

**DEVELOPMENT GEORGE REX**  
**ERF 12403, REX DRIVE, KNYSNA**

**PRELIMINARY REPORT ON**  
**PROVISION OF CIVIL SERVICES TO DEVELOPMENT**

September 2006

N05/152

Report done for :

Jazz Spirit 130 cc  
P O Box 479  
Knysna  
6570

Tel : (044) 382 9701  
Tel : (044) 382 9701  
Email : aafourie@xsinet.co.za

Report done by :

Nieuwoudt & Kie  
P O Box 998  
Knysna  
6570

Tel : (044) 382 6882  
Tel : (044) 382 6884  
Email : nieu@isat.co.za

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## INTRODUCTION

The George Rex development is situated inside Knysna Municipal town boundaries on an open, flat property of some 20 hectare along Rex Drive between Knysna Golf Course and the Hunter's Estate residential developments.

Four different development alternatives are being proposed, which vary from a "do nothing" option to a "high density mixed use" option with combined residential and commercial components.

The alternatives as per the town and urban planners, C.M.A.I., can be summarized as follows :

<b>DESCRIPTION</b>	<b>ALTERNATIVE 2 REV. 3 BID PLAN OPTION</b>	<b>ALTERNATIVE 3 REV. 2 LOW DENSITY OPTION</b>	<b>ALTERNATIVE 4 REV. 4 DENSIFICATION OPTION</b>
Restaurants	4	2	-
Retail units	21	16	16
Office units	31	11	11
Apartments	32	-	209
Single residential units	121	137	116
Community centre	1	-	1
Restaurants m <sup>2</sup>	1,692	1,684	-
Retail units m <sup>2</sup>	11,380	10,209	14,253
Office units m <sup>2</sup>	8,237	2,621	5,835
Apartments m <sup>2</sup>	3,220	-	23,525
Single residential units m <sup>2</sup>	47,448	46,596	38,433
Community centre m <sup>2</sup>	765	-	514

## **EXECUTIVE SUMMARY FOR IMPACT ON ENVIRONMENT**

The impact on the environment resulting from both the construction and the operation stages of the civil services, such as water, sewer, roads, storm water infrastructure for the proposed development has been researched and this report by Nieuwoudt & Kie has been prepared as part of the Environmental Impact Assessment of the project.

The impact on the environment has been identified in this report, with possible mitigation measures recommended to minimize adverse effects. The following impacts can be expected resulting from the construction and operation activities :

<b><u>Construction Stage</u></b>	<b><u>Operational Stage</u></b>
<ul style="list-style-type: none"> <li>• Ground disturbance by road building and pipe laying</li> <li>• Pollution of or interference with storm water drainage across property by earth filling and trenching</li> <li>• Noise by machinery , labour</li> <li>• Disturbance of plant and bird life by machinery, labour</li> </ul>	<ul style="list-style-type: none"> <li>• Scouring and siltation by increased runoff concentration</li> <li>• Visual impact of roads, sidewalks and gabion edge for raised areas</li> <li>• Noise by traffic, pump stations and maintenance operations</li> <li>• Odours from sewer pump stations and sewerage reticulation</li> <li>• Sewage spillage during blockages or leakages</li> </ul>

The environmental impact during construction stage will involve most of the property, leaving practically only the estuarine wetland and drainage way areas relatively unaffected from machine activity.

Although heavy machine activity will be necessary, it will be of the same type used for any other residential development, which with proper control measures included in the construction contract, can limit the environmental impact to acceptable norms. Furthermore, rehabilitation of disturbed areas can be achieved within a relatively short period after construction given the abundance of topsoil, sawdust mulch, runoff water, etc on the property as well as the green intensions of the development itself.

The environmental impact during operational stage relates mainly to traffic noise and visual impact, which can be mitigated by careful landscaping, especially of the wetland / greenbelt area provided on the perimeter and inside the development.

Throughout the construction and operational stages, dealing with storm water will be critical, but given the limited catchment area draining onto this property, i.e. less than 40 hectares, any negative effects of storm water runoff on the environment can be mitigated by implication of correct management measures such as silt screens, retention facilities, erosion controls, etc.

Being underground, all water and sewer lines will have a negligible effect on the environment once all topsoil replacement and revegetation has been completed. Pump stations will be underground type with odour control achieved by correct selection, setting and operation of pumping and ventilation equipment and likelihood that its impact will be less than municipal sewerworks located further along Rex Drive is assured.

The alternative that have the least impact on the environment will obviously be Alternative “1”, with the impact of the other three alternatives considered to be equal in extent on the environment. However, the impact throughout can be mitigated adequately by implementation of correct management plans, control methods during construction and operational stages.

## **EXECUTIVE SUMMARY FOR CIVIL SERVICES PROVISION**

The civil services required for the proposed George Rex development alternatives will include for potable water supply, rain water harvesting, sewage disposal, roads, storm water management and solid waste disposal.

It is proposed that potable water for the development is supplied from Knysna Municipality with rainwater harvesting at individual stands for irrigation purposes to reduce demand for potable water. Standard augmentation levies and capitol contributions towards upgrading of municipal waterworks (presently under construction) reservoir storage and distribution will be applicable as per Council's tariff schedule.

Potable water demand and storage requirements for the development alternatives are as follows :-

<b>DESCRIPTION</b>	<b>ALTERNATIVE 2 REV. 3 BID PLAN OPTION</b>	<b>ALTERNATIVE 3 REV. 2 LOW DENSITY OPTION</b>	<b>ALTERNATIVE 4 REV. 4 DENSIFICATION OPTION</b>
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<u>Water Supply</u>			
Water demand AADD	260kl	225kl	360kl
Reservoir Storage Volume	630kl	560kl	800kl

Rainwater Harvesting, based on a roof area of 200m<sup>2</sup> per stand and annual rainfall of 720mm spread evenly, could reduce demand on potable water for the development alternative as follows:-

<b>DESCRIPTION</b>	<b>ALTERNATIVE 2 REV. 3 BID PLAN OPTION</b>	<b>ALTERNATIVE 3 REV. 2 LOW DENSITY OPTION</b>	<b>ALTERNATIVE 4 REV. 4 DENSIFICATION OPTION</b>
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<u>Rainwater Harvesting</u>			
Possible Rainwater Volume	80kl	65kl	135kl
Percentage Rainwater	30%	29%	37%

It is proposed that sewage disposal for the development include for waterborne sewage to new pump stations on site with pumping mains to be laid through to existing municipal sewer works.

Sewage flow rates and pumping scheme for the development alternatives are as follow :-

DESCRIPTION	ALTERNATIVE 2 REV. 3 BID PLAN OPTION	ALTERNATIVE 3 REV. 2 LOW DENSITY OPTION	ALTERNATIVE 4 REV. 4 DENSIFICATION OPTION
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<u>Sewage Flow</u>			
Peak sewage flow	7 l/s	6 l/s	10 l/s
Number of pump stations	2x	4x	2x

It is proposed that the solid waste disposal for the development is through the municipal waste by rail system with collection of waste by municipality either at one or more collection points within the property or at each stand. Presently the waste by rail system deals with some 540m<sup>3</sup> per week (compacted).

Solid waste generated by the development is as follows :-

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<u>Solid Waste</u>			
Solid Waste Volume	20m <sup>3</sup>	20m <sup>3</sup>	41m <sup>3</sup>
Percentage Waste	3.5%	3.5%	7%



It is proposed that the road access for the development be from Rex Drive and Howard Street respectively, with upgrading at these intersections as per the traffic engineers recommendations to provide for traffic safety and flow.

Internal roads with parking area, sidewalks, etc to be constructed on engineered fill material to service the individual stands.

It is proposed that storm water runoff from the development, which is a critical component, be conveyed to the South West corner where a 450 dia pipe culvert drains the area. This pipe culvert is undersized and has a shallow invert level, which together with the flourishing estuarine wetland in that area presently impact on the drainage system and results in regular flooding of Howard Street and Rex Drive.

Connection to and upgrading of the pipe culverts at the Knysna Golf Course would be preferable given that invert level there is some 700mm deeper and increased flow will improve flushing out of the stagnant water.

Storm water runoff during storm conditions for the development alternatives is as follows :-

DESCRIPTION	ALTERNATIVE 2 REV. 3 BID PLAN OPTION	ALTERNATIVE 3 REV. 2 LOW DENSITY OPTION	ALTERNATIVE 4 REV. 4 DENSIFICATION OPTION
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Community centre m <sup>2</sup>	765	-	514
<u>Storm Water Flow</u>			
Recurrence Interval 1:50	3.8m <sup>3</sup> /s	3.7m <sup>3</sup> /s	4m <sup>3</sup> /s
Recurrence Interval 1:100	4.8m <sup>3</sup> /s	4.7m <sup>3</sup> /s	5m <sup>3</sup> /s

## WATER SUPPLY TO ALTERNATIVE “4”

- Water availability : Present municipal supply scheme from Knysna and Gouna Rivers is designed for a total capacity 21.8Mℓ/day, i.e. sufficient supply until 2009 for the present demand plus 6% growth annually. Council, together with DWAF are presently further investigating the raw water reserve capacity of Knysna River and also underway are planning the future bulk water supply to the greater Knysna area, presently increase capacity for the existing treatment works is being constructed to provide for the total supply scheme. Note - Erf 12403 also have servitude rights to a portion of the water from the Bigai fountain endorsed in its title deed, which stems from the original farm. Present Council use of the fountain water amounts to some 1,5 Mℓ/month or 50 kℓ / day to augment their potable water.
  
- Water demand : Annual Average Daily Demand for overall development
 

116 x stands @ 1,200 ℓ/day	=	139 kℓ/day
209 x units @ 700 ℓ/day	=	146 kℓ/day
<u>20 000m<sup>2</sup> office / shop @ 4 ℓ/day</u>	=	<u>80 kℓ/day</u>
Total for development	=	364 kℓ/day

  - : Instantaneous peak water flow = 27ℓ/s.
  - : Rainwater harvesting from the development areas and storage on site in the rehabilitated wetland / drainage way areas will provide for irrigation water supply for the open areas, etc which in turn will reduce the development's water demand from the municipal supply.
  
- Water storage : The area is supplied from the Old Place Lower Reservoir located at the 85 MSL contourline, which has insufficient capacity for its supply area already. The size of the existing reservoir is 450kℓ and the volume required for the proposed development itself is some 800kℓ. The bulk infrastructure planning presently underway for Knysna Municipality by Messrs Stewart Scott Inc indicates additional 2,600kℓ storage requirement for the overall supply area served by this reservoir.
  
- Water connection : The existing municipal watermain along George Rex Drive, which feeds the area, has insufficient capacity for the development. The size of the existing watermain is 150 dia and the pipe size required for the proposed development itself will be 125mm dia, which will ensure hydraulic pressure of minimum 400 kPa during instantaneous peak flow conditions. The bulk infrastructure planning presently underway for Knysna Municipality by Messrs Stewart Scott Inc indicates requirement for a new 200mm dia watermain for the supply area around the property (refer to the copy of the layout attached to report).
  
- Water reticulation : Pipe lines, fire hydrants, isolating valves, etc where required on development to municipal standards.

### **SEWER DISPOSAL TO ALTERNATIVE “4”**

- Sewer reticulation : Pipe lines, manholes, rodding eyes and house connections for gravity network to municipal standards.
- Sewer pumpstation : At least two internal pumpstations at appropriate locations are expected, given the flat topography of the property. The pumpstation design appropriate for this development will be under ground type with submersible pumps.
- Sewer pumping main : A pumping main of minimum 110mm dia size between the pumpstations and to the connection at the municipal sewer works will be required.
- Sewer flow rates : Annual Average Flow Rate = 270.0 kℓ per day  
Total Peak Sewer Flow = 10.0 ℓ/s
- Sewer connection : Two possibilities for connecting to municipal network exist, namely into existing Loerie Park sewage pump station, which is located on the other side of Rex Drive or into Hornlee sewage outfall in Marlin Road. However, to connect into the intake manhole at the municipal sewage works itself might be the best option (refer to the copy of the layout attached to report).

### **SOLID WASTE DISPOSAL TO ALTERNATIVE “4”**

- Collection of waste : By HOA from dwellings to central point with suitable bulk containers provided.
- Waste by rail : Municipal service from collection point at development to Waste by Rail in town, where adequate capacity exist for development according to council official. Presently some 540m<sup>3</sup> waste (compacted) per week is sent from Knysna to the regional dumpsite at Petro SA, outside Mossel Bay.
- Waste volume : Waste volume according to the Red Book Guidelines will be 0,12m<sup>3</sup> per household per week (compacted), thus overall volume from development expected to be approximately 41m<sup>3</sup> per week

## **STORM WATER DRAINAGE TO ALTERNATIVE “4”**

- Refer to relevant reports dated 1994 by Messrs Ninham Shand, Messrs Hougaard Pieters Engineering & Environmental Consultant and Allanson & Associates respectively.
- Property Topography : The property itself is generally low lying and very flat. Ground levels vary only very slightly with average contourline at 2,0m MSL. This is lower than both the road level along Rex Drive at 2,5m MSL, as well as the ground level at Ashmead Resort, i.e. the property over the road from Erf 12403. The ground level at Ashmead Resort, at almost 4,0m MSL, is likely to be the result of the canal excavation done some 20 years ago.
- Existing Drainage : Drainage of runoff towards the Knysna Lagoon from Erf 12403 is impacted upon by this higher road and ground levels with only a single pipe culvert provided under Rex Drive in the S.W. corner of the property. Along the almost 400m long property boundary with Rex Drive, no other culvert could be found, which is very unlike the rest of Rex Drive where culvert spacing is much more regular and of bigger size (refer to copy of layout attached to report).

To convey runoff across Erf 12403 to above 450mm dia culvert an open earth trench of some 2m x 1m has been provided. The trench is routed along the Eastern and Southern sides of the property, i.e. over 800m long distance with practically no fall and is totally overgrown.

Drainage of runoff onto Erf 12403 is a catchment of some 12 hectares, i.e. Hunters Estate, with at least 9 x storm water outlets of size between 300mm dia and 750mm dia. The side drain along Marlin Road does not drain towards the lagoon as with Howard Street, Vigilance Drive, etc and 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 Rex and Vigilance Drive, i.e. triple 900 x 450mm box culverts. This road runoff then add to the runoff having to be conveyed across Erf 12403 to the single 450mm dia culvert.

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

- Future Proposed Drainage : The existing stormwater drainage ways once re-shaped and rehabilitation between the engineered filled platform areas will ensure effective conveyance across the property from North to South. Large stormwater retention pond is planned which will, during storm conditions allow for slow velocity and controlled ponding.

Upgrade of culvert size under Rex Drive from 450mm dia to at least 1500 x 900mm box culvert size will be required. However, this upgrade should rather be done at the Knysna Golf Course where the existing culverts are also undersized, but the invert level is some 700mm lower and outlet to the lagoon wider and deeper. Thus connection to and upgrading of the drainage system of the golf course is proposed, while retaining the present 450mm dia pipe in the South West corner to maintain the estuarine wetland in that area.

Note, during periods of exceptional high tide, the culvert under Rex Drive will be submersed, thus dictating the water level in the rehabilitated wetlands on the property. This situation will be the same as the rest of the culvert outlets along Rex Drive and elsewhere along the Knysna lagoon.

- Detailed planning : Concentration of street run off to be limited by diverting to suitable open area, as much as possible thus retaining natural storage of catchment area. Intention should be to allow runoff as much as possible to percolate into underground aquifer to assist plant growth, etc.
- Run off control : Silt traps, silt screens, at suitable locations to prevent erosion, siltation during and after construction.

## ACCESS AND ROADS TO ALTERNATIVE “4”

Refer also to study by Messrs ITS

- Access to development : From the town centre access to the property is along Main Road and Rex Drive, with intersection upgrade as per Specialist Traffic Engineer specifications if required.
- Internal Streets : Street permanently surfaced to accommodate the developments traffic volume, road gradients, etc. with road width between 6m and 3m. Passing bays, turning circles at cul de sac ends, parking areas, etc to be provided to suit service vehicles etc. Also sidewalks and pedestrian pathways will be provided to suit pedestrian circulation.
- Geotechnical : Geotechnical investigation showed predominant silty sand material on the property below the approximately 300mm topsoil layer. The recommendation for roadworks are selected subgrade (G7 type material) in compacted layers to 500mm overall thickness, where after subbase gravel (G5 type material) of 150mm with brick paving or similar road surface layer.

Level of ground water table on site from the trial holes was found to be average of 1,400m below natural ground level.

.....  
Gerrit Nieuwoudt Pr Ing  
For Nieuwoudt & Kie

.....  
Date



N PERRING

11 September 2006

Nieuwoudt & Co.  
P O Box 998  
KNYSNA  
6570

Dear Sir

**SERVICES FOR PROPOSED REZONING OF ERF 12403 KNYNSNA**

With reference to the proposed development on erf 12403 Knysna, it is confirmed that Knysna Municipality has sufficient raw water reserves to supply water for the development. Knysna Municipality is also currently extending the Water Treatment Works which when completed during 2006 will have the capacity to provide potable water for the development. If the local water reticulation network or reservoir storage is required to be extended this will be the subject of the services agreement between the developer and the Municipality. It is expected that water demand management principles will be applied to the development in the approval conditions.

With reference to the capacity of the Municipalities Sewerage Treatment Works it is confirmed that there is sufficient capacity to accommodate the development and planning is underway to provide additional capacity at the existing works site when required. As with water any upgrading of the local sewer network to accommodate the development will be the subject of the services agreement between the developer and the Municipality.

The improvements to the George Rex Drive, Main Road (N2) intersection are being considered by the Council and SANRAL as part of the N2 Bypass project. The proposed development will be considered in these improvements.

It is trusted that the foregoing meets your purpose.

Yours faithfully



N PERRING

**DIRECTOR TECHNICAL SERVICES**

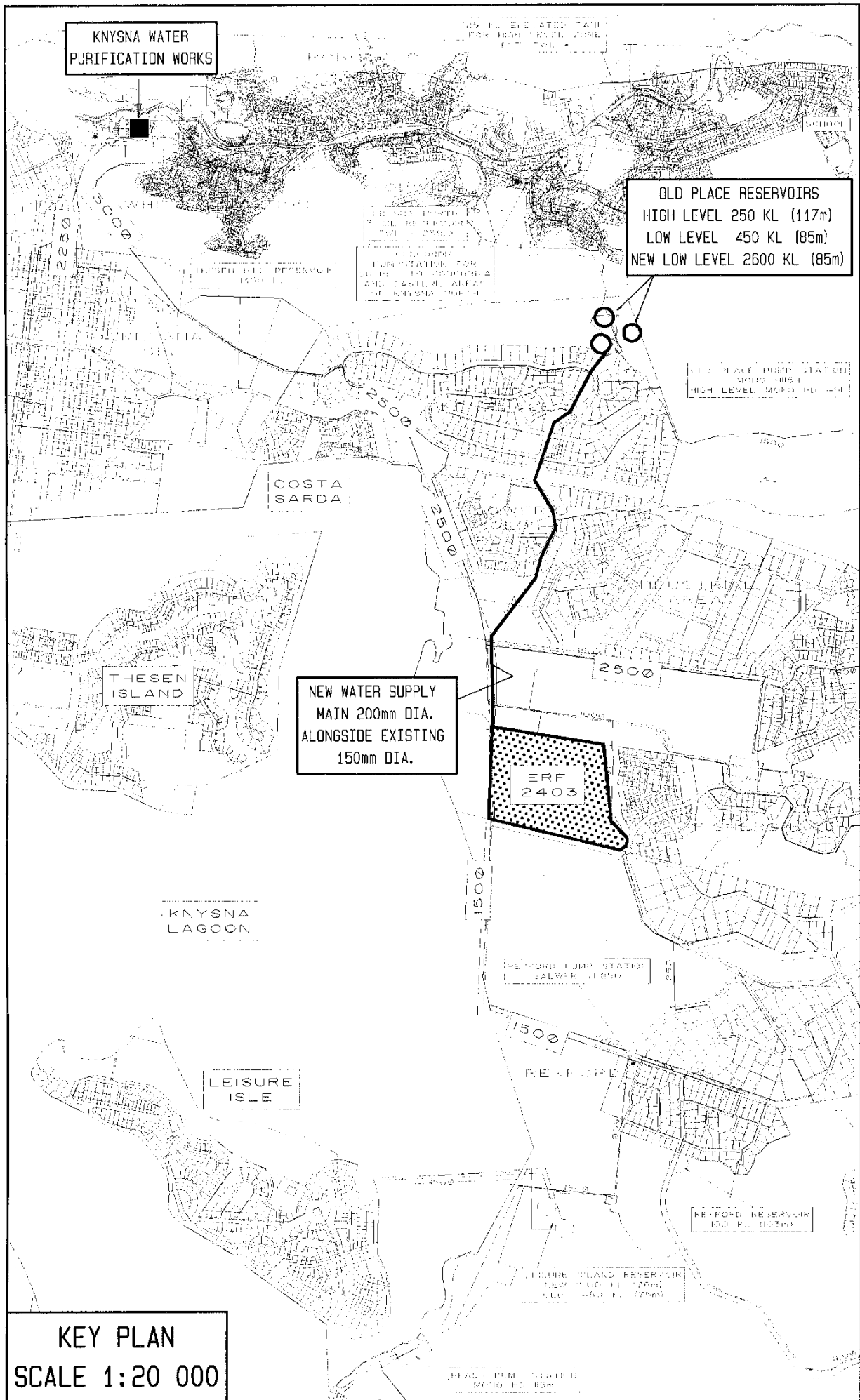
cc CMAI Dr Chris Mulder

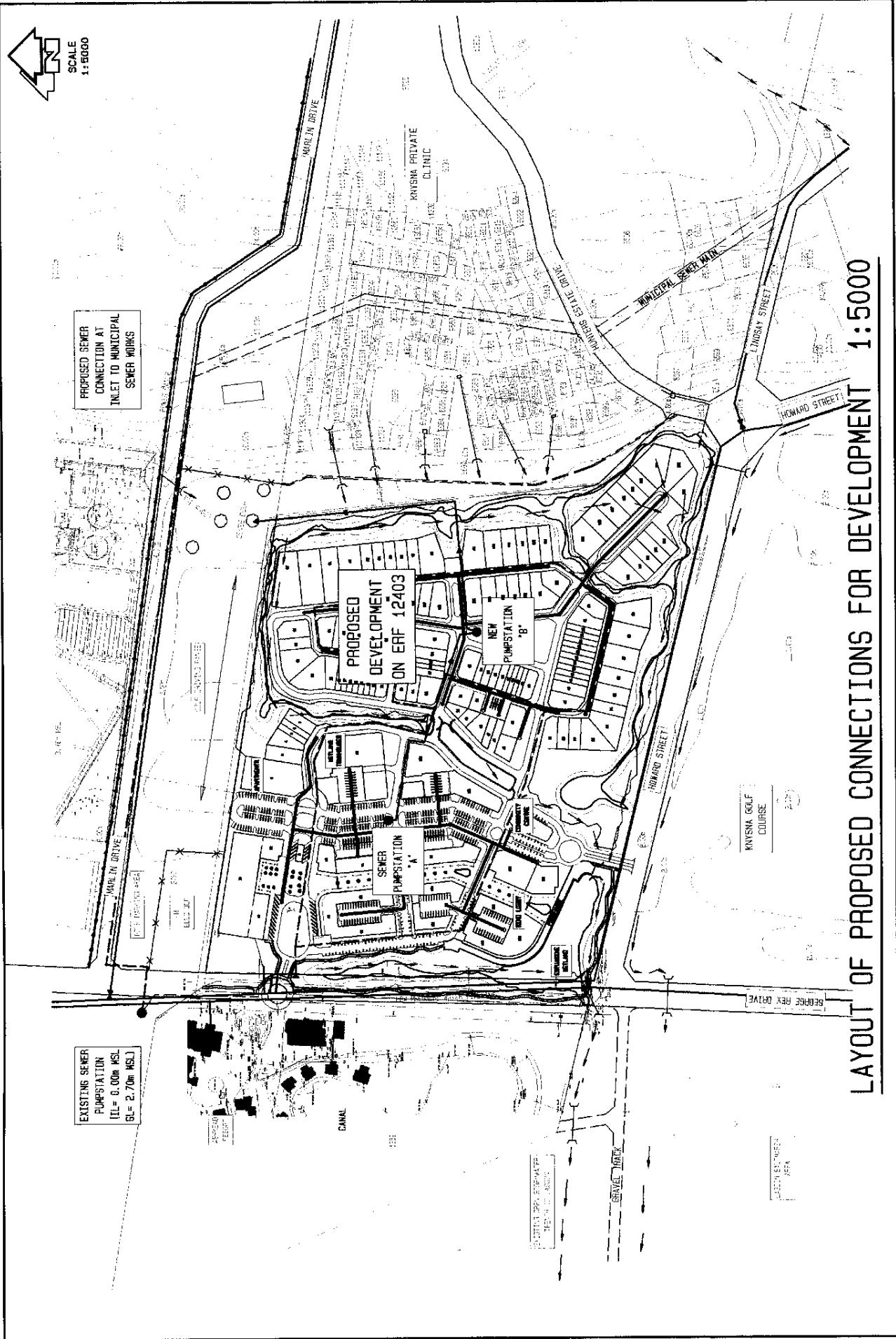
**COMMENTS ON ISSUES RAISED BY I.A.P.**

Based on our investigation and evaluation of the situation, our comment on the issues identified by the Interested and Affected Parties can be summarized as per table below :-

<b><u>Main issues identified by I.A.P.</u></b>	<b><u>Comment or Mitigation on Main Issues</u></b>
1. <u>Stormwater and / or Flooding</u>	<p>Development layout allow for existing drainage ways to be retained between and around the engineered filled platform areas, which once upgraded, will improve conveyance across the property.</p> <p>Also upgrading of culverts under Rex Drive will improve draining of area to the lagoon and allow for controlled ponding in retention pond area to be provided on the property as part of the upgraded stormwater system.</p>
2. <u>Water and Infrastructure</u>	<p>Municipality has confirmed that sufficient raw water reserves is available and currently waterworks are being extended to cater for the total pump supply capacity ( refer to letter from Town Engineer dated 11/09/2006).</p> <p>Additional reservoir storage and supply main capacity will be provided for by the development as part of a services agreement to be concluded.</p> <p>Augmentation levy for new stands, based on Standard Council Tariffs and Charges totaling R22,000 + VAT per equivalent erf for water supply, will be applicable to the development to ensure that the supply to existing users in Knysna is not compromised.</p>
3. <u>Sewerage and Infrastructure</u>	<p>Municipality has confirmed that sufficient capacity is available at the sewerworks to accommodate the development and that planning is underway to provide additional capacity when required (refer to letter from Town Engineer dated 11/09/2006). Upgrading of sewer network to accommodate the development will be subject to services agreement between developer and Council.</p> <p>Augmentation levy for new stands based on Standard Council Tariffs and Charges totaling R9,080 + VAT per equivalent erf for sewer disposal will be applicable to the development to ensure that the supply to existing users in Knysna is not compromised.</p>
4. <u>Suitability to build on</u>	<p>Geo technical investigation and report by experienced geotechnical engineer with testing and ground profiling by civil engineer laboratory was undertaken, which confirm suitability for founding of both roads and buildings.</p> <p>Note that consolidation of structures built on uniform founding material on flat ground, i.e. not on a “cut to fill” platform, is generally even which limit tendency for differential settlement cracking.</p>







SCALE  
1:5000

PROPOSED SEWER  
CONNECTION AT  
INLET TO MUNICIPAL  
SEWER WORKS

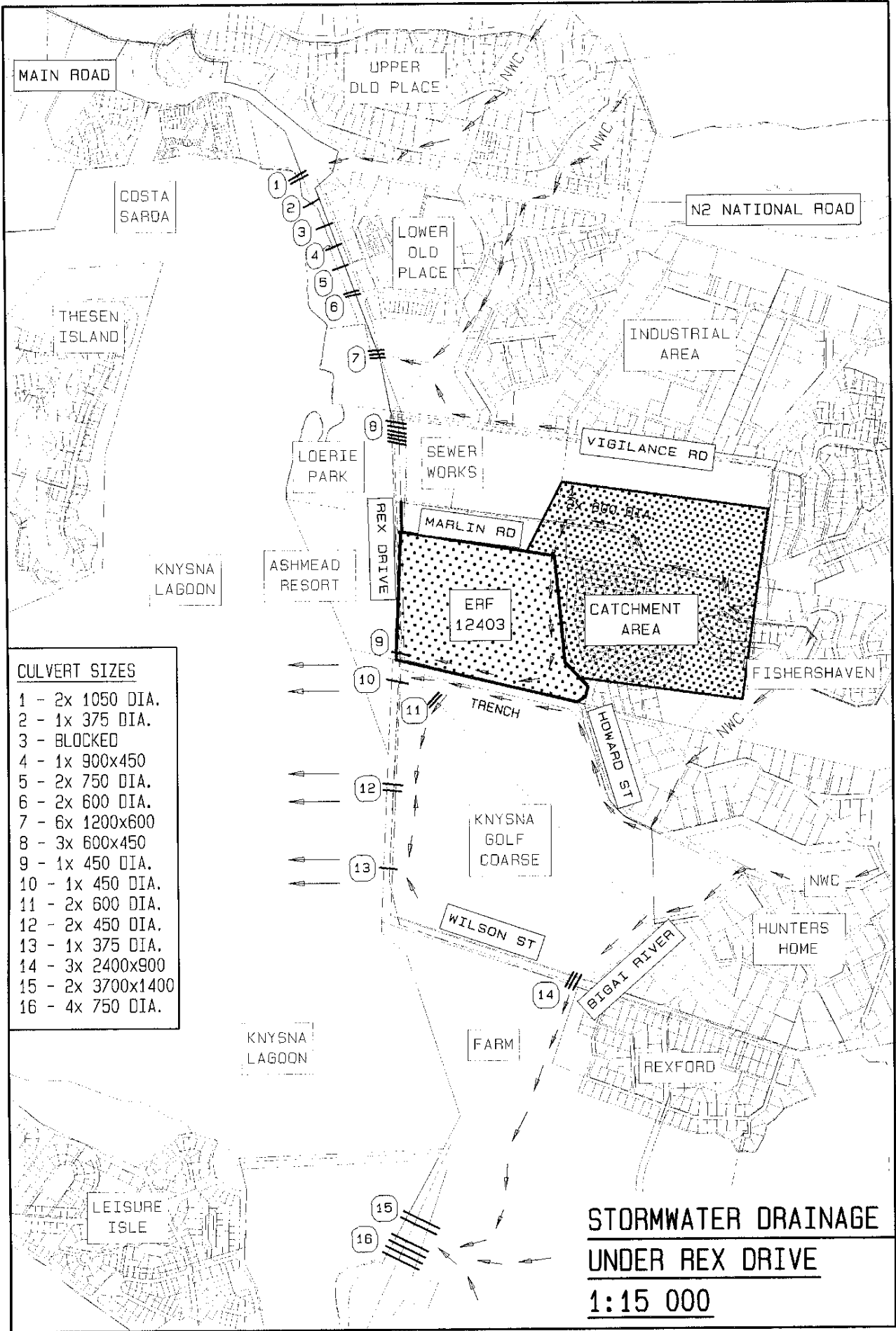
PROPOSED  
DEVELOPMENT  
ON ERF 12403

NEW  
PUMPSTATION  
'B'

SEWER  
PUMPSTATION  
'A'

EXISTING SEWER  
PUMPSTATION  
(TL= 0.00m NSL)  
(BL= 2.70m NSL)

LAYOUT OF PROPOSED CONNECTIONS FOR DEVELOPMENT 1:5000



**CULVERT SIZES**

- 1 - 2x 1050 DIA.
- 2 - 1x 375 DIA.
- 3 - BLOCKED
- 4 - 1x 900x450
- 5 - 2x 750 DIA.
- 6 - 2x 600 DIA.
- 7 - 6x 1200x600
- 8 - 3x 600x450
- 9 - 1x 450 DIA.
- 10 - 1x 450 DIA.
- 11 - 2x 600 DIA.
- 12 - 2x 450 DIA.
- 13 - 1x 375 DIA.
- 14 - 3x 2400x900
- 15 - 2x 3700x1400
- 16 - 4x 750 DIA.

**STORMWATER DRAINAGE  
UNDER REX DRIVE  
1:15 000**