APPENDIX C – ENGINEERING REPORT

GEORGE MUNICIPALITY

PROJECT 20 (5): UPGRADING THEMBALETHU BULK SEWER – PHASE 3 AND 4

CONCEPT & VIABILITY REPORT

REPORT NO: 1762: REV NO. 2

22 JULY 2024

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GEORGE MUNICIPALITY

PROJECT 20 (5): UPGRADING THEMBALETHU BULK SEWER – PHASE 3 AND 4

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29 NOVEMBER 2024

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GEORGE MUNICIPALITY

PROJECT 20 (5): UPGRADING THEMBALETHU BULK SEWER – PHASE 3 AND 4

CONCEPT & VIABILITY REPORT

REPORT NO: 1762 REVISION 3

29 NOVEMBER 2024

1. INTRODUCTION

1.1 BACKGROUND

The purpose of this Concept and Viability Report is to establish George Municipality's requirements and preferences for the concept design for the upgrading of bulk sewer mains in Thembalethu in support of the Upgrading of Informal Settlements Programme (UISP). The Phase 3 and 4 bulk sewer mains are required to accommodate upstream flow as well as future housing developments to allow fully serviceable sites and the implementation of formal housing units in the identified areas. The proposed bulk sewer forms part of the overall bulk sewer upgrades required in Thembalethu as part of the Sanitation Master Plan.

The Municipality is placed under strain when dealing with the operation and maintenance of these sewerage systems due to constant blockages by foreign matter, not only causing a financial burden but resulting in environmental spillages and increased operation and maintenance requirements. The informal areas within Thembalethu currently do not have waterborne sanitation systems and a portion of this project will address these services allowing formal development of the area by extending the current bulk network to include areas that can easily be connected to the existing sanitation infrastructure. The existing upstream bulk sewers and pump stations will be utilised, where possible sewage will be conveyed through the new bulk sewer Phase 3 and 4 to the Outeniqua Waste Water Treatment Works (WWTW).

The bulk sewer will be implemented in a phased approach subject to available funding.

1.2 TERMS OF REFERENCE

George Municipality has appointed Lukhozi Consulting Engineers (Pty) Ltd as their professional engineering service provider for the Upgrading of Thembalethu Bulk Sewer Phase 3 and Phase 4.

The scope of services under the appointment is outlined below:

- Inception, concept design, detail design, documentation & procurement and implementation of Thembalethu Phase 3 and 4 bulk sewerage Infrastructure.
- Advise on criteria that could influence the project life cycle cost significantly.
- Provide the necessary information within the agreed scope of the project to other consultants involved.

- Provision of additional services required to develop and implement the project including construction monitoring.

1.3 PURPOSE OF THE REPORT

The purpose of this report is to provide details pertaining to the concept and viability planning, design, and implementation of Thembalethu Bulk Sewers- Phase 3 and 4.

This report outlines the recommended levels of services to be installed in conformance with the minimum design standards and requirements and, serves to establish the design criteria to be applied to the project.

1.4 PROJECT TEAM

The parties listed below will be involved in the planning, design and implementation of this project.

Employer ..... George Municipality (GM)
Consulting Engineer ..... Lukhozi Consulting Engineers Pty (Ltd)
Geotechnical Engineers ..... Outeniqua Geotechnical Services
Engineering Surveyors ..... Joubert & Brink Surveys (Pty) Ltd
Health and Safety Agents ..... Xaks Consulting
Environmental Assessment Practitioner (EAP) ..... Cape EAPrac

Refer to **Annexure A** – project organogram, for details of the Professional teams' members.

2. SITE DETAILS

2.1 LOCALITY

Thembalethu is located within the jurisdictional boundaries of George Local Municipality of the Western Cape Province.

Coordinates of the centre of the area are 34°0'39.94" S & 22°28'38.70" E.

Access to Thembalethu is obtained via the Thembalethu interchange on the N2 national road from Knysna to Mossel Bay. The site spans along the western boundary of Thembalethu along the Schaapkop River. Access to the site is via Nelson Mandela Boulevard and residential roads, where available.

Refer to locality plan in **Figure 1** below.

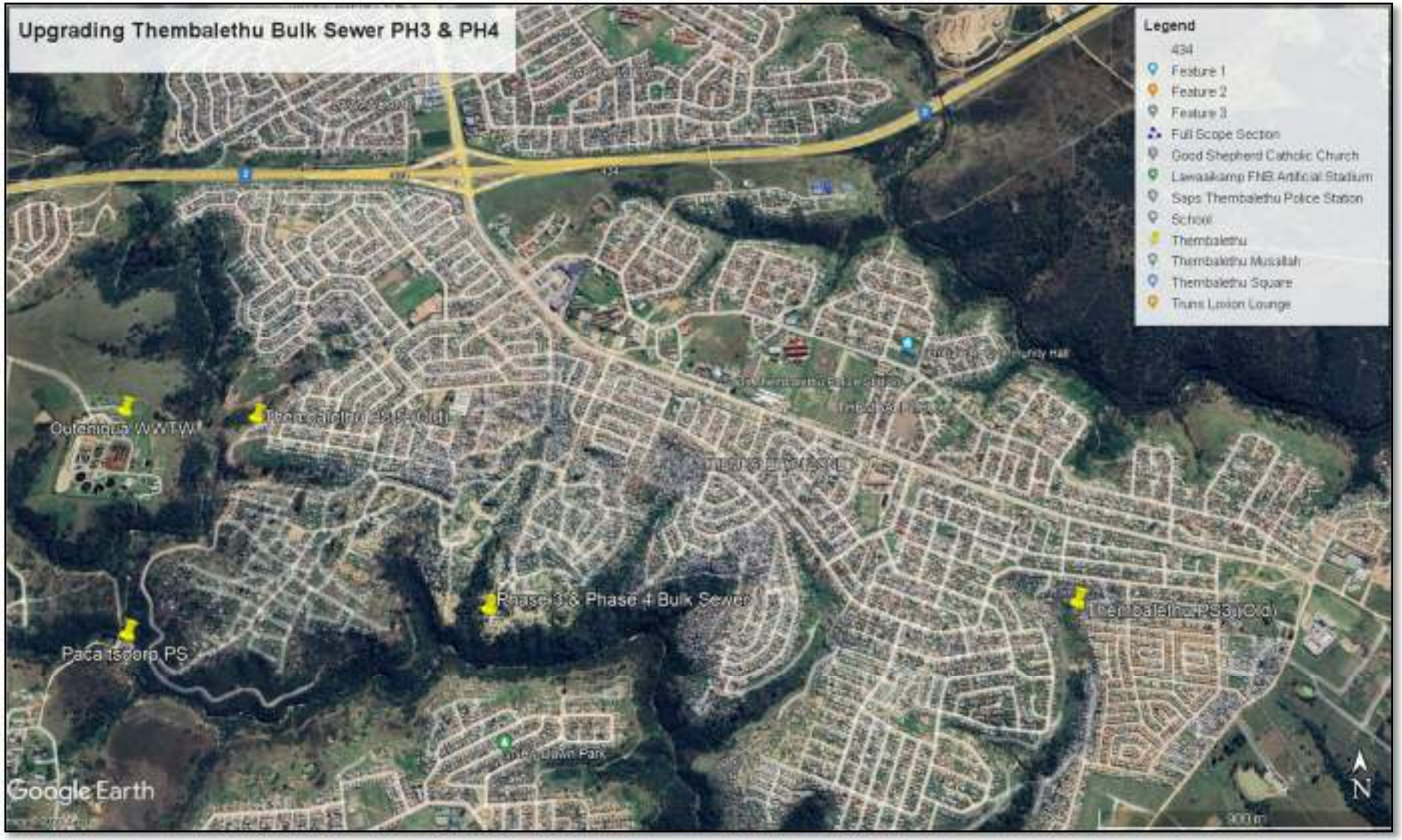


Figure 1: Locality of the planned Phase 3 & Phase 4 bulk sewer and decommissioned Thembalethu pump station no. 3

2.2 ENGINEERING SURVEY

Joubert and Brink Surveys were appointed as the engineering surveyor for this project. A LiDAR and Topographical survey were performed for areas being considered under the Thembalethu Bulk Sewers- Phase 3 and 4 scope of works. The engineering survey was completed, and the final information supplied to Lukhozi on 20 November 2023 and has been used in the concept & viability design.

2.3 GEOTECHNICAL INVESTIGATION

Outeniqua Lab and Geotechnical Services were appointed as the geotechnical engineering sub-consultant for this project. A geotechnical site investigation and report was prepared and submitted for areas being considered under the Thembalethu Bulk Sewers- Phase 3 and 4 scope of works. This is required to focus on identifying potential hazards, defining ground conditions, and offering detailed soil profiles and groundwater occurrence. The geotechnical site investigation was completed in December 2023 and the provisional soil test data was supplied on 14 December 2023. The final soil test and report was submitted on 1 February 2024. A copy of the geotechnical report is attached as Annexure B to this report.

Early indications from the soil test data show that the area will be suitable for the installation of sewers, with soils generally expected to be classified as ‘soft excavation’ over the majority of the route. Some trench shoring may be required in isolated areas with poor soil stability and dewatering of marshy areas may also be needed. These specifics will be confirmed through field and laboratory testing which will form part of the detailed geotechnical investigation report.

2.4 ENVIRONMENTAL INVESTIGATION

An Environmental Assessment Practitioner (EAP), Cape EAPrac, has been appointed to assess the Thembalethu Bulk Sewers- Phase 3 and 4 scope, and commence with the application to the Department of Environmental Affairs & Development Planning (DEA&DP), necessary permit/s with Department of Forestry, Fisheries and the Environment (DFFE) and necessary Water Use License Authorisation (WULA).

An existing environmental authorisation is in place for the implementation of various sanitation infrastructure in Thembalethu, including the Phase 3 & 4 bulk sewers. However, any change to the scope or alignment of the authorisation will require amendment.

The EAP, fresh water ecologist and other specialists undertook a site inspection on 1 November 2023, to determine the environmental sensitivity in relation to any potentially concerning environmental features.

CAPE EAPrac completed the Notice of Intent (NOI) and submitted it to the DEA&DP on 1 December 2023. A feedback letter with respect to the NOI letter was received from DEA&DP on 26 January 2024. The Department indicated that a Part 1 amendment to the existing Environmental Authorisation (EA) can be applied for if the proposed amendment will not change the scope of a valid environmental authorisation, nor increase the level or nature of the impact, which impact was initially assessed and considered when an application was made for an environmental authorisation; or relates to the change of ownership or transfer of rights and obligations. They further indicated that since the

proposed amendment (i.e. this Phase 3 & 4) will change the scope of the authorisation (i.e. new pipeline route not currently in the authorisation), regardless of what the reason is, a Part 1 amendment process cannot be followed for this change. DEA&DP is therefore of the opinion that a Part 2 amendment should be applied for instead.

Further environmental investigation and specialist studies will proceed as required by DEA&DP and a Part 2 amendment which will identify any environmental concerns that may affect the implementation of the Thembalethu Bulk Sewers- Phase 3 and 4 scope. This will be further addressed as the detail design stage will proceed.

Necessary adjustments to the designs will be made based on the final findings of the Basic Assessment if required.

3. SCOPE OF WORKS

3.1 PORTION 2

The Phase 3 and Phase 4 bulk sewers will serve the following areas that will tie into an existing 250mm Diameter bulk sewer line, situated south and south-east of the UISP Areas 5 & 6A and will gravitate to the existing Pacaltsdorp Sewer Pump Station 1. This pump station transfers the sewage to the Outeniqua WWTW, see Figure 2 below. This scope of work is seen as Portion 2.

During the detailed design stage it will be determined if the existing 250mm diameter bulk sewer line requires an upgrade to accommodate the new bulk sewer that will service Phase 3 and Phase 4 internal sewers.

Table 1: Portion 2 Estimated Bulk Gravity Sewers per concept design

Phase	Area	Anticipated Length	Planned Pipe Dia
3	Area 2 and the remainder of the bulk services required to fully service Area 5, 6A and 6B	Approx. 1460m	200mm (160mm was the proposed diameter per the Municipality's project appointment. This diameter is regarded as too small for bulk sewer reticulation for this area due to the small hydraulic loading and the nature and characteristics of the sewage)
4	Old All Brick Quarry Area	Approx. 970m	
Total estimated length of Planned Bulk Gravity Sewer		**2 430m**	

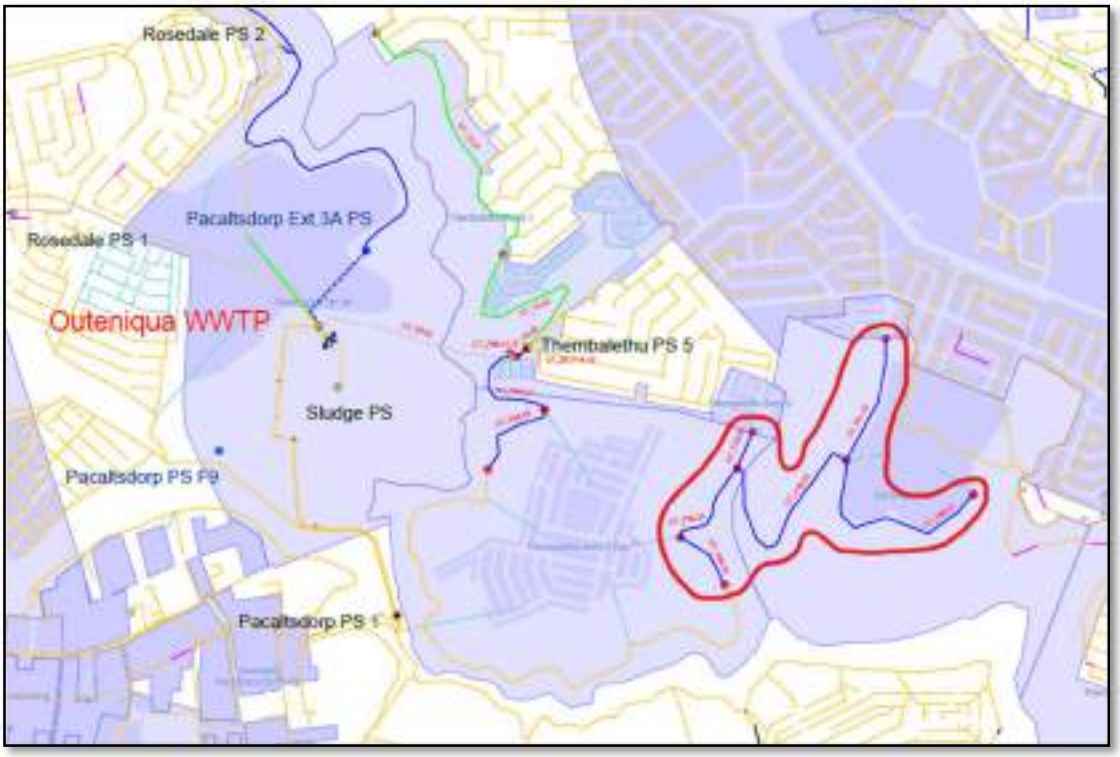


Figure 2: Portion 2 - Phase 3 and Phase 4 gravity bulk sewer (Outlined in red)

3.2 PORTION 1

A portion of the existing gravity sewer near the old, decommissioned Thembalethu sewer pump station no. 3 must be connected to the existing gravity sewer network to the western embankment of Ward 21 existing bulk sewer. This portion of the work is situated east of the planned Phase 3 and Phase 4 bulk sewer lines, but in totality creates the western bulk sewer line. Refer to Figure 3 below.

This portion of the scope of construction works will include the following as a minimum:

- Sewer connection to existing gravity sewer
- Stream crossing
- Construction of associated manholes
- Bulk earthworks and stabilization of erosion donga
- Stormwater crossing for future draining of Siyabulela and Eluxolweni Streets.

This scope of work is currently under construction, as part of T/ING/008/2020: The Appointment of Ad-Hoc Civil Engineering Contractors for a period of three years.

Table 2: Portion 1 Estimated Bulk Gravity Sewers per concept design

Portion	Area	Anticipated Length	Planned Pipe Dia
1A	Ward 9	316 m (200 mm Dia) 50 m (355 mm Dia)	200 mm and 355 mm Dia as per the existing pipeline with steeper falls of minimum 1 in 150
1B	Ward 21	120 m (355 mm Dia)	355 mm Dia as per the existing pipeline with steeper falls of minimum 1 in 150

Portion	Area	Anticipated Length	Planned Pipe Dia
Total estimated length of Planned Bulk Gravity Sewer for Portion 1		**486m**	

Legend:
Existing bulk sewer with poor gradient
New bulk sewer with min fall 1 in 150

Figure 3: Portion 1A&B Ward 9 & Ward 21 existing bulk sewer upgrade

4. WAYLEAVE APPLICATION STATUS

Planning wayleave applications to be submitted where applicable. Table 3 below indicates the status and outcome of each application.

Construction wayleaves will be applied for prior to commencing with construction by the applicable contractor/s.

Table 3: Wayleave Application Status

Service Provider	Service Affected	Comments
George: Electricity Department	Yes	Must be notified 5 days prior any construction. Electrical Representatives to inspect area prior excavation. Form to be filled out.
George: Civil Engineering Services	Yes	Sewer and water affected.
George: Environmental Services	Yes	Check if yellow woods or other protected trees will be in the way of new bulk sewer.

5. SUB-CONSULTANTS AND SPECIALIST SERVICE PROVIDERS

5.1 HEALTH AND SAFETY INVESTIGATION

George Municipality has appointed Xaks Consulting as the H&S Agent on 24 May 2023 for this project and will be involved during all required stages of the project.

The Health and Safety Agent is required to:

a) Attend design meetings.
b) Prepare baseline risk assessment and site-specific health and safety specification. A draft of the baseline risk assessment and site-specific health and safety specification was completed on 14 August 2023. This baseline risk assessment and site-specific health and safety specification will have to be reviewed and finalised during the compilation of the tender document for construction for portion 2.
c) Review the bill of quantities to confirm there are sufficient items and acceptable quantities and pricing prior to and post pricing.
d) Evaluate and approve the successful Contractor's Health and Safety Plan, which will be prepared in response to the risk assessment and specification.
e) Prepare and apply for a Construction Work Permit if required.
f) Attend monthly site meetings and perform monthly audits (minimum two site visits per month).
g) Prepare and submit monthly Health and Safety audit reports.
h) Manage the Contractor's compliance with his Health and Safety Plans, the Health and Safety Specifications and the OHS legislation.
i) Prepare and submit a Health and Safety close-out report on completion of both construction contracts.
j) Accept the duties and responsibilities of the Client as set out in the Construction Regulations.

6. CONCEPT DESIGN CRITERIA

6.1 STANDARDS APPLIED

The following references will be used for the design of the sewerage reticulation network:

- The Neighbourhood Planning & Design Guide: Section K - Sanitation (Red Book 2019)
- SANS 10400-P: Drainage
- George Municipality Civil Engineering Services: Civil Engineering Standards & Requirements for Services (Updated January 2009)

6.2 SEWER FLOW

The Instantaneous Peak Wet Weather Flows (IPWWF) for each of the drainage areas have been calculated using the sewer flow and peak factor method contained in section K.4 of the Human Settlements Planning and Design Guidelines (Red Book 2019). The following was allowed for in the design.

• Unit Hydrographs	:	UH 4	(PDDWF)
• Peak factor	:	2.0	(IPDWF)

- Groundwater infiltration rate : 0.03 (l/min/m/m Ø)
- Allowance for stormwater ingress : 50 % (IPWWF)

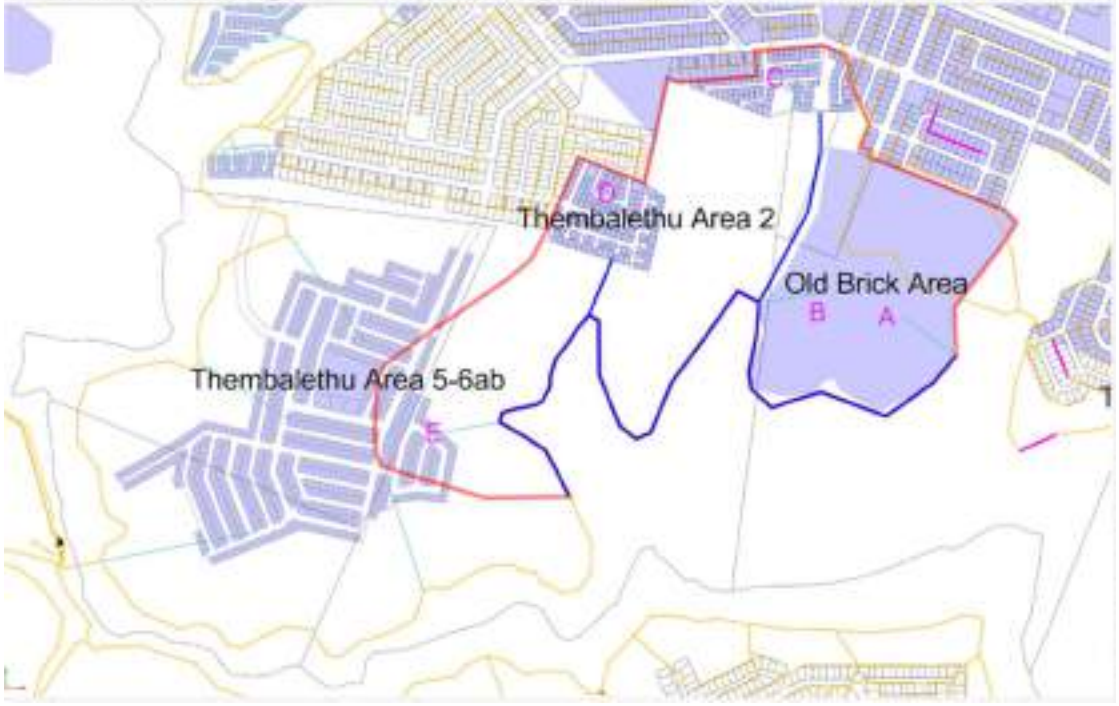
Refer to **Annexure C** attached to this Report for the design flow calculations for the bulk sewer as determined by Lukhozi.

6.2.1 Future Development flows

Table 4 provides a summary of the accumulated flows per drainage areas to a collection point that will drain via the proposed bulk sewers titled phase 3 and 4 in Thembalethu from the recent Sanitation Master Plan.

Table 4: GLS Design flows for Phase 3 and 4

Point	Future Development	Link Code	Portion	Landuse	Units	AADD (kL/d)	PDDWF (kL/d)	MP Design Flow (L/s)
A	Old Brick Area	FG_1120	50%	Low cost housing, very high density (G&W)	206	80,1	78,8	2,0
B	Old Brick Area	FG_1127	50%	Low cost housing, very high density (G&W)	206	80,1	78,8	2,0
C	Thembalethu Area 2	FG_0021	50%	Low cost housing, high density (G&W)	125	55,6	53,4	1,3
D	Thembalethu Area 2	FG_0035	50%	Low cost housing, high density (G&W)	125	55,6	53,4	1,3
E	Thembalethu Area 5-6ab	FG_0030	16%	Low cost housing, high density (G&W)	152	67,3	64,7	1,6



In accordance with the sanitation master plan, the theoretical design flows of the gravity sewer is indicated in **Table 5** below.

Table 5: GLS latest design flows for Phase 3 and 4

Drainage_Area	Model_Type	MP_Item_Type	MP_Item_No	Project_No	Project_Description	MP_Description	Design_Flow	Design_Flow_Unit
Outeniqua WWTW	Gravity	PM	OT_F81.00	RET_OT_060	Construct Thembalethu (2) outfall sewer	New Gravity	1.35	L/s
Outeniqua WWTW	Gravity	PM	OT_F82.00	RET_OT_060	Construct Thembalethu (2) outfall sewer	New Gravity	1.32	L/s
Outeniqua WWTW	Gravity	PM	OT_F99.01	RET_OT_061	Construct Old Brick Area outfall sewer	New Gravity	2.03	L/s
Outeniqua WWTW	Gravity	PM	OT_F99.02	RET_OT_060	Construct Thembalethu (2) outfall sewer	New Gravity	5.41	L/s
Outeniqua WWTW	Gravity	PM	OT_F99.03	RET_OT_060	Construct Thembalethu (2) outfall sewer	New Gravity	6.76	L/s
Outeniqua WWTW	Gravity	PM	OT_F99.04	RET_OT_060	Construct Thembalethu (2) outfall sewer	New Gravity	8.37	L/s

From the design flow calculations, as indicated by GLS, it can be seen that the future design flows are in the order of 1.3 to 2.0 l/s for the various areas with a maximum total design flow of 8.2l/s to 8.4 l/s. The design flow calculations as determined by Lukhozi (including an additional 50% stormwater infiltration) are in the order of 2.04 l/s to 6.75 l/s with a maximum total design flow of 13.5 l/s. The design flows are higher than the calculations as seen on the master planning reports, however this is mainly due to the stormwater infiltration, of 50%, designed for by Lukhozi. When working on an average stormwater infiltration rate of 15% the flows compare closer with the flows as calculated by GLS i.e. in the order of 1.96 l/s to 5.2 l/s with a maximum total design flow of 10.35 l/s. We find the flow rates determined by GLS, considering the actual extensive stormwater infiltration in George, as insufficient. It is necessary to determine the peak flow when sizing the proposed bulk sewer infrastructure and we therefore recommend the maximum design flow rate of 13.5l/s, as calculated by Lukhozi, be used for design purposes.

6.3 SEWERS

6.3.1 Bulk Sewer

The bulk sewers will be installed at an absolute minimum gradient of 1 in 150 per the Municipality's requirements.

The site is not a "greenfield" site since there are informal dwellings that exist along most of the planned bulk sewers proposed route. It can therefore be classified as "brownfield" site. This will mean some informal dwellings will have to be moved to temporary positions during construction to enable the installation of the bulk sewer pipelines as can be seen on the concept design layouts attached to the report. Refer to Annexure D. The exact scope of dwellings to be relocated is unknown and will be determined during detail design and the construction stages.

In addition to the extend of the informal dwellings that are restricting access and construction, benching of steep sloped areas will be required to allow access, and create workable platforms and allow maintenance of the bulk sewer pipelines in future. Sufficient allowance will be made in the tender document to perform this activity ahead of construction. Reinstatement and rehabilitation will be required of all disturbed areas. See heading 6.3.5 of this report discussing the access requirements to construct the bulk sewer pipeline.

The proposed bulk sewers will be positioned along the boundaries of existing informal areas, to allow drainage of the areas below gradients of 1 in 25. However, it will not be possible to drain all the existing informal dwellings. Some of these dwellings are developed at embankments steeper than 1 in 25, where the Municipality does not allow formal development. It is recommended, that these dwellings also be relocated to formal areas as part of the Thembalethu Upgrading of Informal Settlement Programme(UISP) for the area, by the Housing Department.

Single lane stop and go traffic will be created during construction to allow residents access to their properties during the construction phase. The necessary Traffic Management Plan (TMP) and traffic accommodation allowances will be made in the tender document and Bill of Quantities (BoQ) for this. Re-instatement of existing roads, stormwater, water and sewer reticulation will form part of the works where required.

The anticipated length of bulk sewer and manholes to be constructed are indicated in Table 6 below.

Table 6: Summary of quantities

Phase	Estimated Sewer Pipe Length (m) / Dia (mm)	Estimated Manholes (No.)
3 (Pipeline A from SMH A34 to SMH A61 including pipelines B and C see drawings Annexure D)	Approx. 1460 (200mm Dia)	53
4 (Pipeline A from SMH A1 to SMH A34 see drawings Annexure D)	Approx. 970 (200mm Dia)	34
SUB-TOTAL: PORTION 2	**2 430**	**87**
Portion 1A	316m (200mm Dia) 50m(355 mm Dia)	11
Portion 1B	120m(355 mm Dia)	6
SUB-TOTAL PORTION 1	**486**	**17**
TOTAL	**2916**	**104**

6.3.2 Design

The bulk sewers are designed to the following standards:

- Minimum design pipe velocity : 0.7 m/s (design flows calculated velocities are between 0.7-1.5m/s)
- Maximum full pipe velocity : 3.5 m/s (0.8D full depth velocities are between 1.3-3.5m/s)
- Minimum cover to pipes : 1.0 m below finished road level 0.8 m below finished ground level.
- Maximum depth : 4.0 m below finished ground level
- Maximum manhole spacing : 80 m
- Minimum pipe size : 200 mm diameter
- Minimum Erf Connection size : 110 mm diameter
- Minimum gradient sewer main : 1:150 (per George Municipality requirements)
- Maximum gradient sewer main : 1:25

The sewerage reticulation will be designed according to the minimum diameters and gradients shown.

6.3.3 Pipe Materials

Sewer mains will be uPVC Class 34 heavy-duty solid wall complying with SANS 1601, with a pipe stiffness of 400 kPa and smooth inner and outer walls complete with integral sockets, joints, and rubber seal rings.

All fittings will comply with SANS 791.

6.3.4 Manholes

Sewer manholes are to be constructed using 1.0 m diameter precast concrete rings to depths in accordance with the designs and drawings. Manholes deeper than 1.5 m will be reduced to 0.75 m diameter precast rings up to a depth of 1.5 m and 1.0 m diameter precast rings for the rest of the depth. Heavy duty precast concrete type manhole cover and frames will be used for all manholes constructed in the roadways. The manhole cover for sewers with diameter 315 mm Diameter and below will be standard concrete manhole covers. The manhole cover for sewers with diameter above 355 mm Diameter will be specially made security concrete manhole covers to prevent the public from tampering with manholes.

Finished manhole cover levels will be flush with road level in roadways, 50 mm above finished ground level in road reserves and 500 mm above finished ground level in open spaces.

Precast manhole sections will comply with SANS 1294.

6.3.5 Access and maintenance gravel roads

The existing informal gravel access roads, where practically possible, will be used to develop the Thembalehtu Phase 3 and 4 bulk sewers. However, due to the topography of the Thembalethu Phase 3 and 4 with deep erosion areas, dongas etc as well as the minimum gravity falls required for the bulk sewer, new access from the existing informal access roads will have to be constructed to create access and platforms for construction of the new bulk sewer for Portion 2. This will be required along the whole length of the new bulk sewer alignment which mainly follows all along the low-lying contours of the Thembalehtu Phase 3 and 4 areas.

It is estimated that the construction width of average of between 8-15m will be required to construct these access roads and platforms. In extreme cases the construction width could be as wide as a maximum of 25m due to cutting into the disturbed informal areas. This will be created to prevent excessive fill of the undisturbed an existing vegetate areas along the gravity pipeline. To prevent extreme wide cutting into informal and disturbed embankments the construction of gabions and reno mattresses may be considered during construction to prevent erosion of these embankments. Storm water will have cross the access roads at positions where the access roads are in fill and at low points where the storm water will have to be discharged from the gravel access roads in a controlled manner by means of gabions and mattresses. This is to prevent erosion downstream of the roads and bulk sewer pipeline

The final access roads widths will be between 3.5-4.5m wide and will be used by the Municipality's maintenance team for routine maintenance of the bulk sewer in future. The details for these access roads are shown on the drawings found in Annexure D of this document.

6.3.6 Main stream crossings

Due to the topography of Thembalethu and Skaapkop River that flow at the foot hills, various minor and main streams commence within the settlement until it reaches the river.

Because the proposed new gravity sewer follows the lowest possible contour line to obtain maximum drainage, three(3) main stream crossings will have to be crossed and

accommodated in the design along the length of the bulk sewer pipelines. The sewer pipelines will have to cross these main stream crossings by means of sewer pipe bridges as indicated on the layout and long section drawings.

It is proposed that the main stream and/or river crossings be constructed with reinforced concrete bridge structures. The detail for these crossings is shown on the stream crossings and stormwater detailed drawings found in Annexure D of this document.

The reasons for proposing reinforced concrete bridge structures are as follows;

a) Concrete is renowned for its exceptional durability, with concrete exhibiting resistance to corrosion, fire, and external forces. They can withstand challenging environments and provide long-lasting service life, reducing maintenance and replacement costs.
b) Concrete possess excellent structural strength, enabling it to bear heavy loads and resist deformation under pressure.
c) Properly designed concrete mixes can be resistant to chemical attacks, such as sulphur or acidic substances, making them suitable for a wide range of applications, including sewer systems and industrial environments.
d) Concrete offers a reliable and cost-effective solution due to its longevity and minimal maintenance requirements. It requires fewer repairs and replacements compared to alternative materials, resulting in reduced lifecycle costs.
e) It is robust and will last for years as can be seen at other concrete pipe bridges in the Thembalethu area.
f) The bridge structure can be designed in such a way that the bulk sewer pipe can be safely supported within the concrete bridge structure with concrete lids supported over its entire length. This can protect the pipe against vandalism and also allow pipe replacement by removing the concrete lids with lifting equipment should maintenance be required in future.

Steel bridge structures were considered but are not recommended due to the following reasons;

a) Steel in the Thembalethu area is prone to vandalism and/or theft.
b) Steel is not resistant to chemical attacks where leaks can occur, such as sulphur or acidic substances, making them unsuitable for this installation.
c) The main disadvantage of steel bridges, compared to concrete, is that they corrode under the action of the atmosphere, easily rust, and have high maintenance costs, which are expensive in comparison to concrete bridge structures.
d) Steel bridges have design limitations, which can make them unsuitable for certain applications, such as long-span bridges and high-load bridges.
e) Some people may find steel bridges to be unattractive or visually intrusive, particularly in scenic or historic areas.
f) Steel bridges require ongoing maintenance and inspections to ensure their safety and structural integrity over the long term.

Pipe and/or rectangular culverts are proposed for the minor stream crossings. The detail for these minor crossings will also be designed during the detailed design stage.

6.3.7 Minor stream crossings

Due to the topography of Thembalethu and Skaapkop River that flow at the foot hills, various minor and main streams commence within the settlement until it reaches the river.

Because the proposed new gravity sewer follows the lowest possible contour line to obtain maximum drainage, various minor stream crossings will also have to be crossed and accommodated in the design along the length of the bulk sewer pipeline. At these various minor stream crossings, the sewer pipelines will have to be protected from being undermined or scoured away by stormwater by means of stormwater protection measures as indicated on the drawings.

Piping of stormwater is proposed above or below the new bulk sewer pipelines. The detail of these minor stream crossings is detailed under the drawings found in Annexure D of this document. The inlets and outlets to these stormwater piped structures will be protected by a combination of soil rip-rap, gabion baskets and reno mattresses where required, to prevent erosion. It is recommended that the exposed faces of these baskets and mattresses be protected by means of “shotcrete”/gunite from vandalism as well as theft experienced in the Thembalethu area.

6.3.8 Erf Connections

Erf connections (if/where required) will be constructed for each erf indicated on the drawings and will comprise of 110 mm uPVC pipe. Typically, erf connections extend 1.0 m into the erf boundary however, this is a brownfields project with established homes with concrete block boundary walls, fencing, retaining block walls etc. The Employer should therefore consider revising this standard to have the erf connection terminate just outside the boundary of the erf, to avoid any potential damage that may occur to this privately owned infrastructure.

Each erf will receive a single erf connection from the main sewer and where feasible, will be positioned in a manner that aligns itself with the existing sewers, septic / conservancy tanks (if any) to allow for ease of connection.

Female stop end pieces to be solvent welded to the ends of erf connection pipes after the required air testing has been carried out.

The locations of all sewer erf connections are to be marked with No. 8 gauge wire or 5mm Co-Polymer non-biodegradable rope. The wire/rope must be attached to a brick placed at the level of the upper end of the connection and is to extend 0.5 m above the ground.

7. INFORMATION TO BE PROVIDED

For the purposes of this project, Lukhozi Consulting Engineers will provide the following information:

7.1 CONCEPT AND VIABILITY STAGE

Preliminary design layout plans showing known existing services based on information gathered through desktop exercises and surveys together with an indication of the proposed works. Separate drawings have been created for each of the proposed work Portions.

Typical details pertaining to the sewer manholes, trench details, erf connections, bridge crossings, stormwater and road crossing details have been created.

The above drawings are included in **Annexure D** of this document.

8. PROCUREMENT STRATEGY

8.1 CONTRACTOR PROCUREMENT

To ensure the best possible standard of work during the implementation of this complicated project, it is recommended to procure a single Contractor with the highest CIDB grading possible linked to the value of the contract (a minimum 6 CE in this instance). This strategy will allow a high level of accountability, quality of work, and financial security during the implementation phase. Participation Goal requirements could then be achieved by securing various sub-contractors who would report to the main contractor.

Due to limited budget for funding of this project, the Employer may decide if the scope of works will be split the into separate contracts with each main contract being administered independently. This strategy attracts a higher risk of failure due to the inexperience and financial reserves of contractors with lower CIDB gradings.

Each of the contracts will be subject to the conditions set out below.

8.2 CONSTRUCTION CONTRACT

The construction contract will be prepared in accordance with the relevant legislation and George Municipality's supply chain management policy and will consist of the following:

- The format of the Tender / Contract will be prepared in accordance with George Municipality's standard tender document and checked for compliance with SANS10845.
- The contract will be advertised on the online tender bulletins with the relevant CE CIDB grading depending on the estimated value of construction and applicable newspapers.
- Preference scoring will be applied in accordance with the prevailing Preferential Procurement Policy at the time of tender.
- Functionality will be used as a prequalifying criterion.
- The form of contract will be the SAICE General Conditions of Contract for Construction Works, Third Edition, 2015.
- A re-measurable (Bill of Quantities) pricing strategy will be used.
- SANS1200 Construction Standards as amended will apply.

9. FINANCIAL

9.1 AVAILABLE BUDGET

The cost breakdown, provided in table 7 below, of the available budget is based on the provisional budget as previously provided by George Municipality as part of the project appointment. The costs are summarised in Table 7 below.

Table 7: Available Direct and Indirect Costs

ITEM	DESCRIPTION	PROVISIONAL BUDGET (R)
1	**Direct Construction Costs (Client's estimate) (Including Contingencies and Escalation)**	**R8 200 000.00**
2	**Indirect Costs**	

ITEM	DESCRIPTION	PROVISIONAL BUDGET (R)
2.1	Percentage Fee	R894 168.00
2.2	Construction Monitoring	R600 000.00
2.3	Sub-Consultants	R600 000.00
2.4	Reimbursable expenses	R0.00
2.5	**Total Indirect Costs**	**R2 094 168.00**
3	**TOTAL DIRECT + INDIRECT COSTS (EXCLUDING VAT)**	**R10 294 168.00**

9.2 FIRST ORDER ESTIMATE

The cost breakdown of the required budget is based on actual estimates for Portion 1 as well as first order estimates for Portion 2.

The estimate for Portions 1A&B is summarised in Table 8 below.

Table 8: Portion 1 - Estimated required Direct and Indirect Costs

ITEM	DESCRIPTION	PROVISIONAL BUDGET (R)
1	**Direct Construction Costs (EA's estimate) (Including Contingencies and Escalation. Excl. VAT)**	**R4 063 880.00**
2	**Indirect Costs**	
2.1	Percentage Fee	R447 467.00
2.2	Construction Monitoring	R274 428.00
2.3	Sub-Consultants	R200 000.00
2.4	Reimbursable expenses	R0.00
2.5	**Total Indirect Costs**	**R921 895.00**
3	**TOTAL DIRECT + INDIRECT COSTS (EXCLUDING VAT)**	**R4 985 775.00**

The first order estimate for Portion 2 (the main scope) are summarised in Table 9 below.

Table 9: Portion 2 - Estimated required Direct and Indirect Costs

ITEM	DESCRIPTION	PROVISIONAL BUDGET (R)
1	**Direct Construction Costs (EA's first order estimate) (Excluding Contingencies and Escalation)**	**R9 600 000.00**
2	**Indirect Costs**	
2.1	Percentage Fee	R908 068.50
2.2	Construction Monitoring	R550 000.00
2.3	Sub-Consultants	R400 000.00
2.4	Reimbursable expenses	R0.00
2.5	**Total Indirect Costs**	**R1 858 068.50**
3	**TOTAL DIRECT + INDIRECT COSTS (EXCLUDING VAT)**	**R11 458 068.50**

Note the direct cost for Portion 2 excludes;

i. Contingencies
ii. Contract Price Adjustment (CPA)

iii. The stream/river crossings via bridges and culverts as well as erosion protection structures required.
iv. Relocation of informal dwellings and “starter packs” housing etc.

9.3 CASHFLOW FORECAST

The estimated cashflow forecast for the required indirect and direct costs for the complete scope of work is summarised per financial year in Table 10 below.

Table 10: Cashflow Forecast

FINANCIAL YEAR	ESTIMATED INDIRECT EXPENDITURE (R)	ESTIMATED DIRECT EXPENDITURE (R)	ESTIMATED INDIRECT AND DIRECT EXPENDITURE (R)
2022/23	R22 354,20	R0,00	**R22 354,20**
2023/24	R1 756 000,00	R4 063 880,00	**R5 819 880,00**
2024/25	R1 001 609,30	R9 600 000,00	**R10 601 609,30**
TOTAL BUDGET (EXCLUDING VAT)	**R2 779 963,50**	**R13 663 880,00**	**R16 443 843,50**

10. CONCLUSION

In terms of the project brief, Lukhozi Consulting Engineers (Pty) Ltd is appointed as the Consulting Engineer to implement the Phase 3 & 4 Thembalethu bulk sewer which entails the installation of the bulk sewer manholes and related pipe bridge structures to drain the proposed future housing developments to allow fully serviceable sites and the implementation of formal housing units in the identified areas.

The designs have progressed sufficiently to allow for the completion of the concept and viability design report as per the relevant standards and specifications.

The potential additional sewer flow that will be added to the sewer network and wastewater treatment works from the ‘Phase 3 & 4’ project equates to 584.6 kl/day.

It is further recommended that the George Municipality:

- Confirm the funding availability.
- Approve this report and provide instruction to commence with the detailed design stage.

2024/11/29

KOENRAAD POTGIETER (Pr Tech Eng) **GREG TUCKER (Pr Eng, Pr CPM)**

PROFESSIONAL ENGINEERING TECHNOLOGIST **MANAGING DIRECTOR**

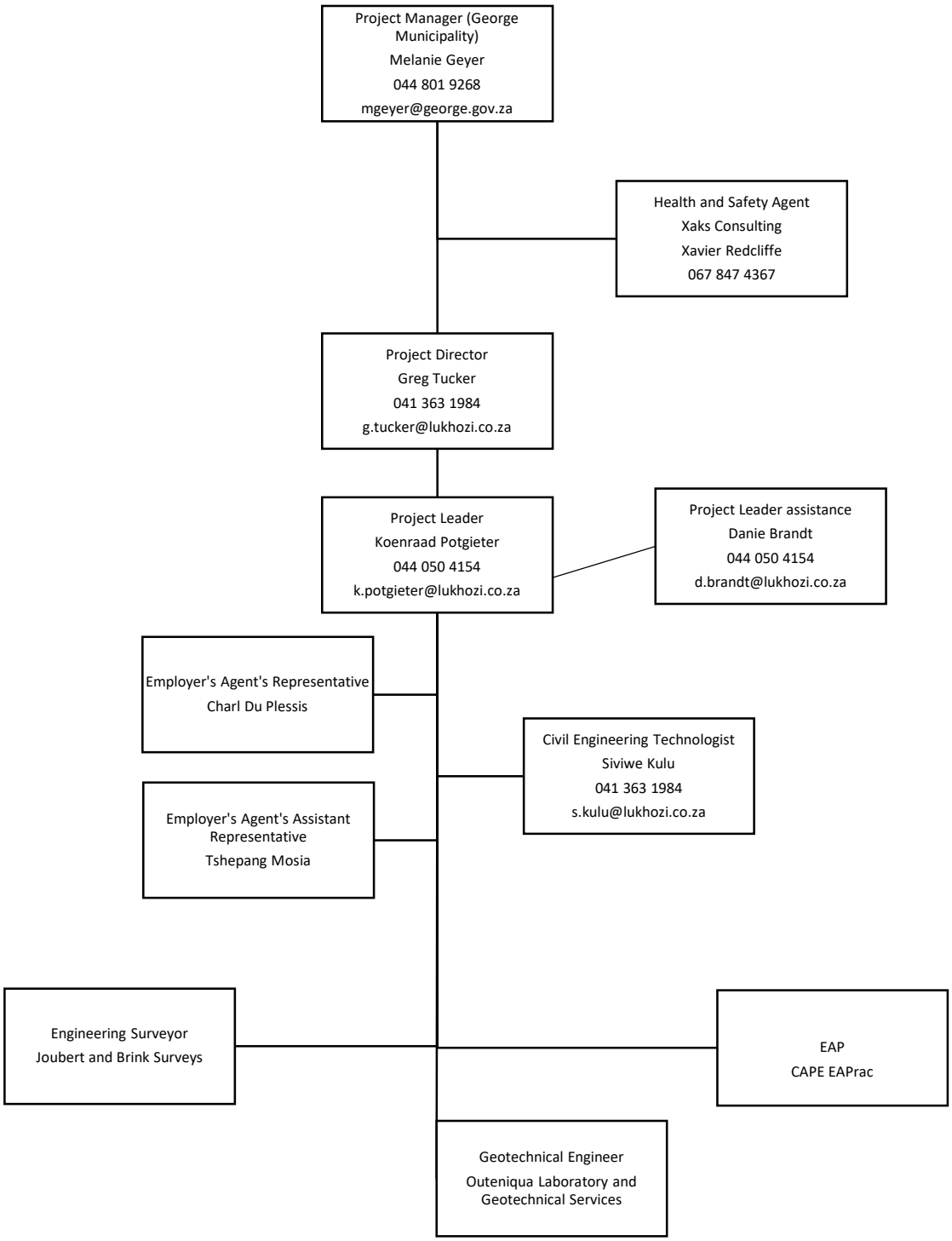
for **LUKHOZI CONSULTING ENGINEERS (PTY) LTD**

LUKHOZI CONSULTING ENGINEERS (PTY) LTD
8 St John's Street
St John's Place
Dormehlsdrift
GEORGE
6529
www.lukhozi.co.za
Tel: 044 050 4154

Date: 14 June 2024

ANNEXURE A

PROJECT ORGANOGRAM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Employer's Agent's Assistant Representative
Tshepang Mosia
Engineering Surveyor
Joubert and Brink Surveys
EAP
CAPE EAPrac
Geotechnical Engineer
Outeniqua Laboratory and Geotechnical Services

ANNEXURE B

GEOTECHNICAL REPORT

ANNEXURE C

SEWER DESIGN FLOWS

ANNEXURE D

DRAWINGS

DOCUMENT CONTROL SHEET

CLIENT: George Municipality

JOB NO: 1762

PROJECT: Thembalethu Bulk Sewer Phase 3 and 4

TITLE: Concept & Viability Design Report

	Prepared By	Reviewed By	Approved By
ORIGINAL	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

REVISION 1	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

REVISION 2	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE

REVISION 3	NAME S Kulu	NAME G Tucker	NAME K Potgieter
DATE 2024/11/29	SIGNATURE	SIGNATURE	SIGNATURE 2024/11/29

APPENDIX D – EA AND WULA

Western Cape Government
Environmental Affairs and Development Planning

Land Management
(Region 3)

REFERENCE: 16/3/1/1/D2/50/0060/12
ENQUIRIES: Shireen Pullen
DATE OF ISSUE: 2014 -03- 14

The Municipal Manager
George Municipality
Private Bag 19
GEORGE
6530

received
14 March 2014

Attention: Mr. S. Erasmus

Tel: (044) 801 9111
Fax: (044) 873 3377

Dear Sir

CORRECTION NOTICE FOR THE ENVIRONMENTAL AUTHORISATION ("EA") ISSUED ON 4 MARCH 2014 FOR THE THEMBALETHU HOUSING AREAS 8 A&B AND THEMBALETHU BULK SERVICES

1. Please be informed that in terms of Section 47A(1)(b) of the National Environmental Management Act, 1998 (Act no. 107 of 1998, as amended) the description of the approved development on page 7 under Section B of the EA is hereby corrected to read as follows:

"The applicant is herein authorised to undertake the following alternatives related to the listed activities:

Formalisation of Area 8A&B (Erf 4056 & Erf 4055):

This authorization is only for the formalisation of 186 erven within Area 8A(Erf 4056) and 8B (Erf 4055) in Thembalethu appropriate to the Draft Subdivisional Plan for Areas 8A&B Alternative 1 – Preferred done by Delplan and dated January 2013. It entails the following:

- 181 residential erven;
- an erf for the existing Telkom tower;
- an erf for the existing crèche and church;
- an erf for the existing corner shop,

- two areas of public open space (one as a thoroughfare between two blocks of erven and one large area designated over the dam area).
- Internal road, water, sewerage, electrical and stormwater services/infrastructure.

Upgrade of Bulk Sewer Infrastructure:

Approximate to Plan No: 108429 GE 400 Rev I, dated 13 November 2013, including:

- New bulk gravity and rising mains totalling a distance of approximately 12km to service for UISP Areas 1, 2, 3, 5, 6A&B, 7 and 8A,B &C;
- Upgrade of Pacaltsdorp No. 1 Pumpstation and Thembalethu No. 6 Pumpstation;
- Decommissioning of Thembalethu Pumpstations No. 3, 4 & 5 and assaciated rising main sewer lines; and
- Five pipe bridges over the Schaapkop River, as well as several stream / tributary crossings as detailed and defined by the Water Use License Application.

Installation of Bulk Electrical Powerline:

A 66kV overhead powerline, aligned from Kraaibosch area, south-east of Thembalethu Areas 4A and 4C to link to the authorised 66kV powerline running along the northern edge of Pacaltsdorp to the Protea Substation. This powerline is to cross over the Schaapkop River in two places."

2. Condition 5 of the EA must also be corrected to read as follows:

"This authorization is only for the formalisation of 186 erven within Area 8A (Erf 4056) and 8B (Erf 4055), the upgrade of bulk sewer infrastructure and the construction of a powerline. The proposed development will comprise of the following:

5.1 Formalisation of Area 8A&B (Erf 4056 & Erf 4055):

The proposed formalisatian will take place in accordance with the Draft Subdivisional Plan for Areas 8A&B and with the preferred lay-out done by Delplan and dated January 2013. It entails the following:

5.1.1 181 residential erven;
5.1.2 an erf for the existing Telkom tower;
5.1.3 an erf for the existing crèche and church;
5.1.4 an erf for the existing corner shop,
5.1.5 two areas of public open space (one as a thoroughfare between two blocks of erven and one large area designated over the dam area).
5.1.6 Internal road, water, sewerage, electrical and stormwater services/infrastructure.

5.2 Upgrade of Bulk Sewer Infrastructure:

Approximate to Plan No: 108429 GE 400 Rev I, dated 13 November 2013, including:

5.2.1 New bulk gravity and rising mains totalling a distance of approximately 12km to service for UISP Areas 1, 2, 3, 5, 6A&B, 7 and 8A,B &C;

5.2.2 Upgrade of Pacaltsdorp No. 1 Pumpstation and Thembalethu No. 6 Pumpstation;

5.2.3 Decommissioning of Thembalethu Pumpstations No. 3, 4 & 5 and associated rising main sewer lines; and

5.2.4 Five pipe bridges over the Schaapkop River, as well as several stream / tributary crossings as detailed and defined by the Water Use License Application.

5.3 Installation of Bulk Electrical Powerline:

A 66kV overhead powerline, aligned from Kraaibosch area, south-east of Thembalethu Areas 4A and 4C to link to the authorised 66kV powerline running along the northern edge of Pacaltsdorp to the Protea Substation. This powerline is to cross over the Schaapkop River in two places."

3. Please ensure that reference is made to this correction notice in all future correspondence and that the notice is at all times attached to the environmental authorisation when distributed.

4. The Department apologise for any inconvenience caused.

Yours Faithfully

MR. KOBUS MUNRO
DIRECTOR: LAND MANAGEMENT (REGION 3)

DATE OF NOTICE: 14 March 2014

Copied to: Ms Siân Holder (Cape EAPrac) Fax: (044) 874 0432

Western Cape Government
Environmental Affairs and Development Planning

DIRECTORATE: LAND MANAGEMENT
REGION 3

EIA REFERENCE: 16/3/1/1/D2/50/0060/12
NEAS EIA REFERENCE: WCP/EIA/0001610/2014
EXEMPTION REFERENCE: 16/3/1/4/D2/50/0029/13
NEAS EXEMPTION REFERENCE: WCP/EIA/0001114/2012
ENQUIRIES: Shireen Pullen
DATE OF ISSUE: 2014 -03- 04

received

The Municipal Manager
George Municipality
Private Bag 19
GEORGE
6530

Attention: Mr. S. Erasmus

Tel: (044) 801 9111
Fax: (044) 873 3377

Dear Sir

APPLICATION FOR ENVIRONMENTAL AUTHORISATION AND EXEMPTION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT 107 OF 1998) AND THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2010: THE PROPOSED THEMBALETHU HOUSING AREAS 8 A&B AND THEMBALETHU BULK SERVICES

With reference to your application for the abovementioned, find below the outcome with respect to this application.

ENVIRONMENTAL AUTHORISATION AND EXEMPTION

DECISION
By virtue of the powers conferred on it by the National Environmental Management Act, 1998 (Act No. 107 of 1998) and the Environmental Impact Assessment Regulations, 2010, ("NEMA EIA Regulations") the competent authority herewith **grants environmental authorisation and exemption** to the applicant to undertake the list of activities specified in section B below with respect to the preferred alternative described in the Final Basic Assessment Report ("final BAR") dated 25 November 2013.

The applicant is herewith exempted from the following provisions of the NEMA EIA Regulations:

Regulation 10(2)(d) of Government Notice No. R.543, which reads as follows:

10(2) The applicant must, in writing, within 12 days of the date of the decision of the application

(d) publish a notice –

(i) informing interested and affected parties of the decision;

(ii) informing interested and affected parties where the decision can be accessed; and

(iii) drawing the attention of interested and affected parties to the fact that an appeal may be lodged against the decision in terms of Chapter 7 of these Regulations, if such appeal is available under the circumstances of the decision,

in the newspapers contemplated in regulation 54(2)(c) and (d) and which newspaper was used for the placing of advertisements as part of the public participation process.

The granting of this environmental authorisotion and exemption (hereinafter referred to as the "environmental authorization") is subject to compliance with the conditions set out in section E below.

A. DETAILS OF THE APPLICANT FOR THIS ENVIRONMENTAL AUTHORISATION

The Municipal Manager
George Municipality
% Mr. S. Erasmus
Private Bag 19
GEORGE
6530

Tel: (044) 801 9111
Fax: (044) 873 3377

The abovementioned Municipality is the holder of this environmental authorisation and is hereinafter referred to as "the applicant".

B. LIST OF ACTIVITIES AUTHORISED

Government Notice No. R544 of 18 June 2010 –

Activity Number: 9
Activity Description:

The construction of facilities or infrastructure exceeding 1000 meters in length for the bulk transportation of water, sewage or storm water -
(i) with an internal diameter of 0,36 meters or more; or
(ii) with a peak throughput of 120 liters per second or more,
excluding where:
a. such facilities or infrastructure are for bulk transportation of water, sewage or storm water or storm water drainage inside a road reserve; or
b. where such construction will occur within urban areas but further than 32 metres from a watercourse, measured from the edge of the watercourse.

Activity Number: 11

Activity Description:
The construction of:
(i) canals;
(ii) channels;
(iii) bridges;
(iv) dams;
(v) weirs;
(vi) bulk storm water outlet structures;
(vii) marinas;
(viii)jetties exceeding 50 square meters in size;
(ix) slipways exceeding 50 square meters in size;
(x) buildings exceeding 50 square meters in size; or
(xi) infrastructure or structures covering 50 square meters or more

Where such construction occurs within a watercourse or within 32 meters of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

Activity Number: 18
Activity Description:
The infilling or depositing of any material of more than 5 cubic meters into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock from
(i) a watercourse;
(ii) the sea;
(iii) the seashore;
(iv) the littoral active zone, an estuary or a distance of 100 meters inland of the high-water mark of the sea or an estuary, whichever distance is the greater-
but excluding where such infilling, depositing, dredging, excavation, removal or moving:
(i) is for maintenance purposes undertaken in accordance with a management plan agreed to by the relevant environmental authority; or
(ii) occurs behind the development setback line.

Activity Number: 23
Activity Description:
The transformation of undeveloped, vacant or derelict land to –
(i) residential, retail, commercial, recreational, industrial or institutional use, inside an urban area, and where the total area to be transformed is 5 hectares or more, but less than 20 hectares, or
(ii) residential, retail, commercial, recreational, industrial or institutional use, outside an urban area and where the total area to be transformed is bigger than 1 hectare but less than 20 hectares; -

except where such transformation takes place for
(i) linear activities;
(ii) for purposes of agriculture or afforestation, in which case Activity 16 of Notice No. R. 545 applies.

Activity Number: 37
Activity Description:

The expansion of facilities or infrastructure for the bulk transportation of water, sewage or storm water where:
(a) the facility or infrastructure is expanded by more than 1000 meters in length; or
(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more–

excluding where such expansion:
(i) relates to transportation of water, sewage or storm water within a road reserve; or
(ii) where such expansion will occur within urban areas but further than 32 meters from a watercourse, measured from the edge of the watercourse.

Activity Number: 40
Activity Description:
"The expansion of
(i) jetties by more than 50 square metres;
(ii) slipways by more than 50 square metres; or
(iii) buildings by more than 50 square metres
(iv) Infrastructure by more than 50 square metres
within a watercourse or within 32 meters of a watercourse, measured from the edge of a watercourse, but excluding where such expansion will occur behind the development setback line";

Activity Number: 56
Activity Description:
"Phased activities for all activities listed in this Schedule, which commenced on or after the effective date of this Schedule, where any one phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold; -

excluding the following activities listed in this Schedule:
2;
11(i)-(vii);
16(i)-(iv);
17;
19;
20;
22(i) & 22(iii);
25;
26;
27(iii) & (iv);
28;
39;
45(i)-(iv) & (vii)-(xv);
50;
51;
53; and
54".

Government Notice No. R546 of 18 June 2010–

Activity Number: 4
Activity Description:
The construction of a road wider than 4 metres with a reserve less than 13, 5 meters.
(d) In Western Cape:
i. In an estuary;
ii. All areas outside urban areas;
iii. In urban areas:
(aa) Areas zoned for use as public open space within urban areas; and
(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority, or zoned for a conservation purpose.

Activity Number: 13
Activity Description:
The clearance of an area of 1 hectare or more of vegetation where 75% or more of the vegetative cover constitutes indigenous vegetation, except where such removal of vegetation is required for:
(1) the undertaking of a process or activity included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), in which case the activity is regarded to be excluded from this list.
(2) the undertaking of a linear activity falling below the thresholds mentioned in Listing Notice 1 in terms of GN No 544 of 2010.

d) In the Western Cape
i. In an estuary;
ii. Outside urban areas, the following:
(aa) A protected area identified in terms of NEMPAA, excluding conservancies;
(bb) National Protected Area Expansion Strategy Focus areas;
(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;
(dd) Sites or areas identified in terms of an International Convention;
(ee) Core areas in biosphere reserves;
(ff) Areas within10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve;
(gg) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined.
iii. In urban areas, the following:
(aa) Areas zoned for use as public open space;
(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose;
(cc) Areas seawards of the development setback line;

(dd) Areas on the watercourse side of the development setback line or within 100 metres from the edge of a watercourse where no such setback line has been determined.

Activity 16
The construction of:
(i) jetties exceeding 10 square meters in size;
(ii) slipways exceeding 10 square meters in size;
(iii) buildings with a footprint exceeding 10 square meters in size; or
(iv) infrastructure covering 10 square meters or more

where such construction occurs within a watercourse or within 32 meters of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line

(d) In Western Cape:
i. All watercourses;
ii. In an estuary;
iii. Outside urban areas, in:
(aa) A protected area identified in terms of NEMPAA, excluding conservancies;
(bb) National Protected Area Expansion Strategy Focus areas;
(cc) World Heritage Sites;
(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;
(ee) Sites or areas identified in terms of an International Convention;
(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adapted by the competent authority or in bioregional plans;
(gg) Core areas in biosphere reserves;
(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve;
(ii) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined.
iv. Inside urban areas:
(aa) Areas zoned for use as public open space;
(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose;
(cc) Areas seawards of the development setback line or within 100 metres of the high water mark where no setback line.

Activity Number: 24
Activity Description:

The expansion of
(a) jetties where the jetty will be expanded by 10 square meters in size or more;
(b) slipways where the slipway will be expanded by 10 square meters or more;

(c) buildings where the buildings will be expanded by 10 square meters or more in size; or
(d) infrastructure where the infrastructure will be expanded by 10 square meters or more

where such construction occurs within a watercourse or within 32 meters of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.

i. In an estuary;
ii. All watercourses;
iii. Outside urban areas, in:
(aa) A protected area identified in terms of NEMPAA, excluding conservancies;
(bb) National Protected Area Expansion Strategy Focus areas;
(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;
(dd) Sites or areas identified in terms of an International Convention;
(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;
(ff) Core areas in biosphere reserves;
(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve;
(hh) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined.
iv. Inside urban areas:
(aa) Areas zoned for use as public open space;
(bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose.

Activity Number: 26
Activity Description:
Phased activities for all activities listed in this Schedule and as it applies to a specific geographical area, which commenced on or after the effective date of this Schedule, where any phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold.
All the areas as identified for the specific activities listed in this schedule.

The abovementioned list is hereinafter referred to as "the listed activities".

The applicant is herein authorised to undertake the following alternative related to the listed activities:

This authorization is only for the formalization of 186 erven within Area 8A(erf 4056) and 8B (erf 4055) in Thembalethu approximate to the Draft subdivisional Plan for Areas 8A&B Alternative 1:-Preferred done by Delplan and dated January 2013. It entails the following:

- 181 residential erven;
- an erf for the existing Telkom tower;
- an erf for the existing crèche and church;
- an erf for the existing corner shop,
- two areas of public open space (one as a thoroughfare between two blocks of erven and one large area designated over the dam area).
- The proposal also entails the upgrade of the bulk services approximate to Plan No: 108429 GE 400 Rev I dated 13November 2013 including:
  - New bulk gravity and rising mains totaling a distance of approximately 8km, mainly to provide service for UISP Areas 1, 5, 6A, 6B and 2.
  - Upgrade to the Pacaltsdorp No.1 Sewer Pump Station as well as the Thembalethu No. 6 Sewer Pump Station.
  - decommissioning of Pumpstations 3 and 5 and installation of associated rising main sewer lines.
  - Several pipe bridges over the Schaapkop River or tributaries

C. PROPERTY DESCRIPTION AND LOCATION

The listed activities will take place on Erf 4056 (8A) and Erf 4055 (8B) Tyolora, which is located within the Thembalethu suburb, 3km south of the N2 national road.

The proposed bulk sewerage pipelines and associated infrastructure will be aligned predominantly on the edge of the Thembalethu residential settlement, along the edge and within the Schaapkop River valley to the south, which separates Thembalethu from Pacaltsdorp.

Co-ordinates:

POINTS ON SITE	LATTITUDE	LONGITUDE
Revised starting point of the activity	34° 00' 51.76"S	22° 29' 39.95"E
Middle point of the activity	34° 00' 40.48"S	22° 28' 26.16"E
End point of the activity	33° 59' 48.39"S	22° 27' 56.11"E
Area 8 A & B	34° 00' 46.81"S	22° 29' 30.41"E
River Crossing 1	34° 00' 46.57"S	22° 28' 58.87"E
River Crossing 2	34° 01' 10.97"S	22° 27' 46.10"E

hereinafter referred to as "the site".

D. DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Cape EAPrac (Pty) Ltd.
c/o Ms. S. Holder
PO Box 2070
GEORGE
6530

Tel: (044) 874 0365
Fax: (044) 874 0432

E. CONDITIONS OF AUTHORISATION

1. This environmental authorisation is valid for a period of **five years** from the date of issue. The holder must commence with all the listed activities within

the said period or this environmental authorisation lapses and a new application for environmental authorisation must be submitted to the competent authority, unless the holder has lodged a valid application for the amendment of the validity period of this environmentol authorisation, before the expiry of this environmental authorisation. In such instances, the validity period will be automatically extended ("the period of administrative extension") from the day before this environmental authorisation would otherwise have lapsed, until the amendment application for the extension of the validity period is decided. The listed activities, including site preparation, may not commence during the period of administrative extension.

2. The listed activities, including site preparation, may not commence within 20 (twenty) calendar days of the date of issue of this environmental authorisation. In the event that an appeal notice and subsequent appeal is lodged with the competent authority, the effect of this environmental authorisation may be suspended until such time as the appeal is decided.

3. The applicant must in writing, within 12 (twelve) calendar days of the date of this decision and in accordance with regulation 10(2)–

   3.1 notify all registered interested and affected parties of –

      3.1.1 the outcome of the application;
      3.1.2 the reasons for the decision as included in Annexure 1;
      3.1.3 the date of the decision; and
      3.1.4 the date of issue of the decision;

   3.2 draw the attention of all registered interested and affected parties to the fact that an appeal may be lodged against the decision in terms of Chapter 7 of the Environmental Impact Assessment Amendment Regulations, 2010 detailed in section F below; and

   3.3 draw the attention of all registered interested and affected parties to the manner in which they may access the decision.

4. Seven calendar days notice, in writing, must be given to the competent authority before commencement of construction activities.

   4.1. The notice must make clear reference to the site details and EIA Reference number given above.

   4.2. The notice must also include proof of compliance with the following conditions described herein:

      Conditions: 2, 3, 9, 12 and 18

5. This authorization is only for the formalization of 186 erven within Area 8A (erf 4056) and 8B(erf 4055) in Thembalethu approximate to the Draft subdivisional Plan for Areas 8A&B Alternative 1:-Preferred done by Delplan and dated January 2013. It entails the following:
   5.1 181 residential erven;

5.2 an erf for the existing Telkom tower;
5.3 an erf for the existing crèche and church;
5.4 an erf for the existing corner shop,
5.5 two areas of public open space (one as a thoroughfare between two blocks of erven and one large area designated over the dam area).
5.6 The preferred alternative also includes the upgrade of the bulk services approximate to Plan No: 108429 GE 400 Rev I, 13/11/13 (option 3) including:
5.6.1 New bulk gravity and rising mains totalling a distance of approximately 8km, mainly to provide service for UISP Areas 1, 5, 6A, 6B and 2.
5.6.2 Upgrade to the Pacaltsdorp No.1 Sewer Pump Station as well as the Thembalethu No. 6 Sewer Pump Station.
5.6.3 Decommissioning of Pumpstations 3 and 5 and installation of associated rising main sewer lines.
5.6.4 Several pipe bridges over the Schaapkop River or tributaries.

6. The holder is responsible for ensuring compliance with the conditions by any person acting on his/her behalf, including an agent, sub-contractor, employee or any person rendering a service to the holder.

7. Any changes to, or deviations from the scope of the description set out in section B above must be accepted or approved, in writing, by the competent authority before such changes or deviations may be implemented. In assessing whether to grant such acceptance/approval or not, the competent authority may request such information as it deems necessary to evaluate the significance and impacts of such changes or deviations and it may be necessary for the holder to apply for further authorisation in terms of the applicable legislation.

8. The applicant must notify the competent authority in writing, within 24 hours thereof if any condition herein stipulated is not being complied with.

9. The draft Environmental Management Programme ["EMP"] submitted as part of the application for environmental authorisation must: -
9.1. be amended to:

9.1.1. incorporate the conditions of authorisation given in this Environmental Authorisation;
9.1.2. include the removal of alien vegetation to co-incide with the end of the construction phase;
9.1.3. The development of a long-term alien management plan after completion of the project which must include follow up removal of invasive alien vegetation and removal of any rubble at least twice a year for a period of not less than 10 years after construction;
9.1.4. incorporate measures pertaining to the identification and allocation of environmental management roles, responsibilities and accountability, including timeframes for the implementation of the EMP;

9.1.5. make provision for the compilation of method statements that are to the satisfaction of the appointed Environmental Control Officer ("ECO");

9.1.6. be submitted to the Directorate: Land Management (Region 3) for consideration at least three weeks prior to the commencement of construction activities;

9.2. be approved by the Department before the commencement of any construction activities ano

9.3. meet the requirements outlined in Section 24N (2) & (3) of the National Environmental Management Act, 1998 (Act no 107 of 1998, as amended) ("NEMA") and regulation 34 of the Environmental Impact Assessment Regulations 2010;

An application for amendment to the EMP must be submitted to the competent authority if any further amendments are to be made to the EMP, other than those mentioned above and approved by the competent authority, and this may only be implemented once the amended EMP has been authorised by the competent authority.

10. The applicant must compile and submit an Environmental Audit Report six months after commencement of construction and thereafter annually with the last report within 12 months after completion of construction activities. Such audit report must indicate the date on which construction activities were commenced with and when it was completed and detail compliance with the mitigation/rehabilitation measures and recommendations referred to in the EMP and conditions of this Environmental Authorisation.

11. Disturbance through the sensitive forest areas must be limited and this area must be demarcated with shade cloth "walling" above and below the work area.

12. A clearly demarcated working footprint must be established, prior to construction activities commencing and all areas outside the demarcated area must be treated as no-go areas.

13. A copy of the environmental authorisation and the EMP must be kept at the site where the listed activities will be undertaken. Access to the site referred to in section C above must be granted and, the environmental authorisation and EMP must be produced to any authorised official representing the competent authority who requests to see it for the purposes of assessing and/or monitoring compliance with the conditions contained herein. The environmental authorisation and EMP must also be made available for inspection by any employee or agent of the applicant who works or undertakes work at the site.

14. The applicant must submit an application for amendment of the environmental authorisation to the competent authority where any detail with respect to the environmental authorisation must be amended, added, substituted, corrected, removed or updated. Further, the rights granted by this environmental authorisation are personal rights (i.e. not attached to a

property, but granted to a natural or juristic person). As such, only the holder may undertake the activities authorised by the competent authority. Permission to transfer the rights and obligations contained herein must be applied for in the following manner:

14.1 The applicant must submit an originally signed and dated application for amendment of the environmental authorisation to the competent authority stating that he/she wishes the rights and obligations contained herein to be transferred, and including (a) confirmation that the environmental authorisation is still in force (i.e. that the validity period has not yet expired or the activity/ies was/were lawfully commenced with); (b) the contact details of the person who will be the new holder; (c) the reasons for the transfer; (d) an originally signed letter from the proposed new holder acknowledging the rights and obligations contained in the environmental authorisation and indicating that he/she has the ability to implement the mitigation and management measures and to comply with the stipulated conditions.

14.2 The competent authority will issue an amendment to the new holder either by way of a new environmental authorisation or an addendum to the existing environmental authorisation if the transfer is found to be appropriate.

15. Non-compliance with a condition of this environmental authorisation or EMP may result in suspension of this environmental authorisation and may render the holder liable for criminal prosecution.

16. Notwithstanding this environmental authorisation, the holder must comply with any other statutory requirements that may be applicable to the undertaking of the listed activities.

17. The halder must appoint a suitably experienced environmental control officer ("ECO") for the construction phase of implementation before commencement of any land clearing or construction activities to ensure compliance with the EMP and the conditions contained herein.

18. An integrated waste management approach, which is based on waste minimisation and incorporates reduction, recycling, re-use and disposal, where appropriate, must be employed. Any solid waste must be disposed of at a landfill licensed in terms of the applicable legislation.

19. No surface or ground water may be polluted due to any actions on the site. The applicable requirements with respect to relevant legislation pertaining to water must be met.

20. The applicable requirements with respect to relevant legislation pertaining to cutting, damaging, disturbing or destroying protected trees or trees from a natural forest must be adhered to.

21. The applicable requirements with respect to relevant legislation pertaining to occupational health and safety must be adhered to.

22. Should any heritage remains be exposed during excavations or any actions on the site, these must immediately be reported to the Provincial Heritage Resources Authority of the Western Cape, Heritage Western Cope (in accordance with the applicable legislation). Heritage remains uncovered or disturbed during earthworks must not be further disturbed until the necessary approval has been obtained from Heritage Western Cape. Heritage remains include: archaeological remains (including fossil bones and fossil shells); coins; indigenous and/or colonial ceramics; any articles of value or antiquity; marine shell heaps; stone artifacts and bone remains; structures and other built features; rock art and rock engravings; shipwrecks; and graves or unmarked human burials.

23. A qualified archaeologist must be contracted where necessary (at the expense of the applicant and in consultation with the relevant authority) to remove any human remains in accordance with the requirements of the relevant authority.

F. APPEALS

Appeals must comply with the provisions contained in Chapter 7 of the NEMA EIA Regulations.

1. An appellant must –
   1.1. submit a notice of intention to appeal to the Minister, within 20 (twenty) calendar days of the date of the decision;

   1.2. submit the appeal within 30 (thirty) calendar days after the lapsing of the 20 (twenty) calendar days contemplated in regulation 60(1), for the submission of the notice of intention to appeal; and

   1.3. within 10 (ten) calendar days of having lodged the notice of intention to appeal, provide each person and organ of state registered as an interested and affected party in respect of the application, or the applicant, with –
      1.3.1. a copy of the notice of intention to appeal form; and

      1.3.2. a notice indicating where and for what period the appeal submission will be made available for inspection by such person, organ of state, or applicant, on the day of lodging it with the Minister, and that a responding statement may be made on the appeal within 30 (thirty) calendar days from the date the appeal submission was lodged with the Minister.

2. A person, organ of state or applicant who submits a responding or answering statement in terms of regulation 63 must within 10 (ten) calendar days of having submitted the responding or answering statement, serve a copy of the statement on the other party.

3. All notice of intention to appeal and appeal forms must be submitted by means of one of the following methods:
   By post: Western Cape Ministry of Local Government, Environmental Affairs and Development Planning
   Private Bag X9186
   CAPE TOWN

8000

By facsimile: (021) 483 4174; or

By hand: Attention: Mr J. de Villiers Tel: (021) 483 3721)
Room 809
8th Floor Utilitas Building,
1 Dorp Street, Cape Town, 8001

4. A prescribed notice of intention to appeal form and appeal form as well as assistance regarding the appeal processes is obtainable from the office of the Minister at: Tel. (021) 483 3721, E-mail Jaap.DeVilliers@westerncape.gov.za or URL http://www.westerncape.gov.za/eadp

G. DISCLAIMER

The Western Cape Government, the Local Authority, committees or any other public authority or organisation appointed in terms of the conditions of this environmental authorisation shall not be responsible for any damages or losses suffered by the holder, developer or his/her successor in any instance where construction or operation subsequent to construction is temporarily or permanently stopped for reasons of non-compliance with the conditions as set out herein or any other subsequent document or legal action emanating from this decision.

Your interest in the future of our environment is appreciated.

Yours faithfully

KOBUS MUNRO
DIRECTOR: LAND MANAGEMENT (REGION 3)

DATE OF DECISION:

4 · 3 · 2014

Copied to:
Ms Siôn Holder (Cape EAPrac) Fax: (044) 874 0432

FOR OFFICIAL USE ONLY:	
EIA REFERENCE:	16/3/1/1/D2/50/0060/12
NEAS EIA REFERENCE:	WCP/EIA/0001610/2014
EXEMPTION REFERENCE:	16/3/1/4/D2/50/0029/13
NEAS EXEMPTION REFERENCE:	WCP/EIA/0001114/2012

ANNEXURE 1: REASONS FOR THE DECISION

In reaching its decision, the competent authority, *inter alia*, considered the following:

a) The information contained in the application form dated 13 November 2013; the Basic Assessment Report (BAR) received by the competent authority on 27 November 2013 and the EMP submitted together with the BAR on 27 November 2013;

b) Relevant information contained in the Departmental information base, including, the Guidelines on Public Participation, Alternatives and Exemptions (dated March 2013);

c) The objectives and requirements of relevant legislation, policies and guidelines, including section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998);

d) The comments received from interested and affected parties and the responses provided thereon, as included in the BAR dated 25 November 2013.

e) The sense of balance of the negative and positive impacts and proposed mitigation measures; and

A site visit was conducted on 11 February 2014 attended by Ms. S. Holder from Cape EAPrac, Mr. Danie Swanepoel from this Department and Mr. A. Molendorf from Aurecon.

All information presented to the competent authority was taken into account in the consideration of the application for environmental authorisation. A summary of the issues which, according to the competent authority, were the most significant reasons for the decision is set out below.

1. Exemption

Exemption from regulation 10(2)(d) was granted due to the small number of comments received during the public participation process. All registered interested and affected parties ("I&AP's) were notified of the exemption application, as required. No significant concerns were raised by I&APs in this regard.

As such, the exemption application was regarded as appropriate by the competent authority in this instance based on the adequate public participation process and the limited number of comments submitted with respect to the application.

2. Public Participation

The public participation process included:

- Identification of and engagement with interested and affected parties;
- Site Notices in English, Afrikaans and Xhosa were placed at the gate on Area 8 ond along the main sewer alignment routes (visible to the public) on 10 and 11 February 2013 and 13 and 26 March 2013;

- Initial Notification Letters were sent on 10 and 11 February 2013 (in English and Xhosa), explaining the project, environmental process and the opportunity to register as Interested & Affected Parties (I&APs) were hand delivered by the EAP and Community Liaison Officer (CLO) to occupiers of Area 8 and directly adjacent neighbours of Area 8;
- Notifications sent to Ward Councillors, Stakeholders, State Departments & Organs of State detailing proposal and process on 18 February 2013;
- Hard copies of the Draft Basic Assessment Report (DBAR) were placed at the George Municipal offices (Planning Department, Progress Street) and Thusong Service Centre (located in Jeriko Street, Thembalethu), for a review & comment period of 40-days. The DBAR has also been made available on the Cape EAPrac website: www.cape-eaprac.co.za/active on 2 October 2013;
- Hard copies of this Final Basic Assessment Report (FBAR) have been placed at the George Municipal offices (Planning Department, Progress Street) ond Thusong Service Centre (located in Jeriko Street, Thembalethu), for review & comment period of 21-days. The DBAR has also been made available on the Cape EAPrac website: www.cape-eaprac.co.za/active on 25 Navember 2013
- A newspaper advertisement was ploced in the George Herald dated 31 January 2013.

No objections were received from I&APs and all the concerns raised by interested and affected parties were responded to and adequately addressed during the public participation process. Specific management and mitigation measures have been considered in this environmental authorization and in the EMP to adequately oddress the concerns raised. CapeNature submitted their support for the development of Areas 8 A&B, but does not support the encroachment of development into the remaining Afro Temperate forest patched and fynbos. The Department of Health did not have any objection to the proposed development. The Department of Agriculture, Forestry and Fisheries supports the development proposal subject to mitigation measures that Includes amongst others that trenches in the forest must be hand-dug to disturb the forest as little as possible. This is unfortunately not possible, and mitigation measures such as strict demarcation with shade cloth "walling" above and below the area is included in the EMP.

This Department concurs with the environmental assessment practitioner's responses to the issues raised during the public participation process and has included appropriate conditions in this environmental authorization and in the EMP.

3.Alternatives

3.1 Development Lay-out Alternatives

Two possible layouts have been designed for the combined Area 8 (Erf 4056 & 4055) property, being:

3.1.1 Lay-out Alternative 1(Preferred Lay-out) to be read together with the preferred sewer alignment alternative

This lay-out is proposed within 32 meters of the small dam on Area 8b This layout proposes the formalisation of 186 erven, which include the following:

- 181 residential erven;

- an erf for the existing Telkom tower;
- an erf for the existing crèche and church;
- an erf for the existing corner shop,
- two areas of public open space (one as a thoroughfare between two blocks of erven and one large area designated over the dam area).
- Internal road, water, sewerage, electrical and stormwater services/infrastructure.

The findings of the ecological assessment of the dam revealed that it is not sensitive to disturbance and that the area would be acceptable for infill. Furthermore, the community wants the dam removed for safety reasons and therefore the proposal to reshape the dam area to allow for the removal of deep standing water and creation of an effective stormwater system within this area of open space. According to the BAR the formalisation of a stormwater channel will allow for the continued management of run-off from the property towards the tributary and river valley to the east.

3.1.2 Lay-out Alternative 2

According to the BAR this layout was design to restrict encroachment of erven into the 32m buffer of the small dam, with the partial overlap of six erven and a portion of an access road into this buffer. This layout proposes the formalisation of 173 residential erven; with the Telkom, crèche / church, corner shop erven and two public open space areas as described in the above layout. The proposal to retain the small dam as it is currently is included in this development proposal. Comment in this regard has been sought from the Department of Water Affairs. Considering the reduced number of residential erven, as well as the low ecological sensitivity and safety risk associated with the small dam, this alternative is not considered to be a desirable option.

3.2 Bulk Sewer Infrastructure Alternatives

Various other sewer infrastructure proposals/alternatives were investigated to solve some of the sewer service difficulties and demands. The proposed bulk sewer infrastructure, involves approximately 12km of sewer pipeline, the upgrade and decommissioning of sewer pumpstations, five (5) river crossings and several stream / tributary crossings, within the Schaapkop River Valley.

Activity Need and Desirability

It is submitted in the BAR that the existing Thembalethu bulk sewer system is overloaded, with blockages and leaks resulting in pollution and sewage spillage into the Schaapkop River, which is a common occurrence. In addition, the BAR further states that the lack of proper sewerage reticulation in the new and proposed formal extensions of Thembalethu UISP (over 4939 erven) and proposed Syferfontein Housing Project (7700 erven) would aggravate the current situation and generate a range of additional, environmental and health problems. The proposed development has been designed to rectify several of the constraints / problems experienced by the current system, while providing the necessary capacity to handle the new and proposed housing developments proposed for the area.

According to the BAR there is currently a need for the George Municipality to intervene as a matter of urgency in order to relieve the lack of services in the informal settlements and to prevent potential community unrest. The development proposal is thus not to create a new township, but rather to upgrade / formalise the *in situ* / existing informal settlement

area, as well as to provide the necessary internal bulk services required for the on-going formalisation of erven throughout Thembalethu.

The currenty sewerage reticulation system for Thembalethu includes the following:
From pumpstation 4 sewage is piped through the township to pumpstation 3 and then to pumpstation 5, which pumps the sewage over River crossing 4 to the Outeniqua Waste Water Treatment Works.

The current proposal is to replace this system with new gravity lines on the edge of Thembalethu, that will feed into the Pacaltsdorp pumpstation 1(which must be upgraded) and pumpstation 6 (which will also be upgraded). From pumpstation 6 the existing rising main will be augmented by a new rising main over the existing bridge crossing1 over the Schaapkop River to the existing 800/700mm diameter bulk sewer gravity line that feeds pumpstation 1. This will result in the decommissioning of three existing pumpstations (3, 4 & 5) and the upgrading of two pumpstations (1&6)

Several infrastructure alternatives were considered, but most have been rejected by the Municipality due to higher cost (higher energy requirements and more pumpstations to maintain. These include the following:

3.2.1 Upgrading of Thembalethu Pumpstation No.3 and existing 200mm diameter rising main

This alternative was considered, since pumpstation 3 and associated 200mm-diameter rising main are currently at or over their design capacity, as well as its potential to open up an additional 700 erven (in Areas 3, 7 & 8) for development in the next housing phases. This alternative was decided against as it was not as financially effective as the preferred alternative.

3.2.2 Upgrading of pumpstation 3 and assisting the existing Rising Main from Pumpstation No.3 to the WWTW Alternatives

3.2.2.1 Alternative 1
A 3.8km-long, 250mm-diameter PVC-u rising main aligned to intersect the least existing services (water, sewer, stormwater, electrical and Telkom cables, roads and sidewalks) and high points (**dark blue dotted line running approx. parallel to yellow line on drawing 108429GE 400 Rev.F).** Due to the relatively high pumping head (powerful pumps) required for this line and the need to for an additional River Crossing No.4 (see below), this option was considered costly.

3.2.2.2 Alternative 2
Linked to the upgrade of Thembalethu Pumpstation No.5, this would require a 315mm-diameter rising main from Pumpstation No.3 to a point connecting to the proposed 350-400mm-diameter bulk gravity sewer proposed to drain Areas 5, 6A & 6B **(orange dotted line below Old 'All-Brick' Works on drawing 108429GE 400 Rev.F).** Although this option would be economical to operate, it would require a larger diameter bulk gravity line around Areas 5, 6A&B (to accommodate the increased flow), and the upgrade of Pumpstation 3.

Preferred option to be read together with the preferred sewer alignment alternative (Drawing 108429GE 400 Rev. I)

The preferred alternative includes two alternatives with two gravity lines, draining east and west of the 'All-Brick' property: ***Orange line:*** *200mm diameter line draining to the west of the 'All-Brick' property to link to the red gravity line, south of Area 6B; and* ***Blue line:*** *250mm diameter line draining to the east of 'All-Brick' property along the same alignment of an existing sewer line to link to Option 1 (at the decommissioned Pumpstation No.3).*

3.2.3 Upgrade of Pumpstation No.5
This alternative requires the demolition of the existing pumpstation building and that it be re-built at a position lower down the slope to allow the upgraded northern bulk sewer (draining Area 1) to gravitate to the new pumpstation. The upgrade would increase the flow-capacity from 15l/s to 180l/s, and entail a new inlet works, a new pumpstation building, new pumps and mechanical screens, a back-up generator and associated electrical reticulation upgrades, as well as some gabion works, a new access road, a telemetry system and a new fence.

3.2.4 River Crossing No.4 (In accordance with Drawing: 108429 REV 402 Rev C done by Aurecon)
This alternative entails the construction of a 50m concrete pipe-bridge across the Schaapkop River to accommodate a 450mm-diameter rising main servicing flows from Pumpstations 3 & 5 to the WWTW.

The option of re-aligning option 3 bulk gravity line from Area 8 to pumpstation 6 to avoid the remnant indigenous forest as recommended by the ecological specialist has been included in the revised activity proposal.

3.6 "No-Go" Alternative

The no-go alternative would result in Area 8A&B not being formalised and the bulk sewer infrastructure required for the greater Thembalethu UISP Housing Project not being built, which would give rise to a number of negative socio-economic, environmental and health impacts. The existing system is overloaded and blockages with sewage spills into the Schaapkop River is currently a common occurrence. The additional pressure on this existing system which the new extensions of Thembalethu are to create (i.e. UISP Areas 1 to 8) would not only aggravate the existing situation and the resultant pollution to this watercourse, but generate a range of environmental and health problems.

The no-go alternative is thus not considered desirable from both social and environmental perspectives (i.e. erosion, pollution and health & safety risks) and the proposed development can be viewed in a positive light when compared to the no-go alternative.

4. Impact Assessment and Mitigation Measures

4.1. Regional/ Planning Context
The proposed site (Erven 4056 and 4055, Tyolora) are registered in the name of George Municipality and are being utilised as an informal settlement at present. The site is currently zoned "Institutional I" (place of instruction) and will have to be rezoned to "Subdivisional Area" to allow for the establishment of infill development. According to the BAR the Western Cape Department of Education confirmed in writing that they do not

require the properties for educational purposes and consequently the land use has been transferred to George Municipality.

George is considered in the Provincial Spatial Development Framework (**"PSDF"**) to be an area for high priority fixed investment urban settlement, with the formalisation of erven and provision of basic services to existing settlements. The Thembalethu settlement is one such area of focus.

The George Spatial Development Framework (**"George SDF"**) includes this area within the urban edge. Infill development and densification is highly recommended in the document. The proposed development of Area 8A and 8B is infill development and therefore adheres to the principles for densification as described in the Western Cape Provincial Spatial Development Framework (WCPSDF)(June 2009), as well as the Draft George Spatial Development Framework. Existing services are utilised and additional costs for the upgrading of services are minimised.

The formalisation / upgrade of informal settlements (UIS) and provision of basic services are highlighted as a priority in the George Integrated Development Plan (**"George IDP'**). Thus this UIS Project aligns with the IDP forward planning into the future.

The Draft Thembalethu Spatial Development Plan **("TSDP")** was compiled as a component of the Draft George SDF. This plan is being revised at present so that it can be approved as a local structure plan. This plan shows that the future growth and development of housing within Thembalethu must be managed through strategic infill and densification. Area 8A and 8B is indicated as a special area for re-development.

4.2. Services/ Bulk Infrastructure

Internal Services for Area 8

The internal water, sewerage and stormwater reticulation networks will link to the existing Municipal services. Provision for effective stormwater drainage will be made by means of a combination of underground pipes and concrete lined V-drains running parallel to the roadways and discharging into the existing stormwater outlets surrounding Area 8 A&B. Energy dissipaters will be placed strategically to avoid erosion and additional runoff into the water courses, as well as litter traps to avoid this type of pollution entering these systems.

The old farm dam will be transformed to serve as an effective stormwater retention pond. A conventional stormwater network of catchpits, manholes and headwalls will convey stormwater generated on Area 8 into this retention pond, after which the stormwater will flow through an outlet pipe, discharging stormwater into the adjacent attributor via a stormwater outlet and silt retention structure, into the tributary to the east.

The services lay-out for Area 8 include a network of 10m wide internal roads, which gain access via the following three access points:

- off the existing Lingelethu Street (western property boundary),
- off the existing Makhaza Street (eastern property boundary), and
- via an existing road of 8m between existing erven 3810 & 3812 (northern property boundary).

Internal and linking electricity, water, sewerage and stormwater services will be aligned with the road network / road reserve as far as possible.

The solid waste generoted by the current and future occupants of Area 8 will be picked up by the George Municipality and disposed of at a licenced Solid Waste Management/ Disposal Facility on a weekly basis.

4.3. Cumulative

Phase 8 A&B: The cumulative loss of currently intact habitat within listed vegetation types may impact the countries' ability to meet its conservation targets. The site is located within the Garden Route Gronite Renosterveld vegetation type, which is listed as Endangered under the Nationol List of Threatened Ecosystems and any further loss of this vegetation type would be considered highly undesirable. The extent of intact habitat at the site is however low and the amount of habitat that would be lost within these areas would be similarly low. In oddition, the fragmentation of the surrounding landscape and the high anthropogenic impact in the area suggests that the long-term viability of the remnont patches is probably compromised.

Upgrade of bulk sewer services: Transformation within Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs" would potentially disrupt the functioning of the CBAs or result in biodiversity loss. In addition, the presence of the sewer line with access trock will increase the fragmentation of hobitat and increase access to o significant area of currently inaccessible areas which may have negative consequences for biodiversity in these areas due to increased levels of hunting or plant collection. The area is olready highly fragmented ond impacted ond the sewer line will fragment the major unfragmented portion of the site.

However, the loss of biodiversity and a functioning ecosystem must be eighed up ogainst the need to provide sewerage services. The lack of sewerage services will result in the pollution and potential health risk.

4.4. Biophysical Impocts

Upgrade of bulk sewer services: According to the BAR the site contains fynbos in proximity to the Old Brick Works and Afrotemperate Forest patches within the Schaapkop River valley. Although these areas ore considered sensitive and retain significant biodiversity, the long-term viability and persistence of these areas is uncertain due to the high alien plant invasion pressure, as well as anthropogenic impacts such as hunting, livestock grazing and collection of plants for traditional medicine.

The forest patch area near Thembalethu No.6 Pump Station is considered to be most sensitive. The construction of the sewer access track will facilitate access to this area which currently represents relatively safe refuge for fauna ond flora. A section of gravity pipeline has been re-aligned to avoid the sensitive indigenous forest patches in proximity to Pumpstation No. 6. However, the sewer line from Area 3 cannot be realigned to avoid the forest area, but it will be located high up on the slope as far as possible to minimise disturbance of the forest.

Phase 8 A&B: The small dam on Area 8 was found to be highly disturbed and thus not sensitive from an ecological perspective. Based on this assessment and the community's wish to have the dam removed due to safety risks associated with it (drowning), the preferred alternative thus included the option to maintain an area of open space around the dam site, remove deep standing water and formalise the dam into a functional stormwater management system. Some of the mitigation measures recommended

include o focus on avoidance of sensitive areas where possible and reducing the development footprint as far as possible, as well as ensuring that the construction approach results in a robust end result, which resists impacts such as erosion, since the long-term maintenance of the access tracks by the municipality is unlikely.

4.5. Biodiversity

The entire Schaapkop River and associated tributaries, to be traversed by the Bulk Sewer & Electrical infrastructure, is designated as a Critical Biodiversity Area ("CBA") and Ecological Biodiversity Area ("ESA"). Transformation within the ESA would potentially disrupt the functioning of the CBA and result in biodiversity loss.

The site is characterized by a few sensitive areas, which include CBA and Endangered Garden Route Granite fynbos and protected Afrotemperate Forest patches. Although these areas are considered sensitive and retain significant biodiversity, the long-term viability and persistence of these areas is uncertain due to the high alien plant invasion pressure as well as anthropogenic impacts such as hunting, livestock grazing and collection of plants for traditional medicine.

The most sensitive area is forest patch near to the Thembolethu No.6 Pump Station. The construction of the sewer access track will facilitate access to this area, which currently represents a relatively safe refuge for fauna and flora. The report by Simon Todd Consulting recommends that an alternative alignment for the sewer line must be investigated, which avoids a greater portion of the forest, or if this isn't possible, building the line without the access track. The applicant proposes to use excavators, which disturb 5 meters during turning movements of the boom and bucket. Manual labour is impractical as the manhole rigs weigh 850kg each. The disturbance area will be rehabilitated to a maintenance access of 3,5 meters wide.

4.6. Visual / Sense of Place

According to the BAR the proposed development will have a positive local medium-term impact on the surrounding environment since it will result in the rehabilitation of some severely eroded sites, including pump stations along the routes.

4.7. Heritage

The heritage specialist indicates in his recommendations that the proposal constitutes infill development and that no heritage resources would be impacted through future development of the site and that no further heritage-related studies would therefore be necessary. Heritage Western Cape (HWC) as the competent authority in terms of the National Heritage Resources Act also confirmed in their final comment dated 26 June 2013, that no further processes in terms of Section 38 of the NHRA apply to the proposed development.

4.8. Socio-economic

According to the BAR the socio-economic impacts of the project, other than the employment opportunities to be created during construction and operation, include the provision of secure tenure on erven and access to basic services for the current informal residents or Areas 8A&B specifically. The BAR further submits that the provision of the bulk services component of this development proposal is to support the Upgrade of Informal Settlements Plan (UISP) for the greater Thembalethu area (Areas 1-8), and the socio-economic benefits of secure erven tenure and access to basic services associated with this.

4.9 Impact Assessment and significance

Overall, the impacts of the development of the bulk sewer infrastructure at Tembalethu are likely to be of local extent, moderate to low intensity and of overall low significance.

National Environmental Management Act Principles

The National Environmental Management Principles (set out in section 2 of the NEMA, which apply to the actions of all organs of state, serve as guidelines by reference to which any organ of state must exercise any function when taking any decision, and which must guide the interpretation, administration and implementation of any other law concerned with the protection or management of the environment), *inter alia*, provides for:

- the effects of decisions on all aspects of the environment to be taken into account;
- the consideration, assessment and evaluation of the social, economic and environmental impacts of activities (disadvantages and benefits), and for decisions to be appropriate in the light of such consideration and assessment;
- the co-ordination and harmonisation of policies, legislation and actions relating to the environment;
- the resolving of actual or potential conflicts of interest between organs of state through conflict resolution procedures; and
- the selection of the best practicable environmental option.

The development will result in both negative and positive impacts.

Negative Impacts:
This includes the disturbance of fynbos vegetation, disturbance of Afromontane forest and the transformation within the ESAs, which can potentially disrupt the functioning of the CBAs or result in biodiversity loss. In addition hereto, the presence of the sewer line with access tracks will increase the fragmentation of habitat and increase access to a significant area of currently inaccessible areas, which may have a negative effect on biodiversity in these areas due to increased levels of hunting or plant collection.

Notwithstanding the afore-mentioned, the negative impacts can partially be mitigated to low and very low levels by minimising the development footprint as far as possible and avoiding the creation of access tracks. The pipeline was also aligned as a mitigation measure to run on the edge of the Thembalethu settlement, along the edge and within the Schaapkop River valley to the south, separating Thembalethu from Pacaltsdorp.

Positive impacts:
The proposed development will result in the removal of the small dam on Area 8, which poses a safety risk. This dam will be formalised into a functional stormwater management system, which will in turn assist with the stormwater management in the area. Another positive impact of the proposed development is the alleviation of housing needs as the proposal includes the formalisation of informal housing in Areas 8A and B. The existing sewage system is overloaded and blockages with sewage spills into the Schaapkop River are currently a common occurrence and the approval of the proposed development will also eliminate this. This Department is therefore of the opinion that the positive impacts of

the proposed development largely outweighs the negative impacts and that the negative impacts can be mitigated to an acceptable level.

In view of the above, the NEMA principles, compliance with the conditions stipulated in this environmental authorisation, and compliance with the EMP, the competent authority is satisfied that the proposed listed activities will not conflict with the general objectives of integrated environmental management stipulated in Chapter 5 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) and that any potentially detrimental environmental impacts resulting from the listed activities can be mitigated to acceptable levels.

----------END----------

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

WESTERN CAPE REGION
PRIVATE BAG X16, SANDAMHOT, 7532
Tel.: 021 941 6795, Fax: 086 579 4133, E-mail: Nthungenin@dwa.gov.za

Enquiry: N. Nthungeni
File number: 27/2/1/K30C/113/6

George Local Municipality – Thembalethu Bulk Sewer System
P O Box 19
George
6573

Dear Sir/Madam

APPLICATION FOR WATER USE LICENSE APPLICATION IN TERMS OF SECTION 40 AND 41 OF THE NATIONAL WATER ACT, 1998 (ACT 36 OF 1998: IMPEDING OR DIVERTING THE FLOW OF WATER IN A WATERCOURSE: VARIOUS PROPERTIES

Your Water Use License Application has reference.

Attached please find the original Water Use License number 16/K30C/CI/2723 dated 15 December 2014 that was issued with regard to the above-mentioned application.

Please ensure that all conditions within the License are adhered to.

Water use charges or levies will be imposed from time to time by responsibly authority or the Department in terms of the Raw Water pricing Strategy as published.

If you need further information, you are welcome to contact this office.

Yours faithfully

WESTERN CAPE: HEAD OF PROVINCIAL OPERATIONS
DATE: 19 January 2015

water & sanitation
Department
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria, 0001, Sedibeng Building, 185 Francis Baard Street, Pretoria.
Tel: (012) 336-7500 Fax: (012) 323-4472 / (012) 326-2715

LICENCE IN TERMS OF CHAPTER 4 OF THE NATIONAL WATER ACT, 1998 (ACT NO. 36 OF 1998) (THE ACT)

I, ***Anil Bijman Singh,*** in my capacity as Director-General (Acting) in the Department of Water and Sanitation acting under authority of the powers delegated to me by the Minister of Water and Sanitation, hereby authorize the following water uses in respect of this licence.

SIGNED: .....

DATE: 15/12/14

LICENCE NO: 16/K30C/CI/2723
FILE NO: 27/2/1/K330/113/8

1. **Licensee:** **George Local Municipality: Thembalethu Bulk Sewer System**
P.O Box 19
GEORGE
6573

2. **Water Uses:**

2.1 Section 21(c) of the Act: Impeding or diverting the flow of water in a watercourse, subject to the conditions set out in Appendices I and II.

2.2 Section 21(i) of the Act: Altering the bed, banks course or characteristics of a watercourse, subject to the conditions set out in Appendices I and II

3. **Properties in respect of which this licence is issued.**

3.1 Farm 7197/4 Tyolora

3.2 Farm 7197/9, Tyolora

3.2 Erf 3679, Tyolora

3.3 Erf 5006, Tyolora

3.4 Erf 3274, Tyolora

3.5 Farm 7197/40 Tyolora

B 04842

3.6 Farm 7197/50, Tyolora

3.7 Farm 7197/58 Tyolora

3.9 Portion 11 of the farm Sandkraal No 197

3.10 Farm 7197/4 Tyolora

4. Registered owner of the Properties

Table 1: Registered owner of properties

Farm 7197/40, Tyolora	T69142/07	George Municipality	34° 0'29.10"S 22°28'28.50"E
Erf 3274, Tyolora	T69142/07	George Municipality	34° 0'35.75"S 22°29'7.99"E
Farm 197/11, Sandkraal	T45867/89	George Municipality	34° 0'39.60"S 22°27'52.08"E
Farm 7197/9, Tyolora			34° 0'37.58"S 22°28'3.36"E
Farm 7197, Tyolora	T19564/99	George Municipality	34° 0'10.62"S 22°28'13.06"E
Farm 7197/4, Tyolora			34° 0'35.75"S 22°29'7.99"E
Farm 7197/50, Tyolora			34° 0'35.75"S 22°29'7.99"E
Farm 7197/58, Tyolora			34° 0'41.14"S 22°29'19.68"E
Erf 3878, Tyolora			34° 1'21.24"S 22°29'15.51"E
Erf 5006 Tyolora			34° 0'44.03"S 22°28'17.46"E

5. Licence and Review Period

5.1 This licence is valid for a period of twenty (20) years from the date of issuance and as provided for under Section 49 of the Act, it may be reviewed in every five (5) years after issuance.

6. Definitions

"Any word or term defined under the Act shall have the same meaning as defined in the Act, unless otherwise specifically stated."

"Provincial Head" The Provincial Head" means the Head of Western Cape Provincial Operations, Department of Water and Sanitation, Private Bag X16; Sanlamhof, 7532

7. Description of activity

The water uses authorised for construction of sewer pipelines consist of impeding or diverting the flow of water and altering the bed, banks, course or characteristics of Schaapkop River and its tributaries during the the construction of the sewer pipeline. The sewer pipeline will be situated within the Breede-Gouritz Water Management Area, in quaternary catchment K30C.

APPENDIX I

General conditions for the licence

1. This licence is subject to all applicable provisions of the National Water Act, 1998 (Act 36 of 1998).

2. The responsibility for complying with the provisions of the licence is vested in the Licensee and not any other person or body.

3. The Licensee must immediately inform the Provincial Head of any change of name, address, premises and/or legal status.

4. If the property/ies in respect of which this licence is issued is subdivided or consolidated, the Licensee must provide full details of all changes in respect of the properties to the Provincial Head within 60 days of the said change taking place.

5. If a Water User Association is established in the area to manage the resource, membership of the Licensee to the Association is compulsory. Rules, regulations and water management stipulation of such association must be adhered to.

6. The Licensee must be responsible for any water use charges and/or levies imposed by a Responsible Authority.

7. While effect must be given to the Reserve as determined in terms of the Act, where a lower confidence determination of the Reserve has been used in issuance of this licence, the licence conditions may be amended should a higher confidence reserve be conducted.

8. The licence shall not be construed as exempting the Licensee from compliance with the provisions of any other applicable Act, Ordinance, Regulation or By-law.

9. The licence and amendment of this licence are also subject to all the applicable procedural requirements and other provisions of the Act, as amended from time to time.

10. The Licensee must conduct an annual internal audit on compliance with the conditions of this licence. A report on the audit shall be submitted to the Provincial Head within one month of the finalization of the audit.

11. The Licensee must appoint an independent external auditor to conduct an annual audit on compliance with the conditions of this licence. Both these audits may be subjected to external audit.

12. If the water use authorised in this licence is not exercised within 3 years of the date of issuance of the licence, the authorization will be withdrawn. Upon commencement of the water use, the Licensee must inform the Relevant Authority in writing.

13. Notices prohibiting unauthorized persons from entering water use premises must be displayed.

14. The Department accepts no liability for any damage, loss or inconvenience, of whatever nature, suffered as a result of amongst other things:

    14.1 Inundation of flood;

14.2 Any *force majeur* event;
14.3 Siltation of the river or dam basin; and
14.4 Required Reserve releases.

APPENDIX II

Section 21(c) of the Act: **Impeding or diverting the flow of water in a watercourse**
and/or
Section 21(i) of the Act: **Altering the bed, banks, course or characteristic of a watercourse**

1. GENERAL

1.1 This licence authorises George Local Municipality for the construction of a sewer pipelines within Schaapkop River and its tributaries for the Section 21(c) and (i) water use activities, for the Thembalethu bulk sewer infrastructure as set out in Table 2.

Table 2: Water use activities

River Crossing No.	Name of the water resources	Property Description (Farm/Erf Number)	Coordinates	Purpose
1	Tributary of Schaapkop River	Farm 7197 Tyolora	34° 0'10.62"S 22°28'13.06"E	Sewage pipeline river crossing
2	Tributary of Schaapkop River	Farm 7197/4 Tyolora	34° 0'22.92"S 22°28'7.49"E	Sewage pipeline river crossing
3	Tributary of Schaapkop River	Farm 7197/4 Tyolora	34° 0'30.96"S 22°28'4.15"E	Sewage pipeline river crossing
4	Tributary of Schaapkop River	Farm 7197/9 Tyolora	34° 0'37.56"S 22°28'3.38"E	Sewage pipeline river crossing
5	Tributary of Schaapkop River	Erf 5008 Tyolora	34° 0'43.13"S 22°28'10.41"E	Sewage pipeline river crossing
6	Tributary of Schaapkop River	Erf 5006 Tyolora	34° 0'44.03"S 22°28'17.46"E	Sewage pipeline river crossing
7	Tributary of Schaapkop River	Farm 7197/40 Tyolora	34° 0'29.10"S 22°28'26.50"E	Sewage pipeline river crossing
8	Tributary of Schaapkop River	Farm 7197/50 Tyolora	34° 0'27.09"S 22°28'1.20"E	Sewage pipeline river crossing
9	Tributary of Schaapkop River	Erf 3274 Tyolora	34° 0'35.75"S 22°29'7.99"E	Sewage pipeline river crossing
10	Tributary of Schaapkop River	Farm 7197/58 Tyolora	34° 0'41.14"S 22°28'19.68"E	Sewage pipeline river crossing
11	Schaapkop River	Erf 3878 Tyolora	34° 1'21.24"S 22°29'15.51"E	Sewage pipeline river crossing
12	Schaapkop River	Portion 11 of the farm Sandkraal No. 197	34° 0'39.80"S 22°27'52.06"E	Sewage pipeline river crossing
13	Tributary of Schaapkop River	Portion 11 of the farm Sandkraal No. 197	34° 0'32.12"S 22°27'49.37"E	Sewage pipeline river crossing
14	Tributary of Schaapkop River	Farm 7197/9 Tyolora	34° 0'16.67"S 22°27'58.09"E	Sewage pipeline river crossing
15	Tributary of Schaapkop River	Erf 3879 Tyolora	34° 1'17.42"S 22°29'22.20"E	Sewage pipeline river crossing
16	Schaapkop River	Farm 7197/9 Tyolora	34° 0'42.37"S 22°27'54.89"E	Sewage pipeline river crossing

1.2 The Licensee must carry out and complete all the activities listed under condition 1.1 according to the following:

1.2.1. Reports submitted to the Department or the Responsible Authority, specifically:

1.2.1.1. Water Use Licence Application (WULA) report compiled by Water & Wastes Utilisation Solution, November 2013.
1.2.1.2. The conceptual drawings included in appendix E of the WULA report designed by Aurecon, October 2013
1.2.1.3. Technical Report for Bulk Services compiled by Aurecon, August 2013.
1.2.1.4. Draft Basic Assessment Report for upgrade of informal settlements project (UISP) – area 8a&b & bulk services on Erf 4056 & 4055 (Area 6A&B) compiled by Cape EAPrac Environmental Assessment Practitioners, September
1.2.1.5. Ecological Assessment Report compiled by Simon Todd Consulting, September 2013.

1.2.2. Reserve determination, dated June 2012;

1.2.3. Environmental Authorisation; 4 March 2014 ;

1.2.4. Conditions of this licence; and

1.2.5. Any other written direction issued by the Provincial Head in relation to this licence.

1.3 No activity must take place within the 1:100 year flood line or the delineated riparian habitat, whichever is the greatest, or within 500 m radius from the boundary of any wetland unless authorised by this licence.

1.4 The conditions of the authorisation must be brought to the attention of all persons (employees, sub-consultants, contractors etc.) associated with the undertaking of these activities and the Licensee must take such measures that are necessary to bind such persons to the conditions of this licence.

1.5 If the Licensee is not the end user/beneficiary of the water use related infrastructure and will not be responsible for long term maintenance and management of the infrastructure, the Licensee must provide a programme for hand over to the successor-in-title including a brief management /maintenance plan and the agreement for infrastructure along with allocation of responsibilities, within three (3) months of the date of issuance of this licence.

1.6 A copy of the water use licence and reports set out under condition 1.2 must be on site at all times.

1.7 A suitably qualified person(s), appointed by the Licensee, and approved in writing by the Provincial Head, must be responsible for ensuring that the activities are undertaken in compliance with the specifications as set out in reports submitted to the Department and the conditions of this licence.

2. FURTHER STUDIES AND INFORMATION REQUIREMENTS

2.1 The current ecological status should not change as the result of the authorised activity and the pipeline crossing the watercourse should not have any joining parts

2.2 A rehabilitation, mitigation and maintaince plan including its associated method statement should be submitted for approval prior commencement to the Provincial Head.

2.2 The Licensee shall submit in writing under reference 27/2/1/K330/113/6 a complete set of construction drawings of the river crossing for approval prior construction

2.3 The Licensee shall within 30 days after completion of the activities inform the Provincial Head in writing and this shall be accompanied by a signature of approval of the registered professional engineer that the construction was done according to the construction drawings.

2.4 The Licensee shall submit an operation and maintenance manual with special reference to:

i. The operation of the scour valves in order to prevent pollution to the Schaapkop River and its tributaries.
ii. The management of culverts to be kept clean in order to prevent debris build up and blockages.

3. PROTECTIVE MEASURES

3.1 Storm Water Management

3.1.1. Storm water management practices must be constructed, operated and maintained in a sustainable manner throughout the project and for the water use activities set out in condition 1.1 and must include but are not limited to the following:

3.1.1.1 Increased runoff due to vegetation clearance and/or soil compaction must be managed, and steps must be taken to ensure that storm water does not lead to bank instability and excessive levels of silt entering the watercourse(s);
3.1.1.2. The velocity of storm water discharges must be attenuated and the banks of the watercourses protected; and
3.1.1.3. Sheet runoff from paved surfaces and access roads need to be curtailed.

3.2 Structures, Construction Plant and Materials

3.2.1. The necessary erosion prevention measures must be employed to ensure the sustainability of all structures.

3.2.2. The height, width and length of structures must be limited to the minimum dimension necessary to accomplish the intended function.

3.2.3. Structures must not be damaged by floods exceeding the magnitude of floods occurring on average once in every 100 years.

3.2.4. Structures must be non-erosive, structurally stable and must not induce any flooding or safety hazard.

3.2.5. Structures must be inspected regularly for accumulation of debris, blockage, erosion of abutments and overflow areas - debris must be removed and damages must be repaired and reinforced immediately.

3.2.6. The construction camp, plant and material stockpiles must be located outside the extent of the watercourse(s) and must be recovered and removed one (1) month after construction has been completed

3.2.7. During construction erosion berms should be installed to prevent gully formation, according to the slope.

3.2.8. All areas affected by construction should be rehabilitated upon completion of the construction phase of the development. Areas should be reseeded with indigenous vegetation species as required, and the use of seednets is recommended to prevent erosion.

3.2.9. During the construction phase no vehicles shall be allowed to indiscriminately drive through any wetland areas.

3.2.10. No construction is allowed within the 1:100 year flood line and/or delineated riparian habitat, whichever is the greatest, or within 500 m radius from the boundary of any wetland unless authorised in this license.

3.2.11 The length of solid pipe (no joints) across the riparian area and/or 1:100 year flood line (whichever is the greatest) to avoid spillages into the watercourse.

3.2.12 The pipe will be elevated over the riparian area and/or 1:100 year flood line (whichever is the greatest) in relation to the other sections of the adjoining pipeline to facilitate no return flow to the watercourse in the event of a spill.

3.2.13 The pipe has to be raised over the riparian area and/or 1:100 year flood line (whichever is the greatest) above the maximum flood level to avoid obstruction and damage.

3.2.14 No structures to be placed within the 1:100 year flood line and/or the delineated riparian areas unless authorised in this license.

3.2.15 The structure of sewer pipeline crossing the watercourse(s) must be non-erosive, structurally stable and may not induce any flooding. Accumulation of debris, blockage erosion of abutments and overflow must be inspected regularly and damaged areas must be repaired immediately.

3.2.16 Once the installation of the pipe has been completed, all construction material e.g excess plastic will be removed, and the banks of the stream in the position of the bridge will be stabilized and rehabilitated.

3.2.17 The manholes or pump stations for the pipeline should be placed at least 30 m away from the river to ensure that no spillages occur into the river should there be a problem with the pipeline.

3.2.18 Where the pipeline is closest to the river (that is approximately 10m from the river), the manholes should be sealed as far as possible to minimize spills from these manholes that may occur as a result of pipeline blockages

3.2.19 All manholes within the 1:100 year flood line or delineated riparian habitat, whichever is the greatest, must be capsulated in concrete to hold a pre-determined capacity to avoid spillage into the river.

3.2.20 The proposed pipeline must be constructed in such a way so as to allow any spills from the pipeline to be quickly observed and repaired.

3.2.21 The pipeline should be regularly monitored and maintained to ensure that any problems with the pipeline are rectified before it can impact on the Schaapkop river and its tributaries.

3.3 Water Quality

3.3.1 The Licensee shall sample the water quality weekly (during construction) and monthly (operation) for the mentioned variables (Table 2) at monitoring points both upstream and downstream of the activities and report to the Provincial Head within thirty (30) days after the results of each sampling event is received:

Table 3: Water quality parameters relevant for sampling.

Variable	Limit
Flow (l/s)	Not applicable
Temperature (°C)	<10% variation
pH	6.0 – 8.5
Electrical conductivity (EC) (mS/m)	<60
Suspended solids (SS) (mg/l)	<25
Dissolved oxygen (mg/l)	>6
Turbidity (NTU)	<3
Secchi disk depth (m)	≥1 meter
Alkalinity (mg $CaCO_3$/l)	<100
PO_4 (mg/l)	<0.5
NO_3/NO_2 (as N) (mg/l)	<6
BTEX, TPH (mg/l)	<1
Faecal coliforms (counts/100ml)	<130

The variables may be amended on discretion of the Responsible Authority. Only an accredited (SANS 17025) laboratory to be used for analysis.

3.3.2 Monitoring must continue for three (3) years after the cessation of the activities listed in condition 1.1.

3.3.3 Monitoring must be undertaken as set out in section 5.

3.3.4 Activities that lead to elevated levels of turbidity of any watercourse(s) must be prevented, reduced, or otherwise remediated. Activities must be scheduled to take place during the dry seasons when flows are lowest where reasonably possible. If this is not possible and if management measures have not been provided for in the reports submitted to the Provincial Head, the Licensee must submit such to the Provincial Head for written approval before these activities commence. Natural in stream hydrology is to be used to determine which months constitute the low flow months.

3.3.5 The Licensee must ensure that the quality of the water to downstream water users does not decrease because of the of the water use activities listed under condition 1.1.

3.3.6 A qualified person must be appointed to assess the quality of water both upstream and downstream of the activities prior to commencement of construction.

3.3.7 Pollution of and disposal/spillage of any material into the watercourse must be prevented, reduced, or otherwise remediated through proper operation, maintenance and effective protective measures.

3.3.8 Vehicles and other machinery must be serviced well above the 1:100 year flood line or deliniated riparian habitat, whichever is the greatest. Oils and other potential pollutants must be disposed off at an appropriate licensed site, with the necessary agreement from the owner of such a site.

3.3.9 Any hazardous substances must be handled according to the relevant legislation relating to transport, storage and use of the substance.

3.3.10 All reagent storage tanks and reaction units must be supplied with a bunded area built to the capacity of the facility and provided with sumps and pumps return the spilled material back into the system. The system must be maintained in a state of good repair and standby pumps must be provided.

3.4 Flow

3.4.1 The Licensee must determine flood lines (1:50 and 1:100 year) prior to construction to ensure risks are adequately managed. Flood lines must be clearly indicated on the site plan(s).

3.4.2 The activities must be conducted in a manner that does not negatively affect catchment yield, hydrology and hydraulics. The Licensee must ensure that the overall magnitude and frequency of flow in the watercourse(s) does not decrease, other than for natural evaporative losses and authorised attenuation volumes.

3.4.3 Appropriate design and mitigation measures must be developed to minimise impacts on the natural flow regime of the watercourse i.e. through placement of structures/supports and to minimise turbulent flow in the watercourse.

3.4.4 Structures to be designed in a way to prevent the damming of stream/river water and not impact on the flow of the water, during the construction and operational phases of all developments.

3.4.5 The development may not impede natural drainage lines.

3.4.6 The diversion structures may not restrict river flows by reducing the overall river width or obstructing river flow.

3.5 Riparian and In-stream Habitat (Vegetation and Morphology)

3.5.1 Activities (including spill clean-up) must start up-stream and proceed into a down-stream direction, so that the recovery processes can start immediately, without further disturbance from upstream works.

3.5.2 Operation and storage of equipment must not take place within the 1:100 year flood line or delineated riparian habitat, whichever is the greatest unless authorised in this license.

3.5.3 Activities must not occur in sensitive riffle habitats.

3.5.4 Indigenous riparian vegetation, including dead trees, outside the limits of disturbance indicated in the site plans must not be removed from the area.

3.5.5 Alien and invader vegetation must not be allowed to further colonise the area, and all new alien vegetation recruitment must be sustainably eradicated or controlled.

3.5.6 Existing vegetation composition must be maintained or improved by maintaining the natural variability in flow fluctuations. Rehabilitated areas shall have a vegetation basal cover of at least 15% at all times.

3.5.7 Recruitment and maintaining of a range of size classes of dominant riparian species in perennial channels must be stimulated.

3.5.8 Encroachment of additional exotic species and terrestrial species in riparian zones must be discouraged.

3.5.9 Accumulation of woody debris on terraces by periodic flooding must be discouraged.

3.5.10 Existing flood terraces and deposition of sediments on these terraces to ensure optimum growth, spread and recruitment of these species must be maintained.

3.5.11 All reasonable steps must be taken to minimise noise and mechanical vibrations in the vicinity of the watercourses.

3.5.12 The necessary erosion prevention mechanisms must be employed to ensure the sustainability of all structures and activities and to prevent in-stream sedimentation.

3.5.13 Soils that have become compacted through the water use activities must be loosened to an appropriate depth to allow seed germination.

3.5.14 Slope/bank stabilisation measures must be implemented with a 1:3 ratio or flatter and vegetated with indigenous vegetation immediately after the shaping.

3.5.15 Stockpiling of removed soil and sand must be stored outside of the 1:100 flood line or delineated riparian habitat, whichever is the greater, to prevent being washed into the river and must be covered to prevent wind and rain erosion.

3.5.16 The indiscriminate use of machinery within the instream and riparian habitat will lead to compaction of soils and vegetation and must therefore be strictly controlled.

3.5.17 The overall macro-channel structures and mosaic of cobbles and gravels must be maintained by ensuring a balance (equilibrium) between sediment deposition and sediment conveyance maintained. A natural flooding and sedimentation regime must thus be ensured as far as reasonably possible.

3.5.18 As much indigenous vegetation growth as possible should be promoted within the proposed development area in order to protect soil and to reduce the percentage of the surface area which is paved.

3.5.19 Run-off from paved surfaces should be slowed down by the strategic placement of berms.

3.6 Biota

3.6.1 The Licensee must take all reasonable steps to allow movement of aquatic species, including migratory species.

3.6.2 All reasonable steps must be taken not to disturb the breeding, nesting and/or feeding habitats and natural movement patterns of aquatic biota.

3.6.3 The current level of diversity of biotopes and communities of animals, plants and microorganisms must be maintained.

4 REHABILITATION AND MANAGEMENT

4.1 The Licensee must embark on a systematic long-term rehabilitation programme to restore the watercourse(s) to environmentally acceptable and sustainable conditions after completion of the activities, which must include, but not be limited to the rehabilitation of disturbed and degraded riparian areas to restore and upgrade the riparian habitat integrity to sustain a bio-diverse riparian ecosystem.

4.2 All disturbed areas must be re-vegetated with an indigenous seed mix in consultation with an indigenous plant expert, ensuring that during rehabilitation only indigenous shrubs, trees and grasses are used in restoring the biodiversity.

4.3 An active campaign for controlling invasive species must be implemented within disturbed zones to ensure that it does not become a conduit for the propagation and spread of invasive exotic plants.

4.4 Rehabilitation must be concurrent with construction.

4.5 Topsoil must be stripped and redistributed.

4.6 Compacted and disturbed areas must be shaped to natural forms and to follow the original contour. In general cut and fill slopes and other disturbed areas must not exceed 1:3 (v:h) ratio, it must be protected, vegetated, ripped and scarified parallel with the contour.

4.7 The Provincial Head must sign a release form indicating that rehabilitation was done satisfactory according to specifications as per this license.

4.8 A photographic record must be kept as follows and submitted with reports as set out in section 5:

4.8.1 Dated photographs of all the sites to be impacted before construction commences;

4.8.2 Dated photographs of all the sites during construction on a monthly basis; and

4.8.3 Dated photographs of all the sites after completion of construction, seasonally.

4.9 Rehabilitation structures must be inspected regularly for the accumulation of debris, blockages instabilities and erosion with concomitant remedial and maintenance actions.

5 MONITORING AND REPORTING

5.1 The Provincial Head must be notified in writing one week prior to commencement of the licensed activity and again upon completion of the activity.

5.2 A comprehensive and appropriate environmental assessment and monitoring programme (including bio-monitoring) to determine the impact, change, deterioration and improvement of the aquatic system associated with the activities listed under condition 1.1 as well as compliance to these water use licence conditions must be developed and submitted to the Provincial Head for written approval before commencement and must subsequently be implemented as directed.

5.3 Six (6) monthly monitoring reports must be submitted to the Provincial Head until otherwise agreed in writing with the Provincial Head: Western Cape Region.

5.4 A qualified and responsible scientist must be retained by the Licensee who must give effect to the various licence conditions and to ensure compliance thereof pertaining to all activities impeding and/or diverting flow of watercourses as well as alterations to watercourses on the properties as set out in condition 1.1.

5.5 The audit reports must include but are not limited to:

5.5.1 Reporting in respect of the monitoring programme referred to in condition <5.2>;

5.5.2 A record of implementation of all mitigation measures including a record of corrective actions; and

5.5.3 Compensation measures for damage where mitigation measures have failed to adequately protect the in-stream and riparian habitat or any other characteristic of the watercourses.

5.6 The Licensee must apply in writing to the Provincial Head for alternative reporting arrangements for which written approval must be provided.

5.7 Monitoring must continue throughout the operation of the sewer pipeline and for the activities listed in condition 1.1.

6 OTHER WATER USERS

6.1 The Licensee must attempt to prevent adverse effect on other water users. All complaints must be investigated by a suitable qualified person and if investigations prove that the Licensee has impaired the rights of other water users, the Licensee must initiate suitable compensative measures.

7. POLLUTION PREVENTION, INCIDENTS AND MALFUNCTIONS

7.1 Pollution incidents shall be dealt with in accordance with Section 19 and 20 of the Act

7.2 Any incident that may cause pollution of any water resource shall immediately be reported to the Responsible Authority

7.3 If surface and/or groundwater pollution has occurred or may possibly occur, the Licensee must conduct, and/or appoint specialists to conduct the necessary investigations and implement additional monitoring, pollution prevention and remediation measures to the satisfaction of the Responsible Authority.

7.4 The Licensee shall keep all records relating to the compliance or non-compliance with the conditions of this licence in good order. Such records shall be made available to the Provincial Head within 14 (fourteen) days of receipt of a written request by the Department for such records.

7.5 The Licensee shall keep an incident report and complaints register, which must be made available to any external auditors and the Department.

8 BUDGETARY PROVISIONS

8.1 The water user must ensure that there is a budget sufficient to complete and maintain the water use and for successful implementation of the rehabilitation programme as set out in this licence.

8.2 The Department may at any stage of the process request proof of budgetary provisions for rehabilitation and closure of project.

[END OF LICENCE]

Western Cape Government

Department of Environmental Affairs and Development Planning
Shireen Pullen
Directorate: Development Management, Region 3
Shireen.Pullen@westerncape.gov.za | Tel: 044 814 2021

REFERENCE: 16/3/1/1/D2/50/0060/12
ENQUIRIES: Shireen Pullen
DATE OF ISSUE: **17 November 2021**

The Municipal Manager
George Municipality
Private Bag 19
GEORGE
6530

Attention: Ms. L. Mooiman

Tel: (044) 801 9111
Email: lcmooiman@george.gov.za

Dear Madam

ACCEPTANCE OF THE UPDATED ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPr) FOR THEMBALETHU BULK SERVICES, GEORGE

1. The above-mentioned document received by the Directorate: Development Management (Region 3) hereinafter referred to a "this Directorate"on 18 October 2021 refers.

2. Based on the review of the content of the updated EMPr and by virtue of the powers conferred on it by the National Environmental Management Act, 1998 (Act No. 107 of 1998) and the Environmental Impact Assessment Regulations, 2014 (as amended), the competent authority herewith approves the amended EMPr.

3. In addition to the above, please be reminded that the EMPr is a working document and can be amended at times to address certain changes (if any) that may be required, provided that the outcomes of the EMPr are still the same and remains relevant.

4. Currently, the EMPr contains an updated Site Development Plan (SDP) and not the SDP referred to in the Environmental Authorisation (EA). In the new updated plan, the pipeline follows the contours slightly up the stream valley, instead of straight across, as indicated on the approved SDP. This section of pipeline was re-aligned to the top of the valley slope to avoid traversing the remaining Afrotemperate Forest patches located within this section of the Schaapkop River Valley. It is hereby confirmed that no application for amendment is required as this slight change in the routing is considered to still be approximate to the site development plan approved as part of the development.

5. A compliance monitoring inspection will be undertaken after commencement of construction activities, in order to determine compliance with the Environmental Authorisation issued on 6 April 2021.

6. Your attention is further drawn to the audit requirements of the aforementioned Environmental Authorisation. Please note that in light of the recent official feedback received from the Chief Director: Development Planning regarding environmental audits, neither the Environmental Assessment Practitioner (EAP) or the Environmental Control Officer (ECO) can undertake an audit nor a person from the same company as the EAP or ECO, as it would represent a circumstance that may compromise the objectivity of the audit. Therefore, all audits to be conducted must be done by an independent auditor (not the EAP/ECO).

7. Please note that it is an offence in terms of Section 49Aof the NEMA to fail to comply with the provisions of an Environmental authorisation. Failure to comply with the requirements of Section 24F of the NEMA shall result in the matter being referred to the Environmental Compliance and Enforcement Directorate of this Department. A person convicted of an offence in terms of the above is liable to a fine not exceeding R10 million or to imprisonment for a period not exceeding 10 years, or to both such fine and imprisonment.

8. Kindly quote the abovementioned reference number in any future correspondence in respect of the abovementioned development.

9. This Department reserves the right to revise initial comments and request further information from you based on any new or revised information received.

Yours faithfully

pp Malcolm Fredericks

Digitally signed by Malcolm Fredericks
Date: 2021.11.16 16:07:01 +02'00'

HEAD OF COMPONENT: ENVIRONMENTAL: IMPACT MANAGEMENT SERVICES
DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND DEVELOPMENT PLANNING

Copies to:

Ms Siân Holder	Cape EAPrac	Email: sian@cape-eaprac.co.za
Mr. A. Molendorf	George Municipality	Email: avmolendorff@george.gov.za

APPENDIX E – GENERIC ENVIRONMENTAL GUIDELINES

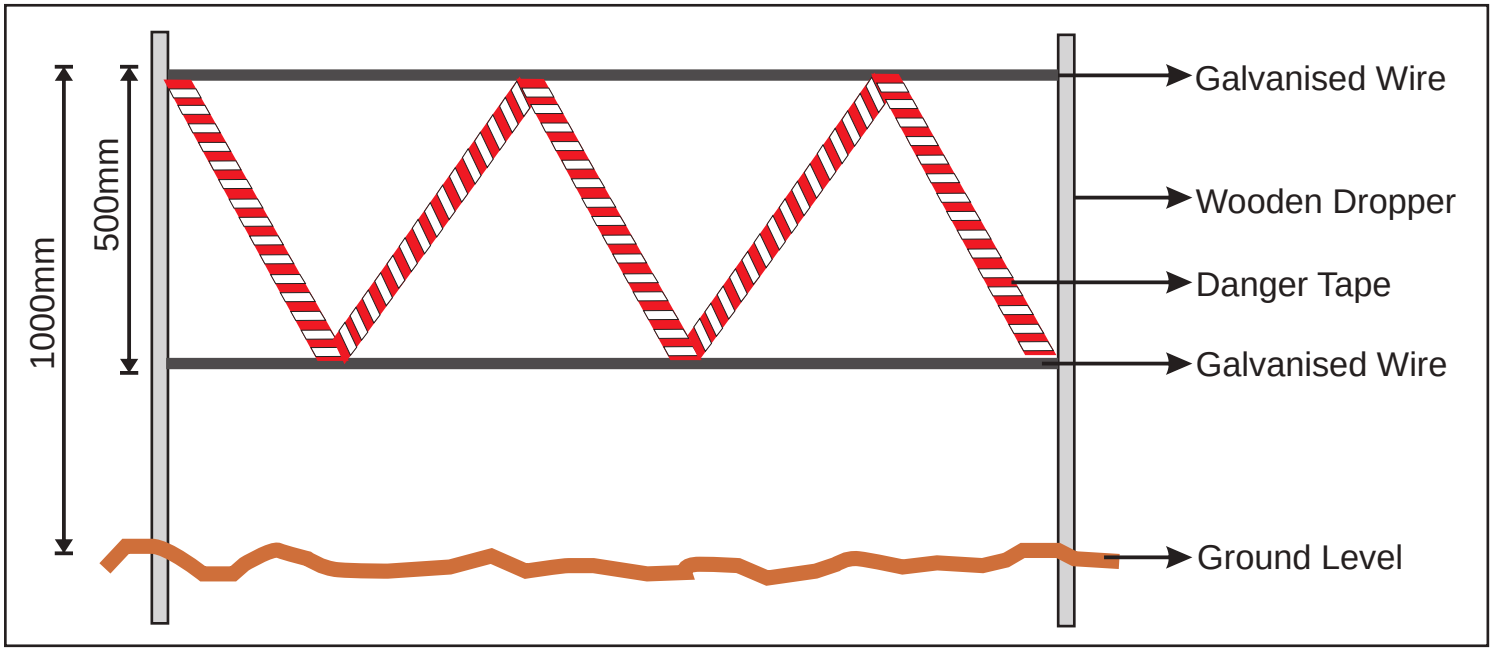


Plate A: Showing a cross section of a typical method of demarcation of no-go areas.

Where demarcation is required on a down slope, it can be more cost effective to include the required silt protection mechanisms on the same support structure as the demarcation. This is detailed in **Plate B** below and must be read in conjunction with the details on erosion control included in the previous diagram.

GENERAL CONSIDERATIONS FOR DEMARCATION OF NO GO AREAS

- The demarcation must include all areas that are going to be disturbed in the total construction (including all service lines)
- The no -go areas may not be accessed by any person (including lunch, tea breaks etc.). Without the explicit written permission from te ECO.
- Maximum fines will be issued for any non compliance with regards to the no go policy.

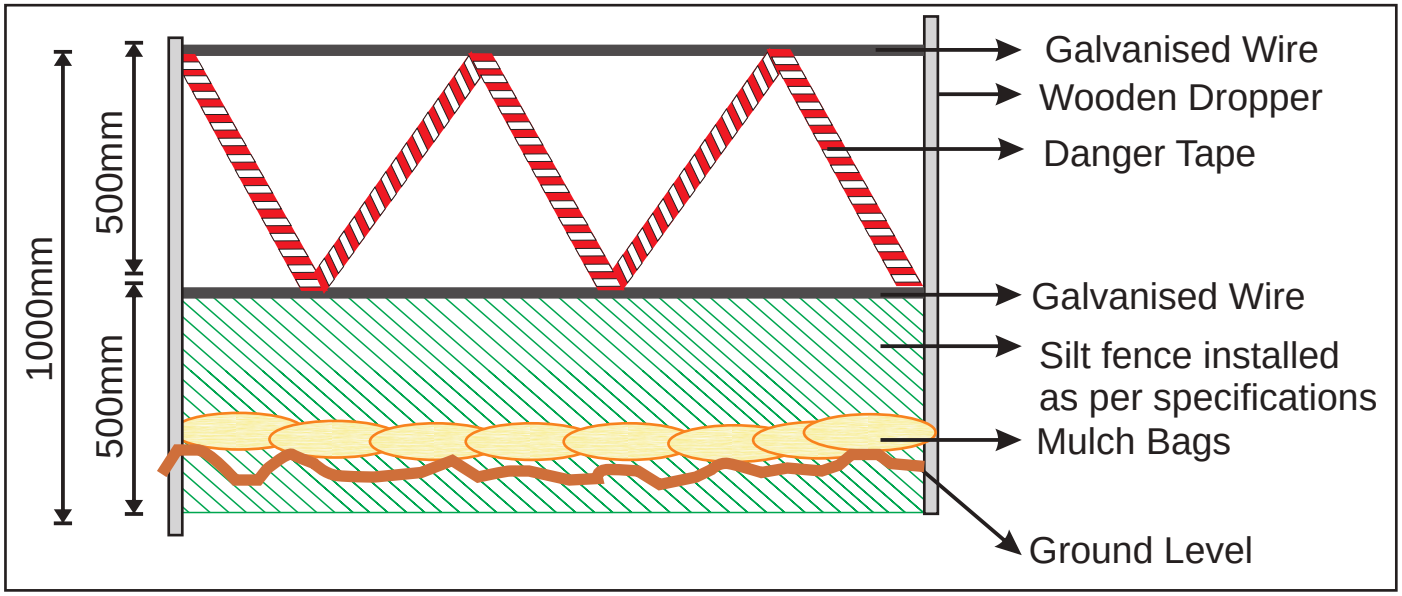
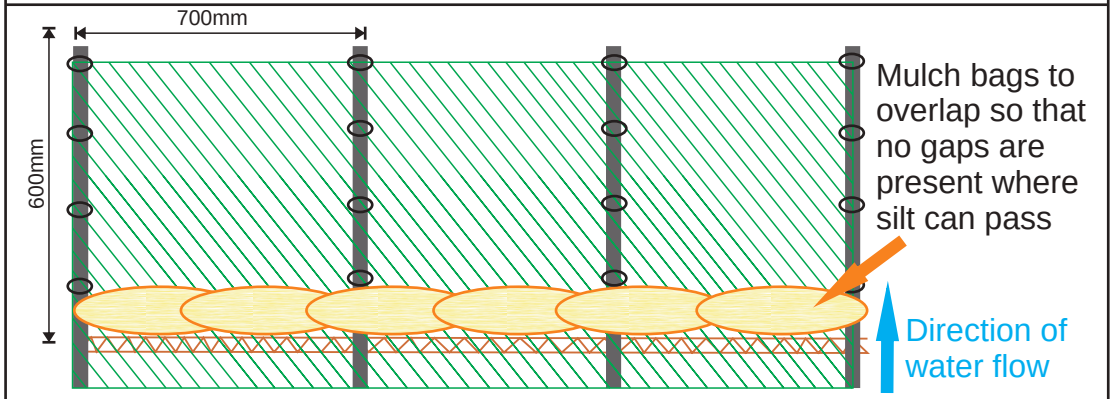


Figure 1: Demarcation of No - Go Areas During Construction

Cape Environmental Assessment Practitioners (Pty) Ltd

Frontal View

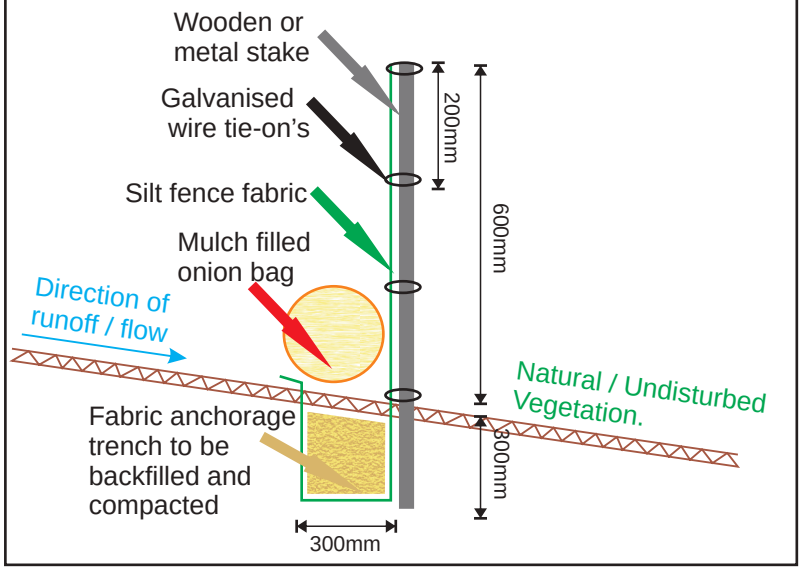


The purpose of a silt fence is to create a temporary barrier to maintain sediment on a construction site in order to prevent soil erosion and pollution through sediment and nutrient loading. Silt fences are designed to detain sediment from the disturbed construction area and also prevent sheet erosion by decreasing the velocity of the run off.

Technical Specifications

- Silt fence fabric to consist out of 50% shade cloth or a geotextile such as biddim (if biddum is used, it is not necessary to place mulch bags).
- Wooden droppers are suitable for the stakes. If the construction program takes place over an extended time frame it may be necessary to use treated droppers or metal stakes.
- The support stakes should not be placed further than 700mm apart on the down slope side of the fabric.
- The fabric should be secured to the stakes using galvanised wire ties not further than 200mm apart.
- The fabric anchorage trench should be at least 300mm deep.

Cross-section View



Planning, Placing and Maintenance

- The silt fence is to be installed on all disturbed slopes where sheet erosion may take place.
- This type of silt fence is not suitable for areas where water is concentrated. i.e. gulleys and storm-water outlets.
- The silt fences should be along the contour lines
- The rows of silt fences should be bowed to prevent erosion and loss of silt on the ends of the fence line.
- Silt fences should be inspected weekly and before every forecast rainfall event. Any damage must be repaired immediately.
- Silt deposits should be cleared after each rainfall event. CLEARED SILT MUST NOT BE PLACED DOWN SLOPE OF THE FENCE.

Top View

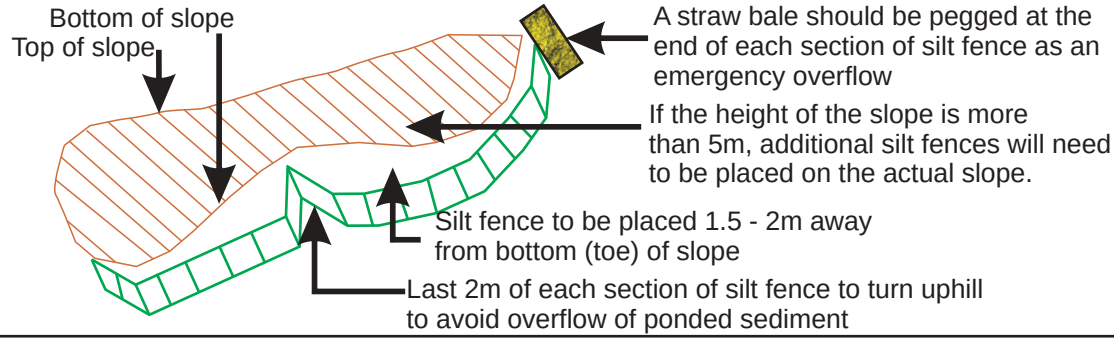
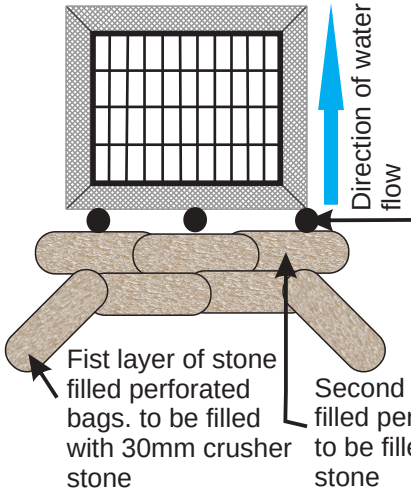


Figure 2: Specifications for Silt Fences

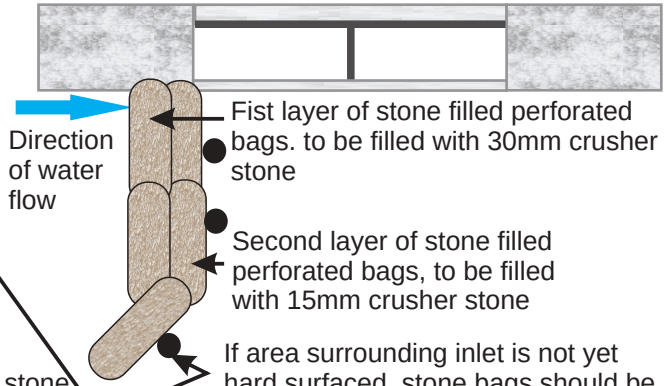
Cape Environmental Assessment Practitioners (Pty) Ltd

Inlet Protection

Drop Inlets



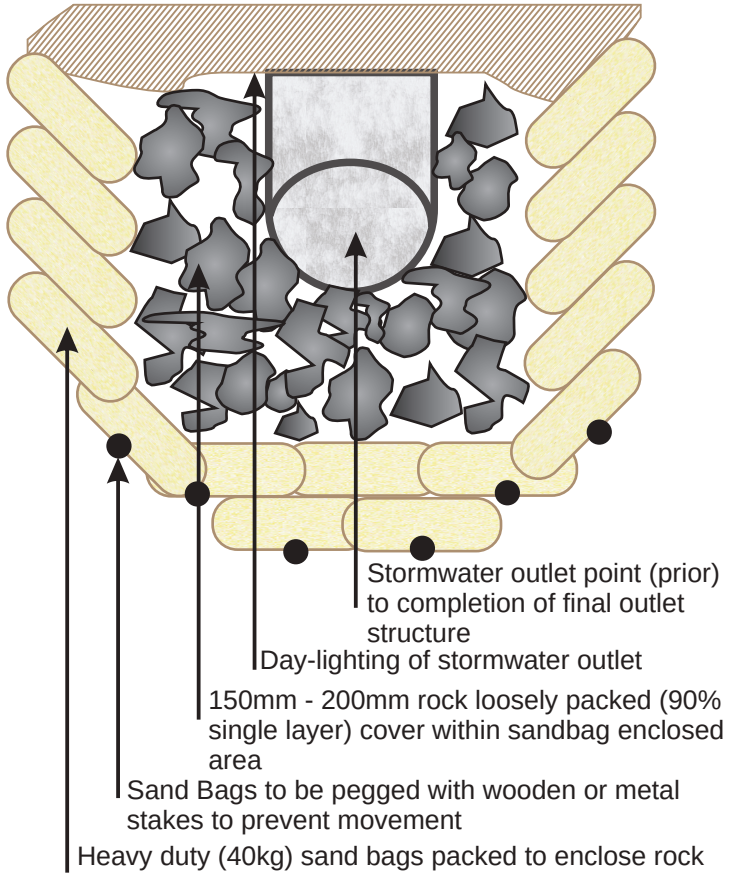
Kerb Inlets



- Should the inlet be positioned at a low point with water entering from a number of sides, a double row of stone bags (as detailed above) should be placed at each side where water enters.

- In low flow, high sediment areas, consideration should be given to cover the inlet structures with biddum (this will only work in low flow areas.)

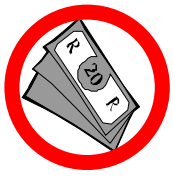
Outlet Protection



- The methodology referred to above is effective as a temporary measure to be used during construction and is in no way intended to replace the permanent measures that must be installed. These permanent measures must be constructed as per the engineers specifications.
- Stormwater systems should ideally be constructed during low rainfall periods in order to allow for permanent protection measures to be put in place before the rainy season.
- Consideration should be given to encase the outlet structure with a geo-fabric such as biddum. This should first be clarified with the site engineer to ensure compatibility with the stormwater system.

Figure 3: Specifications for Temporary Stormwater Management During Construction

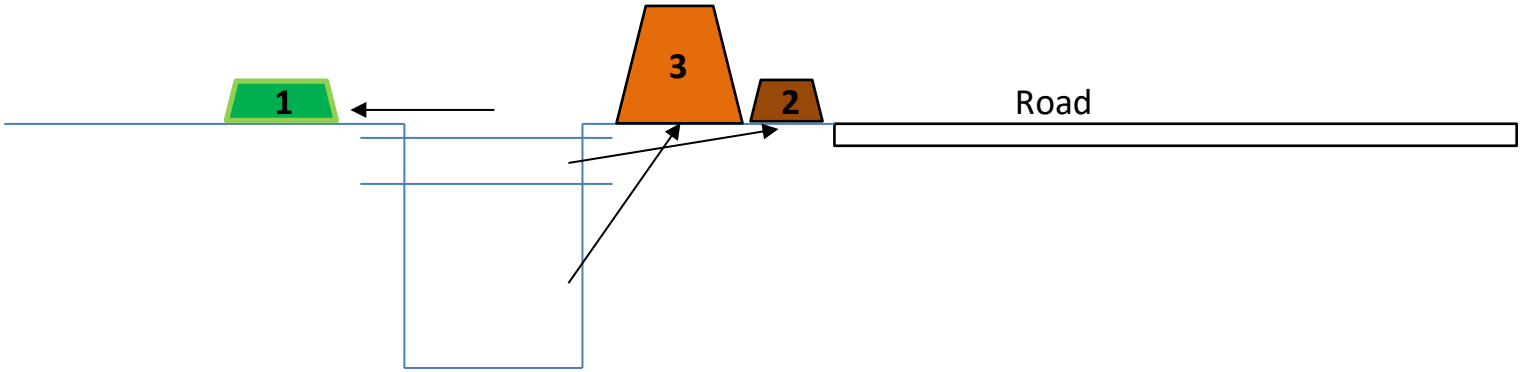
Cape Environmental Assessment Practitioners (Pty) Ltd

	ENVIRONMENTAL DO'S	ENVIRONMENTAL DON'TS
Work Site	 Workers and equipment to stay within site boundaries	 Do not enter no go areas
Materials & Equipment	 Use drip trays Report spills	 Do not create dust Do not drive too fast
	 Store in camp at night Check for leaks Ensure loads don't spill	 Do not wash machinery or tools on site
Waste Management	 Use toilets provided	 Don't burn or bury waste No fires on site Report any other fires
	 Use bins provided for cigarette butts & waste	 Eat in designated area Don't eat at dam or river
Natural Environment	 Save water Use only drinking water provided	 Do not damage trees, flowers or rocks
	 Protect animals and archaeological remains	 Do not swim or wash in the dam or river
Danger & Emergencies	 Know emergency procedures & no's Report accidents	 No smoking near gas or diesel
	 Be careful when working with hazardous substances	 Fines will be issued for non-compliance with environmental specifications

Environmental Guidelines for Trenching

Excavation Methodology:

1. Remove top vegetation layer with as much of the root systems as possible – place on furtherest side of trench from road.
2. Remove ±200mm layer of topsoil – place / stockpile closest to road.
3. Remove remainder of subsoil to required trench depth – place / stockpile next to trench.



Backfill Methodology:

Once Cable Sleeve has been installed, backfill trench as follows:

Reverse order:
3. Backfill with subsoil closest to trench – compact as required.
2. Backfill top of trench with topsoil – do not compact.
1. Cover topsoil with vegetation layer back to natural ground level.

COMMON SNAKES OF THE SOUTHERN CAPE

Garden Route & Klein Karoo

VERY DANGEROUS — Has caused human fatalities

DANGEROUS — Painful bite, but does not require antivenom

MILDLY VENOMOUS — Not thought to be harmful

HARMLESS — Not dangerous to humans

AFRICAN SNAKEBITE INSTITUTE.com ®

Cape Cobra
(*Naja nivea*)

Cape Cobra - juvenile
(*Naja nivea*)

Cape Boomslang - male
(*Dispholidus typus typus*)

Cape Boomslang - female
(*Dispholidus typus typus*)

Puff Adder
(*Bitis arietans arietans*)

Berg Adder
(*Bitis atropos*)

Rinkhals - banded phase
(*Hemachatus haemachatus*)

Coral Shield Cobra
(*Aspidelaps lubricus lubricus*) Photo David Maguire

Karoo Sand Snake
(*Psammophis notostictus*)

Herald or **Red-lipped Snake**
(*Crotaphopeltis hotamboeia*)

Spotted Harlequin Snake
(*Homoroselaps lacteus*)

Rhombic Night Adder
(*Causus rhombeatus*)

Mole Snake
(*Pseudaspis cana*)

Rhombic Egg-eater
(*Dasypeltis scabra*)

Western Natal Green Snake Photo Tyrone Ping
(*Philothamnus natalensis occidentalis*)

Olive Snake
(*Lycodonomorphus inornatus*)

Brown House Snake
(*Boaedon capensis*)

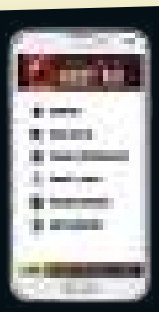
Common Brown Water Snake
(*Lycodonomorphus rufulus*) Photo Tyrone Ping

Delalande's Beaked Blind Snake
(*Rhinotyphlops lalandei*)

Common Slug-eater
(*Duberria lutrix lutrix*) Photo Tyrone Ping

Johan Marais | African Snakebite Institute
+27 82 494 2039 | johan@asiorg.co.za

www.AFRICANSNAKEBITEINSTITUTE.com



JOHAN MARAIS is the author of various books on reptiles including the best-seller *A Complete Guide to Snakes of Southern Africa*. He is a popular public speaker and offers a variety of courses including **Snake Awareness**, **Scorpion Awareness** and **Venomous Snake Handling**. Johan is accredited by the International Society of Zoological Sciences (ISZS) and is a Field Guides Association of Southern Africa (FGASA) and Travel Doctor-approved service provider. His courses are also accredited by the Health Professions Council of South Africa (HPCSA).

APPENDIX F – EAP COMPANY PROFILE

Cape Environmental Assessment Practitioners (Pty) Ltd

Cape EAPrac
Company Profile

Cape Environmental Assessment Practitioners (Pty) Ltd was established in March 2008 by Directors **Doug Jeffery** (EAPASA Reg. No 2019/1746) and **Louise-Mari van Zyl** (EAPASA Reg. No. 2019/1444). The full time professional team includes: **Dale Holder** - Senior Environmental Practitioner (EAPASA Reg.No 2019/301), **Siân Holder** (Practitioner/ECO/Environmental Education), **Mariska Byleveld** - Cadidate Environmental Practitioner (EAPASA Reg. No 2023/6593), **Francois Byleveld** - Candidate Environmental Practitioner (EAPASA Reg.No 2023/6700), **Onke Nandipha** (EAPASA Reg.No 2023/6688) & **Charmaine Mudau** - Full Time On-Site ECOs and **Carin Naudé** - Business Administrator.

The firm implements legislation under the National Environmental Management Act (NEMA), National Environmental Management: Waste Act (NEM:WA) and the National Environmental Management: Air Quality Act (NEM:AQA).

Our main services include:

- Environmental Impact Assessments (EIA's & Basic Assessments)
- Environmental Management Policies & Plans (EMMP's)
- Environmental Control & Monitoring(ECO)
- Environmental Audits
- Environmental Education & Interpretation
- Environmental Constraints Analysis
- Public Participation & Stakeholder Engagement
- Outeniqua Sensitive Coastal Area Permits (OSCA)
- Forestry Applications (for removal/pruning of protected species)
- GIS & Mapping
- Retrospective Damage Assessment (Section 24G)
- Rehabilitation Plans
- Coastal Water Discharge Permits
- Air Quality Licence Applications (AEL's)
- Waste Management Licence Applications (Waste Licence)

PROJECT EXPERIENCE INCLUDES

Reverse Osmosis Desalination; Sensitive Environmental Management including National Parks/Conservation Areas & World Heritage Sites; Renewable Energy Projects (Solar & Wind); Waste Management License Applications for Waste Disposal Sites, Sewerage Plants & Abattoirs; Waste-to -Energy Projects including Biogas Facilities; Marine Aquaculture; Filling Stations; Air Emission Processes for Sawmills, Brick Works & Processing Plants; ECO responsibilities on Private & State Housing Developments, Provincial & Municipal Roads and Infrastructure, Private, Provincial & Municipal applications for development of infrastructure, housing & commercial components

LIST OF ONGOING ***CAPE EAPRAC*** PROJECTS IS AVAILABLE ON REQUEST. PLEASE VISIT OUR WEBSITE FOR MORE DETAILS

PO Box 2070
6530 George

17 Progress Street
6529 George

www.cape-eaprac.co.za

Tel: +27 44 874 0365
Cell: +27 71 603 4132

The Team

Doug Jeffery - Director

Doug Jeffery obtained a Bsc with majors in Botany and Zoology at the University of Cape Town (UCT) and went on to obtain his MSc in Botany also at UCT. He has worked extensively in the Western-, Southern- and Eastern Cape both as a professional Botanist and co-ordinating EIA processes for over 20 years. He is registered with the South African Council for Natural Scientific Professions since 1990. He is also registered with the Environmental Assessment Practitioners Association of South Africa.

email: doug@dougjeff.co.za

Dale Holder

Senior Environmental Practitioner

Dale graduated from the Technicon Pretoria in 1999 with a National Diploma in Nature Conservation. He worked as a Socio-Ecologist for SANParks and as Project Manager for the Department of Marine and Coastal Management. He started working as an environmental practitioner in 2002. His focus is currently on Renewable Energy Infrastructure Assessment, but is also involved with assessments in various other industries.

Registered as a Professional Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (EAPASA). (Reg. No. 2019/301)

email: dale@cape-eaprac.co.za

Siân Holder - Consultant / ECO

Siân completed a National Diploma Nature Conservation (Pta Tech), B-tech Nature Con. (NMMU) and a Masters Degree in Environmental Education (Rhodes University). She joined our team in 2008. She worked as Environmental Assessment Practitioner for many years, but her current focus is on Environmental Control and Monitoring, Rehabilitation and Alien Invasive Management.

email: sian@cape-eaprac.co.za

Carin Naudé

Business Administrator

Carin obtained a BBA degree through UNISA. She gained extensive experience in business management and administration since 1988. She joined *Cape EAP*rac in June 2008 and is responsible for the day to day administrative functions of the business. Her acquired knowledge and leadership skills enables the rest of the team to function efficiently in their respective fields.

email: carin@cape-eaprac.co.za

Louise-Mari van Zyl

Director / Principal Environmental Practitioner

Louise-Mari van Zyl holds a Masters degree in Geography & Environmental Sciences from the University of Stellenbosch. She worked as an Environmental Assessment Practitioner (EAP) since 2002 on projects in the Eastern, Southern, Western & Northern Cape provinces. She is registered as and EAP with the Environmental Assessment Practitioners Association of South Africa.

email: louise@cape-eaprac.co.za

Mariska Byleveld

Candidate Environmental Practitioner

Mariska joined Cape EAPrac in April 2022 . She completed her BSc in Geology in 2016, BSc Honours in 2017 and holds a MSc in Geology from the University of the Free State (2020). She worked as a Geologist for two years before joining our team. She is registered as a Candidate Environmental Practitioner.

email: mariska@cape-eaprac.co.za

Francois Byleveld

Candidate Environmental Practitioner

Francois graduated from the University of the Free State in 2020 with a MSc in Geology. After working in the petroleum industry, he joined our team in May 2023 to train as an Environmental Assessment Practitioner. He is registered as a Candidate EAP.

email: francois@cape-eaprac.co.za

On-Site ECOs

We have three full-time, on-site ECOs, working on PV Solar construction sites in the Northern Cape:

- Onke Nandipha - BSc in Environmental Sciences (2017) and a BSc Honours in Geography (2018) from Walter SisuluUniversity. He is registered as a Candidate EAP with EAPASA.
- Charmaine Mudau - BA in Geography and Environmental Management from the University of the Free State (2014) and a BSc Honours in Geography from UNISA (2020).

Their knowledge and understanding of environmental management make them a valuable asset on site.

email: onke@cape-eaprac.co.za &
email: charmaine@cape-eaprac.co.za

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6530 George

17 Progress Street
6529 George

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Tel: +27 44 874 0365
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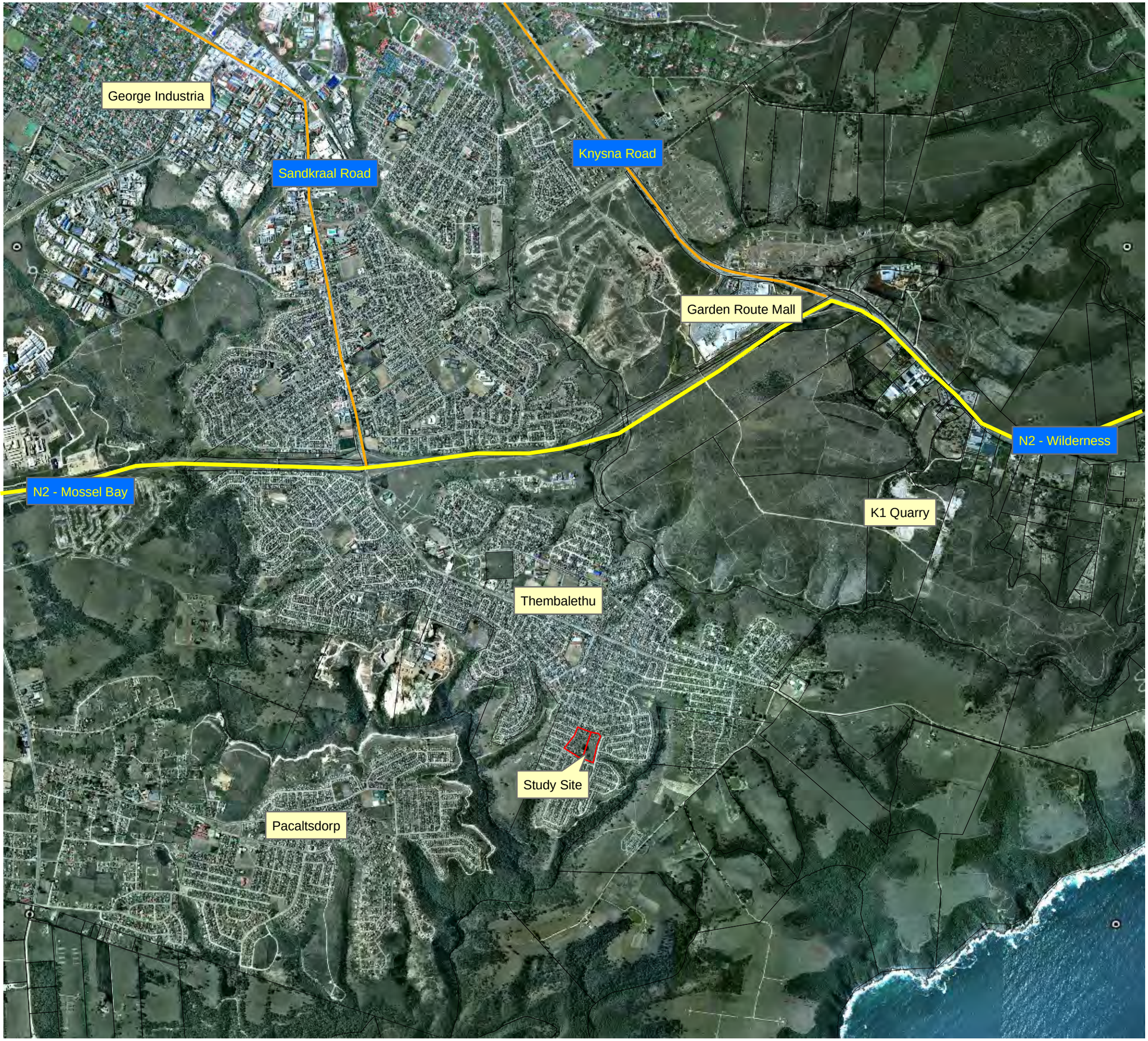
APPENDIX G – LOCALITY AND BIODIVERSITY PLANS 2021 EMPr



Notes

- Map Scale is 1 : 25 000 when printed on A3.
- Aerial Image courtesy of Google Earth Pro 2012
- Imagery date January 2010.

N

0 200 400 800 1,200 1,600 Meters

Map Index

Location Plan

Thembalethu Housing
Area 8A & B

Legend

Area 8A & B (erf 4056 & 4055)

Drawn	Checked	Date	Reference
Dale Holder	Sian Holder	12 November 2012	GEO191

Cape Environmental Assessment Practitioners (Pty) Ltd

SANBI

Thembalethu UISP

Legend

- Towns
- National roads
- Secondary roads
  - ARTERIAL ROUTE
  - MAIN ROAD
  - SECONDARY ROAD
- Minor roads
- GR CBA and ESA Lookup Tab
- GR Critical Biodiversity Areas a Support Areas
  - Protected Areas
  - Critical Biodiversity Areas
  - Ecological Support Areas
- GR Other Natural Areas
- GR Transformation
  - Alien Transformed
  - Dam
  - Degraded
  - Farm
  - Heavy Alien Degradation
  - Natural
  - Plantation
  - Urban
- GR Vegetation Types
  - Baviaanskloof Sandolienveld
  - Baviaanskloof Spekboom Thicket
  - Covie Coastal Proteoid Fynbos
  - De Vlugt Forest-Waboomveld
  - De Vlugt Sandolien-Renosterveld
  - Doornrivier Mesic Proteoid Fynbos
  - Doringrivier Arid Proteoid Fynbos
  - Doringrivier Waboomveld
  - Eensaamheid Renosterveld
  - Garden Route Estuary
  - Garden Route Wetlands
  - Groenvlei Coastal Forest
  - Groot Brak River and Floodplain
  - Haarlem Fynbos-Renosterveld
  - Hartenbos Primary Dune
  - Hartenbos Strandveld
  - Herold Renoster-Sandolienveld
  - Heroldsbay Asteraceous Fynbos

1: 25 138

1.3 0 0.64 1.3 Kilometers

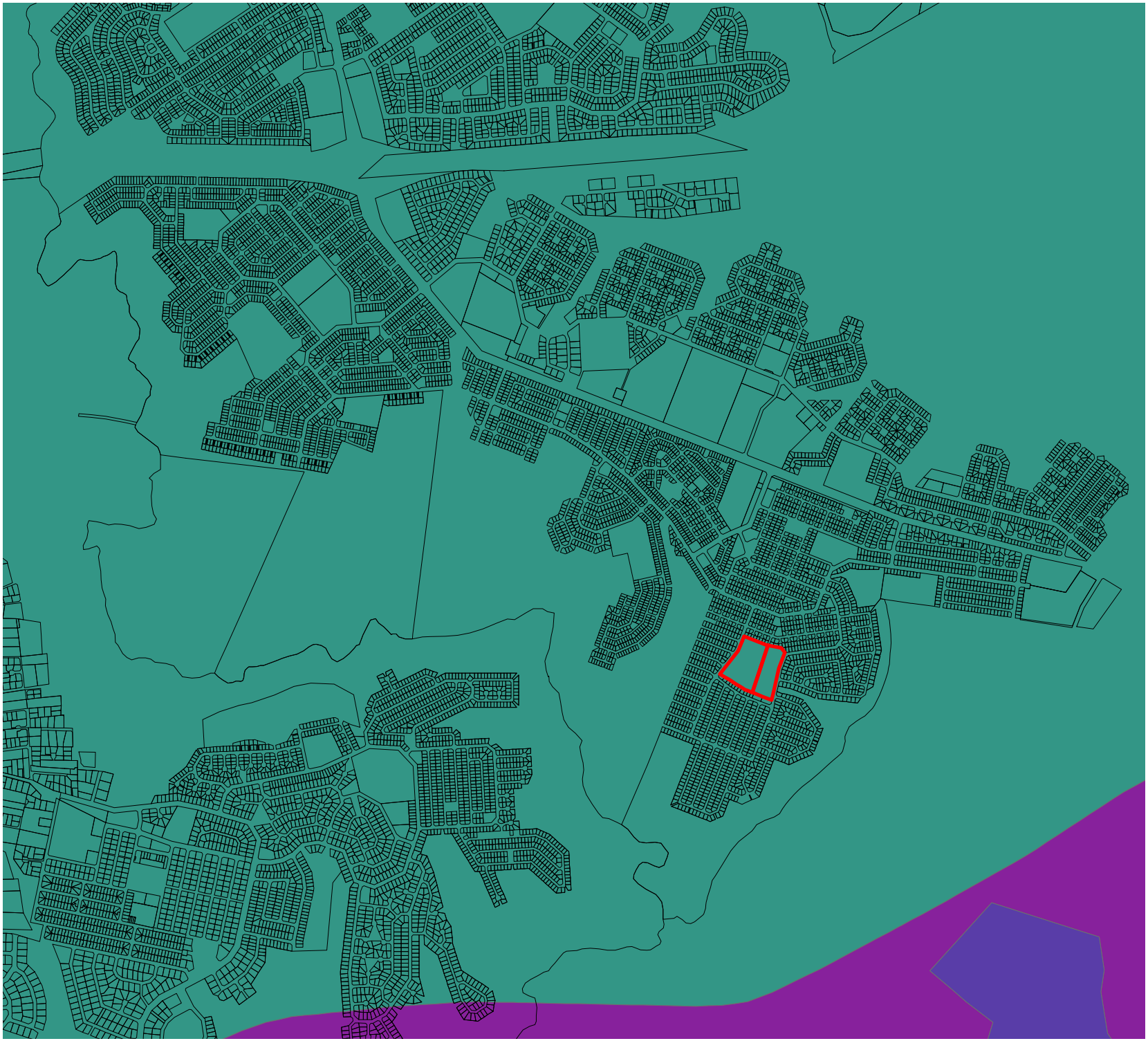
WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Notes

BGIS Critical Biodiversity Area Map



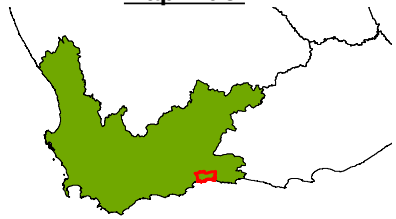
Notes

- Map Scale is 1 : 20 000 when printed on A4.
- Data source courtesy of SANBI BGIS 2012

N

0 125 250 500 750 1,000 Meters

Map Index



Location Plan

Thembalethu Housing
Area 8A & B
Critical Biodiversity Areas

Legend

Areas 8A & B (erf 4056 & 4055)

Vegetation Type, Ecosystem Status

- Garden Route Granite Fynbos, Endangered
- Groot Brak Dune Strandveld, Endangered
- Southern Afrotemperate Forest, Least threatened

Drawn	Checked	Date	Reference
Melissa Mackay	Sian Holder	12 November 2012	GEO191

Cape Environmental Assessment Practitioners (Pty) Ltd

Notes

- Map Scale is 1 : 10 000 when printed on A3.
- Aerial Image courtesy of Google Earth Pro 2012
- Imagery date January 2010.

N

0 55 110 220 330 440 Meters

Map Index

Location Plan

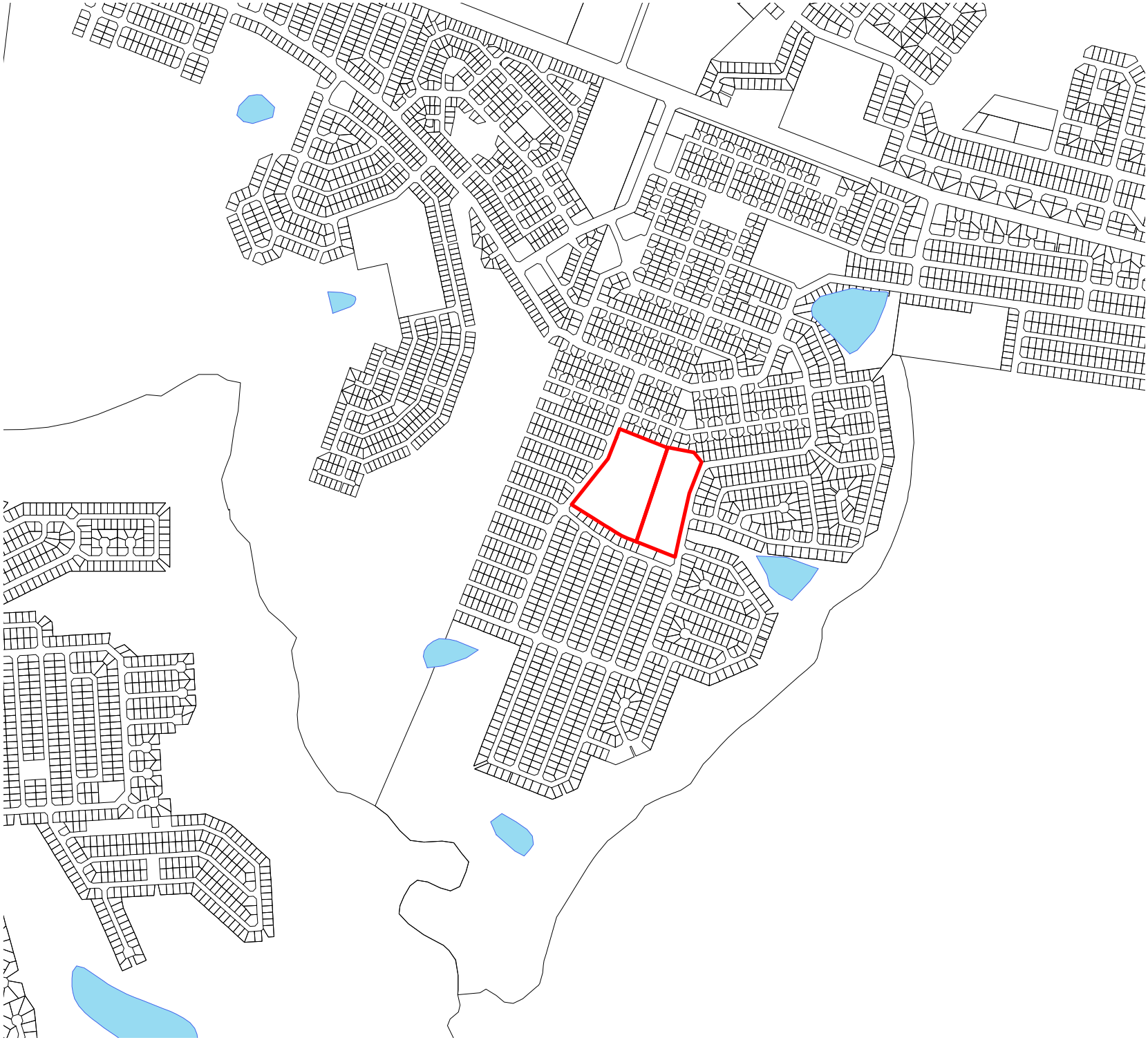
Thembalethu Housing
Area 8A & B
Critical Biodiversity Areas

Legend

- Areas 8A & B (erf 4056 & 4055)
- Critical Biodiversity Areas
- Ecological Support Areas

Drawn	Checked	Date	Reference
Dale Holder	Sian Holder	12 November 2012	GEO191

Cape Environmental Assessment Practitioners (Pty) Ltd



Notes

- Map Scale is 1 : 10 000 when printed on A3.
- Aerial Image courtesy of Google Earth Pro 2012
- Imagery date January 2010.

N

0 55 110 220 330 440 Meters

Map Index

Thembalethu Housing Areas 8A & B

National Freshwater Ecosystem Priority Areas Wetlands

Legend

NFEPA Wetlands

Areas 8A & B (erf 4056 & 4055)

Drawn	Checked	Date	Reference
Dale Holder	Sian Holder	12 November 2012	GEO 191

Cape Environmental Assessment Practitioners (Pty) Ltd

APPENDIX H – APPROVED LAYOUT AND PLANS 2021 EMPr

N2 Rd

RECENTLY UPGRADED N2 BULK SEWER

BULK SEWER TO BE UPGRADED (N2 EXTENSION)

SWARTKOP RIVER

350mm Ø BULK SEWER RIVER CROSSING No.4

OUTENIQUA WASTEWATER TREATMENT WORKS

AREA 1

EXISTING THEMBALETHU No.5 PUMP STATION TO BE DECOMMISSIONED

AREA 2

HIGH POINT

THEMBALETHU

NEW THEMBALETHU No.7 PUMP STATION PHASE 1

EXISTING 200mm Ø FIBRE CEMENT RISING MAIN

RIVER CROSSING No.3

AREA 5

OLD 'ALL BRICK' BRICKWORKS

AREA 7

AREA 8C

PLANNED NEW BULK SEWER PHASE 1

AREA 4B

OPTION 4

EXISTING 400mm Ø FC RISING MAIN, AUGMENTED WITH NEW 700mm Ø GRP RISING MAIN

AREA 6B

AREA 6A

RIVER CROSSING No.2

EXISTING THEMBALETHU No.3 PUMP STATION (TO BE UPGRADED OR DECOMMISSIONED)

NEW RISING MAIN PHASE 1

AREA 4A

AREA 8A

AREA 8B

PACALTSDORP No.1 PUMP STATION TO BE UPGRADED

RIVER CROSSING No.6

PROPOSED 350 - 400mm Ø BULK GRAVITY SEWER

AREA 3

EXISTING THEMBALETHU No.4 PUMP STATION (TO BE DECOMMISSIONED)

EXISTING 600 / 700mm Ø GRP BULK GRAVITY SEWER

NEW DAWN PARK

Dawn

OPTION 1

OPTION 3 REALIGNED

AREA 4C

OPTION 2

BULK SEWER UNDER CONSTRUCTION PHASE 1

Sea View

NEW THEMBALETHU No.6 PUMP STATION PHASE 1

EXISTING 250mm Ø PVC-u RISING MAIN TO BE AUGMENTED BY NEW 500mm Ø GRP RISING MAIN

RIVER CROSSING No.5

RIVER CROSSING No.1

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REV	DATE	REVISION DETAILS	APPROVED
B	05/2013	RIVER CROSSINGS ADDED	A van Molendorff
C	06/2013	STREAM CROSSINGS ADDED	A van Molendorff
D	07/2013	RIVER CROSSING No. 5 ADDED	A van Molendorff
E	07/2013	RIVER CROSSING No. 6 ADDED	A van Molendorff
F	08/2013	ENLARGED SCALE	A van Molendorff
G	11/2013	LAYOUT REVISED	A van Molendorff
H	11/2013	OPTION 3 REALIGNED	A van Molendorff
I	11/2013	LAYOUT REVISED	A van Molendorff

DRAWN	DESIGNED
MC Richards	A v Molendorff

CHECKED
A v Molendorff

APPROVED

NAME	SIGNATURE	DATE
P Jacobs		13/11/13

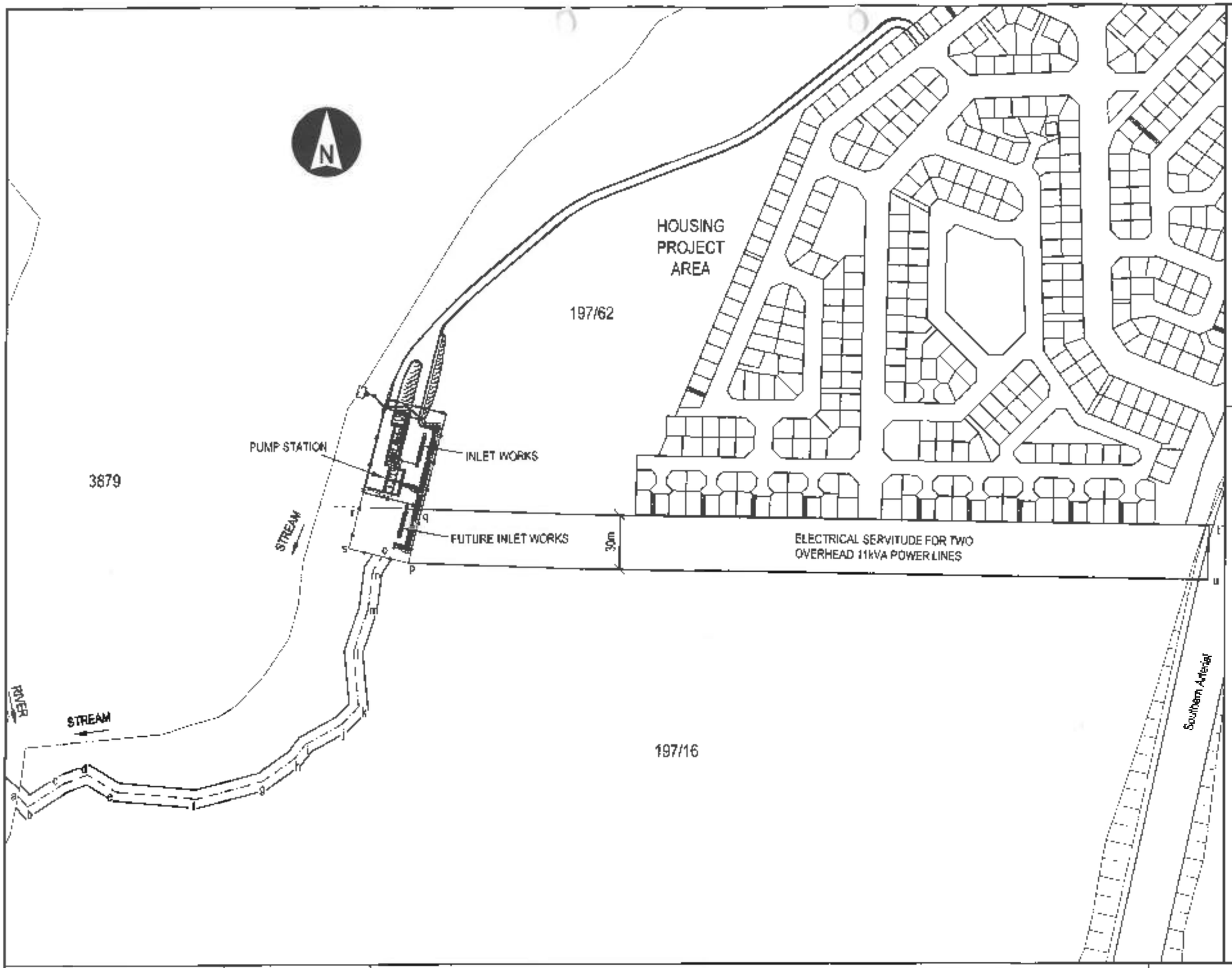
PROJECT
THEMBALETHU HOUSING PROJECT

TITLE
REVISED BULK SEWER MAIN PROPOSALS

FOR DISCUSSION PURPOSES

PROJECT No.	
108429	
SCALE	SIZE
1: 12 750	A3
DRAWING No.	REV.
108429 GE 400	I

APPENDIX I – DETAILED PLANS AREA 1-5
2021 EMPr



AREA p, q, r & s REPRESENTS A PORTION OF LAND TO BE EXPROPRIATED FROM PORTION 16 OF FARM 197 FOR THE EXTENSION OF THE SEWER PUMP STATION IN THE FUTURE. EXTENT = 915m²

LINE a - o REPRESENTS THE CENTRE LINE OF A 10m PIPE LINE SERVITUDE AND MAINTENANCE ACCESS RIGHT - OF - WAY FOR GEORGE MUNICIPALITY'S USE.

AREA l, u, q & p REPRESENTS A 30m SERVITUDE FOR TWO OVERHEAD 11kVA POWER LINES.

PROPOSED SERVITUDE CO-ORDINATE LIST :

POINT	Y	X
a	47288.132	3766266.690
b	47282.952	3766272.733
c	47263.575	3766260.247
d	47250.174	3766256.392
e	47234.565	3766264.884
f	47190.552	3766259.042
g	47154.769	3766259.439
h	47136.837	3766246.696
i	47131.115	3766239.114
j	47111.175	3766228.060
k	47102.641	3766218.546
l	47104.952	3766188.389
m	47097.051	3766164.937
n	47094.333	3766143.727
o	47089.357	3766136.036
p	47074.903	3766139.635
q	47067.498	3766109.892
r	47101.957	3766108.601
s	47107.653	3766131.481
t	46638.788	3766120.153
u	46637.397	3766150.147

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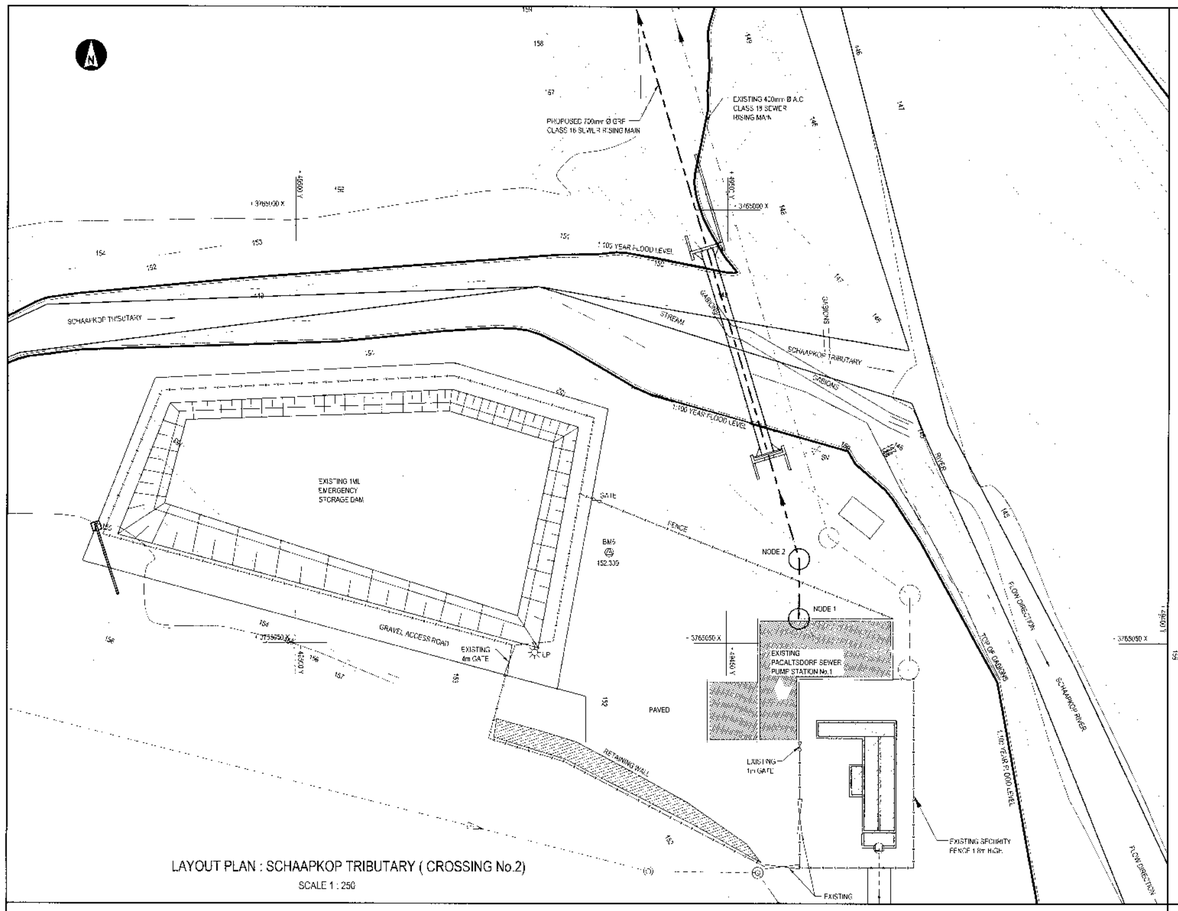
PROJECT DIRECTOR
Pr Eng
DATE : 9 May 2012

GEORGE MUNICIPALITY : SEWERAGE RETICULATION FOR PACALTSDORP : PHASE 2 (THEMBALETHU / ASAZANI)

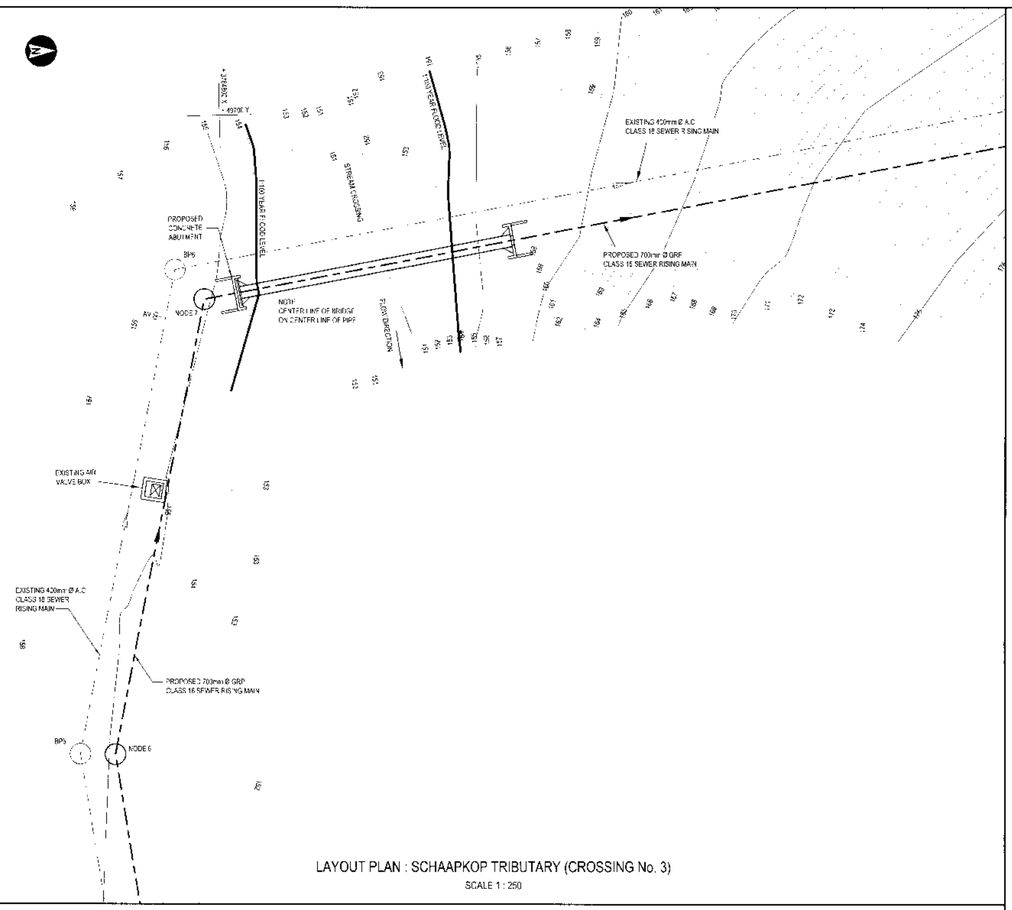
THEMBALETHU PUMP STATION : EXPROPRIATED AREA AND SERVITUDES

DRAWN	VC Dudgeon	SCALE 1 : 2000
DESIGNED :	R Meidenhamer	DRAWING No.
PROJ. MAN.	A van Molendorf	402947 GE 28



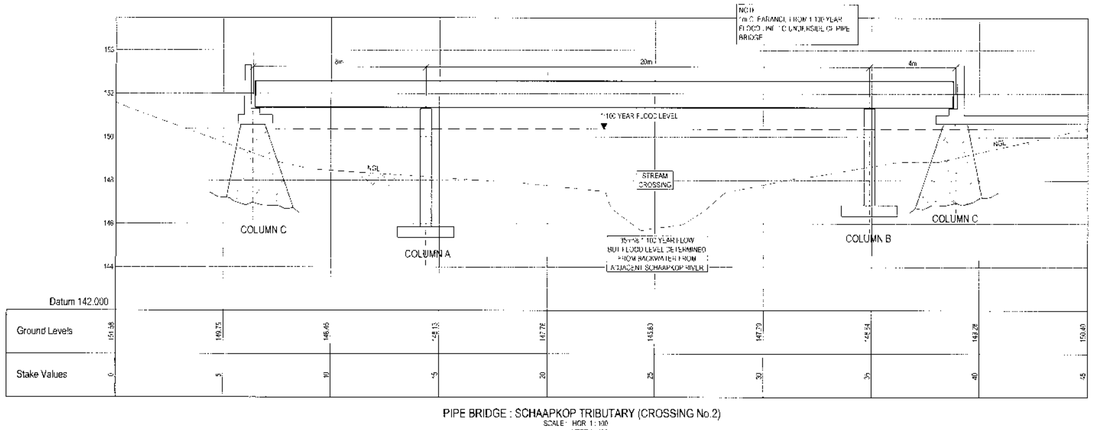
LAYOUT PLAN : SCHAAPKOP TRIBUTARY (CROSSING No.2)

SCALE 1 : 250



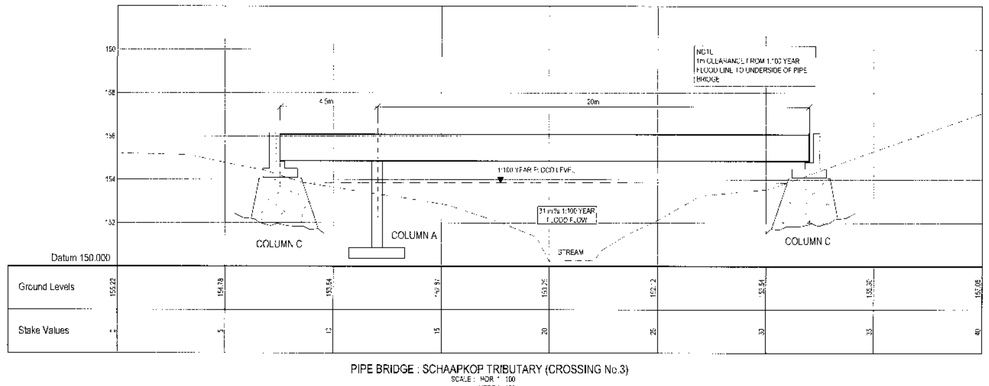
LAYOUT PLAN : SCHAAPKOP TRIBUTARY (CROSSING No. 3)

SCALE 1 : 250



PIPE BRIDGE : SCHAAPKOP TRIBUTARY (CROSSING No.2)

SCALE : HOR 1 : 100
VERT 1 : 100



PIPE BRIDGE : SCHAAPKOP TRIBUTARY (CROSSING No.3)

SCALE : HOR 1 : 100
VERT 1 : 100

APPROVED BY	SIGNATURE	DATE
DRAWN		04/12/2013
DESIGNED		4/12/2013
CHECKED		

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REV	DATE	REVISION DETAILS	APPROVED
D	08/2013	PIPE BRIDGE AMENDMENTS	A van Molsnorff
C	07/2013	CHANGED TO CONCRETE BRIDGE	A van Molsnorff
B	06/2013	FLOOD LINE ADDED	A van Molsnorff
A	05/2013	PIPE BRIDGE ADDED	A van Molsnorff

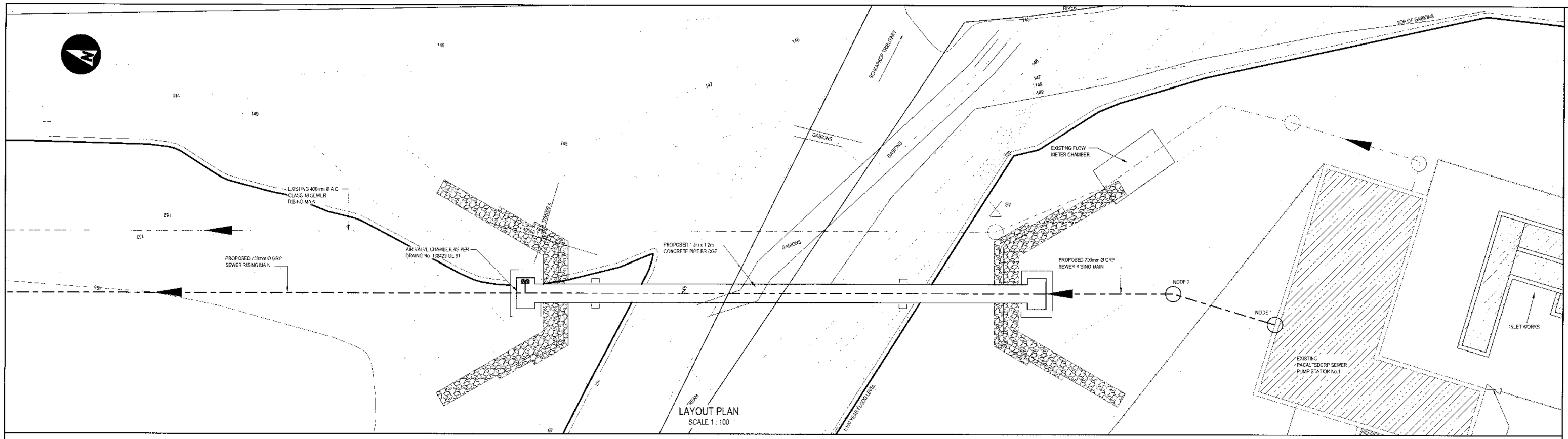
PROJECT

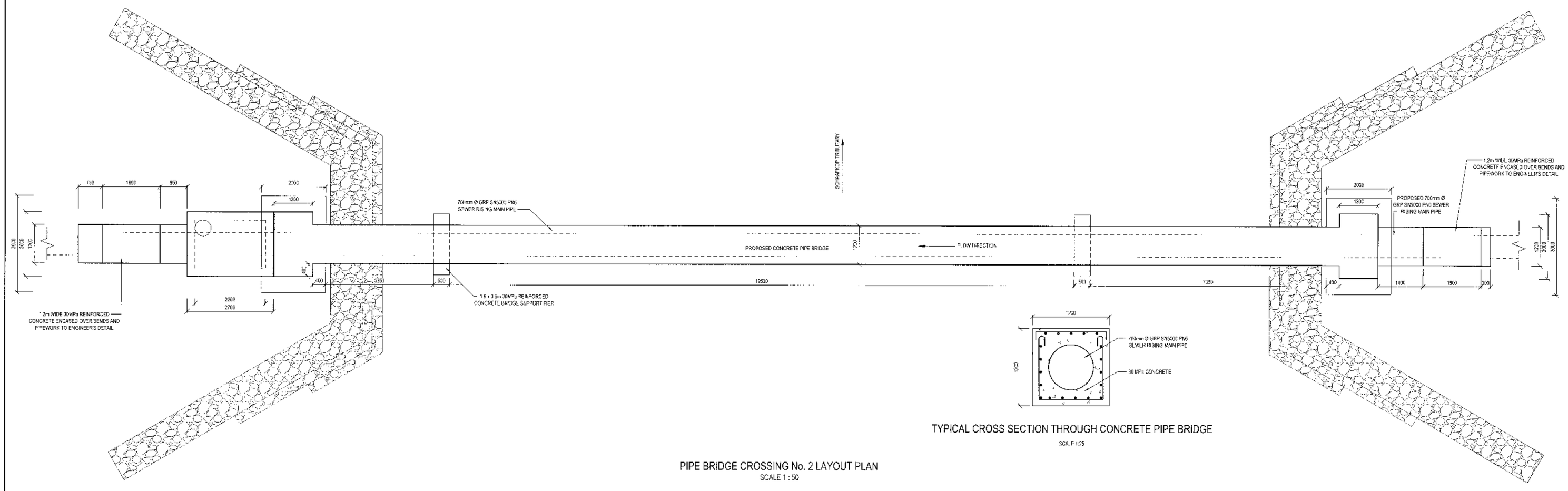
THEMBALETHU UISP BULK SEWER: PHASE 2

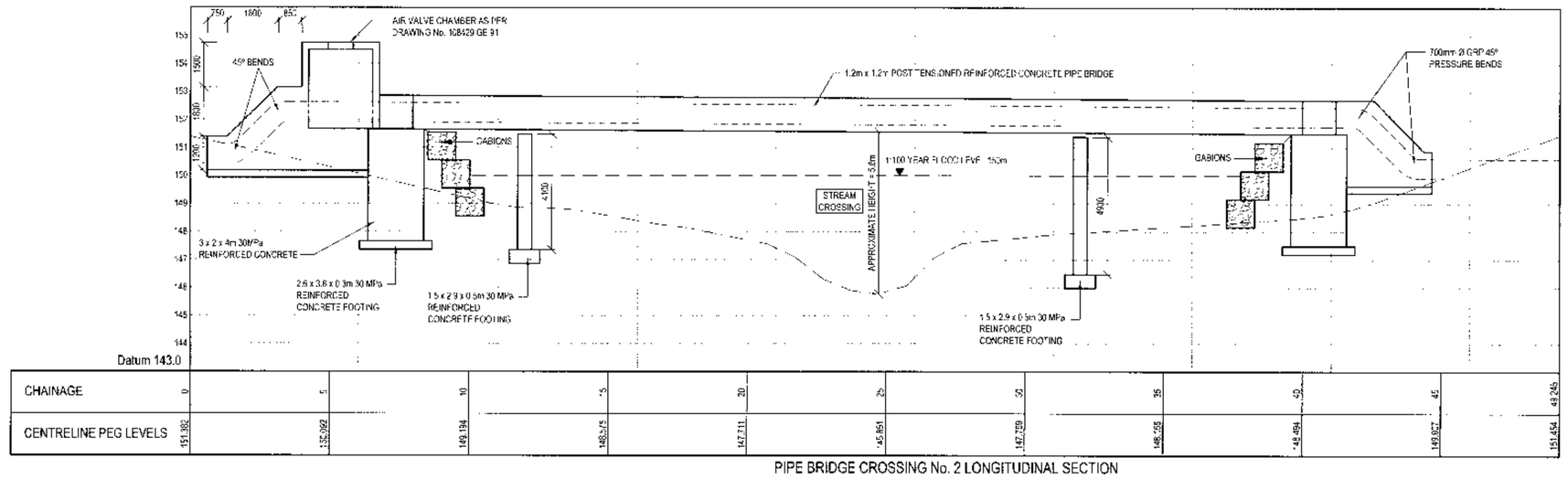
TITLE

PROPOSED PIPE BRIDGE LAYOUT PLAN AND LONGITUDINAL SECTIONS: CROSSING No. 2 AND No. 3

DRAWN	DESIGNED	FOR DISCUSSION PURPOSES ONLY
MC Richards	A Delle Donne	
CHECKED		PROJECT No.
A van Molsnorff		108429
APPROVED		SCALE / SIZE
NAME / SIGNATURE / DATE		AS SHOWN / A0
		DRAWING No. / REV
		108429 GE 404 / D







GENERAL NOTES:

APPROVED BY	SIGNATURE	DATE
DRAWN		
DESIGNED		30/10/2013
CHECKED		

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REV	DATE	REVISION DETAILS	APPROVED
T0	25/10/2013	FOR TENDER PURPOSES ONLY	A van Molendorff
D	08/2013	PIPE BRIDGE AMENDMENTS	A van Molendorff
C	07/2013	CHANGED TO CONCRETE BRIDGE	A van Molendorff
B	06/2013	FLOOD LINE ADDED	A van Molendorff
A	05/2013	PIPE BRIDGE ADDED	A van Molendorff

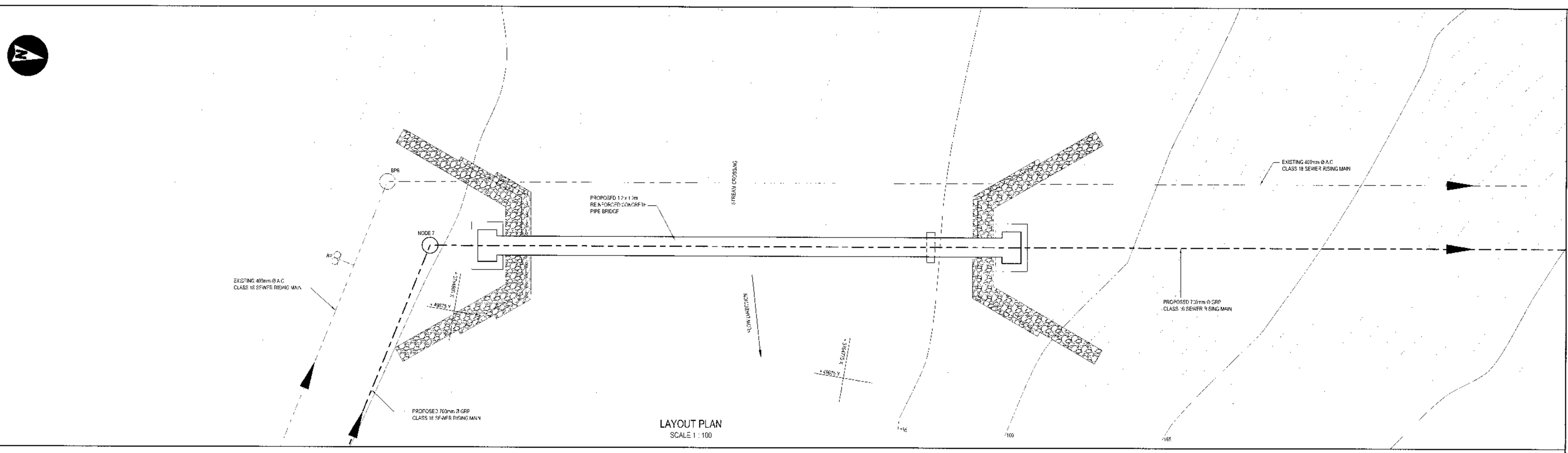
PROJECT

THEMBALETHU BULK SEWER: PHASE 3

TITLE

RIVER CROSSING No. 2
PLAN, LONGITUDINAL SECTION AND DETAIL

DRAWN	DESIGNED	FOR TENDER PURPOSES ONLY
MC Richards	S Liwandi	
CHECKED		PROJECT No.
A v Molendorff		108429
APPROVED		SCALE / SIZE
NAME / SIGNATURE / DATE		AS SHOWN / A0
		DRAWING No. / REV
		108429 GE 404 / T0



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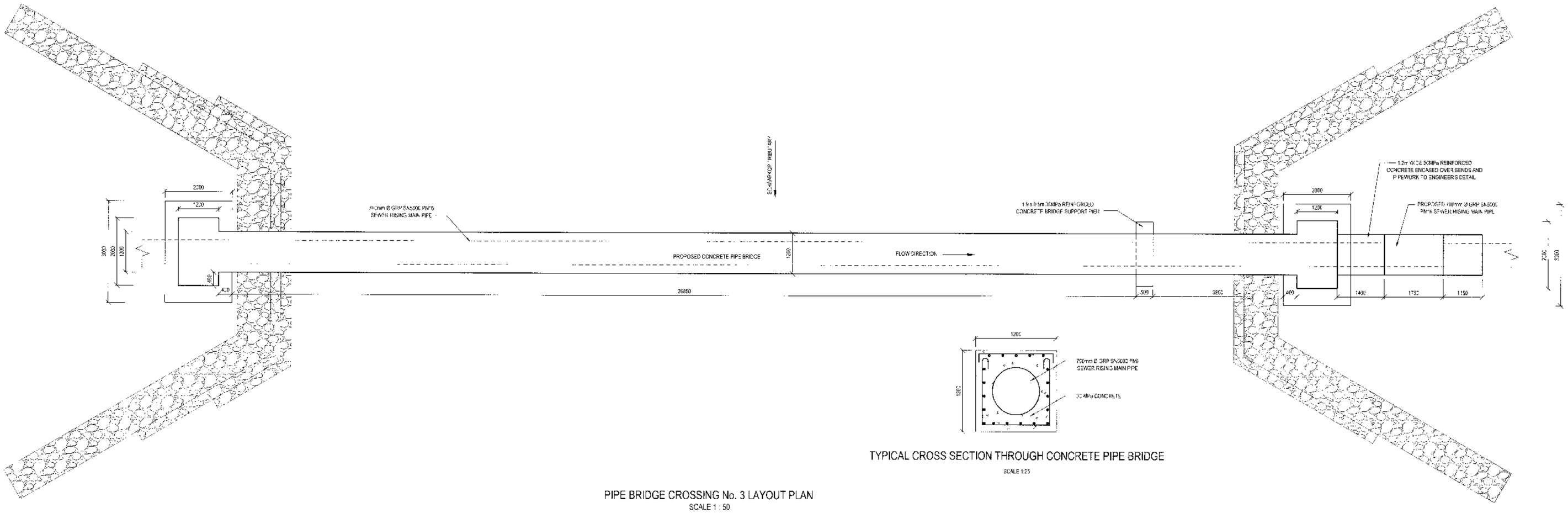
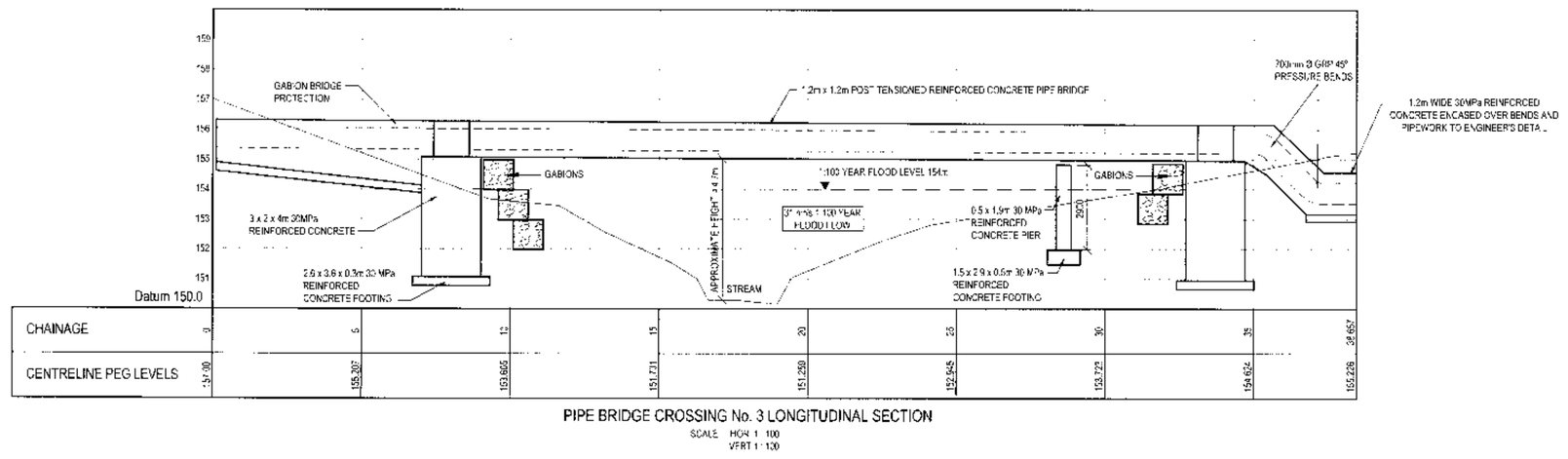


TYPICAL CROSS SECTION THROUGH CONCRETE PIPE BRIDGE
SCALE 1:25

PIPE BRIDGE CROSSING No. 3 LAYOUT PLAN
SCALE 1 : 50



PIPE BRIDGE CROSSING No. 3 LONGITUDINAL SECTION
SCALE: HOR 1 : 100
VERT 1 : 100

GENERAL NOTES:

APPROVED BY	SIGNATURE	DATE
DRAWN		
DES IGNED		31/10/2013
CHECKED		31/10/2013

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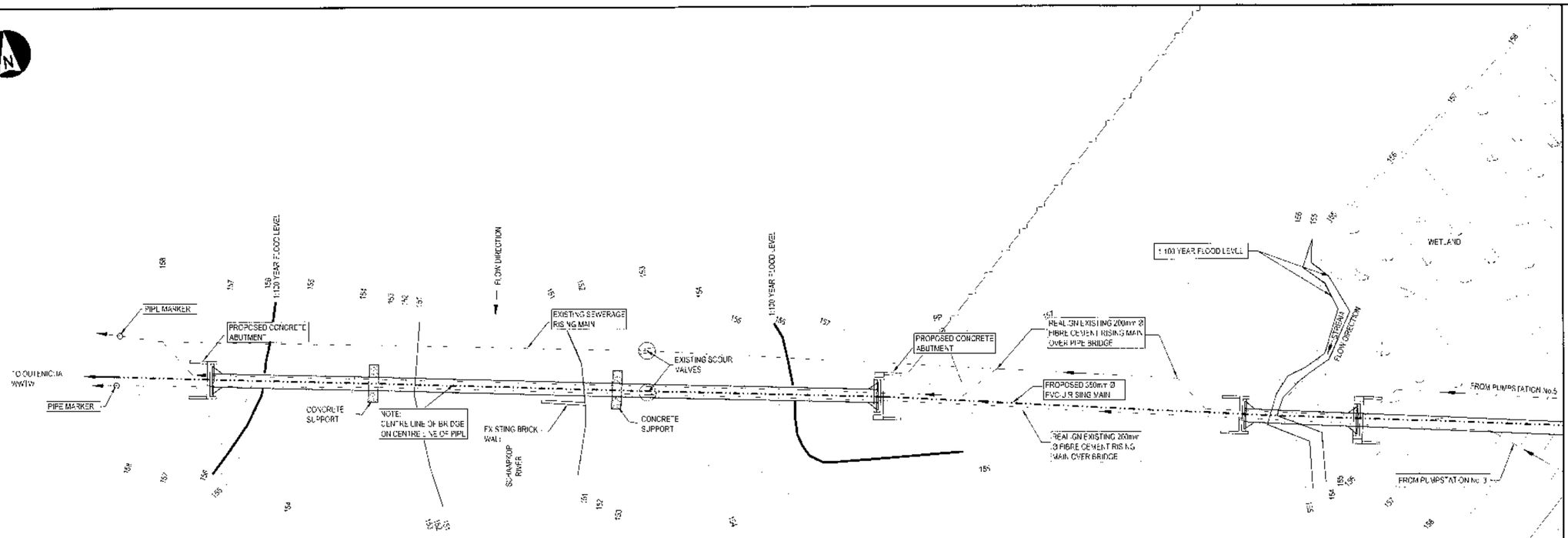
REV	DATE	REVISION DETAILS	APPROVED
T0	25/10/2013	FOR TENDER PURPOSES ONLY	A van Molendorff
D	08/2013	PIPE BRIDGE AMENDMENTS	A van Molendorff
C	07/2013	CHANGED TO CONCRETE BRIDGE	A van Molendorff
B	06/2013	FLOOD LINE ADDED	A van Molendorff
A	05/2013	PIPE BRIDGE ADDED	A van Molendorff

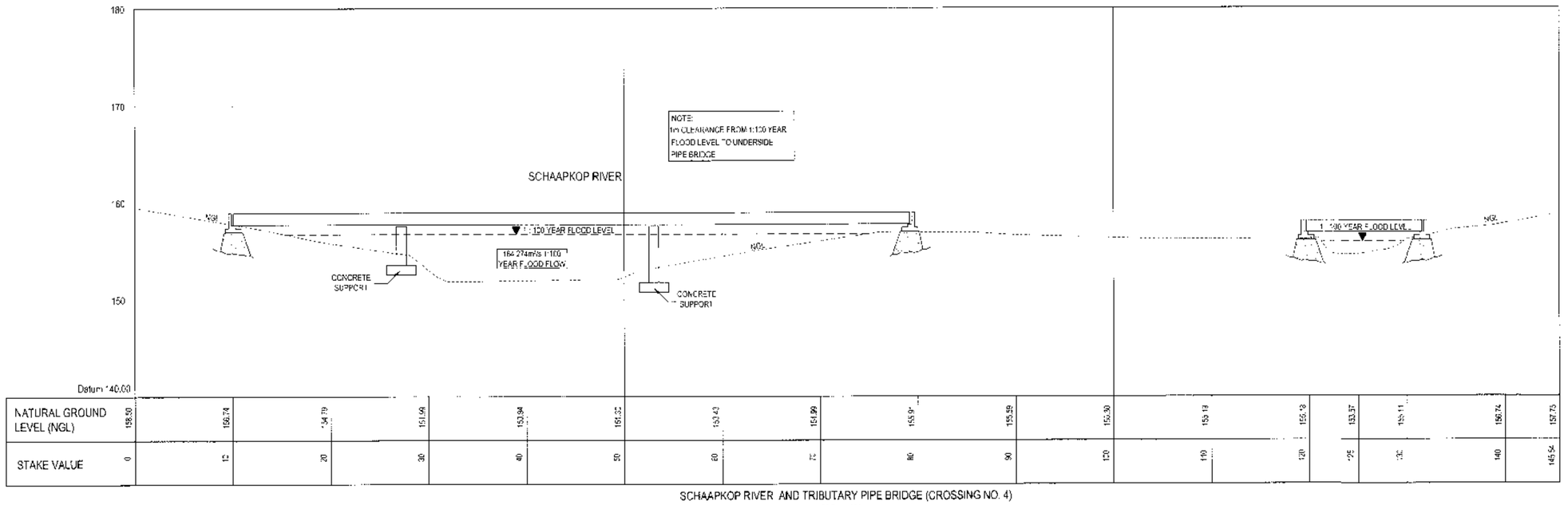
PROJECT
THEMBALETHU BULK SEWER: PHASE 3

TITLE
RIVER CROSSING No. 3
PLAN, LONGITUDINAL SECTION AND DETAIL

DRAWN	DESIGNED	
MC Richards	S Hoare	FOR TENDER PURPOSES ONLY
CHECKED		PROJECT No.
A v Molendorff		108429
APPROVED		SCALE / SIZE
NAME / SIGNATURE / DATE		AS SHOWN / A0
		DRAWING No. / REV
		108429 GE 413 / T0



LAYOUT PLAN (RIVER CROSSING NO. 4)
SCALE 1 : 250



NATURAL GROUND LEVEL (NGL)	158.50	156.74	154.79	151.99	153.94	151.32	153.42	153.99	155.97	155.59	152.30	153.19	155.18	153.37	155.11	156.74	157.75
STAKE VALUE	0	12	20	30	40	50	60	72	80	90	120	110	120	125	130	140	145.54

SCHAAPKOP RIVER AND TRIBUTARY PIPE BRIDGE (CROSSING NO. 4)
SCALE : VERT 1 : 250
HOR 1 : 250

APPROVED BY

	SIGNATURE	DATE
DRAWN		4/9/2013
DESIGNED		4/9/2013
CHECKED		

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REV	DATE	REVISION DETAILS	APPROVED
C	29/8/2013	AMENDED TO CONCRETE BRIDGES	A v Molendorff
B	3/5/2013	AMENDMENT TO SMALL BRIDGE	A v Molendorff
A	9/5/2013	FOR DISCUSSION PURPOSES ONLY	A v Molendorff

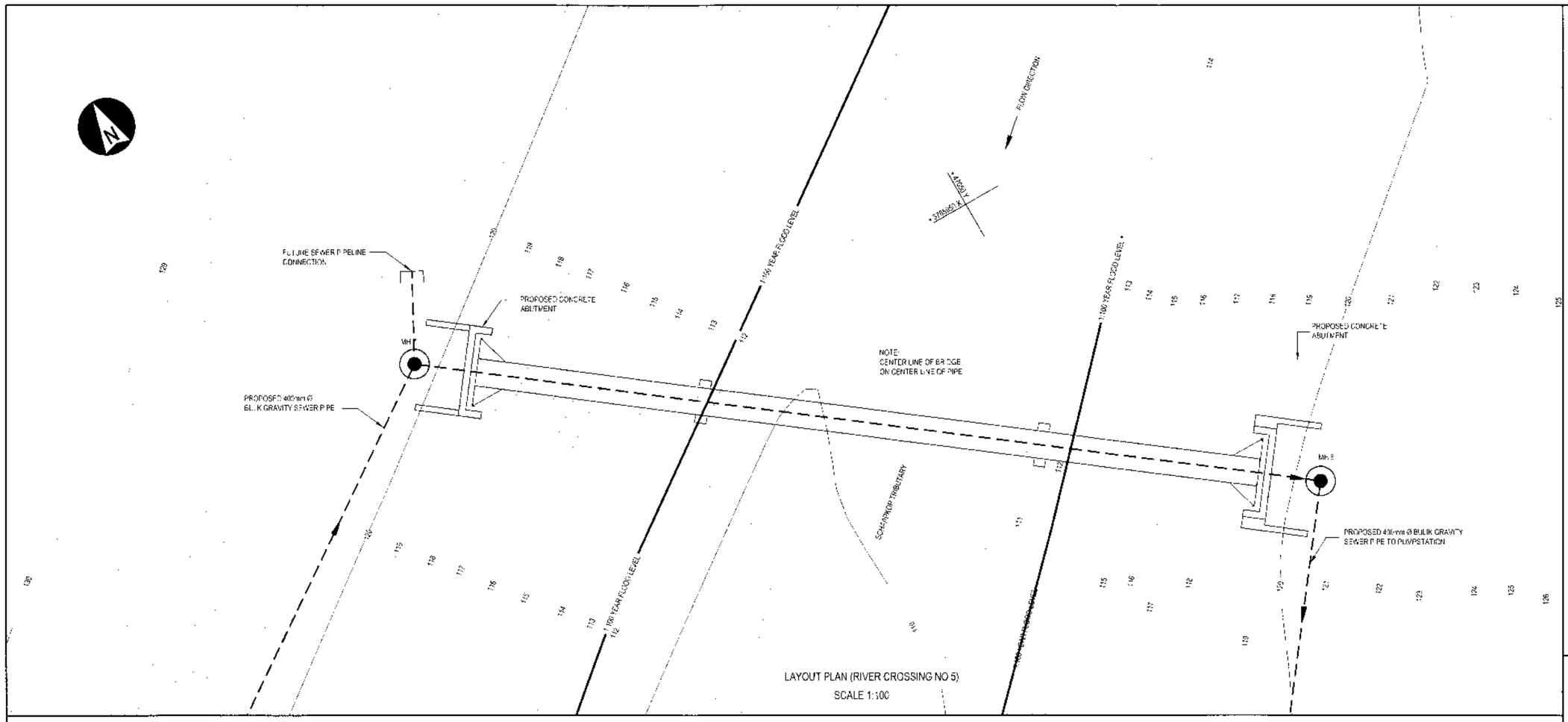
PROJECT

THEMBALETHU UISP BULK SEWER: PHASE 2

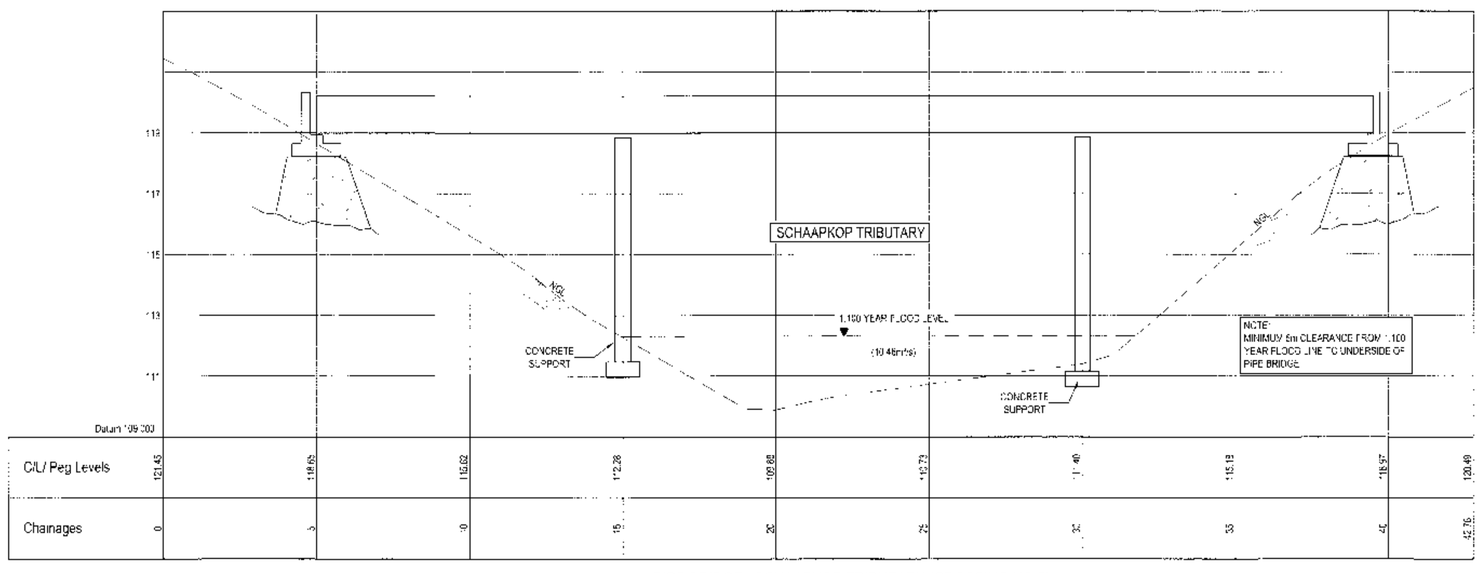
TITLE

PROPOSED PIPE BRIDGE: LAYOUT PLAN AND LONGITUDINAL SECTION (CROSSING NO.4)

DRAWN	DESIGNED	FOR DISCUSSION PURPOSES ONLY
MC Richards	S L Evans	
CHECKED		PROJECT No.
A van Molendorff		108429
APPROVED		SCALE 1 : 250 / SIZE A1
NAME SIGNATURE DATE		DRAWING No. 108429 REV 402 / REV C



LAYOUT PLAN (RIVER CROSSING NO 5)
SCALE 1:100



PIPE BRIDGE : SCHAAPKOP TRIBUTARY (CROSSING NO.5)
SCALE HOR 1:100
VERT 1:100

APPROVED BY

	SIGNATURE	DATE
DRAWN		4/9/2013
DESIGNED		4/9/2013
CHECKED		

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GEORGE MUNICIPALITY

REV	DATE	REVISION DETAILS	APPROVED
C	9/9/2013	CONCRETE PIPE BRIDGE ADDED	A van Molendorff
B	3/9/2013	AMENDMENT TO FLOOD LEVEL	A van Molendorff
A	9/5/2013	FOR DISCUSSION PURPOSES ONLY	A van Molendorff

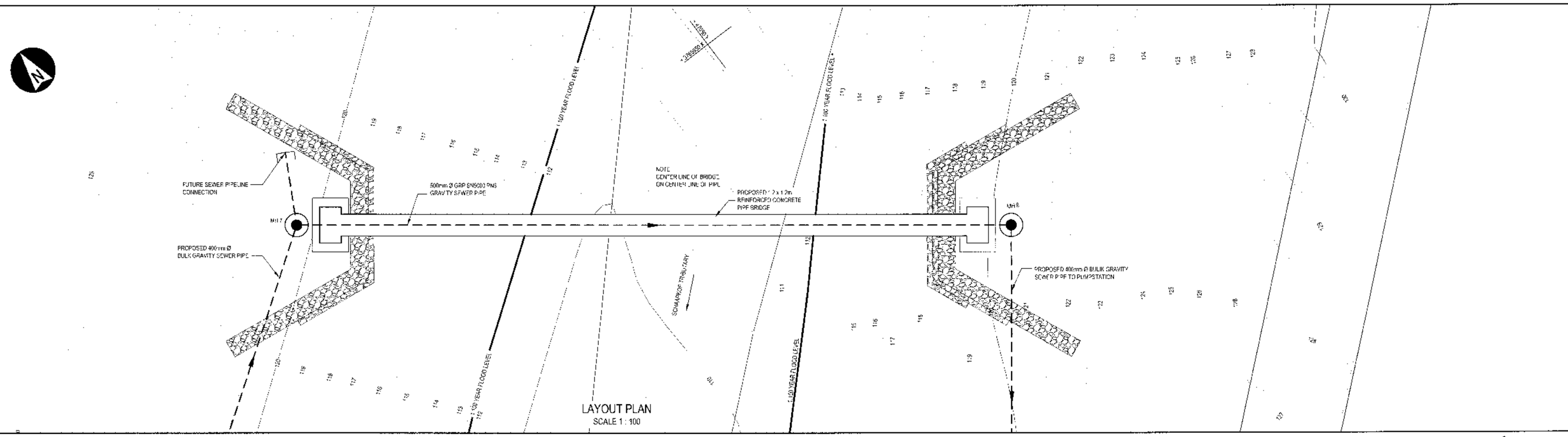
PROJECT

THEMBALETHU UISP BULK SEWER : PHASE 2

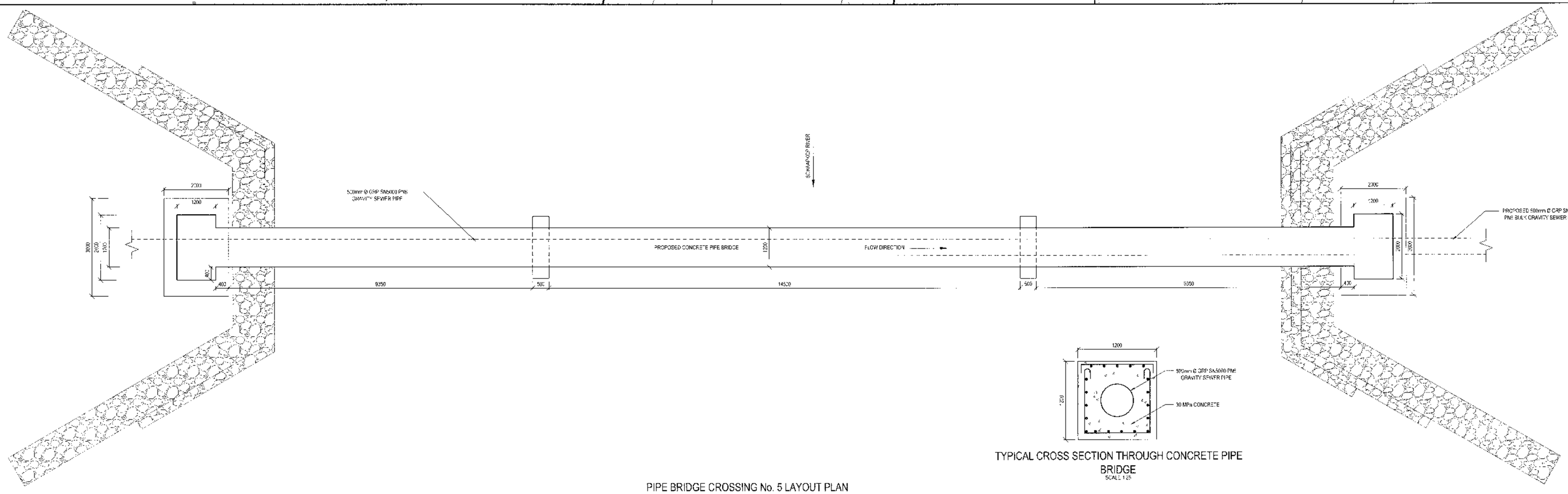
TITLE

PROPOSED PIPE BRIDGE LAYOUT PLAN AND LONGITUDINAL SECTION (CROSSING NO. 5)

DRAWN	DESIGNED	FOR DISCUSSION PURPOSES ONLY
MC Richards	S Liwani	
CHECKED		PROJECT No.
A van Molendorff		108429
APPROVED		SCALE / SIZE
NAME SIGNATURE DATE		AS SHOWN / A1
		DRAWING No. / REV
		108429 GE 405 / C

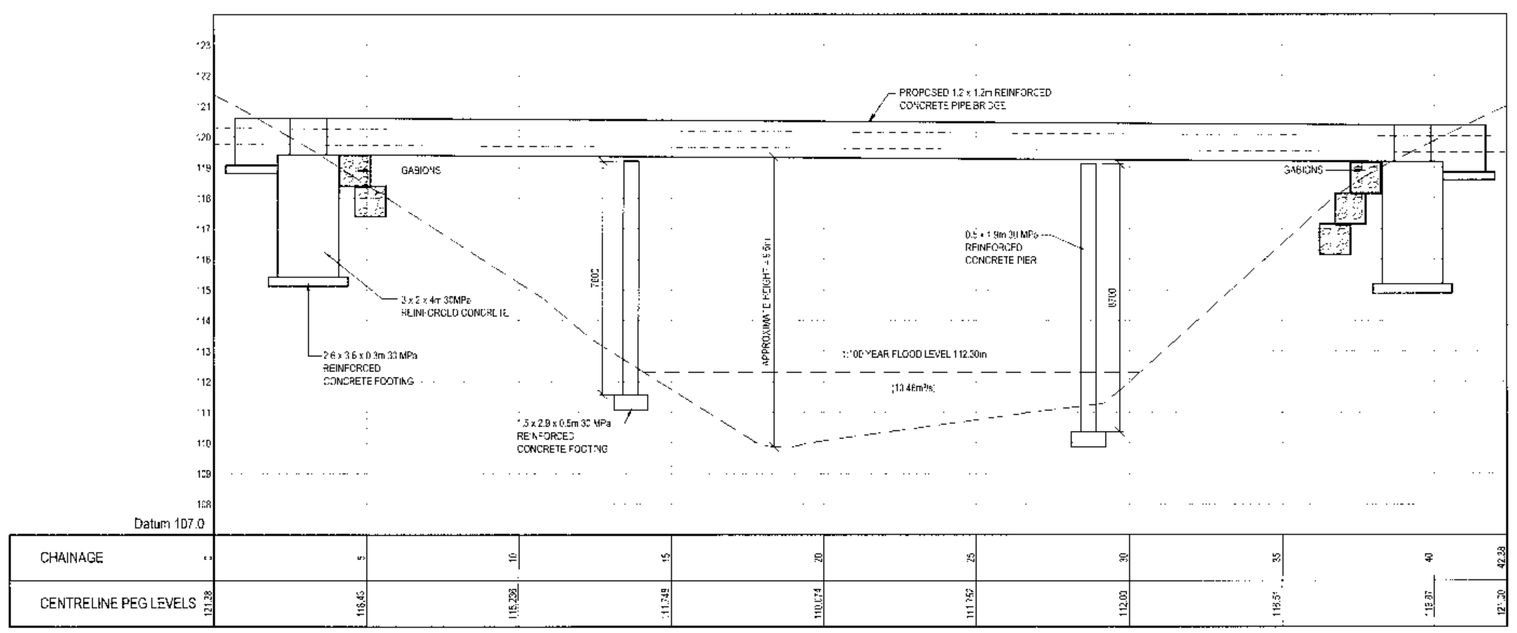


LAYOUT PLAN
SCALE 1 : 100



TYPICAL CROSS SECTION THROUGH CONCRETE PIPE BRIDGE
SCALE 1:25

PIPE BRIDGE CROSSING No. 5 LAYOUT PLAN
SCALE 1 : 50



PIPE BRIDGE CROSSING No. 5 LONGITUDINAL SECTION
SCALE : HOR 1 : 100
VERT 1 : 100

GENERAL NOTES:

APPROVED BY	SIGNATURE	DATE
DRAWN		
DESIGNED		25/9/2013
CHECKED		25/9/2013

THE MASTER HELD AT THE AURECON GEORGE OFFICE BEARS THE SIGNATURE OF APPROVAL

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REV	DATE	REVISION DETAILS	APPROVED
T0	25/ 9/2013	FOR TENDER PURPOSES ONLY	A van Molendorff
C	9/2013	CONCRETE PIPE BRIDGE ADDED	A van Molendorff
B	4/9/2013	AMENDMENT TO FLOOD LEVEL	A van Molendorff
A	9/5/2013	FOR DISCUSSION PURPOSES ONLY	A van Molendorff

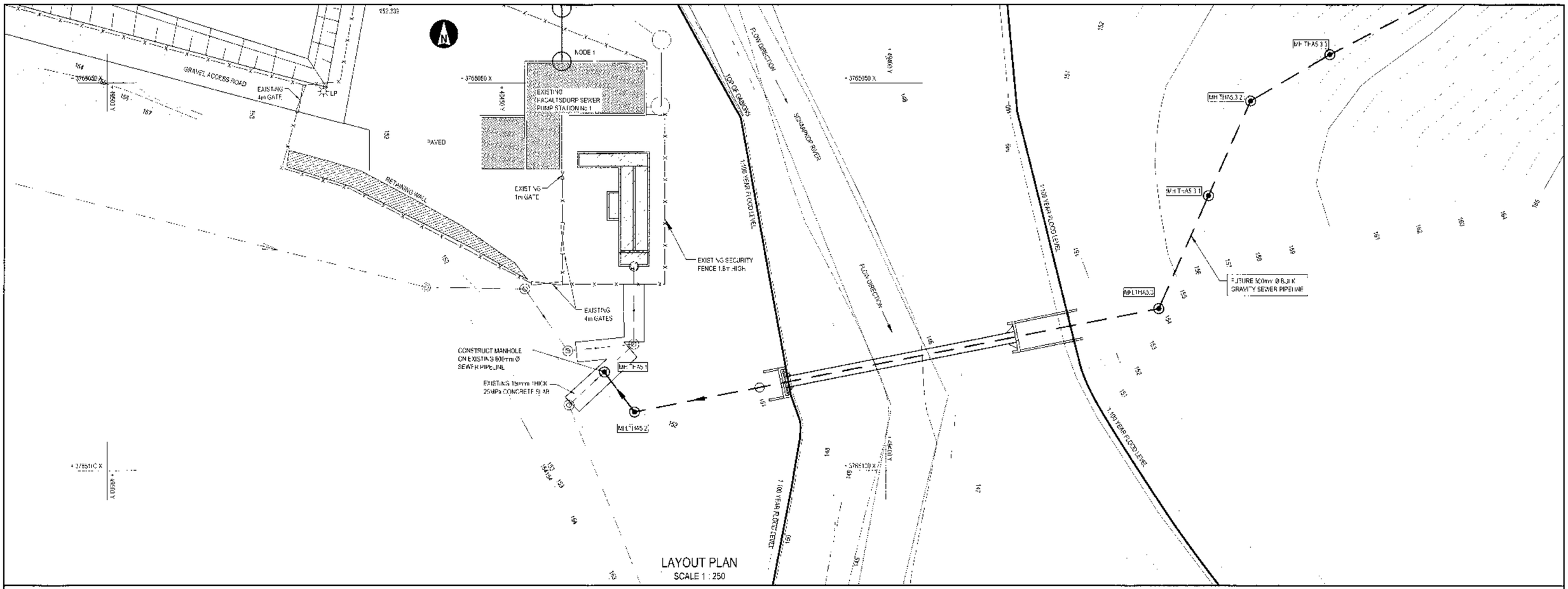
PROJECT

THEMBALETHU BULK SEWER: PHASE 3

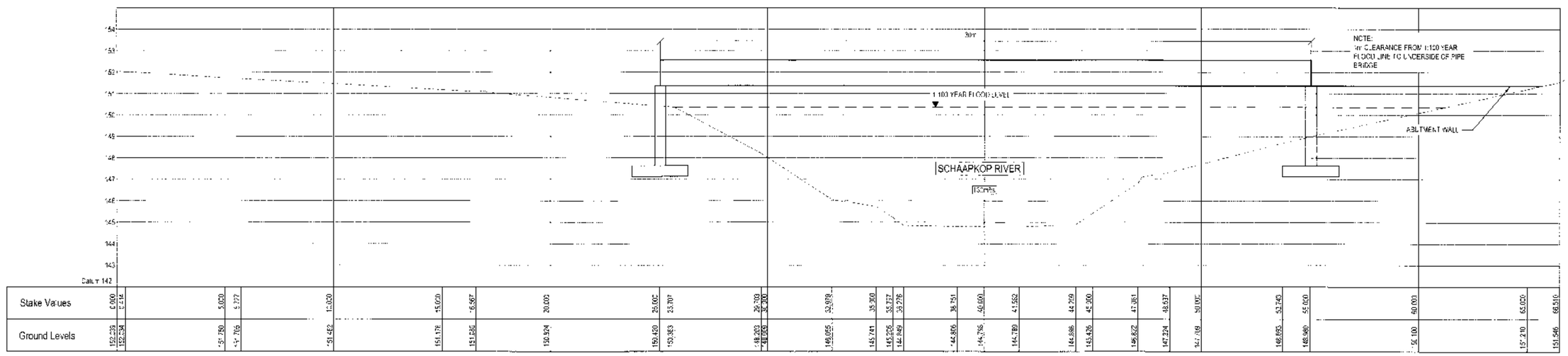
TITLE

RIVER CROSSING No. 5
PLAN, LONGITUDINAL SECTION AND DETAIL

DRAWN	DESIGNED	FOR TENDER PURPOSES ONLY
MC Richards	S L van	
CHECKED		PROJECT No.
A v Molendorff		108429
APPROVED		SCALE / SIZE
NAME / SIGNATURE / DATE		AS SHOWN / A0
		DRAWING No. / REV
		108429 GE 405 / T0



LAYOUT PLAN
SCALE 1 : 250



PIPE BRIDGE : SCHAAPKOP RIVER (CROSSING No.6)
SCALE : HOR 1 : 400
VERT 1 : 100

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REV	DATE	REVISION DETAILS	APPROVED
A	05/2013	AMENDED TO CONCRETE PIPE BRIDGE	A van Molendorff
B	07/2013	FLOOD LINE ADDED	A van Molendorff
C	08/2013	FLOOD LINE DETAIL UPDATED	A van Molendorff

DRAWN	DESIGNED
NC Richards	A Zelie Dorne

CHECKED: A van Molendorff

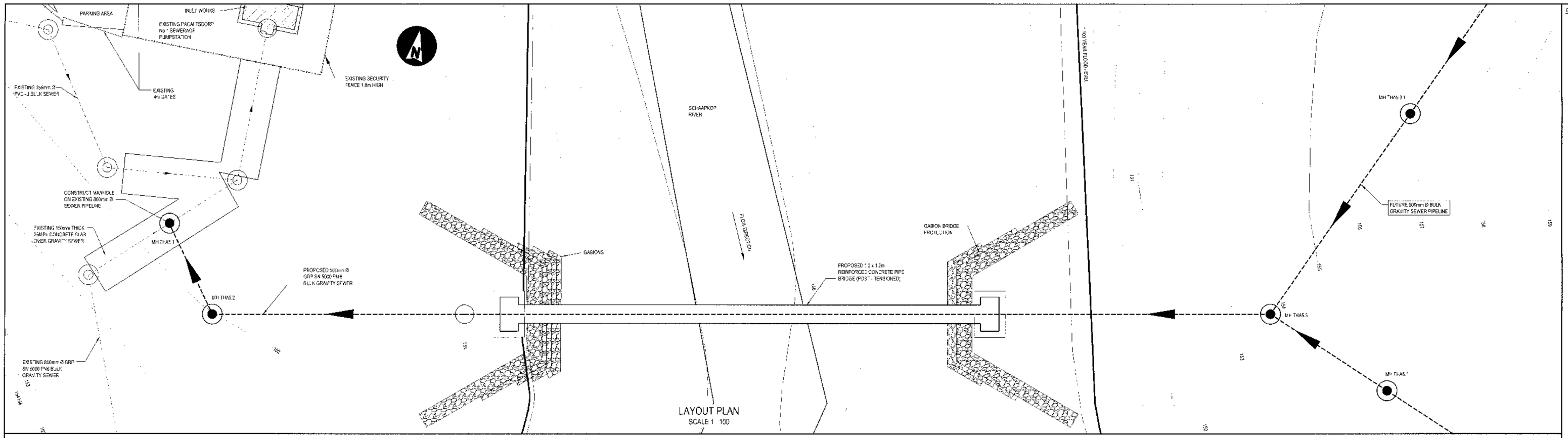
APPROVED: NAME | SIGNATURE | DATE

PROJECT: THEMBALETHU UISP BULK SEWER: PHASE 2

TITLE: SCHAAPKOP RIVER : FLOODLINE CROSS-SECTION AT PACALTSDORP No.1 SEWER PUMPSTATION (CROSSING No. 6)

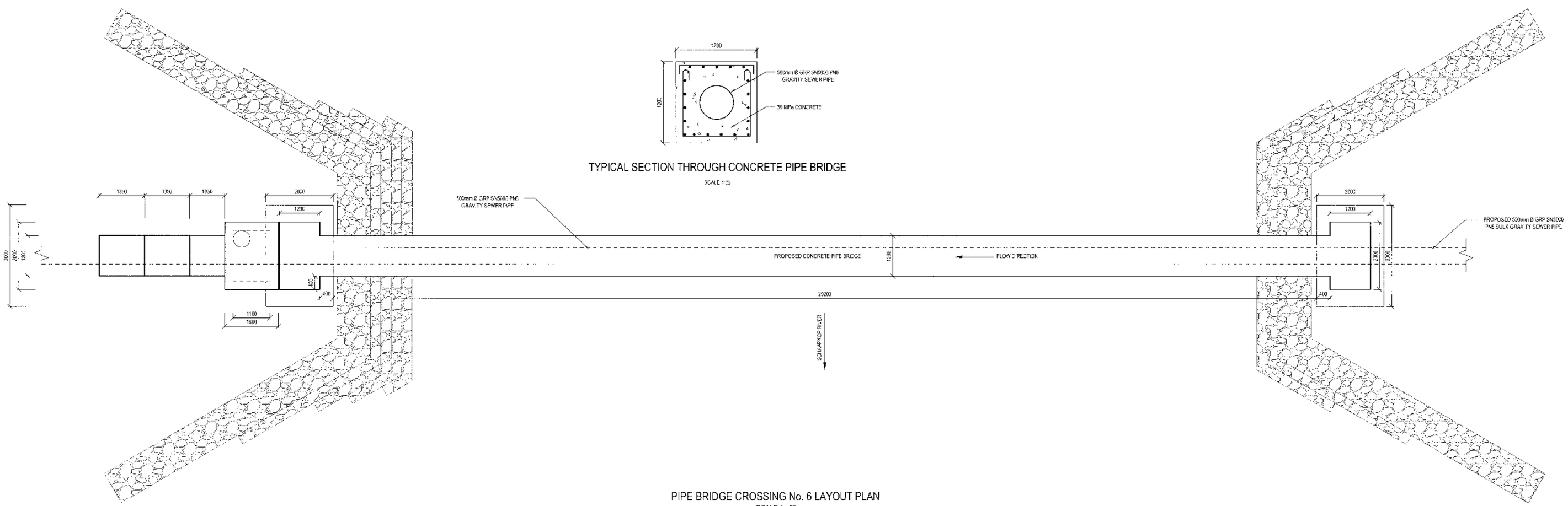
FOR DISCUSSION PURPOSES ONLY

PROJECT No.	
108429	
SCALE	SIZE
AS SHOWN	A1
DRAWING No.	REV
108429 GE 403	C

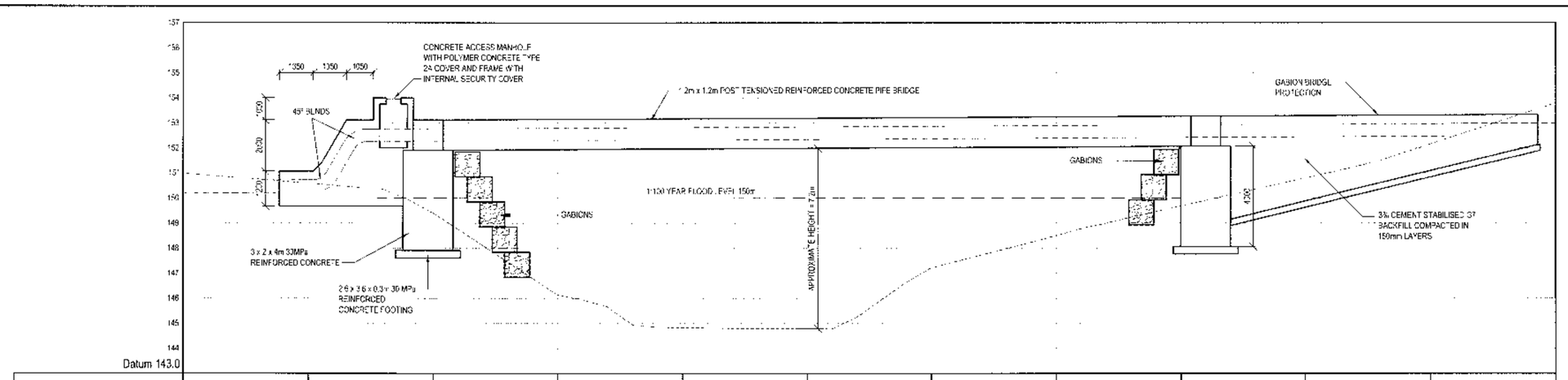


LAYOUT PLAN
SCALE 1 : 100

TYPICAL SECTION THROUGH CONCRETE PIPE BRIDGE
SCALE 1:25



PIPE BRIDGE CROSSING No. 6 LAYOUT PLAN
SCALE 1 : 50



CHAINAGE	0	5	10	15	20	25	30	35	40	45	50	55
CENTRELINE PEG LEVELS	150.28	150.53	149.40	148.14	146.83	144.78	147.22	148.50	149.89	150.80	152.15	153.75

PIPE BRIDGE CROSSING No. 6 LONGITUDINAL SECTION
SCALE: HOR 1 : 100
VERT 1 : 100

GENERAL NOTES:

APPROVED BY

	SIGNATURE	DATE
DRAWN		
DESIGNED		
CHECKED		

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MUNICIPALITY

REV	DATE	REVISION DETAILS	APPROVED
TO	25/10/2013	FOR TENDER PURPOSES ONLY	A v Molendorff
C	08/2013	FLOOD LINE DETAIL UPDATED	A v Molendorff
B	07/2013	FLOOD LINE ADDED	A v Molendorff
A	06/2013	AMENDED TO CONCRETE PIPE BRIDGE	A v Molendorff

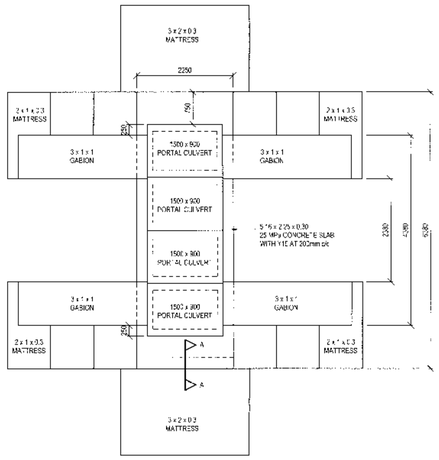
PROJECT

THEMBALETHU BULK SEWER: PHASE 3

TITLE

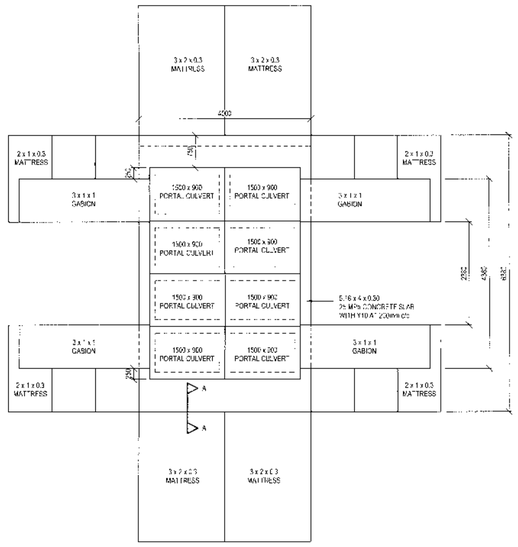
RIVER CROSSING No.6
PLAN, LONGITUDINAL SECTION AND DETAIL

DRAWN	DESIGNED	FOR TENDER PURPOSES ONLY
MC Richards	N Hinds	
CHECKED		PROJECT No.
A v Molendorff		108429
APPROVED		SCALE / SIZE
NAME / SIGNATURE / DATE		AS SHOWN / A0
		DRAWING No. / REV
		108429 GE 403 / T0



TYPE 1:PLAN OF FIRST LAYER OF GABIONS AND MATTRESSES

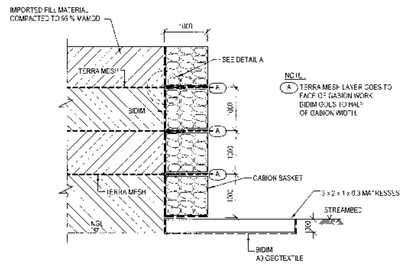
SCALE 1:50



TYPE 2: PLAN OF FIRST LAYER OF GABIONS AND MATTRESSES

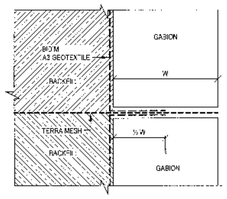
SCALE 1:50

GABION LAYOUT PLAN



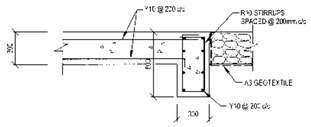
TYPICAL SECTION THROUGH GABION WALL

SCALE 1:50



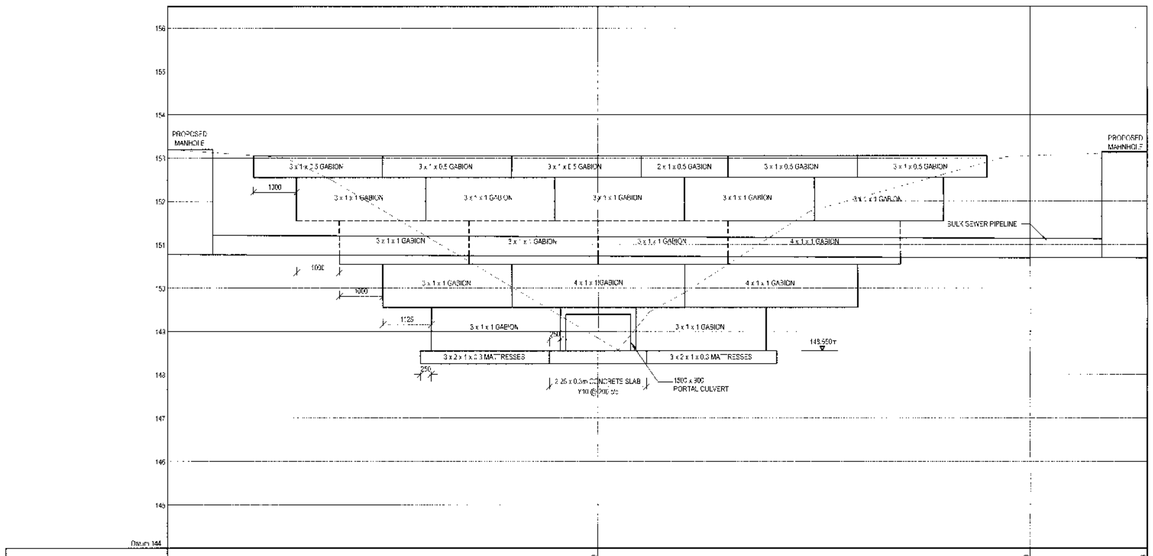
DETAIL A

SCALE 1:20



SECTION A-A

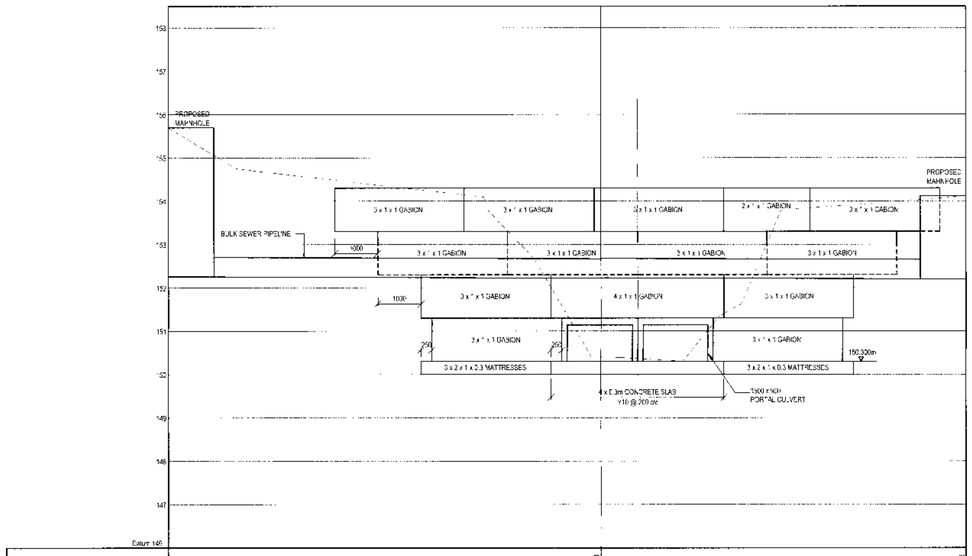
SCALE 1:20



STAKE VALUE	0.000	20.000	22.638
MANHOLE NAME	MH17		MH18
GROUND LEVEL	153.291	153.041	153.192
INLET LEVEL / OUTLET LEVEL	153.291	151.141	150.891
DEPTH	0.419	1.901	2.445
TYPE AND CLASS / PIPE SIZE	PVC-u 250 - 450mm DIA.		
LENGTH / SLOPE	22.638 m 1:150		

STREAM CROSSING TYPE 1 : POINT C (0.68m³/s), D (0.06m³/s), E (0.19m³/s), F (0.06m³/s) & G (1m³/s)

SCALE - VER : 1:50
HOR : 1:500



STAKE VALUE	0.000	17.000	18.446
MANHOLE NAME	MH15		MH16
GROUND LEVEL	155.951	154.426	154.115
INLET LEVEL / OUTLET LEVEL	153.276	152.226	152.153
DEPTH	2.425	1.824	1.824
TYPE AND CLASS / PIPE SIZE	PVC-u 250 - 450		
LENGTH / SLOPE	18.446 m 1:150		

STREAM CROSSING TYPE 2 : POINT B (2.7m³/s) & I (2.14m³/s)

SCALE VER: 1:50
HOR: 1:500

GENERAL NOTES:

APPROVED BY		
	SIGNATURE	DATE
DRAWN		4/09/2018
DESIGNED		10/09/2018
CHECKED		

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REV	DATE	REVISION DETAILS	APPROVED
A	9/2018	FOR DISCUSSION	A van Molendorff

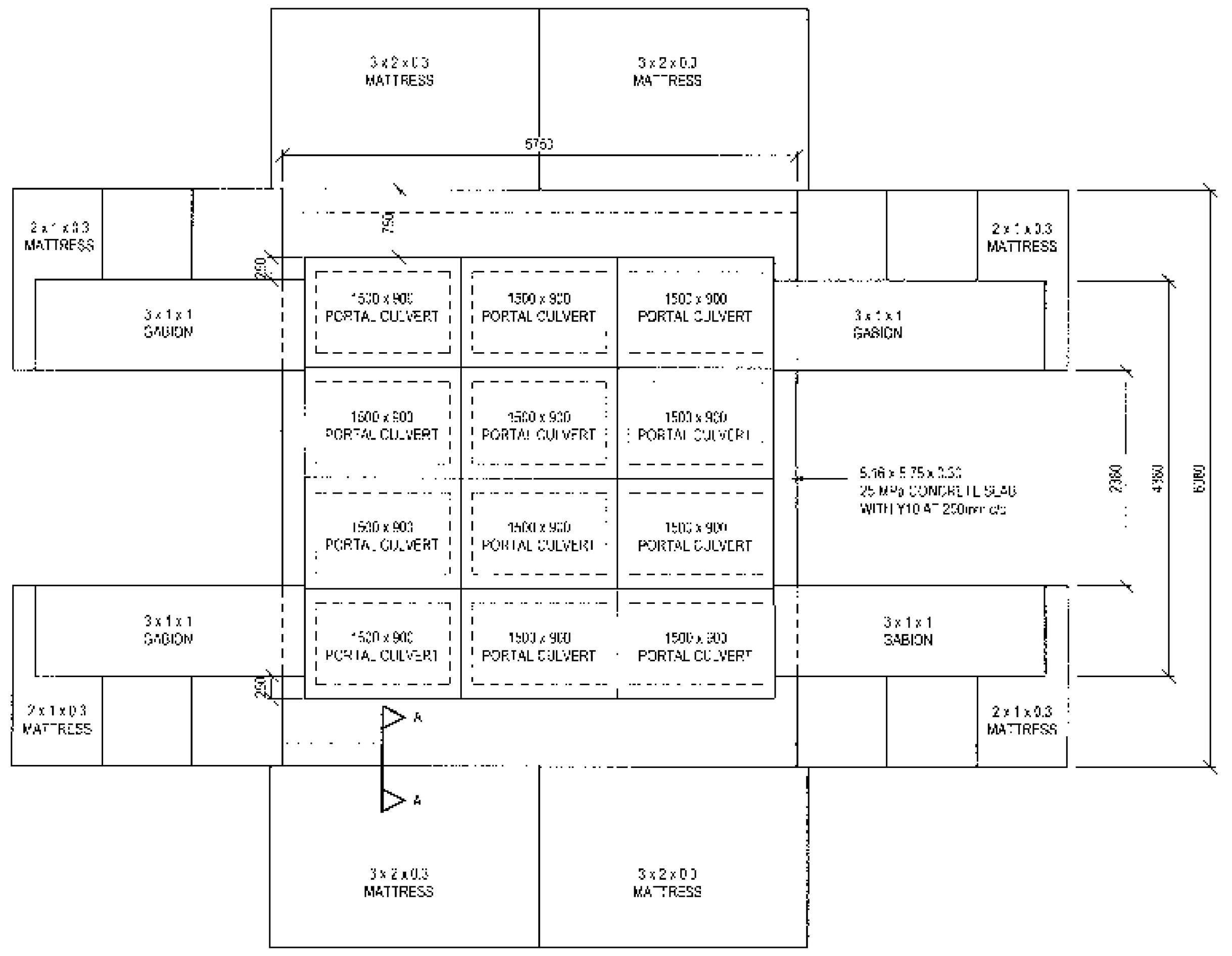
PROJECT

THEMBALETHU UISP BULK SEWER: PHASE 2

TITLE

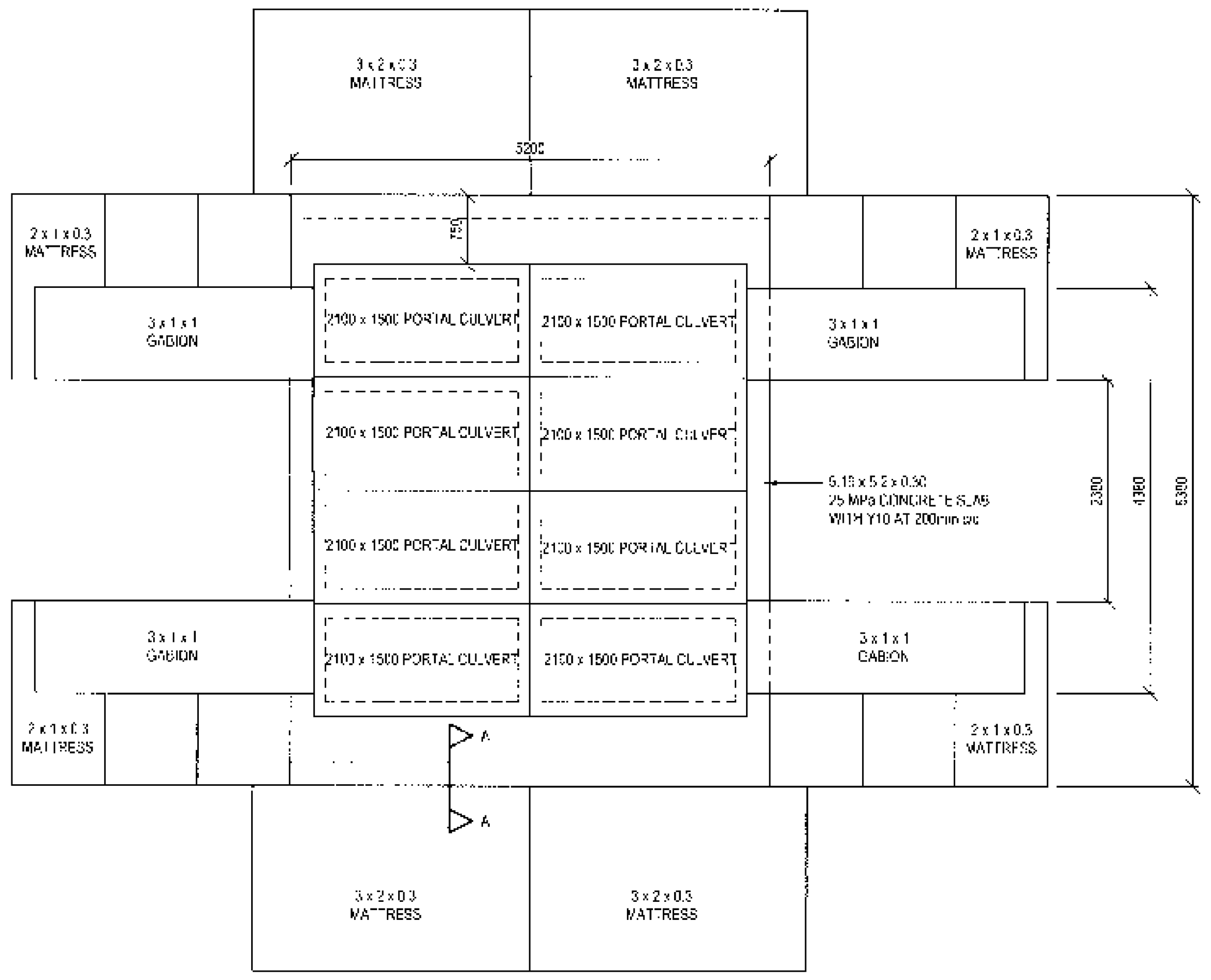
STREAM CROSSING TYPE 1 & 2

DRAWN	DESIGNED	FOR DISCUSSION PURPOSES ONLY
MC Richards	M van Wyk	
CHECKED		PROJECT No.
A van Molendorff		108429
APPROVED		SCALE / SIZE
NAME / SIGNATURE / DATE		AS SHOWN / A0
		DRAWING No. / REV
		108429 GE 410 / A



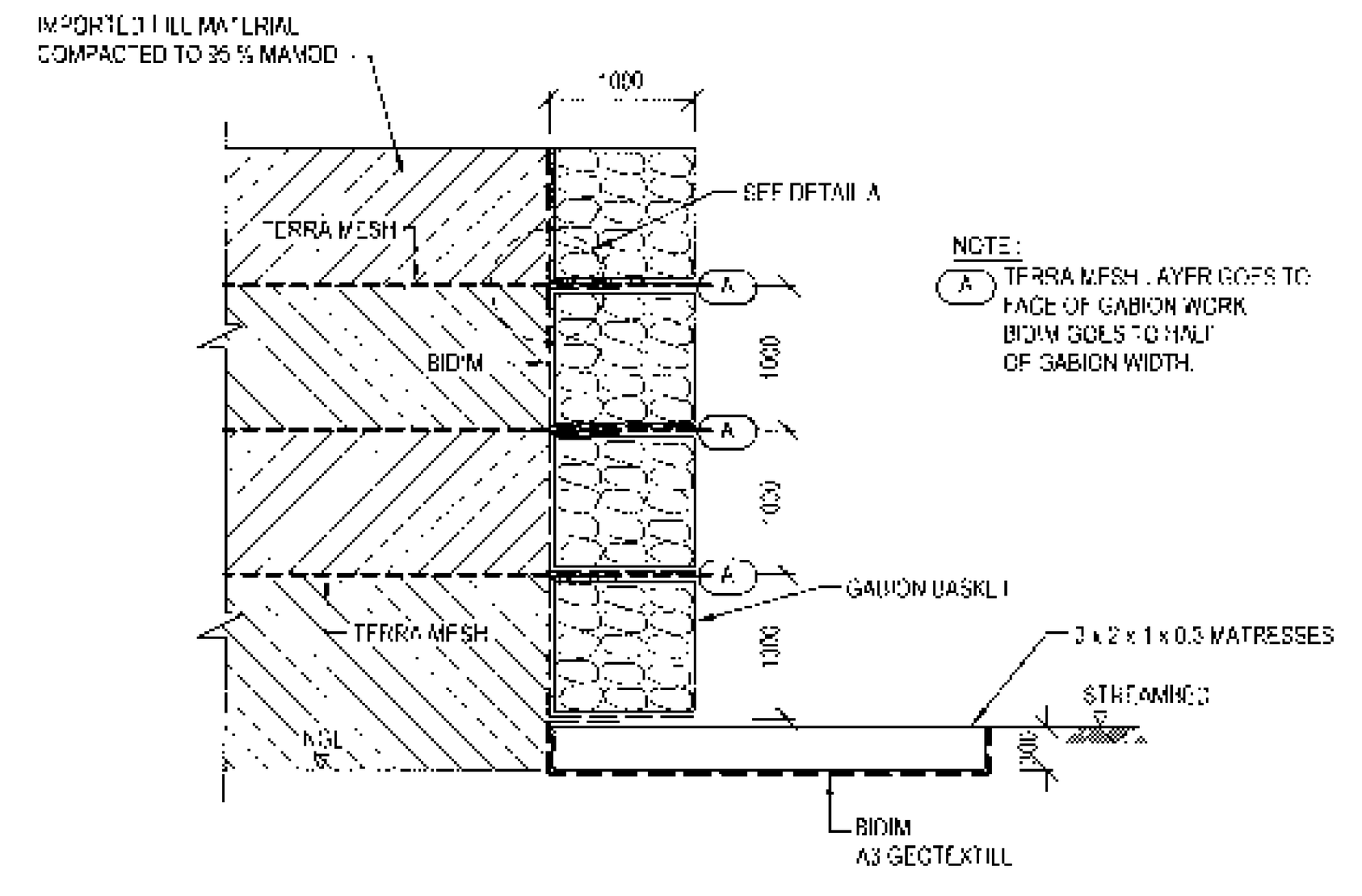
TYPE 3: PLAN OF FIRST LAYER OF GABIONS AND MATTRESSES

SCALE 1 : 50



TYPE 4: PLAN OF FIRST LAYER OF GABIONS AND MATTRESSES

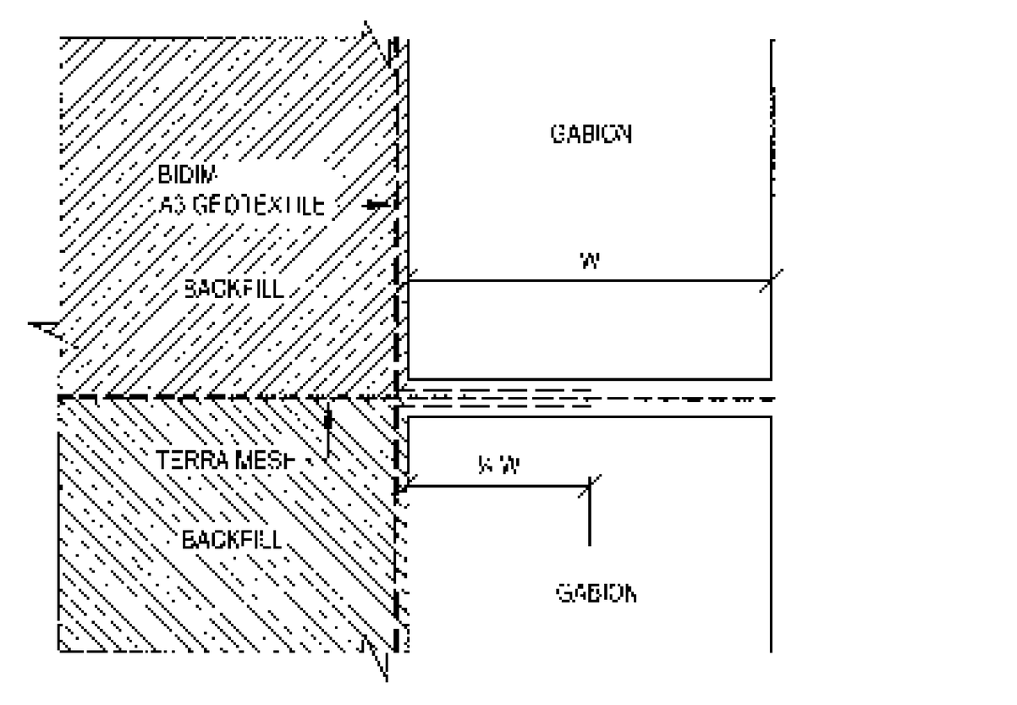
SCALE 1 : 50



TYPICAL SECTION THROUGH GABION WALL

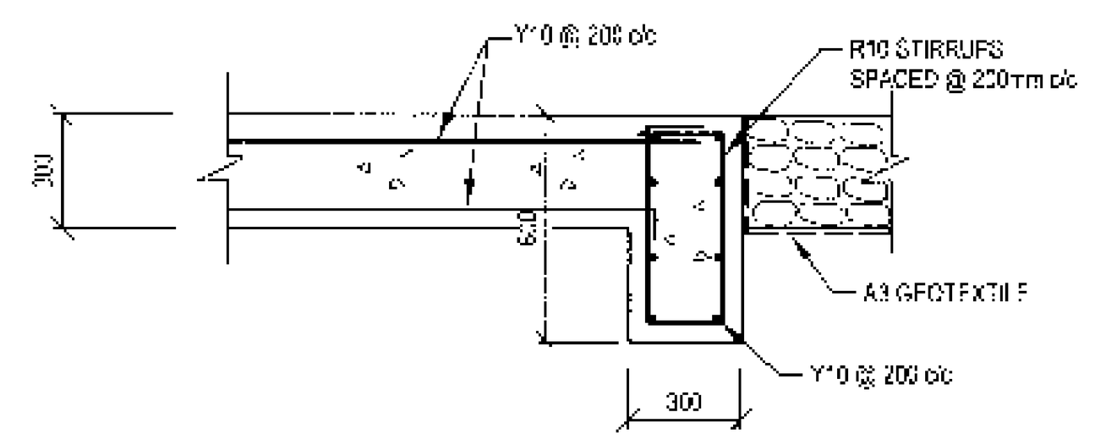
SCALE 1 : 50

GABION LAYOUT PLAN



DETAIL A

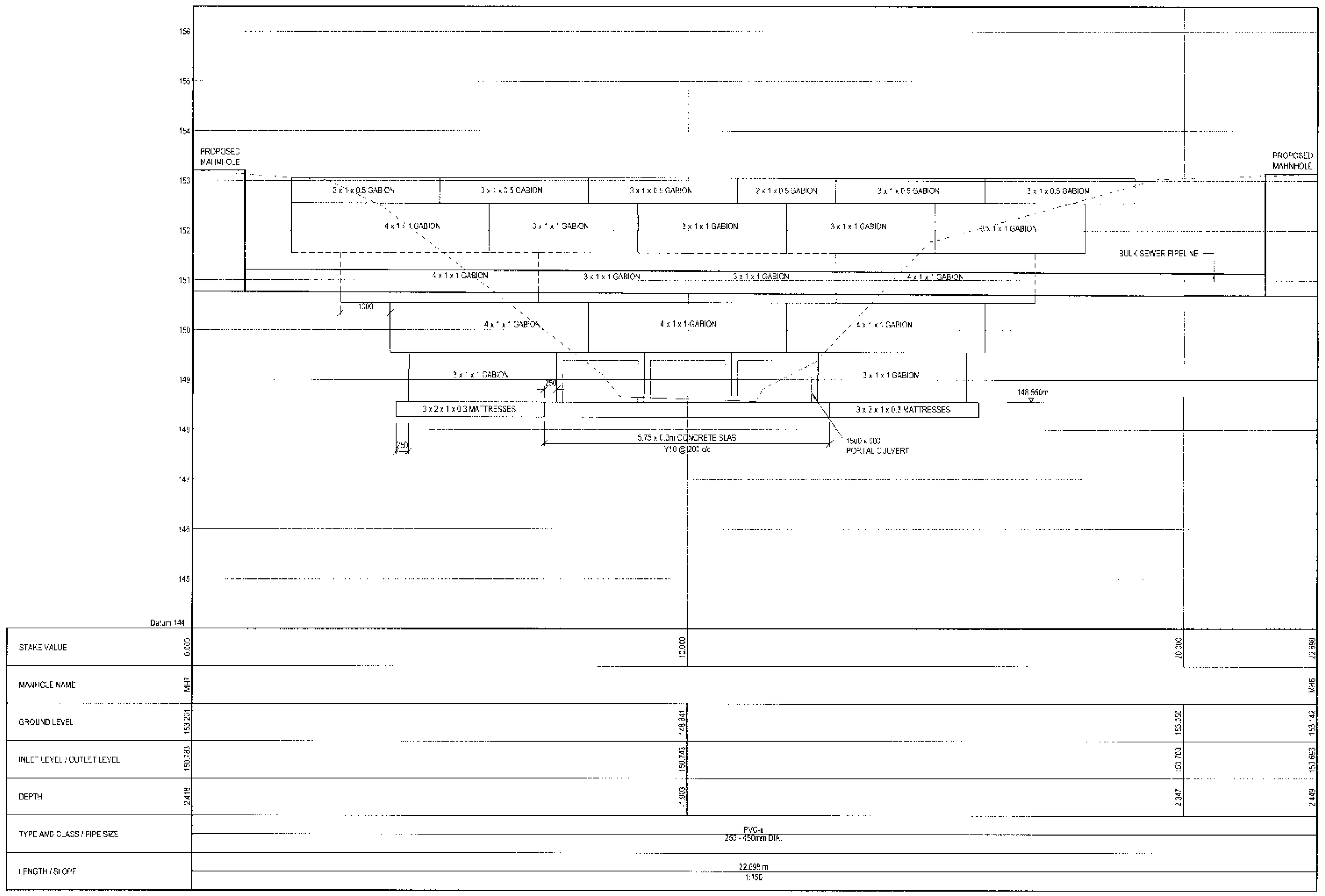
SCALE 1 : 20



SECTION A-A

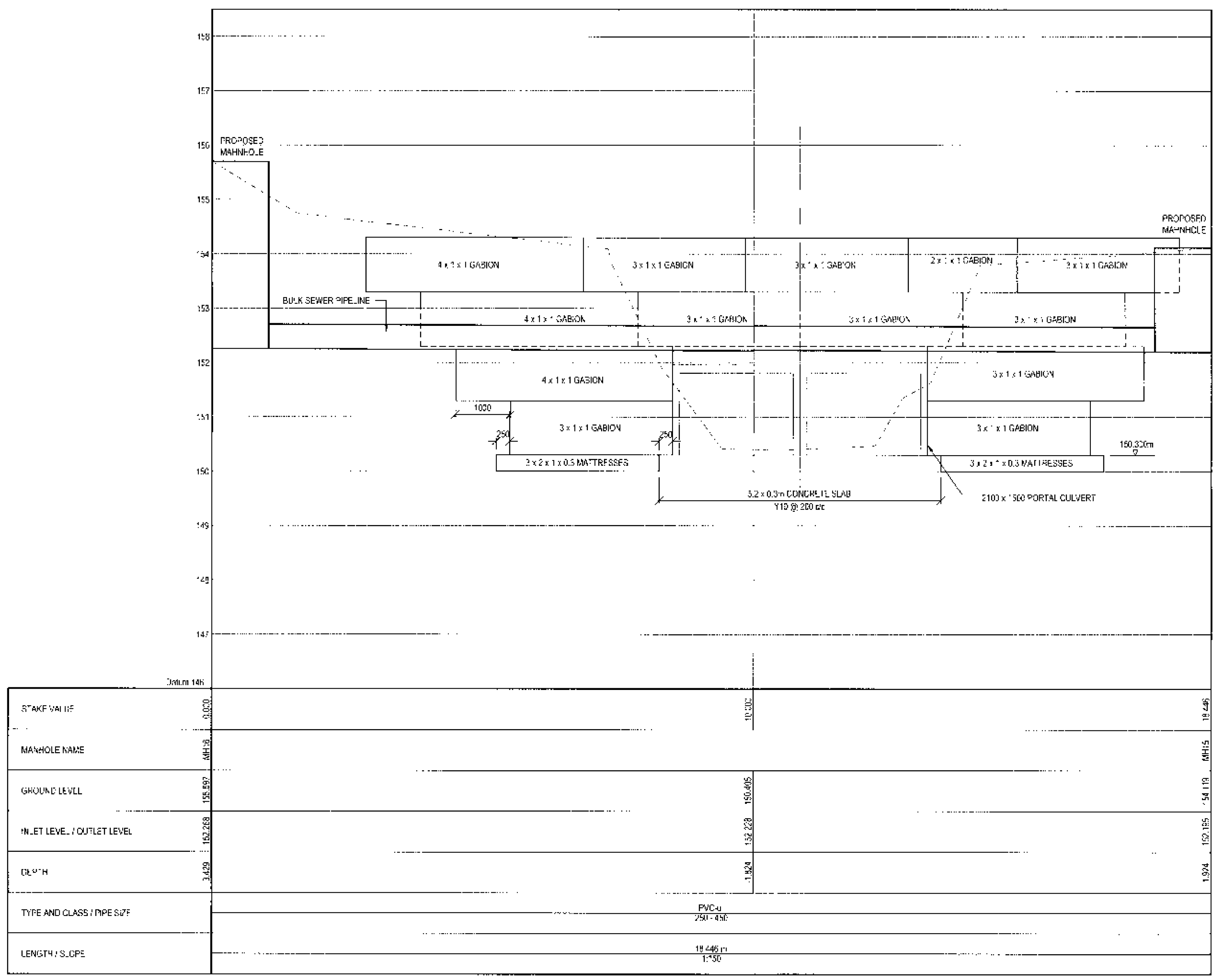
SCALE 1 : 20

GENERAL NOTES:



STREAM CROSSING TYPE 3 : POINT H (3.5m³/s)

SCALE - VER : 1:50
HOR : 1:500



STREAM CROSSING TYPE 4 : POINT J (6m³/s) AND A (8.26m³/s)

SCALE - VER : 1:50
HOR : 1:500

APPROVED BY

	SIGNATURE	DATE
DRAWN	[signature]	4/9/2013
DESIGNED	[signature]	4/9/2013
CHECKED	[signature]	

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REV	DATE	REVISION DETAILS	APPROVED
A	9/2013	FOR DISCUSSION	A van Moyendorff

PROJECT

THEMBALETHU UISP BULK SEWER: PHASE 2

TITLE

STREAM CROSSING TYPE 3 & 4

DRAWN	DESIGNED	FOR DISCUSSION PURPOSES ONLY	
MC Richards	M van Wyk	PROJECT No.	
CHECKED		108429	
A van Moyendorff		SCALE	SIZE
APPROVED		AS SHOWN	A0
NAME / SIGNATURE / DATE		DRAWING No.	REV
		108429 GE 411	A

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aurecon

28 August 2013

Our Ref: 108429/13.22b AvM/mvw

Department: Civil Engineering Services
George Municipality
P O Box 19
GEORGE
6530

Attention: Ms Lindsay Mooiman/ Mr Nico Liebenberg

Madam/Sir,

GEORGE MUNICIPALITY: THEMBALETHU UISP PROJECT: REVISED BULK SEWER PROPOSALS: Revision 3: TECHNICAL REPORT FOR ENVIRONMENTAL AUTHORISATION PROCESS

1. Introduction:

Due to recent changes in the MIG allocation to the George Municipality, the municipality requested that Aurecon review the current proposals regarding the bulk sewer services required for the Thembalethu UISP project. The George Municipality requested Aurecon to look into possible alternative programmes to service the new housing areas in a practical way, these alternatives must be closely aligned to the available funding at the Municipality, as well as aligning with the UISP housing project to avoid any implementation delays.

We therefore take this opportunity to suggest an alternative programme for the bulk sewer infrastructure required in Pacaltsdorp and Thembalethu for the Thembalethu UISP Housing Project. All discussions will need to be read in conjunction with drawing No. 108429 GE 400 Revision F.

The proposal now proposed includes the following:

1) Proposed Bulk Gravity Sewers catering for sewerage flows around Area 3 ranging from approximately 10 ℓ/s to 92ℓ/s (1200m long 300mm diameter and 630m long 350mm diameter PVC-u (Un-plasticised Polyvinyl Chloride) sewer Class 34 (heavy duty) pipelines,

2) Proposed 60m concrete pipe-bridge, for 500mm diameter gravity sewer, over the Schaapkop River tributary,

3) Major upgrade of Pacaltsdorp No 1 Sewer Pump station; design flow increases from current 125 ℓ/s to interim design flow of 345 ℓ/s, with design consideration for a final design flow of 780 ℓ/s at the pump station with future developments), with a new 4m wide paved access road (approximately 500m long) also included,

4) Upgrade 1100 m long Pacaltsdorp No. 1 Pump station rising main with an additional 700mm diameter GRP (Glass Reinforced Polyester), sewer rising main adjacent to the existing 400mm diameter fibre cement rising main, with two (2) minor span concrete pipe bridges,

5) Proposed 30m post-tensioned concrete pipe-bridge, for 500mm diameter gravity sewer, over the Schaapkop River (New proposal) adjacent to Pacaltsdorp No. 1 sewer pump station,

6) Upgrade 710 m long Thembalethu No. 6 Pump station rising main with an additional 500mm diameter GRP (Glass Reinforced Resin), Class 16 sewer rising main adjacent to the existing 250mm diameter PVC-u rising main,

7) Major upgrade of Thembalethu No. 6 Sewer Pump station: current design flow increases from 60 ℓ/s to approximately 185 ℓ/s with design consideration for a final design flow of 380 ℓ/s at the pump station with future developments, with a new 320 ℓ/s inlet works, with mechanical screens, with a new 1.5 MVA emergency power generator. The existing 350kVA emergency generator will then be installed in the next most critical sewerage pump station as part of this contract.

8) New Bulk Gravity Sewers for UISP Areas 1, 5, 6A, 6B and 2; in two sections, catering for sewerage flows from 10 ℓ/s to 115 ℓ/s: First section approximately 2965m long (950m long 200mm diameter, 250m long 250mm diameter, 475m long 300mm diameter and 825m long 400mm diameter PVC-u (Un-plasticised Polyvinyl Chloride) sewer pipeline (Class 34 (heavy duty)) and 485m long 450mm diameter GRP (Glass Reinforced Resin), Class 6 sewer pipelines) Second section approximately 975m long (725m long 200mm diameter and 200m long 250mm diameter PVC-u (Un-plasticised Polyvinyl Chloride) sewer pipeline (Class 34 (heavy duty)),

9) De-commission Thembalethu sewer pump stations No. 4 (15 ℓ/s), No. 3 (45 ℓ/s) and No. 5 (15 ℓ/s).

The proposed programme will see the construction of items 1 to 4 in the 2013/2014 financial year, with items 5 to 9 being completed in the 2014/2015 and 2015/2016 financial years. The above options are now discussed in more detail below:

1. Proposed Bulk Gravity Sewers catering for sewerage flows around Area 3 and associated Pipe bridge

The proposed bulk sewer pipeline is indicated in blue as option 1 on the attached drawing, drawing No 108429 GE 400 Rev F. This pipeline is urgently required to allow the housing project to proceed in the next financial year. By installing the pipeline Area 3 of the Thembalethu UISP project can be serviced. Thembalethu sewerage pump station No. 6 currently only has 15 ℓ/s spare capacity, until it is upgraded in the 2014/2015 financial year. This means that only the new developments can be linked to the new bulk sewer until such time that both Pacaltsdorp No.1 and Thembalethu No. 6 Sewerage Pump stations' upgrades are completed.

The proposed bulk gravity sewerage pipelines will be designed to accommodate the expected sewerage flows around Area 3 ranging from approximately 10 ℓ/s to 92ℓ/s: (1200m long 300mm diameter and 630m long 350mm diameter PVC-u (Un-plasticised Polyvinyl Chloride) sewer Class 34 (heavy duty) pipelines. Initially the pipeline will only be handling a flow of less than 15 ℓ/s until the Thembalethu No.6 sewerage pump station is upgraded. The bulk sewer drains to this pump station, which currently has a design capacity of 60 ℓ/s of which 75% is already committed to Area 4 of the UISP project.

slope. The bench will also allow the Municipality to maintain this asset, by providing a safe access track for maintenance work on the pipeline route. Manholes will be provided every 60m to allow proper maintenance to be carried out.

2. **Proposed 60m concrete pipe-bridge, for 500mm diameter gravity sewer, over the Schaapkop River tributary**

The proposed bulk sewer pipeline servicing Area 3, discussed in Item 1 above, requires a 60m concrete pipe bridge to accommodate the 500mm diameter bulk gravity sewer, as this pipeline needs to cross the Schaapkop River tributary. The position of this crossing is indicated as River crossing No. 5 on the attached drawing, drawing No. 108429 GE 400 Rev F. A 500mm diameter pipeline will be installed in the pipe bridge, which is over and above the initially required diameter of 350mm. This will allow the pipelines to be upgraded to the pipe bridge in the future to accommodate the increasing flows from the area as Thembalethu develops.

A concrete pipe bridge is considered prudent, as the recently completed steel pipe bridge over the Schaapkop River has already been vandalised, only months after being completed. The River valley is also very deep at the crossing point and 13m high piers will be required to support the pipe bridge. This does have the advantage that the pipe bridge is in no danger from flooding. The pipe bridge is proposed to have a 1m x 1m square section, with reinforcing being placed around the perimeter, while the pipeline will be placed in the middle of the concrete section.

3. **Proposed Upgrade of Pacaltsdorp Sewerage Pump station No.1 and Rising main**

3.1 Design flows

The design was based on the following design flows:

- Current inflow = 125 ℓ/s
- Interim flow scenario = 345 ℓ/s
- Future flow scenario = 780 ℓ/s

3.2 Optimisation

The existing rising main is a DN 400 pipeline. An additional rising main needs to be constructed to accommodate the future flows.

A pipeline optimisation was performed for the future rising main to calculate the effective diameter that would result in the lowest net present value (NPV). The optimisation was performed by developing a costing model to calculate the net present values (NPVs) for various pipeline diameters. The NPV takes into account capital, operating and maintenance costs for the ultimate design flow to determine the cost benefits for the various rising main pipe diameter options.

Table 4 below summarises the NPVs calculated for the various pipe diameters. It should be noted that the NPVs do not reflect the construction cost.

Table 4: NPVs for Pacaltsdorp rising main

Pipe diameter (mm)	NPV @ 4% discount	NPV @ 8% discount
600	45,944,237	38,668,924
700	41,992,560	35,982,063
800	40,641,160	34,912,456
900	40,429,949	34,822,313
1000	40,556,017	35,003,919

It is evident from **Table 4** that a rising main with an effective internal diameter of 900 mm would be the optimum solution. The effective diameter is, however, the combined diameter between the existing DN 400 rising main and the future rising main. **Table 5** shows the options that were considered for a future rising main diameter:

Table 5: Options for Pacaltsdorp future rising main

Existing pipe diameter (mm)	Future pipe diameter (mm)	Combined pipe diameter (mm)
400	700	757
400	800	847

3.3 Pump type selection

The design of the existing pump station makes provision for the installation of four (4) pumps, i.e. three duty and one standby. The initial pump selection was therefore based on three duty pumps.

Figure 5 shows the pipeline characteristic curves for DN 400, DN 700 and DN 800 pipelines, as well as the pump curves for an ABS XFP 250 pump, fitted with a 465 mm impeller, and a 200 kW motor operating at 1480 RPM.

Figure 6 shows the pipeline characteristic curves for DN 400 & DN 700, and DN 400 & DN 800, pipelines in parallel, as well as the pump curves for an ABS XFP 250 pump, fitted with a 465 mm impeller, and a 200 kW motor operating at 1480 RPM.

The following should be noted from **Figure 5** (additional comments are provided in italics where required):

- Flow in DN 400 (HW = 110) with one pump operating = 220 *l/s* (v = 1.75 m/s). *The minimum flow that must be achieved with the pump (i.e. based on its allowable operating range) should be 70 l/s. The pump will therefore operate satisfactorily in the DN 400 pipeline.*
- Flow in DN 700 (HW = 110) with one pump operating = 290 *l/s* (v = 0.75 m/s)
- Flow in DN 800 (HW = 110) with one pump operating = 300 *l/s* (v = 0.60 m/s) *The velocity in the DN 800 pipe is lower than the minimum recommended cleaning velocity of 0.7 m/s*
- Flow in DN 700 (HW = 110) with three pumps operating = 760 *l/s* (v = 1.97 m/s).
- Flow in DN 800 (HW = 110) with three pumps operating = 830 *l/s* (v = 1.65 m/s)

The following should be noted from **Figure 6** (additional comments are provided in italics where required):

- Flow in DN 400 & DN 700 (HW = 110) with one pump operating = 295 ℓ/s (v = 0.66 m/s). *The velocity in the combined DN 400 and DN 700 pipelines is marginally less than the minimum recommended cleaning velocity of 0.7 m/s.*
- Flow in DN 400 & DN 800 (HW = 110) with one pump operating = 300 ℓ/s (v = 0.53 m/s). *The velocity in the combined DN 400 and DN 800 pipelines will be much lower than the minimum recommended cleaning velocity of 0.7 m/s.*
- Flow in DN 400 & DN 700 (HW = 110) with three pumps operating = 810 ℓ/s (v = 1.80 m/s). *Three pumps in parallel in an aged DN 400 and DN 700 pipeline would deliver a flow that's higher than the future design flow of 780 ℓ/s*
- Flow in DN 400 & DN 800 (HW = 110) with three pumps operating = 845 ℓ/s (v = 1.50 m/s)
- Flow in DN 400 & DN 700 (HW = 140) with three pumps operating = 840 ℓ/s (v = 1.87 m/s)
- Flow in DN 400 & DN 800 (HW = 140) with three pumps operating = 860 ℓ/s (v = 1.53 m/s)

It is evident from **Figures 5 and 6** that the minimum required cleaning velocities would not be achieved in a DN 800 rising main with only one pump operational, especially when the existing DN 400 pipeline is operated in parallel with the DN 800 pipeline. The future rising main should therefore be a DN 700 pipeline

3.4 Rising Main Recommendation

It appears that a DN 700 rising main would be the optimal pipe diameter for the proposed 1100m rising main. This rising main will be constructed approximately 4m parallel to the existing 400mm diameter fibre-cement rising main. The routes would be the same, with the only exception being that the proposed 700mm diameter rising main will be crossing the two streams (see river crossing no. 2 and 3 on the attached drawing, drawing no. 108429 GE 400) in concrete pipe bridges. The two streams have relatively steep sides, which cannot be easily accommodated by this large diameter pipeline. Therefore a concrete pipe bridge is proposed for these relatively short spans. Due to the large diameter of the proposed rising main a square section of approximately 1.2m x 1.2m will be required for the pipe bridge. Concrete piers will be provided to support the bridge at both ends. The pipe bridge has been designed to be above the 1:100 year flood level. Air- and scour-valves will be provided to allow the pipeline to operate efficiently. The rising main will stop at the entrance to the Outeniqua Wastewater Treatment Works and the flow will be split between the existing inlet works and the proposed new inlet works. The upgrading of the Outeniqua Wastewater Treatment Works falls outside the scope of this report, but we can report that the works will be upgraded over the next three to four years to accommodate the Thembalethu UISP project (4939 erven), as well as the newly proposed Syferfontein Housing Project (7700 erven).

3.5 Pump station Upgrades required

Currently the pump station handles a flow of 125 ℓ/s. The bulk gravity sewer draining to the pump station and the inlet works was upgraded by the Municipality in 2009 to accommodate the ultimate future design flow of 780 ℓ/s. The inlet works was fitted with front-rake screens (one duty, one

standby). At the same time a 1 MVA emergency power supply generator was installed to allow the pump station to remain operational during prolonged power failures. No additional upgrading work is required at these components.

The flow passes through the inlet works and then split between two duty sumps, with a third sump provided. The third sump is currently been filled with a weak mix mortar. The existing flow is accommodated by two pump sets consisting of two pumps each, connected in series. These pumps cannot be re-used and will be sold for scrap. They have been in operation for 14 years and are of no use to the Municipality. The closed vane impellors of these pumps have also been a source of high maintenance due to frequent blockages caused by the pumps' limited solids handling capacity.

The proposal now is to construct a larger sump adjacent to the existing three sumps. The two (2) proposed approximately 2.5 ton pumps, which will have a height of approximately 2.4m, will be temporarily installed into this new sump. The pumps will be capable of pumping approximately 300 *l/s* each and will be linked temporarily to the existing rising main. Due to the existing 400mm diameter rising main's fairly limited capacity, the new pump's flow will initially be throttled back by the VSD drive to approximately 150 *l/s*. At the same time a new separate Motor Control Circuit (MCC) panel room will be constructed adjacent to the main pump dry well. This room will be air-conditioned to cool the variable speed drives (VSD) required for the pumps approximately 200kW motors, which will be housed in the MCC panel.

Once the MCC room is completed the new panel will be installed and connected to the new pumps located in the new sump. This will be a temporary installation, for as soon as the new pumps (one duty and one standby, are put in operation this will allow the existing pumps and the concrete floor between the two pumps connected in series to be demolished. This will then provide the space required for the permanent installation of the new pumps in the dry well, as well as allow the completion of the new upgraded pipework required for the higher design flows. A new 3-ton gantry will be installed to service the new pumps, while the existing two (2) 2-ton gantries will be retained to move the proposed new larger diameter valves around in the dry well for installation and in the future for servicing purposes.

At the same time the existing three sumps division walls will be removed and the sumps will be re-divided into two (2) enlarged sumps required for the higher flows. Once this is completed one of the new pumps will be removed from the sump initially constructed and installed in the newly modified dry well. Once the installation is completed the pump will be tested and put into service, thereby allowing the second pump to be installed and put in service in the dry well. The initial sump constructed will then be modified to accommodate the third pump required in the future. The MCC panel will have the electronics required for this third pump already installed, pending the approval of the Municipality.

The new pumps will also need to be connected to the new 700mm diameter rising main, which will work in conjunction with the existing 400mm diameter rising main to accommodate the future design flows expected at this pumps station. The cross connections required for this pipework will be completed once the new rising main is completed and tested. This will complete the upgrading

currently required at the Pacaltsdorp No. 1 sewerage pump station and allow the completion of the full Thembalethu 4939 erven UISP project.

4. **Proposed 30m post-tensioned concrete pipe-bridge, for 500mm diameter gravity sewer, over the Schaapkop River adjacent to Pacaltsdorp No. 1 sewer pump station**

The proposed bulk sewer pipeline servicing Areas 1, 5, 6A, 6B and Area 2 requires a 30m post tensioned concrete pipe bridge to accommodate the 500mm diameter bulk gravity sewer, as this pipeline needs to cross the Schaapkop River adjacent to the Pacaltsdorp No. 1 Sewerage Pump station. The position of this crossing is indicated as River crossing No. 6 on the attached drawing, drawing No. 108429 GE 400 Rev F. A 500mm diameter pipeline will be installed in the pipe bridge, which is over and above the initially required diameter of 450mm. This will allow the pipelines to be upgraded to the pipe bridge in the future to accommodate the increasing flows from the area as Thembalethu develops.

A post-tensioned concrete pipe bridge is considered prudent, as the recently completed steel pipe bridge over the Schaapkop River has already been vandalised, only months after being completed. The Schaapkop River flood plain is also shallow at the crossing point and the 30m span is required to provide a clear span over the flood-plain, thereby not providing any obstructions in the 1:100 flood levels that are below the bridge level. A concrete span this long can only be achieved by providing post-tensioning in the concrete structure and as discussed above this does have the advantage that the pipe bridge is in no danger from flooding. The pipe bridge is proposed to have a 1.1m x 1.1 m square section, with the reinforcing and the post-tensioning cables being placed around the perimeter, while the pipeline will be placed in the middle of the concrete section.

The bridge supports will be constructed on concrete piles that have been driven into the rock formations below the river bed. The piling position will be outside the 1:100 year flood-plain. The river banks around the piles will be protected with gabions. The adjacent pump station is protected by gabions on the river bank and the intention is merely to extend this protection to the pipe bridge support positions.

5. **Proposed Upgrade of Thembalethu Sewerage Pump station No. 6 and Rising main**

5.1 <u>Design flows</u>

The design was based on the following design flows:

- Current inflow = 60 *l/s*
- Interim flow scenario = 220 *l/s*
- Future flow scenario = 342 *l/s*

5.2 Optimisation

The existing rising main is a DN 250 pipeline. An additional rising main needs to be constructed to accommodate the future flows.

A pipeline optimisation was performed for the future rising main to calculate the effective diameter that would result in the lowest net present value (NPV). The optimisation was performed by developing a costing model to calculate the net present values (NPVs) for various pipeline diameters. The NPV takes into account capital, operating and maintenance costs for the ultimate design flow to determine the cost benefits for the various rising main pipe diameter options.

Table 1 below summarises the NPVs calculated for the various pipe diameters. It should be noted that the NPVs do not reflect the construction cost.

Table 1: NPVs for Thembalethu rising main

Pipe diameter (mm)	NPV @ 4% discount	NPV @ 8% discount
350	25,447,419	21,741,411
400	22,373,407	19,180,586
450	21,140,834	18,185,661
500	20,635,925	17,799,704
600	20,777,822	18,028,356
700	21,496,019	18,760,310
800	21,868,580	19,153,389

It is evident from **Table 1** that a rising main with an effective internal diameter of 500 mm would be the optimum solution. The effective diameter is, however, the combined diameter between the existing DN 250 rising main and the future rising main. **Table 2** shows the options that were considered for a future rising main diameter:

Table 2: Options for Thembalethu future rising main

Existing pipe diameter (mm)	Future pipe diameter (mm)	Combined pipe diameter (mm)
250	450	484
250	500	529

5.3 Pump type selection

The design of the existing pump station makes provision for the installation of four (4) pumps, i.e. three duty and one standby. The initial pump selection was therefore based on three duty pumps.

Figure 1 shows the pipeline characteristic curves for DN 250, DN 450 and DN 500 pipelines, as well as the pump curves for an ABS XFP 200 pump, fitted with a 427 mm impeller, and a 132 kW motor operating at 1480 RPM.

Figure 2 shows the pipeline characteristic curves for DN 250 & DN 450, and DN 250 & DN 500, pipelines in parallel, as well as the pump curves for an ABS XFP 200 pump, fitted with a 427 mm impeller, and a 132 kW motor operating at 1480 RPM.

The following should be noted from **Figure 1** (additional comments are provided in italics where required):

- Flow in DN 250 (HW = 110) with one pump operating = 80 *l*/s (v = 1.63 m/s) *The minimum flow that must be achieved with the pump (i.e. based on its allowable operating range) should be 42 l/s. The pump will therefore operate satisfactorily in the DN 250 pipeline.*
- Flow in DN 450 (HW = 110) with one pump operating = 130 *l*/s (v = 0.82 m/s)
- Flow in DN 500 (HW = 110) with one pump operating = 135 *l*/s (v = 0.69 m/s) *The velocity in the DN 500 pipe is marginally lower than the minimum recommended cleaning velocity of 0.7 m/s.*
- Flow in DN 450 (HW = 110) with three pumps operating = 300 *l*/s (v = 1.89 m/s).
- Flow in DN 500 (HW = 110) with three pumps operating = 335 *l*/s (v = 1.71 m/s)

The following should be noted from **Figure 2** (additional comments are provided in italics where required):

- Flow in DN 250 & DN 450 (HW = 110) with one pump operating = 133 *l*/s (v = 0.72 m/s)
- Flow in DN 250 & DN 500 (HW = 110) with one pump operating = 137 *l*/s (v = 0.62 m/s). *The velocity in the combined DN 250 and DN 500 pipelines will be less than the minimum recommended cleaning velocity of 0.7 m/s.*
- Flow in DN 250 & DN 450 (HW = 110) with three pumps operating = 327 *l*/s (v = 1.77 m/s). *Three pumps in parallel in an aged DN 250 and DN 450 pipeline would deliver a flow that's slightly lower than the future design flow of 342 l/s.*
- Flow in DN 250 & DN 500 (HW = 110) with three pumps operating = 350 *l*/s (v = 1.59 m/s). *Three pumps in parallel in an aged DN 250 and DN 500 pipeline would deliver the future design flow of 342 l/s.*
- Flow in DN 250 & DN 450 (HW = 140) with three pumps operating = 350 *l*/s (v = 1.90 m/s)
- Flow in DN 250 & DN 500 (HW = 140) with three pumps operating = 370 *l*/s (v = 1.68 m/s)

It is evident from **Figures 1 and 2** that the minimum required cleaning velocities would not be achieved in a DN 500 rising main with only one pump operational, especially when the existing DN 250 pipeline is operated in parallel with the DN 500 pipeline.

The option to install two pumps was also evaluated. **Figure 3** shows the pipeline characteristic curves for DN 250, DN 450 and DN 500 pipelines, as well as the pump curves for an ABS XFP 200 pump, fitted with a 450 mm impeller, and a 160 kW motor operating at 1480 RPM.

Figure 4 shows the pipeline characteristic curves for DN 250 & DN 450, and DN 250 & DN 500, pipelines in parallel, as well as the pump curves for an ABS XFP 200 pump, fitted with a 450 mm impeller, and a 160 kW motor operating at 1480 RPM.

The following should be noted from **Figure 3** (additional comments are provided in italics where required):

- Flow in DN 250 (HW = 110) with one pump operating = 105 *l/s* (v = 2.14 m/s). *The minimum flow that must be achieved with the pump (i.e. based on its allowable operating range) should be 42 l/s. The pump will therefore operate satisfactorily in the DN 250 pipeline.*
- Flow in DN 450 (HW = 110) with one pump operating = 180 *l/s* (v = 1.13 m/s)
- Flow in DN 500 (HW = 110) with one pump operating = 185 *l/s* (v = 0.94 m/s). *The velocity in the DN 500 pipe is higher than the minimum recommended cleaning velocity of 0.7 m/s.*
- Flow in DN 450 (HW = 110) with two pumps operating = 310 *l/s* (v = 1.95 m/s).
- Flow in DN 500 (HW = 110) with two pumps operating = 335 *l/s* (v = 1.71 m/s)

The following should be noted from **Figure 4** (additional comments are provided in italics where required):

- Flow in DN 250 & DN 450 (HW = 110) with one pump operating = 183 *l/s* (v = 0.99 m/s)
- Flow in DN 250 & DN 500 (HW = 110) with one pump operating = 167 *l/s* (v = 0.85 m/s). *The velocity in the combined DN 250 and DN 500 pipelines will be higher than the minimum recommended cleaning velocity of 0.7 m/s.*
- Flow in DN 250 & DN 450 (HW = 110) with two pumps operating = 330 *l/s* (v = 1.79 m/s) *Two pumps in parallel in an aged DN 250 and DN 450 pipeline would deliver a flow that's slightly lower than the future design flow of 342 l/s.*
- Flow in DN 250 & DN 500 (HW = 110) with two pumps operating = 345 *l/s* (v = 1.57 m/s). *Two pumps in parallel in an aged DN 250 and DN 500 pipeline would deliver the future design flow of 342 l/s.*
- Flow in DN 250 & DN 450 (HW = 140) with two pumps operating = 346 *l/s* (v = 1.88 m/s)
- Flow in DN 250 & DN 500 (HW = 140) with two pumps operating = 360 *l/s* (v = 1.64 m/s)

It is evident from **Figures 3 and 4** that the option with two pumps will be feasible when using a new DN 450 or DN 500 rising main. The DN 500 rising main would deliver approximately 4% more flow compared to the DN 450 rising main.

5.4 Recommendation

Based on the cost estimate provided in **Table 3**, it appears that the option with two pumps and a DN 500 rising main would be the most economical option. It would also be possible to install a DN 450 rising main together with two pumps at an approximate saving of R 200 000 (excluding VAT), but this would also result in a reduction in flow capacity of 4%. The rising main will be approximately 710m long.

This rising main will be constructed approximately 4m parallel to the existing 250mm diameter PVC-U rising main. A bench will be created in the slope above the existing 250mm rising main and the slope will be stabilised with gabions, where required. The route would be the same, with the proposed 500mm diameter rising main using the existing 30m steel pipe bridge to cross the Schaapkop River (see river crossing no. 1 on the attached drawing, drawing no. 108429 GE 400). The original pipe bridge design made provision for the future 500mm diameter rising main and the pipeline will be installed in the existing cradle provided for the rising main. The existing pipe bridge has been designed to be above the 1:100 year flood level. Air- and scour-valves will be provided on the new rising main to allow the pipeline to operate efficiently. The rising main will stop at the existing transfer manhole, where an existing connection point has been provided for this rising main. The sewerage then gravitates through the existing approximately 3.5km 700/800mm diameter Pacaltsdorp bulk sewerage main to the Pacaltsdorp Sewerage Pump station No.1. The proposed 500mm and existing 250mm diameter rising mains will be able to handle the flow generated by the UISP housing project draining to the Thembalethu No. 6 sewerage pump station.

5.5 Pump station Upgrades required

Currently the pump station handles a design flow of 60 ℓ/s, although a 25% spare capacity currently exists. A bulk gravity sewer draining Area 4 of the UISP housing project, the pump station and the inlet works was constructed by the Municipality in 2012 to accommodate Area 4. The pump station was designed to be upgradeable the ultimate future design flow of 380 ℓ/s. The existing 100 ℓ/s inlet works was fitted with front-rake screens (one duty, one standby). At the same time a 350 kVA emergency power supply generator was installed to allow the pump station to remain operational during prolonged power failures.

The pump station will now be upgraded to handle an interim design flow of 220 ℓ/s. This will require that the inlet works be upgraded and possibly an additional inlet works will need to be constructed to accommodate this increased flow. A new 700 mm diameter bulk sewer inlet pipeline will be constructed to accommodate the increased flow to the pump station.

The existing 350kVA emergency power generator will also then be replaced with a 1.5MVA unit, but this will be simply accomplished by swopping out the existing unit with the new unit. The existing 350kVA unit will then be installed at one of the Municipality's other sewerage pump stations, at this stage it is proposed that the unit be installed at the Eden sewerage pump station.

The existing flow passes through the inlet works and then discharges into one os the two existing sumps. Two additional sumps will now be constructed adjacent to the existing sumps. The existing flow is accommodated by two pump sets (one duty, one standby). These pumps will be re-used at one of the Municipality's existing sewerage pump stations, which require an upgrade This will be finalised later in conjunction with the Municipality. They have only been in operation for 1 year and are a valuable asset to the Municipality.

The proposed flow of 220 ℓ/s will make use of three of the four sumps, but the additional sump needs to be constructed to allow the construction of the dry well building to proceed. A new dry

well building will be constructed below the sumps for the installation of the three (3) new pumpsets (two duty, one standby). Each of the pumps will be able to handle a flow of approximately 183 ℓ/s, therefore to handle the design flow of 220 ℓ/s two pumpsets are required, under VSD control, to pump the proposed flow. The pumps will be linked to the new and existing rising mains to pump the required flow of 220 ℓ/s. At the same time a new Motor Control Circuit (MCC) panel will be installed adjacent to the existing pump's MCC panel. This room will be air-conditioned to cool the variable speed drives (VSD) required for the new pumps, which will be housed in the MCC panel. The MCC panel will have the electronics required for the future fourth pump already installed, pending the approval of the Municipality. The existing MCC panel will remain in operation until the new pump installation comes on-line. The existing pumps and MCC panel will then be moved to a new sewerage pump station, yet to be determined.

A new 2-ton gantry crane will be installed to service the new pumps and valves around in the dry well during installation and in the future for servicing purposes.

The new pumps will be connected to the new 500mm diameter rising main, which will work in conjunction with the existing 250mm diameter rising main to accommodate the future design flows expected at this pumps station. The cross connections required for this pipework will be completed once the new rising main is completed and tested. This will complete the upgrading currently required at the Thembalethu No. 6 sewerage pump station and allow the completion of the Thembalethu UISP project Areas draining to this pump station. This will also allow the connection of the existing sewer network to the new bulk sewer constructed under Item 1 of this project, which drains to the Thembalethu No. 5 sewerage pump station and allow the Municipality to de-commission the existing Thembalethu No. 4 (15 ℓ/s) and Thembalethu No. 3 (35 ℓ/s) sewerage pump stations, thereby reducing the maintenance burden on the municipality.

6. **Proposed Bulk Gravity Sewers catering for sewerage flows around Area 1, 5, 6A, 6B and 2; and associated stream crossings**

The proposed Bulk Gravity Sewers for UISP Areas 1, 5, 6A, 6B and 2;will be constructed in two sections (catering for sewerage flows from 10 ℓ/s to 115 ℓ/s). The proposed bulk sewer pipelines are indicated in blue and red around Areas 1, 5, 6A and 6B on the attached drawing, drawing No. 108429 GE 400 Rev F. The first section draining UISP Areas 1, 5 and a portion of Area 6A will be approximately 2965m long (950m long 200mm diameter, 250m long 250mm diameter, 475m long 300mm diameter and 825m long 400mm diameter PVC-u (Un-plasticised Polyvinyl Chloride) sewer pipeline (Class 34 (heavy duty)) and 485m long 450mm diameter GRP (Glass Reinforced Resin), Class 6 sewer pipelines). The second section draining the rest of Area 6A, 6B and Area 2 will be approximately 975m long (725m long 200mm diameter and 200m long 250mm diameter PVC-u (Un-plasticised Polyvinyl Chloride) sewer pipeline (Class 34 (heavy duty)).

The bulk sewer will be benched into the steep side slope over most of its length and the intention is to use gabions to stabilise the cut slope, which will limit the visual impact of the bench on the slope. The bench will also allow the Municipality to maintain this asset, by providing a safe access track for maintenance work on the pipeline route. Manholes will be provided every 80m to allow proper maintenance to be carried out.

Together with the second section of the bulk sewer, a number of bottlenecks in the Thembalethu connector sewer network have been identified by the Municipality's sewer section, around the housing areas, which will need to be addressed to ensure that the complete system is able to handle the additional flow added into the existing sewerage system. A number of critical areas have been identified, which means that approximately 4965m of existing connector sewers will need to be upgraded (2380m long 160mm diameter, 1325m long 200mm diameter and 1260m long 250mm diameter PVC-u (Un-plasticised Polyvinyl Chloride) sewer pipeline (Class 34: heavy duty), to remove any potential bottlenecks in the existing sewer reticulation network.

Stream crossings

The bulk sewers will all drain to the post tensioned concrete pipe-bridge described under item 4 above Indicated as River crossing No. 6 on the attached drawing, drawing No. 109429 GE 400 Rev F. The preliminarily proposed stream crossings, labelled A to J are also indicated on the attached drawing. As not all the routes have been surveyed yet, additional stream crossings could be identified at a later stage. If this occurs, The Department of Water Affairs (DWA) will be notified and the application will be amended to reflect these areas The proposed River and Stream crossings information are provided in the table below:

Table 4: River and Stream crossing details

Crossing No.	X	Y	River	Owner	1:100 Flood Flow (m^3/s)
A	3 764 159.089	48 977.187	Tributary to Schaapkop River	George Municipality	8.26
B	3 764 472.953	49 188.043	Tributary to Schaapkop River	George Municipality (Being expropriated from private land owner)	2.7
C	3 764 729.369	49 136.819	Tributary to Schaapkop River	George Municipality (Being expropriated from private land owner)	0.68
D	3 764 944.101	49 174.105	Tributary to Schaapkop River	George Municipality / Province	0.06
E	3 765 169.697	49 031.841	Tributary to Schaapkop River	George Municipality / Province	0.19
F	3 765 170.226	48 813.941	Tributary to Schaapkop River	George Municipality / Province	0.06
G	3 765 067.995	48 457.658	Tributary to Schaapkop River	George Municipality / Province	1.00
H	3 765 120.916	47 937.106	Tributary to Schaapkop River	George Municipality / Province	3.50
I	3 765 072.815	47 744.988	Tributary to Schaapkop River	George Municipality / Province	2.14
J	3 765 143.369	47 280.331	Tributary to Schaapkop River	George Municipality / Province	6.00
1	3 766 259.09	47 286.601	Schaapkop River	George Municipality / Province	160.00
2	3 765 014.246	49 445.006	Schaapkop River	George Municipality	35.00
3	3 764 770.032	49 719.900	Tributary to Schaapkop River	George Municipality	31.00
4	3 764 310.182	49 314 732	Tributary to Schaapkop River	George Municipality	124.00
5	3 766 065.883	47 103.521	Tributary to Schaapkop River	George Municipality / Province	10.46
6	3 765 132.358	49 356.519	Schaapkop River	George Municipality / Province	130.00

As per DWA's instructions each of these stream crossings has been provisionally designed for a 1:100 year flood event. Attached please find preliminary design proposals for each of these river and stream crossings. Although these are preliminary design proposals, these should be indicative of the final proposals been prepared for this work. The river crossings have been described separately as part of the programme for the works, but the proposed stream crossings will be discussed in more detail in the text below.

The system we are proposing has been successfully implemented in the previous Pacaltsdorp bulk sewer project, completed in 2009. The system for handling stream crossings is described below

i) The temporary berm is constructed in the stream, which is used to divert the existing flow to a pipeline installed to divert the normal flow past the construction area. The flow is discharged below the construction area and passes through two sets of silt-traps. The silt-traps are required to minimise the loss of silt caused by the construction activities.
ii) Box culverts are installed on a concrete surface bed in the stream bed. The box culverts are sized to accommodate the 1:100 year flood requirements, as per DWA's requirements.

iii) Two gabion walls are constructed parallel to each other, with a 3m distance between the inner faces of the gabion wall. The gabion walls are constructed perpendicularly over the stream over the box-culverts. The two walls are tied together with wire gabion mesh at each 1m height interval. The area in between the gabion walls is then filled with G7 road material to form an access track, which is then used by the Municipality to gain access and maintain the sewer pipeline along its entire length.

iv) The bulk sewer is laid to the correct levels in between the two gabion walls in the road fill material. This removes the need for steel pipe bridges to span over the stream, which are prone to vandalism and theft. The pipeline is now protected between the gabions under the road in-fill material, protecting it from any potential damage from vandals. Access to the bulk sewer and associated manholes is now possible from one convenient access route aligned alongside and above the existing sewer pipeline, which avoids the need for numerous access tracks down the slope to reach the sewer pipeline alignment for maintenance purposes.

v) Reno-mattresses are provided ahead and below the gabion walls to prevent under-mining and erosion of the soil on either side of the structure. Gabion walls are also constructed 5 to 10m downstream of the structure in the stream bed to prevent the river cutting back to the gabion structure and under-mining it in the future.

vi) Once the structure is complete the river flow is diverted through the box-culvert. Once the flow has stabilised the silt behind the silt traps is removed and used to rehabilitate the construction area. Once the flow stabilises the silt traps are then removed.

SUMMARY OF MAIN PROPOSAL

The above-mentioned upgrades will give the most feasible long term solution to the Municipality, but the phasing and sequencing will be adjusted to conform to the Municipalities funding requirements, since the upgrading of the two pump stations (Pacalisdorp No. 1 and Thembalethu No. 6) and related rising mains would require the bulk of this expenditure. It does make the management of these proposals very critical for the next two financial years. This report attempts to go some way in explaining what will be required and why, before the next housing phases begin. A provisional cash-flow and programme is attached for discussion and planning purposes.

ALTERNATIVE PROPOSALS INVESTIGATED

Various other alternatives were investigated to fit the available capital flows and are discussed below, however these have been rejected as being wasteful expenditure and having no major environmental advantage. Contrarily these options have higher energy ouputs, with more pump stations being required to handle the flow.

1. Upgrading of Thembalethu Pump station No. 3:

As an intermediate upgrade proposal the existing Thembalethu pump station No. 3 can be upgraded. This would open up an additional 700 erven (Areas 3, 7 and 8) for development in the next housing phases, but this is not considered the best use of funds. The reasons behind this statement are discussed in more detail later on in this section.

The existing 200mm diameter fibre cement rising main conveys sewage from Pumpstation No. 3 to the Outeniqua Wastewater Treatment Works. The existing 200mm diameter rising main is indicated in yellow on the attached drawing, drawing No. 108429 GE 400 Rev F. The existing Thembalethu sewerage Pump station No. 3 currently has a pumping capacity of approximately 32 l/s, while we estimate (using the "red-book" design guidelines) the existing flow could be as high as 45 l/s, and therefore both the pump station and rising main are already at or over their design capacity. The pumpstation will have to be upgraded to handle a flow of approximately 65 l/s, to provide for the additional serviced erven created by the new UISP housing project phases in the area (Housing Areas 3, 7 and 8A). This pump station currently has only one functional pump, but was due to receive urgent attention. Upgrading of the pump station would consist of a new inlet works, the installation of two new pumps in a new sump, mechanical screens, a back-up generator installation and related electrical supplies, as well as a telemetry system. Initially the basic items will be upgraded, with more costly items like the standby generator being added later. The existing pump station building and sump will have to be extended and provision made for the upgraded access road, stormwater provision and a new security fence. Two alternatives can be considered regarding the rising main for Pump station No. 3, as described below:

1.1 Alternative 1:

One option would be for a 3,8km long 250mm diameter PVC-u rising main, pumping sewage from Pump station No. 3 to the transfer manhole at the Outeniqua Wastewater Treatment Works. The intention is to follow a route that will intersect the least existing services, such as water, stormwater and sewer pipelines, electrical and Telkom cables and existing roads and sidewalks, as well as avoiding certain high points along the route. This proposal is indicated in dark blue below the existing 200mm diameter rising main which is indicated in yellow on the attached drawing, drawing No. 108429 GE 400 Rev F. The existing rising main has a high point in the first third of its length and then flows under siphon action to the Outeniqua WWTW. The new rising main will operate alongside the existing 200mm diameter fibre cement rising main, but will avoid having a siphon action by ensuring the rising main high point is at the Outeniqua WWTW.

This option results in a lengthy rising main, which will have a relatively high pumping head. This requires powerful pumps which will consequently have a reasonably high operating cost, as well as relatively high initial capital expenses.

1.2 Alternative 2:

This option is linked to the upgrading of Thembalethu Pump station No. 5, as described in the next section, and would see a 315mm diameter PVC-u rising main from Pumpstation No. 3 to a point connecting to the proposed 350 – 400 mm diameter bulk gravity sewer proposed to drain the housing Areas 5, 6A and 6B. Please note that the bulk gravity sewer around Area 5, 6A and 6B would need a larger diameter to accommodate the increased flow generated by the rising main discharging the flow from Pump staton No. 3 into this bulk sewer. This option would result in a lower pumping head, with consequently smaller pumps, which will be more cost effective in terms of operating costs as well as initial capital expense. The shorter length of rising main will also be more economical to operate, as opposed to the 250mm diameter rising main described in the previous paragraph. This alternative will allow the Municipality to service a much larger amount of erven, as well as saving on operating costs.

2. Upgrading of Pumpstation No. 5:

The existing Thembalethu Pump station No. 5 will have to be upgraded and re-built at a position lower down the slope. This will allow the upgraded northern bulk sewer (draining Area 1) to gravitate to the new pump station. The current bulk sewer has insufficient fall in places and needs to be re-aligned and upgraded to drain Area 1 (288 erven) of the UISP housing project. Pump station No. 5 currently has a capacity of 15 ℓ/s, and will have to be upgraded to cater for sewer flows of up to 180 ℓ/s. This made up of the existing expected flow of 55 ℓ/s for Pump station No.5, the additional flow of 10 ℓ/s from Housing Area No.1, the flow of 40 ℓ/s from Areas No. 2, 5 and 6, the flow of 60 ℓ/s from Pump station No.3, as well as giving the option of Pump station No.4's flow of 15 ℓ/s to be diverted here as well. By diverting Pump station No.4's flow to the new Pump station No, 5, we allow the new Pump station No.7 which is currently under construction to accommodate 600 existing erven's flow, thereby reducing the stress on the bulk sewer draining to Pump station No. 2 and also improving the operating conditions at the pump station as well.

The upgrade will entail a new inlet works, a new pumpstation building, new pumps and mechanical screens, provision for a back-up generator and associated electrical reticulation upgrades, as well as some gabion work, an access road, a telemetry system and a new fence.

The upgrading of Pump station No. 5 will allow the proposed housing Areas 2, 5, 6A and 6B to be serviced (1 792 UISP erven) and allow the flow from the upgraded Pump station No. 3 to be accommodated at the newly upgraded pump station. The development of these housing areas is however subject to the expropriation of the land on which the development of Areas 6 and 8 is to take place. The process of the expropriation of the portion of land in question has commenced, as part of the housing project. A short section (approximately 555m) of 400 mm diameter sewer rising main will join the upgraded Pump station No. 5, with the existing transfer manhole at the Outeniqua WWTW.

The proposed rising mains servicing Pump stations 3 and 5, discussed in item 1 and 2 above, requires a 50m concrete pipe bridge to accommodate the 450mm diameter rising main, as this pipeline needs to cross the Schaapkop River. The position of this crossing is indicated as River crossing No. 4 on the attached drawing drawing No. 108429 GE 400 Rev F. A 450mm diameter pipeline will be installed in the pipe bridge, which is over and above the initially required diameter of 400mm. This will allow the pipelines to be upgraded to the pipe bridge in the future to accommodate the increasing flows from the area as Thembalethu develops.

A concrete pipe bridge is considered prudent, as the recently completed steel pipe bridge over the Schaapkop River has already been vandalised, only months after being completed. The River valley is wide at the crossing point and piers will be required to support the pipe bridge These piers would need to be designed to withstand the 1:100 year flood waters. The pipe bridge is proposed to have a 1m x 1m square section, with reinforcing being placed around the perimeter, while the pipeline will be placed in the middle of the concrete section

The complete upgrade of Pump station No. 5 will have to include the construction of a 2,5 km long 350 – 400mm diameter gravity sewer to Pumpstation No. 5, draining housing Areas 2, 5, 6A and 6B, as well as the short section of 315mm diameter rising main from Pumpstation No 3, which links to the new bulk sewer. This will include the upgrade of the sewer line described in paragraph 3.1 below. This alternative will however, as mentioned before, serve significantly more erven, provided the expropriation process receives priority.

2.1 Upgrading of northern Thembalethu bulk sewer pipeline:

The Emergency Rehabilitation of Thembalethu Sewer Pipeline along the N2 national road was completed in June 2009 Only a short section at the upstream end of the bulk sewer was upgraded at the time due to cost constraints. A complete upgrade of the bulk sewer line that extends from this pipeline is necessary to accommodate Area 1 of the housing project. Operational difficulties (blockages due to flat gradients) exist further downstream in the bulk sewers alignment to the existing Thembalethu Pump station No.5. Area 1 of the UISP housing project is located adjacent and over the existing pipeline alignment, which would require the realignment of the bulk sewer to accommodate the UISP housing development The existing 1560m pipeline will need to be rerouted to accommodate the development. The newly realigned sewer would be unable to connect to the existing Pump station No 5 due to the

required improved gradient required, resulting in the bulk sewer pipeline ending below the existing pump station incoming invert level.

We recommend that consideration be given to realigning the section from Manhole No.TA35 to the Pump station No.5 to remove any problems with the vertical alignment and to accommodate Area 1 of the UISP housing project.

This will also allow the gradual improvement of the sewer pipelines feeding into the bulk sewer main, as and when funding becomes available. To achieve this, the existing sewer main will be upgraded by installing 930m of 250mmØ and 850m of 200mmØ heavy duty PVC-U sewer pipes, with associated manholes. Manholes will be spaced at a maximum distance of 80m and at all changes in direction or gradient. All existing erf connections will be re-connected into the new sewer main. Minimal disruption of the existing sewerage flow is expected.

The above proposals provide a short-term solution, but due to further development proposed in Thembalethu (Possible sewerage link of Kraaibosch and Victoria Bay areas to Thembalethu) and around the Pacaltsdorp (Syferfontein 7 000 to 15 000 housing development), which could see the need to upgrade the Pacaltsdorp No. 1 pump station and the Thembalethu No. 6 sewerage pump stations in the near future, we feel that the upgrading of the Pacaltsdorp No.1 and Thembalethu No.6 sewerage pump stations must receive priority.

We trust that you find the foregoing acceptable. If you have any queries, please do not hesitate to contact us.

Yours faithfully

AJ VAN MOLENDORFF Pr Tech Eng
Project Manager
pp Aurecon

BG H JACOBS Pr Eng
Office Manager
pp Aurecon

Enclosed: 108429GE400 REV E: Revised Bulk Sewer Main Proposals

Annexure

Existing Gabion Stream Crossing photographs

Concrete Pipe Bridge Photos (for illustration purposes)

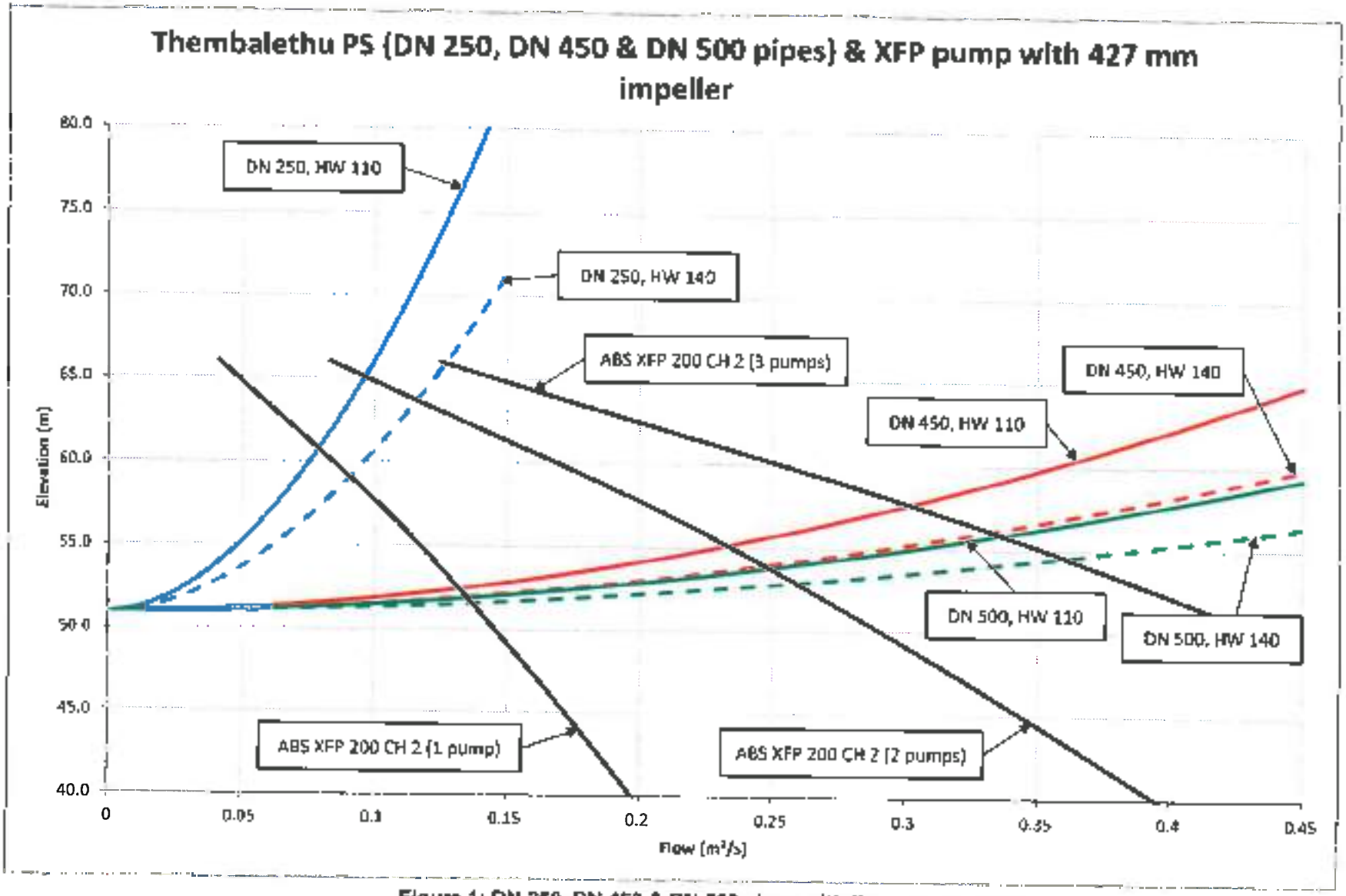


Figure 1: DN 250, DN 450 & DN 500 pipes with three pump option

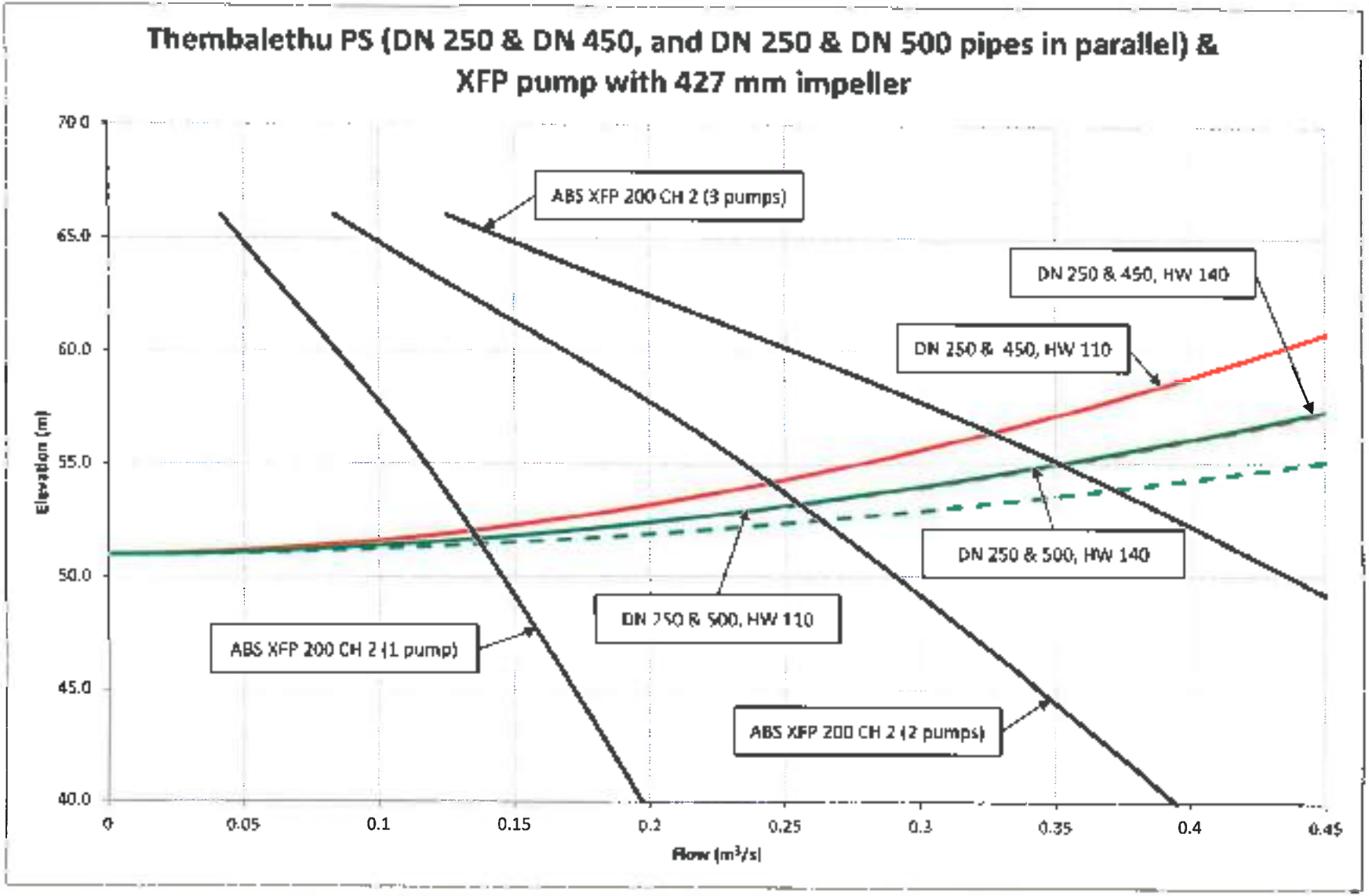


Figure 2: DN 250 & DN 450 and DN 250 & DN 600 pipes in parallel with three pump option

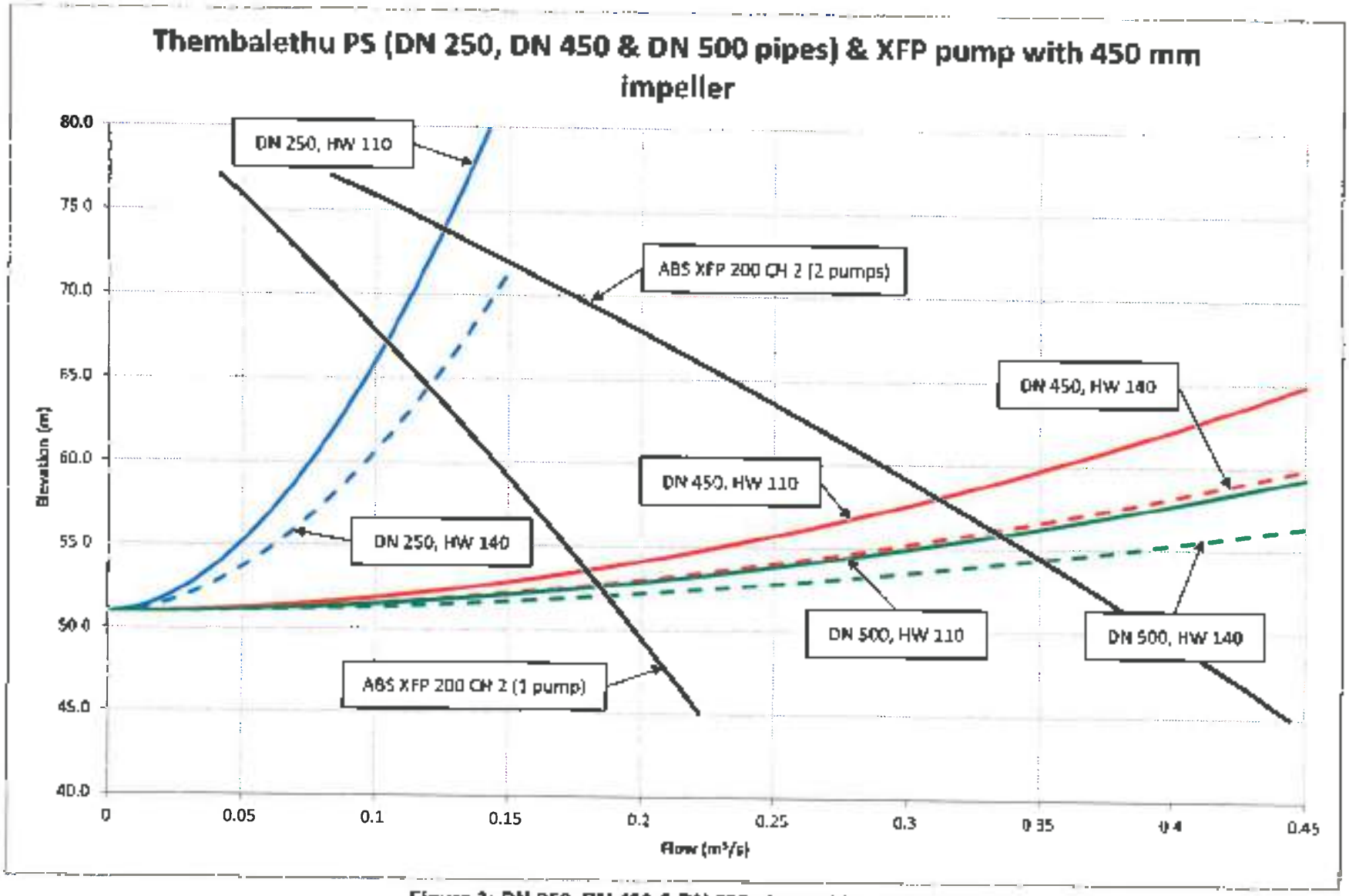


Figure 3: DN 250, DN 450 & DN 500 pipes with two pump option

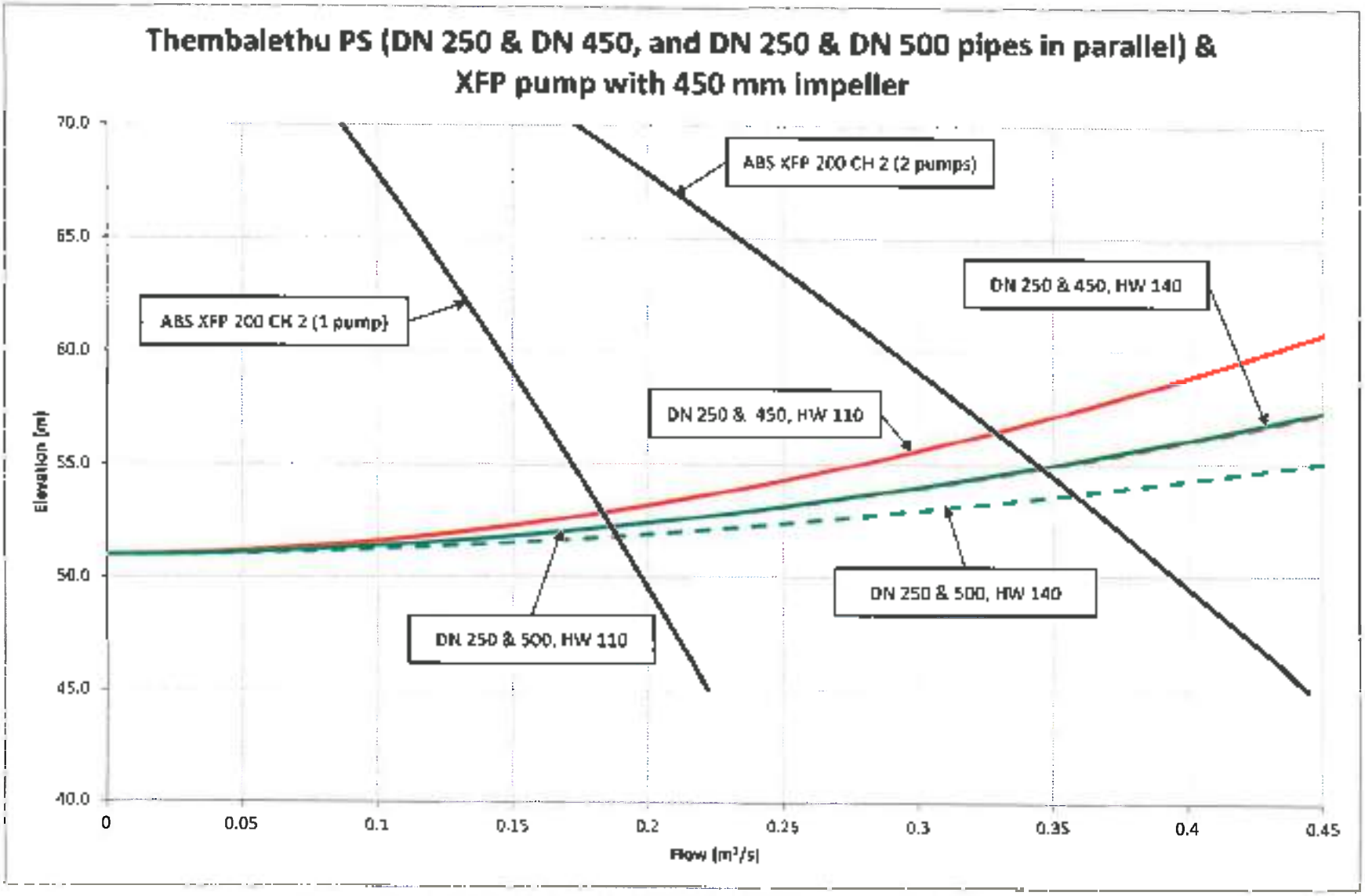


Figure 4: DN 250 & DN 450 and DN 250 & DN 500 pipes in parallel with two pump option

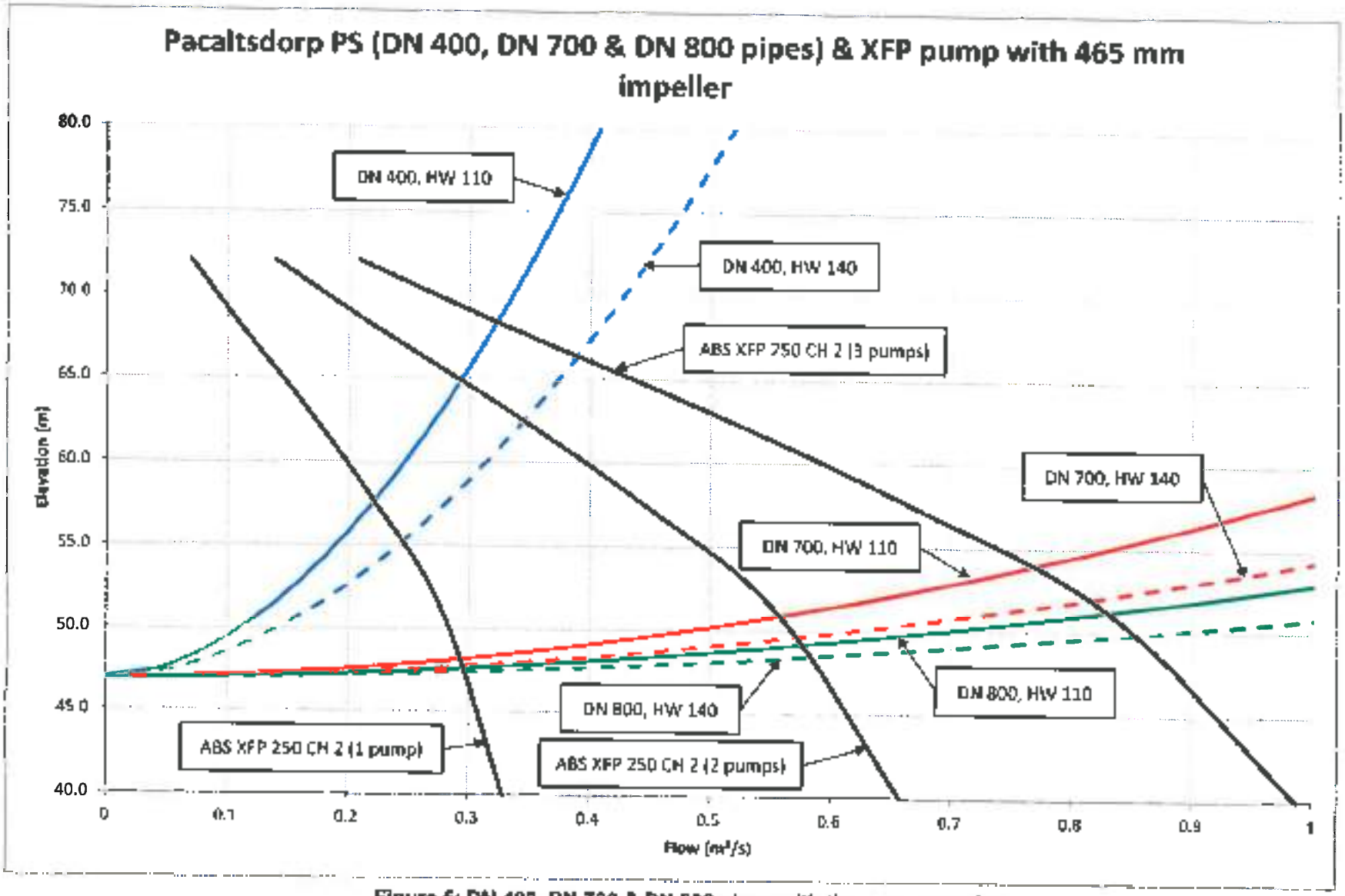


Figure 6: DN 400, DN 700 & DN 800 pipes with three pump option

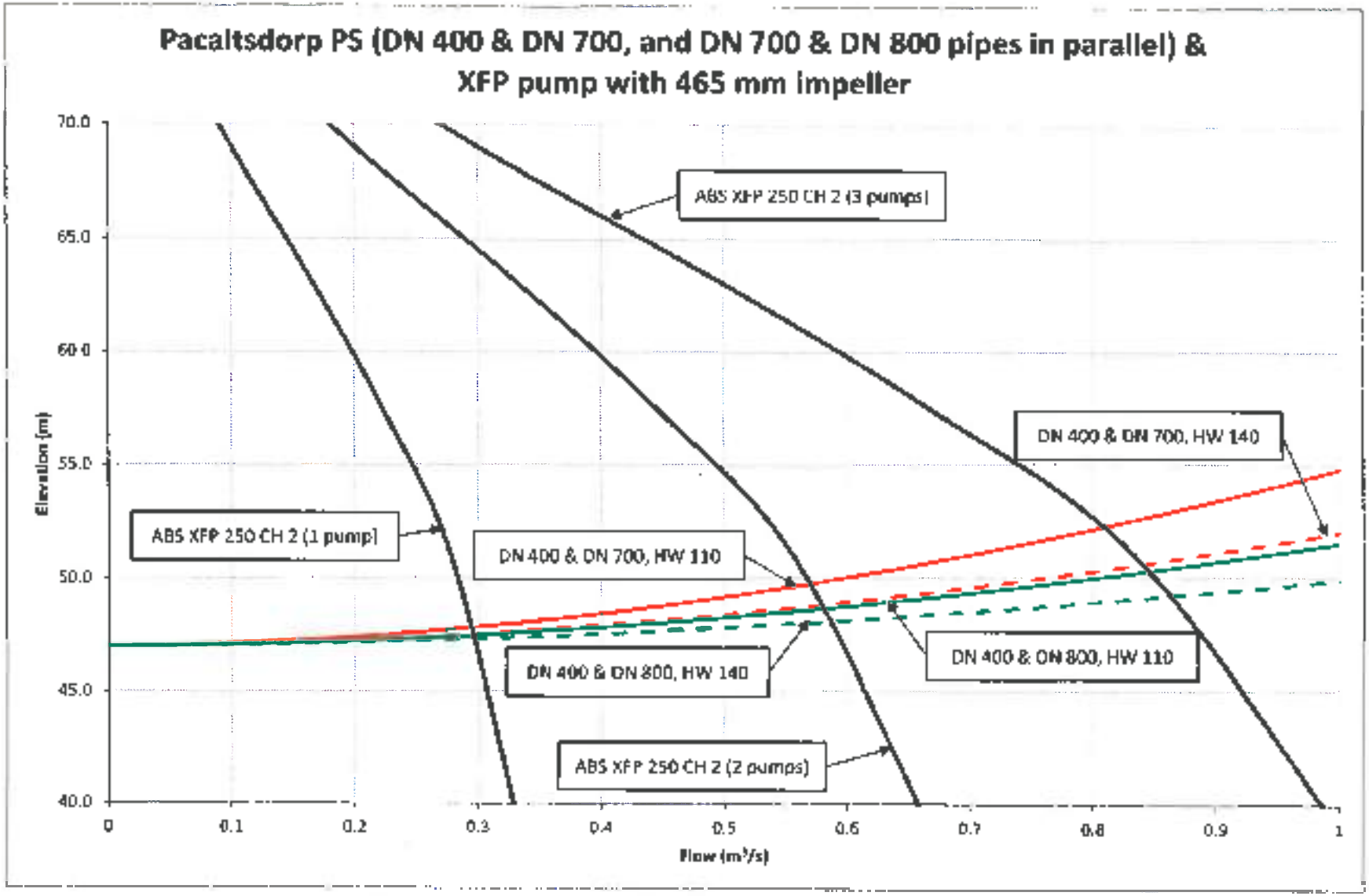


Figure 6: DN 400 & DN 700 and DN 400 & DN 800 pipes in parallel with three pump option

aurecon

GEORGE MUNICIPALITY

REV	DATE	DESCRIPTION OF CHANGE
A	04/2013	FOR DISCUSSION PURPOSES
B	05/2013	RIVER CROSSINGS ADDED
C	05/2013	STREAM CROSSINGS ADDED
D	07/2013	RIVER CROSSING No. 6 ADDED
E	07/2013	RIVER CROSSING No. 7 ADDED
F	09/2013	ENLARGED SCALE

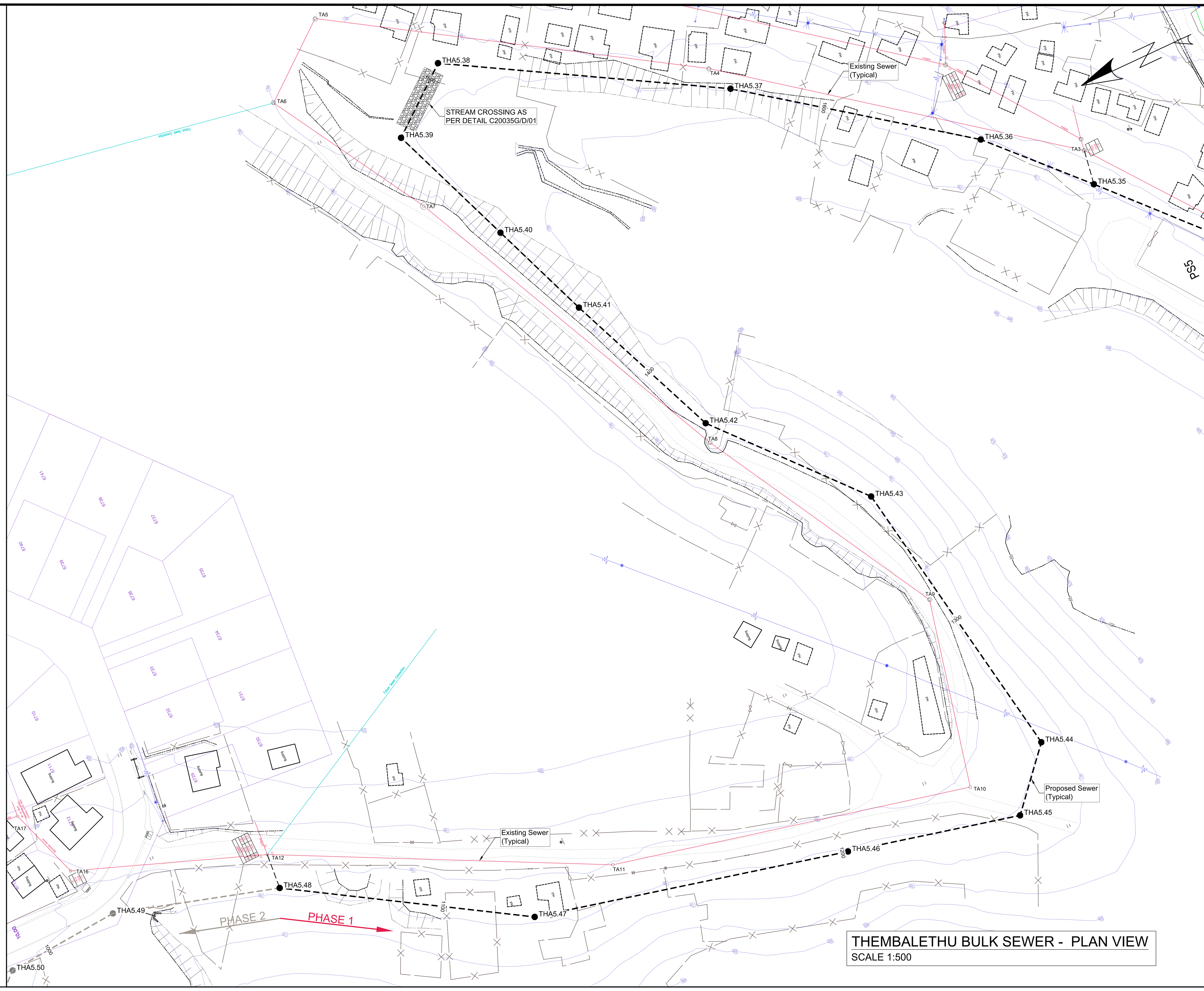
APPROVED	DRAWN	DESIGNED
	VC Dunsjens	A v Molendorff
	CHECKED	
	A v Molendorff	
	APPROVED	

PROJECT: THEMBALETHU HOUSING PROJECT

TITLE: REVISED BULK SEWER MAIN PROPOSALS

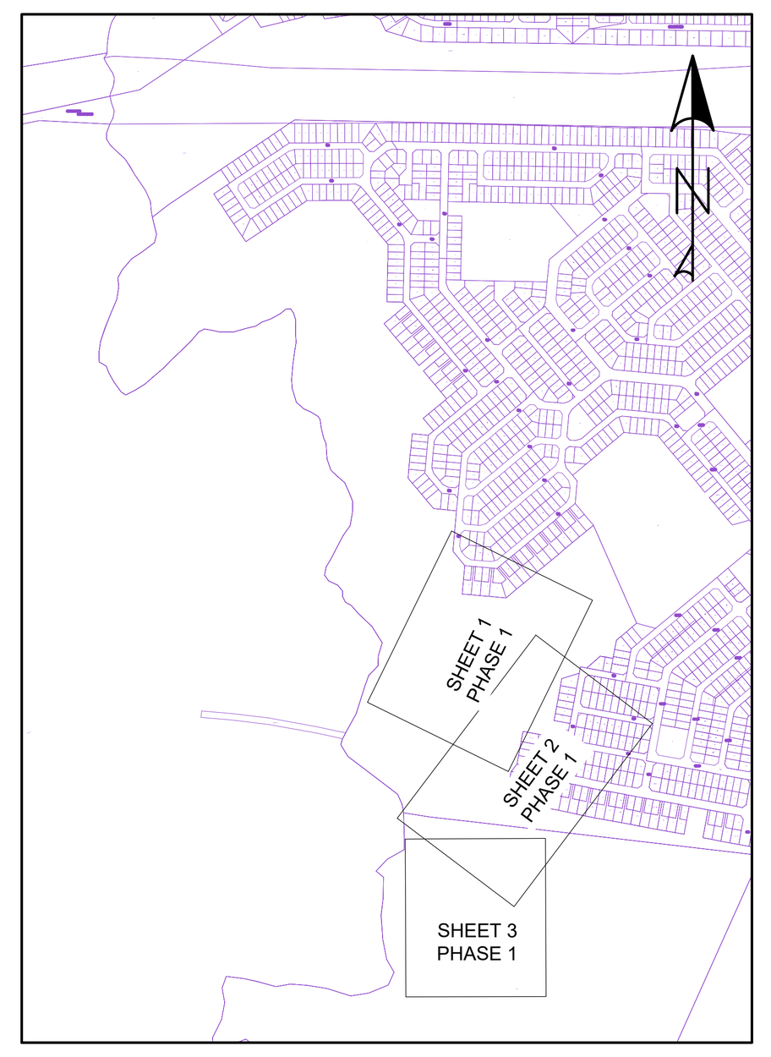
FOR DISCUSSION PURPOSES

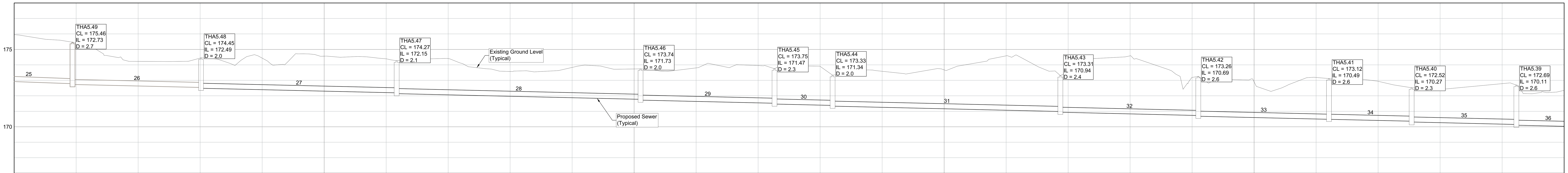
PROJECT No.	108429
SCALE	SIZE
1 : 7 750	A3
DRAWING No.	REV
108429 GE 400	F



THEMBALETHU BULK SEWER - PLAN VIEW
SCALE 1:500

SEE SHEET 2





SCALES:
Horizontal 1:250
Vertical 1:50

DATUM 167.000

DISTANCE (m) FREQUENTIAL	GROUND LEVELS ON CL
1000	175.95
1020	175.41
1040	174.22
1060	174.43
1080	174.44
1100	174.56
1120	174.39
1140	174.41
1160	173.57
1180	173.84
1200	173.74
1220	173.80
1240	173.96
1260	173.90
1280	173.59
1300	173.68
1320	174.58
1340	173.58
1360	174.58
1380	173.19
1400	172.90
1420	173.19
1440	172.94
1460	172.41
1480	172.79
1500	172.32

SLOPE / LENGTH	PIPE
0.73% / 1:136.1 28.36m	UPVC CL34 315mm dia
0.47% / 1:212.8 41.46m	UPVC CL34 315mm dia
0.47% / 1:212.8 63.10m	UPVC CL34 315mm dia
0.47% / 1:212.8 78.67m	UPVC CL34 315mm dia
0.47% / 1:212.8 43.23m	UPVC CL34 315mm dia
0.47% / 1:212.8 18.73m	UPVC CL34 315mm dia
0.47% / 1:212.8 73.47m	UPVC CL34 315mm dia
0.47% / 1:212.8 44.49m	UPVC CL34 315mm dia
0.47% / 1:212.8 42.17m	UPVC CL34 315mm dia
0.47% / 1:212.8 26.67m	UPVC CL34 315mm dia
0.47% / 1:212.8 33.78m	UPVC CL34 315mm dia
0.47% / 1:212.8 20.46m	UPVC CL34 315mm dia

STRUCTURES	PIPE INVERT LEVEL IL (IN)	IL (OUT)
		172.997
X: 3764023.37 Y:-49142.64	172.789	172.739
X: 3764062.91 Y:-49155.11	172.544	172.494
X: 3764116.04 Y:-49189.15	172.197	172.148
X: 3764192.25 Y:-49208.70	171.778	171.728
X: 3764234.13 Y:-49219.39	171.525	171.475
X: 3764246.76 Y:-49205.56	171.387	171.339
X: 3764235.86 Y:-49132.90	170.993	170.944
X: 3764207.30 Y:-49098.79	170.735	170.687
X: 3764191.88 Y:-49059.54	170.489	170.489
X: 3764182.69 Y:-49034.50	170.364	170.314
X: 3764171.06 Y:-49002.79	170.155	170.105
	170.009	

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALEBAR
0 15 30 METER
SCALE 1:500

All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer.

REV	DESCRIPTION	DATE	REV BY	CHKD
A	TENDER (DRAFT)			

REVISIONS

DESIGNED	RL
DRAWN	RL
CHECKED	MLR

CONSULTING ENGINEERS
LYNERS
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GEORGE
6530
Tel: 044 887 0223 / Fax: 044 887 0741
email: george@lyners.co.za

APPROVED
ENGINEER: ____________
DATE: ____________

APPROVED
CLIENT: ____________
DATE: ____________

CLIENT
GEORGE MUNICIPALITY
GEORGE THE CITY FOR ALL REASONS
PO Box 757
George
6530
Tel: 044 887 0223
Fax: 044 887 0741

PROJECT
UPGRADING OF THEMBALETHU BULK SEWER
GRAVITY MAIN - PHASE 1 (THA5.48 - THA5.22)

TITLE
LAYOUT AND PROFILE

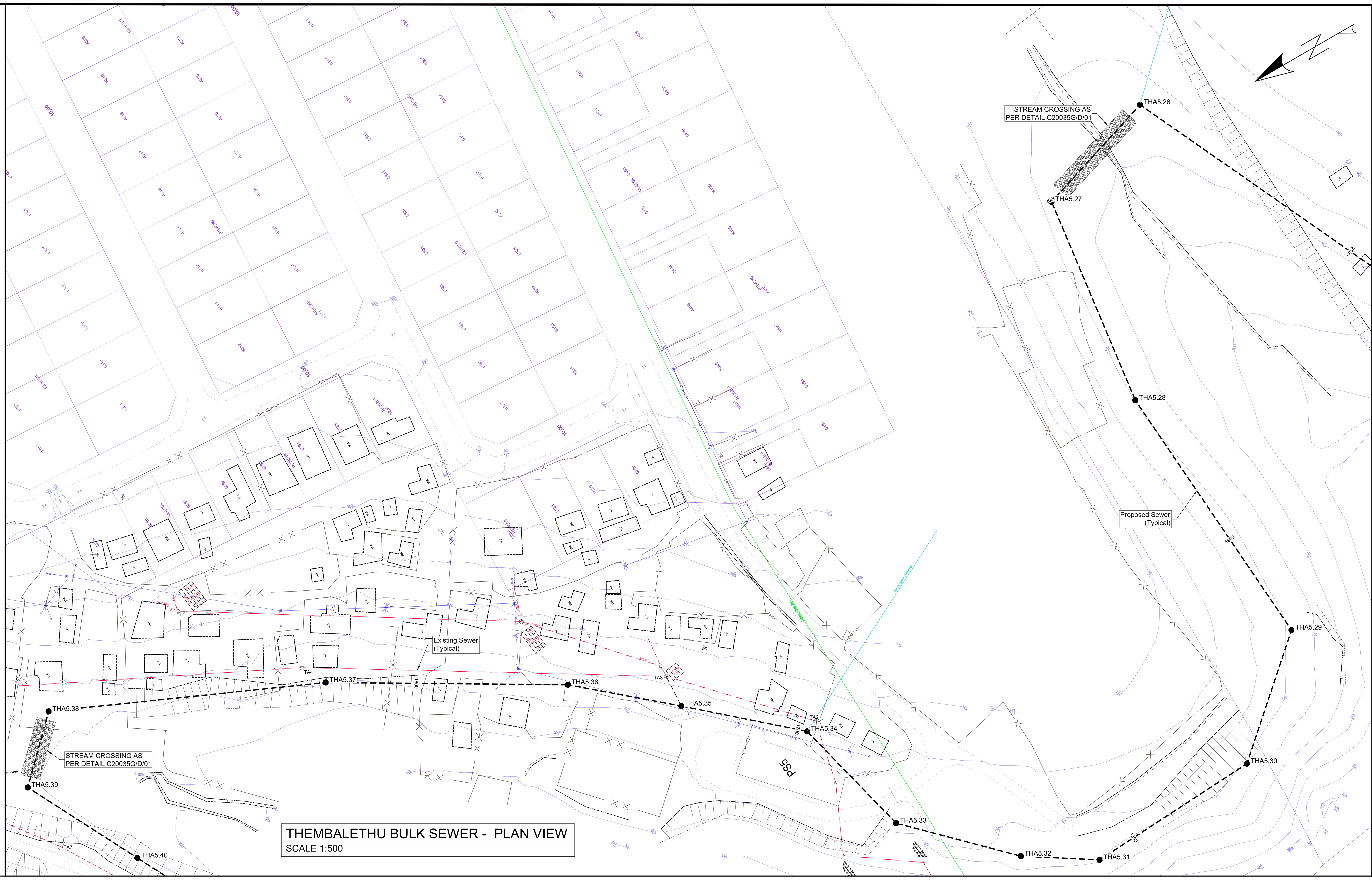
SCALE on A0 1:500
SHEET 3 OF 5
CONTRACT No.
PROJECT No. C20035G
DRAWING No. C20035G-L-01
REV A
COORDINATE SYSTEM: WGS84/23

Auditing: Riaan Louwrens 2021-07-27 Checked: ________ Date: ________

iso full bleed a0 (841.00 x 1189.00 mm)

S:\PROJECTS\SIVIEL\GEORGE\20035CG - THEMBALETHU BULK SEWER MAINS\DRAWINGS\WORKING\PHASE 1\THEMBA_WORKING 33.DWG

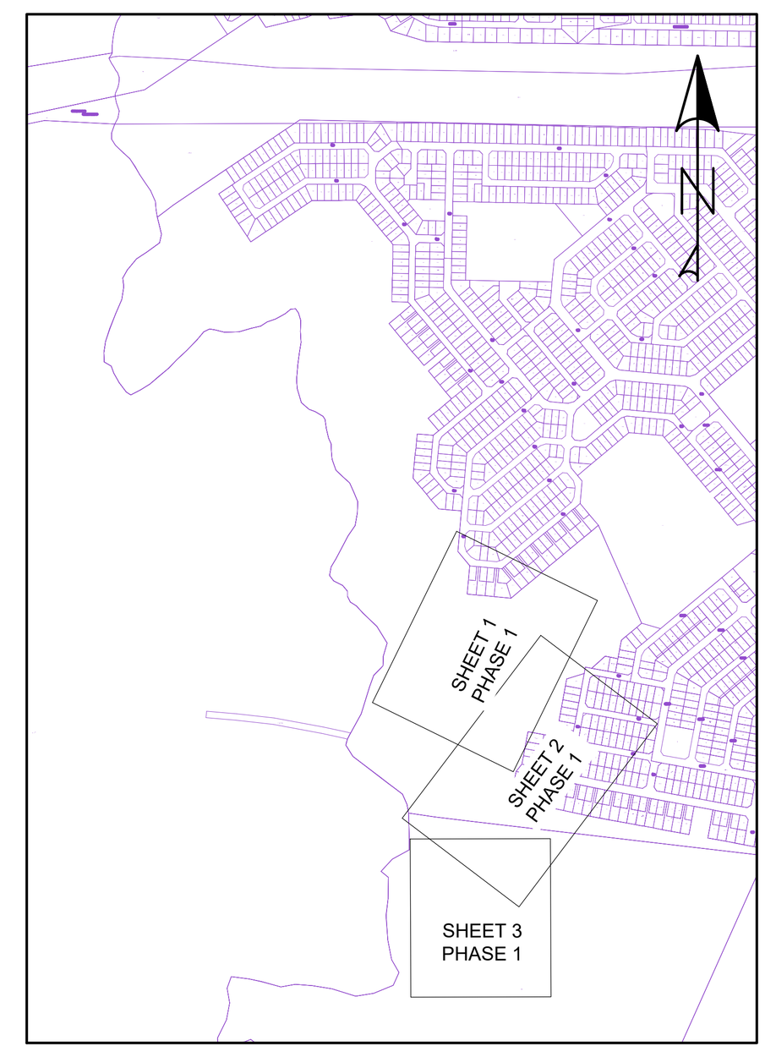
SEE SHEET 2

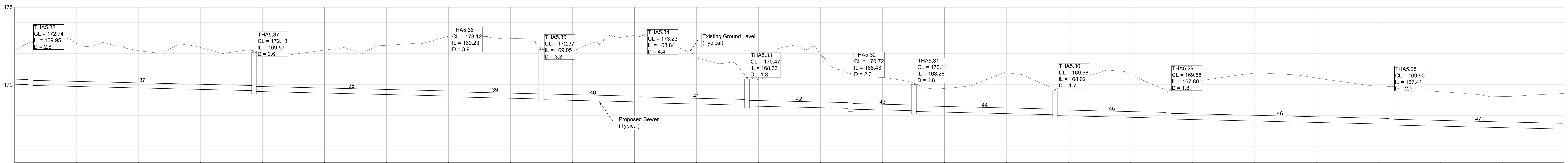


THEMBALETHU BULK SEWER - PLAN VIEW

SCALE 1:500

SEE SHEET 3





SCALES:
Horizontal 1:250
Vertical 1:50

DATUM 165.000

DISTANCE (m) FREQUENTIAL	GROUND LEVELS ON CL
1500	172.32
1520	172.65
1540	172.19
1560	172.39
1580	172.05
1600	172.23
1620	172.54
1640	173.12
1660	172.97
1680	172.15
1700	173.16
1720	171.72
1740	170.33
1760	171.97
1780	170.46
1800	169.76
1820	170.77
1840	170.02
1860	170.68
1880	170.24
1900	170.74
1920	170.43
1940	169.92
1960	169.55
1980	169.24
2000	169.44

SLOPE / LENGTH	PIPE
0.47% / 1:212.8 20.46m	UPVC CL34 315mm dia
0.47% / 1:212.8 72.19m	UPVC CL34 315mm dia
0.47% / 1:212.8 62.77m	UPVC CL34 315mm dia
0.47% / 1:212.8 29.89m	UPVC CL34 315mm dia
0.47% / 1:212.8 33.25m	UPVC CL34 355mm dia
0.47% / 1:212.8 33.15m	UPVC CL34 355mm dia
0.47% / 1:212.8 33.44m	UPVC CL34 355mm dia
0.47% / 1:212.8 20.42m	UPVC CL34 355mm dia
0.47% / 1:212.8 45.59m	UPVC CL34 355mm dia
0.47% / 1:212.8 36.50m	UPVC CL34 355mm dia
0.47% / 1:212.8 72.01m	UPVC CL34 355mm dia
0.47% / 1:212.8 55.87m	UPVC CL34 355mm dia

STRUCTURES	PIPE INVERT LEVEL IL (IN) / IL (OUT)
	170.105
X: 3764187.29 Y:-48990.33	170.009 / 169.960
X: 3764249.06 Y:-49027.69	169.621 / 169.571
X: 3764298.75 Y:-49066.04	169.276 / 169.226
X: 3764318.86 Y:-49088.16	169.085 / 169.045
X: 3764340.88 Y:-49113.07	168.889 / 168.839
X: 3764344.92 Y:-49145.98	168.683 / 168.633
X: 3764365.54 Y:-49172.31	168.476 / 168.426
X: 3764381.23 Y:-49185.38	168.330 / 168.281
X: 3764426.71 Y:-49188.54	168.067 / 168.017
X: 3764456.82 Y:-49167.91	167.845 / 167.796
X: 3764460.50 Y:-49095.99	167.457 / 167.408
	167.145

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALEBAR 0 15 30 METER

SCALE 1:500

All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer.

REV	DESCRIPTION	DATE	REV BY	CHKD
A	TENDER (DRAFT)			

REVISIONS

DESIGNED	RL
DRAWN	RL
CHECKED	MLR

CONSULTING ENGINEERS
LYNERS
PO Box 757
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Tel: 044 887 0223 / Fax: 044 887 0741
email: george@lyners.co.za

APPROVED
ENGINEER: ____
DATE: ____

APPROVED
CLIENT: ____
DATE: ____

CLIENT
GEORGE MUNICIPALITY
GEORGE THE CITY FOR ALL REASONS
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George
6530
Tel: 044 887 0223
Fax: 044 887 0741

PROJECT
UPGRADING OF THEMBALETHU BULK SEWER
GRAVITY MAIN - PHASE 1 (THA5.48 - THA5.22)

TITLE
LAYOUT AND PROFILE

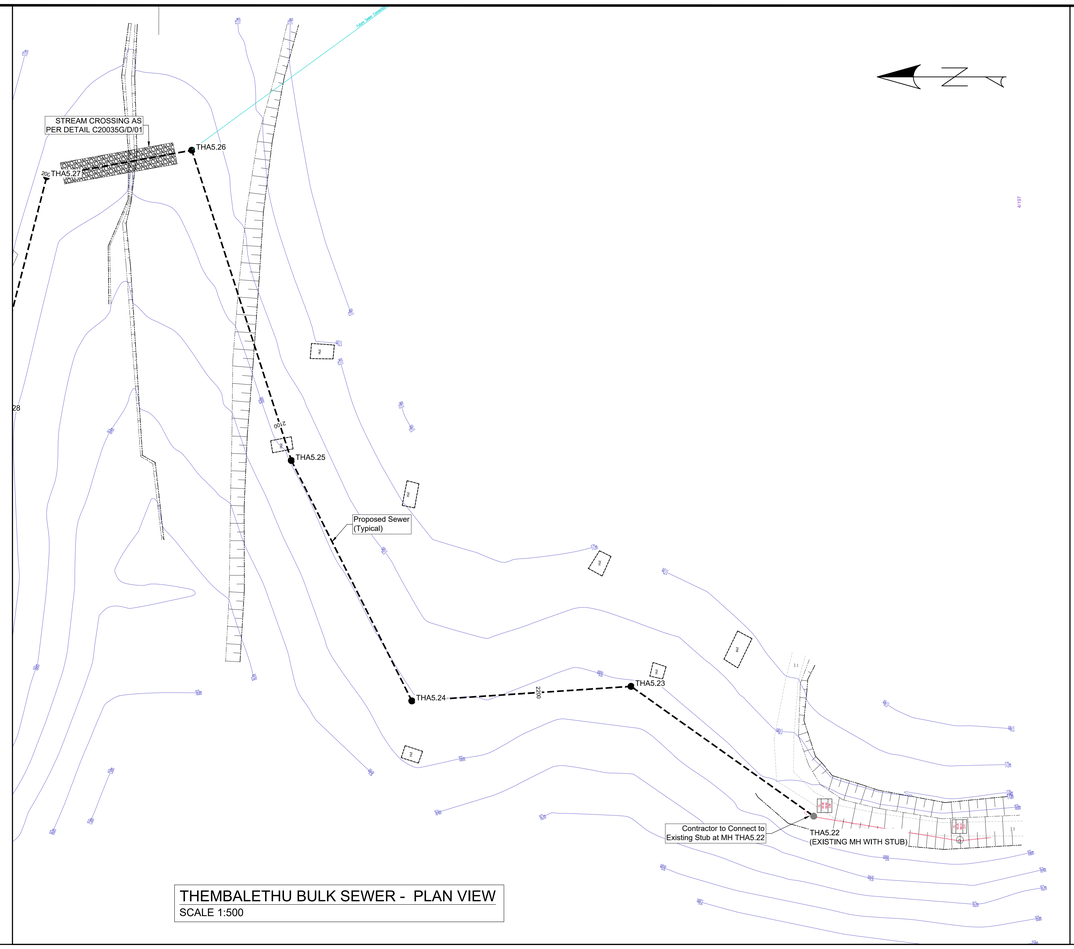
SCALE on A0: 1:500
SHEET: 4 OF 5
CONTRACT No.
PROJECT No. C20035G
DRAWING No. C20035G-L-02
REV A
COORDINATE SYSTEM: WGS84/23

iso full bleed a0 (841.00 x 1189.00 mm)

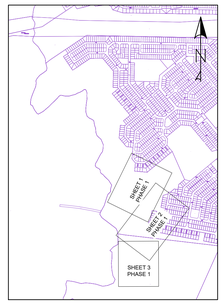
S:\PROJECTS\SIVIEL\GEORGE\20035CG - THEMBALETHU BULK SEWER MAINS\DRAWINGS\WORKING\PHASE 1\THEMBA_WORKING 33.DWG

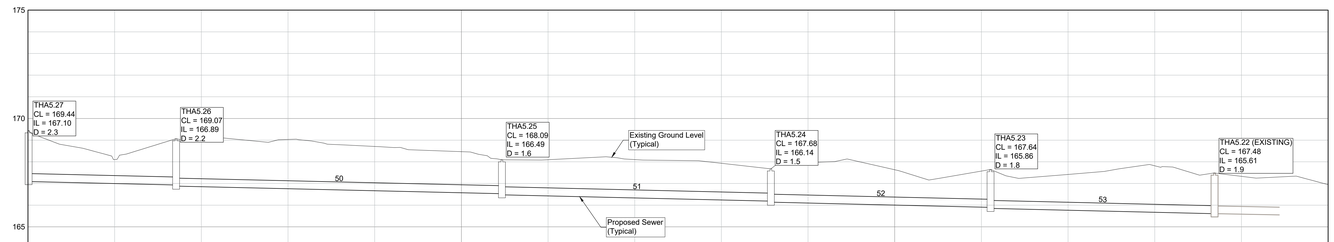
Auditing: Riaan Louwrens 2021-07-27 Checked: ____ Date: ____

SEE SHEET 2



THEMBALETHU BULK SEWER - PLAN VIEW
SCALE 1:500





SCALES:
Horizontal 1:250
Vertical 1:50

DATUM 160.000

DISTANCE (m) FREQUENTIAL	2000	2020	2040	2060	2080	2100	2120	2140	2160	2180	2200	2220	2240	2260	2280	2300	
GROUND LEVELS ON CL	169.44	168.10	169.07	169.03	168.71	168.47	168.10	168.10	167.93	167.67	167.63	167.57	167.42	167.42			
SLOPE / LENGTH	0.47% / 1:212.8 55.17m	0.47% / 1:212.8 34.03m	0.47% / 1:212.8 75.18m				0.47% / 1:212.8 62.07m			0.47% / 1:212.8 50.68m			0.47% / 1:212.8 51.71m				
PIPE	UPVC CL34 355mm dia	UPVC CL34 355mm dia	UPVC CL34 355mm dia				UPVC CL34 355mm dia			UPVC CL34 355mm dia			UPVC CL34 355mm dia				
STRUCTURES	X: 3754474.26 Y: -49054.84		X: 3754507.71 Y: -49035.62				X: 3754539.92 Y: -49107.13			X: 3754588.92 Y: -49168.82			X: 3754659.48 Y: -49158.99			X: 3754651.74 Y: -49198.79	
PIPE INVERT LEVEL IL (IN)	167.145	167.008	166.937	166.887			166.533	166.485		166.193	166.144		165.906	165.856		165.613	
IL (OUT)	167.008		166.887				166.485			166.144			165.856				

The reference made to Engineer will also refer to Employer's Agent for GCC 2015 Contracts

SCALEBAR
0 15 30 METER
SCALE 1:500

All dimensions must be verified on site before the works commence. Refer any discrepancies to the Engineer.

REV	DESCRIPTION	DATE	REV BY	CHKD
A	TENDER (DRAFT)			

REVISIONS

DESIGNED	RL	
DRAWN	RL	
CHECKED	MLR	

CONSULTING ENGINEERS
LYNERS
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email: george@lyners.co.za

APPROVED
ENGINEER: _____
DATE: _____

APPROVED
CLIENT: _____
DATE: _____

CLIENT
GEORGE MUNICIPALITY
PO Box 757
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Tel: 044 887 0223
Fax: 044 887 0741

PROJECT
UPGRADING OF THEMBALETHU BULK SEWER
GRAVITY MAIN - PHASE 1 (THA5.48 - THA5.22)

TITLE
LAYOUT AND PROFILE

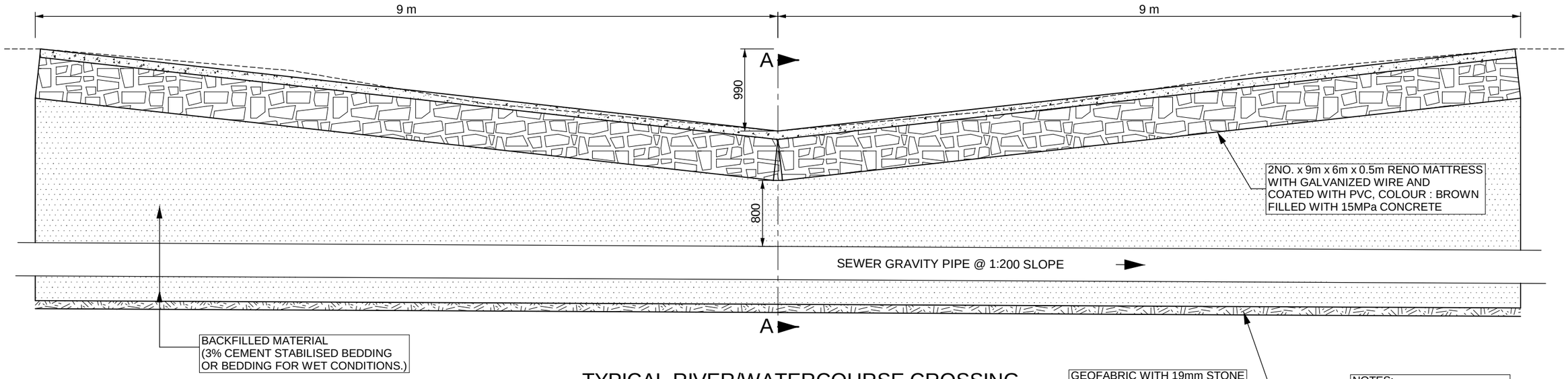
SCALE	on A0	SHEET
1:500		5 OF 5
CONTRACT No.		PROJECT No. C20035G

DRAWING No. C20035G-L-03 REV A
COORDINATE SYSTEM: WGS84/23

Date: 2021-07-27 Checked: Auditing: Riaan Louwrens

iso full bleed a0 (841.00 x 1189.00 mm)

S:\PROJECTS\SIVEL\GEORGE\20035CG - THEMBALETHU BULK SEWER MAINS\DRAWINGS\WORKING\PHASE 1\THEMBA_WORKING 33.DWG



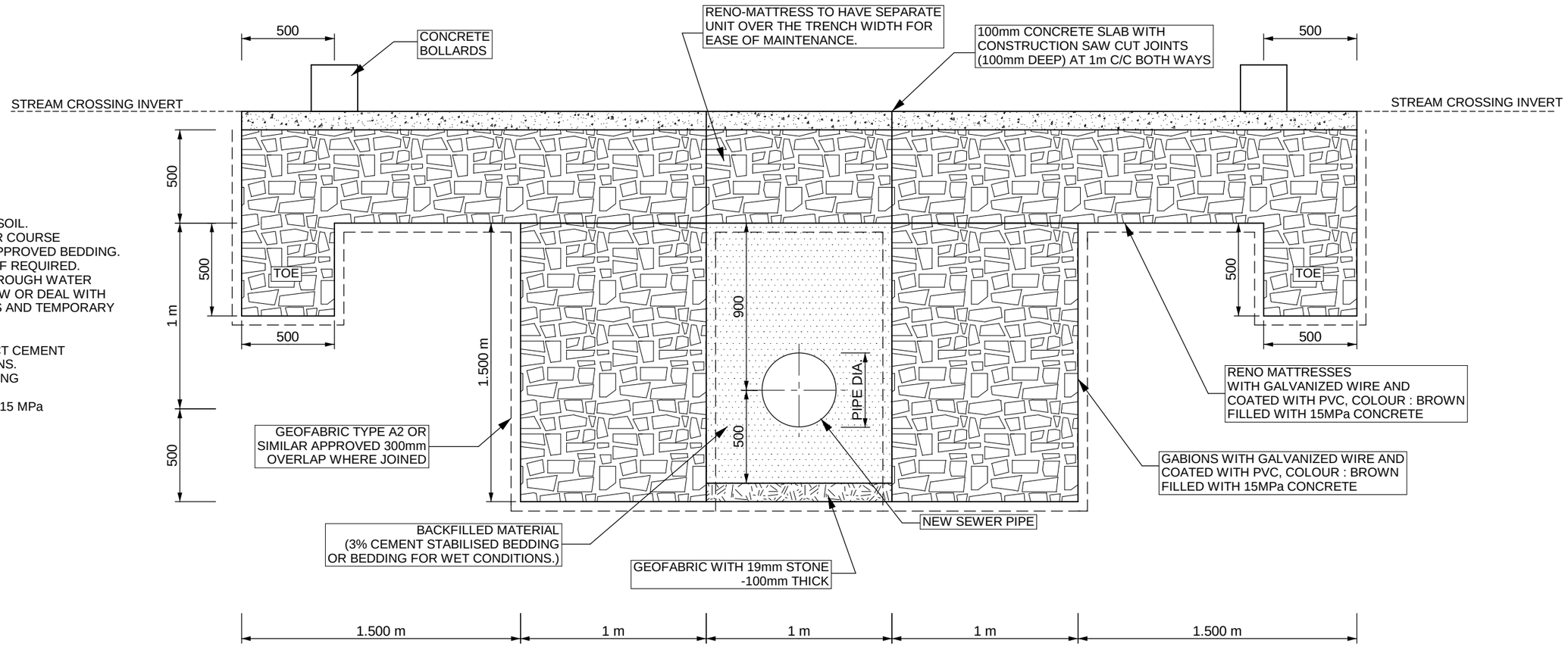
TYPICAL RIVER/WATERCOURSE CROSSING

SCALE 1:50

NOTES:
25mm deep Saw cut transverse joints spaced at 3m max.

NOTES:

1. CLEAR SITE AND STOCKPILE TOPSOIL.
2. EXCAVATE TRENCH UP TO WATER COURSE CROSSING. INSTALL PIPE WITH APPROVED BEDDING. BEDDING FOR WET CONDITIONS IF REQUIRED.
3. EXCAVATE TRENCH FURTHER THROUGH WATER COURSE WHEN THERE IS NO FLOW OR DEAL WITH WATER BY MEANS OF SAND BAGS AND TEMPORARY DRAINAGE PIPES.
4. EXCAVATE FOR GABIONS.
5. INSTALL GEOTEXTILE, CONSTRUCT CEMENT STABILIZED BEDDING AND GABIONS.
6. BACKFILL AND REINSTATE WORKING AREA AND PLACE TOPSOIL.
7. FILL IN RENO MATTRESSES WITH 15 MPa MASS CONCRETE.



SECTION A-A

SCALE 1:25

REV	DESCRIPTION	DATE	REV BY	CHKD
A	ISSUED FOR APPROVAL	01/09/2020	WO	MleR

REVISIONS

DESIGNED	MleR	2020
DRAWN	WO	2020
CHECKED	MleR	2020

CONSULTING ENGINEERS

LYNERS

PO Box 757
GEORGE 6530

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CLIENT

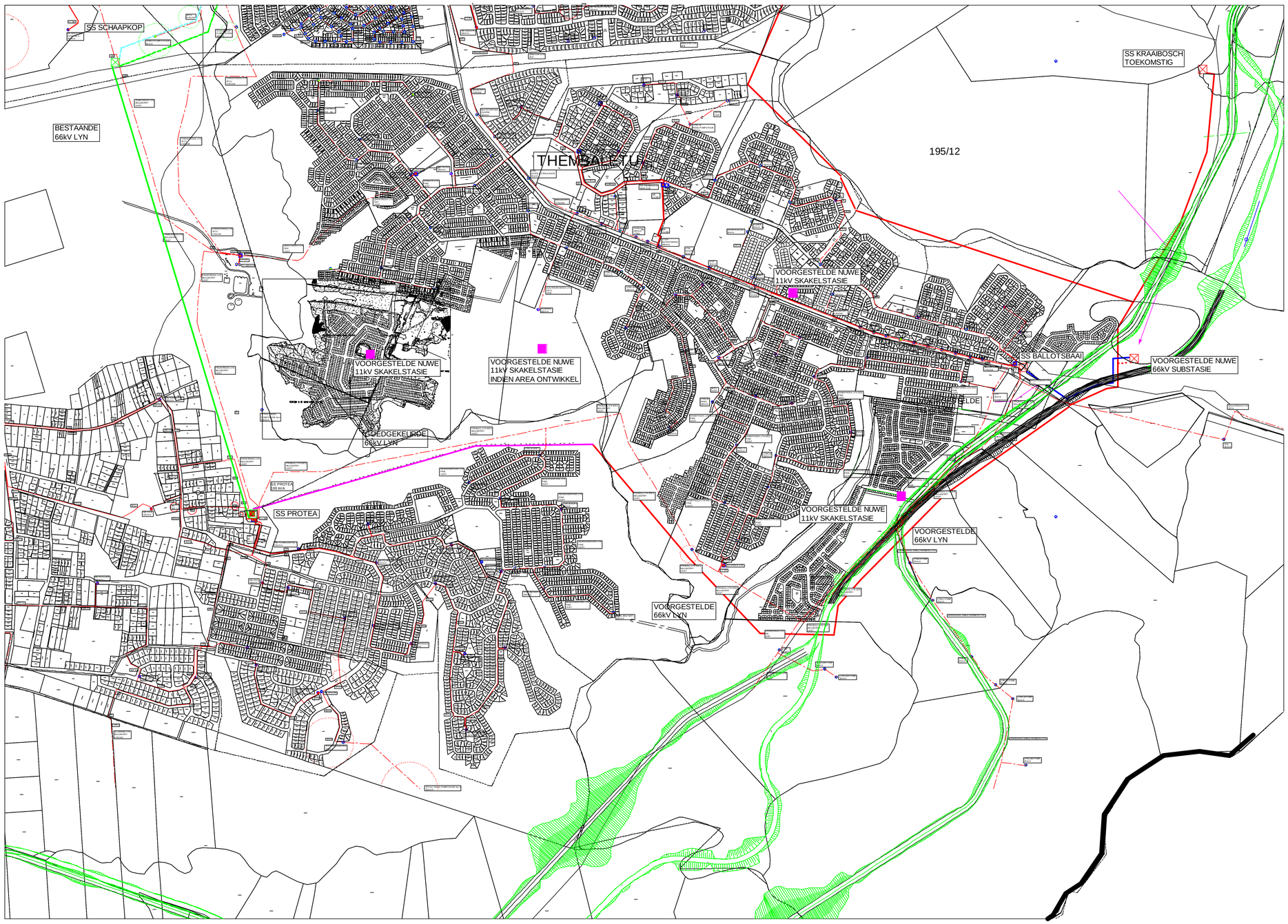
PROJECT: THEMBALETHU BULK SEWER MAINS

TITLE: DETAIL OF STREAM CROSSING

SCALE: AS SHOWN	SHEET: -
CONTRACT No.: C20035G	PROJECT No.: C20035G
DRAWING No.: C20035G/D/01	REV: A
DATE OF FIRST ISSUE:	

Z:\Projects\Sivell\George\20035CG - Thembalethu Bulk Sewer Mains*rawings\CAD C20035G-D-01 STREAM CROSSING DETAIL.DRG.pdf

APPENDIX J – ELECTRICAL DRAWING
2021 EMPr



DRAWING SCHEDULE

LEGEND

BESTAANDE SUBSTASIE	
TOEKOMSTIGE 66/11 KV SUBSTASIE	
TOEKOMSTIGE 11 KV SKAKELSTASIE	
BESTAANDE 66kV LYN	
TOEKOMSTIGE 66kV LYN	
GOEDGEKEURDE TOEKOMSTIGE 66kV LYN	
TOEKOMSTIGE 11kV LYN	

SCALE 1 : 7500

0 200 400m

NR. No.	DATUM DATE	WYSIGINGS AMENDMENTS

KLIENT / CLIENT

GEORGE MUNISIPALITEIT

BDE
RAADGEWENDE ELEKTRIESE INGENIEURS
CONSULTING ELECTRICAL ENGINEERS
KAAPSTAD P.O.BOX 53036 KENILWORTH 7745 TEL. (021) 696 4065
GEORGE P.O.BOX 1862 GEORGE 6530 TEL. (044) 801 9700
E-MAIL bde@bdeconsult.co.za

PROJEK / PROJECT

THEMBALETHU

TEKENING BESKRYWING / DRAWING DESCRIPTION

BEPLANNING : TOEKOMSTIGE 66kV LYN & SUBSTASIE

TEKENING Nr. / DRAWING No.	REV.
GRG 09 04 00005	

CAD NAAM / CAD NAME: GRG 09 04 00005, 20121113	GOEDGEKEUR / APPROVED
SKAAL / SCALE: 1 : 7500	NAGEGAAN / CHECKED
LêER No. / FILE No.: GRG 09 04 00005	CAD NAGEGAAN / CAD CHECKED
AANVANGSDATUM / COMMENCE DATE: 20121112	GETEKEN / DRAWN: REL

APPENDIX K – EAP CV 2021 EMPr

Siân Holder

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EDUCATION

Rhodes University
Masters: Environmental Education – with distinction ((Bursary awarded by National Ports Authority)
2009

Nelson Mandela University
BTech: Nature Conservation (Bursary awarded by Table Mountain Fund, WWF, South Africa)
2004

Pretoria Technikon
National Diploma: Nature Conservation (Bursary awarded by Foundation for Research Development)
1999

WORK EXPERIENCE

Environmental Consultant & Control Officer (ECO) | Cape EAPrac, George
2008 – Present

Environmental Consultant | Hilland Associates, George
Mar – Jun 2008

Acting Manager: Experiential Education & Wilderness Guide for Imbewu, Pride & Umzi Wethu Projects. | Wilderness Foundation, South Africa
Jan 2007 – Mar 2008

Student assistant & Editorial assistant for the South African Journal of Environmental Education (SAJEE) on behalf of the Environmental Education Association of Southern Africa (EEASA) | Rhodes University
Jan 2005 – Dec 2006

Wilderness Guide | Wilderness Foundation, South Africa
2005 – 2006

Co-ordinator of Garden Route Khula Nam Project | Wilderness Foundation & MTO Forestry
Aug 2002 – Dec 2004

Co-ordinator of Tsitsikamma Imbewu Project and Trail & Canoe Guide & Social Ecologist | South African National Parks: Tsitsikamma & Wilderness Sections of Garden Route National Park

2002 – 2004

CORE COMPETENCIES

Practicing as an Environmental Assessment Practitioner (EAP) since 2008, I have gained experience with a variety of projects working in the Eastern Cape, Western Cape and Northern Cape Provinces. My work requires of me to be acquainted with relevant local conservation / environmental management policies and legislation, including the National Environmental Management Act, the 2014 Environmental Regulations, National Environmental Management Waste Act, National Environmental Management Air Quality Act, National Environmental Management Biodiversity Act, Integrated Coastal Management Act, National Protected Areas Act, Outeniqua Sensitive Coastal Areas Regulations, National Forestry Act, National Water Act, National Heritage Resources Act and numerous conservation related regulations and guidelines that form the basis of environmental management.

PROFFESIONAL PORTFOLIO

ENVIRONMENTAL IMPACT ASSESSMENT, BASIC ASSESSMENT & EMP'S

- **Infrastructure:** Overhead transmission lines with associated substations (Municipal, Eskom or associated with renewable energy projects), construction and expansion of roads, flood damage road rehabilitation, stormwater reticulation, retention & dissipation facilities, sewage infrastructure, potable water supply networks etc.
- **Human Settlements:** Facilitate various scale residential developments with associated infrastructure, for Knysna Municipality, Oudtshoorn Municipality, George Municipality and Mossel Bay Municipality.
- **Renewable Energy:** Facilitating various applications for Wind Farms, Solar Farms, Biogas Waste-to-Energy applications.
- **Agricultural:** Applications for the construction and expansion of dams and water works (pipelines, canals, weirs etc.) associated with farming activities.
- **Integrated environmental management:** Environmental management and maintenance plans, environmental monitoring & control functions, environmental auditing.

ENVIRONMENTAL CONTROL AND MANAGEMENT (ECO)

- Management of construction activities for both civil and top-structures developments to ensure compliance with environmental approvals, environmental management plans and in terms of 'Principles of Duty of Care to the Environment'.
- Overseeing the implementation of Alien Invasive Control Plans and Rehabilitation Plans and providing advice on follow-up control and rehabilitation programmes.

ALIEN INVASIVE CONTROL PLANS (ACP)

- **Invasive Plants Control:** Compilation of Control Plans to advise and guide the initial and follow-up methodology for alien plant clearing and control, as well as rehabilitation of indigenous vegetation.

REHABILITATION PLANS & PROGRAMMES

- Compilation of Rehabilitation Plans for the restoration / rehabilitation disturbed environments to natural or near-natural conditions.

WASTE MANAGEMENT LICENCES

- Facilitating applications for general waste & recyclable waste handling/treatment and disposal.
- Applications for anaerobic biogas waste-to-energy projects with organic material at dairies, feedlots, abattoirs and fruit juice factories.

SECTION 24G RECTIFICATION APPLICATIONS

- Facilitating rectification assessment processes for listed activities that commenced unlawfully ito NEMA, NEMWA and NEMAQA (ranging from roads, storm water infrastructure, vegetation clearing, construction activities, air emission generation activities, waste management activities, wetland/riparian disturbances, dams).

ENVIRONMENTAL AWARNESS & TRAINING

- Induction of contractor teams and labourers associated with alien clearing projects, rehabilitation projects, construction projects, as well as school groups for site inspection and environmental awareness outings.