFFICE	• Security at the entrance of the site to monitor anyone or anything coming on site	• Duty room • Toilet • Storeroom & Kitchenette	36.7 m²
C	WASH BAY & SERVICES	• For washing Trucks	• Truck wash bay with grease trap & connect to contaminated water drainage system	
D	REVERSE LOGISTICS	• For controlling and inspecting all the recycled waste off site	• Covered area for inbound,processing, outbound • Concrete slab staging and holding area • Inspection & dispatching office	1 738.8 m²
E	RECYCLING	• For sorting,treatment,processing,storage and recycling	• Sorting out area • treatment area • Processing area • Storage area	993.5 m²
F	LABORATORY	• For scientifically testing all the waste onsite	• Scientific laboratory	60 m²
G	WASHING OF BINS/SKIPS	• Located next to the recycling facility for washing the bins/skips.		100 m²
H	HAZARDOUS WASTE DISPOSAL	• For dumping hazardous waste	• Air space	31 766 m²
I	LEACHATE DAM	• For catching contaminated storm water & water from the wash bay		
J	WEIGH BRIDGE	• For weigh waste carried in and out of site in a truck	• Office • Toilet • Viewing platform	
K	STORM WATER DAM	• For collecting/catching storm water which can be treated and reused on the gravel roads		1 982 m²
L	BOUNDARY WALL	• To secure the site & block the view to the inside from the non landfill site users.	• 2.4 meter high vibracrete wall	1 577.6 m
L	PARKING	• Onsite parking for all vehicles used on site	• Admin block parking • Operations block	30 car parking bays
M	LANDSCAPING	• Paving • Plants		

3. ROAD NETWORK

The surrounding road network consists of the existing municipal road network as shown on **Figure 3**. This network consists of Class 2 to Class 5 roads as shown.

The regional strategic road network in the region is graphically presented on **Figure 4** attached hereto. This network consists of the provincial roads network that is also known as the PWV-roads network its reserves and proposed reserves are protected under the Gauteng Infrastructure Act.

The current access route to the site does not fall under the jurisdiction of the City of Tshwane as no road reserve has been proclaimed or protected under any right-of-way servitude. This access route joins with the municipal road network at Dykor Street just north of the rail-over-road bridge. Dykor Street is defined as a Class 4(a) collector road with minimum 25m reserve width.

A traffic volumes survey was conducted along the main intersections along Dykor Street on 3 March 2015 for a 12-hour period. Traffic volumes were conducted for all movements at the following intersections and noted in 15min intervals:

- Dykor Street and Stormvoël Road
- Dykor Street and Silwereike Street
- Dykor Street and Access road
- Dykor Street and Moreleta Street
- Dykor Street and Pretoria Road

The traffic flow at the access intersection was monitored for the peak periods only. The number of heavy vehicles along Dykor Street was also counted to determine the percentage heavy vehicles on the roadway.

The traffic volumes as surveyed are presented on **Figure 5 and 5.1**attached hereto. A graphical presentation of the 12-hour flow pattern at the four main road intersections is presented in **Annexure C** attached hereto.

4. TRAFFIC ASPECTS OF IMPORTANCE

4.1 Traffic Impact Assessment

A traffic impact assessment report is required for ALL developments. The National Land Transport and Transition Act (Section 29) states that no substantial change or intensification of land use on any property can take place without the planning authority's written consent. The authority may not approve an application which is in conflict with the directions of or conditions required by the planning authority, except to the extent that they are altered by the province's development tribunal upon an appeal by the applicant.

Two sets of guidelines are available according to which the impact of developments are to be determined. These are:

- The Department of Transport's RESEARCH Report RR93/635, Manual for Traffic Impact Studies; and
- COTO documents TMH16 (Volume 1 & 2), and TMH17 South African Traffic Impact and Site Traffic Assessment Manuals dated August 2012.

The DOT's RESEARCH Report RR93/635, Manual for traffic impact studies, provide valuable information to be used in the determination of traffic impact studies for a change in land use rights.

The TMH16 and TMH17 documents on traffic impact assessments prepared by the Committee Of Transport Officials (COTO) are the latest to be applied in the evaluation of the traffic impact by a development.

4.2 Traffic Impact Assessment reporting level

The analysis of traffic impact is based on the principle of analysing the worst situation. In many cases the peak hour of the background traffic and of the site traffic do not coincide, in which case the hour when the combination of the background traffic and the site traffic is the highest should be analysed.

The DOT Manual for Traffic Impact Studies recommends that the following criteria (threshold value for traffic impact studies) are to be followed in the determination of the requirement for a traffic impact study:

1	*More than 150 peak hour trips*	*Prepare a traffic impact study (TIS)*
2	*Less than 150 trips and more than 50 peak hour trips*	*Prepare a traffic impact statement (TISm)*
3	*Less than 50 peak hour trips*	*No study required except if surrounding network is operating above capacity*

A statement, according to the DOT guidelines, is acceptable for developments that are located on Class 4 or 5 roads, and have a total peak hour trip generation of less than 150 and more than 50 peak hour trips and which does not require a change on the road network (except for the access to the development).

The COTO documents however state that a traffic impact study is to be conducted when the number of trips to be generated is more than 50 peak hour trips and for developments generating less than 50 trips in the peak hour an assessment of the existing road network surrounding the site should be conducted..

4.3 Category Traffic Impact Assessment Report

The category of a traffic impact assessment depends on the trip generation of the proposed new development:

Small-scale developments - total peak trips: 500 trips or less.
Medium-sized developments - total peak trips: 500 to 1000 trips.
Large-scale developments - total peak trips of more than 1000 trips.

4.4 Trip generation

There is currently no specific trip generation rates to be applied in the determination of the traffic impact of developments of this nature.

Trip generation will chiefly be based on proposed composition of the “land uses” on the site – see Section 2, taking cognizance of the origin of the hazardous material to be stored.

5. TRIP GENERATION ASPECTS

5.1 Phasing of project

It is assumed that the project is expected to be phased out in two phases: (a) construction phase, and (b) operational phase.

5.2 Construction phase

There is no data or standard formula on the South African Trip Generation Manual (*SATGM)* or any Traffic impact Study Guidelines (Department of Transport (DoT), or COTO (Committee Of Transport Officials)) available for the assessment of the traffic impact of a Landfill Site and Hazardous Waste Facility.

The following assumptions were made with regard to the proposed development to assess the situation with regard to traffic generation for the site:

- The number of people employed during the construction phase (excavations and setting up of structures) will be limited to foremen, supervisors and general construction workers;
- The construction workers will either be transported via mass transport (staff buses) from contractor's sites thus limiting the number of vehicular trips to be generated or they will travel by other public transport modes;
- The majority of the construction workers will be working on site during construction;
- Trips generated by construction vehicles during the construction period will chiefly be site bound;
- The number of trips generated from outside the site by trucks will be limited as construction materials will have to be transported but is not expected to be on a daily basis – it is not expected that more than two trucks will operate and transport material and equipment during the construction phase on a daily basis;
- operating and transporting construction materials during the construction phase

The trips generated during the construction phase is therefore expected to be limited in numbers as well as in terms of the time span that any vehicular trips to be generated will have to be accommodated on the road network.

5.3 Operational phase

5.3.1. Background

There are a few activities on the site that are expected to generate additional traffic during the operational phase of the project. These have been identified as to be the following:

TABLE 2: LAND USES EXPECTED TO GENERATE EXTERNAL TRIPS

Block	Designation	Type of building	Area
A	Administration Operations	2 Offices, boardroom, etc 2 Offices; Staff Canteen with required facilities, etc.	614m²
B	Security office	Duty room	37m²
D	Reserve logistics	Covered area for inbound, processing, outbound; Inspection & dispatching office	1850m²
F	Laboratory	Scientific laboratory	60m²
J	Weigh bridge	Office with recording equipment & data	

The areas above include areas such as kitchen areas; ablution areas, boardrooms etc. that do not have full time employees employed.

The occupancy of these buildings are assumed to be as follows (based on the SANS 10400 occupancy figures):

- Block A - 8 personnel (4 offices), administrative
- Block B - 2 personnel (security officers)
- Block D - 10 personnel, general workers
- Block F - 3 personnel, professional and general
- Block J - 2 personnel, general workers
- Other - 15 general workers (labourers)

There is therefore a total number of 40 employees expected to be employed at the site in the administrative and general working area. Other additional employees may be employed at the disposal site from time to time.

It is obvious from these figures that the number of vehicle trips (private vehicle) would not be significant.(consider vehicles to the landfill)

The following aspects are also to be noted:

- Waste will chiefly be dumped directly from the adjacent Transnet sites
- Excavated material will be stored and stockpiled on site;
- Cover material will be obtained from excavated material on site;
- Other hazardous waste (from other Transnet sites) will occasionally be delivered; at the site as and when needed. These will result in additional trips generated by the other – i.e. Germiston (2 trips per day); Bloemfontein (max 4 trips per day).

5.3.2. Vehicular trip generation

As mentioned earlier, no specific trip generation rates exist for these development types. Vehicular trips are expected to be minimal during the construction phase and will then decline as the site becomes operational.

Daily trips will be generated during the operational phase by the personnel that will be occupied at the site.

The following trip characteristics or modal splits for workers in the Gauteng provincial area for employees as found in the *Household Travel Survey 2013, by Statistics South Africa (Statistical Release P0320) Table 5.3* are as follows:

- Train - 7.4% (3 employees)
- Bus - 5.1% (2 employees)
- Taxi - 30.4% (12 employees)
- Private vehicle - 38.1% (15 employees)
- Passenger - 5.9% (2 employees)
- Walk and other - 13.2% (6 employees)

The application of the above indicates that less than 50 peak hour vehicle trips are expected to be generated by the proposed development and this implies, that according to the applicable guidelines (see Section 4), no traffic impact study would be required for the development.

An assessment of the major access routes to/from the site has however been conducted. The purpose of this assessment is based on the requirements by the guidelines for a statement where specific items will have to be addressed to ensure safe and efficient traffic flow to and from the development whether light or heavy vehicle traffic is generated or not.

6. TRAFFIC IMPACT ASSESSMENT

6.1 Current situation

6.1.1. Main roads

The main routes identified as possible routes along which traffic to and from the site would travel are (see Figure 3):

Stormvoël Road

This is a major Class 2 dual carriageway east-west route serving as major traffic arterial and providing access to the regional and National Roads network in the region. Traffic flow along this route is chiefly controlled by traffic signals. The route is of high quality and carries high volumes of traffic.

Dykor Street

This road is a single carriageway route with one lane per direction and links Stormvoël Road north of the site with Pretoria Road south of the site. It is classified as a Class 4(a) route. It is a route with varying geometric standards and provide direct access to various developments along its entire length.

Road widening occurs at some intersections to ensure safe traffic flow. Intersection control along this route is done by traffic signals, two-way stop control and all-way stop control.

Moreleta Street

Moreleta Street is also defined as a Class 4(a) route and is located south of the railway line south of the site. It functions as a major collector road but has poor access control and poor geometric design standards.

Pretoria Road

Pretoria Road is a Class 3 dual carriageway route as defined in terms of the roads master plan for the region. It has two lanes per direction with road widening and turning lanes at major intersections. Traffic control at major intersections is signalized while minor road intersect with the route as two-way stop controlled intersections.

Direct access is provided to most of the properties located direct adjacent to the route. Mixed land uses are found along the entire length of the route.

The peak hour traffic flow conditions along these routes are graphically presented on **Figure 6** attached hereto – information as obtained from Google Maps Traffic.

Heavy vehicles represent between 2% and 6% of the traffic along Dykor Street throughout the day with the lower percentage applicable during the street peak hours.

6.1.2. Intersection assessment

The current traffic situation along the main access route, Dykor Street, that is expected to be used by traffic to/from the site, see Section 3, has been evaluated to determine the current levels-of-service for the route. The intersections evaluated are:

- Dykor Street and Stormvoël Road - signalized intersection
- Dykor Street and Silwereike Street - two-way stop controlled
- Dykor Street and Access road - two-way stop controlled
- Dykor Street and Moreleta Street - all-way stop controlled
- Dykor Street and Pretoria Road - signalized intersection

The traffic flow at the intersections were evaluated by the application of the SIDRA Intersection Traffic Analysis computer based program and the following results were noted (see **Annexure D** attached hereto):

TABLE 3: LEVEL-OF-SERVICE TRAFFIC FLOW CONDITIONS PER INTERSECTION APPROACH

Intersection	South approach		East approach		North approach		West approach	
	AM	PM	AM	PM	AM	PM	AM	PM
Dykor/Stormvoël	C	C	D	E	-	-	B	C
Dykor/Silwereike	A	A	C	B	A	A	-	-
Dykor/Access	A	A	-	-	A	A	C	C
Dykor/Moreleta	C	C	D	C	F	D	F	F
Dykor/Pretoria	-	-	B	A	D	C	B	B

The above results depict the current traffic flow conditions as observed at the sites and as shown in terms of the flow speeds on Figure 6.

The intersection at Dykor and Moreleta Streets experience congested traffic flow conditions that are caused by the geometric limitations at the intersection due to the rail-

over-road bridge that limits the upgrade of the intersection to improve traffic flow conditions.

Traffic queuing occurs, especially on the northern approach of this intersection, and this influence the traffic flow as far as the intersection of Silwereike Street. The traffic flow at the intersection of Moreleta Street warrants the installation of a traffic signal but the construction of a traffic circle should be considered instead.

The layout of such circle intersection should take note of heavy vehicle movements along the route – this region has various light industrial developments and even heavy industrial developments that generate a substantial number of heavy vehicle trips during the day.

6.2 Impact on roads network

An important factor to be evaluated is the effect that the proposed development might have on the surrounding road network.. This network consists of various roads ranging from Class 2 to Class 5 routes (not shown in roads master plan). Other routes in the region to be considered consist of the Gauteng Strategic Roads Network that is protected in terms of the Gauteng Infrastructure Act, Act 8 of 2001 as amended. These routes are shown on `Figure 4 attached hereto.

The effect of the proposed development on the road network is summarized as follows:

6.2.1. Effect on main routes

Taking cognizance of the small amount of trips that are expected to be generated by the development, it is not expected that the additional traffic would have a significant impact on the surrounding road network.

The site is located within an area where future roads or major upgrades are planned (Strategic road network) but none of these routes will directly be affected by the approval of this development.

6.2.2. Effect of the development on the current intersections

The addition of the expected trips to be generated is not seen as to contribute to any significant changes to the current levels of service and congestion along the route.

It is recommended that when construction starts, heavy vehicle movement to and from

the site should be controlled to minimize the effect of turning vehicles on the traffic flow at the access intersection – no heavy vehicle movements should be allowed to/from the site during the street peak hours.

6.3 Congestion

The increasing rate of urbanization decentralization higher car ownership, reluctance to use public transport, and declining funds for extending the road infrastructure are the main reason for the unsatisfactory situation along this and many other routes.

To some, congestion is not a problem. It is considered to be one result of economic prosperity and one that we will have to learn to live with. However, it is more generally accepted that the consequences of congestion are much more serious to a community, since it impacts negatively on one or more of the following:

- Local traffic in neighbourhoods;
- Economic growth;
- Community access;
- Quality-of-life;
- Road safety;
- Environmental quality.

The assessment of the effect of the approval of this site is summarized as follows:

- Local traffic in neighbourhoods;

It is not expected that any traffic from this development will move along the local road network in the surrounding neighborhoods affecting the residential region close to the site. This region is primarily located south to the site (south of the existing railway lines and Moreleta Street.

- Economic growth;

It is not expected that the development will have a negative impact on economic growth in the region.

- Community access;

The site access will be provided along an existing access route and is not expected to have an impact on access by the community. The current access route serves other developments but the current traffic volumes generated by these developments are low as shown on the applicable figures.

- Quality-of-life;

This development is not expected to negatively impact on the quality of life from a traffic engineering point of view.

- Road safety;

It is not expected that the approval of this development and the traffic generated by the development would significantly impact on road safety in the region. The access route and overall geometry along Dykor Street allows for safe movement for all vehicles. Blocking of the access intersection by approaching Moreleta Street is a concern but is not expected to be worsened by the traffic generated by the development. It is recommended that yellow lines (Box marking RM10) are to be painted within the intersections along Dykor Street, access road and Silwereike Street, to prevent vehicles to stop within the intersection.

- Environmental quality:

It is not expected that the development will have a negative impact on the environmental quality from a traffic engineering point of view provided that all measures required and recommended in this report are adhered to.

6.4 Access to the site

The site is evaluated in terms of the following aspects concerning access to the site and the results are summarized as follows:

6.4.1. Suitable accesses can be provided to the development.

The access to the site is proposed off an existing access road that is well-defined and constructed as paved route. It intersects with Dykor Street and curves at this intersection is such that heavy vehicles can turn without difficulty to and from the access route.

6.4.2. Sight distance evaluation

Adequate stopping and gap acceptance sight distances must be checked and be available at the access to the site.

> *Stopping sight distance (SSD) is the sum of the distance travelled during a driver's brake reaction time (i.e., perception/reaction time) and the braking distance (i.e., distance travelled while decelerating to a stop).*

- The stopping and shoulder sight distances are sufficient in both directions to/from the site access route – sight distance to the south is limited to approximately 75m. No parking should be allowed on the western road verge south of the intersection to ensure that the optimum sight distances are always available.

The minimum safe design stopping distance required for a 60km/h design speed is 85m. The minimum breaking distance required is 42m. It should be noted that although the design speed of Dykor Street is 60km/h, traffic from the Moreleta Street intersection is not free-flow at this stage and is the current 75m clear distance regarded to be safe.

- The sight distances along Dykor Street are sufficient to provide safe and efficient traffic movement to the access road. There are no obstacles that would impact on the site distances at the intersection.

6.4.3. Storage for access control

The access road provides more than sufficient storage should it ever be required that vehicles are to be queued along the access route. The position of the access to the site and access control point is such that sufficient storage area is available.

6.4.4. Ingress and egress movements

Separate ingress and egress lanes are to be provided at the access.

Sufficient space is available for dual lanes at the access to accommodate ingress and egress movements separately. The access routes are to be minimum 7,4 m wide and sufficient space must be available for emergency vehicles should it be required that these vehicles must enter the site. It is required that a minimum free height restriction of 4,2 m should also be available at the access position.

It is recommended that a properly constructed access road is to be provided from the existing access road from Dykor Street to ensure safe vehicular movements to/from the main access road.

6.4.5. Access intersection spacing

The access spacing or separation to the nearest full intersection is in compliance with the road access management requirements.

The access road and spacing thereof where it intersects with Dykor Street comply with the minimum requirements from a traffic safety point of view – the current access intersection is fixed and cannot be moved due to the rail-over-road bridge crossing the access road and existing buildings located direct adjacent to this access road.

6.4.6. Parking and Site development plan

Parking can be provided on-site in accordance with the requirements of the municipality.

A parking area where 30 vehicles can be accommodated is proposed on the site and this should be sufficient for the proposed development.

6.5 General road safety aspects

6.5.1. During construction phase

The impact of construction traffic is normally high due to high speed differential (differences in the travelling speed) of each construction vehicles on roads. High volumes construction vehicles on roads will result in an increase in the means that the probability of accidents occurring.

It is therefore required that the contractors who would be appointed to work on the site during the construction phase must prepare a traffic management plan as part of their construction management process in order to minimise the probability of these instances to occur – it has been indicated that no construction vehicles should be allowed to visit the site during the street peak hour periods.

The construction vehicles must all be fit for service and road worthy and must display the regulated vehicle related signage.

6.5.2. Operational related traffic.

It has been indicated in the report that the operational traffic will be minimal which implies that the impact would not be significant and would also not contribute to an increase in congestion that would result in an increase in the occurrence of accidents.

The operator must however ensure that a proper traffic management plan is drafted should it be required that waste is to be delivered from other sites to this site as and when required. Transportation of hazardous waste by these vehicles must comply with the requirements as set out in the applicable SANS regulations for the “transportation of hazardous dangerous goods and must also comply with the relevant regulations and requirements of the National Road Traffic Act (Act 93 of 1996) as amended.

7. PEDESTRIAN AND CYCLIST REQUIREMENTS

It is not expected that the development would generate significant pedestrian or cyclist traffic neither would the development require any significant public transport facilities to be accommodated on or near the site as is required in terms of the National Land Transport Transition Act (NLTTA).

A pedestrian walkway would be required along the access route to ensure safe and efficient movements of pedestrians that are expected to travel to and from the site during the day although this might be limited due to the provision of a canteen onsite.

8. GOODS VEHICLES OFF-LOADING FACILITIES

This requirement is chiefly applicable to development sites such as retail and other commercial developments where deliveries take place either daily or on a weekly basis. It is not expected that any specific requirements would apply for this development. The site has anyhow sufficient space available for the manoeuvring of delivery vehicles should it be required.

9. MITIGATING MEASURES TO BE APPLIED

Based on the assumptions made in this report, it is not required that any specific road upgrades are to be implemented to accommodate the additional traffic to be generated by the development. It is however recommended that “Box marking” is provided within the intersections of the access road and Silwereike Street to prevent blockage of the intersections by queuing vehicles from Moreleta Street

It is recommended that a pedestrian walkway is to be provided along the current access road to ensure safe and efficient movements to and from the site from Dykor Street.

10. COST APPORTIONMENT

No road upgrades are required for this development. It is however required that lane markings at the intersections of the access road and Silwereike Street is to be changed by the addition of “Box marking (RM10)” in the intersections. It is recommended that the applicant contributes to the initial implementation of these lane markings.

It is further recommended that a pedestrian walkway is to be provided along the current access roadway to ensure safe and efficient movement for pedestrians. The applicant should be responsible for the costs associated with the construction of this walkway.

The applicant is also responsible for the construction of a properly designed roadway from the site access towards current main access route. This roadway should be designed to ensure that it would be able to carry heavy vehicle traffic to and from the main access road and it should also be paved to ensure a dust free roadway.

The applicant is also to contribute to any bulk services contributions that may be required by the City of Tshwane as and when required.

11. CONCLUSIONS AND RECOMMENDATIONS

Based on the assumptions and contents of this report, it is concluded that the proposed development will not have a significant impact on the surrounding roads network or environment from a traffic engineering point of view.

The current traffic flow conditions are not very satisfactorily but the addition of the traffic expected to be generated by the development would not change the current situation.

Limited mitigating measures are proposed for the development to ensure safe and efficient traffic movements and the applicant is to be responsible for the costs associated with these.

It is therefore recommended that the application is to be supported from a traffic engineering point of view.

ANNEXURE A

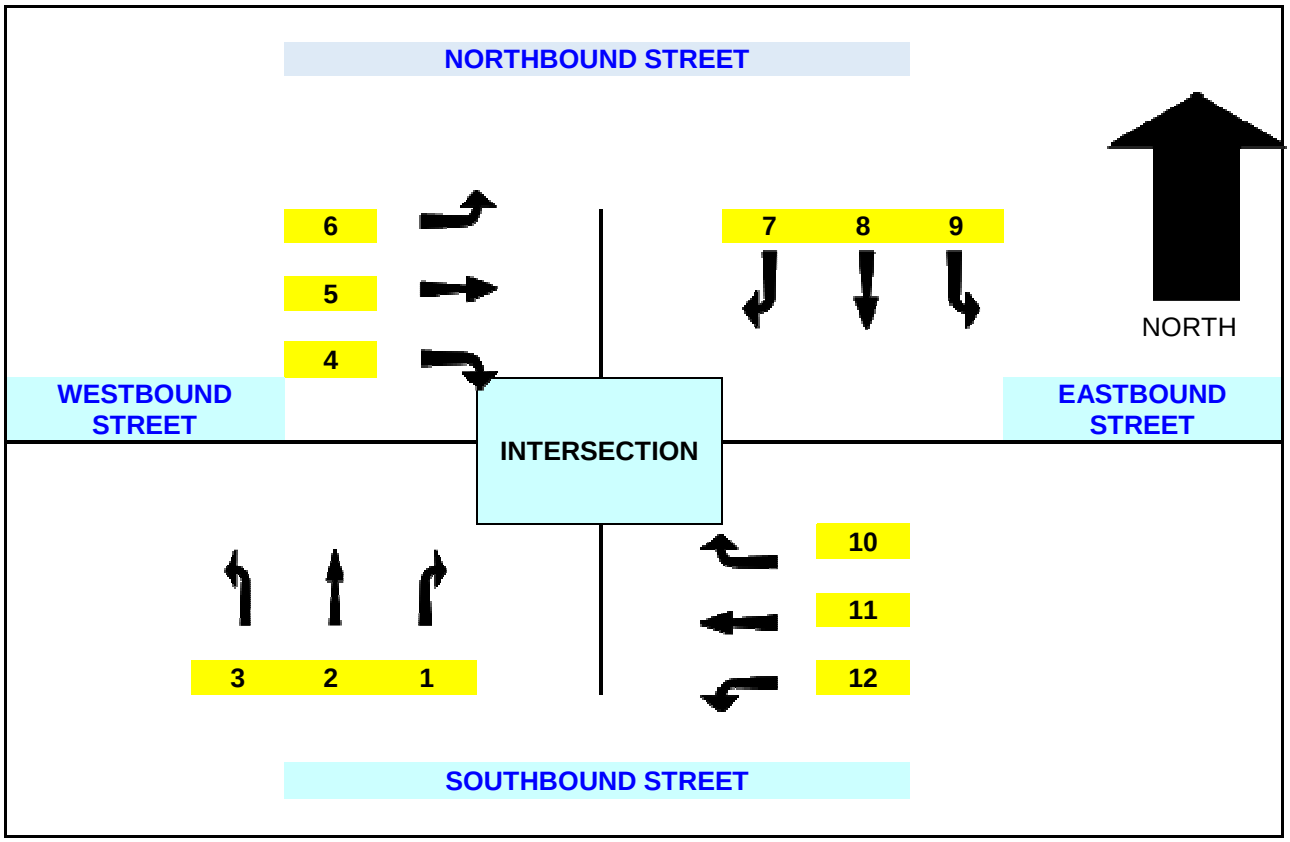
FIGURES

ANNEXURE B

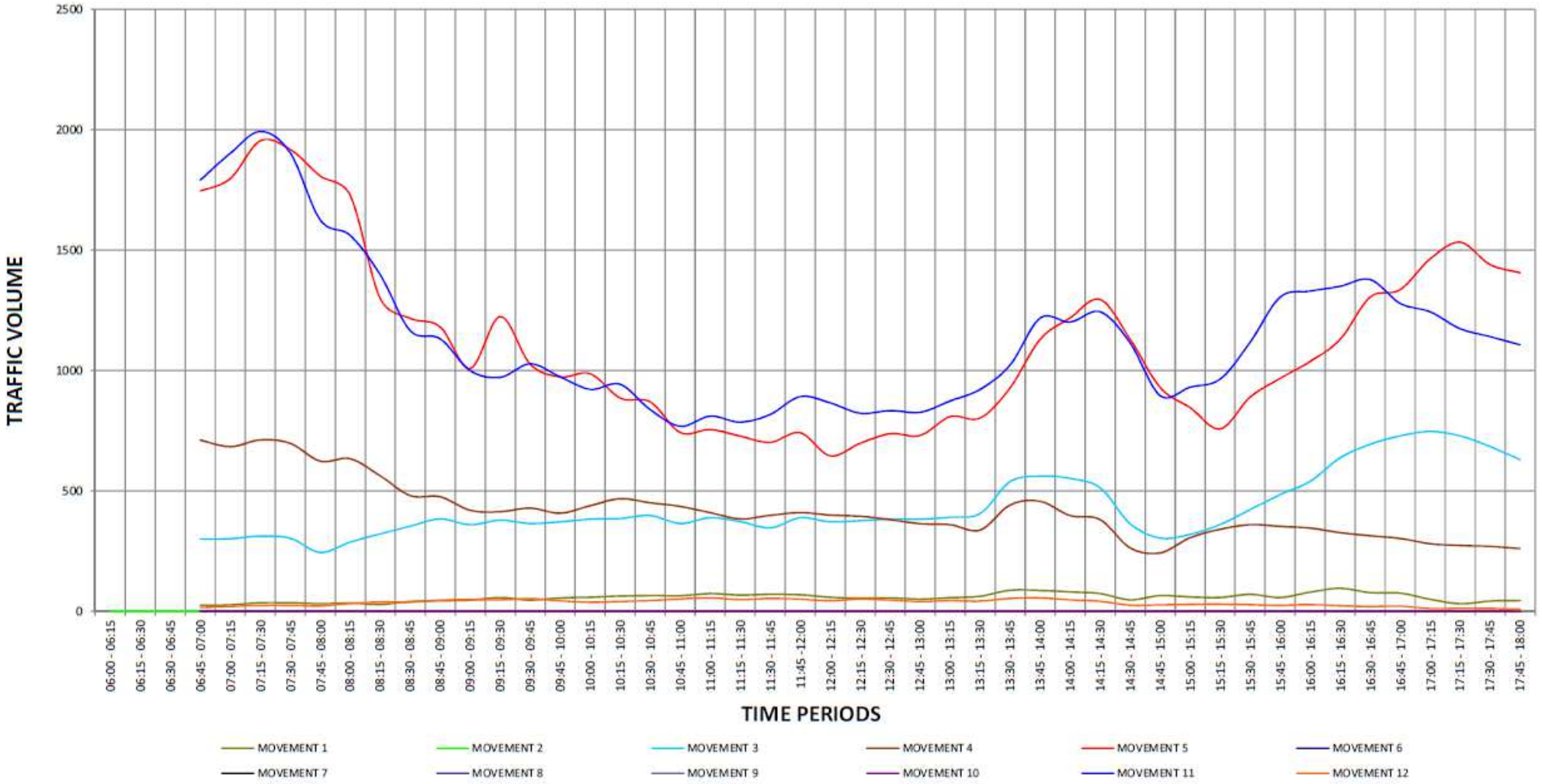
PHOTO REPORT OF CURRENT SITUATION

ANNEXURE C

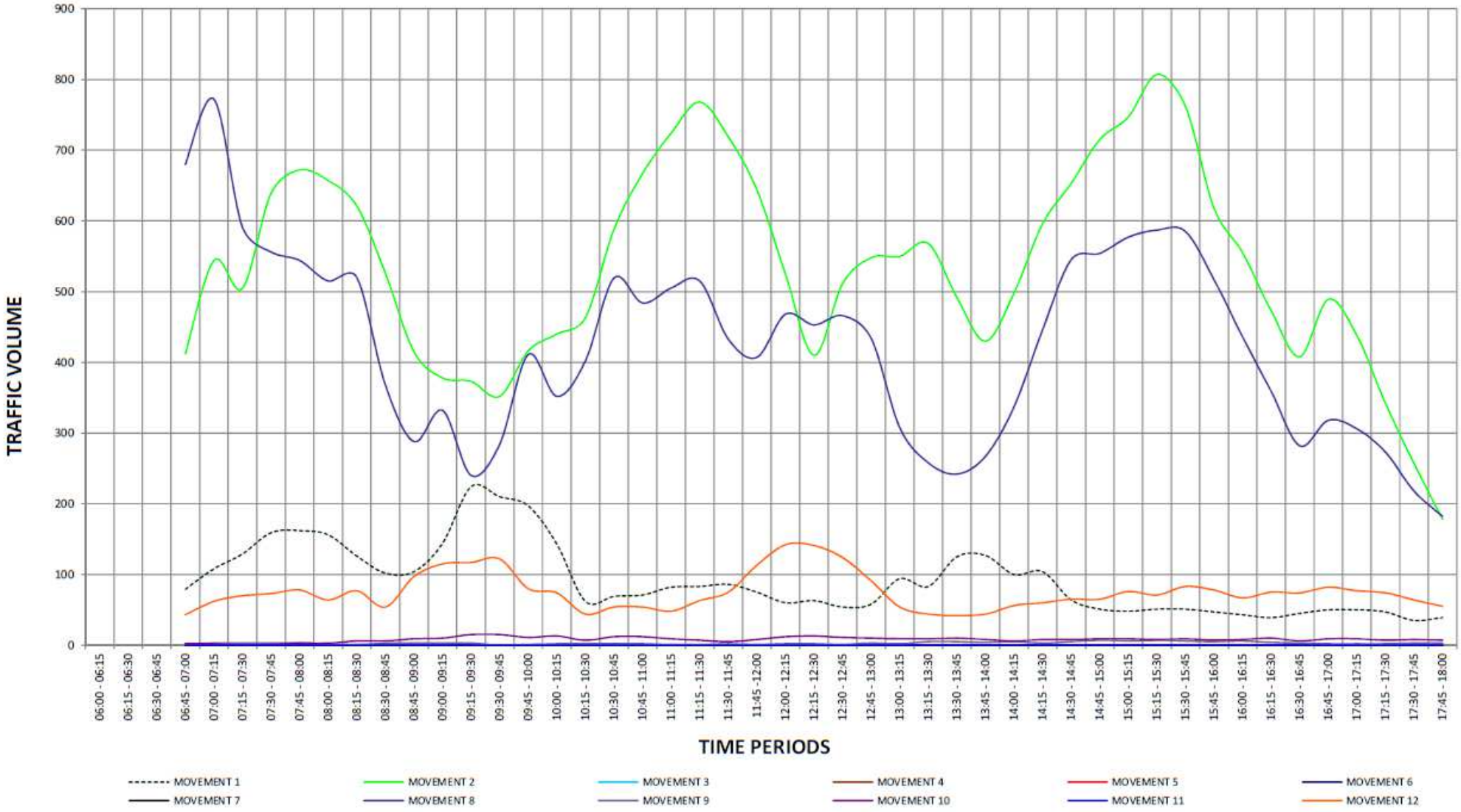
CURRENT 12-HR TRAFFIC FLOW PATTERN AT FOUR MAJOR ROAD INTERSECTIONS



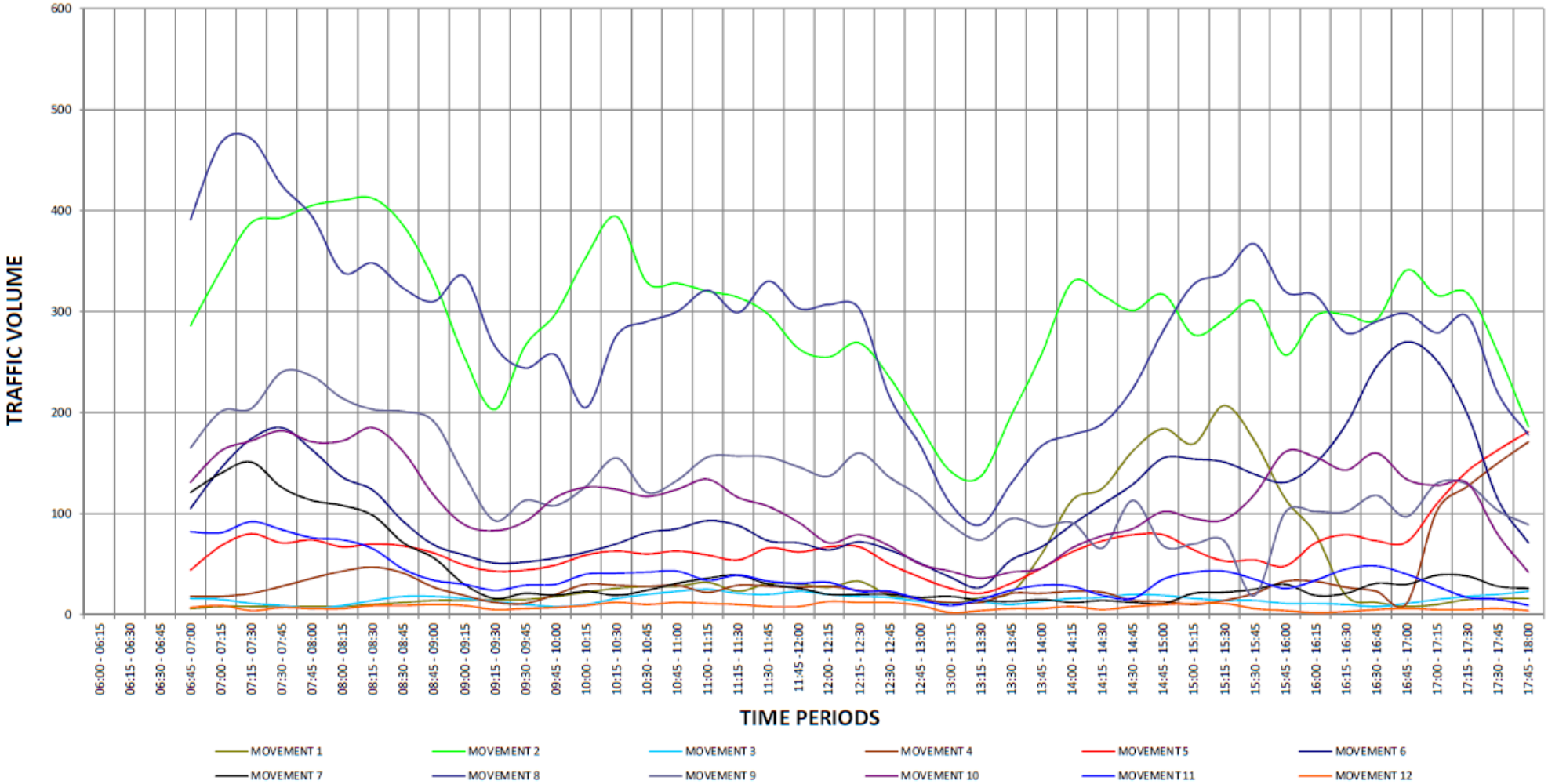
KOEDOESPOORT LANDFILL SITE - HOURLY FLOWS
Stormvoël Rd / Dykor St intersection
12-HR TRAFFIC VOLUME SURVEY: 3 MARCH 2015



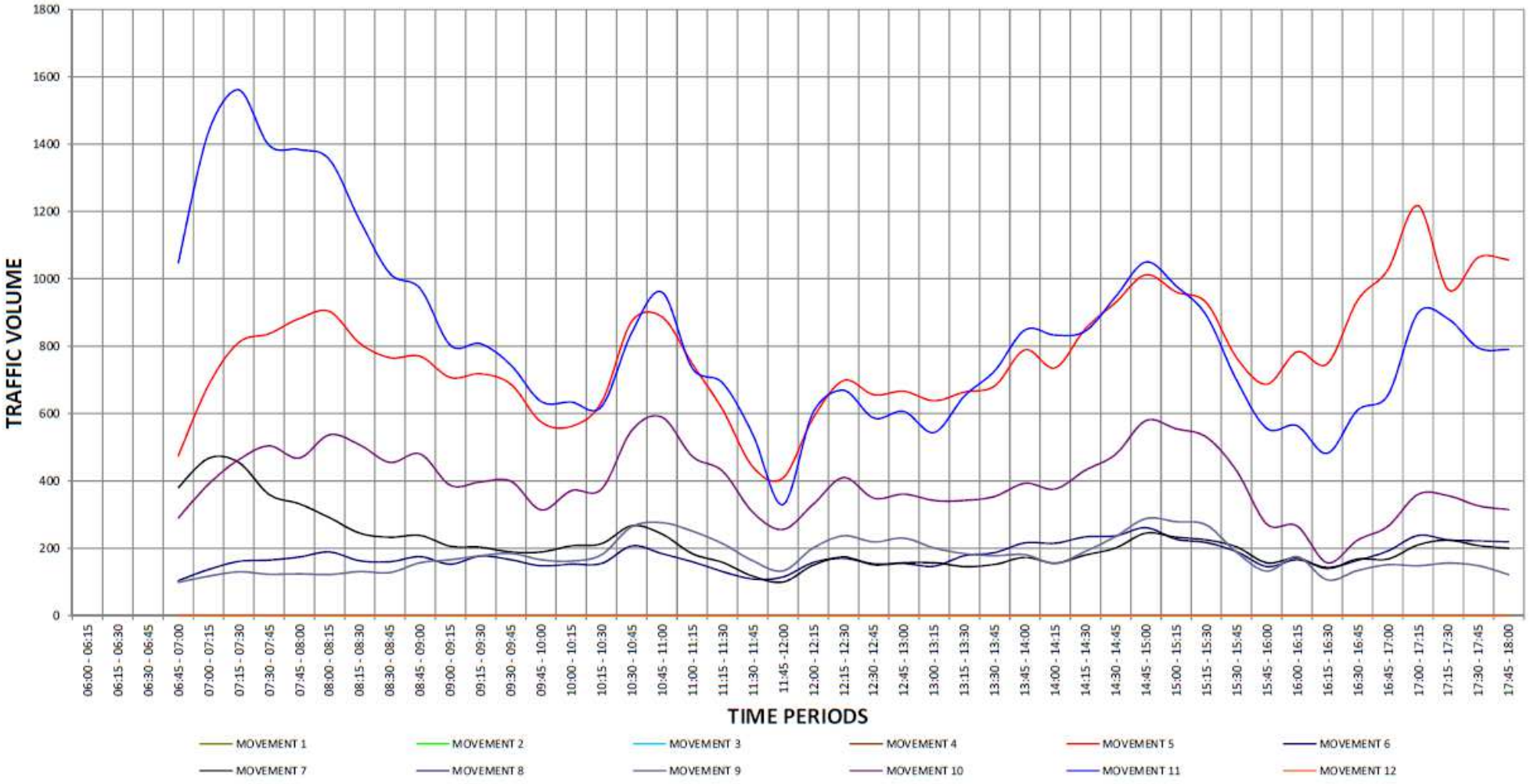
KOEDOESPOORT LANDFILL SITE - HOURLY FLOWS
Silwereike St / Dykor St intersection
12-HR TRAFFIC VOLUME SURVEY: 3 MARCH 2015



KOEDOESPOORT LANDFILL SITE - HOURLY FLOWS
Silwereike St / Dykor St intersection
12-HR TRAFFIC VOLUME SURVEY: 3 MARCH 2015



KOEDOESPOORT LANDFILL SITE - HOURLY FLOWS
Pretoria Rd / Dykor St intersection
12-HR TRAFFIC VOLUME SURVEY: 3 MARCH 2015



ANNEXURE D

SIDRA INTERSECTION ANALYSIS RESULTS

Project: C:\aaTRAFFIC\KOEDOESLANDFILL.sip
8000597, PW @ ASSOCIATES, SINGLE

MOVEMENT SUMMARY — INTERSECTION 1 AM PEAK

INTERSECTION 1: DYKOR ST / STORMVOËL Rd
Signals - Fixed Time Cycle Time = 90 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh / h	%	v / c	sec		veh	m		per veh	km / h
South: DYKOR ST											
1	L	329	0.0	0.585	28.5	LOS C	9.7	58.3	0.77	0.87	33.9
3	R	38	0.0	0.130	51.5	LOS D	0.8	4.9	0.96	0.70	25.0
Approach		367	0.0	0.585	30.9	LOS C	9.7	58.3	0.79	0.86	32.7
East: STORMVOëL Rd											
4	L	26	0.0	0.952	54.0	LOS D	62.4	374.6	1.00	1.18	25.3
5	T	2098	0.0	0.952	45.8	LOS D	62.5	375.0	1.00	1.18	25.5
Approach		2124	0.0	0.952	45.9	LOS D	62.5	375.0	1.00	1.18	25.4
West: STORMVOëL Rd											
11	T	2297	0.0	0.722	4.1	LOS A	22.8	136.6	0.50	0.47	51.2
12	R	510	0.0	1.000	3 74.3	LOS E	27.2	163.2	1.00	1.24	19.9
Approach		2806	0.0	1.000	16.9	LOS B	27.2	163.2	0.59	0.61	39.7
All Vehicles		5298	0.0	1.000	29.5	LOS C	62.5	375.0	0.77	0.86	32.1

MOVEMENT SUMMARY — INTERSECTION 1 PM PEAK

INTERSECTION 1: DYKOR ST / STORMVOËL Rd
Signals - Fixed Time Cycle Time = 75 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh / h	%	v / c	sec		veh	m		per veh	km / h
South: DYKOR ST											
1	L	773	0.0	1.000	3 20.5	LOS C	16.3	98.0	0.78	0.91	38.6
3	R	115	0.0	0.286	42.9	LOS D	2.0	12.3	0.96	0.75	27.7
Approach		887	0.0	1.000	23.4	LOS C	16.3	98.0	0.81	0.89	36.7
East: STORMVOëL Rd											
4	L	29	0.0	0.972	66.2	LOS E	41.8	250.9	1.00	1.31	22.2
5	T	1451	0.0	0.972	58.0	LOS E	41.9	251.3	1.00	1.31	22.3
Approach		1480	0.0	0.972	58.1	LOS E	41.9	251.3	1.00	1.31	22.3
West: STORMVOëL Rd											
11	T	1614	0.0	0.539	3.9	LOS A	11.9	71.3	0.44	0.40	52.2
12	R	364	0.0	0.489	20.6	LOS C	6.4	38.2	0.79	0.82	38.5
Approach		1978	0.0	0.539	7.0	LOS A	11.9	71.3	0.50	0.48	48.9
All Vehicles		4345	0.0	1.000	27.8	LOS C	41.9	251.3	0.74	0.85	33.2

MOVEMENT SUMMARY

INTERSECTION 2 AM PEAK

INTERSECTION 2: DYKOR ST / SILWEREIKE ST
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh / h	%	v / c	sec		veh	m		per veh	km / h
South: DYKOR ST											
2	T	567	0.0	0.542	9.8	LOS A	10.0	60.0	1.00	0.00	42.9
3	R	171	0.0	0.542	18.2	LOS C	10.0	60.0	1.00	1.19	42.7
Approach		738	0.0	0.542	11.7	NA	10.0	60.0	1.00	0.28	42.8
East: SILWEREIKE ST											
4	L	82	0.0	0.188	17.0	LOS C	0.6	3.9	0.64	1.00	41.9
6	R	3	0.0	0.188	16.8	LOS C	0.6	3.9	0.64	1.02	42.1
Approach		85	0.0	0.188	17.0	LOS C	0.6	3.9	0.64	1.00	41.9
North: DYKOR ST											
7	L	3	0.0	0.418	8.2	LOS A	0.0	0.0	0.00	1.09	49.0
8	T	813	0.0	0.418	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		816	0.0	0.418	0.0	NA	0.0	0.0	0.00	0.00	59.9
All Vehicles		1639	0.0	0.542	6.2	NA	10.0	60.0	0.48	0.18	49.9

MOVEMENT SUMMARY

INTERSECTION 2 PM PEAK

INTERSECTION 2: DYKOR ST / SILWEREIKE ST
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh / h	%	v / c	sec		veh	m		per veh	km / h
South: DYKOR ST											
2	T	468	0.0	0.296	2.7	LOS A	2.9	17.6	0.67	0.00	48.7
3	R	53	0.0	0.296	11.1	LOS B	2.9	17.6	0.67	0.95	48.8
Approach		521	0.0	0.296	3.5	NA	2.9	17.6	0.67	0.10	48.7
East: SILWEREIKE ST											
4	L	86	0.0	0.162	14.6	LOS B	0.6	3.5	0.53	0.93	43.7
6	R	11	0.0	0.162	14.4	LOS B	0.6	3.5	0.53	1.02	43.9
Approach		97	0.0	0.162	14.5	LOS B	0.6	3.5	0.53	0.94	43.7
North: DYKOR ST											
7	L	6	0.0	0.239	8.2	LOS A	0.0	0.0	0.00	1.08	49.0
8	T	459	0.0	0.239	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		465	0.0	0.239	0.1	NA	0.0	0.0	0.00	0.01	59.8
All Vehicles		1083	0.0	0.296	3.0	NA	2.9	17.6	0.37	0.14	52.4

MOVEMENT SUMMARY

INTERSECTION 3 AM PEAK

INTERSECTION 3: DYKOR ST / ACCESS RD
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh / h	%	v / c	sec		veh	m		per veh	km / h
South: DYKOR ST											
1	L	19	0.0	0.418	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
2	T	795	0.0	0.418	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		814	0.0	0.418	0.2	NA	0.0	0.0	0.00	0.03	59.7
North: DYKOR ST											
8	T	900	0.0	0.475	8.7	LOS A	12.7	76.1	1.00	0.00	44.8
9	R	9	0.0	0.475	17.1	LOS C	12.7	76.1	1.00	1.17	44.6
Approach		909	0.0	0.475	8.8	NA	12.7	76.1	1.00	0.01	44.8
West: ACCESS RD											
10	L	29	0.0	0.128	22.1	LOS C	0.4	2.4	0.72	1.00	38.3
12	R	5	0.0	0.128	22.0	LOS C	0.4	2.4	0.72	1.01	38.3
Approach		35	0.0	0.128	22.1	LOS C	0.4	2.4	0.72	1.00	38.3
All Vehicles		1758	0.0	0.475	5.1	NA	12.7	76.1	0.53	0.04	50.5

MOVEMENT SUMMARY

INTERSECTION 3 PM PEAK

INTERSECTION 3: DYKOR ST / ACCESS RD
Stop (Two-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh / h	%	v / c	sec		veh	m		per veh	km / h
South: DYKOR ST											
1	L	23	0.0	0.428	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
2	T	811	0.0	0.428	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		834	0.0	0.428	0.2	NA	0.0	0.0	0.00	0.03	59.6
North: DYKOR ST											
8	T	500	0.0	0.261	5.3	LOS A	3.7	22.1	0.84	0.00	46.8
9	R	3	0.0	0.261	13.6	LOS B	3.7	22.1	0.84	1.03	47.3
Approach		503	0.0	0.261	5.4	NA	3.7	22.1	0.84	0.01	46.8
West: ACCESS RD											
10	L	18	0.0	0.114	23.5	LOS C	0.4	2.2	0.75	1.00	37.3
12	R	11	0.0	0.114	23.4	LOS C	0.4	2.2	0.75	1.00	37.4
Approach		28	0.0	0.114	23.5	LOS C	0.4	2.2	0.75	1.00	37.4
All Vehicles		1365	0.0	0.428	2.6	NA	3.7	22.1	0.33	0.04	53.6

MOVEMENT SUMMARY

INTERSECTION 4 AM PEAK

INTERSECTION 4: DYKOR ST / MORELETA ST
Stop (All-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh / h	%	v / c	sec		veh	m		per veh	km / h
South: DYKOR ST											
1	L	17	0.0	0.704	23.4	LOS C	4.9	24.5	0.95	1.63	31.8
2	T	426	0.0	0.704	23.4	LOS C	4.9	24.5	0.95	1.63	32.0
3	R	8	0.0	0.704	23.4	LOS C	4.9	24.5	0.95	1.63	31.9
Approach		452	0.0	0.704	23.4	LOS C	4.9	24.5	0.95	1.63	32.0
East: MORELETA ST											
4	L	9	0.0	0.630	25.1	LOS D	3.8	18.8	0.97	1.51	31.0
5	T	97	0.0	0.630	25.1	LOS D	3.8	18.8	0.97	1.51	31.1
6	R	192	0.0	0.630	25.1	LOS D	3.8	18.8	0.97	1.51	31.1
Approach		298	0.0	0.630	25.1	LOS D	3.8	18.8	0.97	1.51	31.1
North: DYKOR ST											
7	L	253	0.0	1.279	282.6	LOS F	92.2	460.8	1.00	9.21	6.6
8	T	496	0.0	1.279	282.6	LOS F	92.2	460.8	1.00	9.21	6.6
9	R	159	0.0	1.279	282.6	LOS F	92.2	460.8	1.00	9.21	6.6
Approach		907	0.0	1.279	282.6	LOS F	92.2	460.8	1.00	9.21	6.6
West: MORELETA ST											
10	L	195	0.0	1.567	578.6	LOS F	55.1	275.3	1.00	4.90	3.5
11	T	84	0.0	1.567	578.6	LOS F	55.1	275.3	1.00	4.90	3.5
12	R	38	0.0	1.567	578.6	LOS F	55.1	275.3	1.00	4.90	3.5
Approach		317	0.0	1.567	578.6	LOS F	55.1	275.3	1.00	4.90	3.5
All Vehicles		1974	0.0	1.567	231.9	LOS F	92.2	460.8	0.98	5.62	7.8

MOVEMENT SUMMARY

INTERSECTION 4 PM PEAK

INTERSECTION 4: DYKOR ST / MORELETA ST
Stop (All-Way)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh / h	%	v / c	sec		veh	m		per veh	km / h
South: DYKOR ST											
1	L	24	0.0	0.596	24.1	LOS C	3.3	16.5	0.89	1.47	37.2
2	T	359	0.0	0.596	23.6	LOS C	3.3	16.5	0.89	1.47	37.4
3	R	8	0.0	0.596	24.0	LOS C	3.3	16.5	0.89	1.48	37.3
Approach		392	0.0	0.596	23.7	LOS C	3.3	16.5	0.89	1.47	37.4
East: MORELETA ST											
4	L	6	0.0	0.386	20.7	LOS C	1.6	8.0	0.85	1.31	39.4
5	T	51	0.0	0.386	20.4	LOS C	1.6	8.0	0.85	1.31	39.5
6	R	168	0.0	0.386	20.6	LOS C	1.6	8.0	0.85	1.32	39.4
Approach		225	0.0	0.386	20.6	LOS C	1.6	8.0	0.85	1.32	39.4
North: DYKOR ST											
7	L	137	0.0	0.778	33.8	LOS D	6.7	33.3	0.98	1.81	32.0
8	T	333	0.0	0.778	33.4	LOS D	6.7	33.3	0.98	1.81	32.1
9	R	41	0.0	0.778	33.7	LOS D	6.7	33.3	0.98	1.81	32.0
Approach		511	0.0	0.778	33.5	LOS D	6.7	33.3	0.98	1.81	32.0
West: MORELETA ST											
10	L	284	0.0	1.431	448.3	LOS F	59.7	298.7	1.00	5.67	4.5
11	T	95	0.0	1.431	448.1	LOS F	59.7	298.7	1.00	5.67	4.5
12	R	35	0.0	1.431	448.2	LOS F	59.7	298.7	1.00	5.67	4.5
Approach		414	0.0	1.431	448.2	LOS F	59.7	298.7	1.00	5.67	4.5
All Vehicles		1541	0.0	1.431	140.5	LOS F	59.7	298.7	0.94	2.69	12.4

MOVEMENT SUMMARY

INTERSECTION 5 AM PEAK

INTERSECTION 5: DYKOR ST / PRETORIA Rd
Signals - Fixed Time Cycle Time = 75 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh / h	%	v / c	sec		veh	m		per veh	km / h
East: PRETORIA Rd											
5	T	1643	0.0	0.625	7.6	LOS A	17.1	102.5	0.62	0.56	47.2
6	R	531	0.0	0.740	30.0	LOS C	14.5	87.1	0.92	0.98	32.9
Approach		2174	0.0	0.740	13.1	LOS B	17.1	102.5	0.69	0.67	42.7
North: DYKOR ST											
7	L	137	0.0	0.708	33.9	LOS C	10.2	61.3	0.97	0.90	31.2
9	R	492	0.0	0.708	36.8	LOS D	10.8	64.7	0.97	0.88	30.0
Approach		628	0.0	0.708	36.1	LOS D	10.8	64.7	0.97	0.89	30.2
West: PRETORIA Rd											
10	L	183	0.0	0.158	9.7	LOS A	1.5	9.0	0.33	0.68	47.4
11	T	928	0.0	0.736	26.1	LOS C	15.9	95.5	0.95	0.86	33.1
Approach		1112	0.0	0.736	23.4	LOS C	15.9	95.5	0.85	0.83	34.9
All Vehicles		3914	0.0	0.740	19.7	LOS B	17.1	102.5	0.78	0.75	37.8

MOVEMENT SUMMARY

INTERSECTION 5 PM PEAK

INTERSECTION 5: DYKOR ST / PRETORIA Rd
Signals - Fixed Time Cycle Time = 75 seconds (User-Given Cycle Time)

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue		Prop. Queued	Effective Stop Rate	Average Speed
							Vehicles	Distance			
		veh / h	%	v / c	sec		veh	m		per veh	km / h
East: PRETORIA Rd											
5	T	946	0.0	0.322	3.4	LOS A	5.7	34.2	0.36	0.32	53.2
6	R	379	0.0	0.617	23.4	LOS C	10.9	65.5	0.88	0.85	36.5
Approach		1325	0.0	0.617	9.1	LOS A	10.9	65.5	0.51	0.47	47.0
North: DYKOR ST											
7	L	184	0.0	0.601	22.7	LOS C	5.2	31.0	0.93	0.82	37.0
9	R	236	0.0	0.601	36.1	LOS D	6.0	35.9	0.97	0.81	30.2
Approach		420	0.0	0.601	30.2	LOS C	6.0	35.9	0.95	0.81	32.9
West: PRETORIA Rd											
10	L	251	0.0	0.183	8.6	LOS A	1.3	7.7	0.25	0.66	48.4
11	T	1281	0.0	0.625	13.8	LOS B	16.7	100.1	0.77	0.68	41.3
Approach		1532	0.0	0.625	12.9	LOS B	16.7	100.1	0.68	0.68	42.3
All Vehicles		3277	0.0	0.625	13.6	LOS B	16.7	100.1	0.65	0.61	42.5