**ANNEXURE J:**

*Civil Services Report*

# REZONING AND SUBDIVISION OF PORTION 110 of FARM GWAYANG No 208, DIVISION GEORGE

## SERVICES REPORT

## MARCH 2025

**Prepared by: PG Joubert Pr Eng**
**Infrastructure Consulting Engineers cc**
PO Box 186,
Persequor Park,
PRETORIA,0020
Tel: +27 (012) 3492022
E-mail: flip@iceisp.co.za

## TABLE OF CONTENTS

## 1. BACKGROUND AND PURPOSE

The owner of Portion 110 of the Farm Gwayang 208 proposes the development of a precinct aimed at supporting George Airport. The drawing below shows the locality of Portion 110 to the northeast of George Airport. The boundaries of Portion 110 are shown in red.

*Locality plan of Portion 110*

The purpose of this document is to report on the provision of civil engineering services to support the proposed zoning. It forms the basis for services agreements to be concluded between the George Local Municipality (GLM) and the Developer of Portion 110.

## 2. GWAYANG LOCAL SPATIAL DEVELOPMENT FRAMEWORK

The Gwayang Local Spatial Development Framework (GLSDF) guides the future development of the Gwayang area and the George Airport. The GLSDF states the objective as following:

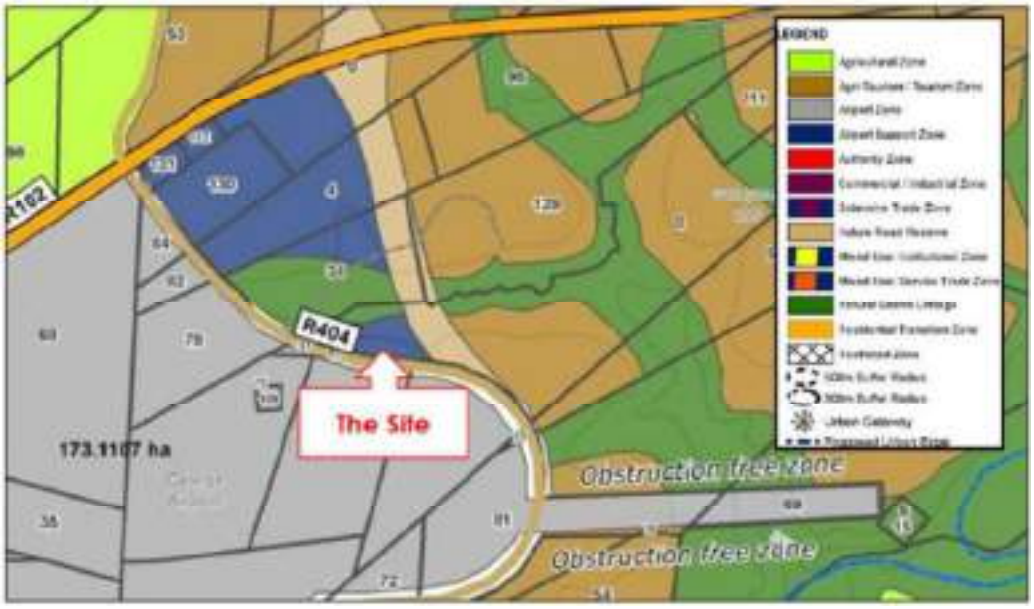
" *The objective of the GLSDF is to compile a Local Spatial Development Framework with development guidelines for the orderly utilization of land and management of land uses along the airport corridor, with due regard to the current spatial development policies and the Council's Economic Revitalization Policy."*

With specific reference to the Airport, the GLSDF emphasizes the significant role of the George Airport in the development of the Southern Cape. "*As demand for travel increases, modern economies expect and demand a range of services and facilities at these transport hubs to improve their travel experience and to support their businesses."* It also refers to the Airport as an urban gateway.

With reference to the provision of municipal services the GLSDF states **that existing services in thisarea are not adequate to support new developments.** All proposed developments must be taken into consideration in the water and sewer master planning.

The GLSDF includes for the development of the major road system. The George Western Bypass forms part of the future road masterplan. This road is planned to cross Portion110 to the east of the proposed light industrial development on Portion 110. The GLSDF proposes the development of the George Airport Support Zone in the area bounded by the R404, R102 and the Bypass. The drawing below shows the proposed site of the development on Portion 110 against the background of the proposed zonings in terms of the GLSDF. The drawing also shows the alignment of the proposed Western Bypass.

## 3. ZONING




The northern part of the Airport Support Zone, on Portions 4, 30, 31, 32 and 39, is currently being developed. These properties are jointly developed as the George Airport Business Park. The roads and civil engineering infrastructure are complete.

Portion 34 is owned by ACSA. A large part of the property is earmarked to form part of the natural scenic linkage system proposed by the Local Spatial Development Framework. The northern corner of the property is proposed for use as an airport support zone.

The drawing below show the proposed subdivision of Portion 110 within the context of the Airport Support Zone.

Following the Gwayang Local Spatial Development Framework, the western corner of Portion 110 between the R404 and the proposed Western Bypass, will be rezoned as Light Industrial Zone 1 and Private Open Space. The marked area to the eastern side of the proposed Western Bypass is proposed for utility services.

The remainder of Portion 110 to the east of the proposed Western Bypass will remain for agricultural purposes.

## 4. NATIONAL CLIMATE CHANGE RESPONSE WHITE PAPER

The National Climate Change Response White Paper is the national response to the threat of climate change. The Paper specifically refers to water scarcity. The Paper promotes medium- and long-term measures to limit the impact of climate change on the availability of water. It calls for "*Implementing best catchment and water management practices to ensure the greatest degree of water security and resource protection under changing climatic conditions and, in particular, investment in water conservation and water demand management".*

This aim of implementing best practice related to water management has to be integrated into the planning and design of engineering infrastructure.

The objectives of the Paper will be implemented in accordance with the Climate Change Bill that was signed into law by the President on 23 July 2024.

## 5. SERVICES MASTER PLAN AND IMPLEMENTATION STRATEGY

George Local Municipality (GLM) developed a scheme of master planning for roads, provision of water and sanitation for the next 40 to 50 years. This scheme is proposed to support the spatial development framework for George. Developers of new projects that are in accordance with the spatial development framework, contribute in a fair way to the development of the relevant infrastructure master plans.

The Gwayang Local Spatial Development Framework makes mention of the **limited infrastructure** available. This limitation to development must be addressed. The practical manner to address this limitation is for the Airport (ACSA), the George Airport Business Park, Portion 34 and Portion 110, to

jointly address the limited infrastructure available. Access to the Airport and the Airport Support Zone is addressed by the Airport Road Masterplan. ITS reports in a separate document on access to Portion 110.

The urban design image below shows the proposed development on Portion 110 in the right-hand corner, the future Western Bypass to the top right, the George Airport Business Park at the top and future development of the Airport at the bottom left.

The existing water and sanitation infrastructure is limited. The developers of the Business Park concluded an agreement with GLM for the development of a privately owned and operated wastewater treatment works to be developed as part of the Business Park. The Business Park supplies 80% of the water demand from either harvested rainwater or re-use of treated wastewater.

ACSA started with the planning process for the expansion of George Airport. The objective is to increase the capacity of the Airport from 900 000 passengers per annum to two million. This expansion will put further pressure on the limited infrastructure. Officials of ACSA indicated interest in finding joint solutions for the treatment of wastewater.

The practical way to address the limited water and sanitation infrastructure is to develop local infrastructure to supply in the needs of all the mentioned stakeholders. Tying the timing of the development of Portion 110 to the expansion process of the Airport, does however not make business sense to the developers of Portion 110. The timeframes for development of ACSA and that of the Developer of Portion 110, are not necessarily aligned.

The Developer however instructed ICE to consider the potential need of all the other stakeholders when preparing alternative solutions for water supply and sanitation. This report therefore proposes alternative solutions to expand limited water and sanitation infrastructure to support the needs of the complete Airport Support Zone as well as the Airport.

## 6. WATER SUPPLY

### 6.1. General

In this Chapter proposals for the provision of water is discussed.

### 6.2. Applicable guiding documents

The planning of water supply to the precinct is informed by the following documents:

- The Neighbourhood Planning and Design Guide, Section J, Water Supply.
- Guidelines for the Provision of Engineering Services in Residential Townships.
- SANS 10400-W:2011 (Edition 3) South African National Standard, Part W: Fire installation.
- George Guidelines – development contributions for water.

### 6.3. The Average Annual Daily Demand

The Average Annual Daily Demand (AADD) refers to the average annual daily water requirement by the user at the point of connection. The Neighbourhood Planning and Design Guide does not give any specific AADD for industrial land use. The George Guidelines proposes an AADD of 400 litre per 100 m² of industrial building size. It allows for a further 10% for water loss. The total demand is therefore 440 litre per 100 m².

The water demand proposed by the George Guidelines is based on national statistics of industrial developments provided by GLS Consulting Engineers (GLS). ICE discussed the expected water demand at the Airport Support Zone with GLS. The specific nature of this development is unlikely to require 400 l per 100 m² per day due to the requirement of the proposed zoning that the land use must be specifically airport related. The discussions lead to a demand of 300 l per 100 m² per day for this project. It is not proposed that this lower ratio be applied for the determination of water demand. Until this approach has been verified with GLS, the higher value of 400 l per 100 m² is accepted.

The proposed development consists of one stand with a single water connection. All internal water distribution pipes will be HDPE class 12 with welded joints. The expected water loss will therefore be minimal. The allowance for 10% reticulation loss is therefore excessive.

The total average annual daily demand for the development is calculated at 43 m³ per day as a maximum, allowing for 400 litres per 100 m² per day as well as 10% water loss, and 32 m³ per day as a minimum, if the demand is reduced to 300 litres per 100 m² per day.

### 6.4. Peak factor

The Neighbourhood Planning and Design Guide proposes a peak factor for hourly flow of 3,3 for business and industrial stands with a Total Annual Average Daily Demand (TAADD) of less than 5 000 m³ per day.

### 6.5. Provision of water for firefighting

The George Guidelines propose that the fire flow demand be treated in accordance with The Neighbourhood Planning and Design Guide. The risk classification for industrial is Moderate Risk 1.

The Planning and Design Guide proposes total fire flow of 100 litres per second, minimum flow at one hydrant of 25 litres per second, minimum pressure at fire node of 15 m and minimum pressure at the rest of the system of 5 m, for high-risk classification developments.

Due to the remote location of this development and the high water demand in case of fire, the developers plan to implement onsite fire water storage and fire water distribution infrastructure. The development will not be dependent on GLM for the supply of fire water.

### 6.6. Water supply

The Annual Water Services Development Plan Performance- and Water Services Audit Report of October 2023, highlights the fact that the water requirement of the George / Wilderness distribution system will exceed the sustainable yield from the various resources between 2028 and 2032 depending on the growth rate of George. Future planning for water supply must therefore aim to limit further demands on resources.

In response to the constrained water resources, water supply for the development of Portion 110 will be from 3 sources, supplied through 3 separate supply pipe systems. The table below shows the makeup of the water supply.

| **Water supply for Portion 110** | | |
|---|---|---|
| **Source** | **Ratio of total demand** | **Average daily supply for source (max) in $m^3$** |
| Municipal supply | 20% | 9 |
| Harvested rainwater | 30% | 13 |
| Recirculated treated and disinfected wastewater | 50% | 21 |

The Airport expansion may also make use of alternative water sources resulting from the limited municipal capacity. The Airport may have ample harvested rainwater available from extended roof areas and large airside aircraft parking and circulation areas. The Airport may also utilize treated and disinfected wastewater for flushing toilets and urinals. This makes up a significant portion of the water demand of an airport.

The developers of the George Airport Business Park are implementing a similar water supply strategy in accordance with their Services Agreement with GLM.

### 6.6.1. Preliminary network layout

The George Guideline proposes that the network design be based on the fire flow plus 2 times the AADD. The Guideline proposes maximum allowed flow velocity of 1,8 m/s, but an absolute maximum of 2,2 m/s. Because extensive on-site firefighting infrastructure will be constructed as part of the development of the first buildings on Portion 110, no fire flow from the municipal supply is required. Fire flow will be from onsite storage and pumps. The storage tanks will be filled with municipal water.

### 6.6.2. Municipal supply

The Developer of Portion 110 is in discussions with the Property Owners Association (POA) of the George Airport Business Park, to become a member of the POA. In this case a municipal water supply main to serve Portion 110 will be installed to join the existing POA internal system downstream of the POA bulk municipal meter. The alignment of the supply main will be subject to the development of Portion 34. The drawings attached in Annexure A show the proposed alignment. The final alignment is subject to an agreement with ACSA, the owner of Portion 34.

An alternative to this is that a separate direct bulk connection be constructed to supply municipal water directly from the municipal bulk supply line on the western side of the R404. Due to the limit demand this connection to the GLM pipeline will be simple. This alternative is preferred.

The size of the water main will be in all cases 110 mm dia. class 12 HDPE pipe with welded joints, to minimize water losses. The flow velocities and friction losses are in all cases lower than the limits proposed by GLM.

### 6.6.3. Harvested rainwater supply

Harvested rainwater supply will be from the reservoir on Portion 110 that will be constructed for the storage of harvested water from roofs. This storage reservoir will be constructed on the utility stand on Portion 110 east. Drawings attached in Annexure A show the alignment of the water mains.

Reservoirs for the harvested water will be covered to limit evaporation.

### 6.6.4. Treated wastewater supply

Treated wastewater will be recirculated from the location of the wastewater treatment facility. This will be either on Portion 110 east or on Portion 4 east. The drawings show alternative treatment facilities with the pipes leading to the light industrial portion.

### 6.7. Development contributions

The policy of the George Local Municipality is that developers must contribute to the provision and development of bulk master plan for services. The George Guideline document stipulates the estimation of these contributions. The table below shows the calculation of development contributions for water and sanitation. The total amount for water is **R 311 313,18 excluding VAT.**

| Development charges | | | | |
|---|---|---|---|---|
| **Service** | **Units** | **Additional demand** | **Unit cost** | **Amount excluding VAT** |
| Water | kl/day | 9 | R 36 320,84 | R 311 313,18 |

*Table showing the calculation of development contributions for water and sanitation*

## 7. SANITATION

### 7.1. General

This Chapter discusses the provision of sanitation for the proposed development on Portion 110.

### 7.2. Applicable guiding documents

The planning of the wastewater draining system for subdivision and rezoning of Portion 110 is informed by the following documents:

- Guidelines – Development Contributions for Sewer (George Guidelines).
  As in the case of water, the guidelines explain the methodology related to the calculation of Development Contributions. The development contributions are based on the expected cost of external infrastructure required to serve George Municipal area for the next 40 to 50 years. A sewer masterplan was developed by GLS Consulting Engineers to guide the development of the infrastructure required to serve future sanitation requirements over the next 40 to 50 years.
- The Neighbourhood Planning and Design Guide, Section K, Sanitation.

### 7.3. Existing and proposed bulk infrastructure

The relevant existing and proposed bulk municipal sewer infrastructure (master plan) is indicated on extracts from a GLS drawing as shown below. The first extract is at a small scale to show existing and proposed pipe systems that transport wastewater from the Airport (Airport PS 1) to the Gwaiing WWTW.

Currently, wastewater from the Airport drains towards the Airport Pump Station (Airport PS 1). From there wastewater is pumped towards the R102 and all along the R102 to the Gwaiing WWTW. The length of this pipe is approximately 5 km. This pipe will have to be deviated partially to accommodate the Western Bypass. GLS confirmed that the capacity of the existing pump station is 20 l per second of which 8 l per second is allocated to the George Airport Business Park.

GLS's planning proposes the rerouting of wastewater from the Airport and the Airport Support Zone to the Gwaiing WWTW. It proposes wastewater to gravitate from the Airport all the way along a tributary of the Gwayang River, to Groeneweide Ext. PS F2. This proposed pipe will cross the gorge of the Gwayang River from west to east. At the Groeneweide Ext PS F2 the proposed main joins an existing rising (pump) main all the way to the Gwaiiang WWTW. This main currently serves the Herolds Bay area. The GLS planning proposes the upgrading of the existing rising main between Groeneweide Ext PS F2 and the Gwaiing WWTW.


The diagram below is at a larger scale and only shows the section between the Airport PS 1 and the Groeneweide Ext PS F2.

The Property Owners Association (POA) of the George Airport Business Park, however, opted to develop its own wastewater treatment works onthe eastern side of the proposed Western Bypass where 390 m³ has to be treated daily. This enables the Business Park to recycle treatedwastewater to supply in 50% of its water demand.

Likewise, the Developer of Portion 110 prefers to treat wastewater locally to have treated wastewater available to supply in the non-potable part of the water demand.

**7.4. Peak day dry weather sewage flow**

The peak day dry weather flow (PDDWF) is estimated as a ratio of the AADD for water. In the case of industrial and business zonings the ratio stipulated by the George Guideline is 80%. The AADD for water is 43 m³ as indicated in the table above. The peak day dry weather sewage flow is therefore 34 m³.

Sizing the sewer reticulation is based on the peak hourly flow. A peak day factor is therefore applied to the PDDWF. The George Guideline proposes the use of an Instantaneous Peak Dry Weather Flow (IPDWF). Pipes are then sized to cope with the instantaneous flow when running 70% full. The remaining 30% of the pipe cross section is allowed for stormwater ingress. The George Guideline however do not specify the ratio between peak day dry weather flow and the instantaneous peak dry weather flow. The Neighbourhood Planning and Design Guide, however, addresses this matter. It proposes a peak factor of between 2.5 and 4 for light industrial land uses. In this case a conservative peak factor of 4 is allowed for.

**7.5. Wastewater treatment options**

There are three options available for the treatment of wastewater from the proposed light industrial portion of Portion 110. The estimated volume of wastewater flowing from Portion 110 is 80% of the water demand or 34 m³ per day. The estimated wastewater flow from the George Airport, when expanded to cope with 2 million passengers per annum, is 123 m³ per day. This is based on sewage flow of 20 litres per passenger as proposed by the Neighbourhood Planning and Design Guide, Section K, Sanitation.

- **Treatment at Gwaiing WWTW**

The first option is to pump wastewater to the existing Airport Pump Station PS 1 and from there along the existing rising main that runs along the R102 to the Gwaiing WWTW. This rising main is planned to be replaced with a new gravity pipe that drains towards Groeneweide Ext PS F2 resulting from capacity limitations of the existing rising main as well as the realignment resulting from the proposed Western Bypass.

The Gwaiing WWTW is currently operating over its capacity and the GLM plans for the upgrading thereof.

The obvious benefit of treatment at the existing WWTW is that wastewater is treated by GLM at a central position. A significant disbenefit is that the treated wastewater will have to be pumped backover approximately 5 km to be available for secondary use.

A further disbenefit is that a new gravity main proposed by the master plan, must be constructed over 1,7 km to Groeneweide Ext PS F2. This route passes through the aquatic buffer area of the Gwayang River and its tributary. It also requires the pipe to cross the Gwayang River.

- **Treatment at the George Airport Business Park approved WWTW**

The second option is to pump the wastewater from Portion 110 to the approved WWTW on Portion 4 east of the proposed Western Bypass. This may consolidate the treatment of wastewater from Portion 110 and the George Airport Business Park in one position. Treated wastewater will be readily available to be recycled for secondary use and to supply 50% of the water demand. This option is subject to the developer of Portion 110 reaching an agreement with the POA of the George Airport Business Park.

The rising main from Portion 110 to Portion 4 East will cross Portion 34. The preferred alignment of this rising main is along the internal road system of Portion 34. The alternative to this is to align the rising main to follow the road reserve boundary of the R404 up to the southern boundary of the George Airport Business Park. From there it follows the southern boundary all the way to Portion 4 East. The attached drawings show the two alignments. Treated wastewater returning to Portion 110 for secondary use will follow one of the two mentioned alignments. The alignment that follows the internal road system of Portion 34 will not require a further crossing of the tributary of the Gwayang River since it will cross the tributary at the location of the existing culvert. The alignment that follows the road reserve boundary of the R404 will require both the rising main with wastewater as well as the rising main with return treated wastewater to cross the tributary.

ICE investigated the potential for the expansion of the WWTW on Portion 4 east to cope with the demand of Portion 110 as well as that of the Airport. There is adequate space available on Portion 4 to the east of the future bypass. Treated wastewater is also available to supply in the non-potable part of the water demand of the Airport.

- **Treating on Portion 110 east of the Western Bypass**

The area on the eastern part of Portion 110, proposed for utility zone, is available to treat wastewater from the Light Industrial Area to be developed on Portion 110. This area is large enough to accommodate an engineered wetland that can treat wastewater from Portion 110 (34 $m^3$), the George Airport Business Park (390 $m^3$) as well as the Airport, including the expanded Airport that will accommodate 2 million passengers per annum (123 $m^3$).

This location is at the lower end of the Airport Support Zone. All wastewaters can be transported from its source along gravity sewers to the WWTW. No sewer pump stations will be required. It also obviates the needfor the existing Airport PS 1. The pump station can be put out of service. The alternative alignment of a pipe to transport sewage from the Airport Business Park to Portion 110 East, is a rising main that follows the southern boundary of the Airport Business Park all the way to the boundary of the R404. From there it will gravitate in a pipe along the R404 road reserve boundary up to the wastewater treatment works on Portion 110 East. A return main with treated wastewater to the Business Park will then follow the same alignment.

The layout of the utility area is indicated on the drawings attached in Annexure A. A Phragmifiltre engineered wetland system is proposed to treat wastewater. Wetlands are planted with phragmites australis reeds. Water circulating through wetlands remains below the surface of wetland media.

This option is preferred. The treatment wetland system can either be developed to treat wastewater from Portion110 only, wastewater from Portion 110 and the George Airport Business Park and thirdly to treat all water from the Airport with that of Portion 110 and the George Airport Business Park.

### 7.6. Preliminary network design

The instantaneous peak dry weather flow is calculated by applying a peak factor of 4 as discussed above. Flow rates in all pipes at 70% of flow depth, are low enough to be accommodated in a 110 mm dia pipe. For ease of maintenance all pipes are sized at 160 mm diameter.

### 7.7. Development contributions

Because the preferred treatment option is for local treatment, the development of Portion 110 willnot impact on the George sewer master planning, no development contributions will be payable.

## 8. HARVESTED RAINWATER

### 8.1. Safe yield from harvested rainwater

Harvested rainwater can be utilized to provide in the water demand. It is proposed that 30% of the water demand comes from harvested water. Safe yield of water from roofs is only possible if water is stored in a dam with adequate capacity and if water from the dam is released in a systematic and planned manner.

The water demand of the proposed development on Portion 110 will be partly supplied with harvested rainwater. This water is harvested from roofs only. The Neighbourhood Planning and Design Guide, Section K, Sanitation proposes that the runoff factor from roofs can be taken as 85% of the rainfall.

Rainfall data for the past 10 years was obtained to analyze the safe yield of the catchment area and the storage required. The graph below shows the outcome of the analysis. The graph confirms that it is safe to supply 30% of the demand from harvested rainwater.

The safe yield of roofs depends on the size of the storage dam and the rainfall data. The analysis confirms that a 900 $m^3$ dam is required to support a safe yield of 30% of the water demand. This is based on the higher demand of 400 litres per 100 $m^2$ per day.

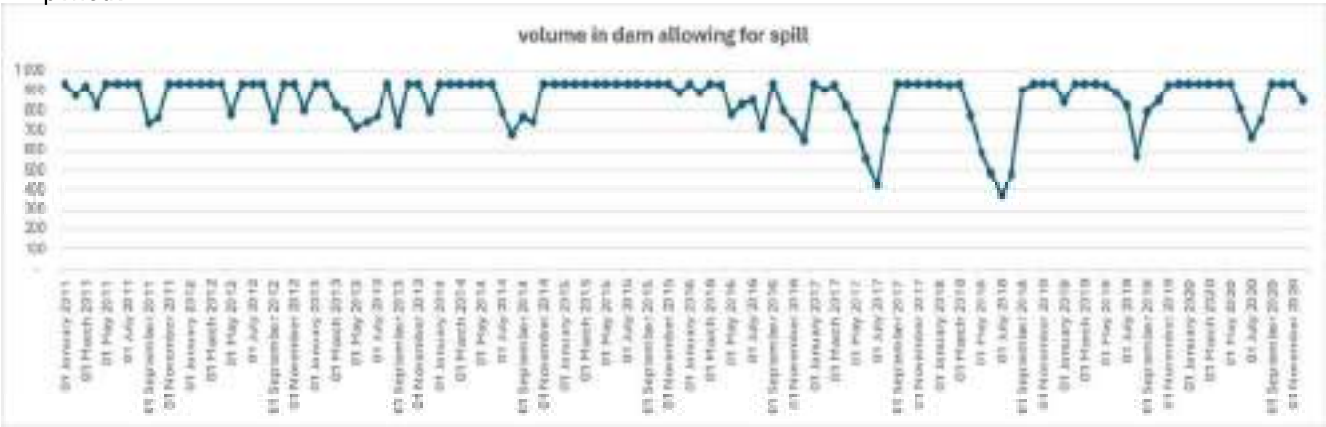
The same calculation was done based on the rainfall statistics for the past 40 years. The outcome was the same.

Further analysis based on the lower demand of 300 l per 100 $m^2$ per day and reduced water losses, show that the safe yield may increase to supply in 50% of the demand if the demand is lower and losses are less. This may in future lead to lower dependency on municipal supply, depending on actual measured consumption.

Due to the significant cost of municipal supply, it is in the interest of the Developer to limit municipal

supply. The long-term objective is to rely exclusively on harvested water and recirculated treated wastewater. All indications are that it is possible but at this stage a cautious approach is preferred.

Municipal water supply is relatively expensive compared to harvesting and releasing rainwater. For this reason, it is essential to control the release of harvested water to ensure availability during dry periods.




Rainwater harvesting reticulation must cope with peak flows during rainfall events. It is therefore optimal to gravitate harvested water into the storage dam to prevent pumping of harvested rainwater to the reservoir during rainfall events.

The supply of water for the George Airport Business Park is done in a similar manner. Harvested water must however be pumped to the eastern part of Portion 4 on the eastern side of the Western Bypass.

### 8.2 Harvested water storage reservoir

The reservoir for the harvested rainwater must be in an appropriate location. Ideally, harvested rainwater must gravitate via a dedicated pipe system to the storage dam to prevent pumping of rainwater. Rainfall must be harvested also during higher intensity storms that yield high peak flow volumes.

The proposed location of the storage facility for Portion 110 is at the Utility Zone on Portion 110 east of the Western Bypass. In this located, the dam size can be increase to cope with the storage requirements ofthe George Airport Business Park. The approved location of the storage dam for the Business Park is on the eastern side of Portion 4. Harvested rainwater must be pumped to that location. The developers of the Business Park may consider the possibility of relocating the storage facility from the eastern part of Portion 4 to the eastern part of Portion 110.

The drawing titled Utility Stand Layout shows the layout of the harvested water storage reservoir and the engineered wetland WWTW on the proposed utility stand. The reservoir is sized to store water for the development on Portion 110 as well as the George Airport Business Park. The storage capacity required to provide a safe yield for both Portion 110 and the Business Park is calculated at 11 000 $m^3$.

The Phragmifiltre engineered wetland system is sized to cope with the load of the development on Portion 110, the George Airport Business Park as well as the George Airport.

## 9. SUMMARY: WATER SUPPLY AND SANITATION

It is clear from the previous chapters on water supply and sanitation that these two services, as well as harvesting rainwater runoff, are inter-dependent. This results from the objective to supply 30% of the water demand through harvesting and storing rainwater and 50% through treated and disinfected wastewater to be recirculated.

- **Wastewater treatment**

The preferred option is to treat wastewater from the Airport, the Business Park as well as Portion 110 at the Utility Area. Drainage of wastewater from source to the Utility Area can happen without the need to pump. The owners of the Business Park will, however, not take part in this scheme if their project is delayed by this proposal. The advantages are compelling.

ACSA showed interest in this scheme. There is, however, no commitment or any formal communication from them in this regard. This solution also requires approval from ACSA for the proposed alignment of gravity sewer pipes across Portion 34.
Even in the case where both the parties mentioned prefer not to participate in this scheme, it is the preferred option for the developer of Portion 110.

A major benefit of this scheme is that there will be no need for the realignment and upgrading of the Municipal infrastructure leading to the Gwaiing WWTW as well as the required upgrading of the WWTW.

Recycled and disinfected treated wastewater can be distributed to the Airport, the Business Park and to the Light Industrial Area to be developed on Portion 110. The route of the drainage pipes can be used for this purpose.

- **Harvested water storage**

The preferred location for the storage of harvested rainwater is at the Utility Area. This frees up space in the Light Industrial Area for the development of airport support buildings. The location is at the lower end of the Airport Support Area. This makes it possible to drain harvested water through a gravity drainage system from all building roofs to a central storage dam. It obviates the need to pump harvested rainwater water.
The size of the Utility zone is based on accommodating a dam with adequate storage capacity to store water for the Business Park as well as the Light Industrial Area on Portion 110.

Storing harvested water from the Business Park at this location is subject to the approval of the Property Owners Association of the Business Park. The advantages of not having to pump harvested water during rainstorms are compelling.

- **Water supply**

Water supply is from three sources: municipal supply for 20% and the remaining from harvested water and treated wastewater as mentioned above.

The preferred route for the supply of municipal water is through a direct connection to the municipal main that runs along the southern side of the R404.

Treated and disinfected wastewater will be pumped from the Utility Area to the Light Industrial Area.

## 10. STORMWATER MANAGEMENT PLAN

### 10.1 General

This Chapter discusses the proposed stormwater master plan for the proposed development of Portion 110 of the Farm Gwayang 208.

### 10.2 National Climate Change Response White Paper

The White Paper proposes: "*Implementing best catchment and water management practices to ensure the greatest degree of water security and resource protection under changing climatic conditions and, in particular, investment in water conservation and water demand management".* This compels designers to investigate international best practice and to apply it within the South African context. It therefore impacts on the design philosophy of the stormwater master plan for Portion 110.

### 10.3 Existing Drainage System

The drawing below shows the general arrangement of the catchment area surrounding the areas of Portion 110 to be developed.

The part of Portion 110 that will be developed for light industrial purposes, drains to the north into a tributary of the Gwayang River. The tributary is indicated in light blue on the drawing below. It drains into an existing dam as shown in the drawing below.

The drainage system of the R404 drains a portion of the Airport. Three areas located to the south of the R404 are demarcated in light blue on the drawing below. The R404 profile shows a high point at the point where the common boundary line of Areas A and B meets the R404. The road slopes to the west from that point towards the quarry and to the south east towards Culvert 3.

There are existing culverts passing underneath the R404 as indicated on the drawing below. Area marked C drains through Culvert 1 to the west of the Light Industrial Area. From that point the existing topography channels the water to pass to the west of the Light Industrial Area. This runoff must be accommodated in the drainage system of the proposed access road to the Light Industrial Zone. A culvert will be provided for this purpose. Downstream of the culvert, erosion protection will be required.

Runoff from Area A passes underneath the R404 at Culvert 2. From that position it drains via the internal drainage system of the Light Industrial Area and eventually to the tributary.

Area B drains to the southwest along the drainage system of the R404 into Culvert 3. This runoff does not impact on the proposed Light Industrial Area or the Utility Area.


*General arrangement of current drainage system*

The area proposed for the Utility Zone receives runoff from the south up to the R404, marked as Area D.

The table below shows the calculated runoff from the mentioned areas.

| area | size in $m^2$ | size in ha | runoff factor | 1 in 5 year event intensity in mm per hour | 1 in 5 year event runoff in $m^3$/ sec | 1 in 50 year event intensity in mm per hour | 1 in 50 year event runoff in $m^3$/ sec |
|---|---|---|---|---|---|---|---|
| Area C | 92 900 | 9,29 | 0,53 | 50 | 0,68 | 100 | 1,37 |
| Area A | 28 000 | 2,80 | 0,53 | 50 | 0,21 | 100 | 0,41 |
| Area B | 21 400 | 2,14 | 0,53 | 50 | 0,16 | 100 | 0,32 |
| Area D | 39 000 | 3,90 | 0,53 | 50 | 0,29 | 100 | 0,57 |

*Runoff from Areas A to D*

The runoff is limited due to small catchment areas. The runoff of these areas will not be affected by the development proposed on Portion 110.

The topographical survey contour map shows the fall of the land. It also provides detail of erosion in the tributary of the Gwayang River. The survey is shown on the attached drawings. The photo below shows the erosion. The cause of erosion can be attributed to increased rainwater runoff resulting from the development of impervious surfaces at the Airport as well as alien plant infestation of the river and the buffer areas of the river.

The gradient of the river along this section up to the dam varies between 2 and 3%. The estimated flow velocity at the bottom of the eroded riverbed is well above the limits to prevent erosion.

### 10.4 Design guidelines and rainfall data source

The planning and design of the stormwater master plan is guided by the following documents:

- The Neighbourhood Planning and design Guide, Section L, Stormwater.
- Drainage Manual of the National Road Agency Limited.

The *Drainage Manual* provides detail on storm events. A further source of rainfall data is a document titled *Design Rainfall and Flood Estimation in South Africa* by JC Smithers and RE Schulze. The latter document was used in the design of the stormwater system.

The Neighbourhood Planning and Design Guide proposes that stormwater designs accommodate minor as well as major storms. The objectives of the minor and the major systems differ. The minor incident design objective is associated with convenience whereas the objective of the major storm design is protection of property and life. The Guide proposes a minor storm design flood recurrence interval of 5 years for industrial and business zoning. Likewise, a recurrence interval of 100 year is proposed for major storms.

*Design Rainfall and Flood Estimation in South Africa* was used to select appropriate rainstorm intensities for different storm durations. This was verified with data from the Drainage Manual. The following results are applicable:

- 15 minute storm duration based on *Design Rainfall and Flood Estimation in South Africa:*
    - 1 in 5 year storm recurrence interval – 50 mm per hour;
    - 1 in 100 year storm recurrence interval – 100 mm per hour.
- 15 minute storm duration based on data obtained from the Drainage Manual:
    - 1 in 5 year storm recurrence interval – 44 mm per hour;
    - 1 in 100 year storm recurrence interval – 80 mm per hour.

For the purpose of the design of the minor and major systems the higher values of the *Design Rainfall and Flood Estimation in South Africa* are used.

The *National Climate Change Response White Paper* is a high-level response document that guides development in South Africa. It proposes that best practice be applied in the search of more sustainable systems with specific reference to water quality. Water as a resource must be protected. *The Neighbourhood Planning and Design Guide* is aligned with this approach. This document states the key objectives of a stormwater management system as follows:

- Minimize the threat of flooding to the area.
- Protect the receiving water bodies in the area.
- Preserve biodiversity in the area.
- Promote the multi-functional use of stormwater management systems.
- Promote the use of the stormwater itself as a water resource.
- Develop sustainable stormwater systems.

The document furthermore promotes water sensitive urban design. This is an approach to urban water management with the aim to manage the urban water cycle in a sustainable manner. The document promotes water harvesting and secondary use of treated wastewater.

### 10.5 Impact of urbanization of runoff hydrograph

There are two critical consequences that result from urbanization with specific reference to the runoff hydrograph. These are:

- The runoff characteristics of the catchment area changes. This is due to surfaces becoming less pervious due to roofs and surfacing of parking and circulation areas as well as roads. In the case of the light industrial development on Portion 110 the ratio of runoff increases from pre-development of approximately 53 % to post development of approximately 75%.
- The second impact is that the hydrological response time reduces due to quicker runoff of the catchment area. This results in the reduction in the critical storm duration which in return increases the design storm intensity.

The combined impact of these two impacts can be seen on the diagram below. It shows how the peak flow increases significantly from pre-development levels to post-development levels.

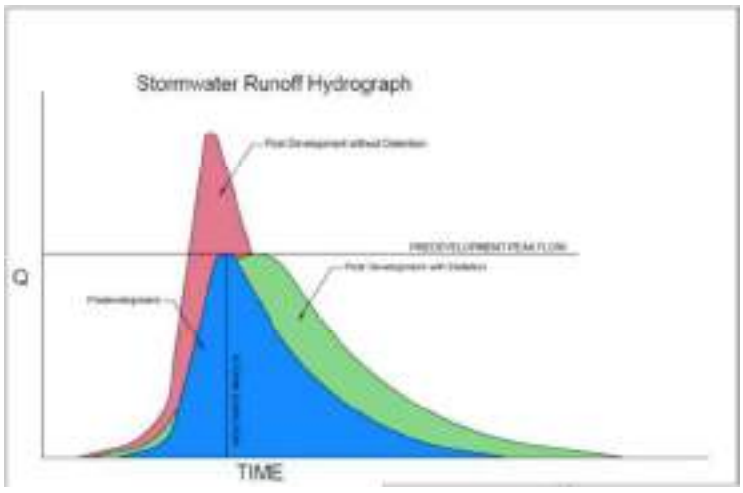



*Diagram showing the impact of development on the runoff hydrograph of a catchment*

The increased peak flows result in flooding of downstream areas with potential damage to property and risk of loss of life in extreme cases. The stability and biodiversity of the receiving water bodies are also at risk.

To meet the objectives of the stormwater master plan as stated above, the impacts of urbanization must be mitigated. A common way to cope with this is the introduction of detention structures.

### 10.6 Rainfall patterns

The graph below shows the rainfall distribution in George. The total annual average rainfall is approximately 660 mm. The rainfall statistics show that George receives rain throughout the year.


### 10.7 International best practices

A literature study of international best practice resulted in an understanding of feasible alternatives to conventional urban drainage systems. Conventional systems refer to the conveyance of runoff on road surfaces and then into a subsurface culvert system, also referred to as the curb-and-gutter system.

The utilization of stormwater detention structures to mitigate the impact of urbanisation on stormwater runoff have been implemented in South Africa over the past 40 to 50 years, with great success. Detention dams mitigate the runoff volume increase but have a limited impact on the quality of runoff. The photo below shows the difference between typical stormwater runoff on the left and clean stormwater runoff. The literature study drew attention to tested stormwater management measures to protect the quality of runoff.

Turbid and Clean Storm Water

Turbidity is complex and expensive to remove from runoff. Turbidity should therefore be prevented from accumulating in runoff from the point of source – where rainwater falls on the surface.

The literature study showed how bio-swales are commonly being used to transport water from point of source. The photos below are examples of bio-swales implemented as best practice measures of stormwater management.

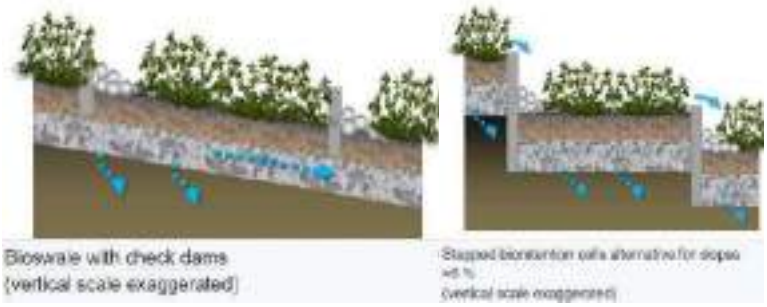
*Examples of swales in City of Duluth and Wisconsin USA*

Bio-swales were also implemented sucsessfully at the George Airport Business Park.

*Bio-swales at George Airport Business Park*

Research in the USA showed that*: "The regular maintenance costs for swales can be higher than a traditional curb-and-gutter system. However, the greater environmental benefits, lower initial capital costs, and positive aesthetic components of grass swales, make them an attractive alternative. (Elsevier Journal of Environmental Management)."* All these benefits are experienced at the George Airport Business Park. Since flow velocities are lower in bio-swales, it also mitigates the increase in the peak runoff.

The research on best practice worldwide reveals practical measures to mitigate any possible impacts that the swales could have. The drawings below show measures to mitigate the risk of erosion in swales through energy dissipation structures where roads have steep grades.




To limit flow velocity in swales the following measures are proposed in the literature. Check dams in swales limit flow velocity and can be used for flood attenuation.

*Lake Superior Duluth Streams*

Research by the University of Maryland, Department of Civil and Environmental Engineering shows that grass swales significantly reduce pollutant mass and mean concentrations for several of the water quality constituents considered, including TSS and the metals lead, copper, zinc, and cadmium.

Grass swales in combination with flow velocity control structures such as check dams will be used upstream of disposal structures where runoff is discharged into nature.

### 10.8 Proposed drainage system

The proposed drainage system consists of culverts, bio-swales and distribution weirs.

**Distribution weirs**

Check dams as shown in the photo above, are proposed to distribute concentrated water at the outlet of the culvert passing underneath the proposed access road to the development. Refer to drawing attached. The width of the distribution is adequate to limit flow velocities downstream of the check dam to lower than 2 m/s. The permissible maximum velocity for grass surfacing under these conditions is 2.5 m/s.

Water passing through Culvert 2 is accommodated in a bio-swale along the eastern boundary of the Light Industrial Area. Velocities in the bio-swale are kept below 2 m/s to prevent erosion. Check dams are also proposed at the outlet of the bio-swale on the eastern side of the industrial development.

Berms and bio-swales are proposed to cut off stormwater runoff from areas upstream of the proposed wetland and harvested rainwater storage dam. The attached drawing shows how the swale discharges into a check dam acting as a weir. This functions in a similar manner as mentioned above.

**Building drainage**

Rainwater will be harvested from all roofs. This drainage system will consist of an underground pipe system. This runoff will be routed to a harvested rainwater dam for re-use. This dam will provide the required peak flow mitigation to counter the impact of increased impermeable surfaces. The dam will be provided with an overflow outlet structure. The outlet will discharge onto the weir structure.

**Drainage of parking and circulation areas**

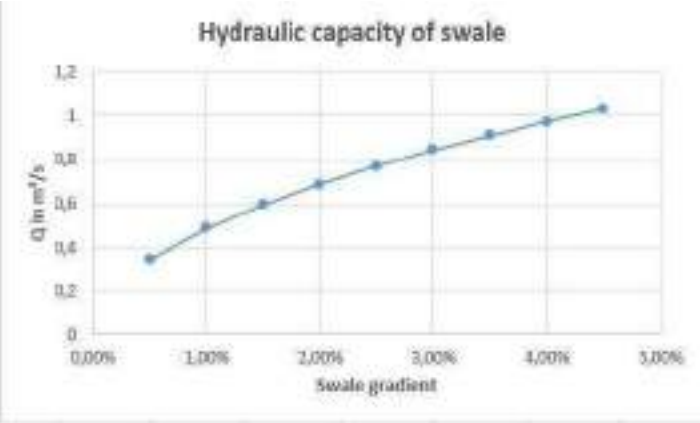
Bio-swales will be used to transport runoff from parking and circulation areas on the site of the Light Industrial Area. Pollutants in runoff will be treated at source through the implementation of on-site swales to drain into a debris trap before discharging into bio-swales that leads up to the tributary of the Gwayang River.

Swales to be vegetated with appropriate indigenous plants to promote trapping of contaminants. Flow velocities to be retained at levels that will prevent turbidity in runoff.

Approximately 50% of runoff from the Light Industrial Area is intercepted by the harvesting system. This allows adequate detention even in cases where the storage dam is full.

The development of the Utility Area will reduce the peak runoff due to the structure of wetlands and the storage dam proposed.

The final detail of the drainage of the Western Bypass is currently not available. It is however not expected that the drainage of the Western Bypass will have a significant impact on the drainage of Portion 110.




One must obviously consider the velocity of water in swales. If the swales are too steep, scouring will occur and if too flat, water will pond and the risk of damage to the road pavement could be significant. Scouring can be mitigated by using appropriate vegetation with root systems that cope with higher velocities and with plant structure that limits the velocity of the flow of water. This will be developed in cooperation with a horticulturist. In general, flow velocities will be kept to less than 2m/s.

Flow velocities more than 2 m/s may occur in cases where grades are steeper than 2% and under full flow conditions.

**Protection of tributary of the Gwayang River**

Protection of the tributary of the Gwayang River is the responsibility of the Airport, the Airport Business Park and the proposed development on Portion 110. The Stormwater Management Plan for Portion 110 provides for adequate measures to limit runoff to predevelopment volumes. The area downstream of the proposed Light Industrial Area will be developed as a private open space. Alien vegetation will be removed from this area. This will serve to limit further erosion of the tributary. The ultimate solution for erosion is, however, the joint responsibility of the Airport and the other adjacent landowners.

## 11. SUMMARY

The owner of Portion 110 of the Farm Gwayang 208, propose the development of the land in accordance with the guidance of the Gwayang Local Spatial Development Framework. The proposed zoning is Industrial Zone 1. A portion of Portion 110 to the east of the alignment of the proposed Western Bypass is proposed for the accommodation of a wastewater treatment works and a harvested rainwater storage dam.

The development is guided by the National Climate Change Response White Paper. It impacts specifically on the stormwater management plan. Innovative measures are proposed to enhance the quality of rainwater runoff through the introduction of bio-swales for the conveyance of stormwater from the point of source.

The conservative estimation of water consumption is 43 m³ per day. This water demand will be supplied through 20% from the GLM, 30% from harvested and stored rainwater and 50% from treated and disinfected wastewater. The municipal supply can be either via the internal pipe system of the George Airport Business Park or via a direct connection to the GLM bulk supply main.

Adequate water storage facilities and a pumpstation will be developed on Portion 110 for the purpose of firefighting. Water supply to the reservoirs will be from municipal supply.

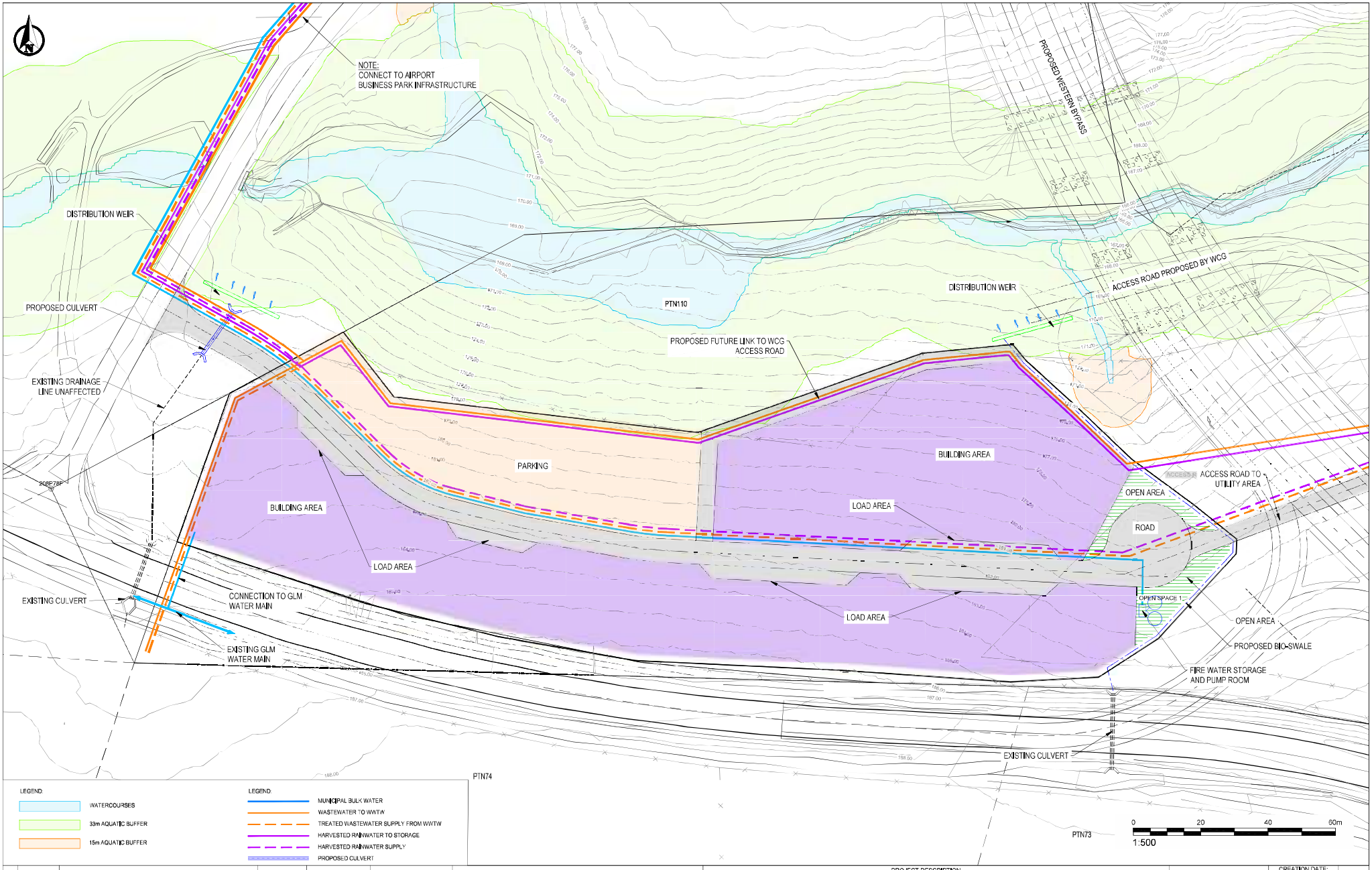
Treatment of wastewater can be at the Gwaiing WWTW or a local engineered wetland wastewater system located on Portion 4 east. As alternative the local WWTW can be located on the Utility Area to be developed on Portion 110. The preferred location is on the Utility Area on Portion 110 east of the Western Bypass. At this location the wastewater from the Business Park as well as the Airport can also be treated. The Utility Area is downstream of the Airport, the Business Park and the Light Industrial Area. Therefore, no pumping of wastewater will be required.

The preferred storing location of harvested water is at the Utility Area. This location is also ideal to store harvested water from the Business Park since harvested water can be transported to this location via a gravity pipe system.

Stormwater runoff intensity will increase due to the development of the Light Industrial Area. This will be mitigated by routing harvested water to water storage dams. Turbidity in runoff will be limited through the implementation of international best practice using bio-swales and check dams.

To implement the preferred infrastructure the cooperation of the POA of the Business Park and ACSA will be required. Both parties showed interest in cooperating. Erosion along the tributary of the Gwayang River must be prevented through a combined effort by all landowners with properties draining towards the tributary.

**ANNEXURE A**




| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| A | 05/04/2025 | ISSUED FOR INFORMATION | PCJ |

AMENDMENTS

| | |
|---|---|
| DESIGNED BY | P.G. JOUBERT |
| CHECKED BY | P.G. JOUBERT |
| DRAWN BY | I. GOUWS |
| CHECKED BY | P.G. JOUBERT |


INFRASTRUCTURE CONSULTING ENGINEERS

PO BOX 188
PERSEQUOR PARK
0020
Tel (012) 349-2022/3/4/5


PROJECT DESCRIPTION

REZONING AND SUBDIVISION OF PORTION 110
OF THE FARM GWAYANG NO 208, DIVISION GEORGE

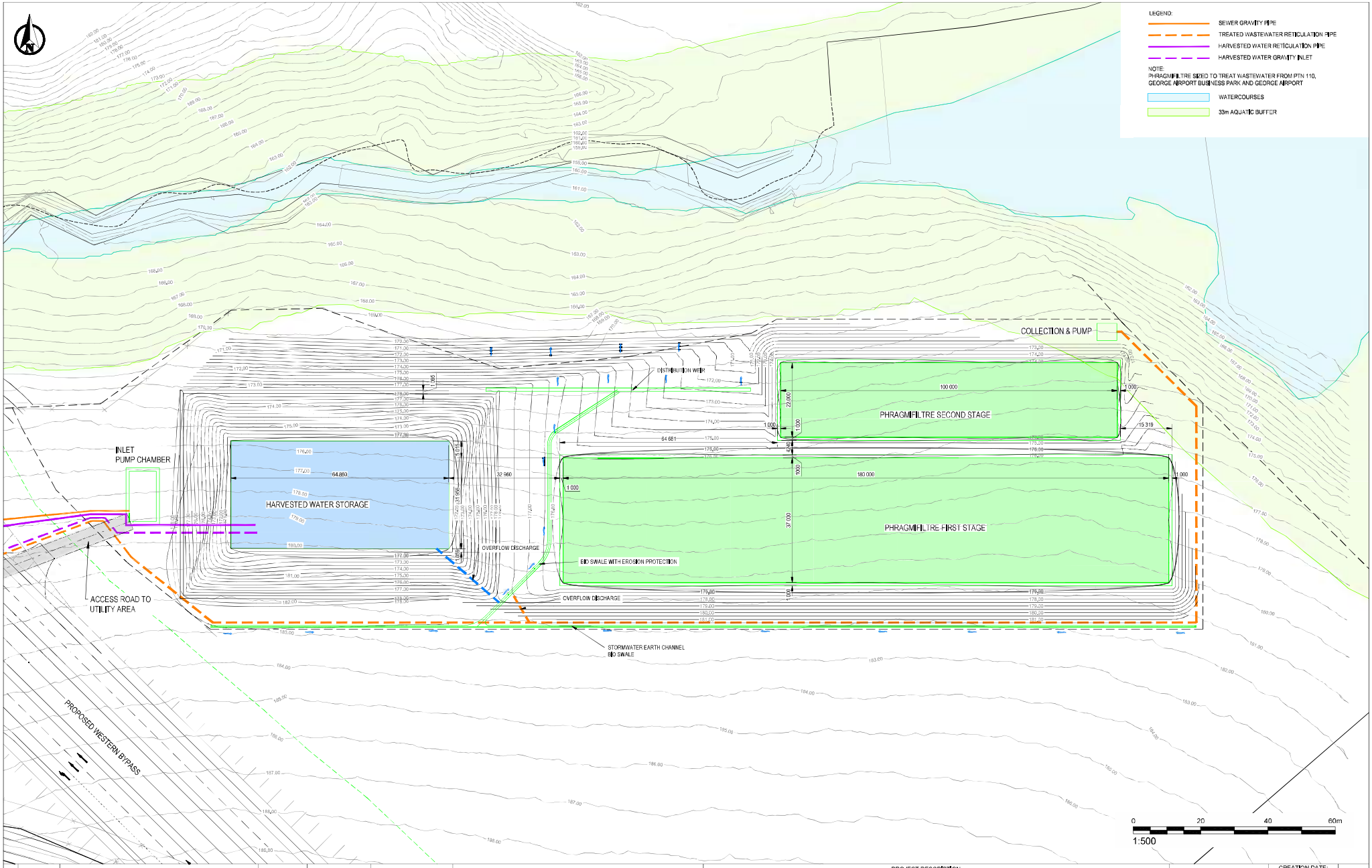
PLAN DESCRIPTION

PTN110 - LIGHT INDUSTRIAL (AIRPORT SUPPORT ZONE)
LAYOUT

APPROVED

DATE

| | |
|---|---|
| CREATION DATE: 12/07/2024 | A1 |
| SCALE 1:500 | REVISION A |
| SHEET | 1 OF 1 |
| PLAN NO. | GASZ-SC1-010-003 |




| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| A | 05/03/2025 | ISSUED FOR INFORMATION | PGJ |

AMENDMENTS

| | |
|---|---|
| DESIGNED BY | P.G. JOUBERT |
| CHECKED BY | P.G. JOUBERT |
| DRAWN BY | I. GOUWS |
| CHECKED BY | P.G. JOUBERT |


INFRASTRUCTURE CONSULTING ENGINEERS
PO BOX 186
PERSEQUOR PARK
0020
Tel (012) 349-2022/3/4/5


PROJECT DESCRIPTION

REZONING AND SUBDIVISION OF PORTION 110 OF THE FARM GWAYANG NO 208, DIVISION GEORGE

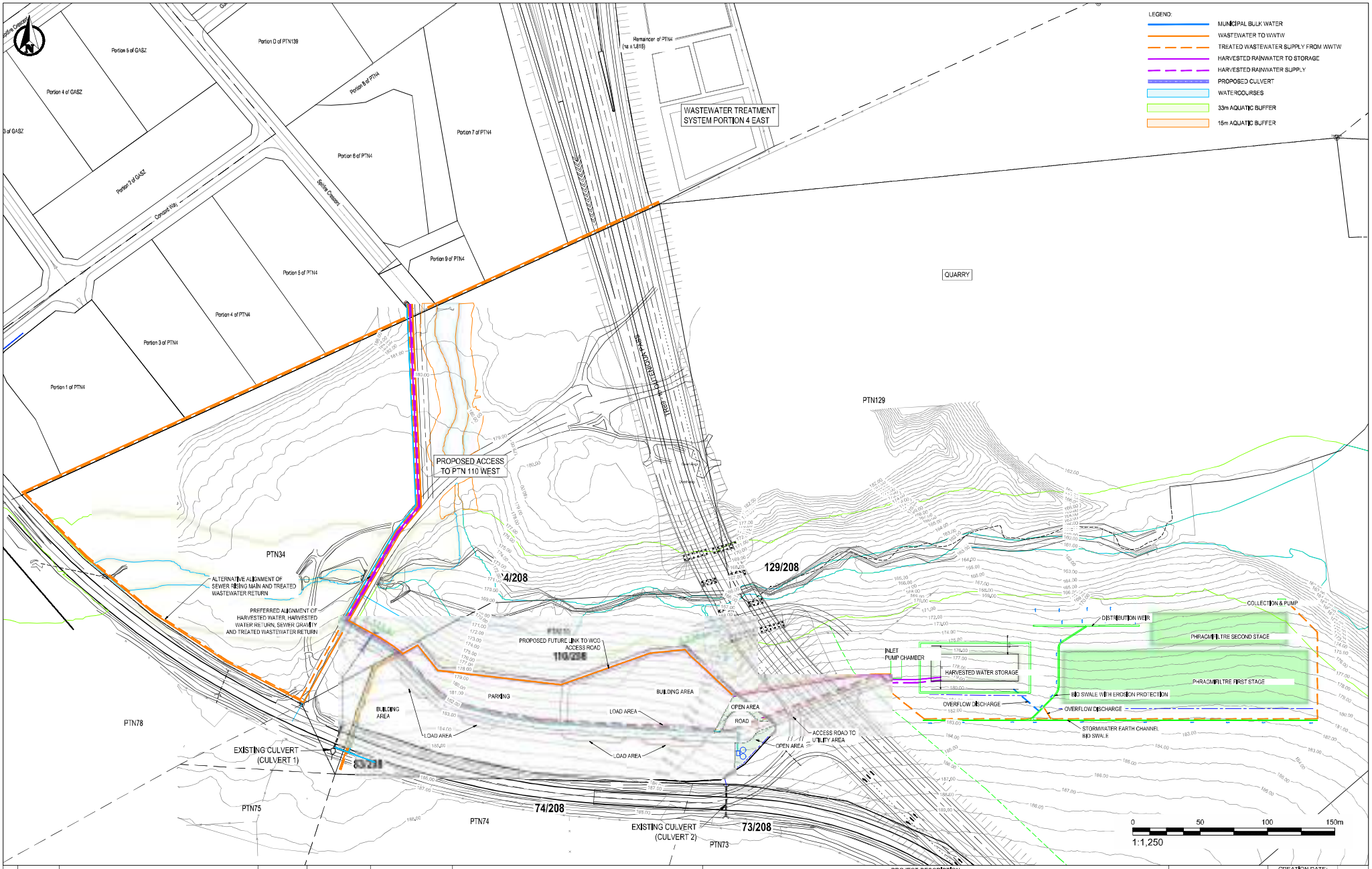
PLAN DESCRIPTION

PTN110 - LIGHT INDUSTRIAL (AIRPORT SUPPORT ZONE) UTILITY STAND LAYOUT

APPROVED

DATE

| | |
|---|---|
| CREATION DATE: 12/07/2024 | A1 |
| SCALE 1:500 | REVISION A |
| SHEET | 1 OF 1 |
| PLAN NO. | GASZ-SC1-140-001 |




| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| A | 10/03/2025 | ISSUED FOR INFORMATION | PGJ |

AMENDMENTS

| | |
|---|---|
| DESIGNED BY | P.G. JOUBERT |
| CHECKED BY | P.G. JOUBERT |
| DRAWN BY | I. GOUWS |
| CHECKED BY | P.G. JOUBERT |


INFRASTRUCTURE CONSULTING ENGINEERS

PO BOX 186
PERSEQUOR PARK
0020
Tel (012) 349-2022/3/4/5


PROJECT DESCRIPTION

REZONING AND SUBDIVISION OF PORTION 110 OF THE FARM GWAYANG NO 208, DIVISION GEORGE

PLAN DESCRIPTION

GENERAL LAYOUT

APPROVED

DATE

| | |
|---|---|
| CREATION DATE: 12/07/2024 | A1 |
| SCALE 1:500 | REVISION A2 |
| SHEET | 1 OF 1 |
| PLAN NO. | GASZ-SC1-100-021 |

**ANNEXURE K:**

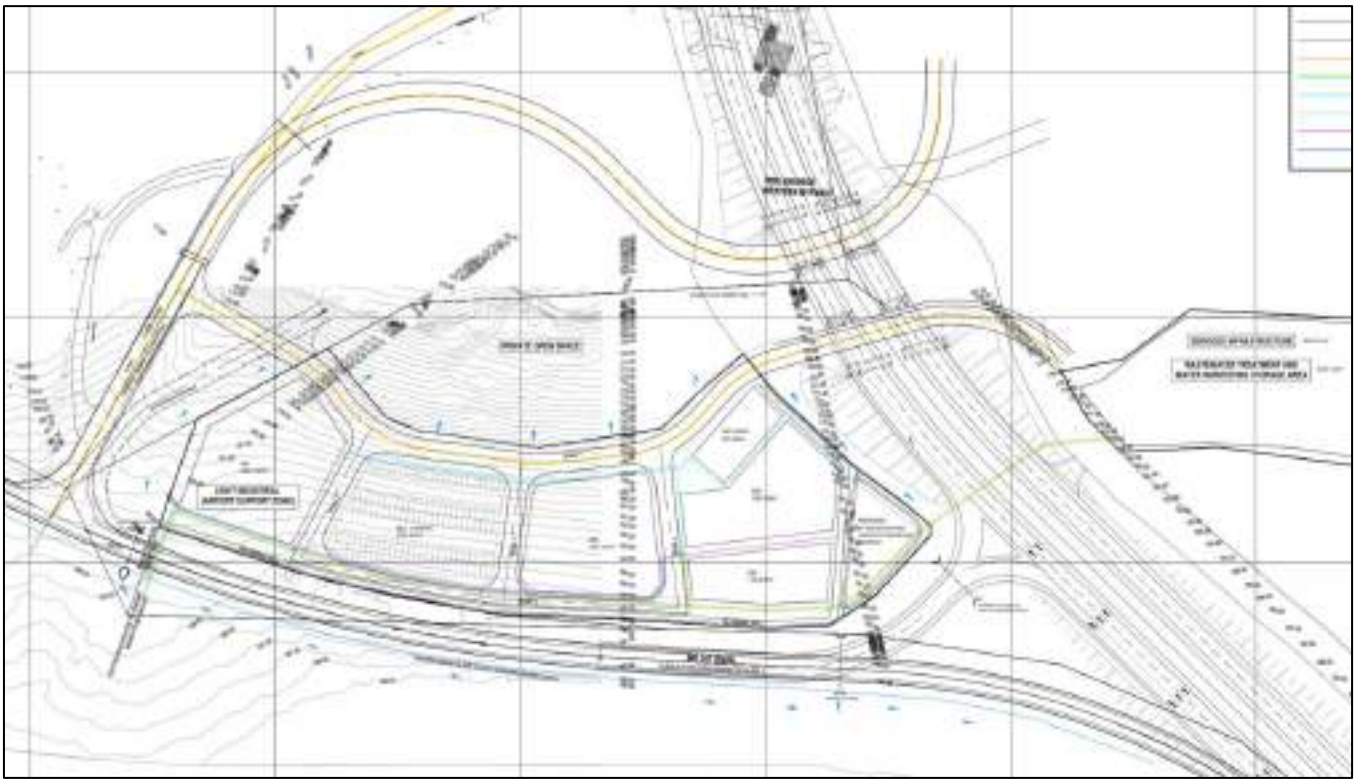
*Electrical Services Report*

# ELECTRO TECHNICAL REPORT FOR:

# Establishment of new Electrical Connection:

# Erf RE/110/208, Portion 110, ASZ Light Industrial

# GEORGE



**Submitted by:**
***BDE* Consulting Engineers**
**February 2025**
**Reference: GRG 476**
**Revision 1**

***BDE* Consulting Engineers (Pty) Ltd**
Reg No. 2004/033886/07
Directors:
DJ de Vries **Pr. Eng. | B. Eng. | GOV. CERT. | SAIEE**
BG Samson **Pr. Eng. | BSc. Eng.**

73 Meade Street
PO Box 1862
George 6530
Tel: 044 801 9700
bde@bdeconsult.co.za

21A First Avenue
Rondebosch East
Cape Town 7780
PO Box 53036
Kenilworth 7745

# TABLE OF CONTENTS

## 1. INTRODUCTION

This electrical engineering services report covers application for a temporary (50kVA) as well as the permanent supply (500KVA) required for the phases of the ASZ Light Industrial development on Portion 110, Erf RE/110/208, George.

Figure 1 indicates in red the location of the envisaged ASZ Light Industrial development on Erf RE/110/208.

Figure 1: Development location

## 2. EXISTING ELECTRICAL INFRASTRUCTURE

The ASZ Light Industrial development is within the licensed electricity distribution area of George Municipality.

There is currently no existing electrical infrastructure servicing the Erf RE/110/208.

## 3. EXPECTED DEMAND AND AVAILABLE ELECTRICAL CAPACITY

The total load demand forecasted for RE/110/208 is summarised in Table 2, and the phased load demand is presented in Table 3.

| **Light industrial Airport Support Zone** | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| **Areas** | **GB m²** | | | | |
| GB 1 | 3039,01 | | | | |
| GB 2 | | 2706,32 | (parking) | | |
| GB 3 | 2437,32 | | | | |
| GB 4 | 1462,15 | | | | |
| GB 5 | 1950,30 | | | | |
| | 8888,78 | | | | |
| At | 60,00 | W/m² | | | |
| Total estimated load | 533,33 | kVA | | | |
| **Estimate** | **500,00** | **kVA without PVS/BESS mitigation** | | | |

Table 2: Total maximum demand forecast

| Description | Watt/m² Light Industrial | Building m² | Total kVA |
|---|---|---|---|
| Estimated maximum demand (undiversified) forecast for complete ASZ Light Industrial development based on planned buildings. | 60 | 8889 | ±533.3 |
| **Phase 1: Total expected maximum kVA to be supplied from temporary connection on MV O/H line:** (Sufficient for ±15% of GB 1 area's expected load demand, plus general supplies to guardhouse, security and lighting.) | | | **±27.6** |
| **Phase 2: Total expected maximum kVA to be supplied from permanent MV connection to future SS Aerotropolis:** (Will supply GB 1 – GB 5 area's expected load demand, plus general supplies to guardhouse, security and lighting.) | | | **±500.0** |
| Proposed Installed transformer capacity for future mini substation at development | | | 500 |

Table 3: Phased maximum demand of development (MV refer to 11kV and O/H to overhead power line)

A 60A three phase temporary connection, supplemented with an equivalent Solar Plant, would be sufficient for the initial Phase 1 of this development. Phase 2 of the development (installation of a 500KVA 11000/420V mini substation), will be implemented when the maximum demand required increases beyond what can be supplied from the phase 1 temporary supply.

## 4. PROPOSED ELECTRICITY DISTRIBUTION NETWORK

### 4.1 Electrical design & analysis

The technical proposal during phase 1 is to establish an electrical connection from a MV O/H line identified close to the ASZ Light Industrial development. The initial load demand during Phase 1 of the development shall then be supplied by a three-phase connection, via a LV cable that will be installed during phase 1.

The green arrow in Figure 4 shows the nearest connecting point on the MV O/H line to the development.


Figure 4: 11kV O/H line (proposed point of connection at green arrow)

The light blue & orange route indicated in Figure 5, shows the proposed cable route for installation of a LV cable to the development from the Point of supply to the Guard house, aproximately 300m. The phase 1 initial supply to the development will be at 420V via the LV cable from a re-purposed 50kVA 11000/400V transformer to be installed at the point of supply.


Figure 5: Proposed cable route for temporary LV and future MV (Cyan colour line) supply to development

Refer to Annexure B for site pictures of the Point of Supply (11000/420V 50kVA pole mounted transformer and Municipal bulk metering kiosk) and Point of Connection (temporary LV cable connection kiosk to Guard house and general loads).

Figure 6 presents a proposed PV + BESS system to supplement the Phase 1 load demand with green energy.

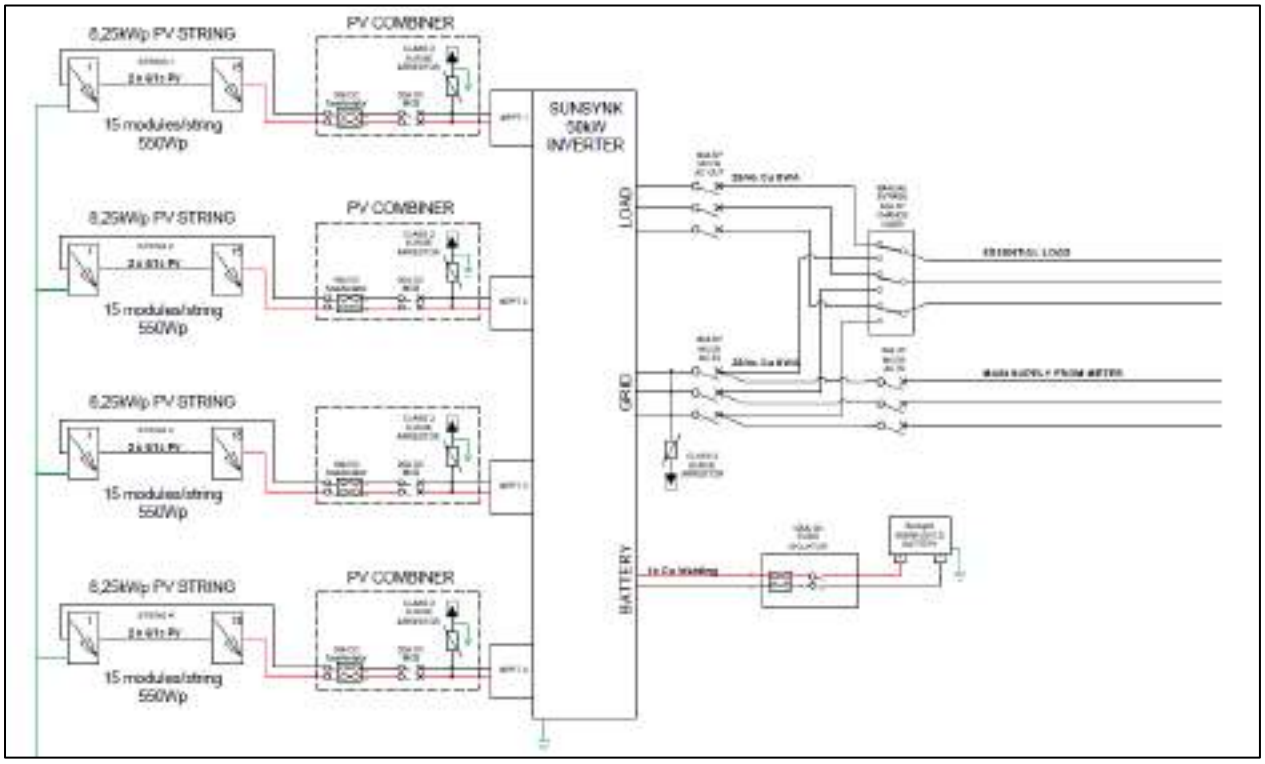


Figure 6: Proposed 50kWp PV + BESS system to supplement the Phase 1 load demand

Figure 7 presents in green the proposed position for the future 500KVA mini substation to be installed during phase 2 of the ASZ Light Industrial development. The installation of the mini substation will be implemented when the maximum demand required by the development increases beyond what can be supplied from the phase 1 temporary supply.

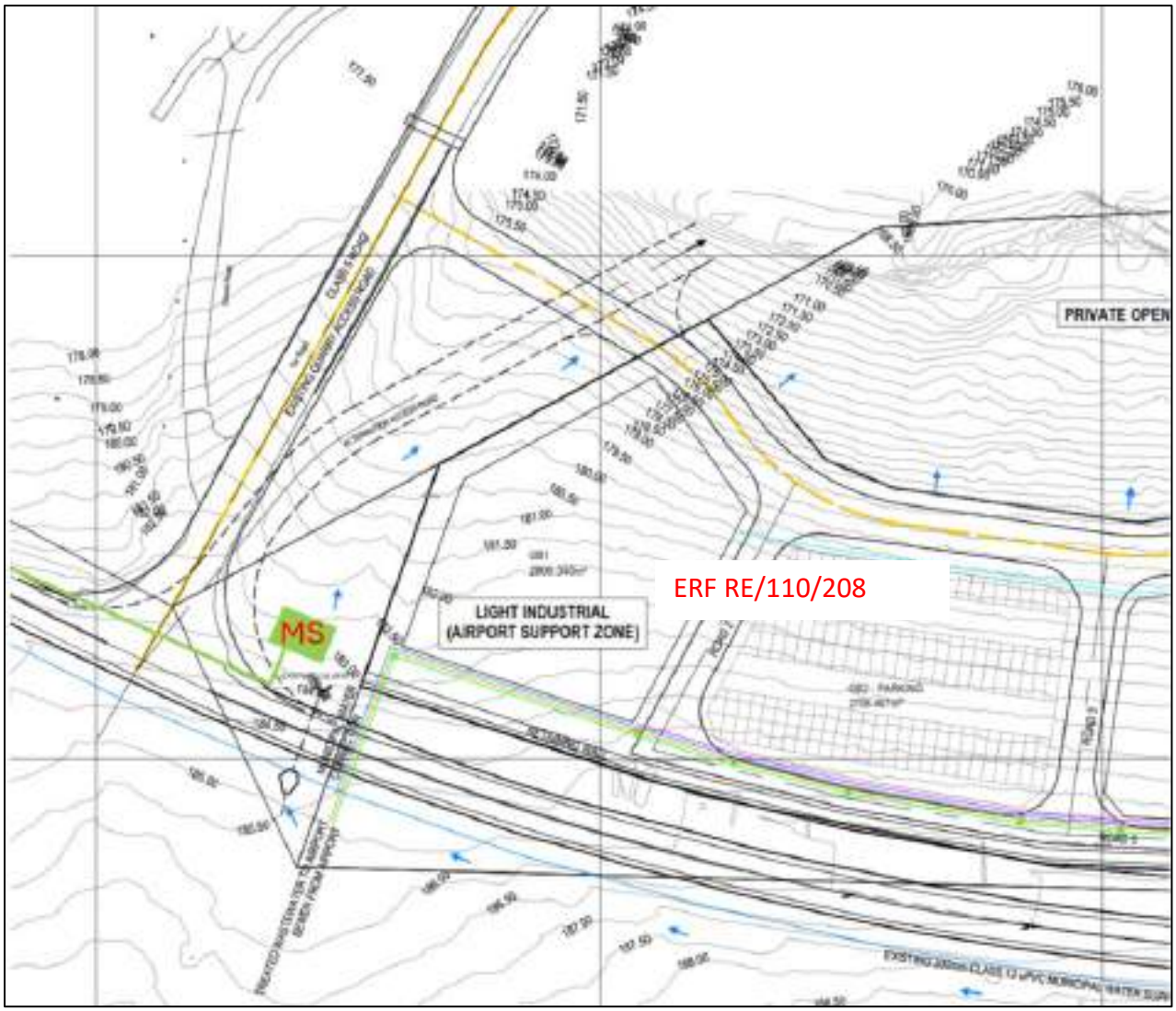



Figure 7: Proposed position for 500KVA minisub (MS -green square)

Annexure A presents the network analysis study results for the proposed feeder, from the temporary connection point to the ASZ Light Industrial development area, based on the initial maximum demand forecasted for the development.

### 4.2 Municipal connection

- The point of the temporary connection will be from the existing MV O/H line feeding the airport, refer to Figure 4 and 5.
- The connection will consist of a 11000/420V 50kVA pole mounted transformer and municipal bulk metering kiosk with a 60A three phase main supply circuit breaker.
- A 70mm² 4 core Al LV cable or 35mm² 4 Core Cu LV will be installed from the bulk metering kiosk to the ASZ Light Industrial development site.
- At the position where the future mini substation will be located (future Point of connection Figure 5), the LV cable can be connected to a kiosk, from which a standard low voltage feeder will supply

the guard house, the general supplies of the development and the initial load requirement of the GB 1 area.

- During Phase 2 of the development a new 95 mm² 3 core AL MV cable will be installed on 11kV to supply the proposed mini substation as indicated in Figure 7.
- The standard municipal development charges payable will apply for a connection at MV/LV level at the point of supply on the MV O/H line during phase 1, based on the municipality taking over the point of supply (transformer and Bulk Metering Kiosk). During Phase 2 of the development the development charges will apply for a connection at MV level when the MV network and mini substation is established and operational.

## 5. CONCLUSION

### 5.1 General

- Adequate spare capacity is available at the temporary point of supply on the MV O/H line to accommodate ASZ Light Industrial development's initial load demand during phase 1.
- The design, supply, and installation will be done following the ruling Municipal specifications and requirements.
- The necessary applications for wayleaves along the MV cable route will be done.

### 5.2 Costing

- The electrical infrastructure required for the ASZ Light Industrial development, will be supplied and installed by the Developer.

### 5.3 Municipal approval required.

- Approval of a new temporary 60A three phase LV supply point from the existing MV O/H line, for the Phase 1 load requirement of the ASZ Light Industrial development on Erf RE/110/208.
- The proposed LV cable, to be temporary used at LV voltage and to be taken over by the municipality in future, will be installed on a route approved by the municipality and in line with the master plan network development for the area.
- Expansion of the MV network during phase 2 of the development, will be formally done in future and will be accompanied by a detail MV design application.
- Construction drawings will be submitted for approval before the commencement of construction.

Please contact us should you need any further information.

Yours faithfully

_____

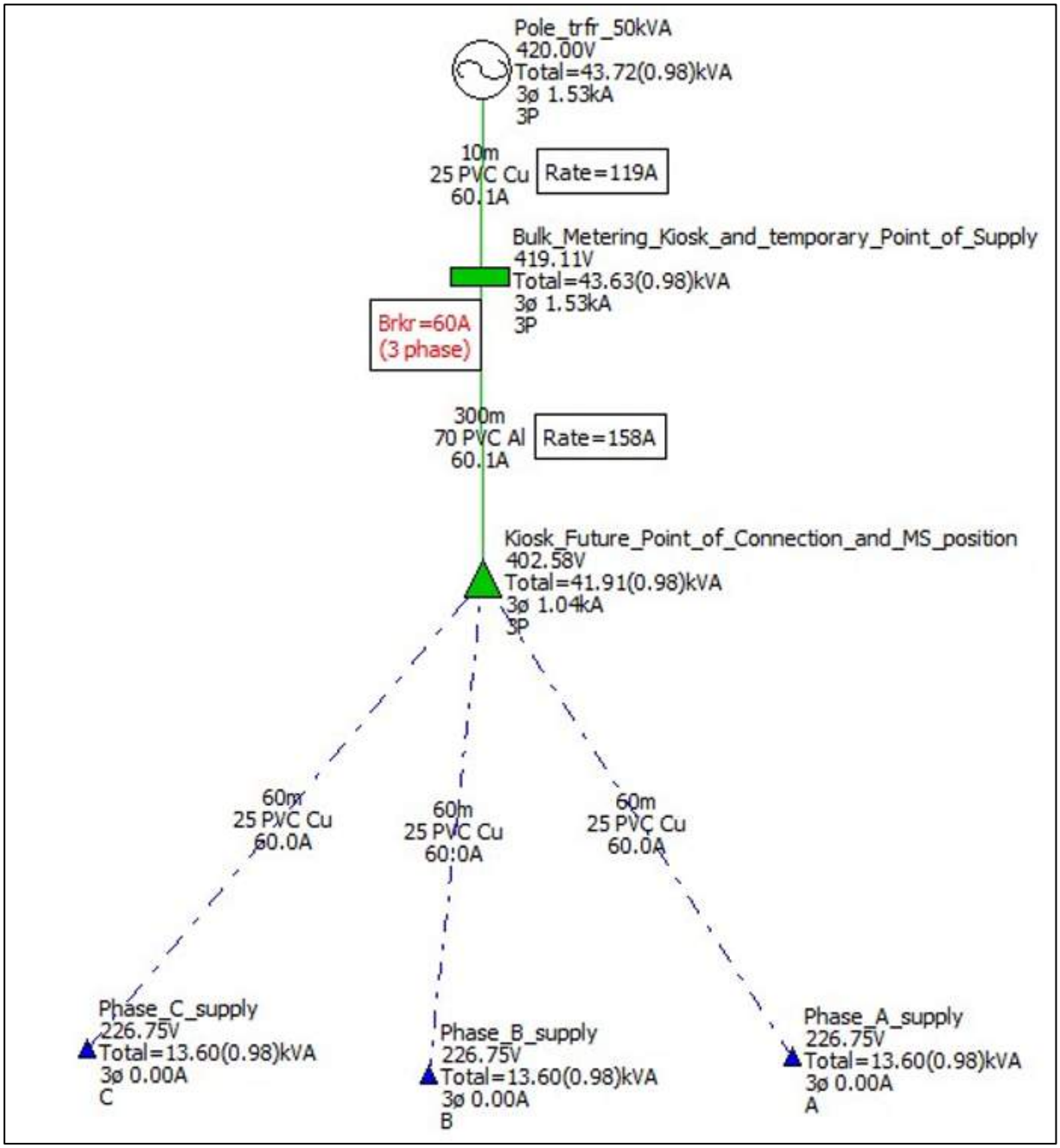
Henri du Plooy (Pr Tech Eng)

**BDE CONSULTING ENGINEERS**

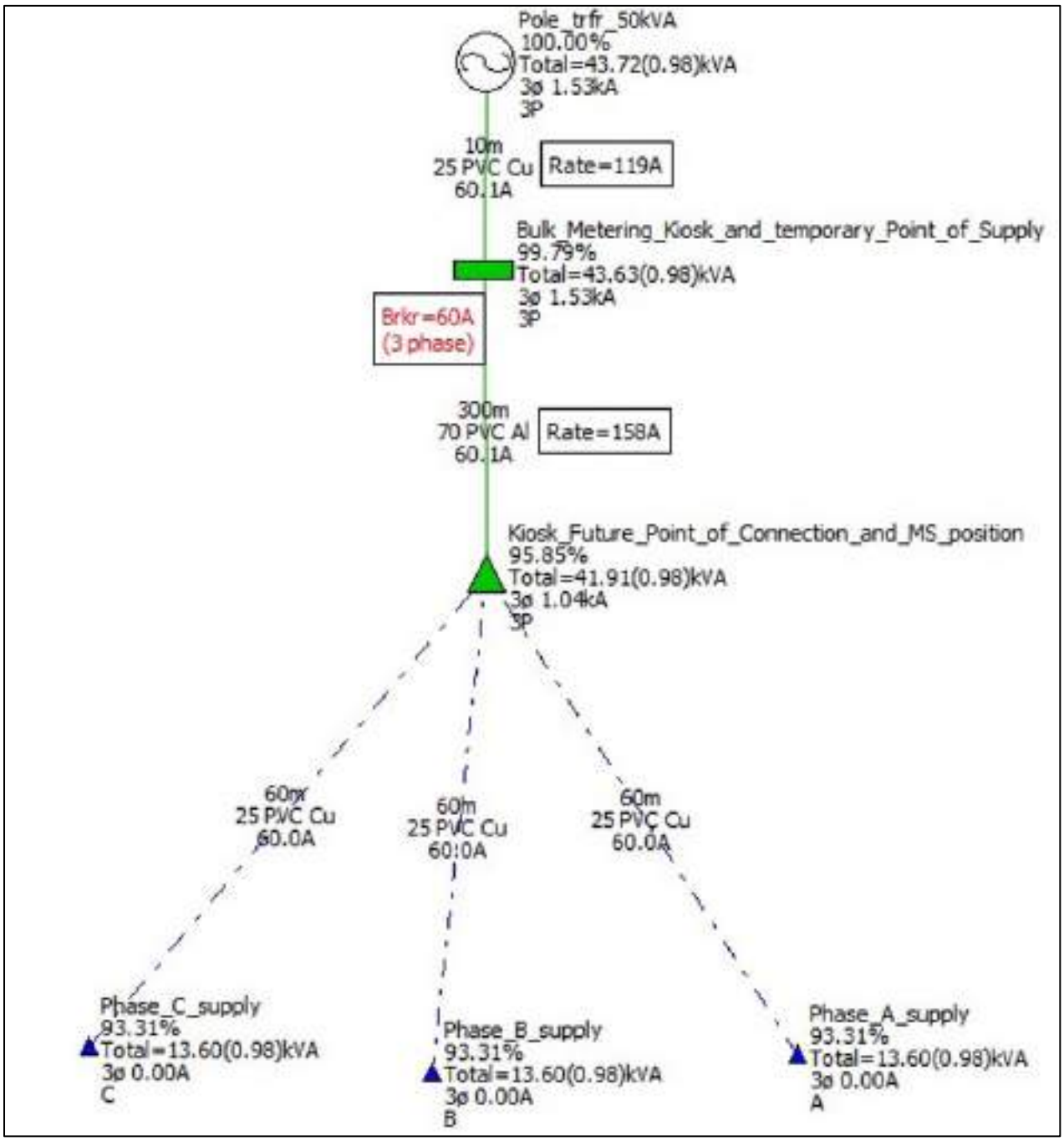
# 6. ANNEXURES

## 6.1 Annexure A: Network analysis results for phase 1 LV supply to development

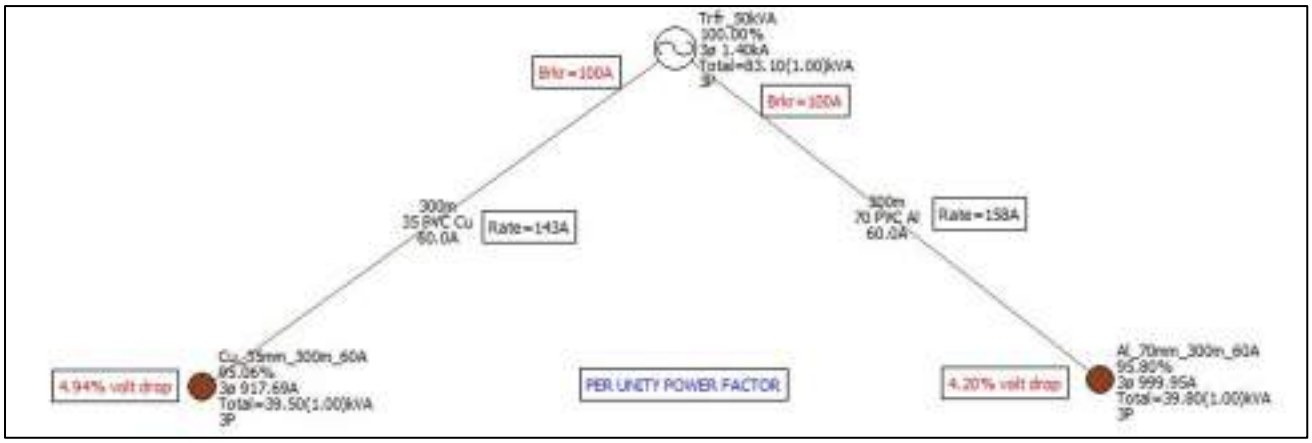
Physical ampere line loading & voltage regulation @ 420 V three-phase

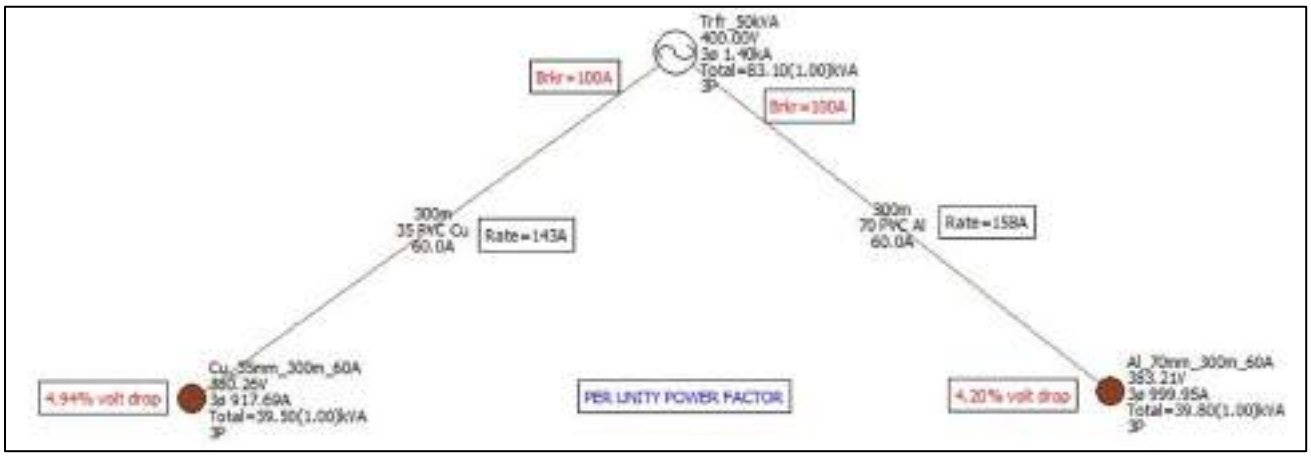


Physical ampere line loading & % voltage regulation @ 420 V three-phase



LV Cable voltage drop within acceptable range from the Point of supply to the Guard House, max distance of 300m



### 6.2 Annexure B: Site photos of proposed positions of the Bulk Metering Kiosk and Transformer


Photo above: Proposed position of Bulk Metering Kiosk.

Photo below: Proposed position of 50kVA 11000/400V pole transformer.

**ANNEXURE L:**

*Traffic Impact Assessment*

# *Portion 110 – George Airport North-Eastern Precinct*

## *Transport Impact Assessment Update*

## *George*

***October 2025***


**5th Floor**

**Imperial Terraces**

**Carl Cronje Drive**

**Tyger Waterfront**

**Bellville, 7530**

**(021) 914 6211 (T)**

**e-mail: westerncape@itsglobal.co.za**

**SUMMARY SHEET**

| | |
|---|---|
| Report Type | Transport Impact Assessment Update |
| Title | Portion 110 – George Airport North-Eastern Precinct |
| Location | George |
| Client | Infrastructure Consulting Engineers (ICE) (Pty) Ltd |
| Reference Number | ITS 4616 |
| Project Team | Christoff Krogscheepers |
| | Lize Neethling |
| Contact Details | Tel: 021 914 6211 |
| Date | October 2025 |
| Report Status | Final Revision 4 |
| File Name | G:\4616 TIA George Airport Precinct\12 Report\Issue\4616_George Airport_TIA_LN_Final Rev 4_2025-10-02.docx |

*It is herewith certified that this Traffic Impact Assessment has been prepared according to requirements of the South African Traffic Impact and Site Traffic Assessment Manual.*

# TABLE OF CONTENTS

## REPORT - SUMMARY TABLE

*This transport impact assessment is reported only in a summary table instead of a lengthy report to assist review and interpretation of the results. This summary table includes all the relevant information that is normally contained in a report. It should be sufficient for review and interpretation of the expected transport impacts as well as the comprehension of the required measures to mitigate the transport impact. If any more detail is required please contact the authors.*

## ANNEXURES

Annexure A: Western Bypass Preliminary Design
Site Development Plan
Traffic Analysis Figures
Annexure B: Trip Generation Tables

## LIST OF FIGURES



## LIST OF TABLES



## ABBREVIATIONS

| | |
|---|---|
| COTO | Committee of Transport Officials |
| Ha | Hectare |
| HCM | Highway Capacity Manual |
| LOS | Level of Service |
| NMT | Non-motorised Transport |
| SATGR | South African Trip Generation Rates |
| SQM | Square Meters ($m^2$) |
| TIA | Transport Impact Assessment |
| V/C | Volume to Capacity Ratio |
| WCG | Western Cape Government |
| GANEP | George Airport North-Eastern Precinct |

# *Transport Impact Assessment*

*Portion 110 – George Airport North-Eastern Precinct, George*

| | |
|---|---|
| **1 Purpose of Study** | The George Airport North-Eastern Precinct (GANEP) has several proposed and approved developments, which will lead to an increase in traffic volumes in the area. As a result, the surrounding road network will need to be upgraded to accommodate the expected development trips. The purpose of this Traffic Study is to investigate the transport impact of the proposed Portion 110 within GANEP in George and investigate whether additional road infrastructure is required to accommodate the expected development traffic.<br><br>In 2019, a Road Master Plan was developed for GANEP (Innovative Transport Solutions (ITS), 2019) and in 2023 a Transport Study was conducted specifically for Portion 110 (Innovative Transport Solutions (ITS), 2023). An update to the previous study was required to include up to date traffic counts. This traffic study evaluates the traffic impact of the proposed Portion 110 within the context of the master plan and based on new and approved development proposals as well as an adjusted timeline of the Western Bypass. |
| **2 Locality** | Portion 110 forms part of the GANEP area and is bound by the R404 to the south and the future George Western Bypass to the east. This area is illustrated in **Figure 1** which is an extract of the GANEP as it appears in the Gwayang Local Spatial Development Framework (GLSDF, Nov 2015).<br><br>  <br>*Figure 1: Extract of Gwayang Local Spatial Development Framework (GLSDF, Nov 2015)* |
| **3 Land Use** | This study is conducted to determine the transport impact of Portion 110. However, due to various planning in the area, both |

| | |
|---|---|
| | Portion 34 and the Airport Planning have been considered to ensure that the recommended road infrastructure will be able to accommodate all the trips within the GANEP area.<br><br><u>Portion 110 of Farm Gwayang No 208</u><br><br>Portion 110 is currently planning on developing with light industrial land uses, like the other portions of the GANEP. It is assumed that a public road will be constructed within Portion 34, linking Portion 110 to the Quarry Access Road. This will allow Portion 110 access to the R404.<br><br><u>Portion 34 of Farm Gwayang No 208</u><br><br>It is currently still uncertain how and when Portion 34 will develop. To ensure that the whole GANEP area is considered in this study it is assumed that Portion 34 will develop with light industrial land uses, like the other portions of the GANEP. It is also assumed that a public road will be constructed within Portion 34 linking Portion 110 to the rest of the GANEP to the north.<br><br><u>Airport Planning</u><br><br>ACSA is planning to expand the George Airport, specifically the commercial side of the airport in the light of more commercial flights. In the GANEP Roads Master Plan, it was assumed that the airport activities would double within the 20-year planning horizon. From the previous Transport Study submitted (ITS, October 2023), ACSA supports the assumption that the passenger and traffic volumes associated with the airport will increase by 20% over the next five years. The traffic demand assumptions for the George Airport are discussed in more detail in **Section 10**.<br><br>As part of the George Airport expansion, an internal ring road will be constructed creating a circular route within the George Airport site linking the R404/Airport Main Access intersection and the R404/Quarry Access Road intersection. It was assumed that this internal ring road will be in place during the future scenario. |
| **4 Existing Roadways** | The R102 is a trunk road (TR209). It is classified as a Class 2 road with a lane width of 3.5m and a 1m shoulder on both sides. The speed limit is 100km/h.<br><br>The R404 (MR347) is a provincial main road and a Class 3 road with a lane width of 3.4m and gravel shoulders on both sides. The speed limit varies between 60km/h to 100km/h. |
| **5 Future Roadways** | The Western Bypass will link the Outeniqua Pass with the N2. The northern section of the route will go through the farming and peri-urban area of Blanco to the north of the Geelhoutboom intersection, while the |

southern section will run from the N2/Herold's Bay interchange past the airport to the Geelhoutboom intersection. The approved route in the northern section is known as the Gwaing Blanco Alignment and the southern section is the Quarry Alternative 3 Alignment. This is illustrated in **Figure 2**. Refer to **Figure A1** in **Appendix A** for the Preliminary Design drawings of the section passing the airport.


*Figure 2: Western Bypass*

In the GANEP Road Master Plan (Innovative Transport Solutions (ITS), 2019) it was assumed that the bypass will be constructed in the distant future. However, according to the latest information obtained from the Western Cape Government (WCG) relating to the timing of the bypass, it would now seem as if the bypass construction could be much sooner. For the purposes of this study, some of the scenarios included the bypass

| | |
|---|---|
| | being in place in the next five years and that once this is built, a significant portion of the current traffic volumes will move to the bypass. |
| **6 Study Intersections (existing control)** | The major intersections in the site vicinity, which were included in this report, are as follows:<br><br>Int. 1: R102/R404 ..... (Stop-controlled)<br>Int. 2: R404/Airport Main Access ..... (Roundabout)<br>Int. 3: R404/Quarry Access Road ..... (Stop-controlled) |
| **7 Analyses Hours** | An electronic traffic survey was conducted on a continuous basis over a 7-day period on the R404 and the George Airport Main Access between Sunday 26 January 2025 and Saturday 1 February 2025.<br><br>Furthermore, 2023 traffic volumes were obtained from the WCG Road Network Information System (RNIS) website (WCG, 2025) at the R102/R404 intersection. The Committee of Transport Officials (COTO) TMH16 Volume 1 states that traffic counts not older than two years may be used if no changes occurred in the area that could have affected the traffic demand (COTO, 2012). No changes have occurred in the area over the past two years that could have a significant impact on the traffic demand. Therefore, the 2023 traffic volumes obtained from RNIS was used after an annual growth rate was applied. The growth rate used is further discussed in **Section 11**.<br><br>The peak hours analysed were:<br><br>• AM peak hour: 07:00 – 08:00<br>• PM peak hour: 17:00 – 18:00 |
| **8 Scenarios Analysed** | The following scenarios were analysed:<br><br>1. 2025 Existing Scenario<br>2. 2030 Background excluding Latent Demand Scenario<br>2.1. Without Bypass<br>2.2. With Bypass<br>3. 2030 Background including Latent Demand Scenario<br>3.1. Without Bypass<br>3.2. With Bypass<br>4. 2030 Total Scenario<br>4.1. Without Bypass<br>4.2. With Bypass |

**9 Existing Intersection Operations**

The capacity analyses in this scenario are based on the existing 2025 traffic volumes, lane configurations and intersection controls. The intersections in the study area were analysed based on the methods described in the Highway Capacity Manual (HCM) and as coded in the Traffix Software to determine the level of service (LOS), delay per vehicle (in seconds) and volume per capacity (v/c) for each intersection in the peak hour.

The analyses results indicated that all study intersections are currently operating at acceptable levels of service (LOS) during both peak hours with acceptable average delays. Therefore, no upgrades are proposed at the study intersections.

Refer to **Figure 3A** for the existing weekday peak hour traffic demand and intersection operations.

**10 Approved Developments/ Latent Rights**

The following portions of Farm Gwayang No 208 have been approved and will be included as in-process developments:

- Portion 4
- Portions 130, 131 and 132
- Portion 139

The total approved traffic volumes are summarised in **Table 1**. These volumes include a reduction of 10% to account for internal trips.

*Table 1: Total In-Process Extent and Trips (after pass-by, diverted and internal trips deducted)*

| Ervens | Size / Volume (GLA) | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total |
| Portion 4 | 33 105 | 94 | 62 | 156 | 78 | 92 | 170 |
| Portion 130 - 132 | 46 863 | 318 | 138 | 456 | 132 | 281 | 413 |
| Portion 139 | 29 450 | 79 | 53 | 132 | 59 | 73 | 132 |
| Total | 109 418 | 491 | 253 | 744 | 269 | 446 | 715 |

The following road infrastructure upgrades were proposed as part of the approved developments:

- A roundabout or traffic signal at the R102/R404 intersection – not completed.
- A single-lane roundabout at the R404/Airport Main Access intersection – completed.

It is assumed that the road infrastructure upgrades that have not yet been completed will be in place in the background, including latent demand, and total scenarios.

From the traffic counts conducted it was determined that the George Airport generated approximately 460 trips (330 inbound, 130 outbound) during the AM peak hour and 310 trips (150 inbound and 160 outbound) during the PM peak hour in 2025. It was assumed that the passenger and traffic volumes will increase by 20% in the next five years. This approximates to a total of 550 trips (390 inbound, 160 outbound) during

| | |
|---|---|
| | the AM peak hour and 370 trips (180 inbound, 190 outbound) during the PM peak hour. |
| **11 Future Background Traffic Conditions** | An average growth rate of 3% per annum was applied to the existing traffic volumes over a five-year horizon period to determine the background 2030 traffic volumes. This growth rate was used in the previous TIA for Portion 110 of GANEP and corresponds to the growth rate along the R404 recorded on RNIS. A lot of growth is expected for the GANEP area; however, the average annual growth rate was deemed sufficient as the approved and proposed developments in the GANEP area are also taken into account for this study.<br><br>Four background scenarios were investigated, these scenarios are as follows:<br><br>• 2030 Background excluding Latent Demand Scenario<br>– Without Bypass: This scenario analyses the network conditions based on the existing traffic volumes and intersection geometry, excluding any road infrastructure upgrades listed in **Section 10**, with a 3% per annum growth rate applied for five years.<br>– With Bypass: This scenario analyses the network conditions with the bypass in place and the re-assigned existing traffic volumes with a 3% per annum growth rate applied for five years excluding any road infrastructure upgrades listed in **Section 10**.<br>• 2030 Background including Latent Demand Scenario<br>– Without Bypass: This scenario analyses the network conditions based on the existing traffic volumes with a 3% per annum growth rate applied for five years plus the approved development trips and their recommended road infrastructure upgrades in place.<br>– With Bypass: This scenario analyses the network conditions with the bypass in place and the re-assigned existing traffic volumes with a 3% per annum growth rate applied for five years plus the approved development trips and their recommended road infrastructure upgrades in place.<br><br>The results of the capacity analyses for the four scenarios are as follows:<br><br>• 2030 Background excluding Latent Demand Scenario<br>– Without Bypass: The R102/R404 intersection is expected to operate at unacceptable levels of service (LOS F) with unacceptable average delays during both peak hours. It is proposed that the intersection be upgraded to a single-lane roundabout or a traffic signal. Thereafter, no capacity |

| | |
|---|---|
| | constraints are experienced, and the intersection is expected to operate acceptably during both peak hours.<br>The remaining two study intersections are expected to operate at acceptable levels of service (LOS) during both peak hours with acceptable average delays. No upgrades are proposed at the R404/Airport Main Access intersection or the R404/Quarry Access Road intersection in this scenario.<br>Refer to **Figure A4** and **Figure A5** for the results of background 2030, excluding latent demand, weekday peak hour traffic demand and intersection operations without the bypass.<br>– With Bypass: All study intersections are expected to operate acceptably during both peak hours. No upgrades are proposed in this scenario.<br>Refer to **Figure A6** for the results of background 2030, excluding latent demand, weekday peak hour traffic demand and intersection operations with the bypass.<br>• 2030 Background including Latent Demand Scenario<br>– Without Bypass: If the upgrades previously proposed (single-lane roundabout or signalisation) at R102/R404 intersection is implemented, all study intersections are expected to continue to operate acceptably during both peak hours. No upgrades are proposed in this scenario.<br>Refer to **Figure A7** for the results of background 2030, including latent demand, weekday peak hour traffic demand and intersection operations without the bypass.<br>With Bypass: If the infrastructure upgrades listed in **Section 10** are implemented, all study intersections are expected to operate at acceptable levels of service (LOS) during both peak hours with acceptable average delays. No upgrades are proposed at in this scenario.<br>Refer to **Figure A8** for the results of background 2030, including latent demand, weekday peak hour traffic demand and intersection operations with the bypass. |
| **12 Site Access** | There is currently no formal access to Portion 110 of GANEP. Comments received from the WCG Department of Infrastructure (Ref. DOI/CFS/RN/LU/REZ/SUB-12/218 (Application No: 2024-11-0094) stipulated that access to the site may only be taken via the Quarry Access Road and servitude right of way. No access off the Western Bypass or R404 may be created or continue to exist.<br><br>Access to Portion 110 light industrial development:<br><br>Alternative 1 (preferred): A public road will be provided within Portion 34 linking Portion 110 to the Quarry Access Road. Portion 110 will therefore gain access to the road network at the existing |

R404/Quarry Access Road intersection. The landowner will need to gain permission from ACSA for this access alternative.

Alternative 2: The existing Quarry Access Road will be realigned to the east closer to the boundary of Portion 110. For this alternative the site will have an access along the realigned Quarry Access Road without the need for a new public road over Portion 34. The site will gain access to the road network at the existing R404/Quarry Access Road intersection.

The alternative accesses to the light industrial development on Portion 110 are illustrated in **Figure 3**.


*Figure 3: Alternative accesses to Portion 110 light industrial development*

As indicated in the GANEP transport study (ITS, 2021) and **Figure 4**, an additional public road will be provided within Portion 34 linking Portion 110 to the rest of GANEP north of Portion 34.

*Figure 4: GANEP proposed access roads to surrounding erven (ITS, 2021)*

According to the Road Access Guidelines (WCG, 2002) a minimum spacing of 60m is required between a high generator and a full

unsignalised intersection along a Class 4 road in an Intermediate roadside development environment. In the GANEP Road Master Plan (Innovative Transport Solutions (ITS), 2019) the Quarry Access Road was classified as a Class 5 access road. Therefore, due to the lower order of the Quarry Road a spacing of 60m between the proposed site access (alternative 1 & 2) and the R404/Quarry Access Road intersection will be sufficient.

Access to Portion 110 service utilities without bypass:

Alternative 1 (preferred): Access to the service utilities proposed on Portion 110 will be directly from the proposed cul-de-sac circle on site. Portion 110 utilities area will gain access to the road network at the existing R404/Quarry Access Road intersection.

Alternative 2: The existing access via servitudes over Portions 129 and 111 north east of the site will be used. Portion 110 utilities area will therefore gain access to the road network from the R102.

Access to Portion 110 service utilities with bypass:

Alternative 1 (preferred): Access to the service utilities proposed on Portion 110 will be directly from the light industrial site, by using the future underpass as proposed by the WCG in the preliminary design for the bypass. Portion 110 utilities area will therefore gain access to the road network at the existing R404/Quarry Access Road intersection.

Alternative 2: The existing access via servitudes over Portions 129 and 111 northeast of the site will be used. Portion 110 utilities area will gain access to the road network from the R102.

The alternative accesses to the service utilities on Portion 110 are illustrated in **Figure 5** and **Figure 6**.

*Figure 5: Alternative access 1 to the utilities area with the Western Bypass*

*Figure 6: Alternative access 2 to the utilities area*

**13 Trip Generation Rates and Development Trips**

It is envisaged that Portion 110 will develop with light industrial uses. The trip generation for Portion 34 was also included as part of the study even though there are no current development envisaged for Portion 34. This is to ensure that the ultimate impact of the GANEP is investigated.

The trip generation rates and the detailed trip generation of the entire GANEP are attached in **Appendix B**. The trip generation is based on the guidance provided in the TMH17 Trip Data Manual (COTO, 2013). The pass-by and diverted trips were limited to 20% which is the maximum allowed pass-by and diverted trips as stated in the TMH17 (COTO, 2013). A 10% reduction was applied to the trip generation to account for internal trips since many of the approved and proposed GANEP developments are complementary and there will be interaction between the uses not only directly but also indirectly with multi-destination trips.

Refer to **Table 2** for a summary of the estimated trip generation for Portions 34 and 110. Note that no detailed plans were obtained for the development of Portion 34. The trip generation for this area was thus determined based on the following assumptions:

Total Developable Area reduced by 13% to make provision for roads.

- A Floor Area Ratio of 75%.
- A Leasable Floor Space of 95%.

These assumptions are similar to what was initially used for the other portions of GANEP.

*Table 2: Total Trips after interal trip reduction*

| Ervens | Size/ Volume (GLA) | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|---|---|---|---|---|---|---|---|
| | | In | Out | Total | In | Out | Total |
| Portion 34 | 21 076 | 91 | 23 | 114 | 23 | 91 | 114 |
| Portion 110 | 8 700 | 38 | 9 | 47 | 9 | 38 | 47 |
| Total | 29 776 | 129 | 32 | 161 | 32 | 129 | 161 |

**14 Trip Distribution**

Two trip distribution options were investigated as determined by the available road network with and without the Western Bypass. Without the Western Bypass, the following trip distribution was assumed:

- 20% to/from George via R102 east
- 10% to/from Groot-Brak via R102 west
- 30% to/from Fancourt via R404 north
- 20% to/from Herold's Bay via the R404 south
- 20% to/from the GANEP Area north of the Airport

It was assumed that the trip distribution would be as follows once the Western Bypass has been constructed:

- 60% to/from George/Western Bypass via R102 east
- 10% to/from Groot-Brak via R102 west
- 10% to/from Herold's Bay via the Western Bypass
- 20% to/from the GANEP Area north of the Airport

**15 Public Transport and Non-Motorised Transport**

George recently implemented the Go George bus system for transporting passengers to the different areas in George. This is being implemented in phases. There are currently no routes to the GANEP area, however, there are planned future routes with stops proposed at the R404/Airport Main Access intersection. An express service will also be implemented directly to the terminal building. Therefore, provision needs to be made for bus facilities along the R102 and the R404.

The GANEP transport study (ITS, 2021) proposed six bus embayments within the vicinity of the GANEP. Two embayments were proposed along the R102, downstream of the R102/R404 intersection on both sides of the R102. Four embayments were proposed along the R404, downstream of both R404/Airport Main Access and the R404/Quarry Access Road intersections on both sides of the R404.

With public transport embayments along the R404, public transport passengers will be able to access the GANEP although they will have to walk distances varying between 500m and 800m depending on where they want to be within the precinct. A Go George station would probably be eventually implemented at the George Airport, allowing for access for passengers with luggage. The Go George buses can then enter the George Airport at the main access of the R404, drop off and pick up passengers at the terminal and make use of the planned George Airport ring road to get to the R404 again.

| | |
|---|---|
| | In summary, it is necessary to provide public transport facilities along both the R102 and R404. Based on the walking distances it is unlikely that the major bus routes would enter the GANEP precinct. At a minimum public transport passengers will have to walk into the area, but this could be averted by adding minibus taxi feeders. However, the demand for such a feeder system will be low unless a larger area is served. Alternatively, Go George service could be provided through the GANEP precinct. The roads within the GANEP precinct are currently private and an agreement with the George Municipality would need to be implemented for this alternative to be realised. |
| **16 Non-motorised Transport** | There are currently no sidewalks along the R404. The GANEP Roads Master Plan (ITS, 2019) proposed a change to the Class 3 dual carriageway cross-section to increase the sidewalk size from 1.5m to 2m. However, this dual carriageway will not be required in the near future. Therefore, it is proposed that a 2m gravel walkway be constructed in the road served and away from the surfaced roadways. This walkway should extend from the proposed bus embayments along the R404 to the R404/Quarry Access Road intersection. |
| **17 Total Traffic Conditions** | To assess the impact of Portion 110 of GANEP on the surrounding road network, the development traffic was added to the 2030 background, including latent demand, traffic volumes.<br><br>Two total scenarios were investigated, these scenarios are as follows:<br><br>• 2030 Total Scenario<br>– Without Bypass: This scenario analyses the network conditions based on the background 2030 traffic volumes, including latent demand, plus the development trips of Portion 110 of GANEP.<br>– With Bypass: This scenario analyses the network conditions with the bypass in place and the re-assigned background 2030 traffic volumes, including latent demand, plus the development trips of Portion 110 of GANEP.<br><br>The results of the capacity analyses for the two scenarios are as follows:<br><br>• 2030 Total Scenario<br>– Without Bypass: The R404/Quarry Access Road intersection is expected to operate at unacceptable levels of service (LOS F) during both peak hours with unacceptable average delays. It is proposed that the intersection be upgraded to a single-lane roundabout. Thereafter, no capacity constraints are experienced, and the intersection is expected to operate acceptably during both peak hours.<br>However, if Portion 34 does not develop, the roundabout at the R404/Quarry Access Road intersection will not be required. |

| | |
|---|---|
| | It is therefore proposed that the R404/Quarry Access Road intersection roundabout only be constructed after Portion 34 has been developed. In the interim, it is proposed that a short dedicated left turn lane (30 m) be constructed along the Quarry Access Road at the R404/Quarry Access Road intersection.<br>The remaining two study intersections are expected to operate at acceptable levels of service (LOS) during both peak hours with acceptable average delays. No upgrades are proposed at the R102/R404 or the R404/Airport Main Access intersections in this scenario.<br>Refer to **Figure A9** for the results of the total 2030 weekday peak hour traffic demand and intersection operations without the bypass.<br>With Bypass: All study intersections are expected to operate at acceptable levels of service (LOS) with acceptable average delays during both peak hours. No upgrades are proposed in this scenario.<br>Refer to **Figure A10** for the results of the total 2030 weekday peak hour traffic demand and intersection operations without the bypass. |
| **18 Parking** | All GANEP parking must be implemented on-site. The parking bays to be provided by the various portions of GANEP must be in accordance with George Municipal standards. |
| **19 Conclusion & Recommendations** | This report investigated the expected transport related impacts associated with the development of Portion 110 as part of GANEP. This study resulted in the following conclusions:<br>• Portion 110 is planned to develop with light industrial land uses (8 700m² GLA), in line with the other portions of GANEP.<br>• It was assumed that Portion 34 of GANEP will also develop with light industrial land uses (possible total of 21 076m² GLA).<br>• ACSA agreed with the assumption that the passenger and traffic volumes would increase by 20% over the next five years.<br>• It was assumed that the Western Bypass could be constructed within the next five years and once built, a significant portion of the existing traffic would be redistributed to the bypass.<br>• Currently all study intersections are operating acceptably with no capacity constraints being experienced.<br>• The expected trips from approved Portion 4, Portion 130 – 132 and Portion 139 of GANEP and the expected traffic growth from the George Airport were included as the latent demand.<br>• As part of the approval of Portion 4, Portion 130 – 132 and Portion 139 of GANEP it was proposed that a single-lane roundabout be constructed at the R404/Airport Main Access intersection and |

| | |
|---|---|
| | that the R102/R404 intersection be upgraded to a roundabout or traffic signal.<br>• The construction of the proposed roundabout at the R404/Airport Main Access intersection has been completed.<br>• An average growth rate of 3% per annum was applied to the existing traffic volumes over a five-year horizon period to determine the background traffic volumes.<br><u>Future Background Traffic Conditions Excluding Latent Demand:</u><br>• Based on the result of the capacity analyses of the 2030 background, excluding latent demand, operations without the bypass, the R102/R404 intersection must be upgraded to a single-lane roundabout or a traffic signal.<br>• After implementing the proposed upgrades, all study intersections are expected to operate acceptably with no capacity constraints during the 2030 background, excluding latent demand, operations without the bypass scenario.<br>• All study intersections are expected to operate acceptably with no capacity constraints under the 2030 background, excluding latent demand, conditions with the bypass scenario.<br><u>Future Background Traffic Conditions Including Latent Demand:</u><br>• All study intersections are expected to operate acceptably with no capacity constraints under the 2030 background, including latent demand, conditions without the bypass scenario.<br>• After implementing the recommended upgrades from the approved developments, all study intersections are expected to operate acceptably with no capacity constraints during the 2030 background, including latent demand, operations with the bypass scenario.<br>• Access to the site may only be from the Quarry Access Road or servitude right of way. No access along R404 or the bypass will be allowed and existing accesses along these roads must be closed.<br>• The preferred access (Alternative 1) to Portion 110 light industrial development is via a new public road provided within Portion 34 that links the site to the Quarry Access Road. Permission from ACSA must be granted for this access alternative.<br>• A minimum spacing of 60m must be provided along the Quarry Access Road between the site access and the R404/Quarry Access Road intersection (Alternative 1 & 2).<br>• The Road Master Plan for GANEP indicated a public road within Portion 34 linking Portion 110 to the rest of GANEP north of Portion 34.<br>• The preferred access (Alternative 1) to Portion 110 service utilities, without the bypass, is directly from the proposed cul-de-sac circle on site. |

| | |
|---|---|
| | • The preferred access (Alternative 1) to Portion 110 service utilities, with the bypass, is directly from the proposed cul-de-sac on site, by using the future underpass as proposed by the WCG in the preliminary design for the bypass.<br>• Portion 110 is expected to generate 47 trips (38 in, 9 out) during the AM peak hour and 47 trips (9 in, 38 out) during the PM peak hour.<br>• The GANEP transport study proposed six bus embayments within the GANEP vicinity. Two embayments were proposed along both sides of the R102, downstream of the R102/R404 intersection. Four embayments were proposed along both sides of the R404, downstream of both R404/Airport Main Access and the R404/Quarry Access Road intersections.<br>• Alternatively, Go George services could be provided through the GANEP precinct. An agreement with the George Municipality would need to be implemented for this alternative to be realised.<br>• A 2m gravel walkway is proposed in the road reserve away from the surfaced roadway. This walkway should extend from the proposed bus embayments along the R404 to the R404/Airport Main Access intersection.<br><u>Total Traffic Conditions Including Latent Demand:</u><br>• Based on the result of the capacity analyses of the 2030 total operations without the bypass, the R404/Quarry Access Road intersection must be upgraded to a single-lane roundabout.<br>• However, if Portion 34 is not developed, the proposed roundabout at the R404/Quarry Access Road intersection is not required. It is proposed that the R404/Quarry Access Road roundabout only be constructed after Portion 34 has been developed.<br>• In the interim, it is proposed that a short dedicated left turn lane (30 m) be constructed along the Quarry Access Road at the R404/Quarry Access Road intersection.<br>• After implementing the proposed upgrade, all study intersections are expected to operate acceptably with no capacity constraints during the 2030 total operations without the bypass scenario.<br>• All study intersections are expected to operate acceptably with no capacity constraints under the 2030 total operations with the bypass scenario.<br>• All on-site parking must be according to the George Municipal Standards.<br>It is recommended that the proposed Portion 110 development be approved by the relevant authorities under the following conditions:<br>• 2030 Background excluding Latent Demand without Bypass Scenario: |

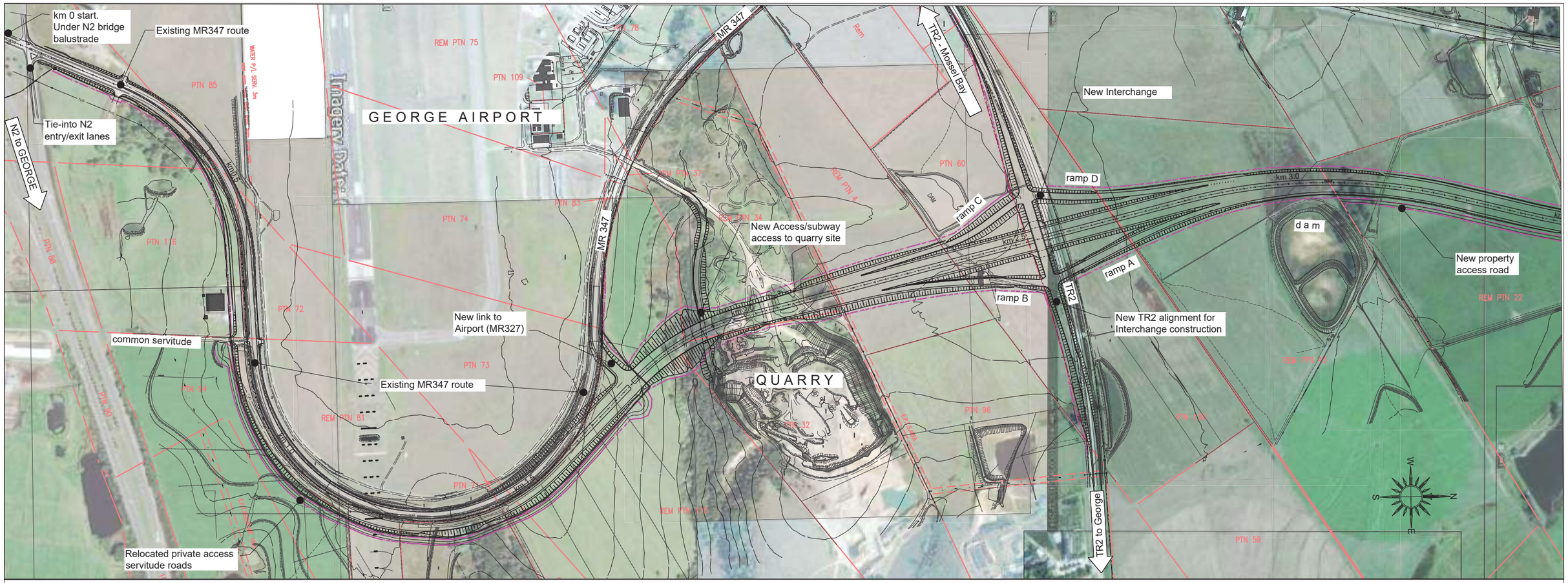
| | |
|---|---|
| | – The R102/R404 intersection be upgraded to single-lane roundabout or a signalised intersection.<br>• 2030 Background including Latent Demand with Bypass Scenario:<br>– The R102/R404 intersection be upgraded to single-lane roundabout or a signalised intersection, as per the recommendations of the approved developments within GANEP.<br>• 2030 Total without Bypass Scenario:<br>– A short dedicated left turn lane (30 m) be constructed along the Quarry Access Road at the R404/Quarry Access Road intersection.<br>– The R404/Quarry Access Road intersection be upgraded to single-lane roundabout once Portion 34 is developed.<br>• The recommendations related to public transport, non-motorised transport and parking are adhered to.<br>With the above recommendations implemented the road network can accommodate the proposed development. Therefore, it is recommended that the proposed development be approved from a transport impact perspective. |

# REFERENCES

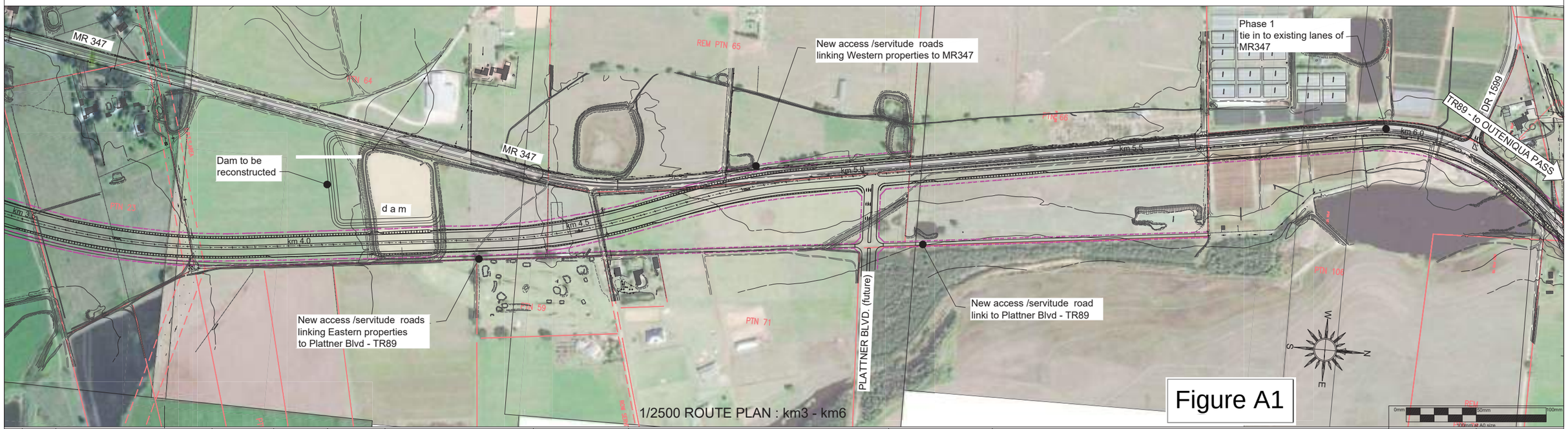
1. Transportation Research Board, Highway Capacity Manual (HCM), 6th Edition, Quality and Level of- Service Concepts, 9 March 2015
2. Committee of Transport Officials, South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Volume 1, August 2012
3. Committee of Transport Officials, South African Trip Data Manual, TMH17, Version 1.1, September 2013
4. Provincial Administration Western Cape, Road Access Guidelines, September 2002
5. Innovative Transport Solutions, Road Planning George Airport North-Eastern Precinct, Road Master Plan and Cost Apportionment, March 2019
6. Innovative Transport Solutions, George Airport North-Eastern Precinct, Transport Study, October 2021
7. Innovative Transport Solutions, Portion 110 – George Airport North-Eastern Precinct, Transport Study, George, October 2023
8. Infrastructure Consulting Engineers, PTN110 – Light Industrial (Airport Support Zone) Final Floor Levels, July 2024
9. Arcus GIBB (Pty) Ltd, Archaeological Impact Assessment, The Proposed George Western Bypass Road, January 2009
10. Kantey & Templer Consulting Engineers, Proposed Trunk Road 89 km 0 to km 12.5 Preliminary Design, September 2016
11. Western Cape Government, Road Network Information System (RNIS) website, 2025
12. WM De Kock Associates, Gwayang Local Spatial Development Framework, November 2015

# Annexure A

## Figures




1/2500 ROUTE PLAN : : km0 - km3




1/2500 ROUTE PLAN : km3 - km6

Figure A1

| NO. | DATE | ADDITIONS AND AMENDMENTS | APPROVED CONS. | APPROVED PRE |
|---|---|---|---|---|
| A | 01-09-2016 | PLOTTED FOR DISCUSSION | PB | WS |

| | |
|---|---|
| DESIGNED BY: | GR TYNDALL P BARKHUIZEN |
| DRAWN BY: | R FORD |
| CHECKED BY: | P BARKHUIZEN |
| APPROVED BY: | GR TYNDALL |

KANTEY & TEMPLER
CONSULTING ENGINEERS
P O BOX 3132 CAPE TOWN SOUTH AFRICA 8000 TEL +27 21 405 9600

CONSULTING ENGINEERS
DATE

WESTERN CAPE GOVERNMENT

DEPARTMENT OF TRANSPORT AND PUBLIC WORKS

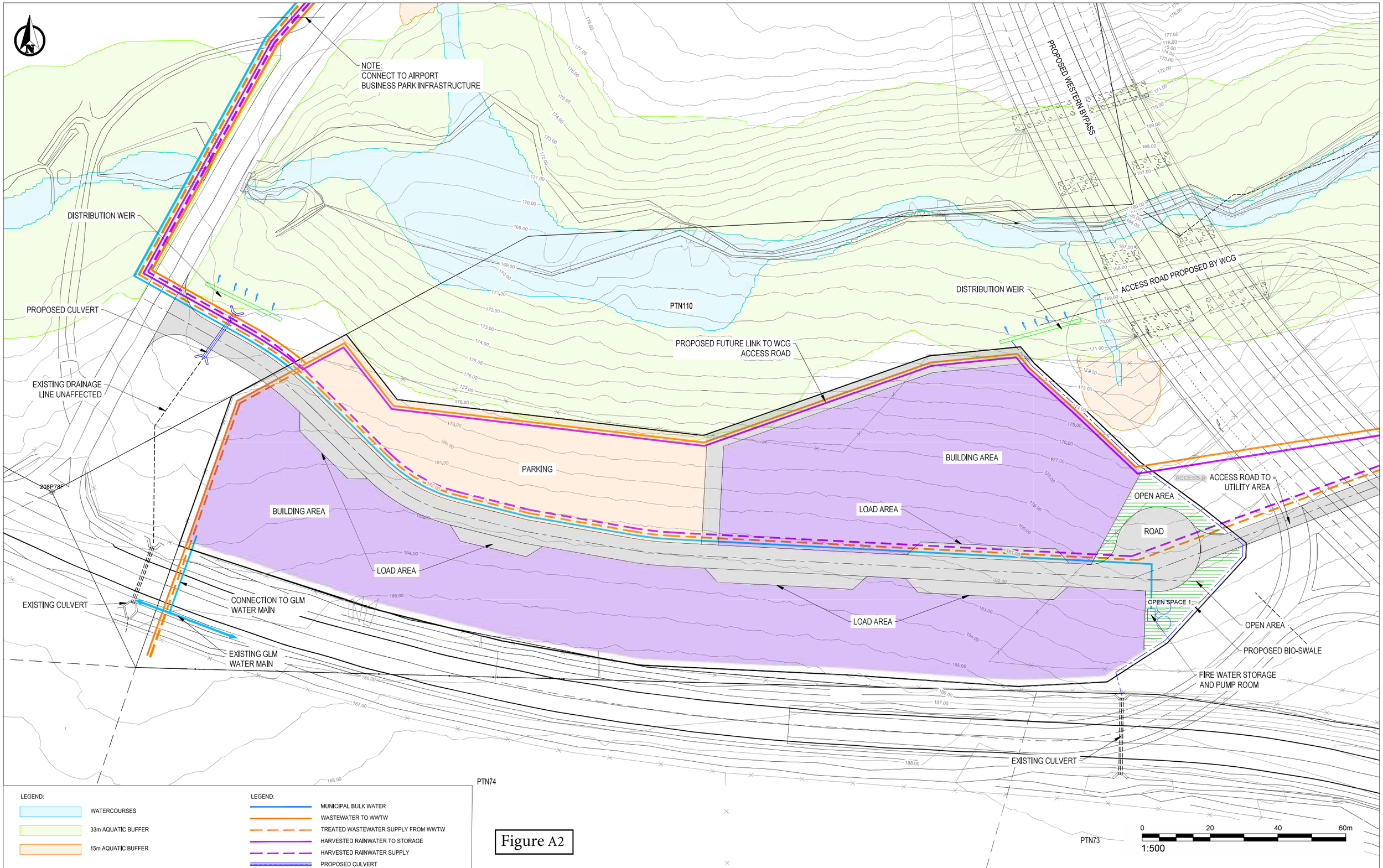
APPROVED
THIS APPROVAL IS FOR PROCEDURAL AND ADMINISTRATIVE REVIEW PURPOSES ONLY AND DOES NOT ATTRACT LEGAL LIABILITY OF ANY KIND FROM WHATSOEVER CAUSE OR HOWEVER ARISING

PROVINCIAL ROADS ENGINEER
DATE

Proposed Trunk Road 89 (George Western Bypass)
km 0 (N2-6) to km12.5 (TR1-1: Outeniqua Pass)
Preliminary Design

Route Plan : km 0 to km 6

| | |
|---|---|
| P.R.E.'s FILE No. | 13/5/1/2/5-377.1 |
| SCALE | 1/2500 |
| CONTRACT No. | C377.1 |
| WCG STRUCTURE PLAN | |
| CONSULTANTS DWG No. | 9643-PD-02 |
| WCG INDEX No. | GD / |




LEGEND:

- WATERCOURSES
- 33m AQUATIC BUFFER
- 15m AQUATIC BUFFER

LEGEND:

- MUNICIPAL BULK WATER
- WASTEWATER TO WWTW
- TREATED WASTEWATER SUPPLY FROM WWTW
- HARVESTED RAINWATER TO STORAGE
- HARVESTED RAINWATER SUPPLY
- PROPOSED CULVERT

Figure A2

| REV | DATE | DESCRIPTION | BY |
|---|---|---|---|
| A | 05/04/2025 | ISSUED FOR INFORMATION | PGJ |

AMENDMENTS

| | |
|---|---|
| DESIGNED BY | P.G. JOUBERT |
| CHECKED BY | P.G. JOUBERT |
| DRAWN BY | I. GOUWS |
| CHECKED BY | P.G. JOUBERT |

INFRASTRUCTURE CONSULTING ENGINEERS
PO BOX 186
PERSEQUOR PARK
0020
Tel (012) 349-2022/3/4/5

PROJECT DESCRIPTION

REZONING AND SUBDIVISION OF PORTION 110 OF THE FARM GWAYANG NO 208, DIVISION GEORGE

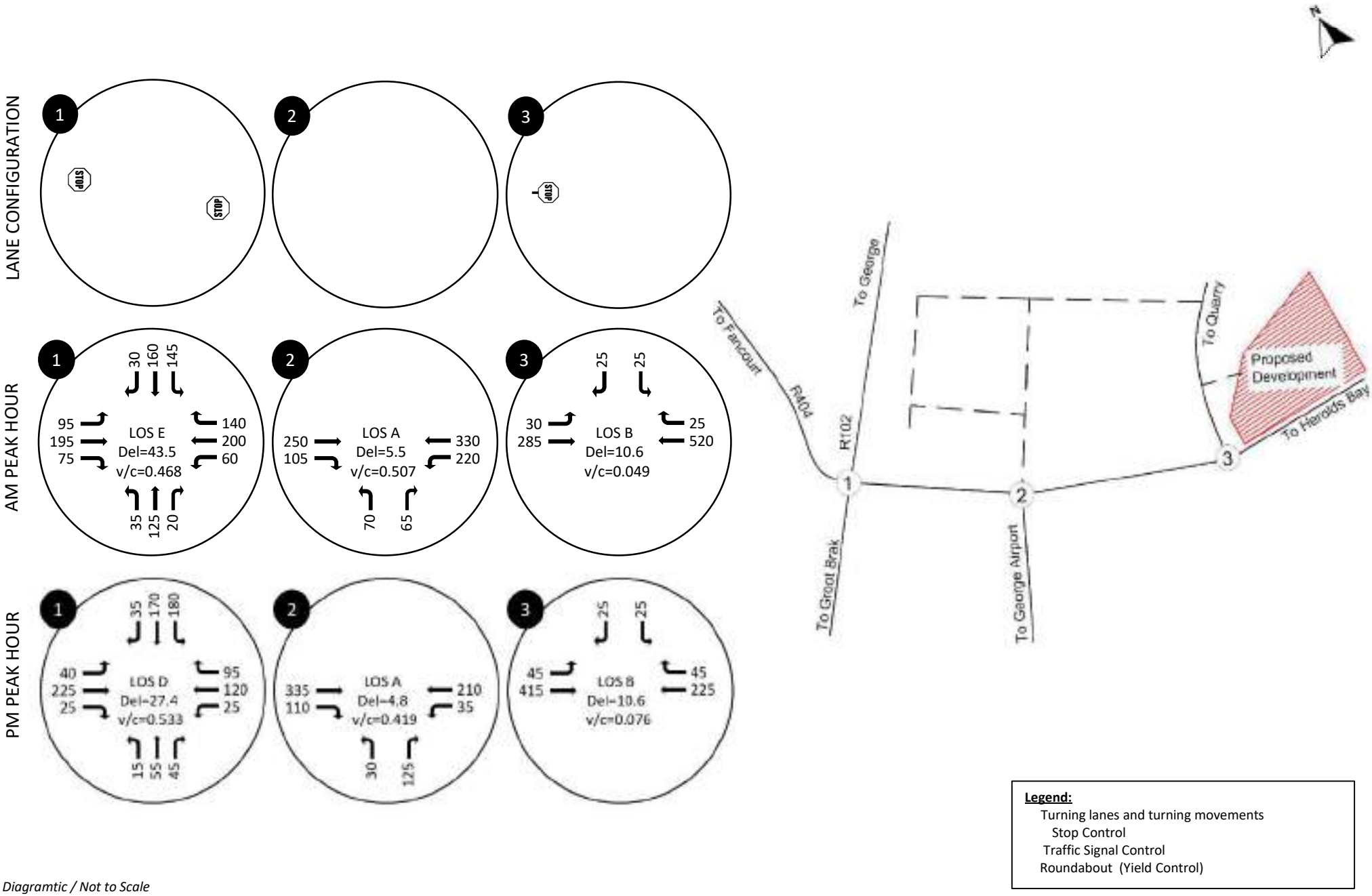
PLAN DESCRIPTION

PTN110 - LIGHT INDUSTRIAL (AIRPORT SUPPORT ZONE) LAYOUT

APPROVED
(Full signature)

DATE

| | |
|---|---|
| CREATION DATE: 12/07/2024 | A1 |
| SCALE 1:500 | REVISION A |
| SHEET | 1 OF 1 |
| PLAN NO. | GASZ-SC1-010-003 |



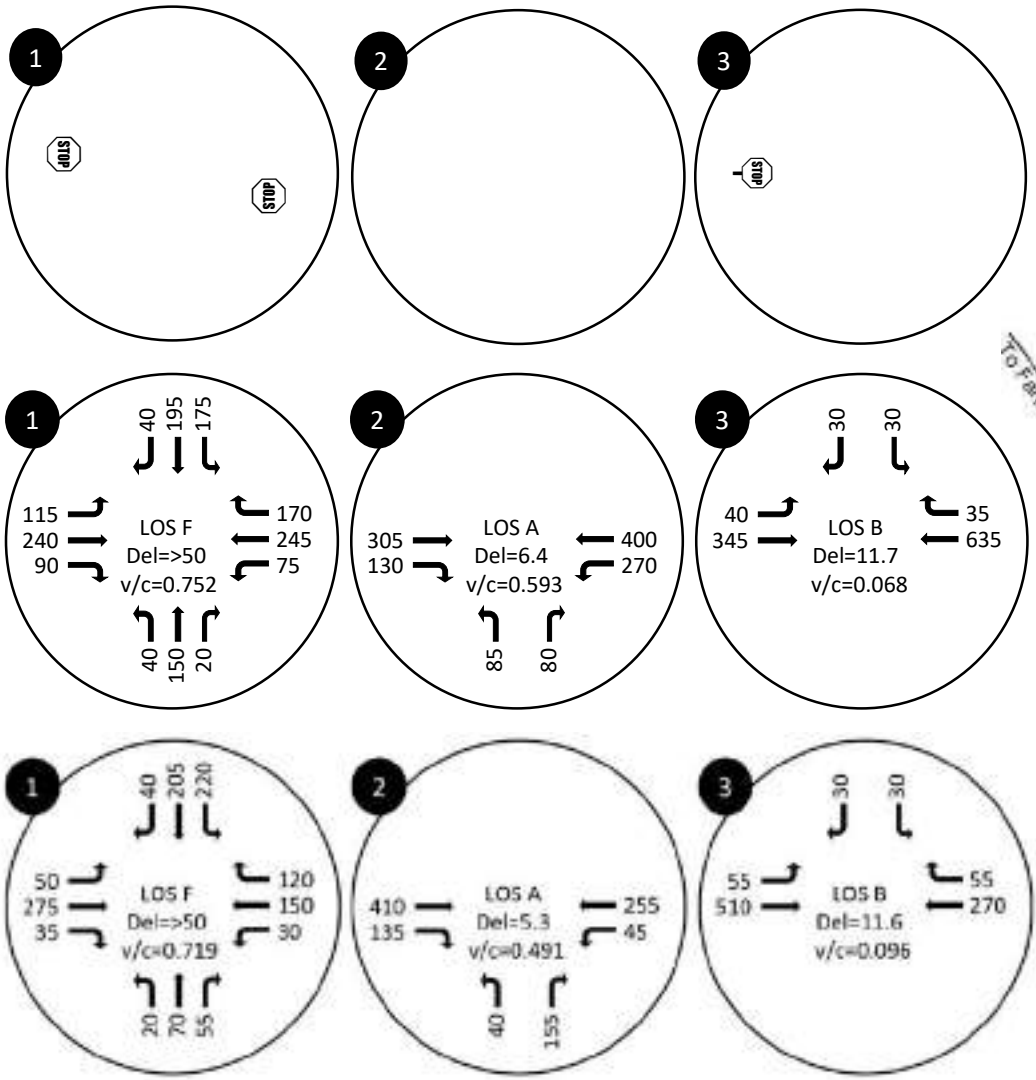

*Diagramtic / Not to Scale*

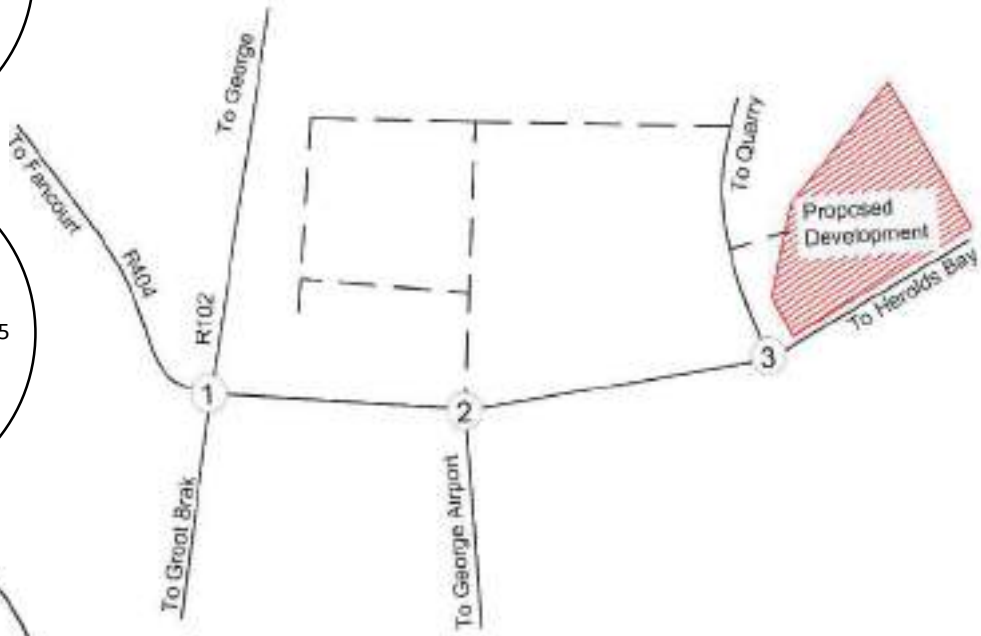
| | | | |
|---|---|---|---|
| its INNOVATIVE TRANSPORT SOLUTIONS | **Portion 110 - George Airport Northern Precinct Transport Study** | **2025 AM & PM EXISTING**<br>Turning Movements & Operations | **Figure:**<br>**A3** |

LANE CONFIGURATION

AM PEAK HOUR

PM PEAK HOUR




**Legend:**

Turning lanes and turning movements

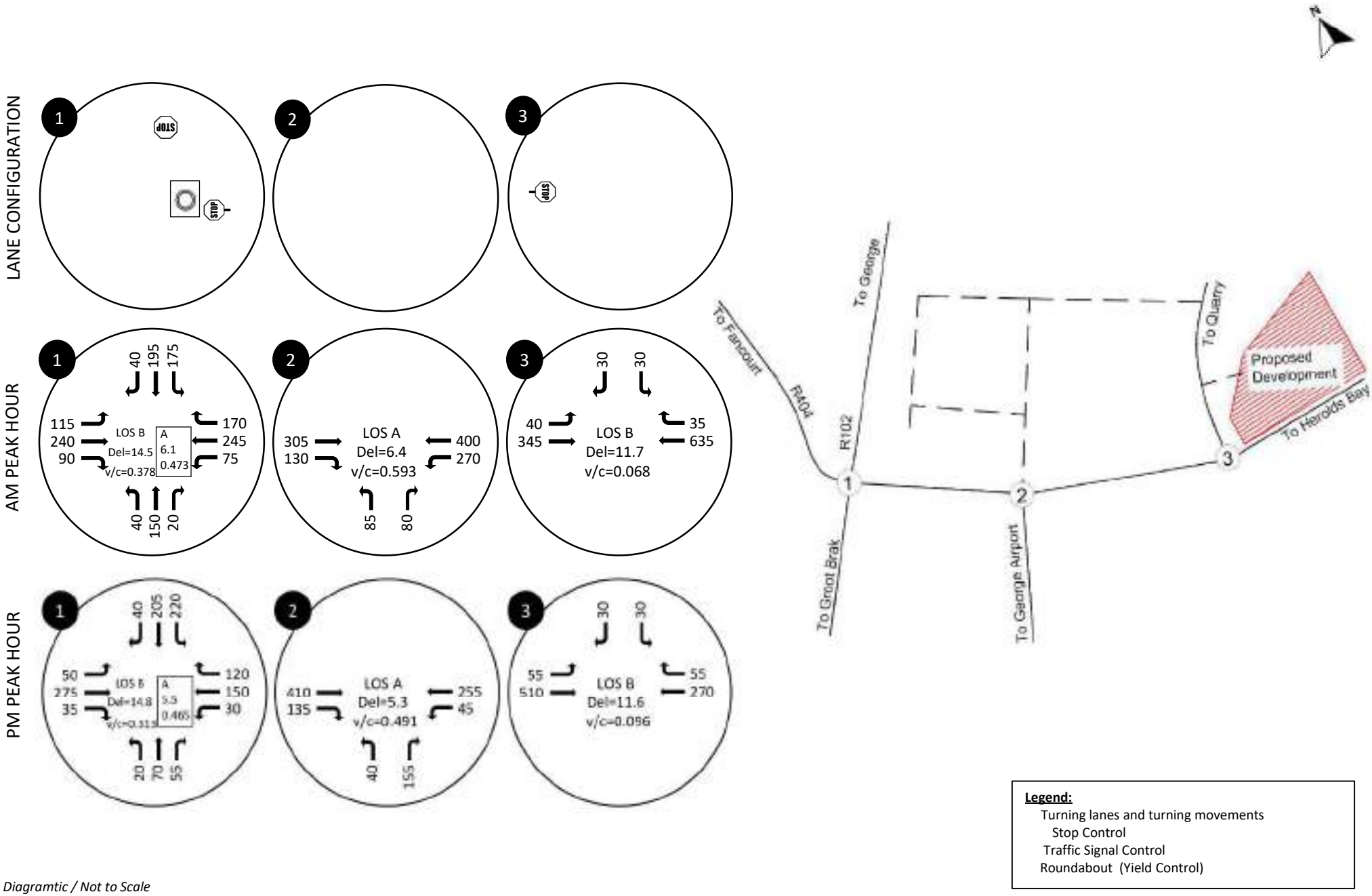
Stop Control

Traffic Signal Control

Roundabout (Yield Control)

*Diagramtic / Not to Scale*

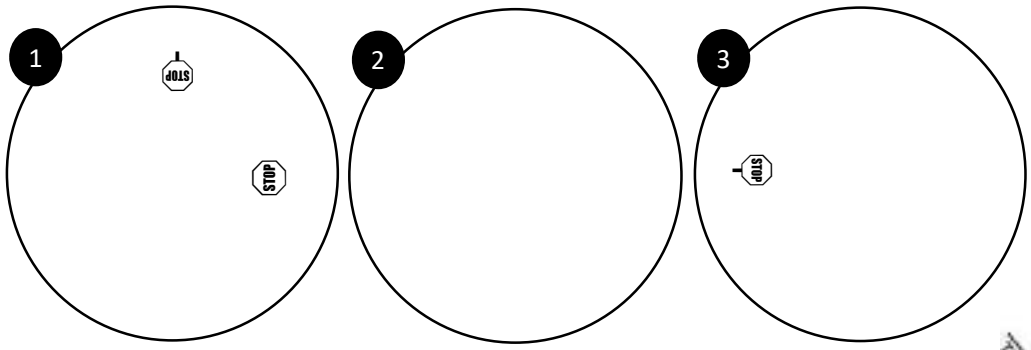
| | | | |
|---|---|---|---|
| its INNOVATIVE TRANSPORT SOLUTIONS | **Portion 110 - George Airport Northern Precinct Transport Study** | **2030 AM & PM BACKGROUND SCENARIO WITHOUT WESTERN BYPASS**<br>Turning Movements & Operations | **Figure:**<br>**A4** |



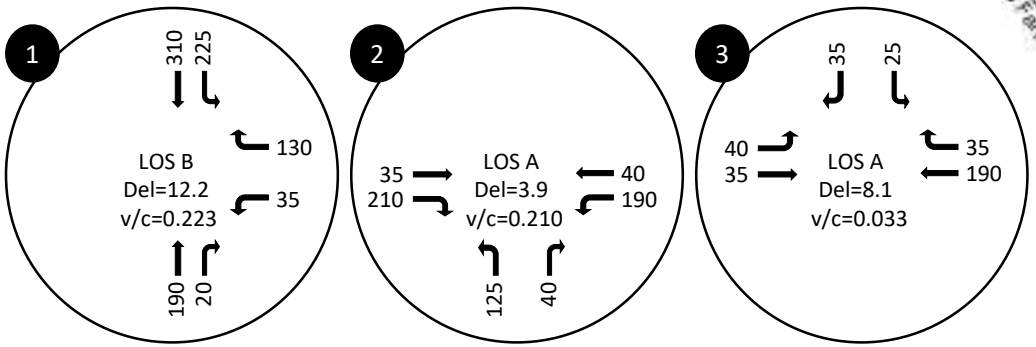

*Diagramtic / Not to Scale*

| | | | |
|---|---|---|---|
| its INNOVATIVE TRANSPORT SOLUTIONS | **Portion 110 - George Airport Northern Precinct Transport Study** | **2030 AM & PM BACKGROUND SCENARIO UPGRADED WITHOUT WESTERN BYPASS**<br>Turning Movements & Operations | **Figure:**<br>**A5** |

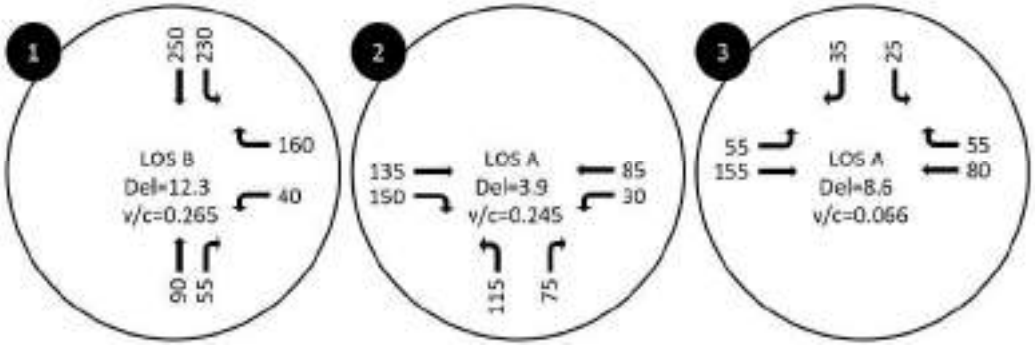
LANE CONFIGURATION

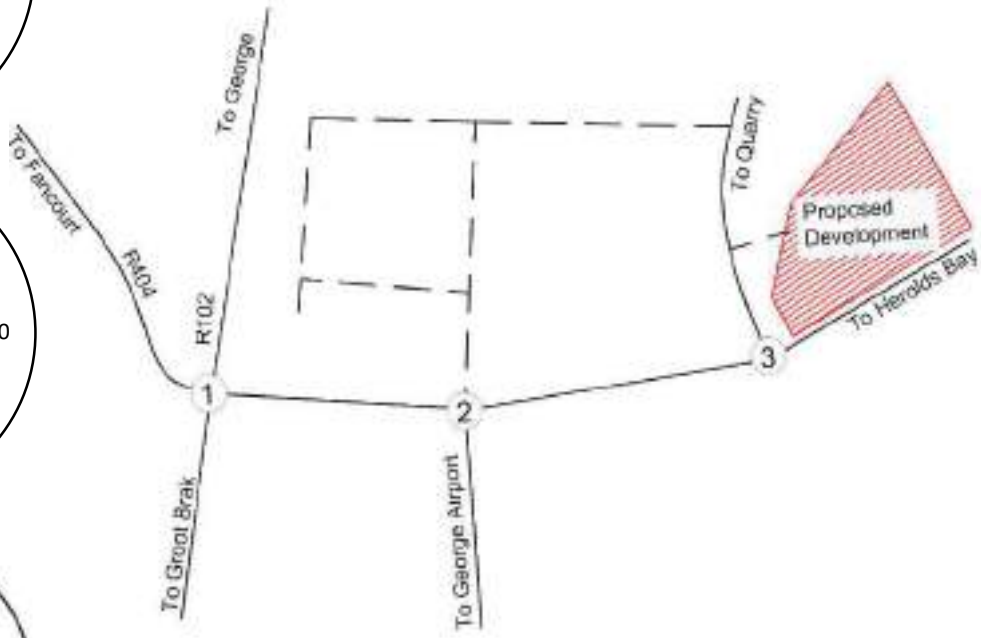



AM PEAK HOUR




PM PEAK HOUR




**Legend:**

Turning lanes and turning movements

Stop Control

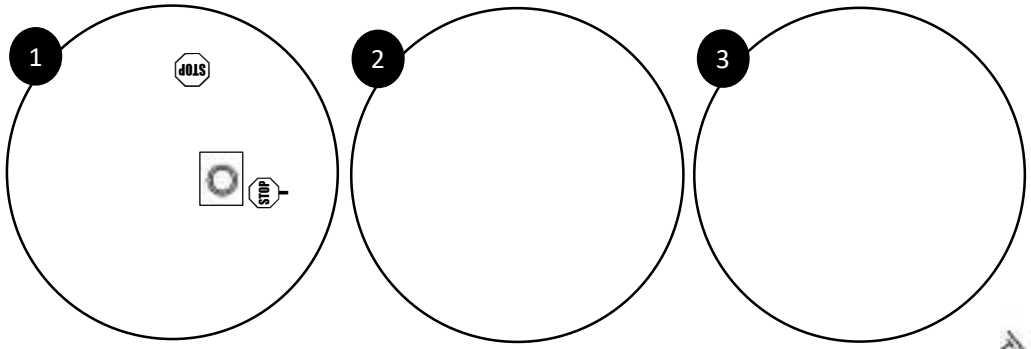
Traffic Signal Control

Roundabout (Yield Control)

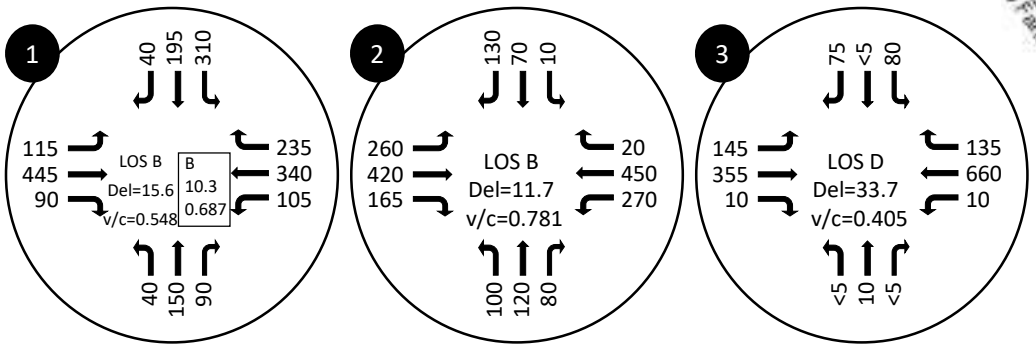
*Diagramtic / Not to Scale*

| | | | |
|---|---|---|---|
| its INNOVATIVE TRANSPORT SOLUTIONS | **Portion 110 - George Airport Northern Precinct Transport Study** | **2030 AM & PM BACKGROUND SCENARIO WITH WESTERN BYPASS**<br>Turning Movements & Operations | **Figure:**<br>**A6** |

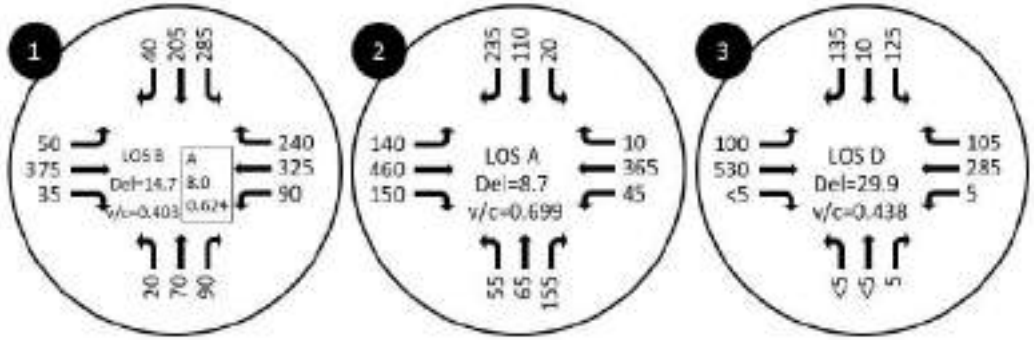
LANE CONFIGURATION

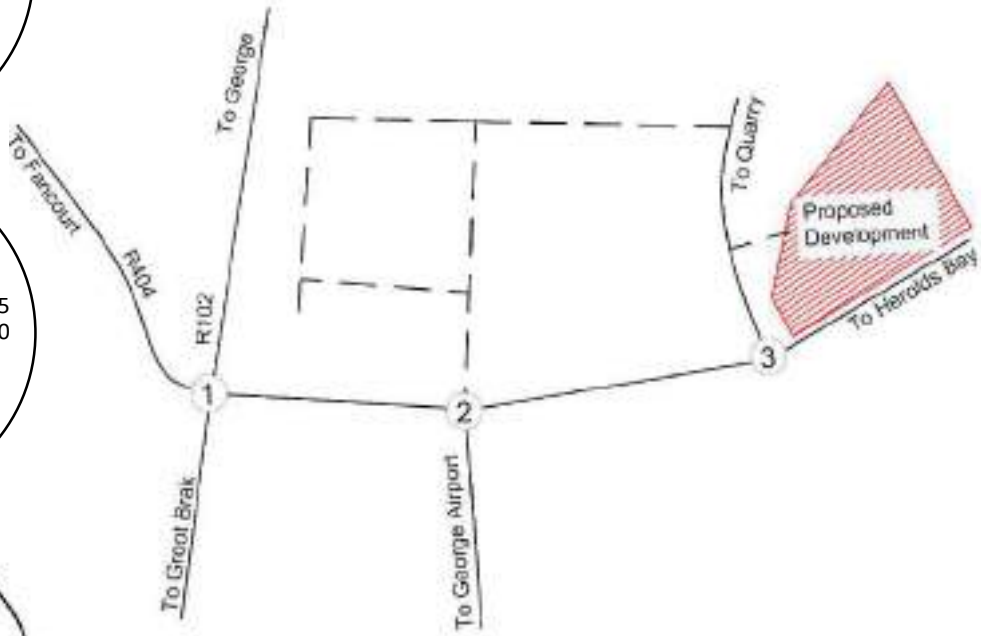



AM PEAK HOUR




PM PEAK HOUR




**Legend:**

Turning lanes and turning movements

Stop Control

Traffic Signal Control

Roundabout (Yield Control)

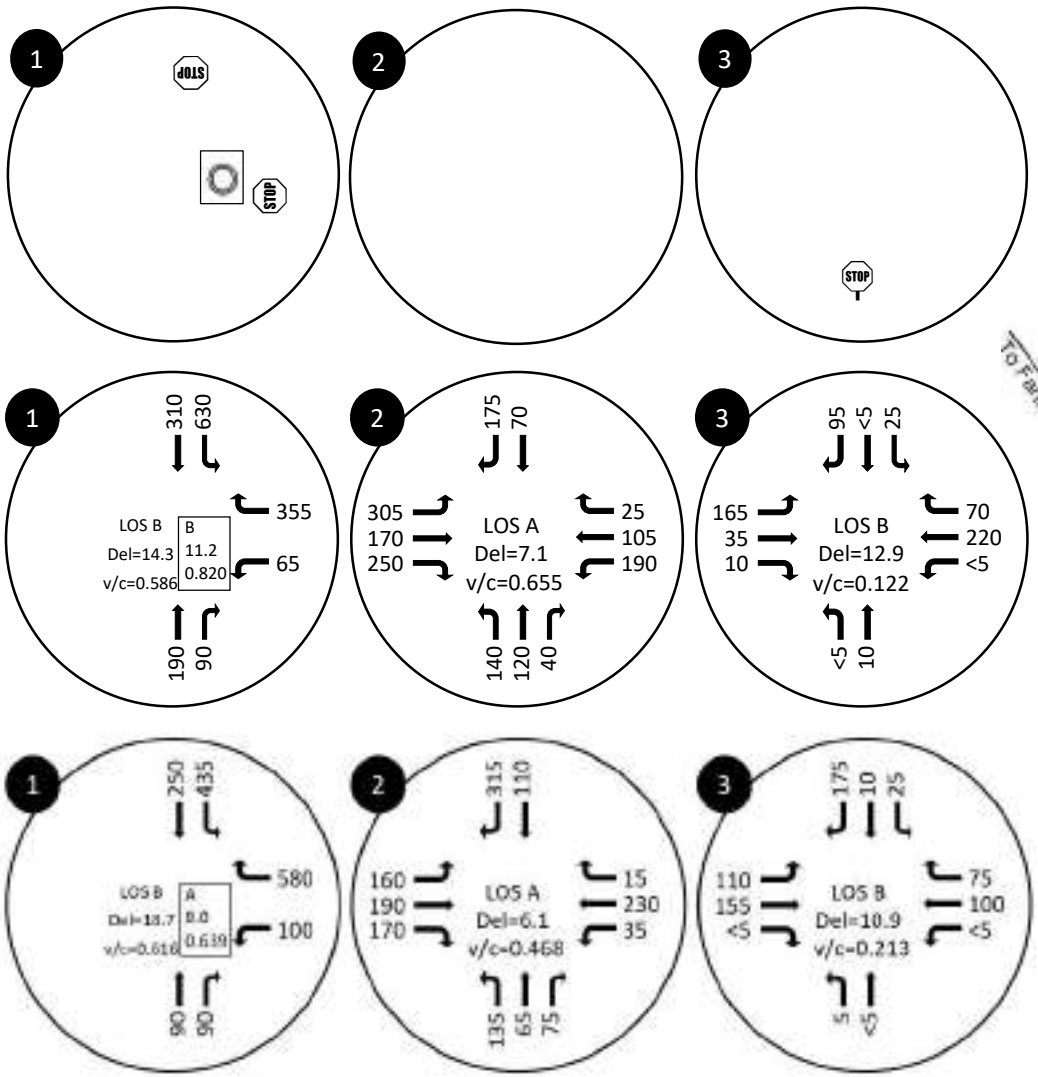
*Diagramtic / Not to Scale*

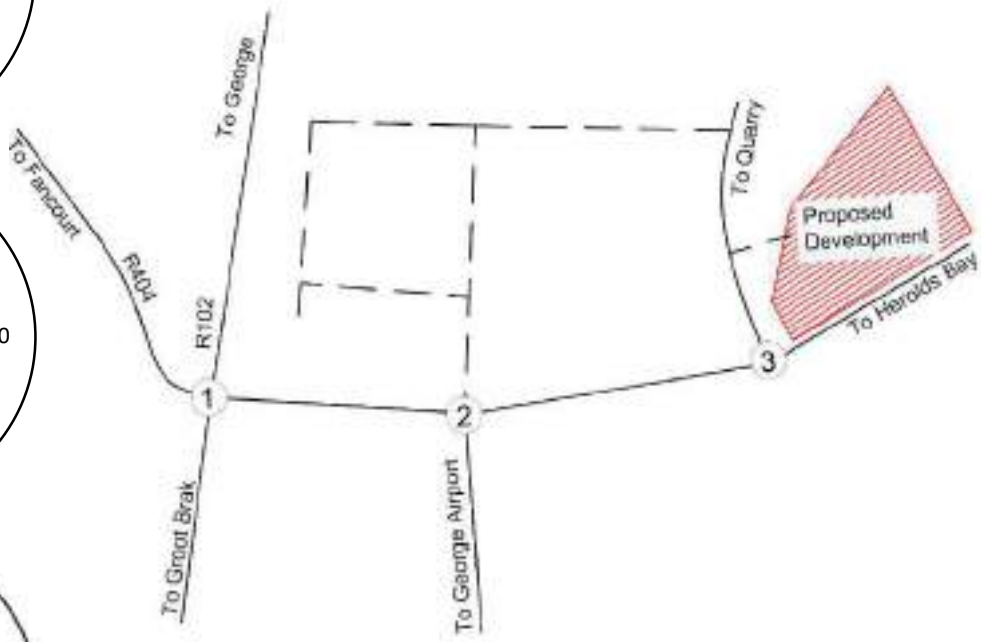
| | | | |
|---|---|---|---|
| its INNOVATIVE TRANSPORT SOLUTIONS | **Portion 110 - George Airport Northern Precinct Transport Study** | **2030 AM & PM BACKGROUND SCENARIO INCLUDING LATENT DEMAND WITHOUT WESTERN BYPASS**<br>Turning Movements & Operations | **Figure:**<br>**A7** |

LANE CONFIGURATION

AM PEAK HOUR

PM PEAK HOUR




**Legend:**

Turning lanes and turning movements

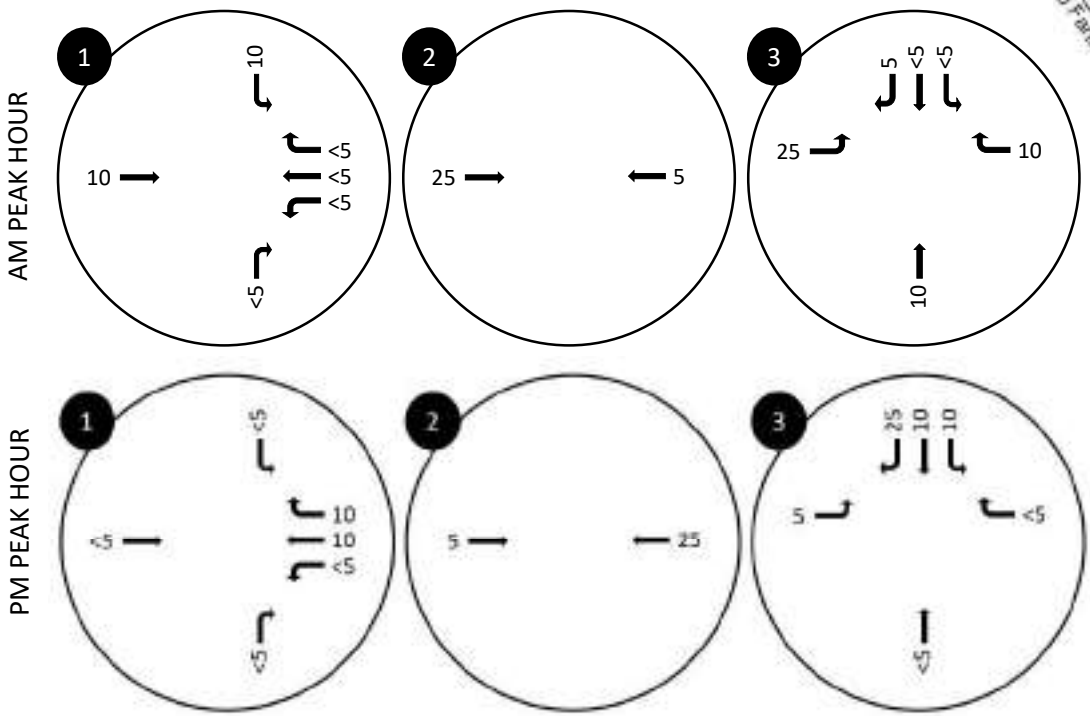
Stop Control

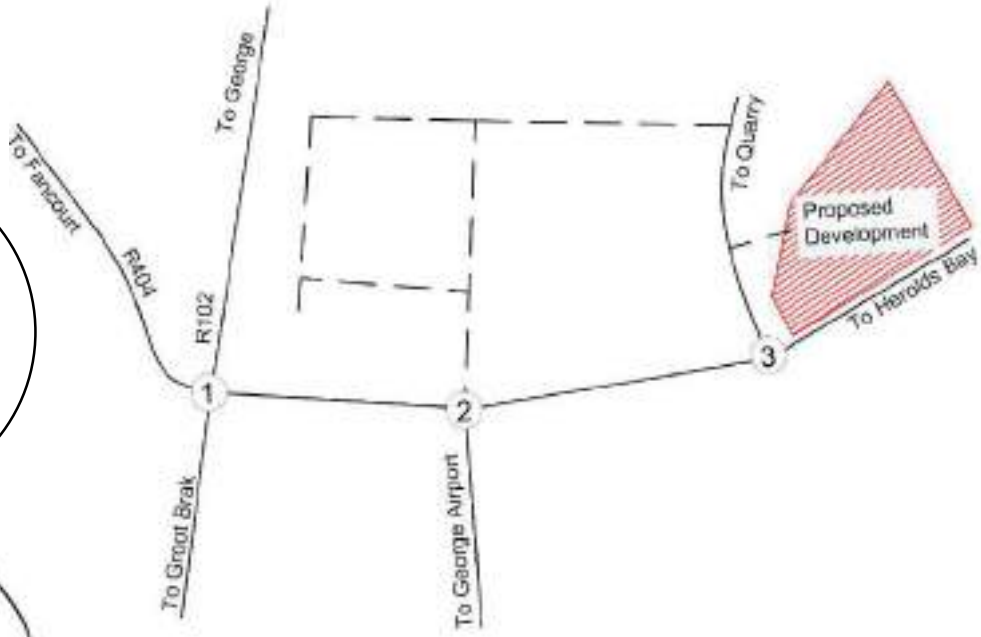
Traffic Signal Control

Roundabout (Yield Control)

*Diagramtic / Not to Scale*

| | | | |
|---|---|---|---|
| its INNOVATIVE TRANSPORT SOLUTIONS | **Portion 110 - George Airport Northern Precinct Transport Study** | **2030 AM & PM BACKGROUND SCENARIO INCLUDING LATENT DEMAND WITH WESTERN BYPASS**<br>Turning Movements & Operations | **Figure:**<br>**A8** |




**Legend:**

Turning lanes and turning movements

Stop Control

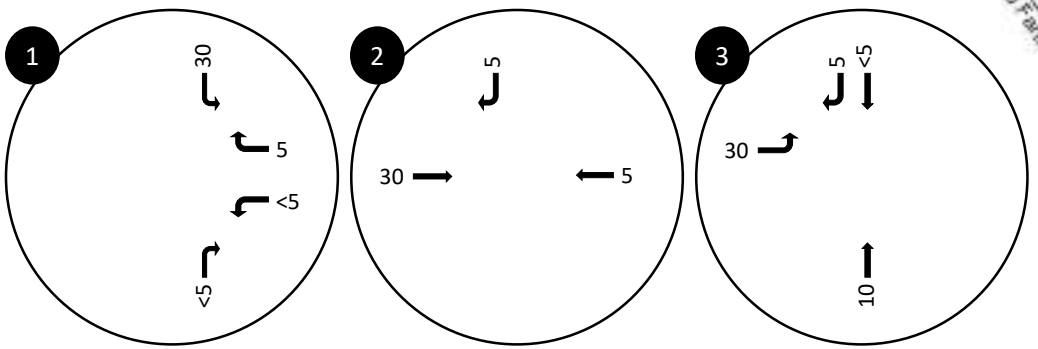
Traffic Signal Control

Roundabout (Yield Control)

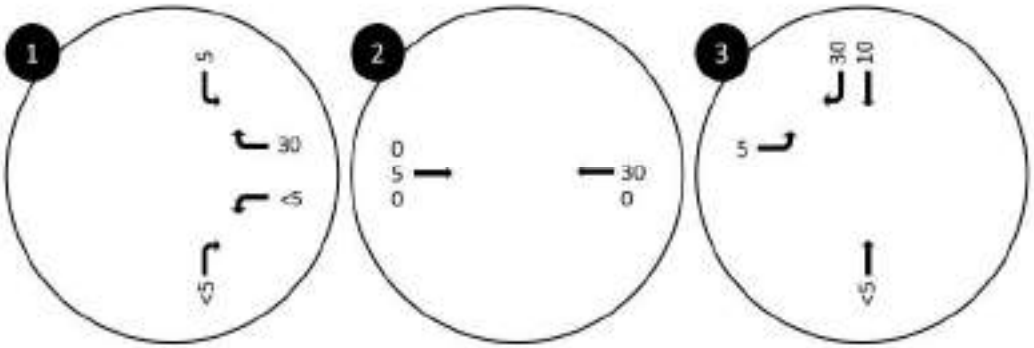
*Diagramtic / Not to Scale*

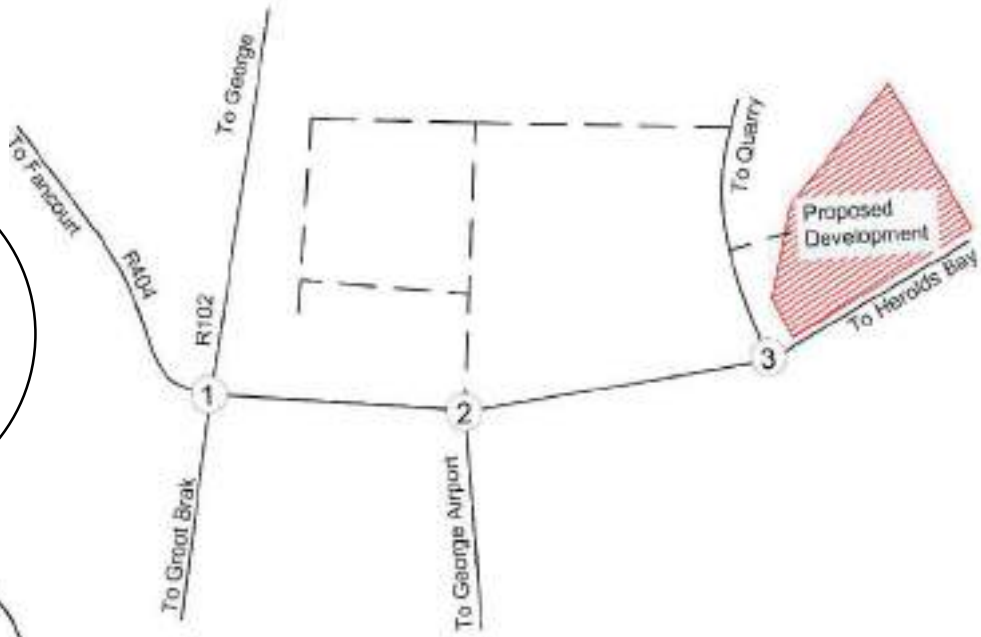
| | | | |
|---|---|---|---|
| its INNOVATIVE TRANSPORT SOLUTIONS | **Portion 110 - George Airport Northern Precinct Transport Study** | **2030 AM & PM TRIP GENERATION WITHOUT WESTERN BYPASS**<br>Turning Movements & Operations | **Figure:**<br>**A9** |

AM PEAK HOUR




PM PEAK HOUR




**Legend:**

Turning lanes and turning movements

Stop Control

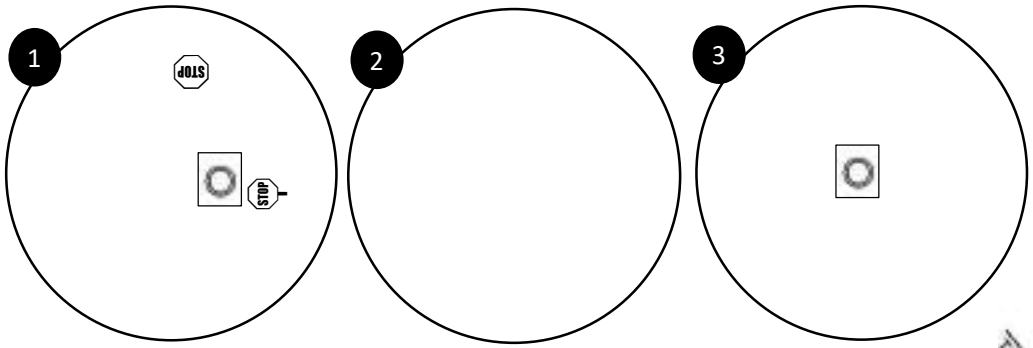
Traffic Signal Control

Roundabout (Yield Control)

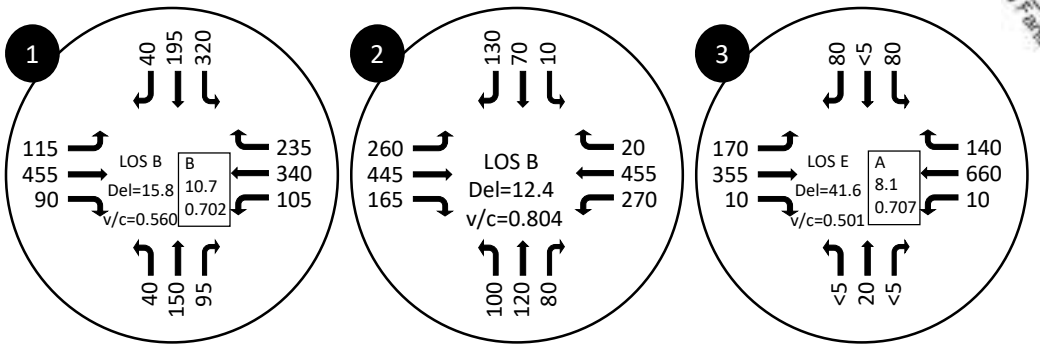
*Diagramtic / Not to Scale*

| | | | |
|---|---|---|---|
| its INNOVATIVE TRANSPORT SOLUTIONS | **Portion 110 - George Airport Northern Precinct Transport Study** | **2030 AM & PM TRIP GENERATION WITH WESTERN BYPASS**<br>Turning Movements & Operations | **Figure:**<br>**A10** |

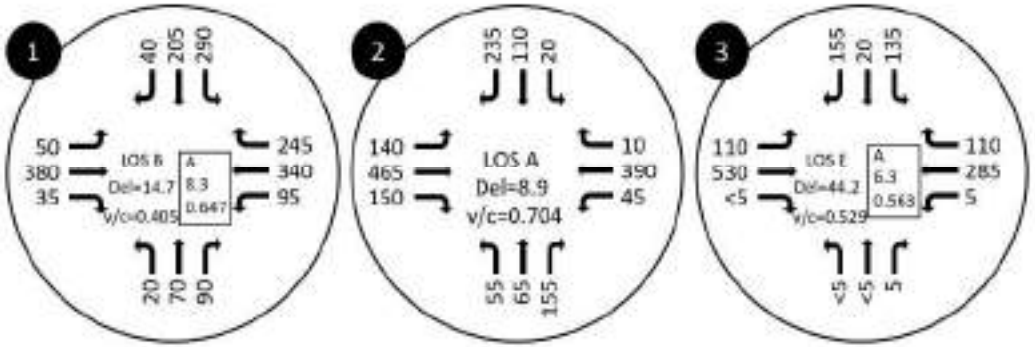
LANE CONFIGURATION

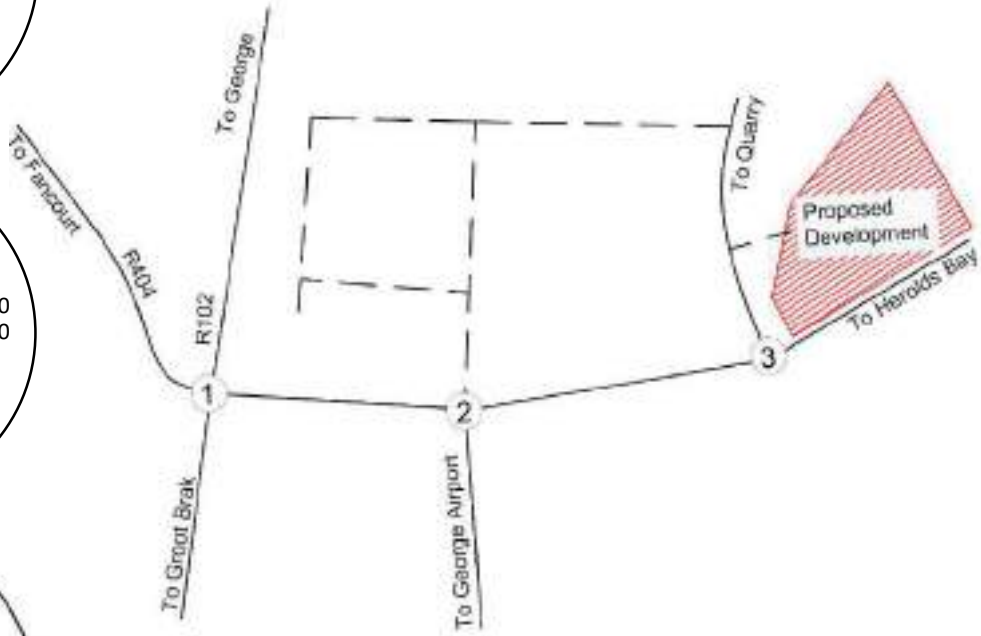



AM PEAK HOUR




PM PEAK HOUR




**Legend:**

Turning lanes and turning movements

Stop Control

Traffic Signal Control

Roundabout (Yield Control)

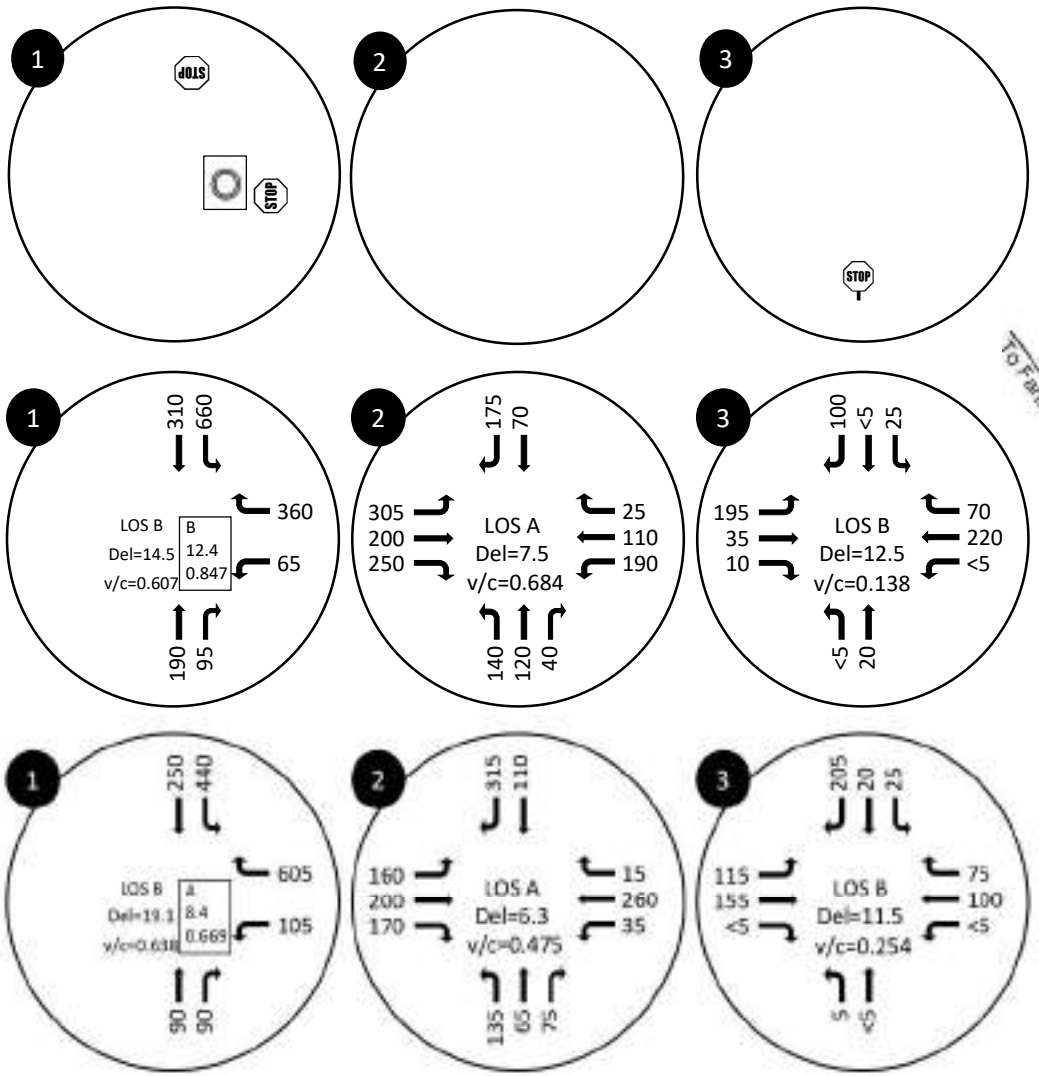
*Diagramtic / Not to Scale*

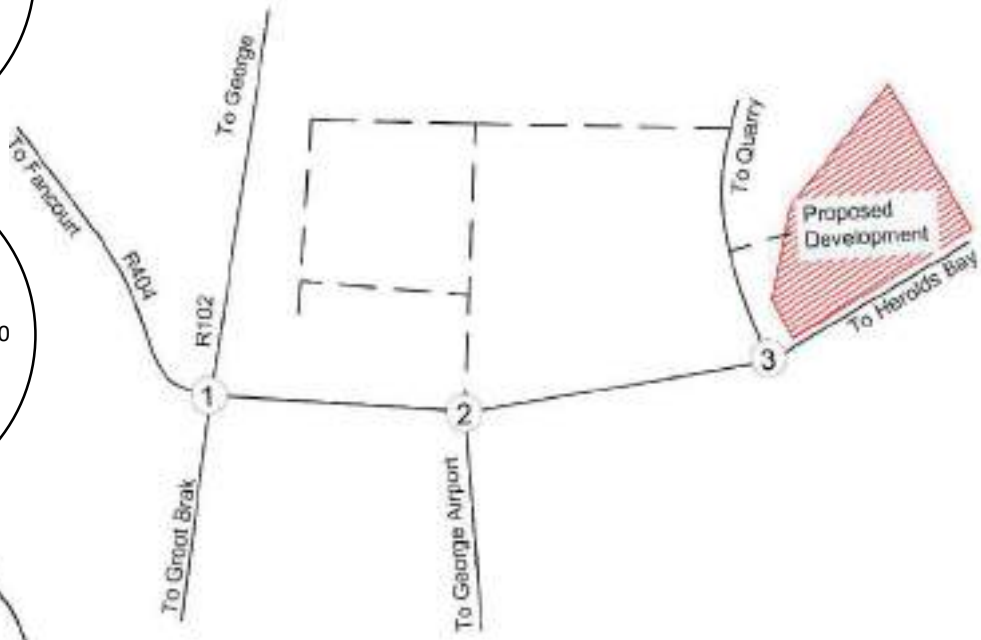
| | | | |
|---|---|---|---|
| its INNOVATIVE TRANSPORT SOLUTIONS | **Portion 110 - George Airport Northern Precinct Transport Study** | **2030 AM & PM TOTAL SCENARIO WITHOUT WESTERN BYPASS**<br>Turning Movements & Operations | **Figure:**<br>**A11** |

LANE CONFIGURATION

AM PEAK HOUR

PM PEAK HOUR




**Legend:**

Turning lanes and turning movements

Stop Control

Traffic Signal Control

Roundabout (Yield Control)

*Diagramtic / Not to Scale*

| | | | |
|---|---|---|---|
| its INNOVATIVE TRANSPORT SOLUTIONS | **Portion 110 - George Airport Northern Precinct Transport Study** | **2030 AM & PM TOTAL SCENARIO WITH WESTERN BYPASS**<br>Turning Movements & Operations | **Figure:**<br>**A12** |

# Annexure B

## Tables

**Table B1: Trip generation rates (GANEP)**

| Ervens | Internal Portions | Land Use | Source | Size/ Volume (GLA) | Units | Weekday AM Peak Hour | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Rate | In | Out | Pass-by | Diverted |
| Portion 4 | | Warehousing | COTO 150 | 32 905 | m2 | 0,50 | 60% | 40% | 0% | 0% |
| | | Filling Station Convenience Store | COTO 820 | 200 | m2 | 4,01 | 65% | 35% | 0% | 0% |
| Portion 130 - 132 | | Service Industry | COTO 110 | 13 544 | m2 | 0,90 | 75% | 25% | 0% | 0% |
| | 1 | Family Restaurant (sit-down) | COTO 932 | 500 | m2 | | | | | |
| | | Fast Food | COTO 933 | 385 | m2 | 45,00 | 55% | 45% | 0% | 0% |
| | 2 | Service Industry | COTO 110 | 5 633 | m2 | 0,90 | 75% | 25% | 0% | 0% |
| | 3-8 | Light Industrial | COTO 140 | 26 801 | m2 | 0,60 | 80% | 20% | 0% | 0% |
| Portion 139 | | Warehousing | COTO 150 | 29 450 | m2 | 0,50 | 60% | 40% | 0% | 0% |
| Portion 34 | | Light Industrial | COTO 140 | 21 076 | m2 | 0,60 | 80% | 20% | 0% | 0% |
| Portion 110 | | Light Industrial | COTO 140 | 8 700 | m2 | 0,60 | 80% | 20% | 0% | 0% |
| | | | | | | Weekday PM Peak Hour | | | | |
| Portion 4 | | Warehousing | COTO 150 | 32 905 | m2 | 0,50 | 45% | 55% | 0% | 0% |
| | | Filling Station Convenience Store | COTO 820 | 200 | m2 | 22,70 | 50% | 50% | 38% | 29% |
| Portion 130 - 132 | | Service Industry | COTO 110 | 13 544 | m2 | 0,90 | 25% | 75% | 0% | 0% |
| | 1 | Family Restaurant (sit-down) | COTO 932 | 500 | m2 | 8,00 | 65% | 35% | 38% | 23% |
| | | Fast Food | COTO 933 | 385 | m2 | 50,00 | 55% | 45% | 52% | 25% |
| | 2 | Service Industry | COTO 110 | 5 633 | m2 | 0,90 | 25% | 75% | 0% | 0% |
| | 3-8 | Light Industrial | COTO 140 | 26 801 | m2 | 0,60 | 20% | 80% | 0% | 0% |
| Portion 139 | | Warehousing | COTO 150 | 29 450 | m2 | 0,50 | 45% | 55% | 0% | 0% |
| Portion 34 | | Light Industrial | COTO 140 | 21 076 | m2 | 0,60 | 20% | 80% | 0% | 0% |
| Portion 110 | | Light Industrial | COTO 140 | 8 700 | m2 | 0,60 | 20% | 80% | 0% | 0% |

| Retail Factors | A | B | |
|---|---|---|---|
| Peak Hour | 6 | 3500 | 6,68 |
| Pass by | 1,95 | 48000 | 2,94 |

| Filling Station Convenience Store | Rate |
|---|---|
| AM | 0,6 |
| PM | 3,4 |
| Pass by | 13% |

**Table B2: Approved and Proposed Trip Generation (GANEP)**

| DRIVEWAY TRIPS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ervens | Internal Portions | Land Use | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | | |
| | | | In | Out | Total | In | Out | Total | |
| Portion 4 | | Warehousing | 99 | 66 | 165 | 74 | 90 | 164 | |
| | | Filling Station Convenience Store | 5 | 3 | 8 | 23 | 23 | 46 | |
| Portion 130 - 132 | | Service Industry | 91 | 30 | 121 | 30 | 91 | 121 | |
| | 1 | Family Restaurant (sit-down) | 0 | 0 | 0 | 26 | 14 | 40 | |
| | | Fast Food | 95 | 78 | 173 | 106 | 87 | 193 | |
| | 2 | Service Industry | 38 | 13 | 51 | 13 | 38 | 51 | |
| | 3-8 | Light Industrial | 129 | 32 | 161 | 32 | 129 | 161 | |
| Portion 139 | | Warehousing | 88 | 59 | 147 | 66 | 81 | 147 | |
| Portion 34 | | Light Industrial | 101 | 25 | 126 | 25 | 101 | 126 | |
| Portion 110 | | Light Industrial | 42 | 10 | 52 | 10 | 42 | 52 | |
| | | **Total Driveway Trips** | **688** | **316** | **1004** | **405** | **696** | **1101** | |
| **Pass-by** | | | | | | | | | |
| Portion 4 | | Warehousing | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Filling Station Convenience Store | 0 | 0 | 0 | 4 | 4 | 8 | |
| Portion 130 - 132 | | Service Industry | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 1 | Family Restaurant (sit-down) | 0 | 0 | 0 | 5 | 3 | 7 | |
| | | Fast Food | 0 | 0 | 0 | 27 | 22 | 48 | |
| | 2 | Service Industry | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 3-8 | Light Industrial | 0 | 0 | 0 | 0 | 0 | 0 | |
| Portion 139 | | Warehousing | 0 | 0 | 0 | 0 | 0 | 0 | |
| Portion 34 | | Light Industrial | 0 | 0 | 0 | 0 | 0 | 0 | |
| Portion 110 | | Light Industrial | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | **Total Pass-by Trips** | **0** | **0** | **0** | **36** | **28** | **64** | max 20% |
| **Diverted** | | | | | | | | | |
| Portion 4 | | Warehousing | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | Filling Station Convenience Store | 0 | 0 | 0 | 6 | 6 | 12 | |
| Portion 130 - 132 | | Service Industry | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 1 | Family Restaurant (sit-down) | 0 | 0 | 0 | 5 | 3 | 8 | |
| | | Fast Food | 0 | 0 | 0 | 24 | 20 | 44 | |
| | 2 | Service Industry | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 3-8 | Light Industrial | 0 | 0 | 0 | 0 | 0 | 0 | |
| Portion 139 | | Warehousing | 0 | 0 | 0 | 0 | 0 | 0 | |
| Portion 34 | | Light Industrial | 0 | 0 | 0 | 0 | 0 | 0 | |
| Portion 110 | | Light Industrial | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | **Total Diverted Trips** | **0** | **0** | **0** | **35** | **29** | **64** | max 20% |
| **TOTAL TRIPS (Inc. Internal Trips)** | | | | | | | | | |
| Portion 4 | | Warehousing | 99 | 66 | 165 | 74 | 90 | 164 | |
| | | Filling Station Convenience Store | 5 | 3 | 8 | 13 | 13 | 25 | |
| Portion 130 - 132 | | Service Industry | 91 | 30 | 121 | 30 | 91 | 121 | |
| | 1 | Family Restaurant (sit-down) | 0 | 0 | 0 | 16 | 9 | 24 | |
| | | Fast Food | 95 | 78 | 173 | 56 | 46 | 101 | |
| | 2 | Service Industry | 38 | 13 | 51 | 13 | 38 | 51 | |
| | 3-8 | Light Industrial | 129 | 32 | 161 | 32 | 129 | 161 | |
| Portion 139 | | Warehousing | 88 | 59 | 147 | 66 | 81 | 147 | |
| Portion 34 | | Light Industrial | 101 | 25 | 126 | 25 | 101 | 126 | |
| Portion 110 | | Light Industrial | 42 | 10 | 52 | 10 | 42 | 52 | |
| | | **GRAND TOTAL** | **688** | **316** | **1004** | **334** | **639** | **973** | |
| **Internal Trips (10%)** | | | | | | | | | |
| | | | 69% | 31% | | 34% | 66% | | |
| | | | 619 | 284 | 904 | 301 | 575 | 876 | |
| **TOTAL TRIPS (After 10% Internal Trips deducted)** | | | | | | | | | |
| Portion 4 | | Warehousing | 89 | 59 | 149 | 67 | 81 | 148 | |
| | | Filling Station Convenience Store | 5 | 3 | 7 | 11 | 11 | 23 | |
| Portion 130 - 132 | | Service Industry | 82 | 27 | 109 | 27 | 82 | 109 | |
| | 1 | Family Restaurant (sit-down) | 0 | 0 | 0 | 14 | 8 | 22 | |
| | | Fast Food | 86 | 70 | 156 | 50 | 41 | 91 | |
| | 2 | Service Industry | 34 | 12 | 46 | 12 | 34 | 46 | |
| | 3-8 | Light Industrial | 116 | 29 | 145 | 29 | 116 | 145 | |
| Portion 139 | | Warehousing | 79 | 53 | 132 | 59 | 73 | 132 | |
| Portion 34 | | Light Industrial | 91 | 23 | 113 | 23 | 91 | 113 | |
| Portion 110 | | Light Industrial | 38 | 9 | 47 | 9 | 38 | 47 | |
| | | **GRAND TOTAL** | **619** | **284** | **904** | **301** | **575** | **876** | |

Pass-by Trips

| Filling Station | Trips Along R404 | Capture Rate | In | Out | Total |
|---|---|---|---|---|---|
| AM | 320 | 4% | 13 | 13 | 26 |
| PM | 320 | 4% | 13 | 13 | 26 |

**Table B3: Total Trip Generation (GANEP)**

| Ervens | Weekday AM Peak Hour | | | Weekday PM Peak Hour | | |
|---|---|---|---|---|---|---|
| | In | Out | Total | In | Out | Total |
| Portion 4 | 94 | 62 | 156 | 78 | 92 | 171 |
| Portion 130 - 132 | 318 | 138 | 455 | 132 | 281 | 413 |
| Portion 139 | 79 | 53 | 132 | 59 | 73 | 132 |
| Portion 34 | 91 | 23 | 113 | 23 | 91 | 113 |
| Portion 110 | 38 | 9 | 47 | 9 | 38 | 47 |
| **GRAND TOTAL** | **619** | **284** | **904** | **301** | **575** | **876** |