Wetland Assessment for the proposed Bombay Road Extension

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VERSION

Draft 1

REFERENCE

BOMBAY

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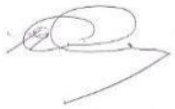
Report reviewer	**Peter Kimberg**	

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DECLARATION

I, **Andrew Husted** 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 Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, 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; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

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25 April 2016

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1 INTRODUCTION

The Biodiversity Company was commissioned to undertake a wetland study for the extension of the Bombay Road in Pietermaritzburg, KwaZulu-Natal.

The focus for the study was the identification, delineation and assessment of wetland areas that may be directly impacted on by the road, with a general wetland identification and delineation for systems within 500m of the project.

The study was conducted to meet the requirements of a Water Use Licence Application (WULA).

1.1 Background

The Bombay Road Extension project has been identified as a medium term roads improvement scheme in the Msunduzi Municipal Transportation plan. The project entails the extension of Bombay Road from Chota Motala Road to Bhambatha Road and linking into Ohrtmann Road to ease congestion within the surrounding vicinity.

1.2 Objectives

The assignment is interpreted as follows: A wetland and risk assessment for the proposed construction of the Bombay Road. To compile the report the following objectives were considered:

- Conduct a desktop assessment of the project area.
- Complete a site visit to assess the baseline conditions.
- Identify, characterise and delineate the local wetland systems.
- Assess the ecological status of the wetland systems.
- Conduct a risk assessment for the project, based on potential impacts to the wetlands.

2 LIMITATIONS

According to the wetland definition used in the National Water Act (NWA), four wetland indicators are used to delineate wetland boundaries. The general area has been disturbed due to the development of the area, this has resulted in the encroachment of industrial areas into the catchment areas, the placement of roads in close proximity to the watercourses, the diversion and management of stormwater and illegal dumping in the area. These disturbances have inhibited the application of the recognised wetland indices, which may affect the accuracy of the delineated areas. Where possible, wetland indicators were implemented for the study, supported by desktop information. Some of the identified disturbances are presented in Figure 1.

Figure 1: Photographs of local disturbances. Left: Access and service roads. Right: Encroachment of yards

3 KEY LEGISLATIVE REQUIREMENTS

3.1 National Water Act (NWA, 1998)

The DWS is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (Act No. 36 of 1998) (NWA) allows for the protection of water resources, which includes:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way.
- The prevention of the degradation of the water resource.
- The rehabilitation of the water resource.

A watercourse means:

- A river or spring.
- A natural channel in which water flows regularly or intermittently.
- A wetland, lake or dam into which, or from which, water flows.
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

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The NWA recognises that the entire ecosystem and not just the water itself, and 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 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) and (i).

However, according to General Notice 1199 as published in the Government Gazette No. 32805 of 2009, it must be noted that as defined by the Replacement General Authorisation in terms of Section 39 of the National Water Act, on account of the extremely sensitive nature of wetlands and estuaries, the section 21(c) and (i) water use General Authorisation does not apply to:

- Any wetland or any water resource within a distance of 500 meters upstream or downstream from the boundary of any wetland.
- Any estuary or any water resource within a distance of 500 meters upstream from the salt mixing zone of any estuary.

For the purposes of this project, a wetland area is defined according to the NWA (Act No. 36 of 1998): "*Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*".

3.2 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations as amended in December 2014, 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.

Regulations pertaining to environmental impact assessments of the National Environmental Management Act, 1998 (Act No. 107 of 1998), with particular emphasis on Appendix 6 (Specialist reports).

4 PROJECT AREA

The Bombay Road extension is located in Pietermaritzburg, KwaZulu-Natal, within the industrial area of Rosedale (Figure 2). The project area is located in the upper catchment area which flows into the uMnsunduze River system.

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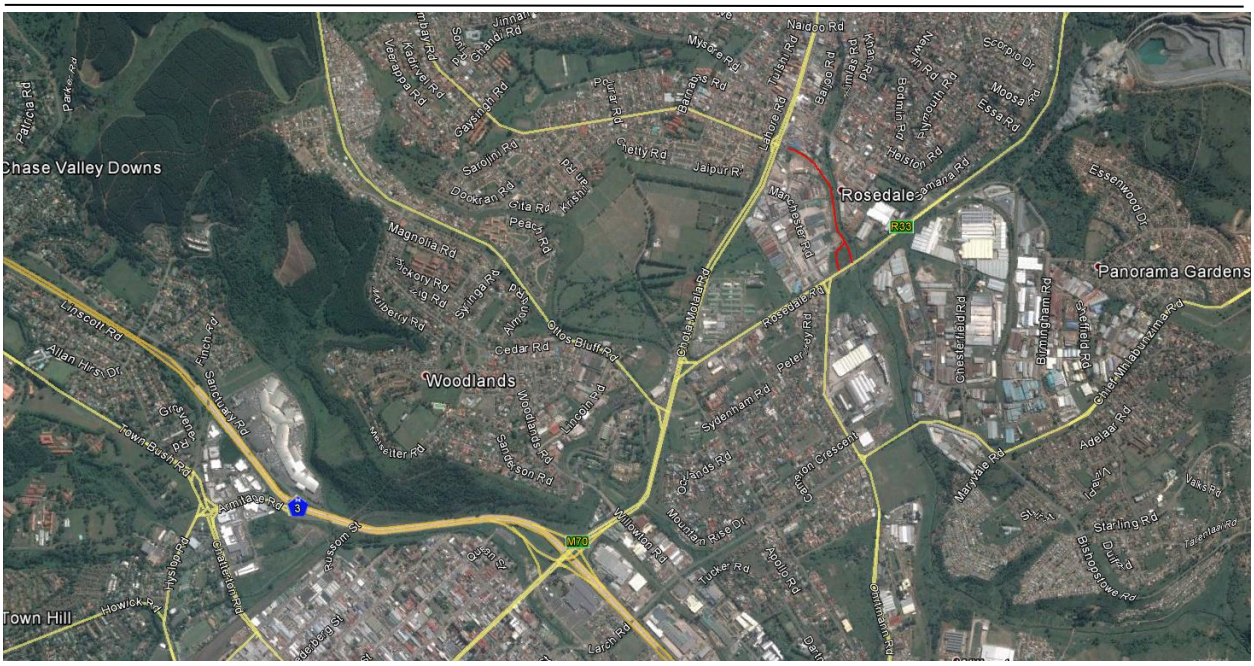

Figure 2: The location of the proposed road extension (red) in relation to the general settings

5 STUDY APPROACH

The National Wetland Classification System (NWCS, 2010) developed by the South African National Biodiversity Institute (SANBI) was considered for this study. This system comprises of a hierarchical classification process, defining a wetland based on the principles of the hydro geomorphic (HGM) approach at higher levels, and further includes structural features at the lower levels of classification (SANBI, 2009).

5.1 Desktop assessment

The desktop assessment consisted of relevant information as presented by the South African National Biodiversity Institutes (SANBI's) Biodiversity Geographic Information Systems (BGIS) website (http://bgis.sanbi.org). Wetland specific information resources taken into consideration during the desktop assessment of the study area included:

- Aerial imagery (Google Earth);
- The National Freshwater Ecosystem Priority Areas (NFEPAs, 2011); and
- Contour data.

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5.2 Wetland delineation

The wetland areas were delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 3. The outer edges of the wetland areas are identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation;
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator, which must be present under normal circumstances. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

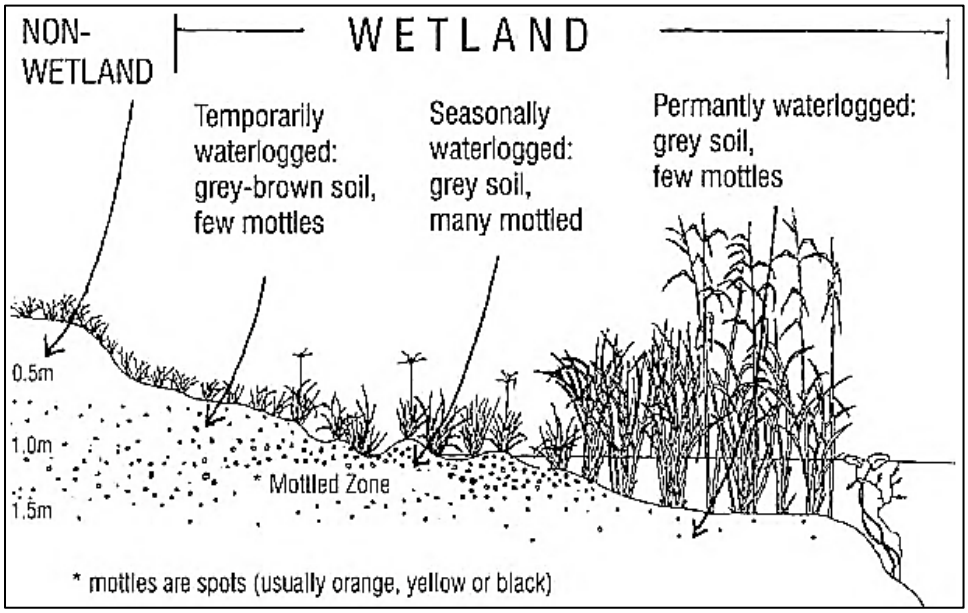

Figure 3: Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (DWAF, 2005)

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5.3 Riparian assessment

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

The riparian areas are also delineated in accordance with the DWAF (2005) guidelines. The riparian areas are identified by considering the following specific indicators:

- Are associated with a watercourse;
- Contain distinctively different plant species than adjacent areas; and contain species similar to adjacent areas but exhibiting more vigorous or robust growth forms; and
- May have alluvial soils.

5.4 Wetland classification

The two fundamental aspects that determine the existence of wetlands, and which form the basic foundation for the hydrogeomorphic (HGM) classification are landform and hydrology (Brinson 1993; Semeniuk & Semeniuk 1995; Finlayson *et al.* 2002; Jones 2002; Kotze *et al.* 2005, Ellery *et al.* 2005). These two aspects are used as key criteria in the description and classification of wetland types; classifying wetlands by (1) their hydrological characteristics; by the way water flows into, through and out of the wetland system, and (2) by their geomorphological or landscape settings. The landscape settings and hydrological/flow characteristics of these main wetland types are described in Table 1.

Table 1: Landscape settings and flow characteristics of the HGM wetland types (DWAF, 2007).

Landscape setting		Flow pattern	HGM Wetland Type
Valley Bottoms	*confined*	channelled	**River**
		standing water	**Lake**
	unconfined	standing water	**Wetland flat**
		diffuse (parallel to valley)	**Unchannelled Valley Bottom**
		channelled (parallel to valley)	**Channelled Valley Bottom**
		channelled (meandering across valley)	**Meandering Floodplain**
Slopes		diffuse	**Seepage (isolated)**
		diffuse(into channel)	**Seepage (connected)**
Crests		diffuse flow	**Seepage (connected)**
		standing water	**Pans and Depressions**

5.5 Present Ecological Status

WET-Health is a tool designed to assess the health or integrity of a wetland. Wetland health is defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition. This technique attempts to assess hydrological, geomorphological and vegetation health in three separate modules. The ecological status categories and descriptions are provided in Table 2.

Table 2: The PES categories and descriptions for WET-Health (Macfarlane et al, 2008)

Category	Description	Range
A	Unmodified,natural	0-0.9
B	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
C	Moderately modified. A moderate change in ecosystem process and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9
D	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4-5.9
E	The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9
F	Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10

5.6 Risk assessment

The risk assessment was conducted in accordance with the DWS risk-based water use authorisation approach and delegation guidelines.

The matrix assesses impacts in terms of consequence and likelihood. Consequence is calculated based on the following formula:

Consequence = Severity + Spatial Scale + Duration

Whereas likelihood is calculated as:

Likelihood=Frequency of Activity + Frequency of Incident +Legal Issues + Detection.

Significance is calculated as:

Significance \Risk= Consequence X Likelihood.

The significance of the impact is calculated according to Table 3.

Table 3: Significance ratings matrix

Rating	Class	Management Description
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Wetlands are excluded.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that theyimpose a long-term threat on a large scale and lowering of the Reserve.

6 FINDINGS

6.1 Wetland delineation

The desktop delineation attempted to identify the location of wetland areas associated with the project area. Two NFEPA wetland units were identified to be within 500m of the project area (Figure 4), namely channelled and unchannelled valley bottom wetlands. The NFEPA dataset suggests the proposed road alignment will traverse the wetland areas. It is worth noting that the NFEPA wetlands that are directly associated with the road route are not classified as ecological priority areas.

Contour data and Google Earth imagery indicate the presence of numerous watercourses within the general area, these include both perennial and non-perennial systems (Figure 4). The project area is associated with the Bayne's Spruit, a perennial watercourse. A topographical wetness index was also generated for the project to determine the likelihood of wetlands in the area (Figure 5).

Figure 4: The project area and the NFEPA wetlands, watercourses and imagery considered for the study

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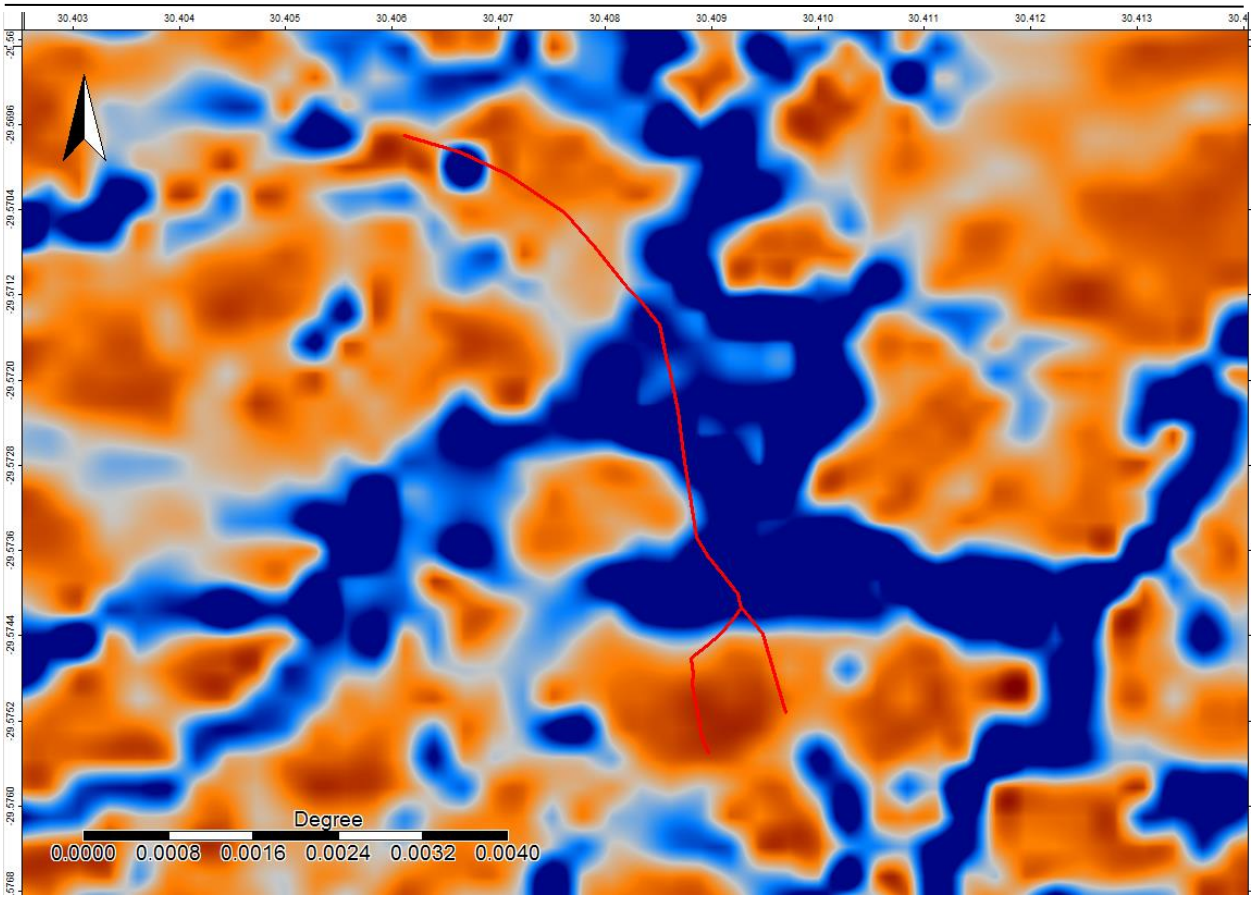

Figure 5: The topographical wetness index processed for the project area showing likely wet areas

The desktop findings were ground truthed, implementing the DWAF (2005) wetland guidelines. Wetland boundaries were ground truthed making use of soil forms, soil wetness, and vegetation to delineate wetland areas. Wetland vegetation that was identified during the study and used to identify and delineate boundaries included *Typha capensis, Phragmites sp, Cyperus sp* and *Juncus sp*. Photographs of areas that were inspected for potential signs of wetness are presented in Figure 5. The delineated areas showing signs of wetness in relation to the project area is presented in Figure 6. The delineated wetland areas have been classified as hillslope seepage wetlands.

Figure 6: Photographs of areas inspected for signs of wetness

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Figure 7: The delineated wetland areas and riparian boundary

6.2 Wetland functional description

According to Kotze *et al* (2007), these systems are normally associated with groundwater discharges, although flows through them may be supplemented by surface water contributions. The accumulation of organic matter and fine sediments in the wetland soils results in the wetland slowing down the sub-surface movement of water down the slope. Some general ecological services of the unit include the following:

- Contribute to some surface flow attenuation.
- Contribution of water to the stream during dry seasons.
- Provide water quality enhancement benefits.
- High potential to remove nitrogen and nitrates.

Seepage wetlands provide a variety of water quality enhancement benefits, such as, removing excess nutrients and inorganic pollutants produced by agriculture, industry and domestic waste

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(Postel and Carpenter, 1997). Sub-surface flow that is characteristic of hillslope wetlands enables the systems to be effective in removing nitrates (Muscutt *et al*., 1993).

6.3 Present Ecological Status

he Present Ecological Status (PES) for the assessed wetland system, the channelled valley bottom wetland is presented in Table 4. Numerous aspects expected to impact on the status of the wetlands were identified during the study, some of these include (Figure 8):

- Services and access routes transect wetland areas, impeding flow and altering the hydro-dynamics of the systems;
- The general area has been developed, with yards and structures encroaching into wetland areas resulting in the loss of vegetation and altered catchment areas;
- The development of the area has also resulted in increased hardened surface areas, reducing infiltration for the catchment, resulting in increased run-off volumes and velocities down the catchment;
- Local disturbances have resulted in the encroachment of alien vegetation into the area, dominating endemic and wetland plant species;
- Attempts to manage and divert stormwater and run-off have also altered the hydro-dynamics of the catchment, resulting in altered flows and flow velocities;
- The development of the area and the associated landscaping have also altered the structure and geomorphology of the catchment; and
- Dumping and solid waste storage and disposal have also altered the status of the wetland systems, this is as a result of introduced pollutants.

Table 4: Summary of the scores for the wetland PES

Wetland	Hydrology		Geomorphology		Vegetation	
	Rating	Description	Rating	Description	Rating	Description
Hillslope Seepage	E	Seriously Modified	E	Seriously Modified	E	Seriously Modified
Overall PES Class					E: Seriously Modified	

The wetland system is in a seriously modified (Category E) state, suggesting the change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable. A summary for the respective modules is as follows:

- The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.
- The change in geomorphic processes is great but some features are still recognizable.

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- Vegetation composition has been substantially altered but some characteristic species remain, although the vegetation consists mainly of introduced, alien and/or ruderal species.

Figure 8: Photographs of aspects impacting on the status of the wetlands

7 RISK ASSESSMENT

The proposed Bombay Road extension will transect two identified wetland areas, this was the key consideration for the risk assessment. The proposed expansion will have a direct impact on the delineated wetlands, resulting in the loss of these areas. The loss of wetland areas cannot be mitigated, and although not preferable, an offset strategy should be developed should the project proceed without any realignments for the road. The risk assessment has taken into

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account the affected wetland types, and also the current status of these systems. Findings from the DWS aspect and impact register / risk assessment are provided below.

Activity	Aspect	Impact
Construction of the road and associated crossings	Drainage patterns change due to road levels.	Impeding the flow of water. Loss of wetland (seepage) areas. Damage to wetlands (or loss). Siltation of water course. Erosion of water course. Flow sediment equilibrium change
	Installation of culverts/pipes for stream or wetland crossings	
	Cutting/reshaping of traversed wetlands	
	Additional Associated Infrastructure	
	Borrow Pits	
	Construction of a crossings	
Tarring of the road surface	Increased vehicle traffic	Impaired water quality. Siltation. Altered hydro-dynamics Impact on bird/animal species
	Stormwater management	

Severity								
Aspect	**Flow Regime**	**Water Quality**	**Habitat**	**Biota**	**Severity**	**Spatial scale**	**Duration**	**Consequence**
Drainage patterns change due to road levels.	3	2	2	1	**2**	2	3	**7**
Installation of culverts/pipes for stream or wetland crossings	2	2	2	1	**1.75**	1	2	**4.75**
Cutting/reshaping of traversed wetlands	3	2	2	2	**2.25**	1	2	**5.25**
Additional Associated Infrastructure	1	1	1	1	**1**	1	1	**3**
Borrow Pits	1	1	1	1	**1**	1	1	**3**
Construction of crossings	2	2	2	1	**1.75**	1	1	**3.75**
Increased vehicle traffic	1	1	1	2	**1.25**	1	1	**3.25**
Stormwater management	2	2	1	1	**1.5**	2	2	**5.5**

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Aspect	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Sig.	Risk Rating
Drainage patterns change due to road levels.	2	3	5	3	**13**	**91**	Moderate
Installation of culverts/pipes for stream or wetland crossings	2	2	5	2	**11**	**52.25**	Low
Cutting/reshaping of traversed wetlands	2	9	5	2	**12**	**63**	Moderate
Additional Associated Infrastructure	1	1	1	1	**4**	**12**	Low
Borrow Pits	1	1	1	2	**5**	**15**	Low
Construction of crossings	2	2	1	1	**6**	**22.5**	Low
Increased vehicle traffic	2	1	1	2	**6**	**19.5**	Low
Stormwater management	2	2	1	2	**7**	**38.5**	Low

The proposed extension will result in the loss of selected wetland areas, further impacting on the downstream systems. The most notable impacts are expected during the construction phase of the project. Taking into consideration the seriously modified status of the delineated wetland areas, the risk associated with the proposed extension vary from low to moderate. Should the road be aligned with the existing road to avoid the wetland area, and realigned at the R33 to avoid the wetland area, there will be no direct loss of wetlands as a result of the project. Should this be achieved, the risks associated with the project would then be considered to be low for all the above mentioned aspects.

7.1 Potential mitigation measures

The mitigation measures that should be considered for the installation of culverts are as follows:

- The proposed extension must make use of the existing road to avoid impacts to the wetland area. Additionally, the road should be realigned to avoid the wetland when connecting with the R33.
- The footprint area associated with the road extension must be minimised, avoiding the wetland (and riparian) areas where possible. Areas earmarked for construction must be marked to ensure a controlled disturbance footprint area.
- The road extension must make use of the existing roads and access as much as possible, before adjacent areas are considered for the extension.
- The delineated wetland areas must be avoided where possible. Laydown yards, camps and storage areas must be beyond the wetland areas. Where possible, the construction of the road must take place from the existing road and not from within the wetland areas.

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- The contractors used for the project should have spill kits available to ensure that any fuel or oil spills are clean-up and discarded correctly.
- It is preferable that construction takes place during the dry season to reduce the erosion potential of the exposed surfaces.
- Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel.
- Adequate stormwater management and soil stabilisation measures in cleared areas must be implemented to avoid erosion that may lead to siltation of nearby watercourses.
- Make use of existing access routes, or where required, limit the number and extent of access routes for construction traffic across watercourses that may lead to the erosion of banks and disturbances of riparian vegetation.
- Prevent uncontrolled access of vehicles through wetlands that can cause a significant adverse impact on the hydrology and soil structure of these areas through rutting (which can act as flow conduits) and through the compaction of soils.

8 CONCLUSION

A wetland study was conducted for the project area, the key focus being the proposed road extension route and the proximity to wetland areas. Two NFEPA wetland units were identified to be within 500m of the proposed road area, namely channelled and unchannelled valley bottom wetlands. These NFEPA wetlands are not considered to be ecological priority areas, and are associated with the Bayne's Spruit. Two hillslope seepage wetland areas were identified and delineated for the study, with the status of these systems determined to be seriously modified. The general development of the area and the associated activities have impacted on the status of these systems.

The proposed road extension will result in the partial loss of the two hillslope areas, which cannot be mitigated. The significance of the risks associated with the project were determined to vary from low to moderate, with a key focus being the direct impacts to the wetland areas. If the road is realigned to avoid further direct impacts to the wetland areas, the risks to the wetlands associated with the project are expected to be low. The most significant impacts area expected during the construction phase of the project.

Mitigation measures and recommendations listed should be adhered to as to ensure the wetland areas associated with the road as well as surroundings are protected.

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