



# BITOU MUNICIPALITY

## PRELIMINARY DESIGN REPORT

FOR

**INTERNAL CIVIL SERVICES FOR ERF 562, KURLAND, BITOU  
MUNICIPALITY**

**SEPTEMBER 2021 (REV 0)**



**COMPILED FOR:**

**BITOU MUNICIPALITY**

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**C21018G**

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**PROJECT 21018CG- PRELIMINARY DESIGN REPORT**

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## BITOU MUNICIPALITY

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#### PRELIMINARY DESIGN REPORT – INTERNAL CIVIL SERVICES FOR ERF 562, KURLAND, BITOU MUNICIPALITY

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# BITOU MUNICIPALITY

## PRELIMINARY DESIGN REPORT

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## 1. INTRODUCTION

### 1.1 Scope of Work

Neil Lyners & Associates (RF)(Pty) Ltd had an inception meeting with Bitou Municipality on 8 February 2021 to execute and manage the process and procedures for the compilation of a civil services report and preliminary design for the low-cost housing development planned for Erf 562 of the Kurland township.

The purpose of this Preliminary Design Report is to provide background information in terms of engineering services required, as well as the intended design methodology thereof and possible restrictions and options in terms of providing engineering services.

This report is based on a draft town planning layout, the urban design, site inspections, liaison with the local authority, previous studies and available existing services information. All opinions and assumptions within this report are preliminary and can only be confirmed after completion of the final design.

### 1.2 Location

#### 1.2.1 Municipality

Bitou Municipality falls within the Eden District Municipal Area of the Western Cape Province. The Municipality is classified as a “Medium” capacity and Category “B” municipality. The Municipality is situated in the South-Eastern corner of the Province. Its Eastern boundary, the Bloukrans River, is also the boundary between the Western- and Eastern Cape Provinces and its southern border adjoins the Indian Ocean. Bitou Municipality falls within the **Breede Gouritz Catchment Agency (BGCMA)**. The Municipality consists of the following seven (7) individual wards, is the only **Water Services Authority (WSA)** within this municipal area and is also the **Water Service Provider (WSP)**.

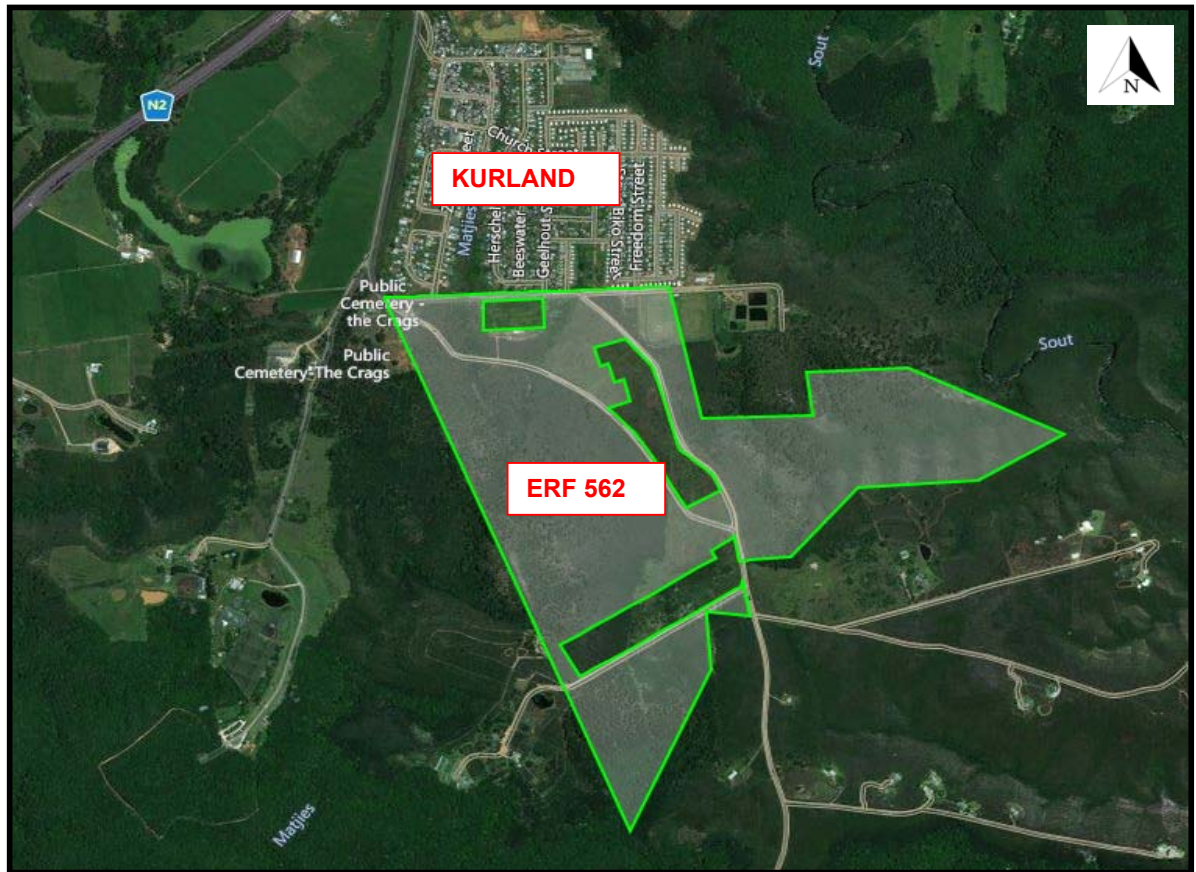


### 1.2.2 Kurland

Kurland falls under the jurisdiction of the Bitou Municipality and is a small residential township which is situated approximately 20 km north east of Plettenberg Bay, adjacent to the N2 Road. Kurland Township consists mostly of low-income households.

### 1.2.3 Erf 562

Erf 562 is a vacant property located directly south of the rural township of Kurland.



**FIGURE 1.1: LAYOUT OF DEVELOPMENT SHOWING ERF 562 & ERVEN 565 - 583**

### 1.2.4 Additional Erven Accommodated (565-583)

The development of erven surrounded by erf 562, visible on Figure 1.1, are also considered in this report. These erven are currently privately owned, and it is estimated that the erven may be subdivided and developed in future. It was suggested by Bitou Municipality that provision must be made in terms of civil services to accommodate a maximum density of 52 units/ha on these erven.

The surveyor general diagram for these erven is included under **Annexure B**.



### 1.3 Background

The Community Service Directorate is currently planning the integrated development of Erf 562 to the south of Kurland and has started with the **environmental impact assessment (EIA)** and Town Planning processes. The town planning layout on the 50-ha property has not been completed but the amount of low cost serviced erven will be in the origin of 1 500. In addition, they are planning the development of 74 serviced sites within the existing township with a **temporary relocation area (TRA)** on a portion of Erf 562.

Erf 562 is one of the Strategic Development Areas identified in **2018 Bitou Local Municipality Spatial Development Framework (MSDF)** for the bulk of future residential development. In terms of the Bitou Municipality housing backlog, 10% of the 4829 units are needed at Kurland. The proposed development will therefore aid significantly in providing houses for these people.

## 2. GEOTECHNICAL

### 2.1 Investigation

Outeniqua Geotechnical Services was appointed by Sonqua Consulting on behalf of Bitou Municipality to undertake a Phase 1 geotechnical site investigation. The physical and geotechnical nature of the site was investigated for the civil engineering design and project planning process, and the investigation was carried out in accordance with SANS 634: Geotechnical Investigations for Township Developments.

### 2.2 Summary Result of Investigation

There are no major geological faults in the immediate vicinity of the site, and there is a low risk of seismic activity in the area. The geology is generally macro-stable on low to moderate slopes, and is generally suitable for urban development with no risk of dissolution (i.e. dolomitic rock or karst terrain).

The soil profile is dominated by residual cohesive (clay) soils formed by chemical weathering of the Goudini Formation feldspathic sandstone, which is locally overlain by a thin colluvium (topsoil) horizon consisting of silty sand. The in-situ soil profile is fairly consistent across the site, with only minor localized variation. No bedrock was encountered in any of the test pits.

Detailed geotechnical report is included under **Annexure J** of the report.



### 3. PRELIMINARY DESIGN CRITERIA

#### 3.1 Design Criteria

All design criteria will be based on the “Guidelines for Human Settlement Planning and Design” referred to as the “Red Book”, the National Building Regulation (SABS 0400) and will be considered in conjunction with “DOHS: Minimum design and construction standards for internal A Grade engineering services”. Furthermore, all standards will comply with the Civil Engineering Department of Bitou Municipality where applicable.

#### 3.2 Provisional Layout & Number of Units

Provisionally the requirement in terms of the number of units are in accordance with Table 2.1 below:

ERF NUMBER	NUMBER OF UNITS	CUMULATIVE UNITS	DEVELOPABLE AREA	DENSITY	NOTE
562	1500	1500	51.9 ha	28.9 units/ha	Primary Scope
562	74	1574	N/A	N/A	Infill housing
565-573	237	1811	4.56 ha	52 units/ha	Additional (Private property surrounded by Erf 562. High probability that even will be developed by Bitou Municipality in the future)
574-583	269	2080	5.18 ha	52 units/ha	

**Table 2.1 : Provisional road layer works and details**

The preliminary layout is included under **Annexure A** of the report.

### 4. ROADS

The structural design period of all pavement layers should be 20 years. Structural design of layers will be in accordance with the TRH4 and the “Red Book” requirements and the envisaged traffic. ITS (Pty) Ltd traffic engineers were appointed for a traffic statement.

#### 4.1 Access

Access to the development will be via **Western Cape Government (WCG)** OP7220 which links directly to National Route 2. **WCG** traffic engineers recommended that OP7220 must be de-proclaimed as a provincial road to become a municipal road. The recommendation is based on the fact that upgrading it to municipal standards will be more affordable for Bitou Municipality if both the capital and maintenance costs of the upgrades are considered. Upgrading to provincial standards will



be approximately 20% more expensive. Bitou Municipality will have to maintain the road on an annual basis with a potential reseal once every fifteen (15) years.

Detail outlining the required upgrades of the access road is included in Traffic Impact Assessment done by ITS under **Annexure C**.

## 4.2 Internal Road Specifications

### 4.2.1 Road Reserve Widths

Road reserve widths will be 8 – 10 meters for residential streets and 13 – 16 meters for collectors (bus routes).

### 4.2.2 Road Widths

Road widths will be 4.5 meters for residential streets and 7.4 meters for collectors (bus routes).

### 4.2.3 Bellmouth Radii and Proposed Refuse Truck Route

In keeping with the urban design philosophy, the bellmouth radii will be kept as small as possible. The radii will vary between 8 meters and 12 meters. The 12 meters radii will be provided along the proposed refuse truck routes.

### 4.2.4 Provisional Road Layerworks

The following minimum specification applies to the layerworks:

LAYER	4.5m WIDE RESIDENTIAL	7.4m BUS ROUTE
<b>SURFACING</b>	30mm continuously graded asphalt. Alternative: Interlocking brick or block paving	40mm continuously graded asphalt. Alternative: Interlocking brick or block paving
<b>BASE COURSE</b>	150mm G4 commercial source natural gravel to have CBR of 80 compacted to 98% MOD AASHTO	Preferred: 150mm G3 commercial source crushed stone compacted to 98% MOD AASHTO Alternative: 150mm G3 commercial source natural gravel to have CBR of 80 compacted to 98% MOD AASHTO
<b>SUBBASE</b>	150mm G5 commercial source natural gravel to have CBR of 45 compacted to 95% MOD AASHTO	150mm G5 commercial source natural gravel to have CBR of 45 compacted to 95% MOD AASHTO
<b>ROADBED/SUBGRADE</b>	150mm G7 compacted to 93% MOD AASHTO	150mm G7 compacted to 93% MOD AASHTO

**Table 3.1 : Provisional road layer works and details**



#### 4.2.5 Kerbs

The following kerbs are considered a conventional application for this type of development:

ROAD DESCRIPTION	KERBING	
	HIGH	LOW
7.4m Bus Route	BK2 & C1	BK2 & C1
4.5m Wide Residential	MK10	CK5

**Table 3.2 : Provisional kerb details**

#### 4.2.6 Miscellaneous Road Design Detail

DESCRIPTION	SPECIFICATION
<b>BRICK PAVING</b>	73mm bricks, laid herringbone interlocking pattern on 20mm clean bedding sand. Bricks to conform to SANS227, class FBXE, 21 MPa min
<b>ROAD MARKINGS AND SIGNAGE</b>	To comply with South Africa Road Traffic Sign Manual (SARTSM)
<b>CROSSFALL</b>	Minimum 2%
<b>DESIGN SPEED</b>	40km/h

**Table 3.3 : Miscellaneous Road Design Specifications**



## 5. WATER SUPPLY

### 5.1 Water Demand

The **peak hour demand (PHD)** is calculated in Table 4.1 below incorporating the following parameters:

*Household Water Demand: 600 ℓ /day/unit*

*Peak Hour Demand / Instantaneous Peak (PHD): PF (hr) = 4,0*

*Un-accounted Water (UAW) = 10%*

ERF NUMBER	NUMBER OF UNITS	CUMULATIVE UNITS	AADD (+UAW) (k ℓ /d)	AADD CUMULATIVE (k ℓ /d)	PEAK HOUR DEMAND (ℓ /s)	PEAK HOUR CUMULATIVE DEMAND (ℓ /s)
562	1500	1500	990.00	990.00	45.83	45.83
562	74	1574	48.84	1038.84	2.26	48.09
565-573	237	1811	156.42	1195.26	7.24	55.34
574-583	269	2080	177.54	1372.80	8.22	63.56

**Table 4.1 : Peak Hour Demand Calculated**

At detailed design stage the internal network will be designed to accommodate the required peak hour demand of 63.56 ℓ/s during peak hours without exceeding the maximum velocity. In addition to the peak hour demand, the network will be designed to comply with the requirements of design fire flow as per the “Red Book”. In terms of the operating pressures, the network will be designed to not drop below six (6) meters head during instantaneous peak demand conditions and also not to exceed above (sixty) 60 meters head during any time of operation.

### 5.2 Internal Water Network

The internal water reticulation system will consist of uPVC pipes varying in size ranging between 90mm and 160mm diameter with the necessary provision made for isolating valves, pressure reducing valves, fire hydrants, required erf connections and water meters. Isolating valves will be installed so that it requires a maximum of four (4) valves to close a pipe section. No valves shall be located in the road surface. All water infrastructure relating to bulk supply and distribution will be located in the road reserve as far as practically possible.

For erf connections, 25mm ID (*two erven on other side of road*), 20mm ID (*two erven on same side of the road*) and 15mm ID (*one erf*) erf connections will be installed.

Pipes will be installed with minimum cover of 800mm.



### 5.3 Bulk Water Supply Infrastructure

The existing bulk water supply to the Kurland area needs to be supplemented to ensure sufficient bulk water supply for the existing Kurland Township, for the development on Erf 562 as well as for future growth of the area over the next 20 years.

The upgrades include the WTW, a new reservoir, a new connector pipe from the WTW to the Kurland township, a new supply pipe along the N2 from Matjiesfontein reservoir to Kurland WTW and a hydrogeological investigation to augment the groundwater supply to the Kurland WTW.

Detail outlining the required upgrades of the bulk water infrastructure are included in a technical report under **Annexure D**. Bitou Municipality plans to supplement the capital budget for these bulk water upgrades with provincial grant funding that will be applied for.

## 6. SEWERAGE

### 6.1 Design Flow Erf 562

The **instantaneous peak dry weather flow (IPDWF) & instantaneous peak wet weather flow (IPWWF)** generated by the development of erf 562 is calculated in Table 5.1 below incorporating the following parameters:

*Household Average Daily Flow: 500 ℓ /day/unit*

*Peak Factor: 2.5*

*Extraneous Flow: 100% Average Daily Dry Weather Flow (ADDWF)*

ERF NUMBER	NUMBER OF UNITS	CUMULATIVE UNITS	ADDWF (k ℓ /d)	ADDWF CUMULATIVE (k ℓ /d)	IPDWF (ADF * 2.5) (ℓ /s)	IPWWF (IPDWF + 100% ADDWF) (ℓ /s)
562	1500	1500	750.00	750.00	21.70	30.38
562	74	1574	37.00	787.00	22.77	31.88
565-573	237	1811	118.50	905.50	26.20	36.68
574-583	269	2080	134.50	1040.00	30.09	42.13

**Table 5.1 : IPDWF & IPWWF of Erf562, 565-573 & 574-583**





## 6.2 Design Flow to Existing Kurland PS1 (Pumpstation)

GLS's 2020 Sewer Masterplan recommends that the existing Kurland PS1 be decommissioned. Inevitably a pumpstation needs to be constructed downstream of existing Kurland PS1 to accommodate the flow from development of erf 562. It is not considered feasible to keep Kurland PS1 operational considering a pumpstation will be constructed downstream that can accommodate the flow of existing Kurland PS1. Decommissioning Kurland PS1 will result in reduced operational and maintenance cost for the municipality.

The **instantaneous peak dry weather flow (IPDWF) & instantaneous peak wet weather flow (IPWWF)** generated by existing housing upstream of Kurland PS1 is calculated in Table 5.2 below incorporating the following parameters:

*Household Average Daily Flow: 500 ℓ /day/unit*

*Peak Factor: 2.5*

*Extraneous Flow: 100%*

ERF NUMBER	NUMBER OF UNITS	ADDWF (k ℓ /d)	IPDWF (ADF * 2.5) (ℓ /s)	IPWWF (IPDWF + 100% ADDWF) (ℓ /s)
VARIOUS	475	237.5	6.87	9.61

**Table 5.2 : IPDWF & IPWWF of housing upstream of Kurland PS1**

## 6.3 Internal Sewer System

Conventional gravity sewerage system is the viable option considering the surrounding infrastructure available and favourable ground conditions. It is recommended that 200mm-160mm diameter uPVC (Class 34) pipes be used as sewer collectors which will be located in the road reserves as far as practically possible. It is recommended that 110mm diameter UPVC pipes be used for erf connections to the individual erven. Manholes will be installed as required on bends and nodes.

## 6.4 Analysing General Layout

The terrain is subdivided by small, non-perennial drainage lines that flow in-between the developable area. The proposed system will require the crossing of the non-perennial drainage lines to reduce the number of pumpstations required. The terrain also has a slight crest in a north/south direction more towards the south-east corner of the development footprint. The crest results that there must be at least two (east and west) primary sewer systems. Excavations will become impractically deep if two primary systems are not included. It is estimated that approximately 30% of the flow will contribute to the eastern system and 70% to the western system, with the exact proportioning pending detailed design.



## 6.5 Preferred Sewer Outfall Concept

The preferred sewer layout is shown on Figure 5.1 which entails two (2) new pumpstations and the decommissioning of existing pumpstation (Kurland PS1) situated north of the proposed development. Considering this layout, the proposed pumpstation on the west will accommodate most of the flow from the development of erf 562 and all of the flow upstream of existing Kurland PS1.

A servitude may result from this preferred layout considering that the bulk gravity pipeline (*green line referenced "2"*) needs to be located outside the boundaries of erf 562 on erf RE/1/302 and erf 15/302. An alternative concept is therefor included but will result in three (3) pumpstations.

## 6.6 Alternative Sewer Outfall Concept

The alternative sewer layout is shown on Figure 5.2. The layout incorporates an additional pumpstation on the western side to avoid the encroachment onto erf RE/1/302 and erf 15/302. Avoiding the encroachment is the only deviation from the preferred sewer outfall concept. This option is not considered more ideal in comparison to the preferred layout considering the additional capital, operational and maintenance costs and environmental risk because of the additional pumpstation.

## 6.7 Crossing Non-Perennial Drainage Lines

Where required non-perennial drainage lines will be crossed by means of open excavation and laying the pipe underground. In conjunction with material density requirements for backfill, the pipe and backfill material will be protected with gabion mattresses to avoid future erosion and damage to the pipeline during flood conditions. A typical detail of this type of crossing is included in **Annexure G**.

Pending a detailed design, crossing of non-perennial drainage lines may require crossing over the drainage lines if excavations exceed minimum depths for underground crossings. Crossing over drainage lines will be done by means of pipe bridges if required. Considering the information available at this stage, it is estimated that crossing over drainage lines may only be required at the locations as shown on Figure 5.1 and Figure 5.2. A detail of this type of crossing is included in **Annexure G**.

## 6.8 Pumpstations

Pumpstations will be designed to have an overflow storage capacity of four (4) hours considering the average daily flow rate. The overflow storage for the large (West 1) pumpstation will be accommodated in an open lined pond as it is considered the most feasible in terms of cost considering the large volumes. Other pumpstations overflow storage will be accommodated in the sumps.

Sumps will be sized, and pump operating controls placed so as to restrict pump starts to a maximum of six times per hour. Typical detail of a sewage pond and pumpstation including generator room is included in **Annexure H**.

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Screens will be included in the design for the protection of pumping equipment.

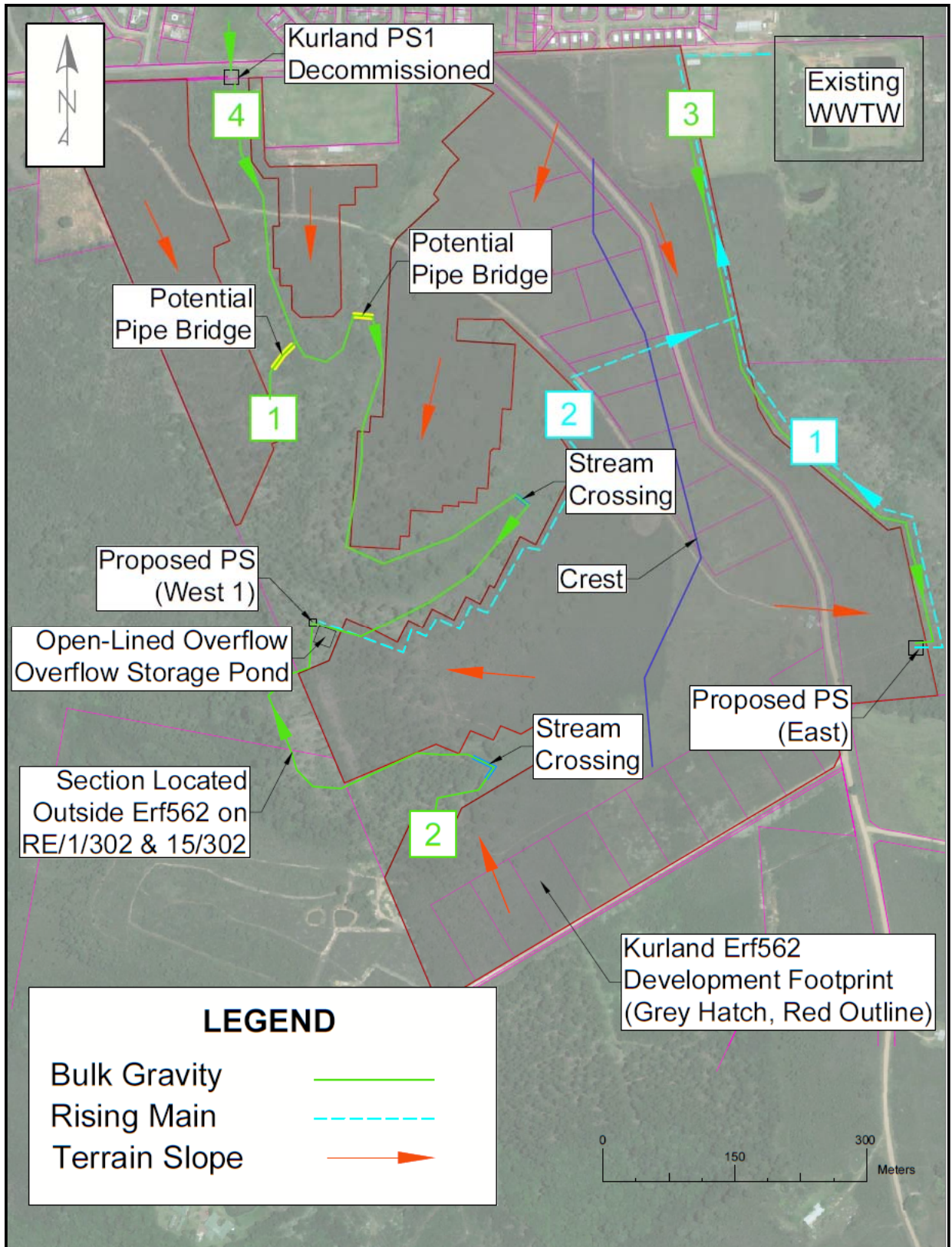
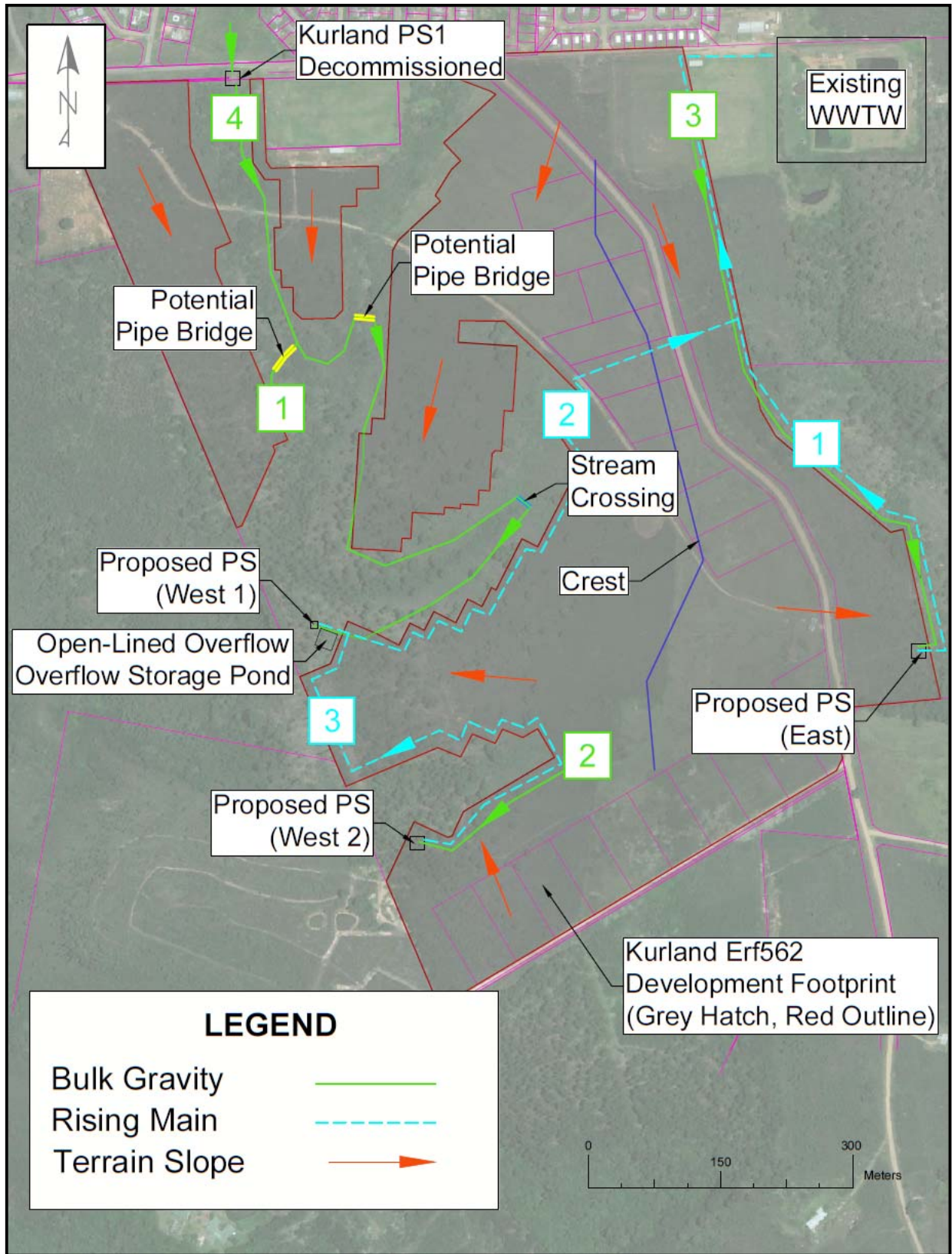


FIGURE 5.1: PREFERRED SEWER OUTFALL CONCEPT





**FIGURE 5.2: ALTERNATIVE SEWER OUTFALL CONCEPT**



## 6.9 Rising Mains

The minimum diameter rising main to be incorporated in the design will be 90mm diameter uPVC. Pending detail design, it is foreseen that the largest rising main to be installed can have a potential size of up to 250mm diameter. Rising mains will be designed to have a velocity of between 0.7 m/s and 2.5m/s. Ideally the velocity will be kept as close to 1.2m/s as possible for optimum energy consumption. Rising mains will be fitted with air release valves and scour valves in accordance with “Red Book” standards.

## 6.10 Bulk Sewer Infrastructure (WWTW)

The existing activated sludge plant servicing the area seems to function very well. However, increased treatment capacity is required to enable accommodation of an estimated increase future flow and load. Based on the actual flow and load data available, the rated capacity of the current infrastructure is roughly 0.6ML/d or a population equivalent of roughly 5 200.

The existing WWTW is proposed to be upgraded to a capacity of 1.35 ML/day to accommodate the proposed flows from Erf562 and surrounding erven to be developed as described under section 5 of this report. Bitou Municipality plans to (and have budgeted) upgrade the existing WWTW over the next three (3) financial years and have appointed consulting engineers for the planning and design phases.

See attached **Annexure E and F** which includes GLS’s Master Planning and a technical memorandum detailing the upgrades required for Kurland WWTW.

## 7. STORMWATER

### 7.1 Design Approach

The storm water drainage will be designed in accordance with the philosophy of providing for a minor and major system. Careful attention will be given to the layout of the road reserves to drain captured and overland storm water away from the proposed development.

The major system will consist of roads and open channels to ensure overland escape routes for the larger storm run-offs. The minor system will consist of kerb inlet catch pits and underground storm water pipes.

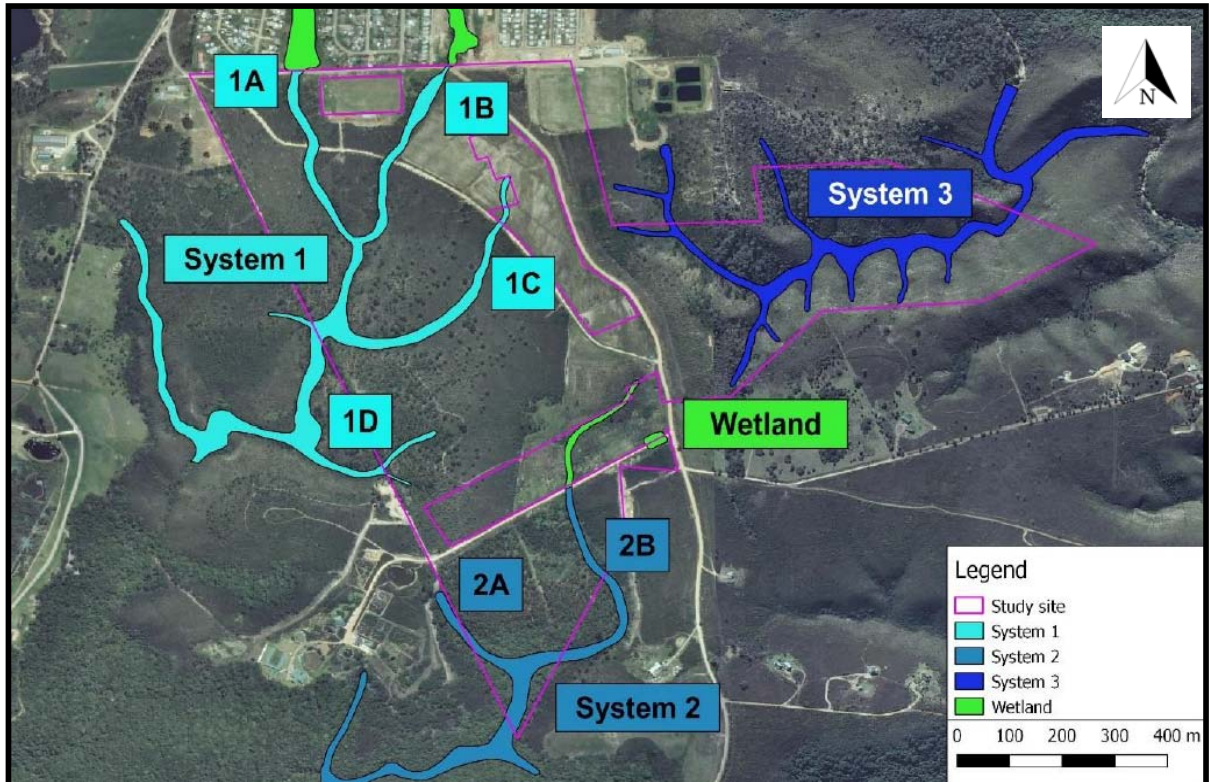
The minor system will be designed to accommodate the 1 in 2-year return period run-offs and the major systems for the 1 in 20-year run-offs. The minimum pipe diameters will be 450 mm for longitudinal runs and catch-pit connections as per the Bitou Municipality’s standards. The maximum size outfall stormwater pipes are expected to be 800mm in diameter.

Refer to **Annexure K** for stormwater management plan.



## 7.2 Stormwater Drainage Systems

As per environmental study by Sharples Environmental Services cc dated February 2020, three natural stormwater drainage systems (non-perennial drainage lines) exist on the site. The three stormwater systems are shown on Figure 6.1 below:



**FIGURE 6.1: ERF 562 NATURAL STORMWATER DRAINAGE SYSTEMS**

## 7.3 Direction of Post Development Flow

The detailed stormwater design will aim at maintaining the proportioning of the run-off between the three natural stormwater drainage systems.

## 7.4 Outlets

At major outlet structures provision for energy dissipation and erosion protection will be provided where required. A typical detail of an outlet structure including erosion protection is included in **Annexure I**.

## 7.5 Pre/Post Runoff

Considering the relatively undeveloped area downstream of the catchments of the three natural stormwater systems, attenuation dams is not deemed necessary in the design. Any flooding downstream as a result of the development is not foreseen.





## 8. SOLID WASTE

The development will be incorporated in the existing municipal waste infrastructure and the municipality will collect the solid waste at approved collections points.

At a rate of 2 kg/person per day and 5 persons per unit the mass of waste that will be generated by the full development (Erven 562, 565-573 & 574-583) will be 20.8 tons per day.

## 9. BULK EARTHWORKS

Bulk earthwork planning will be done for the individual phases and will be planned and optimised with the layout and phasing of the various areas. It is foreseen that platforms will be formed for the roads along sloped areas but no platforms will be required on the erven as erven are only developed on slopes of less than 1:4 gradient.

## 10. RECOMMENDATIONS

The following are recommendations to facilitate the successful development of this site:

- Cadastral boundary and required servitudes to be finalised;
- Cost estimate of required civil engineering services to be completed.

**R LOUWRENS Pr. Techni Eng  
PROFESSIONAL TECHNICIAN  
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**F van Eck Pr. Eng  
TECHNICAL DIRECTOR  
LYNERS**



## 10. ANNEXURES

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Erven 565-573, 574-583 Surveyor General Diagram

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Kurland Extension on Remainder Erf 562 TIA, August 2021

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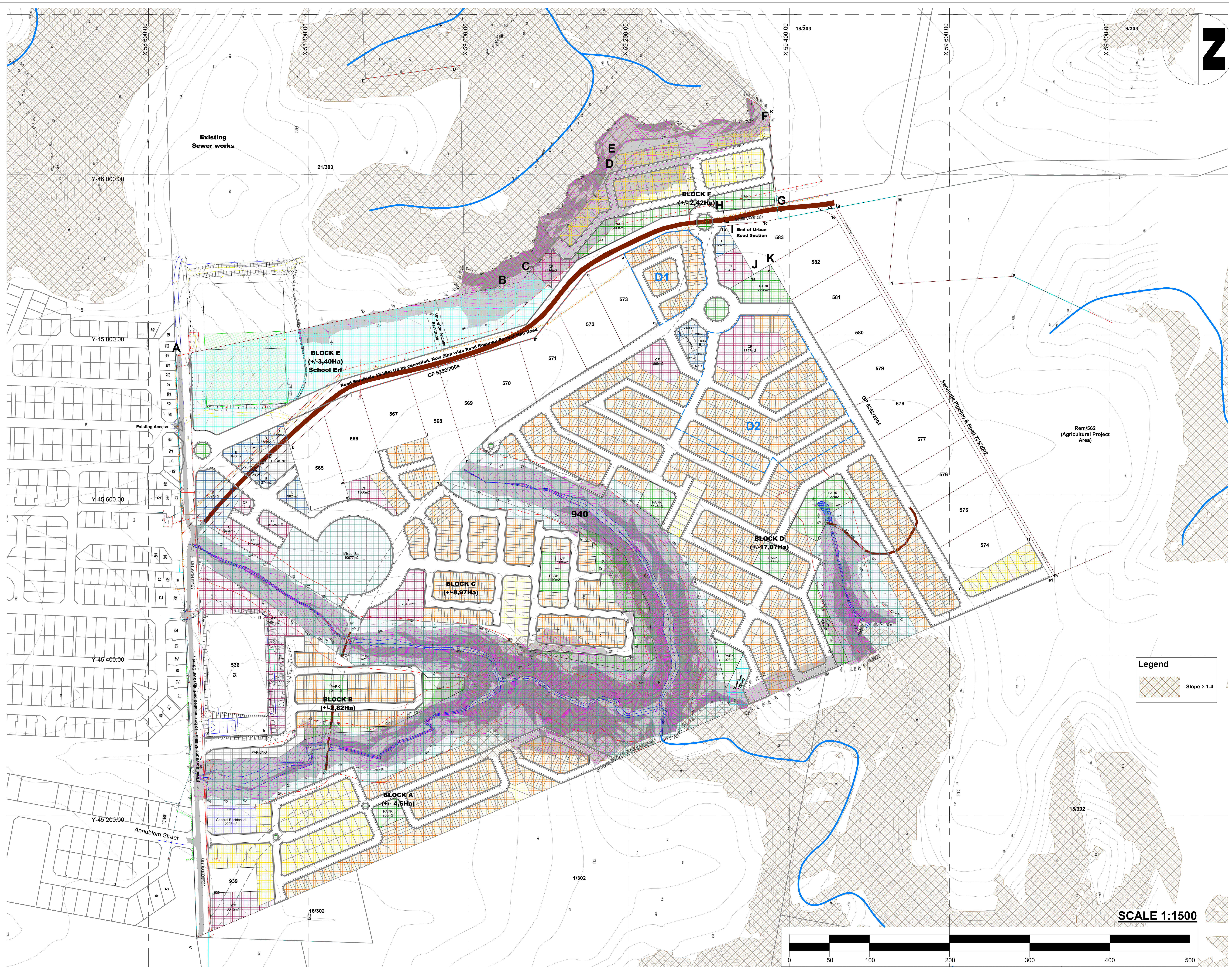




## **ANNEXURE A**

### **Preliminary Site Layout – Town Planning Dwg July 2021**





PROJECT

**KURLAND EXTENSION  
ERF 940 (a Portion of Erf 562)  
Draft 1: LAYOUT PLAN**



LOCALITY SCALE: 1:40000

LAND USE

Proposed Land Use	No. of Erven	Area (ha)
Row Housing	1339	12,03
Semi-Detached Housing	28	0,40
Single Residential (Average 180m <sup>2</sup> )	125	2,56
High Density Housing (Flats, 1-2 Units)	1	0,22
School	1	3,36
Community Facility	13	2,61
Mixed Use (Retail/Tourism/business/recreation/municipal/community facility/utilities)	1	1,98
Business	17	0,86
Parking / market	3	0,35
Active Parks	11	1,94
Conservation	2	11,56
Municipal	1	0,12
Roads		

GENERAL NOTES

1. Erf 652 now described as Erf 940 as per SG Diagram 1920/2020.

**Legend**

- Slope > 1:4

**SCALE 1:1500**



AMENDMENTS

No.	Description	Date

FOR COMMENT ONLY  
Not Final

Drawn by: A. de Villiers  
SCALE: 1:1500  
DRAWING No.: Kurland/940/LAYOUT/1  
LAYOUT PLAN STATUS

TOWN PLANNERS . PROPERTY VALUERS

WM DE KOCK  
Cell: 082 337 0285  
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E-mail: lynette@urbancontent.co.za  
TOWN & REGIONAL PLANNERS

2021070308:5113





## **ANNEXURE B**

### **Erven 565-573, 574-583 Surveyor General Diagram**

**MAIN FIGURE CO-ORDINATES**

System MS 23  
 Constants +0,00 +3700000,00  
 Y Metres X

**CDR**

( KURLAND ALLOTMENT AREA )  
**GENERAL PLAN NO. 6252 /2004**  
 OF SUBDIVISIONS OF

S.G. No. 6252/2004

APPROVED

*Handwritten Signature*

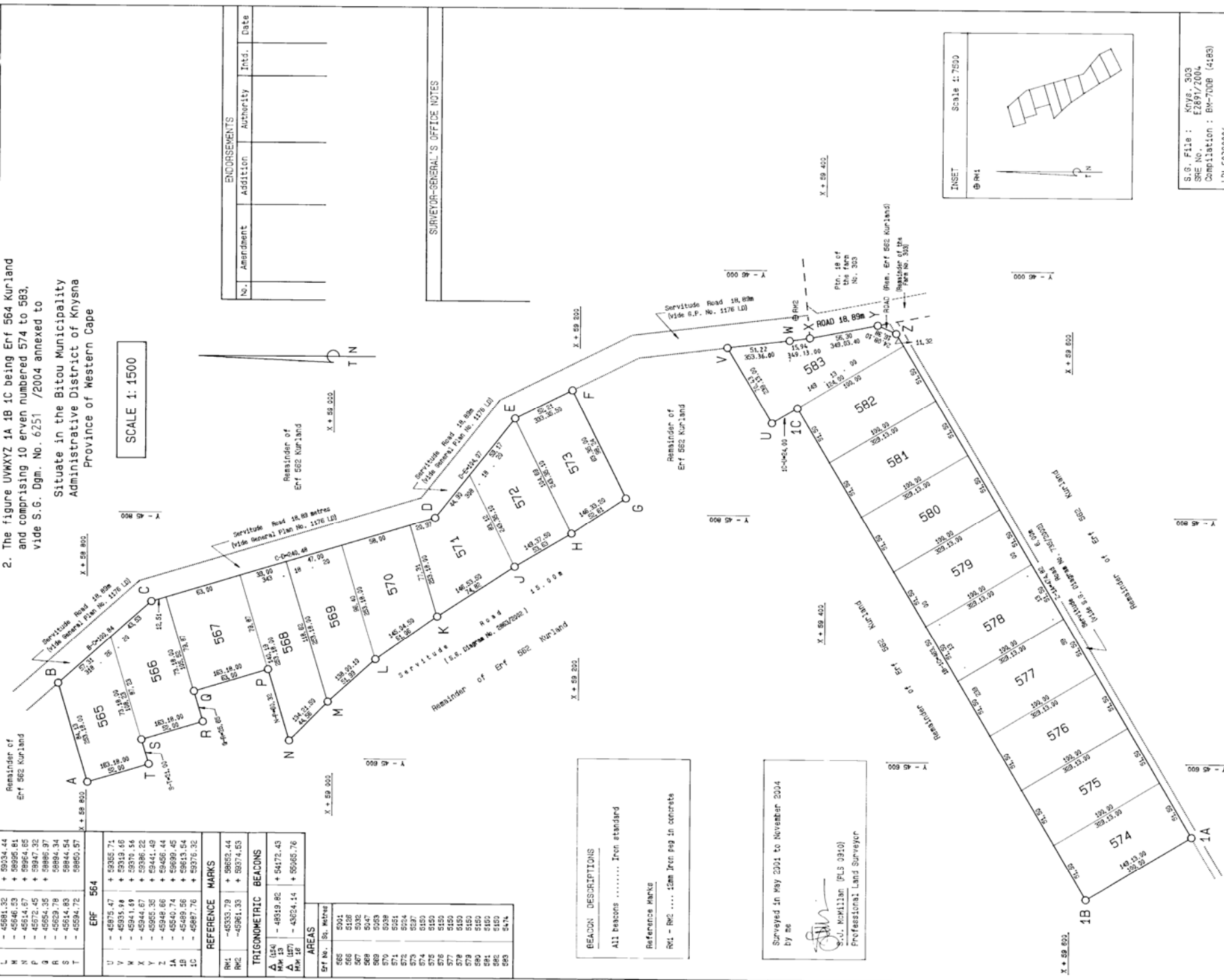
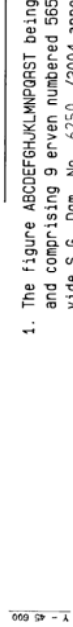
for Surveyor-General : Cape Town  
 Date : 2004-12-31

APPROVED IN TERMS OF ACT 126/1993  
 SECTION 6 & 10  
 Ref. 3033-L3a date: May 2004.

- The figure ABCDEFGHJKLPQRST being Erf 563 Kurland and comprising 9 erven numbered 565 to 573, vide S.G. Dgm. No. 6250 /2004 annexed to
- The figure UVMXYZ 1A 1B 1C being Erf 564 Kurland and comprising 10 erven numbered 574 to 583, vide S.G. Dgm. No. 6251 /2004 annexed to

Situate in the Bitou Municipality  
 Administrative District of Knysna  
 Province of Western Cape

SCALE 1: 1500

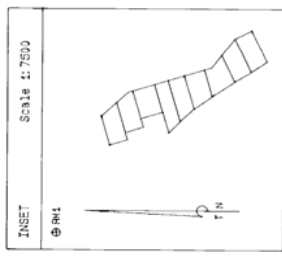


No.	Amendment	Addition	Authority	Intd.	Date

SURVEYOR-GENERAL'S OFFICE NOTES

**BEACON DESCRIPTIONS**  
 All beacons ..... Iron standard  
**REFERENCE MARKS**  
 RM1 - RM2 .... 12cm Iron peg in concrete

Surveyed in May 2001 to November 2004  
 by me  
*S.J. McMillan*  
 S.J. McMillan (PLS 0310)  
 Professional Land Surveyor



S.G. File : KCVS-303  
 SSE No. : E2897/2004  
 Compilation : BM-7006 (4183)  
 LPI C0390006

Erf No.	Sq. Metres
565	5004
566	5128
567	5032
568	5547
569	5078
570	5038
571	5051
572	5024
573	5037
574	5050
575	5100
576	5050
577	5100
578	5100
579	5100
580	5100
581	5100
582	5100
583	5100
584	5100
585	5100

REF	DESCRIPTION	COORDINATES
RM1	-45333,79	+58652,44
RM2	-45261,33	+58774,63

TR	DESCRIPTION	COORDINATES
TR1	-45119,82	+54172,45
TR2	-45224,14	+55085,76

AREA	DESCRIPTION	COORDINATES
AREA1	-45119,82	+54172,45
AREA2	-45224,14	+55085,76



## **ANNEXURE C**

### **Kurland Extension on Remainder Erf 562 TIA, August 2021**

# ***Kurland Extension on Remainder Erf 652***

***Transport Impact Assessment***

***Kurland, Plettenberg Bay***

*Version 2*

***August 2021***



5th Floor

Imperial Terraces

Carl Cronje Drive

Tyger Waterfront

Bellville, 7530

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---

## SUMMARY SHEET

Report Type	Transport Impact Assessment
Title	Kurland Extension on Remainder Erf 652
Location	Kurland, Plettenberg Bay
Client	Cape Town City
Reference Number	ITS 4175
Project Team	Lynne Pretorius, Pr.Eng Theodore Neels
Contact Details	Tel: 021 914 6211
Date	August 2021
Report Status	Version 2
File Name	G:\4175 TIA Kurland Housing, Plettenberg Bay\12 Report\Review\4175_KurlandHousing TIA-Report V2_lp-2021-08-13.docx

*It is herewith certified that this Transport Impact Assessment was undertaken by a professionally registered transport engineer and prepared according to the requirements of the South African Traffic Impact and Site Traffic Assessment Manual.*

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3	Land Use.....	1
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5	Existing Access .....	2
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13	Trip Assignment .....	5
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15	Future Site Access / Access Management / Road Reserve .....	5
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19	Parking .....	9
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## REPORT - SUMMARY TABLE

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

## ANNEXURES

- Annexure A: Site Development Plan  
Annexure B: Traffic Analysis Figures

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## ABBREVIATIONS

COTO	Committee of Transport Officials
Ha	Hectare
HCM	Highway Capacity Manual
LOS	Level of Service
NMT	Non-motorised Transport
SQM	Square Meters (m <sup>2</sup> )
TIA	Transport Impact Assessment
V/C	Volume to Capacity Ratio
WCG	Western Cape Government

# Transport Impact Assessment

*Kurland Extension on Remainder Erf 652, Kurland, Plettenberg Bay*

<p><b>1 Purpose of Study</b></p>	<p>This report summarises an investigation of the transport impacts expected as part of residential development, planned to the South of the existing Kurland Residential development on Remainder Erf 652, Kurland, Plettenberg Bay.</p> <p>The purpose of this investigation is to identify constraints within the surrounding road network and to recommend appropriate mitigation measures, to ensure that acceptable future operations are maintained.</p> <p>A draft version of the TIA was issued, dated 30 June 2021. Since then the Site Development Plan (SDP) was updated. The transport analysis for this development was done based on 1500 residential units as was recommended in the SDP at the time. Since then the SDP has been updated reflecting 1503 residential units. The additional 3 units will have a negligible impact on the analyses results and the findings of the TIA. Accordingly, the analyses has not been updated.</p>						
<p><b>2 Locality</b></p>	<p>Location – Remainder Erf 652, Kurland</p> <p>The future development will be located south of the existing Minor Road OP 772 and immediately south of the existing Kurland residential area.</p> <p>See <b>Figure 1A</b> and <b>Figure 1B</b> for the Locality Plan.</p>						
<p><b>3 Land Use</b></p>	<p><b>Existing Use</b> – The development area is currently vacant undeveloped land.</p> <p><b>Future Use</b> – It is planned to develop the following on the remainder of Erf 652:</p> <p style="text-align: center;"><i>Table 1: Land Use Extents</i></p> <table border="1" data-bbox="544 1486 1370 1608"> <thead> <tr> <th style="background-color: #0070C0; color: white;">Land Uses</th> <th style="background-color: #0070C0; color: white;">Extent</th> </tr> </thead> <tbody> <tr> <td>Residential</td> <td>1 503 Residential Units</td> </tr> <tr> <td>School</td> <td>Undetermined at this stage</td> </tr> </tbody> </table> <p>See <b>Figure 2, Annexure A</b> for the SDP.</p>	Land Uses	Extent	Residential	1 503 Residential Units	School	Undetermined at this stage
Land Uses	Extent						
Residential	1 503 Residential Units						
School	Undetermined at this stage						

<p><b>4 Existing Roadways</b></p>	<p>The major roads in the site vicinity are:</p> <p style="text-align: center;"><i>Table 2: Roadways in Study Area</i></p> <table border="1" data-bbox="544 315 1369 695"> <thead> <tr> <th>Roadway</th> <th>Classification</th> <th>Posted Speed (km/h)</th> <th>NMT Facilities</th> <th>See Photo in Annexure C</th> </tr> </thead> <tbody> <tr> <td>N2 National Road</td> <td>Class 1 Road – Major Arterial</td> <td>80</td> <td>No</td> <td>3 &amp; 4</td> </tr> <tr> <td>OP772</td> <td>Local Collector (Class 4)</td> <td>None (60)</td> <td>No</td> <td>5, 9, 10, 18, 21, 24 &amp; 29</td> </tr> <tr> <td>Mill Access Road</td> <td>Class 5 - Local Street</td> <td>None (60)</td> <td>No</td> <td>13 &amp; 14</td> </tr> <tr> <td>Zimri Street</td> <td>Class 5 - Residential Street</td> <td>60</td> <td>Yes</td> <td>19 &amp; 20</td> </tr> <tr> <td>Geelhout Street</td> <td>Class 5 – Residential Street</td> <td>60</td> <td>Yes</td> <td>25</td> </tr> </tbody> </table> <p>See <b>Figure 1, Annexure A</b> for the locations of these roads.</p>	Roadway	Classification	Posted Speed (km/h)	NMT Facilities	See Photo in Annexure C	N2 National Road	Class 1 Road – Major Arterial	80	No	3 & 4	OP772	Local Collector (Class 4)	None (60)	No	5, 9, 10, 18, 21, 24 & 29	Mill Access Road	Class 5 - Local Street	None (60)	No	13 & 14	Zimri Street	Class 5 - Residential Street	60	Yes	19 & 20	Geelhout Street	Class 5 – Residential Street	60	Yes	25
Roadway	Classification	Posted Speed (km/h)	NMT Facilities	See Photo in Annexure C																											
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OP772	Local Collector (Class 4)	None (60)	No	5, 9, 10, 18, 21, 24 & 29																											
Mill Access Road	Class 5 - Local Street	None (60)	No	13 & 14																											
Zimri Street	Class 5 - Residential Street	60	Yes	19 & 20																											
Geelhout Street	Class 5 – Residential Street	60	Yes	25																											
<p><b>5 Existing Access</b></p>	<p>The development area is currently served with a gravel road access from OP772 at a location 880m south-east of the existing Geelhout Street / OP772 Street intersection.</p> <p>This access will be formalised and will remain as an access to the development.</p> <p>Refer to <b>Section 15</b> for a discussion of the future accesses.</p>																														
<p><b>6 Analyses Hours</b></p>	<p>Residential developments typically generate higher traffic demands during weekday morning- and afternoon peak periods. Hence, the following peak hours were evaluated as part of this investigation:</p> <ul style="list-style-type: none"> <li>• Weekday AM peak hour (typically between 06:45 and 07:45)</li> <li>• Weekday PM peak hour (typically between 07:15 and 08:15)</li> </ul>																														
<p><b>7 Scenarios Analysed</b></p>	<p>The following scenarios were evaluated:</p> <p><b>Scenario 1:</b> 2021 Existing Traffic conditions (<i>Based on 2021 counted traffic volumes</i>)</p> <p><b>Scenario 2:</b> 2026 Background Traffic conditions (<i>Based on Scenario 1 traffic volumes, escalated with a growth rate of 3.19% per annum. The growth rate was obtained from Western Cape Government RNIS database for counting station 2732D</i>)</p> <p><b>Scenario 3:</b> 2026 Total Traffic conditions (<i>Based on Scenario 2 traffic volumes, plus the Kurland Extension Development trips</i>)</p>																														

<p><b>8 Study Intersections (existing control)</b></p>	<p>The scope of the analysis for the TIA included the intersections summarised in Table 3 below:</p> <p style="text-align: center;"><i>Table 3: Study Intersections</i></p> <table border="1" data-bbox="670 327 1245 438"> <thead> <tr> <th>No.</th> <th>Name</th> <th>Existing Control</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>N2 / OP772</td> <td>Priority Stop Controlled</td> </tr> <tr> <td>2</td> <td>Mill Road / OP772</td> <td>Priority Stop Controlled</td> </tr> </tbody> </table> <p>See <b>Figure 3</b> for the Existing Lane Configuration and Intersection Controls of the intersections listed above.</p>	No.	Name	Existing Control	1	N2 / OP772	Priority Stop Controlled	2	Mill Road / OP772	Priority Stop Controlled
No.	Name	Existing Control								
1	N2 / OP772	Priority Stop Controlled								
2	Mill Road / OP772	Priority Stop Controlled								
<p><b>9 Existing 2021 Traffic Conditions (Scenario 1)</b></p>	<p>The 2021 Existing Traffic conditions are based on existing intersection geometries, controls and counted traffic volumes. Peak period traffic counts and site observations were done on Tuesday, 22 June and Wednesday 23 June 2021.</p> <p>The following was observed during the peak hours:</p> <ul style="list-style-type: none"> <li>• Both study intersection operated acceptably</li> <li>• Motorist found sufficient gaps along the N2 and OP772 to enter the roads.</li> <li>• Queues on the OP772 approach to the N2 / OP 772 intersection are short and occasionally reached two vehicles.</li> <li>• No queues were observed at the OP772 / Mill Road intersection</li> </ul> <p>Based on the existing traffic capacity analysis results and on-site observations during peak traffic periods, the following can be concluded:</p> <p>Both intersections are currently operating at acceptably at Levels-of-Service B, delays between 9 &amp; 15 seconds with sufficient spare capacity at the intersections during the peak hours.</p> <p>Refer to <b>Figure 3, Annexure A</b> for the 2021 Existing Traffic Conditions.</p>									
<p><b>10 2026 Background Traffic Conditions (Scenario 2)</b></p>	<p>The 2026 Background Traffic volumes were calculated by applying a 3.19 percent growth rate per annum over a five-year period to the existing counted traffic volumes. This growth rate was obtained from the Western Cape Government' RNIS website based on the growth rate for station 2732D along the N2 (NR208).</p> <p>Based on the Background Traffic capacity analysis results, both intersections will continue to operate at acceptable Levels-Of-Service, delay and with sufficient spare capacity.</p> <p>Refer to <b>Figure 3, Annexure A</b> for the 2026 Background Traffic Conditions.</p>									

**11 Trip Generation and Development Trips**

The following vehicle trip generation rates were used for the proposed development based on The Committee of Transport Officials Trip Data Manual (TMH17-CoTO2013):

*Table 4: Trip Rate and Adjustment Factors*

Land Use	COTO Ref.	Rate	Adjustment Factor	
			Very Low Vehicle Ownership	Public Transport
Residential	COTO 210	1 trip / dwelling unit	70%	15%

These trip generation rates were adjusted for areas with very low vehicle ownership and good access to public transport.

Only the residential units were considered in the trip generation as it is expected that the trips that would be generated by the school, community facilities, businesses, retail, tourism and municipal buildings will be internal to Kurland. Furthermore, it is expected that the majority of learners will walk to the school. Accordingly, only the expected vehicle trips from the residential development were considered in the trip generation.

See **Table 7, Annexure B** for a summary of the trip generation rates as well as reduction factors that were applied. The resulting nett trip generation rate based on the applied reduction factors is 0.26 vehicle trips per residential unit.

Based on the adjusted trip generation rates as indicated in **Table 7, Annexure B** the development is expected to generate the following new peak hour trips:

*Table 5: Nett Development Trips*

Weekday AM Peak Hour			Weekday PM Peak Hour		
In	Out	Total	In	Out	Total
96	287	<b>383</b>	268	115	<b>383</b>

Refer to **Figure 4, Annexure A** for the Trip Generation / Distribution / Assignment for Scenario 3 and refer to **Table 8, Annexure B** for the expected development trips.

**Note:** *The trips indicated above does not take into account the existing backlog in housing provision that currently exists in Kurland. It is expected that a large percentage of the inhabitants to the new Kurland extension will come from the existing Kurland residential development. Therefore adding all the nett new development trips to the 2026 Background trips as part of the 2026 Total Traffic analysis is a Conservative approach.*

<p><b>12 Trip Distribution</b></p>	<p>The following trip distribution was used based on the traffic patterns observed during the site observations and traffic counts:</p> <p>75% of trips to / from the south-west along the N2 25% of trips to / from the north-east along the N2</p> <p>See <b>Figure 4</b> for the expected trip distribution destinations.</p>
<p><b>13 Trip Assignment</b></p>	<p>All the trips generated by the development will drive along OP772 toward the N2 and will distribute north / south along the N2.</p>
<p><b>14 2026 Total Traffic Conditions</b></p>	<p>The 2026 Total Traffic volumes were calculated by adding the expected Kurland residential extension development trips to the 2026 Background Traffic volumes. The geometry used in the analysis is based on the existing geometry.</p> <p>Based on the Total Traffic capacity analysis results it is evident that both study intersections will continue to operate at acceptable Level-Of-Service, short delays and with sufficient spare capacity. Therefore no upgrades are recommended to the study intersection based on a traffic operations and capacity point of view.</p> <p>Refer to <b>Figure 4</b> for the 2026 Total Traffic Conditions.</p>
<p><b>15 Future Site Access / Access Management / Road Reserve</b></p>	<p>The proposed development will be constructed in an area with several natural streams. The development will thus be constructed in several pockets between and around the streams with accesses provided to the different pockets from OP772. Access to the Kurland Extension will be provided to these individual development pockets from the following locations:</p> <p><b><u>New Accesses:</u></b></p> <p><i>New Access One:</i> This access will be provided opposite the existing Zimri Street on the southern side of OP772.</p> <p><i>New Access Two:</i> This access will be provided on the southern side of OP772 at 120m east of Zimri Street and 160m west of Geelhout Street.</p> <p><i>New Access Three:</i> This access will be provided 228m east of Geelhout Street. The section of OP772 where this access will intersect will be realigned and a roundabout will be provided to illuminate possible shoulder sight distance and approach road gradient issues.</p> <p><i>New Access Four:</i> This will be the future access to the school. There are two possible locations for this access. They are indicated as A and B on Figure 5. Both alternatives for Access Four will meet the minimum access spacing requirements as stipulated in the Road Access Guidelines. In the future development of the school the access location should be confirmed, along</p>

with a potential side street opposite the school access. See below *New Access Five*.

*New Access Five* This access will be provided on eastern side of OP772 at 349m or 482m south of New Access Five/Four depending on the final location of the school access.

*New Access Six*: This access will be provided on western side of OP772 at 349m or 482m south of New Access Five/Four depending on the final location of the school access.

OP772 is a Class 4 Provincial Road and the future intersections should be spaced as follows:

Table 6: Access Spacing

AMG Access Spacing's – Class 4 Road / Suburban Environment		
Spacing Between		Spacing Required
High Volume Driveway	High Volume Driveway	60m
High Volume Driveway	Unsignalised Full Intersection	115m
Unsignalised Full Intersection	Unsignalised Full Intersection	115m

Source: Western Cape Government, Access Management Guidelines, Table 12-5

Based on **Figure 5** all the access spacing's will be acceptable and will be within the minimum required intersection / access spacing of 115m. The Zimri Street / New Access One intersection will be spaced 65m north of an existing house entrance. However this is an access to an existing house and therefore will not generate more than two trips at most. Therefore this spacing is not considered problematic.

New Access One will be spaced 145m north of the aligned Mill Road roundabout and 120m south of New Access Two and would thus acceptable.

At the moment shoulder sight distance to the south along OP772 from the Mill Road approach is very limited due to it being situated at the start and outer side of a horizontal curve.

Therefore it is recommended to move this access further south to a more central position in the horizontal curve and to provide a roundabout.

	<p><b><u>Considered Accesses:</u></b></p> <p><b>Figure 5</b> also indicate three access positions where new accesses can be considered. The first two will be accesses to the existing Kurland residential area. These two accesses can be provided by extending the existing Redford Crescent (“Considered Access A”, <b>Figure 5</b>) and extending the existing Church Street (“Considered Access B”, <b>Figure 5</b>) to OP772.</p> <p>The access spacing as a result of such extensions will still meet the minimum access spacing requirements as stipulated in the Access Management Guidelines of the Western Cape Government.</p> <p>In addition, a third considered access, Considered Access C, can be considered as an access at this position would provide a better link between the future school and the future Kurland residential development. This Considered Access C should be considered in the future when the private property potential develop, or else be expropriated for the purpose of public road. However, this access proposal does not form part of the current application or TIA.</p> <p><b><u>Future Road Reserve:</u></b></p> <p>A conceptual design for the new road OP0772 has been undertaken which takes into consideration the proposed accesses, as well as the cross-sectional requirements, along with provincial geometric design standards. This conceptual design is included as Annexure D. Also Refer to <b>Figure 5</b> for the recommended future cross section.</p>
<b>16 Road Conditions</b>	<p><b>Surface:</b> During the site visit it was observed that the following sections of OP772 are not in a good condition and would require some maintenance in the near future. Especially the following sections:</p> <ul style="list-style-type: none"><li>• OP772 between the Engen Garage access and the N2. This section is mostly damaged at the stop markings and the sides of the road is damaged. See <b>Photo 30</b> and <b>Photo 31</b>.</li><li>• OP772 between Zimri Street and the Wastewater Plant Access Road. See <b>Photo 21</b> to <b>Photo 26, Annexure C</b></li></ul> <p><b>Street lighting:</b> During the site visit it was difficult to observed pedestrian / cyclist movements and vehicles with no lights on during the early mornings and late afternoons due to the lack of street lighting provided along OP772. This is especially of concern in the section of OP772 between the Engen Garage access and the N2 where pedestrians are only visible when a vehicle lighting reaches them. See <b>Photo 35, Annexure C</b>.</p> <p>Surfacing upgrades and street lighting are recommended at the section between the Engen Garage access and the N2.</p>



<b>17 Public Transport</b>	<p><b>Existing Facilities:</b> There are bus embayments provide on both sides of the N2 approximately 25m south of the OP772 approach to the N2.</p> <p><b>Site observations:</b> During the site visit it was observed that a few taxis stop in the embayments along the N2 and also in the south-eastern quadrant of the N2 / OP772 intersection. It was also observed that some bakkies and trucks pick up individual workers at the embayment's. The bus and taxi volumes at the study intersections during the peak are indicated on <b>Figure 6</b>. Public transport volumes are relatively low. Based on the site observations it was evident that taxis pick up commuters within the residential area and travel directly to the N2 as there are almost no taxi stops along OP772.</p> <p><b>Recommended Facilities:</b> It is expected that with the expansion of Kurland that taxi volumes along OP772 will increase. Taxi embayments can be considered in the future along OP0772 if required, especially at the school entrance. Taxi volumes currently stopping in the embayments along the N2 are very low and only a small percentage of taxis driving from Kurland to the N2 or returning to Kurland from the N2 use these embayments.</p>
<b>18 Non-Motorised Transport</b>	<p><b>Existing Facilities:</b> There are currently no facilities provided along OP772 and along the N2 at the OP772 intersection for pedestrians and cyclists.</p> <p><b>Site observations:</b> Pedestrian and cyclist activity is high along OP772. Pedestrians walk along OP772 from Kurland to the Mill, the crags, the Mill Shop, Birds of Eden to the south as indicated on <b>Figure 8</b> and <b>Photo 13, 14 &amp; Photo 16</b>.</p> <p>High cyclist and pedestrian volumes were also observed walking and cycling from Kurland to the N2 as indicated in <b>Figure 7</b> and <b>Photos 5, 6 &amp; 8</b>.</p> <p>Due to the long travel distances to work opportunities especially along the N2 a number of people cycle to work as seen from the volumes indicated on <b>Figure 7</b>. There are no facilities provided along OP772 for cyclist however there are shoulders along the N2 that cyclist use.</p> <p><b>Recommended Facilities:</b> It is expected that with the expansion of Kurland to the south that more cyclist and pedestrians will use OP772 between the development and the N2. The existing road has narrow lanes with no pedestrian or cyclist facilities provided. It is recommended that cycle lanes and sidewalks be provided along OP772.</p> <p>It is further recommended that a pedestrian crossing be provided along OP772 in the vicinity of either Geelhout or Zimri Streets, as well as at the future access to the school. Refer to <b>Figure 5</b> for the proposed position of such pedestrian crossing.</p>

	<p>It is also recommended to provide a pedestrian path/walkway/bridge within the new residential development to link the southern and northern residential areas with each other. Refer to <b>Figure 5</b>.</p>
<p><b>19 Parking</b></p>	<p>The following parking rates based on the parking rates for PT1 zones recommended in the Access Management Guidelines of the Western Cape Government, are proposed:</p> <ul style="list-style-type: none"> <li>• Free-standing residential development: 1 parking bay per DU</li> <li>• FLIPS housing: 1 parking bay per DU</li> <li>• BNG/ high-density row housing: 1 parking bay per DU located in shared parking facilities</li> </ul> <p>Parking required for the other non-residential land uses should be provided based on the parking rates for PT1 zones recommended in the Access Management Guidelines. However, a potential reduction in the parking rate can also be negotiated with Bitou Municipality, should it be required due to the expected very low vehicle ownership of future residents.</p>
<p><b>20 Conclusion &amp; Recommendations</b></p>	<p>This report summarises an investigation of the transport impacts expected as part of a Residential Development planned on Remainder Erf 652, Kurland.</p> <p>A draft version of the TIA was issued, dated 30 June 2021. Since then the Site Development Plan (SDP) was updated. The transport analysis for this development was done based on 1500 residential units as was recommended in the SDP at the time. Since then the SDP has been updated reflecting 1503 residential units. The additional 3 units will have a negligible impact on the analyses results and the findings of the TIA. Accordingly, the analyses has not been updated.</p> <p>Based on the investigation the following can be concluded:</p> <p><b>Land Use / Extent:</b> The Kurland Residential extension will consist out of 1503 additional residential units, a school and some business/retail/tourism pockets within it.</p> <p><b>2021 Existing Traffic:</b> The study intersections currently operate acceptably. Hence, no upgrades are required or proposed, from an intersection capacity point of view.</p> <p><b>2026 Background Traffic:</b> All study intersections would continue to operate at acceptably. Hence, no upgrades are required.</p> <p><b>2026 Development Trips:</b> The development is expected to generate 383 trips during the a.m. weekday and p.m. weekday peak hours.</p> <p><b>2026 Total Traffic:</b> All study intersections would continue to operate at acceptably. Hence, no upgrades are required out of a traffic capacity and operations point of view.</p>

**Future Access:** Various accesses are proposed to along OP0722. These accesses will meet the minimum access spacing requirements of the Western Cape Government as stipulated in the Access Management Guidelines.

**Future Road Reserve:** A conceptual design for the new road OP0772 has been undertaken which takes into consideration the proposed accesses, as well as the cross-sectional requirements, along with provincial geometric design standards.

**Road Conditions:** It was observed on-site that certain parts of OP772 would need maintenance as the road surface is not in a good conditions. Specific sections that need attention are:

- OP772 between the N2 and the Engen Filling Station Access
- OP772 east of Zimri Street.

**Public Transport:** It is expected that with the expansion of Kurland that taxi volumes along OP772 will increase. Taxi embayments can be considered in the future along OP0772 if required, especially at the school entrance. .

**Non-Motorised Transport:** the following NMT upgrades are recommended:

- Provide cycle lanes and sidewalks along OP772
- Provide a sidewalk from OP772 to the bus embayment on the eastern side of the N2
- Provide a formal pedestrian / cyclist pathway from either Redford Crescent or Church Street that would link up with sidewalks / cycle lanes along OP772 in the future.
- Provide a pedestrian crossing along OP722 in the vicinity of either Geelhout, as well as at the entrance to the school. The exact location should still be finalised along with further updates to the Site Development Plan.
- Provide a pedestrian walkway/bridge within the future residential development to connect the southern and northern parts of the Kurland Extension.

**Parking:** Parking at a rate of 1 bay per dwelling unit should be provided. A potential reduction can be negotiated with Bitou Municipality, if required, due to the expected low vehicle ownership of the residents.

Based on this investigation, it is evident that the expected transport impacts of the Kurland Residential Extension on Erf 652 could be sufficiently mitigated, provided that the upgrades as discussed in this report are in place. Hence, it is recommended that this development be considered for approval from a transport point of view.

## REFERENCES

1. Highway Capacity Manual (HCM), Quality and Level-of-Service Concepts, Transportation Research Board, 9 March 2015
2. South African Road Classification and Access Management Manual, TRH26, Version 1.0, August 2012
3. South African Trip Data Manual, TMH17, Version 1.1, COTO, September 2013
4. Access Management Guidelines, 2019, Western Cape Government

Annexure A

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Figures

Figure 1: Locality Plan

Figure 2: Site Development Plan

Figure 3: Existing 2021 and 2026 Background Traffic Conditions

Figure 4: Expected development Trips and 2026 Total Traffic Conditions

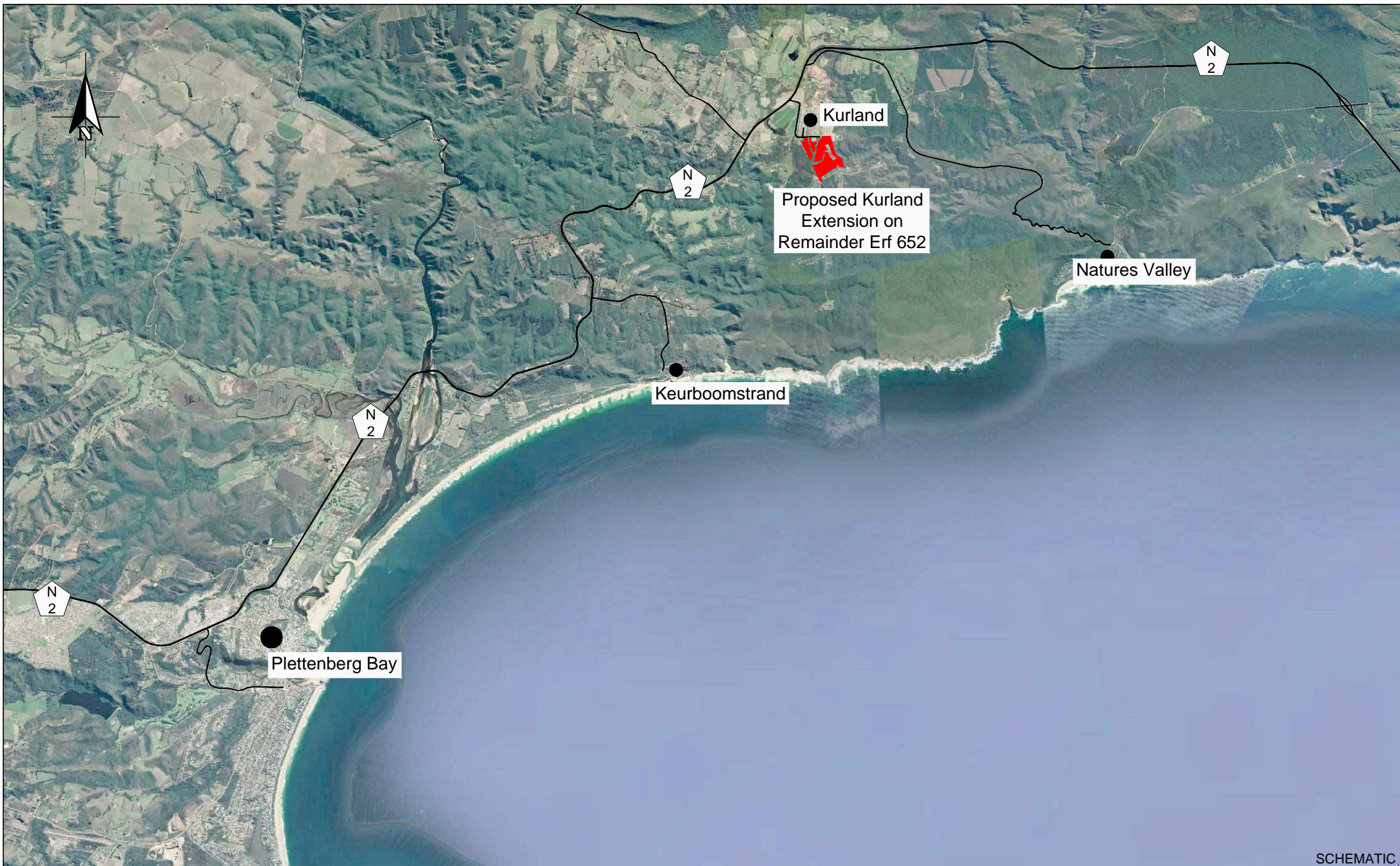
Figure 5: Development Accesses, Spacing and Future Recommended Road Reserve

Figure 6: Bus and Taxi Volumes at N2 and Mill Road Intersections with OP772

Figure 7: Pedestrian and Cyclist Volumes – N2 / OP772

Figure 8: Pedestrian and Cyclist Volumes – Mill Road / OP772





SCHEMATIC

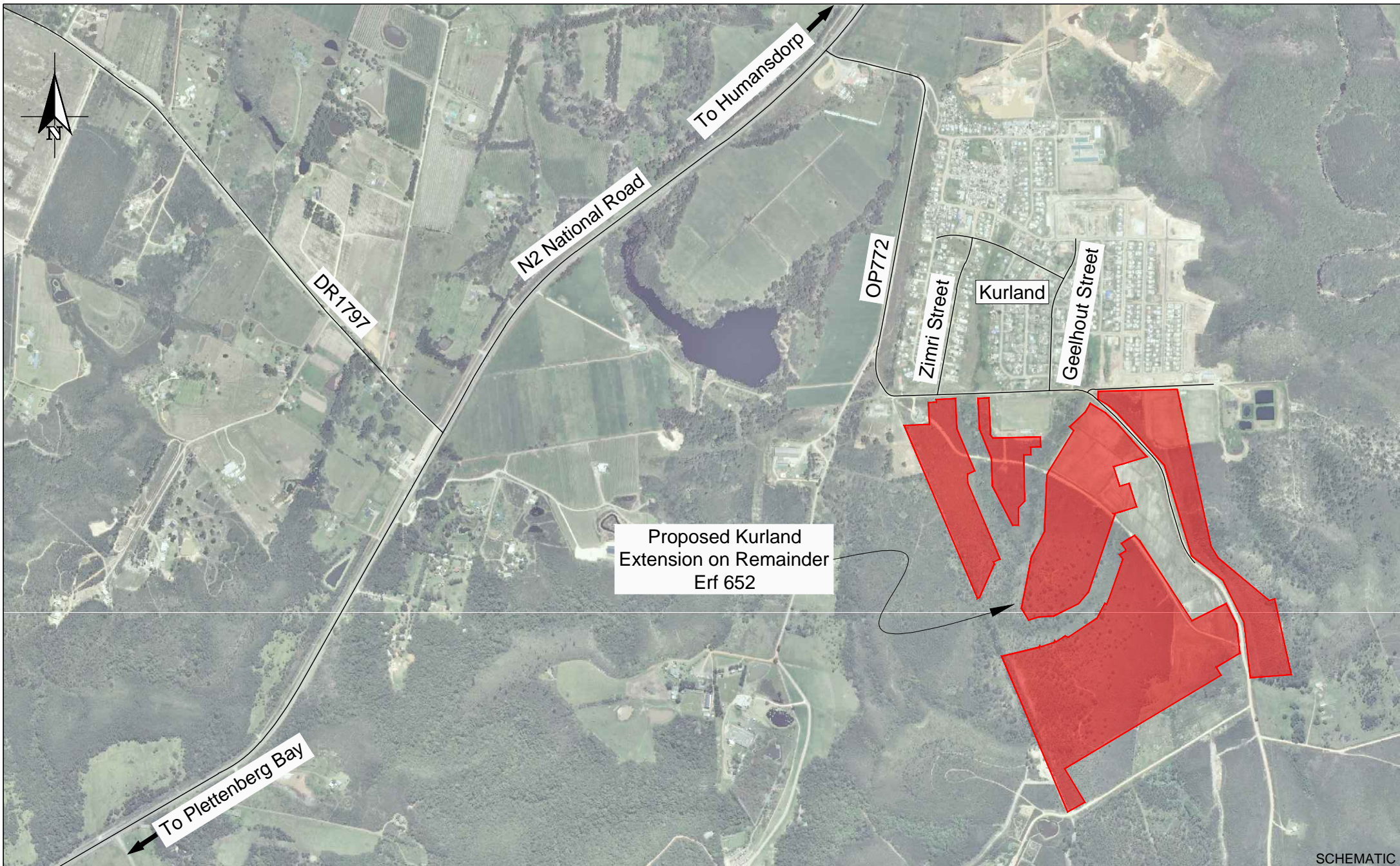


PROJECT:  
PROPOSED KURLAND EXTENSION ON  
REMAINDER ERF 652, KURLAND

FIGURE:  
LOCALITY PLAN  
WIDER AREA

NUMBER:  
1A





SCHEMATIC

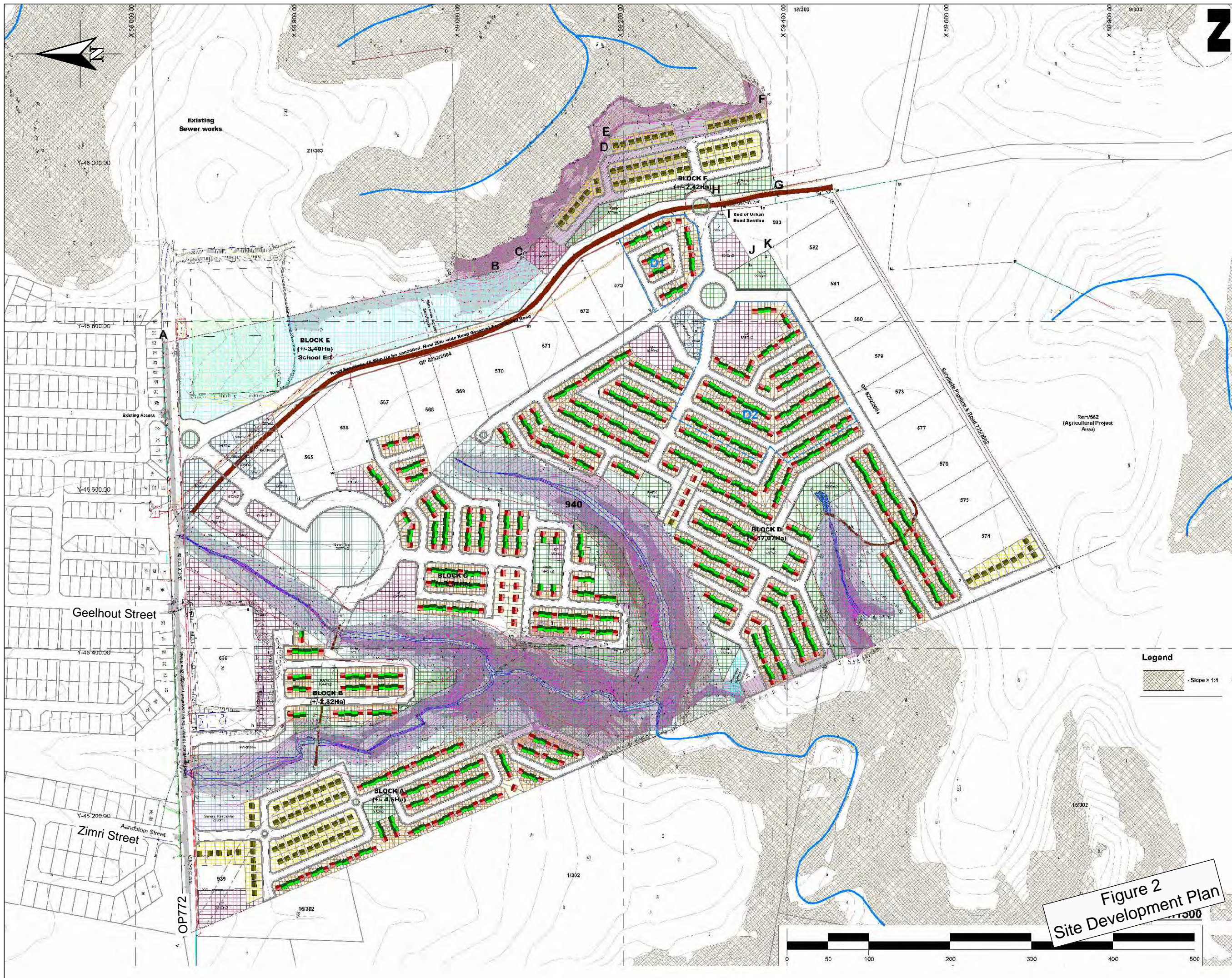


PROJECT:  
**PROPOSED KURLAND EXTENSION  
 ON REMAINDER ERF 652, KURLAND**

FIGURE:  
**LOCALITY PLAN  
 DEVELOPMENT AREA VICINITY**

NUMBER:  
**1B**





**2**

**KURLAND EXTENSION  
ERF 940 (a Portion of Erf 562)  
Draft 1: LAYOUT PLAN**



LOCALITY SCALE: 1:40000

**LAND USE**

Proposed Land Use	Area (m²)	% of Area
Residential	1830	12.00
Single Detached Housing	76	0.47
Single Residential Coverage (R100)	128	0.86
High Density Housing (Flats, Townhouses)	11	0.07
School	1	0.01
Community Facility	1	0.01
Mixed Use (Retail/Tourism / Business / Recreation / Entertainment / Office)	1	0.01
Parking / Roads	3	0.02
Public Parks	1	0.01
Conservation	2	0.01
Watercourse	1	0.01
Roads	1	0.01

**GENERAL NOTES**  
1. Erf 652 n/w described as Erf 940 as per SG Diagram 1920/2020

**Legend**  
Slope > 1:4

**Figure 2  
Site Development Plan**

**AMENDMENTS**

No.	Description

**FOR COMMENT ONLY  
Not Final**

Drawn by: A de Villiers  
SCALE: 1:1500  
DRAWING No: Kurland/940/LAYOUT/1  
LAYOUT PLAN ST4TJ0

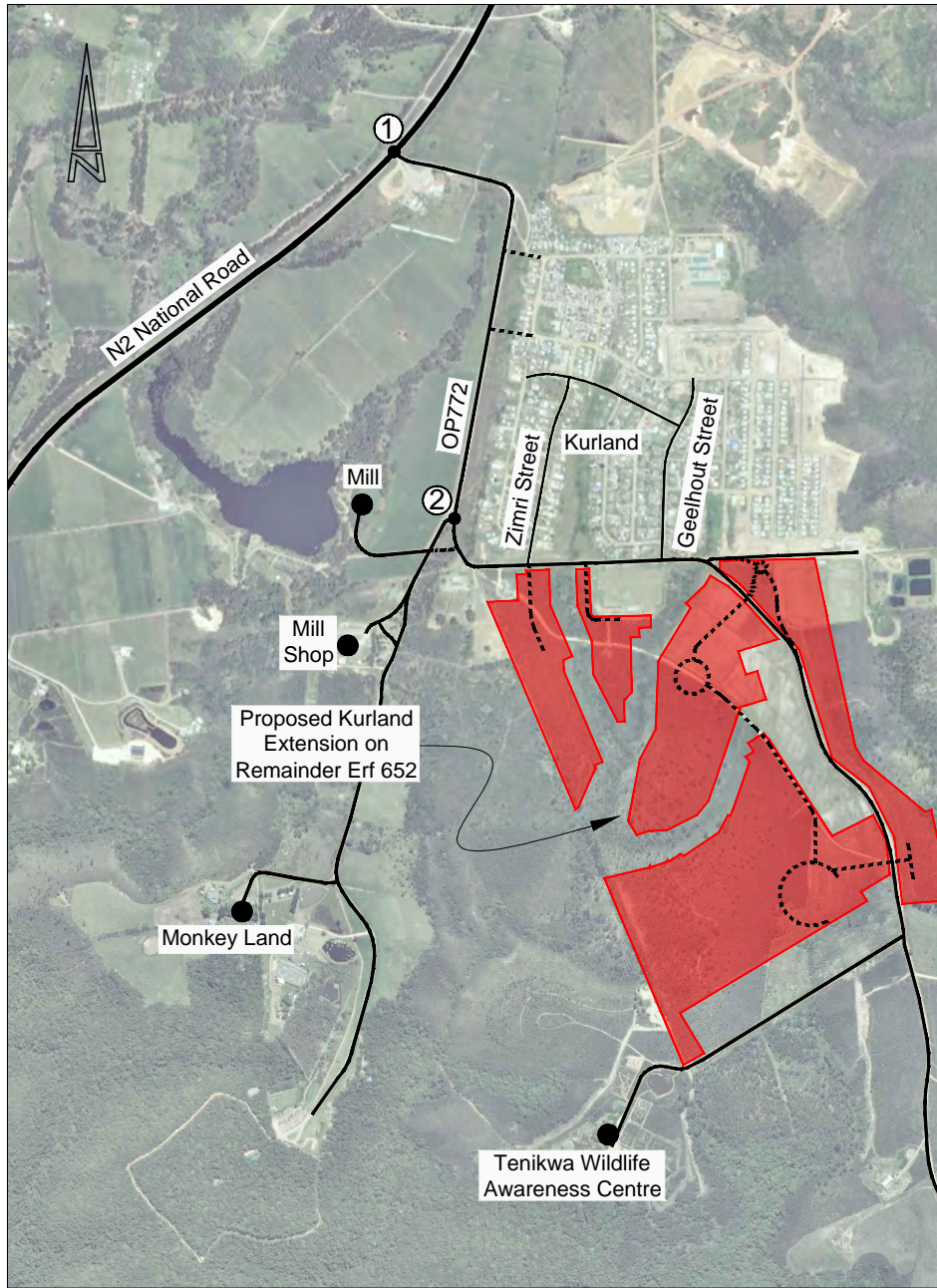
**TOWN PLANNERS - PROPERTY VALUERS**

**WM DE KOCK ASSOCIATES**

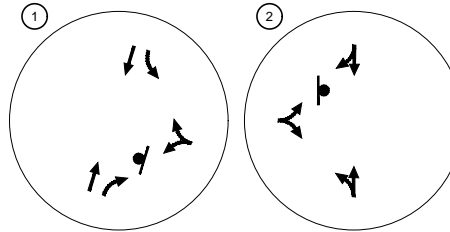
223 Victoria Country Estate  
P.O. BOX 12496 George 6546  
Lynette Groenewald  
Cell: 082 953 3900  
E-mail: lynette@urbancontent.co.za

**URBAN CONTENT**  
TOWN & REGIONAL PLANNERS

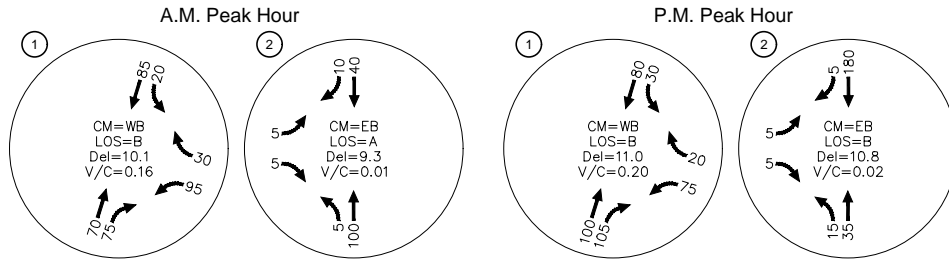




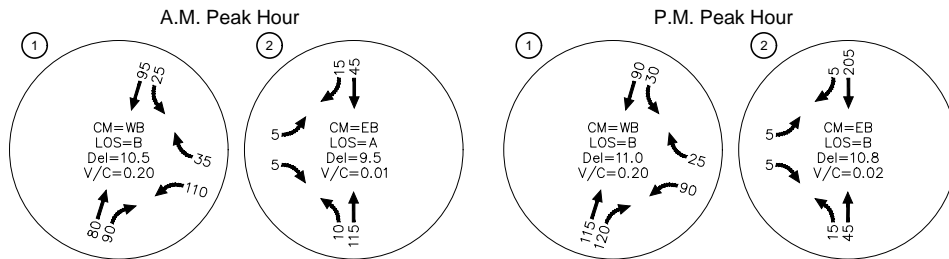
Existing 2021 Lane Configuration and Control



Scenario 1: 2021 Existing Traffic Conditions

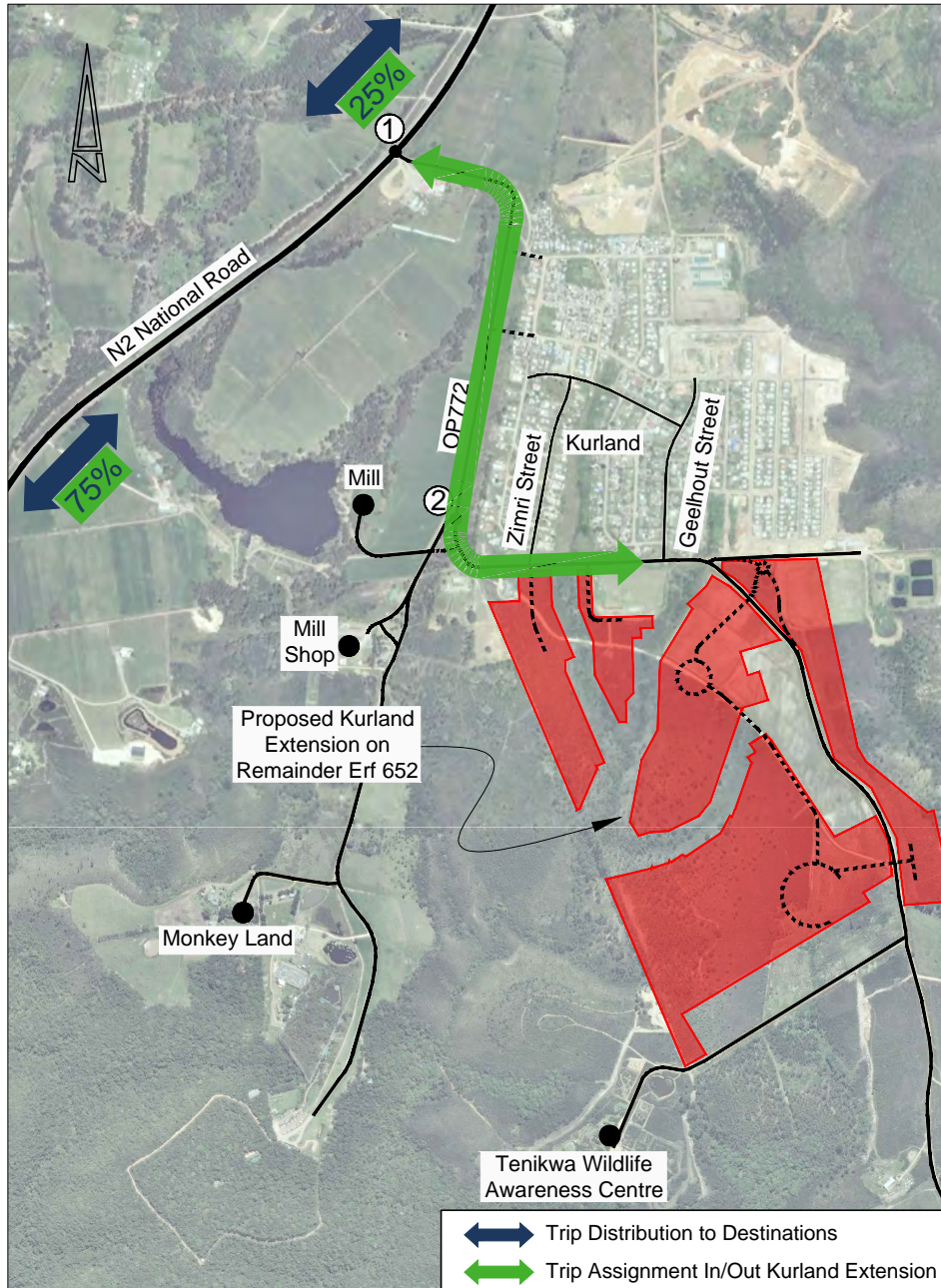


Scenario 2: 2026 Background Traffic Conditions



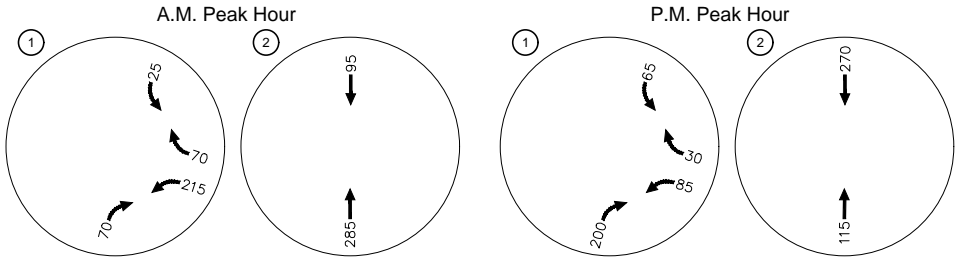
LEGEND	
CM =	CRITICAL MOVEMENT (UNSIGNALLISED)
LOS =	INTERSECTION LEVEL OF SERVICE SIGNALISED / CRITICAL MOVEMENT LEVEL OF SERVICE UNSIGNALISED
Del =	INTERSECTION AVERAGE DELAY SIGNALISED / CRITICAL MOVEMENT LEVEL OF SERVICE ROUNDABOUTS
V/C =	INTERSECTION AVERAGE DELAY UNSIGNALISED / CRITICAL MOVEMENT DELAY UNSIGNALISED
	STOP/ YIELD CONTROL
	DEVELOPMENT AREA



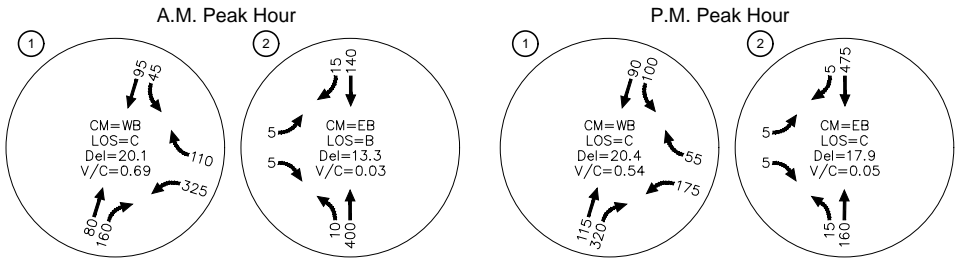


TRIP GENERATION			
PEAK HOUR	IN	OUT	TOTAL
A.M. PEAK	96	287	383
P.M. PEAK	268	115	383

2026 Expected Development Trips



Scenario 3: 2026 Total Traffic Conditions



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



PROPOSED KURLAND EXTENSION ON  
REMAINDER ERF 652, KURLAND

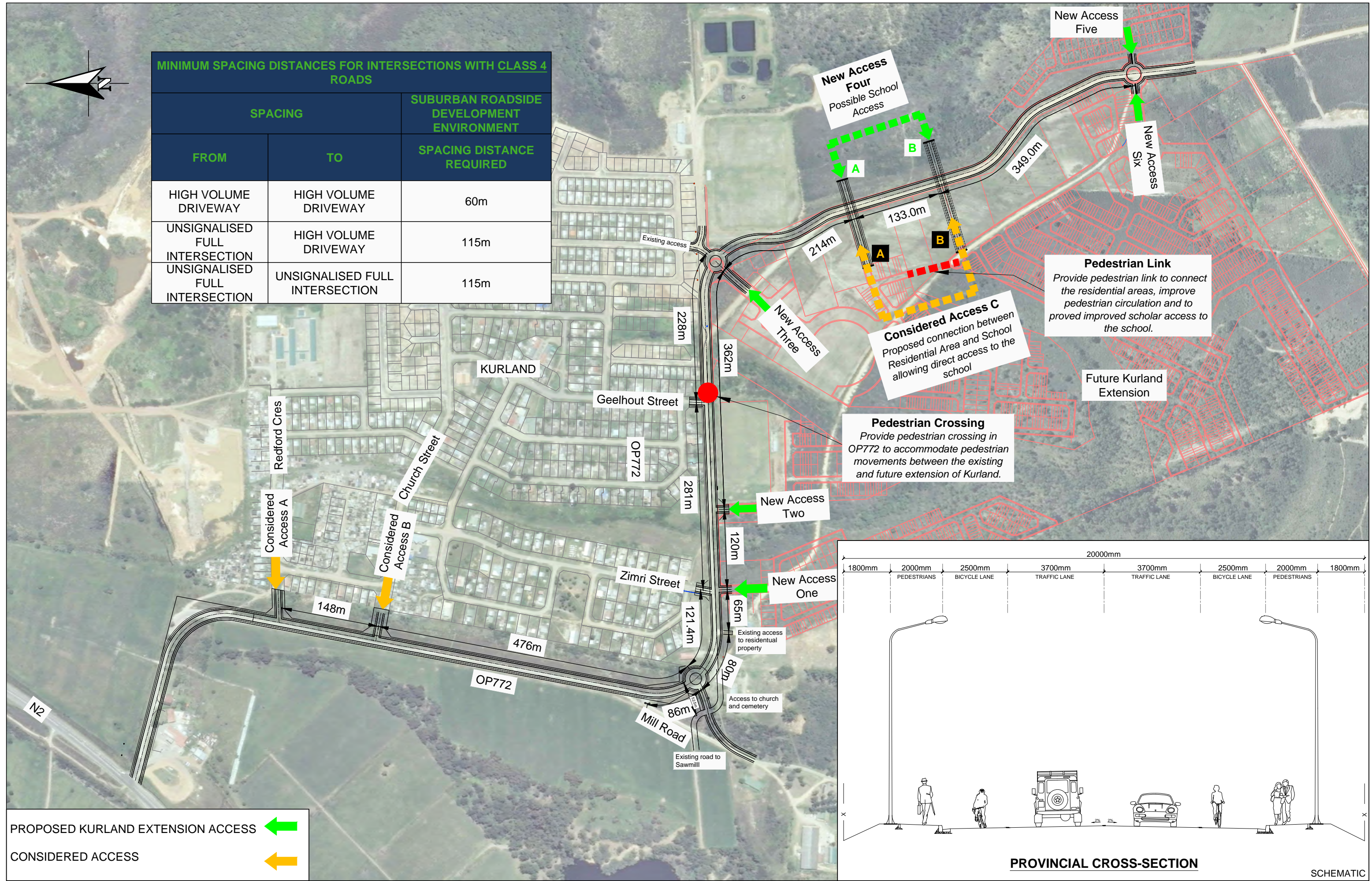
EXPECTED DEVELOPMENT TRIPS AND 2026 TOTAL  
TRAFFIC CONDITIONS

NUMBER:  
4

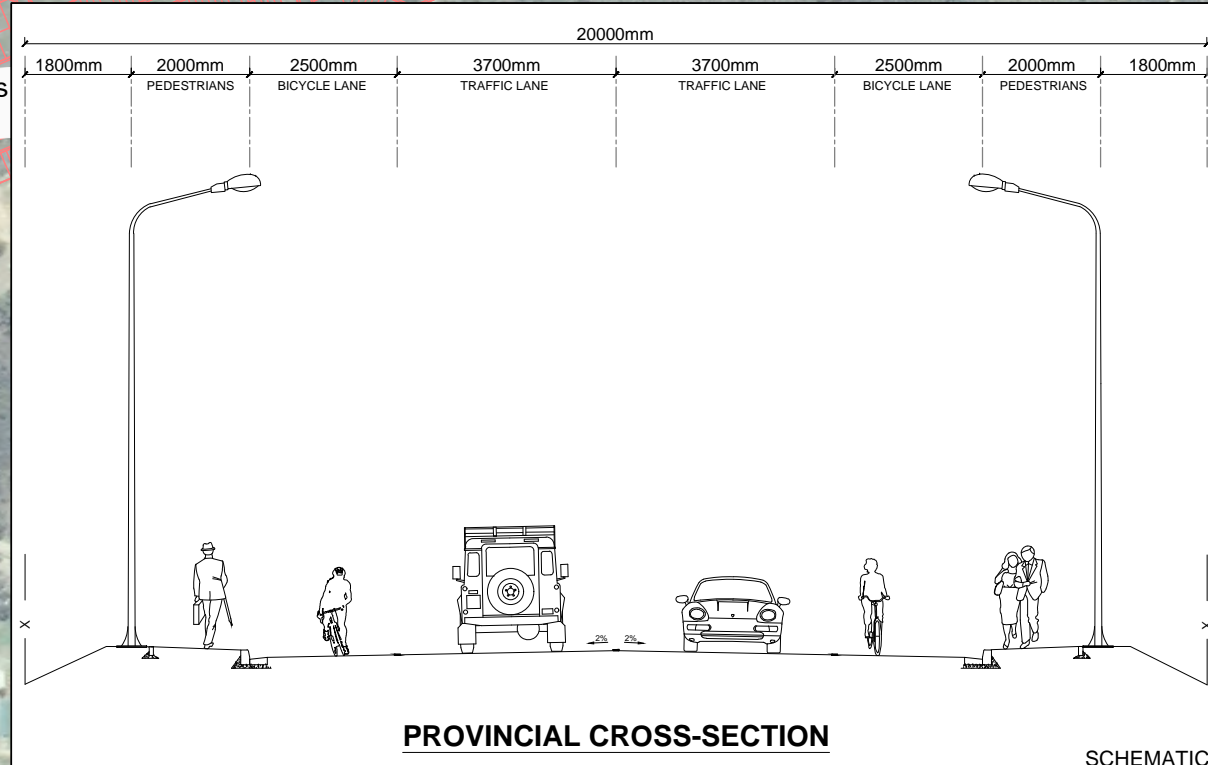




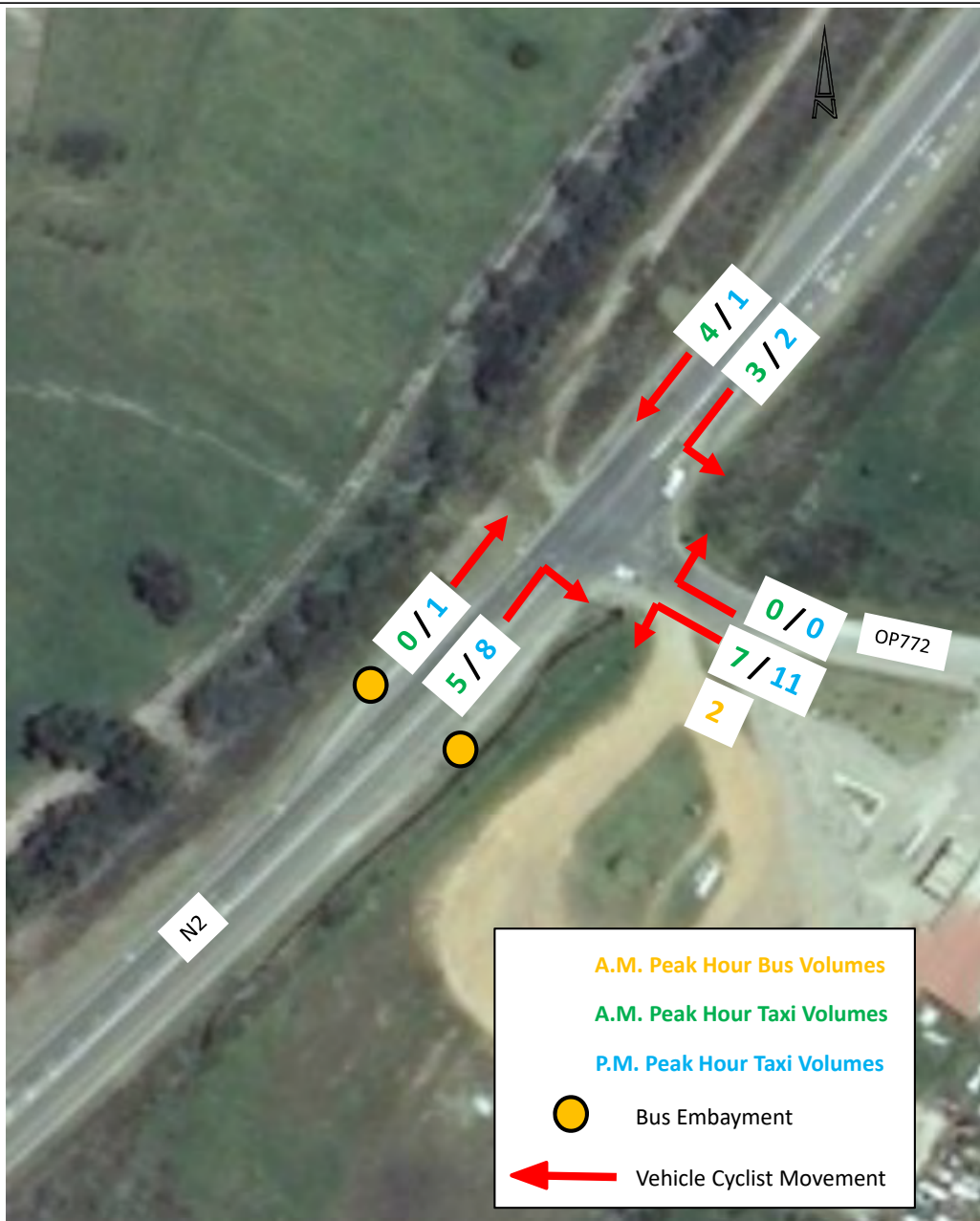
MINIMUM SPACING DISTANCES FOR INTERSECTIONS WITH CLASS 4 ROADS		
SPACING		SUBURBAN ROADSIDE DEVELOPMENT ENVIRONMENT
FROM	TO	SPACING DISTANCE REQUIRED
HIGH VOLUME DRIVEWAY	HIGH VOLUME DRIVEWAY	60m
UNSIGNALISED FULL INTERSECTION	HIGH VOLUME DRIVEWAY	115m
UNSIGNALISED FULL INTERSECTION	UNSIGNALISED FULL INTERSECTION	115m



PROPOSED KURLAND EXTENSION ACCESS ← (Green arrow)  
 CONSIDERED ACCESS ← (Yellow arrow)







PROJECT:

PROPOSED KURLAND EXTENSION ON  
REMAINDER ERF 652, KURLAND

FIGURE:

BUS AND TAXI VOLUMES AT N2 AND MILL ROAD INTERSECTIONS  
WITH OP772

NUMBER:

6

Position	NMT Mode	A.M. Peak Period	P.M. Peak Period
A	Pedestrians	70	50
	Cyclist	37	30
B	Pedestrians	36	18
	Cyclist	14	19
C	Pedestrians	1	1
	Cyclist	0	1
D	Pedestrians	10	19
	Cyclist	0	0
E	Pedestrians	1	0
	Cyclist	0	0

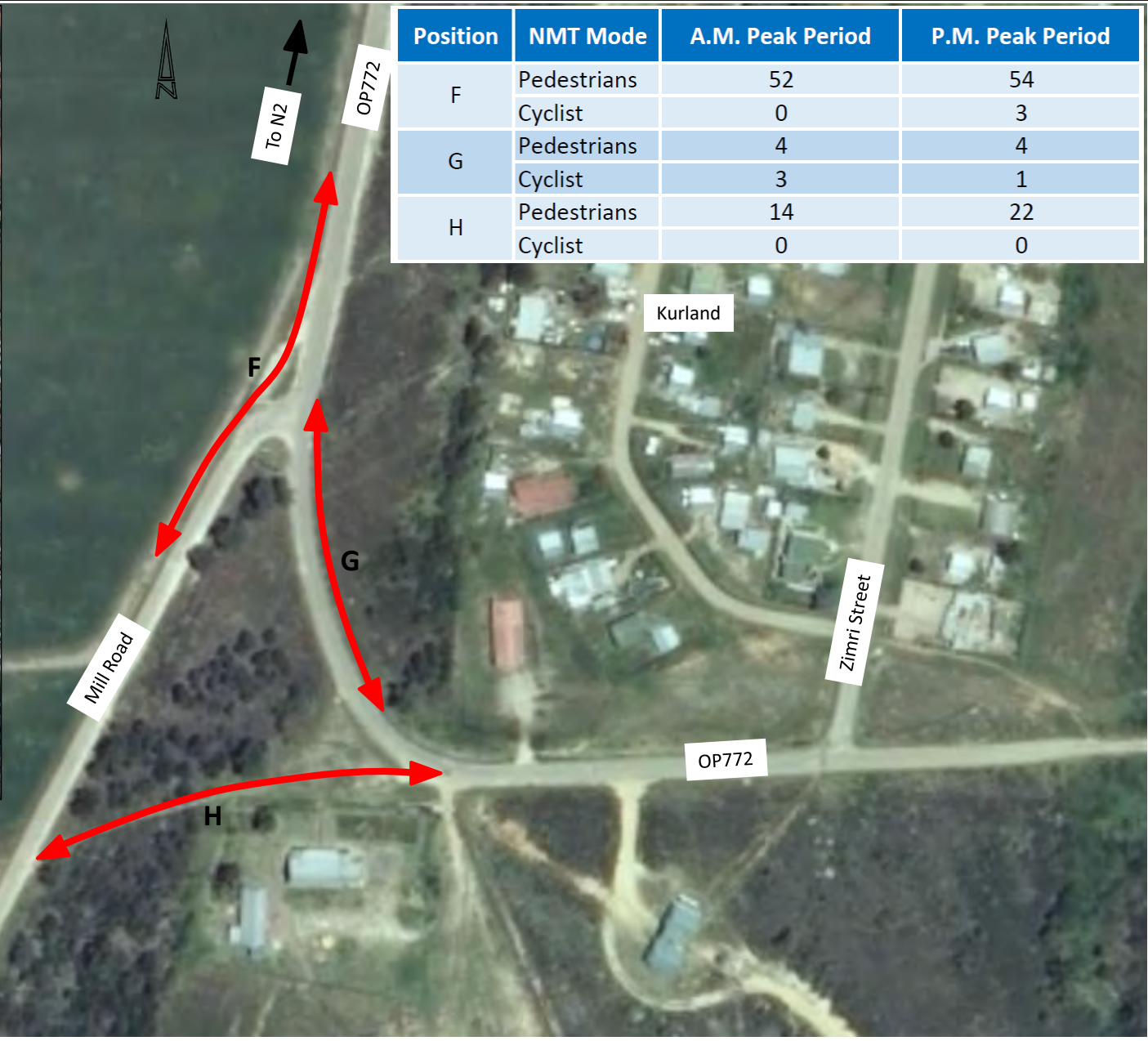


PROJECT: PROPOSED KURLAND EXTENSION ON  
REMAINDER ERF 652, KURLAND

FIGURE: PEDESTRIAN AND CYCLIST VOLUMES  
N2 / OP772

NUMBER: 7





Position	NMT Mode	A.M. Peak Period	P.M. Peak Period
F	Pedestrians	52	54
	Cyclist	0	3
G	Pedestrians	4	4
	Cyclist	3	1
H	Pedestrians	14	22
	Cyclist	0	0



PROJECT: PROPOSED KURLAND EXTENSION ON  
REMAINDER ERF 652, KURLAND

FIGURE: PEDESTRIAN AND CYCLIST VOLUMES  
MILL ROAD / OP772

NUMBER: 8

Annexure B

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Tables



Table 7: Trip Generation for the Proposed Development

Land Use	Unit	Source	Size/ Volume	Weekday AM Peak Hour				Weekday PM Peak Hour				Trip Reduction Factor		
				Rate	Adjusted Rate	In	Out	Rate	Adjusted Rate	In	Out	Vehicle Ownership	Public Transport	Combined Reduction Factor
Residential	Units	CoTO210	1500	1,00	0,26	25%	75%	1,00	0,26	70%	30%	70%	15%	0,745

Table 8: Nett New Driveway Trips for the Proposed Development

Total Driveway Trips						
Land Use	Weekday AM Peak Hour			Weekday PM Peak Hour		
	In	Out	Total	In	Out	Total
Residential	96	287	<b>383</b>	268	115	<b>383</b>
<b>Total Driveway Trips</b>	<b>96</b>	<b>287</b>	<b>383</b>	<b>268</b>	<b>115</b>	<b>383</b>

Annexure C

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Photos



**Photo 1:** Westbound View along OP772 approaching the N2



**Photo 2:** Bus / Taxi embayment on the eastern side of the N2, south of OP772



**Photo 3:** Northbound approach along N2 approaching OP772



**Photo 4:** Southbound approach along N2 approach OP772



**Photo 5:** Eastbound View along OP772 toward Kurland



**Photo 6:** Westbound View along informal pedestrian walkway from Kurland to N2



**Photo 7:** Northbound View OP772, 90 degree bend



**Photo 8:** Eastbound View along informal pedestrian walkway toward Kurland



**Photo 9:** Southbound View along OP772 toward Mill Road



**Photo 10:** Southbound View along OP772 toward Mill Road



**Photo 11:** Southbound View along OP772 toward Mill Road



**Photo 12:** Southbound approach to the OP772 / Mill Road intersection



**Photo 13:** Southbound View along Mill Road



**Photo 14:** Northbound View along Mill Road approaching OP772



**Photo 15:** Shoulder sight distance to the south from Mill Road along OP772



**Photo 16:** Shoulder sight distance to the north from Mill Road along OP772





**Photo 17:** Southbound View along OP772 at sharp horizontal curve.



**Photo 18:** Eastbound View along OP772 approaching Zimri Street



**Photo 19:** Northbound View along Zimri Street



**Photo 20:** Southbound View along Zimri Street approaching OP772





**Photo 21:** Eastbound View along OP772 east of Zimri Street



**Photo 22:** Eastbound View along OP772 toward Geelhout Street



**Photo 23:** Eastbound View along OP772 toward Geelhout Street



**Photo 24:** Eastbound approach to OP772 / Geelhout Street intersection



**Photo 25:** Southbound View along Geelhout Street approaching OP772



**Photo 26:** Eastbound View along OP772 approaching Wastewater Works Access Road



**Photo 27:** Eastbound view at OP772 / Wastewater Works Access Road intersection



**Photo 28:** Westbound View along Wastewater Works Access Road toward OP772



**Photo 29:** Northbound View along OP772 toward Wastewater Works Access Road



**Photo 30:** Westbound View along OP772 at Engen Filling Station Access



**Photo 31:** Westbound View along OP772 approaching the N2



**Photo 32:** Shoulder sight distance to the north along the N2 from OP772



**Photo 33:** Shoulder sight distance to the south along the N2 from OP772



**Photo 34:** Westbound View along OP772 toward N2



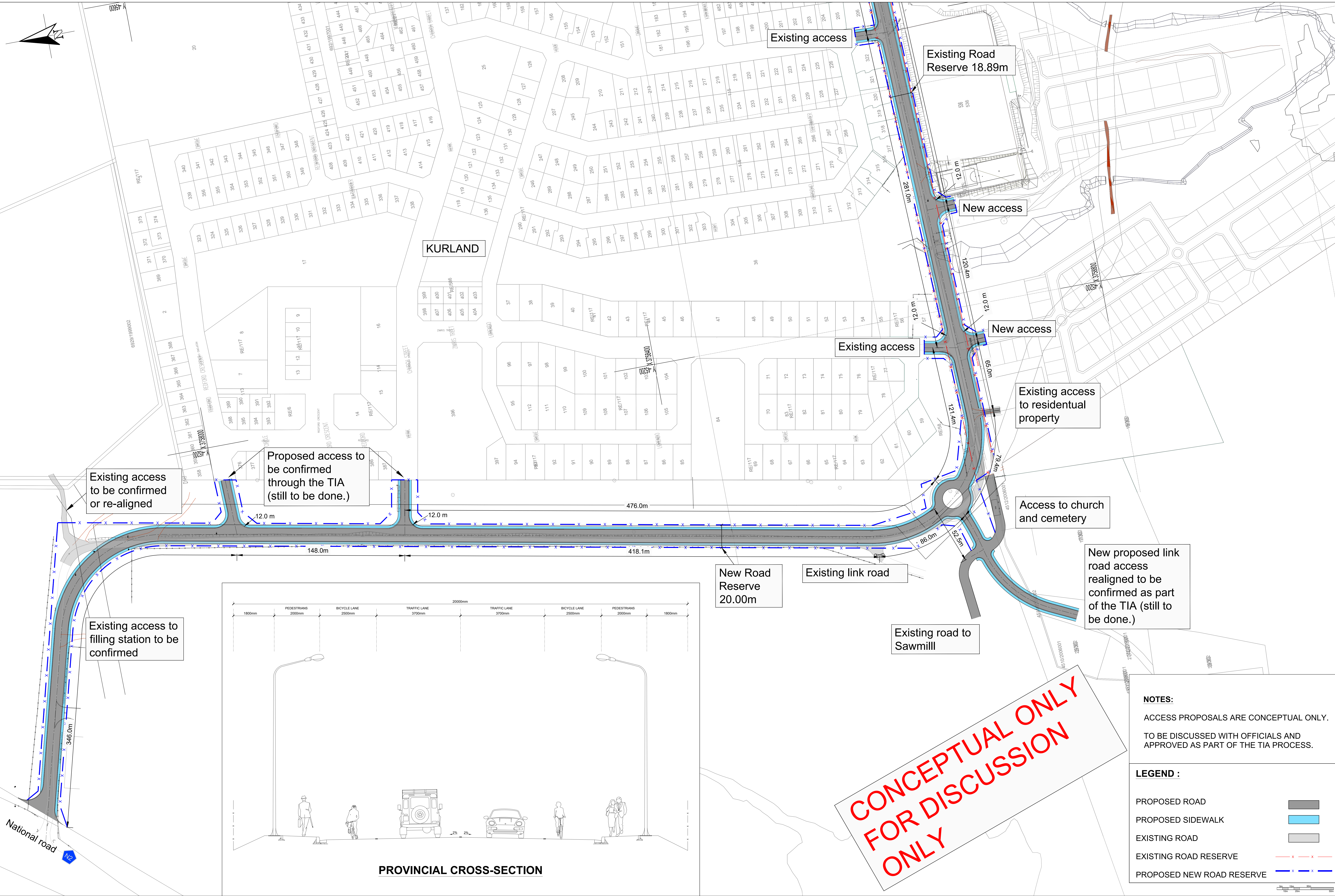
**Photo 35:** The N2 / OP772 intersection during the late afternoon video footage

## Annexure D

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# Conceptual Design of OP0772





Existing access to be confirmed or re-aligned

Proposed access to be confirmed through the TIA (still to be done.)

Existing access to filling station to be confirmed

Existing access

Existing Road Reserve 18.89m

New access

New access

Existing access

Existing access to residential property

Access to church and cemetery

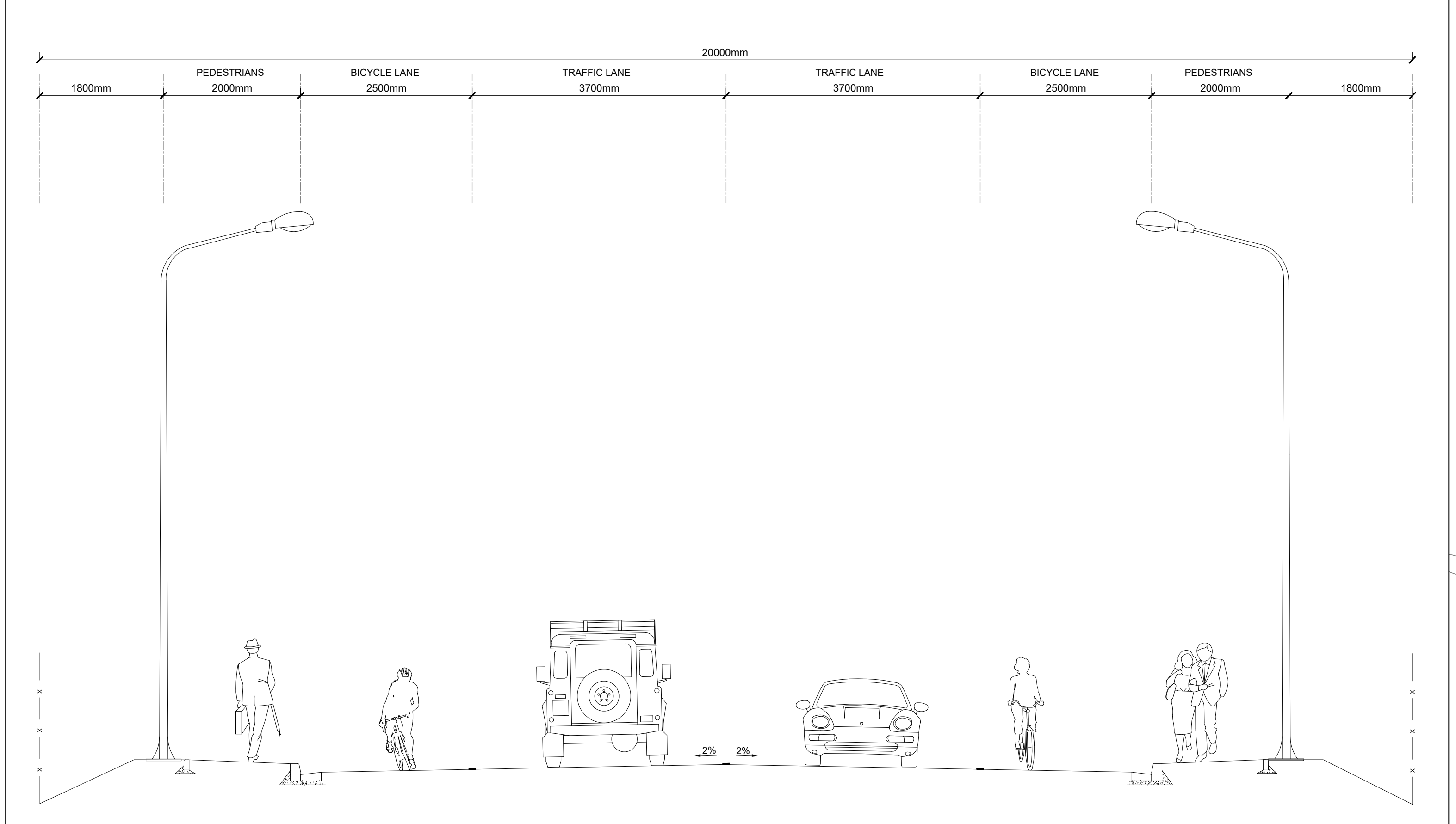
New proposed link road access realigned to be confirmed as part of the TIA (still to be done.)

New Road Reserve 20.00m

Existing link road

Existing road to Sawmill

**CONCEPTUAL ONLY FOR DISCUSSION ONLY**

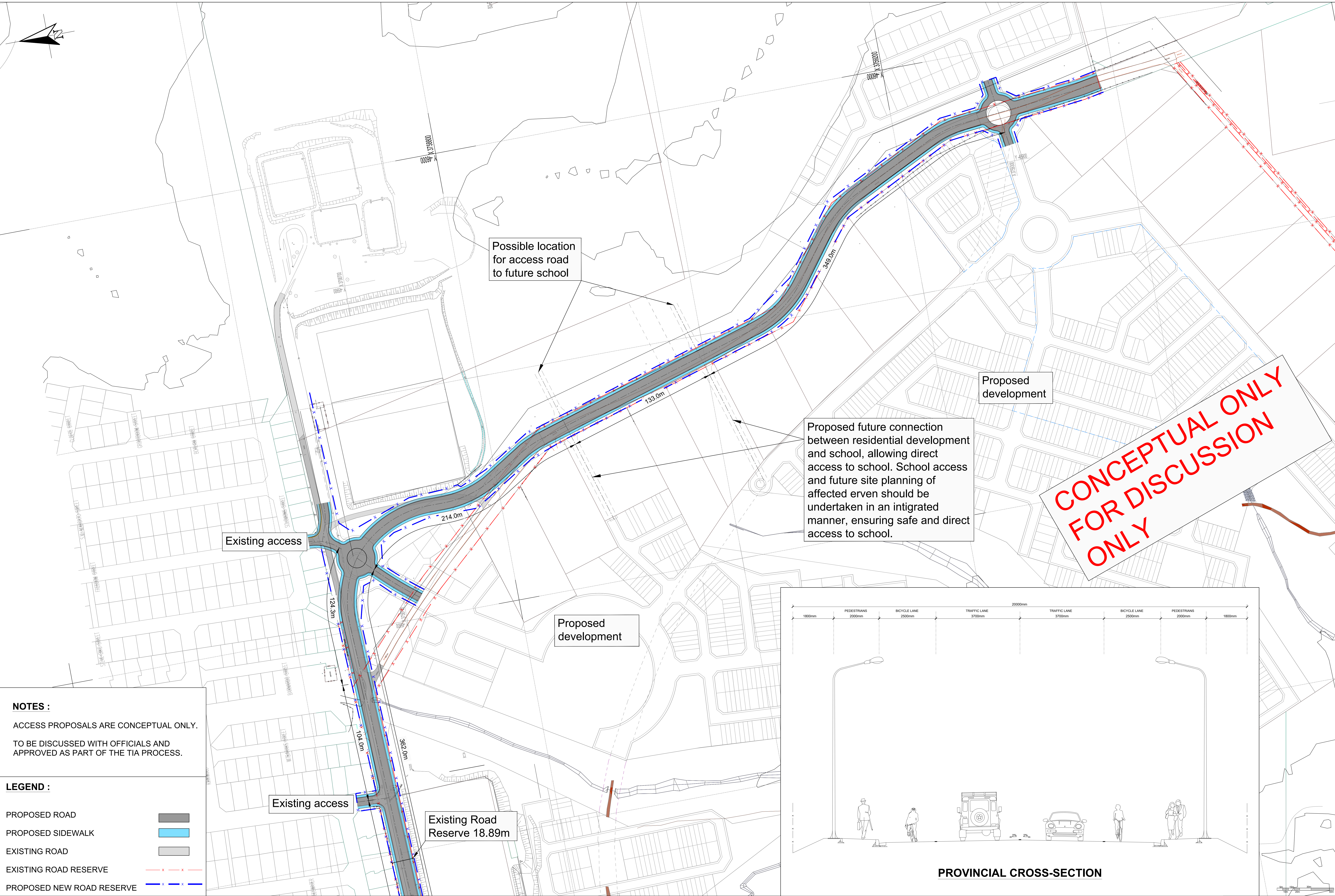


PROVINCIAL CROSS-SECTION

**NOTES:**  
ACCESS PROPOSALS ARE CONCEPTUAL ONLY.  
TO BE DISCUSSED WITH OFFICIALS AND APPROVED AS PART OF THE TIA PROCESS.

**LEGEND :**  
PROPOSED ROAD [Grey line]  
PROPOSED SIDEWALK [Blue line]  
EXISTING ROAD [Black line]  
EXISTING ROAD RESERVE [Red dashed line]  
PROPOSED NEW ROAD RESERVE [Blue dashed line]

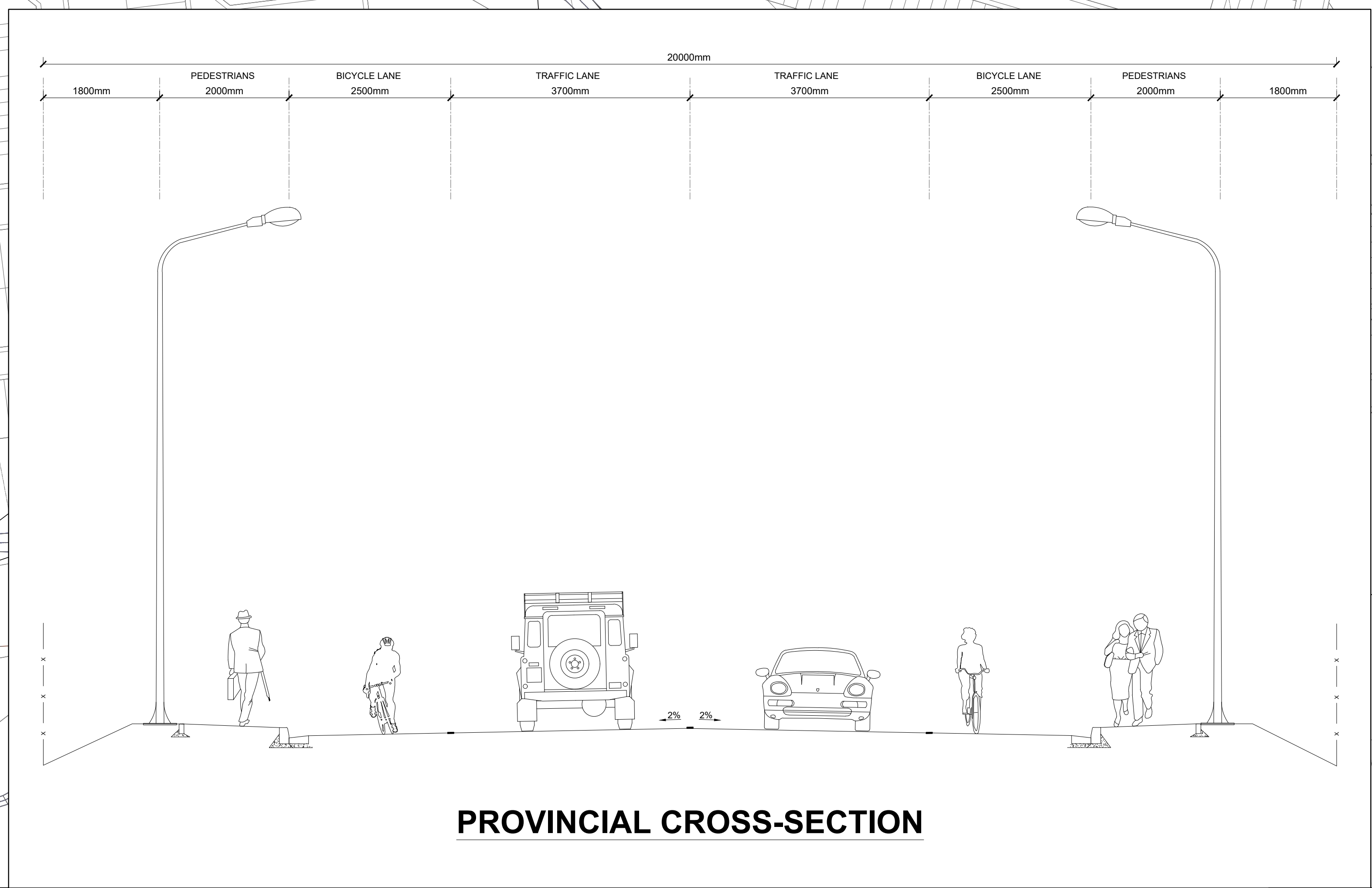




**NOTES :**  
 ACCESS PROPOSALS ARE CONCEPTUAL ONLY.  
 TO BE DISCUSSED WITH OFFICIALS AND APPROVED AS PART OF THE TIA PROCESS.

**LEGEND :**

- PROPOSED ROAD
- PROPOSED SIDEWALK
- EXISTING ROAD
- EXISTING ROAD RESERVE
- PROPOSED NEW ROAD RESERVE







## **ANNEXURE D**

### **Technical Report - Upgrading of Kurland Water Sources, Water Treatment Works, Reservoir & Bulk Supply Pipeline, January 2021**



## **ANNEXURE E**

### **GLS Master Planning**



## **ANNEXURE F**

### **Technical Memorandum - Upgrading of Kurland WWTW by IX Engineers, February 2020**

## TECHNICAL MEMORANDUM

<b>DATE</b>	2021/02/19	<b>Ref No:</b>	.....-TEM-0001-001
<b>TO</b>	Francois van Eck (Lyners)	<b>EMAIL</b>	francois@lyniers.co.za
<b>FROM</b>	Theunis Duminy Sonél van Wageningen	<b>EMAIL</b>	theunis.d@ixengineers.co.za sonel.vw@ixengineers.co.za

### **SCM/2020/80/ENG – UPGRADING OF KURLAND WWTW: THE EXSITING WWTW AND RECOMMENDED UPGRADING TO ENABLE ACCOMODATION OF ESTIMATED FUTURE FLOW AND LOAD**

---

#### **1. INTRODUCTION**

Lyners consulting engineers intends to appoint iX engineers for the investigation and recommendation of a capacity upgrade that would enable the Kurland Wastewater Treatment Works (WwTW) to accommodate the estimated increased future flow and load. Kurland WwTW provides sewage treatment services to the community of Kurland and a portion of Natures Valley.

This Technical Memo addresses a **high-level conceptual design** to information discussions on the proposed upgrade.

#### **2. THE EXISTING KURLAND WASTEWATER TREATMENT WORKS**

The **KURLAND WWTW** is equipped with the following process units and equipment:

- Inlet works with:
  - mechanical screen for pipe sewerage flows
  - grit removal (two parallel grit channels)
  - flow metering through a measuring venturi flume
- Tanker discharge facility with manual screen for tanker discharges that bypasses grit settling and flow measurements
- An Activated Sludge (AS) system (extended aeration for carbonaceous and ammonia removal only) which consist of:
  - An aerobic basin (997.5m<sup>3</sup>)
  - Return Activated Sludge (RAS) pump station
  - Secondary Settling Tanks (SSTs). This basin is equipped with two (2 off), 22kW vertical shaft surface aerators.
- Chlorine disinfection and contact tank upstream of the final discharge to either the Salt River or alternatively to the maturation ponds for polishing and re-use(irrigation).
- Waste sludge is pumped from the RAS pump station to the sludge

#### **3. EXISTING UNIT TREATMENT PROCESSES**

The existing AS plant seems to function very well. However, increased treatment capacity is required to enable accommodation of an estimated increase future flow and load. Any upgrade should also allow for treatment to improved effluent standards and effective sludge management.

Based on the actual flow and load data available, the rated capacity of the current infrastructure is roughly 0.6Ml/d or a population equivalent of roughly 5 200.

A Process Flow Diagram (PFD) of the existing works is included as Annexure 2.

**Table 1: Design Capacity of Existing Units**

Unit	Capacity	Comment
<b>Biological Reactor:</b>		
ADWF	25m <sup>3</sup> /h (600 m <sup>3</sup> /d)	It is important to note that this flow is based on the following parameters of: COD – 950mg/l, Rs – 25 days and an MLSS of 4000mg/l - 4500mg/l (depending whether winter or summer conditions apply)
Organic Load	570kg/d	The population equivalent is estimated at 5 200p
<b>Secondary Settling Tanks:</b>		
ADWF	30 m <sup>3</sup> /h	
PWWF	68 m <sup>3</sup> /h	

#### 4. WASTEWATER CHARACTERISTICS

The characteristics of the raw incoming wastewater determines the organic load on the WwTW. Therefore, the “strength” or pollutant/constituent concentration, along with the incoming flow, dictates the required process volume of the biological reactor to accommodate and treat the organic load to a specified effluent Standard.

Chemical Oxygen Demand (COD) data available for a period 2012 to June 2020 indicates a very strong sewage and as such 950 mg/l COD was assumed for this concept check. The data aligns with the expected strength sewage (in terms of COD concentrations) that is expected when a large percentage of the load is derived from tanker discharges received from Natures valley.

#### 5. TREATED WATER STANDARDS

It is understood that currently effluent compliance is required in terms of the General Limit Values as detailed in the Government Gazette of 6 September 2013. However, it was also confirmed that this might change in the future to the more stringent Special Limit Values. The applicable constituent concentrations for both scenarios are listed below.

**Table 4: Effluent Standards: General- & Special Limits Values**

SUBSTANCE/ PARAMETER	GENERAL LIMIT	SPECIAL LIMIT
Feecal coliforms (per 100 ml)	1000	0
Chemical Oxygen Demand (mg/l)	75	30
pH	5.5-9.5	5.5-7.5
Ammonia (ionised and un-ionised) as Nitrogen (mg/l)	6	2
Nitrate/ Nitrite as Nitrogen (mg/l)	15	1.5
Chlorine as Free Chlorine (mg/l)	0.25	0
Suspended Solids (mg/l)	25	10
Electric Conductivity (mS/m)	70*	50*
Ortho-Phosphate as Phosphorous (mg/l)	10	1

\*above the intake concentration to a specified maximum value



## 6. PROPOSED UPGRADE OPTION

The current reactor basin is designed for carbonaceous and ammonium removal only. Denitrification will only be achieved to some degree due to incidental anoxic conditions, but compliance in terms of nitrates and phosphates cannot be guaranteed as the system is not designed for this.

The available process volume of the current AS reactor was evaluated based on the following parameters as well as the load data stipulated above.

Recommended operating parameters:

- Sludge age (Rs) - 25 days;
- MLSS – 4000 mg/l to 4500mg/l (depending on whether winter or summer conditions apply)

It is proposed to implement some changes to enable operation in both the Modified Ludzack Ettinger (MLE) process configuration (nitrate removal), as well as in the UCT process configuration for biological nutrient removal capability.

For the purposes of this report, a robust assumption of an Unaerated/Aerobic split of 40/60 was accepted given a lack of fully characterised wastewater. Since the current system must remain operational at all times, it is proposed that the existing aerobic reactor basin will thus remain (unchanged) as part of the upgraded biological reactor.

The addition of process volume to increase both the level of treatment as well as the treatment capacity is proposed as follows:

**Table 5: Reactor Process Configurations for Both MLE and UCT process configurations**

REACTOR PROCESS CONFIGURATIONS			
Reactor basin no	Condition	MLE	UCT
1	Anaerobic	N/A	249
2	Anoxic	664	415
3	<b>Aerobic (existing unchanged)</b>	<b>1000</b>	<b>1000</b>
	<b>TOTAL</b>	<b>1 664</b>	<b>1 664</b>

The table below provides a summary of the treatment capacity in terms of flow and loads that would be available should the above upgrades be implemented as recommended.

**Table 7: Estimated Treatment Capacity after Proposed Upgrade (for two different process configurations) Compared with the Current Available Capacity**

Process configuration	Flow (Ml/d)	COD (kg/d)	Estimated equivalent population
<b>MLE after upgrade</b>	1.1	1045	9 500
<b>UCT after upgrade</b>	0.95	903	8 200
<b>Current existing treatment capacity</b>	<b>0.6</b>	<b>570</b>	<b>5 200</b>

The reactor's aerobic basin is the considered the limiting factor, as this basin remain unchanged and the proposed upgrades will be proportionally added in order to provide a treatment works fit for purpose with an increased the capacity without ever disrupting operation of the works during construction.

In the Short Term, sludge handling can be accommodated by desludging the sludge and first maturation dam for the purposes of sludge stabilisation and storage until periodic desludging. However, in the long term when phosphate removal is contemplated, the addition of a containerised mechanical de-watering unit is recommended.

## 7. UPGRADE SUMMARY

The following scope of work is proposed

- Inletworks
  - **NEW** civil structure (consider grit channels or vortex degritter)
  - Relocate existing mechanical screen
  - Additional manual screen
  - Relocate existing flow meter
  - **NEW** Sluices and other equipment
- Biological reactor
  - Retain existing aeration basin
  - **NEW** Add anerobic/anoxic basin, internal recycle facilities, new SST feed box
  - 2 off existing 22.5kW floating aerators
  - **NEW** 1 x 2.2kW vertical shaft mixer in anaerobic zone
  - **NEW** 2 x 2.2kW vertical shaft mixers in anoxic zone
  - **FUTURE** 2 x R-recycle (duty/standby) axial flow pumps
  - **NEW** 2 x A-recycle (duty/standby) axial flow pumps
  - **NEW** 1 x electrically actuated knife gate valves (selection to be manual)
- Secondary Settling Tanks
  - 2 off existing secondary settling tanks
  - 1 off **NEW** secondary settling tank
- Retrofitted or new RAS/WAS pump station
- **NEW** chlorine disinfection building to the relevant OHS and SANS specification
- **EXTENSIONS** to the chlorine disinfection channel
- **NEW** ablutions/office/staff facility building
- Retrofitting the existing office to an MCC room
- Desludging and cleaning of existing sludge pond to for new infrastructure footprint
- Desludging and cleaning of 1<sup>st</sup> dam in the maturation river to serve as new sludge pond
- **FUTURE** mechanical dewatering facilities

---

**Theunis Duminy (Pr Eng)**

iX engineers (Pty) Ltd

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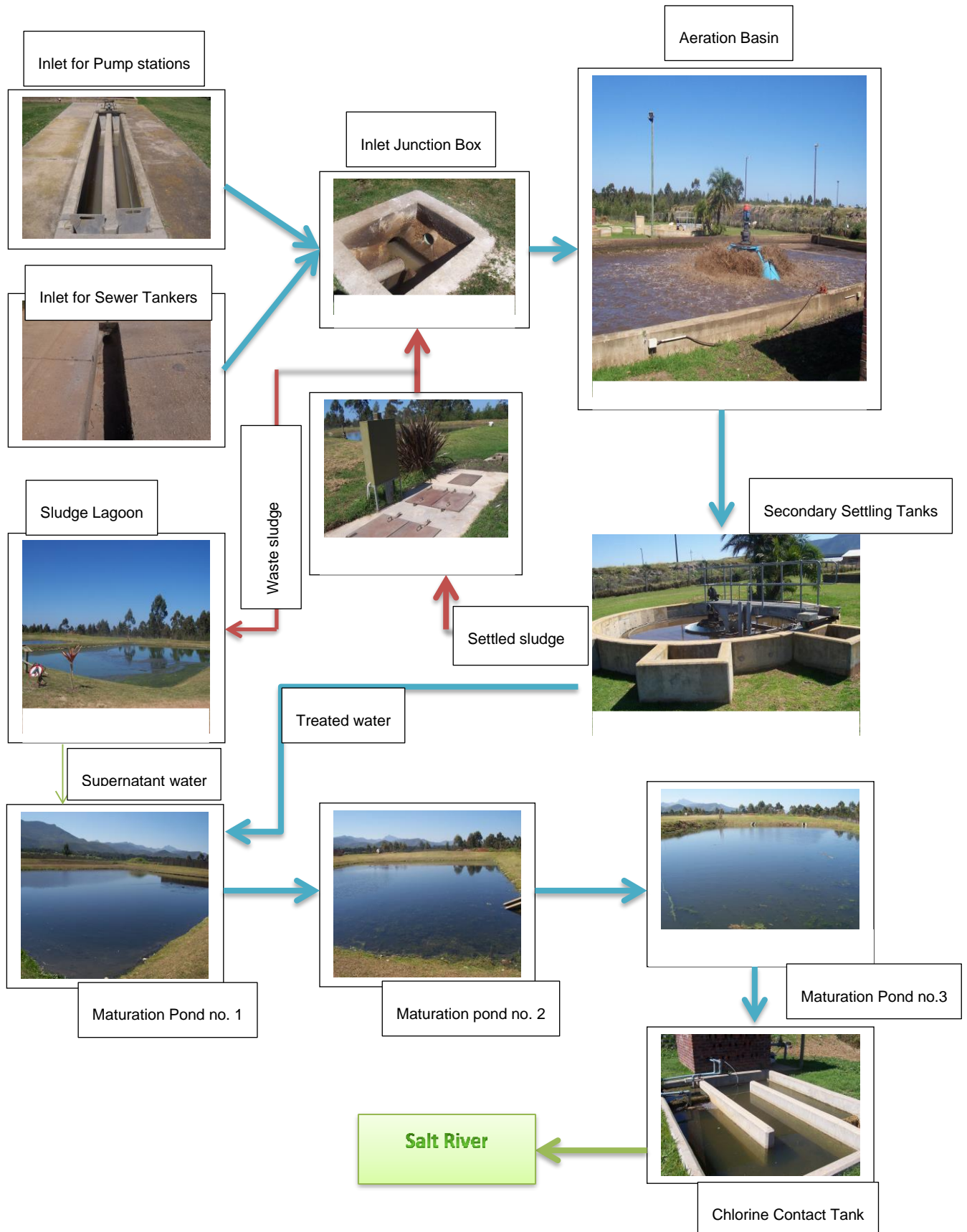
**Sonél van Wageningen (Pr Eng)**

iX engineers (Pty) Ltd

## **ANNEXURE 2 - PROCESS FLOW DIAGRAM OF THE EXISTING WORKS**



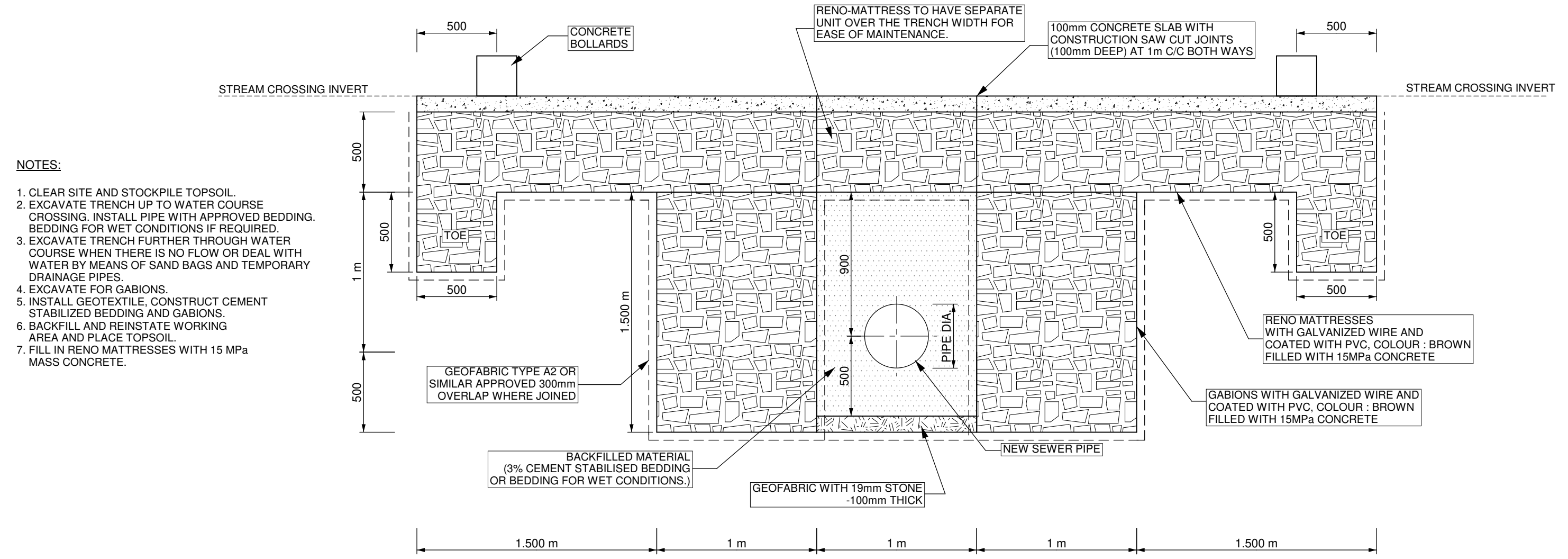
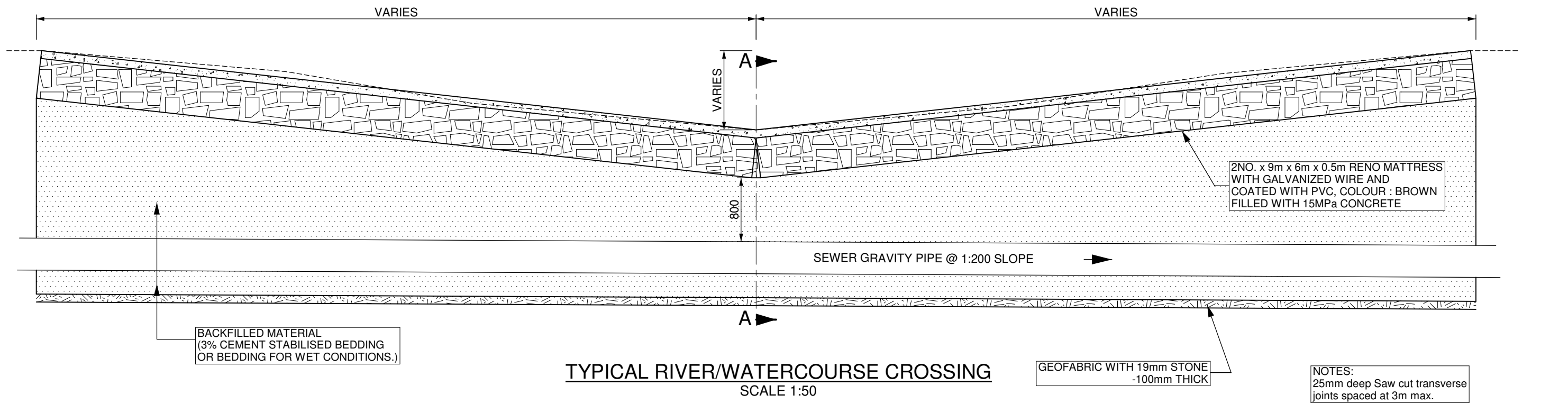
**FLOW DIAGRAM- KURLAND EXISTING WWTW**





## **ANNEXURE G**

**Typical Construction Drawings for Stream Crossings – Refer to  
Annexure for List of Drawings**



**NOTES:**

1. CLEAR SITE AND STOCKPILE TOPSOIL.
2. EXCAVATE TRENCH UP TO WATER COURSE CROSSING. INSTALL PIPE WITH APPROVED BEDDING. BEDDING FOR WET CONDITIONS IF REQUIRED.
3. EXCAVATE TRENCH FURTHER THROUGH WATER COURSE WHEN THERE IS NO FLOW OR DEAL WITH WATER BY MEANS OF SAND BAGS AND TEMPORARY DRAINAGE PIPES.
4. EXCAVATE FOR GABIONS.
5. INSTALL GEOTEXTILE, CONSTRUCT CEMENT STABILIZED BEDDING AND GABIONS.
6. BACKFILL AND REINSTATE WORKING AREA AND PLACE TOPSOIL.
7. FILL IN RENO MATTRESSES WITH 15 MPa MASS CONCRETE.

REV	DESCRIPTION	DATE	REV BY	CHKD
REVISIONS				

DESIGNED	MleR	-
DRAWN	WO	-
CHECKED	MleR	-

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CLIENT	
PROJECT	
TITLE	

SCALE	AS SHOWN
CONTRACT No.	-
DRAWING No.	-
DATE OF FIRST ISSUE:	

SHEET	-
PROJECT No.	-
REV	A

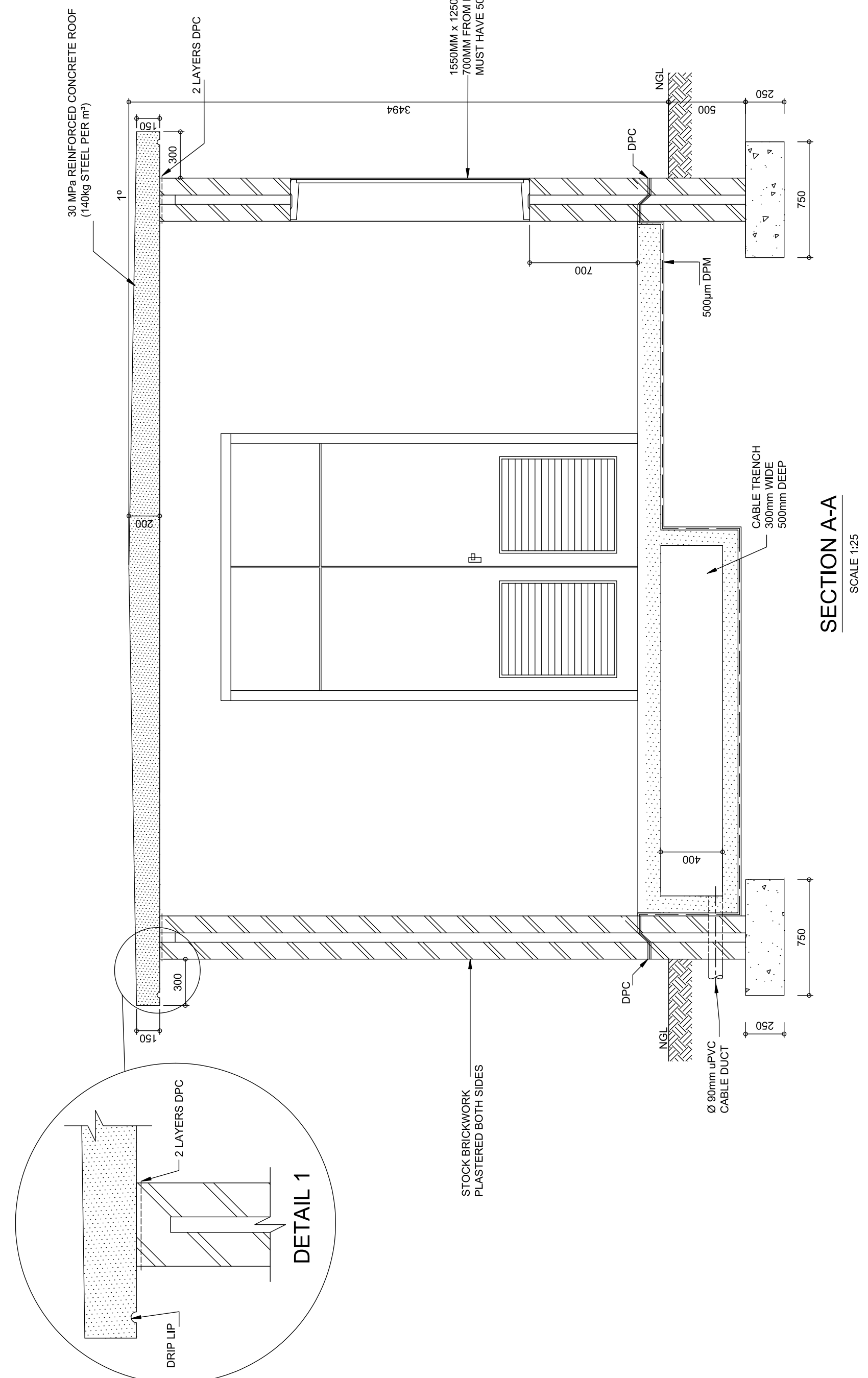




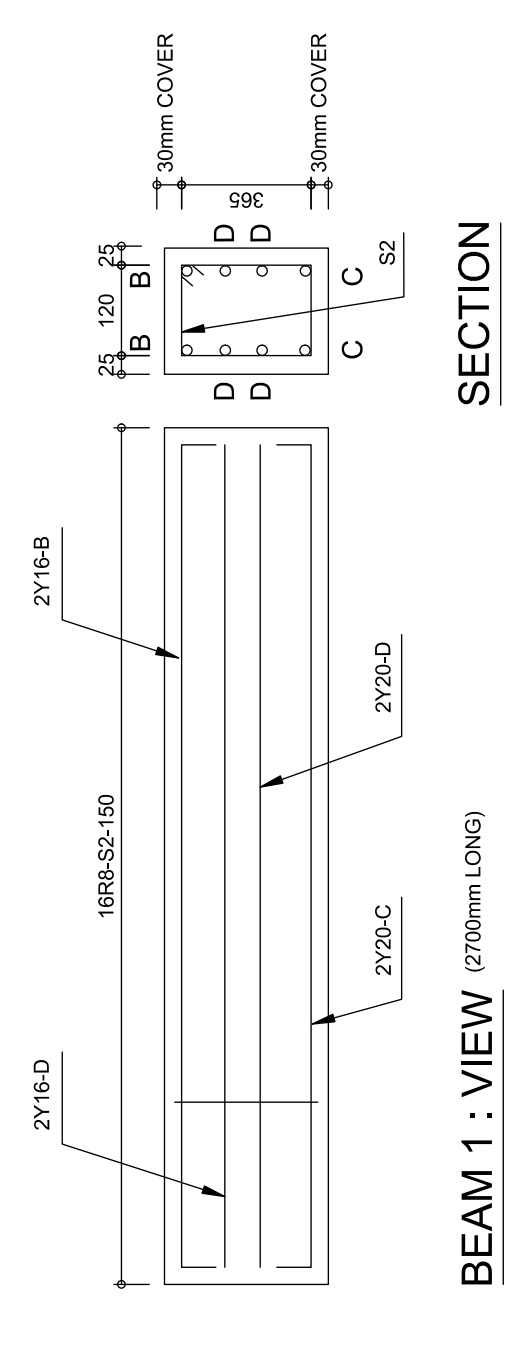


## **ANNEXURE H**

**Typical Construction Drawings for Sewer Pumpstations – Refer  
to Annexure for List of Drawings**



SECTION A-A  
SCALE 1:25

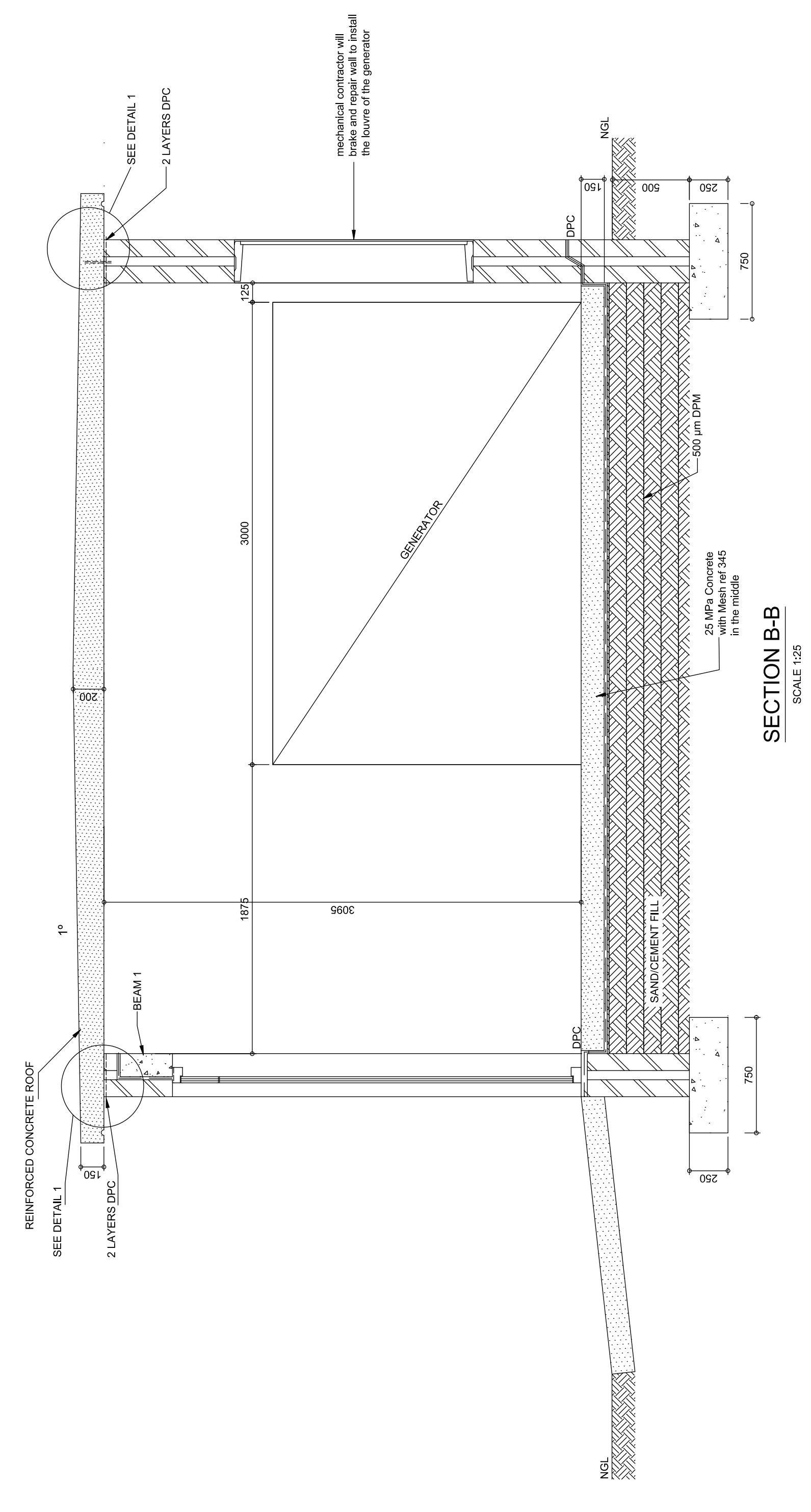


SECTION  
BEAM 1 - VIEW (2700mm LONG)  
SCALE 1:10

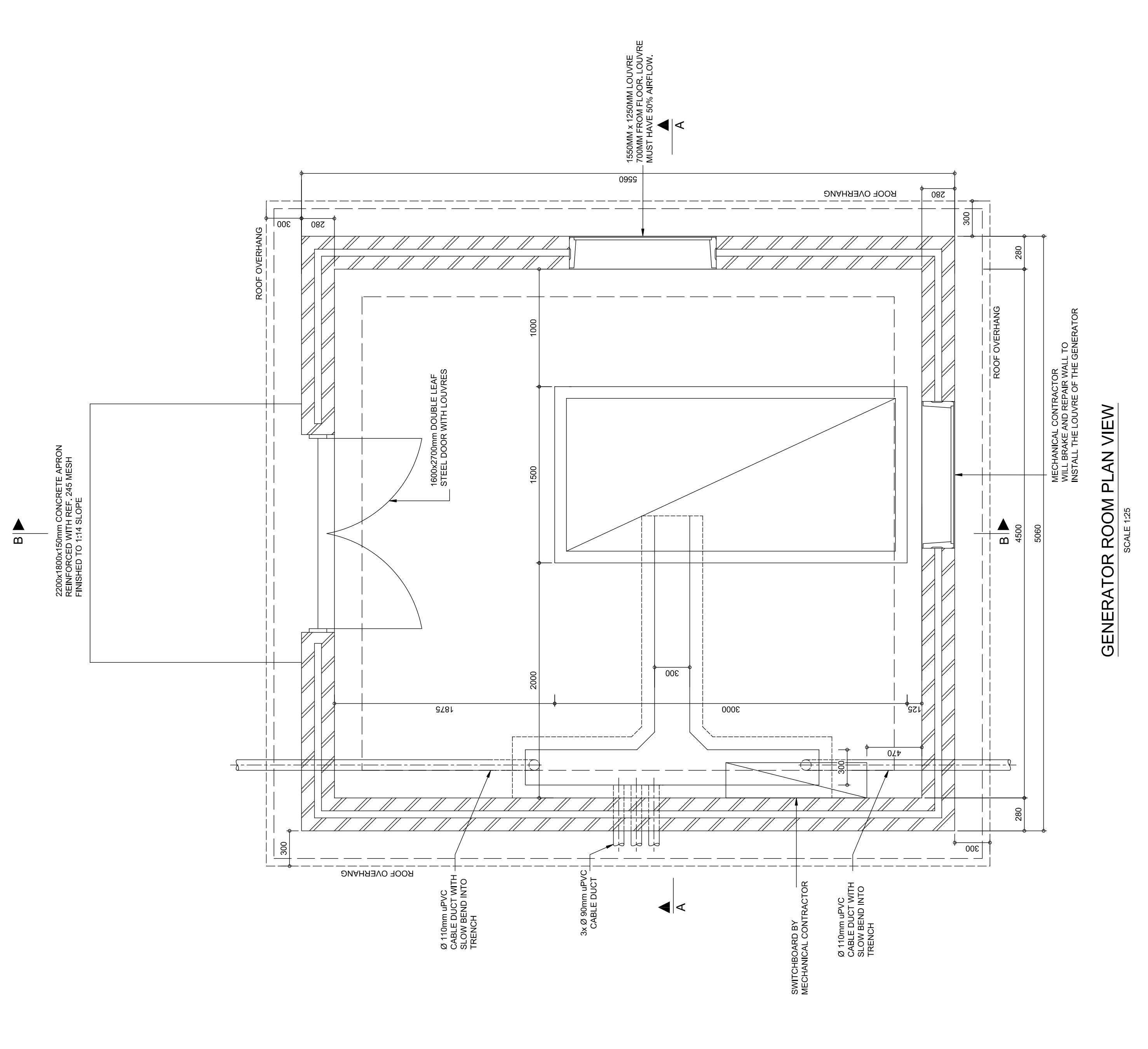
DETAIL OF REINFORCEMENT IN BEAMS  
SCALE 1:10

PART	MARK	TYPE	NUMBER IN EACH	TOTAL NUMBER	LENGTH (mm)	CODE	A	B
BEAM 1	2718-D	RB	2	2	2700	20	2000	2000
	2720-C	RB	2	2	2700	20	2000	2000
	2720-D	RB	2	2	2700	20	2000	2000
	2720-E	RB	2	2	2700	20	2000	2000

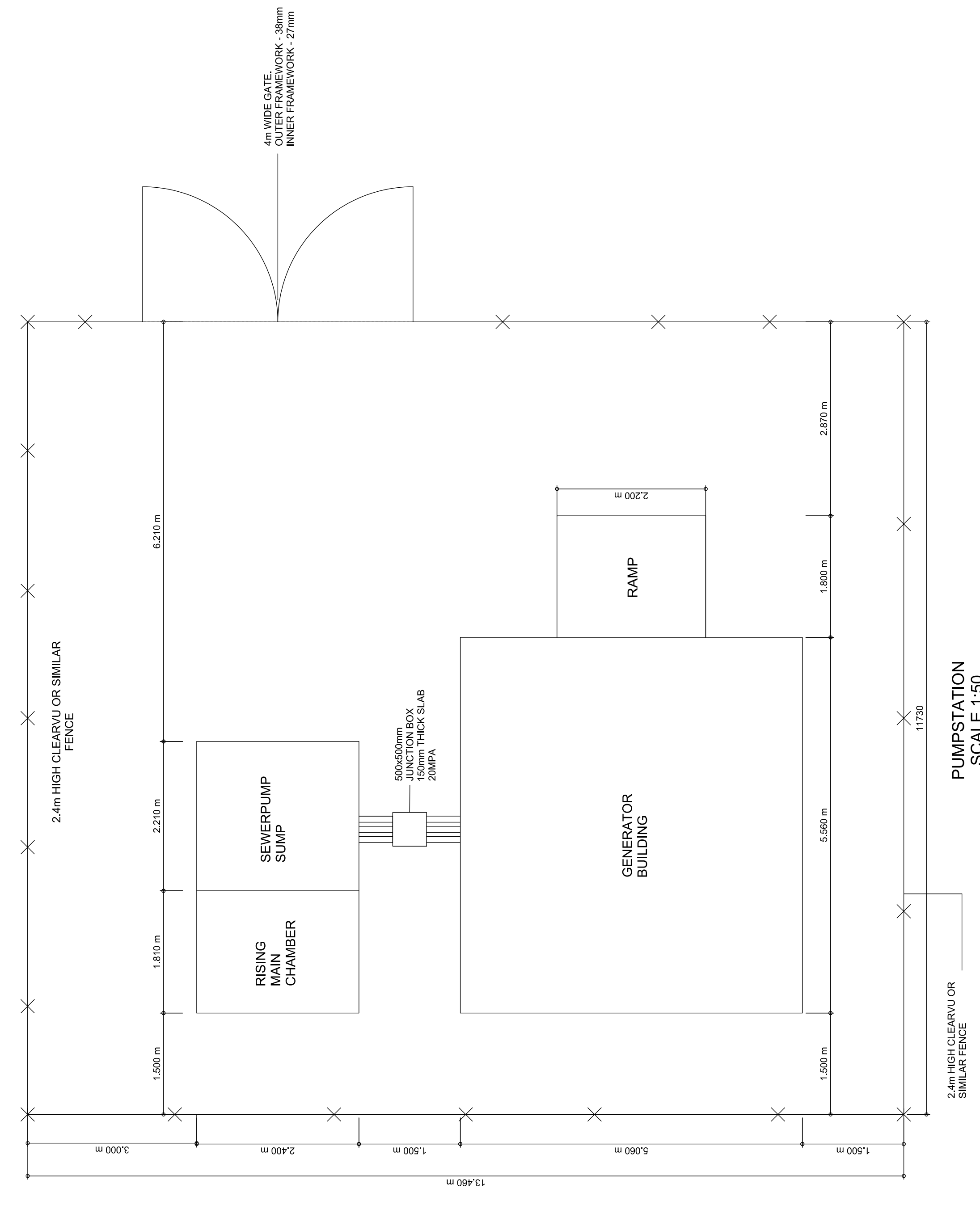
BENDING SCHEDULE



SECTION B-B  
SCALE 1:25



GENERATOR ROOM PLAN VIEW  
SCALE 1:25



PUMPSTATION  
SCALE 1:50

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALE	on A1	SHEET
CONTRACT No.		PROJECT No.
DRAWING No.		REV

PROJECT	
TITLE	

APPROVED	
ENGINEERS:	
DATE:	

APPROVED	
CLIENT:	
DATE:	

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DESIGNED	
DRAWN	
CHECKED	

REV	DESCRIPTION	DATE	REV BY / CHKD

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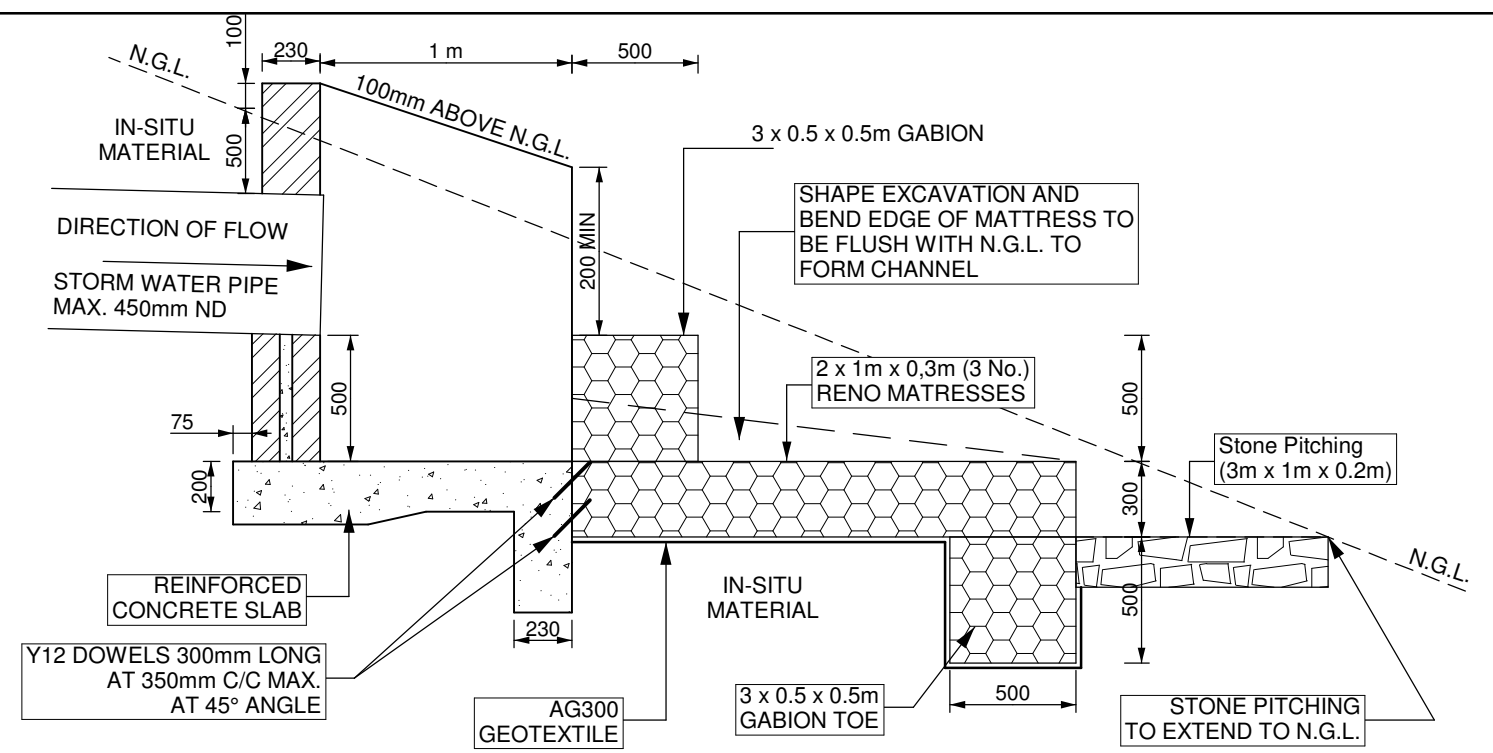




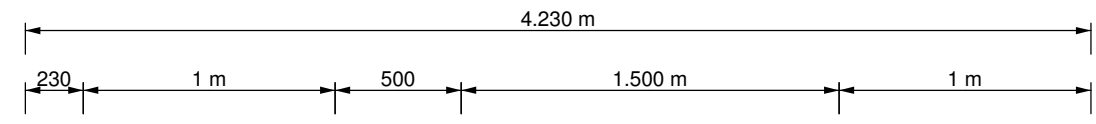


## **ANNEXURE I**

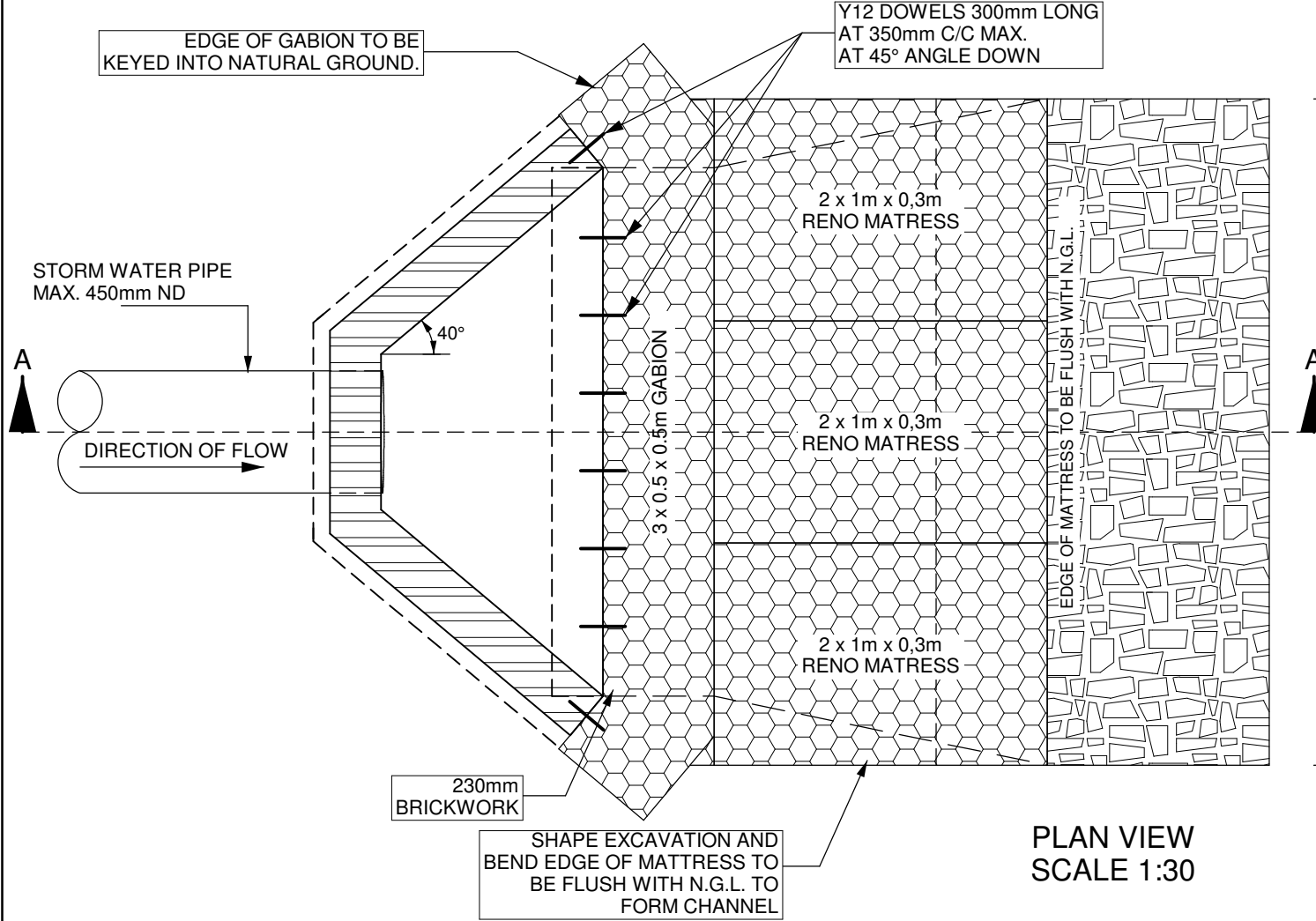
### **Typical Construction Drawing for Stormwater Outlet Structure**



SECTION A-A  
SCALE 1:30



PLAN VIEW  
SCALE 1:30



SLAB REINFORCEMENT  
NTS

SCALEBAR	<table border="1"> <tr> <th>REV</th> <th>DESCRIPTION</th> <th>DATE</th> <th>REV BY</th> <th>CHKD BY</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	REV	DESCRIPTION	DATE	REV BY	CHKD BY						DESIGNED FvE / WO DRAWN WO 01/2016 CHECKED FvE 01/2016	CONSULTING ENGINEERS <b>LYNERS</b> PO Box 757 GEORGE 6530 Tel: (044) 887 0223 Fax: (044) 887 0741 Email: george@lyniers.co.za	APPROVED CONSULTING ENGINEERS: SIGNATURE: _____ DATE: _____ APPROVED CLIENT REPRESENTATIVE: SIGNATURE: _____ DATE: _____	CLIENT _____	PROJECT _____ TITLE _____	SCALE <b>1:30</b> CONTRACT No. _____ DRAWING No. _____ DATE OF FIRST ISSUE: _____	SHEET <b>1 OF 1</b> PROJECT No. _____ REV 
		REV	DESCRIPTION	DATE	REV BY	CHKD BY												
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## **ANNEXURE J**

### **Erf 562 Geotechnical Report by Outeniqua Geotechnical Services, 17 May 2021**



## **ANNEXURE K**

### **Stormwater Management Plan for Erf 562, Kurland, Bitou Municipality, June 2021**



# BITOU MUNICIPALITY

## STORMWATER MANAGEMENT PLAN

FOR

ERF 562, KURLAND, BITOU MUNICIPALITY

JUNE 2021

**DRAFT**

**COMPILED FOR:**

**BITOU MUNICIPALITY**

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**C21018G**





**REPORT DETAILS :**

Lyners Reference No :	C21018G/AA
Client	BITOU MUNICIPALITY
Report prepared by :	F van Eck, R Louwrens
Client representative	F Stuurman
Revision record and date	Draft
Keywords	STORMWATER MANAGEMENT PLAN – ERF 562, KURLAND, BITOU MUNICIPALITY

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## BITOU MUNICIPALITY

### STORMWATER MANAGEMENT PLAN – ERF 562, KURLAND, BITOU MUNICIPALITY

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## **ANNEXURES**

### **Annexure A:**

Study Area Drawing (C21018G-SWMP-1)

### **Annexure B:**

Stormwater Run-Off Layout, Calculations & Headwall Detail (C21018G-SWMP-2)





# BITOU MUNICIPALITY

## STORMWATER MANAGEMENT PLAN – ERF 562, KURLAND, BITOU MUNICIPALITY

### 1. INTRODUCTION

#### 1.1 Scope

Neil Lyners and Associates (RF)(Pty) Ltd was appointed by Bitou Municipality for the preparation of a Stormwater Management Plan for the proposed Development of Erf 562 & Erven 565-583, Kurland. The area under investigation was analysed with relevant codes of practice, policy and guidelines in mind. The need to provide a system that is effective, sustainable and that result in runoffs of good water quality was foremost when approaching the concept of the drainage system. For this reason, the design is reviewed using “The South African Draft Guidelines for Sustainable Urban Drainage Systems”. Sustainable Urban Drainage Systems (SUDS) focuses on sustainability by attempting to imitate the natural hydrological cycle.

The report looks at legal aspects, management of stormwater runoffs as well as recommendations regarding an effective drainage system.

#### 1.2 Available Information

The following information:

- a) Detailed Topographical Survey
- b) Aerial Photography

Field observations were done in addition to the above information in order to evaluate stormwater drainage patterns.

A digital plan was generated, showing contour and cadastral information of the study area, see **Annexure A**.



## 1.3 Legal Aspects Regarding Stormwater

### 1.3.1 General

The applicable legal rules or norms with respect to drainage in South Africa are mainly contained in three sources, namely the common law, amended law (law announcement) and the statute law. The interpretation and quotation of the above fall outside the scope of this report, but a few essential points, regarded as important in the planning of drainage systems, often appear in the amended law and are summarised as follows:

- Nobody shall interfere with the natural flow of water in rural areas without statutory authority (authorised regulation);
- Statutory authority is no remission of responsibility to provide drainage works in a reasonable way. The conception “reasonable way” is determined and evaluated on the basis of three factors, namely the environmental factor, the cost factor and the degree of safety;
- To refrain from acting in a “reasonable way” where it is required, will be considered as illegitimate conduct.

In order to stay within the law and act in a legitimate way, should the possibility of interfering with natural flow exist, it will be advisable to negotiate with lower lying property owners and to conclude an agreement before any construction works commence.

Provisions of the following environmental standards, legislation as well as municipal regulations are applicable:

- National Water Act, Act No 36 of 1998
- National Environmental Management Act, Act No 107 of 1998
- Environmental Conservation Act, Act No 73



### 1.3.2 Prevailing Norms of Stormwater Drainage

Comprehensive guidelines known as “Guidelines for the Provision of Engineering Services in Residential Townships” (July 1983) by the former Department of Community Development, as well as “Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development” (1994) by the National Housing Council were published and have in general been accepted as the norm for the provision of engineering services in urban areas.

The following documents have been accepted in addition to the above-mentioned guidelines:

- Guidelines for Human Settlement Planning and Design, (2005) – CSIR Building and Construction Technology
- The South African Draft Guidelines for sustainable Urban Drainage Systems (SUDS) that was drafted for as part of the Water research Commission of South Africa (WRC) project K5/1826: Alternative technology for Stormwater Management.

In the light of the general application and support of the above-mentioned guidelines, it is accepted as minimum acceptable standards for stormwater drainage. Any deviation from these standards should be justified on the basis of environmental, economical and risk analysis.

For the purpose of this report these guidelines will thus apply throughout as reference and any deviation from that will be motivated.

## **2. TERRAIN**

### **2.1 Locality & Background**

#### **2.1.1 Municipality**

Bitou Municipality falls within the Eden District Municipal Area of the Western Cape Province. The Municipality is classified as a “Medium” capacity and Category “B” municipality. The Municipality is situated in the South-Eastern corner of the Province. Its Eastern boundary, the Bloukrans River, is also the boundary between the Western- and Eastern Cape Provinces and its southern border adjoins the Indian Ocean. Bitou Municipality falls within the Breede Gouritz CMA (BGCMA). The Municipality consists of the following seven (7) individual wards, is the only Water Services Authority (WSA) within this municipal area and is also the Water Service Provider (WSP).



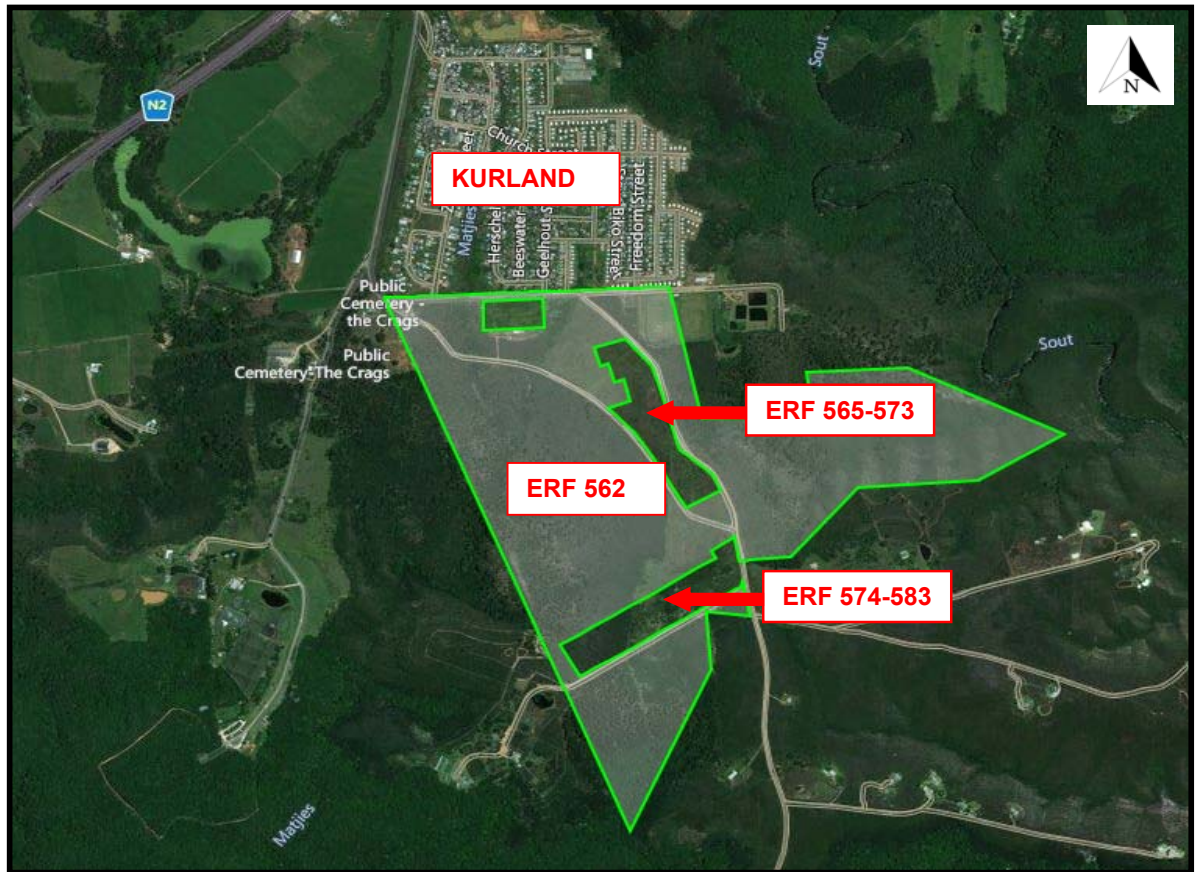


### 2.1.2 Kurland

Kurland falls under the jurisdiction of the Bitou Municipality and is a small residential township which is situated approximately 20 km north-east of Plettenberg Bay, adjacent to the N2 Road. Kurland Township consists mostly of low-income households.

### 2.1.3 Erf 562

Erf 562 is a vacant property located directly south of the rural township of Kurland.



**FIGURE 1: LAYOUT OF DEVELOPMENT SHOWING ERF 562 & ERVEN 565 - 583**

### 2.1.4 Additional Erven Accommodated (565-583)

The development of erven surrounded by erf 562, visible on Figure 1 are also considered in this report. These erven are currently privately owned, and it is estimated that the erven may be subdivided and developed in future. It was suggested by Bitou Municipality that provision must be made in terms of civil services to accommodate a maximum density of 52 units/ha on these erven.



## 2.2 Background

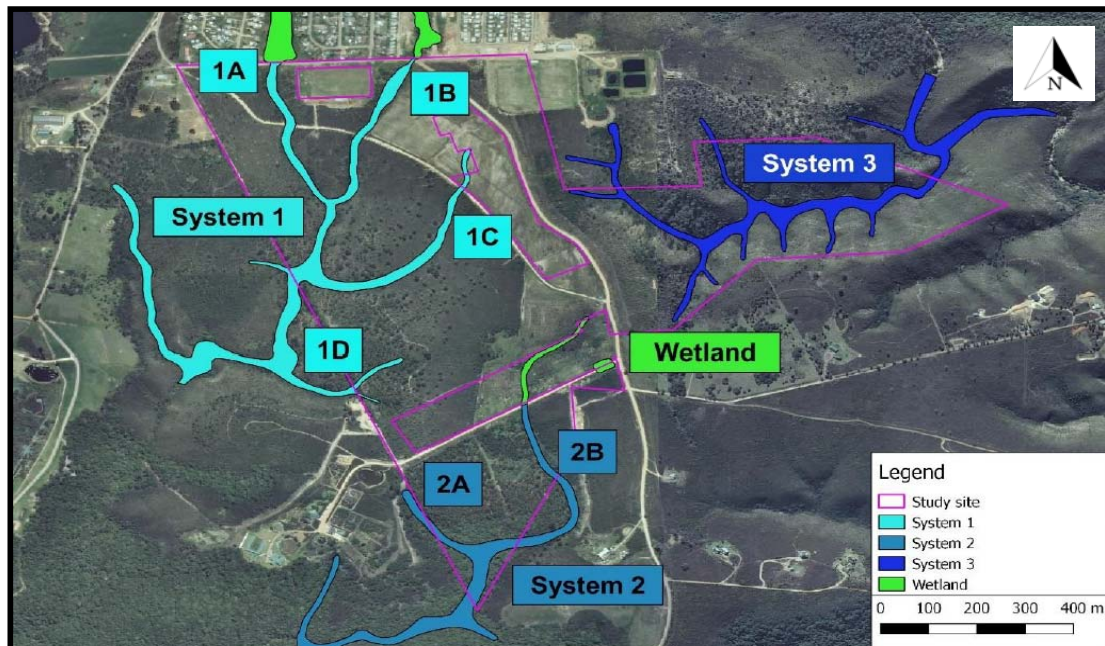
The Community Service Directorate is currently planning the integrated development of Erf 562 to the south of Kurland and has started with the environmental impact assessment (EIA) and Town Planning processes. The town planning layout on the 50-ha property has not been completed but the amount of low cost serviced erven will be in the origin of 2000. In addition, they are planning the development of 74 serviced sites within the existing township with a temporary relocation area (TRA) on a portion of Erf 562.

Erf 562 is one of the Strategic Development Areas identified in 2018 Bitou Local Municipality Spatial Development Framework (MSDF) for the bulk of future residential development. In terms of the Bitou Municipality housing backlog, 10% of the 4829 units are needed at Kurland. The proposed development will therefore aid significantly in providing houses for these people.

## 2.3 Topography & Drainage Setting

The study area of the proposed development is located within the DWS Quaternary Catchment K70A and falls within the Breede Gouritz Water Management Area. The major rivers in the catchment are the Groot- and Bobbejaan River. The catchment has a mean annual precipitation of 920 mm.

Three natural stormwater drainage systems (non-perennial drainage lines) exist on the site. The three stormwater systems are shown in Figure 2 below:



**FIGURE 2: ERF 562 NATURAL STORMWATER DRAINAGE SYSTEMS**



The developable area is largely drained in a southwest to west direction. The area that drains east is largely too steep for development. The drainage lines in the west of the property are also steep, but less so than in the east. The majority of the development is proposed to occur on the hilltop areas due to favourable topography.

The runoff that drains in a western and southern direction ends up in the Buffels River which merges with the Matjies River before reaching the ocean close to Keurboomstrand. The runoff draining east flows into the Sout River, shortly before it mouths into the ocean. All these rivers flow through protected areas.

## **2.4 Existing Infrastructure**

No formal storm water infrastructure exists on site.

## **3. HYDROLOGY**

### **3.1 Runoff Calculations**

All run-off calculations will be based on the widely recognized rational method.

### **3.2 Risks – Cost Considerations & Design Flood Frequencies**

Although runoff calculations are performed with great care, it is still possible that the capacity of a system could be exceeded because of non-hydrological reasons. There has to be a limit to the elimination of probabilities as costs could become unrealistically high in comparison with the benefit of lower costs.

Although the relationship between function, risk, original cost and maintenance cost plays a major role in determining the design flood frequency, it is assumed in general that the following flood frequencies should be provided for under normal circumstances:

- a) Minor system which is the system of pipes, culverts and channels which provides capacity for more regular storms of a smaller nature.
  - i) Residential: 1:2 to 1:5 years
  - ii) Institutional: 1:5 years
  - iii) High value general business, industrial areas and public works: 1:5 years
  - iv) Central business district: 1:5 to 1:10 years
- b) Major system which usually consists of streets, pipe culverts, box culverts and open channels and is in place to deal with more severe storms.





The capacity of these facilities would be theoretically tested to determine the influence of a major storm in the area in order to eliminate possible shortcomings.

Should the major system be insufficient to accommodate major floods, improvements will be considered and alternative detention facilities be provided. The major system will be designed to accommodate the 1:50 year storm.

### 3.3 Design Parameters

The following design parameters will be incorporated in the detail design:

Element	Design Criteria
<b>General</b>	
Mannings coefficient of friction (n)	0.012
Minimum diameter (incl catchpit connections)	450 mm (nominal dia.)
Pipe Diameters – Main lines	Standard diameters of 450mm, 600mm, 750mm, 900mm, 1050mm and 1200mm to be used, thereafter box culverts
Pipe / culvert material	Reinforced concrete (Bearing SANS mark)
Pipe joint type	Spigot and socket (including rubber ring)
Pipe class: (all diameters)	Generally 100D inside road reserve, 75D outside of road reserve
Culvert Class	Generally 100S (Loading conditions for each application to be confirmed)
Bedding type	Class C (SANS 1200 LB)
Position in road reserve	Offset behind kerb (see BM-R1-series)
Minimum slope for catchpit connections	1:100
450mm dia. and larger	Minimum velocity criteria applies
Minimum velocity (80% full flow)	0.9 m/s
Maximum velocity	3.5 m/s
Anchor blocks	450mm dia and larger pipes steeper than 1:8
Minimum cover (road intersections)	1000 mm
Minimum cover (general)	750 mm
Maximum distance between manholes	90 m
<b>Open Stormwater Channels</b>	
Anchor blocks	Unlined: 1:200 (0.50 %) Lined: 1:400 (0.25 %)
Minimum cover (road intersections)	Unlined: 1.0m/s Lined: 2.5m/s
Minimum cover (general)	Unlined: 1: 5 Lined: Varies



## 4. STORMWATER DRAINAGE & CONTROL SYSTEMS

### 4.1 General

#### 4.1.1 Purpose and principles

Stormwater systems can be categorised into two systems, namely major and minor systems. The purpose and principles of stormwater control does not always necessitate minor and major floods being accommodated in a single system. In relatively small catchments the peak runoff and runoff volume of both the minor and major floods are usually of such low magnitude that they can be accommodated in a single system. As catchment areas increase in size, so it becomes less practical and more expensive to retain a single system. In such cases separate minor and major systems should be provided.

#### 4.1.2 Minor System

The primary goal of minor systems is to ensure convenience of nearby residents and the safety of traffic during normal rain showers.

The minor system usually consists of road drainage channels and kerbs, kerb inlets, grid inlets, manholes, pipes, box culverts and small open channels for the rapid discharge of runoffs to the major drainage system.

The sizing of the elements is determined on the basis of short duration, high intensity storms taking into account concentrated flow entering the minor system.

#### 4.1.3 Major System

The major system will seldom be utilised to its full capacity as its purpose is to convey and control large floods.

If justified by costs or natural conditions, the major and minor flows could be accommodated in the same facility. Natural or manmade channels and large diameter culverts are examples.



#### 4.1.4 Recommendations Regarding Design Principles & Considerations

Although dealt with in the “Guidelines for Provision of Engineering Services in Residential Townships”, it is imperative to emphasize a few aspects viewed as policy standpoints with regards to higher lying developments:

- New developments shall not adversely affect the safety risk within existing developments;
- Pollution of the major discharge system as a result of sedimentation, refuse, effluent and other chemical waste shall be actively controlled;
- In order to exercise a degree of control over new developments, the design assumptions, calculations and results shall be submitted to the Local Authority at completion of the detail design phase of the project.

## 4.2 **Sustainable Urban Drainage Systems**

### 4.2.1 General

In order to ensure the sustainability and environmental integrity of a stormwater management plan, it is advisable to consult “The South African Draft Guidelines for Sustainable Urban Drainage Systems”.

Sustainable Urban Drainage Systems (SUDS) focuses on sustainability by attempting to imitate the natural hydrological cycle, something that conventional drainage systems does not focus on. Once an area is developed, the natural permeability of the area is generally reduced as free draining surfaces are replaced with impermeable surfaces such as roofs, roads and paved areas. This process, together with the fact that subsoil is usually compacted during development reduces the infiltration capacity of the area. As development also results in loss of vegetation, the evapotranspiration of the area is also reduced.

Conventional drainage systems are more focused on reducing flooding and possible flood damage to an area (flood attenuation). The focus of the SUDS process is on flood attenuation as well as promoting more natural, sustainable drainage systems.

### 4.2.2 SUDS Processes

The SUDS principle can be broken up into the following three key areas:

- i) Water quantity;
- ii) Water quality; and
- iii) Biodiversity

These processes will now be discussed briefly.





#### 4.2.2.1 Water Quantity Management

Stormwater quantities can be managed through inter alia the following processes as required:

- Capturing rainwater for supplementary water uses on site
- Detaining stormwater before subsequent release
- Conveyance of stormwater (transfer from one location to another)
- Long-term storage in a specified infiltrating area in the form of retention which will drain slowly
- Stormwater detention to protect receiving watercourses in the event of flooding

#### 4.2.2.2 Water Quality Management

Water quality is promoted through cleaning or polishing of stormwater. This can be achieved through inter alia the following processes as required:

- Sedimentation – reducing flow velocities of stormwater runoff to allow sediment particles to fall out of suspension
- Removal of nutrients and metals through plant-uptake
- Photosynthesis – breakdown of organic pollutants through extended exposure to ultra-violet light

#### 4.2.2.3 Biodiversity Management

Biodiversity management is promoted through the following controls that will be implemented:

- Health and safety plans and implementation to prevent injury or death to people
- Environmental risk assessment and management to promote longevity of the system
- Recreation and aesthetics – enhancing visual appearance by creating attractive open spaces
- Education and awareness – distribution of knowledge about stormwater management among interested and affected parties

#### 4.2.3 SUDS Selection

##### 4.2.3.1 Selection Basics

To successfully manage stormwater a number of treatment processes may be required. This multiple process treatment is referred to in the SUDS guideline as a treatment train. A variety of options or combinations of options may be necessary according to the individual requirements of the site. The three key points where intervention is required are as follows:

- Source controls – manage stormwater runoff as close to its source as possible;
- Local controls – manage stormwater runoff in the local area; and
- Regional controls – manage combined stormwater runoff from several developments.



#### 4.2.3.2 Critical Controls Identified

The following critical controls was identified:

- Inlets: Incorporate traps/filters to capture foreign debris
- Outlets: Headwalls with energy dissipaters and gabions mattresses at locations where runoff is discharged from the development footprint to prevent erosion

### 5. STORMWATER MANAGEMENT LAYOUT

The proposed stormwater management layout is included under **Annexure B**. The layout aims to comply with:

- National Water Act, Act No 36 of 1998
- National Environmental Management Act, Act No 107 of 1998
- Environmental Conservation Act, Act No 73
- Sustainable Urban Drainage Systems

### 6. CONCLUSION

The Stormwater Management Plan complies with the relevant regulations as it aims to:

- Delineate stormwater runoff in proportion compared to that of pre-development
- Preserve the quality of runoff water
- Mitigate the risk of any potential flooding downstream
- Reduce impact on biodiversity

**R LOUWRENS Pr. Techni Eng  
PROFESSIONAL TECHNICIAN  
LYNERS**

**F VAN ECK Pr. Eng  
TECHNICAL DIRECTOR  
LYNERS**



## 10. ANNEXURES

### **Annexure A:**

Study Area Slope Analysis (C21018G-SWMP-1)

### **Annexure B:**

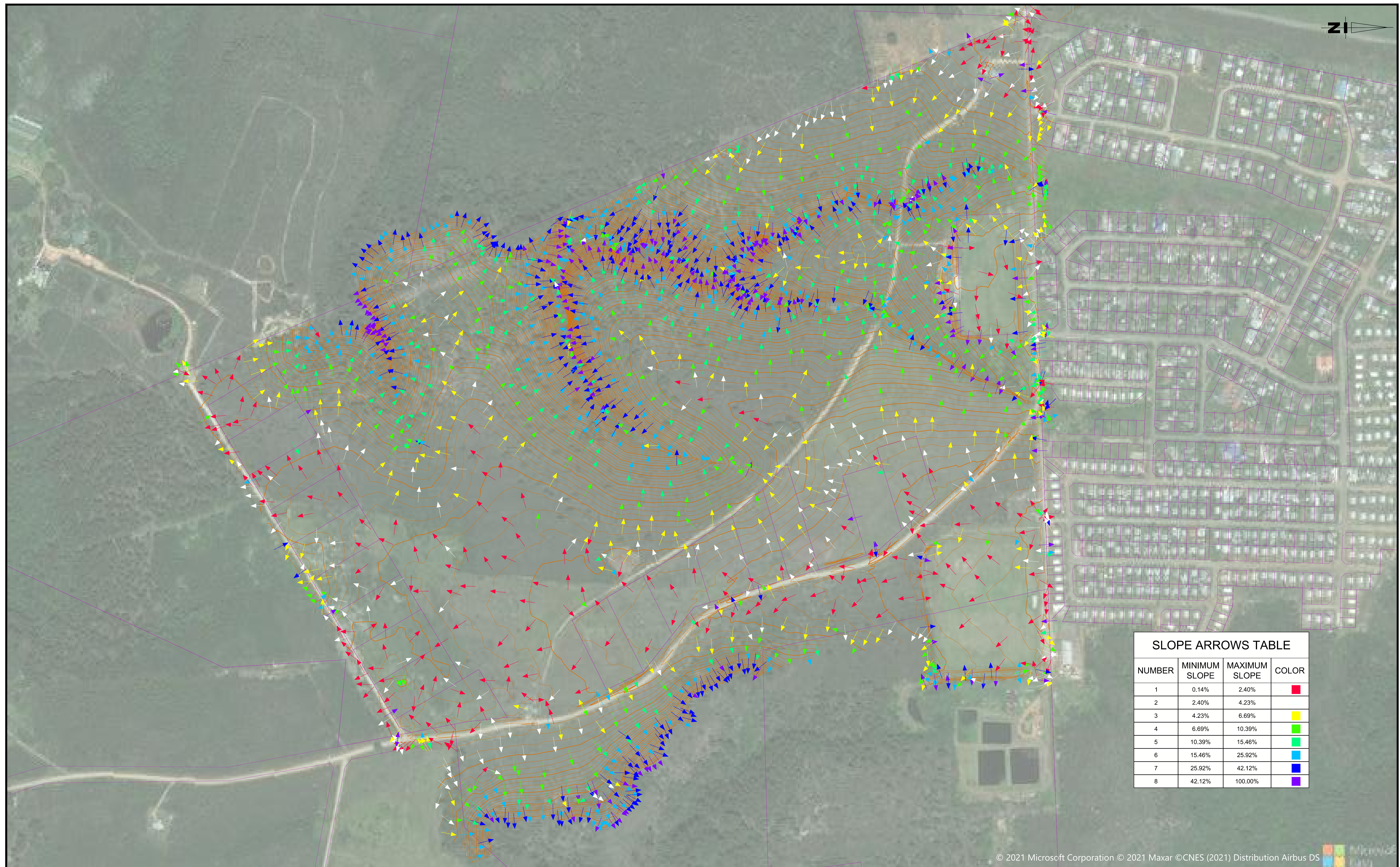
Headwall Detail





## **ANNEXURE A**





SLOPE ARROWS TABLE			
NUMBER	MINIMUM SLOPE	MAXIMUM SLOPE	COLOR
1	0.14%	2.40%	Red
2	2.40%	4.23%	White
3	4.23%	6.69%	Yellow
4	6.69%	10.39%	Green
5	10.39%	15.46%	Cyan
6	15.46%	25.92%	Blue
7	25.92%	42.12%	Dark Blue
8	42.12%	100.00%	Purple

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PROJECT

**INTERNAL CIVIL SERVICES FOR ERF 562,  
KURLAND, BITOU MUNICIPALITY**

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TITLE

**STUDY AREA SLOPE ANALYSIS**

SCALE on A1	SHEET SHEET
CONTRACT No.	PROJECT No.
DRAWING No. <b>C21018G-SWMP-01</b>	REV 
COORDINATE SYSTEM: WGS84/23	





## **ANNEXURE B**



