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Date: Monday, 25 May 2026
Project No: FEN 26-5040

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Attention: Mr Johann Botha

RE: QUALITATIVE IMPACT STATEMENT REGARDING THE UPDATED LAYOUT FOR THE PROPOSED DEVELOPMENT ON ERVEN 1992, 1993, 1994 AND 1995, PORTIONS OF ERF 1990 FISANTEKRAAL, DURBANVILLE, WESTERN CAPE PROVINCE.

In September 2016, BlueScience compiled a freshwater assessment report, which identified the presence of any natural freshwater ecosystems located on the portion 32 of Farm 168 Fisantekraal (rezoned as erven 1992, 1993, 1994 and 1995, portions of erf 1990, hereafter referred to as the "study area"). Environmental Authorisation (EA) for the proposed Fisantekraal Industrial Development had been obtained in 2017 and an amended EA obtained in 2021. However, subsequent to the receipt of the amended EA, changes to the layout of the development area were proposed, allowing for a wider definition of industrial land use than was previously authorised. During the Environmental Assessment Practitioner (EAP)'s consultation with the Department of Environmental Affairs and Development Planning (DEA&DP), it was requested that a freshwater impact statement be submitted in addition to the freshwater impact assessment compiled by BlueScience (2016) as part of the amendment application process.

This technical memorandum provides a qualitative assessment statement of the potential impacts from the proposed development on the freshwater ecosystems associated with the study and investigation areas. After the site investigation conducted by Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd on the 15th of November 2024, an unchannelled valley-bottom (UCVB) wetland was identified approximately 55 m northeast of the study area, within the investigation area - i.e., the 500 m zone of investigation around the study area. The UCVB wetland, which is downgradient of the proposed development was not assessed as part of the study conducted by BlueScience (2016).

1. PROJECT BACKGROUND

The study area is located to the west of the Mosselbank River and is approximately 1 km southwest of the suburb of Fisantekraal and ~1 km south of the Klipheuwel Road and R312 intersection. The initial proposed development included a double-level storage facility including 6100 storage units and 62 parking bays (Figure 1) as well as other linear infrastructure, collectively referred to as the "initial proposed development". The revised phased development layout includes a precooling facility, distribution centre, maintenance workshop, office buildings and light industrial warehouses, as well as an internal road network, service infrastructure (Figure 2), four stormwater retention ponds and stormwater infrastructure (Figure 3). Furthermore, a paved container storage area will be constructed south of the precooling facility. The stormwater ponds will be designed to incorporate Sustainable Drainage Systems (SuDS) for the development, releasing stormwater into the unnamed tributary of the Mosselbank River from the stormwater ponds in an attenuated manner (Peter Wium Consulting Engineer, 2025). Phase one of the proposed development will include the partial construction of the office blocks and workshop, Phase two will include partial construction of the pre-cooling facility. Phase three will include the construction of the remaining precooling facility and workshop extension, while Phase four will include the construction of the remaining office blocks and warehouse. The construction of the warehousing and distribution units on Erf 2006 will take place in five phases (Figure 2).

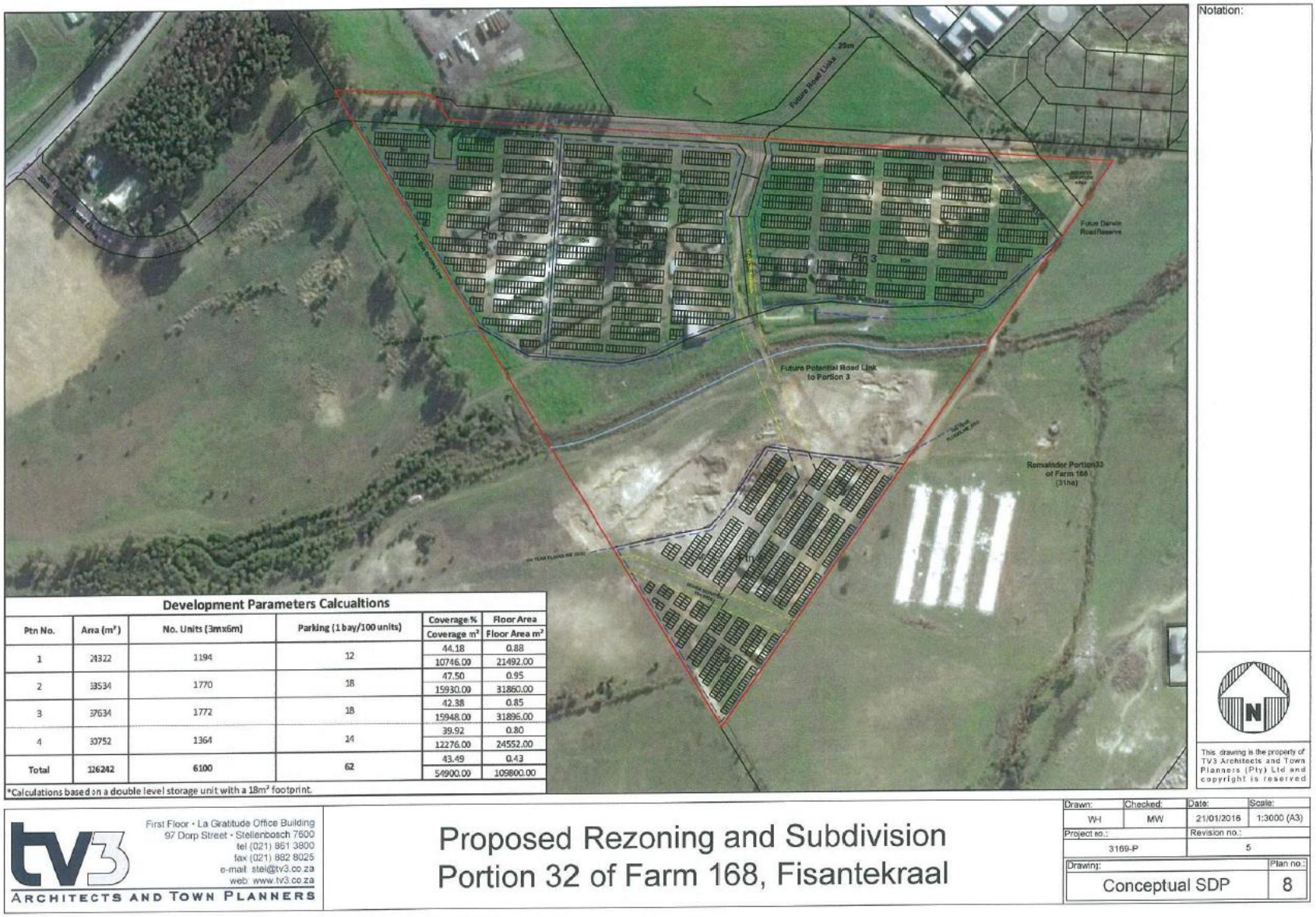

Figure 1: Initial proposed layout for the proposed development associated with the study area (TV3 Architects and Town Planners (Pty) Ltd, 2016).

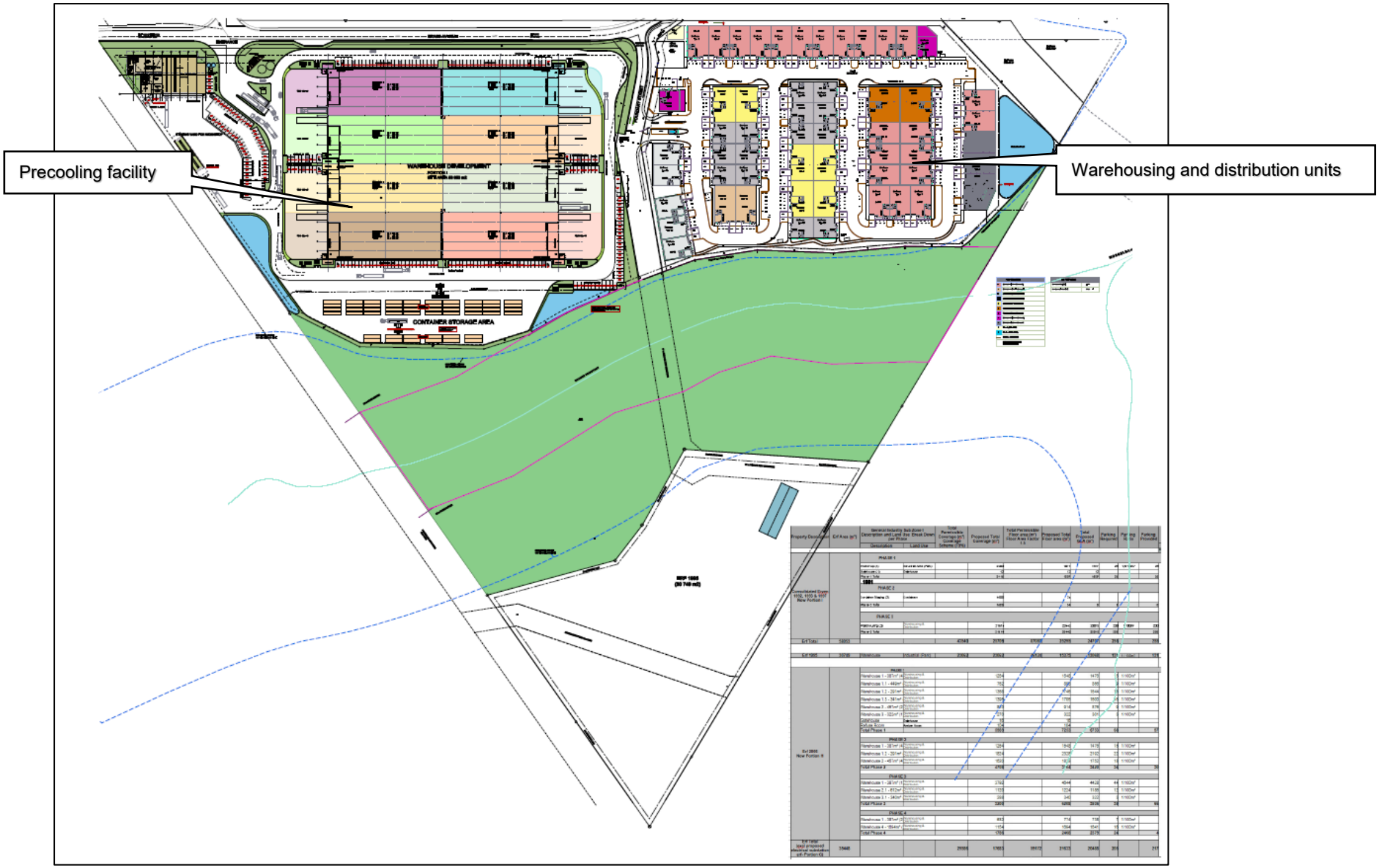

Figure 2: Revised proposed layout for the development associated with the study area (Mike Paterson Associates cc, 2026).

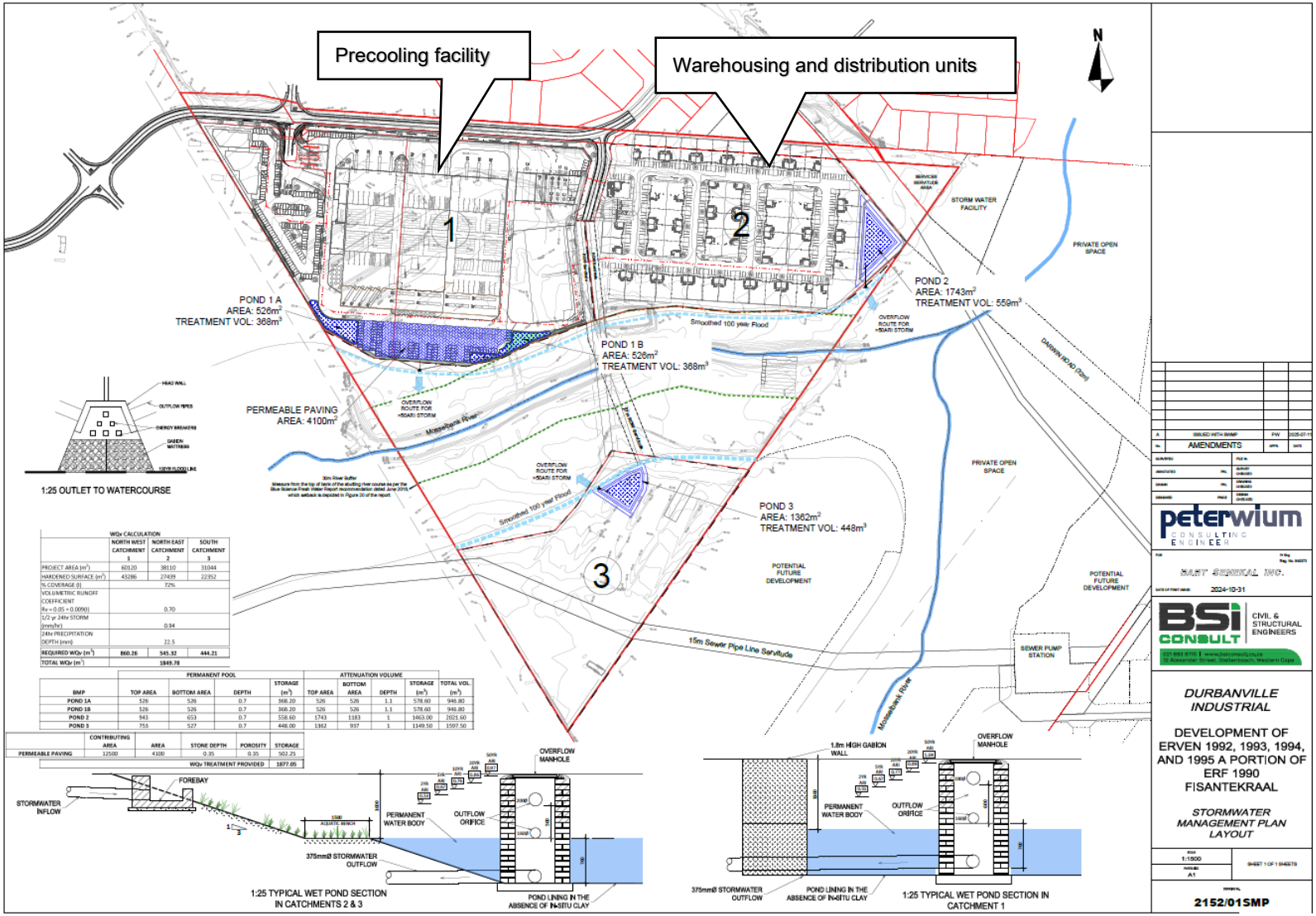

Figure 3: Draft proposed layout for the stormwater infrastructure associated with the study area (BSi Consult, 2025). For illustration purposes only.

2. SUMMARY OF FRESHWATER ASSESSMENT

2.1. Freshwater ecosystems impacted by the proposed development within the study and investigation areas

During the site assessment undertaken in December 2015 by BlueScience (2016), an unnamed tributary of the Mosselbank River was identified bisecting the study area (Figure 4). As part of the ecological assessment, it was determined that the ecological condition of the tributary was moderately to largely modified [Present Ecological State (PES) Category C/D], whilst the riparian habitat was determined to be in a critically modified state (PES E/F). The ecological importance and sensitivity of the tributary was determined to be moderate for this system, however subsequent to further assessment this system was determined to have a high ecological importance and sensitivity (Appendix D).

Classification of the freshwater ecosystems associated with the proposed development was undertaken at Levels 1 - 4 of the Classification System (Ollis *et al.*, 2013) as outlined in Appendix C. A detailed explanation of the methods of assessment undertaken is provided in Appendix C of this memorandum.

As part of this investigation, additional assessments were conducted for the UCVB wetland located downgradient of the proposed development as this system would likely be impacted by the proposed development as well (Appendix D). It was determined that the ecological condition of the UCVB wetland is moderately to largely modified (PES Category C/D) and the ecological importance and sensitivity of the system was determined to be high. The ecoservice provision of the systems was determined to be very low for cultural services and high for provisioning services, specifically water for human use. The UCVB wetland provides further regulating and supporting services such as phosphate and nitrate assimilation. The modified ecological condition of the systems is as a result of catchment land changes, specifically historic and ongoing agricultural practices altering the hydrological regime, geomorphological processes and vegetation composition of these systems, as well as the expansion of the Fisantekraal Industrial Area to the north of the study area.

A 30 m conservation buffer was determined by BlueScience (2016) in accordance with the City of Cape Town's Floodplain and River Corridor Management Policy (2009) for the unnamed tributary of the Mosselbank River; this buffer is anticipated to suitably protect the system from the proposed development (BlueScience, 2016). This buffer was also applied to the UCVB wetland identified within the investigation area. The conservation buffer and applicable legislative zones of regulation (ZoR) as it relates to the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and Government Notice (GN) 4167 as it relates to the National Water Act, 1998 (Act No. 36 of 1998) (NWA) are illustrated visually in Figure 5 and Figure 6 below.

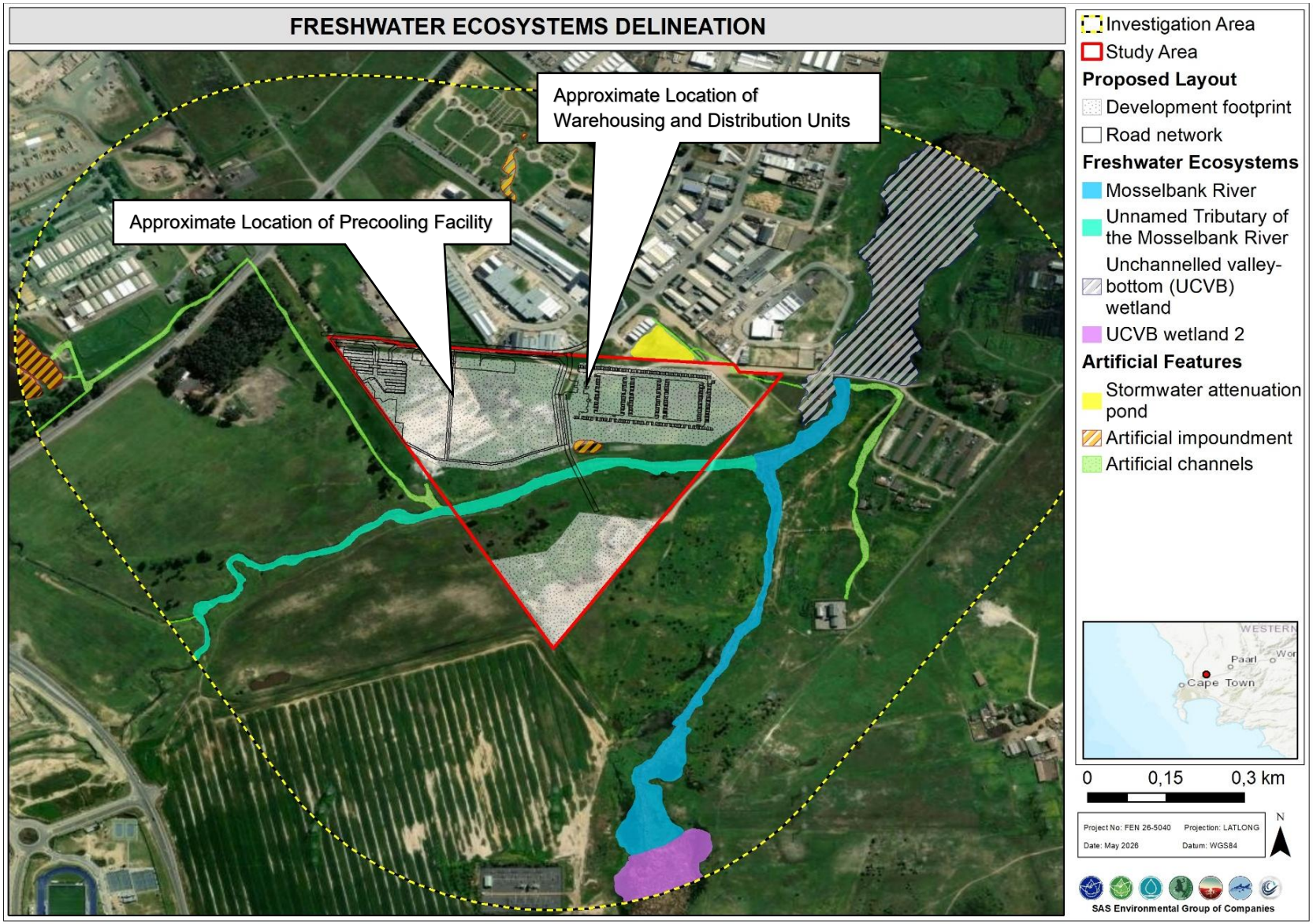

Figure 4: Delineation of the field verified freshwater ecosystems and artificial features associated with the study and investigation areas. Please see Figure 2 for the updated layout.

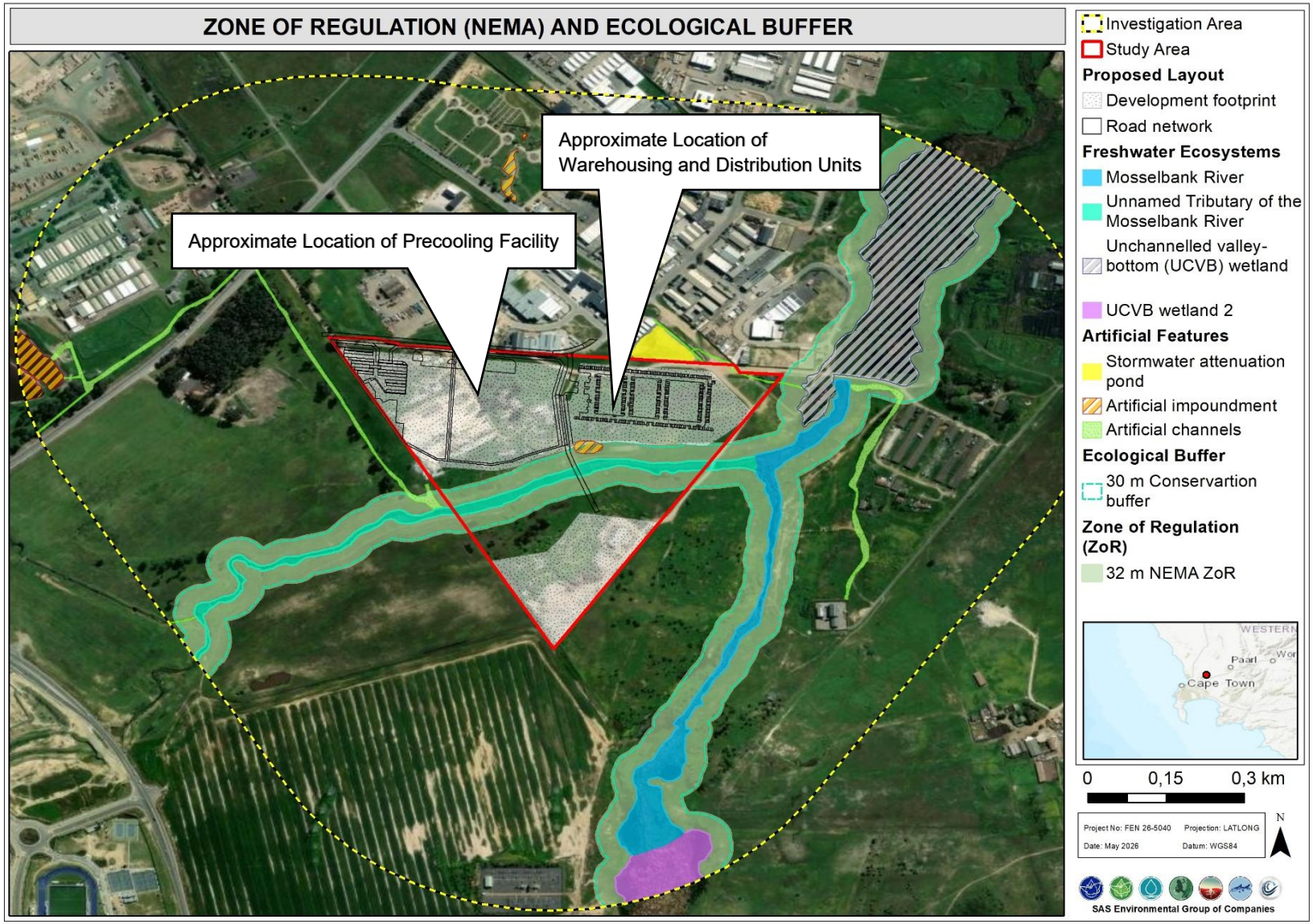

Figure 5: The NEMA zone of regulation and ecological buffer associated with the study and investigation areas. Please see Figure 2 for the updated layout.

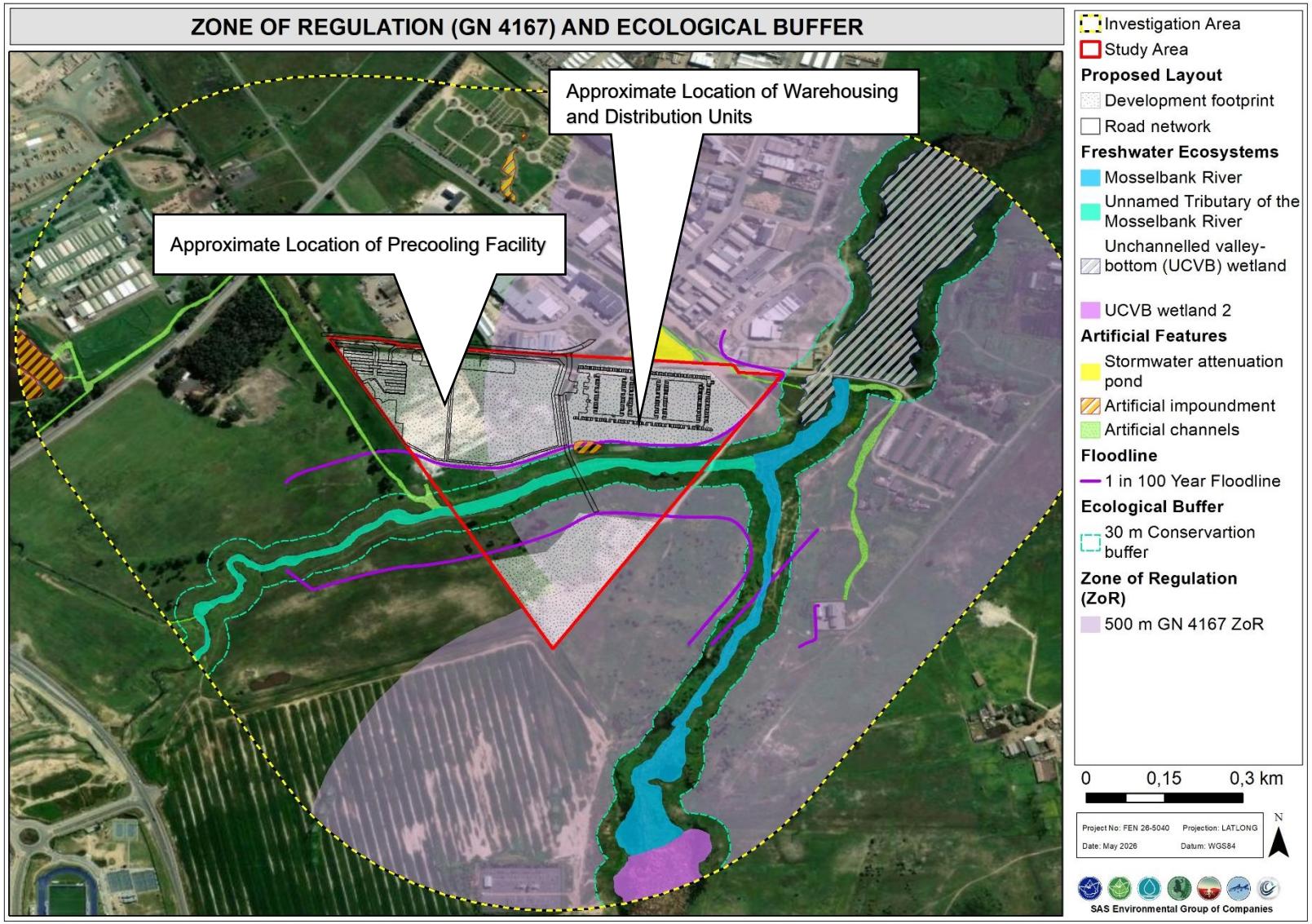

Figure 6: The GN 4167 (NWA) zone of regulation and ecological buffer associated with the study and investigation areas. Please see Figure 2 for the updated layout.

3. SPECIALIST OPINION ON AMENDED LAYOUT

Following the completion of the assessment, the Department of Water and Sanitation (DWS) Risk Assessment Matrix (2023) was conducted (refer to Appendix E for the method of approach) and recommendations were developed to address and mitigate any potential negative ecological impacts associated with the project. These recommendations also include general management measures, which apply to the proposed construction and operational activities. Control measures have been developed to address issues in all phases throughout the life of the project including construction and operation.

The DWS RAM (2023) indicated that an overall 'Low' risk significance to the integrity of the freshwater ecosystems is expected, with a "Moderate" risk significance to the integrity of the unnamed tributary of the Mosselbank River, due to the proposed upgrade of the road bisecting the tributary, as well as the construction and operation of stormwater infrastructure within the study area which will release stormwater into the downgradient freshwater ecosystems (Appendix F). The demolition activities are anticipated to pose a "Low" risk significance to the freshwater ecosystems, assuming that the rubble will not be discarded within the tributary or the 30 m conservation buffer and will be disposed of at a licensed waste processing facility on completion of all demolition activities. Construction rubble may, however, be used on site as part of the road construction (infill) should the developer so desire (where feasible). A routine monitoring and maintenance plan must be compiled and implemented to manage stormwater infrastructure associated with the proposed development, including maintenance of the retention ponds, pipelines and stormwater attenuation system in terms of the integrity of the structures, damage control (including erosion), and the removal of litter, rubble, sediment and weeds, as outlined in the Stormwater Management Plan (SWMP) (Peter Wium Consulting Engineer, 2025).

The following control measures must be implemented, along with the control measures stipulated in the associated freshwater report (BlueScience, 2016):

- Construction of the proposed development must preferably be undertaken during the dry summer period to minimise the volumes of sediment entering the freshwater ecosystems and to minimise water quality impacts;
- Sediment traps must be installed downgradient of the construction works prior to the commencement of construction, to prevent excess sediment from entering the freshwater ecosystems. Sediment traps are to be inspected daily and accumulated sediment to be removed by hand on a weekly basis;
- Soil removed from the construction area must not be stockpiled within the 30 m conservation buffer and 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 river. 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 the stockpiles may not exceed 2 m in height;
- Suitable dust management practices must be implemented for the duration of construction and the National Dust Control Regulations, GN 827 of 2013, should be complied with at all times;
- In all events all machinery and vehicles used during construction must be maintained and equipped with drip trays to prevent oil, petrol or diesel leaks. If breakdowns occur, these vehicles must be towed offsite site to the designated areas/workshops. An emergency spill plan must also be established and implemented for the operation of the proposed workshop. The proposed control measures will ensure that incidental oil spills and leakage are minimised onsite and thus limit any opportunities of water contamination and water quality deterioration;
- The proposed parking areas and internal road network must incorporate permeable paving or Permeable Interlocking Concrete Pavement (PICP) as a SuDS for the proposed development;
- In the context of the SWMP, compiled by Peter Wium Consulting Engineer (2025), applying the principles of SuDS must be implemented for the proposed development to allow for subsurface

infiltration of stormwater, minimising the amount of surface runoff and the associated contribution to flood peaks of the Mosselbank River and its associated UCVB wetland;
- Proliferation of Alien and Invasive Plant species (AIPs) as a result of the construction and operation related disturbances must be monitored and controlled;
- Moderate rehabilitation of the disturbed areas must be undertaken, including removal of existing rubble and building material, control of opportunistic *Phragmites australis* and re-vegetation exclusively with indigenous vegetation to increase biodiversity of the freshwater ecosystems, inclusive of the 30 m conservation buffer that might have been impacted by the construction of the proposed development and road upgrade, thus contributing to improvement the PES of these systems;
- Following rehabilitation activities, a suitable Alien Invasive Management Plan (AIMP) must be implemented to ensure that AIPs do not become established within the areas disturbed by construction activities; and
- General good housekeeping practices must be implemented during all phases of the proposed residential development, to ensure limited direct, indirect and cumulative impacts to the receiving freshwater environment.

As part of the development and operation of the stormwater ponds, the following control measures must be implemented specifically:

- Stormwater ponds must be vegetated with indigenous obligate and facultative hydrophytes suitable for seasonal saturation. This will assist with energy dissipation and prevent sedimentation and erosion as well as improve habitat provision;
- Cobbles must be placed on the concrete aprons to further assist with energy dissipation;
- All materials used to construct the stormwater ponds should not generate toxic leachates or lead to significant changes in pH or dissolved salt concentrations; especially considering that outflow of the pond drains into the unnamed tributary of the Mosselbank River;
- No plastic lining may be used as part of the stormwater ponds' construction as this has various ecological impacts, with special mention of impacts to faunal assemblages;
- Rocks must be placed at any outlet pipes (downgradient of the stormwater ponds), as required and indigenous vegetation established to bind the soil of the bed and to prevent erosion. This will also promote diffuse flow and decrease the velocity of water released downgradient towards the unnamed tributary of the Mosselbank River and the UCVB wetland;
- The operation of the stormwater management system must ensure that stormwater is released into the unnamed tributary of the Mosselbank River in an attenuated manner to mimic natural flow velocities as far as feasibly possible; and
- Regular inspection of the stormwater management system and associated landscaped areas must be undertaken (specifically after large storm events) in order to monitor the occurrence of erosion, particularly of the landscaped areas surrounding the stormwater attenuation system. If erosion has occurred, it must immediately be rehabilitated through stabilisation of the embankments and revegetation with indigenous vegetation.

In conclusion, considering that significant effort has been made to avoid direct impacts on freshwater ecosystems, particularly with regards to the unnamed tributary of the Mosselbank River and the 30 m conservation buffer, it is the opinion of the freshwater specialist that the development may proceed. The proposed new development layout is considered acceptable from a freshwater ecological and resources management perspective.

We trust this information will be useful in the decision-making process regarding the proposed development. Should you have any queries please feel free to contact us.

Yours Faithfully,
Stephen van Staden[1].

[1]Co-authored by Cathrine-Rose De Freitas and peer reviewed by Dietmar de Klerk and Amanda Mileson

4. REFERENCES

BlueScience. 2016. Freshwater Assessment Report for the Proposed Light Industrial Development of Portion 32 of Farm 168, Durbanville. June 2016.

BSi Consult. 2025. Stormwater management plan layout, Durbanville Industrial – Development of Erven 1992, 1993, 1994, and 1995 A Portion of Erf 1999, Fisantekraal. Drawing no. 2152/01SMP. Amendment A. 11 July 2025.

Mike Paterson Associates cc. 2026. Consolidated site development plan, Proposed New Maintenance Workshop, Container Yard and Warehousing on Portion H, I & Erf 1995 Fisantekraal For Pinetop Estate (Pty) Ltdd. Drawing no. 31 of project 2152 E. Revision B. March 2026.

Peter Wium Consulting Engineer. 2025. Stormwater Management Plan For Erven 1992, 1993, 1994 &1995 and Portion of Erf 1990, Cape Farms – District C. Revision 2. September 2025.

TV3 Architects and Town Planners (Pty) Ltd. 2016. Conceptual SDP, Proposed Rezoning and Subdivision Portion 32 of Farm 168, Fisantekraal. January 2016.

Appendix 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 Consulting (Pty) Ltd and its staff reserve the right to, at their sole discretion, 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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Appendix 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) as amended	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) as amended	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 4167 as published in the Government Gazette 49833 of 08 December 2023 as it relates to the NWA (Act No. 36 of 1998) as amended	GN 4167 outlines the parameters and process of a General Authorisation (GA), which replaces the need to apply for a licence in terms of Section 40 of the NWA, provided that the water use is within the limits and conditions of the GA. The notice **replaces GN 509 of 2016**. The GA sets out the need to determine the regulated area of a watercourse, as well as the degree of risk posed by an activity/ies related to a particular water use. In accordance with GN 4167 of December 2023, the regulated area of a watercourse for Section 21c and 21i of the NWA, 1998 is defined as: a) the outer edge of the 1 in 100-year flood line or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake, or dam; b) in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m distance from the edge of a watercourse where the edge of the watercourse (excluding flood plains) is the first identifiable annual bank fill flood bench; or c) In respect of a wetland, a 500 m radius around the delineated boundary (extent) of any wetland, including pans. The GA only applies to the use of water in terms of Section 21(c) and (i) of the NWA where the risk class is **LOW** as determined through the application of the Risk Matrix as prescribed in the Notice. The GA also does not apply where other Section 21 water uses are triggered, does not apply for most sewage infrastructure and pipelines carrying hazardous materials, water uses associated with hazardous materials, water uses associated with water and wastewater treatment works, and for most mining-related water uses.

	The GA may be exercised as follows: i) Section 21(c) or (i) water use activities that are determined to pose a LOW Risk as determined through the application of the Risk Matrix as prescribed in the Notice can be undertaken subject to the general conditions of the GA; ii) Section 21(c) or (i) water use activities set out in Appendix D1 of the Notice can be undertaken without being subject to the requirement of a risk assessment and subject to the general conditions of the GA. Such water use activities in Appendix D1 include inter alia emergency river crossings, fence erection, solar renewable infrastructure that has no direct impact on watercourses and mini-scale hydropower developments; iii) Prescribed water use activities undertaken by certain State Owned Entities as detailed in Appendix D2 of the Notice can be undertaken without being subject to the requirement of a risk assessment and subject to the general conditions of the GA; iv) Maintenance work associated with an 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 can be undertaken; v) River and stormwater management activities including maintenance of infrastructure as contained in a river management plan or similar management plan, may be conducted subject to the approval of such a plan by the relevant DWS regional office or catchment management agency; vi) Rehabilitation of wetlands or rivers where such rehabilitation activities has a LOW risk class as determined through the Risk Matrix can be conducted; and vii) Emergency work arising from an emergency situation and or incident associated with the persons' existing lawful water use entitlement can be undertaken, provided that all work is executed and reported in the manner prescribed in the Emergency protocol contained in Appendix C of the Notice. A 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 with the water use as contemplated in the GA.
City of Cape Town's (CoCT) Floodplain and River Corridor Management Policy (2009)	In accordance with the CoCT Floodplain and River corridor Management Policy, ecological buffers are recommended, **varying in width between 10 m and 40 m for watercourses and up to 75 m recommended for wetlands.** A minimum buffer of 10 m is required for concrete canals.

Appendix 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 freshwater ecosystems 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 freshwater ecosystem associated with the proposed development.

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

All wetland or riparian features encountered within the investigation 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**[7] (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 (Kleynhans *et al*., 2008) 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 Table C4 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. WET-Health

Healthy wetlands are known to provide important habitats for wildlife and to deliver a range of important goods and services to society. Management of these systems is therefore essential if these attributes are to be retained within an ever-changing landscape. The primary purpose of this assessment is to evaluate the eco-physical health of wetlands, and in so doing to promote their conservation and wise management.

Level of Evaluation

Two levels of assessment are provided by WET-Health:

- Level 1: Desktop evaluation, with limited field verification. This is generally applicable to situations where a large number of wetlands need to be assessed at a very low resolution; or
- Level 2: On-site evaluation. This involves structured sampling and data collection in a single wetland and its surrounding catchment.

Framework for the Assessment

A set of three modules has been synthesised from the set of processes, interactions and interventions that take place in wetland systems and their catchments: hydrology (water inputs, distribution and retention, and outputs), geomorphology (sediment inputs, retention and outputs) and vegetation (transformation and presence of introduced alien species).

Units of Assessment

Central to WET-Health is the characterisation of HGM Units, which have been defined based on geomorphic setting (e.g. hillslope or valley-bottom; whether drainage is open or closed), water source (surface water dominated or sub-surface water dominated) and pattern of water flow through the wetland unit (diffusely or channelled) as described under the Classification System for Wetlands and other Aquatic Ecosystems above.

Quantification of Present State of a wetland

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present State score. This takes the form of assessing the spatial extent of the impact of individual activities and then separately assessing the intensity of the impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The impact scores, and Present State categories are provided in the table below.

Table C5: Impact scores and categories of Present State used by WET-Health for describing the integrity of wetlands.

Impact category	Description	Impact score range	Present State category
None	Unmodified, natural	0-0.9	A
Small	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	B
Moderate	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2-3.9	C
Large	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	D
Serious	The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognisable.	6-7.9	E
Critical	Modifications have reached a critical level and the ecosystem processes have been completely modified with an almost complete loss of natural habitat and biota.	8-10	F

Assessing the Anticipated Trajectory of Change

As is the case with the Present State, future threats to the state of the wetland may arise from activities in the catchment upstream of the unit or within the wetland itself or from processes downstream of the wetland. In each of the individual sections for hydrology, geomorphology and vegetation, five potential situations exist depending upon the direction and likely extent of change (table below).

Table C6: Trajectory of Change classes and scores used to evaluate likely future changes to the present state of the wetland.

Change Class	Description	HGM change score	Symbol
Substantial improvement	State is likely to improve substantially over the next 5 years	2	↑↑
Slight improvement	State is likely to improve slightly over the next 5 years	1	↑
Remain stable	State is likely to remain stable over the next 5 years	0	→
Slight deterioration	State is likely to deteriorate slightly over the next 5 years	-1	↓
Substantial deterioration	State is expected to deteriorate substantially over the next 5 years	-2	↓↓

Overall health of the wetland

Once all HGM Units have been assessed, a summary of health for the wetland as a whole needs to be calculated. This is achieved by calculating a combined score for each component by area-weighting the scores calculated for each HGM Unit. Recording the health assessments for the hydrology, geomorphology and vegetation components provide a summary of impacts, Present State, Trajectory of Change and Health for individual HGM Units and for the entire wetland.

6. Ecological Importance and Sensitivity (EIS) (Version 2) (Kotze *et al.* (2020)

"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".[2] The assessment of the ecosystem services supplied by the identified freshwater features was conducted according to the guidelines as described by Kotze *et al.* (2020). An assessment was undertaken that examines and rates 16 different ecosystem services, selected for their specific relevance to the South African situation, as follows:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Phosphate assimilation;
- Nitrate assimilation;
- Toxicant assimilation;
- Erosion control;
- Carbon storage;
- Biodiversity maintenance;
- Provision of water for human use;
- Provision of harvestable resources;
- Food for livestock;
- Provision of cultivated foods;
- Cultural and spiritual experience;
- Tourism and recreation; and
- Education and research.

[2] Department of Water Affairs and Forestry, South Africa Version 1.0 of Resource Directed Measures for Protection of Water Resources, 1999

For each ecosystem service, indicator scores are combined automatically in an algorithm given in the spreadsheet that has been designed to reflect the relative importance and interactions of the attributes represented by the indicators to arrive at an overall supply score. In addition, the demand for the ecosystem service is assessed based on the wetland's catchment context (e.g. toxicant sources upstream), the number of beneficiaries and their level of dependency, which are also all rated on a five-point scale. Again, an algorithm automatically combines the indicator scores relevant to demand to generate a demand score.
*It is important to note that when assessing riparian zones associated with riverine habitats, the contribution of the riparian zone to streamflow regulation is omitted, owing to a lack of relevant studies (Kotze *et al*, 2020).

Table C4: Integrating scores for supply and demand to obtain and overall importance score

Integrating scores for supply & demand to obtain an overall importance score						
		Supply				
		Very Low	Low	Moderate	High	Very High
Demand		0	1	2	3	4
Very Low	0	0,0	0,0	0,5	1,5	2,5
Low	1	0,0	0,0	1,0	2,0	3,0
Moderate	2	0,0	0,5	1,5	2,5	3,5
High	3	0,0	1,0	2,0	3,0	4,0
Very High	4	0,5	1,5	2,5	3,5	4,0

A single overall importance score is generated for each ecosystem service by combining the supply and demand scores. This aggregation therefore places somewhat more emphasis on supply than demand, with the supply score acting as the starting score for a “moderate” demand scenario. The importance score is, however, adjusted by up to one class up where demand is “very high” and by up to one class down where demand is “very low”. The overall importance score can then be used to derive an importance category for reporting purposes.

Table C5: Classes for determining the likely extent to which a benefit is being supplied.

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately-Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.
Moderately-High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

7. 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.

PES			Ecological and Importance Sensitivity (EIS)			
			Very High	High	Moderate	Low
	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 unacceptable (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

8. Freshwater Ecosystem 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.

Appendix D: Results Of Field Investigation

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

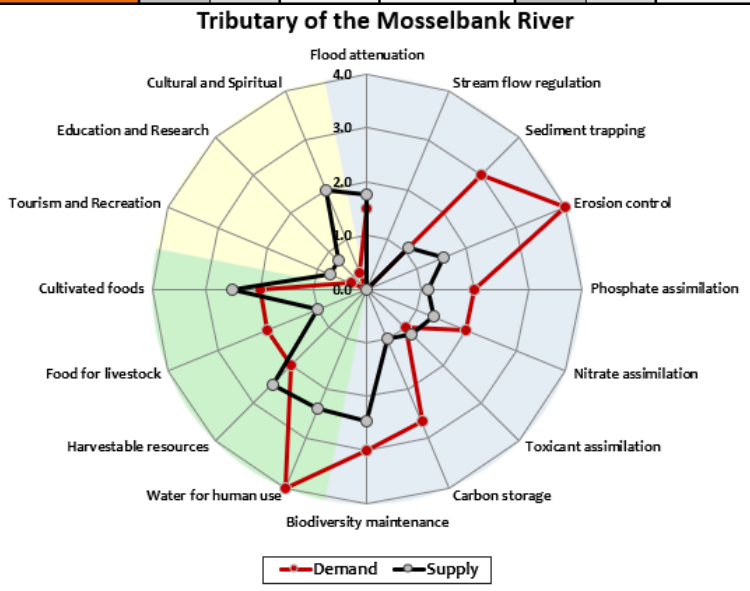
Table D1: Presentation of the results of the PES assessment applied to the UCVB wetland associated with the Mosselbank River.

HGM Unit	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
Floodplain	8	100	2.0	-1	2.8	0	6.8	0
Area weighted impact scores*			2.0	-1.0	2.8	0.0	6.8	0.0
PES Category (See Table 5.29)			C	↓	C	→	E	→

* The total impact score for the wetland as a whole is calculated by summing the area-weighted HGM scores for each HGM unit.

Table D2: Presentation of the results of the Socio-cultural and Ecoservice provision provided by the freshwater ecosystems associated with the proposed development.

		Tributary of the Mosselbank River				UCVB Wetland			
ECOSYSTEM SERVICE		Supply	Demand	Importance Score	Importance	Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	1.8	1.5	1.0	Low	1.2	1.3	0.3	Very Low
	Stream flow regulation	-	-	#VALUE!	#VALUE!	1.0	4.0	1.5	Moderately Low
	Sediment trapping	1.1	3.0	1.1	Low	2.5	3.0	2.5	Moderately High
	Erosion control	1.5	4.0	2.0	Moderate	0.9	4.0	1.4	Moderately Low
	Phosphate assimilation	1.1	2.0	0.6	Very Low	2.7	4.0	3.2	High
	Nitrate assimilation	1.3	2.0	0.8	Low	2.5	4.0	3.0	High
	Toxicant assimilation	1.2	1.0	0.2	Very Low	2.8	1.0	1.8	Moderate
	Carbon storage	1.0	2.7	0.8	Low	1.4	2.7	1.3	Low
	Biodiversity maintenance	2.5	3.0	2.5	Moderately High	2.3	3.0	2.3	Moderately High
PROVISIONING SERVICES	Water for human use	2.4	4.0	2.9	High	2.4	4.0	2.9	High
	Harvestable resources	2.5	2.0	2.0	Moderate	1.5	2.0	1.0	Low
	Food for livestock	1.0	2.0	0.5	Very Low	3.0	2.0	2.5	Moderately High
	Cultivated foods	2.5	2.0	2.0	Moderate	2.1	2.0	1.6	Moderately Low
CULTURAL SERVICES	Tourism and Recreation	0.8	0.3	0.0	Very Low	0.8	0.3	0.0	Very Low
	Education and Research	0.8	0.0	0.0	Very Low	0.8	0.0	0.0	Very Low
	Cultural and Spiritual	2.0	0.3	0.7	Very Low	2.0	0.3	0.7	Very Low



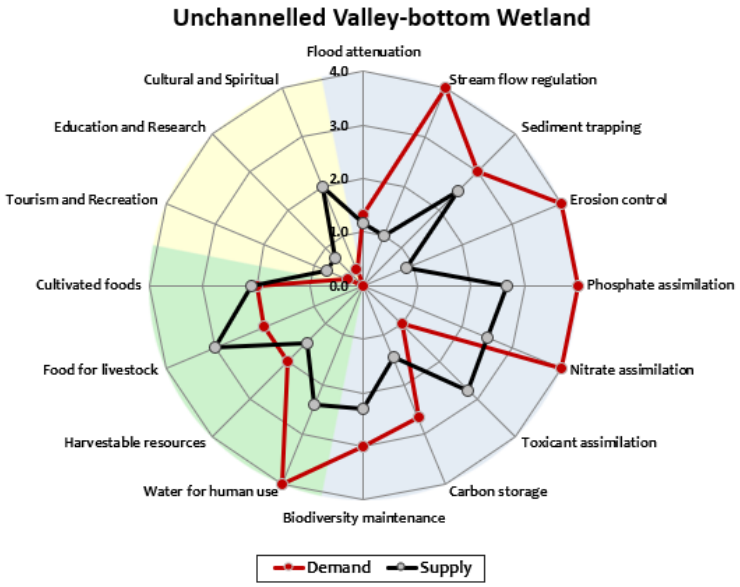


Table D3: Presentation of the EIS assessment applied to the freshwater ecosystems associated with the proposed development.

ECOLOGICAL IMPORTANCE AND SENSITIVITY:	Tributary of the Mosselbank River		UCVB Wetland	
Ecological Importance	*Score (0-4)*	*Confidence (1-5)*	*Score (0-4)*	*Confidence (1-5)*
Biodiversity support	1.00	3.00	1.67	3.00
Presence of Red Data species	0	3	1	3
Populations of unique species	0	3	2	3
Migration/breeding/feeding sites	3	3	2	3
Landscape scale	2.60	3.20	2.60	3.20
Protection status of the wetland	3	3	3	3
Protection status of the vegetation type	4	4	4	4
Regional context of the ecological integrity	2	3	2	3
Size and rareity of the wetland type/s present	2	3	2	3
Diversity of habitat types	2	3	2	3
Sensitivity of the wetland	2.00	3.00	3.00	3.00
Sensitivity to changes in floods	2	3	3	3
Sensitivity to changes in low flows/dry season	2	3	3	3
Sensitivity to changes in water quality	2	3	3	3
ECOLOGICAL IMPORTANCE & SENSITIVITY	***2.60***	***3.00***	***3.00***	***3.00***
HYDROLOGICAL/FUNCTIONAL IMPORTANCE	***3.00***	***2.00***	***3.00***	***3.00***
DIRECT HUMAN BENEFITS	***1.83***	***3.00***	***1.67***	***3.00***

Appendix E: Dws Risk Assessment Methodology

In order for the proponent 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.

DWS Risk Assessment Matrix (2023)

- 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;
- **Environmental impacts** are the consequences of these impacts 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;
- **Intensity** 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 scale** 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 intensity, spatial scale and duration of the impact together comprise the consequence of the impact and when summed can obtain a maximum value of 75. The likelihood of the impact occurring is determined by assigning a likelihood score of between 20% and 100%. The values for likelihood and consequence of the impact are then read off a significance rating matrix and are used to determine whether control is necessary[3].
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.

"RISK ASSESSMENT KEY" (Based on DWS 2023 publication: Section 21 c and i water use Risk Assessment Protocol)

[3] Some risks/impacts that have low significance will however still require control

Table E1: Intensity (What is the intensity of the impact on the resource quality - hydrology, water quality, geomorphology, biota?)

Negative impacts	
Negligible / non-harmful; no change in PES	0
Very low / potentially harmful; negligible deterioration in PES (<5% change)	+1
Low / slightly harmful; minor deterioration in PES (<10% change)	+2
Medium / moderately harmful; moderate deterioration in PES (>10% change)	+3
High / severely harmful; large deterioration in PES (by one class or more)	+4
Very high / critically harmful; critical deterioration in PES (to E/F or F class)	+5
Positive impacts	
Negligible; no change in PES	0
Very low / potentially beneficial; negligible improvement in PES (<5% change)	-1
Low / slightly beneficial; minor improvement in PES (<10% change)	-2
Medium / moderately beneficial; moderate improvement in PES (>10% change)	-3
Highly beneficial; large improvement in PES (by one class or more) and/or increase in protection status	-4
Very highly beneficial; improvement to near-natural state (A or A/B class) and/or major increase in protection status	-5

*PES of affected watercourses must be considered when scoring Impact Intensity

Table E2: Spatial Scale (How big is the area that the activity is impacting on, relative to the size of the impacted watercourses).

Very small portion of watercourse/s impacted (<10% of extent)	1
Moderate portion of watercourse/s impacted (10-60% of extent)	2
Large portion of watercourse/s impacted (60-80%)	3
Most or all of watercourse/s impacted (>80%)	4
Impacts extend into watercourses located well beyond the footprint of the activities	5

Table E3: Duration (How long does the aspect impact on the resource quality).

Transient (One day to one month)	1
Short-term (a few months to 5 years) OR repeated infrequently (e.g. annually) for one day to one month	2
Medium-term (5 – 15 years)	3
Long-term (ceases with operational life)	4
Permanent	5

Table E4: Likelihood of impact (What is the probability that the activity will impact on the resource quality).

Improbable / Unlikely	20%
Low probability	40%
Medium probability	60%
Highly probable	80%
Definite / Unknown	100%

Table E5: Rating Classes.

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 29	(L) Low Risk	Acceptable as is or with proposed mitigation measures. Impact to watercourses and resource quality small and easily mitigated, or positive.
30 – 60	M) Moderate Risk	Risk and impact on watercourses are notable and require mitigation measures on a higher level, which costs more and require specialist input. Licence required.
61 – 100	(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 E6: Calculations.

Intensity = Maximum Intensity Score (negative value for positive impact)	MAX = 5
Severity = Intensity + Spatial Scale + Duration (<Intensity - Spatial Scale - Duration> for positive impact)	MAX = 15 (MIN = -15 for +ve impacts)
Consequence = Severity X Importance rating	MAX = 75
Significance\Risk = (Consequence X Likelihood) X (100/75)	MAX = 100

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 present the key concepts considered in the development of control measures for the proposed construction:

- Control and performance improvement measures and actions that address the risks and impacts[4] are identified and described in as much detail as possible. Controlling 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, control 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 control potential impacts on the ecology of the freshwater and riparian ecosystems traversed by or in close proximity of the proposed infrastructure.

[4] Control measures should address both positive and negative impacts

Appendix F: Dws Risk Assessment Outcomes For The Proposed Development

No.	Phase	Activity	Impact	Potentially affected freshwater ecosystems			Intensity of Impact on Resource Quality					Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
							Abiotic Habitat			Biota											
				Name/s	PES	Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
1	CONSTRUCTION	Site access, clearing and preparation for civil works which involves: • Vehicular transport and access to the site; • Removal of vegetation and associated disturbances to soil; • Removal of topsoil and creation of topsoil stockpiles; and Miscellaneous activities by construction personnel.	• Removal of vegetation leading to exposure of soil; • Increased likelihood of dust generation due to exposed soil; • Increased runoff and erosion due to exposed soil and soil disturbance, leading to sedimentation of the freshwater ecosystems; • Soil and stormwater contamination from oil and hydrocarbons originating from vehicles; and • Proliferation of alien vegetation as a result of disturbances.	Tributary of the Mosselbank River	D	High	2	3	2	2	2	**6**	2	1	**9**	**4**	**36**	80%	**28.8**	**L**	High
				UCVB Wetland	C/D	High	1	2	2	2	2	**4**	2	1	**7**	**4**	**28**	60%	**16.8**	**L**	High

No.	Phase	Activity	Impact	Potentially affected freshwater ecosystems			Intensity of Impact on Resource Quality					Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
							Abiotic Habitat			Biota											
				Name/s	PES	Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
2		Construction activities related to the proposed development - earth works involved in the construction of the proposed development.	• Earthworks could be potential sources of sediment, which may be transported as runoff into freshwater ecosystems; • Disturbances of soil leading increased sediment runoff from the construction site to the freshwater ecosystems, in turn potentially leading to altered freshwater habitat; • Altered runoff patterns, leading to increased erosion and sedimentation of the receiving environment; • Proliferation of alien and/or invasive plant species (AIPs) as a result of disturbances; and • Possible contamination of soil and surface water as a result of concrete works and runoff from the construction site, leading to a reduced ability to support biodiversity.	Tributary of the Mosselbank River	D	High	2	2	1	1	1	**4**	2	2	**8**	**4**	**32**	80%	**25.6**	**L**	High
				UCVB Wetland	C/D	High	1	1	1	1	1	**2**	2	2	**6**	**4**	**24**	60%	**14.4**	**L**	High
3		Construction activities related to the proposed development -	• Exposure of soil, leading to increased runoff and erosion, and thus increased likelihood for further sedimentation of the freshwater ecosystems;	Tributary of the Mosselbank River	D	High	3	3	3	3	2	**8**	2	2	**12**	**4**	**48**	100%	**40**	**M**	High

No.	Phase	Activity	Impact	Potentially affected freshwater ecosystems			Intensity of Impact on Resource Quality					Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
							Abiotic Habitat			Biota											
				Name/s	PES	Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
		construction and upgrade of the road including: - Excavation within the tributary of the Mosselbank River for the installation of throughflow structures; - Placement of culverts (and gabions if required).	• Loss of freshwater habitat and ecological structure of the section of the tributary that will be traversed, resulting in impacts to biota; • Increased sedimentation of the freshwater ecosystems, leading to smothering of vegetation in the downstream reaches (particularly of the UCVB wetland associated with the Mosselbank River); • Proliferation of AIPs as a result of disturbances; and • Potential changes to the ecoservice provision of the freshwater ecosystems; • Potential impacts on water quality and contamination of soil within the freshwater ecosystems; • Erosion of areas surrounding the slabs and outlets; • Potential of backfill material entering the freshwater ecosystems, increasing the sediment load; and • Disruption of the growth medium of vegetation.	UCVB Wetland	C/D	High	3	2	3	2	2	**6**	1	2	**9**	**4**	**36**	80%	**28.8**	**L**	High

No.	Phase	Activity	Impact	Potentially affected freshwater ecosystems			Intensity of Impact on Resource Quality					Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
							Abiotic Habitat			Biota											
				Name/s	PES	Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
4		Construction activities related to the proposed development - construction of buildings and installation of service infrastructure (including linear infrastructure) within the study area.	• Potential conveyance of sediment laden stormwater into the freshwater ecosystems; • Disturbance to vegetation and habitat ecoservice provision; • Potential disturbance to hydrological functioning and activity of the freshwater ecosystems; • Disturbances of soils potentially leading to increased alien vegetation proliferation, and in turn to altered habitat; and • Altered runoff patterns, leading to increased erosion and sedimentation of the freshwater ecosystems; • Compaction of soil and loss of habitat as a result of ongoing disturbance from vehicles and equipment; and • Possible contamination of soil and surface water as a result of concrete works and runoff from the construction site, leading to a reduced ability to support biodiversity.	Tributary of the Mosselbank River	D	High	2	2	2	2	2	**4**	2	2	**8**	**4**	**32**	80%	**25.6**	**L**	High
				UCVB Wetland	C/D	High	2	2	2	1	1	**4**	2	2	**8**	**4**	**32**	60%	**19.2**	**L**	High
5		Construction of stormwater infrastructure	• Disturbances of soil leading to increased AIPs proliferation in the area surrounding the	Tributary of the Mosselbank River	D	High	3	3	2	2	2	**6**	2	2	**10**	**4**	**40**	80%	**32**	**M**	High

No.	Phase	Activity	Impact	Potentially affected freshwater ecosystems			Intensity of Impact on Resource Quality					Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
							Abiotic Habitat			Biota											
				Name/s	PES	Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
		within the GN 4167 ZoR	freshwater ecosystems; • Potential changes to the pattern, flow and timing of water within the freshwater ecosystems and alteration to flow dispersal across the freshwater ecosystems; and • Potential sedimentation of the freshwater ecosystems during the construction work.	UCVB Wetland	C/D	High	3	2	2	1	1	**6**	2	2	**10**	**4**	**40**	60%	**24**	L	High
6		Rehabilitation of the freshwater ecosystems.	• Soil compaction within the freshwater ecosystems; • Potential sedimentation of the freshwater ecosystems caused by substrate disturbances and mobilisation of sediments; and • Impacts to water quality as a result of the application of herbicides	Tributary of the Mosselbank River	D	High	2	1	2	3	2	**6**	2	2	**10**	**4**	**40**	60%	**24**	L	High
				UCVB Wetland	C/D	High	1	1	1	2	1	**4**	1	2	**7**	**4**	**28**	40%	**11.2**	L	High
7	**OPERATIONAL**	Operation of proposed development, internal service infrastructure,	• Increased hydrocarbon input which potentially has toxicological impacts to aquatic communities (fauna and flora); • Alterations to the pattern and timing of water discharging into	Tributary of the Mosselbank River	D	High	3	3	2	2	2	**6**	2	4	**12**	**4**	**48**	60%	**28.8**	L	High

No.	Phase	Activity	Impact	Potentially affected freshwater ecosystems			Intensity of Impact on Resource Quality					Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
							Abiotic Habitat			Biota											
				Name/s	PES	Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
		roads, and associated open space areas.	the freshwater ecosystems which can disrupt important environmental feeding/breeding ques that aquatic biota are dependent upon; • Potential increased nutrient input, which may enrich the freshwater ecosystems and shift the trophic status to a eutrophic state; and • Increased erosion, incision and sedimentation of the freshwater ecosystem banks as a result of increased stormwater discharge.	UCVB Wetland	C/D	High	2	2	2	1	1	**4**	1	4	**9**	**4**	**36**	40%	**14.4**	**L**	High
8		Operation of the stormwater infrastructure associated with the proposed development.	• Altered runoff patterns and increased water inputs to the freshwater ecosystems, altering the flow regime, and potentially leading to erosion and incision; • Increased catchment yield (due to increased runoff) and altered flow regime may lead to changed freshwater ecosystem zonation • Increased water contamination due to hydrocarbons in stormwater from the internal road network. • Flow concentration and potential erosion at concentration points i.e. culverts and other stormwater infrastructure.	Tributary of the Mosselbank River	D	High	3	3	2	2	2	**4**	2	4	**10**	**4**	**48**	80%	**38.4**	**M**	High
				UCVB Wetland	C/D	High	2	1	1	1	1	**4**	1	4	**9**	**4**	**36**	60%	**21.6**	**L**	High

No.	Phase	Activity	Impact	Potentially affected freshwater ecosystems			Intensity of Impact on Resource Quality					Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
							Abiotic Habitat			Biota											
				Name/s	PES	Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
9		Operation and maintenance of the various internal roads and culverts	• Impact on water quality from possible leakages and spillage of hydrocarbons from vehicles using the roads; • Flow concentration and potentially erosion at concentration points i.e. culverts within the freshwater ecosystems; • Altered runoff patterns and increased water inputs to the freshwater ecosystems, resulting in altered flow regime and subsequent impacts on the freshwater ecosystem vegetation; and • Increased impermeable surfaces due to the presence of hardened surfaces, resulting in increased stormwater runoff and potential contaminants entering the receiving downgradient freshwater ecosystems.	Tributary of the Mosselbank River	D	High	3	3	2	2	2	**6**	2	4	**12**	**4**	**48**	60%	**28.8**	**L**	High
				UCVB Wetland	C/D	High	1	2	1	1	1	**4**	1	4	**9**	**4**	**36**	40%	**14.4**	**L**	High
10		Maintenance of proposed stormwater infrastructure, where necessary.	• Disturbances of soil leading increased sediment runoff from the construction site to the freshwater ecosystems, in turn potentially leading to altered freshwater habitat; • Proliferation of AIPs within the freshwater ecosystems; and • Disturbance or removal of	Tributary of the Mosselbank River	D	High	2	2	2	2	2	**4**	2	4	**10**	**4**	**40**	60%	**24**	**L**	High
				UCVB Wetland	C/D	High	2	1	1	2	2	**4**	1	4	**9**	**4**	**36**	40%	**14.4**	**L**	High

No.	Phase	Activity	Impact	Potentially affected freshwater ecosystems			Intensity of Impact on Resource Quality					Overall Intensity	Spatial scale	Duration	Severity	Importance rating	Consequence	Likelihood	Significance	Risk Rating	Confidence level
							Abiotic Habitat			Biota											
				Name/s	PES	Importance	Hydrology	Water Quality	Geomorph	Vegetation	Fauna										
			vegetation whilst carrying out maintenance activities.																		
11		Ongoing AIPs removal (when required), such as - Proactive monitoring to ensure structural integrity is maintained and to identify early signs of erosion, incision and AIPs encroachment.	• Compaction of soil and loss of habitat as a result of ongoing disturbance from vehicles and equipment; • Impacts to water quality as a result of the application of herbicides; and • Disturbance of soil which could lead to erosion.	Tributary of the Mosselbank River	D	High	2	1	1	2	1	**4**	2	2	**8**	**4**	**32**	80%	**25.6**	**L**	High
				UCVB Wetland	C/D	High	2	1	1	2	1	**4**	2	2	**8**	**4**	**32**	60%	**19.2**	**L**	High
12		Functioning of the rehabilitated freshwater ecosystems.	No negative impacts anticipated.	Tributary of the Mosselbank River	D	High	-4	-4	-3	-4	-3	**-8**	2	5	**-15**	**4**	**-60**	100%	**-60**	**+**	High
				UCVB Wetland	C/D	High	-3	-2	-2	-4	-2	**-8**	2	5	**-15**	**4**	**-60**	100%	**-60**	**+**	High

Appendix G: Details, Expertise And Curriculum Vitae Of Specialists

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

Cathrine-Rose De Freitas	MSc Geography and Environmental Studies (Stellenbosch University)
Dietmar de Klerk	BSc Hons Conservation Ecology (Stellenbosch University)
Amanda Mileson	Post Graduate Diploma Nature Conservation (UNISA)
Stephen van Staden	MSc Environmental Management (University of Johannesburg)

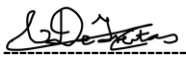
1. (a). (ii) The expertise of that specialist to compile a specialist report including a curriculum vitae

Company of Specialist:	FEN Consulting (Pty) Ltd		
Name / Contact person:	Stephen van Staden		
Postal address:	221 Riverside Lofts, Tygerfalls Boulevard, Bellville		
Postal code:	7539	Cell:	084 415 2356
Telephone:	011 616 7893	Fax:	N/A
E-mail:	stephen@sasenvgroup.co.za		
Qualifications	MSc Environmental Management (University of Johannesburg)		
Registration / Associations	Registered Professional Scientist at 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, Cathrine-Rose De Freitas, declare that -

- I act as the **independent freshwater 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.

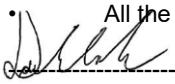


Signature of the Specialist

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

I, **Dietmar de Klerk** , 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, Amanda Mileson, 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, Stephen van Staden, 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

SAS ENVIRONMENTAL GROUP OF COMPANIES –

SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF CATHRINE-ROSE DE FREITAS

PERSONAL DETAILS

Position in Company	Wetland Ecologist
Joined SAS Environmental Group of Companies	2024

AFFILIATIONS

Member of the International Society of Wetland Scientists
Member of the Western Cape Wetlands Forum (WCWF)

EDUCATION

Qualifications

MSc Geography and Environmental Studies (Stellenbosch University)	2022
BSc Hons Environmental Monitoring and Modelling (Unisa)	2020
BSc Environmental Management, majoring in Botany (Unisa)	2017

Short Courses

IAIAsa Introductory EIA report writing course	2020

AREAS OF WORK EXPERIENCE

South Africa – Western Cape, Eastern Cape

KEY SPECIALIST DISCIPLINES

Freshwater Assessments

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

GIS Assessments

- Spatial Analysis and Geoprocessing
- Freshwater Ecosystem Mapping

PUBLICATIONS

- De Freitas, C., & Grenfell, S. (2024). Event-scale suspended sediment fluxes in a dryland environment valley-bottom wetland: Implications for downstream sediment and phosphorous fluxes. *Geomorphology*, *452*, 109101.

SAS ENVIRONMENTAL GROUP OF COMPANIES – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF AMANDA MILESON

PERSONAL DETAILS

Position in Company	Senior Ecologist: Wetland Ecology
Joined SAS Environmental Group of Companies	2013

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member of the South African Wetland Society (SAWS)

Member of the International Society of Wetland Scientists

Member of the Gauteng, Western Cape and Northern Cape Wetland Forums

EDUCATION

Qualifications

N. Dip Nature Conservation (UNISA)	2017
Advanced Diploma Nature Conservation (UNISA)	2020
Postgraduate Diploma Nature Conservation (UNISA)	2023

Short Courses

Wetland Management: Introduction and Delineation (University of the Free State)	2018
Tools for Wetland Assessment (Rhodes University)	2017
Wetland Rehabilitation (University of the Free State)	2015

AREAS OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, Free State, North West, Limpopo, Northern Cape, Eastern Cape
Africa – Zimbabwe, Zambia

KEY SPECIALIST DISCIPLINES

Freshwater Assessments

- Desktop Freshwater Ecosystem Delineation
- Freshwater Ecosystem Verification Assessment
- Freshwater Ecosystem (wetland / riparian) Delineation and Assessment
- Freshwater Ecosystem EcoService and Status Determination
- Freshwater Ecosystem Rehabilitation Assessment / Planning
- Freshwater Ecosystem Maintenance and Management Plans
- Freshwater Ecosystem Plant Species Plans
- Freshwater Ecosystem Offset Plans

Biodiversity Assessments

- Biodiversity Ecological Assessments
- Biodiversity Offset Plans

SAS ENVIRONMENTAL GROUP OF COMPANIES –

SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF DIETMAR DE KLERK

PERSONAL DETAILS

Position in Company	Senior Field Ecologist
Joined SAS Environmental Group of Companies	2024

MEMBERSHIPS

Registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioner Association of South Africa (EAPASA)
(EAPASA – Reg No. 2023/7731)
Registered Professional Natural Scientist with the South African Council for Natural Scientific Professions
(SACNASP – Reg No. 11973)

EDUCATION

Qualifications

BSc Hons Conservation Ecology (Stellenbosch University)	2010

Short Courses

Tools for Wetland Assessment presented by Prof. F. Ellery and Rhodes University	2020

AREAS OF WORK EXPERIENCE

South Africa –Western Cape

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- Facilitation of Environmental Impact Assessments (EIAs)
- Water Use License Applications (General Authorisations)
- Environmental and Water Use Audits
- Environmental Control Officer (ECO) work
- Environmental Management Programme (EMPr) compilation
- Rehabilitation Plan compilation

Freshwater Assessments

- Desktop Freshwater Delineation
- Freshwater (wetland / riparian) Delineation and Assessment
- Freshwater Eco Service and Status Determination
- Rehabilitation Assessment / Planning
- Wetland Offset Reporting

SAS ENVIRONMENTAL GROUP OF COMPANIES –

SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Group CEO, Water Resource Discipline Lead, Managing Member, Ecologist, Aquatic Ecologist
Joined SAS Environmental Group of Companies	2003 (year of establishment)

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)
Accredited River Health Practitioner by the South African River Health Program (RHP)
Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum
Member of the Gauteng Wetland Forum
Member of International Association of Impact Assessors (IAIA) South Africa;
Member of the Land Rehabilitation Society of South Africa (LaRSSA)

EDUCATION

Qualifications

MSc Environmental Management (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000

Short Courses

Integrated Water Resource Management, the National Water Act, and Water Use Authorisations, focusing on WULAs and IWWMPs	2017
Tools for Wetland Assessment (Rhodes University)	2017
Legal liability training course (Legricon Pty Ltd)	2018
Hazard identification and risk assessment training course (Legricon Pty Ltd)	2018
Wetland Management: Introduction and Delineation (WLID1502S) (University of the Free State)	2018
Hydropedology and Wetland Functioning (TerraSoil Science and Water Business Academy)	2018

AREAS OF WORK EXPERIENCE

South Africa – All Provinces
Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia
Eastern Africa – Tanzania Mauritius
West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona
Central Africa – Democratic Republic of the Congo

DEVELOPMENT SECTORS OF EXPERIENCE

1. Mining: Coal, chrome, Platinum Group Metals (PGMs), mineral sands, gold, phosphate, river sand, clay, fluorspar
2. Linear developments (energy transmission, telecommunication, pipelines, roads)
3. Minerals beneficiation
4. Renewable energy (Hydro, wind and solar)
5. Commercial development
6. Residential development
7. Agriculture
8. Industrial/chemical

KEY SPECIALIST DISCIPLINES

Legislative Requirements, Processes and Assessments

- Water Use Applications (Water Use License Applications / General Authorisations)
- Environmental and Water Use Audits
- Freshwater Resource Management and Monitoring as part of EMPR and WUL conditions

Freshwater Assessments

- 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
- Hydropedological Assessment
- Pit Closure Analysis

Aquatic Ecological Assessment and Water Quality Studies

- Habitat Assessment Indices (IHAS, HRC, IHIA & RHAM)
- Aquatic Macro-Invertebrates (SASS5 & MIRAI)
- Fish Assemblage Integrity Index (FRAI)
- Fish Health Assessments
- Riparian Vegetation Integrity (VEGRAI)
- Toxicological Analysis
- Water quality Monitoring
- Screening Test
- Riverine Rehabilitation Plans

Biodiversity Assessments

- Floral Assessments
- Biodiversity Actions Plan (BAP)
- Biodiversity Management Plan (BMP)
- Alien and Invasive Control Plan (AICP)
- Ecological Scan
- Terrestrial Monitoring
- Biodiversity Offset Plan

Soil and Land Capability Assessment

- Soil and Land Capability Assessment
- Hydropedological Assessment

Visual Impact Assessment

- Visual Baseline and Impact Assessments
- Visual Impact Peer Review Assessments