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16532-400-P001		DATE			

JOHANNESBURG ROADS AGENCY

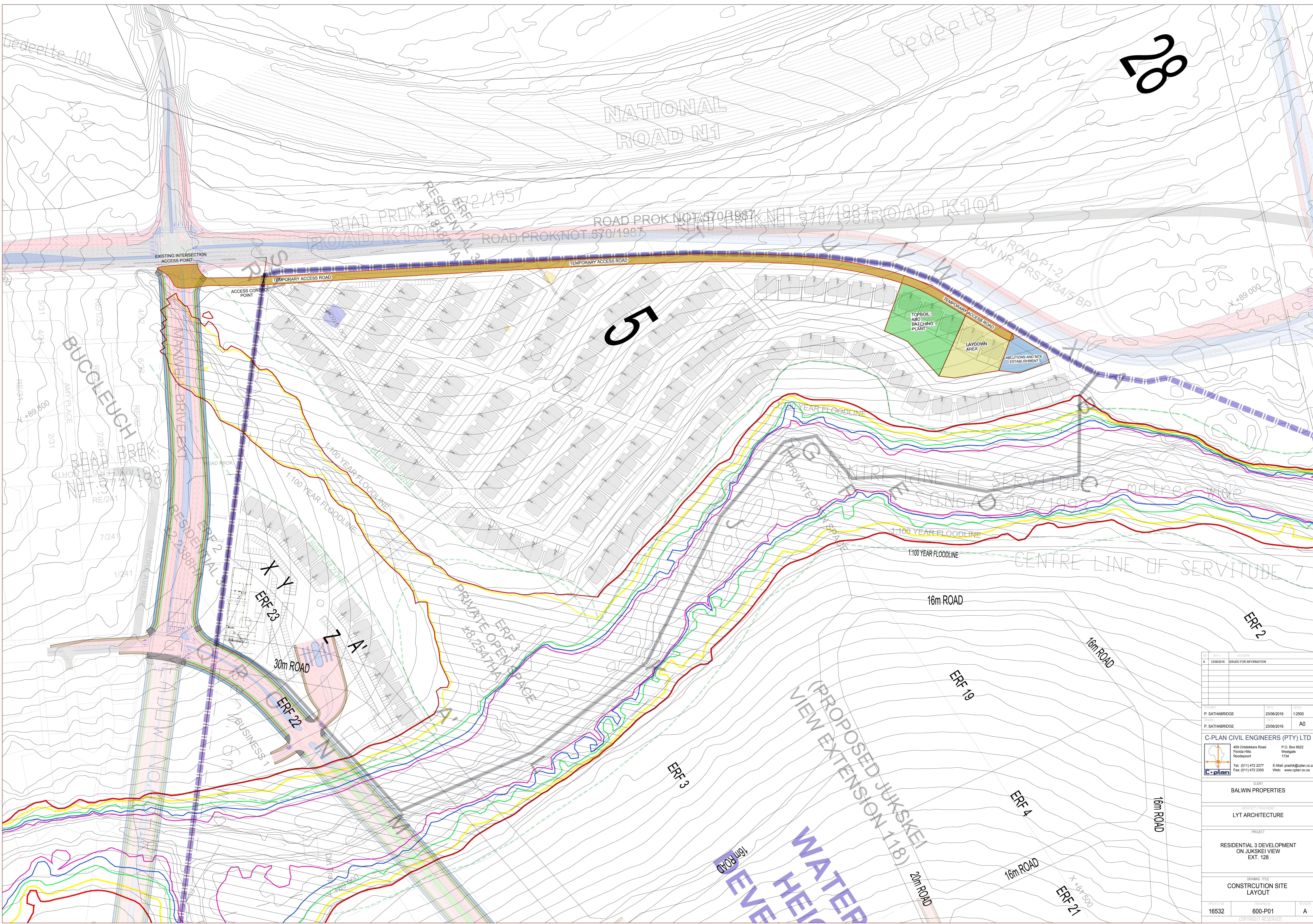
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JOHANNESBURG ROADS AGENCY

STORMWATER MANAGEMENT PLAN
FOR THE RESIDENTIAL 3 DEVELOPMENT
ON JUKESKEI VIEW EXT 128

DESIGN MANAGER	SCALE	AMENDMENTS	APPROVED	DATE	DRAWING No.
	A0	1. FOR WORKSHOP		23/06/2015	16532-400-P001
	1:1000	2. UPDATED TO THE LATEST LAYOUT		10/08/2015	
		3. LAY OUT ABOVE ATT. REMOVED FROM BUFFER AREA		06/09/2015	
DATE					SHEET 1 OF 1



28

5

ERF 2

ERF 19

ERF 3

ERF 4

ERF 21

NO.	DATE	REVISION
A	19/06/2016	ISSUED FOR INFORMATION

PREPARED BY	DATE	SCALE
P. SATHABRIDGE	23/06/2016	1:2500
P. SATHABRIDGE	23/06/2016	A0

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CLIENT
BALWIN PROPERTIES

PROJECT / DRAWING
LYT ARCHITECTURE

PROJECT
RESIDENTIAL 3 DEVELOPMENT ON JUKSKEI VIEW EXT. 128

DRAWING TITLE
CONSTRUCTION SITE LAYOUT

DRAWING NO.	PROJECT NO.	REVISION
16532	600-P01	A

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Method Statement: Kikuyu Development Road bridge construction (Please refer to Outline Services Report for location and details)

1. Installation of working platform across the river with flow pipes to provide access for construction of the foundations for the pier and right abutment, and staging for the deck. The platform would preferably be rock fill to minimize river contamination and allow for better river flow across the platform. Otherwise it would consist of a granular material approved by the environmental authority with rock fill or sand bags around the platform perimeter to minimize contamination and protect the platform against erosion.
2. Due to the lack of information regarding the founding depth it is still uncertain what type of foundation would be required for the pier and abutments. Footings will be dowelled and founded in hard rock.
3. The pier and abutment walls should have the shuttering and concreting done within the platform limits.
4. The falsework supporting the deck shutters should rest on the platform and the platform should be wide enough to prevent concrete from falling into the river.
5. After the deck is constructed the platform should be completely removed, together with the pipes, and the river reinstated back to the same conditions as prior to the construction.
6. As an alternative the culverts will be ordered pre-cast and placed on a 500mm reno mattress founded on hard rock

Method Statement: Kikuyu Development Water and sewer Crossing (Please refer to Outline Services Report for location and details)

1. A water line is to be constructed within confines of the bridge construction, the water line is to be placed in the fill to be placed on top of the culverts, no additional impeding on the wetland is expected from the water construction
2. A second proposed water option is proposed, this is to tie into the recently constructed 250mm dia water line in Bridal Veil avenue close to Afrisam's old entrance along the K101
3. A sewer line is to be constructed to cross the water course close to the bridge and water crossing. The sewer line will cross by means of stills constructed, spanning the 100 year flood extent with 2 piers placed strategically as to not impede on the 5 year recurrence.

PROJECT : **KIKUYU, JUJSKEI VIEW X128**
CONTRACT : ELECTRICAL & ASSOCIATED SERVICES
SCHEDULE : ELECTRICAL & COMMS CABLES
METHOD STATEMENT FOR BRIDGE CROSSINGS
DATE : 2nd NOVEMBER 2016
REF : S:\3900_3999\3965 Waterfall Heights\Corresp\method statement_bridge crossings.docx

1. Bridge Cable Pipe Ducts

- 1.1 Cables crossing within bridges shall be installed in PVC/PE pipes. The axial spacing of the pipe ducts shall be at least equal to the cable spacing on the direct-buried sections.
- 1.2 The internal diameter of the pipe shall be as follows:
 - a) For MV & LV cables – 160mm diameter pipes
 - b) For Comms cables – 110mm diameter pipes
- 1.3 All pipe ducts shall have a minimum surround of 75 mm of concrete to prevent collapsing or deformation after cable installation. The concrete strength shall be at least 15 MPA.
- 1.4 The points of cable entry or exit of pipe ducts are susceptible to ground subsidence and therefore where cables enter or exit pipes they shall be supported on rot-proof bags containing a weak sand-cement mix (30:1) for a distance of approximately 0,5 m into the trench.
- 1.5 Pipe ducts shall, where possible, project a minimum of 1 m beyond the bridge lines so as to completely clear the surface of the bridge.
- 1.6 All pipe ducts shall be sealed until the cable is installed.
- 1.7 Before commencing to draw a cable into a pipe duct, a cylindrical wire brush followed by a mop and a close-fitting mandrel shall be drawn through to clean out any dirt and ensure that the pipe duct has not collapsed.
- 1.8 Pipe ducts over 3 m in length shall be filled with a bentonite and water mix (10:1) that is combined with a sand and cement mix (20:8) in the ratio of 100:1. The mix shall be kept in position by sealing the end of the pipe duct where the cable enters and exits. Pipe ducts under 3 m in length shall be filled with backfill material.
- 1.9 Spare pipe ducts shall be installed for road, railway, river and other service crossings. The number of spare pipe ducts shall be determined by the Project Engineer.
- 1.10 Spare pipe ducts shall always be sealed at the ends to prevent ingress of water, vermin and backfill material.

2. Cable installation

- 2.1 Contractors installing cable shall be in possession of all parts of SANS 10198 and shall work according to that code of practice and this standard. Where a situation arises that is not covered by SANS 10198 or this standard, the contractor shall consult the Project Engineer.
- 2.2 Cable crossing within bridges shall be installed in pipe ducts.
- 2.3 Prior to cable pulling, pipe ducts shall be fitted with bellmouths at both ends to prevent damage to the cable and a suitable lubricant shall be applied to the inside of the pipe.

2.4 Prior to cable pulling, the cable shall be inspected for damage and both ends checked to verify that the cable ends were suitably capped. Damaged or uncapped cable shall not be installed.

2.5 Prior to cable pulling, the cable inner end shall be cut free from the cable drum flange.

2.6 The cable outer end shall be fitted with either a cable pulling sock or a cable pulling eye.

NOTE A cable pulling sock applies tension to the cable outer layers, and may sometimes result in stretching or sliding of these layers over the insulated cores. This can happen with impregnated paper-insulated cables. A cable pulling eye applies tension directly to the conductors, and is preferred for larger cables or longer pulling lengths. A combination between both types of pulling system is often used.

2.7 A swivel (fitted with a bearing to reduce friction) shall be used between the pulling rope and the cable pulling sock or pulling eye.

2.8 When nose pulling the cable, the pulling tension shall not exceed the manufacturers recommendations.

2.9 Cables shall be pulled either by hand (only where the conditions are suitable and by using a team and leader) or by using a winch.

2.10 When a winch is used, it shall be fitted with a reliable and accurate dynamometer whether the cable is nose pulled or bond pulled and it shall be monitored throughout the pull.

2.11 Cable rollers shall be carefully positioned in the trench in the line that the cable is to follow. The rollers shall be spaced so that there is no appreciable cable sag between rollers. A spacing of 2 m is normally suitable but this distance shall be reduced if appreciable sagging is seen to occur. Where appropriate, skid plates or corner rollers shall be used.

2.12 Laid cable that is not immediately jointed or terminated (whether prior to being laid, already laid, still on the cable drum or in transport) shall be sealed by means of cable end caps.

NOTE Only in emergency conditions (i.e. only if no end caps or heat shrink equipment is available) may 'DENSO' tape be used to temporarily seal the end of a cable. If DENSO tape has been used, the cable shall be capped within 24 hours.

2.13 Cable end caps shall be inspected for damage prior to and after cable laying. Damaged end caps shall be removed and replaced.

2.14 Cable outer sheaths damaged during installation shall immediately be repaired using a cable repair sleeve.

ANNEXURE F:

WETLAND REHABILITATION AND INTEGRATED WATER QUALITY AND QUANTITY MONITORING AND MANAGEMENT PROGRAMME



REHABILITATION PLAN

Proposed Jukskei View Extension 128

November 2016

Compiled by:

Dashentha Moodley

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1. Introduction

Bokamoso Landscape Architects and Environmental Consultants CC was appointed by **Balwin Properties Limited** to assist with the Section 21 Water-use License occurring on A Part of the Remaining Extent of Portion 1 of the Farm Waterval 5 IR.

1.1 Project Description

The proposed residential development will cover an area of 14.05671 ha in extent. The proposed development will consist of the following land uses in the township: Erven 1 and 2 are to be zoned Residential 3, and Erf 3 is to be named Private Open Space. The development proposal is for a secure, medium cost affordable housing and "special" erven for various purposes. The proposed development can be regarded as a private township with roads and private open spaces.

The development overall falls within the Department of Water and Sanitation's (DWS) regulated area, i.e. the 1:100 year floodline, or riparian habitat, whichever is the greatest, and/or within a 500m radius from the boundary of a wetland.

The proposed development includes the following activities:

- ✚ Three Erven are proposed in the Township. Erven 1 to 3 are to be zoned "Residential 3", and Erf 3 is to be zoned private open space;
- ✚ Access to the development will be through the use of a proposed road off Maxwell Drive. The proposed access road with an associated storm water culvert to form a part of the crossing, will traverse the stream and associated wetland that is located on the southern portion of the site. This watercourse crossing will require the construction of a bridge over the watercourse;
- ✚ A 160mm uPVC sewer pipeline will traverse the watercourse area. The 200mm sewer mains that will be connected to the Bruma Outfall sewer will be located outside of the 1:100 year floodline.
- ✚ A new 200m water pipeline will be connected adjacent to the existing council water main water pipeline. This will constitute a river crossing; and
- ✚ The attenuation feature will be located on the footprint of the historical dam with the embankments and the footprint still visible in the riparian zone. The idea is for storm water management for this development is to entail smaller pipes that are evenly

distributed throughout the study area and the aim is achieve maximum energy dissipation and reduce erosion.

2. Study Area

2.1 Geographical area

The site lies to the east of the N1 Freeway and the K101, of which both run from a north to a south direction. The site is abound by the proposed K60 to the north and the K101 to the west. To the south the site is bound by Maxwell Drive which will be extended to the east in the future. The co-ordinates for the site lies at **26° 06' 28.79" S and 26° 06' 29.96" E**. The study area is approximately 14. 05671 ha in extent and is situated in the area of jurisdiction of the City of Johannesburg Metropolitan Municipality, Gauteng Province.

(Refer to Figure 1, the Locality Map; Figure 2, the Aerial Map)

See **Figure 1** for Locality map and **Figure 2** for a satellite image of the Study Area.

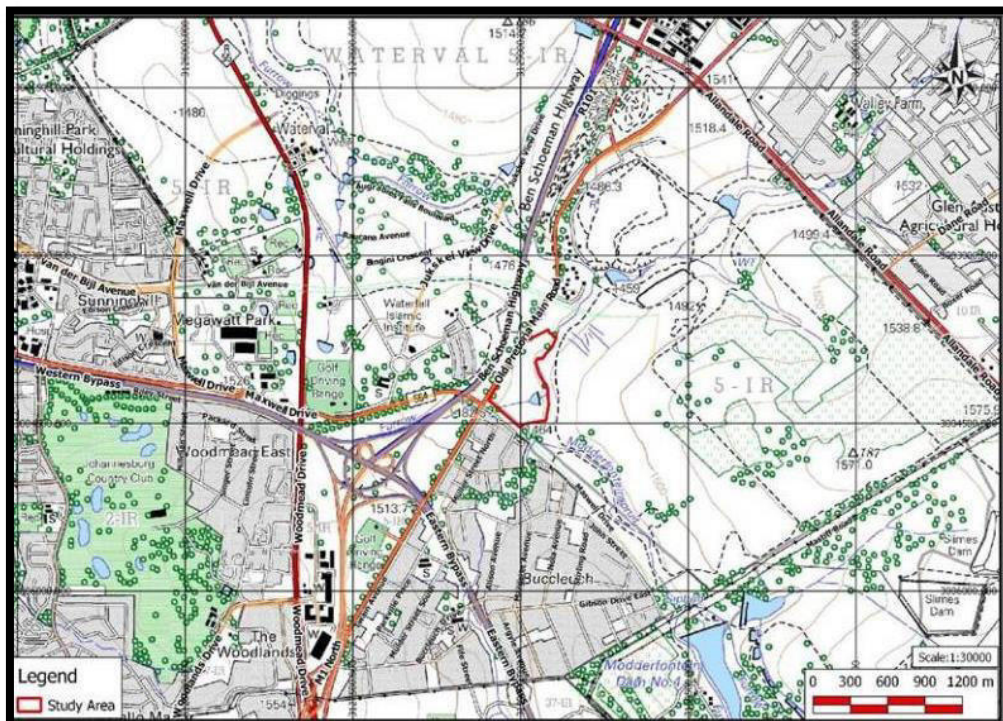


Figure 1: Study Area Locality Map

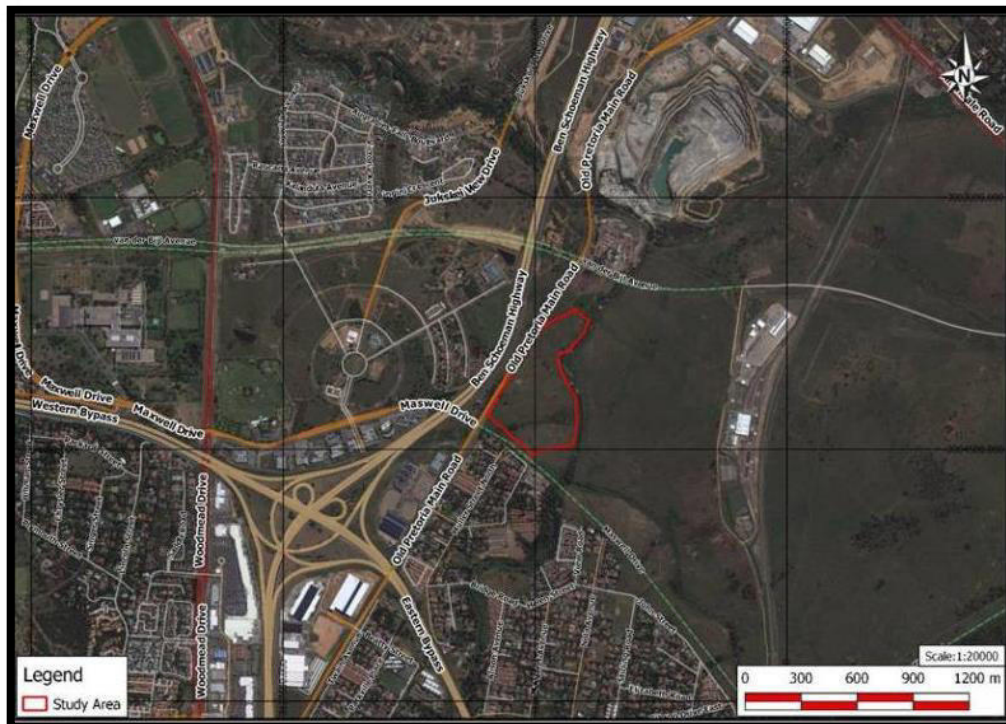


Figure 2: Aerial map

2.2 Wetland Assessment

The site contains a channelled valley bottom wetland that has been categorized with a Present Ecological Status of C which indicates that the wetland is moderately modified, however, with some loss of natural habitat. This PES score of C is due to the stream that enters the Jukskei River which is currently in a critically modified state due to its reduced water quality.

Recommendations made by the specialist:

- The delineated wetland be excluded from the development;
- Due to the hydrology of the area, a buffer zone will be considered insignificant as it will contribute very limited protection of the wetland, and should be removed.
- The main focus should be placed on rehabilitation and upgrading of the watercourse.
- The development should focus on the rehabilitation of the wetland and maintenance and sustenance of its functionality.

- It is integral to further note that development should always be designed outside of the floodlines in order to reduce the risk of flooding. This is due to the fact that wetlands on the Halfway House granite dome cannot attenuate flooding.

2.3 Biodiversity Area

The study area falls within the area designated as Egoli Granite Grassland situated in the Grassland Biome. Two study units were identified on the study site which includes Grassland and a drainage Line cutting through it. Approximately 23% of the remainder of Portion 1 of the Farm Waterval 5IR has a high sensitivity in terms of flora with 77% of the surface area having a low sensitivity. The proposed 22 ha development layout caters for 8 ha of private open space with the purpose of protecting sensitive environments occurring on site.

The development site has been identified as 'Irreplaceable' according to the GDARD C-Plan 3.3 due to the occurrence of the Orange List species *Hypoxis hemerocallidea* which were recorded in abundance in the study site and identified as having a moderate sensitivity according to the Flora Assessment.

Although the development site is covered by Egoli Granite Grassland, a vegetation unit which is considered endangered, its isolation from natural grassland on neighbouring sites is not favorable to its continued pristine status and is deemed to have a **low sensitivity**. The drainage line on the other hand remains connected with the Jukskei River system.

It is recommended that the relocation of the Orange List species *Hypoxis hemerocallidea* be implemented prior to construction. A suitably qualified flora specialist should assist with the relocation of this species.

3. Rehabilitation Plan development process

This Rehabilitation Plan was compiled in accordance with the Department of Water and Sanitation (DWS) **Environmental Best Practice Specifications** Integrated Environmental Management Series.

The DWS defines Rehabilitation as:

'Making the land useful again after a disturbance. It involves the recovery of ecosystem functions and processes in a degraded habitat. Rehabilitation does not

necessarily re-establish the pre-disturbance condition, but does involve establishing geological and hydrologically stable landscapes that support the natural ecosystem mosaic.'

4. Rehabilitation Methodology

The purpose of this rehabilitation plan is to improve the ecological status of the study area compared to the pre-construction status, to prevent erosion, and to improve the aesthetic appeal of the area.

The objective of this rehabilitation plan is to ensure:

- All construction infrastructure is removed post construction;
- Ensure environment is reinstated in disturbed areas;
- Compacted areas are shaped, ripped and scarified;
- Indigenous vegetation is reintroduced;
- Alien vegetation is removed and controlled;
- Site is monitored following rehabilitation; and that
- The development is sustainable overall contributing to and ensuring that the open space systems are rehabilitated.

4.1 Areas to be rehabilitated

All areas disturbed during the implementation of all associated infrastructure are to be rehabilitated. These areas include but are not limit to:

- River bed and banks;
- Channelled valley bottom wetland feature; and
- Riparian zone.

Please take note that as per the recommendation made in the Final Basic Assessment Report, a separate rehabilitation plan should be compiled for purposes of rehabilitating the bridge once the type of bridge structure has been finalized.

4.2 Rehabilitation Methods

4.2.1 Cleaning

All building rubble, waste and weeds are to be removed.

4.2.2 Shaping/Sloping

All slopes should be shaped to a maximum slope of 1:3 to prevent erosion from occurring, and for the safety of humans and animals.

All disturbed areas should be sloped to blend in with the surrounding environment.

4.2.3 Ripping/ Scarifying

Ripping entails loosening the soil up to a depth of 300mm.

Scarifying entails roughening the surface of soil to a depth of 50mm, creating a smoother surface than ripping.

Areas compacted during construction phase should be ripped and scarified in order to loosen soil to allow for seed germination.

4.2.4 Planting/Re-vegetate

Re-vegetation is a very important part of sloping as it will make the soil more stable and create roughness. Planting can be affected by utilising transplanted plants, nursery plants, seed or seedlings.

4.2.5 Stabilisation

Slopes steeper than 1: 3 or slopes where the soils are sandy, must be stabilised.

One or more of the following methods may be required:

- Topsoil covered with a geotextile, plus a specified grass seed mixture;
- A 50:50 by volume rock:topsoil mix 200mm thick, plus a specified grass seed mixture Logging or stepping (logs placed in continuous lines following the contours);

- Earth or rock-pack cut-off berms;
- Benches (sand bags);
- Packed branches;
- Ripping and / or scarifying along the contours;
- Storm water berms.

4.2.6 Landscaping

The constructed residential development and associated infrastructure need to be rehabilitated in such a way so as to fit harmoniously into the surrounding environment by means of landscaping.

It is proposed that the residential area be designed with recreational pedestrian walkways and street furniture along the river. The idea is to make the river frontage area an attractive and aesthetically appealing area that are used by humans for late afternoon strolls and for the general enjoyment of the natural open space. On-going rehabilitation and maintenance works adjacent to the river also forms part of the development plan.

Please take note the landscaping proposed for the watercourse area can be used and/ or implemented for the areas associated with the development that are not open space areas.

The following are proposed to be used as landscaping along the development:

- Indigenous trees and flowers are to be planted along the parking area and along the river edges;
- Boulder rocks are recommended to be placed along the river edges which can assist with erosion control;
- As a form of recreation, benches can be placed around the river area to allow residents to enjoy the scenery of the private open space;
- The walkways are recommended to be edged with dump rock stone to create a more natural and aesthetic appeal of the development overall; and
- It is recommended that green pockets with indigenous plants and flowers be implemented between the residential stands, allowing for a more natural and satisfying appeal of the development.

It is integral to note that landscaping in general should aim to compliment the surrounding natural vegetation and should belnd in with the local vegetation. Landscaping effects that is in harmony with the natural vegetation will both reduce the visual impacts associated with the development and it will also create a more natural habitat for flora and fauna.

4.3 Rehabilitation Action Plan

Rehabilitation actions to be taken together with assigned responsibility are listed in **Table 1** below.

Table 1: Rehabilitation Actions and Responsibility

#	Rehabilitation Action	Method	Responsibility
1	Remove building rubble of construction work activities and any other from the river and from the site	All building rubble generated during the construction phase of the project, as well as building rubble are to be removed from site and disposed of at a registered landfill site with prior permission from the Local Municipality.	Civil contractor/ Environmental Site Officer
2	De-establish site camp	The site camp is to be de-established by removing all construction plant, equipment, storage containers, fencing, ablution, etc.	Civil contractor/ Environmental Site Officer
3	Remove and dispose of all waste generated during construction phase	Domestic waste to be removed to a registered landfill site. Hazardous waste to be removed to an appropriately classed h: landfill site. Ablution (chemical toilets) facilities to be emptied and contents disposed of at a registered and properly functioning sewage treatment works. Clear the site of all inert waste and rubble, including surplus rock, foundations and batching plant aggregates.	Civil contractor/ Environmental Site Officer

#	Rehabilitation Action	Method	Responsibility
4	Clean up river and riparian zone	Any rubble visible on the banks of the river and the wetland area should be collected and disposed of at a registered landfill site.	Civil contractor/ Environmental Site Officer
5	Cap disturbed areas with topsoil	<p>Topsoil stockpiled during the construction phase should be returned to disturbed areas for the purpose of capping. Disturbed areas include but are not limited to site camp area, watercourse area.</p> <p>Topsoil should be returned prior to onset of the wet season.</p> <p>Topsoil should be returned to the same area as from which it was stripped.</p> <p>Replace topsoil to the original depth.</p> <p>All areas of disturbed and compacted soils need to be ripped and re-profiled.'</p> <p>Where the implementation and/ or laying of infrastructure such as cable lines or pipelines are, the area or trench is to be refilled, thereafter rehabilitation is to occur.</p>	Civil contractor Site Manager
6	Slope/Shape embankments	Slopes are to be no steeper than 1:3. Shape all disturbed areas to blend in with the surrounding landscape.	Civil contractor Site Manager
7	Rip and scarify compacted areas	<p>Once topsoil has been returned, area is to be ripped and scarified.</p> <p>Areas compacted during construction phase should be ripped in order to loosen soil to allow for seed germination.</p> <p>Do not rip and scarify during wet conditions as soil will not break up.</p> <p>Rip and scarify along contours to prevent creation of channels which could lead to erosion.</p>	Civil contractor Site Manager

#	Rehabilitation Action	Method	Responsibility
8	Stabilise embankments/slopes	<p>Slopes steeper than 1:3 or slopes where the soils are sandy, must be stabilised.</p> <p>One or more of the following methods are recommended:</p> <ul style="list-style-type: none"> • Topsoil covered with a geotextile, plus a specified grass seed mixture; • Ripping and / or scarifying along the contours; • Gabions. 	Landscape contractor
9	Planting/Re-vegetation of open and sloped areas	<p>All planting is to be conducted by a suitably qualified contractor.</p> <p>Planting method suggested for this project is hydroseeding as it will be best for the sloped areas and is known to be a successful method. This is the most cost effective method for rehabilitation of large areas as all surfaces are covered and vegetation quality is high.</p> <p>Rehabilitated areas needs to have a ground cover of at least 80%.</p> <p>Only seed or seedlings indigenous to the area should be used for planting.</p> <p>Any materials used for seeding, mulching or fertilizing must be certified as weed free.</p> <p>Plants should be irrigated daily for at least 14 days until the grass is able to survive independently.</p>	Civil contractor Site Manager
10	Remove alien invasive vegetation	<p>All alien invasive vegetation encountered within the Study Area and along the riparian zone should be removed. Section 5 describes a recommended alien invasive monitoring programme.</p> <p>A number of alien invasive species occur within the Study Area especially along disturbed areas e.g. clearings, excavations and dirt tracks.</p>	Civil contractor/ Environmental Site Officer

4.4 Timeframe for implementation

Implementation of this plan should commence immediately following completion of the construction phase of the proposed construction activities, and should be concluded within three (3) months. If practical, rehabilitation should commence immediately following completion of a specific section e.g. bridge construction, rather than rehabilitating the entire study area upon completion of all construction or expansion activities. It is also recommended that rehabilitation be planned for completion prior to the onset of the rainy season i.e. during late winter and early spring.

If practical, rehabilitation should commence immediately following completion of a specific section rather than rehabilitating the entire study area upon completion of all construction activities. It is also recommended that rehabilitation be planned for completion prior to the onset of the rainy season i.e. during late winter and early spring.

4.5 Vegetation species to be utilised

Due to the study area being classified as the Egoli Granite Grassland with tall grass species such as *Hyparrhenia hirta* dominating the area, it is recommended that vegetation species endemic to this area be utilised for rehabilitation. Below follows a list of plant species associated with the Egoli Granite Grassland.

Small trees:

- *Diospyros lycioides*, *Celtis africana*

Tall shrubs:

- *Searsia pyroides* and *Dichrostachys cinerea*

Low shrubs:

- *Elephantorrhiza elephantina*, *Tephrosia capensis* var. *capensis*

Graminoids (grasses):

- *Themeda triandra*, *Aristida congesta*, *Cymbopogon caesius*

Herbs:

- *Gladiolus crassifolius*, *Chlorophytum transvaalense*, *Helichrysum nudifolium*, *Hilliardiella oligocephala*, *Hypoxis hemerocallidea*, *Hypoxis rigidula*, *Ledebouria ovatifolia*

5. Alien vegetation eradication

An alien invasive eradication and monitoring programme is recommended for the study area for all phases of the construction activities as this will promote biodiversity in the area and limit the distribution of alien invasive species via water and human activity.

The purpose of the eradication of alien invasive plants is the restoration and rehabilitation of the study area.

Methods that may be used to control alien invasive species include:

- Mechanical treatment
 - Removing by means of hands, tools, instruments or machines.
- Chemical treatment
 - Using herbicides to control target species.
- Biological treatment
 - Using natural enemies of the target specie that affect the biological integrity of the target specie.
- Habitat management
 - Using burning, grazing etc.

Actions to be taken as part of an alien vegetation eradication programme are listed in **Table 2** below. Responsibility for implementing this eradication programme will resort with the appointed Civil Contractor.

Table 2: Alien plant eradication programme

#	Eradication Action	Method
1	Set aside funds for implementation of the programme	During the planning phase of the project, the project budget should cater for alien plant eradication.
2	Establish extent of infestation	Request alien vegetation specialist to conduct survey of the Study Area and adjacent watercourse prior to construction commencing in order to establish: <ul style="list-style-type: none"> • Extent of infestation; • Species to be eradicated.
3	Select treatment method	An appropriate treatment method based on species occurring in the Study Area should be selected.
4	Remove alien vegetation	Alien vegetation removal should commence in areas of highest infestation and prior to flowering. Vegetation should be removed prior to construction commencing. Any alien vegetation spotted during the construction phase should also be removed. Following construction/expansion activities, all disturbed areas should be scouted for presence of alien vegetation, and removed.
5	Rehabilitate cleared areas	Areas where alien vegetation has been removed must be rehabilitated in accordance with this plan (Refer Table 1) .
6	Follow-up eradication	Eradication of alien vegetation must continue until natural vegetation coverage reaches 80% in all disturbed areas.

6. Rehabilitation Plan Responsibility

6.1 Implementation

It is proposed that responsibility for the implementation of this Rehabilitation Plan in accordance with its content, rests with the appointed Civil Contractor.

6.2 Monitoring

6.2.1 Monitoring Responsibility

It is proposed that the responsibility for monitoring the implementation of this Rehabilitation Plan rests with the appointed ECO.

6.2.2 Monitoring Timeframe

It is proposed that effectiveness of rehabilitation be monitored by the appointed ECO from commencement of the rehabilitation phase of the construction/ expansion, and for at least six (6) months following completion of the rehabilitation, to ensure that:

- Rehabilitation commences immediately following completion of the construction phase;
- 80% of endemic vegetation has re-established;
- Alien plant eradication continues until 80% of the endemic vegetation has re-established.

7. REFERENCES

1. Department of Water Affairs & Forestry, February 2005. **Environmental Site Management & Rehabilitation Awareness Course Memorandum: Management Level.** Integrated Environmental management Sub-Series No. IEMS 1.6. Third Edition. Pretoria
2. Department of Water Affairs and Forestry, February 2005. **Environmental Best Practice Specifications: Construction.** Integrated Environmental Management Sub-Series No. IEMS 1.6. Third Edition. Pretoria.

**INTEGRATED WATER QUALITY AND QUANTITY MANAGEMENT AND MONITORING
PLAN (IWQQMMP) FOR THE PROPOSED JUKSKEI VIEW EXTENTION 128 RESIDENTIAL
DEVELOPMENT**

Author: Bokamoso Landscape Architects and Environmental Consultants CC

Date: November 2016

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1) INTRODUCTION AND BACKGROUND

The purpose of this Integrated Water Quality and Quantity Management and Monitoring Plan (IWQQMMP) is to supply the Proposed Jukskei View Extension 128 Residential Development with a dynamic, holistic and integrated system and process management tool aimed at the detection and remediation of adverse environmental impacts, pollution prevention and minimization at source, managing the impact of pollution and waste on the receiving environment and remediating damaged environments.

The plan also serves as a framework to ensure efficient, appropriate, affordable, economical and sustainable use and development of water resources and includes the management of wastes that have the potential to impact on the water resource, in such a manner that it promotes the conservation of water resources, and general health and safety.

In terms of Section 21 of the National Water Act (Act No. 36 of 1998) (NWA), the developer must obtain a water use license for any activity that will pose an impact to the water resource, should that activity impede or divert the flow of water in that water course, or if the activity leads to the alteration of the morphology of the river bed, banks, course and its characteristics (water quality, habitat, biota and the flow regime).

2) DESCRIPTION OF THE PROPOSED DEVELOPMENT

The proposed residential development will cover an area of 14.05671 ha in extent. The proposed development will consist of the following land uses in the township: Erven 1 and 2 are to be zoned Residential 3, and Erf 3 is to be named Private Open Space. The development proposal is for a secure, medium cost affordable housing and “special” erven for various purposes. The proposed development

can be regarded as a private township with roads and private open spaces. The proposed development will be known as Jukskei View Extension 128.

Bokamoso Landscape Architects and Environmental Consultants CC was appointed for the Basic Assessment (BA) and Water Use Licence Application (WULA), required for the proposed Jukskei View Extension 128 Residential Development.

3) PROPERTY DESCRIPTION

3.1 Location

The site lies to the east of the N1 Freeway and the K101, of which both run from a north to a south direction. The site is bound by the proposed K60 to the north and the K101 to the west. To the south the site is bound by Maxwell Drive which will be extended to the east in the future. The co-ordinates for the site lies at $26^{\circ} 06' 28.79''$ S and $26^{\circ} 06' 29.96''$ E. The study area is approximately 14. 05671 ha in extent and is situated in the area of jurisdiction of the City of Johannesburg Metropolitan Municipality, Gauteng Province.

Refer to Figure 1, Locality map and Figure 2, Aerial Map of the Study Area.

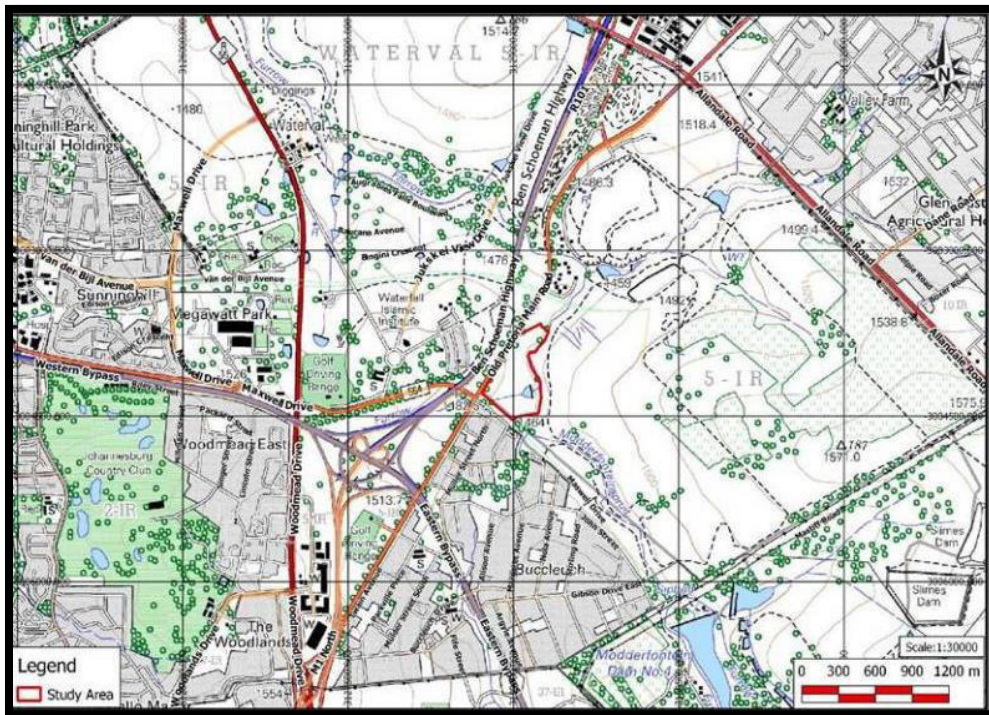


FIGURE 1: Locality Map

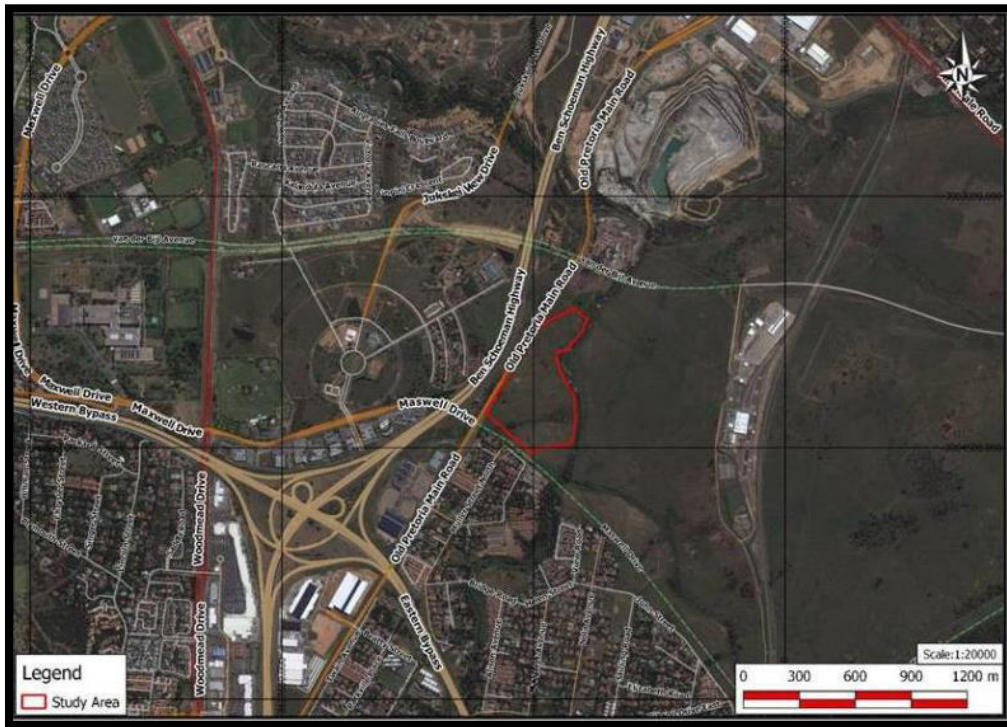


FIGURE 2: Aerial Map

The Study Area is furthermore situated within the Department of Water and Sanitation's **A21C Quaternary Catchment Area**, which covers a total area of 816,5km² and falls within the **Crocodile (west) and Marico Management Area**.

4) SECTION 21 WATER-USE LICENSE APPLIED FOR

This study site is affected by the 1:100 year flood line, the riparian habitat, whichever is the greatest, and is within a 500m radius from the boundary of a wetland. There is one prominent drainage feature namely the Jukskei River and a distinct channelled valley bottom wetland.

Balwin Properties Limited is applying for the following Section 21 Water-Uses:

- ✚ **Section 21(c):** 'Impeding or diverting the flow of water in a watercourse'
- ✚ **Section 21 (i):** 'Altering the bed, banks, course or characteristics of a watercourse'

4.1 Section 21 (c) 'Impeding or Diverting the Flow of Water in a Watercourse'

There are specific activities that will lead to the impedance or diversion of the flow of water in the Jukskei River and the associated wetlands. Such activities includes a bridge crossing for an access road, a culvert crossing, a sewer pipeline crossing and a water pipeline crossing.

The **access road** will be traversing the Jukskei River and associated wetland.

The proposed access road will cross the stream and associated wetland located on the southern portion of the site.

The stream located on the southern portion of the site flows west to east into the Jukskei River which is located to the east of the site. The proposed development will require the construction of a bridge over the watercourse.

A **storm water and/ or culvert crossing** will form a part of the access road crossing.

An **attenuation feature** will be located on the footprint of the historical dam with the embankments and the footprint still visible in the riparian zone. The idea is for storm water management for this development is to entail smaller pipes that are evenly distributed throughout the study area and the aim is achieve maximum energy dissipation and reduce erosion. This will be achieved by a man-made biological filtering system consisting of a combination of smaller rocks or stones and certain wetland vegetation.

Sewer pipelines will be implemented to control and manage the sewage reticulation system for the development. The sewer pipelines however will be within the extent of a watercourse as pipeline river crossings.

A 160mm sewer pipeline will traverse the watercourse.

A new Ø200 mm **water pipeline** will be laid next to the existing council water main from the intersection of Argyle Ave (Bucleuch) and the northern boundary of Frankenwald Ext 27. This new Ø200 mm water main will connect into the existing Ø400 mm water main.

4.1.1 Implications associated with Water-Use Activity Section 21 (c) Water Use

- The protection and sustenance of the wetland on the site;
- The impacts brought about by the proposed activities which can have a detrimental impact on the integrity and sustainability of the wetlands;
- Should erosion, siltation and storm water not be effectively managed, these factors can have detrimental effects to the lower lying drainage features;
- As per the Wetland Delineation Assessment conducted by Bokamoso's Specialist's Division, it is recommended that the wetland be excluded from the development, and that attention should be placed on rehabilitation of the wetland;
- The site should be developed outside of the 1: 100 year floodline in order to reduce the risk of flooding. This is due to the fact that wetlands on the Halfway House granite cannot attenuate flooding;
- Storm water management and its related design must be implemented to ensure that the wetlands are protected, in such a manner that their integrity will not be compromised;
- The storm water will be discharged via smaller pipes that will be located just above the watercourse buffer and into stilling basins, henceforth, it is important that storm water is discharged through multiple discharge points and not via a concentrated flow;
- Impermeable surfaces can lead to an increase in the speed, quantity and quality of storm water runoff;

- Henceforth, a good storm water management plan is required to effectively control and manage storm water so as to prevent surface and ground water contamination;
- The possibility of ground water tables lowering;
- Henceforth, an appropriate groundwater monitoring strategy should be developed as a part of effective and appropriate monitoring.

4.2 Section 21 (i) 'Altering the bed, banks, course or characteristics of a watercourse'

As discussed in terms of Section 21 (c) water use, the activities will also lead to an alteration and/ or a change in the morphology of the river and its associated water quality characteristics (water quality, flow regime, habitat and biota).

4.2.1 Implications associated with Section 21 (i) Water Use

- It is imperative that monitoring of both the surface and ground water occurs and in accordance with a prescribed monitoring programme, so as to achieve effective monitoring of water quality;
- Erosion and sedimentation processes will be quite severe and can alter the characteristics of the watercourse if not appropriately managed;
- Regular monitoring of the storm water management plan, its implementation and effectiveness in terms of preventing adverse and cumulative impacts of erosion;
- Rubble dumping and sedimentation processes can further lead to an adverse effect on the aquatic biota (micro and macro invertebrates) and this can be quite detrimental if not appropriately managed.

5. OBJECTIVES OF THE INTEGRATED WATER QUALITY AND QUANTITY MANAGEMENT AND MONITORING PLAN (IWQQMMP)

Water pollution management:

- To manage, prevent, reduce, control and remediate surface water and groundwater pollution from all identified sources.
- To ensure that the quality of water needed to maintain ecological functions is protected, so that human use of water does not individually or cumulatively compromise the long-term sustainability of aquatic and associated ecosystems.

Land and/ or soil pollution management:

- To manage, prevent, reduce and control soil pollution linked to water quality management;
- To adopt an integrated approach to soil quality management; and
- To manage, prevent, reduce and control soil pollution problems arising from a range of other sources, for example, from the construction camp site brought on by the waste, hazardous material, and chemical storage facilities.

This IWQQMMP addresses the following three phases of the development:

- Pre-construction planning phase;
- Construction phase; and
- Operational phase.

Monitoring

In order for the IWQQMMP to be successfully implemented all the role players involved must have a clear understanding of their roles and responsibilities in the project.

These role players may include the delegated environmental authorities (A), Balwin Properties (BP), the Environmental Control Officer (ECO), Project Manager (PM), Contractors (C), and the Environmental Site Officer (ESO), Landowners, interested and affected parties and the relevant environmental and project specialists are also important role players.

Roles and responsibilities

Balwin Properties (BP)

Balwin Properties (BP) is ultimately accountable for ensuring compliance with the IWQQMMP and conditions contained in the S21 WUL issued by the DWS. BP must appoint an independent Environmental Control Officer (ECO)¹, for the duration of the pre-construction and construction phases, to ensure compliance with the requirements of the RoD, the Environmental Management Plan (EMP), the Storm Water Management Plan (SMP), the IWQQMMP and any other applicable plans or guidelines approved by the involved authorities in terms of the applicable environmental legislation. The ECO must become part of the project team and in order to ensure integrated planning and management, the

ECO must oversee the project throughout all the development phases (planning, construction and post-construction phases).

Project Manager (PM)

The Project Manager is responsible for the coordination of various activities and must ensure compliance with this IWQQMMP through the distribution of the IWQQMMP to the contractors (main contractors and sub-contractors). The monthly ECO report will monitor the contractors' compliance with the IWQQMMP and these monthly reports will also be distributed to the Project Manager on a monthly basis for perusal. If non-compliance is detected, the Project Manager will ensure that the necessary remediation steps are taken.

¹ This is also a condition of the Environmental Authorisation. The same ECO can be used for the S21 WUL compliance monitoring

Environmental Control Officer (ECO)

An independent Environmental Control Officer (ECO) shall be appointed by BP for the duration of the pre-construction, construction and operational phases of the development (including the installation of the services and the bulk infrastructure), to ensure compliance with the requirements of this IWQQMMP as well as with any other guidelines and plans approved in terms of any other relevant environmental authorization.

Contact details of appointed ECO: Details will be sent when appropriate ECO is appointed.

- The ECO shall ensure that the contractors are aware of all the specifications pertaining to the project.
- Any damage to the environment must be repaired immediately after consultation between the ECO, Developer, Consulting Engineer and/ or any other relevant professional consultant and Contractor. If immediate action is not possible, timeframes must be determined and supplied to the ECO and temporary measures must then be implemented to avoid any damage and/ or any further damage to the environment.
- The ECO shall ensure that the developer staff and/or contractor are adhering to all stipulations of the IWQQMMP.
- The ECO shall be responsible for monitoring the IWQQMMP throughout the project by means of site visits, meetings and written correspondence. This monitoring aspect should be documented as part of the site meeting minutes.
- The ECO shall monitor the implementation of an environmental training program.
- A post construction environmental audit is to be conducted to ensure that all conditions in the IWQQMMP have been adhered to.

Environmental Site Officer (ESO)

BPL must appoint an Environmental Site Officer (ESO) for general assistance with daily compliance monitoring. The ESO can be an employee of BPL and must monitor the day-to-day construction and operating processes.

Contractor (C):

The contractors shall be responsible for ensuring that all activities on site are undertaken in accordance with the environmental provisions detailed in this document and that the sub-contractor and laborers are duly informed of their roles and responsibilities in this regard. The contractor will be required, where specified to provide a method statement setting out in detail how the management actions contained in the IWQQMMP will be implemented. The contractors and appointed sub-contractors will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the environmental regulations.

Authority (A):

The authorities are the relevant environmental departments that issued the Environmental Authorization, the Water Use licenses and that approved all the guidelines and plans (including the IWQQMMP) to be implemented during the development phases (pre-construction, construction and operational phases) of the proposed abattoir expansion and upgrading process.

In order to ensure compliance with the relevant guidelines and plans (including the IWQQMMP), the relevant authorities must review the monthly audit and/ or compliance reports compiled and submitted by the ECO. In the case of non-compliance, the relevant authorities must make remediation recommendations or take the necessary action to prevent any damage and/ or further damage to the environment. The relevant authorities should also undertake regular site visits. In the case of this project, the relevant authorities are the Gauteng Department of Agriculture and Rural Development (GDARD) and the Department of Water and Sanitation (DWS). DWS will mainly oversee compliance with the requirements

of the water license that were issued and with the IWQQMMP, and GDARD will mainly oversee compliance with the Record of Decision (RoD) and the EMP.

Lines of Communication

The ECO in writing should immediately report any breach of the IWQQMMP and the Conditions of the Section 21 WUL issued to the Project Manager. The Project Manager should then be responsible for rectifying the problem on-site after discussion with the contractor. Should this require additional cost, then BPL should be notified immediately before any additional steps are taken.

Reporting Procedures to the Developer

Any pollution incidents must be reported to the ECO immediately (within 12 hours). The ECO shall report to BP on a regular basis (site meetings).

Site Instruction Entries

The site instruction book entries will be used for the recording of general site instructions as they relate to the works on site. There should be issuing of stop work order for the purposes of immediately halting any activities of the contractor that may pose an environmental risk.

ESO (Environmental Site Officer) Diary Entries

Each of these books must be available in duplicate, with copies for the Project Manager and BP. These books should be available to the authorities for inspection or on request. All spills are to be recorded in the ESO's diary.

Methods Statements

Method statements from the contractor will be required for specific sensitive actions on request of the authorities or ESO. All method statements will form part of the IWQQMMP documentation and are subject to all terms and conditions contained within the IWQQMMP document. For each instance wherein it is

requested that the contractor submit a method statement to the satisfaction of the ESO, the format should clearly indicate the following:

- What - a brief description of the work to be undertaken;
- How - a detailed description of the process of work, methods and materials;
- Where - a description and/ or a sketch map of the locality of work; and
- When - the sequencing of actions with due commencement dates and completion date estimate.

The contractor must submit the method statement before any particular construction activity is due to start. Work may not commence until the method statement has been approved by the ESO and the DWS.

Record Keeping

All records related to the implementation of this management plan (e.g. site instruction book, ESO diary, methods statements etc.) must be kept together in an office where it is safe and can be retrieved easily. These records should be kept for two years and should be available at any time for scrutiny by any relevant authorities.

6. INTEGRATED WATER QUALITY AND QUANTITY MANAGEMENT AND MONITORING PLAN

Water Management during the Pre-construction / Planning Phase.		
General	Construction activities should preferably take place during the winter months. If it is not possible for construction activities to take place during the winter months, construction activities should take place in phases in order to prevent large exposed areas that will cause an increase in the speed of surface water.	ESO, Contractor, Sub-contractor
	Develop a management plan to ensure a clean-water environment during all phases of the project. The service of a suitably qualified engineer is essential in the planning phase.	Civil Engineer
	<p>Address the concerns and complaints of the affected parties regarding the ground water issues.</p> <ul style="list-style-type: none"> ✚ All remedial action should be done in close liaison with the Department of Water and Sanitation (DWS). ✚ Should an accidental spill occur, construction activities should be ceased temporarily, until the spill has been cleaned up. ✚ The liabilities and proposed preventative and remedial actions will also have to be quantified. <p>Ensure that all surface water and storm water related EMP's are adhered to.</p>	BP, Contractor, ECO
Water Management of Surface Water	Plan to ensure that all contractors that are employed on site are aware of their responsibilities with regard to water pollution prevention according to the requirements of the National Water Act, 1998 (Act 36 of 1998).	BP, Contractor, ECO
	Plan to ensure that there is an effectiveness of measures to prevent pollution of surface water bodies.	ECO
	Take water samples of water bodies that will receive surface water run-off from the study area prior to the construction phase. This information will act as baseline information for the construction and operational phases.	BP, Contractor, ECO
	No raw sewage or other pollutants such as plastic, oil, cement, etc. will be allowed to pollute water.	BP, Contractor, ECO
	Bio-swale and bio-filters could be installed to minimize the risk of pollutants entering the natural drainage system of the area.	BP, Contractor, ECO
	Attenuation ponds and energy dissipaters must be installed on the study area to break the speed of the water and to act as siltation ponds.	BP, Contractor, ECO
	All excess runoff structures must end up in the infiltration structures (thereby ensuring maximum groundwater recharge).	Civil Engineer

	Plan to slope ground surfaces in such a way that no ponding occurs.	Engineer, Contractor, ECO
	The engineer must place emphasis upon the design of drainage and retention systems that provide for efficient use of water quality. Drainage and storm water retention systems should, when possible, be incorporated.	Civil Engineer
Surface Water – Storm Water Management	A Storm Water Management Plan indicating the management of all surface runoff generated as a result of the development prior to entering any natural drainage system or wetland, must be submitted and approved by the local authority and DWS.	BP
	The SWMP should be designed in a way that aims to ensure that post development runoff does not exceed predevelopment values in: <ul style="list-style-type: none"> ▪ Peak discharge for any given storm; ▪ Total volume of runoff for any given storm; ▪ Frequency of runoff; and ▪ Pollutant and debris concentrations reaching water courses. 	Civil Engineer
	Design all storm water structures (and other surface water flow modifications) in such a manner that the impact on the natural systems is minimized. Keep in mind that increased runoff invariably results from increased bare surfaces.	Civil Engineer
	When storm water planning is done, every attempt possible should be made to keep the post construction and pre-construction flows similar.	Civil Engineer
	Storm water outlets shall be correctly designed to prevent soil erosion. Construction guidelines shall be provided for the prevention and restriction of erosion and siltation.	Civil Engineer
	It is imperative that the development should be constructed in such a way that minimum velocities in storm water runoff are created.	Civil Engineer
	Adequate surface and sub-surface drainage should be provided prior or during development of the site to ensure that no build-up of storm water will occur.	Civil Engineer
Water Management of Underground Water	Ground water contamination and/ or pollution is a preliminary issue identified, and it is imperative that it be monitored as there could be other water bodies that are dependent on it as a source of water that feeds into their system.	BP, ECO
	Ensure that all activities that may possibly affect ground water are performed in accordance with the requirements of the National Water Act, 1998 (Act 36 of 1998), DWS and the Local Authority.	BP
	Plan for adequate chemical toilets to be used by contractors during the construction phase, and these toilets are to be placed at least a 100m from the edge of a watercourse.	Contractor, ECO
	The storage and handling of lubricants, oils, paint and material such as cement must be provided for as part of the different contractor's contracts.	ECO

	Specially demarcated and secure storage facilities must be provided for and such storage areas should be clearly illustrated on the master layout plan.	
Water Management during the Construction Phase.		
Water Management of Surface Water	Take water samples of water bodies that will receive surface water during the construction phase on a monthly basis. These samples will be compared with baseline samples taken during the planning phase and monthly samples taken during the construction phase to detect surface water pollution. Consult with DWS and the contractor if water pollution is detected and put an action and/ or a rehabilitation plan in action.	BP, ECO, ESO
	Ensure that contractors are aware of their responsibilities as far as water pollution is concerned in terms of the requirements of the National Water Act, 1998 (Act 36 of 1998). It will be imperative to monitor their activities. It is suggested that a penalty clause be inserted in the contracts to enable the applicant to take the necessary rehabilitation measures in case of non-compliance.	BP, ESO, ECO, Contractor
	Maintain the surface water management infrastructure. The section of the SWMP that supplies guidelines and specifications for temporary storm water management during the construction phase must be implemented.	BP, Contractor
Water Management of Surface Water – Storm Water Management	A SWMP must be compiled for the proposed development. This section of the report must address the management of all surface runoff generated as a result of the construction phase prior to entering any natural drainage system or wetland, and taking cognizance that storm water must be treated to an acceptable level, prior entering the water course.	BP, Engineer
	Surface storm water generated as a result of construction phase must not be channeled directly into any natural drainage system or wetland.	Engineer
	Where necessary, temporary storm water diversion measures are recommended to control peak flows during thunder storms.	Civil Engineer
Water Management of Underground Water	Ensure that all construction activities that may possibly affect ground water are performed in accordance with the requirements of the National Water Act, 1998 (Act 36 of 1998), DWS and the Local Authority.	Contractor, ECO
	Ensure that adequate chemical toilets are available and are used by contractors during the construction phase - the provision and maintenance of which must form part of the contractor's liabilities.	ECO
	The storage and handling of lubricants, oils, paint, and material such as cement must be provided for as part of contractor's contracts. Specifically	ECO