ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED NUCLEAR POWER STATION ('NUCLEAR 1') AND ASSOCIATED INFRASTRUCTURE

Transport Specialist Study
Impact Assessment Phase

March 2011




Prepared by: Arcus GIBB Pty Ltd

Prepared for: Arcus GIBB Pty Ltd

On behalf of: Eskom Holdings Ltd

DECLARATION OF INDEPENDENCE

I, Yusry Frizlar as duly authorised representative of Arcus GIBB (Pty) Ltd hereby confirm my independence as well as that of Arcus GIBB as a specialist and declare that neither I nor Arcus GIBB have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Arcus GIBB was appointed as environmental assessment practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Environmental Impact Assessment for the proposed conventional nuclear power station ('Nuclear 1'). I further declare that I am confident in the results of the studies undertaken and conclusions drawn as a result of it – as is described in my attached report.

Signed on Behalf of Arcus GIBB

Yusry Frizlar
DIRECTOR

Report Authors:	Nuran Nordien (B.Sc Eng (UCT)), 9 years experience Yusry Frizlar (Pr.CPM, B.Sc Eng(UCT), B.Sc (Hon) Transport (UP)), 20 years experience
Reviewer and Approver:	Andrew Bulman (Pr.Eng, B.Sc Eng (UCT), M.Eng Transport (Stell)), 15 years experience

EXECUTIVE SUMMARY

INTRODUCTION

Arcus GIBB (Pty) Ltd (Arcus GIBB) was appointed by Eskom Holdings Limited (Eskom) to undertake an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed construction of a nuclear power station and associated infrastructure on one of three selected sites that are located in the Eastern and Western Cape Provinces, namely:

- ***Thyspunt – Eastern Cape ;***
- ***Bantamsklip – Western Cape;***
- ***Duynefontein (Existing Koeberg Site) – Western Cape.***

Two further sites in the Northern Cape, namely Brazil and Schulpfontein, were excluded from further study in the Scoping Phase of the EIA process

This report details the Impact Assessment Phase of Nuclear-1's Transport Specialist Study.

The aim of this Assessment Phase Transport Specialist Study is to determine the transport impact on the existing transport network during all development phases, i.e. construction, operation and decommissioning, of the proposed nuclear power station.

The **Duynefontein** site requires no significant upgrades during the construction and operational phases of Nuclear-1 with regard to intersection upgrades and heavy load transport road upgrades. Duynefontein, however, requires a significant number of stand-by evacuation vehicles to ensure safe evacuation of construction workers if an accident does occur at the adjacent Koeberg Nuclear Power Station during the construction period. These vehicles can be used to shuttle the construction workers to and from the site during the AM and PM peak periods.

Bantamsklip has a significant impact on the transport network, with upgrades required to the public transport system, heavy load routes and road upgrades required for emergency evacuation purposes. Due to the Bantamsklip site's isolated location, transporting heavy loads by road will require significant upgrades and the alternative transport by sea should be considered. A suitable site on the beach near to Bantamsklip will have to be identified and a landing with loading / off-loading facilities will have to be constructed.

Thyspunt requires significant transport upgrades with regard to public transport and access during the construction phases. The R330 is proposed to be used for heavy load transport and may require pavement structure upgrades to cope with the increased heavy loads. The Oyster-Bay Road is proposed to be upgraded to a surfaced road to be used during the construction and operational phase for surrounding staff access, construction traffic and as a required emergency evacuation route for areas such as Oyster-Bay..

NUCLEAR-1 ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PLAN

TRANSPORTATION SPECIALIST STUDY ASSESSMENT PHASE

TABLE OF CONTENTS

ABBREVIATIONS

AADT	Average Annual Daily Traffic
AFB	Air Force Base
AIS	Automatic Identification System
CPTR	Current Public Transport Record
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPZ	Emergency Protective Zone
IRT	Integrated Rapid Transport
ITP	Integrated Transport Plan
KNPS	Koeberg Nuclear Power Station
LOS	Level of Service
NDoT	National Department of Transport
NMT	Non-motorist Transport
NNR	National Nuclear Regulator
NSIP	Nuclear Siting Investigation Programme
PAZ	Protective Action Zone
PE	Port Elizabeth
PGWC	Provincial Government of the Western Cape
SAMSA	South African Maritime Safety Authority (SAMSA)
SDF	Spatial Development Framework
SID	Standard Instrument Departure
SPMT	Self Propelled Modular Transporter
STAR	Standard Instrument Arrival
TCA	Terminal Control Area
TIA	Transport Impact Assessment
TFTC	Test Flight and Development Centre
TSS	Traffic Separation Schemes
UPZ	Urgent Protective Action Zone

1 INTRODUCTION

1.1 Project Background

Arcus GIBB (Pty) Ltd (Arcus GIBB) was appointed by Eskom Holdings Limited (Eskom) to undertake an Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) for the proposed construction of a nuclear power station and associated infrastructure on one of three selected sites located in the Eastern and Western Cape Provinces.

Transportation was identified as one of the areas requiring a specialist study. Arcus GIBB Transportation therefore forms part of the Nuclear-1 EIA team and is responsible for the transportation specialist study component of the EIA.

The Scoping Phase of the EIA process has resulted in the two sites in the Northern Cape being excluded from further investigation.

1.2 Outcomes of Transport Impact Scoping Study

In August 2007, an Inception Report for the transportation specialist study was prepared as part of the screening and scoping phase. The following five potential sites were considered in the EIA process, as shown in **Figure 1.1**:

- ***Thyspunt – Eastern Cape;***
- ***Bantamsklip – Western Cape;***
- ***Duynefontein (Existing Koeberg Site) – Western Cape;***
- ***Brazil – Northern Cape; and***
- ***Schulpfontein – Northern Cape.***

The transportation specialist study Scoping Report presented the preliminary determination of impacts of Nuclear-1 on the environment and its relevant significance (sensitivity) and possible mitigation measures.

It was recommended that the following transportation impacts be investigated in more detail in the assessment phase of the Nuclear-1 EIA process for the sites:

- ***Site access;***
- ***Emergency evacuation;***
- ***Abnormal load transport routing;***
- ***Fuel transport routing;***
- ***Radioactive waste transport routing;***
- ***Normal daily travel impacts;***
- ***Existing and planned transportation infrastructure; and***
- ***Aviation and shipping line impacts.***

FIGURE 1.1

As discussed in the project background, the Northern Cape sites, Brazil and Schulpfontein were excluded from the scope at the end of the Scoping Study.

1.3 Aim of the Transport Impact Assessment Study

The aim of the Transport Impact Assessment (TIA) is to determine the transport impact on the existing transport network during all phases, i.e. construction, operation and decommissioning, of the proposed nuclear power station. This takes into account the impacts and possible mitigation measures for the development of Nuclear-1 for each of the proposed sites as listed below:

- Duynefontein;
- Bantamsklip; and
- Thyspunt.

This report serves as the transportation output of the assessment phase and presents the detailed transportation findings of each site.

1.4 Scope of this Transport Impact Assessment Study

This Transportation Specialist Study will amongst others, answer the following question:

> *What impact will activities associated with the construction and operation of the proposed nuclear power station have on traffic in the surrounding environment and along the access routes to be used for the transportation of equipment and materials?*

The transportation impacts of the nuclear power station during the construction, commissioning, operational and decommissioning phases of the development are assessed through the following processes and tasks:

- ***Site visits and traffic counts at critical road links in the area of each site under consideration***
- ***Description of the background traffic flow based on traffic counts;***
- ***Calculation of future traffic flow based on the background traffic flow;***
- ***Discussion of access location in terms of access spacing, sight distance and operational requirements;***
- ***Conceptual design of the required road / rail upgrades for the facility or to improve evacuation times;***
- ***Description of the proposed development and operation including routing of heavy vehicles;***
- ***Calculation of trip generation and heavy vehicle movement frequency;***
- ***Analysis of the existing and future operation of the road network;***

- ***Existing and future upgrades to the transport network;***
- ***Analysis of possible evacuation times of the local population using the road network;***
- ***Description of the surrounding road / rail network and future transportation planning proposals for each site;***
- ***The frequency and type of rail use;***
- ***Description of the surrounding aviation air routes, within the 80 km annulus of each site;***
- ***Description of the future development proposals for new, extensions and / or closure of airports affecting each site;***
- ***Description of the shipping line network affecting each site; and***
- ***Description of the activities and functions at the ports and harbours affecting each site***

2 FRAMEWORK

2.1 Legislative Framework

The following legislation and guideline documents form the framework for the transportation specialist study:

- ***National Nuclear Regulator Act, 1999 (Act No. 47 of 1999);***
- ***National Road Traffic Act, 1996 (Act No. 93 of 1996);***
- ***National Department of Transport (NDoT) Manual for Traffic Impact Studies, October 1995;***
- ***Hazardous Substances Act, 1973 (Act No. 15 of 1973);***
- ***National Land Transport Transition Act, 2000 (Act No. 22 of 2000); and***
- ***Sea-Shore Act, 1935(Act No. 21 of 1935)***

2.2 Assumptions & Limitations

The following assumptions were made while compiling this report:

- ***A Protective Action Zone (PAZ) of 0.8 km radius is to be implemented around Nuclear-1. No further development will be allowed within the PAZ. Evacuation of employees within the PAZ to be within 4 hours***
- ***A 0.8 to 3 km Urgent Protective Action Zone (UPZ) is to be implemented around Nuclear-1. Evacuation of public within the UPZ to be within 16 hours.***
- ***Low to medium level radioactive waste will be stored at Vaalputs (Northern Cape Province)***
- ***High level radioactive waste (spent fuel) will be stored within the proposed nuclear power station for a period of approximately 60 years as is currently practised at the existing Koeberg Nuclear Power Station***
- ***Nuclear fuel delivery to Nuclear-1 will occur during the operational stage approximately 2 to 3 times a year as for Koeberg Nuclear Power Station. The fuel will be manufactured internationally and will enter South Africa via a major port and transported by road to the proposed Nuclear-1 site. Due to the infrequent annual fuel delivery consignments, the road transport impacts are expected to be negligible and are therefore not considered further in this study.***
- ***Deducing from the information provided by Eskom, the transportation activities expected to occur during the decommissioning phase of Nuclear-1 are expected to be less than the transport activities expected to occur during the construction and operational phases and are therefore not seen as being critical to this assessment. The decommissioning phase transport impacts should be assessed at a later stage closer to the time of decommissioning and are therefore not considered further in this report.***

- ***Several construction phase details such as the location of laydown are currently unknown.***
- ***Eskom has provided an estimation of construction phase traffic, which was used in the analysis. This estimate is assumed to be accurate.***
- ***The construction phase of Nuclear-1 is expected to be completed within a period of approximately 9 years. The peak construction period of Nuclear-1 is expected to occur during 2017 (year 6 of the construction period), assuming that construction starts in 2011. .***

2.3 Methodology

Each site was assessed from a transportation perspective for the different Nuclear-1 development phases as follows:

- ***Status Quo Assessment (No-Go Alternative);***
- ***Construction Phase Assessment; and***
- ***Operational Phase Assessment.***

The Status Quo Assessment determines the existing background traffic for the three sites.

It is assumed that the mitigation actions required for the Construction Phase of the development are undertaken before the Operational Phase commences. The assessment of the Operational Phase transport impacts takes this into account.

Transport impact categories were identified from the Scoping Phase of the EIA to assess each site in terms of its transportation suitability as follows:

- Traffic analysis;
- Access;
- Public transport;
- Non-motorised transport;
- Waste transport;
- Heavy load transport;
- Emergency evacuation;
- Air routes; and
- Shipping lanes.

3 DESCRIPTION OF THE SITES AND SURROUNDING ENVIRONMENT

3.1 Duynefontein

3.1.1 Locality of the Site

The Duynefontein site is situated on the west coast of South Africa in the Western Cape Province and falls within the City of Cape Town's municipal boundary approximately 35 km north of Cape Town as shown in **Figure 3.1**.

The Duynefontein site currently houses the Koeberg Nuclear Power Station, a visitor's centre, various offices and conference facilities and is also a registered nature reserve. Nuclear-1 is proposed to be situated on the Duynefontein site adjacent to the existing Koeberg Power Station, north of Koeberg nuclear power station.. Vaalputs is located approximately 400 km to the north of the site.

3.1.2 Surrounding Land Use

Several residential centres are located in the vicinity of Duynefontein. Melkbosstrand and Bloubergstrand are situated to the south and Atlantis is located approximately 15 km north of the site. Duynefontein is located on the outskirts of Cape Town, which is the largest centre in close proximity to the site. Saldanha is mainly an industrial centre and is located approximately 100 km north of Duynefontein.

Koeberg Nuclear Power Station has a greater PAZ and UPZ than prescribed by the European Utility Requirements (EUR) for light water reactors as proposed for Nuclear-1. The PAZ is a 5 km zone and the UPZ is a 16km zone at Koeberg Nuclear Power Station. Due to the existing Koeberg Nuclear Power Station on the Duynefontein site the proposed Nuclear-1 exclusion and evacuation zones will be concurrent with Koeberg's existing exclusion and evacuation zones. The Duynefontein residential area falls within this 5 km PAZ radius Koeberg Nuclear Power Station. Melkbosstrand and Bloubergstrand, however, fall within the 16 km UPZ.

Currently a 2 km seaward exclusion zone exists around the sea shore bordering the Koeberg Nuclear Power Station as per the Sea-Shore Act, 1935 (Act No. 21 of 1935). No general activity (swimming, operation of sea vessels etc.) is allowed within the 2 km by 3.2 km area of the sea shore adjacent to Koeberg Nuclear Power Station.

Many of the Koeberg Nuclear Power Station staff resides in the Duynefontein & Melkbosstrand residential areas located south of the site.

3.1.3 Road Network

The West Coast Road (R27) and the N7 are primary regional and national distributors as shown in **Figure 3.2**. The R27 runs in a north-south direction and links Cape Town with the west coast areas. It is located approximately 2.5 km east of the site and provides the main access to the Duynefontein site.

The R27 links with the west coast towns of Langebaan, Vredenburg, Saldanha and Velddrif. The N7 also runs in a north-south direction linking the main towns of the Western Cape and Northern Cape.

FIGURE 3.1

3.1.4 3.1.5 Rail Network

There are two railway line branches, as shown in **Figure 3.2**, running in north-south directions from Cape Town.

The line from Cape Town to Namaqualand runs past Kalbaskraal and has two branches to Malmesbury and towards Saldanha. This line is approximately 24 km east of the site.

The Atlantis goods line runs approximately 6 km east of the site, from Cape Town's CBD, traversing Table View and ending in Atlantis. It connects with the suburban rail system at Chempet Station.

3.1.5 Airports

The existing major and minor airports and landing strips in the vicinity of the site are shown in **Figure 3.2** and are listed as follows:

- ***Major airports and landing strips:***
    - Cape Town International Airport;
    - Ysterplaat and Langebaan (Military airfields); and
    - Stellenbosch airfield.
- ***Minor airports and landing strips:***
    - Diepkloof airfield;
    - Rosenburg farm airstrip;
    - Saldanha airfield; and
    - Kersefontein airfield.

3.1.6 Harbours

The existing harbours in the vicinity of the proposed Nuclear-1 are shown in **Figure 3.2** and are listed as follows:

- ***The Port of Cape Town; and***
- ***The Port of Saldanha.***

FIGURE 3.2

3.2 Bantamsklip

3.2.1 Locality of the Site

Bantamsklip is situated on the southern coast of South Africa and lies within the Western Cape Province approximately 250 km southeast of Cape Town as shown in **Figure 3.3**. It is part of the Overstrand Local Municipality and is within the Overberg District Municipality Area. Bantamsklip is situated to the east of Gansbaai and is currently vacant, but covered with vegetation.

Vaalputs is located approximately 500 km to the north-west of the site. Pearly Beach is located less than 10 km to the north-west and Bredasdorp is located 60 km to the north-east of the site.

3.2.2 Surrounding Land Use

Fishing and holiday towns are scattered along the southern coast in the vicinity of the site. The main towns are Gansbaai, Bredasdorp, Stanford and Hermanus.

3.2.3 Road Network

The N2 runs in an east-west direction approximately 60 km north of Bantamsklip and links to the N7 via Cape Town as shown in **Figure 3.4**. The N2 can be accessed from Bantamsklip via several routes along the R43, R326 and the R320. The R43 is a surfaced road, which runs adjacent to the Bantamsklip site and gives direct access to the site. The site can currently be traversed via off-road tracks.

The Overstrand Local Municipality experiences a large influx of holiday makers during the summer holidays. On average a 50% increase in vehicular traffic and a 100% increase in pedestrians are experienced in this period.

The existing road network has sufficient capacity to carry existing traffic and should be able to do so for the foreseeable future. One outstanding exception however, is the portion of the R43, between Hawston and Hermanus. Delays in excess of 30 minutes are experienced during weekday peak hours, with increasing delays during holiday periods.

The Overstrand Municipality and the Provincial Government of the Western Cape are in discussion over the upgrading of this road section. Delays are also experienced on the N2, in the Grabouw / Sir Lowry's Pass region, but this is generally limited to holiday periods.

3.2.4 Rail Network

A number of railway lines run through the Overberg District Municipality. However, very few of these are operational and where services are delivered, it is mostly limited to the transportation of goods.

FIGURE 3.3

FIGURE 3.4

3.2.5 Airports

The Overberg District Municipality has a number of airstrips. The largest is located at the Test Flight and Development Centre (TFTC) Airforce base between Bredasdorp and Waenhuiskrans in the Cape Agulhus municipal area as shown in **Figure 3.4**.

The Cape Agulhus municipal area also has a second private airstrip at Andrew's Field, between Bredasdorp and Struisbaai. There is also an airstrip at the Bontebok National Park in the Swellendam municipal area, which is used for the transportation of tourists. The Theewaterskloof municipal area, situated to the west of the Overstrand municipal area, also has an airstrip in Caledon.

The closest major commercial airport is at Cape Town International Airport. The TFTC Airfield is planned to be upgraded to provide domestic and international aeronautical transportation capacity for the development of the region's tourism and industrial sectors for the increased economic and social development growth through sustainable development.

3.2.6 Harbours

The Port of Cape Town is the closest harbour in the vicinity of the Bantamsklip site. The harbour is 250km away from the site.

3.3 Thyspunt

3.3.1 Locality of the Site

Thyspunt is situated on the east coast of South Africa and lies within the Eastern Cape Province approximately 80 km west of Port Elizabeth as shown in **Figure 3.5**. It is located in the Cacadu District Municipality on the Kouga Coast.

Vaalputs is located in the Northern Cape Province cross-country from Thyspunt approximately 750 km to the north-west. Humansdorp is located 15 km to the north, Oyster Bay is located 7 km west of the site, and Umuzamawethu is located 5km from the site.

3.3.2 Surrounding Land Use

The surrounding coastal towns such as Oyster-Bay and Cape St. Francis are mainly low-density holiday and tourist destinations with Humansdorp being the closest major town. The inland areas are utilised mainly for farming.

3.3.3 Road Network

The N2 runs in an east-west direction connecting the main centres along the east coast, such as Port Elizabeth, George and Cape Town as shown in **Figure 3.6**. The R102 runs parallel to the N2 from Humansdorp through Jeffrey's Bay to Port Elizabeth.

The N2 links to the N7 via Cape Town. Access to the N2 from Thyspunt is via Humansdorp along the R330 or the unsurfaced Oyster-Bay Road. The R330 is a surfaced road that runs from Humansdorp in a southerly direction past St. Francis Bay to Seal Point on the coast. The existing unsurfaced road, which runs from Humansdorp south to Oyster-Bay, is in fairly good condition during the dry season and requires more maintenance during the wet season.

FIGURE 3.5

FIGURE 3.6

3.3.4 Rail network

There are currently two railway services operating on the railway lines in the Cacadu District Municipality, as shown in **Figure 3.6,** and these are as follows:

- ***Alicedale – Grahamstown; and***
- ***Port Alfred – Bathurst.***

The Alicedale – Grahamstown service is mostly used by work seekers and shoppers travelling to Grahamstown, whereas the Port Alfred – Bathurst service is mostly used by tourists to explore the Bathurst area.

3.3.5 Airports

The main air access to the Cacadu District is via the national airport in the Nelson Mandela Metro as shown in **Figure 3.6**. However, there are other airports in the District which perform significant regional functions.

The provincial government owned air landing field in Ndlambe Municipality is leased by a private company that owns the property around the facility and is utilised for training pilots. About 200 to 250 learners are taught to fly an aircraft per year for both commercial and air transport plane licenses.

The facility has three grass runways and no sophisticated landing instruments are used due to unavailability of tarred runways and other facilities. The private company has requested funding from the Province to surface one of the runways.

Airports that can accommodate light aircraft are located at St. Francis Bay, Humansdorp and Paradise Beach.

3.3.6 Harbours

The main sea access to the Cacadu District is via the national harbour in the Nelson Mandela Metro as shown in **Figure 3.6**. However, there are other harbours which perform significant regional functions in the District.

There are small boat harbours, which have been constructed by private developers, at Port Alfred and Port St. Francis. These are mainly used for recreational purposes and commercial fishing.

4 DUYNEFONTEIN TRANSPORT STATUS QUO ASSESSMENT

4.1 Access & Internal Road Network

4.1.1 Current Access

The Duynefontein site can be accessed via the following three access points as shown in **Figure 4.1**.

- ***R27 / Main Access Road (Access 1);***
- ***R27 / Emergency Access Road (Access 2); and***
- ***Narcissus Avenue / Ou Skip Road (Access 3).***

The three access points are currently unsignalised. Access 1 operates as a main access, Access 2 operates as an emergency access point only and Access 3 operates as a secondary access to the Koeberg Nuclear Power Station.

4.1.2 Access Spacing

In accordance with the Road Access Guidelines (PGWC, 2001) the minimum spacing requirement between unsignalised intersections along the R27 in a semi-rural development environment is as follows:

- ***Class 1 Expressway: 1600 m***

The current spacing along the R27, as shown in **Figure 4.1**, between:

- Access 2 and Access 1 is 1300 m; and
- Access 1 and Napoleon Street is 1500 m.

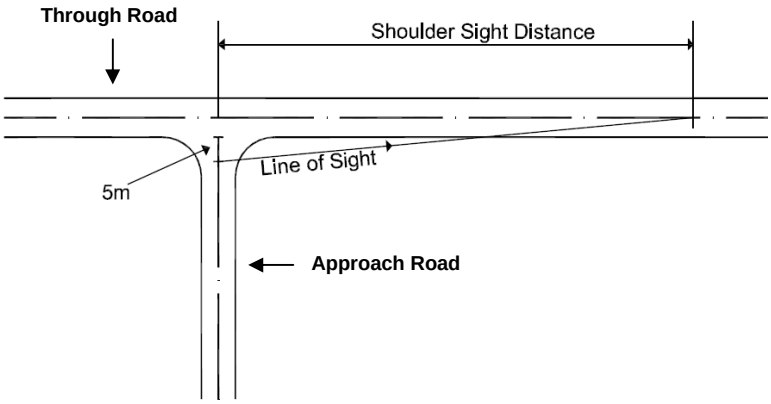
The existing unsignalised intersection spacings shown above are below the minimum requirement of 1600 m.

FIGURE 4.1

4.1.3 Sight Distance

Shoulder sight distance according to the Geometric Design of Rural Road: TRH 17 (NDoT, 1988), can be defined as follows and is shown in the diagram below:

"At a stop-controlled intersection, the driver of a stationery vehicle along an approach road must be able to see enough of the through road to be able to cross before an approaching vehicle reaches the intersection, even if this vehicle comes into view just as the stopped vehicle starts to cross. The line of sight is taken from a point on the centre line of the crossing road and 5 m back from the edge of the through road to a point on the centre line of the through road"



According to the Geometric Design of Rural Roads: TRH 17 (NDoT, 1988) at the 120 km/hr design speed on the R27, the shoulder sight distance for a stop-controlled intersection is 250 m for passenger vehicles. The shoulder sight distance available at both Access 1 and Access 2 is in excess of 250 m and is therefore acceptable.

4.1.4 Internal Road Network

Currently the internal vehicular speed limit is 50 km/hr with traffic calming measures such as speed bumps should be present. The internal road lane widths vary from 3.5 m to 6 m.

4.2 Traffic Analysis

4.2.1 Background Traffic

Manual traffic counts were undertaken on the 18th of June 2008 during the AM (06:00-09:00) and PM (16:00 – 18:00) peak periods, at the following intersections:

- ***R27 / Main Access Road (Access 1);***
- ***R27 / Napoleon Street;***
- ***Ou Skip Road / Narcissus Avenue (Access 3); and***
- ***Ou Skip Road / Main Access Road.***

The locations of the above-mentioned intersections are shown in **Figure 4.1**.

The AM and PM peak hours are:

- ***AM peak hour – 07:00 to 08:00; and***
- ***PM peak hour – 16:30 to 17:30***

The results of the 2008 AM and PM peak hour background traffic counts are shown in **Annexures A1 and A2.**

It is proposed that Nuclear-1 will be completed by 2021. The 2008 background traffic volumes were used to determine the 2021 background traffic by applying an annual growth rate of 2%. No annual growth rate was applied to the background traffic turning movements into the existing Koeberg Nuclear Power Station site as the staff compliment is expected to remain constant.

The growth rate in private car trips was derived from a comparison of the historical data obtained from the PGWC road network information reports website. This growth rate was applied to the counted through traffic volumes on the R27.

The traffic estimated to be generated by the Koeberg Administrative Complex & Training Centre Campus development obtained from the above-mentioned development's TIA (HHO, 2007) were superimposed on the 2018 background traffic volumes as these developments are expected to be completed by 2018.

The calculated 2021 background traffic volumes for the AM and PM peak hours are shown in **Annexures A3 and A4.**

4.2.2 Intersection Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 Computer Programme for the following intersections:

- ***R27 / Main Access Road (Access 1);***
- ***R27 / Napoleon Street;***
- ***Ou Skip Road / Narcissus Avenue (Access 3); and***
- ***Ou Skip Road / Main Access Road.***

The R27 / Access 2 is an emergency access only and was therefore not analysed in this section.

The following traffic scenarios were analysed during the AM and PM peak periods:

- ***2008 Background Traffic; and***
- ***2021 Background Traffic.***

The Level of Service (LOS) and 95th percentile vehicle queue lengths for the above scenarios are summarised in **Annexures A5 to A8**. The analysis results are summarised hereafter. Detailed results are available on request.

(a) R27 / Main Access Road (Access 1)

The existing geometry of the R27 / Main Access Road is shown in **Figure 4.2**.

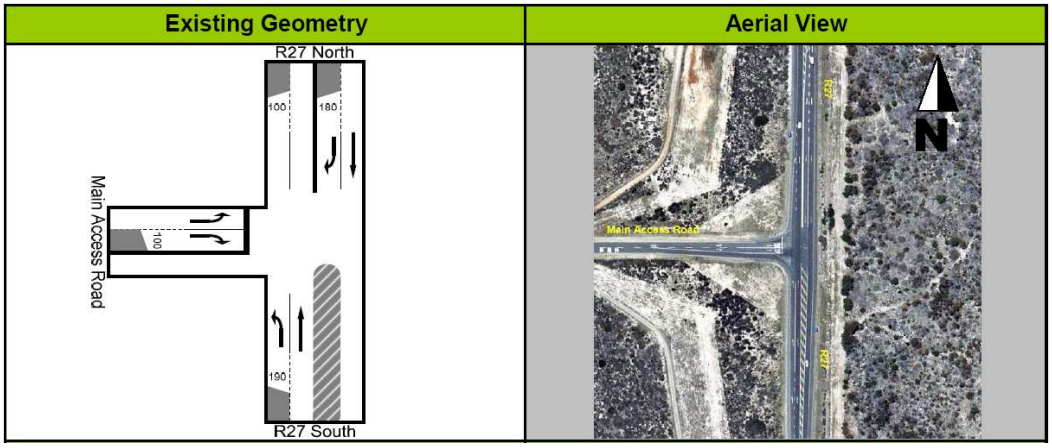


Figure 4.2: R27 / Main Access Road Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches operate acceptably at LOS A to LOS C during the AM and PM peak hours with no significant vehicle queues.

(ii) 2021 Background Traffic

The R27 / Main Access Road intersection eastbound approach turning south onto the R27 deteriorates from LOS C with a 3 vehicle queue length to a LOS F with a 28 vehicle queue length during the PM peak hour.

An upgrade is therefore required to improve the operation of the two way stop, which is supported by the Koeberg Administrative Complex & Training Centre Campus TIA (HHO, 2007).

(iii) Upgrades Required

Subsequently to the submission of the Koeberg Administrative Complex & Training Centre Campus TIA (HHO, 2007) the proposed upgrade of The R27 / Main Access Road intersection to signalised intersection was not approved by the Provincial Government of the Western Cape's Department of Transport and Public Works (PGWC).

The PGWC has proposed the construction of a grade separated structure ***(i.e. where each road is constructed at a different grade or level to reduce traffic movement conflicts using ramps, interchanges or bridges)*** at the R27 / Main Access Road intersection. This proposal is still under investigation and should be considered once the investigation is complete.

The proposal to signalise the R27 / Main Access Road intersection from a two way stop is detailed below in **Figure 4.3.**

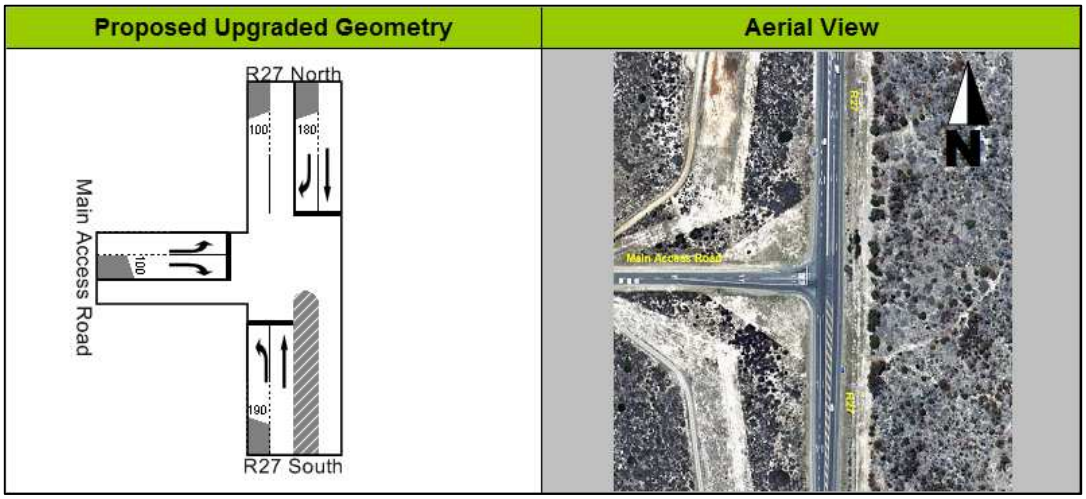


Figure 4.3: R27 / Main Access Road Proposed Intersection Geometry

The R27 / Main Access Road intersection eastbound approach turning south onto the R27 is expected to improve from a LOS F with a 37 vehicle queue length to LOS C with a nine vehicle queue length during the PM peak hour with the signalisation upgrade. Traffic signal warrants contained in the SADC Road Traffic signs manual will, however, have to be complied with before this upgrade can be implemented.

The appropriate warning signs of an upcoming signal, street lighting and reduction in speed limit on the R27 to 80 km/hr will also have to be implemented if traffic signals are installed.

(b) R27 / Napoleon Street

The existing geometry of the R27 / Napoleon Street is shown in **Figure 4.4**.

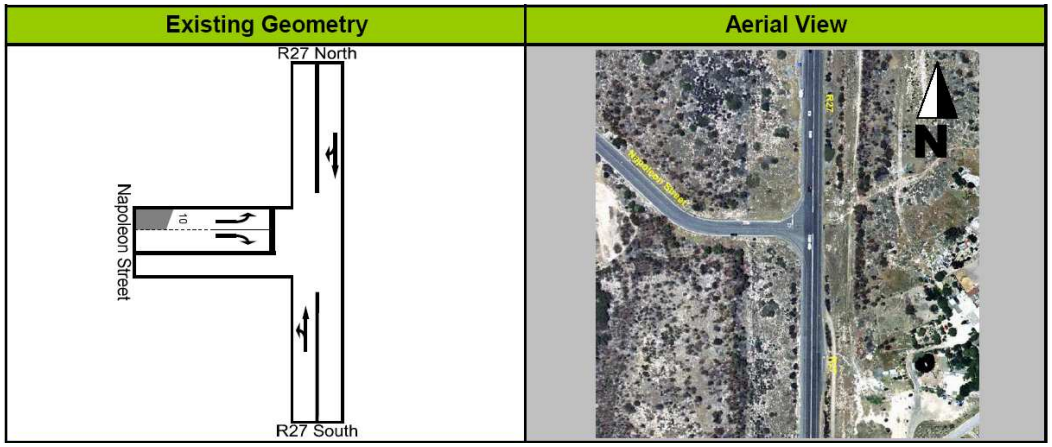


Figure 4.4: R27 / Napoleon Street Existing Intersection Geometry

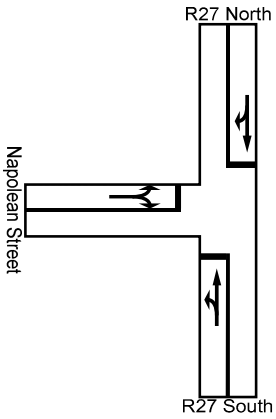
(i) 2008 Background Traffic

All approaches operate acceptably at LOS A to LOS C during the AM and PM peak hours with no significant vehicle queues.

(ii) 2021 Background Traffic

The western approach of Napoleon Street is expected to deteriorate from LOS E with a two vehicle queue length to LOS F with a 13 vehicle queue length in the AM peak. An upgrade is therefore required.

(iii) Upgrades Required

Upgraded Geometry	Aerial View
	

Napoleon Street eastbound approach improves from LOS F with a 13 vehicle queue length to LOS D with a nine vehicle queue length with a signalisation upgrade.

Traffic signal warrants contained in the SADC Road Traffic signs manual will, however, have to be complied with before this upgrade can be implemented.

The appropriate warning signs of an upcoming signal, street lighting and reduction in speed limit on the R27 to 80 km/hr will also have to be implemented if traffic signals are installed.

(c) Ou Skip Road / Narcissus Avenue (Access 3)

The existing geometry of the Ou Skip Road / Narcissus Avenue intersection is shown in **Figure 4.5**.

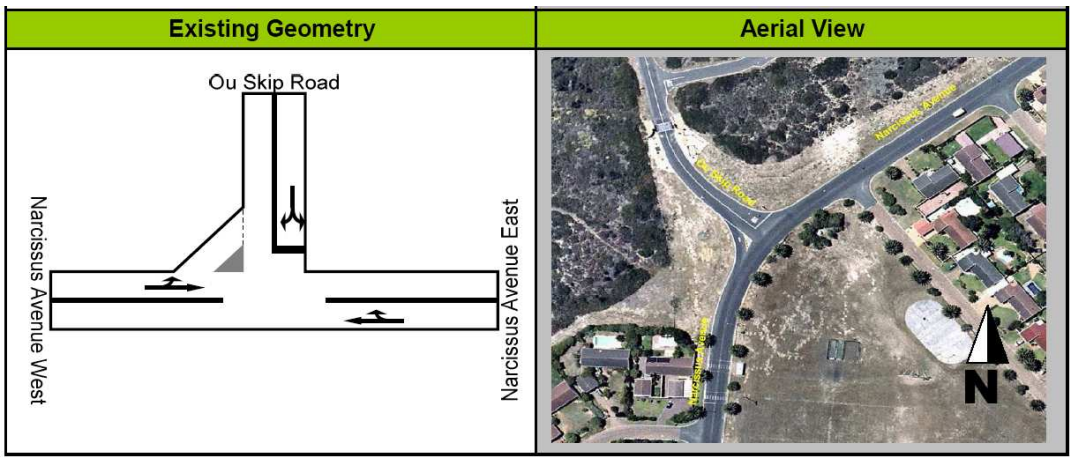


Figure 4.5: Ou Skip Road / Narcissus Avenue Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches operate acceptably at LOS A and LOS B during the AM and PM peak hours, with no significant vehicle queues.

(ii) 2021 Background Traffic

All approaches are expected to continue operating acceptably at LOS A and LOS B during the AM and PM peak hours with no significant vehicle queues. No upgrades are therefore required.

(d) Ou Skip Road / Main Access Road

The existing geometry of the Ou Skip Road / Main Access Road four-way-stop intersection is shown in **Figure 4.6**.

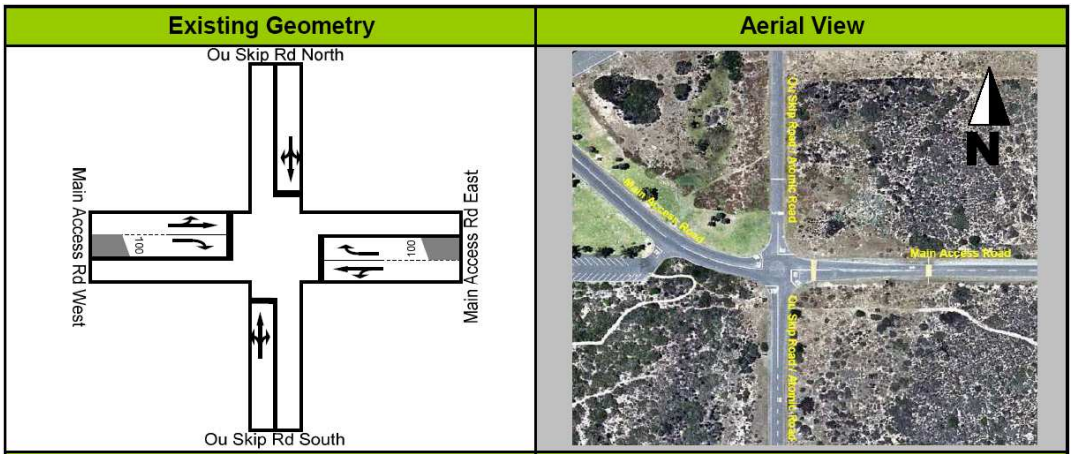


Figure 4.6: Ou Skip Road / Main Access Road Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches operate acceptably at LOS A and LOS B during the AM and PM peak hours with no significant approach delays.

(ii) 2021 Background Traffic

All approaches are expected to continue operating acceptably at LOS A and LOS B during the AM and PM peak hours with no significant approach delays. No upgrades are therefore required.

4.3 Parking

The number of parking bays currently provided at the Koeberg Nuclear Power Station is shown in **Table 4.1** below.

Table 4.1 – Current Parking provided at Koeberg Nuclear Power Station

Type	Parking Bays Provided
Staff	780
Visitors	140
Visitors Centre	25
Total	945

The parking provided is adequate to serve the current operation. An additional 800 parking bays are proposed to serve the Koeberg Administrative Complex & Training Centre Campus development.

4.4 Public Transport

4.4.1 Modal Split

The existing modal split to and from Koeberg Nuclear Power Station are currently 70% private transport and 30% public transport obtained from the "Koeberg Administrative Complex & Training Centre Campus TIA (HHO, 2007). The existing vehicle occupancy is 1.42 for private transport and 5.12 for public transport.

The proposed West Coast integrated rapid transit system (IRT), which will connect the West Coast areas of Blaauwberg and Table View to Cape Town's CBD, is currently in the planning stage for implementation and will improve the public transport access to the area.

4.4.2 Existing Bus Service

Data obtained from the 'City of Cape Town's 2003/2004 Current Public Transport Record (CPTR) indicates that the site is located within easy access of the existing bus services. The main public transport mode is bus, serving the existing Koeberg Nuclear Power Station via the Main Access Rd (Access 1) and the Duynefontein Access (Access 3).

The bus routes are concentrated along the R27 as shown in **Figure 4.7**. Two sheltered bus stops are located within 50 m of Access 1 along the R27 and a transport interchange area is located on-site adjacent to the visitors parking.

The R27 has 51 bus routes with a maximum utilisation of 115% on the route to Hanover Park. There is adequate capacity on the other routes on the R27 to accommodate additional trips to the site. However, additional services may need to be provided on the Hanover Park route.

The routes operating along the Main Access Road and Ou Skip Road have adequate capacity to accommodate additional passengers. However, the route from Koeberg Power Station to Pella is currently operating close to capacity and additional trips may need to be provided on this route.

The proposed restructuring of public transport and the introduction of IRT routes should, however be taken into account before the introduction of new services.

4.4.3 Existing Minibus Taxi Service

The CPTR shows that the proposed Nuclear-1 site is also located within easy access of the existing minibus taxi routes. The secondary public transport mode is the minibus taxi service serving the existing Koeberg Nuclear Power Station via the Main Access Rd (Access 1) and the Duynefontein Access as shown in **Figure 4.8**.

The R27 has 26 minibus taxi routes, with the Main Access Road and Ou Skip Road each with 1 and 4 minibus taxi routes, respectively. However, the bus mode appears to dominate along the R27.

4.4.4 Existing Commuter Rail Services

There are no existing commuter rail stations located in the vicinity of the site.

4.5 Non-Motorised Transport

On-site observations show recreational pedestrians and cyclists present within the Duynefontein farm boundaries. The extensive traffic calming measures and the 50 km / hr speed limit observed on site is conducive to promoting safe non-motorised travel.

4.6 Low to Medium Radioactive Waste Transport

Currently, approximately 48 low to medium radioactive waste consignments are transported from Koeberg Nuclear Power Station to Vaalputs in the Northern Cape Province annually as part of the normal operations of the existing nuclear power station. The current waste route to Vaalputs is discussed in **Chapter 11** and shown in **Figure 11.8**.

FIGURE 4.7

FIGURE 4.8

4.7 Emergency Evacuation

The current evacuation times as stated in the Koeberg Nuclear Power Station Emergency Plan: Transport Modelling & Evacuation Management Plan (HHO, 2005), which need to be complied with, are summarised in **Table 4.2** below. The "Koeberg Nuclear Power Station Emergency Plan: Transport Modelling & Evacuation Management Plan (HHO, 2005)" should be referred to for more detail.

Table 4.2 – Koeberg Nuclear Power Stations current evacuation time assessment results

Legislative Requirements				Koeberg Nuclear Power Station Current Evacuation Assessment	
Persons	**Area**	**Safety Zone**	**Time period**	**Assessment Period**	**Time (2005 to 2030)**
All Public	360 degree radius	PAZ 0km to 5km	Within 4 hours	AM Peak "worst case"	1.8 to 2 hours
All Public	Any 67.5 degrees	UPZ 5km to 16km	Within 16 hours		8.2 to 14.3 hours

The Koeberg Nuclear Power Station modelled evacuation times currently meet the minimum requirements according to the "Koeberg Nuclear Power Station Emergency Plan: Transport Modelling & Evacuation Management Plan (HHO, 2005).

4.8 Air Route and Shipping Lane Impacts

A Site Safety Report, which details all airports, air routes and shipping lane data and Koeberg Nuclear Power Station's impacts on those routes, was completed for the Koeberg Nuclear Power Station in 2006. Existing information (Restricted flying zones etc.) is provided in **Chapter 11.**

4.9 Mitigating Actions Required

The following mitigating actions are recommended:

- The R27 / Main Access Road intersection is required to be upgraded by 2021, to enable the intersection to cope with the projected traffic demand. If the PGWC's proposal to upgrade to a grade separated intersection (***i.e. where each road is constructed at a different grade or level to reduce traffic movement conflicts using ramps, interchanges or bridge***s) is viable then this option should be implemented. If this option is not viable, the R27 / Main Access Road intersection signalisation upgrade option, as shown in **Figure 4.3**, should be reconsidered.

5 BANTAMSKLIP TRANSPORT STATUS QUO ASSESSMENT

5.1 Traffic Analysis

5.1.1 Background Traffic

The 2007 AM and PM peak hour traffic volumes along the R43 were obtained from the Provincial Government's Road Network Information System website for the following intersections:

- ***R43 / DR01211; and***
- ***R43 / DR01206.***

The locations of the above-mentioned intersections are shown in **Figure 5.1**.

The AM and PM peak hours are:

- AM peak hour – 08:00 to 09:00; and
- PM peak hour – 16:00 to 17:00.

The results of the 2007 AM and PM peak hour background traffic are shown in **Annexures B1 and B2**.

Nuclear-1 is expected to be completed by 2021. According to the 'Overberg District Municipality's Integrated Transport Plan (ITP) (2006) the annual growth rate for the area is 3% per annum. This growth rate was applied to the background traffic to determine the 2021 background traffic.

The calculated 2021 background traffic volumes for the AM and PM peak hours are shown in **Annexures B3 and B4**.

5.1.2 Intersection Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 Computer Programme for the following intersections:

- ***R43 / DR01211; and***
- ***R43 / DR01206.***

The following traffic scenarios were analysed during the AM and PM peak periods:

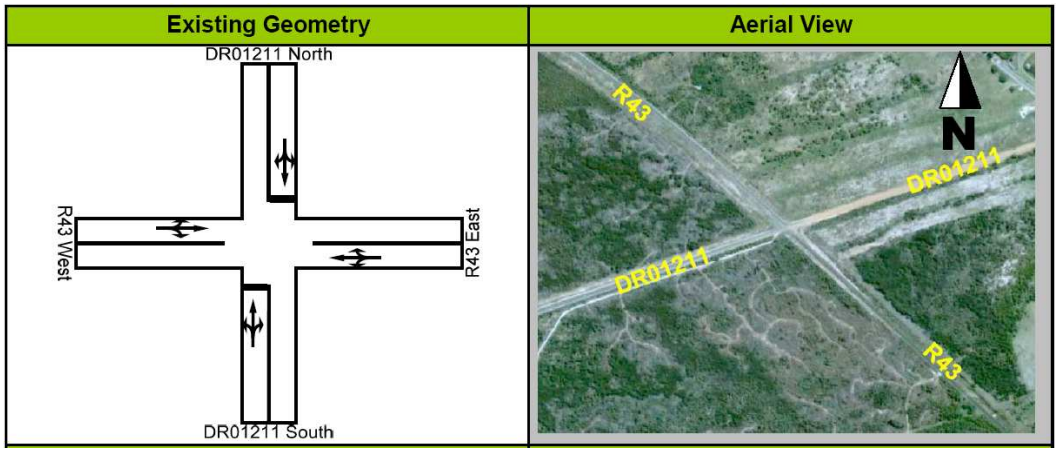
- ***2007 Background Traffic; and***
- ***2021 Background Traffic.***

The LOS and 95th percentile vehicle queue lengths for the above scenarios are summarised in **Annexures B5 to B8**. The analysis results are summarised hereafter. Detailed results are available on request.

FIGURE 5.1

(a) R43 / DR01211

The existing geometry and aerial view of R43 / DR01211 is shown in **Figure 5.2**.



(i) 2007 Background Traffic

All approaches operate at LOS A during the AM and PM peak hours with minimal vehicle queues.

(ii) 2021 Background Traffic

All approaches will operate at LOS A and LOS B during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

(b) R43 / DR01206

The existing geometry and aerial view of R43 / DR01206 is shown in **Figure 5.3**.

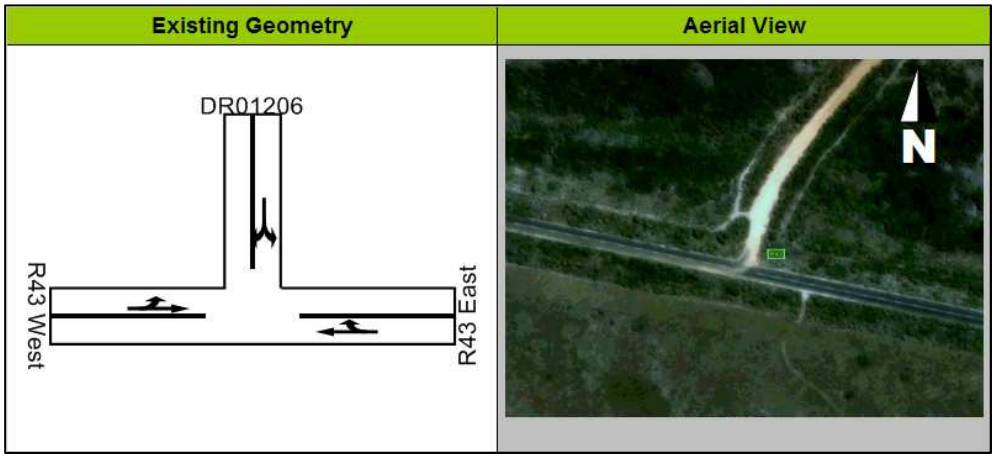


Figure 5.3: R43 / DR01206 Existing Intersection Geometry

(i) 2007 Background Traffic

All approaches operate at LOS A during the AM and PM peak hours, with minimal vehicle queues.

(ii) 2021 Background Traffic

All approaches will operate at LOS A during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

5.2 Public Transport

Public transport in the Overstrand Local Municipality is exclusively road-based and is more prominent in the major towns and almost non-existent in the smaller towns.

Only 30% of residents use public transport, while the remainder choose to walk, cycle or use private transport. The following problems have added to the low levels of public transport usage in the region:

- ***The high costs of public transport;***
- ***The high levels of unemployment;***
- ***The unavailability of public transport; and***
- ***Safety / driver behaviour.***

The existing bus and minibus taxi routes are shown in **Figure 5.4**. The main public transport mode within the area is minibus taxi, which serves the beach resort towns of Gansbaai and Pearly Beach.

Buses are mostly used for the transportation of learners and organised parties and do not fulfil a commuter function as minibus taxis do. Buses are also contracted to transport employees. Tour buses are used for the transportation of exclusive groups.

Public transport facilities are currently provided in Hawston and Hermanus. No formal public transport facilities are provided in Gansbaai or Pearly Beach or in close proximity to Bantamsklip. Where required, workers are mostly transported by their employers in light delivery vehicles or trucks.

5.3 Non-Motorised Transport

The Overberg District Municipality's Integrated Transport Plan (2006) found that 58% of people who travel use non-motorised transport (bicycle or walking). However, there is a lack of non-motorised transport facilities like pedestrian routes and cycle routes. It has identified that the promotion of public transport and non-motorised transport is a priority.

5.4 Mitigating Actions Required

No mitigation actions are recommended.

FIGURE 5.4

6 THYSPUNT TRANSPORT STATUS QUO ASSESSMENT

6.1 Traffic Analysis

6.1.1 Background Traffic

Manual traffic counts were undertaken on the 24th, 25th and 26th of June 2008 during the AM (06:00-09:00) and PM (16:00 – 18:00) peak periods at the following intersections:

- ***R330 / Main Access Road;***
- ***R330 / St Francis Bay Access Road;***
- ***R330/ Oyster-Bay Access Road;***
- ***R330 / Gravel Road;***
- ***Park Road / Main Street;***
- ***Main Street / Jeffrey's Bay Access Road;***
- ***Main Street / N2 South Off-Ramp; and***
- ***Main Street / N2 North Off-Ramp.***

The location of the above-mentioned intersections is shown in **Figure 6.1**.

The AM and PM peak hours are:

- ***AM peak hour - 07:30 to 08:30; and***
- ***PM peak hour - 16:30 to 17:30.***

The results of the 2008 AM and PM peak hour background traffic are shown in **Annexures C1 and C2**.

Nuclear-1 is expected to be completed by 2021. According to the 'Cacadu District Municipality's Spatial Development Framework (SDF) (2007) the annual growth rate for the area is 2% per annum. This growth rate was applied to the 2008 background traffic to determine the 2021 background traffic.

The calculated 2021 background traffic volumes for the AM and PM peak hours are shown in **Annexures C3 and C4**.

6.1.2 Intersection Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 Computer Programme for the following intersections:

- ***R330 / Main Access Road;***
- ***R330 / St Francis Bay Access Road;***
- ***R330/ Oyster-Bay Access Road;***
- ***R330 / Gravel Road;***
- ***Park Road / Main Street;***

FIGURE 6.1

- ***Main Street / Jeffrey's Bay Access Road;***
- ***Main Street / N2 South Off-Ramp; and***
- ***Main Street / N2 North Off-Ramp.***

The following traffic scenarios were analysed during the AM and PM peak periods:

- ***2008 Background Traffic; and***
- ***2021 Background Traffic.***

The LOS and 95th percentile vehicle queue lengths for the above scenarios are summarised in **Annexures C5 to C8**. The analysis results are summarised hereafter. Detailed results are available on request.

(a) R330 / Main Access Road

The existing geometry and aerial view of R330 / Main Access Road is shown in **Figure 6.2**.

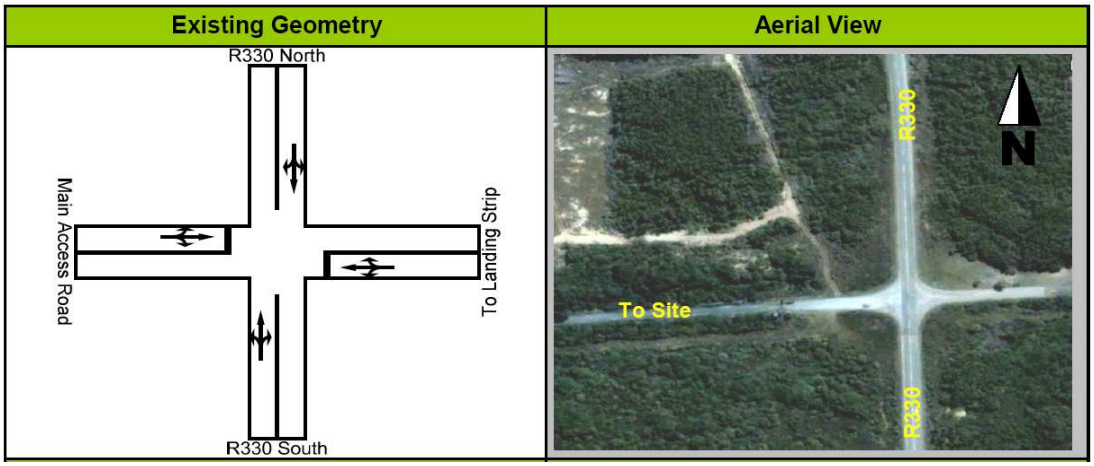


Figure 6.2: R330 / Main Access Road Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches at this intersection operate at LOS A during the AM and PM peak hours with minimal queues.

(ii) 2021 Background Traffic

All approaches at this intersection will operate at LOS A and LOS B during the AM and PM peak hours with minimal queues. No upgrades are therefore required.

(b) R330 / St Francis Bay Access Road

The existing geometry and aerial view of R330 / St Francis Bay Access Road is shown in **Figure 6.3**.

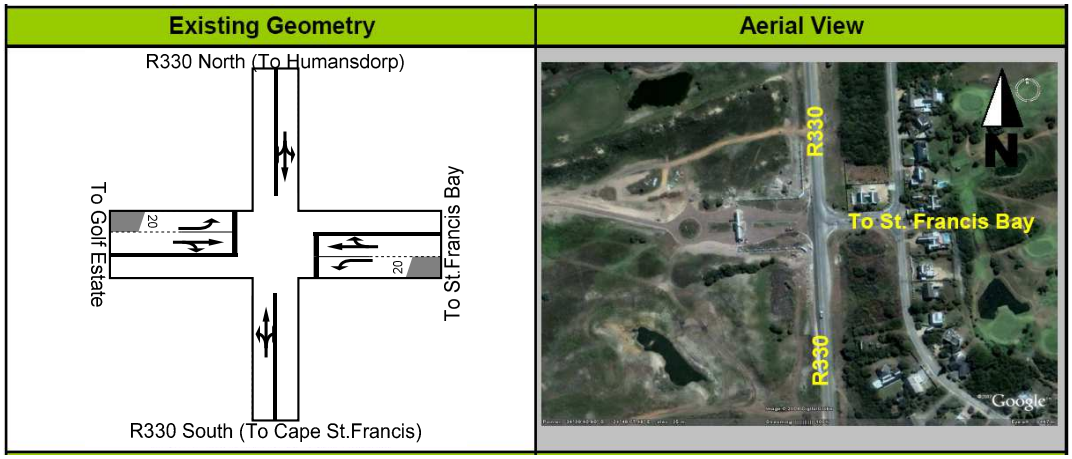


Figure 6.3: R330 / St Francis Bay Access Road Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches operate at LOS A and LOS B during the AM and PM peak hours with minimal vehicle queues.

(ii) 2021 Background Traffic

All approaches are still expected to operate at LOS A and LOS B during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

(c) R330 / Oyster-Bay Access Road

The existing geometry and aerial view of R330 / Oyster-Bay Access Road is shown in **Figure 6.4**.

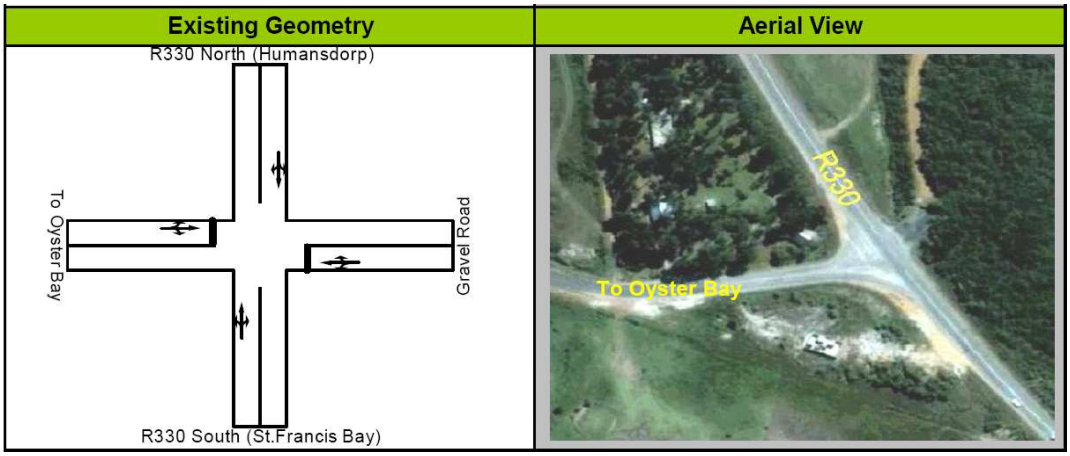


Figure 6.4: R330 / Oyster Bay Access Road Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches on the R330 operate at LOS A during the AM and PM peak hours with minimal vehicle queues. The left and right turns from the Oyster-Bay approach operates at LOS B during both the AM and PM peak periods.

(ii) 2021 Background Traffic

All approaches on the R330 are still expected to operate at LOS A during the AM and PM peak hours with minimal vehicle queues. The left and right turns from the Oyster-Bay approach are expected to operate at LOS B during both the AM and PM peak periods. No upgrades are therefore required.

(d) R330 / Gravel Road

The existing geometry and aerial view of R330 / Gravel Road is shown in **Figure 6.5**.

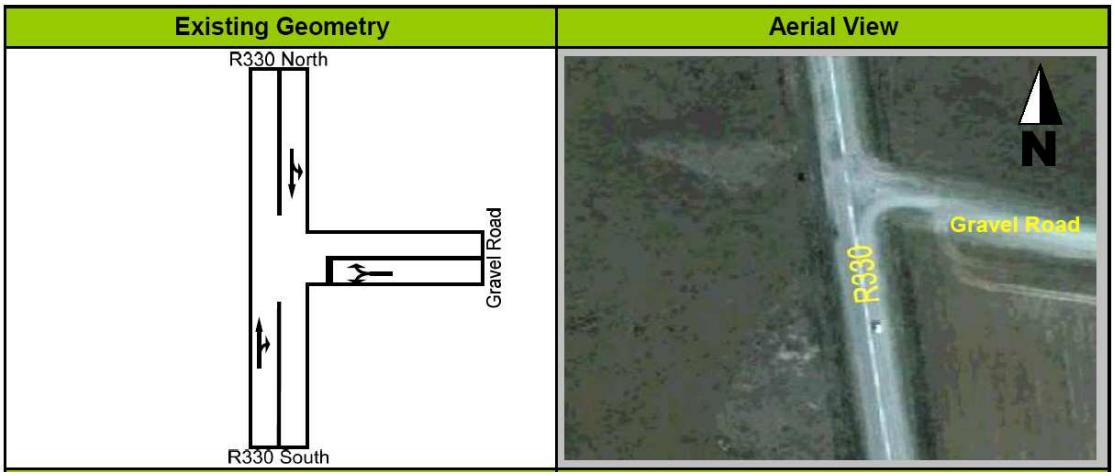


Figure 6.5: R330 / Gravel Road Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches operate at LOS A during the AM and PM peak hours with minimal vehicle queues.

(ii) 2021 Background Traffic

All approaches are still expected to operate at LOS A during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

(e) Park Road (R330) / Main Street (R330)

The existing geometry and aerial view of Park Road / Main Street are shown in **Figure 6.6**.

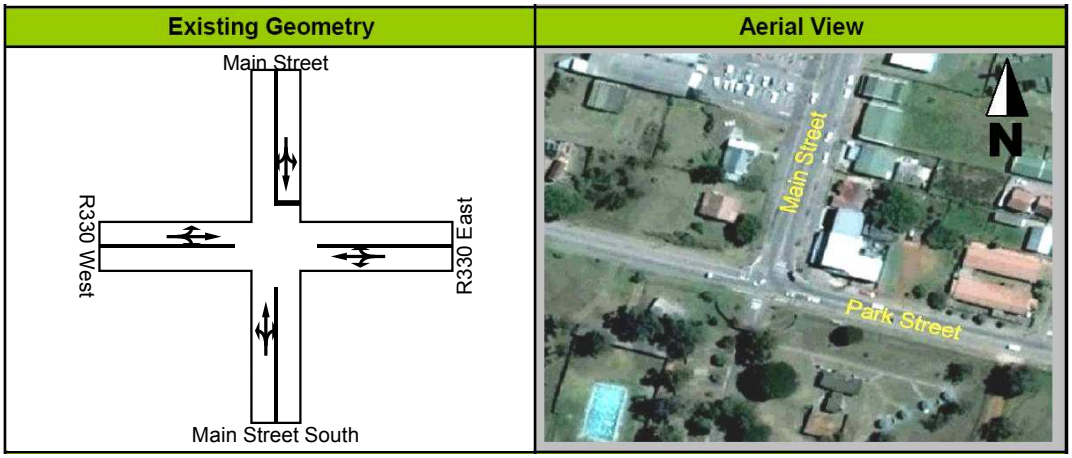


Figure 6.6: Park Road / Main Street Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches operate acceptably at LOS A and LOS B with minimal vehicle queue lengths during the AM and PM peak hours.

(ii) 2021 Background Traffic

All approaches are expected to operate acceptably at LOS A and LOS B with minimal vehicle queue lengths during the AM and PM peak hours. No upgrades are therefore required.

(f) Main Street / Jeffrey's Bay Access Road (R102)

The existing geometry and aerial view of Main Street / Jeffrey's Bay Access Road are shown in **Figure 6.7**.

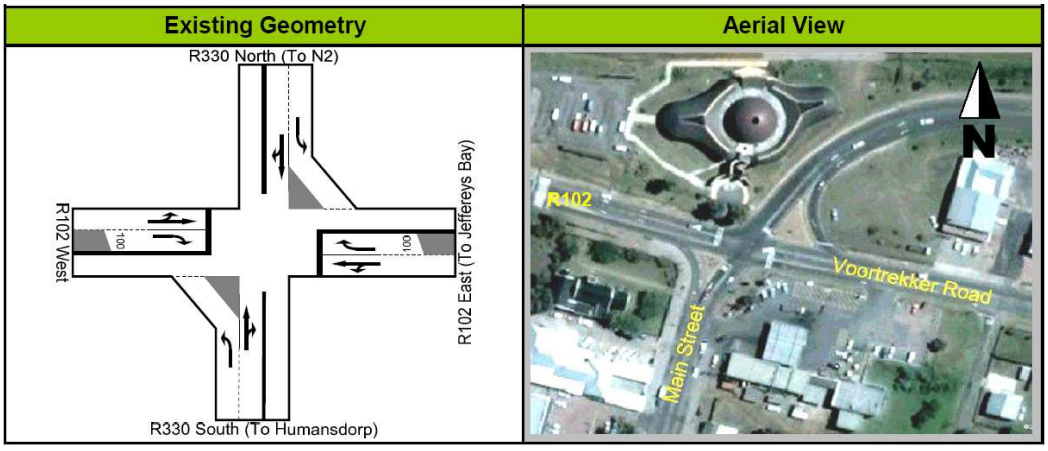


Figure 6.7: Main Street / /Jeffrey's Bay Access Road Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches operate acceptably at LOS A to LOS C with minimal vehicle queue lengths during the AM and PM peak hours.

(ii) 2021 Background Traffic

All approaches are still expected to operate acceptably at LOS A to LOS C with minimal vehicle queue lengths during the AM and PM peak hours. No upgrades are therefore required.

(g) Main Street / N2 South Off-Ramp

The existing geometry and aerial view of Main Street / N2 South Off-Ramp is shown in **Figure 6.8**.

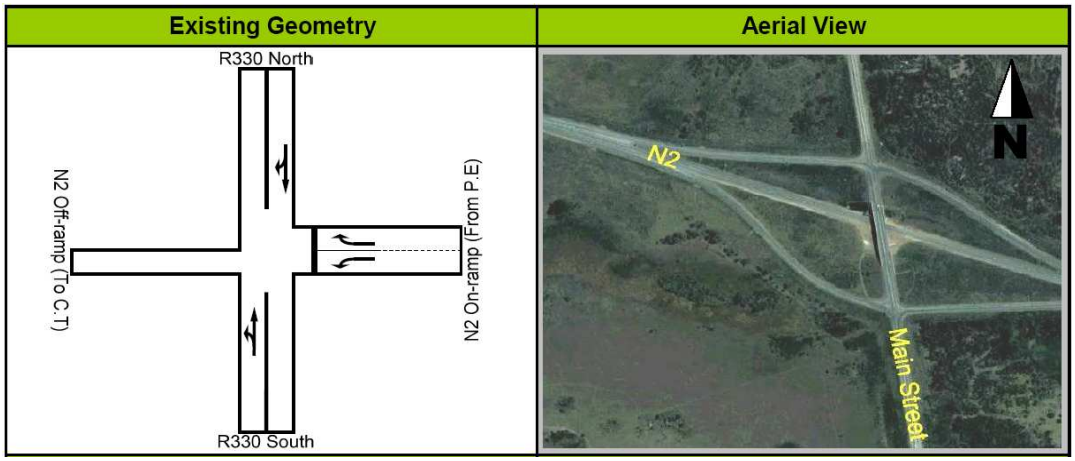


Figure 6.8: Main Street / N2 South Off-Ramp Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches operate acceptably at LOS A and LOS B with minimal vehicle queue lengths during the AM and PM peak hours.

(ii) 2021 Background Traffic

All approaches are still expected to operate acceptably at LOS A and LOS B with minimal vehicle queue lengths during the AM and PM peak hours. No upgrades are therefore required.

(h) Main Street / N2 North Off-Ramp

The existing geometry and aerial view of Main Street / N2 North Off-Ramp are shown in **Figure 6.9**.

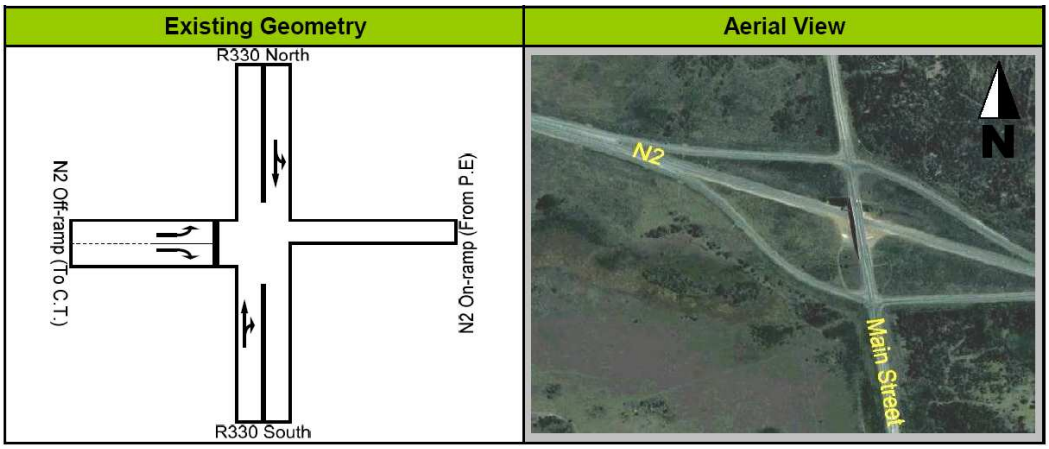


Figure 6.9: Main Street / N2 Off-Ramp Existing Intersection Geometry

(i) 2008 Background Traffic

All approaches operate acceptably at LOS A and LOS B with minimal vehicle queue lengths during the AM and PM peak hours.

(ii) 2021 Background Traffic

All approaches are still expected to operate acceptably at LOS A and LOS B with minimal vehicle queue lengths during the AM and PM peak hours. No upgrades are therefore required.

6.2 Public Transport

The existing modal split, obtained from the 2003 National Household Travel Survey (DoT, 2003) for the Cacadu District Municipality within the Eastern Cape is shown in **Table 6.1**.

Table 6.1: Modal Split for Cacadu District Municipality

District or metro	% of Households						
	Train	Bus	Taxi	Car	Walk	Other	Can't get there
Cacadu	0	0.1	12.9	27.7	56.1	3.1	0.1

Only 30% of residents use private transport, 13% use public transport and the remainder walk or use other means of transport.

The existing public transportation infrastructure within the Cacadu District is dominated by the use of minibus taxis. Of this usage, 83% of minibus taxi commuters utilise taxis for long distance travelling (defined as a route travelling outside a town's

boundary) and 17% use it for local / commuter routes (defined as a route not travelling outside a town's boundary).

Predominant minibus taxi ranks within the Cacadu District are contained within the towns as illustrated in **Figure 6.10**, the determining factor of the predominance being the utilisation of the taxi rank in the form of more than ten outgoing trips a day.

Current trends within the Cacadu District suggest that the utilisation of the bus as a mode of public transportation is declining rapidly. This is particularly evident in the form of local / commuter travel, due to the operation of taxis being far more lucrative and feasible. Long distance bus travel is still typically undertaken by operations such as City to City, Greyhound, Intercape and Translux – all of these service providers only travel on national routes.

In terms of rail transportation only three passenger rail services exist, namely:

- ***The Alicedale / Grahamstown route;***
- ***The Port Alfred / Bathurst route; and***
- ***The Apple Express line.***

The Alicedale / Grahamstown route is primarily used by work seekers and shoppers and the Port Alfred and Bathurst route is primarily used by tourists exploring Bathurst. The Apple Express line is also predominantly utilised by day visitors / tourists travelling between Port Elizabeth and Thornhill (located within the Local Municipality of Kouga).

6.3 Non-Motorised Transport

There are currently minimal non-motorised transport (NMT) movements in the vicinity of the site. However, in the surrounding towns, such as Oyster-Bay, Humansdorp and St Francis Bay, NMT is limited to low-income users from rural areas and scholars.

Animal-drawn carts are widely used as an alternative to motorised transport by people in low-income areas. This is a particular problem on the N2, north of Grahamstown, where carts are used for transport by the communities situated adjacent to the N2.

6.4 Mitigating Actions Required

No mitigation actions are recommended.

FIGURE 6.10

7 TRANSPORTATION IMPACT IDENTIFICATION

7.1 Construction Phase Impacts

The following Nuclear-1 construction phase transport impacts were identified to be investigated:

- ***Daily construction related transport impacts:***
    - Access;
    - Traffic analysis;
    - Parking;
    - Public transport; and
    - Non-motorised transport.

- ***Impacts of heavy load transport to the Nuclear-1 site; and***
- ***Emergency evacuation impacts (Duynefontein only).***

7.2 Operational Phase Impacts

The following Nuclear-1 operational phase transport impacts were identified to be investigated:

- ***Normal daily transport impacts***
    - Access;
    - Traffic analysis;
    - Parking;
    - Public transport;
    - Non-motorised transport;

- ***Low to medium nuclear waste transport;***
- ***Emergency evacuation impacts; and***
- ***Air and shipping route impacts.***

8 DUYNEFONTEIN CONSTRUCTION PHASE IMPACT ASSESSMENT

8.1 Access

Construction vehicle access is proposed to be via the existing R27 / Emergency Access Road intersection (Access 2) to isolate the Nuclear-1 construction vehicle impact on the normal traffic operations of the Koeberg Nuclear Power Station as shown in **Figure 8.1**. The eastern leg of the R27 / Main Access Road intersection is proposed to be constructed by 2017.

8.2 Traffic Analysis

8.2.1 Description

The following section assesses the cumulative transportation impacts of the construction phase on the local transport system. The AM and PM peak periods are the critical daily time periods and therefore the following assessment was undertaken for these peak hours.

The AM and PM peak hours are:

- ***AM Peak hour – 07:00 to 08:00; and***
- ***PM Peak hour – 16:30 to 17:30.***

Eskom has provided a detailed schedule of estimated construction phase trips for each year of the nine year construction phase period. Year 6, estimated to be 2017 is the peak year of the construction phase as shown in **Annexure A12**.

8.2.2 Trip Generation

The trips generated by the proposed Nuclear-1 site at Duynefontein during the construction phase are shown in **Table 8.1** and the detailed trip generation table is provided in **Annexure A12.** These trips include buses, which will transport construction worker to and from the site.

Table 8.1 –Construction Phase Generated Trips

Construction Traffic Type	AM		PM	
	IN	OUT	IN	OUT
General Workers	14	0	0	14
Vendor Staff	304	0	0	304
Eskom Staff	422	0	0	422
Waste and Spoil	1	1	1	1
Construction Resources	8	8	8	8
TOTAL	749	9	9	749

FIGURE 8.1

8.2.3 Trip Assignment & Distribution

To determine the traffic impact of Nuclear-1's construction phase on the surrounding road network, the generated trips were distributed onto the existing road network.

The directional distribution of the generated trips for both the AM and PM peak hours is based on the percentage distribution of the 2008 background traffic flows. Sixty percent of the trips originate from the south (Cape Town, Milnerton etc.) and forty percent originate from north of Duynefontein (Atlantis, Saldanha, etc).

The percentage distribution, for the AM and PM peak hours, is shown in **Annexures A13 and A14,** respectively.

The distribution of Nuclear-1's generated traffic for both the AM and PM peak periods are shown in **Annexures A15 and A16,** respectively..

8.2.4 Intersection Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 Computer Programme for the following main intersections:

- ***R27 / Main Access Road (Access 1);***
- ***R27 / Napoleon Street;***
- ***Ou Skip Road / Narcissus Avenue (Access 3);***
- ***Ou Skip Road / Main Access Road;***
- ***R27 / Access 2; and***
- ***Ou Skip / Access 2.***

The **2017 Construction Total Traffic scenario** was analysed during the AM and PM peak hours. The LOS and 95th percentile vehicle queue lengths for this scenario are summarised in **Annexures A19 and A20**. The analysis results are summarised hereafter. Detailed analysis results are available on request.

(a) R27 / Main Access Road (Access 1)

The 2017 geometry of the R27 / Main Access Road is shown in **Figure 8.2**.

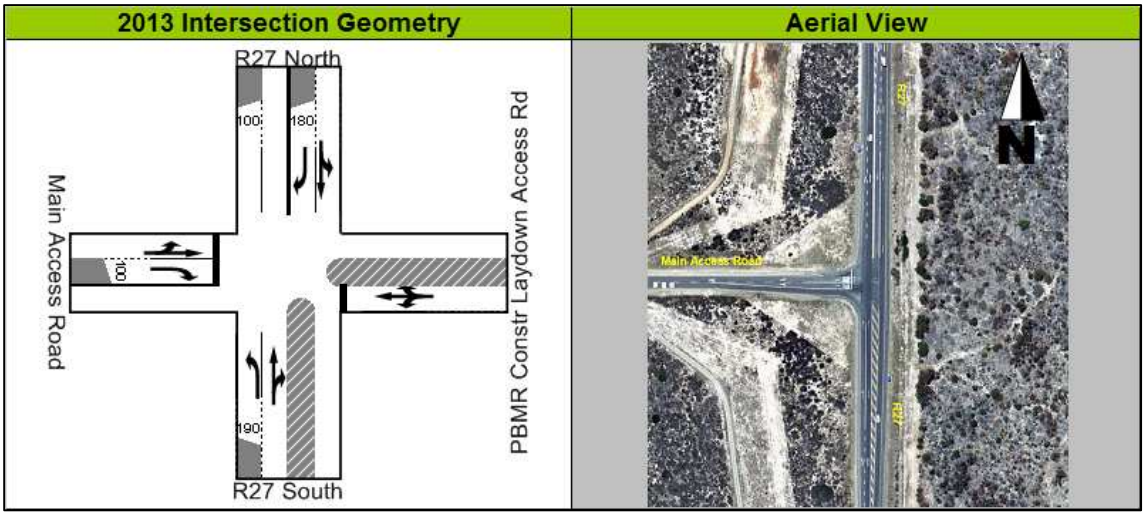


Figure 8.2: R27 / Main Access Road 2013 Intersection Geometry

(i) 2017 Construction Traffic

The through movements of the R27 will operate acceptably at LOS A to LOS C during the AM and PM peak hours with no significant vehicle queues.

The PGWC has proposed the construction of a grade separated structure at the R27/ Main Access Road intersection. This upgrade is not required for the construction and operation of a nuclear power station.

The upgrade option of signalising this intersection is shown in **Figure 8.3**.

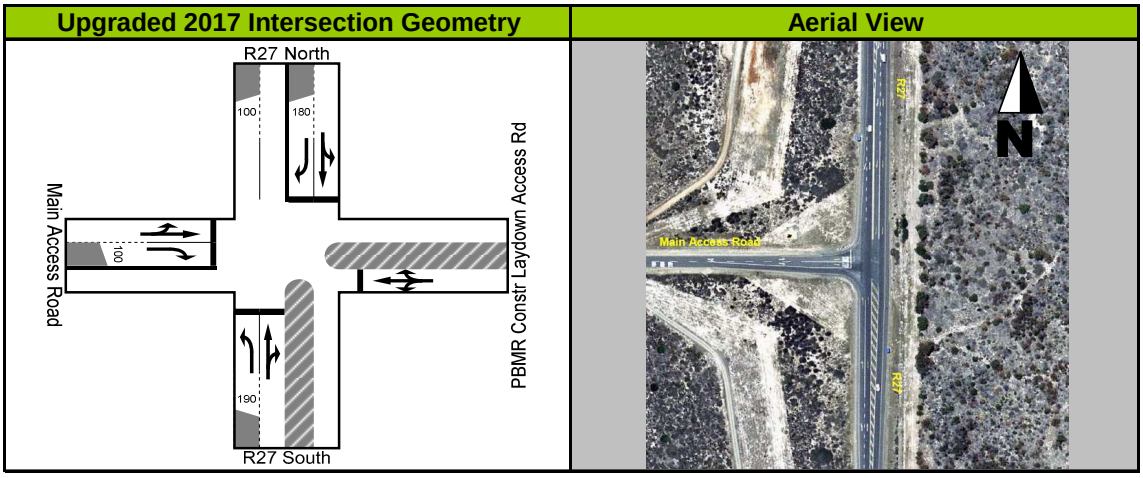


Figure 8.3: R27 / Main Access Road Proposed 2013 Intersection Geometry

If upgraded, the critical right turn from the Main Access Road will improve from LOS F to LOS D during the AM and PM peak hour.

(b) R27 / Napoleon Street

The existing geometry of the R27 / Napoleon Street is shown in **Figure 8.4**.

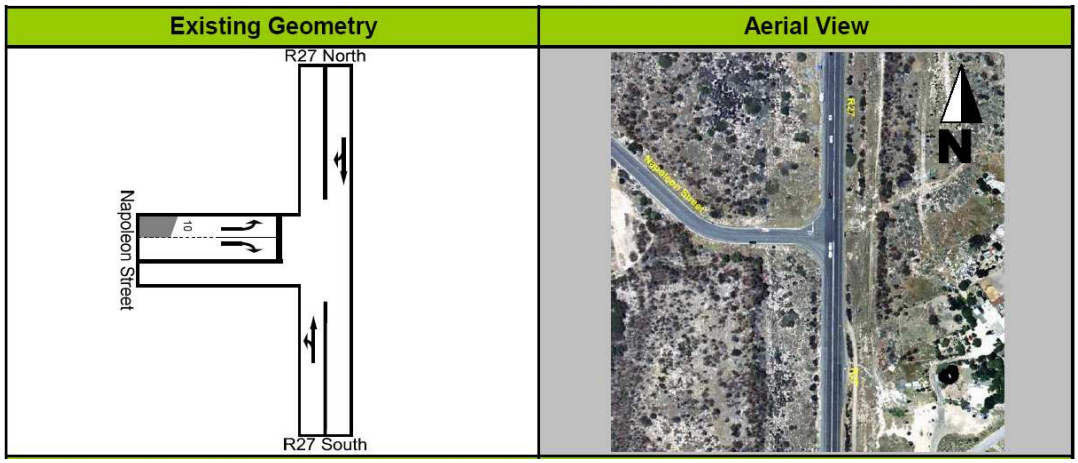


Figure 8.4: R27 / Napoleon Street Existing Intersection Geometry

(i) 2017 Construction Traffic

The south approach of the R27 will operate acceptably at LOS A during the AM and PM peak hours with non-significant vehicle queues. The west approach of Napoleon however, will operate at LOS F with a 100 vehicle queue length during the AM peak hour. An upgrade is therefore required.

(ii) Upgrades Required

This intersection may have to be upgraded to a signalised intersection or a grade separated intersection. However, if Access 1 is upgraded to a grade separated intersection, all adjacent accesses upgrades off the R27 will have to be investigated. These options are to be discussed with the PGWC.

The option to signalise the R27 / Napoleon intersection is discussed below as shown in **Figure 8.5**..

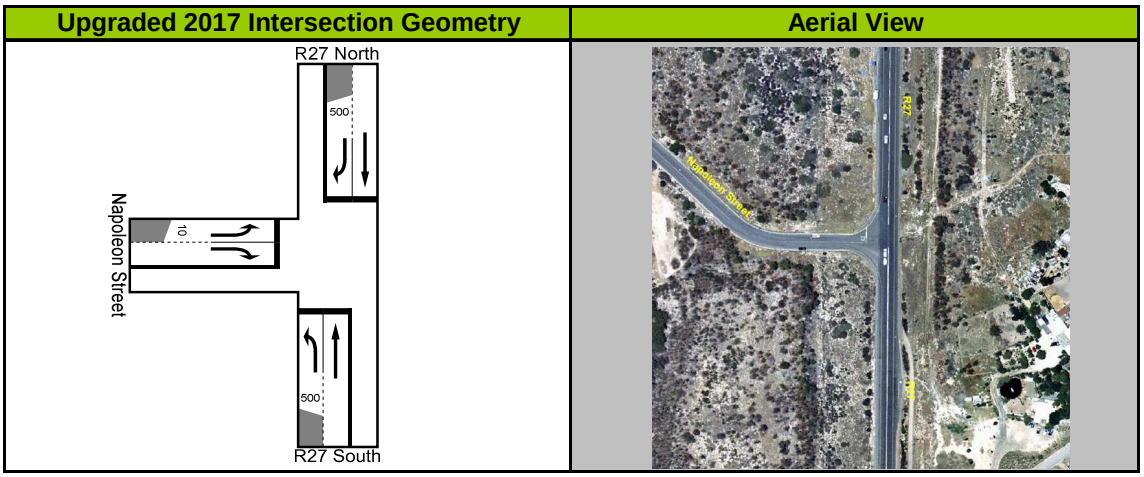


Figure 8.5: R27 / Napoleon Street 2013 Proposed Intersection Geometry

The operation of the west approach of Napoleon will improve from LOS F with a 100 vehicle queue length to LOS E with a 12 vehicle queue length in the AM peak hour.

(c) Ou Skip Road / Narcissus Avenue (Access 3)

The existing geometry of the Ou Skip Road / Narcissus Avenue intersection is shown in **Figure 8.6**.

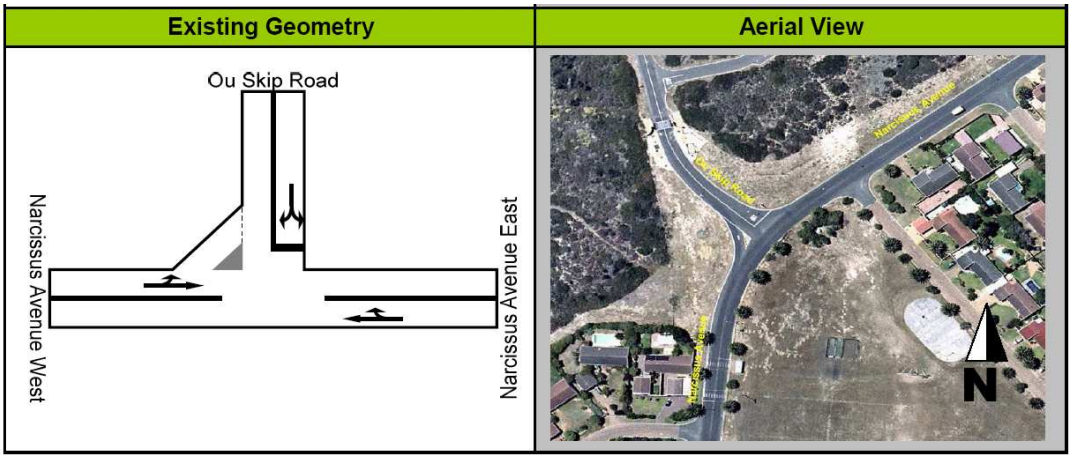


Figure 8.6: Ou Skip Road / Narcissus Avenue 2013 Existing Intersection Geometry

(i) 2017 Construction Traffic

All intersection approaches will operate acceptably with LOS A and LOS B during the AM and PM hours, with no significant vehicle queue lengths.

(d) Ou Skip Road / Main Access Road

The existing geometry of the Ou Skip Road / Main Access Road intersection is shown in **Figure 8.7(a)**.

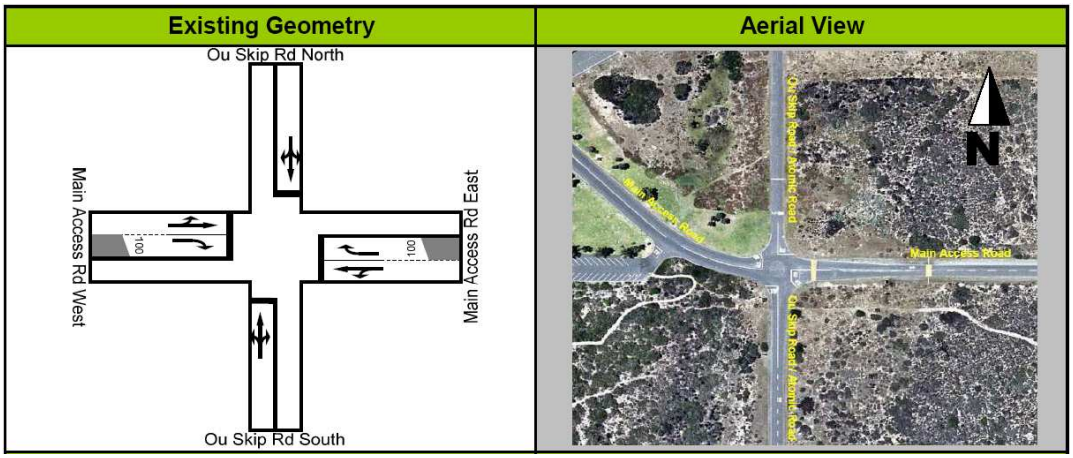


Figure 8.7(a): Ou Skip Road / Main Access Road Existing Intersection Geometry

(i) 2017 Construction Traffic

The southern approach at this intersection will operate at LOS F during the AM and PM peak hours with long vehicle delays expected. An upgrade is therefore required.

(ii) Upgrades Required

Vehicle volumes along the Main Access Road are lower than those travelling along Ou Skip Road. The suggested intersection upgrade is to convert this four-way stop controlled intersection into a two-way stop controlled intersection as shown below in **Figure 8.7(b)**.

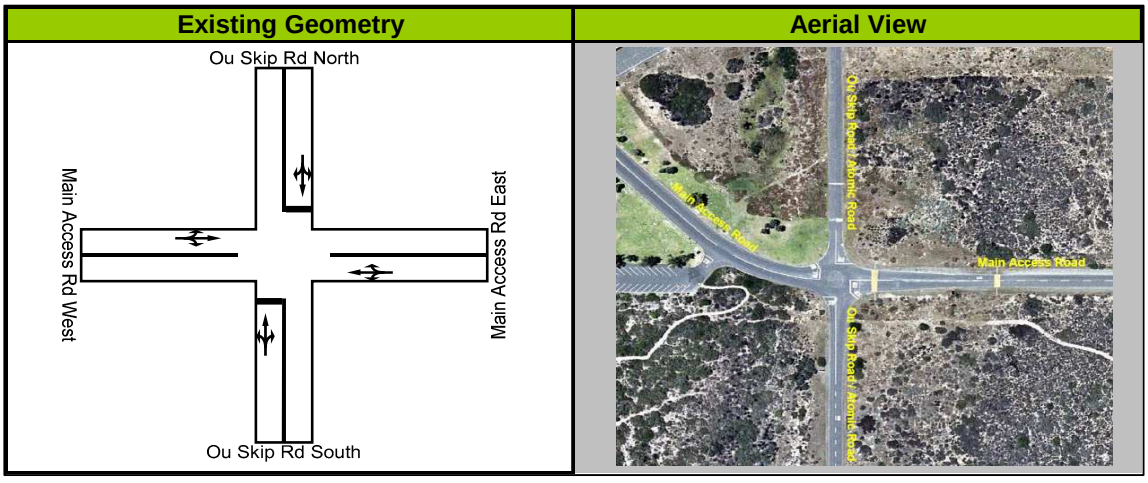


Figure 8.7(b): Ou Skip Road / Main Access Road Proposed Intersection Geometry

The southern approach of this intersection will improve to LOS C and B during the AM and PM peak hour respectively. The overall operation of this intersection will also improve.

(e) R27 / Access 2

The existing geometry of the R27 / Access 2 is shown in **Figure 8.8**.

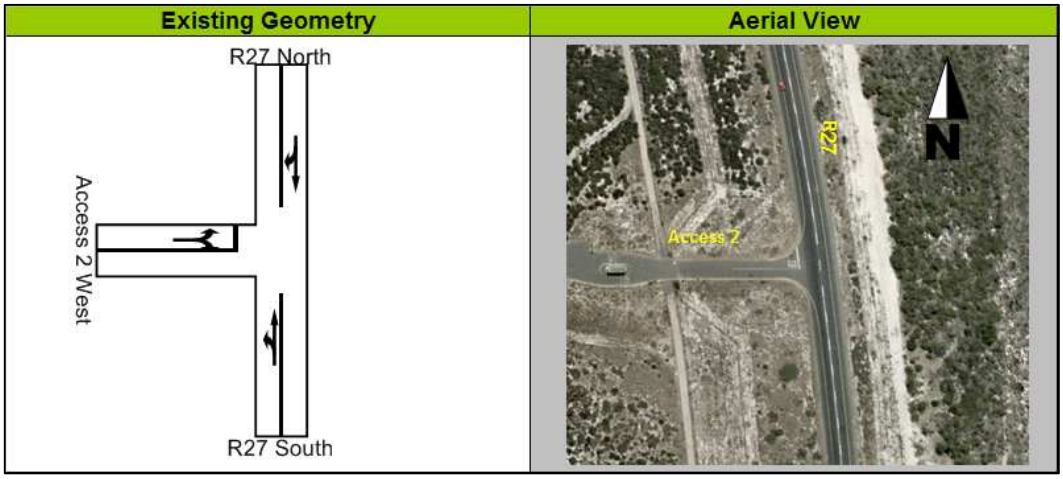


Figure 8.8: R27 / Access 2 Existing Intersection Geometry

(i) 2017 Construction Traffic

The west approach of Access 2 is expected to operate at LOS F, with a 1 vehicle queue length during the AM peak hour. Long vehicle queues are will also occur on the northern approach in the AM and PM peak hours. An upgrade is therefore required to improve the intersection capacity, as well as to ensure safety, as it is expected that a high volume of construction vehicles will utilise this access on a daily basis for the duration of the nine year construction period.

(ii) Upgrades Required

This intersection may have to be upgraded to a temporary signalised intersection for the duration of the construction period. However if Access 1 is grade separated, the upgrade / operation of this intersection should be investigated further. These options are to be discussed with the PGWC.

The option to signalise the R27 / Access 2 intersection is discussed below as shown in **Figure 8.9**.

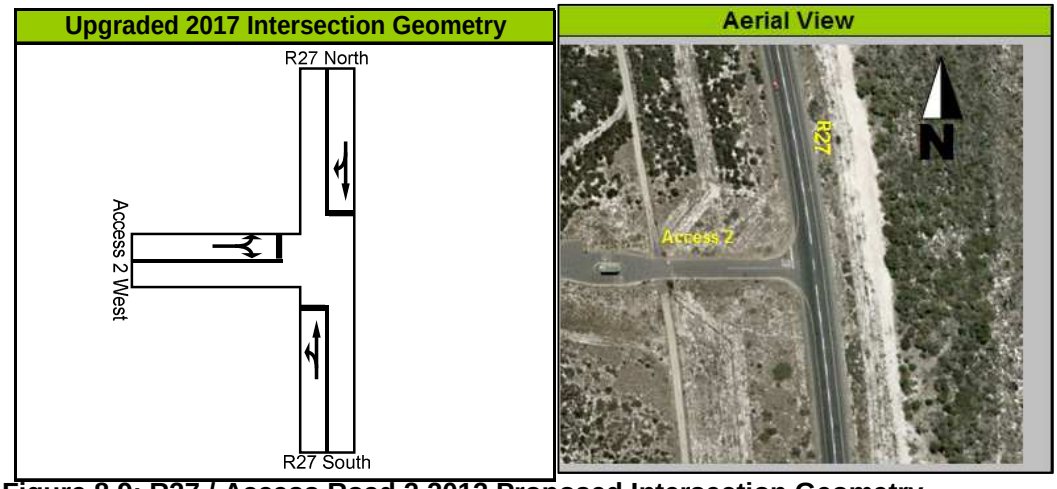


Figure 8.9: R27 / Access Road 2 2013 Proposed Intersection Geometry

The operation of the west approach of Access 2 will improve from LOS F with a 9 vehicle queue length to LOS C with a 2 vehicle queue length.

(f) Ou Skip Road / Access 2

The proposed geometry of the Ou Skip Road / Access 2 intersection is shown in **Figure 8.10**.

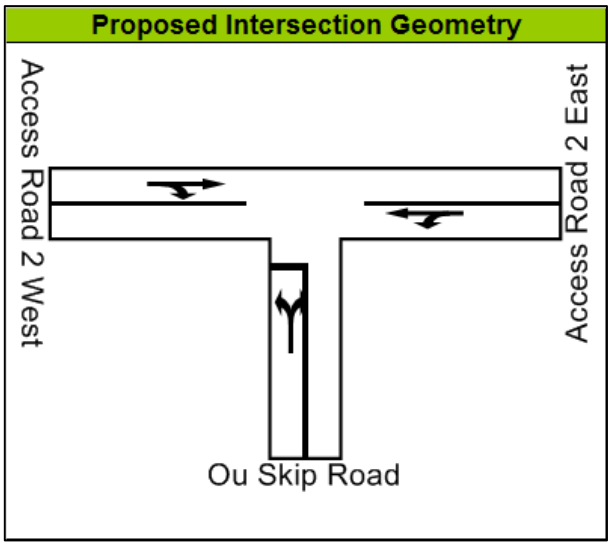


Figure 8.10: Ou Skip Road / Access Road 2 Proposed Intersection Geometry

(i) 2017 Construction Traffic

All intersection approaches will operate acceptably with LOS A to LOS C during the AM and PM hours with no significant vehicle queue lengths.

8.3 Abnormal Loads

8.3.1 Description

According to the Nuclear Siting Investigation Programme (NSIP): West Coast Summary report (Eskom, 1994), several bridges between Cape Town Harbour and the Nuclear-1 site cannot accommodate abnormal loads. Therefore utilising Cape Town Harbour for abnormal loads was dismissed as an option.

A variety of heavy loads will be transported to and from the Nuclear-1 site during the construction period, with the heaviest load being transported via a Self Propelled Modular Transporter (SPMT) as shown in **Figure 8.11.**

An investigation "Transport Study from Saldanha Harbour to Koeberg Power Station for the Abnormal SSC" (Mammoet, 2005) was undertaken in June 2005. The SPMT's dimensions are approximately 42 m in length and can be either 5.33 m (two trailer wide) or 8.23 m (three trailers wide) in width.

The heavy load will be transferred onto a two trailer wide for short periods to navigate specific roads. The transport impacts of the SPMT transporting the abnormal load components are assessed below.

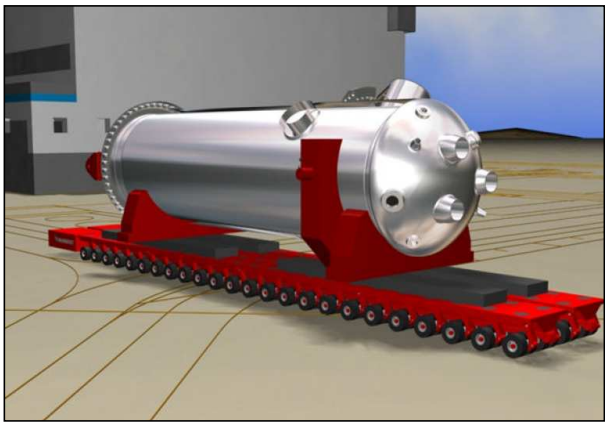


Figure 8.11: Two Trailer Wide Self Propelled Modular Transporter (SPMT)

(a) Route

The results of the above-mentioned study indicate the preferred abnormal load route from Saldanha to the Nuclear-1 site as shown in **Figure 8.12.**

FIGURE 8.12

The preferred route from Saldanha Bay Harbour to the R27 requires the following several minor road upgrades to accommodate the SPMT vehicle as shown in **Figure 8.13**:

- ***Construct a level crossing over the railway line at Saldanha Harbour;***
- ***Upgrade two unsurfaced road sections;***
- ***Three intersection widening upgrades; and***
- ***Several Eskom and Telkom overhead lines will be required to be removed and replaced to allow the heavy load to traverse the route.***

The route along the R27 from R27 / R79 intersection to Koeberg's main access is approximately 100 km and three trailers wide, 8.23 m SPMT will take up the entire width of the R27. Examples are shown in **Figures 8.14 and 8.15**. A comprehensive traffic management plan would have to be undertaken in conjunction with the relevant authorities to minimise the impacts on normal daily traffic.

Figure 8.14: SPMT traversing an intersection[3]

Figure 8.15: SPMT utilising the entire width of road[3]

Due to the low speed (5 km/h) at which the SPMT travels, approximately two stops would have to be constructed along the R27, the first could possibly be at or near the Engen One Stop approximately 10 km from the R79 / R27 intersection. Approximately six picnic spots as shown in **Figures 8.16 and 8.17**, spaced approximately 15 km apart, could be used as traffic lay byes during heavy load transport. These aspects should be investigated in more detail in a Heavy Load Traffic Management Plan.

Figure 8.16: North View of a possible traffic lay bye

Figure 8.17: South view of a possible traffic lay bye

The Modder River Bridge located approximately 27 km from the R27 / Koeberg Main Access intersection, as shown in **Figure 8.18**, has been preliminarily assessed as part of the investigation "Transport Study from Saldanha Harbour to Koeberg Power Station for the Abnormal SSC (Mammoet, 2005), and is seen to be structurally inadequate to accommodate the abnormal load being transported by the SPMT.

Figure 8.18: Modder River Bridge along the R27

The construction of a bypass upstream of the bridge should be undertaken to traverse the Modder River. The SPMT is expected to gain access to the site via the main access on the R27.

8.3.2 Heavy Load Route Traffic

Saldanha Bay is the closest harbour, which has the infrastructure capabilities to load and offload heavy loads. It is therefore envisaged that Saldanha Bay Harbour will be utilised in transporting heavy loads to the Duynefontein site. The R27 links Duynefontein to Saldanha directly.

The AM, midday and PM peak hour 2007 background traffic link volumes along the R27 from Saldanha to the Nuclear-1 site, which were obtained from the Provincial Government of the Western Cape (PGWC) (www.wcape.gov.za) website are shown in **Annexures A9, A10 and A11**. The hourly traffic volumes along the R27 shown in shaded blocks occur during the peak hour and the hourly volumes along the R27 shown in white blocks occur during the non-peak hour.

The R27 can be divided into two traffic profile sections. The boundary of the two sections is roughly the Atlantis turnoff. The northern section of the R27 illustrates a typical daily rural traffic profile, whereby the peak occurs in Midday with no AM and PM defined peaks. The traffic volumes on the northern section of the R27 are noticeably less than the R27 closer to Cape Town. The southern section of R27, closer to Cape Town however illustrates an urban daily traffic profile with defined AM and PM peak hours.

8.3.3 Trip Frequency and Time

It is recommended that the bulk of abnormal loads should be transported during the evening (21h00-05h00) and in daylight hours over weekends during non-peak periods.

Detailed traffic detours and logistics should be investigated in a comprehensive Traffic Management Plan, which should include a specific plan for transporting at night. The frequency of the abnormal load trips is currently unknown.

8.3.4 Access and Internal Road Geometry

Typical left and right turning heavy vehicle intersection paths are shown in **Figures 8.19 and 8.20**. Upgrades to the intersection bellmouths may also be required to accommodate the large turning radii of the vehicles.

Access to the Nuclear-1 site will be gained off the Main Access Road via a two way-minimum 12 m wide road. Currently there are several speed bumps present on the Main Access Road which could hinder the SMPT traversing this road. These speed bumps should, therefore, be temporarily removed during the construction phase of Nuclear-1.

8.4 Normal Heavy Load Transport

The transit of **heavy loads** to the Duynefontein site is expected to occur during the construction phase of Nuclear-1.

The current Average Annual Daily Traffic (AADT) and the percentage of heavy vehicles along the R27 are illustrated in **Annexure A21**. The AADT along the R27 is significantly less north of the R27 / Main Access Road intersection, with a higher heavy vehicle percentage of approximately 10% usage to the north.

The R27 can be considered as an existing heavy load road. The expected daily trip frequency of normal heavy loads during the construction period has been estimated in ***Table 8.1 and Annexure 12..*** The impact of all construction vehicles on the remaining life of the pavement of the R27 shall be investigated which may result in an upgrading of the pavement to maintain the structural integrity of the R27.

8.5 Parking

The 30% private transport and 70% public transport modal split results in approximately 900 temporary parking bays required for the duration of the Nuclear-1 construction phase.

This parking requirement is dependent on the public transport service in operation during the construction phase and the type of special transport shuttle services that Eskom should provide for the construction workers.

FIGURE 8.19

FIGURE 8.20

8.6 Public Transport

It is recommended that the construction workers should be transported by contracted buses to and from the site.

8.7 Non-Motorised Transport

Internal pedestrian trips are expected to increase during the construction phase. Low speeds should be maintained to ensure safety.

8.8 Emergency Evacuation

The Koeberg Nuclear Power Station's 2005 Emergency Plan (HHO, 2005) currently in place will be required to be updated to include the evacuation of the Nuclear-1 6000 workers and personnel. If an emergency evacuation is required it is expected that a total of 8500 construction workers would have to be evacuated, utilising approximately 130 x 65 seater buses, within four hours.

The Koeberg Nuclear Power Station's 2005 Emergency Plan (HHO, 2005) states that "if the capacity of the road system is reduced to 60% of normal capacity the required population evacuation can still be evacuated within acceptable time limits". The transport network road capacity currently available (2005) to accommodate the planned evacuation is approximately 4500 vehicles. One hundred and thirty buses amounts to less than 3% of the current capacity. These 130 buses should be on stand-by for usage during an emergency at Koeberg Nuclear Power Station. The buses and minibus taxis used to transport the commuters during the AM and PM peak could be used as the emergency evacuation vehicles. It is therefore recommended that Eskom acquire these vehicles for the duration of the construction period.

The construction phase of Nuclear-1 is not expected to exceed the maximum allowable evacuation times of 4 and 16 hours as detailed in the current Koeberg Nuclear Power Station Emergency Plan

The current evacuation times that need to be complied with are summarised in **Table 8.2** below. The "Koeberg Nuclear Power Station Emergency Plan: Transport Modelling & Evacuation Management Plan"[6] should be referred to for more detail.

Table 8.2 – Koeberg Nuclear Power Station's current evacuation time assessment results

Legislative Requirements				Koeberg Nuclear Power Station Current Evacuation Assessment	
Persons	Area	Safety Zone	Time period	Assessment Period	Time (2005 to 2030)
All Public	360 degree radius	PAZ 0km to 5km	Within 4 hours	AM Peak "worst case"	1.8 to 2 hours
All Public	Any 67.5 degrees	UPZ 5km to 16km	Within 16 hours		8.2 to 14.3 hours

8.9 Mitigation actions required

The following mitigation actions are therefore proposed for the daily construction phase transport of Nuclear-1:

- ***Construct a level crossing over the railway line at Saldanha Bay Harbour;***
- ***Upgrade two unsurfaced road sections at Saldanha Bay Harbour;***
- ***Three intersection widening upgrades at Saldanha Bay Harbour;***
- ***Construction of a bypass upstream of the Modder River Bridge to traverse the Modder River;***
- ***Construction of an access road to Nuclear-1 off the existing Emergency Access Road to the Nuclear-1 site;***
- ***Abnormal loads be transported during off-peak periods particularly during the night (21h00-0h500).***
- ***The R27 pavement to be investigated to determine its remaining life as well as the impact of construction traffic during the construction phase.***
- ***The R27 / Main Access Road intersection should be upgraded to a signalised intersection as shown in Figure 8.3.***
- ***The R27 / Napoleon Street intersection should be upgraded to a signalised intersection, as shown in Figure 8.5. If Access 1 is grade separated then the signalisation of this intersection may not be required. These options are to be discussed with the PGWC;***
- ***The R27 / Access 2 intersection should be upgraded to a temporary signalised intersection as shown in Figure 8.9. If Access1 is grade separated, then the signalisation of this intersection may not be required and requires further investigation. These options are to be discussed with the PGWC;***
- ***Relevant signage, street lighting and a reduction of the speed limit from 120 km/hr to 80 km/hr is required to be constructed along the R27 approaching the proposed signalised upgrades of the above-mentioned intersections;***
- ***900 temporary parking bays should be provided;***
- ***The "Koeberg Nuclear Power Station Emergency Plan: Transport Modelling & Evacuation Management Plan" should be updated to include the evacuation of the 6000 Nuclear-1 construction workers; and***
- ***A comprehensive Construction Traffic Management Plan should be completed, in conjunction with the authorities, for the duration of the construction period.***

9 BANTAMSKLIP CONSTRUCTION PHASE IMPACT ASSESSMENT

9.1 Access

9.1.1 Access Location

Access to the Nuclear-1 construction site is expected to be directly off the R43 as shown in **Figure 9.1**. There are two new access roads proposed.

9.1.2 Access Spacing

The new accesses off the R43 are proposed for Nuclear-1. In accordance with the PGWC's Road Access Guidelines (2001) the minimum access spacing requirement for a non-signalised intersection in a rural development environment is as follows:

- ***Main Road (R43) – Class 2 Primary Arterial: 600 m***

The proposed accesses should therefore be located a minimum of 600 m from the R43 / DR01206 and the R43 / DR01211 intersections as shown in **Figure 9.1**.

9.1.3 Access Design

The proposed access roads will necessitate the construction of a T-junction intersection with the R43 as shown in **Figure 9.2**.

9.1.4 Sight Distance

It is proposed that the intersection approach for Nuclear-1 be controlled by a stop sign. According to the 'Geometric Design of Rural Roads: TRH 17 (NDoT, 1988) the sight distance required by single unit truck and trailer for a design speed of 120 km/hr is approximately 450 m. The available sight distance along the R43 in the vicinity of the proposed intersections is in excess of 450 m. Therefore the proposed accesses meet the minimum sight distance requirements.

9.2 Traffic Analysis

9.2.1 Description

The following section assesses the cumulative transportation impacts of the construction phase on the local transport system. The AM and PM peak periods are the critical daily time periods and therefore the assessment was undertaken for these peak hours.

The AM and PM peak hours are:

- ***AM Peak hour – 08:00 to 09:00***
- ***PM Peak hour – 16:00 to 17:00***

FIGURE 9.1

FIGURE 9.2

Eskom has provided a detailed schedule of estimated construction phase trips for each year of the nine year construction phase period. Year 6, estimated to be 2017 is the peak year of the construction phase as shown in Annexure B9.

9.2.2 Trip Generation

The trips generated by the proposed Nuclear-1 site at Bantamsklip during the construction phase are shown in **Table 9.1** and the detailed trip generation table is shown in **Annexure B9.** These trips include buses, which will transport construction worker to and from the site.

Table 9.1 –Construction Phase Generated Trips

Construction Traffic Type	AM		PM	
	IN	OUT	IN	OUT
General Workers	0	0	0	14
Vendor Staff	0	0	0	304
Eskom Staff	0	0	0	422
Waste and Spoil	1	1	1	1
Construction Resources	8	8	8	8
TOTAL	9	9	9	749

9.2.3 Trip Assignment & Distribution

To determine the traffic impact of Nuclear-1's construction phase on the surrounding road network, the generated trips were distributed onto the existing road network.

The directional distribution of the internal generated trips for both the AM and PM peak hours is based on the percentage distribution of the 2007 background traffic flows. Construction worker accommodation is expected to be located to the west of the site in the Gansbaai area. Ninety percent of the trips generated originate from the west (Gansbaai, Pearly Beach etc) and ten percent originate from the eastern, Bredasdorp side of the proposed site.

The percentage distribution, for the AM and PM peak hours is shown in **Annexure B10 and B11,** respectively.

The distribution of generated traffic by the proposed development for both the AM and PM peak periods are shown in **Annexures B12 and B13,** respectively.

It was assumed that the peak construction period would occur in year six of the nine year construction period. The 2017 construction phase total traffic (2017 background traffic plus construction generated traffic) for the AM and PM peak periods is shown in **Annexures B14 and B15,** respectively.

9.2.4 Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 Computer Programme for the following main intersections:

- ***R43 / DR01211;***
- ***R43 / DR01206; and***
- ***R43 / Main Access Road.***

The **2017 Construction Total Traffic scenario** was analysed during the AM and PM peak hours. The LOS and 95th percentile vehicle queue lengths for this scenario are summarised in **Annexures B16 and B17**. The analysis results are summarised hereafter. Detailed analysis results are available on request.

(a) R43 / DR01211

The existing geometry and aerial view of R43 / DR01211 is shown in **Figure 9.3**.

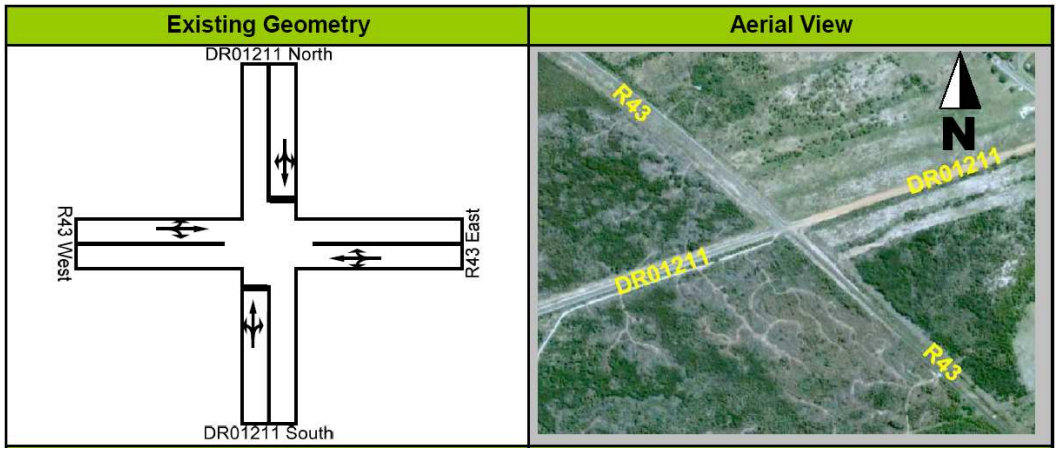


Figure 9.3: R43 / DR01211 Existing Intersection Geometry

(i) 2017 Construction Traffic

All approaches will operate acceptably at LOS A to LOS C with minimal vehicle queue lengths during the AM and PM peak hours. No upgrades are therefore required.

(b) R43 / DR01206

The existing geometry and aerial view of R43 / DR01206 is shown in **Figure 9.4**.

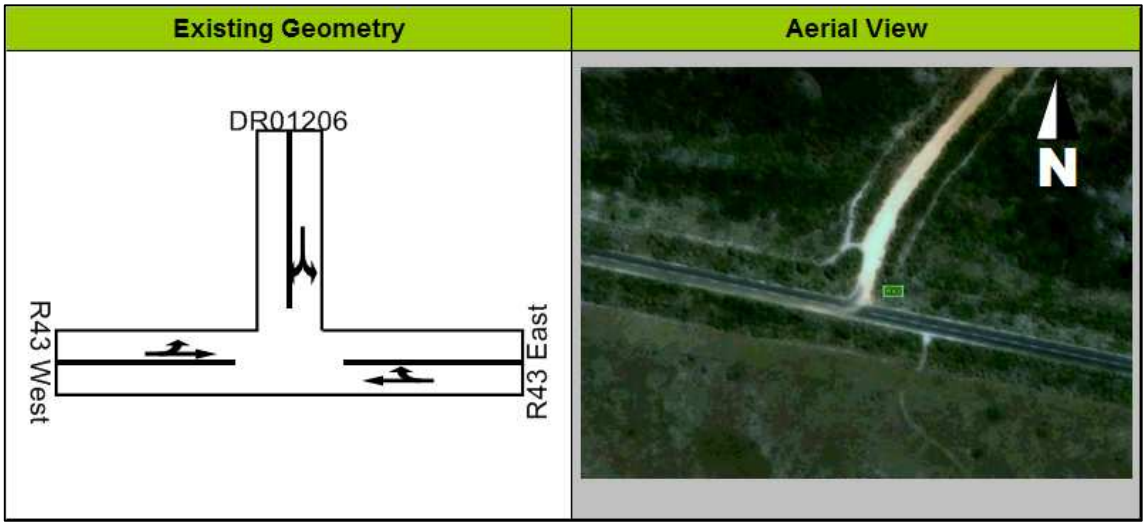


Figure 9.4: R43 / DR01206 Existing Intersection Geometry

(i) 2017 Construction Traffic

All approaches will operate acceptably at LOS A to LOS B with minimal vehicle queue lengths during the AM and PM peak hours. No upgrades are therefore required.

(c) R43 / Main Access Road

The proposed geometry and aerial view of R43 / Main Access Road is shown in **Figure 9.5**.

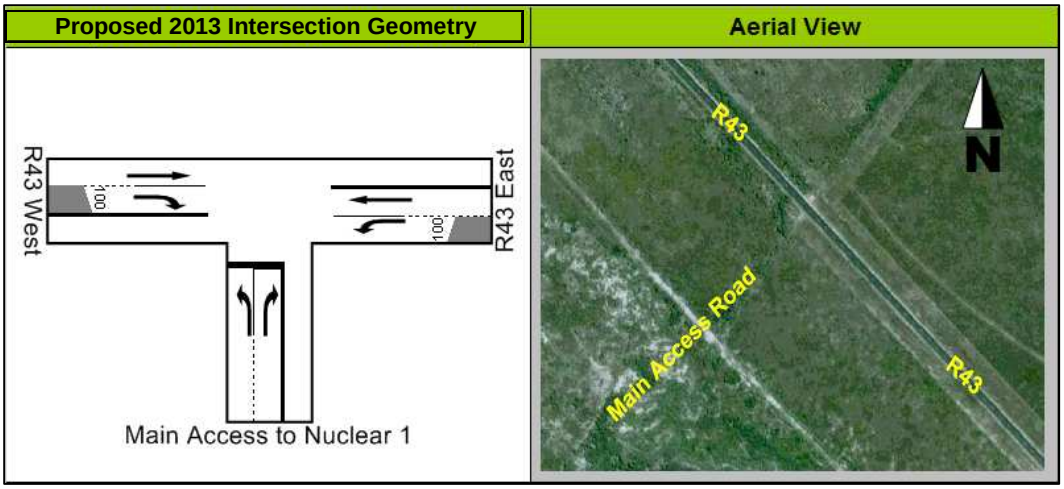


Figure 9.5: R43 / Main Access Road Proposed 2013 Intersection Geometry

(i) 2017 Construction Traffic

All intersection movements will operate from LOS A to LOS B during the AM and PM peak hours with minimal queues. .

9.3 Abnormal Loads

According to the NSIP Southern Cape Summary Report (Eskom, 1994) the feasibility of transporting heavy loads from Table Bay Harbour in Cape Town to the Bantamsklip site was investigated by Drennan, Maud and Partners in 1988. According to this study Cape Town Harbour (Table Bay Harbour) is ideally situated and has the infrastructure capabilities for loading and offloading heavy loads.

However, route studies have shown that there are several bridges between Cape Town Harbour and the Nuclear-1 site that cannot accommodate abnormal loads. **Figure 9.6** shows the results of the preliminary route analysis. Therefore transporting abnormal loads from the Table Bay harbour to Bantamsklip via the preferred road option would require major upgrades.

Transport of the abnormal loads via a barge from Table Bay Harbour to a suitable area on the beach close to the Nuclear-1 site at Bantamsklip will have to be considered. The distance from Cape Town Harbour to Bantamsklip is approximately 150 km. Suitable landing and loading / off-loading facilities appropriate for a barge would have to be constructed along the beach.

The abnormal load would then have to be transported via road from the barge to the Nuclear-1 site at Bantamsklip. This option requires the heavy load to change modes of transport more often than if the load was transported directly via road and is therefore only considered as a last resort.

9.4 Normal Heavy Load Transport

The main section of the heavy vehicle route from Bantamsklip is along the R43 to the N2 via Sir Lowry's pass into Cape Town. The detailed heavy vehicle route and its impacts on the relevant transportation network have been investigated.

The current Average Annual Daily Traffic (AADT) and the percentage of heavy vehicles along the R43 and the N2 are illustrated in **Annexure B18**. The R43 and the N2 can be considered as existing heavy load roads as the percentage heavy vehicles are currently above the average 5%. The R43 road pavement shall be investigated in terms of its remaining pavement life, and the impact of all construction vehicles over the construction period. It is anticipated that the R43 would require strengthening of its pavement.

FIGURE 9.6

9.5 Parking

A total of 720 private vehicle trips will be undertaken for the duration of the construction period. 576 workers will arrive on site while 144 workers will leave the site during the AM peak period. The reverse will occur during the PM peak periods. Temporary parking for 576 light passenger vehicles should therefore be provided on the Nuclear-1 site at Bantamsklip during the construction phase.

9.6 Public Transport

It is recommended that the construction workers should be transported by contracted buses to and from the site.

9.7 Non-Motorised Transport

Internal pedestrian trips are expected to increase during the construction phase. Low speeds should be maintained to ensure safety.

9.8 Mitigation actions required

The following mitigation actions are proposed for the construction phase of Nuclear-1:

- ***Approximately 600 temporary parking bays should be provided;***
- ***Minibus taxis and buses should be provided to shuttle construction workers to the site;***
- ***Construction of the main access off the R43 to the Nuclear-1 site is required;***
- ***The remaining pavement life of the R43 shall be investigated and the possible improvement of the pavement shall be investigated to support the additional traffic generated during the construction phase.***
- ***A suitable site along the coast near the Bantamsklip site should be identified to allow loading and off-loading of the barge, which is proposed to transport heavy loads from Cape Town harbour to the site. A landing facility would be required to be constructed at the appropriate location; and***
- ***A comprehensive Construction Traffic Management Plan should be completed with the relevant authorities before construction commences.***

10 THYSPUNT CONSTRUCTION PHASE IMPACT ASSESSMENT

10.1 Access

10.1.1 Access Requirements

There are currently no viable direct access roads connecting the Thyspunt site to the existing road network. Access to the site will be required during the construction phase and will subsequently be used during the operational phase of Nuclear-1.

The site can be accessed from three possible directions, east, north and west as shown in **Figure 10.1**. The main access is required to:

- convey abnormal loads;
- convey some construction material; and
- provide access to operational staff.
- provide emergency evacuation route

A secondary access is required to:

- convey aggregate to the site;
- provide access to construction workers, staff and operational staff housing opportunities;
- convey construction materials; and
- provide an emergency evacuation route.

10.1.2 Access Routes

(a) Main Access

Several routes have been investigated to access the construction site from Port Elizabeth harbour via the N2 and R102 as shown in Figure 10.1:

- ***Route 1 – R102 through Saffrey Street, R330 to Oyster Bay Road***
- ***Route 2 - R102 through Saffrey Street to the R330***
- ***Route 3 – N2 through the R62 interchange, along the R102 to access road west of the Impofu Dam***
- ***Route 4 – N2 through the R62 interchange, along the R102 to access road east of the Impofu Dam***

The routes were assessed in meeting the requirements of a main access route and a secondary access route as described above. In addition route lengths and impact on settlements were assessed. Route 3 (approx. 85km) and Route 4 (approx. 83km) are considerably longer than Routes 1 and 2 (approx 55km). In addition the vertical alignment of Route 2 (R330) is much easier to traverse for heavy vehicles than the other routes. Using two routes reduces the overall impact of construction traffic compared to using a single route.

It is recommended that the R330 be used as the main access route, and Oyster Bay Road be used as the secondary construction route (for smaller construction vehicles and construction workers).

SafferyStreet requires substantial upgrading of the pavement as well as the vertical alignment. Saffery Street is extensively used by holiday traffic to bypass Humansdorp Main Road. Saffery Street is shown in **Figure 10.1d**.

Substantial pedestrian movements were observed between Humansdorp commercial area and Kwanomzamo. The high volumes of construction vehicles will dramatically increase safety risks to local residents who access the commercial area in Humansdorp. It is recommended a grade separated structure be constructed to improve the safety of residents crossing the R330 during the construction phase.

Currently three alignments are being investigated for the eastern access link from the site to the R330 as shown in **Figure 10.1a**.

Alignment E1 is one of the shortest routes. However, it crosses an mobile dune system at km 8, affects several coastal properties and potentially intersects several wetlands and springs and therefore was considered unsatisfactory.

Alignment E2 follows the existing service road to St. Francis Links Gold Estate and continues in an westerly direction to the site. This is the second shortest route, however it would affect a coastal forest area which was considered unsatisfactory.

Alignment E3 is the longest route. It starts 2km south of the R330 and crosses land that has low environmental sensitivity in a westerly direction, then travels in a westerly direction through a corridor between St Francis Links and the “Dunes” development towards the site. To avoid impacting the St. Francis Links this route alignment does not use the St. Francis Links service road. Alignment E3 is therefore the recommended eastern access alignment.

FIGURE 10.1

FIGURE 10.1 (a)

A link between the R330 and route E3 north of St, Francis Links development was considered as traffic would not impact the development. However, this area has been excised from development during the planning of the St. Francis Links estate by the Department of Environmental Affairs as being too environmentally sensitive, therefore this link was not recommended.

The remaining life of the R330 shall be investigated for possible upgrading by determining whether it can accommodate the increased loading as a result of heavy loads during the construction period. Initial assessment of the Kromme River Bridge indicates that the bridge will be capable of carrying the increased loading during the construction period.

(b) Secondary Access

Two northern access alignments and four western access alignments have been investigated as shown in **Figure 10.1b**.

Both alignment N1 and N2 starts at the site and heads north connecting to the MN50040, which links to the currently unsurfaced DR1763. Alignment N1 requires significant cuttings of 30 to 40 meters to be excavated for the road. Alignment N2 crosses the mobile dune field for 350 meters, which excludes N2 as an alignment option.

Alignment W1, shown in **Figure 10.1c**, runs in a westerly direction from the site between Umzamawethu and Oyster Bay. The disadvantage of this alignment is its close proximity to Oyster-Bay and that it passes between Umzamawethu and Oyster Bay, which will create a barrier between Umzamawethu and Oyster Bay and the coastline. This is also true for alignments W2 and W3. In addition, alignment W2 crosses two private erven. Alignment W3 is similar to W1. If these alignments are approved, a grade separated structure will have to be constructed for pedestrians to ensure the safety of Umzamawethu residents.

Alignment W4 links directly to the DR1763 and therefore has minimal impact on Oyster Bay and has the added advantage of not creating a barrier between Umzamawethu and Oyster Bay. Therefore alignment W4 is the recommended alignment for the secondary access from a traffic point of view.

10.1.3 Access Spacing

The minimum access spacing requirement for a non-signalised intersection in a rural development environment on a Class 2 Primary Arterial is 600 m. The proposed Main access point off the two proposed access routes should therefore be located a minimum of 600 m from similar access points.

10.1.4 Sight Distance

According to the 'Geometric Design of Rural Roads: TRH 17 (NDoT, 1988) 'the shoulder sight distance required by single unit truck and trailer for a design speed of 80 km/hr is approximately 300 m and for a design speed of 120 km/hr the sight distance is 450 m.

These shoulder sight distances should be taken into account when designing the Access point to the Nuclear-1 site of the proposed access road.

FIGURE 10.1 (b)

FIGURE 10.1 (c)

FIGURE 10.1 (d)

10.2 Traffic Analysis

10.2.1 Description

The following section assesses the transportation impacts of the construction phase on the local transport system. The AM and PM peak periods are the critical daily time periods and therefore the following assessment was undertaken for these peak hours.

The AM and PM peak hours are:

- ***AM peak hour - 07:30 to 08:30; and***
- ***PM peak hour - 16:30 to 17:30.***

Eskom has provided a detailed schedule of estimated construction phase trips for each year of the nine year construction phase period. Year 6, estimated to be 2017 is the peak year of the construction phase as shown in Annexure C12.

Table 10.1 –Construction Phase Generated Trips

Construction Traffic Type	Eastern Access Peak Hour				Western Access Peak Hour			
	AM		PM		AM		PM	
	IN	OUT	IN	OUT	IN	OUT	IN	OUT
General Workers	1	0	0	6	1	0	0	8
Vendor Staff	5	0	0	213	2	0	0	91
Eskom Staff	8	0	0	295	3	0	0	127
Waste and Spoil	0	0	0	0	1	1	1	1
Construction Resources	6	6	6	6	0	0	0	0
TOTAL	20	6	6	520	7	1	1	227

The new Oyster Bay Road alignment and design is still to be investigated. The R330 currently accommodates most of the traffic in the area and will accommodate the majority of the construction phase traffic. Therefore only the R330 has been analysed in terms of traffic impacts below.

10.2.2 Trip Assignment & Distribution

To determine the traffic impact of Nuclear-1's construction phase on the surrounding road network, the generated trips were distributed onto the existing road network.

The directional distribution of the generated trips for both the AM and PM peak hours is based on the percentage distribution of the 2008 background traffic flows. The percentage distribution, for the AM and PM peak hours is shown in **Annexure C13 and C14**.

The distributions of generated traffic by the proposed development for both the AM and PM peak periods are shown in **Annexures C15 and C16,** respectively.

It was assumed that the peak construction period would occur during the sixth year (2017) of construction phase. The 2017 construction phase total traffic (2017 background traffic plus construction generated traffic) for the AM and PM peak periods is shown in **Annexures C17 and C18,** respectively.

10.2.3 Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 Computer Programme for the following main intersections:

- ***R330 / Eastern Access Road (Main access);***
- ***R330 / St Francis Bay Access Road;***
- ***R330/ Oyster-Bay Access Road;***
- ***R330 / Gravel Road;***
- ***Park Road / Main Street;***
- ***Main Street / Jeffrey's Bay Access Road;***
- ***Main Street / N2 South Off-Ramp; and***
- ***Main Street / N2 North Off-Ramp.***

The **2017 Construction Total Traffic scenario** was analysed during the AM and PM peak hours.

The LOS and 95th percentile vehicle queue lengths for this scenario are summarised in **Annexures C19 and C20**. The analysis results are summarised hereafter. Detailed analysis results are available on request.

(a) R330 / Eastern Access Road

The proposed eastern access geometry of R330 / Eastern Access Road is shown in **Figure 10.2**.

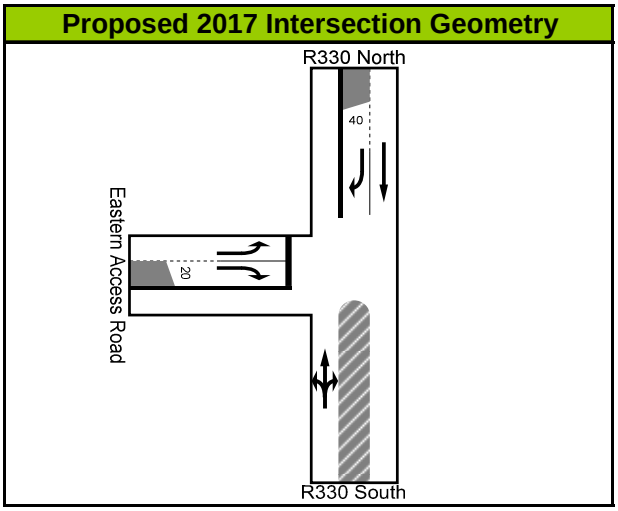


Figure 10.2: R330 / Eastern Access Road Proposed Intersection Geometry

(i) 2017 Construction Traffic

All approaches are expected to operate acceptably during the AM and PM peak hours at LOS A to LOS C with no significant vehicle queues.

(b) R330 / St. Francis Bay Access Road

The existing geometry and aerial view of R330 / St Francis Bay Access Road is shown in **Figure 10.3**.

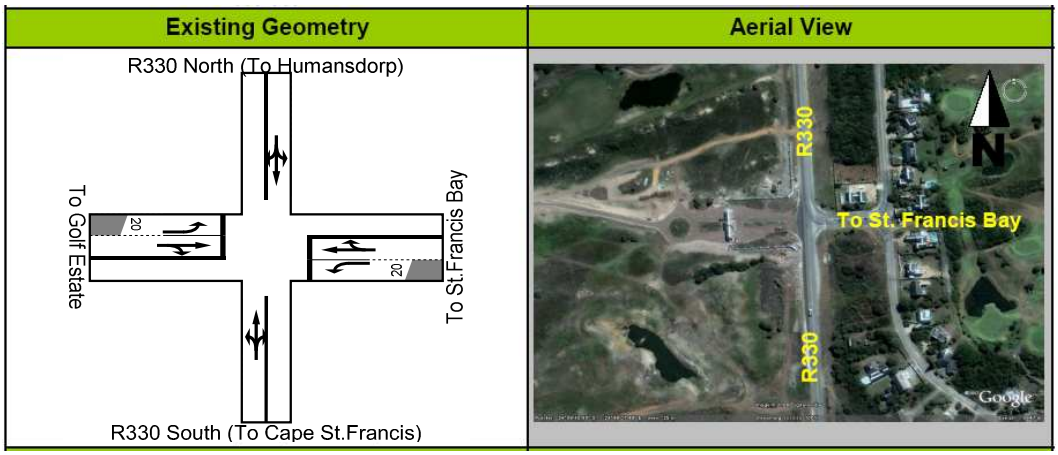


Figure 10.3: R330 / St Francis Bay Access Road Existing Intersection Geometry

(i) 2017 Construction Traffic

The eastern approach of the St. Francis Bay Access Road is expected to operate at LOS B with no significant vehicle queues. No upgrades are therefore required.

(c) R330 / Oyster-Bay Access Road

The existing geometry and aerial view of R330 / Oyster-Bay Access Road is shown in **Figure 10.4**.

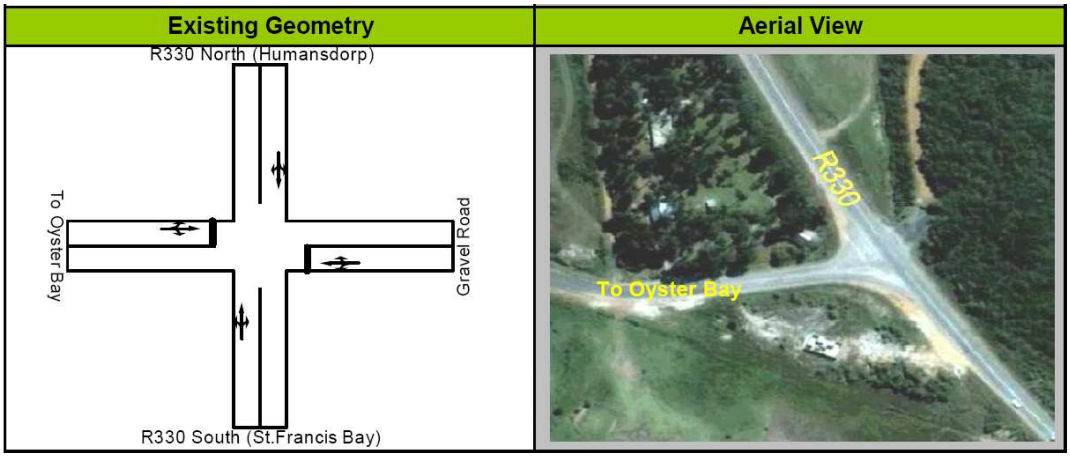


Figure 10.4: R330 / Oyster Bay Access Road Existing Intersection Geometry

(i) 2017 Construction Traffic

All approaches will operate acceptably from LOS A to LOS B with no significant vehicle queue lengths. No upgrades are therefore required.

(d) R330 / Gravel Road

The existing geometry and aerial view of R330 / Gravel Road is shown in **Figure 10.5**.

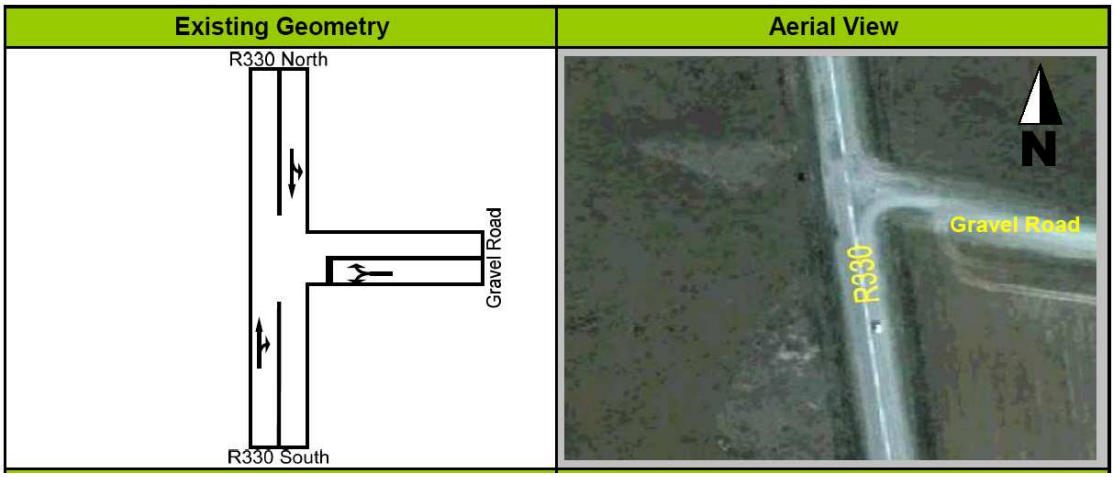


Figure 10.5: R330 / Gravel Road Existing Intersection Geometry

(i) 2017 Construction Traffic

All approaches will operate acceptably from LOS A to LOS B with no significant vehicle queue lengths. No upgrades are therefore required.

(e) Park Road (R330) / Main Street (R330)

The existing geometry and aerial view of Park Road / Main Street is shown in **Figure 10.6**.

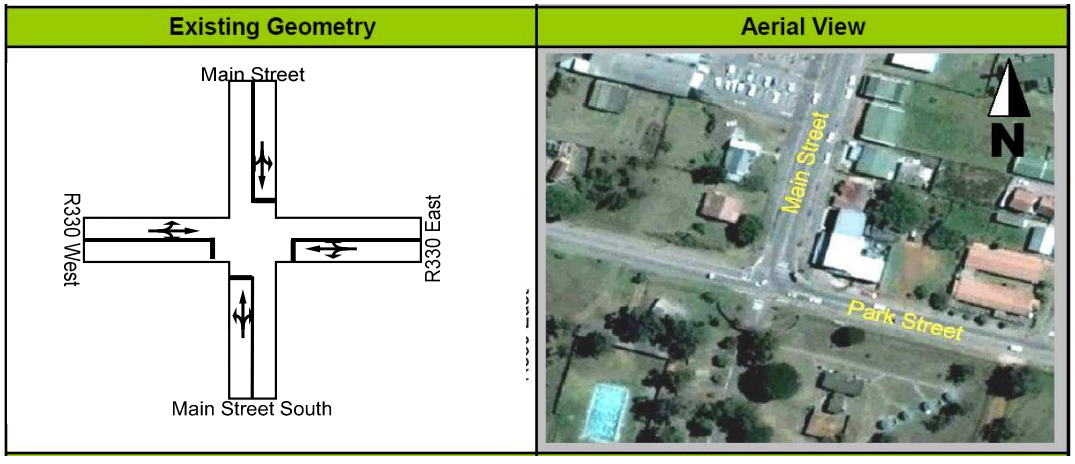


Figure 10.6: Park Road / Main Street Existing Intersection Geometry

(i) 2017 Construction Traffic

All approaches will operate acceptably from LOS A to LOS B with no significant vehicle queue lengths. No upgrades are therefore required.

(f) Main Street / Jeffrey's Bay Access Road

The existing geometry and aerial view of Main Street / Jeffrey's Bay Access Road is shown in **Figure 10.7**.

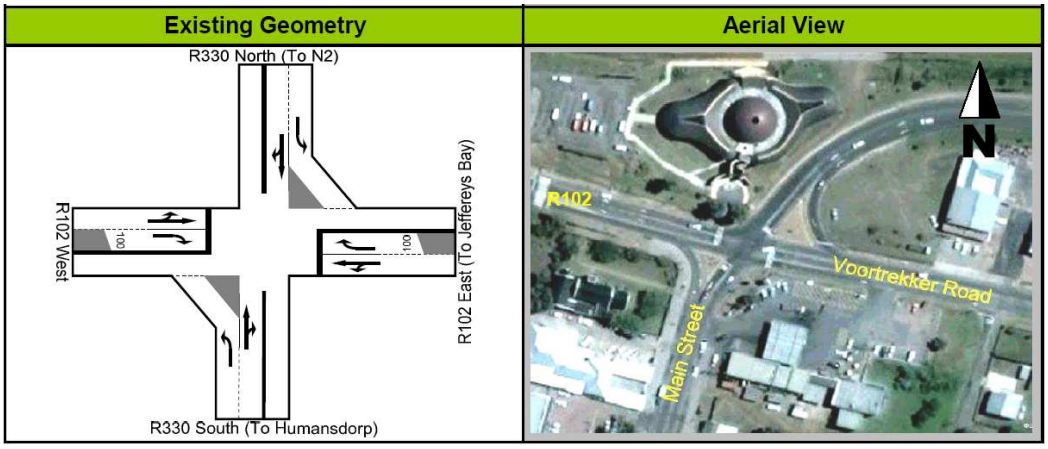


Figure 10.7: Main Street / Jeffrey's Bay Access Road Existing Intersection Geometry

(i) 2017 Construction Traffic

The Jeffrey's Bay Access Road right turns deteriorate to LOS F with a 5 vehicle queue length. Upgrading this intersection to a signalised intersection would improve the operations.

(ii) Upgrades Required

Signalising the Main Street / Jeffrey's Bay Access Road intersection with the existing geometry remaining is recommended. The Jeffrey's Bay right turns will improve from LOS F to LOS C.

(g) Main Street / N2 South Off-Ramp

The existing geometry and aerial view of Main Street / N2 South Off-Ramp is shown in **Figure 10.18**.

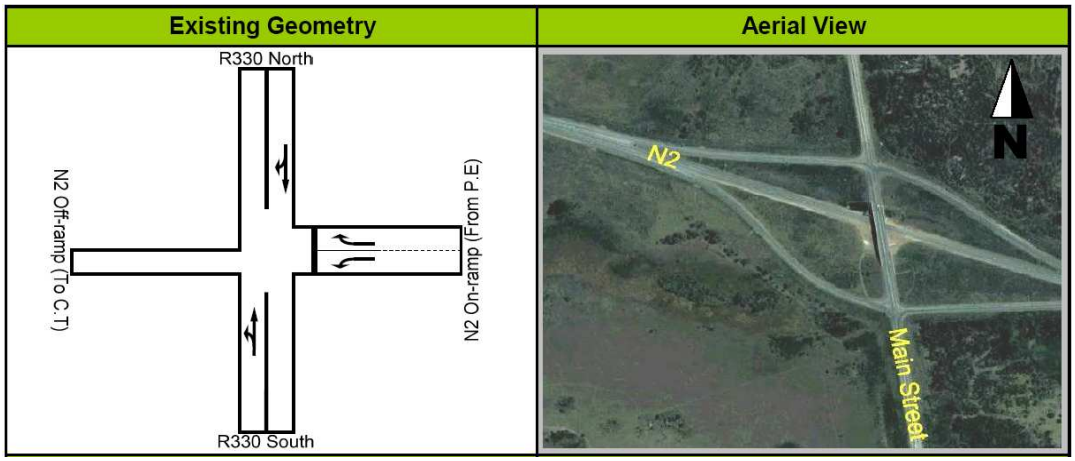


Figure 10.18: Main Street / N2 South Off-Ramp Existing Intersection Geometry

(i) 2017 Construction Traffic

All approaches will operate acceptably from LOS A and LOS B with no significant vehicle queue lengths during the AM and PM peak hours. No upgrades are therefore required.

(h) Main Street / N2 North Off-Ramp

The existing geometry and aerial view of Main Street / N2 North Off-Ramp is shown in **Figure 10.9**.

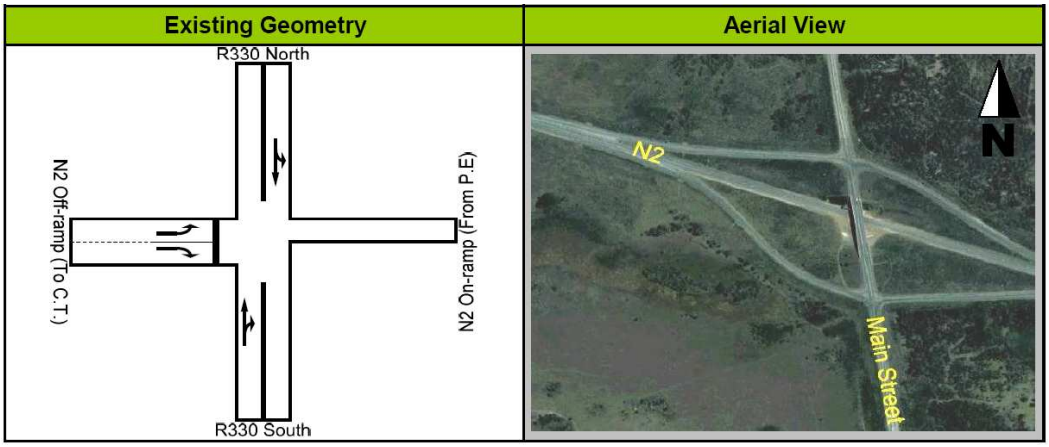


Figure 10.9: Main Street / N2 North Off-Ramp Existing Intersection Geometry

(i) 2017 Construction Traffic

All approaches will operate acceptably from LOS A to LOS B with no significant vehicle queue lengths during the AM and PM peak hours. No upgrades are therefore required.

10.3 Abnormal Loads

10.3.1 Description

Revision 1 of the NSIP Eastern Cape Summary Report (Drennan et al., 1988) investigated the feasibility of transporting heavy loads from Port Elizabeth (PE) Harbour to the Thyspunt site.

According to this study, no off-loading crane facility exists at PE harbour and either Ro-Ro vessels or vessels with high capacity ship's derricks would have to be used. Port Elizabeth Harbour is the closest harbour with the infrastructure capabilities to load and offload heavy loads and should be used to transport abnormal loads to Nuclear-1. The main section of the abnormal vehicle route will be from Port Elizabeth Harbour, via the N2, R102, and via Saffery Street to the R330 to the site.

Abnormal loads may have to be transported via a Two Trailer Wide Self Propelled Modular Transporter (SPMT), as shown in **Figure 10.13.** The SPMT's dimensions are approximately 42 m in length and can be either 5.33 m (two trailer wide) or 8.23 m (three trailer wide) in width.

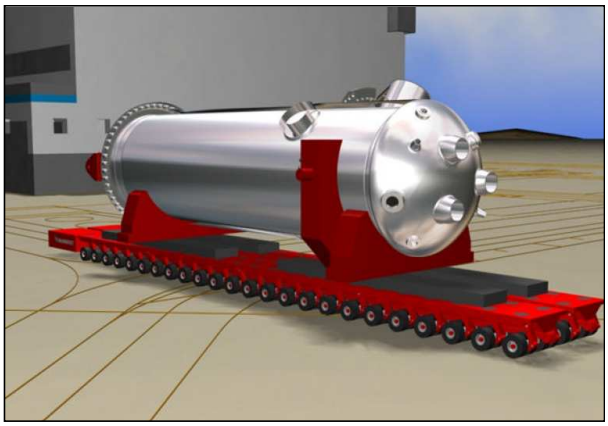


Figure 10.13: Two Trailer Wide Self Propelled Modular Transporter (SPMT)

If the movement of abnormal loads is required, Eskom will undertake a detailed study of the transportation route from Port Elizabeth Harbour to the Thyspunt site.

However, a preliminary assessment of the route from Port Elizabeth Harbour to the site was undertaken as part of this study. The preferred route along the R330 and R102 is shown in **Figure 10.14**. The preliminary assessment indicated that the structures (including the Van Staden Bridge) will cope with the additional loads. Alternative routings have also been investigated ***including accessing the R330 directly from the N2 / Humansdorp Main Rd intersection. The turning circles required for the abnormal load vehicle does not allow for the access from the N2 to the off ramp to Humansdorp Main Road without significant intersection geometry upgrades as shown below in Figures 10.13 a and b.***

Figure 10.13 a: Abnormal load vehicle turning circle exiting N2 onto R330

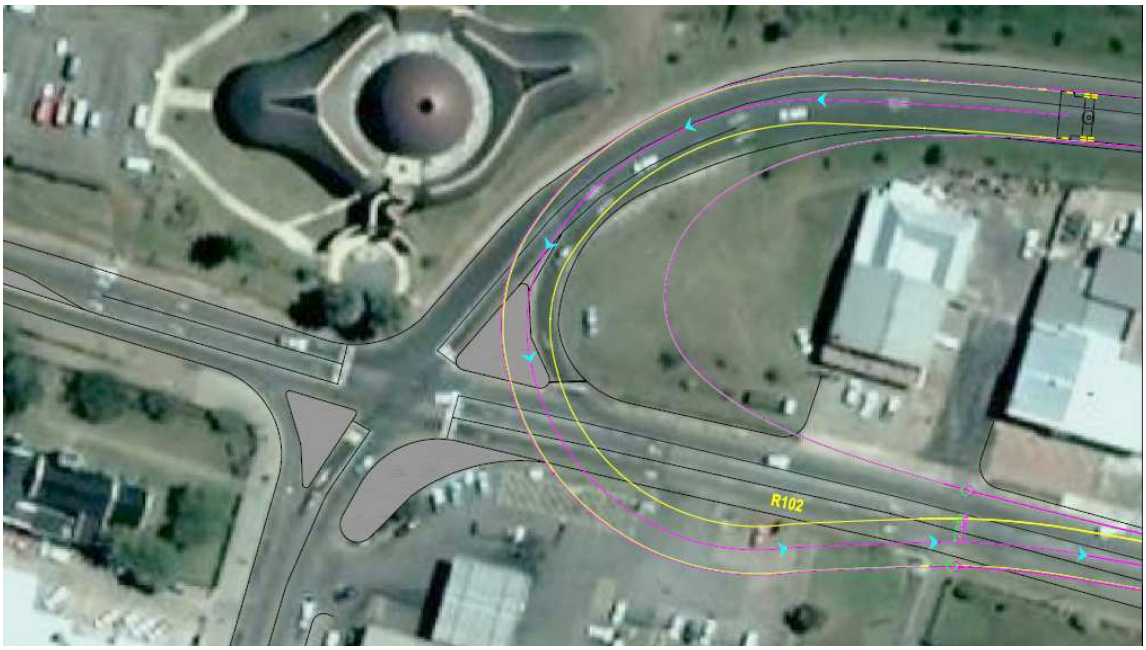


Figure 10.13 b: Abnormal load vehicle turning circle R330 to R102

. Detailed assessments of all the major structures will be conducted. Bypasses for several interchanges will be constructed as a result of height restrictions for overhead bridges.

A comprehensive traffic management plan will be required to minimise the impacts on normal daily traffic.

10.3.2 Heavy Load Route Traffic

The AM, midday and PM peak hour 2007 background traffic link volumes along the N2 and the R330 from Port Elizabeth Harbour to the Nuclear-1 are shown in **Annexures C9, C10 and C11**. The hourly traffic volumes along the N2 and R330 shown in shaded blocks occur during the peak hour and the hourly volumes along the N2 and R330 shown in white block occur during the non-peak hour.

10.3.3 Trip Frequency and Time

It is recommended that the majority of abnormal load trips be undertaken during the evening (21h00-05h00) and in daylight hours over weekends during non-peak periods..

Detailed traffic detours and logistics should be investigated in a comprehensive Traffic Management Plan, which should include a specific plan for transporting at night.

FIGURE 10.14

10.4 Normal Heavy Load Transport

The transit of **heavy loads** to the Thyspunt site is expected to occur throughout Nuclear-1's three life cycle stages (construction, operations and decommissioning).

The proposed Nuclear-1 site will result in heavy vehicles being used during the construction phase, as well as transporting low to medium radioactive waste to Vaalputs in the Northern Cape Province and the transport of Nuclear Fuel during the operational phase, as shown in **Figure 10.14**. The proposed access intersection should be designed to enable these vehicles to easily enter and exit the site without impeding traffic. The intersection should therefore be designed with wider bell-mouths.

The current AADT and the percentage of heavy vehicles along the R330 is illustrated in **Annexure C21**. Annexure C21 also indicates the Nuclear-1 generated construction traffic percentage of total daily traffic. The Nuclear-1 construction traffic ranges from 5% further away from the site, to 67% closer to the site - where background traffic is low and thus most of the traffic in this area will be generated from the site/construction.

The current heavy vehicle component of the AADT along the R330 is significantly above the average 5%, therefore the R330 can be considered as an existing heavy load road. The DR1763 (currently unsurfaced Oyster Bay Road) should be substantially upgraded to be able to accommodate the heavy vehicle traffic.

10.5 Parking

A total of 720 private vehicle trips per day will be undertaken for the duration of the construction period. Five hundred and seventy six workers will arrive on site while 144 workers leave the site during the AM peak period. The reverse will occur during the PM peak periods. Temporary parking for 576 light passenger vehicles should therefore be provided on the site during the construction phase.

10.6 Public Transport

It is recommended that the construction workers should be transported by contracted buses to and from the site.

10.7 Non-Motorised Transport

Internal pedestrian trips are expected to increase during the construction phase. Low speeds should be maintained to ensure safety.

10.8 Mitigation actions required

The following mitigation actions are therefore proposed for the daily construction phase transport of Nuclear-1:

- ***It is recommended that the R330 be used as the main access route, and Oyster Bay Road be used as the secondary construction route (for smaller construction vehicles and construction workers).***

- The Oyster-Bay road (DR1763) should be upgraded to a surfaced road to allow access to the site from the west;
- Grade separated structures should be constructed for the communities of Umzamawethu and Kwanomzamo to mitigate the increased road safety risks as a result of high construction volumes.
- An eastern access road off the R330 towards the site is required to be built;
- A new western access is required to be built to connect the site to the DR1763;
- The Main Street / Jeffrey's Bay Access Road intersection should be upgraded to a signalised intersection.
- It is recommended that the bulk of abnormal loads be transported during the evening (21h00-0h500) and in daylight hours during the of-peak periods.
- Investigation of the remaining pavement life for the R330 and upgraded as required to accommodated construction traffic over the construction period.
- The DR1763 should be upgraded to accommodate heavy construction vehicle traffic
- ***576 temporary parking bays should be provided on-site;***
- ***A comprehensive Construction Traffic Management Plan should be completed in conjunction with the traffic authorities.***

11 DUYNEFONTEIN OPERATIONAL PHASE IMPACT ASSESSMENT

11.1 Access

Access 1 will be used to access Koeberg Nuclear Power Station.

11.2 Traffic Analysis

The following section assesses the transport impacts of the operational phase on the local transport system. The AM and PM peak hours are the critical daily time periods and therefore the following assessment was undertaken for these peak hours.

The AM and PM peak hours are:

- ***AM peak hour – 07:00 to 08:00; and***
- ***PM peak hour – 16:30 to 17:30.***

It is estimated that approximately 1 300 staff members are required to operate the Nuclear-1 site during its operational phase. Visitor traffic to Nuclear-1 is expected to occur outside of the AM and PM peak hours and is therefore not included in the analysis.

It was assumed that shift workers will be used for the duration of the operations. The following shifts were assumed:

- ***Shift 1: 23:00 to 07:00;***
- ***Shift 2: 07:00 to 15:00; and***
- ***Shift 3: 15:00 to 23:00.***

Figure 11.1 shows the shift timetable for Nuclear-1. It was assumed that 15% of workers would operate Nuclear-1 in Shift 1, 60% of workers in Shift 2 and 25% of workers in Shift 3.

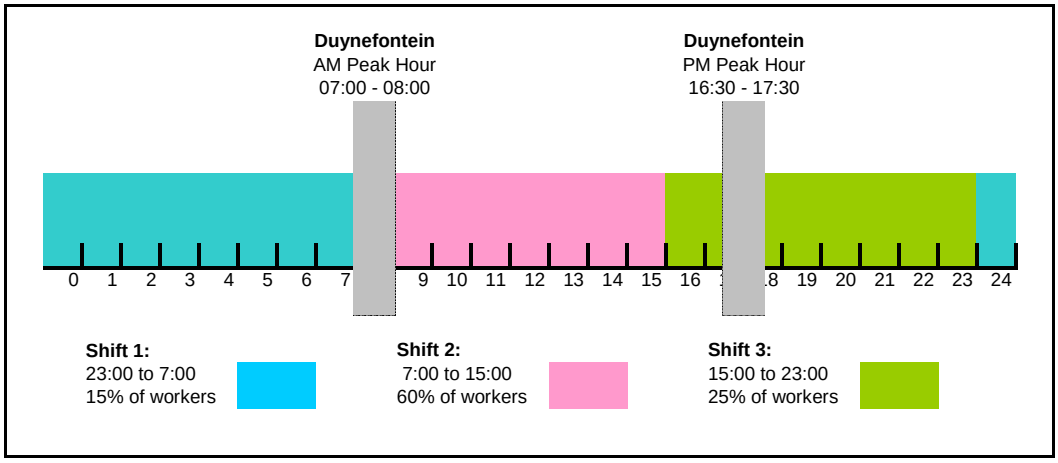


Figure 11.1: Shift Timetable

The shift timetable was interpreted and the results show that:

- ***AM Peak hour: Staff from Shift 1 (195 persons) are expected to depart between 07:00 and 09:00 while staff from Shift 2 (780 persons) are expected to arrive between 06:30 and 07:30, resulting in 30% of Shift 1 staff (59 persons) departing and none of Shift 2 staff arriving during the AM peak hour.***
- ***PM Peak hour: Staff from Shift 2 (780 persons) are expected to depart between 15:00 and 17:00 while staff from Shift 3 (325 persons) are expected to arrive between 14:30 and 15:30 resulting in 50% of Shift 2 staff (390 persons) departing and none of Shift 3 staff arriving during the PM peak hour. However, as a worst case scenario to assess the intersection capacity of the currently unused Emergency Access / R27 intersection, 30% of Shift 3 staff (98 persons) was assumed to arrive during the PM peak hour.***
- ***It should be noted that altering of the operational shift periods of Nuclear-1 could result in additional peak hour trips being generated. Intersection capacities should then be re-assessed to determine whether upgrades are required.***

The current modal split of 70% private transport and 30% public transport.

11.2.1 Trip Generation

The trips generated by the proposed Nuclear-1 site during the operational phase are shown in **Table 11.1** and the detailed trip generation table is provided in **Annexure A22**

Table 11.1 – Summary of Operational Phase Nuclear-1 Peak Hour Trips Generated

Land Use Type	Total Staff (No)	Directional Percentage of Shift Staff Travelling in Peak hour				Total Peak Person Trips Generated						Mode of Transport				Total Vehicle Trips Generated					
		AM Peak		PM Peak		AM Peak			PM Peak				Public Transport			AM Peak			PM Peak		
		In (Shift 2)	Out (Shift 1)	In (Shift 3)	Out (Shift 2)	In	Out	Total	In	Out	Total	Private Transport	Taxi	Bus	Rail	In	Out	Total	In	Out	Total
Duynefontein: Nuclear Operational Phase	1300	50%	80%	30%	30%	390	156	546	98	234	332	70%	10%	20%	0%	186	74	260	46	112	158
TOTAL	**1300**					**390**	**156**	**546**	**98**	**234**	**332**					**186**	**74**	**260**	**46**	**112**	**158**

11.2.2 Trip Distribution and Traffic Assignment

To determine the traffic impact of Nuclear-1's operational phase on the surrounding road network, the generated trips were distributed onto the existing road network.

The directional distribution of the generated trips for both the AM and PM peak hours is based on the percentage distribution of the 2008 background traffic flows. The percentage distribution, for the AM and PM peak hours is provided in **Annexures A23 and A24**.

The distribution of generated traffic by the proposed development for both the AM and PM peak periods is shown in **Annexures A25 and A26,** respectively.

The 2021 operational phase total traffic (2021 background traffic plus operations generated traffic) for the AM and PM peak periods is shown in **Annexures A27 and A28,** respectively.

11.2.3 Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 and HCS2000 computer programmes for the following main intersections:

- ***R27 / Main Access Road;***
- ***R27 / Napoleon Street;***
- ***R27 / Access Road 2;***
- ***Ou Skip Road / Narcissus Avenue;***
- ***Ou Skip Road / Main Access Road; and***
- ***Ou Skip Road / Access Road 2.***

The **2021 Operational Total Traffic** scenario was analysed during the AM and PM peak periods.

The LOS and 95th percentile vehicle queue lengths for the above scenario are summarised in **Annexures A29 and 30.**

During the operational phase of Nuclear-1, less traffic is expected than during the construction phase. The intersection geometry recommended for the construction phase of the project has been used as the base geometry in this assessment. A summary of the analysis results is discussed hereafter. Detailed analysis results are available on request.

(a) R27 / Main Access Road (Access 1)

Due to the proposal to upgrade this intersection to a grade separated facility still being under investigation only the option of the intersection being signalised by 2021 is detail below.

The 2021 geometry of the signalised R27 / Main Access Road intersection is shown in **Figure 11.2**.

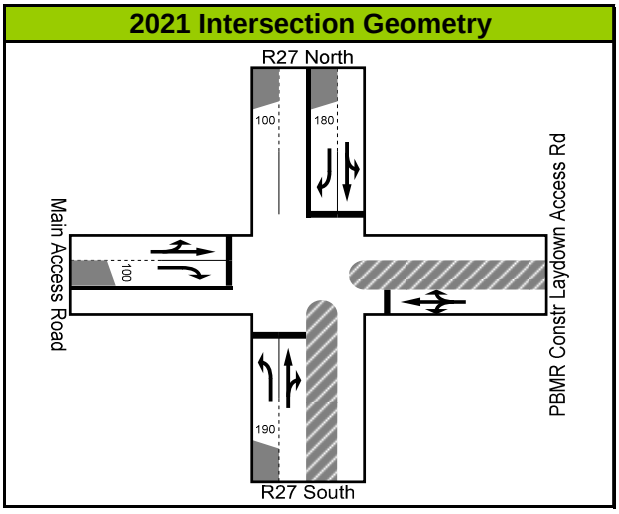


Figure 11.2: R27 / main Access Road 2021 Intersection Geometry

(i) 2021 Operational Traffic

The intersection will operate at intersection LOS A to LOS E with no significant vehicle queues during the AM and PM peak hours. No further upgrades are required.

(b) R27 / Napoleon Street

The 2021 geometry of the signalised R27 / Napoleon Street intersection is shown in **Figure 11.3**.

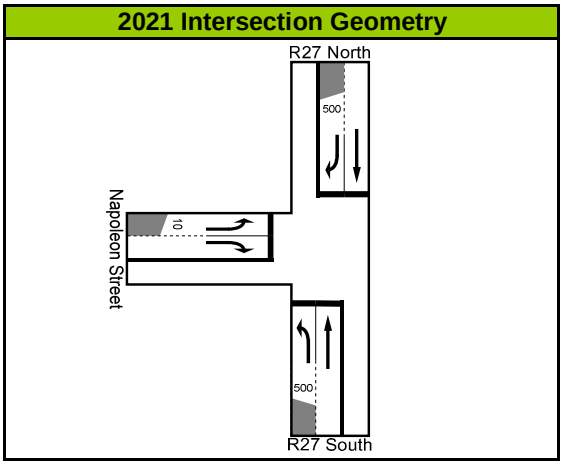


Figure 11.3: R27 / Napoleon Street 2018 Intersection Geometry

(i)

(ii) 2021 Operational Traffic

The intersection will operate acceptably at intersection LOS A to LOS D for the AM and PM peak hours with no significant vehicle queues. No further upgrades are therefore required.

(c) Ou Skip Road / Narcissus Avenue (Access 3)

The existing geometry of the Ou Skip Road / Narcissus Avenue intersection is shown in **Figure 11.4**.

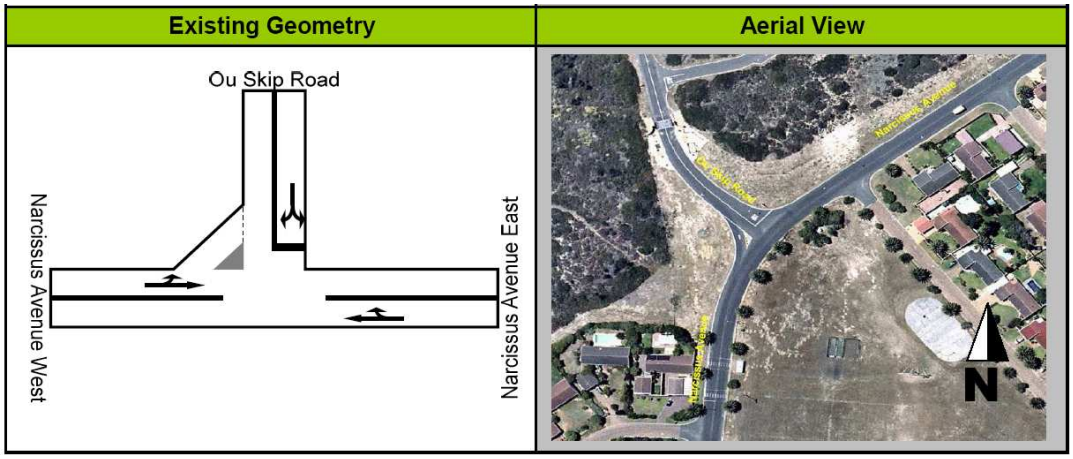


Figure 11.4: Ou Skip Road / Narcissus Avenue Existing Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS B during the AM and PM peak hours with no significant vehicle queues. No upgrades are therefore required.

(d) Ou Skip Road / Main Access Road

The existing geometry of the 4-way stop Ou Skip Road / Main Access Road intersection is shown in **Figure 11.5**.

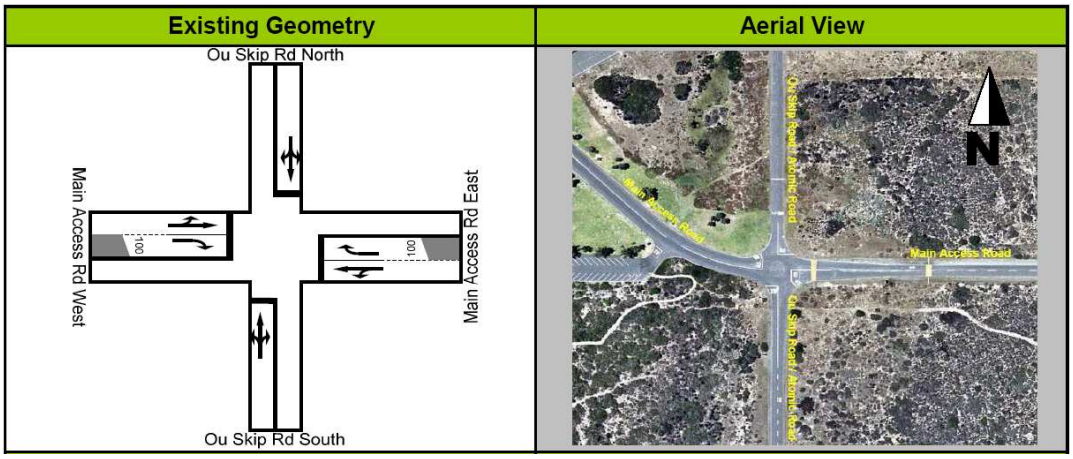


Figure 11.5: Ou Skip Road / Main Access Road Existing Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably from LOS B to LOS D during the AM and PM peak hours with non-significant vehicle delays.

(e) R27 / Access Road 2

The 2021 geometry of the signalised R27 / Access Road 2 intersection is shown in **Figure 11.6**.

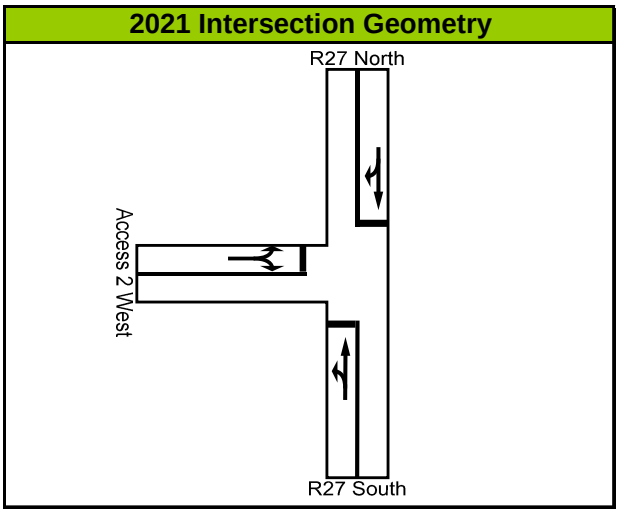


Figure 11.6: R27 / Access Road 2 2018 Intersection Geometry

(i) 2021 Operational Traffic

The intersection will operate acceptably at intersection LOS B for the AM and PM peak hours. No further upgrades are therefore required.

(f) Access Road 2 / Ou Skip Road

The 2021 geometry of the Ou Skip Road / Access Road 2 stop intersection is shown in **Figure 11.7**.

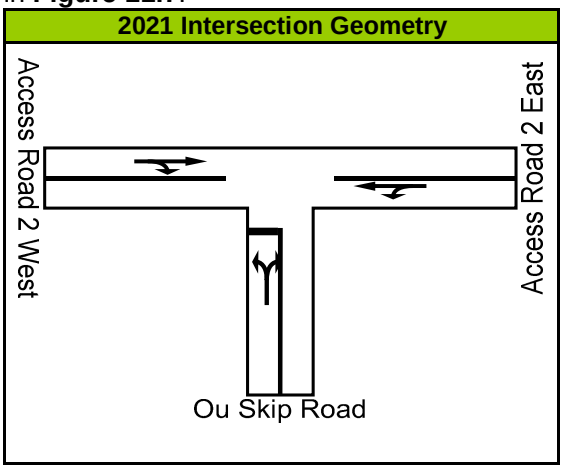


Figure 11.7: Access Road 2 / Ou Skip Road Intersection Geometry

(i)

(ii) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS A and LOS B during the AM and PM peak hours with no significant vehicle queues. No further upgrades are therefore required.

11.3 Parking

Currently Koeberg Nuclear Power Station requires approximately 1 300 staff to operate the power station and provides 950 parking bays in total. The same parking requirements were used for Nuclear-1, which will require approximately 1300 staff members. This links up with the modal split of 70% private vehicle usage and 30% public transport usage to the Duynefontein site.

11.4 Public Transport

The number of public transport trips generated by the proposed Nuclear-1 site at Duynefontein is minimal and the current public transport system as well as the new IRT system should be able to cater for the additional trips.

11.5 Non-Motorised Transport

Traffic calming measures and a speed limit of 40 km/hr should be implemented on the new internal roads that will be built for Nuclear-1, along Access Road 2, to ensure pedestrian and cyclist safety.

11.6 Low to Medium Radioactive Waste Transport

Low to medium-level radioactive waste produced by Nuclear-1 will be stored at Vaalputs, which is located in the Northern Cape Province. In terms of the National Radioactive Waste Management Policy and Strategy for South Africa Vaalputs is the designated national repository for low and intermediate level radioactive waste and will therefore continue to be used while it has sufficient capacity. Currently less than 5% of Vaalputs is being used, so there is sufficient capacity to dispose of radioactive waste.

The transportation of radioactive waste is performed under the regulatory control of the National Nuclear Regulator and in accordance with international standards. Two to four shipments of low to medium-level radio active waste will be made each week. It is proposed that the waste is transported using the current route via the N7 to Vaalputs as shown in **Figure 11.8**.

FIGURE 11.8

Koeberg's low to medium-level radioactive waste is also stored at Vaalputs. Currently approximately 48 low to medium radioactive waste consignments are transported from Koeberg Nuclear Power Station to Vaalputs annually as part of the normal operations.

If Nuclear-1's waste transport consignments coincide with Koeberg's consignments, the impacts on the relevant transportation network should be minimal.

11.7 Emergency Evacuation

A 0 to 0.8 km Protective Action Zone (PAZ) and a 0.8 to 3 km Urgent Protective Action Zone (UPZ) are required by the EUR to be implemented around a nuclear facility for safety purposes. No new developments are allowed to be located within the PAZ and existing and planned developments situated within UPZ are required to be included in the facility's emergency evacuation plan.

Koeberg Nuclear Power Station, however is required to have a 0 to 5 km Protective Action Zone (PAZ) and a 5 to 16 km Urgent Protective Action Zone (UPZ) by the National Nuclear Regulator (NNR) to be implemented around a nuclear facility for safety purposes as shown in **Figure 11.9**. No new developments will be allowed to be built within the PAZ and existing and planned developments situated within UPZ are required to be included in the facility's emergency evacuation plan. The evacuation plan has to demonstrate the ability to evacuate of the public within the PAZ within 4 hours and UPZ within 16-hour periods.

Koeberg Power Station currently has an emergency evacuation plan, which complies with the evacuation time requirements for each zone (PAZ and UPZ), in place.

The Nuclear-1 evacuation zones will be concurrent with the Koeberg Power Station zones. Therefore if Nuclear-1 is built on the Duynefontein site the only additional persons who would need to be included in the existing emergency evacuation plan are the Nuclear-1 staff and general public within 16 km of the site as a result of Nuclear-1 (visitors, etc.).

The Koeberg Nuclear Power Station 2005 Emergency Plan (HHO, 2005) states that *"if the capacity of the road system is reduced by 60% of normal capacity the required population evacuation can still be evacuated within acceptable time limits"*.

During operational phase of Nuclear-1 (1 300 staff) facilities, the 3150 staff members would be evacuated, using approximately 1000 vehicles.

The transport network road capacity currently available to accommodate the planned evacuation is approximately 3600 vehicles per hour and the traffic generated by Nuclear-1 operational phases is approximately 30% of the current capacity. The operational phase Nuclear-1 facilities are therefore not expected to affect the evacuation times assessed in the current Nuclear-1 Emergency Plan as it is located within the Nuclear-1, 5 km PAZ and 16 km UPZ evacuation zones.

FIGURE 11.9

The current evacuation times that need to be complied with are summarised in **Table 11.2** below. The "Koeberg Nuclear Power Station Emergency Plan: Transport Modelling & Evacuation Management Plan (HHO, 2005) could be referred to for more detail and should be updated to include Nuclear-1 facilities.

Table 11.2 – Koeberg Nuclear Power Station's current evacuation time assessment results

Legislative Requirements				Koeberg Nuclear Power Station Current Evacuation Assessment	
Persons	**Area**	**Safety Zone**	**Time period**	**Assessment Period**	**Time (2005 to 2030)**
All Public	360 degree radius	PAZ 0km to 5km	Within 4 hours	AM Peak "worst case"	1.8 to 2 hours
All Public	Any 67.5 degrees	UPZ 5km to 16km	Within 16 hours		8.2 to 14.3 hours

11.8 Air Route Impacts

11.8.1 Air Routes

A Site Safety Report, (Eskom, 2006) which addresses all airports and air routes and Nuclear-1's impacts on those routes, was completed for the Koeberg Nuclear Power Station in 2006. Due to the Nuclear-1 falling within Koeberg Nuclear Power Station's safety zones (5 km UPZ and 16 km EPZ) the impacts of Nuclear-1 on air routes will be the same as the existing Koeberg Nuclear Power Station.

However, Duynefontein is situated on a heading of 333°T and 19.476NM (36.069 km) from Cape Town International Airport. It is situated within the existing restricted area FAR 36 for Koeberg, which extends from Ground level to 2000 feet (ft) above ground level.

Aircrafts such as aviation aircraft, microlights and helicopters generally operate between ground level and 2000 ft. Military aircraft and helicopters routing between AFB Langebaanweg and Ysterplaat could also be found along this route. FAR 36 is a well known restricted area.

The Duynefontein site might require a change to the height restrictions of FAR 36 depending on the requirements for Nuclear-1. The air routes over the Duynefontein site are shown in **Figure 11.10.**

11.9 Shipping Lane Impacts

The South African Maritime Safety Authority (SAMSA) is the custodian of South African seas and the champion of the nation's maritime traditions.

According to Maritime Zones Act, the following zones exist:

FIGURE 11.10

- **Internal waters:** The internal waters of the Republic shall comprise all waters landward of the baselines (which are the straight lines joining the grouped co-ordinates); and all harbours. Any law in force in the Republic, including the common law, shall also apply in its internal waters and the airspace above its internal waters. The right of innocent passage shall not exist in the internal waters, except if the internal waters concerned were territorial waters before the commencement of this Act.
- **Territorial waters:** The sea within a distance of twelve nautical miles from the baselines shall be the territorial waters of the Republic. Any law in force in the Republic, including the common law, shall also apply in its territorial waters and the airspace above its territorial waters. The right of innocent passage shall exist in the territorial waters.
- **Contiguous zone:** The sea beyond the territorial waters, but within a distance of twenty four nautical miles from the baselines, shall be the contiguous zone of the Republic. Within the contiguous zone and the airspace above it, the Republic shall have the right to exercise all the powers which may be considered necessary to prevent contravention of any fiscal law or any customs, emigration, immigration or sanitary law and to make such contravention punishable.
- **Maritime cultural zone:** The sea beyond the territorial waters, but within a distance of twenty four nautical miles from the baselines, shall be the maritime cultural zone of the Republic. Subject to any other law the Republic shall have, in respect of objects of an archaeological or historical nature found in the maritime cultural zone, the same rights and powers as it has in respect of its territorial waters.
- **Exclusive economic zone:** The sea beyond the territorial waters, but within a distance of two hundred nautical miles from the baselines, shall be the exclusive economic zone of the Republic. Subject to any other law the Republic shall have, in respect of all natural resources in the exclusive economic zone, the same rights and powers as it has in respect of its territorial waters.

SAMSA therefore has full jurisdiction (sovereignty) over the internal waters while in the territorial waters and other zones, foreign vessels have rights.

Furthermore, vessels such as boats and \ships (including containers ships) are allowed within five nautical miles from the shoreline, while trawlers and tankers are only allowed in the deep sea (25 nautical miles from the shoreline). These areas are indicated in **Figure 11.11** for Cape Town and Saldanha Harbours.

SAMSA does not keep a record of vessels travelling past the proposed sites. Many vessels have an Automatic Identification System (AIS) that can be turned off. There are also no Traffic Separation Schemes (TSS). Vessels usually catch the current. Separation zones are usually identified alongside “NO GO” zones.

A Site Safety Report (Eskom, 2006), which addresses all shipping lane data and Nuclear-1’s impacts on those routes, was completed for the Koeberg Nuclear Power Station in 2006. Due to the Nuclear-1 falling with the Nuclear-1’s safety zones (5 km UPZ and 16 km EPZ) the impacts of Nuclear-1 on shipping lanes will be the same as the existing Koeberg Nuclear Power Station

FIGURE 11.11

The Sea-Shore Act, 1935 (Act No. 21 of 1935) identifies a security exclusion zone for a nuclear power station as the portion of the sea-shore opposite the seaward boundary of the Duynefontein farm and a corresponding portion of the sea for a distance of 2 km seawards from the low-water mark. The Duynefontein site is situated adjacent to internal waters. SAMSA therefore has authority. This exclusion zone will be concurrent if Nuclear-1 is built adjacent to Koeberg Nuclear Power Station.

11.10 Mitigating Actions Required

The following mitigating actions are therefore proposed for the operational phase transport aspects of the Nuclear-1:

- ***Access Road 2 should be used to access Nuclear-1;***
- ***950 permanent parking bays are to be provided;***

12 BANTAMSKLIP OPERATIONAL PHASE IMPACT ASSESSMENT

12.1 Access

Nuclear-1 is proposed to be accessed via two access points, which should be built during the construction phase, off the R43.

12.2 Traffic Analysis

The following section assesses the cumulative transport impacts of the operational phase on the local transport system. The AM and PM peak hours are the critical daily time periods and therefore the following assessment was undertaken for these peak hours.

The AM and PM peak hours are:

- ***AM Peak hour – 08:00 – 09:00; and***
- ***PM Peak hour – 16:00 to 17:00.***

It is estimated that approximately 1300 staff members are required to operate the Nuclear-1 site during its operational phase. Visitor traffic to Nuclear-1 is expected to occur outside of the AM and PM peak hours and is therefore not included in the analysis.

It was assumed that shift workers will be used for the duration of the operations. The following shifts were assumed:

- ***Shift 1: 23:00 to 07:00;***
- ***Shift 2: 07:00 to 15:00; and***
- ***Shift 3: 15:00 to 23:00.***

Figure 12.1 shows the shift timetable for Nuclear-1. It was assumed that 15% of workers would operate Nuclear-1 in Shift 1, 60% of workers in Shift 2 and 25% of workers in Shift 3.

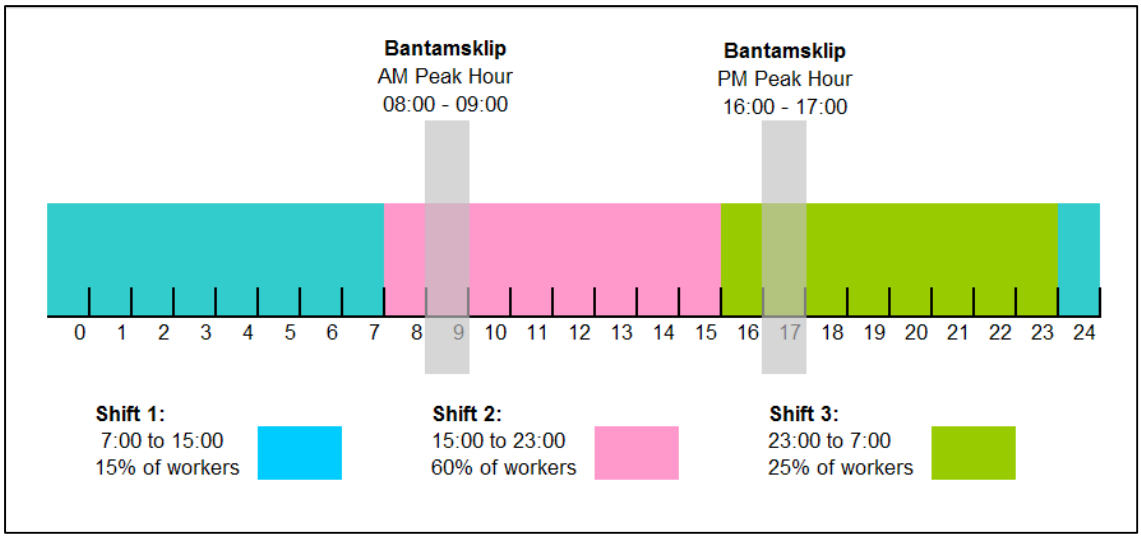


Figure 12.1: Shift Timetable

The shift timetable was interpreted and the results show that:

- ***AM Peak hour: Staff from Shift 1 (195 persons) are expected to depart between 07:00 and 09:00 while staff from Shift 2 (780 persons) are expected to arrive between 06:30 and 07:30, resulting in 30% of Shift 1 staff (59 persons) departing and none of Shift 2 staff arriving during the AM peak hour. However, as a worst case scenario to assess the intersection capacity of the currently unused Access / R43 intersections, 30% of Shift 2 staff (234 persons) was assumed to arrive during the AM peak hour.***
- ***PM Peak hour: Staff from Shift 2 (780 persons) are expected to depart between 15:00 and 17:00 while staff from Shift 3 (325 persons) are expected to arrive between 14:30 and 15:30 resulting in 50% of Shift 2 staff (390 persons) departing and none of Shift 3 staff arriving during the PM peak hour. However as a worst case scenario to assess the intersection capacity of the currently unused Access / R43 intersections, 30% of Shift 3 staff (98 persons) was assumed to arrive during the PM peak hour.***
- ***It should be noted that altering of the operational shift periods of Nuclear-1 could result in additional generated peak hour trips. Intersection capacities should then be re-assessed to determine whether upgrades are required.***

Currently only 30% of residents use public transport, while the remainder walk, cycle or use private transport. However, due to the nature of the area and the nature of Nuclear-1's operations, it has been assumed that additional public transport services will be added to the network to cater for the Nuclear-1 staff trip demand.

The current modal share usage of Koeberg Nuclear Power Station staff members is approximately 70% private vehicles and 30% public transport. This was used as a guide to determine the modal share usage of nuclear power station staff members.

A modal split of 70% private transport, 20% minibus taxis and 10% buses was therefore used.

12.2.1 Trip Generation

During the operational stage of Nuclear-1, normal daily travel between main residential centres, surrounding main towns (e.g. Gansbaai, Hermanus) and the nuclear power station will result in increased usage of surrounding internal road network and national road network. The transportation impacts on the surrounding road network have been investigated.

The peak hour trips generated by the proposed Nuclear-1 site during the operational phase are shown in **Table 12.1** and the detailed trip generation table is provided in **Annexure B19**.

Table 12.1 – Summary of Operational Phase Nuclear-1 Peak Hour Trips Generated

Land Use Type	People (No)	Directional Percentage of Shift Staff Travelling in Peak hour				Total Peak Person Trips Generated						Mode of Transport				Total Vehicle Trips Generated					
		AM Peak		PM Peak		AM Peak			PM Peak							AM Peak			PM Peak		
		In (Shift 2)	Out (Shift 1)	In (Shift 3)	Out (Shift 2)	In	Out	Total	In	Out	Total	Private Transport	Public Transport: Taxi	Bus	Rail	In	Out	Total	In	Out	Total
Proposed Nuclear Site at Bantamsklip	1300	30%	30%	30%	50%	234	59	293	98	390	488	70%	20%	10%	0%	113	28	141	47	188	235
TOTAL	**1300**					**234**	**59**	**293**	**98**	**390**	**488**					**113**	**28**	**141**	**47**	**188**	**235**

12.2.2 Trip Distribution and Traffic Assignment

To determine the traffic impact of Nuclear-1's operational phase on the surrounding road network, the generated trips were distributed onto the existing road network. The directional distribution of the generated trips for both the AM and PM peak hours is based on the percentage distribution of the 2008 background traffic flows. The percentage distribution, for the AM and PM peak hours is provided in **Annexures B20 and B21**.

The distribution of generated traffic by the proposed development for both the AM and PM peak periods is shown in **Annexures B22 and B23,** respectively.

The 2018 operational phase total traffic (2018 background traffic plus operational generated traffic) for the AM and PM peak periods is shown in **Annexures B24 and B25,** respectively.

12.2.3 Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 and HCS2000 computer programmes for the following main intersections:

- ***R43 / DR01211;***
- ***R43 / DR01206;***
- ***R43 / West Access Road; and***
- ***R43 / East Access Road.***

The **2021 Operational Total Traffic** scenario was analysed during the AM and PM peak periods.

The LOS and 95th percentile vehicle queue lengths for the above scenario are summarised in **Annexures A26 and 27.**

During the operational phase of Nuclear-1 less traffic is expected than during the construction phase. The intersection geometry recommended for the construction phase of the project has been used as the base geometry in this assessment.

A summary of the analysis results is discussed hereafter. Detailed analysis results are available on request.

(a) R43 / DR01211

The existing geometry and aerial view of R43 / DR01211 is shown in **Figure 12.2**.

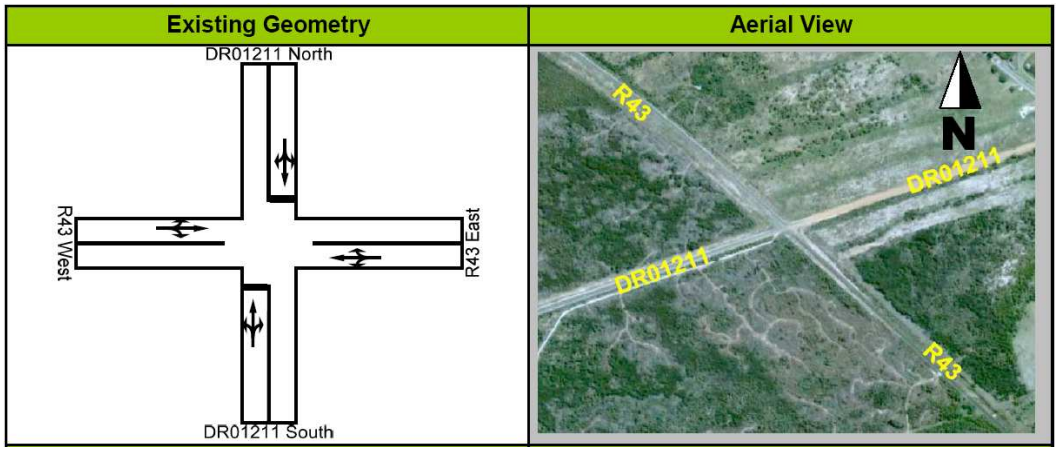


Figure 12.2: R43 / DR01211 Existing Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS A to LOS C during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

(b) R43 / DR01206

The existing geometry and aerial view of R43 / DR01206 is shown in **Figure 12.3**.

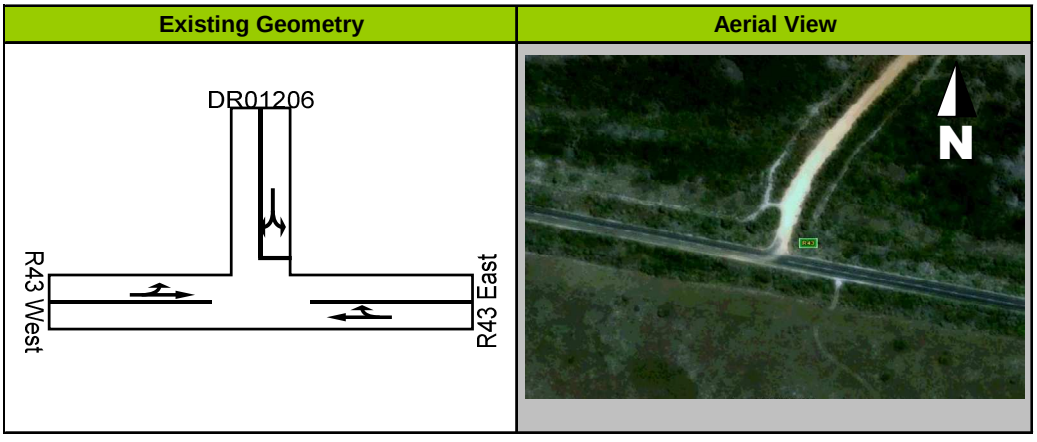


Figure 12.3: R43 / DR01206 Existing Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS A during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

(c) R43 / West Access Road

The existing geometry and aerial view of R43 / DR01206 is shown in **Figure 12.4**.

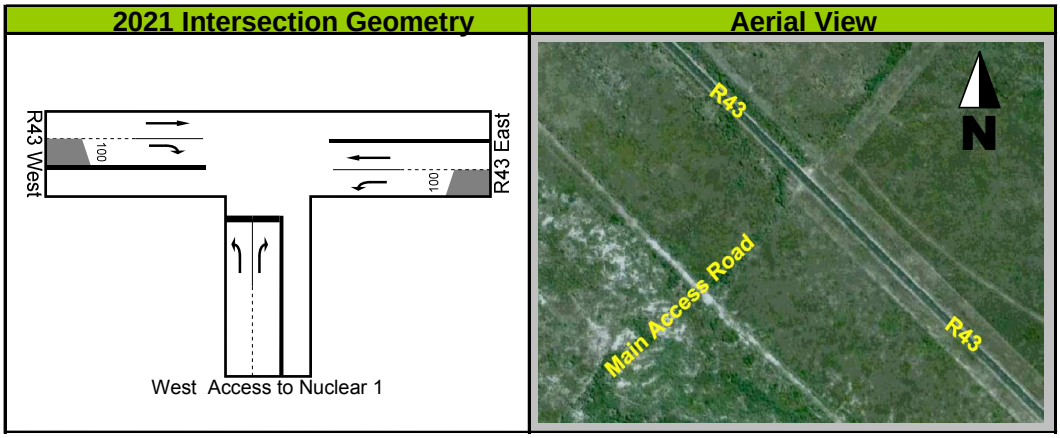


Figure 12.4: R43 / West Access Road Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS A and LOS B during the AM and PM peak hours with minimal vehicle queues.

(d) R43 / East Access Road

The existing geometry and aerial view of R43 / DR01206 is shown in **Figure 12.5**. The East access road will only be utilised during the operational phase of Nuclear-1.

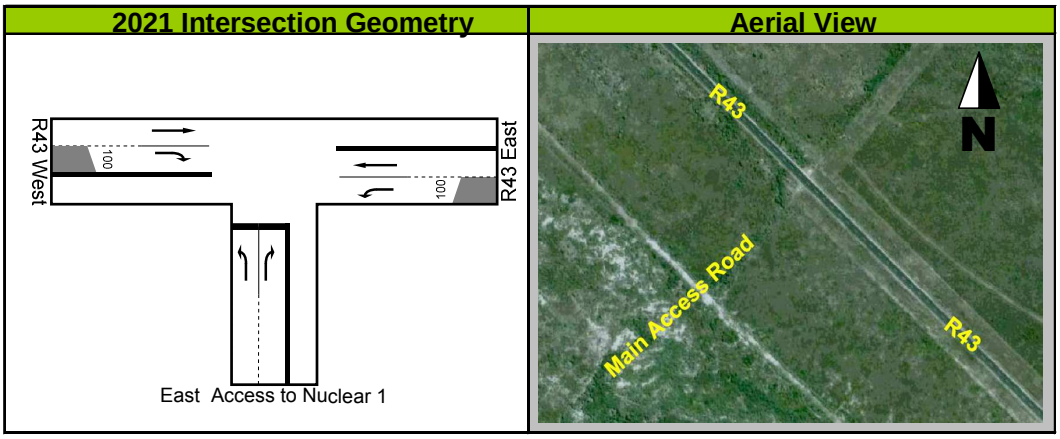


Figure 12.5: R43 / East Access Road Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS A and LOS B during the AM and PM peak hours, with minimal vehicle queues.

12.3 Parking

Currently Koeberg Nuclear Power Station requires approximately 1300 staff to operate the power station and currently provides 950 parking bays in total. This was used as the basis of determining the parking requirements of Nuclear-1, which requires approximately 1300 staff members.

The parking requirement for Nuclear-1 is therefore approximately 950 bays. This links up with the modal split of 70% private vehicle usage and 30% public transport usage expected at the Bantamsklip site.

12.4 Public Transport

Additional public transport services will have to be added to cater for the number of public transport trips generated by the proposed Nuclear-1 site at Bantamsklip.

A total of 30 minibus taxi and 4 bus trips per day need to be provided to transport the Nuclear-1 staff during the operational period.

12.5 Non-Motorised Transport

Traffic calming measures and a speed limit of 40 km/hr should be implemented on the new internal roads that will be built for Nuclear-1 to ensure pedestrian and cyclist safety.

12.6 Low to Medium Radioactive Waste Transport

Low to medium-level radioactive waste produced by Nuclear-1 will be stored at Vaalputs, which is located in the Northern Cape Province.

The transportation of radioactive waste is performed under the regulatory control of the National Nuclear Regulator and in accordance with international standards. Two to four shipments of low to medium-level radio active waste will be made each week.

It is proposed that the waste be transported via the N2 and N7 to Vaalputs as shown in **Figure 12.6.** Maud, Drennan and Partners conducted a preliminary investigation in 1988 with regard to the transport of nuclear waste from the Bantamsklip site to Vaalputs. The results of this study indicates that road transport is the most viable option. Radioactive waste will be required to be transported cross-country from the Western Cape to the Northern Cape.

FIGURE 12.6

12.7 Emergency Evacuation

A 0 to 0.8 km Protective Action Zone (PAZ) and a 0.8 to 3 km Urgent Protective Action Zone (UPZ) are required by the EUR to be implemented around a nuclear facility for safety purposes as shown in **Figure 12.7**. No new developments are allowed to be located within the PAZ and existing and planned developments situated within UPZ are required to be included in the facility's emergency evacuation plan.

The Nuclear-1's Emergency Plan must be compiled to include non-nuclear and nuclear accidents occurring at the Nuclear-1. During the operational phase, the 1 300 staff would be evacuated using approximately 434 vehicles.

A single lane road capacity is approximately 1 500 vehicles per hour. This initial assessment indicates that the road capacity is sufficient to evacuate 434 vehicles an hour.

From a contingency plan point of view the upgrading of the DR 1206 gravel road which links the R43 to Bredasdorp should be considered, since the R43 heading west towards Pearly beach is the only current exit route.

However, a detailed Emergency Plan (including a Transport Model and an Evacuation Management Plan), should be compiled to enable testing of different scenarios.

12.8 Air Route Impacts

Bantamsklip is situated on a heading of 257° T and 35.758 NM (66.223 km) from Air Force Base (AFB) Overberg. AFB Overberg is the SA Air Force's Testing and Development centre. It is also situated under the AFB Overberg Terminal Control Area (TCA) which extends from 6 500 to 14 500 ft above mean sea level.

One of each aircraft type in use by the SA Air Force is stationed as this base. These include fighter aircraft and helicopters. Live missile firing and bomb testing from fully weapon loaded aircraft are conducted at this facility. This facility is also used by foreign countries for aircraft and weapons testing. Aircraft from these countries range from helicopters and fighter aircraft to very large tanking aircraft operating down to very low altitudes.

Exercises by local and foreign Air Forces and Navies are conducted in this area as well. A restricted area (FAR 147 - Ground level to 19 500 ft above mean sea level) has been declared for this reason. Bantamsklip is situated 13.4 NM (24.816 km) within this restricted area.

Bantamsklip is also situated 15.508 NM (27.720 km) to the east of a Danger Area, FAR 143, which extends from Ground Level to 19 500 ft. above mean sea level. FAR 143 is used by the Navy as a training area, which includes the firing of live missiles and guns as well as the demolition of ammunitions. The range of the missiles onboard the new Frigate vessels of the SA Navy is ±43 km, with a safe distance of

FIGURE 12.7

±50 km. FAR 143 is also used for combined exercises by local and foreign Air Forces and Navies, which includes the firing of live ammunition.

General aviation aircraft as well as helicopters also operate along the coast at low levels. A total of 8 known aerodromes/airstrips lie within a 30NM (55.56 km) radius of Bantamsklip. The closest aerodrome is Pearly Beach which is situated 4.763NM (8.821 km) to the North-West of Bantamsklip. The runway direction is in a North-West/South-East direction. The closest air \routes pass 26.597NM (49.257 km) to the north of Bantamsklip.

The Bantamsklip site would require the promulgation of new Restricted / Danger / Prohibited areas. The air routes over the Bantamsklip site are shown in **Figure 12.8**.

12.9 Shipping Lane Impacts

The South African Maritime Safety Authority (SAMSA) is the custodian of South African seas and the champion of the nation's maritime traditions. SAMSA therefore has full jurisdiction (sovereignty) over the domestic waters, while in the territorial waters and other zones, foreign vessels have rights.

Furthermore, vessels such as boats and ships (including containers ships) are allowed within five nautical miles from the shoreline, while trawlers and tankers are only allowed in the deep sea (25 NM from the shoreline). These areas are indicated in **Figure 12.9**.

SAMSA does not keep a record of vessels travelling past the proposed site. Many vessels have an Automatic Identification System (AIS) that can be turned off.

In terms of the Sea-Shore Act (No 21 of 1935), a safety exclusion zone must be identified if a nuclear power station is built on the Bantamsklip site. The proposed exclusion zone for the Bantamsklip site is situated in domestic waters. An application to SAMSA will therefore have to be put forward to create an exclusion zone for Bantamsklip.

FIGURE 12.8

FIGURE 12.9

12.10 Mitigating Actions Required

The following mitigating actions are therefore proposed for the operational phase transport aspects of the Nuclear-1:

- The upgrading of the DR1206 to a surfaced road should be considered. The emergency evacuation plan should give guidance;
- ***950 permanent parking bays are to be provided;***
- A total of 30 minibus taxi and 4 bus trips per day need to be provided to transport the Nuclear-1 staff;
- A detailed emergency evacuation plan should be compiled for the Bantamsklip Nuclear-1 site;
- The Bantamsklip site requires the promulgation of a new Restricted / Danger / Prohibited area for the air space over the proposed nuclear power station; and
- The Bantamsklip site requires an application to be put forward to create an internal water exclusion zone required for a nuclear power station as per the Sea-Shore Act (No.21 of 1935).

13 THYSPUNT OPERATIONAL IMPACT ASSESSMENT

13.1 Access

Access to the site will be via two access routes, the R330 and the upgraded Oyster Bay Road.

13.2 Traffic Analysis

13.2.1 Description

The following section assesses the transport impacts of the operational phase on the local transport system. The AM and PM peak hours are the critical daily time periods and therefore the following assessment was undertaken for these peak hours.

The AM and PM peak hours are:

- ***AM peak hour - 07:30 to 08:30; and***
- ***PM peak hour - 16:30 to 17:30.***

It is estimated that approximately 1 300 staff members are required to operate the Nuclear-1 site during its operational phase. Visitor traffic to Nuclear-1 is expected to occur outside of the AM and PM peak hours and is therefore not included in the analysis.

It was assumed that shift workers will be used for the duration of the operations. The following shifts were assumed:

- ***Shift 1: 23:00 to 07:00;***
- ***Shift 2: 07:00 to 15:00; and***
- ***Shift 3: 15:00 to 23:00.***

Figure 13.1 shows the shift timetable for Nuclear-1. It was further assumed that 15% of workers would operate Nuclear-1 in Shift 1, 60% of workers in Shift 2 and 25% of workers in Shift 3.

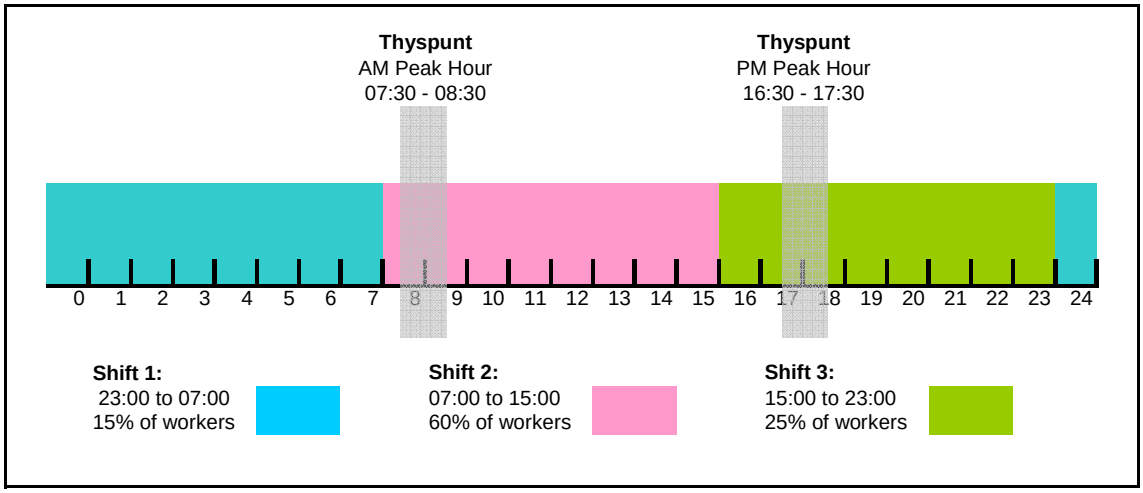


Figure 13.1: Shift Timetable

The shift timetable was interpreted and the results show that:

- ***AM Peak hour: Staff from Shift 1 (195 persons) are expected to depart between 07:00 and 09:00 while staff from Shift 2 (780 persons) are expected to arrive between 06:30 and 07:30, resulting in 30% of Shift 1 staff (59 persons) departing and none of Shift 2 staff arriving during the AM peak hour. However as a worst case scenario to assess the intersection capacity of the currently unused Main Access, 30% of Shift 2 staff (234 persons) was assumed to arrive during the AM peak hour.***
- ***PM Peak hour: Staff from Shift 2 (780 persons) are expected to depart between 15:00 and 17:00 while staff from Shift 3 (325 persons) are expected to arrive between 14:30 and 15:30 resulting in 50% of Shift 2 staff (390 persons) departing and none of Shift 3 staff arriving during the PM peak hour. However as a worst case scenario to assess the intersection capacity of the currently unused Main Access, 30% of Shift 3 staff (98 persons) was assumed to arrive during the PM peak hour.***
- ***It should be noted that altering of the operational shift periods of Nuclear-1 could result in additional generated peak hour trips. Intersection capacities should then be re-assessed to determine whether upgrades are required.***

The existing modal split is 30% private vehicles and 13% public transport, while the remainder walk or use other transport. The private vehicle trips were therefore increased as expected during the operational phase of the nuclear power station.

Furthermore, due to the nature of the area and the nature of the operations, it was assumed additional public transport services would be added to the network to cater for the additional Nuclear-1 staff trip demand. A modal split of 70% private transport, 20% minibus taxis and 10% buses was therefore used.

13.2.2 Trip Generation

During the operational stage of Nuclear-1, normal daily travel between main residential centres (e.g. Humansdorp), surrounding main towns (e.g. Port Elizabeth) and the nuclear power station will result in increased usage of surrounding internal road network and national road network. The transportation impacts on the surrounding road network were investigated.

The trips generated by the proposed Nuclear-1 site during the operational phase are shown in **Table 13.1** and the detailed trip generation table is provided in **Annexure C22**.

Table 13.1 – Summary of Operational Phase Nuclear-1 Peak Hour Trips Generated

Land Use Type	People (No)	Directional Percentage of Shift Staff Travelling in Peak hour				Total Peak Person Trips Generated						Mode of Transport				Total Vehicle Trips Generated					
		AM Peak		PM Peak		AM Peak			PM Peak			Private Transport	Public Transport			AM Peak			PM Peak		
		In (Shift 2)	Out (Shift 1)	In (Shift 3)	Out (Shift 2)	In	Out	Total	In	Out	Total		Taxi	Bus	Rail	In	Out	Total	In	Out	Total
Proposed Nuclear Site at Thyspunt	1300	30%	80%	30%	30%	234	156	390	97.5	234	332	70%	20%	10%	0%	113	75	188	47	113	160
TOTAL	**1300**					**234**	**156**	**390**	**97.5**	**234**	**332**					**113**	**75**	**188**	**47**	**113**	**160**

13.2.3 Trip Distribution and Traffic Assignment

To determine the traffic impact of Nuclear-1's operational phase on the surrounding road network, the generated trips were distributed onto the existing road network. The directional distribution of the generated trips for both the AM and PM peak hours is based on the percentage distribution of the 2008 background traffic flows. The percentage distribution, for the AM and PM peak hours is provided in **Annexures C23 and C24**.

The distribution of generated traffic by the proposed development for both the AM and PM peak periods is shown in **Annexures C25 and C26,** respectively.

The 2021 operational phase total traffic (2021 background traffic plus operations generated traffic) for the AM and PM peak periods is shown in **Annexures C27 and C28,** respectively.

13.2.4 Capacity Analysis

Intersection analysis was performed using the SIDRA 3.2 and HCS2000 computer programmes for the following main intersections:

- ***R330 / Main Access Road;***
- ***R330 / St Francis Bay Access Road;***
- ***R330/ Oyster Bay Access Road;***
- ***R330 / Gravel Road;***
- ***Park Road / Main Street;***
- ***Main Street / Jeffrey's Bay Access Road;***
- ***Main Street / N2 South Off-Ramp; and***
- ***Main Street / N2 North Off-Ramp.***

The **2021 Operational Total Traffic** scenario was analysed during the AM and PM peak periods.

The Level of Service (LOS) and 95th percentile vehicle queue lengths for the above scenario are summarised in **Annexures C29 and C30.**

During the operational phase of Nuclear-1 less traffic is expected than during the construction phase. The intersection geometry recommended for the construction phase of the project has been used as the base geometry in this assessment.

A summary of the analysis results is discussed hereafter. Detailed analysis results are available on request.

(a) R330 / Main Access Road

The 2021 intersection geometry of R330 / Main Access Road is shown in **Figure 13.2**.

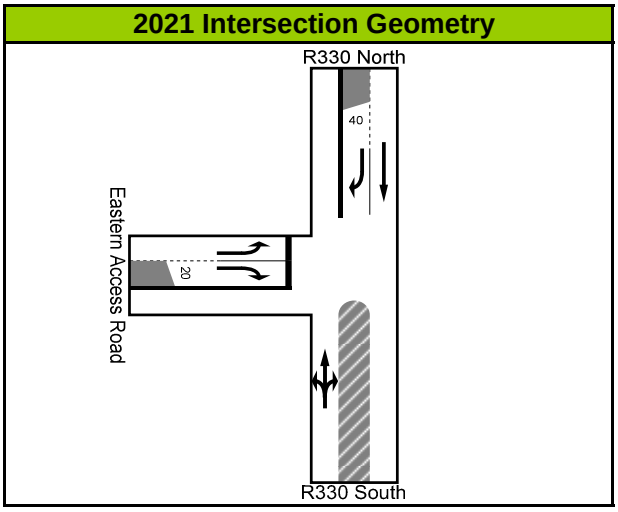


Figure 13.2: R330 / Main Access Road 2018 Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS A during the AM and PM peak hours with minimal vehicle queues. No further upgrades are therefore required.

(b) R330 / St. Francis Bay Access Road

The 2021 geometry of R330 / St Francis Bay Access Road is shown in **Figure 13.3**.

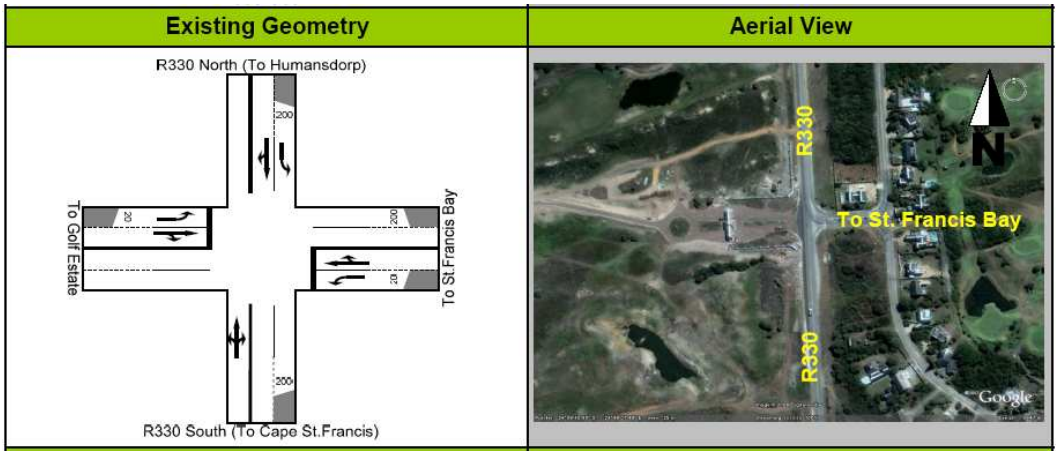


Figure 13.3: R330 / St Francis Bay Access Road 2018 Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS A to LOS C during the AM and PM peak hours with minimal vehicle queues. No further upgrades are therefore required.

(c) R330 / Oyster-Bay Access Road

The existing geometry and aerial view of R330 / Oyster-Bay Access Road is shown in **Figure 13.4**.

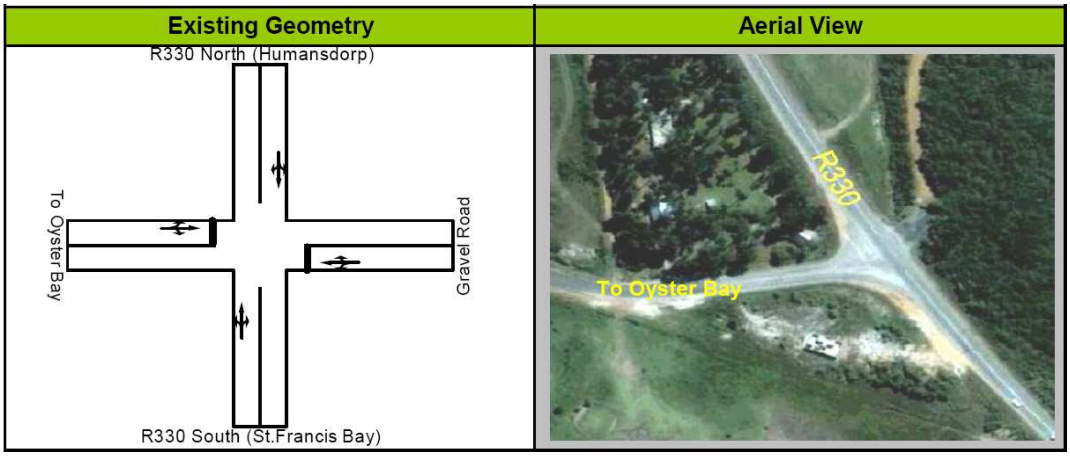


Figure 13.4: R330 / Oyster Bay Access Road Existing Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably from LOS A to LOS B during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

(d) R330 / Gravel Road

The existing geometry and aerial view of R330 / Gravel Road is shown in **Figure 13.5**.

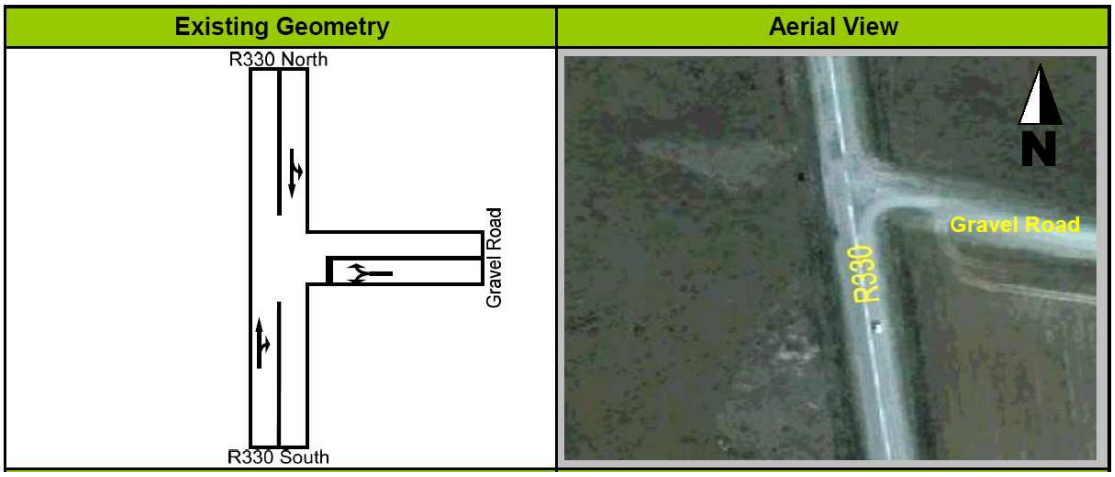


Figure 13.5: R330 / Gravel Road existing Intersection Geometry

(i) 2018 Operational Traffic

All intersection approaches will operate acceptably at LOS A and LOS B during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

(e) Park Road (R330) / Main Street (R330)

The 2021 geometry of Park Road / Main Street is shown in **Figure 13.6**.

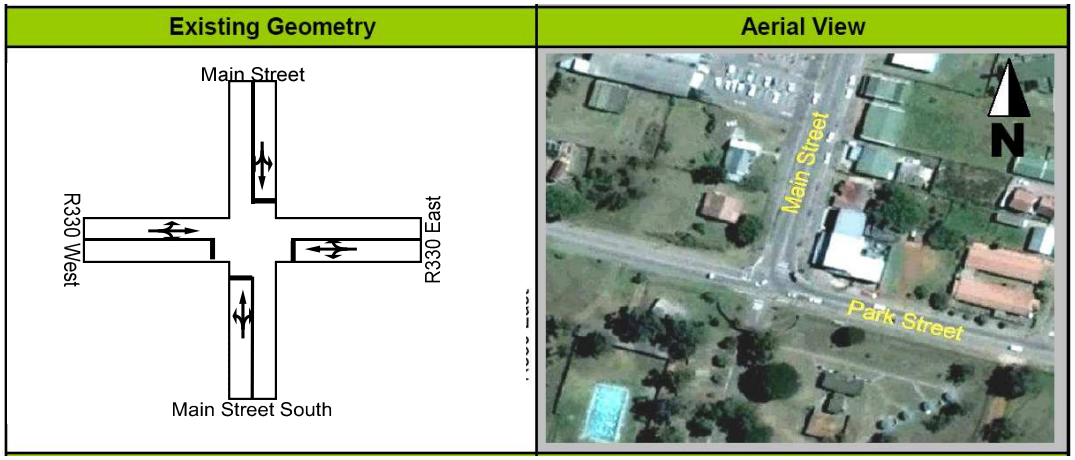


Figure 13.6: Park Road / Main Street 2018 Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS A and LOS B during the AM and PM peak hours with minimal vehicle queues. No further upgrades are therefore required.

(f) Main Street / Jeffrey's Bay Access Road

The 2021 geometry and aerial view of Main Street / Jeffrey's Bay Access Road signalised intersection is shown in **Figure 13.7**.

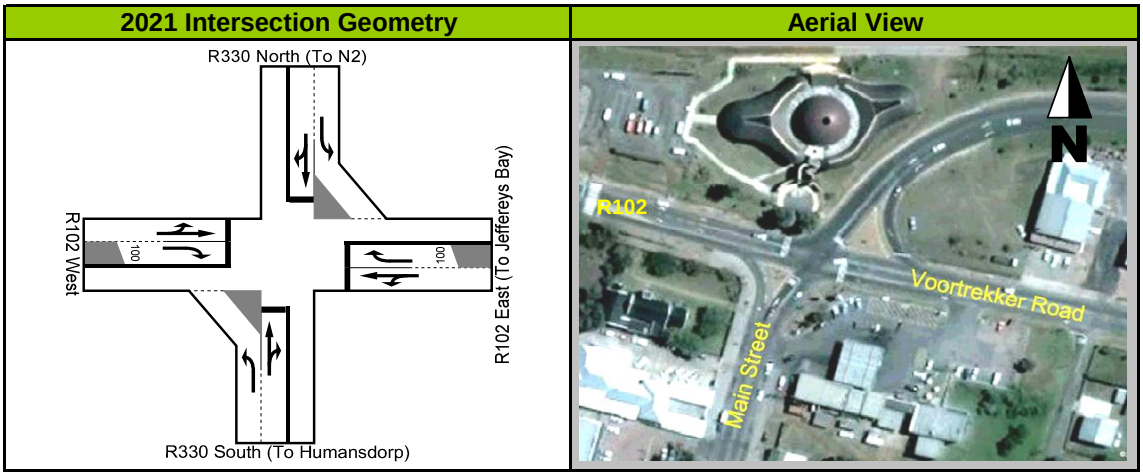


Figure 13.7: Main Street / Jeffrey's Existing Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably from LOS A to LOS C during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

(g) Main Street / N2 South Off-Ramp

The existing geometry and aerial view of Main Street / N2 South Off-Ramp is shown in **Figure 13.8**.

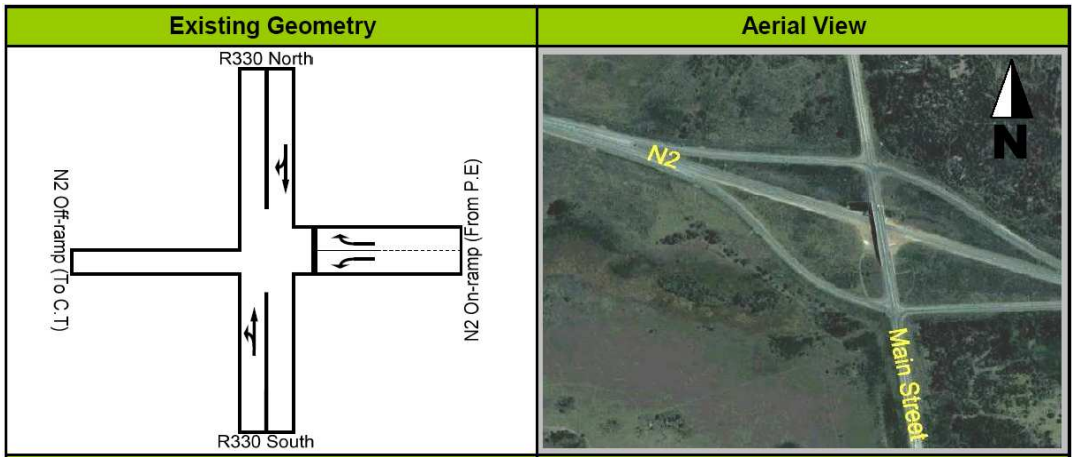


Figure 13.8: Main Street / N2 South off-Ramp Existing Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS A and LOS B during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

(h) Main Street / N2 North Off-Ramp

The existing geometry and aerial view of Main Street / N2 North Off-Ramp is shown in **Figure 13.9**.

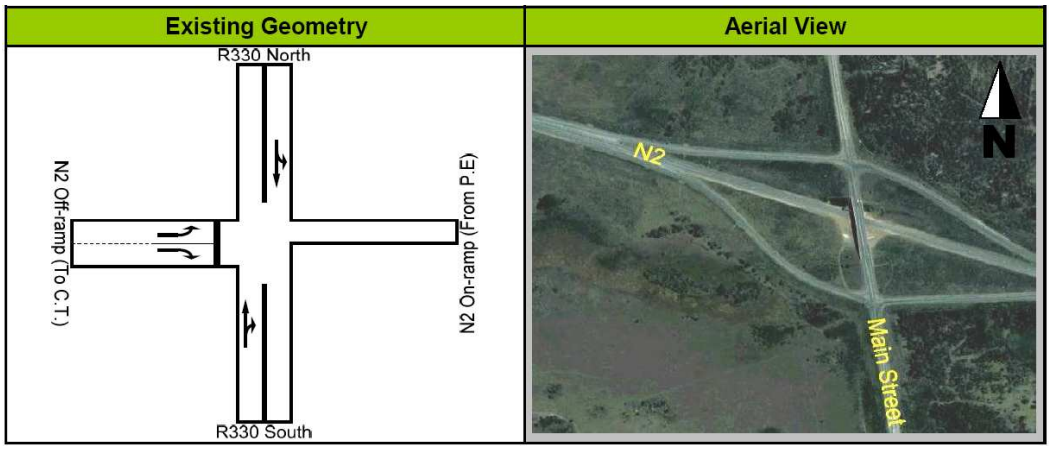


Figure 13.9: Main Street / N2 North Off-Ramp Existing Intersection Geometry

(i) 2021 Operational Traffic

All intersection approaches will operate acceptably at LOS A and LOS B during the AM and PM peak hours with minimal vehicle queues. No upgrades are therefore required.

13.3 Parking

Currently Koeberg Nuclear Power Station requires approximately 1 300 staff to operate the power station and currently provides 950 parking bays in total. This was used as the basis of determining the parking requirements of Nuclear-1, which requires approximately 1 300 staff members.

The parking requirement for Nuclear-1 is therefore approximately 950 bays. This links up with the modal split of 70% private vehicle usage and 30% public transport usage expected at the Thyspunt site.

13.4 Public Transport

Additional public transport services will have to be added to cater for the number of public transport trips generated by the proposed Nuclear-1 site at Thyspunt.

A total of 24 minibus taxi and 4 bus trips per day is required to provide transport for the Nuclear-1 staff during the operational phase.

13.5 Non-Motorised Transport

Traffic calming measures and a speed limit of 40 km/hr should be implemented on the new internal roads that will be built for Nuclear-1 to ensure pedestrian and cyclist safety.

13.6 Low to Medium Radioactive Waste Transport

The transportation of radioactive waste is performed under the regulatory control of the National Nuclear Regulator and in accordance with international standards. Two to four shipments of low to medium-level radio active waste will be made each week.

Maud, Drennan and Partners conducted a preliminary investigation between 1984 and 1987 with regard to the transport of nuclear waste from the Thyspunt site to Vaalputs. The results of this study indicates that road transport is the most viable option. Radioactive waste will be required to be transported cross-country from the Eastern Cape to the Northern Cape. It is proposed that the waste be transported via the N2 and N7 to Vaalputs as shown in **Figure 13.10.**

13.7 Emergency Evacuation

A 0 to 0.8 km Protective Action Zone (PAZ) and a 0.8 to 3 km Urgent Protective Action Zone (UPZ) are required by the EUR to be implemented around a nuclear facility for safety purposes. No new developments are allowed to be located within the PAZ and existing and planned developments situated within UPZ are required to be included in the facility's emergency evacuation plan. The Emergency Evacuation Zones are shown in **Figure 13.11**.

The Nuclear-1's Emergency Plan must be compiled to include non-nuclear and nuclear accidents occurring at the Nuclear-1. During the operational phase, the 1 300 staff would be evacuated using approximately 434 vehicles.

A single lane road capacity is approximately 1 500 vehicles per hour. This initial assessment indicates that the road capacity is sufficient to evacuate 434 vehicles an hour. However, a detailed Emergency Evacuation Plan must be compiled that includes a Transport Model to test the different scenarios and there effects on critical intersection capacities during the evacuation period.

13.8 Air Route Impacts

Thyspunt is situated 87 km from Port Elizabeth International Airport. It is also situated under the Terminal Control Area (TMA) of Port Elizabeth International Airport, which

FIGURE 13.10

FIGURE 13.11

extends from 6500 \ to 14 500 ft above mean sea level. Thyspunt is situated 3.986NM (7.382 km) to the North-East of the OKSET, a Standard Instrument Departure (SID) route termination point for Port Elizabeth International Airport as well as the starting and termination point of the UQ49 Air Route. It is also 10.299NM (19073 km) to the South-South-West of EVISO, a Standard Instrument Arrival (STAR) route starting point for Port Elizabeth International Airport as well as the starting and termination point of the A402, UA402 and UZ14 Air Routes. This might require the redesign of these procedures as well as re-routing of the Air Routes.

A total of 7 known aerodromes/airstrips lie within a 30NM (55.56 km) radius of Thyspunt. It is also situated 6.585NM (12.195 km) to the West of St Francis Field (FACF) and 10.618NM (19.664 km) to the South-West of Paradise Beach (FAPX) aerodromes, which are both licensed aerodromes.

Aircraft operating in this area are Commercial aircraft (up to Boeing 747 size), mostly at higher levels, but smaller General Aviation aircraft as well as helicopters operate down to very low levels along the coast. Military aircraft and helicopters also operate in this area down to very low levels.

The Thyspunt site would require the promulgation of new Restricted / Danger / Prohibited areas. The air routes over the Thyspunt site are shown in **Figure 13.12**.

13.9 Shipping Line Impacts

The South African Maritime Safety Authority (SAMSA) is the custodian of South African seas and the champion of the nation's maritime traditions.

SAMSA therefore have full jurisdiction (sovereignty) over the internal waters while in the territorial waters and other zones, foreign vessels have rights.

Furthermore, vessels such as boats, ships (including containers ships) are allowed within five nautical miles from the shoreline while trawlers and tankers are only allowed in the deep sea (25 NM from the shoreline). These areas are indicated in **Figure 13.13**.

SAMSA does not keep a record of vessels travelling past the proposed sites. Many vessels have an Automatic Identification System (AIS) that can be turned off allowing them to be undetected.

In terms of the Sea-Shore Act (No 21 of 1935), a security exclusion zone must be identified if a nuclear power station is built on the Thyspunt site. However, the proposed exclusion zone for the Thyspunt site is not fully located in domestic waters and the area is therefore semi-uncontrolled.

This could result in security issues for the nuclear power station. An application will therefore have to be put forward to create an exclusion zone for Thyspunt. It should be noted that there are fishing sites along the coast of Port Elizabeth, close to Thyspunt, that will be affected by the implementation of an exclusion zone.

FIGURE 13.12

FIGURE 13.13

13.10 Mitigating Actions Required

The following mitigating actions are therefore proposed for the operational phase transport aspects of the Nuclear-1:

- ***950 permanent parking bays are to be provided on the site;***
- A total of 24 minibus taxi and 4 bus trips per day need to be provided to transport the Nuclear-1 staff;
- A detailed emergency evacuation plan should be compiled for the Thyspunt Nuclear-1 site; and
- The Thyspunt site requires the promulgation of a new Restricted / Danger / Prohibited area for the air space over the proposed nuclear power station.
- The Thyspunt requires an application to be put forward to create an exclusion zone for ships required for a nuclear power station in terms of the Sea-Shore Act (No. 21 of 1935).

14 CONCLUSIONS

The key conclusions are as follows:

The **Duynefontein** site does not require significant upgrades during the construction and operational phases of Nuclear-1 with regard to intersection upgrades and heavy load transport road upgrades. It does, however, require a significant number of stand-by evacuation vehicles to ensure safe evacuation of construction workers if an accident does occur at Koeberg Nuclear Power Station during the construction period. These vehicles can be used to shuttle the construction workers to and from the site during the AM and PM peak periods.

Bantamsklip has a significant impact on the transport network with upgrades required to the public transport system, heavy load routes and road upgrades required for emergency evacuation purposes. Due to the Bantamsklip site's isolated location, transporting heavy loads by road will require significant upgrades and the alternative transport by sea should be considered. However, this would require the construction of landing and loading / off-loading facilities along the beach to be identified.

Thyspunt requires significant transport upgrades with regard to public transport and access during the construction phase. The R330 is proposed to be used for heavy load transport and may require pavement structure upgrades to cope with the increased heavy loads. The Oyster Bay road is proposed to be upgraded to a surfaced road to be used during the construction and operational phases for some construction traffic, surrounding staff access and as a required emergency evacuation route for areas such as Oyster Bay.

15 RECOMMENDATIONS

It is therefore recommended that:

The **Duynefontein** site requires the following mitigation actions:

Construction phase:

- ***Construct a level crossing over the railway line at Saldanha Bay Harbour;***
- ***Upgrade two unsurfaced road sections at Saldanha Bay Harbour;***
- ***Three intersection widening upgrades at Saldanha Bay Harbour;***
- ***Construction of a bypass upstream of the Modder River Bridge to traverse the Modder River;***
- ***Construction of an access road to Nuclear-1 off the existing Emergency Access Road to the Nuclear-1 site;***
- ***Abnormal loads should be transported during off-peak periods particularly during the night (21h00-0h500).***
- ***The R27 / Main Access Road intersection should be upgraded to accommodate the projected traffic. The intersection should be upgraded to a grade separated intersection, as per the PGWC's proposal, if viable. If this is not viable the option of upgrading the intersection to a signalised intersection, as shown in Figure 8.3, should be considered;***
- ***The R27 / Napoleon Street intersection should be upgraded to a signalised intersection, as shown in Figure 8.5. If Access 1 is grade separated then the signalisation of this intersection may not be required. These options are to be discussed with the PGWC;***
- ***The R27 / Access 2 intersection should be upgraded to a temporary signalised intersection as shown in Figure 8.9. If Access1 is grade separated, then the signalisation of this intersection may not be required and requires further investigation. These options are to be discussed with the PGWC;***
- ***Relevant signage, street lighting and a reduction of the speed limit from 120 km/hr to 80 km/hr is required to be constructed along the R27 approaching the proposed signalised upgrades of the above-mentioned intersections;***
- ***Eskom should shuttle construction workers by bus during the AM and PM peak periods and provide stand-by emergency evacuation vehicles;***
- ***900 temporary parking bays should be provided;***
- ***The "Koeberg Nuclear Power Station Emergency Plan: Transport Modelling & Evacuation Management Plan" (HHO, 2006) should be updated to include the evacuation of the 6000 construction workers; and***
- ***A comprehensive Construction Traffic Management Plan should be completed in conjunction with the authorities for the duration of the construction period.***

Operational phase:

- ***Access 2 should be used to access Nuclear-1; and***
- ***Nine hundred and forty five permanent parking bays should be provided.***

The **Thyspunt** site requires the following mitigation actions**:**

Construction phase:

- The Oyster-Bay road should be upgraded to a surfaced road to allow access to the site from the west;
- ***It is recommended that the R330 be used as the main access route, and Oyster Bay Road be used as the secondary construction route (for smaller construction vehicles and construction workers).***
- An access road off the R330 towards the site is required to be built;
- The Main Street / Jeffrey's Bay Access Road should be upgraded to a signalised intersection
- ***Relevant signage, street lighting and a reduction of the speed limit from 120 km/hr to 80 km/hr is required to be constructed along the R330 approaching the proposed R330 / St. Francis Bay traffic circle upgraded intersection;***
- ***Abnormal load trips should be undertaken during the evening (21h00-05h00) and in daylight hours over weekends during non-peak periods***
- The pavement structure of the R330 should be investigated to determine whether it can accommodate the increased heavy load trips during the construction period;
- ***Five hundred and seventy six temporary parking bays should be provided on-site;***
- ***Thirty eight minibus taxis and 24 buses should be provided to transport workers to the site on a daily basis; and***
- ***A comprehensive Construction Traffic Management Plan should be completed in conjunction with the authorities.***

Operational phase:

- ***The upgraded Oyster Bay Road is required to facilitate the evacuation of areas to the west of the site in an event of an emergency at Nuclear-1;***
- ***Nine hundred and forty five permanent parking bays should be provided;***
- A total of 24 minibus taxi and 4 bus trips per day need to be provided to transport the Nuclear-1 staff;
- A detailed emergency evacuation plan should be compiled for the Thyspunt Nuclear-1 site; and
- The Thyspunt site requires the promulgation of a new Restricted / Danger / Prohibited area for the air space over the proposed nuclear power station.

Bantamsklip site requires the following mitigation actions:

Construction phase:

- ***Five hundred and seventy six temporary parking bays should be provided;***
- ***38 minibus taxis and 24 buses should be provided to shuttle construction workers to the site;***
- ***Construction of the two access roads off the R43 to the Nuclear-1 site is required;***
- ***Due to the inaccessibility of the site for abnormal vehicles by road, a suitable site along the coast near the Bantamsklip site should be identified to allow loading and off-loading of the barge, which is proposed to transport heavy loads from Cape Town harbour to the site. A landing facility will be required to be constructed at an appropriate location; and***
- ***A comprehensive Construction Traffic Management Plan should be completed in conjunction with the relevant authorities before construction commences.***

Operational phase:

- The upgrading of the DR1206 to a surfaced road should be considered. The emergency evacuation plan should give guidance;
- ***Nine hundred and forty five permanent parking bays should be provided;***
- A total of 30 minibus taxi and 4 bus trips per day should be provided to transport the Nuclear-1 staff;
- A detailed emergency evacuation plan should be compiled for the Bantamsklip Nuclear-1 site; and
- The Bantamsklip site requires the promulgation of a new Restricted / Danger / Prohibited area for the air space over the proposed nuclear power station.

16 REFERENCES

Provincial Administration: Western Cape, 2001. Road Access Guidelines. Department of Economic Affairs, Agriculture & Tourism: Transport Branch, May 2001

National Department of Transport (NDoT), 1988, TRH 17 The Geometric Guidelines of Rural Roads

Eskom Holdings Ltd, 2007. Koeberg Administrative Complex & Training Centre Campus: Transport Impact Assessment. HHO Africa, September 2007

Eskom Holdings Ltd, 2008. Environmental Impact Assessment for the 400 MW (t) pebble Bed Modular Reactor Demonstration Power Plant: Transportation Specialist Study. Arcus Gibb, July 2008.

City of Cape Town, 2003/2004. Current Public Transport Record (CPTR)

City of Cape Town. Koeberg Nuclear Emergency Plan: Transport Modelling & Evacuation Management Plan. HHO Africa, December 2005

Eskom, 2006. Koeberg Site Safety Report. 2006.

Overberg District Municipality's Integrated Transport Plan (ITP), 2006

Cacadu District Municipality's Spatial Development Framework (SDF), 2007

Department of Transport. 2003 National Household Travel Survey, Technical Report.

Eskom, 1994. Nuclear Siting Investigation Programme (NSIP): West Coast Summary report. December 1994.

Mammoet South Africa (Pty) Ltd., 2005 PBMR Demonstration Power Plan: Transport Study from Saldanha Harbour to Koeberg Power Station for the Abnormal SSC. June 2005.

Eskom, 1994. Nuclear Siting Investigation Programme (NSIP): Southern Cape Summary report. February 1993.

Eskom, 1994. Nuclear Siting Investigation Programme (NSIP): Eastern Cape Summary report. December 1994.

National Radioactive Waste Management Policy and Strategy for South Africa

PGWC website. http://rnis.wcape.gov.za/rnis/rnis_web_reports.main

DOCUMENT CONTROL

IP180_B

CLIENT : ESKOM Holdings Limited

PROJECT NAME : Nuclear-1 Environmental impact Assessment and Management Plan **PROJECT No.** : J27035

TITLE OF DOCUMENT : Transport Specialist Study Assessment Phase

ELECTRONIC LOCATION :

	Approved By	Reviewed By	Prepared By
VERSION 8	NAME **Yusry Frizlar**	NAME **Yusry Frizlar**	NAME **Nuran Nordien**
DATE **March 2011**	SIGNATURE 	SIGNATURE 	SIGNATURE

	Approved By	Reviewed By	Prepared By
REVISION	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

ARCUS GIBB (Pty) Ltd

Postal Address : PO Box 3965 Cape Town 8000

Contact Person : Nuran Nordien

Telephone No. : 021 469 9100

Website : www.arcusgibb.co.za

Physical Address : 14 Kloof Street, Cape Town 8001

Email Address : nnordien@gibb.co.za

Fax No. : 021 424 5571