APPENDIX 25

TRANSPORT IMPACT ASSESSMENT REPORT

Cape Winelands Airport

Transport Impact Assessment
Durbanville, Cape Town

First Draft
23 September 2024

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SUMMARY SHEET

Report Type	Transport Impact Assessment
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Location	Durbanville, Cape Town
Client	Cape Winelands Airfield Ltd
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SPECIALIST DECLARATION

I, Johan C. Brink, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist

Date: 16 February 2024

ABRIDGED CV

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Summary of Experience

Johan boasts a distinguished career as a highly skilled Civil Engineer in Transport Engineering, amassing over 25 years of invaluable experience. His professional journey has been marked by active involvement in a multitude of traffic impact studies, ranging from modest developments to monumental precinct analyses, such as those for the Cape Town Stadium during the World Cup Soccer and the Cape Town International Airport.

In the realm of transport planning and traffic engineering projects, Johan stands as a beacon of expertise. His repertoire includes the successful completion of Integrated Transport Plans, Public Transport Network Plans, Development Charge Policies, and Road Safety Strategies. These accomplishments have been executed for esteemed public sector clients, including the Department of Transport, the South African National Roads Agency, and various provincial and local municipal road authorities.

Johan's knowledge extends far beyond the borders of South Africa, as he has actively contributed his expertise to transport projects in countries like Tanzania, Zambia, Nigeria, and Botswana. His international experience was further enriched during his tenure at Kittelson & Associates, Inc. in Portland, Oregon, USA, where he delved into the intricacies of transport engineering on a global scale.

Currently serving as the Technical Director at ITS, Johan specializes in a diverse range of transportation planning and traffic engineering projects. His responsibilities span from conducting transport impact studies, developing transport masterplans, and overseeing urban transport initiatives to addressing public transport strategies, development charges, strategic transport planning, and capacity analyses. Johan is unwaveringly committed to delivering high-quality services that cater to the unique needs of his clients. Notably, he holds the distinguished title of Fellow Member at the South African Institute of Civil Engineers (SAICE) and actively participates in the Transport Division Committee.

Johan's illustrious career is a testament to his unwavering commitment to excellence in the field of transport engineering, and his influence resonates not only within the borders of South Africa but also across international landscapes.

- Johan Brink has developed skills and expertise in the following areas:
- Transport Impact Studies (TIS): Road Master Planning and Access Management Plans (AMP)
- Transport Master Planning: Traffic calming measures, detailed intersection planning and design,

- Public Transport Planning: Pedestrian and bicycle facilities planning, operations and design.
- Road Safety: Project management, tenders, construction management
- Geometric and Traffic Signal Design: Excellent communication (written and oral) skills
- Development Charge Policies: Excellent project management skills
- Transport Economics: Good understanding of the institutional environment

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1 INTRODUCTION

1.1 Background

The developer is proposing to upgrade and redevelop the existing Fisantekraal Airfield into a new international airport for the region. The development will be divided into four Planning Activity Levels (PAL), based on projected airline traffic forecasts. The site is planned to be operational by 2029 (PAL 1A) with full build-out (PAL 4) projected around the year 2050. The environmental impact assessment (EIA) splits the PAL into two phases: Phase 1 (PAL 1A and 1B) and Phase 2 (PAL 2 to 4). This transport impact assessment (TIA) will assess the impact of Phase 1 (PAL 1B) and Phase 2 (PAL 4).

Phase 1 of the development will include a 3.5 km main runway and associated infrastructure to support the project land and air transport as well as other bulk services. The supplemental uses will be confirmed as the project develops. Forecasts for Phase 1 indicate 1.7 million annual passengers by 2029 (PAL 1A) and 2.5 million annual passengers by 2032 (PAL 1B). Forecasts for Phase 2 indicate airline traffic forecasts reaching 5.2 million annual passengers in the planning horizon of 2050 (PAL 4).

This report presents an assessment of the expected transport-related impacts for the site (hereafter referred to as the “CWA” – Cape Winelands Airport) in the context of the metropolitan-wide area, by identifying potential constraints in the surrounding road network and recommending suitable mitigation measures based on the current proposal and future transport networks.

The proposals raised are based on internal CWA planning team discussions, various meetings with the relevant City of Cape Town (CCT) and Western Cape Government (WCG) officials/representatives and those of Innovative Transport Solutions (ITS).

Figure 1 provides a concept showing the latest development of the site and space allocation. The master plan will be refined based on the continued professional team and relevant transport authority engagements and approval processes.

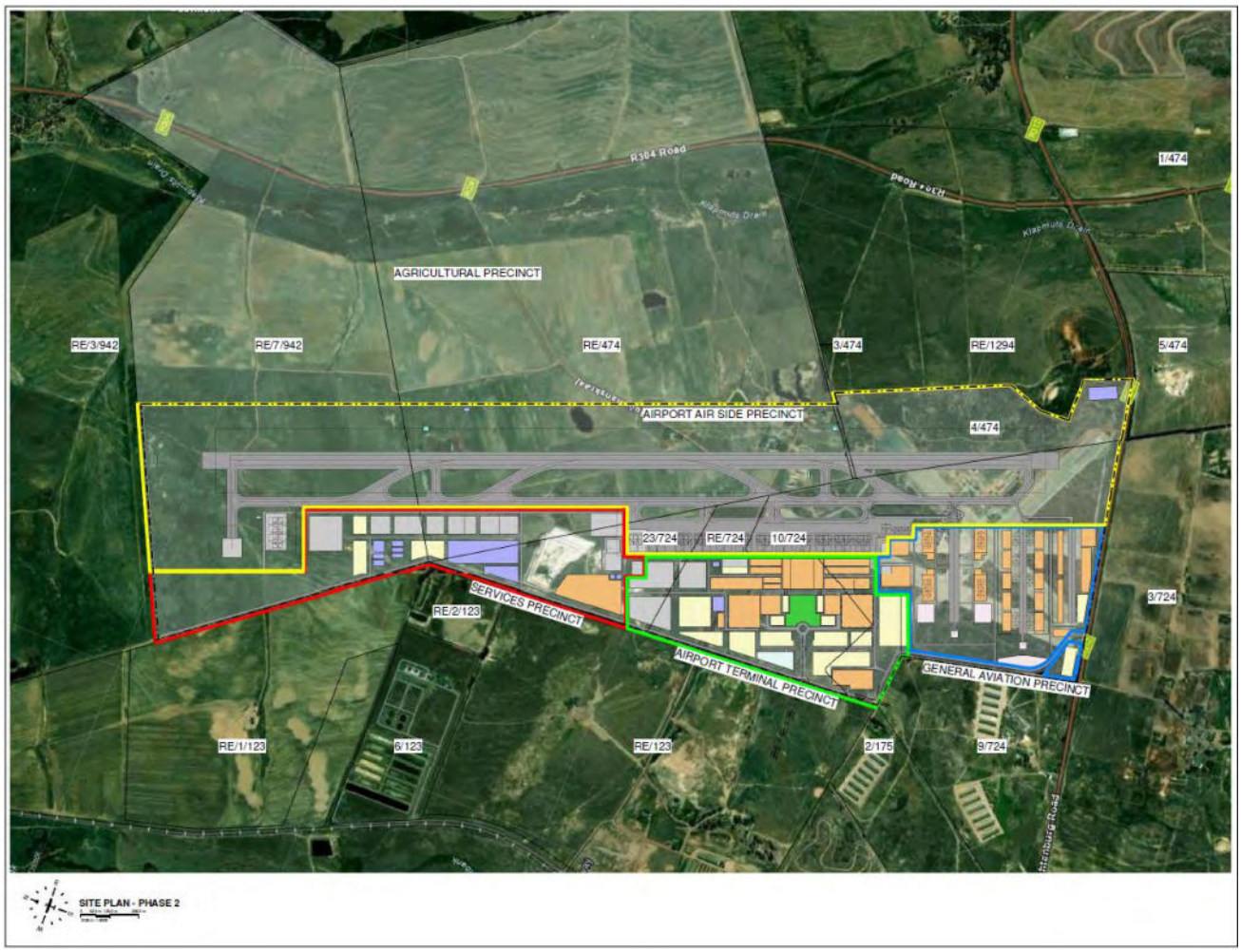

Figure 1: Concept Master Plan

1.2 Study Area Description

The proposed CWA is situated north of Lichtenburg Road (R312), east of Klipheuwel Road (R302) and west of Koelenhof Road (R304). The site will ultimately encompass the remainder of Farm 724 Joostenbergs Vlakte (the entire portion) and a portion of the remainder of Farms 474 and P7/942 Joostenberg Kloof. The remaining portions of Farm 474 and 942 will remain agricultural. Figure 2 provides a locality plan and shows encompassing farm boundaries. Refer to the spatial planning and land use status report for further details regarding the site.

The site is surrounded by small holdings and farmland to the north, south and east and Fisantekraal residential area to the southwest. There are a few planned developments in the area currently in the planning, design and implementation phases which influence the transport network and substantially increase traffic volumes in the area.

Figure 2: Locality Plan

2 EXISTING TRANSPORT

The following section provides a summary of the existing transport networks and traffic volumes in the vicinity of the site.

2.1 Existing Road Network

Table 1 provides a summary of the existing major roadways in the site vicinity. The latest road classification is taken from the CCT's Public Right-of-Way (CITP, 2023) map for the metropolitan road network as illustrated in an extract in Figure 3. The photographs in Figures 4 to 6 illustrate the existing road cross-sections.

Table 1: Major Roadways in Site Vicinity

Roadway	Classification*	Posted Speed (km/h)	Sidewalks	Bike Lanes
Klipheuwel Road (R302 / MR188)	Major Arterial (Class 2)	80 / 100	No	No
Lichtenburg Road (R312 / MR213)	Major Arterial (Class 2)	100	No	No
Koelenhof Road (R304 / MR174)	Major Arterial (Class 2)	100	No	No

*Per CCT PRoW, 2023

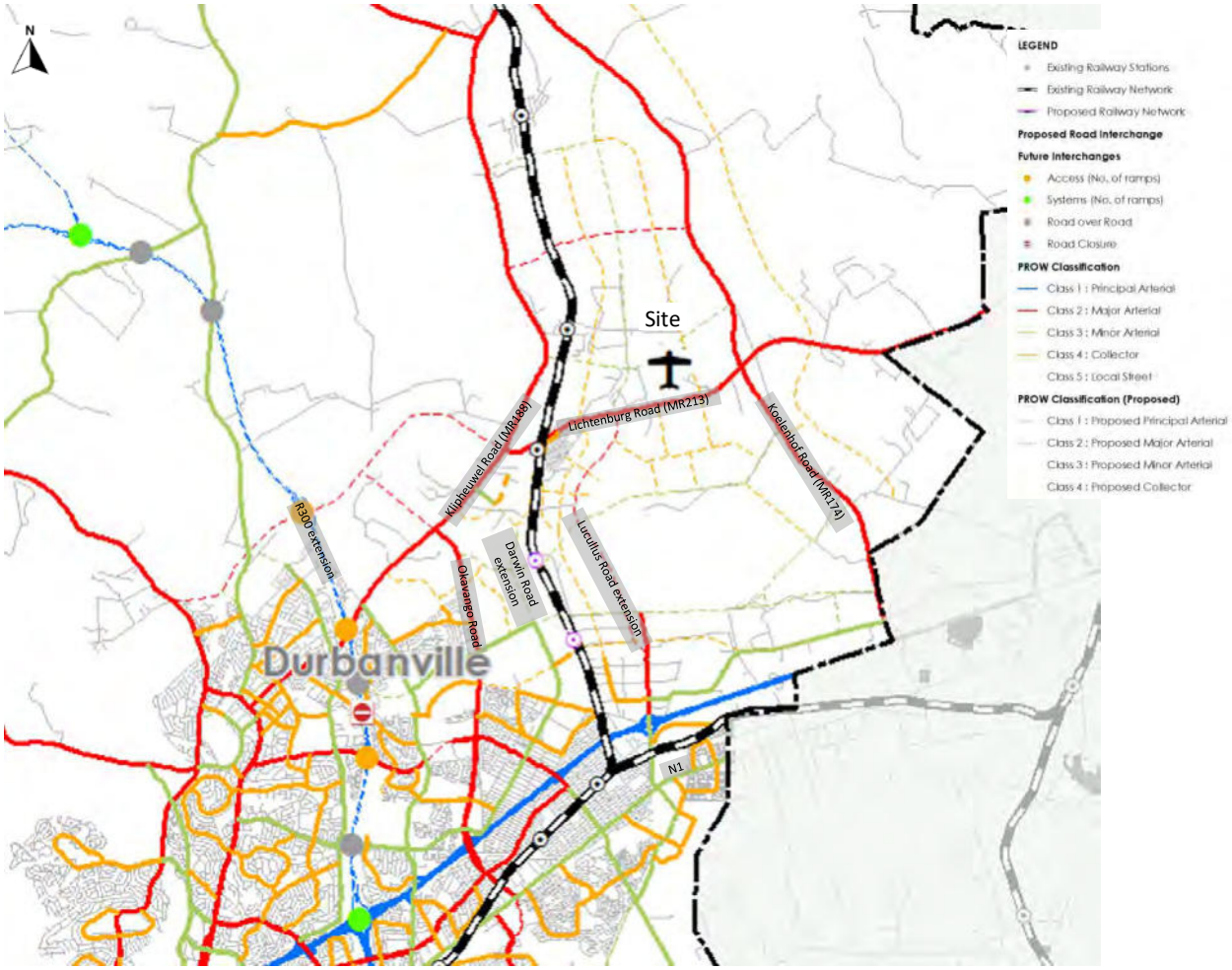

Figure 3: Metropolitan Road & Rail Network (source: CCT CITP, 2023)

Figure 4: Lichtenburg Road

Figure 5: Klipheuwel Road (source: Google Earth)

Figure 6: Koelenhof Road (source: Google Earth)

2.2 Road Reserves

2.2.1 Lichtenburg Road

As confirmed with Andrew Raath from WCG, the proclaimed road reserve the portion of Lichtenburg Road (MR213) next to the site "*is 32m as [indicated in] Provincial Notice (P.N.) 370/1982. However, if any section of the road has been fenced and the width is greater than the said (minimum) width then this can be taken as the road reserve width. If there are no fences, then the road reserve width will be 16m on either side of the existing centre line.*"

2.2.2 Mellish Road

The existing road bordering the west of the property is OP 6/8 (or continuation of Mellish Road). Figure 7 provides a plan showing the provincial roads and numbering. The road is mostly within the site boundary and as confirmed with WCG, the road has a proclaimed road reserve width of 20m as per Provincial Notice (P.N.) 1003/1977. However, if any section of the road has been fenced and the width is greater than the said (minimum) width then this can be taken as the road reserve width. If there are no fences, then the road reserve width will be 10m on either side of the existing centre line. See Figure 8 for the existing road cross-section of Mellish Road.

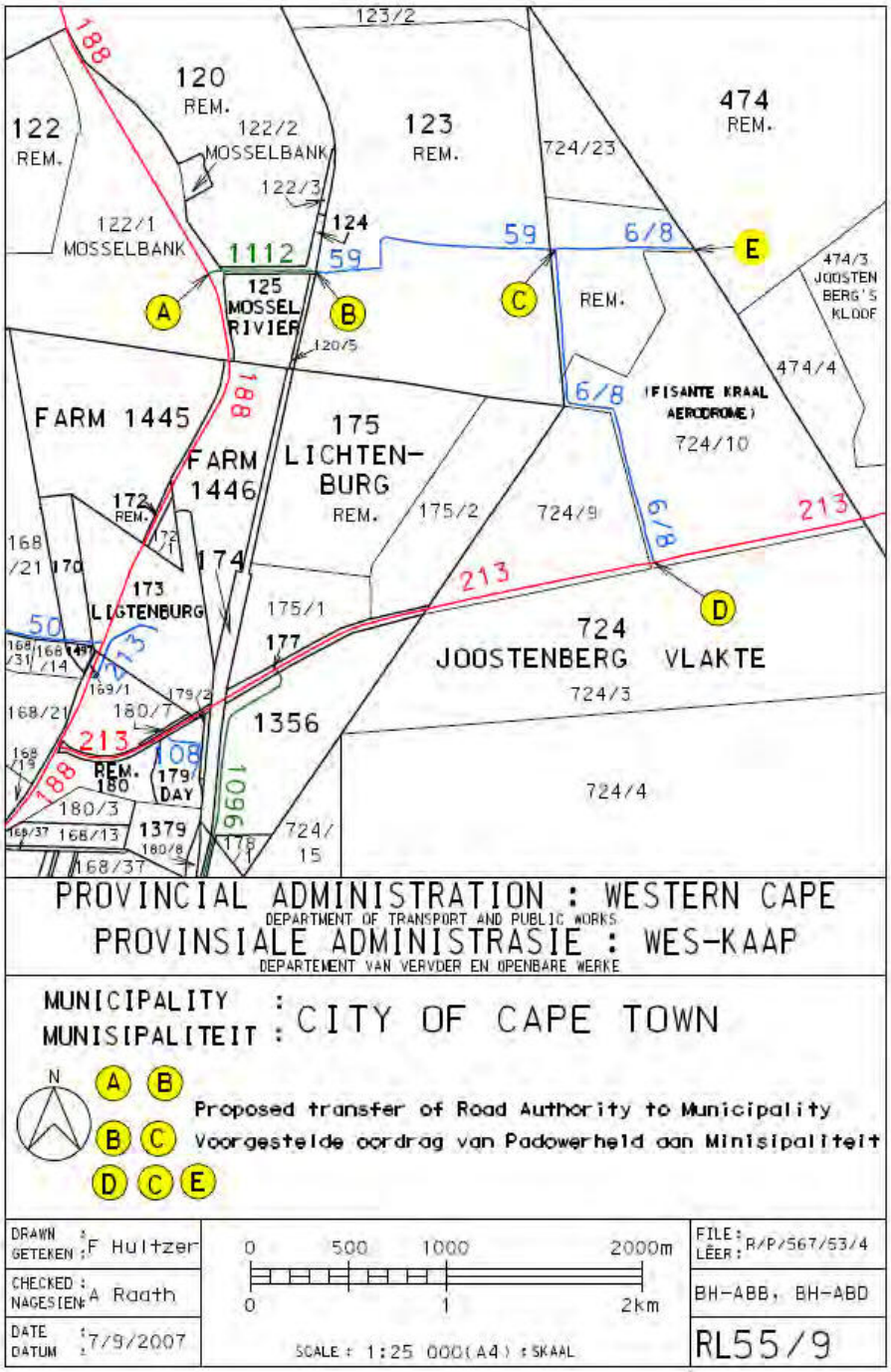

Figure 7: Provincial Roads (source: WCG, A Rath)


Figure 8: OP6/8 (Mellish Road)

2.3 Study Intersections

There are 15 intersections included in the study area, refer to Figure A1 in Annexure A for the locations of these intersections and their existing controls. These intersections were analysed to determine the transport impact of the proposed development on the surrounding road network.

2.4 Existing Traffic Conditions

Traffic counts were conducted during the weekday AM and PM peak periods in March and April 2024. The assessment of the Existing Traffic Conditions is based on 2024 peak-period traffic volumes, as well as the current intersection geometries and controls. Operational analyses were done according to the procedures in the Highway Capacity Manual (HCM), evaluating each intersection for peak-hour level of service (LOS), delay per vehicle (in seconds), and volume-to-capacity (V/C) ratio. Refer to Figures A2.1 and A2.2 in Annexure A for the 2024 Existing Traffic Conditions.

The capacity analysis results indicate that most of the intersections currently operate at an acceptable LOS during the AM and PM peak hours. The intersections operating at a poor LOS or at capacity include:

- Klipheuwel Road/Lichtenburg Road – Currently operates at a LOS F, due to long delays (> 50 seconds) and a V/C ratio greater than 1.0 during the AM and PM peak hours.
- Lichtenburg Road/Boys Biers Drive – Currently operates at a LOS F, due to long delays (> 50 seconds) during the PM peak hour.
- Klipheuwel Road/CSG Plastics Access – Currently operates at a LOS F, due to long delays (> 50 seconds) during the AM peak hour.
- Klipheuwel Road/Stanler Road– Currently operates at a LOS F, due to long delays (> 50 seconds) during the AM peak hour.
- Klipheuwel Road/Arum Lily Street – Currently operates at a LOS F, due to long delays (> 50 seconds) during the AM and PM peak hours.

The current traffic volumes at the Klipheuwel Road/Lichtenburg Road intersection warrant a traffic signal. Therefore, the following upgrades are recommended at this intersection:

- Northbound – Construct a dedicated right-turn lane.
- Southbound – Construct a dedicated left-turn lane.
- Westbound – Construct a dedicated right-turn lane.
- Intersection control – Install a traffic signal.

With this upgrade in place, the Klipheuwel Road/Lichtenburg Road intersection is expected to operate at an acceptable LOS B, as shown in Figure A2.3 in Annexure A.

The Lichtenburg Road/Boys Biers Drive intersection is planned to be converted to a left-in, left-out (LILO) configuration as per the Access Management Plan (AMP) for Lichtenburg Road (MR213), which is further discussed in Section 4. The MR213 AMP also recommended the realignment and signalisation of the Lichtenburg Road/Dulah Omar Street intersection. Additionally, the future development of Greenville Garden City will include completing the construction of the Lucullus Road southern extension and the East-West link road connecting to the Darwin Road extension (see Section 3.2.9). As a result, the demand at the Lichtenburg Road/Boys Biers Drive and Lichtenburg Road/Dulah Omar Street intersections is expected to reduce in the future. No upgrades to the Boys Biers intersection are therefore recommended until the dualling of Lichtenberg is justified.

The long-term dualled access management plan for Klipheuwel Road (MR188) is illustrated in Figure 9. The plan includes the realignment of the CSG Plastics Access to the Klipheuwel Road/Stanler Road intersection. The realigned priority-controlled intersection will be required once Stanler Road is upgraded to meet municipal standards as conditioned by the development of Remainder Farm 180, Portion 3 of Farm 180, and Portion 13 of Farm 168 (see Section 3.2.1). The realigned intersection will include dedicated turning lanes for all the approaches. Additionally, the Klipheuwel Road/Arum Lily Street intersection is planned to be converted to a LILO configuration, as a result of the intersection spacing requirements of the future signalised Klipheuwel Road/Darwin Road intersection.

Figure 9: Klipheuwel Road (MR188) AMP

Based on the recommendations from the MR213 and MR188 AMPs, as well as future planning for the area, no upgrades are recommended at the remaining constrained intersections. Upgrading these intersections for the existing scenario would be abortive given the future access plans for the main roads.

2.5 Public Transport

There are currently no dedicated public transport routes in the vicinity of the site. Fisantekraal is the nearest major residential node and minibus taxis (MBTs) operate between the area and the larger Durbanville area.

The Fisantekraal railway line (Figure 10) does not currently provide commuter rail services, but is identified in the City's long term plan to be upgraded.

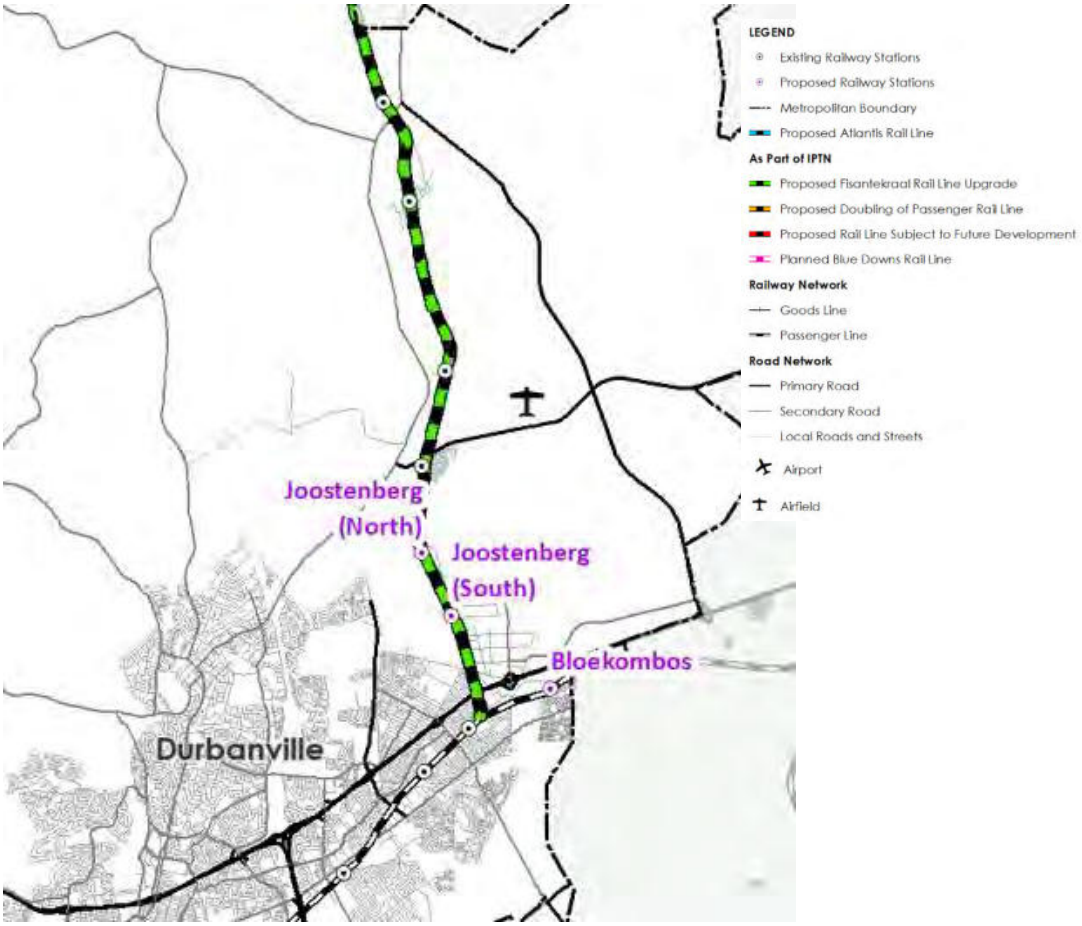

Figure 10: Existing Railway Line (source: CCT CITP, 2023)

2.6 Pedestrians and Cyclists

No dedicated exclusive pedestrian and cycling facilities are provided within the area. All pedestrians and cyclists make use of the existing roadway shoulders or gravel verges.

2.7 Freight

All three provincial main roads accommodate freight traffic. The frequency of freight via the Transnet rail is not known.

3 FUTURE TRANSPORT PLANNING

The following section provides a summary of the known future transport planning based on City planning documents as well as more recent plans based on proposed developments in the area.

3.1 Road Network Planning

Figure 3 also shows the future road network and is based on future land use projections (Spatial Growth Options for Cape Town (City of Cape Town, 2012). The projections may change over time to respond to economic markets and will in relation affect the planned road network. Route alignments may also change based on physical constraints not foreseen in the planning stages.

There are several planned north-south and east-west future roads in the site vicinity linking to the existing road network. The road that will likely be constructed first is the future Class 2 Lucullus Road extension from the N1 linking to Lichtenburg Road. The functional class of the road will change to a Class 3 minor arterial north of Lichtenburg Road. All future planned roads will be City-owned.

With the development and land uptake from the CWA, the east-west links currently crossing the site and well as north of the site will need to be amended in consultation with the City of Cape Town Urban Mobility Directorate.

3.2 Future Developments

There are multiple developments planned in the area, including:

1. Development on Remainder Farm 180, Portion 3 of Farm 180 and Portion 13 of Farm 168
2. Industrial development on Erf 1690
3. Industrial development on Erven 1693 and 1870
4. Storage Facility on Portion 32 of Farm 168
5. Apollo Bricks
6. Groot Phesantekraal Phase 4
7. Groot Phesantekraal Phase 5
8. Bella Riva
9. Greenville Garden City

The location of the planned developments in relation to the CWA is illustrated in Figure 11.

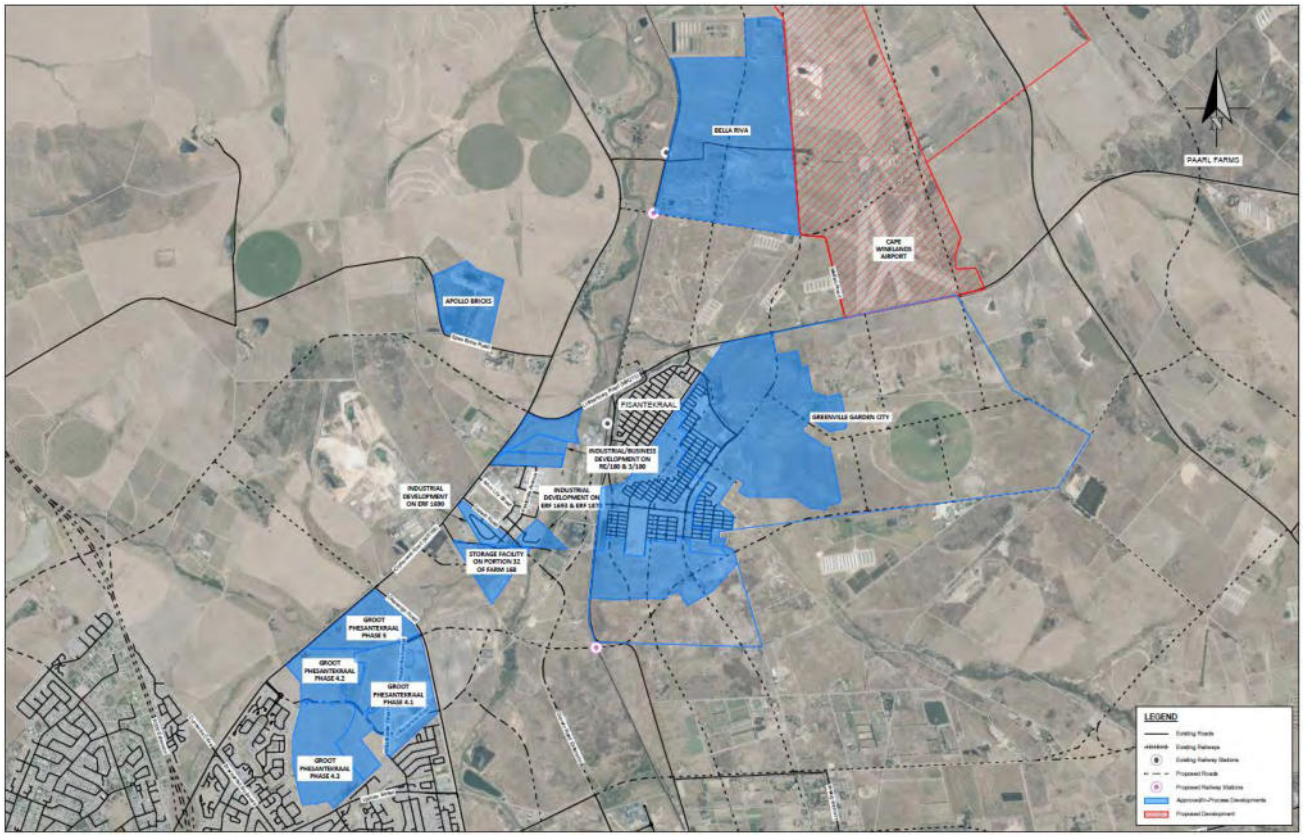

Figure 11: Approved/In-process Developments

The Bella Riva and Greenville Garden City developments are the two major developments in the vicinity of the CWA. Planning for both developments has been ongoing for several years and conditions of approval have been offered by the relevant governing authorities.

3.2.1 Development on Remainder Farm 180, Portion 3 of Farm 180 and Portion 13 of Farm 168

Portion 13 of Farm 168 was approved in 2019, and Remainder Farm 180 and Portion 3 of Farm 180 were approved in 2022. Given that these approvals are only valid for 5 years, an extension of time application was submitted and approved in November 2023 for Portion 13 of Farm 168. The current approvals are based on the land uses and extents summarised in Table 2. The development trips associated with the approved land uses are also detailed in the table.

Table 2: Approved Land Uses and Expected Impact –Remainder Farm 180, Portion 3 of Farm 180 and Portion 13 of Farm 168

Erven	Land Use	Extent	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
Portion 13 of Cape Farm 168	Industrial	30 224 m² GLA	169	73	242	60	181	241
	General Business	1 987 m² GLA	30	16	46	131	131	262
Remainder of Cape Farm 180	Industrial	39 078 m² GLA	219	94	313	78	234	312
	General Business	1 254 m² GLA	19	10	29	83	83	165
Portion 3 of Cape Farm 180	Industrial	29 597 m² GLA	166	71	237	59	178	237
	General Business	570 m² GLA	9	5	14	38	38	76
Total		**102 710 m² GLA**	**612**	**269**	**881**	**449**	**845**	**1 293**

The approved land uses (102 710 m² GLA) were initially expected to generate a total of 881 trips during the weekday AM peak hour and 1 293 trips during the weekday PM peak hour. However, the

latest proposal for the three erven, which includes a 135 867 m² GLA glass factory (see Figure 12), is expected to generate only 58 trips per hour (33 private vehicle trips and 25 heavy vehicle trips). This indicates a significant reduction in traffic impact compared to the approved projections.

Figure 12: Proposed Cape Speciality Glass (CSG) Development on Remainder Farm 180, Portion 3 of Farm 180 and Portion 13 of Farm 168 (source: Project Plus International)

In September 2023, ITS conducted a traffic survey at the existing 70 000 m² Ardagh warehouse on Erf 20414 in Bellville (ITS Ref. 4653) to assess trip generation rates for a similar development. The survey identified a trip rate of 0.02 truck trips per 100 m² GLA for the Ardagh warehouse. Applying this rate to the glass factory results in an estimate of 22 truck trips, which aligns with the projected 25 heavy vehicle trips.

3.2.2 Industrial development on Erf 1690

The TIA for Erf 1690 evaluated a 42 567 m² GLA industrial development (ITS Ref. 3790). The industrial development is expected to generate a total of 285 weekday peak-hour trips (see Table 3).

Table 3: Land Use and Expected Impact – Erf 1690

Erven	Land Use	Extent	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
1690	Industrial	42 567 m² GLA	214	71	285	71	241	285

Based on aerial imagery, construction has already commenced for certain portions of this industrial development.

3.2.3 Industrial development on Erven 1693 and 1870

A 19 016 m² GLA industrial development was assessed in the TIA for erven 1693 and 1870 (ITS Ref. 4152). Table 4 indicates that the industrial development is expected to generate a total of 130 weekday peak-hour trips.

Table 4: Land Use and Expected Impact – Erven 1693 and 1870

Erven	Land Use	Extent	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
1693 and 1870	Industrial	19 016 m² GLA	91	39	130	33	97	130

Based on aerial imagery, construction has already commenced for certain portions of this industrial development.

3.2.4 Storage Facility on Portion 32 of Farm 168

EFG Engineers conducted a transport impact statement (TIS) for a Storage Facility on Portion 32 of Farm 168 in 2015. The TIS assessed a Storage Facility with 6 100 units and its expected is summarised in Table 5.

Table 5: Land Use and Expected Impact – Portion 32 of Farm 168

Erven	Land Use	Extent	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
Portion 32 of Farm 168	Storage Facility	6 100 units	57	57	115	52	52	105

3.2.5 Apollo Bricks

The Apollo Bricks development on Portion 42 of Cape Farm 168 was approved for rezoning and subdivision in 2019. The approved conditions considered a three-phased industrial development according to Table 6.

Table 6: Land Use and Expected Impact – Portion 42 of Farm 168

Erven	Phase	Land Use	Extent	Weekday AM Peak Hour			Weekday PM Peak Hour		
				In	Out	Total	In	Out	Total
Portion 42 of Farm 168	1	Industrial	70 000 m² GLA	381	95	476	95	381	476
	2	Industrial	35 000 m² GLA	190	48	238	48	190	238
	3	Industrial	15 000 m² GLA	82	20	102	20	82	102
Total			**120 000 m² GLA**	**653**	**163**	**816**	**163**	**653**	**816**

It is important to note that per Section 2.8 of the 2019 conditions of approval, it was recommended that an updated TIA be prepared, should the approved TIA become outdated, to evaluate the expected impacts of Phase 2 of the Apollo Bricks development. However, their approval has since lapsed and subsequently omitted from this report.

3.2.6 Groot Phesantekraal Phase 4

The Groot Phesantekraal Phase 4 development was approved in 2019 and consists of three sub-phases (Phase 4.1, 4.2 and 4.3). A trip generation assessment was prepared in 2020 for an

amendment of the land uses. This confirmed that no changes were required for the conditions of approval from a transport perspective.

Certain portions of Phase 4.1 have already been built, and transfers are currently being negotiated and signed for Phase 4.2 between the property owner and prospective developers of specific portions. This has triggered the need to update the TIA for Phase 4.2 (ITS Ref. 3932.6) as per the conditions in the land use application approval. All transport infrastructure improvements as conditioned for Phase 4.1 have already been implemented and no further conditions can be stipulated for this phase provided the trip impact is less than the approval.

The updated (2024) land use extents and their expected development trips are summarised in Table 7.

Table 7: Updated (2024) Land Use and Expected Impact – Groot Phesantekraal Phase 4

Phase	Portion	Land Use	Extent	Weekday AM Peak Hour			Weekday PM Peak Hour		
				In	Out	Total	In	Out	Total
4.1	1	Independent Combined School	558 students	232	182	414	78	54	133
	2 & 4	Independent Institute for Higher Education	4 000 students	640	160	800	240	560	800
	3	Student Apartments	362 units	18	54	72	71	38	109
	5, 6, 7	Multi-level Townhouses	545 units	85	256	341	248	106	355
	5, 6, 7	Retail	9 600 m² GLA	86	46	132	375	375	751
	8	Multi-level Townhouses	65 units	10	31	41	30	13	42
	12	Multi-level Townhouses	157 units	25	74	98	72	31	102
	5	Medical	3 000 m² GLA	30	20	50	18	27	45
Phase 4.1 Subtotal				*1 126*	*823*	*1 949*	*1 132*	*1 205*	*2 337*
4.2	24	Multi-level Townhouses	293 units	46	138	184	134	57	191
	29	Retirement Village	1 080 units	144	215	359	180	180	359
	23	Multi-level Townhouses	97 units	15	46	61	44	19	63
	23	Office	12 000 m² GLA	171	30	202	40	161	202
Phase 4.2 Subtotal				*376*	*429*	*805*	*398*	*417*	*815*
4.3	26	Multi-level Townhouses	811 units	127	381	508	370	158	528
	26	Retail	400 m² GLA	4	2	6	16	16	31
Phase 4.3 Subtotal				*131*	*383*	*514*	*385*	*174*	*559*
Total				**1 633**	**1 635**	**3 267**	**1 915**	**1 796**	**3 711**

3.2.7 Groot Phesantekraal Phase 5

The approved TIA (ITS Ref. 4170) land use extents and their expected development trips for the mixed-use Groot Phesantekraal Phase 5 development is summarised in Table 8.

Table 8: Land Use and Expected Impact – Groot Phesantekraal Phase 5

Development	Land Use	Extent	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
Groot Phesantekraal Phase 5	Bulk Trade Centre	3 514 m² GLA	24	11	35	19	29	48
	Townhouses (Simplexes and Duplexes)	230 units	42	125	167	116	50	166
	Arms Dealership & Shooting Range	18 lanes	4	3	7	10	12	22
	Office	2 000 m² GLA	72	13	85	17	68	85
	Nursery (Garden Centre)	698 m² GLA	5	3	8	5	13	18
	Shopping Centre	22 219 m² GLA	81	34	115	449	449	898
	Fast Food	491 m² GLA	53	43	96	58	48	106
	Vehicle Fitment Centre	400 m² GLA	8	4	12	8	9	17
Total			**289**	**236**	**525**	**682**	**678**	**1 360**

3.2.8 Bella Riva

The Bella Riva development will include multiple development phases and short to long-term bulk infrastructure upgrades associated with the development build-out are proposed. Bella Riva was previously approved, but recent updates have been made to the land use extents. The updated land use extents and their associated development trips per phase are summarised in Table 9.

Table 9: Land Use and Expected Impact – Bella Riva

Phase	Land Use	Extent	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
1	Apartments & Flats	1 181 units	163	489	653	457	196	653
	Townhouses (Simplexes and Duplexes)	571 units	103	309	413	289	124	413
	Shopping Centre	6 250 m² GLA	62	33	95	270	270	540
Phase 1 Subtotal			328	832	1 160	1 016	590	1 606
2	Single Dwelling Units	81 units	18	55	73	51	22	73
	Apartments & Flats	342 units	47	142	189	132	57	189
	Private School	2 000 students	560	560	1 120	210	210	420
	Pre-School (Day Care Centre)	500 students	238	238	475	190	190	380
	Offices	2 000 m² GLA	29	5	34	7	27	34
	Shopping Centre	1 750 m² GLA	17	9	27	76	76	151
Phase 2 Subtotal			909	1 008	1 917	666	581	1 247
3	Single Dwelling Units	894 units	201	603	805	563	241	805
Phase 3 Subtotal			201	603	805	563	241	805
Total			**1 438**	**2 444**	**3 882**	**2 245**	**1 412**	**3 657**

According to recent information received from Bella Riva transport consultants (Sturgeon Consulting), a five-year horizon will be considered for Phase 1, and a 10 to 15-year horizon will be considered for Phases 2 and 3. However, it is likely that Phases 2 and 3 will only realise in the 15-year horizon. Conditions directly related to the proposed CWA include:

- Minor Roads 6/8 and 59 in the east-west direction will be closed. The East-West link road will be constructed from Klipheuwel Road up to the first access point for Phase 1 of the Bella Riva development (five-year horizon).
- Minor Road 6/8 (north-south) or also known as Mellish Road will be used as access from Lichtenburg Road (R312) until signalisation is warranted/required. For this condition, the proposed Lucullus Road northern extension will be required. The Lucullus Road northern extension will only be constructed as part of Phase 2 and 3 of the Bella Riva development (10 to 15-year horizon).

See Figure 13 for the latest Bella Riva SDP.

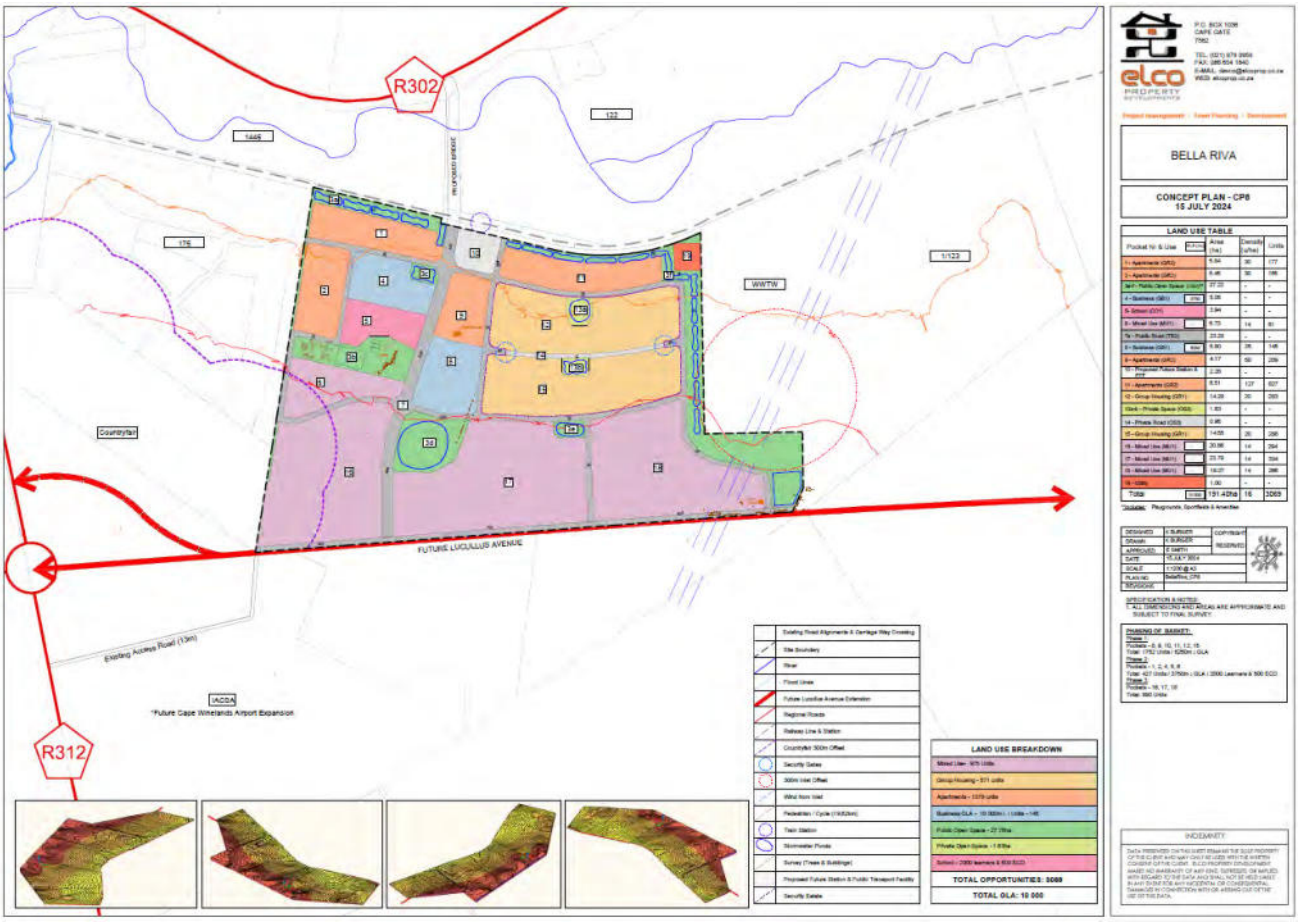

Figure 13: Bella Riva SDP (source: Sturgeon Consulting, 2024)

3.2.9 Greenville Garden City

The Greenville Garden City development is planned to be developed over multiple phases. The subdivisional plan (see Figure 14) has been established and indicates the alignment of Lucullus Road onto Lichtenburg Road (R312).

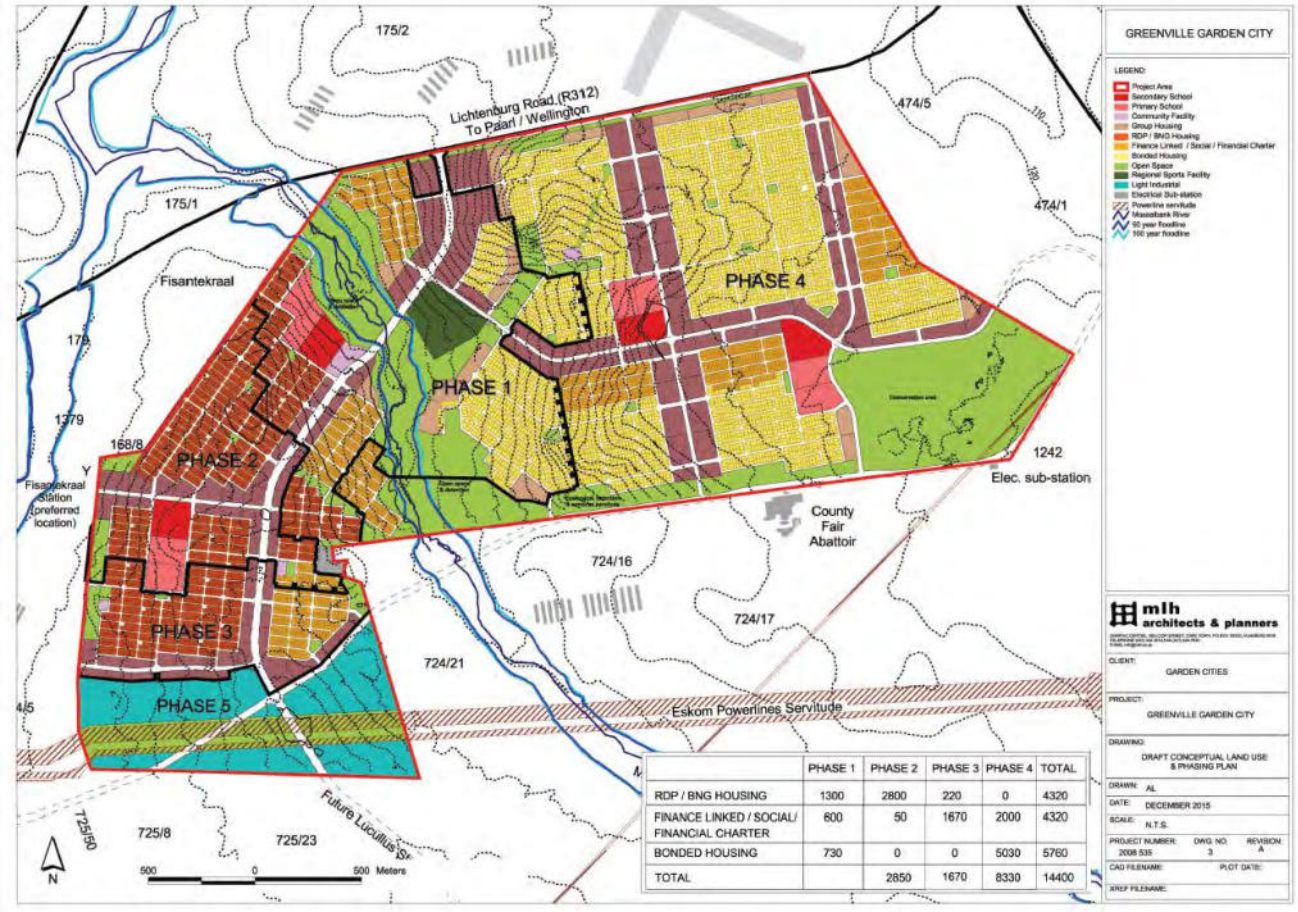

Figure 14: Greenville Conceptual Land Use and Phasing Plan (source: mlh architects and planners)

Only Phases 1 to 3 of the Greenville Garden City development has been approved and construction has already commenced. According to recent information received from Greenville Garden City transport consultants (GIBB), the upcoming Phase 4 of Greenville Garden City development will be swapped with Phase 5 as shown in Figure 14. The development of Phase 4 will include the completion of the construction of the Lucullus Road southern extension and the East-West link road connecting to the Darwin Road extension.

To determine what remains to be built for the remaining Phases 1 to 4, Google Earth historical imagery was used to estimate an annual construction rate. By counting the number of units built each year, an average construction rate of 343 units per year was determined. A calculated trip generation rate, based on the trip assignment for Phases 1 to 3.4, and the average construction rate were used to estimate the development trips for the remaining portions, as summarised in Table 10.

Table 10: Land Use and Expected Impact – Greenville Garden City

Development	Horizon Year	Extent	Weekday AM Peak Hour			Weekday PM Peak Hour		
			In	Out	Total	In	Out	Total
Greenville Garden City	2032	2 744 units	260	641	901	639	361	1 000
	2050	6 174 units	584	1 443	2 026	1 438	812	2 249
Total			**843**	**2 084**	**2 927**	**2 076**	**1 173**	**3 249**

3.3 Background Traffic Conditions

The background traffic conditions are based on 2024 peak-hour traffic volumes, plus the additional trips generated by future developments in the areas.

3.3.1 Historical Traffic Growth

Based on data from the WCG Road Network Information System (RNIS), Klipheuwel Road (MR188) has a historical growth rate of 1.55% (see Figure 15). In contrast, Koelenhof Road (MR174) has a higher historical growth rate of 2.86% (see Figure 16).

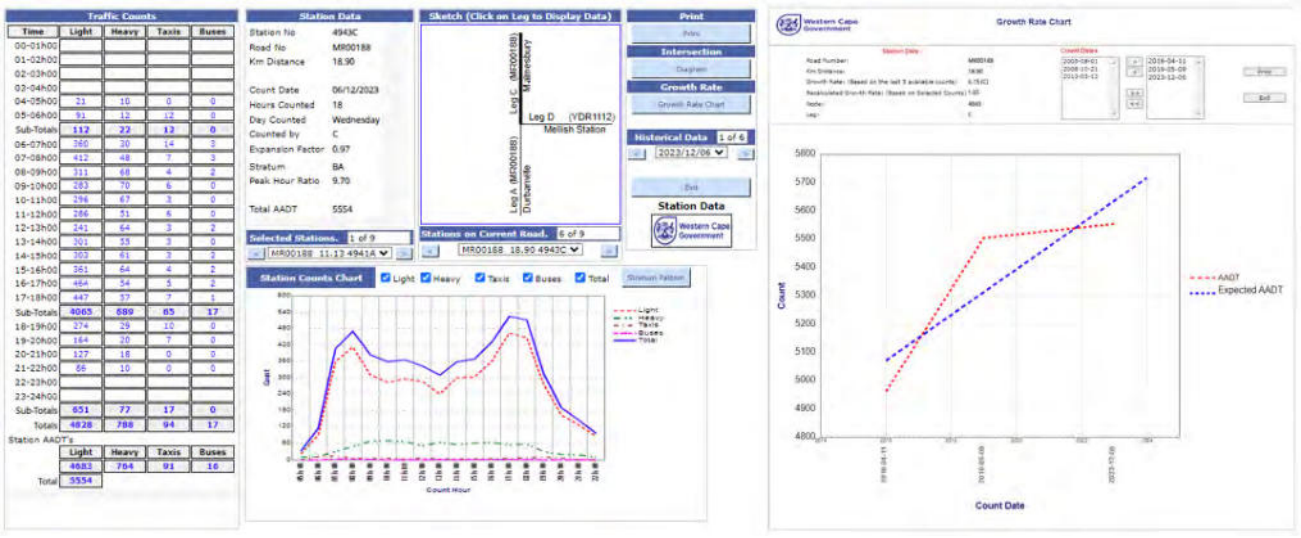

Figure 15: Klipheuwel Road (MR188) Station Data (source: WCG RNIS)

Figure 16: Koelenhof Road (MR174) Station Data (source: WCG RNIS)

Despite the historical growth along Klipheuwel and Lichtenburg Road, the capacity analysis will only include the trips from future developments in the area as it is very likely that the current traffic growth along these roads are as a result of local developments in the area.

3.3.2 2032 Capacity Analysis

An 8-year (2032) horizon will be assessed for the Background Traffic Conditions scenario.

Table 11 summarises the background development trips included in the 8-year horizon. Due to changes in land use extents for some future developments in the area, their expected horizon years, and the lapsing of certain approvals, the 2032 scenario will assess the reduced impact of the glass factory on Remainder Farm 180, Portion 3 of Farm 180, and Portion 13 of Farm 168. The Apollo Bricks development will be excluded, and only Phase 1 of Bella Riva will be considered. Based on the estimated construction rate for the Greenville Garden City development, only Phases 1 to 3 will be considered. As a result, the impact of the Lucullus Road southern extension and the East-West link road connecting to the Darwin Road extension was excluded from this scenario.

Table 11: 2032 Background Development Trips

Development	Phase / % Included	Weekday AM Peak Hour			Weekday PM Peak Hour		
		In	Out	Total	In	Out	Total
Glass Factory on Remainder Farm 180, Portion 3 of Farm 180 and Portion 13 of Farm 168	100%	44*	15*	58	15*	44*	58
Industrial development on Erf 1690	100%	214	71	285	71	241	285
Industrial development on Erven 1693 and 1870	100%	91	39	130	33	97	130
Storage Facility on Portion 32 of Farm 168	100%	57	57	115	52	52	105
Groot Phesantekraal Phase 4	Phase 4.1, 4.2 and 4.3	1 633	1 635	3 267	1 915	1 796	3 711
Groot Phesantekraal Phase 5	100%	289	236	525	682	678	1 360
Bella Riva	Phase 1	328	832	1 160	1 016	590	1 606
Greenville Garden City	Remaining Phase 1, 2 and 3	260	641	901	639	361	1 000
Total		**2 916**	**3 526**	**6 441**	**4 423**	**3 859**	**8 255**

*COTO 120, Heavy industry/manufacturing AM and PM Peak split considered

Over 8 000 background development trips will be added to the road network during the PM peak hour. This increase in traffic will trigger the dualling of Klipheuwel Road, along with several intersection upgrades. These intersection upgrades include:

- Klipheuwel Road/Mellish Road:
  - Northbound – Construct a dedicated right-turn lane.
  - Southbound – Construct a dedicated left-turn lane.
  - Westbound – Construct a dedicated right-turn lane.
  - Intersection control – Install a traffic signal.
- Klipheuwel Road/Lichtenburg Road:
  - Northbound – Construct an additional through lane and dedicated right-turn lane.
  - Southbound – Construct an additional through lane.
  - Westbound – Construct a left-turn slip lane.
- Lichtenburg Road/Dulah Omar Street: Per the MR213 recommendations, realign Dulah Omar Street with the following configuration:
  - Southbound – Construct a shared lane.
  - Eastbound – Construct a dedicated right-turn lane and dedicated left-turn lane.

  - Westbound – Construct a dedicated right-turn lane and dedicated left-turn lane, and an additional through lane.
  - Intersection control: Install a traffic signal.
- Lichtenburg Road/Koelenhof Road:
  - Northbound – Construct a left-turn slip lane.
  - Eastbound – Construct two dedicated right-turn lanes.
  - Westbound – Construct a dedicated right-turn lane.
  - Intersection control: Install a traffic signal.
- Klipheuwel Road/CSG Plastics Access: Realign the CSG Plastics Access to the Klipheuwel Road/Stanler Road intersection.
- Klipheuwel Road/Stanler Road:
  - Northbound – Construct a shared through and left-turn lane, and a dedicated right-turn lane.
  - Southbound – Construct a shared through and left-turn lane, and a dedicated right-turn lane.
  - Eastbound – Construct a shared through and left-turn lane, and a dedicated right-turn lane.
  - Westbound – Construct a shared through and left-turn lane, and a dedicated right-turn lane.
- Klipheuwel Road/Arum Lily Street: Convert to a LILO configuration, as per the recommendations of the MR188 AMP.
- Klipheuwel Road/Darwin Road:
  - Northbound – Construct an additional through lane.
  - Southbound – Construct an additional through lane.
  - Westbound – Construct a dedicated right-turn lane and a left-turn slip lane.
  - Intersection control – Install a traffic signal.
- Klipheuwel Road/Okavango Road:
  - Southbound – Construct two additional through lanes and a left-turn slip lane.
  - Westbound – Construct an additional dedicated right-turn lane.
- Klipheuwel Road/Olifantsrivier Avenue:
  - Northbound – Construct an additional through lane and dedicated right-turn lane.
  - Southbound – Construct an additional through lane:
  - Westbound – Convert the dedicated right-turn lane into a shared right-and-left turn lane.
  - Intersection control – Install a traffic signal.
- Klipheuwel Road/Brackenfell Boulevard:
  - Northbound – Construct two additional through lanes, an additional dedicated right-turn lane and a dedicated left-turn lane.
  - Southbound – Construct two additional through lanes.
  - Westbound – Convert left-turn slip into a dedicated left-turn lane, construct a shared-through and left-turn lane, and an additional dedicated right-turn lane.

The intersection upgrades and capacity analysis results for the 2032 Background Traffic Conditions are provided in Figures A3.1 to A3.3 in Annexure A.

Based on the capacity analysis results, the priority-controlled intersections along Klipheuwel Road and Lichtenburg Road are expected to continue to experience capacity constraints. However, alternative routes are available via the signalised Darwin Road and Dulah Omar Street intersections.

3.4 Public Transport Network Planning

In 2013, the City completed a long-term integrated public transport network (IPTN) plan for Cape Town. The IPTN is currently being updated with the next update scheduled to be ready by 2026.

Figure 17 provides the future planned IPTN routes within the area. The nearest MyCiTi trunk routes to the CWA are the Durbanville CBD and Kraaifontein area. Feeder services from Fisantekraal are planned. Due to the City prioritising public transport services in the southeast metro, establishing MyCiTi services in the general Durbanville area will be long-term.

Public transport facilities are also planned within the Bella Riva precinct and would need to be planned to link up with existing and future services. Golden Arrow Bus Services (GABS) and MBT services are likely to satisfy future public transport demand until the integrated public transport network plan is implemented in this area.

The Fisantekraal rail line may provide commuter services if demand warrants this in the future.

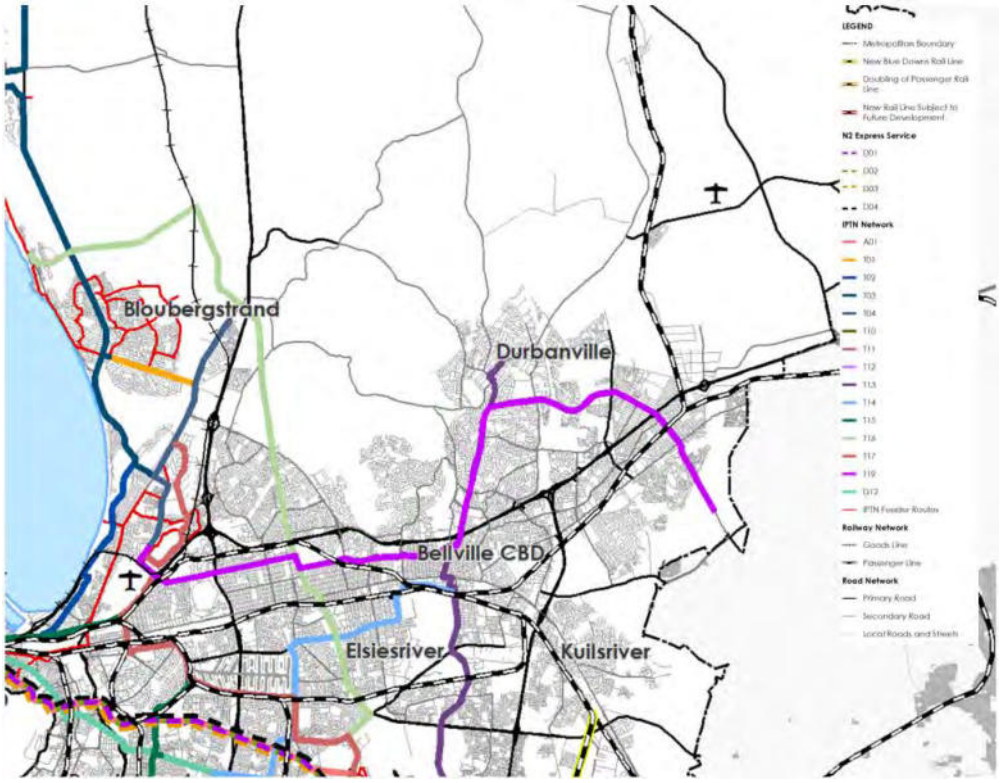

Figure 17: IPTN Plan 2032 (CITP, 2023)

3.5 Future Pedestrian and Cycle Network Planning

The City's long-term cycle route planning indicates that Lucullus Road is a proposed Class 2 cycle route. It is recommended to extend the Class 3 cycle route along Klipheuwel to Lichtenberg and also introduce a cycle route along the latter.

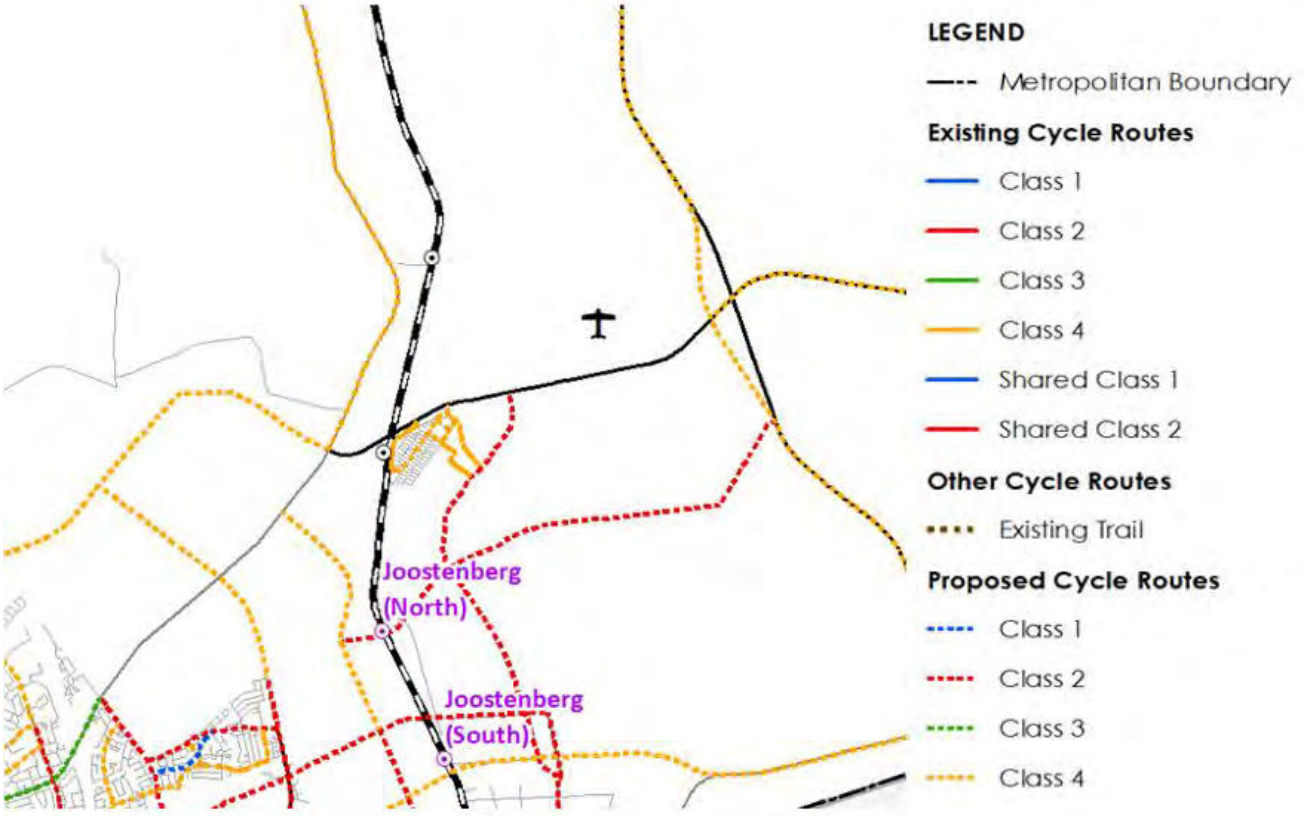

Figure 18: Cycle Route Planning (CITP, 2023)

4 ROAD ACCESS MANAGEMENT

The R312 (MR213) Arterial Management Plan, Greenville Garden City and Bella Riva developments, and discussions with CCT and WCG officials refer.

Table 12 provides the minimum access spacing requirements based on the Road Access Guidelines (Provincial Administration Western Cape, 2002). The future development environment along the major roadways will be suburban as confirmed with the relevant road authorities. Accordingly, any signalised intersections along Class 2 roads would need to be spaced ideally at 800m.

Table 12: Minimum Access Spacing

Roadside Environment	Signalised	Unsignalised
Class 2 roads		
Semi-Rural	1 200	400
Suburban	800	270
Intermediate	540	180
Class 3 roads		
Semi-Rural	800	270
Suburban	540	180
Intermediate	375	120
Class 4 roads		
Semi-Rural	540	180
Suburban	375	120
Intermediate	275	90

The access spacing between driveways can be 30 to 40m along lower order roads.

The access management for Lichtenburg Road (MR213) is shown in Figure 19 and provided in Annexure B. The current alignment of the Lucullus Road southern extension as part of the Greenville Garden City development is approximately 100m to the east of the location provided in the AMP. This therefore results in the spacing to future Dulah Omar realignment to be approximately 900m and 700m spacing to the existing Mellish Road (major access in accordance with the AMP).

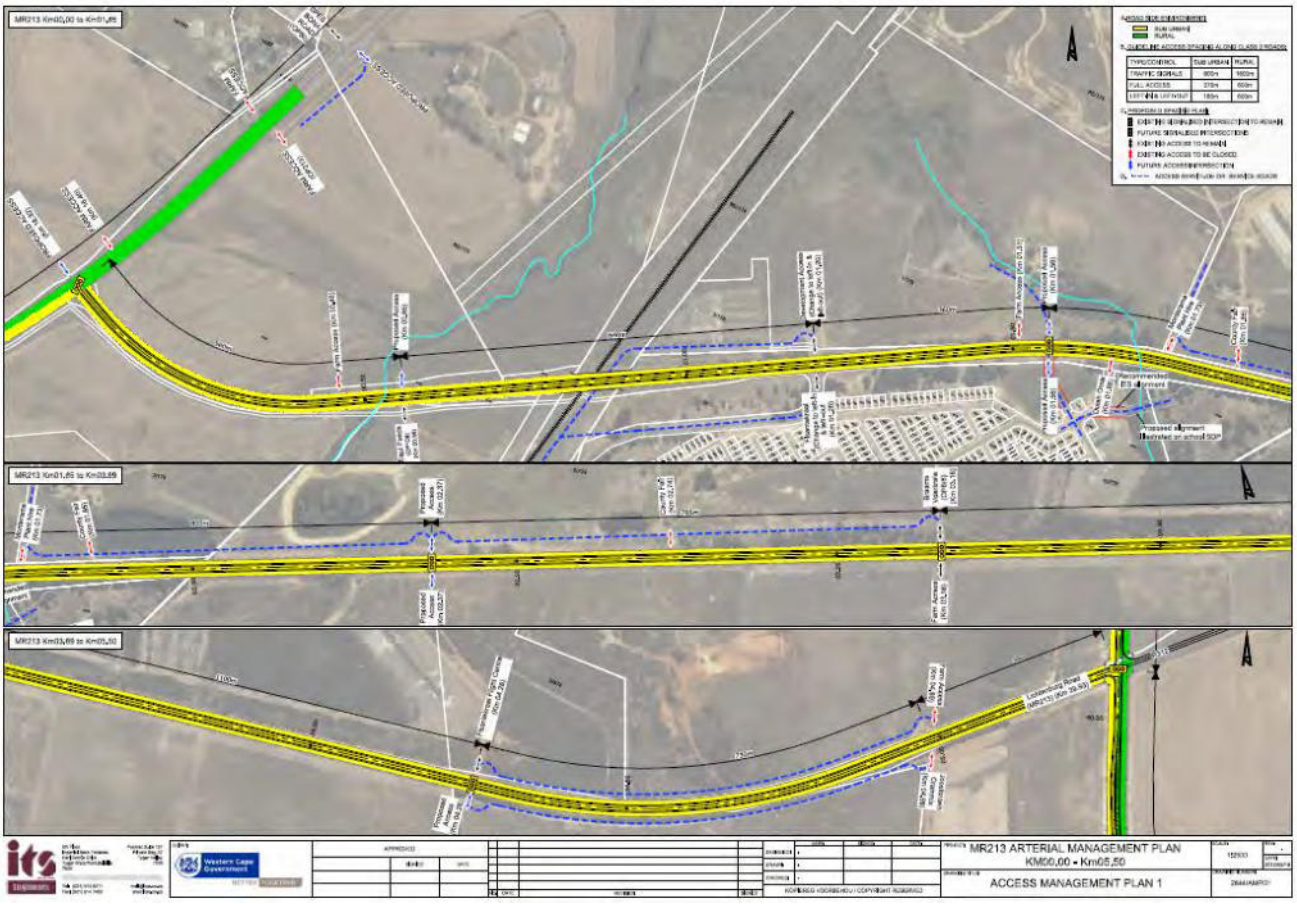

Figure 19: Lichtenburg Road (MR213) AMP

As part of the MR188 AMP, ITS developed a Roads Master Plan (RMP) in 2009. This plan was initiated by local developers and landowners, and it was compiled in conjunction with the City and the Provincial Government to guide future developments in the area. For details, see Figure 20, which illustrates the proposed RMP.

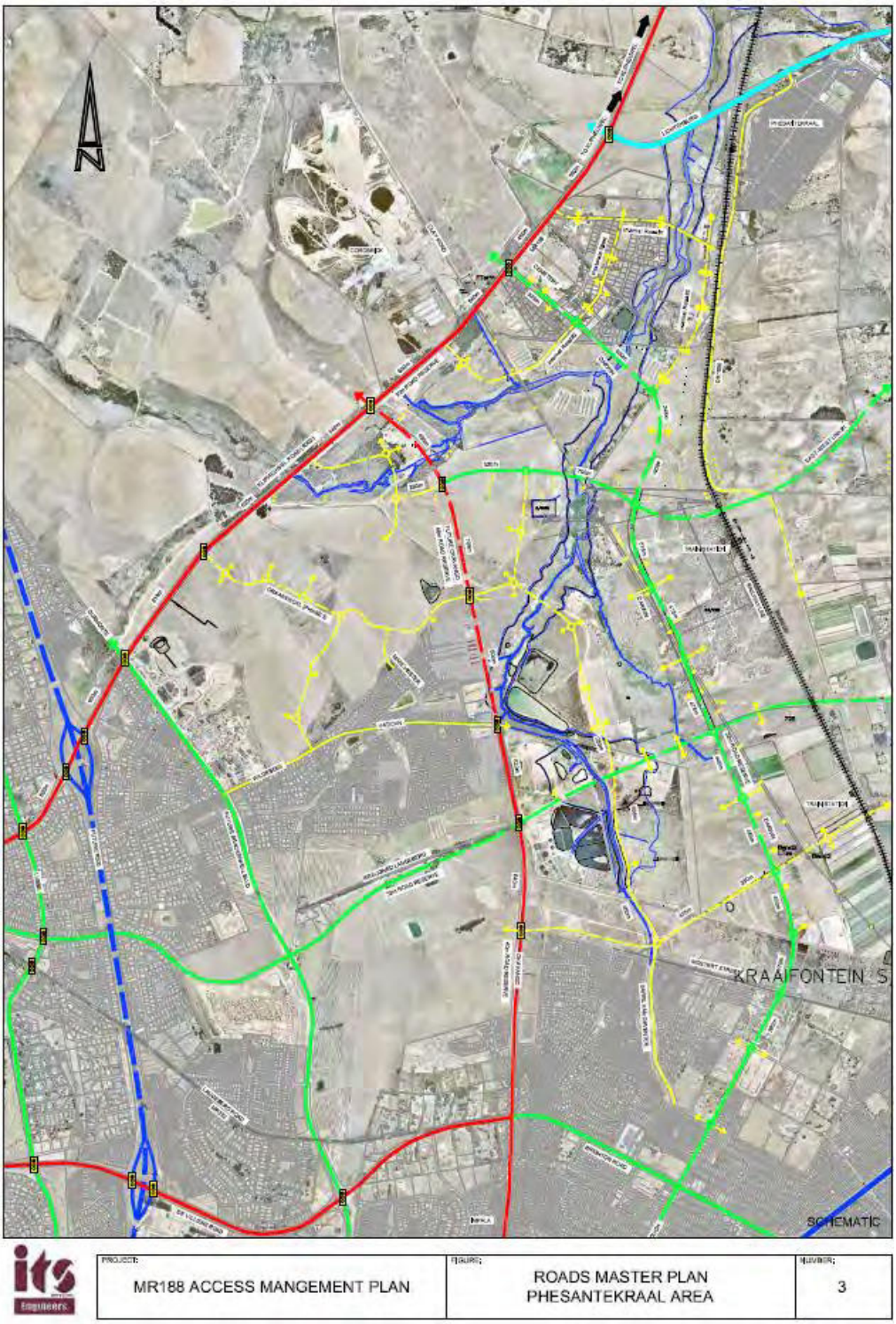

Figure 20: Roads Master Plan (RMP)

5 PROPOSED DEVELOPMENT: CAPE WINELANDS AIRPORT

5.1 Proposed Use

The application is for the rezoning and consent use of an "airport" on the properties. The land use falls under Transport Zoning 1: Transport Use (TR1). The primary uses may include multiple parking garage, utility service, shop, restaurant, service trade, office, warehouse, rooftop base telecommunication station, minor freestanding base telecommunication station, minor rooftop base telecommunication station and container site. Consent uses to accompany the application may include business premises, places of assembly, place of entertainment, hotel, conference facility and a service station.

The CWA is divided into four precincts:

- Terminal Precinct
- Services Precinct
- General Aviation Precinct
- Airport Air Side Precinct

Concept plans for these precincts for Phase 1 (PAL 1B) and Phase 2 (PAL 4) can be found in Annexure B. The main use of the CWA would include Scheduled Services, General Aviation and Cargo Services. Further details regarding land use and passenger projections are provided in Section 5.4 of this report.

5.2 Opportunities to Access the Road Network System

Various access opportunities to the road network system are ultimately available for the site west of the runway i.e. terminals, Fixed Base Operators (FBO's) and hangers. These include the existing Mellish Road (OP 6/8) connection onto Lichtenburg Road, the future Class 3 Lucullus Road extension and the future Class 3 Mellish Road extension through Bella Riva. Site access for any development east of the runway will have the opportunity to access from Lichtenburg Road (R312) in accordance with the AMP.

The site access is largely factored by development timing/phasing (CWA and others), land ownership constraints and infrastructure costing. These options, in no particular order, are as follows:

5.2.1 Option 1: Access via Mellish Road / Lichtenburg Road (R312)

Access via Mellish Road for the initial phase of the CWA is considered the most viable in terms of external factors not impeding progress. The Bella Riva development is conditioned to upgrade this road to acceptable standards. The Lucullus Road extension will need to be built once signal warrants are met and the land has been expropriated for the northern extension.

Mellish Road may become obsolete once the Lucullus Road northern extension is built. It is proposed to assess the feasibility of converting the road for airport use in the future to avoid building two parallel roads (e.g. public road internal parallel routes).

Access from Lichtenburg Road is proposed to line up with the road network planning for Greenville or vice versa. This option will require the realignment of Mellish Road. The future phases of Greenville may be amended subject to the approval of the CWA and a consolidated location of an intersection with Lichtenburg Road must be found.

Access from the Class 2 Provincial Road will need to remain open to the public.

5.2.2 Option 2: Access via Mellish Road / Klipheuwel Road (R302)

The proposed Class 3 route through Bella Riva will ultimately be available for a public connection to the CWA. Similar to the Lucullus Road extension, the feasibility of a joint agreement to design and construct the road should be assessed. This route could then be an option if the Lucullus Road extension is not feasible in the short term.

Consultation with Bella Riva transport consultants and the CCT officials will confirm the preferred alignment of this route.

5.2.3 Option 3: Access via Lucullus Road extension

Access via the Lucullus Road extension is the preferred initial route. Joint funding from Bella Riva and the CWA could possibly be used to construct the road. However, agreements would need to be established between the developers as well as the current landowner to accommodate the existing operations of the chicken farm on the property.

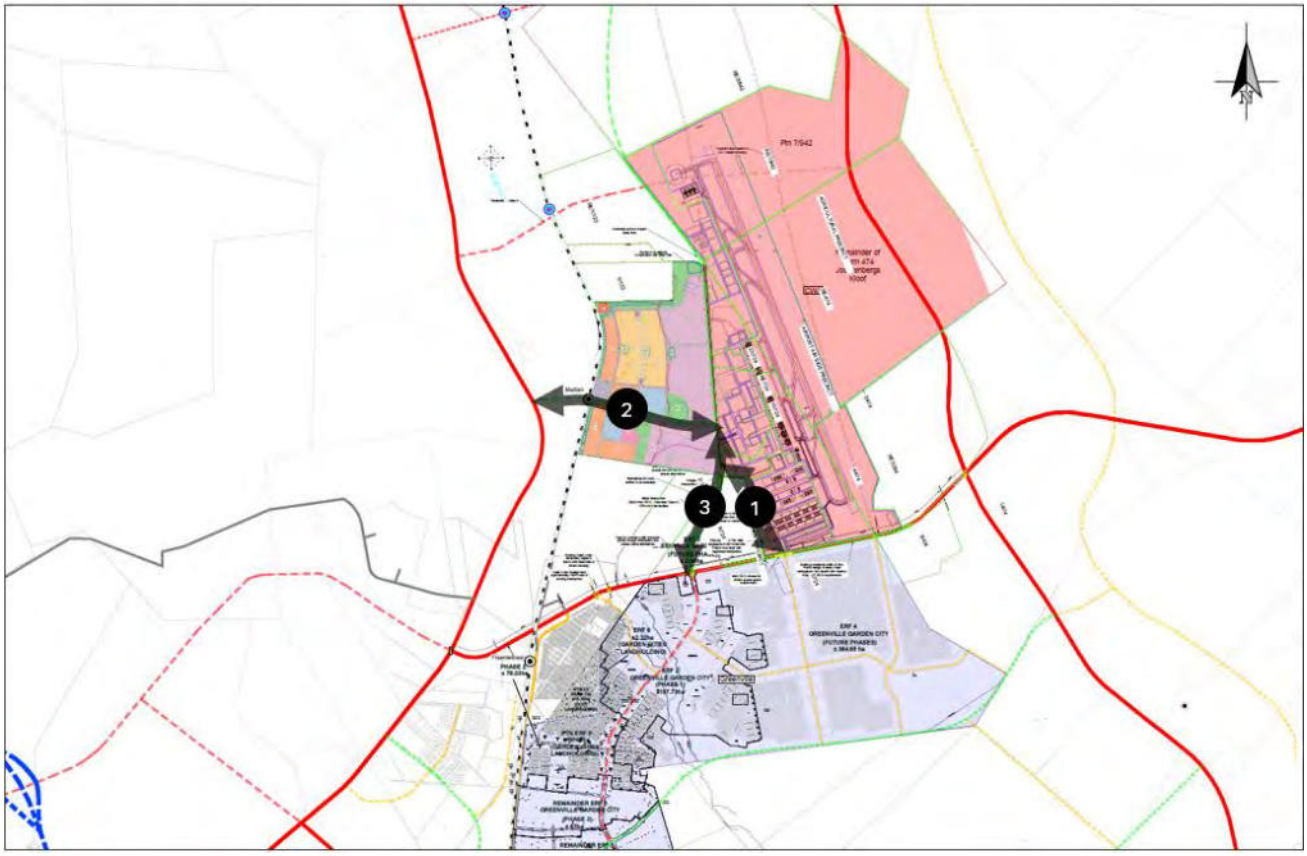

Figure 21: Site Access Opportunities

It is envisaged that the phasing of the access will be:

1. Mellish / Lichtenburg (interim main access)
2. Bella Riva Class 3
3. Lucullus Road

5.3 Airport Phasing

The CWA will be developed in multiple phases with Phase 1 (PAL 1B) planned to be operational by 2032. The phasing will be market driven with the initial phase being the core terminals towards the north of the site. The site will then be developed south towards Lichtenburg Road with any remaining FBOs and hangers. The current estimation of completion of the final phase (PAL 4) is by 2050. See Table 13 for the PAL timeframes and passenger estimates.

Table 13: CWA Phasing

Planning Activity Level (PAL)	PAL Year	Million Annual Passengers (MAP)	EIA Phases
1A	2029	1.7	Phase 1
1B	2032	2.5	
2	2038	3.5	Phase 2
3	2044	4.4	
4	2050	5.2	

5.4 Estimated Vehicle Trip Generation

5.4.1 Trip Generation Rates

The trip generation rates for the commercial airport traffic were derived from data collected at Cape Town International Airport (CTIA). Cordon counts were conducted at 10 locations around the CTIA to determine the number of vehicles entering and exiting through the various access points. Based on these cordon counts, the following peak-hour rates were identified:

- Weekday AM Peak Hour: 136.34 trips per million annual airline passengers
- Weekday PM Peak Hour: 253.64 trips per million annual airline passengers

A Daily Conversion Factor of 13.15 was derived from the 24-hour profile at the CTIA Airport Approach Road counting station for the airport traffic. A daily trip rate of 3335.51 trips per million annual airline passengers was determined.

To determine the vehicular trip generation rates, the supplemental land uses for the airport were categorised based on the land use classifications in COTO TMH 17. A summary of the proposed land uses is presented in Table 14. It is important to note that a GLA factor of 0.85 was applied to the office and retail land uses, and a GLA factor of 1.00 was applied to the warehouse land uses.

Table 14: CWA Land Use Extents

Horizon Year	Planning Activity Level (PAL)	Annual Passengers	COTO Land Use	Extent	Notes
2032	PAL 1B	2 500 000	COTO 710, Offices	25 543 m² GLA	
			COTO 150, Warehousing and Distribution	26 567 m² GLA	
			COTO 946, Filling Station	1 station	
			COTO 820, Shopping Centre	18 540 m² GLA	Includes retail and restaurants
			COTO 310, Hotel, Residential	150 rooms	One hotel with 150 rooms
2050	PAL 4	5 200 000	COTO 710, Offices	53 601 m² GLA	
			COTO 150, Warehousing and Distribution	82 398 m² GLA	
			COTO 946, Filling Station	1 station	
			COTO 820, Shopping Centre	18 540 m² GLA	Includes retail and restaurants
			COTO 310, Hotel, Residential	300 rooms	Two hotels with 150 rooms each

To avoid 'double counting' development trips, an externalisation factor was applied to the supplemental uses since the trip generation rates for airport traffic already include these trips. The following externalisation factors were applied to the supplemental uses:

- COTO 710, Offices – 10%
- COTO 310, Hotel, Residential – 10%
- COTO 820, Shopping Centre – 30%
- COTO 150, Warehousing and Distribution – 100%

5.4.2 Daily Trip Generation

Daily vehicle trip estimates for airport operations for the 2032 and 2050 horizon years are provided in Tables C1 and C2 in Annexure C. The estimated daily trips for 2032 are 13 205 trips and 24 172 trips for 2050.

5.4.3 Peak Hour Trip Generation

Peak hour vehicle trip estimates for the operations of the airport for the 2032 and 2050 horizon years are provided in Tables C3.1 to C4.2 in Annexure C. The peak-hour trip estimates for the respective horizon years are as follows:

- 2032 Horizon:
  - Weekday AM peak hour: 601 total (467 in / 134 out)
  - Weekday PM peak hour: 1 199 total (659 in / 540 out)
- 2050 Horizon:
  - Weekday AM peak hour: 1 314 total (1 004 in / 310 out)
  - Weekday PM peak hour: 2 228 total (1 151 in / 1 077 out)

Based on the estimated trip generation and multiple access points, single-lane roads with dedicated turning lanes should be able to accommodate the vehicle demand. However, it is suggested that multi-lane roads be constructed for the main public circulation route for more ideal vehicular flow. The planning of road reserve will make allowance for dualling when necessary.

5.5 Estimated Trip Distribution and Assignment

The estimated trip distribution for the CWA follows similar origin and destination patterns as the CTIA. Tracker data from the CTIA (see Table 15) shows that areas outside the metro, such as Paarl, Somerset West, and Stellenbosch, contribute to more than 15% of airport traffic. Some areas within the metro will likely prefer to travel via the N1 (SANRAL to upgrade the N1 interchange) and Lichtenburg Road to the CWA, as this route offers shorter travel times compared to Klipheuwel Road. Klipheuwel Road has several intersections that cause more frequent stops, leading to longer travel times.

Table 15: CTIA Tracker Data

Locations	Tracker Data
Cape Town	37%
Sea Point	9%
V&A Waterfront	7%
Bellville	13%
Rondebosch	1%
Stellenbosch	8%
Camps Bay	4%
Green Point	6%
Paarl	2%
Hout Bay	3%
Khayelitsha	3%
Somerset West	6%
Mitchells Plain	1%
Total	**100%**

Therefore, the following trip distribution was considered for Phase 1 (PAL 1B) of the CWA:

- 10% north along Klipheuwel Road
- 30% east along Lichtenburg Road
- 55% south along Klipheuwel Road
- 5% along Okavango Road

Refer to Figures A4.1 and A4.2 in Annexure A for the peak hour trip distribution and assignment for the 2032 horizon.

5.6 Public Transport

The modal split spilt for the CTIA is shown in Figure 22. The modal split for the CTIA indicates that approximately 30% of air passengers and airport staff use public transport options, including scheduled bus services, MBTs, metered taxis, and e-hailing services.

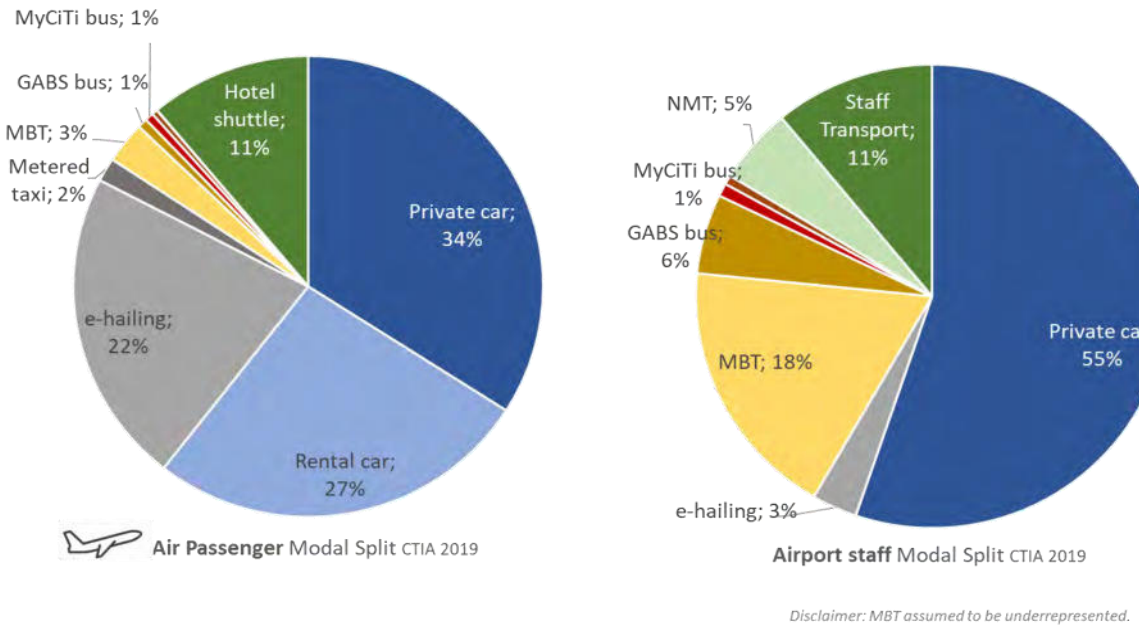

Figure 22: CTIA Modal Split of Air Passengers and Airport Staff

The public transport split for the CWA is expected to be similar to that of the CTIA.

Public transport services should be scoped to link the CWA with planned and existing services. Bus stops should be provided near the terminal buildings.

Once the Fisantekraal commuter rail service is in operation, a shuttle service between the CWA and the rail station should be established. Such service will be demand driven and phased with the future development of the CWA.

The details of public transport facilities for the CWA will be finalised at a later stage. However, provision for these facilities must be included in the finalisation of the SDP.

5.7 Pedestrians and Cyclists

All public roads need to be designed to accommodate pedestrian and bicycle movements. Detailed of which can only be more refined upon development and finalisation of a refined master plan SDP.

5.8 Freight / Cargo

Prior discussions regarding cargo indicated that operations will be on the site east of the runway. Access from the external road can be provided along Lichtenburg Road in accordance with the access management plan and aligned with the future Greenville development. Any movement of cargo between the east and west of the site will be done internally via internal access roads. WCG will not accept movement along Lichtenburg Road. Recent proposals exclude development on the east of the runway and the accommodation of linking the east and west of the site for transport of people and goods is therefore not application.

There is also the possibility of linking the cargo to the rail. However, this will depend on the regional freight movement along the rail network/infrastructure and the type of cargo and its destinations.

These discussions will continue with the refinement of the layouts.

5.9 Site Circulation (Road Based Transport)

Comment on the internal circulation will still be performed as part of further engagements. The connections to the public road system must be discussed and confirmed with the relevant road authorities.

In concept, the site will be separated by primary and secondary roads. A separate one-way system for drop and go's and access to the parkades are envisioned. These routes also need to be linked with dedicated public transport services. Separate access points and circulation will be identified for the supplemental uses.

5.10 Internal Road Requirements

Road reserve requirements are shown in Figure 23. Typical cross-sections for the internal roads per class and function are shown in Figure 24.

The main roads would ultimately have 2 lanes per direction. However, construction could be phased and only a single lane per direction would be required if vehicle demand does not warrant dual carriageways or significant turning movements.

Controlled access points to restricted areas need to be identified. Space for U-turns in from of any controlled access points should be provided.

The main road circulating adjacent to the terminals and parking area should include dedicated public transport, e-hailing and passenger vehicle stop and go zones. Details of this can be finalised with refined of the SDP and terminal layout requirements.

The access along Lichtenburg Road (R312) via Mellish Road as well as the need for the Mellish Road upgrade is largely dependent on the timing of the Lucullus Road northern extension.

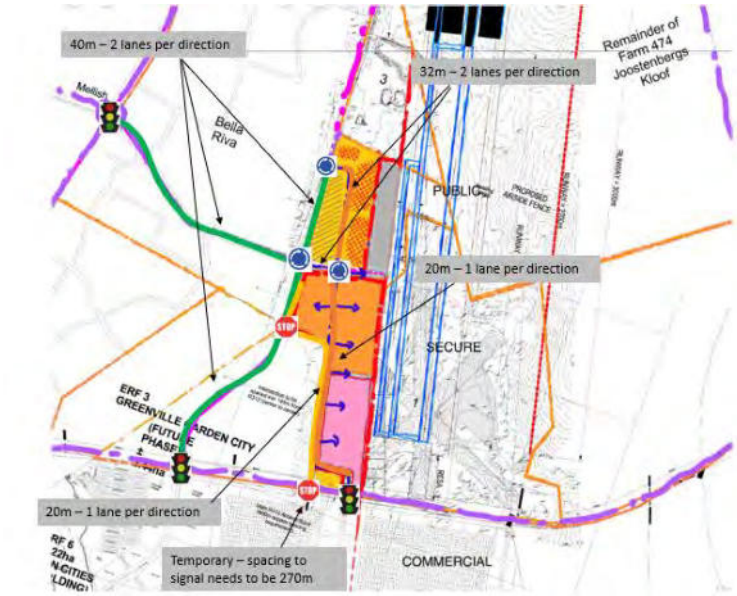

Figure 23: Internal Roads – Subject to further refinement of the master plan and site plan

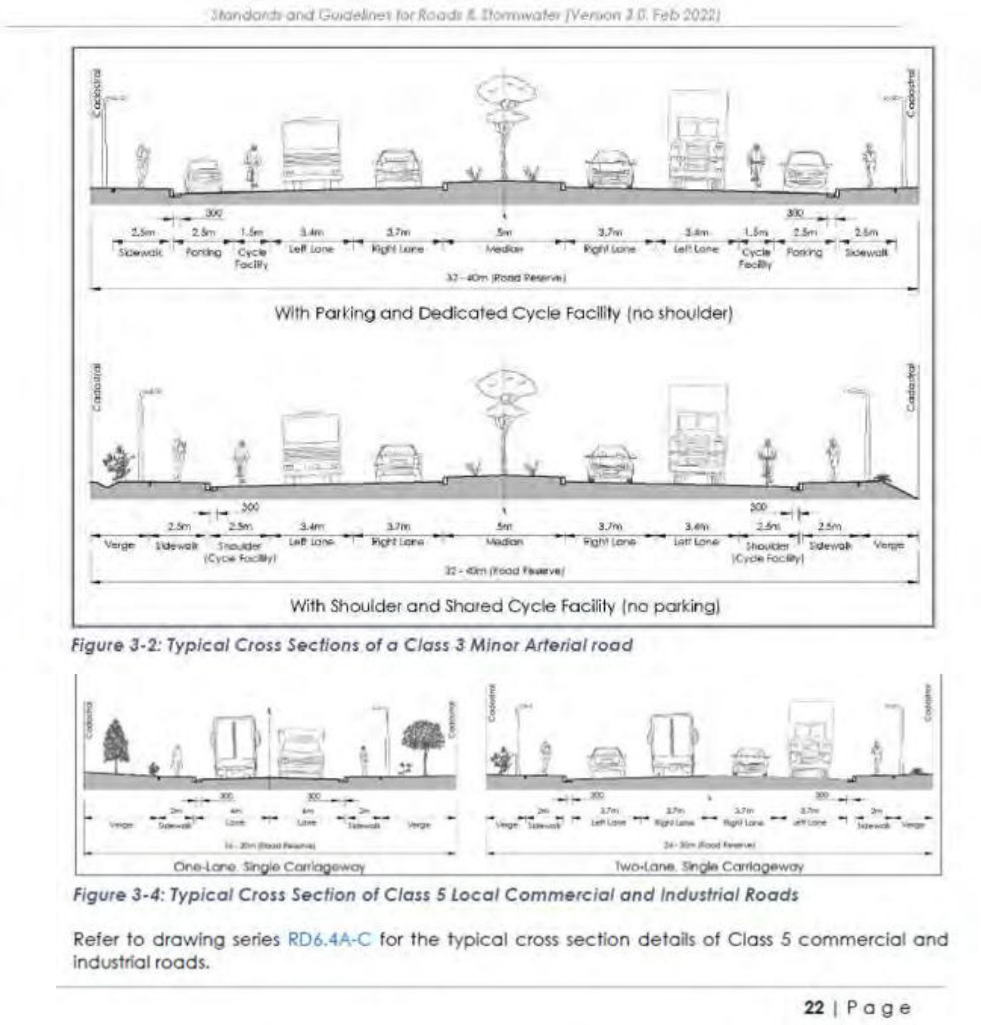

Figure 3-2: Typical Cross Sections of a Class 3 Minor Arterial road

Figure 3-4: Typical Cross Section of Class 5 Local Commercial and Industrial Roads

Refer to drawing series RD6.4A-C for the typical cross section details of Class 5 commercial and industrial roads.

Figure 24: Typical Cross-sections (City of Cape Town Roads and Stormwater Standards, v3, Feb 2022)

5.11 Parking

The CTIA makes provision for 682 bays per million annual passengers based on 2019 surveys done by ITS. Based on the CTIA parking provision, 1 705 parking bays should be provided for Phase 1 (PAL 1B) based on the projected 2.5 million annual passengers. The parking provision for any future phases of the CWA can established based on actual parking demand based on the 2032 scenario.

Provision of parking within the FBO and hanger restricted areas can be based on the projected number of employees, number of hanger spaces and specific tenant requirements.

6 TOTAL TRAFFIC CONDITIONS

An 8-year (2032) and 26-year (2050) horizon year will be assessed for the CWA. This aligns with the CWA Phase 1 (PAL 1B) projections of 2.5 million annual passengers by 2032 and Phase 2 (PAL 4) projections of 5.2 million annual passengers by 2050.

6.1 2032 Capacity Analysis

The 2032 Total Traffic Condition scenario is based on 2032 Background Traffic Conditions volumes, plus the expected CWA development trips for the 8-year horizon. This scenario assumes that the upgrades as recommended in the 2032 Background Traffic Conditions will be in place.

The Total Traffic Conditions scenario assessed the development of Phase 1 (PAL 1B) of the CWA with the realigned Mellish Road access and the remainder of the East-West link from the first Bella Riva access point as a secondary access. Refer to Figure A5.1 in Annexure A for the proposed upgrades, and Figures A5.2 and A5.3 for the capacity analysis results for the 2032 Total Traffic Conditions.

The following upgrades are recommended Phase 1 (PAL 1B) of the CWA:

- Lichtenburg Road/Mellish Road:
  - Southbound – Construct two dedicated right-turn lanes and a dedicated left-turn lane.
  - Eastbound – Construct a dedicated left-turn lane.
  - Westbound – Construct an additional through lane and a dedicated right-turn lane.
  - Intersection control – Install a traffic signal.
- East-West Link/CWA Access:
  - Intersection control – Construct a dual-lane roundabout.

Based on the capacity analysis results, the priority-controlled intersections along Klipheuwel Road and Lichtenburg Road will continue to experience capacity constraints. However, alternative routes are available via the signalised Darwin Road and Dulah Omar Street intersections.

The Klipheuwel Road/Olifantsrivier Avenue intersection is also expected to operate at capacity during the PM peak hour. However, these vehicles can be redistributed as there is still sufficient capacity available at the Klipheuwel Road/Okavango Road intersection.

6.2 2032 Sensitivity Analysis

A sensitivity analysis was conducted to assess the impact of using only the Mellish Road / Lichtenburg Road access for Phase 1 (PAL 1B) of the CWA. Refer to Figures A5.4 and A5.5 in Annexure A for the sensitivity analysis.

The results of the capacity analysis indicate that the proposed upgrades for the 2032 Total Traffic Conditions scenario will be sufficient to accommodate Phase 1 (PAL 1B) of the CWA.

6.3 2050 Capacity Analysis

The City's EMME model was updated to assess the impact of Phase 2 (PAL 4) of the CWA for the 2050 scenario. The updated model included the total future development trips in the area, including those from the CWA, and evaluated the impact of the R300 northern extension. It also included several future road links, such as the Darwin Road extension, the northern and southern extensions of Lucullus Road, the East-West link to Klipheuwel Road, and the East-West link connecting the Lucullus Road southern extension to the Darwin Road extension.

The EMME model results showed that the future road network will be capable of supporting future developments in the area, including Phase 2 (PAL 4) of the CWA. It is, however, recommended that an updated TIA be prepared after 2032 for each PAL once new SDPs are available and the latest traffic conditions can be assessed closer to the time.

7 DEVELOPMENT CHARGES

Development charges (DCs) were estimated for the CWA and future developments in the area to determine the available funds for the proposed upgrading of the road network for the 2050 scenario. The available DCs for the developments are provided in

Table 16. The Durbanville Industrial (ITS Ref. 4541) and Groot Phesantekraal Phase 6 developments were also included since their development will affect the future road network planning for the area. It is important to note that all DC estimates have been rounded up to the nearest R50 000.

Table 16: Development Charges

Development	% Included	Roads	Transport	Total
CWA	100%	R161 600 000	R4 600 000	R166 200 000
Bella Riva	100%	R69 650 000	R1 700 000	R71 350 000
Groot Phesantekraal Phase 4	100%	R106 850 000	R3 050 000	R109 900 000
Groot Phesantekraal Phase 5	100%	R35 850 000	R2 150 000	R38 000 000
Greenville Garden City	Estimated construction rate	R37 250 000	R900 000	R38 150 000
Industrial development on Erf 1690	100%	R14 250 000	R1 050 000	R15 300 000
Industrial development on Erven 1693 & 1870	100%	R6 400 000	R450 000	R6 850 000
Glass Factory on Remainder Farm 180, Portion 3 of Farm 180 and Portion 13 of Farm 168	100%	R45 400 000	R3 250 000	R48 650 000
Storage Facility on Portion 32 of Farm 168	100%	R36 700 000	R2 600 000	R39 300 000
Durbanville Industrial	100%	R69 250 000	R4 950 000	R74 200 000
Groot Phesantekraal Phase 6	100%	R214 800 000	R13 350 000	R228 150 000
Total		**R798 000 000**	**R38 050 000**	**R836 050 000**

A high-level cost estimate was completed to determine if the available DCs are sufficient to upgrade the road network. The cost for each upgrade is provided in Table 17. It is important to note that all cost estimates have been rounded up to the nearest R50 000.

Table 17: High-level Cost Estimate

Upgrade	Road Class	Road Reserve (m)	Quantity	Unit	Amount
Dualling of Klipheuwel Road between Olifantsrivier Road and Lichtenburg Road	2	40	3.12	km	R199 800 000
Dualling of Okavango Road between Mosselbank River culvert and Vatican Street	2	40	1.56	km	R100 150 000
Construction of the East-West Link between Okavango Road and Lucullus Road extension	3	32	2.84	km	R160 200 000
Construction of Darwin Road extension to Amadeus Drive	3	32	2.83	km	R159 150 000
Construction of the East-West Link between Klipheuwel Road and Lucullus Road extension	3	40	1.77	km	R122 300 000
Realignment and construction of Mellish Road	4	20	1.16	km	R39 150 000
Construction of Lucullus Road extension (North) between the East-West Link and Lichtenburg Road	3	40	1.42	km	R98 200 000
Total					**R878 950 000**

When comparing the cost of the road upgrades with the available DCs, there is a shortfall of R42 900 000. This shortfall can be covered by further future developments in the area, such as the Darwin Housing or Lucullus Gardens developments, which are already in the application process. The costs of upgrading the road network should be divided and phased among the various developments to ensure that the road network can accommodate their development as they progress.

8 CONSTRUCTION TRAFFIC

If it is assumed that all earthworks for the CWA construction will be sourced from existing quarries, mostly located west of the site, initial estimates indicate that approximately 875 000 m³ of earthworks will be required for construction (worst-case scenario). With a truck capacity of 15 m³, this equates to approximately 58 167 truckloads. However, most of the earthworks will be done on-site to balance cut and fill areas.

The quarries can be accessed either via the existing surfaced road network or the gravel road network. Due to the poor condition of the gravel roads and the heavy loads expected, it is recommended that trucks use the surfaced road network. A detailed construction management plan must be developed for the CWA, ensuring that deliveries are scheduled outside peak hours to prevent congestion during peak periods. This will be done once a suitable contractor has been appointed.

It is important to note that the final quantities for earthworks will depend on the results of the geotechnical investigation for the CWA site. As a result, the initial estimates presented may change based on these findings.

9 CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations from this TIA are as follows:

- **2024 Existing Traffic Conditions –** Most of the study intersections currently operate at an acceptable LOS during peak hours. However, several intersections, including Klipheuwel Road/Lichtenburg Road, Lichtenburg Road/Boys Biers Drive, and Klipheuwel Road/Arum Lily Street, experience significant delays (LOS F) during peak periods. Upgrades are recommended for Klipheuwel Road/Lichtenburg Road, including the installation of a traffic signal and additional turn lanes, which are expected to improve the LOS to B.

  Planned future developments and access management plans (AMPs) for Lichtenburg Road (MR213) and Klipheuwel Road (MR188) include changes to intersection configurations and realignments, which are expected to reduce demand at some constrained intersections. Given these future plans, no further upgrades are recommended for the remaining intersections. Upgrades are recommended as part of the Background Traffic Conditions scenario and mitigation of these intersections will be done by these background developments.
- **2032 Background Traffic Conditions –** Given the multiple developments planned in the area, over 8 000 background development trips will be added to the road network during the PM peak hour. This increase in traffic will trigger the need for road upgrades, especially along Klipheuwel and Lichtenburg Roads. The proposed upgrades include the dualling of Klipheuwel Road between Brackenfell Boulevard and Lichtenburg Road, the installation of traffic signals at several intersections, and the construction of additional turning lanes. The Klipheuwel Road/Arum Lily Street intersection will be converted to a left-in, left-out (LILO) configuration as part of their access management plan (AMP).

  With proposed upgrades in place, capacity constraints are expected at some priority-controlled intersections. However, alternative routes via signalised intersections such as Klipheuwel Road/Darwin Road and Lichtenburg Road/Dulah Omar Street will help alleviate traffic congestion.
- **Proposed Land Use –** The CWA is divided into four precincts: Terminal, Services, General Aviation, and Airport Air Side. The development of these precincts is subdivided into four Planning Activity Levels (PAL) based on projected airline traffic forecasts.

  Phase 1 includes constructing a 3.5 km main runway and supporting infrastructure for land, air transport, and bulk services. Additional developments will include offices, hotels, residential areas, retail spaces, and warehouses. Phase 1 (PAL 1B) forecasts project 1.7 million annual passengers (PAL 1A), rising to 2.5 million annual passengers by 2032. Phase 2 (PAL 4) airline traffic is expected to reach 5.2 million annual passengers by 2050.

- **Proposed Access Phasing:**
    1. Mellish Road will be the initial connection from Lichtenburg.
    2. The East-West link to Klipheuwel Road when Bella Riva constructs this. CWA to engage with Bella Riva landowner/developer to establish if feasible to build Lucullus Road extension and/or the East-West Class 3 road. The East-West Class 3 at this stage is the most likely to come first.
    3. The ultimate link will be via the northern extension of Lucullus Road once the EIA approval has been completed by the City of Cape Town. The alignment and road reserve requirements of Lucullus Road bordering the west edge of the site must be confirmed.
- **Development Trips –** The estimated daily trips for 2032 are 13 205 trips and 24 172 trips for 2050.

  The peak-hour trip estimates for the respective horizon years are as follows:
    - 2032 Horizon:
        - Weekday AM peak hour: 601 total (467 in / 134 out)
        - Weekday PM peak hour: 1 199 total (659 in / 540 out)
    - 2050 Horizon:
        - Weekday AM peak hour: 1 314 total (1 004 in / 310 out)
        - Weekday PM peak hour: 2 228 total (1 151 in / 1 077 out)
- **2032 Total Traffic Conditions –** This scenario assessed the impact of Phase 1 (PAL 1B) of the CWA the realigned Mellish Road access and the East-West link from Bella Riva as a secondary access.

  The proposed upgrades include the installation of a traffic signal at Lichtenburg Road/Mellish Road and the construction of a dual-lane roundabout at the East-West Link/CWA Access intersection. As with the 2032 Background Traffic Conditions, capacity constraints are expected to continue at the priority-controlled intersections along Klipheuwel and Lichtenburg Roads. However, alternative routes via signalised intersections on Klipheuwel Road/Darwin Road and Lichtenburg Road/Dulah Omar Street will help alleviate congestion. Additionally, the Klipheuwel Road/Olifantsrivier Avenue intersection is expected to reach capacity during the PM peak hour. This traffic can be redistributed to the Klipheuwel Road/Okavango Road intersection, which has sufficient capacity.
- **2032 Sensitivity Analysis –** A sensitivity analysis was conducted to evaluate the impact of using only the Mellish Road/Lichtenburg Road access for Phase 1 (PAL 1B) of the CWA. The capacity analysis results show that the proposed upgrades in the 2032 Total Traffic Conditions scenario will be sufficient to accommodate the traffic generated by Phase 1 (PAL 1B). Mellish Road is therefore the only access required to accommodate the CWA Phase 1 (PAL 1B) traffic. It is, however, recommended that the East-West link across Bella Riva Phase 1 be extended to the airport by CWA when the road reserve available.

- **2050 Capacity Analysis –** The City's EMME model was updated to evaluate the impact of Phase 2 (PAL 4) of the CWA for the 2050 scenario. This update included the total exnt of the future developments in the area and assessed the R300 northern extension along with several new road links, including the Darwin Road extension, and the extensions of Lucullus Road and the East-West links. The results indicated that the future road network will be sufficient to accommodate the future developments, including Phase 2 (PAL 4) of the CWA.

The future developments will require several upgrades to be implemented as more than 8 000 peak-hour trips will be added to the road network. The construction of the R300 northern extension, along with new road links such as the Darwin Road extension and extensions of Lucullus Road and the East-West links, is expected to reduce the demand at some of the study intersections. Therefore, it is recommended that the construction of these road links be fast-tracked to ensure that the intersection upgrades are not abortive in the future.

Based on this assessment, it is evident that the impact of the CWA will be relatively low compared to the other future developments in the area. Hence, it is recommended that Phase 1 (PAL 1B) of the CWA be approved from a transport point of view, and that an updated TIA be prepared for the future phases of the CWA.

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3. Committee of Transport Officials (COTO), TMH 16, Volume 2, August 2012
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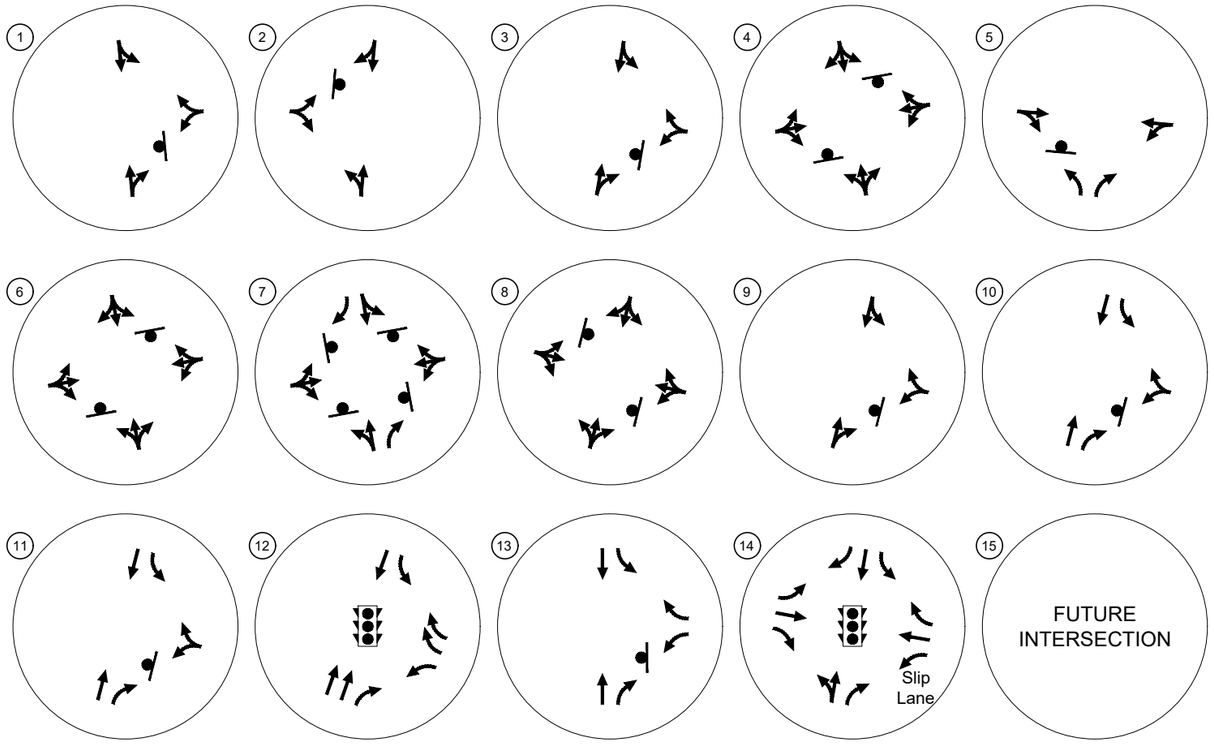
5. Western Cape Government, Access Management Guidelines, 2020
6. City of Cape Town, Standards and Guidelines for Roads and Stormwater, Version 3, 2022
7. Department of Transport, Guidelines for Traffic Impact Studies, PR 93/635, 1995
8. Provincial Administration Western Cape, Road Access Guidelines, Second Edition, 2002

Annexure A

Figures



LEGEND

- TRAFFIC SIGNAL
- STOP/YIELD CONTROL

PROJECT:	FIGURE:	NUMBER:
CAPE WINELANDS AIRPORT, DURBANVILLE	EXISTING (2024) LANE CONFIGURATION AND INTERSECTION CONTROLS	A1

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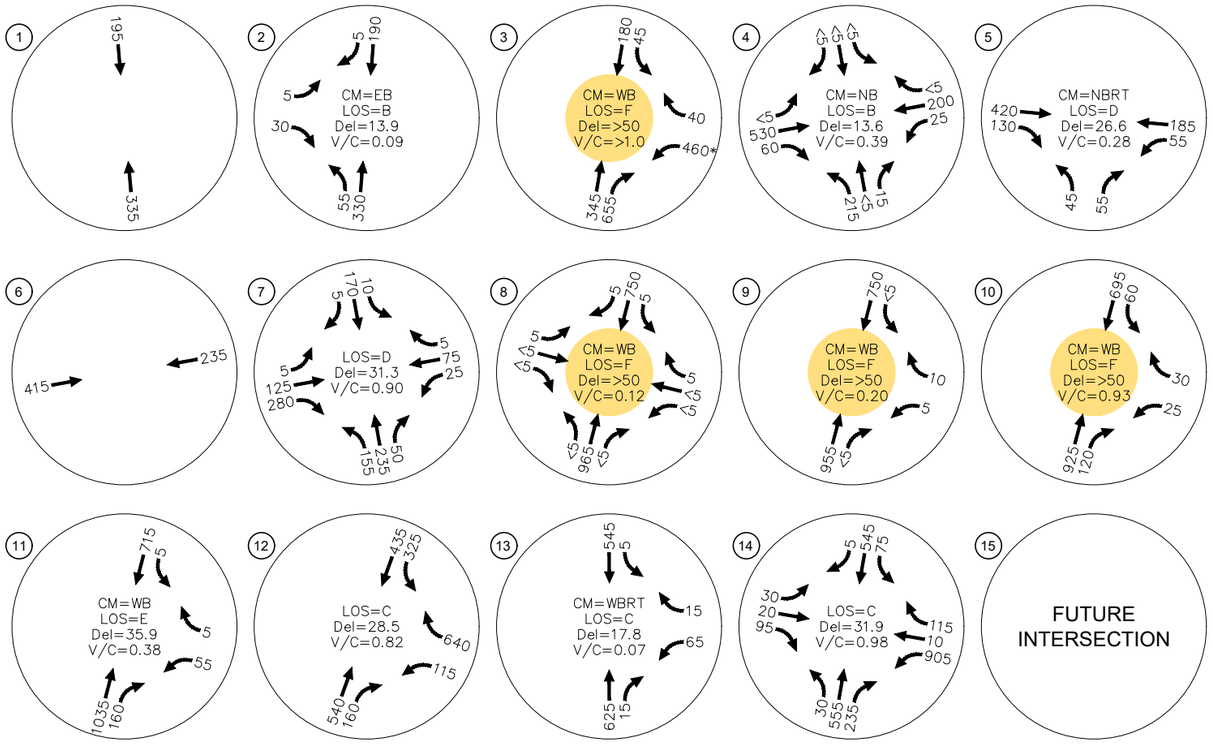

Notes:

- * Volumes adjusted to account for different count dates

LEGEND

CM = CRITICAL MOVEMENT (UNSIGNALISED)

LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) /
CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)

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Del = INTERSECTION AVERAGE DELAY (SIGNALISED) /
CRITICAL MOVEMENT DELAY (UNSIGNALISED)

V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

PROJECT:	FIGURE:	NUMBER:
CAPE WINELANDS AIRPORT, DURBANVILLE	EXISTING (2024) WEEKDAY AM PEAK HOUR TRAFFIC CONDITIONS	A2.1

Notes:

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PROJECT:

CAPE WINELANDS AIRPORT, DURBANVILLE

FIGURE:

EXISTING (2024) WEEKDAY PM PEAK HOUR TRAFFIC CONDITIONS

NUMBER:

A2.2

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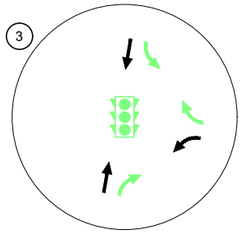

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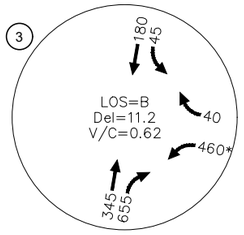

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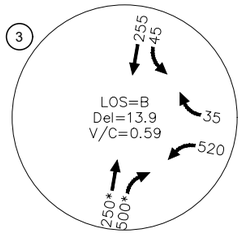

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LEGEND

- TRAFFIC SIGNAL
- STOP/YIELD CONTROL
- EXISTING TRAFFIC CONDITIONS UPGRADES
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PROJECT:

CAPE WINELANDS AIRPORT, DURBANVILLE

FIGURE:

EXISTING (2024) WEEKDAY AM AND PM PEAK HOUR TRAFFIC CONDITIONS WITH UPGRADES

NUMBER:

A2.3

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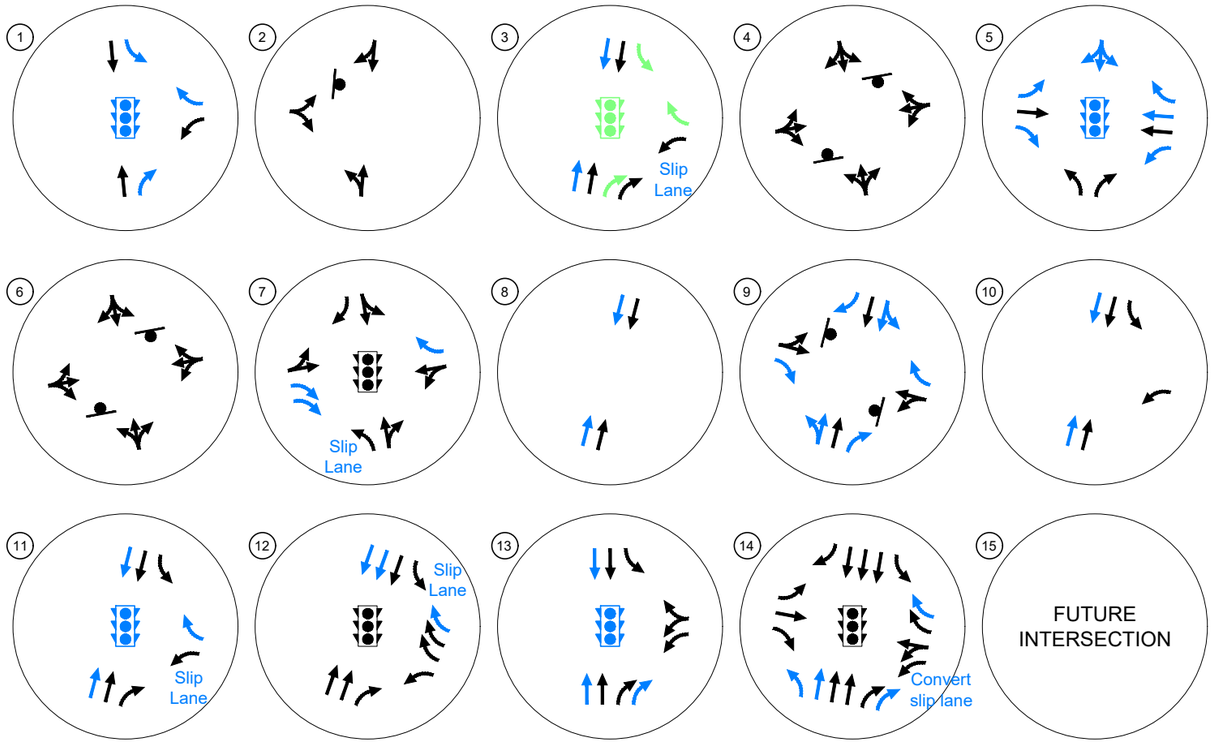

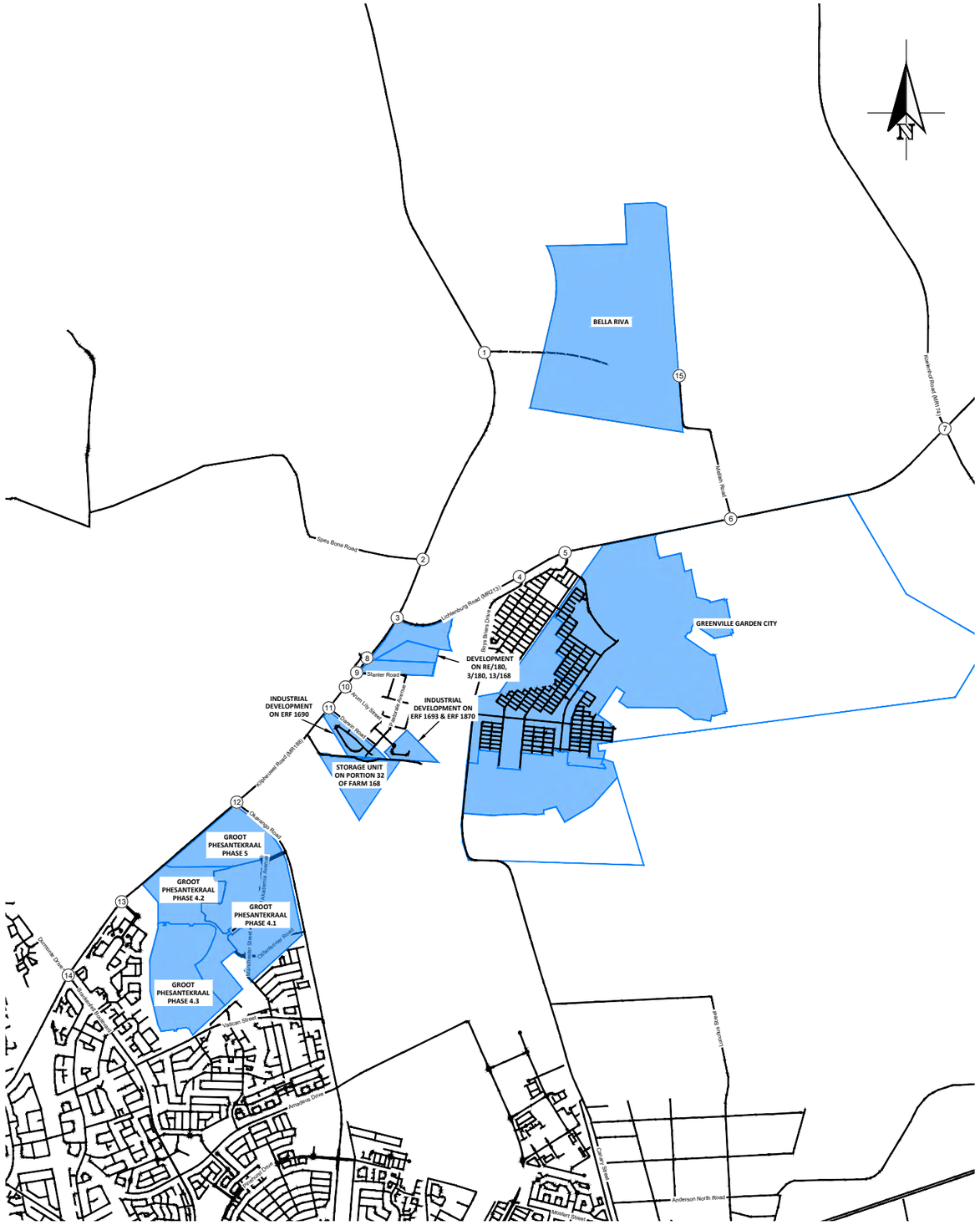

LEGEND

- TRAFFIC SIGNAL
- STOP/YIELD CONTROL
- EXISTING TRAFFIC CONDITIONS UPGRADES
- BACKGROUND TRAFFIC CONDITIONS UPGRADES

PROJECT:	FIGURE:	NUMBER:
CAPE WINELANDS AIRPORT, DURBANVILLE	PROPOSED UPGRADES FOR BACKGROUND (2032) TRAFFIC CONDITIONS	A3.1

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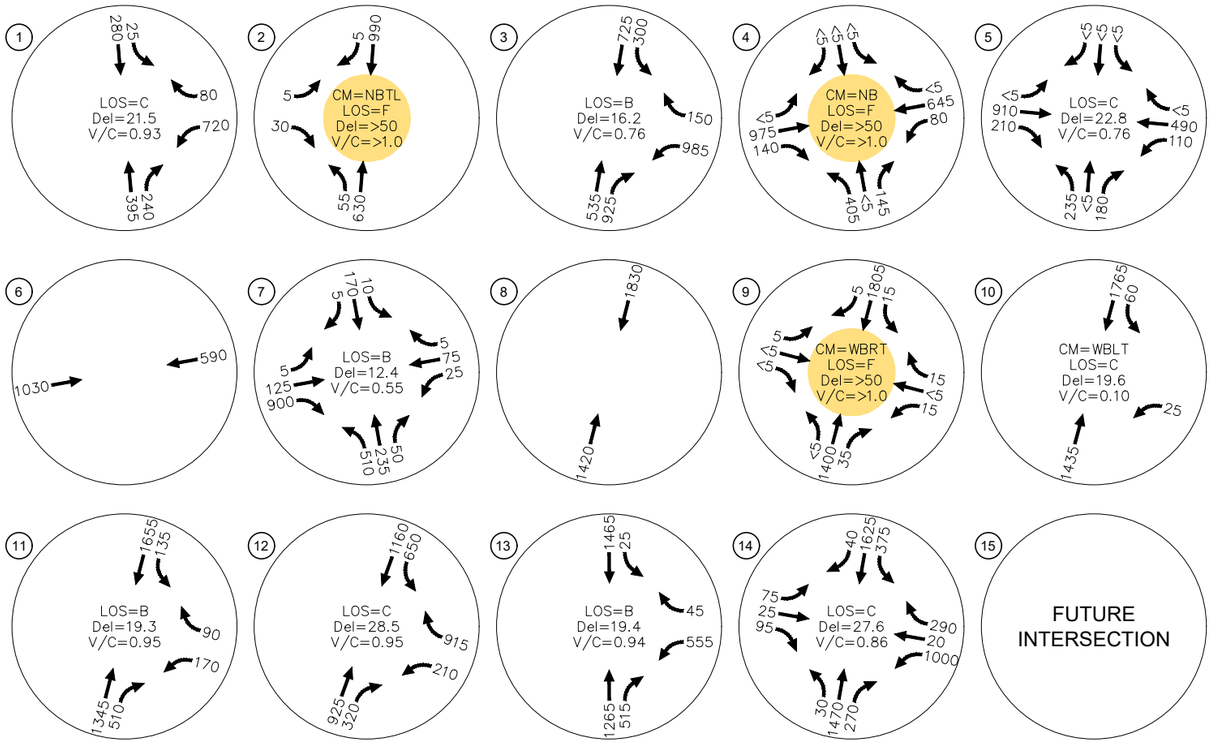

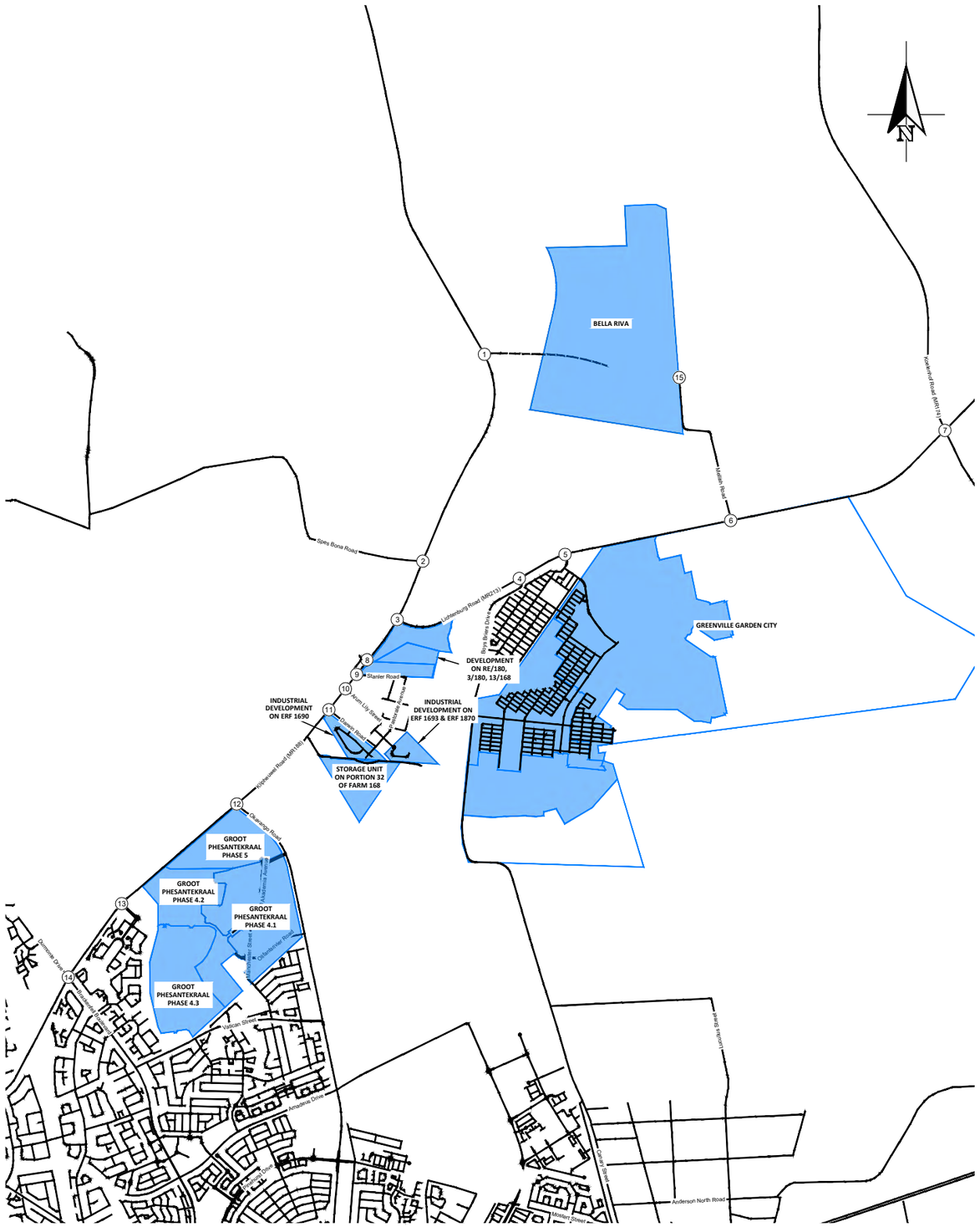

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PROJECT:

CAPE WINELANDS AIRPORT, DURBANVILLE

FIGURE:

BACKGROUND (2032) WEEKDAY AM PEAK HOUR TRAFFIC CONDITIONS WITH UPGRADES

NUMBER:

A3.2

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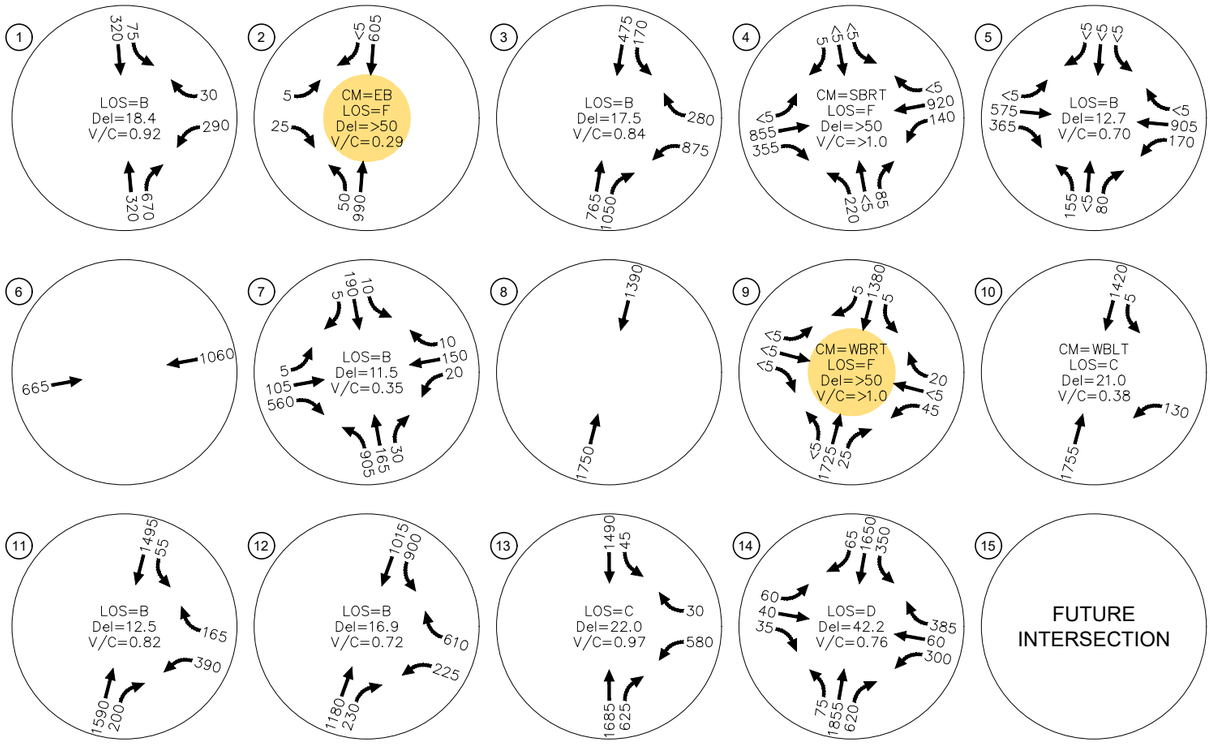

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PROJECT:	FIGURE:	NUMBER:
CAPE WINELANDS AIRPORT, DURBANVILLE	BACKGROUND (2032) WEEKDAY PM PEAK HOUR TRAFFIC CONDITIONS WITH UPGRADES	A3.3

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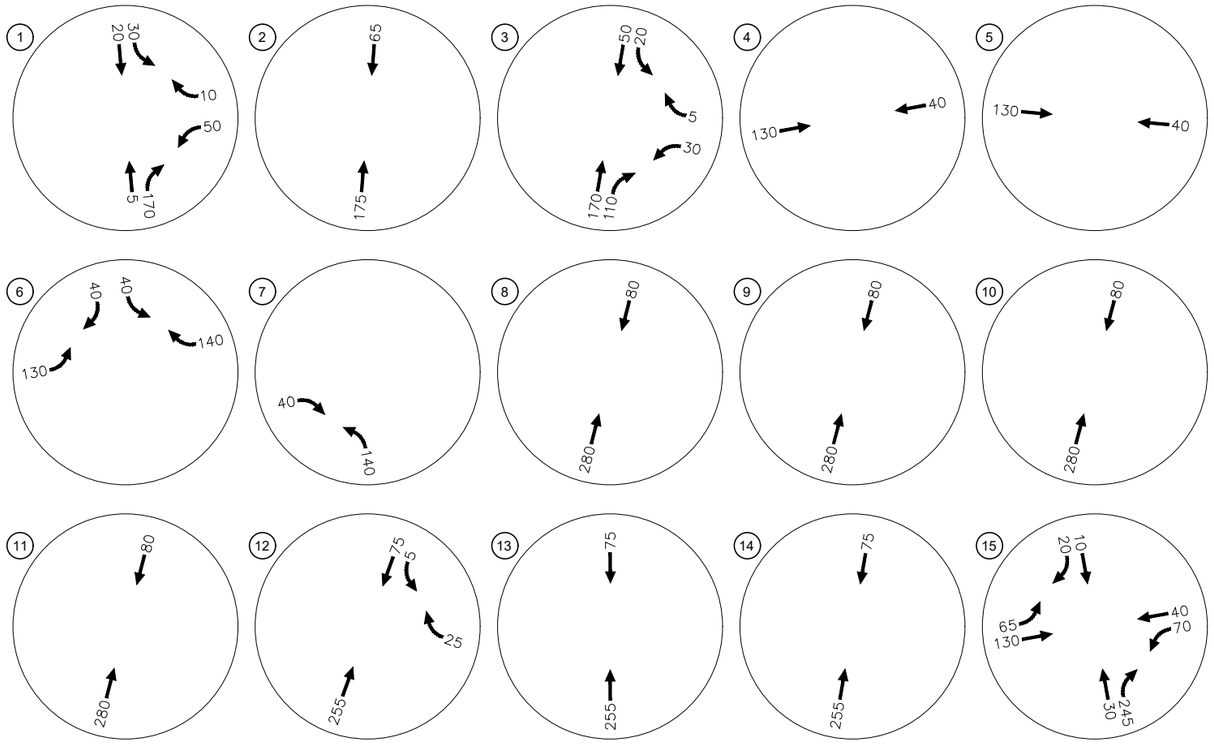

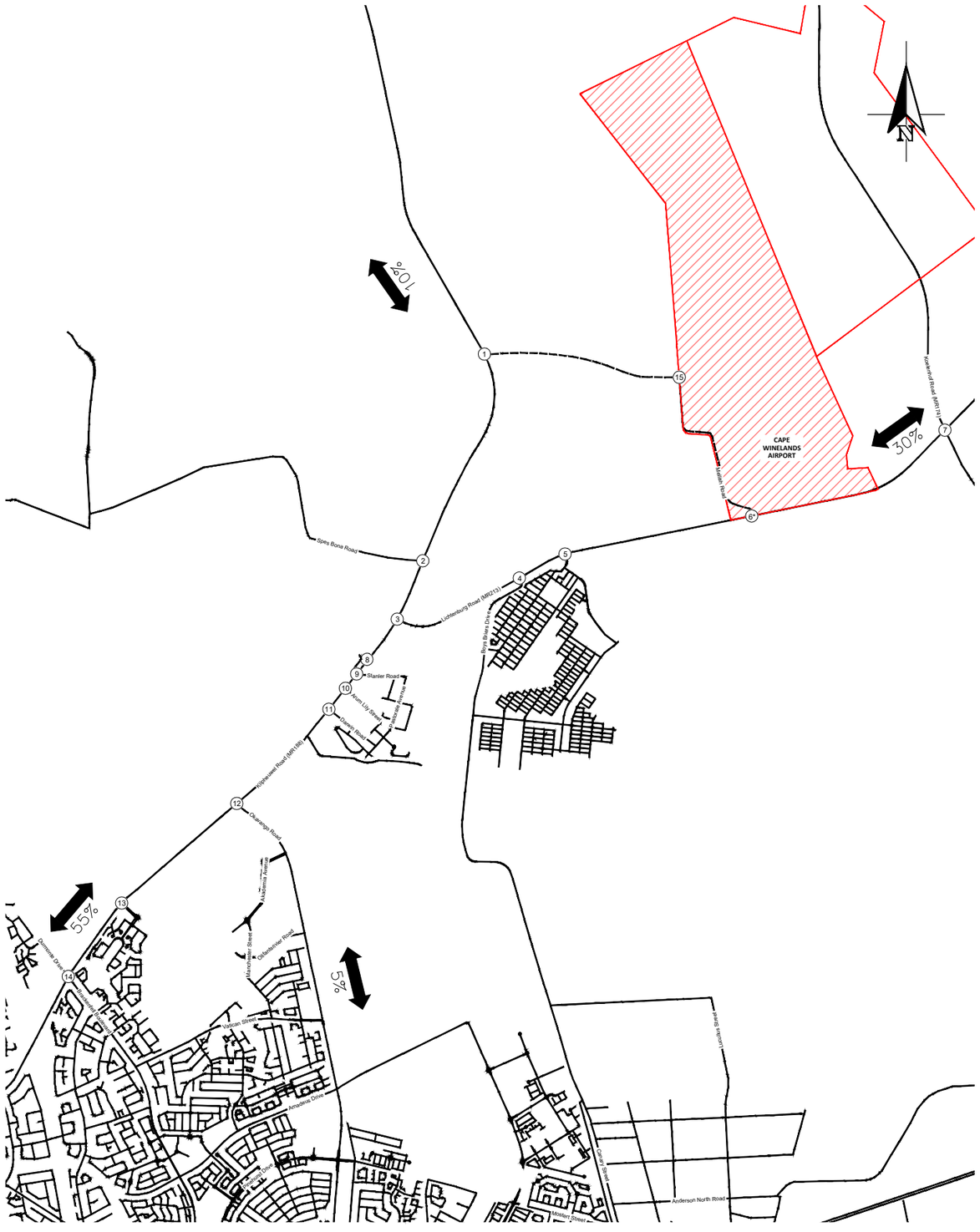

EXPECTED DEVELOPMENT TRIPS			
PEAK PERIOD	IN	OUT	TOTAL
AM PEAK HOUR	467	134	601
PM PEAK HOUR	659	540	1 199

PROJECT:	FIGURE:	NUMBER:
CAPE WINELANDS AIRPORT, DURBANVILLE	2032 WEEKDAY AM PEAK HOUR TRIP DISTRIBUTION AND ASSIGNMENT	A4.1

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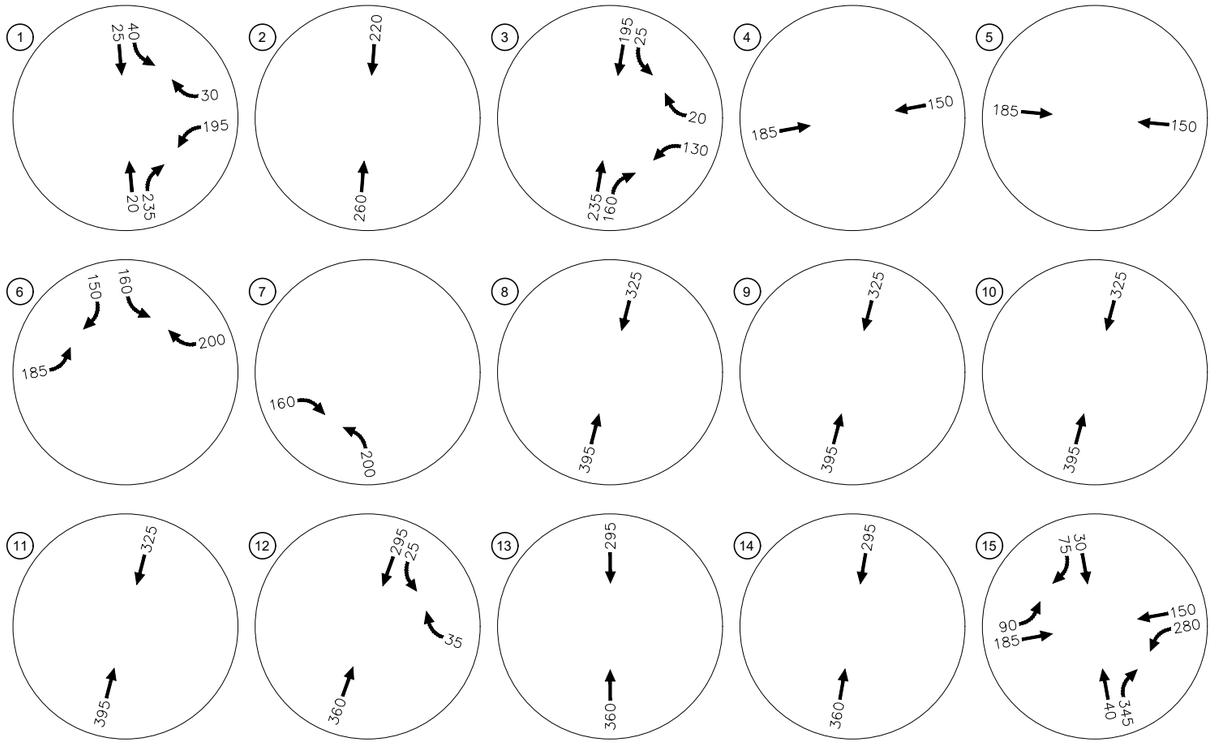

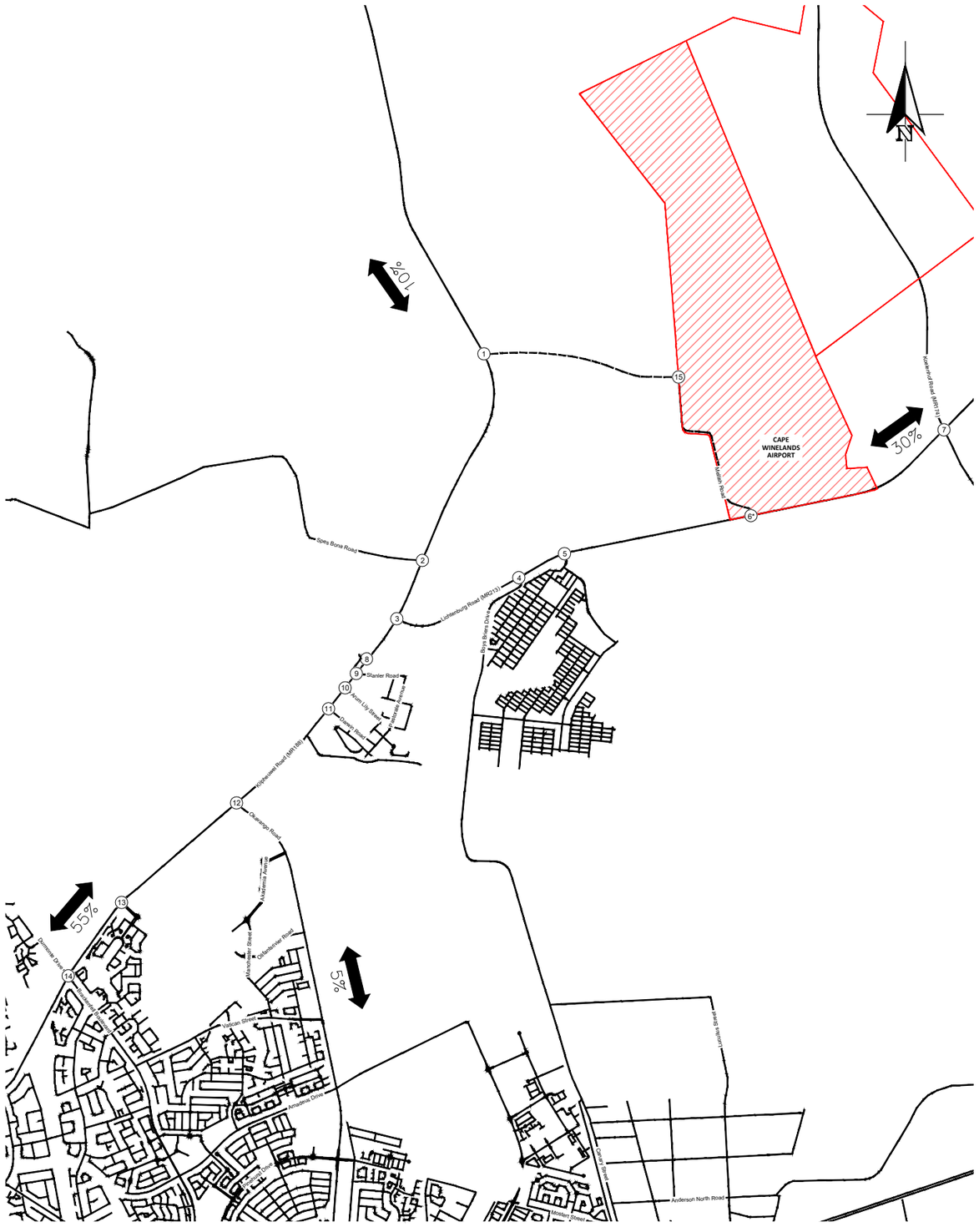

EXPECTED DEVELOPMENT TRIPS			
PEAK PERIOD	IN	OUT	TOTAL
AM PEAK HOUR	467	134	601
PM PEAK HOUR	659	540	1 199

PROJECT:

CAPE WINELANDS AIRPORT, DURBANVILLE

FIGURE:

2032 WEEKDAY PM PEAK HOUR
TRIP DISTRIBUTION AND ASSIGNMENT

NUMBER:

A4.2

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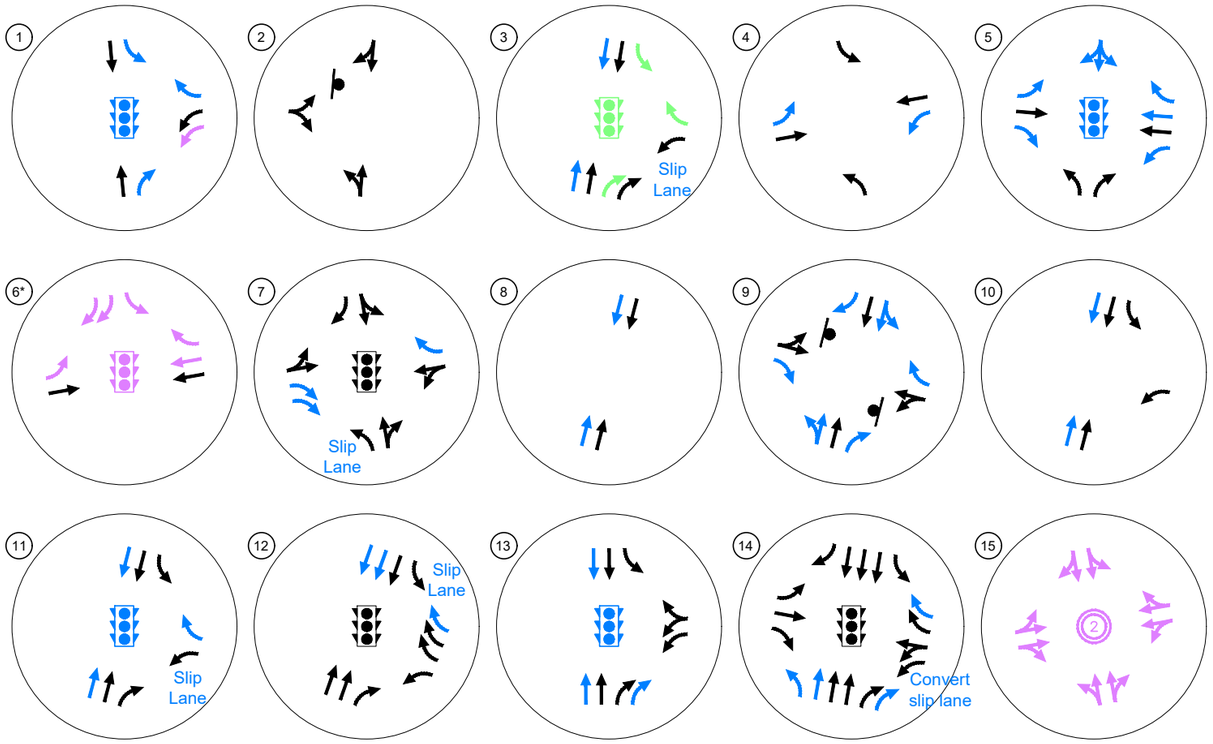

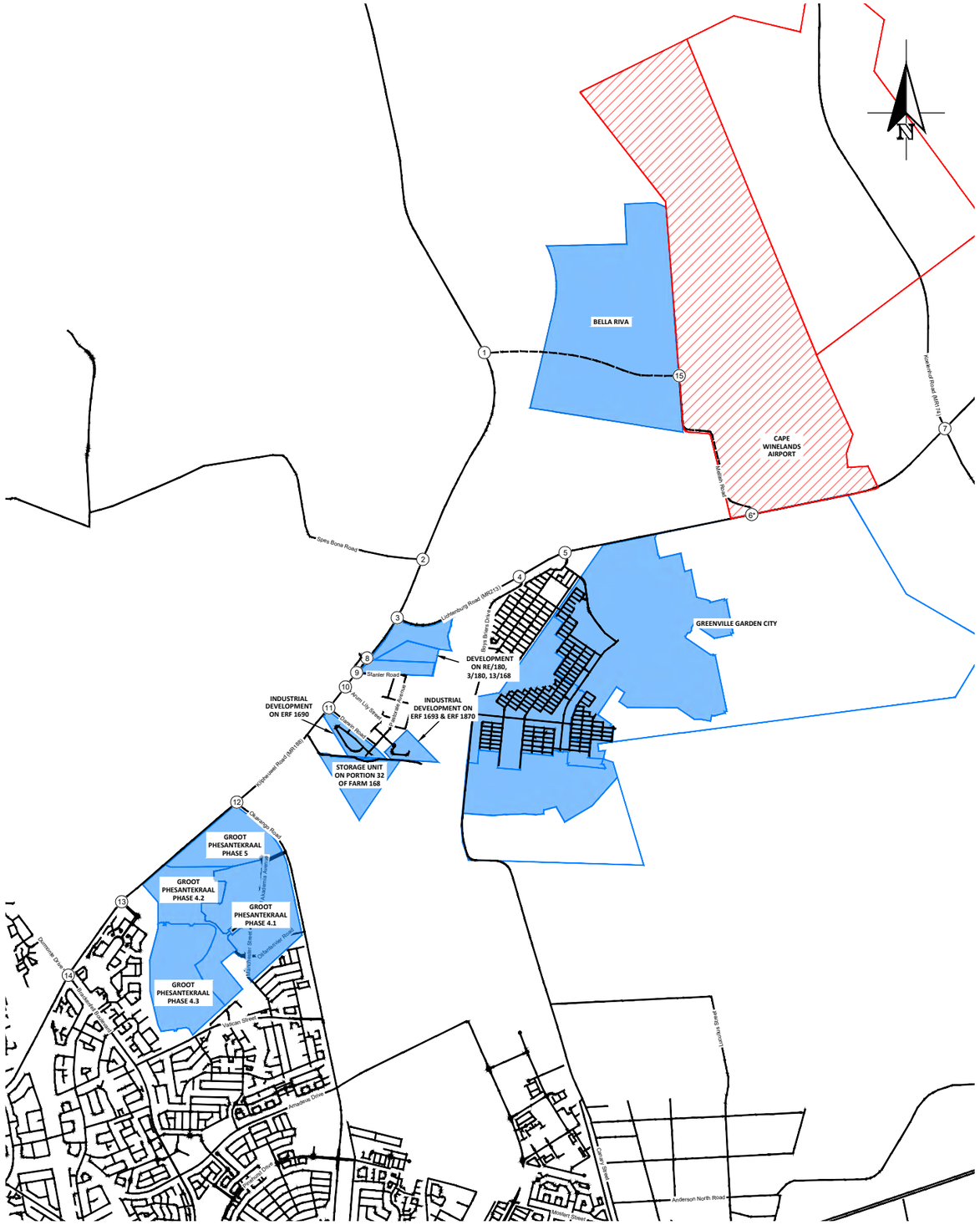

LEGEND

- TRAFFIC SIGNAL
- STOP/YIELD CONTROL
- ROUNDABOUT
- EXISTING TRAFFIC CONDITIONS UPGRADES
- BACKGROUND TRAFFIC CONDITIONS UPGRADES
- TOTAL TRAFFIC CONDITIONS UPGRADES

PROJECT:	FIGURE:	NUMBER:
CAPE WINELANDS AIRPORT, DURBANVILLE	PROPOSED UPGRADES FOR TOTAL (2032) TRAFFIC CONDITIONS	A5.1

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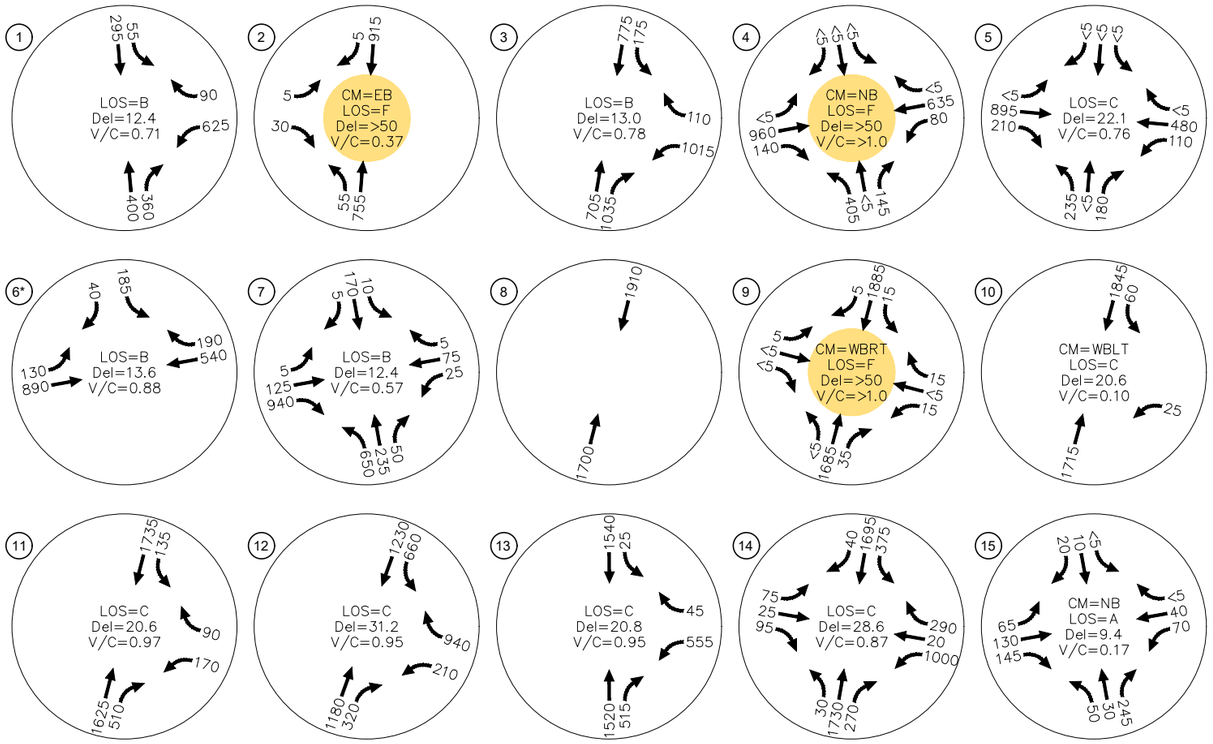

LEGEND
CM = CRITICAL MOVEMENT (UNSIGNALISED)
LOS = INTERSECTION LEVEL OF SERVICE (SIGNALISED) / CRITICAL MOVEMENT LEVEL OF SERVICE (UNSIGNALISED)
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Del = INTERSECTION AVERAGE DELAY (SIGNALISED) / CRITICAL MOVEMENT DELAY (UNSIGNALISED)
V/C = CRITICAL VOLUME-TO-CAPACITY RATIO

PROJECT:	FIGURE:	NUMBER:
CAPE WINELANDS AIRPORT, DURBANVILLE	TOTAL (2032) WEEKDAY AM PEAK HOUR TRAFFIC CONDITIONS	A5.2

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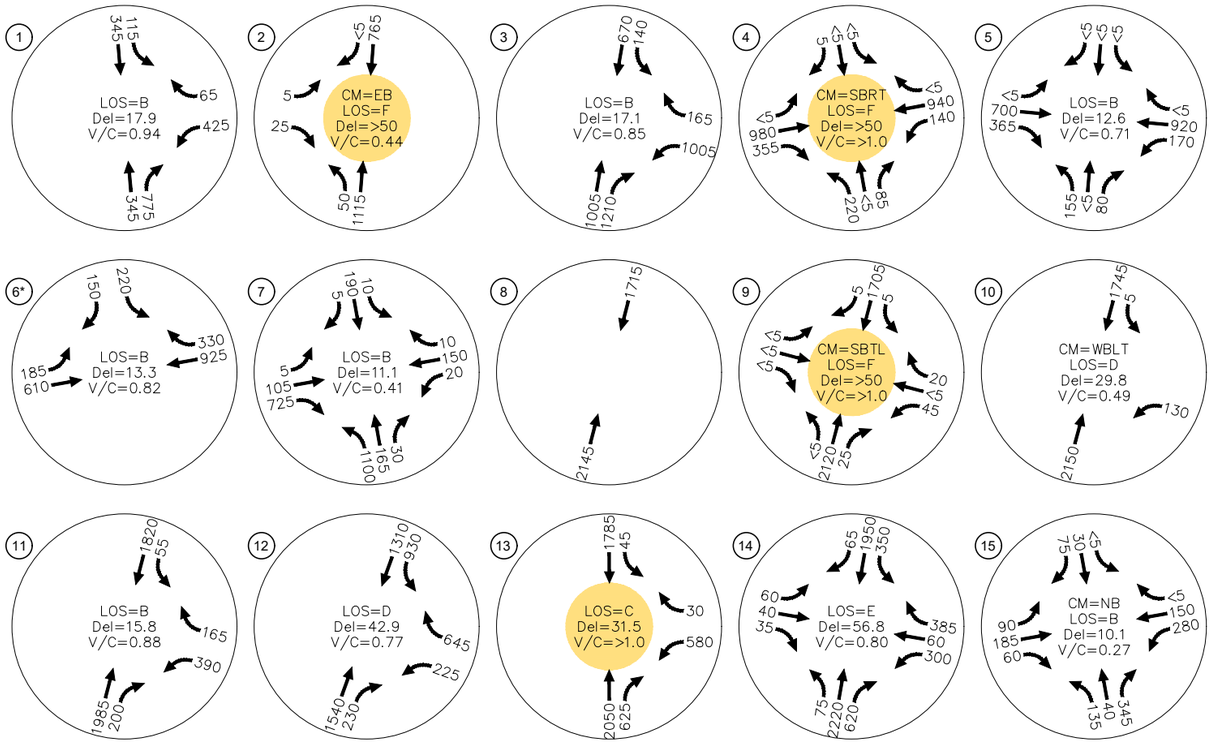

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PROJECT:	FIGURE:	NUMBER:
CAPE WINELANDS AIRPORT, DURBANVILLE	TOTAL (2032) WEEKDAY PM PEAK HOUR TRAFFIC CONDITIONS	A5.3

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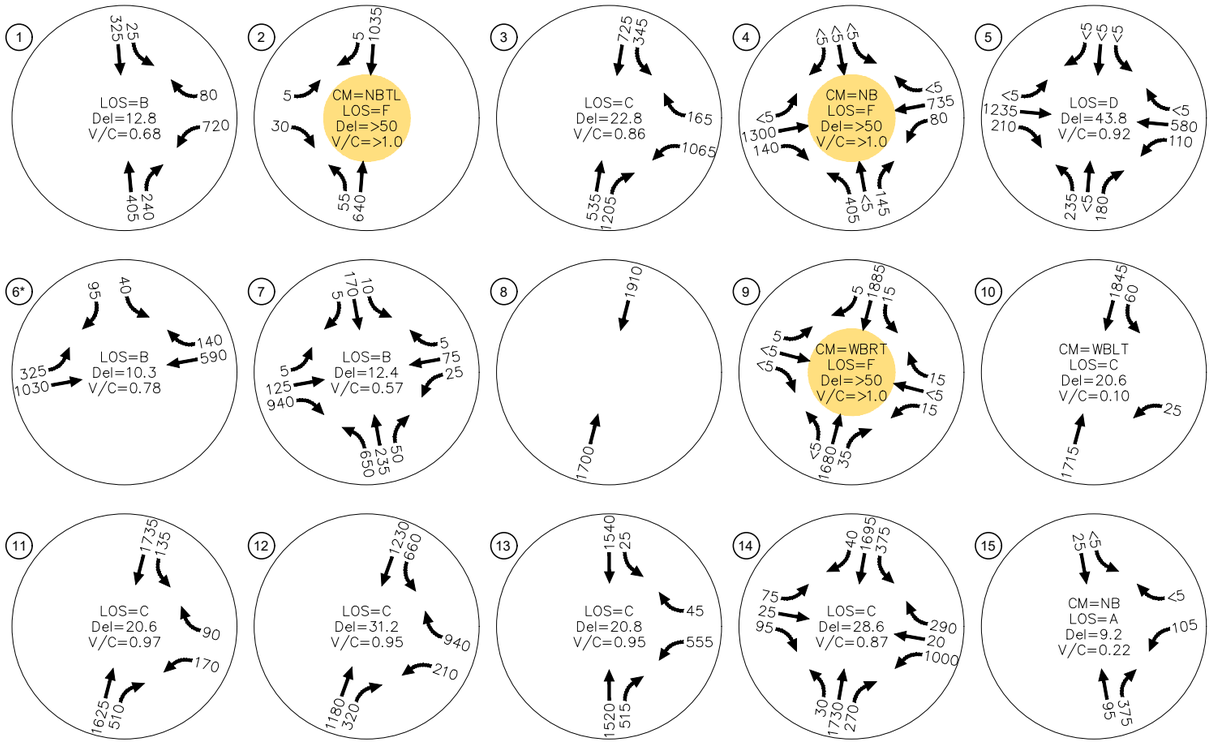

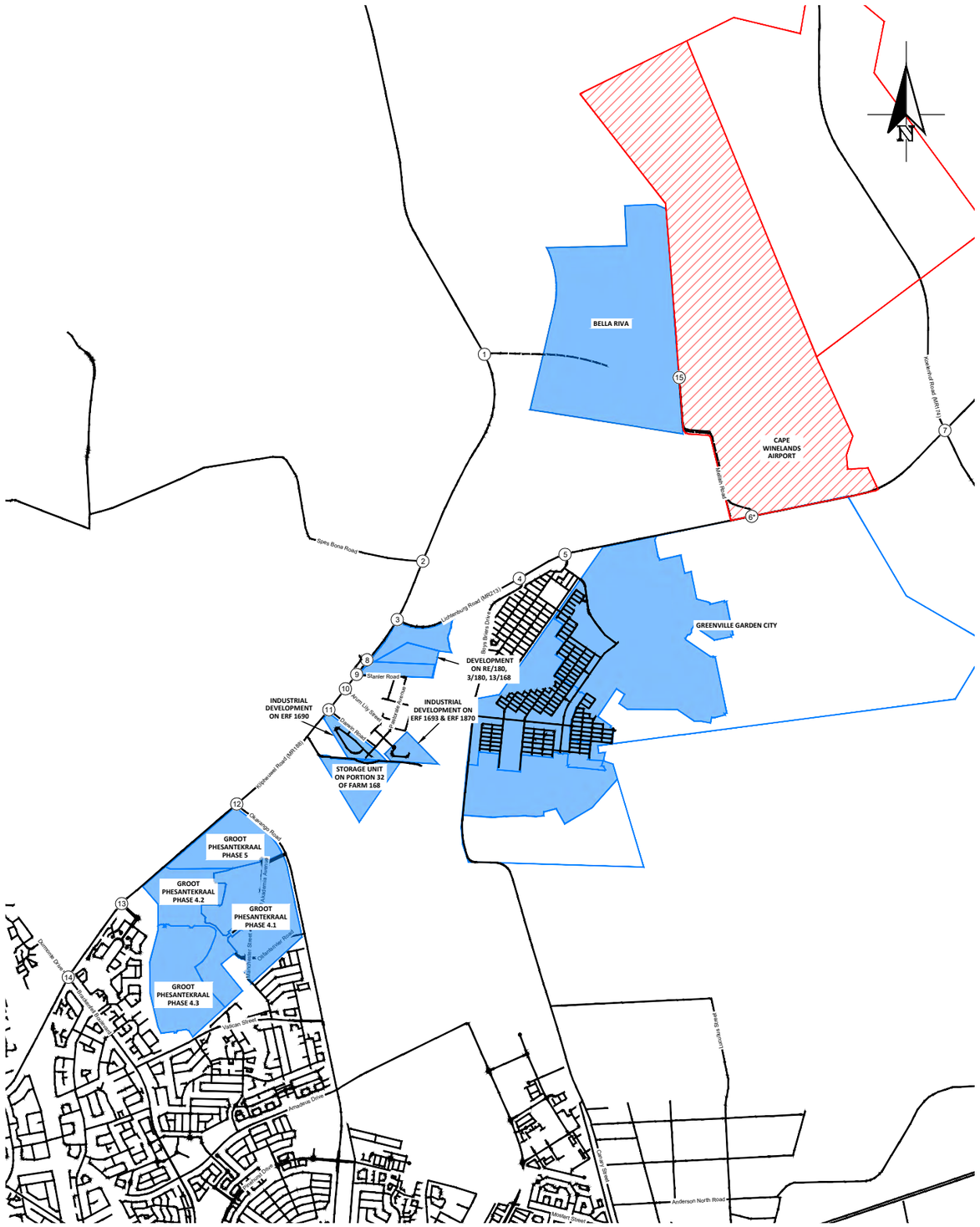

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PROJECT:	FIGURE:	NUMBER:
CAPE WINELANDS AIRPORT, DURBANVILLE	TOTAL (2032) WEEKDAY AM PEAK HOUR TRAFFIC CONDITIONS - *SENSITIVITY ANALYSIS*	A5.4

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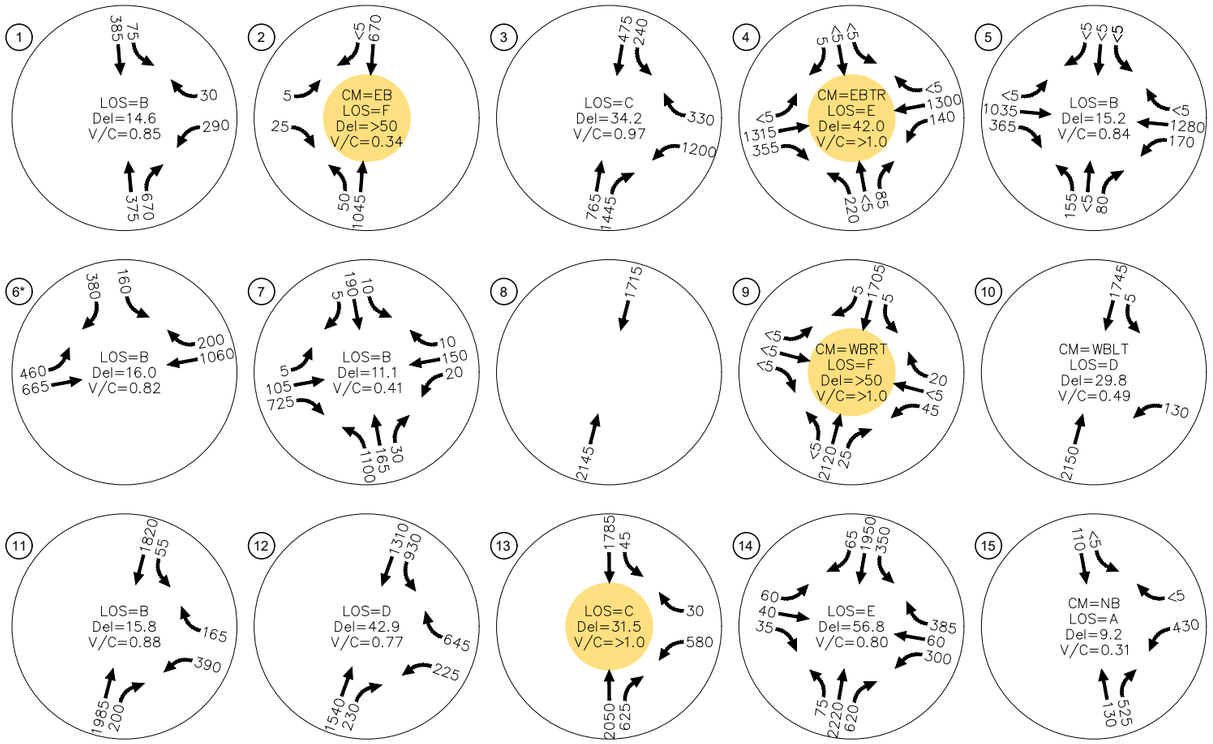

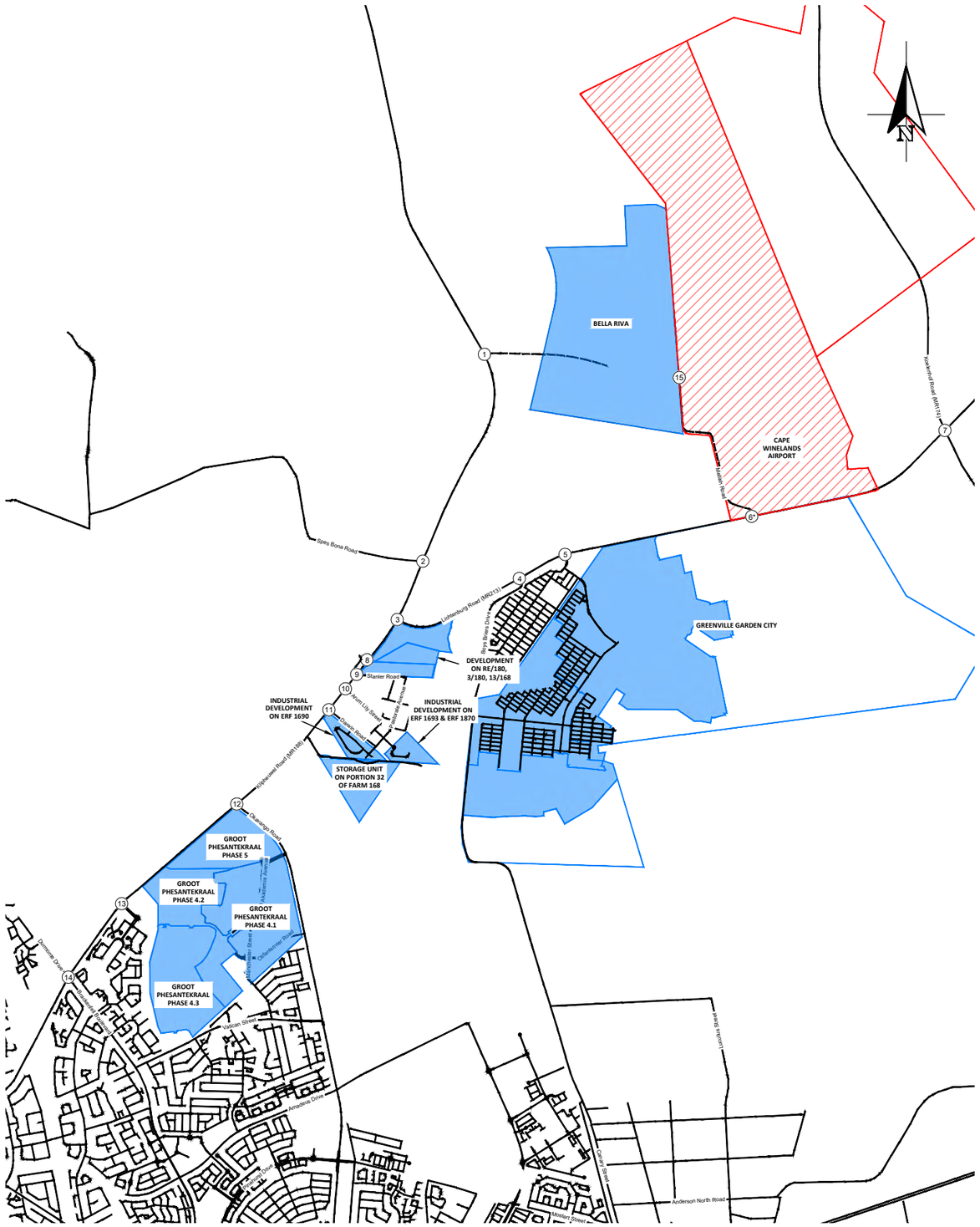

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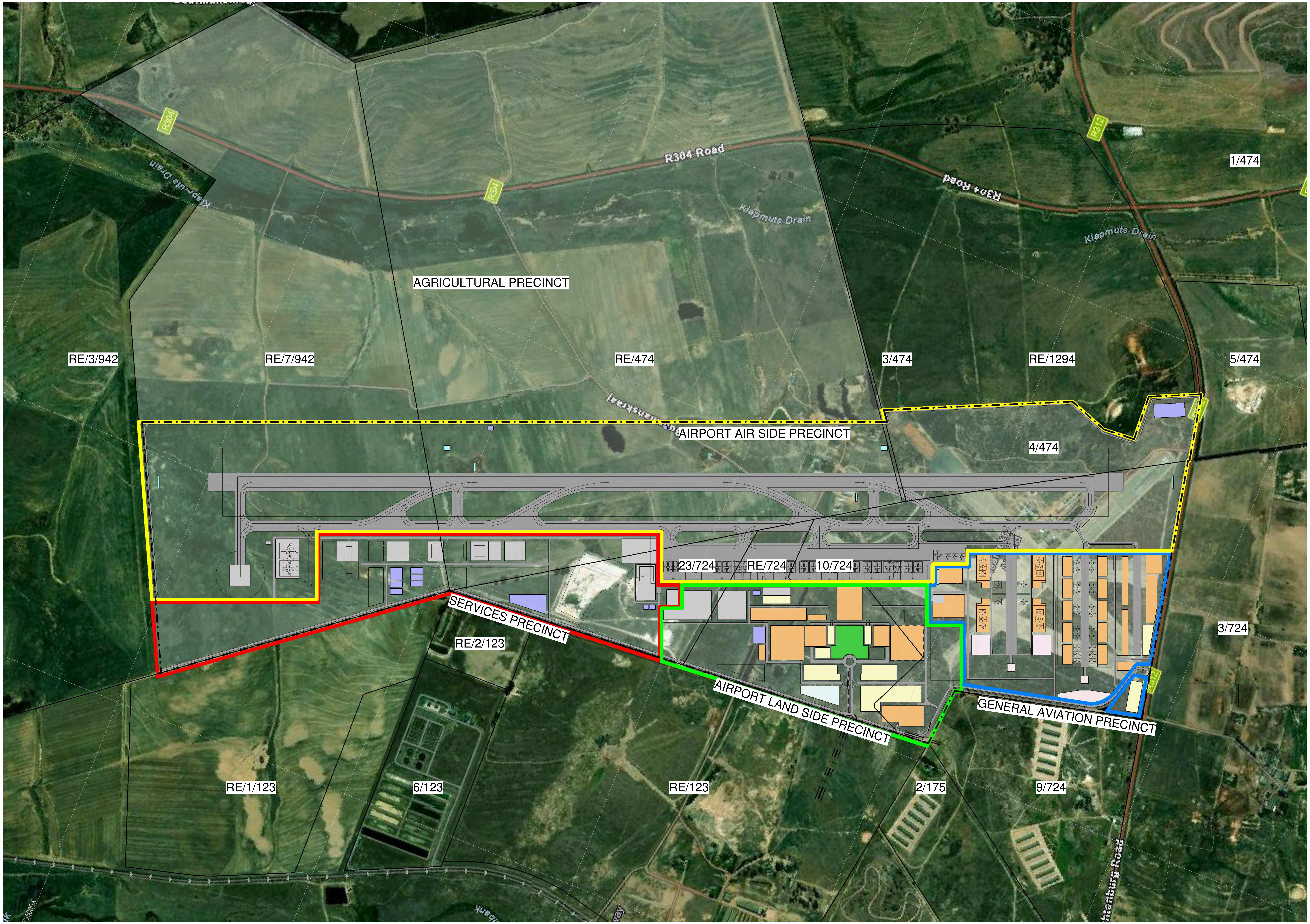
PROJECT:	FIGURE:	NUMBER:
CAPE WINELANDS AIRPORT, DURBANVILLE	TOTAL (2032) WEEKDAY PM PEAK HOUR TRAFFIC CONDITIONS - *SENSITIVITY ANALYSIS*	A5.5

G:\4334 TIA Winelands Airport\11 Drawing & Figures\CAD\4334 TIA Winelands Airport_Traffix_JG_2024-09-23.dwg

Annexure B

Precinct Plans



SITE PLAN - PHASE 1

0 62.5 m 125.0 m 250.0 m

SCALE: 1:5000

GENERAL NOTES

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DRAINAGE NOTES

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* MARKED COVERS TO BE PROVIDED AT GROUND LEVEL FOR i.e's BELOW PAVING
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* SOIL WATER PIPES HAVING A VERTICAL DROP EXCEEDING 1200mm TO THE MAIN DRAIN TO BE ANTI-SYPHONED.
* ALL BRANCH DRAINS EXCEEDING 6m IN LENGTH TO BE VENTED.
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* a) EXTINGUISHERS TO BE INSTALLED IN ACCORDANCE WITH SABS 0105.
  b) HOSE REELS TO BE INSTALLED IN ACCORDANCE WITH SABS 543.
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* PORTABLE FIRE EXTINGUISHERS TO BE HUNG ON PURPOSE MADE BOARDS AND LOCATED IN SECURE POSITIONS AS INDICATED ON PLAN.
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* STRUCTURAL ELEMENTS AND COMPONENTS TO COMPLY WITH TT7.
* FIRE EXIT DOORS ARE TO BE FITTED WITH EMERGENCY EXIT LOCKSETS.
* SYMBOLIC SAFETY SIGNS TO BE IN ACCORDANCE WITH S.A.B.S. CODE 1186 AND POSITIONED AS REQUIRED BY THE FIRE DEPARTMENT.

Rev	Description	Revision Date
9	ISSUED - BOUNDARY FENCE LINE ADJUSTED	2024-08-20
8	ISSUED - PHASE 1 UPDATED	2024-08-19
7	ISSUED FOR COMMENT	2024-08-15
6	ROADS UPDATED	2024-08-15
5	ISSUED FOR REVIEW	2024-08-14
4	Added ATCT and Helipad	2024-05-24
3	FOR REVIEW	2024-04-10
2	FOR REVIEW	2024-04-03
1	FOR REVIEW	2024-04-03

CAPEX PROJECTS
UNIT 10 First Floor
BOSKRUIN BUSINESS PARK
BOSKRUIN
cnr Kelly & Bosbok street
2188
Tel: 011 792 4260/ 8169

CLIENT

CAPE WINELANDS AERO

Client

Engineer

Registration NO: Designer

SACAP NO: ..

CLIENT
ENVIRONMENTAL CONSULTANT

TITLE
PHASE 1

DRAWING
CWA - PRECINCT PLANS

SIZE		DWG NO	REV
A0		2024-3297 408	9
SCALE 1 : 5000		DATE 2024-08-20	DRAWN BY: CW DENNIS

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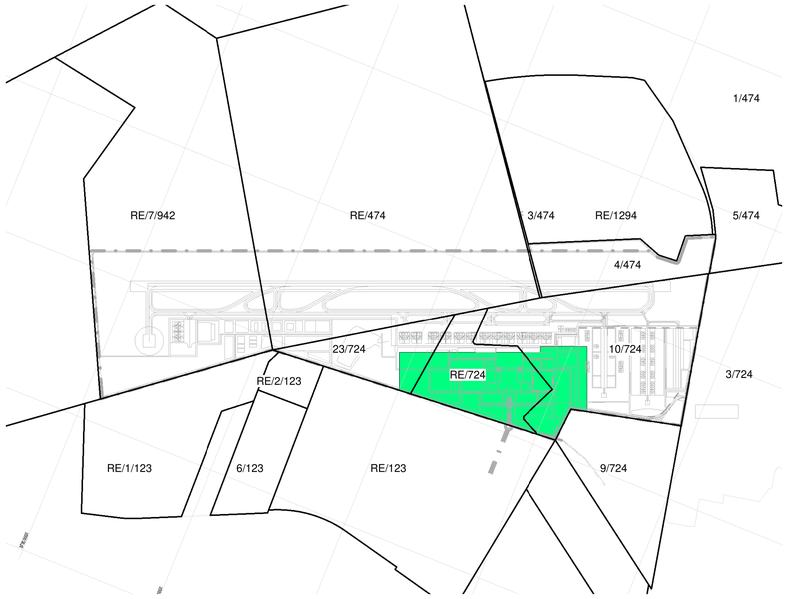
PHASE 1 - Airport Terminal Precinct

0 16.3 m 32.5 m 65.0 m
SCALE: 1:1300



Key Plan - PHASE 1 Airport Terminal Precinct

0 187.5 m 375.0 m 750.0 m
SCALE: 1:15000

56.54 ha

PHASE 1 - TERMINAL PRECINCT		
Name	Occupancy	Area
00	LANDSCAPED AREA	16538 m²
A01	PASSENGER TERMINAL BUILDING	13979 m²
A02.1	CAR RENTAL	1725 m²
A02.2	CAR RENTAL	11666 m²
A04.1	PUBLIC TRANSPORT	7516 m²
A04.2	PICK UP & DROP OFF	5569 m²
A08.1	PARKING	1827 m²
A08.2	PARKING	19515 m²
A08.3	PARKING	19590 m²
A08.4	PARKING	13469 m²

PHASE 1 - TERMINAL PRECINCT		
Name	Occupancy	Area
B09.2	GSE STAGING	3819 m²
B11.2	CARGO	17436 m²
B11.3	CARGO	14043 m²
C09	ENERGY CENTRE	3250 m²
C11.1	AS SS	600 m²

PHASE 1 - TERMINAL PRECINCT		
Name	Occupancy	Area
C11.2	LS SS	600 m²
E01.1	AIRPORT USE: HOTEL 1	2623 m²
E04.4	AIRPORT USE	9144 m²
E04.5	AIRPORT USE	9342 m²
E04.6	AIRPORT USE	19563 m²
E04.9	AIRPORT USE	3819 m²
E.1	AERO VINTAGE	1999 m²
E.2	RESTAURANT	1999 m²
F01	SERVICE STATION	9075 m²

MRO	Maintenance Repairs and Operations
FBO	Fixed Based Operators
GA	General Aviation
GSE	Ground Support Equipment
ARFF	Aircraft Rescue and Firefighting
FATO	Final Approach and Take-off (Helipad)
WTWP/WTWW	Wastewater Treatment Plant / Works
RDTS	Remote Digital Control Tower System
PAPI	Precision Approach Path Indicator

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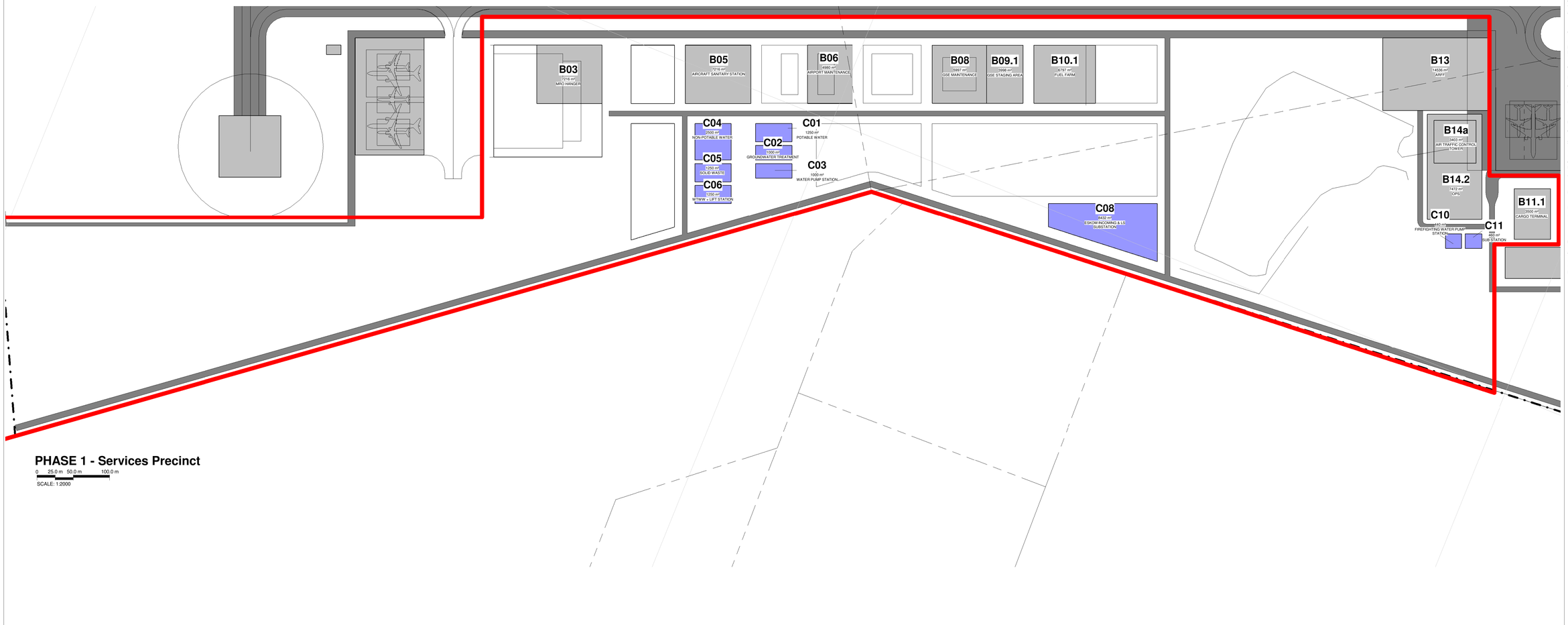
Client
Engineer
Registration NO: Designer
SACAP NO:

CLIENT: ENVIRONMENTAL CONSULTANT

TITLE: PHASE 1 TERMINAL PRECINCT

DRAWING: CWA - PRECINCT PLANS

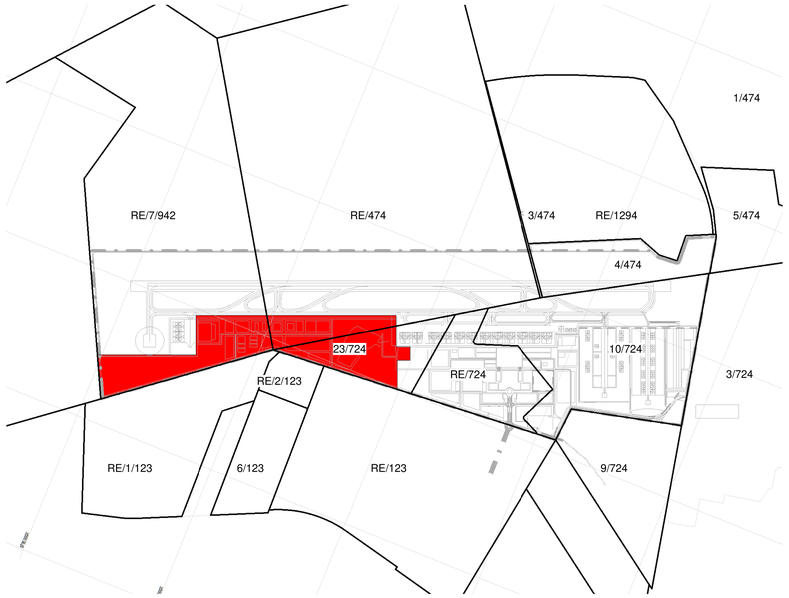
SIZE: A0
DWG NO: 2024-3297 409
REV: 9
SCALE: As indicated
DATE: 2024-09-20
DRAWN BY: CW DENNIS



PHASE 1 - Services Precinct

0 25.0 m 50.0 m 100.0 m

SCALE: 1:2000



Key Plan - PHASE 1 Services Precinct

0 187.5 m 375.0 m 750.0 m

SCALE: 1:15000

64.49 ha

PHASE 1 - SERVICES		
Name	Occupancy	Area
B03	MRO HANGER	7216 m²
B05	AIRCRAFT SANITARY STATION	7216 m²
B06	AIRPORT MAINTENANCE	4980 m²
B07	CATERING BUILDING	Not Placed
B08	GSE MAINTENANCE	5997 m²
B09.1	GSE STAGING AREA	3998 m²
B10.1	FUEL FARM	6797 m²
B10.2	FUEL FARM	Not Placed
B11.1	CARGO TERMINAL	3500 m²
B13	ARFF	14536 m²
B14.2	OPS	7472 m²
B14a	AIR TRAFFIC CONTROL TOWER	3403 m²
B24.1	SUB STATION	260 m²

PHASE 1 - SERVICES		
Name	Occupancy	Area
C01	POTABLE WATER	1250 m²
C02	GROUNDWATER TREATMENT	1000 m²
C03	WATER PUMP STATION	1000 m²
C04	NON-POTABLE WATER	2500 m²
C05	SOLID WASTE	1250 m²
C06	WTWW + LIFT STATION	1250 m²
C08	ESKOM INCOMING & LS SUBSTATION	8432 m²
C10	FIREFIGHTING WATER PUMP STATION	440 m²
C11	SUB STATION	460 m²
E04.14	AIRPORT USE	Not Placed
E04.15	AIRPORT USE	Not Placed

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Client
Engineer
Registration NO: Designer
SACAP NO:

CLIENT: ENVIRONMENTAL CONSULTANT

TITLE: PHASE 1 SERVICES PRECINCT

DRAWING: CWA - PRECINCT PLANS

SIZE	CHG NO	REV
A0	2024-3297 410	9

SCALE: As indicated | DATE: 2024-09-20 | DRAWN BY: CM DENNIS

GENERAL NOTES

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  b) HOSE REELS TO BE INSTALLED IN ACCORDANCE WITH SABS 543.
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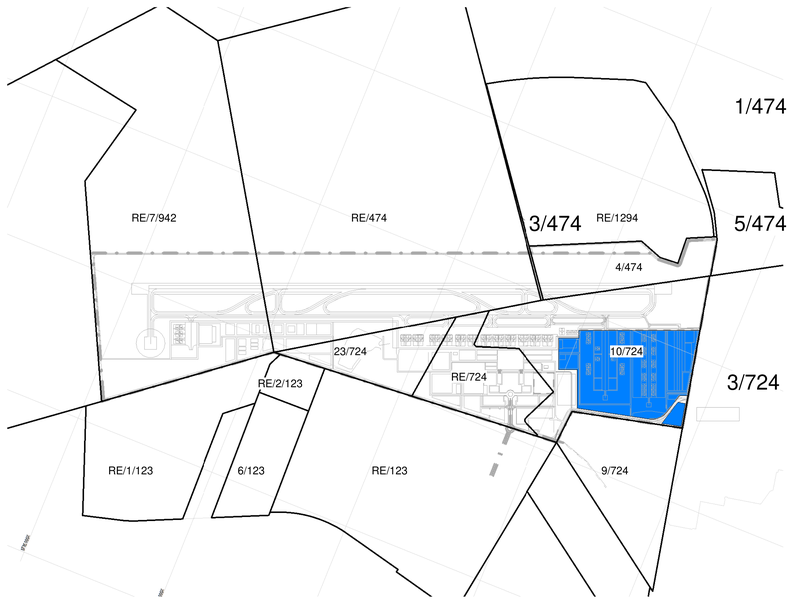
49.10 ha



Key Plan - PHASE 1 General Aviation Precinct

0 187.5 m 375.0 m 750.0 m
SCALE: 1:15000

MRO	Maintenance Repairs and Operations
FBO	Fixed Based Operators
GA	General Aviation
GSE	Ground Support Equipment
ARFF	Aircraft Rescue and Firefighting
FATO	Final Approach and Take-off (Helipad)
WTWP/WTWW	Wastewater Treatment Plant / Works
RDTS	Remote Digital Control Tower System
PAPI	Precision Approach Path Indicator

PHASE 1 - GENERAL AVIATION

Name	Occupancy	Area
A03	GA/VIP/GOVERNMENT TERMINAL	6419 m²
A08.5	PARKING	10753 m²
A08.6	PARKING	2987 m²
A10.1A	FBO 1	5787 m²
A10.1B	FBO 1	1230 m²
A10.2A	FBO 2	5787 m²
A10.2B	FBO 2	1230 m²
A10.3A	FBO 4	5787 m²
A10.3B	FBO 4	1230 m²
A10.4A	FBO 3	5798 m²
A10.4B	FBO 3	1220 m²
A11.1	GA HANGERS	3200 m²
A11.2	GA HANGERS	3200 m²
A11.3	GA HANGERS	3200 m²
A11.4	GA HANGERS	3200 m²
A11.5	GA HANGERS	3200 m²
A11.6	GA HANGERS	3200 m²
A11.7	GA HANGERS	3200 m²
A11.8	GA HANGERS	3200 m²
A11.9	GA HANGERS	3200 m²
A11.10	GA HANGERS	3200 m²
A11.11	GA HANGERS	4678 m²
A11.12	GA HANGERS	4971 m²
A11.13	GA HANGERS	8512 m²
A16	GA CLUBHOUSE & FUELING	5204 m²

PHASE 1 - GENERAL AVIATION

Name	Occupancy	Area
B11	SPECIAL CARGO FACILITY	1575 m²
B14.1	OPS	1500 m²
B17.1	ACCESS CONTROL	102 m²
B17.2	ACCESS CONTROL	100 m²
B17.3	ACCESS CONTROL	100 m²

PHASE 1 - GENERAL AVIATION

Name	Occupancy	Area
E04.12	AIRPORT USE	6315 m²
E04.13	AIRPORT USE	4636 m²

PHASE 1 - GENERAL AVIATION

Name	Occupancy	Area
PH.1	HELIPORT	6220 m²
PH.2	HELIPORT	6220 m²
PH.3	HELIPORT	992 m²
PH.4	HELIPORT	992 m²
PH.5	HELIPORT	8938 m²

Rev	Description	Revision Date
9	ISSUED - BOUNDARY FENCE LINE ADJUSTED	2024-09-20
8	ISSUED - PHASE 1 UPDATED	2024-09-19
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6	ROADS UPDATED	2024-06-15
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4	Added ATCT and Helipad	2024-05-24
3	FOR REVIEW	2024-04-10
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1	FOR REVIEW	2024-04-03

CAPEX PROJECTS
UNIT 10 First Floor
BOSKRUIN BUSINESS PARK
BOSKRUIN
cnr Kelly & Bostock street
2188
Tel: 011 792 4260/ 8169

CLIENT: CAPE WINELANDS AERO

Client
Engineer
Registration NO: Designer
SACAP NO:

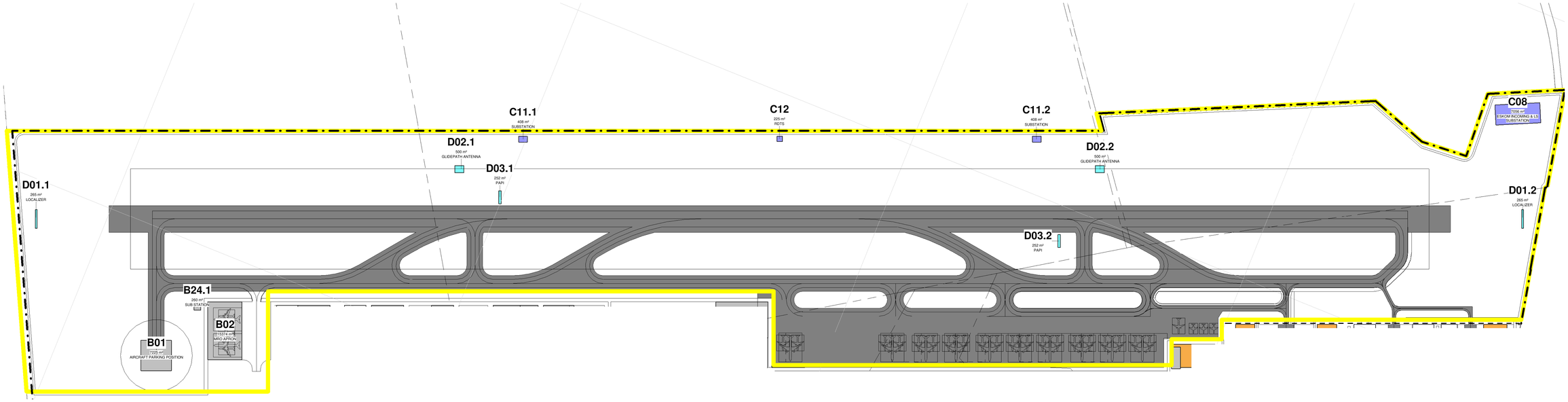
CLIENT: ENVIRONMENTAL CONSULTANT

TITLE: PHASE 1 GENERAL AVIATION PRECINCT

DRAWING: CWA - PRECINCT PLANS

SIZE	DWG NO	REV
A0	2024-3297 411	9

SCALE	DATE	DRAWN BY:
As indicated	2024-09-20	CW DENNIS



PHASE 1 - Airport Air Side Precinct

0 512.5 m 1025.0 m 2050.0 m

SCALE: 1:41000

248.41 ha

PHASE 1 - AIR SIDE		
Name	Occupancy	Area
B01	AIRCRAFT PARKING POSITION	7225 m²
B02	MRO APRON	15374 m²
B12	CARGO APRON	Not Placed

PHASE 1 - AIR SIDE		
Name	Occupancy	Area
C08	ESKOM INCOMING & LS SUBSTATION	7056 m²
C11.1	SUBSTATION	408 m²
C11.2	SUBSTATION	408 m²
C12	RDTS	225 m²

PHASE 1 - AIR SIDE		
Name	Occupancy	Area
D01.1	LOCALIZER	265 m²
D01.2	LOCALIZER	265 m²
D02.1	GLIDEPATH ANTENNA	500 m²
D02.2	GLIDEPATH ANTENNA	500 m²
D03.1	PAPI	252 m²
D03.2	PAPI	252 m²

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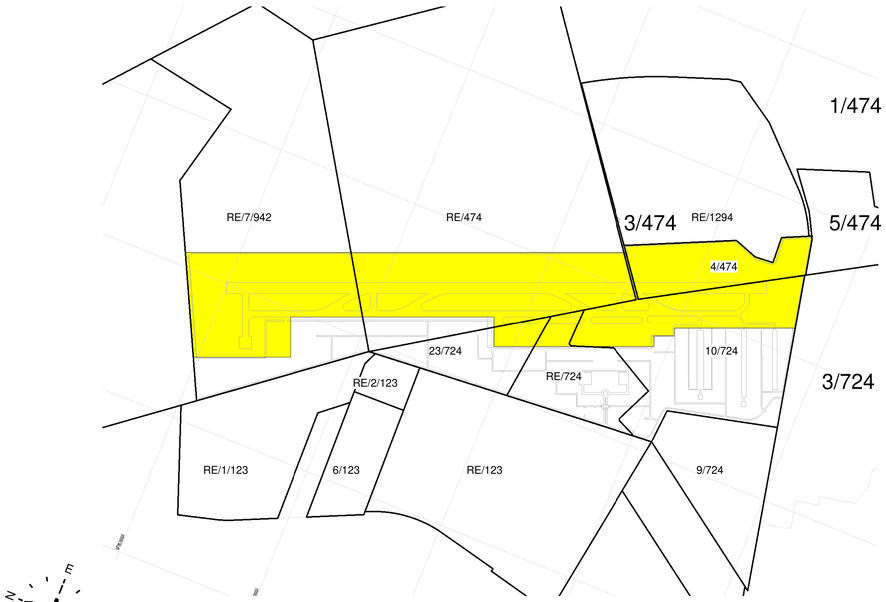

Key Plan - PHASE 1 Airport Air Side Precinct

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SCALE: 1:15000

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CLIENT: CAPE WINELANDS AERO

Client

Engineer

Registration NO: Designer

SACAP NO:

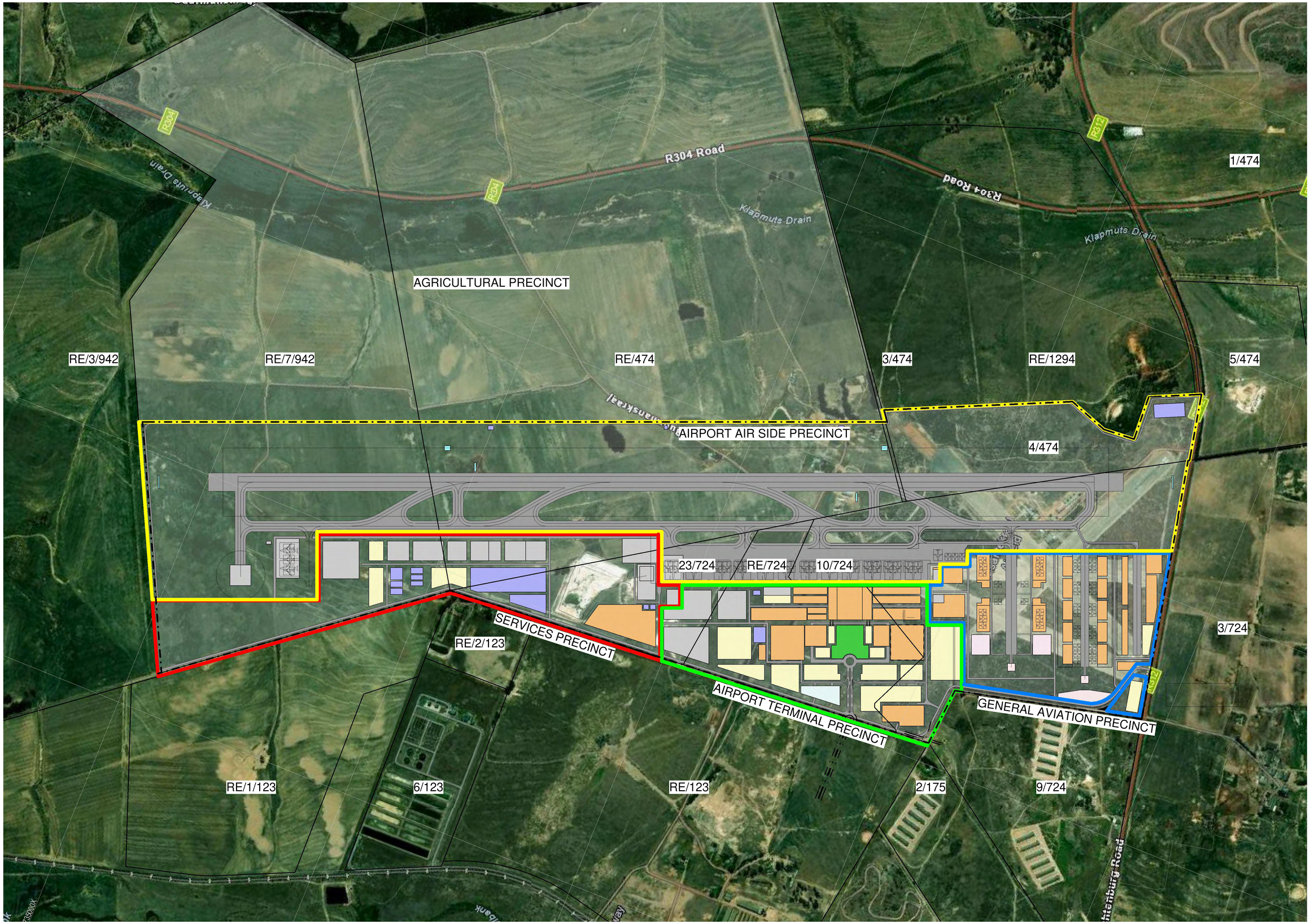
CLIENT: ENVIRONMENTAL CONSULTANT

TITLE: PHASE 1 AIRPORT AIR SIDE PRECINCT

DRAWING: CWA - PRECINCT PLANS

SIZE	DWG NO	REV
A0	2024-3297 412	9

SCALE: As indicated | DATE: 2024-09-20 | DRAWN BY: CM DENNIS



N E S W

SITE PLAN - PHASE 2

0 62.5 m 125.0 m 250.0 m

SCALE: 1:5000

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1	FOR REVIEW	2024-03-26

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CLIENT

CAPE WINELANDS AERO

Client

Engineer

Registration NO: Designer

SACAP NO:

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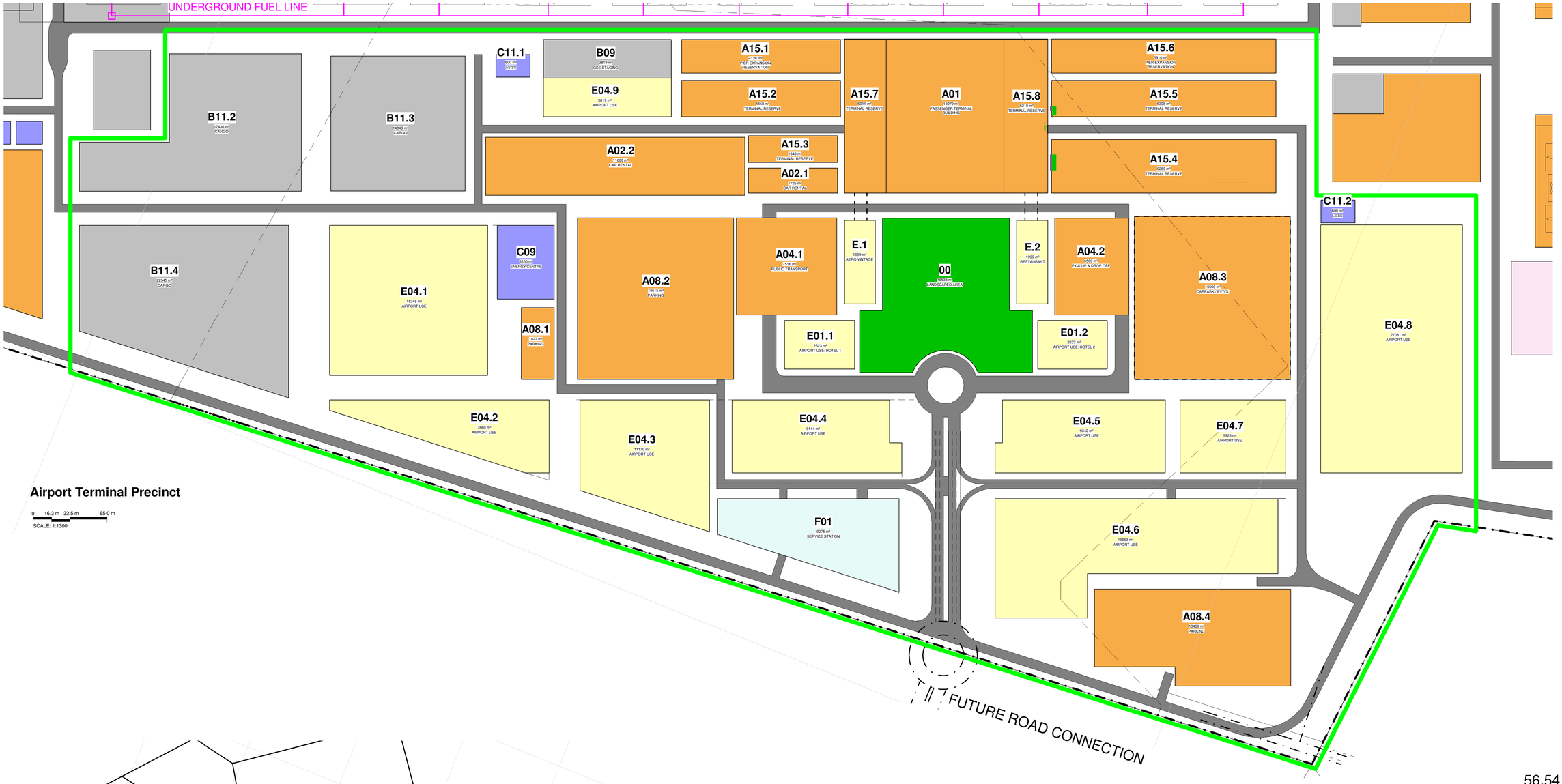
TITLE: PHASE 2

DRAWING: CWA - PRECINCT PLANS

SIZE	DWG NO	REV
A0	2024-3297 400	14

SCALE 1: 5000 | DATE 2024-09-20 | DRAWN BY: CW DENNIS

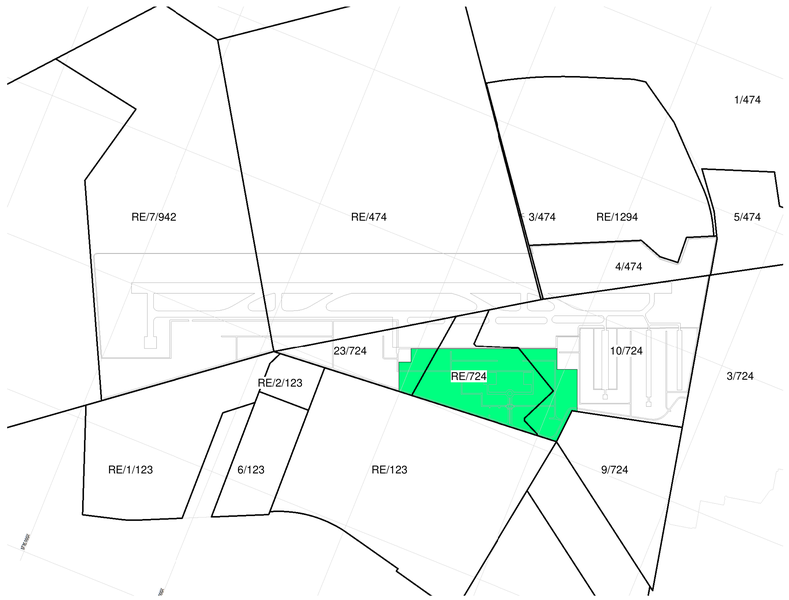


Airport Terminal Precinct

0 16.3 m 32.5 m 65.0 m

SCALE: 1:1300

56.54 ha



Key Plan - Airport Terminal Precinct

Name	Occupancy	Area
00	LANDSCAPED AREA	16538 m²
A01	PASSENGER TERMINAL BUILDING	13979 m²
A02.1	CAR RENTAL	1725 m²
A02.2	CAR RENTAL	11666 m²
A04.1	PUBLIC TRANSPORT	7516 m²
A04.2	PICK UP & DROP OFF	5569 m²
A08.1	PARKING	1827 m²
A08.2	PARKING	19515 m²
A08.3	CARPARK / EVTOL	19590 m²
A08.4	PARKING	13469 m²
A15.1	PIER EXPANSION RESERVATION	4126 m²
A15.2	TERMINAL RESERVE	4468 m²
A15.3	TERMINAL RESERVE	1843 m²
A15.4	TERMINAL RESERVE	9289 m²
A15.5	TERMINAL RESERVE	6308 m²
A15.6	PIER EXPANSION RESERVATION	5910 m²
A15.7	TERMINAL RESERVE	5011 m²
A15.8	TERMINAL RESERVE	5210 m²

Name	Occupancy	Area
B11.2	CARGO	17436 m²
B11.3	CARGO	14043 m²
B11.4	CARGO	22545 m²
C09	ENERGY CENTRE	3250 m²
C11.1	AS SS	600 m²

Name	Occupancy	Area
E01.1	AIRPORT USE: HOTEL 1	2623 m²
E01.2	AIRPORT USE: HOTEL 2	2623 m²
E04.1	AIRPORT USE	18348 m²
E04.2	AIRPORT USE	7660 m²
E04.3	AIRPORT USE	11170 m²
E04.4	AIRPORT USE	9144 m²
E04.5	AIRPORT USE	9342 m²
E04.6	AIRPORT USE	19563 m²
E04.7	AIRPORT USE	5928 m²
E04.8	AIRPORT USE	27081 m²
E04.9	AIRPORT USE	3819 m²
E.1	AERO VINTAGE	1999 m²
E.2	RESTAURANT	1999 m²
F01	SERVICE STATION	9075 m²

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CLIENT: CAPE WINELANDS AERO

Client

Engineer

Registration NO: Designer

SACAP NO:

CLIENT: ENVIRONMENTAL CONSULTANT

TITLE: PHASE 2 TERMINAL PRECINCT

DRAWING: CWA - PRECINCT PLANS

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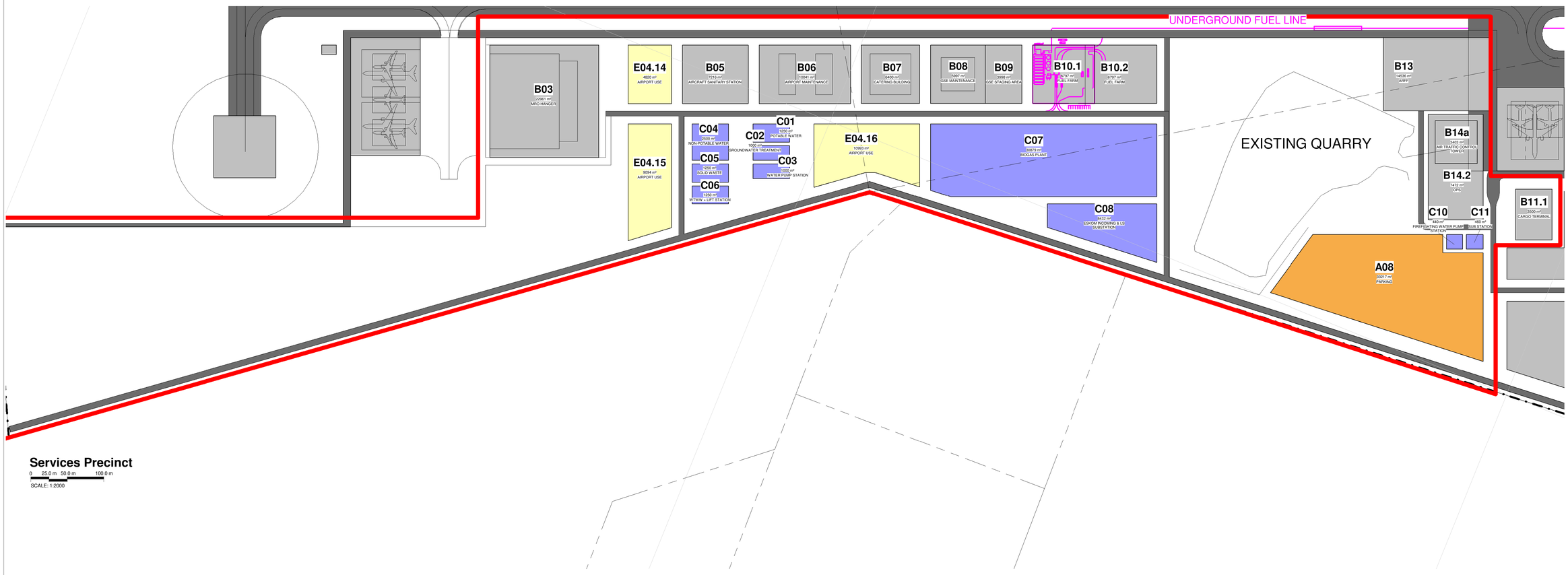
A0	2024-3297 401	14

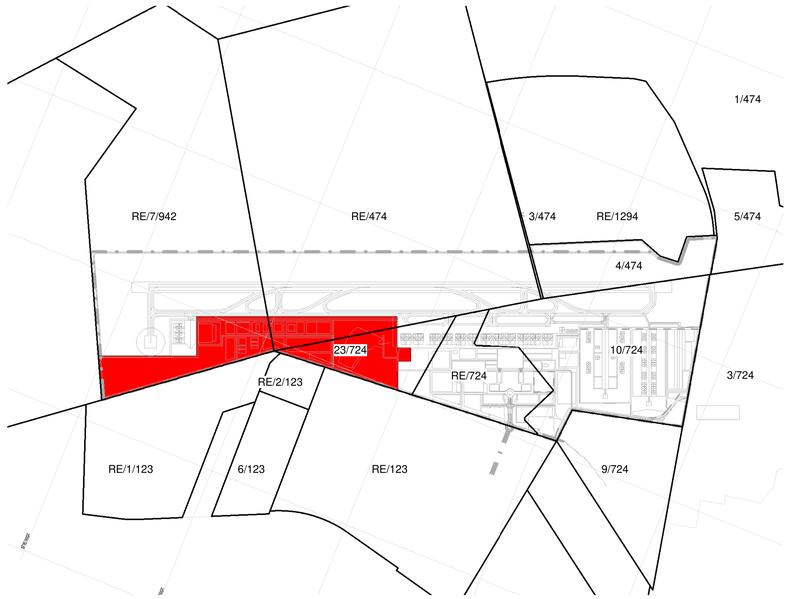
SCALE: As indicated | DATE: 2024-09-20 | DRAWN BY: CW DENNIS



Services Precinct

0 25.0 m 50.0 m 100.0 m

SCALE: 1:2000



Key Plan - Services Precinct

64.49 ha

Name	Occupancy	Area
A08	PARKING	33217 m²
B03	MRO HANGER	22961 m²
B05	AIRCRAFT SANITARY STATION	7216 m²
B06	AIRPORT MAINTENANCE	10041 m²
B07	CATERING BUILDING	6400 m²
B08	GSE MAINTENANCE	5997 m²
B09	GSE STAGING AREA	3998 m²
B10.1	FUEL FARM	6797 m²
B10.2	FUEL FARM	6797 m²
B11.1	CARGO TERMINAL	3500 m²
B13	ARFF	14536 m²
B14.2	OPS	7472 m²
B14a	AIR TRAFFIC CONTROL TOWER	3403 m²

Name	Occupancy	Area
C01	POTABLE WATER	1250 m²
C02	GROUNDWATER TREATMENT	1000 m²
C03	WATER PUMP STATION	1000 m²
C04	NON-POTABLE WATER	2500 m²
C05	SOLID WASTE	1250 m²
C06	WTWW + LIFT STATION	1250 m²
C07	BIOGAS PLANT	30879 m²
C08	ESKOM INCOMING & LS SUBSTATION	8432 m²
C10	FIREFIGHTING WATER PUMP STATION	440 m²
C11	SUB STATION	460 m²

Name	Occupancy	Area
E04.14	AIRPORT USE	4820 m²
E04.15	AIRPORT USE	9094 m²
E04.16	AIRPORT USE	10993 m²

MRO	Maintenance Repairs and Operations
FBO	Fixed Based Operators
GA	General Aviation
GSE	Ground Support Equipment
ARFF	Aircraft Rescue and Firefighting
FATO	Final Approach and Take-off (Helipad)
WTWP/WTWW	Wastewater Treatment Plant / Works
RDTS	Remote Digital Control Tower System
PAPI	Precision Approach Path Indicator

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* MARKED COVERS TO BE PROVIDED AT GROUND LEVEL FOR i.d's BELOW PAVING
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* SOIL WATER PIPES HAVING A VERTICAL DROP EXCEEDING 1200mm TO THE MAIN DRAIN TO BE ANTI-SYPHONED.
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Rev	Description	Revision Date
14	ISSUED - BOUNDARY FENCE LINE ADJUSTED	2024-08-20
13	ISSUED - PHASE 1 UPDATED	2024-08-19
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7	Revised SDP/EIA For Comment	2024-07-23
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4	FOR REVIEW	2024-04-10
3	FOR REVIEW	2024-04-03
2	FOR REVIEW	2024-04-03
1	FOR REVIEW	2024-03-28

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UNIT 10 First Floor
BOSKRUIN BUSINESS PARK
BOSKRUIN
cnr Kelly & Bosbok street
2188
Tel: 011 792 4260/ 8169

CLIENT: CAPE WINELANDS AERO

Client

Engineer

Registration NO: Designer

SACAP NO:

CLIENT: ENVIRONMENTAL CONSULTANT

TITLE: PHASE 2 SERVICES PRECINCT

DRAWING: CWA - PRECINCT PLANS

SIZE: A0 | DRG NO: 2024-3297 402 | REV: 14

SCALE: As indicated | DATE: 2024-08-20 | DRAWN BY: CW DENNIS

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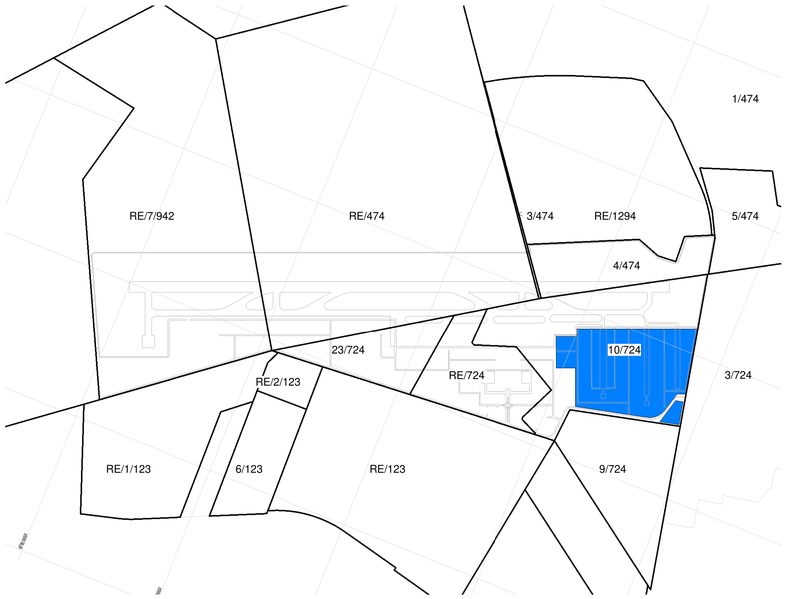

Key Plan - General Aviation Precinct

49.10 ha

Name	Occupancy	Area
A03	GA/VIP/GOVERNMENT TERMINAL	6419 m²
A08.5	PARKING	10753 m²
A08.6	PARKING	2987 m²
A10.1A	FBO 1	5787 m²
A10.1B	FBO 1	1230 m²
A10.2A	FBO 2	5787 m²
A10.2B	FBO 2	1230 m²
A10.3A	FBO 4	5787 m²
A10.3B	FBO 4	1230 m²
A10.4A	FBO 3	5798 m²
A10.4B	FBO 3	1220 m²
A11.1	GA HANGERS	3200 m²
A11.2	GA HANGERS	3200 m²
A11.3	GA HANGERS	3200 m²
A11.4	GA HANGERS	3200 m²
A11.5	GA HANGERS	3200 m²
A11.6	GA HANGERS	3200 m²
A11.7	GA HANGERS	3200 m²
A11.8	GA HANGERS	3200 m²
A11.9	GA HANGERS	3200 m²
A11.10	GA HANGERS	3200 m²
A11.11	GA HANGERS	4678 m²
A11.12	GA HANGERS	4971 m²
A11.13	GA HANGERS	8512 m²
A16	GA CLUBHOUSE & FUELING	5204 m²

Name	Occupancy	Area
B11	SPECIAL CARGO FACILITY	1575 m²
B14.1	OPS	1500 m²
B17.1	ACCESS CONTROL	102 m²
B17.2	ACCESS CONTROL	100 m²
B17.3	ACCESS CONTROL	100 m²

Name	Occupancy	Area
E04.12	TRANSPORT USE	6315 m²
E04.13	AIRPORT USE	4636 m²

Name	Occupancy	Area
PH.1	HELIPORT	6220 m²
PH.2	HELIPORT	6220 m²
PH.3	HELIPORT	992 m²
PH.4	HELIPORT	992 m²
PH.5	HELIPORT	8938 m²

MRO	Maintenance Repairs and Operations
FBO	Fixed Based Operators
GA	General Aviation
GSE	Ground Support Equipment
ARFF	Aircraft Rescue and Firefighting
FATO	Final Approach and Take-off (Helipad)
WTWP/WTWW	Wastewater Treatment Plant / Works
RDTS	Remote Digital Control Tower System
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Tel: 011 792 4260/ 8169

CLIENT: CAPE WINELANDS AERO

Client
Engineer
Registration NO: Designer
SACAP NO:

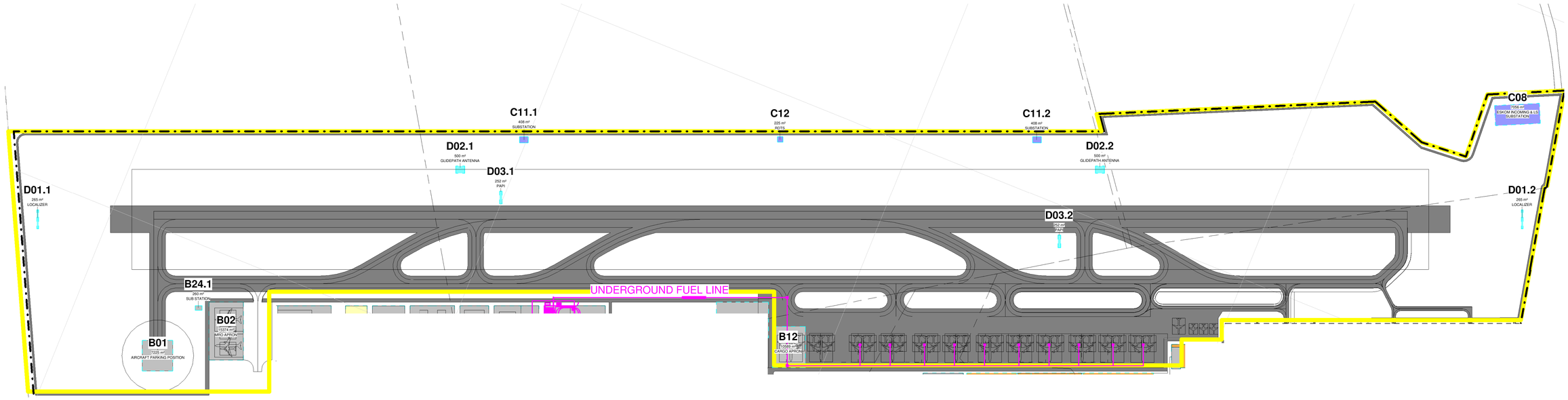
CLIENT: ENVIRONMENTAL CONSULTANT

TITLE: PHASE 2 GENERAL AVIATION PRECINCT

DRAWING: CWA - PRECINCT PLANS

SIZE	DWG NO	REV
A0	2024-3297 403	14

SCALE: As indicated | DATE: 2024-09-30 | DRAWN BY: CW DENNIS



Airport Air Side Precinct

0 50.0 m 100.0 m 200.0 m

SCALE: 1:4000

248.41 ha

Name	Occupancy	Area
B01	AIRCRAFT PARKING POSITION	7225 m²
B02	MRO APRON	15374 m²
B12	CARGO APRON	10589 m²
B24.1	SUB STATION	260 m²

Name	Occupancy	Area
C08	ESKOM INCOMING & LS SUBSTATION	7056 m²
C11.1	SUBSTATION	408 m²
C11.2	SUBSTATION	408 m²
C12	RDTS	225 m²
D01.1	LOCALIZER	265 m²
D01.2	LOCALIZER	265 m²
D02.1	GLIDEPATH ANTENNA	500 m²
D02.2	GLIDEPATH ANTENNA	500 m²
D03.1	PAPI	252 m²
D03.2	PAPI	252 m²

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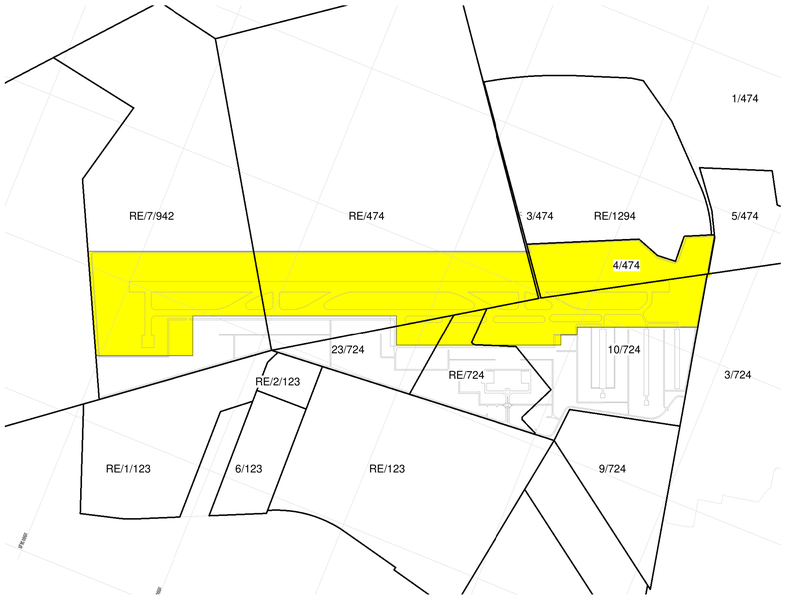

Key Plan - Airport Air Side Precinct

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Engineer

Registration NO: Designer

SACAP NO:

CLIENT: ENVIRONMENTAL CONSULTANT

TITLE: PHASE 2 AIRPORT AIR SIDE PRECINCT

DRAWING: CWA - PRECINCT PLANS

SIZE	DWG NO	REV
A0	2024-3297 404	14

SCALE: As indicated | DATE: 2024-09-20 | DRAWN BY: CM DENNIS

Annexure C

Tables

Table C1: 2032 Daily Trip Generation

WEEKDAY DAILY														
	LAND USE	EXTENT		TRIP RATE		% IN	% OUT	% HEAVY	SOURCE	ASSUMED EXTERNALISATION FACTOR	PRIMARY TRIPS	IN	OUT	HEAVY VEHICLES
1	GENERAL AVIATION AND ASSOCIATED LAND USES (NON-COMMERCIAL OPERATIONS)													
	Offices	25 543	m^2 GLA	8.50	trips/100m2 GLA	85%	15%	5%	COTO 710, Offices	10%	217	185	32	11
	Hotel	150	rooms	3.25	trips/room	60%	40%	0%	COTO 310, Hotel, Residential	10%	49	29	20	0
	Retail	18 540	m^2 GLA	68.35	trips/100m2 GLA	65%	35%	2%	COTO 820, Shopping Centre	30%	3 802	2 471	1 331	76
	Warehousing	26 567	m^2 GLA	3.00	trips/100m2 GLA	60%	40%	10%	COTO 150 Warehousing and Distribution	100%	798	479	319	80
	Filling Station	1	station			100%			No new trips generated	0%	0	0	0	0
	SUB-TOTAL										**4 866**	**3 164**	**1 702**	**167**
2	COMMERCIAL OPERATIONS - DOMESTIC													
	Airfield - Per million Annual Airline Pax	2 500 000	annual pax	3335.51	trips/million Annual Airline Pax	86%	14%	1%	CTIA information	100%	8 339	7 158	1 181	83
	SUB-TOTAL										**8 339**	**7 158**	**1 181**	**83**
TOTAL NUMBER OF TRIPS											**13 205**	**10 322**	**2 883**	**250**

Table C2: 2050 Daily Trip Generation

WEEKDAY DAILY														
	LAND USE	EXTENT		TRIP RATE		% IN	% OUT	% HEAVY	SOURCE	ASSUMED EXTERNALISATION FACTOR	PRIMARY TRIPS	IN	OUT	HEAVY VEHICLES
1	GENERAL AVIATION AND ASSOCIATED LAND USES (NON-COMMERCIAL OPERATIONS)													
	Offices	53 601	m^2 GLA	8.50	trips/100m2 GLA	85%	15%	5%	COTO 710, Offices	10%	456	387	69	23
	Hotel	300	rooms	3.25	trips/room	60%	40%	0%	COTO 310, Hotel, Residential	10%	98	59	39	0
	Retail	18 540	m^2 GLA	68.35	trips/100m2 GLA	65%	35%	2%	COTO 820, Shopping Centre	30%	3 802	2 471	1 331	76
	Warehousing	82 398	m^2 GLA	3.00	trips/100m2 GLA	60%	40%	10%	COTO 150 Warehousing and Distribution	100%	2 472	1 483	989	247
	Filling Station	1	station			100%			No new trips generated	0%	0	0	0	0
	SUB-TOTAL										**6 827**	**4 400**	**2 427**	**346**
2	COMMERCIAL OPERATIONS - DOMESTIC													
	Airfield - Per million Annual Airline Pax	5 200 000	annual pax	3335.51	trips/million Annual Airline Pax	86%	14%	1%	CTIA information	100%	17 345	14 889	2 456	173
	SUB-TOTAL										**17 345**	**14 889**	**2 456**	**173**
TOTAL NUMBER OF TRIPS											**24 172**	**19 289**	**4 883**	**519**

Table C3.1: 2032 AM Peak-Hour Trip Generation

WEEKDAY AM PEAK HOUR												
	LAND USE	EXTENT		TRIP RATE		% IN	% OUT		SOURCE	ASSUMED EXTERNALISATION FACTOR	PRIMARY TRIPS	IN	OUT
1	GENERAL AVIATION AND ASSOCIATED LAND USES (NON-COMMERCIAL OPERATIONS)												
	Offices	25 543	m^2 GLA	2.10	trips/100m2 GLA	85%	15%		COTO 710, Offices	10%	54	46	8
	Hotel	150	rooms	0.50	trips/room	60%	40%		COTO 310, Hotel, Residential	10%	8	5	3
	Retail	18 540	m^2 GLA	1.17	trips/100m2 GLA	65%	35%		COTO 820, Shopping Centre	30%	65	43	22
	Warehousing	26 567	m^2 GLA	0.50	trips/100m2 GLA	60%	40%		COTO 150 Warehousing an Distribution	100%	133	80	53
	Filling Station	1	station			100%			No new trips generated	0%	0	0	0
	SUB-TOTAL										**260**	**174**	**86**
2	**COMMERCIAL OPERATIONS - DOMESTIC**												
	Airfield - Per million Annual Airline Pax	2 500 000	annual pax	136.34	trips/million Annual Airline Pax	86%	14%		CTIA information	100%	341	293	48
	SUB-TOTAL										**341**	**293**	**48**
TOTAL NUMBER OF TRIPS											**601**	**467**	**134**

Table C3.2: 2032 PM Peak-Hour Trip Generation

WEEKDAY PM PEAK HOUR												
	LAND USE	EXTENT		TRIP RATE		% IN	% OUT		SOURCE	ASSUMED EXTERNALISATION FACTOR	PRIMARY TRIPS	IN	OUT
1	GENERAL AVIATION AND ASSOCIATED LAND USES (NON-COMMERCIAL OPERATIONS)												
	Offices	25 543	m^2 GLA	2.10	trips/100m2 GLA	20%	80%		COTO 710, Offices	10%	54	11	43
	Hotel	150	rooms	0.50	trips/room	55%	45%		COTO 310, Hotel, Residential	10%	8	4	4
	Retail	18 540	m^2 GLA	6.64	trips/100m2 GLA	70%	30%		COTO 820, Shopping Centre	30%	369	259	110
	Warehousing	26 567	m^2 GLA	0.50	trips/100m2 GLA	45%	55%		COTO 150 Warehousing an Distribution	100%	133	60	73
	Filling Station	1	station			100%			No new trips generated	0%	0	0	0
	SUB-TOTAL										**564**	**334**	**230**
2	**COMMERCIAL OPERATIONS - DOMESTIC**												
	Airfield - Per million Annual Airline Pax	2 500 000	annual pax	253.64	trips/million Annual Airline Pax	51%	49%		CTIA information	100%	635	325	310
	SUB-TOTAL										**635**	**325**	**310**
TOTAL NUMBER OF TRIPS											**1 199**	**659**	**540**

Table C4.1: 2050 AM Peak-Hour Trip Generation

WEEKDAY AM PEAK HOUR													
	LAND USE	EXTENT		TRIP RATE		% IN	% OUT		SOURCE	ASSUMED EXTERNALISATION FACTOR	PRIMARY TRIPS	IN	OUT
1	GENERAL AVIATION AND ASSOCIATED LAND USES (NON-COMMERCIAL OPERATIONS)												
	Offices	53 601	m^2 GLA	2.10	trips/100m2 GLA	85%	15%		COTO 710, Offices	10%	113	96	17
	Hotel	300	rooms	0.50	trips/room	60%	40%		COTO 310, Hotel, Residential	10%	15	9	6
	Retail	18 540	m^2 GLA	1.17	trips/100m2 GLA	65%	35%		COTO 820, Shopping Centre	30%	65	43	22
	Warehousing	82 398	m^2 GLA	0.50	trips/100m2 GLA	60%	40%		COTO 150 Warehousing an Distribution	100%	412	247	165
	Filling Station	1	station			100%			No new trips generated	0%	0	0	0
	SUB-TOTAL										605	395	210
2	COMMERCIAL OPERATIONS - DOMESTIC												
	Airfield - Per million Annual Airline Pax	5 200 000	annual pax	136.34	trips/million Annual Airline Pax	86%	14%		CTIA information	100%	709	609	100
	SUB-TOTAL										709	609	100
TOTAL NUMBER OF TRIPS											1 314	1 004	310

Table C4.2: 2050 PM Peak-Hour Trip Generation

WEEKDAY PM PEAK HOUR													
	LAND USE	EXTENT		TRIP RATE		% IN	% OUT		SOURCE	ASSUMED EXTERNALISATION FACTOR	PRIMARY TRIPS	IN	OUT
1	GENERAL AVIATION AND ASSOCIATED LAND USES (NON-COMMERCIAL OPERATIONS)												
	Offices	53 601	m^2 GLA	2.10	trips/100m2 GLA	20%	80%		COTO 710, Offices	10%	113	23	90
	Hotel	300	rooms	0.50	trips/room	55%	45%		COTO 310, Hotel, Residential	10%	15	8	7
	Retail	18 540	m^2 GLA	6.64	trips/100m2 GLA	70%	30%		COTO 820, Shopping Centre	30%	369	259	110
	Warehousing	82 398	m^2 GLA	0.50	trips/100m2 GLA	45%	55%		COTO 150 Warehousing and Distribution	100%	412	185	227
	Filling Station	1	station			100%			No new trips generated	0%	0	0	0
	SUB-TOTAL										909	475	434
2	COMMERCIAL OPERATIONS - DOMESTIC												
	Airfield - Per million Annual Airline Pax	5 200 000	annual pax	253.64	trips/million Annual Airline Pax	51%	49%		CTIA information	100%	1 319	676	643
	SUB-TOTAL										1 319	676	643
TOTAL NUMBER OF TRIPS											2 228	1 151	1 077