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FRESHWATER ECOLOGICAL ASSESSMENT FOR THE PROPOSED MOUNT VIEW RESIDENTIAL DEVELOPMENT ON THE REMAINDER OF FARM 869, FARM 1262, REMAINDER OF FARM 866, REMAINDER OF FARM 1054, PORTIONS 2 AND 3 OF FARM 1054 AND PORTION 2 OF FARM 870, SIR LOWRY'S PASS, WESTERN CAPE

Prepared for

Guillaume Nel Environmental Consultants

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EXECUTIVE SUMMARY

The proponent wishes to develop the Mount View residential development on Farm 869, Farm 1262, remainder of Farm 866, remainder of Farm 1054, portions 2 and 3 of Farm 1054 and portion 2 of farm 870, located in Sir Lowry's Pass, Western Cape Province, hereafter referred to as the study area. The unnamed tributary of Sir Lowry's Pass River was noted to bisect the study area. The 1:100 year floodline of this system has been modelled. Five channelled valley bottom (CVB) wetland fragments, which would have naturally been associated with the entire channel length of the unnamed tributary, were also identified within the study area. Based on the findings of the watercourse assessment and the results of the risk assessment, it is the opinion of the ecologist that the proposed development poses a Moderate risk to the integrity of the unnamed tributary and CVB wetlands provided that adherence to cogent, well-conceived and ecologically sensitive construction plans are implemented and the mitigation measures provided in this report as well as general good construction practice are adhered to. Authorisation by means of a Water Use Licence Application in terms of Sections 21 (c), (e) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) must be obtained from the relevant authorities prior to the commencement of any works.

MANAGEMENT SUMMARY

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was appointed to conduct a specialist freshwater ecological assessment as part of the environmental assessment and Water Use Authorisation (WUA) processes for the proposed Mount View residential development on Farm 869, Farm 1262, remainder of Farm 866, remainder of Farm 1054, portions 2 and 3 of Farm 1054 and portion 2 of farm 870, located in Sir Lowry's Pass, Western Cape Province, hereafter referred to as the "study area". The proposed residential development will consist of a residential development, green spaces and various recreational and commercial zones. An unnamed tributary of Sir Lowry's Pass River bisects the central portion of the study area.

The purpose of this report is to define the ecology of the study area in terms of the natural watercourse characteristics, including mapping of all watercourses, defining areas of increased Ecological Importance and Sensitivity (EIS), and defining the Present Ecological State (PES) of the watercourses associated with the study area. The Department of Water and Sanitation (DWS) Risk Assessment Matrix was applied to determine the significance of the impacts associated with the development and mitigatory measures were identified which aim to minimise the potential impacts.

A desktop study was conducted, in which the watercourses were identified for on-site investigation, and relevant national and provincial databases were consulted. The results of the desktop study are contained in Section 4 of this report.

During the assessment undertaken in October 2020, a riparian watercourse, the unnamed tributary of the Sir Lowrys Pass River was identified bisecting the study area in a north to south westerly direction. It should be noted that the riparian extent of the unnamed tributary exceeds the extent of the modelled 1:100 year floodline. This is due to the confined active channel of the tributary. Five channelled valley bottom (CVB) wetlands (numbered 1 to 5) were also identified to be associated with the unnamed tributary within the study area. Due to the fragmentated nature of the CVB wetlands, and altered habitat conditions of these wetland systems as observed within the study area, CVB wetland 1 presented a different and more intact habitat and vegetation cover compared to the CVB wetlands 2 to 5. The detailed results of the field assessment are contained in Section 5 of this report and summarised in the tables below.

Table A: Summary of the results of the watercourses.

Watercourse	PES	Ecoservices	EIS	REC and RMO
Unnamed tributary of Sir Lowry's Pass River	Category D (Largely modified)	Intermediate	High	Category C/D Improve
Extent of modification	**High** Significant modifications are anticipated to the reach of the unnamed tributary associated with the unauthorised infilled material where 0.032 ha of riparian habitat will be lost due to the proposed removal of the unauthorised infilled material. However, as part of the rehabilitation phase the tributary active channel and associated vegetation must be reinstated. Other modifications anticipated to the extent of the unnamed tributary may result from the installation of new and upgrading of existing culvert structures which will necessitate work within the active channel of the unnamed tributary. Stormwater released from the discharge points adjacent to the unnamed tributary must disperse before entering the watercourse to prevent incision and erosion. No new infrastructure is proposed within the unnamed tributary that may fragment or degrade the system. The removal of the unauthorised infilled material and upgrading of the culvert within the tributary will improve the ecological integrity of the riparian habitat and hydrological connectivity between the upstream and downstream reach of the tributary, which may potentially compensate for the original loss of riparian habitat due to the removal of infilled material.			
CVB wetland 1	C (Moderately Modified)	Intermediate	Intermediate	REC: B/C RMO: Improve
CVB wetlands 2 to 5	Category D (Largely modified)	Intermediate	Intermediate	Category C/D Improve
Extent of modification	**High** Significant modifications are anticipated to the reach of the CVB wetland (3) associated with the removal of unauthorised infilled material as part of the proposed Mount View residential development which will result in the anticipated loss of 0.136 ha of wetland habitat. However, as part of the rehabilitation phase the wetland seasonal and temporary zones and associated vegetation must be reinstated. Similarly, habitat fragmentation is likely within this reach of the CVB wetland. Thus, it is recommended that the wetland habitat loss due to these activities be ideally reinstated within the fill area following removal of the infilled material to ensure no net to the CVB wetland. The long-term impacts for the removal of the infilled material can be considered low as rehabilitation of this site will ensure ecological connectivity and increase the area of wetland habitat. Stormwater released from the surrounding outlet structures into the wetlands must disperse before entering the wetland to prevent incision and erosion.			

Following the assessment of the watercourses, the DWS Risk Assessment Matrix of 2016 was applied in order to ascertain the significance of possible impacts which may occur as a result of the proposed construction and operational activities associated with the Mount View residential development . The results of this assessment are presented in Section 7 of this report, of which a summary is provided below.

Table B: Summary of the DWS Risk Assessment outcomes.

Phases	Activity	Risk Rating
Construction Phase	Site clearing prior to commencement of construction activities ➢ Removal of vegetation and associated disturbances to soils.	**L**
	Construction activities related to building activities outside the delineated extent of the watercourses and above the 1:100 year floodline but within the 500 m GN509 Zone of Regulation ➢ Earth works involving removal of topsoil and creation of soil stockpiles including; ➢ Construction of residential households, internal roads, stormwater attenuation facilities, internal sewage network, Wastewater Treatment Plants; and landscaping associated with the proposed residential development.	**L**
	Construction activities related to building activities outside the delineated extent of the watercourses but below the 1:100 year floodline and within the 32 m NEMA and 500 m GN509 Zone of Regulation ➢ Establishment of stormwater discharge points below the 1:00 year floodline and within the delineated wetlands and associated conservation buffer	**M**
	Construction activities within the watercourses ➢ Removal of unauthorised infilled material within the riparian habitat of the unnamed tributary and portions of the CVB wetland 3, below the 1:100 year floodline. ➢ Installation of the rectangular portal culvert with 330mm brick wing walls under the section of the internal roadway which traverses the northern reach of unnamed tributary,	**M**

Phases	Activity	Risk Rating
	andupgrading of the culvert below Old Sir Lowry's Pass Road within the downstream reach of the tributary. ➢ Installation of the bulk sewer and water pipelines along the Old Sir Lowry's Pass Road within the downstream reach of the tributary.	
	Construction activities within the variable conservation buffer of the watercourses ➢ Construction of the portions of the three private erven located within the variable conservation buffer. ➢ Proposed construction of a stub wall just outside the edge of the variable conservation buffer to separate the lawn areas from the conservation buffer. ➢ Establishment of in situ compacted walkways.	L
Operational Phase	Potential indiscriminate waste disposal and/or spillage from construction vehicles	L
	Rehabilitation of the watercourses	M
	Operation of the residential estate and associated open space areas	L
	Operation and maintenance of the road culvert crossing the unnamed tributary	L
	Operation of the stormwater retention facilities and wastewater treatment plants.	M
	Use of treated effluent for irrigation purposes	L

The activities associated with the construction and operational phases of the proposed Mount View residential development , which include site preparation, excavation and removal of unauthorised infill material within portions of a unnamed tributary and CVB wetland, culvert, bulk service pipelines and stormwater outlets within the watercourses, pose a Moderate risk to the overall integrity of the watercourses. The proposed removal of the unauthorised infilled material will result in an anticipated loss of 0.032 ha of riparian habitat of the unnamed tributary and 0.136 ha of wetland habitat loss of the CVB wetland 3. The majority of the impacts are considered fully reversible, except those associated with loss of wetland and riparian vegetation related to the removal of the infilled material which will partially fragment the systems. It is strongly recommended that the wetland habitat loss due to these activities be ideally reinstated within the fill area following removal of the infilled material to ensure no net loss of riparian habitat and CVB wetland. The long-term impacts for the removal of the infilled material can be considered acceptable as rehabilitation of this site will ensure ecological connectivity and reinstatement of riparian and wetland habitat. All watercourses within the study area including the variable conservation buffer should be suitably rehabilitated with indigenous vegetation consisting of facultative and terrestrial vegetation. This must however be approved by the relevant legislative authorities as a viable option.

Most potential impacts are considered direct (construction of culvert road crossing, loss of riparian and wetland habitat), with indirect impacts arising from potential water quality concerns and increased sediment loads entering the watercourses through the stormwater channels. Assuming that strict enforcement of cogent, well-developed mitigation measures takes place, the significance of impacts arising from the proposed residential development are likely to be managed during the construction and operational phases.

Based on the findings of the freshwater ecological assessment and the results of the impact assessment, it is the opinion of the ecologist that the proposed Mount View residential development poses a Moderate risk to the integrity of the unnamed tributary and associated CVB wetlands provided that adherence to cogent, well-conceived and ecologically sensitive construction plans are implemented and the mitigation measures provided in this report as well as general good construction practice are adhered. Authorisation by means of a Water Use Licence Application in terms of Sections 21 (c), (e) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) must be obtained from the relevant authorities prior to the commencement of any works.
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DOCUMENT GUIDE

The table below provides the specialist report requirements for the assessment and reporting of impacts on aquatic biodiversity in terms of Government Notice 320 as promulgated in Government Gazette 43110 of 20 March 2020 in line with the Department of Environmental Affairs screening tool requirements, as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998).

No.	Requirements	Section in report/Notes
2.1	Assessment must be undertaken by a suitably qualified SACNASP registered specialist	Cover Page and Annexure G.
2.2	Description of the preferred development site , including the following aspects-	
2.2.1	a. Aquatic ecosystem type b. Presence of aquatic species and composition of aquatic species communities, their habitat, distribution and movement patterns	Section 4 and 5
2.2.2	Threat status, according to the national web based environmental screening tool of the species and ecosystems, including listed ecosystems as well as locally important habitat types identified	Section 4: Table 1
2.2.3	National and Provincial priority status of the aquatic ecosystem (i.e. is this a wetland or river Freshwater Ecosystem Priority Area (FEPA), a FEPA sub- catchment, a Strategic Water Source Area (SWSA), a priority estuary, whether or not they are free-flowing rivers, wetland clusters, etc., a CBA or an ESA; including for all a description of the criteria for their given status	Section 4: Table 1
2.2.4	A description of the Ecological Importance and Sensitivity of the aquatic ecosystem including: a. The description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement of surface and subsurface water, recharge, discharge, sediment transport, etc.); b. The historic ecological condition (reference) as well as Present Ecological State (PES) of rivers (in-stream, riparian and floodplain habitat), wetlands and/or estuaries in terms of possible changes to the channel, flow regime (surface and groundwater)	Section 4: Table 1
2.3	Identify any alternative development footprints within the preferred development site which would be of a “low” sensitivity as identified by the national web based environmental screening tool and verified through the Initial Site Sensitivity Verification	None. Entire site considered high sensitivity.
2.4	Assessment of impacts – a detailed assessment of the potential impact(s) of the proposed development on the following very high sensitivity areas/ features:	Section 7: Table 6
2.4.1	Is the development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal?	Yes, with implementation of the proposed mitigation measures
2.4.2	Is the development consistent with maintaining the Resource Quality Objectives for the aquatic ecosystems present?	
2.4.3	How will the development impact on fixed and dynamic ecological processes that operate within or across the site, including: a. Impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); b. Change in the sediment regime (e.g. sand movement, meandering river mouth/estuary, changing flooding or sedimentation patterns) of the aquatic ecosystem and its sub-catchment; c. The extent of the modification in relation to the overall aquatic ecosystem (i.e. at the source, upstream or downstream portion, in the temporary / seasonal / permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.) and d. Assessment of the risks associated with water use/s and related activities.	Section 5: Table 3 and 4
2.4.4	How will the development impact on the functionality of the aquatic feature including:	Section 5: Table 3 and 4

	a. Base flows (e.g. too little/too much water in terms of characteristics and requirements of system); b. Quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over abstraction or instream or off-stream impoundment of a wetland or river); c. Change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchanneled valley-bottom wetland to a channelled valley-bottom wetland); d. Quality of water (e.g. due to increased sediment load, contamination by chemical and/or organic effluent, and/or eutrophication); e. Fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and f. Loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g. waterfalls, springs, oxbow lakes, meandering or braided channels, peat soils, etc).	
2.4.5	How will the development impact on key ecosystem regulating and supporting services especially Flood attenuation; Streamflow regulation; Sediment trapping; Phosphate assimilation; Nitrate assimilation; Toxicant assimilation; Erosion control; and Carbon storage.	Section 5: Table 3 and 4
2.4.6	How will the development impact community composition (numbers and density of species) and integrity (condition, viability, predator-prey ratios, dispersal rates, etc.) of the faunal and vegetation communities inhabiting the site?	Section 5: Table 3 and 4
2.4.7	In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to: size of the estuary; availability of sediment; wave action in the mouth; protection of the mouth; beach slope; volume of mean annual runoff; and extent of saline intrusion (especially relevant to permanently open systems).	N/A Closest Estuary is located 4,6km west from the study area.
3.	The report must contain as a minimum the following information:	
3.1	Contact detail of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae.	Annexure G
3.2	A signed statement of independence by the specialist.	Annexure G
3.3	A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment.	Section 5
3.4	The methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant.	Section 3, Annexure C and Annexure D
3.5	A description of the assumptions made, any uncertainties or gaps in knowledge or data.	Section 1.3
3.6	The location of areas not suitable for development, which are to be avoided during construction and operation, where relevant.	Section 7: Table 6.
3.7	Additional environmental impacts expected from the proposed development.	Section 7: Table 6.
3.8	Any direct, indirect and cumulative impacts of the proposed development on site.	Section 7.2
3.9	The degree to which impacts and risks can be mitigated.	Section 7.3
3.10	The degree to which impacts and risks can be reversed.	Section 7.3
3.11	The degree to which the impacts and risks can cause loss of irreplaceable resources.	Section 7.3
3.12	A suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies.	Section 6
3.13	Proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr).	Section 7: Table 6.
3.14	A motivation must be provided if there were development footprints identified as per paragraph 2.3 for reporting in terms of Section 24(5)(a) and (h) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) that were identified as having a “low” aquatic biodiversity and sensitivity and that were not considered appropriate.	None. The entire study area falls within a high aquatic biodiversity sensitivity.
3.15	A substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not.	Section 8
3.16	Any conditions to which this statement is subjected.	Section 8

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GLOSSARY OF TERMS

Alien vegetation:	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally. Vegetation species that originate from outside of the borders of the biome -usually international in origin.
Biodiversity:	The number and variety of living organisms on earth, the millions of plants, animals and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystems, ecological processes and landscape of which they are integral parts.
Buffer:	A strip of land surrounding a wetland or riparian area in which activities are controlled or restricted, in order to reduce the impact of adjacent land uses on the wetland or riparian area.
Catchment:	The area where water is collected by the natural landscape, where all rain and run-off water ultimately flows into a river, wetland, lake, and ocean or contributes to the groundwater system.
Delineation (of a wetland):	To determine the boundary of a wetland based on soil, vegetation and/or hydrological indicators.
Ecoregion:	An ecoregion is a "recurring pattern of ecosystems associated with characteristic combinations of soil and landform that characterise that region".
Facultative species:	Species usually found in wetlands (76%-99% of occurrences) but occasionally found in non-wetland areas
Gleying:	A soil process resulting from prolonged soil saturation which is manifested by the presence of neutral grey, bluish or greenish colours in the soil matrix.
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 living in anaerobic soils).
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 defined 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).
Perennial:	Flows all year round.
RDL (Red Data listed) species:	Organisms that fall into the Extinct in the Wild (EW), critically endangered (CR), Endangered (EN), Vulnerable (VU) categories of ecological status.
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 No. 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 Vegetation (WetVeg) type:	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.

ACRONYMS

°C	Degrees Celsius
BAR	Basic Assessment Report
BGIS	Biodiversity Geographic Information Systems
CBA	Critical Biodiversity Area
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EC	Ecological Class or Electrical Conductivity (use to be defined in relevant sections)
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMC	Ecological Management Class
EMP	Environmental Management Program
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Areas
GA	General Authorisation
GIS	Geographic Information System
GN	Government Notice
GPS	Global Positioning System
HGM	Hydrogeomorphic
IHI	Index of Habitat Integrity
m	Meter
MAP	Mean Annual Precipitation
MC	Management Classes
NAEHMP	National Aquatic Ecosystem Health Monitoring Programme
NBA	National Biodiversity Assessment
NEMA	The National Environmental Management Act, 1998 (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Areas
NWA	National Water Act, 1998 (Act No. 36 of 1998)
NWCS	National Wetland Classification System
PEMC	Present Ecological Management Class
PES	Present Ecological State
REC	Recommended Ecological Category
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SAS	Scientific Aquatic Services
subWMA	Sub-Water Management Area
WetVeg Groups	Wetland Vegetation Groups
WMA	Water Management Areas
WRC	Water Research Commission

1 INTRODUCTION

1.1 *Background*

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was appointed to conduct a specialist freshwater ecological assessment as part of the environmental assessment and Water Use Authorisation (WUA) processes for the proposed Mount View residential development on the remainder of Farm 869, Farm 1262, remainder of Farm 866, remainder of Farm 1054, portions 2 and 3 of Farm 1054 and portion 2 of farm 870, Sir Lowry's pass, Western Cape, hereafter referred to as the "study area". (refer to Section 2 for the detailed project description). In order to identify all watercourses that may potentially be impacted by the proposed Mount View residential development, a 500 m "zone of investigation" was implemented around the study area, in accordance with Government Notice (GN) 509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) (NWA), in order to assess possible sensitivities of the receiving freshwater environment. This area – i.e. the 500 m zone of investigation around the study area – will henceforth be referred to as the "investigation area".

The purpose of this report is to define the ecology of the watercourse associated with the study area in terms of the natural watercourse characteristics, including mapping of the watercourse, defining areas of increased Ecological Importance and Sensitivity (EIS), and defining the Present Ecological State (PES) of the watercourses associated with the study area. BlueScience[1] undertook a freshwater habitat impact assessment of the study area as part of a screening assessment for the proposed development in 2018, which is used as the background to this study. The Department of Water and Sanitation (DWS) Risk Assessment Matrix as promulgated in Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) was applied to determine the significance of the impacts associated with the proposed Mount View residential development and mitigatory measures were identified which aim to minimise the potential impacts.

This study further aims to provide detailed information to guide the proposed Mount View residential development in the vicinity of the watercourse, to ensure the ongoing functioning of the ecosystems, such that local and regional conservation requirements and the provision of ecological services in the local area are supported while considering the need for sustainable economic development. This report, after consideration of the above, must guide the Environmental Assessment Practitioner (EAP), by means of a reasoned opinion and recommendations, as to the viability of the proposed development activities from a watercourse management perspective.

1.2 *Structure of this report*

This report investigates the impact significance of the proposed residential development, as explained in Section 2 below, in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as well as the National Water Act, 1998 (Act No. 36 of 1998) (NWA) by means of the DWS Risk Assessment Matrix. The following structure is applicable to this report:

Section 1: Introduction
Provides an introduction, the structure of this report and the assumptions and limitations.

[1] BlueScience, 2018. Freshwater Constraints and Opportunities Report for the Proposed Development of Kleine Goedeverwachting, Farm 2/870, Sir Lowry S Pass. Report reference: P542-May18
BlueScience, 2018. Freshwater Screening Report for The Proposed Development of Goedeverwachting, Sir Lowry S Pass. Report reference: P541-May18

Section 2: Project Description
Provides the location of the study area as well as a brief summary of the activities associated with the proposed Mount View residential development .

Section 3: Assessment Approach
Provides the relevant methodology and definitions applicable to this report, a description of the sensitivity mapping and the risk assessment approach.

Section 4: Desktop Assessment Results
Reports on the findings from the relevant national, provincial and municipal datasets (such as the National Freshwater Ecosystem Priority Areas [NFEPA], 2011 database; the DWS Resource Quality Information System (RQIS) PES/ EIS, 2014 database, Western Cape Biodiversity Spatial Plan (2017) and the City of Cape Town Wetlands database (2017) was undertaken to aid in defining the PES and EIS of the watercourse.

Section 5: Site Based Watercourse Assessment Results
This section reports the following:

- A description and delineation of all watercourses associated with the study area according to "Department of Water Affairs and Forestry (DWAF)[2] (2008): A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones". All features are mapped according to their ecological sensitivity;
- Delineation of all watercourses (using desktop methods) within 500 m of the study area in accordance with Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to activities as stipulated in Section 21 (c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998);
- The classification of the watercourses according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis *et al*., 2013);
- The EIS of the watercourse according to the method described by Rountree and Kotze*,* (2013);
- The services provided by the watercourses associated with the study area were assessed according to the method of Kotze *et al.* (2009);
- The Index of Habitat Integrity of the watercourse according to the resource directed measures guideline as advocated by Kleynhans (2005);
- The Present Ecological State (PES) of the watercourses according to the resource directed measures guideline as advocated by MacFarlane *et al*. (2008); and
- The allocation of a suitable Recommended Ecological Category (REC), Recommended Management Objective (RMO) and Best Attainable State (BAS) to the watercourse based on the results obtained from the PES, Ecoservices and EIS assessments.

Section 6: Legislative Requirements
Provides the applicable legislative requirements based on the findings from Section 5 and indicates any applicable zones of regulation that may trigger various enviro-legal authorisation requirements.

Section 7: Risk Assessment
Provides the outcomes from the DWS Risk Assessment Matrix which highlights all potential impacts and that may affect the watercourse. Management and mitigation measures are provided which should be implemented during the various development activities (planning, construction and operational phases) in order to assist in minimising the impact on the receiving environment. The anticipated cumulative impacts and reversibility/irreplaceable loss that the proposed development may have on the watercourses is expanded upon in this section.

[2] The Department of Water Affairs and Forestry (DWAF) was formerly known as the Department of Water Affairs (DWA). At present, the Department is known as the Department of Water and Sanitation (DWS). For the purposes of referencing in this report, the name under which the Department was known during the time of publication of reference material, will be used.

Section 8: Conclusion
Summarises the key findings and recommendations based on the risk assessment outcomes and legislative requirements.

1.3 *Assumptions and Limitations*

- The ground-truthing and delineation of the watercourse boundaries and the assessment thereof are limited to a two-day site visit undertaken in October 2020 (Western Cape spring season) and January 2021 (Western Cape summer season) of the study area. During the field assessment in January 2021, the wetlands associated with the proposed residential development were field delineated using land surveying principles to ensure accuracy. All watercourses identified within the investigation area were delineated in fulfilment of GN509 of the National Water Act, 1998 (Act No. 36 of 1998) using various desktop methods including use of topographic maps, historical and current digital satellite imagery and aerial photographs;
- Most areas surrounding the study area have undergone anthropogenic changes as a result of the surrounding agricultural activities, linear infrastructure development and urbanisation. The watercourse delineation as presented in this report is therefore regarded as a best estimate of the boundaries based on the site conditions present, as observed during the site assessment. The results obtained are, however, considered sufficiently accurate to allow informed planning and decision making to take place;
- Watercourses and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to obligate/facultative species. Within this transition zone, some variation of opinion on the watercourse boundaries may occur. However, if the DWAF (2008) method is followed, all assessors should get largely similar results; and
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, it is expected that the watercourse has been accurately assessed and considered, based on the field observations and the consideration of existing studies and monitoring data in terms of riparian and wetland ecology.

2 PROJECT DESCRIPTION

The proposed Mount View residential development is situated on the remainder of Farm 869, Farm 1262, remainder of Farm 866, remainder of Farm 1054, portions 2 and 3 of Farm 1054 and portion 2 of farm 870, within the Stellenbosch Farms district. The farm is located on the edge of Sir Lowry's Pass Village between Tre-Donne and High Riding residential estates. Access to the study area is gained via the Old Sir Lowry's Pass Road which bisects the southern portion of the study area. An unnamed tributary of the Sir Lowry's Pass River bisects the central portion of the study area and crosses under the Old Sir Lowry's Pass Road. The total size of the study area is approximately 31.24 hectare (ha) (Figures 1 and 2).

The site development plan (SDP) for the proposed Mount View residential development was revised to address comments from the public participation process and recommendations from the freshwater assessment report for the proposed Mount View residential development undertaken by FEN (2020). Figure 3 below shows the latest SDP for the proposed Mount View residential development in relation to the delineated watercourses and respective variable conservation buffer as per section 5.1 and 6 below. The proposed Mount View residential development will consist of a residential development with single residential erven, with a portion of the development site allocated to open green space and a clubhouse facility with restaurants, commercial space, gymnasium, pool and a creche. As per the Civil Engineering Services Report prepared by KLS Consulting Engineers (2021), the proposed Mount View residential development will consist of the following:

Mount View Lower (south of Old Sir Lowry's Pass Road)

- 77 single residential erven – (1.64ha @ 21 density per hectare (du/ha))
- Development area – 3.64 ha (site area - 8.00 ha)
- Private road – 0.62 ha
- Green spaces – 1.06 ha

Mount View Upper (north of Old Sir Lowry's Pass Road)

- 318 single residential erven – (6.8 ha @ 19 du/ha)
- Development area – 16.75 ha (site area – 23.24 ha)
- Public precincts – 0.74 ha
- Private road – 2.3 ha
- Green spaces – 5.57 ha

The pre- and post-development 1:100 year floodline have been modelled for the unnamed tributary of the Sir Lowry's Pass River located within the study area (Storey ENG, 2019, 2021). The majority of the proposed Mount View residential development is situated above the post-development 1:100 year floodline; however, some of the development aspects (as described below) are located below the post-development 1:100 year floodline and within the conservation buffer of the watercourses (Figure 3).

Listed below are the activities associated with the Mount View residential development located below the post-development 1:100 year floodline, conservation buffer and those within close proximity to the watercourse, as per the Civil Engineering Services Report prepared by KLS Consulting Engineers (2021). Please refer to the Civil Engineering Services Report for a full description of the proposed development activities.

- Some activities as part of the lower development are located below the post-development 1:100 year floodline and within the delineated boundary of the watercourses. As part of the development, it is proposed that previously unauthorised infilled material below the 1:100 year floodline and within the riparian area and delineated boundary of the wetland associated with the unnamed tributary of the Sir Lowry's Pass River (located downgradient of the Old Sir Lowry's Pass Road as shown in Figure 4), be removed to spoil on site and the infilled area subsequently reshaped and rehabilitated. KLS Consulting Engineers calculated the footprint and volume of material to be removed as 4111 m^3;
- Alteration of the modelled pre-development 1:100 year floodline to reduce the extent of the floodable area south east of Old Sir Lowry's Pass Road to accommodate portions of the proposed Mount View residential development. This will entail:
    - An open stormwater channel proposed upgradient of Old Sir Lowry's Pass Road to channel flow to the existing culvert under the road within the unnamed tributary. The stormwater channel will be approximately 96 m in length and located as shown on Figure 3;
    - Enlargement of the existing pipe culvert below Old Sir Lowry's Pass Road to a 2.4 m wide and 1 m high portal culvert;
    - A flood management berm is proposed just downstream of the culvert and extends parallel to the road in a south eastern direction. The berm will be 1 m high above the natural ground level and will extend for approximately 50 m, located as shown on Figure 3; and
    - Landscaping of the adjusted floodline and culverts for erosion control.
- Internal Roads and Parking Areas
    - An internal roadway is proposed to traverse the unnamed tributary along the northern boundary of the study area, on an existing access road for the site and will require the installation of a rectangular portal culvert with 330 mm brick wing walls. This culvert will be sized to accommodate up to a 1:100 year flow in the watercourse and have reno-mattresses at the inlet and outlet to reduce erosion including riprap below the culvert outlet to dissipate flow and further reduce erosion; and

- All internal roads/parking areas within development clusters will be designed to accommodate low vehicle traffic (construction vehicles, furniture removal and refuse trucks). This road network will consist of 6.3 m / 5.5 m wide brick paved roads with formal kerbs/edgings, roadside open stormwater channels and a stormwater drainage system consisting of an underground pipe/road edge culvert network.

- Internal Stormwater Network
  - Three new stormwater attenuation facilities will be constructed above the post-development 1:100 year floodline as part of the development in addition to utilising the existing farm impoundment situated north of the main farm house (see Figure 3 below for the position and identification of these stormwater attenuation facilities);
  - The main purpose of these facilities will be to attenuate stormwater run-off and promote on-site infiltration. In order to achieve the required attenuation, the storage volume of the attenuation facility must be able to retain a 1:50 year post-development flood while only discharging a peak flow equal to the 1:10 year pre-development flow; and
  - Outlet structures will discharge stormwater into an open stormwater channel network, which will convey stormwater run-off into the watercourse. Gabion weirs will be constructed within the stormwater channel to reduce stormwater velocity and erosion. The stormwater discharge points will be located below the post-development 1:100 year floodline but above the 1:50 year post-development floodline but some encroaching into the delineated watercourses. The estimated position of the stormwater discharge points is indicated in Figure 3 below.
- Three portions of private erven associated with the proposed lower and upper Mount View residential development are located within the conservation buffer of the watercourses;
- Portions of *in situ* compacted walkways are located above the post-development 1:100 year floodline but within the conservation buffer as part of the lower and upper development;
- Wastewater Treatment Plant (WWTP)
  - Two WWTPs are proposed for the Mount View residential development , namely WWTP A and WWTP B. WWTP A will be situated in the most western corner of the proposed lower Mount View residential development , above the modelled post-development 1:100 year floodline and outside the conservation buffer of the watercourses. The treated effluent will be used for irrigation purposes in order to minimise the load on the municipal water supply. Treated effluent from the WWTP will be pumped into irrigation storage tanks located next to the stormwater attenuation facilities. Storage tanks will have an emergency overflow which will discharge treated effluent into a bio-retention swale before discharging into the stormwater attenuation facility. It is recommended that a second WWTP (i.e. WWTP B) be installed should the Macassar waste water treatment works (WWTW) not be upgraded before the start of construction of the upper development. The Macassar WWTW is part of the existing municipal foul sewer network where all sewage generated from the proposed Mount View residential development will ultimately feed to. The Macassar WWTW is currently undergoing upgrades proposed to be completed by December 2025. The proposed WWTP B is located above the modelled post-development 1:100 year floodline and outside the conservation buffer of the watercourses, at the entrance of the upper development located upgradient of the Old Sir Lowry's Pass Road (see Figure 3 below). The WWTP B is proposed to be handled in the same manner as the WWTP A.
- Internal Sewage Network
  - The proposed lower Mount View residential development will require the installation of a pump station in the most western corner of the study area, above the post-development 1:100 year floodline and outside the conservation buffer of the watercourses. This pump station will be situated next to the WWTP A and will pump treated effluent into irrigation storage tanks located next to the stormwater attenuation facilities where it will be used for irrigation supply.

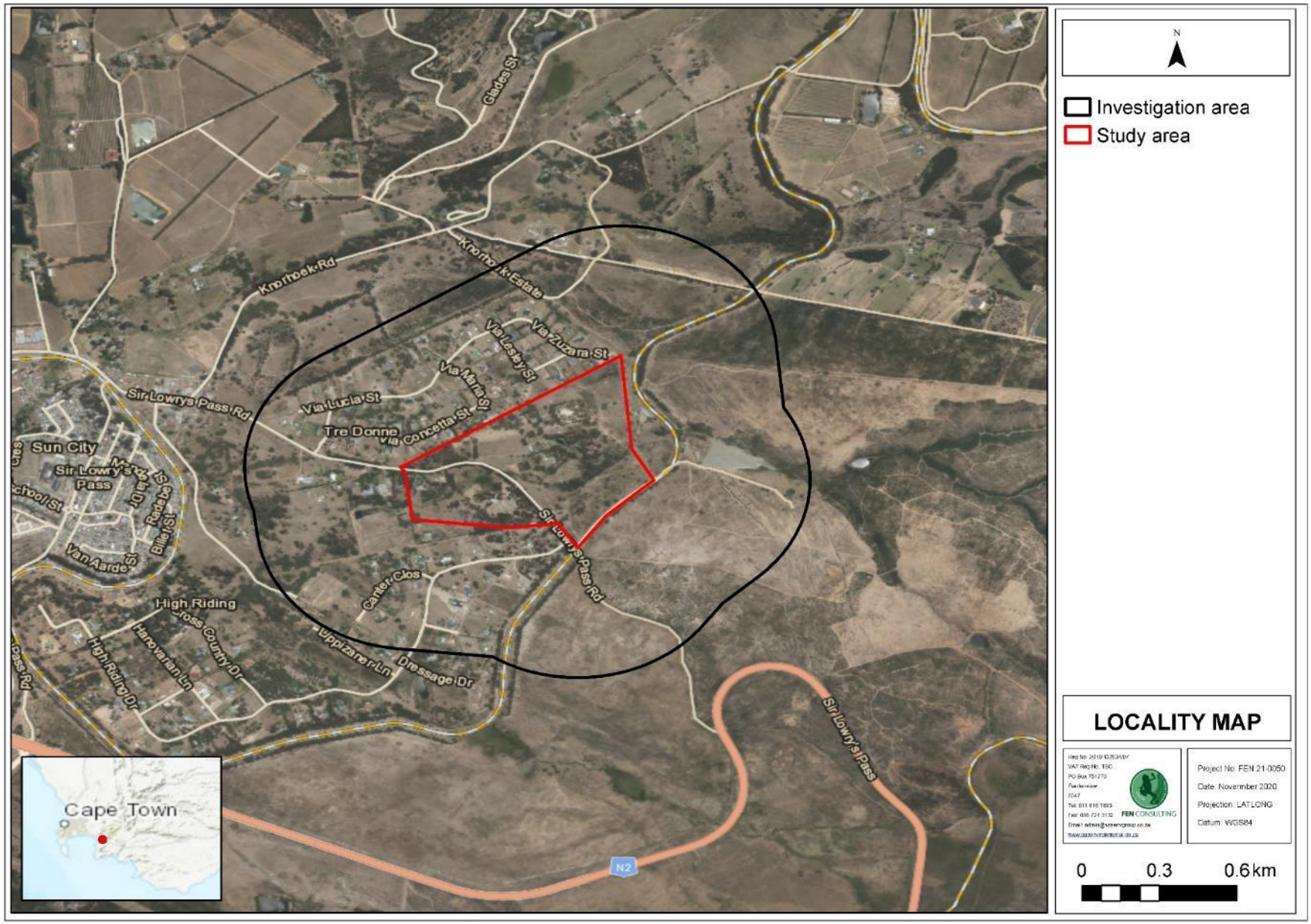


Figure 1: Digital satellite image depicting the study area and investigation area in relation to its surrounding environment.

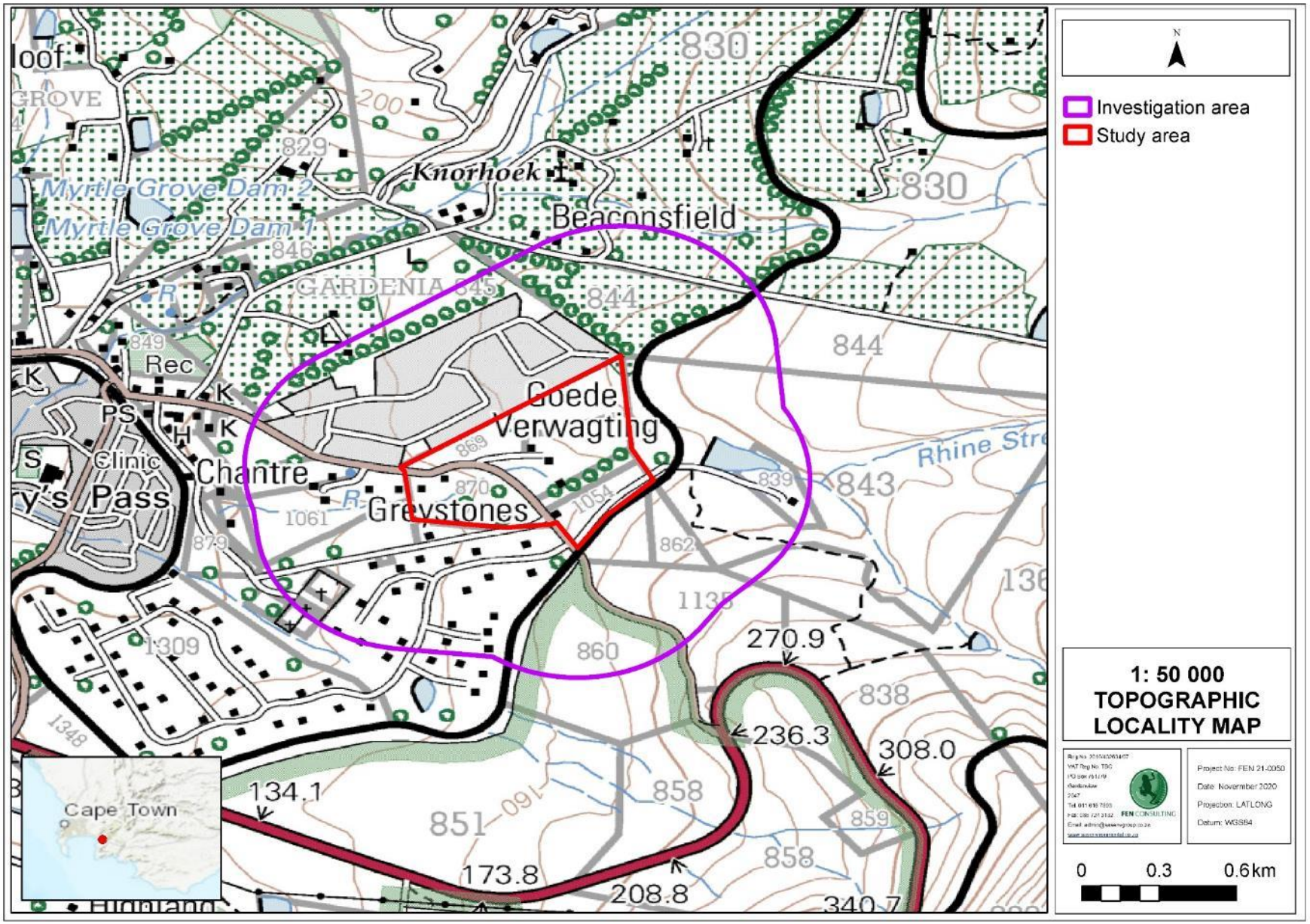


Figure 2: Location of the study and investigation areas depicted on a 1:50 000 topographical map in relation to surrounding environment.

Figure 3: The provisional Site Development Plan (SDP) for the proposed Mount View residential development as provided by Urban Studio (2021) in relation to the delineated watercourses (blue areas) and associated variable conservation buffer (dark blue dashed line). The stormwater attenuation facilities are numbered 1 to 4.

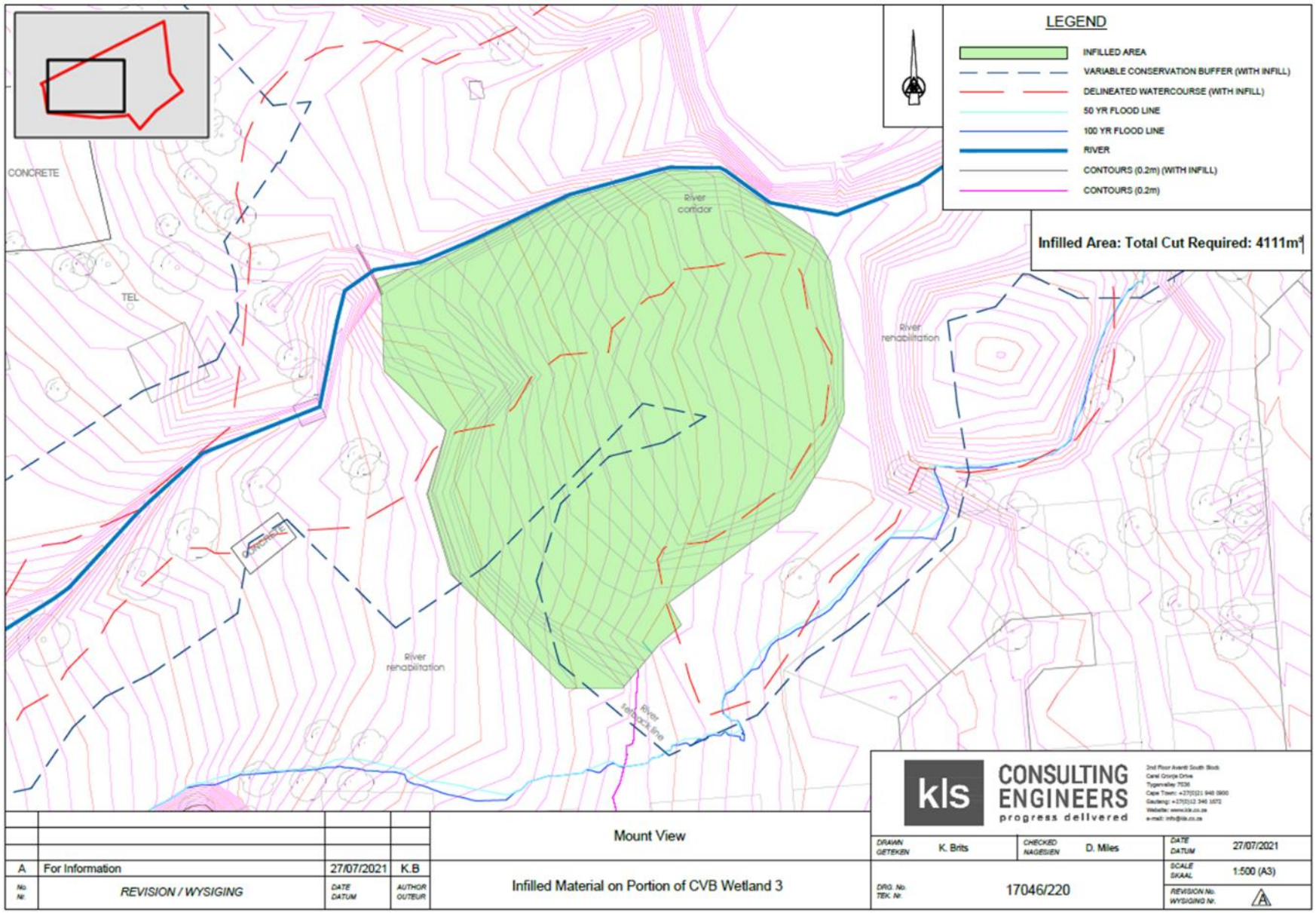


Figure 4: The footprint and volume of the unauthorised infilled material (4111 m^3) located within the southern portion of the study area in relation to the delineated unnamed tributary and associated wetland (see Section 5 below) as calculated by KLS Consulting Engineers (2021).

3 ASSESSMENT APPROACH

3.1 *Watercourse Verification*

As part of this assessment, the following definitions, as per the National Water Act, 1998 (Act No. 36 of 1998) are of relevance:

Watercourse means-

(a) A river or spring;
(b) A natural channel in which water flows regularly or intermittently;
(c) A wetland, lake or dam into which, or from which water flows; and
(d) Any collection of water, which the Minister may, by notice of the Gazette, declare a watercourse.

Wetland habitat is "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."

Riparian habitat includes the physical structure and associated vegetation of areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas**.**

The watercourse delineation took place according to the method presented in the "Updated manual for the identification and delineation of wetland and riparian resources" (DWAF, 2008). The foundation of the method is based on the fact that watercourses have several distinguishing factors including the following:

- Landscape position;
- The presence of water at or near the ground surface;
- Distinctive hydromorphic soils;
- Vegetation adapted to saturated soils; and
- The presence of alluvial soils in stream systems.

A site assessment was undertaken on the 21th of October 2020, during which the presence of any watercourse characteristics as defined by DWAF (2008) or wetlands and riparian habitats as defined by the National Water Act, 1998 (Act No. 36 of 1998) were noted (please refer to Sections 4 and 5 of this report). In addition to the delineation process, a detailed assessment of the delineated watercourses was undertaken, at which time factors affecting the integrity of the watercourses were taken into consideration and aided in the determination of the functioning and the ecological and socio-cultural services provided by the watercourses. A detailed explanation of the methods of assessment undertaken is provided in **Annexure C** of this report.

3.2 *Sensitivity Mapping*

All watercourses associated with the study area were delineated with the use of a Global Positioning System (GPS). Geographic Information System (GIS) was used to project these features onto aerial photographs and topographic maps. The sensitivity map presented in Section 6 should guide the design, layout and management of the proposed Mount View residential development.

3.1 *Risk Assessment and Recommendations*

Following the completion of the assessment, a risk assessment was conducted (please refer to **Annexure D** for the method of approach) and recommendations were developed to address and mitigate impacts associated with the proposed Mount View residential development. These recommendations also include general management measures, which apply to the proposed construction and operational/maintenance activities. The detailed mitigation measures are outlined in Section 7 of this report, while the general management measures which are considered best practice mitigation applicable to this project, are outlined in **Annexure F**

4 DESKTOP ASSESSMENT RESULTS

4.1 *National and Provincial Datasets*

The following section contains data accessed as part of the desktop assessment and presented as a "dashboard-style" report below (Table 1). The dashboard report aims to present concise summaries of the data on as few pages as possible in order to allow for integration of results by the reader to take place. Where required, further discussion and interpretation are provided.

It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics associated with the proposed Mount View residential development at the scale required to inform the environmental authorisation and/or water use authorisation processes. Given these limitations, this information is considered useful as background information to the study, and is important in legislative contextualisation of risk and impact, and was thus used as a guideline to inform the assessment and to focus on areas and aspects of increased conservation importance during the field survey. It must, however, be noted that site verification of key areas may potentially contradict the information contained in the relevant databases, in which case the site verified information must carry more weight in the decision-making process.

Table 1: Desktop data (from desktop databases only) relating to the characteristics of the associated with the study area.

Aquatic ecoregion and sub-regions in which the study area is located		Detail of the study area in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database	
Ecoregion	Southern Folded Mountains		
Catchment	Berg/Bot/Potberg	River FEPA	The study and investigation areas are located within a subWMA considered to be a Fish Support Area (FEPACODE = 2). Fish sanctuaries in a lower than A or B ecological condition are identified as fish support areas. Fish support areas include sub-quaternary catchments that are important for migration of the threatened fish species *Galaxias mollus*.
Quaternary Catchment	G22K		
WMA	Berg	NFEPA Wetlands (Figure 5)	According to the NFEPA database (2011), a single artificial channelled valley bottom wetland is located within the central portion of the study area, while a natural unchanneled valley bottom wetland with an artificial feature is located in the eastern portion of the investigation area. Both these wetlands are considered to be in a heavily to critically modified (Class Z3) ecological condition. During the site verification, the channelled valley bottom wetland located in the study area was verified to be an artificial impoundment.
subWMA	Greater Cape Town		
Dominant characteristics of the Southern Folded Mountains Ecoregion Level II (19.04) (Kleynhans et al., 2007)			
Dominant primary terrain morphology	Plains; low relief, undulating hills	Wetland Vegetation Type	The study and investigation areas are located within the Southwest Granite Fynbos (Critically Endangered) Wetland Vegetation type. The conservation value of the vegetation types is as per Mbona *et al.* (2015).
Dominant primary vegetation types	South and South-west coast renosterveld, Dune Thicket, West coast renosterveld		
Altitude (m a.m.s.l)	0 - 1300		
MAP (mm)	500 - 1000		
The coefficient of Variation (% of MAP)	<20 - 50		
Rainfall concentration index	30 - 50		
Rainfall seasonality	Winter	NFEPA Rivers (Figure 5)	As per the NFEPA database (2011), the Sir Lowrys River is located approximately 800 m north of the study area. This river is considered to be in a largely modified (Class D) ecological condition according to the PES 1999 classification and a moderately modified (Class C) ecological condition according to the NFEPA Dataset.
Mean annual temp. (°C)	16 - 28		
Winter temperature (July)	4 – 16		
Summer temperature (Feb)	10 – 18		
Median annual simulated runoff (mm)	>250		
National Biodiversity Assessment (2018): South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Figure 6) (National Wetland Map 5 is included in the NBA)			
According to the NBA 2018: SAIIAE there is a dam within the study area and another in the investigation area. There is a natural unchannelled valley bottom wetland located within the central portion of the study area, and a natural channelled valley bottom wetland is located within the northern portion of the investigation area. The unchannelled valley bottom wetland and channelled valley bottom wetland are considered to be in a natural or good ecological condition (Class A/B). The Ecosystem Threat Status (ETS) of these wetlands is critically endangered, and the ecosystem protection level (EPL) thereof is poorly protected. According to the NBA 2018 SAIIAE Dataset, the Sir Lowrys Pass River is considered to be seriously modified (Class E). The EPL of the Sir Lowrys Pass River is not protected and the ETS is critically endangered.			
Importance of the study area according to the City of Cape Town Biodiversity Network (2019) (Figure 7)			
According to the City of Cape Town Biodiversity Network (2019), southern and eastern portions of the study area fall within “Other Natural Areas”. Until the Biodiversity Network is secured elsewhere, these areas may become important if these are required as biodiversity offset sites. Higher impact activities could be considered on degraded portions. Sustainable management within general land-use principles. These areas are of local significance and will result in impaired ability to meet targets, given that higher categories will not always be achievable. A small north eastern portion of the study area is classified as an “Other Ecological Support Area (OESA)”. These areas are irreversibly modified sites of conservation significance. These areas are considered a high priority but have a low urgency. OESAs generally fall outside the urban edge, are essential for protected sites, are of local significance and are required for long-term ecological functioning of neighbouring natural ecosystems. Loss of these areas would result in the degradation of ecological processes and potential loss of biodiversity elements.			

Importance of the study area according to the City of Cape Town wetlands dataset (2017) (Figures 8 and 9)
The City of Cape Town Wetlands Dataset (2017) identified three depression linked channel features, two isolated depression features and one channelled valley bottom wetland within the study area. The channelled valley bottom wetland is classified as a Category 1 Critical Biodiversity Area (CBA), which are areas required to meet the vegetation and species biodiversity targets. One depression linked with a channel is considered a Critical Ecological Support Area (CESA), which are unselected areas that are in natural vegetation. These areas are essential for ecological support for CBAs and protected sites. The remaining depression features are classified as Other Ecological Support Areas (OESA), which are open space areas irreversibly modified by agriculture r other activities. These sites are essential for protected sites.
National web based environmental screening tool (2020)
The study area is located in an area considered of very high aquatic biodiversity sensitivity. This is due to the presence of wetlands and the study area is situated within a strategic water source area. According to the Strategic Water Source Area Database (2017), the study area is situated within the Boland Surface Water Area and the Southwestern Cape Ranges Groundwater Area.

CBA = Critical Biodiversity Area; CESA = Critical Ecological Support Area; CR = Critically Endangered; EI = Ecological Importance; ES = Ecological Sensitivity; ESA = Ecological Support Area; EN = Endangered; m.a.m.s.l = Metres above mean sea level; MAP = Mean Annual Precipitation; NFEPA = National Freshwater Ecosystem Priority Area; OESA = Other Ecological Support Area; PES = Present Ecological State; WMA = Water Management Area.

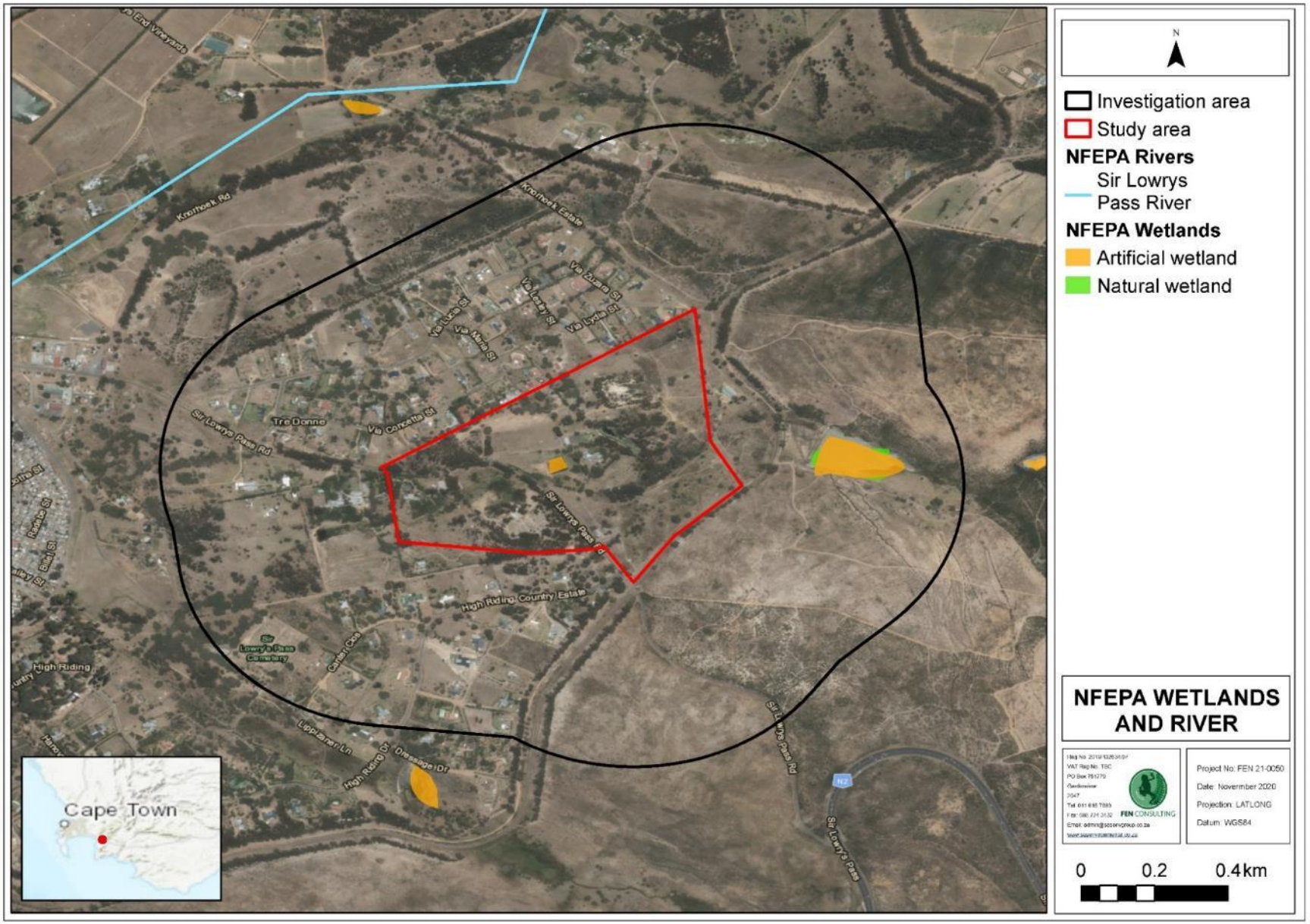


Figure 5: Rivers and artificial wetlands associated with the study and investigation areas, according to the NFEPA database (2011).

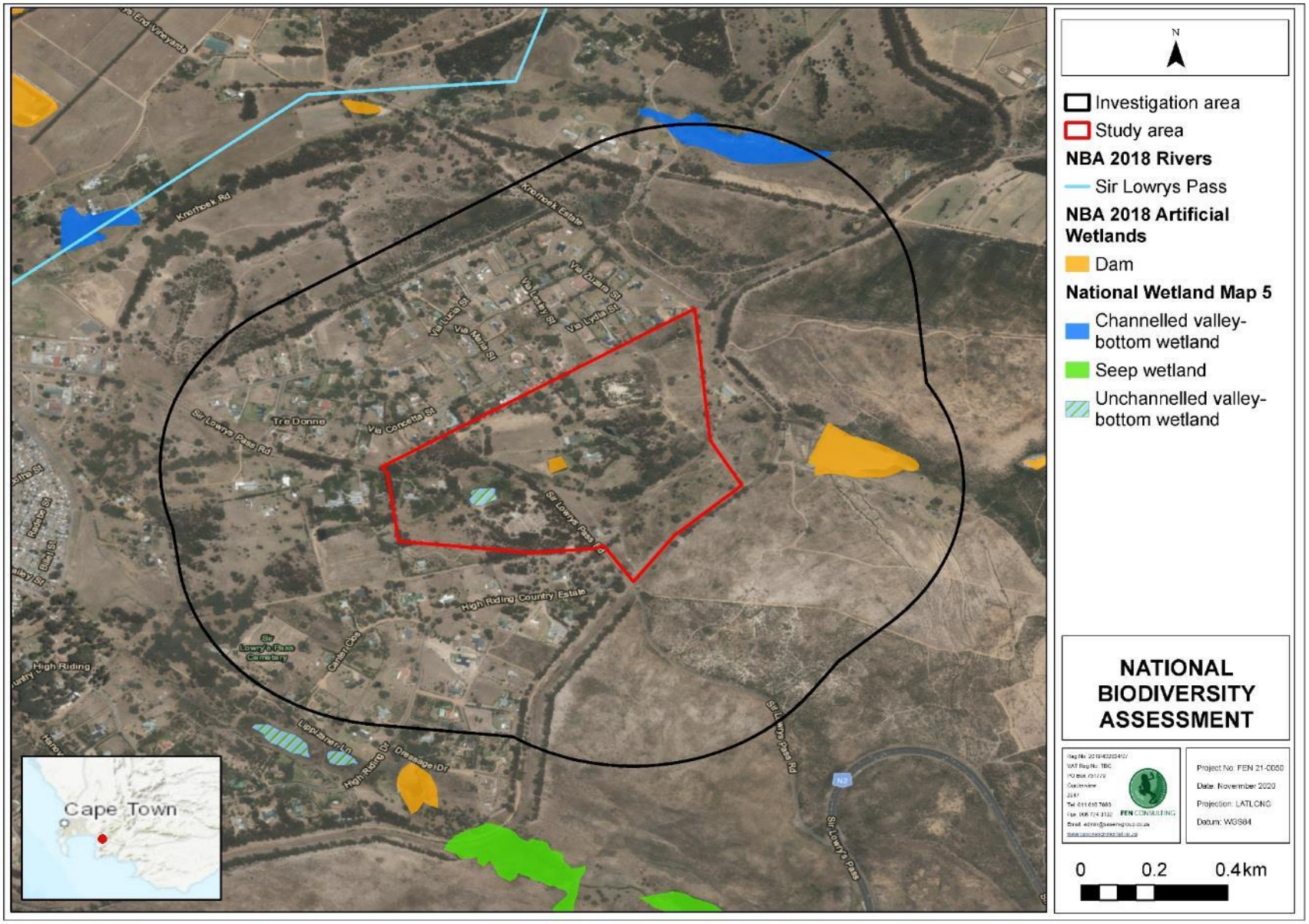


Figure 6: Wetland HGM units and rivers associated with the study and investigation areas according to the National Biodiversity Assessment database (2018).

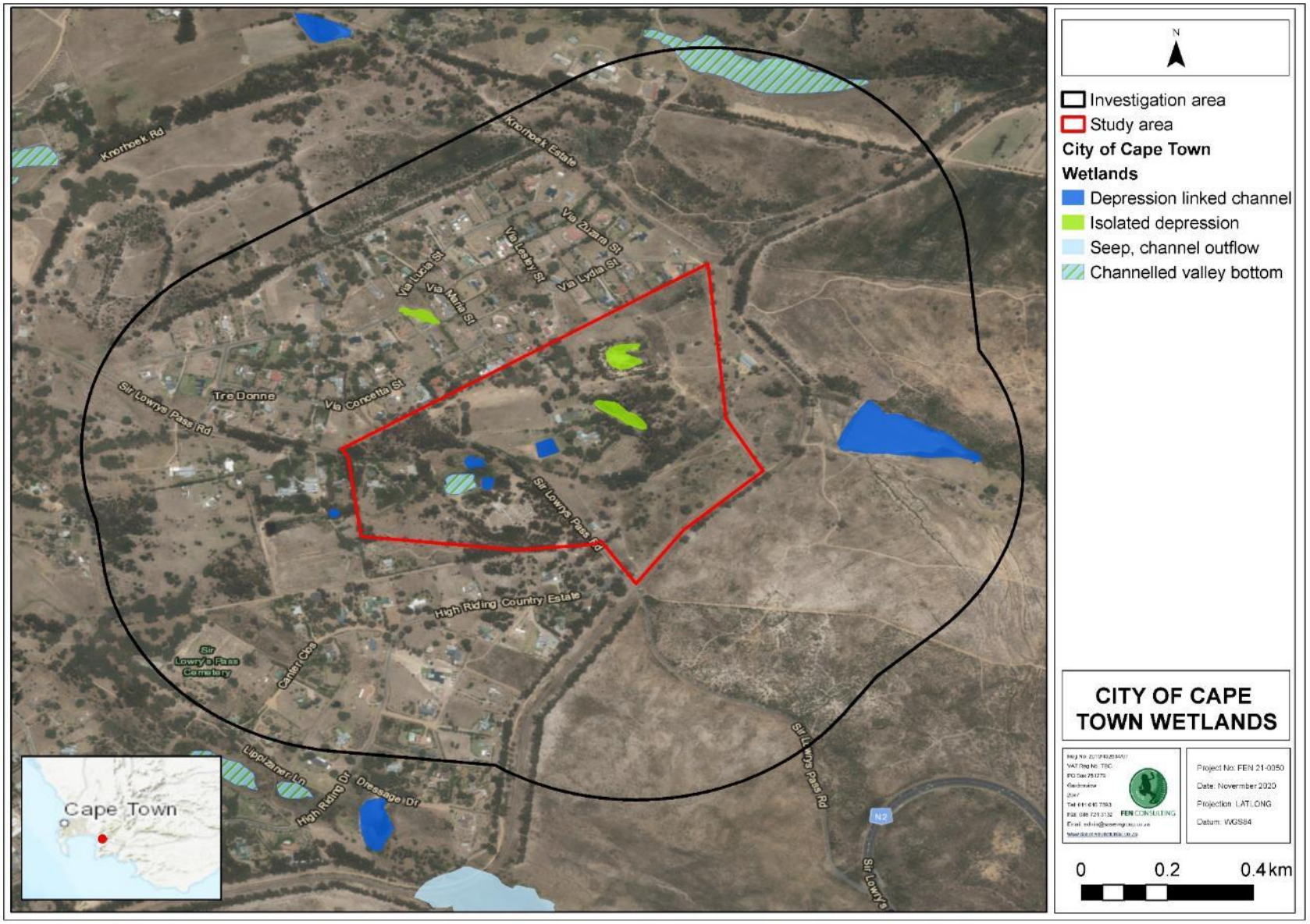


Figure 7: Wetland classifications associated with the study and investigation area, according to the City of Cape Town (CoCT) Wetlands database (2017).

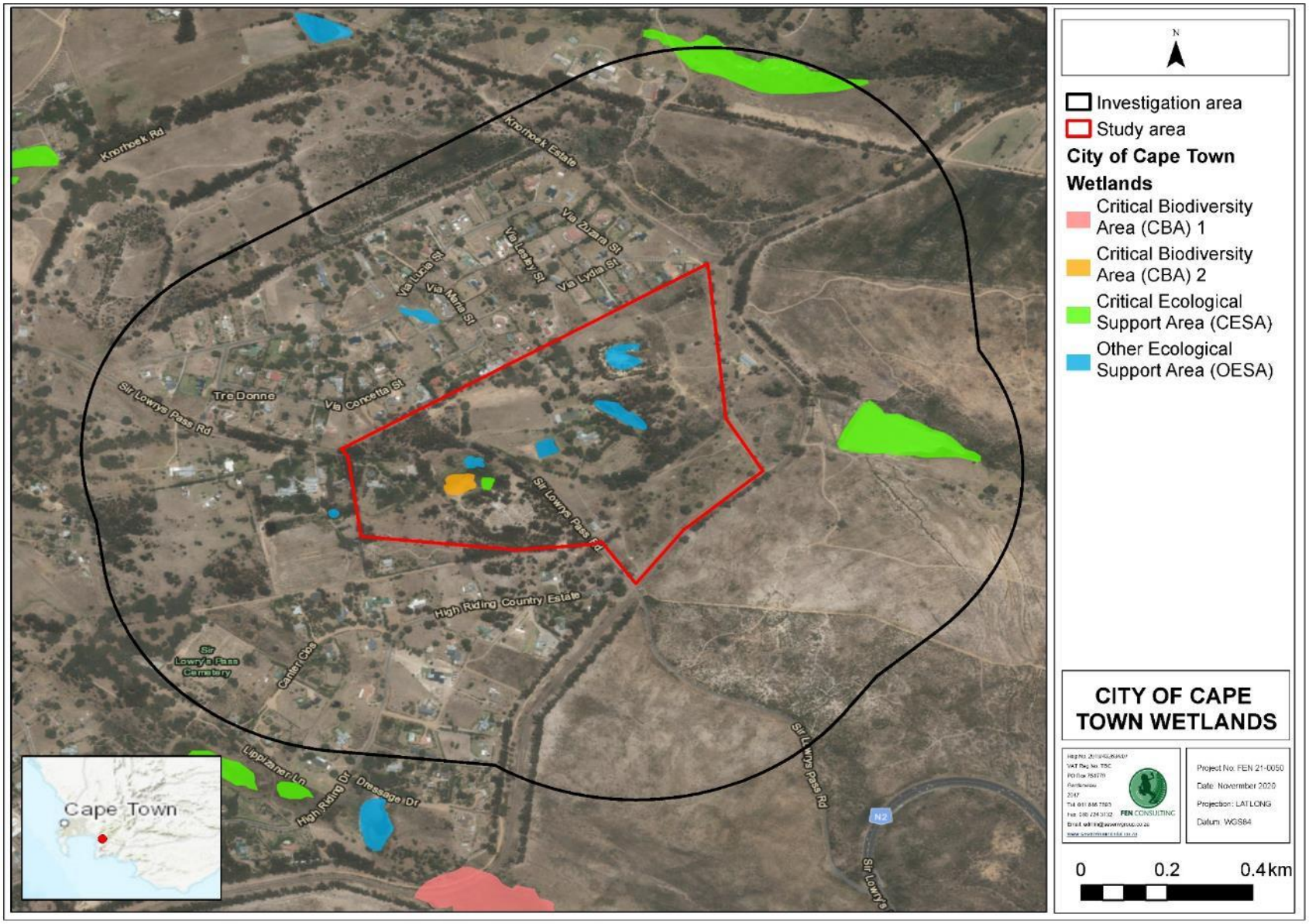


Figure 8: Areas of ecological importance associated with the study and investigation area, according to the City of Cape Town (CoCT) Wetlands database (2017).

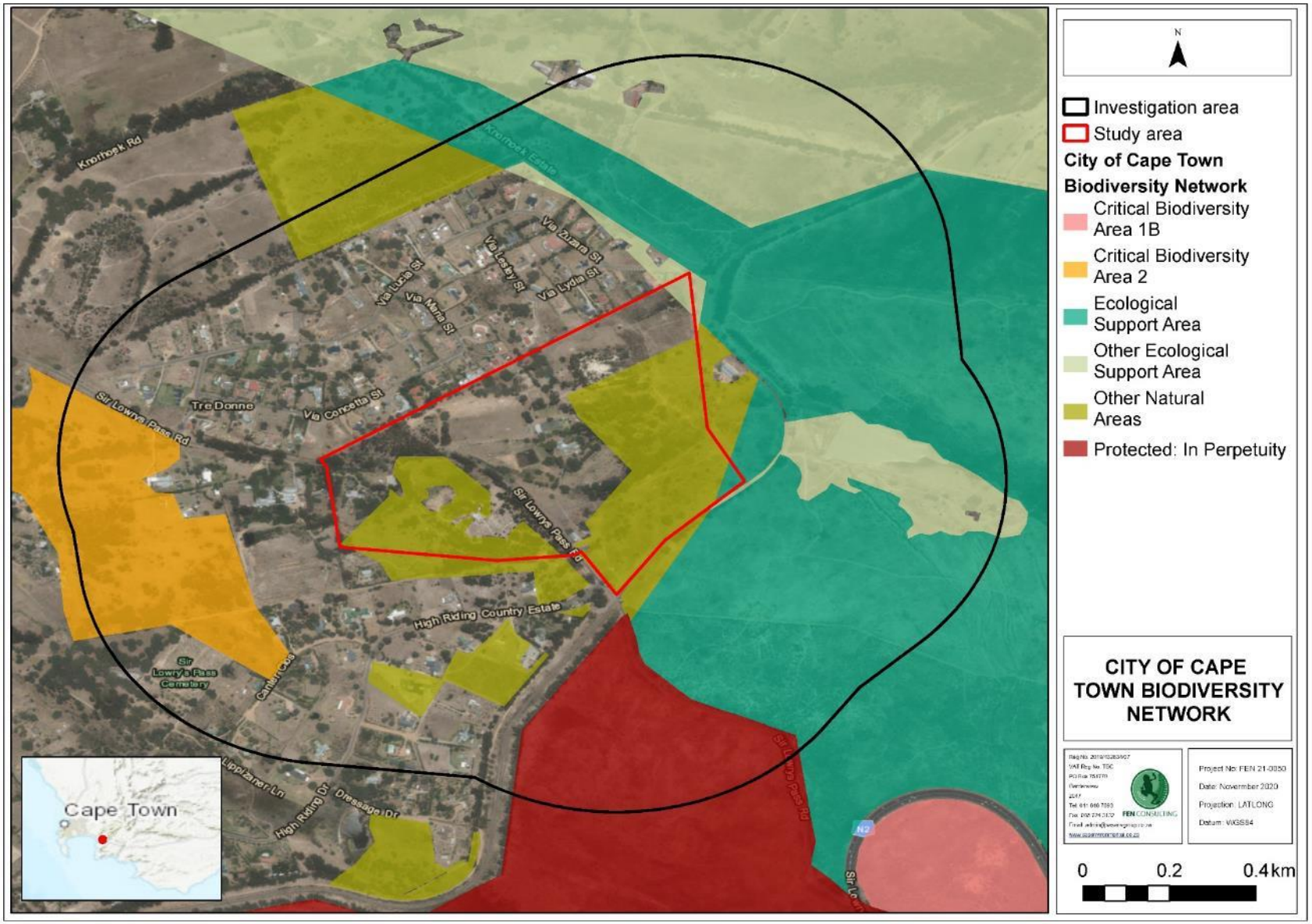


Figure 9: Areas of ecological importance associated with the study and investigation area, according to the City of Cape Town (CoCT) Biodiversity Network database (2017).

5 RESULTS: WATERCOURSE ASSESSMENT

In preparation for the field assessment, aerial photographs, digital satellite imagery and provincial and national watercourse databases (as outlined in Section 4 of this report) were used to identify points of interest in the surrounding area at a desktop level. A diversity of signatures corresponding with watercourses can be identified. In this regard, specific mention is made of the following:

- Linear features: since water flows/moves through the landscape, watercourses often have a distinct linear element to their signature which makes them discernable on aerial photography or satellite imagery;
- Vegetation associated with watercourses: a distinct increase in density as well as shrub size near flow paths;
- Hue: with water flow paths often show as white/grey or black and outcrops or bare soils displaying varying chroma created by varying vegetation cover, geology and soil conditions. Changes in the hue of vegetation with watercourse vegetation often indicated on black and white images as areas of darker hue (dark grey and black). In colour imagery these areas mostly show up as darker green and olive colours or brighter green colours in relation to adjacent areas where there is less soil moisture or surface water present; and
- Texture: with areas displaying various textures, created by varying vegetation cover and soil conditions.

On review of the historical photograph dating back to 1938, a watercourse, the unnamed tributary of Sir Lowry's Pass River, can be identified bisecting the study area (Figure 10). Based on the historical photograph, the surrounding landscape had already been transformed for agricultural land-use purposes. Urban development was still limited but linear infrastructure is visible such as the Old Sir Lowry's Road bisecting the southern portion of the study area and traversing the watercourse flowing in a north to south direction through the study area. Despite the agricultural activities within and surrounding the study area, the riparian vegetation associated with the unnamed tributary of the Sir Lowry's Pass River appears to be quite dense in the central portion of the study area.

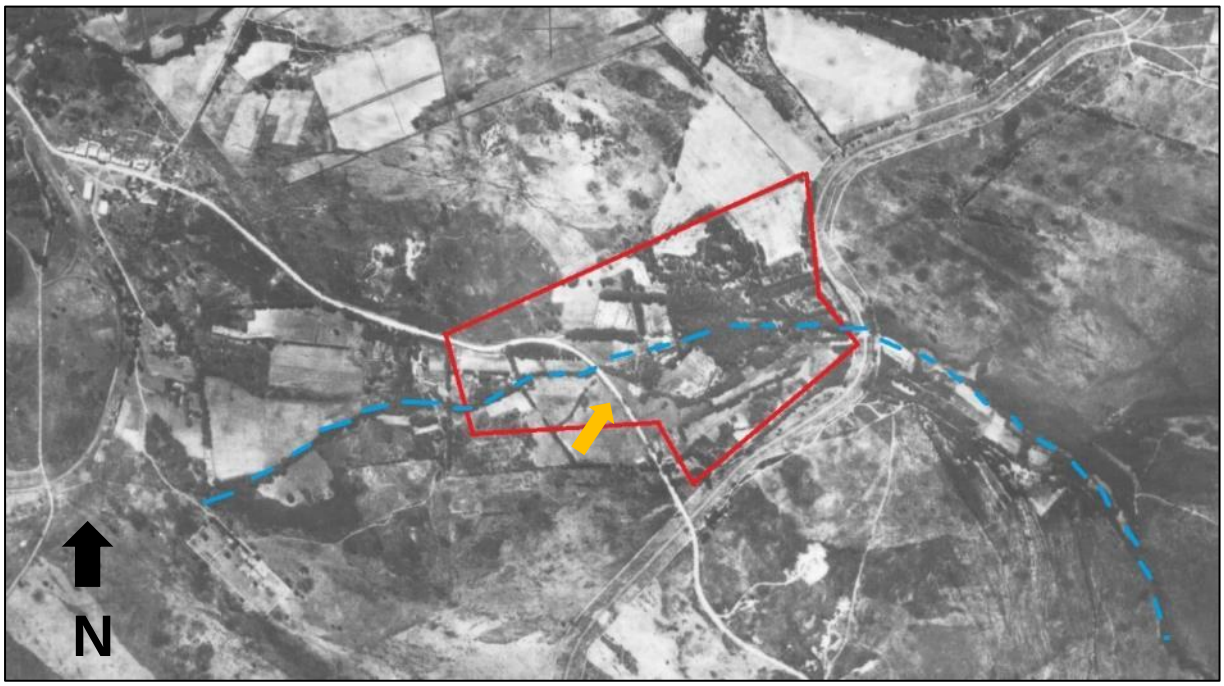


Figure 10: Historical photograph (1938) of the study area (indicated in red) relative to the location of the unnamed tributary of Sir Lowry's Pass River (blue dashed line) and Old Sir Lowry's Road traversing the southern extent of the study area (orange arrow).

On review of the digital satellite imagery, circa 2020 (Figure 11), the surrounding environment has transformed from a largely agricultural land use to a predominantly peri-urban setting. Homesteads and artificial impoundments have been established in the study area and the vegetation associated with the watercourse has decreased in density and cover, specifically associated with the watercourse reach in the northern portion of the study area.

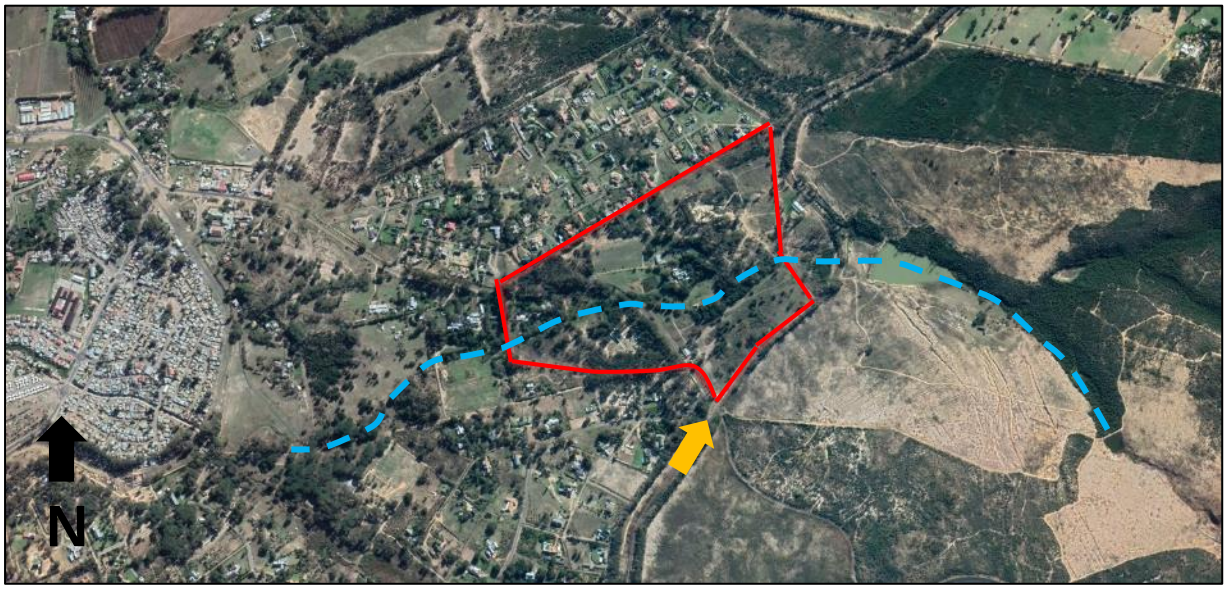


Figure 11: Digital satellite imagery of the study area (red outline), circa 2020, relative to the watercourse (blue dashed line) and the Old Sir Lowry's Road bisecting the southern extent of the study area (orange arrow).

5.1 *Watercourse delineation*

During the assessment undertaken in October 2020, a riparian watercourse, the unnamed tributary of the Sir Lowry's Pass River was identified bisecting the study area in a north to south westerly direction. It should be noted that the riparian extent of the unnamed tributary exceeds the extent of the modelled 1:100 year floodline (Figure 14). This is due to the confined active channel of the tributary. Five channelled valley bottom (CVB) wetlands were also identified to be associated with the unnamed tributary within the study area. The delineated extent of these watercourses is provided in Figure 14 in relation to the proposed road, erven layout and stormwater management structures associated with the proposed Mount View residential development. Numbers are used to identify the CVB wetlands and letters are used to identify the artificial impoundments delineated on site. Due to the fragmentated nature of the CVB wetlands, and altered habitat conditions of these wetland systems as observed within the study area, CVB wetland 1 presented a different and more intact habitat and vegetation cover compared to the CVB wetlands 2 to 5 – as such the PES for the CVB wetland within the southern extent of the study area was assessed separately to the other CVB wetlands, although the ecoservices and EIS remained the same for all.

The delineation of the reach of the unnamed tributary of the Sir Lowry's Pass River and associated CVB wetlands within the study area, as provided in this report, are considered accurate taking into consideration the conditions at the time of assessment (i.e. seasonal variations, disturbances to soils and vegetation, changes to the pattern, flow and timing of water within the tributary due to impacts arising from artificial impoundments and diversion of flow of the unnamed tributary into the artificial impoundments). All watercourses identified within the study area and associated investigation area were delineated according to the guidelines advocated by DWAF (2008) and taking into consideration soil characteristics as defined by Job (2009). During the field assessment, the following indicators were used in order to determine the boundary of the watercourses:

- ***Topography/elevation*** was used to determine in which parts of the landscape watercourses would most likely occur.
- **Vegetation associated with riparian areas and wetlands**: the identification of riparian areas relies heavily on vegetation indicators. Using vegetation, the outer boundary of a riparian area can be defined as the point where a distinctive change occurs:
  - in species composition relative to the adjacent terrestrial area; and
  - in the physical structure, such as vigour or robustness of growth forms of species similar to that of adjacent terrestrial areas. Growth form refers to the health, compactness, crowding, size, structure and/or numbers of individual plants
  - The edge of the riparian area of the unnamed tributary is dominated by tree species, and primarily invasive species including *Casuarina cunninghamiana*, *Eucalyptus camaldulensis*, *Ricinus communis*, *Paraserianthes lophantha*, *Acacia melanoxylon*, *Ligustrum lucidum*, *Pennisetum clandestinum*, *Salix babylonica*, *Solanum mauritianum* and *Quercus robur*. Vegetation within the CVB wetlands varied from a *Watsonia borbonica* and sedge species dominated habitat in the CVB wetland within the southern extent of the study area to a reduced vegetation cover to the rest of the CVB wetland in the study area (see Figure 12 below);

Figure 12: (Left): The outside edge of the riparian vegetation of the unnamed tributary relative to the terrestrial area in the southern portion of the study area. The riparian edge of the tributary is indicated by the yellow dashed line (Right): Vegetation within the channelled valley bottom wetland associated with the southern extent of the study area (CVB wetland 1).

- ***Soil form indicators*** were used to determine the presence of soils that are associated with prolonged and frequent saturation with key wetland indicators including gleying, mottling, organic streaking and increased clay content, as well as alluvial soils. Mottling was evident within the first 30cm of the soil surface of the soil samples taken within the channelled valley bottom wetlands. A course, sandy layer was present at 40 cm for the soil sample taken on CVB wetland 1, and a sandy layer with mottles over a clay layer at 70 cm was noted in CVB wetlands 2 to 5. Mottling is indicative of a fluctuation in the level of groundwater, where the alternation between aerobic and anaerobic conditions in the soil causes dissolved iron to return to an insoluble state and be deposited in the form of patches, or mottles, in the soil (Figure 13). This indicates that the area adjacent to the river is episodically inundated through horizontal and bidirectional overspill, and subsequent subsurface flow returning to the active channel;

Figure 13: Photograph indicating mottling and saturated soil identified within CVB wetland 1 (left), and CVB wetlands 2 to 5.

- ***The presence of alluvial soils:*** the National Water Act, 1998 (Act No. 36 of 1998) definition of riparian zones refers to the structure of the banks and likely presence of alluvium. A good indicator of the presence of riparian zones is the occurrence of alluvial deposited material adjacent to the active channel. Alluvial soils are soils derived from material deposited by flowing water, especially in the valleys of large rivers. Riparian areas often, but not always, have alluvial soils. While the presence of alluvial soils cannot always be used as a primary indicator to delineate riparian areas accurately, it can be used to confirm the topographical and vegetative indicators. Unlike wetland areas, riparian zones are usually not saturated for a long enough duration for redoximorphic features to develop. This is because rivers are mainly driven by flow, originating from its local catchment which flows through the river (not residing in the river as with wetlands), thus not allowing enough time for redoximorphic features to form.

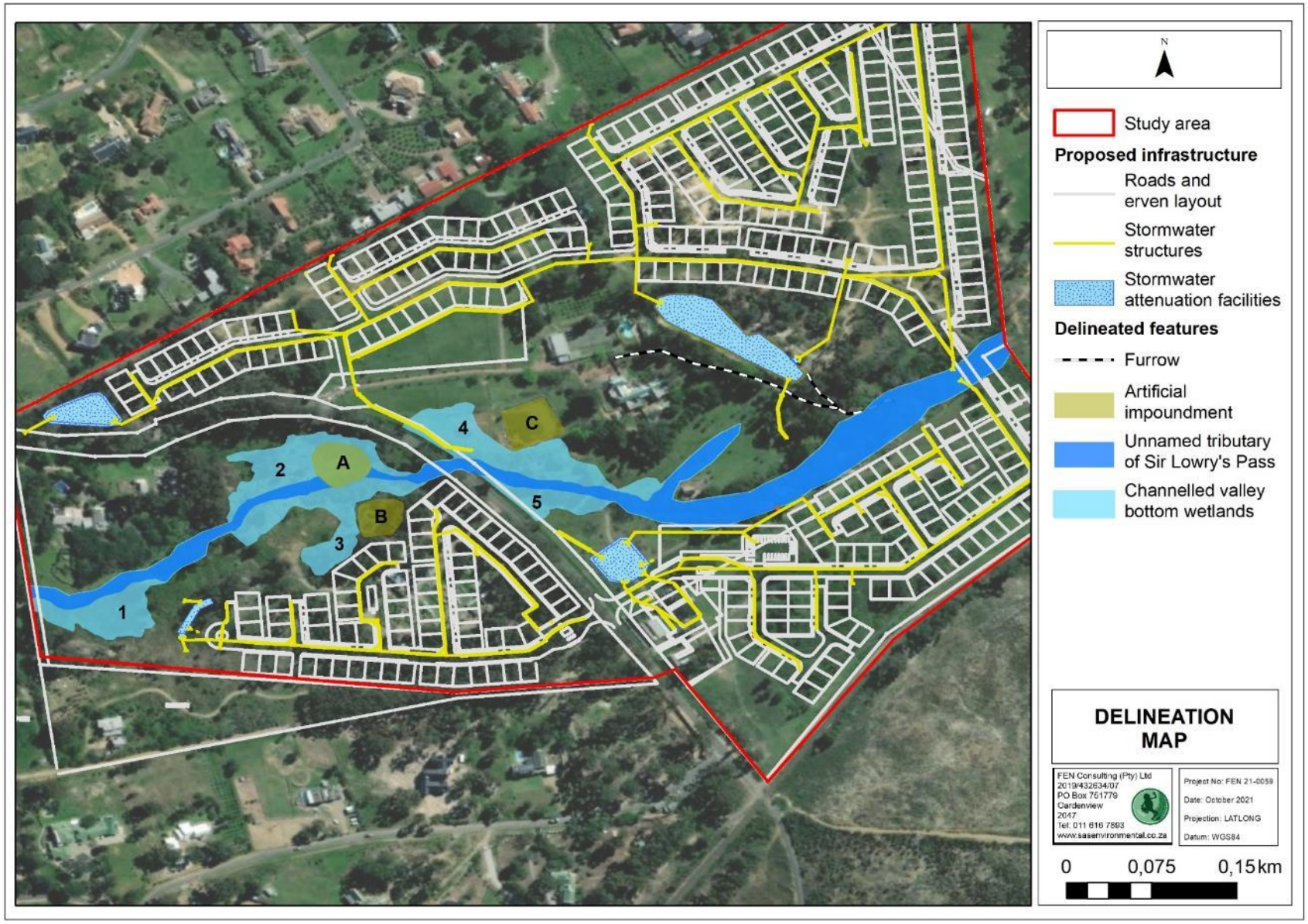


Figure 14: **A map presenting the delineated watercourses associated with the study area in relation to the proposed road and erven layout and stormwater management structures. The different CVB wetlands (1 through 5) and artificial impoundments (A – C) are numbered accordingly.**

5.2 *Field Verification Results*

During the site assessment, an unnamed tributary of the Sir Lowry's Pass River was identified bisecting the central portion of the study area, flowing in a general north to south westerly direction. The riparian marginal vegetation of the unnamed tributary is dominated by large tree species such as *Eucalyptus camaldulensis.* Pedestrian walkways were noted along the length of the channel of the tributary indicating use of this system for recreational purposes by the local residents (Figure 15).

Figure 15: Photographs of the active channel and riparian habitat of the unnamed tributary of Sir Lowry's Pass River.

As per the delineation map presented in Figure 14 above, five CVB wetlands were identified to be associated with the unnamed tributary of Sir Lowry's Pass River. CVB wetland 1 was noted to be well vegetated with *Watsonia borbonica* while the rest of the CVB wetlands (CVB wetlands 2 to 5) showed reduced vegetation cover due to mowing and grazing (Figure 16 below).

Figure 16: Photographs of the channelled valley bottom wetlands identified on site. (Top left and right): Vegetation within the CVB wetland associated with the southern extent of the study area (CVB wetland 1), (Bottom left and right): Vegetation within the CVB wetlands (CVB 2 to 5) has been impacted by mowing an grazing associated with the residential area.

Several artificial impoundments were noted within and off stream of the unnamed tributary, including a weir within the channel of the unnamed tributary. Some alien trees noted along the artificial impoundments include *Eucalyptus camaldulensis* and *Salix babylonica* Some areas of the northern reach of the tributary were noted to be poorly vegetated with eroded embankments (Figure 17).

Figure 17: Modifications noted within the unnamed tributary of Sir Lowry's Pass River and associated CVB wetlands. (Top left): a broken weir and a pedestrian walkway noted within the channel of the unnamed tributary; (Top right): artificial impoundment A and B traversing both the unnamed tributary and CVB wetlands; (Bottom left): Overspill from impoundment A; and (Bottom right): poorly vegetated areas with eroded embankments noted on the northern reach of the tributary.

5.1 *Watercourse classification*

The watercourses as described above were classified according to the Classification System outlined in Annexure C of this report as an Inland System, located within the Southwest Granite Fynbos wetland vegetation type. Table 2 below presents the classification from level 3 to 4 of the 'Classification System of Wetlands and other Aquatic Ecosystems' (Ollis *et al*, 2013).

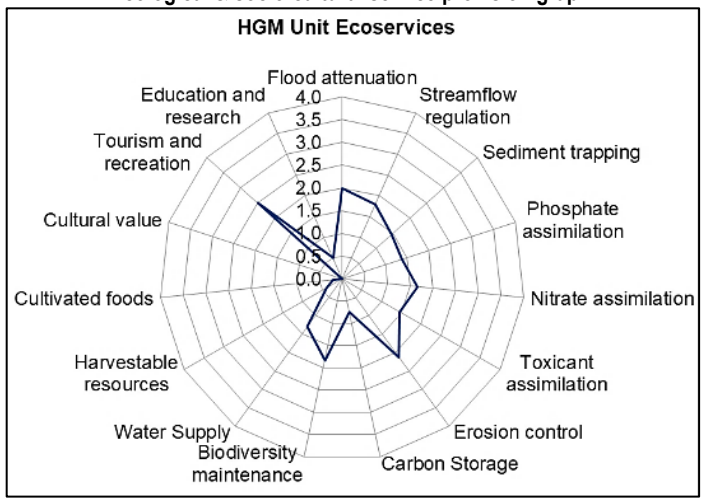
Table 2: Classification of the watercourses located in the investigation area.

Watercourse	Level 3: Landscape Unit	Level 4: Hydrogeomorphic (HGM) Type
Channelled Valley Bottom Wetland	Valley Floor: the base of a valley, situated between two distinct valley side-slopes, where alluvial or fluvial processes typically dominate.	Channelled valley-bottom wetland: A valley bottom wetland with a river channel running
Unnamed tributary of Sir Lowry's Pass River	Plain—an extensive area of low relief. These areas are generally characterised by relatively level, gently undulating or uniformly sloping land with a very gentle gradient that is not located within a valley.	River—a linear landform with clearly discernable bed and banks, which permanently or periodically carries a concentrated flow of water. A river is taken to include both the active channel

Table 3 below provide a summary of the field verification findings in terms of relevant aspects (hydrology, geomorphology and vegetation components) associated with the watercourses. The details pertaining to the methodology used to assess the watercourses are contained in **Annexure C**

Table 3: Summary of results of the unnamed tributary of Sir Lowry's Pass River.

Ecological & socio-cultural service provision graph:



IHI Discussion

IHI Category D (Largely Modified)

The instream habitat of the unnamed tributary of Sir Lowry's Pass River is considered moderately to largely modified due to alterations of the natural flow and channel characteristics, specifically as a result of the instream impoundments and the diversion of flow associated with the downstream reach of the tributary. Noted within the northern portion of the study area, a small furrow diverts water from the tributary into an artificial off stream impoundment. The riparian habitat of the tributary is considered to be largely modified, primarily as a result of the loss of the natural vegetation and the subsequent alien vegetation encroachment including species such as *Acacia saligna*, *Phytolacca octandra*, *Eucalyptus camaldulensis*, *Populus x canescens* and *Salix babylonica*. Some areas of the northern reach of the tributary were noted to be poorly vegetated with eroded embankments, however, the majority of the riparian zone was considered well vegetated, albeit with invasive tree species.

Figure 18: Photograph representative of the unnamed tributary of Sir Lowry's Pass River. (Top left): northern reach of the tributary, well vegetated with riparian trees; (top right): incised river channel of the unnamed tributary with high north western embankment; (bottom left): Weir in northern extent of tributary, from where the irrigation furrow is diverting water to an artificial impoundment; and (bottom right): downstream reach of tributary, with *Colocasia esculenta* in the foreground and riparian trees in background in the marginal area of the tributary.

EIS discussion

Moderate

The unnamed tributary is considered of moderate ecological importance on a landscape scale, mainly as a result of the Southwest Granite Fynbos wetland vegetation type within which this system is located (according to NFEPA, 2011) which is considered to be critically endangered and well protected (Mbona *et al.* 2015). It is noted, however, that no remaining representative areas of this vegetation type were observed during the site visit. The unnamed tributary also occurs in a subWMA considered to be a fish support area that is important for migration of the threatened fish species *Galaxias mollus,* although none were identified at the time of the site visit. However, based on the ecological characteristics of the tributary as observed on site, it is the opinion of the freshwater ecologist that the EIS of the tributary can best be described as 'Moderate'.

Ecoservice provision	**Intermediate (1,4)** The system is considered of intermediate importance for the provision of indirect benefits such as flood attenuation, sediment trapping, phosphate, nitrate and toxicant assimilation, biodiversity maintenance, erosion control and water supply (through the presence of artificial impoundments). The vegetation cover of the riparian habitat plays an important role in provision of these indirect benefits. The unnamed tributary also lends a high aesthetic value to the property residents and due to its location within an open space area, the tourism and recreational value is considered moderately high. The tributary is not considered of value for harvestable resources, cultivated foods or cultural value due to the peri-urban environment wherein it is located.	**REC Category and RMO**	**REC: Category D; BAS: Category: D** **RMO: Mainatain** Since this riparian system is of moderate Ecological Importance and Sensitivity, and has been largely modified, the Recommended Management Objective (RMO) is to maintain the ecological state of the riparian habitat. Nevertheless, rehabilitation activities such as Alien and Invasive Vegetation (AIP) control and reinstatement of indigenous riparian vegetation are recommended. Development of the surrounding area will decrease surface roughness of the local catchment and increase surface stormwater run-off. The implementation of Sustainable Drainage Systems (SuDS) is recommended. Careful planning of the stormwater management plan is imperative to ensure the hydraulic regime is retained.

Watercourse characteristics:

a) Hydrologic regime

The unnamed tributary is located on a foothill after which it flows through a landscape dominated by agricultural activities before entering the north eastern boundary of the study area. The unnamed tributary slightly meanders through the study area, with relatively low embankments. The unnamed tributary has undergone several modifications including a weir downstream close to the southern boundary of the study area that has not been maintained, resulting in a back-flooding effect within the channel, albeit not extensively. Additionally, streamflow was also noted to be diverted through an irrigation furrow into an impoundment on the western extent of the tributary and into two small farm impoundments down gradient of the Old Sir Lowry's Pass Road.

b) Geomorphology and sediment balance

Riparian vegetation clearing, particularly in the northern portion of the unnamed tributary and the incised channel of the unnamed tributary in the upstream reach (due to the loss of riparian species) were noted contributing to geomorphological changes to the system. However, no significant sediment deposition was noted within the tributary, as it may have been deposited in the instream impoundments located within the downstream reach of the tributary.

c) Habitat and biota

The riparian habitat vegetation consisted predominantly of herbaceous species and large AIP tree species including *Casuarina cunninghamiana, Colocasia esculenta, Melia azedarach, Persicaria decipiens, Eucalyptus camaldulensis, Ricinus communis, Paraserianthes lophantha, Acacia melanoxylon, Ligustrum lucidum, Pennisetum clandestinum, Salix babylonica, Solanum mauritianum and Quercus robur.* Indigenous vegetation was limited but the following species were abundant: *Olea europaea subsp. africana, Pennisetum macrourum, Typha capensis, Watsonia borbonica, Isolepis prolifera, Cynodon dactylon, Zantedeschia aethiopica, Chasmanthe aethiopica, Juncus krausii, Cyperus textilis, Searsia angustifolia and Psoralea pinnata.* Only remnants of tolerant indigenous flora were present. The dense riparian vegetation found within certain areas of the unnamed tributary assists with erosion control and embankment stability.

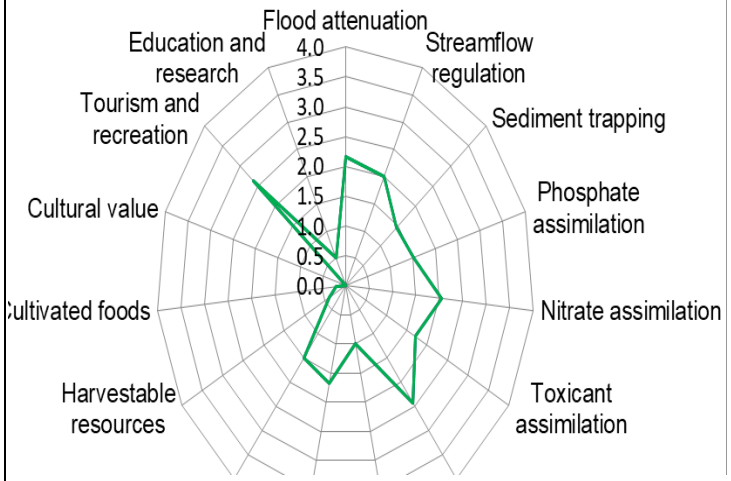
d) Water quality

Although not part of the scope of this project, basic water quality parameters were taken and the water quality was noted to be good (6,6 pH, Electrical Conductivity (EC): 0.29 mS/m and a temperature of 16,9 ºC). In accordance with the Resource Quality Objectives of South Africa, the EC and the pH fall within the ideal range (<30cmS/m and between pH 6.5 – pH 8.0).

Extent of modification anticipated	**High** Significant modifications are anticipated to the reach of the unnamed tributary associated with the unauthorised infilled material where 0.032 ha of riparian habitat will be lost due to the proposed removal of the unauthorised infilled material. Other modifications anticipated to the extent of the unnamed tributary may result from the installation of new and upgrading of existing culvert structures which will necessitate work within the active channel of the unnamed tributary. Stormwater released from the discharge points adjacent to the unnamed tributary must disperse before entering the watercourse to prevent incision and erosion. No new infrastructure is proposed within the unnamed tributary that may fragment or degrade the system. The removal of the unauthorised infilled material and upgrading of the culvert within the tributary will improve the ecological integrity of the riparian habitat and hydrological connectivity between the upstream and downstream reach of the tributary, which may potentially compensate for the original loss of riparian habitat due to the removal of infilled material.
Impact Significance and Business Case:	**Moderate Risk** **The removal of the unauthorised infilled material within the riparian habitat of the unnamed tributary will result in the anticipated loss of 0.032 ha.** As such, as part of the rehabilitation phase the tributary active channel and associated vegetation must be reinstated. The majority of activities associated with the proposed Mount View residential development will be located above the post-development 1:100 year floodline of the unnamed tributary of the Sir Lowry's Pass River. As such, most development activities are considered to pose a low risk to the integrity of the unnamed tributary, except for works within the active channel of the tributary including installation of new and upgrading of exiting culvert which may include the casting of concrete for new aprons and wingwalls, installation of bulk service pipelines, as well as the stormwater attenuation facility discharge outlets which fall within the 1:100 year floodline. It is imperative that adherence to cogent, well-conceived and ecologically sensitive construction plans is implemented, including rehabilitation of the unnamed tributary following the removal of the unauthorised infilled material, and the mitigation measures provided in this report as well as general good construction practice are adhered to. It is also recommended that, where possible, construction works within the active channel of the tributary be undertaken during the dry, summer months when the flow is very low within the watercourses.

Table 4: Summary of results of the channelled valley bottom wetlands associated with the unnamed tributary of the Sir Lowrys Pass River.

Ecological & socio-cultural service provision graph:



PES Discussion

CVB wetland 1: Category C (Moderately Modified)
CVB wetlands 2 to 5: Category D Largely Modified)

The CVB wetland on the southern extent of the study area (CVB wetland 1) is considered moderately modified while the rest of the CVB wetlands (CVB 2 to 5) are considered largely modified. Under natural conditions the CVB wetlands would have been associated with the entire tributary reach and contained a much greater diversity of habitat and plant species. The wetland has been largely transformed by woody alien invasive vegetation along the tributary and wetland system. Surrounding land-uses, including mowing and grazing which have contributed to the reduced surface roughness of the CVB wetlands and impoundments affecting water distribution and retention patterns within the wetland by concentrating and impeding flow, particularly the CVB wetlands 2 to 5, has also resulted in modification to the wetlands. CVB wetland 1, though transformed, is well vegetated and comprises diverse plant species such *Colocasia esculenta*, *Watsonia borbonica* and *Zantedeschia aethiopica.*

Figure 19: Photograph representative of the channelled valley bottom wetlands associated with the unnamed tributary of Sir Lowry's Pass River. (Top left): the CVB wetland (1) associated with the southern extent of the unnamed tributary dominated by *Watsonia borbonica*; (Top right): CVB wetland (5) within the northern portion of the unnamed tributary receiving surface flow from tributary – no distinct vegetation present due to grazing activities; (Bottom left and right): CVB wetlands at the existing Old Sir Lowry's Pass road crossing.

EIS discussion

Moderate

All of the CVB wetlands identified within the study area are considered of moderate ecological importance on a landscape scale, mainly as a result of the Southwest Granite Fynbos wetland vegetation type within which this system is located (according to NFEPA, 2011) which is considered to be critically endangered and well protected (Mbona *et al.* 2015). It is noted, however, that no remaining representative areas of this vegetation type within the wetlands were observed during the site visit. The hydro-functional importance of the system is considered to be moderate while the direct human benefits are considered to be low.

Ecoservice provision	**Intermediate (1,3)** The CVB wetlands are considered of intermediate importance for the provision of indirect benefits such as flood attenuation (though to a certain extent given the fragmented nature of the system), stream flow regulation, sediment trapping, nitrate and toxicant assimilation, and erosion control. The CVB wetlands are also considered important for phosphate assimilation and biodiversity maintenance. Due to its location within an open space area, the tourism and recreational value is considered moderately high as residents walk around the system. The CVB wetlands are not considered of value for harvestable resources, cultivated foods or cultural value due to the urban environment its located.	**REC Category and RMO**	**REC: Category C/D; BAS: Category: C** **RMO: Improve and Maintain** Since the CVB wetlands 2 to 5 have been largely modified, the Recommended Management Objective (RMO) is to improve the ecological state of these CVB wetlands through Alien and Invasive Vegetation (AIP) control and reinstatement of indigenous wetland vegetation. Although the determined RMO is to maintain the PES of CVB wetland 1 since it is considered moderately modified, it is recommended that no further degradation to the wetland should be permitted as a result of the proposed Mount View residential development. Development of the surrounding area will decrease surface roughness of the local catchment and increase surface stormwater run-off, thus rehabilitation (including revegetation with indigenous species) of these systems is necessary to maintain and/or improve their present ecological state.
Watercourse characteristics:			
a) Hydrologic regime The CVB wetlands on site have undergone a series of modifications both due to the past and present land use changes. The CVB wetlands would have been associated with the entire reach of the unnamed tributary under natural conditions but at present are fragmented due to agricultural activities, invasion by alien woody species and growing urban development in the catchment and study area. Water inputs to the CVB wetlands are from overbank flooding from the unnamed tributary and from surface runoff from the local catchment. impoundments and weirs, the retaining of water in the landscape has resulted in a pronounced wet response, allowing these wetland areas to establish. **b) Water quality** No surface water was present at the time of the assessment. Nevertheless, the water quality of the CVB wetlands are expected to be the same as that of the unnamed tributary given that these systems are subjected to the same catchment land-uses.		**c) Habitat and biota** The CVB wetlands have been largely transformed by woody alien invasive vegetation that occurs along the unnamed tributary as well as surrounding land-use. The CVB wetlands 2 to 5 have been subjected to reduced surface roughness due to mowing and grazing activities on site. CVB wetland 1 is well vegetated and supports a population of unique species including *Colocasia esculenta*, *Watsonia borbonica* and *Zantedeschia aethiopica.* **d) Geomorphology and sediment balance** Infilling and depositional features from formal and informal roads traversing the system were identified within the CVB wetlands, modifying the geomorphological characteristics. Historical infilling was noted downstream of the impoundments, downgradient of the Old Sir Lowry's Road (impoundment B). Other modifications to the geomorphic integrity of the CVB wetlands include the in stream and off stream impoundments reducing the sediment input into the system.	
Extent of modification anticipated	**High** Significant modifications are anticipated to the reach of the CVB wetland (3) associated with the removal of unauthorised infilled material as part of the proposed Mount View residential development which will result in the anticipated loss of 0.136 ha of wetland habitat. However, as part of the rehabilitation phase the wetland seasonal and temporary zones and associated vegetation must be reinstated. Similarly, habitat fragmentation is likely within this reach of the CVB wetland. Thus, it is recommended that the wetland habitat loss due to these activities be ideally reinstated within the fill area following removal of the infilled material to ensure no net to the CVB wetland. The long-term impacts for the removal of the infilled material can be considered low as rehabilitation of this site will ensure ecological connectivity and increase the area of wetland habitat. Stormwater released from the surrounding outlet structures into the wetlands must disperse before entering the wetland to prevent incision and erosion.		
Impact Significance and Business Case:	**Moderate Risk** **The removal of the unauthorised infilled material within CVB wetland 3 will result in the anticipated loss of 0.136 ha.** As most of the proposed development activities will be located outside the delineated extent of the wetland, no direct significant impacts are expected to occur to the wetlands. It is however noted that the removal of unauthorised infilled material within the reach of the CVB wetland 3 may partially fragment the system and result in wetland habitat loss, however the removal of the infilled material may be considered a positive measure given that the infill site is rehabilitated to allow reinstatement of functional wetland habitat. Stormwater released below the 1:100 year floodline of the tributary will disperse into the wetlands. This was determined to pose a Moderate risk to CVB wetland 4. However should the recommended control measures as presented in Section 7 be implemented, no detrimental impacts to the wetlands are expected and the proposed rehabilitation works should maintain the RMO.		

6 LEGISLATIVE REQUIREMENTS

The following legislative requirements were considered during the assessment. A detailed description of these legislative requirements is presented in **Annexure B** of this report:

- The Constitution of the Republic of South Africa, 1996[3];
- The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA);
- The National Water Act, 1998 (Act No. 36 of 1998) (NWA);
- Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998); and
- The City of Cape Town's (CoCT) Floodplain and River Corridor Management Policy (2009).

According to Macfarlane *et al.* (2015) the definition of a buffer zone is variable, depending on the purpose of the buffer zone, however in summary, it is considered to be "a strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another". Buffer zones are considered important to provide protection of basic ecosystem processes (in this case, the protection of aquatic and wetland ecological services), reduce impacts on watercourses arising from upstream activities (e.g. by removing or filtering sediment and pollutants), provision of habitat for aquatic and wetland species as well as for certain terrestrial species, and a range of ancillary societal benefits (Macfarlane *et. al,* 2015). It should be noted, however that buffer zones are not considered to be effective mitigation against impacts such as hydrological changes arising from stream flow reduction, impoundments or abstraction, nor are they considered to be effective in the management of point-source discharges or contamination of groundwater, both of which require site-specific mitigation measures (Macfarlane *et. al,* 2015).

The definition and motivation for a regulated zone of activity for the protection of the assessed watercourses can be summarised as follows:

Table 5: Articles of Legislation and the relevant zones of regulation applicable to each article.

Regulatory authorisation required	Zone of applicability
Water Use License Application in terms of the National Water Act, 1998 (Act No. 36 of 1998).	**Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998)** In accordance with GN509 of 2016 as it relates to the National Water Act, 1998 (Act 36 of 1998), a regulated area of a watercourse in terms of water uses as listed in Section 21c and 21i is defined as: • the **outer edge of the 1:100 year floodline 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; • in the absence of a determined 1:100 year floodline or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or • a **500 metre radius from the delineated boundary (extent) of any wetland** or pan in terms of this regulation.
Listed activities in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) EIA Regulations (2014), as amended.	**Activity 12** of Listing Notice 1 (GN 327) of the National Environmental Management Act, 1998 (Act No.107 of 1998) EIA regulations, 2014 (as amended) states that: *The development of:* *(xii) Infrastructure or structures with a physical footprint of 100 square meters or more;* *Where such development occurs—* *a) Within a watercourse;* *b) In front of a development setback; or*

[3] Since 1996, the Constitution has been amended by seventeen amendments acts. The Constitution is formally entitled the 'Constitution of the Republic of South Africa, 19996". It was previously also numbered as if it were an Act of Parliament – Act No. 108 of 1996 – but since the passage of the Citation of Constitutional Laws Act, neither it not the acts amending it are allocated act numbers.

Regulatory authorisation required	Zone of applicability
	c) *If no development setback has been adopted, within 32 meters of a watercourse, measured from the edge of a watercourse.* *Excluding where such development occurs within an urban area* **Activity 19** of Listing Notice 1 (GN 327) of the NEMA EIA regulations, 2014 (as amended) states "*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse".*
City of Cape Town's Floodplain and River Corridor Management Policy (2009)	In accordance with the (CoCT) Floodplain and River corridor Management Policy, ecological buffers are recommended, with up to 75m recommended for wetlands. A minimum buffer of 10 m is required for concrete canals.

The following Zones of Regulation (ZoR) are applicable to the pre-development phase of the project (Figure 20):

- A 32 m Zone of Regulation in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) was assigned for the unnamed tributary of Sir Lowry's Pass River and CVB wetlands (Figure 20);
- GN509 Zone of Regulation, in accordance with the National Water Act, 1998 (Act No. 36 of 1998) for the unnamed tributary is considered the combined extent of the delineated edge of the unnamed tributary and the moddelled pre-development 1:100 year floodline (Figure 20);
- A 500 m ZoR in accordance with the National Water Act, 1998 (Act No. 36 of 1998) was assigned to CVB wetlands.

The following Zones of Regulation (ZoR) are applicable to the post-development phase of the project (Figure 21):

- A conservation buffer in accordance with the (CoCT) Floodplain and River corridor Management Policy was applied to the unnamed tributary of the Sir Lowry's Pass River and CVB wetlands. Although the policy recommends a minimum conservation buffer of 10 m, a variable conservation buffer of varying width (minimum of 5 m from the delineated edge of the watercourses) was applied to accommodate the proposed development layout in some areas, with the provision that the buffer extent be increased in size to 15 m to compensate for the reduced buffer extent and to ensure that the conservation area extent is equal to the 10 m buffer and that the buffer area be suitably rehabilitated (Figure 21);
- A 32 m Zone of Regulation in accordance with the National Environmental Management Act, 1998 (Act No. 107 of 1998) was assigned for the unnamed tributary of Sir Lowry's Pass River and Channelled Valley Bottom wetlands;
- GN509 Zone of Regulation, in accordance with the National Water Act, 1998 (Act No. 36 of 1998) for the unnamed tributary is considered the combined extent of the delineated edge of the unnamed tributary and the moddelled post-development 1:100 year floodline;
- A 500 m ZoR in accordance with the National Water Act, 1998 (Act No. 36 of 1998) was assigned to CVB wetlands.

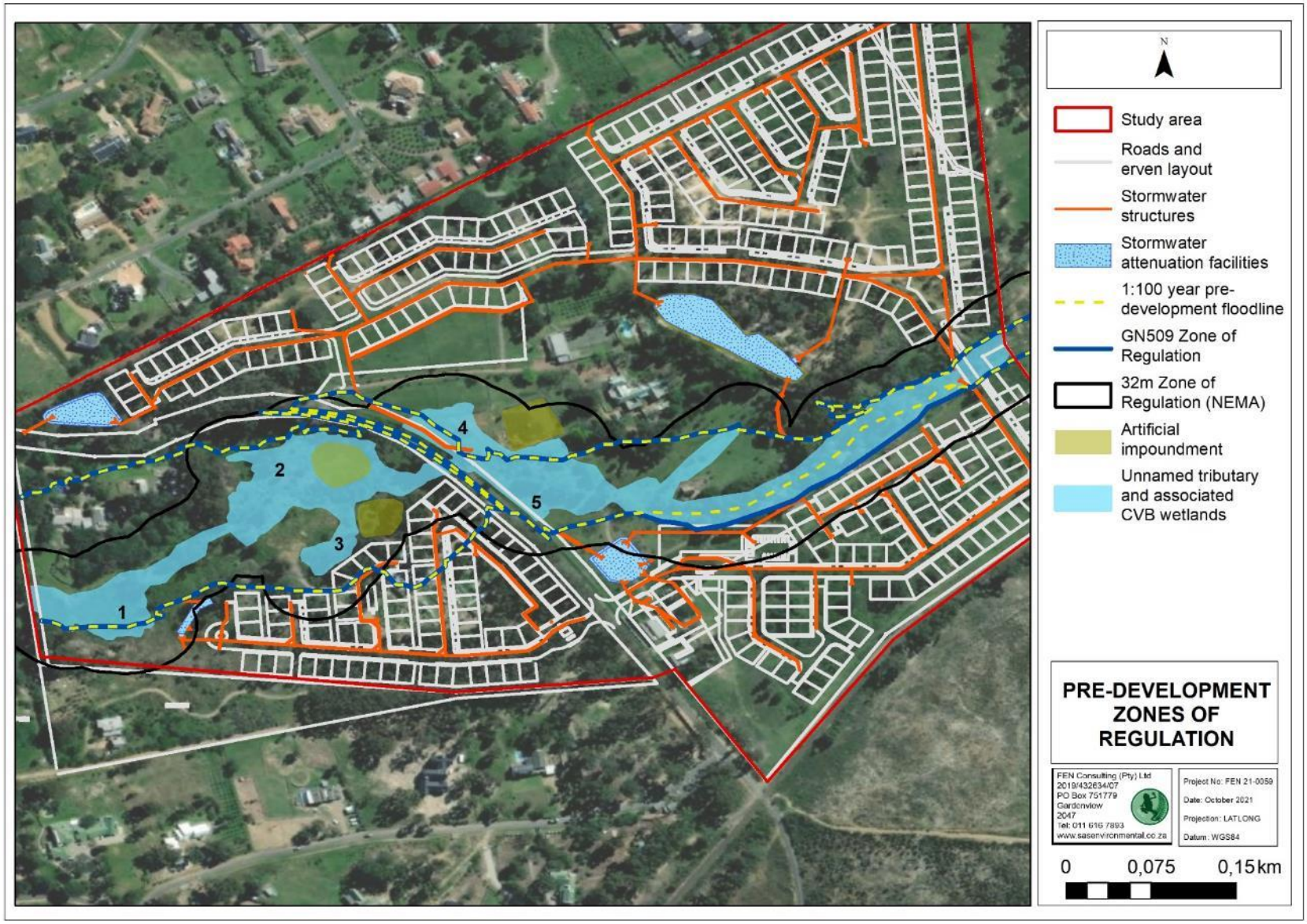


Figure 20: Watercourses associated with the proposed Mount View residential development and the respective zones of regulation according to NEMA and GN509 as it relates to the NWA for the pre-development phase of the project. The extent of the 500 m GN509 ZoR exceeds the study area, hence it is not visible on the map. The delineated watercourses shown are those mapped using land surveying principles.

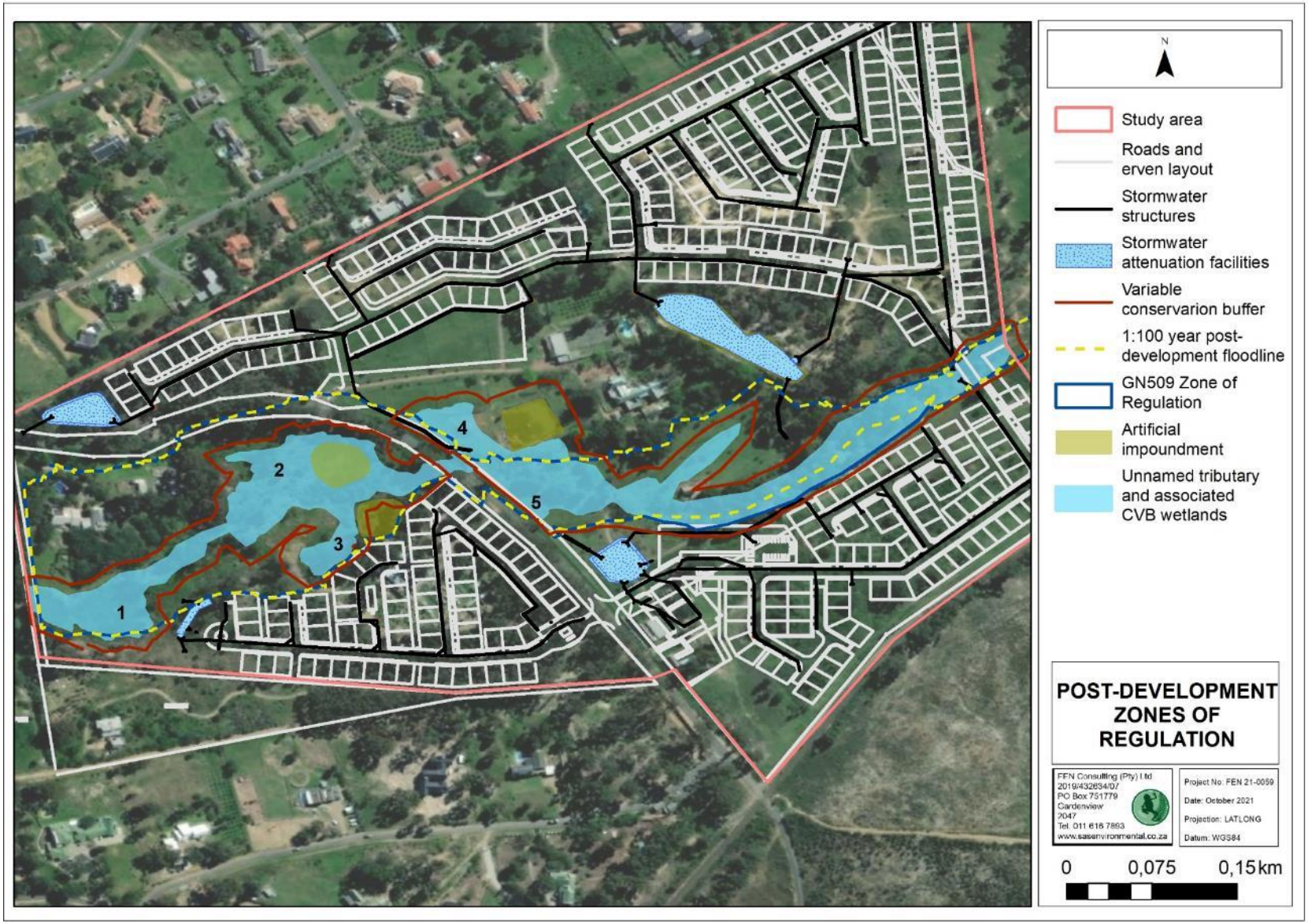


Figure 21: Watercourses associated with the proposed Mount View residential development and the respective zones of regulation according to NEMA and GN509 as it relates to the NWA for the post-development phase of the project. The extent of the 500 m GN509 ZoR exceeds the study area, hence it is not visible on the map. The delineated watercourses shown are those mapped using land surveying principles.

7 DWS RISK ASSESSMENT

Following the assessment of the unnamed tributary of Sir Lowry's River and associated channelled valley bottom wetlands, the DWS specified Risk Assessment Matrix (as promulgated in GN509 of 2016 as it relates to the National Water Act, 1998 (Act No. 36 of 1998)) was applied to ascertain the significance of risk associated with the proposed Mount View residential development on the key drivers and receptors (hydrology, water quality, geomorphology, habitat and biota) of the assessed watercourses. The points below summarise the considerations undertaken:

- The DWS risk assessment was applied assuming a high level of mitigation measures is implemented, thus the results of the DWS risk assessment provided in this report presents the perceived impact significance ***post-mitigation***;
- In applying the risk assessment, it was assumed that the mitigation hierarchy as advocated by the DEA *et al* (2013) would be followed, i.e. the impacts would first be avoided, minimised if avoidance is not feasible, rehabilitated as necessary and offset if required;
- The proposed activities were assessed based on their relation to the delineated extent of the watercourses, their associated conservation buffer, the post-development 1:100 year floodline of the unnamed tributary, and the applicable ZoRs of the watercourses. The following considerations were undertaken:
- Activities located within the watercourses and the 32 m NEMA ZoR include:
    - The footprint and volume of the unauthorised infilled material to be removed was calculated to be 4111 m³ by KLS Consulting Engineers. The location of this unauthorised infilled material in relation to the delineated watercourses is shown in Figures 23 and 24 below. The infilled material to be removed extends into CVB wetland 3 and the riparian habitat of the unnamed tributary;
    - It is highly recommended that the proponent make provision for an offset investigation to be undertaken to ascertain the functional hectare equivalents and the habitat hectare equivalents required to offset the anticipated wetland loss of CVB wetland 3 and the riparian habitat loss of the unnamed tributary associated with the unauthorised infilled material. It is recommended that feasible wetland and riparian offset receiving areas be investigated in order to compensate for the total of 0.136 ha of wetland and 0.032 ha of riparian habitat hectare equivalents lost. These targeted wetlands and riparian areas should be ideally reinstated within the fill area following removal of the infilled material to ensure no net loss of riparian habitat and CVB wetland;
    - The installation of a culvert road crossing within the northern reach of the unnamed tributary, and the upgrading of the culvert crossing below Old Sir Lowry's Pass Road within the unnamed tributary;
    - The bulk service sewer and water pipelines will traverse the central portion of the unnamed tributary along the existing Old Sir Lowry's Pass Road;
    - Portions of the proposed open stormwater channel encroach into the southern extent of CVB wetland 5;
    - Some of the proposed stormwater outlet structures (channels and discharge points) will be located within the delineated wetlands, particularly within CVB wetland 4 (see Figure 14 above).
- Activities specifically within the variable conservation buffer of the watercourses:
    - Portions of three private erven are located within the variable conservation buffer (Figure 25). A stub wall of approximately 300 mm height and 230 mm width is proposed outside the edge of the variable conservation buffer to separate the lawn area of the private erven currently located within the conservation buffer and the start of the conservation buffer, as a means of restricting and protecting the conservation buffer from AIP infestation. A solid concrete foundation and masonry wall is proposed for the stub wall (Figure 22 below);

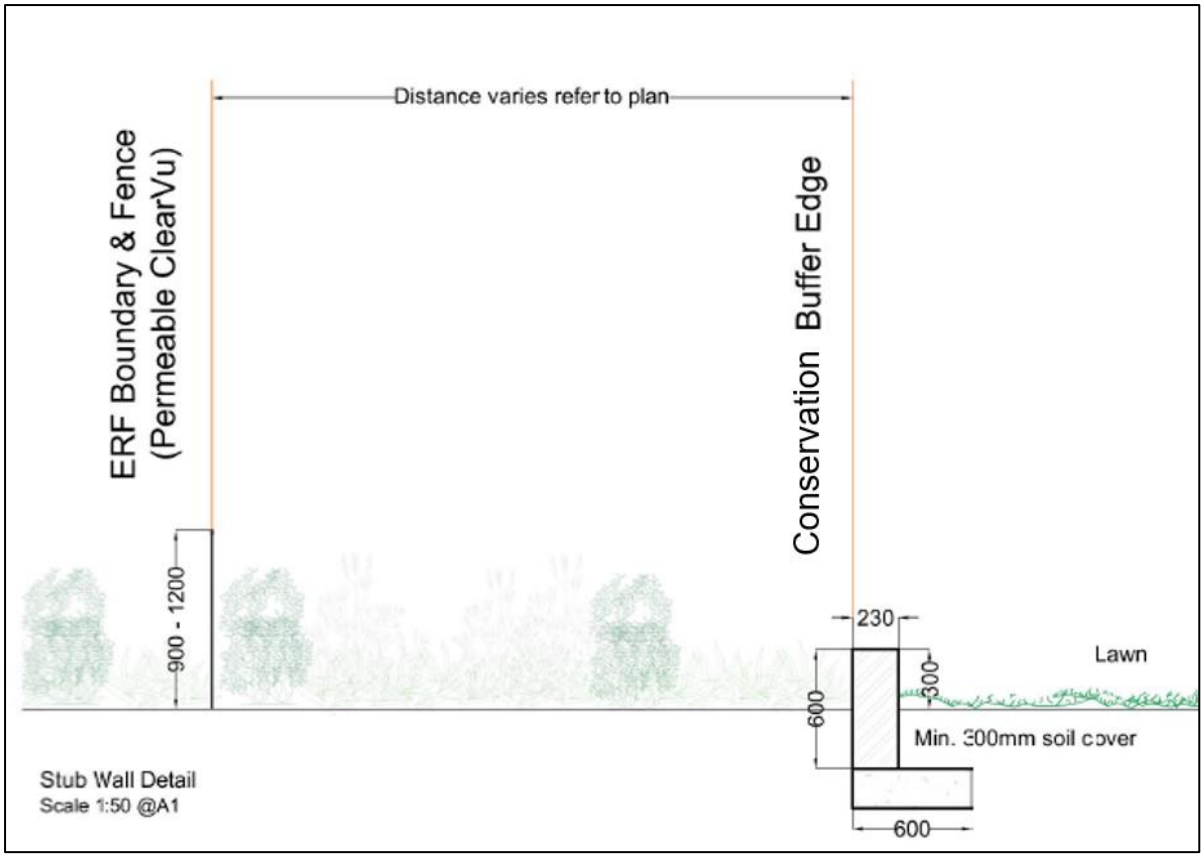


Figure 22: Schematic diagram of the proposed stub wall outside the edge of the variable conservation buffer of the watercourses for the portions of the proposed Mount View residential development located within the variable conservation buffer as provided by Viridian Consulting (2021).

  - Portions of in situ compacted walkways; and
  - Some of the proposed stormwater outlet structures (channels and discharge points);
- Activities outside the delineated extent of the watercourses and associated conservation buffer and above the post-development 1:100 year floodline but within the 500 m GN509 ZoR of the wetlands, include earth works associated with construction and construction of residential erven; internal roads, stormwater attenuation facilities, the WWTPs and the internal sewage network and landscaping associated with the proposed residential development;
- The activities and the associated risks they pose are all highly site-specific, not of a significant extent relative to the area of the watercourse assessed, and therefore have a limited spatial extent (i.e. within the investigation zone). The exception are risks to water contamination and operation of the Mount View residential development including stormwater releases, however, if the system is well managed, this risk is considered low;
- While the operation and maintenance of the proposed Mount View residential development will be a permanent activity, the construction thereof is envisioned to take no more than a few years. However, the frequency of the construction impacts may be daily during this time;
- Most impacts are considered to be easily detectable, with the exception of contamination of surface and groundwater which will require some effort;
- The considered mitigation measures are easily practicable;
- Rehabilitation of the CVB wetland and riparian habitat of the unnamed tributary associated with the removal of the unauthorised infill material and the watercourses in general, must be undertaken to manage any indirect impacts and to reinstate wetland habitat around areas where wetland has been lost (i.e. re-sloping and revegetation of wetland habitat directly impacted by the construction activities). The watercourses and associated conservation buffer must preferably be rehabilitated to

conditions as close as possible to the “natural” state. This is especially applicable to the removal of alien and invasive plants and the revegetation of the affected areas. This will ensure that the ecological service provision of the watercourses is maintained and where feasible, improved.

7.1 *Risk Assessment Discussion*

The following potential ecological risks on the reach of the unnamed tributary of Sir Lowry’s Pass River and the associated CVB wetlands were considered as part of this assessment:

- Loss of watercourse habitat and ecological structure resulting in impacts to biota;
- Changes to the socio-cultural and service provision;
- Impacts on the hydrology and sediment balance of the watercourses;
- Impacts on water quality; and
- Proliferation of alien and invasive plant species.

The results of the risk assessment are summarised in Table 6 below, including key mitigation measures for each activity that must be implemented.

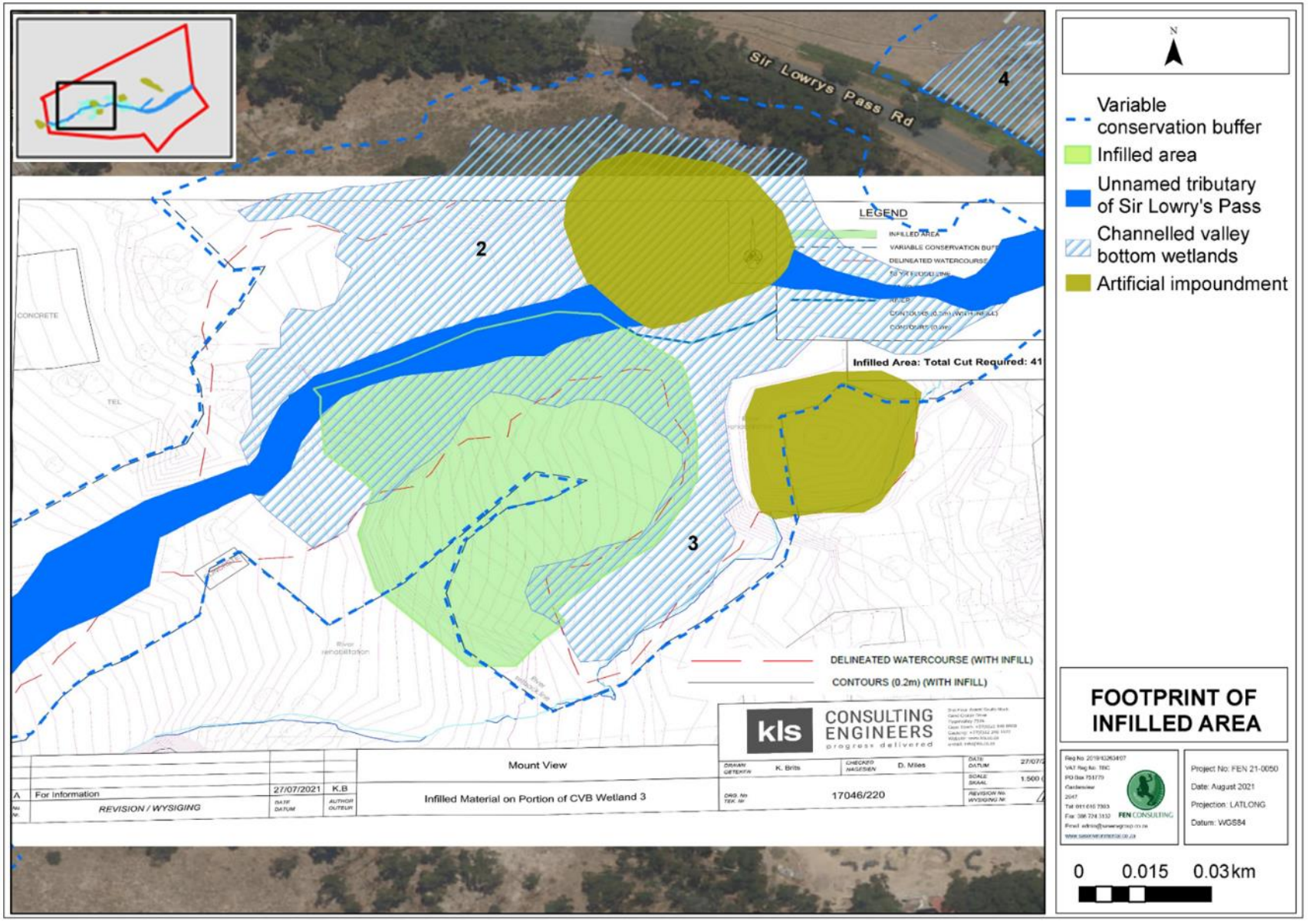


Figure 23: Map indicating the footprint and volume of the unauthorised infilled material to be removed as part of the proposed Mount View residential development, overlayed in relation to the delineated watercourses and associated variable conservation buffer.

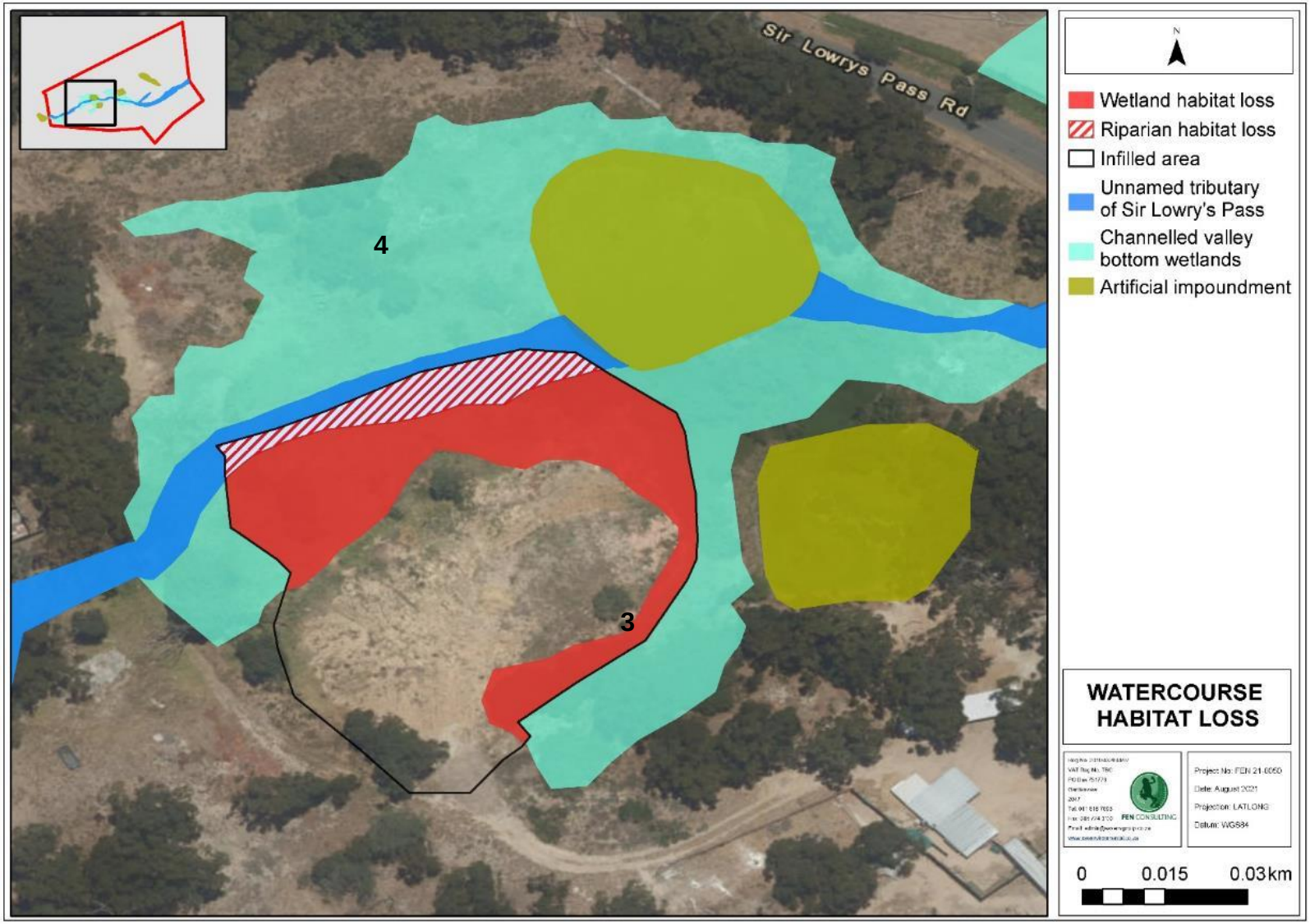


Figure 24: Map depicting the wetland and riparian habitat loss associated with the removal of the unauthorised infilled material within the southern reach of the unnamed tributary and CVB wetland 3. Numbers depict the different CVB wetlands.

Note: The alignment of the footprint of the unauthorised infilled material to be removed has been extrapolated from the engineering drawings (provided in Figure 4 above) and therefore may not be entirely accurate.

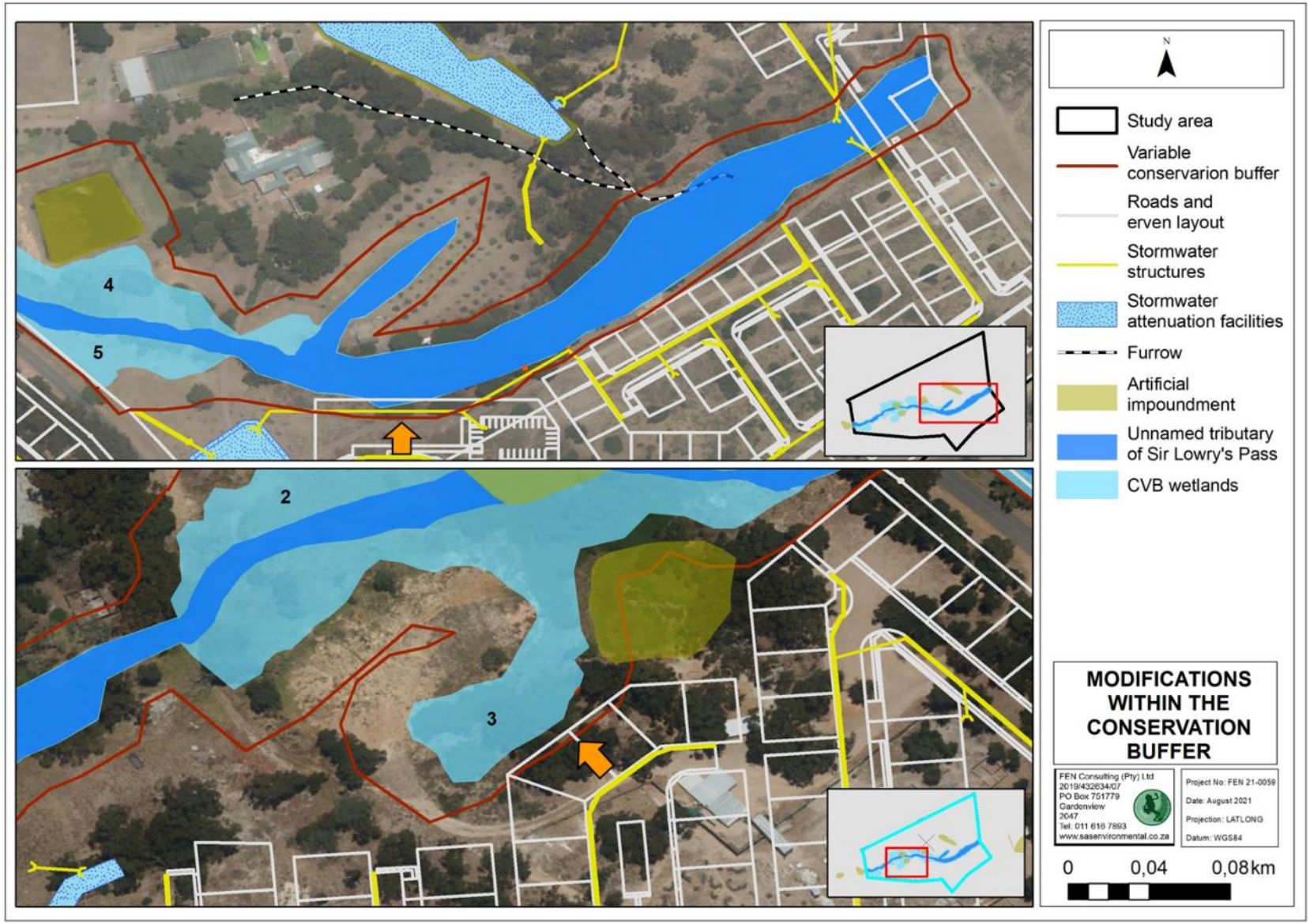


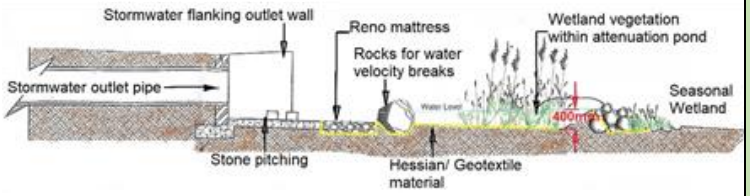
Figure 25: Portions of the proposed Mount View residential development located within the variable conservation buffer and encroaching into the delineated boundary of the upstream reach of the watercourse (top) (as indicated by the orange arrow). Numbers depict the different CVB wetlands.

Table 6: Summary of the results of the DWS risk assessment applied to the watercourses which may potentially be impacted by the proposed Mount View residential development.

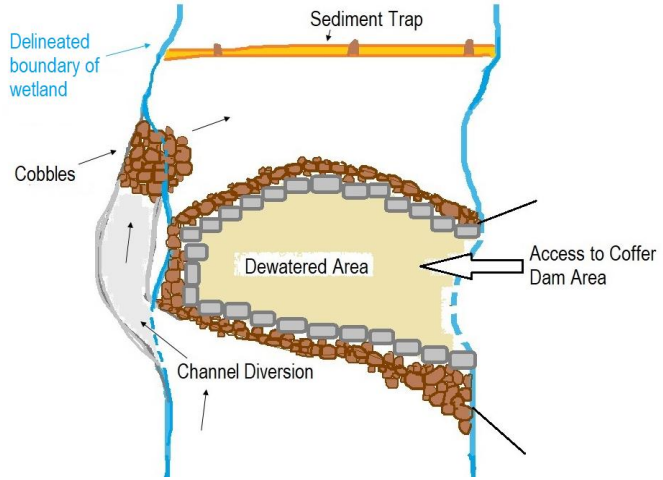
No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
1	Construction Phase	Site access, clearing and preparation for civil works	· Removal of vegetation including the removal of all alien trees including their roots within the construction footprint; · Removal of all existing piles of disposed and spread material around the site; · Removal of all fences and previously used farm materials on the site; and · Associated disturbances of soils above the 1:100 year floodline of the unnamed tributary of Sir Lowry's Pass River	· Potential increased dust generation, leading to potential smothering of watercourse vegetation and potentially altering surface water quality within the watercourses; and · Decreased ecoservice provision.	**2,5**	**5,5**	**10**	**55**	**L**	High	• It is recommended that the variable conservation buffer be utilised as a conservation buffer from the delineated edge of the watercourses. This area should be demarcated a no-go area and no unauthorised activities are allowed within the delineated extent of the watercourses. If a more permanent fencing is desired, a pole and electric wire fence is considered suitable as this will still allow movement of faunal species (Figure A);  **Figure A: Example of a barrier fence used to demarcate the no-go area around the wetlands and associated conservation buffer area.** • Areas which are to be cleared of vegetation, including contractor laydown areas, must remain as small as possible, in order to reduce the risk of proliferation of alien vegetation, and in order to retain a level of protection to the watercourses during construction (e.g. dust generation, sediment trapping, slowing of stormwater runoff – specifically due to the study area being at a gradient sloping towards the watercourses); • Contractor laydown areas and equipment storage are to remain outside of the 32 m NEMA ZoR associated with the watercourses; • Clear areas for the proposed construction in a phased manner and retain as much indigenous vegetation as possible; and • No indiscriminate driving of construction equipment is allowed. All vehicles and machinery must utilise existing roads or pre-planned construction roads.	Fully Reversible
2			Possible indiscriminate driving within the 1:100 year floodline. of the unnamed tributary of Sir Lowry's Pass	· Indirect impacts to the watercourse, leading to exposed/compacted soils, in turn leading to increased runoff and erosion;	**1**	**4**	**13**	**52**	**L**	High		

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
	Construction Phase		River and potentially the CVB wetlands	· Decreased ecoservice provision; and · Further decreased ability to support biodiversity.								
3		Construction activities related to building activities outside the delineated extent of the watercourses and associated conservation buffer and above the post development 1:100 year floodline but within the 500 m GN509 Zone of Regulation	Earth works involving removal of topsoil and creation of soil stockpiles including: · The demolition of the existing farm dam and large earth berm situated north of the main farm house to allow this area to be included in the development footprint by means of removing the large berm and filling the material in controlled layers within the existing dam	· Disturbances of soils leading to increased alien vegetation proliferation, and in turn to altered freshwater habitat. · Altered runoff patterns, leading to increased erosion and sedimentation of freshwater habitat.	**1**	**3**	**9**	**27**	**L**	High	• All footprint areas must remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • All vehicles are to remain within existing roads and no new roads should be developed without prior authorisation; • All stockpiles should not exceed 2m in height and should be covered with a suitable geotextile such as hessian sheeting to prevent excessive dust generation; **<u>Cement usage</u>** • Concrete and cement-related mortars can be toxic to aquatic life. Proper handling and disposal should minimize or eliminate discharges into watercourses. High alkalinity associated with cement, which can dramatically affect and contaminate both soil and ground water. The following recommendations must be adhered to: · Proper handling and disposal should minimise or eliminate discharges into watercourses. High alkalinity associated with cement, which can dramatically affect and contaminate both soil and ground water. The following recommendations must be adhered to: · Fresh concrete and cement mortar should not be mixed below the 1:100 year floodline of the unnamed tributary of Sir Lowry's Pass River and at least 10 m from the delineated extent of all watercourses. Mixing of cement may be done within the construction camp, may not be mixed on bare soil, and must be within a lined, bound or bunded portable mixer. Consideration must be taken to use ready mix concrete; · No mixed concrete shall be deposited directly onto the ground. A batter board or other suitable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing; · Cement bags must be disposed of in the demarcated hazardous waste receptacles and the used bags must be suitably disposed of; and · Spilled or excess concrete must be disposed of at a suitable landfill site.	Fully Reversible
4			Construction of: · Residential households; · Internal roads and walkways; · Stormwater attenuation facilities and discharge points, particularly that associated with the stormwater attenuation facility 2 (Figure 3 above);	· Disturbances of soils leading to increased alien vegetation proliferation, and in turn to altered freshwater habitat. · Altered runoff patterns, leading to increased erosion and sedimentation of freshwater habitat;	**1,25**	**4,25**	**12**	**51**	**L**	High		Fully Reversible

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
			· Wastewater Treatment Plants. · Internal sewage network; and · Landscaping associated with the proposed residential development.	· Proliferation of AIP plants within the stormwater system, which could lead to dispersal of AIP seeds into the watercourses; · Increased sediment loads entering the watercourses.						High	• Only indigenous vegetation species may be used as part of the landscaping of the development, and invasive plant species should be eradicated	
5	Construction Phase	Construction activities related to building activities below the post development 1:100 year floodline and within the 32 m NEMA and 500 m GN509 Zone of Regulation	· Establishment of stormwater discharge points below the 1:00 year floodline and within the delineated wetlands and associated conservation buffer (stormwater outlets associated with CVB wetland 4); and · Establishment of stormwater channels (as part of reducing the 1:100 floodline)	· Alterations to the sediment loads within the watercourses. · Potential deposition of waste material into the watercourses. · Potential changes to the water retention pattern of the watercourses.	**4,25**	**7,25**	**14**	**101.5**	**M**	High	• The use of Sustainable Drainage Systems (SuDs) to manage stormwater is considered critical for the residential development as there will be an increase in hardened surfaces within close proximity to the watercourses. SuDs will assist in preventing significant impacts on the hydrological functioning of the watercourses, reduce the risk of flooding during high flow periods and reduce the risk of increased erosion; • On review of the Civil Engineering Services Report prepared by KLS Consulting Engineers (2020), the proposed Mount View residential development will utilise open swales (considered to be SuDs) for the discharge of treated effluent before discharging into storage tanks. The following is deemed applicable for the construction of the SuDs: · SuDs should be constructed through excavation of the *in-situ* material, sloped to a ratio not steeper than 3:1 and lined with rocks and cobbles to assist with energy dissipation and prevent sedimentation and erosion as well as improve the aesthetic appeal of the SuDs (Figure B); and · SuDs should be vegetated with indigenous obligate and facultative species suitable for seasonal saturation. Wooden boardwalks could be developed over the swales for pedestrian walkways should the developer so desire.	Fully Reversible

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
	Construction Phase		.	.							 **Figure B: Examples of open swales, considered to be SuDs utilised as part of residential developments for conveyance of stormwater** Since some of the stormwater discharge points proposed may fall within the delineated extent of the CVB wetland, the design of the stormwater discharge points must incorporate energy dissipating structures to prevent erosion and incision. Figure C below provides an example of a stormwater outlet into a watercourse habitat.  **Figure C: Schematic of an outlet structure directly adjacent to a wetland.** • Cobbles should be placed in front of the stormwater discharge points and below the reno mattress to further assist with energy dissipation. At no point should erosion or gully formation be allowed as this will have impact on the water dispersal into and across the watercourses, which could potentially reduce the extent and functionality of the wetland in the long-term; • All soils compacted within the watercourses as a result of construction equipment must be loosened prior to revegetation with suitable indigenous species; • No indiscriminate movement of vehicles or personnel is allowed within the watercourses or the 32 m NEMA ZoR where no activities are proposed. Careful planning of all construction equipment must be undertaken beforehand to ensure that the minimum impact on the watercourses occurs; and	

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
	Construction Phase										• Litter traps should be installed at all the inspection chambers to prevent any litter from entering into the watercourses. <u>Concrete works</u> See Activity 3 and 4 above with regards to concrete mixing on site	
6		Construction activities within the watercourses	Removal of unauthorised infilled material within portions of the CVB wetland 3 and riparian habitat of the unnamed tributary located below the 1:100 year floodline. This may involve: · Diversion of the active channel of the unnamed tributary within the infilled reach; · Clear and grubbing of the area of all existing vegetation and materials; · excavation and stripping of topsoil, cut-to-spoil; and · Reshaping of the fill area following removal of the infill material.	· Removal of the infilled material will result in an anticipated loss of 0.032 ha of riparian habitat and 0.136 ha of wetland habitat; · Alteration to the patterns and timing of flow within the downstream reach of the unnamed tributary and CVB wetland; · Removal of any remaining vegetation which may still provide habitat and deliver ecoservices; · Potential sedimentation of the watercourses; · Increased likelihood of dust generation due to exposed soil; and	**5**	**10**	**16**	**160**	**M**	High	• Use should be made of existing roads to gain access to the areas proposed to be excavated below the floodline. Due to the relative accessibility of the site, no unnecessary crossing of the unnamed tributary may be permitted. This will limit any further erosion of the tributary; • The clearing of vegetation within the footprint area must be kept to a minimum to avoid unnecessary disturbance within the active channel of the tributary and channelled valley bottom s; • The removed vegetation must be stockpiled outside of the delineated boundary of the wetlands. The footprint areas of these stockpiles should be kept to a minimum. Should the vegetation not be suitable for reinstatement after the construction phase or be alien/invasive vegetation species, all material must be disposed of at a registered garden refuse site and may not be burned or mulched on site; • Limit construction equipment within the watercourses to what is essential; • The proposed excavation activities for the removal of the unauthorised infilled material will potentially result in bank destabilisation, and an increase in bank incision and sedimentation of the watercourses. Therefore, sediment control devices must be constructed in situ prior to excavation activities and reshaping activities. <u>With regards to the diversion of flow in preparation for the removal of the unauthorised infilled material within the active channel of the unnamed tributary:</u> • Should construction works not be finalised during the dry season, a coffer dam area can be created and dewatered around the construction area associated with any pillars by using sandbags and cobbles. Water must be diverted into the downstream reaches, around the coffer area (as indicated in Figure D below). Water must be allowed to flow to the downstream reaches at all times. And sediment traps must be installed.	Partially reversible

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
				· Potential indiscriminate movement of construction equipment leading to compaction of soils which may result in the formation of gullies, resulting in erosion and incision.							• Sediment traps must be installed every 20 m downstream for any works for a length of 200 m. For example, see Figure E below. • Ensure that the creation of the diversion (by means of sandbags) does not result in a significant water level difference upstream or downstream of the installation site; • It is recommended that a suitably qualified freshwater specialist and Environmental Control Officer (ECO) should monitor any coffer dam areas created on site as well as sediment traps at least bimonthly during the construction period to monitor the CVB wetland and tributary conditions during construction and after the removal of the diversion.  **Figure D: Schematic drawing of a coffer dam and sediment trap recommended to be implemented around the construction area associated with activities within or in close proximity to the active channel.**	

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
				.							  **Figure E: Examples of silt traps to be used during the construction phase, to limit additional sediment from entering the downstream reach of the the unnamed tributary.** • The area must be suitably compacted and reshaped to levels close to the surrounding wetland habitat to allow opportunities for the reinstatement of wetland habitat and to prevent any erosion or preferential flow paths from occurring; • All shaping must be done as natural as possible, and the area should be designed to have varying depths to facilitate microhabitat formation • The excavated fill material can be spoiled on site. However, not within the watercourses or open spaces; • Excavated materials may not be contaminated, and it must be ensured that the minimum surface area is taken up, and the stockpiles may not exceed 2m in height. Stockpiling of removed materials may only be temporary (may only be stockpiled during the period of construction at a particular site) and should be disposed of at a registered waste disposal facility; • All exposed soil must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting) to prevent erosion and sedimentation of the tributary; • Since portions of the unauthorised infilled material are located within the CVB wetland 3, the removal thereof will result in loss of wetland habitat. The wetland loss should ideally be reinstated within the fill area following removal of the infilled material to ensure no net loss to the CVB wetland;	

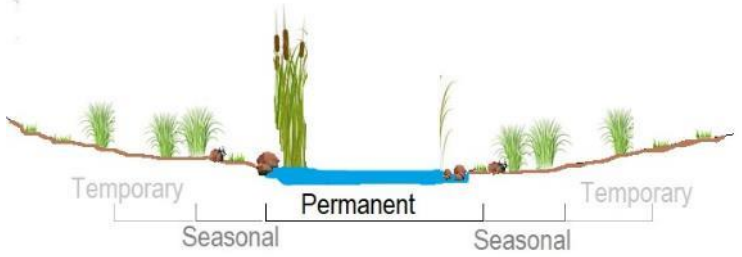
No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
	Construction Phase			.							• No hard infrastructure is allowed within the reshaped area and use of hard engineering structure (such as gabion retention structures or reno-mattresses) should be avoided as far as feasibly possible • Revegetation of re-profiled slopes of the infilled area, the excavated area below the 1:100 year floodline and any other areas (including the unnamed tributary) that may have potentially been impacted by the opposed infilling/excavation activities; • Rehabilitation of the disturbed area must be undertaken, including re-vegetation with indigenous wetland vegetation and stabilisation of the embankments of the unnamed tributary in the affected area following a suitably developed watercourse management plan for the study area; • Only indigenous vegetation species may be used as part of the landscaping of the development, and invasive plant species should be eradicated; and • Soil shaping and final designs should be overseen by a suitably qualified freshwater specialist to ensure wetland functionality is reinstated.	
7			Installation of the rectangular portal culvert with 330 mm brick wing walls under the section of the internal roadway which traverses the northern reach of the unnamed tributary and upgrading of the existing culvert under Old Sir Lowry's Pass Road within the downstream reach of the tributary. This may involve the following: · Diversion of flow by means of sandbags;	· Disturbances of soils leading to ponding of water as a result of over compaction of soils in some areas, increased alien vegetation proliferation, and in turn altered riparian habitat; · Excavation and trenching leading to stockpiling of soil; · Altered runoff patterns, leading to increased erosion and sedimentation of the downstream riparian habitat; · Decrease of surface water quality due to the use of concrete within the active channel of the tributary;	**5**	**7**	**15**	**105**	**M**	High	• The design of the culvert should ensure adequate flow connectivity between the upstream and downstream portions of the tributary; • The culvert structure must extend the width of the tributary to ensure recharge of the tributary downgradient of the crossing; • The crossing and the through-flow structures should be sized to accommodate the post-development 1:100 year flood and must be placed to be level/flush with the tributary bed to ensure under scouring or erosion at the inlet side does not occur; • It is recommended that the construction associated with the culvert be undertaken during the dry summer months, when limited throughflow of water is experienced. However, should construction occur within the rainy season, a diversion for the drainage line should be excavated around the proposed culvert crossing location for the period of construction to ensure hydrological connectivity is maintained, however this should be considered at the time of construction on consultation with the ECO. <u>With regards to the diversion of flow in preparation for the installation of the culvert crossing:</u> • See Activity 6 above with regards to creation of a sump area and sediment traps. • The duration of impacts within the tributary should be minimised as far as possible by ensuring that the duration of time in which flow alteration and sedimentation will take place is minimised; and	Fully Reversible

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
			· Excavation activities and compaction of soils for the construction of the culvert; · Concrete works; · Installation of reno-mattresses at the inlet and outlet of the culvert and riprap below the culvert outlet; · Movement of construction equipment and personnel within the unnamed tributary.	· Constriction of flow leading to turbulent erosive flow of increased velocity and possible loss of recharge to downstream areas, impacting on downstream biota; Decrease of surface water quality due to the use of concrete within the active channel of the tributary.							· It is recommended that a freshwater specialist ECO should monitor the diversion site once a week during the diversion period to monitor the tributary conditions during construction and after the removal of the diversion. <u>With regards to excavation and soil compaction activities within the tributary associated with the culvert:</u> · During excavation activities, soil removed from the dewatered section should be stockpiled outside the delineated edge of the tributary; · Excavated materials should not be contaminated, and it should be ensured that the minimum surface area is taken up, and the stockpiles may not exceed 2m in height. Mixture of the lower and upper layers of the excavated soil should be kept to a minimum, so as for later usage as backfill material or as part of rehabilitation activities; and · All exposed soils must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting) to prevent erosion and sedimentation of the tributary. • See Activity 3 and 4 above with regards to concrete mixing on site.	
8	Construction Phase		· Installation of the bulk service sewer and water pipelines along the Old Sir Lowry's Pass Road within the downstream reach of the tributary.		**5**	**7**	**15**	**105**	**M**	High	<u>With regards to trenching of pipes</u> • The bulk sewer and water pipeline must remain within the existing road reserve and must be attached to existing culverts over the watercourse; • Soil can be stockpiled alongside the trench, with preference to the eastern side, furthest away from the watercourse. Stockpiles may not exceed 2 m in height (Figure F) and all trenches must be backfilled as soon as feasibly possible; • Protect exposed soil and stockpiles from wind, and limit the time in which soil are exposed, by covering with a suitable geotextile such as hessian sheeting during extremely windy conditions; • Trenches should be backfilled as soon as the pipes have been installed in any given section in order to reduce potential erosion of exposed soil; • Mixture of the lower and upper layers of the excavated soil should be kept to a minimum. • Unused excavated soil/sediment should be utilised as part of the open space areas or be removed from site to a registered landfill.	Fully Reversible

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
			.	.							 **Figure F: Excavation for pipe trenching with stockpiles alongside.** Rehabilitation on completion of construction • Care must be taken when constructing the culverts to ensure that the design accommodates a 1 in 100 year flood event and that the base levels are maintained so that no erosion or ponding of water occurs surrounding the crossing. • Soil surrounding the wingwalls must be suitably backfilled and sloped (minimum of a 1:3 ratio) and concrete aprons as well as gabion mattresses should be installed both up and downstream for energy dissipation and sediment trapping. • All soils within the tributary surrounding the culvert must be loosened on completion of works to allow for re-vegetation. • All footprint areas must remain as small as possible and vegetation clearing to be limited to what is absolutely essential; • All vehicles are to remain within existing roads and no new roads should be developed to access this construction site; • All stockpiles must be located at least 10 m from the delineated extent of the tributary should not exceed 2 m in height and should be covered with a suitable geotextile such as hessian sheeting to prevent excessive dust generation;	

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
9	Construction Phase	Construction/development activities within the variable conservation buffer of the watercourses	· Construction of the portions of the three private erven located within the variable conservation buffer. It is understood that the portions of the erven falling within the variable conservation buffer and encroaching into the delineated boundary of the unnamed tributary are the outdoor lawn or garden areas of the proposed residential erven (thus no building infrastructure).	· Disturbances of soils leading to increased alien vegetation proliferation, and in turn to altered freshwater habitat. · Altered runoff patterns, leading to increased erosion and sedimentation of freshwater habitat; · Increased sediment loads entering the watercourses; and · Potential impacts on water quality of the receiving freshwater environment.	**1,3**	**4,3**	**12**	**51**	**L**	High	• All stockpiles must be located at least 10 m from the delineated extent of the tributary should not exceed 2 m in height and should be covered with a suitable geotextile such as hessian sheeting to prevent excessive dust generation; • No formal paving should be used for the proposed walkway. *In situ* compaction of soil for the walkways as proposed is preferred; • Revegetation of the areas surrounding the walkways with suitable indigenous species is recommended. These can be low growing species such as grasses, shrubs, or fynbos vegetation to allow access for access during fire emergencies; • Once construction activities are done, the surrounding area to the construction footprint must be suitably rehabilitated. Only indigenous vegetation species may be used as part of the landscaping of the development, and invasive plant species should be eradicated.	
10	Construction Phase		· Proposed construction of a stub wall, approximately 320 mm wide and 300 mm high, just outside the edge of the variable conservation buffer to separate the lawn areas from the conservation buffer.								**Cement usage** See Activity 3 and 4 above with regards to concrete mixing on site	

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
11			Establishment of in situ compacted walkways approximately 1.6 m wide.	· Disturbances of soils leading to increased alien vegetation proliferation, and in turn to altered freshwater habitat. · Altered runoff patterns, leading to increased erosion and sedimentation of freshwater habitat; · Increased sediment loads entering the watercourses; and · Potential impacts on water quality of the receiving freshwater environment.	**1,3**	**3,3**	**12**	**39**	**L**	High		
12		Potential indiscriminate waste disposal and/or spillage from construction vehicles	Disposal of construction-related wastes (such as rubble, hazardous chemicals and litter)	· Altered flow regime as a result of solid waste within the freshwater environment. · Altered water quality due to chemical waste disposal.	**1**	**1,25**	**10**	**30**	**L**	High	• No waste disposal is to be permitted below the 1:100 year floodline of the unnamed tributary of Sir Lowry's Pass River and associated CVB wetlands; • Any solid waste or litter generated as part of the construction activities must be disposed of within suitable waste bins; • Re-fuelling of vehicles must be undertaken at a suitable facility off site or on a non-permeable surface, associated with a construction camp outside of the 1:100 year floodline of the Unnamed tributary of Sir Lowry's Pass River ; and • All wastes are to be removed from the site and disposed of at a registered facility.	Fully Reversible

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
13	Operational Phase	Rehabilitation of the watercourse areas below the post-development 1:100 year floodline following the removal of infilled material and construction activities	· Movement of construction vehicles within the watercourses. · Soil exposure and reshaping, resulting in potential sedimentation and erosion. · Re-vegetation of surrounding wetland areas, remove any obstructions to flow. · Proliferation of alien and invasive plant species within the unnamed tributary and CVB wetland 3 and surroundings.	· Loss of wetland and riparian habitat; · Potential changes to the hydrological drivers of the CVB wetland, resulting in decreased functional wetland habitat; · Soil compaction within the watercourses; and · Potential sedimentation of the watercourses due to activities within the watercourses; and · Impacts to water quality as a result of the application of herbicides.	**5**	**8**	**14**	**112**	**M**	High	• On completion of works, the unnamed tributary and associated CVB wetland 3 must be reinstated. At no point should a straight channel be excavated, and no hard infrastructure is allowed (i.e., no gabion walls, concrete slabs etc); • All rehabilitation actions should be implemented to reinstate the wetland as close as possible to the reference state (i.e., natural), not the state of the wetland prior to the proposed removal of unauthorised infilled material; • The impacted wetland and tributary area must be re-instated, and soil-scaping must be undertaken in such a way as to reinstate the seasonal and temporary zones of the CVB wetland. Works should be undertaken during the dry season, (ideally during March/April just before the rainy season. A site-specific rehabilitation, maintenance and monitoring plan as initially compiled by FEN Consulting (Pty) Ltd (2021) must be updated to include specific rehabilitation measures for the reinstatement of riparian and wetland habitat.  **Figure F: Representation of the permanent, seasonal and temporary wetland zones to be associated with the rehabilitated CVB wetland 3 following construction activities.**	Fully Reversible

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
			.	.							• All disturbed soil must be ripped and loosened. Any existing erosion must be remediated. • Following construction, a suitable alien invasive management plan must be implemented to ensure that alien invasive plant species do not become established within the areas disturbed by construction activities; • Rehabilitation of the unnamed tributary and CVB wetlands must be undertaken, including clearing of woody alien invasive vegetation and reinstatement of indigenous wetland vegetation. • A Residual Wetland Impact Compensation Plan may need to be compiled (should it be requested by the legislative authorities) by a suitably qualified freshwater ecologist as part of investigating the functional habitat hectare equivalents that must be conserved by the proponent to account for the above-mentioned residual wetland and riparian habitat loss associated with the removal of the unauthorised infilled material, should the rehabilitation of the impacted areas not be sufficient; • The variable conservation buffer should also be rehabilitated with terrestrial vegetation. It is considered advantageous if the area below the 1:100 year floodline be rehabilitated with indigenous terrestrial vegetation and that indigenous wetland vegetation be reinstated within the CVB wetland 3 to create an open space corridor and reinstate the ecological buffer to the wetland; • When activities do occur within the active channel of the tributary, silt traps as applicable to Activity 1 above, should be implemented; and • Incorporate as much indigenous terrestrial, wetland and riparian vegetation into the landscape plan for all open space areas and stormwater, attenuation facilities.	

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
14	Operational Phase	Operation of the residential development and associated open space areas	· Potential fertilizers entering the watercourses through stormwater run-off; · Potential indiscriminate movement of vehicles within the watercourses for perimeter inspections/ maintenance.	· Potential eutrophication of water as a result of increased nitrates and phosphate loads into the watercourses. · Proliferation of alien and invasive plant species within the watercourses.	**1,25**	**4,25**	**11**	**46,75**	**L**	High	• An alien vegetation management plan should be developed and implemented and managed by the property managers or various Homeowner Association's for all open space areas as well as the watercourses. • No vehicles are permitted to enter into the watercourses. Any maintenance works must be undertaken by foot or the relevant authorisations obtained beforehand. • As much indigenous terrestrial, wetland and riparian vegetation should be included into the landscape plan for the open space areas. Indigenous vegetation will reduce the irrigation requirements as well as fertilizers. • Care must be taken when using herbicides and pesticides in gardens and open space areas, especially during the rainy season when stormwater runoff is high. These chemicals must be used in accordance with the prescribed quantities to prevent contamination of surface water in the nearby watercourse, especially since stormwater is released therein.	Fully Reversible
15		Operation and maintenance of the road culvert crossing the unnamed tributary.	· Debris collecting on the upstream side of the culvert could potentially impact on the flow; · Disturbances to or removal of vegetation whilst accessing the culvert crossing to carry out maintenance activities.	· Disturbance to flow regime and temporary inundation of the channel upstream of the inlet; · Potential loss of indigenous vegetation and the further proliferation of alien floral species due to the disturbances.	**1,75**	**3,75**	**12**	**45**	**L**	High	• All watercourses are to be considered "off limits" to any vehicular activity; • Disturbances to the watercourses should be limited to what is essential for long-term maintenance in line with the mitigation measures presented herein; • Existing access roads must be used for monitoring purposes. No indiscriminate movement of vehicles is allowed as this would result in the compaction of soils and potential loss of riparian and instream habitat; • Hot spots for the build-up of debris and excess sediment must be identified and when necessary, debris/excess sediment must be removed by hand to prevent future flooding and potential damage to infrastructure. In this regard, special mention is made of periods following high rainfall and subsequent high instream water volumes. Removal of debris must be undertaken in line with the above listed construction mitigation measures; • The watercourses must be monitored for alien and invasive vegetation encroachment and all alien vegetation/weeds must be removed according to a suitable alien vegetation control plan. Annual follow up should be undertaken to all watercourses for at least 3 years post construction; and • Any erosion or gully formation must be identified on an ongoing basis and re-profiled and revegetated accordingly.	Fully Reversible

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
16		Operation of the stormwater retention facilities and wastewater treatment plants.	· Potential of sewerage to spill from the treatment plant at inlet chamber due to blockages; · Lack of humus to be wasted from the plant during maintenance activities, causing the plant to become anaerobic; · Contaminated stormwater runoff entering the tributary from the outlets of the stormwater retention facilities; and · Erosion of the tributary at the outlet of the stormwater outlets.	· Alteration of the hydroperiod of the tributary; Sedimentation of the tributary and impact on the water quality of the tributary leading to the degradation of the freshwater habitat and sensitive freshwater species (although unlikely to be present); Erosion of soils, alteration to the geomorphology of the freshwater habitat, and reduction of the ecoservices provided by the tributary as a result; · Potential spillage of sewerage into the tributary (unlikely due to distance from tributary), decreasing the quality of surface water present in the tributary; and The anaerobic conditions in the septic tank could lead to a decrease in effluent quality which will be discharge into the tributary;	**2**	**5**	**14**	**70**	**M**	High	• The likelihood of erosion is reduced due to a higher surface roughness of the earth swale, allowing for water to enter the tributary at a lower velocity; • The swales should be inspected regularly to ensure proper functioning, monitoring of erosion and clearing of any debris or litter in the swales; • Any water potentially discharged into the watercourses (that is not used for irrigation purposes - from the storage tanks/attenuation facilities) must regularly be tested to monitor the quality of the effluent and to be pro-active regarding potential spills or malfunctioning of the treatment plant; • Regular inspection of the effluent pipe outlet structure should be undertaken to monitor the occurrence of erosion. If erosion has occurred, it should immediately be rehabilitated by means of revegetation; • Control measures associated with the constructed wetland/retention pond, if implemented: • The constructed wetland/retention pond should be cleared of litter during regular maintenance activities; and • The effluent outlet in the basin and the earth swale should be monitored for erosion. If erosion is noted, the area associated with the outlet should be rehabilitated with the use of cobbles, with guidance from a freshwater specialist; and • The quality of the treated effluent used for irrigation purposes must be tested at regular intervals and must comply with the wastewater limit values applicable to irrigation of any land or property as stated by Government Notice 665 as published in the Government Gazette 36820 of 2013 as it relates to activity as stipulated in Section 21(e) of the National Water Act, 1998 (Act No. 36 of 1998).	Fully Reversible

No.	Phase	Activity	Aspect	Impact	Severity	Consequence	Likelihood	Significance	Risk Rating	Confidence Level	Control Measures	Reversibility of Impact
17		Use of treated effluent for irrigation purposes	· Potential of low-quality effluent to enter the unnamed tributary via surface water runoff	· Decrease in the quality of surface water present in the unnamed tributary	**2,25**	**5,25**	**10**	**52,25**	**L**	High		Fully Reversible

The activities associated with the construction and operational phases of the proposed Mount View residential development , which include site preparation, excavation and removal of unauthorised infill material within portions of a unnamed tributary and CVB wetland, culvert, bulk service pipelines and stormwater outlets within the watercourses, pose a Moderate risk to the overall integrity of the watercourses. The proposed removal of the unauthorised infilled material will result in an anticipated loss of 0.032 ha of riparian habitat of the unnamed tributary and 0.136 ha of wetland habitat loss of the CVB wetland 3. The majority of the impacts are considered fully reversible, except those associated with loss of wetland and riparian vegetation related to the removal of the infilled material which will partially fragment the systems. It is strongly recommended that the wetland habitat loss due to these activities be ideally reinstated within the fill area following removal of the infilled material to ensure no net loss of riparian habitat and CVB wetland. The long-term impacts for the removal of the infilled material can be considered acceptable as rehabilitation of this site will ensure ecological connectivity and reinstatement of riparian and wetland habitat. All watercourses within the study area including the variable conservation buffer should be suitably rehabilitated with indigenous vegetation consisting of facultative and terrestrial vegetation. This must however be approved by the relevant legislative authorities as a viable option.

Most potential impacts are considered direct (construction of culvert road crossing, installation of bulk service pipelines, loss of riparian and wetland habitat), with indirect impacts arising from potential water quality concerns and increased sediment loads entering the watercourses through the stormwater channels. Assuming that strict enforcement of cogent, well-developed mitigation measures takes place, the significance of impacts arising from the proposed residential development are likely to be managed during the construction and operational phases.

It is recommended that ongoing monitoring of the structural integrity of the proposed outlet structures and of the rehabilitation efforts be implemented during the operational phase to avoid potential blockages and monitor erosion and incision. Additional “good practice” mitigation measures applicable to a project of this nature are provided in **Appendix F** of this report.

7.2 *Cumulative Impacts*

Cumulative impacts are activities and their associated impacts on the past, present and foreseeable future, both spatially and temporally, considered together with the impacts identified in Section 7.1 above. Wetlands and riparian areas within the region are under continued threat due to growing urbanisation in the surrounding areas. The impacts on the reach of the CVB wetland associated with the removal of unauthorised infilled material will result in a partial loss of wetland habitat, however, should this area be rehabilitated to create functional wetland habitat, the long-term impacts can be considered acceptable. Impacts can further be reduced through the implementation of the variable conservation buffer, which is reinstated with indigenous fynbos vegetation.

With the rehabilitation and the removal of all alien and invasive vegetation species, the PES and ecoservice provision of the watercourses will likely be improved, as per the REC and RMO. Long term alien invasive vegetation management and utilisation of indigenous vegetation as part of any landscaping will assist in the positive cumulative impacts on watercourses, which are becoming heavily invaded by large alien and invasive trees.

8 CONCLUSION

FEN Consulting was appointed to conduct a specialist freshwater ecological assessment as part of the environmental assessment and WUA processes for the proposed Mount View residential development on the remainder of Farm 869, Farm 1262, remainder of Farm 866, remainder of Farm 1054, portions 2 and 3 of Farm 1054 and portion 2 of farm 870, located in Sir Lowry's Pass.

During the assessment undertaken in October 2020, a riparian watercourse, the unnamed tributary of the Sir Lowry's Pass River was identified bisecting the study area in a north to south westerly direction. It should be noted that the riparian extent of the unnamed tributary exceeds the extent of the modelled 1:100 year floodline. This is due to the confined active channel of the tributary. Five channelled valley bottom (CVB) wetlands were also identified to be associated with the unnamed tributary within the study area. The results of the ecological assessment discussed in Section 5 of this report are summarised in the table below:

Table 7: Summary of results of the field assessment as discussed in Section 5.

Watercourse	PES	Ecoservices	EIS	REC and RMO
Unnamed tributary of Sir Lowry's Pass River	Category D (Largely modified)	Intermediate	High	Category C/D Improve
Extent of modification	**High** Significant modifications are anticipated to the reach of the unnamed tributary associated with the unauthorised infilled material where 0.032 ha of riparian habitat will be lost due to the proposed removal of the unauthorised infilled material. However, as part of the rehabilitation phase the tributary active channel and associated vegetation must be reinstated. Other modifications anticipated to the extent of the unnamed tributary may result from the installation of new and upgrading of existing culvert structures which will necessitate work within the active channel of the unnamed tributary. Stormwater released from the discharge points adjacent to the unnamed tributary must disperse before entering the watercourse to prevent incision and erosion. No new infrastructure is proposed within the unnamed tributary that may fragment or degrade the system. The removal of the unauthorised infilled material and upgrading of the culvert within the tributary will improve the ecological integrity of the riparian habitat and hydrological connectivity between the upstream and downstream reach of the tributary, which may potentially compensate for the original loss of riparian habitat due to the removal of infilled material.			
CVB wetland 1	C (Moderately Modified)	Intermediate	Intermediate	REC: B/C RMO: Improve
CVB wetlands 2 to 5	Category D (Largely modified)	Intermediate	Intermediate	Category C/D Improve
Extent of modification	**High** Significant modifications are anticipated to the reach of the CVB wetland (3) associated with the removal of unauthorised infilled material as part of the proposed Mount View residential development which will result in the anticipated loss of 0.136 ha of wetland habitat. However, as part of the rehabilitation phase the wetland seasonal and temporary zones and associated vegetation must be reinstated. Similarly, habitat fragmentation is likely within this reach of the CVB wetland. Thus, it is recommended that the wetland habitat loss due to these activities be ideally reinstated within the fill area following removal of the infilled material to ensure no net to the CVB wetland. The long-term impacts for the removal of the infilled material can be considered low as rehabilitation of this site will ensure ecological connectivity and increase the area of wetland habitat. Stormwater released from the surrounding outlet structures into the wetlands must disperse before entering the wetland to prevent incision and erosion.			

The following summarises the risks associated with the proposed activities associated with the construction and operational phases:

Table 8: Summary of the DWS Risk Assessment outcomes.

Phases	Activity	Risk Rating
Construction Phase	Site clearing prior to commencement of construction activities ➢ Removal of vegetation and associated disturbances to soils.	L
	Construction activities related to building activities outside the delineated extent of the watercourses and above the 1:100 year floodline but within the 500 m GN509 Zone of Regulation ➢ Earth works involving removal of topsoil and creation of soil stockpiles including; ➢ Construction of residential households, internal roads, stormwater attenuation facilities, internal sewage network, Wastewater Treatment Plants; and landscaping associated with the proposed residential development.	L
	Construction activities related to building activities outside the delineated extent of the watercourses but below the 1:100 year floodline and within the 32 m NEMA and 500 m GN509 Zone of Regulation ➢ Establishment of stormwater discharge points below the 1:00 year floodline and within the delineated wetlands and associated conservation buffer	M
	Construction activities within the watercourses ➢ Removal of unauthorised infilled material within the riparian habitat of the unnamed tributary and portions of the CVB wetland 3, below the 1:100 year floodline. ➢ Installation of the rectangular portal culvert with 330 mm brick wing walls under the section of the internal roadway which traverses the northern reach of unnamed tributary, and upgrading of the culvert below Old Sir Lowry's Pass Road within the downstream reach of the tributary. ➢ Installation of the bulk sewer and water pipelines along the Old Sir Lowry's Pass Road within the downstream reach of the tributary.	M
	Construction activities within the variable conservation buffer of the watercourses ➢ Construction of the portions of the three private erven located within the variable conservation buffer. ➢ Proposed construction of a stub wall just outside the edge of the variable conservation buffer to separate the lawn areas from the conservation buffer. ➢ Establishment of in situ compacted walkways.	L
Operational Phase	Potential indiscriminate waste disposal and/or spillage from construction vehicles	L
	Rehabilitation of the watercourses	M
	Operation of the residential estate and associated open space areas	L
	Operation and maintenance of the road culvert crossing the unnamed tributary	L
	Operation of the stormwater retention facilities and wastewater treatment plants.	M
	Use of treated effluent for irrigation purposes	L

Based on the findings of the freshwater ecological assessment and the results of the impact assessment, it is the opinion of the ecologist that the proposed Mout View residential developent poses a **Moderate risk to the integrity of the unnamed tributary and associated CVB wetlands** provided that adherence to cogent, well-conceived and ecologically sensitive construction plans are implemented and the mitigation measures provided in this report as well as general good construction practice are adhered. Authorisation by means of a Water Use Licence Application in terms of Sections 21 (c), (e) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) must be obtained from the relevant authorities prior to the commencement of any works.

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.ANNEXURE A: Indemnity and Terms of Use of this Report

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and FEN CC and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field or pertaining to this investigation.

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ANNEXURE B: Legislative Requirements

The Constitution of the Republic of South Africa, 1996	The environment and the health and well-being of people are safeguarded under the Constitution of the Republic of South Africa, 1996 by way of section 24. Section 24(a) guarantees a right to an environment that is not harmful to human health or well-being and to environmental protection for the benefit of present and future generations. Section 24(b) directs the state to take reasonable legislative and other measures to prevent pollution, promote conservation, and secure the ecologically sustainable development and use of natural resources (including water and mineral resources) while promoting justifiable economic and social development. Section 27 guarantees every person the right of access to sufficient water, and the state is obliged to take reasonable legislative and other measures within its available resources to achieve the progressive normalization of this right. Section 27 is defined as a socio-economic right and not an environmental right. However, read with section 24 it requires of the state to ensure that water is conserved and protected and that sufficient access to the resource is provided. Water regulation in South Africa places a great emphasis on protecting the resource and on providing access to water for everyone.
National Environmental Management Act, 1998 (Act No. 107 of 1998)	The National Environmental Management Act, 1998 (Act No. 107 of 1998) and the associated Regulations as amended in 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact. Provincial regulations must also be considered.
National Water Act , 1998 (Act No. 36 of 1998)	The National Water Act, 1998 (Act No. 36 of 1998) recognises that the entire ecosystem and not just the water itself in any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) & (i). A watercourse is defined as: a) A river or spring; b) A natural channel in which water flows regularly or intermittently; c) A wetland, lake or dam into which, or from which water flows; and d) Any collection of water which the minister may, by notice in the Gazette, declare a watercourse.
Government Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the National Water Act , 1998 (Act No. 36 of 1998)	In accordance with Government Notice (GN)509 of 2016, a regulated area of a watercourse for section 21c and 21i of the NWA, 1998 is defined as: ➢ The outer edge of the 1:100 year floodline 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; ➢ In the absence of a determined 1:100 year floodline or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or ➢ A 500 m radius from the delineated boundary (extent) of any wetland or pan. This notice **replaces GN1199** and may be exercised as follows: i) Exercise the water use activities in terms of Section 21(c) and (i) of the Act as set out in the table below, subject to the conditions of this authorisation; ii) Use water in terms of section 21(c) or (i) of the Act if it has a low risk class as determines through the Risk Matrix; iii) Do maintenance with their existing lawful water use in terms of section 21(c) or (i) of the Act that has a LOW risk class as determined through the Risk Matrix; iv) Conduct river and storm water management activities as contained in a river management plan; v) Conduct rehabilitation of wetlands or rivers where such rehabilitation activities have a LOW risk class as determined through the Risk Matrix; and vi) Conduct emergency work arising from an emergency situation or incident associated with the persons' existing lawful water use, provided that all work is executed and reported in the manner prescribed in the Emergency protocol. A General Authorisation (GA) issued as per this notice will require the proponent to adhere with specific conditions, rehabilitation criteria and monitoring and reporting programme. Furthermore, the water user must ensure that there is a sufficient budget to complete, rehabilitate and maintain the water use as set out in this GA. Upon completion of the registration, the responsible authority will provide a certificate of registration to the water user within 30 working days of the submission. On written receipt of a registration certificate from the Department, the person will be regarded as a registered water user and can commence within the water use as contemplated in the GA.

ANNEXURE C: Method of Assessment

1. Desktop Study

Prior to the commencement of the field assessment, a background study, including a literature review, was conducted in order to determine the ecoregion and ecostatus of the larger aquatic system within which the watercourses and drainage line features present in close proximity of the proposed development are located. Aspects considered as part of the literature review are discussed in the sections that follow.

1.1 National Freshwater Ecosystem Priority Areas (NFEPA; 2011)

The NFEPA project is a multi-partner project between the Council of Scientific and Industrial Research (CSIR), Water Research Commission (WRC), South African National Biodiversity Institute (SANBI), DWA, South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities of conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development.

The NFEPA project aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. Freshwater ecosystems provide a valuable, natural resource with economic, aesthetic, spiritual, cultural and recreational value. However, the integrity of freshwater ecosystems in South Africa is declining at an alarming rate, largely as a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (competition between stakeholders for utilisation) and institutional (building appropriate governance and co-management mechanisms).

The NFEPA database was searched for information in terms of conservation status of rivers, wetland habitat and wetland feature present in the vicinity of the proposed development.

1.2 *Department of Water and Sanitation (DWS) Resource Quality Information Services Present Ecological State / Ecological Importance and Sensitivity (PES/EIS) Database (2014)*

The PES/EIS database as developed by the DWS RQIS department was utilised to obtain background information on the project area. The PES/EIS database has been made available to consultants since mid-August 2014. The information from this database is based on information at a sub-quaternary catchment reach (subquat reach) level with the descriptions of the aquatic ecology based on the information collated by the DWS RQIS department from all reliable sources of reliable information such as SA RHP sites, EWR sites and Hydro WMS sites. The results obtained serve to summarise this information as a background to the conditions of the watercourse traversed by the proposed linear development.

2. Classification System for Wetlands and other Aquatic Ecosystems in South Africa (2013)

All wetland or riparian features encountered within the study area was assessed using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems, hereafter referred to as the "Classification System" (Ollis et. al., 2013). A summary on Levels 1 to 4 of the classification system are presented in the tables below.

Table C1: Classification System for Inland Systems, up to Level 3.

WETLAND / AQUATIC ECOSYSTEM CONTEXT		
LEVEL 1: SYSTEM	**LEVEL 2: REGIONAL SETTING**	**LEVEL 3:LANDSCAPE UNIT**
Inland Systems	DWA Level 1 Ecoregions OR NFEPA WetVeg Groups OR Other special framework	Valley Floor
		Slope
		Plain
		Bench (Hilltop / Saddle / Shelf)

Table C2: Hydrogeomorphic (HGM) Units for the Inland System, showing the primary HGM Types at Level 4A and the subcategories at Level 4B to 4C.

FUNCTIONAL UNIT		
LEVEL 4:HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	**B**	**C**
River	Mountain headwater stream	Active channel
		Riparian zone
	Mountain stream	Active channel
		Riparian zone
	Transitional	Active channel
		Riparian zone
	Upper foothills	Active channel
		Riparian zone
	Lower foothills	Active channel
		Riparian zone
	Lowland river	Active channel
		Riparian zone
	Rejuvenated bedrock fall	Active channel
		Riparian zone
	Rejuvenated foothills	Active channel
		Riparian zone
	Upland floodplain	Active channel
		Riparian zone
Channelled valley-bottom wetland	(not applicable)	(not applicable)
Unchannelled valley-bottom wetland	(not applicable)	(not applicable)
Floodplain wetland	Floodplain depression	(not applicable)
	Floodplain flat	(not applicable)
Depression	Exorheic	With channelled inflow
		Without channelled inflow
	Endorheic	With channelled inflow
		Without channelled inflow
	Dammed	With channelled inflow
		Without channelled inflow
Seep	With channelled outflow	(not applicable)
	Without channelled outflow	(not applicable)
Wetland flat	(not applicable)	(not applicable)

Level 1: Inland systems
From the classification system, Inland Systems are defined as **aquatic ecosystems that have no existing connection to the ocean** (i.e. characterised by the complete absence of marine exchange and/or tidal influence) but **which are inundated or saturated with water, either permanently or periodically.** It is important to bear in mind, however, that certain Inland Systems may have had a historical connection to the ocean, which in some cases may have been relatively recent.

Level 2: Ecoregions & NFEPA Wetland Vegetation Groups
For Inland Systems, the regional spatial framework that has been included in Level 2 of the classification system is that of the DWA's Level 1 Ecoregions for aquatic ecosystems (Kleynhans *et. al.,* 2005). There is a total of 31 Ecoregions across South Africa, including Lesotho and Swaziland. DWA Ecoregions have most commonly been used to categorise the regional setting for national and regional water resource management applications, especially in relation to rivers.

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina & Rutherford, 2006) groups' vegetation types across the country, according to Biomes, which are then divided into Bioregions. To categorise the regional setting for the wetland component of the NFEPA project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting Bioregions into smaller groups through expert input (Nel *et al*., 2011). There are currently 133 NFEPA WetVeg Groups. It is envisaged that these groups could be used as a special framework for the classification of wetlands in national- and regional-scale conservation planning and wetland management initiatives.

Level 3: Landscape Setting
At Level 3 of the classification system for Inland Systems, a distinction is made between four Landscape Units (Table C1) on the basis of the landscape setting (i.e. topographical position) within which an HGM Unit is situated, as follows (Ollis *et. al.,* 2013):

- **Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley;
- **Valley floor:** The base of a valley, situated between two distinct valley side-slopes;
- **Plain:** an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land; and
- **Bench (hilltop/saddle/shelf):** an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction), and shelves/terraces/ledges (relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction).

Level 4: Hydrogeomorphic Units
Seven primary HGM Types are recognised for Inland Systems at Level 4A of the classification system (Table C2), on the basis of hydrology and geomorphology (Ollis *et. al*., 2013), namely:

- **River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water;
- **Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it;
- **Unchanneled valley-bottom wetland:** a valley-bottom wetland without a river channel running through it;
- **Floodplain wetland:** the mostly flat or gently sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank;
- **Depression:** a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates;
- **Wetland Flat:** a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat; and
- **Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend into a valley floor.

The above terms have been used for the primary HGM Units in the classification system to try and ensure consistency with the wetland classification terms currently in common usage in South Africa. Similar terminology (but excluding categories for “channel”, “flat” and “valleyhead seep”) is used, for example, in the recently developed tools produced as part of the Wetland Management Series including WET-Health (Macfarlane *et. al*., 2008), WET-IHI (DWAF, 2007) and WET-EcoServices (Kotze *et. al*., 2009).

3. Wet-Ecoservices (2009)

“The importance of a water resource, in ecological, social or economic terms, acts as a modifying or motivating determinant in the selection of the management class” (DWA, 1999). The assessment of the ecosystem services supplied by the identified wetlands was conducted according to the guidelines as described by Kotze *et al.* (2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the service is provided:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Phosphate trapping;
- Nitrate removal;
- Toxicant removal;
- Erosion control;
- Carbon storage;
- Maintenance of biodiversity;
- Water supply for human use;
- Natural resources;
- Cultivated foods;
- Cultural significance;
- Tourism and recreation; and
- Education and research.

The characteristics were used to quantitatively determine the value, and by extension sensitivity, of the wetlands. Each characteristic was scored to give the likelihood that the service is being provided. The scores for each service were then averaged to give an overall score to the wetland.

Table C3: Classes for determining the likely extent to which a benefit is being supplied.

Score	Rating of the likely extent to which the benefit is being supplied
<0.5	Low
0.6-1.2	Moderately low
1.3-2	Intermediate
2.1-3	Moderately high
>3	High

4. Index of Habitat Integrity

The general habitat integrity of each site was discussed based on the application of the Index of Habitat Integrity (Kleynhans *et al.* 2008). It is important to assess the habitat at each site in order to aid in the interpretation of the results of the community integrity assessments, by taking habitat conditions and impacts into consideration. This method describes the Present Ecological State (PES) of both the in-stream and riparian habitat at each site. The method classifies habitat integrity into one of six classes, ranging from unmodified/natural (Class A) to critically modified (Class F), as indicated in the table below.

Table C4: Classification of Present State Classes in terms of Habitat Integrity [Kleynhans et al. 2008]

Class	Description	Score (% of total)
A	Unmodified, natural.	90 - 100
B	Largely natural with few modifications. The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.	80 - 89
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.	60 - 79
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.	40 – 59
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.	20 – 39
F	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.	0 - 19

5. Ecological Importance and Sensitivity (EIS) (Rountree & Kotze, 2013)

The purpose of assessing importance and sensitivity of water resources is to be able to identify those systems that provide higher than average ecosystem services, biodiversity support functions or are especially sensitive to impacts. Water resources with higher ecological importance may require managing such water resources in a better condition than the present to ensure the continued provision of ecosystem benefits in the long term (Rountree & Kotze, 2013).

In order to align the outputs of the Ecoservices assessment (i.e. ecological and socio-cultural service provision) with methods used by the DWA (now the DWS) used to assess the EIS of other watercourse types, a tool was developed using criteria from both WET-Ecoservices (Kotze, *et, al,* 2009) and earlier DWA EIA assessment tools. Thus, three proposed suites of important criteria for assessing the Importance and Sensitivity for wetlands were proposed, namely:

- Ecological Importance and Sensitivity, incorporating the traditionally examined criteria used in EIS assessments of other water resources by DWA and thus enabling consistent assessment approaches across water resource types;
- Hydro-functional importance, taking into consideration water quality, flood attenuation and sediment trapping ecosystem services that the wetland may provide; and
- Importance in terms of socio-cultural benefits, including the subsistence and cultural benefits provided by the wetland system.

The highest of these three suites of scores is then used to determine the overall Importance and Sensitivity category (Table C5) of the wetland system being assessed.

Table C5: Ecological Importance and Sensitivity Categories and the interpretation of median scores for biota and habitat determinants (adapted from Kleynhans, 1999).

EIS Category	Range of Mean	Recommended Ecological Management Class
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications.	>3 and <=4	A
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications.	>2 and <=3	B
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications.	>1 and <=2	C
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications.	>0 and <=1	D

6. Recommended Management Objective (RMO) and Recommended Ecological Category (REC) Determination

"A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability but carries a higher risk of ecosystem failure" (DWA, 1999).

The RMO (table below) was determined based on the results obtained from the PES, reference conditions and EIS of the watercourse (sections above), with the objective of either maintaining, or improving the ecological integrity of the watercourse in order to ensure continued ecological functionality.

Table C6: Recommended management objectives (RMO) for watercourses based on PES & EIS scores.

			Ecological and Importance Sensitivity (EIS)			
			Very High	High	Moderate	Low
PES	A	Pristine	A Maintain	A Maintain	A Maintain	A Maintain
	B	Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good	A Improve	B/C Improve	C Maintain	C Maintain
	D	Fair	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Poor	D* Improve	E/F* Improve	E/F* Maintain	E/F* Maintain

***PES Categories E and F are considered ecologically unnacceptable (Malan and Day, 2012) and therefore, should a watercourse fall into one of these PES categories, an REC class D is allocated by default, as the minimum acceptable PES category.**

A watercourse may receive the same class for the REC as the PES if the watercourse is deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as enhance the PES of the watercourse.

Table C7: Description of Recommended Ecological Category (REC) classes.

Class	Description
A	Unmodified, natural
B	Largely natural with few modifications
C	Moderately modified
D	Largely modified

7. Watercourse Delineation

For the purposes of this investigation, a wetland is defined in the National Water Act, 1998 (Act No. 36 of 1998) as “land which is transitional between terrestrial and aquatic systems where the water table is at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soil”.

The wetland zone delineation took place according to the method presented in the DWAF (2005) document “A practical field procedure for identification and delineation of wetlands and riparian areas.

An updated draft version of this report is also available and was therefore also considered during the wetland delineation (DWAF, 2008). The foundation of the method is based on the fact that wetlands and riparian zones have several distinguishing factors including the following:

- The position in the landscape, which will help identify those parts of the landscape where wetlands are more likely to occur;
- The type of soil form (i.e. the type of soil according to a standard soil classification system), since wetlands are associated with certain soil types;
- The presence of wetland vegetation species; and
- The presence of redoxymorphic soil feature, which are morphological signatures that appear in soils with prolonged periods of saturation.

By observing the evidence of these features in the form of indicators, wetlands and riparian zones can be delineated and identified. If the use of these indicators and the interpretation of the findings are applied correctly, then the resulting delineation can be considered accurate (DWAF, 2005 and 2008).
Riparian and wetland zones can be divided into three zones (DWAF, 2005). The permanent zone of wetness is nearly always saturated. The seasonal zone is saturated for a significant period of wetness (at least three months of saturation per annum) and the temporary zone surrounds the seasonal zone and is only saturated for a short period of saturation (typically less than three months of saturation per annum), but is saturated for a sufficient period, under normal circumstances, to allow for the formation of hydromorphic soils and the growth of wetland vegetation. The object of this study was to identify the outer boundary of the temporary zone and then to identify a suitable buffer zone around the wetland area.

ANNEXURE D: Risk Assessment Methodology

In order for the EAP to allow for sufficient consideration of all environmental impacts, impacts were assessed using a common, defensible method of assessing significance that will enable comparisons to be made between risks/impacts and will enable authorities, stakeholders and the client to understand the process and rationale upon which risks/impacts have been assessed. The method to be used for assessing risks/impacts is outlined in the sections below.

The first stage of the risk/impact assessment is the identification of environmental activities, aspects and impacts. This is supported by the identification of receptors and resources, which allows for an understanding of the impact pathway and an assessment of the sensitivity to change. The definitions used in the impact assessment are presented below.

- An **activity** is a distinct process or task undertaken by an organisation for which a responsibility can be assigned. Activities also include facilities or infrastructure that is possessed by an organisation;
- An **environmental aspect** is an 'element of an organizations activities, products and services which can interact with the environment'[4]. The interaction of an aspect with the environment may result in an impact;
- **Environmental risks/impacts** are the consequences of these aspects on environmental resources or receptors of particular value or sensitivity, for example, disturbance due to noise and health effects due to poorer air quality. In the case where the impact is on human health or wellbeing, this should be stated. Similarly, where the receptor is not anthropogenic, then it should, where possible, be stipulated what the receptor is;
- **Receptors** can comprise, but are not limited to, people or human-made systems, such as local residents, communities and social infrastructure, as well as components of the biophysical environment such as wetlands, flora and riverine systems;
- **Resources** include components of the biophysical environment;
- **Frequency of activity** refers to how often the proposed activity will take place;
- **Frequency of impact** refers to the frequency with which a stressor (aspect) will impact on the receptor;
- **Severity** refers to the degree of change to the receptor status in terms of the reversibility of the impact; sensitivity of receptor to stressor; duration of impact (increasing or decreasing with time); controversy potential and precedent setting; threat to environmental and health standards;
- **Spatial extent** refers to the geographical scale of the impact; and
- **Duration** refers to the length of time over which the stressor will cause a change in the resource or receptor.

The significance of the impact is then assessed by rating each variable numerically according to the defined criteria (refer to the table below). The purpose of the rating is to develop a clear understanding of influences and processes associated with each impact. The severity, spatial scope and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 15. The frequency of the activity, impact, legal issues and the detection of the impact together comprise the likelihood of the impact occurring and can obtain a maximum value of 20. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether mitigation is necessary[5].

The model outcome of the impacts was then assessed in terms of impact certainty and consideration of available information. The Precautionary Principle is applied in line with South Africa's National Environmental Management Act, 1998 (Act No. 107 of 1998) in instances of uncertainty or lack of information, by increasing assigned ratings or adjusting final model outcomes. In certain instances, where a variable or outcome requires rational adjustment due to model limitations, the model outcomes have been adjusted.

[4] The definition has been aligned with that used in the ISO 14001 Standard.
[5] Some risks/impacts that have low significance will however still require mitigation

"RISK ASSESSMENT KEY" (Based on DWS 2015 publication: Section 21 (c) and (i) water use Risk Assessment Protocol)

Table D1: Severity (How severe does the aspects impact on the resource quality (flow regime, water quality, geomorphology, biota, habitat)

Insignificant / non-harmful	1
Small / potentially harmful	2
Significant / slightly harmful	3
Great / harmful	4
Disastrous / extremely harmful and/or wetland(s) involved	5
Where "or wetland(s) are involved" it means that the activity is located within the delineated boundary of any wetland. The score of 5 is only compulsory for the significance rating.	

Table D2: Spatial Scale (How big is the area that the aspect is impacting on)

Area specific (at impact site)	1
Whole site (entire surface right)	2
Regional / neighbouring areas (downstream within quaternary catchment)	3
National (impacting beyond secondary catchment or provinces)	4
Global (impacting beyond SA boundary)	5

Table D3: Duration (How long does the aspect impact on the resource quality)

One day to one month, PES, EIS and/or REC not impacted	1
One month to one year, PES, EIS and/or REC impacted but no change in status	2
One year to 10 years, PES, EIS and/or REC impacted to a lower status but can be improved over this period through mitigation	3
Life of the activity, PES, EIS and/or REC permanently lowered	4
More than life of the organisation/facility, PES and EIS scores, a E or F	5
PES and EIS (sensitivity) must be considered.	

Table D4: Frequency of the activity (How often do you do the specific activity)

Annually or less	1
6 monthly	2
Monthly	3
Weekly	4
Daily	5

Table D5: The frequency of the incident or impact (How often does the activity impact on the resource quality)

Almost never / almost impossible / >20%	1
Very seldom / highly unlikely / >40%	2
Infrequent / unlikely / seldom / >60%	3
Often / regularly / likely / possible / >80%	4
Daily / highly likely / definitely / >100%	5

Table D6: Legal issues (How is the activity governed by legislation)

No legislation	1
Fully covered by legislation (wetlands are legally governed)	5
Located within the regulated areas	

Table D7: Detection (How quickly or easily can the impacts/risks of the activity be observed on the resource quality, people and resource)

Immediately	1
Without much effort	2
Need some effort	3
Remote and difficult to observe	4
Covered	5

Table D8: Rating Classes

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
170 – 300	(H) High Risk	Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve. Licence required.

A low risk class must be obtained for all activities to be considered for a GA

Table D9: Calculations

Consequence = Severity + Spatial Scale + Duration
Likelihood = Frequency of Activity + Frequency of Incident + Legal Issues + Detection
Significance\Risk = Consequence X Likelihood

The following points were considered when undertaking the assessment:

- Risks and impacts were analysed in the context of the *project's area of influence* encompassing:
  - Primary project site and related facilities that the client and its contractors develops or controls;
  - Areas potentially impacted by cumulative impacts for further planned development of the project, any existing project or condition and other project-related developments; and
  - Areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later or at a different location.
- Risks/Impacts were assessed for construction phase and operational phase; and
- Individuals or groups who may be differentially or disproportionately affected by the project because of their disadvantaged or vulnerable status were assessed.

Control Measure Development

The following points presents the key concepts considered in the development of mitigation measures for the proposed construction:

- Mitigation and performance improvement measures and actions that address the risks and impacts[6] are identified and described in as much detail as possible. Mitigating measures are investigated according to the impact minimisation hierarchy as follows:
  - Avoidance or prevention of impact;
  - Minimisation of impact;
  - Rehabilitation; and
  - Offsetting.
- Measures and actions to address negative impacts will favour avoidance and prevention over minimisation, mitigation or compensation; and
- Desired outcomes are defined and have been developed in such a way as to be measurable events with performance indicators, targets and acceptable criteria that can be tracked over defined periods, wherever possible.

Recommendations

Recommendations were developed to address and mitigate potential impacts on the freshwater ecology of the resources in traversed by or in close proximity of the proposed infrastructure.

Reversibility and/or irreplaceable loss

[6] Mitigation measures should address both positive and negative impacts

The following indicates the rationale for the reversibility scoring in relation to the watercourses.

Table D10: Reversibility of impacts on the watercourse

Reversibility Rating:	**Irreversible** (the activity will lead to an impact that is permanent)
	Partially reversible (The impact is reversible to a degree e.g. acceptable revegetation measures can be implemented but the pre-impact species composition and/or diversity may never be attained. Impacts may be partially reversible within a short (during construction), medium (during operation) or long term (following decommissioning) timeframe
	Fully reversible (The impact is fully reversible, within a short, medium or long-term timeframe)

ANNEXURE E: Results of Field Investigation

PRESENT ECOLOGICAL STATE (PES), ECOSERVICES AND ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS) RESULTS

Table E1: Presentation of the results of the IHI assessment applied to the unnamed tributary of Sir Lowry's Pass River and associated channelled valley bottom wetlands.

INSTREAM IHI	
Base Flows	-3.5
Zero Flows	0.5
Floods	3.0
HYDROLOGY RATING	**2.6**
pH	0.5
Salts	0.0
Nutrients	0.0
Water Temperature	0.0
Water clarity	0.0
Oxygen	0.0
Toxics	0.0
PC RATING	**0.5**
Sediment	1.5
Benthic Growth	1.5
BED RATING	**1.5**
Marginal	-2.0
Non-marginal	-2.5
BANK RATING	**2.3**
Longitudinal Connectivity	-3.0
Lateral Connectivity	-2.5
CONNECTIVITY RATING	**3.0**
INSTREAM IHI %	**61.9**
INSTREAM IHI EC	**C/D**
INSTREAM CONFIDENCE	**3.0**

RIPARIAN IHI	
Base Flows	-2.0
Zero Flows	-0.5
Moderate Floods	3.0
Large Floods	3.0
HYDROLOGY RATING	**2.2**
Substrate Exposure (marginal)	0.5
Substrate Exposure (non-marginal)	0.5
Invasive Alien Vegetation (marginal)	1.0
Invasive Alien Vegetation (non-marginal)	2.5
Erosion (marginal)	0.5
Erosion (non-marginal)	1.0
Physico-Chemical (marginal)	0.5
Physico-Chemical (non-marginal)	1.0
Marginal	2.0
Non-marginal	2.5
BANK STRUCTURE RATING	**2.1**
Longitudinal Connectivity	3.0
Lateral Connectivity	3.5
CONNECTIVITY RATING	**3.2**
RIPARIAN IHI %	**52.6**
RIPARIAN IHI EC	**D**
RIPARIAN CONFIDENCE	**3.0**

TableE2: Summary of the results from the WET-Health assessment of the Channelled Valley Bottom Wetland associated with the southern and central to northern extent of the unnamed tributary, respectively.

HGM Unit	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
CVB wetland 1	0.25	17.36	4	-2	1	0	4.1	-1
CVB wetlands 2 to 5	1.19	82.64	6.5	-2	1.8	0	6.48	-1
Area weighted impact scores*			6.1	-2.0	1.7	0.0	6.1	-1.0
PES Category			E	↓↓	B	→	E	↓

Table E3: Presentation of the results of the Socio-cultural and Ecoservice provision provided by the unnamed tributary of Sir Lowry's Pass River and associated channelled valley bottom wetlands.

Ecosystem service	CVB wetland 1	CVB wetlands 2 to 5	Unnamed tributary
Flood attenuation	2.0	2.3	2.2
Streamflow regulation	1.8	1.8	2.0
Sediment trapping	1.5	1.3	1.5
Phosphate assimilation	1.4	1.5	1.5
Nitrate assimilation	1.7	1.9	2.0
Toxicant assimilation	1.5	1.5	1.7
Erosion control	2.1	2.4	2.4
Carbon Storage	0.8	0.5	1.0
Biodiversity maintenance	1.8	2.0	1.7
Water Supply	1.3	1.3	1.5
Harvestable resources	0.4	0.4	0.4
Cultivated foods	0.2	0.2	0.2
Cultural value	0.0	0.0	0.0
Tourism and recreation	2.5	2.5	2.6
Education and research	0.5	0.8	0.5
SUM	**19.4**	**20.3**	**21.2**
Average score	**1.3**	**1.4**	**1.4**

Table E5: Presentation of the EIS assessment applied to the watercourses.

WATERCOURSE:			unnamed tributary	CVB wetland 1	CVB wetlands 2 to 5
Ecological Importance and Sensitivity			Score (0-4)	Score (0-4)	Score (0-4)
Biodiversity support			**B (average)**	**C (average)**	**C (average)**
			2.33	1.67	1.33
Presence of Red Data species			3	0	0
Populations of unique species			2	3	2
Migration/breeding/feeding sites			2	2	2
Landscape scale			**C (average)**	**C (average)**	**C (average)**
			1.6	1.8	1.6
Protection status of the wetland			1	1	1
Protection status of the vegetation type			3	3	3
Regional context of the ecological integrity			2	3	2
Size and rarity of the wetland type/s present			1	1	1
Diversity of habitat types			1	1	1
Sensitivity of the wetland			**A (average)**	**A (average)**	**A (average)**
			2	2	2
Sensitivity to changes in floods			3	3	3
Sensitivity to changes in low flows/dry season			2	2	2
Sensitivity to changes in water quality			1	1	1
ECOLOGICAL IMPORTANCE & SENSITIVITY (max of A,B or C)			**A**	**A**	**A**
Hydro-Functional Importance			**Score (0-4)**		
Regulating & supporting benefits	**Flood attenuation**		0	1	1
	Streamflow regulation		1	2	2
	Water Quality Enhancement	2	3	2	2
		2	3	2	2
		2	2	2	2
		2	3	2	2
		2	3	3	3
	Carbon storage		0	0	0
HYDRO-FUNCTIONAL IMPORTANCE (average score)			1.4 C (Average)	1.8 (Average)	1.8 (Average)
Direct Human Benefits			**Score (0-4)**	**Score (0-4)**	**Score (0-4)**
Subsistence benefits	***Water for human use***		2	2	2
	Harvestable resources		0	0	0
	Cultivated foods		0	0	0
Cultural benefits	***Cultural heritage***		0	0	0
	Tourism and recreation		1	1	3
	Education and research		0	0	0
DIRECT HUMAN BENEFITS (average score)			0.67 (D average)	0.5 (D average)	0.8 (D average)

ANNEXURE F: Risk Analysis and Mitigation Measures

General construction management and good housekeeping practices

Latent and general impacts which may affect the freshwater ecology and biodiversity, will include any activities which take place in close proximity to the proposed activities that may impact on the receiving environment. Mitigation measures for these impacts are highlighted below and are relevant to the watercourse identified in this report:

Development footprint

- All development footprint areas should remain as small as possible and should not encroach into watercourses unless absolutely essential and where project activities are located in the watercourses. It must be ensured that the watercourse habitat is off-limits to construction vehicles and non-essential personnel;
- The boundaries of footprint areas, including contractor laydown areas, are to be clearly defined and it should be ensured that all activities remain within defined footprint areas. Edge effects will need to be extremely carefully controlled;
- Planning of temporary roads and access routes (if applicable) should avoid watercourses and be restricted to existing roads where possible;
- Appropriate sanitary facilities must be provided for the life of the construction phase and all waste removed to an appropriate waste facility;
- All hazardous chemicals as well as stockpiles should be stored on bunded surfaces and have facilities constructed to control runoff from these areas;
- It must be ensured that all hazardous storage containers and storage areas comply with the relevant SABS standards to prevent leakage;
- No fires should be permitted in or near the construction area; and
- Ensuring that an adequate number of waste and “spill” bins are provided will also prevent litter and ensure the proper disposal of waste and spills.

Vehicle access

- All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent ingress of hydrocarbons into the topsoil;
- In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss; and
- All spills should they occur, should be immediately cleaned up and treated accordingly.

Vegetation

- Removal of the alien and weed species encountered on the property must take place in order to comply with existing legislation (amendments to the regulations under the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) and Section 28 of the National Environmental Management Act, 1998 (Act No. 107 of 1998)) Removal of species should take place throughout the construction, operational, and maintenance phases; and
- Species specific and area specific eradication recommendations:
  - Care should be taken with the choice of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used;
  - Footprint areas should be kept as small as possible when removing alien plant species*;* and
  - No vehicles should be allowed to drive through designated sensitive wetland areas during the eradication of alien and weed species.

Soils

- Sheet runoff from access roads should be slowed down by the strategic placement of berms;
- As far as possible, all construction activities should occur in the low flow season, during the drier summer months;
- As much vegetation growth as possible (of indigenous floral species) should be encouraged to protect soils;

- No stockpiling of topsoil is to take place within the recommended buffer zone around the watercourses (unless specified otherwise), and all stockpiles must be protected with a suitable geotextile to prevent sedimentation of the wetland;
- All soils compacted as a result of construction activities as well as ongoing operational activities falling outside of project footprint areas should be ripped and profiled; and
- A monitoring plan for the development and the immediate zone of influence should be implemented to prevent erosion and incision.

Rehabilitation

- Construction rubble/silt removed from the dam must be collected and disposed of at a suitable landfill site; and
- All alien vegetation in the footprint area as well as immediate vicinity of the proposed development should be removed. Alien vegetation control should take place for a minimum period of two growing seasons after rehabilitation is completed.

Risk significance on the watercourse ecology of the study area

The table below serves to summarise the anticipated impacts that might occur during the construction and operational phases as well as the mitigation measures that must be implemented in order to maintain and enhance the ecological integrity of the resource.

Table F1: Risk Assessment outcomes for the proposed Mount View residential development .

No.	Phase	Activity	Aspect	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph & Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence Level
1	Construction Phase	Site access, clearing and preparation for civil works	· Removal of vegetation including the removal of all alien trees including their roots within the construction footprint; · Removal of all existing piles of disposed and spread material around the site; · Removal of all fences and previously used farm materials on the site; and · Associated disturbances of soils above the 1:100 year floodline of the unnamed tributary of Sir Lowry's Pass River	3	2	3	2	**2.5**	2	1	**5.5**	2	2	5	1	**10**	**55**	**L**	High
2			Possible indiscriminate driving within the 1:100 year floodline. of the unnamed tributary of Sir Lowry's Pass River and potentially the CVB wetlands	1	1	1	1	**1.0**	1	2	**4.0**	5	2	5	1	**13**	**52**	**L**	High
3		Construction activities related to building activities outside the delineated extent of the watercourses and associated conservation buffer and above the 1:100 year floodline but within the 500 m GN509 Zone of Regulation	Earth works involving removal of topsoil and creation of soil stockpiles including: The demolition of the existing farm dam and large earth berm situated north of the main farm house to allow this area to be included in the development footprint by means of removing the large berm and filling the material in controlled layers within the existing dam	1	1	1	1	**1.0**	1	1	**3.0**	5	2	1	1	**9**	**27**	L	High
4			Construction of: · Residential households; · Internal roads and walkways; · Stormwater attenuation facilities; · Wastewater Treatment Plants; · Internal sewage network; and · Landscaping associated with the proposed residential development.	1	2	1	1	**1.3**	1	2	**4.3**	5	1	5	1	**12**	**51**	L	High

No.	Phase	Activity	Aspect	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph & Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence Level
5	Construction Phase	Construction activities related to building activities outside the delineated extent of the watercourses but below the 1:100 year floodline and within the 32 m NEMA and 500 m GN509 Zone of Regulation	· Establishment of stormwater discharge points below the 1:00 year floodline and within the delineated wetlands and associated conservation buffer (stormwater outlets associated with CVB wetland 1 and 4); and · Establishment of stormwater channels associated with the proposed residential development and activities associated with the alteration of the 1:100 year pre-development floodline.	4	4	5	4	**4.3**	1	2	**7.3**	5	3	5	1	**14**	**101.5**	**M**	High
6		Construction activities within the watercourses	Removal of unauthorised infilled material within portions of the CVB wetland 3 and riparian habitat of the unnamed tributary located below the 1:100 year floodline. This may involve: · Diversion of the active channel of the unnamed tributary within the reach associated with the unauthorised infilled material; · Clear and grubbing of the area of all existing vegetation and materials; · Exacation and stripping of topsoil, cut-to-spoil; and · Reshaping of the fill area following removal of the infill material.	5	5	5	5	**5**	2	3	**10**	5	5	5	1	**16**	**160**	M	High
7			Installation of the rectangular portal culvert with 330mm brick wing walls under the section of the internal roadway which traverses the northern reach unnamed tributary and upgrading of the existing culvert under Old Sir Lowry's Pass Road within the downstream reach of the tributary. This may involve the following: · Diversion of flow by means of sandbags; · Excavation activities and compaction of soils for the construction of the culvert; · Concrete works; · Installation of reno-mattresses at the inlet and outlet of the culvert and riprap below the culvert outlet; · Movement of construction equipment and personnel within the unnamed tributary.	5	5	5	5	**5.0**	1	1	**7.0**	4	5	5	1	**15**	**105**	**M**	High

No.	Phase	Activity	Aspect	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph & Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence Level
		Installation of the bulk service sewer and water pipelines along the Old Sir Lowry's Pass Road within the downstream reach of the tributary.	.	5	5	5	5	**5.0**	1	1	**7.0**	4	5	5	1	**15**	**105**	**M**	High
8	Construction Phase	Construction activities within the variable conservation buffer of the watercourses	· Construction of the portions of the three private erven located within the variable conservation buffer. It is understood that the portions of the erven falling within the variable conservation buffer are the outdoor lawn or garden areas of the proposed residential erven; and · Proposed construction of a stub wall, approximately 320 mm wide and 300 mm high, just outside the edge of the variable conservation buffer to separate the lawn areas from the conservation buffer	1	2	1	1	**1.3**	1	2	**4.3**	5	1	5	1	**12**	**51**	L	
9			· Establishment of in situ compacted walkways approximately 1.6 m wide	1	2	1	1	**1.3**	1	1	**3.3**	5	1	5	1	**12**	**39**	L	
10		Potential indiscriminate waste disposal and/or spillage from construction vehicles	Disposal of construction-related wastes (such as rubble, hazardous chemicals and litter)	1	1	1	1	**1.0**	1	1	**3.0**	2	2	5	1	**10**	**30**	L	High
	Operational Phase	Rehabilitation of the watercourse areas below the post-development 1:100 year floodline following the removal of infilled material and construction activities	· Re-vegetation of surrounding wetland areas, remove any obstructions to flow; · Alien and invasive plant removal.	5	5	5	5	**5**	1	2	**8**	5	3	5	1	**14**	**112**	M	High

No.		Activity	Aspect	Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph & Vegetation)	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Confidence Level
12	Operational Phase	Operation of the residential development and associated open space areas	· Potential fertilizers entering the watercourses through stormwater run-off; · Potential indiscriminate movement of vehicles within the watercourses for perimeter inspections/ maintenance.	1	2	1	1	**1.3**	2	1	**4.3**	5	4	1	1	**11**	**46.75**	**L**	High
13		Operation and maintenance of the road culvert crossing the unnamed tributary.	· Debris collecting on the upstream side of the culvert could potentially impact on the flow; · Disturbances to or removal of vegetation whilst accessing the culvert crossing to carry out maintenance activities.	2	1	2	2	**1.8**	1	1	**3.8**	5	1	5	1	**12**	**45**		High
14		Operation of the stormwater retention facilities and wastewater treatment plants.	· Potential of sewerage to spill from the treatment plant at inlet chamber due to blockages; · Lack of humus to be wasted from the plant during maintenance activities, causing the plant to become anaerobic; · Contaminated stormwater runoff entering the tributary from the outlets of the stormwater retention facilities; and *Erosion of the tributary at the outlet of the stormwater outlets.	3	2	2	1	**2.0**	2	1	**5.0**	5	2	5	2	**14**	**70**	**M**	High
15		Use of treated effluent for irrigation purposes	· Potential of low-quality effluent to enter the unnamed tributary via surface water runoff	2	3	2	2	**2.3**	2	1	**5.3**	5	2	1	2	**10**	**52.5**	**L**	High

ANNEXURE G: Details, Expertise and Curriculum Vitae of Specialists

1. (a) (i) Details of the specialist who prepared the report

Rabia Mathakutha	MSc Plant Science (University of Pretoria)
Kim Marais	BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)
Christel du Preez	MSc Environmental Sciences (North West University)

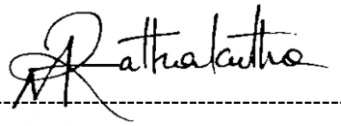
1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	Scientific Aquatic Services (Pty) Ltd		
Name / Contact person:	Rabia Mathakutha		
Postal address:	221 Riverside Lofts, Tygerfalls Boulevard, Bellville,		
Postal code:	7539	Cell:	083 739 2284
Telephone:	011 616 7893	Fax:	086 724 3132
E-mail:	rabia@sasenvgroup.co.za		
Qualifications	MSC Plant Science		
Registration / Associations	Registered Candidate Member of the South African Council for Natural Scientific Professions (SACNASP)		

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Rabia Mathakutha, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct

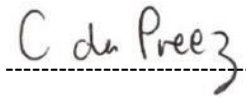


Signature of the Specialist

1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Christel du Preez, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



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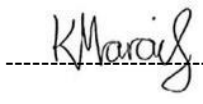
1. (b) a declaration that the specialist is independent in a form as may be specified by the competent authority

I, Kim Marais, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF RABIA MATHAKUTHA

PERSONAL DETAILS

Position in Company	Field Ecologist Wetland ecology
Joined SAS Environmental Group of Companies	2020

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Candidate member of the South African Council for Natural Scientific Professions (SACNASP – Reg. No. 120040)
Member of the Western Cape Wetland Forum (WCWF)
South African Association of Botany (SAAB)

EDUCATION

Qualifications

MSc Plant Science (University of Pretoria)	2018
BSc (Hons) Environmental Science (Biogeography) (University of KwaZulu-Natal)	2015
BSc Environmental Science (Life Science stream) (University of KwaZulu-Natal)	2014

Short Courses

Official DWS Section 21 (c) and (i) Water Use Authorisation Course	2018
Basic and Applied Statistics in R	2016

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga
Africa – Lesotho, Mozambique

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant Species Plan

SAS ENVIRONMENTAL GROUP OF COMPANIES –

SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF KIM MARAIS

PERSONAL DETAILS

Position in Company	Senior Scientist Water Resource Manager
Joined SAS Environmental Group of Companies	2015

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 117137/17)
Member of the Western Cape Wetland Forum (WCWF)

EDUCATION

Qualifications

BSc (Hons) Zoology (University of the Witwatersrand)	2012
BSc (Zoology and Conservation) (University of the Witwatersrand)	2011

Short Courses

Aquatic and Wetland Plant Identification (Cripsis Environment)	2019
Tools for Wetland Assessment (Rhodes University)	2018
Certificate in Environmental Law for Environmental Managers (CEM)	2014
Certificate for Introduction to Environmental Management (CEM)	2013

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, KwaZulu-Natal, Northern Cape, Eastern Cape,
Africa - Uganda

KEY SPECIALIST DISCIPLINES

Biodiversity Assessments

- Biodiversity Action Plans (BAP)
- Alien and Invasive Control Plans (AICP)
- Faunal Eco Scans
- Faunal Impact Assessments

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Watercourse Maintenance and Management Plans
- Freshwater Offset Plans

Aquatic Ecological Assessment and Water Quality Studies

- Riparian Vegetation Integrity (VEGRAI)
- Water quality Monitoring
- Riverine Rehabilitation Plans

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use Licence Applications / General Authorisations)
- Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions
- Public Participation processes

SAS ENVIRONMENTAL GROUP OF COMPANIES –
SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CHRISTEL DU PREEZ

PERSONAL DETAILS

Position in Company	Senior Scientist Watercourse ecology
Joined SAS Environmental Group of Companies	2016

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Professional member of the South African Council for Natural Scientific Professions (SACNASP – Reg No. 120240)

Member of the Western Cape Wetland Forum (WCF)

Member of the Gauteng Wetland Forum (GWF)

EDUCATION

Qualifications

MSc Environmental Sciences (North West University)	2017
BSc Hons Environmental Sciences (North West University)	2012
BSc Environmental and Biological Sciences (North West University)	2011

Short Courses

Wetland and Aquatic plant Identification presented by Carin van Ginkel	2019
Wetland Management: Introduction and Delineation presented by the Centre of Environmental Management University of the Free State	2018
Tools for Wetland Assessment presented by Prof. F. Ellery and Rhodes University	2017
Basic Principles of ecological rehabilitation and mine closure presented by the Centre for Environmental Management North West University	2015

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, Limpopo, Western Cape, Northern Cape, Eastern Cape

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater Verification Assessment
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Maintenance and Management Plans
- Plant species and Landscape Plans
- Freshwater Offset Plans