

FRESHWATER ASSESSMENT FOR PERIODIC MAINTENANCE OF DR 1797 NEAR KURLAND IN THE WESTERN CAPE

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EXECUTIVE SUMMARY

The Western Cape Government's Department of Transport and Public Works proposes to undertake periodic maintenance works on DR 1797 near Kurland in the Western Cape. The work will cover upgrades to the existing gravel road that will be tarred from km 0.00 to km 4.87. The study area is located within the K60E quaternary catchment, with a small portion near the N2 Highway being located in quaternary catchment K70A. These catchments are drained by the Whiskey Creek Tributary of the Keurbooms River and the Buffels Tributary of the Matjies River respectively. A number of artificial wetland areas occur along the DR 1797 that are associated with dams within the agricultural areas.

The DR1797 road is located in a wider area mapped of very high aquatic biodiversity due to the Aquatic Critical Biodiversity Areas (CBAs), Freshwater Ecosystem Priority Area (FEPA) Rivers, Wetlands and Estuaries as well as Strategic Water Source Areas occurring in this wider area. The catchment of the Whiskey Creek Tributary of the Keurbooms River is mapped as FEPA River Sub-catchment, while the catchment of the Buffels/Matjies River Catchment is not mapped. Farm dams near the road have been mapped as artificial FEPA Wetlands. The minor tributaries of Whiskey Creek Tributary at the road are all mapped as aquatic ESAs. The road is also located in a National Strategic Water Source Area (Tsitsikamma) and a Sub-national Groundwater Strategic Water Source Area. The proposed works on the road will however not impact on the areas mapped as FEPA rivers or wetlands, aquatic CBAs, or the strategic water source areas.

The watercourses along the DR1797 road are in a largely to severely modified state, particularly as a result of indigenous vegetation removal from within the riparian zone and the subsequent invasion of invasive alien vegetation. The ecological importance and sensitivity of the Whiskey Creek and Buffels Tributaries is Moderate to High. The recommended Target Ecological Categories for the watercourses is moderately modified (C category).

Most of the aquatic habitat that the DR1797 road crosses comprise of highly modified watercourse channels and artificial wetlands related to instream dams within these watercourses. Disturbance of these aquatic features is thus not deemed to be significant. The disturbance of aquatic habitat will also provide an opportunity for invasive alien plants to proliferate. This would however largely occur within the road reserves that are regularly maintained.

Thus, considering that the proposed activities are largely improvements to the existing road in terms of upgrading the existing culvert structures, one can expect that the cumulative impact of this activity on the aquatic habitat will be of a low to very low significance short term impacts and in many cases, positive over the longer term. While these impacts to the freshwater ecosystems are each of a low significance it is essential that they be adequately mitigated to minimise the potential cumulative impacts.

All of the proposed activities pose a low risk for the construction and operations phases and can potentially be authorised by means of the General Authorisations for Section 21(c) and (i) water uses.

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1. BACKGROUND

The Western Cape Government's Department of Transport and Public Works proposes to upgrade DR 1797 near Kurland in the Western Cape. The existing gravel road is proposed to be tarred from km 0.00 to km 4.87. The study area is located across the K60E quaternary catchment, with a small section within K70A. These quaternary catchments are drained by the Whiskey Creek Tributary of the Keurbooms River and the Buffels Tributary of the Matjies River. A number of artificial wetland areas occur along the road that are associated with dams within the adjacent agricultural areas. This report assesses these aquatic features and discusses the potential impacts of the proposed works upon them.

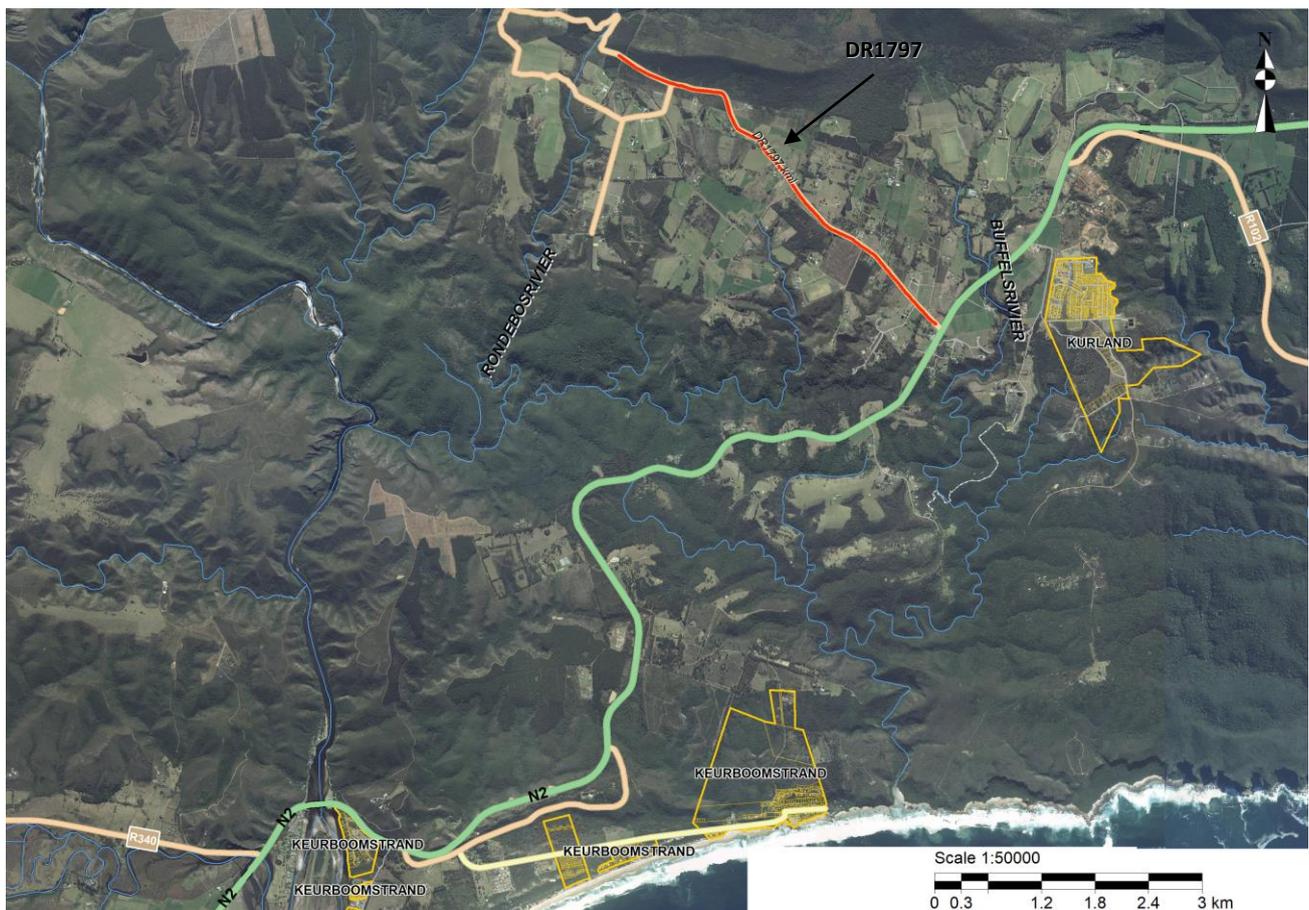


Figure 1. Locality map for the proposed road works (red lines) (CapeFarmMapper, 2020)

Table 1: Summary of key information related to the water resources in the study area

Descriptor	Name / details	Notes
Water Management Area	Fish to Tsitsikamma; Gouritz	
Catchment Area	Whiskey Creek/Keurbooms, Buffels/Matjies	
Quaternary Catchment	K60E (Whiskey Creek /Keurbooms) K70A (Buffels/Matjies)	
Present Ecological state	Whiskey Creek /Keurbooms and Buffels/Matjies: B (Largely Natural)	DWS PES and EI&ES national rapid assessments (2012)
Ecological Importance	Whiskey Creek /Keurbooms and Buffels/Matjies Rivers: High	
Ecological Sensitivity	Whiskey Creek /Keurbooms and Buffels/Matjies Rivers: Very High	
Latitude	33°57'17.02"S	Start of road works DR1797 (Kurland N2 Intersection)
Longitude	23°28'29.24"E	
Latitude	33°55'48.79"S	End of road works DR1797 (At secondary road, Redford)
Longitude	23°26'33.24"E	

2. TERMS OF REFERENCE

The agreed upon scope of work for this project is as follows:

1. Specialist wetland assessment and delineation.
2. Assessment of engineering method statements to ensure viable mitigation measures.
3. Completion of the risk assessment matrix in accordance of the requirements of Section 21 (c) and (i) published in GG No. 40229 on 26 August 2016.
4. The documents are to be completed by a SACNASP registered professional.

In addition, it is anticipated that a Basic Assessment process will be required to obtain environmental authorisation. The specialist assessment study is thus required to assessment the environmental impacts of the proposed upgrade of DR 1797 and to provide mitigation measures to reduce the environmental impact.

3. APPROACH TO THE STUDY AND STUDY LIMITATIONS AND ASSUMPTIONS

Input into this report was informed by a combination of desktop assessments of existing aquatic ecosystem information for the study area and catchment, as well as by a more detailed site assessment of the aquatic ecosystems along the road to be upgraded. During the field visit undertaken in May 2019, the characterisation and integrity assessments of the aquatic ecosystems were undertaken. The site assessments were undertaken autumn when most of the aquatic features were relatively dry however this was not seen to be a constraint to the assessment.

Mapping of the aquatic ecosystems was undertaken using a Garmin Colorado 300 GPS and mapped in Google Earth and PlanetGIS Professional. The SANBI BiodiversityGIS and CapeFarmMapper websites were also consulted to identify any constraints in terms of fine-scale biodiversity conservation mapping as well as possible aquatic ecosystems mapped in the Freshwater Ecosystem Priority Areas maps. This information/data was used to inform the water resource protection related recommendations.

Limitations and uncertainties often exist within the various techniques adopted to assess the condition of ecosystems. The following techniques and methodologies were utilized to undertake this study:

- Analysis of the aquatic ecosystems was undertaken at a rapid level according to nationally developed methodologies that do not involve detailed habitat and biota assessments.
- The guideline document, "A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas" document, as published by DWAF (2005) was followed for the delineation of the wetland areas.

- The wetlands were subsequently classified according to their hydro-geomorphic determinants based on a classification system devised by Kotze *et al* (2004) and SANBI (2009). Notes were made on the levels of degradation in the wetlands based on field experience and a general understanding of the types of systems present.
- A Present Ecological State (PES) assessment was conducted for each wetland identified and delineated within the study area.
- The river health assessment was undertaken according to the Index of Habitat Integrity.
- The ecological importance and sensitivity assessment of the aquatic features was conducted according to the guidelines as developed by DWAF (1999).

The level of aquatic assessment and environmental water requirement determination undertaken was considered to be adequate for this study.

4. USE OF THIS REPORT

This report reflects the professional judgment of its author. The full and unedited content of this should be presented to the client. Any summary of these findings should only be produced in consultation with the author.

5. OVERVIEW OF THE PROPOSAL

5.1. OVERVIEW OF THE STUDY AREA

The study area is located near Kurland, east of Plettenberg Bay, within the Garden Route District Municipality in the Western Cape. The surrounding topography comprises of a number of low hills with the land use activities comprising mostly of farmed areas. The watercourses and associated wetlands in the area are similarly modified, being more impacted within the agricultural areas.

5.2. ACTIVITY DESCRIPTION

The proposed works comprises of the following works:

- Upgrading of DR1797 from km 0.0 to km 4.8 from a Class 4 gravel road to a Class 4 surfaced road (two 3.4 m wide lanes with a 300 mm gravel shoulder on each side).
- Both vertical and horizontal realignment is required although the intention is that the works should largely stay within the existing fence line/road reserve.

- Subsoil drains and unlined side drains are proposed where required.
- All pipe culverts and box culvert barrels must be replaced and where necessary the hydraulic capacity improved to accommodate a 1 in 2-year flood event. The culvert inlet and outlet levels must be shaped to ensure free drainage along the road. The third structure in particular will need to be upgraded to a 5m wide by 3m high culvert with a length of 20 m.

The construction is proposed to be undertaken in four phases:

- The 1st phase will comprise of upgrade to the section of road between km 0.00 and km 1.43. Temporary widening to accommodate traffic will be on the LHS (south).
- The 2nd phase will comprise of upgrade to the section of road between km 1.43 and km 2.70. Temporary widening to accommodate traffic will be on the RHS (north).
- The 3rd phase will comprise of upgrade to the section of road between km 2.70 and km 3.64. Temporary widening to accommodate traffic will be on the LHS (south).
- The 4th phase will comprise of upgrade to the section of road between km 3.64 and km 4.87. Temporary widening to accommodate traffic will be on the LHS (south).



Figure 2. Locality map showing section of road where land expropriation would be required for the proposed works

6. LEGAL REQUIREMENTS

The following Acts, regulations and ordinances are applicable to the freshwater aspects of the proposed project:

6.1. NEMA AND ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS

The National Environmental Management Act (NEMA), Act 107 of 1998, is the overarching piece of legislation for environmental management in South Africa and includes provisions that must be considered in order to give effect to the general objectives of integrated environmental management. These provisions are contained in Section 24 (4)(a)(b) of the Act and will be considered during the EIA process. Activities listed in terms of Chapter 5 of NEMA in Government Notice No. R. 983, 984 and 985, dated 4 December 2014, as amended in 2017, trigger a mandatory Basic Assessment, or even a full scoping Environmental Impact Assessment process, prior to development. Many of the listed activities relate to activities within or adjacent to aquatic ecosystems. The proposed upgrades to the DR 1797 were determined to require and Environmental Authorisation.

6.2. NATIONAL WATER ACT, 1998 (ACT NO. 36 OF 1998)

The purpose of the National Water Act is to provide a framework for the equitable allocation and sustainable management of water resources. Both surface and groundwater sources are redefined by the Act as national resources which cannot be owned by any individual, and rights to which are not automatically coupled to land rights, but for which prospective users must apply for authorisation and register as users. The National Water Act also provides for measures to prevent, control, and remedy the pollution of surface and groundwater sources.

REGULATIONS REQUIRING THAT A WATER USER BE REGISTERED, GN R.1352 (1999)

Regulations requiring the registration of water users were promulgated by the then Minister of the Department of Water Affairs (DWA) (now the Department of Water and Sanitation) in terms of provision made in section 26(1)(c), read together with section 69 of the National Water Act, 1998. Section 26(1)(c) of the Act allows for registration of all water uses including existing lawful water use in terms of section 34(2). Section 29(1)(b)(vi) also states that in the case of a general authorisation, the responsible authority may attach a condition requiring the registration of such water use. The Regulations (Art. 3) oblige any water user as defined under section 21 of the Act to register such use with the responsible authority and effectively to apply for a Registration Certificate as contemplated under Art.7(1) of the Regulations.

GENERAL AUTHORISATION IN TERMS OF S. 39 OF THE NATIONAL WATER ACT

According to the preamble to Part 6 of the NWA, *“This Part established a procedure to enable a responsible authority, after public consultation, to permit the use of water by publishing general authorisations in the Gazette...”* *“The use of water under a general authorisation does not require a licence until the general authorisation is revoked, in which case licensing will be necessary...”*

The General Authorisations for Section 21 (c) and (i) water uses (impeding or diverting flow or changing the bed, banks, or characteristics of a watercourse) as defined under the NWA have recently been revised (Government Notice R509 of 2016). The proposed works within or adjacent to river channel or its associated wetland areas are likely to change the characteristics of the associated freshwater ecosystems and may therefore require authorization. Determining if a water use licence is required for these water uses is now determined based on the risk of the proposed activities degrading the ecological status of a watercourse. A low risk of impact could be authorised in terms of a General Authorisations (GA). A risk assessment for the proposed project is included in this freshwater impact assessment report.

7. DESCRIPTION OF THE STUDY AREA

7.1. PHYSICAL CHARACTERISTICS

The section of roadworks is located on coastal strip and stretches eastwards from Whiskey Creek in the Keurbooms Catchment to cross the Buffels River. The general topography comprises of low hills. The altitude of the works ranges from approximately 295 m above mean sea level (mamsl) and drops down to 235 mamsl at the intersection with the N2 Highway near Kurland (Figure 3). The gradient is relatively flat and in general slopes towards the coast in the south with shallow valleys associated with the small watercourses crossed by the road.

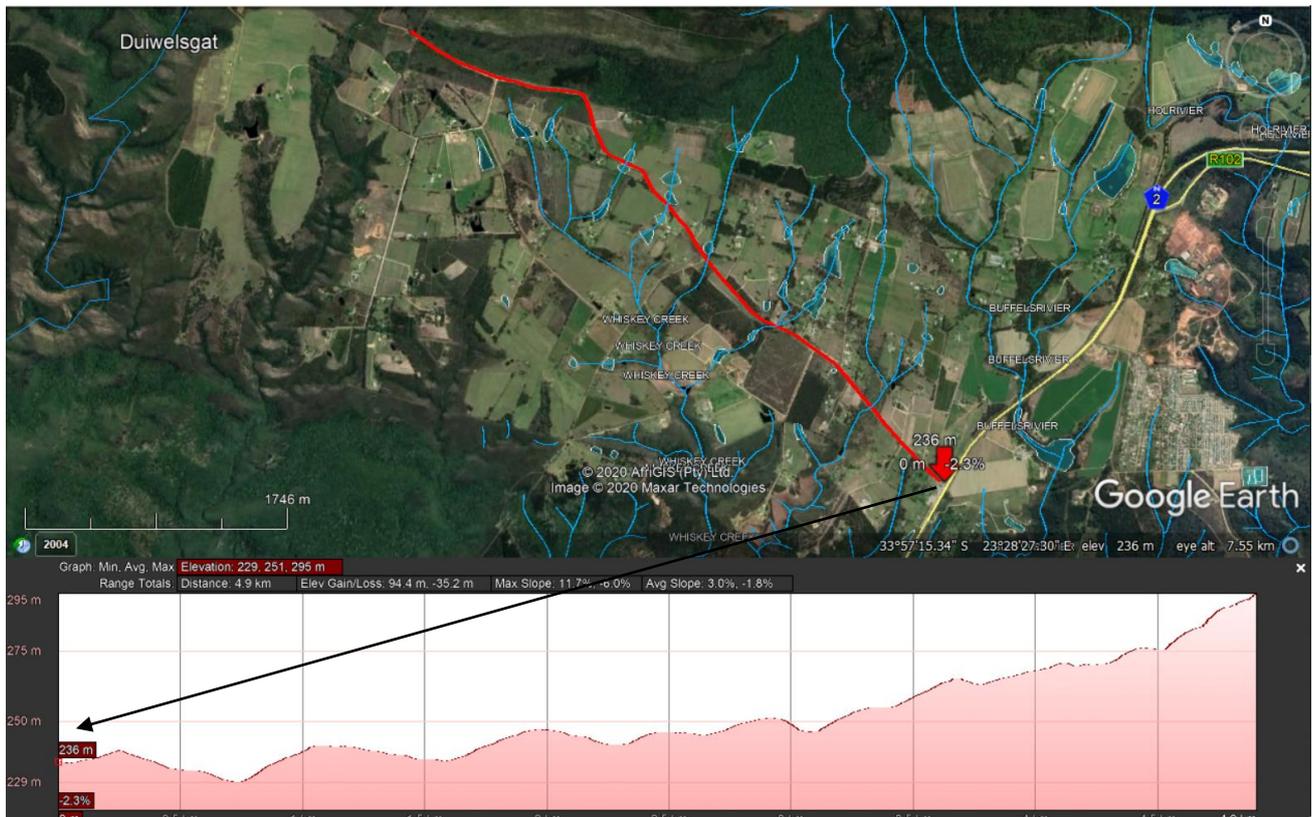
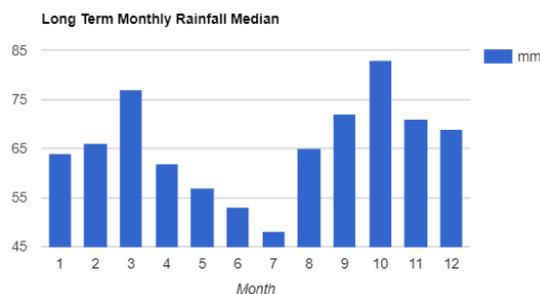


Figure 3. Google Earth image of the study area with the mapped watercourses and the associated elevation profile for the road where the starting point for the road is associated with the left-hand side of the profile.

7.2. CLIMATE

The area has a mean annual precipitation of about 870 mm, with higher rainfall in March and October (75 to 85 mm) and lower rainfall in July (46 mm) (Figure 4). Temperatures are higher in January/February (22°C) and lower in July and August (14°C). Flow in the watercourses differs slightly from the rainfall (Figure 5) due to the fact that the runoff is largely generated in the mountainous areas in the north and contributed to by groundwater. Construction works in the watercourses should be avoided in the higher flowing period of August to November / December.

Long Term Climate Graph (1950 - 2000)



Long Term Climate Graph (1950 - 2000)

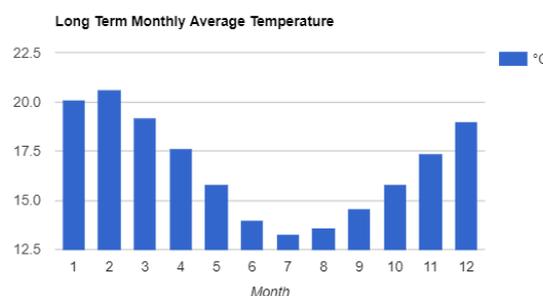


Figure 4. Average monthly rainfall (left), temperature (right) (CapeFarmMapper, 2019) for the area

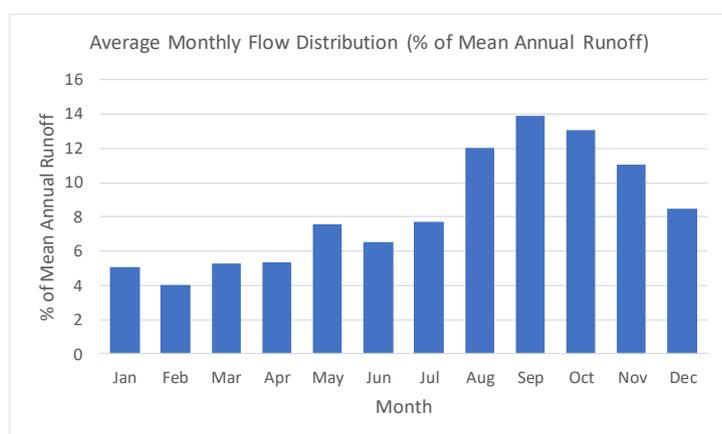


Figure 5. Average monthly flow distribution in the watercourses in the area (bottom)

7.3. GEOLOGY AND SOIL

The study area the geology of the area is dominated in the west by mainly quartzitic sandstone, with subordinate shale, of the Table Mountain Group, Cape Supergroup. These areas are rocky with limited soils. Prisma-cutanic and/or pedocutanic diagnostic horizons are dominant in the soils that do occur (Figure 6). The B horizons are mainly not red, and the soils are highly erodible.

7.4. FLORA

Mucina and Rutherford (2006) mapped vegetation in South Africa on a national scale. Due to indigenous vegetation removal, this mapping was guided by habitat determinants such as soil type. Due to the large scale at which this mapping was conducted, the finer scale boundaries of mapped units are often not always very accurate. Finer scale determinants (such as moisture regimes, slope, aspect etc.) are often not taken account. The mapping has been updated by the South African National Biodiversity Institute (SANBI) in 2009,

2012 and 2018. The vegetation map in Figure 7 shows the 2018 update of the mapping of Mucina and Rutherford (2006).

The mapped indigenous vegetation type for the area in which the road upgrade is to be undertaken is Tsitsikamma Sandstone Fynbos (purple area in Figure 7). This vegetation type occurs on relatively low mountains and comprises of a dense medium to tall proteoid and ericaceous fynbos shrubland with fynbos thicket in wetter areas. The vegetation type is considered to be Least Threatened.

A small patch of Southern Afrotemperate Forest (dark green area in Figure 7) occurs along the northern extent of the road. This vegetation type typically occurs within the narrow coastal strip between Humansdorp in the east and Mossel Bay and comprises of tall, multi-layered afrotemperate forests. The vegetation type is still widespread and is considered to be Least Threatened.

The dominant indigenous plant species along the watercourses in the wider area comprises of *Afrocarpus falcatus*, *Cunonia capensis*, *Podocarpus elongatus*, *P. latifolius*, *Ilex mitis*, *Sideroxylon inerme*, *Olea capensis* subsp. *macrocarpa*, *Olea europaea* subsp. *Africana*, *Buddleja saligna*, *Ochna arborea* var. *arborea*, *Diospyros whyteana*, *Virgilia divaricata*, *Passerina corymbosa*, *Halleria lucida*, *Searsia crenata*, *S. glauca*, *S. lucida*, *Stoebe plumosa*, *Strelitzia alba*, *Rhoicissus tomentosa*, *Chrysanthemoides monilifera*, *Calopsis paniculatus*, *Blechnum capense*, *B. tabulare*, *Pteridium aquilinum*, *Cliffortia strobilifera*, *C. odorata*, *Psoralea affinis*, *Pronium serratum*, *Carpha glomerata*, *Isolepis diabolica*, *Juncus effusus*, *J. kraussi*, *J. capensis*, *Ficinia nodosus*, *Paspalum vaginatum*, *Stenotaphrum secundatum*, *Sporobolus virginicus* and *Triglochin bulbosa*.

Most of the watercourses in the study area have however been invaded with exotic grasses and alien trees and shrubs (mostly River gums *Eucalyptus camaldulensis*, black wattle *Acacia mearnsii*, blackwood *A. melanoxylon*, bugweed *Solanum mauritianum* and bramble *Rubus cuneifolius*).

7.5. AQUATIC FEATURES

The study area is located within the K60E quaternary catchment, with a small portion near the N2 Highway being located in quaternary catchment K70A. These catchments are drained by the Whiskey Creek Tributary of the Keurbooms River and the Buffels Tributary of the Matjies River respectively. A number of artificial wetland areas occur along the DR 1797 that are associated with dams within the agricultural areas (Figure 8). These aquatic ecosystems were ground-truthed during the site visit and are discussed in more detail in the following section.

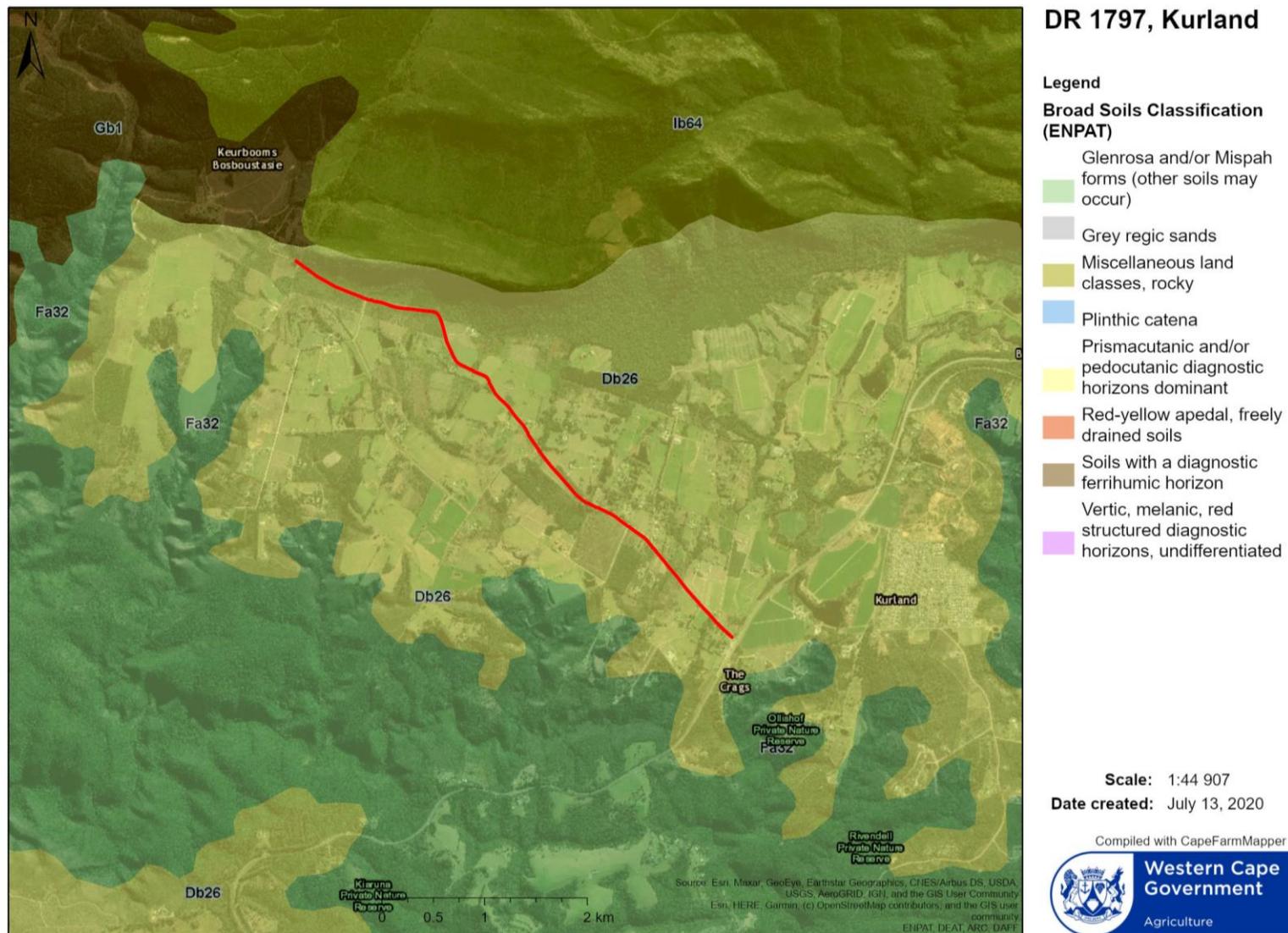


Figure 6. Soil map for the area (red line represents road to be upgraded) (ENPAT data obtained from CapeFarmMapper in July 2020)



Figure 7. Vegetation map for the area (red line represents DR 1797 to be upgraded) (SANBI 2018 VegMap obtained from CapeFarmMapper in July 2020)

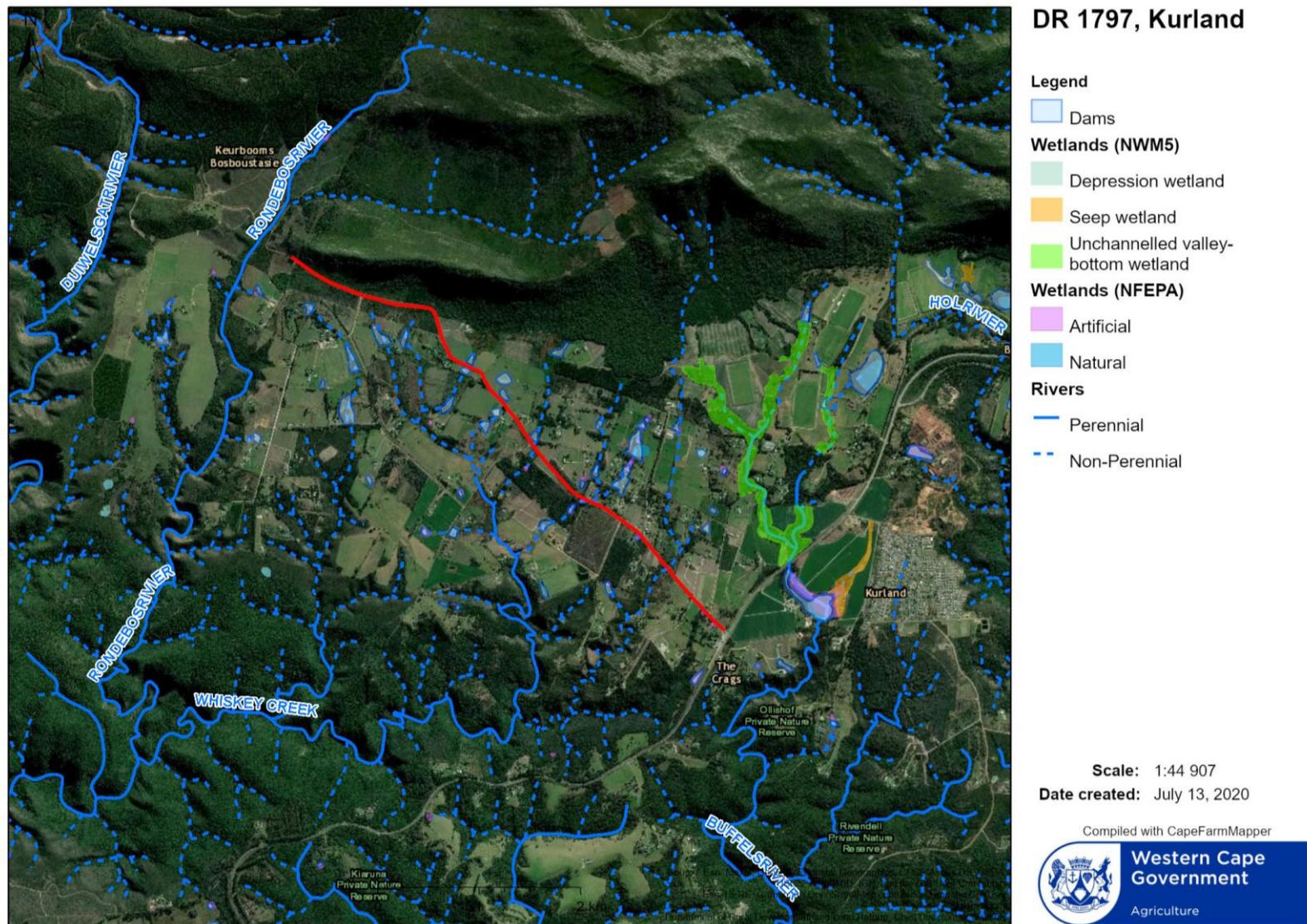


Figure 8. The mapped rivers and wetlands (CSIR NFEPA wetlands (2011) and National Wetland Map 5, accessed in July 2020 from CapeFarmMapper)

7.6. LAND USE

The study area will primarily be located within the road reserve of the road being upgraded. The 2017 National Landcover mapping (Figure 9) shows the areas surrounding the DR 1797 as comprising of cultivated (pink areas) and built up areas (yellow areas) with some natural vegetation cover remaining. The wider area to the east comprises of natural forested areas and shrubland (light and dark green areas) with patches of planted forest (orange areas). Much of this area comprises of the formally protected Tsitsikamma National Park. The built-up areas of Kurland Village and Nature's Valley occur to the east the road to be upgraded.

7.7. BIODIVERSITY CONSERVATION IMPORTANCE

There are two freshwater biodiversity conservation mapping initiatives of relevance to the study area, the national FEPA mapping and the 2017 Western Cape Biodiversity Spatial Plan (WCBSP).

FEPAs are intended to provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. FEPAs were determined through a process of systematic biodiversity planning and were identified using a range of criteria for serving ecosystems and associated biodiversity of rivers, wetlands, and estuaries. The catchment of the Whiskey Creek Tributary of the Keurbooms River is mapped as FEPA River Sub-catchment, while the catchment of the Buffels/Matjies River Catchment is not mapped (Figure 10). This would imply that the Whiskey Creek Tributary should where possible be rehabilitated. Farm dams near the road have been mapped as artificial FEPA Wetlands.

The WCBSP provides a map of the areas of biodiversity importance for the entire province, covering terrestrial, freshwater, coastal and estuarine ecosystems. The map is a product of a provincial wide systematic biodiversity plan that delineates Critical Biodiversity Areas (CBA) (Terrestrial and Aquatic), Ecological Support Areas (ESA) (Critical and Other), Other Natural Remaining Areas for each local authority within the province. These are areas that require safeguarding to ensure the continued existence and functioning of species and ecosystems, including the delivery of ecosystem services. The minor tributaries of Whiskey Creek Tributary at the road are all largely mapped as aquatic ESAs in the WCBSP, most of which requires restoration (Figure 11). In addition, the study area is located within the Garden Route Biosphere Reserve and adjacent to the Garden Route National Park and the Whiskey Creek Nature Reserve. The proposed works should aim at reducing impacts upon the aquatic ESAs.

The DR1797 road is located in a wider area mapped of very high aquatic biodiversity due to the Aquatic CBAs, FEPA Rivers, Wetlands and Estuaries as well as Strategic Water Source Areas occurring in this wider area. The Aquatic CBAs and FEPA mapped features are discussed above. While the road is located in a National Strategic Water Source Area (Tsitsikamma) and a Sub-national Groundwater Strategic Water Source Area, the proposed works on the road will not impact on these areas as strategic water source areas.

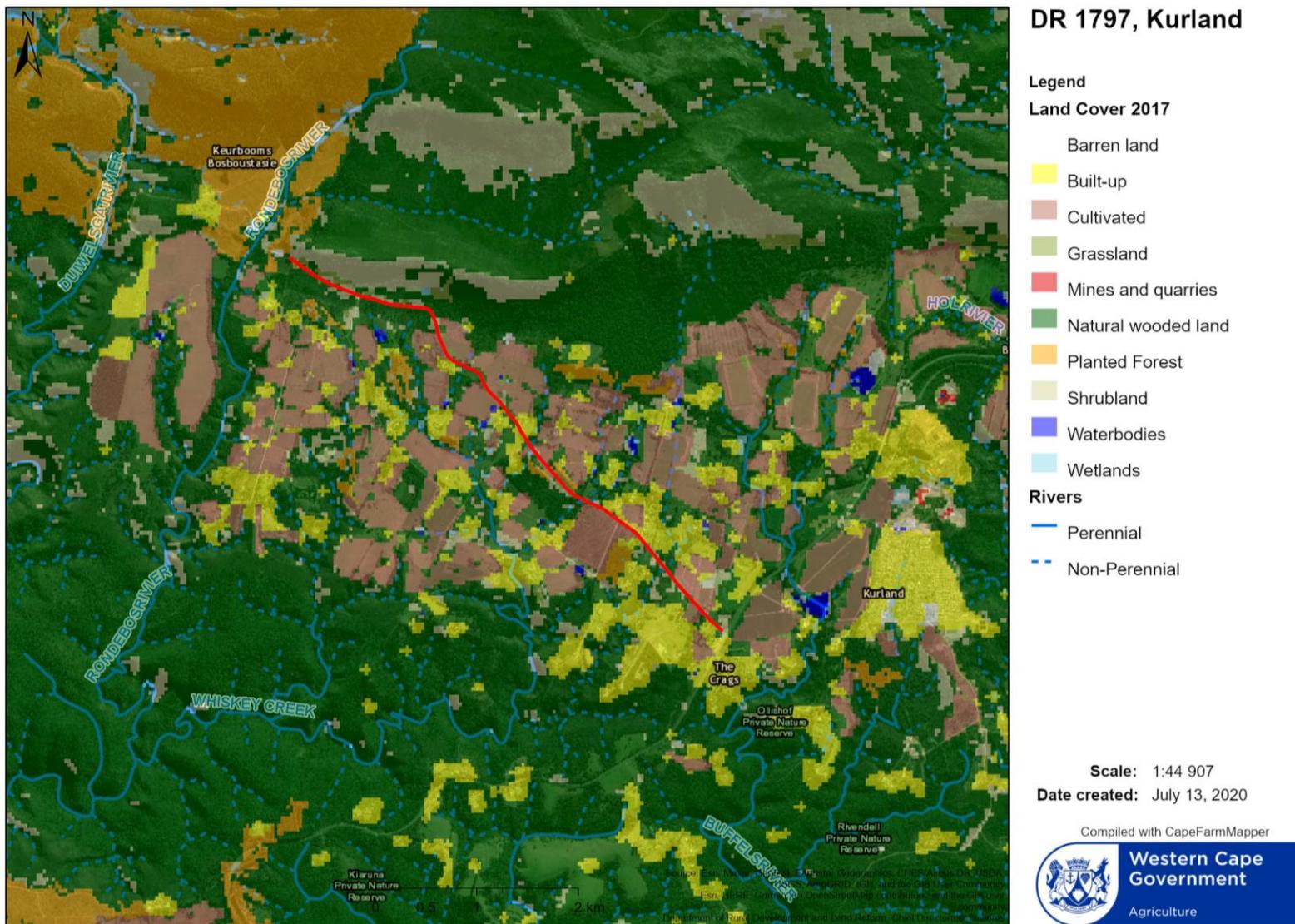


Figure 9: Land cover map (NGI 2017) for the surrounding area (CapeFarmMapper, 2020)

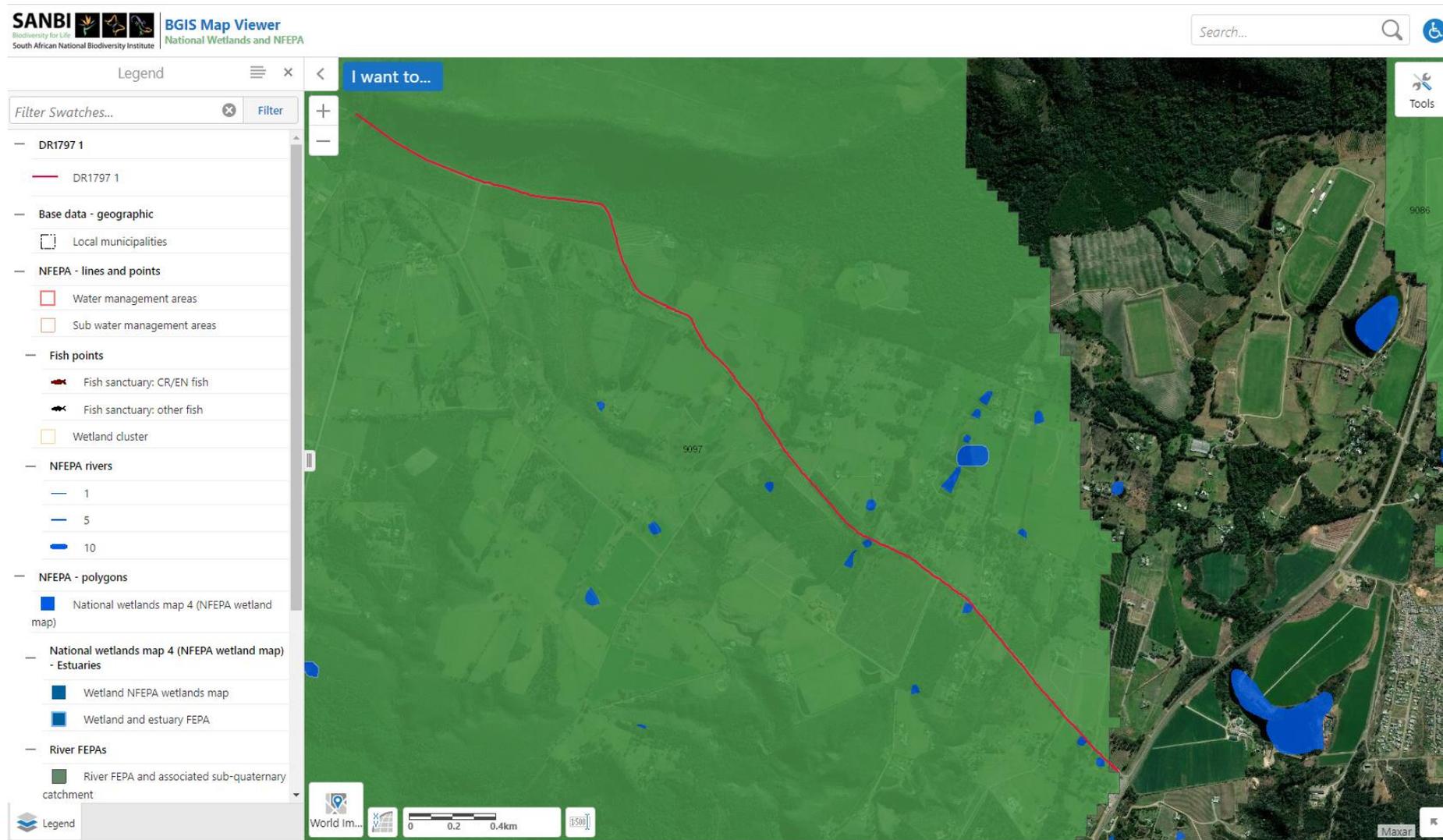


Figure 10. Freshwater Ecosystem Protected Areas map for the area (CSIA NFEPA maps, downloaded from SANBI BiodiversityGIS in July 2020)

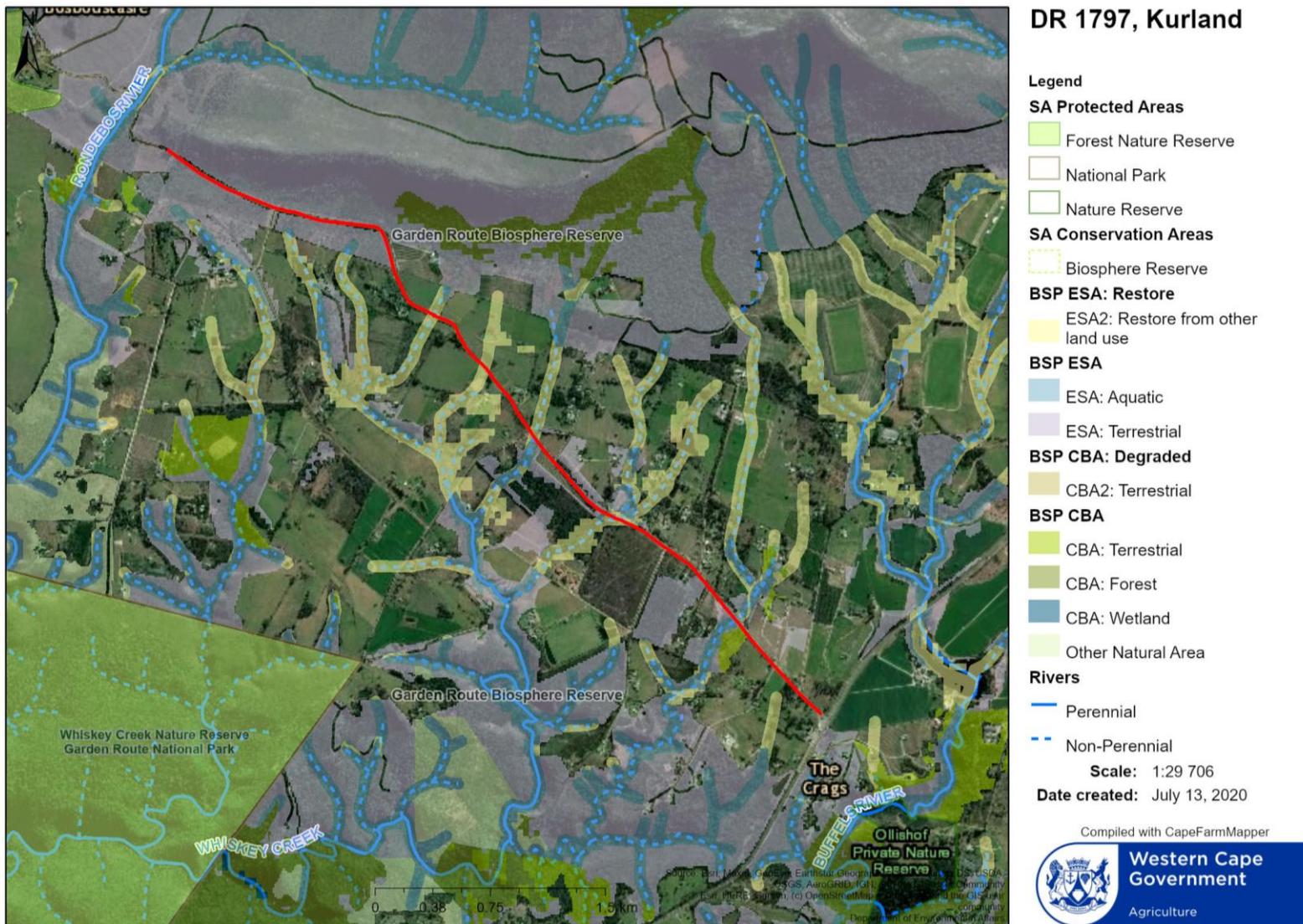


Figure 11. Western Cape Biodiversity Framework map for the area (downloaded for CapeFarmMapper July 2020)



Screening Report Map



21 July 2020



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Figure 12. Aquatic Biodiversity Screening Map for DR1797 (SANBI Screening Tool, July 2020)

8. FRESHWATER ASSESSMENT

This section comprises of an assessment of the ecological condition and the ecological importance and sensitivity of the Whiskey Creek Tributary of the Keurbooms River as well as its tributaries that are crossed by the DR1797. The Buffels Tributary of the Matjies River has also been assessed as the road occurs within the upper catchment of the river, however none of the watercourses associated with this river are crossed by the road. No wetland assessment has been undertaken as all the wetland areas within the study area are artificial and associated with dams constructed in the Whiskey Creek Tributary.

8.1. ASSESSMENT OF THE RIVERS AND TRIBUTARIES

In order to assess the ecological condition and ecological importance and sensitivity of the watercourses that are crossed by DR1797, it is necessary to understand how the watercourses might have appeared under unimpacted conditions. This is achieved through classifying the watercourses according to their ecological characteristics, in order that it can be compared to ecologically similar watercourses.

River typing or classification involves the hierarchical grouping of rivers into ecologically similar units so that inter- and intra-river variation in factors that influence water chemistry, channel type, substratum composition and hydrology are best accounted for. Any comparative assessment of river condition should only be done between rivers that share similar physical and biological characteristics under natural conditions. Thus, the classification of rivers provides the basis for assessing river condition to allow comparison between similar river types. The primary classification of rivers is a division into Ecoregions. Rivers within an ecoregion are further divided into sub-regions.

Ecoregions: groups of rivers within South Africa, which share similar physiography, climate, geology, soils, and potential natural vegetation. For the purposes of this study, the ecoregional classification presented in DWAF (1999), which divides the country's rivers into 18 ecoregions, was used. The study area lies within the South Eastern Coastal Belt Ecoregion with its associated characteristics (Table 2).

Table 2. Characteristics of the Southern Coastal Belt Ecoregion:

Main Attributes	Characteristics (dominant types in bold)
Terrain Morphology: Broad division	Plains; Low Relief (limited); Plains Moderate Relief; Closed Hills; Mountains; Moderate and High Relief
Vegetation types	Dune Thicket; Mesic Succulent Thicket ; Valley Thicket; Coastal Grassland; Grassy Fynbos (limited); Eastern Thorn Bushveld; Mountain Fynbos; South and South West Coast Renosterveld; Afromontane Forest ;
Altitude (m a.m.s.l)	0-500; 500-700 limited
MAP (mm)	300 to 1000
Rainfall seasonality	All year to very late summer
Mean annual temp. (°C)	14 to 20
Median annual simulated runoff (mm) for quaternary catchment	10 to >250

Sub-regions: sub-regions (or geomorphological zones) are groups of rivers or segments of rivers, within an ecoregion, which share similar geomorphological features, of which gradient is the most important. The use of geomorphological features is based on the assumption that these are a major factor in the determination of the distribution of the biota.

Table 3. Geomorphological and Physical features for the river and tributaries within the study area

River	Whiskey Creek Tributary	Buffels Tributary
Geomorphological zone	Upper Foothill	Lower foothill
Lateral mobility or entrenchment	Unconfined	Semi-confined
Channel form	Simple channel	Simple channel
Channel pattern	Single thread: low sinuosity	Single thread: low sinuosity
Channel type	cobbles with alluvium	cobbles with alluvium
Dominant biotopes	Run-riffle with pools	Run-riffle with pools
Hydrological Type	Seasonal	Seasonal

8.1.1. DESCRIPTION OF FRESHWATER FEATURES

WHISKEY CREEK TRIBUTARY OF THE KEURBOOMS RIVER

The DR1797 crosses the upper reaches of the Whiskey Creek Tributary. The river arises as a number of smaller streams off of the southern slopes of the foothills of the Langkloof Mountains. Landcover on the slopes comprises of pine plantations and natural areas. As the watercourses flow onto the flatter plateau where the road is located, agriculture dominates, and a number of small instream farm dams have been constructed in the watercourses (Figure 13). The watercourses are thus highly modified, comprising of narrow, straightened channels between the dams and their associated wetland habitats.

The vegetation along the watercourses comprises of a mix of alien trees such as cluster pines *Pinus pinaster*, black wattles *Acacia mearnsii* and *Eucalyptus* trees. The dominant indigenous plant species along the watercourses comprises of *Olea europaea subsp. africana*, *Buddleja saligna*, *Halleria lucida*, *Searsia crenata*, *Passerina corymbosa*, *Stoebe plumosa*, *Calopsis paniculatus*, *Pteridium aquilinum*, *Cliffortia strobilifera*, *C. odorata*, *Isolepis prolifera*, *Juncus effuses*, *J. capensis*, *Paspalum vaginatum* and *Stenotaphrum secundatum*. Water lilies *Nymphaea capensis* and bulrush *Typha capensis* tend to dominate in the dams.



Figure 13. View of two of the tributaries of the Whiskey Creek Tributary, with their associated instream farm dams at DR1797

BUFFELS TRIBUTARY OF THE MATJIES RIVER

Although DR1797 at the N2 is located within the catchment of the Buffels Tributary, the road does not cross any of the watercourses associated with this river. The upper reaches of the Buffels Tributary of the Matjies River arise within and directly to the west of Kurland in the foothills of the Langeberg Mountains as the Wit Hol River. The Buffels River with its large instream Buffelsrivier Dam is located to the east of the study area with two of its smaller tributaries starting within the Kurland village. As a result, the watercourses associated with the river in the area are in a highly modified condition. The vegetation comprises of a mix of alien and indigenous vegetation that is overgrown with invasive alien kikuyu grass *Pennisetum clandestinum* (Figure 14).



Figure 14. View of the Buffels Tributary within Kurland Village, to the east of the study area

The present ecological status of the streams was determined using Site Characterisation and Habitat Integrity (HI) assessments. The ecological importance and sensitivity of the river was also assessed.

8.1.2. HABITAT INTEGRITY

The evaluation of Habitat Integrity (HI) provides a measure of the degree to which a river has been modified from its natural state. The methodology (DWAF, 1999) involves a qualitative assessment of the number and severity of anthropogenic perturbations on a river and the damage they potentially inflict upon the system. These disturbances include both abiotic and biotic factors, which are regarded as the primary causes of degradation of a river. The severity of each impact is ranked using a six-point scale from 0 (no impact) to 25 (critical impact).

The Habitat Integrity Assessment is based on assessment of the impacts of two components of the river, the riparian zone, and the instream habitat. Assessments are made separately for both components, but data for the riparian zone are interpreted primarily in terms of the potential impact on the instream component. The total scores for the instream and riparian zone components are then used to place the habitat integrity of both in a specific habitat category (Table 5).

Table 4. Results for the Habitat Integrity assessment

River	Whiskey Creek Tributary	Buffels Tributaries
Instream Habitat Integrity		
Water Abstraction	12	7
Flow Modification	14	9
Bed Modification	12	14
Channel Modification	9	12
Water Quality	7	14
Inundation	10	5
Exotic Macrophytes	6	9
Exotic Fauna	5	4
Rubbish Dumping	5	10
INTEGRITY CLASS	D	D
Riparian Zone Habitat Integrity		
Vegetation Removal	12	15
Exotic Vegetation	11	12
Bank Erosion	5	6
Channel Modification	8	12
Water Abstraction	12	8
Inundation	10	5
Flow Modification	14	9
Water Quality	8	14
INTEGRITY CLASS	E	E

Table 5. Habitat Integrity categories (From DWAF, 1999)

CATEGORY	DESCRIPTION	SCORE (%)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-90
C	Moderately modified. A 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	40-59
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In worst instances, basic ecosystem functions have been destroyed and changes are irreversible.	0

The watercourses along the DR1797 road are in a largely to severely modified state, particularly as a result of indigenous vegetation removal from within the riparian zone and the subsequent invasion of invasive alien vegetation.

8.1.3 ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

The EIS assessment considers a number of biotic and habitat determinants surmised to indicate either importance or sensitivity. The determinants are rated according to a four-point scale (Figure 6). The median of the resultant score is calculated to derive the EIS category (Figure 8).

Table 6. Scale used to assess biotic and habitat determinants of either importance or sensitivity

Scale	Definition
1	One species/taxon judged as rare or endangered at a local scale.
2	More than one species/taxon judged to be rare or endangered on a local scale.
3	One or more species/taxon judged to be rare or endangered on a Provincial/regional scale.
4	One or more species/taxon judged as rare or endangered on a National scale (i.e. SA Red Data Books)

Table 7. Results of the EIS assessment

Biotic Determinants	Whiskey Creek Tributary	Buffels Tributary
Rare and endangered biota	2.0	2.0
Unique biota	2.0	2.0
Intolerant biota	2.5	2.0
Species/taxon richness	2.5	2.0
Aquatic Habitat Determinants		
Diversity of aquatic habitat types or features	2.0	2.0
Refuge value of habitat type	2.0	3.0
Sensitivity of habitat to flow changes	2.5	2.0
Sensitivity of flow related water quality changes	2.5	2.0
Migration route/corridor for instream & riparian biota	2.0	2.0
National parks, wilderness areas, Nature Reserves, Natural Heritage sites, Natural areas, PNEs	1.0	2.0
RATINGS	2	2
EIS CATEGORY	Moderate/high	Moderate/high

Table 8. Ecological importance and sensitivity categories (DWAF, 1999).

EISC	General description	Range of median
Very high	Quaternaries/delineations that are considered to be unique on a national and international level based on unique biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are usually very sensitive to flow modifications and have no or only a small capacity for use.	>3-4
High	Quaternaries/delineations that are considered to be unique on a national scale based on their biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) may be sensitive to flow modifications but in some cases may have substantial capacity for use.	>2-≤3
Moderate	Quaternaries/delineations that are considered to be unique on a provincial or local scale due to biodiversity (habitat diversity, species diversity, unique species, rare and endangered species). These rivers (in terms of biota and habitat) are not usually very sensitive to flow modifications and often have substantial capacity for use.	>1-≤2
Low/marginal	Quaternaries/delineations that are not unique on any scale. The rivers (in terms of biota and habitat) are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1

The ecological importance and sensitivity of the Whiskey Creek and Buffels Tributaries is Moderate to High.

8.2. RECOMMENDED ECOLOGICAL CATEGORIES AND RESOURCE QUALITY OBJECTIVES

Draft Target Ecological Categories (TEC) and Resource Quality Objectives (RQOs) have been determined for the more significant water resources in the Breede Gouritz Water Management Area and are provided in Table 9 below. The tributaries of Whiskey Creek River (K60E) have not been included. Given that the watercourses are in a D/E ecological state and of moderate to high EIS, the recommended TEC for the watercourses is moderately modified (C category).

Table 9. Draft Recommended Target Ecological Categories for the rivers and estuaries in the area

Quaternary Catchment	RU	Resource Name	Biophysical Node Name	TEC	Natural MAR (million m ³ /a)
K60E		Keurbooms River	gx9	B	91.30
K70A		Buffels River	gx4	B/C	1.80
K70A	G15-E31	Matjies Estuary	Gxi16	C	3.25
K70A		Sout River	gx5	B	3.80
K70A	G15-E32	Sout(Oos) Estuary	Gxi17	A	5.99
K70A	G15-E33	Groot(Wes) Estuary	Gxi23	B	11.10

9. ASSESSMENT OF IMPACTS

9.1. GENERAL DESCRIPTION OF IMPACTS OF PROPOSED ACTIVITIES AND MITIGATION MEASURES

This section provides an assessment of the potential aquatic ecosystem impacts that are likely to be associated with the proposed road upgrade and associated maintenance activities. The impact assessment and recommended mitigation measures are for the proposed road works to DR1797. The roadway and associated structures are already in existence adjacent to or within the freshwater features described in the previous section.

The road, together with some other physical modifications (surrounding agriculture) to the freshwater features has resulted in the current ecological condition of the watercourses. Therefore, it can be expected that the likely impacts of the proposed upgrade of the road are of a limited extent and of a short-term nature, occurring mostly during the construction and maintenance phases.

Longer term impacts that are likely to occur as a result of the proposed activities relate to how the construction and maintenance work is undertaken for the road as well as the potential encroachment of invasive alien vegetation into the freshwater features where they have been disturbed by the construction activities. Considering that the proposed works in the watercourses relate to upgrades to the existing culverts, one can expect positive longer term impacts as the new structures will be less likely to impede flow in the watercourse and would also require less maintenance work.

General mitigation measures are:

- Work within the watercourses and wetland areas should be limited as far as possible both in terms of extent and duration. Construction within the watercourses and wetland areas should as far as possible, take place during the drier months of the year (January to July).
- It is important that the culvert structures be adequately sized and properly installed in the watercourses to ensure that they do not confine / intensify flow (installing a culvert smaller than the natural channel width) in the watercourse and also do not impede the flow (a culvert placed higher than the base level of the natural bed) or alter the watercourse channel hydraulics (culvert orientated such that it alters the natural flow direction or velocity) in such a manner to increase deposition of sediment or rate of erosion at the structure;
- Rubble and debris from existing structures and the construction activities should be removed from aquatic features and riparian zones after construction is complete so as not to impede flow to the features.
- Once construction is complete, the area should be rehabilitated to resemble that of the surrounding landscape and where necessary vegetated with suitable local indigenous plants as occur at the site. Any invasive alien plants from the road reserve should be controlled on an ongoing basis according to methods as provided by the Working for Water Programme.
- Longer term maintenance works on the structures such as repairs to the structures or removal of sediment and debris at the structures within the watercourses should be in accordance with an approved Maintenance Management Plan (MMP).

The DEADP MMP guidelines (DEADP 2017) provide the following set of guiding principles for maintenance work in water courses that are of relevance to this site:

- Repairs and maintenance should be undertaken within the dry season, except for emergency maintenance works.
- Where at all possible, existing access routes should be used. In cases where none exist, a route should be created through the most degraded area avoiding sensitive/indigenous vegetation areas.
- Responsible management of pollutants through ensuring handling and storage of any pollutants is away from the watercourse. When machinery is involved, ensure effective operation with no leaking parts, and refuel outside of the riparian area, at a safe distance from the watercourse to manage any accidental spillages and pose no threat of pollution.
- At no time should the flow of the watercourse be blocked (temporary diversions may be allowed) nor should the movement of aquatic and riparian biota (noting breeding periods) be prevented during maintenance actions.
- In circumstances which require the removal of any topsoil, this must be sufficiently restored through sustainable measures and practices.

- Concerted effort must be made to actively rehabilitate repaired or reshaped banks with indigenous local vegetation.
- No deepening of the watercourse beyond the original, pre-damage determined thalweg, unless such deepening is directly related to the natural improved functioning and condition of such a watercourse.
- Where at all possible, limit the disturbance to the zone of the thalweg. This is due to the ecological importance of the low flow channel and respective habitat being allowed to re-establish improving the ecological condition.
- The build-up of debris/sediment removed from a maintenance site may:
 - be utilised for the purpose of in-filling or other related maintenance actions related to managing erosion, which form part of an adopted MMP.
 - not be used to enlarge the height, width, or any extent of existing berms.
 - not be deposited anywhere within the watercourse or anywhere along the banks of a river where such action is not part of the proposed maintenance activity (ies). Material that cannot be used for maintenance purposes must be removed out of the riparian area to a suitable stockpile location or disposal site. Further action and consideration may be required where the possibility of contaminated material may occur, such as in urban watercourses.
- The use of foreign material, such as concrete, rubble, woody debris, and/or dry land based soil, is strictly prohibited from being used in maintenance actions, unless for the specific purpose of repairs to existing infrastructure, coupled with appropriate mitigation measures.
- On completion of the maintenance action, the condition of the site in terms of relative topography should be similar to the pre-damaged state (i.e. the shape of the riverbank should be similar or in a state which is improved to manage future damage). This ultimately dictates that the channel, banks, and bed cannot be made narrower, higher or deepened respectively. Exceptions are considered for the management of stormwater and improvements for water quality within the urban context.

9.2. DESCRIPTION AND MAPPING OF FRESHWATER CONSTRAINTS

The watercourses along this section of road (Figure 15) are significantly modified, often with the instream dams immediately upstream or downstream of the road. As a result of the agricultural activities and disturbance of the aquatic habitats immediately adjacent to the road, as well as the flatter topography at this road, the culverts along the road are subject to high sediment deposition and are likely to need regular maintenance to keep these culverts clean of sediment and debris. The sizing and construction of

the culverts and the stormwater channels along the road should take this into account. Alien vegetation clearing within the watercourse channels along the road is also likely to be an ongoing maintenance activity. Any widening of the road at the watercourses should preferably take place on the downstream side (south) of the road as the watercourse downstream of the road has already been impacted by the activities at the road.

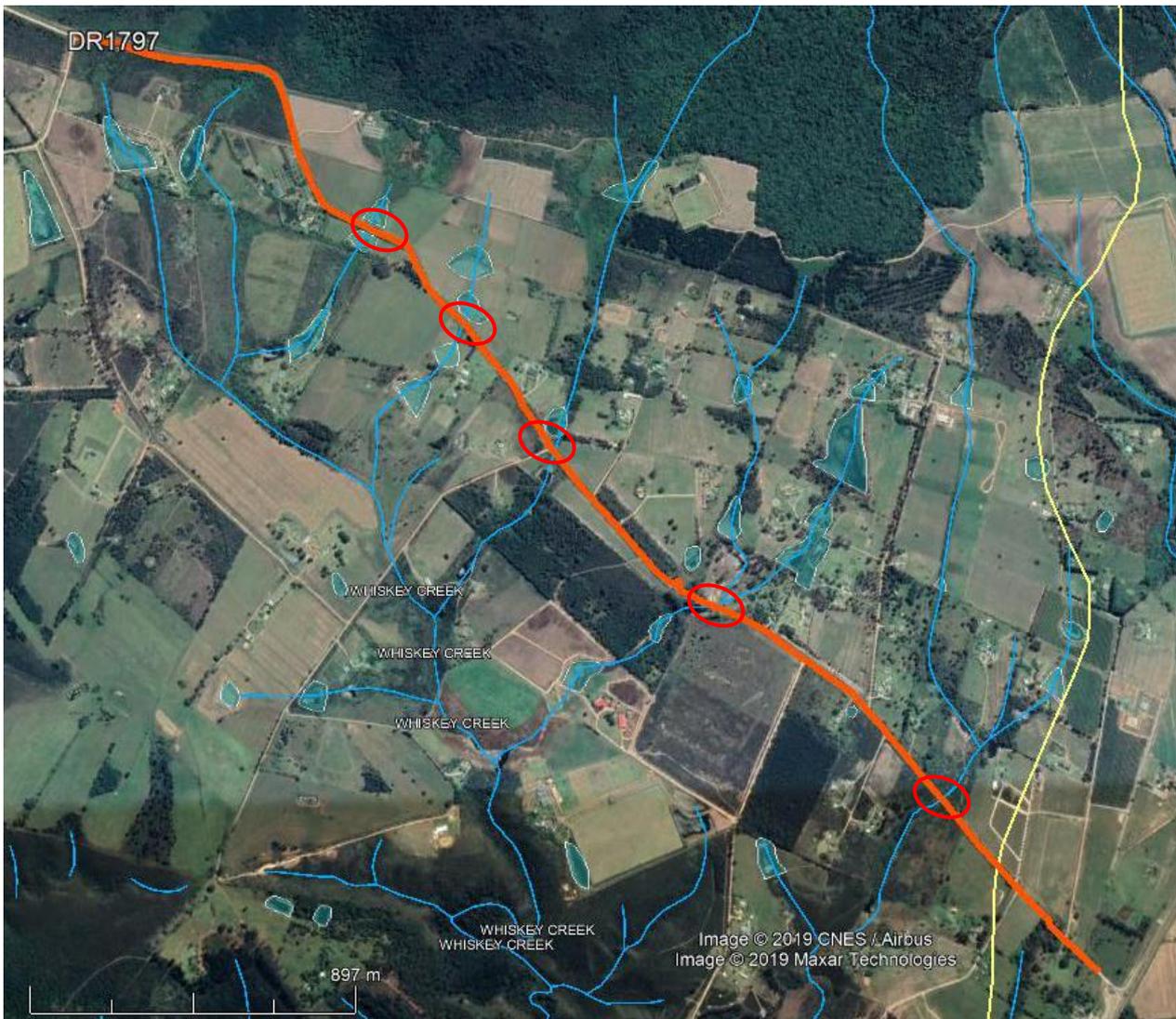


Figure 15. Google Earth image showing the freshwater constraints (red ovals) along DR1797

9.3. AQUATIC HABITAT MODIFICATION OR LOSS

Nature of Impact: The most probable impact of the proposed activities is on the *aquatic habitats* adjacent to the proposed works (see Section 9.2) that can be expected during the construction phase due to the fact that the activities associated with road upgrade will need to take place within or adjacent to watercourses and wetland habitat. Most of the aquatic habitat that the DR1797 road crosses comprise of

highly modified watercourse channels and artificial wetlands related to instream dams within these watercourses. Disturbance of these aquatic features is thus not deemed to be significant. The disturbance of aquatic habitat will also provide an opportunity for invasive alien plants to proliferate. This would however largely occur within the road reserves that are regularly maintained.

Significance of impacts without mitigation:

Construction Phase: As described above, a localized impact of medium to low intensity in the short term that is expected to have a low negative significance in terms of its impact on the aquatic habitat in the study area.

Operation Phase: Over the longer term a negative impact of a low significance could be expected due to ongoing disturbance that is related to the need to undertake maintenance activities on the road at watercourses or adjacent to the wetland areas. A longer-term positive impact may occur due to the fact that it is proposed to upgrade the existing culverts at the road which would improve the hydraulic capacity of the culverts and reduce their impact on the watercourses.

Proposed mitigation:

Construction Phase:

- Work within the watercourses and wetland areas should be limited as far as possible to remain within the footprint of the road. The disturbed areas should be rehabilitated immediately afterwards with planting of local indigenous vegetation if necessary, to reduce the risk of erosion or alien plant growth in these areas.
- Construction within watercourses should as far as possible take place during the drier months of the year.
- Removal of indigenous vegetation should be avoided as far as possible, only cut back intrusive growth.
- Care should be taken that any works undertaken along the section of road that lie within relatively undisturbed areas (along the western extent of the road) does not introduce alien plant seed to the area.
- The upgraded culvert structures be adequately sized and installed in the watercourses in such a manner so as to not increase the rate of deposition or erosion at the structure.
- Only existing disturbed areas should be utilised as laydown and stockpile areas if required.
- Spoil material should be removed to approved dumping sites.

- Where there are steeper gradients along the road, stormwater mitigation measures should be implemented to prevent erosion, particularly where the runoff from the road drains into the watercourses.

Operation Phase:

- Maintenance works on the structures should be in accordance with an approved MMP.
- Any invasive alien plants within the road reserve should be monitored and removed on an ongoing basis according to methods as provided by the Working for Water Programme.
- Minimise the frequency of, or requirement for, maintenance activities within the aquatic features.

Significance of impacts after mitigation:

Construction Phase: The significance of the impact on the aquatic ecosystems with mitigation is expected to be a low to very low (negative) in the short term.

Operation Phase: The significance of the impact on the aquatic ecosystems with mitigation is expected to be a very low negative in the long term.

9.4. WATER QUALITY IMPACTS

Nature of impact: Impairment of the **surface water quality** could potentially occur during the construction phase.

Significance of impacts without mitigation:

Construction Phase: A slight risk of a localized impact of low intensity that is expected to have a low overall significance in terms of its impact on the identified aquatic ecosystems in the area.

Proposed mitigation:

Construction Phase:

The works should be undertaken during the dry periods to minimise the risk of contaminated runoff and sediment washing into the adjacent aquatic habitats. Contaminated runoff from the construction site(s) should be prevented from entering the watercourses and wetland areas. The laydown area and main construction site for the road upgrade should be located away at least 30 m from the indicated freshwater constraints (See Section 9.2) and should be placed within existing disturbed areas. Where construction site(s) need to be located near the rivers/streams, all materials on the construction site(s) should be properly stored and contained. Disposal of waste from the site(s) should also be properly managed. Construction workers should be given ablution facilities at the construction works that are

located away from the river systems (at least 30m) and regularly serviced. These measures should be addressed, implemented, and monitored in terms of the Environmental Management Plan for the construction phase.

Increased sedimentation or turbidity at each of the construction works should be mitigated as far as possible by making use of sandbags, settling ponds or screens to minimise the load of sediment being washed downstream of the sites. All litter and debris associated with the construction works should be contained and removed daily to an approved disposal site.

Significance of impacts after mitigation:

Construction Phase: Provided that the mitigation measures are effectively implemented the water quality impacts of the proposed road upgrades should be of very low to negligible significance.

9.5. FLOW MODIFICATION

Nature of Impact: ***There is only a very low risk of longer-term modification of the flow characteristics*** to downstream watercourse habitats as a result of the proposed activities due to the modification of the stormwater drains and the culvert structures.

Significance of impacts without mitigation:

Construction Phase: The construction activities would be expected to have a very limited impact in terms of the extent and duration.

Operation Phase: The expected impact of the upgraded road to this flow modification would be of a very low to insignificant level. Any impact on the aquatic features is likely to be positive.

Proposed mitigation:

Construction Phase:

- The watercourse channels should remain open and not be constricted as a result of the works (i.e the conveyance capacity of the channels should not be reduced). The base level of the watercourses should also not be raised or deepened at the culvert as a result of any of the works.
- Once the works is complete, the area should be rehabilitated to resemble that of the surrounding landscape to ensure that the flow in the watercourses and to the more natural wetland areas is not modified by the activities.

Operation Phase:

- Stormwater runoff from the roads, as proposed, is supported.

- As previously stated for DR1797 in Section 9.2, the culverts along the road are subject to high sediment deposition and are likely to need regular maintenance to keep these culverts clean of sediment and debris. The sizing and construction of the culverts and the stormwater channels along the road should take this into account.
- The watercourse crossings should be kept clear of invasive alien plant growth and debris to ensure that the crossings do not become blocked and result in localised flooding of the area.

Significance of impacts after mitigation:

Construction Phase: A localised impact of low intensity that is expected to have a very low negative significance in terms of its impact on the identified aquatic ecosystems in the area during construction phase.

Operation Phase: An impact of low positive significance is expected post-construction.

9.6. CUMULATIVE IMPACTS

The watercourses and wetland areas within the proposed road upgrade area have already been modified by the road construction and maintenance activities. Thus, considering that the proposed activities are largely improvements to the existing road in terms of upgrading the existing culvert structures, one can expect that the cumulative impact of this activity on the aquatic habitat will be of a low to very low significance short term impacts and in many cases, positive over the longer term. While these impacts to the freshwater ecosystems are each of a low significance it is essential that they be adequately mitigated to minimise the potential cumulative impacts.

9.7. SUMMARY TABLE OF POTENTIAL IMPACTS OF THE VARIOUS PROPOSED ACTIVITIES

CONSTRUCTION PHASE:

Potential impact on freshwater features	Upgrading of DR1797 – surfacing of road
Nature of impact:	Aquatic habitat modification or loss as well as flow and water quality impacts
Extent of impact:	Local
Duration of impact	Short term
Intensity of Impact:	Low
Consequence of impact	Low
Probability of occurrence:	Probable
Degree impact can be reversed:	Partially reversible
Irreplaceability of resources:	Low
Indirect impacts	Risk for erosion and growth of invasive alien plants in disturbed areas
Cumulative impact prior to mitigation:	Low
Significance of impact pre-mitigation	Low
Degree impact can be avoided:	Medium
Degree impact can be managed:	High
Degree impact can be mitigated:	Medium
Proposed mitigation:	See previous section
Residual impacts:	Limited modification of aquatic habitat
Cumulative impact post mitigation:	Low to very low
Significance after mitigation	Very low

OPERATION PHASE

Potential impact on freshwater features	Periodic maintenance of upgraded road and culverts
Nature of impact:	Aquatic habitat disturbance
Extent of impact:	Local
Duration of impact	Short term
Intensity of Impact:	Very low
Consequence of impact	Very low
Probability of occurrence:	Possible
Degree impact can be reversed:	Reversible
Irreplaceability of resources:	Low
Indirect impacts	Risk for erosion and growth of invasive alien plants in disturbed areas
Cumulative impact prior to mitigation:	Very low
Significance of impact pre-mitigation	Very low
Degree impact can be avoided:	High
Degree impact can be managed:	High
Degree impact can be mitigated:	Medium to high
Proposed mitigation:	See previous section
Residual impacts:	None
Cumulative impact post mitigation:	Very low, potentially positive
Significance after mitigation	Very low, potentially positive

10. RISK ASSESSMENT

The risk matrix is a tool utilised to inform Section 21(c) and (i) water uses only. The assessment indicates the level of risk certain activities pose to freshwater resources. The outcomes are used to guide decisions regarding water use authorisation of the proposed activity. A summary of the potential risk can be seen in Table 10. The risk rating classes can be seen in Table 11.

Table 10. A summary of the risk assessment for the proposed road works

COMPONENT: Upgrade of DR1797							
Nr.	Phases	Activity	Aspect	Impact	Significance	Risk Rating	Adjusted Risk Rating
3	Construction	Upgrade gravel road to a tarred surface with some horizontal and vertical alignment and replacement of all pipe and box culverts as well as improvement to surface water drainage along road	Disturbance works on watercourse crossings with short term flow impacts and risk of water quality impacts	Disturbance of aquatic habitat, flow impact and water quality impairment	57.5	M/L*	L
	Operation	Maintenance activities associated with the upgraded road	The potential for the road to alter flow, for contaminated run-off from the road surface to enter the aquatic features as well as possible increased disturbance and alien vegetation within aquatic habitats.	Habitat disturbance, flow modification and water quality impairment	36	L	L

* The risk of the proposed works is still considered to be low, when mitigated, despite the score being slightly higher than 56

All of the proposed activities pose a low risk for the construction and operations phases and can potentially be authorised by means of the General Authorisations for Section 21(c) and (i) water uses.

Table 11: Risk rating classes for the Risk Assessment

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 they impose a long-term threat on a large scale and lowering of the Reserve.

A summary of the sections of road that contain aquatic features within or adjacent to the proposed road works are provided in Table 12 that can guide the authorisation process.

Table 12. Summary of the sections of DR1797 that contain aquatic features and that will require authorisation for the proposed works

Km	Within Regulated Watercourse Area	Suitable for Commencement Maintenance Activities	Aquatic features
DR1797			
0.00 - 0.67	No	Yes	None
0.67 – 0.73	Yes	No – GA required	Tributary of the Whiskey Creek River
0.73 – 1.53	No	Yes	None
1.53 - 1.59	Yes	No – GA required	Tributary of the Whiskey Creek River
1.59 – 2.10	No	Yes	None
2.10 – 2.30	Yes	No – GA required	Tributary of the Whiskey Creek River
2.30 – 2.62	No	Yes	None
2.62 – 2.70	Yes	No – GA required	Tributary of the Whiskey Creek River
2.70 – 3.00	No	Yes	None
3.00 – 3.11	Yes	No – GA required	Tributary of the Whiskey Creek River
3.11 – 4.80	No	Yes	None

11. CONCLUSIONS AND RECOMMENDATIONS

The study area is located within the K60E quaternary catchment, with a small portion near the N2 Highway being located in quaternary catchment K70A. These catchments are drained by the Whiskey Creek Tributary of the Keurbooms River and the Buffels Tributary of the Matjies River respectively. A number of artificial wetland areas occur along the DR 1797 that are associated with dams within the agricultural areas.

The catchment of the Whiskey Creek Tributary of the Keurbooms River is mapped as FEPA River Sub-catchment, while the catchment of the Buffels/Matjies River Catchment is not mapped. Farm dams near the road have been mapped as artificial FEPA Wetlands. The minor tributaries of Whiskey Creek Tributary at the road are all mapped as aquatic ESAs.

The watercourses along the DR1797 road are in a largely to severely modified state, particularly as a result of indigenous vegetation removal from within the riparian zone and the subsequent invasion of invasive alien vegetation. The ecological importance and sensitivity of the Whiskey Creek and Buffels Tributaries is Moderate to High. The recommended Target Ecological Categories for the watercourses is moderately modified (C category).

Most of the aquatic habitat that the DR1797 road crosses comprise of highly modified watercourse channels and artificial wetlands related to instream dams within these watercourses. Disturbance of these aquatic features is thus not deemed to be significant. The disturbance of aquatic habitat will also provide an opportunity for invasive alien plants to proliferate. This would however largely occur within the road reserves that are regularly maintained.

Thus, considering that the proposed activities are largely improvements to the existing road in terms of upgrading the existing culvert structures, one can expect that the cumulative impact of this activity on the aquatic habitat will be of a low to very low significance short term impacts and in many cases, positive over

the longer term. While these impacts to the freshwater ecosystems are each of a low significance it is essential that they be adequately mitigated to minimise the potential cumulative impacts.

All of the proposed activities pose a low risk for the construction and operations phases and can potentially be authorised by means of the General Authorisations for Section 21(c) and (i) water uses.

Given the above assessment and findings, there should be no reason from an aquatic ecosystem perspective, for the proposed road upgrade to not be approved.

12. REFERENCES

Department of Water Affairs and Forestry. (1999). *Resource Directed Measures for Protection of Water Resources. Volume 3: River Ecosystems Version 1.0*. Resource Directed Measures for Protection of Water Resources, Pretoria, South Africa.

Department of Water Affairs and Forestry. (2005a). *A practical field procedure for identification and delineation of wetlands and riparian areas*. Department of Water Affairs and Forestry, Pretoria.

Department of Water Affairs and Forestry. (2005b). *River Ecoclassification: Manual for Ecostatus Determination (Version 1)*. Water Research Commission Report Number KV 168/05. Pretoria.

Department of Water Affairs and Forestry. (2007). *River Ecoclassification: Manual for Ecostatus Determination (Version 2)*. Riparian Vegetation Response Index, Water Research Commission Report Number KV 168/05. Pretoria.

Driver, Nel, Snaddon, Murray, Roux, Hill. (2011). *Implementation Manual for Freshwater Ecosystem Priority Areas*. Draft Report for the Water Research Commission.

Hatch. (2019). *Specialist Terms of Reference: Periodic Maintenance of TR2/12 – Kurland to Eastern Cape Border (Bloukranspas)*

Kotze, D., Marneweck, G.C., Batchelor, A.L., Lindley, D.S. And Collins, N.B. (2005). *WET-EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands*. Dept. Tourism, Environmental and Economic Affairs, Free State.

Macfarlane, D. M., Kotze, D. C., Ellery, W. N., Walters, D., Koopman, V., Goodman, P., et al. (2008). *WETHealth: A technique for rapidly assessing wetland health*. WRC report TT340/08. South Africa: WRC.

Marneweck, G.C. and Batchelor, A. 2002. *Wetland inventory and classification*. In: Ecological and economic evaluation of wetlands in the upper Olifants River catchment. (Palmer, R.W., Turpie, J., Marneweck, G.C and Batchelor (eds.). Water Research Commission Report No. 1162/1/02.

Mucina, L. and Rutherford, M. C. (eds.) (2006). *The Vegetation of South Africa, Lesotho and Swaziland*. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

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 Biodiversity GIS. <http://bgis.sanbi.org>

Van Ginkel, C. E., Glen, R. P., Gordon-Gray, K. D., Cilliers, C. J., Muasya, M. and P. P. van Deventer (2011) *Easy identification of some South African wetland plants*. WRC Report No TT 479/10

Vlok, J and Schutte-Vlok, AL. (2010). *Plants of the Klein Karoo*.

WRC. 2011. *Atlas for Freshwater Ecosystem Priority Areas – Maps to support sustainable development of water resources* (WRC Report No. TT 500/11).

ANNEXURE A: DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

BACKGROUND AND QUALIFICATIONS OF SPECIALIST CONSULTANT

- Organisation:** BlueScience (Pty) Ltd
- Contact details:** PO Box 455, Somerset Mall, 7137
- Names:** Ms Toni Belcher and Mr Dana Grobler
- Profession:** Aquatic Ecologists for BlueScience, SACNASP No 400040/10
- Expertise:** BlueScience (Pty) Ltd provides water resource management services and includes the following:
- Rivers and wetlands scoping and impact assessments.
 - River rehabilitation plans and implementation.
 - Wetland rehabilitation plans and implementation.
 - Water use authorisation applications (WULA).
 - Biomonitoring of rivers (including macro-invertebrates, fish & water quality).
 - Water use compliance auditing (internal auditing).
 - Water use compliance monitoring and reporting for license holders (including water quality sampling and measurements).
 - Ecological Reserve determination of rivers and wetlands.
 - River Maintenance and Management Plans (MMP).
 - NEMBA – alien vegetation assessment and management plans; and
 - Water resources capacity building and training.

Summary of projects undertaken by BlueScience since July 2012:

Type of project	Number of projects undertaken
Dam developments	78
Other freshwater and freshwater impact assessments	365
River reach MMP	6
ESKOM	34
Renewable energy (WEF and Solar)	30
Roads (Provincial and National roads)	48
River monitoring and rehabilitation projects	58
Water resource study	12
Water use authorisation applications (not linked to a freshwater assessment study)	26
Water use authorisation audits and licensing monitoring)	7

DECLARATION OF INDEPENDENCE

I, Antonia Belcher, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
 - other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity; or
 - ~~am not independent, but another specialist (the "Review Specialist") that meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);~~
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Signature of the Specialist:



Name of Company:

BlueScience (Pty) Ltd

Date:

3 July 2020

APPENDIX B: PES AND EI&ES FOR THE RIVERS IN THE STUDY AREA

DUIWELSGAT RIVER, A TRIBUTARY OF THE KEURBOOM RIVER NEAR WHISKEY CREEK

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
K60E-09085	Duiwelsgat	11.04	1	Y		LARGELY NATURAL	B
MEAN EI CLASS	MEAN ES CLASS	DEFAULT ECOLOGICAL CATEGORY (DEC)	RECOMMENDED ECOLOGICAL CATEGORY (REC)				
HIGH	VERY HIGH	A	0.00				
PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE			ECOLOGICAL SENSITIVITY		
INSTREAM HABITAT CONTINUITY MOD	SMALL	FISH SPP/SQ	4.00	INVERT TAXA/SQ	46.00	FISH PHYS-CHEM SENS DESCRIPTION	HIGH
RIP/WETLAND ZONE CONTINUITY MOD	MODERATE	FISH: AVERAGE CONFIDENCE	1.00	INVERT AVERAGE CONFIDENCE	3.00	FISH NO-FLOW SENSITIVITY DESCRIPTION	VERY HIGH
POTENTIAL INSTREAM HABITAT MOD ACT.	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS	MODERATE	INVERT REPRESENTIVITY PER SECONDARY, CLASS	VERY HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	VERY HIGH
RIPARIAN-WETLAND ZONE MOD	MODERATE	FISH REPRESENTIVITY PER SECONDARY: CLASS	MODERATE	INVERT RARITY PER SECONDARY: CLASS	MODERATE	INVERTS VELOCITY SENSITIVITY	VERY HIGH
POTENTIAL FLOW MOD ACT.	SMALL	FISH RARITY PER SECONDARY: CLASS	MODERATE	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	VERY HIGH	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES	VERY HIGH
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	VERY HIGH	HABITAT DIVERSITY CLASS	MODERATE	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	VERY HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	HIGH	HABITAT SIZE (LENGTH) CLASS	LOW	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION	VERY HIGH
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	VERY HIGH	INSTREAM MIGRATION LINK CLASS	VERY HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	VERY HIGH		

MATJIES RIVER

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
K70A-09110	0.00	5.59	1	Y		LARGELY NATURAL	B
MEAN EI CLASS	MEAN ES CLASS	DEFAULT ECOLOGICAL CATEGORY (DEC)	RECOMMENDED ECOLOGICAL CATEGORY (REC)				
HIGH	VERY HIGH	A	0.00				
PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE			ECOLOGICAL SENSITIVITY		
INSTREAM HABITAT CONTINUITY MOD	SMALL	FISH SPP/SQ	2.00	INVERT TAXA/SQ	53.00	FISH PHYS-CHEM SENS DESCRIPTION	HIGH
RIP/WETLAND ZONE CONTINUITY MOD	SMALL	FISH: AVERAGE CONFIDENCE	1.00	INVERT AVERAGE CONFIDENCE	4.06	FISH NO-FLOW SENSITIVITY DESCRIPTION	HIGH
POTENTIAL INSTREAM HABITAT MOD ACT.	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS	MODERATE	INVERT REPRESENTIVITY PER SECONDARY, CLASS	VERY HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	VERY HIGH
RIPARIAN-WETLAND ZONE MOD	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS	MODERATE	INVERT RARITY PER SECONDARY: CLASS	HIGH	INVERTS VELOCITY SENSITIVITY	VERY HIGH
POTENTIAL FLOW MOD ACT.	SMALL	FISH RARITY PER SECONDARY: CLASS	LOW	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	VERY HIGH	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES	VERY HIGH
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	VERY HIGH	HABITAT DIVERSITY CLASS	LOW	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	LOW	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION	VERY HIGH
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE	VERY HIGH	INSTREAM MIGRATION LINK CLASS	VERY HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	VERY HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	VERY HIGH		

APPENDIX C: SIGNIFICANCE RATINGS OF POTENTIAL ENVIRONMENTAL IMPACTS

For each impact, the **EXTENT** (spatial scale), **MAGNITUDE** (severity of impact) and **DURATION** (time scale) are assessed and used to ascertain the **SIGNIFICANCE** of the impact, firstly in the case of no mitigation and then with the most effective mitigation measure(s) in place. The tables below indicate the scale used to assess these variables and defines each of the rating categories.

Extent: “Extent” defines the physical extent or spatial scale of the impact.

Rating	Description
LOCAL	Extending only as far as the activity, limited to the site and its immediate surroundings. Specialist studies to specify extent.
REGIONAL	Western Cape. Specialist studies to specify extent.
NATIONAL	South Africa
INTERNATIONAL	

Duration: “Duration” gives an indication of how long the impact would occur.

Rating	Description
SHORT TERM	0 - 5 years
MEDIUM TERM	5 - 15 years
LONG TERM	Where the impact will cease after the operational life of the activity, either because of natural processes or by human intervention.
PERMANENT	Where mitigation either by natural processes or by human intervention will not occur in such a way or in such time span that the impact can be considered transient.

Intensity: “Intensity” establishes whether the impact would be destructive or benign.

Rating	Description
ZERO TO VERY LOW	Where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected.
LOW	Where the impact affects the environment in such a way that natural, cultural and social functions and processes continue, albeit in a slightly modified way.
MEDIUM	Where the affected environment is altered, but natural, cultural and social functions and processes continue, albeit in a modified way.
HIGH	Where natural, cultural and social functions or processes are altered to the extent that it will temporarily or permanently cease.

Loss of resources: “Loss of resource” refers to the degree to which a resource is permanently affected by the activity, i.e. the degree to which a resource is irreplaceable.

Rating	Description
LOW	Where the activity results in a loss of a particular resource but where the natural, cultural and social functions and processes are not affected.
MEDIUM	Where the loss of a resource occurs, but natural, cultural and social functions and processes continue, albeit in a modified way.
HIGH	Where the activity results in an irreplaceable loss of a resource.

Status of impact: The status of an impact is used to describe whether the impact would have a negative, positive or zero effect on the affected environment. An impact may therefore be negative, positive (or referred to as a benefit) or neutral.

Probability: “Probability” describes the likelihood of the impact occurring.

Rating	Description
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IMPROBABLE	Where the possibility of the impact to materialise is very low either because of design or historic experience.
PROBABLE	Where there is a distinct possibility that the impact will occur.
HIGHLY PROBABLE	Where it is most likely that the impact will occur.
DEFINITE	Where the impact will occur regardless of any prevention measures.

Degree of confidence: This indicates the degree of confidence in the impact predictions, based on the availability of information and specialist knowledge.

Rating	Description
HIGH	Greater than 70% sure of impact prediction.
MEDIUM	Between 35% and 70% sure of impact prediction.
LOW	Less than 35% sure of impact prediction.

Significance: “Significance” attempts to evaluate the importance of a particular impact, and in doing so incorporates the above three scales (i.e. extent, duration and intensity).

Rating	Description
VERY HIGH	Impacts could be EITHER: <i>of high intensity at a regional level and endure in the long term;</i> OR <i>of high intensity at a national level in the medium term;</i> OR <i>of medium intensity at a national level in the long term.</i>
HIGH	Impacts could be EITHER: <i>of high intensity at a regional level and endure in the medium term;</i> OR <i>of high intensity at a national level in the short term;</i> OR <i>of medium intensity at a national level in the medium term;</i> OR <i>of low intensity at a national level in the long term;</i> OR <i>of high intensity at a local level in the long term;</i> OR <i>of medium intensity at a regional level in the long term.</i>
MEDIUM	Impacts could be EITHER: <i>of high intensity at a local level and endure in the medium term;</i> OR <i>of medium intensity at a regional level in the medium term;</i> OR <i>of high intensity at a regional level in the short term;</i> OR <i>of medium intensity at a national level in the short term;</i> OR <i>of medium intensity at a local level in the long term;</i> OR <i>of low intensity at a national level in the medium term;</i> OR <i>of low intensity at a regional level in the long term.</i>
LOW	Impacts could be EITHER <i>of low intensity at a regional level and endure in the medium term;</i> OR <i>of low intensity at a national level in the short term;</i> OR <i>of high intensity at a local level and endure in the short term;</i> OR <i>of medium intensity at a regional level in the short term;</i> OR <i>of low intensity at a local level in the long term;</i> OR <i>of medium intensity at a local level and endure in the medium term.</i>
VERY LOW	Impacts could be EITHER <i>of low intensity at a local level and endure in the medium term;</i> OR <i>of low intensity at a regional level and endure in the short term;</i> OR <i>of low to medium intensity at a local level and endure in the short term.</i>
INSIGNIFICANT	Impacts with: Zero to very low intensity with any combination of extent and duration.
UNKNOWN	In certain cases it may not be possible to determine the significance of an impact.

Degree to which impact can be mitigated: This indicates the degree to which an impact can be reduced / enhanced.

Rating	Description
NONE	No change in impact after mitigation.
VERY LOW	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact.
LOW	Where the significance rating drops by one level, after mitigation.
MEDIUM	Where the significance rating drops by two to three levels, after mitigation.
HIGH	Where the significance rating drops by more than three levels, after mitigation.

Reversibility of an impact: This refers to the degree to which an impact can be reversed.

Rating	Description
IRREVERSIBLE	Where the impact is permanent.
PARTIALLY REVERSIBLE	Where the impact can be partially reversed.
FULLY REVERSIBLE	Where the impact can be completely reversed.

APPENDIX D. RISK MATRIX FOR THE PROJECT

ASPECTS AND IMPACT REGISTER/RISK ASSESSMENT FOR WATERCOURSES INCLUDING RIVERS, PANS, WETLANDS, SPRINGS, DRAINAGE LINES

PROJECT: PROPOSED UPGRADE OF DR1797 NEAR KURLAND IN THE WESTERN CAPE

COMPILED BY: Toni Belcher, BlueScience (SACNASP 400040/10)

DATE: July 2020

COMPONENT: Upgrade of DR1797

Nr.	Phases	Activity	Aspect	Impact	Severity					Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Adjusted Risk Rating	Control Measures	Confidence	Type Watercourse; PES and EIS
					Flow Regime	Physico & Chemical (Water Quality)	Habitat (Geomorph+ Vegetation)	Biota																
1	Construction	Upgrade gravel road to a tarred surface with some horizontal and vertical alignment and replacement of all pipe and box culverts as well as improvement to surface water drainage along road	Disturbance works on watercourse crossings with short term flow impacts and risk of water quality impacts	Disturbance of aquatic habitat, flow impact and water quality impairment	3	2	3	3	2.75	1	2	5.75	1	3	5	1	10	57.5	M/L	L	The works should be limited as far as possible and the disturbed areas rehabilitated afterwards. Disturbed sediment from the works in the watercourses should be prevented from impacting on the aquatic habitats downstream. No spoil material should be left in the watercourses. Any widening of the road should preferably take place on the downstream side of the road. The watercourse channels should remain open and not be constricted as a result of the works (i.e the conveyance capacity of the channels should not be reduced). The base level of the watercourse should also not be raised or deepened at the culvert as a result of the works. Should significant areas of cover vegetation be removed in the watercourses, these areas should be revegetated with suitable local indigenous vegetation occurring within the watercourses.	High	Whiskey Creek Tributaries PES=D/E and EIS=Moderate to high	
	Operation	Maintenance activities associated with the upgraded road	The potential for the road to alter flow, for contaminated run-off from the road surface to enter the aquatic features as well as possible increased disturbance and alien vegetation within aquatic habitats.	Habitat disturbance, flow modification and water quality impairment	2	2	2	2	2	1	1	4	1	2	5	1	9	36	L	L	Works should be undertaken in accordance with an approved MMP	High		

* Risks although greater than 56 are still deemed to be low

Signed: 

Date: 10 July 2020

List of Section 21(c) and (i) Water Use Activities associated with the proposed works:

Road	approx. km	Aquatic Feature	Latitude	Longitude
DR1797	0.7	Whiskey Creek Tributary	33°57'2.29"S	23°28'9.97"E
	1.56	Whiskey Creek Tributary	33°56'44.97"S	23°27'45.96"E
	2.2	Whiskey Creek Tributary	33°56'31.10"S	23°27'28.34"E
	2.65	Whiskey Creek Tributary	33°56'18.69"S	23°27'17.63"E
	3.08	Whiskey Creek Tributary	33°56'9.98"S	23°27'7.52"E