# TRAFFIC IMPACT ASSESSMENT

AUGUST 2023

# ERF 1466, FRANSCHHOEK
# "FRANSCHHOEK SKYTRAM"

**PREPARED FOR:**

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Detail Trip Generation Calculations

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Detail SIDRA Analysis Output

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Proposed Site Layout Plans

# APPENDIX E

Detail Parking Demand Calculations

# 1. INTRODUCTION

*EFG Engineers (Pty) Ltd* was appointed to prepare a Traffic Impact Assessment for the proposed Franschhoek cableway project. The cableway will be known as *Franschhoek Skytram*.

The cableway will be a tourist attraction proposed to operate from Erf 1466, Franschhoek i.e., *Haute Cabrière*, along the R45 (MR191, km26.61). The cableway is to be constructed from Erf 1466 to a point near the peak of Middagkrans Mountain in Franschhoek. The cableway route to be followed will be in a south-easterly direction to the top of Franschhoek Mountain situated above the Franschhoek Pass. Other affected properties are Erf 1467 and Remainder Erf 23, Franschhoek.

**Figure 1.1** shows a locality plan for *Haute Cabrière* that also shows the urban edge of Franschhoek.

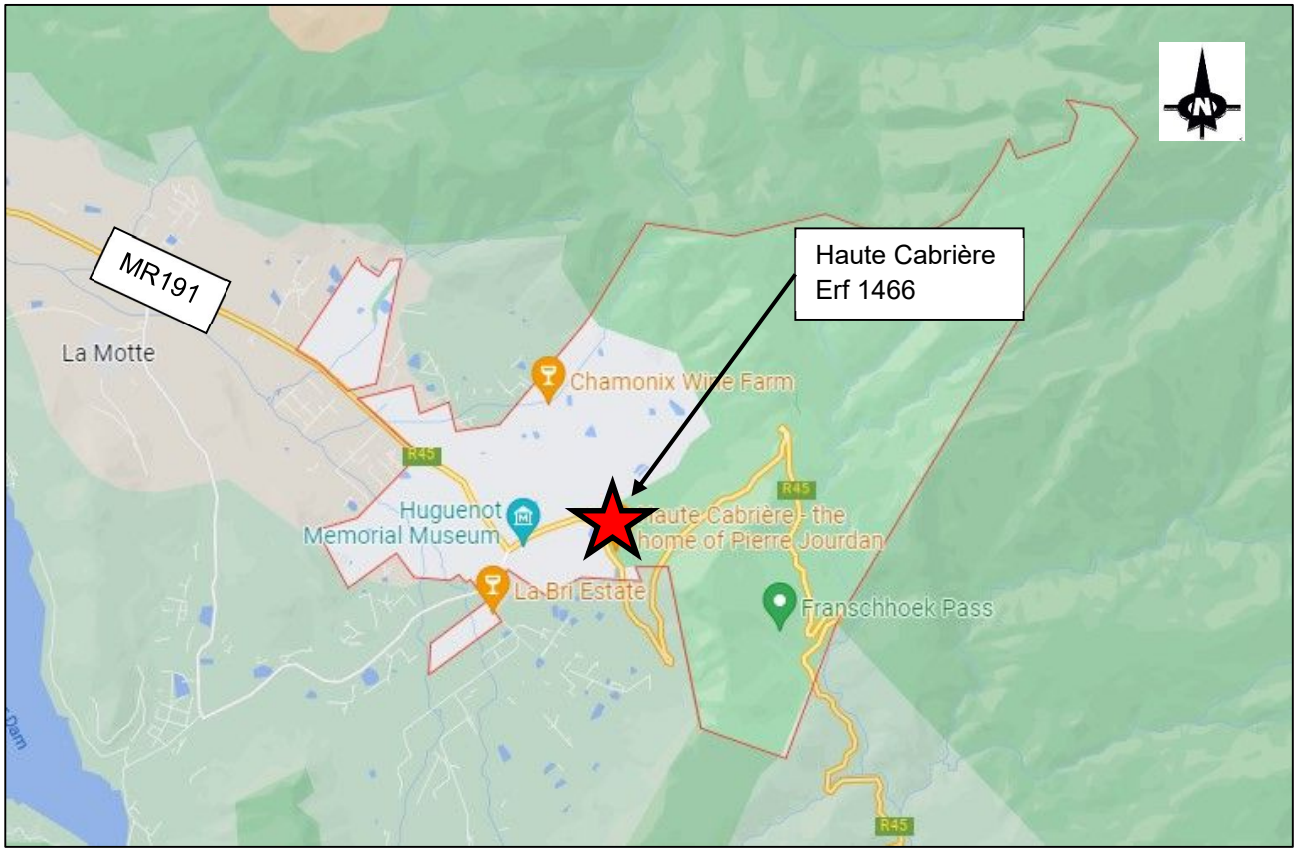



**Figure 1.1: Locality Plan – Erf 1466, Franschhoek**

The RCAM classification of MR191 (according to the WCG RNIS) is given in **Table 1.1**.

**Table 1.1: RCAM Classification of MR191**

| Start km | End km | RCAM Class |
|---|---|---|
| 0.00 | 21.88 | R2a |
| 21.88 | 22.69 | U2a |
| 22.69 | 23.71 | R2a |
| 23.71 | 26.02 | U2a |
| 26.02 | 49.87 | R3a |

## 2. LAND USE

Erf 1466 is zoned as Agricultural land (Stellenbosch Municipality Zoning Scheme). Existing land uses include a wine cellar, wine tasting facilities and restaurant. The site forms part of the Mont Rochelle Nature Reserve.

The proposed development elements include the construction of a Lower Station and minor amenities at *Haute Cabrière*.

The Top Station is planned for the Middagkrans Mountain and will include walkways, viewing platforms, wine tasting, commercial, restaurant and restroom facilities. Site Development Plans are included in **Appendix D**.

An area breakdown of the proposed land use components at the Lower and Top Stations are given in **Table 2.1 and Table 2.2** for which rights are now being applied. The components that would typically contribute to GLA is highlighted in yellow.

**Table 2.1: Land Use Components - Existing Facilities & Lower Station**

| Land Use Component | Lower Station (footprint m²) | Assumed 85% m² GLA (minimum) |
|---|---|---|
| **Existing Pavillion Restaurant & Wine Tasting (*the wine cellars will have a low parking rate*)** | **236** | **201** |
| **Existing Underground Barrel Maturation Cellar and Conference Area** | **1660** | **1411** |
| Existing Guard House | 6 | - |
| Existing Grape Reception Area | 134 | - |
| **Total - Existing Facilities** | **2036** | **1612** |
| **Reception and upstairs office (excl. balcony) (38m²+182m²-22m²)** | **198** | **168** |
| **Ticket office** | **38** | **32** |
| **Café / Coffee shop** | **114** | **97** |
| **Outdoor concrete seating area** | **65** | **55** |
| Walkway Link | 307 | - |
| Lower station platform extent by GAG (overlaps with Lower station machine room below of 334m²) | 395 | - |
| Parking structure forecourt | 1810 | - |
| Parking structure (Level P1 incl. ramp) (overlaps with the generator, wine dispatch, stores and lockers = 182m²) | 1713 | - |
| Ablutions | 114 | - |
| **Total – Lower Station** | **4754** | **352** |

Based on **Table 2.1**, the additional GLA after constructing the components for the Lower Station as highlighted in yellow will typically range from ±350m² to ±450m² GLA (assuming that the GLA ranges from 85% to 100% of the footprint area).

**Table 2.2: Land Use Components - Top Station**

| Land Use Component | Top Station (footprint m²) | Assumed 85% m² GLA (minimum) |
|---|---|---|
| **Curio / Souvenir shop** | **61** | **52** |
| **Adventure centre / Kiosk** | **50** | **43** |
| **Enviro & Heritage centre** | **104** | **88** |
| **Franschhoek Vignerons wine bar** | **152** | **129** |
| **Café (restaurant) incl. BOH** | **233** | **198** |
| **Fine dining restaurant incl. BOH** | **328** | **279** |
| Top station platform (overlaps with WC's & dry store = 55m², Pergola with poly carb = 136m², control room-GAG = 40m², Souvenir shop = 61m²) | 493 | - |
| Timber decking | 2372 | - |
| Yard area | 30 | - |
| Ablutions | 46 | - |
| Walkway / paths (613m long @ 1.5m wide) | 920 | - |
| **Total – Top Station Footprint (excl. Curio / Souvenir shop overlapping with the top station platform)** | **4728** | **789** |

Based on **Table 2.2**, the additional GLA after constructing the components for the Top Station as highlighted in yellow will typically range from ±800m² to ±950m² GLA (assuming that the GLA ranges from 85% to 100% of the footprint area).

The total new GLA for the Lower and Top Stations is therefore between ±1150m² - ±1350m².

# 3. EXISTING TRAFFIC

## 3.1 Annual Traffic Distribution (Daily Volumes)

EStation (Station 5013, Franschhoek) traffic data was obtained from the WCG for the period January 2017 to February 2022. The EStation is located at km 16.86 along MR191. At the time of this report the dataset for March 2022 to July 2022 was not yet available.

**Figure 3.1** shows the annual traffic distribution (daily volumes) for the years 2017, 2018 and 2019 (pre-Covid19 traffic conditions) based on the data from EStation 5013. No differentiation was done between weekday and weekend traffic i.e., all daily volumes are shown.

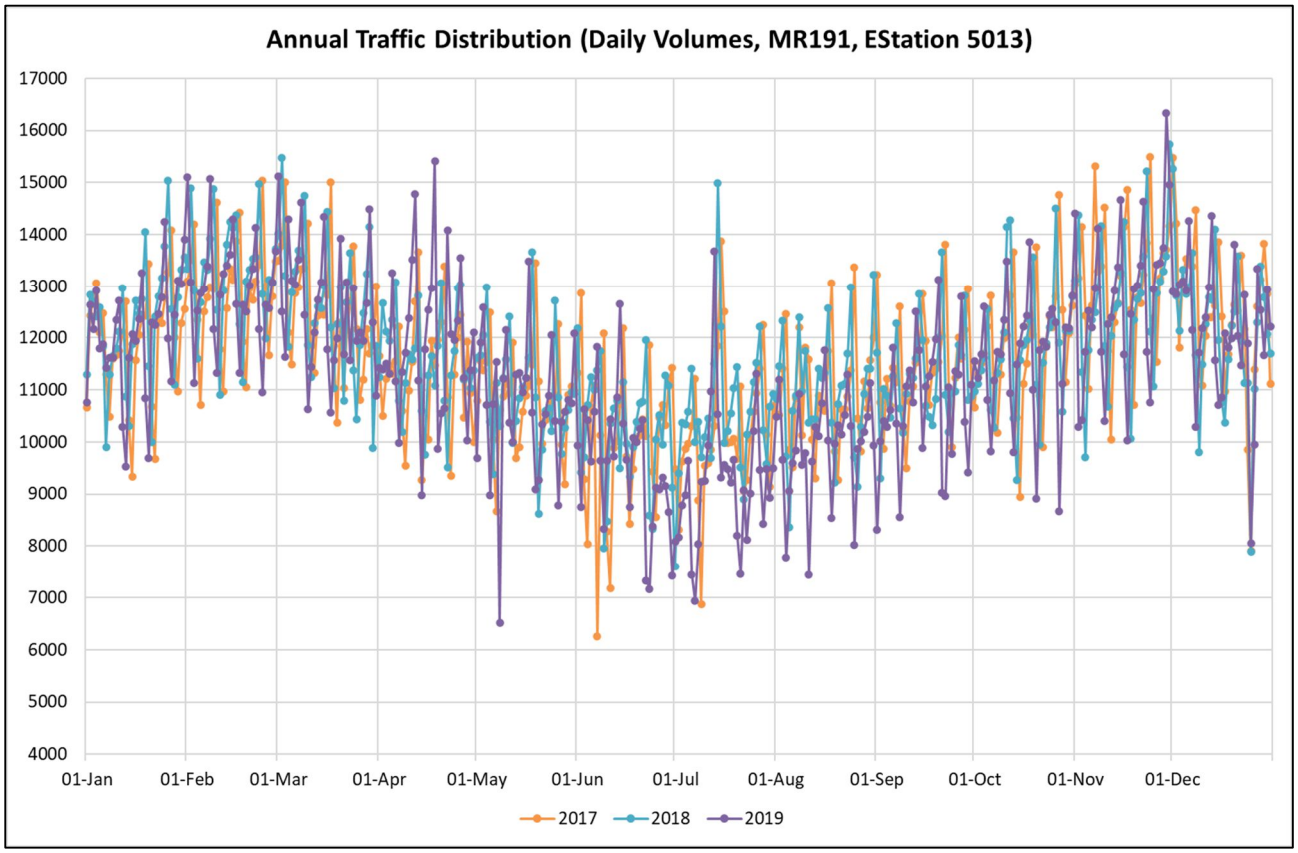



**Figure 3.1: Annual Traffic Distribution (Daily Volumes, MR191, EStation 5013, Jan 2017-Dec 2019)**

**Figure 3.1** shows that the background traffic growth was insignificant between 2017-2019 leading up to Covid19. However, a conservative background traffic growth of 2% per annum will be assumed for any escalation calculations that are to follow elsewhere in the report. Peak traffic periods during a typical year can be observed during February/March and November/December.

**Figure 3.2** compares the annual traffic distribution (daily volumes) of the 2019 pre-Covid19 data to the available EStation data for 2020, 2021 and 2022 to evaluate the impact of the Covid19 Pandemic. Based on this information and the daily traffic volumes observed for 2022 the traffic has recovered and compares well with 2019 pre-Covid19 data.

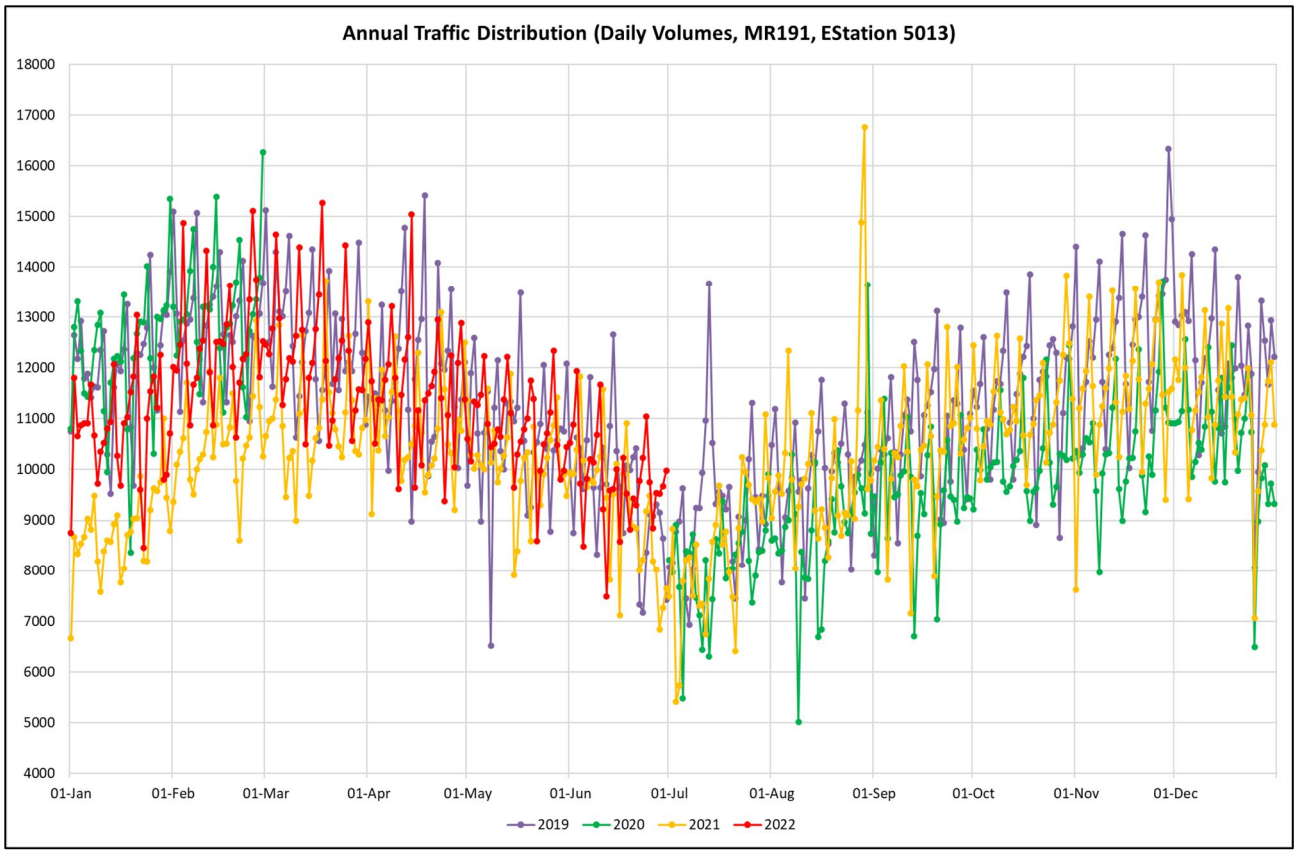



**Figure 3.2: Annual Traffic Distribution (Daily Volumes, MR191, EStation 5013, Jan 2019-Jun 2022)**

## 3.2 Traffic Survey (March 2022)

*Haute Cabrière* is located within the urban edge of Franschhoek (see **Figure 1.1**). However, the town of Franschhoek attracts a significant number of tourists and weekend traffic. It is therefore necessary to also consider the traffic patterns as observed over a weekend / long weekend / holiday period that includes influence days in addition to traffic observed on normal days.

Updated traffic counts were conducted at selected key intersections on 18 March 2022 (Friday), 19 March 2022 (Saturday) and 20 March 2022 (Sunday).

Human Rights Day (public holiday) was on Monday, 21 March 2022, which would imply that the selected days for the traffic counts were all *Influenced Days* (as per the table in Appendix B of COTO TMH 3):

| Weekday of Public Holiday | Days influenced by Public Holidays | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Wed | Thu | Fri | Sat | Sun | Mon | Tue | Wed |
| Sunday | | | | | | | | |
| Monday | | | | | | | | |
| Tuesday | | | | | | | | |
| Wednesday | | | | | | | | |
| Thursday | | | | | | | | |
| Friday | | | | | | | | |
| Saturday | | | | | | | | |

Public Holiday Influenced Days

The survey periods are therefore deemed appropriate given that the proposed development is anticipated to typically generate most of its trips over holidays/long weekends.

The scope of the 2022 traffic survey is summarised in **Table 3.1**.

**Table 3.1: Scope of March 2022 Traffic Survey**

| No. | Locations to be Counted | Survey Periods | Type of Survey |
|---|---|---|---|
| 1 | R45 / Robertsvlei Rd<br>(Four-legged intersection) | Fri (06:00-18:00) (12 hours)<br>Sat Peak (10:00-15:00) (5 hours)<br>Sun Peak (10:00-15:00) (5 hours) | Full classified<br>All movements<br>(cars, trucks, taxis, buses) |
| 2 | R45 / Excelsior Rd<br>(Three-legged intersection) | Fri (06:00-18:00) (12 hours)<br>Sat Peak (10:00-15:00) (5 hours)<br>Sun Peak (10:00-15:00) (5 hours) | Full classified<br>All movements<br>(cars, trucks, taxis, buses) |
| 3 | Excelsior Rd / Robertsvlei Rd<br>(Three-legged intersection) | Fri (06:00-18:00) (12 hours)<br>Sat Peak (10:00-15:00) (5 hours)<br>Sun Peak (10:00-15:00) (5 hours) | Full classified<br>All movements<br>(cars, trucks, taxis, buses) |
| 4 | Lambrechts Rd / Haute Cabrière<br>(Four-legged intersection) | Fri (06:00-18:00) (12 hours)<br>Sat Peak (10:00-15:00) (5 hours)<br>Sun Peak (10:00-15:00) (5 hours) | Full classified<br>All movements<br>(cars, trucks, taxis, buses) |

**Figure 3.3**, **Figure 3.4** and **Figure 3.5** show the hourly two-way approach traffic volume distributions for the key intersections listed in **Table 3.1** and all days counted. The highest traffic volumes were observed during the Friday PM peak period. Midday peak traffic can be observed for the Saturday and Sunday.

As Monday, 21 March 2022, was Human Rights Day, the peak traffic observed on Friday, 18 March 2022, during the PM peak hour, would typically include travellers towards the Overberg for the long weekend and therefore the highest directional split would be expected in the Overberg direction on the Friday afternoon.

Although not surveyed, it is anticipated that the peak hourly traffic volume on Monday, 21 March 2022 (Human Rights Day), would be of a similar order, but would show a reversed directional split with most vehicles travelling back from Overberg at the end of the long weekend.

Based on the two-way traffic volume of ±1 300 vehicles along MR191 at the R45 / Robertsvlei intersection between 16:00 and 17:00 on the Friday, the directional split was observed as ±60% travelling through Franschhoek towards the Overberg and ±40% in the opposite direction.

Considering historic traffic data from Estation 5013 for the long weekend of 19-22 April 2019 (Easter weekend), a similar travel pattern was observed. Friday, 19 April 2019 was Good Friday, hence, the Influence Day to compare data with is Thursday, 18 April 2019. A two-way volume of just under 1 500 vehicles was observed at Estation 5013 on the Thursday along MR191 with a directional split of ±57% towards the Overberg via Franschhoek and ±43% in the opposite direction.

The traffic on Monday, 22 April 2019 (Family Day) at Estation 5013 showed a similar two-way volume with a similar directional split, but only reversed with the higher proportion travelling away from Franschhoek at the end of the long weekend.

The traffic data as observed during the 2022 survey is acceptable for analysis purposes as travel patterns and traffic volumes correspond well with historic pre-Covid19 traffic data.

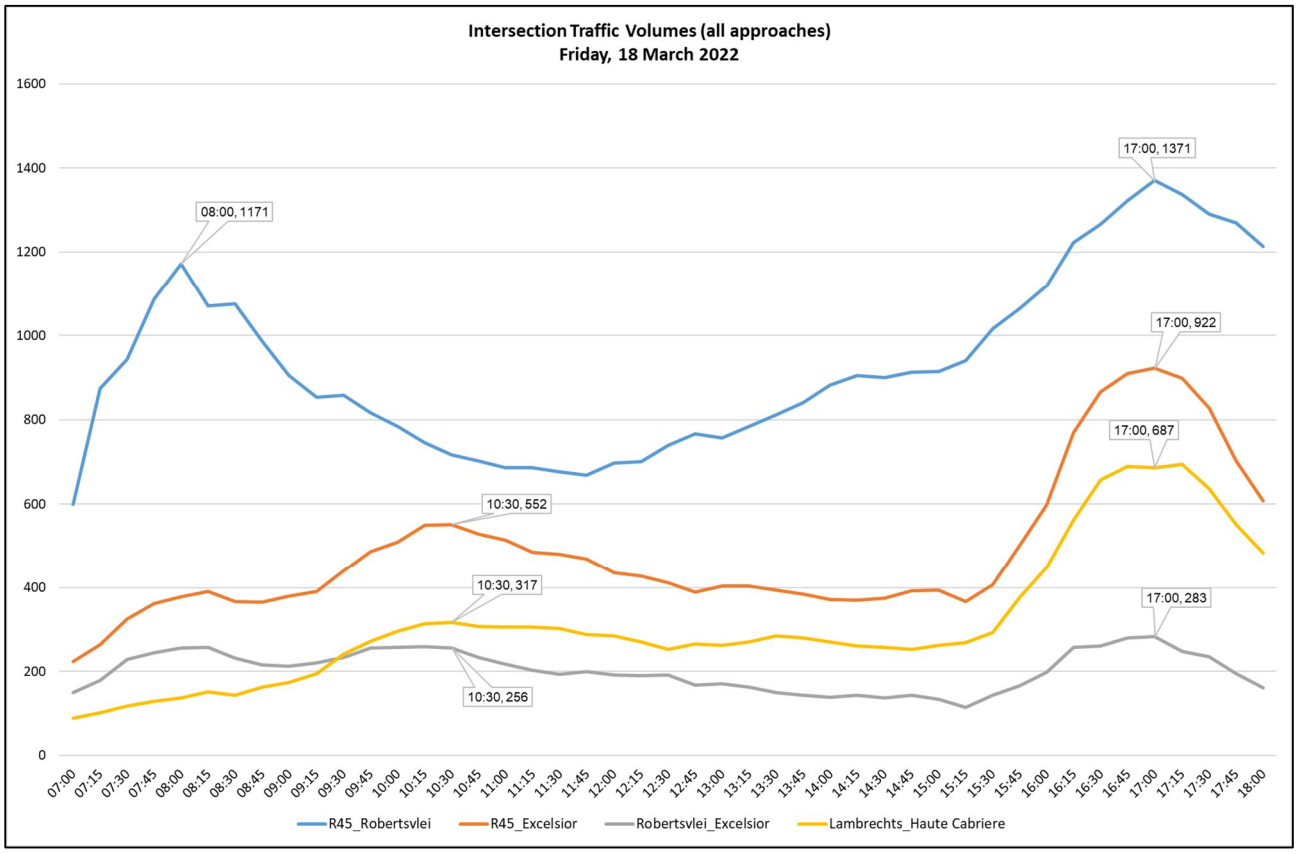



**Figure 3.3: Hourly Two-Way Approach Traffic Volume Distribution – Friday, 18 March 2022**

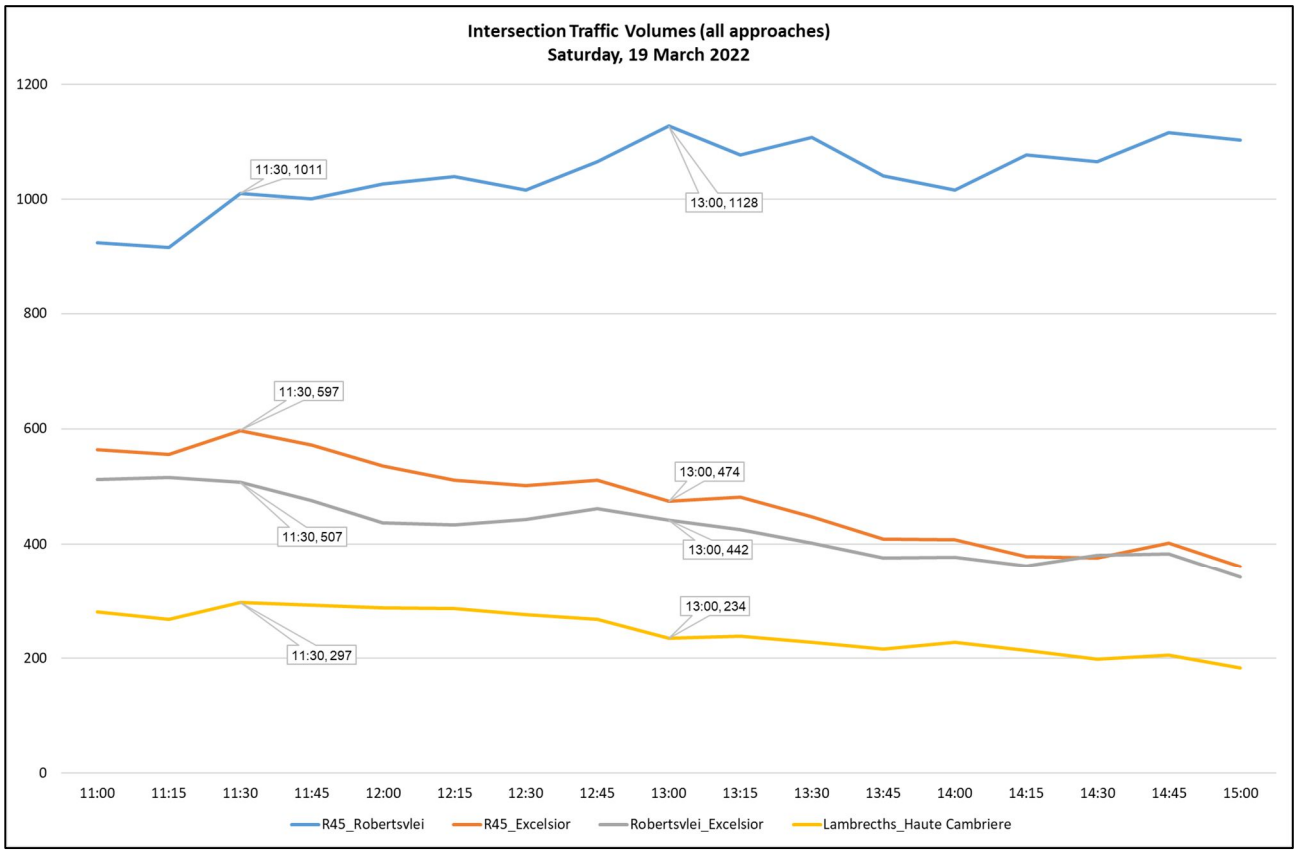



**Figure 3.4: Hourly Two-Way Approach Traffic Volume Distribution – Saturday, 19 March 2022**

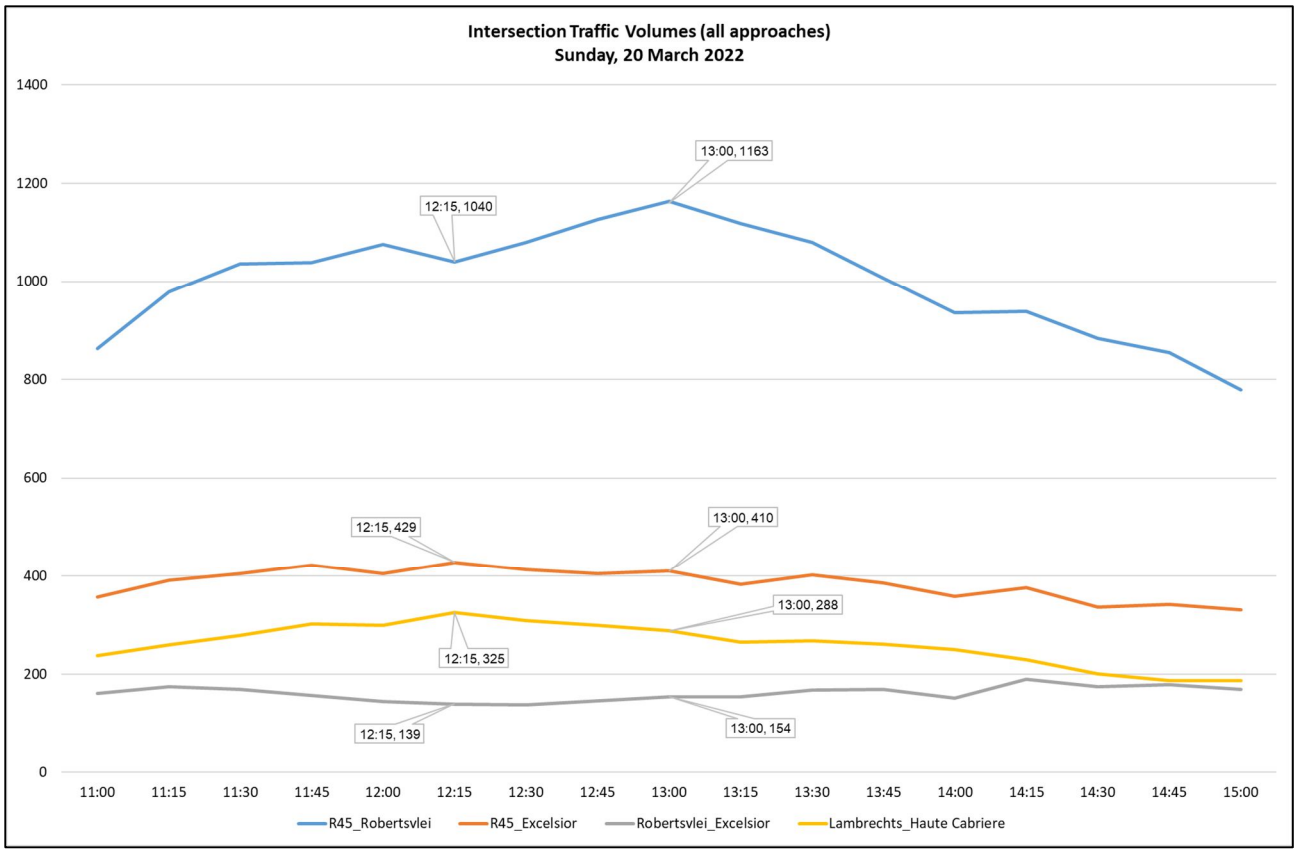



**Figure 3.5: Hourly Two-Way Approach Traffic Volume Distribution – Sunday, 20 March 2022**

## 3.3 Road Network Diagrams (Background Traffic 2022)

**Figure 3.6**, **Figure 3.7** and **Figure 3.8** show the background traffic for 2022 for the following periods:

- 18 March 2022, Friday PM (16:00-17:00);
- 19 March 2022, Saturday MD (12:00-13:00); and
- 20 March 2022, Sunday MD (12:00-13:00)

Existing traffic data at Estation 5013 shows that the Friday PM peak hour is the critical peak hour (even when not overlapping with a long weekend). The Friday AM peak hour was therefore not considered to be critical and was not investigated further.

It can similarly be observed from Estation 5013 data that the traffic volumes during MD peak hours on typical Saturdays and Sundays are higher than during typical Friday MD peak hours. The Friday MD peak hour was therefore not considered to be critical and was not investigated further.

I shall be shown elsewhere in the report that the development peak hour overlaps with the MD background peak traffic on a Saturday and Sunday.

The Friday PM peak hour is investigated further as the peak background traffic generator, while the Saturday and Sunday MD peak hours are investigated further as the peak development traffic generators.

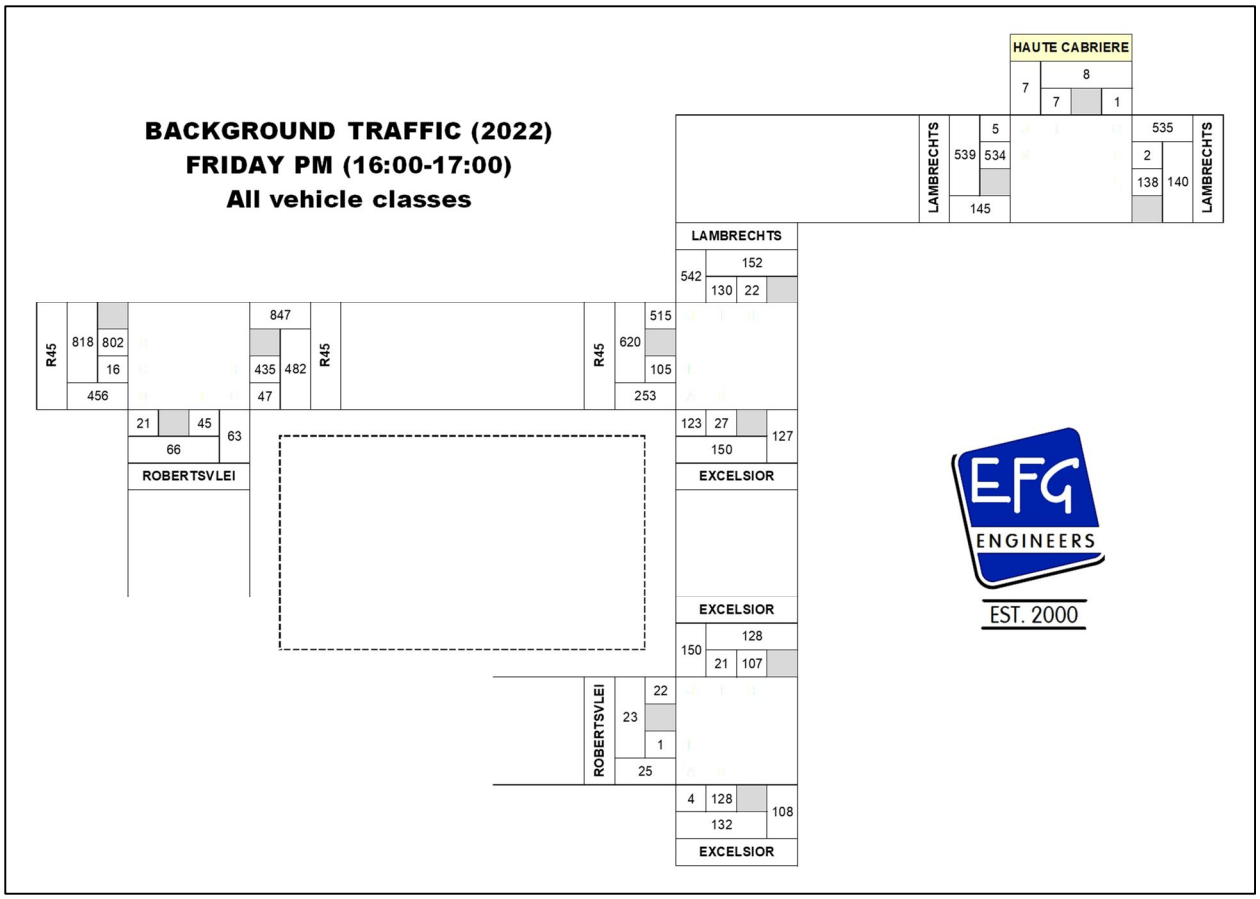



**Figure 3.6: Background Traffic (2022) - Friday PM (16:00-17:00)**

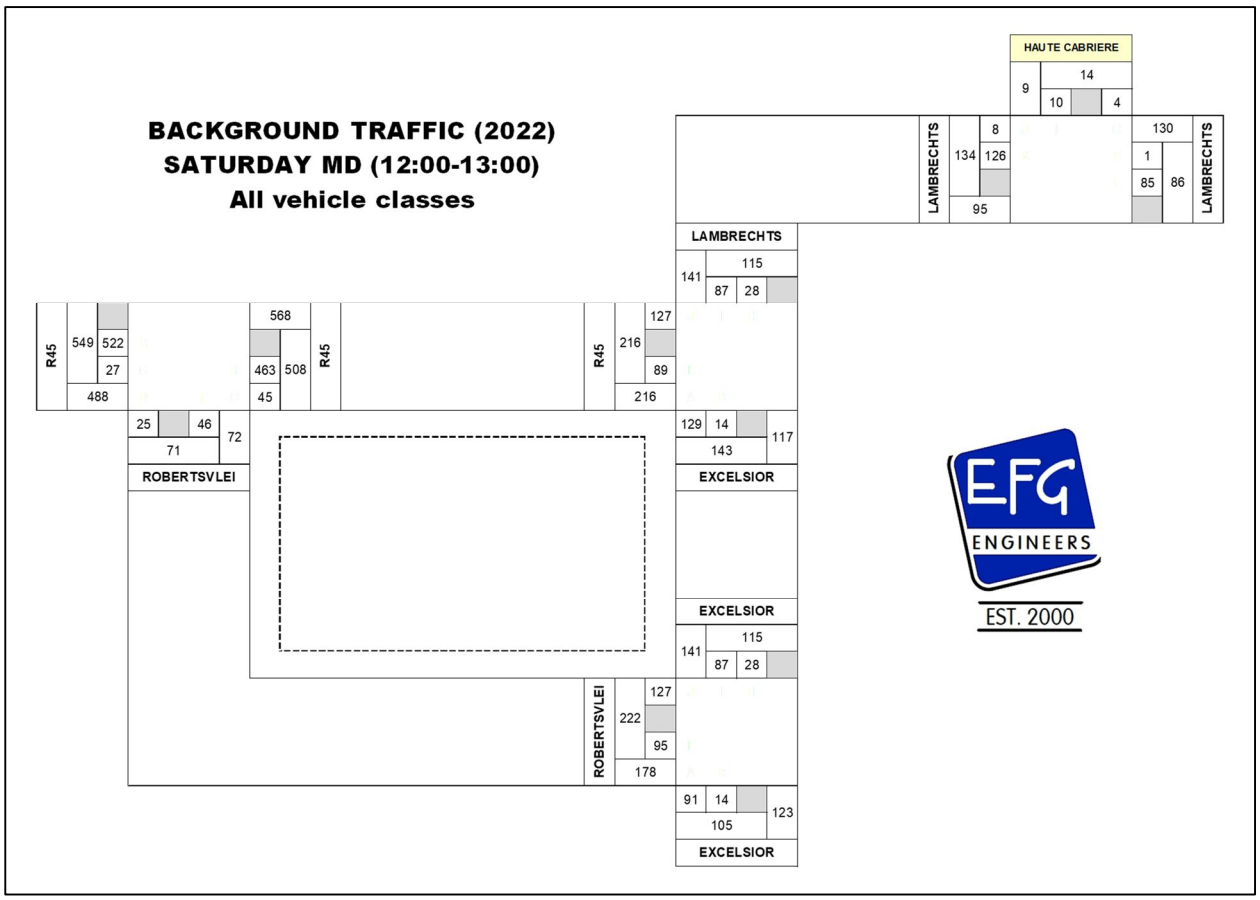



**Figure 3.7: Background Traffic (2022) – Saturday MD (12:00-13:00)**

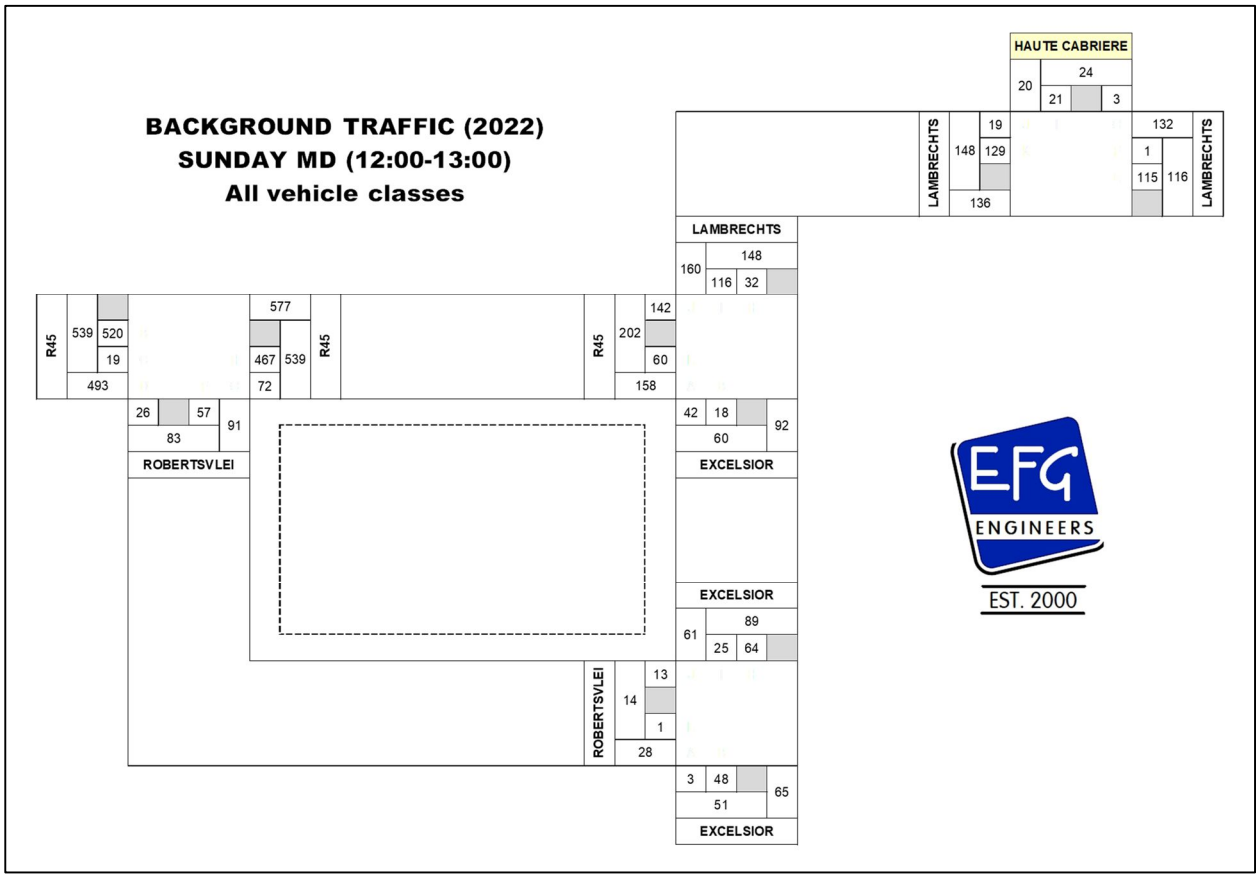



**Figure 3.8: Background Traffic (2022) – Sunday MD (12:00-13:00)**

## 3.4 Road Network Diagrams (Background Traffic 2029)

**Figure 3.9**, **Figure 3.10** and **Figure 3.11** show the background traffic for the design horizon year (2029) for the following periods:

- Friday PM (16:00-17:00);
- Saturday MD (12:00-13:00); and
- Sunday MD (12:00-13:00)

The traffic in **Figure 3.6**, **Figure 3.7** and **Figure 3.8** were escalated by 2% per annum as was previously motivated.

At the time of this report, it was anticipated that the development would open by earliest in 2024. Hence, the design horizon of 2029 was considered based on a 5-year future scenario after opening of the development.

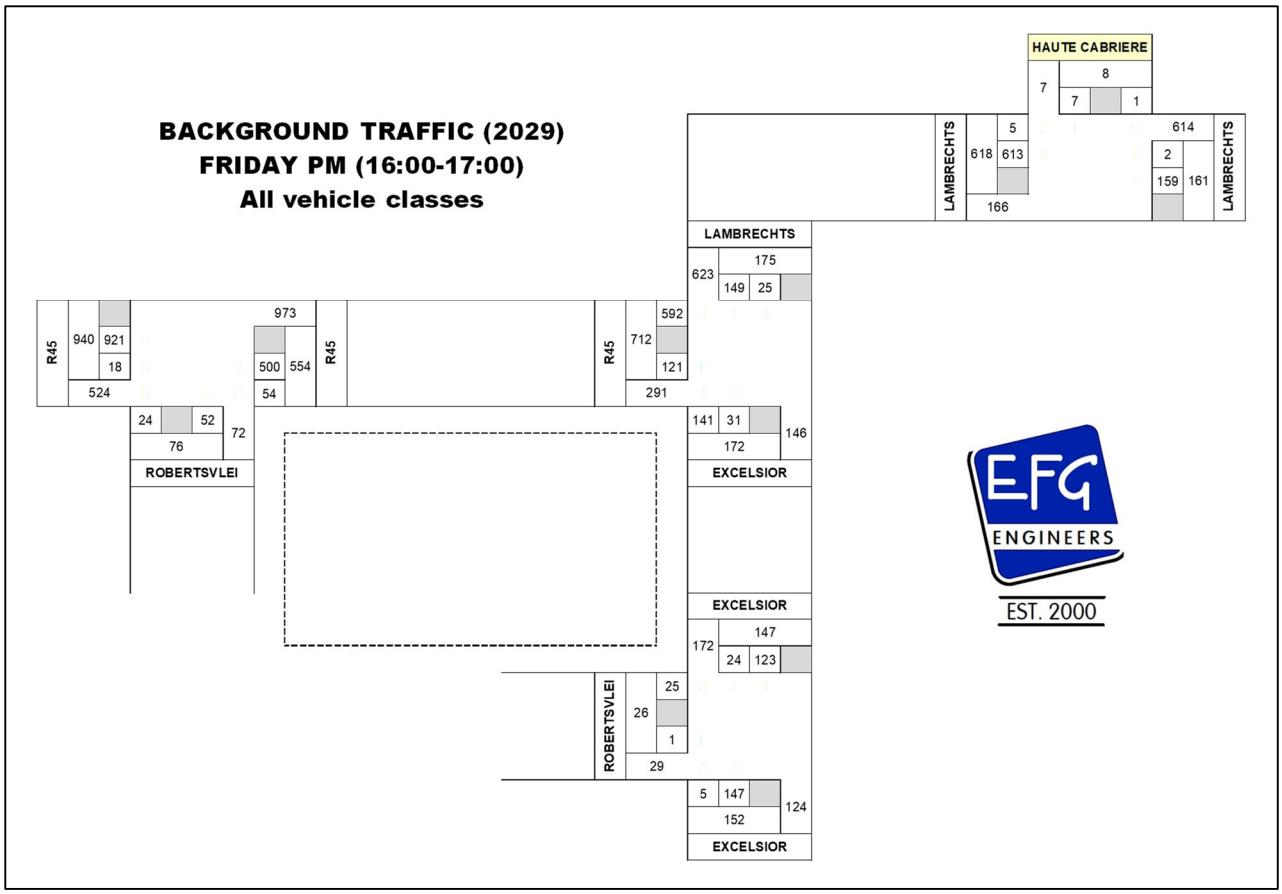



**Figure 3.9: Background Traffic (2029) - Friday PM (16:00-17:00)**

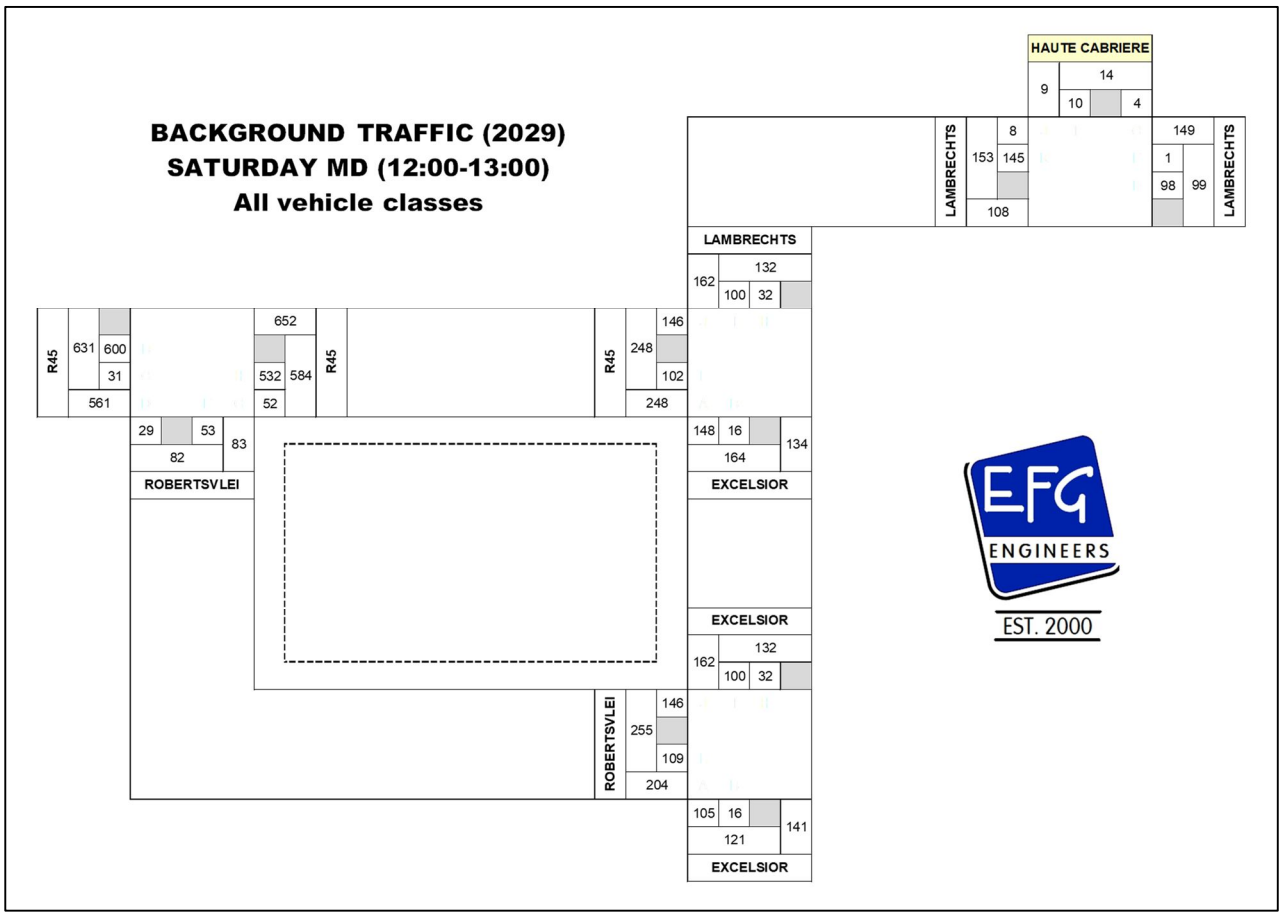



**Figure 3.10: Background Traffic (2029) – Saturday MD (12:00-13:00)**

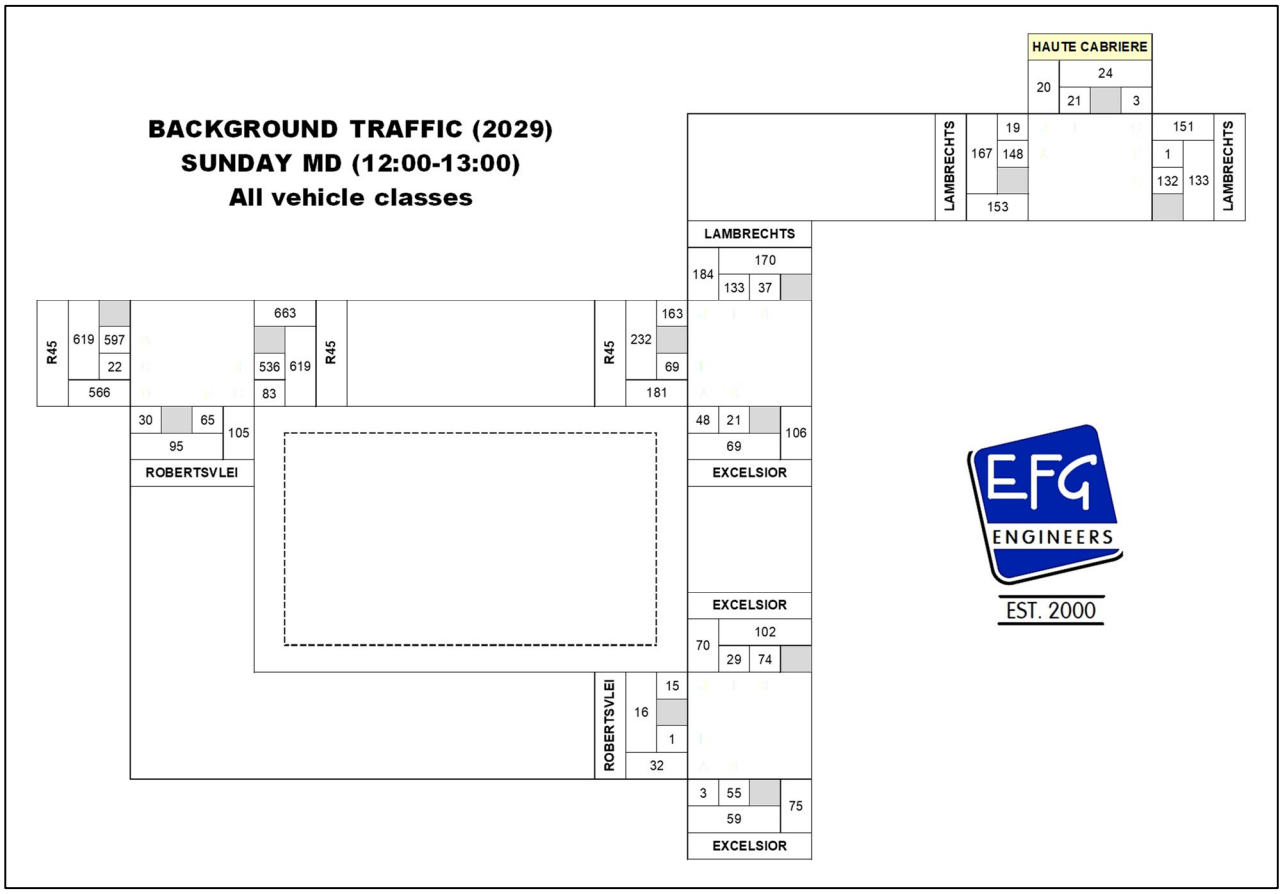



**Figure 3.11: Background Traffic (2029) - Sunday MD (12:00-13:00)**

# 4. DEVELOPMENT TRAFFIC

## 4.1 Visitors per Month

Trip data was received from the client based on their expectations taking into account experience and knowledge from other cableway facilities they are involved with. This informed the trip generation assumptions as part of this study.

The anticipated number of visitors for the proposed cableway facility in Franschhoek is anticipated to vary from a minimum of 120 visitors per day (during off-peak season e.g., July) to a maximum of 3 000 visitors per day over a 12-hour period during peak season (i.e., December/January/February).

**Table 4.1** and **Figure 4.1** show the anticipated number of daily visitors for each month of the year.

**Table 4.1: Visitors per Day per Month (Peak Season; 3 000 Visitors per day)**

| Month | # people / day | # days | Total # people / month (assuming no downtime) |
|---|---|---|---|
| Jan | 3 000 | 31 | 93 000 |
| Feb | 3 000 | 28 (29*) | 84 000 (87 000*) |
| Mar | 1 800 | 31 | 55 800 |
| Apr | 900 | 30 | 27 000 |
| May | 600 | 31 | 18 600 |
| Jun | 300 | 30 | 9 000 |
| Jul | 120 | 31 | 3 720 |
| Aug | 180 | 31 | 5 580 |
| Sep | 960 | 30 | 28 800 |
| Oct | 960 | 31 | 29 760 |
| Nov | 1 200 | 30 | 36 000 |
| Dec | 3 000 | 31 | 93 000 |
| **Total** | **16 020** | **365 (366*)** | **484 260 (487 260*)** |

*Leap year

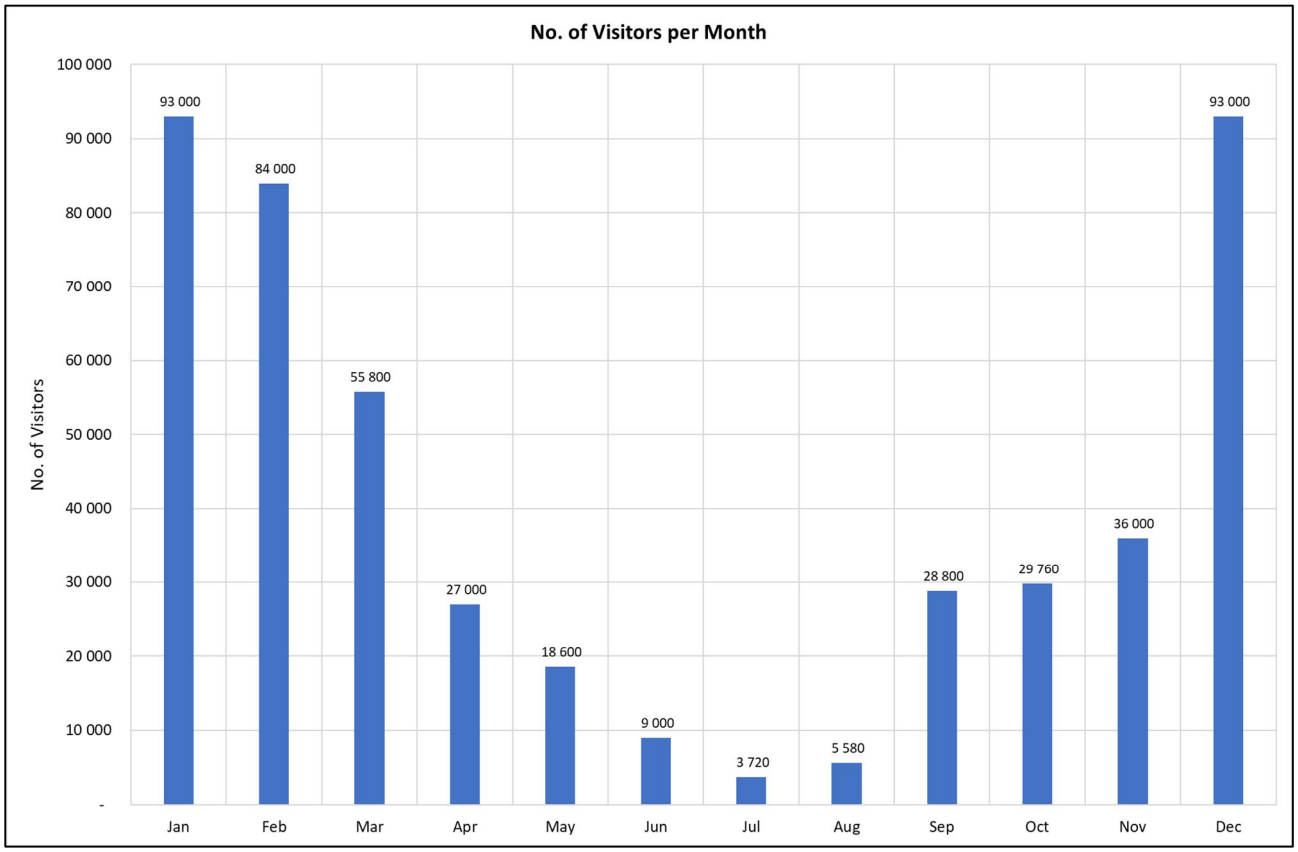



**Figure 4.1: No. of Visitors per Month (Peak Season; 3 000 Visitors per day)**

## 4.2 Hourly Distribution of Visitors in Peak Season

The proposed cableway facility is planned to accommodate a maximum of ±550 visitors on the top of the mountain at any given time.

**Figure 4.2** shows the assumed hourly distribution of visitors travelling up and down the mountain per hour and the resulting accumulation of visitors on top of the mountain of up to ±550 visitors.

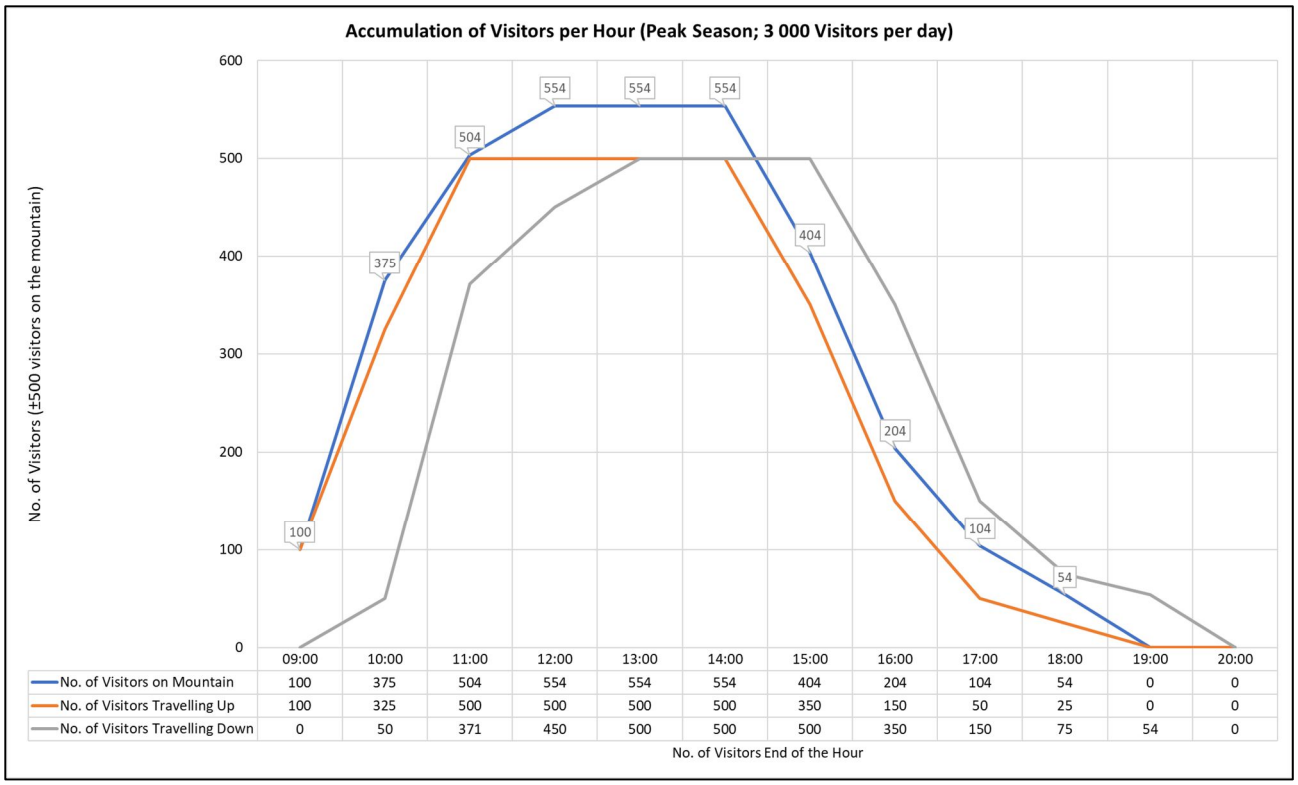



**Figure 4.2: Hourly Accumulation of Visitors (Peak Season; 3 000 Visitors per day)**

## 4.3 Modes of Transport and Modal Split

Discussions were had with the Franschhoek Wine Tram company to confirm to what extent the tram service will be able to meet the additional traffic demand of the proposed cableway during peak season. Overall, there was a positive reaction to the proposed development, but the Tram company will only be able to make a commitment towards expanding their current infrastructure pending further negotiations.

The assessments conducted in this report is based on peak season traffic conditions when the most visitors are expected at the cableway. It is further (realistically) assumed in the evaluations that a portion of the visitors will arrive at the cableway per tram i.e., there will be transfer to visitors from large tour buses to the tram service as the planning does not allow for large tour buses to be accommodated on-site.

**Table 4.2** gives the assumed modal split and the assumed vehicle occupancies per mode of transport.

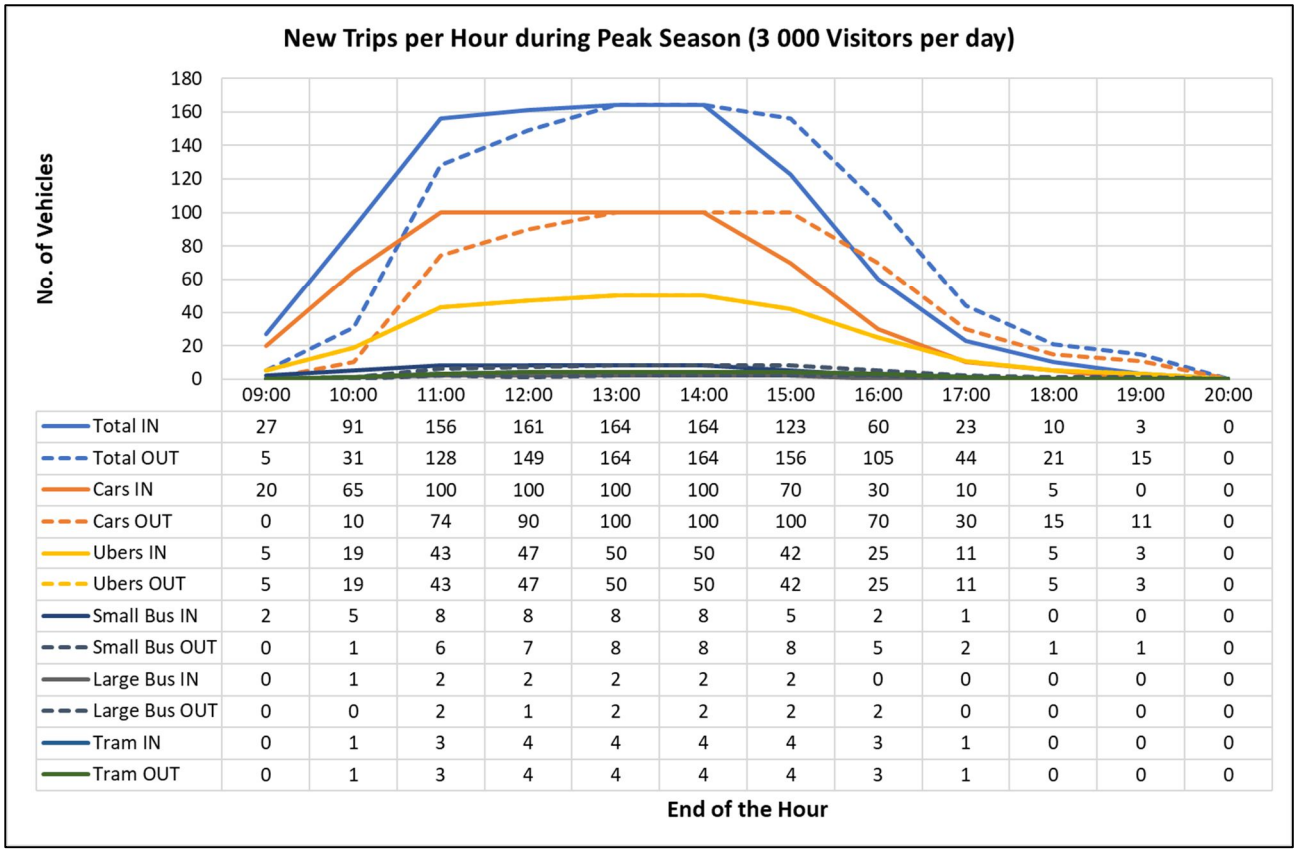
**Table 4.2: Modal Split (Peak Season; 3 000 Visitors per day)**

| Mode | Split | Average Veh Occupancy* | Estimate of Visitors Per Day |
|---|---|---|---|
| Car | 50.0% | 2.5 | 1 500 |
| Ubers (or Similar) | 12.5% | 2.5 | 375 |
| Small Tour Bus / Mini-bus | 12.5% | 8 | 375 |
| Large Tour Bus | 25.0% | 40 | 750* |
| Tram Service | | 32 | |
| | | **Total** | **3 000** |

*It is currently anticipated that 375 daily peak season visitors will arrive by Large Tour Bus and 375 by Tram. Those arriving by Large Tour Bus would park off site and will then be transferred to the tram service (or a shuttle service) to be taken to *Haute Cabrière* to visit the cableway.

## 4.4 Hourly Distribution of New Vehicle Trips

**Figure 4.3** shows the hourly distribution of vehicle trips during peak season for 3 000 visitors per day. This was estimated based on the assumptions in **Table 4.2** and assumed visitor distribution in **Figure 4.2**. The trip distribution is given per mode of transport. Detail calculations are included in **Appendix A**.




| | 09:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total IN | 27 | 91 | 156 | 161 | 164 | 164 | 123 | 60 | 23 | 10 | 3 | 0 |
| Total OUT | 5 | 31 | 128 | 149 | 164 | 164 | 156 | 105 | 44 | 21 | 15 | 0 |
| Cars IN | 20 | 65 | 100 | 100 | 100 | 100 | 70 | 30 | 10 | 5 | 0 | 0 |
| Cars OUT | 0 | 10 | 74 | 90 | 100 | 100 | 100 | 70 | 30 | 15 | 11 | 0 |
| Ubers IN | 5 | 19 | 43 | 47 | 50 | 50 | 42 | 25 | 11 | 5 | 3 | 0 |
| Ubers OUT | 5 | 19 | 43 | 47 | 50 | 50 | 42 | 25 | 11 | 5 | 3 | 0 |
| Small Bus IN | 2 | 5 | 8 | 8 | 8 | 8 | 5 | 2 | 1 | 0 | 0 | 0 |
| Small Bus OUT | 0 | 1 | 6 | 7 | 8 | 8 | 8 | 5 | 2 | 1 | 1 | 0 |
| Large Bus IN | 0 | 1 | 2 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 | 0 |
| Large Bus OUT | 0 | 0 | 2 | 1 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 |
| Tram IN | 0 | 1 | 3 | 4 | 4 | 4 | 4 | 3 | 1 | 0 | 0 | 0 |
| Tram OUT | 0 | 1 | 3 | 4 | 4 | 4 | 4 | 3 | 1 | 0 | 0 | 0 |

*It is currently anticipated that 375 daily peak season visitors will arrive by Large Tour Bus and 375 by Tram. Those arriving by Large Tour Bus would park off site and will be transferred to the tram service (or a shuttle service) to be taken to *Haute Cabrière* to visit the cableway. Hence, 4 additional trams (or mini-bus shuttles) should be added to the trips per hour over the peak period between 12:00-14:00 for the transfers. The use of the tram or mini-bus shuttles will depend on further negotiations with the Tram Company.

**Figure 4.3: New Trips per Hour during Peak Season (3 000 Visitors per day)**

The development peak period is anticipated to be 12:00-14:00. The Saturday and Sunday peak hour of 12:00-13:00 is critical as the development peak period overlaps with the midday peak on these days. The development peak does not overlap with peak hour commuter traffic in terms of weekday traffic.

The total development peak hour trip generation as per **Figure 4.3** is estimated as 328 trips (164 trips IN and 164 trips OUT), but this will increase to 338 trips (169 trips IN and 169 trips OUT) in terms of transferring passengers from large buses to trams or a shuttle service.

Large buses will therefore not enter the *Haute Cabrière* site to drop off or pick up visitors, but will park off-site at a designated location.

## 4.5 Development Trip Assignment & Distribution

**Figure 4.4**, **Figure 4.5** and **Figure 4.6** show the development trips for all modes of transport and for the following periods:

- Friday PM (16:00-17:00);
- Saturday MD (12:00-13:00); and
- Sunday MD (12:00-13:00)

Allowance was made for "internal trips", i.e., trips with their origin within Franschhoek. Separate diagrams that distinguish between different transport modes are included in **Appendix B**.

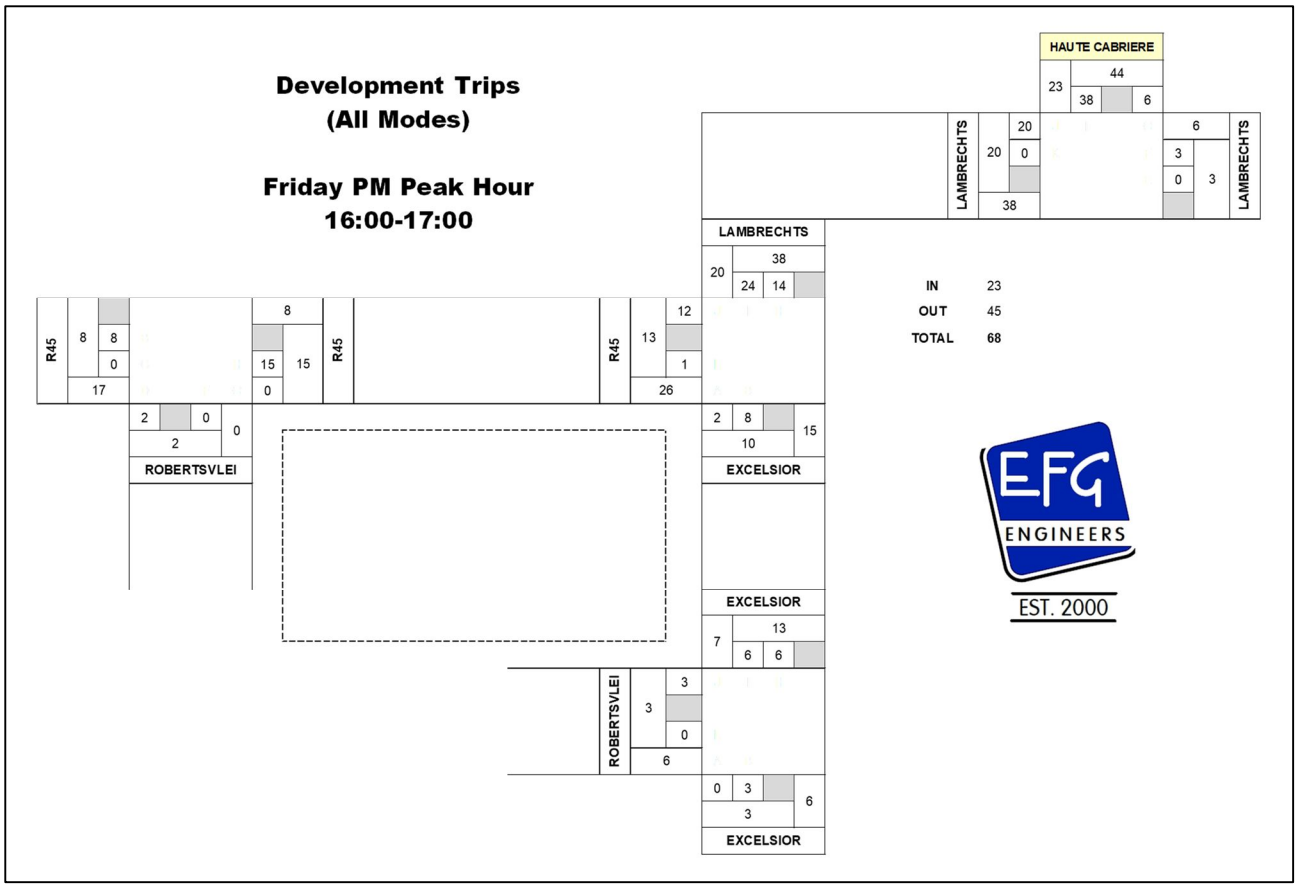



**Figure 4.4: Development Trips - Friday PM (16:00-17:00)**

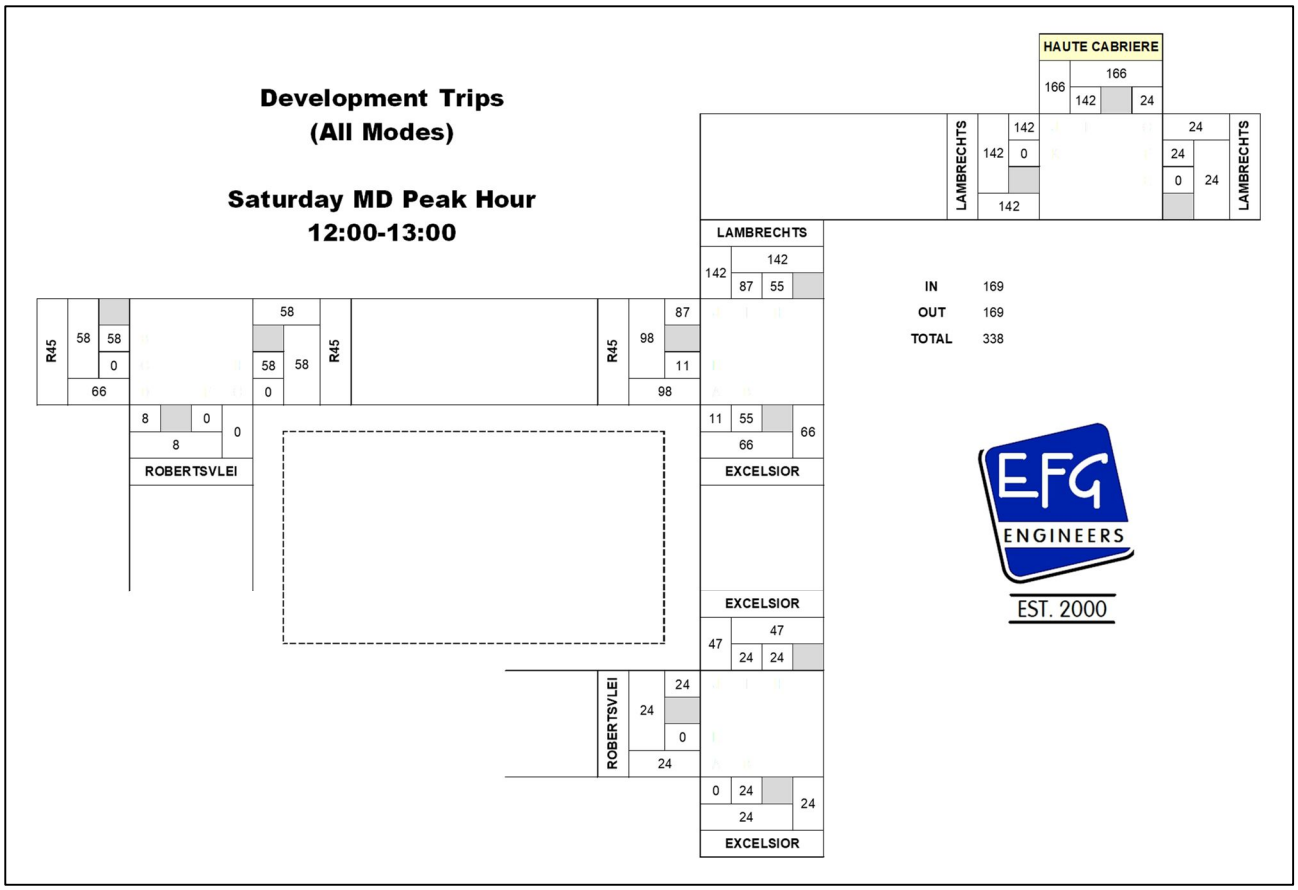



**Figure 4.5: Development Trips - Saturday MD (12:00-13:00)**

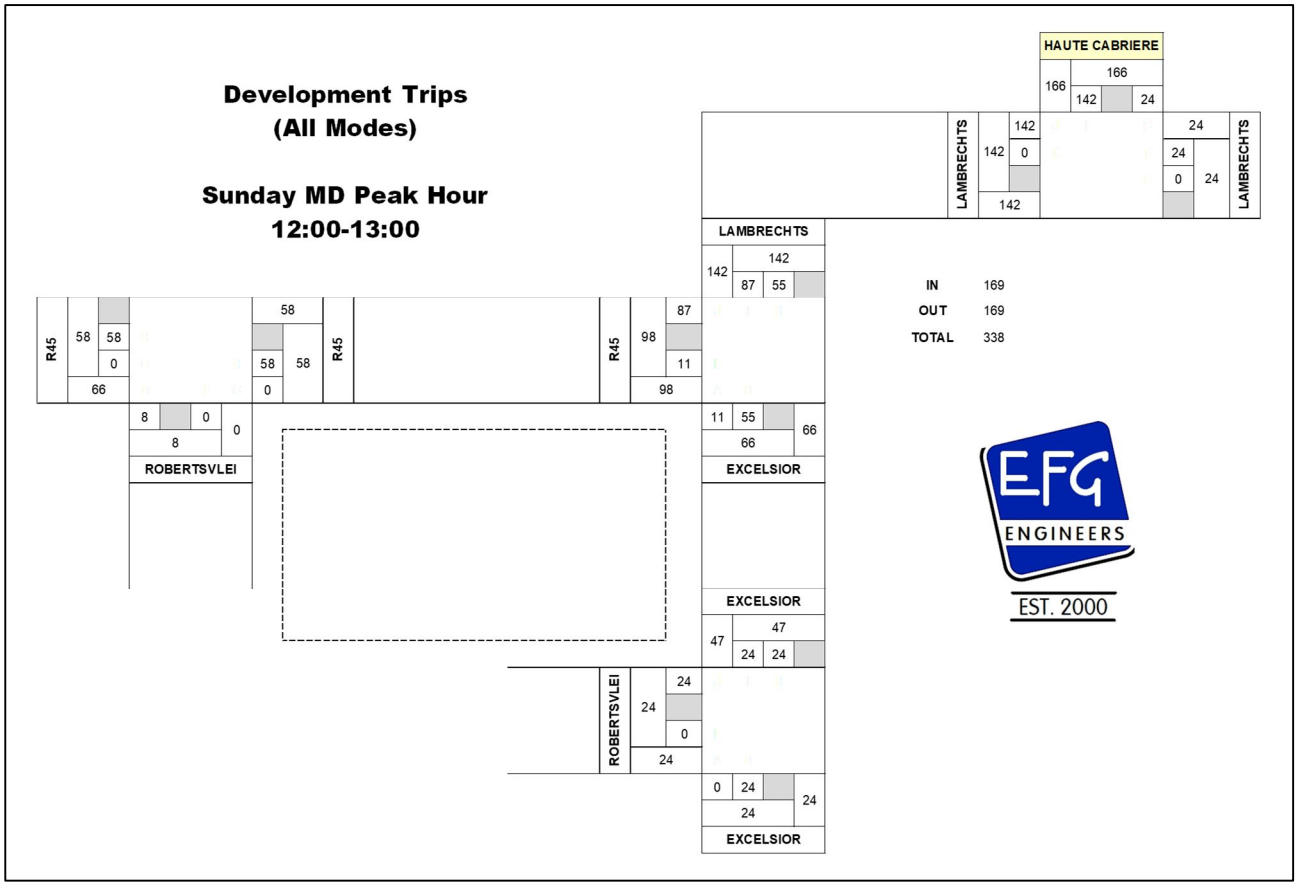



**Figure 4.6: Development Trips - Sunday MD (12:00-13:00)**

# 5. FUTURE TRAFFIC

**Figure 5.1**, **Figure 5.2** and **Figure 5.3** show the future traffic for 2029 (5-year design horizon) for the following periods:

- Friday PM (16:00-17:00);
- Saturday MD (12:00-13:00); and
- Sunday MD (12:00-13:00)

At the time of this report, it was anticipated that the development would open by earliest 2024. Hence, the year 2029 was considered based on a 5-year design horizon after the opening of the development.

The peak hour future traffic for 2029 is the total of the estimated peak hour background traffic for 2029 in **Figure 3.9**, **Figure 3.10** and **Figure 3.11** and the estimated peak hour development trips in **Figure 4.4**, **Figure 4.5** and **Figure 4.6**.

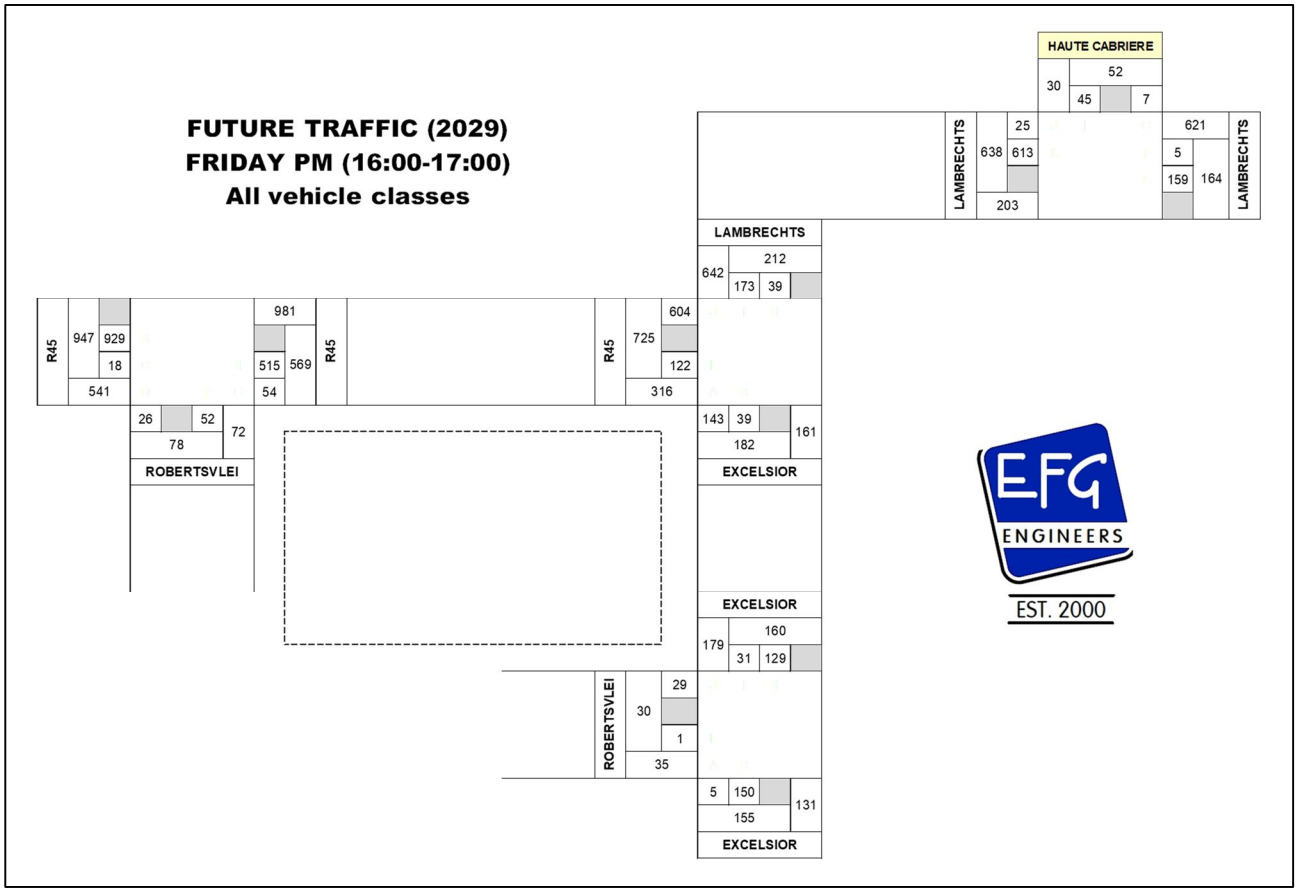



**Figure 5.1: Future Traffic (2029) - Friday PM (16:00-17:00)**

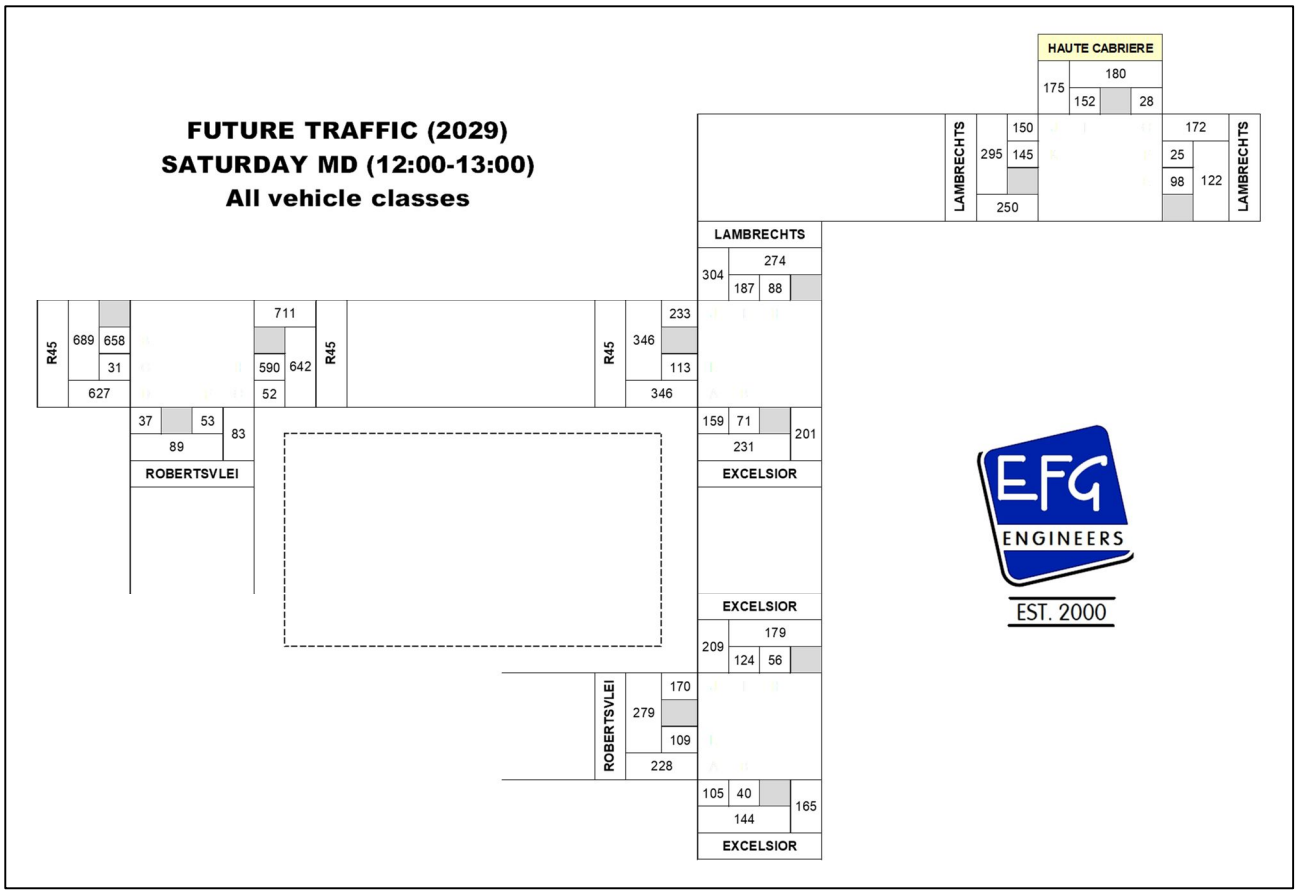



**Figure 5.2: Future Traffic (2029) – Saturday MD (12:00-13:00)**

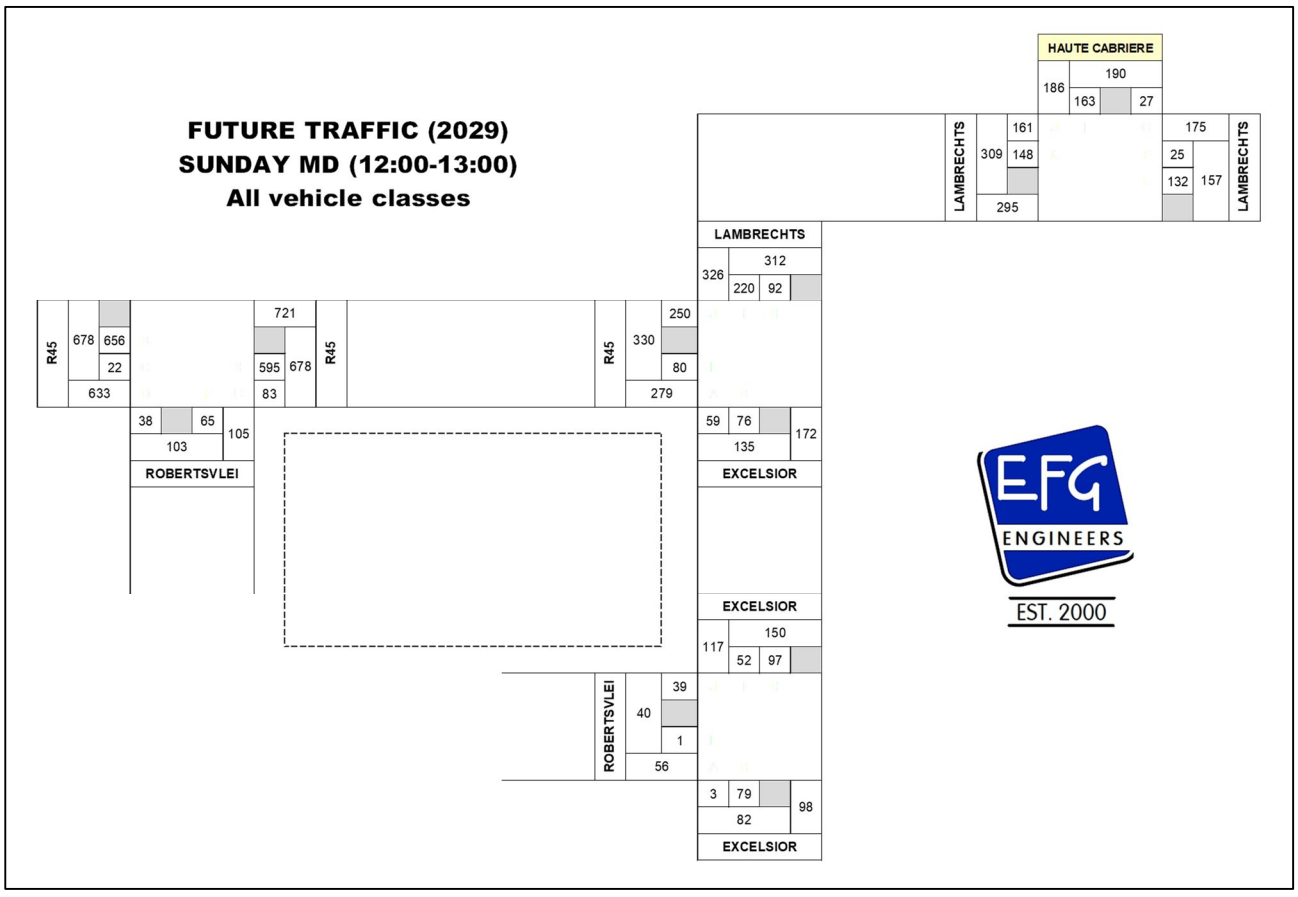



**Figure 5.3: Future Traffic (2029) – Sunday MD (12:00-13:00)**

# 6. CAPACITY ANALYSIS

## 6.1 Traffic Scenarios for SIDRA Analysis

The following time periods were considered for all SIDRA analyses:

- Friday PM (16:00-17:00);
- Saturday MD (12:00-13:00); and
- Sunday MD (12:00-13:00)

**Table 6.1** summarises the different traffic scenarios that were analysed. All analyses were based on the existing road geometries at each intersection.

**Table 6.1: Traffic Scenarios for SIDRA Analysis**

| No. | Intersection | Intersection Layout and Control | Traffic Scenario |
|---|---|---|---|
| 1 | R45 / Robertsvlei Rd | Four-legged, TWSC | • Status quo (2022)<br>• Background traffic (2029)<br>• Future total traffic (2029) |
| 2 | R45 / Excelsior Rd | Three-legged, AWSC | • Status quo (2022)<br>• Background traffic (2029)<br>• Future total traffic (2029) |
| 3 | Excelsior Rd / Robertsvlei Rd | Three-legged, TWSC | • Status quo (2022)<br>• Background traffic (2029)<br>• Future total traffic (2029) |
| 4 | Lambrechts Rd / Haute Cabrière | Four-legged (analysed as Three-legged), TWSC | • Status quo (2022)<br>• Background traffic (2029)<br>• Future total traffic (2029) |

## 6.2 Existing Intersection Layouts

**Figure 6.1 to 6.4** show the existing layouts of the key intersections that were analysed.

**Figure 6.1: Intersection Layout - R45 / Robertsvlei Road**

**Figure 6.2: Intersection Layout - R45 / Excelsior Road**

**Figure 6.3: Intersection Layout - Excelsior Road / Robertsvlei Road**

**Figure 6.4: Intersection Layout - Lambrechts Road / Haute Cabrière Access**

## 6.3 Input Parameters

It is common practice to adhere to the default input parameters of the SIDRA INTERSECTION 9.0 software. However, in terms of two-way stop control intersections the default base critical gap and follow-up headway parameters for a right-turn from a minor approach are amended to values that are considered more appropriate to South African conditions. Please refer to **Table 6.2**.

**Table 6.2: Base Critical Gap and Follow-Up Headway for Two-Way Control Intersections**

| Parameter | SIDRA Default (seconds) | Applied for South African conditions (seconds) |
|---|---|---|
| Critical Gap | 7.0 | 5.3 |
| Follow-up Headway (typically ±60% of Critical Gap as rule of thumb) | 4.0 | 3.2 |

## 6.4 Summary of SIDRA Results

**Table 6.3**, **Table 6.4** and **Table 6.5** show summaries of the *SIDRA INTERSECTION 9.1* results for all key intersections based on the traffic scenarios for the Friday PM, Saturday MD and Sunday MD, respectively.

Detail SIDRA analysis output is included in **Appendix C**.

**Table 6.3: Summary of SIDRA Results - Friday PM (16:00-17:00)**

| FRIDAY PM (16:00-17:00) | R45 / Robertsvlei (TWSC) | R45 / Excelsior (AWSC) | Excelsior / Robertsvlei (TWSC) | Lambrechts / Haute Cabrière (TWSC) |
|---|---|---|---|---|
| **Status Quo (2022)** | | | | |
| v/c | 0.457 | 0.769 | 0.078 | 0.293 |
| Intersection Delay | 1.0 | 22.3 | 1.3 | 0.3 |
| Intersection LOS | n/a | C | n/a | n/a |
| Critical Movement | South RT | South LT | West LT | North LT |
| Critical Movement Delay | 13.6 | 30.2 | 8.7 | 10.9 |
| Critical Movement LOS | B | D | A | B |
| **Background Traffic (2029)** | | | | |
| v/c | 0.526 | 0.883 | 0.089 | 0.336 |
| Intersection Delay | 1.2 | 29.6 | 1.3 | 0.3 |
| Intersection LOS | n/a | D | n/a | n/a |
| Critical Movement | South RT | South LT | West LT | North LT |
| Critical Movement Delay | 16.5 | 34.2 | 8.8 | 11.7 |
| Critical Movement LOS | C | D | A | B |
| **Future Traffic (2029)** | | | | |
| v/c | 0.530 | 0.941 | 0.097 | 0.347 |
| Intersection Delay | 1.2 | 33.9 | 1.4 | 0.9 |
| Intersection LOS | n/a | D | n/a | n/a |
| Critical Movement | South RT | West RT | West LT | East RT |
| Critical Movement Delay | 17.5 | 41.4 | 8.8 | 14.8 |
| Critical Movement LOS | C | E | A | B |

**Table 6.4: Summary of SIDRA Results - Saturday MD (12:00-13:00)**

| SATURDAY MD (12:00-13:00) | R45 / Robertsvlei (TWSC) | R45 / Excelsior (AWSC) | Excelsior / Robertsvlei (TWSC) | Lambrechts / Haute Cabrière (TWSC) |
|---|---|---|---|---|
| **Status Quo (2022)** | | | | |
| v/c | 0.314 | 0.384 | 0.168 | 0.074 |
| Intersection Delay | 1.3 | 15.1 | 6.4 | 0.7 |
| Intersection LOS | n/a | C | n/a | n/a |
| Critical Movement | South RT | South LT | West LT | North LT |
| Critical Movement Delay | 11.1 | 20.9 | 8.2 | 9.7 |
| Critical Movement LOS | B | C | A | A |
| **Background Traffic (2029)** | | | | |
| v/c | 0.364 | 0.439 | 0.194 | 0.084 |
| Intersection Delay | 1.5 | 15.8 | 6.4 | 0.6 |
| Intersection LOS | n/a | C | n/a | n/a |
| Critical Movement | South RT | South LT | West LT | North LT |
| Critical Movement Delay | 12.2 | 22.2 | 8.2 | 9.8 |
| Critical Movement LOS | B | C | A | A |
| **Future Traffic (2029)** | | | | |
| v/c | 0.399 | 0.621 | 0.219 | 0.164 |
| Intersection Delay | 1.5 | 17.9 | 6.1 | 4.2 |
| Intersection LOS | n/a | C | n/a | n/a |
| Critical Movement | West RT | West LT | West LT | North LT |
| Critical Movement Delay | 17.6 | 21.4 | 8.3 | 8.9 |
| Critical Movement LOS | C | C | A | A |

**Table 6.5: Summary of SIDRA Results - Sunday MD (12:00-13:00)**

| SUNDAY MD (12:00-13:00) | R45 / Robertsvlei (TWSC) | R45 / Excelsior (AWSC) | Excelsior / Robertsvlei (TWSC) | Lambrechts / Haute Cabrière (TWSC) |
|---|---|---|---|---|
| **Status Quo (2022)** | | | | |
| v/c | 0.304 | 0.368 | 0.051 | 0.082 |
| Intersection Delay | 1.4 | 14.3 | 1.8 | 1.1 |
| Intersection LOS | n/a | B | n/a | n/a |
| Critical Movement | South RT | South LT | West LT | North LT |
| Critical Movement Delay | 11.2 | 17.3 | 8.2 | 10.1 |
| Critical Movement LOS | B | C | A | B |
| **Background Traffic (2029)** | | | | |
| v/c | 0.352 | 0.422 | 0.059 | 0.092 |
| Intersection Delay | 1.6 | 14.8 | 1.8 | 1.0 |
| Intersection LOS | n/a | B | n/a | n/a |
| Critical Movement | South RT | South LT | West LT | North LT |
| Critical Movement Delay | 12.4 | 17.6 | 8.2 | 10.2 |
| Critical Movement LOS | B | C | A | B |
| **Future Traffic (2029)** | | | | |
| v/c | 0.386 | 0.677 | 0.087 | 0.173 |
| Intersection Delay | 1.6 | 18.7 | 2.4 | 4.2 |
| Intersection LOS | n/a | C | n/a | n/a |
| Critical Movement | West RT | West LT | West LT | North LT |
| Critical Movement Delay | 18.8 | 26.1 | 8.3 | 8.9 |
| Critical Movement LOS | C | D | A | A |

The following conclusions can be drawn from the SIDRA Analysis results:

- Status Quo 2022 – All intersections are currently operating adequately during all peak hours.
- Background Traffic 2029 – All intersections are anticipated to operate adequately during all peak hours in 2029 based on only background traffic growth and no peak season cableway development traffic.
- Future Traffic 2029 – It is anticipated that the right-turn from the R45 at the R45 / Excelsior AWSC intersection will operate at LOS E (i.e., unacceptable delays) during the 2029 Friday PM Peak hour in

peak season based on background traffic growth and including peak season cableway development traffic. It should however be noted that this Friday PM Peak includes the peak flow towards Overstrand which will only happen at the start of a long weekend or holiday period. All other intersections are anticipated to operate at adequate LOS and to experience acceptable delays.

- The R45/ Excelsior AWSC intersection could be considered for an intersection upgrade by the year 2029, but an upgrade here should be financed with DCs if available. The overall intersection operational capacity is still adequate after adding the cableway peak season traffic and considering the design horizon of 5-years post opening of the cableway. It should also be noted that the critical Peak Hour is the Friday PM peak hour which includes the peak flow towards Overstrand at the start of a long weekend. As this scenario will only occur a few times in a year the LOS E, as estimated, is also only likely to happen a few times a year and is therefore not that critical.

# 7. TURNING LANE WARRANT EVALUATION

## 7.1 Right-Turn Lane Warrant

The right-turn lane warrants as per the *WCG Road Access Management Guidelines (dated 2020)* were investigated at all four key intersections based on the following traffic scenarios:

- Status quo (2022) traffic; and
- Future traffic (2029) i.e., the design horizon year.

**Table 7.1** and **Table 7.2** summarise the traffic data to inform the right-turn lane warrant evaluation for the Status quo (2022) and Future traffic (2029) scenarios respectively.

**Table 7.1: Input Data for Right-Turn Lane Warrant Evaluation (Status Quo; 2022)**

| R45 / Robertsvlei | | | | |
|---|---|---|---|---|
| | **Vo** | **Va** | **Vr** | **% of Va** |
| **Fri PM** | 482 | 818 | 16 | 2% |
| **Sat MD** | 508 | 549 | 27 | 5% |
| **Sun MD** | 539 | 539 | 19 | 4% |
| **R45 / Excelsior** | | | | |
| | **Vo** | **Va** | **Vr** | **% of Va** |
| **Fri PM** | 150 | 152 | 130 | 86% |
| **Sat MD** | 143 | 115 | 87 | 76% |
| **Sun MD** | 60 | 148 | 116 | 78% |
| **Excelsior / Robertsvlei** | | | | |
| | **Vo** | **Va** | **Vr** | **% of Va** |
| **Fri PM** | 132 | 128 | 21 | 16% |
| **Sat MD** | 105 | 115 | 87 | 76% |
| **Sun MD** | 51 | 89 | 25 | 28% |
| **Lambrechts / Haute Cabrière** | | | | |
| | **Vo** | **Va** | **Vr** | **% of Va** |
| **Fri PM** | 539 | 140 | 2 | 1% |
| **Sat MD** | 134 | 86 | 1 | 1% |
| **Sun MD** | 148 | 116 | 1 | 1% |

**Table 7.2: Input Data for Right-Turn Lane Warrant Evaluation (Future Traffic; 2029)**

| R45 / Robertsvlei | | | | |
|---|---|---|---|---|
| | **Vo** | **Va** | **Vr** | **% of Va** |
| **Fri PM** | 569 | 947 | 18 | 2% |
| **Sat MD** | 642 | 689 | 31 | 4% |
| **Sun MD** | 678 | 678 | 22 | 3% |
| **R45 / Excelsior** | | | | |
| | **Vo** | **Va** | **Vr** | **% of Va** |

| | | | | |
|---|---|---|---|---|
| **Fri PM** | 182 | 212 | 173 | 82% |
| **Sat MD** | 231 | 274 | 187 | 68% |
| **Sun MD** | 135 | 312 | 220 | 71% |
| **Excelsior / Robertsvlei** | | | | |
| | **Vo** | **Va** | **Vr** | **% of Va** |
| **Fri PM** | 155 | 160 | 31 | 19% |
| **Sat MD** | 144 | 179 | 124 | 69% |
| **Sun MD** | 82 | 150 | 52 | 35% |
| **Lambrechts / Haute Cabrière** | | | | |
| | **Vo** | **Va** | **Vr** | **% of Va** |
| **Fri PM** | 638 | 164 | 5 | 3% |
| **Sat MD** | 295 | 122 | 25 | 20% |
| **Sun MD** | 309 | 157 | 25 | 16% |

Operating speeds of ±100km/h is prevalent along the R45 past Robertsvlei Road. This is supported by the speed profile data from EStation 5013 in terms of the average 85$^{th}$ percentile speed of 90km/h-100km/h along this section of the R45 that. The right-turn lane warrant will therefore be evaluated based on 100km/h at this location.

Operating speeds of ±60km/h or less is typical on the approaches to the R45 / Excelsior all-way stop intersection given the intersection's location within town just prior to exiting the town. The right-turn lane warrant will therefore be evaluated based on 60km/h at this location.

The operating speeds at the Excelsior / Robertsvlei intersection is likely in the order of 80km/h or more as the legal speed limit just south of the intersection is indicated as 80km/h. The right-turn lane warrant will be evaluated based on 100km/h at this location (to be conservative).

The speed limit past *Haute Cabrière* is 80km/h, however, an advisory speed of 60km/h is given for the sake of the mountain pass. The right-turn lane warrant will be evaluated based on 100km/h at this location (to be conservative).

The right-turn lane warrant charts are given in **Figure 7.1** to **7.8**.

### 7.1.1 R45 / Robertsvlei Intersection

*(Based on Figure 14-2, WCG Road Access Management Guidelines, 2020)*

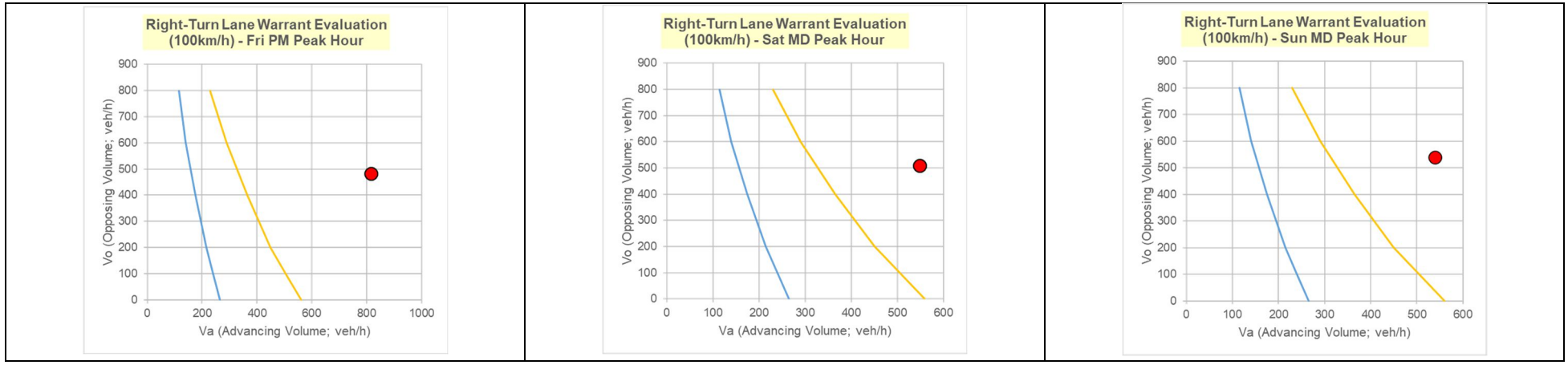



**Figure 7.1: R45 / Robertsvlei - Right-Turn Lane Warrant Chart (Status Quo; 2022)**

*(Based on Figure 14-2, WCG Road Access Management Guidelines, 2020)*

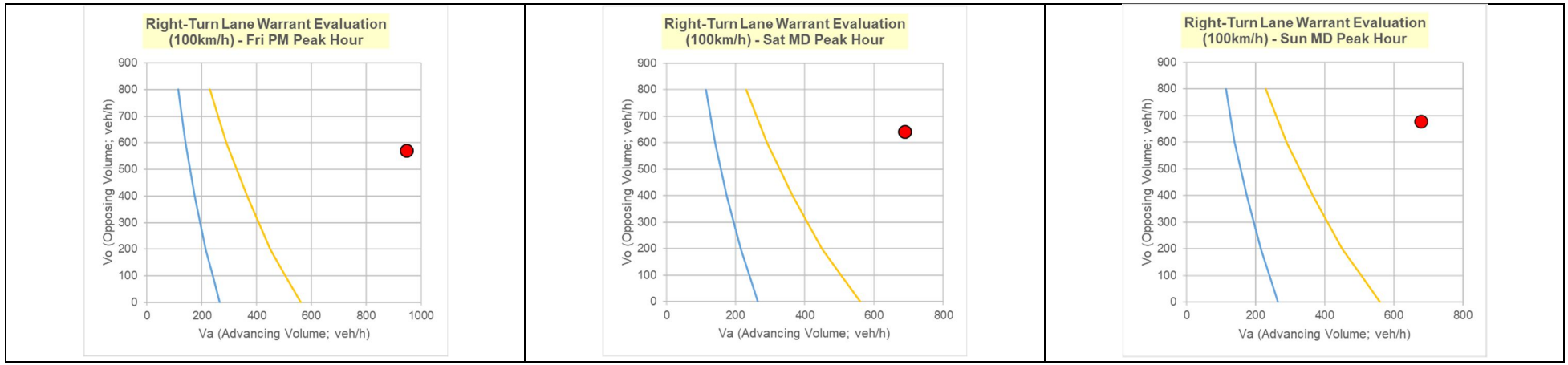



**Figure 7.2: R45 / Robertsvlei - Right-Turn Lane Warrant Chart (Future Traffic; 2029)**

### 7.1.2 R45 / Excelsior Intersection

*(Based on Figure 14-2, WCG Road Access Management Guidelines, 2020)*

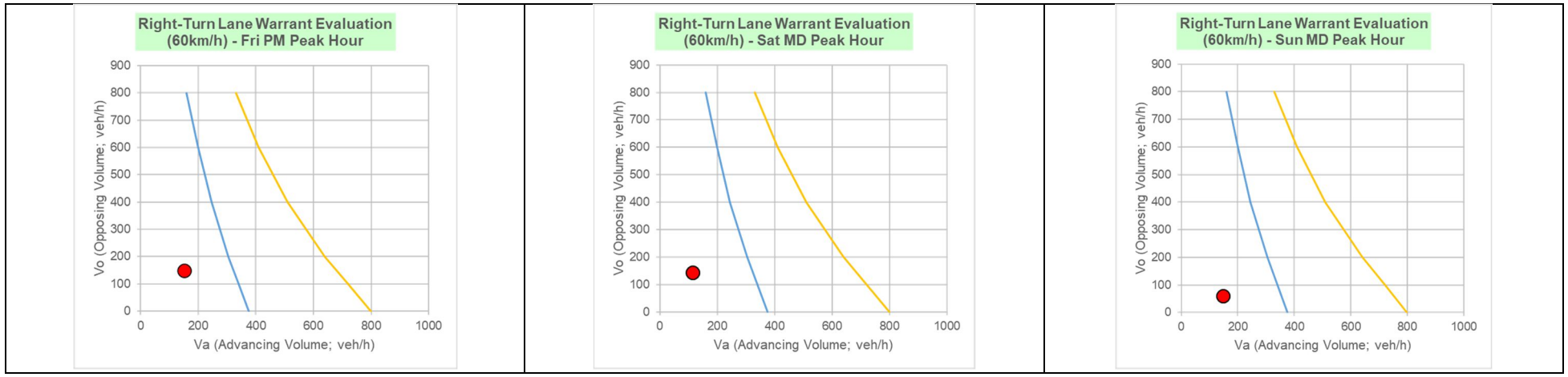



**Figure 7.3: R45 / Excelsior - Right-Turn Lane Warrant Chart (Status Quo; 2022)**

*(Based on Figure 14-2, WCG Road Access Management Guidelines, 2020)*

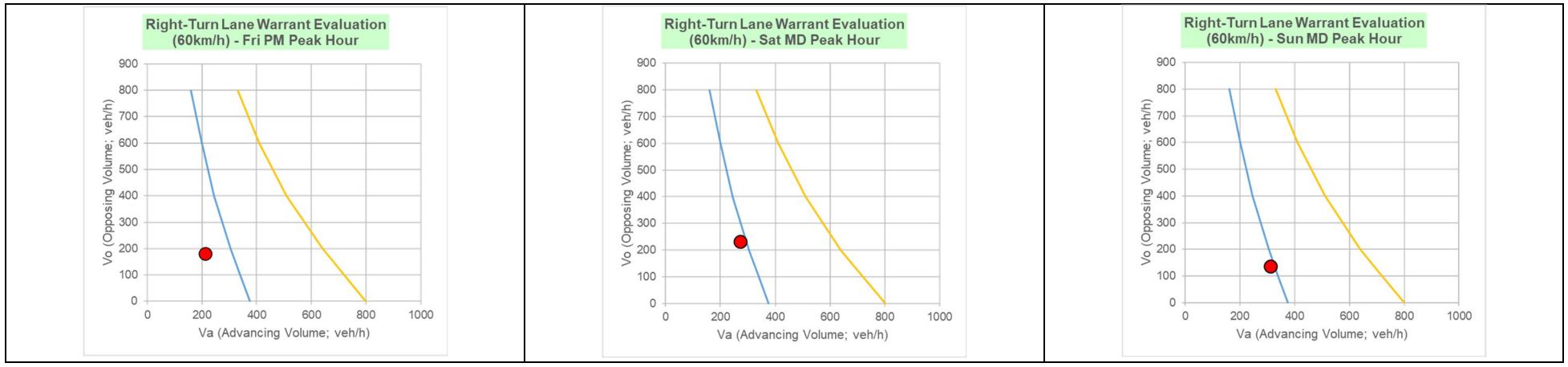



**Figure 7.4: R45 / Excelsior - Right-Turn Lane Warrant Chart (Future Traffic; 2029)**

### 7.1.3 Excelsior / Robertsvlei Intersection

*(Based on Figure 14-2, WCG Road Access Management Guidelines, 2020)*

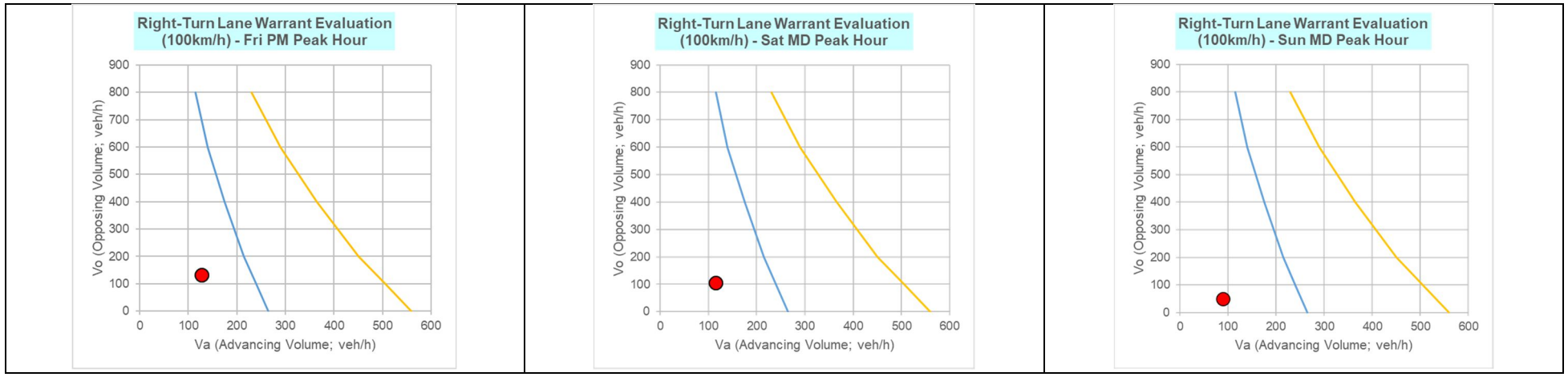



**Figure 7.5: Excelsior / Robertsvlei - Right-Turn Lane Warrant Chart (Status Quo; 2022)**

*(Based on Figure 14-2, WCG Road Access Management Guidelines, 2020)*

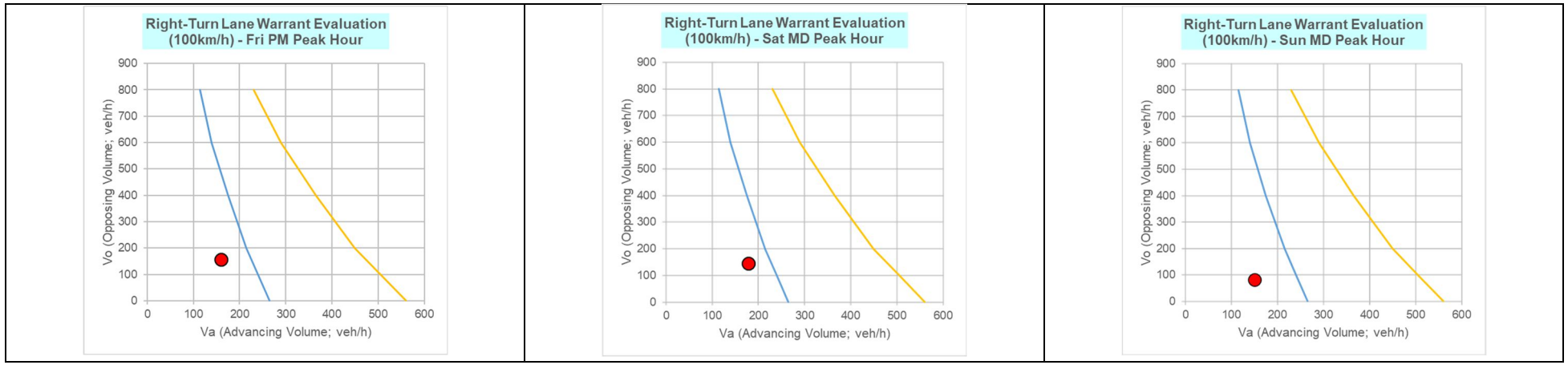



**Figure 7.6: Excelsior / Robertsvlei - Right-Turn Lane Warrant Chart (Future Traffic; 2029)**

### 7.1.4 Lambrechts / Haute Cabrière Intersection

*(Based on Figure 14-2, WCG Road Access Management Guidelines, 2020)*

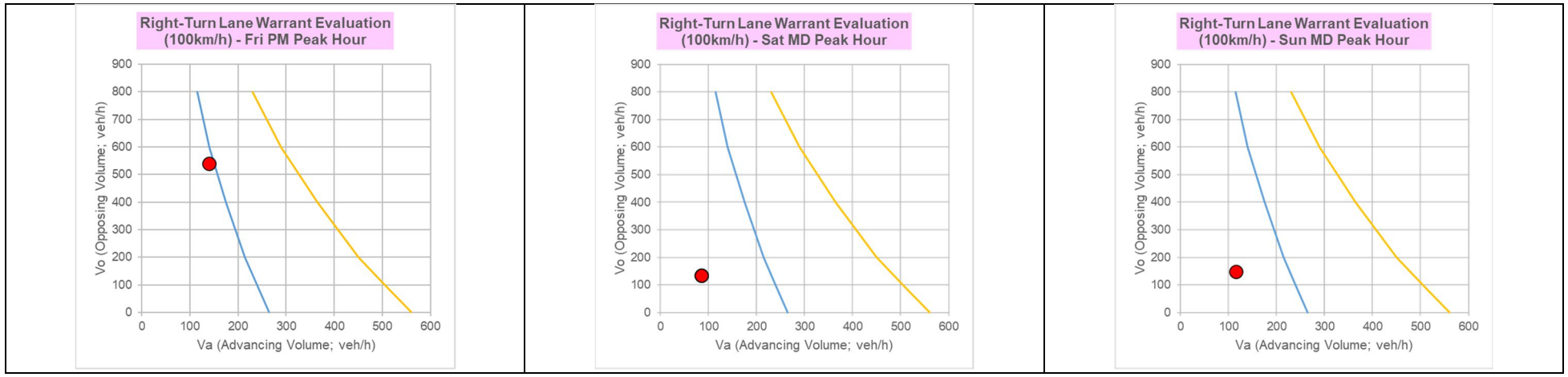



**Figure 7.7: Lambrechts / Haute Cabrière - Right-Turn Lane Warrant Chart (Status Quo; 2022)**

*(Based on Figure 14-2, WCG Road Access Management Guidelines, 2020)*

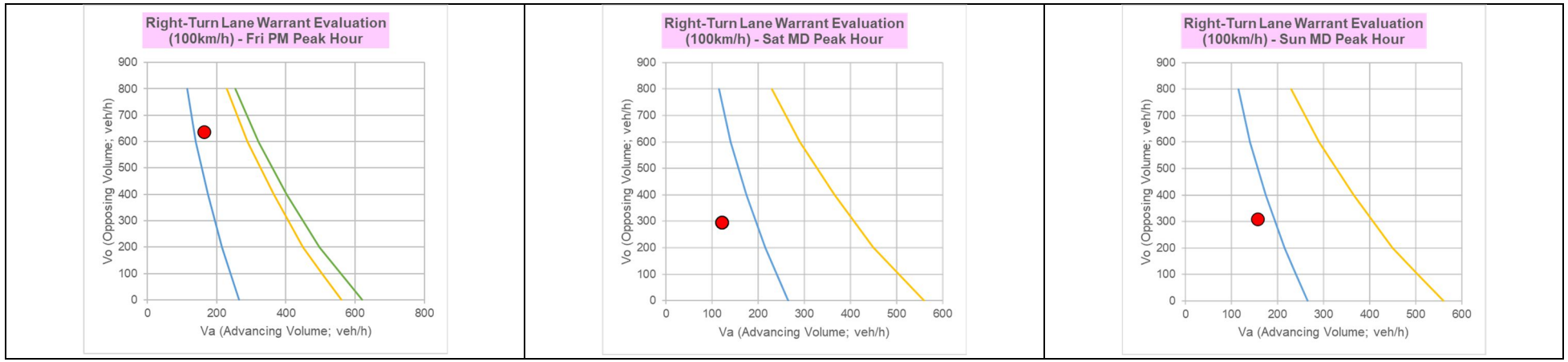



**Figure 7.8: Lambrechts / Haute Cabrière - Right-Turn Lane Warrant Chart (Future Traffic; 2029)**

### 7.1.5 Conclusions

Based on the right-turn lane warrant evaluation as per the *WCG Road Access Management Guidelines (dated 2020)* the following conclusions can be drawn:

- The existing traffic volumes (i.e., status quo 2022 traffic) warrant a right-turn lane at the R45 / Robertsvlei Intersection. Improvements at this intersection should be carried out by the road authority and should not be a Developer's cost. It should however be noted that there are currently surfaced shoulders on the R45 that allow through traffic to pass the traffic waiting to turn right.

- A right-turn lane is not warranted at the R45 / Excelsior intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

- A right-turn lane is not warranted at the Excelsior / Robertsvlei intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

- A right-turn lane is not warranted at the Lambrechts / *Haute Cabrière* intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

## 7.2 Left-Turn Lane Warrant

The left-turn lane warrants as per the *WCG Road Access Management Guidelines (dated 2020)* were investigated at all four key intersections based on the following traffic scenarios:

- Status quo (2022) traffic; and
- Future traffic (2029) i.e., the design horizon year.

**Table 7.3** and **Table 7.4** summarise the traffic data to inform the left-turn lane warrant evaluation for the Status quo (2022) and Future traffic (2029) scenarios respectively.

**Table 7.3: Input Data for Left-Turn Lane Warrant Evaluation (Status Quo; 2022)**

| **R45 / Robertsvlei** | | |
|---|---|---|
| | **Va** | **Vl** |
| **Fri PM** | 482 | 47 |
| **Sat MD** | 508 | 45 |
| **Sun MD** | 619 | 83 |
| **R45 / Excelsior** | | |
| | **Va** | **Vl** |
| **Fri PM** | 150 | 123 |
| **Sat MD** | 143 | 129 |
| **Sun MD** | 69 | 48 |
| **Excelsior / Robertsvlei** | | |
| | **Va** | **Vl** |
| **Fri PM** | 132 | 4 |
| **Sat MD** | 105 | 91 |
| **Sun MD** | 59 | 3 |
| **Lambrechts / Haute Cabrière** | | |
| | **Va** | **Vl** |
| **Fri PM** | 539 | 5 |
| **Sat MD** | 134 | 8 |
| **Sun MD** | 167 | 19 |

**Table 7.4: Input Data for Left-Turn Lane Warrant Evaluation (Future Traffic; 2029)**

| R45 / Robertsvlei | | |
|---|---|---|
| | **Va** | **Vl** |
| **Fri PM** | 569 | 54 |
| **Sat MD** | 642 | 52 |
| **Sun MD** | 678 | 83 |
| **R45 / Excelsior** | | |
| | **Va** | **Vl** |
| **Fri PM** | 182 | 143 |
| **Sat MD** | 231 | 159 |
| **Sun MD** | 135 | 59 |
| **Excelsior / Robertsvlei** | | |
| | **Va** | **Vl** |
| **Fri PM** | 155 | 5 |
| **Sat MD** | 144 | 105 |
| **Sun MD** | 82 | 3 |
| **Lambrechts / Haute Cabrière** | | |
| | **Va** | **Vl** |
| **Fri PM** | 638 | 25 |
| **Sat MD** | 295 | 150 |
| **Sun MD** | 309 | 161 |

Similar to the right-turn lane warrant evaluation, the following operating speeds apply for the left-turn lane warrant evaluation:

- R45 / Robertsvlei – 100km/h;
- R45 / Excelsior – 60km/h;
- Excelsior / Robertsvlei – 80km/h; and
- Lambrechts / *Haute Cabrière* – 100km/h.

The left-turn lane warrant charts are given in **Figure 7.9** to **Figure 7.16**.

### 7.2.1 R45 / Robertsvlei Intersection

*(Based on Figure 14-4, WCG Road Access Management Guidelines, 2020)*

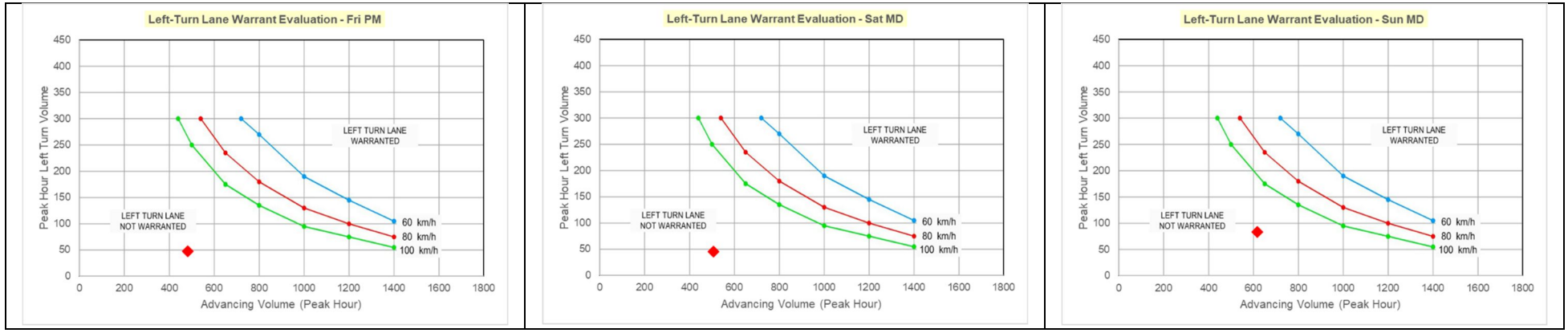



**Figure 7.9: R45 / Robertsvlei - Left-Turn Lane Warrant Chart (Status Quo; 2022)**

*(Based on Figure 14-4, WCG Road Access Management Guidelines, 2020)*

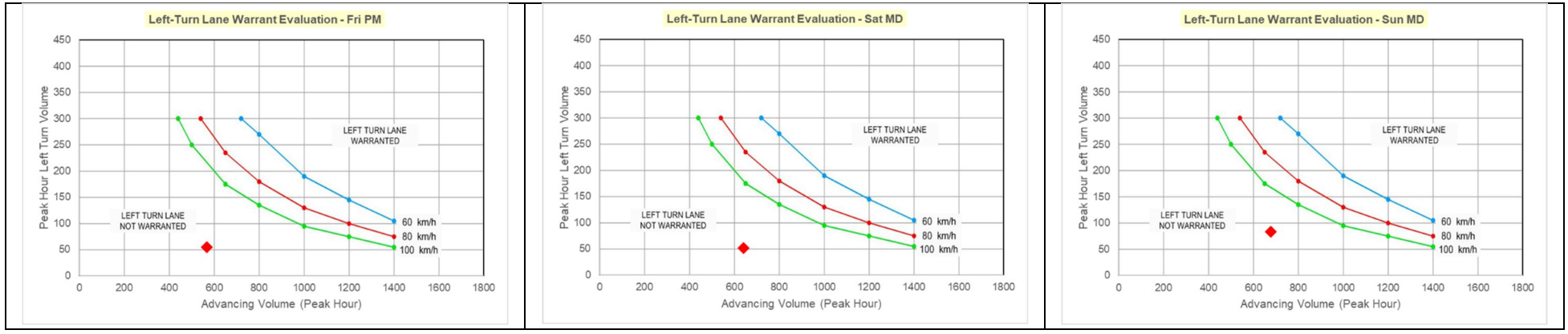



**Figure 7.10: R45 / Robertsvlei - Left-Turn Lane Warrant Chart (Future Traffic; 2029)**

### 7.2.2 R45 / Excelsior Intersection

*(Based on Figure 14-4, WCG Road Access Management Guidelines, 2020)*

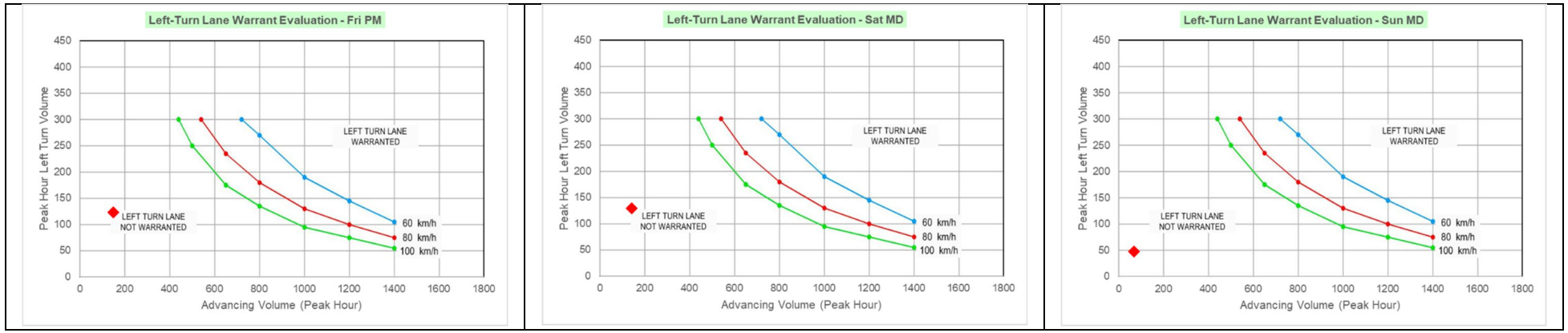



**Figure 7.11: R45 / Excelsior - Left-Turn Lane Warrant Chart (Status Quo; 2022)**

*(Based on Figure 14-4, WCG Road Access Management Guidelines, 2020)*

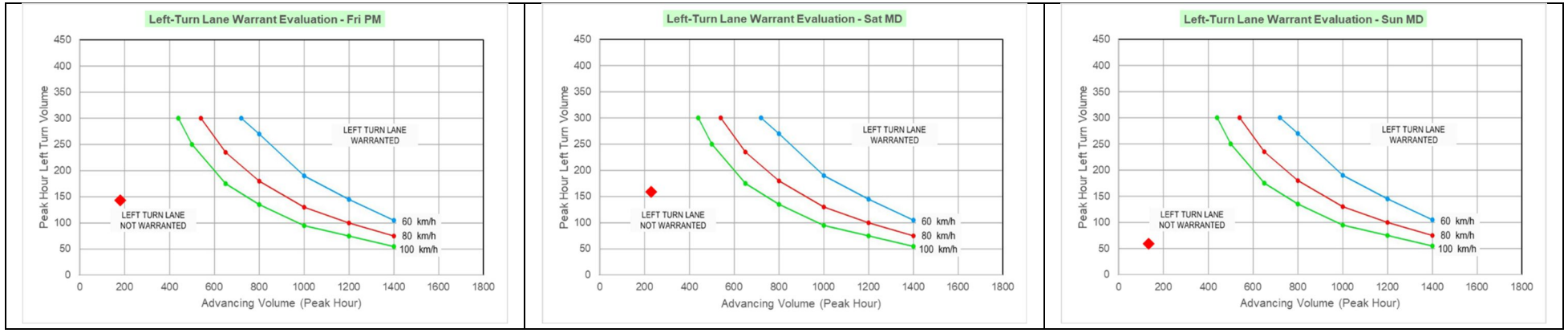



**Figure 7.12: R45 / Excelsior - Left-Turn Lane Warrant Chart (Future Traffic; 2029)**

### 7.2.3 Excelsior / Robertsvlei Intersection

*(Based on Figure 14-4, WCG Road Access Management Guidelines, 2020)*

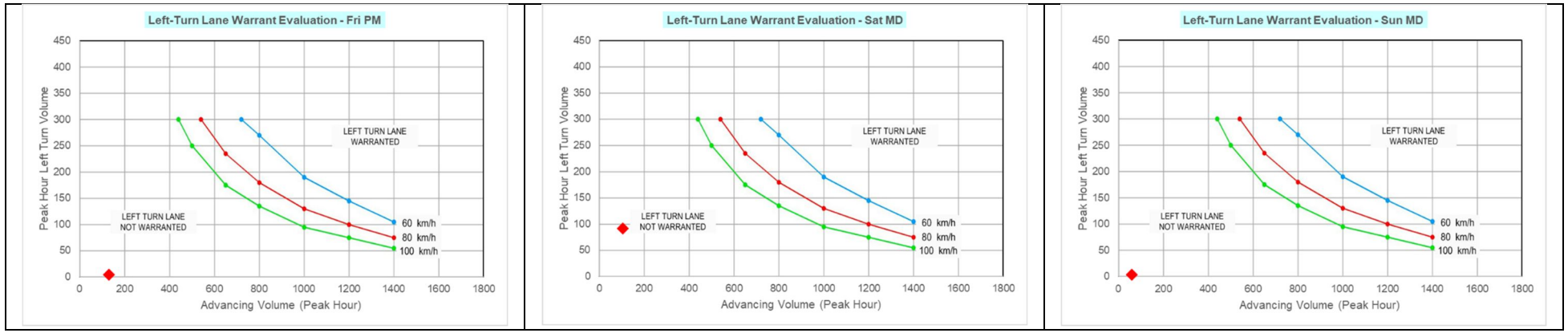



**Figure 7.13: Excelsior / Robertsvlei - Left-Turn Lane Warrant Chart (Status Quo; 2022)**

*(Based on Figure 14-4, WCG Road Access Management Guidelines, 2020)*

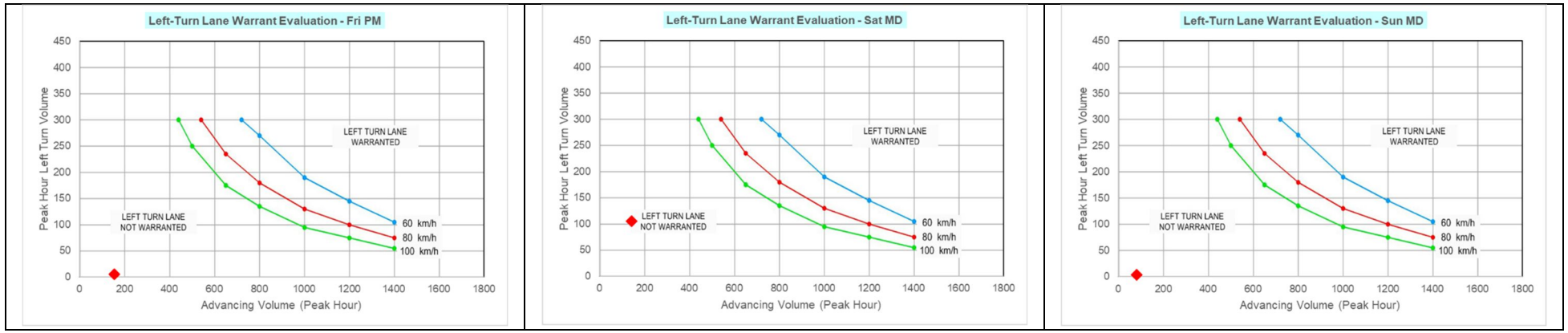



**Figure 7.14: Excelsior / Robertsvlei - Left-Turn Lane Warrant Chart (Future Traffic; 2029)**

### 7.2.4 Lambrechts / Haute Cabrière Intersection

*(Based on Figure 14-4, WCG Road Access Management Guidelines, 2020)*

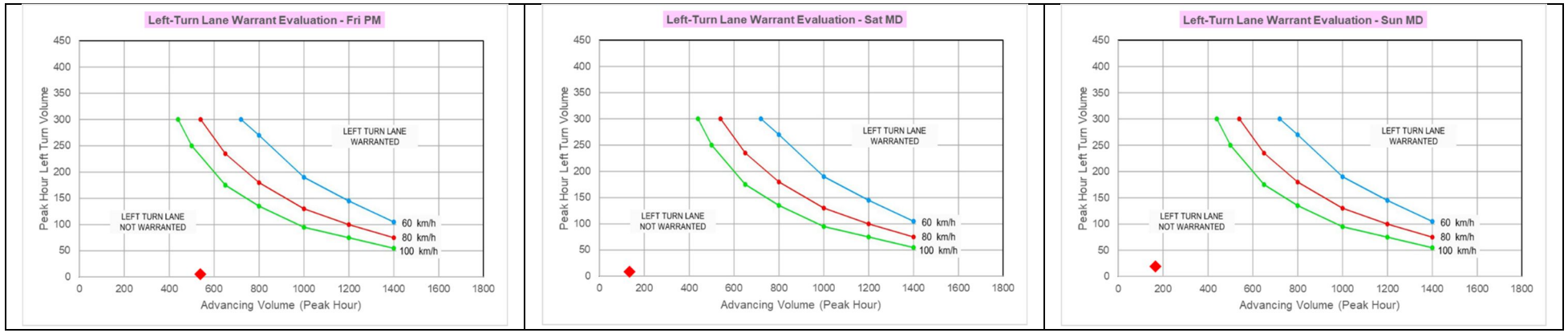



**Figure 7.15: Lambrechts / Haute Cabrière - Left-Turn Lane Warrant Chart (Status Quo; 2022)**

*(Based on Figure 14-4, WCG Road Access Management Guidelines, 2020)*

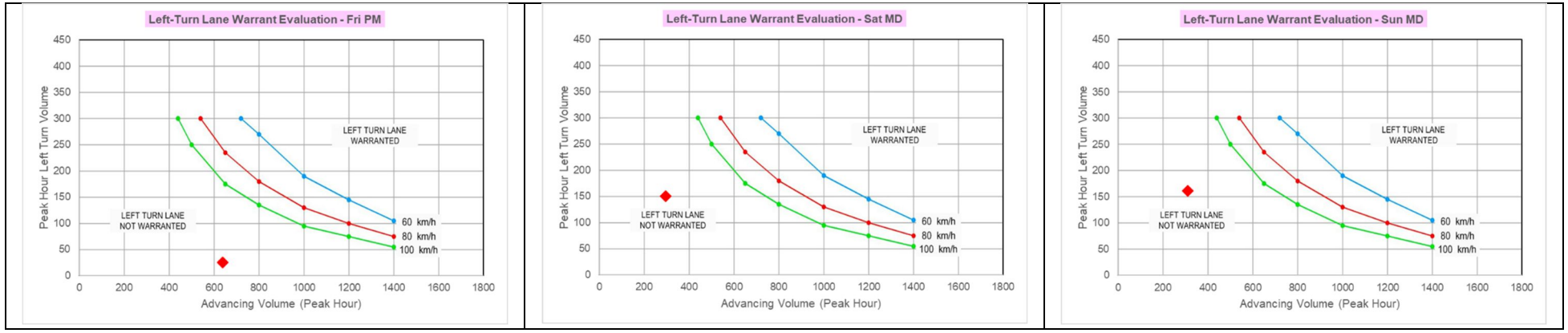



**Figure 7.16: Lambrechts / Haute Cabrière - Left-Turn Lane Warrant Chart (Future Traffic; 2029)**

### 7.2.5 Conclusions

Based on the left-turn lane warrant evaluation as per the *WCG Road Access Management Guidelines (dated 2020)* the following conclusions can be drawn:

- A left-turn lane is not warranted at the R45 / Robertsvlei Intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

- A left-turn lane is not warranted at the R45 / Excelsior intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

- A left-turn lane is not warranted at the Excelsior / Robertsvlei intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

- A left-turn lane is not warranted at the Lambrechts / *Haute Cabrière* intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

However, the developer will review and consider upgrading the Lambrechts / *Haute Cabrière* intersection and construct a left-turn lane and right-turn lane at their own cost to enhance the safety at the access to *Haute Cabrière*, especially in terms of vehicles travelling down from the direction of the mountain pass. Site Development Plans are shown in **Appendix D** (also showing the upgraded access to *Haute Cabrière* off Lambrechts Road).

# 8. PARKING & CIRCULATION

## 8.1 Existing Parking Provision

Based on the egress and ingress movements counted during the traffic survey, the total existing peak on-site parking demand was estimated as 27 bays during the Sunday peak period on 20 March 2022. However, based on previous experience for other days of the year, the parking demand could be in excess of this number.

There is adequate parking available on-site in terms of the existing land use components of the site.

**Figure 8.1** shows the existing parking areas (yellow, blue and green) that provide parking for a total of ±43 vehicles. There is potential to provide more parking within the yellow area. This is a gravelled area where the parking bays are not formalised.

**Figure 8.1: Existing Parking Provision at Haute Cabrière**

The existing parking provision is ±43 parking bays (see **Figure 8.1**) for ±1600m² (see **Table 2.1**). Based on these numbers the parking provision calculates to ±2.7 bays / 100m², which is considered adequate for the existing operations given the use of public transport (i.e., Wine Tram) to travel to/from the site in combination with private transport.

## 8.2 Proposed Parking Provision (Off-Peak Periods)

The additional parking requirements for the proposed development during the cableway's off-peak periods were estimated based on the minimum parking requirements of the Stellenbosch Municipality Zoning Scheme By-Law, 2019. **Table 8.1** summarises the By-Law parking requirements.

**Table 8.1: Parking Requirements during Off-Peak Season (Stellenbosch Municipality Zoning Scheme By-Law, 2019)**

| Land Use Components | Estimated GLA (m²) | Parking Requirement (Stellenbosch Municipality Zoning Scheme By-Law, 2019) | No. of Additional Parking Bays Required as per By-Law |
|---|---|---|---|
| **Lower Station** | | | |
| Reception and upstairs office + Ticket office | 236 (198+38) | 4 bays / 100m² | 10 |
| Café / Coffee Shop | 114 | 4 bays / 100m² | 5 |
| Outdoor concrete seating area | 55 | 0.25 bays / seat* | 10 |
| **Top Station** | | | |
| Curio / Souvenir Shop | 52 | 4 bays / 100m² | 2 |
| Adventure Centre / Kiosk | 43 | 4 bays / 100m² | 2 |

| Land Use Components | Estimated GLA (m²) | Parking Requirement (Stellenbosch Municipality Zoning Scheme By-Law, 2019) | No. of Additional Parking Bays Required as per By-Law |
|---|---|---|---|
| Enviro & Heritage Centre | 88 | 4 bays / 100m² | 4 |
| Franschhoek Vignerons Wine Bar | 129 | 4 bays / 100m² | 6 |
| Restaurant (all day Café) | 198 | 4 bays / 100m² | 8 |
| Restaurant (potential fine dining restaurant) | 279 | 4 bays / 100m² | 12 |
| | | **Total No. of Bays** | **59** |

*It is assumed that each seat will take up ±1.5m²

The actual parking demand during the cableway's off-peak periods will be less than the By-Law requirement of 59 bays as visitors to the site make use of public transport such as the wine tram and ubers in addition to private transport.

Tour buses might also transport cableway visitors to the area during off-peak periods, but large tour buses are planned to park off-site and visitors are to be transferred to a shuttle service or the wine tram to visit *Haute Cabrière*.

The By-Law makes provision for shared parking where two or more land uses are combined on the same land unit to share a common parking area.

A multi-storey parking garage will be constructed as part of the cableway development. The parking garage will be available during off-peak periods. On this basis, there will be sufficient parking available during the cableway off-peak periods. Detail w.r.t. the parking requirements during the cableway's peak season is discussed in the next section.

## 8.3 Proposed Parking Provision & Circulation (Peak Season; 3 000 Visitors per day)

A pragmatic approach is necessary to estimate the parking requirements for the cableway at *Haute Cabrière* for different modes of transport during the cableway's peak periods i.e., December / January / February for 3 000 visitors per day. The assumptions and approaches to estimate the parking demands for each mode of transport will be discussed under separate subheadings. Relevant detail calculations are included in **Appendix E**.

### 8.3.1 Private Cars

Assumption/Principle: Private cars will enter the site at the existing *Haute Cabrière* access off Lambrechts Road and follow the internal road towards the multi-storey parking garage that has three levels of parking.

The parking demand for private cars at the cableway facility equals the accumulation of vehicles on-site over a 12-hour period in peak season based on the hourly arrivals and departures estimated in previous sections of the report (refer to **Figure 4.3**).

No. of Parking Bays Required: Estimated as 111 standard parking bays (incl. 3 X disabled bays minimum)

Proposed Parking Provision: The construction of a multi-storey parking garage as indicated on the layout plans with three levels:

- P1 – 61 bays; and
- P2 & P3 – 87 bays.
- Total: 148 parking bays within the parking garage.

**Figure 8.2** shows the parking layout on the ground level as well as first parking level (P1). **Figure 8.3** shows the parking layout for the second and third levels of the parking garage (P2 & P3). Based on the above, a surplus of 37 parking bays is therefore provided.

### 8.3.2 Ubers (or Similar) & Small Tour Buses / Mini-Buses

Assumption/Principle: Ubers & Mini-Buses will arrive to pick up visitors as well as drop off visitors and circulate through the forecourt of the parking building. The mini-buses will park on-site while the Ubers leave the site.

It is anticipated that 50 X Ubers (or Similar) will arrive in the peak hour during peak season based on 3 000 visitors per day. Similarly, it is anticipated that 8 X Mini-buses will arrive.

If each of the 58 vehicles spent a maximum of 10 minutes in a drop-off / pick-up bay then all the vehicles will be able to make their drop-offs and pick-ups within an hour (as is the peak hour demand).

No. of Drop-off/ Pick-up Bays & On-site Bays Required: Estimated as 9 standard parking bays in the forecourt as a peak demand during the peak season peak hour (for drop-offs / pick-ups by Ubers and Mini-buses). See **Figure 8.2**.

It is further estimated that 9 bays will be required in the parking garage for the on-site parking of the Mini-buses.

Proposed Parking Provision: A covered forecourt will be provided at the multi-storey parking garage as indicated on the layout plans. There will be a surplus of parking bays available in the parking garage where the mini-buses will be able to park once they have dropped passengers.

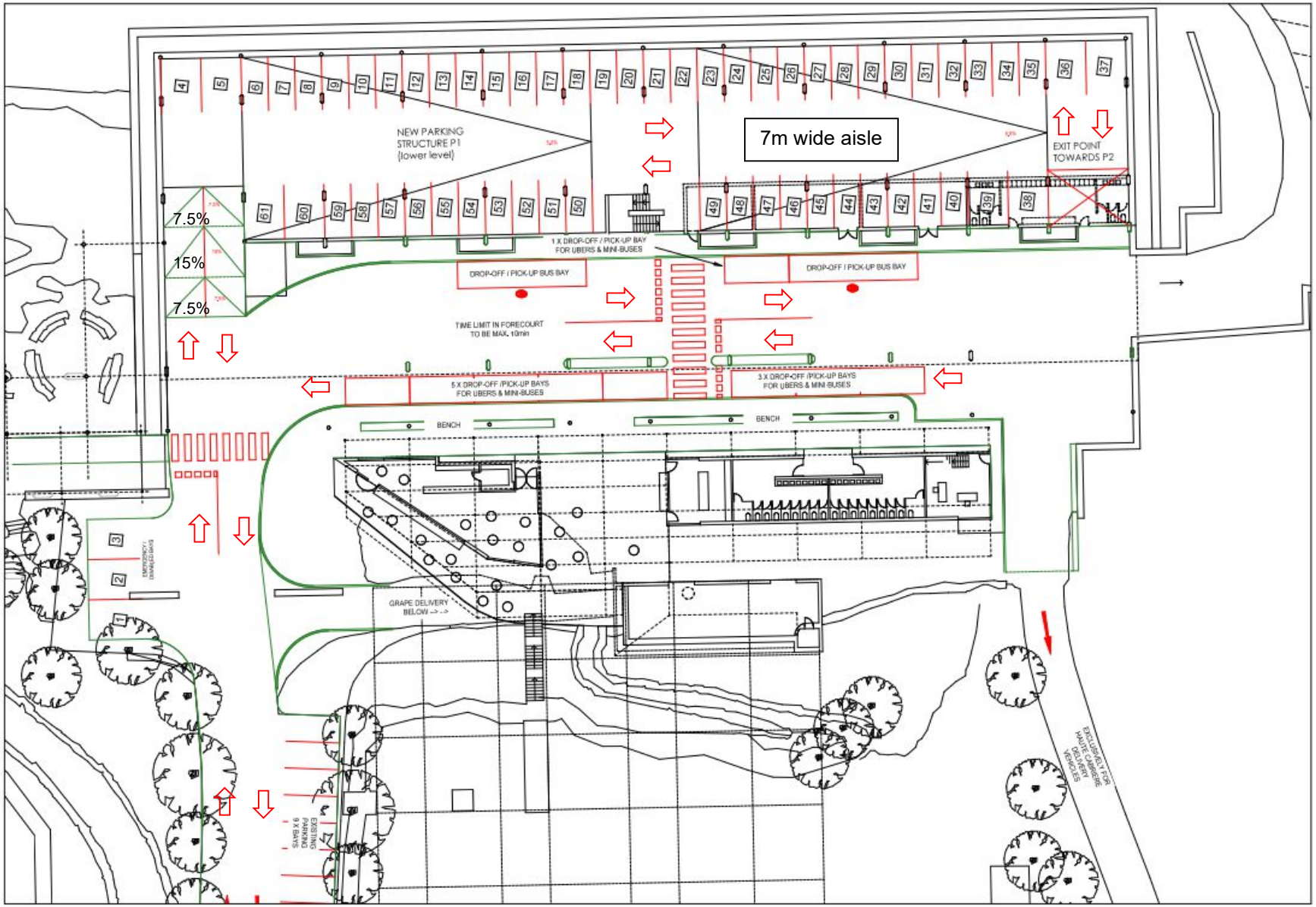



**Figure 8.2: Parking Layout – Ground Level & P1**

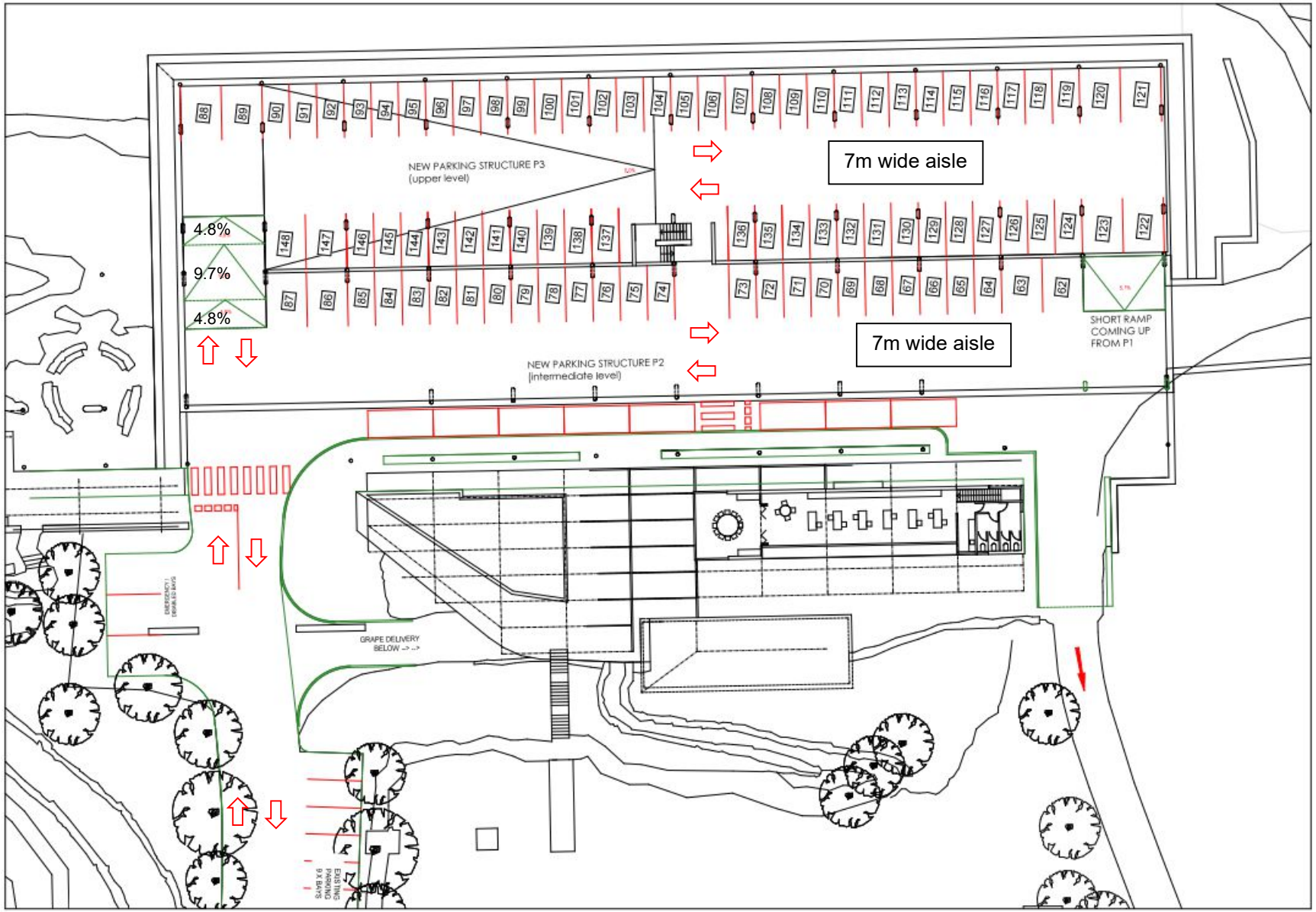



**Figure 8.3: Parking Layout - P2 & P3**

### 8.3.3 Large Tour Buses

A meeting was held with the Stellenbosch Municipality regarding options for off-site parking for the Large Tour Buses that will transport cableway visitors. Large Tour Buses will not park on-site at *Haute Cabrière*.

**Figure 8.4** shows an existing gravelled area where Tour Buses currently park along Excelsior Road adjacent to a property locally known as the "circus grounds". The Municipality indicated that it is not unusual for buses to park there and it would be acceptable if any Large Tour Bus make use of this gravelled area. The "circus grounds" are planned to be developed into a public park and open-air theatre venue, but at the time of this report only a concept layout was available with no further detail planning or a timeframe available in terms of this development's implementation.

**Figure 8.4: Parking for Tour Buses along Excelsior Road**

| | |
|---|---|
| Assumption/Principle: | The off-site parking demand for the Large Tour Buses is assumed to be equal to the accumulation of the number of buses over a 12-hour period in peak season based on the hourly arrivals and departures estimated in previous sections of the report (refer to **Figure 4.3**). |
| No. of Parking Bays Required: | Estimated as 3 X large embayments for large buses. |
| Proposed Parking Provision: | See **Figure 8.4**. |

### 8.3.4 Wine Tram

It is planned that cableway visitors be transferred from the Large Tour Buses to the existing Wine Tram services. A discussion was held with the Wine Tram company to test the possibility of accommodating additional visitors travelling to/from the proposed cableway at *Haute Cabrière*. At the time of this report, the Wine Tram company showed an interest (in principle) to put an agreement in place for the sake of expanding their infrastructure to accommodate additional visitors to/from *Haute Cabrière* for the cableway, but such an agreement has not been formalised.

Should there be no agreements with the Wine Tram to meet the additional traffic demand for the cableway, it would be necessary for the Cableway Company to provide a shuttle service to transport visitors from the parking area for the Large Buses to *Haute Cabrière* and back as needed.

| | |
|---|---|
| Assumption/Principle: | The parking demand for Wine Tram buses at *Haute Cabrière* will be similar to the Uber movements as parking bays will be treated as drop and go / pick-up bays. Wine Tram buses will arrive to pick up visitors as well as drop off visitors and circulate through the forecourt of the parking building. The circulation of the Wine Tram buses through the forecourt will be illustrated elsewhere.<br><br>The arrivals and departures of the Wine Tram buses will depend on the Wine Tram company's set schedule (i.e., the "Pink" and "Grey" lines) and however this schedule might be adjusted in the future to meet the additional demand generated by the cableway at *Haute Cabrière*. |
| No. of Drop-off/ Pick-up Bays Required for Tram: | Will depend whether agreements will be made with the Tram company. |
| Proposed Parking Provision: | Parking building forecourt drop and go zones i.e., two larger bus embayments provided. See **Figure 8.2**. |

### 8.3.5 Emergency Vehicles & Disabled Parking

Three bays (Bays No. 1, 2 and 3) have been designated to be for disabled parking and emergency parking. Their positions are shown in **Figure 8.2** next to the entrance to the parking forecourt. These positions are preferred as they are in close proximity to the pedestrian walkway that leads to the cableway launching area/station. The parking bays are 3.75m wide (opposed to standard bays that are 2.5m wide). Disabled bays should not be demarcated on parking levels P1 to P3 as wheelchair access is only proposed to be accommodated from the ground level.

### 8.3.6 Pedestrian Movements

Pedestrian crossings are proposed as shown in **Figure 8.2** and **Figure 8.3**. The pedestrian crossing within the forecourt provides a direct link from the staircase in the parking building to the pedestrian walkway leading to the cableway launching area/station.

The ramps in the parking garage that links each building level are suitable for vehicular use only (whether valet or public parking) and are not suitable for pedestrians to move from one level to the other. Pedestrians should use the provided staircase as shown on the plans.

### 8.3.7 Vehicle Tracking

**Figure 8.5** shows the proposed circulation through the proposed forecourt at *Haute Cabrière* for the Private Cars (yellow), Small Tour Buses / Mini-buses (green) and Wine Tram buses (blue/purple). The Wine Tram buses have two options to exit the site. The first option is to enter and park at point "A", reverse into "B" and then turn left from "B" towards the main entrance. The second option is to enter and turn into "B", reverse into "A" and then continue straight towards the main entrance.

There are exit points at "A" and "B" onto existing gravel routes exclusively used by *Haute Cabrière* delivery vehicles. However, it is proposed that points "A" and "B" be made available to public traffic in the event of an emergency evacuation.

### 8.3.8 Summary of Parking Requirements in the Peak Hour (Peak Season; 3 000 Visitors per Day)

**Table 8.2** summarises the cableway's peak hour parking requirements during peak season for 3 000 visitors per day. Please note that the parking bay assignments are suggestions only.

**Table 8.2: Summary of Parking Demand in the Peak Hour (Peak Season; 3 000 Visitors per Day)**

| Mode of Transport | On-Site Drop-Off / Pick-Up Bays in the Peak Hour | Longer Duration Parking Demand in the Peak Hour | Minimum Dimensions | Location | Parking Provision | Remarks |
|---|---|---|---|---|---|---|
| Private Cars | - | 111 | Standard Bay (2.5m X 5.0m) | Parking garage | 148 | Surplus of 37 bays |
| Ubers & Small Tour Buses (Mini-buses) | 9 | 9 | Standard Bay (2.5m X 5.0m or 2.5m X 6.0m if parallel) | Forecourt | Forecourt | Mini-buses will make drop-offs in the forecourt and then park in the parking garage |
| Large Tour Buses | - | 3 | Standard Large Bus Embayment | Off-site as per **Figure 8.4** | Off-site as per **Figure 8.4** | - |
| Wine Tram Service or Shuttle Service | 2 | - | Standard Bus Embayment | Forecourt and circulation as per **Figure 8.5**. | Forecourt | - |
| Emergency Vehicles & Disabled Parking | - | 3 | Special Bay (3.75m X 5.0m) | Shown on **Figure 8.2 & 8.3** | Shown on **Figure 8.2 & 8.3** | - |
| **Total** | **11** | **123 Bays On-site + 3 Bays Off-site for Large Buses** | - | - | - | - |

It would be necessary to indicate be means of appropriate signage in the forecourt that vehicles that are dropping off or picking up visitors may not spend more than 10 minutes in the forecourt before exiting the forecourt. This will ensure that the hourly number of vehicles arriving at the forecourt in peak season can all be accommodated.

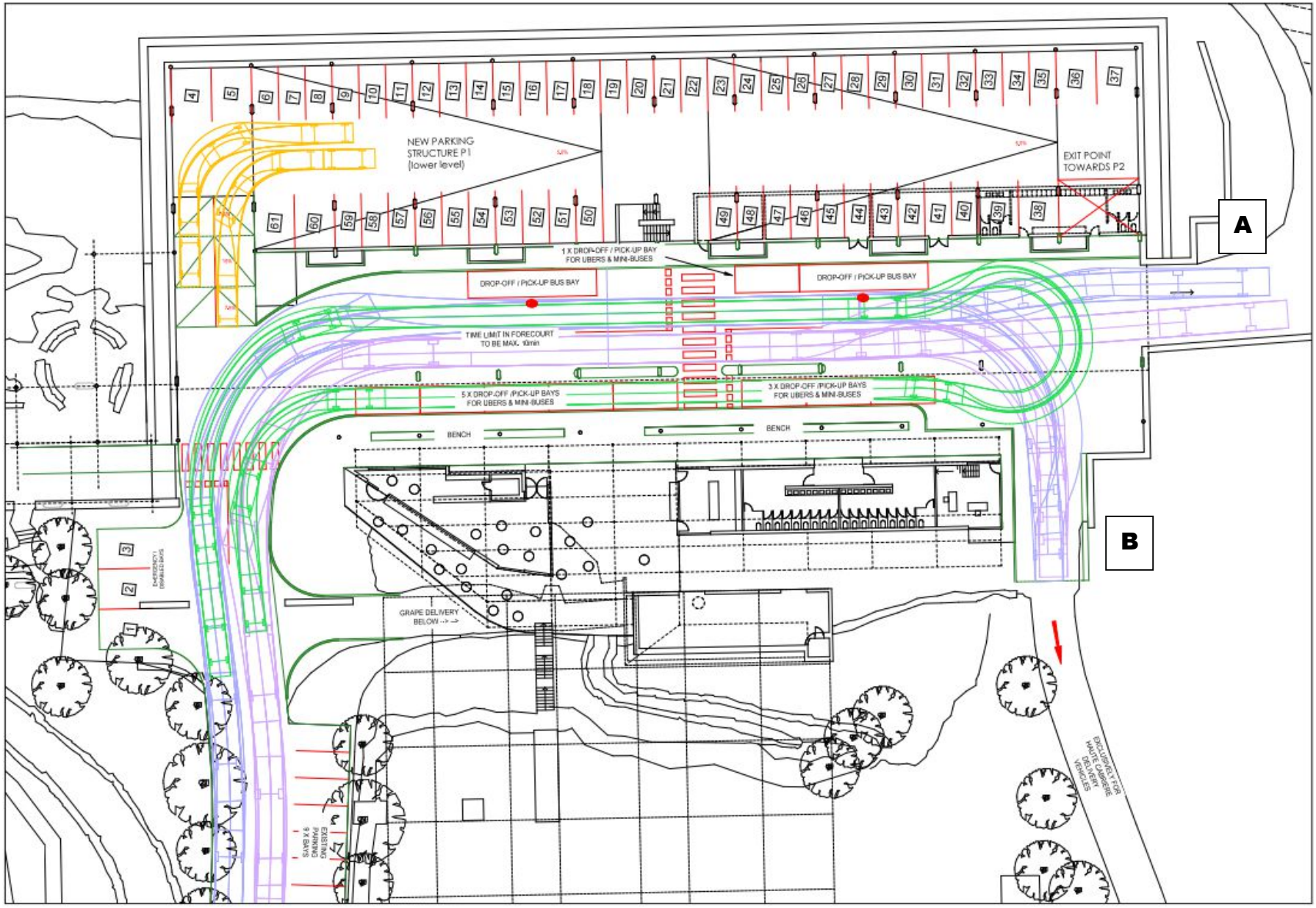



**Figure 8.5: On-Site Vehicle Tracking & Circulation through the Parking Building Forecourt**

# 9. ROAD IMPROVEMENTS

## 9.1 Access to Haute Cabrière

It was previously shown that the turning lane warrants are not met for the future 2029 traffic scenario that includes the peak season cableway development traffic in the peak hour.

The developer will nonetheless review and consider upgrading the existing access to *Haute Cabrière* to improve the safety of the junction in terms of vehicles arriving from the direction of the mountain pass that want to turn right into the site. A left-turn lane and right-turn lane may be constructed, which will be a safety benefit as decelerating vehicles arriving from either the mountain pass direction or Franschhoek direction will be separated from the traffic travelling at higher speeds. The safety benefit will be especially be experienced during the peak season months of the cableway when 3 000 visitors to the cableway are anticipated per day.

The proposed intersection upgrade is shown (in concept) on the layout plans included in **Appendix D**.

## 9.2 Intersection of R45 / Excelsior Road

Based on information received from the Stellenbosch Municipality the R45 / Excelsior intersection was considered for an upgrade to a traffic circle in previous years. However, the concept was not implemented at the time.

Based on the SIDRA analysis results in this report, a traffic circle would significantly increase the intersection capacity. However, the results also show that based on the existing intersection layout and the future 2029 traffic scenario that include the cableway peak season traffic, the operational capacity is anticipated to be adequate. Any intersection upgrades at this location should only be considered should these be approved by the local and provincial authorities and be financed by the road authority and/or DC's if available.

The following table gives the minimum and preferred requirements for a Roundabout as per WCG requirements. A minimum Inscribed Diameter of 26m is acceptable for a single lane, however, 32m is the preferred starting ICD. A larger inscribed diameter implies that the tracking of a wider range of design vehicles can be accommodated.

| *Roundabout type* | *Min ICD* | *Max ICD* | *Preferred start ICD* | |
|---|---|---|---|---|
| | | | *Urban* | *Rural* |
| *Single lane* | *26 m* | *55 m* | *32 m* | *40 m* |
| *Two lane* | *43 m* | *65 m* | *48 m* | *50 m* |

A rough conceptual roundabout is shown in **Figure 9.1** which will need to be considered in more detail if this is supported and found to be viable. The intention of the concept as shown is to give an indication of the potential impact of a Roundabout with an Inscribed Diameter of 32m at the intersection of R45 / Excelsior Road. Based on **Figure 9.1**, it is anticipated that some land would need to be acquired towards the monument and further land might need to be utilised pending detail design.

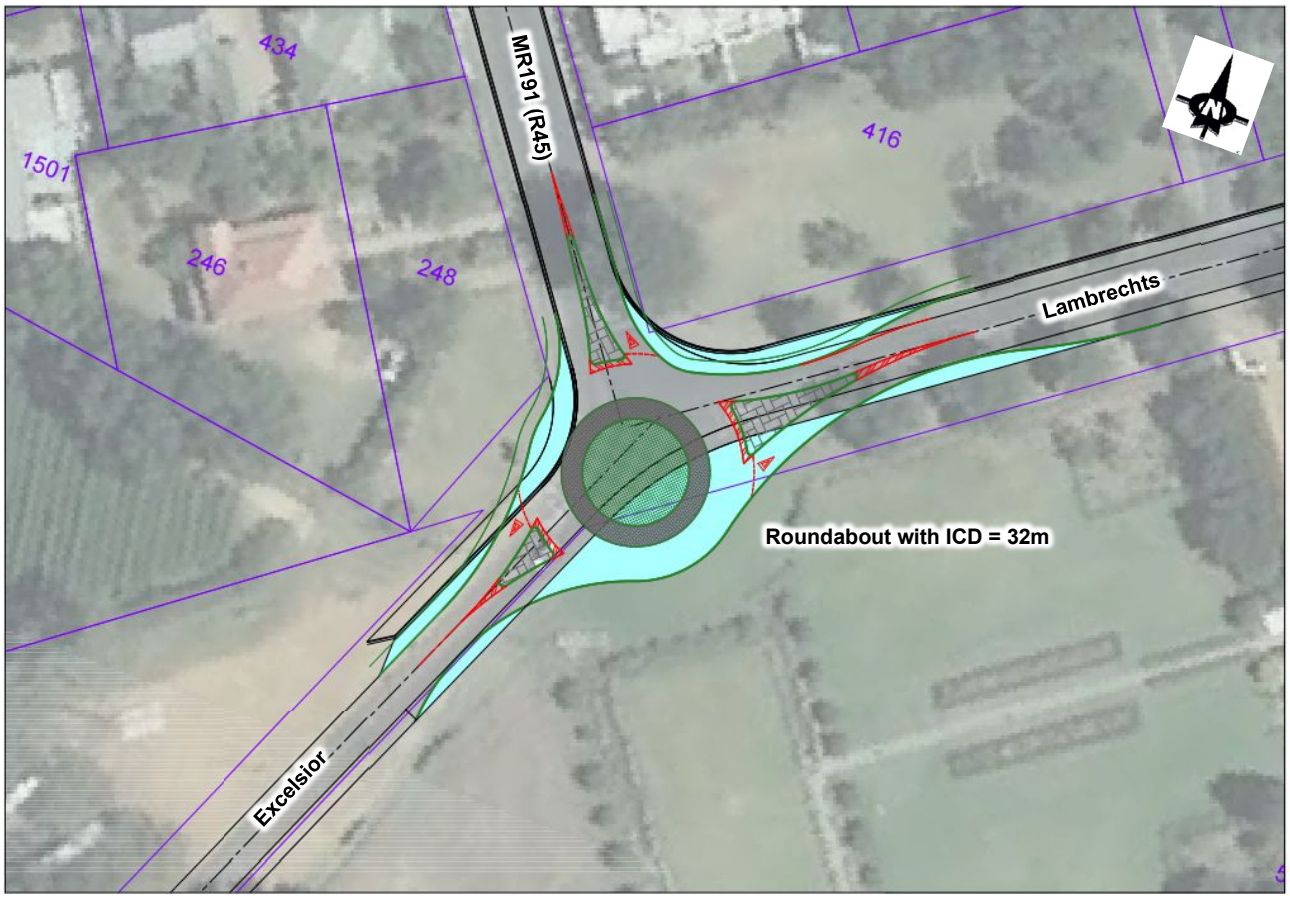



**Figure 9.1: Potential Impact of a 32m ICD Roundabout at R45 / Excelsior**

## 10. CONCLUSIONS

Based on the findings of this study, the following conclusions can be drawn:

- This TIA investigates the traffic impact of the proposed cableway development (i.e., *Franschhoek Skytram)* planned for Erf 1466, Franschhoek that is currently zoned as Agricultural land. The existing development (*Haute Cabrière)* includes a wine cellar, wine tasting facilities and restaurant.

- **Table 2.1** and **Table 2.2** gives a breakdown of the proposed land use components at the Lower and Top Stations. The total new GLA for the Lower and Top Stations amounts to between ±1150m² - ±1350m².

- Traffic data from EStation 5013 at km16.86 along MR191 shows that the peak traffic periods during a typical year can be observed during February/March and November/December and daily volumes fluctuate between 12 000-14 000 vehicles per day during these periods (for pre-Covid19 conditions).

- The 2022 traffic data from January 2022 to June 2022 observed from EStation 5013 shows that the traffic corresponds well with observed pre-Covid19 traffic volumes.

- Background traffic growth was insignificant between 2017-2019. However, a conservative annual growth of 2% was assumed for escalation calculations where applicable.

- Updated traffic counts were conducted at selected key intersections on 18 March 2022 (Friday), 19 March 2022 (Saturday) and 20 March 2022 (Sunday):

    - R45 / Robertsvlei Road;
    - R45 / Excelsior Road;
    - Excelsior Road / Robertsvlei Road; and
    - Lambrechts Road / *Haute Cabrière*.

- The highest traffic volumes were observed during the Friday PM peak period during the March 2022 survey. Midday peak traffic was observed for the Saturday and Sunday. The latest traffic data for March 2022 corresponds well with historic traffic (pre-Covid19) and was considered suitable for the purpose of assessment as part of this study.

- The following critical peak hours were identified for further assessment based on the hourly traffic distributions observed during the March 2022 survey:

    - Friday, 16:00-17:00; and
    - Saturday/Sunday, 12:00-13:00.

- The existing 2022 traffic was escalated to 2029 volumes (i.e., to a five-year future design horizon) based on a growth of 2% per annum as previously motivated. At the time of this report, it was anticipated that the development would open by earliest 2024. Hence, the design horizon year was taken as 2029.

- The peak hour development trips were estimated for the critical peak hours as previously mentioned. The following approach was followed:

    - Obtain trip data from client-based knowledge and details of other similar facilities;
    - Determine the monthly number of visitors for a typical year (**Figure 4.1**);
    - Determine the hourly number of visitors based on the peak season i.e., 3 000 visitors per day over a 12-hour period (as per the trip data received). A maximum of ±550 visitors can be accommodated on top of the mountain at any time (**Figure 4.2**);
    - Determine the visitor transport modal split per hour as per **Table 4.2**. The applicable modes of transport are Private Cars, Ubers (or similar), Small Tour Buses (Mini-buses), Large Tour Buses and the existing Wine Tram service in Franschhoek.
    - Convert the estimated visitor trips to vehicular trips based on the assumed vehicle occupancies in **Table 4.2**. The hourly vehicular trips in peak season are shown in **Figure 4.3**.

- The total development peak hour trip generation as per **Figure 4.3** is estimated as 328 trips (164 trips IN and 164 trips OUT), but this will increase to 338 trips (169 trips IN and 169 trips OUT) in terms of transferring passengers from large buses to trams or a shuttle service.

- It is planned to have a transfer from Large Tour Buses to the Wine Trams or a shuttle bus service along the route. The Large Buses will park off-site.

- It was assumed in this study (to be conservative) that all development trips would be primary (new) trips. However, allowance was made for “Internal trips” with their origins within Franschhoek.

- The estimated development trips were distributed over the local road network in a pragmatic way.

- The future traffic scenarios were estimated by adding the assigned development trips for the proposed cableway to the existing 2022 traffic volumes and background 2029 traffic volumes to obtain total traffic for 2022 and total traffic for 2029 which is the design horizon.

- Capacity analysis was done with SIDRA INTERSECTION 9.1 for the four key intersections based on the following traffic scenarios:

    - Status quo 2022;
    - Background traffic 2029; and
    - Future total traffic 2029.

- The following conclusions can be drawn from the SIDRA Analysis results (**Chapter 6**):

    - Status Quo 2022 – All intersections are currently operating adequately during all peak hours.

    - Background Traffic 2029 – All intersections are anticipated to operate adequately during all peak hours in 2029 based on only background traffic growth and no peak season cableway development traffic.

    - Future Traffic 2029 – It is anticipated that the right-turn from the R45 at the R45 / Excelsior AWSC intersection will operate at LOS E (i.e., unacceptable delays) during the 2029 Friday PM Peak hour in peak season based on background traffic growth and including peak season cableway development traffic. All other intersections are anticipated to operate at adequate LOS and to experience acceptable delays.

    - The R45/ Excelsior AWSC intersection could be considered for an intersection upgrade by the year 2029, but an upgrade here will have to be financed by the road authority and/or with DCs if available. The overall intersection operational capacity is still adequate after adding the cableway peak season traffic and considering the design horizon of 5-years post opening of the cableway. Based on information received from the Stellenbosch Municipality the R45 / Excelsior intersection was considered for an upgrade to a traffic circle in previous years. However, the concept was not implemented at the time.

- The following conclusions can be drawn from the Right-Turn Lane Warrant Evaluation (**Chapter 7**):

    - The existing traffic volumes (i.e., status quo 2022 traffic) warrant a right-turn lane at the R45 / Robertsvlei Intersection. Improvements at this intersection should be carried out by the road authority and should not be a Developer's cost. It should however be noted that there are currently surfaced shoulders on the R45 that allow through traffic to pass the traffic waiting to turn right.

    - A right-turn lane is not warranted at the R45 / Excelsior intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

    - A right-turn lane is not warranted at the Excelsior / Robertsvlei intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

    - A right-turn lane is not warranted at the Lambrechts / *Haute Cabrière* intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

- The following conclusions can be drawn from the Left-Turn Lane Warrant Evaluation (**Chapter 7**):

    - A left-turn lane is not warranted at the R45 / Robertsvlei Intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

- A left-turn lane is not warranted at the R45 / Excelsior intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

- A left-turn lane is not warranted at the Excelsior / Robertsvlei intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

- A left-turn lane is not warranted at the Lambrechts / *Haute Cabrière* intersection. This is based on existing traffic volumes as well as the estimated future traffic scenario for the design horizon in 2029 that includes the peak season cableway development traffic.

- There is adequate parking available on-site in terms of the existing land use components of the site.

- After the cableway opens, and after constructing the parking garage as part of the cableway development, there will be adequate parking available during the off-peak season of the cableway. The minimum parking requirements during off-peak season was based on the requirements of the Stellenbosch Municipality Zoning Scheme By-Law, 2019.

- A pragmatic approach was followed to estimate the parking requirements for the cableway for different modes of transport during the cableway's peak periods i.e., December / January / February for 3 000 visitors per day. The parking provision during the cableway's peak season will be adequate. **Table 8.2** gives a summary of the estimated peak season parking requirements in the peak hour.

- It would be necessary to indicate be means of appropriate signage in the forecourt that vehicles that are dropping off or picking up visitors may not spend more than 10 minutes in the forecourt before exiting the forecourt. This will ensure that the hourly number of vehicles arriving at the forecourt in peak season can all be accommodated.

- The vehicle tracking for on-site circulation through the parking garage forecourt is shown in **Figure 8.5**.

- The developer will consider upgrading the access to *Haute Cabrière* by constructing a left-turn lane and right-turn lane at the access as shown on the layout plans in **Appendix D**. Such an upgrade will improve the safety of the intersection.

- **Figure 9.1** shows the potential impact that the construction of an Urban Roundabout with an Inscribed Diameter of 32m might have at the intersection of R45 / Excelsior Road.

## 11. RECOMMENDATIONS

It is recommended that the proposed cableway development known as *Franschhoek Skytram* planned for Erf 1466, Franschhoek be approved from a Traffic Impact perspective as adequate mitigation measures have been proposed as part of this TIA.

Signed by:David Enderby Faure
Signed at:2023-08-08 13:39:19 +02:00
Reason:Witnessing David Enderby Faure

**David Faure** (PrEng)

EFG Engineers (Pty) Ltd

Signed by:Andri De Bruin
Signed at:2023-08-08 11:19:51 +02:00
Reason:Witnessing Andri De Bruin

**Andri de Bruin** (PrEng, MScEng)

EFG Engineers (Pty) Ltd

# APPENDIX A
# Detail Trip Generation Calculations

| | 09:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Up | 100 | 325 | 500 | 500 | 500 | 500 | 350 | 150 | 50 | 25 | 0 | 0 |
| Down | 0 | 50 | 371 | 450 | 500 | 500 | 500 | 350 | 150 | 75 | 54 | 0 |
| Cumulative Up | 100 | 425 | 925 | 1425 | 1925 | 2425 | 2775 | 2925 | 2975 | 3000 | 3000 | 3000 |
| Cumulative Down | 0 | 50 | 421 | 871 | 1371 | 1871 | 2371 | 2721 | 2871 | 2946 | 3000 | 3000 |
| **On the Mountain** | **100** | **375** | **504** | **554** | **554** | **554** | **404** | **204** | **104** | **54** | **0** | **0** |

| **Private Car (park on site)** | **09:00** | **10:00** | **11:00** | **12:00** | **13:00** | **14:00** | **15:00** | **16:00** | **17:00** | **18:00** | **19:00** | **20:00** | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arrive | 20 | 65 | 100 | 100 | 100 | 100 | 70 | 30 | 10 | 5 | 0 | 0 | 600 |
| Depart | 0 | 10 | 74 | 90 | 100 | 100 | 100 | 70 | 30 | 15 | 11 | 0 | 600 |
| **Total** | **20** | **75** | **174** | **190** | **200** | **200** | **170** | **100** | **40** | **20** | **11** | **0** | |

| **Uber/Similar (drop and go)** | **09:00** | **10:00** | **11:00** | **12:00** | **13:00** | **14:00** | **15:00** | **16:00** | **17:00** | **18:00** | **19:00** | **20:00** | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arrive (Drop) | 5 | 16 | 25 | 25 | 25 | 25 | 17 | 8 | 3 | 1 | 0 | 0 | 150 |
| Depart (Drop) | 5 | 16 | 25 | 25 | 25 | 25 | 17 | 8 | 3 | 1 | 0 | 0 | 150 |
| Arrive (Collect) | 0 | 3 | 18 | 22 | 25 | 25 | 25 | 17 | 8 | 4 | 3 | 0 | 150 |
| Depart (Collect) | 0 | 3 | 18 | 22 | 25 | 25 | 25 | 17 | 8 | 4 | 3 | 0 | 150 |
| **Total** | **10** | **38** | **86** | **94** | **100** | **100** | **84** | **50** | **22** | **10** | **6** | **0** | |

| **Small Tour Bus (park on site)** | **09:00** | **10:00** | **11:00** | **12:00** | **13:00** | **14:00** | **15:00** | **16:00** | **17:00** | **18:00** | **19:00** | **20:00** | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arrive | 2 | 5 | 8 | 8 | 8 | 8 | 5 | 2 | 1 | 0 | 0 | 0 | 47 |
| Depart | 0 | 1 | 6 | 7 | 8 | 8 | 8 | 5 | 2 | 1 | 1 | 0 | 47 |
| **Total** | **2** | **6** | **14** | **15** | **16** | **16** | **13** | **7** | **3** | **1** | **1** | **0** | |

| **Large Tour Bus (arrive, park off-site, de** | **09:00** | **10:00** | **11:00** | **12:00** | **13:00** | **14:00** | **15:00** | **16:00** | **17:00** | **18:00** | **19:00** | **20:00** | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arrive | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 0 | 0 | 0 | 0 | 19 |
| Depart | 0 | 0 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 0 | 0 | 0 | 19 |
| **Total** | **1** | **2** | **6** | **6** | **6** | **6** | **6** | **4** | **1** | **0** | **0** | **0** | |

| **Tram Bus (drop and go)** | **09:00** | **10:00** | **11:00** | **12:00** | **13:00** | **14:00** | **15:00** | **16:00** | **17:00** | **18:00** | **19:00** | **20:00** | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Arrive (Drop) | 1 | 3 | 4 | 4 | 4 | 4 | 3 | 1 | 0 | 0 | 0 | 0 | 24 |
| Depart (Drop) | 1 | 3 | 4 | 4 | 4 | 4 | 3 | 1 | 0 | 0 | 0 | 0 | 24 |
| Arrive (Collect) | 0 | 0 | 3 | 4 | 4 | 4 | 4 | 3 | 1 | 1 | 0 | 0 | 24 |
| Depart (Collect) | 0 | 0 | 3 | 4 | 4 | 4 | 4 | 3 | 1 | 1 | 0 | 0 | 24 |
| **Total** | **2** | **6** | **14** | **16** | **16** | **16** | **14** | **8** | **2** | **2** | **0** | **0** | |

**Note:**

Should agreements not be put in place with the Wine Tram company, a shuttle service will need to be hired, else, invested in by the Cableway Company.

| New Trips per Mode | 09:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Private Car IN | 20 | 65 | 100 | 100 | 100 | 100 | 70 | 30 | 10 | 5 | 0 | 0 |
| Private Car OUT | 0 | 10 | 74 | 90 | 100 | 100 | 100 | 70 | 30 | 15 | 11 | 0 |
| Uber/Similar IN | 5 | 19 | 43 | 47 | 50 | 50 | 42 | 25 | 11 | 5 | 3 | 0 |
| Uber/Similar OUT | 5 | 19 | 43 | 47 | 50 | 50 | 42 | 25 | 11 | 5 | 3 | 0 |
| Small Tour Bus IN | 2 | 5 | 8 | 8 | 8 | 8 | 5 | 2 | 1 | 0 | 0 | 0 |
| Small Tour Bus OUT | 0 | 1 | 6 | 7 | 8 | 8 | 8 | 5 | 2 | 1 | 1 | 0 |
| Large Tour Bus IN | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 0 | 0 | 0 | 0 |
| Large Tour Bus OUT | 0 | 0 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 0 | 0 | 0 |
| Tram Bus IN | 1 | 3 | 7 | 8 | 8 | 8 | 7 | 4 | 1 | 1 | 0 | 0 |
| Tram Bus OUT | 1 | 3 | 7 | 8 | 8 | 8 | 7 | 4 | 1 | 1 | 0 | 0 |
| Total IN | 29 | 94 | 161 | 166 | 169 | 169 | 127 | 62 | 23 | 11 | 3 | 0 |
| Total OUT | 6 | 33 | 133 | 155 | 169 | 169 | 160 | 107 | 45 | 22 | 15 | 0 |
| **Total Trips** | **35** | **127** | **294** | **321** | **338** | **338** | **287** | **169** | **68** | **33** | **18** | **0** |

# APPENDIX B
# Development Trip Distribution Diagrams

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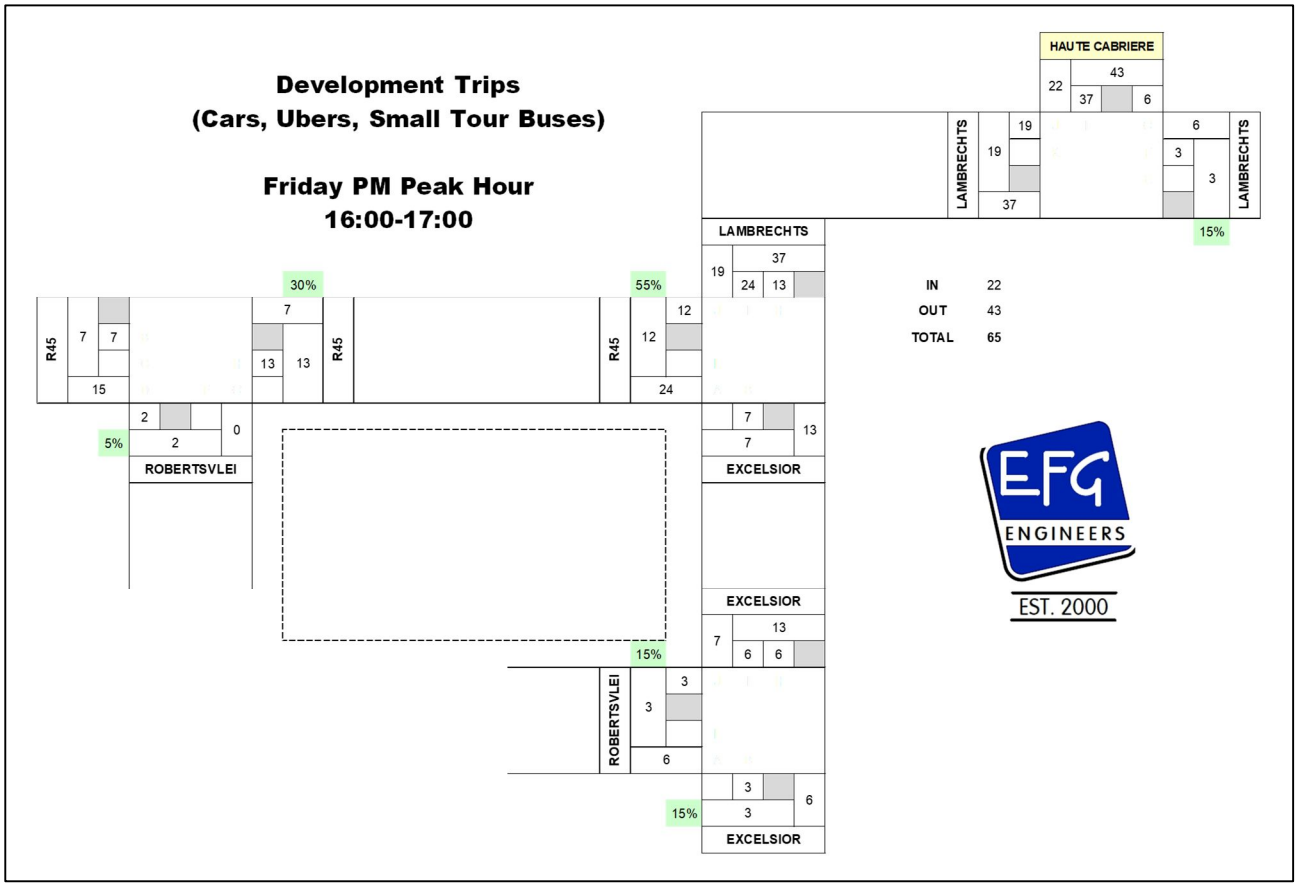
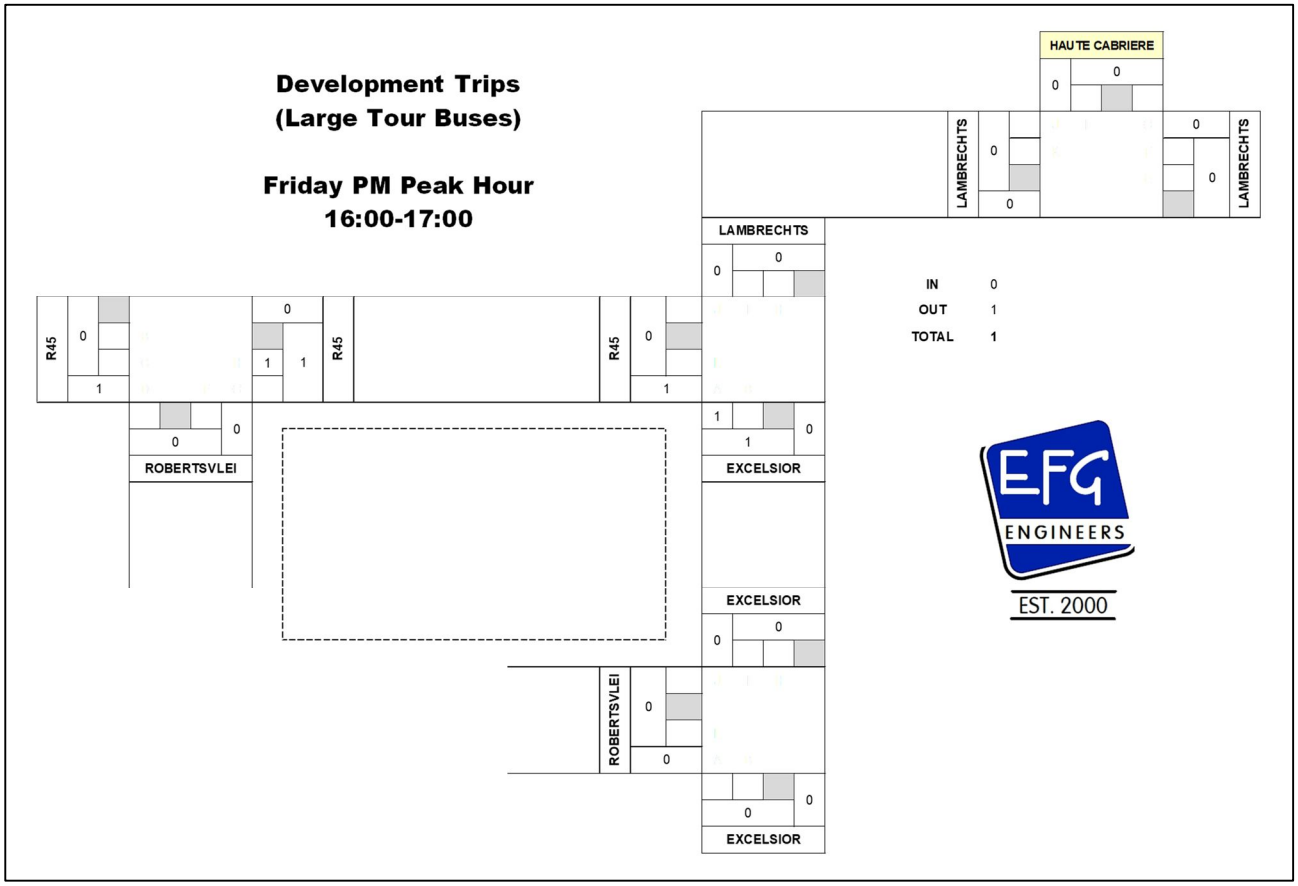
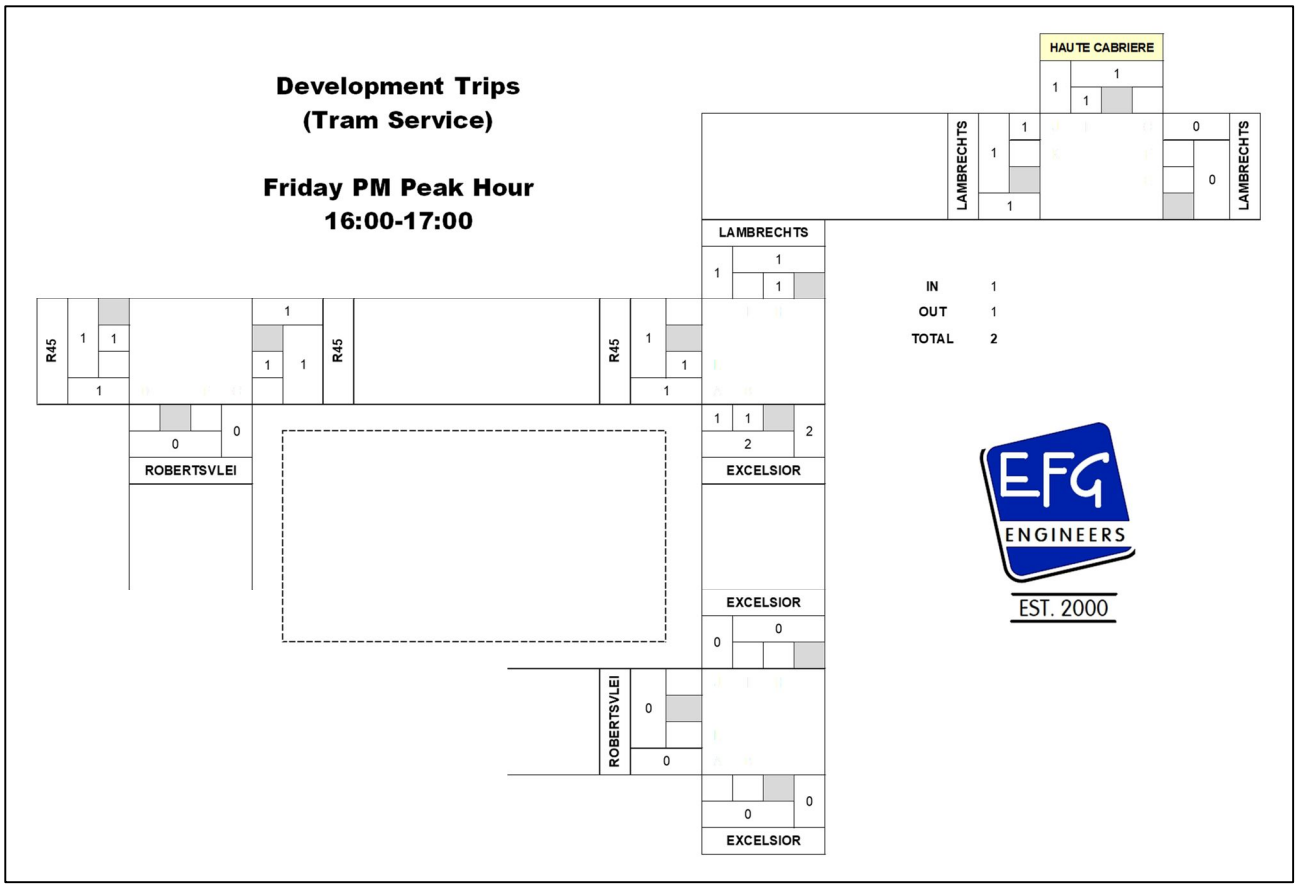
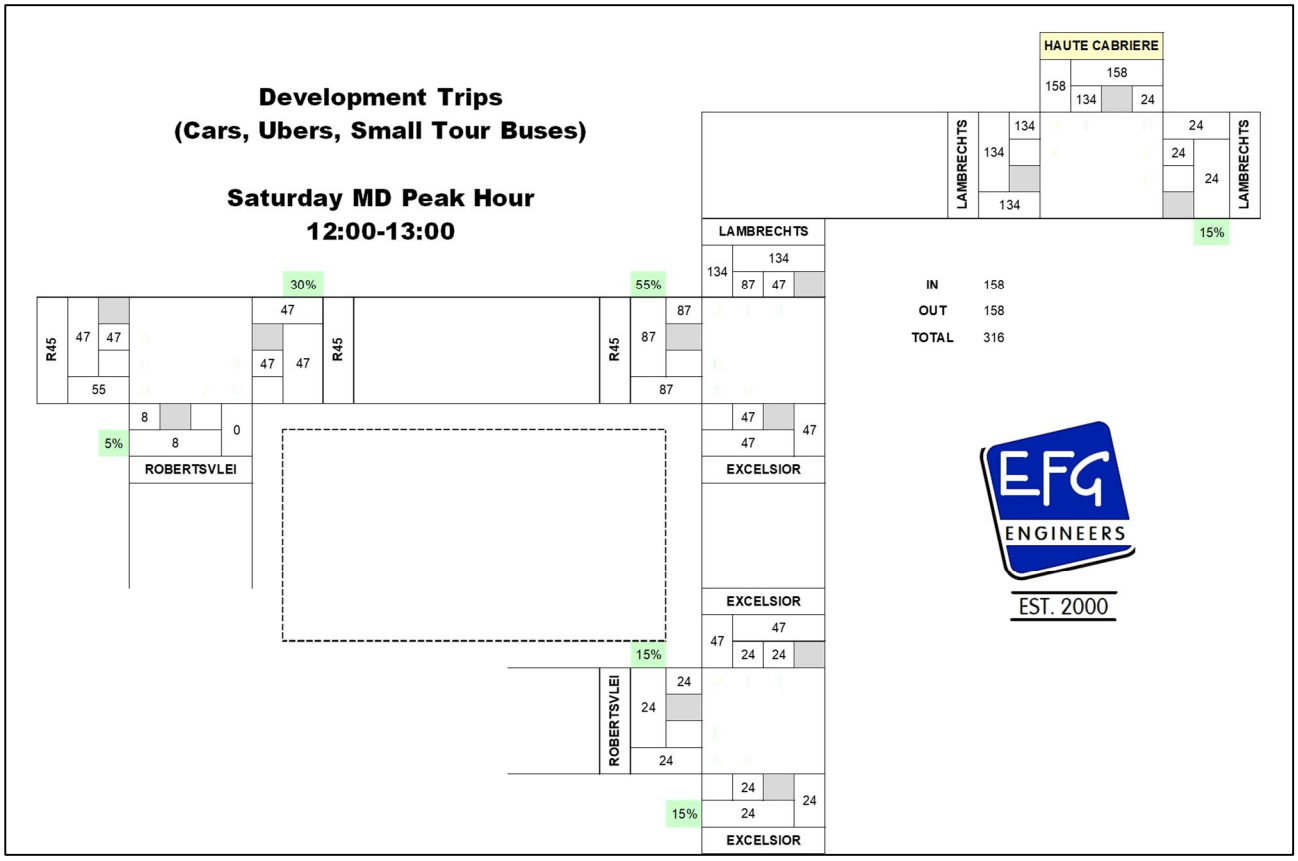
# Friday PM Peak Hour

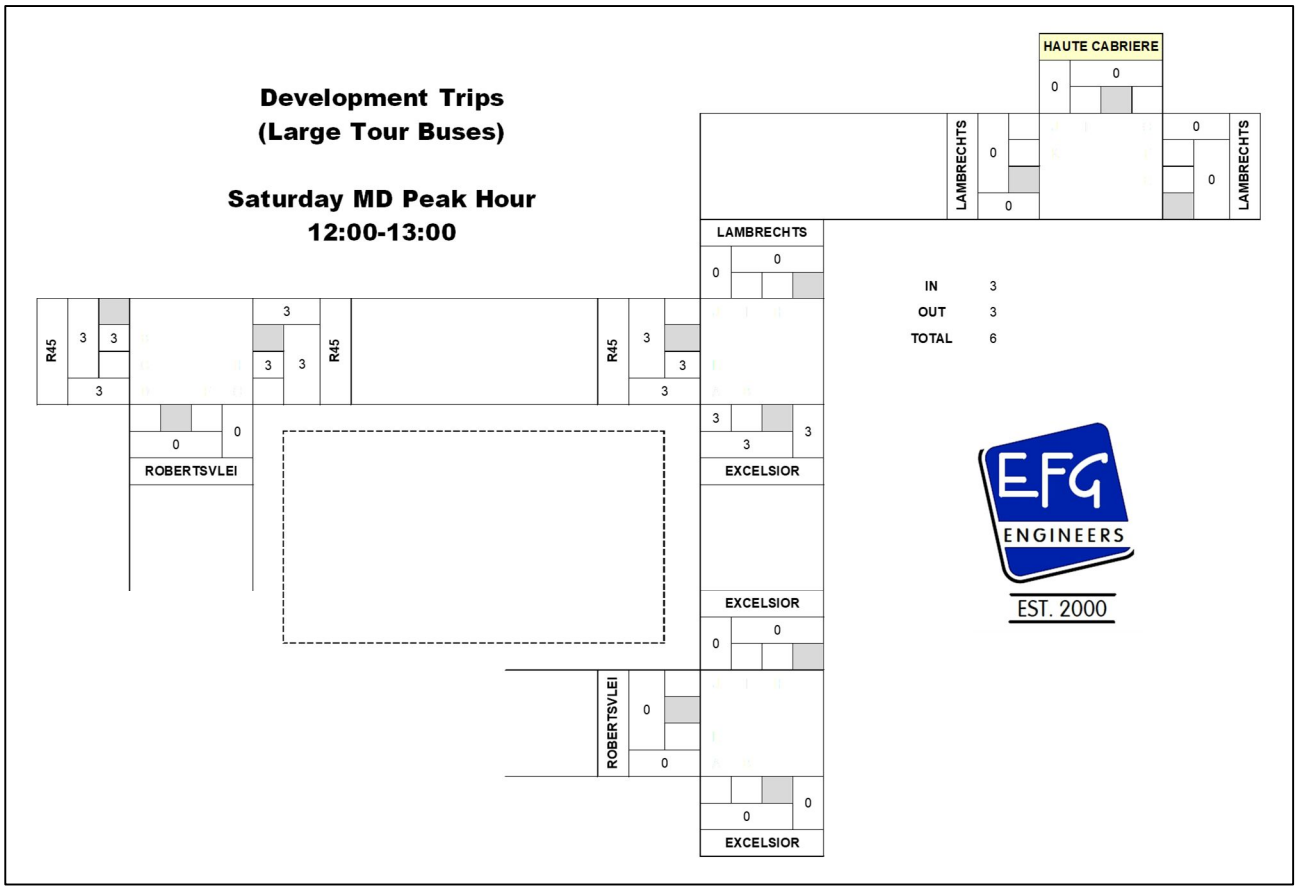


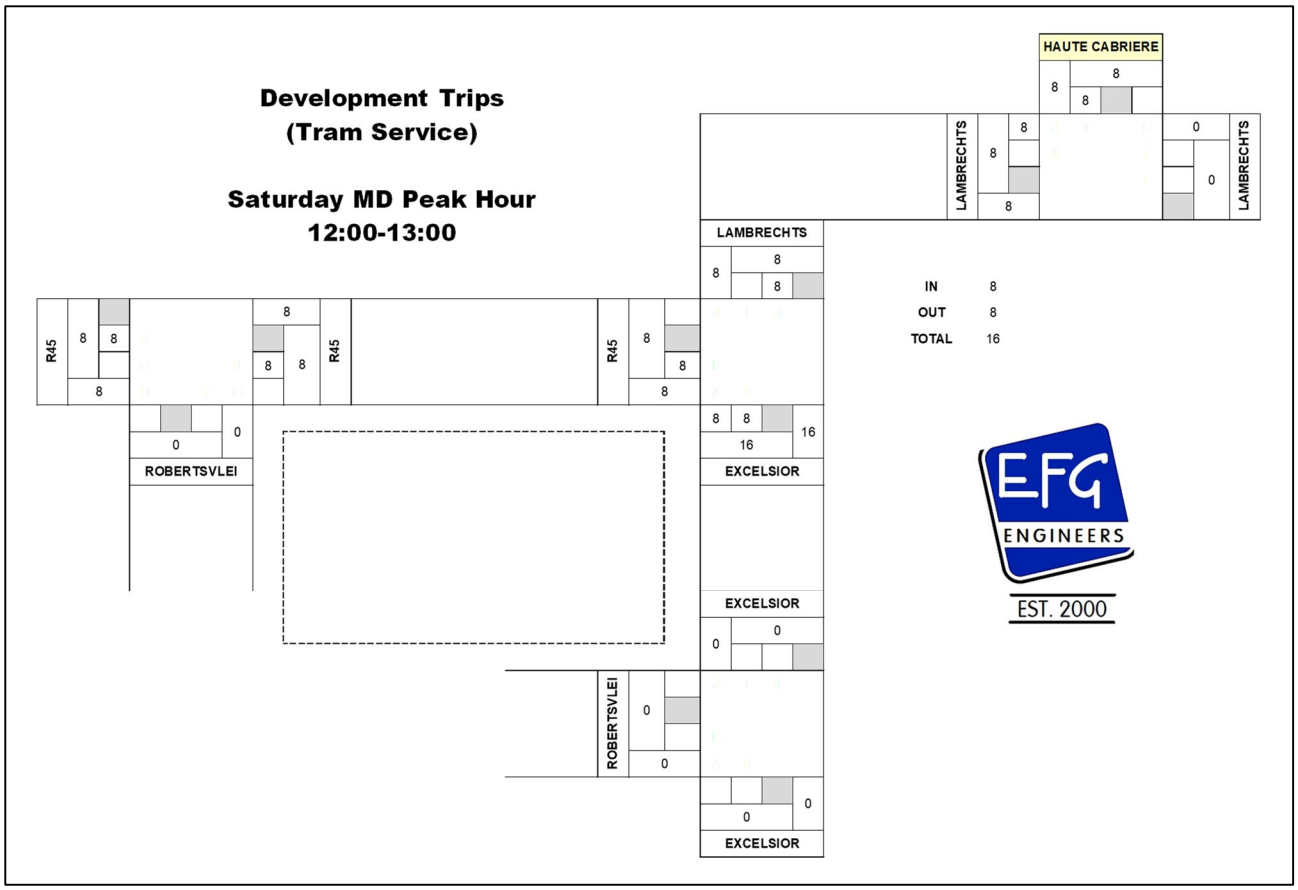




Development Trips
(Tram Service)
Friday PM Peak Hour
16:00-17:00
HAUTE CABRIERE
LAMBRECHTS
LAMBRECHTS
LAMBRECHTS
R45
R45
R45
ROBERTSVLEI
ROBERTSVLEI
EXCELSIOR
EXCELSIOR
EXCELSIOR
IN 1
OUT 1
TOTAL 2
EFG
ENGINEERS
EST. 2000

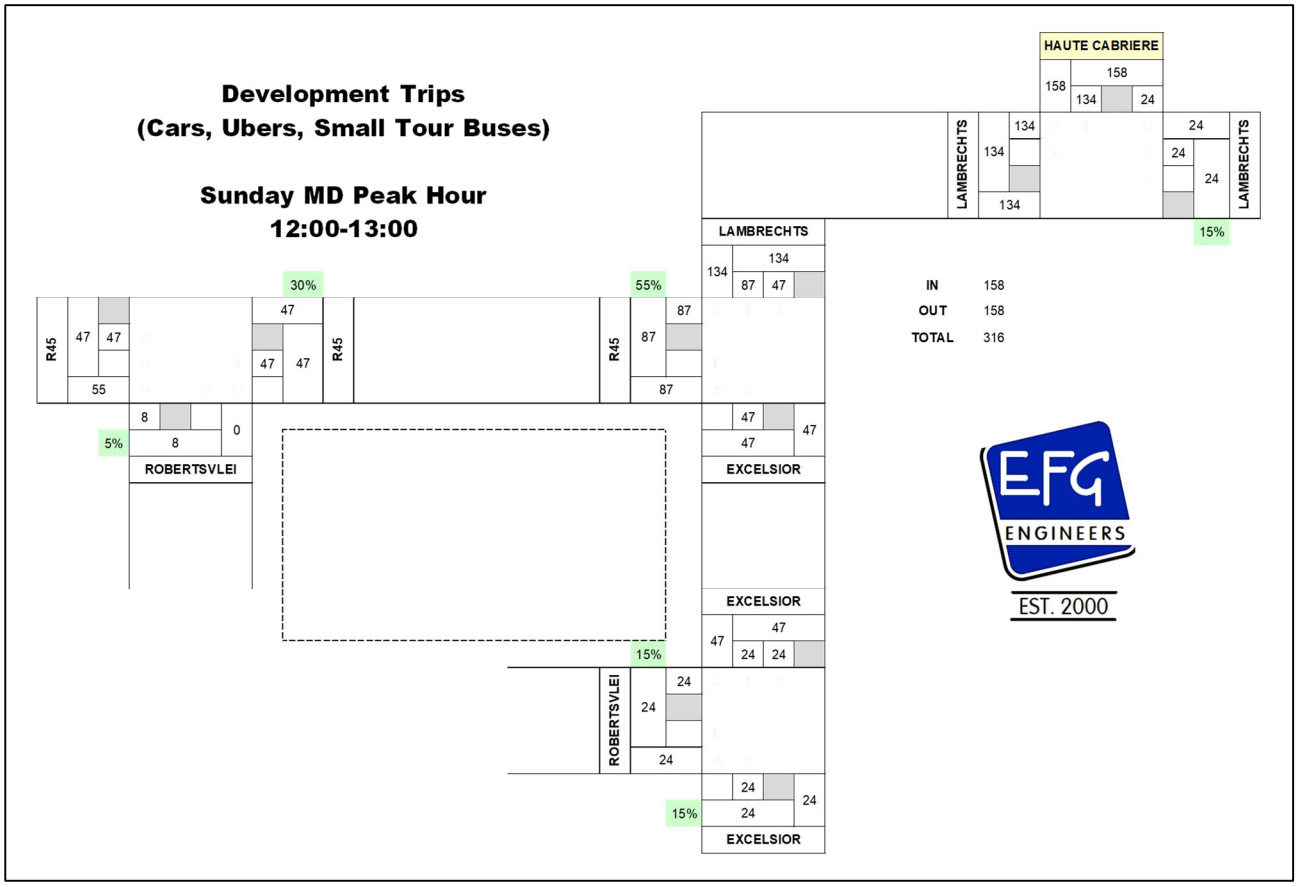
# Saturday MD Peak Hour

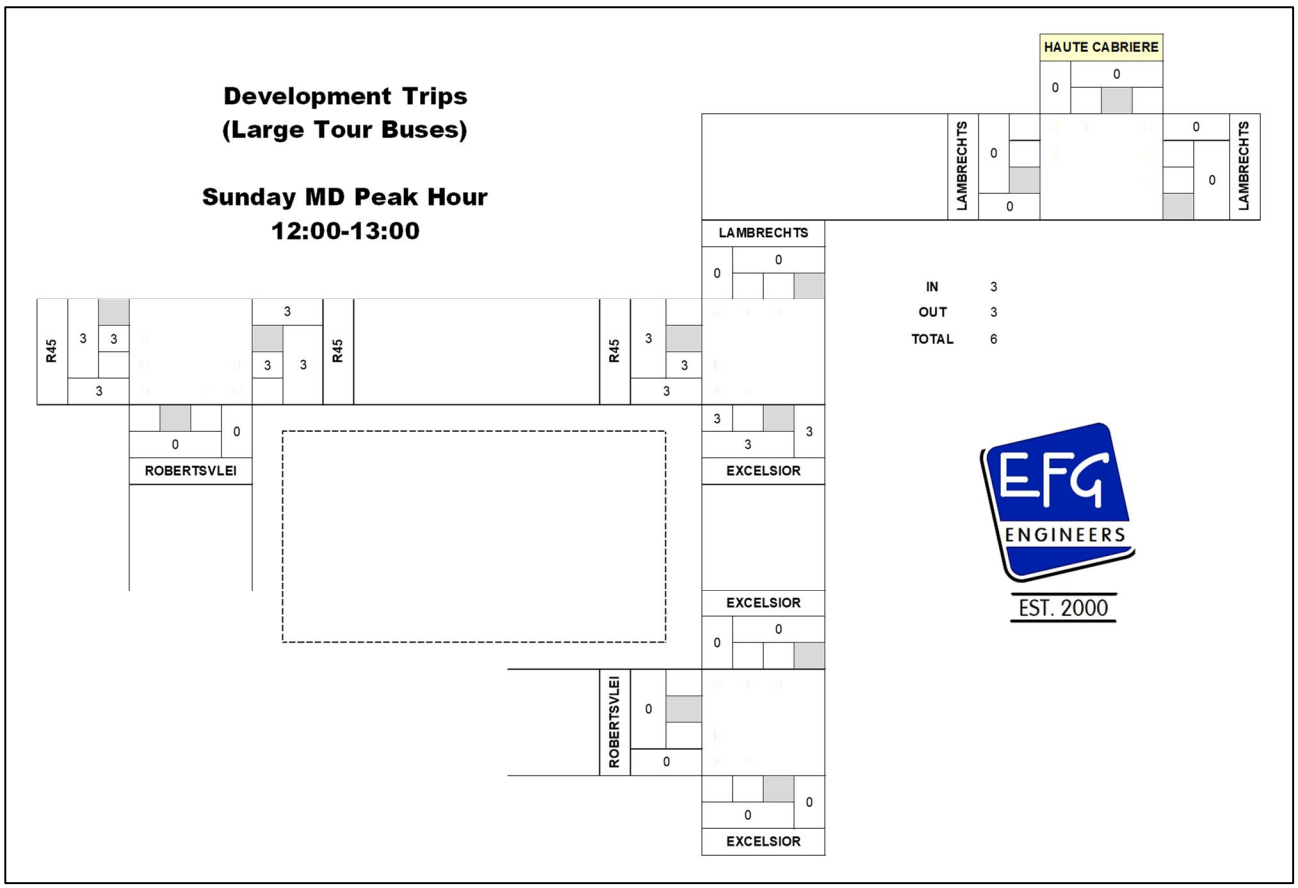


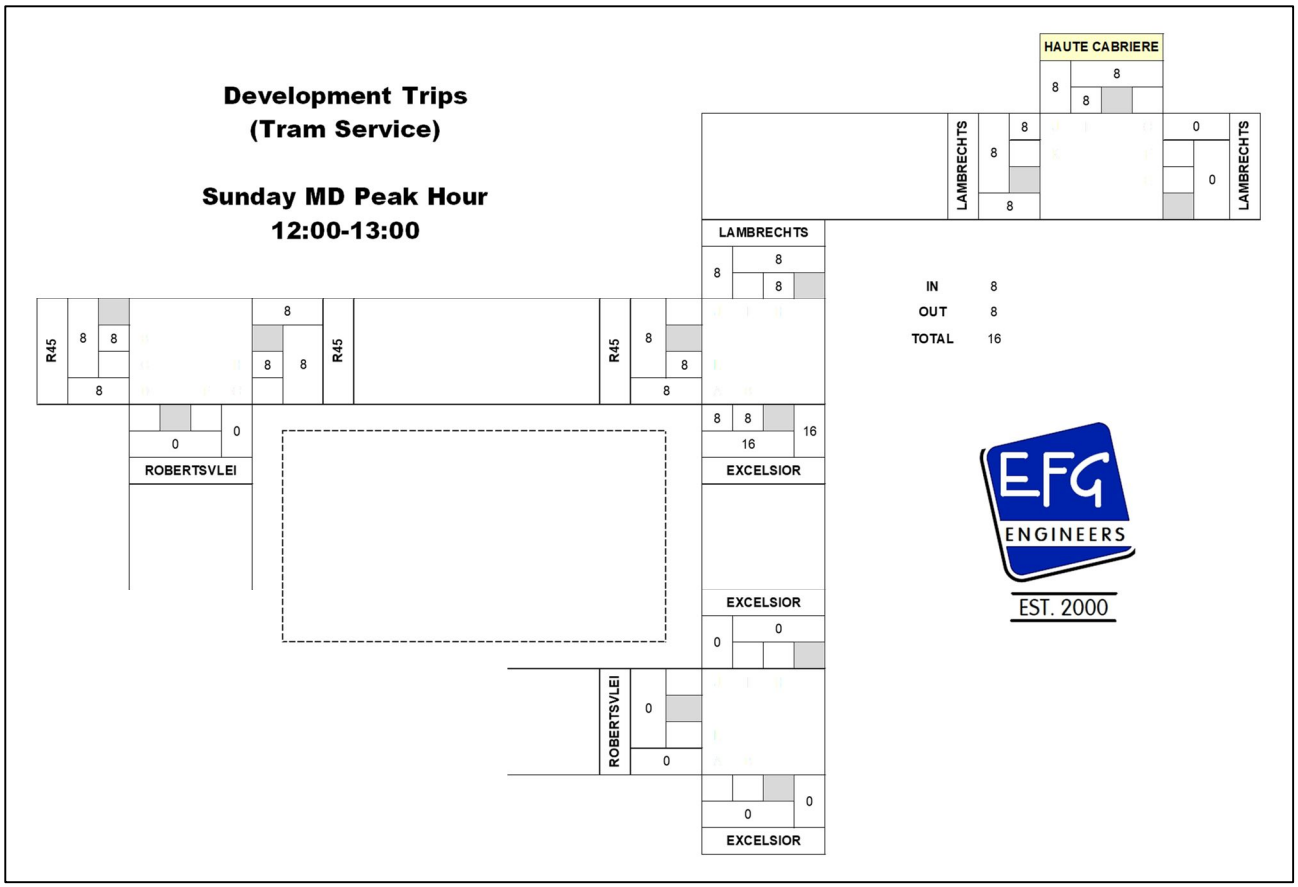




Development Trips
(Tram Service)
Saturday MD Peak Hour
12:00-13:00
HAUTE CABRIERE
LAMBRECHTS
LAMBRECHTS
LAMBRECHTS
R45
R45
R45
ROBERTSVLEI
ROBERTSVLEI
EXCELSIOR
EXCELSIOR
EXCELSIOR
IN 8
OUT 8
TOTAL 16
EFG ENGINEERS
EST. 2000

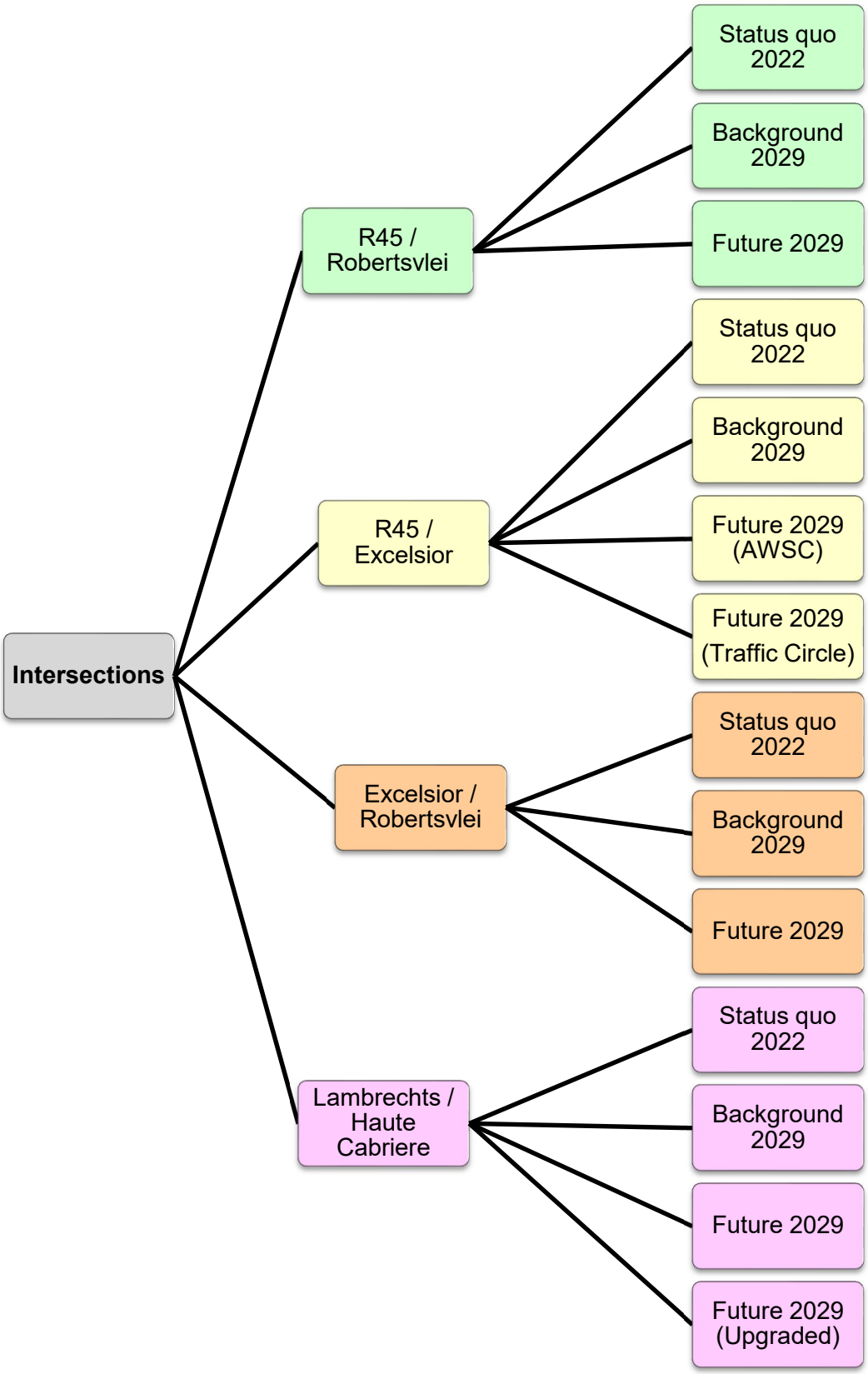
# Sunday MD Peak Hour



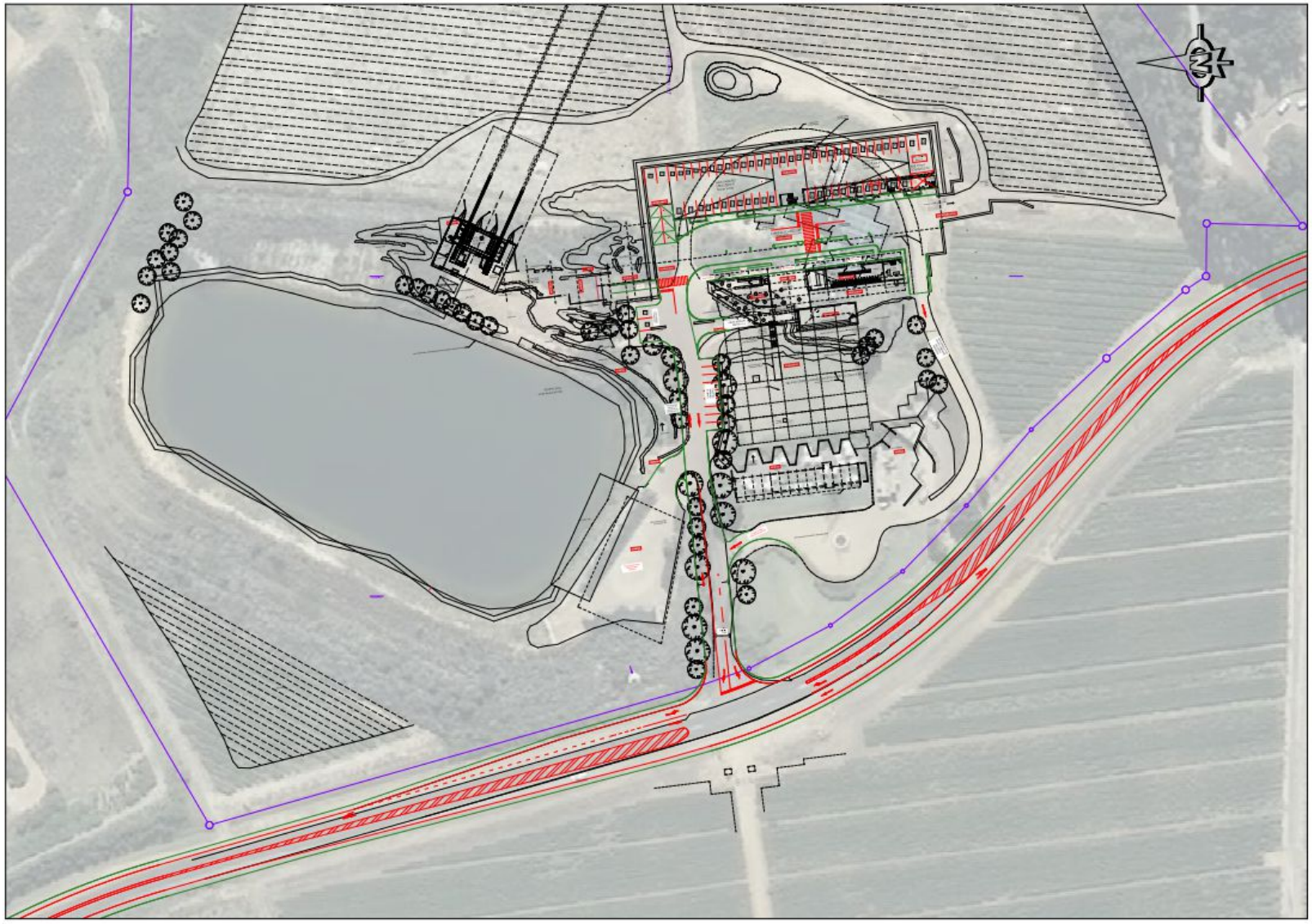




Development Trips
(Tram Service)
Sunday MD Peak Hour
12:00-13:00
HAUTE CABRIERE
LAMBRECHTS
LAMBRECHTS
LAMBRECHTS
R45
R45
R45
ROBERTSVLEI
ROBERTSVLEI
EXCELSIOR
EXCELSIOR
EXCELSIOR
IN 8
OUT 8
TOTAL 16
EFG
ENGINEERS
EST. 2000

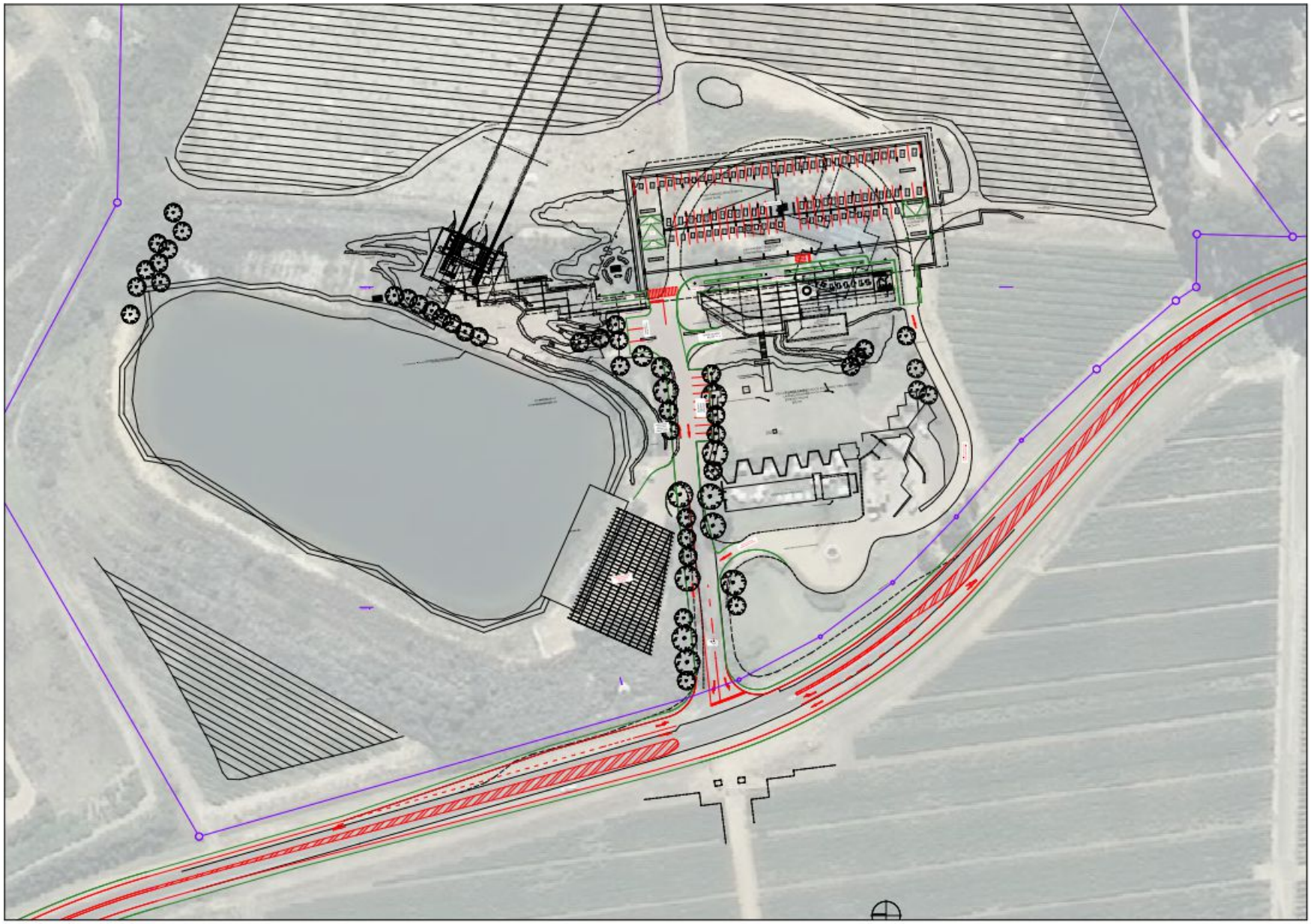
# APPENDIX C
## Detail SIDRA Analysis Output (Movement Summaries)



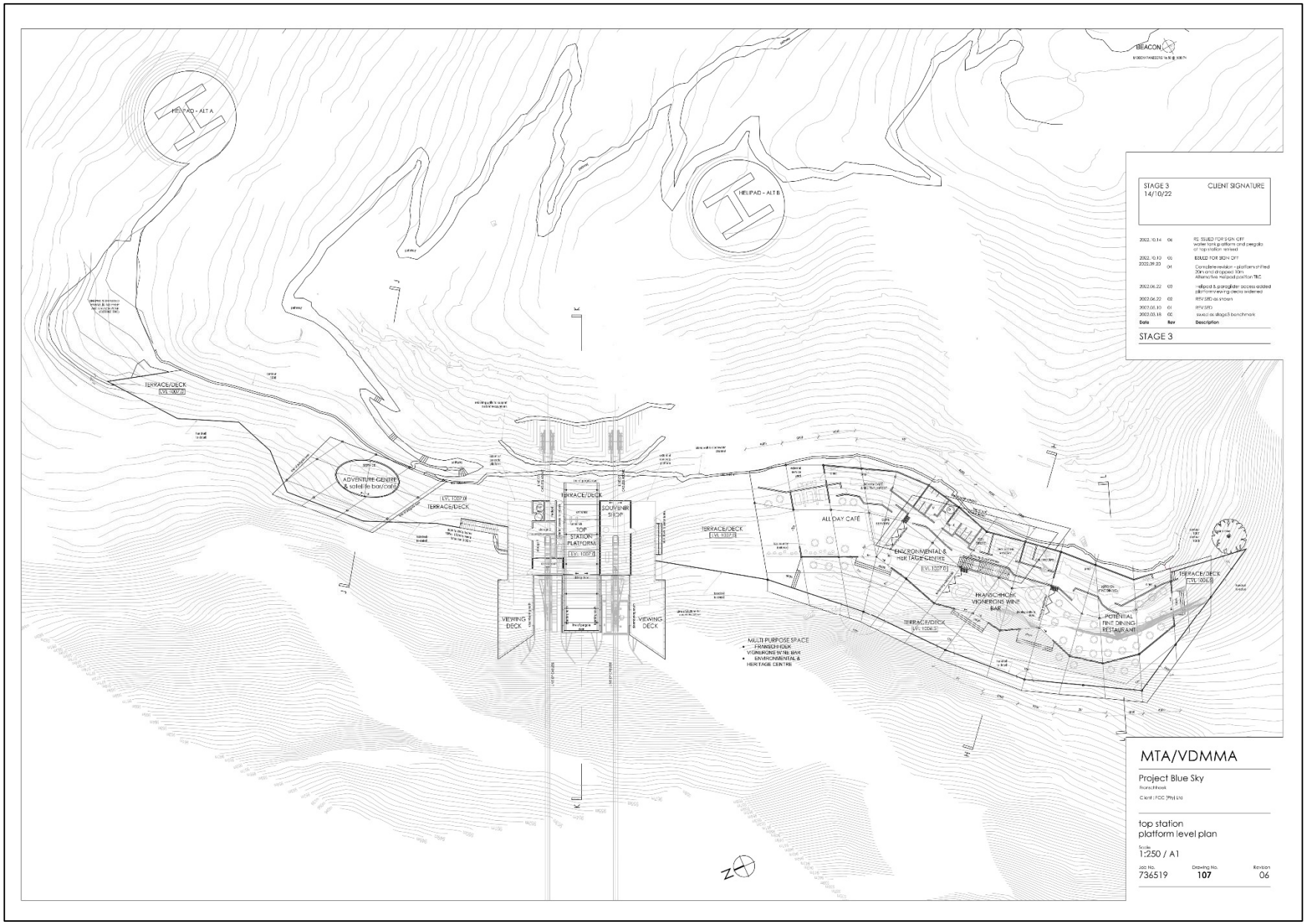
# APPENDIX D



**LOWER STATION INCL. LEVEL 1 PARKING**



**LOWER STATION INCL. LEVEL 2 AND LEVEL 3 PARKING**




**TOP STATION FEATURES AND AMENITIES**

# APPENDIX E
## Detail Parking Demand Calculations

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## Private Cars

| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 08:00-09:00 | 0 | 0 | 0 | 0 | 0 | 0.333 | avg arrival (veh/min) | 00:03:00 | min/veh | | |
| | 5 | 5 | 2 | 0 | 2 | 0.000 | avg departure (veh/min) | #DIV/0! | min/veh | 100% | Parking Demand 111 |
| | 10 | 10 | 3 | 0 | 3 | | | | | | |
| | 15 | 15 | 5 | 0 | 5 | | | | | | |
| | 20 | 20 | 7 | 0 | 7 | | | | | | |
| | 25 | 25 | 8 | 0 | 8 | | | | | | |
| | 30 | 30 | 10 | 0 | 10 | | | | | | |
| | 35 | 35 | 12 | 0 | 12 | | | | | | |
| | 40 | 40 | 13 | 0 | 13 | | | | | | |
| | 45 | 45 | 15 | 0 | 15 | | | | | | |
| | 50 | 50 | 17 | 0 | 17 | | | | | | |
| | 55 | 55 | 18 | 0 | 18 | | | | | | |
| | 60 | 60 | 20 | 0 | 20 | | | | | | |
| 09:00-10:00 | 0 | 60 | 20 | 0 | 20 | 1.083 | avg arrival (veh/min) | 00:00:55 | min/veh | | |
| | 5 | 65 | 25 | 1 | 24 | 0.167 | avg departure (veh/min) | 00:06:00 | min/veh | 100% | |
| | 10 | 70 | 31 | 2 | 29 | | | | | | |
| | 15 | 75 | 36 | 3 | 33 | | | | | | |
| | 20 | 80 | 42 | 3 | 39 | | | | | | |
| | 25 | 85 | 47 | 4 | 43 | | | | | | |
| | 30 | 90 | 53 | 5 | 48 | | | | | | |
| | 35 | 95 | 58 | 6 | 52 | | | | | | |
| | 40 | 100 | 63 | 7 | 56 | | | | | | |
| | 45 | 105 | 69 | 8 | 61 | | | | | | |
| | 50 | 110 | 74 | 8 | 66 | | | | | | |
| | 55 | 115 | 80 | 9 | 71 | | | | | | |
| | 60 | 120 | 85 | 10 | 75 | | | | | | |
| 10:00-11:00 | 0 | 120 | 85 | 10 | 75 | 1.667 | avg arrival (veh/min) | 00:00:36 | min/veh | | |
| | 5 | 125 | 93 | 16 | 77 | 1.238 | avg departure (veh/min) | 00:00:48 | min/veh | 100% | |
| | 10 | 130 | 102 | 22 | 80 | | | | | | |
| | 15 | 135 | 110 | 29 | 81 | | | | | | |
| | 20 | 140 | 118 | 35 | 83 | | | | | | |

| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | 145 | 127 | 41 | 86 | | | | | |
| | 30 | 150 | 135 | 47 | 88 | | | | | |
| | 35 | 155 | 143 | 53 | 90 | | | | | |
| | 40 | 160 | 152 | 60 | 92 | | | | | |
| | 45 | 165 | 160 | 66 | 94 | | | | | |
| | 50 | 170 | 168 | 72 | 96 | | | | | |
| | 55 | 175 | 177 | 78 | 99 | | | | | |
| | 60 | 180 | 185 | 84 | 101 | | | | | |
| 11:00-12:00 | 0 | 180 | 185 | 84 | 101 | 1.667 | avg arrival (veh/min) | 00:00:36 | min/veh | |
| | 5 | 185 | 193 | 92 | 101 | 1.500 | avg departure (veh/min) | 00:00:40 | min/veh | 100% |
| | 10 | 190 | 202 | 99 | 103 | | | | | |
| | 15 | 195 | 210 | 107 | 103 | | | | | |
| | 20 | 200 | 218 | 114 | 104 | | | | | |
| | 25 | 205 | 227 | 122 | 105 | | | | | |
| | 30 | 210 | 235 | 129 | 106 | | | | | |
| | 35 | 215 | 243 | 137 | 106 | | | | | |
| | 40 | 220 | 252 | 144 | 108 | | | | | |
| | 45 | 225 | 260 | 152 | 108 | | | | | |
| | 50 | 230 | 268 | 159 | 109 | | | | | |
| | 55 | 235 | 277 | 167 | 110 | | | | | |
| | 60 | 240 | 285 | 174 | 111 | | | | | |
| 12:00-13:00 | 0 | 240 | 285 | 174 | 111 | 1.667 | avg arrival (veh/min) | 00:00:36 | min/veh | |
| | 5 | 245 | 293 | 182 | 111 | 1.667 | avg departure (veh/min) | 00:00:36 | min/veh | 100% |
| | 10 | 250 | 302 | 191 | 111 | | | | | |
| | 15 | 255 | 310 | 199 | 111 | | | | | |
| | 20 | 260 | 318 | 207 | 111 | | | | | |
| | 25 | 265 | 327 | 216 | 111 | | | | | |
| | 30 | 270 | 335 | 224 | 111 | | | | | |
| | 35 | 275 | 343 | 232 | 111 | | | | | |
| | 40 | 280 | 352 | 241 | 111 | | | | | |
| | 45 | 285 | 360 | 249 | 111 | | | | | |
| | 50 | 290 | 368 | 257 | 111 | | | | | |
| | 55 | 295 | 377 | 266 | 111 | | | | | |
| | 60 | 300 | 385 | 274 | 111 | | | | | |

| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13:00-14:00 | 0 | 300 | 385 | 274 | 111 | 1.667 | avg arrival (veh/min) | 00:00:36 | min/veh | |
| | 5 | 305 | 393 | 282 | 111 | 1.667 | avg departure (veh/min) | 00:00:36 | min/veh | 100% |
| | 10 | 310 | 402 | 291 | 111 | | | | | |
| | 15 | 315 | 410 | 299 | 111 | | | | | |
| | 20 | 320 | 418 | 307 | 111 | | | | | |
| | 25 | 325 | 427 | 316 | 111 | | | | | |
| | 30 | 330 | 435 | 324 | 111 | | | | | |
| | 35 | 335 | 443 | 332 | 111 | | | | | |
| | 40 | 340 | 452 | 341 | 111 | | | | | |
| | 45 | 345 | 460 | 349 | 111 | | | | | |
| | 50 | 350 | 468 | 357 | 111 | | | | | |
| | 55 | 355 | 477 | 366 | 111 | | | | | |
| | 60 | 360 | 485 | 374 | 111 | | | | | |
| 14:00-15:00 | 0 | 360 | 485 | 374 | 111 | 1.167 | avg arrival (veh/min) | 00:00:51 | min/veh | |
| | 5 | 365 | 491 | 382 | 109 | 1.667 | avg departure (veh/min) | 00:00:36 | min/veh | 100% |
| | 10 | 370 | 497 | 391 | 106 | | | | | |
| | 15 | 375 | 503 | 399 | 104 | | | | | |
| | 20 | 380 | 508 | 407 | 101 | | | | | |
| | 25 | 385 | 514 | 416 | 98 | | | | | |
| | 30 | 390 | 520 | 424 | 96 | | | | | |
| | 35 | 395 | 526 | 432 | 94 | | | | | |
| | 40 | 400 | 532 | 441 | 91 | | | | | |
| | 45 | 405 | 538 | 449 | 89 | | | | | |
| | 50 | 410 | 543 | 457 | 86 | | | | | |
| | 55 | 415 | 549 | 466 | 83 | | | | | |
| | 60 | 420 | 555 | 474 | 81 | | | | | |
| 15:00-16:00 | 0 | 420 | 555 | 474 | 81 | 0.500 | avg arrival (veh/min) | 00:02:00 | min/veh | |
| | 5 | 425 | 558 | 480 | 78 | 1.167 | avg departure (veh/min) | 00:00:51 | min/veh | 100% |
| | 10 | 430 | 560 | 486 | 74 | | | | | |
| | 15 | 435 | 563 | 492 | 71 | | | | | |
| | 20 | 440 | 565 | 497 | 68 | | | | | |
| | 25 | 445 | 568 | 503 | 65 | | | | | |
| | 30 | 450 | 570 | 509 | 61 | | | | | |
| | 35 | 455 | 573 | 515 | 58 | | | | | |

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| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | 460 | 575 | 521 | 54 | | | | | |
| | 45 | 465 | 578 | 527 | 51 | | | | | |
| | 50 | 470 | 580 | 532 | 48 | | | | | |
| | 55 | 475 | 583 | 538 | 45 | | | | | |
| | 60 | 480 | 585 | 544 | 41 | | | | | |
| 16:00-17:00 | 0 | 480 | 585 | 544 | 41 | 0.167 | avg arrival (veh/min) | 00:06:00 | min/veh | |
| | 5 | 485 | 586 | 547 | 39 | 0.500 | avg departure (veh/min) | 00:02:00 | min/veh | 100% |
| | 10 | 490 | 587 | 549 | 38 | | | | | |
| | 15 | 495 | 588 | 552 | 36 | | | | | |
| | 20 | 500 | 588 | 554 | 34 | | | | | |
| | 25 | 505 | 589 | 557 | 32 | | | | | |
| | 30 | 510 | 590 | 559 | 31 | | | | | |
| | 35 | 515 | 591 | 562 | 29 | | | | | |
| | 40 | 520 | 592 | 564 | 28 | | | | | |
| | 45 | 525 | 593 | 567 | 26 | | | | | |
| | 50 | 530 | 593 | 569 | 24 | | | | | |
| | 55 | 535 | 594 | 572 | 22 | | | | | |
| | 60 | 540 | 595 | 574 | 21 | | | | | |
| 17:00-18:00 | 0 | 540 | 595 | 574 | 21 | 0.083 | avg arrival (veh/min) | 00:12:00 | min/veh | |
| | 5 | 545 | 595 | 575 | 20 | 0.250 | avg departure (veh/min) | 00:04:00 | min/veh | 100% |
| | 10 | 550 | 596 | 577 | 19 | | | | | |
| | 15 | 555 | 596 | 578 | 18 | | | | | |
| | 20 | 560 | 597 | 579 | 18 | | | | | |
| | 25 | 565 | 597 | 580 | 17 | | | | | |
| | 30 | 570 | 598 | 582 | 16 | | | | | |
| | 35 | 575 | 598 | 583 | 15 | | | | | |
| | 40 | 580 | 598 | 584 | 14 | | | | | |
| | 45 | 585 | 599 | 585 | 14 | | | | | |
| | 50 | 590 | 599 | 587 | 12 | | | | | |
| | 55 | 595 | 600 | 588 | 12 | | | | | |
| | 60 | 600 | 600 | 589 | 11 | | | | | |
| 18:00-19:00 | 0 | 600 | 600 | 589 | 11 | 0.000 | avg arrival (veh/min) | #DIV/0! | min/veh | |
| | 5 | 605 | 600 | 590 | 10 | 0.180 | avg departure (veh/min) | 00:05:33 | min/veh | 100% |
| | 10 | 610 | 600 | 591 | 9 | | | | | |

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| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 15 | 615 | 600 | 592 | 8 | | | | | |
| | 20 | 620 | 600 | 593 | 7 | | | | | |
| | 25 | 625 | 600 | 594 | 6 | | | | | |
| | 30 | 630 | 600 | 594 | 6 | | | | | |
| | 35 | 635 | 600 | 595 | 5 | | | | | |
| | 40 | 640 | 600 | 596 | 4 | | | | | |
| | 45 | 645 | 600 | 597 | 3 | | | | | |
| | 50 | 650 | 600 | 598 | 2 | | | | | |
| | 55 | 655 | 600 | 599 | 1 | | | | | |
| | 60 | 660 | 600 | 600 | 0 | | | | | |
| 19:00-20:00 | 0 | 660 | 600 | 600 | 0 | 0.000 | avg arrival (veh/min) | #DIV/0! | min/veh | |
| | 5 | 665 | 600 | 600 | 0 | 0.000 | avg departure (veh/min) | #DIV/0! | min/veh | 100% |
| | 10 | 670 | 600 | 600 | 0 | | | | | |
| | 15 | 675 | 600 | 600 | 0 | | | | | |
| | 20 | 680 | 600 | 600 | 0 | | | | | |
| | 25 | 685 | 600 | 600 | 0 | | | | | |
| | 30 | 690 | 600 | 600 | 0 | | | | | |
| | 35 | 695 | 600 | 600 | 0 | | | | | |
| | 40 | 700 | 600 | 600 | 0 | | | | | |
| | 45 | 705 | 600 | 600 | 0 | | | | | |
| | 50 | 710 | 600 | 600 | 0 | | | | | |
| | 55 | 715 | 600 | 600 | 0 | | | | | |
| | 60 | 720 | 600 | 600 | 0 | | | | | |

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## Small Tour Buses / Mini-buses – On-Site Parking

| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 08:00-09:00 | 0 | 0 | 0 | 0 | 0 | 0.033 | avg arrival (veh/min) | 00:30:00 | min/veh | | | |
| | 5 | 5 | 0 | 0 | 0 | 0.000 | avg departure (veh/min) | #DIV/0! | min/veh | 100% | max | 9 |
| | 10 | 10 | 0 | 0 | 0 | | | | | | | |
| | 15 | 15 | 1 | 0 | 1 | | | | | | | |
| | 20 | 20 | 1 | 0 | 1 | | | | | | | |
| | 25 | 25 | 1 | 0 | 1 | | | | | | | |
| | 30 | 30 | 1 | 0 | 1 | | | | | | | |
| | 35 | 35 | 1 | 0 | 1 | | | | | | | |
| | 40 | 40 | 1 | 0 | 1 | | | | | | | |
| | 45 | 45 | 2 | 0 | 2 | | | | | | | |
| | 50 | 50 | 2 | 0 | 2 | | | | | | | |
| | 55 | 55 | 2 | 0 | 2 | | | | | | | |
| | 60 | 09:00 | 2 | 0 | 2 | | | | | | | |
| 09:00-10:00 | 0 | 60 | 2 | 0 | 2 | 0.083 | avg arrival (veh/min) | 00:12:00 | min/veh | | | |
| | 5 | 65 | 2 | 0 | 2 | 0.017 | avg departure (veh/min) | 01:00:00 | min/veh | 100% | | |
| | 10 | 70 | 3 | 0 | 3 | | | | | | | |
| | 15 | 75 | 3 | 0 | 3 | | | | | | | |
| | 20 | 80 | 4 | 0 | 4 | | | | | | | |
| | 25 | 85 | 4 | 0 | 4 | | | | | | | |
| | 30 | 90 | 5 | 1 | 4 | | | | | | | |
| | 35 | 95 | 5 | 1 | 4 | | | | | | | |
| | 40 | 100 | 5 | 1 | 4 | | | | | | | |
| | 45 | 105 | 6 | 1 | 5 | | | | | | | |
| | 50 | 110 | 6 | 1 | 5 | | | | | | | |
| | 55 | 115 | 7 | 1 | 6 | | | | | | | |
| | 60 | 10:00 | 7 | 1 | 6 | | | | | | | |
| 10:00-11:00 | 0 | 120 | 7 | 1 | 6 | 0.133 | avg arrival (veh/min) | 00:07:30 | min/veh | | | |
| | 5 | 125 | 8 | 2 | 6 | 0.100 | avg departure (veh/min) | 00:10:00 | min/veh | 100% | | |
| | 10 | 130 | 8 | 2 | 6 | | | | | | | |
| | 15 | 135 | 9 | 3 | 6 | | | | | | | |
| | 20 | 140 | 10 | 3 | 7 | | | | | | | |

| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | 145 | 10 | 4 | 6 | | | | | |
| | 30 | 150 | 11 | 4 | 7 | | | | | |
| | 35 | 155 | 12 | 5 | 7 | | | | | |
| | 40 | 160 | 12 | 5 | 7 | | | | | |
| | 45 | 165 | 13 | 6 | 7 | | | | | |
| | 50 | 170 | 14 | 6 | 8 | | | | | |
| | 55 | 175 | 14 | 7 | 7 | | | | | |
| | 60 | 11:00 | 15 | 7 | 8 | | | | | |
| 11:00-12:00 | 0 | 180 | 15 | 7 | 8 | 0.133 | avg arrival (veh/min) | 00:07:30 | min/veh | |
| | 5 | 185 | 16 | 8 | 8 | 0.117 | avg departure (veh/min) | 00:08:34 | min/veh | 100% |
| | 10 | 190 | 16 | 8 | 8 | | | | | |
| | 15 | 195 | 17 | 9 | 8 | | | | | |
| | 20 | 200 | 18 | 9 | 9 | | | | | |
| | 25 | 205 | 18 | 10 | 8 | | | | | |
| | 30 | 210 | 19 | 11 | 8 | | | | | |
| | 35 | 215 | 20 | 11 | 9 | | | | | |
| | 40 | 220 | 20 | 12 | 8 | | | | | |
| | 45 | 225 | 21 | 12 | 9 | | | | | |
| | 50 | 230 | 22 | 13 | 9 | | | | | |
| | 55 | 235 | 22 | 13 | 9 | | | | | |
| | 60 | 12:00 | 23 | 14 | 9 | | | | | |
| 12:00-13:00 | 0 | 240 | 23 | 14 | 9 | 0.133 | avg arrival (veh/min) | 00:07:30 | min/veh | |
| | 5 | 245 | 24 | 15 | 9 | 0.133 | avg departure (veh/min) | 00:07:30 | min/veh | 100% |
| | 10 | 250 | 24 | 15 | 9 | | | | | |
| | 15 | 255 | 25 | 16 | 9 | | | | | |
| | 20 | 260 | 26 | 17 | 9 | | | | | |
| | 25 | 265 | 26 | 17 | 9 | | | | | |
| | 30 | 270 | 27 | 18 | 9 | | | | | |
| | 35 | 275 | 28 | 19 | 9 | | | | | |
| | 40 | 280 | 28 | 19 | 9 | | | | | |
| | 45 | 285 | 29 | 20 | 9 | | | | | |
| | 50 | 290 | 30 | 21 | 9 | | | | | |
| | 55 | 295 | 30 | 21 | 9 | | | | | |
| | 60 | 13:00 | 31 | 22 | 9 | | | | | |

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| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13:00-14:00 | 0 | 300 | 31 | 22 | 9 | 0.133 | avg arrival (veh/min) | 00:07:30 | min/veh | |
| | 5 | 305 | 32 | 23 | 9 | 0.133 | avg departure (veh/min) | 00:07:30 | min/veh | 100% |
| | 10 | 310 | 32 | 23 | 9 | | | | | |
| | 15 | 315 | 33 | 24 | 9 | | | | | |
| | 20 | 320 | 34 | 25 | 9 | | | | | |
| | 25 | 325 | 34 | 25 | 9 | | | | | |
| | 30 | 330 | 35 | 26 | 9 | | | | | |
| | 35 | 335 | 36 | 27 | 9 | | | | | |
| | 40 | 340 | 36 | 27 | 9 | | | | | |
| | 45 | 345 | 37 | 28 | 9 | | | | | |
| | 50 | 350 | 38 | 29 | 9 | | | | | |
| | 55 | 355 | 38 | 29 | 9 | | | | | |
| | 60 | 14:00 | 39 | 30 | 9 | | | | | |
| 14:00-15:00 | 0 | 360 | 39 | 30 | 9 | 0.083 | avg arrival (veh/min) | 00:12:00 | min/veh | |
| | 5 | 365 | 39 | 31 | 8 | 0.133 | avg departure (veh/min) | 00:07:30 | min/veh | 100% |
| | 10 | 370 | 40 | 31 | 9 | | | | | |
| | 15 | 375 | 40 | 32 | 8 | | | | | |
| | 20 | 380 | 41 | 33 | 8 | | | | | |
| | 25 | 385 | 41 | 33 | 8 | | | | | |
| | 30 | 390 | 42 | 34 | 8 | | | | | |
| | 35 | 395 | 42 | 35 | 7 | | | | | |
| | 40 | 400 | 42 | 35 | 7 | | | | | |
| | 45 | 405 | 43 | 36 | 7 | | | | | |
| | 50 | 410 | 43 | 37 | 6 | | | | | |
| | 55 | 415 | 44 | 37 | 7 | | | | | |
| | 60 | 15:00 | 44 | 38 | 6 | | | | | |
| 15:00-16:00 | 0 | 420 | 44 | 38 | 6 | 0.033 | avg arrival (veh/min) | 00:30:00 | min/veh | |
| | 5 | 425 | 44 | 38 | 6 | 0.083 | avg departure (veh/min) | 00:12:00 | min/veh | 100% |
| | 10 | 430 | 44 | 39 | 5 | | | | | |
| | 15 | 435 | 45 | 39 | 6 | | | | | |
| | 20 | 440 | 45 | 40 | 5 | | | | | |
| | 25 | 445 | 45 | 40 | 5 | | | | | |
| | 30 | 450 | 45 | 41 | 4 | | | | | |
| | 35 | 455 | 45 | 41 | 4 | | | | | |

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| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | 460 | 45 | 41 | 4 | | | | | |
| | 45 | 465 | 46 | 42 | 4 | | | | | |
| | 50 | 470 | 46 | 42 | 4 | | | | | |
| | 55 | 475 | 46 | 43 | 3 | | | | | |
| | 60 | 16:00 | 46 | 43 | 3 | | | | | |
| 16:00-17:00 | 0 | 480 | 46 | 43 | 3 | 0.017 | avg arrival (veh/min) | 01:00:00 | min/veh | |
| | 5 | 485 | 46 | 43 | 3 | 0.033 | avg departure (veh/min) | 00:30:00 | min/veh | 100% |
| | 10 | 490 | 46 | 43 | 3 | | | | | |
| | 15 | 495 | 46 | 44 | 2 | | | | | |
| | 20 | 500 | 46 | 44 | 2 | | | | | |
| | 25 | 505 | 46 | 44 | 2 | | | | | |
| | 30 | 510 | 47 | 44 | 3 | | | | | |
| | 35 | 515 | 47 | 44 | 3 | | | | | |
| | 40 | 520 | 47 | 44 | 3 | | | | | |
| | 45 | 525 | 47 | 45 | 2 | | | | | |
| | 50 | 530 | 47 | 45 | 2 | | | | | |
| | 55 | 535 | 47 | 45 | 2 | | | | | |
| | 60 | 17:00 | 47 | 45 | 2 | | | | | |
| 17:00-18:00 | 0 | 540 | 47 | 45 | 2 | 0.000 | avg arrival (veh/min) | #DIV/0! | min/veh | |
| | 5 | 545 | 47 | 45 | 2 | 0.017 | avg departure (veh/min) | 01:00:00 | min/veh | 100% |
| | 10 | 550 | 47 | 45 | 2 | | | | | |
| | 15 | 555 | 47 | 45 | 2 | | | | | |
| | 20 | 560 | 47 | 45 | 2 | | | | | |
| | 25 | 565 | 47 | 45 | 2 | | | | | |
| | 30 | 570 | 47 | 46 | 1 | | | | | |
| | 35 | 575 | 47 | 46 | 1 | | | | | |
| | 40 | 580 | 47 | 46 | 1 | | | | | |
| | 45 | 585 | 47 | 46 | 1 | | | | | |
| | 50 | 590 | 47 | 46 | 1 | | | | | |
| | 55 | 595 | 47 | 46 | 1 | | | | | |
| | 60 | 18:00 | 47 | 46 | 1 | | | | | |
| 18:00-19:00 | 0 | 600 | 47 | 46 | 1 | 0.000 | avg arrival (veh/min) | | min/veh | |
| | 5 | 605 | 47 | 46 | 1 | 0.017 | avg departure (veh/min) | | min/veh | 100% |
| | 10 | 610 | 47 | 46 | 1 | | | | | |

| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | |
|---|---|---|---|---|---|---|---|
| | 15 | 615 | 47 | 46 | 1 | | |
| | 20 | 620 | 47 | 46 | 1 | | |
| | 25 | 625 | 47 | 46 | 1 | | |
| | 30 | 630 | 47 | 47 | 0 | | |
| | 35 | 635 | 47 | 47 | 0 | | |
| | 40 | 640 | 47 | 47 | 0 | | |
| | 45 | 645 | 47 | 47 | 0 | | |
| | 50 | 650 | 47 | 47 | 0 | | |
| | 55 | 655 | 47 | 47 | 0 | | |
| | 60 | 19:00 | 47 | 47 | 0 | | |
| 19:00-20:00 | 0 | 660 | 47 | 47 | 0 | 0.000 | avg arrival (veh/min) |
| | 5 | 665 | 47 | 47 | 0 | 0.000 | avg departure (veh/min) |
| | 10 | 670 | 47 | 47 | 0 | | |
| | 15 | 675 | 47 | 47 | 0 | | |
| | 20 | 680 | 47 | 47 | 0 | | |
| | 25 | 685 | 47 | 47 | 0 | | |
| | 30 | 690 | 47 | 47 | 0 | | |
| | 35 | 695 | 47 | 47 | 0 | | |
| | 40 | 700 | 47 | 47 | 0 | | |
| | 45 | 705 | 47 | 47 | 0 | | |
| | 50 | 710 | 47 | 47 | 0 | | |
| | 55 | 715 | 47 | 47 | 0 | | |
| | 60 | 20:00 | 47 | 47 | 0 | | |

100%

## Large Tour Buses – Off-Site Parking (see Figure 8.4)

| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 08:00-09:00 | 0 | 0 | 0 | 0 | 0 | 0.017 | avg arrival (veh/min) | 01:00:00 | min/veh | | | |
| | 5 | 5 | 0 | 0 | 0 | 0.000 | avg departure (veh/min) | #DIV/0! | min/veh | 100% | max | 3 |
| | 10 | 10 | 0 | 0 | 0 | | | | | | | |
| | 15 | 15 | 0 | 0 | 0 | | | | | | | |
| | 20 | 20 | 0 | 0 | 0 | | | | | | | |
| | 25 | 25 | 0 | 0 | 0 | | | | | | | |
| | 30 | 30 | 1 | 0 | 1 | | | | | | | |
| | 35 | 35 | 1 | 0 | 1 | | | | | | | |
| | 40 | 40 | 1 | 0 | 1 | | | | | | | |
| | 45 | 45 | 1 | 0 | 1 | | | | | | | |
| | 50 | 50 | 1 | 0 | 1 | | | | | | | |
| | 55 | 55 | 1 | 0 | 1 | | | | | | | |
| | 60 | 09:00 | 1 | 0 | 1 | | | | | | | |
| 09:00-10:00 | 0 | 60 | 1 | 0 | 1 | 0.033 | avg arrival (veh/min) | 00:30:00 | min/veh | | | |
| | 5 | 65 | 1 | 0 | 1 | 0.000 | avg departure (veh/min) | #DIV/0! | min/veh | 100% | | |
| | 10 | 70 | 1 | 0 | 1 | | | | | | | |
| | 15 | 75 | 2 | 0 | 2 | | | | | | | |
| | 20 | 80 | 2 | 0 | 2 | | | | | | | |
| | 25 | 85 | 2 | 0 | 2 | | | | | | | |
| | 30 | 90 | 2 | 0 | 2 | | | | | | | |
| | 35 | 95 | 2 | 0 | 2 | | | | | | | |
| | 40 | 100 | 2 | 0 | 2 | | | | | | | |
| | 45 | 105 | 3 | 0 | 3 | | | | | | | |
| | 50 | 110 | 3 | 0 | 3 | | | | | | | |
| | 55 | 115 | 3 | 0 | 3 | | | | | | | |
| | 60 | 10:00 | 3 | 0 | 3 | | | | | | | |
| 10:00-11:00 | 0 | 120 | 3 | 0 | 3 | 0.050 | avg arrival (veh/min) | 00:20:00 | min/veh | | | |
| | 5 | 125 | 3 | 0 | 3 | 0.050 | avg departure (veh/min) | 00:20:00 | min/veh | 100% | | |
| | 10 | 130 | 4 | 1 | 3 | | | | | | | |
| | 15 | 135 | 4 | 1 | 3 | | | | | | | |
| | 20 | 140 | 4 | 1 | 3 | | | | | | | |

| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | 145 | 4 | 1 | 3 | | | | | |
| | 30 | 150 | 5 | 2 | 3 | | | | | |
| | 35 | 155 | 5 | 2 | 3 | | | | | |
| | 40 | 160 | 5 | 2 | 3 | | | | | |
| | 45 | 165 | 5 | 2 | 3 | | | | | |
| | 50 | 170 | 6 | 3 | 3 | | | | | |
| | 55 | 175 | 6 | 3 | 3 | | | | | |
| | 60 | 11:00 | 6 | 3 | 3 | | | | | |
| 11:00-12:00 | 0 | 180 | 6 | 3 | 3 | 0.050 | avg arrival (veh/min) | 00:20:00 | min/veh | |
| | 5 | 185 | 6 | 3 | 3 | 0.050 | avg departure (veh/min) | 00:20:00 | min/veh | 100% |
| | 10 | 190 | 7 | 4 | 3 | | | | | |
| | 15 | 195 | 7 | 4 | 3 | | | | | |
| | 20 | 200 | 7 | 4 | 3 | | | | | |
| | 25 | 205 | 7 | 4 | 3 | | | | | |
| | 30 | 210 | 8 | 5 | 3 | | | | | |
| | 35 | 215 | 8 | 5 | 3 | | | | | |
| | 40 | 220 | 8 | 5 | 3 | | | | | |
| | 45 | 225 | 8 | 5 | 3 | | | | | |
| | 50 | 230 | 9 | 6 | 3 | | | | | |
| | 55 | 235 | 9 | 6 | 3 | | | | | |
| | 60 | 12:00 | 9 | 6 | 3 | | | | | |
| 12:00-13:00 | 0 | 240 | 9 | 6 | 3 | 0.050 | avg arrival (veh/min) | 00:20:00 | min/veh | |
| | 5 | 245 | 9 | 6 | 3 | 0.050 | avg departure (veh/min) | 00:20:00 | min/veh | 100% |
| | 10 | 250 | 10 | 7 | 3 | | | | | |
| | 15 | 255 | 10 | 7 | 3 | | | | | |
| | 20 | 260 | 10 | 7 | 3 | | | | | |
| | 25 | 265 | 10 | 7 | 3 | | | | | |
| | 30 | 270 | 11 | 8 | 3 | | | | | |
| | 35 | 275 | 11 | 8 | 3 | | | | | |
| | 40 | 280 | 11 | 8 | 3 | | | | | |
| | 45 | 285 | 11 | 8 | 3 | | | | | |
| | 50 | 290 | 12 | 9 | 3 | | | | | |
| | 55 | 295 | 12 | 9 | 3 | | | | | |
| | 60 | 13:00 | 12 | 9 | 3 | | | | | |

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| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 13:00-14:00 | 0 | 300 | 12 | 9 | 3 | 0.050 | avg arrival (veh/min) | 00:20:00 | min/veh | |
| | 5 | 305 | 12 | 9 | 3 | 0.050 | avg departure (veh/min) | 00:20:00 | min/veh | 100% |
| | 10 | 310 | 13 | 10 | 3 | | | | | |
| | 15 | 315 | 13 | 10 | 3 | | | | | |
| | 20 | 320 | 13 | 10 | 3 | | | | | |
| | 25 | 325 | 13 | 10 | 3 | | | | | |
| | 30 | 330 | 14 | 11 | 3 | | | | | |
| | 35 | 335 | 14 | 11 | 3 | | | | | |
| | 40 | 340 | 14 | 11 | 3 | | | | | |
| | 45 | 345 | 14 | 11 | 3 | | | | | |
| | 50 | 350 | 15 | 12 | 3 | | | | | |
| | 55 | 355 | 15 | 12 | 3 | | | | | |
| | 60 | 14:00 | 15 | 12 | 3 | | | | | |
| 14:00-15:00 | 0 | 360 | 15 | 12 | 3 | 0.050 | avg arrival (veh/min) | 00:20:00 | min/veh | |
| | 5 | 365 | 15 | 12 | 3 | 0.050 | avg departure (veh/min) | 00:20:00 | min/veh | 100% |
| | 10 | 370 | 16 | 13 | 3 | | | | | |
| | 15 | 375 | 16 | 13 | 3 | | | | | |
| | 20 | 380 | 16 | 13 | 3 | | | | | |
| | 25 | 385 | 16 | 13 | 3 | | | | | |
| | 30 | 390 | 17 | 14 | 3 | | | | | |
| | 35 | 395 | 17 | 14 | 3 | | | | | |
| | 40 | 400 | 17 | 14 | 3 | | | | | |
| | 45 | 405 | 17 | 14 | 3 | | | | | |
| | 50 | 410 | 18 | 15 | 3 | | | | | |
| | 55 | 415 | 18 | 15 | 3 | | | | | |
| | 60 | 15:00 | 18 | 15 | 3 | | | | | |
| 15:00-16:00 | 0 | 420 | 18 | 15 | 3 | 0.017 | avg arrival (veh/min) | 01:00:00 | min/veh | |
| | 5 | 425 | 18 | 15 | 3 | 0.050 | avg departure (veh/min) | 00:20:00 | min/veh | 100% |
| | 10 | 430 | 18 | 16 | 2 | | | | | |
| | 15 | 435 | 18 | 16 | 2 | | | | | |
| | 20 | 440 | 18 | 16 | 2 | | | | | |
| | 25 | 445 | 18 | 16 | 2 | | | | | |
| | 30 | 450 | 19 | 17 | 2 | | | | | |
| | 35 | 455 | 19 | 17 | 2 | | | | | |

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| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 40 | 460 | 19 | 17 | 2 | | | | | |
| | 45 | 465 | 19 | 17 | 2 | | | | | |
| | 50 | 470 | 19 | 18 | 1 | | | | | |
| | 55 | 475 | 19 | 18 | 1 | | | | | |
| | 60 | 16:00 | 19 | 18 | 1 | | | | | |
| 16:00-17:00 | 0 | 480 | 19 | 18 | 1 | 0.000 | avg arrival (veh/min) | #DIV/0! | min/veh | |
| | 5 | 485 | 19 | 18 | 1 | 0.017 | avg departure (veh/min) | 01:00:00 | min/veh | 100% |
| | 10 | 490 | 19 | 18 | 1 | | | | | |
| | 15 | 495 | 19 | 18 | 1 | | | | | |
| | 20 | 500 | 19 | 18 | 1 | | | | | |
| | 25 | 505 | 19 | 18 | 1 | | | | | |
| | 30 | 510 | 19 | 19 | 0 | | | | | |
| | 35 | 515 | 19 | 19 | 0 | | | | | |
| | 40 | 520 | 19 | 19 | 0 | | | | | |
| | 45 | 525 | 19 | 19 | 0 | | | | | |
| | 50 | 530 | 19 | 19 | 0 | | | | | |
| | 55 | 535 | 19 | 19 | 0 | | | | | |
| | 60 | 17:00 | 19 | 19 | 0 | | | | | |
| 17:00-18:00 | 0 | 540 | 19 | 19 | 0 | 0.000 | avg arrival (veh/min) | #DIV/0! | min/veh | |
| | 5 | 545 | 19 | 19 | 0 | 0.000 | avg departure (veh/min) | #DIV/0! | min/veh | 100% |
| | 10 | 550 | 19 | 19 | 0 | | | | | |
| | 15 | 555 | 19 | 19 | 0 | | | | | |
| | 20 | 560 | 19 | 19 | 0 | | | | | |
| | 25 | 565 | 19 | 19 | 0 | | | | | |
| | 30 | 570 | 19 | 19 | 0 | | | | | |
| | 35 | 575 | 19 | 19 | 0 | | | | | |
| | 40 | 580 | 19 | 19 | 0 | | | | | |
| | 45 | 585 | 19 | 19 | 0 | | | | | |
| | 50 | 590 | 19 | 19 | 0 | | | | | |
| | 55 | 595 | 19 | 19 | 0 | | | | | |
| | 60 | 18:00 | 19 | 19 | 0 | | | | | |
| 18:00-19:00 | 0 | 600 | 19 | 19 | 0 | 0.000 | avg arrival (veh/min) | | min/veh | |
| | 5 | 605 | 19 | 19 | 0 | 0.000 | avg departure (veh/min) | | min/veh | 100% |
| | 10 | 610 | 19 | 19 | 0 | | | | | |

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| Hour | 5min | 5min cum | Arrivals | Departures | Parking Demand | | |
|---|---|---|---|---|---|---|---|
| | 15 | 615 | 19 | 19 | 0 | | |
| | 20 | 620 | 19 | 19 | 0 | | |
| | 25 | 625 | 19 | 19 | 0 | | |
| | 30 | 630 | 19 | 19 | 0 | | |
| | 35 | 635 | 19 | 19 | 0 | | |
| | 40 | 640 | 19 | 19 | 0 | | |
| | 45 | 645 | 19 | 19 | 0 | | |
| | 50 | 650 | 19 | 19 | 0 | | |
| | 55 | 655 | 19 | 19 | 0 | | |
| | 60 | 19:00 | 19 | 19 | 0 | | |
| 19:00-20:00 | 0 | 660 | 19 | 19 | 0 | 0.000 | avg arrival (veh/min) |
| | 5 | 665 | 19 | 19 | 0 | 0.000 | avg departure (veh/min) |
| | 10 | 670 | 19 | 19 | 0 | | |
| | 15 | 675 | 19 | 19 | 0 | | |
| | 20 | 680 | 19 | 19 | 0 | | |
| | 25 | 685 | 19 | 19 | 0 | | |
| | 30 | 690 | 19 | 19 | 0 | | |
| | 35 | 695 | 19 | 19 | 0 | | |
| | 40 | 700 | 19 | 19 | 0 | | |
| | 45 | 705 | 19 | 19 | 0 | | |
| | 50 | 710 | 19 | 19 | 0 | | |
| | 55 | 715 | 19 | 19 | 0 | | |
| | 60 | 20:00 | 19 | 19 | 0 | | |

100%