FRESHWATER ECOLOGICAL IMPACT ASSESSMENT

PROPOSED AGRICULTURAL EXPANSION ON CORNER FARM (PORTION 7 OF FARM NO.466, CALEDON)

Prepared for:

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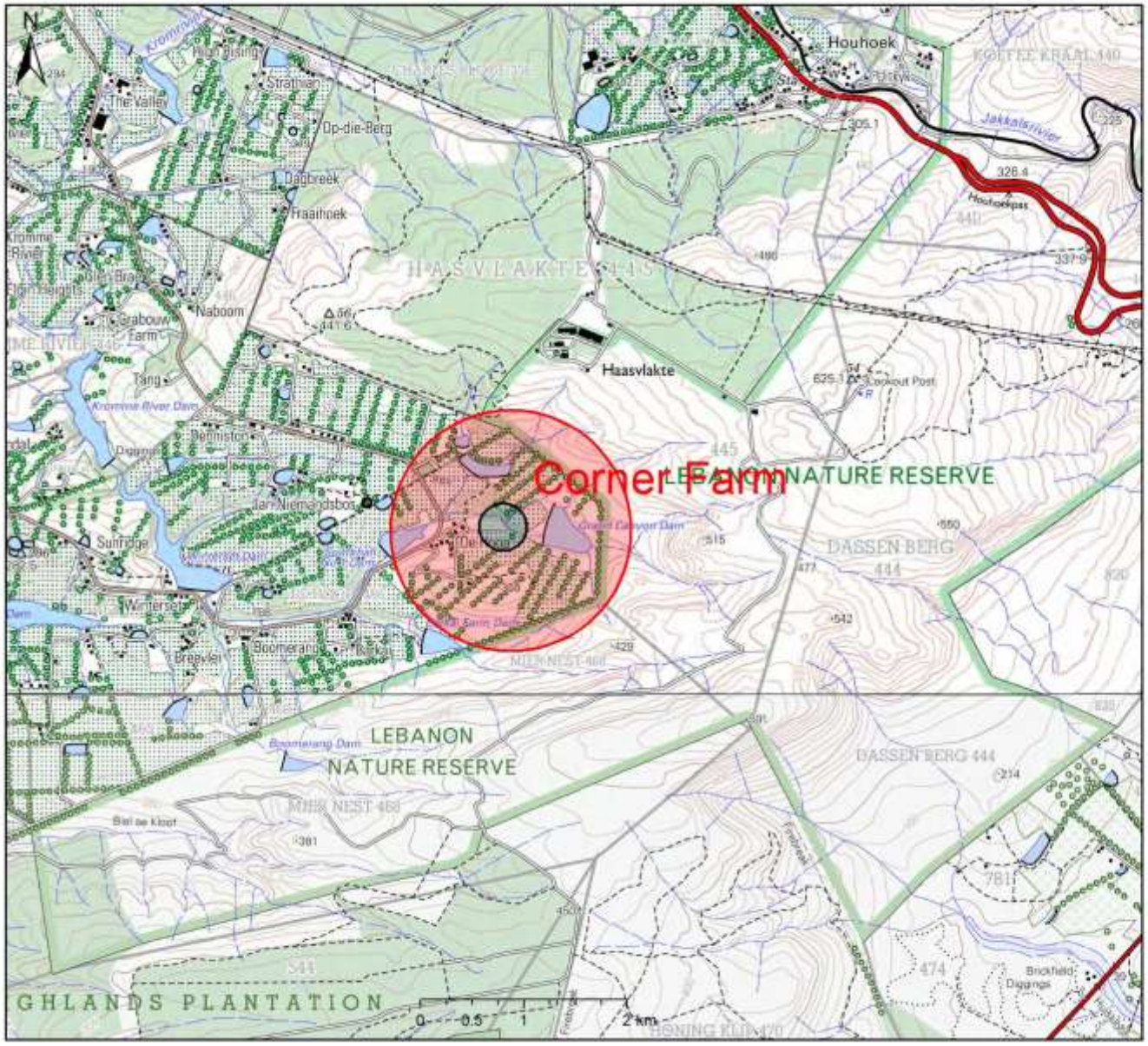
1. INTRODUCTION AND BACKGROUND

Eco Impact Legal Consulting (Pty) Ltd (Eco Impact) has been appointed by Vacation Station (Pty) Ltd to assess the impacts of the proposed clearing of indigenous vegetation on the farm Corner Farm Nr 466 Portion 7 in the Grabouw region to establish approximately 19.6ha of agricultural land to be used for cultivation of crops/orchards such as apple trees.

Figure 1: Study site – Corner Farm Locality Map.



Scale: 1:50 000
Date created: January 23, 2018

Western Cape Government
Agriculture

Figure 2: The 1:50 000 topographical map for the study area on Corner Farm (Grabouw). Study area indicated by red circle.

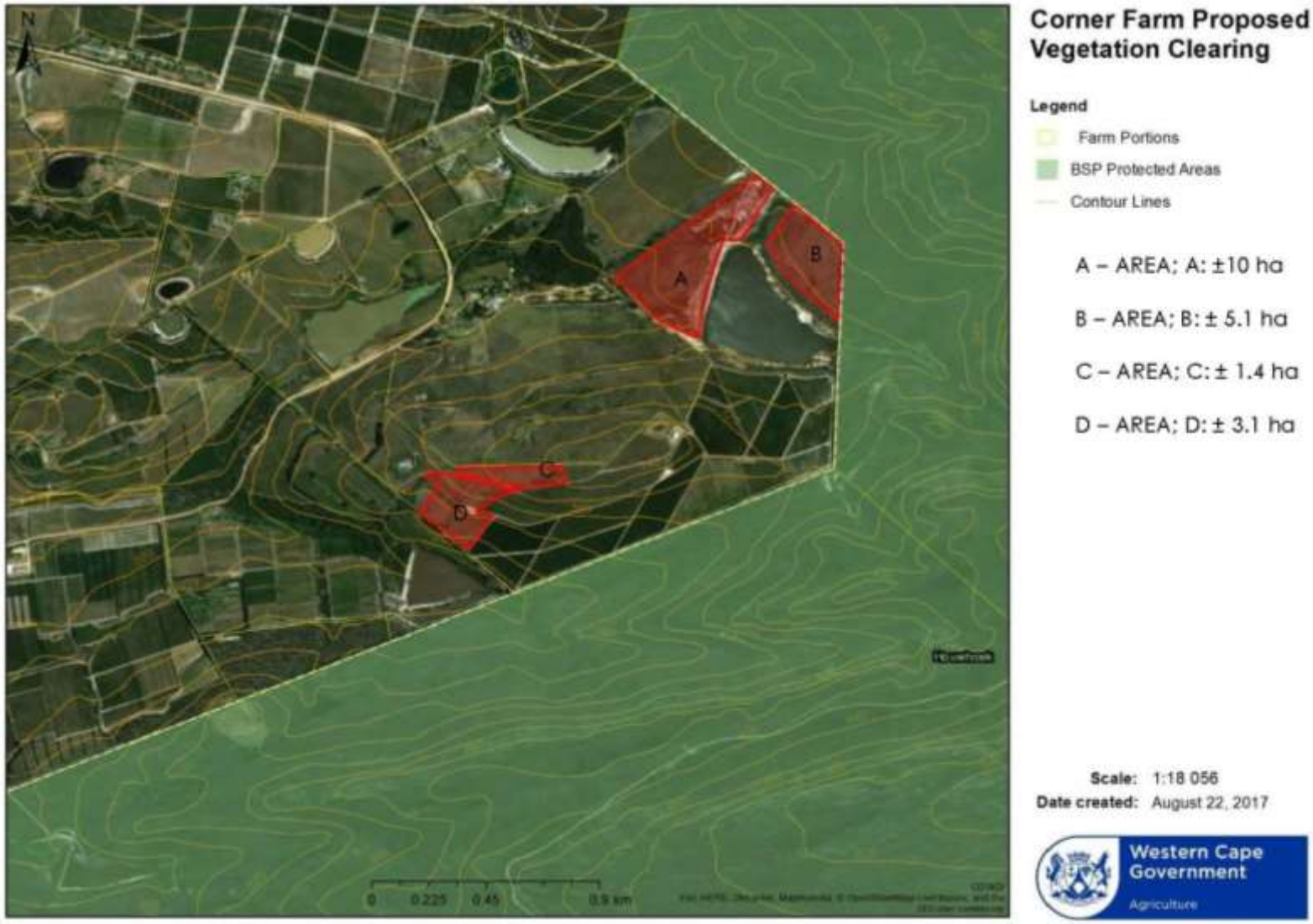


Figure 3: The extent and location of the proposed development areas on Corner Farm. Note the location of areas A,B,C & D as will be referred to them accordingly in this report.

2. METHODOLOGY, ASSUMPTIONS AND LIMITATIONS OF THE STUDY

Input into this report was informed by a combination of desktop assessments of existing freshwater ecosystem information for the study area and catchment, as well as by a more detailed assessment of the freshwater features at the site.

The site was visited in July 2017 and on 12 October 2017. During the field visit, the characterisation and integrity assessments of the ecological features were undertaken. Mapping of the features was undertaken using Google Maps with GPS tracker. The features were mapped while doing the field survey. The SANBI Biodiversity GIS website was also consulted to identify any constraints in terms of fine-scale biodiversity conservation mapping as well as possible freshwater features mapped in the Freshwater Ecosystem Priority Areas maps. This information/data was used to inform the resource protection related recommendations.

The basic terms of reference (TOR) for this study were the Cape Nature recommended TOR for biodiversity specialists, and are as follows:

- Produce a baseline analysis of the botanical attributes of the study area as a whole.
- This report should clearly indicate any constraints that would need to be taken into account in considering the development proposals further.
- The baseline report must include a map of the identified sensitive areas as well as indications of important constraints on the property. It must also:
- Describe the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering viability etc.

In terms of biodiversity pattern, identify or describe:

Community and ecosystem level
- The main vegetation type, its aerial extent and interaction with neighbouring types, soil or topography;
- The types of plant communities that occur in the vicinity of the site
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, etc.*)

Species level
- Red Data Book species of conservation concern (RDBSCC) - (provide location)
- The viability of and estimated population size of the RDBSCC that are present (include degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High = 70-100% confident, Medium 40-70% confident, Low 0-40% confident)
- The likelihood of other RDBSCC species occurring within the vicinity (include degree of confidence)

Other pattern issues
Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.
- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying
- The condition of the site in terms of current or previous land uses

In terms of biodiversity process, identify or describe:

- The key ecological “drivers” of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in the vicinity i.e. watercourses, biome boundaries, migration routes etc.
- Any possible changes in key processes e.g. increase fire frequency or drainage/artificial recharge of aquatic systems.

- Describe what is the significance of the potential impact of the proposed project – with and without mitigation – on biodiversity pattern and process at the site, landscape, and regional scales.

- Recommend actions that should be taken to prevent or mitigate impacts. Indicated how these should be scheduled to ensure long-term protection, management and restoration of affected ecosystems and biodiversity.

- Indicate limitations and assumptions, particularly in relation to seasonality.

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:

- The ecological importance and sensitivity assessment was conducted according to the guidelines as developed by DWAF (1999).
- Recommendations are made with respect to the adoption of buffer zones within the development site, based on the wetlands functioning and site characteristics.

The level of aquatic assessment undertaken was considered to be adequate for this study.

3. DESCRIPTION OF THE ECOLOGICAL FEATURES AND THE WIDER STUDY AREA

The site is located within the G40D quaternary catchment. The primary aquatic features on the site are the drainage lines and associated wetland land areas and man-made dams, which eventually feeds into the Ribbok/Krom River System. These drainage lines originates from the Houwhoek mountain range surrounding the property along the northern and eastern borders. It flows southwest, across the site and through the farms where it eventually connects to the Ribbok/Krom River tributary which feeds into the Palmiet River system. The Ribbok/Krom River itself is severely transformed due to agricultural developments which depend largely on irrigation derived from dams built within this river system and surrounding drainage lines.

Table 1: Key water resource information for the study area.

DESCRIPTOR	NAME/ DETAILS	NOTES
Water Management Area (WMA)	Breede WMA	-
Catchment Area	Ribbok/Krom River	Tributary of the Palmiet River System
Quaternary Catchment	G40D	-
Present Ecological State	C (Moderately Modified)	NFEPA (2011) for Krom River
EcoStatus	Poor	DWAF (2011) for Krom River
Ecological Importance and Sensitivity	Ecological Importance – Low Ecological Sensitivity – Low	DWAF (2011) for Krom River
Type of water resource	Seasonal (Runoff drainage line)	

Water resource potentially impacted	Drainage line feeding into man-made dam – overflow eventually feeds into Ribbok/Krom River	
Latitude	34°14' 07.46"S	Proposed crossing of drainage line at Site B.
Longitude	19°07' 43.43"E	
Site visit	Mr Nicolaas Hanekom and Johmandie Pienaar	July 2017 & 12 October 2017

3.1. SITE CHARACTERISATION

In order to assess the condition and ecological importance and sensitivity of the study area, it is necessary to understand how the river might have appeared under unimpacted conditions. This is achieved through classifying the river according to its ecological characteristics, in order that it can be compared to ecologically similar rivers. 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 ecoregions, was used. The Ribbok/Krom River at the site falls within the Southern Folded Mountains Ecoregion (Table 2).

Table 2: Characteristics of the Southern Folded Mountains Ecoregion (**Dominant Types In Bold**)

Main Attributes	Characteristics
Terrain Morphology	Plains; Low Relief (limited); Plains Moderate Relief (limited)**;** Lowlands; Hills and Mountains; Moderate and High Relief: Open Hills; Lowlands; Mountains; Moderate to High Relief; **Closed Hills; Mountains; Moderate and High Relief**
Vegetation types	Patches Afromontane Forest; Xeric Succulent Thicket (limited); Valley Thicket (limited); Spekboom Succulent Thicket; **Grassy Fynbos; Mountain Fynbos**; Limestone Fynbos; Sand Plain Fynbos (Limited); South and South West Coast Renosterveld; Central Mountain Renosterveld; West Coast Renosterveld (very limited) Eastern Mixed Nama Karoo; Central Nama Karoo; Great Nama Karoo (limited); Eastern Thorn Bushveld (very limited); **Little Succulent Karoo**; Lowland Succulent Karoo (very limited);
Altitude (m a.m.s.l)	0-300 limited; 300-1900, 1900-2100 (limited)
MAP (mm)	100 to 1500
Coefficient of Variation (% of annual	<20 to 40

precipitation)	
Rainfall concentration index	<15 to 55
Rainfall seasonality	Very late summer to winter to all year
Mean annual temp. (°C)	10-20
Median annual simulated runoff (mm) for quaternary catchment	<5 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. The geomorphological and other physical characteristics associated with the watercourses within the study sites are given in Table 3.

Table 3: General Geomorphological and Physical features of the Watercourses

Geomorphological Zone	Lower Foothill Zone
Lateral mobility	Confined
Channel form	Simple (no macro channel)
Channel pattern	Single channel
Channel type	Rock with limited soils
Channel modification	Channel has been modified by stream crossings, establishment of cultivated lands and dams.
Hydrological type	Non-perennial
Ecoregion	Southern Folded Mountains
Vegetation type	Southwest Sandstone Fynbos
Rainfall region	Winter

3.2. DESCRIPTION OF THE WATERCOURSE/S AND ASSOCIATED STUDY AREA

The study site is located along the lower foothills of the Houw Hoek mountain range within Elgin Valley and abuts the Kogelberg Nature Reserve. The topography of the site is undulating and slopes downwards from east to west. The highest elevation of the areas surveyed is 318m above mean sea level at Site B and 256m above mean sea level at Site D.

The soils of the site are predominantly shallow of the Houwhoek form, and the geology mainly quartzitic sandstone of the Peninsula Formation and in the west of the Rietvlei Formation, Table Mountain Group.

Terrestrial Vegetation Characteristics on Site:

The vegetation within the proposed development areas consists of mainly Kogelberg Sandstone Fynbos (status = Least Threatened) in sites A & B and Elgin Shale Fynbos (status = Critically Endangered) in sites C & D (see Figure 4 below).

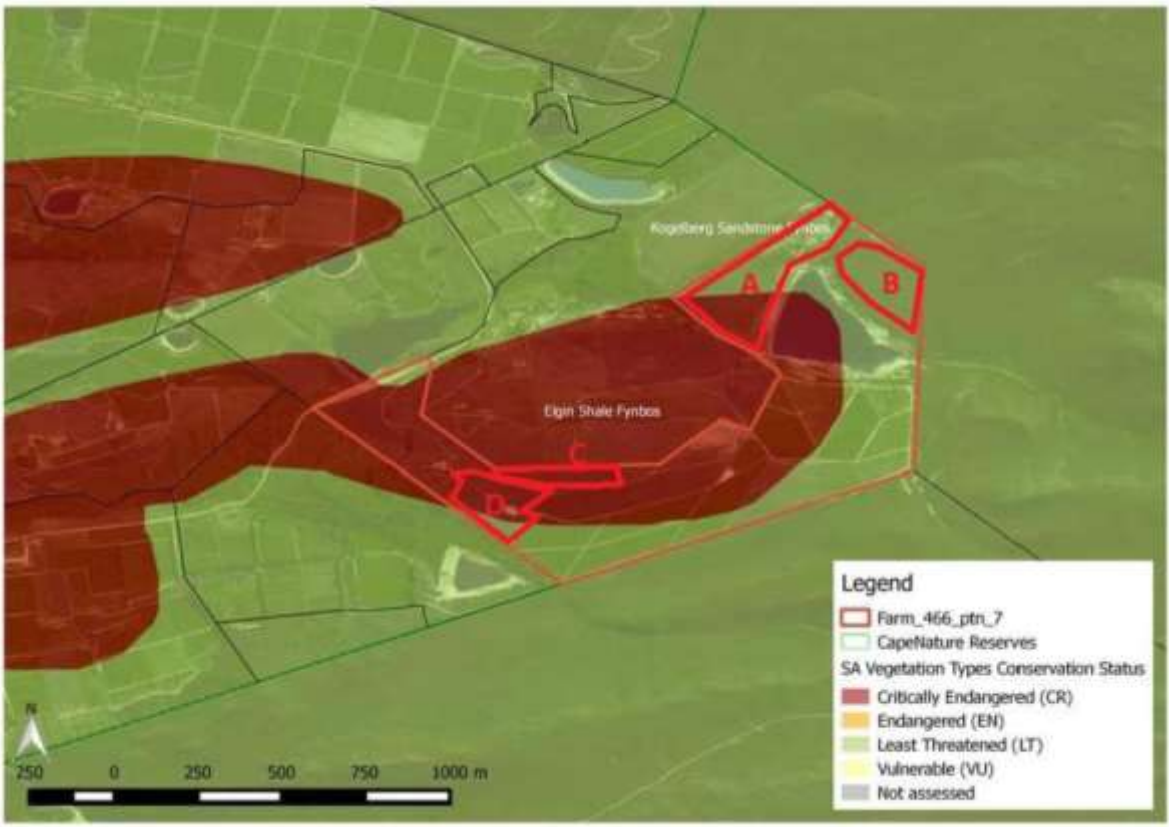


FIGURE 4: National vegetation types as mapped within proposed development areas.

The fynbos vegetation at sites A & B consists of a very similar flora. Both sites were heavily disturbed previously. Site A was ploughed previously and the upper reach were excavated for gravel, but has not been tilled for a number of years now (about 3 years). A number of species re-established here from seed, e.g. several species of *Serotinous proteaceae*, that blew in from the adjacent nature reserve after the recent fire. Most of site B was heavily disturbed several years ago, but several species has also been re-established on the site. During the botanical impact assessment, as was conducted by Mr Jan Vlok during December 2017 a total of 119 different plant species were recorded on sites A & B, most of these species occurred in small undisturbed patches within these two sites which remain primarily along and within the drainage lines and associated wetland areas. This probably represents about 70-80% of the total number of species that occur in the affected areas. Only two of the species recorded are threatened species, *Diastella thymelaeiodes* ssp. *thymelaeiodes* (status = Near Threatened and *Otholobium thomii* (status = Endangered) which was recorded immediately adjacent to the drainage line areas. It is unlikely that any other threatened plant species occur at these two sites. There is a clear dominance of pioneer species such as *Athanasia trifurcate* at site A, and graminoids (Cyperaceae, Poaceae and Restionaeae) at site B.

Both the renosterveld sites at C & D also consist of previously ploughed areas. Both areas have not been tilled for a number of years (about 3-5 years). A total of 57 species were recorded during the botanical survey on these two sites most of which are indigenous 'weedy' species. No threatened species were noted, or are expected to occur on these two sites. There are clear indicators of disturbance at site C such as *Stoebe plumosa* and *Anthospermum aethiopicum*. And on site D the dominant disturbance indicator plants are *Helichrysum cymosum* and *H. pandurifolium*.

Wetland/drainage line Characteristics on Site:

Sites A and B have the most significant wetland characteristics associated with the natural and man-made drainage lines and dam located mainly along the northwestern and southern borders of the proposed development sites. These wetlands, drainage lines and dam have also been mapped as Ecological Support Areas (Res) in the latest Western Cape Biodiversity Spatial Plan (2017) as well as artificial and natural Wetland Freshwater Priority Areas (NFEPAs).

The wetland indicator species within sites A and B as recorded on site are species such as *Capeochloa cincta*, *Carpha glomerata, Drosera capensis, Platycaulis callistachyus and Erica perspicua* which is locally abundant. These wetland and drainage line areas have also been invaded by *Acacia longifolia*, but not in dense stands.

The instream and riverbank habitat integrity of the drainage line which separates sites A and B (northwestern border of site B) is still in a mostly natural and stable condition except for the two man-made river crossings which were historically constructed to gain access to site B. This drainage has an average width of approximately 15m. The lower lying crossing just above the dam at site B was constructed by infilling the drainage line with a gravel crossing of about 30m long and 10m wide. This crossing was therefore constructed at one of the widest points in the drainage line and has since washed away at the eastern end of the crossing and can no longer be used. Another infilled stream crossing was created at the top of the drainage line which is about 8m long and 5m wide, this crossing was created at a narrowest point in the drainage line and is therefore the preferred crossing in terms of minimizing potential impacts and maintenance requirements.

Photo 1.1: Drainage line and existing crossings (access roads) to site B.

Photo 1.2: Instream and bank habitat at Site B drainage line.

Photo 1.3: Instream and bank habitat at Site B drainage line.

Photo 1.4: Lower lying crossing (not recommended to be used as a drainage line crossing)

Photo 1.5: Higher lying crossing (recommended to be upgraded and used as a drainage crossing for access to site B)

The wetlands and drainage line areas remaining within and along the borders of site A have been significantly transformed and modified due to previous mining of sand and gravel and vineyard plantations. The higher lying section of the drainage line running along the northwestern border of the site has no remaining wetland characteristics, but is still important in maintaining hydrological connectivity of the drainage line originating from the Houwhoek mountains which feeds the lower lying wetlands areas on site.

Photo 2.1 Upper reaches of transformed drainage line at site A.

Photo 2.2 Lower reaches of transformed drainage line at site A.

Photo 2.3 Instream habitat condition of upstream reaches of transformed/excavated drainage line at site A.

Photo 2.4 Instream habitat conditions of downstream reaches of transformed drainage line and wetland area below dam wall at site A.

There is no evidence of any wetlands conditions or drainage lines at site C.

Photo 3.1: Site C

A narrow channeled drainage line runs along the southeastern border of site D. The average width of the drainage line is approximately 2m wide. Some wetland indicator species such as *Zantedeschia aethiopica* is located within the channeled drainage line, and due to the channelization taking place several years ago (more than 10) the instream habitat integrity and stability of the drainage line is relatively good.

Photo 4.1: Channeled drainage line along southeastern border of site D.

Photo 4.2: Instream habitat condition of channeled drainage line along southeastern border of site D.

3.3. HABITAT INTEGRITY OF THE AFFECTED DRAINAGE LINES

The Index of Habitat Integrity (IHI) provides a measure of the degree to which a river has been modified from its natural state. For a description of the methodology refer to Appendix B. The general scores for the instream and riparian zone components of the habitat integrity of the affected watercourse are given in Table 4 below.

Table 4: Index of Habitat Integrity Assessment results and criteria assessed in the affected watercourses **at Site B: North-western drainage line.**

Instream Criteria	Score	Riparian Zone Criteria	Score
Water Abstraction	5 (2.8)	Vegetation Removal	20 (10.4)
Flow Modification	10 (5.2)	Exotic Vegetation	15 (6.6)
Bed Modification	10 (5.2)	Bank Erosion	20 (9.6)

Channel Modification	10 (5.2)	Channel Modification	25 (13)
Water Quality	0	Water Abstraction	25 (13)
Inundation	20 (8)	Inundation	25 (12)
Exotic Macrophytes	0	Flow Modification	25 (14)
Exotic Fauna	0	Water Quality	5 (2.4)
Solid waste disposal	0		
Instream Habitat Integrity Score	73.6	Riparian Zone Habitat Integrity Score	19
Integrity Class	C	Integrity Class	F

3.4. ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

The EIS Assessment considers a number of biotic and habitat determinants surmised to indicate either importance or sensitivity.

Table 5: Results of the EIS assessment for the affected watercourses/wetlands

Biotic Determinants	**Score**
Rare and endangered biota	4
Unique biota	2
Intolerant biota	1
Species/taxon richness	2
Aquatic Habitat Determinants	
Diversity of aquatic habitat types of features	3
Refuge value and habitat type	3
Sensitivity of habitat to flow changes	2
Sensitivity of flow related water quality changes	3
Migration route/corridor for instream and riparian biota	1
National parks, wilderness areas, Nature Reserves, Natural Heritage sites, PNEs	2
EIS Category	**Moderate**

3.5. BIODIVERSITY CONSERVATION VALUE

Two biodiversity conservation mapping initiatives are of relevance to the freshwater ecosystems within the study area; the Western Cape Biodiversity Spatial Plan mapping initiatives that were undertaken on a regional basis and the national Freshwater Ecosystem Priority Areas mapping initiative.

The Critical Biodiversity Areas (CBA) map for the area aims to guide sustainable development by providing a synthesis of biodiversity information to decision makers. The CBA map indicates areas of land as well as aquatic features which must be safeguarded in their natural state if biodiversity is to persist and ecosystems are to continue functioning. Ecological Support Areas (ESAs) are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. Concerning the sites assessed sites A and B have the most significant wetland characteristics associated with the natural and man-made drainage lines and dam located mainly along the northwestern and southern borders of the proposed development sites. These wetlands, drainage lines and dam have been mapped as Ecological Support Areas (Res) in the latest Western Cape Biodiversity Spatial Plan (2017), and the dam has been mapped as an artificial and natural Freshwater Priority Area (FEPAs).

Freshwater Ecosystem Priority Areas (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 dam and associated surrounding wetland areas at site B have also been mapped as artificial and natural Freshwater Priority Areas (FEPAs).

The conservation objective for Critical Biodiversity Areas (CBAs) and ESAs here is to maintain natural land, rehabilitate land where degraded to a natural or near-natural condition; and where ecological processes and linkages are to be maintained to cater for evolutionary processes and adaptation to climatic variability and to protect ecological infrastructure.

The implication for management for river FEPAs and associated sub-quaternary catchments is that surrounding land and smaller stream networks need to be managed to maintain the current condition of river reaches; and improve the condition of rivers and rehabilitate rivers to their former condition where required. Long term maintenance of the hydrological and ecological structure and functioning of rivers is important for protection of ecological infrastructure.

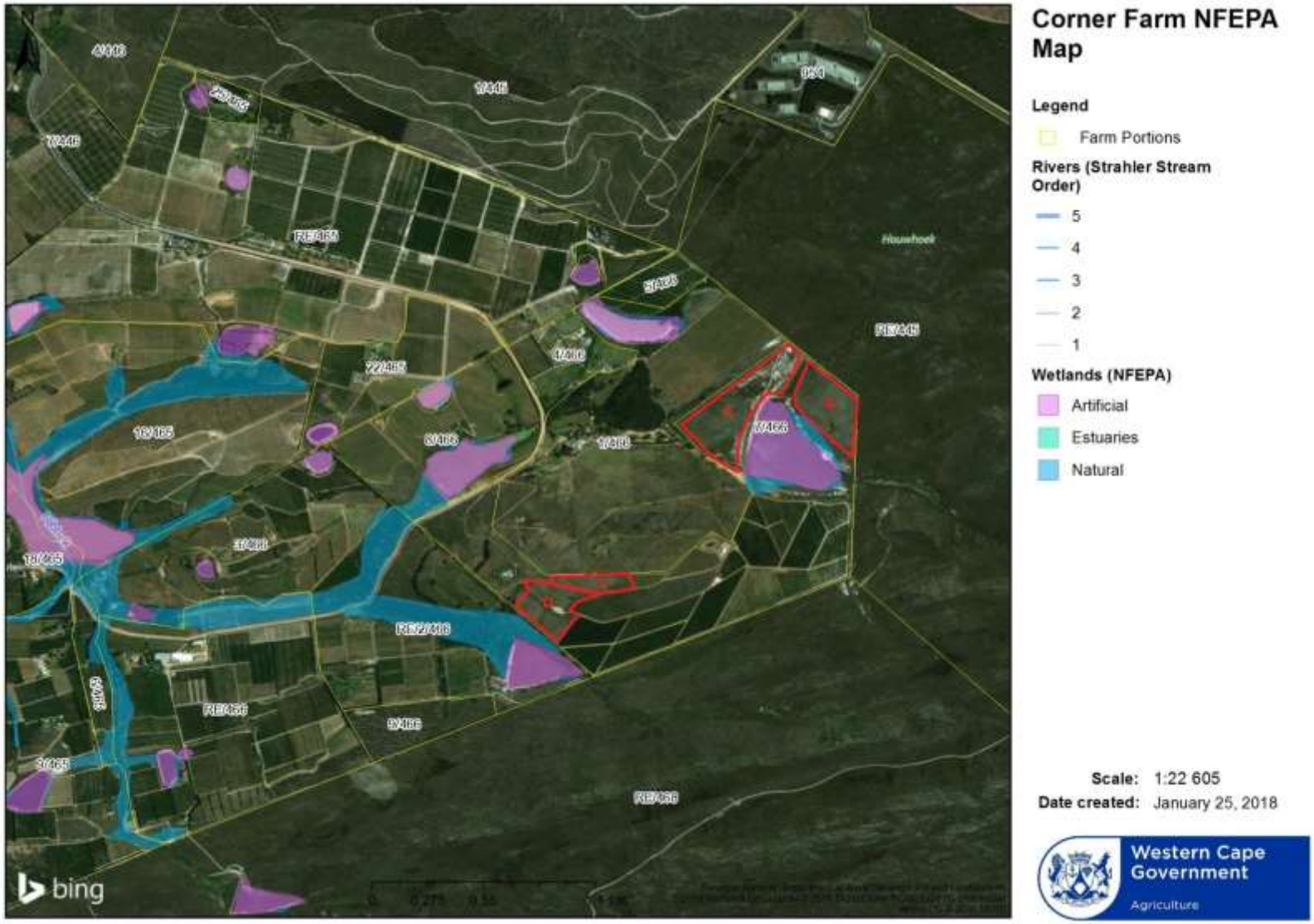


FIGURE 5: NFEPA Map of Corner Farm property assessed.

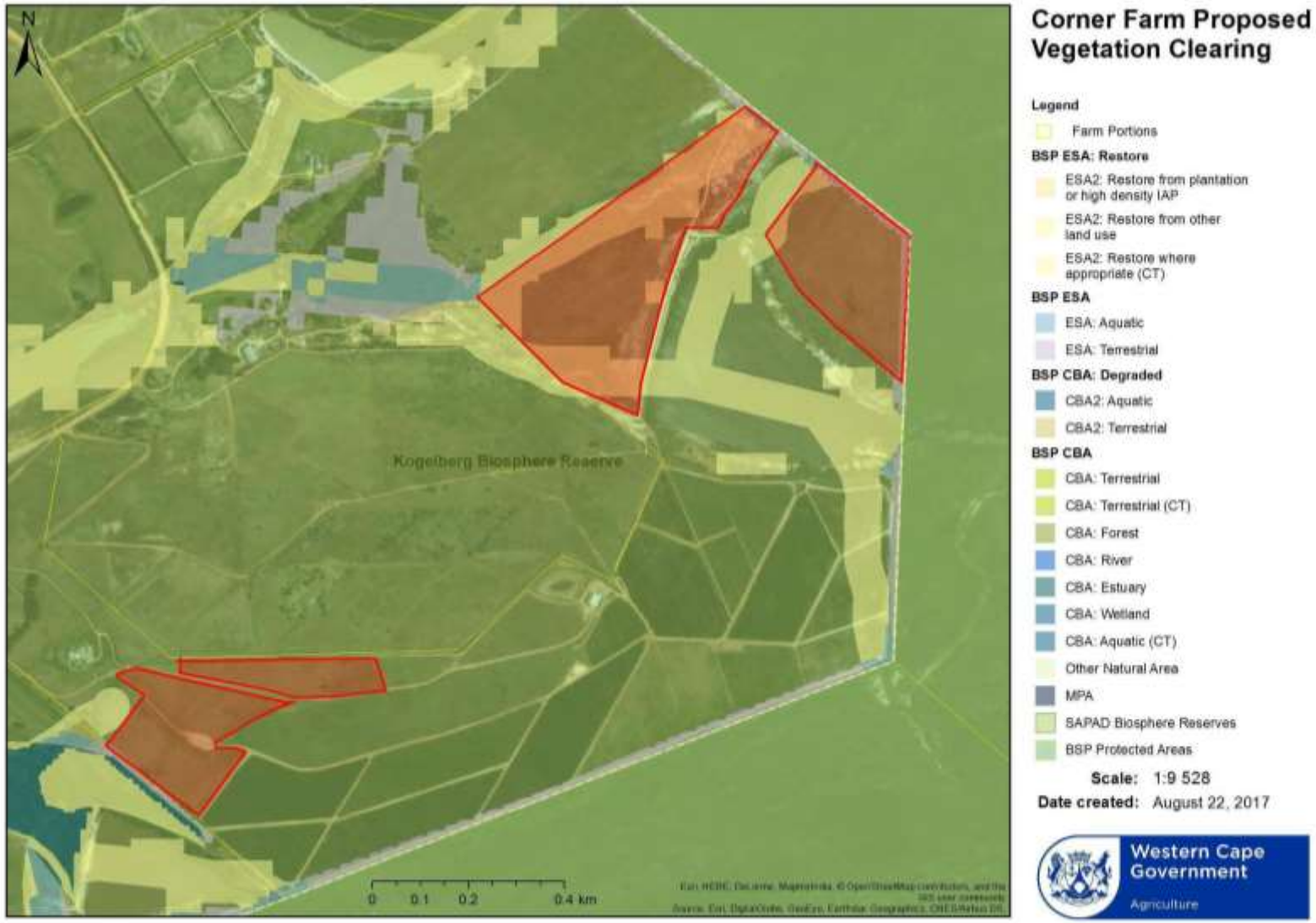


FIGURE 6: ESA(Res) areas as mapped within proposed development areas (WCBSP 2017)

4. IMPACT ASSESSMENT OF THE PROPOSED ACTIVITIES

This section provides an assessment of the potential impacts to freshwater ecosystems that are likely to be associated with the proposed activities. The impact assessment and recommended mitigation measures are provided below:

NATURE OF IMPACT: **LOSS OF RIPARIAN AND/OR WETLAND HABITAT AND BED/BANK MODIFICATION**

As the proposed drainage line crossing includes the clearing and reshaping of the river banks and channel, loss of riparian habitat as well as bed and bank modifications could be expected.

Significance of impacts without mitigation: A low localised negative impact with localised loss of aquatic habitat integrity and vegetation as well as bed/bank modification could be expected during the construction phase.

Proposed mitigation:

Construction phase:

- Construction activities must be controlled and restricted to the development footprint only.
- The proposed drainage line crossing must be located on the existing crossing footprint as far as possible.
- The construction area and all proposed no-go areas must be demarcated before construction starts and remain demarcated throughout construction phase.
- The construction activities must be monitored by an Environmental Control Officer.
- Work within the stream channel during construction of the crossing should be limited as far as possible and rehabilitated immediately afterwards, where the banks are reshaped as according to surrounding contours and rubble is removed from the stream and banks.
- All disturbed areas should receive ongoing monitoring and management of erosion and invasive plant growth.

Operational phase:

- All no-go areas must remain demarcated throughout the operational phase. Demarcation must be by means of basic fence i.e. standard wooden droppers with 1 to 2 wire strands.
- Should any disturbance i.e. erosion occur within the no-go areas the affected areas should immediately be rehabilitated and prevention measures must be put in place to ensure that the disturbance does not happen again.
- All alien invasive plant species must be removed and managed on an ongoing basis from the no-go areas. Removal of alien invasive plant species must take place according to CapeNature approved methods, having the least negative impact on the environment.

Significance of impacts after mitigation: The significance of the impact on the aquatic ecosystems with mitigation is expected to be low.

NATURE OF IMPACT: ALTERED FLOW

The construction of the drainage line crossing and establishment of new orchards may have an impact upon the flow within the drainage lines and amount of runoff that the wetland areas receive.

Significance of impacts without mitigation: Medium to high negative impact on the receiving water resources if not mitigated.

Proposed mitigation:

Construction phase:

- Construction work (i.e. construction of drainage line crossing and establishment or

orchards – site clearance) must be carried out in the low rainfall season (mid to late summer) and completed in that low rainfall season to minimise the impact on the flow in the drainage line and runoff into the wetland areas.
- The new drainage line crossing must allow free flow and be able to accommodate at least the 1:50 year flood event and must not erode or cause erosion of the site and surrounds.
- All rubble and waste debris that has resulted from the clearing and demolition of the existing structures in the river channel should be removed out of the river channel, its banks and the riparian buffer zone.

Operational phase:
- The drainage line flow must not be impeded and should be kept clean of woody debris or rubble and where necessary nuisance plant growth should it occur.
- Monitoring and clearing of blockages within the stream channel will need to be undertaken on an ongoing basis. Clearing of debris and nuisance growth of plants within the channel if necessary should also be undertaken by hand during the low/no flow period.
- Current stormwater runoff flow to wetland areas may not be impeded by the proposed orchards and adequate stormwater channels must be constructed and maintained throughout the proposed development areas to maintain current runoff conditions without leading to erosion.

Significance of impacts after mitigation: The significance of the impact on the aquatic ecosystems with mitigation is expected to be low.

NATURE OF IMPACT: EROSION
Disturbance to soil which is caused during the construction of the drainage line crossing and establishment of new orchards may lead to erosion of the site and surrounds

Significance of impacts without mitigation: Medium to high negative impact on the receiving environment if not mitigated.

Proposed mitigation:

Construction phase:
- The riparian and wetland vegetation cover should be disturbed as little as possible during the construction of the drainage line crossing and may not be disturbed at all within the proposed no-go areas.
- Access to roads and other areas must be controlled to avoid disturbance of areas outside the development footprint. Personnel should be restricted to the immediate construction areas only.
- Monitor construction areas frequently for signs of erosion and if signs of erosion are detected implement repair and preventative measures immediately.

Operational phase:
- Only use one existing access road to the sites for operational purposes and avoid disturbance of “new” areas outside the existing access road and infrastructure footprint.
- Rehabilitate or stabilise eroded areas immediately to prevent increase in erosion.

Significance of impacts after mitigation: The significance of the impact on the aquatic ecosystems with mitigation is expected to be low.

NATURE OF IMPACT: FACILITATION OF INVASION BY ALIEN PLANT SPECIES
Disturbance to soil which is caused during the construction of the drainage line crossing and establishment of new orchards may lead to the establishment of weeds and other alien plant species on the site and surrounds.

Significance of impacts without mitigation: Medium to high negative impact on the receiving environment if not mitigated.

Proposed mitigation:

Construction phase:

- Care should be taken that any soil used for construction or orchard establishment purposes that is brought onto the site does not contain the seeds of alien invasive plants.

Operational phase:

- During the early establishment phase of the drainage line crossing and orchard, ongoing monitoring and control of the growth of invasive alien plants will be necessary as it will be easier to remove the young invasive alien plants.
- Fertilisers used within the proposed orchards/cultivated lands must not contain any weed or alien invasive plant species seeds.
- Monitoring and clearing of alien invasive plants along the banks and within the streams and wetlands will need to be undertaken on an ongoing basis according to the applicable recognised CapeNature approved methods for clearing of alien invasive plant growth.

Significance of impacts after mitigation: The significance of the impact on the aquatic ecosystems with mitigation is expected to be low.

NATURE OF IMPACT: POLLUTION OF WATER RESOURCES WATER QUALITY

During construction and operational activities waste produced or products/materials used on site may lead to pollution of surface and underground water resources.

Significance of impacts without mitigation: Medium to high negative impact on the receiving environment if not mitigated.

Proposed mitigation:

Construction phase:

- Ablution facilities should be available for construction workers, should be located outside the riparian and wetland zones and should be regularly serviced.
- Proper on-site management for the storage and use of materials, waste and pesticides/weed killers to prevent any potential pollution of the drainage lines, wetlands and dams should be addressed in the Environmental Management Plan for the project.

Operational phase:

- Ablution facilities should be available for operational workers, should be located outside the riparian and wetland zones and should be regularly serviced.
- Proper on-site management for the storage and use of materials, waste and pesticides/weed killers to prevent any potential pollution of the drainage lines, wetlands and dams should be addressed in the Environmental Management Plan for the project.

Significance of impacts after mitigation: The significance of the impact on the aquatic ecosystems with mitigation is expected to be low.

5. CUMULATIVE IMPACTS

Cumulatively, if adequately mitigated the potential impacts of the proposed activities to be undertaken will be of low negative significance and will in the short term just require some rehabilitation of the disturbed areas and longer term monitoring and control of the growth of alien invasive plants and erosion.

6. RECOMMENDTIONS AND CONCLUDING REMARKS

The overall freshwater ecological condition of the wetlands, drainage lines, dams and general remaining riparian habitats are deemed to be moderately to largely modified and the ecological importance and sensitivity low. However the functioning of the drainage lines and associated wetlands areas as assessed on sites A, B and D are important in maintaining current hydrological functioning and freshwater ecosystems on the sites and surrounds. These areas together with adequate buffer areas have therefore been delineated as no-go areas and are recommended to be demarcated by a land surveyor as no-development areas before site clearance commences and remain demarcated throughout the operational phase of the proposed activities to ensure ongoing protection of these areas. Refer to figures 7.1 and 7.2 below for delineation of the recommended no-go areas.

The only development activity allowed within these areas is the upgrade and maintenance associated with the higher lying drainage line crossing to gain access to site B. Before the drainage line crossing is upgraded a design that meets the required specifications approved by BGCMA must be submitted and approved for this crossing. The design must allow for free flow and be able to accommodate the 1:50 year flood event without causing erosion, eroding itself or being washed away. The materials to be used and design of the formal drainage line crossing must also not lead to erosion of the crossing and surrounds. The construction and maintenance of this crossing must take place under the guidance of an Environmental Management Plan ("EMP"). An Environmental Control Officer ("ECO") must be appointed before construction commences to ensure that all requirements of the EMP are being implemented and monitor compliance throughout the construction and maintenance/operational phases. A detailed construction method statement must be provided by the developer/landowner to be approved by the ECO before commencement and must describe how construction activities will be implemented to ensure compliance with the EMP. The associated impacts of construction and maintenance/operation of this crossing must be strictly managed and kept to minimum as far as possible.

Any areas disturbed within the recommended no-go areas must be rehabilitated immediately throughout the construction and operational phases to the satisfaction of the appointed Environmental Control Officer.

Cumulatively, the potential impacts of the proposed activities to be undertaken on the freshwater ecosystems remaining on site will be of low negative significance if the above mentioned and below recommendations are implemented:

Construction phase:

- Construction activities must be controlled and restricted to the development footprint only.
- The proposed drainage line crossing must be located on the existing crossing footprint as far as possible.
- The construction area and all proposed no-go areas must be demarcated before construction starts and remain demarcated throughout construction phase.
- The construction activities must be monitored by an Environmental Control Officer.
- Work within the stream channel during construction of the crossing should be limited as far as possible and rehabilitated immediately afterwards, where the banks are reshaped as according to surrounding contours and rubble is removed from the stream and banks.
- All disturbed areas should receive ongoing monitoring and management of erosion and invasive plant growth.
- Construction work (i.e. construction of drainage line crossing and establishment or orchards – site clearance) must be carried out in the low rainfall season (mid to late summer) and completed in that low rainfall season to minimise the impact on the flow in the drainage line and runoff into the wetland areas.

- The new drainage line crossing must allow free flow and be able to accommodate at least the 1:50 year flood event and must not erode or cause erosion of the site and surrounds.
- All rubble and waste debris that has resulted from the clearing and demolition of the existing structures in the river channel should be removed out of the river channel, its banks and the riparian buffer zone.
- The riparian and wetland vegetation cover should be disturbed as little as possible during the construction of the drainage line crossing and may not be disturbed at all within the proposed no-go areas.
- Access to roads and other areas must be controlled to avoid disturbance of areas outside the development footprint. Personnel should be restricted to the immediate construction areas only.
- Monitor construction areas frequently for signs of erosion and if signs of erosion are detected implement repair and preventative measures immediately.
- Care should be taken that any soil used for construction or orchard establishment purposes that is brought onto the site does not contain the seeds of alien invasive plants.
- Ablution facilities should be available for construction workers, should be located outside the riparian and wetland zones and should be regularly serviced.
- Proper on-site management for the storage and use of materials, waste and pesticides/weed killers to prevent any potential pollution of the drainage lines, wetlands and dams should be addressed in the Environmental Management Plan for the project.

Operational phase:

- All no-go areas must remain demarcated throughout the operational phase. Demarcation must be by means of basic fence i.e. standard wooden droppers with 1 to 2 wire strands.
- Should any disturbance i.e. erosion occur within the no-go areas the affected areas should immediately be rehabilitated and prevention measures must be put in place to ensure that the disturbance does not happen again.
- All alien invasive plant species must be removed and managed on an ongoing basis from the no-go areas. Removal of alien invasive plant species must take place according to CapeNature approved methods, having the least negative impact on the environment.
- The drainage line flow must not be impeded and should be kept clean of woody debris or rubble and where necessary nuisance plant growth should it occur.
- Monitoring and clearing of blockages within the stream channel will need to be undertaken on an ongoing basis. Clearing of debris and nuisance growth of plants within the channel if necessary should also be undertaken by hand during the low/no flow period.
- Current stormwater runoff flow to wetland areas may not be impeded by the proposed orchards and adequate stormwater channels must be constructed and maintained throughout the proposed development areas to maintain current runoff conditions without leading to erosion.
- Only use one existing access road to the sites for operational purposes and avoid disturbance of “new” areas outside the existing access road and infrastructure footprint.
- Rehabilitate or stabilise eroded areas immediately to prevent increase in erosion.
- During the early establishment phase of the drainage line crossing and orchard, ongoing monitoring and control of the growth of invasive alien plants will be necessary as it will be easier to remove the young invasive alien plants.
- Fertilisers used within the proposed orchards/cultivated lands must not contain any weed or alien invasive plant species seeds.
- Monitoring and clearing of alien invasive plants along the banks and within the streams and wetlands will need to be undertaken on an ongoing basis according to the applicable recognised CapeNature approved methods for clearing of alien invasive plant

growth.

- Ablution facilities should be available for operational workers, should be located outside the riparian and wetland zones and should be regularly serviced.
- Proper on-site management for the storage and use of materials, waste and pesticides/weed killers to prevent any potential pollution of the drainage lines, wetlands and dams should be addressed in the Environmental Management Plan for the project.

These measures should be addressed, implemented and monitored in terms of the EMP for the construction and operational phases.

The Breede Gouritz Catchment Management Agency should be approached for comment on the water use aspects of the proposed activities that may need to be authorised. The proposed works within the drainage line may be deemed to be changing the characteristics of the streams and may therefore require authorization by this Department.

Figure 7.1: Demarcated no-go drainage lines and wetland areas at Sites A and B.

Figure 7.2: Demarcated no-go drainage line area at Site D.

Demarcated No-go Areas GPS Co-ordinates to be plotted and demarcated by a professional land surveyor:

Site A:	GPS Co-ordinates:
1	34°14'04.09"S 19°07'38.30"E
2	34°14'04.38"S 19°07'38.86"E
3	34°14'06.80"S 19°07'36.11"E
4	34°14'08.06"S 19°07'33.96"E
5	34°14'09.32"S 19°07'30.24"E
6	34°14'10.32"S 19°07'31.95"E
7	34°14'10.00"S 19°07'33.52"E
8	34°14'10.53"S 19°07'34.11"E
9	34°14'11.08"S 19°07'33.29"E
10	34°14'10.94"S 19°07'30.98"E
11	34°14'09.98"S 19°07'29.48"E
12	34°14'12.32"S 19°07'24.75"E
13	34°14'14.84"S 19°07'21.09"E
14	34°14'15.74"S 19°07'21.43"E
15	34°14'17.60"S

	19°07’24.90”E
16	34°14’17.09”S 19°07’27.89”E
17	34°14’16.55”S 19°07’31.15”E
18	34°14’05.67”S 19°07’36.33”E
19	34°14’07.41”S 19°07’33.65”E
20	34°14’08.73”S 19°07’29.75”E

Site B:	**GPS Co-ordinates:**
1	34°14’08.55”S 19°07’44.64”E
2	34°14’12.53”S 19°07’40.08”E
3	34°14’15.58”S 19°07’43.11”E
4	34°14’18.21”S 19°07’46.70”E
5	34°14’19.36”S 19°07’48.82”E
6	34°14’06.35”S 19°07’41.75”E
7	34°14’08.81”S 19°07’39.21”E
8	34°14’11.39”S 19°07’36.70”E
9	34°14’10.58”S 19°07’42.29”E

Site D:	**GPS Co-ordinates:**
1	34°14’40.09”S 19°07’04.33”E
2	34°14’40.24”S 19°07’05.00”E
3	34°14’41.97”S 19°07’03.59”E
4	34°14’43.68”S 19°07’01.69”E
5	34°14’43.61”S 19°07’01.27”E
6	34°14’41.86”S 19°07’03.06”E
7	34°14’40.63”S 19°07’04.34”E

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APPENDIX A: ABBREVIATED CURRICULUM VITAE AND DECLARATION OF INDEPENDENCE OF FRESHWATER SPECIALIST

BACKGROUND AND QUALIFICATIONS OF SPECIALIST CONSULTANT

Full Name: Nicolaas Hanekom
Year of Birth: 1967
Nationality: South African
Profession: Environmental Scientist and Environmental Assessment Practitioner
Years in Profession: Since 1989

This Freshwater Impact Assessment was conducted by Nicolaas Hanekom who has 26 years' experience working as an ecologist in the field of nature conservation. He has extensive field experience, knowledge of freshwater ecology, knows the region in which he is working and exercises sound and unbiased scientific and professional judgment. He has received training on the basics of freshwater ecosystems impact assessment during his career in nature conservation. He is a qualified Environmental Assessment Practitioner who holds a M. Tech, Nature Conservation from the Cape Peninsula University of Technology and a registered Professional Natural Scientist (Ecologist) with the South African Council for Natural Scientific Professions ("SACNASP").

Summary of Experience:

- Assistance Reserve Manage at Gariep Dam Nature Reserve (1993-1998)
- Reserve Manager, Conservation Services Manager for Western Cape Nature Conservation Board (1998-2001)
- Part time external Lecturer at Cape Peninsula University of Technology (2003-2005)
- Director: Environmental Management at Cape Lowlands Environmental Services (2006-2010)
- Environmental Impact Assessment Practitioner at Eco Impact (Pty) Ltd (2010 to date)
- Safety Health & Environmental System consulting

Mr Hanekom meets the legal requirements to act as a specialist on this project in terms of Regulation 13 of the Environmental Impact Assessment Regulations, 2014 that took effect on 8 December 2014, which regulates the general requirements for Environmental Assessment Practitioners ("EAP"s) and specialists. The regulation states that:

An EAP and a specialist, appointed in terms of regulation 12(1) or 12(2), must –

(1)(a) be independent;
(b) have expertise in conducting environmental impact assessments or undertaking specialist work as required, including knowledge of the Act, these Regulations and any guidelines that have relevance to the proposed activity;
(c) ensure compliance with these Regulations;
(d) perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the application;
(e) take into account, to the extent possible, the matters referred to in regulation 18 when preparing the application and any report, plan or document relating to the application; and
(f) disclose to the proponent or applicant, registered interested and affected parties and the competent authority all material information in the possession of the EAP and, where applicable, the specialist, that reasonably has or may have the potential of influencing-
(i) any decision to be taken with respect to the application by the competent authority in terms of these Regulations; or
(ii) the objectivity of any report, plan or document to be prepared by the EAP or specialist, in terms of these Regulations for submission to the competent authority; unless access to that information is protected by law, in which case it must be indicated that such protected information exists and is only provided to the competent

authority.

(2) In the event where the EAP or specialist does not comply with sub regulation (1)(a), the proponent or applicant must, prior to conducting public participation as contemplated in chapter 5 of these Regulations, appoint another EAP or specialist to externally review all work undertaken by the EAP or specialist, at the applicant's cost.

THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I Nicolaas Willem Hanekom, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of NEMA, the Environmental Impact Assessment Regulations, 2014.

Signature of the specialist

Eco Impact Legal Consulting (Pty) Ltd
Name of company

20 October 2017
Date

APPENDIX B: METHODOLOGIES USED IN THE ASSESSMENT

RIVER HEALTH ASSESSMENTS:

INDEX OF HABITAT INTEGRITY

Assessment of habitat integrity of a river can be seen as a precursor of the assessment of biotic integrity and is a measure of the degree to which a river has been modified from its natural state. Habitat and biotic integrity together constitute ecological integrity (Kleynhans, 1996). A site-based approach was carried out at all sites, where it is based on ground level observations at each monitoring site, but also makes use of other sources of information (maps, local knowledge etc.). The objectives of the Index of Habitat Integrity (IHI) assessment are to put into perspective the significance of various factors in the degradation of the habitat integrity of a specific river (Kleynhans, 1996).

The methodology (Kleynhans, 1996) involves an assessment of the number and severity of anthropogenic impacts 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 with 0 (no impact), 1 to 5 (small impact), 6 to 10 (moderate impact), 11 to 15 (large impact), 16 to 20 (serious impact) and 21 to 25 (critical impact).

Table A1: Criteria evaluated in the Index for Habitat Integrity

Instream Criteria	Weight	Riparian Zone Criteria	Weight
Water abstraction	14	Vegetation Removal	13
Flow modification	13	Exotic Vegetation	11
Bed modification	13	Bank Erosion	12
Channel modification	13	Channel Modification	13
Water quality	14	Water Abstraction	13
Inundation	10	Inundation	12
Exotic macrophytes	9	Flow Modification	14
Exotic fauna	8	Water Quality	12
Solid waste disposal	6		

Based on the relative weights of the criteria, the impacts of each criterion are estimated as follows:

Rating for the criterion/maximum value (25) x weight (percent)

Example: for criterion, which received a rating to 10 in the assessment, with weighting of 14 is calculated as follows:

10/25 x 14 = 5.6

The estimated impacts for all criteria calculated in this way are summed, expressed as a percentage and subtracted from 100 to arrive at a provisional assessment of habitat integrity for the instream and riparian components respectively. The eventual total scores for the instream and riparian zone components are then used to place the habitat integrity in of both in a specific habitat integrity category. These categories are indicated in Table A2 below.

Table A2: Intermediate Habitat Integrity categories (from Kleynhans, 1996)

Category	Description	Score (% of total)
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 has occurred.	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 almost complete loss of natural habitat and biota. In worst instances basic ecosystem functions have been destroyed and changes are irreversible.	0-19

ECOLOGICAL IMPORTANCE AND SENSITIVITY (EIS)

EIS 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. The median of the resultant score is calculated to derive the EIS category.

Table A3: Definition of the four-point scale used to assess biotic and habitat determinants presumed to indicate either importance or sensitivity

Four point 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 A4: 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	>2-≤3

	capacity for use.	
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 which are not unique on any scale. These rivers (in terms of biota and habitat) are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1