# DEVELOPMENT GEORGE REX SPORT & ADVENTURE CENTRE

## ERF 12403, REX DRIVE, KNYSNA

## PRELIMINARY REPORT ON PROVISION OF BULK CIVIL SERVICES TO PROPOSED DEVELOPMENT

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# DEVELOPMENT GEORGE REX SPORT & ADVENTURE CENTRE
# ERF 12403, REX DRIVE, KNYSNA

## CONTENTS

# 1 INTRODUCTION AND BACKGROUND

This report deals with the proposed development of Erf 12403 Knysna and the associated requirements with respect to bulk civil engineering services for the proposed development of the erf. The contents of this report are intended to form the basis of discussions between the developer and the Knysna Municipality (KM) in order to prepare a draft Service Level Agreement (SLA). The draft SLA will then be used as a motivation for the KM staff to provide a letter to the developer confirming that sufficient bulk services are available for the proposed development.

The professional Town Planner engaged by the developer, '*Marike Vreken Urban and Environmental Planners*', has prepared a '*Specialist Planning Report for Environmental Authorisation Purposes*' in support of the planning and approval process for the development of Erf 12403 Knysna. The Town Planners report eloquently and comprehensively covers the Background to the development, the Applicant and details of the subject property. In the interest of avoiding repetition we have included the report by the Town Planner as **Annexure A** and it can be referenced for this information.

The Town Planners report refers to three (3) alternative options for developing the site. **Alternative 1**, as referred to in Section 4 of their report, is the preferred option. The development areas and associated demands in this engineering report only refer to those of **Alternative 1**. The proposed developable areas for **Alternative 1** are summarized as follows:

| DESCRIPTION | ALTERNATIVE 1 | | |
|---|---|---|---|
| General Residential Zone | 6,733 m² | | |
| (Portions 3 & 6) | + 5,112 m² | = | 11,845 m² |
| Business Zone | 3,377 m² | | |
| (Portions 1, 2, 5, 7 & 8) | + 6,733 m² | | |
| | + 4,796 m² | | |
| | + 7,173 m² | | |
| | + 4,148 m² | = | 26,227 m² |
| Business Zone with consent use to allow a Place of Entertainment | | | |
| (Portion 4) | 13,834 m² | = | 13,834 m² |
| Private Open Space | 7,657 m² | | |
| (Portions 9, 10, 13 & 14) | + 1,922 m² | | |
| | + 45,167 m² | | |
| | + 71,087 m² | = | 125,833 m² |
| Special Zone as Private Roads | 12,505 m² | | |
| (Portions 11 & 12) | + 3,825 m² | = | 16,330 m² |
| **TOTAL** | | | **194,069 m²** |

# 2 SITE CHARACTERISTICS

The enclosed relevant portions of the town planners report (Annexure A) adequately covers the site characteristics with respect to Topography, Drainage, Vegetation and the Built Environment.

# 3 BULK CIVIL SERVICES

The bulk civil services required for the proposed George Rex development will include the following; potable water supply, sewage disposal, roads (access), storm water management and solid waste disposal. The following chapters deal with each of the above separately and as previously mentioned, only **Alternative 1** as referenced in the Town Planners report will be considered in terms of demand calculations.

# 4 WATER SUPPLY

It is proposed that bulk potable water supply for the development be sourced from a combination of the following:

- rainwater harvesting from roofs of buildings in the development with dedicated reservoir(s) for storage provided on the property
- ground water from the aquifer on the property with aquifer re-charging measures provided through rainwater harvesting from parking areas/internal roads being directed to open spaces/wetlands
- ***the Bigai Fountain (see below), of which the legal rights and yield are in the process of being determined***
- municipal water supply to augment the abovementioned water supply sources

Note that there are other hotel/resort type developments in the KM that have similar combined type potable water supply arrangements as mentioned above which have been successfully implemented and operated for many years, i.e. Knysna Hollow with its 80-bed facility along the Welbedacht Road.

*With respect to the Bigai Fountain; the title deed to the subject property is endorsed with rights to an equal portion of the water from the fountain. This stems from the original farm. Presently the Knysna Municipality makes use of this fountain water to augment their own supply requirements. It is understood (but yet to be confirmed) that this amounts to some 1,5ML per month or 50kL per day. Once these figures are confirmed along with the potential yield from the fountain, the water balance calculations will be updated to reflect the actual scenario. In the meanwhile, the calculations will assume that the current consumption by the municipality in the total potential yield from the fountain and that 50% of this can be credited to the water balance calculation for the site. This is assumed to be the most conservation route for the time being.*

Further measures such as water sterilization (of harvested and aquifer water) along with hydraulic water pressure boosting will be required. Standby electrical supply will be provided for power interruptions as proposed by the appointed electrical consulting engineer.

## *4.1 Water Demand*

Due to the specific nature of the proposed development determination of the daily and annual water demand and more specifically the peak rate of demand, is open ended to an extent, i.e. sports events at irregular times (probably between 3 to 6 times a year), closure of office/retail buildings over weekends and over public holidays, average annual occupancy of hotel and residential component estimated between 30% to 40%, various areas having peak demands at off-peak times, etc. Nonetheless, the following calculation has been prepared. For the above reasons the calculated total Annual Average Daily Demands (AADD) along with the associated Peak Demands are considered to be *very* conservative.

Potable water demand requirements for Alternative 1 of the development are estimated as follows:

**Table 1 – Water Demand Calculations:**

| Water Demand Calculations | | | | | |
|---|---|---|---|---|---|
| **Source** | **Area ($m^2$) or No. of Units** | **Water Demand L/day** | | **Total AADD L/day** | |
| General Residential Zone - Portion 3 - Flats x 60 | 60 | 600 | per unit | 36 000 | Fig 9.9 (<600$m^2$)* |
| General Residential Zone - Portion 6 - Hotel x 120 beds | 120 | 250 | per bed | 30 000 | Table 9.12 (Hospital)* |
| Business Zone - Portions 1, 2, 5, 7 & 8 | 26 227 | 400 | per 100$m^2$ | 104 908 | Table 9.14 (Offices & Shops)* |
| Business Zone (Consent Place of Entertainment) - Portion 4 | 100 | 50 | No. of Swimmers | 5 000 | Estimate |
| Private Open Space - Portions 9, 10, 13 & 14 | 125 833 | 0 | m2 | 0 | |
| Special Zone as Private Roads - Portions 11 & 12 | 16 330 | 0 | m2 | 0 | |
| | | | **Annual Average Daily Demand (AADD)** | **175 908** | |
| | | | **Equivalent Erven (ee = AADD/1000)*** | **176** | |
| | | | | **7329.5 L/hr** | |
| | | | | **2.04 L/s** | |
| | | | Peak Factor (PF) | **8** | Fig 9.11* |
| | | | Peak Summer Demand (AADD x PF)** | **16.29 L/s** | |

** Reference to Guidelines and Human Settlement and Planning*

*** Not applicable to demand on KM infrastructure*

Note:

- Flats assumed at 100% occupancy year round (unlikely)
- Hotel assumed at 100% occupancy year round (unlikely)

## *4.2 Fire Demand*

It is proposed that all firefighting requirements be provided by a direct connection to the KM water reticulation system. Accordingly, a separate and dedicated fire main will be installed on the site for firefighting purposes. Therefore, firefighting demand requirements will not form part of the domestic on-site water collection, storage and distribution calculations.

## *4.3 Water Balance*

As previously mentioned under 'Water Supply' the sources of water for the development will be Rainwater Harvesting, Groundwater, the Bigai Fountain and Municipal Water.

Rainwater Harvesting from roof areas is being proposed. The suitable areas for harvesting water are the Business Zoned portions for commercial, retail and entertainment and the Residential Zoned portion for the Hotel. Harvesting water from ground level sources, namely roads, parking areas and gardens, is not considered practical and is therefore not being considered.

Ground water from boreholes and/or spikes on the property is proposed as a further source of potable water. Recharging of the aquifer will be supplemented through 'harvesting' surface water runoff from the paved parking, internal roads and garden areas. This will be achieved by collecting this surface runoff and discharging it onto the surface of the Private Open Space (Portions 13 and 14) wetlands.

The allowable yield from ground water sources per DWAF regulation for "General Authorization" in Zone "E" will be; 400kL per hectare per annum x 20hectare for this property = 8000kL per annum. This yield is being used in the water balance calculations at this stage. A study is being commissioned to determine if a higher yield can be realistically achieved. If the outcome of the study is positive and the applicable permits are applied for, then the water balance calculation will be updated to reflect the revised ground water yield figures.

*The yield from the Bigai Fountain is addressed under the opening paragraphs of Section 4 of this report.*

Municipal water supply to the development is proposed as a third augmenting source of potable water. The municipal supply will also be used for the supply for firefighting. This will negate the need for storage onsite for firefighting. This will also necessitate the need for a separate firefighting pipeline on the property.

Note all irrigation of open areas is to be sourced from treated effluent water from the nearby Municipal Waste Water Treatment Works (WWTW) or from treated effluent that is generated on-site. This is much like the arrangement with the Pezula Golf Estate. This will both reduce the demand on the municipal water supply and assist the KM in disposing of their treated effluent from their WWTW.

Based on the above the Water Balance calculation is derived as follows:

| **Water Balance Calculations** | |
|---|---|
| **Demand** | |
| **Source** | **Demand kL/day** |
| Annual Average Daily Demand (AADD) | 176 |
| **Annual Demand (@ 200 days due to varied consumers on site)** | **35 182** |
| **Supply** | |
| **Alternative Sources (non-municipal)** | **Yield Per Annum (kL)** |
| Rainwater Harvesting (750mm Annual Precip @ 80% efficiency from 20,000m$^2$ of roofs) | 12 464 |
| Ground Water (DWAF Zone E @ 400kL/Ha/Annum x 20Ha) | 8 000 |
| Bigai Fountain (50% of 1,5ML per month or 50kL per day) | 9 125 |
| Total Water available from Alternative Sources | **29 589** |
| **Surplus/Deficit (kL/Annum)** | **-5 593** |
| | **Deficit** |
| **Demand on Municipal Supply (kL/Annum)** | **5 593** |
| **Demand on Municipal Supply (kL/Day)** | **15** |

Based on these calculations the development, once fully developed, requires an annual supply of **5,593 kL** from the KM. This supply will be in the form of a trickle feed as it is proposed to provide on site storage for 2 days of water demand, hence peak demand will be derived from the on-site storage infrastructure as opposed to being supplied directly from the KM water reticulation network.

## *4.4 Water Storage*

Two forms of storage are required on site, these being raw water storage for water from rainwater harvesting, ground water and the Bigai Fountain and potable clear water storage for treated water that is ready for consumption. The volume of raw water storage is primarily determined by the statistically highest rainfall month and the potential to collect this water. While potable water storage volume is based on providing adequate storage for 2 days of Annual Average Daily Demand (AADD). Based on this the following water storage calculation is derived:

| Water Storage Calculations | |
|---|---|
| **Source** | **kL** |
| **Raw Water Storage** | |
| For Rainwater Harvesting | 1 400 |
| For Groundwater | 667 |
| | **2 067** |

| | |
|---|---|
| **Potable Storage** | |
| Annual Average Daily Demand (AADD) kL | 176 |
| 2 Days of AADD | 352 |
| | **528** |

The location of the raw water storage on the site is important to determine early on. It is recommended that this storage be in the form of a lined surface water dam located within the open space portions allocated within the wetlands. Based on the present calculations an area of approximately 4000m$^2$ should be set aside in these areas. This storage facility could be designed in such a way that it is aesthetically pleasing and complimentary to the wetlands around it.

### *4.5 Water Connection*

The existing Municipal water main along George Rex Drive is a 150mm diameter pipe. Bulk infrastructure planning for Knysna Municipality by Stewart Scott Inc. indicated that a new 200mm diameter water main for the supply area around the property is required.

It is proposed that a 125mm connection be provided to the site. The size is determined primarily by the firefighting requirements of flow and pressure. The internal reticulation will be split immediately after the site connection into a fire main and a trickle feed to the on-site potable water reservoir.

### *4.6 Water Reticulation (on-site)*

On-site water reticulation will be comprised of pipe lines, fire hydrants, isolating valves, etc. All infrastructure will be designed and installed to municipal standards. Please refer to Appendix C for conceptual layout of the internal water reticulation.

## 5 SEWAGE DISPOSAL

It is proposed that sewage disposal for the development include for normal waterborne sewage on site that is reticulated to two new pump stations both which are also to be located on site. Thereafter a new pumping main is to be laid through to the existing municipal WWTW, which is located approximately 100m away along George Rex Drive.

Note that the re-use of the grey water component as a potential potable water source will be considered only if it is required to further augment the water supply to the development. However, the cost effectiveness thereof is doubtful, i.e. collection, storage, treatment, etc. In addition to this, it can be seen from the water balance calculation, that the water demand on the municipal water supply is extremely low for a development of this nature which will negate the need for an additional water source in the form of grey water recirculation.

## 5.1 Sewer Demand

Sewage flow rates for the development options are as follows:

| Sewer Demand Calculations | | |
|---|---|---|
| **Demand** | | |
| **Source** | **Demand** | |
| Annual Average Daily Demand (AADD) Water | 110 | kL per day |
| (excludes residential due to being off-peak) | 1.27 | L per sec |
| Effective discharge into Sewer System @ 80% of AADD | 1.02 | L per sec |
| Extraneous Flows @ 15% | 0.15 | L per sec |
| | 1.17 | L per sec |
| Peak Factor (Chapter 10, Appendix C*) | 2.50 | |
| **Peak Flow (PF)** | **2.93** | **L per sec** |

** Reference to Guidelines and Human Settlement and Planning*

## 5.2 Sewer Connection

There are three options for connecting the site to the municipal sewerage network. These are:

- Connect into the existing Loerie Park sewage pump station. This is located on the other side of George Rex Drive.
- Connect directly into the Hornlee sewage outfall in Marlin Road.
- Connect directly into the intake manhole at the Hornlee Municipal sewage works. This is the preferred option.

## 5.3 Sewerage Reticulation (on-site)

On-site sewer reticulation will be comprised of pipe lines in 110mm and 160mm diameter respectively with associated manholes, rodding eyes and connections to buildings for a normal water bourn type gravity network system. It is anticipated that two sewer pump stations will be required on site to move the effluent across the site and to discharge it to the municipal system. Standby electrical supply for power interruptions together with an emergency overflow storage facility of suitable capacity will be provided for the sewer pump stations. All infrastructure will be designed and installed to municipal standards. Please refer to Appendix C for conceptual layout of the internal sewer reticulation.

# 6 SOLID WASTE

It is proposed that the solid waste disposal for the development be handled through the Municipal waste by rail system. It is proposed that the collection of waste from the site be done by the Municipality at one or more collection points within the property. The HOA will collect the waste internally and store it at the municipal collection points.

The local train service is out of commission to convey the waste, consequently road trucks are used to transport the solid waste in specialized containers. Presently municipal waste in transported to the Petro SA site near Mossel Bay. This arrangement expires at the end of 2018. By June/July of 2019 a new site developed by the Garden Route District Municipality (formerly the Eden District Municipality) will be operational. Capacity has been set aside in this site for the waste from Knysna. The capacity set aside for Knysna is enough for the current and future demands of the area.

The proposed development intends to apply strict recycling measures in waste disposal management. It is anticipated that this will reduce the volumes going to the municipal system by 50%. Most solid waste recycling activities will be accommodated inside the development with sorting taking place at the source with a 3-bag collection system for the extraction of recyclable materials, etc. The waste set aside for recycling will be collected by a private company that will be contracted to the development.

The anticipated volume/mass of waste generated by the development in extremely difficult to determine. There are no norms and standards for waste generation in South Africa known to the author. Accordingly, this aspect cannot be commented on this report. Suffice to say, the municipality should be able to provide guidance in this respect should they require further detail.

# 7 ROADS

## *7.1 Access and TIA*

It is proposed that the road access for the development be from George Rex Drive and Howard Street respectively, with upgrading at these intersections as per the traffic engineers' recommendations to provide for suitable traffic safety and flow. Refer to the TIA study by Messrs. **Innovative Transport Solutions (Pty) Ltd** which is titled **Erf 12403, Knysna – TIA Update August 2018**.

## *7.2 Road Improvements (on-site)*

Internal streets are to be constructed on engineered fill and permanently surfaced with suitable paving (precast concrete pavers, asphalt or similar) and designed to accommodate the developments traffic volume, and anticipated vehicle sizes and loads (service vehicles, etc.). Road widths are proposed to be between 6m and 3m with passing bays where required. Adequately sized turning circles will be provided at cul-de-sac ends.

Sidewalks and pedestrian pathways will be provided for adequate pedestrian circulation.

Refer to Appendix C for a dimensioned preliminary layout.

A geotechnical investigation done in 2005 by Siyakhula Lab (now known as Outeniqua Lab) showed predominantly silty sand material on the property below a topsoil layer approximately 300mm thick. Based on the investigation the preliminary recommendation for the road pavement is as follows:

- Selected gravel Sub-grade (G7 type material) in compacted layers with a minimum overall thickness of 500mm
- Sub-Base (G5 type material) 150mm thick
- Base (C4 type material) 150mm thick
- Surfacing to be paving/asphalt or similar.

Inclusion of a geo-fabric material to separate different layers below and facilitate sub-soil drainage will most likely be required. Additionally, a geo-grid type soil reinforcement inside the road layer works to limited rutting or similar deformation should be considered.

# 8 STORM WATER

## *8.1 Property Topography*

The property itself is generally low lying and very flat. Ground levels vary only slightly with the average contour line at 2,0m MSL. This is lower than both the road level along George Rex Drive which is at +/-2,5m MSL, as well as the ground level at The Moorings, which is positioned between the subject property and the Knysna Lagoon. The higher ground level at The Moorings Resort, at almost the 4,0m MSL contour line, is likely to be the result of the canal excavation done around 30 years ago.

The level of the ground water table on site, as determined from the trial holes, was found to be an average of 1,700mm below natural ground level.

## *8.2 Existing Drainage*

Drainage of runoff onto Erf 12403 is comprised of an off-site catchment area of 12 hectares. This is mostly from the adjacent Hunters Estate. There are at least 9 storm water outlets, with sizes varying between 300mm and 750mm diameter, that discharge onto the subject site. The side drain along Marlin Road (along the north of the property) does not drain towards the lagoon. This is unlike Howard Street, Vigilance Drive, etc. Instead the road runoff is directed towards Erf 2790 and Erf 12403 along its Eastern boundaries instead of being

directed to the closer and bigger culvert at the intersection of George Rex Drive and Vigilance Drive, i.e. triple 900 x 450mm box culverts. This road runoff then adds to the runoff having to be conveyed across/around Erf 12403 and towards a single 450mm diameter culvert that discharges under George Rex Drive and into the Knysna Lagoon.

Ponding and flooding on the property and surrounding streets have been experienced in recent flood conditions.

Drainage of runoff towards the Knysna Lagoon from Erf 12403 is impacted upon by the higher road and ground levels adjacent to the site. Additionally, there is only a single pipe culvert (450mm diameter) provided under George Rex Drive in the South West corner of the property (corner of George Rex Drive and Howard Street). No other culverts could be found along the 400m long property boundary with George Rex Drive. This is unlike the rest of George Rex Drive where culvert spacing is much more regular and of a bigger size.

An open earth drainage channel, approximately 2m x 1m in size, is used to convey runoff across/around Erf 12403, from East to West. This channel terminates at the above mentioned 450mm diameter culvert under George Rex Drive. This channel is routed along the Eastern and Southern sides of the property over a distance of approximately 800m. There is practically no fall along the entire length of this channel and it is totally overgrown.

During periods of exceptional high tide, the culvert under George Rex Drive gets submerged. This will dictate the water level in the rehabilitated wetlands on the property. This situation will be the same as the rest of the culvert outlets along George Rex Drive and elsewhere along the Knysna Lagoon.

## *8.3 Proposed Drainage*

Firstly, the overgrown storm water channels should be rehabilitated.

Secondly, it is proposed that storm water runoff from the development be planned in such a way that the runoff be conveyed to the Private Open Space portions. This runoff should be discharged onto the surface of these portions to promote both attenuation and ground water recharge. This surface flow should then discharge into the rehabilitated channels where it will be conveyed to the South West corner of the property (corner of George Rex Drive and Howard Street) where the existing 450mm diameter pipe culvert presently drains the area. However, this culvert is undersized and has a shallow invert level. This impacts on the overall effectiveness and hydraulic capacity of the drainage system on the property and results in regular flooding of Howard Street.

Due to the above restriction it is proposed to provide a connection to the existing Municipal storm water trench/channel on the south side of Howard Street and to upgrade the existing pipe culverts under George Rex Drive at the Knysna Golf Course. The invert level of this culvert is 700mm deeper than the 450mm culvert referenced above. The resulting drainage should be improved by using this 'lower' culvert.

The upgrading of the existing pipe culverts under George Rex Drive at the Knysna Golf Course has been previously recommended to the KM by SSI engineering consultants. The motive for this recommendation was to alleviate flooding of the lower lying sections of the residential area of Hunters Home. It is proposed to upgrade this culvert to at least a 1500 x 900mm box culvert.

Detailed storm water runoff calculations and culvert sizing will be performed during the detailed design stage of the project. The KM will be provided with a suitable design report and drawings for review and approval prior to implementation.

Refer to Appendix C for a plan of the preliminary master stormwater layout for both off-site and on-site improvements.

## *8.4 Storm Water (on-site)*

Concentration of street and surface runoff is to be limited by diverting runoff to suitable open areas at regular intervals/spacing. This will facilitate the recharging of the aquifer through surface percolation.

To prevent erosion and siltation during and after construction use will be made of silt traps, silt screens, at suitable locations.

### *8.5 Storm Water Management*

For the most part Storm Water Management has been addressed in elsewhere is this report under a myriad of separate items. Below is both a summary of these separate items and some additional points that form part of the Storm Water Management Plan:

- Existing site characteristics are addressed under Section 2 above.
- Rainwater harvesting of runoff from roofs will form a substantial part of the planned water resources for the project. This water will not be collected in rainwater tanks, but rather will directed to a lined surface water dam located within the open space portions allocated within the wetlands. This pond can be developed in such a way that it looks natural and part of the environment. It will also form a surface water for bird and aquatic life and therefore contribute to the environmental benefit of the project.
- Existing site topography and existing storm water drainage are covered in Section 8.1 and 8.2 above.
- Proposed storm water drainage is addressed in Sections 8.3 and 8.4 above. These sections are summarized as follows:
    - Overgrown storm water channels on site are to be rehabilitated.
    - Surface runoff from hardened areas, such as roads and parking areas is be diverted and discharged onto the surface of the open space areas/wetlands. In doing this one is able to promote natural treatment of pollutants in the water through environmental contact time and exposure to UV. In addition to this it will have the added benefits of promoting attenuation and recharge of ground water resources.
    - Surface water that does not percolate into the ground water system but that continues to travel across the surface of the wetlands will ultimately discharge into the existing rehabilitated surface channel around the perimeter of the site and leave the site via further formal drainage infrastructure.
    - Upgrades to the existing offsite storm water infrastructure will further ensure better management of peak runoff and prevent or minimize the current localized flooding experienced in the immediate vicinity of the site.
    - Erosion and siltation during and after construction will be achieved by the use of silt traps and silt screens, at suitable locations along energy dissipators at storm water outlets.

## 9 FLOOD LINE

The determination of the flood line for the property was previously dealt with in a letter by the late Mr. Gerrit Nieuwoudt, PrEng. A copy of this letter is included as Appendix B to this report. The outcome of this letter is that the 1:100-year flood line elevation for the subject property is 2.26m MSL.

## 10 PHASING IN OF DEMAND

It is well known that the Knysna Municipality presently has extremely limited spare capacity, if any, in their bulk services. However, they are actively planning and implementing programs and projects to both alleviate and create spare capacity in their bulk services. Discussions with the KM allude to the need to phase the development to limit the demand on the municipal services, especially in the short term.

However, based on the current processes (numerous development planning applications, etc.) that the development is going through to achieve approval from all the role players, it is anticipated that the developer will break ground for construction no earlier than 2021. All water required for construction will be sourced from the site, primarily from ground water. Accordingly, it is expected that the development will only start to generate demand for bulk services in late 2022. This demand will initially be extremely low and ramp up slowly from there as the development is built out to completion. This will depend on the market at the time.

Accordingly, it is anticipated that in the next 4 years the municipality would have resolved most of the bulk services capacity challenges and should be able to accommodate the proposed development.

## 11 AUGMENTATION LEVIES

Augmentation levies and capital contributions will be levied on the proposed development. The amounts for these contributions will be determined through a process of preparing a Service Level Agreement (SLA) for the development.

These levies will be based on the demands presented in this report, once in its final form, and the current published levy structure for the municipality. These amounts will then be offset against the reduced demand that the development places on municipal infrastructure due to alternative methods of sourcing water, etc. Costs imposed on the developer for improving the municipal infrastructure to facilitate the development, where the municipal infrastructure would ordinarily require improvement in the future, are also typically offset against the calculated levy contributions.

# 12 CONCULSION AND RECOMMENDATIONS

This report provides insight into the bulk services required and the demand that these could potentially place on the infrastructure of the Knysna Municipality. Use of alternative water sources has been considered and taken into account in the water balance calculation for the project. The net result is that once fully developed the development will only require around 15kL per day of potable water from the municipality. This is extremely low for a development of this nature.

Use of grey water recycling on the development is not favored, primarily due to the cost and difficulty of maintaining such a system. This is especially true considering that the development is literally across the road from the municipal waste water treatment works.

The site is faced with storm water management challenges. However, all of these can be resolved through thoughtful planning, design and implementation.

Solid waste management is easily accommodated in the plans of the solid waste department. These plans will be implemented long before the development generates any solid waste.

While the Knysna Municipality currently has limited capacity in their bulk water and sewer systems it is anticipated that these will be resolved before the development places any demand on the system in late 2022, which is 4 years from now. Accordingly, phasing of the development to accommodate the current lack of available bulk services should be unnecessary. This will however be discussed and negotiated further with the responsible municipal officials while preparing a draft Service Level Agreement (SLA).

Where applicable the standard augmentation levies and capital contributions towards upgrading of municipal infrastructure will be required. These amounts will be subject to amendment based on discussions with municipal officials while negotiating a draft Service Level Agreement for the development.

We trust that the above provides enough information for the Knysna Municipality to provide a way forward to the developer with respect to their bulk services and confirmation that these will be adequate to service the proposed development. Please contact the author should any further information be required.

**Tony Liebold Pr Tech Eng**
ECSA Registration No.: 200570017
For Nieuwoudt & Kie Consulting Engineers

# APPENDIX A

Marike Vreken Urban and Environmental Planners
'Specialist Planning Report for Environmental Authorisation Purposes'

# KNYSNA ERF 12403

## Specialist Planning Report for

### Environmental Authorisation Purposes

**CLIENT:** JAZZ SPIRIT 130 (PTY)LTD

**PREPARED BY:** MARIKE VREKEN URBAN AND ENVIRONMENTAL PLANNERS

Marike Vreken
Urban & Environmental Planners
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**AUGUST 2018**

# SECTION A : BACKGROUND

## 1. BACKGROUND

Erf 12403 Knysna is located in the eastern parts of Knysna, directly west of George Rex Drive between Marlin Street to the North and Howard Street to the south. Knysna Erf 12403 is currently zoned 'Undetermined' zone in terms of the Knysna Zoning Scheme Regulations (1992), and 19,4069ha in extent.


*FIGURE 1: KNYSNA ERF 12403*

Knysna Erf 12403 originated from the development of Hunters Estate Retirement Village in the 1990's. At the time the Knysna Wilderness Plettenberg Bay Guide Plan was amended to accommodate Hunter's Estate Retirement Village and then the condition of approval was that 80% of the site had to be retained as wetland area and 20% could be used for future development.

During the 2006 application, the application was for guide plan amendment to amend this condition. The guide plan amendment application was supported by Knysna Municipality during the Council meeting of October 2007 – refer to attached Council Minutes (***ANNEXURE A***).

The Guide Plan decision was never amended – the Minister of the Department of Environmental Affairs and Development Planning (DEADP) resolved not to make a decision on the guide plan amendment application, until there is a decision on the application for environmental authorisation.

The application for environmental authorisation was never concluded. Biophysical information such as the delineation of the wetland was an aspect that had to be addressed.

The proposal now is to rehabilitate the wetland, include more Private Open Space as a green buffer and develop an area for mixed use commercial, recreation, institutional and residential purposes. The applicant intends to develop a mixed use development, with access to the northwest off George Rex Drive and an alternative access onto Howard Street to the south.

In order to allow a mixed use development on the property, it is necessary to apply for rezoning & subdivision in terms of the Knysna Municipality By-law on Municipal Land Use Planning (2016) and also to apply for environmental authorisation. **Eco Route Environmental Consultancy** was appointed to facilitate the Environmental Authorisation process for this development, and this report serves as the "Specialist Planning Report" that informs the Environmental Authorisation process.

This Specialist Planning Report provides a description of the proposed development and to "contextualises" the envisaged project within the administrative, legal, and planning policy framework. These policies are for the most part not prescriptive legal requirements, but rather guidelines to inform detailed planning and design, and to be interpreted and applied at the level of an individual project.

## 2. THE APPLICATION

Marike Vreken Urban and Environmental Planners has been appointed by **JAZZ SPIRIT 130 (PTY)LTD** to prepare and submit the required application documentation (refer to *Error! Reference source not found.*: Power of Attorney & Company Resolution for:

i. The rezoning of Knysna Erf 12403 from "Undetermined Zone" to "Subdivisional Area" in terms of Section 15(2)(a) from the Knysna Municipality By-law on Municipal Land Use Planning (2016);

ii. The subdivision of Knysna Erf 12403 into 14 Portions (5 x Business Zone portions; 1 x Business Zone (with consent use to allow 'a place of entertainment') portion; 2 x General Residential Zone portions, 4 x Private Open Space portions & 2 x Special Zone portions) in terms of Section 15(2)(d) from the Knysna Municipality By-law on Municipal Land Use Planning (2016).

## 3. PROPERTY DESCRIPTION SIZE AND OWNERSHIP

A copy of the Title Deed for Knysna Erf 12403, which includes all the information outlined below, is contained in ***ANNEXURE C*** and a copy of the SG Diagram is attached as ***ANNEXURE D***

| | |
|---|---|
| Title Deed Number | T74762/2005 |
| Title Deed Description: | Erf 12403 Knysna in the municipality and division of Knysna, Province of the Western Cape |

# 10. SITE CHARACTERISTICS

## 10.1. Topography

The property has a very even gradient and all of the site is developable in terms of the 1:4 slope guidelines. According to the Eco Route Wetland report (2014:5), the height Erf 12403 ranges between 4 meters and 10 meters in elevation whereas the development built on the eastern boundaries elevation ranges between 10 meters and 80 meters.

## 10.2. Drainage

There is a depression that follows the eastern and southern boundaries of the application area. Given the topography of the site as described in Par 10.1 above, the topography indicates that in all probability, the storm water runoff from the eastern boundary maybe one of the water inputs to the wetland from sub-surface flow. The drainage channels constructed 27 years ago and not maintained has resulted that the outflow from the wetland is non-existent resulting in the water to stagnation on Erf 12403 forming a wetland Eco Route (2014:5).


*FIGURE 23: DRAINAGE ON KNYSNA ERF 12403*

The image above shows the locality of the wetland and storm water drainage on the site.

The applicant proposes to retain and protect the wetland and also to clear the aliens in the depression where the man-made storm water channel is located. This area will be included in a private open space and will be used as a private nature area.

## 10.3. Vegetation

According to Eco Route (2014:4), the vegetation composition has been largely altered and introduced alien and/or ruderal species occur in approximately equal abundances to the characteristic indigenous wetland species.

Vegetation cover is likely to improve as a result of alien clearing over the next 5 years. The presence of *Sesbania punicia* is of special concern as it is an invasive alien species that favours wet growing conditions at the edge of wetlands and rivers. This species is extremely poisonous.

## 10.4. Built Environment

Except for an inhabitable ruin on the property (shown in Figure 3), the application area is currently vacant and does not contain any structures.

# APPENDIX B

100 Year Flood Line Letter

# NIEUWOUDT & Co Kie

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Ref: N05/152

**PER HAND**

Messrs. CMAI
P O Box 2498
Knysna
6570

26 March 2008

Attention: Dr. Chris Mulder

**DEVELOPMENT "GEORGE REX PLACE": ERF 12403, REX DRIVE, KNYSNA**
**DETERMINATION OF FLOODLINES FOR PROPERTY BASED ON RECENT FLOODS**

The property is located inside the lagoon basin area and forms a small part of the flat, low lying section of Knysna town around the perimeter of the lagoon.

The ground levels in this flat, low lying section of town varies between 1.50m MSL and 2.50m MSL with the ground level on Erf 12403 mostly at 2,0m MSL contour.

The flood lines applicable to Erf 12403 will thus be the same as for all other properties (developed or undeveloped) in this section of town which include for the bottom half of Knysna's own CBD area.

Council, on the basis of their research done for this overall low lying section around the lagoon has set over 12 years ago that the floor level for all new buildings be at 3.00m MSL minimum.

The flood lines for this low lying section will be impacted on by the water level in the lagoon, with its tidal and wave action, as well as by manmade items both upstream and downstream of each property.

In the case of Erf 12403 it is George Rex Drive built in the 1940's, raised well above the natural ground either side and provided with limited culvert capacity thus preventing free through flow of water to and from the lagoon and therefore resulting in substantial ponding taking place.

The recent floods of August 2006 and November 2007 where some 370mm fell in over a 48 hour period are both regarded as 1:100 year floods with widespread damage all over the South Cape region.

George Rex Drive was overtopped by less than 100mm depth where the road level is at 2.16m MSL at the neighboring golf course culverts. Thus for all practical purposes 2.26m MSL contour line can be considered the 1:100 flood line for Erf 12403. Photographic evidence of the above is available on request if required.

Note any upgrading of the culvert capacity below George Rex Drive as has been proposed by the Developer and also planned by Council will reduce the ponding and thus the flood line for Erf 12403.

Yours faithfully

Gerrit Nieuwoudt Pr Eng

# APPENDIX C

Drawings

## STORMWATER WITH ERF 12403 UNDEVELOPED, i.e. PRESENT SITUATION

| | CULVERT PROVIDED | CAPACITY PROVIDED | STORM RECURRANCE | PEAK FLOW | COMMENT ON SITUATION |
|---|---|---|---|---|---|
| 1 | EXISTING 450dia PIPE UNDER GEORGE REX WITH INVERT AT 1.25m MSL | 0.4 $m^3/s$ | 1:50 | 3.1 $m^3/s$ | CAPACITY PROVIDED TOTALLY INADEQUATE |
| | | | 1:100 | 5.0 $m^3/s$ | CAPACITY PROVIDED TOTALLY INADEQUATE |
| 2 | EXISTING DOUBLE 450dia PIPES UNDER GEORGE REX WITH INVERT AT 0.70m MSL | 0.8 $m^3/s$ | 1:50 | 3.1 $m^3/s$ | CAPACITY PROVIDED TOTALLY INADEQUATE |
| | | | 1:100 | 5.0 $m^3/s$ | CAPACITY PROVIDED TOTALLY INADEQUATE |

## STORMWATER WITH ERF 12403 DEVELOPED, i.e. FUTURE SITUATION

| | CULVERT PROVIDED | CAPACITY PROVIDED | STORM RECURRANCE | PEAK FLOW | COMMENT ON SITUATION |
|---|---|---|---|---|---|
| 1 | EXISTING 450dia PIPE UNDER GEORGE REX WITH INVERT AT 1.25m MSL | 0.4 $m^3/s$ | | | |
| | ADDITIONAL | PLUS | | | |
| | NEW DOUBLE 1200x600 CULVERT UNDER HOWARD STREET WITH INVERT AT 0.85m MSL | 3.3 $m^3/s$ | 1:50 | 3.6 $m^3/s$ | CAPACITY PROVIDED IN ORDER |
| | | | 1:100 | 5.8 $m^3/s$ | CAPACITY PROVIDED INADEQUATE |
| 2 | NEW TRIPLE 1200x1200 CULVERTS UNDER GEORGE REX TO REPLACE DOUBLE 450dia PIPES | 12.0 $m^3/s$ | 1:50 | 7.2 $m^3/s$ | CAPACITY PROVIDED IN ORDER |
| | | | 1:100 | 11.6 $m^3/s$ | CAPACITY PROVIDED IN ORDER |

KNYSNA LAGOON

EXISTING BOX CULVERTS
6x 1200 x 600mm
CAPACITY = 10.0 $m^3/s$

MUNICIPAL SILT TRAP AREA

EXISTING BOX CULVERTS
3x 600 x 450mm
CAPACITY = 1.2 $m/s^3$

LOERIE PARK

WATER LEVEL =m MSL

MUNICIPAL SEWER WORKS

KM ELEC DEP

DRIVING RAIL

PROPOSED DETRITIS TRAP

ASHMEAD RESORT

ERF 12403

KNYSNA LAGOON

TRENCH

EXISTING 450mmØ S/W PIPE TO REMAIN IN PLACE AS IS
IL= 1.25m MSL

EXISTING 450mmØ S/W PIPE TO REMAIN IN PLACE AS IS
IL= 1.18m MSL (BLOCKED)

REPLACE EXISTING TWO 450mm Ø STORMWATER PIPES WITH
3x 1200x1200mm BOX CULVERTS
IL= 0.70m MSL
(REFER TO DETAIL)

OPEN CHANNEL TO LAGOON

FURTHER UPGRADING OF STORM-WATER PIPES UNDER REX DRIVE PLANNED BY COUNCIL AT WILSON STREET INTERSECTION TO IMPROVE DRAINAGE OF GOLF COURSE AREA

INSTALL TWO NEW BOX CULVERTS 1200x600mm UNDER HOWARD STREET TO CONNECT TO EXISTING TRENCH IN CORNER OF GOLF COURSE

EXISTING 600mm dia STORMWATER PIPE

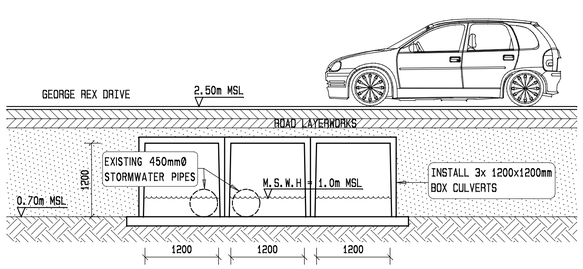
KNYSNA GOLF COURSE

HUNTERS HOME

CATCHMENT AREA
= 50 hectares

450mmØ S/W
750mmØ S/W
450mmØ S/W
375mmØ S/W
375mmØ S/W
375mmØ S/W

VIGILANCE ROAD
MARLIN ROAD
HOWARD STREET
EXISTING TRENCH
UPGRADE EXISTING TRENCH
GEORGE REX DRIVE
REX DRIVE
SANDPIPER STREET
MAENGOUT STREET
INDUSTRIAL AREA
PROGRESS STREET
JONKER STREET
MUNICIPAL V.T.C
MUNICIPAL CEMETRY AREA
HUNTERS DRIVE
LINDSAY STREET
NATURAL WATER COURSE
FISHERSHAVEN




UPGRADING OF S/W CULVERT UNDER GEORGE REX DRIVE 1:50

LAYOUT OF PROPOSED MASTER STORMWATER DRAINAGE WITH DIVERSION TO GOLF COURSE CULVERT 1:2500

REVISION

PROJECT

DEVELOPMENT GEORGE REX SPORT AND ADVENTURE CENTRE
ERF 12403, REX DRIVE, KNYSNA

ENGINEERS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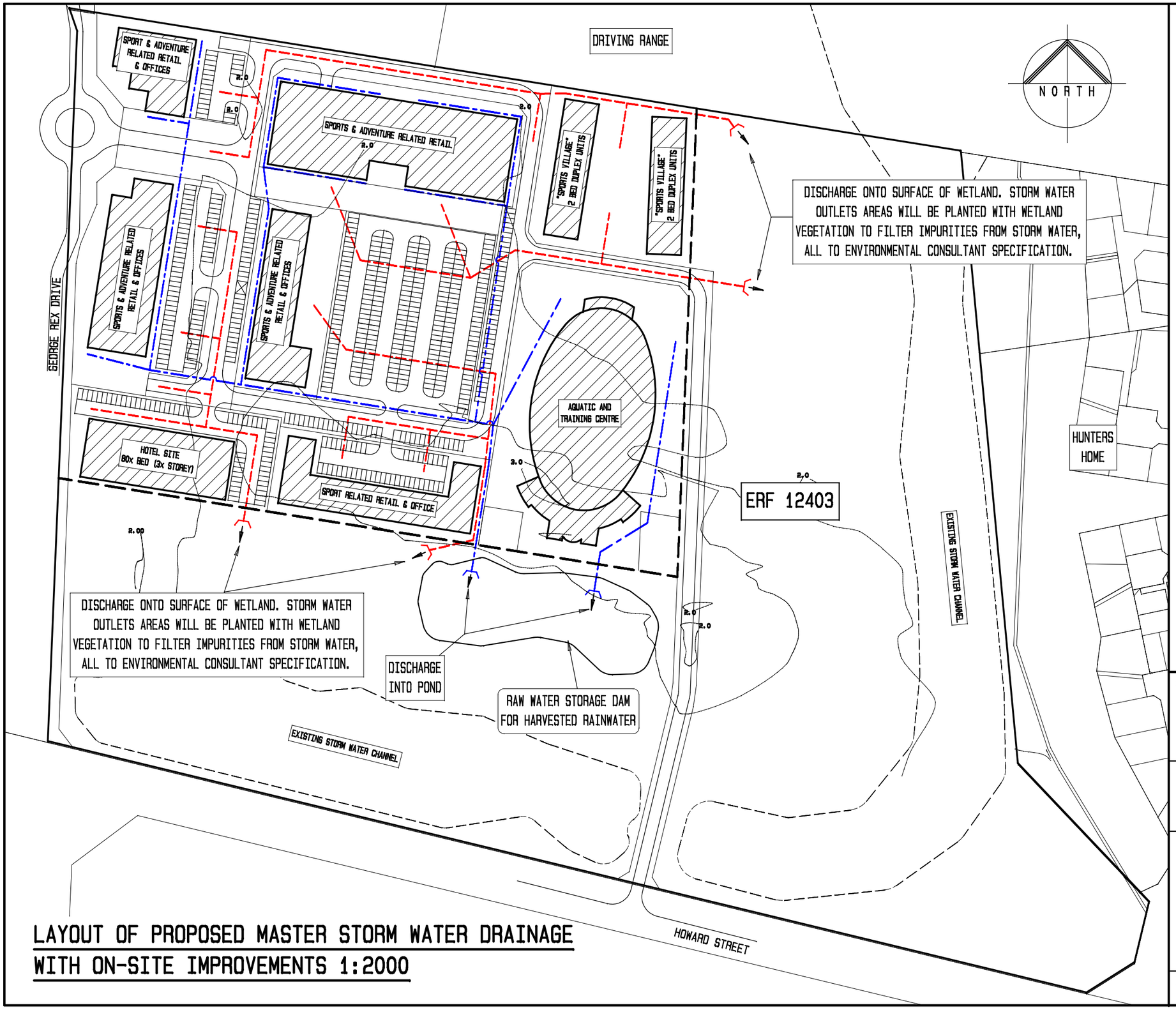


## LAYOUT OF PROPOSED MASTER STORM WATER DRAINAGE WITH ON-SITE IMPROVEMENTS 1:2000

## LEGEND

- STORM WATER RETICULATION FOR OPEN AREAS, PARKING AND ROADS (PIPE SIZES & LEVELS TBD)
- RAINWATER HARVESTING RETICULATION FROM BUILDING ROOFS (PIPE SIZES & LEVELS TBD)

NOTE:
REFER TO DRAWING N15/60-3 FOR PROPOSED OFF-SITE STORM WATER IMPROVEMENTS

## CONCEPTUAL DRAWING

PROJECT
DEVELOPMENT GEORGE REX SPORT AND ADVENTURE CENTRE
ERF 12403, GEORGE REX DRIVE, KNYSNA

TITLE
LAYOUT OF PROPOSED MASTER STORM WATER DRAINAGE WITH ON-SITE IMPROVEMENTS

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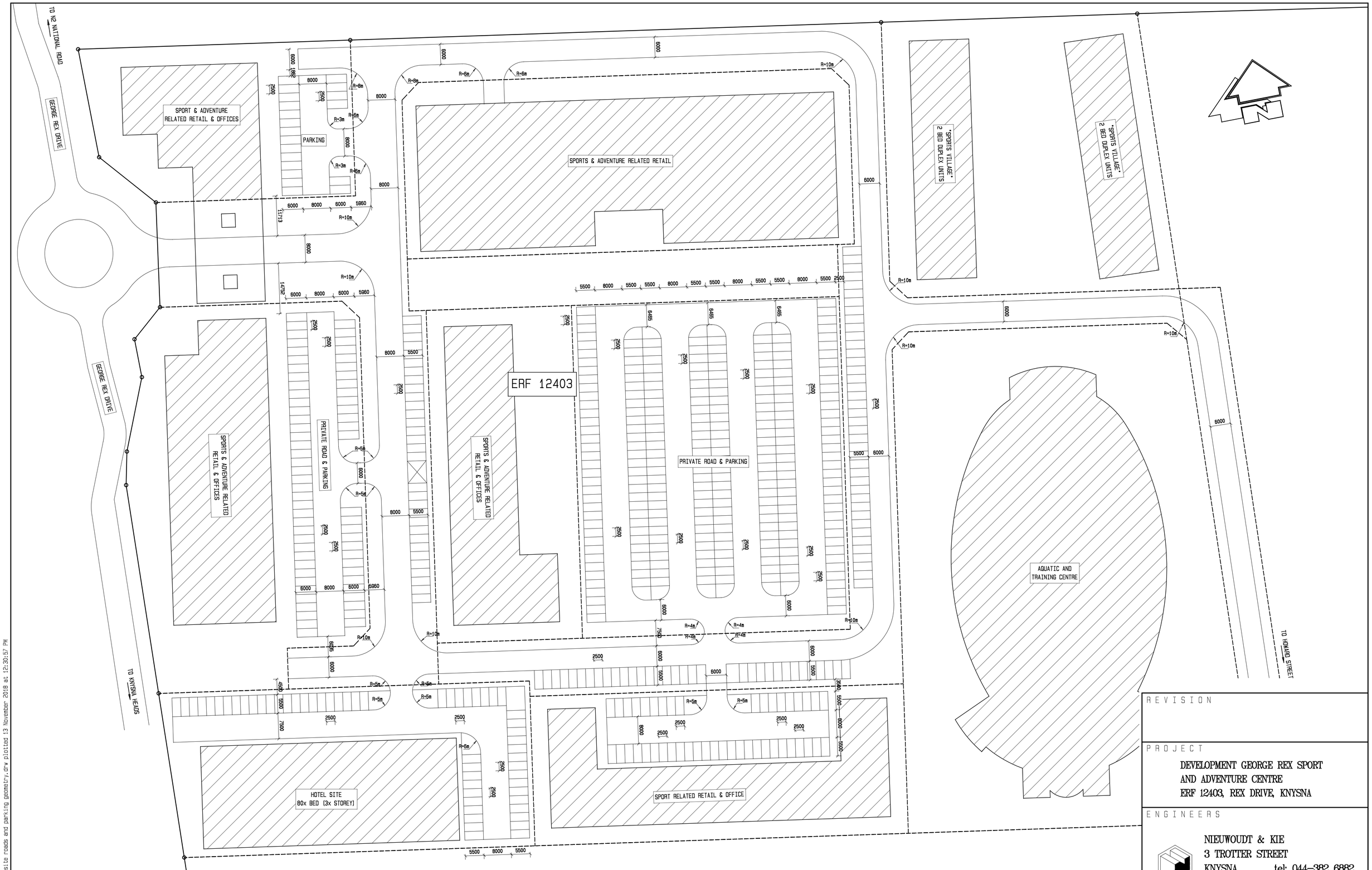


ON-SITE ROADS AND PARKING GEOMETRY 1:500

REVISION

PROJECT

DEVELOPMENT GEORGE REX SPORT AND ADVENTURE CENTRE
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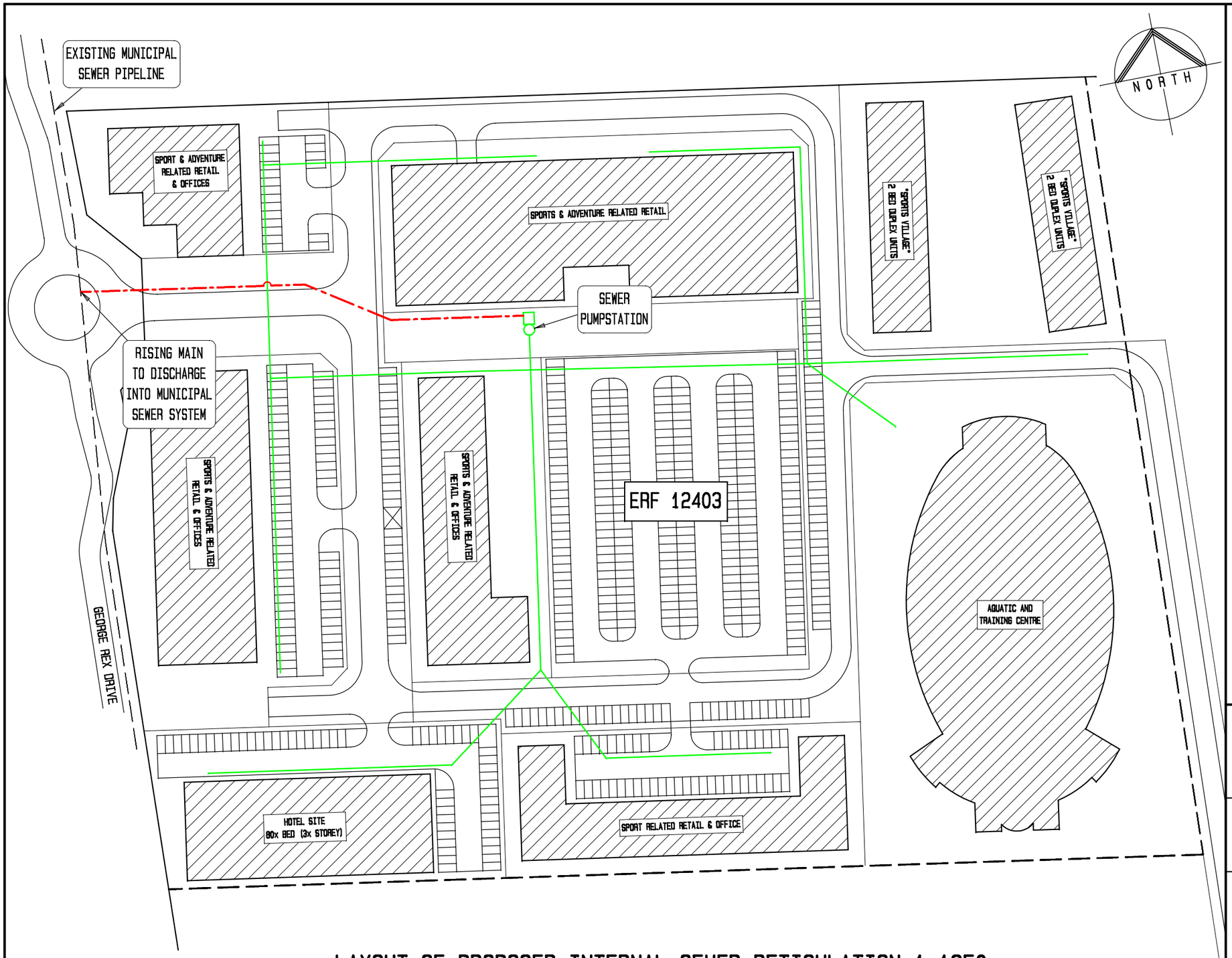


## LAYOUT OF PROPOSED INTERNAL SEWER RETICULATION 1:1250

## LEGEND

- EXISTING MUNICIPAL SEWER PIPE
- SEWER RISING MAIN
- INTERNAL GRAVITY SEWER RETICULATION

**CONCEPTUAL DRAWING**

PROJECT

DEVELOPMENT GEORGE REX SPORT AND ADVENTURE CENTRE
ERF 12403, GEORGE REX DRIVE, KNYSNA

TITLE

LAYOUT OF PROPOSED INTERNAL SEWER RETICULATION

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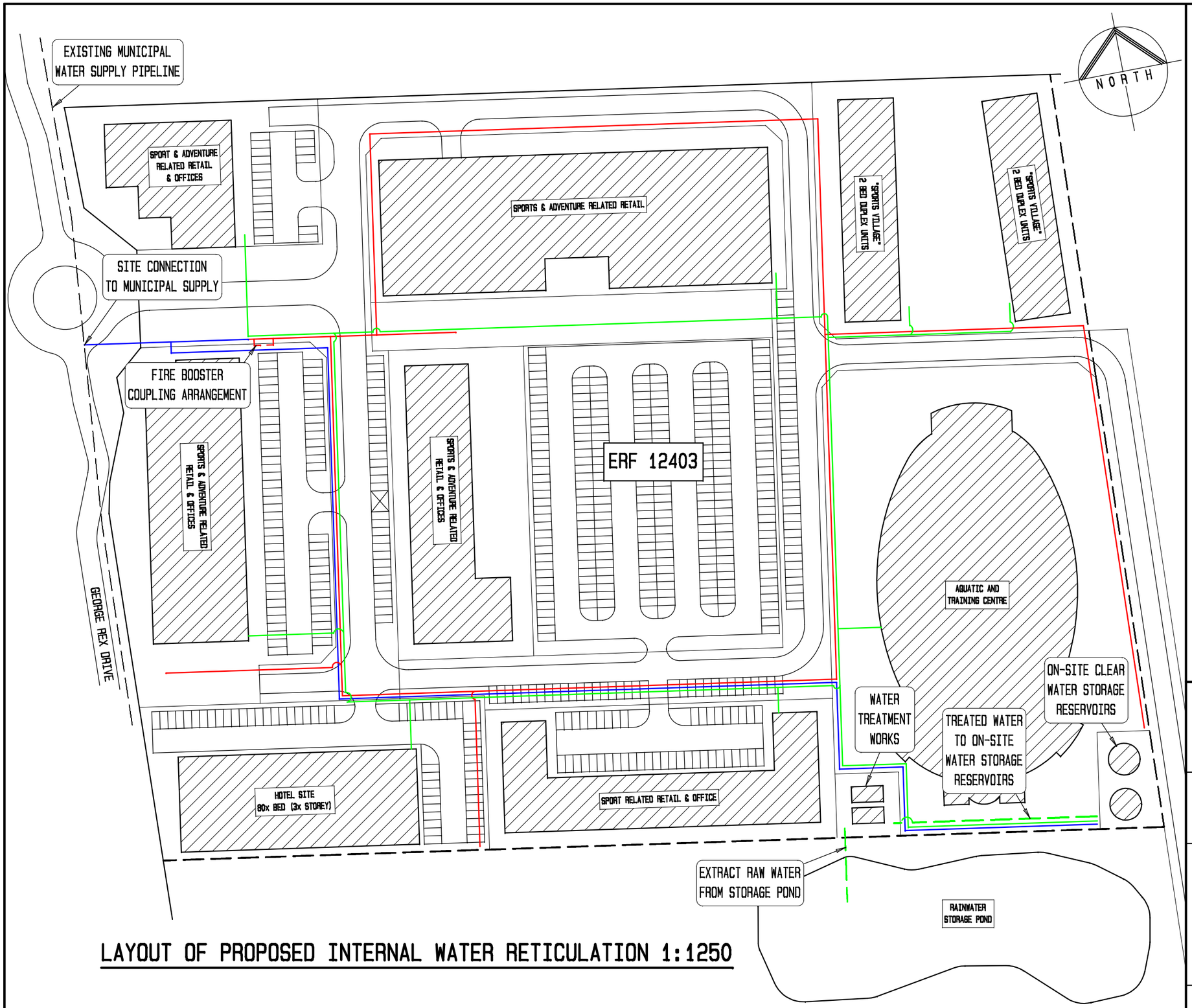


## LAYOUT OF PROPOSED INTERNAL WATER RETICULATION 1:1250

## LEGEND

- APPROXIMATE POSITION OF EXISTING MUNICIPAL WATER SUPPLY MAIN
- INTERNAL DOMESTIC WATER SUPPLY
- INTERNAL SUPPLY TO FIRE MAIN & BACKUP DOMESTIC WATER SUPPLY TO ON-SITE STORAGE RESERVOIR
- FIRE RETICULATION MAIN

**CONCEPTUAL DRAWING**

PROJECT

DEVELOPMENT GEORGE REX SPORT AND ADVENTURE CENTRE
ERF 12403, GEORGE REX DRIVE, KNYSNA

TITLE

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