PROPOSED WHITE KEI RIVER SAND MINE,

EASTERN CAPE

AQUATIC ECOLOGICAL ASSESSMENT

FINAL REPORT

Prepared for:
EOH Coastal & Environmental Services

Prepared by:

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Environmental and Aquatic Management Consulting
(CK 2009/112403/23)

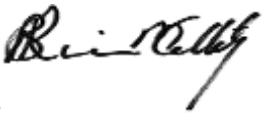
May 2016

SPECIALIST REPORT DETAILS

This report has been prepared as per the requirements of the Environmental Impact Assessment Regulations and the National Environmental Management Act (Act 107 of 1998), any subsequent amendments and any relevant National and / or Provincial Policies related to biodiversity assessments.

Report prepared by: Dr. Brian Colloty Pr.Sci.Nat. (Ecology) / Certified EAP / Member of SAEIES & SASAqS

I, **Dr. Brian Michael Colloty** declare that this report has been prepared independently of any influence or prejudice as may be specified by the National Department of Environmental Affairs (DEA)



Signed: Date: 20 May 2016

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ACRONYMS

CSIR	Council for Scientific and Industrial Research
DWS	National Department of Water and Sanitation
DWAF	National Department of Water Affairs and Forestry (now DWA)
EIA	Environmental Impact Assessment
GIS	Geographic Information System
NFEPA	National Freshwater Ecosystem Priority Areas (Nel *et al*., 2011)
PES	Present Ecological State Score
SANBI	South African National Biodiversity Institute
SC&A	Scherman Colloty & Associates

1 Introduction

Scherman Colloty & Associates cc (SC&A) was appointed by EOH Coastal and Environmental Services as an independent specialist to evaluate the aquatic ecological aspects of the proposed mining of sand from the bed and banks of the White Kei River. The proposed mining will occur within an area that is at times inundated by water impounded by the Xonxa Dam.

This document reports on the results obtained in a survey of the regional literature and observations made during a site visit conducted in March 2016. The main objective of this report is to provide comment on the potential impact of the proposed activities based on any constraints as a result of the presence of any sensitive aquatic habitats.

Several important national and provincial scale conservation plans were also reviewed, with the results of those studies being included in this report. Most conservation plans are produced at a coarse scale so it is thus important to verify the actual status of the study area during this initial phase, prior to the final development plan being produced.

Certain aspects of the development may also trigger the need for Section 21, Water Use License Applications such as development within 500m of a wetland boundary or within a river bed or bank. These applications must be submitted to the relevant Department of Water and Sanitation Office, and information contained in this report must be used in the supporting documentation if required.

1.1 Terms of reference

- An aquatic biodiversity assessment of the study area. This will cover the study area and a 500m development buffer in relation to available information on the aquatic vegetation and fish.
- Maps depicting demarcated aquatic and wetland vegetation delineated to a scale of 1:10 000, following the methodology described by the Department of Water and sanitation (DWS, previously DWA), together with a classification of delineated wetland areas, according to the methods contained in the Level 1 WET-Health methodology and the latest National Wetland Classification System (2010).
- The determination of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of any waterbodies, estimating their biodiversity, conservation and ecosystem function importance with regard ecosystem services.
- Recommend buffer zones and No-go areas around any delineated aquatic vegetation areas based on the relevant legislation or best practice.
- Provide mitigations regarding project related impacts, including engineering services that could negatively affect demarcated aquatic vegetation units.
- Recommend specific actions that could enhance the aquatic functioning in the areas, allowing the potential for a positive contribution by the project.
- Supply the client with geo-referenced GIS shape files of the waterbodies as per the required specifications supplied.

The above detail could be required for inclusion in the respective water use license application / GA documents submitted to DWS should these be required

1.2 Limitations

In order to obtain a comprehensive understanding of the dynamics of both the flora and fauna of both the aquatic communities within a study site, as well as the status of endemic, rare or threatened species in any area, assessments should always consider investigations at different time scales (across seasons/years) and through replication. Due to time constraints these long-term studies are not always feasible and are mostly based on instantaneous sampling.

It should be emphasised that information, as presented in this document, only has reference to the study area as indicated on the accompanying maps. Therefore, this information cannot be applied to any other area without detailed investigation.

Furthermore, additional information may come to light during a later stage of the process or development. This company, and/or specialist investigators do not accept any responsibility for conclusions, suggestions, limitations and recommendations made in good faith, based on the information presented to them, obtained from the surveys or requests made to them at the time of this report as produced or based on the timing of the surveys.

2 Project locality

The study area is approximately 20km east of Queenstown on the banks of the White Kei river and located in the S10E Quaternary Catchment (Figure 2).

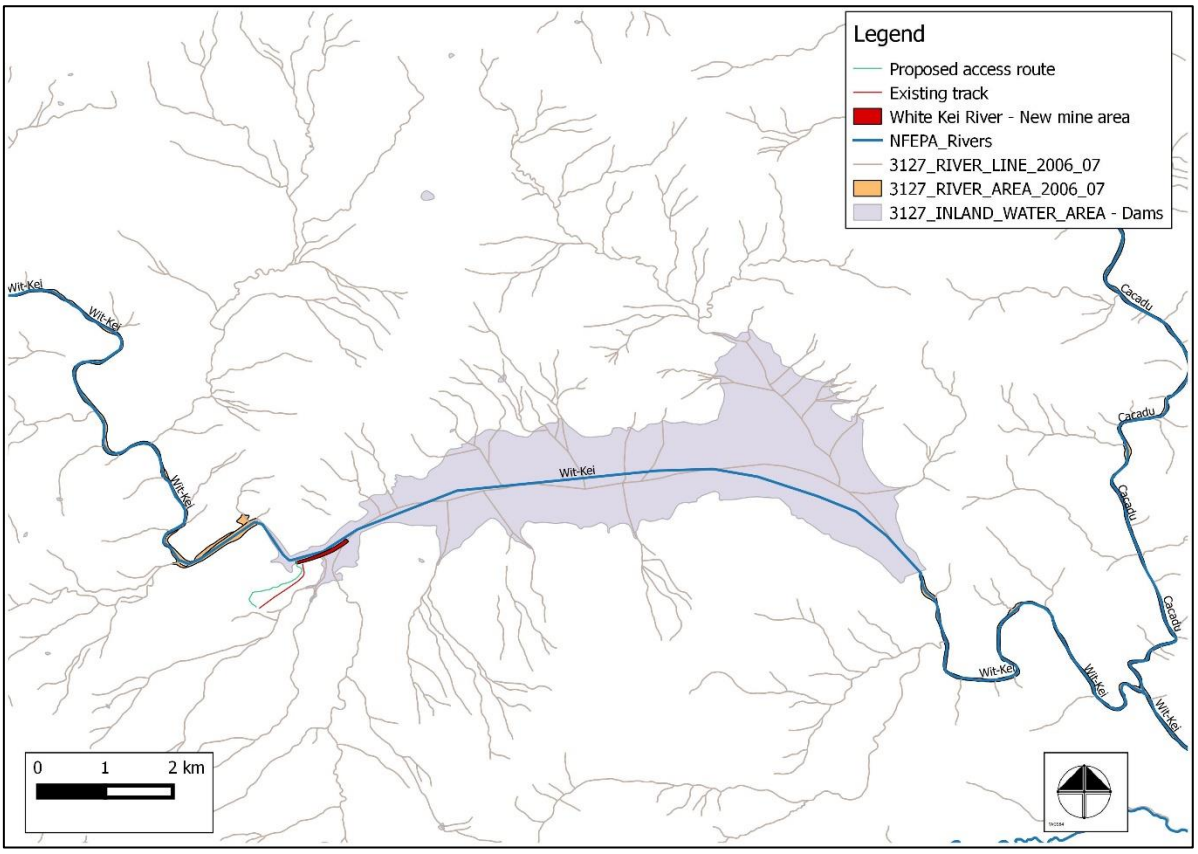


Figure 1: A map showing the project locality, the inundation area of the dam, major river systems and 1:50 000 scale water courses

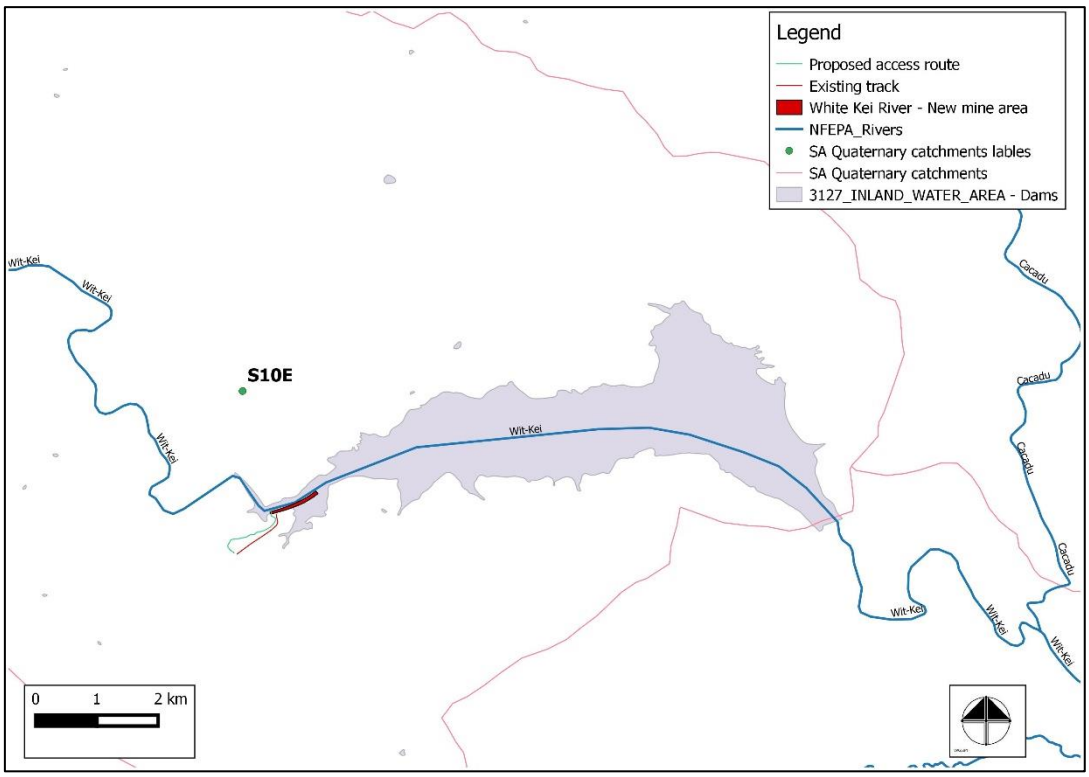


Figure 2: The respective quaternary catchments within study region together with the main stem river systems

3 Project description

HTJ Transport CC proposes the mine a 4.9 ha portion of the bed and banks of the White Kei River where it enters the impoundment area of the Xonxa Dam (Figure 1 & 2)

Plate 1: A view of the proposed mining area, showing the accumulation of sediment within the main channel and banks

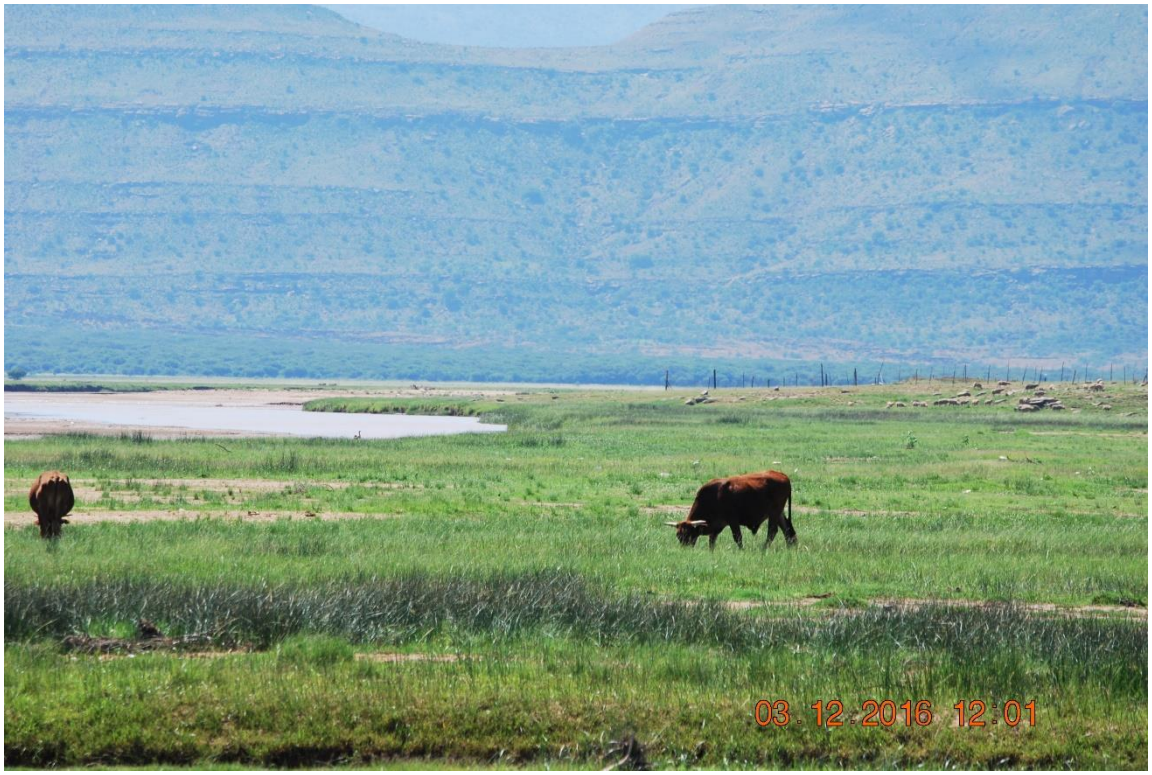


Plate 2: A view of the wetland areas, which are found on the sediment bars, colonised by obligate sedge species (*Juncus* & *Isolepis* spp), during dry periods when this portion of the Xonxa Dam is not inundated

Plate 3: The surrounding floodplains and catchment areas are highly degraded due to overgrazing, resulting in erosion and donga formation, contributing to the clay and silt loads within the main channel of the White Kei River

Plate 4: Evidence of illegal mining that has already occurred within some of the new mining area

4 Results

The proposed mining area is dominated by silts and sand accumulated by the Xonxa Dam, where over time the banks have been colonised by obligate wetland plants (Plate 1 & 2). The surrounding catchments, which are mostly overgrazed, easily erode contributing to the high sediment loads in the downstream main channel (Plate 3). Some of the adjacent landowners (Mr. Johnson) indicated that prior to the dam, the river was a steeply incised channel with bedrock and cobble. Over time the dam has trapped sediment, silting up the upstream areas. Water samples were taken directly upstream of the present mining areas (not associated with this proposed project) and just below the proposed mining area, and submitted to a SANAS accredited laboratory. The results (Appendix 2) of the determinands measured were well within the DWS Target Water Quality Ranges for Freshwater Ecosystems, with regard pH, Nitrate, Electrical Conductivity, Sodium and Sulphates. This would indicate that little to no chemical pollution occurs, i.e. no eutrophication and low salt loads. Elevated bacteriological counts were observed in the upstream sample (E coli. And Total Coliforms), but this was possibly due to the large number of cattle that were grazing near and in the sample site during the time of the survey.

What was significant for both samples was the elevated Total Suspended Solids values, which could be attributed to the high level of fines (sediments) found in the samples. As the river velocity slows upon entering the dam inundation area, these would likely settle out. Consequently, several channelled valley-bottom wetlands have developed on the sand bars observed within the study area, which are presently being mined by other operators (Plate 4) or are heavily grazed by sheep and cattle. due to the lack of fodder in upper catchments.

The the wetland areas, which are artificial as a result of the dam are thus degraded and impacted upon by the surrounding land use practices, and would in essence also disappear when the dam is completed inundated with water (Figure 2). The final delineation of the respective wetland areas is summarised in Figure 4, indicating that portions of the mining area will be located within its footprint.

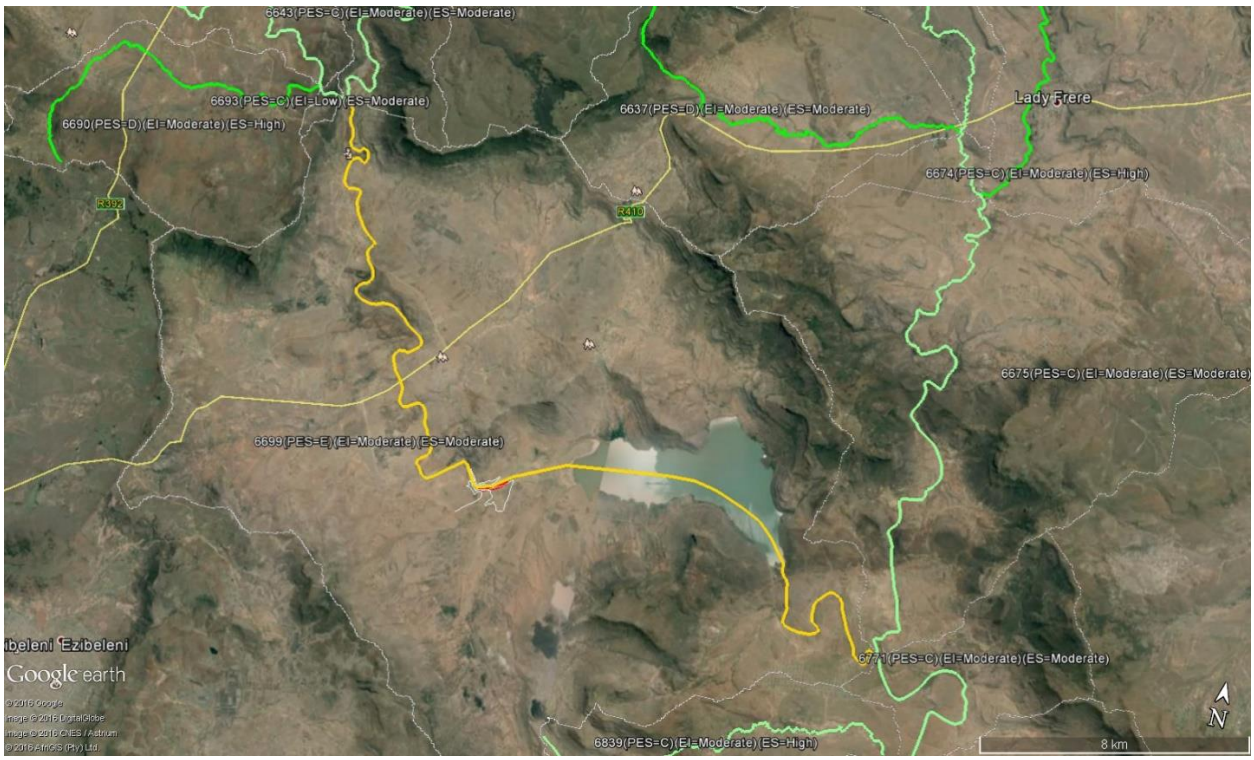
This degradation is reiterated in the past databases (NFEPA) for the study area, and have indicated that the wetlands / watercourses are mostly artificial (Figure 3). Where the National Wetland Inventory (SANBI), which is contained in the National Freshwater Ecosystem Priority Areas (NFEPA) spatial database, area wetlands were rated as Z = manipulated / artificial.

This was further substantiated in the more recent Present Ecological State (PES) and Ecological Importance and Ecological Sensitivity Assessment (EI/ES) assessment published by the Department of Water and Sanitation (DWS, 2014). This included all aspects such as water quality, riparian vegetation, invertebrates, fish and hydrology at a subquaternary catchment level (See below).

Based then on the available information and again confirmed during the site visit, the majority of the main water courses within the study area, when considering the remainder of the downstream catchments were rated as being Seriously modified, i.e. the loss of natural habitat, biota and basic ecosystem functions is extensive (PES = E).

Also included in the updated PES assessment (DWS, 2014) was information on the Ecological Importance (EI) and Ecological Sensitivity (ES). Most of the scores in the DWS results indicated that the EI for the study area were **Moderate**. The ES for the system was also rated as **Moderate** due to the scale of impacts that affect the wetland / water courses observed, although the White Kei River still forms an important aquatic corridor within the greater region. However, the study area subquaternary

catchment does not form part of any Aquatic Critical Biodiversity Area (CBA) as listed by Berliner & Desmet (2007) in the Eastern Cape Biodiversity Conservation Plan (ECBCP) (Figure 5).



The results for each of the affected Sub-quaternary catchment 6699 summarised below:

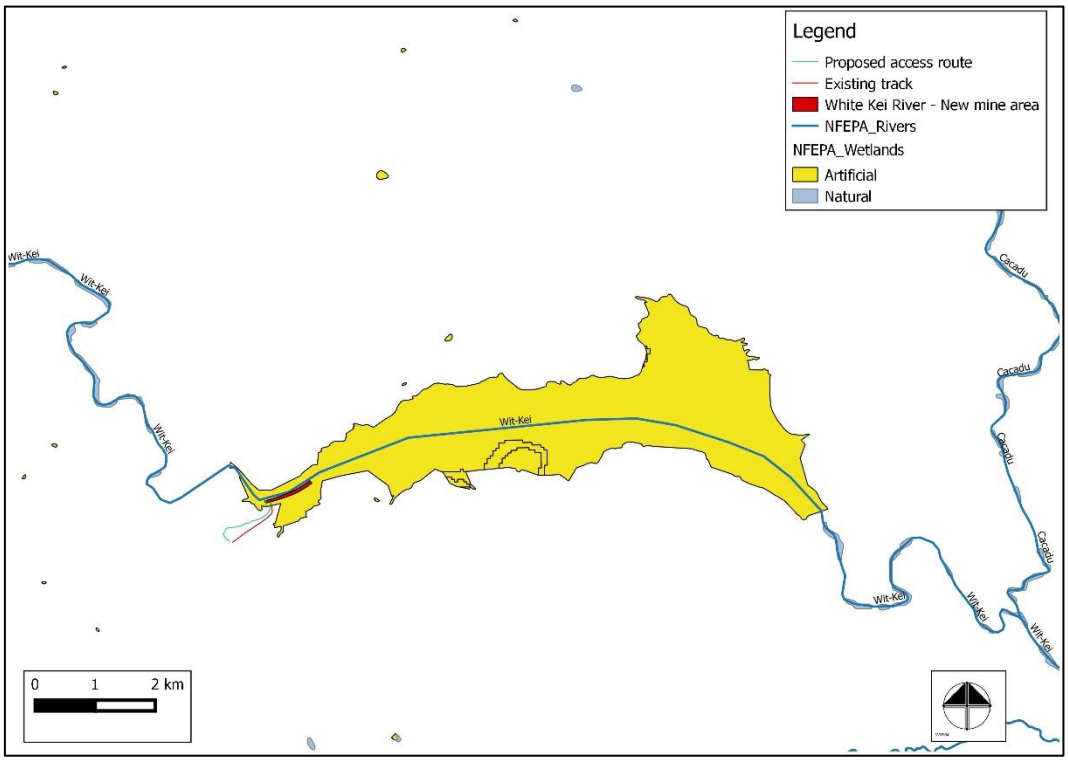


Figure 3: The wetlands / watercourses as shown in the National Wetland Inventory (v4, 2015), (Source: SANBI)

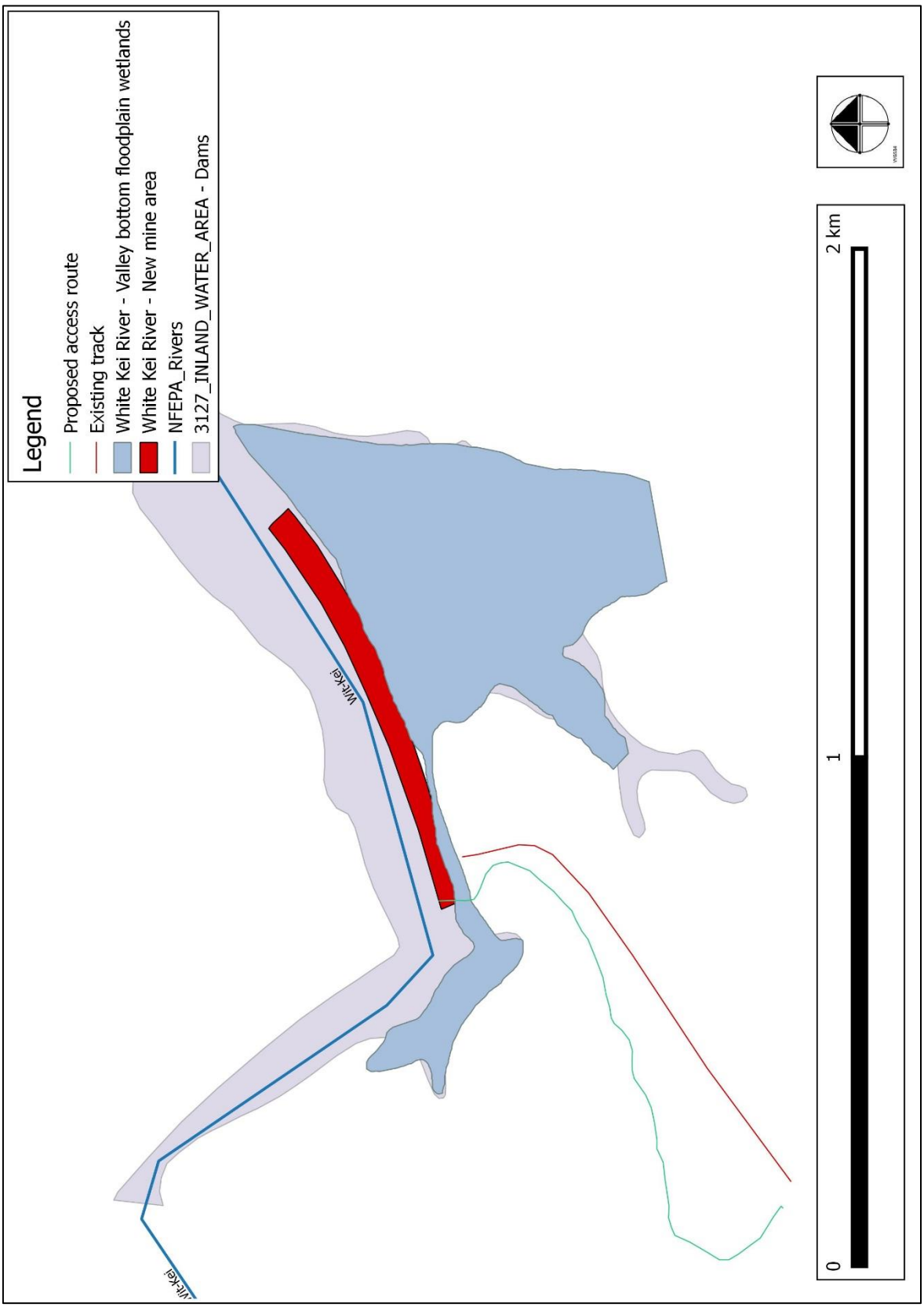


Figure 4: The delineated wetland areas in relation to the proposed mining area

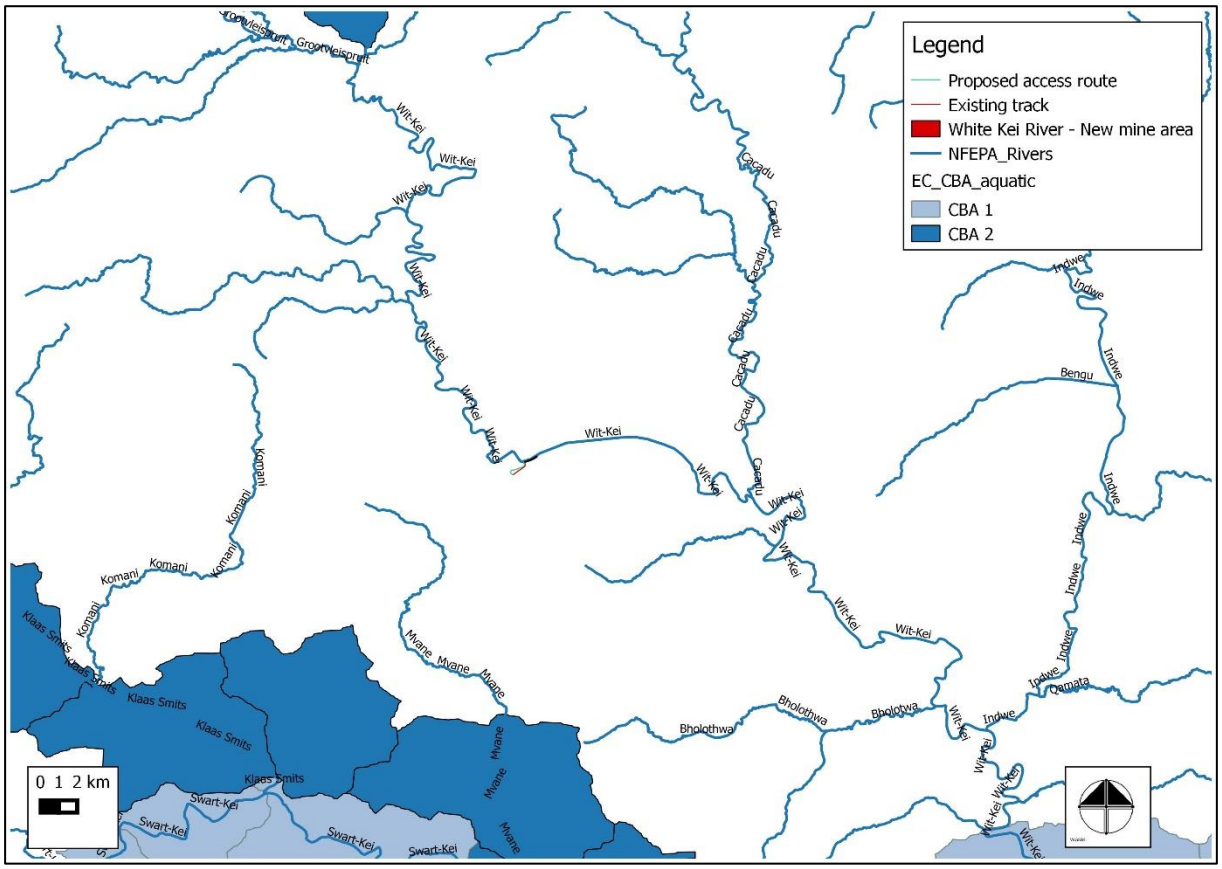


Figure 5: Aquatic Critical Biodiversity Areas as per the ECBCP (Berliner & Desmet, 2007)

5 Ecological sensitivity assessment

Based on the findings of this study, the various habitats (rivers and wetlands) could be ranked in terms of their sensitivity to development, using the following criteria, listed in order of importance, i.e. the habitat or Present Ecological State score:

Sensitivity criterion	Applicable to study area	Comment
Contained Species of Special Concern (SSC)	None observed	-
Habitat was protected under a form of legislation	Yes	Wetlands, bed and banks of a water course protected under various forms of legislation such as the National Water Act
Exhibited a high degree of biodiversity	Diversity was low	-
Exhibited a limited degree of degradation	Degradation and current land use impacts High	-
A unique habitat that is not well represented within the region	Yes	Wetlands, but these are artificial with a moderate Importance and Sensitivity
Provided an important ecosystem role or support system, e.g. ecological corridor	Yes	Habitat for various waterfowl

Thus based on the PES / EIS scores and the criteria listed above, the wetland areas although impacted and artificial do provide a unique habitat within the region. The overall sensitivity of the delineated wetlands would thus be considered **Moderate**.

6 Assessment of Impacts and Identification of Management Actions

6.1 - Impact 1: Changes to the river morphology and loss of wetlands

Issue	Impact Description	Nature of impact	Temporal	Spatial	Likelihood	Severity	Significance Pre-mitigation	Mitigation	Significance Post-mitigation
Loss of wetland vegetation and changes to the bed and bank morphology	Due to the nature of the proposed project this would start at the onset of the mining phase, but persist in the long term as the beds and banks of the watercourse / dam will the removed	Direct	Permanent	Localised	Probable	Moderate	MODERATE	As far possible the wetlands on the Southern bank should be avoided and mining should occur in the channel and northern banks. The proposed access road footprint should be kept as small as possible and be provided with suitable stormwater management features, that will prevent additional erosion within the terrestrial as well as aquatic habitats	LOW

6.3 - Impact 2: Impact of changes to water quality

Issue	Impact Description	Nature of impact	Temporal	Spatial	Likelihood	Severity	Significance Pre-mitigation	Mitigation	Significance Post-mitigation
Presently little is known about the water quality of the water courses but it is well known that the Total Suspended Sediment loads are always elevated due to the erosion that is taking place within surrounding	Due to the nature of the proposed project this would start at the onset of the mining phase, but persist in the long term as the beds and banks of the watercourse / dam will the removed. This bed and bank disturbance will also add to the suspended sediment	Direct	Permanent	Localised	Possible	Moderate	MODERATE	As far possible the wetlands on the Southern bank should be avoided and mining should occur in the channel and northern banks. Access and stockpiles should be limited to previously disturbed areas • Littering and contamination of water sources during mining must be prevented • Emergency plans must be in place in case of spillages of diesel	LOW

Issue	Impact Description	Nature of impact	Temporal	Spatial	Likelihood	Severity	Significance Pre-mitigation	Mitigation	Significance Post-mitigation
catchment This was reflected in the results obtained from the water samples taken directly upstream and downstream of the proposed mining area.	loads within the water column, but these would quickly settle out as flow velocities reduce within the impounded area of the dam							and hydraulic fluids. • All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised • Any necessary ablution facilities must be beyond the 32m buffer described previously.	

7 Conclusion and recommendations

Several wetland habitats were highlighted in this study, which could be impacted upon by the mining. Based on observations in the field it was found that with mitigation all the impacts would be rated as LOW. This was based on the consideration that the majority of the systems were either largely manipulated or located with areas that had been transformed by the creation of the Xonxa Dam.

The project has in fact the potential to enhance the functioning of the observed water courses by removing the silt and sand accumulated within the impoundment, although it is advised the wetland area shown in this study are left intact as they are current protecting what remains of the banks of the surrounding areas. Similarly, the proposed access road should also be kept as small as possible and any runoff / stormwater generated must be managed with suitable energy dissipation features to prevent further erosion of the surrounding areas. The road and the stormwater management features must be constructed in such a manner that these disturbed areas are easily rehabilitated during the closure phase of the project.

8 References

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SANBI (2009). Further Development of a Proposed National Wetland Classification System for South Africa. Primary Project Report. Prepared by the Freshwater Consulting Group (FCG) for the South African National Biodiversity Institute (SANBI).

SANBI (2009). Further Development of a Proposed National Wetland Classification System for South Africa. Primary Project Report. Prepared by the Freshwater Consulting Group (FCG) for the South African National Biodiversity Institute (SANBI).

9 Appendix 1 - Wetland delineation and assessment

During this study and due to the nature of the seasonal wetland and watercourses observed, it was decided that the accepted National Wetlands Classification System (NWCS) be adopted. This classification approach has integrated aspects of the HGM approached used in the WET-Health system as well as the widely accepted eco-classification approach used for rivers.

The NWCS (SANBI, 2009) uses hydrological and geomorphological traits to distinguish the primary wetland units, i.e. direct factors that influence wetland function. Other wetland assessment techniques, such as the DWAF (2005) delineation method, only infer wetland function based on abiotic and biotic descriptors (size, soils & vegetation) stemming from the Cowardin approach (SANBI, 2009). Several transects were sampled perpendicular to the wetlands in which information of the soils (cores) and vegetation were collected.

The NWCS has a six tiered hierarchical structure, with four spatially nested primary levels of classification (Figure 2). The hierarchical system firstly distinguishes between Marine, Estuarine and Inland ecosystems (**Level 1**), based on the degree of connectivity the particular systems has with the open ocean (greater than 10 m in depth). Level 2 then categorises the regional wetland setting using a combination of biophysical attributes at the landscape level, which operate at a broad bioregional scale. This is opposed to specific attributes such as soils and vegetation.

Level 2 has adopted the following systems:

- Inshore bioregions (marine)
- Biogeographic zones (estuaries)
- Ecoregions (Inland)

Level 3 of the NWCS assess the topographical position of inland wetlands as this factor broadly defines certain hydrological characteristics of the inland systems. Four landscape units based on topographical position are used in distinguishing between Inland systems at this level. No subsystems are recognised for Marine systems, but estuaries are grouped according to their periodicity of connection with the marine environment, as this would affect the biotic characteristics of the estuary.

Level 4 classifies the hydrogeomorphic (HGM) units discussed earlier. The HGM units are defined as follows:

- Landform – shape and localised setting of wetland
- Hydrological characteristics – nature of water movement into, through and out of the wetland
- Hydrodynamics – the direction and strength of flow through the wetland

These factors characterise the geomorphological processes within the wetland, such as erosion and deposition, as well as the biogeochemical processes.

Level 5 of the assessment pertains to the classification of the tidal regime within the marine and estuarine environments, while the hydrological and inundation depth classes are determined for the inland wetlands. Classes are based on frequency and depth of inundation, which are used to determine the functional unit of the wetlands and are considered secondary discriminators within the NWCS.

Level 6 uses of six descriptors to characterise the wetland types on the basis of biophysical features. As with Level 5, these are non hierarchal in relation to each other and are applied in any order, dependent on the availability of information. The descriptors include:

(i) Geology;

(ii) Natural vs. Artificial;

(iii) Vegetation cover type;

(iv) Substratum;

(v) Salinity; and

(vi) Acidity or Alkalinity.

It should be noted that where sub-categories exist within the above descriptors, hierarchical systems are employed, thus are nested in relation to each other.

The HGM unit (Level 4) is the **focal point of the NWCS**, with the upper levels (Figure 3 – Inland systems only) providing means to classify the broad bio-geographical context for grouping functional wetland units at the HGM level, while the lower levels provide more descriptive detail on the particular wetland type characteristics of a particular HGM unit. Therefore Level 1 – 5 deals with functional aspects, while Level 6 classifies wetlands on structural aspects.

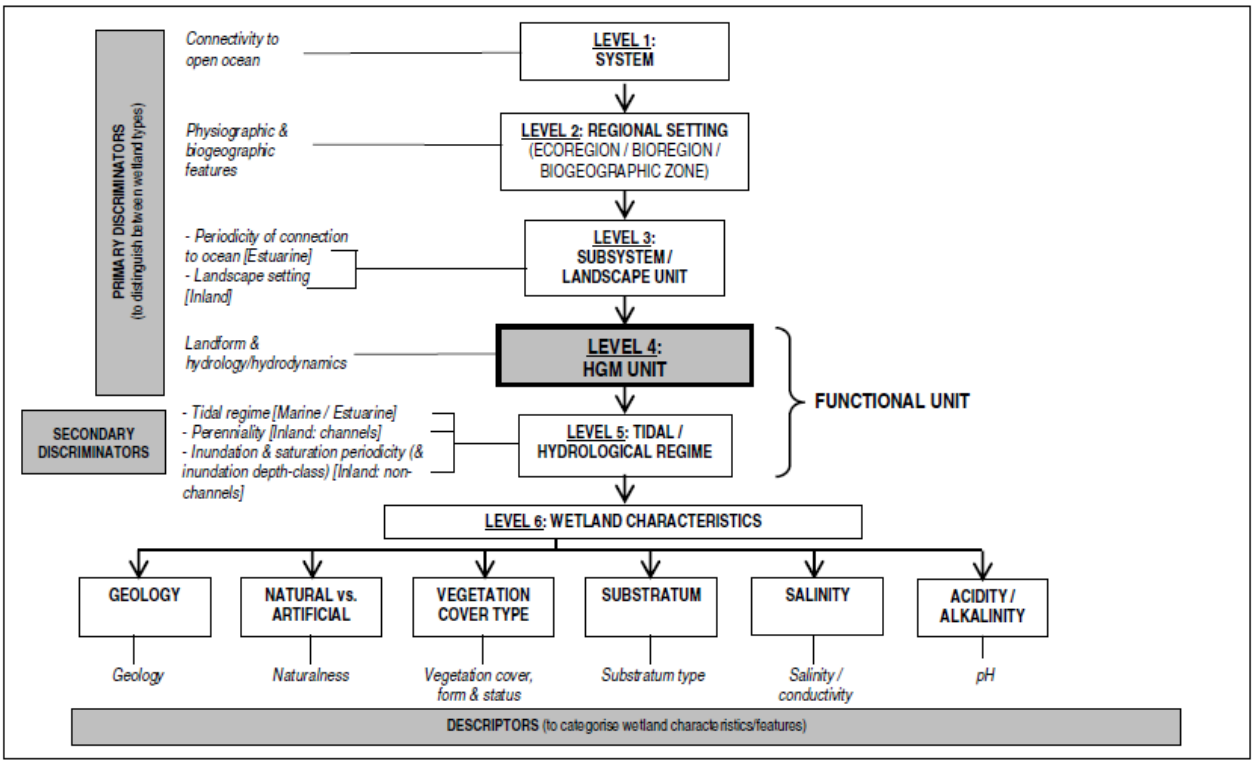

Figure 2: Basic structure of the National Wetland Classification System, showing how 'primary discriminators' are applied up to Level 4 to classify Hydrogeomorphic (HGM) Units, with 'secondary discriminators' applied at Level 5 to classify the tidal/hydrological regime, and 'descriptors' applied at Level 6 to categorise the characteristics of wetlands classified up to Level 5 (From SANBI, 2009).

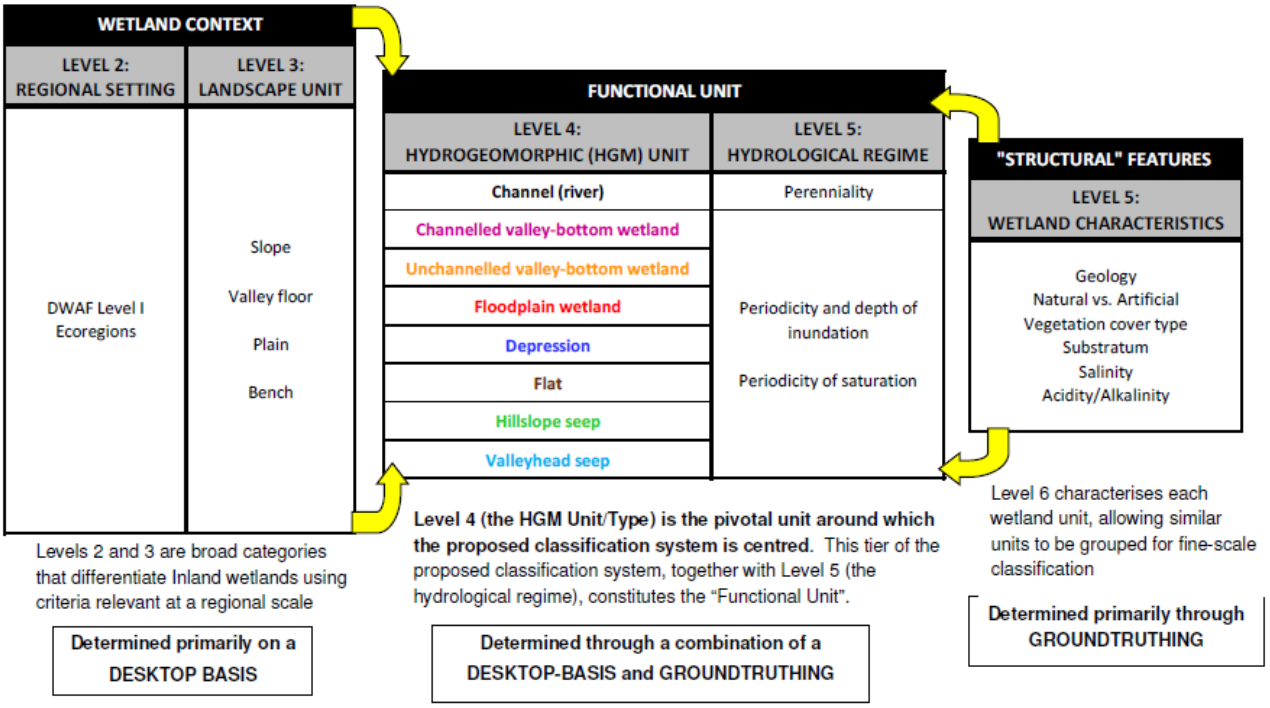

Figure 3: Illustration of the conceptual relationship of HGM Units (at Level 4) with higher and lower levels (relative sizes of the boxes show the increasing spatial resolution and level of detail from the higher to the lower levels) for Inland Systems (from SANBI, 2009).

9.1.1 Wetland condition and conservation importance assessment

To assess the Present Ecological State (PES) or condition of the observed wetlands, a modified Wetland Index of Habitat Integrity (DWAF, 2007) was used. The Wetland Index of Habitat Integrity (WETLAND-IHI) is a tool developed for use in the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP), formerly known as the River Health Programme (RHP). The output scores from the WETLAND-IHI model are presented in the standard DWAF A-F ecological categories (Table 2), and provide a score of the Present Ecological State of the habitat integrity of the wetland system being examined. The author has included additional criteria into the model based system to include additional wetland types. This system is preferred when compared to systems such as WET-Health – wetland management series (WRC 2009), as WET-Health (Level 1) was developed with wetland rehabilitation in mind, and is not always suitable for impact assessments. This coupled to degraded state of the wetlands in the study area, a complex study approach was not warranted, i.e. conduct a Wet-Health Level 2 and WET-Ecosystems Services study required for an impact assessment.

The WETLAND-IHI model is composed of four modules. The "Hydrology", "Geomorphology" and "Water Quality" modules all assess the contemporary ***driving processes*** behind wetland formation and maintenance. The last module, "Vegetation Alteration", provides an indication of the intensity of human landuse activities on the wetland surface itself and how these may have ***modified*** the condition of the wetland. The integration of the scores from these 4 modules provides an overall Present Ecological State (PES) score for the wetland system being examined. The WETLAND-IHI model is an MS Excel-based model, and the data required for the assessment are generated during a rapid site visit.

Additional data may be obtained from remotely sensed imagery (aerial photos; maps and/or satellite imagery) to assist with the assessment. The interface of the WETLAND-IHI has been developed in a format which is similar to DWAF's River EcoStatus models which are currently used for the assessment of PES in riverine environments.

Conservation importance of the individual wetlands was based on the following criteria:

- Habitat uniqueness
- Species of conservation concern
- Habitat fragmentation with regard ecological corridors
- Ecosystem service (social and ecological)

The presence of any or a combination of the above criteria would result in a HIGH conservation rating if the wetland was found in a near natural state (high PES). Should any of the habitats be found modified the conservation importance would rate as MEDIUM, unless a Species of conservation concern was observed (HIGH). Any systems that was highly modified (low PES) or had none of the above criteria, received a LOW conservation importance rating. Wetlands with HIGH and MEDIUM ratings should thus be excluded from development with incorporation into a suitable open space system, with the maximum possible buffer being applied. Wetlands which receive a LOW conservation importance rating could be included into stormwater management features, but should not be developed so as to retain the function of any ecological corridors.

10 Appendix 2 – Water Quality Results

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2016/05/03

ANALYTICAL REPORT

OUR REF:	SCHERMAN COLLOTY & ASSOCIATES
COMPANY NAME:	SCHERMAN COLLOTY & ASSOCIATES
CONTACT ADDRESS:	1 ROSSINI RD PARI PARK PORT ELIZABETH
CONTACT PERSON:	BRIAN COLLOTY
SAMPLE TYPE:	SURFACE WATER / RIVER
DATE SUBMITTED:	2016/03/16

Determinand	Units	Method No	Results	
			2623/16 WHITE KEI UPSTREAM 1	2623/16 WHITE KEI DOWNSTREAM
Chloride	mg Cl/l	16	24	14
*E. coli**	colonies per 100ml	31	1	2
Electrical conductivity at 25°C	mS/m	2	54	57
Nitrate*	mg N/l	Calc.	<0.1	<0.1
pH at 25°C	pH units	1A	7.8	7.9
Sodium	mg Na/l	6A	24	15
Sulphate	mg SO_4/l	67	19.0	18.2
Total Suspended Solids	mg/l	12	200	241
Total coliforms*	colonies per 100ml	31	100	10

Comment:
Bacteriological samples were analysed at our satellite laboratory in Port Elizabeth.

Technical Signatory: Chemistry_____ Bacteriology_____

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