



**PRELIMINARY DESIGN REPORT FOR  
CIVIL ENGINEERING INFRASTRUCTURE  
FOR DELMORE PARK EXTENSION 7**

**REPORT NO** : 1897/01  
**DATE** : JULY 2008  
**CLIENT** : RP DEVCO (PTY) LTD  
(trading as Reiger Park Developments)  
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## TABLE OF CONTENTS

|   | <b>PAGE</b> |
|---|-------------|
| <b>1. INTRODUCTION</b>                              | <b>1</b>    |
| 1.1 TERMS OF REFERENCE                              | 1           |
| 1.2 LOCALITY AND EXTENT                             | 1           |
| 1.3 LOCAL AUTHORITY                                 | 3           |
| 1.4 DEVELOPER                                       | 3           |
| 1.5 CONSULTING ENGINEER                             | 3           |
| 1.6 OTHER RELEVANT STUDIES                          | 4           |
| 1.6.1 Stormwater management plan                    | 4           |
| 1.6.2 Geotechnical investigation                    | 4           |
| <b>2. PHYSICAL CHARACTERISTICS</b>                  | <b>4</b>    |
| 2.1 TOPOGRAPHY                                      | 4           |
| 2.2 FLOOD LINES                                     | 4           |
| 2.3 SITE GEOLOGY                                    | 4           |
| 2.4 OTHER PHYSICAL DEVELOPMENT CONSTRAINTS          | 5           |
| 2.4.1 PWV Routes                                    | 5           |
| 2.4.2 Escom Power Line Servitude                    | 5           |
| <b>3. LAND USE</b>                                  | <b>5</b>    |
| <b>4. DESIGN STANDARDS AND SPECIFICATIONS</b>       | <b>5</b>    |
| 4.1 DESIGN STANDARDS                                | 5           |
| 4.2 SPECIFICATIONS                                  | 6           |
| <b>5. BULK INFRASTRUCTURE</b>                       | <b>6</b>    |
| 5.1 EMM REQUIREMENTS FOR BULK SERVICES CERTIFICATES | 6           |
| 5.2 WATER SUPPLY                                    | 6           |
| 5.2.1 Demand  | 6           |
| 5.2.2 Bulk Services Certificate for water supply    | 6           |
| 5.2.3 Bulk water connection                         | 7           |

|       |  |    |
|-------|--|----|
| 5.3   | SANITATION                               | 8  |
| 5.3.1 | Sewage effluent                          | 8  |
| 5.3.2 | Bulk Services Certificate for sanitation | 8  |
| 5.3.3 | Sewer connection                         | 8  |
| 5.3.4 | Sewage treatment works                   | 8  |
| 5.4   | ACCESS ROADS                             | 8  |
| 5.5   | STORMWATER DRAINAGE                      | 9  |
| 5.6   | WASTE MANAGEMENT                         | 9  |
| 6.    | <b>INTERNAL SERVICES</b>                 | 9  |
| 6.1   | WATER RETICULATION                       | 9  |
| 6.1.1 | Layout                                   | 9  |
| 6.1.2 | Design standards and design parameters   | 10 |
| 6.1.3 | General details                          | 10 |
| 6.2   | SANITATION                               | 10 |
| 6.2.1 | Layout                                   | 10 |
| 6.2.2 | Design parameters and design standards   | 11 |
| 6.2.3 | General Details                          | 11 |
| 6.3   | STREETS                                  | 11 |
| 6.3.1 | Layout                                   | 11 |
| 6.3.2 | Road Classification                      | 12 |
| 6.3.3 | Pavement Design                          | 12 |
| 6.3.4 | General Details                          | 13 |
| 6.4   | STORMWATER DRAINAGE                      | 13 |
| 6.4.1 | Layout                                   | 13 |
| 6.4.2 | Design criteria and design parameters    | 13 |
| 6.4.3 | General details                          | 14 |
| 7.    | <b>IMPLEMENTATION</b>                    | 14 |

## FIGURES

|                 |   |                        |    |
|-----------------|---|------------------------|----|
| <b>Figure 1</b> | : | Locality plan          | 2  |
| <b>Figure 2</b> | : | Implementation program | 15 |

## TABLES

|                  |   |   |    |
|------------------|---|---|----|
| <b>Table 3.1</b> | : | Land use  | 5  |
| <b>Table 5.1</b> | : | Water demand  | 6  |
| <b>Table 5.2</b> | : | Sewage effluent   | 8  |
| <b>Table 6.1</b> | : | Design parameters and design standards for water supply         | 10 |
| <b>Table 6.2</b> | : | Design parameters and design standards for sewer network system | 11 |
| <b>Table 6.3</b> | : | Geometrical and structural design classification                | 12 |
| <b>Table 6.4</b> | : | Pavement design   | 12 |
| <b>Table 8.1</b> | : | Cost estimate for civil engineering infrastructure              | 16 |

## DRAWINGS

| <b>Drawing No</b> | <b>Description</b>                             |
|-------------------|--|
| 1897-A01          | : Layout plan and list of drawings             |
| 1897-B01          | : Water network : Layout plan                  |
| 1897-B02          | : Water network : General details              |
| 1897-C01          | : Sewer network : Layout plan                  |
| 1897-C02          | : Sewer network : General details              |
| 1897-D01          | : Streets and stormwater : Layout plan         |
| 1897-D02          | : Streets and stormwater : Spruit crossing     |
| 1897-D03          | : Streets and stormwater : General details     |
| 1897-E01          | : Stormwater retention ponds : General details |

## ANNEXURE A : SERVICES CERTIFICATE FOR WATER SUPPLY

## ANNEXURE B : SERVICES CERTIFICATE FOR SANITATION

## ANNEXURE C : DRAWINGS

## 1. INTRODUCTION

### 1.1 TERMS OF REFERENCE

VIP Consulting Engineers has been appointed by *RP Devco (Pty) Ltd* as consulting civil engineers for the proposed township of Delmore Park Extension 7.

This appointment *inter alia* includes the preparation of a Preliminary Design Report for civil engineering infrastructure.

The following issues are dealt with during the preliminary design phase of the project and are addressed in the Preliminary Design Report:

- i) The availability of bulk civil engineering infrastructure for the proposed township.
- ii) Design standards for internal civil engineering infrastructure.
- iii) Preliminary designs and layout plans for the internal civil engineering infrastructure.
- iv) Provisional implementation program for the design and construction of the civil engineering infrastructure.
- v) Cost estimates for the construction of civil engineering infrastructure.

The Preliminary Design Report will also serve as a reference for the Services Agreement between the Developer and the Local Authority.

The *proposed township* of Delmore Park Extension 7 is located in Boksburg in Ekurhuleni. The township will be established in terms of the Boksburg Town Planning Scheme.

### 1.2 LOCALITY AND EXTENT

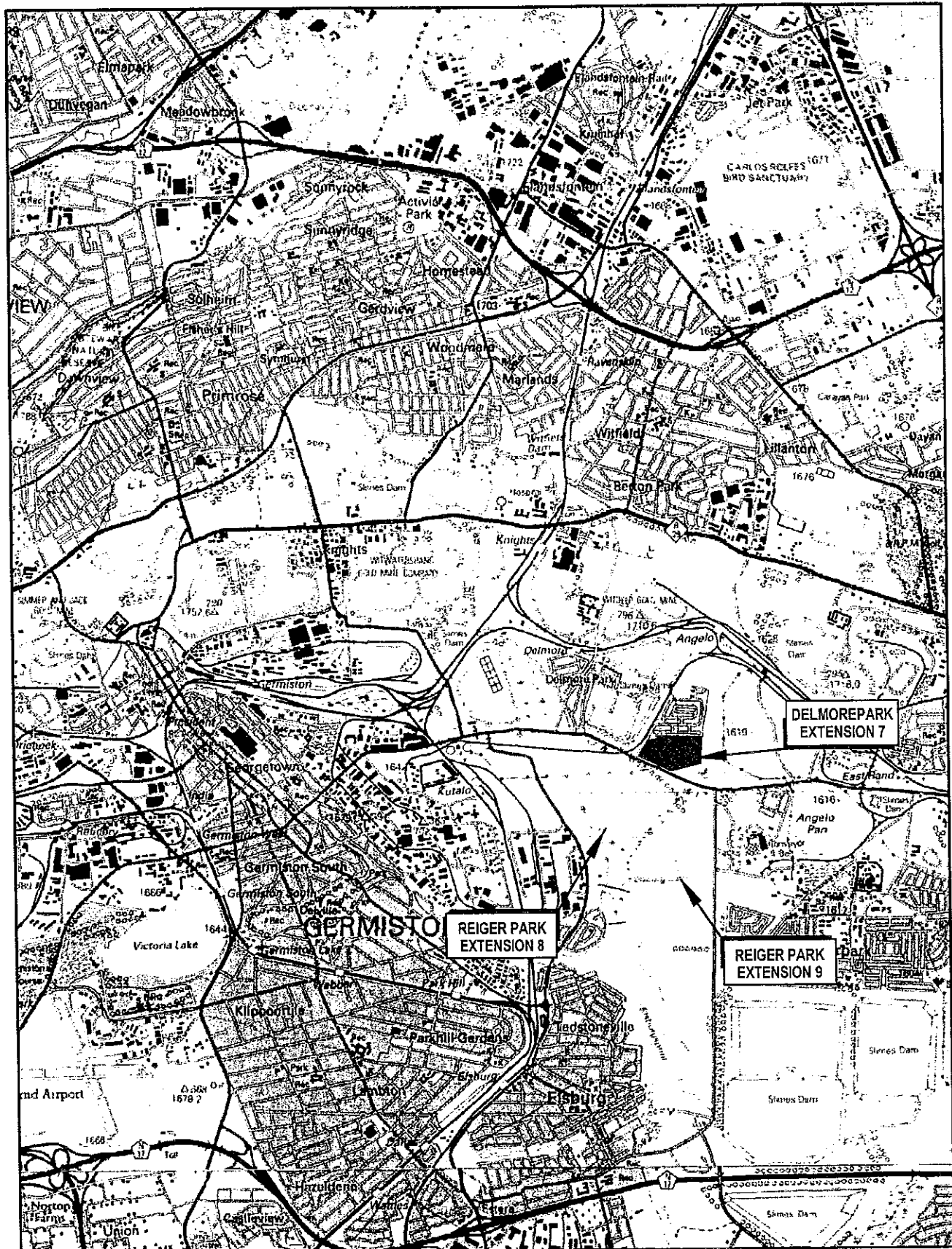
The *proposed township* is situated on a part of Portion 396 of the farm Driefontein 85 IR.

The locality of the *proposed township* is shown in **Figure 1**.

The site for the *proposed township* is bordered by du Preez Street along its western boundary, by Commissioner Street along its southern boundary, by Delmore Park Extension 2 along its northern boundary and by the proposed PWV13 along its eastern boundary.

The *proposed township* will cover an area of approximately 14.4 ha. The layout plan for the proposed township is shown on **Drawing No 1897-A01**.

The *proposed township* will comprise 252 residential stands, three community facility stands and four public open space stands.



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PROJECT : DELMOREPARK EXTENSION 7  
 BOKSBURG

SCALE:  
 1 : 50 000

SERVICE DETAIL : LOCALITY PLAN

DRAWING No. :  
 FIGURE 1

### 1.3 LOCAL AUTHORITY

The *proposed township* of Delmore Park Extension 7 falls within the Boksburg Service Delivery Unit of the Ekurhuleni Metropolitan Municipality.

The civil engineering infrastructure for the *proposed township* will be installed to the required standards of the Ekurhuleni Metropolitan Municipality. The maintenance of the infrastructure will be taken over by the Ekurhuleni Metropolitan Municipality on completion thereof.

### 1.4 DEVELOPER

The developer of the *proposed township* is **RP Devco (Pty) Ltd** (trading as Reiger Park Developments).

Contract particulars for the developer are as follows :

Physical address : 27<sup>th</sup> Floor UCS Building  
209 Smith Street  
Braamfontein

Postal address : PO Box 2232,  
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2060

Telephone number : (011) 339 3618

Fax number : 086 611 3734

E-mail address : wvos@sabrehomes.co.za

The contact person for the Developer is Mr W Vos.

### 1.5 CONSULTING ENGINEER

The consulting engineer for the civil engineering infrastructure is **VIP Consulting Engineers (Pty) Ltd**.

Contact particulars for the consulting engineer are as follows :

Physical address : VIP Consulting Engineers (Pty) Ltd  
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The contact person for the consulting engineer is Mr I W Henning.

## 1.6 OTHER RELEVANT STUDIES

### 1.6.1 Stormwater management plan

The Ekurhuleni Metropolitan Municipality, in terms of their "*General Stormwater Management Requirements*" (Version 1, January 2007), requires a detailed stormwater management plan for all developments. The detailed stormwater management plan for the *proposed township* has been developed by VIP Consulting Engineers and is dealt with in their *Report No 1845/01 : Stormwater Management Plan for the proposed Reiger Park Developments on various portions of the farms Driefontein 85 IR and Driefontein 87 IR in the Ekurhuleni Mining Belt*.

The cost for the implementation of the stormwater management infrastructure for the *proposed township* is included in the cost estimates contained in this report.

### 1.6.2 Geotechnical investigation

A geotechnical investigation of the site has been conducted by Infraconsult and is reported in their report of January 2008.

## 2. PHYSICAL CHARACTERISTICS

### 2.1 TOPOGRAPHY

The site for the *proposed township* is bordered by a tributary of the Elsburg Spruit (a tributary of the Klip River) along its eastern boundary.

The site slopes gradually towards the Elsburg Spruit. Slopes vary between 3.5% and 5.0%.

The elevation of the site varies between 1610m and 1620m above mean sea level.

### 2.2 FLOOD LINES

The site is not affected by any flood lines

### 2.3 SITE GEOLOGY

The site is underlain by rocks of the Turffontein Subgroup of the Central Rand Group belonging to the Witwatersrand Supergroup. These consist in the main of sandstone, siltstone, shale and conglomerate. Recent deposits in the form of sand, silt and gravel overly the residual soils.

The conglomerate is gold bearing and has been extensively mined in this area.

The weathering profile of the Halfway House granites is typical of granites in many parts of southern Africa. Jointing or minor compositional difference gives rise to troughs of decomposition adjacent to large whalebacks and tors of unweathered rock. The soil cover is thin on the whalebacks and absent on the tors. There is an abrupt change from highly weathered to unweathered rock.

The residual soil consists generally of angular grains of quartz and feldspar with a small percentage of kaolinitic clay.



## 2.4 OTHER PHYSICAL DEVELOPMENT CONSTRAINTS

### 2.4.1 PWV Routes

The proposed PWV13 forms the eastern boundary for the *proposed township*. The proposed PWV13 has been accommodated in the layout plans for the *proposed township*.

### 2.4.2 Escom Power Line Servitude

The site for the *proposed township* is affected by an Escom power line servitude along its southern boundary.

The servitude has been accommodated in the proposed layout.

## 3. LAND USE

The land use table for the proposed township is shown in **Table 3.1**.

**TABLE 3.1 : LAND USE**

| LAND USE           | Number of stands | Area (ha)    | %           |
|--------------------|------------------|--------------|-------------|
| Residential 1      | 252              | 9.03         | 62.52%      |
| Community facility | 3                | 0.43         | 3.01%       |
| Public open space  | 4                | 1.82         | 12.57%      |
| Streets            | -                | 3.16         | 21.90%      |
| <b>TOTAL</b>       | <b>259</b>       | <b>14.44</b> | <b>100%</b> |

## 4. DESIGN STANDARDS AND SPECIFICATIONS

### 4.1 DESIGN STANDARDS

The following design standards for civil engineering infrastructure will apply :

- i) *Guidelines for the provision of engineering services and amenities in residential township development* issued by the National Housing Board (Red book).
- ii) *Guidelines for human settlement planning and design (2000)* compiled under the patronage of the Department of Housing and published by the CSIR Building and Construction Technology (New Red book).
- iii) Material Standards of the Water Division of the Municipal Infrastructure Department of the Ekurhuleni Metropolitan Municipality.
- iv) Guidelines for the Geometric Design of Urban Arterial Roads (UTG 1) issued by the Committee of State Road Authorities (CSRA) and published by the Department of Transport.
- v) Structural Design of Interurban and Rural Road Pavements (TRH 4) issued by the CSRA.
- vi) Guidelines for Road Construction Materials TRH 14) issued by the CSRA.

## 4.2 SPECIFICATIONS

The SABS 1200 (SANS 0120) series of standardizes specifications for civil engineering construction will apply.

## 5. BULK INFRASTRUCTURE

### 5.1 EMM REQUIREMENTS FOR BULK SERVICES CERTIFICATES

The Ekurhuleni Metropolitan Municipality (EMM) has appointed Community Engineering Services (CES) to do master planning for water and sanitation bulk infrastructure in Ekurhuleni. EMM requires, as interim arrangement until the bulk services master plan is implemented, that developers obtain bulk services certificates for water and sanitation from CES for all proposed developments.

The purpose of the bulk services certificate is to ;

- i) confirm that the bulk infrastructure has adequate capacity to accommodate the proposed development, and
- ii) indicate the preferred location for connection of internal infrastructure into the bulk infrastructure system.

RP Devco has accordingly appointed CES for the bulk services certificates for the *proposed township*.

## 5.2 WATER SUPPLY

### 5.2.1 Demand

The water demand expressed as annual average daily demand (AADD) for the *proposed township* is estimated at 154.6kl/day. The instantaneous peak demand (excluding fire flow requirements) is 7.2l/s. Fire flow requirements for the proposed township are 15l/s (Moderate Risk 2).

The determination of the annual average daily demand is shown in **Table 5.1**.

**TABLE 5.1 : WATER DEMAND**

| LAND USE                        | NUMBER OF UNITS / STANDS | TOTAL LAND AREA (ha) | FLOOR AREA RATIO | DEVELOPED FLOOR AREA (m <sup>2</sup> ) | DESIGN PARAMETER      |       | AADD (kl/day) |
|---------------------------------|--------------------------|----------------------|------------------|--|-----------------------|-------|---------------|
|                                 |                          |                      |                  |  | Unit                  | Rate  |               |
| Residential – 250m <sup>2</sup> | 252                      | 9.03                 |                  |  | l/stand/day           | 600.0 | 151.2         |
| Community facility              | 3                        | 0.43                 | 20%              | 860                                    | l/m <sup>2</sup> /day | 4.0   | 3.4           |
| Park                            | 4                        | 1.82                 |                  |  |                       | -     | -             |
| <b>TOTAL</b>                    |                          |                      |                  |  |                       |       | <b>154.6</b>  |

### 5.2.2 Bulk Services Certificate for water supply

The bulk services certificate for water supply to the *proposed township* issued by CES on 18 March 2008 is attached as **Annexure A**.

### 5.2.3 Bulk water connection

The *proposed township* falls within the southern portion of the Madeley Water District. This area is supplied directly from Rand Water Connection 2153 located along Main Reef Road. The residual pressure in the distribution mains is regulated by means of a 150mm dia pressure reducing valve (PRV) located directly downstream of the Rand Water Connection.

The distribution mains consists of a 250mm dia pipe that runs from the connection in Main Reef Road in a southerly direction along Ayelo Station Road and Du Preez Street up to Commissioner Street. This 250mm dia pipe terminates in Du Preez Street directly apposite the entrance to the proposed township of Reiger Park Extension 8.

CES has indicated in the Services Certificate for Water supply that the existing 250mm distribution mains does not have sufficient capacity to supply all anticipated future developments in this area. CES has subsequently recommended that the supply capacity of the distribution mains be augmented by the construction of a 400mm dia pipe in parallel to the existing 250mm dia pipe over a distance of 2000m.

The existing 150mm dia PRV will also have to be replaced by a 300mm dia PRV.

The Ekurhuleni Metropolitan Municipality (EMM) will in the normal course of events, implement the proposed augmentation measure and will recover a pro rata shares of the cost from developer of all proposed developments that will be served by it. The EMM has however not made provision for this project in its medium term budget. The EMM will subsequently allow the Developer to construct the augmentation measures at its own cost and will then refund a portion of the cost (the balances after accounting for the Developer's pro rata shares) at some future date. To qualify for the refund the Developer has to comply strictly with the EMM's procurement policy when appointing a contractor for the construction of the augmentation measures.

The cost of the augmentation measures is provisionally estimated at R2 000 000.00. This cost has not been included in the cost estimate for civil engineering infrastructure because the proportioning of the cost between different developments is not yet available.

The responsibilities of the Developer in respect of the augmentation measures will be addressed in detail in the Services Agreement between the EMM and the Developer.

CES has indicated in the Services Certificate that the Madelay Reservoir has sufficient surplus capacity.

The location for the bulk water connection is shown on **Drawing No 1897-B01**.

### 5.3 SANITATION

#### 5.3.1 Sewage effluent

The effluent flow rate from the *proposed township* expressed as annual average daily dry weather flow (AADDWF) is estimated at 124.1kl/day. The instantaneous peak flow rate is estimated at 4.3l/s.

The determination of the annual average daily dry weather flow is shown in **Table 5.2**.

**TABLE 5.2 : SEWAGE EFFLUENT**

| LAND USE                           | NUMBER OF UNITS / STANDS | TOTAL LAND AREA (ha) | FLOOR AREA RATIO | DEVELOPED FLOOR AREA (m <sup>2</sup> ) | DESIGN PARAMETER      |       | AADDWF (kl/day) |
|------------------------------------|--------------------------|----------------------|------------------|--|-----------------------|-------|-----------------|
|                                    |                          |                      |                  |  | Unit                  | Rate  |                 |
| Residential 1 (250m <sup>2</sup> ) | 252                      | 9.03                 |                  |  | l/stand/day           | 480.0 | 121.0           |
| Community facility                 | 3                        | 0.43                 | 20%              | 860                                    | l/m <sup>2</sup> /day | 3.6   | 3.1             |
| <b>TOTAL</b>                       |                          |                      |                  |  |                       |       | <b>124.1</b>    |

#### 5.3.2 Bulk Services Certificate for sanitation

The bulk services certificate for sanitation for the *proposed township* issued by CES on 17 March 2008 as well as a supplementary certificate issued by CES on 2 April 2008 is attached as **Annexure B**.

#### 5.3.3 Sewer connection

The *proposed township* falls within the sub-drainage area of the Boksburg-Rondebult outfall sewer.

The Boksburg-Rondebult outfall sewer has sufficient capacity to accommodate the proposed development (subject to qualifications as set out in Clause 2.2 of the services certificate).

The location for the bulk sewer connection is shown on **Drawing No 1897-C01**.

A new parallel sewer is currently being planned to replace the existing Boksburg-Rondebult outfall sewer. This sewer will be known as the Lillianton outfall sewer and construction is expected to commence during 2008. CES has indicated in the supplementary certificate that the Lillianton outfall sewer will have sufficient capacity to accommodate the *proposed township*.

#### 5.3.4 Sewage treatment works

Effluent from the *proposed township* will be treated at the Rondebult Sewage Treatment Works that is managed by ERWAT.

### 5.4 ACCESS ROADS

Access to and egress from the proposed township will be obtained from Du Preez Street along the western boundary of the *proposed township*.

## 5.5 STORMWATER DRAINAGE

The Elsburg Spruit function as regional drainage system for the area. Stormwater from the *proposed township* will be discharged into the Elsburg Spruit.

## 5.6 WASTE MANAGEMENT

The Ekurhuleni Metropolitan Municipality will provide a waste removal service for the *proposed township*.

## 6. INTERNAL SERVICES

### 6.1 WATER RETICULATION

#### 6.1.1 Layout

The *proposed township* will be provided with a comprehensive water supply network with a water connection to each stand.

The layout of the water supply network is shown on **Drawing No 1897-B01**.

### 6.1.2 Design standards and design parameters

The design parameters and design standards for the water reticulation system are shown in Table 6.1

**TABLE 6.1 : DESIGN PARAMETERS AND DESIGN STANDARDS FOR WATER SUPPLY**

| DESCRIPTION OF DESIGN PARAMETERS     | CATEGORY/APPLICATION  | PROPOSED DESIGN STANDARD   |
|--------------------------------------|---|--|
| Water demand                         | Residential 1 : 250m <sup>2</sup>                           | 600l / stand / day   |
|                                      | Residential 1 : 180m <sup>2</sup>                           | 500l / stand / day   |
|                                      | Residential 3 : 120 units/ha                                | 400l / unit / day  |
|                                      | Other   | 400l /100m <sup>2</sup> /day, 40% FOR                                    |
| Peak factors<br>(instantaneous peak) | 0- 500 stands   | 6  |
|                                      | + 500 stands  | 4  |
| Hydraulic design                     | Friction coefficient C (Hazen Williams)                     | 140  |
| Residual pressures                   | Minimum head under instantaneous peak demand                | 24 m   |
|                                      | Maximum head under zero flow conditions                     | 90 m   |
|                                      | Minimum head under instantaneous peak demand and fire flow. | 3 m  |
| Material                             | Water network   | Class 9 Upvc   |
|                                      | House Connections   | Class 12,5 HDPE (Type IV)  |
|                                      | Fire Hydrants   | Pilar-Woodlands, tamper proof  |
| Minimum pipe diameters               | General   | 90 mm diameter   |
|                                      | Residential with Fire Hydrant                               | 110 mm dia min.  |
|                                      | Single House Connection                                     | 20 mm dia  |
|                                      | Double House Connection                                     | 25 mm dia, branching to 2x20   |
| Spacing of gate valves               | All areas   | Any 600 m length of network need to be isolated by closing max. 4 valves |
| Fire-risk categories                 | All areas   | Low risk – Group 1   |
| Design fire flow                     | All areas   | 1 Fire hydrant – 15 l/s  |
| Spacing of fire hydrants             | All areas   | 240 m Maximum  |
| Watermeters                          | 500mm outside boundary stand                                | Supplied and installed on request by the Council                         |

### 6.1.3 General details

General details for the water reticulation network are shown on **Drawing No 1897-B02**.

## 6.2 SANITATION

### 6.2.1 Layout

The proposed township will be provided with a comprehensive water bourne sewage network system with individual stand connections to every stand.

The layout of the sewer network system is shown on **Drawing No 1897-C01**.

### 6.2.2 Design parameters and design standards

The design parameter and design standards for the sewer network system are shown in **Table 6.2**.

**TABLE 6.2 : DESIGN PARAMETERS AND DESIGN STANDARD FOR SEWER NETWORK SYSTEM**

| DESCRIPTION OF DESIGN PARAMETER   | CATEGORY/APPLICATION              | PROPOSED DESIGN STANDARD   |
|-----------------------------------|-----------------------------------|--|
| Design flows                      | Residential 1 : 250m <sup>2</sup> | 480l / stand / day   |
|                                   | Residential 1 : 180m <sup>2</sup> | 400l / stand / day   |
|                                   | Residential 3 : 120 units/ha      | 360l / unit / day  |
|                                   | Stormwater infiltration           | 15 %   |
| Peak factors (instantaneous peak) | 0 – 500 stands                    | 3.5  |
|                                   | + 500 stands                      | 2,0  |
|                                   | Friction Coefficient              | 140 (Hazen Williams c)   |
| Sewer pipes                       | Flow depth                        | 80% full flow  |
|                                   | Erf connections                   | 110 mm dia   |
|                                   | Main sewers                       | 160 mm dia (mm) class 34 solid, mainlite or similar approved                   |
| Minimum cover                     | Material                          | Class 400 uPVC   |
|                                   | In servitudes / midblock          | 800 mm   |
| Manholes                          | In street reserves                | 1600 mm  |
|                                   | Maximum spacing                   | 80 m   |
|                                   | Manhole diameter                  | 1 000 mm < 3m deep; 1 250mm > 3m deep  |
|                                   | Shaft diameter                    | 700 mm, deeper than 3.0 m  |
| Sewer position                    | Material                          | Precast concrete manhole with concrete adaptor slab and concrete manhole cover |
|                                   | Mid block                         | Drains 80 % of stand under gravity   |
| Minimum Slopes                    | 110mm dia house connections       | 1:60   |
|                                   | 160mm dia : 0-24 erven            | 1:80 flow = 1/5D, > 0,6m/s   |
|                                   | 0-24 erven<br>+ 24 erven          | 1:100 flow = 1/2D, > 0,82m/s<br>1:150  |
|                                   | 200mm dia                         | 1:300  |

### 6.2.3 General details

The general details for the sewer network system are shown on **Drawing No 1897-C02**.

## 6.3 STREETS

### 6.3.1 Layout

The layout plan for the streets for the *proposed township* is shown on **Drawing No 1897-D01**.

The proposed crossing of the Elsburg Spruit is shown on **Drawing No 1897-D02**.

### 6.3.2 Road Classification

The roads for the proposed township will be classified according to the following functional classes :

- i) Local distributor (Class 4)
- ii) Residential access collector (Class 5b)
- iii) Residential access loop (Class 5a)

The geometrical and structural design classification for each of the functional classes are shown in **Table 6.3**.

**TABLE 6.3 : GEOMETRICAL AND STRUCTURAL DESIGN CLASSIFICATION**

| FUNCTIONAL CLASS             | ROAD CLASS | ROAD CATEGORY | TRAFFIC CLASS | WIDTH OF ROADWAY BETWEEN KERB FACES | CUMULATIVE EQUIVALENT TRAFFIC |
|------------------------------|------------|---------------|---------------|-------------------------------------|-------------------------------|
| Local Distributor            | 4          | UB            | E2            | 6,0 – 7,0m                          | 1,5 x 10 <sup>6</sup>         |
| Residential access collector | 5a         | UC            | E1            | 5,5m                                | 0,2 x 10 <sup>6</sup>         |
| Residential access loop      | 5b         | UD            | ER            | 5,0m                                | 0,05 x 10 <sup>6</sup>        |

The road classification will be implemented in accordance with the recommendations of the traffic impact study.

### 6.3.3 Pavement Design

The proposed pavement design for the various road classes are shown in **Table 6.4**.

**TABLE 6.4 : PAVEMENT DESIGN**

| DESCRIPTION    | ROAD CLASS   |  |   |
|----------------|--|--|---|
|                | Class 4 (6,0 – 7,0m wide)                                  | Class 5a (5,5m wide)                                       | Class 5b (5,0m wide)                                    |
| Wearing course | 25mm continuously graded medium asphalt                    | 20mm continuously graded medium asphalt                    | 20mm continuously graded medium asphalt                 |
| Base course    | 150mm G2 crushed stone base at 95% Mod AASHTO density      | 125mm G4 natural gravel base at 95% Mod. AASHTO density    | 125mm G4 natural gravel base at 95% Mod. AASHTO density |
| Subbase        | 150mm G4 semented gravel subbase at 95% Mod AASHTO density | 125mm G5 natural gravel subbase at 93% Mod. AASHTO density | -   |
| Subgrade       | 150mm Insitu subgrade at 93% Mod. AASHTO density           | 150mm Insitu subgrade at 93% Mod. AASHTO density           | 150mm Insitu subgrade at 93% Mod. AASHTO density        |
| Roadbed        | 150mm Insitu roadbed at 90% Mod. AASHTO density            | 150mm Insitu roadbed at 90% Mod. AASHTO density            | 150mm Insitu roadbed 90% Mod. AASHTO density            |



Semi-mountable or mountable kerbs will be provided on both sides of the roadway throughout the township.

All traffic signs and markings will be in accordance with the most recent specifications for traffic signs as prescribed by the Department of Transport.

#### 6.3.4 General details

General details and typical cross sections of the street are shown on **Drawing No 1897-D03**.

### 6.4 STORMWATER DRAINAGE

#### 6.4.1 Layout

The stormwater drainage facilities will comprise of the following three components :

- i) the internal stormwater network system
- ii) the stormwater retention system
- iii) the regional stormwater system

The internal stormwater network system will consist of road channels linked to an underground (piped) stormwater network.

The stormwater retention system will consist of one retention pond. The pond is located at the discharge point of the internal stormwater network system directly upstream of the discharge point into the Elsburg Spruit.

The purpose of the stormwater retention pond is to remove silt and debris from the stormwater run-off before it enters the wetland.

The tributaries of the Elsburg Spruit that borders the proposed township on its south eastern and south western boundaries functions as regional stormwater system. The outflow from the stormwater retention pond discharges directly into these tributaries.

#### 6.4.2 Design criteria and design parameters

The internal stormwater network system consisting of road channels linked to an underground (piped) stormwater network system will be designed for a rainfall event of 2 year recurrence interval. Over land sheet flow will be assumed for excess flow from rainfall events of larger magnitude.

The capacity of the stormwater retention ponds are designed to intercept a flood event of 2 year recurrence interval without over topping. The spillway structure of the retention ponds are designed for a flood event of 25 year recurrence interval.

The following rainfall parameters will be used in the design of the stormwater network system and the stormwater retention system :

- Mean annual precepitation : 700mm
- Rainfall intensity for 2 year recurrence interval : 60mm/hr
- Rainfall intensity for 25 year recurrence interval : 200mm/hr

The minimum diameter for stormwater pipes will be 450mm.

The minimum longitudinal gradient of roads, pipes, box culverts and canals will be 1:150 to prevent siltation. The minimum cross-fall for streets will be 2%.

Road channels will be created by using mountable kerbs or semi-mountable kerbs with a maximum height of 150mm.

#### **6.4.3 General details**

The general details of the stormwater drainage facilities are shown on **Drawing No 1897-D02**.

The general details for the stormwater retention ponds are shown in **Drawing No 1897-E01**.

### **7. IMPLEMENTATION**

The implementation program for the design and construction of the civil engineering infrastructure are shown in **Figure 2**.

# DELMORE PARK EXTENSION 7 IMPLEMENTATION PROGRAM

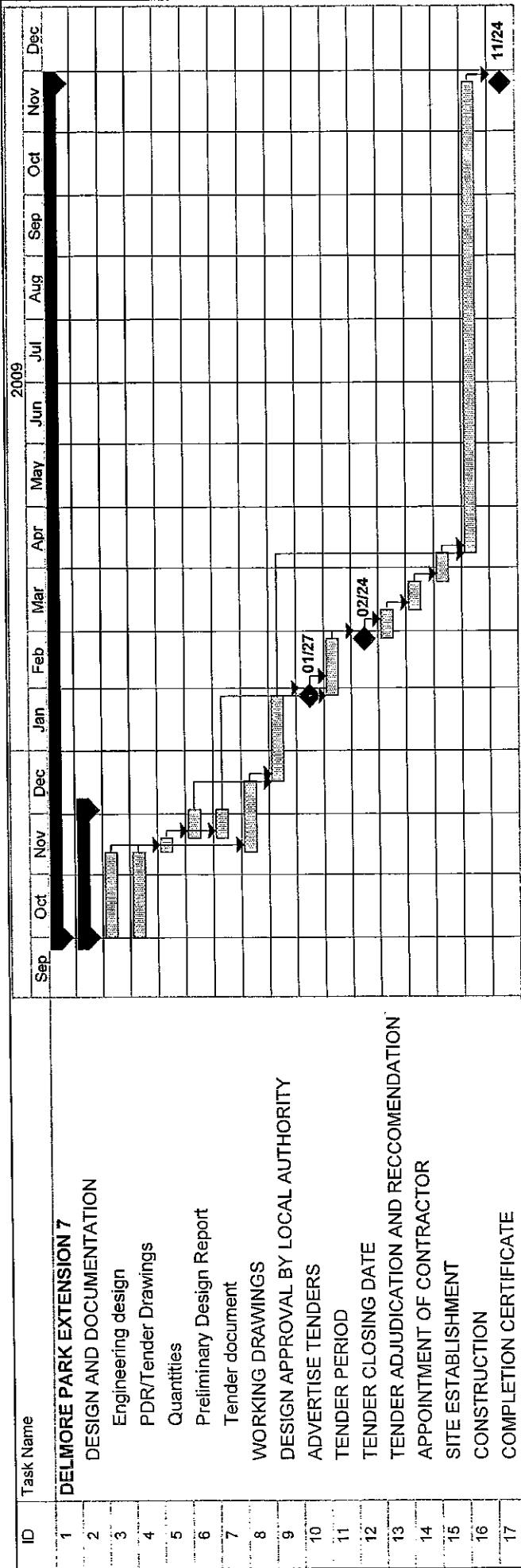


FIGURE 2: IMPLEMENTATION PROGRAM

**8. COST ESTIMATE**

The cost estimate for the design and construction of the civil engineering infrastructure for *proposed township* is shown in **Table 8.1**.

**TABLE 8.1 : COST ESTIMATE FOR CIVIL ENGINEERING INFRASTRUCTURE**

| DESCRIPTION                                     | AMOUNT                |
|---|-----------------------|
| 1. Preliminary and General                      | R 850 000.00          |
| 2. Water Network                                | R 1 000 000.00        |
| 3. Sewer Network                                | R 1 000 000.00        |
| 4. Stormwater Retention Ponds                   | R 200 000.00          |
| 5. Streets & Stormwater                         | R 3 000 000.00        |
| <b>SUBTOTAL A</b>                               | <b>R 6 050 000.00</b> |
| Contingencies (10%)                             | R 605 000.00          |
| Professional Fees                               | R 700 000.00          |
| <b>SUBTOTAL B</b>                               | <b>R 7 355 000.00</b> |
| VAT (14%)                                       | R 1 029 700.00        |
| <b>TOTAL PROJECT COST FOR INTERNAL SERVICES</b> | <b>R 8 384 700.00</b> |

# **ANNEXURE A**

## **SERVICES CERTIFICATE FOR WATER SUPPLY**

18 March 2008

**The Regional Director: Water Services**  
Ekurhuleni Metropolitan Municipality  
P O Box 215  
**BOKSBURG**  
1460

**CEs**

11 ELECTRON STREET  
PO BOX 814  
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EMAIL ces@glc.co.za  
REG NO 96 13328/07  
COMMUNITY  
ENGINEERING  
SERVICES

**Attention: Mr. Danie van der Merwe**

Dear Sir

**PROPOSED REIGERPARK DEVELOPMENTS ON LAND PARCELS 2 AND 5 -  
BOKSBURG: ASSESSMENT OF IMPACT ON WATER SUPPLY SYSTEM AND REQUIRED  
WORKS**

As requested by the consultant VIP Consulting Engineers, we have investigated the capacity of the water supply system to serve the proposed Reigerpark developments situated land parcels 2 and 5 as set out in Figure A included herewith and comment as follows:

**1. EXTENT OF DEVELOPMENT**

As indicated in the information provided to us the proposed development would comprise the following land use distribution:

|               | LAND USE                          | NO OF UNITS / STANDS | DEVELOPMENT AREA (ha) |
|---------------|-----------------------------------|----------------------|-----------------------|
| LAND PARCEL 2 | RESIDENTIAL GROUPOUSING UNITS     | 1 845                | 87 ha                 |
|               | SINGLE RESIDENTIAL STANDS         | 893                  |                       |
|               | BUSINESS COMMERCIAL DEVELOPMENT   |                      |                       |
|               | SCHOOL, CLINIC, CRECHE AND CHURCH |                      |                       |
| LAND PARCEL 5 | BONDED HOUSING                    | 256                  | 16 ha                 |
| TOTAL         |                                   | 2 994                | 103 ha                |

The location and layout of existing water supply services in the vicinity of the site are indicated on Figure A included herewith. We confirm that the site is located within the current Boksburg urban development boundary as per the Spatial Development Framework (2005).

The development areas were previously considered as part of the Boksburg Water Master Plan (February 2007), but due to the higher proposed densities was updated as reflected in this report.

## 2. WATER SYSTEM

### 2.1 Water Demand:

The total water demand for the two development sites are calculated as follows:

| LAND PARCEL 2                       | UNIT | QTY   | UNIT DEMAND (kl/day) | AADD (kl/day)     |
|-------------------------------------|------|-------|----------------------|-------------------|
| RESIDENTIAL GROUPOUSING UNITS       | No   | 1 845 | 0.6                  | 1 107             |
| SINGLE RESIDENTIAL STANDS           | No   | 893   | 0.8                  | 714               |
| BUSINESS COMMERCIAL DEVELOPMENT     | ha   | 5.85  | 20.0                 | 117               |
| SCHOOL, CLINIC, CRECHE AND CHURCH   | No   | 1     | 20.0                 | 20                |
| PLUS 15% UAW                        |      |       |                      | 342               |
| <b>TOTAL AVERAGE DEMAND (AADD)</b>  |      |       |                      | <b>2 300 kl/d</b> |
| <b>PEAK DEMAND (EXCL FIRE FLOW)</b> |      |       |                      | <b>93 l/s</b>     |
| <b>FIRE FLOW (MEDIUM RISK 2)</b>    |      |       |                      | <b>15 l/s</b>     |

| LAND PARCEL 5                       | UNIT | QTY | UNIT DEMAND (kl/day) | AADD (kl/day)   |
|-------------------------------------|------|-----|----------------------|-----------------|
| BONDED HOUSING                      | No   | 256 | 0.7                  | 179             |
| PLUS 15% UAW                        |      |     |                      | 32              |
| <b>TOTAL AVERAGE DEMAND (AADD)</b>  |      |     |                      | <b>211 kl/d</b> |
| <b>PEAK DEMAND (EXCL FIRE FLOW)</b> |      |     |                      | <b>9 l/s</b>    |
| <b>FIRE FLOW (MEDIUM RISK 2)</b>    |      |     |                      | <b>15 l/s</b>   |

### 2.2 Existing Water Services, Proposed Connection Point and Proposed Upgrading

Both of the developments fall within the southern portion of the Madeley water district that is supplied directly through a PRV (M7) that is immediately downstream of the Rand Water (RW) connection (Ref. 2153) located along Main Reef Road. This RW connection also supplies the Madeley reservoir.

Figure B included herewith has reference. There is an existing 250 mm Ø pipe that runs from the above-mentioned PRV in Main Reef Road in a southerly direction along Angelo Station Road and Du Preez Street up to the proposed development, with two existing connections to Delmore Park townships along the way. The existing system analysis including the demand of the proposed developments indicated that there is not sufficient capacity in the 250 mm Ø pipe to supply the developments on land parcels 2 and 5, which means that upgrading will be required. The installation of a parallel 400 mm Ø pipe from the PRV in Main Reef Road along Angelo Station Road is proposed (Item M10.4). However, due to the many other developments adjacent to Du

Preez Street that have not yet developed, the proposed 400 mm Ø pipe needs to be extended up to the first connection to Delmore Park, which constitutes a revision to the master plan.

It is proposed that the development on parcel 2 should be supplied through a 300 mm Ø pipe (Item M11.4) to be connected to the existing 250 mm Ø pipe in Du Preez street to cross the K110 road at the main entrance to the development. The development on parcel 5 should be supplied through a 200 mm Ø pipe (Item M11.1-3) to be connected to the same 250 mm Ø in Du Preez Street. In the future scenario, this pipe will be extended to supply further developments to the east of parcel 5. Therefore we recommend that a future connection point (200 mm Ø stub) be supplied in the vicinity of the eastern boundary of parcel 5.

We confirm that the Madeley reservoir has sufficient spare capacity available.

The existing 150 mm Ø PRV and meter (M7) need to be upgraded to a 300 mm Ø.

### 3. DEVELOPER CONTRIBUTIONS TO UPGRADING OF INFRASTRUCTURE

CEs hereby confirms that any contributions of the developer to the required upgrading of the existing infrastructure, whether it be in the form of a cash contribution or in the form of constructing sections of new infrastructure, is a matter to be discussed and agreed upon between the developer and the Ekurhuleni Metropolitan Municipality.

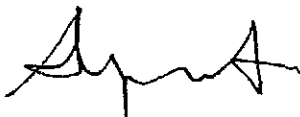
### 4. SUMMARY RECOMMENDATIONS

In summary, the upgrading requirements are as follows (Refer to Figure B):

- i. Install Item M10.4
- ii. Install Item M11.4
- iii. Install Item M11.1-3
- iv. Upgrade the PRV and meter (M7) at the start of the existing 250 mm Ø pipe to a 300 mm Ø.

We trust you find the above sufficient in terms of your request. Should you have any further queries, please do not hesitate to contact us. The contact person regarding the above is Cobus Compion.

Yours sincerely  
**COMMUNITY ENGINEERING SERVICES**  
 REG. NO.: 96/13328/07

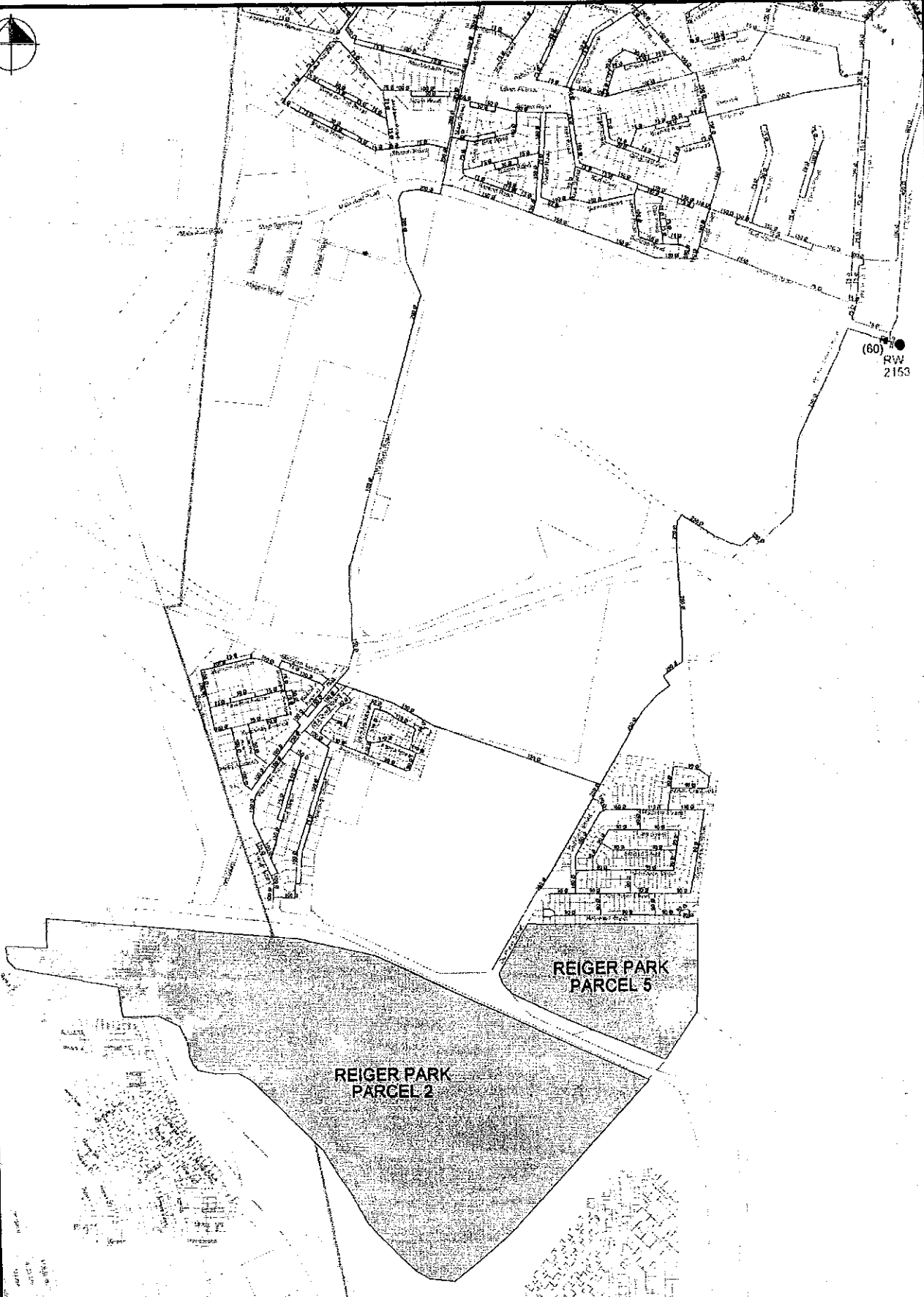


Per: LC (LEON) GEUSTYN  
 DIRECTOR

Directors:  
 L C Geustyn  
 F J Haupt  
 J E Kock  
 L H Matlala







March 2008

Ad hoc water supply capacity investigation  
Reiger Park Land Parcels 2 and 5 - Boksburg



Figure A

Location and layout of  
existing water supply services

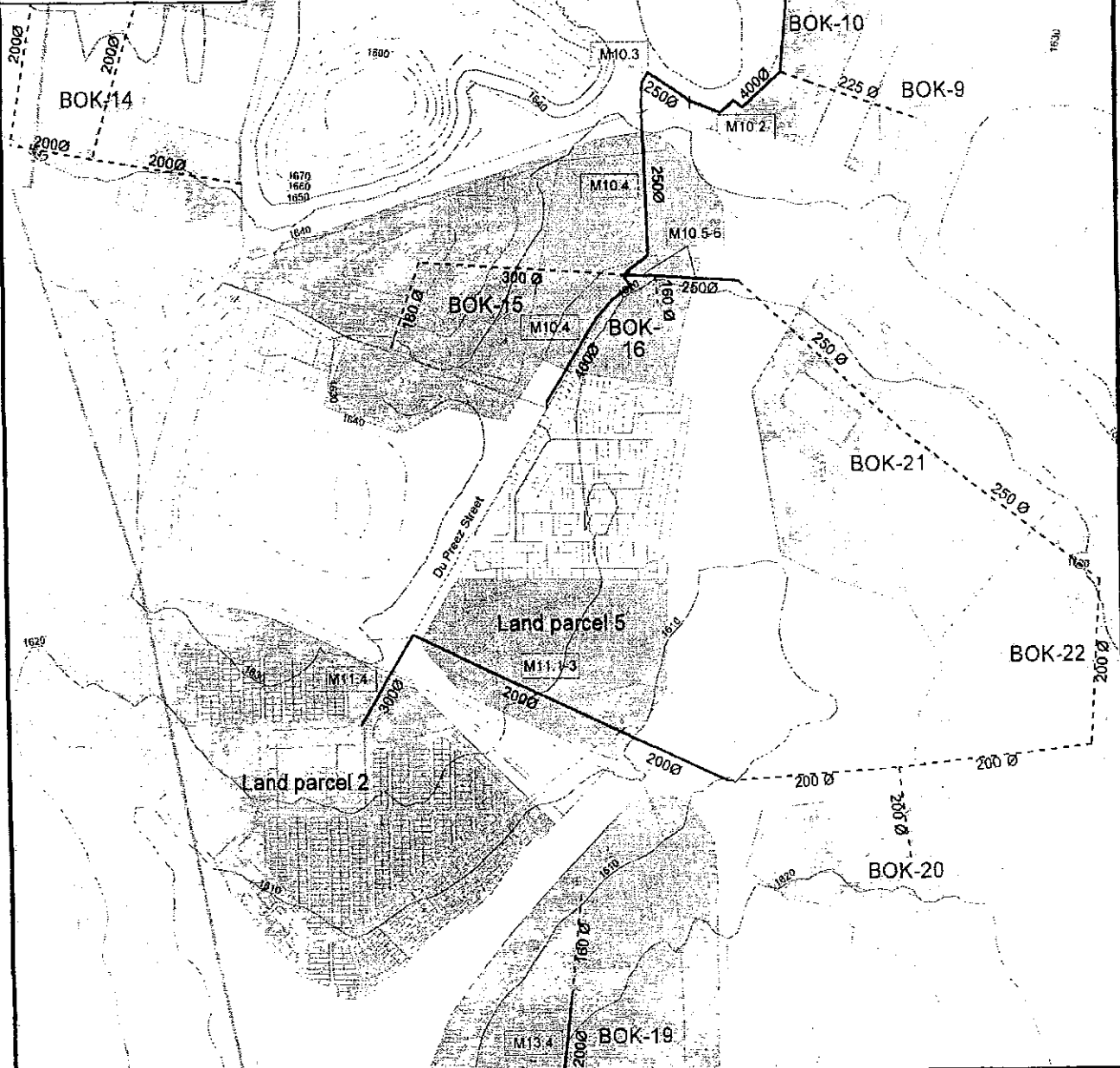
1300 / Ad hoc investigations / Reports / Reigerpark / Part 1 / 1300 - Environmental Report - 1300 - 1300

**Legend :**

- Reservoir
- Tank
- Pump Station
- Raw Water Bulk Connections
- Flow Control Valve
- Pressure Reducing Valve

**Proposed Upgrades**

- 350  $\phi$  Master Plan item with diameter
- Future Schematic Pipes
- Future Reservoir
- Future Bulk Connections
- Future Pump Station
- Close Valve
- Open Valve
- Proposed Bulk Meter
- Proposed Bulk Meter and PRV
- 1620 10m Contours
- Future Development Area



March 2008  
 Ad hoc water supply capacity investigation  
 Reigerpark land parcels 2 & 5 - Boksburg



Figure B  
 Master Plan - Extract

# **ANNEXURE B**

## **SERVICES CERTIFICATE FOR SANITATION**

17 March 2008

**The Regional Director: Water Services**  
Ekurhuleni Metropolitan Municipality  
P O Box 215  
**BOKSBURG**  
1460

**CEs**

11 ELECTRON STREET  
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EMAIL ces@gls.co.za  
REG NO 96 13328/07  
COMMUNITY  
ENGINEERING  
SERVICES

**Attention: Mr. Danie van der Merwe**

Dear Sir

**PROPOSED REIGERPARK DEVELOPMENTS ON LAND PARCELS 1, 2 AND 5 -  
BOKSBURG: ASSESSMENT OF IMPACT ON SEWER SYSTEM AND REQUIRED WORKS**

As requested by the consultant VIP Consulting Engineers, we have investigated the capacity of the sewer system to serve the proposed Reigerpark developments situated on land parcels 1, 2 and 5 as set out in Figure A included herewith and comment as follows:

**1. EXTENT OF DEVELOPMENT**

As indicated in the information provided to us the proposed development would comprise the following land use distribution:

| LAND USE      |                                   | NO OF UNITS / STANDS | DEVELOPMENT AREA (ha) |
|---------------|-----------------------------------|----------------------|-----------------------|
| LAND PARCEL 1 | SUBSIDY HOUSING                   | 2157                 | 46 ha                 |
| LAND PARCEL 2 | RESIDENTIAL GROUPOUSING UNITS     | 1 845                | 87 ha                 |
|               | SINGLE RESIDENTIAL STANDS         | 893                  |                       |
|               | BUSINESS COMMERCIAL DEVELOPMENT   |                      |                       |
|               | SCHOOL, CLINIC, CRECHE AND CHURCH |                      |                       |
| LAND PARCEL 5 | BONDED HOUSING                    | 256                  | 16 ha                 |
| TOTAL         |                                   | 5 151                | 149 ha                |

The location and layout of existing sewer services in the vicinity of the site are indicated on Figure A included herewith. We confirm that the site is located within the current Boksburg urban development boundary as per the Spatial Development Framework (2005).

The development areas were previously considered as part of the Boksburg Sewer Master Plan (February 2007), but due to the higher proposed densities was updated as reflected in this report.

## 2. SEWER SYSTEM

### 2.1 Sewage Flow:

The total water demand for the three development sites are calculated as follows:

| LAND PARCEL 1                      | UNIT | QTY   | UNIT DEMAND (kl/day) | AADD (kl/day)     |
|------------------------------------|------|-------|----------------------|-------------------|
| SUBSIDY HOUSING                    | No   | 2 157 | 0.6                  | 1 294             |
| PLUS 15% UAW                       |      |       |                      | 229               |
| <b>TOTAL AVERAGE DEMAND (AADD)</b> |      |       |                      | <b>1 523 kl/d</b> |
| <b>PEAK SEWAGE FLOW</b>            |      |       |                      | <b>35 l/s</b>     |

| LAND PARCEL 2                      | UNIT | QTY   | UNIT DEMAND (kl/day) | AADD (kl/day)     |
|------------------------------------|------|-------|----------------------|-------------------|
| RESIDENTIAL GROUPOUSING UNITS      | No   | 1 845 | 0.6                  | 1 107             |
| SINGLE RESIDENTIAL STANDS          | No   | 893   | 0.8                  | 714               |
| BUSINESS COMMERCIAL DEVELOPMENT    | ha   | 5.85  | 20.0                 | 117               |
| SCHOOL, CLINIC, CRECHE AND CHURCH  | No   | 1     | 20.0                 | 20                |
| PLUS 15% UAW                       |      |       |                      | 342               |
| <b>TOTAL AVERAGE DEMAND (AADD)</b> |      |       |                      | <b>2 300 kl/d</b> |
| <b>PEAK SEWAGE FLOW</b>            |      |       |                      | <b>48 l/s</b>     |

| LAND PARCEL 5                      | UNIT | QTY | UNIT DEMAND (kl/day) | AADD (kl/day)   |
|------------------------------------|------|-----|----------------------|-----------------|
| BONDED HOUSING                     | No   | 256 | 0.7                  | 179             |
| PLUS 15% UAW                       |      |     |                      | 32              |
| <b>TOTAL AVERAGE DEMAND (AADD)</b> |      |     |                      | <b>211 kl/d</b> |
| <b>PEAK SEWAGE FLOW</b>            |      |     |                      | <b>6 l/s</b>    |

The unit water demand for each individual residential stand, grouphousing unit or hectare of other type of land use was combined with a unique unit hydrograph for the specific land use (derived over history for the flow pattern of similar types of developments) and yielded a peak sewage flow of 35 l/s, 48 l/s and 6 l/s respectively for the three development sites. This sewage flow is higher than previously considered as part of the Sewer Master Plan (February 2007), which was updated accordingly.

## 2.2 Existing Sewer Services, Proposed Connection Point and Proposed Upgrading

### Drainage area

Due to a number of sewage diversion structures downstream of the developments, all three of the developments currently fall simultaneously in three different drainage areas namely the area draining under direct gravity to the Waterval WWTW, Dekema WWTW and to the Rondebult WWTW. All three of the proposed developments fall in the sub-drainage area of the Boksburg-Rondebult outfall sewer. Only the corner of land parcel 2 to the west of Simon Bekker Road fall in the Delmore outfall sewer sub-drainage area.

The current sewer drainage areas under discussion are indicated on figure B.

### Pump stations

No pump stations are affected by the development

### Main outfall sewers

Based on data captured from previous Keeve Steyn sewer models, the existing 375mm  $\varnothing$  Boksburg-Rondebult outfall sewer that runs parallel to the spruit between land parcel 1 and 2, has a certain degree of spare capacity available. Unfortunately we do not have as-built slope information available to us for the entire long section of the pipe and therefore we recommend that the pipe be surveyed to confirm the diameter and slope. The upgrading requirements to this pipe, if any, will depend on the outcome of this survey.

We can, in the mean time, comment on the section of pipe for which we have as-built information available to us. Furthermore we can comment on the diameter- and slope requirements for the section of pipe for which we do not have as-built slope information. Regardless of the above, we still recommend that the entire length of the pipe between point A and C (see figure A) be surveyed to confirm the diameter and slope. The pipe section between point A and B (see figure A) has sufficient spare capacity to accommodate the additional flow generated by land parcel 5.

The section of pipe downstream of point B (for which we do not have as built slope information) will receive the additional flow from land parcel 1 and 2. The diameter/slope requirements to accommodate the current flow scenario including the additional flow from land parcels 1, 2 and 5 are as follows:

| Diameter            | Minimum required slope |
|---------------------|------------------------|
| 375mm $\varnothing$ | 1 in 200               |
| 400mm $\varnothing$ | 1 in 280               |
| 450mm $\varnothing$ | 1 in 520               |

Should the results of the survey indicate that the pipe downstream of point B does not have sufficient capacity as per the requirements set out above, the pipe must be upgraded to accommodate the ultimate future flow scenario. This would entail the construction of approximately 670m of 525mm  $\varnothing$  pipe between point B and point C.

### **Network sewer pipes and connection to existing system**

No existing network sewers are affected by any of the three proposed developments as all three developments can drain directly into main outfall sewers. Should the requirements set out in the previous paragraph be satisfied, the developments can proceed by making the following connections to the existing system:

- Land parcel 1: 250mm  $\emptyset$  minimum connection to the existing 375mm  $\emptyset$  Boksburg-Rondebult outfall at point B. Please note that a 150mm  $\emptyset$  minimum connection point is to be provided in the vicinity of the south-eastern corner of the development for a future development to connect to as well as to receive flow from the Butch Jantjies pump station drainage area (Butch Jantjies PS to be decommissioned in the future flow scenario – see figure B).
- Land parcel 2: 300mm  $\emptyset$  minimum connection to the existing 375mm  $\emptyset$  Boksburg-Rondebult outfall at point B to drain area of land parcel 2 to the east of Simon Bekker Road. The area to the west of Simon Bekker Road can connect to either the existing mine dewatering line or to a newly constructed 675mm  $\emptyset$  Delmore outfall (see report on Reigerpark Land Parcels 3 and 4 for the required actions to be taken regarding the mine dewatering line and the possible new 675mm  $\emptyset$  Delmore outfall).
- Land parcel 5: 150mm  $\emptyset$  minimum connection to the existing 375mm  $\emptyset$  Boksburg-Rondebult outfall at point A.

### **Wastewater Treatment Works**

The Waterval WWTW, Dekema WWTW and the Rondebult WWTW currently have treating capacities of 105 Ml/day, 36 Ml/day and 36 Ml/day respectively. Due to the fact that ERWAT is currently in the process of determining the exact extent of upgrading requirements at each of their works we are not going to comment on the spare capacity of the WWTW's.

### **3. DEVELOPER CONTRIBUTIONS TO CONSTRUCTION / UPGRADING OF INFRASTRUTURE**

CEs hereby confirms that any contributions of the developer to the required construction of infrastructure and/or the upgrading of the existing infrastructure, whether it be in the form of a cash contribution or in the form of constructing sections of new infrastructure, is a matter to be discussed and agreed upon between the developer and the Ekurhuleni Metropolitan Municipality.

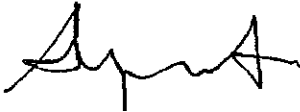
#### 4. SUMMARY RECOMMENDATIONS

In conclusion, please note the following:

- The section of the Boksburg-Rondebult outfall sewer between point A and C must be surveyed to confirm the diameter and slope.
- Should the above survey confirm that the pipe has sufficient spare capacity as per the requirements set out in this report the developments can proceed by making connections to the existing 375mm  $\emptyset$  Boksburg-Rondebult outfall sewer as per Figure A.
- Should the above survey confirm that the existing 375mm  $\emptyset$  Boksburg-Rondebult outfall sewer does not have sufficient spare capacity, the pipe must be upgraded between point B and C to accommodate the ultimate future flow scenario by constructing approximately 670m of 525mm  $\emptyset$  pipe.

We trust you find the above sufficient in terms of your request. Should you have any further queries, please do not hesitate to contact us. The contact person regarding the above is Louis Strijdom.

Yours sincerely  
COMMUNITY ENGINEERING SERVICES  
REG. NO.: 96/13328/07



Per: LC (LEON) GEUSTYN  
DIRECTOR

Directors  
L C Geustyn  
F J Haupt  
J E Kock  
L H Matlala





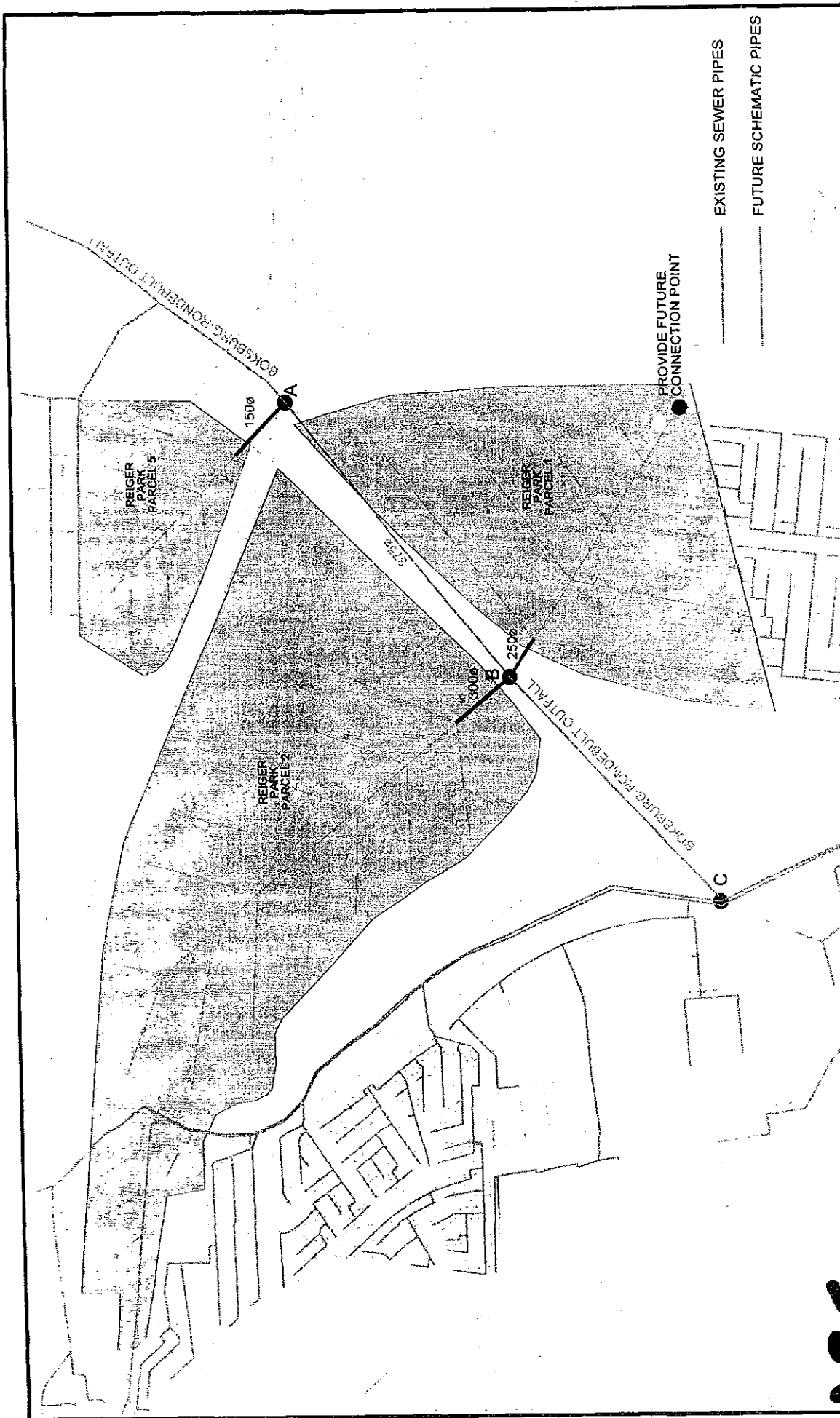


Figure A

Location and layout of existing sewer services



March 2008

Ad Hoc Sewer Capacity Investigation  
Reigerpark land parcels 1, 2 & 5 - Germiston / Boksburg





March 2008

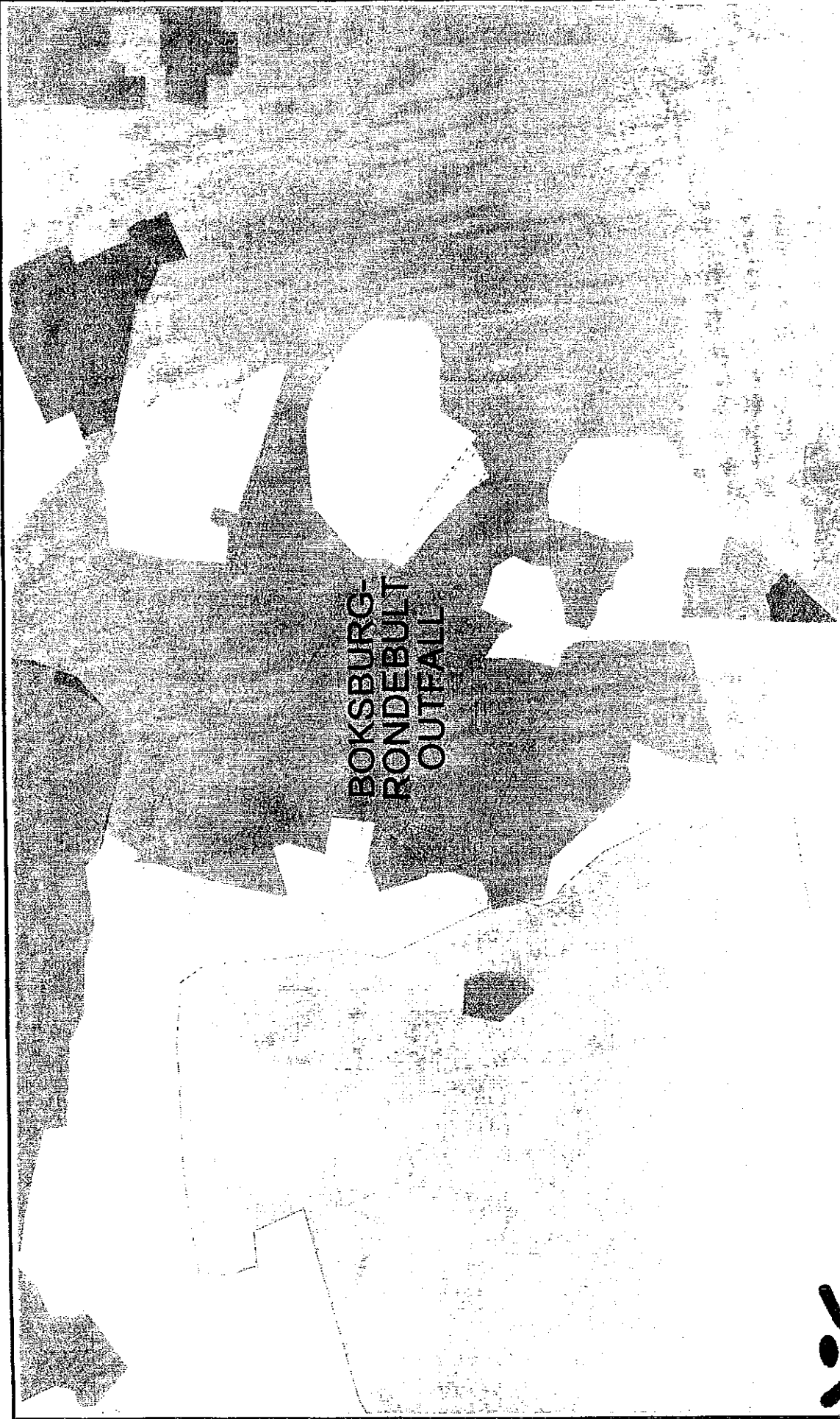
Ad Hoc Sewer Capacity Investigation  
Reigerpark land parcels 1, 2 & 5 - Germiston / Boksburg

Figure B

**CES**

Layout of existing drainage areas

**BOKSBURG-  
RONDEBULT  
OUTFALL**



2 April 2008

**The Regional Director: Water Services**  
Ekurhuleni Metropolitan Municipality  
P O Box 215  
**BOKSBURG**  
1460

**CES**

11 ELECTRON STREET  
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EMAIL ces@glc.co.za  
REG NO 96 13328/07  
COMMUNITY  
ENGINEERING  
SERVICES

**Attention: Mr. Danie van der Merwe**

Dear Sir

**PROPOSED DEVELOPMENTS ON REIGERPARK LAND PARCELS 1, 2 AND 5 –  
BOKSBURG: ASSESSMENT OF IMPACT ON SEWER SYSTEM AND REQUIRED  
WORKS**

Please refer to the sewer capacity study report produced by CES for the above mentioned proposed developments.

The report states that the developments can connect to the existing Boksburg-Rondebult outfall sewer should a survey confirm the diameter and slope of this pipe to be sufficient. Since the compilation of the report, however, we have received design information for a new Boksburg-Rondebult outfall sewer (Lillianon outfall sewer) as designed by Hlanganani Consulting Engineers.

Due to more and/or denser future developments anticipated by CES in the Boksburg sewer Masterplan, however, the proposed future pipe recommended by CES (450 - 525mm Ø) is larger than the Hlanganani design diameter of 315 - 400mm Ø.

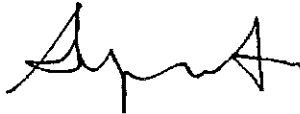
We have modeled the 315 – 400mm Ø proposed new pipe and have run a revised analysis. CES hereby confirms that the proposed new pipe has sufficient capacity to accommodate the additional flow generated by the developments on Reiger Park land parcels 1, 2 and 5 in the current flow scenario, but the pipe might experience capacity problems in the future scenario should the future developments proceed at the anticipated densities allowed for in the Masterplan.

As far as the proceeding of the developments on Reiger Park land parcels 1, 2 and 5 is concerned we conclude as follows:

1. The developments can proceed by making connections to the existing Boksburg-Rondebult outfall sewer if a survey can confirm the slope and diameter requirements as set out in the initial report mentioned above or;
2. Should the existing Boksburg-Rondebult outfall sewer be replaced (proposed new pipe diameter discrepancies to be discussed and agreed upon between CES and Hlanganani), the developments can proceed by connecting to the new outfall sewer.

We trust you find the above in order. Should you have any further queries, please do not hesitate to contact us. The contact person regarding the above is Louis Strijdom.

Yours sincerely  
COMMUNITY ENGINEERING SERVICES  
REG. NO.: 96/13328/07



---

Per: LC (LEON) GEUSTYN  
DIRECTOR

Directors:  
L C Geustyn  
F J Haupt  
J E Kock  
L H Matlala



# **ANNEXURE C**

## **DRAWINGS**

NOTES / NOTAS:



| NO. | REVISIONS | DATE |
|-----|-----------|------|
|     |           |      |
|     |           |      |
|     |           |      |
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SHEET SCALE 1:1250

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PLUMBING  
MECHANICAL  
PAPERWORK

**VP CONSULTING ENGINEERS (Pty) Ltd**  
Licensing and Service of Engineers  
Pretoria (122690)

PROJECT  
1887-401  
CIVIL ENGINEERING SERVICES  
DELMORE PARK EXTENSION 7

CLIENT  
DELMORE PARK  
MANAGEMENT

DATE  
17-11-2010

PROJECT NUMBER  
1887-401

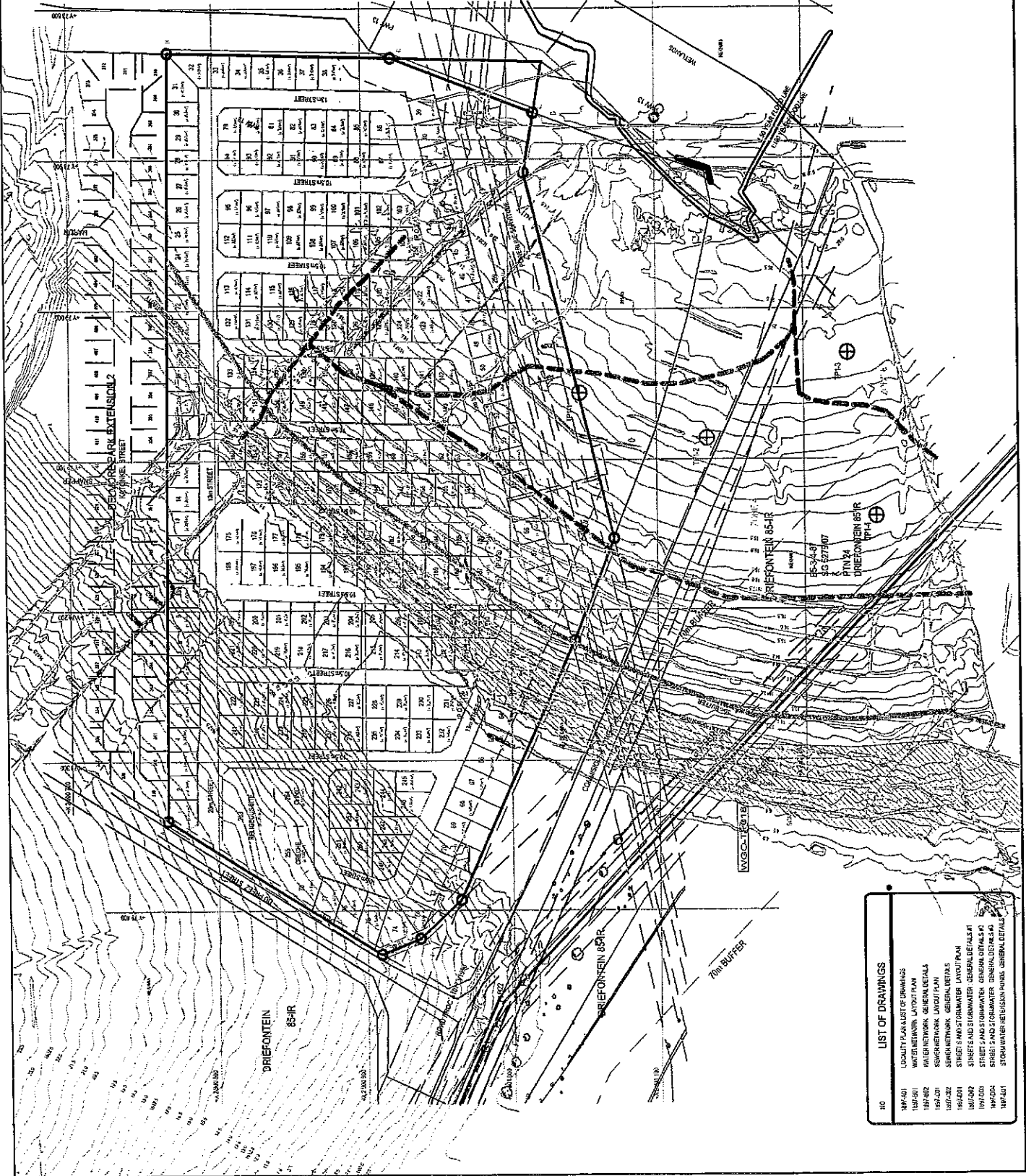
DATE  
17-11-2010

PREPARED BY  
DRAWN BY  
CHECKED BY  
DATE  
APPROVED BY  
DIRECTOR

PROJECT LOCATION  
DELMORE PARK  
MANAGEMENT

PROJECT NUMBER  
1887-401

DATE  
17-11-2010



| NO      | LIST OF DRAWINGS                         |
|---------|--|
| 187-401 | LOCALITY PLAN LIST OF DRAWINGS           |
| 187-501 | WATER NETWORK LAYOUT PLAN                |
| 187-601 | WATER NETWORK GENERAL DETAILS            |
| 187-701 | SEWER NETWORK LAYOUT PLAN                |
| 187-801 | SEWER NETWORK GENERAL DETAILS            |
| 187-901 | STREET LIGHTS/STORMWATER LAYOUT PLAN     |
| 188-001 | STREET LIGHTS/STORMWATER GENERAL DETAILS |
| 188-101 | STREET LIGHTS/STORMWATER GENERAL DETAILS |
| 188-201 | STREET LIGHTS/STORMWATER GENERAL DETAILS |
| 188-301 | STREET LIGHTS/STORMWATER GENERAL DETAILS |
| 188-401 | STREET LIGHTS/STORMWATER GENERAL DETAILS |
| 188-501 | STREET LIGHTS/STORMWATER GENERAL DETAILS |

NOTES / NOTAS:



| NO. | BESONNEN | DAAT |
|-----|----------|------|
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|     |          |      |
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|     |          |      |

SRKAL SCALE 1:1250



**PRETORIA**  
 2nd Floor, Sandton City, Sandton  
 2106 Sandton City, Johannesburg 2004  
 P.O. Box 10141, Joburg North, 2004  
 Tel: 011 553 9220 (10)  
 Fax: 011 553 9220 (10)  
 Email: info@vipeng.co.za

**VIP CONSULTING ENGINEERS (Pty) Ltd**  
 Consulting Civil and Structural Engineers  
 Hoofstad Pretoria

REGISTRATION NO. 12345  
 COMPANY NO. 123456789

**CIVIL ENGINEERING SERVICES  
 DELMORE PARK EXTENSION 7**

**WATER NETWORK:  
 LAYOUT PLAN**

|                    |                       |                     |                          |
|--------------------|-----------------------|---------------------|--------------------------|
| CLIENT INFORMATION |                       | PROJECT INFORMATION |                          |
| CLIENT NAME        | DELTA 4               | PROJECT NAME        | DELMORE PARK EXTENSION 7 |
| CLIENT ADDRESS     | 123 Main St, Pretoria | PROJECT ADDRESS     | Delemore Park, Pretoria  |
| CLIENT CONTACT     | J. P. R.              | PROJECT CONTACT     | AUGUST 2001              |
| CLIENT PHONE       | 011 553 9220          | PROJECT PHONE       | 011 553 9220             |
| CLIENT FAX         | 011 553 9220          | PROJECT FAX         | 011 553 9220             |
| CLIENT EMAIL       | j.p.r@delta4.co.za    | PROJECT EMAIL       | vip@vipeng.co.za         |
| CLIENT WEBSITE     | www.delta4.co.za      | PROJECT WEBSITE     | www.vipeng.co.za         |
| CLIENT LOGO        |                       | PROJECT LOGO        |                          |
| CLIENT DRAWING NO. | 1897-B01              | PROJECT DRAWING NO. |                          |
| CLIENT PROJECT NO. |                       | PROJECT PROJECT NO. |                          |
| CLIENT DATE        |                       | PROJECT DATE        |                          |
| CLIENT SCALE       |                       | PROJECT SCALE       |                          |
| CLIENT DRAWN BY    |                       | PROJECT DRAWN BY    |                          |
| CLIENT CHECKED BY  |                       | PROJECT CHECKED BY  |                          |
| CLIENT APPROVED BY |                       | PROJECT APPROVED BY |                          |
| CLIENT SIGNATURE   |                       | PROJECT SIGNATURE   |                          |
| CLIENT DATE        |                       | PROJECT DATE        |                          |



**NOTAS / NOTES :**

1. WATER PIPES MUST BE SPVC CLASS 6 EXCEPT ROAD CROSSINGS WHICH SHOULD BE SPVC CLASS 12.
2. ALL BPP COMPONENTS MUST BE CONSTRUCTED WITH PIPE TYPE 'V' CLASS PH 12.5, 1500 PRESSURE RATES.
3. GATE VALVES UP TO 300mm DIA MUST BE FLANGED GATE VALVE CLASS PH-6.
4. ALL VALVES TO BE MOVED WITHIN 200mm TO 250mm BY ANTI-CORROSION CLOSING STAINLESS STEEL WORKINGS FINISHED WITH A COP TOP TO 50mm DIA.
5. ALL VALVES TO BE MOVED WITHIN 200mm TO 250mm BY ANTI-CORROSION CLOSING STAINLESS STEEL WORKINGS FINISHED WITH A COP TOP TO 50mm DIA.
6. ALL VALVES TO BE MOVED WITHIN 200mm TO 250mm BY ANTI-CORROSION CLOSING STAINLESS STEEL WORKINGS FINISHED WITH A COP TOP TO 50mm DIA.
7. ALL VALVES TO BE MOVED WITHIN 200mm TO 250mm BY ANTI-CORROSION CLOSING STAINLESS STEEL WORKINGS FINISHED WITH A COP TOP TO 50mm DIA.

| REV. | DESCRIPTIONS | DATE |
|------|--------------|------|
| 1/1  |              |      |
| 1/2  |              |      |
| 1/3  |              |      |
| 1/4  |              |      |

**SCALE AS SHOWN**

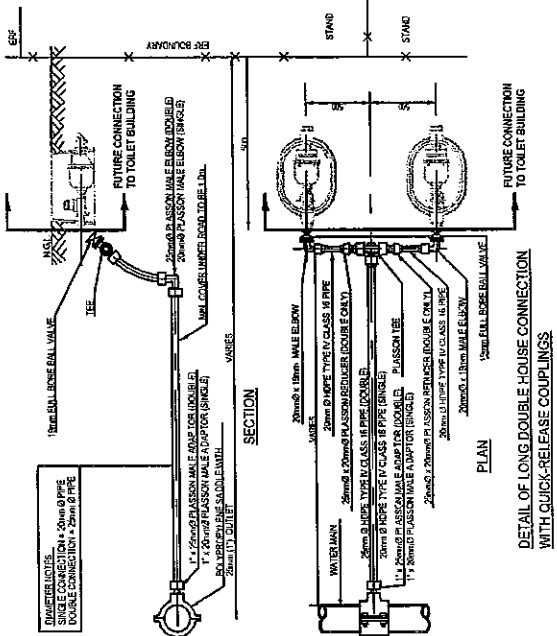


**VIP CONSULTING ENGINEERS (Pty) Ltd**  
 10100 SOUTHERN CROSS ROAD  
 FRANKFURT REGION  
 SOUTH AFRICA

**CIVIL ENGINEERING SERVICES**  
**DELORME PARK EXTENSION 7**

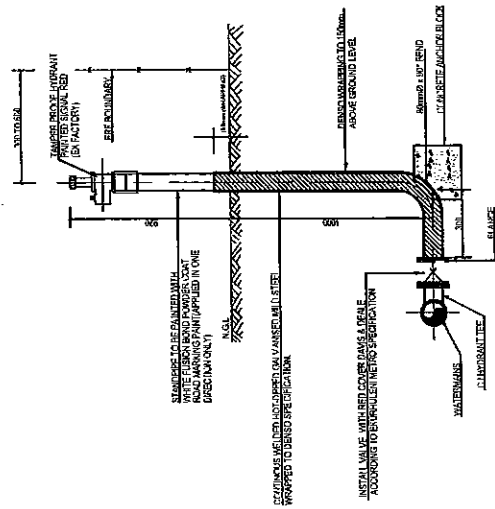
**WATER NETWORK :  
 GENERAL DETAILS**

|                |                                |
|----------------|--------------------------------|
| PROJECT NUMBER | F-DATA/DRINKWATER/PH-1/1901807 |
| CLIENT         | DELRORME PARK                  |
| DESIGNER       | W.E.H.                         |
| CHECKED        | M.H.                           |
| DATE           | AUGUST 2006                    |
| PROJECT        | PHASE 1/1                      |
| PROJECT        | PHASE 2/2                      |
| PROJECT        | PHASE 3/3                      |
| PROJECT        | PHASE 4/4                      |
| PROJECT        | PHASE 5/5                      |
| PROJECT        | PHASE 6/6                      |
| PROJECT        | PHASE 7/7                      |
| PROJECT        | PHASE 8/8                      |
| PROJECT        | PHASE 9/9                      |
| PROJECT        | PHASE 10/10                    |



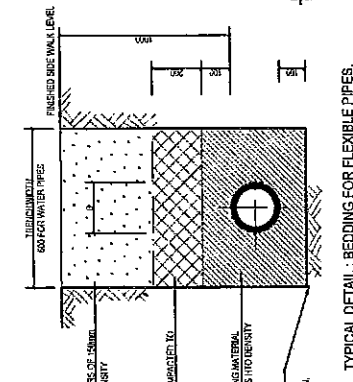
**DETAIL OF LONG DOUBLE HOUSE CONNECTION WITH QUICK-RELEASE COUPLINGS**

M.S.



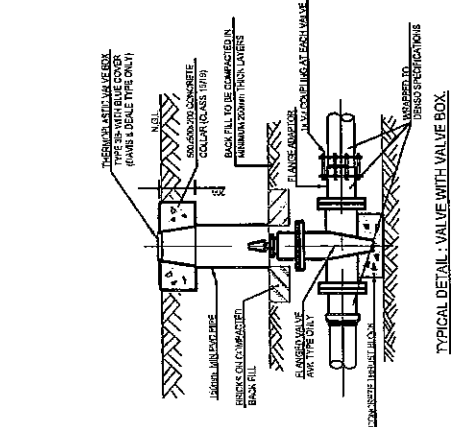
**TYPICAL DETAIL: WOODLANDS TYPE FIRE HYDRANT**

M.S.



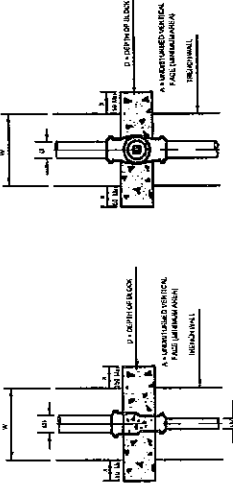
**TYPICAL DETAIL: BEDDING FOR FLEXIBLE PIPES**

M.S.



**TYPICAL DETAIL: VALVE WITH VALVE BOX**

M.S.



**GATE VALVE**

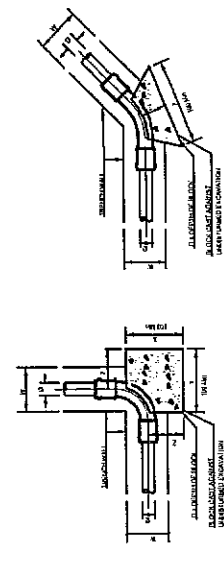
**REDUCER**

**THRUST BLOCKS FOR REDUCERS**

| Block Dia | Block Length | Block Width | Block Height | Block Area |
|-----------|--------------|-------------|--------------|------------|
| 200       | 100          | 50          | 100          | 20000      |
| 250       | 125          | 62.5        | 125          | 31250      |
| 300       | 150          | 75          | 150          | 45000      |
| 350       | 175          | 87.5        | 175          | 61250      |
| 400       | 200          | 100         | 200          | 80000      |
| 450       | 225          | 112.5       | 225          | 101250     |
| 500       | 250          | 125         | 250          | 125000     |
| 550       | 275          | 137.5       | 275          | 151250     |
| 600       | 300          | 150         | 300          | 180000     |
| 650       | 325          | 162.5       | 325          | 211250     |
| 700       | 350          | 175         | 350          | 245000     |
| 750       | 375          | 187.5       | 375          | 281250     |
| 800       | 400          | 200         | 400          | 320000     |
| 850       | 425          | 212.5       | 425          | 361250     |
| 900       | 450          | 225         | 450          | 405000     |
| 950       | 475          | 237.5       | 475          | 451250     |
| 1000      | 500          | 250         | 500          | 500000     |

**THRUST BLOCKS FOR GATE VALVES**

| Block Dia | Block Length | Block Width | Block Height | Block Area |
|-----------|--------------|-------------|--------------|------------|
| 200       | 100          | 50          | 100          | 20000      |
| 250       | 125          | 62.5        | 125          | 31250      |
| 300       | 150          | 75          | 150          | 45000      |
| 350       | 175          | 87.5        | 175          | 61250      |
| 400       | 200          | 100         | 200          | 80000      |
| 450       | 225          | 112.5       | 225          | 101250     |
| 500       | 250          | 125         | 250          | 125000     |
| 550       | 275          | 137.5       | 275          | 151250     |
| 600       | 300          | 150         | 300          | 180000     |
| 650       | 325          | 162.5       | 325          | 211250     |
| 700       | 350          | 175         | 350          | 245000     |
| 750       | 375          | 187.5       | 375          | 281250     |
| 800       | 400          | 200         | 400          | 320000     |
| 850       | 425          | 212.5       | 425          | 361250     |
| 900       | 450          | 225         | 450          | 405000     |
| 950       | 475          | 237.5       | 475          | 451250     |
| 1000      | 500          | 250         | 500          | 500000     |



**90° BEND**

**1 1/2" 22 1/2° & 45° BENDS**

**THRUST BLOCKS FOR 90° BENDS**

| Block Dia | Block Length | Block Width | Block Height | Block Area |
|-----------|--------------|-------------|--------------|------------|
| 200       | 100          | 50          | 100          | 20000      |
| 250       | 125          | 62.5        | 125          | 31250      |
| 300       | 150          | 75          | 150          | 45000      |
| 350       | 175          | 87.5        | 175          | 61250      |
| 400       | 200          | 100         | 200          | 80000      |
| 450       | 225          | 112.5       | 225          | 101250     |
| 500       | 250          | 125         | 250          | 125000     |
| 550       | 275          | 137.5       | 275          | 151250     |
| 600       | 300          | 150         | 300          | 180000     |
| 650       | 325          | 162.5       | 325          | 211250     |
| 700       | 350          | 175         | 350          | 245000     |
| 750       | 375          | 187.5       | 375          | 281250     |
| 800       | 400          | 200         | 400          | 320000     |
| 850       | 425          | 212.5       | 425          | 361250     |
| 900       | 450          | 225         | 450          | 405000     |
| 950       | 475          | 237.5       | 475          | 451250     |
| 1000      | 500          | 250         | 500          | 500000     |

**THRUST BLOCKS FOR T-JUNCTIONS**

| Block Dia | Block Length | Block Width | Block Height | Block Area |
|-----------|--------------|-------------|--------------|------------|
| 200       | 100          | 50          | 100          | 20000      |
| 250       | 125          | 62.5        | 125          | 31250      |
| 300       | 150          | 75          | 150          | 45000      |
| 350       | 175          | 87.5        | 175          | 61250      |
| 400       | 200          | 100         | 200          | 80000      |
| 450       | 225          | 112.5       | 225          | 101250     |
| 500       | 250          | 125         | 250          | 125000     |
| 550       | 275          | 137.5       | 275          | 151250     |
| 600       | 300          | 150         | 300          | 180000     |
| 650       | 325          | 162.5       | 325          | 211250     |
| 700       | 350          | 175         | 350          | 245000     |
| 750       | 375          | 187.5       | 375          | 281250     |
| 800       | 400          | 200         | 400          | 320000     |
| 850       | 425          | 212.5       | 425          | 361250     |
| 900       | 450          | 225         | 450          | 405000     |
| 950       | 475          | 237.5       | 475          | 451250     |
| 1000      | 500          | 250         | 500          | 500000     |

**THRUST BLOCKS FOR TIE BARS**

| Block Dia | Block Length | Block Width | Block Height | Block Area |
|-----------|--------------|-------------|--------------|------------|
| 200       | 100          | 50          | 100          | 20000      |
| 250       | 125          | 62.5        | 125          | 31250      |
| 300       | 150          | 75          | 150          | 45000      |
| 350       | 175          | 87.5        | 175          | 61250      |
| 400       | 200          | 100         | 200          | 80000      |
| 450       | 225          | 112.5       | 225          | 101250     |
| 500       | 250          | 125         | 250          | 125000     |
| 550       | 275          | 137.5       | 275          | 151250     |
| 600       | 300          | 150         | 300          | 180000     |
| 650       | 325          | 162.5       | 325          | 211250     |
| 700       | 350          | 175         | 350          | 245000     |
| 750       | 375          | 187.5       | 375          | 281250     |
| 800       | 400          | 200         | 400          | 320000     |
| 850       | 425          | 212.5       | 425          | 361250     |
| 900       | 450          | 225         | 450          | 405000     |
| 950       | 475          | 237.5       | 475          | 451250     |
| 1000      | 500          | 250         | 500          | 500000     |

**TYPICAL DETAILS & SIZES FOR THRUST BLOCKS**

M.S.

- NOTES:**
1. CONCRETE THIRST BLOCKS BE CLASS 12/15.
  2. DIMENSIONS MAY BE REDUCED FOR LIGHTER EARTH BEARING PRESSURES.
  3. DIMENSIONS MAY BE REDUCED FOR LIGHTER EARTH BEARING PRESSURES.
  4. 2 SHALL BE THE MAXIMUM OF 200 OR 150.
  5. 1/2 OF THE DEPTH OF THE BLOCK SHALL BE BELOW THE PIPE AXIS.
  6. KEEP COUPLINGS AND FLANGES 20mm CLEAR OF CONCRETE.

**DETAIL: VALVE MARKER**

M.S.

**DETAIL OF SHORT DOUBLE HOUSE CONNECTION WITH QUICK-RELEASE COUPLINGS**

M.S.



NOTES / NOTAS:



| NO. | REVISIONS | DATE |
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|     |           |      |

SKAAL  
SCALE  
1:1250



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241 First Avenue, Park Street  
2001  
Tel: 011 461 1000  
Fax: 011 461 1010  
Email: info@vip.co.za

VIP CONSULTING ENGINEERS (PTY) LTD  
Civil Engineering and Structural Engineers  
Pretoria

PROJECT  
NAME: CIVIL ENGINEERING SERVICES  
DELORMORE PARK EXTENSION 7

DESIGNED BY  
DRAWN BY

SEWER NETWORK:  
LAYOUT PLAN

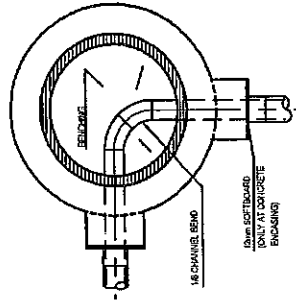
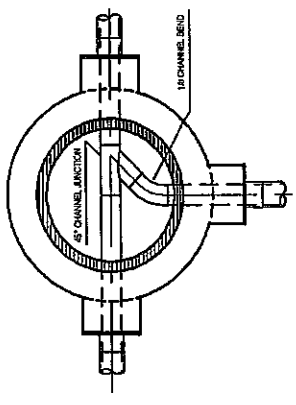
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| DATE OF PREPARATION | DATE OF ISSUE | DATE OF REVISION |
|                     |               |                  |
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|                     |               |                  |

|             |          |
|-------------|----------|
| PROJECT NO. | 1897-C01 |
| DATE        |          |
|             |          |
|             |          |
|             |          |



**NOTES:**

1. ALL AGGREGATES IN CONCRETE FOR MANHOLES MUST BE OF LOGICAL ORIGIN AS SPECIFIED.
2. ALL REINFORCING MUST BE MILD STEEL, ACCORDING TO SANS 500.
3. FINISHES OF MANHOLES SHALL BE GENERALLY BY GRINDING ABOVE FINISHED LEVEL ON SIDEWALKS.
4. STEPPINGS MUST BE CASTED INTO WALLS AND GROUNDED THROUGHOUT THE ENTIRE MANHOLE.
5. ALL JOINTS AND FITTINGS MUST COMPLY WITH SANS 554:1977 (AS AMENDED).
6. ALL MANHOLE COVERS TO BE CONCRETE COVERS WITH STEEL BAND AS APPROVED BY THE ENGINEER.
7. MANHOLE SECTIONS MAY BE USED WITH THE APPROVAL OF THE ENGINEER AND MUST BE SEaled IN A BITUMINOUS SEALANT.
8. SEWER MANHOLES MUST BE WATERPROOFED (ONLY AT TORTOISE FINISHING).
9. SEE DRAWING NO. 1752/7A & 7A FOR CONSTRUCTION DETAILS.
10. SEWER PIPES TO BE Laid 1.0m FROM THE EDGES OF MANHOLES AND 2.0m FROM BOUNDARIES IN ROAD RESERVE.

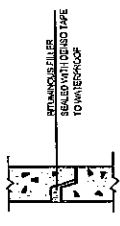


TYPICAL DETAILS : BENDS AND CONNECTIONS IN MANHOLES. SCALE 1 : 20

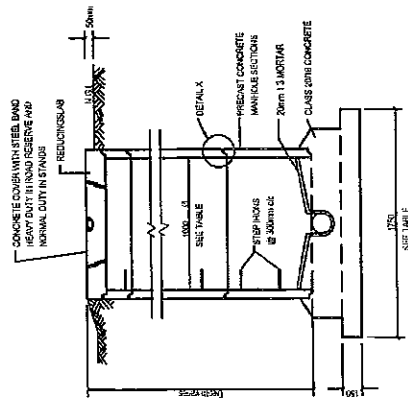
**NOTE:**

1. DIMENSIONS FOR SEWER MANHOLE ON DETAIL IS AS FOR TYPE 1.

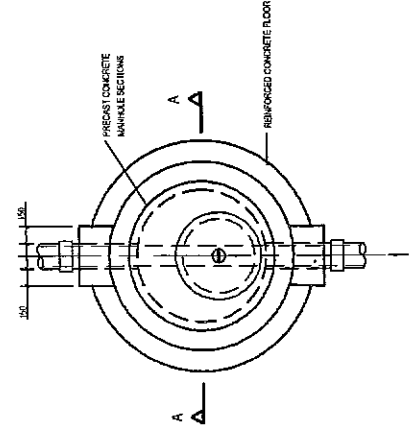
| TYPE | DEPTH            | DIAMETER |
|------|------------------|----------|
| 1    | 0.7m to 3.0m     | 1000mm   |
| 2    | 3.0m to 4.5m     | 1200mm   |
| 3    | Deeper than 4.5m | 1500mm   |



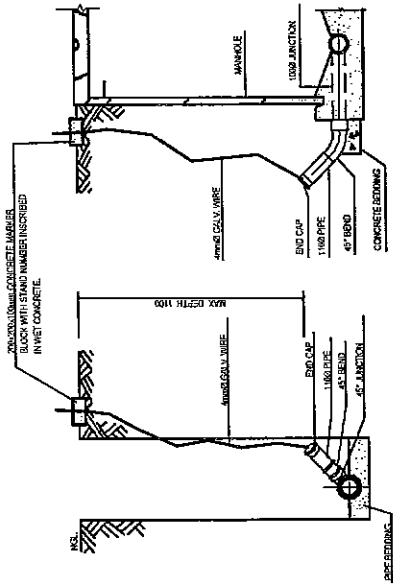
DETAIL X SCALE 1 : 5



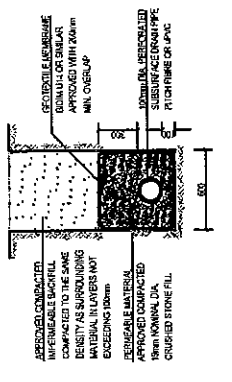
SECTION A-A SCALE 1 : 20



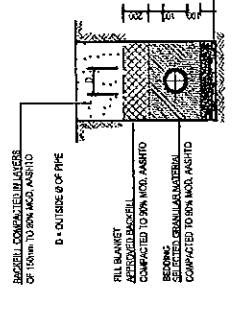
DETAIL : CONCRETE SEWER MANHOLE SCALE 1 : 20



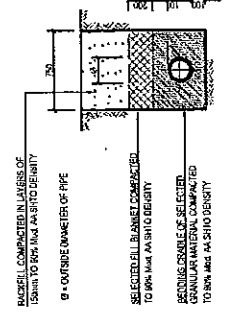
TYPICAL LAYOUT OF HOUSE CONNECTIONS



TYPICAL DETAIL : SUBSURFACE DRAIN SCALE 1 : 20



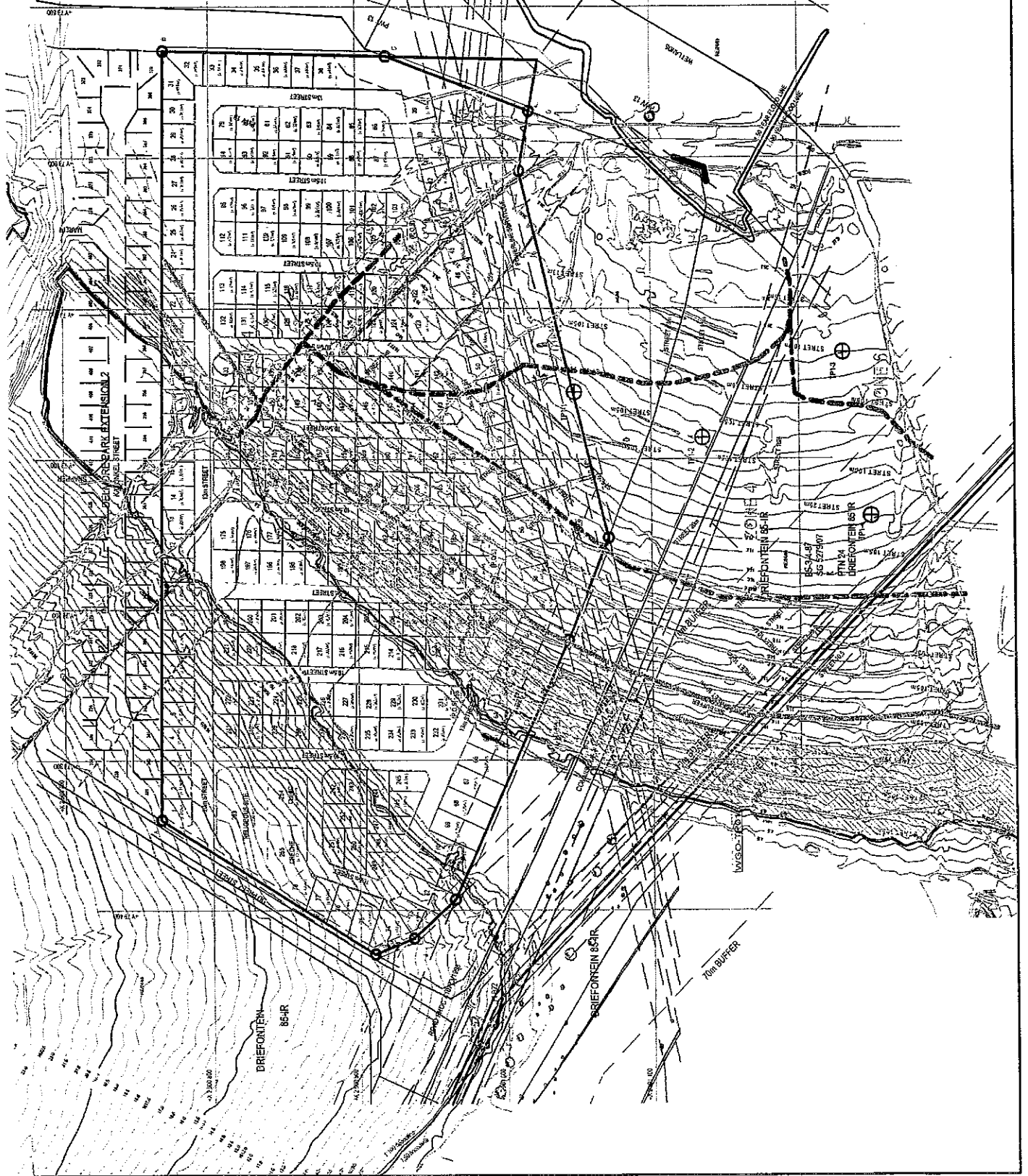
BEDDING DETAILS : FLEXIBLE PIPES. SCALE 1 : 20



BEDDING DETAILS : FULLY ENCASED CONCRETE. SCALE 1 : 20

|  |  |
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| <p><b>CIVIL ENGINEERING SERVICES</b><br/>DELMORE PARK EXTENSION 7</p>  | <p><b>SEWER NETWORK: GENERAL DETAILS</b></p>   |
| <p><b>VIP CONSULTING ENGINEERS (Pty) Ltd</b><br/>Registered Structural Engineers<br/>Reg No: 12402/07</p>  | <p><b>GENERAL INFORMATION</b></p> <p>PROJECT: DELMORE PARK EXTENSION 7</p> <p>DATE: AUGUST 2008</p> <p>SCALE: 1:20</p> |
| <p><b>VIP CONSULTING ENGINEERS (Pty) Ltd</b><br/>101 Main Street, 1st Floor, Sandton, Johannesburg, South Africa. Tel: +27 (0)11 790 1000. Fax: +27 (0)11 790 1001. Email: vip@vip.co.za</p> | <p><b>CLIENT</b></p> <p>DELMORE PARK EXTENSION 7</p>   |
| <p><b>SCALE</b></p> <p>AS SHOWN</p>  | <p><b>DATE</b></p> <p>18/07/08</p>   |

NOTES / NOTAS :



| NO. | REVISION | DATE |
|-----|----------|------|
|     |          |      |
|     |          |      |
|     |          |      |
|     |          |      |
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SKAAL  
SCALE 1:1250



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Pines 2016, 1171, Setai Lane 28A  
Tel: +27 (0) 11 288 1200  
Cell: +27 (0) 82 764 1234  
E-mail: info@vipeng.co.za  
FRANCOIS  
BENNETT  
RICHARD  
FRANCOIS  
VIP CONSULTING ENGINEERS (Pty) Ltd  
Consultants and Surveyors  
Reg No. 22766/01

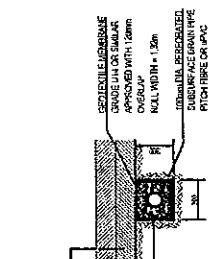
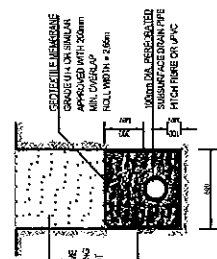
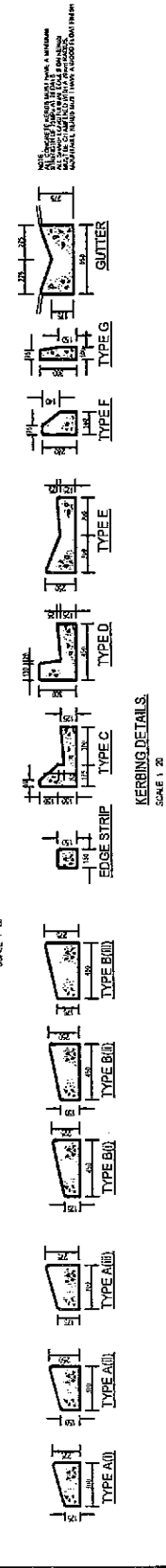
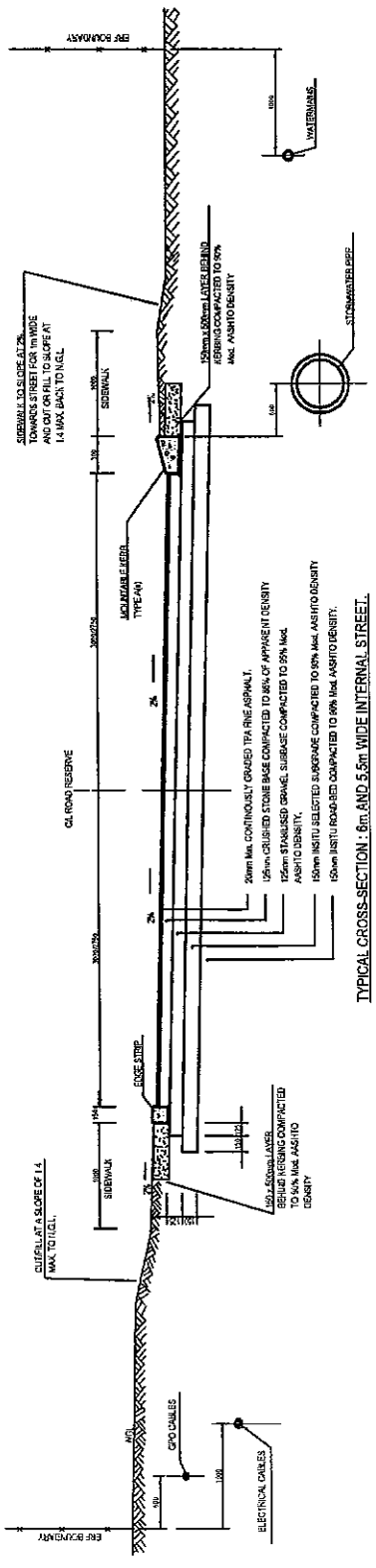
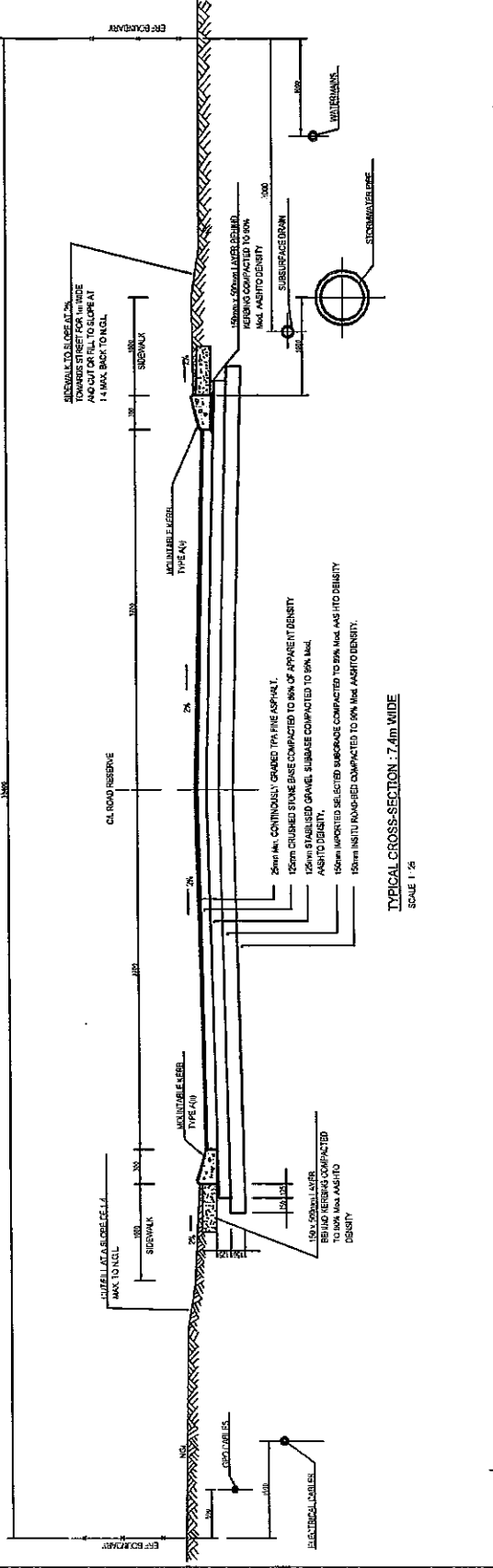
CIVIL ENGINEERING SERVICES  
DELMORE PARK EXTENSION 7

STREETS AND STORMWATER  
LAYOUT PLAN

| NO. | REVISION | DATE |
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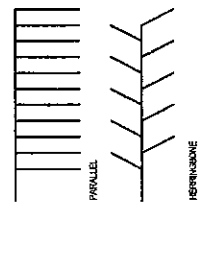
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|---------------|-------------|
| PROJECT NO.   | 1897-D01    |
| DATE          | AUGUST 2008 |
| BY            |             |
| CHECKED       |             |
| APPROVED      |             |
| SCALE         |             |
| TOTAL SHEETS  |             |
| CURRENT SHEET |             |

NOTAS/MOTES:



**DRAIN SPACING (m)**

| DEPTH        | 1.0m | 1.2m | 1.5m |
|--------------|------|------|------|
| SAND         | 75   | 95   | 110  |
| SILT SAND    | 65   | 75   | 90   |
| SANDY SILT   | 47   | 52   | 57   |
| SILT         | 18   | 25   | 30   |
| ORGANIC CLAY | 5    | 6    | 8    |
| SILT CLAY    | 3    | 4    | 6    |



|    |                  |      |
|----|------------------|------|
| NO | REVISED DRAWINGS | DATE |
|    |                  |      |
|    |                  |      |

**WETPRO HOUSING**  
(Pty) Ltd.

ESTD 2002  
4011 CAMPFIRE PARK  
180

367 RUIJIN ROAD  
3

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Fax: +27 (0) 11 884 4105  
Email: info@wetpro.co.za

**VIP**

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**CIVIL ENGINEERING SERVICES**  
DELORME PARK EXTENSION 7

**STREETS & STORMWATER**  
GENERAL DETAILS #1

PROJECT NO: 1897-002

DATE: 18/11/2024

SCALE: AS SHOWN

PROJECT: CIVIL ENGINEERING SERVICES DELORME PARK EXTENSION 7

CLIENT: WETPRO HOUSING (PTY) LTD

DESIGNER: WETPRO HOUSING (PTY) LTD

DRAWN BY: VENKATACHANDRAN VENKATACHANDRAN

CHECKED BY: VENKATACHANDRAN VENKATACHANDRAN

DATE: 18/11/2024

PROJECT NO: 1897-002

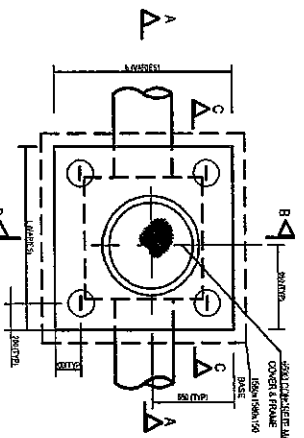
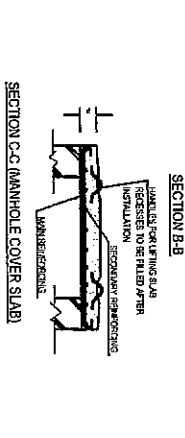
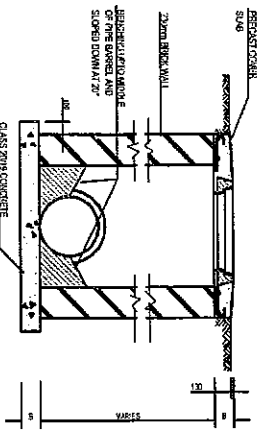
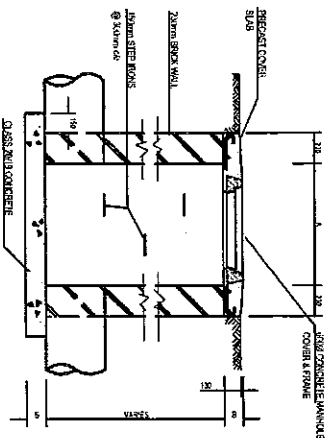
CLIENT: WETPRO HOUSING (PTY) LTD

DESIGNER: WETPRO HOUSING (PTY) LTD

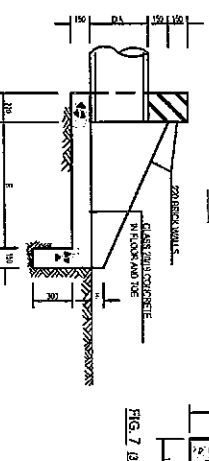
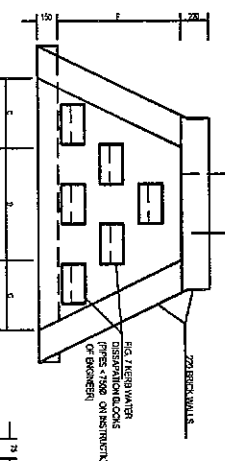
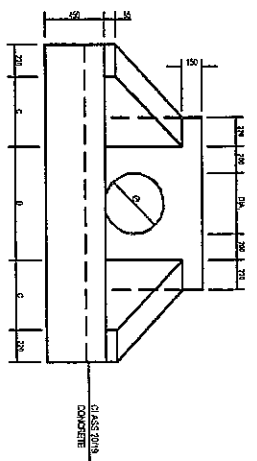
DRAWN BY: VENKATACHANDRAN VENKATACHANDRAN

CHECKED BY: VENKATACHANDRAN VENKATACHANDRAN

DATE: 18/11/2024



DETAIL: MANHOLE  
SCALE 1:20



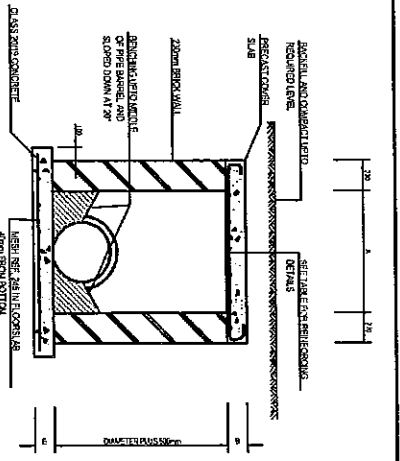
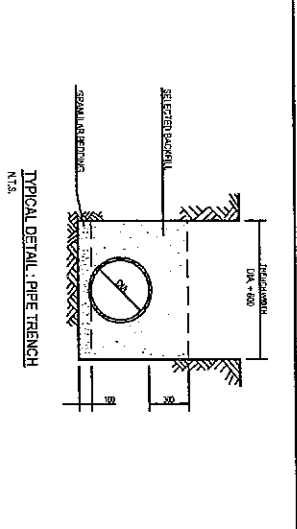
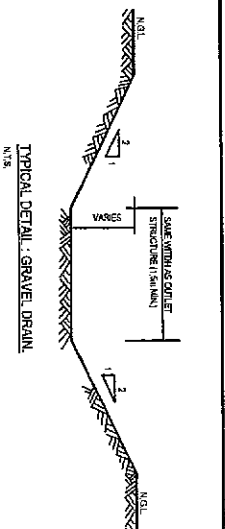
DETAIL: IN-OR OUTLET STRUCTURE  
SCALE 1:20

| DIMENSIONS FOR STRUCTURE WITH DIFFERENT DIA. PIPES |         |         |         |
|--|---------|---------|---------|
|  | 450x300 | 450x450 | 600x300 |
| A  | 300mm   | 150mm   | 150mm   |
| B  | 150mm   | 150mm   | 150mm   |
| C  | 150mm   | 150mm   | 150mm   |
| D  | 150mm   | 150mm   | 150mm   |
| E  | 150mm   | 150mm   | 150mm   |
| F  | 150mm   | 150mm   | 150mm   |

| MANHOLE COVER SLAB REINFORCING BENDING SCHEDULE |      |     |            |
|---|------|-----|------------|
| L   | B    | d   | SECTIONARY |
| 1250  | 1250 | 150 | R1@200mm   |
| 1500  | 1500 | 175 | R1@200mm   |
| 2000  | 1500 | 200 | R1@200mm   |
| 2500  | 2000 | 225 | R1@200mm   |

| MEASUREMENTS AND REINFORCING FOR JUNCTION BOX |      |     |            |
|---|------|-----|------------|
| L   | B    | d   | SECTIONARY |
| 1250  | 1250 | 150 | R1@200mm   |
| 1500  | 1250 | 175 | R1@200mm   |
| 2000  | 1500 | 200 | R1@200mm   |
| 2500  | 2000 | 225 | R1@200mm   |

| PIPE CLASSES FOR PIPES UNDER ROADWAYS |            |      |      |      |      |      |      |      |      |
|---------------------------------------|------------|------|------|------|------|------|------|------|------|
| Ø (mm)                                | COVER (mm) |      |      |      |      |      |      |      |      |
|                                       | 0.5        | 1.0  | 1.5  | 2.0  | 2.5  | 3.0  | 3.6  | 4.0  | 4.5  |
| 100                                   | 100        | 100  | 100  | 100  | 100  | 100  | 100  | 100  | 100  |
| 150                                   | 150        | 150  | 150  | 150  | 150  | 150  | 150  | 150  | 150  |
| 200                                   | 200        | 200  | 200  | 200  | 200  | 200  | 200  | 200  | 200  |
| 250                                   | 250        | 250  | 250  | 250  | 250  | 250  | 250  | 250  | 250  |
| 300                                   | 300        | 300  | 300  | 300  | 300  | 300  | 300  | 300  | 300  |
| 350                                   | 350        | 350  | 350  | 350  | 350  | 350  | 350  | 350  | 350  |
| 400                                   | 400        | 400  | 400  | 400  | 400  | 400  | 400  | 400  | 400  |
| 450                                   | 450        | 450  | 450  | 450  | 450  | 450  | 450  | 450  | 450  |
| 500                                   | 500        | 500  | 500  | 500  | 500  | 500  | 500  | 500  | 500  |
| 550                                   | 550        | 550  | 550  | 550  | 550  | 550  | 550  | 550  | 550  |
| 600                                   | 600        | 600  | 600  | 600  | 600  | 600  | 600  | 600  | 600  |
| 650                                   | 650        | 650  | 650  | 650  | 650  | 650  | 650  | 650  | 650  |
| 700                                   | 700        | 700  | 700  | 700  | 700  | 700  | 700  | 700  | 700  |
| 750                                   | 750        | 750  | 750  | 750  | 750  | 750  | 750  | 750  | 750  |
| 800                                   | 800        | 800  | 800  | 800  | 800  | 800  | 800  | 800  | 800  |
| 850                                   | 850        | 850  | 850  | 850  | 850  | 850  | 850  | 850  | 850  |
| 900                                   | 900        | 900  | 900  | 900  | 900  | 900  | 900  | 900  | 900  |
| 950                                   | 950        | 950  | 950  | 950  | 950  | 950  | 950  | 950  | 950  |
| 1000                                  | 1000       | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 |

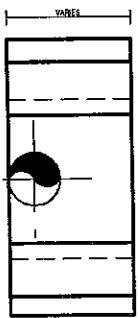
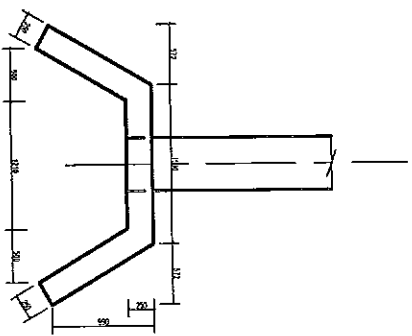
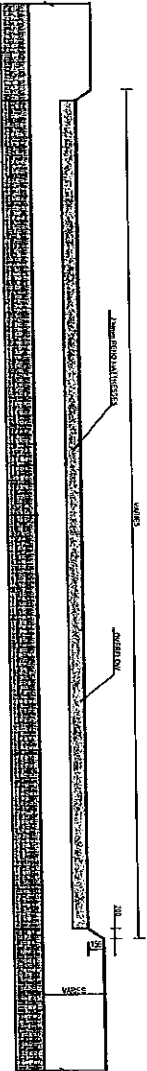
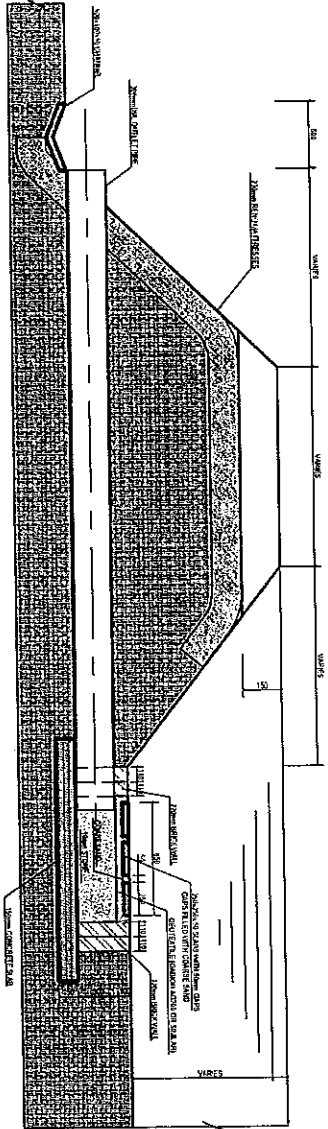
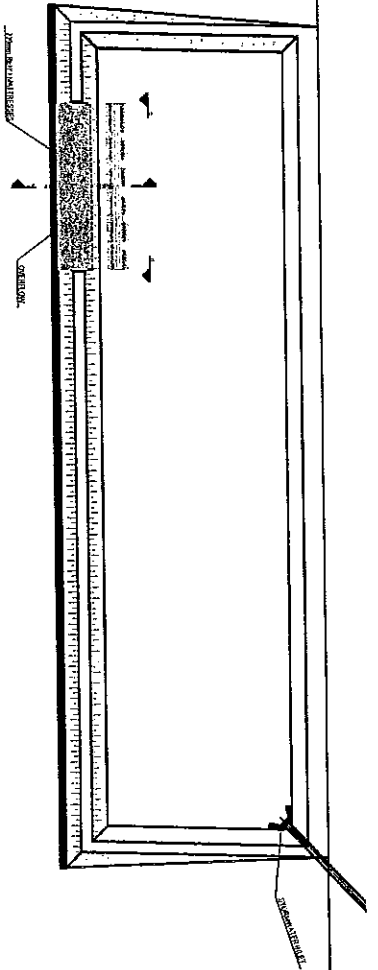


TYPICAL SECTION: JUNCTION BOX  
SCALE 1:20

- NOTES:
- CONCRETE IN SLABS MUST BE CLASS 20/25
  - WITH COVER TYPE PIPES
  - WELDED MESH: 200 REINFORCING TO BE USED IN FLOOR SLABS OF STRUCTURES
  - USE OF TOWMAYER PIPES TO BE PLACED ON BEDDED RIVERS TO BE TAKEN INTO CONSIDERATION

|              |  |
|--------------|--|
| PROJECT NAME | CIVIL ENGINEERING SERVICES<br>DELMORE PARK EXTENSION 7 |
| CLIENT       | STREETS & STOREMARTER<br>GENERAL DETAILS #2            |
| DATE         | 18/07/2013   |
| SCALE        | AS SHOWN   |
| DESIGNER     | PHOTONIA   |
| CHECKER      | PHOTONIA   |
| APPROVER     | PHOTONIA   |
| DATE         | 18/07/2013   |
| SCALE        | AS SHOWN   |
| PROJECT NAME | CIVIL ENGINEERING SERVICES<br>DELMORE PARK EXTENSION 7 |
| CLIENT       | STREETS & STOREMARTER<br>GENERAL DETAILS #2            |
| DATE         | 18/07/2013   |
| SCALE        | AS SHOWN   |
| DESIGNER     | PHOTONIA   |
| CHECKER      | PHOTONIA   |
| APPROVER     | PHOTONIA   |
| DATE         | 18/07/2013   |
| SCALE        | AS SHOWN   |





|           |  |
|-----------|--|
| NO.       |  |
| REVISIONS |  |
| DATE      |  |

SHEET SCALE AS SHOWN



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 REGISTERED CONSULTING ENGINEERS  
 No. 1870  
 Registered in New Zealand  
 Registered under the Engineering Act 2002

**CIVIL ENGINEERING SERVICES**  
**DELMORE PARK EXTENSION 7**

**STORMWATER RETENTION PONDS**  
**GENERAL DETAILS**

|             |            |      |      |
|-------------|------------|------|------|
| DESIGNED BY | ENGINEER   | DATE | BY   |
| DRAWN BY    | CHECKED BY | DATE | BY   |
| CHECKED BY  | DATE       | BY   | DATE |
| DATE        | BY         | DATE | BY   |
| DATE        | BY         | DATE | BY   |
| DATE        | BY         | DATE | BY   |

|                  |                          |
|------------------|--------------------------|
| PROJECT NO.      | 1897-E01                 |
| DATE             | 14/01/2024               |
| PROJECT NAME     | DELMORE PARK EXTENSION 7 |
| PROJECT LOCATION | DELMORE PARK EXTENSION 7 |
| PROJECT CLIENT   | DELMORE PARK EXTENSION 7 |
| PROJECT ADDRESS  | DELMORE PARK EXTENSION 7 |
| PROJECT CONTACT  | DELMORE PARK EXTENSION 7 |
| PROJECT PHONE    | DELMORE PARK EXTENSION 7 |
| PROJECT FAX      | DELMORE PARK EXTENSION 7 |
| PROJECT EMAIL    | DELMORE PARK EXTENSION 7 |
| PROJECT URL      | DELMORE PARK EXTENSION 7 |
| PROJECT WEBSITE  | DELMORE PARK EXTENSION 7 |