



STRUCTURAL & CIVIL ENGINEERING DESIGN CONSULTANTS

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# PROPOSED NEW RESIDENTIAL **2** DEVELOPMENT ON PORTION 91 OF FARM 304 MATJIESFONTEIN

## BULK SERVICES AND CIVIL ENGINEERING INFRASTRUCTURE REPORT

Project No 23G210

ISSUED FOR REZONING APPROVAL

April 2023

### CONSULTING ENGINEER:

Poise Consulting Engineers  
12 Boston Light Drive  
Plettenberg Bay  
6600

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▪ CAPE TOWN  
103 ROODEBLOEM ROAD  
WOODSTOCK, CAPE TOWN  
T: 021 422 0822

▪ GARDEN ROUTE  
12 BOSTON LIGHT DRIVE  
PLETTENBERG BAY  
T: 044 533 9087

# PROPOSED NEW RESIDENTIAL 2 DEVELOPMENT ON PORTION 91 OF FARM 304 MATJIESFONTEIN

## 1. INTRODUCTION

Portion 91 of the Farm 304 Matjiesfontein is to be rezoned for Residential 2 development.

The total area of the site is approximately 14 hectares. Approximately 8.6 hectares of the site comprises steep forested area which will be preserved in its natural state. Within the remaining area the development will comprise 73 Residential 2 erven of average size 375 square meters.

The Developer has appointed Poise Consulting Engineers to attend to the design of the civil engineering services for the development.

This report addresses the sewer and water connection requirements and capacities for the new development and summarizes the proposed road access and stormwater management principals to be adopted.

**This report is submitted for Re-Zoning approval purposes.**

## 2 SITE DESCRIPTION

The site is situated on the northern side of Keurboomstrand Road MR395 approximately 2 kilometers south of Keurboomstrand Village.

Access will be off Road MR395

The approximate coordinate of the centre of the site is 34° 00' 18" S and 23° 26' 10" E.

Approximately 8.6 hectares located on the northern side of the site comprises existing forest areas which will be preserved.

The area of the site to be developed slopes from north to south at an average gradient of approximately 1,5%, with a small area in the north east corner increasing to 12%.

Figure 1: Site Location

#### 4. DESIGN STANDARDS

The following design standards will be applicable:

- Guidelines for Human Settlement Planning and Design, compiled for the Department of housing by the CSIR (Red Book)
- Relevant specific specifications of the Bitou Engineering Services Department

#### 5. WATER RETICULATION

##### **Water Connection**

The water connection for the development will be off the existing 200mm watermain in Keurboomstrand road. See Figure 1 of the attached GLS report

##### **Water Demand**

The water demand is based on average daily demand of 600 litres per erf and 73 erven

Average Daily Demand : 43,8 kl

Based on a peak factor of 4 the maximum peak flow demand will be 2,0 litres per second.

The fire flow criteria is Low Risk Group 1 which requires provision for a fire flow 15 litres per second with a minimum residual head 10 meters.

##### **Impact on Capacity**

The development falls within the Matjiesfontein Reservoir distribution zone with a static head of 55.5m MSL.

The GLS Capacity Analysis Report confirms that the existing reticulation system and reservoir has sufficient capacity to service the Development

The Development will have a 100mm water connection to the existing diameter 250mm bulk watermain situated on the southern side of the reserve of in Road MR395. See attached GLS Figure 1.

##### **Alternative Water Sourcing**

The above demand figures represent the worst case demand from the municipal system. The Developer's intent is to optimise the use of rainwater harvesting for domestic use and the use of treated greywater for irrigation purposes, within economic feasibility.

Detailed solutions will be addressed in the detailed design stage and will be to Bitou Engineering Department approval.

##### **Internal Reticulation**

The internal water pipes will remain the property of the development and will not be taken over by Bitou Municipality. The domestic internal water reticulation system will be of Class 9 UPVC pipes of up to 110mm diameter. Minimum cover to watermains will be 800mm.

Fire Hydrants will be provided at maximum 180m intervals

The reticulation system will be designed to provide for a minimum residual head of 24m under peak domestic flow conditions, and 15m under peak domestic plus fire flow conditions.

Construction of all watermains and connections will be in accordance with Bitou Municipality and SABS 1200 specifications.

## 6. SEWER RETICULATION

### **Sewer Connection**

The sewer connection for the Development will be to the existing 160mm reticulation pipe situated immediately opposite the site on the southern side of Keurboomstrand Road. See attached GLS Figure 4.

### **Sewerage Discharge**

The sewerage discharge demand is based on average daily discharge of 480 litres per erf and 73 erven

Average Daily Discharge: 35.0 kl

Based on a peak factor of 2.5 the maximum peak discharge will be 2,0 litres per second.

### **Impact on Capacity**

The Development falls within the drainage area of the Keurboomstrand main pump station. Effluent from this pumpstation is routed to the Municipal Ganse Valley wastewater treatment plant through the Matjiesfontein and Aventura pump stations and their respective rising mains. The GLS Capacity Analysis report confirms that these systems have sufficient capacity to accommodate the Development.

Notwithstanding, certain rising main upgrades have been recommended and are currently being addressed.

### **Alternative Sewerage Treatment**

The above discharge figures represent the worst case discharge to the municipal system. The Developer's intent is to adopt an on site system for treatment of grey water for irrigation purposes. Detailed solutions will be addressed in the detailed design stage and will be to Bitou Engineering Department approval

### **Internal Reticulation**

The internal sewer pipes will be the property of the development and will not be taken over by Bitou Municipality.

The internal sewer reticulation system will be of 160mm Class 34 UPVC sewer pipes. Manholes will be of precast concrete ring structures, in accordance with SABS 1200D standards. Manholes will be provided at a maximum of 80 meter intervals.

Minimum cover to sewers will be 1000mm under roadways and 700mm elsewhere.

Construction of all sewers, connections and manholes will be in accordance with SABS 1200 specifications

## 7. ACCESS

### Access

The site access will be off Keurboomstrand Road MR395

Any road widening or sliplane requirements will be dealt with in a Traffic Impact Assessment to be submitted under separate cover.

### Internal Roads

Internal roads will be private roads and will not be taken over by Council

### Pavement and Geometric Standards

The development will include the following roads which will be classed as follows:

<u>Description</u>	<u>Width</u>	<u>Category/Class</u>
Main Access Collector	5,5m	UC/ES1
Internal Access Roads	4,5/5.05m	UC/ES0,3

The minimum bellmouth radii will be 7.5m

### Kerbs

The main access will have standard SABS figure 7 pre-cast concrete semi mountable on both sides. The internal roads will have edgings on the high side and mountable kerbing on the low side of the crossfall.

## 8. STORMWATER MANAGEMENT

The site stormwater will be managed within 2 catchment areas.

Stormwater runoff from the northern steep forested area will be routed through an open channel to the existing pond close to the north eastern corner of the area to be developed.

The development portion of the site is flat with no gradient along its southern boundary and has no defined drainage discharge points. The existing flat and permeable conditions allow for natural infiltration

The developed erven will generally discharge to the road surfaces which in turn will discharge to a number of retention ponds positioned across the site.

Because the site is very flat underground stormwater pipes will not be feasible. The positions of the ponds are however such the road surfaces will have sufficient capacity to contain the runoff on surface and discharge it to the ponds without flooding.

The discharge from the ponds will be primarily through infiltration with allowance for excess flood to discharge to the Road MR395 reserve in which it will spread and discharge via further infiltration

Refer to attached Stormwater Management Report

**9. Attachments**

DWG No: 23G210 S01

General Layout: Roads, Stormwater, Sewer and Water Reticulation.

Stormwater Management Report

GLS Bulk Services Analysis Report

GLS Figure 1

GLS Figure 4

Prepared By:

Date: 23 April 2023



**D W BOTES** Pr.T.Eng ECSA  
(FOR POISE CONSULTING ENGINEERS)



REZ/304  
Public Road  
91/304  
129304  
13304



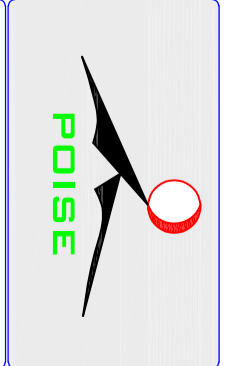
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LEGEND	
	ROADWAY
	SW TRAPEZOIDAL CHANNEL
	ROAD/POND SW OUTLET
	UPVC WATER
	FIRE HYDRANT
	GATE VALVE
	BULK WATER METER
	Ø150 UPVC SEWER
	Ø110 UPVC SEWER
	SEWER MANHOLE
	SEWER PUMP STATION
	SEWER RISING MAIN

**Project**  
PORTION 91 OF THE FARM 304  
MATJIESPONTEN

**Description**  
GENERAL LAYOUT  
ROADS STORMWATER SEWER AND  
WATER RETICULATION

REV	DATE	BY	CHKD	APP'D
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3				
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**STRUCTURAL & CIVIL CONSULTING ENGINEERS**

**SAPE TOWN**  
DORRIS ROAD  
8001 02 9882

**BARDEN ROUTE**  
26 PICTURES  
8600 044 535 9697

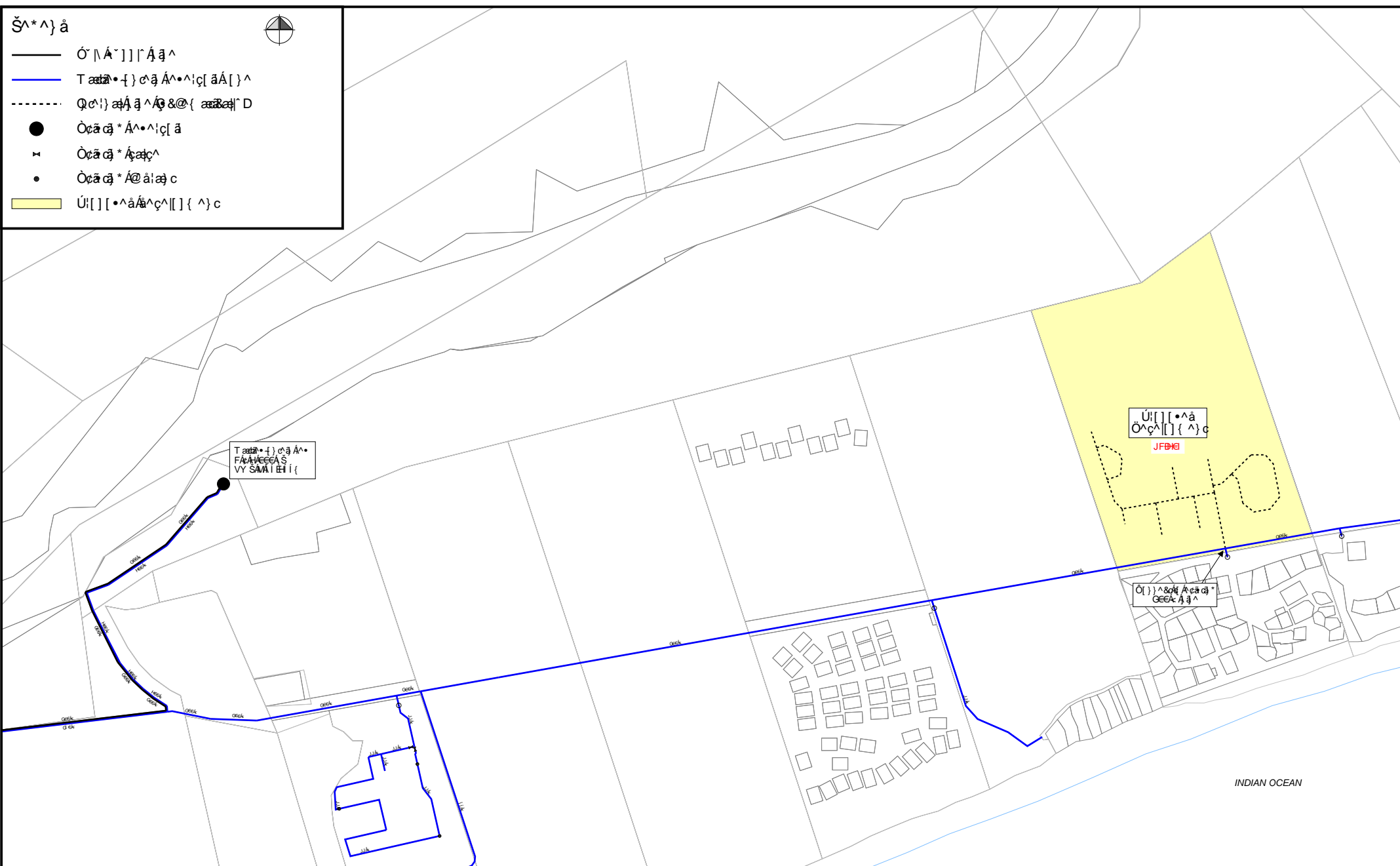
**SOUTH AFRICA**  
ENGINEERING@POISE.CO.ZA  
WWW.POISE.CO.ZA

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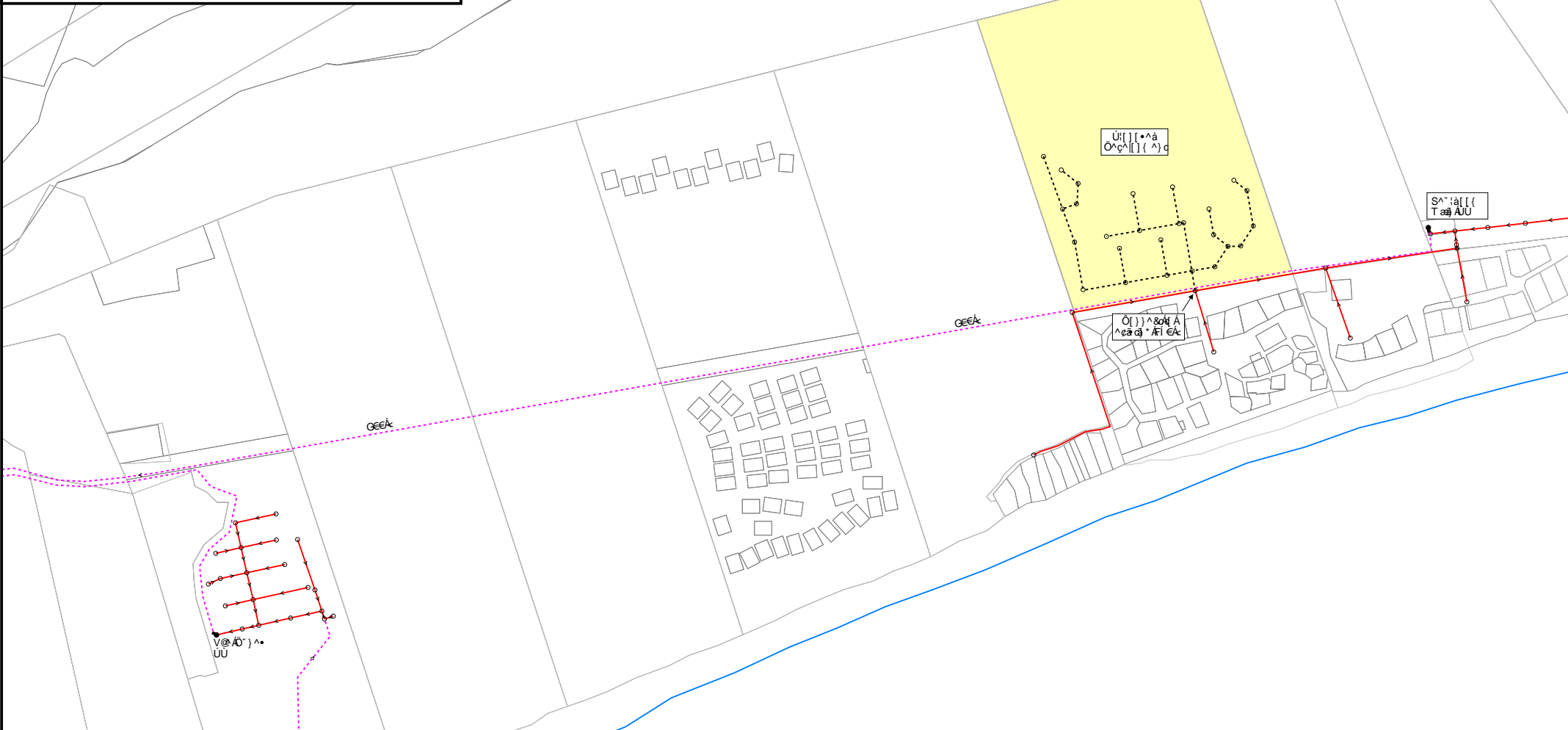
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STRUCTURAL & CIVIL ENGINEERING DESIGN CONSULTANTS

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**PROPOSED NEW RESIDENTIAL 2 DEVELOPMENT ON PORTION  
91 OF FARM 304 MATJIESFONTEIN**

**STORMWATER MANAGEMENT REPORT**

**Project No 23G210**

April 2023

**CONSULTING ENGINEER:**

Poise Consulting Engineers  
12 Boston Light Drive  
Plettenberg Bay  
6600

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▪ CAPE TOWN  
103 ROODEBLOEM ROAD  
WOODSTOCK, CAPE TOWN  
T: 021 422 0822

▪ GARDEN ROUTE  
12 BOSTON LIGHT DRIVE  
PLETTENBERG BAY  
T: 044 533 9087

**STORMWATER MANAGEMENT REPORT**  
**PROPOSED RESIDENTIAL 2 DEVELOPMENT**  
**PORTION 91 OF FARM 304 MATJIEFONTEN**

## **2. INTRODUCTION**

Portion 91 of the Farm 304 Matjiesfontein is to be rezoned for Residential 2 development.

The total area of the site is approximately 14 hectares. Approximately 8.6 hectares of the site comprises steep forested area which will be preserved in its natural state. Within the remaining area the development will comprise 73 Residential 2 erven of average size 375 square meters. The Developer has appointed Poise Consulting Engineers to attend to the design of the civil engineering services for the development.

This report addresses the stormwater management principals to be adopted.

The site stormwater will be managed within 2 catchment areas.

Stormwater runoff from the northern steep forested area will be routed through an open channel to the existing pond close to the north eastern corner of the area to be developed.

The development portion of the site is flat with no gradient along its southern boundary and has no defined drainage discharge points. The existing flat and permeable conditions allow for natural infiltration

The developed erven will generally discharge to the road surfaces which in turn will discharge to a number of retention ponds positioned accross the site.

Because the site is very flat underground stormwater pipes will not be feasible. The positions of the ponds are however such the road surfaces will have sufficient capacity to contain the runoff on surface and discharge it to the ponds without flooding.

The discharge from the ponds will be primarily through infiltration with allowance for excess flood to discharge to the Road MR395 reserve in which it will spread and discharge via further infiltration

The provision of the retention facilities proposed will ensure that the post development discharge will not exceed the pre-development discharge for the 1 in 5 and 1 in 50 year recurrence interval storms.

## **1. LOCALITY**

The site is situated on the northern side of Keurboomstrand Road MR395 approximately 2 kilometers south of Keurboomstrand Village.

The approximate coordinate of the centre of the site is 34° 00' 18" S and 23° 26' 10" E.

## 2. SITE DESCRIPTION

### Topography:

The northern forested area is extremely steep at gradient of approximately 50%.

The area of the site to be developed slopes from north to south at an average gradient of approximately 1,5%, with a small area in the north east corner increasing to 12%.

### Soils:

The site to be developed is blanketed by estuarine/alluvial sand deposits overlying sandstones. In calculating the runoff factors permeable conditions are assumed.

### Vegetation:

The areas of the site affected by the development are generally grassed lands.

### Rainfall:

Modelling is based on a Mean Annual Precipitation of 650mm

## 3. MODELLING

### Pre-development:

#### Catchment A

Catchment A is of area 12,09 ha at an extremely steep slope of 50% and a runoff length of 360 meters, heavily vegetated, with assumed semi-permeable conditions

In calculating the run-off coefficient C the following factors were used:

- Slope  $C_S$                     0.26
- Permeability  $C_P$             0.16
- Vegetation  $C_V$               0.04

Using adjustment factors of 0.80 and 0.95 for the 5 year and 50 year storms respectively the following run-off coefficients were obtained:

- 1:5RI                            0.37
- 1:50RI                         0.44

The time of concentration, calculated using the Kirby Formula for overland flow with roughness coefficient 0.6 is 21 minutes.

#### Catchment B

Catchment B is of area 4.44 ha at a slope of 1,5% and a runoff length of 180 meters, sparsely grassed with permeable conditions

In calculating the run-off coefficient C the following factors were used:

- Slope  $C_S$                     0.03
- Permeability  $C_P$                 0.08
- Vegetation  $C_V$                  0.21

Using adjustment factors of 0.65 and 0.95 for the 5 year and 50 year storms respectively the following run-off coefficients were obtained:

- 1:5RI                                0.21
- 1:50RI                               0.30

The time of concentration, calculated using the Kirby Formula for overland flow with roughness coefficient 0.3 is 25 minutes.

There are no predevelopment impermeable surfaces.

The pre-development peak discharge rate is indicated in Table 1.

The pre-development Catchment Areas are indicated on attached Figure 1

### Discharge

The pre-development discharge of Catchment A is to the existing pond close to the north eastern corner of the site. This pond drains naturally through infiltration with overflow under flood conditions discharging by infiltration over the remainder of the site.

### Post-development:

All erven will be shaped to discharge to the road surfaces from where the stormwater will be routed to the ponds of Catchments A and B.

#### Catchment A

The runoff from the steep northern forested area, Catchment A1, will be routed via a surface channel to the existing Pond A1 situated at near the north eastern corner of the developed area. This area remains undeveloped

The runoff from the central northern area of the developed area, Catchment A2, will discharge to Pond A2.

The post development runoff factor for Catchment A2 calculated on the basis of 100% for non permeable areas and 30% for unsurfaced areas is 0,79.

#### Catchment B

Approximately 60% of the total areas of Catchments B1 to B5 will be covered with impermeable surfaces

The runoff from the erven in Catchment B will be routed on road surfaces to discharge to Ponds B1 to B5

The post development runoff factor calculated on the basis of the 100% for non permeable areas and 30% for unsurfaced areas is 0,72

The post-development Catchment Areas and ponds are indicated on attached Figure 2

#### 4. STORMWATER MANAGEMENT AND RETENTION

##### Management:

All post development stormwater runoff generated from the non-permeable roof and road surfaces will be routed through surface channels and on road surfaces to the retention ponds to be provided

The retention ponds are sized to ensure that the total post development peak discharge does not exceed the total predevelopment discharge from the proposed development catchment areas, for the 1:5 and 1:50 year storm intervals.

The road surface and open channels will have sufficient capacity to ensure that the post-developed runoff for a 1 in 50 year RI storm event is conveyed to the retention ponds

The retention pond volumes and areas are included in Table 1.

#### 5. FINAL DISCHARGE

The retention ponds have sufficient area and depth to provide for natural infiltration of the 1 to 50 year Post Development rainfall event.

The assumed infiltration rate is 0,05 centimeters per second. Table 1 indicates the pond infiltration discharge capacities which in all cases exceed the peak 1 in 50 year inflow.

Should the capacity of these ponds be exceeded the discharge will be through overflow dissipation outlets to the road MR395 reserve, from where it will spread and naturally dissipate.

#### 6. ATTACHMENTS

Table 1: Catchment Areas, Pre-development and Post-development flows,  
Retention Pond Data

Figure 1: Pre Development Catchment Areas

Figure 2 Post Development Catchment Areas and Pond Positions

DWG No. 23G210 S01

General Layout: Roads Stormwater Sewer and Water Reticulation

Prepared By:



Date: 23 April 2023

**TABLE 1**  
**PORTION 91 OF FARM 304 MATJIESFONTEIN: STORMWATER MANAGEMENT REPORT**  
**CATCHMENT AREAS, PRE-DEVELOPMENT AND POST-DEVELOPMENT FLOWS, POND DATA**

CATCHMENT AREA	AREA	50 Yr PRE DEV FLOW	POND NO	50 YR. POST DEV. PEAK INFLOW	ATTENUATION VOLUME	POND AREA	INFILTRATION CAPACITY @ ,05cm/sec
No	Ha	m3/s		m3/s	m3	m2	m3/sec
Pre Dev. A	12,09	1,24					
Pre Dev B	4,44	0,31					
Post Dev A1	10,74		A1	1,06	1758	1622	0,81
Post Dev A2	0,71		A2	0,13	522	1044	0,52
A1-A2 Tot	11,45			1,18	2280	2666	1,33
Post Dev B1	0,88		B1	0,18	329	657	0,33
Post Dev B1	0,77		B2	0,16	280	559	0,28
Post Dev B1	0,49		B3	0,10	297	594	0,30
Post Dev B1	1,03		B4	0,22	250	500	0,25
Post Dev B1	1,48		B5	0,31	483	965	0,48
B1-B5 Tot	4,65			0,97	1637,500	3275,000	1,64

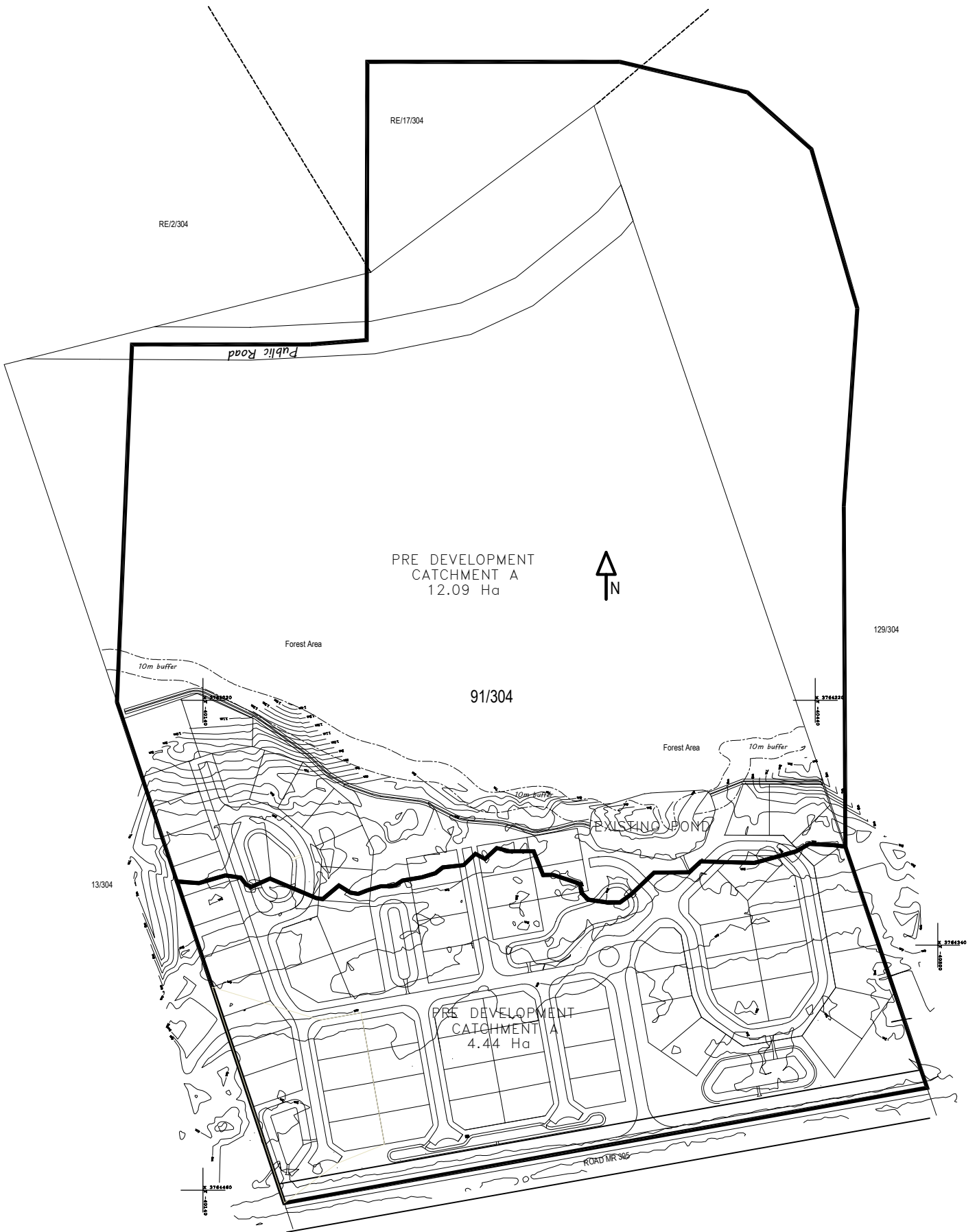


FIGURE 1  
PRE DEVELOPMENT CATCHMENTS



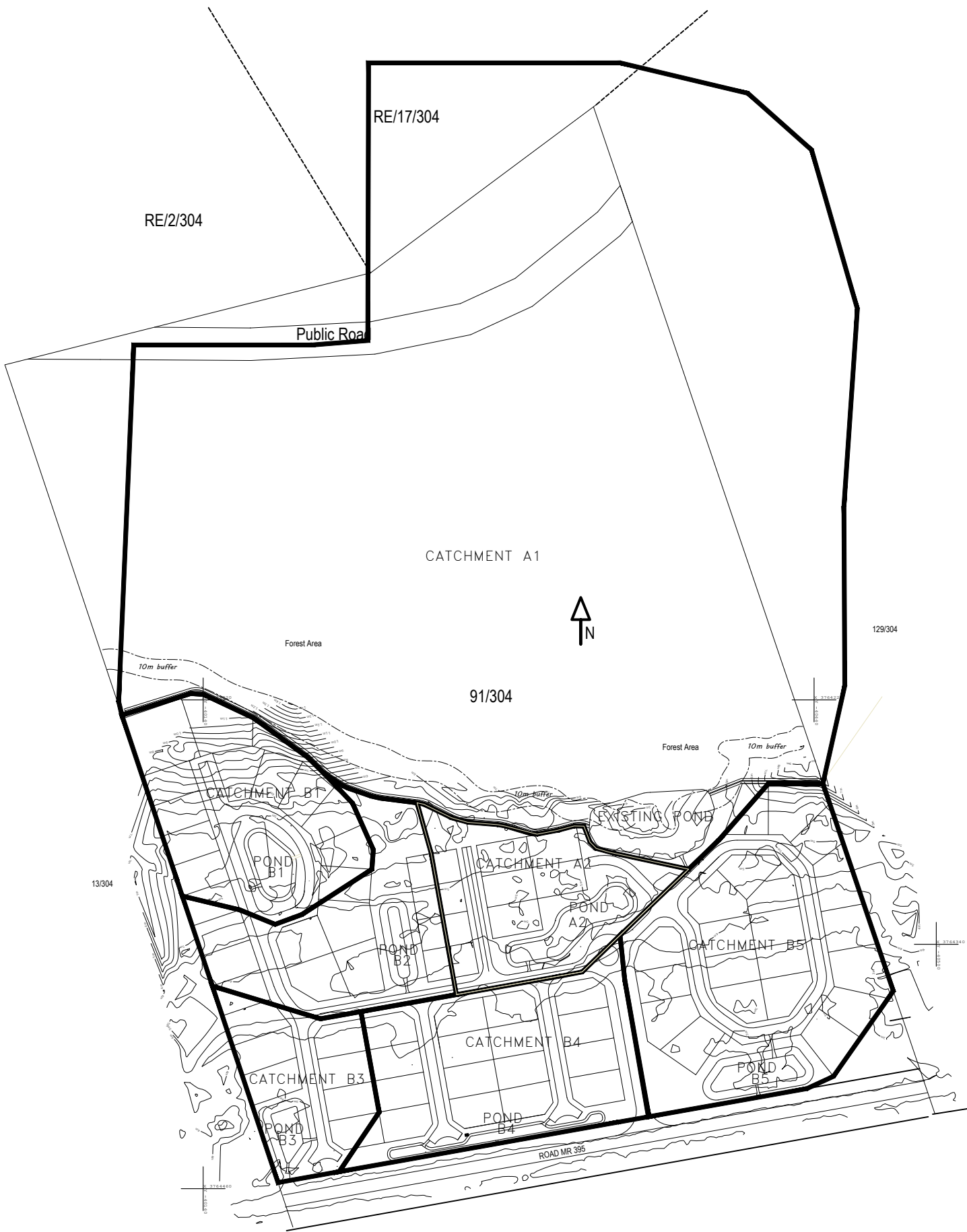


FIGURE 2  
POST DEVELOPMENT CATCHMENTS