AQUATIC CONSTRAINTS ANALYSIS & DWS RISK ASSESSMENT MATRIX FOR THE PROPOSED WRENCHVILLE PHASE 2 LOW-COST HOUSING DEVELOPMENT, KURUMAN, NORTHERN CAPE PROVINCE.

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GLOSSARY

Catchment	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flow into a river, wetland, lake and/or ocean or contributes to groundwater.
Delineation (wetland)	The process of determining the boundary of a wetland based on soil, vegetation and/or hydrological indicators.
Ecoregion	An Ecoregion is an "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise the region".
Facultative species	Species usually found in wetlands (76% - 99%) but occasionally also found in non-wetland areas.
Gleying	A soil process resulting from prolonged soil saturation which is manifested by the presence of natural grey, bluish or greenish colours in the soil matrix.
Groundwater	Subsurface water in the saturated zone below the water table.
Hydromorphic soil	A soil that in its undrained condition is saturated or flooded long enough to develop anaerobic conditions favouring the growth and regeneration of hydrophytic vegetation (vegetation adapted to survival in anaerobic soils).
Hydrology	The study of the occurrence, distribution and movement of water over, on and under the land surface.
Hydromorphy	A process of gleying and mottling resulting from the intermittent or permanent presence of excess water in the soil profile.
Indigenous vegetation	Vegetation occurring naturally within a specific area.
Mottles	Soils with variegated colour patterns are described as being mottled, with the "background colour" referred to as the matrix and the spots or blotches of colour referred to as mottles.
Obligate species	Species almost always found in wetlands (>99% of occurrences).
Seasonal zone of wetness	The zone of a wetland that lies between the Temporary and Permanent zones and is characterised by saturation from three to ten months of the year, within 50cm of the surface.
Temporary zone of wetness	The outer zone of a wetland characterised by saturation within 50cm of the surface for less than three months of the year.
Watercourse	In terms of the definition contained within the National Water Act, 1998 (Act 36 of 1998) a watercourse means: • A river or spring; • A natural channel which water flows regularly or intermittently; • A wetland, dam or lake into which, or from which, water flows; and • Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse; • and a reference to a watercourse includes, where relevant, its bed and banks.
Wetland	"Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."
Wetland Vegetation	Broad groupings of wetland vegetation, reflecting differences in regional context, such as geology, climate, and soils, which may in turn have an influence on the ecological characteristics and functioning of wetlands.

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1. INTRODUCTION

1.1 BACKGROUND

Dietmar de Klerk from DDK Consulting was appointed by Guillaume Nel Environmental Consultants (GNEC) on behalf of COGHSTA, to undertake a Field Verification and compile an Aquatic Constraints Analysis pertaining to the proposed Wrenchville Phase 2 Low-Cost Housing Development in Kuruman, Ga-Segonyana Municipality, Northern Cape Province. The Proposed locality for the Wrenchville Phase 2 Low-Cost Housing Development is situated adjacent to the existing residential neighbourhood of Wrenchville, approximately 3.5 kilometres North-East of Kuruman's town centre.

COGHSTA is proposing to facilitate the development of the Wrenchville Phase 2 Low-Cost Housing Development on the concerned property, in order to alleviate the current housing shortage within the Ga-Segonyana Municipality's administrative area in Kuruman. Access to the concerned property will be taken off Buitekant Street within the existing residential neighbourhood of Wrenchville. Additionally, the proposed Wrenchville Phase 2 Low-Cost Housing Development will consist of numerous smaller internal access roads, although no detailed designs were available at the time of completion of this Report.

Additionally, according to the knowledge and information provided to the Author, the entire concerned property will be developed for the proposed Wrenchville Phase 2 Low-Cost Housing Development, with no rehabilitation of the surrounding areas to form part of the development proposal. Compliance Monitoring with respect to National and Provincial Legislation will be implemented and Audited by means of the approved Environmental Management Plan (EMP) if/when it gets approved. Auditing of the development proses will be undertaken by means of a suitably qualified Environmental Control Officer (ECO), to be appointed once the Development Proposal receives Environmental Authorisation (EA) from the Competent Authority.

Additionally, in terms of the Environmental Impact Assessment Regulations – National Environmental Management Act, 1998 (Act No.107 of 1998) ("NEMA"), the following activities constituted the Listed Activities as listed in Government Notice (GN) No. R 983, (GN) No. R. 984 and (GN) No. R. 985:

GN Reg No. 983 – Activity 27

The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for-

(i) the undertaking of a linear activity; or

(b) maintenance purposes undertaken in accordance with a maintenance management plan

GN Reg No. 983 – Activity 28

Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:

(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or

(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare

excluding where such land has already been developed for residential. mixed, retail, commercial, industrial or institutional purposes.

In order to identify all Aquatic Resources that may potentially be impacted by the proposed Wrenchville Phase 2 Low-Cost Housing Development in Kuruman, a 500 metre investigation zone around the study area, in accordance with Regulation 509 of 2016 as it relates the to National Water Act, 1998 (Act 36 of 1998), was used as a guide in order to assess all potential sensitivities in the receiving environment related to aquatic resources. The investigation area (500m zone around the study area) was assessed using Desktop Analyses and onsite investigation/inspection.

This Aquatic Constraints Analysis was compiled utilizing all relevant information as presented by SANBI's Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org) as well as other relevant Mapping Databases that includes the use of available Digital Satellite imagery. Following these Digital Investigations, a Field Verification was undertaken in early April 2019, in order to ground-truth these results.

1.1.2 BULK SERVICES

Lyners Consulting Engineers and Project Managers was appointed as Consulting Civil Engineers for the provision of a Civil Engineering Services Report for the proposed Wrenchville Phase 2 Low-Cost Housing Development in Kuruman. The purpose of the report was to provide background information in terms of the engineering services required for the proposed development. The report was based on the draft town planning layout, site inspections, available existing service information and liaising with additional parties including the local municipality and GLS Master Planning Consultants. All the recommendations within the report is preliminary with confirmation only after additional analysis and detail designs.

Design Criteria:

The proposed development will consist of approximately 200 residential units, with all design criteria based on the "Guidelines for Human Settlement Planning and Design", the National Building Regulation (SABS 0400), the Code of Practise: Water Supply and Drainage for Buildings (Part 1 & 2) (SABS 0252), SANS 1936-3: Development of dolomite land and will comply with the standards of the Civil Engineering Departments of the Ga-Segonyana Municipality where applicable. All funding for the proposed development will be made available by COGHSTA as part of this Level B Housing Subsidy for this proposed development.

Bulk Earthworks:

The topography's grade and the effect it would have on proposed road layout and drainage together with the size of usable area for individual erven had to be considered within the bulk earthwork design philosophy. The general slope of the proposed development will be designed with a 1% fall towards the Non-Perennial Watercourse in order to comply with the NHBRC.

Access and Roadways:

The structural design of all proposed pavement layers should provide a lifespan of minimum 20 years and the structural design of these layers are to be designed in accordance with THR4, the "Red Book" requirements and the envisaged traffic load of the proposed development. The Ga-

Segonyana Municipality's minimum design criteria requires a 10-metre-wide road reserve with a 5-metre minimum gravel top width. Keeping with the urban design philosophy, the bell mouth radii will be kept to a minimum to accommodate as many new proposed residential structures as possible. The radii will vary in size between 8 and 10 metres, with the 10 metre radii, where needed, provided to accommodate refuse disposal and fire trucks.

No preliminary geotechnical survey was conducted at the time of completion of the Preliminary Service Report, and therefore, the following road layer works are proposed for planning purposes:

Road Reserve	Gravel width / Road surface	Layer works		Verges (Insitu)	Bellmouth Radii Varies
		G4 Base	G7 Selected (sand/insitu)		
10m	5m	150mm	300mm	2.5m	8m to 10m

Water Supply:

The existing potable water supply in the surrounding Wrenchville area appears to be insufficient and will need to be upgraded in order to facilitate the proposed development. The preliminary potable water design criteria are as follows:

- Average Annual Daily Demand: **600 Litre/day per residential unit**.
- Number of proposed residential units: **200**
- Total Annual Daily Demand: **120 Kl/day**
- Fire requirements: **5.83 litre/day**
- Instantaneous Peak Factor: **7.06**
- Instantaneous Peak Flow: **15.64 L/s**
- Minimum storage requirement: **240 Kl Based on 48hr storage**

The internal potable water reticulation system will comply with the minimum requirements of the Ga-Segonyana Municipality's Engineering Department, with internal distribution network consisting primarily of HDPE PE100 PN12.5 (110mm – 160mm) pipes with individual Erf connections. Proposed pipes will be installed according to SANS 1200 and SANS 1936 with a minimum cover of 800mm above pipes not constructed within roadways or erven and 1000mm for pipes constructed within the roadways.

Sewerage:

The expected sewerage flow rates for the proposed development are as follows:

- Average Daily Weather Flow: **84 000 L/day**
- Average Dry Weather Flow per residential unit: **420 L/unit/day**
- Infiltration Factor: **15%**
- Average Wet Weather Flow (AWWF): **1.12 L/s**
- Peak Factor ("Redbook"): **3.36**
- Instantaneous Peak Wet Weather Flow Rate (IPF): **3.76 L/s**

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Currently there is no Bulk Sewerage on the perimeter of the proposed development's location, but it is proposed to tie-into a proposed new sewer outfall that will form part of the bulk service investigation for the proposed development.

The current proposal is to install a Bulk Sewer Pipeline that will run north of the proposed development's location above the 1:50 year floodline but below the 1:100 year floodline of the Non-Perennial Watercourse. The proposed manholes will however be located above the 1:100 year floodline. The proposed Bulk Sewer will pass underneath Buitekant Street through an existing Culvert, run alongside the Kuruman River (D41L-02299) in a southern direction and finally connect to the existing pump station situated next to the Kuruman River (D41L-02299) adjacent to the Bridge Crossing on Buitekant Street.

Additionally, two layouts for the Bulk Sewer is proposed with the preferred layout still dependant on future geotechnical analysis of the soil composition for both routes. Currently onsite investigations are still underway pertaining to the most feasible route for the proposed Bulk Sewer pipeline. The image below depicts the locations for both of the proposed Bulk Sewer pipeline routes. Currently the indicated yellow route diversion is the preferred alternative due to the fact that the purple route will entail excavations of up to 6 metres deep in areas containing bedrock. However, the yellow line diversion will need to pass through the existing Municipal Waste Processing Facility located north-west of the proposed development. The feasibility of this route is still being investigated. For the purpose of this Constraints Analysis and Risk Matrix, both proposed Bulk Sewer routes were taken into consideration relating to the potential impacts on surrounding Freshwater Resources.

The internal sewer reticulation system will comply with the minimum requirements of the Ga-Segonyana Municipality's Engineering Department and SANS 1936. A new sewerage system consisting of 160 mm diameter HDPE PE 100 PN 12.5 pipes are proposed with individual Erf connections also to be supplied.

Fig 1: Proposed Bulk Sewer Pipeline Layouts: Yellow Line: Preferred layout diversion subject to ongoing feasibility investigations.

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Stormwater:

The Level B Housing Subsidy, provided by COGHSTA for the proposed development, allows for aboveground reticulation only, with no allowance for underground Stormwater Reticulation. Therefore, all stormwater originating from the proposed development will be drained overland via the insitu roadside drains towards the Non-Perennial Watercourse situated north of the proposed development. All proposed Stormwater Drainage Points will be situated above the 1:100 year Floodline of the abovementioned watercourse. Please refer to the image below for reference.

Electricity Supply:

No provisions for electricity are made, as the electrification of the proposed development does not form part of the scope of services or the current Level B Housing Subsidy.

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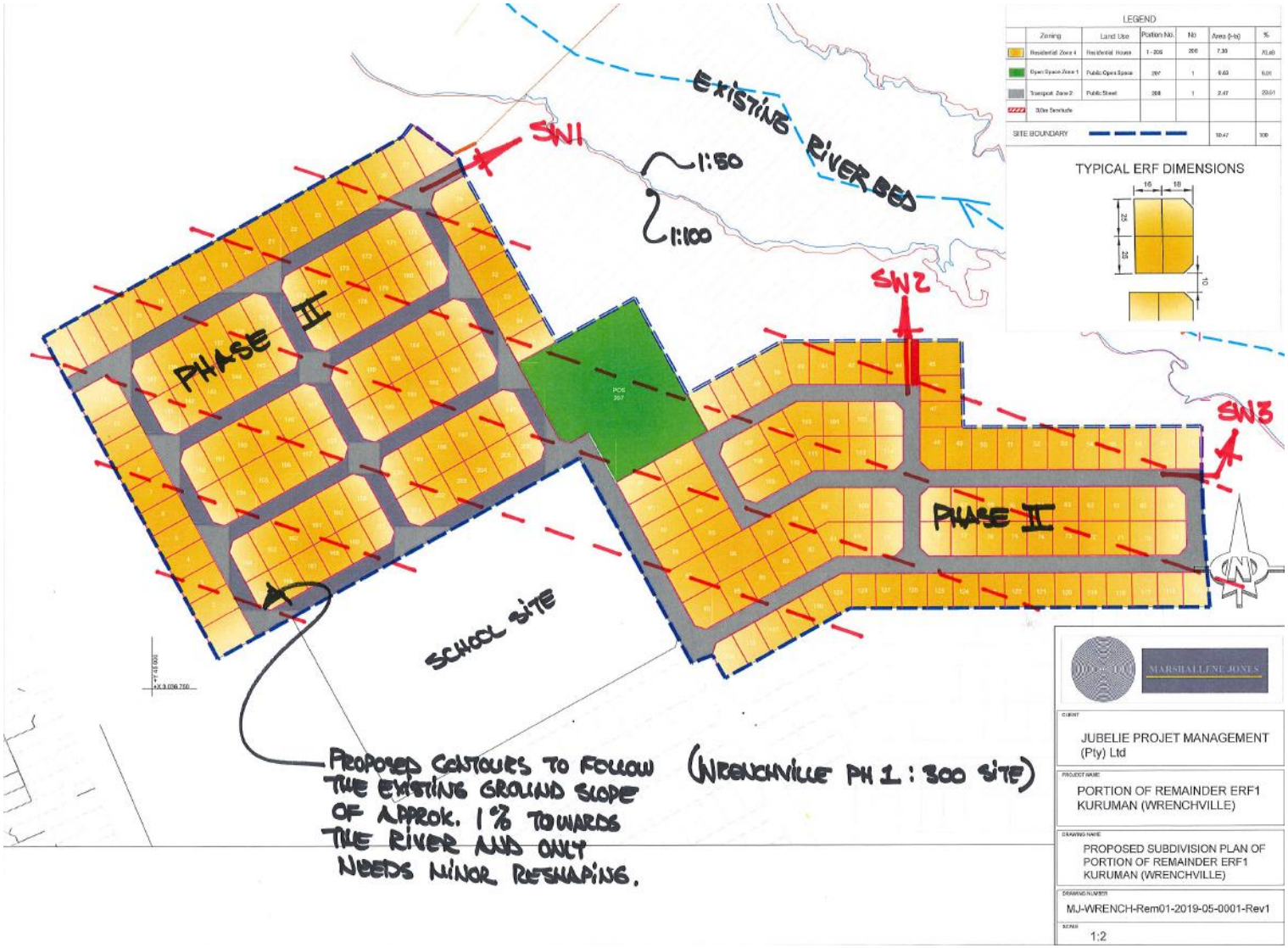

Fig 2 (above): Preliminary proposed Stormwater Drainage Points as part of the Development Proposal

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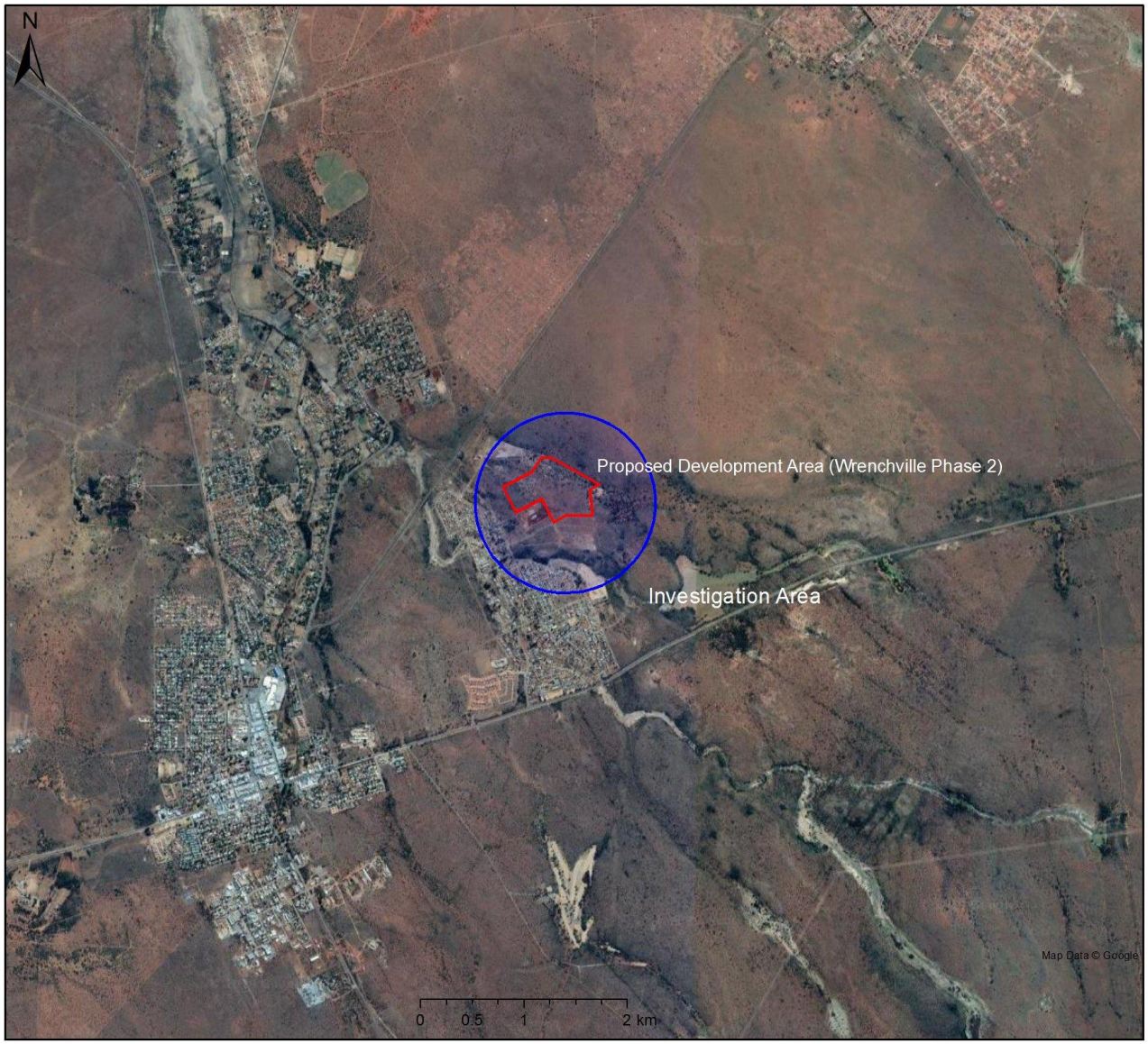
1.2 ASSUMPTIONS AND LIMITATIONS

- The Aquatic Resource Delineations as presented in this report were compiled utilising various desktop methods including the use of Topographic Maps, historical and current Digital Satellite Imagery and/or Aerial Photographs. The ground-truthing and delineation of the aquatic resource boundaries and the assessments thereof, were confided to a single site visit undertaken in early April 2019 and was undertaken as a rapid assessment for planning purposes and the delineations and assessment undertaken are not entirely definitive. All Aquatic Resources indentified within the investigation area, as per the desktop databasis are included as part of this Constriants Analysis, however, these resources were not ground-truthed nor were they delineated. This Aquatic Constriants Analysis considered the concerned study area only;
- Global Positioning System (GPS) technology is inherently somewhat inaccurate and some inacucurancies due to the use of this technology may occur, however, the delineations as provided in this report are deemed accurate enough to fulfil the requirements of this Report.
- Aquatic Resources and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to Obligate/Facultative species. Within this transitional zone, some variation of opinion on the boundaries of aquatic resources may occur. However, if the DWAF (2008) method is followed, all assessors are expected to obtain similar results; and
- Ecology being highly dynamic and complex, certain aspects (some of which may be classified as important) may have been overlooked. However, the delineations/findings contained in this report are deemed appropriately accurate to provide the necessary guidance/guidelines pertaining to the proposed development of the Wrenchville Phase 2 Low-Cost Housing Development in Kuruman, Northern Cape Province.



Wrenchville Phase 2 - Locality Map

Scale: 1:50 000
Date created: April 16, 2019

Compiled with CapeFarmMapper

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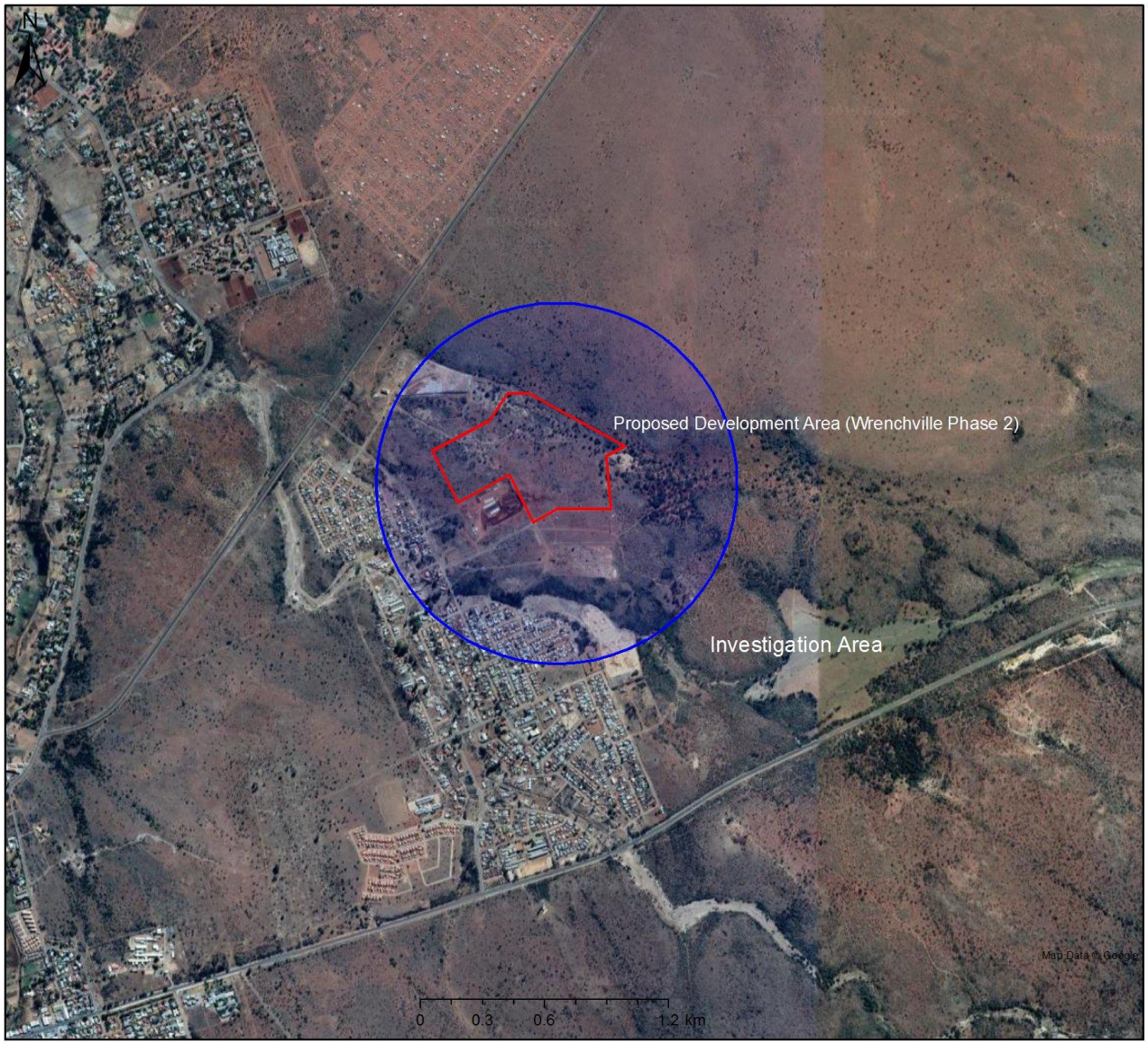

Wrenchville Phase 2 - Locality Map

Scale: 1:25 000
Date created: April 16, 2019

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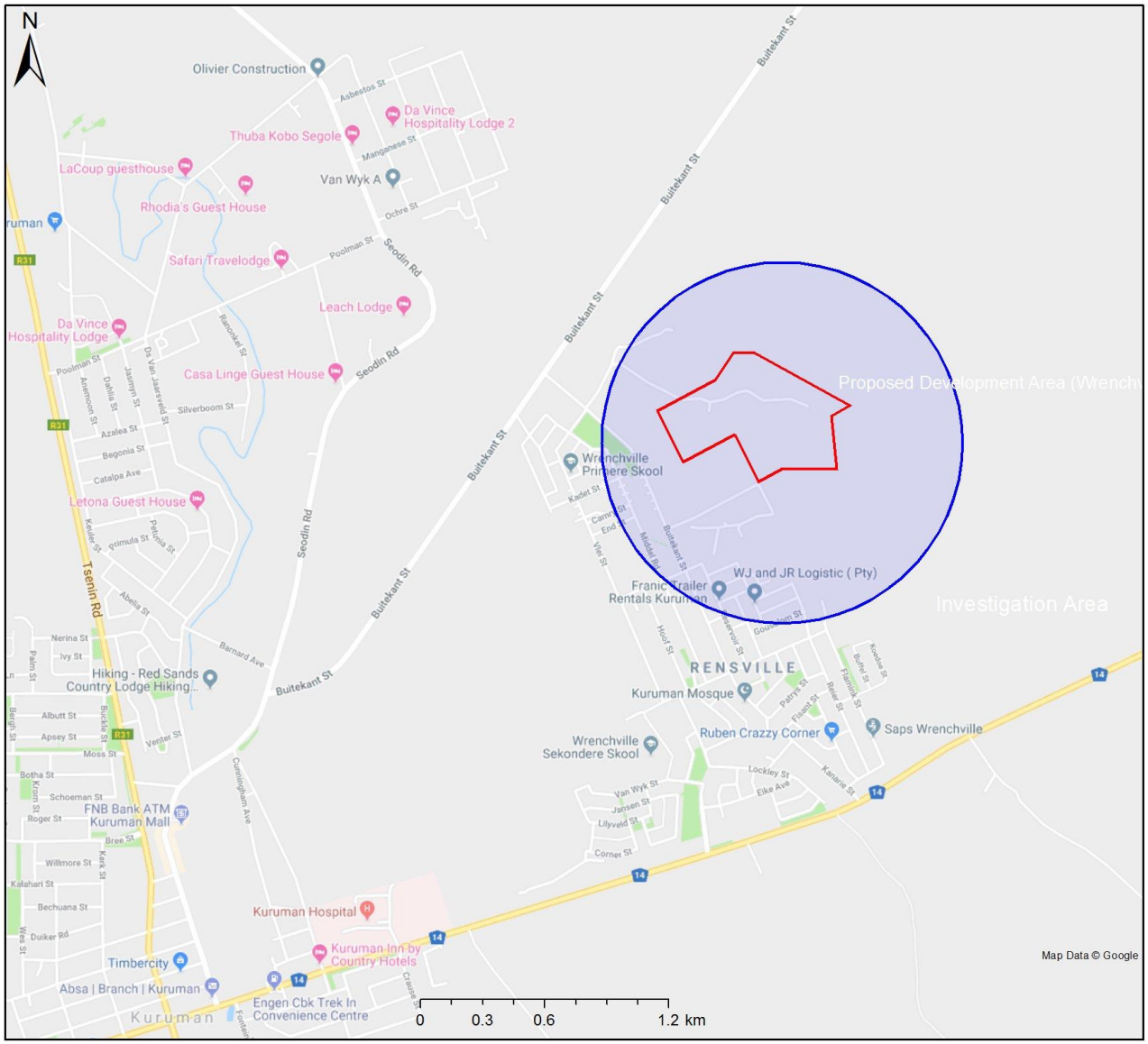

Wrenchville Phase 2 - Google Street View

Scale: 1:25 000
Date created: April 16, 2019

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2. RESULTS

2.1. DESKTOP FINDINGS

The following Tables contains data accessed as part of the Desktop Assessment. It is important to note that although all data sources used provide useful and verifiable, high quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics at the scale required to inform the EIA and/or Water Use Authorisation processes. This information is however adequate to provide a background of the concerned property with respect to numerous environmental indicators. This data was therefore utilised to guide and inform this analysis and to focus on areas of increased ecological importance during the site-specific verification survey.

AQUATIC ECOREGION AND SUB-REGIONS IN WHICH STUDY AREA IS LOCATED	
Ecoregion	Southern Kalahari
Catchment	Molopo River – Catchment ID: D
Quaternary Catchment	D41L
Area (Ha)	540 178.11
MAR (mm)	1.80
MAP (mm)	391.31
WMA	Lower Vaal
Major Rivers	Harts, Molopo and Vaal
Area (km^2)	133 880.39
Mean Annual Run-off	0.79 mm/annum

TABLE 1 (ABOVE): AQUATIC ECOREGION AND SUB-REGION OF STUDY AREA

TABLE 2 (BELOW): ECOLOGICAL STATUS OF THE MOST PROXIMAL SUB-QUATERNARY REACHES (DWS)

ECOLOGICAL STATUS OF THE MOST PROXIMAL SUB-QUATERNARY REACHES (DWS)	
Sub-Quaternary Reach	**D41L – 02299 (Kuruman River)**
Proximity to study area	Approximately 650 m South-West of Property
Assessed by expert?	Yes
PES Category Median	Category D (Largely Modified)
Mean EI Class	Low
Mean ES Class	Very Low
Stream Order	2
Default Ecological Class (based on median PES and highest EI or ES mean)	Category D (Largely Modified)
Length	13 Km
Sub-Quaternary Reach	**D41L – 02303 (Kuruman Eye)**
Proximity to study area	Approximately 2 Km West of Property
Assessed by expert?	Yes
PES Category Median	Category E (Seriously Modified)
Mean EI Class	Low
Mean ES Class	Moderate
Stream Order	1
Default Ecological Class (based on median PES and highest EI or ES mean)	C (Moderately Modified)

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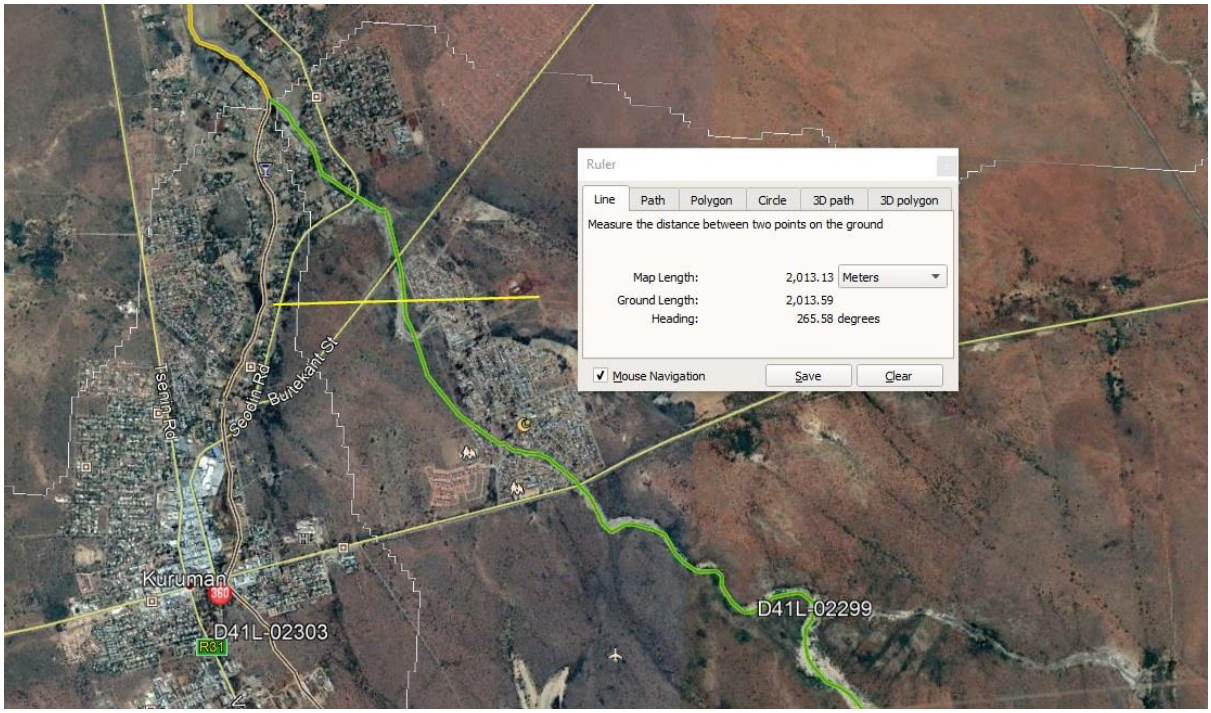

FIG 6: **D41L-02299** & **D41L-02303** Sub-Quaternary Reaches in relation to Study Area

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DETAIL OF THE STUDY AREA IN TERMS OF THE NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREA (NFEPA) (2011) DATABASE	
NFEPA Rivers	Two tributaries of the Kuruman River, D41L-0229 & D41L-02303 is situated approximately 650m (D41L-02299) and 2 Km (D41L-02303) respectfully from the concerned property. According to the NFEPA Database both D41L-02299 and D41L-02303 is considered largely natural with minor modification NFEPA Rivers (Class B), whilst the DWS PES Dataset classified the rivers as Largely and Seriously modified (Class D – D41L-02299 and Class E – D41L-02303 respectively). Please refer to Fig 5 below.
NFEPA Wetlands	(1) According to the NFEPA Database, a Natural Valley-Bottom Depression Wetland of Eastern Kalahari Bushveld Group 3 Classification is situated approximately 750 metres South-East of the defined property boundary proposed for the development of the Wrenchville Phase 2 Low-Cost Housing Development. This Natural Valley-Bottom Depression Wetland is considered to have a NFEPA Condition of AB (Natural or Good with percentage natural land cover >75%) and a NFEPA Rank of 3. (2) An additional NFEPA Database Natural Valley-Bottom Depression Wetland of Eastern Kalahari Bushveld Group 3 Classification is situated approximately 1.4 Km South of the defined property boundary proposed for the development of the Wrenchville Phase 2 Low-Cost Housing Development. This Natural Valley-Bottom Depression Wetland is also considered to have a NFEPA Condition of AB (Natural or Good with percentage natural land cover >75%) and a NFEPA Rank of 3. This Wetland System is also connected to the D41L-02299 Kuruman River. Please refer to Fig 6 below.

TABLE 3: DETAIL OF STUDY AREA IN TERMS OF THE NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREAS (NFEPA) DATABASE

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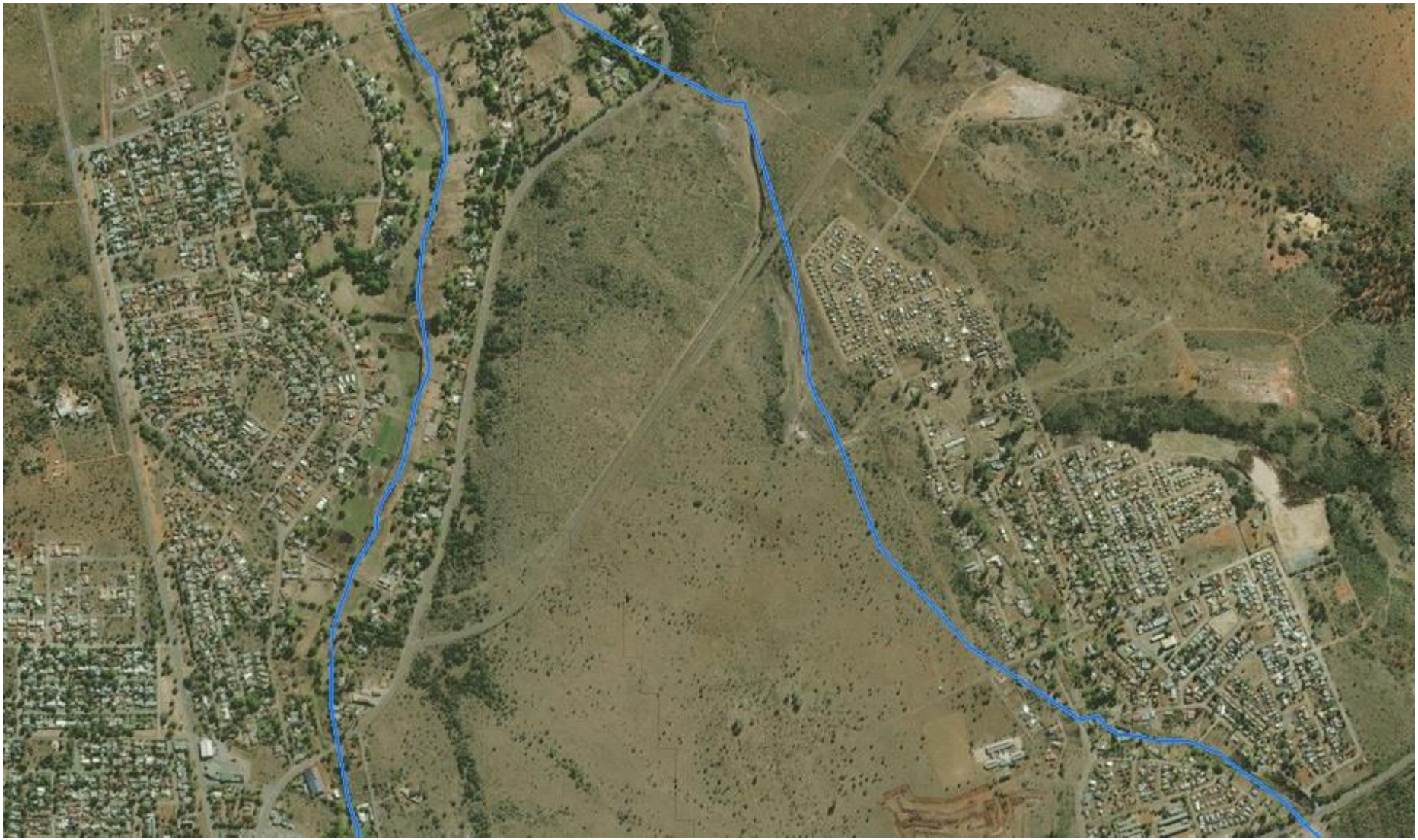

Fig 7: NFEPA Rivers Map (above)

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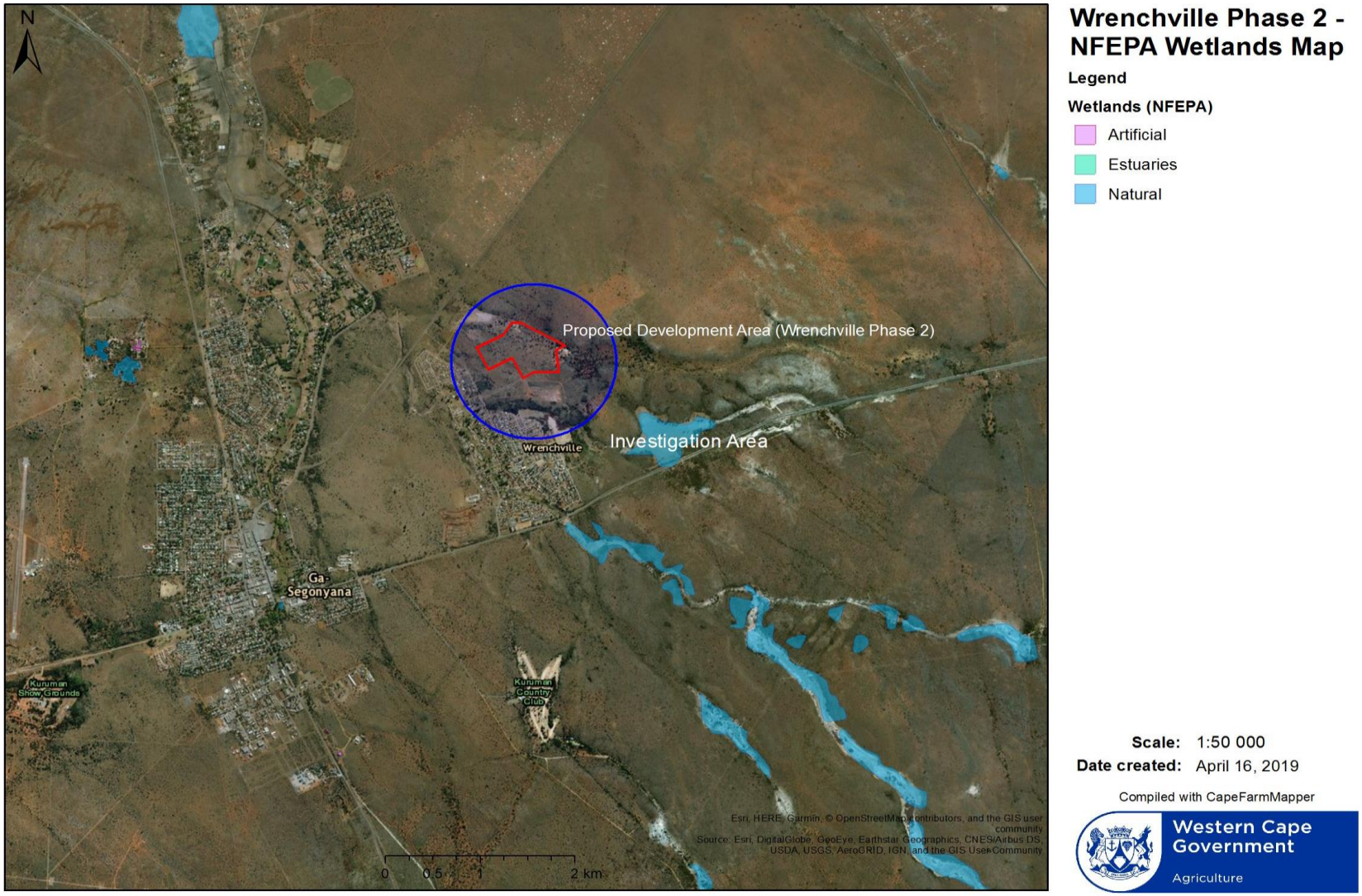

FIG 6: NFEPA Wetlands Map (above)

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CLIMATIC CONDITIONS AND TOPOGRAPHY OF STUDY AREA	
Köppen-Geiger Climate Zone	**BSh** – Hot Steppe Climate
Mean Annual Rainfall	353.00 mm
Mean Annual Temperature	17.6^{o}C
Annual Total Evaporation	1563.30 mm
Positive Chill Units May-Sept	520.70 PCU
Global Horizontal Irradiance	2184 kWh/m^2/annum
Photovoltaic Yield Static	1897 kWh/kW
Photovoltaic Yield Tracking	2205 kWh/kW
Photovoltaic Optimal Angle	28 degrees

TABLE 4: CLIMATIC CONDITIONS AND TOPOGRAPHY OF STUDY AREA

TERRESTRIAL ECOSYSTEMS AND STATUS	
Biome	Savanna
Bioregion	Eastern Kalahari Bushveld
Vegetation Type(s) Please refer to figure below	**SVk 9** – Kuruman Thornveld
Threatened Ecosystems (Critically Endangered)	None
Threatened Ecosystems (Endangered)	None
Threatened Ecosystems (Vulnerable)	None

TABLE 5: TERRESTRIAL ECOSYSTEMS AND STATUS

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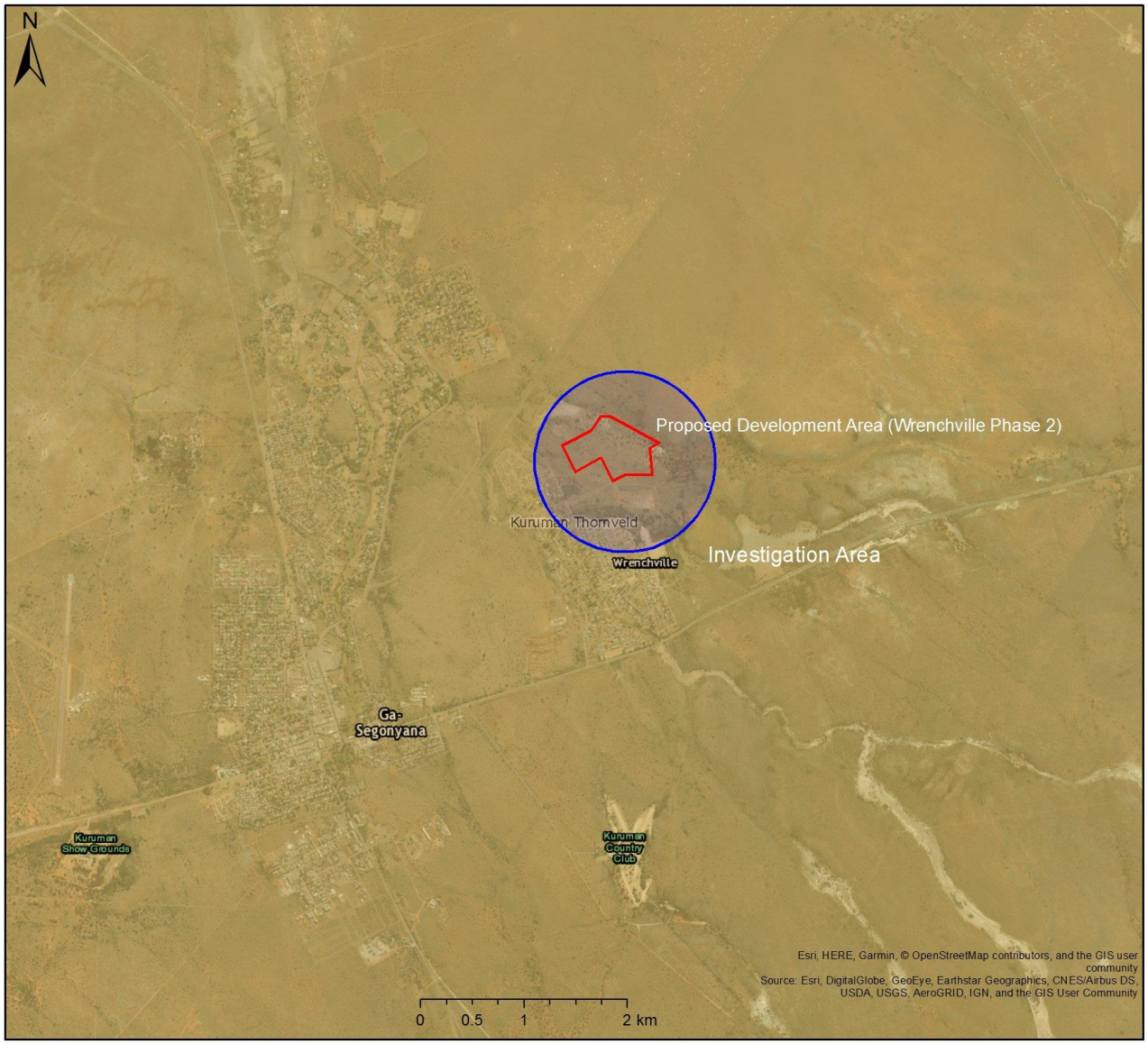

Wrenchville Phase 2 - Vegetation Map

Legend

Biomes (Low Rebelo)

- Forest
- Fynbos
- Grassland
- Nama Karoo
- Savanna
- Succulent Karoo
- Thicket

Scale: 1:50 000

Date created: April 16, 2019

Compiled with CapeFarmMapper

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2.2. SITE VERIFICATION RESULTS

A Site Visit was undertaken on 6 April 2019, during which any and all areas representing Wetland characteristics, as defined by DWAF (2008) and Watercourses defined by the National Water Act, 1998 (Act No.36 of 1998) were identified. The following indicators were utilised to assist in the determination of a defined watercourse within the concerned study area.

- Terrain Units were used to determine in which parts of the affected landscape a watercourse and/or wetland was most likely to be located;
- Surface water and/or saturated soil identification to determine if there is a permanent zone of wetness and to define the outer boundaries (temporary zone) of the watercourse and/or wetland;
- Soil form indicators to determine the presence of any soils associated with prolonged and frequent saturation together with a fluctuating water table within 50 cm of the surface. Additionally, the presence of mottling and/or gleying within the soil profile could also indicate saturated anaerobic soil conditions resulting from prolonged saturation.
- The presence of Obligate and/or Facultative wetland species are utilised in conjunction with Terrain Units and observable change in vegetation composition, in order to determine the watercourse/wetland boundaries. Obligate species are predominantly associated with an aquatic feature (>99%) but are also occasionally found in areas not associated with such a feature and regularly associated with disturbed areas. Facultative species are normally associated with an aquatic feature (76% - 99%), although occasionally not associated with such a feature and often in areas showing signs of disturbance.

It should be noted that for accurate wetland identification, at least two of the abovementioned indicators need to be present (*Pers Comm Prof. F. Ellery*).

3. KEY OBSERVATIONS

The concerned property earmarked for the development of the Wrenchville Phase 2 Low-Cost Housing Development is situated adjacent to the existing residential development of Wrenchville approximately 3.5 Km from Kuruman's town centre within the administrative area of the Ga-Segonyana Municipality. Access to the property is gained from Buitekant Street within the residential area of Wrenchville and during the site visit, earthworks pertaining to Phase 1 of the Wrenchville Low-Cost Housing Development had already begun. The majority of the property is situated on a small hill with only the northern portion of the property sloping downwards towards a Riparian corridor situated along the northern edge of the property. The entire concerned property is covered with natural Kuruman Thornveld vegetation with numerous signs of current/previous disturbance in the form of numerous informal footpaths and dumping areas. No Obligate and/or Facultative species were identified.

Please refer to the images below for reference:

Photo 1: Earthworks pertaining to Phase 1 of Wrenchville Low-Cost Housing Development adjacent to concerned property. Direction: South

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Photo 2: Earthworks pertaining to Phase 1 of Wrenchville Low-Cost Housing Development adjacent to concerned property. Direction: West

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Photo 3: Earthworks pertaining to Phase 1 of Wrenchville Low-Cost Housing Development adjacent to concerned property. Existing graveyard visible in the background. Direction: South.

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Photo 4: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Direction: North-West

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Photo 5: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Direction: North

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Photo 6: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Riparian Area situated along the northern section of property visible in background. Direction: North-East

Photo 7: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Existing graveyard visible in background and newly constructed school on the right-hand side of photograph. Direction: South

Photo 8: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Existing graveyard visible in background and newly constructed school on the right-hand side of photograph. Direction: South

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Photo 9: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Newly constructed school adjacent to concerned property visible in photograph. Direction: South-West

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Photo 10: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Signs of previous disturbance. Direction: South-West

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Photo 11: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Signs of previous disturbance. Direction: West

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Photo 12: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Signs of previous disturbance. Direction: West

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Photo 13: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Signs of previous disturbance. Direction: North-West

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Photo 14: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Direction: North

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Photo 15: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Riparian Area visible in background. Direction: North

Photo 16: Concerned property proposed for development of Wrenchville Phase 2 Low-Cost Housing Development. Natural Kuruman Thornveld Vegetation. Riparian Area visible in background. Direction: North-East

Within the defined development area of the concerned property proposed for the development of the Wrenchville Phase 2 Low-Cost Housing Development, the majority of the development area is situated on a small hill adjacent to the existing developed areas. The northern portion of the development area slopes downhill towards a Riparian Area situated along the northern border of the concerned property. This northern section of the property forms a natural valley situated between two small hills (koppies) within the landscape. This Riparian Valley area forms a natural channel for sheet flow water to accumulate, forming a Non-Perennial Watercourse running along the northern boundary of the concerned property. Graeme McGill Consulting was appointed in 2017 in order to determine the 1:50 and 1:100 floodlines for this watercourse. A survey of the watercourse comprising of a series of cross-sections taken at right angles to the watercourse, was measured by Joubert & Brink Land Surveyors, with the cross-sections extending up to Buitekant Street. The extent of the catchment was determined using 5m contours and the Water Drop Paths method in Civil3D in combination with onsite observations. The flood peaks were determined by utilising three different methods and using the average of these three methods. Graeme McGill Consulting used the HEC-RAS program to calculate the water surface profiles and the geometric input data was obtained from the survey information provided by Joubert & Brink Land Surveyors. The energy levels were utilised to delineate the 1:50 and 1:100 Year floodlines as shown in the image below.

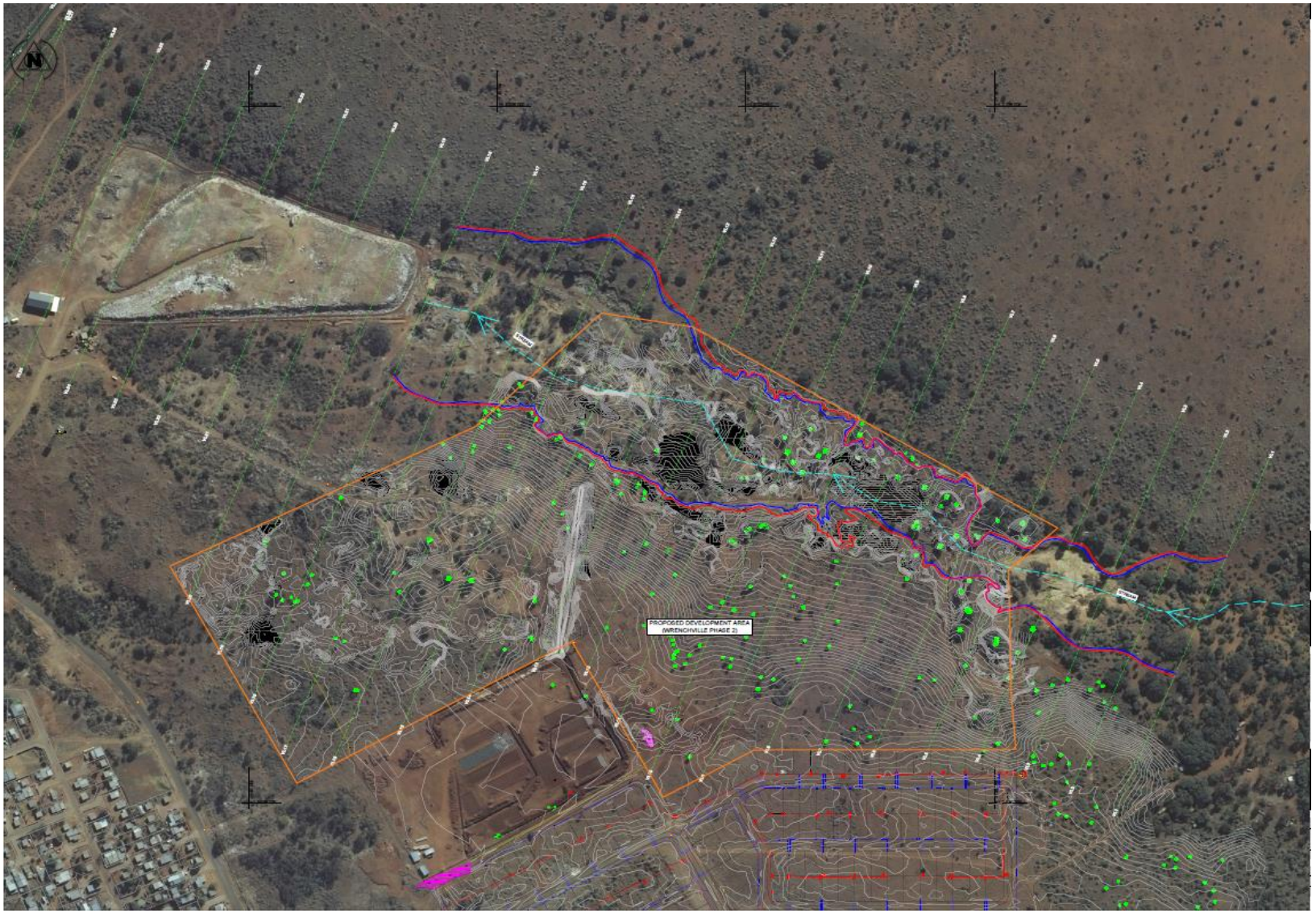

Fig 10: Extract from **Graeme McGill Consulting** – **MC277-C402** – 1:50 and 1:100 Year Floodlines. **Blue Line**: 1:50 Floodline / **Red Line**: 1:100 Floodline. **Orange**: Development Area

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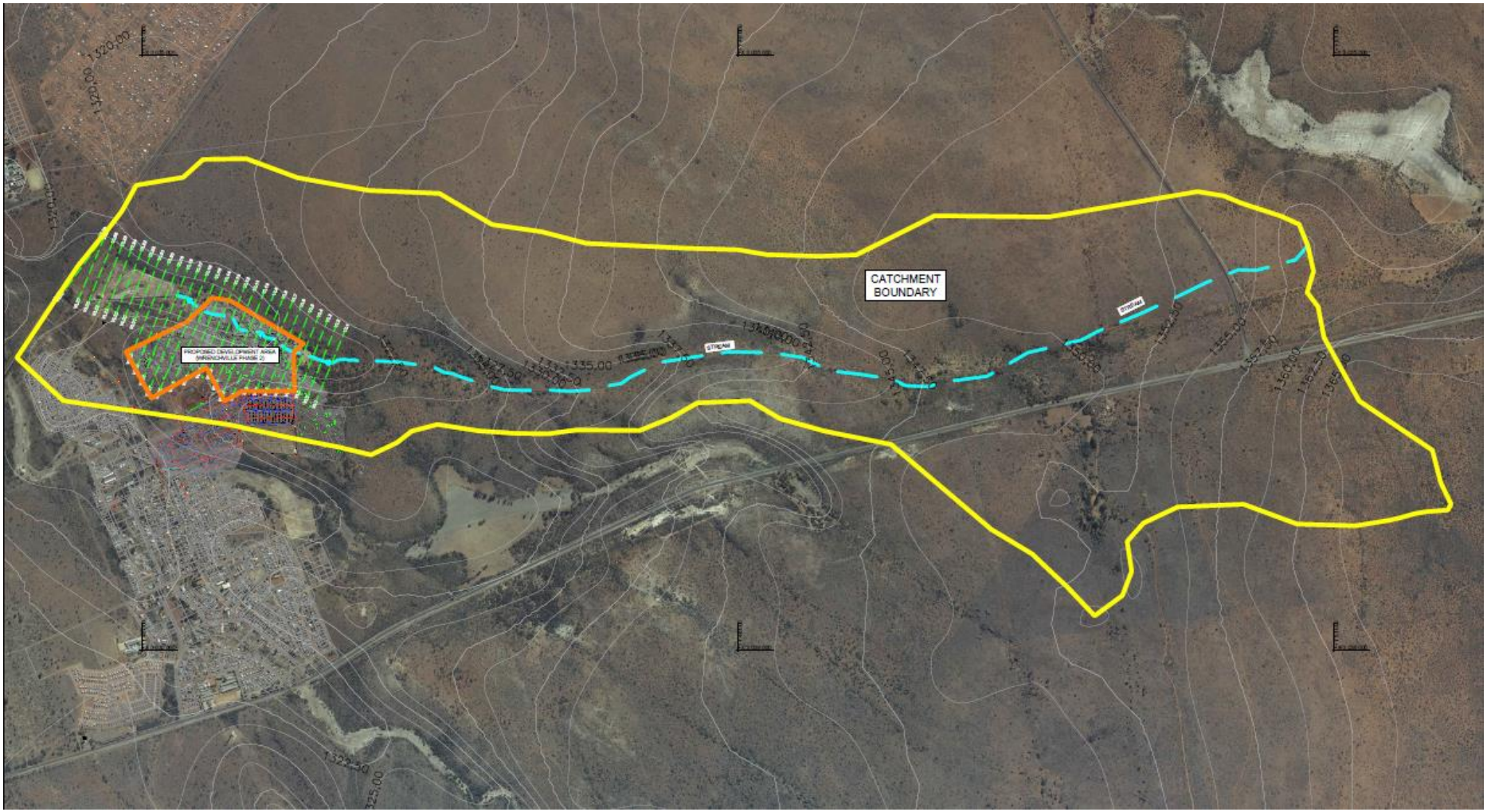

Fig 11: Extract from **Graeme McGill Consulting** – **MC277-C401** – **Catchment Boundary**. **Orange**: Development Area. **Yellow**: Catchment Boundary

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Onsite investigation facilitated by the Author on 06 April 2018 confirmed a semi-natural stream channel and associated Riparian Area located along the northern boundary of the proposed development area. Additionally, the stream channel and associated Riparian Area has visible signs of severe disturbance both past and present. Certain sections of the stream channel seem to have been excavated, utilised for informal dumping, covered and then re-excavated. Portions of the Riparian Area are excavated several metres below the original stream channel surface level. The Kuruman Formal Landfill is situated north-west of the concerned development area at the lower end of the watercourse reach, upstream of Buitekant Street. The watercourse then flows through two 2.4m x 1.8m box culverts underneath Buitekant Street. The entire stream channel and Riparian Area along the northern boundary of the concerned development area is covered with multiple gullies and eddies with excavations progressed to such an extent that no definitive stream channel is evident anymore. Sampling of soil cores within this Riparian Area was assessed to be irrelevant, as its clearly evident that the concerned area is not inundated with water at regular intervals or for prolonged periods at a time to form Hydromorphic Soils (wetland conditions). The entire development area is covered with Kuruman Thornveld vegetation with various degree of disturbance. No additional wetland areas were identified within the development area. Additionally, the stream channel and associated Riparian Area along the northern section of the development area is heavily disturbed, consisting of large-scale excavation areas together with informal dumping sites consisting of wood, plastic, glass, metal and animal remains. Furthermore, a sand quarry is situated in the north-eastern corner of the proposed development area, within the stream channel Riparian Area.

Please refer to photographs below of stream channel and associated Riparian Area

Photo 17: Sand quarry with rubble piles situated in the North-Eastern corner of the proposed development area. Situated within the concerned stream channel and associated Riparian Area. Natural Kuruman Thornveld Vegetation. Direction: East

Photo 18: Sand quarry with rubble piles situated in the North-Eastern corner of the proposed development area. Situated within the concerned stream channel and associated Riparian Area. Natural Kuruman Thornveld Vegetation. Direction: East

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Photo 19: Sand quarry with rubble piles situated in the North-Eastern corner of the proposed development area. Situated within the concerned stream channel and associated Riparian Area. Natural Kuruman Thornveld Vegetation. Direction: South-East

Photo 20: Sand quarry with rubble piles situated in the North-Eastern corner of the proposed development area. Situated within the concerned stream channel and associated Riparian Area. Natural Kuruman Thornveld Vegetation. Direction: South

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Photo 21: Rubble piles situated in the Riparian Area and 1:100 Floodline Delineation of the watercourse running along the northern boundary of the proposed development area. Natural Kuruman Thornveld Vegetation. Direction: South-West

Photo 22: Rubble piles and gravel access roads situated within the 1:100 Floodline Delineation of the watercourse running along the northern boundary of the proposed development area. Natural Kuruman Thornveld Vegetation. Direction: South-West

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Photo 22: Rubble piles alongside gravel access roads situated within the 1:100 Floodline Delineation of the watercourse running along the northern boundary of the proposed development area. Natural Kuruman Thornveld Vegetation. Direction: South-West

Photo 23: Centre of stream channel for watercourse running along the northern boundary of the proposed development area. Clear signs of numerous excavation activities. Natural Kuruman Thornveld Vegetation. Direction: North

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Photo 24: Centre of stream channel for watercourse running along the northern boundary of the proposed development area. Clear signs of numerous excavation activities and informal rubble dumping. Natural Kuruman Thornveld Vegetation. Direction: North-West

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Photo 25: Centre of stream channel for watercourse running along the northern boundary of the proposed development area. Clear signs of numerous excavation activities and informal rubble dumping. Natural Kuruman Thornveld Vegetation. Direction: West

Photo 26: Centre of stream channel for watercourse running along the northern boundary of the proposed development area. Clear signs of numerous excavation activities and informal rubble dumping. Highly uneven landscape due to excavation activities. Natural Kuruman Thornveld Vegetation. Direction: West

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Photo 27: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area. Clear signs of numerous excavation activities and informal rubble dumping. Highly uneven landscape due to excavation activities. Natural Kuruman Thornveld Vegetation. Direction: West

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Photo 28: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area. Clear signs of numerous excavation activities and informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: West

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Photo 29: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area. Clear signs of numerous excavation activities and informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: West

Photo 30: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area. Clear signs of numerous excavation activities and informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: West

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Photo 31: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the formal landfill site. Clear signs of numerous excavation activities and informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: South-East

Photo 32: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the Kuruman Formal Landfill site. Clear signs of numerous excavation activities and informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: South-East

Photo 33: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the Kuruman Formal Landfill site. Clear signs of numerous excavation activities and informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: South

Photo 34: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the Kuruman Formal Landfill site. Clear signs of numerous excavation activities and informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: North-East

Photo 35: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the Kuruman Formal Landfill site. Clear signs of numerous excavation activities and informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: East

Photo 36: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the Kuruman Formal Landfill site. Clear signs of numerous excavation activities and informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: East

Photo 37: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the Kuruman Formal Landfill site. Clear signs of informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: West

Photo 38: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the Kuruman Formal Landfill site. Clear signs of informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: West

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Photo 39: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the Kuruman Formal Landfill site. Clear signs of informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: East

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Photo 40: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the Kuruman Formal Landfill site. Clear signs of informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: East

Photo 41: Stream Channel and associated Riparian Area for watercourse running along the northern boundary of the proposed development area, adjacent to the Kuruman Formal Landfill site. Clear signs of informal rubble dumping. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: North-East

Photo 42: Example of informal dumping areas within the 1:100 Year Floodline of the watercourse running along the northern boundary of the proposed development area. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: North

Photo 43: Example of informal dumping areas within the 1:100 Year Floodline of the watercourse running along the northern boundary of the proposed development area. Note the highly uneven landscape due to excavation activities several metres deep. Natural Kuruman Thornveld Vegetation. Direction: North

Photo 44: Example of informal dumping areas adjacent to gravel access road within the 1:100 Year Floodline of the watercourse running along the northern boundary of the proposed development area. Natural Kuruman Thornveld Vegetation. Direction: North

Photo 45: Gravel access road towards the concerned development area, running from the Kuruman Formal Landfill site in an Eastern direction crossing through the stream channel until it terminates at the sand quarry in the north-eastern corner of the proposed development area. Natural Kuruman Thornveld Vegetation. Direction: North-East

Photo 46: Gravel access road towards the concerned development area, running from the Kuruman Formal Landfill site in an Eastern direction crossing through the stream channel until it terminates at the sand quarry in the north-eastern corner of the proposed development area. Natural Kuruman Thornveld Vegetation. Direction: North-East

Photo 47: Formal Kuruman Landfill site. Direction: North-East

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Photo 48: Gravel access road towards the concerned development area, running from the Formal Kuruman Landfill site in an Eastern direction crossing through the stream channel until it terminates at the sand quarry in the north-eastern corner of the proposed development area. Direction: North-East

According to the information provided to the Author, the current Draft Layout of the proposed Wrenchville Phase 2 Low-Cost Housing Development in Kuruman, indicates that a large portion of the development area is "undevelopable". This area is situated towards the North of the concerned property and includes the entire Riparian and 1:100-year Floodline Delineation Area of the Non-Perennial Watercourse running along the northern portion of the concerned property. Currently, the only structures proposed within this area, is the required **Bulk Sewer Pipeline** to service the proposed development. The Bulk Sewer Pipeline is proposed to be located below the 1:100 year Floodline of the concerned Non-Perennial Watercourse situated north of the proposed development, whilst the associated manholes are to be constructed above the 1:100 year Floodline Delineation.

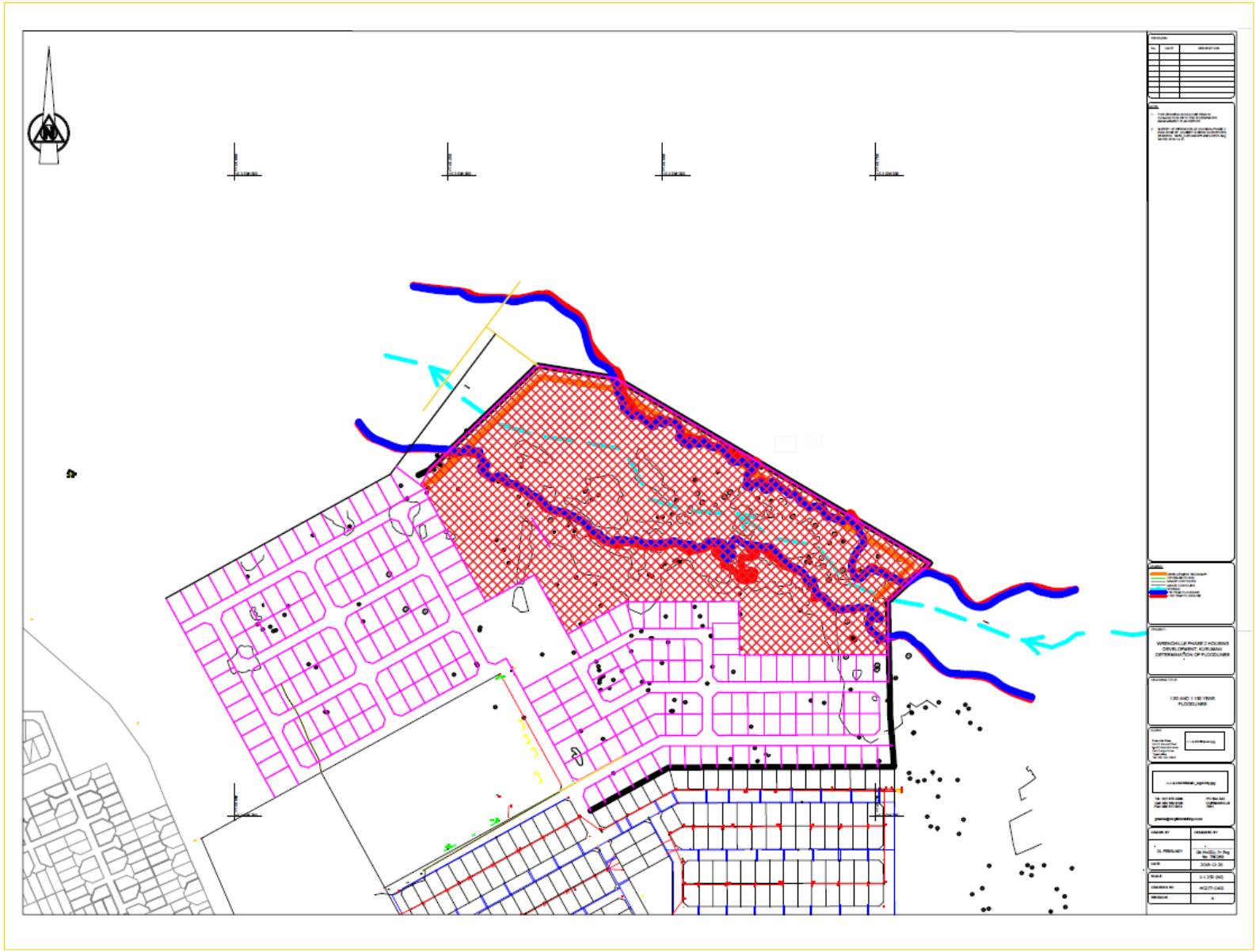
Given the observations made by the Author within this area during the Site Inspection, the Author concurs with this notion, as the severely degraded and excavated nature of the area along the northern portion of the property will cause severe developmental constraints.

Certain portions within the Riparian Area are excavated to such an extent, that the surface level in some areas differs by more that several metres. The bulk earthworks required to develop this area would place significant time and financial constraints on the development proposal. Additionally, the severe extent of illegal dumping activities, will also result in significant financial expenditure to clean up and remove from the property.

Currently the Draft Layout proposal of the Wrenchville Phase 2 Low-Cost Housing Development, makes provision for only the proposed Bulk Sewer Pipeline to be constructed within the 1:100-year Floodline Delineation of the Non-Perennial Watercourse running along the northern section of the property. Should this change during the developmental process, then the potential impacts of these additional structures within the 1:100-year Floodline would also need to be evaluated and included in the compiled Risk Assessment Matrix.

Please refer to the image below indicating the current Draft Layout of the Wrenchville Phase 2 Low-Cost Housing Development, including the "No-Development Zone" covering the entire Riparian and 1:100-year Floodline Area of the Non-Perennial Watercourse towards the north of the concerned property. The proposed "No-Development Zone" is indicated in the image below as the red square.

NB: Only the proposed Bulk Sewer Pipeline is to be constructed within this "No-Development Zone"



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Observed Aquatic Features (watercourses/wetlands) within the defined Investigation Area, corresponds to the DWA and/or NFEPA Watercourse Mapping Units. The confirmed watercourses/wetlands within the Investigation Area are summarised as follows:

(1) According to the NFEPA Database, two tributaries of the Kuruman River, **D41L-0229** & **D41L-02303** is situated approximately 650m (D41L-02299) and 2 Km (D41L-02303) respectfully from the concerned property. According to the NFEPA Database both D41L-02299 and D41L-02303 is considered largely natural with minor modification NFEPA Rivers (Class B), whilst the DWS PES Dataset classified the rivers as Largely and Seriously modified (Class D – D41L-02299 and Class E – D41L-02303 respectively). On site investigation revealed that the location and condition of these abovementioned tributaries corresponds with the NFEPA and DWA mapping units respectively, although slight variation in location and streamflow direction was noticed. These deviations were however assessed to be negligible given the distance of these watercourses from the proposed development area of the Wrenchville Phase 2 Low-Cost Housing Development.

Photo 49: D41L-02299 flowing underneath Mossie Street in Wrenchville. Severely overgrown and disturbed. Direction: South-West

Photo 50: D41L-02299 culvert crossing underneath Mossie Street in Wrenchville. Severely overgrown and polluted. Direction: East.

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Photo 51: D41L-02299 culvert crossing underneath Mossie Street in Wrenchville. Severely overgrown and polluted. Direction: East.

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Photo 52: D41L-02299 flowing underneath Mossie Street in Wrenchville. Severely overgrown and disturbed. Direction: East

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Photo 53: D41L-02299 flowing underneath Buitekant Street in Wrenchville. Direction: East

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Photo 53: D41L-02299 flowing underneath Buitekant Street in Wrenchville. Direction: East

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Photo 54: D41L-02299 flowing underneath Buitekant Street towards Wrenchville. Direction: West

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(2) According to the NFEPA Database, a Natural Valley-Bottom Depression Wetland of Eastern Kalahari Bushveld Group 3 Classification is situated approximately 750 metres South-East of the defined property boundary proposed for the development of the Wrenchville Phase 2 Low-Cost Housing Development. This Natural Valley-Bottom Depression Wetland is considered to have a NFEPA Condition of AB (Natural or Good with percentage natural land cover >75%) and a NFEPA Rank of 3. On site investigation revealed that the location of this abovementioned Valley-Bottom Depression Wetland corresponds with the NFEPA Mapping Unit. The condition of this wetland was however not assessed by the Author, given the distance this wetland is located from the proposed development area together with accessibility constraints. Given the scope of works associated with the Wrenchville Phase 2 Low-Cost Housing Development together with the distance between the proposed development area and this wetland, no significant impacts on this Valley-Bottom Depression Wetland is expected as a result of the development proposal. Additionally, the proposed location of the Wrenchville Phase 2 Low-Cost Housing Development does not fall within the *500m regulated area* of this wetland system.

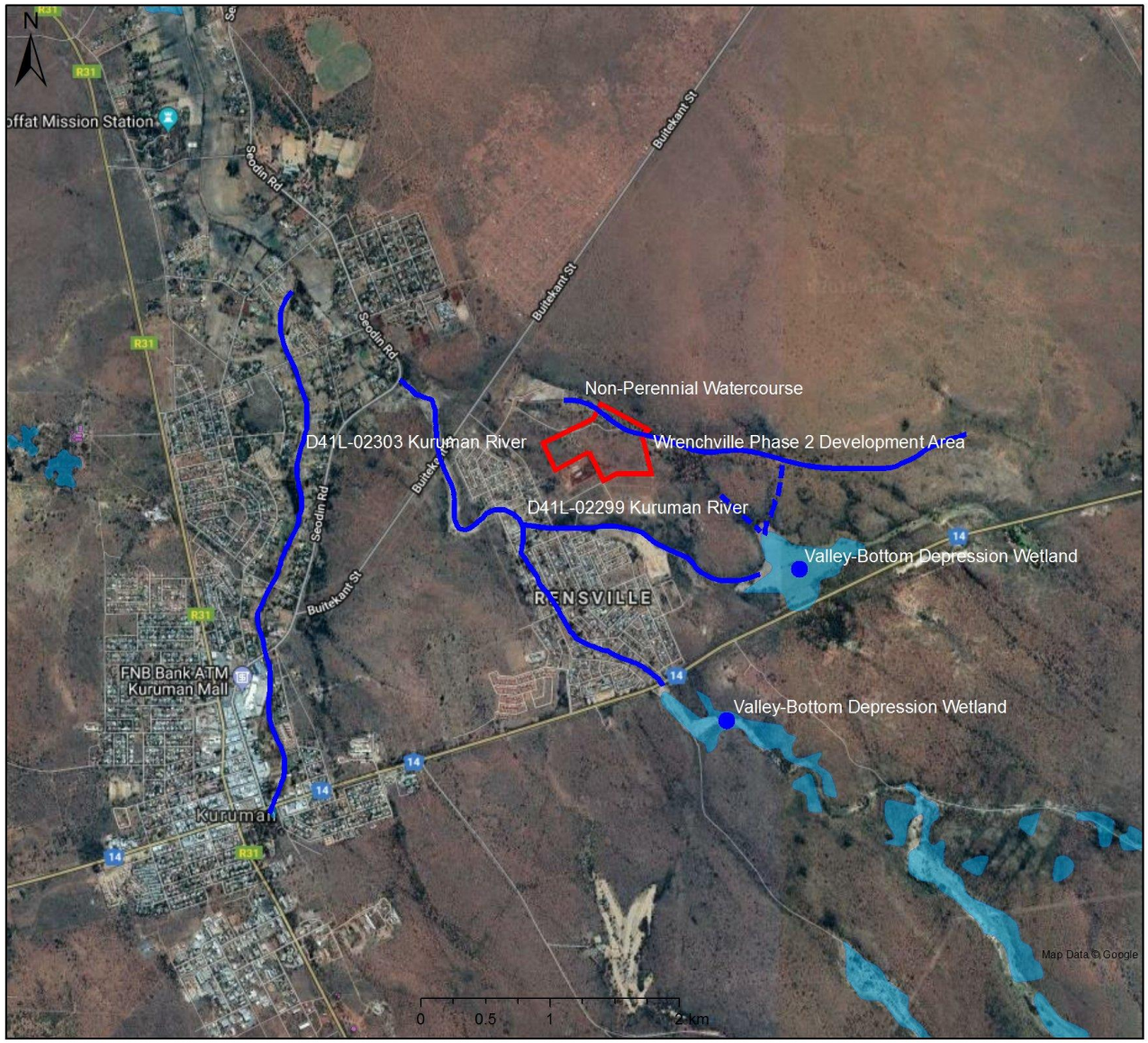
Photo 55: Natural Valley-Bottom Depression Wetland approximately 750m South-East of the proposed Wrenchville Phase 2 Low-Cost Housing Development adjacent to N14. Direction: North

Photo 56: Natural Valley-Bottom Depression Wetland approximately 750m South-East of the proposed Wrenchville Phase 2 Low-Cost Housing Development adjacent to N14. Direction: North

Photo 57: Natural Valley-Bottom Depression Wetland approximately 750m South-East of the proposed Wrenchville Phase 2 Low-Cost Housing Development adjacent to N14. Direction: North

(3) An additional NFEPA Database Natural Valley-Bottom Depression Wetland of Eastern Kalahari Bushveld Group 3 Classification is situated approximately 1.4 Km South of the defined property boundary proposed for the development of the Wrenchville Phase 2 Low-Cost Housing Development. This Natural Valley-Bottom Depression Wetland is also considered to have a NFEPA Condition of AB (Natural or Good with percentage natural land cover >75%) and a NFEPA Rank of 3. This Wetland System is also connected to the D41L-02299 Kuruman River. On site investigation revealed that the location of this abovementioned Valley-Bottom Depression Wetland corresponds with the NFEPA Mapping Unit. The condition of this wetland was however not assessed by the Author, given the distance this wetland is located from the proposed development area together with accessibility constraints. Given the scope of works associated with the Wrenchville Phase 2 Low-Cost Housing Development together with the distance between the proposed development area and this wetland, no significant impacts on this Valley-Bottom Depression Wetland is expected as a result of the development proposal. Additionally, the proposed location of the Wrenchville Phase 2 Low-Cost Housing Development does not fall within the *500m regulated area* of this wetland system.

Photo 58: Natural Valley-Bottom Depression Wetland approximately 1.4 Km South of the proposed Wrenchville Phase 2 Low-Cost Housing Development adjacent to N14. Direction: South-East



Confirmed Aquatic Features

Legend

Wetlands (NFEPA)

- Artificial
- Estuaries
- Natural

Scale: 1:40 000

Date created: April 19, 2019

Compiled with CapeFarmMapper

Western Cape Government
Agriculture

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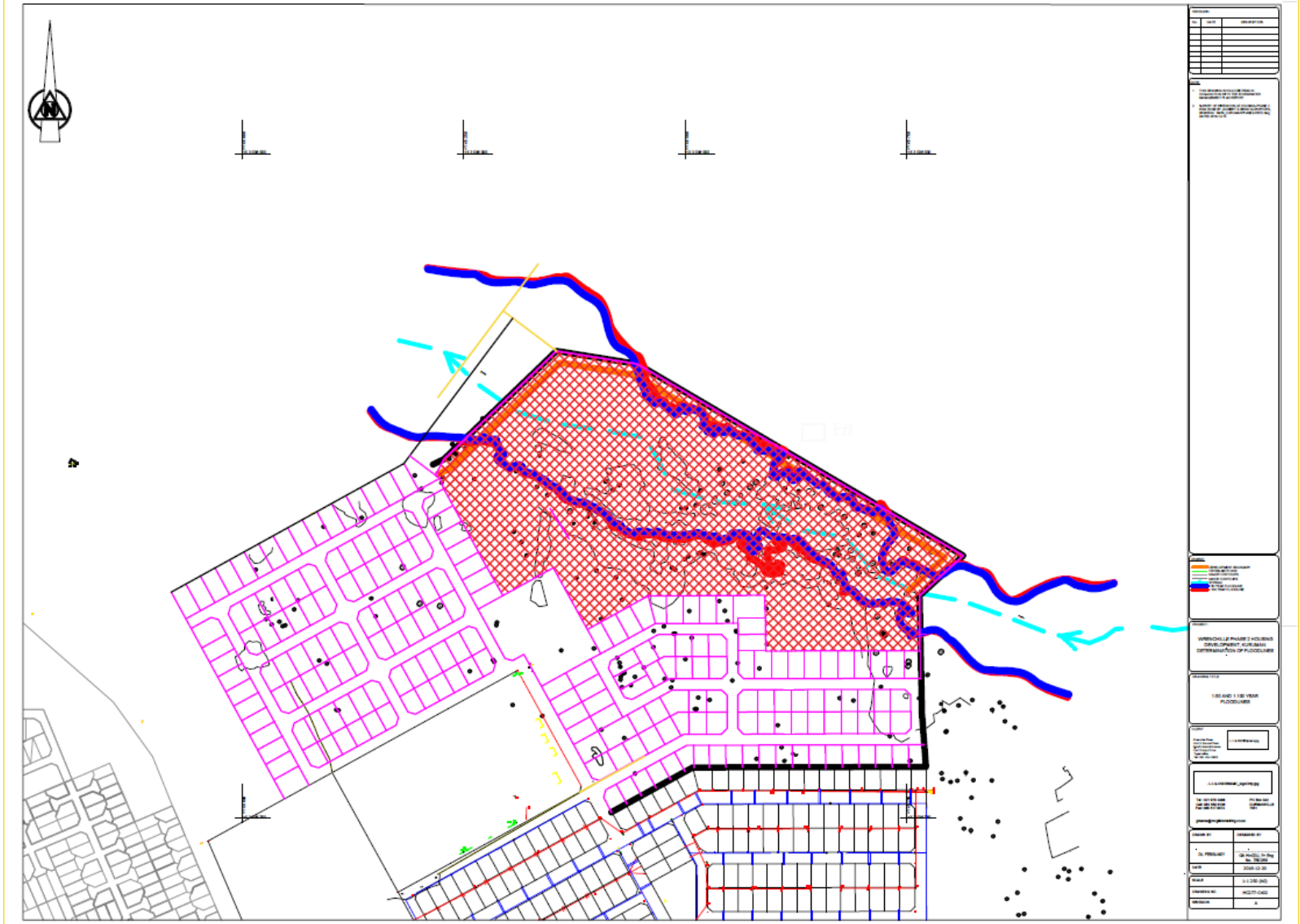
Based on the findings during the Site Inspection of 06 April 2019, the Author concurs with the proposed Draft Layout for the Wrenchville Phase 2 Low-Cost Housing Development as illustrated below. The defined “No-Development Zone” illustrated in red will ensure that limited development takes place within the Riparian and/or 1:100-year Floodline area of the Non-Perennial Watercourse running along the northern border of the concerned property. Currently, the only structures proposed to be constructed within the 1:100 year Floodline area, is the proposed Bulk Sewer Pipeline to service the development proposal. The proposed Bulk Sewer Pipeline will pass underneath Buitekant Street through an existing Culvert, run alongside the Kuruman River (D41L-02299) in a southern direction and finally connect to the existing pump station situated next to the Kuruman River (D41L-02299) adjacent to the Bridge Crossing on Buitekant Street.



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4. DWS RISK ASSESSMENT MATRIX

General Notice 509 of 2016 indicates that any Section 21(c) or 21(i) Water Use Activities, as listed in the National Water Act, 1998 (Act No. 36 of 1998) within the regulated areas of a watercourse where the risk class is considered to be Low, can be Generally Authorised (GA). Any activities that score a Medium or High-Risk Class must undergo a Full Water Use Licence Application (WULA). The following scoring is applicable to the outcomes of a Risk Assessment Matrix.

Rating	Class	Management Description
1 -55	**Low**	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.
56 - 169	**Medium**	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which require specialist input.
170 - 300	**High**	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

TABLE 6: DWS RATING CLASSES

Should a sensitivity rating fall within the Low - Medium range (56-81) a manual adjustment can be made to allow for a Low Risk, with relevant reasoning and implementation of mitigation measures.

According to General Notice 509 of 2016, the "regulated area of a watercourse" for section 21(c) or (i) of the Act, water uses in terms of General Notice 509 of 2016, means the following:

(a) *The outer edge of the 1:100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;*

(b) *In the absence of a determined 1:100-year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or*

(c) *A 500-metre radius from the delineated boundary (extent) of any wetland or pan.*

Exclusions from General Notice 509 of 2016:

"This General Authorisation does not apply –

(a) to the use of water in terms of section 21(c) or (i) of the Act within the regulated area of a watercourse where the Risk Class is Medium or High as determined by the Risk Matrix. The Risk Matrix must be completed by a suitable qualified SACNASP professional member."

RISK ASSESSMENT MATRIX APPLICABILITY

Based on the Site Inspection undertaken on 06 April 2019, consideration was given to General Notice 509 of 2016 for Section 21(c) or 21(i) Water Use Activities, as listed in the National Water Act, 1998 (Act No. 36 of 1998) pertaining to the proposed Wrenchville Phase 2 Low-Cost Housing Development. The location of the proposed Bulk Sewer Pipeline within the Riparian Area / defined 1:100 year Floodline Delineation of the concerned Non-Perennial Watercourses, constitutes the compilation of a DWS Risk Assessment Matrix. The submission of a Water Use License (WUL) in terms of Section 21(c) and 21(i) of the National Water Act, 1998 (Act No. 36 of 1998) is hence *applicable* to the current development proposal. Additionally, should the current design proposal change in any way and additional structures be proposed within the 1:100 year Floodline Delineation, then the impacts of

these structures on the surrounding Water Resources will have to be evaluated and included in the compiled Risk Assessment Matrix.

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DWS RISK ASSESSMENT MATRIX – GN 509 OF 2016 FOR THE PROPOSED BULK SEWER PIPELINE AS PART OF THE PROPOSED WRENCHVILLE PHASE 2 LOW-COST HOUSING DEVELOPMENT IN KURUMAN, NORTHERN CAPE PROVINCE.																					
PHASE	**ACTIVITY**	**ASPECT**	**IMPACT**	**Flow Regime**	**Physical & Chemical (Water Quality)**	**Habitat(Geomorph+ Vegetation)**	**Biota**	**Severity**	**Spatial Scale**	**Duration**	**Consequence**	**Frequency of activity**	**Frequency of impact**	**Legal Issues**	**Detection**	**Likelihood**	**Significance/Risk**	**Risk Rating**	**Confidence Level**	**Impact Rating**	**Borderline Low Moderate Rating Class**	**MITIGATION MEASURES TO BE IMPLEMENTED**
CONSTRUCTION PHASE	Clearing of Indigenous vegetation within the 1:100 year Floodline Delineation / Riparian Areas of the concerned Non-Perennial Watercourses to allow for the construction/installation of the new proposed Bulk Sewer Pipeline.	(1) Vegetation clearing for proposed activities. (2) Exposure of soils leading to increased runoff, erosion, and thus potential increased sediment into the concerned watercourse. (3) Compaction of soils as a result of vehicle movement. (4) Potential increased pollutants washing downstream. (5) Potential proliferation of alien invasive species. (6) Increased likelihood of dust generation due to exposed soils.	(1) Loss of freshwater habitat and ecological structure resulting in impacts on biota. (2) Potential changes to the ecoservice provision of the concerned watercourse. (3) Impacts on hydrology and sediment balance of the watercourse. (4) Potential risks to water quality parameters.	2	1	2	2	**1.75**	3	2	**6.75**	1	1	5	1	**8**	**54**	**LOW**	**HIGH - 80%**	**NEGATIVE**	**N/A**	1) Vegetation clearing must be kept to a minimum as to prevent excessive dust generation and exposure of soils to wind and water erosion. 2) No equipment of any kind (materials/plant) may be stored within the watercourse/riparian areas while not in use. 3) Vehicles are to be serviced at the contractor laydown area and all re-fuelling is to take place outside of the concerned watercourses / Riparian Areas. 4) Sanitation services are to be provided to all construction personnel, whereby at least one portable toilet will be provided per ten (10) personnel and will be emptied at regular intervals. 5) Construction personnel are to be informed that no firewood may be harvested, all litter must be stored immediately and only in closed provided dustbins and no litter is to remain behind following completion of concerned activities. 6) Concerned watercourse Stream Channels/Riparian areas are to be clearly marked as NO-GO areas.

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	Excavation of trench required for the proposed Bulk Sewer Pipeline within 1:100 year Floodline Delineation / Riparian Areas of the concerned Non-Perennial Watercourses.	(1) Removal of topsoils. (2) Compaction of soils as a result of vehicle movement. (3) Potential increased pollutants washing downstream. (4) Potential proliferation of alien and invasive species. (5) Increased likelihood of dust generation due to exposed soils.	(1) Potential changes to the ecoservice provision of the watercourse. (2) Impacts on hydrology and sediment balance. (3) Potential risks to water quality parameters.	3	3	4	3	**3.25**	1	2	**6.25**	1	2	5	2	**10**	**62.5**	**MEDIUM**	**HIGH - 80%**	**NEGATIVE**	**N/A**	1) During excavation, the topsoil as well as the natural vegetation should be removed up to a depth of 150mm and be stockpiled outside of the 32m buffer zone of the concerned watercourses. The vegetation is to be kept moist until it can be used to rehabilitate the exposed areas as part of the backfilling activities. 2) Excavated material should not be contaminated, and it should be ensured that the minimum required surface area is utilised. The stockpiles may not exceed 2m in height. Mixture of the lower and upper layers of the excavated soil should be kept to an absolute minimum, for later usage as backfill material. 3) All exposed soils must be protected for the duration of the concerned activity with a suitable geotextile (e.g. hessian sheeting) in order to prevent erosion and sedimentation of the watercourses in close proximity to these stockpiles.

	Installation of proposed Bulk Sewer Pipelines and associated manholes.	(1) Mixing and casting of concrete. (2) Placement of bedding material within the excavated trenches for support purposes. (3) Backfilling of excavated trenches where after it will be compacted. 4) Miscellaneous activities by construction personnel as part of the concerned activity	(1) Impacts on hydrology and sediment balance of the concerned watercourses. (2) Potential risks to water quality parameters. 3) Erosion of excavated trenches 4) Potential of over-compaction of soils within the concerned watercourses.	3	2	3	2	**2.5**	1	1	**4.5**	1	2	5	2	**10**	**45**	**LOW**	**HIGH - 80%**	**NEGATIVE**	**N/A**	1) For the installation of the manholes, a plastic liner should be placed on the bottom of the excavated trench before concrete is poured as a base. The manholes should be sealed with an approved epoxy. No contamination of surface and/or groundwater may be allowed 2) No mixed concrete may be deposited outside of the designated construction area. Mixing trays and impermeable sumps should be provided, onto which any mixed concrete can be deposited whilst it awaits placing and concrete spilled outside of the demarcated construction area must be promptly removed and taken to a suitable municipal waste processing facility. 3) After installation of the sewer pipelines and manholes, the open trenches should be closed as soon as feasibly possible, ensuring that no trenches are left exposed for extended periods of time. 4) The concerned trenches should be backfilled with the stockpiled excavated materials in layers up to 150mm below the natural ground level, after which the topsoil is replaced. 5) Soil must be recompacted to a depth of 450 mm and all construction material are to be removed from the construction areas upon completion of concerned activity.

	Potential indiscriminate disposal of waste material within the regulated areas of the concerned watercourses.	(1) Disposal of construction waste in the form of construction rubble, potential hazardous chemicals and general litter. (2) Potential increased pollutants washing downstream.	(1) Impacts on hydrology (altered flow regimes) as a result of solid waste within the concerned watercourses. (2) Potential changes to the ecoservice provision of the watercourses. (3) Potential risks to water quality parameters.	1	2	1	1	**1.25**	1	1	**3.25**	1	1	5	1	**8**	**26**	**LOW**	**HIGH – 80%**	**NEGATIVE**	**N/A**	1) All construction rubble and sediment as a result of the excavation/construction activities must be removed from the concerned watercourses and disposed of at a licensed municipal processing facility. 2) Construction personnel are to be informed that no firewood may be harvested, all litter must be stored immediately and only in closed provided dustbins and no litter is to remain behind following completion of construction activities. 3) Concerned watercourse Stream Channels/Riparian areas are to be clearly marked as NO-GO areas.
	Potential spillage of hazardous substances by construction vehicles (plant) within the regulated areas of the concerned watercourses.	(1) Potential spillage of hazardous substances by construction vehicles (plant)	(1) Potential changes to the ecoservice provision of the concerned watercourses. (2) Potential negative impacts to water quality.	1	2	1	2	**1.5**	1	1	**3.5**	1	1	5	1	**8**	**28**	**LOW**	**HIGH – 80%**	**NEGATIVE**	**N/A**	1) Vehicles are to be serviced at the contractor laydown area and all re-fuelling is to take place outside of the concerned watercourses / Riparian Areas.

OPERATIONAL PHASE	Operation and future maintenance of the proposed Bulk Sewer Pipelines within the regulated areas of the concerned watercourses.	(1) Potential catastrophic failure of concerned infrastructure, resulting in blockages and/or leakage of sewage.	(1) Potential changes to the ecoservice provision of the concerned watercourses (2) Potential negative impacts to water quality. (3) Potential contamination of soils, groundwater and surface water.	3	4	3	4	**3.5**	3	2	**8.5**	1	2	5	2	**10**	**85**	**MEDIUM**	**HIGH – 80%**	**NEGATIVE**	**N/A**	1) The Bulk Sewer pipeline and manholes must be pressure tested for integrity upon the completion of construction/installation activities. 2) The Managing Authority must test the integrity of the Bulk Sewer Pipeline at least once every five years or more often should there be any sign or reports of potential leaks/spillage. 3) Should a blockage occur, all possible mitigation measures are to be implemented in order to prevent the pollution of the concerned watercourses during repair activities, including placing sheeting around the manhole used for access as well as containment containers for any effluent withdrawn during these activities. 4) Should repair of the Bulk Sewer Line be required to address a leak, then mitigations as per Activity No. 2 and 3 (above) are to be implemented depending on the location of the leak.

		(2) Unblocking of Bulk Sewer Pipeline (accessed via manholes)	(1) Vehicular access to the sewer pipeline resulting in: Soil compaction, Vegetation degradation and Soil and stormwater contamination from oils and hydrocarbons. (2) Contamination of the watercourses with additional sewage effluent. (3) Increased concentration of salts, nitrate and toxic ammonia concentrations. (4) Increased counts of E. coli; and - Potential eutrophication of the system. (5) Excess production of hydrogen sulphide gas. (6) increased alien invasive species encroachment.	2	2	2	2	**2**	1	1	**5**	1	1	5	1	**8**	**40**	**LOW**	**HIGH – 80%**	**NEGATIVE**	**N/A**	1) The Bulk Sewer pipeline and manholes must be pressure tested for integrity upon the completion of construction/installation activities. 2) The Managing Authority must test the integrity of the Bulk Sewer Pipeline at least once every five years or more often should there be any sign or reports of potential leaks/spillage. 3) Should a blockage occur, all possible mitigation measures are to be implemented in order to prevent the pollution of the concerned watercourses during repair activities, including placing sheeting around the manhole used for access as well as containment containers for any effluent withdrawn during these activities. 4) Should repair of the Bulk Sewer Line be required to address a leak, then mitigations as per Activity No. 2 and 3 (above) are to be implemented depending on the location of the leak.

		(3) Repair of the Bulk Sewer Pipeline in the event of a detected leak.	(1) Impacts as per Activity 2 and 3 (above) are applicable depending on the location of the leak.	3	3	4	3	**3.25**	1	2	**6.25**	1	2	5	2	**10**	**62.5**	**MEDIUM**	**HIGH – 80%**	**NEGATIVE**	**N/A**	1) The Bulk Sewer pipeline and manholes must be pressure tested for integrity upon the completion of construction/installation activities. 2) The Managing Authority must test the integrity of the Bulk Sewer Pipeline at least once every five years or more often should there be any sign or reports of potential leaks/spillage. 3) Should a blockage occur, all possible mitigation measures are to be implemented in order to prevent the pollution of the concerned watercourses during repair activities, including placing sheeting around the manhole used for access as well as containment containers for any effluent withdrawn during these activities. 4) Should repair of the Bulk Sewer Line be required to address a leak, then mitigations as per Activity No. 2 and 3 (above) are to be implemented depending on the location of the leak.

5. CONCLUSION

Dietmar de Klerk from DDK Consulting was appointed by Guillaume Nel Environmental Consultants (GNEC) on behalf of COGHSTA, to undertake a Field Verification and compile an Aquatic Constraints Analysis pertaining to the proposed Wrenchville Phase 2 Low-Cost Housing Development in Kuruman, Ga-Segonyana Municipality, Northern Cape Province. The Proposed locality for the Wrenchville Phase 2 Low-Cost Housing Development is situated adjacent to the existing residential neighbourhood of Wrenchville, approximately 3.5 kilometres North-East of Kuruman's town centre.

COGHSTA is proposing to facilitate the development of the Wrenchville Phase 2 Low-Cost Housing Development on the concerned property, in order to alleviate the current housing shortage within the Ga-Segonyana Municipality's administrative area in Kuruman. Access to the concerned property will be taken off Buitekant Street within the existing residential neighbourhood of Wrenchville. Additionally, the proposed Wrenchville Phase 2 Low-Cost Housing Development will consist of numerous smaller internal access roads, although no detailed designs were available at the time of completion of this Report.

Additionally, according to the knowledge and information provided to the Author, the entire concerned property will be developed for the proposed Wrenchville Phase 2 Low-Cost Housing Development, with no rehabilitation of the surrounding areas to form part of the development proposal. Compliance Monitoring with respect to National and Provincial Legislation will be implemented and Audited by means of the approved Environmental Management Plan (EMP) if/when it gets approved. Auditing of the development proses will be undertaken by means of a suitably qualified Environmental Control Officer (ECO), to be appointed once the Development Proposal receives Environmental Authorisation from the Competent Authority.

Additionally, in terms of the Environmental Impact Assessment Regulations – National Environmental Management Act, 1998 (Act No.107 of 1998) ("NEMA"), the following activities constituted the Listed Activities as listed in Government Notice (GN) No. R 983, (GN) No. R. 984 and (GN) No. R. 985:

GN Reg No. 983 – Activity 27

The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for-

(i) the undertaking of a linear activity; or

(b) maintenance purposes undertaken in accordance with a maintenance management plan

GN Reg No. 983 – Activity 28

Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:

(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or

(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare

excluding where such land has already been developed for residential. mixed, retail, commercial, industrial or institutional purposes.

In order to identify all Aquatic Resources that may potentially be impacted by the proposed Wrenchville Phase 2 Low-Cost Housing Development in Kuruman, a 500 metre investigation zone around the study area, in accordance with Regulation 509 of 2016 as it relates to the National Water Act, 1998 (Act 36 of 1998), was used as a guide in order to assess all potential sensitivities in the receiving environment related to aquatic resources. The investigation area (500m zone around the study area) was assessed using Desktop Analyses and onsite investigation/inspection.

Within the defined Development Area of the concerned property proposed for the development of the Wrenchville Phase 2 Low-Cost Housing Development, the majority of the development area is situated on a small hill adjacent to the existing developed areas. The northern portion of the development area slopes downhill towards a Riparian Area situated along the northern border of the concerned property. This northern section of the property forms a natural valley situated between two small hills (koppies) within the landscape. This Riparian Valley area forms a natural channel for sheet flow water to accumulate, forming a Non-Perennial Watercourse running along the northern boundary of the concerned property.

Graeme McGill Consulting was appointed in 2017 in order to determine the 1:50 and 1:100 floodlines for this watercourse. A survey of the watercourse comprising of a series of cross-sections taken at right angles to the watercourse, was measured by Joubert & Brink Land Surveyors, with the cross-sections extending up to Buitekant Street. The extent of the catchment was determined using 5m contours and the Water Drop Paths method in Civil3D in combination with onsite observations. The flood peaks were determined by utilising three different methods and using the average of these three methods. Graeme McGill Consulting used the HEC-RAS program to calculate the water surface profiles and the geometric input data was obtained from the survey information provided by Joubert & Brink Land Surveyors. The energy levels were utilised to delineate the 1:50 and 1:100 Year Floodlines.

Onsite investigation facilitated by the Author on 06 April 2018 confirmed a Non-Perennial Watercourse and associated Riparian Area located along the northern boundary of the proposed development area. Additionally, the stream channel and associated Riparian Area has visible signs of severe disturbance both past and present. Certain sections of the stream channel seem to have been excavated, utilised for informal dumping, covered and then re-excavated. Portions of the Riparian Area are excavated several metres below the original stream channel surface level. The Kuruman Formal Landfill Site is situated north-west of the concerned development area at the lower end of the watercourse reach, upstream of Buitekant Street. The watercourse then flows through two 2.4m x 1.8m box culverts underneath Buitekant Street. The entire stream channel and Riparian Area along the northern boundary of the concerned development area is covered with multiple gullies and eddies with excavations progressed to such an extent that no definitive stream channel is evident anymore.

Sampling of soil cores within this Riparian Area was assessed to be irrelevant, as its clearly evident that the concerned area is not inundated with water at regular intervals or for prolonged periods at a time to form Hydromorphic Soils (wetland conditions). The entire development area is covered with natural Kuruman Thornveld vegetation with various degree of disturbance. No additional wetland areas were identified within the development area. Additionally, the stream channel and associated Riparian Area along the northern section of the development area is heavily disturbed, consisting of large-scale excavation areas together with informal dumping sites consisting of wood, plastic, glass, metal and animal remains. Furthermore, a sand quarry is situated in the north-eastern corner of the proposed development area, within the stream channel Riparian Area.

Observed Aquatic Features (watercourses/wetlands) within the defined Investigation Area, corresponds to the DWA and/or NFEPA Watercourse Mapping Units. The confirmed watercourses/wetlands within the Investigation Area are summarised as follows:

1) According to the NFEPA Database, two tributaries of the Kuruman River, **D41L-0229** & **D41L-02303** is situated approximately 650m (D41L-02299) and 2 Km (D41L-02303) respectfully from the concerned property. According to the NFEPA Database both D41L-02299 and D41L-02303 is considered largely natural with minor modification NFEPA Rivers (Class B), whilst the DWS PES Dataset classified the rivers as Largely and Seriously modified (Class D – D41L-02299 and Class E – D41L-02303 respectively). On site investigation revealed that the location and condition of these abovementioned tributaries corresponds with the NFEPA and DWA mapping units respectively, although slight variation in location and streamflow direction was noticed. These deviations were however assessed to be negligible given the distance of these watercourses from the proposed development area of the Wrenchville Phase 2 Low-Cost Housing Development.

(2) According to the NFEPA Database, a Natural Valley-Bottom Depression Wetland of Eastern Kalahari Bushveld Group 3 Classification is situated approximately 750 metres South-East of the defined property boundary proposed for the development of the Wrenchville Phase 2 Low-Cost Housing Development. This Natural Valley-Bottom Depression Wetland is considered to have a NFEPA Condition of AB (Natural or Good with percentage natural land cover >75%) and a NFEPA Rank of 3. On site investigation revealed that the location of this abovementioned Valley-Bottom Depression Wetland corresponds with the NFEPA Mapping Unit. The condition of this wetland was however not assessed by the Author, given the distance this wetland is located from the proposed development area together with accessibility constraints. Given the scope of works associated with the Wrenchville Phase 2 Low-Cost Housing Development together with the distance between the proposed development area and this wetland, no significant impacts on this Valley-Bottom Depression Wetland is expected as a result of the development proposal. Additionally, the proposed location of the Wrenchville Phase 2 Low-Cost Housing Development does not fall within the *500m regulated area* of this wetland system.

(3) An additional NFEPA Database Natural Valley-Bottom Depression Wetland of Eastern Kalahari Bushveld Group 3 Classification is situated approximately 1.4 Km South of the defined property boundary proposed for the development of the Wrenchville Phase 2 Low-Cost Housing Development. This Natural Valley-Bottom Depression Wetland is also considered to have a NFEPA Condition of AB (Natural or Good with percentage natural land cover >75%) and a NFEPA Rank of 3. This Wetland System is also connected to the D41L-02299 Kuruman River. On site investigation revealed that the location of this abovementioned Valley-Bottom Depression Wetland corresponds with the NFEPA Mapping Unit. The condition of this wetland was however not assessed by the Author, given the distance this wetland is located from the proposed development area together with accessibility constraints. Given the scope of works associated with the Wrenchville Phase 2 Low-Cost Housing Development together with the distance between the proposed development area and this wetland, no significant impacts on this Valley-Bottom Depression Wetland is expected as a result of the development proposal. Additionally, the proposed location of the Wrenchville Phase 2 Low-Cost Housing Development does not fall within the *500m regulated area* of this wetland system.

Based on the findings during the Site Inspection of 06 April 2019, the Author concurs with the proposed Draft Layout for the Wrenchville Phase 2 Low-Cost Housing Development. The defined "No-Development Zone" illustrated in red will ensure that limited development takes place within the Riparian and/or 1:100-year Floodline Zone of the Non-Perennial Watercourses. Currently, the only

structures proposed to be constructed within the Riparian / 1:100 year Floodline areas, is the proposed Bulk Sewer Pipeline to service the development proposal. The proposed Bulk Sewer will run along the northern section of the concerned property, within the delineated 1:100 year Floodline, will pass through an existing Culvert underneath Buitekant Street, run alongside the Kuruman River (D41L-02299) and finally connect to an existing Pump Station situated next to the Kuruman River (D41L-02299) adjacent to the bridge crossing over Buitekant Street

General Notice 509 of 2016 indicates that any Section 21(c) or 21(i) Water Use Activities, as listed in the National Water Act, 1998 (Act No. 36 of 1998) within the regulated areas of a watercourse where the risk class is considered to be Low, can be Generally Authorised (GA). Any activities that score a Medium or High-Risk Class must undergo a Full Water Use Licence Application (WULA).

Should a sensitivity rating fall within the Low - Medium range (56-81) a manual adjustment can be made to allow for a Low Risk, with relevant reasoning and implementation of mitigation measures.

According to General Notice 509 of 2016, the "regulated area of a watercourse" for section 21(c) or (i) of the Act, water uses in terms of General Notice 509 of 2016, means the following:

(a) *The outer edge of the 1:100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;*

(b) *In the absence of a determined 1:100-year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or*

(c) *A 500-metre radius from the delineated boundary (extent) of any wetland or pan.*

Exclusions from General Notice 509 of 2016:

"This General Authorisation does not apply –

(a) to the use of water in terms of section 21(c) or (i) of the Act within the regulated area of a watercourse where the Risk Class is Medium or High as determined by the Risk Matrix. The Risk Matrix must be completed by a suitable qualified SACNASP professional member."

RISK ASSESSMENT MATRIX APPLICABILITY

Based on the Site Inspection undertaken on 06 April 2019, consideration was given to General Notice 509 of 2016 for Section 21(c) or 21(i) Water Use Activities, as listed in the National Water Act, 1998 (Act No. 36 of 1998) pertaining to the proposed Wrenchville Phase 2 Low-Cost Housing Development. The location of the proposed Bulk Sewer Pipeline within the defined 1:100 year Floodline Delineation / Riparian Areas of the concerned Non-Perennial Watercourses, constitutes the compilation of a DWS Risk Assessment Matrix. The submission of a Water Use License (WUL) in terms of Section 21(c) and 21(i) of the National Water Act, 1998 (Act No. 36 of 1998) is hence *applicable* to the current development proposal. Additionally, should the current design proposal change in any way and additional structures be proposed within the 1:100 year Floodline Delineation / Riparian Areas, then the impacts of these structures on the surrounding Water Resources will have to be evaluated and included in the compiled Risk Assessment Matrix.

RISK ASSESSMENT MATRIX RESULTS

The results of the Risk Matrix are presented above, and show that, assuming mitigation measures are strictly enforced; impact significance is of Low and Medium levels during both Construction and Operational phases of the proposed development. Therefore, it is considered imperative that suitable mitigation measures, as provided for in the Risk Matrix, are strictly adhered to in order to minimise the impacts associated with the development and decrease the significance of cumulative impacts on the Freshwater Resources.

IMPACT			
CONSTRUCTION PHASE		**Pre-Mitigation**	**Post-Mitigation**
1	Clearing of Indigenous vegetation within the 1:100 year Floodline Delineation of the concerned Non-Perennial Watercourse to allow for the construction/installation of the new proposed Bulk Sewer Pipeline.	**LOW**	**LOW**
2	Excavation of trench required for the proposed Bulk Sewer Pipeline within 1:100 year Floodline Delineation / Riparian Habitat of the concerned Non-Perennial Watercourses.	**MEDIUM**	**MEDIUM**
3	Installation of proposed Bulk Sewer Pipelines and associated manholes.	**LOW**	**LOW**
4	Potential indiscriminate disposal of waste material within the regulated areas of the concerned watercourses.	**LOW**	**LOW**
5	Potential spillage of hazardous substances by construction vehicles (plant) within the regulated areas of the concerned watercourses.	**LOW**	**LOW**
OPERATIONAL PHASE		Pre-Mitigation	Post-Mitigation
1	Potential catastrophic failure of concerned infrastructure, resulting in blockages and/or leakage of sewage.	**MEDIUM**	**MEDIUM**
2	Unblocking of Bulk Sewer Pipeline (accessed via manholes)	**LOW**	**LOW**
3	Repair of the Bulk Sewer Pipeline in the event of a detected leak.	**MEDIUM**	**MEDIUM**

TABLE 7: DWS RISK MATRIX RESULTS

Based on the findings of this Freshwater Constraints Analysis, the following mitigation measures are proposed to minimise potential impacts on the surrounding Freshwater Resources:

- If feasible, construction must be scheduled for the dry season in order to minimise the risk of sediment runoff reaching the watercourses as a result of the proposed activities.
- It is highly recommended that an Alien Vegetation Management Plan be compiled during the Planning Phase and implemented concurrently with the commencement of proposed activities.
- All exposed soils must be protected for the duration of the construction phase with a suitable geotextile (e.g. hessian sheeting) in order to prevent erosion and sedimentation of the watercourses. During excavation, soils should not be stockpiled within close proximity to the stream channels in order to prevent sedimentation of the watercourses.
- Soil stockpiles may not exceed 2 metres in height.
- Any remaining soils following the completion of the proposed activities are to be levelled and rehabilitated with locally indigenous vegetation to minimise the risk of further sedimentation of the watercourses.
- It is recommended that the Managing Authority test the integrity of the proposed Bulk Sewer Pipeline at least once every five years or more often should there be any sign or reports of leaks.
- Should a Blockage/Spill occur, all possible mitigation measures are to be implemented in order to prevent the pollution of the concerned watercourses during repair activities, including placing sheeting around the manhole used for access as well as containment containers for any effluent withdrawn during these activities.

Based on the findings of this Freshwater Constraints Analysis and the results of the DWS Risk Assessment Matrix, it is the opinion of the Author that the proposed development, specifically the construction/installation of the proposed Bulk Sewer Pipeline, may pose a direct risk to the surrounding Freshwater Resources (unnamed Non-Perennial Watercourse along the northern boundary of the property and the Kuruman River - D41L-02299). Adherence to cogent, ecologically sensitive designs and construction methods, the strict adherence to the provided mitigation measures as well as general good practise construction methods, is essential if the significance of the perceived impacts is to be reduced to acceptable levels.

It is the opinion of the Author therefore that the proposed Wrenchville Phase 2 Low-Cost Housing Development in Kuruman, from a Freshwater Resource perspective, be considered favourably, subject to the strict adherence of the mitigation measures forming a condition of approval and being legally binding through the approval process. The strict enforcement of the mitigation measures will serve the purpose of ensuring that the ecological integrity of the Freshwater Resources is not compromised further.

END

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