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KIMBERLEY:
OLIPHANT HOUSING ESTATE CIVIL INFRASTRUCTURE.
OUTLINE SCHEME REPORT

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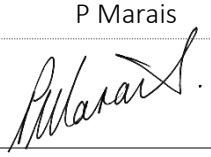
		Signature		
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LIST OF ANNEXURES

1. SCOPE

It is the intention of the Developer to provide a total of 2886 housing units on the property, known as Remainder of Portion 18 of the Farm Roode Pan 70, Kimberley in the Sol Plaatjie Local Municipality. The above units will consist of 175 freehold units and 2711 sectional title units.

The full number of units will be provided with surfaced access roads, a metered water supply and waterborne sewerage.

The area intended for development has been sub-divided into three areas, with a fourth area set aside purely for open space and wetland.

The site is bounded by the Transnet Railway line in the east and by the Midlands Road to the west. To the south the site is restricted by the unnamed stream that discharges into the Kamfers Dam.

2. ACCESS

Access to the development is from Midlands Road, which in turn connects into Barclay Road to give access into the north east of Kimberley.
Access approval conditions need to be obtained from the Provincial and Local Road Authorities.

There is a single major access off Midlands Road which provides access to units in Areas 1, part of Area 2 and Area 3, with a further minor access to three erven in Area 3, which are non- contiguous to the rest of the development, due to an intervening conservation zone.

3. INTERNAL ROADS

The primary internal access road will consist of a four lane double carriageway, having two lanes inbound and two lanes outbound, between the Midlands Road intersection and the intersection within the development giving access to Area 2. Each lane will be 3,5 metres wide.

All other internal roads in Areas 1 and 3 are set-off in road reserves of 20 metres and since they serve areas of high-density housing (100 units per hectare), no areas serve less than 200 housing units. This level is deemed compatible with a collector road and thus these roads should be provided with roads containing two, 3,5 metre wide lanes.

Area 2 has road reserves ranging from 10 metres wide to 16 metres wide. The larger road reserve again can be classified as containing a Collector Road, and thus demand a 7 metre wide roadway.
The 13 metre and 210 metre road reserves all serve freehold units with fewer than 200 units, and thus can be categorized as Local Access Roads with 5,5 metre road widths.

The exception to the above is the cul-de-sac entrance to Erven 18, 19 and 20 in Area 2, which gives access to high density housing with the potential of accommodating 423 units – well above the threshold of 200 units defining the limit to a local access road. Although a road reserve of only 13 metres has been provided, it will require the provision of a 7 metre wide roadway.

Except for the main access road into Area 1, there are no adjacent commercial sites to the roads and thus the volume of heavy vehicles on all other roads will consist of light delivery vehicles and refuse removal trucks.

The recommendations of TRH 4 were applied to arrive at the following pavement designs. Kimberley is taken as a dry region with the availability of suitable road making aggregates.

Main Access Road (25 m Road Reserve):
This is assessed as a Category B Road with an E2 level of traffic over its design life.
Pavement Design:

30 mm Asphalt Surface
150 mm G3 (G2 if G3 not available) Base course
150 mm G5 Sub-base

Remainder of Internal Roads:
These are assessed as Category C Roads with an E 1 level of traffic over their design life.
Pavement Design:

Double Seal Surface Treatment
100 mm G4 Base
150 mm G5 Sub-base

Depending on the capability of the asphalt surfacing contractors in Kimberley and the suitability of the surfacing aggregate, consideration may be given to applying a 25 mm continuously graded asphalt surfacing.

4. ENVIRONMENTAL IMPACT ASSESSMENT

An EIA application and scoping report had been submitted to the Department of Agriculture, Environmental Affairs, Rural Development and Land Affairs, for approval.
Confirmation letter from the Department is attached as Annexure D.

5. SEWERS

There are no municipal sewers in the immediate vicinity of the proposed development, with the nearest bulk

sewer facility, being the Homevale Wastewater Treatment Works, located some 1,5 km from the lowest point of the Development. It is understood that the Municipality is experiencing operational difficulties with this treatment works, and at present is not capable of handling any further volumes of sewage.

As noted in Section 1 of this Report, it is planned to have 175 freehold units with an occupancy rate of 6 persons per dwelling unit and the remaining 2711 high density units having an occupancy rate of 5 persons per dwelling unit.
Typical standards used for the design of the sewer reticulation are summaries in the following table:

Parameter	Element	Guidelines
Minimum Pipe diameter	Gravity sewers	110 mm
	Connections	100 mm
Minimum Velocity at full flow	Gravity sewers Rising mains	0,7 m/s 0,7 m/s
Peak Factor	Residential	3.0
Stormwater Infiltration		15% of design flow
Pipe capacity	Flow level in pipe as percentage of diameter	67% at design flow
Minimum Gradients for Pipes	110 mm dia 160 mm dia 200 mm dia 300 mm dia and bigger	1: 60 1: 140 1: 200 1 : 350
Hydraulic Calculations	Manning Equation	n = 0,012
Pipe Materials	All pipes	uPVC Class 32 heavy duty structured wall to SABS 1601 or HDPE equivalent.
Location of Sewers	All Areas	Sewers 1.5m to 2m from road reserve boundaries depending on the road reserve width, unless otherwise indicated. 1m from the erf boundary for midblock reticulation
Connections	For Stands	110 mm uPVC with slip on couplings or HDPE equivalent.
Cover over pipe	In road reserves Other areas	1000mm (min) 800mm (min)
Manholes	Spacing	80m maximum

5.1 Sewer Discharge Calculation

The sewer generated on site is set to be 500 l/day for the high-density units, and 750 l/day for the freehold units.

Sewer demand can therefore be calculated as follows:

(175 units x 750 l/day) + (2711 units x 500 l/day) = 1 487 kl/day
=1487x1000/(24x60x60)= 17.2 l/s
Peak Factor = 1.58
Average Annual Dry Weather Flow = 17.2 x 1.58= 27.2 l/s
Average Annual Wet Weather Flow = 27.2 x 1.15 = 31.28 l/s

The level and location of the three areas in relation to the Homevale WWTW, will necessitate the provision of two small pump stations serving the three erven of Area 3 as well as one serving erven 18 – 20 of Area 2. A single large pump station would need to be located in Erf 22, to pump the full flow from the development to Homevale WWTW.

However, as noted earlier this is not an immediate option, therefore other workable options need to be addressed.

Option 1

The exact reasons for the inability of Homevale WWTW to handle further sewage have not been divulged and thus any option to assist in overcoming this lack of capacity, would need to be investigated prior to carrying out any remedial work and the costs, all of which be borne by the Developer. In view of the large costs associated with up-sizing of wastewater treatment works, this is not seen as a viable option.

Option 2

The only way to ensure that the volume of effluent emanating from the full development can be dealt with over the full phased development, which will take several years, will be for the Developer to establish their own on-site package plant. These plants are modular and thus can be sized and upgraded as more development takes place.

In view of the restrictions on the volumes of stormwater and treated water entering the Kamfers Dam, the uncontrolled release of “grey water” into the Dam cannot be tolerated and this water would need to be pumped to irrigate the Open Areas and Conservation Areas of Areas 3 and 2 respectively. It is further proposed that the package plant be located in Erf 22 of Area 2, in such a way that, should the Homevale WWTW be upgraded during the phased development of Oliphant Estate, then consideration could be given to replacing the package plant with a Sewer Pump Station and Rising main to the then upgraded Homevale WWTW.

The rising mains from the last two pump stations will be required to cross the conservation zone, shown as Erf 21 as well as the unnamed stream and the flood plain at the south of the site. This will need to be addressed in the final Environmental Report.

6. WATER

In the initial approach to the Sol Plaatjie Municipality in 2016, it had been advised then that the required water was available. No written confirmation was received from the Director however.

In an e-mail sent on 17 March 2022 the Municipality was requested to confirm that the Municipality could supply the Development with a total of 1873 kl/d of potable water. No response has since been forthcoming.
Based on the latest layout and distribution of dwelling types, a daily demand of 1804 kl/d was calculated. The anticipated peak flow is 96 l/sec.

Typical standards used for the design of the water reticulation are summarized in the table below:

6.1. Design Parameters

Parameter	Element	Guideline
Pressure	Maximum (Static)	9,0 bar
	Minimum: Reticulation Mains	2,5 bar
Flow Velocity	ø≤150mm	1,0 m/s – 3.5m/s
	ø〈200mm	1.5m/s – 2.5m/s
Fire flow	Hydrant Spacing: Residential	240m max.
	Hydrant Spacing: Industrial	180m max.
	Flow: Residential Flow Industrial	15 l/s @ 0,7 bar at hydrants 38 l/s stream flow 50.0l/s @1.5bar
Peak Factor	Design peak	4.0 x AADD
Pipe Location	All areas	1m to 1.5m from boundaries
Pipe Materials	110mm-300 mm dia	uPVC Class 12 spigot and socket or HDPE PE100, PN12.5
Pipe Size	Network Pipes	110mm minimum
	Adjacent house connections	1 stand: 25mm minimum 2 stands: 32mm minimum
120	House connections across street	1 stand: 25mm minimum 2 stands: 32mm minimum
Parameter	**Element**	**Guideline**
Cover to pipes	Asphalted and paved roads and traffic areas	1000 mm minimum
	Other areas	800 mm
	Maximum: All areas	1500 mm
Valves	Type	RSV – Class 16 to SANS664, cap top, non-rising spindle and anti-clockwise closing.

6.2. Potable Water and Fire Demand Calculation

The water demand per site is tabulated below:

Water demand					
Erf	Zoning	Ha	Units	Demand	Kl/day
Rem of Ptn 18	Residential 3	150 total 45.64 dev	2886	0.625	1804

Total water demand = 1804 kl/d
Allow for "unaccounted for water" (15%) = 2075 kl/d
AADD = 2075 x 1000/(24*60*60)
= 24 l/s
Peak Hour Flow = 24 x 4
= 96 l/s

The proposed development will fall under Fire Risk Category: Moderate Risk 1 with a water flow of 25l/s per hydrant.

The number of hydrants required for the proposed development will be finalised in the detailed design stage of the project.

The above peak flow will require a supply pipe having a diameter of at least 375 mm and it will be necessary in discussions with the Municipality to assess their ability to provide this required volume of water. It is anticipated that the development will be carried out over a period of 10 years.

7. STORMWATER

The internal stormwater reticulation will be designed to provide for a 5 year storm generally, with a 10 year storm applied to areas deemed critical. In addition, the level of the Kamfers Dam is sensitive to the volume of inflow to it, bearing in mind that the dam is in fact a pan (ie. no outlet) and the level in the dam dictated by the total inflow and the evaporation. Should the current balance be disturbed by the Development, this will seriously impact on the breeding of the flamingos.

In essence, the MAP for the area is 602 mm per annum, while the evaporation rate is recorded as 2900 mm per annum. The area of the pan is approximately 400 ha. and thus for the water level in the dam to remain constant, the catchment of the pan must be a maximum of (400 x 2900)/602 which equates to 1927 ha. This assumes the runoff is 100 %. The more likely runoff co-efficient is nearer 40%, which means the catchment must be 2,5 times that i.e. 4820 ha.

The proposed development area is only 150 ha. with only 30.4 % (45.64ha.) actually being developed and 69.6 % remaining undisturbed. Compared to the total catchment this represents only 0.95 %. In other words, the proposed development will have little effect on the water level, but nevertheless, steps will be taken to attenuate this small additional stormwater input to the Kamfers Dam to minimise any rise in water level.

The catchment of the dam is fixed, and in past times the near 5000 ha. of catchment, having an average annual precipitation of approximately 600 mm, filled the pan. In a year this amounts to just under 5 metres depth of water in the pan. What stops this pan simply filling up is firstly the fact that 2,9 m of water is evaporated each year and secondly the fact that as it fills, the surface area increases, so the volume of water evaporated increases until an equilibrium is arrived at. This is a simplistic scenario, as fluctuations in both rainfall and evaporation upset the balance.

The Rational Method was used to calculate stormwater run-off per site and the required attenuation.

The values used in the calculation are indicated below:

KIMBERLEY - OLIPHANT ESTATE			
ATTENUATION REQUIRED			
RUNOFF AT 5yr (BEFORE DEVELOPMENT) / 25yr (DEVELOPED)			
AREA 1			
ITEM	AREA		
Area (A) km²	**0.3318**		
Mean Annual rainfall (MAP) mm	**602**		
Return period (T) yrs	**5yr**	**25yr**	
Runoff coefficient (C)	**0.03**	**0.342**	
Time of Concentration (tc)	**1.58**	**1.58**	
Rainfall Intensity (I)	**22.3**	**43**	
Runoff Q=0.278xCxIxA (m³/s)	**0.06**	**1.36**	
Difference 25yr - 5yr (m³/s)	**1.295**		
Attenuation volume required (m³)	**1.58(1.295x60x60)=7,364m³**		
Attenuation pond details	Dimensions (m)	outlet Ø (mm)	capacity (m³)
	(43x43x1)4	**(150)4**	**7396**

KIMBERLEY - OLIPHANT ESTATE			
ATTENUATION REQUIRED			
RUNOFF AT 5yr (BEFORE DEVELOPMENT) / 25yr (DEVELOPED)			
AREA 2			
ITEM	AREA		
Area (A) km²	**0.236**		
Mean Annual rainfall (MAP) mm	**602**		
Return period (T) yrs	**5yr**	**25yr**	
Runoff coefficient (C)	**0.03**	**0.432**	
Time of Concentration (tc)	**1.48**	**1.48**	
Rainfall Intensity (I)	**21.6**	**37**	
Runoff Q=0.278xCxIxA (m³/s)	**0.04**	**1.05**	
Difference 25yr - 5yr (m³/s)	**1.006**		
Attenuation volume required (m³)	**1.48(1.006x60x60)=5,361m³**		
Attenuation pond details	Dimensions (m)	outlet Ø (mm)	capacity (m³)
	(37x37x1)4	**(100)4**	**5,476**

KIMBERLEY - OLIPHANT ESTATE			
ATTENUATION REQUIRED			
RUNOFF AT 5yr (BEFORE DEVELOPMENT) / 25yr (NOT DEVELOPED)			
AREA 3			
ITEM	AREA		
Area (A) km²	**0.5**		
Mean Annual rainfall (MAP) mm	**602**		
Return period (T) yrs	**5yr**	**25yr**	
Runoff coefficient (C)	**0.03**	**0**	
Time of Concentration (tc)	**2.06**	**0**	
Rainfall Intensity (I)	**18.4**	**0**	
Runoff Q=0.278xCxIxA (m³/s)	**0.08**	**0.00**	
Difference 25yr - 5yr (m³/s)			
Attenuation volume required (m³)	**N / A**		
Attenuation pond details	Dimensions (m)	outlet Ø (mm)	capacity (m³)

KIMBERLEY - OLIPHANT ESTATE			
ATTENUATION REQUIRED			
RUNOFF AT 5yr (BEFORE DEVELOPMENT) / 25yr (DEVELOPED)			
AREA 4			
ITEM	AREA		
Area (A) km²	**0.428**		
Mean Annual rainfall (MAP) mm	**602**		
Return period (T) yrs	**5yr**	**25yr**	
Runoff coefficient (C)	**0.03**	**0.093**	
Time of Concentration (tc)	**1.34**	**1.34**	
Rainfall Intensity (I)	**24**	**45**	
Runoff Q=0.278xCxIxA (m³/s)	**0.086**	**0.498**	
Difference 25yr - 5yr (m³/s)	**0.412**		
Attenuation volume required (m³)	**1.34(0.412x60x60)=1,987**		
Attenuation pond details	Dimensions (m)	outlet Ø (mm)	capacity (m³)
	(31.5x31.5x1)2	**(150)2**	**1,984**

It is considered impractical to construct any form of attenuation dam due to its cost effectiveness, instead is the following proposed:

(i) That an artificial wetland be considered.

(ii) To minimize the size of the wetland, is it recommended that rainwater harvesting be maximised by the using of rainwater storage tanks at the housing blocks.

8. CONCLUSIONS

At this stage, the issues with the reliability of the Homevale STWW are of concern, and until a response from the Municipality regarding their upgrade proposals are tabled, the route of the package plant must be pursued. There is however scope for a phased development to take place, to align with the present capacity of the treatment works and the proposed programme of the treatment works future upgrades.

ANNEXURE A

ANNEXURE B

ANNEXURE C

ANNEXURE D