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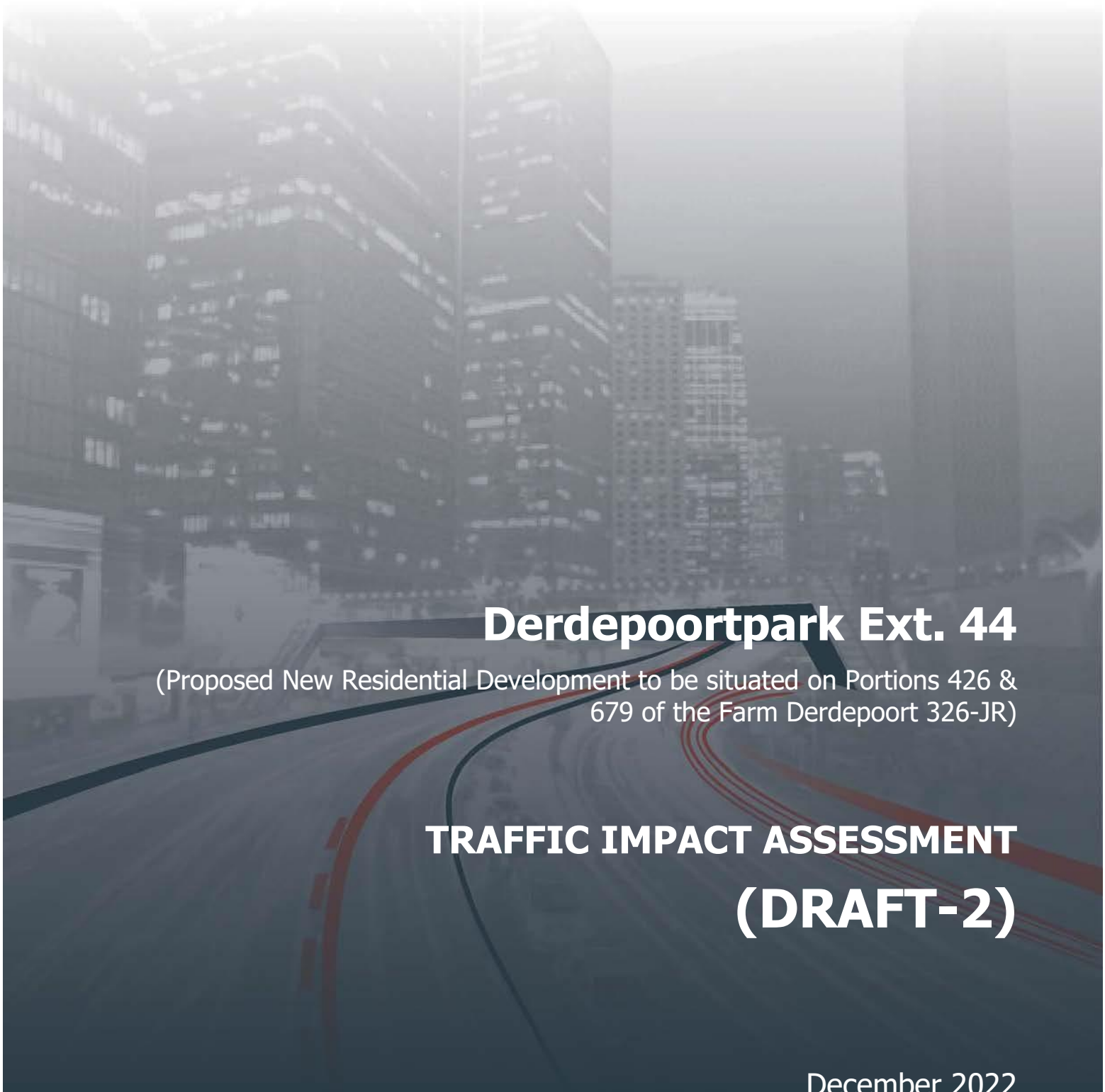

Derdepoortpark Ext. 44

(Proposed New Residential Development to be situated on Portions 426 & 679 of the Farm Derdepoort 326-JR)

TRAFFIC IMPACT ASSESSMENT

(DRAFT-2)

December 2022

Document Verification

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1. Introduction & Background

Dhubecon Consulting Engineers (Pty) Ltd have been appointed to undertake this Traffic Impact Assessment (TIA) as part of the township application for a proposed new residential development which is to be situated on Portions 426 & 679 of the Farm Derdepoort 326-JR in Pretoria. The site location is shown in attached **Figure 1** and **Figure 2** and falls under the jurisdiction of the City of Tshwane (CoT).

The subject site's developable area is approximately 7.93ha in extent and the proposed township will be known as Derdepoortpark Ext. 44. With reference to the town planner's proposed Township Layout Plan enclosed in **Annexure A**, the township will be zoned 'Residential 3' with a proposed development density of 120 units/ ha. Based on this density and its developable area, this particular township would have a permissible development extent of 952 units. The expected target market would be the middle-income market, similar to other nearby residential developments/ complexes in the study.

The proposed township is bounded by Baviaanspoort Road (M15/ Future K139) to the west, also known as the Moloto Road (R573) further north of the site. Intaba Street borders the site to the south-east and Sefako Makgatho Drive (R513/ K14) is located just north of the site. It is important to note that the implementation of the future K139 (Baviaanspoort / Moloto Road) west of the site has been taken over from Gautrans by SANRAL, who are planning significant upgrades on the majority of this road as well as other roads in the study area. These upgrades include the realignment and rehabilitation of existing roads as well as the implementation of a new grade-separated interchange between Baviaanspoort Road / Moloto Road and Sefako Makgatho Drive, near the north-western corner of the site. Furthermore, an entirely new north-south road between Baviaanspoort Road and Stormvoël Road is planned (M8), which forms part of the implementation of the K139 provincial road. A key plan of these upgrades in the vicinity of the site is shown in **Annexure B**. According to information received from KBK Engineers (Pty) Ltd, who are the design engineers responsible for the designs of these upgrades, construction of the first phase of these upgrades could start as early as mid-2023. The key plan of the planned SANRAL upgrades shown in **Annexure B** was also sourced from KBK Engineers (Pty) Ltd.

This study investigates the impact of the additional traffic to be generated by the proposed development on the immediate surrounding road network and determines whether it is necessary to implement any road and/or intersection improvements to mitigate the anticipated traffic impact whilst also taking account of the future SANRAL upgrades. New traffic counts had been undertaken at identified key intersections in the study area in order to quantify and assess the traffic flow operations. The study also investigates the proposed site layout, the site access arrangements and provides comments with respect to non-motorised and public transport.

2. Site Location & Surrounding Road Network

2.1 SITE LOCATION

The site is situated near the south-eastern quadrant of the intersection between Baviaanspoort Road (M15/ future K-route 139) / Moloto Road (R573) and Sefako Makgatho Drive (R513/ K14), roughly 1.4km east of the N1 freeway in Pretoria. As shown in **Figure 1** and **Figure 2**, the site is bordered by:

- A neighbouring development to the north and directly north of this development is the Class 2 road known as Sefako Makgatho Drive (R513);
- Baviaanspoort Road (M15) to the west; and
- Intaba Street to the south-east.

The following existing and/or future streets are relevant to the study area:

2.2 EXISTING ROAD NETWORK

Sefako Makgatho Drive (R513 / K14): is classified as a Class 2 east-west major arterial road, which is situated about 120m to the north of the site. The road comprises of a 4-lane dual carriageway road (two lanes per direction) with additional turning lanes provided at its intersection with Baviaanspoort Road (M15 / D1386). Furthermore, most of the main intersection along this road are signalised. It is anticipated that most of the development's estimated traffic would travel via this road given its close proximity to the site as well as the fact that this is the most convenient road for vehicles to use to get to the N1 freeway, which is situated about 1.5km west of the site.

Currently the traffic volumes on this road, in the vicinity of its intersection with Kameeldrift Road and Intaba Street, are in the order of 2,900vph and 2,600vph (total both directions), during the weekday AM and PM peak hours, respectively.

Baviaanspoort Road (M15 / Future K139): is a Class 2 north-south major arterial road, which runs along the western boundary of the site. The road comprises of a 2-lane single carriageway (one lane per direction, undivided) with additional turning lanes provided at its priority stop T-intersection with Intaba Street. It is also to note that north of its full signalized intersection Sefako Makgatho Drive, the road is known as the Moloto Road (R573) instead.

Currently the traffic volumes on this road, at its intersection with Intaba Street, are in the order of 2,000vph (total both directions), during both the weekday AM and PM peak hours, respectively.

Intaba Street: is classified as a Class 4b collector road which runs along the south-eastern boundary of the site. From this road, a single security-controlled access in the form of a priority stop controlled butterfly T-intersection is proposed. The access is discussed further in Section 3.2.

Currently the traffic volumes on this road, past the site, are in the order of 430vph (total both directions), during both the weekday AM and PM peak hours, respectively.

N1 Freeway: is classified as a Class 1 freeway which is located about 1.5km to the west of the site. It is considered important to the site as it would provide regional accessibility via the intersection with Sefako Makgatho Drive and it is expected that a large amount of the development's traffic would distribute towards this freeway in particular.

2.3 PLANNED FUTURE ROAD NETWORK

Attached **Figure 3** and **Figure 4** shows the relevant extracts of CoT's Road Master Plan (2015) and Gautrans Strategic Road Network (2007), respectively, in the vicinity of the subject site.

In terms of the local municipal road network, there are no planned roads in the study area that will be affected by the proposed development. However, it is important to note that Intaba Street is currently in a sub-standard condition and as part of the SANRAL road upgrades, this road would actually be rehabilitated and formalized up to the required road standards.

As indicated in **Drawing No. 0637/CL/01**, the portion of this road that travels past the south-eastern boundary of the township (approximately 480m in length) would become the responsibility of the developer to rehabilitate, should the development of the subject township occur before the SANRAL upgrades are carried out. The implementation and responsibility of these road upgrades are therefore highly dependent on the timeline of the implementation of the subject township and the SANRAL road upgrades planned in the area.

With reference to **Annexure B**, the following information is relevant for the other road upgrades that will be implemented by SANRAL:

- SANRAL will construct the future K139 provincial road that travels past the western boundary of the site. This upgrade comprises the upgrading of Baviaanspoort Road (M15) to a dual carriageway road separated by a median island that has three lanes traveling in each direction. It is also to note that that the Baviaanspoort / Moloto Road will form a grade separated interchange with Sefako Makgatho Drive near the north-western corner of the site. Given the extent of this planned upgrade, this specific intersection was not included as part of the analysed key intersections of the report as any upgrade proposed for this intersection would be redundant given that the capacity which would be provided by this planned new interchange would supersede any minor upgrade that is proposed to the existing intersection for the developer.
- With regards to Intaba Street, apart from the rehabilitation of the road as discussed above, this road is also set to be extended in a southbound direction from the south-eastern corner of the site. Approximately 600m south of the site's south-eastern corner, this road's alignment is set to curve in a western direction until it eventually intersects with Baviaanspoort Road (M15). At this planned new intersection, the intention is also to construct a whole new southern leg which will also intersect with Stormvoël Road (M8) further to the south. This southern leg also forms part of the planned alignment of the K139 road as mentioned above and which can also be seen on **Figure 4**. The northern and southern approaches of this intersection is viewed as the K139 while the western and eastern approaches are respectively viewed as Baviaanspoort Road and Intaba Street for the purposes of this report.
- It is important to note that there is an existing priority stop controlled T-intersection between Intaba Street and the existing Baviaanspoort Road (M15) near the south-western corner of the property. This intersection would, however, be closed off in the future and the traffic through this intersection would redistribute towards the newly planned intersection between the K139, Intaba Street and Baviaanspoort Road (M15) further to the south instead. The main reason behind the closure of the T-intersection is due to the sub-standard spacing between this intersection and the planned grade-separated interchange between Baviaanspoort Road (M15) / Moloto Road (R573) and Sefako Makgatho Drive (R513) as well as the newly planned intersection further south.
- At the existing signalized intersection between Sefako Makgatho Drive (R513) & Intaba Street to the north-east of the site, additional through lanes will be implemented in each direction on Sefako Makgatho Drive. Sefako Makgatho Drive (R513) would therefore have four lanes traveling in each direction based on the layout as per **Annexure B**.

According to information received from KBK Engineers (Pty) Ltd, who are the design engineers responsible for the designs of these upgrades, construction of the first phase of these upgrades could commence as early as mid-2023. The upgrades are also discussed further in Section 6.2.

3. Proposed Development & Site Access

3.1 PROPOSED DEVELOPMENT

The proposed residential township, known as Derdepoortpark Ext. 44, will be situated on Portions 426 & 679 of the Farm Derdepoort 326-JR, in Pretoria. The site location is shown in attached **Figure 1** and **Figure 2** and falls under the jurisdiction of the City of Tshwane (CoT).

With reference to the town planner's proposed township layout in **Annexure A**, the township will be zoned *Residential 3* with a permissible development density of 120 units/ ha and a developable area of 7.93ha. Considering this density and the developable area, the township could comprise of 952 units as a maximum extent. The development would typically consist of multi-storey apartment buildings which is intended for the middle-income households, similar to other developments within the study area.

Parking will be provided as per the requirements of the relevant Town Planning Scheme, or as separately motivated otherwise.

3.2 SITE ACCESS ARRANGEMENTS

As shown in attached **Figure 2**, a single access to the development is proposed off Intaba Street which is classified as a Class 4b residential collector road past the site. Note that the final position of the access will be confirmed as part of the submission of the SDP for the development. It can, however, be confirmed that the access will be located on the south-eastern boundary of the site on Intaba Street and that there is ample sight distance available in all directions on this road in particular.

A conceptual layout of the proposed access is shown in **Drawing No. 0637/CL/02a** in which it is proposed that a butterfly-type access be implemented. To implement this access configuration, local road widening on the western side of Intaba Street will be required so that a short right turning lane on the northern approach and a short receiving acceleration lane on the southern approach of the access intersection can be implemented.

Alternatively, as shown in **Drawing No. 0637/CL/02b**, it has been proposed to implement a traffic circle with an outside diameter of approximately 30m as the intersection's control (see also Section 6.1). The capacity analyses, as provided in Section 5.3 and 5.4 of this report, indicates that both options would have sufficient capacity to accommodate the design traffic. The final intersection control to be implemented, i.e, a butterfly intersection or traffic circle, would then be subject to the authorities' preferred option.

Two inbound lanes and two outbound lanes are recommended for the access. Important to note is that the access will be security controlled and therefore adequate stacking distance should be provided to ensure that inbound vehicles queuing at the security gate do not impact on the through traffic along Intaba Street. For this purpose, *THM 16 Vol 2 (Committee Draft 2.0, October 2019)*, was used to determine the required stacking distance for this site access. The following assumptions were made:

- Total development trip generations for weekday PM peak entering the development are **433vph** (see Section 4.3);
- Service flow rate of 450 veh/hr was assumed for 'Swipe magnetic card'; it is expected that this system will be used or something very similar, such as a biometric system; and
- Peak hour factor (PHF) = 0.85.

The traffic ratio percentage calculated to be about 113% (for the 90th percentile queue), which then according to Table 33 of the *THM 16 (Vol 2)* a theoretical storage length of three (3) vehicles (approximately 20m) is required for a double entry channel. It is recommended, however, that a minimum stacking distance of 25m be provided which would allow for about four (4) light passenger

vehicles to queue comfortably without stacking onto Intaba Street. Given the extent of the development (952 units) this recommended stacking distance is considered appropriate.

In order to accommodate emergency and service vehicles, it is also necessary to ensure that at least one traffic lane (inbound or outbound) has a width of at least 3.5m wide with a total free-space of 4.5m and a height clearance of 5.2m, or as per the requirements of the local authority.

4. Traffic Flows & Development Trip Generation

4.1 EXISTING TRAFFIC FLOWS & OPERATIONS

Given the type and extent of the proposed development, new detailed traffic surveys were carried out to quantify the existing traffic volumes in the vicinity of the site. The traffic surveys comprised of manual traffic counts which were done on Thursday the 29th of September 2022 at the following key intersections:

- Sefako Makgatho Drive (R513) / Intaba Street / Kameeldrift Road [Classified]; and
- Baviaanspoort Road (M15) / Intaba Street.

The existing weekday morning (AM) and afternoon (PM) peak hour traffic volumes at the above-mentioned key intersections are summarised in **Figure 5**. It was found that the weekday AM peak hour traffic occurred during 06:15 - 07:15, while the PM peak hour traffic occurred during 16:30 - 17:30. To determine the available public transport availability in the vicinity of the site, classified traffic surveys were undertaken at the key intersection of Sefako Makgatho Drive, Intaba Street and Kameeldrift Road.

4.2 FUTURE BACKGROUND TRAFFIC FLOWS

Apart from the existing 2022 traffic volumes, a future base traffic volume scenario had been considered for the report, namely 2027. The future 2027 background traffic presented in this document, and as summarised in **Figure 8**, comprises of traffic growth over 5 years at the rate discussed below.

4.2.1 Traffic growth

The *THM16, Volume 1, South African Traffic Impact and Site Traffic Assessment Manual (Committee Draft 2.0, May 2018)* suggests that for developments which generate more than 50 peak hour trips, it is necessary to undertake a full traffic impact assessment which must also include traffic growth and/or the potential traffic generations of other nearby approved developments that still need to realise.

In order to make provision for other developments in the area and increases in traffic along the main routes, traffic growth is added. In this case the traffic growth makes provision for those other developments not accounted for in Section 4.2.2 below.

It has been assumed that the background traffic would increase at the rate of 3.0% per annum for 5 years to future 2027, which is in accordance with the *TMH17 guidelines*. The growth rate is considered reasonable and typical to that used in most traffic studies in Gauteng.

4.2.2 Trips Generations from "Other Developments" (Latent Rights)

Three (3) 'Other Developments' in this case has been included as latent rights for the purposes of the study. This development's location relative to the site is indicated in **Figure 2** and is also briefly discussed below:

- **Erven 149 & 150, Derdepoortpark Ext. 14:** is a residential development which is situated about 580m north of the subject site with a single security-controlled access that will be provided from Eglantine Street. This site is located directly north of the Tshwane Shopping Mall.

  The necessary information regarding the estimated trip generations and distributions from this latent rights development was obtained from the TIA (issued in October 2019) for this township by Dhubecon Consulting Engineers (Pty) Ltd. The estimated trips, at the relevant key intersections of this TIA, are shown schematically in **Figure 6a**. At the time of undertaking this study, construction of this latent rights development has commenced, however, none of the units

have been occupied as yet. Therefore, the full extent of this township's estimated trips was included as latent rights for the purposes of this study.

- **Derdepoortpark Ext. 5 & 10:** are two neighbouring mixed land use townships that are situated at the north-eastern quadrant of the intersection between Sefako Makgatho Drive (R513) & Intaba Street. Both these townships have already been serviced and in the case of Derdepoort Ext. 10, the township is already partially developed.

  The necessary information regarding the estimated trip generations and trip distributions from these developments were obtained from a TIA (issued in October 2014) that was undertaken by Techworld Consulting Engineers (Pty) Ltd. In the case of Derdepoortpark Ext. 5, the full development trips were included as latent rights, but for Derdepoortpark Ext. 10, only the remaining traffic that is yet to realize has been included as latent rights for this study. The estimated latent rights trips through the relevant key intersections of this study are summarized in **Figure 6b** and **Figure 6c**, respectively.

The estimated total future 2027 background traffic presented in this document, and as summarised in **Figure 8**, consists of two components, namely the background traffic with growth of 3% per annum over a period of 5 years and the total latent trips (**Figure 7**) that still needs to realise (which is the summation of **Figures 6a-c**), as discussed above.

4.3 DEVELOPMENT TRIP GENERATION

In order to estimate the expected trip generations of the proposed development, the latest and most relevant guideline, entitled *TMH 17 Volume 1, South African Trip Data Manual (Committee Draft 2.0, May 2018*) had been used as a basis, which has been based on a comprehensive data base, which makes provision for different types of residential developments, as well different income levels of developments, vehicle ownership and availability of public transport services.

The *Trip Data Manual* allows for *'Apartments and Flats'*, which is viewed as the most accurate description for the development in the *TMH 17*, with adjustments allowed in terms of '*Low Vehicle Ownership'*, '*Transit Nodes and Corridors*' (availability of public transport) and '*Mixed Land Use Developments'*. In this case, however, no adjustment factors had been applied, given the anticipated target market and the location of the subject development.

The *TMH17's* suggested trip rate for *'Apartments and Flats'* is **0.65 trips/** unit during both the AM and PM peak hours, respectively. Using this base trip rate, it is estimated that the proposed 952-unit development will generate a maximum of **619 peak hour trips** (total IN plus OUT) during both the AM and PM peaks. **Table 1** below summarises the total estimated AM and PM peak traffic generations for the proposed development, using the recommended directional splits (IN:OUT) as per the *TMH 17* of 25:75 and 70:30 for the AM and PM peaks, respectively.

Table 1: Estimated Development Trips

Peak	Development Trips (vph)		
	IN	OUT	TOTAL
Weekday AM Peak hr	155	464	**619**
Weekday PM Peak hr	433	186	**619**

4.4 TRIP DISTRIBUTION & ASSIGNMENT

Assumptions on the expected trip distribution were based on the location of the proposed site access and local streets in relation to the surrounding existing road network, existing traffic volumes and patterns in the study area, the type of development in relation to employment as well as our knowledge of the area.

Figures 9 depicts the expected trip distributions of the trips generated by the township as a result of the 952-unit residential development. Given the above distributions, **Figures 10** indicates the estimated development weekday AM and PM peak hour trips at the key intersections.

4.5 ASSESSMENT TRAFFIC FLOWS WITH DEVELOPMENT

Figure 11 shows the total existing 2022 peak hour traffic volumes with the estimated traffic generations from the proposed development, which is the summation of **Figure 5** and **Figure 10**.

Figure 12 shows the total future 2027 base traffic volumes with the estimated traffic generations from the proposed development and other latent rights developments, which is the summation of **Figure 8** and **Figure 10**.

In this report **Figure 5**, **Figure 8**, **Figure 11** and **Figure 12** had been used for assessing the current traffic conditions, as well as the traffic impact of the proposed development and future background traffic flows, onto the surrounding road network.

5. Traffic Impact & Capacity Analyses

Capacity analyses had been undertaken in order to quantify the anticipated traffic impact of the proposed development. For this purpose, the latest *PTV Vistro 2022* traffic engineering software was used. With reference to the analyses of the various scenarios mentioned below, this section comments on the current traffic operations without the additional development traffic, as well as the likely traffic flow conditions with the additional development traffic. Where necessary and feasible, intersection improvements have been identified that would mitigate the likely traffic impact and/or improve current traffic flow conditions.

The following key intersections have been analysed for potential traffic impact, namely:

- Sefako Makgatho Drive (R513) / Intaba Street;
- Baviaanspoort Road (M15) / Intaba Street; and
- Intaba Street / Site Access.

The following scenarios were analysed, namely:

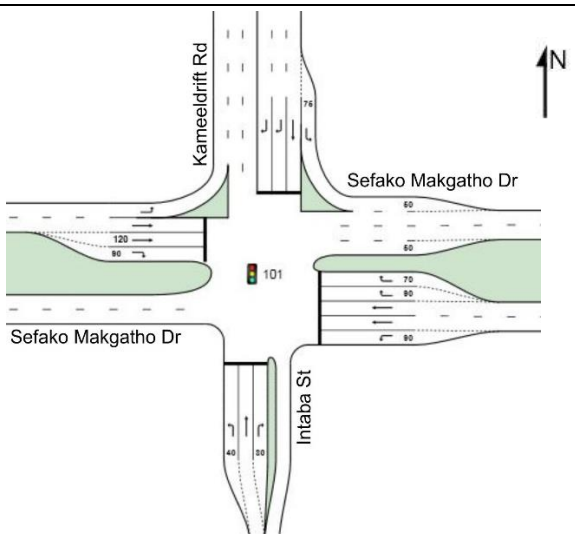
- **Scenario 1:** Existing 2022 weekday AM and PM peak hour traffic volumes WITHOUT the estimated development trips (as per **Figure 5**);
- **Scenario 2:** Future 2027 base weekday AM and PM peak hour traffic volumes PLUS the total latent rights trips WITHOUT the estimated development trips (as per **Figure 8**);
- **Scenario 3:** Existing 2022 weekday AM and PM peak hour traffic volumes PLUS the estimated development trips (as per **Figure 11**);
- **Scenario 4:** Future 2027 base weekday AM and PM peak hour traffic volumes PLUS the total latent rights trips PLUS the estimated development trips (as per **Figure 12**).

Results of the PTV Vistro capacity analyses at the various intersections are discussed in the following sub-sections, with the details of the outputs enclosed in **Annexure C**. To note is that for all the traffic analyses of signalised intersections, optimised traffic signal phasing and settings had been used.

5.1 SEFAKO MAKGATHO DRIVE (R513) / INTABA STREET / KAMEELDRIFT ROAD

Existing Geometry & Control:

- Four-legged signalized intersection;
- **North:** One through lane with two right turning lanes and a left turning slip-way;
- **South:** One through lane with a short right turning lane and a short left turning lane;
- **East**: Two through lanes with two short right turning lanes and a short left turning lane; and
- **West**: Two through lanes (one full length lane and one short lane) with a short right turning lane and a left turning slip-way.



Analysis Results & Conclusion | Intersection: **Sefako Makgatho Dr / Intaba St / Kameeldrift Rd**

Detailed Results: **Annexures C1 to C10**

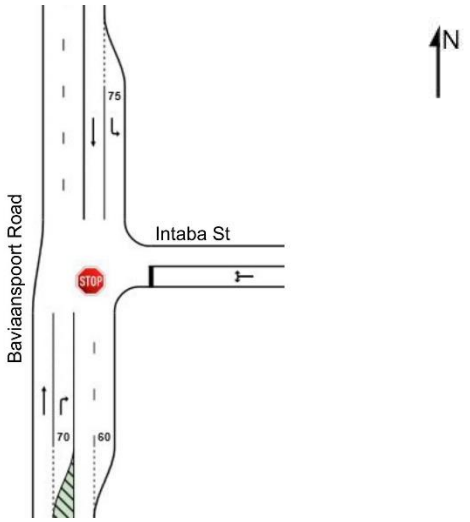
Scenario	Geometry & Control	Peak	Overall			Comment
			LOS	Delay(s)	v/c_{max}	
Scenario 1	Existing geometry	AM	C	23	0.59	Acceptable overall level of operation
Scenario 2	Existing geometry	AM	D	49	0.82	Acceptable overall level of operation
Scenario 3	Existing geometry	AM	C	28	0.69	Acceptable overall level of operation
Scenario 4	Existing geometry	AM	E	58	0.91	Poor overall level of operation
Scenario 4	Proposed geometry	AM	D	46	0.86	Acceptable overall level of operation
Scenario 1	Existing geometry	PM	C	24	0.43	Acceptable overall level of operation
Scenario 2	Existing geometry	PM	D	46	0.74	Poor level of operation at northern approach
Scenario 3	Existing geometry	PM	C	27	0.62	Acceptable overall level of operation
Scenario 4	Existing geometry	PM	E	74	0.96	Poor overall level of operation
Scenario 4	Proposed geometry	PM	D	45	0.72	Acceptable overall level of operation

Conclusion:	This intersection currently operates within an acceptable range with the current traffic demand and will continue to do so even after the additional development traffic is added (Scenario 1 & 3) during both AM & PM peak hours. However, once the additional development traffic, latent rights and future growth in the existing background traffic is added, the overall operation of the intersection will deteriorate to a Level of Service (LOS) E during the peaks which suggests that a minor upgrade will be required to restore all approaches of the intersection to an acceptable LOS. The proposed upgrade for the developer would be to implement a left turning slip-way at the southern approach as the development's traffic will definitely increase the traffic volumes for this specific left turning movement during both peaks. The increase in this movement would be due to the fact that Sefako Makgatho Drive in a westbound direction leads directly to the N1 freeway where a significant portion of the development's traffic is expected to distribute towards. This upgrade, along with updated timing plans, would ensure that every approach of the intersection would operate with an acceptable LOS. The implementation of the left turning slip-way at the southern approach would also allow for more of the high volume of right turning vehicles from the northern approach (Kameeldoring Road) to pass through the intersection successfully as the slip-way to some extent removes the conflicting (opposing) movement between the right turning volumes from the northern approach and the left turning movement from the southern approach. The planned SANRAL upgrades at this intersection would comprise of the implementation of additional through lanes in each direction on Sefako Makgatho Drive. In total, there would be four through lanes traveling per direction on Sefako Makgatho Drive (see **Annexure B**). If, however, the subject development occurs before the SANRAL upgrades, then the left turning slip-way would have to be implemented before the SANRAL upgrades as well. This could also imply that when the SANRAL road upgrades are implemented, then this left turning slip-way would have to be reconstructed by SANRAL if Sefako Makgatho Drive is widened in a southern direction to accommodate the additional through lanes instead of road widening in a northern direction by reducing the width of the median island. It is anticipated that once the SANRAL upgrades have been fully implemented that this intersection would operate well with ample spare capacity and would easily be able to accommodate the future traffic volumes.
Upgrade Required:	Yes, as per **Drawing No. 0637/CL/03** & **Annexure B**
Upgrade Responsibility:	Developer & SANRAL

5.2 BAVIAANSPOORT ROAD (M15) / INTABA STREET INTERSECTION

Existing Geometry & Control:

- Priority stop controlled T-intersection with free-flow conditions prevailing along Baviaanspoort Road;
- **North:** One through lane with one short left turning lane;
- **South:** One through lane with one short right turning lane; and
- **East**: One shared left turning and right turning lane.



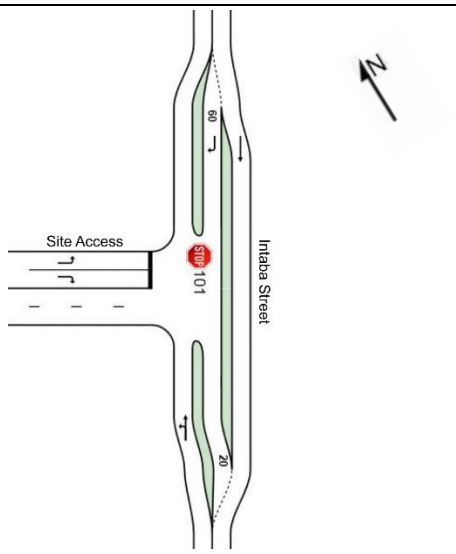
Analysis Results & Conclusion			Intersection: **Baviaanspoort Rd / Intaba St**			
Detailed Results: **Annexures C1 to C10**						
Scenario	**Geometry & Control**	**Peak**	**Stop Approach**			**Comment**
			LOS	**Delay(s)**	**v/c_{max}**	
Scenario 1	Existing geometry	AM	F	>200	0.77	Very poor level of operation in terms of delay
Scenario 2	Existing geometry	AM	F	>200	>1	Very poor overall level of operation
Scenario 3	Existing geometry	AM	F	>200	1.0	Very poor overall level of operation
Scenario 4	Existing geometry	AM	F	>200	>1	Very poor overall level of operation
Scenario 4	Proposed geometry	AM	C	24	0.73	Acceptable overall level of operation
Scenario 1	Existing geometry	PM	F	>200	>1	Very poor overall level of operation
Scenario 2	Existing geometry	PM	F	>200	>1	Very poor overall level of operation
Scenario 3	Existing geometry	PM	F	>200	>1	Very poor overall level of operation
Scenario 4	Existing geometry	PM	F	>200	>1	Very poor overall level of operation
Scenario 4	Proposed geometry	PM	C	31	0.70	Acceptable overall level of operation

Conclusion:	This intersection currently operates with high delays experienced at the stop approach on Intaba Street which can be expected due to the high through volumes on Baviaanspoort Road. It is therefore difficult for vehicles on Intaba Street to find gaps to successfully turn onto Baviaanspoort Road, which is especially true for the right turning vehicles which has to cross both the northbound and southbound traffic streams on Baviaanspoort Road. In the case of the left turning movement on Intaba Street, this movement is only opposed by the southbound traffic on Baviaanspoort Road which makes it easier for them to successfully merge onto Baviaanspoort Road. The signalized intersection between Sefako Makgatho Drive and Baviaanspoort Road / Moloto Road also causes some platooning to occur that creates some additional gaps for the left turning movement. Nevertheless, the delays at the approach are expected to increase considerably in the future for both peaks with the additional latent rights traffic, development traffic and growth in the existing background traffic and no geometric upgrades would actually mitigate these delays unless this intersection becomes signalized as well. As per **Drawing No. 0637/CL/03**, geometric upgrades as well as the signalization of the intersection is proposed for the developer. These upgrades would restore the intersection to an acceptable LOS with ample spare capacity at all approaches of the intersection. It is, however, important to note that the signalization and geometric upgrades as per **Drawing No. 0637/CL/03** would become redundant once the SANRAL upgrades are constructed, specifically the extension of Intaba Street in a southern direction which is planned to form a new intersection with Baviaanspoort Road about 600m south of the site. As mentioned in Section 2.3, near the south-eastern corner of the site, Intaba Street is set to be extended in a southern direction on a new road alignment that will eventually follow a curve in a western direction until it intersects with Baviaanspoort Road, forming the eastern approach of this new intersection. The southern approach (K139) would also be an entirely new road which would intersect with Stormvoël Road further to the south (as part of the implementation of the K139). This planned full intersection will replace the existing T-intersection between Baviaanspoort Road and Intaba Street. Once this intersection is constructed, it is expected that all of the traffic traveling through the existing T-intersection between Intaba Street & Baviaanspoort Road would redistribute to this new intersection instead. However, the planned geometry for this new intersection would have ample capacity and would easily accommodate the traffic from the existing Intaba Street / Baviaanspoort Road that redistributes to this new intersection. As per **Annexure B**, there would be at least three lanes per direction in a north-south direction with separate turning lanes provided and in an east-west direction, single through lanes are planned with separate turning lanes as well. This planned geometry would be able to accommodate far more vehicles than the subject T-intersection. The signalization and geometric upgrades proposed at this T-intersection would only be required if the subject development occurs before the SANRAL upgrades or if the SANRAL upgrades are delayed. These signals would therefore only be temporarily active (or could perhaps never be installed if the SANRAL upgrades are implemented according to schedule) until the intersection is replaced by the newly planned full intersection further south.
Upgrade Required:	Yes, as per **Drawing No. 0637/CL/04**, but only if the subject development is to occur before the planned SANRAL upgrades.
Upgrade Responsibility:	Developer / SANRAL, depending on the timelines.

5.3 INTABA STREET / SITE ACCESS [OPTION 1: BUTTERFLY GEOMETRY]

Proposed Geometry & Control:

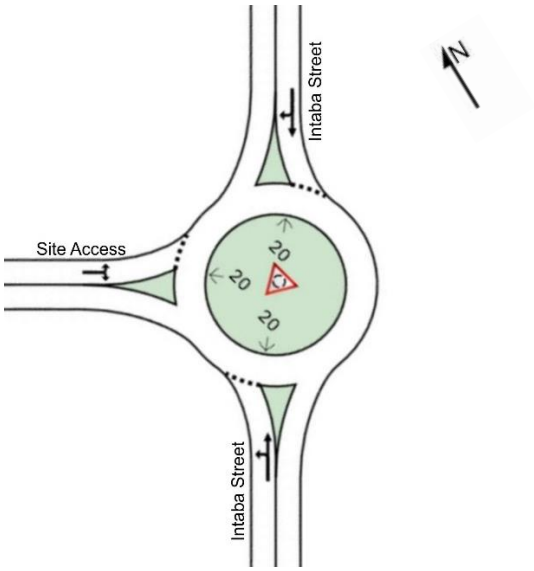
- Priority stop controlled butterfly T-intersection with free-flow conditions prevailing along Intaba Street;
- **North-West:** One left turning lane and one right turning lane;
- **North-East:** One through lane and one short right turning; and
- **South-East**: One shared through and left turning lane.



Analysis Results & Conclusion			Intersection: **Intaba St / Site Access [Butterfly]**			
Detailed Results: **Annexures C3-C4 and C8-C9**						
Scenario	**Geometry & Control**	**Peak**	**Stop Approach**			**Comment**
			LOS	**Delay(s)**	**v/c_{max}**	
Scenario 3	Proposed geometry	AM	C	22	0.45	Acceptable overall level of operation
Scenario 4	Proposed geometry	AM	D	35	0.60	Acceptable overall level of operation
Scenario 3	Proposed geometry	PM	D	32	0.34	Acceptable overall level of operation
Scenario 4	Proposed geometry	PM	D	48	0.46	Acceptable level of operation in terms of capacity

Conclusion:	The proposed site access configuration will have adequate capacity to accommodate the anticipated development trips, and will ensure that inbound vehicles do not impact on the movement of other vehicles travelling along Intaba Street. The implementation of the butterfly configuration will also allow for traffic turning right out of the site to make use of the acceleration lane that would allow them to safely merge with the through traffic on Intaba Street. The presence of this acceleration lane would also to some extent create more gaps for vehicles from the development to merge onto Intaba Street, resulting in lower delays at the site access stop approach.
Upgrade Required:	Yes, as per **Drawing No. 0637/CL/02a**
Upgrade Responsibility:	Developer

5.4 INTABA STREET / SITE ACCESS [OPTION 2: TRAFFIC CIRCLE]

Proposed Geometry & Control: • Traffic circle with single circulating lanest; • **North-West:** One shared left turning right turning lane; • **North-East:** One shared through and right turning; and • **South-East**: One shared through and left turning lane.	

Analysis Results & Conclusion			Intersection: **Intaba St / Site Access [Traffic Circle]**			
Detailed Results: **Annexures C3-C4 and C8-C9**						
Scenario	**Geometry & Control**	**Peak**	**Stop Approach**			**Comment**
			LOS	**Delay(s)**	**v/c_{max}**	
Scenario 3	Proposed geometry	AM	A	7	0.41	Very good overall level of operation
Scenario 4	Proposed geometry	AM	A	9	0.60	Very good overall level of operation
Scenario 3	Proposed geometry	PM	A	7	0.52	Very good overall level of operation
Scenario 4	Proposed geometry	PM	B	10	0.68	Good overall level of operation

Conclusion:	The proposed traffic circle access configuration will have adequate capacity to accommodate the anticipated development trips, and will ensure that inbound vehicles do not impact on the movement of other vehicles travelling along Intaba Street. The implementation of the traffic circle would also provide some traffic calming along Intaba Street which results in vehicles traveling at lower speeds on Intaba Street.
Upgrade Required:	Yes, as per **Drawing No. 0637/CL/02b**
Upgrade Responsibility:	Developer

6. Road and/or Intersection Upgrades

Based on the estimated additional traffic generations that will result from the proposed development and the projected trip distribution onto the surrounding road network during the weekday AM and PM peak hours, the capacity analyses in Section 5 as well as site observations during the peaks, it was concluded that external road and/ or intersection upgrades would be required for this proposed development. The required road & intersection upgrades for the developer are listed in Section 6.1 while the upgrades that will be implemented by SANRAL in the future is listed in Section 6.2.

6.1 UPGRADES BY DEVELOPER

A key plan of the overall road & intersection upgrades to be implemented by the developer is provided in **Drawing No. 0637/CL/01**. The following upgrades are proposed for the developer:

- Rehabilitation of Intaba Street (as per **Drawing No. 0637/CL/01**):
  Intaba Street's condition past the site's frontage has significantly deteriorated over the years and it would only degrade further with the added development traffic, latent rights traffic and future growth in the background traffic. Given these poor existing road conditions, it is proposed that the developer rehabilitate this road back to a standard Class 4b road past the site's frontage. As per **Drawing No. 0637/CL/01**, the section of Intaba Street to be rehabilitated by the developer is approximately 480m in length.

  NOTE: The rehabilitation of Intaba Street also forms part of SANRAL's planned upgrades in the area and as a result, the rehabilitation of this road should only be the responsibility of the developer if this development occurs before the implementation of the SANRAL upgrades.

- Site Access to Derdepoortpark Ext. 44:

  - **OPTION 1:** Butterfly intersection geometry as per **Drawing No. 0564/CL/02a**

    To implement this access configuration, a short right turning lane on the northern approach and a short acceleration lane on the receiving end of the southern approach is to be constructed. The access (north-western) approach is to comprise of two inbound lanes with two outbound lanes and a minimum stacking distance of at least 25m.

  - **OPTION 2:** Traffic circle intersection geometry as per **Drawing No. 0564/CL/02b**

    The implementation of a traffic circle with an outside diameter in the order of 30m with single circulating lanes. The recommended stacking at the access is recommended to be at least 25m in total.

  It is our recommendation that the traffic circle geometry be approved and implemented. Although both proposed options would have sufficient capacity to accommodate the anticipated traffic, the traffic circle would also induce traffic calming to some extent. Considering that Intaba Street is a fairly long road section without any major intersections between Baviaanspoort Road and Sefako Makgatho Drive, road users could possibly accelerate to unsafe speeds on this road if there isn't any form of traffic calming induced on the road. Furthermore, a set of public transport laybys is proposed at the access intersection which means the safety of pedestrians in the vicinity of Intaba Street should also be taken into account. It is on this basis that the traffic circle geometry be implemented instead of the butterfly geometry as the deflection of the circle would force vehicles to reduce their speed in the vicinity of the site access. The geometry of the access intersection is, however, subject to the authorities' preferred option and it would therefore by necessary for CoT to confirm their viewpoint on the access intersection's geometry.

- Sefako Makgatho Drive (R513) / Intaba Street / Kameeldrift Road

  (as per **Drawing No. 0637/CL/03**):

  It is proposed that the developer implement a left turning slip-way at the southern approach of the intersection. Along with this geometric upgrade, updated road markings and timing plans would also be required.

  NOTE: The planned SANRAL upgrades at this intersection would comprise of the implementation of additional through lanes in each direction on Sefako Makgatho Drive. In total, there would be four through lanes traveling per direction on Sefako Makgatho Drive (see **Annexure B**). If, however, the subject development occurs before the SANRAL upgrades, then the left turning slip-way would have to be implemented before the SANRAL upgrades as well. This could also imply that when the SANRAL road upgrades are implemented, then this left turning slip-way would have to be reconstructed by SANRAL, if Sefako Makgatho Drive is widened in a southern direction to accommodate the additional through lanes instead of widening in a northern direction by reducing the width of the median island.

- Baviaanspoort Road (M15) / Intaba Street (as per **Drawing No. 0637/CL/04**):

  At the eastern approach of this intersection, road widening would be required to implement a short right turning lane with a dedicated continuous left turning slip-lane. In addition to the geometric upgrades, it is further proposed that this intersection should become signalized by the developer.

  NOTE: It is, however, important to note that the signalization and geometric upgrades as per **Drawing No. 0637/CL/04** would become redundant once the SANRAL upgrades are constructed, specifically the extension of Intaba Street in a southern direction which is planned to form a new intersection with Baviaanspoort Road / K139 about 600m south of the site. This planned full intersection will replace the existing T-intersection between Baviaanspoort Road and Intaba Street, i.e., this intersection will be closed off (see **Annexure B**). Once this intersection is constructed, it is expected that all of the traffic traveling through the existing T-intersection between Intaba Street & Baviaanspoort Road would redistribute to this new intersection instead.

  The signalization and geometric upgrades proposed at this T-intersection would only be required if the subject development occurs before the SANRAL upgrades or if the SANRAL upgrades are delayed for some reason. These signals would therefore only be temporarily active (or could perhaps never be installed if the SANRAL upgrades are implemented according to schedule) until the intersection is replaced by the newly planned full intersection further south.

In the event of bulk engineering contributions payable with respect to roads and stormwater, it is recommended these contributions be off-set against the proposed road and intersection upgrades, as outlined above and where possible, since these upgrades will also benefit other future developments and the road authorities.

6.2 UPGRADES BY SANRAL

A key plan of the overall road & intersection upgrades to be implemented by SANRAL in the vicinity of the site is provided in **Annexure B**. This key plan was sourced from KBK Engineers (Pty) Ltd who are the consultants responsible for the designs of these upgrades. Given the large extent of the upgrades, these upgrades will be implemented in phases with the first construction phase planned to start as early as mid-2023 based on information received from the design engineers. These timelines are, however, not final at this stage and are subject to change. The following upgrades are planned in the vicinity of the Derdepoortpark Ext. 44 township:

- Rehabilitation & Extension of Intaba Street**:** The planned road rehabilitation & extension of Intaba Street forms part of the first phase of the SANRAL-upgrades and is expected to commence mid-2023. As per Section 6.1, the portion of Intaba Street traveling past the site was also

recommended to be rehabilitated by the developer. If there are no delays with regards to the implementation of this upgrade then it is likely that this road rehabilitation will be completed before the required upgrades for the developer commences. In the event that this occurs then the 480m length of Intaba Street to be the rehabilitated by the developer would not be required anymore as this would have already been done by SANRAL.

Apart from the rehabilitation of the road as discussed above, this road is also set to be extended in a southbound direction from the south-eastern corner of the site. Approximately 600m south of the site's south-eastern corner, this road's alignment is set to curve in a western direction until it eventually intersects with Baviaanspoort Road (M15) and the new north-south K139 road. At this planned new intersection, the intention is to construct a whole new southern leg which will also intersect with Stormvoël Road (M8) further to the south (see below). This southern approach forms part of the planned alignment of the K139 road which can also be seen on **Figure 4**.

- Baviaanspoort Road (M15) Upgrade (the implementation of the K139): This road upgrade forms part of the first phase of the SANRAL-upgrades and is planned to commence mid-2023. Past the western boundary of the site, this road is a single carriageway undivided road (one lane per direction). As per **Annexure B**, this road would be upgraded to K-route standards (i.e., the K139 road as per **Figure 4** will be constructed) with three lanes traveling per direction that is separated by a median island (dual carriageway road). As mentioned above, Baviaanspoort Road (M15) / the K139 road is set to intersect with the Intaba Street extension with the addition of a new southern leg of the K139 that would follow a new road alignment. This new north-south road alignment is planned to intersect with Stormvoël Road (M8) further to the south.

  The geometry of the planned new intersection between Baviaanspoort Road (M15) / K139 / Intaba Street, as per **Annexure B,** comprises the following:

  - Northern Approach (K139): Three through lanes with two short right turning lanes and one short left turning lane;
  - Southern Approach (K139): Three through lanes with one short right turning lane and one short left turning lane;
  - Eastern Approach (Intaba Street): One through lane with one short right turning lane and one short left turning lane; and
  - Western Approach (Baviaanspoort Road): One through lane with a short right turning lane and two short left turning lanes.

  The above-mentioned upgrades make up the first phase of the SANRAL-upgrades and once these upgrades conclude, the T-intersection between Intaba Street and Baviaanspoort Road at the south-western corner of the subject site will be closed off. The intention is for the existing traffic traveling through this T-intersection to redistribute to the newly planned intersection between Baviaanspoort Road (M15) / K139 / Intaba Street, which would have ample capacity to accommodate the expected traffic demand.

  Sefako Makgatho Drive (R513) Upgrades: As per **Annexure B**, this road is set to form a grade separated interchange with Baviaanspoort Road / Moloto Road at the position of the existing intersection between these roads. Construction of this upgrade is currently planned to commence end-2024. This specific intersection between Sefako Makgatho Drive / Baviaanspoort Road / Moloto Road was not included as one of the key intersections for the scope of the study as the planned interchange will supersede any minor upgrade that is proposed for the developer at this intersection.

  As part of the planned road upgrades on Sefako Makgatho Drive, additional through lanes will also be constructed in each direction. At the intersection between Sefako Makgatho Drive / Intaba Street / Kameeldrift Road, there are currently two through lanes traveling in each direction (east-west) on Sefako Makgatho Drive. The key plan in **Annexure B**, however, indicates that

two additional through lanes will be implemented in each direction, which adds up to four lanes traveling per direction. It is to note that at the eastern approach of the intersection, one of the two existing right turning lanes would be utilized as a through lane instead. We are in support of this proposal as the traffic demand on this right turning movement is actually not of such a higher order that it warrants a double right turning lane (see **Figure 5**). By implication of removing the double right turning lane, this would also allow for the signal timing plans of the intersection to not include a protected right turning phase for this movement, resulting in a more efficient overall operation of the intersection.

It is evident that some of the SANRAL-upgrades would supersede some of the development's required upgrades if the construction of the SANRAL-upgrades occurs according to schedule which in turn could complicate the development's services agreement with council. It is therefore suggested that at the time of compiling the services agreement of Derdepoortpark Ext 44, discussions should be held with council to determine/confirm what upgrades the developer should be responsible for. Furthermore, at the time of compiling the services agreement, more information regarding the final schedule/ phasing of the SANRAL-upgrades are likely to become known which would simplify the undertaking of this services agreement.

7. Non-Motorised & Public Transport

7.1 AVAILABILITY OF SERVICES & FACILITIES

On-site observations and the classified traffic surveys indicated that there is an existing public transport presence in the study area comprising mainly of minibus taxi and bus services. Classified traffic surveys were carried out at the intersection between Sefako Makgatho Drive, Intaba Street and Kameeldrift Road and it was noted that approximately 8% and 6% of the AM and PM peak hour traffic was minibus taxis. Considering the high traffic volumes through this intersection, this is in fact a considerable number of minibus taxis as can be expected from a prominent arterial road such as Sefako Makgatho Drive. It was further observed that there are also a variety of bus services provided along this road as well as along Baviaanspoort Road.

It is, however, expected that most of the residents/ tenants of the proposed development will use their own private vehicles for commuting, instead of public transport, given the medium income target market. The proposed development will however create various employment opportunities for domestic workers, security staff, gardening and maintenance personnel, who are generally public transport users. It is expected that particularly minibus taxis would respond to this demand by providing more services in the area, particularly past the site's south-eastern frontage on Intaba Street.

In terms of the existing paved sidewalks past the site's relevant frontages, paved sidewalks have not yet been provided past the site's south-eastern frontage as the development site is currently vacant (undeveloped).

7.2 PROPOSED FACILITIES

In order to make provision for users of public transport, generated by the proposed development, the following facilities are proposed:

- **Paved Sidewalks:** It is recommended that a new paved sidewalk of at least 1.8m be wide be constructed along the site's frontage on Intaba Street. This proposed new sidewalk is shown conceptually in **Drawing No. 0637/CL/01**.

- **Public Transport Layby:** To make provision for users of public transport, it is recommended that a set of public transport laybys be constructed at the site's access intersection on Intaba Street (see **Drawing No. 0637/CL/01**).

More details of the above would be submitted as part of the Site Development Plans and/or detail designs of the external roads.

8. Summary, Conclusions & Recommendations

[TO BE FINALIZED]

Figures

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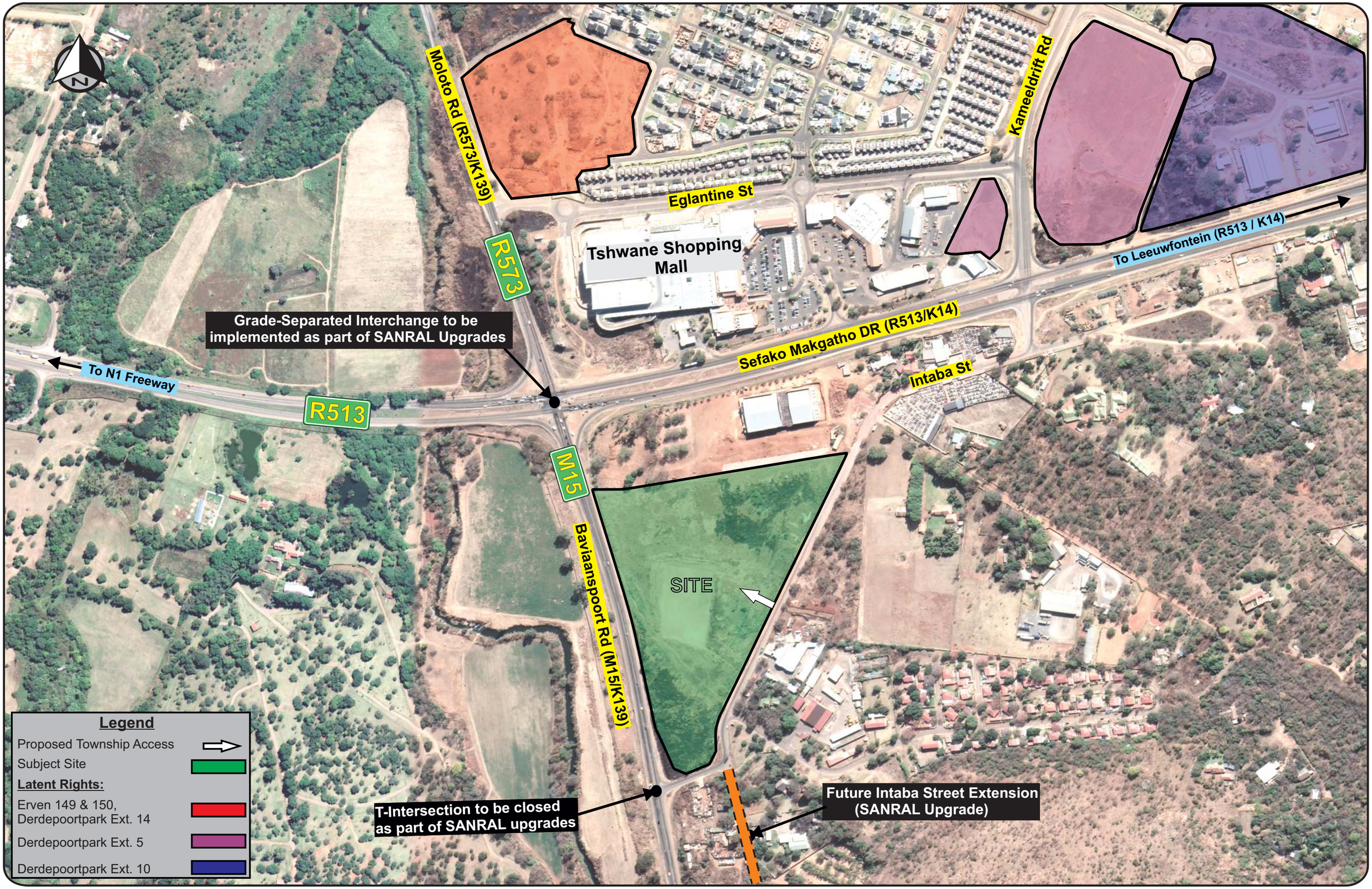
Project Name	Derdopoortpark Ext. 44	Proj Ref. P0637
Description	**Locality Plan**	Figure **1**



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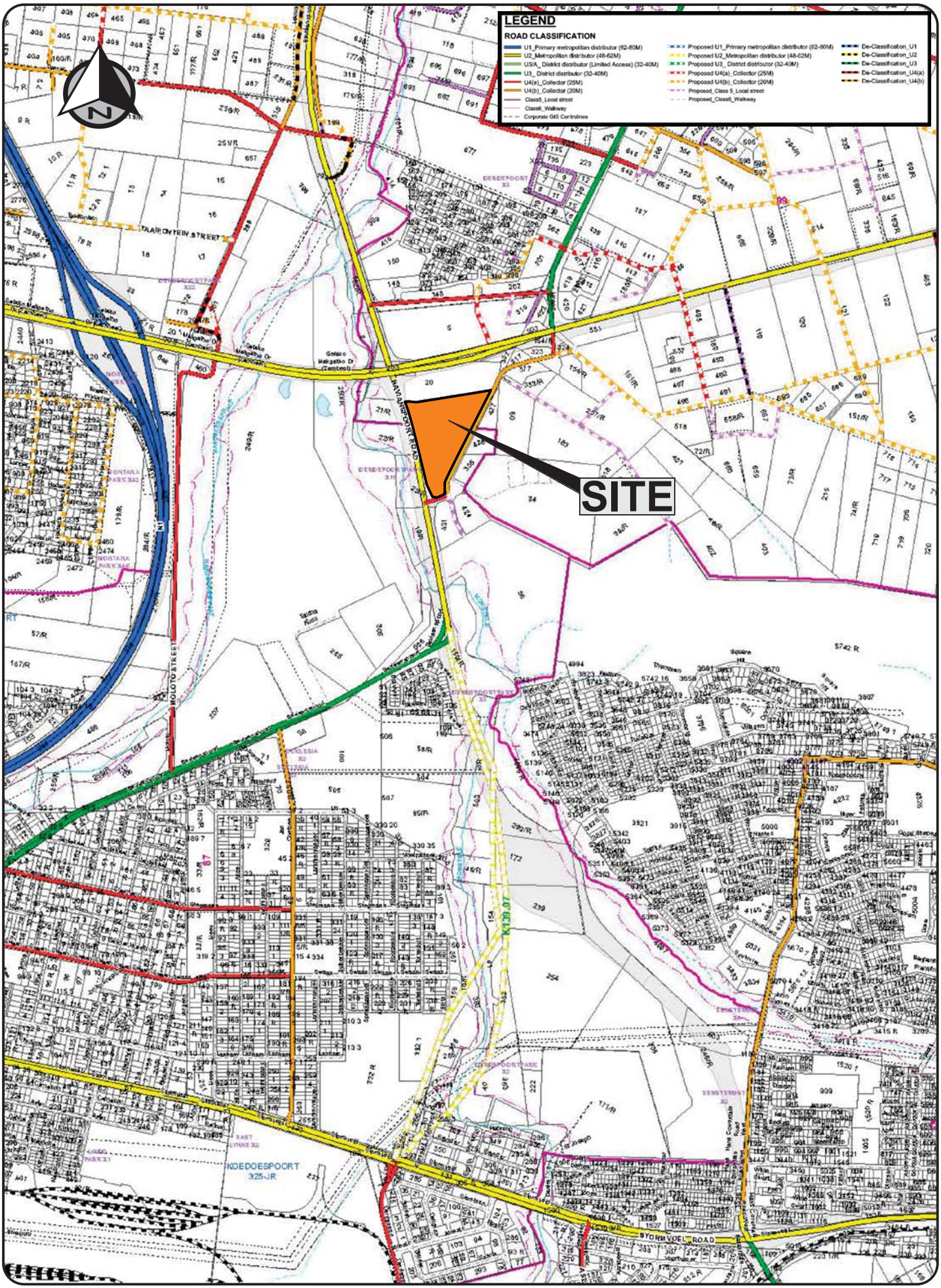
Client	Notes

Project Name	Proj Ref.
Derdepoortpark Ext. 44	P0637
Description	**Figure**
Site Aerial View & Key Plan	**2**



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Project Name	Proj Ref.
Derdepoortpark Ext. 44	P0637
Description	Figure
Extract of CoT's Road Master Plan (2015)	**3**

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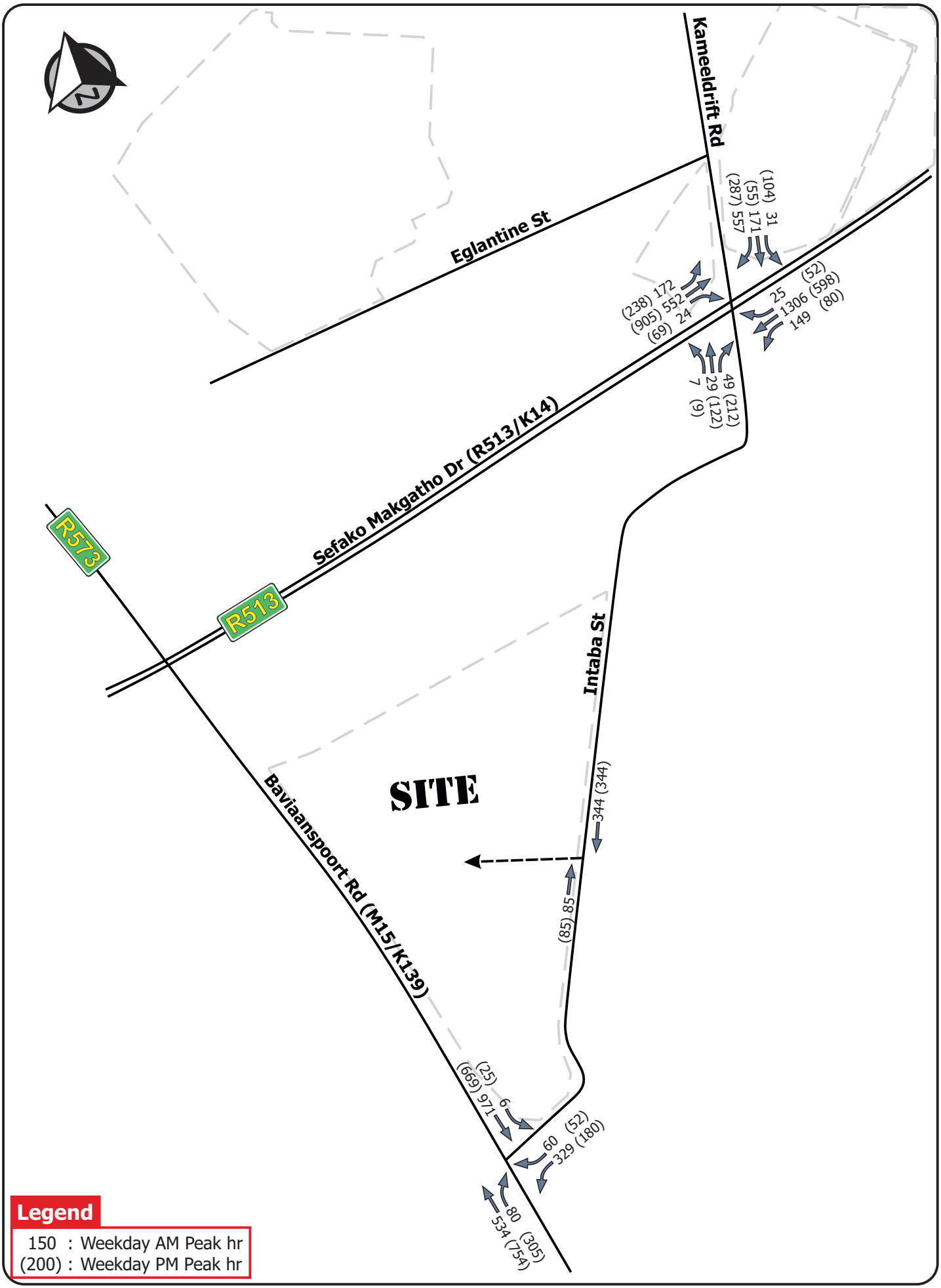
Project Name	Proj Ref.
Derdepoortpark Ext. 44	P0637
Description	Figure
Extract of Gautrans' Strategic Major Road Network (2007)	**4**



Legend

150 : Weekday AM Peak hr
(200) : Weekday PM Peak hr

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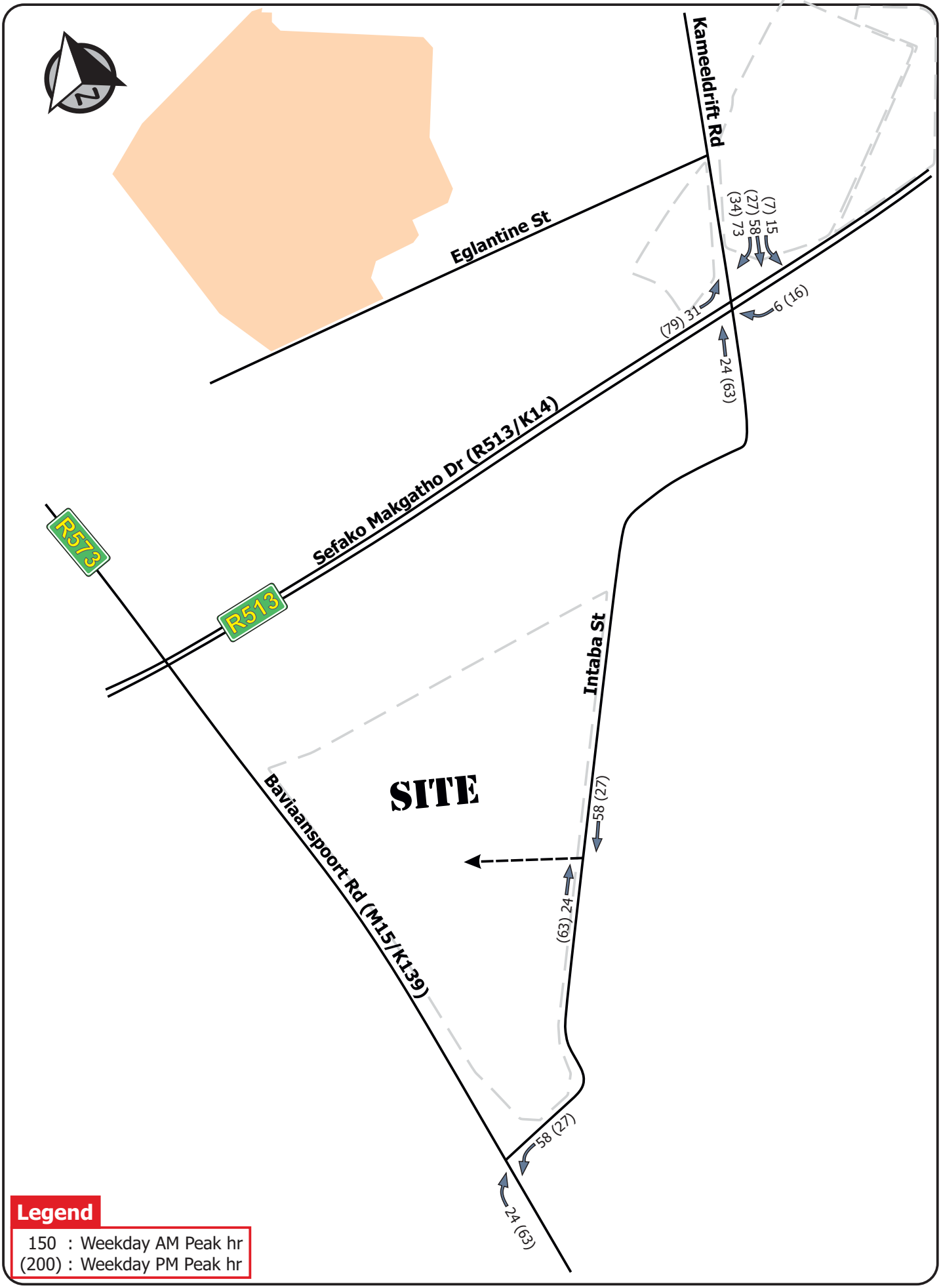
Project Name	Proj Ref.
Derdepoortpark Ext. 44	P0637
Description	Figure
Existing 2022 Peak Hour Traffic Volumes	**5**



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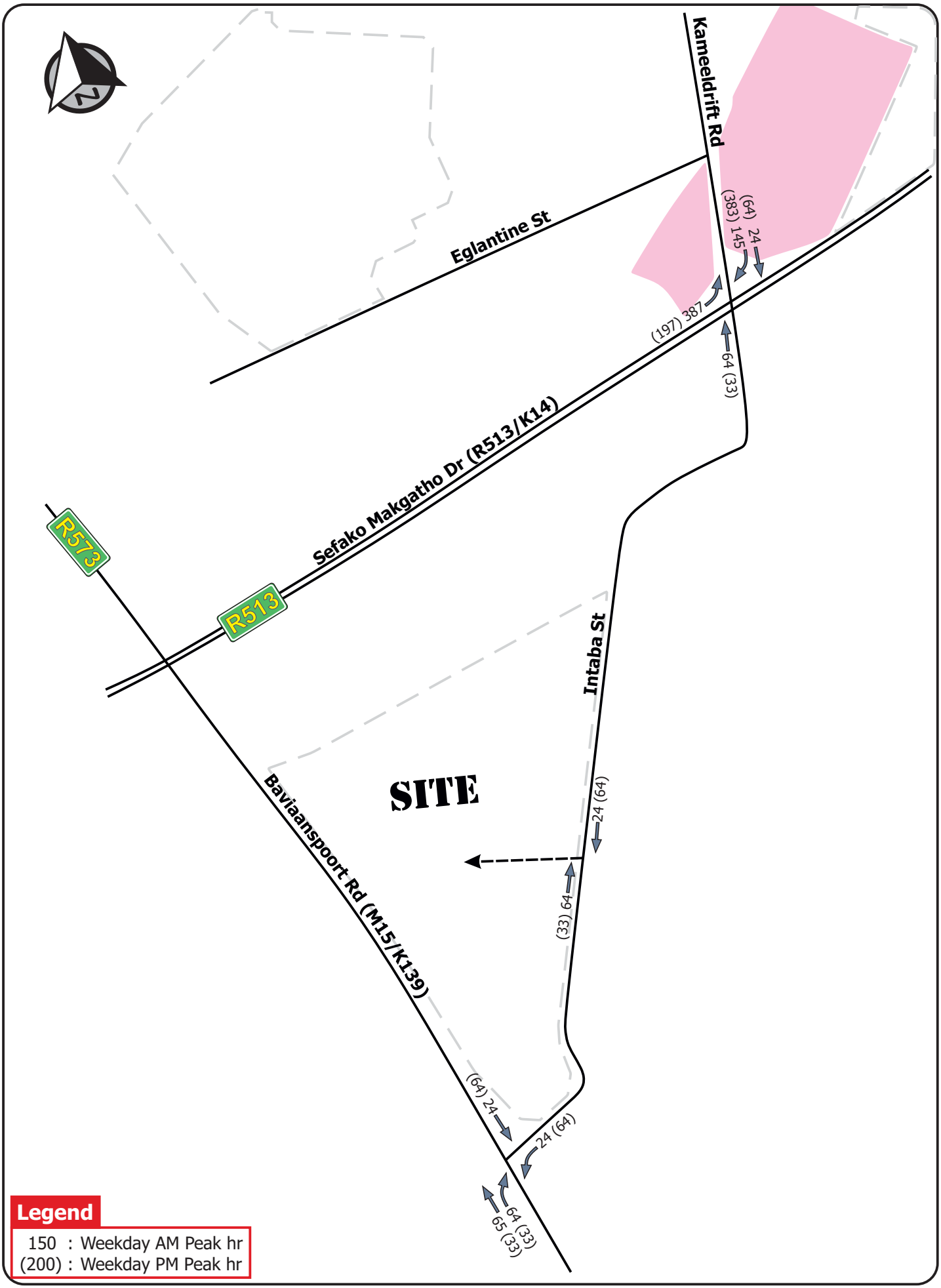
Project Name: Derdepoortpark Ext. 44		Proj Ref. P0637
Description: **Latent Rights Trips: Erven 149 & 150, Derdepoortpark Ext. 14**		Figure **6a**



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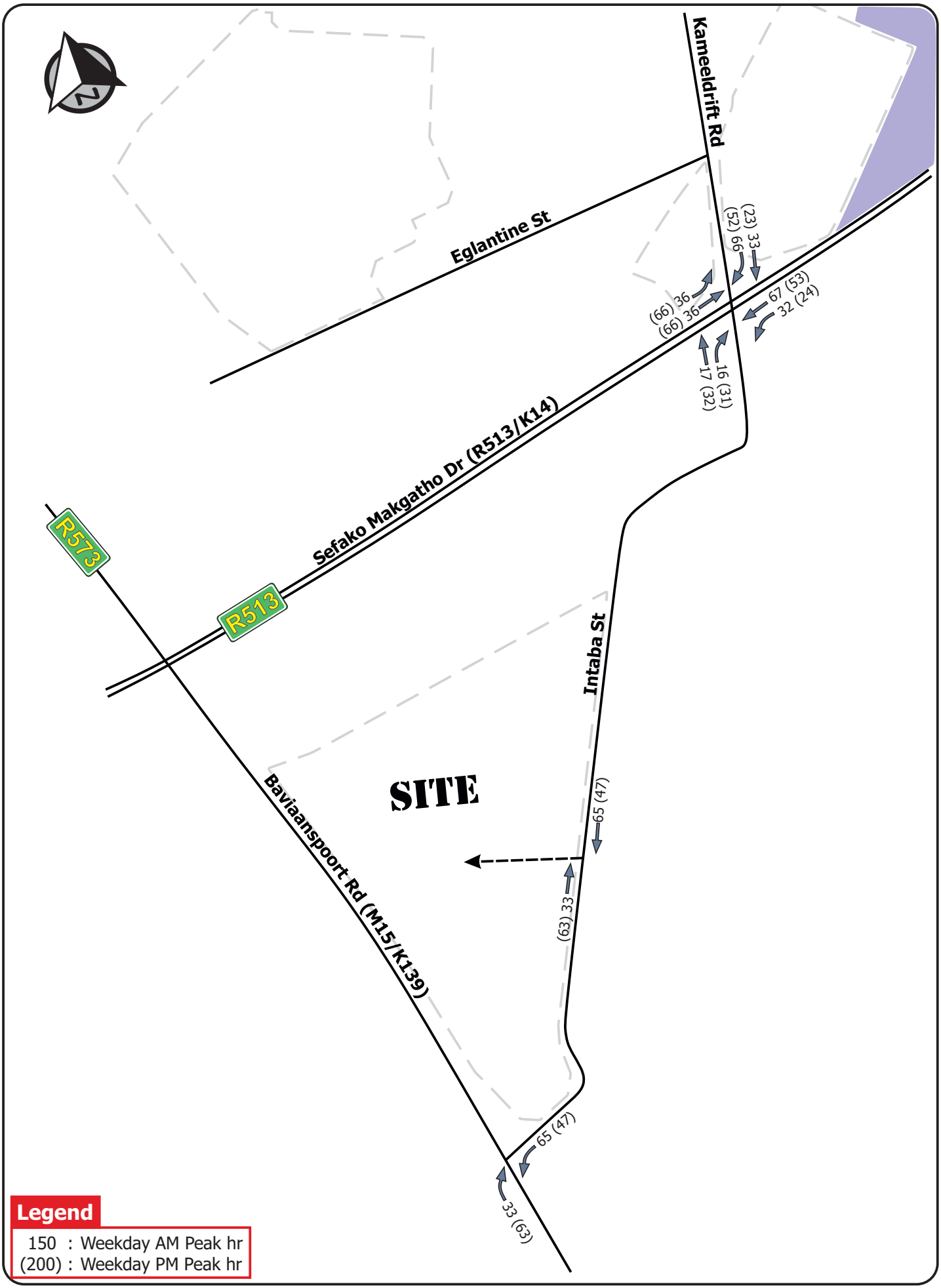
Project Name	Proj Ref.
Derdepoortpark Ext. 44	P0637
Description	Figure
Latent Rights Trips: Derdepoort Ext. 5	**6b**



Legend

150 : Weekday AM Peak hr
(200) : Weekday PM Peak hr

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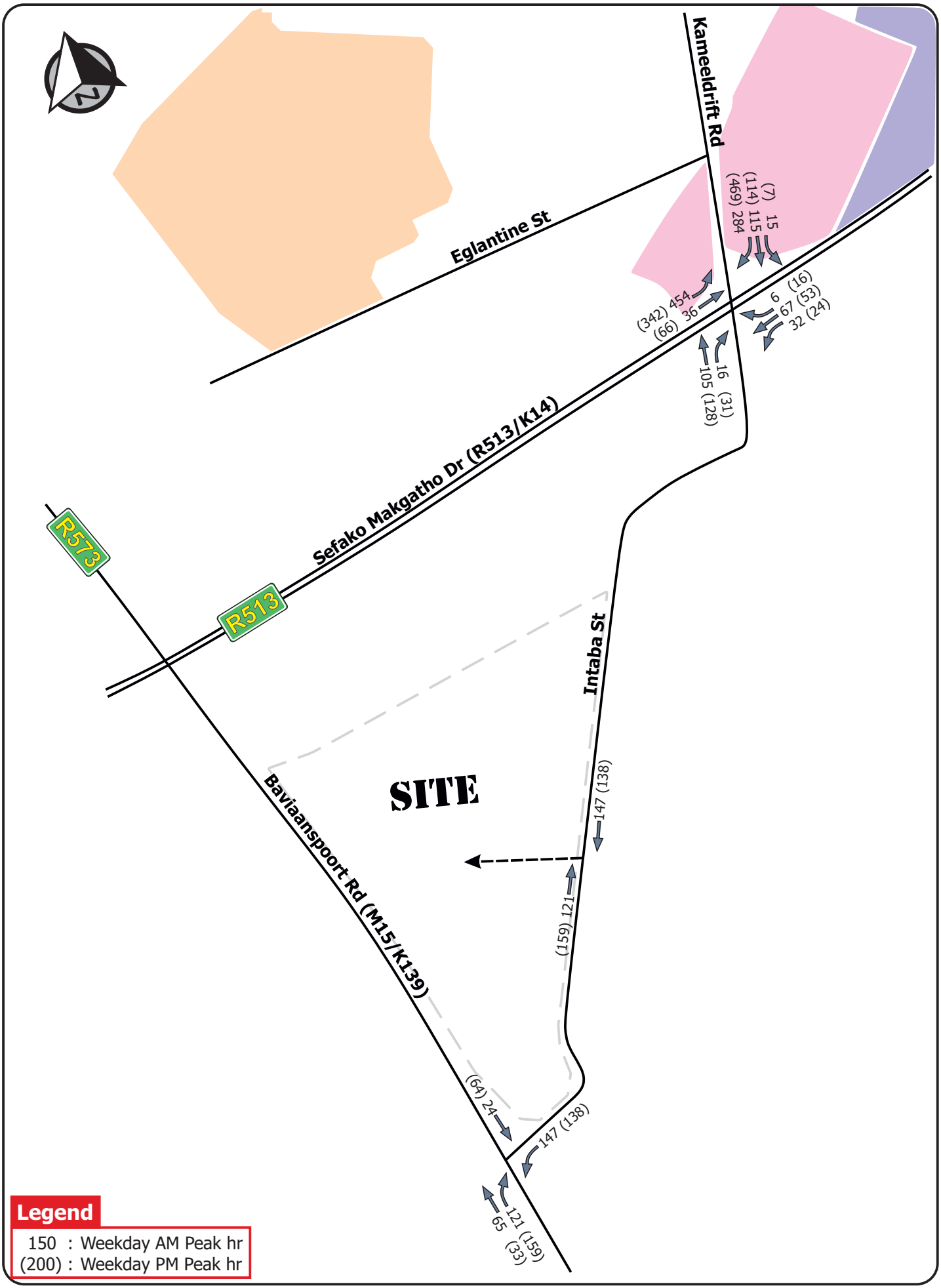
Project Name	Derdepoortpark Ext. 44	Proj Ref. P0637
Description	**Latent Rights Trips: Derdepoortpark Ext. 10**	Figure **6c**



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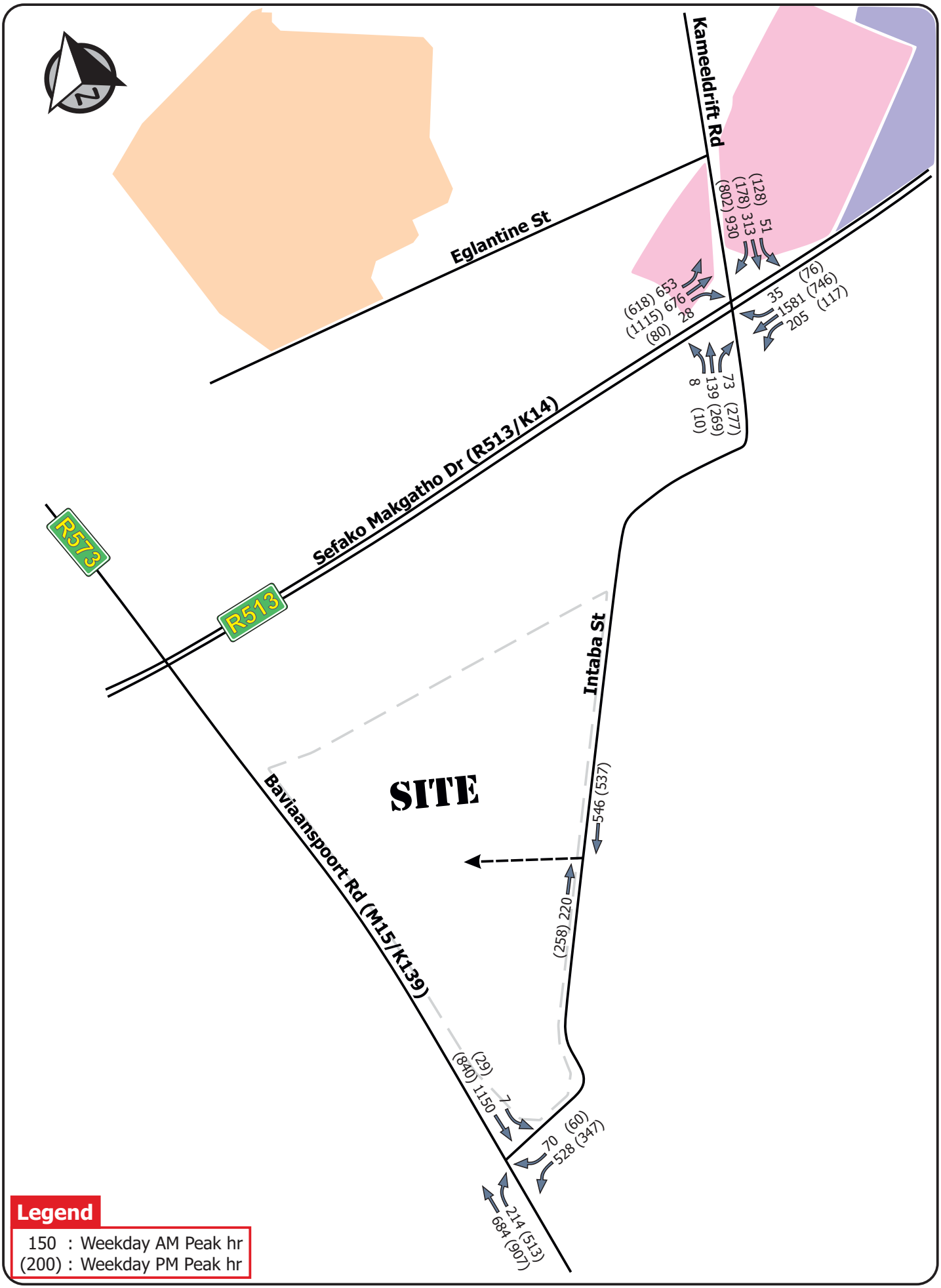
Project Name	Derdepoortpark Ext. 44	Proj Ref. P0637
Description	**Total Latent Rights Trips**	Figure **7**



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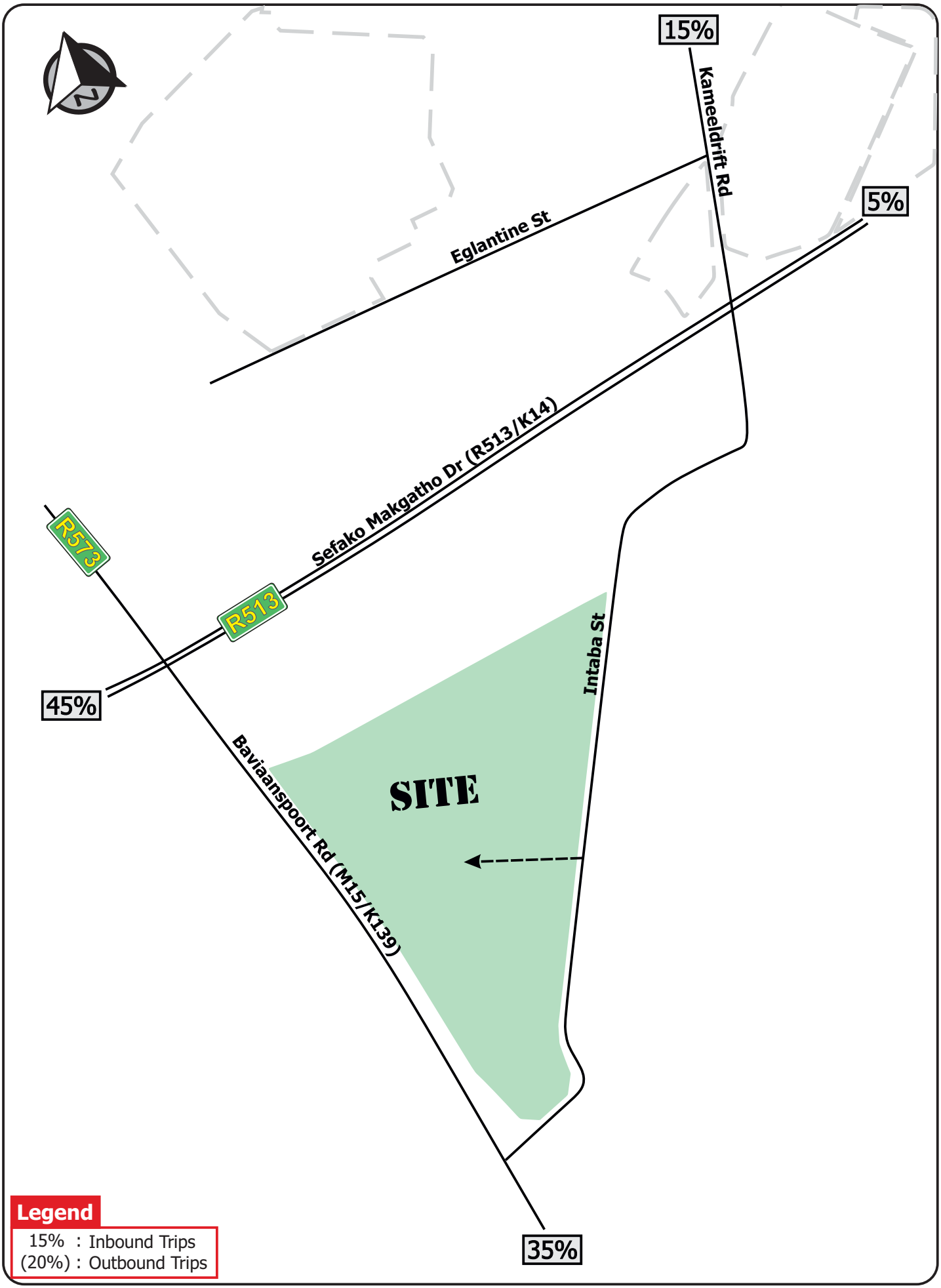
Project Name	Proj Ref.
Derdepoortpark Ext. 44	P0637
Description: **Future 2027 Base Peak Hour Traffic Volumes + Total Latent Rights Trips**	Figure: **8**



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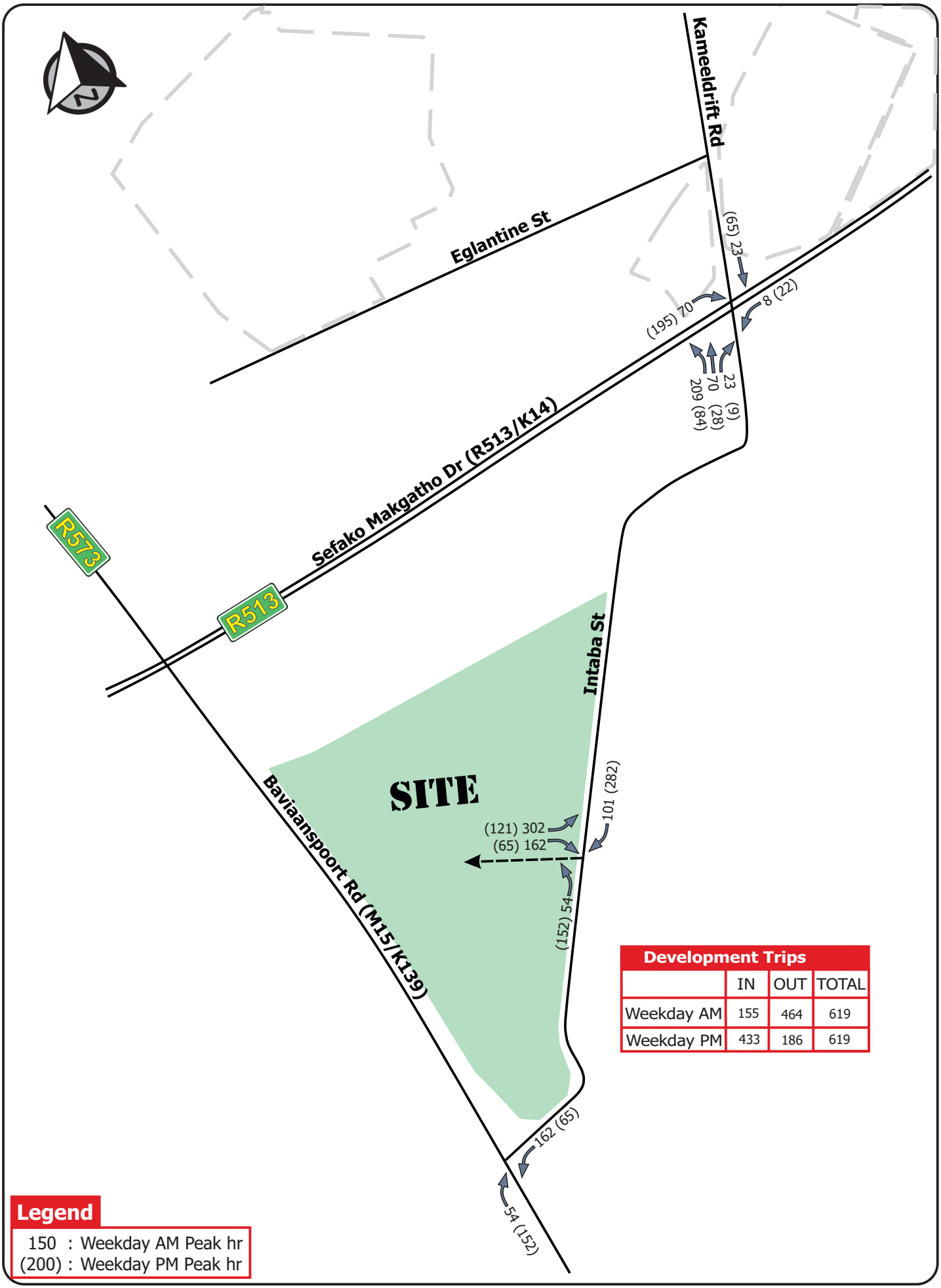
Project Name	Derdepoortpark Ext. 44	Proj Ref. P0637
Description	**Expected Development Trip Distribution**	Figure **9**



Development Trips			
	IN	OUT	TOTAL
Weekday AM	155	464	619
Weekday PM	433	186	619

Legend

150 : Weekday AM Peak hr
(200) : Weekday PM Peak hr

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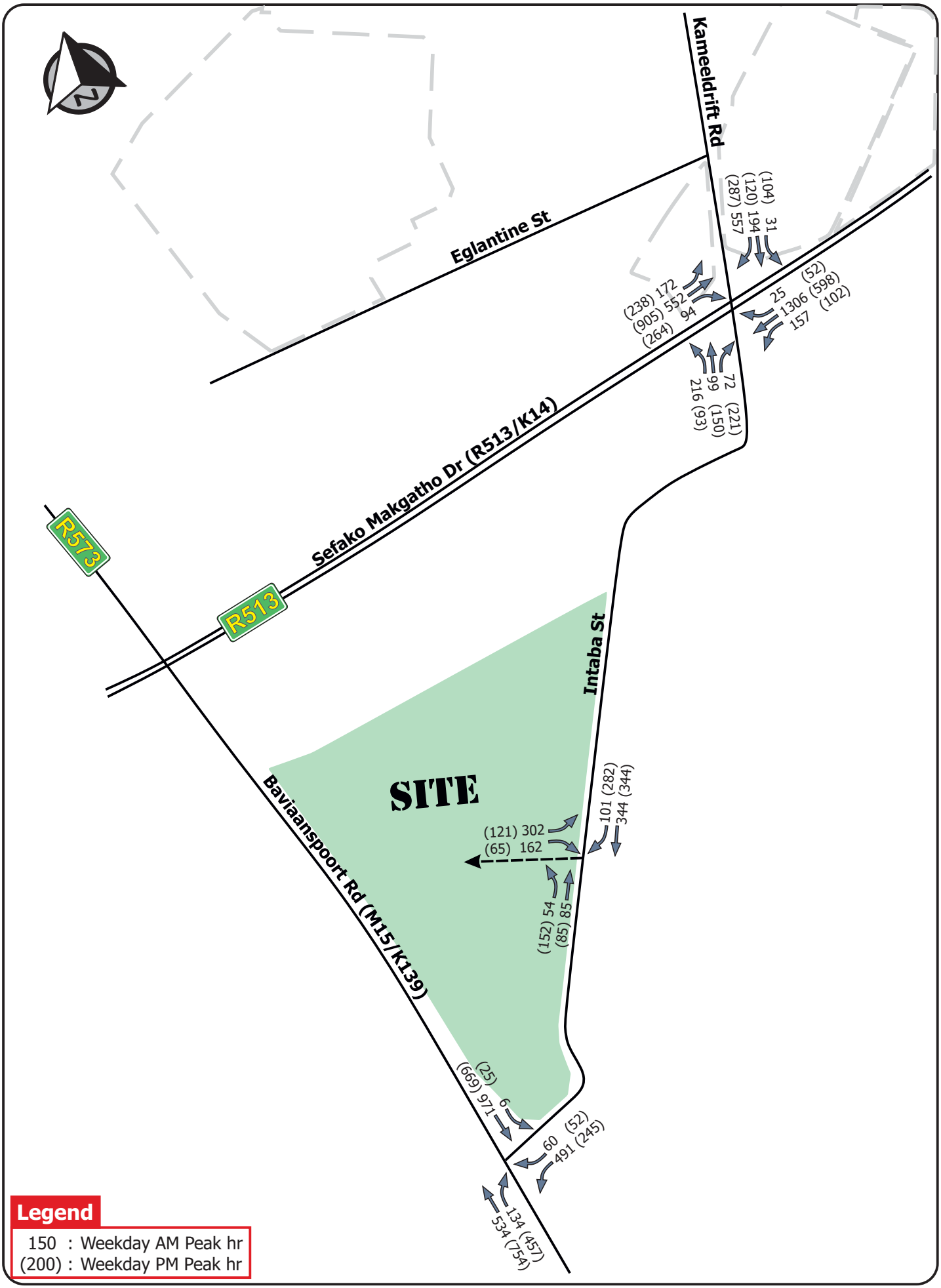
Project Name	Derdepoortpark Ext. 44	Proj Ref. P0637
Description	**Estimated Development Trips**	Figure **10**



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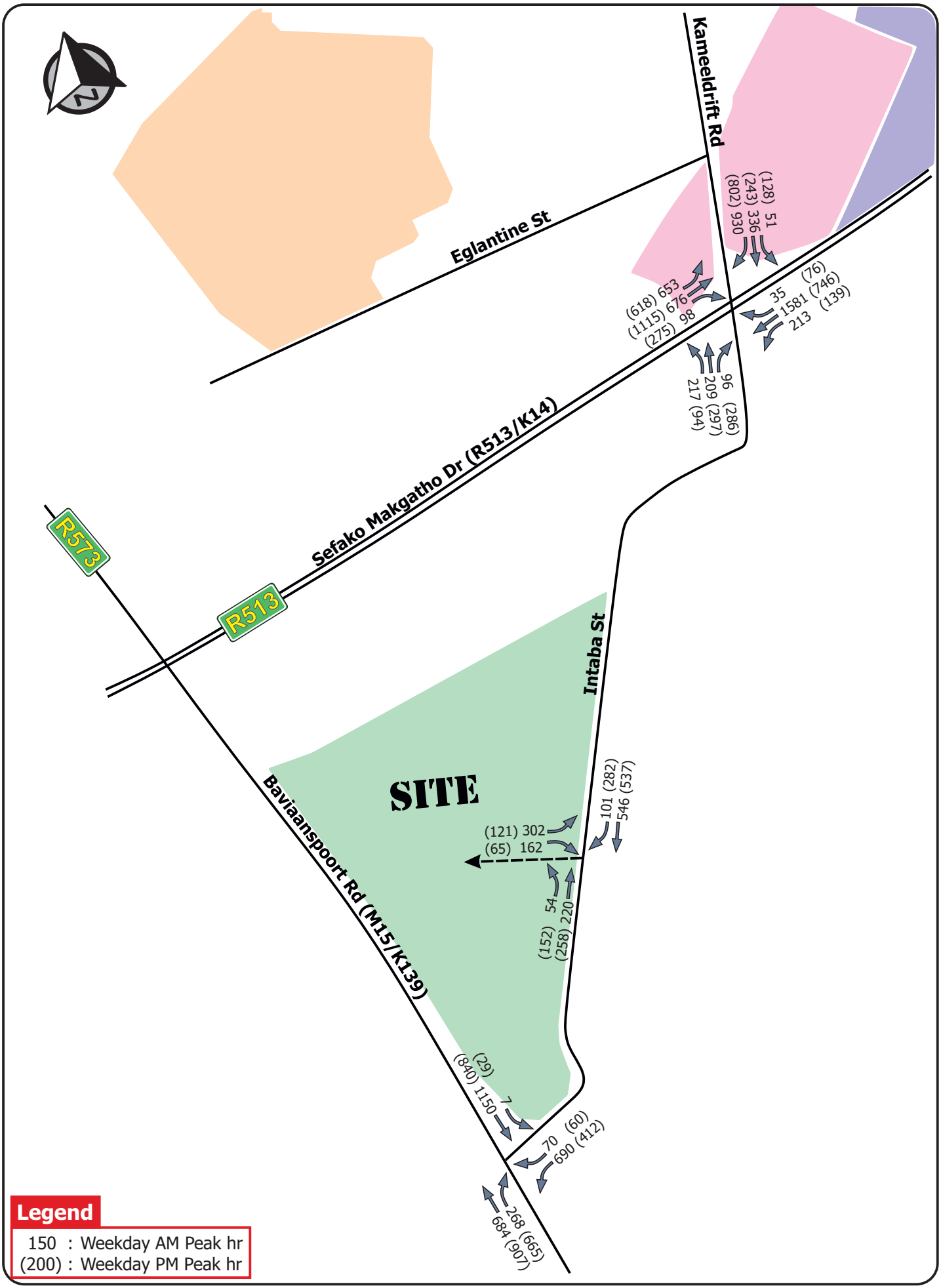
Project Name	Proj Ref.
Derdepoortpark Ext. 44	P0637
Description: **Existing 2022 Peak Hour Traffic Volumes + Estimated Development Trips**	Figure: **11**



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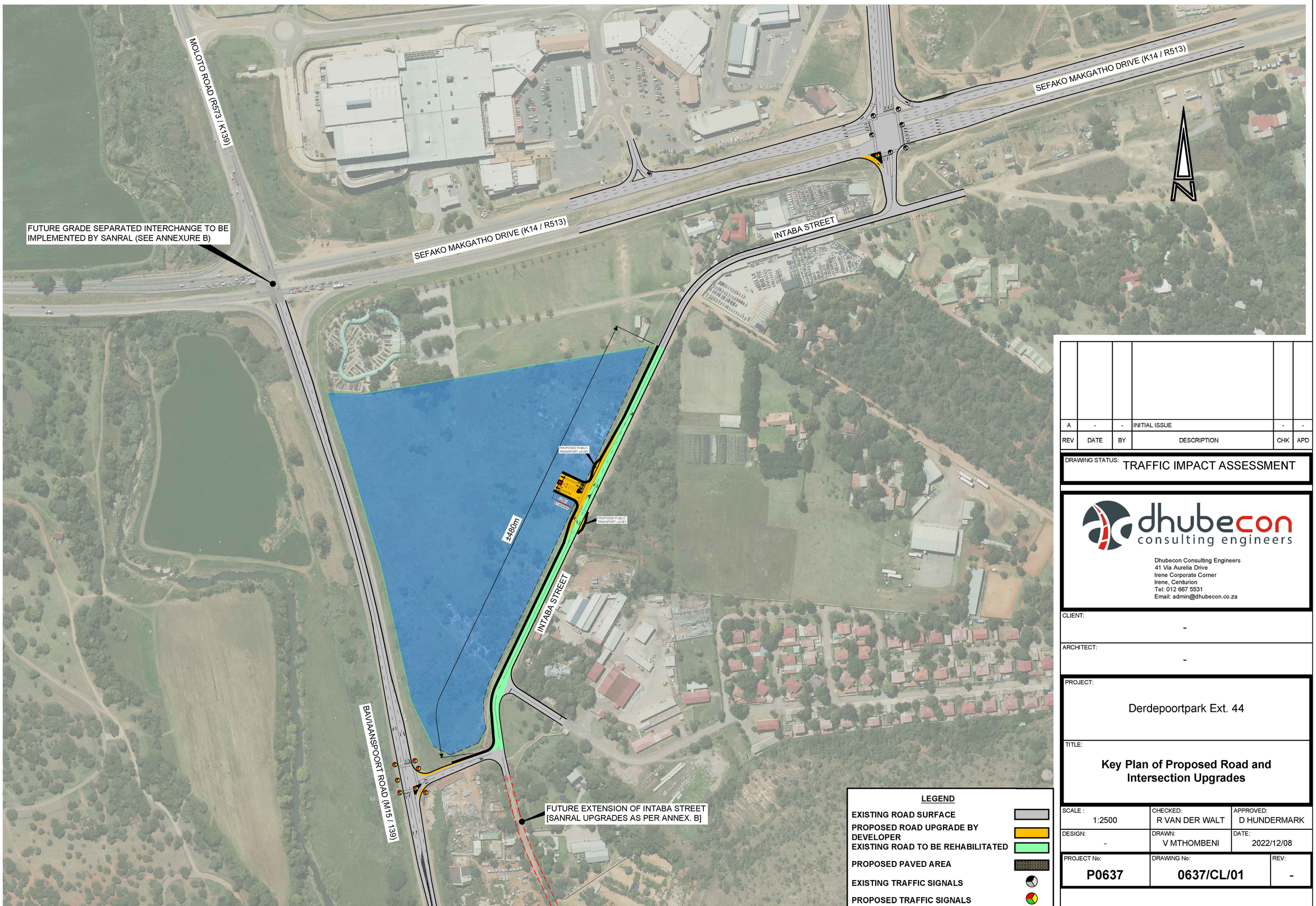
Project Name	Proj Ref.
Derdepoortpark Ext. 44	P0637
Description	**Figure**
Future 2027 Base Peak Hour Traffic Volumes + Total Latent Rights Trips + Estimated Development Trips	**12**

Drawings

Drawing No. 0637/CL/01	Key Plan of Proposed Road & Intersection Upgrades
Drawing No. 0637/CL/02a	Proposed Site Access Arrangement [Option 1: Butterfly Intersection]
Drawing No. 0637/CL/02b	Proposed Site Access Arrangement [Option 2: Traffic Circle]
Drawing No. 0637/CL/03	Proposed Road & Intersection Upgrade: Sefako Makgatho Drive (R513) & Intaba Street & Kameeldrift Road
Drawing No. 0637/CL/04	Proposed Road & Intersection Upgrade: Baviaanspoort Road (M15) & Intaba Street



REV	DATE	BY	DESCRIPTION	CHK	APD
A	-	-	INITIAL ISSUE	-	-

DRAWING STATUS: TRAFFIC IMPACT ASSESSMENT

dhubecon consulting engineers

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Email: admin@dhubecon.co.za

CLIENT: -

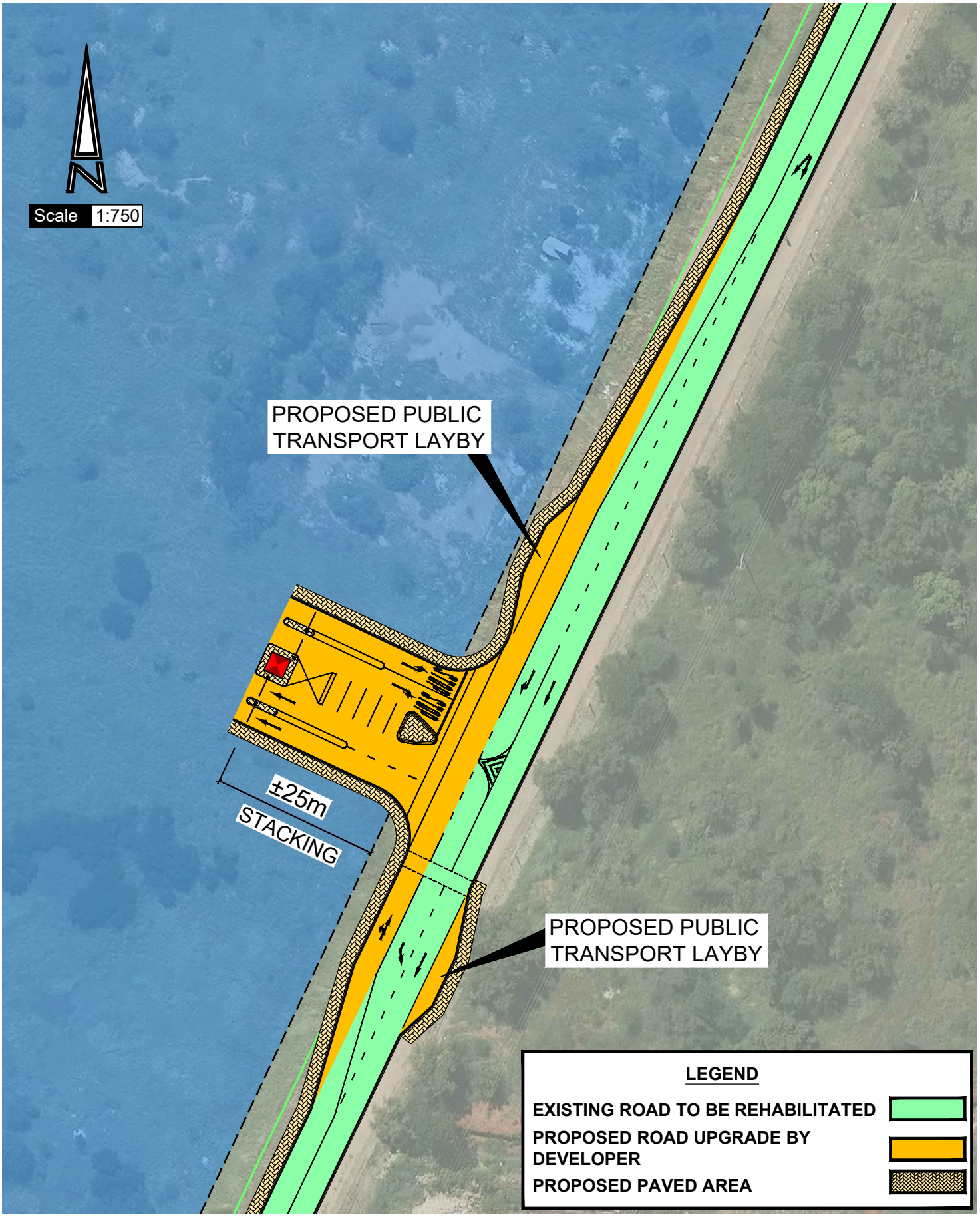
ARCHITECT: -

PROJECT: Derdepoortpark Ext. 44

TITLE: **Key Plan of Proposed Road and Intersection Upgrades**

SCALE :	CHECKED:	APPROVED:
1:2500	R VAN DER WALT	D HUNDERMARK
DESIGN:	DRAWN:	DATE:
-	V MTHOMBENI	2022/12/08

PROJECT No:	DRAWING No:	REV:
P0637	0637/CL/01	-



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PROJECT: Derdepoortpark Ext. 44

TITLE: **Proposed Site Access Arrangement**

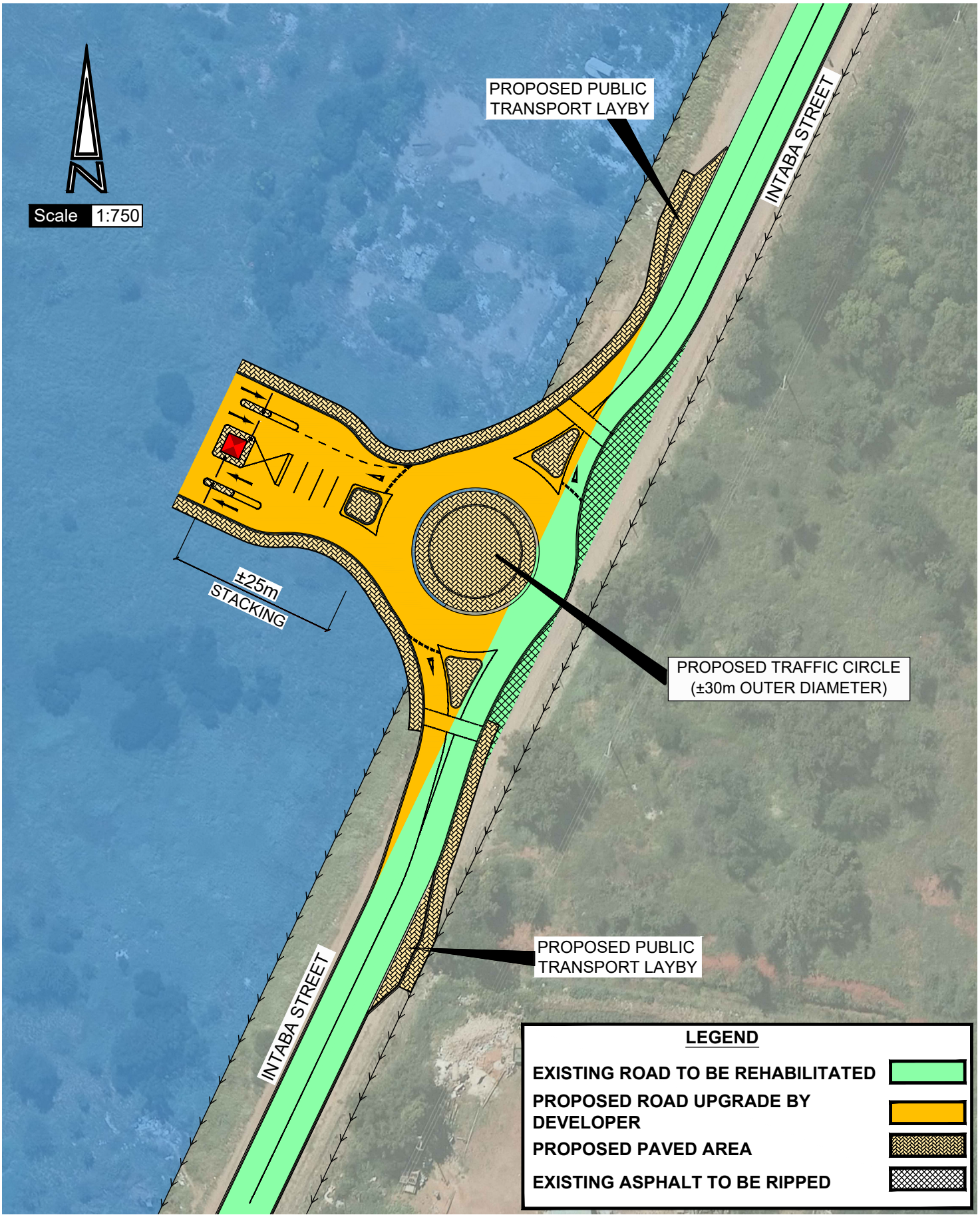
DRAWING STATUS: TRAFFIC IMPACT ASSESSMENT

DRAWING No: **0637/CL/02a**

PROJECT No: **P0637**

DATE: 2022/12/08

REV: -



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PROJECT: Derdepoortpark Ext. 44

TITLE: **Proposed Site Access Arrangement**

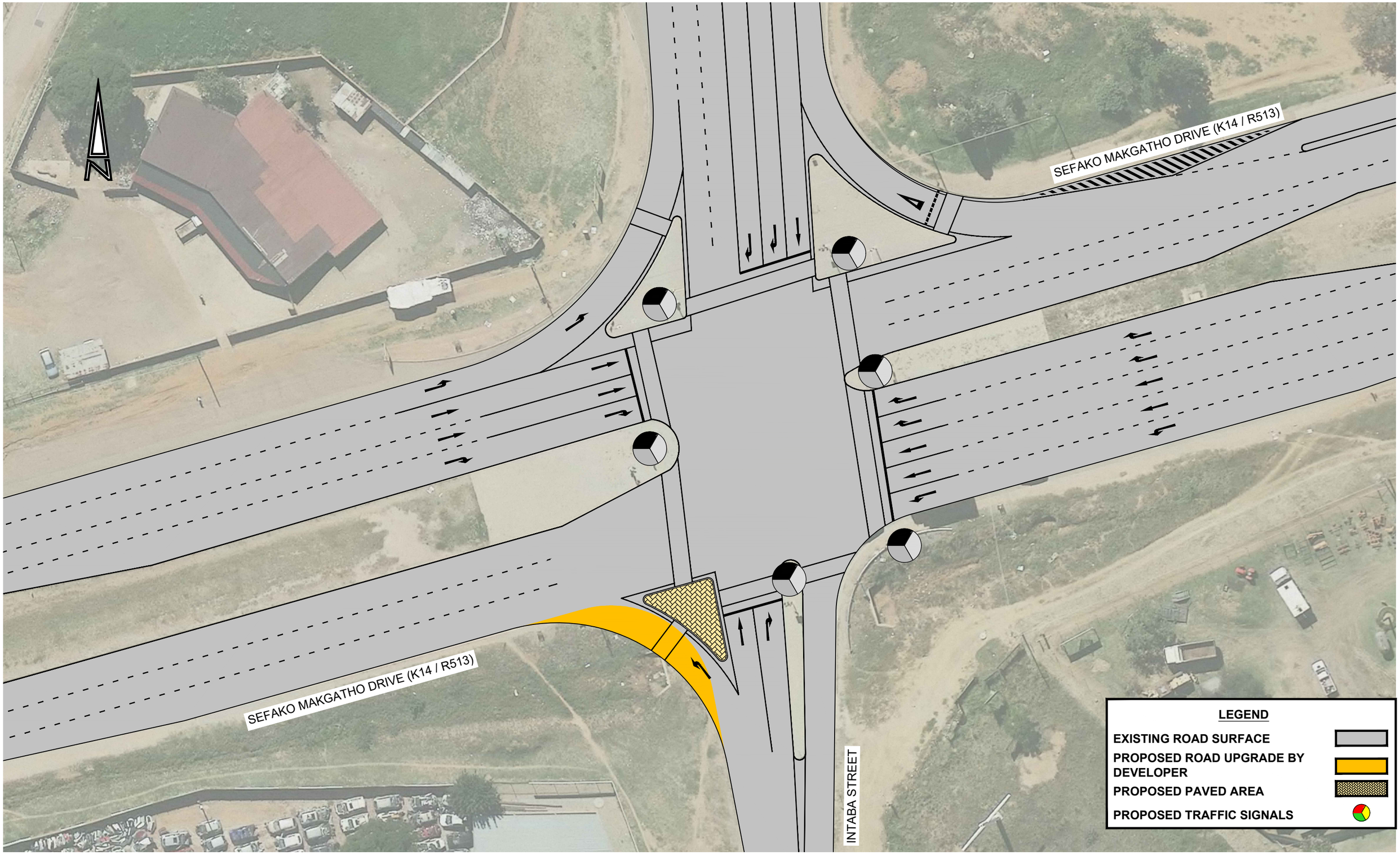
DRAWING STATUS: TRAFFIC IMPACT ASSESSMENT

DRAWING No: **0637/CL/02b**

PROJECT No: **P0637**

DATE: 2022/12/09

REV: -



REV	DATE	BY	DESCRIPTION	CHK	APD
A	-	-	INITIAL ISSUE	-	-

DRAWING STATUS: TRAFFIC IMPACT ASSESSMENT

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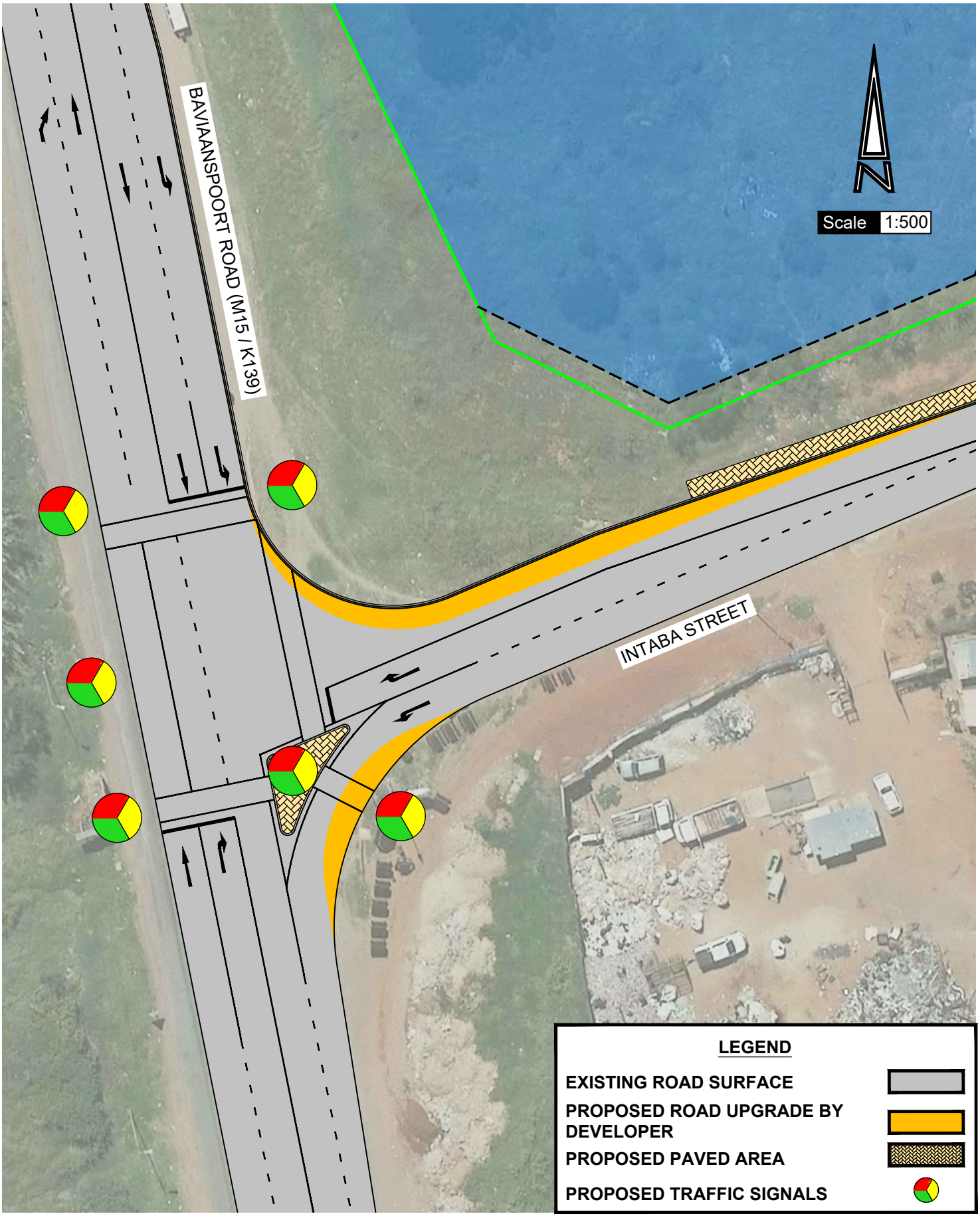
PROJECT: Derdepoortpark Ext. 44

TITLE: **Proposed Road & Intersection Upgrade:** Sefako Makgatho Drive (R513) & Intaba Street & Kameeldrift Road

SCALE :	CHECKED:	APPROVED:
1:500	R VAN DER WALT	D HUNDERMARK
DESIGN:	DRAWN:	DATE:
-	V MTHOMBENI	2022/11/10

PROJECT No:	DRAWING No:	REV:
P0637	0637/CL/03	-



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PROJECT: Derdepoortpark Ext. 44

TITLE: **Proposed Road & Intersection Upgrade:** Baviaanspoort Road (M15) & Intaba Street

DRAWING STATUS: TRAFFIC IMPACT ASSESSMENT

DRAWING No: **0637/CL/04**

PROJECT No: **P0637**

DATE: 2022/11/08

REV: -

Annexures

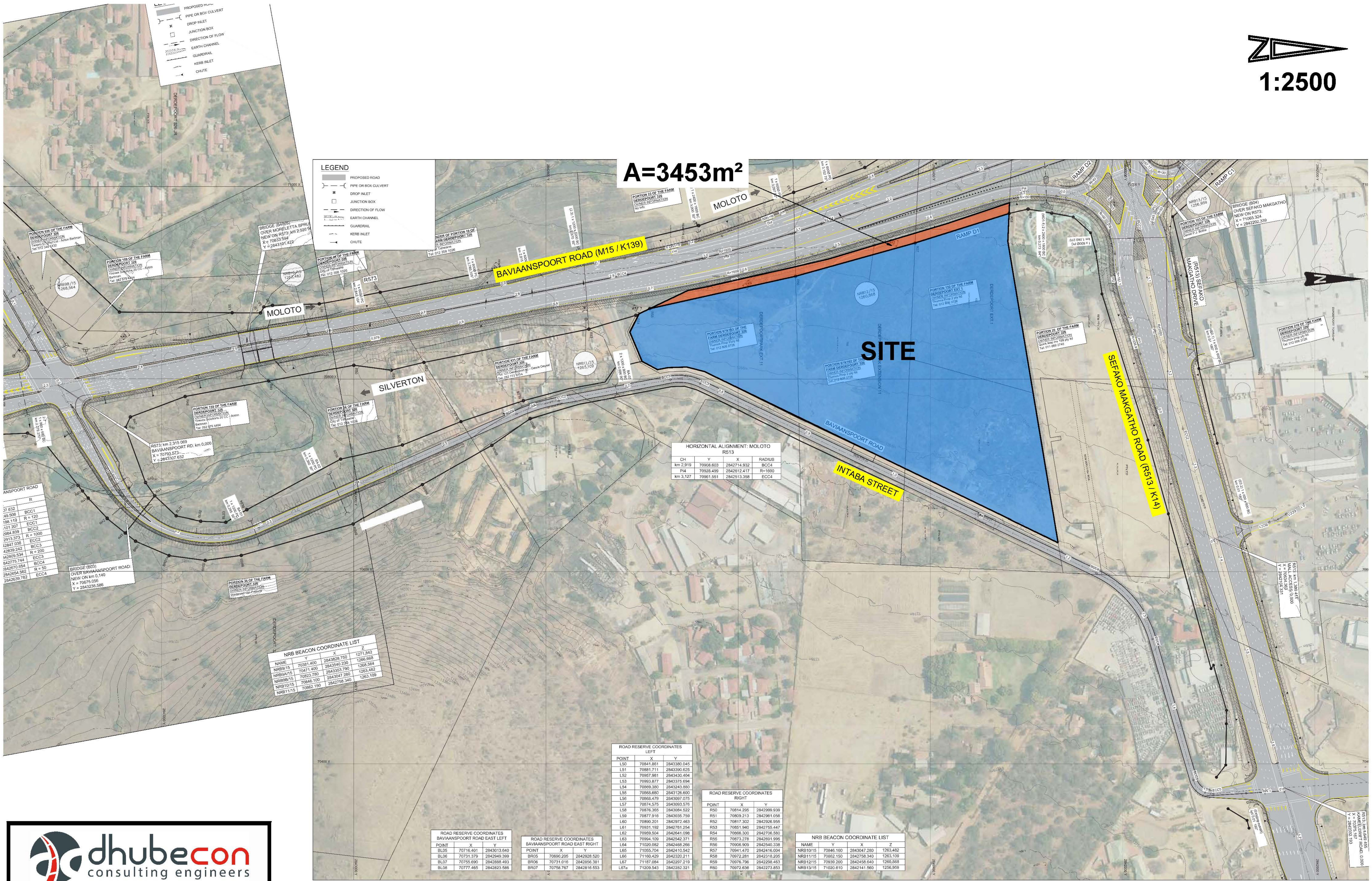
Annexure A	Town Planner's Proposed Township Layout Plan
Annexure B	Key Plan of Future SANRAL Road & Intersection Upgrades
Annexure C	Relevant Outputs of the PTV Vistro 2022 Intersection Capacity Analyses

Annexure A

Town Planner's Proposed Township Layout Plan

Annexure B

Key Plan of Future SANRAL Road & Intersection Upgrades



HORIZONTAL ALIGNMENT: MOLOTO R513			
CH	Y	X	RADIUS
km 2,919	70908.603	2842714.932	BCC4
PI4	70928.499	2842612.417	R=1600
km 3,127	70961.551	2842513.358	ECC4

NRB BEACON COORDINATE LIST			
NAME	Y	X	Z
NRB9/15	70381.400	2843828.750	1271,842
NRB9A/15	70471.400	2843540.230	1266,668
NRB9B/15	70823.780	2843353.790	1268,564
NRB10/15	70846.100	2843047.280	1263,482
NRB11/15	70862.150	2842758.340	1263,109

ROAD RESERVE COORDINATES BAVIAANSPOORT ROAD EAST LEFT		
POINT	X	Y
BL05	70716.401	2843013.640
BL06	70731.379	2842949.399
BL07	70755.690	2842888.493
BL08	70777.465	2842823.586

ROAD RESERVE COORDINATES BAVIAANSPOORT ROAD EAST RIGHT		
POINT	X	Y
BR05	70690.205	2842928.520
BR06	70731.016	2842856.381
BR07	70758.767	2842816.553

ROAD RESERVE COORDINATES LEFT		
POINT	X	Y
L50	70841.861	2843380.045
L51	70881.711	2843390.625
L52	70957.981	2843430.404
L53	70993.877	2843375.694
L54	70869.380	2843243.880
L55	70868.660	2843126.600
L56	70868.479	2843097.075
L57	70874.575	2843093.576
L58	70876.365	2843084.522
L59	70877.916	2843035.759
L60	70890.201	2842972.463
L61	70931.192	2842761.254
L62	70959.504	2842641.098
L63	70994.109	2842542.371
L64	71020.082	2842468.266
L65	71055.704	2842410.542
L66	71160.429	2842320.211
L67	71187.084	2842297.219
L67a	71209.543	2842282.321

ROAD RESERVE COORDINATES RIGHT		
POINT	X	Y
R50	70814.295	2842999.939
R51	70809.213	2842961.056
R52	70817.302	2842926.955
R53	70851.940	2842755.447
R54	70866.300	2842706.580
R55	70873.278	2842691.995
R56	70906.909	2842540.338
R57	70941.470	2842416.004
R58	70972.281	2842318.205
R59	70976.796	2842298.463
R60	70972.636	2842273.853

NRB BEACON COORDINATE LIST			
NAME	Y	X	Z
NRB10/15	70846.100	2843047.280	1263,482
NRB11/15	70862.150	2842758.340	1263,109
NRB12/15	70939.200	2842458.640	1260,868
NRB13/15	71020.610	2842141.560	1256,959

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Annexure C

Relevant Outputs of the PTV Vistro 2022 Intersection Capacity Analyses