WATER USE LICENCE APPLICATION SUMMARY REPORT

NAME OF APPLICANT:

Plett Lagoon Estate Pty (Ltd)

Compiled by

Confluent Environmental (Pty) Ltd

Authors: Sonia Jordaan
Reviewed: Dr. Jackie Dabrowski
August 2024

1. Applicant Details

Name of applicant: Plett Lagoon Estate (Pty) Ltd
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2. Person Submitting the Application

Jackie Dabrowski (Ph.D., Pr.Sci.Nat. Aquatic Science)
The South African Council for Natural Scientific Professions (SACNASP)
Registration Number 11516
Date of registration 27 January 2016

3. Background and Purpose

3.1 Background

The applicant, Plett Lagoon Estate (Pty) Ltd, hereafter referred to as the developer is applying for a Water Use License (WUL) in terms of the National Water Act (NWA; Act 36 of 1998), to build a housing estate in Plettenberg Bay, Western Cape. The proposed housing development will be on RE/6503, located largely within the Estuarine Functional Zone (EFZ) of the Keurbooms Estuary (Figure 1). Site access will be from Beacon Way at the southwestern corner of the development. The development will be known as Plett Lagoon Estate.

Figure 1: Proposed location of Plett Lagoon Estate, Plettenberg Bay: within the Estuarine Function Zone of the Keurbooms Estuary.

The applicant is applying for the authorisation of water uses in terms of Section 21 of the NWA as follows:

Section 21(c); Impeding or diverting the flow of water in a watercourse and
Section 21 (i); Altering the bed, banks, course or characteristics of a watercourse.
Section 21(e): engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1)
Section 21(g): disposing of waste in a manner which may detrimentally impact on a water resource;

There are no existing lawful water uses on the property.

3.2 **Location of Water Uses**

The water uses take place in quaternary catchment K60E, located within the Bitou Municipality and administrative district of Knysna, Western Cape (Figure 2).

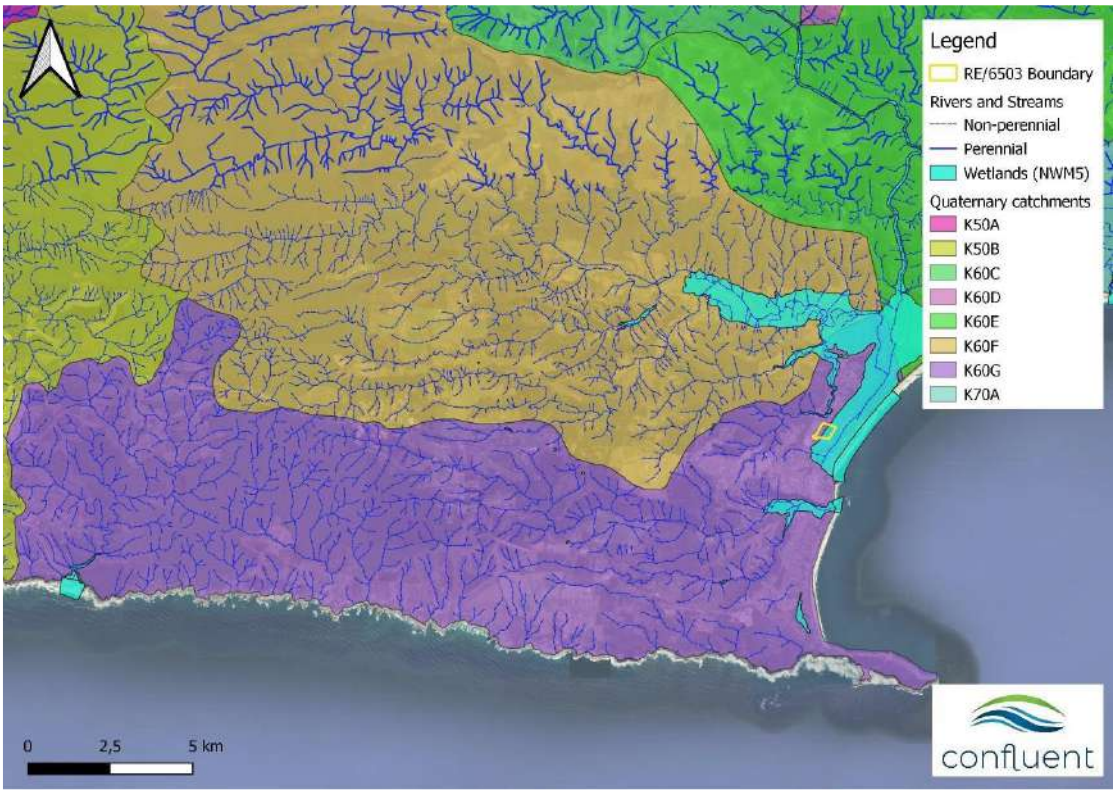

Figure 2: Location of the site in quaternary catchment K60E showing mapped wetlands and rivers.

The property is approximately 19 hectares in extent and is in the town of Plettenberg Bay between the Keurbooms Estuary to the southeast and the Plettenberg Bay Primary School to the west. A wetland was identified and delineated to the south of the proposed development (Figure 3) The Site Development Plan was scaled back to exclude the wetland, so that 60% of the site will be zoned as public open space and managed as open space for nature conservation by the development's body. The eastern portion of the site is below the 5 m.a.m.s.l. contour which places it in the Estuarine Functional Zone of the Keurbooms Estuary (Aquatic specialist report, Appendix 1).

*Figure 3: Site Development Plan, Delineated wetland and 30 m wetland buffer on the development site for Plett Lagoon Estate, RE/6503, Plettenberg Bay. ****Note**: The property boundary for RE/6503 is incorrect on Cape Farm Mapper and includes the piece of land adjacent to the school grounds to the northwest as per Title Deed T 98661/1996.*

The geographic location at the property where the water uses will take place is:
Latitude: -34° 2' 23.6646" and Longitude: 23° 22' 29.2614"

Property details of Plett Lagoon Estate are presented in Table 1.

Table 1: Property details

Property description	Title Deed number	Owner details on Title Deed
RE/ 6503	T98661/1996	SG Storey RA Cook

4. Administrative Documents and Other Technical Reports Submitted to Support The WULA

4.1 Administrative Documents

4.1.1 Letter of Appointment
4.1.2 Title deed of property
4.1.3 Tax invoice of Breede-Gouritz administration fee
4.1.4 Applicant's company registration certificate
4.1.5 Applicant's contact details

4.2 Reports and Other Technical Documents

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Table 2 lists reports and other documents submitted as part of the application.

Table 2: List of reports and other technical documents submitted with this application.

Report Title	Compiled by	Date of report
Civil Engineering Services Report	VITA Consulting Engineers, Riaan van Dyk	July 2024
Aquatic Specialist Assessment: Aquatic Biodiversity Impact Assessment	Confluent Environmental (Pty) Ltd, Jackie Dabrowski	August 2024
GLS Infrastructure Planning	PC du Plessis	February 2023
WULA Technical report with Section 27 Motivation	Confluent Environmental (Pty) Ltd, Sonia Jordaan	August 2024
Wastewater Treatment: Membrane Bioreactor Wastewater treatment plant	Alveo Water, Benita Aspeling	April 2024

5. Project Description

The Site Development Plan (SDP) had to be scaled back to exclude the delineated wetland and the wetland buffer zone (Figure 3). The exclusion of the wetland area resulted in the development area occupying only 40% of the site, with the remainder (almost 60%) of the site zoned as public open space to be managed for conservation by the development's body corporate.

The proposed residential development is classified as a Greenfields Development and will consist of the following split zoning house units and amenities as indicated in Table *3* below:

Table 3: Land use and zoning of Plett Lagoon Estate.

Land use	Zoning	Quantity	Area (ha)	Percentage (%)
Dwelling House	Single Residential Zone I	9	2.2671	11.86
Group Housing	General Residential Zone II	41	4.0654	21.27
Private Open Space	Open Space Zone II	9	0.3717	1.94
Nature Conservation	Open Space Zone III	1	10.5784	55.35
Private Streets	Transport Zone III	4	1.8303	9.58
TOTAL		**64**	**19.1129**	**100**

See Figure 4 for the SDP of Plett Lagoon Estate in relation to the delineated and buffered wetland area.

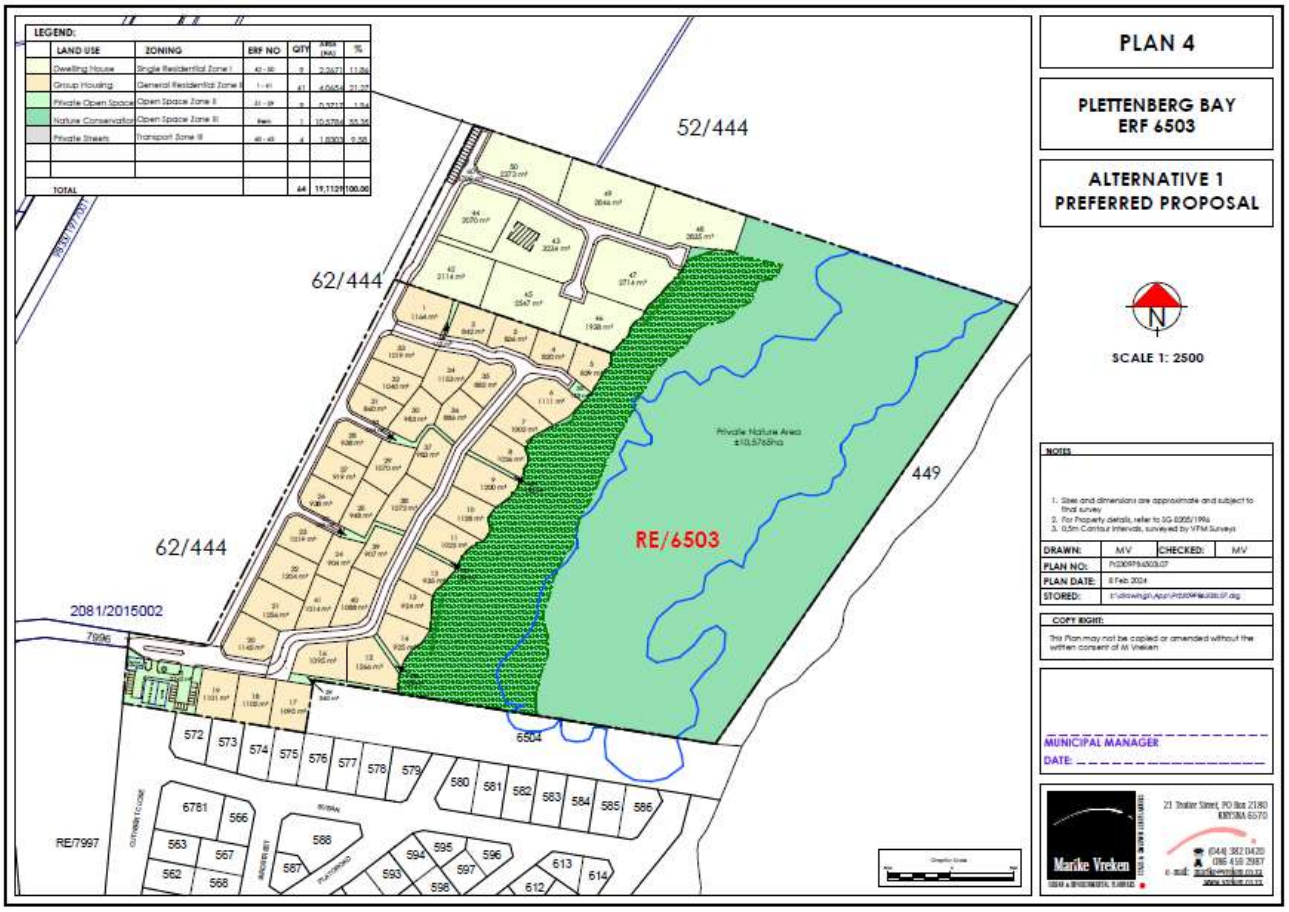

Figure 4: Site Development Plan for Plett Lagoon Estate on RE/6503, Plettenberg Bay

The construction of Plett Lagoon Estate is within 500m of a wetland and therefore in the regulated area of a watercourse as defined in GN4167 of the NWA. The development includes sewer lines within the regulated area of a watercourse, as well as a wastewater treatment plant from which the treated water will be used for irrigation, which is excluded from a General Authorisation and therefore requires a WUL as per Section 36 of the NWA of 1998.

Currently, there is no capacity through the municipal wastewater system to accommodate the wastewater generated by the proposed development, until upgrades to the municipal wastewater treatment plant at Ganzevallei have been undertaken. Once upgrades to the municipal WWTW have been undertaken, wastewater from the development will be pumped to a new foul sewer pumpstation within the road reserve from where it will be pumped to the municipal bulk sewer connection in Susan Street on a permanent basis. In the interim it will be gravity fed to a pump station located adjacent to the wetland buffer within the development, from where it will be pumped to the proposed new packaged wastewater treatment plant (WWTP). The WWTP has a membrane bioreactor (MBR) or similar, and is a containerised WWTP of ±12m in size to be located at the entrance to the development (Figure 4). The MBR technology combines microfiltration with bio-digestion to allow for physical separation as well as biological removal during the wastewater treatment process. Information regarding the onsite treatment of wastewater, and irrigation with treated wastewater was provided by VITA Consulting Engineers and Alveo Water (Appendix *4* and Appendix *5*)

See Figure 5 below for a block diagram of the proposed WWTP process.

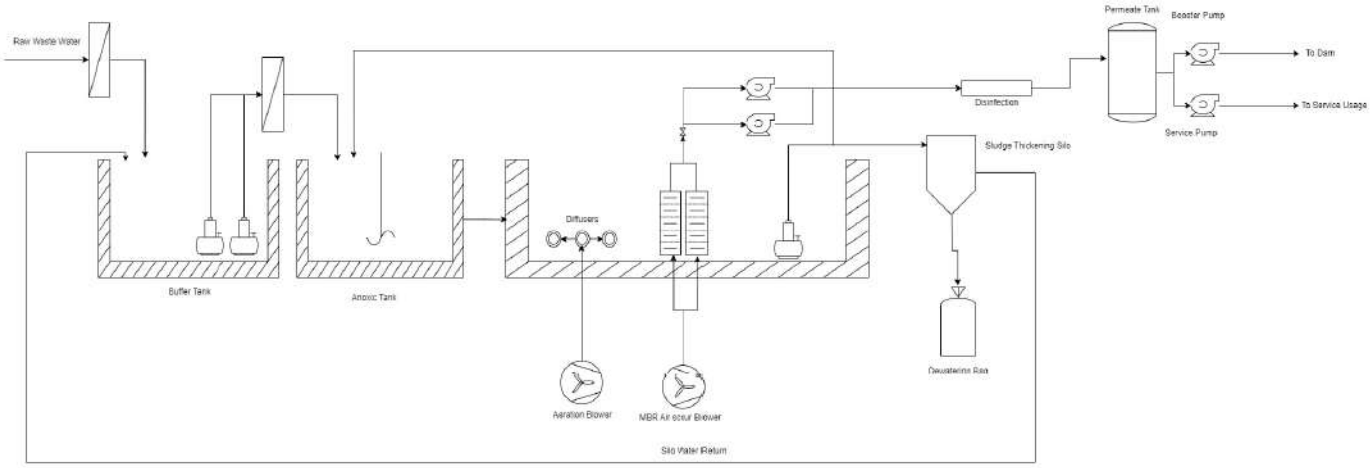

Figure 5: Block diagram of the proposed Membrane Bioreactor WWTP (Alveo Water, Appendix 5)

The plant will treat the annual average sewage flow of up to 40 m^3 of wastewater per day. The development will be built in stages over 2-3 years, therefore the maximum expected wastewater to be treated by the WWTP might never be reached, depending on the upgrade status of the municipal WWTW. Therefore, to make use of all the treated water it will be used on a temporary basis on open/undeveloped erven as well as for the irrigation of road verges, open landscape areas, swales and private open spaces but excluding the wetland and buffer area. See the Water Balance sheet in Appendix 6 for the irrigation volume calculations in relation to the expansion of the development. The volume of wastewater generated by the development will gradually increase as construction progress.

The Water Balance spreadsheet (Appendix *6*) indicates landscaped areas, when development starts, and zero occupancy is present as well as irrigation volumes needed for open areas as occupancy increases. The total area to be irrigated at full occupation, with irrigation areas allocated as per the Irrigation map from VITA Consulting Engineers (Figure 6) is approximately 4.9 hectare.

It is anticipated that the maximum peak flow of ±40 m^3/day of treated effluent at full occupation will be used for irrigation. The VITA Consulting Engineers water balance calculation (Appendix *6*), indicates that a deficit in irrigation water supply will be experienced when compared to the irrigation demand of the development area to be irrigated. The irrigation requirement will be ±45 000 m^3/a, whereas the irrigation supply will be ±15 000 m^3/a.

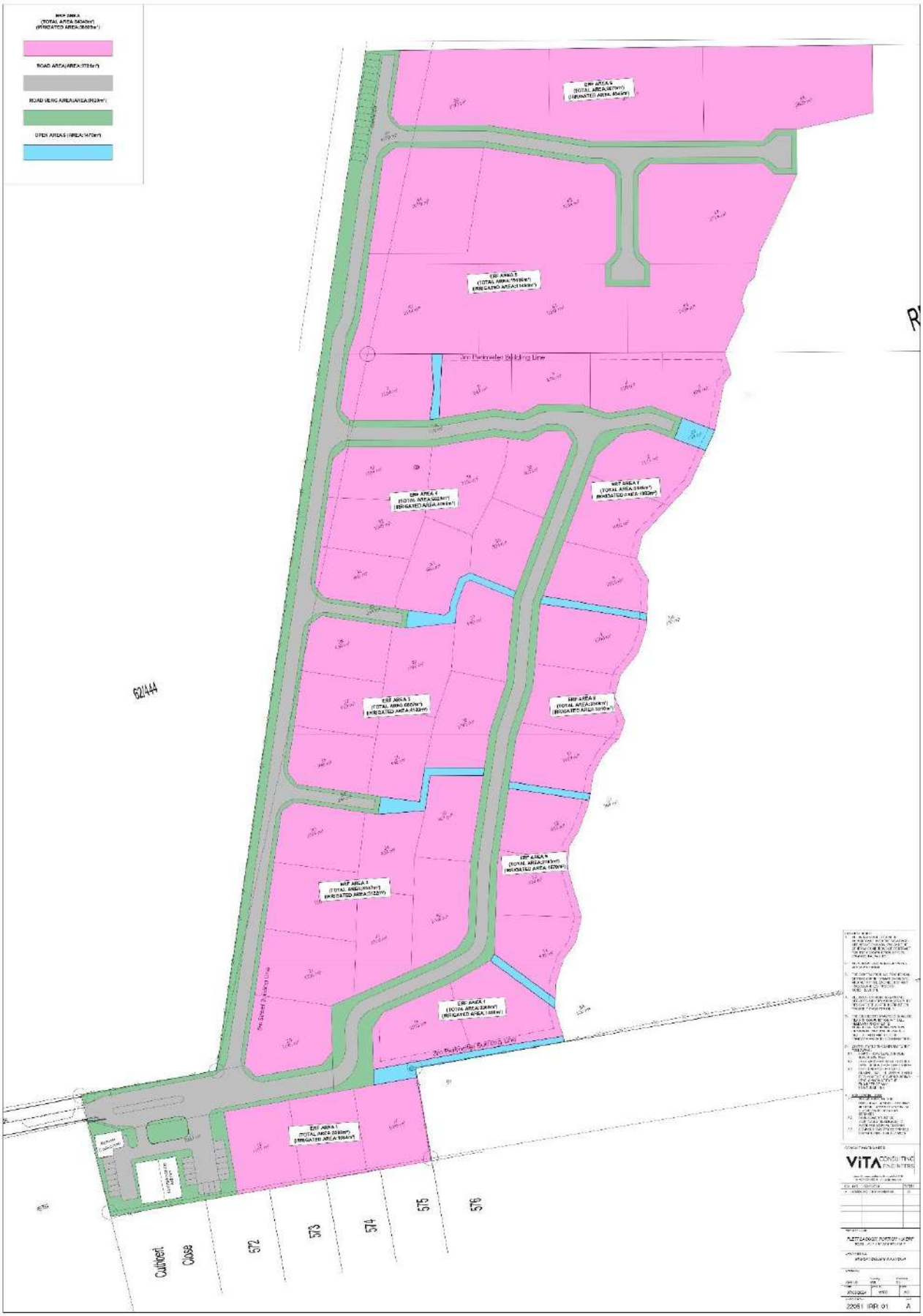

Figure 6: SDP indicating areas to be irrigated with treated wastewater (from VITA engineering report)

The maximum concentration of wastewater parameters in the treated effluent are expected to be below the general limit as prescribed in Section 21(e) of the General Authorisation. The treated water quality objectives given in the report for the WWTP can be found in Table 4 below which is referenced from the report provided by Alveo Water (Appendix *5*).

*Table 4: Treated water quality objectives of Alveo WWTP (*Appendix 5*)*

Parameter	General limit
COD (mg COD/l)	75
Ammonia as Nitrogen (mg N/l)	3
Nitrate as Nitrogen (mg N/l)	15
Orthophosphates (mg P/l)	10
Total Suspended Solids (mg TSS/l)	25
pH	5.5 – 9.5
Faecal Coliform (per 100ml)	1000

Emergency storage, should there be no need to irrigate due to high rainfall, is provided in the irrigation holding tanks with 40 m^3 capacity, equal to 24 hours emergency storage period. Though irrigation must take place, even when high rainfall is experienced, the predominantly sandy soil of RE/6503 has a very high permeability, which is estimated to be 86 mm/day (Civil engineering report, Appendix 4).

Should a problem occur in the MBR WWTP, it is usually fouling of the membrane. This is far along in the process and the water will be fully treated by this stage of the process, but the Total Suspended Solids would still be high. The MBR has 50% extra capacity to allow for more fouling before the membranes need cleaning, while the permeate pumps are designed to allow for increased pumping time should the membrane start to foul up, to allow for replacement of the membranes to be arranged. Certain parameters of the WWTP can be measured online and read at any time, so that changes can be made if need be. Spares of critical equipment will be on site should pumps or blowers break down. A back-up generator will also be available should electricity supply not be available (Alveo Water, Appendix *5*).

For further information on the Alveo Water treatment plant, see Appendix 5.

The water uses applicable to this application are:

21(c): Impeding or diverting the flow of water in a water course.
21(i): Altering the bed, banks, course or characteristics of a water course.
21(e): engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1)
21(g): disposing of waste in a manner which may detrimentally impact on a water resource;

Potable water supply for the housing development will be provided by the Bitou Municipality (Appendix *2*, Municipal approval letter).

6. Methods Statement (only for 21 (c) and (i) Activities)

Construction methods typical for a housing estate would be followed. This would include mass earth moving and the use of heavy machinery for excavation work for the construction of the housing development on RE/6503.

The aquatic specialist report (Appendix *1*) recommends that demarcated no-go areas must be

temporarily fenced off to protect the sensitive wetland and buffer area. This will ensure that the construction of the development adjacent to the wetland will have as low an impact as possible on the water resource. The possible impacts and mitigation measures of the construction and operational phase are addressed in the Aquatic Specialist Report (Confluent Environmental, August 2024). Specific detail on the stormwater management is given in the following section of this report.

There is not sufficient capacity in the existing Plettenberg Bay municipal sewer system to accommodate the proposed housing development. A temporary wastewater treatment plant will be installed inside a 12m container next to the maintenance building (near the entrance) of the development until necessary upgrades were made to the Ganzevallei WWTW to allow for sufficient capacity to accommodate the development within the municipal bulk sewer system (Civil Engineering Services Report, Appendix *4*).

The master plan indicated that the development should be accommodated within the Goose Valley reservoir zone, that upgrades is needed according to the master plan to be able to accommodate additional developments (GLS report, Appendix *3* and Civil Engineering Services Report, Appendix *4*). A temporary solution will be done by developers, with an estimated construction start date of September 2024. See Civil Engineering Services Report (Appendix *4*) for more details on the bulk water supply upgrades.

7. Stormwater Management Plan

The stormwater management plan for the proposed housing development is guided by Sustainable Drainage Systems (SuDS) design principles. VITA Consulting Engineers, Civil Engineering Services Report (Appendix 4), further provides information on measures to be taken to control stormwater in the proposed housing development.

According to the report, the high permeability of the *in situ* sands, will ensure high infiltration rates of stormwater into the subsoil layers. Therefore, a formalised stormwater connection is not required for this housing development.

The pre- and post-development peak run-off flow coefficients were compared. The conclusion was made that the housing development will add less than 10% impermeable surfaces to the catchment area. Therefore, it will have little impact on the run-off coefficients. The open swale stormwater network will be able to convey up to a 1:5 year rainfall event. For rainfall events larger than the 1:5 year, stormwater will be conveyed over internal roadways towards the lower lying eastern portion of the site, to follow the existing natural drainage routes and permeate through the *in situ* soils to the subsurface water reserves.

The report states that subsoil drainage networks will be used due to the seasonal perched ground water table. A 110 mm perforated pipe network will be installed 800 mm below the final road level to act as the subsoil drainage network. The open swale network will have an attenuation function to ensure peak flows will be the same as pre-development rates and to treat stormwater runoff.

The detention capacity and percolation rate of the stormwater swales, together with the gradient of the swales being less than the pre-development crossfalls, allows stormwater run-off to accumulate inside the swales and allow for contact time with the permeable *in situ* dune sands. The percolation rate of the *in-situ* dune sands is estimated at 86 mm/day (Civil Engineering Services Report, Appendix *4*).

7.1 Erosion Prevention

Since the cohesion of the dune sands is poor and susceptible to erosion, erosion preventative measures will be put in place. According to the Civil Engineering Services report, the detailed stormwater design will include the following erosion preventative measures:

- Concentration of stormwater will be minimised to prevent high volume/flow rates;
- Hard surface run-off (*driveways*) will be routed into swales via the internal roadways;
- Sheet flow into open swales will be promoted to maximise contact time with permeable dune sands;
- All channels with an internal velocity higher than 1m/s will be formalised (*armorflex*);
- All unlined channels will be landscaped with appropriate vegetation;
- Energy dissipation structures will be installed at high energy discharge points. These structures will be gabion baskets, which will create two weirs to lower the run-off velocity in order to prevent erosion downslope from them.

Further mitigation measures to prevent erosion on the site are given in the Aquatic Specialist Report (Appendix 1):

- Wherever possible driveways and parking areas must use open paver / permeable paving systems such as grass blocks or SuDS-pave type products. These should not be underlain with G7 due to its low permeability. This will utilise the highly permeable nature of soils at the site to reduce runoff to roads in > 1:5 year rainfall events.

- Stormwater outlets leading towards the wetland will need to ensure water does not form concentrated flow paths downslope and is attenuated and drained on the upper slope area. Following discussions with the engineer and engineering specialist at BOCMA it was considered likely that soil permeability at the site will be sufficient to facilitate local draining to groundwater if small detention ponds are included at the end of outlets. This will avoid the need for constructed outlets directing stormwater into the wetland.

- Detention ponds for stormwater management must be located on the inside of the residential area so they can be monitored for erosion and maintained clear of alien plants and free of litter.

8. Rehabilitation Plan

According to the Aquatic Specialist Report (Appendix 1), the wetland is in a very good ecological state. A few impacts are discussed in the PES section of the report. The recommendation is to deal with these impacts prior to starting construction, so that the wetland's condition can be improved, and best practice management of the wetland for conservation started early on.

There is no rehabilitation plan relevant for this housing development.

9. Water Uses Applied For

The application includes the following water uses as detailed in Table 5.

Table 5**:** Water Uses in this application.

Water use(s) activities	Purpose	Capacity/ Volume	Property Description	Co-ordinates
Section 21 (c) – impeding or diverting the flow of water to a watercourse				
Impeding the flow of water to watercourse (wetland)	Construction of a housing development within 500m of a wetland	N/A	RE/6503	34.041842°S 23.372702°E & 34.038037°S 23.375591°E
Section 21 (i) – altering the bed, banks course or characteristics of a watercourse				
Altering the characteristics of a watercourse (wetland)	Construction of a housing development within 500m of a wetland	N/A	RE/6503	34.041842°S 23.372702°E & 34.038037°S 23.375591°E
Section 21 (g) - disposing of waste in a manner which may detrimentally impact on a water resource				
Wastewater treatment plant (WWTP) within 500m of a wetland	Construction of a WWTP within 500m of a wetland to convey wastewater to a temporary package plant until the municipal bulk sewer connection once upgraded can be used	40 m^3/day	RE/6503	34° 2'30.97"S 23°22'23.19"E & 34° 2'30.69"S 23°22'23.35"E
Section 21 (e) - engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1)				
Irrigation of paved verges and private erven with treated wastewater within 500m of a wetland	Use of treated wastewater to irrigate designated areas of the development	40 m^3/day	RE/6503	34° 2'29.80"S 23°22'18.80"E & 34° 2'19.12"S 23°22'37.64"E

10. Description of the Environment

The site to be developed is located at the lower extent of quaternary catchments K60E and K60G, which drain the Keurbooms River to the east and the Piesang River to the west respectively (Aquatic Specialist Report, Appendix *1*). The Mean Annual Precipitation is 647 mm, which can fall with a very high intensity. According to Cape Farm Mapper the average temperature is 16.5 ℃ with a temperate climate, no dry season and warm summers (Köppen-Geiger Climate Zones, 1980-2016). The property is located adjacent to the Keurbooms River, with the Keurbooms Estuary mapped as the primary aquatic feature proximal to the site.

The Present Ecological State of the estuary is classified as **A, natural**, and the same category is applicable for the Recommended Ecological Category. The estuary has a high conservation value, supporting one of only three known populations of the iconic Knysna Seahorse occurring in *Zostera* (seagrass) beds.

The Ecological Importance and Sensitivity of the wetland was determined to be '**Very High'** (Aquatic specialist report, Appendix *1*).

11. Impacts and Mitigation Measures

The potential impacts and mitigation measures that are expected from the proposed activities are presented in Table *6***.** The phases assessed by the aquatic specialist, were the design and layout, construction and operational phases of the proposed housing development.

11.1 Design and layout phase

11.1.1 Stormwater management

The stormwater management plan compiled by Vita Consulting Engineers proposes SuDS-type design features for the management of stormwater, which are fully supported. The report acknowledges the high erodibility of soils on the site. Being downslope of the proposed development, the wetland is vulnerable to smothering by transported sediment from eroded slopes, and being inward draining, this material would eventually form terrestrialised islands with different vegetation, most likely being colonised by alien plant species. Avoidance of erosion is therefore the primary aim of managing stormwater on the site. The following additional mitigation measures are recommended to further reduce impacts:

- Wherever possible driveways and parking areas must use open paver / permeable paving systems such as grass blocks or sudpave-type products. This will utilise the highly permeable nature of soils at the site to reduce runoff to roads in > 1:5 year rainfall events

- Stormwater outlets leading towards the wetland will need to ensure water does not form concentrated flow paths downslope and is attenuated and drained on the upper slope area. Following discussions with the engineer and engineering specialist at BOCMA it was considered likely that soil permeability at the site will be sufficient to facilitate local draining to groundwater if small detention ponds are included at the end of outlets. This will avoid the need for constructed outlets directing stormwater into the wetland.

- Detention ponds for stormwater management must be located on the inside of the fenced residential area so they can be monitored for erosion and maintained clear of aliens and free of litter.

11.1.2 Fenceline

Alternative scenarios were assessed for fencing the development in the Aquatic Specialist Report. The 'Original Fenceline' was first proposed in an earlier version of the report and discussions, but subsequent concerns about safety on the site prompted the proposal of alternative fenceline layouts.

a. Original Fenceline:

As the wetland area is the last remaining area of significant wetland and natural vegetation remaining along the western shoreline of the Keurbooms Lagoon, it is important to protect the function as an ecological corridor. Wildlife currently moves between the wetland and lagoon area, and an important function of the wetland is the provision of shelter and habitat for feeding, breeding and movement. The following mitigation measures are recommended:

- The fence line should enclose the residential area only and not the wetland area. The final location is yet to be determined but should minimise the disturbance of natural vegetation on the slope as far as possible. This is very important for the ongoing stability of the slope which is protected by established vegetation.

- Install code-operated pedestrian gates along the fence line aligned to existing pathways and roads to allow joggers and walkers access to the wetland and lagoon.

- Use alternative security measures to monitor the wetland such as guarding or cctv cameras.

- It is assumed that typical Clearvu-type fencing would be preferred, however this seriously restricts the movement of any animals. Install larger grid sections along the base of the fence line in a few sections, to allow smaller-bodied vertebrates to move in and out of the residential area.
- Do not use any electric strands along the base of the fence line.

b. Additional and Alternative Fencelines

The original fenceline, the yellow line in Figure 7 below, avoided the buffer and wetland area and minimised vegetation disturbance. This fencelinne had zero impacts on the wetland and buffer, but from an aesthetic perspective, the developer prefers to place the fence at the bottom of the slope along an existing pathway, hence fragmenting an area of ±1.3 ha natural vegetation and which encroach into the wetland buffer (Aquatic specialist report, Appendix *1*).

Figure 7: RE/6503 fenceline options in relation to delineated wetland (Aquatic Report Appendix 1)

An impact assessment was compiled by the aquatic specialist, for the Construction phase and Operational phase of the development, see Table *6* below.

Table 6: Summary of impacts and mitigation measures.

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
Construction Phase			
Pre-construction wetland rehabilitation	Habitat degradation by alien vegetation and through mowing	• Control alien vegetation in isolated stands where it occurs. No herbicide to be used in the wetland. Large trees must be fully ring-barked, while smaller plants can be hand-pulled or removed using a tree popper. Shrubs of bramble and Lantana must be cut back with clippers until the stump is visible, which must then be removed. • All vegetation biomass must be removed from the wetland and disposed of at a green waste dump. No vegetation must be dumped in the wetland. • Follow up alien must be conducted every 6 months following initial clearing to ensure emergent seedlings are consistently removed. • Cease mowing the northern area of the wetland barring one path that can be maintained for access	Minor - Positive Mitigation exists and will considerably reduce the significance of impacts
Disturbance to wetland and buffer areas	Vehicles, workers and materials active in wetland and buffer area	• Pre-construction, temporary fencing must be erected along No-Go areas with the top of the slope leading to the wetland indicated as the sensitive feature. • Signage indicating No-go areas must be placed on fencing. • All contractors must attend a site induction and be briefed that vehicles, workers, equipment and materials may not encroach into No-Go areas around wetlands. • Consider the termination of contracts or fines for encroachment into the no-go area.	Negligible-Negative Mitigation exists and will considerably reduce the significance of impacts
Stormwater runoff from the site	Sedimentation in the wetland and creation of preferential flow paths	• The objective of stormwater management during the construction phase is to eliminate the risk as far as possible of discharging sediment-laden water downslope into the wetland. • Daily and weekly site meetings must consider forecasted rainfall to avoid working during such periods, and to plan accordingly for predicted high	Negligible-Negative Mitigation exists and will notably reduce significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
		rainfall events. Work on the site must cease altogether during rainfall. • The site office must have a store of materials suitable for rapid response to erosion control such as shade-cloth (silt-fencing), haybales (check-dams), wooden droppers, hessian fabric, and fencing wire. • All material stores should be kept on flat areas and bunded to prevent material loss during rainfall. • When construction commences in the residential area, create a compacted, low soil berm along the perimeter of the site approximately 400 mm high to retain stormwater on site and reduce runoff to surrounding areas. • Monitor the site during / following periods of rainfall, and install haybale check dams at points where runoff collects and could overtop / breach the soil berm. • Following rainfall, any water that must be pumped out of pools in excavated areas must not be directed to the wetland. The soil berm system or a temporary haybale check dam can be constructed to contain	
Installation of fence line	Greater than necessary footprint for fenceline installation Loss of vegetation, habitat disturbance, water pollution and harm to animals	• Access points for delivery of material are only from the northern side along drier parts of the wetland where the area has been mowed and disturbed already. No Access is permitted by vehicle along the southern edge because this has high sensitivity wetland vegetation and is very wet. • The fenceline may not be installed during the breeding season from September to February. This is to avoid disturbance or harm to dispersing wildlife which are more active and vulnerable at this time. • The limit of disturbance along the fenceline area is 2 m on one side of the fencline which should be already transformed by the jeep track. • Fencelines can be installed with the help of a small machine such as a bobcat, but should otherwise	Minor-Negative Mitigation exists and will considerably reduce the significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
		be installed by hand. No excavators or larger machines are permitted to drive along the fenceline. • Vegetation obstructing work on the fenceline should be cut or trimmed, and not uprooted, unless in the direct path of the fenceline. • Disturbed soil along the fenceline should be revetated with low growing indigenous grass already found at the site. Stenotaphrum secondatum (buffalo grass) is recommended in wetland areas. This can create a relatively open area along the fenceline which can be monitored or patrolled on foot. • Any concrete mixing for posts must be contained in a wheelbarrow or small vehicle (e.g. Kubota), and is not permitted on the ground, especially in the wetland or buffer areas. • Excess concrete must be removed from the site and disposed of. No waste materials, dirty water, or concrete may be left in the wetland area. This must be monitored closely by the ECO with incidents immediately reported to DEA&DP and/or BOCMA. • Absolutely no washing of tools in water in the wetland. • No water from the wetland may be used to mix concrete. • Any vegetation cleared for installation of the fence must be removed from the site, or lightly scattered. It cannot be piled up along the fence as in Fig. 22 which creates further barriers and smothers vegetation.	
Operational Phase			
Stormwater management runoff. Slope erosion and sedimentation of the wetland	Damage caused by stormwater runoff	• The site should be assessed by an aquatic specialist 6 months following conclusion of construction to confirm that stormwater management infrastructure is functional and not causing any impacts to the wetland.	Negligible-Negative Mitigation exists and will notably reduce significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
		• Stormwater management infrastructure such as swales, drains and culverts must be routinely monitored and maintained to ensure they are free of blockages and functional. This includes a regular inspection of all stormwater outflows to identify any emerging erosion issues, and keep the structures clear of excessive siltation and litter. • Where erosion is occurring, immediately identify and control the origin of the flow path, and protect the site of erosion by replacing soil with soil from the site, and stabilising with indigenous vegetation found on the site. Where more serious interventions are required spot installations of gabions may be suitable for stabilisation provided they are not in the wetland buffer or in the wetland itself. As far as possible, flows must be attenuated, and the source of erosion controlled upslope within the residential area. • Eroded areas of the steep banks must be refilled with topsoil (from the site), reseeded with indigenous vegetation, covered with a light mulch and protected with soil saver mats. The use of silt fencing can be extended to problem areas to provide further protection.	
Alien vegetation establishment	Establishment of aliens in disturbed areas post-construction resulting in habitat degradation	• Follow up inspection and control of alien vegetation in the residential development and the wetland on a 6-monthly basis. • No herbicides to be used in the wetland or wetland buffer. Sprays and / or cut-stump treatments may be used in the residential areas. • Ensure bare areas of vegetation are replanted with indigenous vegetation that occurs naturally on the site. • Under no circumstances may removed alien plants be discarded in the wetland. The HOA must inform the landscaping / gardening team that no dumping of vegetation or discarding of waste material may happen in the wetland or buffer area.	Negligible-positive Mitigation exists and will considerably reduce the significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
Landscaping, fire-breaks and recreational pathways maintenance	Inappropriate mowing, planting or trimming of vegetation leading to habitat degradation	• The north-eastern boundary fire-break should be maintained at 20m wide as a defensible zone for adjacent housing. Mowing with weed eaters can continue along the 20m strip. IF it is thought that reed growth (Phragmites) beyond the 20 m fire-break poses a serious fire risk (agreed to in writing by SCFPA), then reeds may be cut by hand to 1m high for an additional 20 m with no soil disturbance by vehicles or machinery permitted. Reeds (no other vegetation) must be cut during winter to avoid disturbance to breeding birds, and removed from the wetland area to avoid smothering vegetation. • The south-western boundary between RE/6503 and neighbouring Erf 6504 can be maintained with a 5m firebreak which provides vehicle access along the fenceline. The wetland area along this section should not be trimmed lower than 1m however. This is to prevent disturbance to the eggs of aquatic biota which are often deposited in the base of stems and leaves close to the water. As there are no houses in the adjacent Erf 6504 the fire risk is reduced, and in any event the entire Erf 6504 is maintained with very low-cut vegetation. Should this situation change (ie. houses built), then the SCFPA should be consulted on best practice adjustments in consultation with an aquatic specialist. • Currently at least two road-width pathways are maintained by mowing through the wetland/open space which provide access for firefighting. Comment on the necessity of vehicle access should be provided by the SCFPA as it would be preferable to maintain narrower paths at a width of 3 m to allow walking / jogging / small vehicle access only (e.g. kabota). Whether maintained as roads or pathways, maintenance must include the removal of alien vegetation (previously discussed), trimming of pathways using hand-held	Negligible-positive Mitigation exists and will considerably reduce the significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
		weed eaters and no disturbance to indigenous plant roots or soil is permitted. • Use simple markers along the designated edge of paths and fire-breaks to ensure landscaping teams do not encroach further than the designated edge. • No herbicides can be used to maintain pathways or fire-breaks in the wetland area or buffer. • The existing footprint of any mowed or cleared pathways may not be enlarged. • No new pathways may be created in addition to those already existing in the open space area. • Do not plant any exotic plants that do not occur naturally at the site in any area of the wetland or buffer. i.e.. under no circumstances may kikuyu grass be planted in any part of the wetland or buffer. • No vehicles (tractors pulling mowers) may be used to cut vegetation in any part of the wetland, for firebreaks or pathways. • No fire-break may be cut along the new fenceline proposed adjacent to the estuary. • Ensure gardening / landscaping team / homeowners do not dump green waste into the open space area	
Leaking, blocked or overflowing sewerage infrastructure	Pollution and eutrophication of the wetland leading to habitat degradation and impacts to biota	• All sewerage infrastructure must be well maintained and kept free of obscuring vegetation. Manholes, sewer lines, and the pump stations must be accessible, easily observed, and routinely inspected for leaks or blockages. • Emergency response measures to sewage spillages should be maintained on site, including lime to treat sewage and sand bags to contain spill and limit their dispersal. An emergency response protocol must be established by management of the HOA. • Residents should be provided with information of what can / cannot be flushed into toilets. This knowledge is often assumed, but is frequently	Negligible-Negative Mitigation exists and will considerably reduce the significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
		over-estimated. Even educated people treat a toilet like a rubbish bin. • Ensure sufficient backup power systems are available for the operation of pump stations during load shedding and at peak times (e.g. December).	
Irrigation with treated wastewater daily resulting in eutrophication of the wetland	Seepage of treated wastewater into the wetland could result in eutrophication	• Under NO circumstances can treated wastewater be discharged to the stormwater system, as this leads directly to the wetland which has a unique water chemistry that supports a diverse assemblage of fauna and flora. • Install 2 groundwater spikes / wells at 10m depth to monitor ground water on the upland area (within the estate) near the wetland buffer. These should be located at least 200 m apart and provide easy access during the construction and operational phase. They should not be located in any area of significant natural vegetation, and should rather be sited in grassy areas. • Collect a water sample from each monitoring point on a monthly basis during the construction and operational phase and submit to a registered laboratory for the analysis of parameters indicated by DWS general limits. • Water chemistry results should not vary by more than 10% of background values as established prior to the development. Therefore, the spikes should be installed for monitoring prior to the commencement of construction, and water sampling to establish the baseline should be undertaken for 3 months. • If water chemistry deviates significantly from background levels and begins to indicate eutrophication (nutrient enrichment; e.g. elevated levels for > 3 months), then an alternative solution to the irrigation of water must be provided. This could involve discharging to clay-lined ponds or irrigating on the neighbouring school's sports fields. Proactive steps to mitigate eutrophication must be taken from the first month that elevated	Minor-Negative Mitigation exists and will notably reduce significance of impacts

Impacts of the activity on the water resources	Impacts of the activity to other water users	Mitigation Measures	Post-mitigation impact
		levels are noted, so that if elevated levels persist, a solution is fully actionable by the 3rd month. • Water samples must be submitted to the Bitou Municipality, BOCMA and be reviewed by an aquatic ecologist on a quarterly basis for the first two years of operation of the estate.	

12. Water Demand and Water Supply Analysis

12.1 Water Demand

A capacity analysis was drawn up by GLS Consultancy (Appendix *3*) for Plett Lagoon Estate. The purpose was to determine if the existing water network system has sufficient capacity to accommodate the proposed new housing development.

According to VITA Consulting Engineers Civil Engineering Services report (Appendix *4*), the potable water demand for the development will be as follows:

- Gross annual average daily demand = 61 m^3/day
- Instantaneous peak demand (peak factor – 10) = 7.06 ℓ/s
- Fire flow criteria (low risk) = 15 ℓ/s @ 10 m

12.2 Water Supply Analysis

Bitou Municipality (Appendix *2*) confirmed that bulk infrastructure can be supplied for the proposed housing development from the existing water reticulation system, provided that the developer implements the upgrade of services as detailed in the GLS network analysis report of 27 February 2023 (Appendix *3*).

According to GLS consultancy, the Goose Valley, Wittedrift and Matjiesfontein reservoirs are at capacity and should be upgraded according to the master plan before additional developments within the supply areas of the reservoirs can be accommodated.

To accommodate the proposed housing development as well as other potential development areas within the Goose Valley, Wittedrift and Matjiesfontein reservoirs, the minimum upgrades required to improve the existing bulk supply system are stipulated in the report.

The Plettenberg Bay sewer reticulation system can accommodate the proposed development, with the sewer connection position proposed to be at the existing 150 mm diameter outfall sewer in Susan Street (GLS Consultancy, Appendix *3*), only once Ganzevallei Wastewater Treatment Works (WWTW) has been upgraded. Bitou Municipality has commenced with the appointment of a Professional Service Provider to start with the upgrading process, such as the preliminary design, environmental authorisations etc. A bulk connection to the Bitou sewer network will be commissioned once the Ganzevallei WWTW has been upgraded and the temporary Wastewater Treatment Plant (WWTP) will then be decommissioned and removed from the development (Civil Engineering Services Report, Appendix *4*). In Appendix *7* the Municipal approval letter can be found, for the development to treat their wastewater until such time that the upgrade to the bulk sewer line has been done to allow the development's wastewater to be treated at Ganzevallei WWTW.

12.3 Water Balance

A water balance for the use of treated effluent for irrigation is provided in the Vita water balance spreadsheet, Appendix *6*. This was calculated over a 12-month period for each phase, indicating the residence increase as the development is being built, with the estimate 40.1 m^3/day treated effluent once the development is fully developed as the final and maximum volume expected.

The irrigation area is approximately 4.9 ha at full occupancy (Figure 6) and includes road verges, open areas, and occupied erven. The total irrigation application of 3 mm/day (see Table 7 below,

as per Appendix *6* Water balance calculations) has been estimated based on a daily irrigation of 3 mm/m^2 and a storage capacity of 40 m^3 in tanks. According to the water balance calculation, the total yearly averaged irrigation demand that can be accommodated on the property is ±3 737 m^3/month. This is greater than the maximum peak supply from the wastewater package plant (which is, when averaged over a year, estimated at 2 520 m^3/month) and provides a factor of 1.5 safety margin.

Table 7: Landscaping Water Demand

	Daily Demand
Road verges / open erven	3 mm/m2
Occupied Erven	3 mm/m2
Trees	5 litre/tree
Hedges and SuDS areas	3 mm/m2
Other	3 mm/m2

During abnormally wet conditions when irrigation is not possible due to high rainfall periods, the treated effluent will be stored in the on-site irrigation tanks (40 m^3 capacity) with sufficient surplus capacity to accommodate all the generated treated effluent for an emergency period of 24 hours. Should additional emergency storage be needed, a honey sucker will remove the effluent from site to be disposed off at an accredited wastewater site (Vita Consulting Engineering, Appendix *4*).

Based on the calculated water balance (Appendix *6*) it is estimated that treated effluent generated from the package plant will not result in excess wastewater generated on the property, even at the fully developed stage. The calculations are based on a water demand of 3 mm/m^2 for road verges, open erven, occupied erven and SUDS areas, and 5 mm/m^2 for trees. See Table 8 for the monthly irrigation balance when the development will be completed (VITA Consulting Engineers Water Balance spreadsheet, Appendix *6*).

Table 8: Monthly irrigation balance (Fully occupied), obtained from Water Balance spreadsheet (Vita Consulting Engineers, Appendix 6*)*

Months	Water demand (m^3)	Treated effluent (m^3)	Irrigation shortfall (m^3)
50 developed erven			
January	5544.38	1240.1	4304.28
February.	5007.83	1120.1	3887.73
March	5544.38	1240.1	4304.28
April	5365.53	1200.1	4165.43
May	1403.53	1240.1	163.43
June	1358.26	1200.1	158.16
July	1403.53	1240.1	163.43
August	1403.53	1240.1	163.43
September	1358.26	1200.1	158.16
October	5544.38	1240.1	4304.28
November	5365.53	1200.1	4165.43
December	5544.38	1240.1	4304.28
Total	**44 843.52**	**14 601.2**	**30 242.32**

13. Water Quality

Possible negative impacts to water quality of the wetland which could be caused during the construction and operational phase of the project has been addressed. During the operational phase

of the housing development, stormwater runoff is primarily associated with impacts on water quality. Several impacts have been anticipated and mitigation measures are provided in Table *6* of this report.

To ensure water quality is maintained and monitored for change over time, 2 groundwater spikes / wells at 10m depth will need to be drilled (as per Aquatic Report Appendix *1*), to monitor the groundwater quality on the upland area and near the wetland buffer. Monitoring wells should be located 200m apart with easy access during both the construction and operational phase.

Water quality monitoring must commence before construction begins to ensure a meaningful baseline against which subsequent samples can be compared. Samples must be collected at both points on a monthly basis during the construction and operational phase.

14. Public participation

The public participation (PP) process must be completed in terms of Section 41 (4) of the National Water Act, Act no 36 of 1998. A public participation (PP) started 10 November 2023 until 1 February 2024.

A second PP will run allowing 60-working days allowing Interested and Affected parties to comment on the development. This PP will include the wastewater treatment plant and fence line along the development. The PP will commence 16 August 2024, the summary thereof will be summarised in a PP report.

15. Inputs/Authorisations from other Departments /Stakeholders

1. Municipal approval for development (Appendix *2*).
2. Municipal approval for development to allow package plant until upgrade of Municipal wastewater plant (Appendix *7*).

16. Section 27 (1)

The requirements contained in Section 27(1) of the National Water Act, 1998 (Act 36 of 1998) have been considered and are discussed further below.

a) Existing Lawful Water Uses

There are no existing lawful water use in place.

b) Need to redress the results of past racial and gender discrimination

The construction of the housing development, Plett Lagoon Estate on RE/6503 in Plettenberg Bay, will contribute to redressing the results of past racial and gender discrimination. It will create work opportunities during the construction and operational phase of the project.

The proposed project's focus is on using local labour and local professionals in all phases of the project. Approximately 80% of the workforce during the construction phase will be locally sourced, with approximately 95% of the workforce employed from the local area during operational phase of the development. Skilled and unskilled job opportunities will be created during the construction

phase of the project, of which some will become permanent opportunities once the development is in the operational phase.

Small, Medium and Micro Enterprises (SMME) subcontractors will be used. The value of the combined construction phase of the different houses and infrastructure thereof is estimated to be approximately R500 million. A significant contribution and jobs will be created for SMME contractors. Approximately 80% of consultants for the project will be sourced locally.

Depending on the skills available, all phases of the project will source locally skilled and unskilled contractors. Material suppliers for the project will be largely local suppliers from Plettenberg Bay and the surrounding areas. Local consultants from various specialised fields will be used. This will include:

- A town planner
- Civil engineering services and consultants
- Electrical design consultants and contractors
- Sales personnel
- Landscaping engineers
- Structural engineers
- Conveyancers
- Environmental consultants etc.

During the construction and operational phase of the project it is estimated that 200-300 of skilled and unskilled workers will be needed. This will allow further economic growth and development for these individuals and businesses, while benefitting their families. With the start of the operation of the mall, additional work opportunities will be created by shop owners who are likely to employ a variety of workers for the different services to be provided by shops.

The employment opportunities foreseen to be created due to the project can be found in Table 9. The job opportunities created with this project will allow further economic growth and development for these individuals and businesses, while benefitting their families. With occupation of the development, additional work opportunities will be created by owners who are likely to employ domestic workers, service providers, garden services and security guards etc.

The applicant does not have a BBBEE status.

c) Efficient and Beneficial Use of Water in the Public Interest

In terms of the improvement and enhancement of the economy the proposed housing development will provide both temporary and permanent employment and contribute to the local economy. The water use in this case is Section 21 (c) and (i) for the development of the housing estate within 500 m of the wetland. The people that will benefit from this water use will be the community of Plettenberg Bay, since many jobs will be created both during the construction and operational phase of the housing development.

The proposed development occurs adjacent to a wetland area, classified as a depression wetland with a PES of A (Natural) and an EIS of 'Very High'. It has a wide variety of wetland plant species. Freshwater species were dominant, but a few species typically located in the supratidal zone of estuaries were recorded. Species considered to be obligate as well as facultative wetland plants were found. A 30 m wetland buffer was recommended by the aquatic specialist, as it will protect the wetland from the residential development upslope, but also provide a level of connectivity between the terrestrial and wetland areas with the lagoon. The aquatic specialist considered impacts which may occur during the construction and operation phase of the project. The conclusion was that most of the impacts will be Negligible negative with some impacts being negligible positive (Aquatic specialist report, Appendix *1*).

The buffer of 30 m around the delineated wetland performs an important function for the maintenance of connectivity between the lagoon and the wetland. It buffers the lagoon from the development as well as the wetland from the development. The aquatic specialist supports the development of the Plett Lagoon Estate, provided that the residential areas are outside the wetland and buffer area and that the wetland is conserved and well maintained, while adhering to the mitigation measures stipulated.

d) Socio-economic Impact

Housing for a growing population is becoming increasingly important on a global, national and local level. Building houses not only creates part-time employment during the construction phase, but also ensures permanent work opportunities, which in turn create downstream employment opportunities.

This project is expected to contribute approximately R550 million a year to the economy through:
Seasonal contract work – R200 million
Permanent work – R100 million
Direct costs to local suppliers – R250 million.

Permanent direct and indirect work, such as domestic workers as well as skilled vocations such as plumbers and electricians are created with the construction of the development. Indirect job opportunities will also be created during operational phase when homeowners enter into contracts with local service providers such as fibre contracts, delivery services etc.

The expected annual income, either through direct or indirect job creation, is expected to benefit the local Plettenberg Bay community and surrounding areas. People who will be employed for this development will consist of skilled and unskilled workers, providing opportunity for different social areas to be uplifted by means of employment.

The expected costs and income which will be generated by this development:

- The total cost for this project is expected to be R600 million.
- The expected annual income created by the development is approximately R120 million, for labourer jobs, consultants employed, materials bought and capital investment.
- A total of ±R300 million is expected to be for employment during construction.

Socio-economic impacts are expected to be positive, by reducing unemployment within the local municipality of Bitou, benefitting the local economy as well as living conditions of the community. Failure of this project to be approved will result in loss of employment opportunities listed in Table 9.

i) Of Water Use or Uses if Authorised:

The development of the housing estate will create not only part-time employment during the construction phase, but also ensure permanent work opportunities once it is operational. The estimated job opportunities that will be created is summarised in Table 9 below.

Table 9: Employment opportunities created by the Plett Lagoon Estate development

Job Opportunities	Number of Job Opportunities	Type of employment	Affected sectors of the economy
Direct	300 35 80	Contract: Construction Contract: Operational Permanent: Operational	Civils Planning Surveying Security
Indirect	70	Permanent:	

		Domestic Gardeners Security	Town planners Environmental specialists Architects Engineers Geologists Heritage consultants
	Ad hoc numbers	Contract: Plumbers Electricians Service providers Estate maintenance	

The contribution to the municipality due to the development is envisaged to be approximately R15-20 million, which can be used to support a range of municipal services. The expected annual contribution to the economy by direct and indirect work being created, is estimated to generate a spending turnover of at least R550 million.

The development will help to reduce unemployment within the local municipality of Bitou, benefitting the local economy and wellbeing of the living conditions of the community. Failure of this project to be approved will result in the loss of employment opportunities as listed in Table *9* above.

Bitou Municipality supports the development of the proposed housing development and confirmed that civil services will be available for this development with proposed upgrades, allowing the interim use of a package plant on site (Appendix *2* and Appendix *7*).

ii) Of the Failure to Authorise Water Use or Uses:

Failure to authorise the water use of the proposed Plett Lagoon Estate, will forfeit the economical benefits to the local area as well as local people who can benefit from work opportunities during the construction and operational phase of the project.

e) Any Catchment Management Strategy Applicable to the Relevant Water Resource

The dynamic nature of local, national and global environments constantly present local government with new challenges and demands. Similarly, the needs and priorities of the local communities within Plettenberg Bay are ever-changing. This presupposes greater co-ordination and integration with other external stakeholders such as national and provincial government, business community and civil society.

The Keurbooms Estuary resource quality objectives indicates that the key threat to the system includes barriers to flow and movement of fauna within the system, alien invasive vegetation in the catchment, habitat loss and modification, reduction in freshwater runoff and disturbance caused by recreational activities.

The Bitou municipality's vision is to *'partner with communities and stakeholders to sustainably deliver quality services so that everyone in Bitou can live and prosper together'*. Economic development and job creation is one of the strategies of Bitou Municipality, which is stipulated in the IDP 2022-2027. Although not a function of the municipality, they are obligated to create an environment for economic growth and job creation. Their strategy is to create a safe environment for investors and develop investor friendly policies. Their plan is to support township tourism and other SMME ventures.

The aquatic specialists' finding was that the wetland's Present Ecological State (PES) is A (Natural), but had a score close to the boundary with B (Largely Natural). Minor impacts slightly reduced the state of the wetland from its natural reference condition, due to isolated areas invaded with invasive

plants, mowing of some areas of wetland vegetation and existing roads and paths through the wetland. Most impacts affect vegetation which is reflected in the score of B, Largely Natural, determined in the PES assessment. Minimal impacts were observed to affect the wetland's hydrology water quality or geomorphology (Aquatic specialist report).

The EIS of the wetland was determined to be 'Very High', with a definition of this category wetland as follows:

"Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers."

The aquatic specialist advised that an important aspect of this wetland type's sensitivity is that it is inward draining (endorheic) and therefore any water, sediment or material inputs cannot be 'flushed out' of the system. Therefore, careful consideration was given to mitigation measures to manage the stormwater and sewage on site with SuDS- type interventions to effectively manage stormwater on site with minimal risk to the wetland habitat and water quality.

Application for the WUL and the implementation of associated licensing conditions such that the Reserve and Resource Quality Objectives are met is linked directly to Strategic Area 1 of the BOCMA management strategy:

"Protecting People and Nature as well as sharing for Equity and Development."

The WUL application process has been implemented to ensure that water use activities are authorised in a manner that achieves these broad mission statements, particularly the mission of ensuring healthy water resources and allocating water for all forever.

f) Likely Effect of the Water Use to be Authorized on the Water Resource and on Other Water Users.

Stormwater run-off is a factor which can potentially cause harm to the wetland adjacent to the property development, if not adequately managed. Increased volumes and velocities of stormwater discharging into the wetland have the potential to cause down cutting and channel incision. However, mitigation factors have been put in place to prevent damage to the adjacent wetland.

The development will occur outside of the delineated area of the wetland which is also buffered by a vegetated buffer zone of 30 m in width. The aquatic specialist supports the SuDS-type design features for the stormwater management of the property. The Engineering report acknowledges the erodibility of the soils on the site and with the wetland being downslope of the proposed development, the smothering of the wetland due to transported sediment from eroded slopes needs to be avoided. Therefore, the primary aim is to avoid erosion by managing the stormwater from the site.

With the measures put in place to manage stormwater through SuDS-type interventions, the aquatic specialist concluded that there should be minimal risk to the wetland habitat and water quality. In addition, if the development is planned outside of the wetland and buffer area, the wetland is conserved and well maintained, hence the development of Plett Lagoon Estate is supported.

Emergency measures will be put in place to ensure that the treated effluent from the package plant can be contained for 24 hours, should it not be suitably treated for irrigation purposes. If required, after the initial 24-hour emergency period, the municipal treatment works will be contacted to remove

the effluent if it cannot be re-circulated. An automated alarm system will notify the personnel when there is a problem with the treatment works.

g) Class and the Resource Quality Objectives (RQO) of the Water Resource

Plett Lagoon Estate on RE/6503, falls within the Gouritz Catchment, within quaternary catchment K60E (Figure 2). The eastern portion of the site is below the 5 m.a.m.s.l. contour which places it in the Estuarine Functional Zone of the Keurbooms Estuary (Figure 1). The quaternary catchment falls within the G15 Coastal Integrated Unit of Analysis (IUA). The Water Resource Class for this IUA is II, indicating moderate protection and moderate utilisation, with a Targeted Ecological Category (TEC) of B. The wetland to the south of the development (Figure 3) lies below the 5 m contour line and is protected by a 30 m buffer.

RQO's are defined as clear goals (numerical or descriptive statements) relating to the quality of a water resource and are set in accordance to the management class for the resource to ensure the water resource is protected. The purpose of RQO's is to set clear objectives for the resource against which water use licenses and the related impacts can be evaluated and managed to achieve a balance between the need to protect and utilise the resource.

The Present Ecological State of the wetland is A (Natural) but had a score close to the boundary with B (Largely Natural), and the Recommended Ecological Category (REC) is therefore A/B. Every effort must therefore be made to minimise impacts to the wetland and ensure that it's PES does not deteriorate.

The estuary has a high conservation value, therefore, guidelines are provided in the Keurbooms-Bitou Estuarine Management Plan (K-BEMP) to protect and conserve the status for land parcels within or spanning the EFZ, which will be considered in view of the proposed development of the Plett Lagoon Estate (Aquatic Specialist Report).

h) Investments Already Made and to be Made by the Water User in Respect of the Water Use in Question

Significant investments have already been made in the acquisition of the property, appointment of contractors and various environmental authorisation and planning development processes in excess of R65 million.

i) Strategic Importance of the Water Use to be Authorised

The Bitou Integrated Development Plan (2022-2027) has seven strategic objectives. Three of these are applicable to the proposed new development:

- *Re-establish, grow and expand tourism within the municipality*
  This development contributes to this objective by attracting more people to either move to Plettenberg Bay or rent the newly built houses as holiday accommodation, which supports the tourism industry locally.
- *Facilitate growth, jobs and empowerment of the people of Bitou*
  This is enhanced by the development through job creation and expanding the number of residents in the municipal area who will spend money locally.
- *To build institutional and financial sustainability*
  Providing direct, permanent employment to skilled and unskilled people will provide financial support to families.

Some of the Strategic objective focus areas of Bitou municipality fall under Town Planning, where interventions in land use management (development control), spatial planning, compliance motoring, SMME contractor support and informal trading forms part of it. The Municipality is a major role player in development planning, where people's needs and priorities must be considered and linked with national guidelines. The development strategies of Bitou Municipality are focused on delivering the expected outcomes of the local development mandate.

The proposed development project will create a significant number of employment opportunities (Table *9*). Work opportunities have already been created in the planning phase with land surveying, as well as the employment of numerous and various local professionals, including but not limited to town planners, environmental specialists, architects, heritage consultants, geologists, archaeologists and engineers.

Should this water use be authorised, it will create the opportunity for high income earners to contribute to the wealth of people in the area from disposable income that will be spent in the area. Rental opportunities within the homes will also encourage new visitors to the area, contributing to the local economy.

j) The Quality of Water in the Water Resource Which May be Required for The Reserve and For Meeting International Obligations

It is not foreseen that there will be a significant impact on downstream water quality or quantity in the adjacent wetland. Any changes in water quality due to irrigation with treated wastewater should be anticipated through monitoring of groundwater in the two wells recommended. This development will not be taking water from a watercourse and Bitou Municipality has sufficient raw water for the development with the implementation of upgrades (Appendix *2***.**). Therefore, the ecological reserve in terms of water quantities is not applicable

Mitigating measures that have been recommended by the aquatic specialist, including the wetland buffer and on-site stormwater management, aim to ensure that the water quality is maintained in the adjacent depression wetland during the construction and operational phases.

k) Probable Duration of Any Undertaking for Which A Water Use is to be Authorised

The duration of the project's water uses is permanent.

17. Declaration by the Applicant with Signature Confirming that the Information Submitted is Correct.

18. Appendices

Appendix 1 – Aquatic Specialist Report (Confluent Environmental)

Appendix 2 - Bulk Civil Services provision letter (Bitou Municipality)

Appendix 3 – GLS Consulting report

Appendix 4 – Civil Engineering Services Report (VITA Consulting Engeineers)

Appendix 5 – Alveo Water (Membrane Bioreactor Wastewater Treatment Plant)

Appendix 6 – Water Balance Spreadsheet for irrigation with treated wastewater (VITA Consulting Engineers)

Appendix 7 – Confirmation letter to confirm WWTP may be operated on a temporary basis (Bitou Municipality)

[END OF WULA SUMMARY REPORT]

Aquatic Biodiversity Impact Assessment

Proposed construction of Plett Lagoon residential estate on Erf 6503, Plettenberg Bay, Western Cape

Prepared for Cape EAPrac (Pty) Ltd by Dr. Jackie Dabrowski

Confluent Environmental (Pty) Ltd

Compiled in July 2023
Revised in March 2024 for amended Site Development Plan
Revised in May 2024 for proposed fence around wetland area
Revised in July 2024 for inclusion of sewage package plant

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DECLARATION OF CONSULTANTS INDEPENDANCE

I consider myself bound to the rules and ethics of the South African Council for Natural Scientific Professions (SACNASP);

• At the time of conducting the study and compiling this report I did not have any interest, hidden or otherwise, in the proposed development that this study has reference to, except for financial compensation for work done in a professional capacity;

• Work performed for this study was done in an objective manner. Even if this study results in views and findings that are not favourable to the client/applicant, I will not be affected in any manner by the outcome of any environmental process of which this report may form a part, other than being members of the general public;

• I declare that there are no circumstances that may compromise my objectivity in performing this specialist investigation. I do not necessarily object to or endorse any proposed developments, but aim to present facts, findings and recommendations based on relevant professional experience and scientific data;

• I do not have any influence over decisions made by the governing authorities;

• I undertake to disclose all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by a competent authority to such a relevant authority and the applicant;

• I have the necessary qualifications and guidance from professional experts in conducting specialist reports relevant to this application, including knowledge of the relevant Act, regulations and any guidelines that have relevance to the proposed activity;

• This document and all information contained herein is and will remain the intellectual property of Confluent Environmental. This document, in its entirety or any portion thereof, may not be altered in any manner or form, for any purpose without the specific and written consent of the specialist investigators.

• All the particulars furnished by me in this document are true and correct.

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1. INTRODUCTION

Confluent Environmental Pty (Ltd) were appointed by Cape EAPrac to provide aquatic specialist inputs to the proposed residential development known as Plett Lagoon Estate on RE/6503 (Figure 1). The property is approximately 19 hectares in extent and is in the town of Plettenberg Bay between the Keurbooms Estuary to the east and the Plettenberg Bay Primary School to the west. Site access is via Beacon Way on the southwestern corner of the property. The eastern portion of the site is below the 5 m.a.m.s.l. contour which places it in the Estuarine Functional Zone of the Keurbooms Estuary Figure 1.

Figure 1. Proposed site of a housing development known as Plett Lagoon Estate on RE/6503, Plettenberg Bay.

1.1 The Proposed Development

The Site Development Plan (SDP) which was originally assessed for this report in July 2023 is presented in Figure 4. The original Site Development Plan proposed at Plett Lagoon Estate had split-zoning as follows:

- Residential Zone 1: 2.27 ha
- Residential Zone 2: 4.06 ha
- Open Space Zone 2: 0.37 ha
- Open Space Zone 3: 10.57 ha (includes wetland area)
- Transport Zone (Streets): 1.83 ha

Housing and amenities will consist of:

- Single Residential: 42-50 Erven
- Group Housing: 41 Units

Following identification and delineation of the wetland on site, the Site Development Plan was scaled back to exclude the wetland with the result that 10.5 hectares (almost 60%) of the site will be zoned as public open space and managed as a nature conservation area by the development's body corporate (Figure 4).

1.1.1 Updated Site Development Plan March 2024

The SDP was updated following feedback received from the Bitou Municipality. The development footprint remained the same, but the density of residential erven reduced to 50 residential plots in total. For ease of comparison a snapshot of the original SDP is compared to the updated SDP in Figure 2.

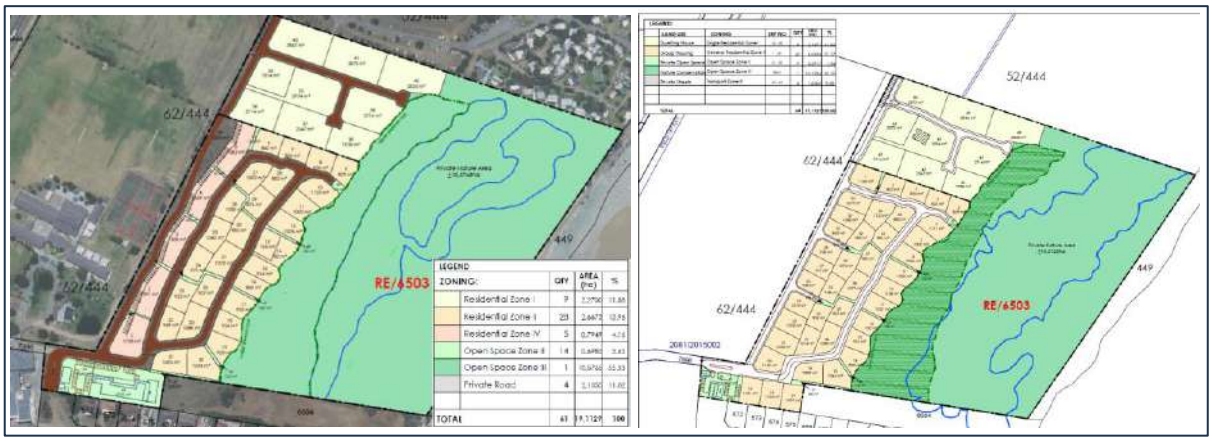

Figure 2. Original Site Development Plan assessed for the report (left, July 2023), followed by the updated SDP reviewed in the updated report (right, March 2024).

Differences that were identified in the revised SDP are as follows:

- One less internal road in the residential area. This was reduced from three parallel roads to two in the revised SDP.
- The original layout had 75 erven and the new layout has 50 erven (9 Zone 1 and 41 Zone 2).

From the perspective of Aquatic Biodiversity the footprint of development is the same, and the revised SDP has still been planned to fully accommodate the wetland buffer determined in this report. While the reduction in erven hasn't reduced the footprint, it will reduce human traffic at the site which should slightly reduce the impact to the wetland in terms of foot traffic accessing the area which is a slight positive impact. The approach to stormwater management has remined the same and is described in the following section.

There are no additional negative impacts anticipated from the revised SDP and therefore the remainder of the report remains unchanged.

1.1.2 Proposal to Fence Wetland Area

The original Site Development Plan included a security fence around the proposed development area only (yellow line in Figure 3). This was a recommendation of the first and second versions of this report with the aim to maintain connectivity between the wetland and

adjacent Keurbooms Estuary predominantly for the movement of wildlife. This mitigation measure was recommended to avoid the impact of fragmentation. Subsequently, the developer has proposed an additional security fence due to concerns about security in the wetland area, and to secure this area for future residents of the estate. In addition the presence of vagrants sleeping in the wetland area was linked to a fire that occurred historically on the site.

Two alternative fence routes have been proposed along the estuary, and two routes are also being considered to secure the housing area. All proposed alternative fencelines follow existing jeep tracks to minimise the requirement for vegetation clearance and allow for easy access and maintenance. Estuary alternative 1 traverses the buffer and part of the wetland area, while alternative 2 encroaches into less actual wetland area. The original development fenceline followed the transition line between transformed grassland and more natural thicket vegetation on the upper slope along essentially flat ground. The alternative development fenceline follows the base of the slope along an existing pathway and intersects areas of the buffer. As the proposed alternatives all interact with the wetland and estuary to some extent, their respective impacts must be assessed and mitigation measures proposed, if feasible, to minimise these impacts. This is addressed further in the impact assessment which also considered mitigation measures recommended by the faunal specialist (Biodiversity Africa, April 2024).

Figure 3. RE/6503 showing proposed fenceline alternatives in relation to delineated wetland and buffer areas.

1.1.3 Stormwater Management

Aspects of the development that may influence the wetland and Keurbooms estuary include the management of stormwater and wastewater from the site. Vita Engineers provided a Civil Engineering Services Report (June 2023) for the site which states the following:

<u>Stormwater Management</u>

- The pre-development site drains from the higher lying western boundary to the lower lying eastern boundary.
- The site is underlain by aeolian sands several metres thick with high permeability, therefore promoting the infiltration of surface water runoff from the site.
- A network of swales along roads has been proposed as the main SuDS-based attenuation feature. The swales aim to attenuate peak flows to pre-development runoff rates and to treat stormwater runoff by percolation through sands.
- Channels with flow velocities > 1m/s will be lined and protected with open pavers, while unlined channels with lower flow velocities will be vegetated.

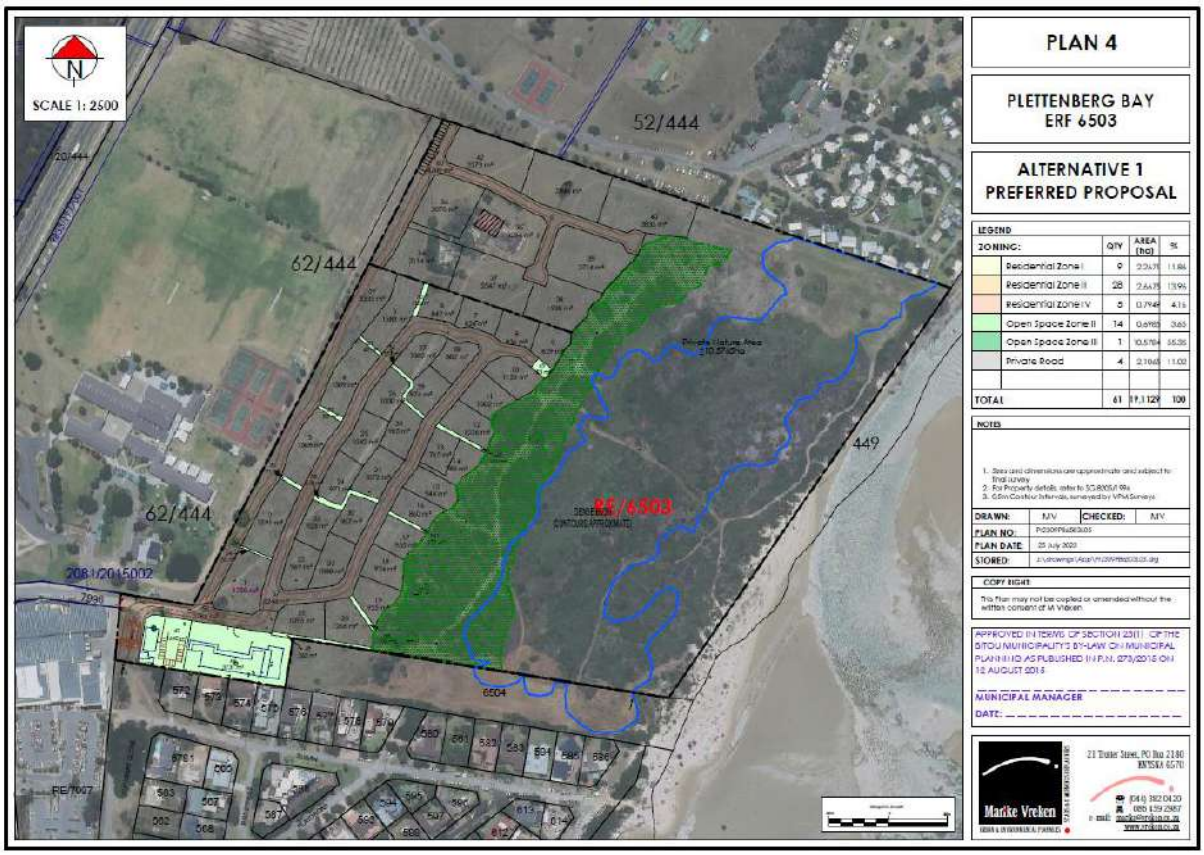

Figure 4. Proposed Site Development Plan for RE/6503, Plettenberg Bay.

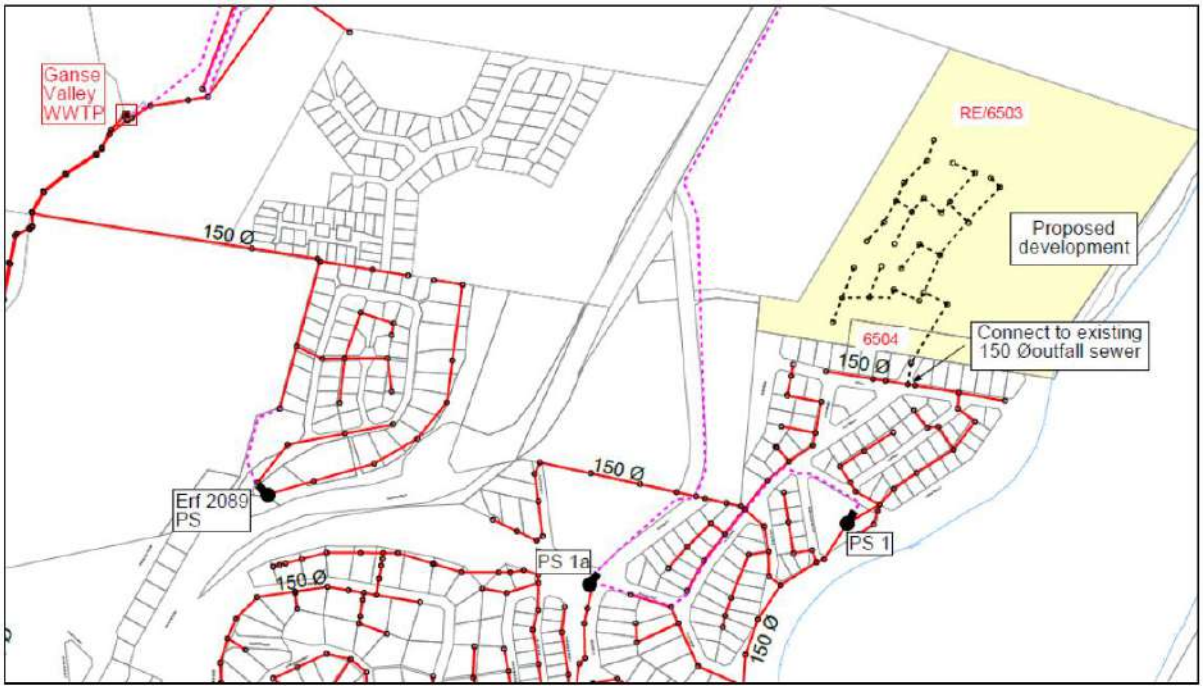

Figure 5. External sewer masterplan extracted from GLS Consulting (Feb, 2023).

Sanitation

The Bitou Municipality confirmed that there is currently insufficient capacity to accommodate this development's sewages through the existing municipal infrastructure. The municipality have agreed to allow installation of a sewage package plant for the development until their wastewater treatment works has been upgraded and can accommodate sewage from the site.

The proposed package plant is an Alveo Water Membrane Bioreactor Wastewater Treatment Plant with the following description:

"The proposed packaged wastewater treatment plant is a membrane bioreactor (MBR). MBR technology combines microfiltration with bio-digestion to reap the benefits of combined physical separation and biological removal. The dependency of effluent quality on influent quality is partially removed with an MBR system and thus MBR systems consistently provide quality effluent water. Furthermore, the minimal transfer of suspended solids through the MBR system allows the concentration of active bacteria to increase as much as four (4) times that possible in a CAS plant. This ensures that superior bio-digestion occurs with the use of an MBR at a fraction of the area required when using CAS alone.

The containerised WWTP will be constructed in one 12m container which will house the following:

- 3mm fine screen
- Anoxic tank mixer
- Aerobic section diffuser disks and pipework
- MBR membranes
- Blowers for aeration and membrane scouring

- Permeate pumps to remove water from the MBR chamber.
- UV disinfection
- CIP tank and skid to clean membranes periodically.
- All electrical MSS, cabling and instrumentation required for a fully functional plant
- Generator.

The treatment plant footprint will be 20m x 6m and the location of the plant is near the entrance to the estate in the south-west corner (Figure 6). The rising main sewer line runs along the eastern edge of the development parallel to the edge of the wetland buffer and includes a pump station towards the northern section of the development which is indicated in Figure 6. It is proposed to irrigate the treated wastewater across open areas of the estate on a regular (likely daily) basis. It is envisaged that the Bitou Municipality will eventually upgrade their wastewater treatment works and then the estate will 'switch over' to this system, rendering the package plant obsolete. But until then, the treated effluent would need to be irrigated across the site.

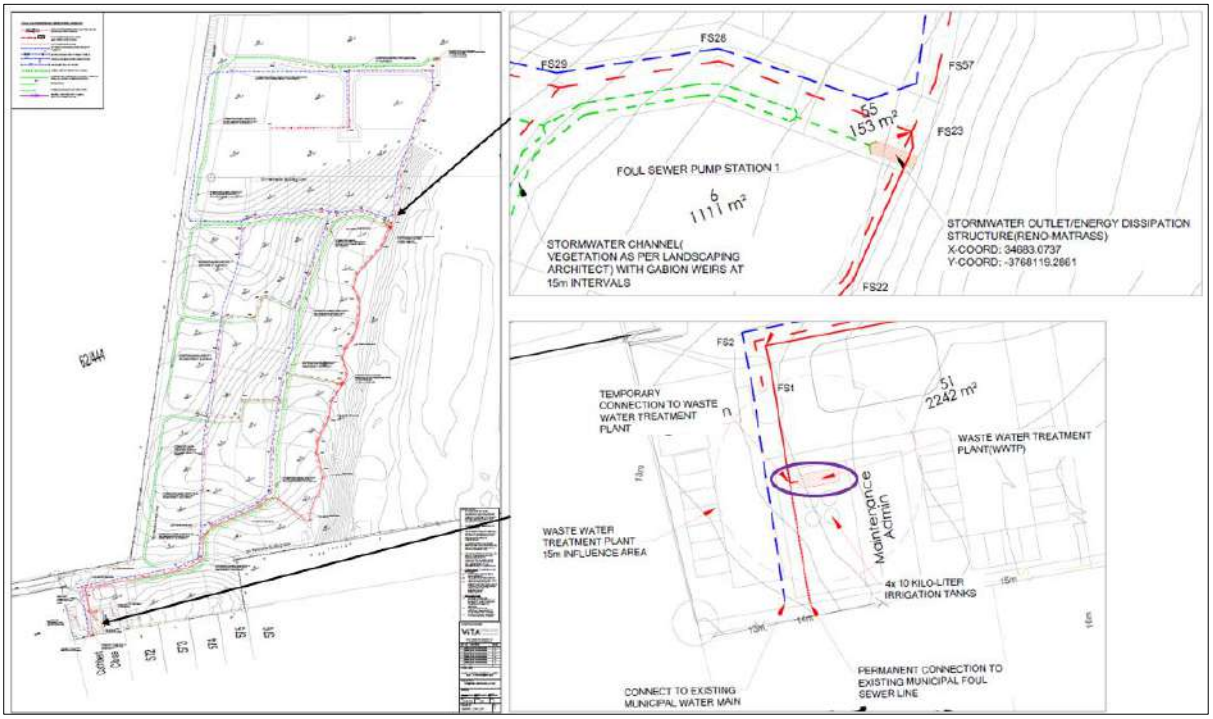

Figure 6. Extract of stormwater and sewage reticulation from Appendix E, Pg. 65 of the Engineering Services Report (Vita Consulting Engineers, July 2024). Enlarged sections highlight the location of a sewer pump station and the sewage package plant (encircled).

1.2 DFFE Screening Tool Results

According to the Department of Environment, Forestry and Fisheries (DFFE) screening tool, aquatic biodiversity at the site has a **Very High** sensitivity (Figure 7). The sensitivity features identified are:

- Critical Biodiversity Area 1 – Aquatic
- Keurbooms Estuary
- FEPA Sub-catchment

- Wetlands (Estuary)

As both an estuary and freshwater wetland are located at the site, the scope of work for this report is guided by the legislative requirements of the National Environmental Management Act (NEMA) and the National Water Act (NWA; Act No 36 of 1998).

Figure 7. Results of the DFFE Screening Tool which indicate Very High Sensitivity of the Aquatic Biodiversity theme.

1.3 Scope of work

According to the protocols specified in GN 320 (Protocol for the specialist assessment and minimum report content requirements for environmental impacts on aquatic biodiversity) of the National Environmental Management Act (NEMA; Act No. 107 of 1998), assessment and reporting requirements for aquatic biodiversity are associated with a level of environmental sensitivity identified by the national web-based environmental screening tool (screening tool). An applicant intending to undertake an activity identified in the scope of this protocol on a site identified by the screening tool as being of:

- **Very High** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Specialist Assessment; or
- **Low** sensitivity for aquatic biodiversity, must submit an Aquatic Biodiversity Compliance Statement.

The objectives of this assessment included the following:

- To undertake a Site Sensitivity Verification for aquatic biodiversity using desktop analysis and a site inspection. Sensitivity will be verified as either **Very High** or **Low**; and,
- Compile an Aquatic Biodiversity Compliance Statement or Aquatic Biodiversity Specialist Assessment based on the sensitivity verification for the site. This includes assessment of the following:

Interrogation of available desktop resources including:

- DWS spatial layers (1:50 000 rivers)
- National Freshwater Ecosystem Priority Areas (NFEPA) spatial layers (Nel *et al.,* 2011)
- National Wetland Map 5 and Confidence Map (CSIR, 2018)
- Western Cape Biodiversity Spatial Plan (WCBSP, 2017).

Conduct a site visit to determine the site sensitivity:

- Identification and classification of watercourses within and adjacent to the site according to methods detailed by Ollis *et al*. (2013);
- Determine the watercourse Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) using an appropriate method (if watercourses are present).
- Delineate wetland / riparian areas following methods prescribed by DWAF (2015).
- Determine an appropriate buffer for wetland areas using the site-specific buffer tool developed by Macfarlane and Bredin (2016).

This report will also meet the requirements for a Water Use License Application (WULA) which will be required given installation and connection to sewage pipelines will be necessary within the regulated area of a wetland (defined as 500 m from a wetland). The relevant water uses will be:

Section 21 c) impeding or diverting the flow of water in a watercourse;

Section 21 i) altering the bed, banks, course or characteristics of a watercourse;

Section 21 e) engaging in a controlled activity identified as such in sections 37(1) or declared under section 38(1), and;

Section 21 g) disposing of waste in a manner which may detrimentally impact on a water resource.

1.4 Assumptions and Exclusions

The site visit was undertaken on 21 May 2023 which is considered Winter. It is possible that sensitive features such as rare or unique biota (e.g. amphibians), plants or habitat were not observed during the site visit, but are influenced by season, time of day, flow level or vegetation cover. However, recent good rainfall along with rainfall during the site visit meant that wetland features were quite evident and easily identified. In fact, this May was considered the 6th wettest May on record since the late 1800s (*pers. comm*. J. Crowther, local dairy farmer).

2. CATCHMENT CONTEXT

2.1 Catchment features

The development site is located at the lower extent of quaternary catchments K60E and K60G which drain the Keurbooms River to the east and the Piesang River to the west respectively. The property is located adjacent to the Keurbooms River. Rainfall is relatively high by South

African standards with a Mean Annual Precipitation of 647 mm which can fall with a Very High intensity. Coupled with the High erodibility of soils in the area, erosion of soils and stormwater management are factors which must always be carefully considered when planning a development (Table 1 & Figure 8).

Table 1. Summary of relevant catchment features for the proposed development area.

Feature	Description
Quaternary catchment	K60E & K60G
Mean Annual Runoff	101 mm
Mean Annual Precipitation	647 mm (weather station No. 0014633W)
Inherent erosion potential of soils (K-factor)	0.56, High
Rainfall intensity	Very High
Ecoregion Level II	20.02, Southeastern coastal belt
Geomorphological Zone	Floodplain / Estuary
NFEPA area	Sub-quaternary reach 9188, Fish FEPA
Mapped Vegetation Type	FFg5: Garden Route Shale Fynbos (Endangered; FFh9) and Goukamma Dune Thicket (Least Concern; AT36)
Soils	Soils with limited pedological development
Conservation	Critical Biodiversity Area 1 and 2 (Terrestrial & Aquatic; WCBSP, 2017)

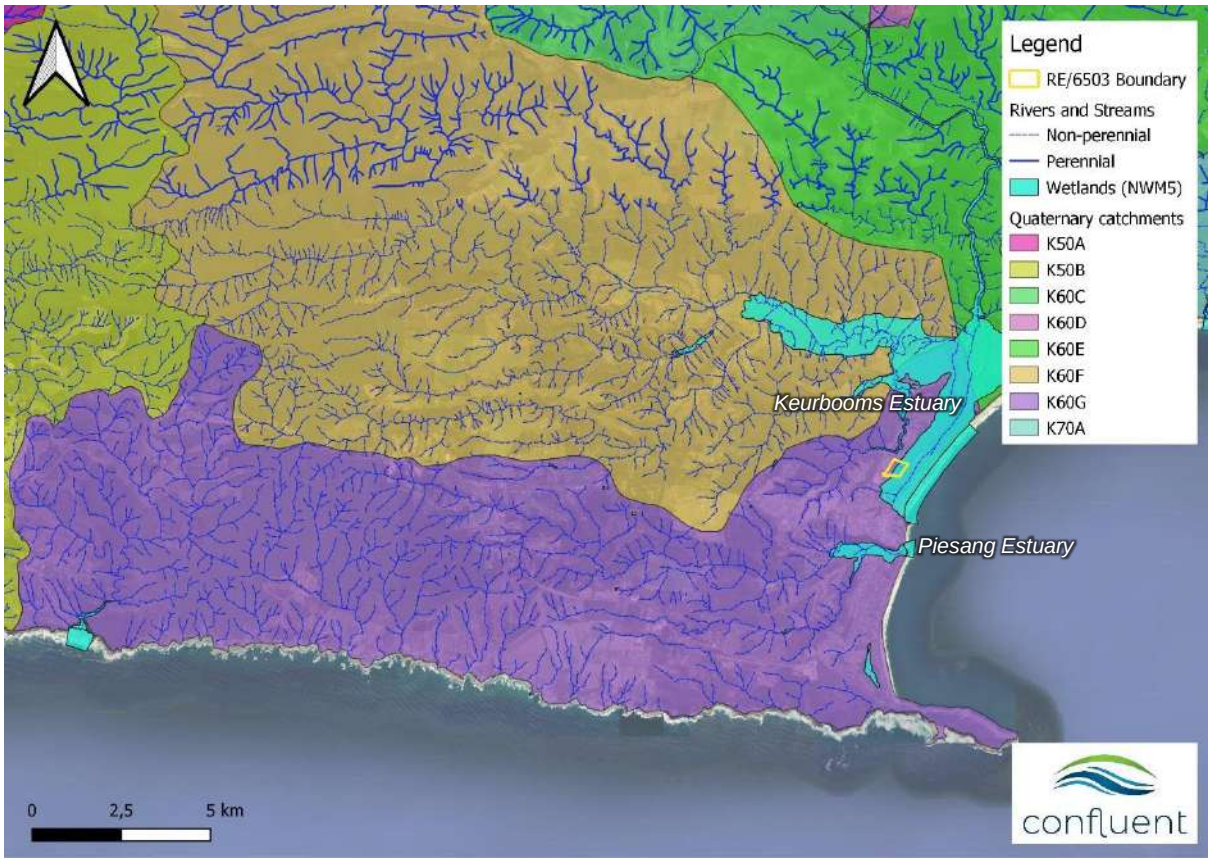

Figure 8. Location of the property at the boundary of quaternary catchments K60E and K60G.

Rainfall occurs year-round with seasonal peaks in spring and autumn (Figure 9).

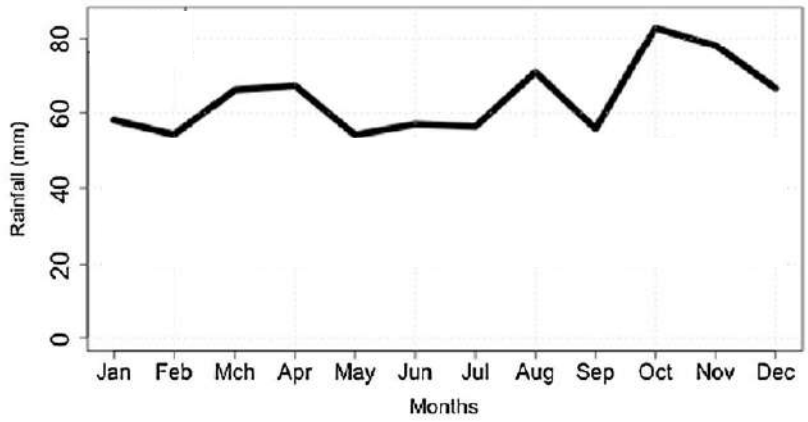

Figure 9. Area-averaged monthly rainfall for the coastal Southern Cape indicating peaks in Mar-Apr, Aug, and Oct. Data averaged between 1979 and 2011 (Engelbrecht *et al*., 2015).

The project area is located within the southeastern coastal belt (Ecoregion Level 2:20.02). The terrain is described as closed hills of moderate and high relief and moderately undulating plains. Altitude ranges between 0 – 1 300 m.a.m.s.l.

2.2 Vegetation

The mapped vegetation type on the western half of the property Garden Route Shale Fynbos which is categorised as Endangerd (FFh9; NVM, 2018), while the eastern half of the property is Goukamma Dune Thicket which is classed as Least Concern (AT36; Figure 10). Vegetation in the Keurbooms Estuary is mapped as non-terrestrial, which is correct as most of the vegetation is considered aquatic.

Figure 10. Mapped vegetation at the site according to VegMap (2018).

2.3 Conservation and catchment management

2.3.1 WCBSP

The Western Cape Biodiversity Spatial Plan (WCBSP; 2017) indicates the western half of the site as a Critical Biodiversity Area 2, which corresponds with the higher-lying area (Figure 11). The eastern half of the site and Keurbooms Estuary are mapped as a Critical Biodiversity Area 1, mostly consisting of Aquatic habitat. The definition and management objectives of each of these classes are described in Table 2.

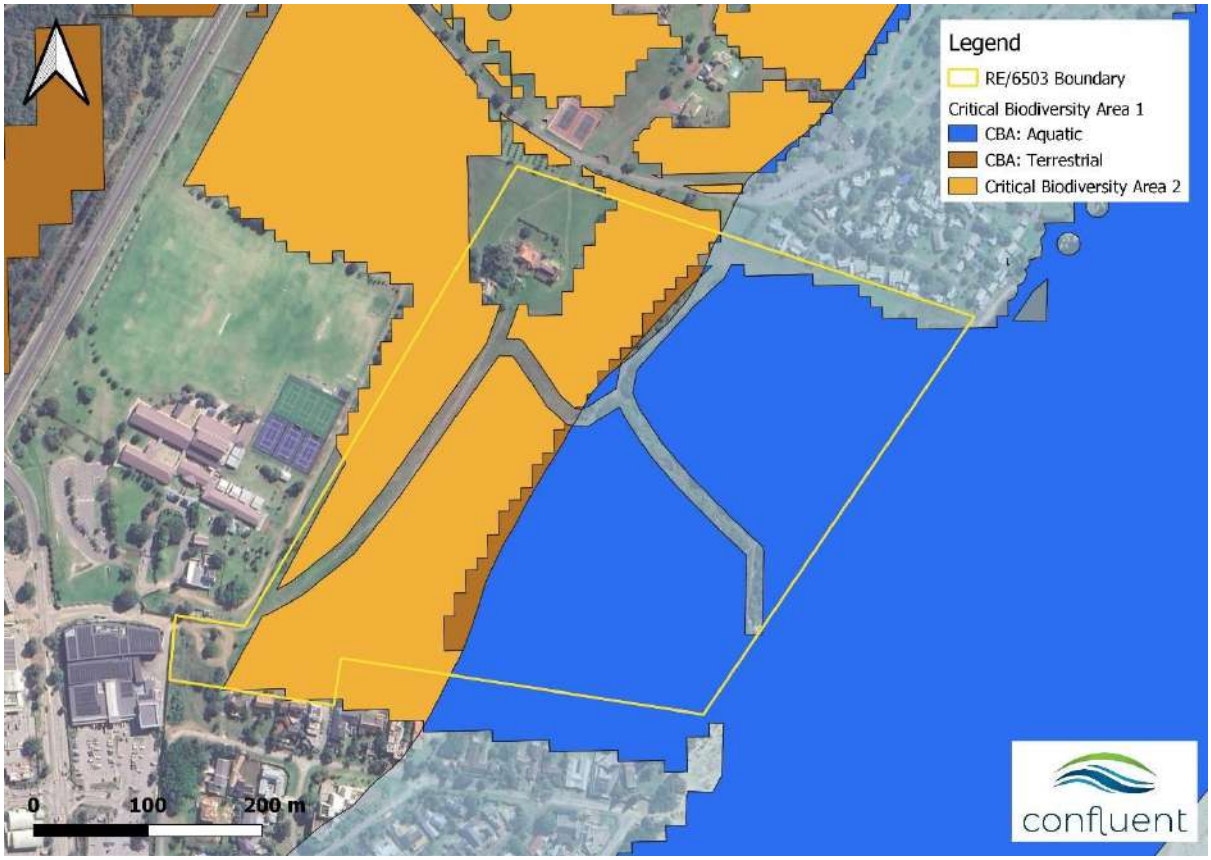

Figure 11. Mapped conservation features of the Western Cape Biodiversity Spatial Plan (2017).

Necessary actions in relation to the WCBSP are to ensure that development on the site does not result in negative impacts to ecological structure and function of watercourses adjacent to the site.

Table 2. Definitions and objectives for conservation categories identified in the Western Cape Biodiversity Spatial Plan (WCBSP, 2017).

WCBSP Category	Definition	Management Objective
Critical Biodiversity Area 1 (CBA1)	Areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of natural habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land uses are appropriate.

Critical Biodiversity Area 2 (CBA2)	Areas in a degraded or secondary condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure.	Maintain in a natural or near-natural state, with no further loss of habitat. Degraded areas should be rehabilitated. Only low-impact, biodiversity-sensitive land-uses are appropriate.

2.3.2 NFEPA

According to the National Freshwater Ecosystem Priority Atlas (NFEPA; Nel *et al*., 2011) the sub-quaternary reach (SQR 9188) is classified as a FishFEPA, which is a Fish Support Area.

Fish Support Areas were identified in river systems in a good ecological state (PES A or B) and that have been identified as FEPAs (Freshwater Ecosystem Priority Areas). These rivers contribute to national biodiversity goals and support sustainable use of water resources. Fish Support Areas also include sub-quaternary catchments that are important for the migration of threatened or near threatened species.

This is due to the presence of Endangered or Critically Endangered fish in the quinary catchment of the Keurbooms River. Fish recorded in the system include the extremely range restricted *Pseudobarbus* sp. nov. 'Keurbooms' (previously *Pseudobarbus tenuis*), *Pseudobarbus afer* (Endangered, Eastern Cape Redfin), and *Sandelia capensis* (Data Deficient, Cape Kurper).

Generally, *Pseudobarbus tenuis* occurs in the headwater streams while *Psuedobarbus afer* occurs in the forested peat-stained water. The main threat to these fishes is through the introduction of predatory alien fish species of bass and trout. Impacts related to forestry and agriculture are also known to affect populations.

2.3.3 Strategic Water Source Area

Aquatic biodiversity within the site has been identified as Very High. One of the reasons is that the site falls within the Outeniqua Strategic Water Source Area for surface water (SWSA-sw). SWSAs are defined as areas of land that supply a disproportionate (ie. Relatively large) quantity of mean annual runoff in relation to their size and are therefore considered nationally relevant (Le Maitre *et al*., 2018). A key objective in the management of SWSAs is to ensure the quantity and quality of water within and flowing from SWSAs is protected from developments that cause unacceptable and irreparable impacts.

2.4 Mapped Watercourses

The only mapped aquatic feature proximal to the site is the Keurbooms Estuary which is indicated as the area below the 5 m.a.m.s.l. contour (Figure 1 and Figure 12). The 0.5 m contours are shown for this area as they provide a more detailed picture of the micro-topography.

2.4.1 Keurbooms-Bitou Estuary

The estuary feeds what is known as the Keurbooms Lagoon. The Present Ecological State of the estuary is classified as A/B, and the same category is applicable for the Recommended

Ecological Category. The estuary has a high conservation value, supporting one of only three known populations of the iconic Knysna Seahorse occurring in *Zostera* (segrass) beds. In terms of management objectives, the Keurbooms-Bitou Estuarine Management Plan (K-BEMP) states that formal protection mechanisms to obtain conservation status for land parcels within or spanning the EFZ must be investigated. In terms of land-use and infrastructure, the following relevant guidelines are provided in the K-BEMP:

- Planning should allow for the maintenance of a riparian zone along the length of the estuary where sensitive habitats (e.g. wetlands, supratidal saltmarsh and indigenous vegetation) occur. The implementation of the CML, CPZ, floodlines and inclusion of Critical Biodiversity Areas within all planning schemes should allow for this.

- Development and land use in the catchment and estuarine area should not lower water quality or interfere with normal hydrodynamic or sedimentary processes and cycles;

These management guidelines will be considered in view of the proposed development of the Plett Lagoon Estate.

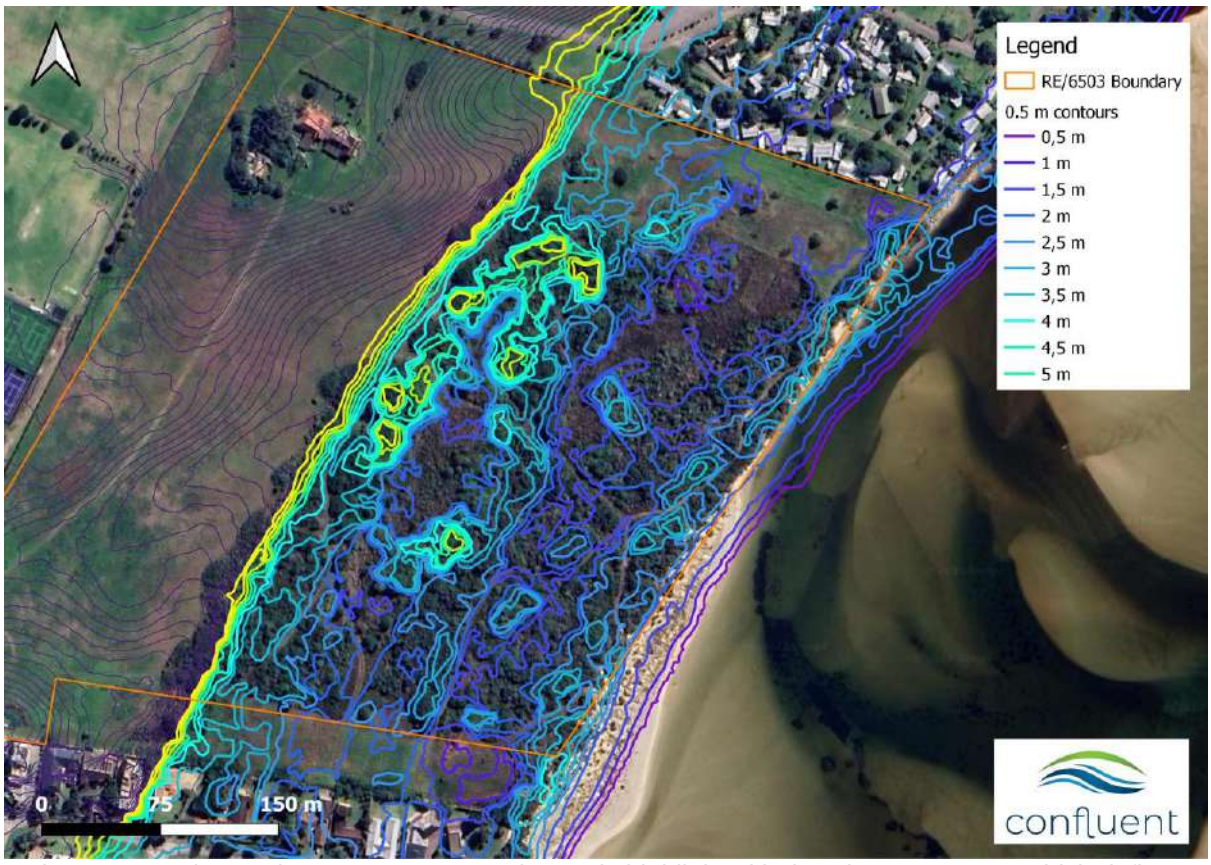

Figure 12. RE/6503 site contours at 0.5m intervals highlighted below the 5m contour which defines the Estuarine Functional Zone (EFZ).

2.5 Historical assessment

Historical aerial and satellite photos were examined of the site over a period of approximately 8 decades (Figure 13).In the earliest photo from 1936, very little development had occurred either on the property itself or in the neighbouring properties. The difference between the more grassy, open vegetation to the west of the site, compared to the more densely vegetated eastern portion is evident throughout the site's history. Dense vegetation along the lagoon no

the neighbouring properties was cleared for construction of housing developments around the 1970s. The residence located on RE/6503 in the northern corner was evident as a small settlement in 1936 and has always been the site of a residence to the present day. Footpaths through the wetland were evident from 2011, although they were probably present for a while before then, but overgrown.

Figure 13. Historical photos showing the approximate property boundary for a period of 86 years (CD:NGI & Google Earth imagery).

3. SITE ASSESSMENT

3.1 Site Visit

The site was visited on 21 May 2023. Above average rainfall had been experienced in the Garden Route in May and it rained periodically during the site assessment. An extensive area of 5.2 km was walked to assess aquatic features where accessible (Figure 14).

Figure 14. GPS track of route walked during the site assessment on 21 May 2023.

3.2 Wetland Delineation

Wetlands were delineated using a combination of hydrophilic plant species, soils with redoximorphic features (e.g. mottling and/or gleying; Figure 15), and topographical location (Figure 16).

A wide variety of wetland plant species were observed throughout the wetland area. These were dominated by freshwater species but included a few species typically located in the supratidal zone of estuaries. Species considered to be obligate as well as facultative wetland plants were recorded (Table 3).

Table 3. Wetland plant species identified in the depression on RE/6503.

Common name	*Species name*
Fluitjiesriet	*Phragmites australis*
Vleibiesie / knobby club-rush	*Ficinia nodosa*
Impepho / fume everlasting	*Helichrysum cymosum*
Arum lily	*Zantedeschia aethiopica*
White carpet	*Falkia repens*
Brak rush	*Juncus krausii*
Oak waxberry	*Morella quercifolia*
Cogon grass	*Imperata cylindrica*
Manyspike flatsedge	*Cyperus polystachyus*
Slender knotweed	*Persicaria decipiens*
Water pimpernel	*Samolus porosus*
Black bog-rush	*Schoenus nigricans*
Brook weed	*Samolus valerandi*

Hydric soils display indicators which are predominantly formed by the accumulation or loss of iron, manganese, sulfur or carbon under permanent or periodic saturated and anaerobic conditions. Sandy soils such as those on the RE/6503 seldom show the same degree of mottling and gleying as saturated or seasonally saturated soils with a higher clay content. Nonetheless, soils from multiple points showed degrees of mottling and gleying in permanent and seasonal zones of the wetland, and standing water was often present from 30 cm depth (Figure 15).

Figure 15. Wetland soil indicators observed at the site.

Wetland vegetation and soil auger results observations were combined with the fine-scale site topography to delineate the depression wetland as indicated in Figure 16. The wetland is mostly located below the 2.5 m to 3 m.a.m.s.l. contours at the site.

Figure 16. Wetland delineation based on soil, vegetation, and topography of the site.

3.3 Wetland Classification

The interdunal water-filled depression is classified as a depression wetland (Ollis *et al*., 2013; Figure 17). No channelled flow into or out of the depression is present and the wetland is inward draining (endorheic).

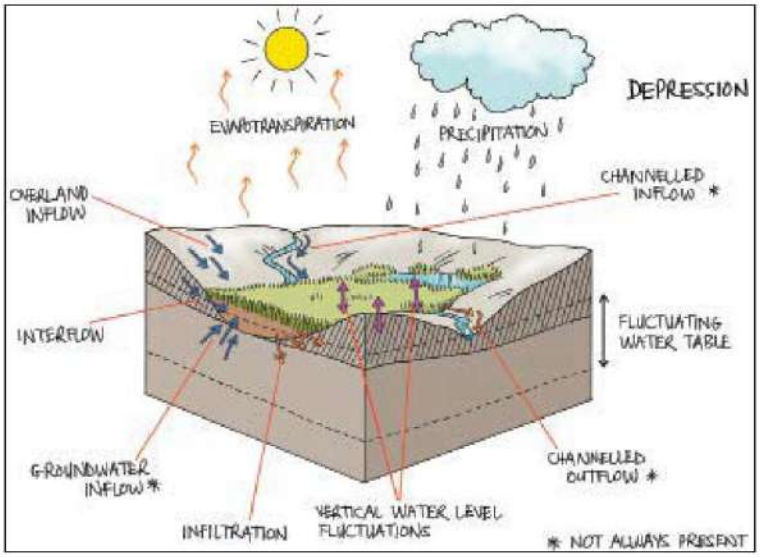

Figure 17. Conceptual illustration of the interdunal depression wetland (from Ollis *et al*., 2013).

Figure 18. Photos of various wetland and estuarine features on RE/6503.

3.4 Wetland Buffer

Buffers are located where the land meets a delineated watercourse, and refer to the zone where these two habitats interface. Buffer areas are linear zones adjacent to watercourses managed with the intention of protecting water resources from diffuse pollution associated with adjacent land uses. In addition, they provide habitat for wildlife within, and act as corridors for movement, feeding and breeding through fragmented landscapes. In this case the buffer performs an important function for the maintenance of conectivity between the lagoon and the wetland. It buffers not only the lagoon from the development, but also the wetland from the

development. The width of the aquatic impact buffer zone was determined to be **30 m** through use of the site-based wetland buffer tool developed by Macfarlane & Bredin (2017).

Figure 19. Delineated wetlands and 30 m wetland buffer in relation to the remainder of the site.

4. ECO-CLASSIFICATION

4.1 Present Ecological State (PES)

The PES of the wetland was determined using the updated WET-Health Version 2 method described by Macfarlane *et al.* (2020). Methods for the assessment are provided in Appendix 1. The result of the assessment was an overall **PES of A, Natural,** although the score was close to the boundary with B, Largely Natural. Minor impacts have occurred which have slightly reduced the state of the wetland from its natural reference condition (Figure 20). These are summarised as follows:

- Natural wetland and thicket vegetation has been invaded in isolated areas by alien invasive plants.
- An area of approximately 0.7 ha of wetland vegetation to the north is mowed on a regular basis. There are areas of alien invasion within the mowed area.
- Existing roads and walking paths are established through the wetland and surrounding area. These are maintained by vegetation trimming and are infrequently travelled by vehicle.

Most impacts affect vegetation which is reflected in the score of B, Largely Natural, determined in the PES assessment. Minimal impacts were observed to affect the wetland's hydrology water quality or geomorphology.

Table 4. Summarised Present Ecological State determined for the depression wetland using WET-Health.

Final (adjusted) Scores				
PES Assessment	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	1,2	0,3	1,2	1,9
PES Score (%)	91%	97%	90%	81%
Ecological Category	**A**	**A**	**A**	**B**
Trajectory of change	↓	↓	→	→
Confidence (revised results)	High	High	Medium	High
Combined Impact Score	1,1			
Combined PES Score (%)	91%			
Combined Ecological Category	**A**			
Hectare Equivalents	5,2 Ha			

Figure 20. Photos of various impacts affecting vegetation of the wetland.

4.2 Ecological Importance and Sensitivity

The Ecological Importance and Sensitivity (EIS) was determined using methods provided in Appendix 2 which was developed by Rountree *et al*. (2013). The EIS of the wetland was determined to be '**Very High'** (Table 5). The definition of wetlands in this category is as follows:

"Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers."

An important aspect of this wetland type's sensitivity is that it is inward draining (endorheic) and therefore any water, sediment or material inputs cannot be 'flushed out' of the system.

Table 5. Summarised Ecological Importance and Sensitivity of East and West Wetland.

Ecological importance and sensitivity	Score 0-4	Confidence 1-5	Motivation
Biodiversity support	**3.6**		
Presence of Red Data species	3	3	None observed in wetland, but Plett lagoon is home to Knysna seahorses and the wetland plays a supportive role.
Populations of unique species	4	3	Diverse and abundant population of wetland plants creating unique habitat which usually supports unique vertebrate and invertebrate species.
Migration/feeding/breeding sites	4	4	Habitat for amphibians, reptiles, small mammals, birds etc. Good connectivity between the wetland and lagoon.
Landscape scale	**3.4**		
Protection status of wetland	3	4	Identified as CBA1 on WCBSP and ownership is private (not public open space).
Protection status of vegetation type	3	4	Located at ecotone between disturbed fynbos (mapped CR) and thicket / wetland / estuarine vegetation (LC).
Regional context of the ecological integrity	4	4	In good condition for peri-urban wetland but will be increasingly pressured if proposed development go ahead.
Size and rarity of the wetland types present	4	4	Moderate to large size and one of the last remaining interdunal depression wetlands along the Keurbooms Lagoon.
Diversity of habitat types	3	4	Areas of seasonal, temporary and permanent wetland interspersed with thicket 'islands'. Relatively diverse habitats.
Sensitivity of the wetland	**3**		
Sensitivity to changes in floods	3	3	Erosion of slopes to the west would result in sediment deposition and vegetation smothering in the wetland. Thicket areas would be inundated leading to vegetation transition.
Sensitivity to changes in low flows	2	3	Loss of permanent wetland vegetation, but water levels already fluctuate to an extent.

Sensitivity to changes in water quality	4	4	High nutrients can transform vegetation to a greater dominance by reeds such as *Typha capensis* and *Phragmites australis*.
Hydrofunctional Importance	**2**	**3**	
Direct human benefits	**1.8**	**3**	
ECOLOGICAL IMPORTANCE AND SENSITIVITY	**3.6**	**VERY HIGH**	

5. LEGISLATIVE IMPLICATIONS

5.1 Site Sensitivity Verification

The Site Sensitivity in terms of Aquatic Biodiversity for Option C is **confirmed as Very High** as indicated by the DFFE Screening Tool because significant wetland habitat is present on the site.

5.2 Water Use Authorisation

The presence of a wetland on the property means that the construction and operation of the proposed housing development would be taking place in the Regulated Area of a Watercourse as defined in GN4167 of the National Water Act. For wetlands this is defined as the area within a 500m radius of the wetland. The installation of sewage package plant with the intention of irrigating wastewater for the development is an activity which is currently excluded from the General Authorisation, meaning it would be necessary to apply for a Water Use License.

A specialist impact assessment for all phases of the proposed development will be compiled in order to meet the requirements for both the NEMA and the NWA.

6. IMPACT ASSESSMENT

Methods used for the impact assessment are provided in Appendix 3. The impact assessment follows the mitigation hierarchy of avoidance, minimisation of impacts, restoration of damaged ecosystems and offsets for residual damage, prioritised in that order.

6.1 Design and Layout Phase

6.1.1 Stormwater management

The stormwater management plan compiled by Vita Consulting Engineers proposes SuDS-type design features for the management of stormwater which are fully supported. The report acknowledges the high erodibility of soils on the site. Being downslope of the proposed development the wetland is vulnerable to localised smothering by transported sediment from eroded slopes, and being inward draining, this material would eventually form terrestrialised islands with different vegetation, most likely being colonised by alien plant species. Avoidance of erosion is therefore the primary aim of managing stormwater on the site. The following additional mitigation measures are recommended to further reduce impacts:

- Wherever possible driveways and parking areas must use open paver / permeable paving systems such as grass blocks or sudpave-type products. These should not be underlain with G7 due to its low permeability. This will utilise the highly permeable nature of soils at the site to reduce runoff to roads in > 1:5 year rainfall events.

- Stormwater outlets leading towards the wetland will need to ensure water does not form concentrated flow paths downslope and is attenuated and drained on the upper slope area. Following discussions with the engineer and engineering specialist at BOCMA it was considered likely that soil permeability at the site will be sufficient to facilitate local draining to groundwater if small detention ponds are included at the end of outlets. This will avoid the need for constructed outlets directing stormwater into the wetland.
- Detention ponds for stormwater management must be located on the *inside* of the fenced residential area so they can be monitored for erosion and maintained clear of aliens and free of litter.

6.1.2 Original Fenceline

Note This was the original recommendation regarding the design and layout of the fenceline prior to the proposed additional fencing along the estuary.

As the wetland area is the last remaining area of significant wetland and natural vegetation remaining along the western shoreline of the Keurbooms Lagoon, it is important to protect the function as an ecological corridor. Wildlife currently move between the wetland and lagoon area, and an important function of the wetland is the provision of shelter and habitat for feeding, breeding and movement. Fences can seriously restrict the movement of wildlife and at worst can contribute to mortalities (Figure 21). The following mitigation measures are recommended:

- The fenceline should enclose the residential area only, and not the wetland area. The final location is yet to be determined but should minimise the disturbance of natural vegetation on the slope as far as possible. This is very important for the ongoing stability of the slope which is protected by established vegetation.
- Install code-operated pedestrian gates along the fenceline aligned to existing pathways and roads to allow joggers and walkers access to the wetland and lagoon.
- Use alternative security measures to monitor the wetland such as guarding or cctv cameras.
- It is assumed that typical Clearvu-type fencing would be preferred, however this seriously restricts the movement of any animals. Install larger grid sections along the base of the fenceline in a few sections, to allow smaller-bodied vertebrates to move in and out of the residential area.
- Do not use any electric strands along the base of the fenceline.

Figure 21. Dead tortoise wedged in a diamond mesh fenceline in an estuarine area, Sedgefield.

6.1.3 Additional and Alternative Fencelines

The alternative residential area fenceline and two alternative options along the estuary are compared in terms of their impacts from a design and layout perspective. The reason for the original recommendations for fencing were to maintain the open link between the wetland and estuary for the purpose of wildlife movement. However, the alternative fenceline along the wetland edge is due to concerns about security and fire risk management.

1. *Original versus Alternative fenceline (residential area)*

Throughout comparisons of fenceline alternatives reference is made to Figure 22 and Figure 23. Benefits of the original fenceline (yellow line) were that it completely avoided the buffer and wetland area, minimised vegetation disturbance, and did not intersect any of the more natural habitat associated with the wetland and buffer area (Figure 22). The original fence resulted in zero direct impacts to the wetland or buffer, from an aesthetic perspective the developer would prefer to place the fence at the bottom of the slope along an existing pathway, which would reduce vegetation disturbance compared to areas outside of paths, but would fragment an area of about 1.3 ha of more natural vegetation from the adjacent wetland area and encroach into the buffer, quite close to the wetland in places.

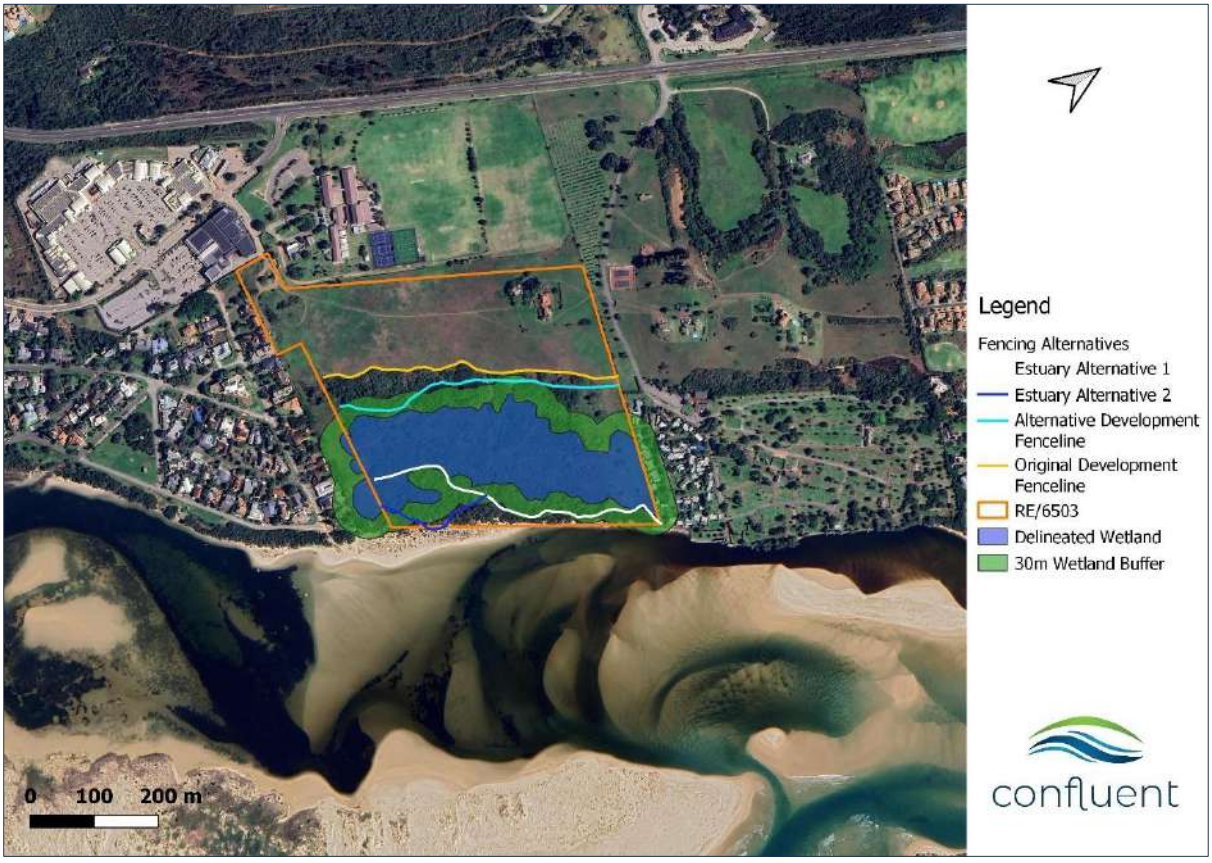

Figure 22. Rotated view of RE/6503 showing the alternative fenceline options in relation to the surrounding area and delineated wetland features.

Figure 23. Photos of existing a proposed aspects of the alternative fenceline options.

2. *Estuary Fenceline Alternative 1 Versus Alternative 2*

Alternative 1 and 2 along the estuary follow the same path until the south-eastern area where they split with Alternative 1 following a pathway that crosses the buffer and approximately 134 m of wetland. This is compared to Alternative 2 which crosses less of the buffer and wetland with approximately 30 m through the wetland near to the estuary. Alternative 1 leaves more of the habitat open on the estuary side (about 1.5 ha open to the estuary) while Alternative 2 intersects more habitat from the estuary (0.5 ha open to the estuary) but crosses through more actual wetland habitat. The area of wetland intersected by Alternative 1 has a large diversity of wetland plant species, very high saturation levels and standing water at times (See Figure 23A, E and F). The installation and maintenance of the fence for Alternative 1 could have

potentially higher impacts on the wetland than for Alternative 2 because it crosses an extensive area of wetland with high water levels.

6.1.4 Preferred Fencing Options

An impact assessment comparing the fencing alternatives in the residential area and along the estuary is presented in Table 6. This impact assessment is compiled under the assumption that all recommended design mitigation measures as recommended in this, and the terrestrial faunal assessment are adhered to (the residual negative impact). All the mitigation measures in the faunal assessment are agreed with except for the width between the vertical struts. The standard width is 11 cm for palisade fencing. The width of Sensitive Species 8 (a species highlighted as possibly present in the faunal report) is 14-21 cm. Insurance companies stipulate that their cover is limited to burglar bars with a maximum width of 12 cm. Therefore, if the width between the palisade fencing can be specified as **12 cm** it will create slightly more room for animal movement. The faunal report recommends periodic gaps measuring **40 cm high and 21 cm wide aligned with animal paths**. This fencing system is considered reasonably permeable for most species likely to be present at the site.

Table 6. Comparison of impacts for fencing options for the residential area and the eastern extent along the estuary. Ratings assume full implementation of mitigation measures for the design and layout phase.

IMPACT: Habitat fragmentation and restricted wildlife movement through wetland / estuary habitat				
	Residential Area		Estuary Fenceline	
	Original Fenceline	**Alternative Fenceline**	**Alternative 1**	**Alternative 2**
Duration	Permanent	Permanent	Permanent	Permanent
Extent	Very Limited	Limited	Local	Local
Intensity	Low	Moderate	High	Moderate
Probability	Likely	Almost Certain	Almost Certain	Almost Certain
Confidence	High	High	High	High
Reversibility	High	Medium	Medium	Medium
Resource Irreplaceability	Medium	Medium	High	High
Significance	Minor - Negative	Moderate - Negative	Moderate - Negative	Moderate Negative

The ***preferred alternative for the residential area is the Original Fenceline*** because the impact is Minor compared to the Alternative which is Moderate. Along the estuary fence line the **preferred option is Alternative 2** because the construction *and maintenance* impacts are likely to be much lower in terms of water quality and habitat disturbance than for Alternative 1. This benefit only slightly outweighs the benefit of greater open habitat along the estuary for Alternative 1. This is reflected in the same Moderate Negative significance for each of the fence lines proposed in the wetland / buffer area.

6.2 Construction Phase Impact Assessment

An Environmental Control Officer (ECO) must be appointed for the duration of the construction phase with a high frequency of site visits (scheduled and unscheduled) during earth-moving and fence installation phases.

6.2.1 Pre-construction Wetland Rehabilitation

The wetland is in a very good ecological state, apart from a few impacts which are discussed in the PES section. It is recommended that prior to commencement of construction, these impacts be dealt with to improve the wetland's condition and ensure that best practice management of the wetland commences early on. Mitigation of existing impacts will result in a positive outcome if all mitigation measures are implemented (Table 7).

Table 7. Construction phase: pre-construction wetland rehabilitation.

Project phase	**Construction**			
Impact	**Pre-construction wetland rehabilitation**			
Description of impact	**Habitat degradation by alien vegetation and through mowing**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• Control alien vegetation in isolated stands where it occurs. No herbicide to be used in the wetland. Large trees must be fully ring-barked, while smaller plants can be hand-pulled or removed using a tree popper. Shrubs of bramble and Lantana must be cut back with clippers until the stump is visible, which must then be removed. • All vegetation biomass must be removed from the wetland and disposed of at a green waste dump. No vegetation must be dumped in the wetland. • Follow up alien must be conducted every 6 months following initial clearing to ensure emergent seedlings are consistently removed. • Cease mowing the northern area of the wetland barring one path that can be maintained for access to the lagoon and a strip large enough for a single vehicle along the boundary fenceline.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Positive	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Very low	Natural and/ or social functions and/ or processes are slightly altered	Very high	Natural and/ or social functions and/ or processes are majorly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Likely	The impact may occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - positive**	
Comment on significance				
Cumulative impacts				

6.2.2 Unnecessary Disturbance to Sensitive Areas

The wetland and buffer are no-go zones for any workers, equipment, vehicles, or materials for the duration of the development. As the slope is sensitive to erosion and disturbance of vegetation, it is recommended that termporary fencing be established along the edge of the slope identifying it as a No-go area. Sensitive areas must be established using temporary

fencing and signage before commencement of construction and all personnel involved in the project must be briefed about no-go areas. Impacts are likely to be a negligible negative if all mitigation measures are fully implemented (Table 8).

Table 8. Construction phase: Unnecessary disturbance to sensitive areas.

Project phase	**Construction**			
Impact	**Disturbance to wetland and buffer areas**			
Description of impact	**Vehicles, workers and materials active in wetland and buffer areas**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• Pre-construction, temporary fencing must be erected along No-Go areas with the top of the slope leading to the wetland indicated as the sensitive feature. • Signage indicating No-go areas must be placed on fencing. • All contractors must attend a site induction and be briefed that vehicles, workers, equipment and materials may not encroach into No-Go areas around wetlands. • Consider the termination of contracts or fines for encroachment into the no-go area.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	Impact will last between 1 and 5 years	Immediate	Impact will self-remedy immediately
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	High	The resource is irreparably damaged and is not represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	The impact of unnecessarily increasing the footprint of disturbance by entering no-go areas can be mitigated to a large extent by full implementation of these mitigation measures.			
Cumulative impacts	Not applicable			

6.2.3 Stormwater Runoff During Construction

Effective management of stormwater during construction can have a significant impact on the state of the wetland and buffer in the long term. Management interventions need to consider proactive and reactive measures to mitigate the impacts of stormwater runoff as the site topography evolves during the construction phase. Mitigation measures are recommended, and if fully monitored and implemented the impacts could be minimised to a negligible negative level (Table 9).

Table 9. Construction phase: stormwater runoff from the site

Project phase	**Construction**			
Impact	**Stormwater runoff from the site**			
Description of impact	**Sedimentation in the wetland and creation of preferential flow paths**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**• The objective of stormwater managmeent during the construction phase is to eliminate the risk as far as possible of discharging sediment-laden water downslope into the wetland. • Daily and weekly site meetings must consider forecasted rainfall to avoid working during such periods, and to plan accordingly for predicted high rainfall events. Work on the site must cease altogether during rainfall. • The site office must have a store of materials suitable for rapid response to erosion control such as shade-cloth (silt-fencing), haybales (check-dams), wooden droppers, hessian fabric, and fencing wire. • All material stores should be kept on flat areas and bunded to prevent material loss during rainfall. • When construction commences in the residential area, create a compacted, low soil berm along the permiter of the site approximatly 400 mm high to retain stormwater on site and reduce runoff to surrounding areas. • Monitor the site during / following periods of rainfall, and install haybale check dams at points where runoff collects and could overtop / breach the soil berm. • Following rainfall, any water that must be pumped out of pools in excavated areas must not be directed to the wetland. The soil berm system or a temporary haybale check dam can be constructed to contain water until it seeps into the ground or slowly disperses through the haybales which act as a filter.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance	Risk reduction is dependent on proactive and reactive mitigation measures as contruction progresses across the site.			
Cumulative impacts	Not applicable			

6.2.4 Construction Phase: Installation of Fences

This section has been updated to include the construction phase for any of the proposed fencing alternatives as the impacts should be fairly similar with similar mitigation measures. It is more likely that differences between the fencing options will be apparent in the operational phase. In many instances, the construction of fencelines in residential estates can have a significant impact on the natural environment. Fencelines can cross watercourses and migration corridors, and their construction can involve significant earth-moving and vegetation clearance. This is not considered necessary for the development, and measures to mitigate impacts associated with an anticipated fenceline are provided in Table 10.

Table 10. Construction phase: Installation of fenceline

Project phase	**Construction**			
Impact	**Greater than necessary footprint for fenceline installation**			
Description of impact	**Loss of vegetation, habitat disturbance, water pollution and harm to animals**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• Access points for delivery of material are only from the northern side along drier parts of the wetland where the area has been mowed and disturbed already. No Access is permitted by vehicle along the southern edge because this has high sensitivity wetland vegetation and is very wet. • The fenceline may not be installed during the breeding season from September to February. This is to avoid disturbance or harm to dispersing wildlife which are more active and vulnerable at this time. • The limit of disturbance along the fenceline area is 2 m on one side of the fencline which should be already transformed by the jeep track. • Fencelines can be installed with the help of a small machine such as a bobcat, but should otherwise be installed by hand. No excavators or larger machines are permitted to drive along the fenceline. • Vegetation obstructing work on the fenceline should be cut or trimmed, and not uprooted, unless in the direct path of the fenceline. • Disturbed soil along the fenceline should be revetated with low growing indigenous grass already found at the site. Stenotaphrum secondatum (buffalo grass) is recommended in wetland areas. This can create a relatively open area along the fenceline which can be monitored or patrolled on foot. • Any concrete mixing for posts must be contained in a wheelbarrow or small vehicle (e.g. Kubota), and is not permitted on the ground, especially in the wetland or buffer areas. • Excess concrete must be removed from the site and disposed of. No waste materials, dirty water, or concrete may be left in the wetland area. This must be monitored closely by the ECO with incidents immediately reported to DEA&DP and/or BOCMA. • Absolutely no washing of tools in water in the wetland. • No water from the wetland may be used to mix concrete. • Any vegetation cleared for installation of the fence must be removed from the site, or lightly scattered. It cannot be piled up along the fence as in Fig. 22 which creates further barriers and smothers vegetation.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Short term	Impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Low	The resource is not damaged irreparably or is not scarce	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Minor - negative**	
Comment on significance				
Cumulative impacts				

6.3 Operational Phase Impact Assessment

6.3.1 Stormwater Management

Stormwater detention areas must be monitored on a routine basis and *ad hoc* following rainfall to check for erosion or overflows. Even a single severe event can result in creation of an erosion gully, depositing sediment in the wetland and destabilising the slope. This impact should be avoided at all costs. Mitigation measures have been recommended in Table 11

which should reduce the risk to a negligible negative level. However, it is emphasised that monitoring is required to ensure that despite all the SuDS-type interventions aimed at attenuating stormwater and other flows emanating from the site, proactive stormwater management and erosion-control must be implemented.

Table 11. Operational Phase: Stormwater management

Project phase	**Operation**			
Impact	**Damage caused by stormwater runoff**			
Description of impact	**Slope erosion and sedimentation of the wetland**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**• The site should be assessed by an aquatic specialist 6 months following conclusion of construction to confirm that stormwater management infrastructure is functional and not causing any impacts to the wetland. • Stormwater management infrastructure such as swales, drains and culverts must be routinely monitored and maintained to ensure they are free of blockages and functional. This includes a regular inspection of all stormwater outflows to identify any emerging erosion issues, and keep the structures clear of excessive siltation and litter. • Where erosion is occurring, immediately identify and control the origin of the flow path, and protect the site of erosion by replacing soil with soil from the site, and stabilising with indigenous vegetation found on the site. Where more serious interventions are required spot installations of gabions may be suitable for stabilisation provided they are not in the wetland buffer or in the wetland itself (an amendment to the WUL may be required). As far as possible, flows must be attenuated, and the source of erosion controlled upslope within the residential area. • Eroded areas of the steep banks must be refilled with topsoil (from the site), reseeded with indigenous vegetation, covered with a light mulch and protected with soil saver mats. The use of silt fencing can be extended to problem areas to provide further protection.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Very limited	Limited to specific isolated parts of the site
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Low	Natural and/ or social functions and/ or processes are somewhat altered
Probability	Likely	The impact may occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance				
Cumulative impacts	Not applicable			

6.3.2 Operational Phase: Alien Vegetation

Every effort must be made to ensure the area disturbed during construction is kept free of alien vegetation. This includes not only the residential area, but the wetland and buffer too. Follow up alien vegetation control must take place on a routine basis bi-annually in perpetuity. Provided the recommended mitigation measures are followed the impacts are predicted to be a Negligible Positive (Table 12).

Table 12. Operational Phase Impact: Alien vegetation establishment

Project phase	**Operation**			
Impact	**Alien vegetation establishment**			
Description of impact	**Establishment of aliens in disturbed areas post-construction resulting in habitat degradation**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• Follow up inspection and control of alien vegetation in the residential development and the wetland on a 6-monthly basis. • No herbicides to be used in the wetland or wetland buffer. Sprays and / or cut-stump treatments may be used in the residential areas. • Ensure bare areas of vegetation are replanted with indigenous vegetation that occurs naturally on the site. • Under no circumstances may removed alien plants be discarded in the wetland. The HOA must inform the landscaping / gardening team that no dumping of vegetation or discarding of waste material may happen in the wetland or buffer area.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Positive	
Duration	Medium term	Impact will last between 5 and 10 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Low	The resource is not damaged irreparably or is not scarce
Significance	**Minor - negative**		**Negligible - positive**	
Comment on significance				
Cumulative impacts	Not applicable			

6.3.3 Operational phase: Landscaping, Fire-breaks and Pathways Maintenance

Landscaping along the edge of the built estate, fire-breaks cut along the property boundary, and pathways in the open space area all contribute to fragmentation of the wetland and associated thicket vegetation (Figure 24). While this has all occurred historically, the lack of significant development and fencing across the site created less fragmented conditions than the future scenario anticipated with development of the estate. Therefore, the management of this area should be reconsidered.

Given the high ecological importance of the wetland it should be managed for conservation outcomes. This means that disturbance and fragmentation of sensitive wetland habitat by mowing teams must be kept to a minimum. Fire is currently considered a risk and has occurred previously on the site. However, this is reportedly associated with vagrants on the site, the presence of which will be deterred by the fenceline proposed to protect the estate. Along with the frequently high moisture levels in the wetland, thicket vegetation, and reduced security risk, the fire risk should be reduced (although **comment on this should be obtained from the Southern Cape Fire Protection Agency,** of which the landowners are already members).

Provided the mitigation measures are implemented as listed in Table 13 the impacts should be a Negligible positive because the wetland will be less impacted by fragmentation than at present.

Figure 24. Photos supplied by landowner showing current approach to cutting firebreaks (cut by the Southern Cape Fire Protection Agency) looking East along the boundary fenceline (left) and a fire-fighting access road into the open space around the wetland (right).

Table 13. Operational phase: Landscaping, fire-breaks and recreational pathways maintenance.

Project phase	**Operation**			
Impact	**Landscaping, fire-breaks and recreational pathways maintenance**			
Description of impact	**Inappropriate mowing, planting or trimming of vegetation leading to habitat degradation**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• The north-eastern boundary fire-break should be maintained at 20m wide as a defensible zone for adjacent housing. Mowing with weedeaters can continue along the 20m strip. IF it is thought that reed growth (Phragmites) beyond the 20 m fire-break poses a serious fire risk (agreed to in writing by SCFPA), then reeds may be cut by hand to 1m high for an additional 20 m with no soil disturbance by vehicles or machinery permitted. Reeds (no other vegetation) must be cut during winter to avoid disturbance to breeding birds, and removed from the wetland area to avoid smothering vegetation. • The south-western boundary between RE/6503 and neighbouring Erf 6504 can be maintained with a 5m firebreak which provides vehicle access along the fenceline. The wetland area along this section should not be trimmed lower than 1m however. This is to prevent disturbance to the eggs of aquatic biota which are often deposited in the base of stems and leaves close to the water. As there are no houses in the adjacent Erf 6504 the fire risk is reduced, and in any event the entire Erf 6504 is maintained with very low cut vegetation. Should this situation change (ie. houses built), then the SCFPA should be consulted on best practice adjustments in consultation with an aquatic specialist. • Currently at least two road-width pathways are maintained by mowing through the wetland/open space which provide access for fire-fighting. Comment on the necessity of vehicle access should be provided by the SCFPA as it would be preferable to maintain narrower paths at a width of 3 m to allow walking / jogging / small vehicle access only (e.g. kabota). Whether maintaned as roads or pathways, maintenance must include the removal of alien vegetation (previously discussed), trimming of pathways using hand-held weedeaters and no disturbance to indigenous plant roots or soil is permitted. • Use simple markers along the designated edge of paths and fire-breaks to ensure landscaping teams do not encroach further than the designated edge. • No herbicides can be used to maintain pathways or fire-breaks in the wetland area or buffer. • The existing footprint of any mowed or cleared pathways may not be enlarged. • No new pathways may be created in addition to those already existing in the open space area. • Do not plant any exotic plants that do not occur naturally at the site in any area of the wetland or buffer. ie. under no circumstances may kikuyu grass be planted in any part of the wetland or buffer. • No vehicles (tractors pulling mowers) may be used to cut vegetation in any part of the wetland, for firebreaks or pathways. • No fire-break may be cut along the new fenceline proposed adjacent to the estuary. • Ensure gardening / landscaping team / homeowners do not dump green waste into the open space area as this will smother indigenous plants and encourage the spread of alien and exotic plant species.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Positive	
Duration	Short term	Impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Limited	Limited to the site and its immediate surroundings	Very limited	Limited to specific isolated parts of the site
Intensity	Moderate	Natural and/ or social functions and/ or processes are moderately altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Certain / definite	There are sound scientific reasons to expect that the impact will definitely	Unlikely	Has not happened yet but could happen once in the lifetime of the
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	High	The affected environment will be able to recover from the impact
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Negligible - positive**	
Comment on significance				
Cumulative impacts	No applicable.			

6.3.4 Operational phase: Leaking, Blocked or Overflowing Sewerage Infrastructure

While significant efforts have been made to ensure sewage pump stations and infrastructure are well planned, positioned and maintained within the development, experience has shown

that even well-intentioned developments can have periodic problems with leaking, blocked or overflowing sewerage pipes or pump stations. Maintenance and regular inspections are key to ensuring that any issues are detected and dealt with early. Mitigation measures are provided in sTable 14.

sTable 14. Operational phase impact: leaking, blocked or overflowing sewerage infrastructure.

Project phase	**Operation**			
Impact	**Leaking, blocked or overflowing sewerage infrastructure**			
Description of impact	**Pollution and eutrophication of the wetland leading to habitat degradation and impacts to biota**			
Mitigatability	High	Mitigation exists and will considerably reduce the significance of impacts		
Potential mitigation	**• All sewerage infrastructure must be well maintained and kept free of obscuring vegetation. Manholes, sewerlines, and the pump stations must be accessible, easily observed, and routinely inspected for leaks or blockages. • Emergency response measures to sewage spillages should be maintained on site, including lime to treat sewage and sand bags to contain spill and limit their dispersal. An emergency response protocol must be established by management of the HOA. • Residents should be provided with information of what can / cannot be flushed into toilets. This knowledge is often assumed, but is frequently over-estimated. Even educated people treat a toilet like a rubbish bin. • Ensure sufficient backup power systems are available for the operation of pump stations during load shedding and at peak times (e.g. December).**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Short term	Impact will last between 1 and 5 years	Brief	Impact will not last longer than 1 year
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Very low	Natural and/ or social functions and/ or processes are slightly altered
Probability	Probable	The impact has occurred here or elsewhere and could therefore occur	Unlikely	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
Confidence	High	Substantive supportive data exists to verify the assessment	High	Substantive supportive data exists to verify the assessment
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Minor - negative**		**Negligible - negative**	
Comment on significance				
Cumulative impacts	Not applicable			

6.3.5 Operational Phase: Irrigation With Treated Wastewater Causing Eutrophication

According to the engineering services report, all the treated effluent will be used for irrigation, with dedicated irrigation storage tanks installed near the package plant (4 x 10 kilo-litre). The volumes to be irrigated will be up to 40 m^3 per day, which would be at full capacity / development of the estate. Until the estate has been fully developed, irrigation of treated effluent is likely to be fairly achievable given low occupancy and extensive open space. But as the occupancy rates increase and open space decreases there will be increased pressure to irrigate over smaller areas. In either event, the quality of treated water to be irrigated (aim to comply with DWS General Limits) is still considered high in nutrients compared to natural waters, and therefore poses a risk of eutrophication (nutrient enrichment) to the wetland.

This can be mitigated to an extent through monitoring of water quality in two wells. The wells must be installed and baseline water quality determined prior to commencement of the construction phase. However, success of this mitigation is reliant on a proactive response to monitoring results, and possible increases in nutrient levels. Provided mitigation measures provided in Table 15

Table 15. Operational phase impact: Irrigation with treated wastewater resulting in eutrophication of the wetland.

Project phase	**Operation**			
Impact	**Irrigation with treated wastewater daily resulting in eutrophication of the wetland**			
Description of impact	**Seepage of treated wastewater into the wetland could result in eutrophication**			
Mitigatability	Medium	Mitigation exists and will notably reduce significance of impacts		
Potential mitigation	**• Under NO circumstances can treated wastewater be discharged to the stormwater system, as this leads directly to the wetland which has a unique water chemistry that supports a diverse assemblage of fauna and flora. • Install 2 groundwater spikes / wells at 10m depth to monitor ground water on the upland area (within the estate) near the wetland buffer. These should be located at least 200 m apart and provide easy access during the construction and operational phase. They should not be located in any area of significant natural vegetation, and should rather be sited in grassy areas. • Collect a water sample from each monitoring point on a monthly basis during the construction and operational phase and submit to a registered laboratory for the analysis of parameters indicated by DWS general limits. • Water chemistry results should not vary by more than 10% of background values as established prior to the development. Therefore, the spikes should be installed for monitoring prior to the commencement of construction, and water sampling to establish the baseline should be undertaken for 3 months. • If water chemistry deviates signficantly from background levels and begins to indicate eutrophication (nutrient enrichment; e.g. elevated levels for > 3 months), then an alternative solution to the irrigation of water must be provided. This could involve discharging to clay-lined ponds, or irrigating on the neighbouring school's sportsfields. Proactive steps to mitigate eutrophication must be taken from the first month that elevated levels are noted, so that if elevated levels persist, a solution is fully actionable by the 3rd month. • Water samples must be submitted to the Bitou Municipality, BOCMA and be reviewed by an aquatic ecologist on a quarterly basis for the first two years of operation of the estate.**			
Assessment	**Without mitigation**		**With mitigation**	
Nature	Negative		Negative	
Duration	Long term	Impact will last between 10 and 15 years	Short term	Impact will last between 1 and 5 years
Extent	Local	Extending across the site and to nearby settlements	Limited	Limited to the site and its immediate surroundings
Intensity	High	Natural and/ or social functions and/ or processes are notably altered	Moderate	Natural and/ or social functions and/ or processes are moderately altered
Probability	Almost certain / Highly probable	It is most likely that the impact will occur	Probable	The impact has occurred here or elsewhere and could therefore occur
Confidence	High	Substantive supportive data exists to verify the assessment	Medium	Determination is based on common sense and general knowledge
Reversibility	Medium	The affected environment will only recover from the impact with significant intervention	Medium	The affected environment will only recover from the impact with significant intervention
Resource irreplaceability	Medium	The resource is damaged irreparably but is represented elsewhere	Medium	The resource is damaged irreparably but is represented elsewhere
Significance	**Moderate - negative**		**Minor - negative**	
Comment on significance	Mitigation will reduce the intensity and timeframe of the impact as a response to water quality monitoring will include finding alternative sites for disposal of water or improvement of water treatment.			
Cumulative impacts				

7. CONCLUSIONS

The proposed residential development known as Plett Lagoon Estate initially included housing which extended into the wetland area. Since biodiversity specialist inputs have been provided, the proposed development has been significantly reduced to a revised SDP (July 2023) and updated Site Development Plan (March 2024) which exclude any development from the wetland and buffer area entirely.

An update to the original SDP proposed that a security fence be installed along the estuarine edge of the development. Various options were assessed and compared, and if all mitigation measures are implemented the impact would be a Moderate Negative in terms of habitat fragmentation. The No Go option would always be preferable when considering habitat fragmentation and fencing, however, residents would not feel secure without the presence of the fence and a fire risk would be posed by vagrants sleeping in the wetland bush. Therefore, the mitigation measures aimed at deterring criminals but maintaining wildlife movement through fencing should be fully adhered to should the fence line be approved. Fenceline Alternative 2 along the estuary is preferred.

Mitigation measures proposed to manage both stormwater and sewage on site have been carefully considered in the report provided by Vita Consulting Engineers. The SuDS-type interventions proposed in this report provide confidence that stormwater can be effectively managed on site, with minimal risk to the wetland's habitat and water quality. A few additional mitigation measures in terms of the design and layout of stormwater outflows were recommended in this report.

The wetland was classified as a depression with a PES of A (Natural) and an EIS of 'Very High'. As the last remaining natural wetland habitat on the western bank of Keurbooms Lagoon, the wetland has great significance. A wetland buffer of 30 m was recommended and not only protects the wetland from the residential development upslope, but provides a level of connectivity between the terrestrial and wetland areas with the lagoon. The impact assessment determined most of the construction and operational phase impacts to be a Negligible negative with some impacts being a negligible positive.

Development of the Plett Lagoon Estate is supported provided the residential areas are planned outside of the wetland and buffer area, and the wetland is conserved, well maintained and remains a functional component of the Keurbooms Estuary.

8. APPENDICES

8.1 Present Ecological State Methods

The wetland area was assessed using the Level 2 WET-Health assessment tool developed by Macfarlane *et al*. (2020). The tool aims to assess the integrity of a wetland which is defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition. The reference condition is inferred from conceptual models of the selected hydrogeomorphic wetland type. The method combines an assessment of hydrological, geomorphological, water quality and vegetation health four modules.

Data collection involved a desktop review of the extent and intensity of catchment land use impacts and was undertaken using historical and recent aerial imagery of the site (Chief Directorate: National Geo-spatial Information and satellites). Fieldwork onsite involved the identification and recording of observable impacts to the wetland at the site of relevant activities as well as at reference points upstream and downstream of the activities, and in the catchment area of the wetland. The magnitude of observed impacts to the hydrological, geomorphological and vegetation components of the wetland were calculated and combined as per the tool to provide a measure of the overall wetland condition of the wetland. Resultant scores were then used to assign the wetland into one of six PES categories as shown in Table 16.

Table 16. Wetland Present Ecological State categories and impact descriptions.

Ecological Category	Description	PES Score
A	Unmodified, natural.	90-100%
B	Largely natural with few modifications / in good health. A small change in natural habitats and biota may have taken place but the ecosystem functions are still predominantly unchanged.	80-89%
C	Moderately modified / fair condition. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60-79%
D	Largely modified / poor condition. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40-59%
E	Seriously modified / very poor condition. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39%
F	Critically modified / totally transformed. Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota.	0-19%

8.2 Ecological Importance and Sensitivity Methods

The revised method for the determination of the EIS of a wetland considers the three following ecological aspects (Rountree *et al*., 2013):

- **Ecological importance and sensitivity**
  - Biodiversity support including rare species and feeding/breeding/migration;
  - Protection status, size and rarity in the landscape context;
  - Sensitivity of the wetland to floods, droughts and water quality fluctuations.

- **Hydro-functional importance**
    - Flood attenuation;
    - Streamflow regulation;
    - Water quality enhancement through sediment trapping and nutrient assimilation;
    - Carbon storage
- **Direct human benefits**
    - Water for human use and harvestable resources;
    - Cultivated foods;
    - Cultural heritage;
    - Tourism, recreation, education and research.

Each criterion is scored between 0 and 4, and the average of each subset of scores is used to derive a score for each of the three components listed above. The highest score is used to determine the overall Importance and Sensitivity category of the wetland system (Table 17).

Table 17.Ecological importance and sensitivity categories for wetlands. Interpretation of average scores for biotic and habitat determinants.

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and <=4	A
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and <=3	B
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and <=2	C
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these floodplains is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	>0 and <=1	D

8.3 Impact Assessment Methods

Criteria are ascribed for each predicted impact. These include the intensity (size or degree scale), which also includes the type of impact, being either a positive or negative impact; the duration (temporal scale); and the extent (spatial scale), as well as the probability (likelihood). The methodology is quantitative, whereby professional judgement is used to identify a rating for each criterion based on a seven-point scale (Table 18) and the significance is auto-generated using a spreadsheet through application of the calculations.

For each predicted impact, certain criteria are applied to establish the likely **significance** of the impact, firstly in the case of no mitigation being applied and then with the most effective mitigation measure(s) in place.

These criteria include the **intensity** *(*size or degree scale), which also includes the **nature** of impact, being either a positive or negative impact; the **duration** (temporal scale); and the **extent** (spatial scale). These numerical ratings are used in an equation whereby the **consequence** of the impact can be calculated. Consequence is calculated as follows:

Consequence = type x (intensity + duration + extent)

To calculate the significance of an impact, the **probability** (or likelihood) of that impact occurring is applied to the consequence.

Significance = consequence x probability

Depending on the numerical result, the impact would fall into a significance category as negligible, minor, moderate or major, and the type would be either positive or negative (as below).

Significance:	negative	positive
Negligible	Negligible - negative	Negligible - positive
Minor	Minor - negative	Minor - positive
Moderate	Moderate - negative	Moderate - positive
Major	Major - negative	Major - positive

Table 18. Assessment criteria for the evaluation of impacts

Criteria	Numeric Rating	Category	Description
Duration	**1**	**Immediate**	Impact will self-remedy immediately
	2	**Brief**	Impact will not last longer than 1 year
	3	**Short term**	Impact will last between 1 and 5 years
	4	**Medium term**	Impact will last between 5 and 10 years
	5	**Long term**	Impact will last between 10 and 15 years
	6	**On-going**	Impact will last between 15 and 20 years
	7	**Permanent**	Impact may be permanent, or in excess of 20 years
Extent	**1**	**Very limited**	Limited to specific isolated parts of the site
	2	**Limited**	Limited to the site and its immediate surroundings
	3	**Local**	Extending across the site and to nearby settlements
	4	**Municipal area**	Impacts felt at a municipal level
	5	**Regional**	Impacts felt at a regional level
	6	**National**	Impacts felt at a national level
	7	**International**	Impacts felt at an international level
Intensity	**1**	**Negligible**	Natural and/ or social functions and/ or processes are negligibly altered
	2	**Very low**	Natural and/ or social functions and/ or processes are slightly altered
	3	**Low**	Natural and/ or social functions and/ or processes are somewhat altered
	4	**Moderate**	Natural and/ or social functions and/ or processes are moderately altered
	5	**High**	Natural and/ or social functions and/ or processes are notably altered
	6	**Very high**	Natural and/ or social functions and/ or processes are majorly altered

Criteria	Numeric Rating	Category	Description
	7	**Extremely high**	Natural and/ or social functions and/ or processes are severely altered
Probability	1	**Highly unlikely / None**	Expected never to happen
	2	**Rare / improbable**	Conceivable, but only in extreme circumstances, and/or might occur for this project although this has rarely been known to result elsewhere
	3	**Unlikely**	Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur
	4	**Probable**	Has occurred here or elsewhere and could therefore occur
	5	**Likely**	The impact may occur
	6	**Almost certain / Highly probable**	It is most likely that the impact will occur
	7	**Certain / Definite**	There are sound scientific reasons to expect that the impact will definitely occur

When assessing impacts, broader considerations are also considered. These include the level of confidence in the assessment rating; the reversibility of the impact; and the irreplaceability of the resource as set out in (Table 19, Table 20, & Table 21), respectively.

Table 19. Definition of confidence ratings.

Category	Description
Low	Judgement is based on intuition
Medium	Determination is based on common sense and general knowledge
High	Substantive supportive data exists to verify the assessment

Table 20. Definition of reversibility ratings.

Category	Description
Low	The affected environment will not be able to recover from the impact - permanently modified
Medium	The affected environment will only recover from the impact with significant intervention
High	The affected environmental will be able to recover from the impact

Table 21. Definition of irreplaceability ratings.

Category	Description
Low	The resource is not damaged irreparably or is not scarce
Medium	The resource is damaged irreparably but is represented elsewhere

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05 OCTOBER 2023

VITA CONSULTING ENGINEERS
51 Lourensford Estate
Somerset West
7130

Attention: Riaan van Dyk

Dear Sir

CONFIRMATION OF BULK SERVICES: ERVEN 6504 & RE/6503

We confirm that Bitou Municipality has bulk infrastructure capacity in its networks and can accommodate the proposed development, subject to the following conditions.

1. That the developer enters and sign a Service Level Agreement with Bitou Municipality,
2. That the developer implements the upgrade of services as detailed and required in the GLS network analysis report, dated 27 February 2023.

Please contact the official dealing with this project for any further information in this regard.

Yours faithfully

MR. VW. FELTON
DIRECTOR: ENGINEERING SERVICES

Official dealing with this;
Miss Asiphe Mgoqi: Engineering Services: Project Manager: Planning & Development

Draft report

27 February 2023

The Director: Engineering Services
Bitou Municipality
Private Bag X1002
Plettenberg Bay
6600

Attention: Ms Asiphe Mgoqi

Dear Madam,

PROPOSED RESIDENTIAL DEVELOPMENT ON ERF 6504 AND THE REMAINDER OF ERF 6503, PLETTENBERG BAY: CAPACITY ANALYSIS OF THE BULK WATER & SEWER SERVICES

The request by Mr Riaan van Dyk of Vita Consulting Engineers for GLS Consulting to investigate and comment on the bulk water supply and sewer discharge of the proposed development (retirement village development on portion 53 of Farm 444, Plettenberg Bay), refers.

This document should inter alia be read in conjunction with the Water Master Plan (performed for the Bitou Municipality) dated June 2020 and the Sewer Master Plan dated June 2020.

The proposed development was not taken into consideration for the master plans for the water and sewer networks.

1 WATER DISTRIBUTION SYSTEM

1.1 Distribution zone

For this re-analysis of the water master plan it is proposed that the development area should be accommodated in the existing Goose Valley reservoir zone. The proposed connection to the existing water system is to the existing 250 mm diameter supply pipeline from the Goose Valley reservoir in Beacon Way, as shown on Figure 1 attached.

The proposed development is situated inside the water priority area.

1.2 Water demand

No provision was made in the original water analysis for the master plan for development on Erf 6504 and the remainder of Erf 6503 in Plettenberg Bay .

For this re-analysis, the total annual average daily demand (AADD) and fire flow for the proposed development were calculated and classified as follows:

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Reg no: 2007/003039/07
www.gls.co.za

Directors: RL Pole, AG Hingeston, AN Umichand

- 40 x retirement units @ 0,6 kL/d/unit = 24,0 kL/d
- 31 x Single residential units @ 1,0 kL/d/unit = 31,0 kL/d

TOTAL = 55,0 kL/d *

* As per Table J.2 from Section J – Water Supply of "The Neighbourhood Planning and Design Guide" (so called "Red book").

- Fire flow criteria (Low risk) = 15 L/s @ 10 m

1.3 Present situation

1.3.1 Reticulation network

It is recommended that the proposed development is accommodated within the existing Goose Valley reservoir water distribution zone and not within the Town PRV no. 3 zone.

The Goose Valley water distribution zone is supplied with water from the Goose Valley reservoir (Top Water Level (TWL) of 89.7 m above mean sea level (m a.s.l.)) through a 250 mm Ø main supply pipe under gravity. The existing water reticulation system also supplies bulk water to the Wittedrift and Matjiesfontein reservoirs (through the reticulation network, see section 1.3.3 further on in the report) and has consequently insufficient capacity to accommodate the domestic water demand of the proposed development in order to comply with the pressure and fire flow criteria as set out in the master plan.

Link services items BPW14.1 will be required to connect the internal reticulation network of the proposed development to the existing municipal water network.

Link services

- BPW14.1 : 70 m x 200 mm Ø new pipe = R 284 000 *

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2022/23 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

The route of link services item BPW14.1 is schematically shown on Figure 1, but has to be finalised subsequent to a detailed pipeline route investigation.

1.3.2 Reservoir capacity

Bulk water is currently supplied from the Goose Valley reservoir to the Matjiesfontein and Wittedrift reservoirs, which has a negative effect on the available reservoir storage capacity available for the Goose Valley reservoir supply area (this is discussed in section 1.3.3 of this report further on).

The Matjiesfontein reservoir is the main supply reservoir for the areas east of the Keurbooms River and the Wittedrift reservoir is the main supply reservoir for Wittedrift and Green Valley.

The Goose Valley reservoir has consequently insufficient spare capacity to accommodate any additional developments.

Note: The Goose Valley reservoir will have sufficient spare capacity available to accommodate the development if the Wittedrift and Matjiesfontein reservoirs are supplied with water directly from the Town reservoirs through a dedicated bulk system, as discussed in paragraph 1.4.1 further on in the report.

1.3.3 Bulk supply

The Plettenberg Bay bulk water system was designed to supply the Wittedrift and Matjiesfontein reservoirs with bulk water from the Town reservoirs, located on the Plettenberg Bay Water Treatment Plant (WTP) site, and the Goose Valley reservoir with bulk water through the Goose Valley PS, also located at the Plettenberg Bay WTP site.

The Matjiesfontein reservoir was supplied with water through a 150 mm diameter dedicated pipeline between the Town reservoirs and the Matjiesfontein reservoir, and the Wittedrift reservoir through a 90 mm diameter pipe that connects to the Town/Matjiesfontein pipeline.

The 150 mm supply pipe to the Matjiesfontein and Wittedrift reservoirs is however at capacity (capacity of pipeline is ±1,0 ML/d and peak demand of the supply system is currently ±2,3 ML/d) and bulk supply to the Matjiesfontein and Wittedrift reservoirs is therefore currently supplied from the Goose Valley reservoir through the network of the Goose Valley water distribution zone. The Goose Valley reticulation network connects to the Matjiesfontein bulk pipeline before the bridge over the Keurbooms River.

The system is therefore currently not operated as it was designed for. The current operation consequently puts pressure on the available spare capacity of the Goose Valley system and is also not economically the best solution for the longer term (water that could have gravitated to the Matjiesfontein reservoir is currently pumped via the Goose Valley system).

The Goose Valley reservoir is supplied with water through a 200 mm diameter dedicated pipe between the Goose Valley PS and reservoir.

The capacity of the existing Goose Valley PS and accompanying 200 mm supply pipeline is 40 L/s (3,4 ML/d if pumped 24 hours a day). Peak demand from the Plettenberg Bay WTP to the Goose Valley reservoir is calculated at 2,7 ML/d (based on bulk water readings of the Goose Valley PS supplied by Bitou Municipality from July 2020 to March 2022). This implies that during peak demand conditions (December holiday) the Goose Valley PS should be operational 19 hours a day in order to supply the demand.

Bitou Municipality has indicated that their Goose Valley bulk system is under pressure during peak demand conditions and that the larger bulk system (supply to Matjiesfontein reservoir) should be upgraded according to the master plan before additional developments can be accommodated within the existing Goose Valley reservoir supply area.

1.4 Implementation of the master plan

1.4.1 Bulk supply

In the water master plan the following upgrades are proposed in order to augment the existing bulk supply system between the Town reservoirs at the WTP site and the Matjiesfontein reservoir on the eastern side of the Keurbooms River:

<u>Bulk supply augmentation</u>

• BPW.B39	: 930 m x 400 mm Ø new bulk pipe (replace 150 mm Ø)	= R	6 108 000 *
• BPW.B67	: 2 670 m x 355 mm Ø new bulk pipe (replace 150 mm Ø)	= R	13 813 000 *
• Item 1	: Close existing isolating valve	= R	No cost
	Total	= R	19 921 000 *

In the Water Master Plan item DPW.B40 was proposed to connect an existing 300 mm Ø pipeline from the Town reservoir zone to the existing 150 mm Ø Matjiesfontein bulk pipeline (at the intersection of the N2 National Road and the service road towards the Goose Valley reservoir), in order to augment bulk water supply to the Matjiesfontein and Wittedrift reservoirs.

Bitou Municipality has however indicated that this 300 mm Ø pipeline (3,6 km asbestos cement pipeline from the Town reservoirs) is in a poor condition, has been abandoned and can not be utilised to augment the bulk water supply system. The master plan should therefore be amended to reflect this.

It is therefore proposed that the following master plan item is included in the water master plan in the place of the existing 300 mm Ø AC pipeline.

- Item 2 : 3 600 m x 400 mm Ø new bulk pipe (replace 300 mm Ø) = R 22 631 000 *

These upgrades will solve the existing backlog of bulk supply to the Matjiesfontein reservoir as well as provide spare capacity for potential future development areas, as documented in the water master plan.

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2022/23 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

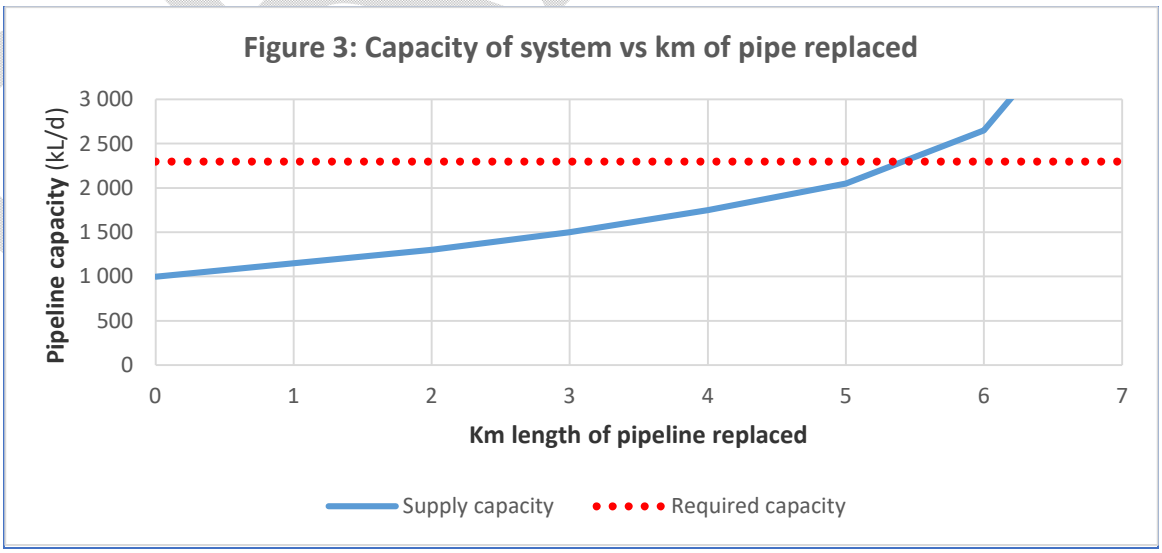
Take note that the routes of the proposed pipelines are schematically shown on Figure 2 attached, but have to be finalised subsequent to detail pipeline route investigations.

1.5 *Minimum upgrades required to bulk system*

The capacity of the existing bulk supply system from the Town reservoirs to the Matjiesfontein reservoir is calculated at 1,0 ML/d. The required supply to the Matjiesfontein reservoir during peak holiday periods is calculated at 2,3 ML/d (refer to paragraph 1.3.3).

It is therefore proposed that the existing 150 mm Ø pipeline between the Town reservoirs and the bridge over the Keurbooms River is replaced and isolated from the existing Goose Valley network as proposed in the water master plan in order to augment supply to the Matjiesfontein reservoir. This will then alleviate pressure that currently exist on the supply to the Goose Valley reservoir in order to accommodate future developments within the reservoir supply area.

Figure 3 below shows how supply to the Matjiesfontein reservoir will improve as sections of master plan items 2, BPW.B39 and BPW.B67 are implemented (from the Town reservoir towards the Keurbooms River):



Roughly 5,5 km of the existing 7,7 km x 150 mm Ø bulk pipeline between the Town reservoirs and the Keurbooms River should be upgraded in order to supply the Matjiesfontein reservoir from the Town reservoirs under gravity (no augmentation of bulk supply from the Goose Valley reservoir will then be required).

The minimum upgrades required to the improve the existing bulk supply system in order to accommodate the proposed development in the existing system are:

- Master plan item 2 (3,6 km x 400 mm Ø replace existing 300 mm Ø abandoned AC pipe).
- Master plan item BPW.B39 (0,9 km x 400 mm Ø replace existing 150 mm Ø bulk pipe).
- Portion of master plan item BPW.B67 (1,0 km x 355 mm Ø replace existing 150 mm Ø bulk pipe).

1.6 Additional development planned in the short-term for Goose Valley reservoir zone

Although GLS Consulting cannot comment on the implementation timeframes of proposed developments, it should be noted that capacity analyses for the following developments (that should be supplied with water from the Goose Valley/Matjiesfontein/Wittedrift bulk supply system) have been performed in the last 3 years:

- Portion 32 of Farm 304 (Final report dated 15 September 2022, estimated water demand of 9,6 kL/d).
- Portion 38 of Farm 444 (Final report dated 3 October 2022, estimated water demand of 10,2 kL/d).
- Erf 155, Keurboomstrand (Final report dated 7 December 2022, estimated water demand of 3,0 kL/d).
- Portions 19 & 27 of Farm 444 (Final report dated 7 December 2022, estimated water demand of 234,9 kL/d).
- Portion 53 of Farm 444 (Final report dated 7 December 2022, estimated water demand of 101,9 kL/d).
- Portion 7 of Farm 306, Wittedrift (Final report dated 9 December 2022, estimated water demand of 60,0 kL/d).
- Erven 103 & 104, Wittedrift (Final report dated 9 December 2022, estimated water demand of 36,0 kL/d).
- Erf 342, Wittedrift (Final report dated 9 December 2022, estimated water demand of 4,7 kL/d).
- Portion 91 of Farm 304 (Draft report dated 27 February 2023, estimated water demand of 43,8 kL/d).

The scope of the report does not cover the cumulative effect of the proposed developments. However, it should be noted that the simultaneous development of the proposed developments will accelerate the need for the master plan to be implemented.

2 SEWER NETWORK

2.1 Drainage area

It is proposed that sewage from the proposed development is accommodated within the existing Plettenberg Bay Pumping Station (PS) 1 drainage area.

The proposed connection point for the internal sewer reticulation network of the development to the existing municipal sewer system is to the existing 150 mm diameter outfall sewer in Susan Street, as shown on Figure 4 attached.

From PS no. 1 sewage is pumped through a 160 mm diameter rising main directly towards the Plettenberg Bay PS no. 1a.

Sewage is pumped from the Plettenberg Bay PS 1a through a 355 mm diameter dedicated rising main to the Ganse Valley Wastewater Treatment Plant (WWTP).

The proposed development is situated inside the sewer priority area.

2.2 Sewer flow

No provision was made in the original sewer master plan for development on Erf 6504 and the remainder of Erf 6503.

For this re-analysis, the peak daily dry weather flow (PDDWF) for the proposed development was calculated at 38,5 kL/d.

2.3 Present situation

The existing gravity sewer system between the proposed development gravitating towards the Plettenberg Bay PS 1 and the pumping system from the Plettenberg PS 1 to Plettenberg Bay PS1a have sufficient capacity to accommodate the proposed development.

The Plettenberg Bay PS 1a and accompanying 355 mm diameter rising main also have sufficient spare capacity to accommodate the proposed development.

3 CONCLUSION

The developer of Erf 6504 and the remainder of Erf 6503 in Plettenberg Bay may be liable for the payment of a Development Contribution (as calculated by Bitou Municipality) for bulk water and sewer infrastructure as per Council Policy.

The master plan indicated that the proposed development area should be accommodated in the existing Goose Valley reservoir zone. The proposed connection to the existing water system is to the existing 250 mm diameter supply pipeline from the Goose Valley reservoir in Beacon Way, as shown on Figure 1. Link services items BPW14.1 is required to connect the internal reticulation network of the proposed development to the existing municipal water network.

The bulk water system to the Goose Valley, Wittedrift and Matjiesfontein reservoirs is at capacity and should be upgraded according to the master plan before additional developments within the reservoir supply areas can be accommodated.

The minimum upgrades required to improve the existing bulk supply system (in order to accommodate the proposed development together with other potential development areas within the existing supply areas of the Goose Valley, Wittedrift and Matjiesfontein reservoirs), are:

- Master plan item 2 (3,6 km x 400 mm Ø replace existing 300 mm Ø abandoned AC pipe).
- Master plan item BPW.B39 (0,9 km x 400 mm Ø replace existing 150 mm Ø bulk pipe).
- Portion of master plan item BPW.B67 (1,0 km x 355 mm Ø replace existing 150 mm Ø bulk pipe).

There is sufficient capacity in the existing Plettenberg Bay sewer reticulation system to accommodate the proposed development. The recommended position for the sewer connection for the proposed development is to the existing 150 mm diameter outfall sewer in Susan Street, as shown on Figure 4 attached.

Also, find attached hereto Appendix A which includes general notes from Bitou Local Municipality regarding development approvals and conditions.

We trust that you find this of value.

Yours sincerely,

GLS CONSULTING (PTY) LTD
REG. NO.: 2007/003039/07

_____
Per: PC DU PLESSIS

cc. Vita Consulting Engineers
51 Lourensford Estate
Somerset West
7130

Attention: Mr Riaan van Dyk

APPENDIX A **February 2023**

GENERAL NOTES FROM BITOU LOCAL MUNICIPALITY ATTACHED TO GLS BULK WATER AND SEWER SERVICES CAPACITY REPORT

1. The GLS report is a services capacity report and the costs estimated in this report are only approximate values applicable at the time of the study.

2. Should the development be approved by Council the approval will be linked to certain development conditions. These conditions will be the official conditions applicable to the project and will take precedence over this report. Once approval is granted, Council will enter into a formal services agreement with the developer.

3. Costs for network upgrades, etc. As mentioned in the GLS report could change from time to time due to escalation, new tariff structures, additional requirements etc.

4. The Developer may be liable to pay a Development Contribution as per Council policy. The value payable will be calculated using Bitou Local Municipality's Development Contribution Calculator.

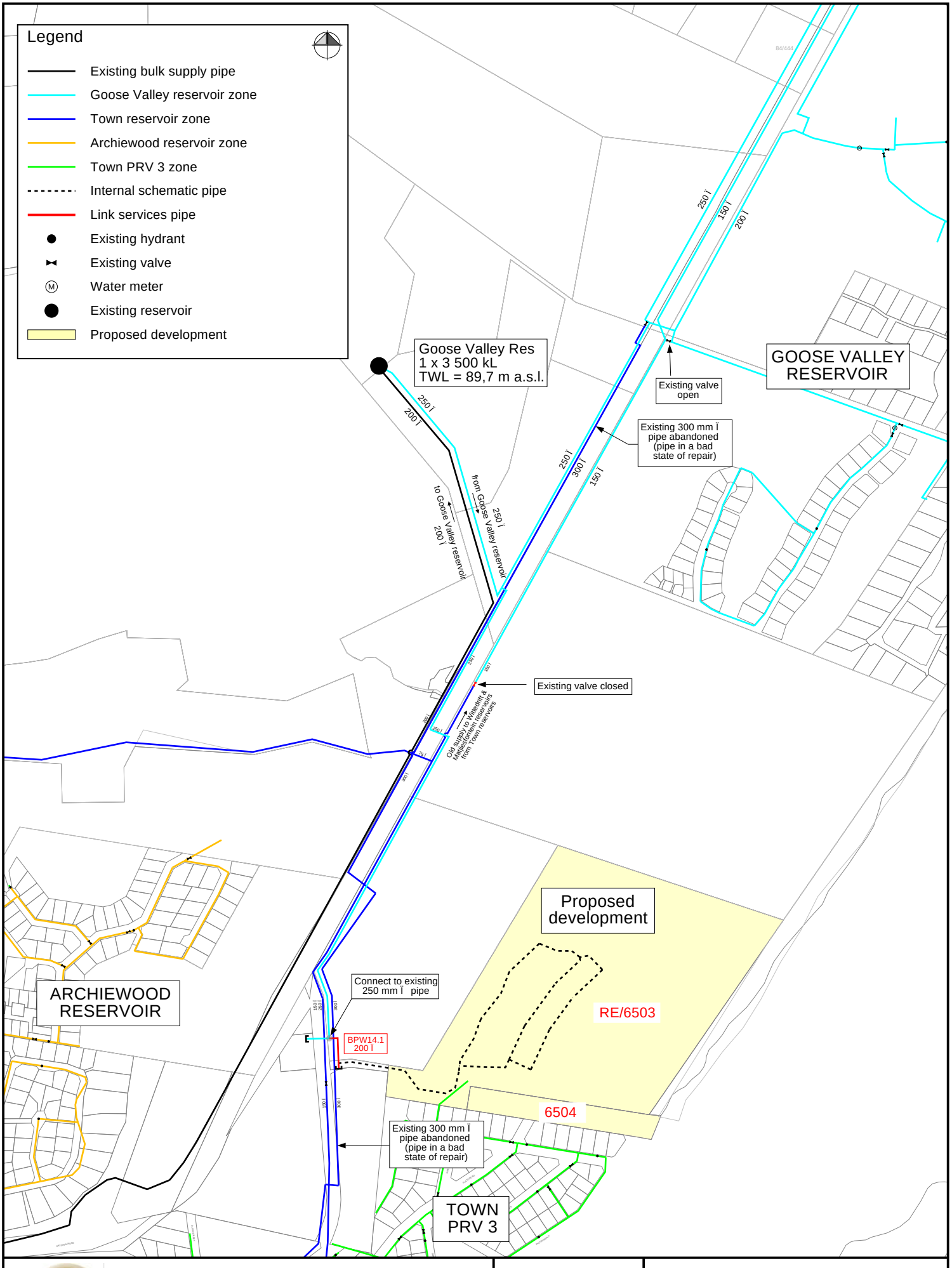
5. The Development Contribution monies are calculated according to the approved Council Policy at the time of payment.

6. The Development Contribution monies are payable before the approval of the building plan certificate or final approval of the subdivision for the transfer of units will be issued, as applicable for the type of development.

7. Where servitudes are required, all the costs and arrangements therefore will be for the developer's account.

8. The developer will be solely responsible for the cost of the link services as identified in the GLS report. The developer will also be responsible for the costs of upgrading to the minimum requirements of the services as identified in the GLS report. These costs may however be offset against the Development Contribution monies payable.

9. The above conditions are subject to any approved Council policies, which may be amended from time to time.

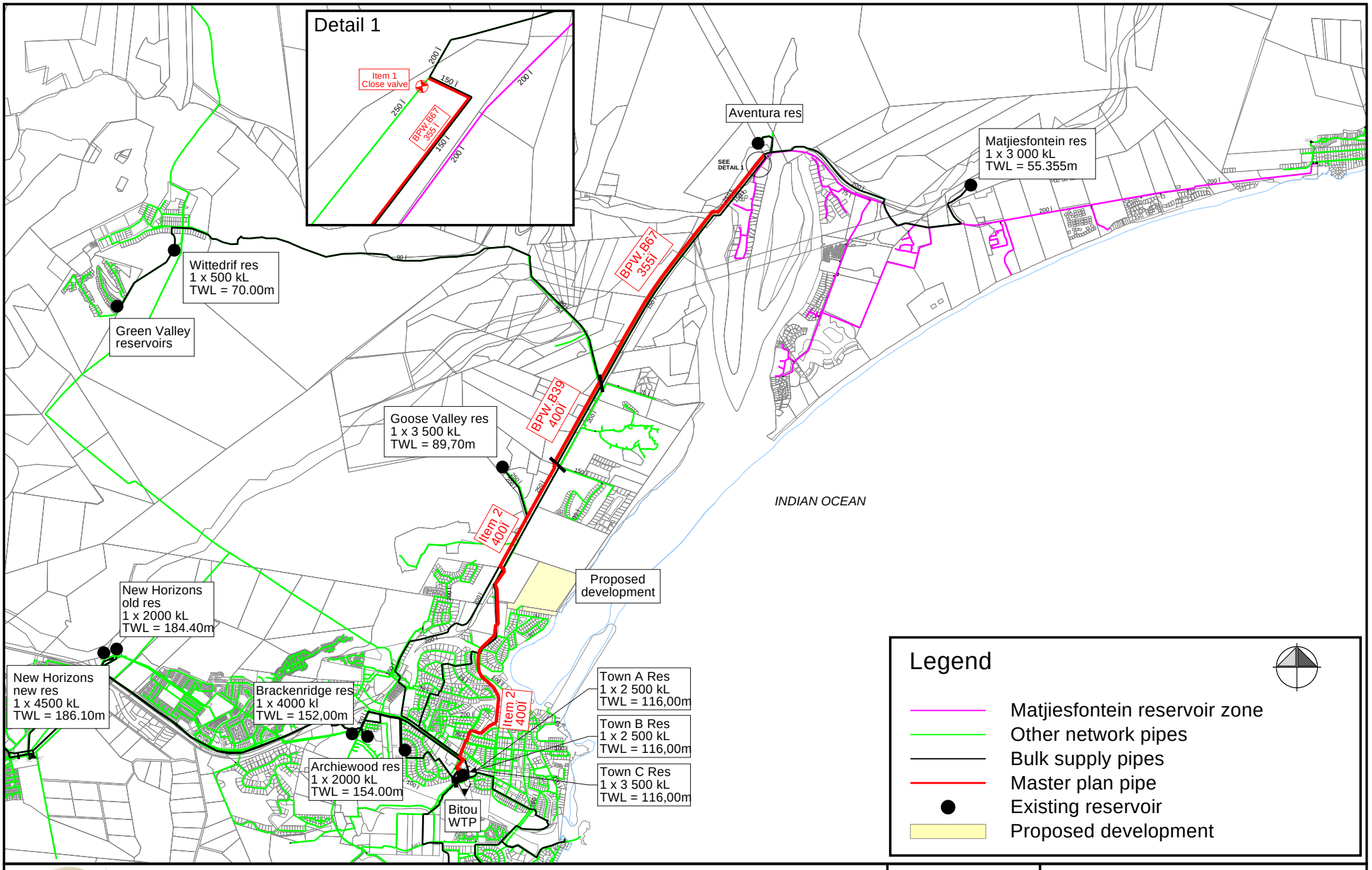


February 2023

Erven 6504 and RE/6503 - Plettenberg Bay

GLS Infrastructure planning

Figure 1 (Draft)
Proposed Development
Erven 6504 and RE/6503 - Plettenberg Bay
Existing Water System



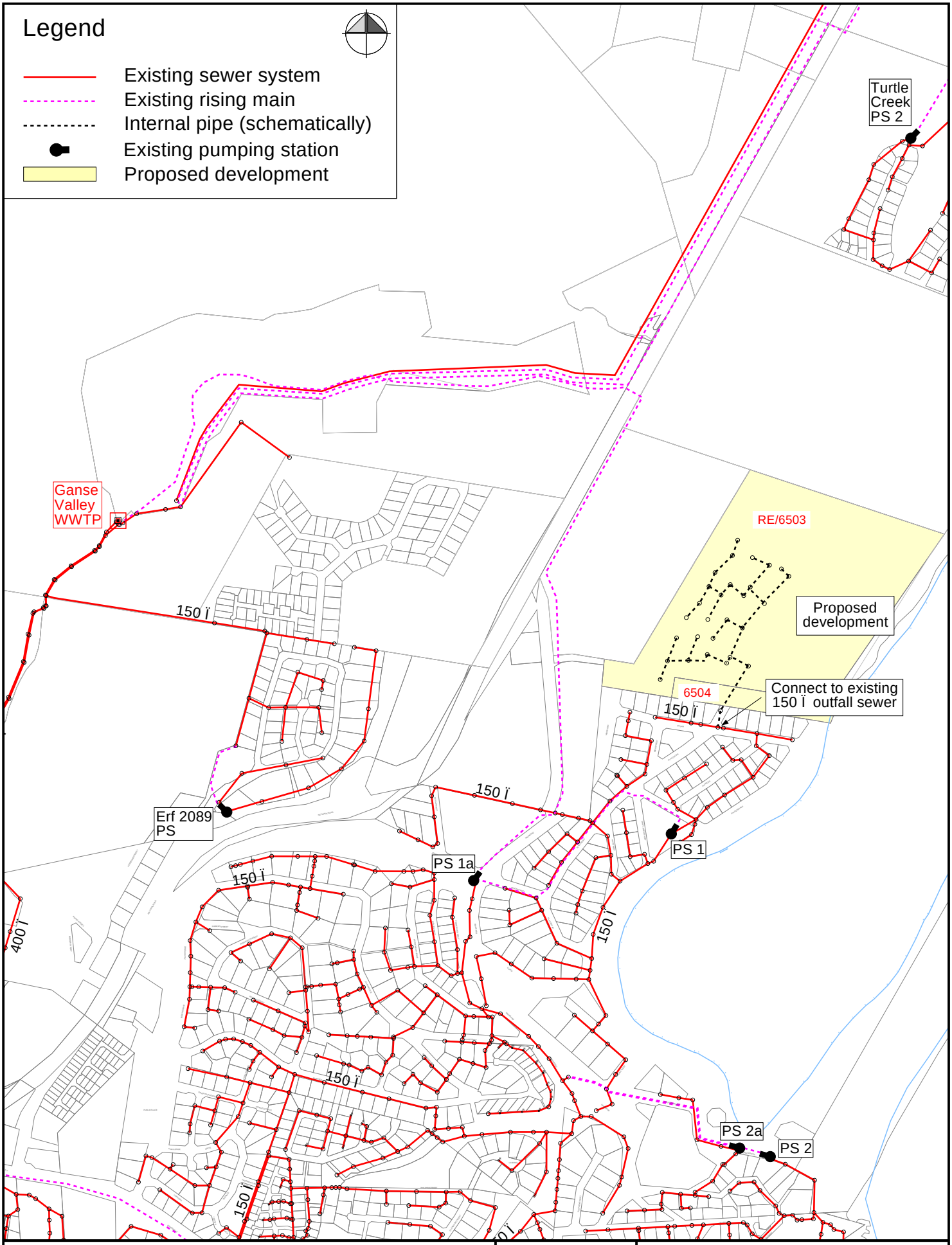
February 2023

Erven 6504 and RE/6503 - Plettenberg Bay

GLS Infrastructure planning

Figure 2 (Draft)

Proposed Development
Erven 6504 and RE/6503 - Plettenberg Bay
Water master plan



February 2023

Erven 6504 and RE/6503 - Plettenberg Bay

GLS Infrastructureplanning

Figure 4(Draft)
Proposed Development
Erven 6504 and RE/6503 - Plettenberg Bay
Existing Sewer System

Plett Lagoon Estate

Erf 6503, Plettenberg Bay, Western Cape

Civil Engineering Services Report

Revision: E (*July 2024*)

Prepared for:	Prepared by:
Plett Lagoon Estate (Pty) Ltd 70 Sandown Road Rondebosch Cape Town 7700	VITA Consulting Engineers Riaan van Dyk riaan@vitaeng.co.za 51 Lourensford Estate Somerset West, 7130

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1. Executive Summary

VITA Consulting Engineers has been appointed by Plett Lagoon Estate (Pty) Ltd as the Civil Engineering Consultants for the proposed development on Erf 6503, Plettenberg Bay.

The proposed rezoning is for a split-zoning, consisting of the following:

- Residential Zone I: 2.27ha
- Residential Zone II: 4.07ha
- Open Space Zone II: 0.37ha
- Open Space Zone III: 10.58ha
- Transport Zone III: 1.83ha

The proposed development is classified as a Greenfields Development, consisting of the following amenities:

- Single Residential: 9 Erven
- General Residential: 41 Erven
- Guardhouse, refuse room, etc.

The objective of this report is to address all civil engineering issues generated by the proposed development and to provide sufficient information to the local and provincial authorities in terms of the required roads- and civil engineering infrastructure for the proposed residential development.

The following documents and guidelines have been used in the civil services infrastructure design and management implementation of this development:

- The Topographical Survey compiled by VPM Surveys (*7 February 2023*)
- TIA completed by UDS (*March 2024*)
- The Sub-division plan compiled by Marike Vreken Town Planners (*February 2024*)
- Municipal Services Capacity Analysis Report compiled by GLS Consulting (*27 February 2023*)
- Guidelines for Human Settlement Planning and Design (*CSIR "Red Book"*)
- The South African National Roads Agency Limited: Drainage Manual

2. Locality

The development site is situated on Erf 6503, Plettenberg Bay. The site is approximately 19.11 hectares in extent and is situated on the north-eastern outskirts of Plettenberg Bay, approximately 1.5km from the CBD. The development is located within the Bitou Municipal district.

The site has an irregular polygonal shape and is bordered by Portion 52 of Farm 444 (*northern boundary)*, the Keurbooms river estuary (*eastern boundary*), undeveloped Erf 6504 (*southern boundary*) and Plettenberg Bay Primary School (*western boundary*). Access to the site is gained via Beacon Way, off the School/Checkers access road (*Erf 7996*) on the south-western corner of the site.

Figure 2-1: Locality – Portion 38 of Farm 444, Plettenberg Bay *(Cape Farm Mapper)*

3. Pre-Development Conditions

The pre-development site is mostly undeveloped, with an existing residential dwelling and outbuildings located near the northern corner of the site.

3.1 Site Topography

The topographical survey indicates that the property has a varying topography with fairly flat slopes along the north-western boundary to steep slopes situated along a north/south axis through the centre of the property. The highest portion of the property is situated near the south-western corner of the site with an approximate level of 18 msl. The lowest portion of the site is situated on the eastern boundary (*estuary*) of the site, with an approximate level of 1 msl.

The residential portion of the development will be situated on the fairly flat portion of the property, along the western boundary up to the north/south ridge. The steep slopes for this portion of the property vary between 6% (*maximum*) and 2.5% (*minimum*).

The Open Space III portion has fairly flat slopes towards the Keurbooms estuary and is situated below the 5m contour.

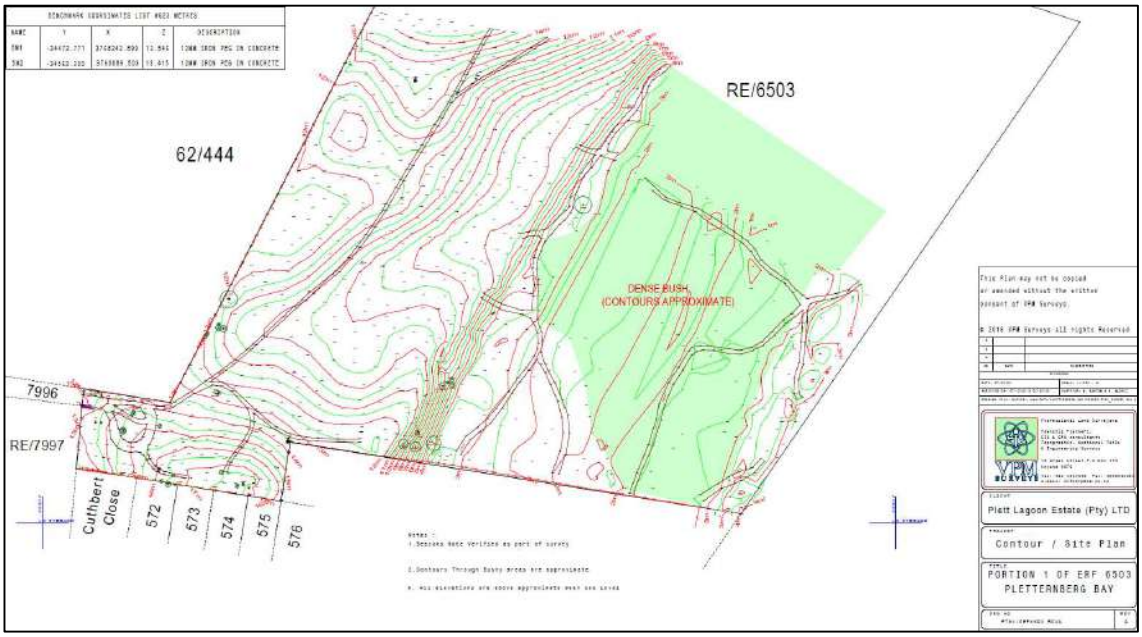


Figure 3-1: Topographical Contours *(VPM Surveys – February 2023) – Appendix A*

3.2 Site Vegetation

The western portion of the site is covered by short grass and weeds, while the eastern portion of the site is covered by dense vegetation/thicket, including indigenous fynbos, milkwoods and shrubs. A biodiversity investigation was compiled to determine the extent of the environmental sensitive areas on site. The biodiversity sensitivity map was used to determine the proposed cadastral layout to ensure that the erven and roads/civil services infrastructure do not encroach into environmentally sensitive areas.

Figure 2-2: Environmental Sensitive Areas


Figure 3-3: Environmental Sensitive Vegetation towards Keurbooms River

3.3 Site Geology

The site is situated on the Kirkwood Formation (*Uitenhage Group*). The insitu materials on site is characterized by a relatively consistent soils profile. The site is underlain by Quaternary aeolian sands of several meters thick. These aeolion sands are overlain by medium dense, fine silty sand. A dense root-bed with organic rich topsoil of approximately 0mm-300mm thickness make up the top portion of the natural soil profile.

The soils on site are classified as "Soft Excavation" in terms of the SABS 1200 DM specifications. The sands are classified as non-plastic, with an estimated friction angle of approximately 30°, with no apparent cohesion.

The sands have an expected bearing capacity of approximately 100-125kPA, which will/must be confirmed by a suitable structural engineer for each individual units' foundations.

The sands have a very high permeability, which is estimated to be 10^{-3} mm/s or 86mm/day.

4. Description of the Proposed Development

The proposed development will consist of Residential Zone I (*9 x single residential erven*), Residential Zone II (41 *x single residential erven*), Open Space Zone II (*amenities*), Open Space Zone III (*private nature reserve)* and Transport Zone III (*private streets).*

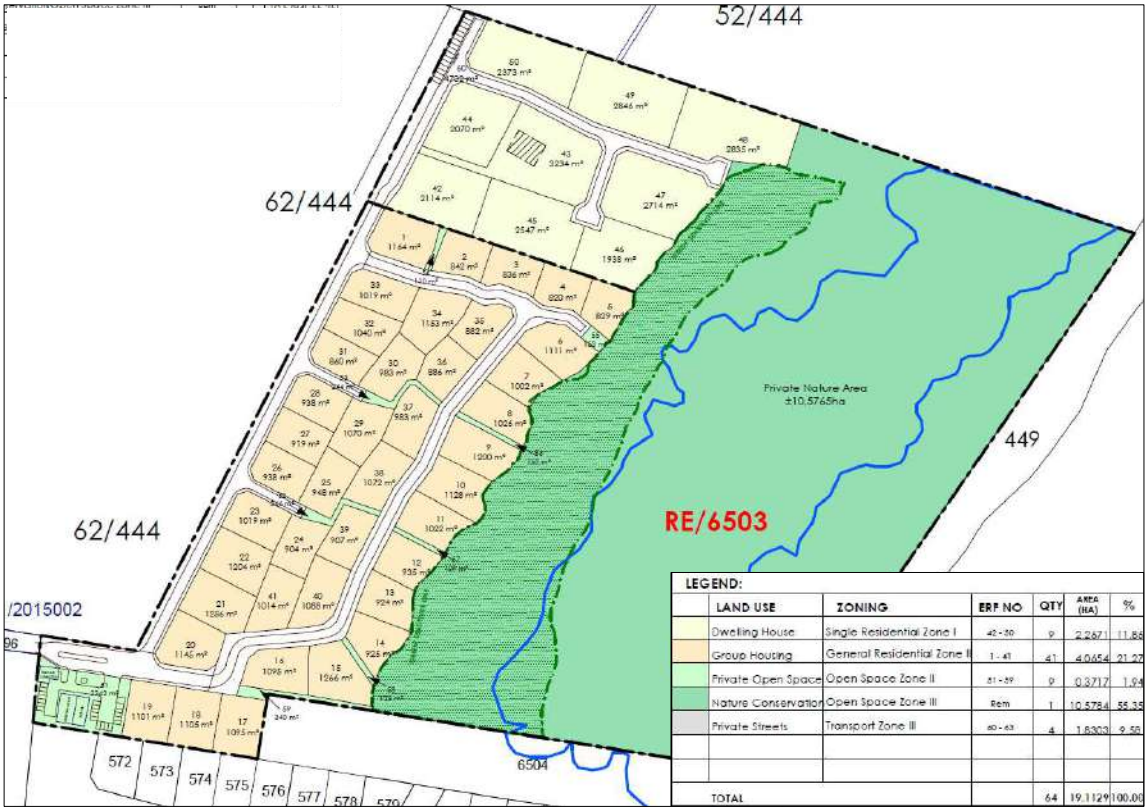


Figure 4-1: Proposed Zoning Layout (*Marike Vreken Urban and Environmental Planners*) - *Appendix B*

The "Open Space III" (*10.58ha*) portion of the development will serve as a "private nature reserve" which will be managed and owned by the development's Body Corporate.

5. Site Clearance

All road reserves and services corridors (*situated outside the environmentally sensitive areas*) will be cleared of vegetation and the top 0 - 300mm of organic rich topsoil will be stripped and stockpiled for re-use as part of the landscaping.

All existing structures which do not form part of the new development (*i.e. residential dwelling and outbuildings*) will be demolished and rubble will be removed from site.

Due to the environmentally sensitive natural vegetation on site, care will/must be taken to not disturb any areas outside of the required civil works footprint.

6. Roads and Parking Areas

6.1 External Roads

UDS (Pty) Ltd was commissioned to compile a traffic impact statement for the proposed development and their findings were included in a report (*refer to Appendix B*). The Traffic Statement, along with the findings and recommendations were submitted to- and discussed with Bitou Municipality (*20 June 2023*).

The UDS Traffic Statement originally proposed that the access to the development should be off the existing School & Checkers Yard Access Road (*Erf 7996)*.

Figure 6-1: Beacon Way/School & Checkers Yard Access Road Intersection

Bitou municipality stated that although they would consider the findings of the traffic statement, they would prefer that access to the development be provided through the southern boundary onto the Susan Road reserve. The reasoning behind this request was because of the existing congestion caused at the Beacon Way/School road intersection as a result of the peak school traffic.

As part of the public participation process for the Environmental Assessment, the Poortjies Residents stated that the proposed access through Poortjies is not desirable as the increased traffic would be detrimental to the existing suburb.

Subsequent meetings with Bitou Municipal officials concluded that the initial access through Beacon Way/School intersection would be acceptable if the intersection is upgraded to a formal traffic circle. The proposed traffic circle layout (*refer Appendix C.1*) was approved by

Bitou Municipality (*refer Appendix C.2*) on 14 February 2024. The upgrading of the intersection (*and associated costs*) will be the responsibility of the development (*Erf 6503*).

The updated UDS Traffic Statement concluded that the development should be endorsed on the following conditions:

- Sufficient stacking space exceeding 14metres must be provided at the entrance
- A minimum entry lane width of 4 metres must be provided at the entrance.
- Sufficient sight distance must be allowed for in the placement of trees (*internal roads*)
- Sufficient space must be provided for vehicles reversing out of driveways
- Traffic calming measures must be implemented along roads within the development longer than 100-metres.
- A pedestrian gate be considered on the western boundary of the development, providing access to the school and retail areas.
- That access be reverted to the previous proposal via the Poortjies residential area

6.2 Internal Roads and Parking Areas

The design philosophy for the proposed internal road network will be similar to that of a typical urban road network, which includes a minimum 2.0% crossfall and 0.5% longitudinal slope. This road network will consist out of 5.5m wide brick paved roads with formal kerbs/edgings, roadside channels and a stormwater drainage network.

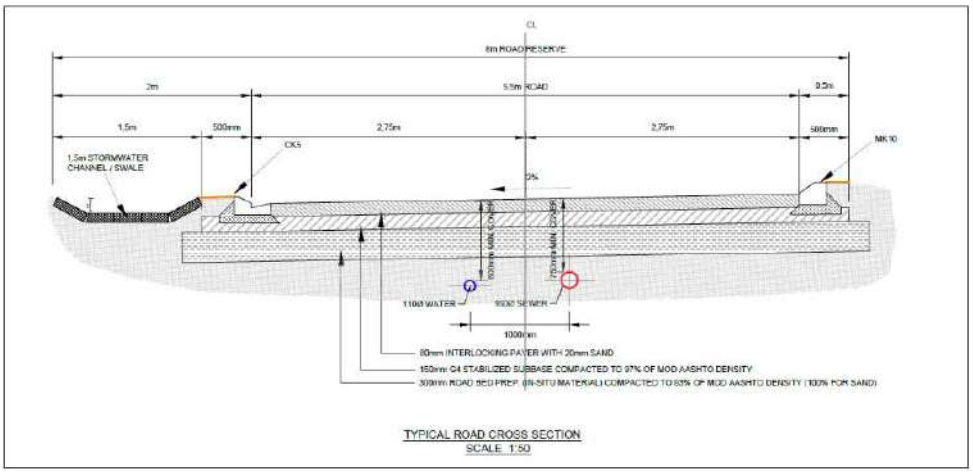


Figure 6-2: Road Cross Section

The internal roads/parking areas have been designed for low heavy vehicle traffic (*construction vehicles, furniture removal and refuse trucks*) and makes allowance for the insitu subgrade conditions.

- Road Category C/D (TRH4) or UC (UTG)
- Pavement Class ES 0.1 (TRH4).
- Structural design period 20 years
- Surface finish: Concrete Paving

Each single residential unit will have a double garage and two additional parking bays in front of the garage.

7. Stormwater Drainage

7.1 Existing Municipal Stormwater Network

The pre-development site drains from the higher laying western boundary towards the lower laying eastern boundary.

Figure 7-1: Overland drainage patterns

There is no formal bulk municipal stormwater infrastructure in the vicinity of the site. The high permeability of the insitu sands ensures that all stormwater run-off permeates into the subsoil layers and a formalised bulk stormwater connection for the development is not required.

The residential dwellings, roads- and civil infrastructure has been positioned to fall above the pre-scribed 5m contour.

7.2 Hydrological Data

The nearest SAWB weather station to the development site is Plettenberg Bay (POL).

Weather Service Station			Plettenberg Bay (POL)			
Weather Station Number			0014633W			
Mean Annual Precipitation			647mm			
Coordinates (*Longitude and Latitude*)			Long: 34°3′ Lat: 23°22′			
Return Period	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr	1:100yr
1 Day	56mm	83mm	104mm	128mm	163mm	194mm

Table 1: SAWB 0014633W: Plettenberg Bay *(Lat: 34° 3′ Long: 23° 22′)*

The hydrological rainfall data of rainfall station, Plettenberg Bay (POL), was used for all stormwater run-off calculations.

7.3 Run-off Factors

The pre-development topography, soil conditions and undergrowth were used to calculate the following pre-development run-off factors:

$$C_{pre} = (C_s + C_p + C_v) \times D_F \times F_t$$

Return Period	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr	1:100yr
Run-off factor C	0.111	0.122	0.133	0.149	0.184	0.222

Table 2: Pre-development Run-off Coefficient

The development will not add substantial hard/impermeable surfaces to the catchment area (*less than 10%*) and will therefore have little impact on the run-off coefficients. The post-development run-off coefficients were calculated to be:

$$C_{post} = (C_{lawn} + C_{Residential} + C_{industry} + C_{business}) \times F_t$$

Return Period	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr	1:100yr
Run-off factor C	0.134	0.147	0.161	0.179	0.222	0.268

Table 3: Post-development Run-off Coefficients

7.4 Peak Flows

The pre- and post-development peak flows were calculated to be:

$$Q = \frac{C \times I \times A}{3600}$$

Return Period	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr	1:100yr
Pre-development (19.11ha)	0.284	0.528	0.753	1.039	1.611	2.236
Post-development (19.11ha)	0.343	0.636	0.908	1.253	1.943	2.697

Table 4: Peak Flow rates in m³/s

7.5 Internal Stormwater Network

The standard stormwater design principle, as set out in section 1 will be implemented in the planning and design of the internal stormwater system.

The following minimum design specifications will be implemented:

- Minimum pipe specification: Class 75 D Concrete spigot & socket pipes
- Minimum pipe diameter: 375mm Nominal diameter
- Minimum design flow: 1.0m/s inside a half-full pipe
- Maximum spacing between manholes/inlets: 80m

An open swale stormwater network will be designed to have sufficient capacity to adequately manage and convey up to a 1:5year rainfall event. The open swales network will follow the road network and will have inlet structures and pipe culverts at road crossings. For rainfall events with a return period larger than 1:5 year, the internal roadways will act as overland flow routes which will convey stormwater run-off towards the lower lying eastern portion of the site, where it will follow the existing natural drainage routes and permeate through the insitu soils in to the subsurface water reserves.

The cohesion of the dune sands is very poor and will therefore be very susceptible to erosion. The following erosion preventative measures will be incorporated in the detail stormwater design:

- Concentration of stormwater will be minimised to prevent high volume/flow rates
- Hard surface run-off (*driveways*) will be routed into swales via the internal roadways
- Sheetflow into open swales will be promoted to maximise contact time with permeable dune sands
- All channels with an internal velocity higher than 1m/s will be formalised (*armorflex*)
- All unlined channels will be landscaped with appropriate vegetation
- Energy dissipation structures will be installed at high energy discharge points

Due to the likely occurrence of a seasonal perched ground water table, provision will be made for a subsoil drainage network beneath the roads. The subsoil drainage network will consist of a 110mm diameter perforated pipe network installed 800mm below the final road level.

7.6 Energy dissipation structures

Energy dissipation structures will be installed at the swale discharge points, which will fall outside of the 32m bufferzone. The proposed energy dissipation structures will be constructed from gabion baskets which will create two weirs where the velocity/energy of the run-off will be lowered in order to prevent downstream erosion.

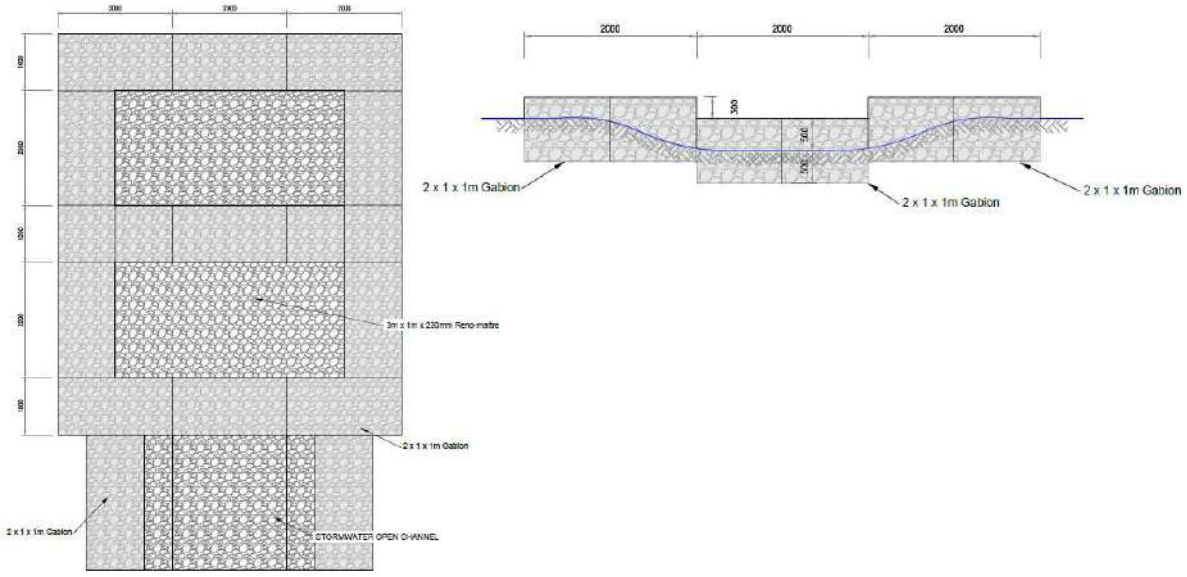


Figure 7-2: Typical gabions energy dissipation structure.

7.7 Attenuation and Treatment

The secondary purpose of the open swale network will be to attenuate peak flows to pre-development rates and treat stormwater run-off.

The attenuation requirement, reducing the post-development peak flows to pre-development flow rates, were calculated using the ABT & GRIGG formula:

$$V_{st} = 60 \left(\frac{1+m}{2}\right) q_{pa} t_{ca} (1-a)^2$$

	1:2yr	1:5yr	1:10yr	1:20yr	1:50yr
Attenuation Required	9.01	16.72	23.87	32.93	51.07

Table 5: Attenuation Requirement in m³

The internal stormwater network makes allowance for the required attenuation volumes through the detention capacity and percolation rate of the stormwater swales. The gradient

inside the swales will be less than the pre-development crossfalls, allowing stormwater run-off to accumulate inside the swales, providing more contact time with the permeable insitu dune sands. The percolation rate of the insitu dune sands is estimated at 10^{-3} mm/s or 86mm/day.

$$A_{fb} = \frac{WQ_v \times d_{fb}}{k \times (h_{fb} + d_{fb}) t_{fb}}$$

	Wetted Perimeter	Catchment Area	1:50yr Attenuation Volume	Drainage Time
Western/ Central Roadside Swale	1,380m^2	31,485m^2	8.41m^3	55 minutes
Eastern Swale parallel to estuary	620m^2	24,530m^2	6.56m^3	1h 36min
Swale: Northern Erven	410m^2	27,840m^2	7.44m^3	2h 45min

Table 6: Attenuation and Treatment Potential of Internal Stormwater Swales in m^3

8. Sanitation

8.1 Existing Municipal Foul Sewer

GLS Consulting was commissioned to undertake a re-analysis of the bulk municipal sewer infrastructure capacity and the impact of the proposed development in the existing network. GLS formalised their findings in a report (*27 February 2023*) which was presented to Bitou Municipality for approval.

The GLS report concluded the following:

- The master plan indicated that the proposed development should be accommodated within the existing Plettenberg Bay Pumping Station (PS1) drainage area.
- There is sufficient capacity in the existing Plettenberg Bay sewer reticulation system to accommodate the proposed development.
- The recommended position for the sewer connection for the proposed development is to the existing 150 mm diameter outfall sewer in Susan Street, as shown on Figure 4.

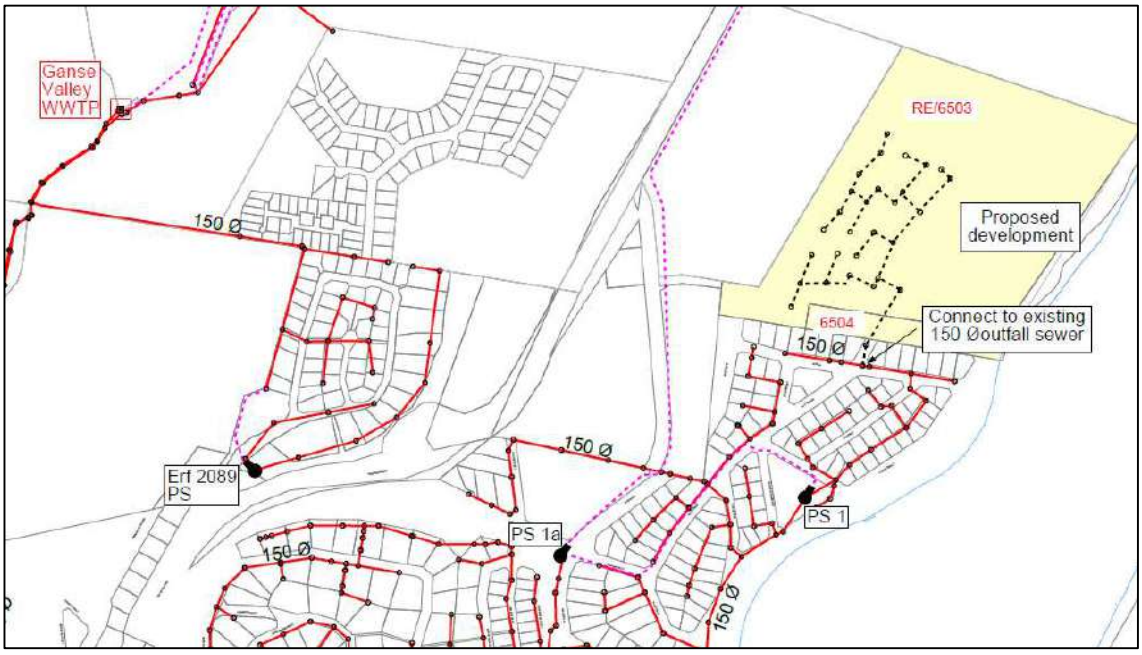


Figure 8-1: Extract from GLS Consulting (Feb 2023) Figure 4: External Sewer Masterplan

8.2 Ganzevallei Wastewater Treatment Works

The license conditions for the Ganzevallei WWTW authorize an effluent discharge of 6Ml per day. The average daily discharge is currently at approximately 5.8Ml per day, with the reserve 0.2Ml per day reserved for already approved developments.

The Ganzevallei WWTW will therefore have to be upgraded in order to accommodate further developments. Bitou Municipality has appointed a Professional Service Provider to

commence with the upgrading process (*preliminary design, environmental authorization application, etc.*).

The interim solution for the treatment of wastewater from the development will be the installation of a temporary on-site wastewater treatment plant (*refer to section 8.4*). A permanent connection to the bulk Bitou Municipal network will be activated once the Ganzevallei WWTW upgrades have been completed.

8.3 Internal Sewage Network

The estimated sewage yield generated from the proposed development will be:

- Annual Average Daily Sewage Yield: 40.1m^3 per day
- Peak Daily Wet Weather Sewage Yield (*Peak Factor - 3.5*): 1.62 l/s

The internal sewage infrastructure will consist of a 160mm diameter uPVC Class 34 gravity pipe network and round precast concrete ring manholes inside the road reserves. The internal infrastructure will drain towards a new foul sewer pumpstation. The pumpstation will also be situated inside the road reserve and will not encroach into the environmentally sensitive area.

The pumpstation will convey all sewage from the development via a 75mm rising main towards an existing 160mm underground pipe and manholes network inside the Susan Road reserves (*as per GLS Report*) on the southern boundary of the site (*permanent solution*). The temporary on-site wastewater treatment plant will be situated at the maintenance building (*near the entrance*).

The permanent connection to the Bitou Municipal network will be installed as part of the initial services installation. The minor amendment to the rising main (*once the temporary wastewater treatment plant is removed*) will remain the development's responsibility.

The underground gravity network will adhere to the following requirements:

- Minimum self-cleansing velocity inside a half full pipe – 0.7m/s
- Maximum full-bore velocity – 3.5m/s
- Maximum spacing between manholes – 90m
- The bedding and blanket material for the internal sewage pipe trenches will adhere to SABS 1200 regulations for Class C bedding and blanket.

The underground pumpstation will have the following minimum requirements:

- The pumpstation will be equipped with duty- and standby pumpsets
- The pumpstation will have back-up power (*genset or invertor/batteries*)
- The pumpstation sump will have an emergency back-up volume equal to the 4-hour peak flow

8.4 Temporary Wastewater Treatment Plant

A temporary wastewater treatment plant will be installed inside a 12m container next to the maintenance building (*near the entrance*). The proposed WWTP will use a combination of conventional treatment (*natural bacteria*) and membrane technology (*microfiltration*) to treat the sewage effluent to comply with general water limits stipulated by the Department of Water Affairs.

SUBSTANCE/PARAMETER	GENERAL LIMIT
Faecal Coliforms (per 100 ml)	1000
Chemical Oxygen Demand (mg/l)	75 (i)
pH	5,5-9,5
Ammonia (ionised and un-ionised) as Nitrogen (mg/l)	6
Nitrate/Nitrite as Nitrogen (mg/l)	15
Chlorine as Free Chlorine (mg/l)	0,25
Suspended Solids (mg/l)	25
Electrical Conductivity (mS/m)	70 mS/m above intake to a maximum of 150 mS/m
Ortho-Phosphate as phosphorous (mg/l)	10
Fluoride (mg/l)	1
Soap, oil or grease (mg/l)	2,5

Figure 8-2: DWAF Treated Water Limits

All the treated effluent will be used for irrigation purposes, with dedicated irrigation storage tanks (*4 x 10kilo-liter*) installed next to the WWTP container. The WWTP will have the treatment capacity for 40m^3 per day (*refer appendix G for design and financial proposal*).

The efficacy of the WWTP will rely on regular maintenance and a signed service agreement between the developer and a qualified service provider will be submitted as part of the Service Level Agreement with Bitou Municipality (*refer appendix G for a similar agreement proposal*). The WWTP will also be equipped with a back-up generator to cater for electrical downtime.

In addition to regular maintenance, a stringent testing schedule will be required to ensure the treated effluent complies with DWAF limits. A wellpoint/shallow borehole (*10m deep*) will be installed on site for the purposes of monitoring the groundwater quality (*ensuring the irrigation with the treated effluent does not adversely affect the groundwater quality*). It is recommended that a sample of the treated effluent must be tested twice per month and a sample of the groundwater should be tested once per month. The test results must be submitted to DWAF and Bitou Municipality. Failure to comply with the prescribed limits will result in hefty fines and/or prosecution.

The temporary WWTP will be removed from site once the Ganzevallei WWTW has sufficient capacity.

9. Water Reticulation

9.1 Existing Bulk Municipal Network

The master planning analysis undertaken by GLS Consulting concluded the following:

- The master plan indicated that the proposed development should be accommodated within the existing Goose Valley reservoir zone.
- The proposed connection to the existing water system is to the existing 250 mm diameter supply pipeline from the Goose Valley reservoir in Beacon as shown on Figure 1.
- Link services items BPW14.1 is required to connect the internal reticulation network of the proposed development to the existing municipal water network.
- The bulk water system to the Goose Valley, Wittedrift and Matjiesfontein reservoirs is at capacity and should be upgraded according to the master plan before additional developments within the reservoir supply areas can be accommodated.
- The minimum upgrades required to the improve the existing bulk supply system (*in order to accommodate the proposed development in the existing system*), are:
    - Master plan item 2 (*3,6 km x 400 mm Ø replace existing 300 mm Ø abandoned AC pipe*)
    - Master plan item BPW.B39 (*0,9 km x 400 mm Ø replace existing 150 mm Ø bulk pipe*).
    - Portion of master plan item BPW.B67 (*1,0 km x 355 mm Ø replace existing 150 mm Ø bulk pipe*).

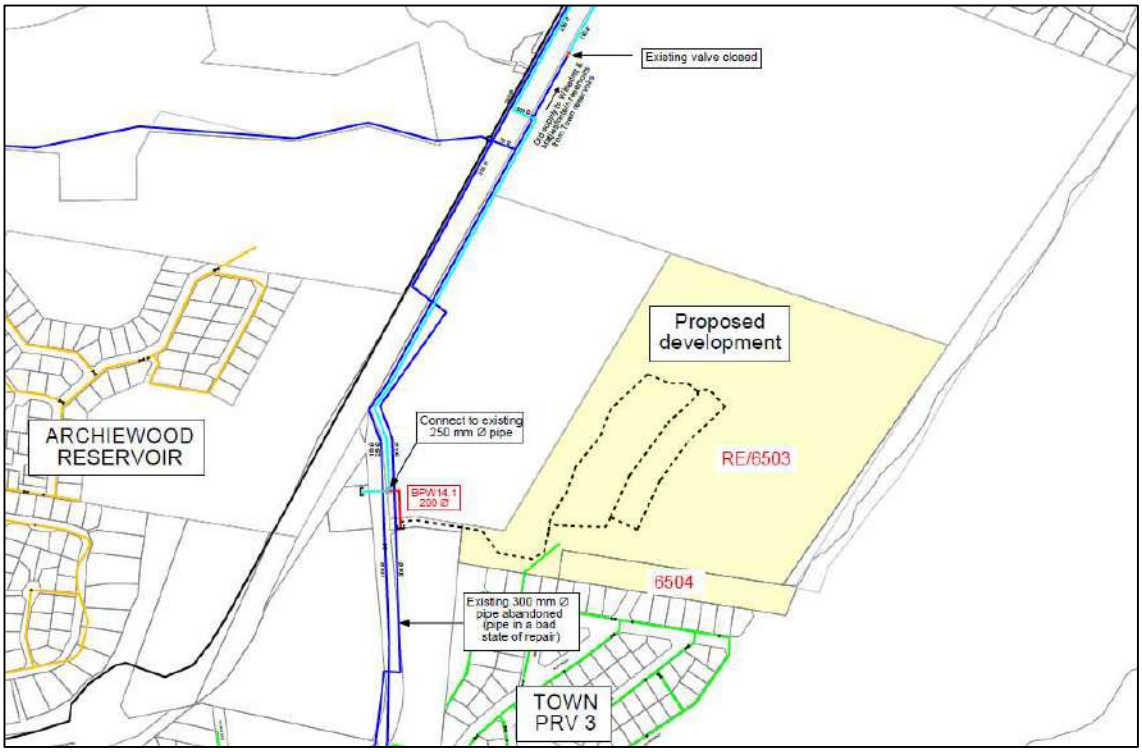


Figure 9-1: Extract from GLS Consulting (*February 2023*) Figure 1: External Watermain Link Upgrades

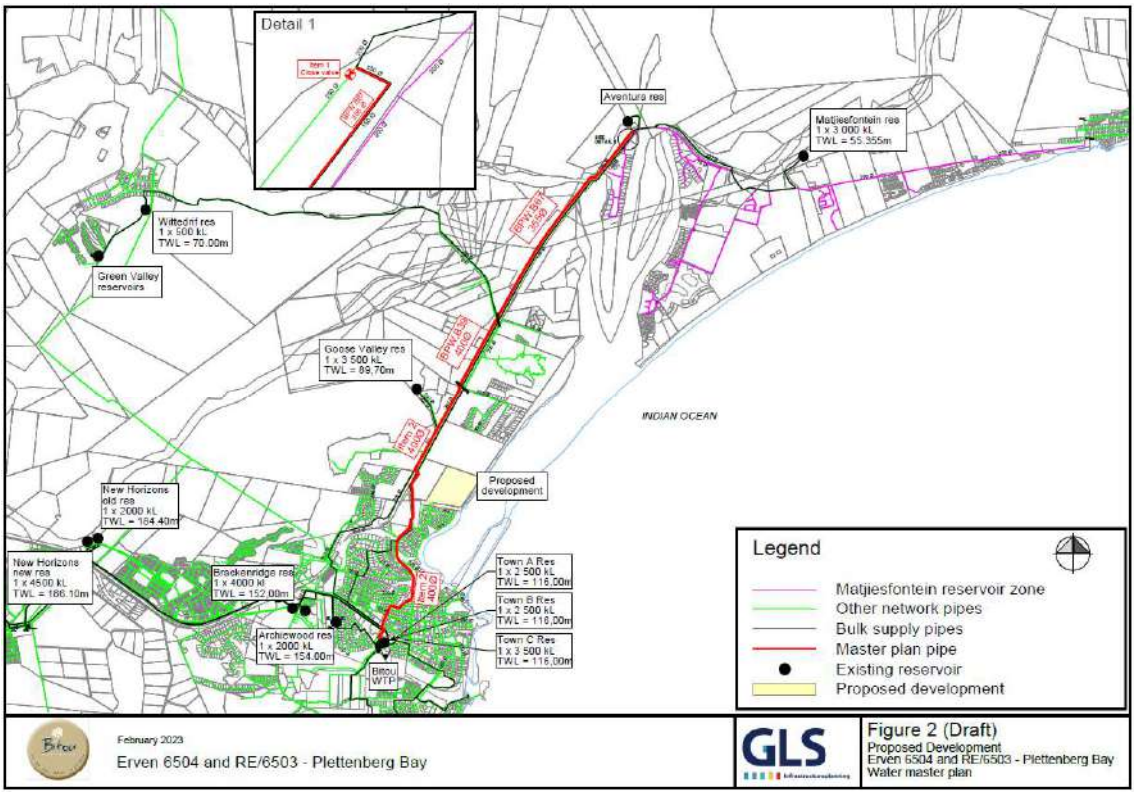


Figure 9-2: External Bulk Supply Upgrades – GLS Consulting (*February 2023*)

GLS estimated the costs for the design and installation of Item 2, BPW.B39 and BPW.B67 to be R42 million.

Various meetings with GLS and Bitou municipality was held to discuss a proposed interim solution to increase the bulk supply to the Goose Valley Reservoir. GLS provided the following temporary solution:

- Installation of an additional 160mm bulk main off the existing 160mm distribution main in the N2 road reserve (*refer figure 5*) which will free up an additional 860kl/day.
- There is sufficient capacity in the 860kl/day to accommodate the developments on Farm 444/38, Farm 304/32 and erf 6503.

This temporary solution was discussed with Bitou Municipality on 9 March 2023, who stated that they will except the temporary solution on the following conditions:

- Design, installation, etc. costs for the temporary solution will be the responsibility of the developer/developers and will not be deductible from the Augmentation Levee's
- The temporary solution is not a permanent solution and Augmentation Levee's for Water and Sewage will be used towards the permanent solution.
- The proposed pro-rata contribution towards the temporary solution must be resolved between the developers of the different properties.
- A Service Level Agreement must be drafted for the development.

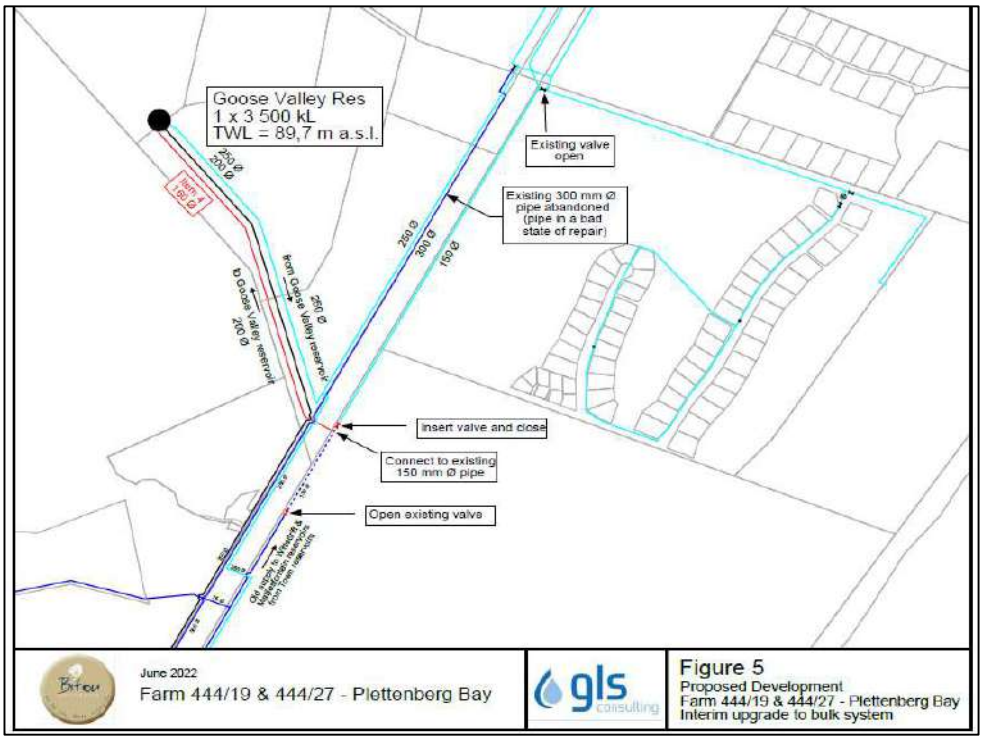


Figure 9-3: External Bulk Supply Interim Solution – GLS Consulting (October 2022)

The route of the 160mm diameter temporary pipeline will follow the existing servitude for the 200mm- and 250mm diameter pipelines and a new temporary servitude will not be required. The installation of the pipeline will not require the disturbance of more than 300m^2 of vegetation and therefore no additional environmental applications will be required.

The implementation of the temporary solution will be done by the developer of Portion 19 and 27 of Farm 444, as this development will be the first to have a civil contractor on site (*estimated construction start for September 2024*). The pro-rata contributions (*Farm 444/38, Farm 304/32 and Erf 6503*) for the installation of the pipe will be paid directly to the developer of Portion 19 and 27 of Farm 444.

9.2 Internal Water Reticulation

The potable water demand for the development will be:

- Gross Annual Average Daily Demand: 46m^3 per day
- Instantaneous Peak Demand (*Peak Factor - 10*): 5.32 l/s
- Fire flow criteria (*low risk*): 15l/s @ 10m

The proposed internal metered water reticulation network will consist of a combined domestic and fire water reticulation network consisting of a 75mm diameter uPVC Class 12 potable water main. Allowance will be made for individual water meters to be located 1m inside the erf boundaries for every property.

The water reticulation network will adhere to the following design requirements:

- Minimum pipe size – 75mm diameter

- Minimum pipe class – uPVC Class 12 / HDPE PE100 Class 12.5
- Specials & Fittings – As per Bitou Municipal Engineering Standards
- The bedding and blanket material will comply with SABS 1200 regulations for Class C bedding and blanket
- Fire hydrants will be spaced for low-risk areas

9.3 Irrigation Demand

9.3.1 Road Verge and Private Open Space Irrigation

The irrigation for the road verges and private open spaces will be done via an irrigation pumpstation, 4 x 10kilo-liter storage tanks and an underground 110mm diameter uPVC Class 10 pipeline. The irrigation schedule will be managed by the homeowner's association.

The treated effluent, generated from the temporary WWTP, will be collected in the irrigation storage tanks and used for irrigation purposes. The treated effluent will be used for irrigation purposes until the Ganzevallei WWTW upgrades have been completed. After removal of the WWTP from site, a municipal water connection to the irrigation tanks will be commissioned and the irrigation for these areas will be done from rainwater harvesting tanks as well as the potable water supply.

In order to use all the treated effluent available, it is intended to temporarily irrigate the open/undeveloped erven (*refer to appendix H for the irrigation water balance*). The irrigation demand will decrease during the winter months and an irrigation water balance sheet was compiled to ensure that there will be no surplus treated effluent during the months of August/September (*highest precipitation per month*).

9.3.2 Irrigation for individual erven

Each erf will have a dedicated 22mm diameter HDPE PE100 irrigation connection which will be connected to the estate's irrigation network. In addition to the irrigation connection, each property will have a minimum volume of 5,000 litres rainwater harvesting tanks, which will collect stormwater run-off from roofs and hardened surfaces (*prescribed for individual homeowners as part of the estates building guidelines*).

10. Solid Waste

The minimum requirements for domestic waste collection (*as per the National Domestic Collection Standards, 2011*) will be applicable to this development. The proposed development will generate approximately 20kg of solid waste per household per week.

The development's homeowner's association will administrate the collection of the domestic waste from each individual property towards a communal refuse storage facility located at the entrance to the proposed development. The refuge storage area will be adequately sized to accommodate the correct amount of 240l refuge bins for organic waste as well as make allowance for waste separation bins for temporary storage of recycling. Recycled waste to be collected by a registered Bitou Municipality service provider. A minimum target of 50% diversion of organic waste to be implemented by the homeowner's association.

Allowance will be made for adequate turning space at the entrance to the proposed development to accommodate the turning movement of a standard refuse truck.

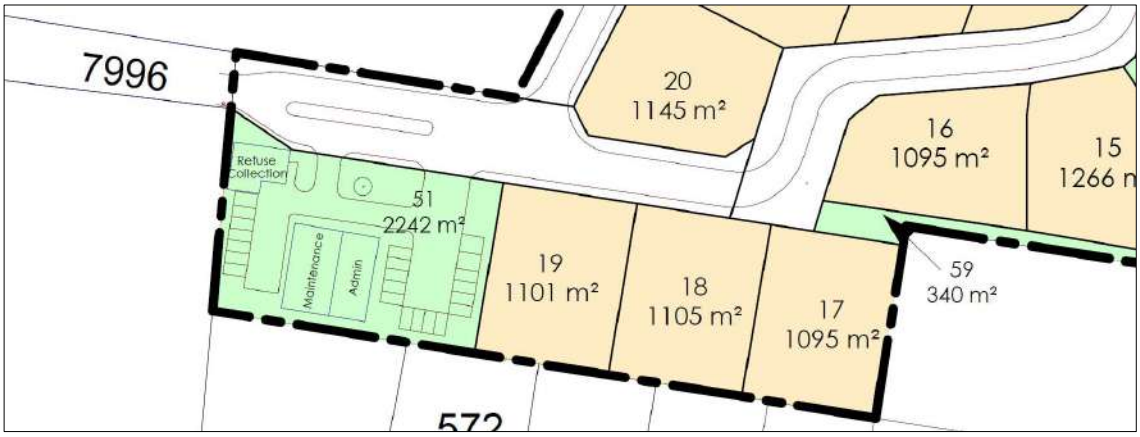


Figure 10-1: Refuse Collection at Entrance Facility

11. Maintenance for Roads and Civil Services Infrastructure

The completed development will be handed over to a Homeowner's Association/Body Corporate, who will except responsibility for the daily operations and maintenance of all civil infrastructure within the development.

The maintenance of the civil infrastructure will be explained to the HOA and they will be furnished with engineering maintenance manuals (*pumpstation*) and checklists (*weekly and monthly*).

It is advised that a professional engineer inspect and assess the civil services infrastructure on a yearly basis to ensure that the structural integrity and functionality of the civil amenities are intact.

Provision must be made for at least 2.5% of the total initial capital expenditure for the installation of the civil and roads infrastructure to be allocated for maintenance purposes.

All maintenance works must be carried out in accordance with all provisions of the Occupational Health and Safety Act (*Act 85 of 1993*). Maintenance staff must be well educated on the operation of the civil services network as a whole and potential safety hazards should be identified before any maintenance/remedial works are carried out. All maintenance personnel must always be equipped with the necessary protective gear (*PPE*).

12. Conclusion

The findings of this Civil Engineering Services Report provide sufficient evidence to **support** the application for

"The rezoning of Erf 6503 Plettenberg Bay to 'Residential Zone I' (2.27 ha) & 'Residential Zone II' (4.07 ha) & 'Open Space Zone II' (0.37 ha) & 'Open Space Zone III' (10.58 ha) & 'Private Road' (1.83 ha) in terms of Section 15(2)(a) of the Bitou Municipality Land Use Planning Bylaw, 2015"

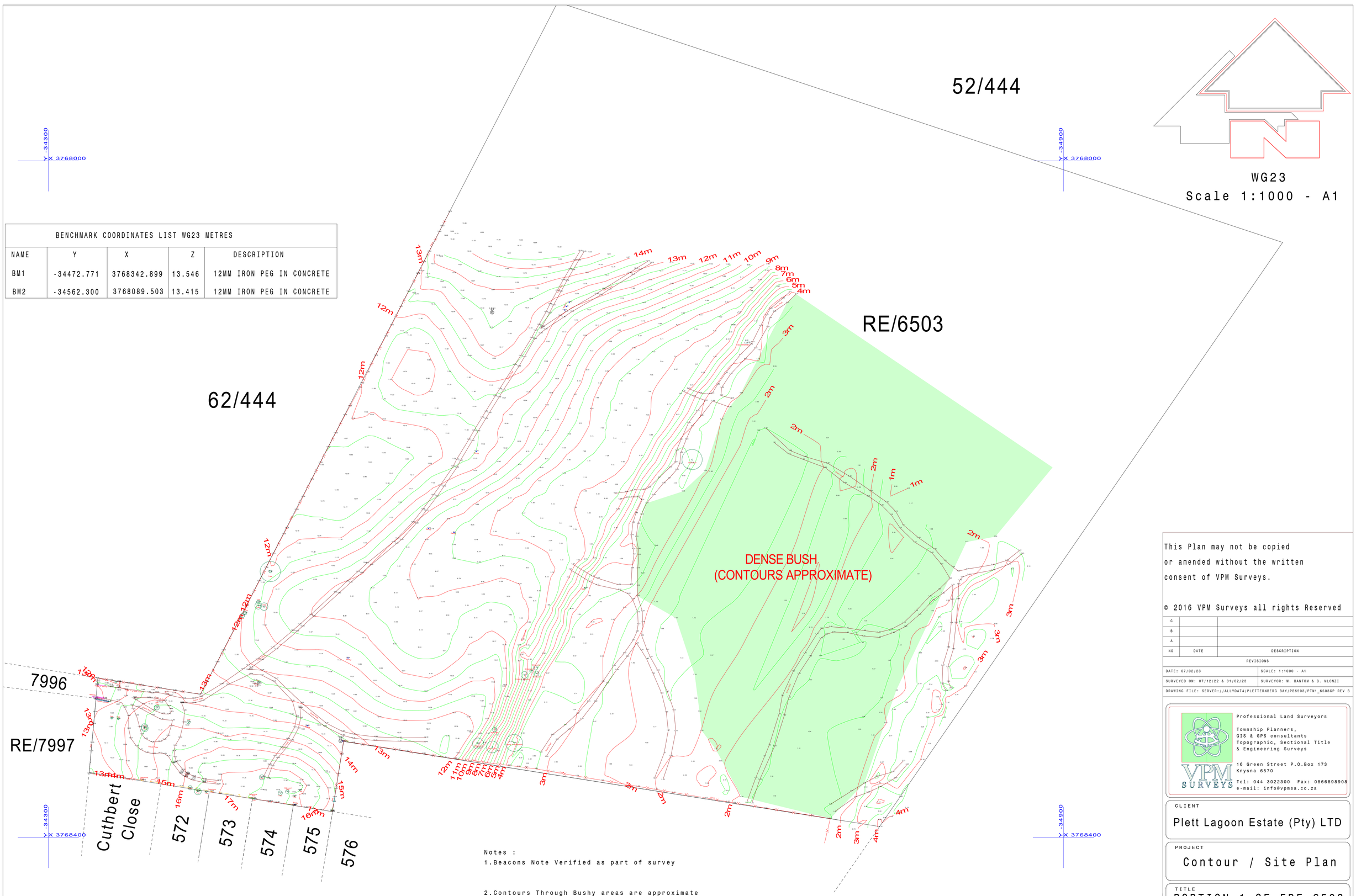
A Services Level Agreement, between the Developer and Bitou Municipality, must be compiled to address the upgrading of the external engineering infrastructure (*i.e. potable water and sewer networks*) required for this development.

The Service Level Agreement must clearly stipulate the following:

- The phasing of the proposed development
- The extent of the external upgrades required for each phase.
- Augmentation Levee's payable for each phase of the development
- Responsibility for external upgrades
- Application of Augmentation Levee's for external upgrades in lieu of direct payment to Bitou Municipality.

Riaan van Dyk (*Pr Eng 20150503*)
for Vita Consulting Engineers

Appendix A: Topographical Survey



BENCHMARK COORDINATES LIST WG23 METRES				
NAME	Y	X	Z	DESCRIPTION
BM1	-34472.771	3768342.899	13.546	12MM IRON PEG IN CONCRETE
BM2	-34562.300	3768089.503	13.415	12MM IRON PEG IN CONCRETE

WG23

Scale 1:1000 - A1

Notes :

1.Beacons Note Verified as part of survey

2.Contours Through Bushy areas are approximate

3. All elevations are above approximate mean sea level

NO	DATE	DESCRIPTION
C		
B		
A		

REVISIONS

DATE: 07/02/23 | SCALE: 1:1000 - A1

SURVEYED ON: 07/12/22 & 01/02/23 | SURVEYOR: W. BANTOM & B. MLONZI

DRAWING FILE: SERVER://ALLYDAT4/PLETTERNBERG BAY/PB6503/PTN1_6503CP REV B

VPM SURVEYS

Professional Land Surveyors

Township Planners,
GIS & GPS consultants
Topographic, Sectional Title
& Engineering Surveys

16 Green Street P.O.Box 173
Knysna 6570

Tel: 044 3022300 Fax: 0866898908
e-mail: info@vpmsa.co.za

CLIENT

Plett Lagoon Estate (Pty) LTD

PROJECT

Contour / Site Plan

TITLE

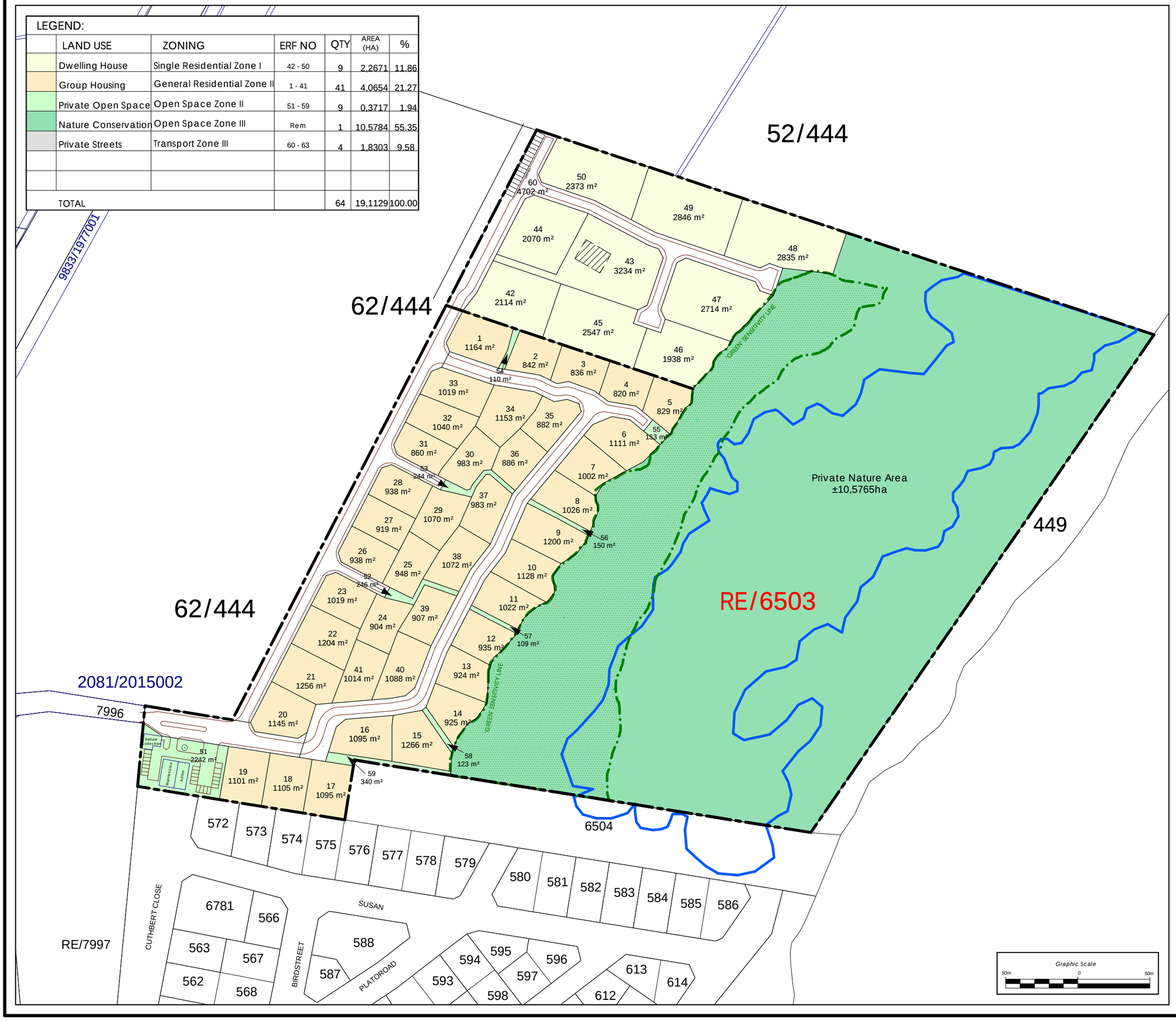
PORTION 1 OF ERF 6503
PLETTERNBERG BAY

DRG NO	REV
PTN1/ERF6503 REVA	A

Appendix B: Sub-Division Layout

LEGEND:

	LAND USE	ZONING	ERF NO	QTY	AREA (HA)	%
	Dwelling House	Single Residential Zone I	42 - 50	9	2,2671	11.86
	Group Housing	General Residential Zone II	1 - 41	41	4,0654	21.27
	Private Open Space	Open Space Zone II	51 - 59	9	0,3717	1.94
	Nature Conservation	Open Space Zone III	Rem	1	10,5784	55.35
	Private Streets	Transport Zone III	60 - 63	4	1,8303	9.58
	TOTAL			64	19,1129	100.00



PLAN 4

PLETTENBERG BAY
ERF 6503

ALTERNATIVE 1
PREFERRED PROPOSAL

N

SCALE 1: 2500

NOTES

1. Sizes and dimensions are approximate and subject to final survey
2. For Property details, refer to SG 8205/1996
3. 0,5m Contour intervals, surveyed by VPM Surveys

DRAWN:	MV	CHECKED:	MV
PLAN NO:	Pr2309PB6503L07		
PLAN DATE:	8 Feb 2024		
STORED:	*z:\drawings\App\Pr2309PB6503L07.drg*		

MUNICIPAL MANAGER

DATE: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Marike Vreken
STADS & OMGEWINGSBEPLANNERS
URBAN & ENVIRONMENTAL PLANNERS

21 Trotter Street, PO Box 2180
KNYSNA 6570

(044) 382 0420
086 459 2987
e-mail: marike@vreken.co.za
www.vreken.co.za

Appendix C: Traffic Impact Statement (*UDS*)

Date: 09 April 2024

Our Ref: UDS627/Reports/

51 Lourensford Estate
Somerset West
7130

Attention: Mr. Riaan van Dyk

Dear Sir

UPDATED TRAFFIC IMPACT STATEMENT FOR THE PROPOSED DEVELOPMENT ON RE 6503, PLETTENBERG BAY

This company was appointed to update the previously prepared Traffic Impact Statement (TIS) dated 26 July 2023 for a proposed development on RE 6503 in Plettenberg Bay based on an amended layout.

1. LOCALITY AND BACKGROUND

The subject property is located in Plettenberg Bay east of the N2 (National Route 2) and is currently accessed via Beacon Way as shown in ***Diagram 1*** below and the attached ***Locality Plan.***

Diagram 1: *Location of Subject Property*

head office
Unit 8, Time Square Building,
9 Electron Street, Techno Park,
Stellenbosch

PO Box 50487
V&A Waterfront
8002

T +27 (0)21 880 0443
F +27 (0)86 523 8227
info@udsafrica.co.za

general enquiries
Elmarie Els 021 880 0443

managing member
A Khan PrEng

associates
JW Wessels PrEng
P v Blerk PrEng
JN Louw PrCPM

offices
Clanwilliam, Stellenbosch,
Somerset West

Reg no. 2003/043709/23

urban development solutions

2. PREVIOUSLY AND CURRENTLY PROPOSED DEVELOPMENT

The development was initially proposed to have 77 residential units. Of the 77 units, 37 units were proposed to be single residential units and 40 units were proposed to be apartments. The initial layout proposed access via Poortjies residential area to the south of the development, however objections were received which led to the investigation of an alternate route. Access is now proposed via the Plettenberg Bay Primary School / Checkers access which intersects with Beacon Way opposite the Engen Filling Station to the north of the shopping centre. In addition to this, the number of units have also been reduced to 50 residential units. Of the 50 residential units, 9 units will be registered as Single Residential Zone I and 41 units will be registered as General Residential Zone II (Group Housing). In both cases, it was proposed that the development be access-controlled.

The access arrangements will be further discussed in ***Section 4***. Please see the proposed layout on the attached ***Alternative 1 Preferred Proposal*** prepared by *Marike Vreken Urban and Environmental Planners*.

3. TRAFFIC IMPACT

3.1 Existing Traffic

Traffic counts were performed on Monday, the 22nd May 2023 during the AM (06:00 – 09:00) and PM (15:30 – 18:30) at the following intersections which were agreed upon with the Bitou Municipality:

1. N2 / Beacon Way intersection
2. Beacon Way / School Access Road intersection
3. Beacon Way / Checkers / Market Square intersection
4. Beacon Way / Zenon Street

The 2023 peak hour traffic volumes are as indicated in the attached ***Figure 1.*** The peak hours were found to be 07:15 – 08:15 and 16:15 – 17:15, which coincides with the morning and evening commuter peak periods.

3.2 Traffic Generated

The South African Trip Data Manual TMH17 was used to estimate the trips expected to be generated by the proposed development. TMH17 suggests a trip generation rate of 1 trip per single residential unit, therefore 50 trips are expected in the AM (12 IN / 38 OUT) and PM (35 IN / 15 OUT) peak hour.

3.3 Traffic Distribution and Growth

The South African Trip Data Manual (TMH17) suggests an annual growth rate of 0 – 3% for low growth areas and 3 – 4% for average growth areas. As the area around Beacon Way is mostly built up, low growth is expected, however, to err on the side of caution an annual growth rate of 3% was used. The 2023 traffic was projected to 2029 to evaluate a 5-year future scenario both with and without the proposed development in order to establish whether the road network can accommodate the projected growth. See ***Figure 2*** for the *Projected 2029 AM/PM Peak Hour Traffic Volumes.*

The expected trip distribution is as indicated in the attached ***Figure 3.*** As far as possible, the background traffic was used to model the trip distribution. It should be noted that the access from the property was modelled via the new preferred access which intersects with Beacon Way. This will be discussed further in *Section 4.*

Figure 4 shows the estimated 2029 AM/PM peak hour traffic volumes, including the traffic generated by the proposed development as well as a 3% annual growth rate.

3.3 Traffic Impact

The existing traffic was analysed using SIDRA Intersection Analysis 9.1. Service levels A to D are considered acceptable, where a level of service (LOS) below D and a degree of saturation above 0.85 is considered unacceptable.

N2 / Beacon Way Intersection

The N2 / Beacon Way intersection is a priority-controlled T-junction with a stop control on Beacon Way. There are turning lanes on each approach as shown in ***Diagram 2.*** It should be noted that according to information, the intersection will be upgraded to a roundabout with construction beginning in 2024.

Diagram 2: *N2 / Beacon Way intersection*

The existing 2023 traffic volumes along with the existing lane layout was analysed and the intersection is experiencing an overall delay of approximately 7.8 seconds in the AM peak hour and 211.2 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along Beacon Way which experiences a LOS E with a delay of 42.7 seconds in the AM peak hour and a LOS F with delays exceeding 1000 seconds in the PM peak hour.

In 2029, after applying a 3% growth rate p.a., the intersection with its current layout (T-intersection) is expected to experience an average delay of 45.7 seconds in the AM peak hour and 565.5 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along Beacon Way which experiences a LOS F with unacceptable delays in the AM and PM peak hour. If the intersection is analysed as a roundabout, an overall LOS A is expected to be experienced in the AM (5.8 second delay) and PM (6.8 second delay) peak hour. The worst delay is expected to be experienced on the right-turning movement along Beacon Way with 10.3 seconds delay in the AM peak hour and 10.4 seconds delay in the PM peak hour.

After the subject development's traffic is added to the network in 2029, the upgraded intersection (roundabout) is still expected to experience an overall delay of 5.8 seconds in the AM peak hour and 6.8

seconds in the PM peak hour. The worst delay is expected to be maintained with the right-turning movement along Beacon Way, which experiences a LOS B in both the AM (10.3 seconds). The worst delay in the PM peak hour is expected on the right-turning movement along the southern south-western approach of the N2 with a delay of 11.4 seconds.

No further upgrades to this intersection are required to accommodate the development.

Beacon Way / School Access Road / Filling Station Intersection

The Beacon Way / School Access Road / Filling Station intersection is currently priority-controlled with a stop control on the side streets as shown in ***Diagram 3*** below. There is one lane per direction on all approaches. It has been proposed that the development take access via the eastern leg (School Access Road).

Diagram 3: *Beacon Way / Filling Station / School Access Road intersection*

The existing 2023 traffic volumes along with the existing lane layout were analysed and the intersection is expected to experience an overall average delay of approximately 6.6 seconds in the AM peak hour and 2.2 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along the school access road on the eastern approach which experiences a LOS C with a delay of 16.8 seconds in the AM peak hour and 20.7 seconds in the PM peak hour.

In 2029, after applying a 3% growth rate p.a., the intersection (current layout) is expected to experience an average delay of 8.1 seconds in the AM peak hour and 2.8 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along the school access road on the eastern approach which experiences a LOS C with a delay of 24.5 seconds in the AM peak hour and a LOS D in the PM peak hour with a delay of 28.5 seconds.

After the intersection is upgraded to a roundabout, the subject development's traffic is added to the network in 2029 and the intersection is expected to experience an average delay of 7.6 seconds in the AM peak hour and 5.8 seconds in the PM peak hour. The worst delay is experienced on the right-turning movement from the filling station on the western approach which experiences a LOS B with a delay of 11.2 seconds in the AM peak hour and 11.3 seconds in the PM peak hour. It is expected that in all the scenarios above, the early afternoon peak would experience congestion at the end of the school day.

It should be noted that in SIDRA, the size of the roundabout is not a critical factor in the analysis. This will be further discussed in *Section 4.*

Beacon Way / Checkers / The Market Square Intersection

The Beacon Way / Checkers / The Market Square intersection is a full signalized intersection as shown below in ***Diagram 4.*** There are turning lanes on each approach.

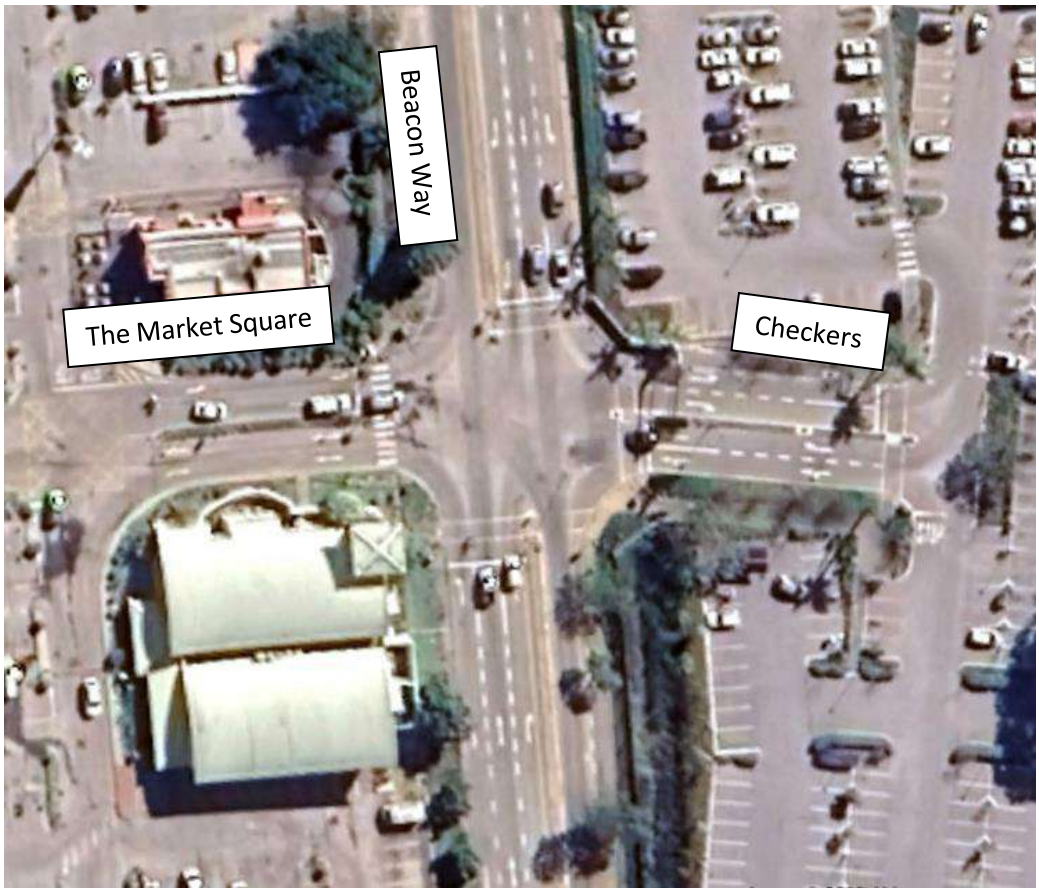


Diagram 4: *Beacon Way / Checkers / The Market Square intersection*

The existing 2023 traffic volumes along with the existing lane layout was analysed and the intersection is expected to experience an overall average delay of approximately 23.7 seconds in the AM peak hour and 29.3 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along Beacon Way northern approach which experiences a LOS D with a delay of 35.3 seconds in the AM peak hour and 36.1 seconds in the PM peak hour.

In 2029, after applying a 3% growth rate p.a., the intersection is expected to experience an average delay of 28.4 seconds in the AM peak hour and 36.3 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along Beacon Way northern approach which experiences a LOS D with a delay of 45.1 seconds in the AM and 49.3 seconds in the PM peak hour.

After the subject development's traffic is added to the network in 2029, the intersection is expected to experience an overall delay of 28.6 seconds in the AM peak hour and 37.7 seconds in the PM peak hour. The worst delay, in both peak hours, is experienced on the right-turning movement along Beacon Way northern approach which experiences a LOS D with a delay of 45.4 seconds in the AM and 49.3 seconds in the PM peak hour.

No upgrades are required due to the development.

Beacon Way / Zenon Street Intersection

The Beacon Way / Zenon Street intersection is a roundabout with one lane per direction as shown below in ***Diagram 5.***

Diagram 5: *Beacon Way / Zenon Street intersection*

The existing 2023 traffic volumes along with the existing lane layout was analysed and the intersection is expected to experience an overall average delay of approximately 5.0 seconds in the AM peak hour and 5.3 seconds in the PM peak hour. All movements experience a LOS A or B.

In 2029, after applying a 3% growth rate p.a., the intersection is expected to experience an average delay of 5.1 seconds in the AM peak hour and 5.4 seconds in the PM peak hour. All movements are still expected to experience a LOS A or B.

After the subject development's traffic is added to the network in 2029, the intersection is expected to experience an overall delay of 5.1 seconds in the AM peak hour and 5.4 seconds in the PM peak hour. As above, the intersection is expected to experience a LOS A or B on all movements.

No upgrades are required at this intersection due to the introduction of the development.

4. GEOMETRY

The proposed development is in a region accessed via the N2 / Beacon Way intersection. The N2 is a National Route (NR00208) and as previously mentioned, the intersection is planned to be upgraded to a roundabout with construction planned to start in 2024.

As mentioned, access was previously proposed via the Poortjies residential area where vehicles would travel southward along Plato Road, into Zenon Street and access Beacon Way via the Beacon Way / Zenon Street roundabout. However, objections were received from the Poortjies community. The civil engineer on the project and Bitou Municipality then investigated alternatives and agreed to allow access via the Beacon Way / Filling Station / School Access Road intersection provided it is upgraded to a roundabout. A layout of the roundabout is shown in the attached ***Beacon Way Traffic Circle*** as prepared by *VITA Consulting Engineers.*

According to the drawing, there are two lanes per direction along Beacon Way at the proposed roundabout (Beacon Way / Filling Station / School Access). The proposed two lanes per direction, along with the roundabout's internal island diameter of approximately 7.5-metres is considered undesirable as sufficient deviation is not provided for the through traffic. It should also be noted that due to the size of the roundabout (ICD of approximately 26- to 31-metres), it appears the wheel-tracking, as per the civil engineer's drawing, for a truck making a right-turning movement would encroach on the left-turning lane of the same approach and cut into both circulating lanes, this is considered undesirable. It is the opinion that based on the land-use of the proposed development (residential), access will be more desirable via the Poortjies residential development. It is anticipated that the Beacon Way / Zenon Street intersection will be able to accommodate the additional residential traffic generated as the intersection largely serves residential traffic, whereas the Beacon Way / Filling Station / School Access intersection serves the filling station, retail deliveries and school trips.

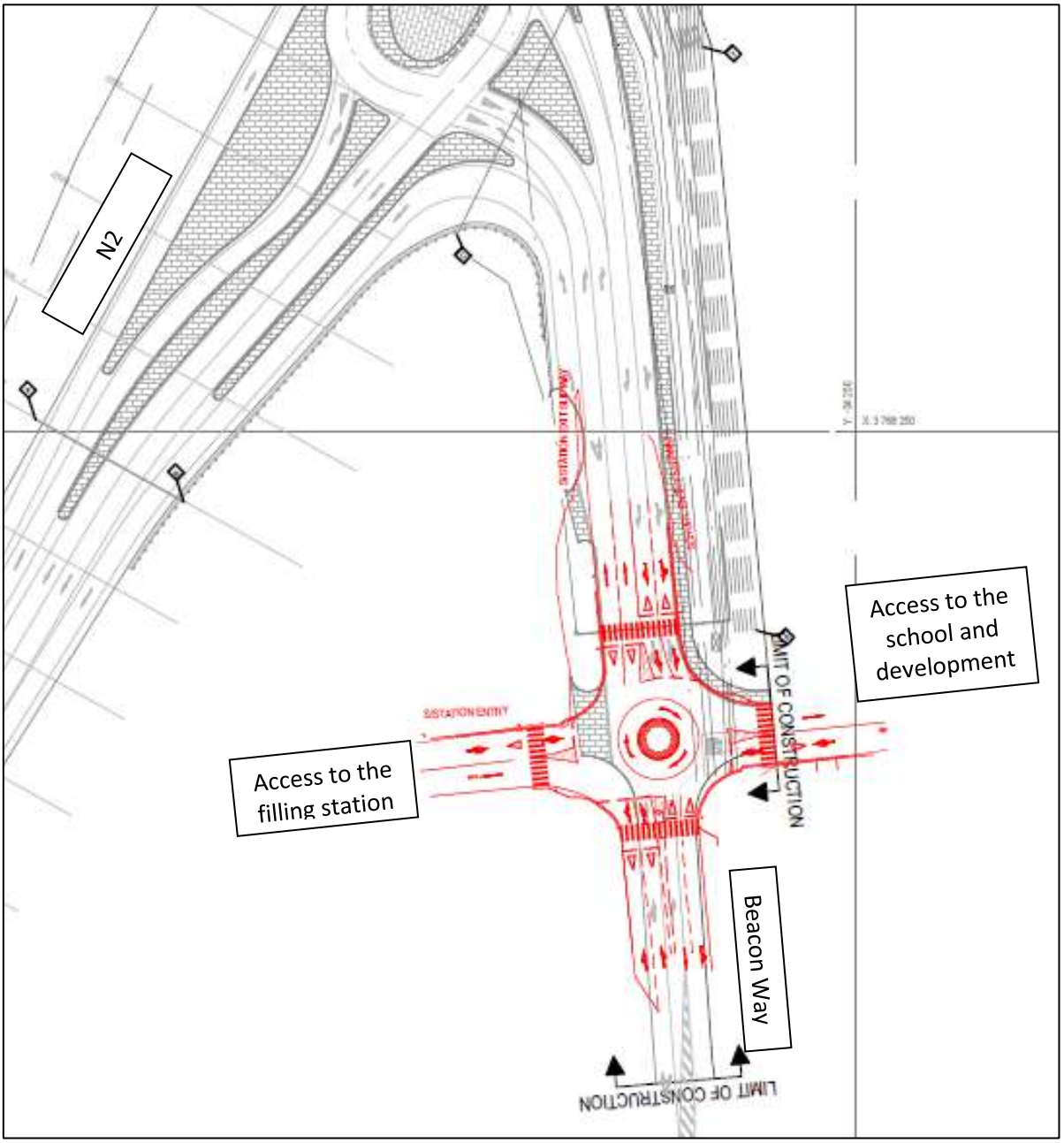


Diagram 6: *Beacon Way / Filling Station / School Access Road roundabout (prepared by VITA Consulting Engineers)*

The Minimum Standards for Civil Engineering Services in Townships (2007) states that a minimum of 6-metres stacking distance is required for less than 15 residential units and 12-metres stacking distance is required for 40 units. There are no stipulated requirements for developments larger than 40-units, however, based on the data available and assuming a best fit trendline, the recommended stacking for 50 units should be approximately 14-metres. The layout of the gatehouse has not been confirmed, therefore, sufficient stacking distance should be provided during further design stages. In addition to this, it should be ensured that one of the entry lanes are at least 4.0 metres wide to accommodate emergency vehicles.

The internal road reserves are a minimum of 12-metres wide. It should be ensured that vehicles parked in driveways and garages have sufficient space to reverse. It is also recommended that sight-distance be considered in the placement of trees.

Refuse will be collected at the gatehouse. It should be ensured a turning around area is provided.

5. NON-MOTORISED AND PUBLIC TRANSPORT

A sidewalk exists along at least one side of Beacon Way and the School Access Road. It is recommended the sidewalk be continued up to the access of the development. It is also recommended that traffic calming be considered within the development along the north-south road along the western boundary.

It is not expected that additional public transport infrastructure would be required as result of the proposed development.

6. PARKING

The Bitou Municipality Zoning Scheme recommends 2 bays per unit for single residential units. According to the planners, 2 bays per unit will be provided. An additional 22 bays are proposed at the gatehouse for visitors.

Parking spaces should also be provided in accordance with normal parking standards, i.e. 2.5 by 5.0 metre bays and 3.7 by 5.0 metre bays for disabled users with 7.5 metre aisle widths as per the Bitou Municipality Zoning Scheme.

7. CONCLUSIONS

It can therefore be concluded that:

- This subject property (RE 6503) is located to the east of the N2, currently accessed via Beacon Way.
- This report serves as an update to the previously submitted report dated 26 July 2023.
- The previous proposal consisted of 77 units, of which 37 are proposed to be single residential units and 40 apartment units. The current proposal consists of 50 residential units. 9 units will be registered as Single Residential Zone I and 41 units will be registered as General Residential Zone II (Group Housing). In both cases, it was proposed the estate be access-controlled.
- Traffic counts were performed on Monday, 22nd May 2023 at the N2/Beacon Way intersection, Beacon Way / Filling Station / School Access intersection, Beacon Way / Market Square / Checkers intersection, Beacon Way / Zenon Street.
- Using TMH17, 50 trips are expected in the AM (12 IN / 38 OUT) and PM (35 IN / 15 OUT) peak hour.
- A 3% annual growth rate was used to project the traffic to 2029 to evaluate a 5-year future scenario.
- SIDRA 9.1 results were as follows:
    - N2 / Beacon Way Intersection:
        - Existing (2023 traffic): Average delay of 7.8 seconds (AM peak hour) and 211.2 seconds (PM peak hour). The worst delay is experienced on the right-turning movement along Beacon Way which experiences a LOS F and unacceptable delays.
        - Projected 2029 traffic: Average delay of 45.7 seconds (AM peak hour) and 565.5 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along Beacon Way which experiences a LOS F and unacceptable delays.
        - The local municipality has confirmed that the N2/Beacon Way intersection will be upgraded to a roundabout with construction starting in 2024. The Projected 2029 traffic was therefore analysed using the approved roundabout. An average delay of 5.8 seconds (AM peak hour) and 6.8 seconds (PM peak hour) is expected with the upgrade. The worst delay is expected to be experienced on the right-turning movement along Beacon Way which experiences a 10.4 second delay in the PM peak hour.
        - Estimated (2029 + Subject Development): Using the upgraded intersection, the average delays were maintained after the development traffic was added.

- No further upgrades above and beyond the aforementioned roundabout is required.

- Beacon Way / Filling Station / School Access Intersection:
  - Existing (2023 traffic): Average delay of 6.6 seconds (AM peak hour) and 2.2 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along the school access which experiences a 20.7 second delay in the PM peak hour.
  - Projected 2029 traffic: Average delay of 8.1 seconds (AM peak hour) and 2.8 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along the school access which experiences a 28.5 second delay in the PM peak hour.
  - Projected (2029 + Subject Development): In order to accommodate the development taking access via the School Access Road, it was proposed the intersection be upgraded to a roundabout. The upgraded intersection is therefore expected to experience an average delay of 7.6 seconds (AM peak hour) and 5.8 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement from the filling station which experiences an 11.3 second delay in the PM peak hour.
- Beacon Way / The Market Square / Checkers Intersection
  - Existing (2023 traffic): Average delay of 23.7 seconds (AM peak hour) and 29.3 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along Beacon Way which experiences a 36.1 second delay in the PM peak hour.
  - Projected 2029 traffic: Average delay of 28.4 seconds (AM peak hour) and 36.3 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along Beacon Way which experiences a 45.1 second delay in the PM peak hour.
  - Projected (2029 + Subject Development): Average delay of 28.6 seconds (AM peak hour) and 37.7 seconds (PM peak hour). The worst delay is expected to be experienced on the right-turning movement along Beacon Way which experiences a 49.3 second delay in the PM peak hour.
  - No additional lanes are required.
- Beacon Way / Zenon Street
  - Existing (2023 traffic): Average delay of 5.0 seconds (AM peak hour) and 5.3 seconds (PM peak hour). All movements are expected to experience a LOS A or B.

        - Projected 2029 traffic: Average delay of 5.1 seconds (AM peak hour) and 5.4 seconds (PM peak hour). All movements are expected to experience a LOS A or B.
        - Projected (2029 + Subject Development): Average delay of 5.1 seconds (AM peak hour) and 5.4 seconds (PM peak hour). All movements are expected to experience a LOS A or B.
        - No upgrades are required.
- As mentioned, the N2 / Beacon Way intersection is planned to be upgraded to a roundabout with construction starting in 2024.
- Access to the development was initially proposed via Poortjies on the southern boundary of the subject erf, however after objections were received, access is now proposed via the School / Checkers delivery yard Access Road which will intersect with Beacon Way. In order to accommodate the development traffic, the civil engineer and municipality agreed to upgrade the intersection to a roundabout. It should be noted that due to the proposed size of the roundabout (ICD of approximately 26- to 31-metres), it appears that the wheel-tracks, as per the civil engineer's drawings, of a truck making a right-turning movement would encroach on the left-turning lane of the same approach and cut into both circulating lanes.
- Access to the subject property is proposed to be gated, however the details for the guard house has not been confirmed. The Minimum Standards for Civil Engineering Services in Townships (2007) only stipulates specifications up to 40 units, however, using the ratios provided, stacking distance should be approximately 14-metres.
- An entry lane of minimum 4.0 metres should be provided for emergency vehicles.
- Internal reserves are a minimum of 12-metres wide. It should be ensured vehicles parked in driveways and garages have sufficient space to reverse.
- Refuse collection will occur at the gatehouse.
- The Bitou Municipality Zoning Scheme recommends 2 bays per unit for single residential units. According to the planners, 2 bays per unit will be provided. An additional 22 bays are proposed at the gatehouse for visitors.

8. RECOMMENDATIONS

The development be recommended on condition that:

- Sufficient stacking space exceeding 14-metres be provided.
- A minimum entry lane of 4.0-metres be provided.
- Sufficient sight distance be ensured in the placement of trees along the internal roads.
- It should be ensured that there is sufficient space for vehicles reversing out of driveways.
- Traffic calming be considered along roads within the development longer than 100-metres.
- A turning area is provided for refuse collection.
- It be considered that access be reverted to the previous proposal via the Poortjies residential area.

Trust the above is sufficient for the purpose of the investigation. More information can be provided upon request.

Yours faithfully,

Compiled by: Shameez Patel Papathanasiou (MScEng)

Approved by Piet van Blerk (PrEng)

UDS AFRICA

ATTACHMENTS

Locality Plan

Alternative 1 Preferred Proposal

Beacon Way Traffic Circle

Figure 1 - Existing AM/PM Peak Hour Traffic Volumes (22 May 2023)

Figure 2 - Projected 2029 AM/PM Peak Hour Traffic Volumes
(Using a 3% growth rate p.a.)

Figure 3 – Distribution of Traffic Generated by the Development

Figure 4 – Estimated 2029 AM/PM Peak Hour Traffic Volumes (Incl. Proposed Development as well as a 3% growth rate p.a.)

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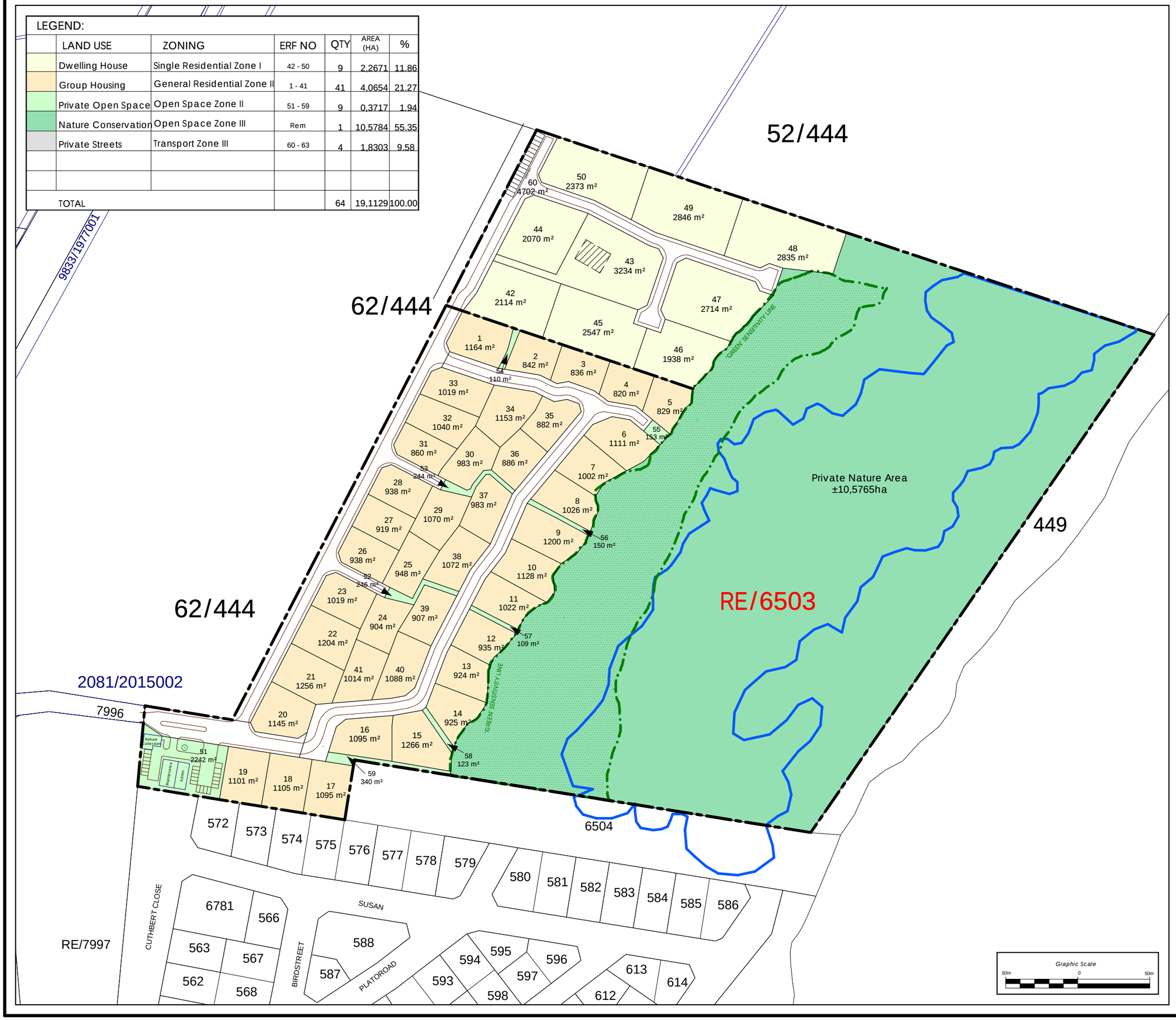
Locality Plan

LEGEND:

	LAND USE	ZONING	ERF NO	QTY	AREA (HA)	%
	Dwelling House	Single Residential Zone I	42 - 50	9	2,2671	11.86
	Group Housing	General Residential Zone II	1 - 41	41	4,0654	21.27
	Private Open Space	Open Space Zone II	51 - 59	9	0,3717	1.94
	Nature Conservation	Open Space Zone III	Rem	1	10,5784	55.35
	Private Streets	Transport Zone III	60 - 63	4	1,8303	9.58
	TOTAL			64	19,1129	100.00



PLAN 4

PLETTENBERG BAY
ERF 6503

ALTERNATIVE 1
PREFERRED PROPOSAL

N

SCALE 1: 2500

NOTES

1. Sizes and dimensions are approximate and subject to final survey
2. For Property details, refer to SG 8205/1996
3. 0,5m Contour intervals, surveyed by VPM Surveys

DRAWN:	MV	CHECKED:	MV
PLAN NO:	Pr2309PB6503L07		
PLAN DATE:	8 Feb 2024		
STORED:	*z:\drawings\App\Pr2309PB6503L07.drg*		

MUNICIPAL MANAGER

DATE: _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Marike Vreken
STADS & OMGEWINGSBEPLANNERS
URBAN & ENVIRONMENTAL PLANNERS

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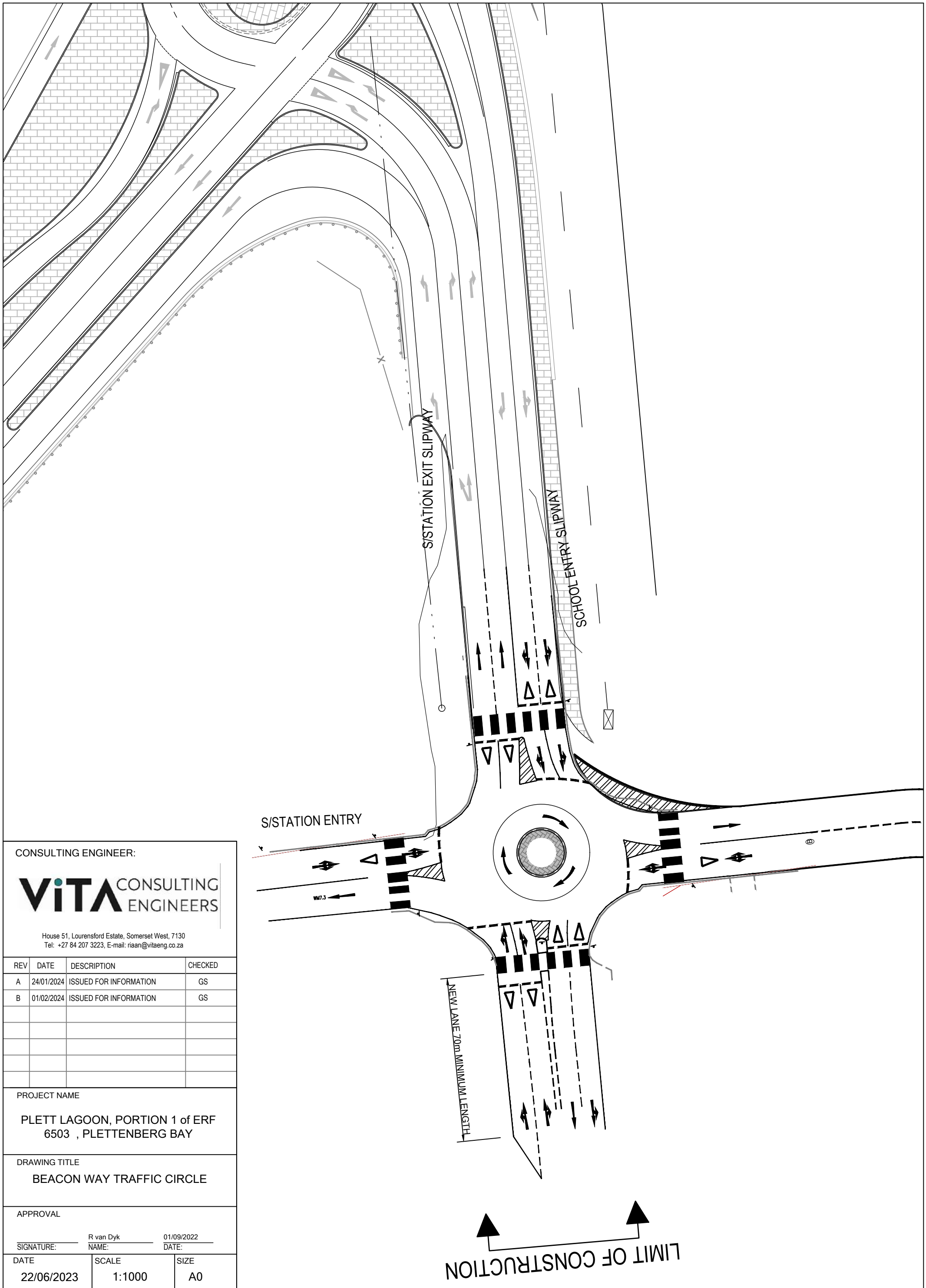


CONSULTING ENGINEER:

ViTA CONSULTING ENGINEERS

House 51, Lourensford Estate, Somerset West, 7130
Tel: +27 84 207 3223, E-mail: riaan@vitaeng.co.za

REV	DATE	DESCRIPTION	CHECKED
A	24/01/2024	ISSUED FOR INFORMATION	GS
B	01/02/2024	ISSUED FOR INFORMATION	GS

PROJECT NAME

PLETT LAGOON, PORTION 1 of ERF 6503 , PLETTENBERG BAY

DRAWING TITLE

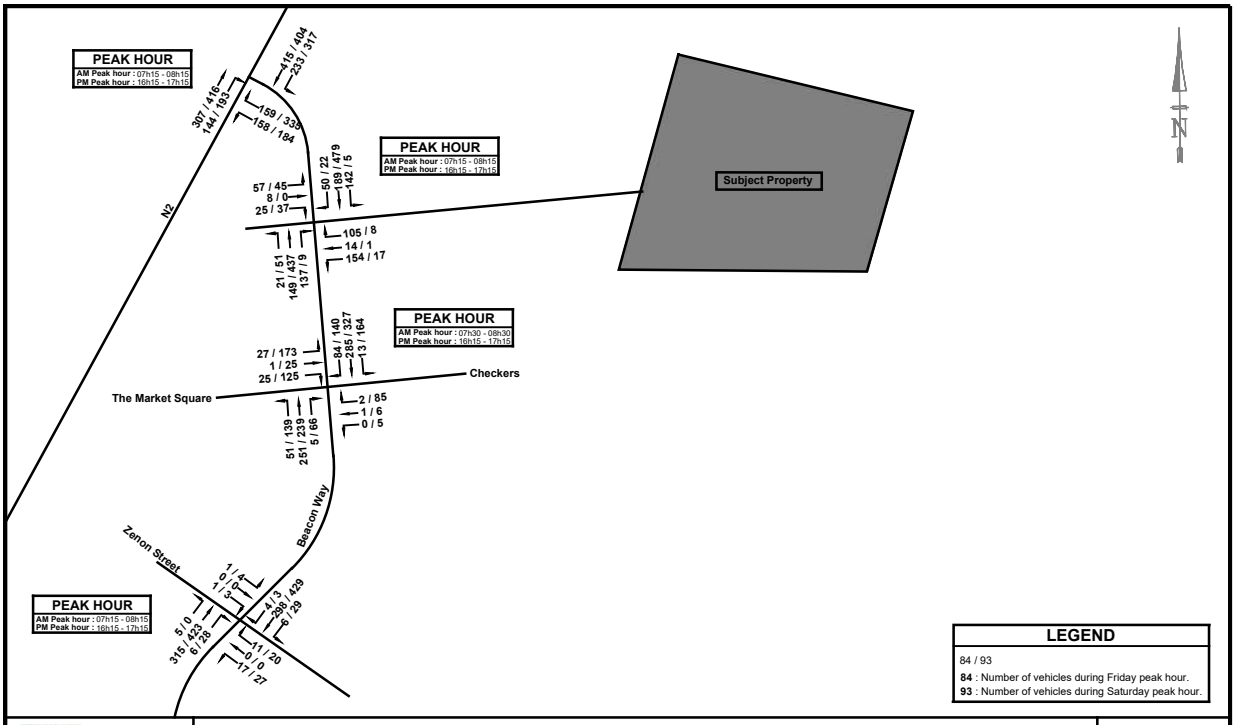
BEACON WAY TRAFFIC CIRCLE

APPROVAL

SIGNATURE:	NAME:	DATE:
	R van Dyk	01/09/2022

DATE	SCALE	SIZE
22/06/2023	1:1000	A0

DRAWING NO.	REV
22051_TURN_01	B



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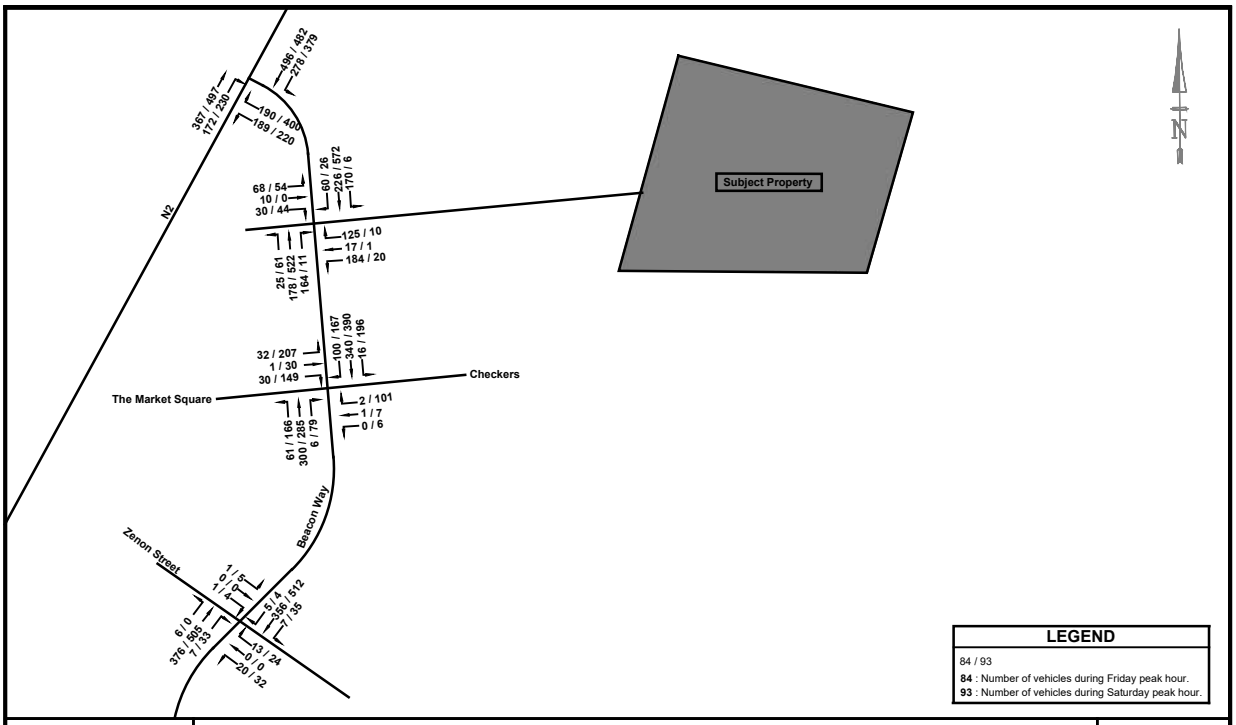
Existing 2023 AM/PM Peak Hour Traffic Volumes
(22 May 2023)

Figure 1



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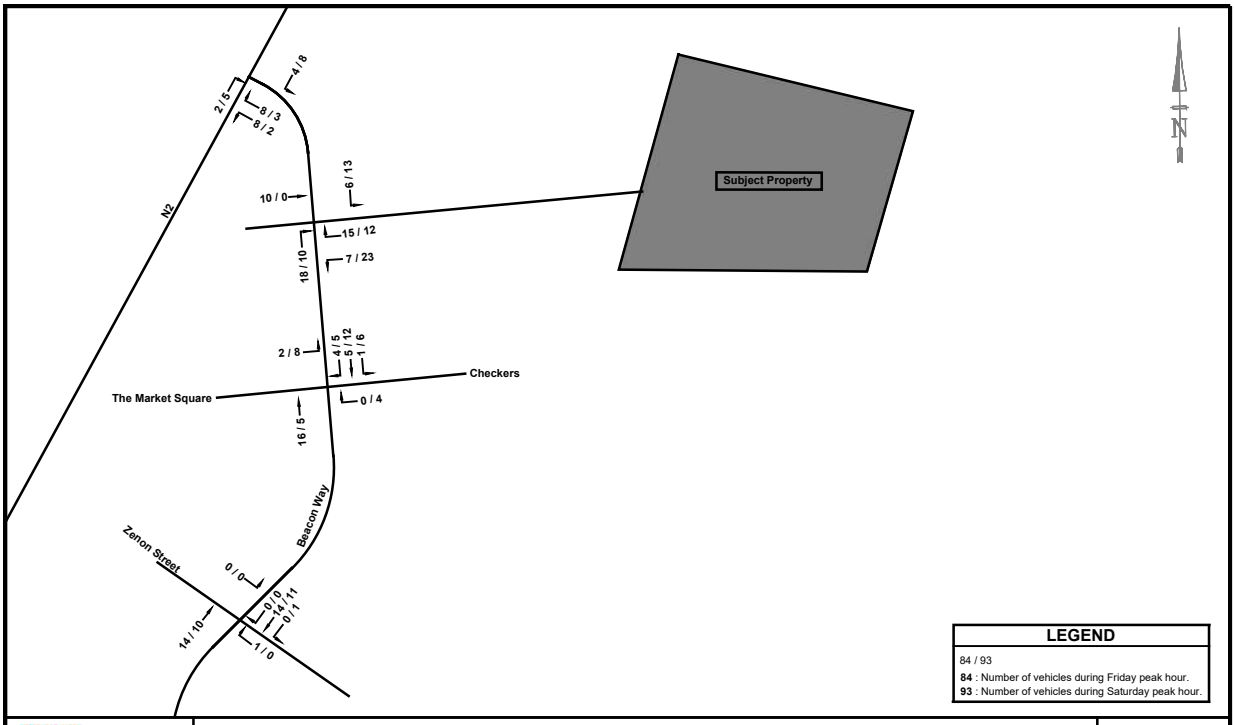
Projected 2029 AM/PM Peak Hour Traffic Volumes
(Using a 3% growth rate p.a.)

Figure 2



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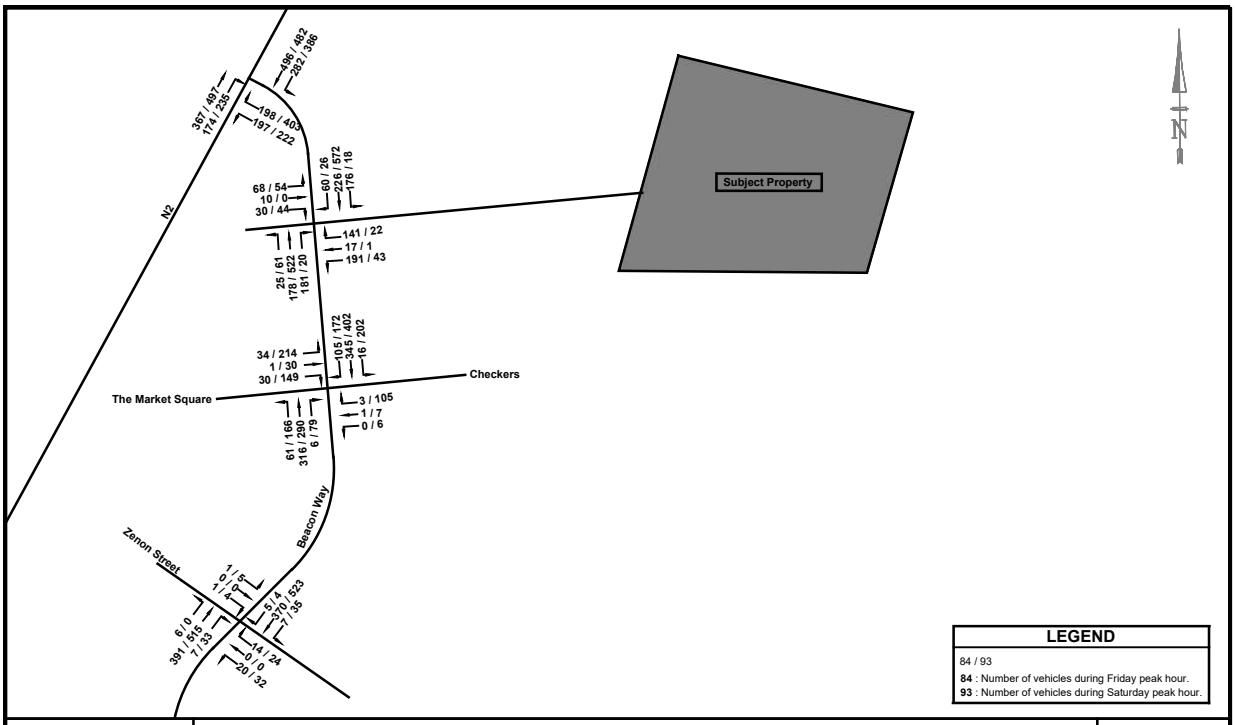
Distribution of Traffic Generated by the Development

Figure 3



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Estimated 2029 AM/PM Peak Hour Traffic Volumes Incl. Proposed Development as well as a 3% growth rate p.a.)

Figure 4

munisipaliteit umasipala municipality
to be the best together
Private Bag X1002 Plettenberg Bay 6600
Tel+27 (0)44 501 3000 Fax +27(0)44 533 3485

Ref: 9/1/3 Enquiries: Z Mputa Contact Details: 044 501 3266
Email: zmputa@plett.gov.za

14 February 2024

The Director
VITA Consulting Engineers
House 51 Lourensford Estate,
Somerset West
7130

For the attention of Mr. R Van Dyk

Dear Sir

PLETT LAGOON PORTION 1 OF ERF 6503: APPOVAL FOR BEACON WAY TRAFFIC CIRCLE CONCEPTUAL LAYOUT PLAN

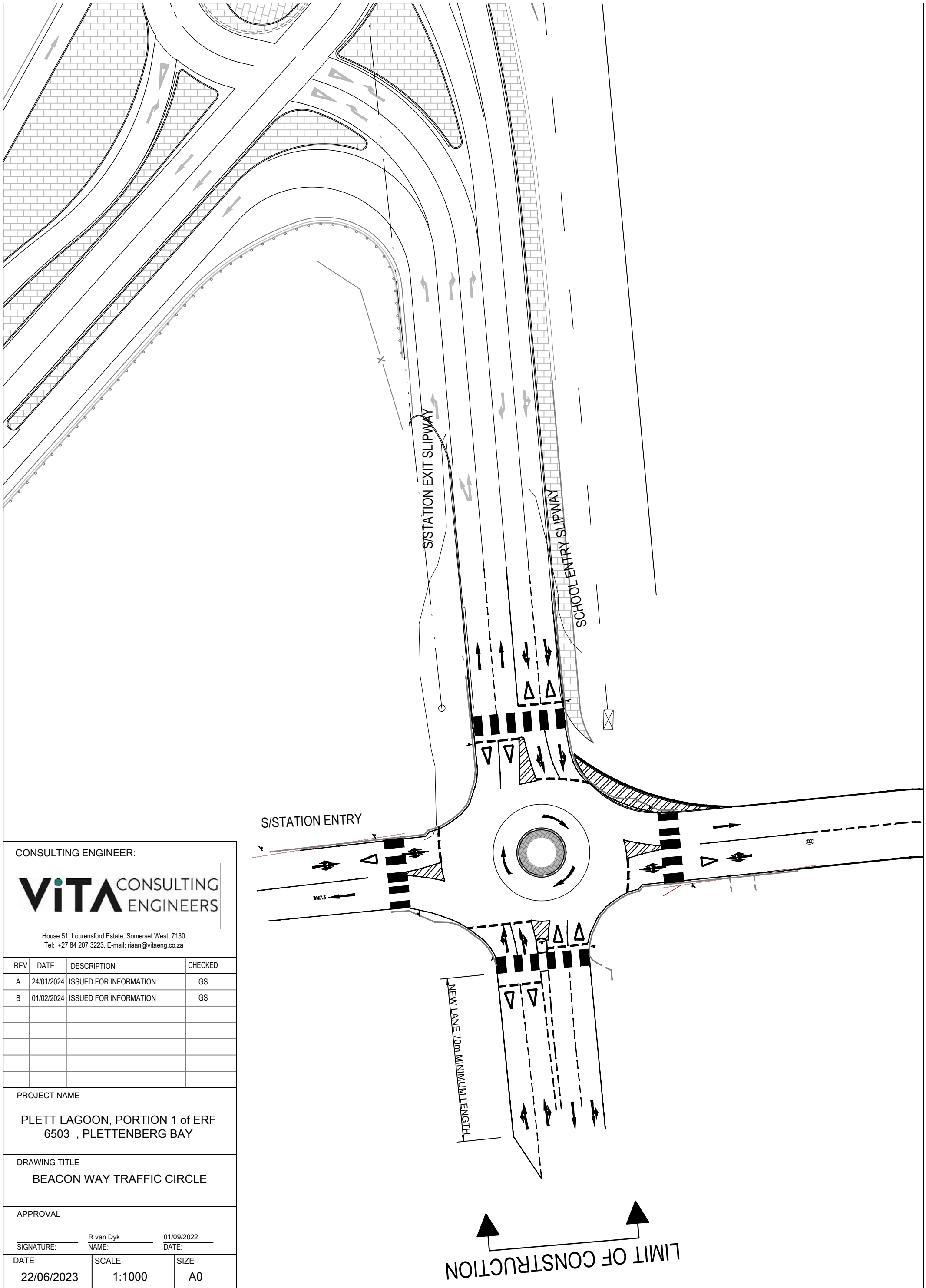
We hereby approve the drawing No. 22051_TURN_01 revision B for the abovementioned development in condition that:

1. All Roads and Stormwater must be designed as per Guidelines for Human Settlement Planning and Design.
2. The design should be approved by municipality prior to implementation of works, .
3. The Engineer must ensure that they obtain the wayleaves from the municipality before construction.
4. The Engineer must inform the municipality during construction for monitoring and must be invited to the site meetings.
5. The Municipality must be invited on completion for final inspection and approval.
6. As build drawing PDF and sharefiles must be submitted to the municipality.
7. The Engineer must ensure that the developer covers all the cost towards this upgrade, with no contribution from the Municipality

Should there be any clarity required or information requested our division is willing to cooperate and assist where applicable.

Yours Faithful

_____
Z MPUTA
Manager: Transport, Roads and Stormwater



CONSULTING ENGINEER:

ViTA CONSULTING ENGINEERS

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Tel: +27 84 207 3223, E-mail: riaan@vitaeng.co.za

REV	DATE	DESCRIPTION	CHECKED
A	24/01/2024	ISSUED FOR INFORMATION	GS
B	01/02/2024	ISSUED FOR INFORMATION	GS

PROJECT NAME

PLETT LAGOON, PORTION 1 of ERF 6503 , PLETTENBERG BAY

DRAWING TITLE

BEACON WAY TRAFFIC CIRCLE

APPROVAL

SIGNATURE:	NAME:	DATE:
	R van Dyk	01/09/2022

DATE	SCALE	SIZE
22/06/2023	1:1000	A0

DRAWING NO.	REV
22051_TURN_01	B

Appendix D: Municipal Services Capacity Analysis (*GLS Consulting*)

Draft report

27 February 2023

The Director: Engineering Services
Bitou Municipality
Private Bag X1002
Plettenberg Bay
6600

Attention: Ms Asiphe Mgoqi

Dear Madam,

PROPOSED RESIDENTIAL DEVELOPMENT ON ERF 6504 AND THE REMAINDER OF ERF 6503, PLETTENBERG BAY: CAPACITY ANALYSIS OF THE BULK WATER & SEWER SERVICES

The request by Mr Riaan van Dyk of Vita Consulting Engineers for GLS Consulting to investigate and comment on the bulk water supply and sewer discharge of the proposed development (retirement village development on portion 53 of Farm 444, Plettenberg Bay), refers.

This document should inter alia be read in conjunction with the Water Master Plan (performed for the Bitou Municipality) dated June 2020 and the Sewer Master Plan dated June 2020.

The proposed development was not taken into consideration for the master plans for the water and sewer networks.

1 WATER DISTRIBUTION SYSTEM

1.1 Distribution zone

For this re-analysis of the water master plan it is proposed that the development area should be accommodated in the existing Goose Valley reservoir zone. The proposed connection to the existing water system is to the existing 250 mm diameter supply pipeline from the Goose Valley reservoir in Beacon Way, as shown on Figure 1 attached.

The proposed development is situated inside the water priority area.

1.2 Water demand

No provision was made in the original water analysis for the master plan for development on Erf 6504 and the remainder of Erf 6503 in Plettenberg Bay .

For this re-analysis, the total annual average daily demand (AADD) and fire flow for the proposed development were calculated and classified as follows:

GLS Consulting (Pty) Ltd
T +27 21 880 0388
Stellenpark, Block D North, Cnr of R44 and School Rd, Jamestown, Stellenbosch, 7600, ZA | PO Box 814, Stellenbosch, 7599, ZA
Reg no: 2007/003039/07
www.gls.co.za

Directors: RL Pole, AG Hingeston, AN Umichand

- 40 x retirement units @ 0,6 kL/d/unit = 24,0 kL/d
- 31 x Single residential units @ 1,0 kL/d/unit = 31,0 kL/d

TOTAL = 55,0 kL/d *

* As per Table J.2 from Section J – Water Supply of "The Neighbourhood Planning and Design Guide" (so called "Red book").

- Fire flow criteria (Low risk) = 15 L/s @ 10 m

1.3 Present situation

1.3.1 Reticulation network

It is recommended that the proposed development is accommodated within the existing Goose Valley reservoir water distribution zone and not within the Town PRV no. 3 zone.

The Goose Valley water distribution zone is supplied with water from the Goose Valley reservoir (Top Water Level (TWL) of 89.7 m above mean sea level (m a.s.l.)) through a 250 mm Ø main supply pipe under gravity. The existing water reticulation system also supplies bulk water to the Wittedrift and Matjiesfontein reservoirs (through the reticulation network, see section 1.3.3 further on in the report) and has consequently insufficient capacity to accommodate the domestic water demand of the proposed development in order to comply with the pressure and fire flow criteria as set out in the master plan.

Link services items BPW14.1 will be required to connect the internal reticulation network of the proposed development to the existing municipal water network.

Link services

- BPW14.1 : 70 m x 200 mm Ø new pipe = R 284 000 *

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2022/23 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

The route of link services item BPW14.1 is schematically shown on Figure 1, but has to be finalised subsequent to a detailed pipeline route investigation.

1.3.2 Reservoir capacity

Bulk water is currently supplied from the Goose Valley reservoir to the Matjiesfontein and Wittedrift reservoirs, which has a negative effect on the available reservoir storage capacity available for the Goose Valley reservoir supply area (this is discussed in section 1.3.3 of this report further on).

The Matjiesfontein reservoir is the main supply reservoir for the areas east of the Keurbooms River and the Wittedrift reservoir is the main supply reservoir for Wittedrift and Green Valley.

The Goose Valley reservoir has consequently insufficient spare capacity to accommodate any additional developments.

Note: The Goose Valley reservoir will have sufficient spare capacity available to accommodate the development if the Wittedrift and Matjiesfontein reservoirs are supplied with water directly from the Town reservoirs through a dedicated bulk system, as discussed in paragraph 1.4.1 further on in the report.

1.3.3 Bulk supply

The Plettenberg Bay bulk water system was designed to supply the Wittedrift and Matjiesfontein reservoirs with bulk water from the Town reservoirs, located on the Plettenberg Bay Water Treatment Plant (WTP) site, and the Goose Valley reservoir with bulk water through the Goose Valley PS, also located at the Plettenberg Bay WTP site.

The Matjiesfontein reservoir was supplied with water through a 150 mm diameter dedicated pipeline between the Town reservoirs and the Matjiesfontein reservoir, and the Wittedrift reservoir through a 90 mm diameter pipe that connects to the Town/Matjiesfontein pipeline.

The 150 mm supply pipe to the Matjiesfontein and Wittedrift reservoirs is however at capacity (capacity of pipeline is ±1,0 ML/d and peak demand of the supply system is currently ±2,3 ML/d) and bulk supply to the Matjiesfontein and Wittedrift reservoirs is therefore currently supplied from the Goose Valley reservoir through the network of the Goose Valley water distribution zone. The Goose Valley reticulation network connects to the Matjiesfontein bulk pipeline before the bridge over the Keurbooms River.

The system is therefore currently not operated as it was designed for. The current operation consequently puts pressure on the available spare capacity of the Goose Valley system and is also not economically the best solution for the longer term (water that could have gravitated to the Matjiesfontein reservoir is currently pumped via the Goose Valley system).

The Goose Valley reservoir is supplied with water through a 200 mm diameter dedicated pipe between the Goose Valley PS and reservoir.

The capacity of the existing Goose Valley PS and accompanying 200 mm supply pipeline is 40 L/s (3,4 ML/d if pumped 24 hours a day). Peak demand from the Plettenberg Bay WTP to the Goose Valley reservoir is calculated at 2,7 ML/d (based on bulk water readings of the Goose Valley PS supplied by Bitou Municipality from July 2020 to March 2022). This implies that during peak demand conditions (December holiday) the Goose Valley PS should be operational 19 hours a day in order to supply the demand.

Bitou Municipality has indicated that their Goose Valley bulk system is under pressure during peak demand conditions and that the larger bulk system (supply to Matjiesfontein reservoir) should be upgraded according to the master plan before additional developments can be accommodated within the existing Goose Valley reservoir supply area.

1.4 Implementation of the master plan

1.4.1 Bulk supply

In the water master plan the following upgrades are proposed in order to augment the existing bulk supply system between the Town reservoirs at the WTP site and the Matjiesfontein reservoir on the eastern side of the Keurbooms River:

<u>Bulk supply augmentation</u>

• BPW.B39	: 930 m x 400 mm Ø new bulk pipe (replace 150 mm Ø)	= R	6 108 000 *
• BPW.B67	: 2 670 m x 355 mm Ø new bulk pipe (replace 150 mm Ø)	= R	13 813 000 *
• Item 1	: Close existing isolating valve	= R	No cost
	Total	= R	19 921 000 *

In the Water Master Plan item DPW.B40 was proposed to connect an existing 300 mm Ø pipeline from the Town reservoir zone to the existing 150 mm Ø Matjiesfontein bulk pipeline (at the intersection of the N2 National Road and the service road towards the Goose Valley reservoir), in order to augment bulk water supply to the Matjiesfontein and Wittedrift reservoirs.

Bitou Municipality has however indicated that this 300 mm Ø pipeline (3,6 km asbestos cement pipeline from the Town reservoirs) is in a poor condition, has been abandoned and can not be utilised to augment the bulk water supply system. The master plan should therefore be amended to reflect this.

It is therefore proposed that the following master plan item is included in the water master plan in the place of the existing 300 mm Ø AC pipeline.

- Item 2 : 3 600 m x 400 mm Ø new bulk pipe (replace 300 mm Ø) = R 22 631 000 *

These upgrades will solve the existing backlog of bulk supply to the Matjiesfontein reservoir as well as provide spare capacity for potential future development areas, as documented in the water master plan.

(* Including P & G, Contingencies and Fees, but excluding VAT - Year 2022/23 Rand Value. This is a rough estimate, which does not include major unforeseen costs).

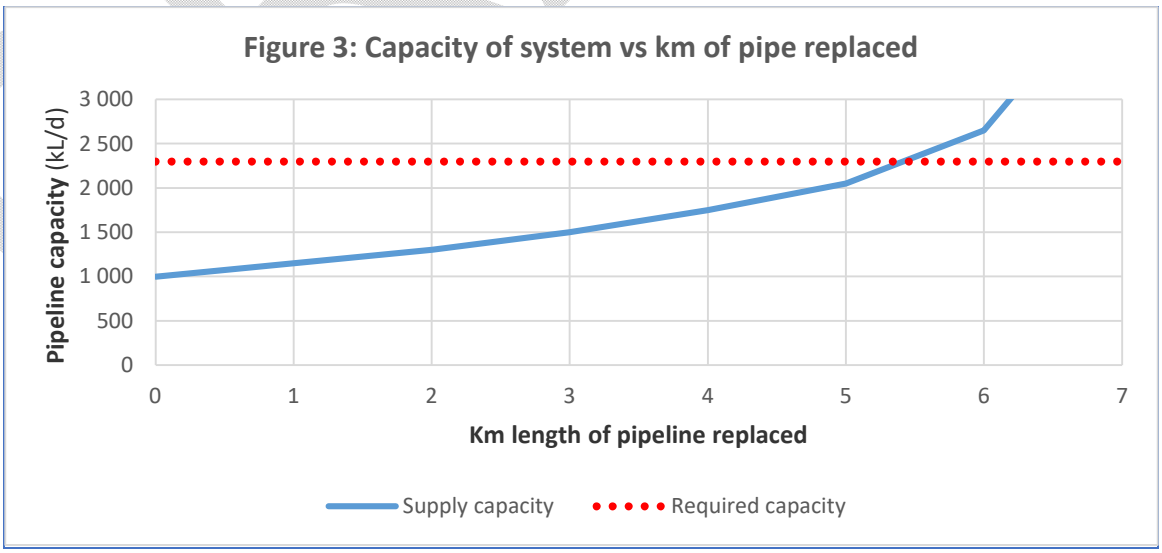
Take note that the routes of the proposed pipelines are schematically shown on Figure 2 attached, but have to be finalised subsequent to detail pipeline route investigations.

1.5 *Minimum upgrades required to bulk system*

The capacity of the existing bulk supply system from the Town reservoirs to the Matjiesfontein reservoir is calculated at 1,0 ML/d. The required supply to the Matjiesfontein reservoir during peak holiday periods is calculated at 2,3 ML/d (refer to paragraph 1.3.3).

It is therefore proposed that the existing 150 mm Ø pipeline between the Town reservoirs and the bridge over the Keurbooms River is replaced and isolated from the existing Goose Valley network as proposed in the water master plan in order to augment supply to the Matjiesfontein reservoir. This will then alleviate pressure that currently exist on the supply to the Goose Valley reservoir in order to accommodate future developments within the reservoir supply area.

Figure 3 below shows how supply to the Matjiesfontein reservoir will improve as sections of master plan items 2, BPW.B39 and BPW.B67 are implemented (from the Town reservoir towards the Keurbooms River):



Roughly 5,5 km of the existing 7,7 km x 150 mm Ø bulk pipeline between the Town reservoirs and the Keurbooms River should be upgraded in order to supply the Matjiesfontein reservoir from the Town reservoirs under gravity (no augmentation of bulk supply from the Goose Valley reservoir will then be required).

The minimum upgrades required to the improve the existing bulk supply system in order to accommodate the proposed development in the existing system are:

- Master plan item 2 (3,6 km x 400 mm Ø replace existing 300 mm Ø abandoned AC pipe).
- Master plan item BPW.B39 (0,9 km x 400 mm Ø replace existing 150 mm Ø bulk pipe).
- Portion of master plan item BPW.B67 (1,0 km x 355 mm Ø replace existing 150 mm Ø bulk pipe).

1.6 Additional development planned in the short-term for Goose Valley reservoir zone

Although GLS Consulting cannot comment on the implementation timeframes of proposed developments, it should be noted that capacity analyses for the following developments (that should be supplied with water from the Goose Valley/Matjiesfontein/Wittedrift bulk supply system) have been performed in the last 3 years:

- Portion 32 of Farm 304 (Final report dated 15 September 2022, estimated water demand of 9,6 kL/d).
- Portion 38 of Farm 444 (Final report dated 3 October 2022, estimated water demand of 10,2 kL/d).
- Erf 155, Keurboomstrand (Final report dated 7 December 2022, estimated water demand of 3,0 kL/d).
- Portions 19 & 27 of Farm 444 (Final report dated 7 December 2022, estimated water demand of 234,9 kL/d).
- Portion 53 of Farm 444 (Final report dated 7 December 2022, estimated water demand of 101,9 kL/d).
- Portion 7 of Farm 306, Wittedrift (Final report dated 9 December 2022, estimated water demand of 60,0 kL/d).
- Erven 103 & 104, Wittedrift (Final report dated 9 December 2022, estimated water demand of 36,0 kL/d).
- Erf 342, Wittedrift (Final report dated 9 December 2022, estimated water demand of 4,7 kL/d).
- Portion 91 of Farm 304 (Draft report dated 27 February 2023, estimated water demand of 43,8 kL/d).

The scope of the report does not cover the cumulative effect of the proposed developments. However, it should be noted that the simultaneous development of the proposed developments will accelerate the need for the master plan to be implemented.

2 SEWER NETWORK

2.1 Drainage area

It is proposed that sewage from the proposed development is accommodated within the existing Plettenberg Bay Pumping Station (PS) 1 drainage area.

The proposed connection point for the internal sewer reticulation network of the development to the existing municipal sewer system is to the existing 150 mm diameter outfall sewer in Susan Street, as shown on Figure 4 attached.

From PS no. 1 sewage is pumped through a 160 mm diameter rising main directly towards the Plettenberg Bay PS no. 1a.

Sewage is pumped from the Plettenberg Bay PS 1a through a 355 mm diameter dedicated rising main to the Ganse Valley Wastewater Treatment Plant (WWTP).

The proposed development is situated inside the sewer priority area.

2.2 Sewer flow

No provision was made in the original sewer master plan for development on Erf 6504 and the remainder of Erf 6503.

For this re-analysis, the peak daily dry weather flow (PDDWF) for the proposed development was calculated at 38,5 kL/d.

2.3 Present situation

The existing gravity sewer system between the proposed development gravitating towards the Plettenberg Bay PS 1 and the pumping system from the Plettenberg PS 1 to Plettenberg Bay PS1a have sufficient capacity to accommodate the proposed development.

The Plettenberg Bay PS 1a and accompanying 355 mm diameter rising main also have sufficient spare capacity to accommodate the proposed development.

3 CONCLUSION

The developer of Erf 6504 and the remainder of Erf 6503 in Plettenberg Bay may be liable for the payment of a Development Contribution (as calculated by Bitou Municipality) for bulk water and sewer infrastructure as per Council Policy.

The master plan indicated that the proposed development area should be accommodated in the existing Goose Valley reservoir zone. The proposed connection to the existing water system is to the existing 250 mm diameter supply pipeline from the Goose Valley reservoir in Beacon Way, as shown on Figure 1. Link services items BPW14.1 is required to connect the internal reticulation network of the proposed development to the existing municipal water network.

The bulk water system to the Goose Valley, Wittedrift and Matjiesfontein reservoirs is at capacity and should be upgraded according to the master plan before additional developments within the reservoir supply areas can be accommodated.

The minimum upgrades required to improve the existing bulk supply system (in order to accommodate the proposed development together with other potential development areas within the existing supply areas of the Goose Valley, Wittedrift and Matjiesfontein reservoirs), are:

- Master plan item 2 (3,6 km x 400 mm Ø replace existing 300 mm Ø abandoned AC pipe).
- Master plan item BPW.B39 (0,9 km x 400 mm Ø replace existing 150 mm Ø bulk pipe).
- Portion of master plan item BPW.B67 (1,0 km x 355 mm Ø replace existing 150 mm Ø bulk pipe).

There is sufficient capacity in the existing Plettenberg Bay sewer reticulation system to accommodate the proposed development. The recommended position for the sewer connection for the proposed development is to the existing 150 mm diameter outfall sewer in Susan Street, as shown on Figure 4 attached.

Also, find attached hereto Appendix A which includes general notes from Bitou Local Municipality regarding development approvals and conditions.

We trust that you find this of value.

Yours sincerely,

GLS CONSULTING (PTY) LTD
REG. NO.: 2007/003039/07

_____
Per: PC DU PLESSIS

cc. Vita Consulting Engineers
51 Lourensford Estate
Somerset West
7130

Attention: Mr Riaan van Dyk

APPENDIX A **February 2023**

GENERAL NOTES FROM BITOU LOCAL MUNICIPALITY ATTACHED TO GLS BULK WATER AND SEWER SERVICES CAPACITY REPORT

1. The GLS report is a services capacity report and the costs estimated in this report are only approximate values applicable at the time of the study.

2. Should the development be approved by Council the approval will be linked to certain development conditions. These conditions will be the official conditions applicable to the project and will take precedence over this report. Once approval is granted, Council will enter into a formal services agreement with the developer.

3. Costs for network upgrades, etc. As mentioned in the GLS report could change from time to time due to escalation, new tariff structures, additional requirements etc.

4. The Developer may be liable to pay a Development Contribution as per Council policy. The value payable will be calculated using Bitou Local Municipality's Development Contribution Calculator.

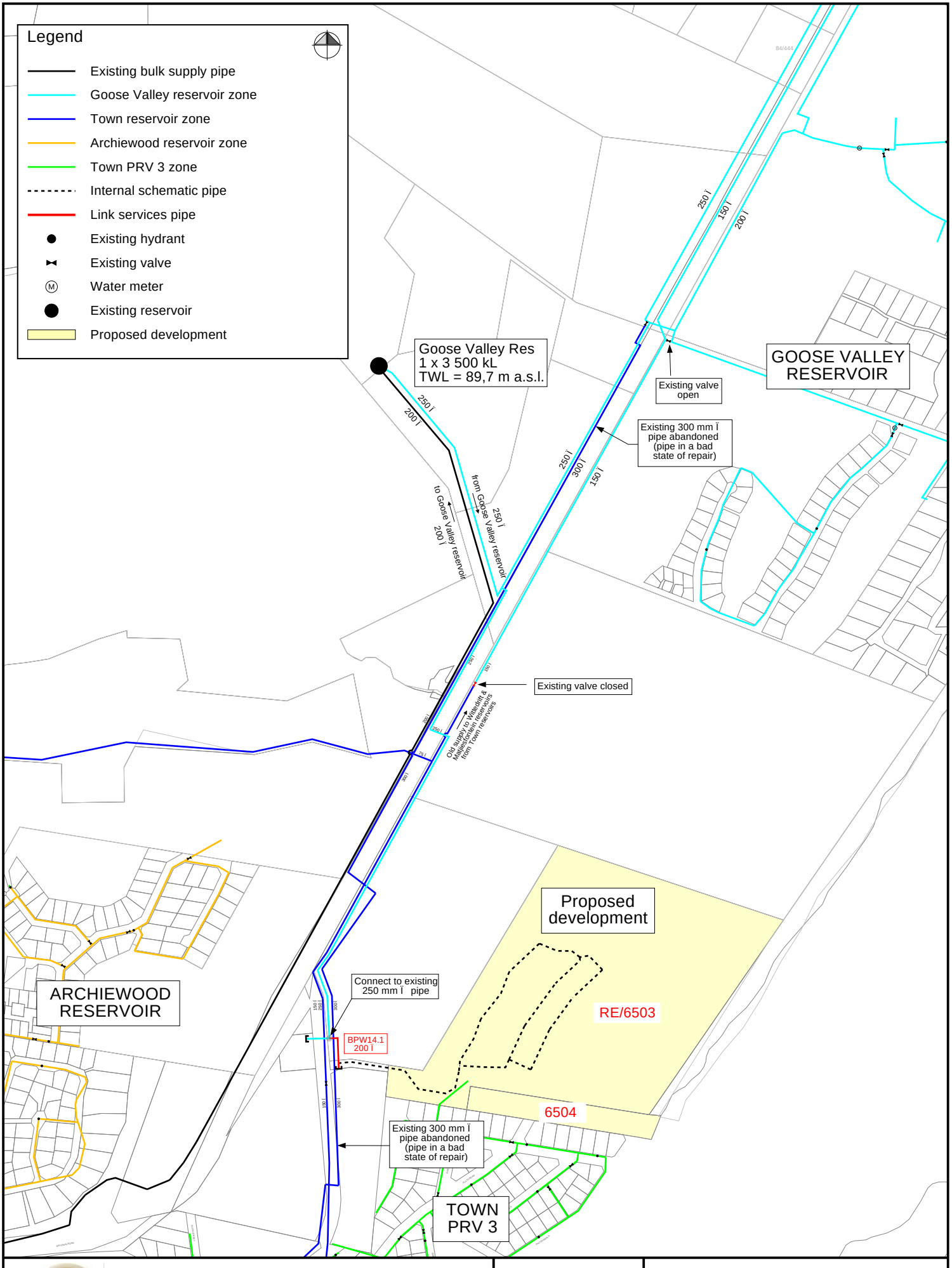
5. The Development Contribution monies are calculated according to the approved Council Policy at the time of payment.

6. The Development Contribution monies are payable before the approval of the building plan certificate or final approval of the subdivision for the transfer of units will be issued, as applicable for the type of development.

7. Where servitudes are required, all the costs and arrangements therefore will be for the developer's account.

8. The developer will be solely responsible for the cost of the link services as identified in the GLS report. The developer will also be responsible for the costs of upgrading to the minimum requirements of the services as identified in the GLS report. These costs may however be offset against the Development Contribution monies payable.

9. The above conditions are subject to any approved Council policies, which may be amended from time to time.

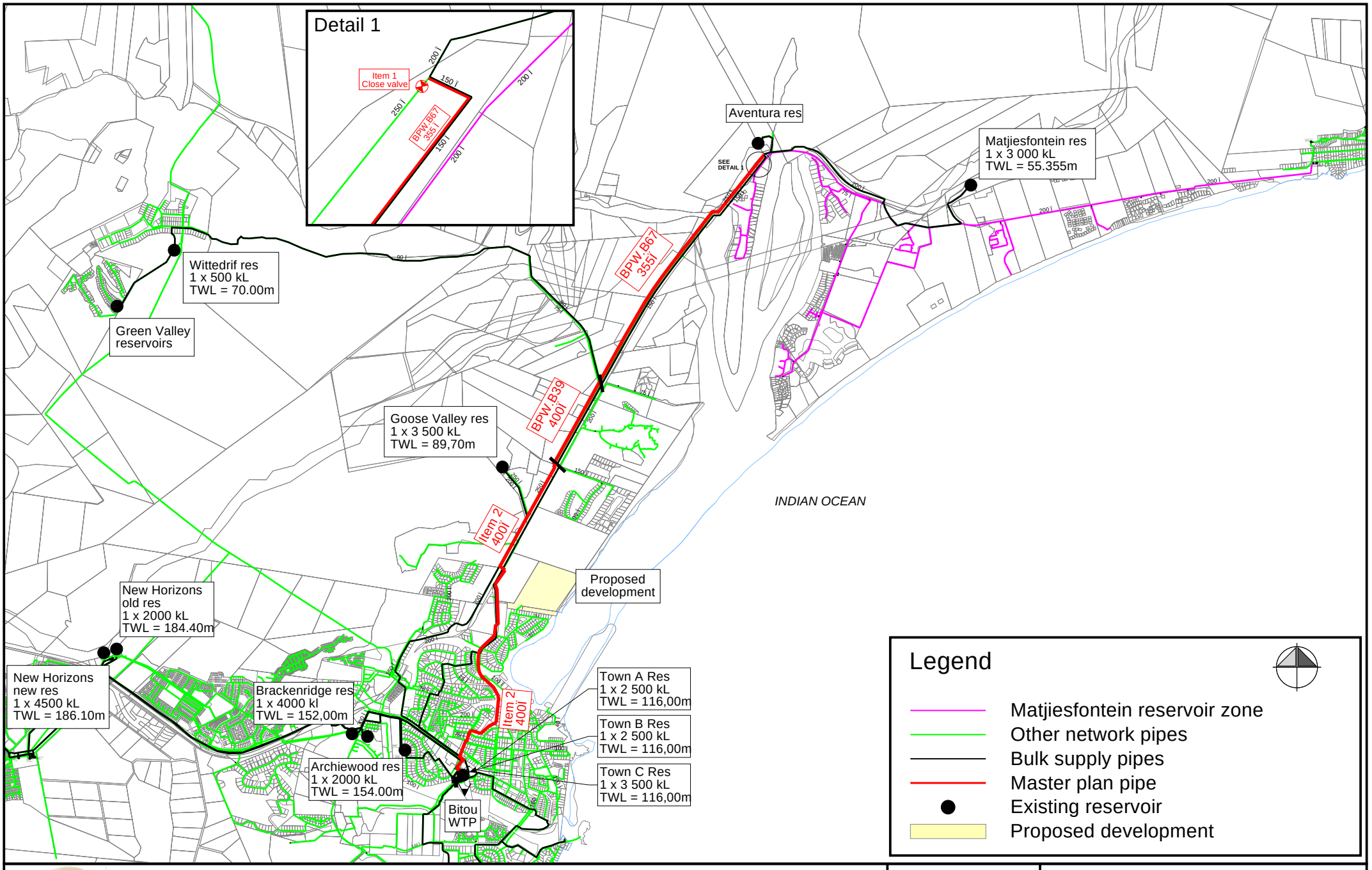


February 2023

Erven 6504 and RE/6503 - Plettenberg Bay

GLS Infrastructure planning

Figure 1 (Draft)
Proposed Development
Erven 6504 and RE/6503 - Plettenberg Bay
Existing Water System



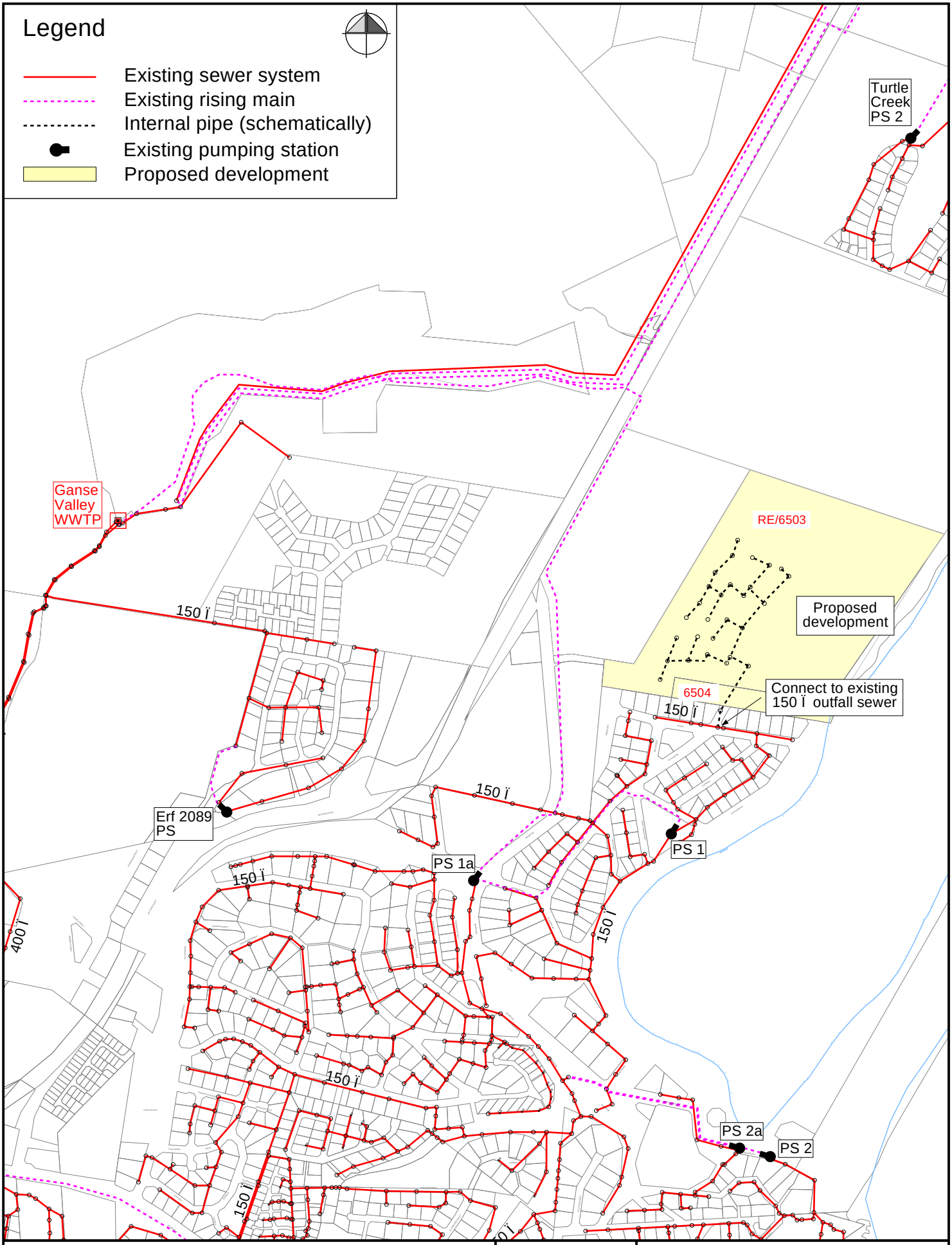
February 2023

Erven 6504 and RE/6503 - Plettenberg Bay

GLS Infrastructure planning

Figure 2 (Draft)

Proposed Development
Erven 6504 and RE/6503 - Plettenberg Bay
Water master plan



February 2023

Erven 6504 and RE/6503 - Plettenberg Bay

GLS Infrastructureplanning

Figure 4(Draft)
Proposed Development
Erven 6504 and RE/6503 - Plettenberg Bay
Existing Sewer System

Appendix E: Civil Engineering Services Layouts (*VITA Consulting*)

CIVIL ENGINEERING SERVICES LEGEND

- 160mmØPVC-U 25.409m@1:49.2 — 160mm Ø FOULSEWER (uPVC Heavy Duty class 34) SLOPE AND LENGTH SHOWN
- FS9 — FOUL SEWER MANHOLE COVER AND INVERT LEVEL SHOWN
- FOUL SEWER RISING MAIN
- POTABLE WATER SIZES AS SHOWN (uPVC CLASS 12)
- FH — GATE VALVE AND FIRE HYDRANT (TYPE 4)
- y — DOUBLE AND SINGLE ERF CONNECTIONS
- W2 — WATER SETTING OUT NODES
- 1500mm WIDE STORMWATER CHANNEL
- STORMWATER LINE (SPIGOT & SOCKET CLASS 75D) 375mm Ø (UNLESS OTHERWISE SHOWN)
- SW 1 — SW MANHOLE
- STORMWATER IN/OUTLET STRUCTURE
- 2 x 110mm / 2 x 160mm — GENERAL SLEEVES (uPVC CLASS 6) SIZE AND NUMBER SHOWN

62/444

GARAGES

3m Perimeter Building Line

5m Street Building Line

3m Perimeter Building Line

Cuthbert Close

572 573 574 575 576

RE/7997

7996

STORMWATER OUTLET/ENERGY DISSIPATION STRUCTURE(RENO-MATRASS) X-COORD:34765.6045 Y-COORD:34765.6045

STORMWATER OUTLET/ENERGY DISSIPATION STRUCTURE(RENO-MATRASS) X-COORD: 34683.0737 Y-COORD: -3768119.2861

STORMWATER OUTLET/ENERGY DISSIPATION STRUCTURE(RENO-MATRASS) X-COORD:34604.1587 Y-COORD:--3768232.9864

FOUL SEWER PUMP STATION 1

TEMPORARY CONNECTION TO WASTE WATER TREATMENT PLANT

WASTE WATER TREATMENT PLANT(WWTP)

WASTE WATER TREATMENT PLANT 15m INFLUENCE AREA

Maintenance Admin

4x 10 KILO-LITER IRRIGATION TANKS

CONNECT TO EXISTING MUNICIPAL WATER MAIN

PERMANENT CONNECTION TO EXISTING MUNICIPAL FOUL SEWER LINE

GENERAL NOTES:

1. ALL WORK MUST BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATION SABS 1200 AND THE GENERAL CONDITIONS OF CONTRACT FOR THE CONSTRUCTION OF CIVIL ENGINEERING WORKS.
2. CO-ORDINATES ARE BASED ON THE W.G.S.84 SYSTEM.
3. THE CONTRACTOR HAS TO CHECK ALL SETTING OUT INFORMATION ON SITE AND NOTIFY THE ENGINEER OF ANY IRREGULARITIES PRIOR TO CONSTRUCTION.
4. ALL MODIFICATIONS TO EXISTING SERVICES AND DEVIATIONS FROM THE DESIGN TO BE AS PER INSTRUCTION FROM THE ENGINEER ONLY.
5. THE ENGINEER'S DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S, CONSULTANT'S AND SPECIALIST'S DRAWINGS - ANY DISCREPANCIES SHALL BE REFERRED TO THE ENGINEER PRIOR TO CONSTRUCTION.
6. COVER LEVELS TO CONFORM TO THE FOLLOWING:
   - 6.1. TOP OF ROAD LEVELS INSIDE ROAD RESERVES
   - 6.2. 75mm ABOVE NATURAL GROUND LEVEL IN NON-DEVELOPED AREAS
   - 6.3. THE CONTRACTOR HAS TO ENSURE THAT THE COVER LEVELS TIES IN WITH THE SURROUNDING LEVELS AND NOTIFY THE ENGINEER OF ANY IRREGULARITIES
7. ERF CONNECTIONS:
   - 7.1. POTABLE WATER- AND ELECTRICAL CONNECTIONS MAY BE BEND TO AVOID HORIZONTAL CLASHES WITH SHALLOW SERVICES
   - 7.2. FOUL SEWER MUST BE VERTICALLY RE-ALIGNED TO AVOID HORIZONTAL CLASHES
   - 7.3. CONNECTIONS MAY BE SHIFTED TO AVOID VERTICAL CLASHES

CONSULTING ENGINEER:

VITA CONSULTING ENGINEERS

House 51, Lourensford Estate, Somerset West, 7130
Tel: +27 84 207 3223, E-mail: riaan@vitaeng.co.za

REV	DATE	DESCRIPTION	CHECKED
A	23/06/2023	ISSUED FOR INFORMATION	GS
B	29/06/2023	ISSUED FOR INFORMATION	GS
C	26/07/2023	ISSUED FOR INFORMATION	GS
D	26/02/2024	ISSUED FOR INFORMATION	GS
E	30/04/2024	ISSUED FOR INFORMATION	GS
F	12/07/2024	ISSUED FOR INFORMATION	GS

PROJECT NAME

PLETT LAGOON, PORTION 1 of ERF 6503 , PLETTENBERG BAY

DRAWING TITLE

COMBINED SERVICES LAYOUT

APPROVAL

SIGNATURE: | R van Dyk NAME: | 01/09/2022 DATE:

DATE	SCALE	SIZE
22/06/2023	1:500	A0

DRAWING NO. 22051_CIV_01 | REV F

OVERLAND RUNOFF FLOW PATH

EMERGENCY OVERFLOW

CATCHMENT AREAS

Catchment A	=	8.549 Ha
TOTAL	=	8.549 Ha

62/444

GENERAL NOTES:

1. ALL WORK MUST BE DONE IN ACCORDANCE WITH THE STANDARD SPECIFICATION SABS 1200 AND THE GENERAL CONDITIONS OF CONTRACT FOR THE CONSTRUCTION OF CIVIL ENGINEERING WORKS.
2. CO-ORDINATES ARE BASED ON THE W.G.S.84 SYSTEM.
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   - 6.1. TOP OF ROAD LEVELS INSIDE ROAD RESERVES
   - 6.2. 75mm ABOVE NATURAL GROUND LEVEL IN NON-DEVELOPED AREAS
   - 6.3. THE CONTRACTOR HAS TO ENSURE THAT THE COVER LEVELS TIES IN WITH THE SURROUNDING LEVELS AND NOTIFY THE ENGINEER OF ANY IRREGULARITIES
7. ERF CONNECTIONS:
   - 7.1. POTABLE WATER- AND ELECTRICAL CONNECTIONS MAY BE BEND TO AVOID HORIZONTAL CLASHES WITH SHALLOW SERVICES
   - 7.2. FOUL SEWER MUST BE VERTICALLY RE-ALIGNED TO AVOID HORIZONTAL CLASHES
   - 7.3. CONNECTIONS MAY BE SHIFTED TO AVOID VERTICAL CLASHES

CONSULTING ENGINEER:

ViTA CONSULTING ENGINEERS

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REV	DATE	DESCRIPTION	CHECKED
A	23/06/2023	ISSUED FOR INFORMATION	GS
B	29/06/2023	ISSUED FOR INFORMATION	GS
C	15/06/2023	ISSUED FOR INFORMATION	GS
D	23/02/2024	ISSUED FOR INFORMATION	GS

PROJECT NAME

PLETT LAGOON, PORTION 1 of ERF 6503 , PLETTENBERG BAY

DRAWING TITLE

STORMWATER CATCHMENT AREA LAYOUT

APPROVAL

SIGNATURE: _____ NAME: R van Dyk DATE: 01/09/2022

DATE	SCALE	SIZE
22/06/2023	1:500	A0

DRAWING NO.	REV
22051_SWC_01	D

Appendix F: Minutes of Bitou Engineering Department Meeting – 9 March 2023

Riaan van Dyk

From: Riaan van Dyk <riaan@vitaeng.co.za>
Sent: Monday, March 13, 2023 8:10 AM
To: 'Asiphe Masivuye Mgoqi'; 'Edward Charles Oosthuizen'
Cc: 'Lwamkelo Mapasa'
Subject: Plettenberg Bay Developments
Attachments: Portions 19 & 27 of Farm 444 - Figure 5(Draft).pdf; Portions 19 & 27 of Farm 444 - Figure 2(Draft).pdf

Good morning Asiphe/Eddie,

Thank you very much for taking time to meet on Thursday

I hereby wish to confirm the following items discussed during our meeting:

1) Appointment letters
    a. Bitou stated that they have had previous discussions with other consulting engineers regarding the developments on Farm 444/38 and Farm 304/32. RvD will submit appointment letters to Bitou to confirm his appointment as civil engineering consultant on the aforementioned developments.

2) Temporary water solution (*refer figure 5*)
    a. GLS provided a temporary solution (*installation of an additional 160mm bulk main off the existing 160mm distribution main in the N2 road reserve – refer figure 5*) which will free up an additional 860kl/day.
    b. This temporary solution formed the basis for the approval of the development on Farm 444/19 & 27, with specific conditions incorporated in the Service Level Agreement for the permanent solution.
    c. There is sufficient capacity in the 860kl/day to accommodate the developments on Farm 444/38, Farm 304/32 and erf 6503.
    d. The temporary solution should form the basis for the approval of the aforementioned developments, with the similar conditions to be included in the SLA:
        i. Design, installation, etc. costs for the temporary solution will be the responsibility of the developer/developers and will not be deductible from the Augmentation Levee's
        ii. The temporary solution is not a permanent solution and Augmentation Levee's for Water and Sewage will be used towards the permanent solution.
        iii. The proposed pro-rata contribution towards the temporary solution must be resolved between the developers of the different properties.

3) Permanent water solution (*refer figure 2*)
    a. The permanent water solution entails the construction of a new 400mm/355mm watermain from the Bitou WTP to the Aventura Reservoir, with the costs estimated by GLS to be approximately R36m.
    b. The route, design, application and approval process for the pipeline will take approximately 18months.
    c. Bitou will liaise with their designated appointed consulting engineers to start the process as soon as possible.
    d. Augmentation Levees (*water and sewerage*) from each development will be used for the installation of a portion of the pipeline.
    e. A Service Level Agreement must be drafted for each development.
    f. Bitou's designated appointed consulting engineers will be responsible for professional services for phases 1-3 (*feasibility, approval and detail design*) of the pipeline and consulting engineers from each development will be responsible for phases 4-6 (*procurement, construction and close-out*)

g. The Augmentation Levee's for each development (*and/or phase of the development*) will be re-calculated according to the specific year in which the levee's are paid.

4) Confirm capacity and connections with GLS
   a. Vita must set up a meeting with GLS to confirm the position and capacity of each development's connection into the bulk municipal network.

5) Possible off-grid solutions
   a. Bitou stated that they are willing to approve off-grid water and sewage solutions, on condition that specific requirements are met, with special conditions included in the SLA
      i. The developer is responsible to obtain all the necessary environmental and regulatory approvals (*including GA or WULA*)
      ii. All electrical equipment *(borehole, booster pumps, etc.)* must have a back-up electrical supply (*generator, invertor and battery pack or solar*)
      iii. Potable water must adhere to SANS 241 Class 1 water parameters.
      iv. Wastewater must be treated to Department of Water Affairs (DWA) General Limits parameters.
      v. Water and treated effluent samples must be collected, analyzed by an independent laboratory and submitted to Bitou council on a monthly basis for the first year and quarterly basis for the second year.
      vi. Should the water samples not adhere to the required standards, the developer/homeowners association will be liable for the costs to install the required potable water and foul sewer connections (*as proposed in the GLS capacity reports*).
      vii. Augmentation levee's for potable water will not be applicable if the development adheres to the off grid requirements, but foul sewer levee's will still be applicable

I trust that you find the above a fair reflection of our meeting – I will forward the relevant documents (*appointments letters, draft Services Reports, proposed SLA wording, etc*.) as soon as possible.

Regards,

Riaan van Dyk *Pr. Eng*
Director
M 084 207 3223
E riaan@vitaeng.co.za

ViTA CONSULTING ENGINEERS

51 Lourensford Estate, Somerset West, 7130

Appendix G: Temporary on-site Wastewater Treatment Plant Proposal and Proposed Maintenance Agreement

Membrane Bioreactor Wastewater Treatment Plant

For

PLETTENBERG BAY RESIDENTIAL DEVELOPMENT

April 2024

APPROVALS				
Revision	Date	Issued to	Prepared by	Checked by
0	30 April 2024	Riaan van Dyk	Benita Aspeling	Meyer de Villiers
1	13 May 2024	Riaan van Dyk	Benita Aspeling	Meyer de Villiers

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1 Introduction

We thank you for the opportunity to resubmit our proposal for the wastewater treatment plant (WWTP) and lifting stations for the Plettenberg Bay Residential Development. This proposal serves to provide a temporary technical and commercial solution in lieu of a sewer connection until the Bitou Municipality relevant wastewater treatment plants have been upgraded.

The Plettenberg Bay Residential Development comprises 50 units. At 800ℓ of effluent per unit per day that equates to a total of 40kℓ/day.

Alveo has sized for 12 hour buffer in order to ensure that the containerised portion itself does not need to be designed for peak flows. The proposed project also includes a containerised wastewater treatment plant (WWTP) and a sludge removal solution. It is noted that the emergency overflow is not in Alveo's scope. Alveo has priced for the civil cost of designing and constructing the conservancy tank and sludge handling solution such that the client can choose to include it from the total price or not. Alveo Water will supply and install the Mechanical and Electrical (M&E) elements of the conservancy tank.

Alveo Water will further design, manufacture, deliver, install and commission the complete WWTP. Our civil subcontractor will construct the WWTP platform. The treated water must be stored and irrigated or released into the stormwater network by the client as per the services report.

The wastewater will be treated to Department of Water and Sanitation (DWS) General Limits Standards as detailed in table 1.

Table 1: Treated Water Quality Objectives

SUBSTANCE/PARAMETER	GENERAL LIMIT
Faecal Coliforms (per 100 ml)	1000
Chemical Oxygen Demand (mg/l)	75 (i)
pH	5,5-9,5
Ammonia (ionised and un-ionised) as Nitrogen (mg/l)	6
Nitrate/Nitrite as Nitrogen (mg/l)	15
Chlorine as Free Chlorine (mg/l)	0,25
Suspended Solids (mg/l)	25
Electrical Conductivity (mS/m)	70 mS/m above intake to a maximum of 150 mS/m
Ortho-Phosphate as phosphorous (mg/l)	10
Fluoride (mg/l)	1
Soap, oil or grease (mg/l)	2,5

Client initial upon proposal acceptance

2 Technical Description

The scope of works of the projects includes the civil design of the conservancy tank, WWTP platform and drying beds or underground sludge storage tank, as well as the process, mechanical & electrical (P,M&E) design of the aforementioned pumps and package wastewater treatment plant. The civil design will be done to SANS 1200. A detailed Process and M&E design will be completed for the packaged wastewater treatment plant. The Process and M&E design deliverables will be used to manufacture, install and commission the packaged wastewater treatment plant.

2.1 WWTW process design

2.1.1 Raw Water Quality

No raw samples of the effluent have been taken. The preliminary design used for this proposal was based on **typical medium strength** wastewater as detailed in table 2. If the water quality analyses of the samples taken during the operational phase of the project show an average deviation of more than 10% above the values provided in table 2, then subsequent infrastructure changes may be required, which will result in additional costs.

Table 2: Raw Water Quality Parameters Used for Design

PARAMETER	Average
pH	6-9
COD (mg/L)	800
BOD (mg/L)	400
FOG (mg/L)	5
TSS mg/L	350
N Total	60
Ammonia-N	45
P Total	15
Ortho-P	10

2.1.2 Wastewater production

No water meter data was available for the wastewater production values. The Vitae Consulting Engineers' Services report stated that the expected effluent yield from the development will be 40*k*ℓ/day for 50 units.

2.1.3 Description of Technology

The proposed packaged wastewater treatment plant is a membrane bioreactor (MBR). Membrane Bioreactor (MBR) technology combines microfiltration with bio-digestion to reap the benefits of combined physical separation and biological removal. The dependency of effluent quality on influent quality is partially removed with an MBR system and thus MBR systems consistently provide quality effluent water. Furthermore, the minimal transfer of suspended solids through the MBR system allows the concentration of active bacteria to increase as much as four (4) times that possible in a CAS plant. This ensures that superior bio-digestion occurs with the use of an MBR at a fraction of the area required when using CAS alone.

Client initial upon proposal acceptance

2.2 Block Flow Diagram

A block flow diagram of a typical MBR process is provided in figure 1.

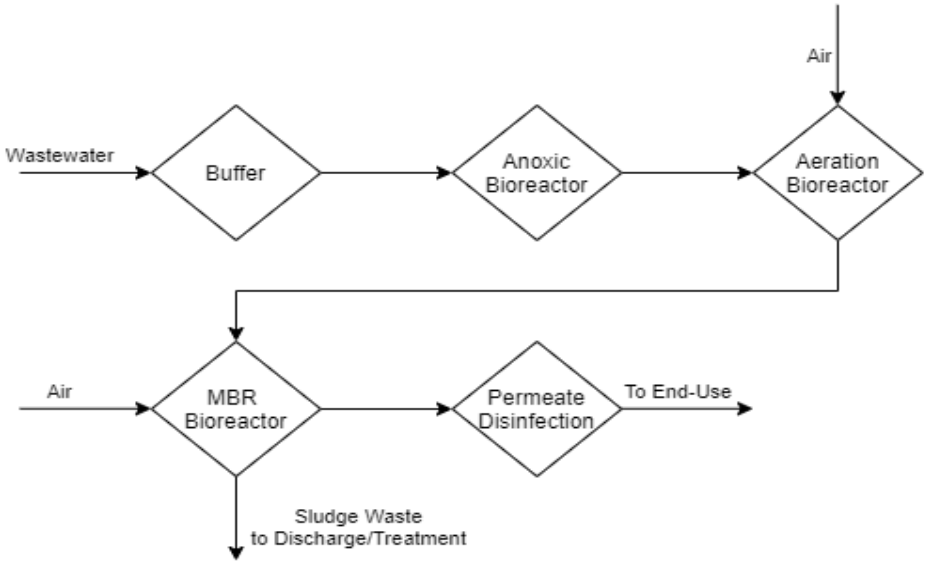


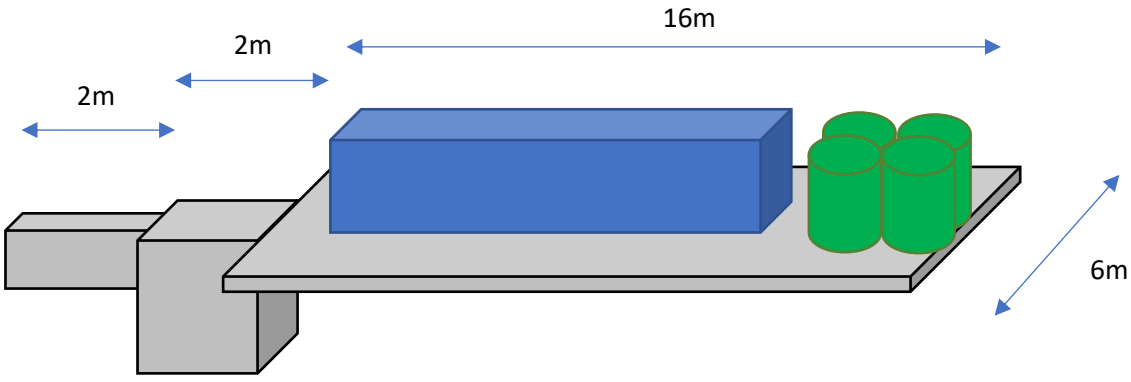
Figure 1: Block Flow Diagram of Proposed Treatment Process

2.3 Treatment Plant Description

The containerised WWTP will be constructed in one 12m container which will house the following:

- 3mm fine screen
- Anoxic Tank Mixer
- Aerobic section diffuser disks and pipework
- MBR membranes
- Blowers for aeration and membrane scouring
- Permeate pumps to remove water from MBR chamber
- UV disinfection
- CIP tank and skid to clean membranes periodically
- All electrical MCC, cabling and instrumentation required for a fully functional plant
- Generator

The treatment plant footprint will be 20m x 6m as illustrated below:



Client initial upon proposal acceptance

It may be preferable to move the buffer tank to downstream of the container (away from the residents), to allow the drying beds to be built on top of the buffer tank and thus significantly reducing civil costs. The civil costs in this report assume that the drying beds will be built on top of the buffer/conservancy tank.

Figure 2: Image of a similar containerized package plant

2.4 Electrical Requirements

Table 3: Estimated Power Usage of the proposed 45kℓ/day wastewater treatment plant

Description	kW	kWh/day
Buffer Pump in conservancy tank	0,55	4,4
Anoxic Mixer	0,75	17,6
RAS Pump	0,55	6,6
Permeate Pump	0,75	16,5
Aeration Blower	3	64,8
Scour Blower	4	58
UV Light	0,06	1,32
NaOCl Dosing Pump	0,28	6,05
Irrigation pump	3	0,5
Total Power Requirement	**12,86**	**175,77**

Sufficient 3 phase + Earth + Neutral power must be provided by the client to meet the power demands as detailed in table 4.

It is believed that a 25KVA generator will be sufficient for this plant on the condition that the irrigation pump does not run when the generator is on.

Client initial upon proposal acceptance

3 Costing

3.1 Capital Costs

Table 4 below illustrates the civil, mechanical and electrical costs associated with 1 x 45m³/day containerised MBR plant.

Table 4: Capex Cost Summary for 45kℓ/day WWTP

Section	Description		
	CIVIL WORK FOR STRUCTURE		
1	Civil Work	R	331 100.00
Sub-Total		**R**	**331 100.00**
	PLETTENBERG BAY WASTEWATER TREATMENT PLANT		
2	EC&I	R	382 553.00
3	Container conversion	R	339 000.00
4	Buffer tank equipment	R	49 500.00
5	Screens	R	139 500.00
6	Anoxic equipment	R	19 400.00
7	Aeration system	R	108 300.00
8	A recycle and WAS pumps and piping	R	33 100.00
9	MBR system and permeate pumps	R	443 400.00
10	Treated water disinfection	R	21 925.00
11	Treated water storage tanks and irrigation system	R	126 775.00
12	Sludge thickening and drying beds	R	42 300.00
13	Generator	R	179 700.00
14	Commissioning spares	R	2 200.00
14	Design & Overheads	R	145 170.00
Sub-Total		**R**	**2 092 823.00**
	Transport, Installation and Commissioning		
15	Transport equipment to site	R	40 000.00
16	Installation & Commissioning Travel costs	R	32 700.00
17	Installation & Commissioning Labour	R	54 400.00
18	O&M Manuals and training	R	5 000.00
19	1 x Water Sample for Testing	R	2 500.00
Sub-Total		**R**	**134 600.00**
TOTAL EXCLUDING VAT		**R**	**2 558 523.00**

3.2 Pricing Notes

The following additional items were requested by Vitae Consulting Engineers and are included in our price above:

- Irrigation pump and tanks (4 x 10kL).
- Standby generator and panel.
- Sludge drying beds OR underground sludge storage compartment.

Client initial upon proposal acceptance

The following spares are recommended to be purchased and kept on site for emergencies:

Table 5: Recommended 2-year spares

Description	Recommended Quantity	Cost per spare unit
Spare Air Blower	1	R 23 000.00
UV light and quartz	2	R 3 500.00
Buffer lifting pump	1	R 8 900.00
RAS pump	1	R 8 900.00
Membrane module	1	R 21 500.00

The spares referenced in Table 5 above are additional and it is the client's responsibility to indicate which spares and the quantity of such spares to be included in the final proposal price. Ordering of spares after delivery of the wastewater treatment equipment may result in price differences and subsequently a Variation Order (VO). Alveo Water therefore suggests that all spares are ordered along with overall acceptance of the proposal.

3.3 Operational Costs

5 270kWh @ R1.90 of electricity will be consumed by the plant per month at maximum design flow. The chemical cost as stated below will be an estimated R2 640.00/month.

Our standard bi-weekly inspection service and maintenance visits will be charged at R16 120.00 per month. A wastewater sample analyses costs R1 100.00 and must be taken every month. The total monthly expense will thus be an estimated R19 860 excluding electricity and VAT. An operational service level agreement can be drawn up upon request by the client.

Table 6: Expected monthly chemicals required to operate the plant.

Description	Expected monthly consumption (kg/m)	Cost per spare kg	Expected monthly cost (R/m)
Poly-Aluminium Chloride	60	R 14.00	R 840.00
Sodium Hypo	150	R 12.00	R 1 800.00
TOTAL			**R 2 640.00**

Client initial upon proposal acceptance

3.4 Delivery

The expected project timeline is as follows:

- Design and Drawings: 3 weeks
- Ordering of materials and equipment: 5 weeks
- M&E manufacturing: 6 weeks (can run concurrently with the civils).
- M&E installation and commissioning: 2 weeks

A total project duration of 16 weeks is anticipated. This timeline may also be impacted by import clearance times and port congestion. It is also noted that the project can only commence upon receipt of upfront deposit payment.

3.5 Conditions

- All prices are quoted in South African Rand (ZAR).
- Prices exclude Value Added Taxes (VAT) and money transfer commission.
- All prices are valid for 60 days.
- This quote/tender price is subject to change if substantial exchange rate fluctuations of over 10% occur during the validity or contract periods should the value of the imported goods amount to more than 10% of the total materials value.
- The country of origin of the proposed wastewater treatment plant is South Africa.

3.6 Assumptions, Exclusions and Battery Limits

The following exclusions and assumptions have been made to generate this proposal:

- Costs exclude main power supply to control panel located in container.
- Excludes a remote monitoring system for the treatment plant.
- Excludes DWA WULA for General Authorisation.

Client initial upon proposal acceptance

4 Terms and Conditions

1. General Assumptions

- Electricity will be available during installation for power tools and for commissioning.
- Bulk electricity supply and connection to the MCC panel is the responsibility of the client.
- Potable water will be available during construction and commissioning.
- Access will be provided for the delivery and assembly of the wastewater treatment equipment.
- Alveo Water's Proposal assumptions, terms and conditions will be take priority over any other agreements or contracts signed, unless otherwise agree upon by both Alveo Water and the Client.
- The default form of contract for Alveo Water's proposals is the General Conditions of Contract for Construction Works (GCC) 2015 edition.

2. Risk and Ownership

Notwithstanding delivery of any goods to the client, ownership of the wastewater treatment plant shall not pass to the client until Alveo Water has received payment in full for all goods and services associated with the manufacture, installation and commissioning of the wastewater treatment plant. If final settlement has not been received within six months after practical completion of the plant, Alveo Water reserves the right to recover and sell the plant or any part thereof to recover costs. The client will forfeit their deposit and/or any amounts paid to date.

3. Completion

Alveo Water adheres to the General Conditions of Contract (GCC) for Construction Work (2015) requirements for project completion as outlined in section 5.14 of the said contract. The GCC defines three completion milestones with associated completion certificates in order to formalize the completions procedures on a project, namely Practical Completion, Completion and Final Approval. Alveo Water prescribe to these projects milestone and the employer/employer's agent is advised to familiarize themselves with the contractual terms associated with these milestones highlighted in section 5.14 of the GCC.

In addition to the three milestones described in the preceding paragraph, Alveo Water further defines an additional milestone relevant to the packaged Mechanical and Electrical works generally provided by Alveo Water. This additional milestone is named Factory Acceptance Testing (FAT) and is defined as follows:

Simulated testing performed on the designed equipment following assembly of the equipment, where the simulated testing is required to verify that the assembled equipment is capable of operating at its design capacity and produce the required design products. Factory Acceptance Testing can be performed in the production factory or on a site as deemed suitable by the design engineer. The FAT must be performed according to the FAT checklists and documentation and signed off by Alveo Water's responsible engineer. The Employer/Employers Agent is also required to witness and sign-off the FAT certificate in order to confirm acceptance of the FAT.

In such cases where Alveo Water cannot reach completion as a results of circumstances and delays outside of Alveo Water's control and during which a FAT has been completed, Alveo Water will allow for a 6 month period from the completion of the FAT after which the warranty and defects liability period will be deemed to have taken effect from the date of the factory acceptance test as recorded on the factory acceptance test certificate.

4. Warranty, Liability and Indemnity

Alveo Water warrants the equipment against defective materials and workmanship for a period of one year from the date of completion, fair wear and tear excluded. The warranty is subject to the following conditions:

- The purchase price and all other due fees associated with the treatment plant have been fully paid.
- The equipment has been correctly operated in accordance with the Operation and Maintenance manual.
- The equipment has not been subjected to undue climatic conditions beyond its design capacity. This includes rain, spray, wind, heat and dust.
- The warranty specifically excludes any damage caused by the client or client's representative or that beyond the control of Alveo Water.
- The warranty does not apply to our electrical panels and equipment connected to poor quality temporary electricity generators. These generators provide unbalanced phases with varying voltages. If electrical instruments and motors are damaged while connected to temporary power generators, we will not be able to honour our guarantees.
- If the electrical panel is opened or tampered with, the warranty is null and void.
- It is the client's responsibility to protect the equipment against power surges, which could damage equipment.
- Programming software is the Intellectual Property of Alveo Water and shall not be distributed or communicated to third parties in any way.
- The starting date of the warranty is when completion is reached (as per Section 3).

Alveo Water's liability to the client shall in any event and under all circumstances be limited to the costs of remedying any defective workmanship, repairing any defective goods, or replacing any defective goods not capable of repair.

Alveo Water shall under no circumstance whatsoever be liable for any loss of profit or any damages of whatsoever nature, direct or indirect, consequential or otherwise, suffered by the client or any other person or entity, whether or not caused by the negligence of Alveo Water, its agents or employees.

Alveo Water's professional liability shall be limited to twice (2) the amount of the Design and Overheads fee.

Client initial upon proposal acceptance

5. Variations

Additional work, equipment or features requested by the client or consultant will be treated as Variation Orders (VO). Alveo Water will price the VO for approval and will only proceed once the financial and time implications of the VO have been approved.

6. Payment Terms

Our payment terms are as follows:

- 50% on acceptance of this proposal
- 20% after successful factory acceptance testing (FAT) of plant
- 20% after delivery to site
- 10% after commissioning
- Variation Orders will be invoiced on their signed acceptance

Alveo Water will only commence with the project once the client signs the proposal where required and the deposit is reflected on the bank statement. Note that no allowance for an Advanced Payment Guarantee (APG) has been made. All costs involved in obtaining an APG will be treated as a VO. Payment is required into a South African bank account belonging to Alveo Water. Interest at SA prime plus 2% per annum will be charged on late payments (calculated pro rata per day).

7. Delays

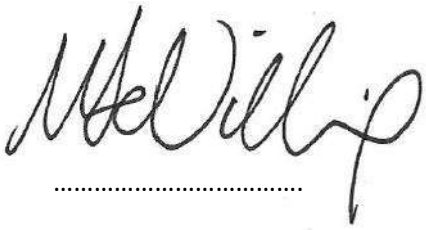
If long lead times are experienced on certain mechanical and electrical equipment, the client will be informed of expected delays or given an option to change the equipment to a similar approved product. Export or import, shipping and transport delays are not under the control of Alveo Water and thus Alveo Water will not be held responsible for such delays. Severe weather, strikes, coups, terrorism, war, epidemics, etc. (considered Force Majeure) or any such events that result in delays are out of the control of Alveo Water and thus Alveo Water will not be held responsible for such delays.

If work on site is held up due to the client having to complete work required for environmental compliance, such as obtain a WULA or an EIA, Alveo Water will be allowed to continue with commissioning work as to invoice the client in full.

Client initial upon proposal acceptance

5 Acceptance of Offer

You are requested to indicate your acceptance of the Terms and Conditions of this appointment by initialling each page of this proposal document, providing a full signature on this page of the proposal document, and returning it to Alveo Water.



…….	…….
For Alveo Water	For Client
Meyer de Villiers	Print Name:
Managing Director	Print Position:
Date:	Date:

CERTIFICATE
OF COMPLIANCE TO
ISO 9001:2015
ISO LOGIC
THE LOGICAL CHOICE
COMPLIANCE DIVISION

Client initial upon proposal acceptance

TECHNICAL & FINANCIAL PROPOSAL

Project Client: Vita Consulting Engineers

Project Title: Plettenberg Bay Service Level Agreement

Proposal Number:

Electronic File Ref.:

APPROVALS				
Revision	Date	Issued to	Prepared by	Approved by

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4. Availability 4
5. Service Proposal Conditions 4
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ALVEO WATER
Clean Water | Better Life

1. Introduction

We thank you for the opportunity to submit our proposal for servicing of the Plettenberg Bay Wastewater Treatment Plant (WWTP) treating wastewater in an MBR WWTP.

The objective of this proposal is to effectively operate and maintain critical aspects of the WWTP to achieve the treated water specifications. Plettenberg Bay needs to have a person on site to be able to do daily tasks such as cleaning screenings, general site maintenance and WAS wasting as per Operating Manual. Alveo Water will be responsible for weekly/monthly duties of the WWTP as indicated in the table below. Successful operation is a joint effort between the Plettenberg Bay and Alveo Water.

The SLA is proposed for a period of 12 months from the date that the agreement is signed. The SLA will be renewed annually after agreeing on increased rates.

2. Scope

- Maintenance of treatment works equipment.
- Maintenance of buffer tank.
- Periodic checks and services of the treatment works equipment.

It is proposed to start the SLA initially with a service every 2 weeks, which can then be adjusted to more often or less often depending on need. The SLA includes labour hours and travel costs only. Chemical and equipment replacement / repair costs are additional and are for the client's account.

Client initial upon proposal acceptance

3. Alveo Water Service Duties

The daily/routine checks and duties of the **Alveo Water Operation and Maintenance team are tabulated below**:

Table 1: Alveo Water service duties

Procedure	Daily	Weekly	Monthly	Quarterly	Annual
Remotely check plant operation		✓			
Check mechanical screen on operation & discard screenings as needed			✓		
Inspect buffer pump operation			✓		
Inspect aeration and MBR blower operation			✓		
Check RAS pump operation			✓		
Check all dosing operation & refill chemical tank as needed			✓		
Check permeate system operation			✓		
Check control panel operation & alarms/warnings			✓		
Check sensors operation & Take instrument/sensor readings			✓		
Take water meter readings			✓		
Check UV light operation			✓		
General housekeeping			✓		
Complete a Sludge Volume Index (SVI) tests & evaluate sludge health for desludging			✓		
Evaluate membrane fouling			✓		
Take sample for analysis			✓		
Report on plant operation & performance			✓		
CIP (Clean-in-place) of membranes				✓	
Clean drying beds				✓	
Inspect control panel and all electrical equipment				✓	
Replace UV bulb (as needed)					✓
Replace blower air filter					✓
Service dosing pumps					✓

Client initial upon proposal acceptance

4. Availability

Alveo Water will be available 5 days a week during normal business hours to attend to breakdowns. Alveo Water will be available after hours and on weekends for emergencies after ascertaining the urgency and establishing the availability of personnel. This requires a person on site to relay information via telephone/email.

5. Service Proposal Conditions

Alveo Water commits to achieve the effluent water quality that is compliant with the discharge limits. The commitment above will become void if the circumstances described below are not maintained or adhered to:

1. No other water source is introduced into the feed water supply.
2. The water reuse treatment plant, or any part thereof, is operated according to sound practices, as outlined in the O & M Manual.
3. Routine maintenance is performed as outlined in Table 1 and the O & M Manual.
4. Alveo Water is notified within 2 hours of any breakdown or faulty equipment.
5. The raw water quality does not deviate from the design water quality by more than 10% for 3 consecutive samples.

The financial implications for the servicing work are tabulated below in Table 2.

Table 2: Service Agreement costs for routine service of the treatment plant

Description	UOM	Qty	Unit Cost	Total Cost
Technical labour (Day Visit)	h	4	575	2300
Travel cost (flight & driving costs)	km	-	-	5760
Total cost (Ex VAT)				**R8 060**

Table 3: Service Agreement costs for quarterly CIP of membranes

Description	UOM	Qty	Unit Cost	Total Cost
Perform CIP (Quarterly membrane, Clean-In-Place)	Sum	1	5200	5200
Total cost (Ex VAT)				**R5 200**

Client initial upon proposal acceptance

Table 4: Adhoc/call out costs

Description	UOM	Qty	Unit Cost
Technician labour	hr	-	R575 per hour or part thereof
Engineer labour rate	hr	-	R850 per hour or part thereof
Travel to site	km	1	R5 760

ADDITIONAL NOTES:

- Additional callouts apart from the daily & weekly services will be charged at additional cost according to the same rates as above.
- The above costs for servicing are payable within 30 days following the receiving of the monthly invoice.
- The above costs are subject to escalation at the start of the new financial year per the CPI of the previous year.
- This Service Level Agreement does not propose any additional warranties or guarantees on the equipment of the WWTP.
- Any equipment that requires replacement outside of the warranty will be invoiced separately.

6. Acceptance of Offer

You are requested to indicate your acceptance of the terms and conditions of this appointment by initialling each page of this proposal document, providing a full signature on this page of the proposal document, and returning it to Alveo Water.

…….	…….
For Alveo Water	For Client
Meyer de Villiers	Print Name:
Managing Director	Print Position:
	Date:

Client initial upon proposal acceptance

Appendix H: Irrigation Water Balance

ERF 6503 PLETTENBERG BAY: PLETT LAGOON ESTATE

Irrigation Water Balance Calculations
Revision C - 16 May 2024

1 Average Precipitation Depth per Month

	Precipitation Depth	Days
January	43 mm	31 days
February	35 mm	28 days
March	48 mm	31 days
April	42 mm	30 days
May	34 mm	31 days
June	48 mm	30 days
July	66 mm	31 days
August	92 mm	31 days
September	89 mm	30 days
October	49 mm	31 days
November	57 mm	30 days
December	48 mm	31 days

2.1 Landscaping Water Demand

	Daily Demand
Road verges/open erven	3 mm/m^2
Occupied Erven	3 mm/m^2
Trees	5 liter/tree
Hedges and SUDS areas	3 mm/m^2
Other	3 mm/m^2

2.2 Seasonal adjustment

October - April	100%
May - September	25%

***Note:** Seasonal adjustment will not be applicable to open erven and trees*

3 Landscaped Areas

	Area in m^2
Road verges	4500 m^2
Swales	1150 m^2
General landscaped areas	3717 m^2
Trees	150 No
Occupied erven	1000 m^2/erf
*Open erven	63325 m^2

***Note:** Open erven area will change as the development progresses.*

4 Treated Effluent Volume

	No	Avg Sewage Yield (l/day)	Total Sewage Yield (m^3/day)
Erven	50	800	40
GH	1	100	0.1
			40.1

***Note:** Available treated effluent will change as the development progresses.*

6 Monthly Irrigation Water Balance

	Development Status - 25% Occupancy 25% 13 erven			Development Status - 50% Occupancy 50% 25 erven			Development Status - 75% Occupancy 75% 38 erven			Development Status - 100% Occupancy 100% 50 erven		
Month	Water Demand m^3	Treated Effluent m^3	Irri Shortfall m^3	Water Demand m^3	Treated Effluent m^3	Irri Shortfall m^3	Water Demand m^3	Treated Effluent m^3	Irri Shortfall m^3	Water Demand m^3	Treated Effluent m^3	Irri Shortfall m^3
January	6520.3	322.5	6197.80	6164.0	620.1	5543.89	5900.69	942.5	4958.19	5544.38	1240.1	4304.28
February	5889.3	291.3	5598.00	5567.5	560.1	5007.38	5329.65	851.3	4478.35	5007.83	1120.1	3887.73
March	6520.3	322.5	6197.80	6164.0	620.1	5543.89	5900.69	942.5	4958.19	5544.38	1240.1	4304.28
April	6310.0	312.1	5997.87	5965.2	600.1	5365.06	5710.34	912.1	4798.24	5365.53	1200.1	4165.43
May	4960.2	322.5	4637.70	3766.9	620.1	3146.80	2596.84	942.5	1654.34	1403.53	1240.1	163.43
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October	6520.3	322.5	6197.80	6164.0	620.1	5543.89	5900.69	942.5	4958.19	5544.38	1240.1	4304.28
November	6310.0	312.1	5997.87	5965.2	600.1	5365.06	5710.34	912.1	4798.24	5365.53	1200.1	4165.43
December	6520.3	322.5	6197.80	6164.0	620.1	5543.89	5900.69	942.5	4958.19	5544.38	1240.1	4304.28

Appendix I: Confirmation of Services and Refuse Capacity – Bitou Municipality

Bitou

munisipaliteit umasipala municipality

to be the best together

Private Bag X1002 Plettenberg Bay 6600
Tel+27 (0)44 501 3000 Fax +27(0)44 533 3485

Our Ref.	Enquiries	Tel	email address
Erven 6504 &RE/6503	A. Mgoqi	044- 501 3264	amgoqi@plett.gov.za

VITA CONSULTING ENGINEERS
51 Lourensford Estate
Somerset West
7130

02 JULY 2024

Attention: Riaan van Dyk

Dear Sir

CONFIRMATION OF BULK SERVICES: ERVEN 6504 & RE/6503

We confirm that Bitou Municipality has bulk infrastructure capacity in its networks and can accommodate the proposed development, subject to the following conditions.

1. That the developer enters and sign a Service Level Agreement with Bitou Municipality,
2. That the developer makes payment of the prescribed Augmentation contributions in order for the municipality to implement the bulk upgrade of services as detailed and required in the GLS network analysis report, dated 3 October 2022.
3. That the developer implements and maintain a temporary wastewater treatment plant until the upgrades to the Ganzevallei WWTW has been completed. The temporary wastewater treatment plant must be approved by the relevant authorities as part of the civil engineering services for the development. A bulk connection to the Bitou sewer network must be commissioned once the Ganzevallei WWTW has been upgraded and the temporary WWTP must be decommissioned and removed from site. All costs will be for the account of the developer
4. That the developer duly communicate point 3 above with all future owners/Homeowners Associates and or Body corporate.

Please contact the official dealing with this project for any further information in this regard.

Yours faithfully

MR. VW. FELTON
HEAD OF DEPARTMENT: ENGINEERING SERVICES

Official dealing with this;
Miss Asiphe Mgoqi: Engineering Services: Project Manager: Planning & Development

Bitou

munisipaliteit umasipala municipality

to be the best together

Private Bag X1002 Plettenberg Bay 6600
Tel+27 (0)44 501 3000 Fax +27(0)44 533 3485

Our Ref.	Enquires	Tel	Email address
Erven 6504 & RE/6503	D. Baartman	044 501 3462	dbaartman@plett.gov.za

03/06/2024

VITA CONSULTING ENGINEERS

51 Lourensford Estate

Sommerset West

7130

Attention: Riaan Van Dyk

Dear Sir

CONFRIMATION OF WASTE DISPOSAL CAPACITY: ERVEN 6503

We confirm that Bitou Local Municipality has sufficient capacity for waste disposal for proposed development.

The approved tariffs by council for waste collection will be applicable.

Yours faithfully

MS. MA. PAULSEN

DIRECTOR: COMMUNITY SERVICES

Membrane Bioreactor Wastewater Treatment Plant

For

PLETTENBERG BAY RESIDENTIAL DEVELOPMENT

April 2024

APPROVALS				
Revision	Date	Issued to	Prepared by	Checked by
0	30 April 2024	Riaan van Dyk	Benita Aspeling	Meyer de Villiers
1	13 May 2024	Riaan van Dyk	Benita Aspeling	Meyer de Villiers

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1 Introduction

We thank you for the opportunity to resubmit our proposal for the wastewater treatment plant (WWTP) and lifting stations for the Plettenberg Bay Residential Development. This proposal serves to provide a temporary technical and commercial solution in lieu of a sewer connection until the Bitou Municipality relevant wastewater treatment plants have been upgraded.

The Plettenberg Bay Residential Development comprises 50 units. At 800ℓ of effluent per unit per day that equates to a total of 40kℓ/day.

Alveo has sized for 12 hour buffer in order to ensure that the containerised portion itself does not need to be designed for peak flows. The proposed project also includes a containerised wastewater treatment plant (WWTP) and a sludge removal solution. It is noted that the emergency overflow is not in Alveo's scope. Alveo has priced for the civil cost of designing and constructing the conservancy tank and sludge handling solution such that the client can choose to include it from the total price or not. Alveo Water will supply and install the Mechanical and Electrical (M&E) elements of the conservancy tank.

Alveo Water will further design, manufacture, deliver, install and commission the complete WWTP. Our civil subcontractor will construct the WWTP platform. The treated water must be stored and irrigated or released into the water body designated for this plant by the client as per the services report.

The wastewater will be treated to Department of Water and Sanitation (DWS) General Limits Standards as detailed in table 1.

Table 1: Treated Water Quality Objectives

Parameter	General Limit
COD (mg COD/l)	75
Ammonia as Nitrogen (mg N/l)	3
Nitrate as Nitrogen (mg N/l)	15
Orthophosphates (mg P/l)	10
Total Suspended Solids (mg TSS/l)	25
pH	5.5 – 9.5
Faecal Coliform (per 100ml)	1000

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2 Technical Description

The scope of works of the projects includes the civil design of the conservancy tank, WWTP platform and sludge drying solution, as well as the process, mechanical & electrical (P,M&E) design of the aforementioned pumps and package wastewater treatment plant. The civil design will be done to SANS 1200. A detailed Process and M&E design will be completed for the packaged wastewater treatment plant. The Process and M&E design deliverables will be used to manufacture, install and commission the packaged wastewater treatment plant.

2.1 WWTW process design

2.1.1 Raw Water Quality

No raw samples of the effluent have been taken. The preliminary design used for this proposal was based on **typical medium strength** wastewater as detailed in table 2. If the water quality analyses of the samples taken during the operational phase of the project show an average deviation of more than 10% above the values provided in table 2, then subsequent infrastructure changes may be required, which will result in additional costs.

Table 2: Raw Water Quality Parameters Used for Design

PARAMETER	Average
pH	6-9
COD (mg/L)	800
BOD (mg/L)	400
FOG (mg/L)	5
TSS mg/L	350
N Total	60
Ammonia-N	45
P Total	15
Ortho-P	10

2.1.2 Wastewater production

No water meter data was available for the wastewater production values. The Vitae Consulting Engineers' Services report stated that the expected effluent yield from the development will be 40*k*ℓ/day for 50 units.

2.1.3 Description of Technology

The proposed packaged wastewater treatment plant is a membrane bioreactor (MBR). Membrane Bioreactor (MBR) technology combines microfiltration with bio-digestion to reap the benefits of combined physical separation and biological removal. The dependency of effluent quality on influent quality is partially removed with an MBR system and thus MBR systems consistently provide quality effluent water. Furthermore, the minimal transfer of suspended solids through the MBR system allows the concentration of active bacteria to increase as much as four (4) times that possible in a CAS plant. This ensures that superior bio-digestion occurs with the use of an MBR at a fraction of the area required when using CAS alone.

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2.2 Block Flow Diagram

A block flow diagram of a typical MBR process is provided in figure 1.

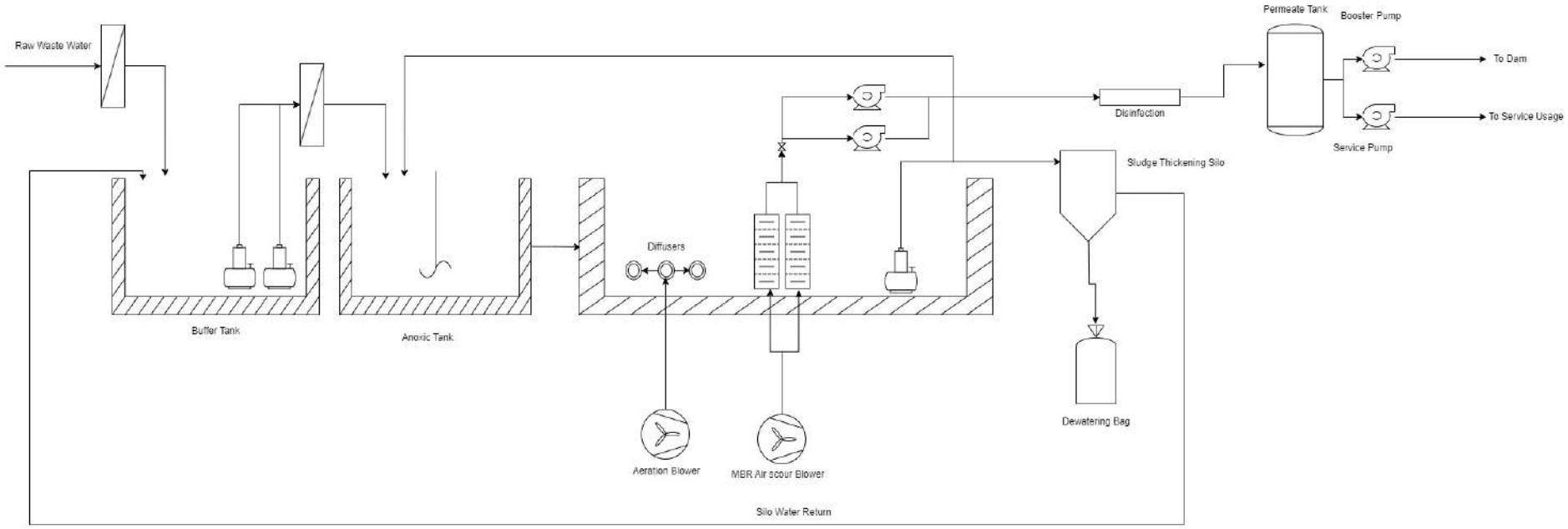

Figure 1: Block Flow Diagram of Proposed Treatment Process

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2.3 Treatment Plant Description

The containerised WWTP will be constructed in one 12m container which will house the following:

- 3mm fine screen
- Anoxic Tank Mixer
- Aerobic section diffuser disks and pipework
- MBR membranes
- Blowers for aeration and membrane scouring
- Permeate pumps to remove water from MBR chamber
- UV disinfection
- CIP tank and skid to clean membranes periodically
- All electrical MCC, cabling and instrumentation required for a fully functional plant
- Generator

The treatment plant footprint will be 20m x 6m as illustrated below:

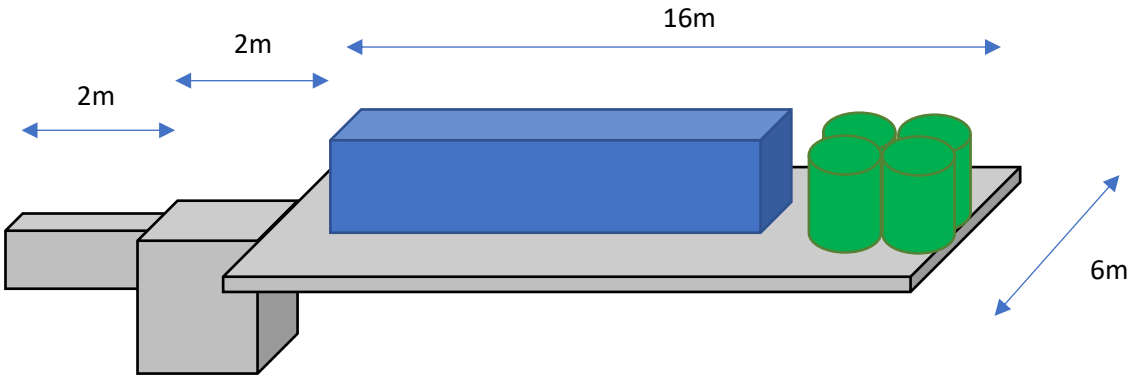

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Figure 2: Image of a similar containerized package plant

2.4 Electrical Requirements

Table 3: Estimated Power Usage of the proposed 45kℓ/day wastewater treatment plant

Description	kW	kWh/day
Buffer Pump in conservancy tank	0,55	4,4
Anoxic Mixer	0,75	17,6
RAS Pump	0,55	6,6
Permeate Pump	0,75	16,5
Aeration Blower	3	64,8
Scour Blower	4	58
UV Light	0,06	1,32
NaOCl Dosing Pump	0,28	6,05
Irrigation pump	3	0,5
Total Power Requirement	**12,86**	**175,77**

Sufficient 3 phase + Earth + Neutral power must be provided by the client to meet the power demands as detailed in table 4.

It is believed that a 30KVA generator will be sufficient for this plant.

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3 Costing

3.1 Capital Costs

Table 4 below illustrates the civil, mechanical and electrical costs associated with 1 x 45m³/day containerised MBR plant.

Table 4: Capex Cost Summary for 45kℓ/day WWTP

Section	Description		
	CIVIL WORK FOR STRUCTURE		
1	Civil Work	R	331 100.00
Sub-Total		**R**	**331 100.00**
	PLETTENBERG BAY WASTEWATER TREATMENT PLANT		
2	EC&I	R	382 600.00
3	Container conversion	R	399 000.00
4	Buffer tank equipment	R	49 500.00
5	Screens	R	139 500.00
6	Anoxic equipment	R	19 400.00
7	Aeration system	R	108 300.00
8	A recycle and WAS pumps and piping	R	33 100.00
9	MBR system and permeate pumps	R	443 400.00
10	Treated water disinfection	R	21 925.00
11	Treated water storage tanks and irrigation system	R	126 775.00
12	Sludge thickening and sludge handling	R	43 700.00
13	Generator	R	210 900.00
14	Commissioning spares	R	2 200.00
14	Design & Overheads	R	145 300.00
Sub-Total		**R**	**2 125 600.00**
	Transport, Installation and Commissioning		
15	Transport equipment to site	R	40 000.00
16	Installation & Commissioning Travel costs	R	32 700.00
17	Installation & Commissioning Labour	R	54 400.00
18	O&M Manuals and training	R	5 000.00
19	1 x Water Sample for Testing	R	2 500.00
Sub-Total		**R**	**134 600.00**
TOTAL EXCLUDING VAT		**R**	**2 591 300.00**

3.2 Pricing Notes

The following additional items were requested by Vitae Consulting Engineers and are included in our price above:

- Irrigation pump and tanks (4 x 10kL).
- Standby generator and panel.
- Sludge dewatering stand and drying bags.

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The following spares are recommended to be purchased and kept on site for emergencies:

Table 5: Recommended 2-year spares

Description	Recommended Quantity	Cost per spare unit
Spare Air Blower	1	R 23 000.00
UV light and quartz	2	R 3 500.00
Buffer lifting pump	1	R 8 900.00
RAS pump	1	R 8 900.00
Membrane module	1	R 21 500.00

The spares referenced in Table 5 above are additional and it is the client's responsibility to indicate which spares and the quantity of such spares to be included in the final proposal price. Ordering of spares after delivery of the wastewater treatment equipment may result in price differences and subsequently a Variation Order (VO). Alveo Water therefore suggests that all spares are ordered along with overall acceptance of the proposal.

3.3 Operational Costs

5 270kWh @ R1.90 of electricity will be consumed by the plant per month at maximum design flow. The chemical cost as stated below will be an estimated R2 640.00/month.

Our standard bi-weekly inspection service and maintenance visits will be charged at R16 120.00 per month. A wastewater sample analyses costs R1 100.00 and must be taken every month. The total monthly expense will thus be an estimated R19 860 excluding electricity and VAT. An operational service level agreement can be drawn up upon request by the client.

Table 6: Expected monthly chemicals required to operate the plant.

Description	Expected monthly consumption (kg/m)	Cost per spare kg	Expected monthly cost (R/m)
Poly-Aluminium Chloride	60	R 14.00	R 840.00
Sodium Hypo	150	R 12.00	R 1 800.00
TOTAL			**R 2 640.00**

3.4 Emergency Procedures

Typically when one has problems with a MBR WWTP plant, it is due to fouling of the membrane, leading to the permeate pump not being able to pump sufficient treated water out of the system. This leads to the plant overflowing. Our designs ensure that the plant will overflow as far along in the process as possible to get the cleanest emergency overflow effluent. This is at the MBR chamber. The water will be fully treated, but will contain mixed liquor suspended solids, therefore TSS would be high. All other items would remain in spec.

In our design, we have provided 50% extra capacity on the MBR. This allows far more fouling before CIP (cleaning the membranes) is needed. Furthermore, the permeate pumps are designed with a

Client initial upon proposal acceptance

conservative pumping and resting time, such that we can increase the pumping time and reduce resting time when the membrane starts to foul up, while new membranes are being ordered.

Spares of all critical equipment will be on site should any pumps or blowers break down.

Certain parameters will be measured online and can be read anytime, such as trans membrane pressure and reactor water level, which indicate health of the plant. Furthermore, monthly samples will be sent to a SANAS accredited laboratory for verification. Should the water quality start to deteriorate, changes can be made / new equipment ordered before the plant exceeds design specifications.

In the case of an emergency and the above is not sufficient, the MBR chamber will overflow. It is recommended that a swale or some other natural structure be built to allow filtration of this water prior to discharge to a water body, to allow removal of the suspended solids and therefore resulting in water within specifications as it reaches the final water body.

3.5 Delivery

The expected project timeline is as follows:

- Design and Drawings: 3 weeks
- Ordering of materials and equipment: 2 weeks
- M&E manufacturing: 15 weeks (can run concurrently with the civils).
- Equipment transportation, installation and commissioning: 3 weeks

A total project duration of 23 weeks is anticipated. This timeline may also be impacted by import clearance times and port congestion. It is also noted that the project can only commence upon receipt of upfront deposit payment.

3.6 Conditions

- All prices are quoted in South African Rand (ZAR).
- Prices exclude Value Added Taxes (VAT) and money transfer commission.
- All prices are valid for 60 days.
- This quote/tender price is subject to change if substantial exchange rate fluctuations of over 10% occur during the validity or contract periods should the value of the imported goods amount to more than 10% of the total materials value.
- The country of origin of the proposed wastewater treatment plant is South Africa.

3.7 Assumptions, Exclusions and Battery Limits

The following exclusions and assumptions have been made to generate this proposal:

- Costs exclude main power supply to control panel located in container.
- Excludes a remote monitoring system for the treatment plant.
- Excludes DWA WULA for General Authorisation.

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4 Terms and Conditions

1. General Assumptions

- Electricity will be available during installation for power tools and for commissioning.
- Bulk electricity supply and connection to the MCC panel is the responsibility of the client.
- Potable water will be available during construction and commissioning.
- Access will be provided for the delivery and assembly of the wastewater treatment equipment.
- Alveo Water's Proposal assumptions, terms and conditions will be take priority over any other agreements or contracts signed, unless otherwise agree upon by both Alveo Water and the Client.
- The default form of contract for Alveo Water's proposals is the General Conditions of Contract for Construction Works (GCC) 2015 edition.

2. Risk and Ownership

Notwithstanding delivery of any goods to the client, ownership of the wastewater treatment plant shall not pass to the client until Alveo Water has received payment in full for all goods and services associated with the manufacture, installation and commissioning of the wastewater treatment plant. If final settlement has not been received within six months after practical completion of the plant, Alveo Water reserves the right to recover and sell the plant or any part thereof to recover costs. The client will forfeit their deposit and/or any amounts paid to date.

3. Completion

Alveo Water adheres to the General Conditions of Contract (GCC) for Construction Work (2015) requirements for project completion as outlined in section 5.14 of the said contract. The GCC defines three completion milestones with associated completion certificates in order to formalize the completions procedures on a project, namely Practical Completion, Completion and Final Approval. Alveo Water prescribe to these projects milestone and the employer/employer's agent is advised to familiarize themselves with the contractual terms associated with these milestones highlighted in section 5.14 of the GCC.

In addition to the three milestones described in the preceding paragraph, Alveo Water further defines an additional milestone relevant to the packaged Mechanical and Electrical works generally provided by Alveo Water. This additional milestone is named Factory Acceptance Testing (FAT) and is defined as follows:

Simulated testing performed on the designed equipment following assembly of the equipment, where the simulated testing is required to verify that the assembled equipment is capable of operating at its design capacity and produce the required design products. Factory Acceptance Testing can be performed in the production factory or on a site as deemed suitable by the design engineer. The FAT must be performed according to the FAT checklists and documentation and signed off by Alveo Water's responsible engineer. The Employer/Employers Agent is also required to witness and sign-off the FAT certificate in order to confirm acceptance of the FAT.

In such cases where Alveo Water cannot reach completion as a results of circumstances and delays outside of Alveo Water's control and during which a FAT has been completed, Alveo Water will allow for a 6 month period from the completion of the FAT after which the warranty and defects liability period will be deemed to have taken effect from the date of the factory acceptance test as recorded on the factory acceptance test certificate.

4. Warranty, Liability and Indemnity

Alveo Water warrants the equipment against defective materials and workmanship for a period of one year from the date of completion, fair wear and tear excluded. The warranty is subject to the following conditions:

- The purchase price and all other due fees associated with the treatment plant have been fully paid.
- The equipment has been correctly operated in accordance with the Operation and Maintenance manual.
- The equipment has not been subjected to undue climatic conditions beyond its design capacity. This includes rain, spray, wind, heat and dust.
- The warranty specifically excludes any damage caused by the client or client's representative or that beyond the control of Alveo Water.
- The warranty does not apply to our electrical panels and equipment connected to poor quality temporary electricity generators. These generators provide unbalanced phases with varying voltages. If electrical instruments and motors are damaged while connected to temporary power generators, we will not be able to honour our guarantees.
- If the electrical panel is opened or tampered with, the warranty is null and void.
- It is the client's responsibility to protect the equipment against power surges, which could damage equipment.
- Programming software is the Intellectual Property of Alveo Water and shall not be distributed or communicated to third parties in any way.
- The starting date of the warranty is when completion is reached (as per Section 3).

Alveo Water's liability to the client shall in any event and under all circumstances be limited to the costs of remedying any defective workmanship, repairing any defective goods, or replacing any defective goods not capable of repair.

Alveo Water shall under no circumstance whatsoever be liable for any loss of profit or any damages of whatsoever nature, direct or indirect, consequential or otherwise, suffered by the client or any other person or entity, whether or not caused by the negligence of Alveo Water, its agents or employees.

Alveo Water's professional liability shall be limited to twice (2) the amount of the Design and Overheads fee.

Client initial upon proposal acceptance

5. Variations

Additional work, equipment or features requested by the client or consultant will be treated as Variation Orders (VO). Alveo Water will price the VO for approval and will only proceed once the financial and time implications of the VO have been approved.

6. Payment Terms

Our payment terms are as follows:

- 50% on acceptance of this proposal
- 20% after successful factory acceptance testing (FAT) of plant
- 20% after delivery to site
- 10% after commissioning
- Variation Orders will be invoiced on their signed acceptance

Alveo Water will only commence with the project once the client signs the proposal where required and the deposit is reflected on the bank statement. Note that no allowance for an Advanced Payment Guarantee (APG) has been made. All costs involved in obtaining an APG will be treated as a VO. Payment is required into a South African bank account belonging to Alveo Water. Interest at SA prime plus 2% per annum will be charged on late payments (calculated pro rata per day).

7. Delays

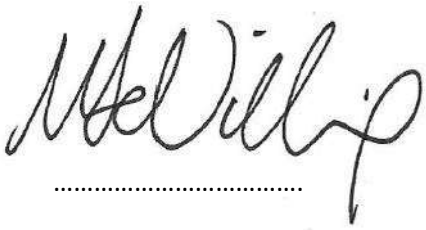
If long lead times are experienced on certain mechanical and electrical equipment, the client will be informed of expected delays or given an option to change the equipment to a similar approved product. Export or import, shipping and transport delays are not under the control of Alveo Water and thus Alveo Water will not be held responsible for such delays. Severe weather, strikes, coups, terrorism, war, epidemics, etc. (considered Force Majeure) or any such events that result in delays are out of the control of Alveo Water and thus Alveo Water will not be held responsible for such delays.

If work on site is held up due to the client having to complete work required for environmental compliance, such as obtain a WULA or an EIA, Alveo Water will be allowed to continue with commissioning work as to invoice the client in full.

Client initial upon proposal acceptance

5 Acceptance of Offer

You are requested to indicate your acceptance of the Terms and Conditions of this appointment by initialling each page of this proposal document, providing a full signature on this page of the proposal document, and returning it to Alveo Water.



…….	…….
For Alveo Water	For Client
Meyer de Villiers	Print Name:
Managing Director	Print Position:
Date:	Date:

CERTIFICATE
OF COMPLIANCE TO
ISO 9001:2015
ISO LOGIC
THE LOGICAL CHOICE
COMPLIANCE DIVISION

Client initial upon proposal acceptance

ERF 6503 PLETTENBERG BAY: PLETT LAGOON ESTATE

Irrigation Water Balance Calculations
Revision C - 16 May 2024

1 Average Precipitation Depth per Month

	Precipitation Depth	Days
January	43 mm	31 days
February	35 mm	28 days
March	48 mm	31 days
April	42 mm	30 days
May	34 mm	31 days
June	48 mm	30 days
July	66 mm	31 days
August	92 mm	31 days
September	89 mm	30 days
October	49 mm	31 days
November	57 mm	30 days
December	48 mm	31 days

2.1 Landscaping Water Demand

	Daily Demand
Road verges/open erven	3 mm/m^2
Occupied Erven	3 mm/m^2
Trees	5 liter/tree
Hedges and SUDS areas	3 mm/m^2
Other	3 mm/m^2

2.2 Seasonal adjustment

October - April	100%
May - September	25%

***Note:** Seasonal adjustment will not be applicable to open erven and trees*

3 Landscaped Areas

	Area in m^2
Road verges	4500 m^2
Swales	1150 m^2
General landscaped areas	3717 m^2
Trees	150 No
Occupied erven	1000 m^2/erf
*Open erven	63325 m^2

***Note:** Open erven area will change as the development progresses.*

4 Treated Effluent Volume

	No	Avg Sewage Yield (l/day)	Total Sewage Yield (m^3/day)
Erven	50	800	40
GH	1	100	0.1
			40.1

***Note:** Available treated effluent will change as the development progresses.*

6 Monthly Irrigation Water Balance

	Development Status - 25% Occupancy 25% 13 erven			Development Status - 50% Occupancy 50% 25 erven			Development Status - 75% Occupancy 75% 38 erven			Development Status - 100% Occupancy 100% 50 erven		
Month	Water Demand m^3	Treated Effluent m^3	Irri Shortfall m^3	Water Demand m^3	Treated Effluent m^3	Irri Shortfall m^3	Water Demand m^3	Treated Effluent m^3	Irri Shortfall m^3	Water Demand m^3	Treated Effluent m^3	Irri Shortfall m^3
January	6520.3	322.5	6197.80	6164.0	620.1	5543.89	5900.69	942.5	4958.19	5544.38	1240.1	4304.28
February	5889.3	291.3	5598.00	5567.5	560.1	5007.38	5329.65	851.3	4478.35	5007.83	1120.1	3887.73
March	6520.3	322.5	6197.80	6164.0	620.1	5543.89	5900.69	942.5	4958.19	5544.38	1240.1	4304.28
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July	4960.2	322.5	4637.70	3766.9	620.1	3146.80	2596.84	942.5	1654.34	1403.53	1240.1	163.43
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Bitou

munisipaliteit umasipala municipality

to be the best together

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Our Ref.	Enquiries	Tel	email address
Erven 6504 &RE/6503	A. Mgoqi	044- 501 3264	amgoqi@plett.gov.za

VITA CONSULTING ENGINEERS
51 Lourensford Estate
Somerset West
7130

02 JULY 2024

Attention: Riaan van Dyk

Dear Sir

CONFIRMATION OF BULK SERVICES: ERVEN 6504 & RE/6503

We confirm that Bitou Municipality has bulk infrastructure capacity in its networks and can accommodate the proposed development, subject to the following conditions.

1. That the developer enters and sign a Service Level Agreement with Bitou Municipality,
2. That the developer makes payment of the prescribed Augmentation contributions in order for the municipality to implement the bulk upgrade of services as detailed and required in the GLS network analysis report, dated 3 October 2022.
3. That the developer implements and maintain a temporary wastewater treatment plant until the upgrades to the Ganzevallei WWTW has been completed. The temporary wastewater treatment plant must be approved by the relevant authorities as part of the civil engineering services for the development. A bulk connection to the Bitou sewer network must be commissioned once the Ganzevallei WWTW has been upgraded and the temporary WWTP must be decommissioned and removed from site. All costs will be for the account of the developer
4. That the developer duly communicate point 3 above with all future owners/Homeowners Associates and or Body corporate.

Please contact the official dealing with this project for any further information in this regard.

Yours faithfully

MR. VW. FELTON
HEAD OF DEPARTMENT: ENGINEERING SERVICES

Official dealing with this;
Miss Asiphe Mgoqi: Engineering Services: Project Manager: Planning & Development