APPENDIX B6:

BIODIVERSITY OFFSET STUDY

BIODIVERSITY OFFSET AND COMPENSATION STUDY AND IMPLEMENTATION PLAN

Prepared for

Nemai Consulting

July 2018

Prepared by:	**Scientific Aquatic Services**
Report compiled by:	**S. van Staden (Pr. Sci.Nat)**
	N. Cloete (Pr. Sci.Nat)
	K. Marais (Pri. Sci. Nat)
	A. Mileson
	C. Hooton
	H. de Beer
Report reviewer:	**S. van Staden (Pr. Sci.Nat)**
Report reference:	**SAS 2171744**
Date:	**July 2018**

Scientific Aquatic Services CC
CC Reg No 2003/078943/23
Vat Reg. No. 4020235273
PO Box 751779
Gardenview
2047
Tel: 011 616 7893
Fax: 011 615 6240
E-mail: admin@sasenvgroup.co.za

EXECUTIVE SUMMARY

The proposed infrastructure associated with the uMkhomazi Water Project Phase 1 (uMWP-1) hereafter referred to as the "Project", comprises the following:

- A new dam at the farm Smithfield (referred to hereafter as the "Smithfield Dam") near Richmond on the uMkhomazi River[1];
- Water conveyance infrastructure, which will entail a raw water tunnel and pipeline, to a balancing dam (preferred option referred to as the Langa Dam) within the Baynesfield Estate land;
- A Water Treatment Works (WTW) in the uMlaza River Valley; and
- A potable water pipeline from the WTW to Umlaas Road, where it will connect to the existing 57' pipeline.

According to the Department of Environmental Affairs' (DEA) comments on the Final Environmental Impact Assessment (EIA) Report (November 2016), there was lack of clarity as to the location and acceptability of potential offset sites to compensate for the residual impact of the proposed development (the uMWP-1). It was also unclear if the proposed offsets would be feasible, practical and lawful. The DEA thus requested that an Offset Feasibility Assessment be undertaken.

Although the Project was considered potentially "fatally flawed" due to the significance and irreversibility of anticipated impacts on sensitive natural areas and on faunal Species of Conservation Concern (SCC), with particular mention of the loss of habitat for the Critically Endangered *Hirundo atrocaerulea* (Blue Swallow) in the vicinity of the proposed balancing dam, it is considered essential for the continued economic and social development of the area serviced by the Integrated Mgeni Water Services Scheme (WSS), *viz* the Durban and Pietermaritzburg areas.

The Project's most significant ecological impact will be during the first impoundment of the proposed Smithfield Dam, since this will lead to inundation of habitat for: *Hirundo atrocaerulea* (Blue Swallow) and *Capys penningtoni* (Pennington's Protea Butterfly), as well as inundation of *Gnomeskelus fluvialis* (Riverine Keeled Millipede), inundation of terrestrial Critical Biodiversity Areas (CBA's), inundation of wetlands, riparian areas and instream habitat.

Following on from the evaluation of the proposed recipient areas in terms of the ecological condition of the watercourses and grasslands therein, as well as determining the extent and suitability of these natural resources, an Implementation Plan was developed to guide the practical application of the Biodiversity Offset and Compensation Initiative. This Implementation Plan is applicable to the freshwater, CBA/grassland and Species of Conservation Concern aspects of the Biodiversity Offset and Compensation Initiative and includes (but is not limited to): alien vegetation control measures, general rehabilitation recommendations, anticipated budgets to implement the rehabilitation measures, monitoring and auditing requirements.

The budgets presented in this report include Value Added Tax (V.A.T) at a rate of 15% and are calculated using 2018 costings. It is estimated that the total budget for the Biodiversity Offset and Compensation Initiative is **R150,000,000 (rounded and including VAT).** This includes the following budgets:

- Execution and maintenance for three (3) year period of Wetland Offset and Compensation Initiative: **R37,850,000 (rounded and including VAT);**
- Execution and maintenance for three (3) year period of Riparian Zone Offset and Compensation Initiative as well as employment of River stewards for 30 years: **R15,450,000 (rounded and including VAT);**
- Execution and maintenance for three (3) year period of Grassland and CBA Offset and Compensation Initiative: **R38,181,000 (rounded and Incl. VAT);**
- Offset and compensation programmes for the three (3) identified faunal SCC species (namely Blue Swallow, Riverine Keeled Millipede and Pennington's Protea Butterfly): **R40, 477,000 (rounded and Incl VAT).** This is split between the three species as follows:
  - Blue Swallow: **R29,307,750 (incl VAT);**
  - Riverine Keeled Millipede: **R6,085,915 (incl VAT);** and
  - Pennington's Protea Butterfly: **R5, 082,770 (incl VAT)**.

Please refer to Sections 11.2.6, 11.3.5 and 11.4.4 for the detailed breakdowns of these budgets. It should also be noted that should further specialist studies determine that the Riverine Keeled Millipede does not occur within the proposed Smithfield Dam FSL footprint and/or that Pennington's Protea Butterfly will not be affected, no compensation will be required and therefore the associated budget will be redirected to the other aspects of the offset.

This report addresses the key aspects of the feasibility of a Biodiversity Offset and Compensation Initiative, however before implementation can take place, a number of steps remain to be taken in finalizing the detailed offset design, and then in actual implementation of the biodiversity offset, rehabilitation and compensation work. The Department of Water and Sanitation (DWS) could appoint a single Implementing Agent to co-ordinate and manage wetland rehabilitation and offsets (e.g. Endangered Wildlife Trust [EWT], Wildlands Conservation Trust or the Worldwide Fund for Nature [WWF]). The overall plans for an institutional arrangement rollout have been defined to further guide the rollout of the Biodiversity Offset and Compensation Initiative.

This Biodiversity Offset Study found that most of the Biodiversity Offset targets can be met and that the Biodiversity Offset and Compensation Initiative is viable for the project. Appropriate offset areas have been identified and the degree of willingness by landowners has shown that with further effort the Stewardship Program could be successfully implemented. An additional landowner within the ideal areas identified for offsets, and in the vicinity of the Impendle Nature Reserve, has indicated late interest in the project which would add approximately 1900 ha of offset land to the project. This is being explored further and will be included in the final submission to the DEA. It is deemed possible that additional landowners can be onboarded in future phases of the project. Furthermore, although no initiative can address the impact on the three (3) faunal species of most significant conservation concern (i.e. *Hirundo atrocaerulea* [Blue Swallow], *Capys penningtoni* [Pennington's Protea Butterfly] and *Gnomeskelus fluvialis* [Riverine Keeled Millipede]), cogent plans have been developed to, as best possible, mitigate where feasible and compensate for the impact on these three (3) faunal species.

In order to negate the impact of the proposed Langa (or Mbangweni) Balancing Dam which is especially significant in light of the impact on the critically endangered Blue Swallows (*Hirundo atrocaerulea)* in the area, an additional, or second tunnel, should be considered which would mean the Langa balancing dam is not required. To develop an additional, or second tunnel would, however very significantly increase the cost of the implementation of the Project and could pose a financial fatal flaw to the project. Should the Compensation Initiative for the Blue Swallow not be deemed viable or appropriate, this technological alternative (i.e. the additional, second tunnel) must be implemented as part of the Project to further minimise the impact of the proposed development and only the residual impacts of the proposed Smithfield Dam offset and compensated for.

This Biodiversity Offset and Compensation Initiative and Implementation Plan document must be submitted to the competent authority as part of the Environmental Impact Assessment (EIA) and Authorisation Process. Upon approval, the Biodiversity Offset and Compensation Initiative and Implementation Plan document becomes binding and all aspects of the proposed rehabilitation and mitigation recommendations made herein must be adhered to by the proponent and appointed Implementing Agent/s.

The objective of this Study was to provide sufficient information on the ecology of the area, together with the best considered and assessed Biodiversity Offset and Compensation Plan that could be developed within the time and budgetary constraints during this high-level planning and investigative phase of the Project. This is to allow for the Environmental Assessment Practitioner (EAP) and the relevant authorities to apply the principles of Integrated Environmental Management (IEM) as well as the concept of sustainable development. The needs for conservation as well as the risks to other spheres of the physical and socio-cultural environment need to be compared and considered, along with the need to ensure economic development of the region and the country.

It is the opinion of the Ecologists who compiled this Biodiversity Offset and Compensation Initiative report (as listed on the cover page) that this Study provides the relevant information required in order to consider and implement IEM as well as to ensure that the best long term use of the resources within the study area will be made in support of the principle of sustainable development.

MANAGEMENT SUMMARY

Introduction and setting the scene

The Integrated Mgeni Water Supply System (WSS) is the main water source that supplies five (5) million people and industries in the eThekwini Municipality, uMgungundlovu District Municipality (DM) and Msunduzi Local Municipality (LM), all of which comprise the economic hub of the KwaZulu-Natal (KZN) Province (Nemai, 2016). The existing water resources of the Integrated Mgeni WSS are insufficient to meet the long-term water requirements of the system, and these existing water sources cannot be further developed. The Department of Water and Sanitation (DWS) recently completed the feasibility investigations for the proposed the development of the uMkhomazi Water Project (uMWP-1), which is earmarked to transfer water from the undeveloped uMkhomazi River to the Integrated Mgeni WSS. These feasibility investigations indicate that the uMWP-1 is the next most viable option to augment the Integrated Mgeni WSS.

- The Project will consist of a raw water component and a potable water component;
- The Project's raw water component will consist of a new storage dam (the proposed Smithfield Dam) on the uMkhmazi River, a 32.5 km long raw water conveyance tunnel, a ±5.0 km long raw water pipeline to the proposed Baynesfield Water Treatment Works (WTW), the proposed Langa Balancing Dam as well as a ±1.6 km long bi-directional off-take pipeline to and from Langa Balancing Dam. Some of the water from Smithfield Dam will be stored in the Langa Balancing Dam to supply water to the Baynesfield WTW during maintenance period of the tunnel and in case of emergencies; and
- The Project's potable water component will cosist of a the afore-mentioned Baynesfield WTW, which will have capacity of about 625 Mℓ/day, storage reservoirs/s at the Baynesfield WTW and a ±16.0 km long potable water from the WTW to Umlaas road where it will link into the existing bulk potable water supply infrastructure (the existing '57 pipeline) of the Mgeni WSS.

Problem Statement

Although the Project was considered to be potentially "fatally flawed" due to the significance and irreversibility of anticipated impacts on sensitive natural areas and on faunal Species of Conservation Concern (SCC), it is considered essential for the continued economic and social development of the areas that are supplied by the Integrated Mgeni WSS.

The Project's most significant ecological impact will be during first impoundment of the proposed Smithfield Dam and balancing dam, since it will have the following impacts that are considered most significant:

1. Inundation of habitat for:
    a. *Hirundo atrocaerulea* (Blue Swallow) a critically endangered species. The proposed balancing dam options pose the most significant threat in this regard pertaining to the foraging habitat of this species; and
    b. *Capys penningtoni* (Pennington's Protea Butterfly) with specific mention of stands of their food source, namely *Protea caffra*;
2. Inundation of habitat for, and potentially individuals of, *Gnomeskelus fluvialis* (Riverine Keeled Millipede), which is only known to occur in the leaf litter of indigenous riparian forest within the uMkhomazi River near the Smithfield Dam;
3. Inundation of terrestrial Critical Biodiversity Areas (CBAs), including:
    a. Irreplaceable CBAs; and
    b. Optimal CBAs
4. Inundation of wetlands, riparian areas and instream habitat which are ecologically sensitive and are also often identified as CBAs.

To mitigate impacts in line with the mitigation hierarchy as advocated by the Department of Environmental Affairs (DEA) *et al.* (2013), alternatives were investigated to avoid, or minimize, the impact of the Project. The following points highlight the key mitigatory investigations that were undertaken:

1. An option was investigated for a balancing dam referred to as the Baynesfield Balancing Dam. This balancing dam would increase the extent of the existing Baynesfield Dam, but this option was, however, determined to be impractical from both engineering and socio-economic points of view;
2. In order to negate the impact of the proposed Langa Balancing Dam, which is especially significant in light of the impact on the critically endangered Blue Swallows (*Hirundo atrocaerulea)* in the area, and alternative tunnel alignment, or an additional, or second tunnel,

should be considered. To develop an additional, or second, tunnel would, however dramatically increase the cost of the implementation of the Project. Should this proposed Biodiversity Offset and Compensation Initiative as outlined in this document not be deemed viable or appropriate, this technological alternative (i.e. the additional / second tunnel) must be implemented as part of the Project to further minimise the impact of the proposed development and only the residual impacts of the proposed Smithfield Dam offset and compensated for, and; and

3. The realignment of the R617 road, since the original proposed re-alignment would have posed a very significant risk to *Capys penningtoni* (Pennington's Protea Butterfly) and would have directly impacted on the Impendle Nature Reserve. The deviation of the R617 has subsequently been re-evaluated and a revised proposed re-alignment option has been recommended which will negate the impact on *Capys penningtoni.*

No mitigatory options are available to avoid, or minimise, the potential risk to *Gnomeskelus fluvialis* which may occur within the riparian zone of the uMkhomazi River that will be affected by the first impoundment of the proposed Smithfield Dam, except for rescue and relocation of this species to identified areas of riparian forest above Smithfield Dam's Full Supply Level.

Background to biodiversity offsets

In March 2017, a draft National Biodiversity Offset Policy was published by the DEA for public comment. According to this document, biodiversity offsets are defined as "*conservation measures designed to remedy the residual negative impacts of development on biodiversity and ecological infrastructure, once the first three groups of measures in the mitigation sequence have been adequately and explicitly considered (i.e. to avoid, minimise and rehabilitate / restore impacts). [Biodiversity] Offsets are the 'last resort' form of mitigation, only to be implemented if nothing else can mitigate the impact."* The South African National Biodiversity Institute (SANBI, 2004) further defines biodiversity offsets as "*measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken"*.

According to the publication Ezemvelo KZN Wildlife (EKZNW) Concise Guideline: Biodiversity Offsets in KwaZulu-Natal (2013), broadly speaking, biodiversity offsets should not be considered when the residual impacts are of 'very high' significance (e.g. if an irreversible impact will occur within an area designated as a CBA). However, as in the draft National Biodiversity Offset Policy (2017), the EKZNW Concise Guideline notes that "*in situations where it is clear that development will be authorized due to strategic interests and the nature of development means that residual negative impacts on biodiversity are unavoidable*", exceptions to the rigid application of the mitigation hierarchy may be made insofar as offsets may be considered as a 'last resort', and consideration should be given to offsets as early as possible in the planning process.

Environmental offsetting provides a means by which to slow – and possibly even reverse – "ecological deficit" by counterbalancing the degradation, destruction and depletion of natural resources through protection, rehabilitation, restoration and replenishment thereof. Ecological deficit is defined by the Global Footprint Network (www.footprintnetwork.org[1]) as "the difference between the biocapacity and ecological footprint of a region or country. An ecological deficit occurs when the footprint of a population exceeds the biocapacity of the area available to that population."

According to the draft National Biodiversity Offset Policy (DEA, 2017), although remaining impacts of 'very high' significance are considered a 'fatal flaw' for development, in cases where the development is authorised for overriding public and economic considerations, offset ratios are typically set very high (30:1 being the highest ratio stipulated by South African Guidelines) and may require some form of compensation other than ecological offsetting. Ecological offsetting is aimed at counterbalancing residual impacts on biodiversity, whilst compensation may take the form of a contribution to a socially desirable cause or intervention in recognition of loss, damage, harm or degradation. Both the DEA (2017) and the Department of Environmental Affairs and Development Planning (DEA&DP) (2011) note that offsets need to be undertaken according to various ratios based on the ecological importance and sensitivity and vulnerability of the ecosystem.

Due to the above, an investigation into the required wetland, biodiversity offset and faunal Species of Conservation Concern (SCC) compensation was launched for the two raw components of the Project,

[1] https://www.footprintnetwork.org/resources/glossary/ Retrieved 23rd January 2018

i.e. the proposed Smithfield Dam and the proposed balancing dam options (i.e. Langa, Mbangweni and Baynesfield Balancing Dams) located at Baynesfield Estate.

The offset ratios as defined by DEA&DP (2011) were refined in the Draft Wetland Offset Calculator specifically pertaining to wetland offsets (Macfarlane D. *et al* 2016). The Draft Wetland Offset Calculator was designed to guide the criteria and importance of wetland habitat in terms of water resource and ecosystem value, ecosystem conservation, as well as presence of species of conservation concern. The outcomes/results of the application of the Draft Wetland Offset Calculator are hectare equivalents representative of the wetland that requires an offset. The Draft Wetland Offset Calculator was used during the determination of the wetland offsets required for the Smithfield Dam and both balancing dam options, namely Langa and Mbangweni, under consideration.

The terrestrial CBA trade-offs and conservation requirements were calculated using the offset ratios for different vegetation types in KZN as defined by EKZNW in “Concise Guideline: Biodiversity Offsets in KwaZulu-Natal” (2013).

Taking the above guidelines (i.e. the DEA [2017] and EKZNW [2013] guidelines as discussed above) into consideration, the following offset ratios were determined for the various ecosystems which will be impacted by the proposed development:

- 30:1 for areas designated as “CBA Irreplaceable”;
- 20:1 for wetlands (subsequently reduced to 11:1 by the wetland offset calculator);
- 5:1 for areas designated as “CBA Optimal”; and
- 1:1 for riparian habitat.

Due to the magnitude of the wetland offset it was deemed unlikely that the Project would achieve the recommended ratio of 20:1 for the wetland offset. Therefore, it is proposed that a reduced offset ratio of 5:1 for wetland habitat only be defined as the minimum objective, in order to significantly increase the chances of a viable, successful Biodiversity Offset and Compensation Initiative. The wetland offset ratio (of 5:1) is almost double that of the precedent set by the Spring Grove Dam Biodiversity Offset Programme. In the opinion of the biodiversity offset specialist, the lower offset ratior (i.e. 5:1) will greatly increase the ability of the proponent to implement a successful offset, thus having a greater long-term benefit to the receiving environment.

Results of baseline freshwater resource assessments

A freshwater resource delineation and assessment were undertaken as part of the Environmental Authorisation Process for the uMWP-1 project, during August and September 2015 by Enviross CC (*Proposed uMkhomazi Water Project. Raw Water Component, Kwazulu-Natal. Aquatic & Wetland Baseline Ecological Integrity & Potential Impact Surveys*. Enviross CC, January 2016.) According to Enviross CC (2016), numerous seep zones and valley bottom wetlands are located below Smithfield Dam’s FSL, and the results of Enviross CC’s assessment correlate with the National Freshwater Ecosystem Priority Areas (NFEPA) Database (2011), i.e. the assessed wetlands are deemed to be in largely natural condition (i.e. a Present Ecological State [PES] A). These wetlands are considered of importance in terms of the provisioning of goods and services (such as harvestable resources and flood attenuation) to the surrounding communities.

Several wetlands were also identified by Enviross CC (2016) within the Baynesfield Area where the proposed balancing dam options (Langa and Mbangweni) are located. These wetlands will also be below the FSL of both balancing dam options.

In summary, it can be concluded that the wetlands affected by the proposed Smithfield Dam, and both balancing dam options (Langa and Mbangweni) are deemed to be of high ecological importance and sensitivity, for varying reasons.

Riparian habitat that would be impacted (i.e. lost) due to the construction and first impoundment of Smithfield Dam is associated with the uMkhomazi River and its small tributaries confluencing within the Smithfield Dam Basin. The total loss of riparian habitat due to inundation will be 135 ha. This reach of riparian habitat that will be inundated during the first impoundment of the Smithfield Dam occurs along an approximately 16.8km long stretch of the uMkhomazi River, and includes riparian habitat associated with small drainage features (unnamed tributaries of the uMkhomazi River) which confluence with the uMkhomazi River. Riparian habitat and the vegetation components were deemed to be in a “moderately modified” condition (PES C), which is largely driven by erosion within the uMkhomazi River Catchment, livestock grazing within the riparian zones and the presence of some invasive exotic vegetation (Enviross CC, 2016).

It can be concluded that the riparian habitat that will be impacted upon by the proposed Smithfield Dam is considered to be of moderate Ecological Importance and Sensitivity (EIS), whilst the instream habitat is considered of high EIS.

Results of baseline terrestrial ecological assessments
The majority of the proposed Project's footprint is located on privately owned land, which is predominantly used for commercial farming and forestry. Patches of natural habitats were noted along the rivers and on the slopes.

The most prevalent vegetation types present within the Project footprint is Southern KwaZulu-Natal Moist Grassland in the west surrounding the proposed Smithfield Dam, Midlands Mistbelt Grassland and Drakensberg Foothill Moist Grassland along the raw water conveyance route (i.e. the raw water tunnel and pipeline from Smithfield Dam to the Baynesfield WTW), and Ngongoni Veld in the east at Baynesfield Estate (Mucina & Rutherford, 2006).

The proposed Project's footprint is identified as being a preferred habitat for avifaunal SCC, with special mention of *Hirundo atrocaerulea* (Blue Swallow). Preferred habitat for two (2) other faunal SCC, namely *Capys penningtoni* (Pennington's Protea Butterfly) and *Gnomeskelus fluvialis* (Riverine Keeled Millipede), is also located within the proposed uMWP-1 footprint area, thus these species may potentially be negatively impacted as a result of the first impoundment of the proposed Smithfield Dam.

Offset Quantum Requirements
The offset quantum for the Riparian Zone Offset, the Wetland and Watercourse Offset Intiative as well as the grassland and CBA Biodiversity Offset and Compensation Initiative are summarised in Table A below. These offset requirements, as briefly discussed under the heading "**Background to biodiversity offsets"** above, were utilised to guide further investigations of the Biodiversity Offset and Compensation Initiative Study.

Table A: Summary of offset requirements using relevant national and provincial guidelines.

Wetland habitat: Offset Ratio 20:1 advocated by DEA (2017) and DEA&DP (2011)		
Dam	**Habitat loss (Hectares)**	**Offset target (hectares)**
Smithfield Dam	55	1100
Langa Balancing Dam Option	44	880
Mbangweni Balancing Dam Option	59	1180
Riparian habitat: Offset Ratio 1:1		
Smithfield Dam	17 km	17 km
CBA 'Irreplaceable' habitat Offset Ratio 30:1 as advocated by EKZNW (2013)		
Smithfield Dam	29.45	883.5
Langa Balancing Dam Option	14.76	442.8
Mbangweni Balancing Dam Option	15.59	466.8
CBA 'Optimal' habitat Offset Ratio 5:1 as advocated by EKZNW (2013)		
Smithfield Dam	129.22	646.1
Langa Balancing Dam Option	N/A	
Mbangweni Balancing Dam Option	N/A	

Landowner Engagement for Stewardship Sites
Four (4) broad offset target recipient areas were identified by using desktop methods, which seemed to provide the required biodiversity characteristics to use for the offset. Within these four (4) main target areas, various farms were identified as potentially suitable offset sites. As far as feasibly possible, contact details for the various landowners of these identified farms were obtained from Nemai

Consulting, during the field work and as referrals from other landowners. All the identified landowners were contacted telephonically and informed about the proposed wetland and biodiversity offset requirements, the concept of the Stewardship Initiative to be set up with the DWS, and they were informed that their property had been identified as a potential site. All telephonic conversations were followed up with an email which contained the following information:

1. The Background Information Document (BID), which included information on:
    a. Basic background on the need for the Project;
    b. The EIA and Water Use Licencing Application (WULA) Process being undertaken by NEMAI Consulting (Pty) Ltd;
    c. Offset Requirements;
    d. Summary of Phase 2 of the Watercourse and Biodiversity Offset Study; and
    e. Contact details for Scientific Aquatic Services (SAS) as well as NEMAI Consulting (Pty) Ltd.
2. Additional maps indicating the identified wetlands and terrestrial CBAs of the target area within which their properties are located;
3. A summary of possible benefits that could arise from the Stewardship Agreements.

Landowners were requested to confirm whether or not they would be interested in future engagement regarding such a stewardship.

Since contact details were not available for all landowners within the target recipient sites at the time of this Biodiversity Offset Study, and some landowners could not be reached, approximately 50% of all landowners within the recipient sites were contacted, including the Department of Rural Development and Land Reform (DRDLR), which owns the majority of farm portions within the S2 Target Recipient Site. Approximately 45% of the landowners who were contacted indicated their willingness in principle to participate in such a Stewardship Programme. By overlaying the delineated watercourses and terrestrial CBA datasets on the farm portions belonging to those landowners who have indicated a willingness to participate, the extent of wetland and CBA habitat which is likely to be realistically available to achieve a successful offset was estimated.

Offset locations and interventions

Based on the all of the above information i.e. the offset requirements as laid out by the DEA (2017) and EKZNW (2013, as well as the wetland hectare equivalents as determined by application of the Draft Wetland Offset Calculator, the following was determined:

- The overall target of 84.7 wetland functional hectare equivalents (based on an offset ratio of 11:1, and as calculated for Smithfield Dam and the Langa Balancing Dam option only) can realistically be achieved, and exceeded by 13.3 wetland functional hectare equivalents;
- The overall target of 920.8 wetland ecosystem conservation hectare equivalents will not be met, and will fall short by 281.6 wetland ecosystem conservation hectare equivalents;
- Offset targets for CBA Irreplaceable and CBA Optimal habitat for both the Smithfield Dam and Langa Balancing Dam Option can potentially be significantly exceeded.

Fieldwork was undertaken to ground-truth the extent and ecological condition of the proposed offset target areas, in terms of both wetland and terrestrial requirements. Following on from this, rehabilitation measures were developed and compiled into a comprehensive, albeit generic, Rehabilitation and Management Guideline which is presented in Section 11 of this Biodiversity Offset Report. These Rehabilitation and Management Guidelines will then in due course be presented to the relevant authorities and stakeholders for approval. If the Project proceeds, these Rehabilitation and Management Guidelines will need to be made specific to each individual stewardship site.

Strength Weakness Opportunity Threat (SWOT) Analyses Findings

A Strength Weakness Opportunity Threat (SWOT) analyses was undertaken to identify the potential risks and opportunities associated with the Project. These key risks and opportunities associated with the Project are discussed below.

Taking into consideration the final offset requirements as discussed in Sections 4.2 and 9.3 of this Biodiversity Offset Report (this report) it is clear that all four (4) proposed recipient sites (as defined in Section 5 of this Biodiversity Offset Report) are required if the offset targets are to be met. Furthermore, whilst various guidelines (DEA, 2017; Macfarlane *et al*, 2016) advice that offsets should preferably be within a single area, this is not practical for a development of this extent. It is the opinion of the

Biodiversity Offset specialists that whilst there are risks associated with each of the four (4) proposed recipient sites, these risks (or similar) are likely to be inherent within the context of any given Offset and Compensation Initiative, and that the approach presented here increases the potential for success as the offset is not reliant on a single farm portion or landowner. In addition, particularly within the Smithfield 3 Target Recipient Site, Non-Governmental Organisation (NGOs) such as Birdlife South Africa, and Government administered initiatives such as Working for Wetlands (jointly administered by the DWS and the DEA), are already active, thus increasing the potential for the proponent to partner with such NGOs or Government administered initiatives to implement a well-rounded, holistic Offset Programme.

Key risks of the Biodiversity Offset and Compensation Initiative include the following:

- Very little is known about the three (3) key faunal species of concern (Blue Swallow, Penningtons Protea Butterfly, Keeled Riverine Millipede). Thus, the compensation initiatives around them have a significant possibility of being unsuccessful and therefore the Biodiversity Offset and Compensation Initiative could be regarded as a failure;
- Many of the land portions in the four (4) Target Recipient Sites are subject to land claims and therefore there is significant risk that any implemented biodiversity offsets could be nullified if land is transferred to claimants who are not sensitive to conservation initiatives. In future engagements with the DRDLR it is hoped that the legal status pertaining to such Stewardship Programmes should land be transferred to claimants can be clarified;
- Privately owned land – obtaining final agreement from landowners may be a challenge. It is possible that land owners will stipulate that no offset requirements may negatively impact on existing or future sustainable commercial activities on each property. One on one engagements will need to take place to explain the potential benefits that can accrue as a result of the offset activities;
- Based on observations during ground-truthing, the implementation of an offset in the four (4) Target Recipient Sites may be technically complicated due to factors such as naturally erodible soils and ongoing anthropogenic disturbances; and
- Mismanagement of funds and wasteful expenditure by the Implementing Agent of the Offset and Compensation Initiative leading to no net gain or improvement in biodiversity.

Procedural risk is best mitigated by ensuring that extensive engagement with the relevant stakeholders, in particular Provincial Authorities such as EKZNW, landowners and the surrounding communities.

The primary risk associated with procurement of land is the financial implications of purchasing significant portions of land on which to implement the proposed offset; however, the purchase of land is not considered a necessity – or practicable - in the context of this Biodiversity Offset and Compensation Initiative. However, should purchase agreements prove feasible, the purchase of land should be preferred over Stewardship Agreements. In order to mitigate this risk, it is suggested that various partnerships – such as Stewardship Programmes managed by landowners – be implemented. Furthermore, it must be ensured that well executed and accountable auditing, both from a technical and a financial point of view, takes place.

Recipient site characterisation – Wetlands and Riparian Zones

The freshwater resources within the four (4) target recipient sites were assessed on a systems level, and were found to be in moderately modified condition, although of high to very high Ecological Importance and Sensitivity despite the decreased ecological integrity. The results of the freshwater resource assessment of freshwater resources within the Target Recipient Sites are summarised in the table below:

Table B: Summary of the results of the assessments of the various freshwater resources within the target recipient sites.

Target recipient site	PES	Ecoservices	EIS	REC
Smithfield 1	C	Intermediate	High	B/C
Smithfield 2	C	Moderately High	High	B/C
Smithfield 3	C	Moderately High	Very High	B/C
Baynesfield	C	Moderately High	Very High	B/C

Impacts on the various freshwater resource systems that were assessed include the construction of drainage channels, instream infrastructure (weirs, roads, bridge piers), erosion and bank incision and proliferation of alien vegetation, particularly wattle (*Acacia spp.*) and Bugweed (*Solanum mauritanium*).

The intensity and magnitude of these impacts varies between systems, but it is, however, the opinion of the Ecologist that these impacts can be appropriately rehabilitated and managed to improve the overall functioning and ecological integrity of the assessed freshwater resource systems, thus contributing towards the achievement of the goals and objectives of the Biodiversity Offset and Compensation Initiative.

In addition to the areas identified for the Wetland Offset and Compensation Initiative a “like for like” Riparian Zone Offset and Compensation Initiative was developed. Riparian areas have been identified in three (3) areas adjacent to the Smithfield Dam Basin for rehabilitation at three (3) strategic points around the proposed Smithfield Dam.

These identified riparian areas as discussed in the paragraph above can be summarised as follows:

- A length of the uMkhomazi River of 9 km downstream of the proposed Smithfield Dam’s dam wall;
- A length of 3 km on the Luhane River, a tributary of the Umkhomazi River, to the south of and flowing into the proposed Smithfield Dam; and
- A length of the uMkhomazi River of 4.5 km upstream of the proposed Smithfield Dam and above it’s FSL.

Recipient site characterisation – Grasslands and Critical Biodiversity Areas (CBAs)
A site visit was undertaken in March 2018 during which the presence of CBA grasslands was noted within the Target Recipient Sites. Factors affecting the integrity of the CBAs within the Target Recipient Sites were recorded e.g. alien and invasive vegetation, and overgrazing. Based on these observations the PES of the CBAs and grasslands within the Target Recipient Sites could be determined and the suitability of the grasslands to meet the offset requirements assessed. Furthermore, the proposed mitigatory measures were identified to aid in grassland management in order to improve the Present Ecological State of the CBAs.

The majority of the grassland areas present within the Target Recipient Sites were intact, but areas within the communal tribal lands have shown indications of over grazing and burning. Rehabilitation measures proposed include but are not limited to possible fencing off of areas, custodian programs to guide and assist with good grazing and burning practices, alien vegetation control and re-vegetation with indigenous species.

Following the assessment of the CBA and grassland areas, it is the opinion of the Ecologist that rehabilitation and conservation initiatives of the CBA and grassland areas will adequately meet the requirements of the Biodiversity Offset and Compensation Initiative. The habitat and ecological functioning of these CBA and grassland areas within the Target Recipient Sites can be improved, in turn providing a valuable resource in terms of both ecological service provision and direct benefits to the surrounding communities.

Offset and Compensation intervention overview
Based on results of the landowner engagement process the following offset extents could be achieved:

- The overall target of 84.7 wetland functional hectare equivalents (based on an offset ratio of 11:1, and as calculated for the Smithfield Dam and Langa Balancing Dam Option only) can realistically be achieved, and exceeded by 13.3 wetland functional hectare equivalents;
- The overall target of 920.8 wetland ecosystem conservation hectare equivalents will not be met, and will fall short by 281.6 wetland ecosystem conservation hectare equivalents;
- Offset targets for CBA Irreplaceable and CBA Optimal habitat for both the Smithfield Dam and the Langa Balancing Dam Option can potentially be exceeded;
- The management of 17 km of riparian areas primarily located on the uMkhomazi River upstream and downstream of the Smithfield Dam. This intervention is in line with the requirements defined by the DWS - Sub-Directorate: Instream Water Use (Mr. P. Ackerman Pers. comm. 2017). Furthermore, this Riparian Offset Initiative serves the additional purpose of, as best possible, ensuring that, on a like for like basis, riparian areas are conserved and that the area nearest to the Lundy’s Hill population of *Gnomeskelus fluvialis* (Riverine Keeled Millipede), that will not be affected by the Project will be managed.

Based on the consideration of the impacts of the proposed Project, as well as the characteristics of the receiving environment and those of the recipient sites, the following points broadly summarise the envisaged interventions to take place as part of the offset to improve the grasslands, CBAs and to achieve the functional wetland hectare equivalent targets:

- Riparian vegetation restoration both upstream and downstream of the proposed Smithfield dam on the Umkhomazi River, as well as on the Luhane River flowing into the proposed Smithfield Dam including alien vegetation management, bank shaping and stabilisation;
- Wetland and watercourse restoration including alien vegetation management and erosion control;
- Grassland and CBA offset restoration including alien vegetation management and erosion control as well as management of fire and grazing; and
- Various initiatives for the SCC Compensation, including:
  - *Gnomeskelus fluvialis* (Riverine Keeled Millipede) rescue and relocation. If after search and relocation initiatives none are found, the budget provided for this may be redirected;
  - Planting of *Protea caffra* (food source for *Capys penningtoni* – Pennington's Protea Butterfly);
  - Research, habitat creation and conservation management for *Hirundo atrocaerulea* – the Blue Swallow; and
  - Provision of budget for these three above-mentioned SCC (Blue Swallow, Riverine Keeled Millipede and Pennington's Protea Butterfly).

Budgetary Requirements

A budget estimate was developed considering the cost to develop the Biodiversity Offset and Compensation Initiative as well as to provide budget to facilitate the implementation thereof. It must be noted that the budget is prepared to feasibility level only. Budget was also provided for maintenance of the proposed Rehabilitation and Management Guidelines with specific mention of follow-up alien vegetation control and revegetation for a period of three (3) years. It must, however, be noted that budget for overall ongoing management and maintenance has been estimated for a period of 30 years. In addition, budget has been defined for ongoing monitoring most applicable to each of the aforementioned species of conservation concern. Furthermore, budget has also been defined for specific research largely based on recommendations by the relevant faunal specialists.

The budgets presented in this report include Value Added Tax (V.A.T) at a rate of 15% and are calculated using 2018 costings. It is estimated that the total budget for the Biodiversity Offset and Compensation Initiative is **R150,000,000 (rounded and including VAT).** This includes the following budgets:

- Execution and maintenance for three (3) year period of Wetland Offset and Compensation Initiative: **R37,850,000 (rounded and including VAT);**
- Execution and maintenance for three (3) year period of Riparian Zone Offset and Compensation Initiative as well as employment of River stewards for 30 years: **R15,450,000 (rounded and including VAT);**
- Execution and maintenance for three (3) year period of Grassland and CBA Offset and Compensation Initiative: **R38,181,000 (rounded and Incl. VAT);**
- Offset and compensation programmes for the three (3) identified faunal SCC species (namely Blue Swallow, Riverine Keeled Millipede and Pennington's Protea Butterfly): **R40, 477,000 (rounded and Incl VAT).** This is split between the three species as follows:
  - Blue Swallow: **R29,307,750 (incl VAT);**
  - Riverine Keeled Millipede: **R6,085,915 (incl VAT);** and
  - Pennington's Protea Butterfly: **R5, 082,770 (incl VAT)**.

Please refer to Sections 11.2.6, 11.3.5 and 11.4.4 for the detailed breakdowns of these budgets. It should also be noted that should further specialist studies determine that the Riverine Keeled Millipede does not occur within the proposed Smithfield Dam FSL footprint and/or that Pennington's Protea Butterfly will not be affected, no compensation will be required and therefore the associated budget will be redirected to the other aspects of the offset.

Due to the nature of the proposed Project, and the related wetland offsets as well as the biodiversity compensations, it is important to ensure the long-term sustainability and viability of both the proposed Smithfield Dam and balancing dam (Langa or Mbangweni), as well as the Biodiversity Offset and Compensation Initiative. In this regard, the proponent is obliged to ensure that the proposed dams are sustainably managed for the life of the Project (defined as a 30-year period) and that these efforts are viable and sustainable "in perpetuity" (defined as 99 years) and that funding is provided for a lifetime (legally defined as 30 years).

While this high-level biodiversity planning process has elicited in principle agreement of various strengths or merely interest by many landowners it should be noted that there are no guaranteed outcomes at present. Nevertheless, the overall risk of not being able to meet the Biodiversity Offset targets is considered to be reasonably low, since through the engagement process, the level of interest from the landowners consulted showed “proof of concept”. This “proof of concept” demonstrates that with more effort, the Biodiversity Offset and Compensation Initiative could be successfully rolled out. The conservative approach taken to budgeting and the contingency included in the budget should address required further interactions.

Way forward

Several steps remain to be taken, initially in the process of finalizing the detailed offset design, and subsequently in actual implementation of the biodiversity offset, rehabilitation and compensation work. The DWS via the Implementing Agent (e.g. the Trans-Caledon Tunnel Authority [TCTA]) could appoint a single implementing agent to co-ordinate and manage wetland rehabilitation and offsets (e.g. the Endangered Wildlife Trust [EWT], Wildlands Conservation Trust or Worldwide Fund for Nature [WWF]). This Implementing Agent would be appointed on contract to work with relevant government agencies and authorities to ensure that the detailed wetland, grassland and CBA rehabilitation and offset plans are prepared and implemented according to schedule. The Implementing Agent could, where appropriate, sub-contract work to contractors and/or consultants. This arrangement would be the least complex from the DWS’ perspective. Alternatively, the DWS could request a number of different government agencies, who in turn could appoint contractors and/or consultants, to undertake the following required tasks:

- Detailed design and planning of wetland rehabilitation;
- Detailed design and planning of biodiversity offsets;
- Secure relevant authorisation for the detailed wetland rehabilitation and biodiversity offset plans;
- Establish and secure protection for offset sites; and
- Either implement, or oversee, the long-term management of the Offset and Compensation Initiative.

This arrangement would, however, be relatively complex and could place a higher demand on the DWS, particularly since neither ecosystem rehabilitation nor biodiversity management are the DWS’ core functions. The overall plans for institutional arrangement rollout have been defined in Section 11.1.1 of this report to further guide the rollout of the Biodiversity Offset and Compensation Initiative.

Conclusion and reasoned opinion

The only alternative is for the project to implement a secondary tunnel that can supply water in times of maintenance (i.e. a redundant tunnel). This would negate the requirement for a balancing dam, thus negating the impact from the Langa Balancing Dam, which is especially significant in light of the impact on the local population of the Blue Swallow (*Hirundo atrocaerulea)*, a critically endangered species. To develop an alternative or second tunnel would, however very significantly increase the cost of the implementation of the Project which could pose a financial fatal flaw to the project. Should the Biodiversity Offset and Compensation Initiative presented in this report not be deemed viable or appropriate, this technological alternative (i.e. an additional, or second, tunnel) must be implemented as part of the Project to further minimise the impact of the proposed development and only the residual impacts of the Smithfield Dam offset and compensated for.

This Biodiversity Offset and Compensation Initiative and Implementation Plan document must be submitted to the competent authority as part of the EIA Process. Upon approval, this document becomes binding and all aspects of the proposed rehabilitation and mitigation recommendations made herein must be adhered to by the proponent and appointed implementing agent/s.

The objective of this Study was to provide sufficient information on the ecology of the Target Recipient Sites, together with the best considered and assessed Biodiversity Offset and Compensation Initiative that could be developed within the time and budgetary constraints during this phase of the Project. This allows for the EAP and the relevant authorities to apply the principles of IEM and the concept of sustainable development. The needs for conservation as well as the risks to other spheres of the physical and socio-cultural environment need to be compared and considered along with the need to ensure economic development of the region and the country.

It is the opinion of the Ecologists that this Biodiversity Offset Study provides the relevant information required in order to consider and implement IEM as well as to ensure that the best long term use of the resources within the study area will be made in support of the principle of sustainable development.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS

Alien vegetation/ plant species	Plants that do not occur naturally within the area but have been introduced either intentionally or unintentionally.
Endangered	Organisms in danger of extinction if causal factors continue to operate.
Endemic species	Species that are only found within a pre-defined area. There can therefore be sub-continental (e.g. southern Africa), national (South Africa), provincial, regional or even within a particular mountain range.
Biodiversity	The number and variety of living organisms on earth, the millions of plants, animals and micro-organisms, the genes they contain, the evolutionary history and potential they encompass and the ecosystems, ecological processes and landscape of which they are integral parts.
Habitat	In relation to a specific species, a place or type of site where such species naturally occurs.
Indigenous Vegetation	Vegetation occurring naturally within a defined area. In relation to a specific area, a species that occurs, or has historically occurred, naturally in a free state in nature within that specific area, but excludes a species introduced in that area as a result of human activity.
Rehabilitated Areas	Rehabilitated Areas refer to the areas identified to meet the Offset Requirements only and does not extend to the greater subject property. These rehabilitation areas include an identified watercourse surrounded by a prescribed terrestrial buffer area.
Watercourse	As defined by the National Water Act, 1998 (Act 36 of 1998): "A river or spring; A natural channel in which water flows regularly or intermittently; A wetland, lake or dam into which, or from which, water flows; and Any collection of water which the Minister may by notice in the Government Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks."

ABBREVIATIONS LIST

AIP	Alien and Invasive Plants
AIS	Alien and Invasive Species
BID	Background Information Document
BBOP	Business and Biodiversity Offsets Programme
BGIS	Biodiversity Geographical Information System
BID	Background Information Document
BSPT&P	Biodiversity Spatial Planning Terms and Processes (database)
BV	Biodiversity Value
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CR	Critically Endangered
CS	Conservation Status
CSIR	Council of Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEADP	Department of Environmental Affairs and Development Planning
DEDEA	Department of Economic Development and Environmental Affairs
DEDTEA	Department of Economic Development, Tourism and Environmental Affairs
DEMC	Desired Ecological Management Class
DM	District Municipality
DRDLR	Department of Rural Development and Land Redistribution
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
ECO	Environmental Control Officer
IEM	Integrated Environmental Management
IWULA	Integrated Water Use Licence Application
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EKZNW	Ezemvelo KwaZulu-Natal Wildlife
EN	Endangered
ESA	Ecological Support Area
EWR	Ecological Water Resource
EWT	Endangered Wildlife Trust
FEPA	Freshwater Ecosystems Priority Areas
FS	Functional Status
FSL	Full Supply Level
GDARD	Gauteng Department of Agriculture and Rural Development
GIS	Geographic Information System
GN	General Notice
GPS	Global Positioning System
Ha	Hectares
HaE	Hectare equivalents
HGM	Hydrogeomorphic
IBA	Important Bird Area
KZN	KwaZulu-Natal
LM	Local Municipality
LT	Least Threatened
m	Metres
M&E	Monitoring and Evaluation

m.a.s.l.	Metres Above Mean Sea Level
MAP	Mean Annual Precipitation
MAPE	Mean annual potential evaporation
MASMS	Mean annual soil moisture stress
MAT	Mean annual temperature
MFD	Mean Frost Days
mm	Millimetres
MOU	Memorandum of Understanding
MP	Management Plan
NBA	National Biodiversity Assessment
NDP	National Development Plan
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NEMPAA	National Environmental Management Protected Areas Act
NFEPA	National Freshwater Ecosystems Priority Areas
NGO	Non-Governmental Organisation
NPAES	National Protected Areas Expansion Strategy
NRM	Natural Resource Management
NT	Near Threatened
NWA	National Water Act
PES	Present Ecological State
PFMA	Public Finance Management Act
RDL	Red Data List
RQS	Resource Quality Services
SAIAB	South African Institute of Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SAPAD	South African Protected Areas Database
SAS	Scientific Aquatic Services
SCC	Species of Conservation Concern
SQR	Sub-Quaternary Catchment Reach
Sub-WMA	Sub- Water Management Area
SWOT	Strength Weakness Opportunity Threat
TDS	Total Dissolved Solids
uMWP	uMkhomazi Water Project
uMWP-1	Phase 1 of the uMkhomazi Water Project
VU	Vulnerable
WetVeg	Wetland Vegetation
WMA	Water Management Area
WMS	Hydro Water Management Sites
WRC	Water Research Commission
WSS	Water Supply System
WTW	Water Treatment Works
WUL	Water Use Licence
WWF	World Wide Fund for Nature

1 INTRODUCTION

The Integrated Mgeni Water Supply System (WSS) is the main water source that supplies five million people and industries in the eThekwini Municipality, uMgungundlovu District Municipality (DM) and Msunduzi Local Municipality (LM), all of which comprise the economic hub of the KwaZulu-Natal (KZN) Province (Nemai, 2016). The existing water resources of the Integrated Mgeni WSS are insufficient to meet the long-term water requirements of the system, and these existing water sources cannot be further developed The Department of Water and Sanitation (DWS) recently completed the feasibility investigations for the proposed the development of the uMkhomazi Water Project (uMWP-1), which is earmarked to transfer water from the undeveloped uMkhomazi River to the Integrated Mgeni WSS. These feasibility investigations indicate that the uMWP-1 is the next most viable option to augment the Integrated Mgeni WSS.

The proposed Project comprises the following:

- A raw water component and a potable water component;
- The Project's raw water component will consist of a new storage dam (the proposed Smithfield Dam) on the uMkhmazi River, a 32.5 km long raw water conveyance tunnel, a ±5.0 km long raw water pipeline to the proposed Baynesfield Water Treatment Works (WTW), the proposed Langa Balancing Dam as well as a ±1.6 km long bi-directional off-take pipeline to and from Langa Balancing Dam. Some of the water from Smithfield Dam will be stored in the Langa Balancing Dam to supply water to the Baynesfield WTW during maintenance period of the tunnel and in case of emergencies; and
- The Project's potable water component will cosist of a the afore-mentioned Baynesfield WTW, which will have capacity of about 625 Mℓ/day, storage reservoirs/s at the Baynesfield WTW and a ±16.0 km long potable water from the WTW to Umlaas road where it will link into the existing bulk potable water supply infrastructure (the existing '57 pipeline) of the Mgeni WSS.

The project area is situated in inland in KwaZulu-Natal and to the west of the towns of Pietermaritzburg and Howick. The western part of the project area falls within the Harry Gwala District Municipality (Ingwe Local Municipality), whereas the eastern portion is in the uMgungundlovu District Municipality (Richmond Local Municipality and Mkhambathini Local Municipality). The western portion of the project area, including the dam site and dam basin of the proposed Smithfield Dam and the first ± 21 km of the tunnel, falls under Traditional Authority and state-owned land. The area is characterised by traditional homestead settlements and rural subsistence agriculture. The eastern part of the project area, which includes the remaining part of the tunnel (± 11.5 km), balancing dam and raw water pipeline, is privately owned and predominantly used for commercial farming and forestry. (Nemai Consulting, 2016).

1.1 *Proposed Dams*

1.1.1 Proposed Smithfield Dam

The proposed Smithfield Dam will be located on the uMkhomazi River, approximately midway between the Lundy's Hill Bridge and Deepdale Bridge, near the town of Richmond (Nemai, 2016). It will be a Category III dam, with an associated large size and high hazard rating, and according to Nemai (2016), when at Full Supply Level (FSL), the water surface area will be approximately 953 ha. Smithfield Dam will inundate a section of approximately 17 km of the uMkhomazi River and approximately 4 km of the Luhane River (a tributary of the uMkhomazi River).

1.1.2 Proposed Langa Balancing Dam (preferred option)

According to Nemai (2016), operational requirements for inspection and maintenance of long transfer tunnels, such as the Lesotho Highlands Transfer Scheme, include the provision of balancing dams on the downstream side. These dams store water for the supply during down time periods required for inspection and maintenance periods of the tunnels. During the scoping phase for the proposed uMWP-1, three alternatives for the balancing dam were considered. Details of these alternatives are contained within the EIA report compiled by Nemai (2016). For various reasons, as explained in the EIA report, the preferred balancing dam option is the proposed Langa Balancing Dam. This will be located on the Mbangweni River, which is a tributary of the uMlaza River. According to the EIA report (Nemai, 2016) the proposed Langa Dam will cover approximately 144 ha of land when at full capacity. Gross storage volume when at FSL (923 masl) will be approximately 15.67 million m^3.

1.1.3 Proposed Mbangweni Balancing Dam

The proposed Mbangweni balancing dam, and alternative to the Langa Dam, would also be located on the Mbangweni River, approximately 250 m upstream of the existing Mbangweni Dam. The Mbangweni Dam will flood approximately 185 ha of land (Nemai, 2016), and is likely to have a similar capacity and FSL as Langa Dam, should it be authorized instead of Langa Dam.

Figures 1 and 2 below provide a visual representation of the location of the Smithsfield Dam as well as the Langa and Mbangweni balancing dams.

1.1.4 Proposed Baynesfield Balancing Dam

An option was investigated for the balancing dam referred to as the Baynesfield Balancing Dam. This dam would increase the extent of the existing Baynesfield Dam, however this option was determined to be unfeasible from an engineering and socio-economic point of view. For example, the loss of cultivated land below the Baynesfield Balancing Dam's FSL equates to approximately 122,8405ha, which is unlikely to be acceptable to the Baynesfield Estate operations.

Additionally, the proposed Baynesfield Balancing Dam would result in the loss of around 83.69ha of terrestrial CBA Irreplaceable habitat, in comparison to 14.76ha below the proposed Lanaga Balancing Dam FSL, and 15.56ha below the proposed Mbangweni Balancing Dam FSL. Similarly, wetland habitat loss as a result of the first filling of the Baynesfield Balancing Dam is estimated to be 84ha. This is almost double that of the anticipated loss of wetland habitat associated with the Langa Balancing Dam (44ha), and roughly 1.5 times that which would be lost if the Mbangweni Balancing Dam is authorised (59ha).

However, according to Allan (2018), the location of the proposed Baynesfield Balancing Dam is not within the extent of the recommended conservation buffer zones stipulated by conservation authorities on Blue Swallows as necessary for the protection of this species and its breeding and foraging habitat, whereas both the Langa and Mbangweni Balancing dams fall within the recommended buffer zones (Allan, 2018).

(or Mbangwini)The only alternative is for the project to implement a secondary tunnel that can supply water in times of maintenance (i.e. a redundant tunnel). This would negate the impact from the Langa dam which is especially significant in light of the impact on Blue Swallow (*Hirundo atrocaerulea)*, a critically endangered species. To develop a second tunnel would, however very signficantly increase the cost of the implementation of the project which could lead to a financial fatal flaw.

The table below summarises the total footprint areas in hectares of the proposed Baynesfield, Langa and Mbangweni Balancing Dam options, as well as a summary of the total Critical Biodiversity Areas and wetland hectarage present within the footprint areas of each proposed balancing dam. From this table, it can be seen that the overall losses incurred within the proposed Langa Balancing Dam FSL will be lower than those within both the proposed Baynesfield and Mbangweni Balancing Dams FSL.

It should be noted that the estimated hectares (ha) provided for the "Terrestrial Irreplaceable" in the table below were derived from spatial data obtained from Ezemvelo KZN Wildlife with regards to the Terrestrial Systematic Conservation Plan (EKZNW, 2010), in which the Critical Biodiversity Areas (CBA) Optimal and Irreplaceable were divided. The potential CBA Optimal and CBA Irreplaceable lost as a result of the first impoundment of each proposed dam were calculated by using the CBA Irreplaceable and CBA Optimal layers, and subtracting the wetland features from the terrestrial vegetation to obtain the terrestrial CBA lost. Thus, some discrepancy between the estimates provided in the table below and those estimates provided in the EIA document prepared by Nemai (2016) is expected. However, it is the opinion of the authors that the estimated hectares provided in Table 1 below are sufficiently accurate for use in decision making and they have thus been utilized for the purposes of this investigation.

It should further be noted that whilst the dataset available from EKZNW contains layers and metadata detailing why a certain area has been designated as a CBA, inclusion of such a fine level of detail in the planning phases of the Biodiversity Offset is deemed impractical. Thus, for the purposes of this high-level planning exercise and considering the required quantum of offset, specifically in terms of terrestrial habitat, the most appropriate approach was considered to be the use of the high-level CBA Optimal and CBA Irreplaceable spatial data.

Table 1: Summary of the total footprint areas, CBAs and wetland losses associated with the proposed Langa and Mbangweni balancing dams.

Balancing Dams	Total footprint area (hectares)	Terrestrial CBA (Irreplaceable) (hectares)	Terrestrial CBA (Optimal) (hectares)	Wetland losses (hectares)	Riparian vegetation losses (hectares)
Mbangweni	**185**	**15.56**	**0**	**59**	**0**
Langa	**144**	**14.76**	**0**	**44**	**0**
Baynesfield	**341**	**83.69**	**0**	**84**	**0**

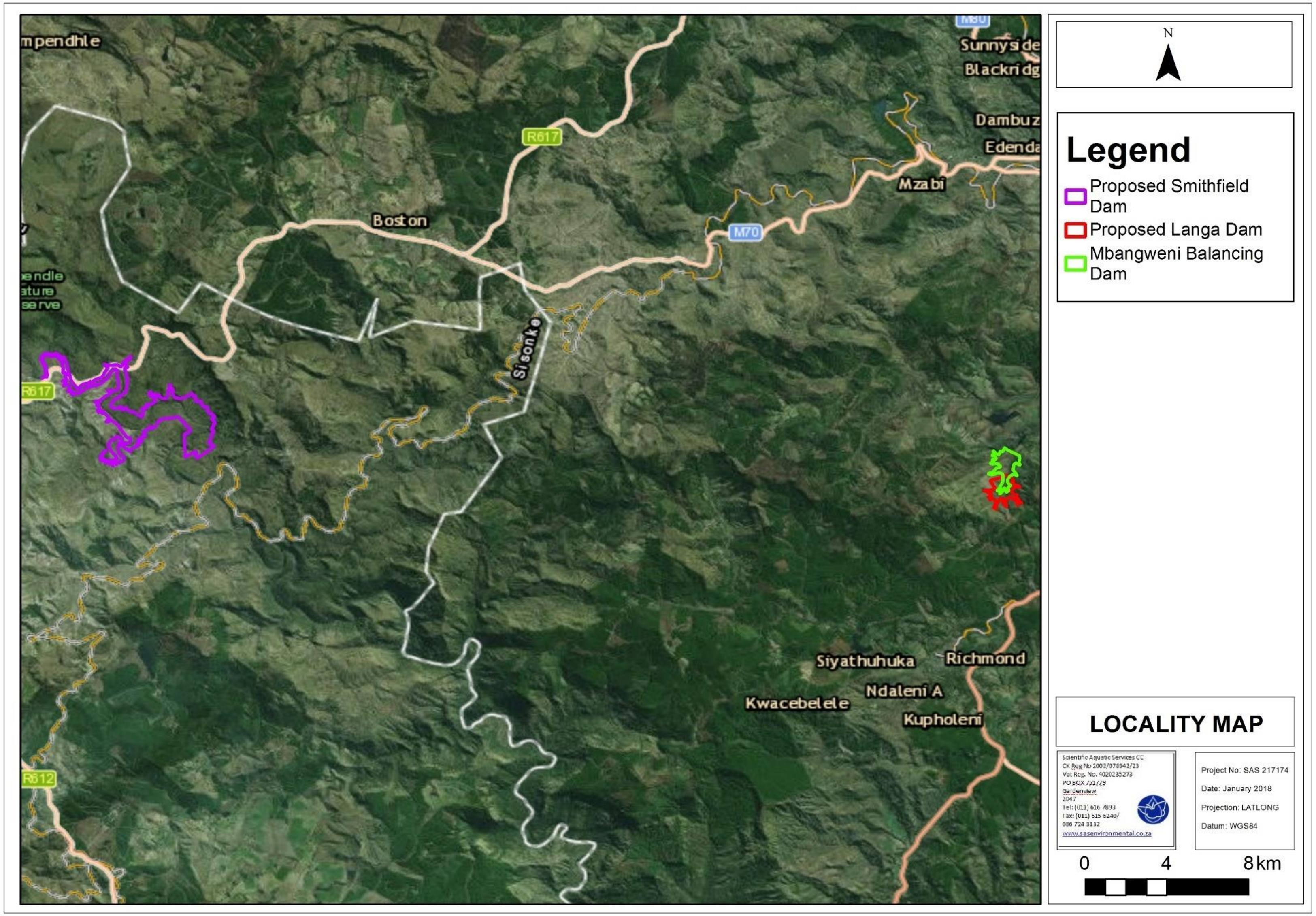


Figure 1: Digital satellite image depicting the location of the project footprint in relation to surrounding areas.

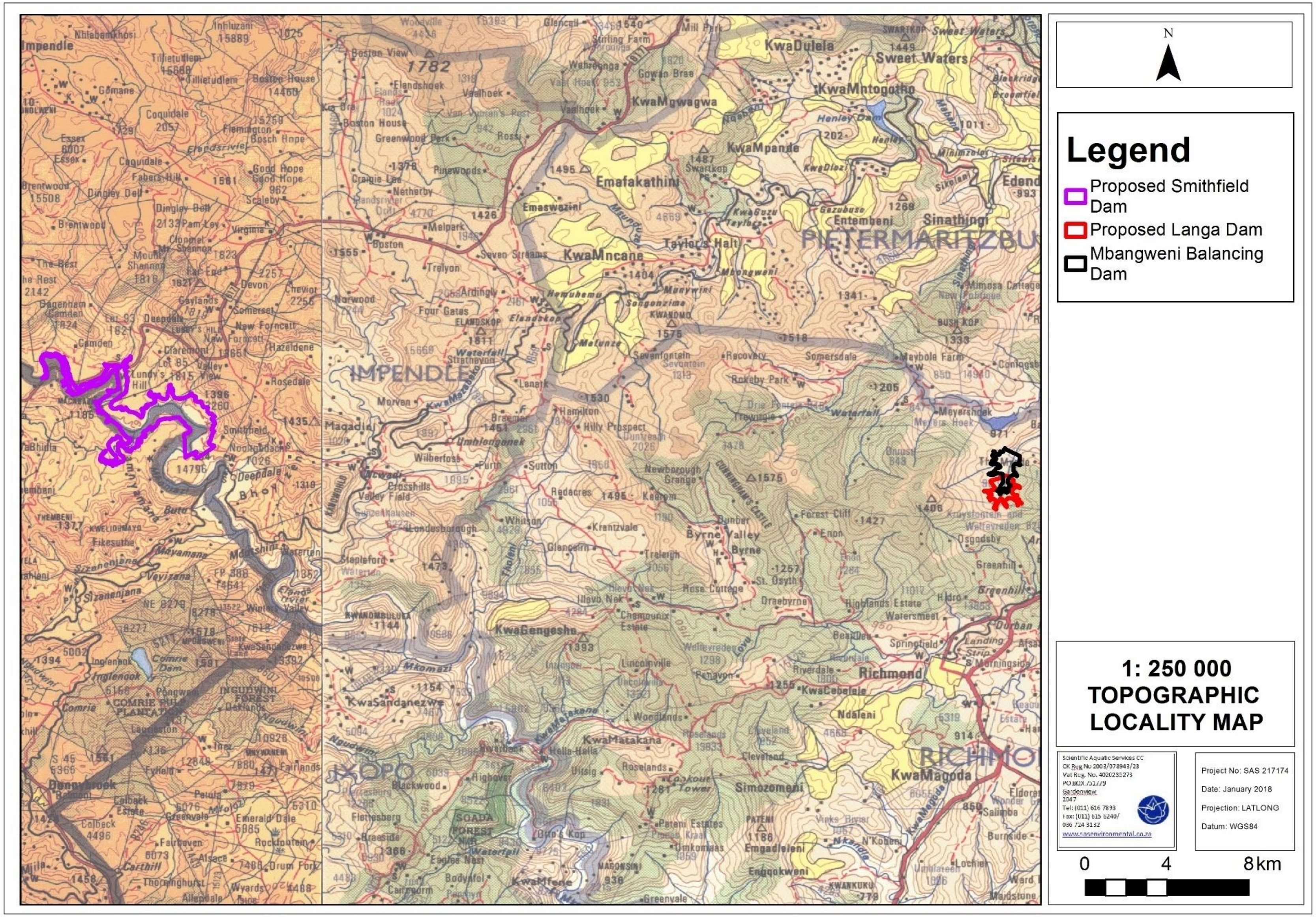


Figure 2: Location of the project footprint depicted on a 1:250 000 topographic map in relation to surrounding areas.

1.2 *Problem Statement*

Although the project was considered during the environmental assessment and authorisation process to be potentially "fatally flawed" due to the significance and irreversibility of anticipated impacts on sensitive natural areas and on faunal Species of Conservation Concern (SCC), it is considered essential for the continued economic and social development of the area supplied by the Integrated Mgeni WSS. The EIA report compiled by Nemai (2016) also assessed the implications of the 'no go' option. According to Nemai (2016), the 'no go' alternative is not supported due to the following reasons:

- The long-term water deficit that will exist in the Integrated Mgeni WSS means that the water requirements of the supply area will not be met;
- Water supply shortfalls could adversely affect the various water user sectors, and would suppress development with related socio-economic implications; and
- Over-utilisation of water resources could adversely affect the ecological functioning of the Mgeni River system, i.e. the required ecological reserve of the Mgeni River will be compromised.

The most significant ecological impact that the project has is due to first impoundment. First impoundment will have the following impacts which are considered most significant:

- Inundation of habitat for:
  - *Hirundo atrocaerulea* (Blue Swallow) critically endangered species. The balancing dams pose the most significant threat in this regard; and
  - *Capys penningtoni* (Pennington's Protea Butterfly) with specific mention of stands of their food source, namely *Protea caffra*;
- Inundation of preferred habitat for, and potentially individuals of, *Gnomeskelus fluvialis* (Riverine Keeled Millipede) which only occur in the leaf litter of indigenous riparian forest within the uMkhomazi River in the vicinity of the Smithfield Dam;
- Inundation of terrestrial Critical Biodiversity Areas (CBAs), including:
  - Irreplaceable CBAs; and
  - Optimal CBAs
- Inundation of wetlands, riparian areas and instream habitat which by definition are ecologically sensitive and are also often identified as CBA's.

To mitigate impacts in line with the mitigation hierarchy as advocated by the Department of Environmental Affairs (DEA) (2013), alternatives were investigated to avoid or minimize the impact of the project. The following points highlight the key mitigatory investigations undertaken:

- An option was investigated for the dam referred to as the Baynesfield Dam. This Dam would increase the extent of the existing Baynesfield dam, however this option was determined to be impractical from both engineering and scoio-economic points of view;
- In order to negate the impact of the proposed Langa Balancing Dam, which is especially significant in light of the impact on the critically endangered Blue Swallows (*Hirundo atrocaerulea)* in the area, and alternative tunnel alignment, or an additional, or second tunnel, should be considered. To develop an additional, or second, tunnel would, however dramatically increase the cost of the implementation of the Project;
- Realignment of the R617 road since the original proposed re-alignment would have posed a very significant risk to *Capys penningtoni* (Pennington's Protea Butterfly) and would have directly impacted on the Impendle Nature Reserve. This road has subsequently been re-evaluated and new proposed re-alignment has been developed which will negate the impact on *Capys penningtoni.*

No mitigatory options are available to avoid or minimise the potential risk to *Gnomeskelus fluvialis* (Riverine Keeled Millipede*)* which may occur within the riparian zone of the uMkhomazi River that will be affected by first impoundment of the proposed Smithfield Dam, except for rescue and relocation of this species to identified areas of riparian forest above Smithfield Dam's Full Supply Level (FSL).
Due to the above, an investigation into the required wetland, biodiversity offset and faunal Species of Conservation Concern (SCC) compensation was launched for only the two raw water project components, i.e. the Smithfield dam and the balancing dam located at Baynesfield Estate.

1.3 *Scope of Work*

The Scope of Work and specific outcomes in terms of this biodiversity offset study included:

- Review existing information to understand the project and the required offset;
- Attendance of a meeting with relevant stakeholders to identify potential offset alternatives;
- Define the residual negative impacts on wetland ecosystem services, wetland condition and species of conservation concern within the proposed project footprint as well as immediate surroundings, and define wetland hectare equivalents and offset requirements;
- Calculate offset requirements using the wetland offset calculator (Macfarlane *et. al*, 2016);

- Define the offset requirements based on the guidelines provided by Macfarlane *et. al* (2016) for wetland offsets. Consideration was given to both the extent of wetland areas to be offset as well as the functional requirements of the wetlands to be generated in the proposed offset;
- Define the biodiversity offset requirements based on the guidelines provided by IEM (2013) for biodiversity offsets in KwaZulu Natal. Consideration was given to both the extent of CBA areas to be offset as well as the requirements of the ratio offset for CBAs to be generated in the proposed recipient sites. The basic offset ratios and the specific offset requirements set out within the draft National Biodiversity Offset Policy (2017) was also considered as the minimum starting point;
- Based on the findings, both on-site and off-site options for wetland and biodiversity offsets were assessed in the surrounding area with preference given to the nearest options to the development footprint as well as options in the same quaternary catchment;
- Biodiversity aspects highlighted that will affect the proposed recipient sites included the confirmation of the loss of biodiversity (including CBAs, wetlands, habitat for threatened species such as *Hirundo atrocaerulea* (Blue Swallows), *Capys penningtoni* (Pennington's Protea Butterfly) and *Gnomeskelus fluvialis* (Riverine Keeled Millipede) with assistance from the relevant specialists within the basins of Smithfield Dam and the balancing dam (Nemai, 2016);
- Conduct a site visit to ground-truth ecological conditions within the proposed recipient offset sites;
- A background study of relevant national, provincial and municipal datasets (such as National Freshwater Ecosystem Priority Areas [NFEPA] and the DWS RQS PES/EIS database) was undertaken to aid in defining the EIS of the freshwater resources within the proposed recipient sites;
- Freshwater resources within the proposed recipient sites were delineated using desktop methods and ground truthed and calibrated according to "DWAF, 2008: A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones". Aspects such as soil morphological characteristics, vegetation types and wetness were used to delineate the various zones of wetness (permanent and temporary) according to the guidelines.
- The classification assessment of the freshwater resources was undertaken according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis *et al*., 2013);
- The EIS of the freshwater resources were determined according to the method described by Rountree & Kotze*,* (2013);

- The services provided by the freshwater resources within the proposed recipient sites were assessed according to the method of Kotze *et al* (2009) in which services to the ecology of the site as well as services to the people of the area were defined;
- PES of the freshwater resources was assessed according to the resource directed measures guideline as advocated by Macfarlane *et al*., (2008);
- The wetland offset calculator (Macfarlane *et al*, 2016) will be applied to the freshwater resources within the proposed recipient sites;
- Refine objectives and targets for the wetland offset strategy together with stakeholders such as government authorities;
- Attempt to obtain consensus amongst relevant stakeholders on final offset ratios to be utilized;
- Obtain agreement in principle from the proponent, landowners and other relevant stakeholders;
- Undertake a high level risk assessment of the likelihood of success considering the identified approach and opportunities were to be undertaken;
- A strategy to address and reduce the risks identified were to be developed;
- High level project prioritization;
- High level site-specific plans including specific site-level objectives and a description of actions / interventions were to be developed;
- High level measurable outcomes and a monitoring program were to be defined;
- High level budget estimates of the proposed projects/interventions, and high level monitoring program were to be generated;
- The proposed projects/interventions and expected outcomes were to be presented to the authorities;
- Establish performance auditing and reporting requirements; and
- Present the findings in a report for consideration by the proponent and relevant authorities.

The report provides initial high level recommendations on the biodiversity offset strategies to be implemented. As far as possible international best practice such as the Business and Biodiversity Offsets Programme (BBOP) Guidelines (2009), as well as the Ezemvelo KZN Wildlife (2013) and Macfarlane *et al* (2016) guidelines were followed.

1.4 *Legislative requirements*

The following legislative requirements were considered during the assessment:

- The National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA);

- The National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (NEMBA);
- Notice 388 of 2013, Threatened or Protected Species Regulations as it related to the National Environmental Management: Biodiversity Act, 2004;
- General Notice 599 of 2014, Alien and Invasive Species List, 2014 as it relates to the National Environmental Management: Biodiversity Act, 2004;
- Restricted activities as listed in General Notice R598 of the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004);
- Notice 509 of 2004, Exempted Alien Species list as it relates to the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004));
- General Notice 864 of 2016, Alien and Invasive Species Regulations as it relates to the National Environmental Management: Biodiversity Act, 2004;
- The National Environmental Management Protected Areas Act, 2014 (Act 21 of 2014)
- Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983) (CARA);
- The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (1947);
- Occupational Health and Safety Act, 1993 (Act 85 of 1993) (OHSA);
- The National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998);
- The National Water Act, 1998 (Act 36 of 1998) (NWA);
- General Notice 509 of 2016 as it relates to the National Water Act, 1998 (Act 36 of 1998);
- Draft National Biodiversity Offset Policy, 2017 as published in the Government Gazette 40733 of 2017; and
- The Public Finance Management Act, 1999 (Act 1 of 1999).

The details of each of the above, as they pertain to this study, are presented in **Appendix B** of this report.

1.5 *Assumptions and Limitations*

The following assumptions and limitations are applicable to this report:

- All effort was made to understand the requirements for offset as best possible, however information on CBAs and on specific species of concern is often not available. Thus, best professional knowledge and best technological solutions, with special mention of GIS were used to best understand these aspects;
- The assessments of the freshwater resources as well as the grasslands was confined to the four identified target recipient sites and does not include the neighbouring and adjacent properties, which were only considered as part of the desktop assessment

insofar as land uses within the relevant catchment areas may have an effect on the ecological condition of the assessed watercourses;

- Limitations in the accuracy of the wetland and grassland delineations in some areas are anticipated due to anthropogenic disturbances such as the presence of roads, agricultural activities and commercial plantations. The delineations presented in this report are, however, considered to be the best estimate of the riparian and wetland habitat boundaries based on site conditions present at the time of the assessment;
- Due to the landscape in some areas being rugged and very undeveloped, and with many areas of interest occurring on extensive private properties with limited access, some freshwater resources were inaccessible. Therefore, verification points for freshwater resources were located at points as close to the areas of interest to be verified as possible and where necessary the conditions at the exact point required were inferred or extrapolated;
- Similarly, use was made of aerial photographs, digital satellite imagery as well as provincial and national wetland databases to identify areas of interest prior to the field survey. Any additional wetland areas and grasslands and drainage features noted during the field survey were also assessed and added to the number of survey points. Although all possible measures were undertaken to ensure all wetland features, riparian zones and drainage features were assessed and delineated, some smaller ephemeral drainage features may have been overlooked;
- Data presented in this report is based on a single site visit, undertaken in March 2018. The effects of natural seasonal and long-term variation in the ecological conditions are therefore unknown, as aquatic and terrestrial ecosystems are dynamic and complex. It is therefore possible that aspects of the ecology, some of which may be important, could have been overlooked;
- Wetlands, riparian and terrestrial zones create transitional areas where an ecotone is formed as vegetation species change from terrestrial to wetland species. Within this transition zone some variation of opinion on the wetland boundary may occur, however if the Department of Water Affairs and Forestry (DWAF[2]) (2008) method is followed, all assessors should get largely similar results;
- Identification of CBA areas were undertaken on a desktop level with the aid of existing available databases. The databases currently available are not recent enough to exclude areas that have been anthropogenically disturbed;

[2] The Department of Water Affairs and Forestry (DWAF) was formerly known as the Department of Water Affairs (DWA). At present, the Department is known as the Department of Water and Sanitation (DWS). For the purposes of referencing in this report, the name under which the Department was known during the time of publication of reference material, will be used.

- As much effort as possible was made to liaise with landowners and obtain indications of willingness to take part in the initiative, within budget constraints and within timeframes. However due to time constraints, no definitive agreements could be reached. This study has thus aimed to present the degree of interest shown by landowners and the level of commitment by landowners to partake obtained. This can then be used as a "proof of concept" to determine whether the biodiversity offset project is deemed viable and can be further developed and rolled out; and
- This biodiversity offset study focuses on the high-level planning and overall biodiversity and wetland offset requirements. Further refinements, specific to certain detailed areas is deemed essential to be undertaken in the future.

1.6 *Indemnity and Terms of use of this Report*

Please refer to **Appendix A** of this report for all indemnity and terms of use.

2 OFFSET CONCEPTS AND DEFINITIONS

Due to the nature of the proposed Project, and the related wetland offsets and biodiversity compensations, it is important to ensure the long-term sustainability and viability of the proposed Smithfield Dam and Langa (or Mbangweni) Balancing Dam, the biodiversity and wetland offsets, and the compensation initiatives. In this regard, the proponent is obliged to ensure that the proposed dams are sustainably managed for the life of the Project (defined as a 30-year period) and that these efforts are viable and sustainable "in perpetuity" (defined as 99 years) and that funding is provided for a lifetime (legally defined as 30 years). The following sections provide a guide to the biodiversity and wetland offset principles that were followed during the design, implementation and management of the offset.

2.1 *Guiding Principles*

Prior to commencing with the site-specific wetland and biodiversity offset and compensation investigation, consideration was given to the aims and objectives of the proposed wetland offset / biodiversity compensation programme, to provide a framework by which target offset and compensation areas could be identified.

These guiding principles were split into primary (i.e. high-level principles in line with generally accepted international, national and provincial offset guidelines) and secondary principles (project and site-specific aims and objectives), and are briefly discussed below.

2.1.1 Primary principles

Six (6) primary principles were identified which formed the core of identifying suitable wetland and biodiversity recipient sites, namely:

- Only wetland loss was quantified utilizing available tools (Macfarlane, 2016). Instream and riparian resource loss was not included in the calculated quantum but has been taken into account on a “like for like” basis;
- To achieve a “net gain” offset for wetlands and terrestrial areas considered to be of irreplaceable or high biodiversity value;
- To give due consideration to the relevant national and provincial offset ratio guidelines;
- To contribute, as far as practicable and viable, to the over-riding aim and objective of the National Protected Areas Expansion Strategy (NPAES), which is to achieve cost-effective protected area expansion for ecological sustainability and increased resilience to climate change;
- To ensure, as far as practicable and feasible, that perceived “fatal flaws” in terms of impacts on faunal SCC are compensated for; and
- Ensuring that the wetland offset is economically viable and sustainable, both in the immediate and long-term and from both a capital cost perspective as well as from an ongoing maintenance and support perspective.

The principles of a “net gain” and the relevant offset ratio guidelines are discussed in further detail in Section 2.2 of this report.

2.1.2 Secondary principles

Several secondary principles were identified which were considered ideal to achieve through the proposed wetland and biodiversity offset but which are not considered essential, namely:

- To improve the existing habitat within the target offset/compensation areas, to increase overall biodiversity, provide habitat for floral and faunal SCC and improve ecosystem services;
- Improving existing habitat within the target offset/compensation areas will not only achieve the above but may improve resilience of floral and faunal communities to the effects of climate change, thus potentially mitigating against declining populations of threatened species. According to Erwin (2009), globally, climate change is recognized as a threat to both species survival and the health of natural systems. Wetland systems are particularly vulnerable to altered hydrological patterns, both in terms of quantity and quality of their water supply, and therefore it is anticipated that climate change will have a pronounced effect on wetlands as a result of altered hydrological regimes

associated with climate change (Erwin, 2009). Improving the quality of wetland habitat, for example by eradicating alien invasive species such as *Acacia mearnsii*, will contribute towards improved resilience by minimising alterations to hydrological regimes;

- To utilise offset and compensation technologies and implementation methods, as far as possible, that are technologically simple and with a proven track record, so as to ensure, as far as possible, that a successful offset and compensation for faunal SCC is implemented;
- To improve ecosystem services (regulating, provisioning, cultural and supporting services as per the International Finance Corporation's Performance Standard 6, 2012) with specific mention of the following:
  - Support of the longevity and use-ability of the proposed dams through the improvement of ecological service provision upstream of the proposed dams (sediment trapping and nutrient/toxicant assimilation being considered amongst the most important ecoservices provisioned);
  - Mitigate loss of downstream ecological service provision, in particular streamflow regulations, alteration to the sediment balance, and ensuring maintenance of the EWR of downstream communities; and
  - Contribute to socio-cultural benefits for surrounding communities by improved provision of ecological services such as flood attenuation, as well as by expanding existing, or securing additional, conservation areas and increasing tourism opportunities. Increased tourism linked to the proposed offset may in turn provide employment and economic empowerment opportunities for local communities in the vicinity of the proposed dams.

2.2 *Introduction to Biodiversity and Wetland Offsets*

2.2.1 Consideration of the Mitigation Hierarchy

Offsets are applied within a mitigation hierarchy and are only aimed at mitigating or compensating for any remaining impacts of project development on the environment (often called "compensatory mitigation") after all appropriate and feasible steps have first been taken to avoid/prevent, minimize/reduce and remediate/rehabilitate impacts (Macfarlane D. *et al,* 2016).

- First, the proposed development should try to avoid or prevent negative impacts on biodiversity and ecosystem services by seeking alternative types of development, or alternative locations, different scales of development, different layouts and siting of development components, etc.;

- Secondly, if the above-mentioned alternatives have been exhausted, every effort should be made to minimize negative impacts and to rehabilitate or remediate affected areas;
- 'Residual impacts' are what will remain after minimizing impacts and rehabilitation. These residual impacts would then need to be compensated for, and this may involve the specific application of an offset.

Environmental offsetting provides a means by which to slow – and possibly even reverse – "ecological deficit" by counterbalancing the degradation, destruction and depletion of natural resources through protection, rehabilitation, restoration and replenishment thereof. Ecological deficit is defined by the Global Footprint Network (www.footprintnetwork.org[3]) as "the difference between the biocapacity and ecological footprint of a region or country. An ecological deficit occurs when the footprint of a population exceeds the biocapacity of the area available to that population." The South African National Development Plan (NDP, 2030) recognises that globally, market and policy failures have resulted in the economy entering a period of "ecological deficit" as natural capital (groundwater, marine life, terrestrial biodiversity, and prime agricultural land to name a few) are being degraded, destroyed or depleted faster than it can be replenished.

It should, however, be noted that according to the draft National Biodiversity Offset Policy (DEA, 2017), although remaining impacts of 'very high' significance are considered a 'fatal flaw' for development, in cases where the development is authorised for overriding public and economic considerations, offset ratios are typically set very high (30:1 being the highest ratio stipulated by South African guidelines) and may require some form of compensation other than ecological offsetting. Whilst ecological offsetting counterbalances residual impacts on biodiversity, compensation may take the form of a contribution to a socially desirable cause or intervention in recognition of loss, damage, harm or degradation.

Specific offset ratios are defined by the Department of Environmental Affairs (DEA) (2017) and the Department of Environmental Affairs and Development Planning (DEA&DP) (2011) depending on the circumstances, particularly in terms of ecosystem threat statuses. These ratios are discussed in detail Section 2.2.2 below.

[3] https://www.footprintnetwork.org/resources/glossary/ Retrieved 23rd January 2018

2.2.2 National and Provincial Offset Guidelines

In March 2017, a draft National Biodiversity Offset Policy (DEA, 2017) was published for public comment. It should be noted that at the time this Biodiversity Offset and Compensation Initiative report was prepared, the policy was still in a draft format and had not been promulgated, thus the contents of the policy may be amended in due course.

According to the DEA (2017), biodiversity offsets are defined as "*conservation measures designed to remedy the residual negative impacts of development on biodiversity and ecological infrastructure, once the first three groups of measures in the mitigation sequence have been adequately and explicitly considered (i.e. to avoid, minimise and rehabilitate / restore impacts). Offsets are the 'last resort' form of mitigation, only to be implemented if nothing else can mitigate the impact."*

The South African National Biodiversity Institute (SANBI, 2004) further defines biodiversity offsets as "*measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken*."[4]

In terms of the draft National Biodiversity Offset Policy (DEA, 2017) as well as the Western Cape Provincial Guideline on Biodiversity Offsets (Western Cape, 2007), the significance of remaining or residual impacts should be identified on a regional as well as national scale when considering biodiversity conservation initiatives. If the residual impacts lead to irreversible loss of irreplaceable biodiversity, the residual impacts should be considered to be of *very high significance* and when residual impacts are considered to be of *very high significance*, offset initiatives are not considered an appropriate way to deal with the magnitude and/or significance of the biodiversity loss, and other alternatives should be sought (i.e. the proposed activity should not be authorised in its current form). In the case of residual impacts determined to have *medium to high significance*, an offset initiative may be investigated. If the residual biodiversity impacts are considered of *low significance* no biodiversity offset is required.[5]

Whilst thought of as a "last resort" to counteract the cumulative impacts on biodiversity, offset strategies do have the potential to increase the future value of biodiversity within a region. Thus, the recently gazetted draft National Biodiversity Offset Policy (DEA, 2017) aims to provide a set of national guidelines relating to biodiversity offsets for South Africa, since at

---

[4] Business and Biodiversity Offsets Programme (BBOP). 2009. *Biodiversity Offset Design Handbook*. BBOP, Washington, D.C.
[5] Provincial Guideline on Biodiversity Offsets, Western Cape, 2007.

present, only three sets of provincial draft biodiversity guidelines and/or policies are available, namely the Western Cape (DEA&DP, 2007), Kwa-Zulu Natal (EKZNW, 2009, 2013) and Gauteng (GDARD, 2013).

The principles enshrined in the draft National Biodiversity Offset Policy (DEA, 2017) aim to support the general principles of the NEMA, by ensuring that "*due remedy is obtained for significant adverse impacts on biodiversity resulting from development*." The policy is intended to "contribute to securing priority biodiversity and ecosystem functioning in perpetuity, for the benefit of both present and future generations".

In terms of biodiversity offsets relating specifically to wetland habitat, the draft National Biodiversity Offset Policy (DEA, 2017) notes that the policy must be read in conjunction with the "Wetland Offsets – A best-practice guidelines for South Africa" (Macfarlane D. *et al,* 2016). The various protocols for defining wetland impacts and developing appropriate offset metrics were thus considered in the approach to the uMWP-1 offset.

As mentioned previously the concept of a biodiversity offset is relatively new and there is presently no standard method for determining the most suitable biodiversity offset. The objective of biodiversity offsets, through the development authorisation and associated EIA process is to ensure that residual impacts on biodiversity and ecosystem services that are of moderate to high significance (i.e. do not represent a 'fatal flaw' from a biodiversity perspective) are compensated by developers in such a way that ecological integrity is maintained and development is sustainable (Macfarlane D. *et al,* 2016).

The significance of a residual negative impact on biodiversity is critically influenced by the characteristics of the receiving environment, for example, if an area is identified in a bioregional plan or fine scale biodiversity plan as a Critical Biodiversity Area (CBA), a priority site, a listed protected area, a threatened ecosystem or habitat containing threatened species or special habitat (Macfarlane D. *et al,* 2016).

Biodiversity offsets generally target features or areas with similar biodiversity as that residually impacted by development but may target features or areas with biodiversity of higher conservation significance. There are many different possible kinds of offsets, but in practice they generally fall into the following broad categories as described by the Business and Biodiversity Offsets Programme (BBOP) Handbook (2009):

- *"Like for like"* - Undertaking positive management interventions to restore an area or stop degradation: improving the conservation status of an area of land by restoring habitats or ecosystems and reintroducing native species. Where proven methods exist or there are no other options, reconstructing or creating ecosystems can be undertaken. Also, reducing or removing current threats or pressures by, for instance, introducing sustainable livelihoods or substitute materials. This can either be done on the development site (on-site offset) or a distance from the site (off-site offset);

- *Averting risk*: Protecting areas of biodiversity where there is imminent or projected loss of that biodiversity; entering into agreements such as contracts or covenants/stewardships with individuals in which they give up the right to convert habitat in the future in return for payment or other benefits now; or
- *"Trading up"* - Providing compensation packages for local stakeholders affected by the development project or monetary compensation for a biodiversity conservation trust (Western Cape Provincial Guideline on Biodiversity Offsets, 2007).

According to the DEA (2017) and the DEA&DP (2011), offsets need to be undertaken according to various ratios based on the ecological importance and sensitivity and vulnerability of the ecosystem. The following table summarises the recommended offset ratios and guidelines which have been defined by the DEA (2017):

Table 2: Guidelines of appropriate offset ratios based on the impacted biodiversity features (DEA, 2017).

<table>
<tr><th>Feature</th><th>Basic offset ratio and specific requirements of the offset</th><th>Adjustments to size and/or number of offsets</th></tr>
<tr><td colspan="3">Composite biodiversity attributes</td></tr>
<tr><td>Areas of irreplaceable biodiversity</td><td colspan="2"><u>Impacts on irreplaceable biodiversity to be avoided</u>

Offset at 30:1 only where no alternatives to the development project are deemed feasible and where project is of overriding public importance. Refer to the DEA guideline on "Need and Desirability". Offset sites to comprise areas of highest conservation priority that are currently without protection.</td></tr>
<tr><td>Areas of composite biodiversity significance recognised in approved biodiversity policy, bioregional, biodiversity of spatial conservation plans</td><td colspan="2"><u>Impacts preferable to be avoided</u>

Offset ratio at <u>minimum</u> 20 times the impacted area. Offset sites to comprise areas of highest conservation priority that are currently without protection. E.g. Protected areas (as identified in S9 of the NEM: Protected Areas Act), CBAs, verified wetland and river feature FEPAs, areas earmarked for protected area expansion.</td></tr>
<tr><td colspan="3">Biodiversity pattern</td></tr>
<tr><td>Ecosystem status (using most up-to-date and reliable biodiversity information, and applying all relevant criteria for listing threat status (e.g. criteria established in GN 1002 – see DEA, 2011)</td><td>Impacts on Critically Endangered ecosystems should be avoided. Offset at 30:1 only where no alternatives to the listed activity are feasible and where activity is of overriding pubic importance;

Basic offset ratio:
• Endangered ecosystems <u>at least 10 but up to 20 times</u> impacted area.</td><td>Offset sites to comprise areas of highest priority for conservation currently without protection.

Offset requirements should be adjusted where necessary on the advice of a biodiversity specialist, to account for the condition of the impacted site, and the condition of, and ability to restore offset areas.</td></tr>
</table>

	• Vulnerable ecosystems from 1 to 5 times impacted area. • Least Threatened, then generally no offset required, ***provided that*** other criteria do not apply.	
Species threat status (using most up-to-date and reliable biodiversity information).	Impacts on the habitat of Critically Endangered species and local endemic species with highly restricted distributions should be avoided. When threatened or localised endemic species are impacted, the offset must cater explicitly for the habitat needs of the affected species and prevent any change (i.e. increase) in their threat status. A precautionary approach must be exercised in cases where highly threatened of vulnerable species are affected.	Where the ecosystem is listed as Least Threatened, it may be necessary to provide an offset to cater for residual negative impacts on threatened species. Where an offset requirement has been determined for a threatened ecosystem (i.e. recognised as Vulnerable, Endangered or Critically Endangered) using the basic offset ratio, it may be necessary to increase size of offset and/or number of offset sites on the advice of a relevant biodiversity specialist to ensure enough of that species' habitat would be protected and managed to ensure its status would not change (i.e. worsen).
Special habitats	The offset area must include good examples of impacted special habitats.	Where the ecosystem is Least Threatened, it may be necessary to provide an offset to cater for residual negative impacts on special habitats. Where an offset requirement has been determined for a threatened ecosystem using the basic offset ratio, it may be necessary to provide an offset, and/or to increase the size of an offset and/or number of offset sites on the advice of a relevant biodiversity specialist to ensure that special habitats are represented.
Biodiversity process		
Important ecological corridors (e.g. linking mountains to coast, along gradients, linking protected areas or other priority areas for biodiversity) or areas important for ecological functioning.	If any important corridors are impacted, the offset must incorporate areas that would provide substitute corridors or linkages connecting priority areas.	Where the ecosystem is Least Threatened, it may be necessary to provide an offset to cater for residual negative impacts on important biodiversity process areas. Where an offset requirement has been determined for a threatened ecosystem using the basic offset ratio, it may be necessary to provide an offset, and/or to increase the size of an offset and/or number of offset sites on the advice of a relevant biodiversity specialist to ensure that ecological linkages are represented and connectivity maintained.
Ecosystem services		
Areas that provide ecological goods and services of high value to communities or society as a whole, and on which there is a high level of dependence.	The offset must provide acceptable substitute goods and services.	Where the ecosystem is Least Threatened, it may be necessary to provide an offset to cater for residual negative impacts on ecosystem services. Where an offset requirement has been determined using the basic offset ratio, it may be necessary to provide additional offset sites that would provide the necessary ecosystem services, and/or

		compensation in kind. The potential to rehabilitate degraded parts of earmarked offset areas, to improve ecosystem services delivery to affected communities should be considered.

Additionally, the following ratios were defined by the DEA&DP (2011):

- A 30:1 ratio for '*critically endangered*' ecosystems, where an offset would be appropriate only in exceptional circumstances;
- A 20:1 ratio for '*endangered'* ecosystems;
- A 5:1 ratio for '*vulnerable'* ecosystems; and
- No offset for '*least threatened*' ecosystems.

The area determined by the basic offset ratio should then be adjusted by considering a range of context specific criteria such as size, habitat intactness and species composition. In practical terms for a project, offsets can be achieved through several mechanisms (DEA&DP; 2011):

- Securing habitat for conservation either on the development site or away from the development site;
- Providing a financial guarantee up-front for a specified period of time during which the proponent could pursue the securing of habitat for conservation. Should the proponent fail to secure habitat during that period, the financial guarantee would be used by the State or designated organization to secure habitat; or
- Providing monetary compensation.

The key factors that need to be considered in evaluating an offset proposal area (DEA&DP; 2011) where habitat will be secured for conservation are as follows:

- Proposed biodiversity offset should compensate fully for the residual negative impacts on biodiversity and be functionally viable in the long term;
- The offset should result in benefits for biodiversity;
- Where the proponent is to secure habitat as an offset, but the offset has a residual negative effect on local communities, they should be adequately compensated in an appropriate manner, depending on the nature of the loss;
- The offset should be acceptable to the main affected parties;
- There should be a sufficient guarantee that the offsets would be secured, managed, monitored and audited, as required, in the long term; and
- There should not be any unacceptable risks associated with the offset.

According to "Towards a best-practice guideline for wetland offsets in South Africa" (Macfarlane D. *et al,* 2016) the goals of wetland offsets in South Africa are as follows:

- Provide appropriate and adequate compensation for residual impacts on key water ecosystem services and contribute to achieving water resource objectives (including both Water Resource Management and Water Resource Quality Objectives) by:
  - Ensuring "no net loss" in the overall wetland functional area by providing gains in wetland area and/or conditions equal to or greater than the losses due to residual impacts;
  - Directing offset activities that will improve key regulating and supporting services towards those wetlands where these specific services can best be enhanced, and where these offset activities will contribute best to achieving water resource objectives including both Water Resource Management and Quality Objectives;
  - Providing 'in kind' services through offset activities, or substitute services acceptable to affected communities, for residual impacts on direct (provisioning or cultural) services, to ensure that these communities are at least as well off as prior to the development taking place;
- Secure formal protection of wetland systems in a good condition so as to contribute to meeting national biodiversity and protection targets for the representation and persistence of different wetland types, thereby ensuring that cumulative impacts of increased water use, development authorisation and land use change do not jeopardize the ability to meet the country's targets; and
- Adequately compensate for residual impacts on threatened or otherwise important (e.g. wetland dependent) species through appropriate offset activities that support and improve the survival and persistence of these species.

2.2.3 Ezemvelo KZN Wildlife Concise Guideline: Biodiversity Offsets in KwaZulu-Natal (2013)

Of all the provinces in South Africa, KwaZulu-Natal contains the greatest combined area of Critically Endangered and Endangered terrestrial ecosystems in South Africa: 688 000 ha. Of this area, one third (224 000 ha) consists of Critically Endangered ecosystems; second only in area to the Western Cape. All potential biodiversity offsets should be evaluated against the objective and desired outcome of offsets stated below.

The objective of the biodiversity offsets policy in KwaZulu-Natal, through the development authorisation and any change in land-use process, is to ensure that residual impacts on biodiversity and ecosystem services that are of medium to high significance (i.e. that do not represent a fatal flaw from a biodiversity perspective) are duly compensated by developers in such a way that a material contribution is made to implementing provincial and/or municipal level conservation plans and reaching associated targets, and to safeguarding valued ecosystem services. An additional objective is to achieve development and conservation objectives more effectively by creating opportunities for conservation beyond the site of development, rather than focusing only on that site.

According to the Ezemvelo KZN Wildlife Concise Guideline: Biodiversity Offsets in KwaZulu-Natal (EKZNW, 2013), broadly speaking, biodiversity offsets should not be considered when the residual impacts are of 'very high' significance (e.g., if an irreversible impact will occur within an area designated as a CBA), however, as in the draft National Biodiversity Offset Policy (DEA, 2017), the EKZNW Concise Guideline (2013) notes that "in situations where it is clear that development will be authorized due to strategic interests and the nature of development means that residual negative impacts on biodiversity are unavoidable", exceptions to the rigid application of the mitigation hierarchy may be made insofar as offsets may be considered as a 'last resort', and consideration should be given to offsets as early as possible in the planning process.

2.2.4 Wetland Specific Offset Guidelines

The offset ratios as defined by DEA&DP (2011) were refined in the draft wetland offset calculator specifically pertaining to wetland offsets (Macfarlane D. *et al* 2016). The wetland offset calculator was designed to guide the criteria and importance of wetland habitat in terms of water resource and ecosystem value, ecosystem conservation, and presence of species of conservation concern. At the end of the process, hectare equivalents representative of the wetland that requires an offset are provided. The wetland offset calculator was used during the determination of the wetland offsets required for the proposed Smithfield Dam and both balancing dam alternatives (i.e. Langa and Mbangweni Dams) under consideration.

Hectare Equivalents: To enable the quantification of an appropriate offset, it is important to establish a unit or measurement that will allow for losses (due to the proposed impacts) and gains (due to the proposed offset) in wetland / biodiversity values to be assessed. This is central to the concept of offsets, and the goal of achieving no net loss. In the past, the area of wetland affected (as measured in hectares, for example) was a commonly used 'currency' and is still used in many instances. However, the approach taken in these guidelines which is based international best practice, shows that a more refined "currency" that better incorporates a measure of ecological function, quality, and/or integrity. The basic "hectare equivalents" used in these guidelines are a combination of area impacted and the change in condition or functionality. These basic values are modified based on the significance of the feature being impacted (in the case of the calculation of the required offset) or the quality of the offset achieved (in the case of the offset receiving calculation). This currency ('hectare equivalents') is used as a surrogate for residual loss and has been adopted as the primary currency for evaluating impacts to wetlands as a result of the proposed development.

Where a wetland offset is deemed appropriate, various actions may be used to deliver the required outcomes. These actions can be broadly grouped into the different categories listed below as provided by Macfarlane D. *et al* (2016).

- **Protection**: This refers to the implementation of legal mechanisms (e.g. declaration of a Protected Environment or Nature Reserve under the National Environmental Management: Protected Areas Act, 2014 (Act 21 of 2014), a legally binding conservation servitude, or a long-term biodiversity agreement under the National Environmental Management Act, 2004 (Act 10 of 2004) and putting in place appropriate management structures and actions. This may include setting appropriate water reserve determinations and specifying protection measures within the DWS planning instruments. Furthermore, inclusion of offset sites into appropriate land use zones and land use plans, including provincial and local conservation plans, ensure that conservation outcomes are secured and maintained in the long-term. In light of the high regional rate of loss of wetlands and associated biodiversity, protection is necessary for any wetland offset, irrespective of the means used to deliver the "no net loss" outcome (i.e. rehabilitation, or other activities that compensate for wetland degradation or loss). It is important to recognize that increased protection (especially at a catchment level) greatly improves the chance of long-term persistence of wetland function and biodiversity, and therefore contributes to "no net loss" objectives. As protection increases the current "value" of a wetland system, it is important that the offset mechanism fully recognises the benefits associated with increased protection in reducing potential for long term loss and adding to the overall conservation estate, in line with national conservation goals and targets;
- **Averted loss*****:*** This refers to physical activities which prevent the loss or degradation of an existing wetland system, its ecosystem services and its biodiversity, where there is a clearly demonstrated threat of decline in the system's condition, ability to provide ecosystem services or support overall Water Resource Objectives (both quality and quantity). This would apply in situations where a wetland head-cut[6] is stabilised to prevent an erosion gully from propagating further into the wetland, where excessive sediment inputs are prevented from entering a wetland through the stabilization of erosion dongas alongside the wetland or by creating structures to trap such sediment before reaching the wetland, or where there is significantly improved management of a wetland (e.g. reduced grazing pressure or control of invasive aliens impacting on wetland ecosystem functioning). These actions can therefore count as 'gains' which

[6] Erosion occurring upstream of a specific point.

contribute to achieving a "no net loss" outcome for key wetland services. Although, it can be argued that protection mechanisms measured against the regional background rate of wetland / biodiversity loss are part of 'averted loss';

- **Rehabilitation**: Rehabilitation results in an improvement in wetland condition, function, and associated biodiversity. Rehabilitation involves the manipulation of the physical, chemical, or biological characteristics of a degraded wetland system in order to repair or improve wetland integrity and associated ecosystem services. This could involve actions such as removing obstructions to flow or assisting the regeneration of the natural vegetation. By increasing the condition of a wetland system and its biodiversity, a positive contribution is made towards the goal of "no net loss";
- **Establishment**: This involves the development (i.e. creation) of a new wetland system where none existed before by manipulating the physical, chemical, or biological characteristics of a specific site. Successful establishment would result in 'gains' in wetland area, functions and biodiversity values. It is important to note, however, that while selected ecosystem services may quite readily be created through establishment, many ecological values – let alone whole intact systems - are very difficult, if not impossible to create. In general, establishment as a mechanism for delivering an offset should therefore be avoided, or only used in exceptional circumstances, where it is known (based on research and demonstrated experience) that a particular system or service that has been lost can be reliably created elsewhere. Sites would also need to be located such that they do impact on important terrestrial resources (e.g. intact natural grasslands);
- **Direct compensation**: Direct compensation involves directly compensating affected parties for the ecosystem services lost as a result of development activities. This is ideally done by providing an equivalent substitute form of offset or in some cases may take the form of monetary compensation. This form of offset action is generally most relevant to direct services (e.g. loss of grazing land) but may occasionally be applied to compensate for losses of regulating and supporting services (e.g. through the direct treatment of polluted water). From an ecological point of view compensation is a very new concept considered in the latest discussions on biodiversity impact management which are expanded upon in Section 2.3 below.

2.3 *Fatally Flawed Projects from a Biodiversity Perspective*

Certain landscapes, ecosystems or elements of ecological infrastructure are unique and irreplaceable and must be protected and maintained. This includes, but is not limited to, areas where there are no longer any other options in the landscape to meet biodiversity and conservation objects and targets, Critically Endangered ecosystems and/or habitat for a population of locally endemic and Critically Endangered species.

In the latest thinking within the DEA (Mr. P. Lukey, 2018, Pers. comm.), biodiversity offsetting cannot be used as a vain attempt to replace these irreplaceable landscapes, natural heritage sites, ecosystems or elements of ecological infrastructure. By definition, biodiversity offsetting is not applicable in the case of proposed developments that have fatal flaws as it is simply impossible to counterbalance the remaining impacts (e.g. nothing can counterbalance the extinction of species or a unique natural heritage site).

2.4 *Exceptional Circumstances, the Mitigation Hierarchy and Biodiversity Compensation*

Compensation, unlike offsetting, is not an option in the mitigation hierarchy as it may have no direct benefits to biodiversity. In the latest thinking within the DEA (Mr. P. Lukey, 2018, Pers. comm.) in cases where a development has been determined fatally flawed but is authorised in national interest for justifiable social or economic reasons, compensation for the loss of biodiversity, as opposed to a biodiversity offset, must be undertaken. In these instances, an authorising authority may require applicants to carry out certain additional activities to further compensate for some remaining impacts of a development. Although the compensation initiative may, in some instances, be similar to biodiversity offsets, unlike offsetting which counterbalances residual impacts on biodiversity, compensation is usually a contribution to a socially desirable cause or intervention in recognition of loss, damage, harm or degradation. In these situations, the compensation initiative must:

- Target priority areas;
- Have equal or greater value than an offset initiative with an offset ratio of 30:1;
- Provide protection of the compensation area for at least 99 years; and
- Provide for the effective management of the compensation area over a minimum period of 30 years.

2.5 *Project Execution Plan*

Details pertaining to the project execution plan for both the wetland offset and terrestrial Biodiversity Offset and Compensation Initiative can be found in Appendix C of this report; however, a brief summary of each is provided below.

2.5.1 Wetland offset calculations

In terms of wetland trade-offs and conservation requirements, these were calculated using the wetland offset calculator as defined by McFarlane et al (2016) which defines both functional (i.e. water resources and ecosystem services such as flood attenuation) hectare equivalent requirements as well as ecosystem conservation (i.e. the contribution of the wetland ecosystem to biodiversity conservation objectives) target hectare equivalents. Please refer to Appendix C for details of the method of assessment.

2.5.2 Critical Biodiversity Area offset calculations

The terrestrial CBA trade-offs and conservation requirements were calculated using the offset ratios for different vegetation types in KZN as defined by EKZNW in “Concise Guideline: Biodiversity Offsets in KwaZulu-Natal” (2013) which is defined as the measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from projects development after appropriate prevention and mitigation measures have been taken. The aforementioned guideline is in line with the offset ratios mentioned within the draft National Biodiversity Offset Policy (DEA, 2017).

3 PROJECT SPECIFIC BACKGROUND

To apply the various assessment methods and offset calculators, it is important to have a very good understanding of the wetland and biodiversity aspects and characteristics of the areas requiring offsetting. The sections that follow provide a summary of site specific information considered for the determination of offsets required for the proposed Smithfield Dam and Langa Balancing Dam.

3.1 *Regional Context*

The following section contains data accessed as part of the desktop assessment and is presented as a “dashboard” style report below (Tables 5 and 6). The dashboard reports aim to present concise summaries of the data on as few pages as possible in order to allow for integration of results by the reader to take place. Where required, further discussion and interpretation is provided, and information that was considered to be of particular importance was emboldened.

The Smithfield Dam, the majority of the Langa Dam and a small portion of the Mbangweni Dam are situated within the Sub-Escarpment Grassland Group 3 (Endangered)[7], while the remaining portion of the Langa Dam and the majority of the Mbangweni Dam is situated within the Sub-Escarpment Savanna (Endangered) wetland vegetation types. The conservation status of the applicable WetVeg types increases the significance of the loss of these wetlands from the project footprint in terms of a regional context and will in turn affect the requirements including the quantum of the offset calculation.

The Smithfield Dam is situated within the Southern Kwa-Zulu Natal Moist Grassland (Vulnerable). The Langa and Mbangweni Balancing Dams fall within two vegetation types: Ngongoni Veld (Vulnerable) and Midlands Mistbelt Grassland (Endangered) (Mucina & Rutherford, 2012). According to the vegetation types for KZN as defined by Scott and Escott (2011), the proposed Smithfield Dam Basin is situated within the Southern KwaZulu Natal Moist Grassland (Endangered) and the proposed Langa and Mbangweni Balancing Dams are situated within the Temperate Alluvial Vegetation (Vulnerable) and Midlands Mistbelt Grassland (Critically Endangered).

According to the KZN Biodiversity Spatial Planning Terms and Processes database (KZN BSPT&P, 2016), the proposed dams are indicated to include areas classified as "CBA: Irreplaceable", as well as "CBA: Optimal" and "ESA" (Figure 4). Whilst the KZN BSPT&P (2016) does not specifically differentiate between terrestrial and aquatic/freshwater CBAs, it can be concluded that the freshwater systems within these CBAs and Ecological Support Area (ESAs) are considered of high ecological importance. According to the Terrestrial Systematic Conservation Plan (EKZNW, 2010) the proposed dams straddle areas classified as "CBA: Irreplaceable", as well as "CBA: Optimal". The criteria for the CBA listed for each proposed dam are listed in Tables 3 and 4 below as different faunal and floral SCC, including protected vegetation types, are highlighted to be present within the CBA's.

The project footprint (both proposed dams) falls within the South Eastern Uplands Aquatic Ecoregion. The proposed Smithfield Dam is situated within two quaternary catchments,

[7] The ecosystem threat statuses of WetVeg groups used in this report and in the offset calculations are as per *Wetland offsets: a best-practice guideline for South Africa* (Macfarlane *et al*, 2016). These ecosystem threat statuses and protection levels for wetland groups were revised using data from the 2014 *Supporting better decision-making around coal mining in the Mpumalanga Highveld through the development of mapping tools and refinement of spatial data on wetlands (Mbona et al., 2014).* Whilst the methods used were identical to those applied in the National Biodiversity Assessment (Driver *et al*., 2012) these data are based on revised wetland dataset and are reported on at a Wetland Group Level. Thus, some variance between the ecosystem threat statuses and protection levels may be found between Driver *et al.* (2012) and Macfarlane *et al.* (2016).

namely U10F and U10E, whilst the proposed Langa and Mbangweni Balancing Dams are located within the U60B quaternary catchment (Figure 3).

Furthermore, the proposed Smithfield Dam is located approximately 500 m to 1, 8 km south of the Impendle Nature Reserve (considered an important bird area), approximately 5 km south of the Mount Shannon Protected Environment, and approximately 5 km and 10 km south of the Kwa-Zulu Natal Mistbelt Grassland Important Bird Areas (consists of a series of disconnected grassland patches on farms located in the KwaZulu-Natal Midlands). The Langa and Mbangweni Dams are situated within the Kwa-Zulu Natal Mistbelt Grassland Important Bird Area. A small western portion of the Langa Dam is situated within the informal conservation area namely Zinti Valley Private Nature Reserve. According to the draft EIA report (Nemai, 2016), the Zinti Valley Private Nature Reserve was identified as preferred habitat for *Hirundo atrocaerulea* (Blue Swallow).

Please refer to Tables 4 and 5, and Figures 3 to 8 below for further details.

Table 3: Data relating to the CBA criteria with regards to protected vegetation types including floral and faunal species associated with the proposed Smithfield Dam.

	CBA	Class	Number of Species listed	Species Listed
Smithfield Dam	Optimal	Vegetation type	1	Southern KwaZulu Natal Moist Grassland (EN)
		Flora	2	*Encephalartos ghellinckii* (VU), *Hesperantha woodii* (LC)
		Butterfly	2	*Lepidochrysops pephredo* (VU), *Capys penningtoni* (EN)
		Millipede	1	*Doratogonus cristulatus*
		Reptile	2	*Bradypodion bourquini, Bradypodion thamnobates* (NT)
		Snail	1	*Euonyma lymneaeformis*
		TOTAL	**9**	
	Irreplaceable	Vegetation type	1	Southern KwaZulu Natal Moist Grassland (EN)
		Flora	1	*Encephalartos ghellinckii* (VU)
		Butterfly	2	*Lepidochrysops pephredo* (VU), *Capys penningtoni* (EN)
		Millipede	1	*Doratogonus cristulatus*
		Reptile	1	*Bradypodion bourquini* (NT)
		Snail	1	*Euonyma lymneaeformis*
		TOTAL	**7**	

Table 4: Data relating to the CBA criteria with regards to protected vegetation types including floral and faunal species associated with the proposed balancing dams (Langa and Mbangweni)

	CBA	Class	Number of Species listed	Species Listed
Langa Dam	Irreplaceable	Vegetation type	3	Temperate Alluvial Vegetation: Midland Floodplain Grassland (VU), Midlands Mistbelt Grassland (CR), Midland Floodplain Grassland
		Flora	6	*Senecio* exuberans(EN), *Dierama reynoldsii, Gerbera aurantiaca* (EN), *Asclepias woodii* (NT)
		Birds	2	*Anthropoides paradiseus* (VU), *Hirundo atrocaerulea* (CR)
		Mammal	1	*Ourebia ourebi* (EN)
		Millipede	5	*Spinotarsus glomeratus, Doratogonus peregrinus, Doratogonus cristulatus, Doratogonus montanus, Doratogonus natalensis* (VU)
		Reptile	1	*Bradypodion bourquini* (NT)
		Insect	1	*Eremidium erectus, Pagopedilum martini*
		Snail	1	*Euonyma lymneaeformis*
		TOTAL	**20**	

Table 5: Desktop data relating to the character of freshwater resources associated with the proposed Smithfield Dam and Langa/Mbangweni Balancing Dam and surrounding regions.

<table>
<tr><th colspan="4">Aquatic ecoregion and sub-regions in which the Smithfield Dam and Langa Balancing Dam is located</th><th colspan="2">Detail of the Smithfield, Langa and Mbangweni Dams in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database</th></tr>
<tr><td>Ecoregion</td><td colspan="3">South Eastern Uplands</td><td rowspan="6">FEPACODE</td><td rowspan="6">The Langa and Mbangweni Dams are located within a SubWMA currently not considered important in terms of fish importance or conservation. The majority of the Smithfield Dam is situated within a SubWA considered a Freshwater Ecosystem Priority Area (FEPA), and the remaining portion is considered a Fish Support Area (FishFSA). FEPA: River Freshwater Ecosystem Priority Area (FEPA) achieves biodiversity targets for river ecosystems and threatened fish species and were identified in rivers that are currently in a good condition (A or B ecological category). Although the FEPA status applies to the actual river reach, shading of the whole sub-quaternary catchment reach indicate that the surrounding land and smaller stream network needs to be managed in a way that maintains the good condition of the river reach. FishFSA: Fish sanctuaries in a lower than A / B ecological condition, including sub-quaternary catchments that are important for migration of threatened fish species.</td></tr>
<tr><td>Catchment</td><td colspan="3">Mkomazi</td></tr>
<tr><td>Quaternary Catchment</td><td colspan="3">U10F (Majority of Smithfield Dam), U10E (Western portion of Smithfield Dam), U60B (Langa and Mbangweni Dams)</td></tr>
<tr><td>WMA</td><td colspan="3">Mvoti to Umzimkulu</td></tr>
<tr><td>subWMA</td><td colspan="3">Mgeni (Langa and Mbangweni Dams), Mkomazi (Smithfield Dam)</td></tr>
<tr><th colspan="4">Dominant characteristics of the South Eastern Uplands Ecoregion (Level II 16.03) (Kleynhans et al., 2007)</th></tr>
<tr><td>Dominant primary terrain morphology</td><td>Low mountains</td><td rowspan="2">Rainfall concentration index</td><td rowspan="2">30 to 50</td><td rowspan="3">NFEPA Wetlands</td><td rowspan="3">According to the NFEPA database there are several natural wetland features situated within all three proposed dams. The majority of the wetland features situated within the Smithfield Dam are in a natural or good condition, with one wetland feature considered in a moderately modified ecological condition. The wetland feature identified by NFEPA within the Langa/Mbangweni Dam is also in a moderately modified ecological condition. Furthermore, all the wetlands are identified as FEPA due to their importance to crane species observed within the area or breeding of such species occurring in the area.</td></tr>
<tr><td rowspan="3">Dominant primary vegetation types</td><td rowspan="3">Afromontane forest, Valley Thicket, Short Mistbelt Grassland, North-eastern Mountain Grassland</td></tr>
<tr><td>Rainfall seasonality</td><td>Mid-summer</td></tr>
<tr><td>Mean annual temp. (°C)</td><td>16 to 18</td><td rowspan="2">Wetland Vegetation Type</td><td rowspan="2">The Smithfield Dam, majority of Langa Dam and a small portion of the Mbangweni Dam are situated within the Sub-Escarpment Grassland Group 3 (Endangered) WetVeg type, whilst the remaining portion of the Langa Dam and majority of Mbangweni Dam are situated within the Sub-Escarpment Savanna (Endangered) wetland vegetation type.</td></tr>
<tr><td>Altitude (m a.m.s.l)</td><td>300 to 1100</td><td rowspan="2">Winter temperature (July)</td><td rowspan="2">4 to 22</td></tr>
<tr><td>MAP (mm)</td><td>700 to 800</td><td rowspan="3">NFEPA Rivers</td><td rowspan="3">According to the NFEPA Database the Mkomazi and Luhane Rivers traverse the Smithfield Dam. Furthermore, there are no river systems indicated within 500m of the Langa and Mbangweni Dams. The Mkomazi River is considered to be in a largely natural ecological condition, thus is classified as a FEPA river. The Luhane River is considered not intact according to the NFEPA Database, however it is considered largely natural according to the older PES assessments of 1999 and considered a FishFSA.</td></tr>
<tr><td>Coefficient of Variation (% of MAP)</td><td>20 to 30</td><td>Summer temperature (Feb)</td><td>14 to 28</td></tr>
<tr><td>Median annual simulated runoff (mm)</td><td colspan="3">30 to 180</td></tr>
<tr><th colspan="6">Detail of the Smithfield and Langa Dams in terms of the Draft KwaZulu-Natal Biodiversity Spatial Planning Terms and Processes (2016)</th></tr>
<tr><td>Critical Biodiversity Area (CBA) Irreplaceable</td><td colspan="5">The Langa and Mbangweni Dams traverse an Irreplaceable CBA, and a small northern portion of the Smithfield Dam is situated within an Irreplaceable CBA. CBA: Irreplaceable are areas considered critical to meet biodiversity targets and thresholds, which are required to ensure the persistence of viable populations of species and the functionality of ecosystems.</td></tr>
<tr><td>CBA Optimal</td><td colspan="5">Several Optimal CBAs are situated within the Smithfield Dam. CBA Optimal areas, are areas which represent the best localities out of a potentially larger selection of available planning units that are optimally located to meet both the conservation target but also the criteria defined by either the Decision Support Layers (Coverages used in the C-Plan to aid the optimisation process in which a minimal reserve configuration is achieved) or the Cost Layer (A single combined coverage used to aid the optimisation process in which a minimal reserve configuration is achieved). CBA Optimal areas are based on the optimised outputs derived using systematic conservation planning software, with the planning units identified representing the localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved. Even though these areas are considered 'optimised' for a variety of species, this does not mean that it is the only areas where these species occur, but there are more alternate options available within which the features located within can be met.</td></tr>
<tr><td>Ecological Support Area (ESA) and Protected Areas</td><td colspan="5">A small northern portion of the Smithfield Dam is situated within an ESA also considered a landscape corridor. aESAs are required to support and sustain the ecological functioning of CBAs, and these areas are functional but not in natural pristine areas. Furthermore, a small western portion of the Langa and Mbangweni Dams are situated within the Zinti Valley Private Nature Reserve.</td></tr>
</table>

CBA = Critical Biodiversity Area; DWS = Department of Water and Sanitation; EI = Ecological Importance; ES = Ecological Sensitivity; m.a.m.s.l = Metres Above Mean Sea Level; MAP = Mean Annual Precipitation; NFEPA = National Freshwater Ecosystem Priority Areas; PES = Present Ecological State WMA = Water Management Area

Table 6: Desktop data relating to the character of terrestrial areas associated with the proposed Smithfield Dam and Langa/Mbangweni Balancing Dam and surrounding regions.

Details of the Smithfield, Langa and Mbangweni Dams in terms of Mucina & Rutherford (2012)	
Biome	The Smithfield Dam, the majority of the Langa Dam and a portion of the Mbangweni Dam is situated with the **Grassland Biome.** The remaining portion of the Langa Dam and majority of the Mbangweni Dam is situated within the **Savanna Biome.**
Bioregion	The Smithfield Dam, majority of the Langa Dam and a portion of the Mbangweni Dam is located within the **Sub-Escarpment Grassland Bioregion**. The remaining portions of the Langa and Mbangweni Dams are located within the **Sub-Escarpment Savanna Bioregion.**
Vegetation Type	The Smithfield Dam is situated within the **Southern Kwa-Zulu Natal Moist Grassland**. The Langa and Mbangweni Dams fall within two vegetation types: **Ngongoni Veld** and **Midlands Mistbelt Grassland.**
Conservation details pertaining to the Smithfield, Langa and Mbangweni Dams (Various databases)	
NBA (2011)	The Smithfield Dam falls within an area that is currently poorly protected, and the Langa and Mbangweni Dams are situated within an area currently not protected.
National Threatened Ecosystems (2011)	A small northern portion of the Smithfield Dam falls within a threatened ecosystem listed as **endangered** (remaining extent of Impendle Highlands vegetation type), with the rest of the site situated within a least threatened ecosystem. Various portions of the Langa and Mbangweni Balancing Dams are situated within an ecosystem listed as **endangered** (remaining extent of the Pietermaritzburg South vegetation type), with the remaining portions situated within least threatened ecosystem.
NPAES (2009) & SAPAD (2017)	Several protected areas are present within 10 km of the Dams: Minerva PNR, Impendle NR, and Mount Shannon PE. Additionally, a small western portion of the Langa and Mbangweni Dams are situated within the informal conservation area namely Zinti Valley Private Nature Reserve.
IBA (2015)	The Langa and Mbangweni Dams are situated within the Kwa-Zulu Natal Mistbelt Grassland Important Bird Area, while the Smithfield Dam is situated approximately 460m south of the Impendle Nature Reserve also considered to be an important bird area.

Description of the vegetation type(s) relevant to the Smithfield, Langa and Mbangweni Dams (Mucina & Rutherford, 2012)			
Vegetation type	Southern KwaZulu Natal Moist Grassland	Ngongoni Veld	Midlands Mistbelt Grassland
Climate	Summer rainfall	Summer	Summer rainfall
Altitude (m)	880 to 1480	400 to 900	760 to 1400
MAP * (mm)	920	888	915
MAT* (°C)	15.6	17.7	15.8
MFD (Days)	15	2	7
MAPE* (mm)	1634	1646	1620
MASMS* (%)	67	69	68
Distribution	Kwa-Zulu Natal and Eastern Cape Provinces	Kwa-Zulu Natal and Eastern Cape Provinces	Kwa-Zulu Natal and Eastern Cape Provinces
Geology and Soils	Karoo Supergroup mudstones dominate this area, those of the Volksrust Formation occurring to the south and those of the Adelaide Subgroup to the north. Jurassic dolerite dykes are also present. The dominant soils are mottled and poorly drained, with a depth of 300–500 mm; the clay content ranges from 15–35%, representing soil forms such as Wasbank, Wesselnek, Longlands and Cartref, and Oatsdale on well drained soils.	Acid, leached, heavy soils are derived from Karoo Supergroup sediments (including significant Dwyka tillites) and intrusive Karoo dolerites. Also Glenrosa and Mispah soils occur.	Apedal and plinthic soil forms derived mostly from Ecca Group (Karoo Supergroup) shale and minor sandstone and less importantly from Jurassic dolerite dykes and sills.
Conservation	Vulnerable. Target 23%. 4% statutorily conserved in nature reserves. More than one third is transformed due to cultivation, plantations, urbanisation and dams.	Vulnerable. Target 25%. Only less than 1% statutorily conserved. 39% has been transformed for cultivation, plantations and urban development.	Endangered. Target 23%. Only a small fraction statutorily conserved. More than half already transformed for plantations, cultivation and urban sprawl.
Vegetation & Landscape features	Gently sloping valley bottoms of tall mixed veld dominated by *Hyparrhenia hirta* and sparsely scattered *Acacia sieberiana*. *Themeda triandra* is the dominant grass on veld that has been well managed. Overgrazed areas are dominated by species such as *Eragrostis curvula*, *E. plana*, *Sporobolus africanus* and *S. pyramidalis*.	Dense, tall grassland dominated by unpalatable, wiry Ngongoni grass (*Aristida junciformis*), with this monodominance associated with low species diversity. Wooded areas (thornveld) are found in valleys at lower altitudes.	Hilly and rolling landscape mainly associated with a discontinuous east-facing scarp formed by dolerite intrusions. Dominated by forb-rich, tall, sour *Themeda triandra* grasslands transformed by the invasion of native 'Ngongoni grass (*Aristida junciformis* subsp. *junciformis*). Only a few patches of the original species-rich grasslands remain.

NBA = National Biodiversity Assessment; NPAES = National Protected Areas Expansion Strategy; SAPAD = South African Protected Areas Database; IBA = Important Bird Area; MAP – Mean annual precipitation; MAT – Mean annual temperature; MAPE – Mean annual potential evaporation; MFD = Mean Frost Days; MASMS – Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply).

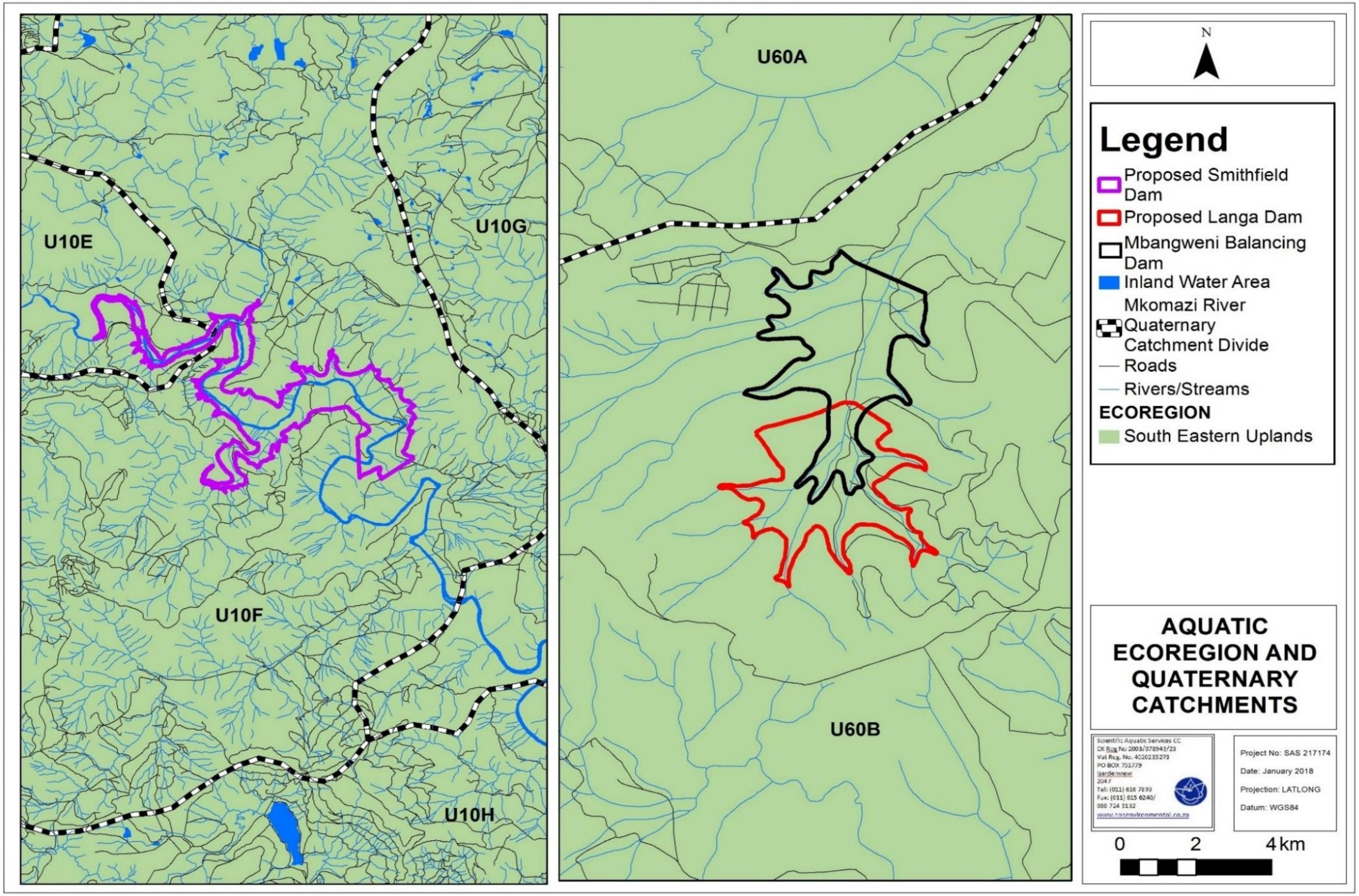


Figure 3: Aquatic Ecoregions and quaternary catchments associated with the proposed project footprint.

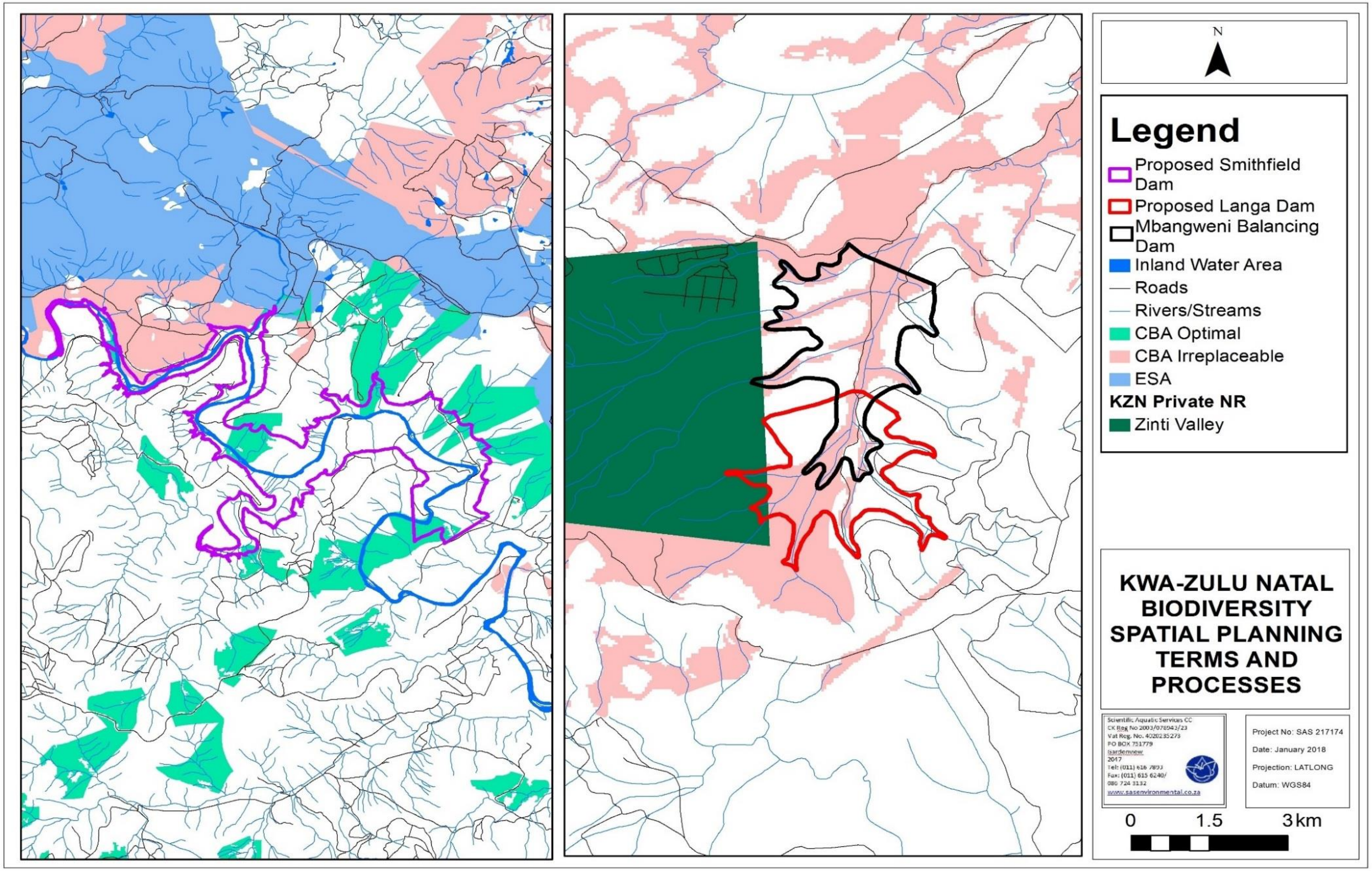


Figure 4: Locality of wetlands and terrestrial CBAs associated with the project footprint, according to the KZN Biodiversity Spatial Planning Terms and Processes database (2014).

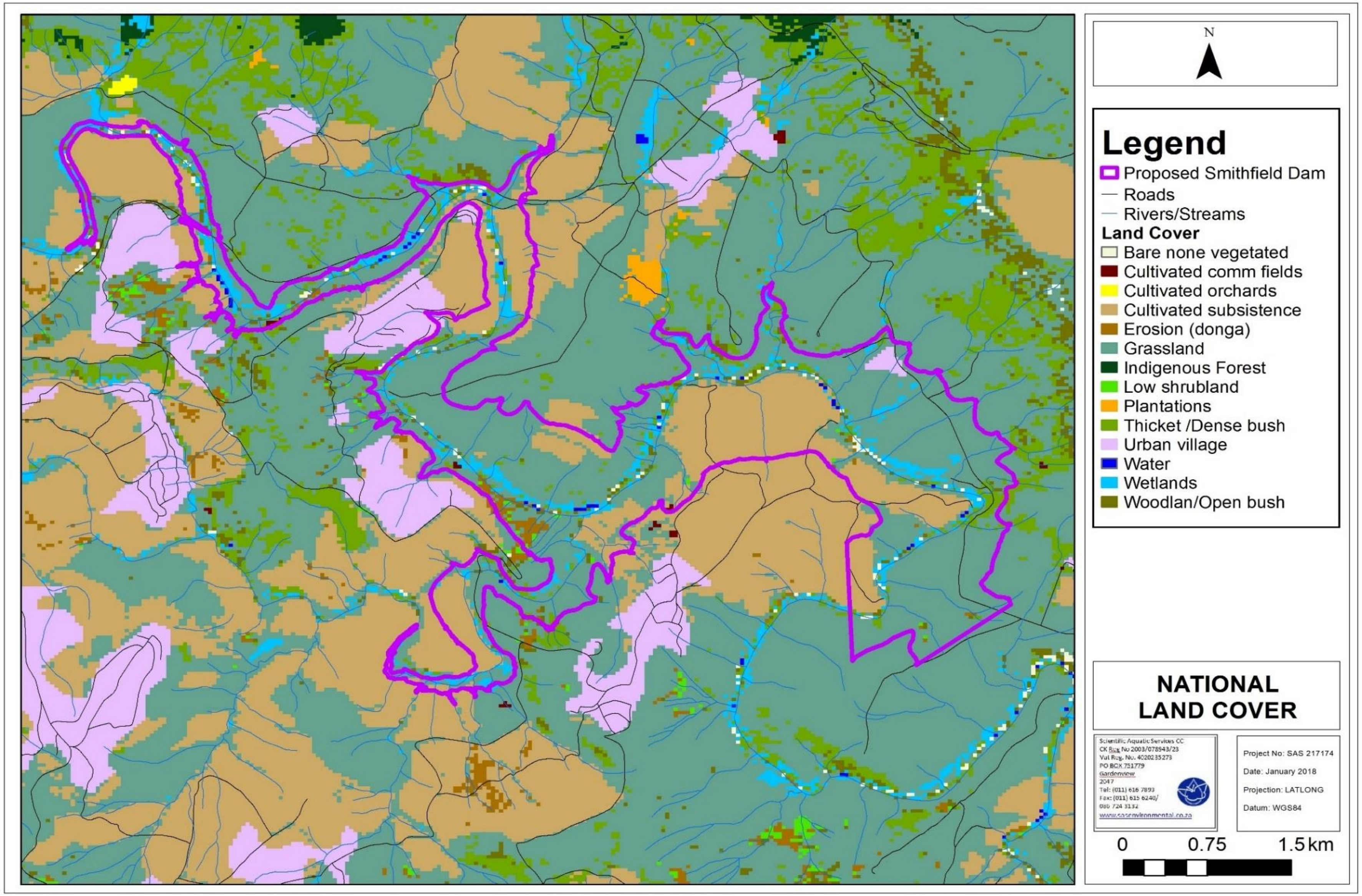


Figure 5: Land cover and sensitivity of the proposed Smithfield Dam footprint according to the National Landcover database (2014).

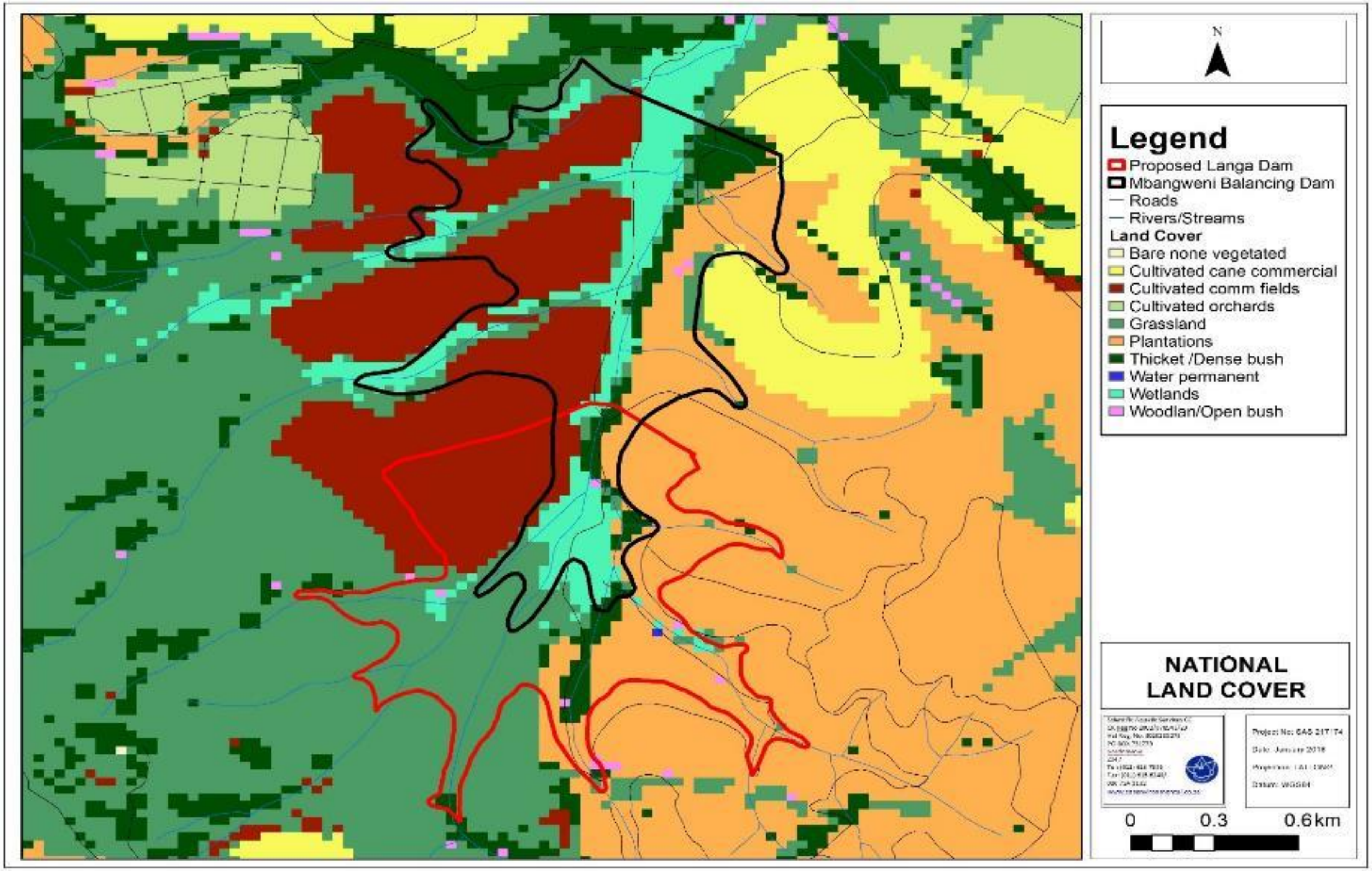


Figure 6: Land cover and sensitivity of the proposed Langa and Mabangweni Balancing Dam footprint according to the National Landcover database (2014).

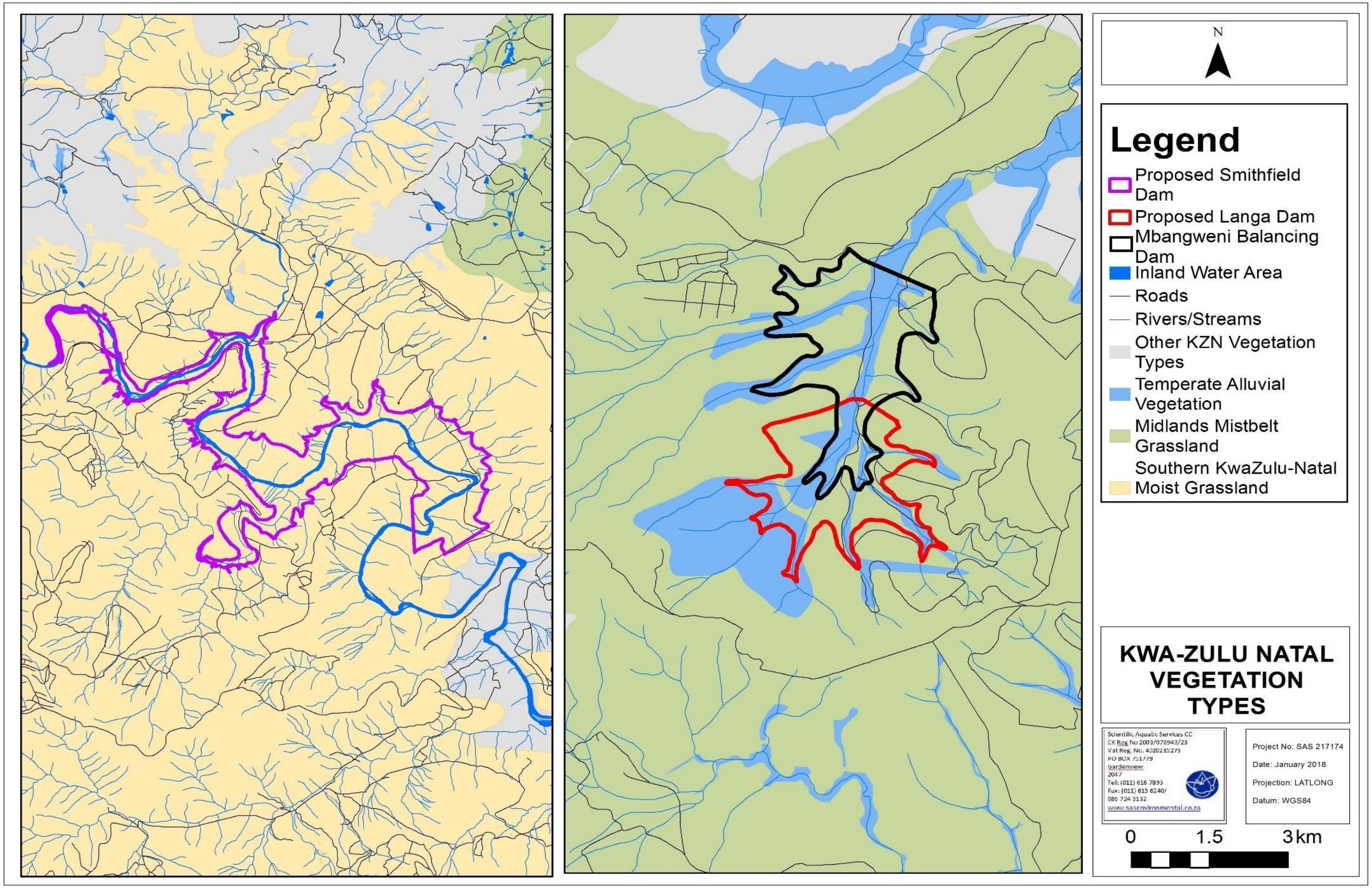


Figure 7: KwaZulu Natal vegetation types associated with the proposed Smithfield Dam and Langa Dam (Scott and Escott, 2011)

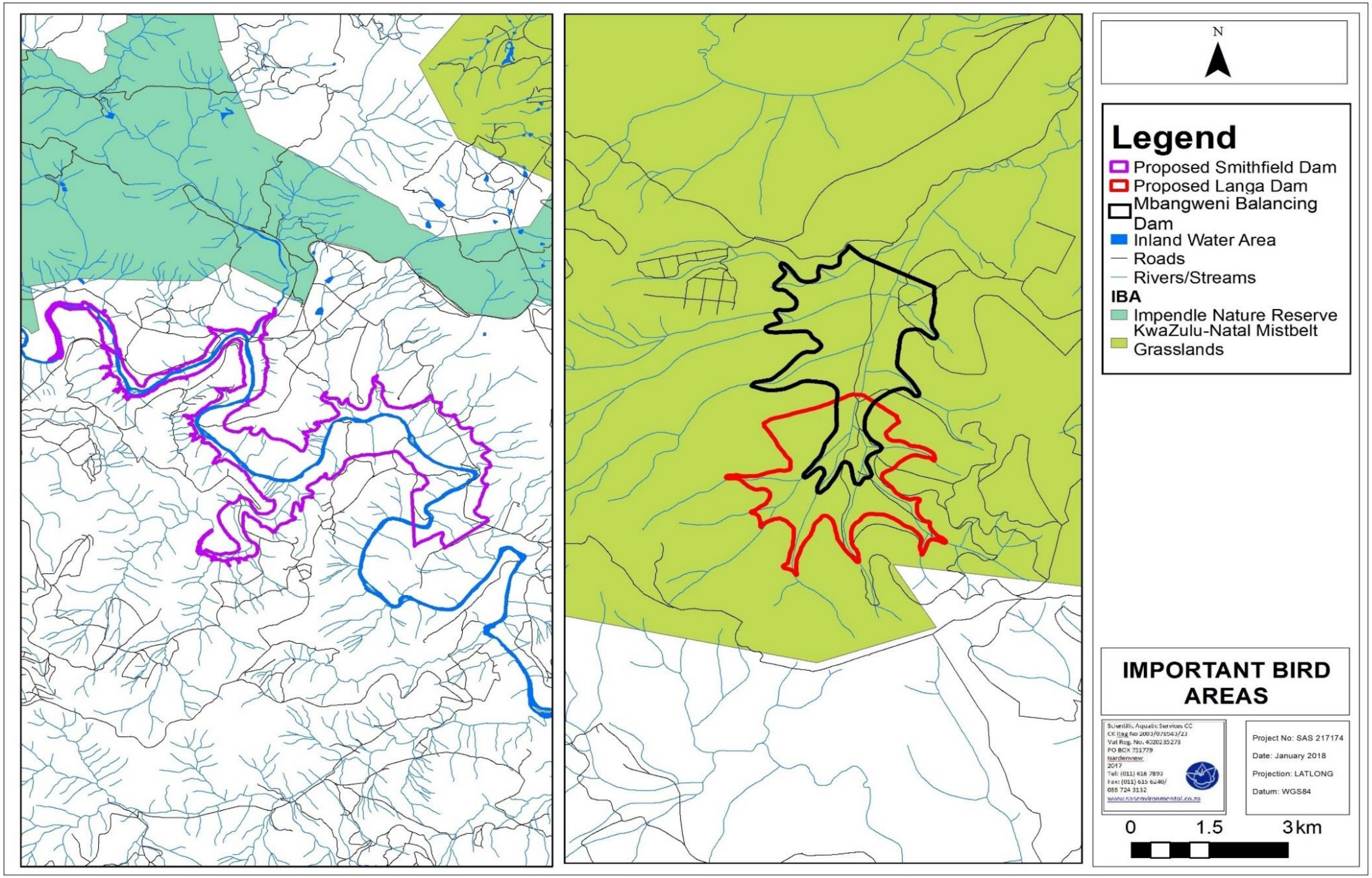


Figure 8: Proposed Langa Dam situated within the KwaZulu-Natal Mistbelt Grassland IBA and Smithfield approximately 460m south of the Impendle Nature Reserve, also considered to be an important bird area (IBA, 2015)

3.1.1 Ecological status of sub-quaternary catchments [Department of Water and Sanitation (DWS) Resource Quality Services (RQS) PES/EIS database]

The PES/EIS database, as developed by the DWS RQS department, was utilised to obtain additional background information on the project area. The PES/EIS database has been made available to consultants since mid-August 2014. The information from this database is based on information at a sub-quaternary catchment reach (subquat reach) level with the descriptions of the aquatic ecology based on the information collated by the DWS RQIS department from all reliable sources of reliable information such as South African River Health Programme sites, Ecological Water Resource (EWR) sites and Hydro Water Management System (WMS) sites.

Key information on background conditions associated with the project footprint, as contained in this database and pertaining to the Present Ecological State (PES), ecological importance (EI) and ecological sensitivity (ES) for the sub-quaternary catchment reaches (SQR) in closest proximity to the project footprint was accessed for the following SQRs:

- U10F-04560 (Luhane River);
- U10F-04528 (uMkhomazi River); and
- U10F-04380 (uMkhomazi River).

These aquatic ecosystems are indicated by the DWS RQS database to be in largely natural condition (PES B) and of high to very high ecological importance and ecological sensitivity. A summary of the relevant data for each SQR can be found in Appendix F, whilst the locality of the above EWR sites are indicated in the figure below.

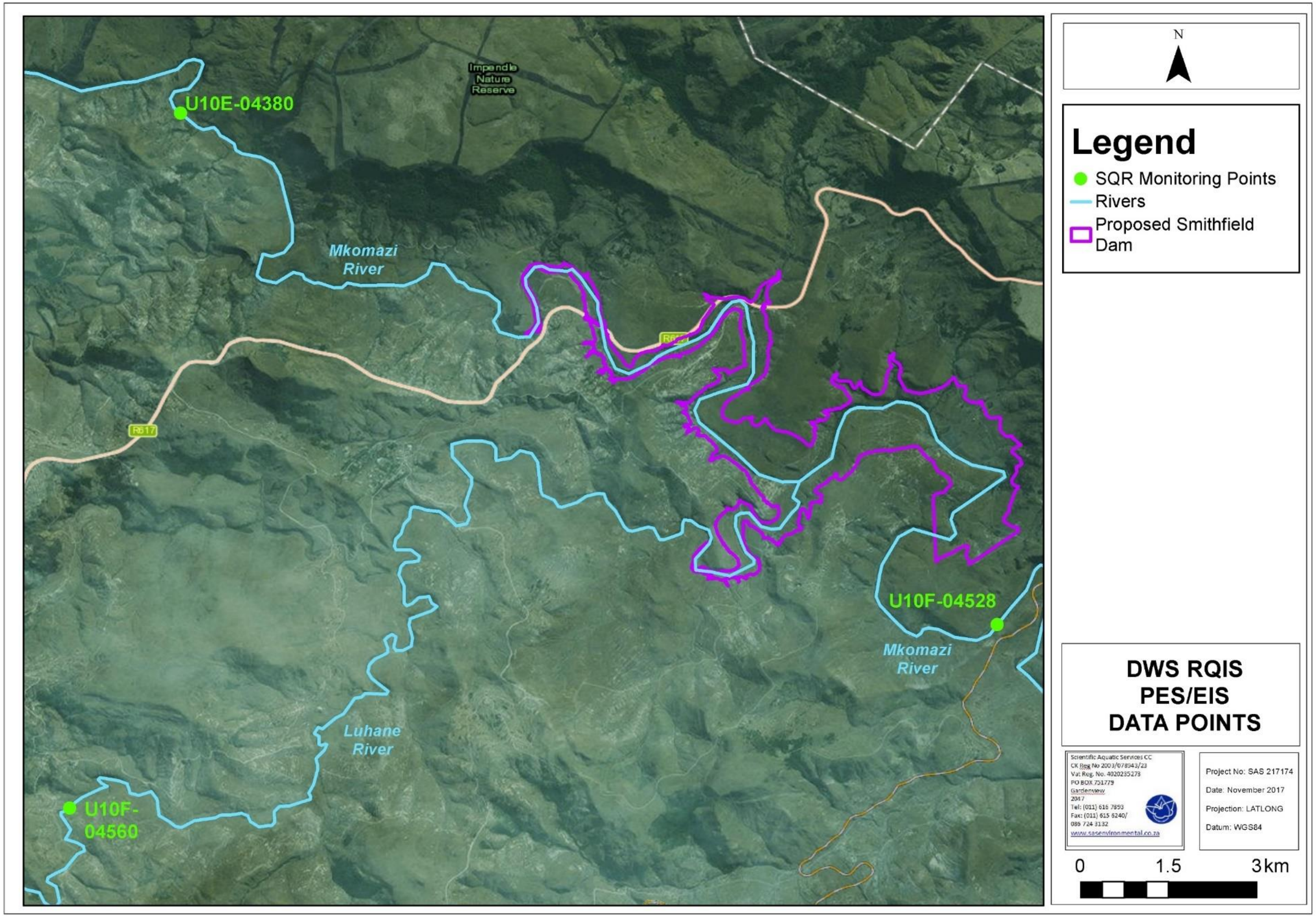


Figure 9: Applicable sub-quaternary catchment reaches associated with the proposed Smithfield Dam.

3.1.2 Terrestrial Ecological Conservation Status

According to the National Biodiversity Assessment (2011) the Smithfield Dam falls within an area that is currently poorly protected, and the Langa and Mbangweni Dams are situated within an area currently not protected.

A small northern portion of the Smithfield Dam falls within a threatened ecosystem listed as endangered (remaining extent of Impendle Highlands vegetation type), with the rest of the site situated within a least threatened ecosystem. Various portions of the Langa and Mbangweni Balancing Dams are situated within an ecosystem listed as endangered (remaining extent of the Pietermaritzburg South vegetation type), with the remaining portions situated within least threatened ecosystem (National Threatened Ecosystems, 2011).

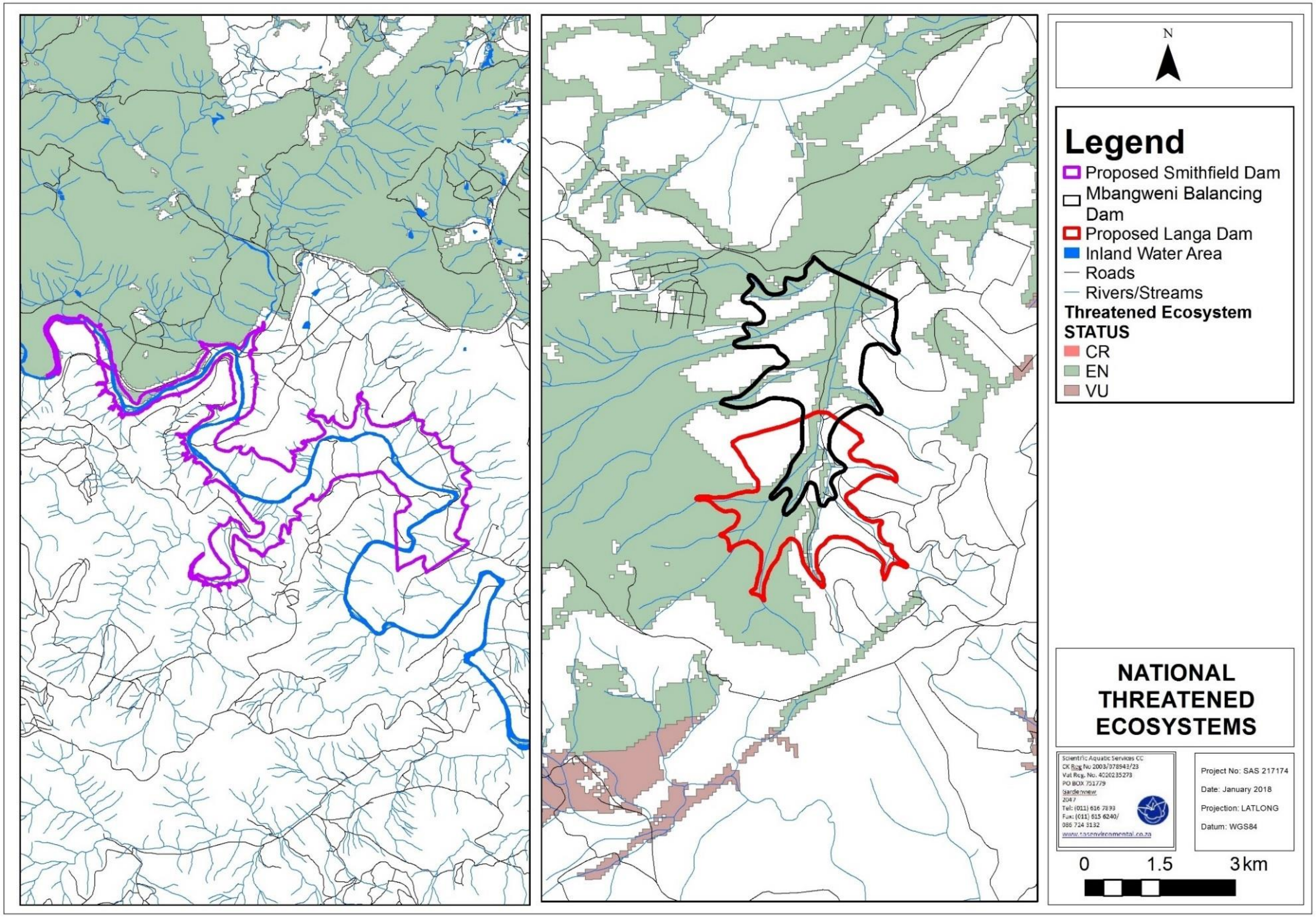


Figure 10: Endangered ecosystem associated with proposed Smithfield Dam and Langa Dam (National Threatened Ecosystems (2011)

3.2 *Characteristics of Wetland Resources*

According to the National Freshwater Ecosystem Priority Areas (NFEPA) database (2011), several wetlands are located beneath the FSL of the proposed Smithfield Dam, and are considered to be in a largely natural to moderately modified condition, whilst those beneath the FSL of the proposed Langa and Mbangweni Balancing Dams are considered by NFEPA to be moderately modified.

A freshwater resource delineation and assessment were undertaken as part of the environmental authorisation process for the uMWP-1 project, during August and September 2015 by Enviross CC (*Proposed uMkhomazi Water Project. Raw Water Component, Kwazulu-Natal. Aquatic & Wetland Baseline Ecological Integrity & Potential Impact Surveys*. Enviross CC, January 2016.) According to Enviross CC (2016), numerous seep zones and valley bottom wetlands are located beaneath the FSL of the proposed Smithfield dam footprint, and the results of the assessment correlate with the NFEPA Database, i.e. the assessed wetlands are deemed to be in largely natural condition (i.e. a Present Ecological State [PES] A). These wetlands are considered of importance in terms of the provisioning of goods and ecological services (such as grazing for livestock and flood attenuation) to the surrounding communities, whilst ecological aspects such as nutrient and toxicant assimilation are deemed to be of marginally lower importance although this is attributed to the lack of ecological pressures which would allow for the provisioning of such services (for example, increased inputs of nutrients to the systems would then increase the opportunity for nutrient assimilation by the wetlands). These wetlands are also deemed ecologically important in terms of biodiversity maintenance, as they provide important breeding and foraging habitat for a number of Species of Conservation Concern (SCC), such as the Blue Swallow (*Hirundo atrocaerulea*).

Several wetlands were also identified by Enviross CC (2016) within the Baynesfield Area where the proposed Langa and Mbangweni Balancing Dams are located. The results of the assessment undertaken by Enviross CC (2016) indicate that due to impacts associated with commercial cultivation and forestry (the dominant land use in this area) the wetlands are in a moderately modified condition, i.e. in a PES Category C. Since these wetlands are located within privately owned land utilised for commercial purposes, they are not considered of value in terms of provisioning of goods and services to local communities, but instead are deemed to be important for their contribution to ecological processes within the catchment.

Approximately 55 ha of wetland habitat is expected to be flooded – and therefore lost – following the completion and first impoundment of the Smithfield Dam, whilst approximately

44 ha and 59 ha will be lost as a result of the construction and first impoundment of the Langa and Mbangweni Balancing Dams respectively.

3.2.1 Wetland Ecostatus *(*PES*)*

Enviross CC (2016) applied the WETLAND -IHI method of assessment as defined by the Department of Water Affairs and Forestry (DWAF[8], 2007) in order to determine the PES of the wetlands identified within the project footprint. The WETLAND-IHI (Wetland Index of Habitat Integrity) is a wetland habitat assessment tool used to establish the overall PES of a wetland unit associated with the proposed development site. The output scores of the WETLAND-IHI model are presented in the standard DWA A-F ecological categories (Table 7 below), and provide a score of the PES of the habitat integrity of the wetland system being examined. The model is composed of four modules, namely *Hydrology, Geomorphology* and *Water Quality* modules, which all assess the contemporary *driving processes* behind the wetland formation and maintenance. The last module, *Vegetation Alteration*, provides an indication of the intensity of human land-use activities on the wetland surface itself and how these have modified the condition of the wetland. The integration of the scores from these four modules provides an overall PES score for the wetland system being examined (DWA, 2007).

Table 7: Description of the A-F ecological categories (after Kleynhans, 1996, 1999) from DWA, 2007. (Taken from Enviross CC, 2016)

Ecological Category	PES % Score	Description
A	90-100%	Unmodified, natural.
B	80-90%	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	60-80%	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	40-60%	Largely modified. A large loss of habitat, biota and basic ecosystem functions has occurred.
E	20-40%	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	0-20%	Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

The overall score for the wetland features assessed with reference to the table above, were calculated as follows (Enviross CC, 2016):

[8] The Department of Water Affairs and Forestry (DWAF) was formerly known as the Department of Water Affairs (DWA). At present, the Department is known as the Department of Water and Sanitation (DWS). For the purposes of referencing in this report, the name under which the Department was known during the time of publication of reference material, will be used

Table 8: Results from the WETLAND-IHI for the wetlands within the local area.

Site	Vegetation	Hydrology	Geomorphology	Water quality	Overall PES
Smithfield Dam	96.4%	93.0%	95.0%	98.3%	95.4%
	A	A	A	A	A
Langa & Mbangweni* balancing dams	84.9%	66.8%	68.8%	84.7%	**76.7%**
	B	C	C	B	C

***Mbangweni Balancing Dam does not form part of the scope of work for the biodiversity offset, however it was one of the alternative balancing dam options assessed in the EIA.**

3.2.2 Wetland Ecological Importance and Sensitivity (EIS) and Function

According to Enviross CC (2016), “The EIS is an indication of the general importance of the functions that the wetland performs within the landscape from an ecological as well as socio-economical perspective. The scores therefore require interpretation as a lower score does not necessarily indicate a non-sensitive or unimportant wetland complex. For example, an ecologically pristine wetland within a landscape that does not supply resources to communities (for a potential variety of reasons) would be rated with only a moderate EIS score. This is by no means a measure of the ecological sensitivity of the wetland, but rather a rating of the services provided by the wetlands taken as an average between the socio-economic and ecological components. A degraded wetland unit that supports subsistence agriculture, receives nutrients and toxicants and has a surrounding community that is reliant on the good and services that the wetland unit can provide may be rated very similarly. In this instance, more weight is placed on the importance of the resources that the wetland can provide and less weight on the ecological functioning.” The EIS of the various wetlands was inferred based on the scores obtained from the EcoServices (wetland function) assessment undertaken by Enviross CC (2016).

The wetlands located within the FSL of the proposed Smithfield Dam obtained an overall ecological services rating of 2.5 (out of a possible 4), translating to a High (Category B) ecological service supply. According to Enviross CC (2016), “factors including the dependency on the resources offered by the wetlands to the surrounding communities are rated relatively high, but aspects such as nutrient and toxicant trapping are rated relatively lower as the system is generally not subjected to these ecological pressures. The wetlands are also limited to close association with the watercourse and therefore the functionality of these wetlands are comparatively limited. The highest functions are designated to the maintenance of biodiversity within the region as well as the resources that the wetland units provide to surrounding communities, thus it can be inferred that the wetlands within the Smithfield Dam FSL are deemed to be ecologically important on a local scale for their provision of goods and services to the local communities, as well as ecologically in terms of breeding and foraging habitat for a number of faunal species, including faunal SCC.

Similarly, the wetlands within the FSL of the proposed Langa Balancing Dam obtained an overall ecological services rating of 2.0, thus also indicating a high level of service provision (Category B). In contrast to the wetlands associated with the Smithfield Dam, however, those within the Langa Balancing Dam FSL are considered to have a higher ecological functionality and importance in terms of provisioning services such as nutrient and toxicant trapping, since the system is located within a catchment area utilised predominantly for commercial cultivation, thus inputs of agrochemicals is anticipated to be higher than in the region of the proposed Smithfield Dam. Again, the highest functions are designated to the maintenance of biodiversity within the region, making the wetland units important to biodiversity maintenance within the area (Enviross CC, 2016).

In summary, it can be concluded that the wetlands affected by the proposed Smithfield Dam and both Balancing Dam options are deemed to be of high ecological importance and sensitivity, for varying reasons.

3.3 *Characteristics of Riparian Zones and Instream Ecology*

In accordance with the findings from Enviross (2016), no true riparian habitat was identified within the footprint areas of the two alternative balancing dam localities, only within the proposed Smithfield Dam FSL footprint. The riparian habitat which would be impacted (i.e. lost) due to the construction and first impoundment of the proposed Smithfield Dam is thus associated with the uMkhomazi River and its small tributaries confluencing within the proposed Smithfield Dam's Basin, and the total loss of riparian habitat due to inundation will be 135ha. This area of riparian habitat occurs predominantly along a stretch of the uMkhomazi River of approximately 16.8 km in length, but includes the riparian habitat associated with the small tributaries of the uMkhomazi River. Riparian habitat and the vegetation components were deemed to be in a moderately modified condition (PES C), which is largely driven by erosion within the uMkhomazi River catchment area, livestock grazing within the riparian zones and the presence of some invasive exotic vegetation.

The riparian zones of the river reach associated with the proposed Smithfield Dam site are classified as foothills, dominated mostly by cobble beds, but with some sand. The riparian zones are expected to be moderate (in extent) throughout most of the watercourse, but wider in sections, especially at bend points where sand deposition occurs (Enviross, 2016). The river within this reach is dominated by bedrock and cobble beds, with gravel as the substrate for a medium-fast flowing river that alternates between rapids, glides and open pools. It incorporates a wide diversity of flow-depth classes. It therefore offers a diversity of habitat of good quality. The river reach is largely dominated by cobble habitat with some bedrock within the shallow faster-flowing areas, whilst gravel and sandbank deposits are common within the deeper, quieter areas (Enviross, 2016).

Functions which may be fulfilled by the riparian zones associated with the uMkhomazi River in the vicinity of the proposed Smithfield Dam include (but are not limited to) stabilisation of stream banks, flood attenuation, nutrient and sediment assimilation, habitat and faunal migratory corridors for both terrestrial and aquatic species, and provision of buffers between the aquatic ecosystem and upgradient land uses. Whilst not specified by Enviross (2016), it is reasonable to assume, based on the location of the project, that the riparian zone may also provide certain socio-cultural benefits such as provision of firewood and other harvestable resources.

The field assessment was undertaken by Enviross in August 2015, at a variety of sites along the reach of the uMkhomazi River which will be impacted by the proposed Smithfield Dam. These sites were selected as general representative sites characterising the habitat types within the reach. Sites were also chosen that provided good habitat diversity, making for the highest potential to support the highest aquatic biodiversity to ascertain the overall potential of the system to support aquatic biodiversity. According to Enviross (2016), the instream IHI was rated relatively good (83.7% [PES] B). This is largely due to the presence of a diversity of habitat types (biotopes). A limiting feature is thought to be that the marginal vegetation is predominantly reeds, and general erosion within the catchment area that has led to a degree of siltation of the watercourse substrates. There are also a small degree of instream barriers (for example a low level gauging weir). The river reach offers a wide diversity of substrates and flow-depth classes that presents a diversity of habitat types that are regarded as being in good condition". Together with relatively good water quality, the habitat integrity allows for a good diversity of macro-invertebrates. Invertebrate taxa known to be intolerant to degradation of water quality made up a large proportion of the taxa that were sampled. Overall fish ecological integrity was rated relatively low (69.1%) but this was attributed to be the result of the survey being limited to a single sampling run. The lack of any substantive migratory barriers, together with a diversity of habitat of good quality and good water quality means that all reference species are expected to occur. There is therefore a low confidence in the fish survey results for the river reach. The Ecological Importance and Sensitivity of the system remains within a High category.

Water quality results indicated that the river segment has retained relatively good water quality and that water quality is not regarded as a limiting factor to supporting aquatic biodiversity.

In summary, it can be concluded that the riparian habitat which will be impacted by the proposed Smithfield Dam is considered to be of moderate ecological importance and sensitivity (EIS), whilst the instream habitat is considered of high EIS. It is recommended that the offset incorporates stretches of river that comprise similar characteristics to the reach that will be impacted and are of the same river type, so as to account for specific habitat requirements of the aquatic biota.

3.4 *Characteristics of the Fauna and Flora for the Smithfield and Langa dams*

The majority of the proposed uMWP footprint area is located on privately owned land which is predominantly used for commercial farming and forestry. Patches of natural habitats were noted along the rivers and on the slopes. Some sections of the proposed uMWP footprint area have resulted in increased habitat modification and transformation as well as increased human presence and associated disturbances (illegal faunal collection, indiscriminate killing of all snake species, frequent fires). The increased habitat destruction and disturbances are all causal factors in the alteration and disappearance of faunal diversity in the area (Nemai, 2016).

Suitable habitats for mammalian, reptile and amphibian species, such as rivers and grasslands were present within the proposed footprint area. During the various field assessments which were conducted as part of the specialist reports during the initial EIA process (Pachnoda Consulting CC, 2018; WildSkies Ecological Services, 2015; Nemai, 2016) several common faunal species were observed. Subsistence hunting and habitat transformation within the proposed uMWP footprint area would limit the occurrence of sensitive mammal, reptile and amphibian species. Areas where smaller faunal species could occur would be along the greenbelts associated with riparian vegetation that provide ecological corridors. The fact that communities in these areas hunt for social, cultural and spiritual reasons will mean that no antelope will be found in the immediate vicinity of the homesteads, although they may be maintaining an existence in natural bush close to the homesteads, albeit in very low numbers. Small predators will be present and, for the most part, will continue to survive in that environment, although they may be killed for “muthi” purposes (Nemai, 2016).

The most prevalent vegetation types present on the site is Southern KwaZulu-Natal Moist Grassland in the west surrounding Smithfield dam, Midlands Mistbelt Grassland and Drakensberg Foothill Moist Grassland along the raw water conveyance route, and Ngongoni Veld in the east at Baynesfield (Mucina & Rutherford, 2006). The main relevance of this classification to this study is that grassland is the dominant vegetation type on site. It is thus expected that the avifaunal community to be dominated by grassland dependant species. Mistbelt grassland is particularly sensitive for avifauna, being the core habitat of the Blue Swallow *Hirundo atrocaerulea* amongst other species. Micro habitats identified on, or within close proximity to the proposed uMWP footprint area are grassland, wetland, streams, woodland, indigenous forest, exotic tree arable lands (WildSkies Ecological Services, 2015).

The proposed uMWP footprint area is identified as being a preferred habitat for avifaunal SCC, with special mention of *Hirundo atrocaerulea* (Blue Swallow). Two other faunal SCC namely *Capys penningtoni* (Pennington's Protea Butterfly) and *Gnomeskelus fluvialis* (Riverine Keeled Millipede) were also identified to be negatively impacted as preferred habitat will be lost by the proposed uMWP footprint area.

4 WETLAND AND BIODIVERSITY OFFSET CALCULATIONS

4.1 *Wetland Resource calculations*

The manner in which offsets are considered is undertaken according to the method provided by SANBI (2012) and by Macfarlane *et al* (2016). In order to calculate the quantum of offset required, Macfarlane *et al* (2016) as part of the attempt to develop a national standard, developed a tool for the calculation of wetland offset requirements by making use of risks and threat statuses in conjunction with the consideration of extent of the wetland and the PES and the perceived state of the wetland before and after development to define the required wetland offset necessary to meet the offset targets (refer to Section 3.2). The identification of required wetland offsets is divided into three key themes, namely water resources and ecosystem services, ecosystem conservation, and species of conservation concern (Refer to Appendix C for more detail of the methodology). Each of these themes must be evaluated in the specific context of the impacted wetland to ensure that the residual impacts associated with the wetland are included when assessing proposed impacts and deciding on adequate mitigation measures, including offsets (Macfarlane D. *et al,* 2016).

In summary of the findings of the wetland assessment undertaken by Enviross CC (2016) (and summarised in Chapter 3 above) the following were utilised as part of the offset calculations:

- The wetland features within the full supply levels of both proposed dams can be considered of high ecological significance, although those within the Baynesfield area where the balancing dam will be located were found to be of decreased ecological integrity;
- All results as obtained from the wetland assessment were used to address two of the three key themes (i.e. wetland function and ecosystem conservation) and determine the residual impact that will result due to the proposed development. Since a CBA/biodiversity offset forms part of this study, offsets and compensation pertaining to species of conservation concern is addressed within those sections and was not dealt with as part of the wetland offset calculations;
- Those within the Smithfield Dam FSL are deemed important in terms of socio-cultural benefits, including provision of water, natural resources that may be utilized by surrounding communities, cultural significance, and tourism/recreation and educational and research purposes;
- The wetlands at Baynesfield, within the proposed Langa Balancing Dam FSL, are similarly considered to provide high levels of ecological functioning, and here the emphasis is on the provision of ecological services such as nutrient and toxicant assimilation, sediment trapping, and flood attenuation and erosion control;
- The integrated PES scores were used in the calculations, i.e. a PES A for the wetlands associated with the proposed Smithfield Dam, and a PES C for those associated with the proposed Langa / Mbangweni Balancing Dam;
- In a regional context, the wetlands within the proposed Smithfield Dam FSL are indicated to fall within the Sub-Escarpment Grassland Group 3 WetVeg type, which is classified as “Endangered” according to SANBI (2012). Similarly, those within the proposed Langa / Mbangweni Dam area are dominated by the Sub-Escarpment Grassland Group 3 WetVeg type, although a small area of the Sub-Escarpment Savanna (also classified as “Endangered”) is also within the footprint area; and
- The wetlands associated with the proposed development are located within areas designated as CBAs and ESAs and are therefore considered by provincial regulating authorities to be key conservation areas.

The wetland offset calculator was used to calculate the functional hectare equivalents as well as the habitat hectare equivalents for the themes ecosystem services and ecosystem conservation, respectively. Whilst consideration is given to SCC in the method, these considerations are addressed in the terrestrial offset and biodiversity compensation discussions and were therefore not assessed as part of the wetland offset requirements.

It should be noted that whilst the offset ratios provided in the various guidelines (DEA, 2017 and DEA&DP, 2011) are used by Macfarlane *et. al* (2016) as the basis for the calculator, various site-specific variables are then taken into consideration, thus gradually reducing the offset ratio to account for such variables. Whilst an offset ratio for ecosystems considered to be ‘Endangered’ may initially be 20:1 (according to the DEA&DP, 2011 and the DEA, 2017), the wetland offset calculator reduces this ratio to 15:1. The wetland offset calculator then has various multipliers to account for the importance of the impacted wetlands in a regional and national conservation context, and local site attributes (buffer zone integrity, connectivity etc) and reduces the final ratio accordingly to 11:1.

Taking the above calculation and guidelines into consideration, the rationale for utilising an offset ratio of 11:1 during preliminary investigations is as follows:

- The applicable Wetland Vegetation Groups (WetVeg Group) for the Smithfield Dam and both balancing dams are considered to be ‘Endangered ’according to Mbona *et al*, 2014);
- According to the DEA&DP (2011) and the DEA (2017), an ecosystem considered to be “Endangered” must be offset at a ratio of 20:1;
- In order to obtain a combined offset ratio for a specific WetVeg Group, Macfarlane *et al* (2016) multiply the threat status of the applicable WetVeg Group by the relevant protection ratios. In the case of the proposed Smithfield Dam and the balancing dams, the WetVeg group is considered ‘Endangered’ (therefore, Macfarlane *et al* allocate a score of 7.5) and the protection status is ‘Not Protected’ (and is thus allocated a score of 2). Therefore, the initial ratio utilised by the calculator is 15:1;
- The method then takes into consideration the priority of the affected wetland in terms of regional and national conservation plans, as well as local site attributes including uniqueness and importance of biota present in the wetland, integrity of the buffer zone (deemed to be 500m from the wetland) and local connectivity with other natural areas and wetland systems;
- Since the calculations for this development have been undertaken bearing the precautionary principle in mind, a ‘high’ importance in terms of regional conservation plans was assigned, whilst a moderate biodiversity value and buffer compatibility score were allocated to the wetlands in question, and connectivity was considered to be ‘good’; and

- These variables resulted in a final offset ratio of 11:1 being utilised by the wetland offset calculator.

The tables below provide a summary of the functional and habitat hectare equivalents calculated for the wetlands. Please refer to Appendix C for the wetland calculator method of assessment.

Table 9: Functional area equivalents calculated for the wetlands within the proposed Smithfield Dam full supply level.

Wetland Functionality Targets			
Impact Assessment	Prior to development	Wetland size (ha)	55
		Functional value (%)	90
	Post development	Functional value (%)	0
		Change in functional value (%)	90
	Key Regulating and Supporting Services Identified		
	Development Impact (Functional hectare equivalents)		49.5
Offset calculation	Offset Ratios	Triggers for potential adjustment in exceptional circumstances	None
		Functional Importance Ratio	1.0
	Functional Offset Target (Functional hectare equivalents)		49.5

Table 10: Ecosystem Conservation Targets for the wetlands within the proposed Smithfield Dam full supply level.

Ecosystem Conservation Targets				
Impact Assessment	**Prior to development**	Wetland size (ha)	**55**	
		Habitat intactness (%)	**90**	
	Post development	Habitat intactness (%)	**0**	
		Change in habitat intactness (%)	**90**	
	Development Impact (Habitat hectare equivalents)		**49.5**	
Determining offset ratios	**Ecosystem Status**	Wetland Vegetation Group (or type based on local classification)	Sub-Escarpment Grassland Group 3	
		Threat status of wetland	Threat status	**EN**
			Threat status Score	**7.5**
		Protection level of wetland	Protection level	**Not Protected**
			Protection level Score	**2**
			Ecosystem Status Multiplier	**15**
	Regional and National Conservation context	Priority of wetland as defined in Regional and National Conservation Plans	High Importance	**1**
			Regional & National Context Multiplier	**1.0**
	Local site attributes	Uniqueness and importance of biota present in the wetland	Moderate biodiversity value	**0.75**
		Buffer zone integrity (within 500m of wetland)	Buffer compatibility score	**0.5**
		Local connectivity	Good connectivity	**1**
			Local Context Multiplier	**0.7**
			Ecosystem Conservation Ratio	**10.88**
Offset Calculation	**Development Impact (Habitat hectare equivalents)**		**49.5**	
	Ecosystem Conservation Ratio		**10.9**	
	Ecosystem Conservation Target (Habitat hectare equivalents)		**538.3**	

Table 11: Functional area equivalents calculated for the wetlands within the proposed Langa Balancing Dam full supply level.

Wetland Functionality Targets			
Impact Assessment	Prior to development	Wetland size (ha)	44
		Functional value (%)	80
	Post development	Functional value (%)	0
		Change in functional value (%)	80
	Key Regulating and Supporting Services Identified		
	Development Impact (Functional hectare equivalents)		35.2
Offset calculation	Offset Ratios	Triggers for potential adjustment in exceptional circumstances	None
		Functional Importance Ratio	1.0
	Functional Offset Target (Functional hectare equivalents)		35.2

Table 12: Ecosystem Conservation Targets for the wetlands within the proposed Langa Balancing Dam full supply level.

Ecosystem Conservation Targets				
Impact Assessment	Prior to development	Wetland size (ha)	44	
		Habitat intactness (%)	80	
	Post development	Habitat intactness (%)	0	
		Change in habitat intactness (%)	80	
	Development Impact (Habitat hectare equivalents)		35.2	
Determining offset ratios	Ecosystem Status	Wetland Vegetation Group (or type based on local classification)	Sub-Escarpment Savanna (EN) / Sub-Escarpment Grassland Group 3 (EN)	
		Threat status of wetland	Threat status	EN
			Threat status Score	7.5
		Protection level of wetland	Protection level	Not Protected
			Protection level Score	2
			Ecosystem Status Multiplier	15
	Regional and National Conservation context	Priority of wetland as defined in Regional and National Conservation Plans	High Importance	1
			Regional & National Context Multiplier	1.0
	Local site attributes	Uniqueness and importance of biota present in the wetland	Moderate biodiversity value	0.75
		Buffer zone integrity (within 500m of wetland)	Buffer compatibility score	0.5
		Local connectivity	Good connectivity	1
			Local Context Multiplier	0.7
			Ecosystem Conservation Ratio	10.88
Offset Calculation	Development Impact (Habitat hectare equivalents)		35.2	
	Ecosystem Conservation Ratio		10.9	
	Ecosystem Conservation Target (Habitat hectare equivalents)		382.8	

Table 13: Functional area equivalents calculated for the wetlands within the proposed Mbangweni Balancing Dam full supply level.

Wetland Functionality Targets			
Impact Assessment	Prior to development	Wetland size (ha)	59
		Functional value (%)	80
	Post development	Functional value (%)	0
		Change in functional value (%)	80
	Key Regulating and Supporting Services Identified		
	Development Impact (Functional hectare equivalents)		47.2
Offset calculation	Offset Ratios	Triggers for potential adjustment in exceptional circumstances	None
		Functional Importance Ratio	1.0
	Functional Offset Target (Functional hectare equivalents)		47.2

Table 14: Ecosystem Conservation Targets for the wetlands within the proposed Mbangweni Balancing Dam full supply level.

Ecosystem Conservation Targets				
Impact Assessment	Prior to development	Wetland size (ha)	59	
		Habitat intactness (%)	80	
	Post development	Habitat intactness (%)	0	
		Change in habitat intactness (%)	80	
	Development Impact (Habitat hectare equivalents)		47.2	
Determining offset ratios	Ecosystem Status	Wetland Vegetation Group (or type based on local classification)	Sub-Escarpment Savanna (EN) / Sub-Escarpment Grassland Group 3 (EN)	
		Threat status of wetland	Threat status	EN
			Threat status Score	7.5
		Protection level of wetland	Protection level	Not Protected
			Protection level Score	2
			Ecosystem Status Multiplier	15
	Regional and National Conservation context	Priority of wetland as defined in Regional and National Conservation Plans	High Importance	1
			Regional & National Context Multiplier	1.0
	Local site attributes	Uniqueness and importance of biota present in the wetland	Moderate biodiversity value	0.75
		Buffer zone integrity (within 500m of wetland)	Buffer compatibility score	0.5
		Local connectivity	Good connectivity	1
			Local Context Multiplier	0.7
			Ecosystem Conservation Ratio	10.88
Offset Calculation	Development Impact (Habitat hectare equivalents)		47.2	
	Ecosystem Conservation Ratio		10.9	
	Ecosystem Conservation Target (Habitat hectare equivalents)		513.3	

As can be seen in the tables above, the ecosystem conservation hectare equivalents equate to **538.3 hectares, 382.8 hectares and 513.3 hectares for the proposed Smithfield Dam, Langa Balancing Dam and Mbangweni Balancing Dam respectively**. These results are attributed to the high to moderate ecological state of the affected wetlands, the high degree of ecological functioning, and the threat status and protection level of the applicable WetVeg groups according to Macfarlane *et al*. (2016).

Due to the ecosystem threat status (i.e. "Endangered") of the WetVeg types applicable to the project footprint areas, the final ecosystem conservation ratio of 1:11 utilised by the calculator results in a relatively large portion of wetland area which will need to be conserved and rehabilitated to meet the required ecosystem conservation targets. In particular, since the footprint of the proposed Mbangweni Balancing Dam would result in the loss of 59 ha of wetland area, the required ecosystem conservation target is calculated to be 513.3 ha. This area of wetland is not available within the identified Baynesfield land parcel (see Section 5 below) and therefore, should the Mbangweni Balancing Dam be authorised, the required offset target (as calculated using a 11:1 ratio) is unlikely to be met. Thus, it is the opinion of the ecologists that, should the offset ratios as stipulated in the national and provincial guidelines be utilised (i.e. 20:1), this is likely to pose a significant threat to the successful implementation of a sustainable wetland offset, a primary principle of the offset investigation. To achieve the objective of ensuring a more ecologically and economically viable offset, a reduced ratio of 11:1 is considered acceptable and will ensure less risk to implementing a sustainable offset which is a key aspect in the implementation of a successful offset.

Whilst the target for the proposed Langa Balancing Dam can be met within property already owned by the Joseph Baynes Estate, it is the opinion of the ecologists that it may be prudent, from a conservation perspective, to rather decrease the ecosystem conservation target, and focus on rehabilitating the unaffected portions of the system on which the proposed Langa / Mbangweni Balancing Dams will be located, with the aim of significantly improving the overall ecological integrity and functionality of that system, so as to mitigate the impacts of the proposed balancing dam. This would include the north-western portion of the system where the existing Baynesfield Dam is located. There would, however, be insufficient wetland areas within the property owned by the Joseph Baynes Estate to meet the requirements for the Mbangweni Balancing Dam, even if the offset ratio is reduced from 20:1 (as recommended by the DEA, 2017) to 11:1 as per the wetland offset calculator.

4.2 *Riparian and Instream Offset Requirements*

At the time of the study, no guidelines or offset ratios specific to the offset of riparian and instream resources were available at a provincial or national level. The uMkhomazi River is classified as a FEPA River (refer to Section 3.1 of this report) and is therefore deemed of high conservation value. In the absence of specific policy and offset ratios relating to rivers in South Africa, it is strongly recommended that at minimum, the same length of river, of the same river type and in a similar condition to that of the impacted river reach, be incorporated into a recipient site as a like for like offset. Should the targeted recipient site be of a decreased ecological condition, rehabilitation measures will need to be implemented or an increased area should be conserved and managed. In addition, the targeted offset reach should possess the same characteristics as the reach which will be impacted by the proposed Smithfield Dam.

In conclusion, **a minimum stretch of 17 km of riverine habitat**, with similar instream and riparian characteristics to that of the affected stretch of the uMkhomazi River, will need to be identified as part of the offset to ensure that sufficient riparian and instream habitat is conserved.

4.3 *Terrestrial Offset Calculations*

The terrestrial Critical Biodiversity Area (CBA) trade-offs and conservation requirements were calculated using the offset ratios for different vegetation types in KwaZulu-Natal as defined by IEM in “Concise Guideline: Biodiversity Offsets in KwaZulu-Natal” (2013). These CBA trade-offs are defined as the measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from projects development after appropriate prevention and mitigation measures have been taken.

Terrestrial offsets were calculated by undertaking a scoring process to quantitatively determine the biodiversity value of a defined area to determine the Biodiversity Value (BV) of the respective land parcels. The biodiversity of an area is a combination of its diversity of species and habitats, the integrity of its ecological processes and functional value. This can be captured in two broader categories namely conservation status and functional status. The conservation status encompasses species diversity, habitat diversity and ecological processes. The functional status encompasses ecological services and human use services. A quantitative scoring system is used to first determine the value of each of the components namely conservation status and functional status, from which the overall biodiversity value is determined. A summary of the calculations for each land parcel is presented in the table below.

Please refer to Appendix C of this report for more information on the method of assessment used for the terrestrial biodiversity offset.

It should be noted that the terrestrial offsets have also been used as a requirement to meet the species conservation targets, although as a secondary principle the wetland offset will aim to improve the support of the requirements of these species, since transformation and disturbance within the proposed development footprint area have had a reduction in the preferred breeding and feeding habitat available that can support floral and faunal SCC. Species that were highlighted in the terms of reference for the Biodiversity Offsets were *Hirundo atrocaerulea* (Blue Swallow), *Capys penningtoni* (Pennington’s Protea Butterfly) and *Gnomeskelus fluvialis* (Riverine Keeled Millipede). Four active *Hirundo atrocaerulea* (Blue Swallow) nests were located at the proposed Baynesfield Balancing Dam, as well as two inactive *Hirundo atrocaerulea* (Blue Swallow) nests were also located within the Baynesfield area (Pers. coms David Allan, 2018). Two floral and several other faunal SCC have a medium to high or high probability to be present within the proposed uMWP-1 area (Nemai, 2016) (WildSkies Ecological Services, 2015), but these species preferred habitat should be protected when the aforementioned SCC preferred habitat is protected.

The identification of required Critical Biodiversity Area offsets was divided into two key themes, namely irreplaceable and optimal. Each of these themes was evaluated in the specific context of the terrestrial habitat to be impacted by the proposed Smithfield Dam and the Langa and Mbangweni Balancing Dams. A detailed method of assessment is provided in Appendix C of this report. The terrestrial CBA offset ratios were used to calculate the functional hectare equivalents as well as the habitat hectare equivalents for the CBA, respectively, and these results are presented in the tables below.

Table 15: Summary of terrestrial biodiversity conservation and trade off calculations

Land Parcel	Type of *CBA	Biodiversity value	Total Potential Loss	Offset Ratio (Ezemvelo Guidelines)	Offset Target (hectares)	Total Potential Available *CBA Recipient site
Proposed Development Parcels						
Smithfield Dam	Irreplaceable	High	29.45	30:1	883.5	
	Optimal	High	129.22	5:1	646.1	
Langa Balancing Dam	Irreplaceable	Moderate	14.76	30:1	442.8	
	Optimal	Moderate	-	-	-	
Mbangweni Balancing Dam	Irreplaceable	Moderate	15.59	30:1	466.8	
	Optimal	Moderate	-	-	-	
Proposed Offset Parcels						
Smithfield 1	Irreplaceable	High				1225.75
	Optimal	High				0.27
Smithfield 2	Irreplaceable	High				1698.24
	Optimal	High				5183.07
Smithfield 3	Irreplaceable	High				4590.45
	Optimal	High				-
Langa 1	Irreplaceable	Moderate				2208.90
	Optimal					83.87
Total Extent for Smithfield Dam			**158.67 ha**		**1 529.6 ha**	**12 697.78 ha**
Total Extent for Langa Balancing Dam			**14.76 ha**		**442.8 ha**	**2 292.77 ha**
Total Extent for Mbangweni Balancing Dam			**15.59 ha**		**466.8 ha**	**2 292.77 ha**

The points below summarise the results of the offset calculations:

- All of the proposed uMWP footprint areas fall within the Southern KwaZulu-Natal Moist Grassland, Temperate Alluvial Vegetation and Midlands Mistbelt Grassland (Ezemvelo KZN Wildlife Vegetation Types for KwaZulu-Natal);
- The Ezemvelo KZN Wildlife Concise Guideline: Biodiversity Offsets in KwaZulu-Natal (2013) draft document proposed a 5:1 offset ratio for the South KwaZulu-Natal Moist Grassland vegetation types and 30:1 for CBA's;
- The extent of each proposed development area, along with the proposed recipient site, was calculated. *Note that wetlands were excluded from these calculations;*
- The total potential habitat loss for Smithfield Dam are calculated at **29.45 ha (Irreplaceable CBA) and 129.22 ha (Optimal CBA), Langa Balancing Dam 14.76 ha (Irreplaceable CBA) and Mbangweni Balancing Dam 15.59 ha** (Irreplaceable CBA) should each proposed development area be utilised to its full extent;
- Furthermore, if the Ezemvelo KZN Wildlife 5:1 and 30:1 offset ratio is applied, the total required offset target extent is **1 529.6 ha for the Smithfield Dam,442.8 ha for the Langa Balancing Dam and 466.8 ha for the Mbangweni Balancing Dam**;
- The total potentially available land identified (please refer to Section 5 for details) for biodiversity offset is 12 697.78 ha for the Smithfield Dam and 2 292.77 ha for the Langa Balancing Dam and Mbangweni Balancing Dam. The Langa Balancing Dam is the preferred option as the total loss of Irreplaceable CBA is lower than that of the

Mbangweni Balancing Dam. Thus, if the entire potentially available recipient site is utilised and managed as a biodiversity conservation initiative, the initiative can contribute to biodiversity conservation in the uMWP-1 and meet the offset targets;

- The biodiversity value for the Smithfield dam is high and moderate for the Langa Balancing Dam and Mbangweni Balancing Dam. This is a result of all parcels being subjected to largely similar ecological drivers and modifiers. Furthermore, the impacts from human use is evident for all of the parcels. With active management and the implementation of actions such as alien vegetation control, ecological monitoring and the optimisation of human use, the biodiversity value of the land parcels under active management may, however, be increased.

5 IDENTIFICATION OF PRELIMINARY OFFSET ALTERNATIVES

With the identification of offset initiatives, it is important to identify alternatives that are the most similar to the wetlands and terrestrial areas that will be lost, to ensure that the alternatives would eventually compensate for the wetland ecoservices and ecosystem conservation value hectare equivalents (both wetland and terrestrial) as determined above.

As an alternative to physical offsetting (which may include rehabilitation of targeted areas should it be required), i.e. monetary compensation was considered in addition to the offset.

Monetary compensation can include contributions to an accredited biodiversity conservation fund, revolving land trust or dedicated offsets fund, for the purpose of acquiring and managing additional priority habitat, or provision of finance for the expansion or management of public protected areas. This type of offset is attractive and relatively simple for the developer, and effectively removes any responsibility for identifying and securing appropriate offsets in the landscape. It does, however, place an additional burden on those institutions and organisations responsible for biodiversity conservation in KwaZulu-Natal to undertake these tasks; a burden that – depending on the capacity of these bodies – may be inappropriate and thus undesirable and unsustainable. Additionally, challenges pertaining to the agreement on the quantum of financial contribution to compensate for loss on both an initial capital level as well as for ongoing management and maintenance may be experienced, as well as potential mismanagement of funds and wasteful expenditure by the target offset site management leading to no net gain or improvement in target wetlands or CBAs. Thus, whilst funding alone may be an 'attractive' option to the party requiring the offset, and may have its advantages, it is widely not considered to be an appropriate offset mechanism in isolation, although the competent authority may require that such compensation takes place in addition to the biodiversity offset, given the significance of anticipated impacts associated with this project.

The track record of off-site mitigation projects in South Africa has indicated a high level of risk in terms of success of these types of projects. Major stumbling blocks are usually associated with the issues of landownership and the restriction of future land use for the affected area. Given the quantum of the offset required, there is however no alternative to an offsite offset and thus the investigated options will be expanded upon in the sections below.

5.1 *Offset Alternatives Identified*

Although it is preferable for the offsetting of the hectare equivalents to be part of one wetland system or CBA, where such large areas are required this is often not feasible or practical, and therefore it can be compensated for as several smaller, separate wetland and biodiversity offset/compensation initiatives although this is not considered ideal. When identifying potential recipient sites, bearing the aforementioned key themes and guiding principles (Section 2.1), in mind, consideration was given to the following criteria:

- Preference is given to wetland habitat located within the same catchment as, and as close as possible to, those wetlands which will be lost, with the aim of minimising the residual impacts on key water ecosystem services, and on biodiversity as a whole within the project footprint. Of particular importance in this regard is ensuring that upstream and downstream requirements are considered and met, and that the flow drivers of the uMkhomazi River are protected or compensated for as much as possible. Where this is not feasible, potential recipient sites located within the same quaternary catchment were then identified;
- Proximity to the Impendle Nature Reserve and Mount Shannon Protected Areas was also taken into consideration, since the areas adjacent to the projected environments are less likely to be subjected to significant impacts and may potentially, in time, be incorporated into such protected environments, thus contributing towards the long-term sustainability of the offsets as well as potentially meeting provincial biodiversity and protection targets for wetlands and assist with the execution of the NPAES;
- Wetland offsets within the Impendle Nature Reserve and Mount Shannon Protected Areas themselves were considered; however, preliminary analysis of digital satellite imagery indicated that insufficient wetland habitat of a suitable condition and similar type to those that will be impacted is available, particularly within Impendle Nature Reserve. Nevertheless, these areas will remain under consideration as potential

recipient sites should the need arise in agreement with the competent authority and relevant governing department responsible for management of these protected areas;

- Preference was given land portions which contain the largest extent of wetland habitat so as to ensure that as few land purchase transactions as possible are required. The rationale for this is that it is likely to be impractical to either purchase numerous farms or obtain agreement from all landowners to implement the necessary rehabilitation activities and provide continued protection of the wetlands and buffer zones. Thus, although extensive wetland areas were identified on a desktop level within the targeted areas, the entire extent identified was not necessarily included in the initial calculations of available habitat for offsetting;
- According to Macfarlane (2013), "the significance of wetland loss is linked to the ecosystem threat status and protection levels of a given wetland type. An impact to a wetland with a higher threat status (e.g. EN) is therefore regarded as more significant than impacts to a wetland of lower threat status (e.g. LT) and therefore a higher ratio applies to the former. Similarly, impacts to wetland types that are poorly protected are regarded as more significant than impacts to wetlands that are well protected within existing conservation areas."
- To reduce the need to rehabilitate large tracts of wetland habitat so that the functional and ecosystem conservation targets can be met, preference is given to wetlands which are likely to be in a similar ecological state to those which will be lost, i.e. if the wetlands within the proposed Smithfield Dam FSL are deemed to be in a largely natural state, then wetlands identified for offset purposes should, ideally, be in a similar or better ecological condition; and
- Wetland habitat situated within already severely disturbed areas was not considered to be a viable offset option, since it is unlikely to be financially viable to reinstate such wetlands to the necessary ecological and functional state to meet the requirements, nor are offsets in such areas likely to be sustainable in the long-term. This includes those areas impacted upon by the informal or communal settlements in the vicinity of the proposed Smithfield Dam, commercial agriculture and commercial plantations.

Since a fairly large recipient site is required to meet the conservation targets for the proposed Smithfield dam, three (3) potential offset investigation areas were identified within which sufficient suitable wetland and CBA habitat is likely to be present in order to meet the target. These are referred to within this document as "Smithfield 1 (S1), Smithfield 2 (S2) and Smithfield 3 (S3)". S3 is the least preferred portion of land to implement offsets within due to the distance of this land parcel from the proposed Smithfield dam (approximately 16 km). S3 is also not situated within the same quaternary catchment as the wetlands which would be impacted should the proposed development proceed. As the investigations were undertaken however, it became evident that it will be necessary to include this area or at least a significant portion thereof to meet the offset requirements.

Only one area was identified around the proposed balancing dams, namely the Baynesfield Recipient Site, which has ample wetland and CBA habitat, was identified in this vicinity to meet the offset requirements of the Langa Balancing Dam Option (which is the preferred option); however, should the proposed Mbangweni Balancing Dam be authorised, additional off-site target areas will need to be identified in order to meet the wetland offset requirements. Initial investigations indicate that the landowners in this area are, in principle, accommodating to the proposed Biodiversity Offset and faunal SCC Compensation Initiatives.

It should be noted that the identified wetlands were delineated utilising desktop methods such as digital satellite imagery and were not ground-truthed in great detail. The ‘precautionary principle’ was therefore applied, thus excluding areas which may potentially comprise of wetland habitat, but which cannot be confirmed as such on using desktop methods. The wetland delineations as presented in this phase of the study were nevertheless considered appropriately accurate to meet the initial requirements of this phase of the study and guide the future phases of the investigation. In addition, the condition of these wetlands will need to be ascertained in due course; however, for the purposes of this initial investigation, it is assumed that they are in a similar condition to those which will be lost should the proposed development proceed. Please refer to Figure 11 below for the locality of the proposed offset recipient sites, and Figures 12 to 15 for the locality of possible wetlands within those recipient sites.

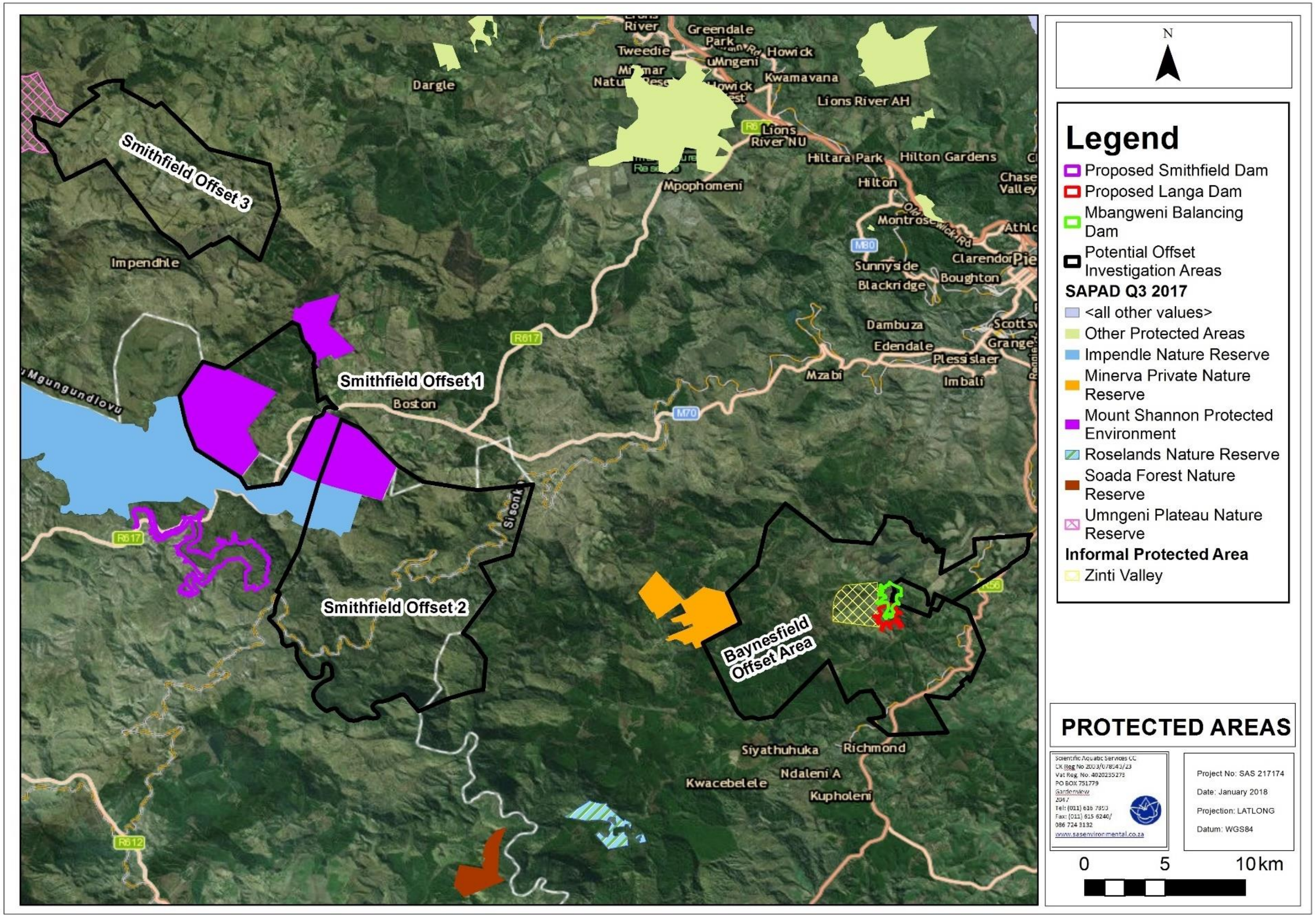


Figure 11: The proposed offset target areas for investigation, in relation to the project footprint and surrounding protected areas.

The tables below summarise the areas of wetland that will be lost, the required functional hectare equivalents and the ecosystem conservation targets, as well as the estimated available wetland habitat and functional hectare equivalents available in each land parcel.

Table 16: Summary of wetland conservation and trade off requirements: Smithfield Dam (target areas: Smithfield 1 and Smithfield 2)

Ha lost	Functional HaE lost	Ecosystem Conservation targets	Smithfield 1			Smithfield 2			Total Est. Functional HaE available	Total Est. Ecosystem Conservation HaE available
			Ha avail.	Est. Functional HaE	Est. Conservation HaE	Ha avail.	Est. Functional HaE	Est. Conservation HaE		
55	49.5	538.3	407.4	26.9	332.2	290	19.1	238	46	570

***HaE = Hectare equivalents**

Table 17: Summary of wetland conservation and trade off requirements: Langa and Mbangweni Balancing Dams

Balancing Dam	Ha lost	Functional HaE lost	Ecosystem Conservation targets	Baynesfield Recipient site			Shortfall (ha)
				Ha avail.	Estimated Functional HaE available	Est. Conservation HaE available	
Langa	44	35.2	382.8	535.7	428.6	381.2	1.6
Mbangweni	59	47.2	513.3				132.1

***HaE = Hectare equivalents**

An initial high level desktop assessment of the available wetland resources in the immediate vicinity of the proposed Smithfield Dam and proposed Langa and Mbangweni Balancing Dams indicated that sufficient wetland hectarage is available to meet the functional and conservation targets for the proposed Smithfield Dam and Langa Balancing Dam (although there is an insignificant shortfall for Langa Dam). Insufficient wetland hectarage is, however, available to meet the required ecosystem conservation hectare target for the Mbangweni Dam option. As previously noted, ground-truthing of these areas would need to be undertaken to refine and accurately determine the extent of available wetland areas, as well as to determine the condition of the identified wetlands in future phases. Ground-truthing took place before the development of the offset implementation and rehabilitation plan was compiled, to inform specific rehabilitation measures that will need to be implemented to meet the biodiversity offset and conservation targets. High level rehabilitation measures are recommended in Section 6 of this report.

Of the three preliminary offset sites for investigation around the Smithfield Dam Area, S1 and S3 comprise predominantly privately-owned land, whilst the majority of S2 comprises state-owned land. The Baynesfield Recipient site falls on privately owned land. Due to the extent of wetland and terrestrial CBAs required to achieve the ecosystem conservation targets, some off-site offsets will be essential. The location of the identified target wetlands for rehabilitation are indicated in the figures below and are based on potential available hectares within the proposed offset recipient sites, ecological integrity (according to available national and provincial databases such as NFEPA and the KZN Biodiversity Spatial Planning Terms and Processes), and the importance of the system on a catchment level. Consideration was also given to the over-arching guiding principles discussed in Section 2.1 of this report

Table 18: Summary of the high level desktop assessment of the suitability of the proposed target offset sites, with specific reference to wetland offsets (based on Macfarlane *et al.* 2016).

Criterion	Relevance	Acceptability guidelines			
		S1	S2	S3	Baynesfield
Like for Like	Targeted wetlands should be aligned with "like-for-like" criteria to ensure that gains associated with wetland protection are commensurate with losses.	Acceptable	Ideal	Acceptable	Ideal
Landscape planning	To what degree is wetland selection aligned with Regional and National Conservation Plans	Ideal	Maybe acceptable	Acceptable	Acceptable
Wetland condition	The habitat condition of the wetland should ideally be as good / better that that of the impacted site prior to development (or at least B PES Category in the case of largely un-impacted wetlands)	Acceptable	Acceptable	Acceptable	Acceptable
Local biodiversity value	Wetlands that are unique or that are recognised as having a high local biodiversity value should be prioritised for wetland protection.	Ideal	Acceptable	Acceptable	Acceptable
Viability of maintaining conservation values	Connectivity and consolidation with other intact ecosystems together with the potential for linkage between existing protected areas is preferable.	Ideal	Acceptable	Acceptable	Ideal
	Overall opinion	**Ideal**	**Acceptable**	**Acceptable**	**Ideal**

Table 19: Summary of the high level desktop assessment of the suitability of the proposed target offset sites, with specific reference to the secondary guiding principles set out in Section 2.1

Guiding Principle (Section 2.1)	Acceptability guidelines			
	S1	S2	S3	Baynesfield
To improve the existing habitat within the target recipient sites to increase overall biodiversity, provide habitat for floral and faunal Species of Conservation Concern (SCC) and improve ecosystem services	Acceptable (habitat has been transformed by agriculture and commercial forestry, thus opportunity exists to improve habitat).	Acceptable (habitat has been transformed by subsistence agriculture, thus opportunity exists to improve habitat).	Ideal	Ideal
Improve resilience of floral and faunal communities to the effects of climate change	Acceptable	Acceptable	Acceptable	Acceptable
To utilise offsets that are technologically simple and with a proven track record, so as to ensure, as far as possible, that a successful offset is implemented	Acceptable	Acceptable	Acceptable	Acceptable
Support of the longevity and use ability of the proposed dams through the improvement of ecological service provision upstream of the proposed dams	Maybe acceptable (some wetland systems within this area drain into the uMkhomazi River however the linkages would have to be investigated further).	Maybe acceptable (the southern wetland systems within this parcel drain into the uMkhomazi River, but downstream of the proposed dam)	Unacceptable (recipient site is not in same catchment as proposed dam)	Acceptable (several wetland systems have been identified upstream of the proposed balancing dams, and are also part of the impacted system)
Mitigate loss of downstream ecological service provision, in particular streamflow regulations, alteration to the sediment balance, and ensuring maintenance of the Ecological Water Requirements (EWR) of downstream communities	Maybe acceptable	Ideal (includes a reach of the uMkhomazi River of approximately 19.2 km, which could potentially be used as part of the riparian and instream offset).	Unacceptable	Ideal
Contribute to socio-cultural benefits for surrounding communities by improved provision of ecological services such as flood attenuation, as well as by expanding existing, or securing additional, conservation areas and increasing tourism opportunities. Increased tourism linked to the proposed offset may in turn provide employment and economic empowerment opportunities for local communities in the vicinity of the proposed dams	Acceptable	Acceptable	Ideal	Acceptable (land is privately owned; thus local communities are less likely to benefit. However, several tourism activities are already underway within this area and could potentially be expanded).
Ensuring that the biodiversity offset is economically viable and sustainable, both in	Acceptable	Acceptable	Acceptable	Ideal

Guiding Principle (Section 2.1)	Acceptability guidelines			
	S1	S2	S3	Baynesfield
the immediate and long-term and from both a capital cost perspective as well as from an ongoing maintenance and support perspective				
Overall opinion	**Acceptable**	**Acceptable**	**Maybe acceptable should additional off-site offsets be required**	**Ideal / Acceptable**

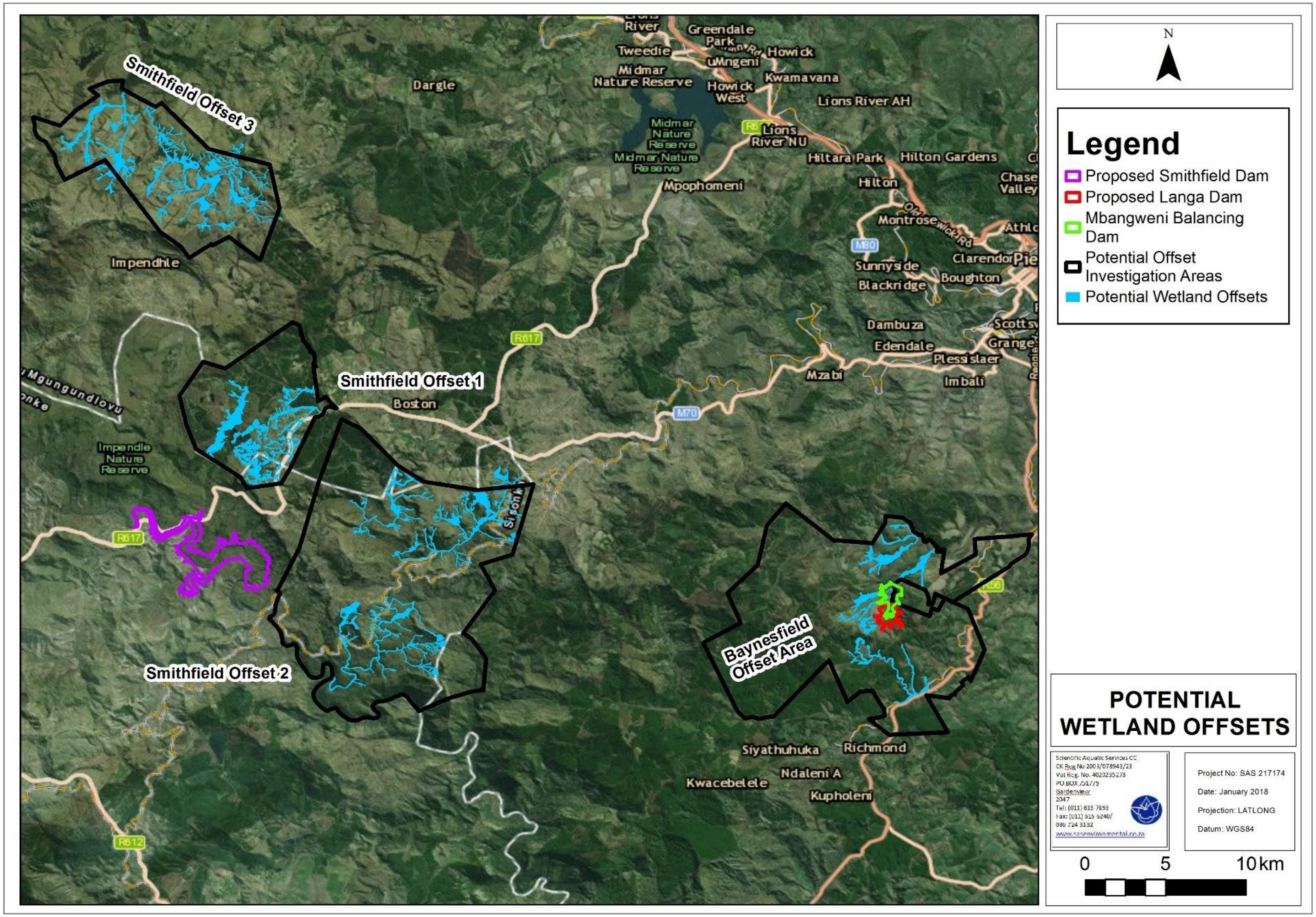


Figure 12: Locations of the preliminary wetland offset alternatives conceptually depicted on digital satellite imagery.

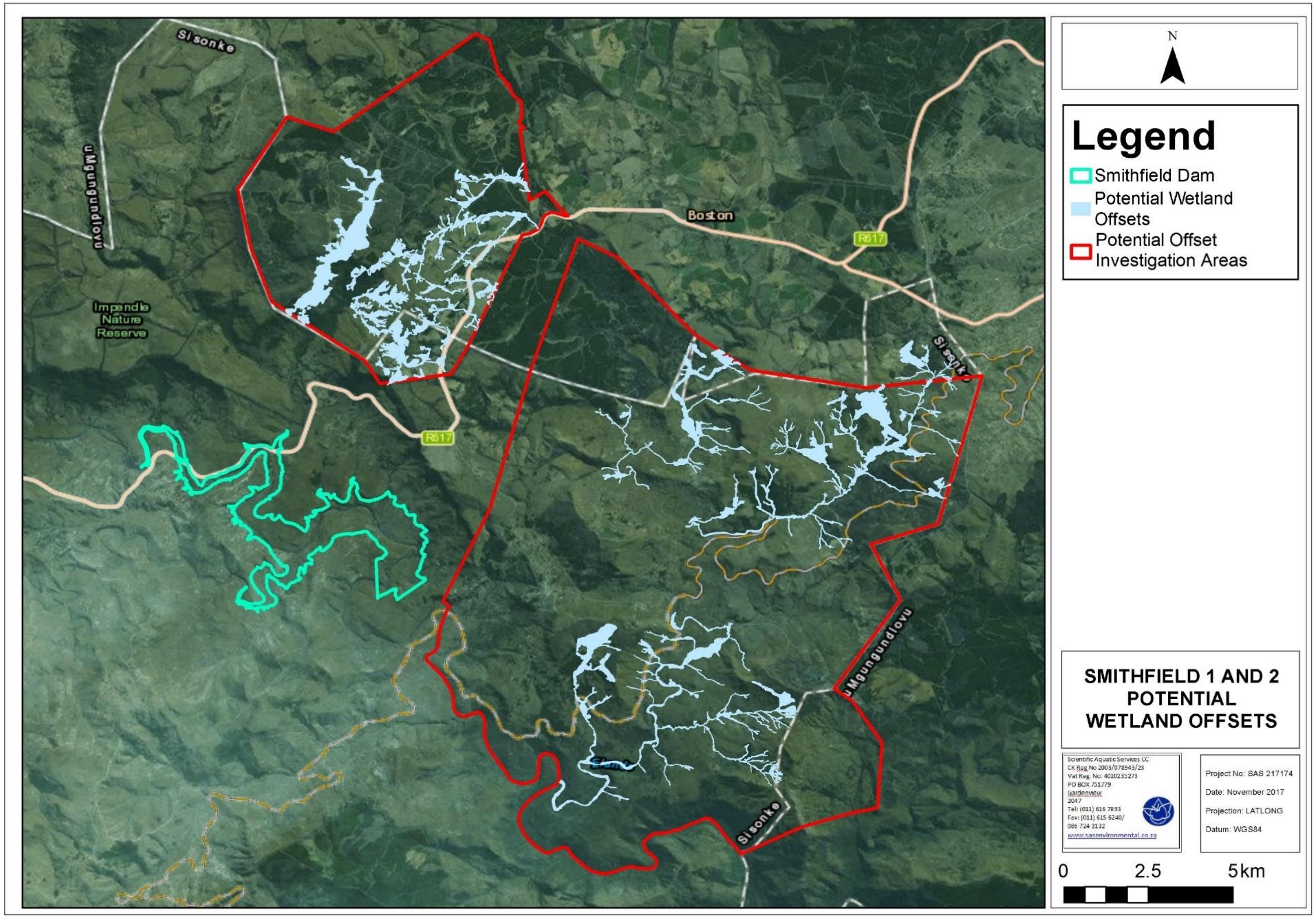


Figure 13: Locations of the preliminary wetland offset alternatives in the S1 and S2 potential offset target areas, conceptually depicted on digital satellite imagery.

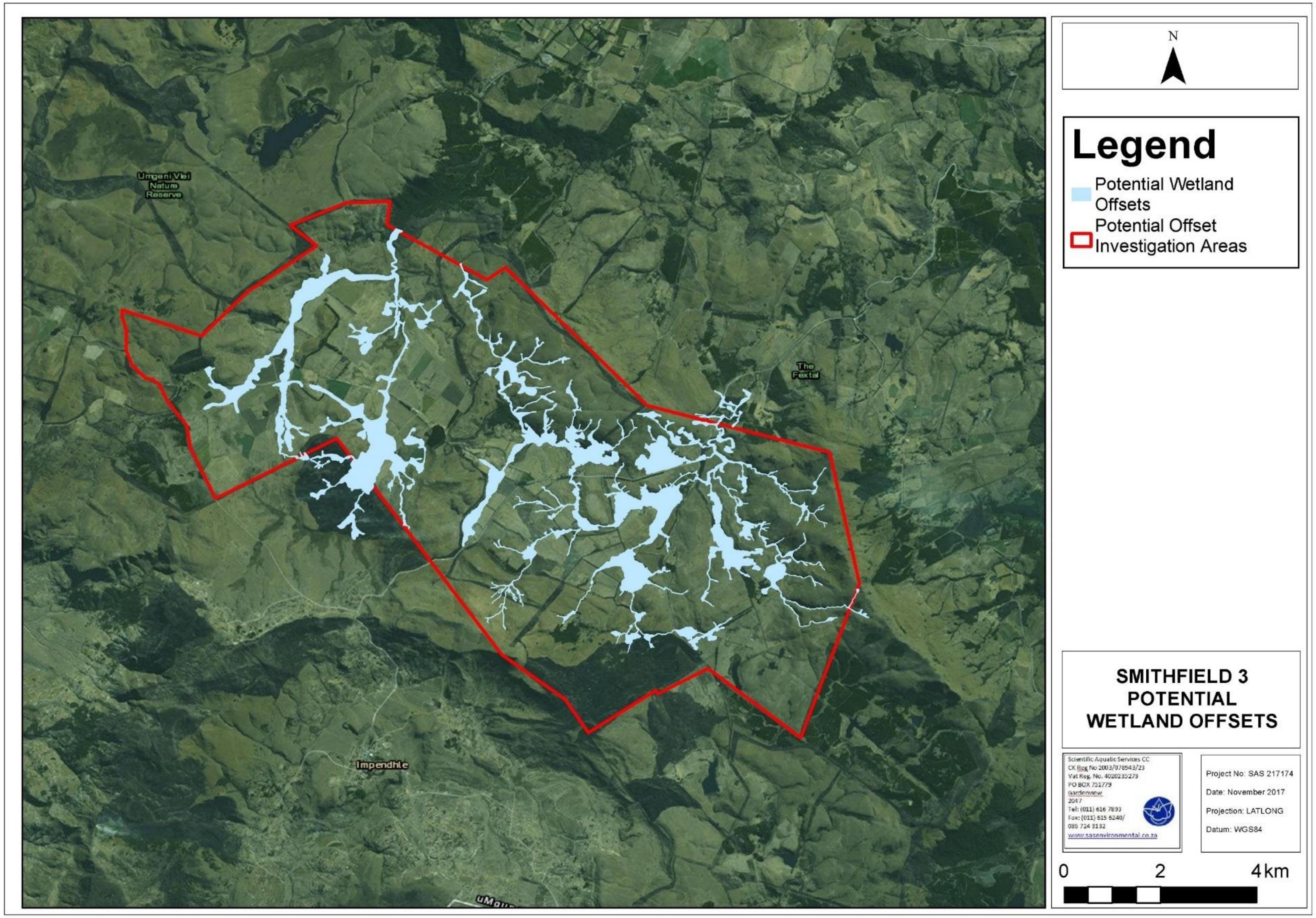


Figure 14: Locations of the preliminary wetland offset alternatives in the S3 potential offset target area, conceptually depicted on digital satellite imagery.

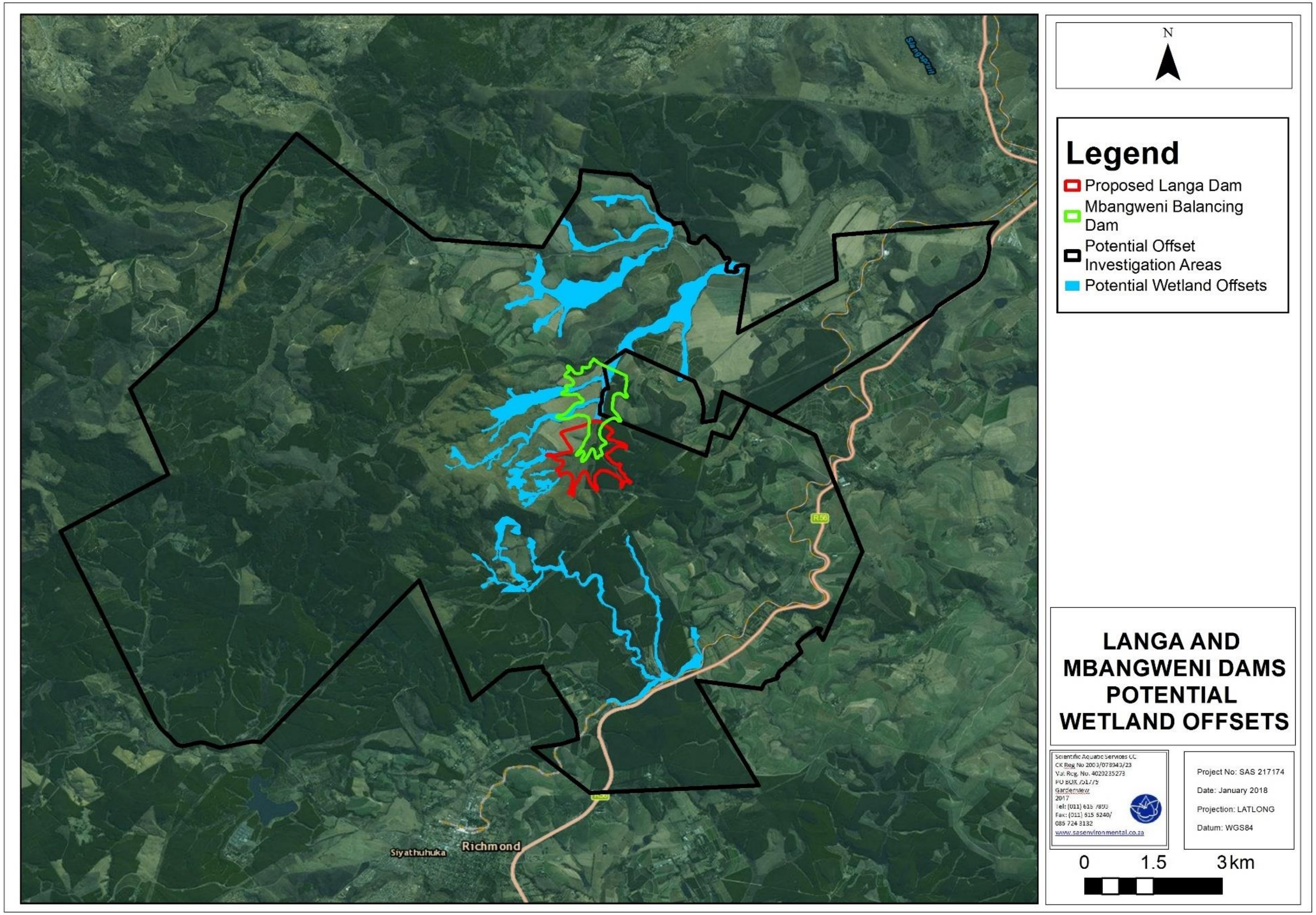


Figure 15: Locations of the preliminary wetland offset alternatives in the Baynesfield potential offset target area, conceptually depicted on digital satellite imagery.

5.1.1 Wetland offsets: Site specific constraints

Due to the nature of land use upstream of the proposed Smithfield Dam (rural communal areas with a high incidence of subsistence agriculture, leading to significant habitat transformation) no potential recipient sites upstream of the proposed Smithfield Dam could be identified. Areas immediately upstream of the dam are highly unlikely to provide opportunities for effective and sustainable offsets. Furthermore, should the second phase of the uMWP be initiated in the decades to come, wetland areas identified for offsetting activities upstream of the proposed Smithfield Dam at this point in time may be threatened by the proposed Impendle Dam. It may therefore be necessary to identify off-site recipient sites in order to meet upstream requirements.

5.1.2 Terrestrial offsets: Site specific constraints

The identification of suitable CBA habitat was undertaken using desktop methods and relied substantively upon the accuracy of available datasets; thus, field investigations will need to be undertaken in order to verify the suitability of the potential offset target areas.

Assuming, however, that the identified wetland and CBA target areas are in a largely similar ecological condition to those that will be impacted by the proposed development, efficient and effective rehabilitation of the wetlands and identified terrestrial areas were deemed likely to provide an appropriate to offset those that will be lost or impacted as a result of the proposed development at this stage in the investigation.

5.2 *Proposed Compensation Measures for Faunal SCC*

The following mitigatory measures are proposed to compensate for the loss of faunal SCC habitat and endangered vegetation types resulting from the proposed development areas:

- *Protea caffra* is the main food source for the protected *Capys penningtoni* (Pennington’s Protea Butterfly). Existing populations of *P. caffra* present within the proposed Smithfield dam that will be lost during the first flooding event as well as during development of other project aspects should be mapped and counted. The proposed compensation for lost *P. caffra* will be to cultivate these plants from seeds and/or cuttings to a ratio of 30:1 for every individual tree that is lost. The cultivated *P. caffra* must be planted above the full supply level of the proposed Smithfield Dam and in areas where no further disturbance will take place. A monitoring program must be implemented to monitor the effective rehabilitation of planted individuals;

- Nesting sites for *Hirundo atrocaerulea* (Blue Swallows) have been identified and as compensation, the properties should be managed under some form of stewardship agreement and managed in such a way as to promote preferred nesting habitat for this species. Extension of existing protected areas where these species occur should be considered, and funds can be donated to existing projects that aim to protect and conserve *H. atrocaerulea* habitat. Existing landowners can be guided to improve the preferred habitat by managing grazing plans for cattle, and to prevent areas from being burnt too frequently or infrequently. These additional management actions are likely to improve the overall habitat availability, increase nesting site potential and increase overall productivity of the grasslands for foraging by *H. atrocaerulea*;
- The protection of riparian forest which is planned on a like for like basis will address the need to compensate for the potential impacts on *Gnomeskelus fluvialis* (Riverine Keeled Millipede). As part of this process, the riparian habitat will not only be conserved but through programs such as Working for Water (WfW) the condition of these forest areas can be improved. This will further promote the accumulation of indigenous leaf litter as required by *G. fluvialis*;
- Offsets implemented during this project are to be protected from future impacts and developments. Furthermore, it is considered more ideal to incorporate recipient sites into existing formally protected areas (e.g. Impendle Nature Reserve, Mount Shannon Protected Environment) in order to ensure ongoing long-term protection and management; and
- Control of alien and invasive vegetation within the proposed recipient sites will be beneficial to both the community (job creation and skills development) and the indigenous vegetation (preferred habitat conditions for the specific grasslands should be achieved as competition from alien and invasive vegetation will be lowered).

6 PHASE 2: SWOT ANALYSIS OF THE OPPORTUNITIES AND CONSTRAINTS

During the first phase of the Biodiversity Offset and Compensation Initiative study, various alternatives were considered, including off-site offsets and monetary compensation, in addition to on-site offsets. Phase 2 considers possible limitations that will need to be addressed before implementation of the offset can commence. This includes aspects such as procurement of land, restriction of future land use and long-term management of off-site offsets poses further challenges to the successful implementation and longevity of such an offset.

Thus, as part of the process of identifying potential sites for conservation and rehabilitation offsets, and conservation compensations, a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis was undertaken. It must be noted that the wetlands within the Offset target areas as described in Section 5 above were ground-truthed in March 2018 (please refer to Appendices G and H for the results of the assessment) and were deemed to be suitable to meet the offset requirements. These alternatives and their key attributes are summarised below:

- **Monetary compensation** whereby a quantum of money equivalent to the implementation of a biodiversity offset and compensation plan as well as funds that would have been provided for the mandatory 30-year management period for offsets would be donated to an existing conservation body to assist with acquisition of further land and for management of the existing land. This is particularly relevant to the proposed compensation for loss of breeding habitat for the Critically Endangered *Hirundo atrocaerulea* (Blue Swallow), where it could be beneficial to expand the boundaries of compensation initiative to areas further afield than the areas targeted in the offset program;
- **Biodiversity compensation:** As it is not practical to "offset" faunal species, several "compensation" measures were identified in order to provide additional breeding and foraging habitat for specific threatened species with the aim of ensuring ongoing conservation of these species. Please refer to Sections 5.2 and 9 for further details;
- **Offset sites identified**:

  As ascertained in Section 4 above, large extents of wetland and terrestrial CBA habitat are required to meet the offset extent and hectare equivalent requirements of the offset. Thus, whilst proximity to the proposed development was a primary consideration in identifying possible offset recipient sites, it was necessary to investigate additional land parcels further afield. The following is a summary of the four potential recipient sites:

  - **Smithfield 1**: an area located approximately 4 km north of the proposed Smithfield Dam. This area is bordered on three sides by the Impendle Nature Reserve and the Mount Shannon Protected Area, and preliminary investigations indicate that sufficient wetland and CBA Irreplaceable habitat exists within the area to meet a portion of the offset targets. This was supported by ground-truthing which was undertaken in March 2018. This land is, however, privately owned (much of it by

Mondi) and thus agreements (in the form of a stewardship) will need to be entered into with the various landowners, if the land cannot be purchased outright;

- **Smithfield 2**: an area located to the east of the proposed Smithfield Dam, the majority of which is owned by the KZN Department of Rural Development and Land Reform. This is considered ideal for offsetting terrestrial CBA areas, and following appropriate specialist investigation, may prove to be crucial in terms of providing suitable areas in which to provide compensation for the threatened *Capys penningtoni* (Pennington's Protea Butterfly) and *Gnomeskelus fluvialis* (Riverine Keeled Millipede). From a wetland perspective, insufficient wetland habitat exists within this area to meet the required targets; however, due to scarcity of suitable wetland habitat, and in consideration of the requirement to ensure that sufficient riparian and instream aquatic habitat is included in the offset, it is the opinion of the specialists that this area provides an ideal opportunity for aquatic ecosystem conservation. It has thus been included as a potential recipient site for offset activities;
- **Smithfield 3**: this area is located approximately 17 km north of the proposed Smithfield Dam, and is therefore the least preferred option, since it is not in the same quaternary catchment as the proposed development. Investigations during the field assessment in March 2018, however, indicated that this area holds significant potential for offsetting activities, since there are extensive wetlands within the area which are considered ideal candidate sites for rehabilitation. In addition, it is believed that *C. penningtoni* occurs within the area (J. Campbell, Pers. Comm.) Initial discussions with landowners/tenants in this area also indicate that there is willingness to participate in conservation activities;
- **Baynesfield**: the properties surrounding the proposed balancing dam (i.e. Langa or Mbangweni) are considered ideal for offsetting. The owners of Baynesfield Estate, as well as other landowners in this vicinity, have indicated their willingness to co-operate with the proposed offset programme (although it should be noted that no offset activities are to interfere with the sustainable and ecologically conscious commercial farming activities already underway on the property). As discussed in further detail in Section 9.3 of this report, insufficient wetland habitat is available within this potential recipient site to meet the offset requirements for either balancing dam. This is not considered to be a fatal flaw or a constraint however, as sufficient wetland hectarage exists within the three proposed Smithfield offset recipient sites as well as on farms adjacent to Baynesfield to compensate for the shortfall within the Baynesfield area.

The opportunities and constraints associated with each of the above offset alternatives are presented in the subsections (6.1-6.4) below with a synthesis of the findings presented in Section 6.9.

6.1 *Procedural aspects*

Procedural risks in this assessment refers to the risks associated with regulatory procedures and authorisations required in order to ensure that the offset is legally implemented and that the offset is recognised and protected in the relevant spheres of government authority and regulation. Key procedural aspects considered included:

- Water use authorisation;
- Environmental risks and risks of authorisation on three levels:
  - National;
  - Provincial; and
  - Municipal.
- Town planning risks and authorisation.

The table below presents the findings of the risk assessment undertaken for procedural risks.

Table 20: SWOT Analysis: Procedural aspects.

OFFSET OPTION	STRENGTHS AND OPPORTUNITIES	WEAKNESSES AND THREATS
Smithfield 1	➢ Adjacent to existing protected areas (western portion of the recipient site is within a section of the Mount Shannon Protected Environment). Thus, expansion of these areas may be feasible in future as part of the overall offset; ➢ Regional authorities (EKZNW, Ezemvelo DEDTEA) are likely to support the offset in this area, given proximity to existing protected areas ➢ Southern portion of the offset site falls within the same quaternary catchment as the proposed Smithfield Dam;	➢ Many of the land portions in this area are subject to land claims and thus there is significant risk that any implemented offset could be nullified if land is transferred to claimants. In future engagements with the Department of Rural Development and Land Redistribution it is hoped that this can be clarified;
Smithfield 2	➢ Majority of the area is state-owned land, managed by the KZN DRD&LR who have indicated willingness to enter into further discussions and potentially co-operate with the proponent with regards to the Biodiversity Offset and Compensation Initiative;	➢ Future land uses may not support the offsets; ➢ Successful implementation and longevity of the offset may be threatened by existing rural communal settlements; ➢ Support from DRD&LR is crucial; ➢ Only a small portion falls within the same quaternary catchment as Smithfield Dam, thus may not be supported by DWS; ➢ Some portions of land are likely to be subject to land claims and thus risks as identified for the Smithfield 1 option are valid in this area too.
Smithfield 3	➢ Large tracts of wetland areas which may provide an opportunity to supplement the wetland offset should additional hectarage be required; ➢ Working for Wetlands and Conservation Outcomes are active in this area, therefore may	➢ Situated approximately 17 km from the proposed Smithfield Dam, therefore not within the same quaternary catchment and may not be supported by DWS as a result; ➢ Privately owned land – obtaining final agreement from landowners may be a challenge;

OFFSET OPTION	STRENGTHS AND OPPORTUNITIES	WEAKNESSES AND THREATS
	➢ be potential to partner with one or both organisations to optimise the offset activities; ➢ The landowners engaged with have indicated willingness to enter into further discussions;	➢ Not considered ideal by the offset consultants due to the location and distance from the development site; ➢ It is likely that land owners will stipulate that no offset requirements may negatively impact on existing or future sustainable commercial activities on each property; ➢ Some portions of land are likely to be subject to land claims and thus risks as identified for the Smithfield 1 option are valid in this area too.
Baynesfield	➢ Agreement in principle to participate in the offset project has been obtained from Baynesfield Estate Trust; ➢ "In principle" willingness to participate has been indicated by landowners other than the Baynesfield Estate Trust in the surrounding area; ➢ Large portions of the target offset wetlands are located on the same system as that which will be impacted by the proposed balancing dam;	➢ Baynesfield Estate Trust has stipulated that no offset requirements may negatively impact on existing or future sustainable and ecologically conscious commercial activities planned within the Estate; ➢ It is likely that other landowners in the area will have similar conditions of establishment.
Financial contribution to existing facility	➢ Relatively easy to initiate with a Memorandum of Understanding developed and implementation plan and financial model developed; ➢ Other existing nature reserves such as Impendle, Mount Shannon and Zinti Conservancy which are already declared nature reserves/protected areas could be easily approached for some type of offset and especially monetary contributions to improve wetland systems ecology and functionality.	➢ Funding alone of another site by the party requiring an offset is generally not considered to be an appropriate offset mechanism; ➢ Problems with agreement on the quantum of financial contribution to compensate for loss on both an initial capital level as well as for ongoing management and maintenance; ➢ Potential mismanagement of funds and wasteful expenditure by the target offset site management leading to no net gain or improvement in target wetlands or terrestrial habitat.

6.2 *Procurement aspects*

Procurement aspects in this assessment refers to the risks associated with the procurement of an appropriate offset. Key procedural aspects considered included:

- Available offset locations;
- Willing land owners in appropriate locations;
- Willingness of landowners to enter into stewardship or other binding agreements
- The cost of potentially having to procure land to be used for offset;
- The cost of designing and procuring the expertise to develop offsets; and
- Structures and funding of management and maintenance of offsets.

The table below presents the findings of the SWOT analysis undertaken for procurement risks.

Table 21: SWOT Analysis: Procurement aspects.

OFFSET OPTION	STRENGTHS AND OPPORTUNITIES	WEAKNESSES AND THREATS
Smithfield 1	➢ The majority of the land parcel is state-owned, thus increasing the opportunity for inter-departmental co-operation ➢ Existing protected areas which border the recipient site could potentially be expanded in future to encompass the offsets; and	➢ The majority of farms within this land parcel are privately owned and landowners may be unwilling to sell or enter into stewardship agreements; ➢ Land claims lodged against specific properties within the recipient site may result in current landowners being unable or unwilling to enter into any form of stewardship programme; and ➢ Many of the land portions in this area are subject to land claims and thus there is significant risk that any implemented offset could be nullified if land is transferred to claimants. In future engagements with the Department of Rural Development and Land Redistribution it is hoped that this can be clarified.
Smithfield 2	➢ Landowners in this vicinity have indicated "in principle" willingness to enter into further discussions regarding stewardship or biodiversity Management Agreements; and ➢ Such inter-departmental co-operation may potentially significantly decrease costs associated with land purchases.	➢ Much of the land parcel is settled. Such settlements may expand in time, posing a risk to the ongoing management and maintenance of the offsets, which may in turn increase management costs; ➢ If land must be purchased, available land may be too costly to viably implement the Biodiversity Offset and Compensation Initiative, especially as impacts arising from existing land uses may have had significant impacts on wetland and terrestrial habitat; ➢ Available land within appropriate locations may not have sufficient wetland or CBA terrestrial habitat available to facilitate the required offset; ➢ Land claims lodged against specific properties within the recipient site may result in current landowners being unable or unwilling to enter into any form of stewardship programme; and ➢ Many of the land portions in this area are subject to land claims and thus there is significant risk that any implemented offset could be nullified if land is transferred to claimants. In future engagements with the Department of Rural Development and Land Redistribution it is hoped that this can be clarified.
Smithfield 3	➢ Preliminary investigations on a high-level desktop basis indicate that suitable wetlands and terrestrial CBAs are located within this area for the Biodiversity Offset and Compensation Initiative; and ➢ Existing stewardship programmes and a willingness of landowners to participate in conservation initiatives is evident in this land parcel, inferring that purchase of land may not be necessary to implement a successful offset programme.	➢ Distance of the land parcel from the Smithfield Dam (and therefore from the Smithfield Dam) may increase management costs in the long-term; and ➢ Land claims lodged against specific properties within the recipient site may result in current landowners being unable or unwilling to enter into any form of stewardship programme; and ➢ Many of the land portions in this area are subject to land claims and thus there is significant risk that any implemented offset could be nullified if land is transferred to claimants. In future engagements with the Department of Rural Development and Land Redistribution it is hoped that this can be clarified.
Baynesfield	➢ Agreement in principle has been obtained from the Baynesfield Estate Trust for offset activities to occur on land owned by the Trust.	➢ Land owned by the Baynesfield Estate Trust cannot be purchased but stewardship or other agreements could be entered into; ➢ Additional privately-owned properties within the offset target area may be required to meet wetland offset targets; and ➢ Land claims lodged against specific properties within the recipient site may result in current landowners being unable or unwilling to enter into any form of stewardship programme.
Financial contribution to existing facility	➢ Potential Benefactors such as the Blue Swallow Stewardship Project (administered by Birdlife South Africa) have been identified but have not yet been engaged; and ➢ Relatively easy to initiate with a Memorandum of Understanding developed and implementation plan and financial model developed.	➢ Problems with agreement on the quantum of financial contribution to compensate for loss on both an initial capital level as well as for ongoing management and maintenance; and ➢ Mismanagement of funds and wasteful expenditure by the target offset site management leading to no net gain or improvement in target compensation areas.

6.3 *Technical aspects and constraints*

Technical aspects and constraints in this assessment refers to the risks associated with the technicalities in developing an offset which includes:

- Some aspects of procedure in order to achieve an appropriate offset;
- Some aspects of procurement and funding required to successfully implement the offset;
- Technical aspects developing the offset with specific mention of:
  - Determining if the quantum of offset is achievable for each option;
  - The technical expertise required to rehabilitate wetlands;
- The cost of designing and procuring the expertise to develop offsets; and
  - The availability of sufficient expertise to develop offsets wetlands (applicable in some instances).
- Structures and funding of management and maintenance of offsets.

The table below presents the findings of the SWOT analysis undertaken for technical risks.

Table 22: SWOT Analysis: Technical aspects.

OFFSET OPTION	STRENGTHS AND OPPORTUNITIES	WEAKNESSES AND THREATS
Smithfield 1	➢ Based on preliminary investigations and ground-truthing, observations made of the site, opportunities for protection and rehabilitation of wetlands is considered straight forward and presents little technical risk.	➢ Much of the area is utilised for commercial forestry which may restrict opportunities for rehabilitation and conservation of grassland areas; ➢ Based on observations during ground-truthing, the implementation of an offset in this area may be technically complicated due to factors such as naturally erodible soils and ongoing anthropogenic disturbances; and ➢ Very little is known about the three key faunal species of concern. Thus, the compensation initiatives around them have a significant possibility of being unsuccessful and thus the Biodiversity Offset and Compensation Initiative could be regarded as a failure, should this occur.
Smithfield 2	➢ Conservation and/or rehabilitation of watercourses in this vicinity provides the opportunity for improved delivery of direct and indirect benefits to the surrounding communities; ➢ Based on preliminary investigations and ground-truthing, opportunities for protection and rehabilitation of watercourses (wetland and riparian habitat) is considered straight forward and presents little technical risk; and ➢ Extent of available riparian habitat for the Biodiversity Offset and Compensation Initiative can translate to increased habitat for *Gnomeskelus fluvialis* (Keeled Riverine Millipede).	➢ Existing and planned future commercial agriculture activities by landowners may impede or restrict rehabilitation and maintenance of wetlands, grasslands and management of Blue Swallow nesting sites; and ➢ Very little is known about the three key faunal species of concern. Thus, the compensation initiatives around them have a significant possibility of being unsuccessful and thus the Biodiversity Offset and Compensation Initiative could be regarded as a failure, should this occur.
Smithfield 3	➢ Based on preliminary investigations and ground-truthing, opportunities for protection and	➢ Existing and planned future commercial agriculture activities by landowners may impede or restrict

OFFSET OPTION	STRENGTHS AND OPPORTUNITIES	WEAKNESSES AND THREATS
	rehabilitation of wetlands is considered straight forward and presents little technical risk.	rehabilitation and maintenance of wetlands, grasslands and management of Blue Swallow nesting sites; and ➢ Very little is known about the three key faunal species of concern. Thus, the compensation initiatives around them have a significant possibility of being unsuccessful and thus the Biodiversity Offset and Compensation Initiative could be regarded as a failure, should this occur.
Baynesfield	➢ Based on preliminary investigations and ground-truthing, opportunities for protection and rehabilitation of wetlands is considered straight forward and presents little technical risk. The Baynesfield Estate Trust has agreed to the Biodiversity Offset and Compensation Initiative in principle.	➢ Existing and planned future commercial agriculture activities by landowners may impede or restrict rehabilitation and maintenance of wetlands, grasslands and management of Blue Swallow nesting sites; and ➢ Very little is known about the three key faunal species of concern. Thus, the compensation initiatives around them have a significant possibility of being unsuccessful and thus the Biodiversity Offset and Compensation Initiative could be regarded as a failure, should this occur.
Financial contribution to existing facility	➢ Potential Benefactors such as the Blue |Swallow Stewardship Project have been identified, but not engaged with as yet; ➢ Relatively easy to initiate with a Memorandum of Understanding developed and implementation plan and financial model developed; and ➢ Conservation and intervention plans can be developed by competent site mangers at the alternate sites and be implemented.	➢ Funding alone of another site is largely not considered to be an appropriate offset mechanism; ➢ Mismanagement of funds and wasteful expenditure by the target offset site management leading to no net gain or improvement in biodiversity; ➢ Rehabilitation interventions not being successful and not leading to a net improvement in wetland condition or an increase in conserved wetland resources; ➢ It is possible that DWS / implementing Agent could no longer be held responsible for ensuring adequate management and hence a failed offset could arise; and ➢ Existing and planned future commercial agriculture activities by landowners may impede or restrict rehabilitation and maintenance of wetlands, grasslands and management of Blue Swallow nesting sites; and ➢ Very little is known about the three key faunal species of concern. Thus the compensation initiatives around them have a significant possibility of being unsuccessful and thus the Biodiversity Offset and Compensation Initiative could be regarded as a failure, should this occur.

6.4 *Funding aspects*

Funding aspects refers to financial risks associated with the offset, from conception, through design, initiation to implementation and operation. Some alternatives will have far higher capital or initial costs than others while some alternatives will have higher operational and Maintenance cost requirements.

The table below presents the findings of the SWOT analysis undertaken for funding risks for the various recipient sites.

Table 23: SWOT Analysis: Funding aspects.

OFFSET OPTION	STRENGTHS AND OPPORTUNITIES	WEAKNESSES AND THREATS
Smithfield 1	➢ The site is relatively close to the proposed Smithfield Dam development site, therefore certain costs can be optimised, e.g. storage of equipment, travel costs between storage sites and rehabilitation areas; ➢ potential rehabilitation areas are located on private land which falls within the Dargle Conservancy, thus it may be possible to enter into "in kind" agreements with participating landowners to provide services in return for labour to assist with rehabilitation activities; and ➢ Bordered by existing protected areas, thus it may be feasible to enter into agreements with managing bodies to share expenses.	➢ Wasteful expenditure if rehabilitated areas are not controlled post rehabilitation, overgrazing and overutilization and alien vegetation proliferation again occur.
Smithfield 2	➢ Potential for community upliftment projects relating to the rehabilitation activities, for example, the establishment of an onsite nursery could result in employment opportunities; ➢ In close proximity to proposed Smithfield Dam development site therefore some costs (e.g. storage) can be optimised;	➢ Access is restricted within this area due to lack of roads infrastructure – construction of roads could inflate costs associated with the Biodiversity Offset and Compensation Initiative.
Smithfield 3	➢ Working for Wetlands are already active in this area, and stewardship programmes are in place, thus potential for interdepartmental co-operation and/or formation of partnerships with these organisations to share expenditure exists; ➢	➢ Due to distance from the proposed Smithfield Dam site, it would be necessary to establish new contractor laydown areas.
Baynesfield	➢ Potential for entering into a stewardship project with the Baynesfield Estate Trust, Mondi and other neighbouring landowners, thereby reducing direct costs to the proponent; ➢ Potential to enter into "in kind" agreements with landowners in this land parcel, thus reducing direct financial expenditure; ➢	➢ Entering into in kind" agreements may be a procedural risk in terms of the various financial management Acts and/or proponent's internal supply chain management policies; ➢
Financial contribution to existing facility	➢ Potential benefactors such as the EWT, Working for Water and Working for Wetlands have been identified. ➢ Relatively easy to initiate with a Memorandum of Understanding developed and implementation plan and financial model developed.	➢Problems with agreement on the quantum of financial contribution to compensate for loss on both an initial capital level as well as for ongoing management and maintenance. ➢Mismanagement of funds and wasteful expenditure by the target offset site management leading to no net gain or improvement in target wetlands.

6.5 *Watercourse ecological opportunities*

In addition to the obvious ecological benefits of the proposed watercourse offsets (e.g. improvement of water quality through restoration of natural vegetation and the reduction of sediment inputs through erosion control), several other opportunities may arise as a result of the offset. These include, but are by no means limited to, the following:

➢ Increased habitat availability for wetland-dependent fauna: in addition to specific species which were considered as part of this study, species such as the Critically

Endangered Wattled Crane (*Bugeranus carunculatus*) are known to occur within the vicinity of the Smithfield 3 recipient site (as observed during the site assessment in March 2018). Improvement of the overall ecological integrity of wetland systems in the proposed recipient sites increases the potential for establishing new breeding populations of such threatened species;

- Increased opportunities for tourism as the overall ecological condition of the watercourses is improved through rehabilitation, activities such as fishing and boating may become more appealing. This in turn may lead to increased economic opportunities for the local communities;
- Creation of additional wetland areas around the spillway of the proposed Langa Balancing Dam is deemed possible and can create additional wetland habitat, thus contributing towards increased wetland biodiversity and maintenance of ecosystem processes;
- Removal of extensive stands of *A. mearnsii*: this is considered a critical aspect of the rehabilitation activities (please refer to Sections 11.1.7, 11.2.3 and 11.3.2). There is, however, likely to be significant volumes of organic waste matter as a result of the clearing exercise, which could be utilised by the local communities for domestic purposes such as firewood or fencing.

6.6 *Terrestrial ecological opportunities*

In addition to the clear ecological benefits of the proposed CBA offsets (e.g. improvement of the present ecological state of the grassland through restoration of natural vegetation and the management of burning and grazing programs), several other opportunities may arise as a result of the offset. These include, but are by no means limited to, the following:

- Increased tourism opportunities when the ecological condition of the grasslands are improved to such an extent that areas with a high diversity of plants can be demarcated as Wildflower Reserves. This in turn may lead to increased economic opportunities for the local communities;
- Increased habitat availability for grassland-dependent fauna: in addition to specific species which were considered as part of this study, species such as *Ourebia ourebi* are known to occur within the vicinity of the Baynesfield recipient site (please refer to Table 5). Improvement of the overall ecological integrity of grassland areas in the proposed recipient sites increases the potential for establishing new breeding populations of such threatened species;
- Removal of extensive stands of *Acacia mearnsii* is considered a critical aspect of the rehabilitation activities. There is however likely to be significant volumes of organic

waste matter as a result of the clearing exercise, which could be utilised by the local communities for domestic purposes such as firewood or fencing. Local communities will also be empowered with skills to effectively control alien and invasive plant species;

- Uncontrolled grazing practices are widespread in the community surrounding the proposed Smithfield Dam. Such practices are likely to continue and extend into areas currently unaffected by grazing, as grazing land is lost due to inundation. Whilst this is not feasible to prevent altogether, opportunity exists for the education of local communities in the practice of sustainable grazing, particularly around wetland areas. Whilst floral species composition in wetlands is generally fairly resistant to the impacts of grazing, the impacts of trampling by livestock is of greater concern as this leads to erosion (SANBI, 2014). Thus, it is recommended that any areas of the wetlands which are accessed by livestock are continuously monitored for erosion, and that where necessary, eroded areas are rehabilitated and managed pro-actively to prevent the need for expensive rehabilitation in future. There is a need for Grazing Education Schools, with focus and operating in rural communities as to educate them in the importance of carrying capacity of the veld;
- The opportunity for funding of cattle fence (or several fences) to aid with grazing management. This must be done with collaboration of the local community.

6.7 *Species Specific Opportunities*

With the loss of habitat for the identified species of conservation concern several opportunities to compensate for the habitat loss (e.g. create additional breeding habitat for *Hirundo atrocaerulea* [Blue swallow] by artificially digging holes, clearing of alien and invasive plant species within riparian forest areas to increase preferred habitat for *Gnomeskelus fluvialis* [Riverine Keeled Millipede] and cultivating and replanting *Protea caffra* at a ratio of 30:1 for individual plants lost which is the main food source for *Capys penningtoni* [Pennington's Protea Butterfly]), several other opportunities may arise as a result of the compensation. These include, but are by no means limited to, the following:

- The opportunity for funding to be made available to purchase land that is currently not protected, but where the grassland is in pristine condition and the area is known to be used by protected species. One such area is at Nottingham Road, where the farm is used by floating flock of *Bugeranus carunculatus* (Wattled Cranes). When such land is purchased it can be given to EKZNW to manage the area in accordance with established protocols;

- Expand existing stewardship programs to incorporate the affected areas where the proposed compensation initiatives will take place. Funding to be made available to aid in the implementation of such programs; and
- The project will allow for further research and monitoring of the species of concern which will contribute to the knowledge of the ecology of these species but also the general ecology of the area.

6.8 *Synthesis and Discussion*

Taking into consideration the final offset requirements as discussed in Sections 4.2 and 9.3 of this report it is clear that all four (4) proposed recipient sites are required if the offset targets are to be met. Furthermore, whilst various guidelines (DEA, 2017; Macfarlane *et al*, 2016) advice that offsets should preferably be within a single area, this is not practical for a development of this extent. It is the opinion of the biodiversity offset specialist that whilst there are risks associated with each of the four proposed recipient sites, these risks (or similar) are likely to be inherent within the context of any given offset initiative, and that the approach presented here increases the potential for success as the offset is not reliant on a single farm portion or landowner. In addition, particularly within the Smithfield 3 recipient site, Non-Governmental Organisations (NGOs) such as Birdlife South Africa and government departments such as Working for Wetlands are already active, thus increasing the potential for the proponent to partner with such organisations to implement a well-rounded, holistic offset programme.

Key risks include the following:

- Very little is known about the three key faunal species of concern (Blue Swallow, Riverine Keeled Millipede and Pennington's Protea Butterfly). Thus, the compensation initiatives around them have a significant possibility of being unsuccessful and thus the Biodiversity Offset and Compensation Initiative could be regarded as a failure, should this occur. Many of the land portions in this area are subject to land claims and thus there is significant risk that any implemented offset could be nullified if land is transferred to claimants. In future engagements with the Department of Rural Development and Land Redistribution it is hoped that this can be clarified;
- Privately owned land – obtaining final agreement from landowners may be a challenge It is likely that land owners will stipulate that no offset requirements may negatively impact on existing or future sustainable commercial activities on each property;

- Based on observations during ground-truthing, the implementation of an offset in this area may be technically complicated due to factors such as naturally erodible soils and ongoing anthropogenic disturbances; and
- Mismanagement of funds and wasteful expenditure by the target offset site management leading to no net gain or improvement in biodiversity.

6.9 *Risk Mitigation*

Mitigation of risks associated with the intended offset should be managed in line with key concepts outlined by the Department and Environmental Affairs, as outlined by the mitigation hierarchy (DEA, 2013). On this basis and during the planning for the implementation of a risk assessment it is considered essential to, in order of priority, manage risks as follows:

- First, the offset planning should try to avoid or prevent the risks which have been identified, which would lead to the failure of the successful implementation of the biodiversity offset. This is done by ensuring that the unknown factors which could lead to failure are reduced through the use of proven technologies and prevent cumulative impacts on other aspects of ecology such as terrestrial biodiversity impacts;
- Secondly if the above-mentioned mitigation options have been exhausted, every effort should be made to reduce the risks identified. In the context of offsetting this can be achieved by ensuring that sound planning of the implementation process is undertaken; and
- Residual risks need to be managed and addressed in the offset implementation plan in order to reduce the risk.

The risks identified are discussed in light of the above approach in the table below.

Table 24: Risk mitigation options for each risk aspect.

Risk Aspect	Risk Mitigation
Procedural Risks	This risk is best mitigated by ensuring that extensive engagement with the relevant stakeholders, in particular Provincial authorities such as Ezemvelo KZN Wildlife, landowners and the surrounding communities, takes place. Furthermore, it is deemed essential that procedural risks in terms of environmental and water use permitting be managed by means of ensuring that the Biodiversity Offset and Compensation Initiative is technically sound and that the outcome of the offset can be achieved with the least impacts on all resources including watercourses, threatened grasslands, Species of Conservation Concern and socio-cultural resources and ecoservices. Additionally, the properties utilised as part of the Biodiversity Offset and Compensation Initiative must be sterilised from future high-impact activities such as mining, although low-impact developments such as cogent, well-designed tourism developments, for example, bird hides may potentially be authorised.
Procurement Risks	The primary risk associated with procurement is the financial implications of purchasing significant portions of land on which to implement the proposed offset; however, the purchase of land is not considered a necessity – or practicable - in the context of this Biodiversity Offset

Risk Aspect	Risk Mitigation
	and Compensation Initiative. In order to mitigate this risk, it is suggested that various partnerships – such as Stewardship Programmes managed by landowners – be implemented. Furthermore; it must be ensured that well executed and accountable auditing, both form a technical and a financial point of view takes place Procurement risks can also refer to procurement of equipment and services, and in this regard, the Public Finance Management Act (Act 1 of 1999) must be complied with.
Technical Risks	This risk must be managed by utilising existing technologies with a proven track record. In this regard rehabilitation of freshwater resources to meet offset targets by means of increasing hectare equivalents is considered the most appropriate mechanism for risk avoidance. Through careful planning the risks of failure in increasing hectare equivalents can be reduced to very low levels.
Funding Risks	Funding risks can be reduced by reducing the quantum required to implement the offset. One of the key costs in initiating the offset is land cost. Therefore, it is recommended that as far as feasible, interdepartmental partnerships, biodiversity stewardship programmes, Public Private Partnerships with relevant NGOs and so on, be developed and entered into, in order to minimise the financial risk associated with a sole income revenue.

7 WATERCOURSE OFFSET RECIPIENT SITES ASSESSMENT

During a field assessment undertaken in March 2018, key areas were selected for ground-truthing and the extent and ecological condition of the identified freshwater resources within the identified target recipient areas was assessed to determine the suitability of the freshwater resources to meet the offset requirements. This information was utilised to determine the available biodiversity areas, with specific mention of CBAs, wetland functional hectare equivalents and ecosystem conservation hectare equivalents (please refer to Appendices D and E for details regarding the method of assessment and the full results thereof).

The freshwater resources within the four target recipient sites were assessed on a systems level, and were found to be in moderately modified condition, although of high to very high Ecological Importance and Sensitivity despite the decreased ecological integrity. The results of the assessment are summarised in the table below:

Table 25: Summary of the results of the assessments of the various freshwater resources within the target recipient sites.

Target recipient site	PES	Ecoservices	EIS	REC
Smithfield 1	C	Intermediate	High	B/C
Smithfield 2	C	Moderately High	High	B/C
Smithfield 3	C	Moderately High	Very High	B/C
Baynesfield	C	Moderately High	Very High	B/C

Impacts on the various systems include construction of drainage channels, instream infrastructure (weirs, roads, bridge piers), erosion and bank incision and proliferation of alien vegetation, particularly wattle (*Acacia spp.*) and *Solanum mauritanium*. The intensity and magnitude of these impacts varies between systems however it is the opinion of ecologist that these impacts can be appropriately rehabilitated and managed to improve the overall functioning and ecological integrity of the systems, thus contributing towards the achievement of the goals and objectives of the Biodiversity Offset and Compensation Initiative. Please refer to Section 11 for further detail of the rehabilitation and management measures.

In addition to the areas identified for the Wetland Offset and Compensation Initiative a “like for like” Riparian Zone Offset and Compensation Initiative was developed. Riparian areas have been identified in three areas adjacent to the Smithfield Dam for rehabilitation at three strategic points around the dam. Refer to the figure below.

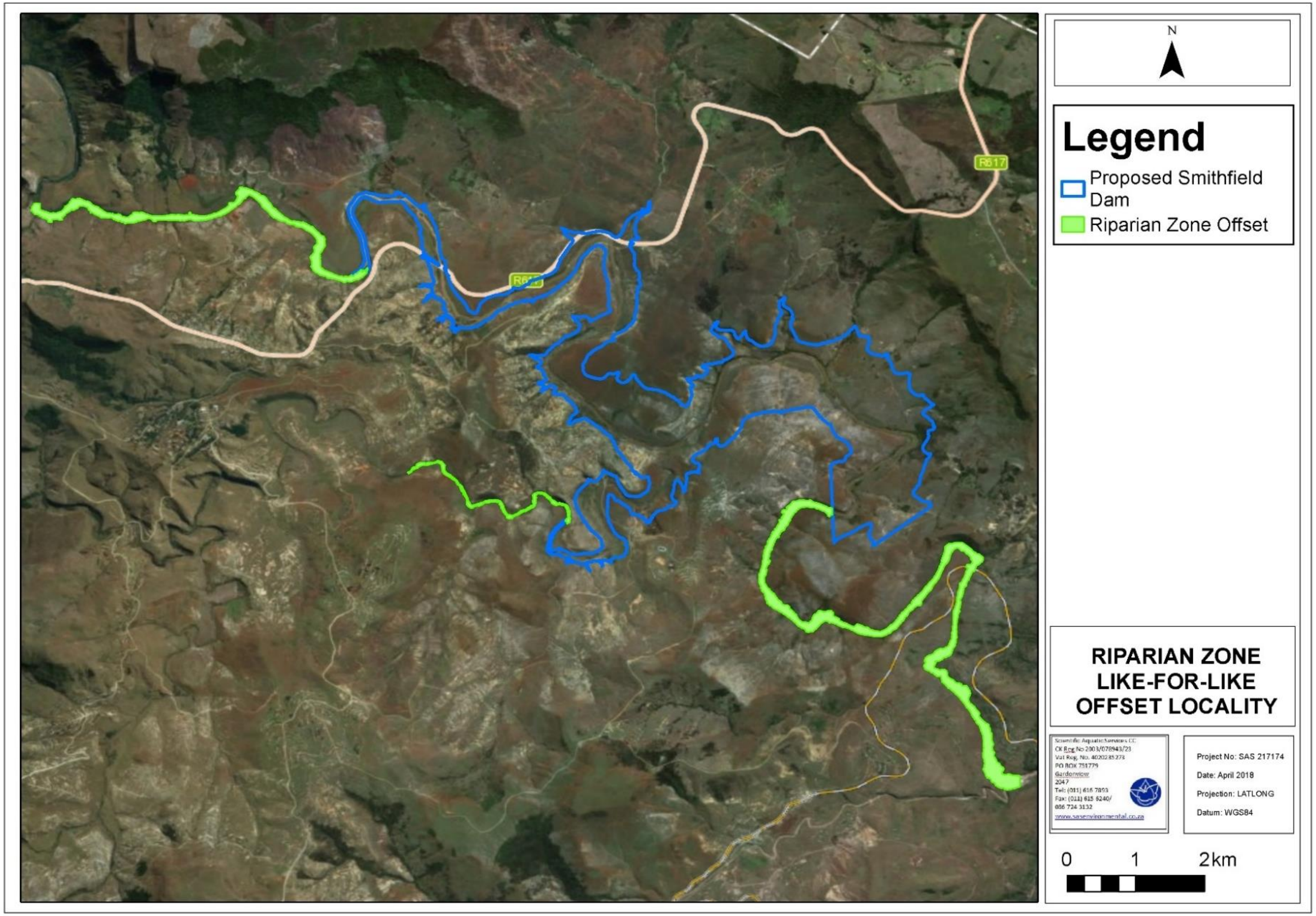


Figure 16: The proposed riparian zone offset target areas, in relation to the Smithfield Dam full supply level.

These areas can be summarised as follows:

- A length of the uMkhomazi River of 9 km downstream of the proposed dam wall;
- A length of 3 km on a tributary of the Umkhomazi River to the south of and entering the proposed dam; and
- A length of the uMkhomazi River of 4.5 km upstream of the full supply level of the dam.

The above intervention is in line with the requirements defined by the Department of Water and Sanitation - Sub-Directorate: Instream Water Use (Mr. P. Ackerman Pers. comm. 2017) where the upstream and downstream ecology of the river is rehabilitated.

This initiative serves the additional purpose of as best possible ensuring that on a like for like basis riparian areas are conserved and that the area nearest to the Lundy's Hill population of *Gnomeskelus fluvialis,* that will not be affected by the proposed dam, will be rehabilitated and managed for the life of the dam.

8 TERRESTRIAL CBA OFFSET RECIPIENT SITES ASSESSMENT

A site visit was undertaken in March 2018 during which the presence of CBA grasslands were noted within the target recipient sites. Factors affecting the integrity of the CBA were recorded e.g. alien and invasive vegetation and overgrazed areas within these areas. Based on these observations the present ecological state of the CBA's and grasslands within the study could be determined and the suitability of the grasslands to meet the offset requirements assessed. Furthermore, the proposed mitigatory measures were identified to aid in grassland management to improve the present ecological state of the CBA.

The majority of the grassland areas present within the recipient sites were intact, but areas within the communal tribal lands have shown indication of over grazing and burning of the area. Rehabilitation measures will include bur not limited to possible fencing off areas, custodian programs to guide and assist with good grazing and burning practices, alien vegetation control and re-vegetation with indigenous species.

Following the assessment of the CBA and grassland areas, it is the opinion of the ecologist that rehabilitation and conservation initiatives of the CBA and grassland areas will adequately meet the requirements of the Biodiversity Offset and Compensation Initiative. The habitat and ecological functioning of these areas can be improved, in turn providing a valuable resource in terms of both ecological service provision and direct benefits to the surrounding communities. Please refer to Appendix J for the full details of the CBA site assessment.

9 SPECIES SPECIFIC COMPENSATION IDENTIFICATION AND ASSESSMENT

Consideration was given to the need and desirability of the proposed uMkhomazi Water Project during the early stages of the EIA study, and it was determined that the construction and subsequent operation of the proposed Smithfield Dam and related infrastructure will have significant socio-economic benefits to the communities served by the dam. Therefore, whilst it is acknowledged that the project will have a 'very high' impact on biodiversity (in particular CBAs and three faunal species of critical conservation concern) and wetlands within the project footprint area, such impacts must be considered in the context of the need for sustainable development and the responsibility of the proponent to provide adequate water supplies to the affected areas.

Given the above, this project can be considered fatally flawed from a biodiversity perspective. However, the project is likely to be authorised in national interest for justifiable social or economic reasons. Therefore, compensation for the loss of biodiversity must be undertaken.

Compensation initiatives were identified to compensate for the loss of the identified faunal species of conservation concern that will be affected by the proposed dams. These are detailed in the sections below.

9.1 *Hirundo atrocaerulea (Blue Swallow)*

9.1.1 Problem Statement

The Blue Swallow (*Hirundo atrocaerulea*) is listed as 'Critically Endangered' as a result of the loss of viable and important habitat due to agricultural activities and habitat transformation. There are only an estimated 30-40 known breeding pairs remaining within the areas associated with the uWMP-1 project area, with limited alternative habitats and known populations within the southern KwaZulu-Natal region. According to Athol Marchant[9] (District

[9] Refer to Appendix L.

Athol Marchant	EKZNW	EZEMVELO KZN WILDLIFE District Ecologist Ukhahlamba	T: 033 2391513 C: 084 682 7635 E: athol.marchant@kznwildlife.com

Ecologist, EKZNW; Pers. Com 2018) the number of breeding pairs of Blue Swallow may even be as few as 24 pairs, all located within KZN.

9.1.2 Background information

The Blue Swallow (*Hirundo atrocaerulea*) is listed as 'Critically Endangered' in the latest Red Data Book covering the birds of South Africa, Lesotho and Swaziland (Taylor *et al.* 2015) and its global conservation status is considered 'Vulnerable' (BirdLife International 2018). This species has undergone a catastrophic decrease in South Africa in recent times. It is now one of the ten most threatened species on the South African mainland. It once occurred in Limpopo and Mpumalanga Provinces but now appears either extinct in these provinces or close to it. It has also entirely disappeared from the northern and central parts of its range in KwaZulu-Natal. The population persisting in southern KwaZulu-Natal, which includes the birds present in the project area, is the last, or at least the last significant, remaining population in South Africa. This population is estimated at only about 30-40 breeding pairs. The greatest threat that has operated to reduce Blue Swallow populations in South Africa has been the destruction and degradation of its grassland habitat brought about mainly by commercial afforestation, agriculture and dense human settlement.

9.1.3 Findings of Specialist studies

David Allan was requested to provide a bridging study for the proposed Smithfield Dam and the Langa, Mbangweni and Baynesfield Balancing Dams (Allan, 2018+). This aim of this study was to provide additional information on this species, building on from the initial study conducted by WildSkies Ecological Services (2015). The results from this study are summarised below.

Smithfield Dam and associated tunnel routes (Western Portion of the uWMP-1):

- The proposed pipelines are situated away from any Blue Swallow breeding sites and tunnel construction is unlikely to have any negative impact on these breeding areas;
- The Smithfield Dam walls are situated away from any Blue Swallow breeding sites and the construction of the dam walls are unlikely to have any negative impact on these breeding areas;
- The Mount Shannon Blue Swallow breeding areas are particularly distant from the project footprint and are unlikely to be negatively affected by any project components;
- All project components are situated beyond the 1.5 km buffer zone from Blue Swallow breeding habitat at Impendle Nature Reserve (relevant to the stipulation of Evans & Bouwman 2010); and

➢ Some project components, i.e. all or some of the R617 road deviations, the gravel road and the uppermost extent of the inundation area of Smithfield Dam, lie within the 4 km buffer zone. It is important to note, however, that the habitat in these areas, i.e. the low-lying regions along the uMkhomazi River, do not comprise mistbelt Blue Swallow breeding and foraging habitat (Figure 17).

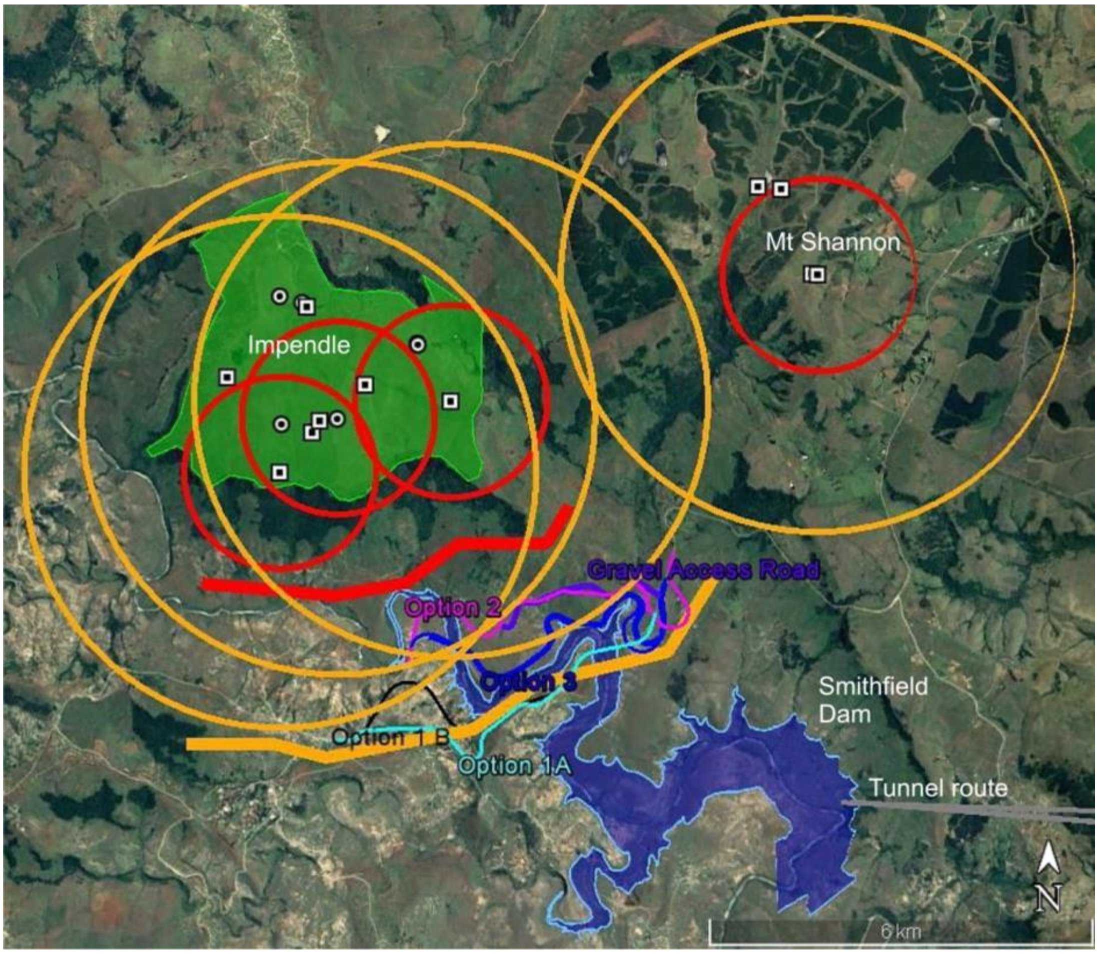


Figure 17: The boundaries of the 1.5 km (red lines) and 4 km (yellow lines) buffer zones around the Blue Swallow nesting localities at Smithfield. Also shown are the three road options associated with the Smithfield dam.

Baynesfield and Trewirgie (Eastern Portion of the uWMP-1):

➢ A total of 147 holes were located within this portion of the project area. Of those holes, 97 were located on Baynesfield and 50 on Trewirgie. A total of 114 of these holes were antbear burrows (69 on Baynesfield and 45 on Trewirgie), 29 were sinkholes (28 on Baynesfield and one on Trewirgie) and four were artificial holes (all on Trewirgie). All these holes present themselves as possible nest building sites for Blue Swallows;

➢ Of the holes located, a total of 67% were categorized as being suitable to highly suitable for breeding (61% at Baynesfield and 79% at Trewirgie); and

- During the assessment, six nests were located. Of these six nests, nesting adults were observed at 4 of these, whilst at the remaining 2 only the remnants of old nests were observed;

Taking into consideration the recommendation by Wakelin & Hill (2007) that "The *status quo* of the primary grasslands, within a 4 km radius of all Blue Swallow nests sites, must be protected and maintained" and Evans & Bouwman (2010) that "In order to conserve this threatened species, habitat transformation (excluding rehabilitation) should not be allowed within an absolute minimum of 1.5 km radius of a Blue Swallow nest", it has been found that:

- Both Langa and Mbangweni Balancing Dams lie entirely within the 1.5 km buffer zone around the outer boundaries of the main Blue Swallow breeding habitat patches, supporting Nesting Localities 1, 2 and 3 relevant to the locations of the three balancing dam options (Figure 18); and
- Baynesfield Balancing Dam option essentially remains outside the 1.5 km buffer relevant to any habitat modification as well as the 4 km buffer relevant to the transformation of primary grassland.

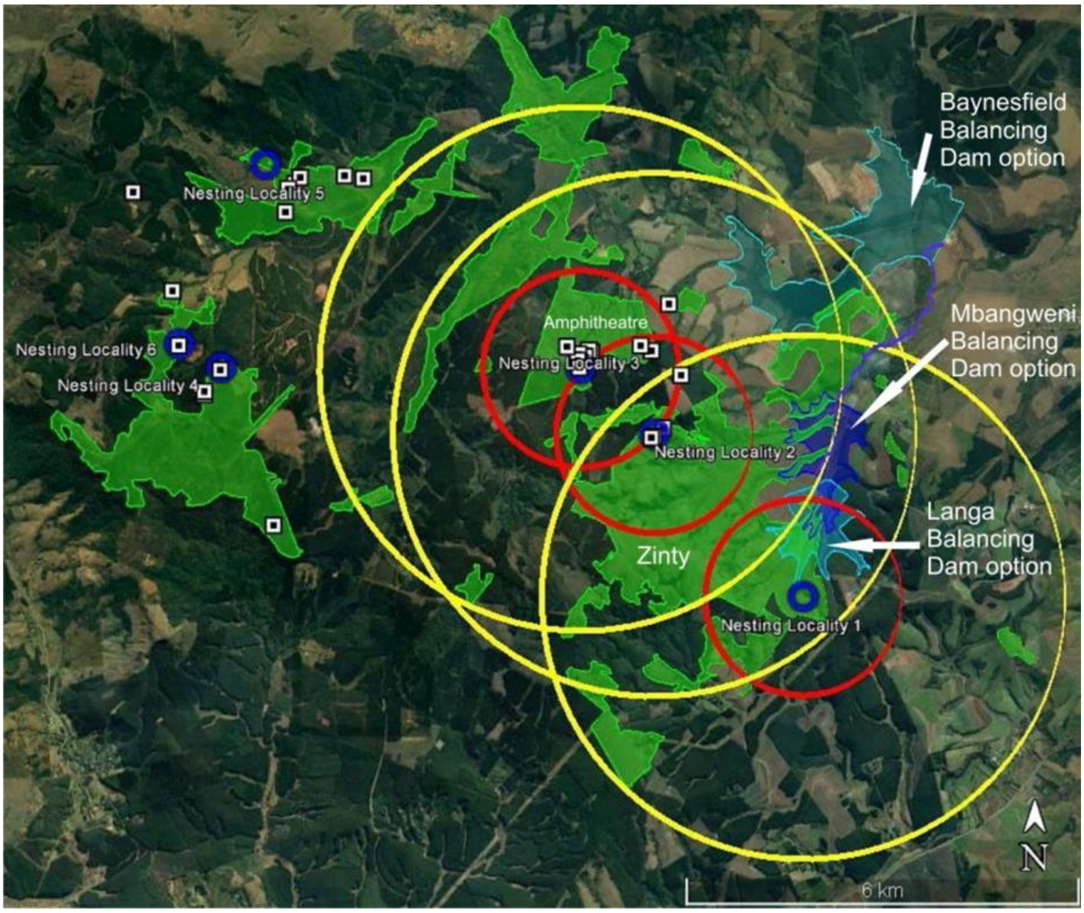


Figure 18: The boundaries of the 1.5 km (red lines) and 4 km (yellow lines) buffer zones around the three Blue Swallow nesting localities at Baynesfield.

9.1.4 Synthesis and Compensation Analyses and Compensation Criteria

The aforementioned study was used in conjunction with the desktop background information for the proposed recipient sites to highlight preferred habitat areas for the Blue Swallow (*Hirundo atrocaerulea*). A field assessment was undertaken by Scientific Aquatic Services in March 2018 to verify the condition of the preferred mistbelt grassland habitat areas. Results from the investigations and studies undertaken concluded that the Langa and Mbangweni Balancing Dam options should be considered as fatally flawed based on the level of habitat destruction and proximity to known nesting sites. In regard to the latter, the Baynesfield Balancing Dam option is an acceptable alternative from an avifaunal perspective. The fatal flaws inherent to both the Langa and Mbangweni Balancing Dams cannot be mitigated as they involve permanent destruction of irreplaceable critical habitat, nor would any offset approach seem appropriate for the same reason.

9.2 *Capys penningtoni (Pennington's Protea Butterfly)*

Capys penningtoni (Pennington's Protea Butterfly) was only formally described when it was collected near Elandskop in 1940 along the mountains of the "little berg" from Elandskop to Bulwer and northeast to Loteni and Inhlozane Mountain near Dargle. *C. penningtoni* is known to occur in fewer than 10 localities in the Southern Drakensberg foothills. According to the Animal Demography unit LepiMAP database, the last *C. penningtoni* recording was in 1993 in the western part of KwaZulu-Natal. *C. penningtoni* is one of the three endemic species to South Africa and restricted to the KZN Moist Grassland containing *Protea caffra* (Pachnoda, 2018). Searches for evidence of the butterfly on the Nkawini Mountain in subsequent years revealed a single adult female in 2015 and one adult male on 29 September 2016, but none in 2017. Two buds with the characteristic exit hole chewed by the larvae of the butterfly were noticed *on P. caffra* in Marwaqa Nature Reserve on 19 September 2017 (A. Armstrong - African Butterfly News, Addition November / December 2017-6). *C. penningtoni* is one of the three endemic species to South Africa and restricted to the KZN Moist Grassland containing *Protea caffra* (Pachnoda, 2018).

9.2.1 Background information

C. penningtoni has a very specific habitat distribution, namely the Kwazulu-Natal Moist Grasslands located within the Drakensberg foothills between 900 and 1900 m.a.s.l. *C. penningtoni* is closely associated with their larval host plant, *Protea caffra* (Pachnoda, 2018). This species is found among trees of *P. caffra* or *P. simplex*. Eggs are laid singly on Protea buds. The larvae burrow on the base of the flower heads to develop to pupate (Henning *et al*., 2009).

C. penningtoni is endemic to South Africa and listed as **Endangered** B1ab (i, ii, iii) +2ab (i, ii, iii) given its small area of occupancy and the continual decline of habitat within its area of occupancy (Mecenero et al., 2013). This taxon is very localised despite the plant food being widespread. Habitat destruction of one the greatest threats due to inappropriate overgrazing regimes resulting in an increase of tall coarse grass species. This in turn increases the fuel load of graminoid cover beneath the Protea stands, rendering in vulnerable uncontrolled fires.

9.2.2 Findings of Specialist studies

Pachnoda Consulting cc was requested to provide an invertebrate assessment report for the proposed Smithfield dam on the uMkhomazi River, near Bulwer, KwaZulu-Natal. The study focused on the potential occurrence of *C. penningtoni* along suitable habitat within the full supply level of the proposed dam and the R617 road diversion.

According to Pachnoda; (2018), *C. penningtoni* was not observed during the field assessment in November 2017. It was however noted that the probability of this species occurring within the higher-lying areas north of the road is very high due to the presence of *Protea caffra* stands, where these *Protea* stands are cumulatively inter-linked with each other for habitat and food availability.

In addition, the floristic richness and ecological quality of the montane grassland is correlated with altitude. At higher altitude the slope increases and grazing pressure on these graminoid areas are less severe. This provides suitable foraging habitat for these and other butterfly species.

Buffer zones were applied to the *Protea* stands and were subsequently modified and calibrated according to transformed habitat and/or habitat rendered as unsuitable for *C. penningtoni* to occupy. Buffer zones are intended to protect sensitive features from disturbances. Considering that KwaZulu-Natal has no prescribed buffer zones, the buffer zone widths as prescribed by the Gauteng Department of Agriculture and Rural Development (GDARD) were applied to the current study. According to the GDARD sensitivity mapping rules (GDARD, 2014), a buffer of 400 m is required and was allocated from the edge of the *Protea* stands. Figure 19 illustrates the position of potential breeding habitat within Smithfield dam.

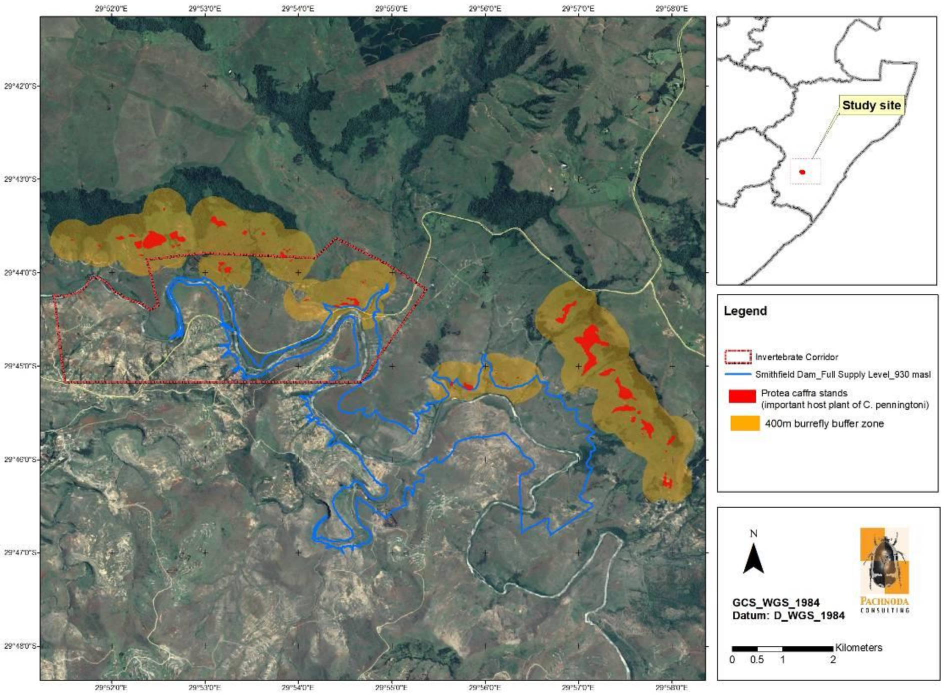


Figure 19: A map illustrating the spatial position of potential breeding habitat (*Protea caffra* stands) for *Capys penningtoni* on the study area. A 400 m buffer zone is included and modified where it occurs with habitat that is either transformed or unsuitable for occupancy.

9.2.3 Synthesis and Compensation Analyses and Compensation Criteria

During the study it was noted that the inundation and first impoundment could potentially result in the loss of *Protea caffra* stands. Excessive inundation and moisture over time could result in the inundation and die-back of individual *Protea caffra* trees. The probability of inundation of stands on the eastern part (Figure 20) is definite since these occur within the full supply level of the dam. However, the number of trees associated with these stands are low (c. only a few individuals).

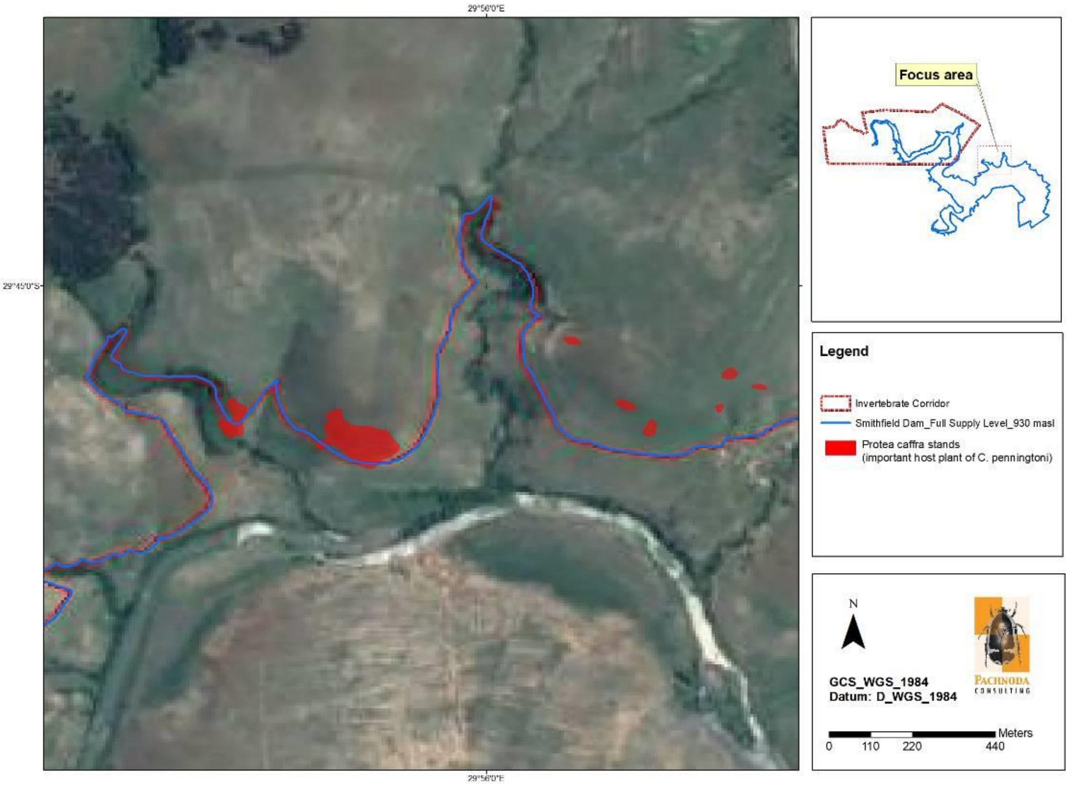


Figure 20: A map illustrating the spatial position of *Protea* stands on the eastern parts of the study site corresponding to the full supply level of the proposed dam.

Pachnoda Consulting (2018) recommended after their field assessment and investigation that:

- A monitoring protocol be implemented to control the water levels of the dam in such a way to not exceed the full supply level;
- Replacement of lost *Protea* species either through purchased species or seed harvesting and/or cuttings from individuals that will be lost. Seed harvesting seed harvesting and/or cuttings would be the preferred method of sourcing to maintain the genetic integrity of the *Protea* population; and
- Procure and distribute funds to assist with local (on site), as well as regional monitoring of *Capys penningtoni* as currently undertaken by staff of Ezemvelo KZN Wildlife. Monitoring should include other known localities of *C. penningtoni* and should include a geographic area that encompasses the entire known extent of occurrence of *C. penningtoni*. Monitoring should aim to estimate the population size of *C. penningtoni* as well as the size of the sub-population occurring within the project area. Monitoring is necessary to gain information on the ecological requirements of *C. penningtoni* and to apply adaptive management to veld and grazing regimes in the area; and

9.3 *Gnomeskelus fluvialis (Riverine Keeled Millipede)*

9.3.1 Problem Statement

Information on *Gnomeskelus fluvialis* (Riverine Keeled Millipede) is scant. Virtually nothing is known about the ecology and habitat requirements of *G. fluvialis*, except that it is assumed to occur in close proximity to riparian zones rivers or streams (*sensu* "fluvialis") (Pachnoda, 2018).

9.3.2 Background information

The distribution range of *G. fluvialis* is poorly known and it is currently known from only two historical localities: Lundy's Hill along the uMkhomazi River (where it was collected by R. F. Lawrence in November 1957, approximately 27.4 km east of Bulwer) and Deepdale. The species is thus only known from the uMkhomazi River catchment and is endemic to KwaZulu-Natal. According to Pachnoda (2018) it has not been collected since 1959.

9.3.3 Findings of Specialist studies

Pachnoda Consulting cc was requested to provide an invertebrate assessment report for the proposed Smithfield Dam on the uMkhomazi River, near Bulwer, KwaZulu-Natal. The study focused on the potential occurrence of *G. fluvialis* along suitable habitat within the full supply level of the proposed dam and the R617 road deviation.

According to Pachnoda; (2018) *G. fluvialis* was not observed on the study area even during intensive searching in a variety of habitat types. However, the occurrence of *G. fluvialis* is regarded as **probable** (low confidence) in the study area since:

- It is known to occur in the vicinity of the proposed development based on historical records (*c*. 1959);
- Potential suitable habitat is present along the uMkhomazi River; and
- It may naturally occur in low abundances or is naturally rare within its distribution range.

Based on the above arguments, it is possible that this species is either easily overlooked and/or highly specialised and thus it may have already declined owing to habitat degradation and inappropriate grazing regimes.

In order to compare riparian habitats within the study area with each other considering high apparent probability to provide habitat for *G. fluvialis*, those habitats with high abundances of polydesmoid millipedes (in particular habitat types with high abundances of *Gnomeskelus* spp.) were regarded as important. Most of these habitat types have western or southern aspects on slopes that range from steep to moderate. In addition, keeled millipedes are invariably absent or rare in habitat types that are accessible to cattle (owing to trampling and soil compaction) or in habitat type with clayey soils with a high base status.

According to Figure 21 it is evident that the most important habitat units with a high probability to sustain moderate to high numbers of polydesmoid millipedes occur near:

- Deepdale (not part of the full supply level);
- Near the bridge where the R617 crosses a tributary of the uMkhomazi River; and
- In forest types with a steep slope on southern aspects.

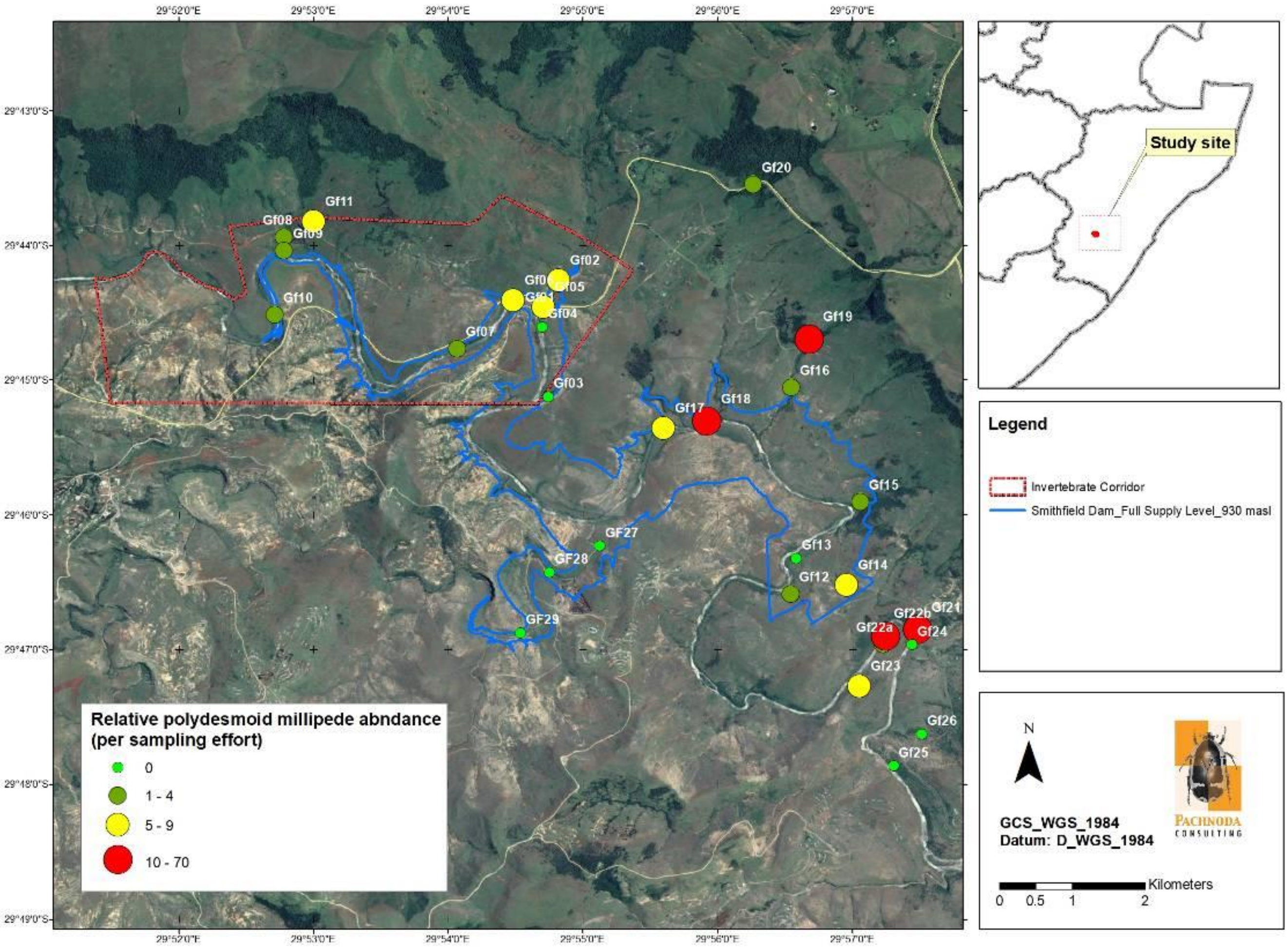


Figure 21: Relative abundance (per sampling effort) of polydesmoid millipedes sampled in a variety of habitat types along the uMkhomazi River. Habitat types sustaining moderate to high numbers of millipedes provide potential habitat for *G. fluvialis*.

9.3.4 Synthesis and Compensation Analyses and Compensation Criteria

The aforementioned study was used in conjunction with the desktop background information for the proposed recipient sites to highlight preferred habitat areas for the *Gnomeskelus fluvialis*. A field assessment was undertaken by Scientific Aquatic Services in March 2018 to verify the condition of the preferred riparian forest habitat areas. Results from the field assessment concluded that the appropriate riparian vegetation forest conditions were still present in the area and notably downstream of the proposed Smithfield dam wall, but alien and invasive plant proliferation is present within these areas.

Pachnoda (2018) recommended that habitat types conforming to the above habitat structure form part of the proposed Biodiversity Offset and Compensation Initiative process for the Smithfield Dam. It was further recommended that it be investigated to determine whether the extension of the Impendle Nature Reserve boundaries southwards to the full supply level of the dam immediately north of the uMkhomazi River to increase the protection of the riparian forest habitat.

Protection of the preferred habitat for *G. fluvialis* will be implemented. This will be achieved with the help of existing programs such as Working for Water Program that will assist in clearing AIP simultaneously increasing work opportunities for the local community. Conservation areas should be demarcated in areas where high abundances of *Gnomeskelus spp.* are present as identified in Figure 21.

Millipedes and molluscs are potential candidates for relocation because of their high levels of endemism and linked to this their conservation status, but also because their low mobility means that they are more likely to remain in a new habitat provided it is able to support populations of the target species. Many millipede and mollusc species are relatively long lived, which means that relocation could make a contribution to sustaining population numbers even if habitat is lost.

According to Hammer (2017) the lack of scientific studies on relocation of millipedes and molluscs is probably because this is not perceived by conservation biologists as a beneficial activity in terms of biodiversity conservation – i.e. the habitat is still lost and the area of occupancy of endemic / threatened species is still reduced, even if the population size is maintained. This means that the threat status is not reduced by moving individuals from one area to another. However, as populations decline with the loss of habitat through increasing development, relocation may become the only option for terrestrial invertebrate species of conservation concern.

Funds will be made available to assist with synecological and autecological studies/research of *G. fluvialis* at a tertiary (e.g. universities) or statutory level (in liaison with Ezemvelo KZN Wildlife). Funding will also be made available for the taxonomic revision and the phylogenic relationship of Polydesmoid millipedes, with special mention of the genus *Gnomeskelus*.

10 BIODIVERSITY OFFSET AND COMPENSATION INITIATIVE ASSESSMENT OF AVAILABILITY AND ADEQUACY OF ACHIEVED TARGETS

Within the four (4) main target areas various farms were identified as potentially suitable offset sites. As far as feasibly possible contact details for the various landowners were obtained from Nemai Consulting, during the field work and as referrals from other landowners. All the identified landowners were contacted telephonically and informed about the proposed wetland and biodiversity offset requirements, the concept of the stewardship initiative to be set up with the DWS and informed that their property had been identified as a potential site. All telephonic conversations were followed up with an email which contained the following information:

4. The Background Information Document (BID), which included information on:
   a. Basic Background on the need for the Smithfield Dam;
   b. The EIA and WULA Process being undertaken by NEMAI Consulting (Pty) Ltd;
   c. Offset Requirements:
   d. Summary of Phase 2 of the Watercourse and Biodiversity study; and
   e. Contact details for SAS as well as NEMAI Consulting (Pty) Ltd.
5. Additional maps indicating identified wetlands and terrestrial CBAs of the target area within which their property is located;
6. A summary of possible benefits that could arise from the stewardship agreement.

Landowners were requested to confirm whether or not they would be interested in future engagement regarding such a stewardship. All responses were documented in the Landowner Engagement Report (Appendix M).

As previously discussed, anticipated losses of wetland, riparian and important terrestrial habitat (i.e. areas classified as CBAs by the KZN Biodiversity Spatial Planning Terms and Processes datasets) were ascertained during the various specialist assessments undertaken as part of the EIA process (please refer to Section 4.3 of this report). From there, the applicable national and provincial guidelines were consulted to obtain the recommended offset ratios for each habitat type (please refer to Section 2.2 for details of the various guidelines). To recap, the following ratios are applied by the various guidelines:

- The national guidelines published by the DEA in 2017 advocate a ratio of 30:1 for Critically Endangered ecosystems (e.g. the CBAs) and 20:1 for Endangered ecosystems;
- The EKZNW guidelines also advocate a ratio of 30:1 for Critically Endangered ecosystems and lower ratios (either 5:1 or 3:1) for less threatened ecosystems;
- The guidelines and calculation tool developed by Macfarlane *et al* (2016) for wetland offsets (considered to be a "best practice" guideline as far as wetland-specific offsets are concerned) advocates various ratios similar to those advocated by the DEA, but taking into consideration factors such as the PES and EIS of the impacted wetland system and quality of terrestrial buffers around the wetland system, the tool also provides various multipliers (ecosystem, regional and national context and local context) to obtain an appropriate offset ratio to calculate ecosystem conservation hectare equivalents. Thus, a ratio of 11:1 was calculated by the tool for the wetland offsets (please refer to Section 4.1 for detailed calculations);
- In the absence of guidelines pertaining to riparian habitat offset ratios, previous similar studies were consulted (e.g. the biodiversity offset study undertaken by the Institute of Natural Resources for the Spring Grove Dam in 2013) for guidance. Based on the precedent set by that study, a 1:1 "like for like" ratio was utilised to determine the offset required for the loss of riparian habitat associated with the uMkhomazi River, arising from the construction and first impoundment of the proposed Smithfield Dam.

Taking the above into consideration, the following offset ratios were <u>initially</u> determined for the various ecosystems which will be impacted by the proposed development:

- 30:1 for areas designated as "CBA Irreplaceable";
- 20:1 for wetlands (subsequently reduced to 11:1 by the wetland offset calculator);
- 5:1 for areas designated as "CBA Optimal"; and
- 1:1 for riparian habitat.

Due to the magnitude of the wetland offset it was deemed unlikely that the project would achieve the recommended ratio of 20:1, or even 11:1 as calculated by the wetland calculator. Therefore, it a reduced offset ratio of 5:1 for wetland habitat only was defined as the minimum objective, in order to significantly increase the chances of a viable, successful Biodiversity Offset and Compensation Initiative. This wetland offset ratio (i.e. 5:1) is almost double that of the precedent set by the Spring Grove Dam biodiversity offset programme and in the opinion of the biodiversity offset specialist will greatly increase the ability of the proponent to implement a successful offset, thus having a greater long-term benefit to the receiving environment.

In the context of this biodiversity offset study and taking the above into consideration, the following offsets would be required:

Table 26: Summary of offset requirements using relevant national and provincial guidelines.

Wetland habitat: Offset Ratio 20:1 advocated by DEA (2017) and DEA&DP (2011)		
Dam	**Habitat loss (Hectares)**	**Offset target (hectares)**
Smithfield Dam	55	1100
Langa Dam	44	880
Mbangweni Dam	59	1180
Riparian habitat: Offset Ratio 1:1		
Smithfield Dam	17 km	17 km
CBA 'Irreplaceable' habitat Offset Ratio 30:1 as advocated by EKZNW (2013)		
Smithfield Dam	29.45	883.5
Langa Dam	14.76	442.8
Mbangweni Dam	15.59	466.8
CBA 'Optimal' habitat Offset Ratio 5:1 as advocated by EKZNW (2013)		
Smithfield Dam	129.22	646.1
Langa Dam	N/A	
Mbangweni Dam	N/A	

It is clear from the above that, should the respective national and provincial guidelines be followed, extensive tracts of land would need to be secured and, importantly, protected from future development to meet the offset requirements. This is deemed an excessively onerous responsibility for the proponent, and the inherent risks associated with securing and protecting such extensive areas, particularly of wetland habitat, are considered unacceptably high and will most likely lead to failure of the Biodiversity Offset and Compensation Initiative.

With regards to the wetland offsets for Smithfield and Langa Dams specifically, an offset ratio of 11:1 as derived from the wetland offset calculator (Macfarlane, 2016) was deemed ambitious, but potentially achievable if sufficient landowners agree and commit to participation in the Biodiversity Offset and Compensation Initiative. However, should the Mbangweni Balancing Dam be approved instead of the Langa Balancing Dam, even a ratio of 11:1 is not realistically achievable.

It should however be noted that whilst the targets described above are considered unrealistic in terms of wetland offsets, based on analysis of CBAs as indicated by the KZN Biodiversity Spatial Planning Terms and Processes datasets, not only can terrestrial biodiversity targets be achieved, but potentially, these targets can be exceeded (please refer to Table 27 below).

It should be noted that the extent of potentially available wetland and riparian habitat was determined based on the delineations derived during the study as described in Appendix G of this report, whilst terrestrial CBA habitat was determined using available datasets, as described in Appendix J.

As part of the biodiversity offset study, landowners within the target recipient sites were consulted to determine the degree of willingness to participate in the Biodiversity Offset and Compensation Initiative in the form of a Stewardship Programme (please refer to Appendix M for details of this process). Since contact details were not available for all landowners within the target recipient sites at the time of the study, and some landowners could not be reached, approximately 50% of all landowners within the recipient sites were contacted, including the Department of Rural Development and Land Reform, which owns the majority of farm portions within the Smithfield 2 target recipient site. Of the landowners who were contacted, approximately 45% have indicated their willingness in principle to participate in such a programme. By overlaying the delineated watercourses and terrestrial CBA datasets on the farm portions belonging to those landowners who have indicated a willingness to participate, the extent of wetland and CBA habitat which is likely to be realistically available to achieve a successful offset was estimated.

Based on the above information, the following was determined:

- The overall target of 84.7 wetland functional hectare equivalents (based on an offset ratio of 11:1, and as calculated for the Smithfield and Langa Dams only) can realistically be achieved, and exceeded by 13.3 wetland functional hectare equivalents;
- The overall target of 920.8 wetland ecosystem conservation hectare equivalents will not be met, and will fall short by 281.6 wetland conservation hectare equivalents;
- Offset targets for CBA Irreplaceable and CBA Optimal habitat for both the Smithfield and Langa Dams can potentially be exceeded.

The tables below provide detailed summaries of the above discussions. In consideration of the shortfall of wetland ecosystem conservation hectare equivalents, it is once again highlighted that an offset ratio of even 11:1 is considered from a practical implementation point of view, unrealistic and unachievable. Therefore, it is strongly recommended that the competent authority give due consideration to reducing the offset ratio to 5:1 for wetland habitat only, in order to significantly increase the chances of a viable, successful Biodiversity Offset and Compensation Initiative. This offset ratio is almost double that of the precedent set by the Spring Grove Dam biodiversity offset programme and in the opinion of the specialist will greatly increase the ability of the proponent to implement a successful offset, thus having a greater long-term benefit to the receiving environment.

It is important to note than an additional landowner within the ideal areas identified for offsets, and in the vicinity of the Impendle Nature Reserve, has indicated late interest in the project which would add approximately 1900 ha of offset land to the project. This is being explored further and will be included in the final submission to the DEA. It is deemed possible that additional landowners can be onboarded in future phases of the project.

Table 27: Summary of wetland and riparian losses, offset requirements, and achievements.

Dam	Loss (ha)	Required (20:1)	Required (Macfarlane 2016) (11:1 Ecosystem Conservation)		Desktop post Ground-truthing (11:1)		Willing landowners (11:1)		Shortfall (based on Macfarlane, 2016)		Percentage of target achieved	
			Functional HaE	Conservation HaE	Functional HaE	Conservation HaE	Functional HaE	Conservation HaE	Functional HaE	Conservation HaE	Functional HaE	Conservation HaE
Smithfield	55	1100	49.5	538.8	105.2	848.2	54.6	431.9	**5.1**	**-106.9**	110.30	80.16
Smithfield (RIPARIAN)	68	NA	NA		NA		NA		**NA**		100.00	
Langa	44	880	35.2	382	62	293.5	43.4	207.3	**8.2**	**-174.7**	123.30	54.27
Mbangweni	59	1180	47.2	513.3	62	293.5	43.4	207.3	**-3.8**	**-306**	91.95	40.39
TOTAL*	**99**		**84.7**	**920.8**	**167.2**	**1141.7**	**98**	**639.2**	13.3	-281.6	**115.70**	**69.42**
ACHIEVEMENT RATIO	**NA**										15.7	-30.6

*Excluding Mbangweni Balancing Dam

Table 28: Summary of CBA losses, requirements, and achievements.

Dam	CBA Type	Loss	Ezemvelo Ratios (30:1 Irreplaceable) (5:1 Optimal)	Recommended by Specialist (exceeds target)	Total potential available (Desktop)	Willing landowners	Percentage of Target Achieved
Smithfield Dam	Irreplaceable	29.45	883.5	382.85	837.04	2969.57	336
	Optimal	129.22	646.1	1421.42	2513.33	3291	509
Langa Dam	Irreplaceable	14.76	442.8	501.84	1737.52	640.883	145
	Optimal	0	0	0	44.74	16.4142	NA
Mbangweni	Irreplaceable	15.59	467.7	530.06	1737.52	640.883	137
	Optimal	0	0	0	44.74	16.4142	NA

11 BIODIVERSITY OFFSET IMPLEMENTATION PLAN

11.1 *General Management and guiding principles*

Following on from the evaluation of the proposed recipient areas in terms of the ecological condition of the watercourses and grasslands therein, as well as determining the extent and suitability of these natural resources, an Implementation Plan was developed to guide the practical application of the Biodiversity Offset and Compensation Initiative. This Implementation Plan is applicable to the freshwater, CBA/grassland and Species of Conservation Concern aspects of the initiative and includes (but is not limited to): alien vegetation control measures, general rehabilitation recommendations, anticipated budgets to implement the rehabilitation measures, monitoring and auditing requirements. This section thus aims to guide the practical roll out and implementation of the proposed Biodiversity Offset and Compensation Initiative.

The Implementation Plan provides a technical framework to all parties involved in the roll-out, practical implementation and authorisation process of the proposed Biodiversity Offset and Compensation Initiative. Additionally, it seeks to improve the Present Ecological State (PES) of the identified freshwater resources and grassland areas through management and rehabilitation, with the aim of achieving an overall biodiversity “net gain” in the local area.

11.1.1 Institutional Arrangements

Implementation of the offsets needs to take place within a well-structured governance framework that clearly defines roles, responsibilities, targets and outcomes, as well as the source and use of finances and processes for decision making and reporting. This section aims to define the most appropriate processes and mechanisms to facilitate and support the various role-players in undertaking their responsibilities in a transparent and efficient manner. The DWS does not have the necessary in-house skills and capacity, or mandate, either to implement or undertake the ‘day to day and practical management of the offset sites. The options discussed in this section therefore aim to utilize the most appropriate organizations in terms of their mandate, skills and capacity for undertaking specific aspects of offset implementation, building on existing initiatives and relationships. The institutional arrangements presented for this offset program are based largely on those proposed for the Spring Grove Dam (Cox & Brownlie, 2015) which are visually presented in the figure below and with extensive use of the institutional governance as proposed by (Cox & Brownlie, 2015) proposed for the uMWP-1 project and presented below.

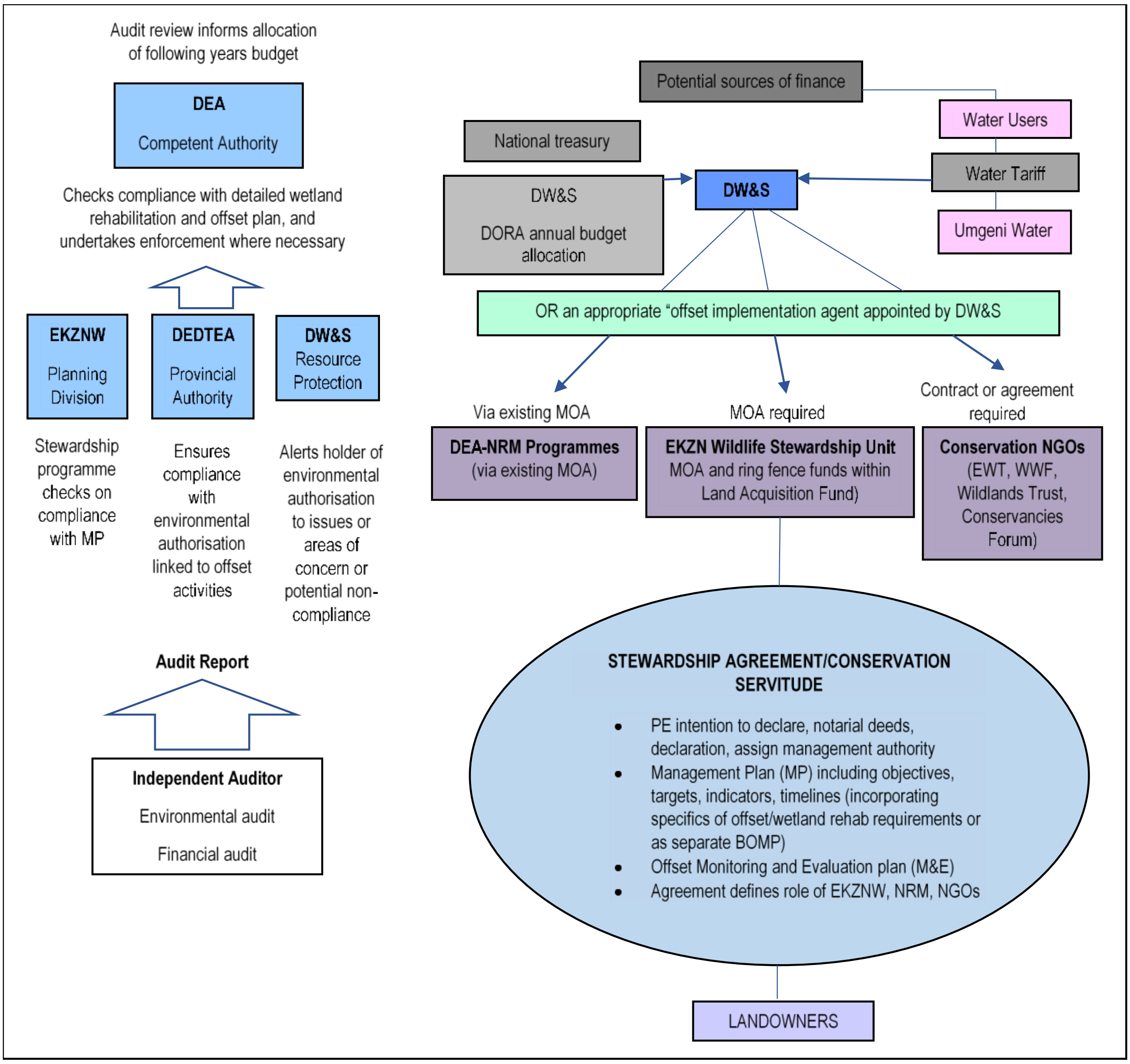


Figure 22: Flow Diagram Presenting proposed institutional arrangements and stakeholders (adapted from Cox & Brownlie, 2015).

11.1.1.1 Funding Model and Sources of Funding

Historically, the costs associated with significant residual impacts of large projects on the environment were not accounted for in the development costs and were effectively transferred to society as externalities e.g. loss of ecosystem services. Offsets provide a mechanism for internalizing these costs and thereby accounting for the 'full cost' of the project. To do so however, requires that these costs are known and included in the capital budget of the project as well as defining the ongoing management costs include consideration of the Biodiversity Offset and Compensation Initiative programs. As the applicant and holder of the environmental authorisation, the DWS will be legally responsible for satisfying its conditions regarding wetland rehabilitation and biodiversity offsets (i.e. securing and managing these offsets, with associated financial provision).

In the case of uMWP-1 project, taking into account the 'polluter or environmental degrader pays principle' in NEMA, the offset costs must be included in both the capital budget for the project and/or transferred to water users via the water tariff during the operational phase of the project (applying a 'user pays' principle). The appointed implementing and managing agent (Potentially Umgeni Water) for DWS, has a contractual responsibility to meet the conditions of EA which could become burdensome and it is important that these costs are understood upfront.

The two fundamental costing options available are:

1. **DWS allocation from National Treasury:** This option would mean that a portion of the budget allocated to the DWS could be reserved each year according to the calculated projections of offset costs and re-directed to an appropriate agency tasked with the implementation of the Biodiversity Offset and Compensation Initiative activities; and
2. **Adjustment of the Water Tariff:** The tariff for water can be passed to downstream users. Depending on the magnitude of the cost in the tariff to cover offset requirements, this option could be contentious. The degree to which there is resistance to this option depends on the implications it has for the tariff i.e. if the increase is negligible over an extended period then it may be acceptable. Pursuing this option requires that the implications (increase) to the tariff from the offset are accurately calculated in the detailed planning phase.

Combinations of the above two options can also be investigated to ensure an appropriate and sustainable outcome.

It would be essential for the funds transferred by DWS to offset implementing agents to be ring fenced explicitly for specific offset actions or tasks within appropriate financial vehicles and systems, so that their expenditure can be clearly traced and audited. An annual audit of the transfer of funds from DWS for the purposes of rehabilitation, offsets and compensation initiatives, as well as of expenditure of these funds, will be required. The ability to undertake such an audit requires that clear structures and accounting systems are set up to trace the flow of funds between organizations and track expenditure against planned activities. The allocation of finance for successive years would be reliant on the outcomes of the audit from the preceding years.

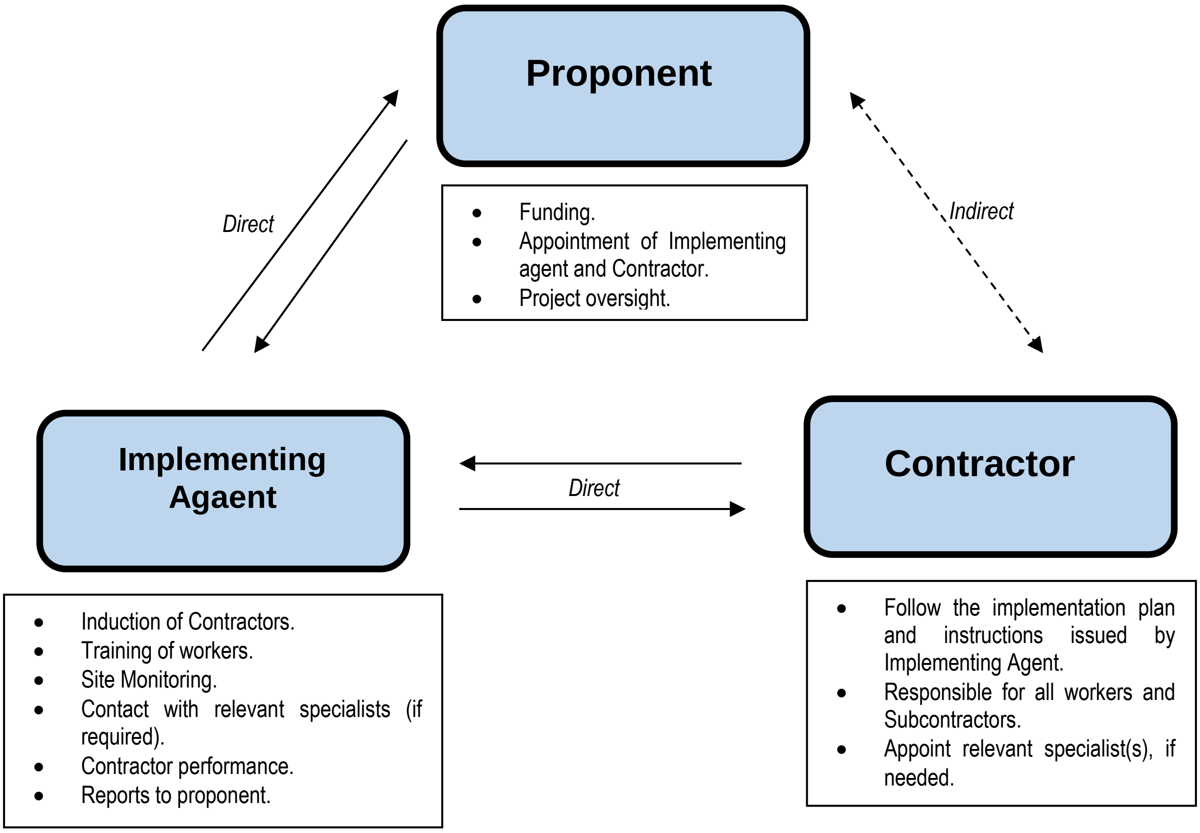
11.1.1.2 Management and Implementation Structures

DWS will be the holder of the EA and thus responsible for meeting the wetland rehabilitation and offset conditions. However, conservation is not the core function of this department, and there are other government departments, agencies and programmes which are mandated to and focus is better suited to the design and implementation of wetland rehabilitation and offsets. They include the DEA's NRM programmes, which comprise Working for Water, Working for Wetlands, Working on Land and Working on Fire. These programmes plan, design and undertake rehabilitation of natural systems. Similarly, the EKZNW Stewardship Programme is responsible for facilitating and securing the long-term management of biodiversity on private land through the various mechanisms including stewardship. There are also various conservation NGOs and consultants that work with both the NRM programmes and the EKZNW Stewardship unit in undertaking NRM activities and facilitating land being entered into the stewardship programme. Importantly, however, the involvement of these organizations in undertaking rehabilitation and offset work on behalf of DWS requires the transfer of adequate funds from DWS to cover the costs of these activities. Certain elements will need to be in place to facilitate the transfer of funds between DWS and offset implementing agents, and to trace and audit expenditure.

Memoranda of agreement or other binding agreements will need to be developed between the DWS and implementing agent/s such as the DEA Natural Resource Management (NRM), the EKZN, NGOs and their associated sub-programs to be implemented for the UMWP-1. These MoA will enable the relevant programmes to undertake resource management on behalf of DWS on the condition that DWS provide the necessary funding.

11.1.2 Roles and Responsibilities on the Ground

The following roles and responsibilities are applicable to this implementation plan and associated management actions:



11.1.2.1 Proponent

- The proponent must ensure sufficient funding for the implementation and long-term maintenance of the mandated rehabilitation requirements as stipulated in this report;
- The Proponent may opt to enter into a stewardship or partnership programme to sustain long-term management and funding;
- The Proponent will be responsible for the appointment of an Implementing agent to monitor and audit the rehabilitation requirements as well as the Contractor performance;
- The Proponent will be responsible for ensuring all Contractors receive a copy of this document and understand its contents;
- The Proponent/ Implementing agent must ensure that that suitable penalties are in place for non-conformance of the conditions of the Water Use Licence as well as this Implementation Plan by the Contractor(s); and
- Should ownership of the property change, the role and responsibility for compliance with this Implementation Plan as well as long-term maintenance must also be transferred.

11.1.2.2 Implementing Agent

The Implementing agent is the entity or are the entities responsible for the implementation monitoring and auditing of the implementation plan both during rehabilitation and post-rehabilitation for phases of the offset. The Implementing agent is mandated to do the following:

- Ensure that all Contractor(s)/ Sub-contractor(s)/ employees are fully aware of their environmental responsibilities and the sensitivities of the site. This should take the form of an initial environmental awareness-training program in which requirements of this document will be explained;
- Monitor site activities on a regular basis to ensure that there is minimal unintended environmental impact to the surrounding areas as well as the areas to be rehabilitated;
- The Implementing agent should have all relevant contact details for the team responsible for implementation of this plan and any rapid response units, as needed, as well as details of the relevant specialists who developed the rehabilitation and implementation plans;
- Ensure that a 'hotline' exists for reporting incidents, specifically unplanned/uncontrolled fires breaking out and resolving any problems rapidly;
- Conduct all audits in line with the relevant authorisation requirements and a review of management and rehabilitation measures; and
- Compile all relevant technical and financial management reports and documentation (see Sections 11.1.9, 11.2.5 and 11.3.5 for further details of all required monitoring).

11.1.2.3 Training of Rehabilitation Workers

The Implementing agent is to facilitate an initial environmental induction to all Contractors and associated workers in environmental awareness, including minimisation of disturbance to areas of increased ecological sensitivity, as well as fauna and flora with a no poaching policy, management of waste and prevention of water pollution. Furthermore, the Implementing agent is to ensure that all operational workers have received basic training on fire management and prevention measures and be aware of any emergency protocols required.

Contractor Performance

The Implementing agent must ensure that the Contractor adheres to the conditions of this Implementation Plan. Should the Contractor require clarity on any aspect of this Implementation Plan, the Contractor must contact the Implementing agent directly, who, if needed can consult with the specialists involved in Phases one (1) through three (3) of the Biodiversity Offset Plan. Should the Implementing agent feel that the conditions of the environmental authorisation (for the proposed expansion project) or of this implementation plan are not being met by the Contractor(s), the Implementing agent has been given the authority by the Proponent to stop works if in his/her opinion there is/may be a serious threat to or impact on the surrounding environment and instruct the contractor(s) on suitable rectification and remediation actions that must be implemented immediately.

11.1.2.4 Contractors

- The Contractor(s) in this case refers to any Contractor(s) on site, including the sub-contractors associated with the rehabilitation of the identified areas only;
- The Contractor is to report directly to the Implementing agent; and
- It is the responsibility of the Contractor(s) to ensure that they adhere to this implementation plan as well as any mitigation measures instructed by the Implementing agent.

11.1.3 Biodiversity Offset and Compensation Initiative Budget

For any conservation initiative to be successful, adequate funding needs to be put in place to ensure follow through of the project. A budget estimate was developed considering six key aspects of the Biodiversity Offset and Compensation Initiative as presented below:

- Development of MOUs between the stewardship group and the various land owners as well as ongoing management of the Stewardship Programme, Biodiversity Offset and Compensation Initiative;
- Budgetary requirements for the riparian vegetation restoration initiative;
- Budgetary requirements for the wetland offset and watercourse restoration initiative;
- Budgetary requirements for the Grassland and CBA offset and watercourse restoration initiative;
- Budgetary requirements for the Species of Conservation Concern Compensation initiative, including:
  - *Gnomeskelus fluvialis* (Riverine Keeled Millipede) rescue and relocation (should further specialist studies locate populations of this species);
  - Planting of *Protea caffra* (Food source *for Capys penningtoni* – Pennington's Protea Butterfly); and
  - Research, habitat rehabilitation and conservation management for *Hirundo atrocaerulea* – Blue Swallow.

A budget estimate was developed considering both initial planning work and specifically the development of specific grazing and fire management plans per offset recipient site. Budget was then allocated to initial site preparation work including but not limited to:

- Alien and invasive species removal;
- Removal of waste and rubble;
- Bank re-sloping and stabilisation;
- Re-sloping and erosion intervention in grasslands;
- Preparation for revegetation; and
- Revegetation.

A budget estimate was developed considering the cost to develop the Biodiversity Offset and Compensation Initiative as well as to provide budget to facilitate the implementation thereof. It must be noted that the budget is prepared to feasibility level only. Budget was also provided for maintenance of the proposed Rehabilitation and Management Guidelines with specific mention of follow-up alien vegetation control and revegetation for a period of three (3) years. It must, however, be noted that budget for overall ongoing management and maintenance has been estimated for a period of 30 years. In addition, budget has been defined for ongoing monitoring most applicable to each of the aforementioned species of conservation concern. Furthermore, budget has also been defined for specific research largely based on recommendations by the relevant faunal specialists.

It is estimated that **R40, 476,435 (Incl VAT).** Will be required to provide for the compensation for impact on these species in addition to the **R76, 030,500 (Incl VAT)** budget for grassland and wetland rehabilitation and offsetting (**Budget for initial works and 3 years of monitoring and maintenance only**) and management of the Biodiversity Offset and Compensation Initiative for a 30 year period. The total budget for the Biodiversity Offset and Compensation Initiative is thus **R150,000,000 (rounded and Incl VAT).** The table below provides further detail in this regard. It should also be noted that should further specialist studies determine that the Riverine Keeled Millipede does not occur within the proposed Smithfield Dam FSL footprint and/or that Pennington's Protea Butterfly will not be affected, no compensation will be required and therefore the associated budget will be redirected to the other aspects of the offset.

Table 29: Budget Summary for the Biodiversity Offset and Compensation Initiative.

BUDGET COST ESTIMATE AS FOR THE IMPLEMENTATION OF THE BIODIVERSITY OFFSET AND COMPENSATION INITIATIVE FOR THE UMKHOMAZI PHASE 1 PROJECT	
BIODIVERSITY OFFSET AND COMPENSATION - IMPLEMENTATION COST SUMMARY	
REVISION 0	**May 2018**
DESCRIPTION	**TOTAL (incl VAT)**
Development of MOU's and management	17,787,797.50
Riparian Vegetation restoration	R15,448,496.25
Wetland Offset program	R37,848,958.13
Grassland Offset Program	R38,181,532.95
Protea Caffra compensation for *Capys penningtoni*	R5,082,770.00
Blue Swallow compensation (*Hirundo atrocaerulea*)	R29,307,750.00
Riverine Keeled Millipede Compensation (Gnomeskelus	R6,085,915.00
Total	**R149,743,219.83**

11.1.4 Implementation Plan Process Overview

The Implementation plan is based on a five – step approach, which includes:

Step 1
Planning

→ Initial planning before rehabilitation activities, including AIP clearing.
Continue through all phases.

All plans and authorisations must be in place prior to commencement of the rehabilitation activities. This includes but it not limited to:

- Obtaining all required authorisations and permits;
- Appointment of an implementing agent and Contractors;
- Planning for on-site requirements; and
- Timeframes and budgetary allowances.

Step 2
Rehabilitation of wetland

→ Wetland re-sloping to be undertaken during the drier winter months (May to August).

The rehabilitation of the watercourses and grassland areas within the identified potential recipient sites will enhance the service provision of the watercourses through:

- Re-sloping of embankments, where deemed necessary in order to decrease the risk of erosion;

- Repair of erosion and bank incision (thus restoring flow patterns, improving instream habitat and reducing sedimentation of downstream areas);
- Removal of waste materials and rubble, thus restoring natural flow patterns; and
- Removal of weeds and AIPs.

Step 3 Weed and AIP Clearing	→	Timing may be species specific, but in general during spring/early summer (September to January) during the growing season, but prior to seeding of plants.

During rehabilitation activities, in particular concurrently with activities such as re-sloping of embankments, removal of alien vegetation should take place, as this will increase the success of indigenous vegetation re-establishment. This will include:

- Mechanical removal of all large stems (focus mainly on any NEMBA listed species);
- Chemical treatment of AIPs (taking care not to contaminate surface water);
- Burn stacks and controlled burn conditions; and
- Removal of plants that are not burnt.

Step 4 Re-vegetation	→	Hydro-seeding and planting of graminoid species to take place in late spring/early summer (September/October) shortly before the onset of summer rains

The re-vegetation of the rehabilitation areas will commence on completion of any required re-sloping and removal of all AIPs. Only indigenous vegetation species may be reinstated. Ascertaining and implementing sustainable grazing practices in co-operation with the communities who utilise the offset site are included in this step.

Step 5 Monitoring and Auditing	→	Throughout rehabilitation activities as well as post rehabilitation monitoring.

Ongoing monitoring and auditing of all rehabilitation and IAP clearing will be required throughout and following completion of these activities. A list of monitoring and auditing requirements is provided to maximise success of the rehabilitation.

These steps will be expanded upon in greater detail in the sections that follow.

11.1.5 Step 1: Planning

Before rehabilitation activities can commence all necessary permits and authorisations will be required, including but not limited to:

- Water Use Authorisation for all rehabilitation activities (Section 21 c and i of the National Water Act);
- Approvals for work in sensitive habitats such as primary grassland, CBAs and watercourses in terms of NEMA; and
- Burning permits for AIP clearing (if stack burning is to be utilised);

Whilst it is not deemed essential (or practical) to declare the potential recipient sites as Nature Reserves, it is strongly recommended that where feasible insofar as landowner co-operation and legal requirements allow, conservancies and stewardship areas be designated in order to afford a level of protection to the watercourses and rehabilitated grasslands from future development. As a minimum, Biodiversity Management agreements need to be entered into

11.1.5.1 Appointment of a Contractor and all required specialists

During the planning phase certain aspects need to be considered in order to effectively implement this plan. This includes:

- Appointment of a suitably qualified Contractor(s) to undertake the required work:
- Appointment of an implementing agent to audit and monitor the rehabilitation activities as well as to undertake the required post rehabilitation monitoring;
- Should the Contractor not have the appropriate expertise for implementation of this plan then it is the responsibility of the Contractor to appoint a suitably qualified specialist ecologists to manage and oversee the implementation.

11.1.5.2 Planning for on-site requirements

The following objectives and control measures must be implemented as part of the planning phase.

Table 30: Relevant Objectives and Control Measures to be implemented as part of the planning phase

Objectives or requirements	Control Measures
Control Site Establishment and Access	➢ Access control for the potential recipient areas must be implemented for all vehicles to ensure that no unauthorised persons are onsite. This must be carried out in conjunction with the respective landowners or tenants of each property, to ensure that landowner/tenant rights are respected at all times; ➢ Wetland and riparian zone boundaries must be clearly demarcated with temporary fencing in or near areas of active work, and no personnel or vehicles are to be permitted to enter demarcated wetlands or riparian zones unless essential;

Objectives or requirements	Control Measures
	➢ Each rehabilitation area should be demarcated with danger tape prior to commencing rehabilitation activities; in order to control access and ensure that rehabilitation activities occur in the correct area ➢ With regards to watercourse rehabilitation it is essential that activities start upstream, and proceed downstream, in order to minimise impacts on downstream portions of the watercourses; ➢ Adequate signage (in the appropriate languages commonly spoken in the area) must be placed around the planned rehabilitation areas; ➢ Dedicated rehabilitation camp, laydown areas and parking area for vehicles must be located away from all identified sensitive areas; and ➢ All access roads to the relevant rehabilitation areas must be planned and demarcated. Use of existing roads must be favoured.
Indigenous plant harvesting and propagation	➢ It is strongly recommended that an on-site nursery be established at a central location close to the potential recipient sites for the purposes of propagating plants for the rehabilitation process. The nursery can also be utilised for rescue and relocation purposes prior to construction of the proposed dams, and those plants then utilised during the rehabilitation process. The establishment of a nursery could potentially provide a community skills development project or employment opportunities for members of the communities close to Smithfield Dam; ➢ Further to the above, it is recommended that grass seed within each of the potential recipient sites be undertaken, to be utilised during the revegetation stage of the rehabilitation process. This would need to be planned to coincide with the flowering season (usually mid to late summer). This activity could also form a part of an appropriate community upliftment project; ➢ It is the responsibility of the Contractor to liaise with and appoint a service provider to carry out hydroseeding, should this be necessary. In the same vein, it is the contractor's responsibility to liaise with relevant nurseries regarding available plant species and/or propagation of required species if additional plants are required. If the Contractor does not have the expertise to undertake such interactions, then they will be responsible for appointing a suitably qualified botanist to oversee this requirement; ➢ Availability of species / seeds / hydroseeding service provider needs to be secured before rehabilitation activities commence to ensure that plants are ready and available for re-vegetation (Step 4), so as not to leave areas exposed and vulnerable to erosion and incision; and ➢ Specific attention must be given to the nursery requirements for the propagation of Protea caffra in support of C*apys penningtoni.* Refer to section 11.4.2.
Alien and Invasive Plants	➢ Due to the extent of AIP proliferation within the potential recipient sites, it is crucial that AIP control planning takes place prior to commencement of other rehabilitation activities. It is suggested that AIP clearing takes place concurrently with the other rehabilitation measures outlined in this report; ➢ A period contract must to be established to allow for annual maintenance and removal of newly germinated plants for a minimum period of three years following rehabilitation. Long-term AIP control must be secured, as the success of the entire program will depend on it; ➢ Cost calculations must be performed for each area and addressed according to priority. Please refer to the relevant sub-sections within Section 10 of this report for the anticipated budgetary requirements for each aspect (wetland/watercourse and CBA/grassland); ➢ Timetables should be created for the control operations. Care must also be taken to include time when operations fall behind due to unfavourable weather conditions or labour strikes; ➢ The areas to be cleared must be divided into specific control areas through the use of man-made or natural boundaries to specify specific areas e.g. roads, fences. Each area must be numbered to simplify record keeping; ➢ A once-off detailed AIP survey must be performed within each rehabilitation area prior to the commencement of rehabilitation activities in which the following information must be recorded: • AIP species that are present during the survey and their specific growth form e.g. herb, shrub and trees, including any coppice present; • Density of infestation must be recorded in an estimation of percentage (%) cover: o 0-5% :Scattered infestation o 5-25% :Sparse o 25-50% :Medium

Objectives or requirements	Control Measures
	o 50-75% :Dense o 75-100%: Very dense. • Should the Contractor and/or the implementing agent not have the expertise to identify and mark the AIPs, it is the responsibility of the Contractor to appoint a suitably qualified botanist to assist.
Rehabilitation Plans	➢ All watercourse rehabilitation work (Step 2, Section 10.2) must be scheduled to commence during the drier winter season to limit the impact on the watercourses and associated riparian zones. Timeframes must thus be properly planned. ➢ Water will need to be made available for irrigation purposes for the first season after indigenous vegetation has been planted. It is recommended that all planted specimens be watered during the first summer.
Unplanned Fire Management	➢ Unplanned fires can occur within the potential recipient sites and surrounds, particularly during winter. Thus, preventative measures should be implemented by the proponent in order to reduce the likelihood of fires. This includes: • Restricted access to vulnerable areas; and • Awareness - Contractors working on site must be made aware of how their actions may result in the ignition of wild fires and must be adequately prepared to suppress any fires that may start whilst they are working. Informational signage around the recipient site should be erected to promote vigilance and reporting of veldfires, and to indicate that no fires are to be permitted outside of designated burn sites. Such burn sites must not be within the delineated wetland boundaries.

11.1.6 Step 2: Rehabilitation

Restoration of both aquatic and terrestrial ecosystems which have been impacted upon as a result of anthropogenic activities is a means by which to mitigate and minimise further ecological deficits and, where relevant, associated economic losses (Cooke, 1999). However, full restoration of an ecosystem infers “a return to pre-disturbance conditions and relies on historic landscapes or ecosystems as models…it implies complete recreation of a system equivalent to the model” (Cooke, 1999). Restoration, according to Cooke (1999) is valuable as an ideal, however, in “most cases, it is impractical, uncalled for, or even impossible.” Thus, rehabilitation of affected ecosystems, defined by Cooke (1999) as the “repair and replacement of essential ecosystem structures and functions in the context of ecoregional attainability in order to achieve specified objectives” will be the core focus of the Biodiversity Offset and Compensation Initiative. The aims of the rehabilitation process as it relates to wetland/riparian ecology, to improvement of the grasslands and species-specific compensation activities within the potential recipient sites, is discussed in greater detail in Sections 10.2 to 10.4 respectively. However, there are general “good housekeeping” and rehabilitation measures common to all aspects of the proposed rehabilitation of both watercourses and grasslands. These are summarised in the table below and must be implemented in conjunction with environment-specific measures stipulated in Sections 10.2 to 10.4.

Table 31: Rehabilitation and control measures to be implemented with rehabilitation of wetlands.

Objective/ Requirement	Control Measures
Indigenous Vegetation	➢ Where possible, any indigenous vegetation, specifically any endangered species, should be rescued prior to the commencement of any earthworks (either associated with the construction of the proposed dams, or during embankment re-shaping as part of rehabilitation measures) and housed at a dedicated nursery, for re-instatement during the revegetation stage (Step 4); ➢ Should the Contractor not have the expertise to identify and rescue such species, they will need to appoint a suitably qualified botanist to assist in order to ensure that plants are harvested correctly for maximum survival; and ➢ Any permits that may be required for the rescue and harvesting of these species should be in place prior to any earthworks.
Earthworks	➢ All rehabilitation work should be done during the drier winter months (May to September) to reduce contamination of surface water, increased sedimentation and erosion; ➢ Footprint areas for equipment must be kept as small as possible to reduce unnecessary disturbances of soils and vegetation; ➢ Where necessary steep banks should be re-sloped to prevent erosion, specifically: • Embankments to be re-sloped to a maximum of a 1:3 ratio with a 1:4 ratio considered more appropriate; • Any topsoils moved during re-sloping activities should be stockpiled and re-instated after re-sloping as indigenous vegetation seeds will be present within the soil.
Erosion prevention and topsoil management	➢ Any area where active erosion is observed must be immediately rehabilitated in such a way as to ensure that the surface hydrology of the area is re-instated to conditions which are as natural as possible, and that preferential surface flow paths do not form; ➢ Actions to be taken to prevent any further erosion from occurring within the rehabilitated areas are as follows: • Re-vegetating the disturbed and rehabilitated areas (Step 4 below); • Stabilise the soil through the use of geotextiles, especially effective with growing vegetation; and • Apply a layer of mulch to the rehabilitated areas to allow the soil to slowly soak up the water and reduce the impact of rain on bare soil.
Stormwater Management	➢ Storm water management systems must be put into place prior to vegetation clearing; ➢ Storm water must be managed within the area; ➢ Management measures should include berms, silt fences, hessian curtains, pebbling and that stormwater be diverted away from areas susceptible to erosion. Care must be taken to avoid additional disturbance during the implementation of these measures; and ➢ Re-profile the disturbed areas as soon as work has been completed, to ensure that runoff and stormwater drains into the soil.

11.1.6.1 CBA grassland rehabilitation and Species-Specific Compensation Activities

Successful rehabilitation depends upon conceptual planning, research and design flexibility. The key objectives of the grassland and species-specific compensation activities are to:

- ➢ Meet the requirements of relevant local and regional authorities;
- ➢ Contribute towards meeting local and provincial grassland and species of conservational concern conservation targets;
- ➢ Manage the compensation activities to maintain and/or improve ecological integrity of the identified recipient sites;
- ➢ Maximise the ecological functioning of the identified grassland that will be rehabilitated;
- ➢ Ensure continued dominance of indigenous floral species within the identified rehabilitated areas;

- Implement sound fire, grazing and alien vegetation control management plans, as to improve the grasslands present ecological state;
- Cultivate *Protea caffra* that will be lost due to the construction of the dam;
- The riparian forest habitat, preferred habitat for *Gnomeskelus fluvialis* (Riverine Keeled Millipede), will not only be conserved but through programs such as Working for Water the condition of these forest areas will be improved;
- Manage grasslands and create additional habitat for Hirundo atrocaerulea (Blue Swallow);
- Control of alien and invasive vegetation, to improve the grasslands and possibly increase preferred habitat for species of conservational concern;
- Detail specific actions deemed necessary to assist in mitigating the potential environmental impact on the rehabilitated grassland areas;
- Evaluate and monitor the rehabilitated areas throughout the rehabilitation process and thereafter; and
- Minimise further adverse impacts on the identified grassland and preferred Species of Conservational Concern preferred habitat areas. For further detail refer to Section 11.4 below.

11.1.7 Step 3: AIP Clearing

Alien floral species were encountered throughout all four potential recipient sites, both within freshwater and terrestrial ecosystems, including *Acacia mearnsii* (Black Wattle)*, A. dealbata* (Silver Wattle), *Rubus cuneifolius* (American bramble), and *Solanum mauritanium* (Bugweed). Both *Acacia* species are Category 2 species under the NEMA Alien and Invasive Species Regulations (2014), whilst *S. mauritanium* and *R. cuneifolius* are Category 1b species under the same regulations.

Under these regulations, Category 1b species must be removed and destroyed as they have high invasive potential. In addition, the removal of such species allows for the re-establishment of indigenous flora, reinstatement of natural hydraulic processes and increased faunal habitat availability

AIP control can be divided up into two phases, namely:

- The initial control phase whereby AIPs are removed from the rehabilitation areas; and
- The follow-up control whereby AIPs (coppice, saplings, and seedlings) within the rehabilitation areas are controlled. The follow-up control must be done for a minimum of three (3) times a year during the growing season (September – April) for the first three (3) years and thereafter a minimum period of four (4) years on an annual basis

to ensure that new AIP infestation does not occur within the rehabilitated areas, after which the follow-up period should be re-assessed based on the need.

The following definitions are applicable to this section:

Hand Pull	Saplings and seedlings must be pulled out by hand. All root material should be removed to avoid re-sprouting of the plant.
Frill	The technique whereby an axe or cane knife is used to chip/cut around the base of a tree (±2mm deep) in order to place herbicide into the cuts (cutting not to be so deep as to ringbark). Herbicide to be applied within 30 minutes from frilling.
Ringbark	Removal of a ring of bark at least 25cm wide and pull down to just below ground level. Ring barking interferes with the circulation of the tree and results in it slowly dying.
Tree Felling	Complete removal of the AIP down to a stump by means of a chainsaw, hand axe or cane knife.
Stumping	The treatment of the remaining stump after felling with an appropriate herbicide (see recommended below).
Soil application	The application of herbicide (see recommended below) to the soil which is taken up by the plants roots.
Foliar Spray	The application of herbicides directly to the leaves. Foliar spraying can be done by using the following: a) A hose and handgun spraying the solution from a herbicide tank; b) A backpack spray unit; or c) Splatter guns which allow for larger droplets at higher concentrations – suitable for regrowth.
Planned burning	This refers to specific and approved burn sites where chopped AIP material can be stacked and burnt under controlled conditions in order to reduce loads. At no point should a fire be started within the rehabilitation areas and allowed to spread through unchopped AIPs.
Stump Coppice	New shoots that regenerate from the stumps of felled trees.
Root Suckers	New vertical regrowth that arises from the base of the trunk, a new stem arising away from the main, stumped stem.

The table below indicates the recommended control measures to be implemented as part of the rehabilitation plans. All recommended herbicides and active ingredients are listed under species specific control. It is important to note that AIP control must be conducted from the outer sections inwards in order to contain the existing AIP and prevent further spread of AIP species.

Table 32: Relevant Objectives and Control Measures to be implemented as part of the AIP clearing.

Objectives or requirements	Control Measures
Initial Control	
General Good housekeeping	**Waste and Litter Problems** ➢ Suitable ablution facilities need to be provided for all personnel; ➢ Waste and litter should be cleared and be disposed of at a registered and approved disposal site; ➢ Suitable general waste receptacles must be provided; and ➢ Dumping of waste or litter must be prohibited within the offset site and all watercourses. Any waste noted must be cleared immediately.
Mechanical Control	➢ Methods to be used to control AIP within the rehabilitated areas include hand pulling (herbaceous species and saplings), frilling, ring-barking and tree felling, after which an applicable herbicide should be applied (see below);

Objectives or requirements	Control Measures
	➢ Areas with dense seedlings should not be uprooted or hoed out, as this will result in soil and seed bank disturbance, which will likely result in return flushes and germination of alien seedling growth. Stumping should be favoured; ➢ When stump density is high, plants should not be cut. This is impractical as there will be many untreated stumps. Instead cut the stumps in dense areas with brush cutters and remove the top growth. Stumps will start to coppice and foliar spay should be used to control the coppice regrowth; ➢ For low – medium density infestation a stumping treatment must be used. Stumps must be treated within 30 minutes from chopping; ➢ Pathways should be cut to increase exposed areas so that a foliar spray treatment is more effective without compromising the indigenous vegetation; ➢ All branches that have been mechanically removed can be transported to and stacked within the demarcated burning sites (see Planned Burnings below). Stacks can be burnt during the summer months when the soils are wet and the latent heat of evaporation will minimize soil damage and reduce the formation and spreading of ash; ➢ Stacks may not be created or burnt within any commercial plantations, or a 1 km radius thereof; ➢ Stacks must be strictly monitored and may not be burnt on days where the wind speeds may risk spreading the fires outside of the burn sites, resulting in an uncontrolled fire; and ➢ During the winter months, cut branches can be chopped and supplied to the surrounding local communities to use as fire wood for cooking.
Chemical Control	➢ Dense seedling growth must be controlled with knapsack sprayers with a flat fan nozzle; ➢ If grass is present, the use of a registered selective herbicide must be used so as to prevent damage to the grass, and if grass is not present a registered non-selective or selective herbicide can be used; ➢ Suitable dye must be used to limit over- or under spray of areas; ➢ Chemical control will entail limited usage of registered herbicides for a specific species and one must adhere to the measurements on the product label; and ➢ **Care must be taken as to not use herbicides containing Glyphosate, Diquat and Paraquat within the identified watercourses associated with the rehabilitation area. These chemicals may only be used in the terrestrial zone of the rehabilitation areas.**
Planned Burning	➢ Fire is not recommended as a control mechanism for AIPs, due to the risk of an uncontrolled fire occurring, particularly as *Pinus* species are known to have flammable properties and are easily killed by fire, and also taking into account the proximity of settlements and commercial agricultural activities in all potential recipient sites; ➢ Fire should therefore only be used in approved burn sites to burn materials removed from the rehabilitation areas and transported to the designated burn sites. These burn sites may be set-up within already disturbed areas such as roads or previously plowed/mowed areas where the risk of an unplanned fire spreading to the surrounding vegetation is limited. The exact locations of such must be identified by the Contractor, in liaison with the ECO and relevant landowners/tenants; ➢ Access to and from these burn sites should be marked out by the Contractor; and ➢ Personnel responsible for the burn sites must be sufficiently trained on how to handle the burn sites and what the protocol is should a fire become uncontrolled.
Follow-up Control	
Follow-up AIP treatment	➢ Follow-up control is essential to control alien saplings, seedlings and coppice regrowth to achieve and sustain the progress that was made in the initial phase. If the follow up control phase is neglected, the alien infestation will become worse and denser than before the eradication process started; ➢ Follow-ups must be done for a minimum of three (3) times a year during the growing season (September – April) for the first three (3) years and thereafter a minimum period of four (4) years on an annual basis to ensure that new AIP infestation does not occur within the rehabilitated areas, after which the follow-up period should be re-assessed based on the need; ➢ An annual assessment before mobilisation of the clearing crew should be undertaken to determine equipment and personnel requirements in order to secure the necessary funding; and ➢ After initial control operations dense regrowth may arise as new regrowth will sprout in the form of stump coppice, seedlings and root suckers. The following should therefore be applied: • Plants that are less than 1m in height must be controlled by foliar application.

Objectives or requirements	Control Measures
	• If grass is present, the use of a registered selective herbicide must be used so as to not harm the grass, and if grass is not present a registered non-selective or selective herbicide can be used. • Areas with dense seedlings should not be uprooted or hoed out, as these areas will result in soil disturbance and will in return promote flushes and germination of alien seedling growth.

11.1.8 Step 4: Revegetation

The last stage of the rehabilitation activities should be to re-instate indigenous vegetation within the rehabilitation areas. Propagation and purchasing of the required species should have been undertaken as part of the Planning (Step 1) and must be ready and available for transplantation as soon as re-sloping and stabilisation of embankments and clearing of alien vegetation activities have been completed. The following points are of key importance for re-vegetation:

- Planting must start as soon as possible after re-sloping of streambanks to minimise the duration of bare ground being exposed which could lead to further erosion and sedimentation of the area, and to establish ecological habitats. Furthermore, all disturbed areas as part of the rehabilitation, as well as where AIP have been removed should also be re-instated with indigenous vegetation;
- Re-instatement of indigenous vegetation should be undertaken in early spring (September). This will ensure that vegetation is allowed to become established prior to the onset of the hot summer months, and prior to the onset of the dry winter period, which will maximize growth and early establishment;
- Should the Contractor not have the relevant expertise on planting of specimens, they should appoint a suitably qualified botanist to assist with the re-vegetation; and
- It is strongly recommended that the proponent investigate appointing a Community Liaison Officer to assist with developing and implementing education programmes within the communities that utilise the proposed Smithfield 2 recipient site for grazing of domestic livestock, with the primary purpose of imparting the importance for sustainable grazing (and burning) practices.

11.1.9 Step 5: Monitoring

Ongoing monitoring and auditing of corporate aspects of the Biodiversity Offset and Compensation Initiative, such as financial aspects, legislative compliance, involvement of various stakeholders (especially landowners and tenants) and success of stewardship agreements entered into as part of the initiative, is considered a crucial aspect of the Initiative. Aspects which should be monitored include:

- Finances: detailed budgets must be developed prior to the implementation of the programme, and all expenditure accounted for and audited annually in accordance with the Public Finance Management Act (Act 1 of 1999);
- Compliance with all relevant legislation (as outlined in this report, and any additional Acts which may be relevant in terms of corporate governance) must be monitored and included as part of the auditors' Terms of Reference;
- Regular communication with all stakeholders must take place throughout the life of the project, especially those landowners that enter into stewardship programmes;
- Ongoing monitoring of potential "threats" such as mining, commercial or residential development of land within the proposed recipient sites is necessary in order to protect the biodiversity offsets and ensure the long-term success thereof;
- The data gathered during the monitoring processes (both on a corporate level and in terms of ecological data – refer to Section 11) must be used as part of an adaptive management approach to evaluate the success or failure of the offset, and to proactively change management approaches if necessary.

11.2 *Freshwater Offset specific implementation*

11.2.1 Offset and Rehabilitation Target Areas: Wetland Offset and Compensation Initiative

Following on from the assessment of the freshwater resources (please refer to Appendix G of this report), rehabilitation, management and monitoring measures were developed specific to the freshwater resources as part of the overall implementation plan for the Biodiversity Offset and Compensation Initiative. According to Kotze *et al.* (2009), "*wetland rehabilitation is the process of assisting in the recovery of a wetland that has been degraded or in maintaining the health of a wetland that is in the process of degrading."* Key to this definition are the following concepts:

- "Rehabilitation" is not in itself a goal to be achieved, but is rather an ongoing process, whereby a wetland system is afforded the opportunity to stabilise and self-maintain ecological processes;
- The aim of rehabilitation should be to emulate or duplicate natural processes and re-establish naturally occurring ecological drivers of any given wetland, in such a manner that recovery or maintenance of the system is comparable to that of an unimpacted system, and to allow for the restoration of functionality;
- Rehabilitation interventions may have varying ecological starting points and objectives (for example, to restore a system to a pristine state, or to simply restore basic

ecological functioning). The overall target endpoint will depend on what can be realistically achieved given the site conditions, and the perceived importance of various ecosystem attributes and services. Any rehabilitation project should therefore be based on an understanding of both the ecological starting point and on a defined goal endpoint, and it is essential to understand and accept that it is not feasible to predict exactly how a wetland system will respond to the rehabilitation interventions (Kotze *et al*, 2009).

The key objectives of the watercourse (i.e. wetland and riparian zone) rehabilitation implementation and management plan in the context of the proposed Biodiversity Offset and Compensation Initiative are to:

- Contribute towards meeting local and provincial wetland and riverine conservation targets by planning and managing the rehabilitation activities in such a manner that ecological integrity of the identified offset wetland and riparian systems is maintained and/or improved;
- Maximise the ecological functioning and socio-cultural service delivery of the target watercourses by reinstating or maintaining natural ecological processes;
- Minimise further adverse impacts on the identified watercourses and associated buffer areas;
- Ensure the continued dominance of indigenous floral species within the target watercourses;
- Detail specific actions deemed necessary to assist in mitigating the potential environmental impact on the rehabilitated wetland areas;
- Define monitoring requirements for the rehabilitated areas throughout the rehabilitation process and thereafter which will aid in evaluating the success of the rehabilitation activities as well as enable proactive management going forward; and
- Meet the requirements of the relevant local and regional authorities.

It is strongly recommended that as Working for Wetlands are already active within the Smithfield 3 recipient site, the proponent and/or offset steering committee developed should engage with the relevant team in order to ensure that the rehabilitation efforts associated with the proposed Biodiversity Offset and Compensation Initiative and those of Working for Wetlands complement each other.

11.2.2 Wetland and Riparian Zone Rehabilitation

Table 33: Rehabilitation and control measures to be implemented with rehabilitation of wetlands.

Objective/ Requirement	Control Measures
Indigenous Vegetation	➢ Where possible, any indigenous vegetation, specifically any endangered species, should be rescued and relocated prior to the commencement of any earthworks (associated with embankment re-shaping) and housed at a dedicated nursery, for re-instatement during the revegetation stage (Step 4); ➢ Should the Contractor not have the expertise to identify and rescue such species, they will need to appoint a suitably qualified botanist to assist in order to ensure that plants are harvested correctly for maximum survival; and ➢ Any permits that may be required for the rescue and harvesting of these species should be in place prior to any earthworks.
Earthworks	➢ All rehabilitation work should be done during the drier winter months (May to September) to reduce contamination of surface water, increased sedimentation and erosion; ➢ Should the ECO not have the relevant expertise, it is recommended that the rehabilitation be overseen by a suitably qualified wetland specialist to ensure maximum service provision is achieved over the long-term in terms of hydrology, geomorphology, water quality and biota; ➢ Footprint areas for equipment must be kept as small as possible; ➢ Where necessary steep banks should be re-sloped to prevent erosion, specifically: • Embankments to be re-sloped to a maximum of a 1:3 ratio with a 1:4 ratio considered more appropriate; • All embankments should be earthed banks and landscaped with indigenous wetland vegetation, and if necessary to provide further stability, with a commercially available product such as BioMac®, coir logs, Geojute, or MacMat-R®, all of which provide erosion control whilst simultaneously supporting the establishment of vegetation (picture examples below); • Any topsoils moved during re-sloping activities should be stockpiled and re-instated after re-sloping as indigenous vegetation seeds will be present within the soil.  ***Example of coir logs used to stabilise steep banks until vegetation is re-established***  ***MacMat-R® used for bank stabilisation during wetland rehabilitation near Chrissiesmeer, Mpumalanga.***

Objective/ Requirement	Control Measures
Erosion prevention and Topsoil Management	➢ Any area where active erosion is observed will be immediately rehabilitated in such a way as to ensure that the hydrology and geomorphological processes of the area is re-instated to conditions which are as natural as possible; ➢ Exposed slopes along the edge of rehabilitated watercourses, particularly within the Smithfield 1 and Smithfield 2 Recipient sites as well as the targeted extents of the uMkhomazi River will be reshaped to a 1:4 slope wherever practicable and taking into consideration sensitive faunal and floral assemblages ➢ Exposed slopes along the edge of rehabilitated watercourses, particularly within the Smithfield 1 and Smithfield 2 Recipient sites as well as the targeted extents of the uMkhomazi River and the associated tributary are highly prone to erosion, given the naturally erodible nature of the soils. Drainage control features such as earth berms or perimeter berm/swales (see below) must be used to intercept and convey runoff from above disturbed areas to suitable dispersal areas or drainage systems. This helps to reduce the sedimentation from exposed areas**.** Walker, D. 1999 et al. and USEPA. 2005 have identified the following methods: • **Brush layering** is when branches are placed perpendicular to the slope contour. This method is effective for earth reinforcement and mass stability. Brush layers break up the slope length, preventing surface erosion, and reinforce the soil with branch stems and roots, providing resistance to sliding or shear displacement. Brush layers also trap debris, aid infiltration on dry slopes, dry excessively wet sites, and mitigate slope seepage by acting as horizontal drains. Brush layers facilitate vegetation establishment by providing a stable slope and a favourable microclimate for growth of vegetation. USEPA 2005 • **Live gully repair** is a technique that is similar to branch packing but is used to repair rills and gullies. Live gully repairs offer immediate reinforcement and reduce the velocity of concentrated flows. They also provide a filter barrier that reduces further rill and gully erosion and must be used where gully erosion is taking place on the project footprint. USEPA 2005. ➢ Ensure that no further incision or canalisation occurs within the rehabilitated watercourses (i.e. monitoring on a regular basis must take place in order to be proactive in this regard). If incision is identified, remediation must commence immediately, and the surrounding area is to be reprofiled to a 1:3 slope, covered with a commercially available geotextile as described above, which is to be staked to the surface of the slopes until indigenous wetland vegetation can be re-instated (Step 4 below). ➢ Actions to be taken to prevent any further erosion from occurring within the rehabilitated areas are as follows: • Re-vegetating the disturbed and rehabilitated areas (Step 4 below); • Stabilise the soil through the use of geotextiles, especially effective with growing vegetation; and • Apply a layer of mulch to the rehabilitated areas to allow the soil to slowly soak up the water and reduce the impact of rain on bare soil.
Stormwater Management	➢ Storm water management systems must be put into place prior to vegetation clearing; ➢ Storm water must be managed within the area; ➢ Management measures should include berms, silt fences, hessian curtains, pebbling and that stormwater be diverted away from areas susceptible to erosion. Care must be taken to avoid additional disturbance during the implementation of these measures; and ➢ Re-profile the disturbed areas as soon as work has been completed, to ensure that runoff and stormwater drains into the soil.

11.2.3 Step 3: AIP Clearing

At the time of the assessment in March 2018 several watercourses within all four target recipient sites were considered to have a high incidence of alien floral invasion. Species which were identified and are deemed to be of concern with regards to floral diversity include (but are not necessarily limited to): *Acacia mearnsii* (Black Wattle)*, A. dealbata* (Silver Wattle), *Rubus cuneifolius* (American bramble), and *Solanum mauritanium* (Bugweed). Both *Acacia* species are Category 2 species under the NEMA Alien and Invasive Species Regulations (2014), whilst *S. mauritanium* and *R. cuneifolius* are Category 1b species under the same regulations.

11.2.4 Step 4: Revegetation

The following criteria have been used to inform the selection of wetland plant species within the offset site:

- Plants must be hardy, and ideally able to withstand:
  - Elevated nutrients;
  - Periodically high hydrocarbons (oils);
  - Occasional high sediment inflows;
  - Elevated ammonia concentrations;
  - Periods of low oxygen, depending on zonation; and
  - Periodic inundation (it is assumed that inundation is likely during the rainy season).
- Plants must be readily available;
- Plants must establish rapidly to facilitate prompt onset of wetland function;
- The maintenance requirements of the plants should be low, bearing in mind that all plants are likely to require maintenance at some stage; and
- Plants should ideally be locally indigenous and no plants that are alien and invasive should be planted or allowed to remain in the study area.

It is important to note that the Contractor must ensure a variety of plants be used for each rehabilitation area, depending on seasonal planting requirements and availability. No one specific species should be allowed to completely dominate the rehabilitation area.

11.2.5 Step 5: Freshwater Resource Monitoring

Prudent monitoring of the rehabilitation areas is of utmost importance to ensure success and to provide a continual flow of data, enabling all parties involved to accurately assess and manage water resource related progress and issues. To ensure the accurate gathering of data, the following techniques and guidelines should be followed:

- The implementing agent must ensure that all aspects as stipulated in this implementation plan are being adhered to and that the rehabilitation and implementation is being undertaken according to good freshwater resource management principles.

- Site walk through surveys should be applied as the preferred method of monitoring with specific focus on:
  - AIP clearing activities and proliferation;
  - Burn sites;
  - Erosion monitoring;
  - Wetland rehabilitation;
  - Waste and litter problems; and
  - Vegetation regrowth.
- The rehabilitation areas must be inspected for erosion after all significant rainfall events;
- Areas where re-vegetation has taken place must be monitored annually to ensure vegetation becomes established, and that no new AIP establish;
- If any areas of excessive sedimentation are observed, the excess sediment should be carefully removed, preferably by hand;
- All data gathered should be measurable (qualitative and quantitative);
- Monitoring actions should be repeatable and temporally and spatially comparable;
- Data should be auditable;
- Data gathered should be an accurate representation of the various floral communities and habitat units represented by each monitoring site;
- Data, when compared to previous sets, should show spatial and temporal trends; and
- Reports should present and interpret the data obtained.

An example of a field form which is to be completed by the relevant Contractor and/or the implementing Agent is available in Appendix K of this report. This form should be completed during the annual follow-up prior to mobilisation of any clearing teams to inform the planning of equipment, personnel and thus required funding.

11.2.6 Budgetary Allowances

In order for any conservation initiative to be successful, adequate funding needs to be put in place to ensure follow through of the project. A budget estimate was allocated to initial site preparation work including but not limited to:

- Alien and invasive species removal;
- Removal of waste and rubble;
- Re-sloping and bank stabilisation;
- Preparation for revegetation; and revegetation.

In addition to the physical interventions into riparian zone restoration the project will employ three full time “River Keepers” for each reach of riparian zone to be managed. These persons will be trained and tasked with minor alien vegetation control, litter control, and general monitoring of the riverine integrity. Furthermore, these River Keepers will be tasked with educating the local communities on managing and appreciating the river. This is aimed at changing attitudes in the local community and assist in leading to changed behaviour which could improve the condition of the catchment and the local riverine resources.

Allowance has also been made for ongoing maintenance and management for a period of three years. Since after this period the amount of ongoing maintenance is difficult to ascertain, no budgetary allowance has been made beyond a three-year period. It must however be noted that budget for overall ongoing management and maintenance has been made for a period of 30 years.

It is estimated that **R37, 850,000 (rounded and including VAT at a rate of 15%)** will be required to execute the Wetland Offset and Compensation Initiative and maintain it for a three-year period. It is estimated that **R15, 450,000 (rounded and including VAT at a rate of 15%)** will be required to execute the Riparian Zone Offset and Compensation Initiative and maintain it for a three-year period. The following tables provides a budget breakdown for each task in these two (Wetland and Riparian Zone) Offset and Compensation Initiatives.

Table 34: Implementation costs for the implementation of the wetland Offset and Compensation Initiative.

BUDGET COST ESTIMATE AS FOR THE IMPLIMENTATION OF THE BIODIVERSITY OFFSET AND COMPENSATION INITIATIVE FOR THE UMKHOMAZI PHASE 1 PROJECT

WETLAND STEWARDSHIP

REVISION 0 **May 2018**

	DESCRIPTION	UNIT	QTY.	RATE	TOTAL
	SECTION 1 : PREPARATION				
1.1	Alien and invasive species removal	ha	1120.0	R 4,000.00	R 4,480,000.00
1.2	Removal of any waste and litter from wetland areas	sum			R 100,000.00
1.3	Temporary stormwater management measures including sediment traps	sum	188	R 3,500.00	R 656,250.00
1.4	Resloping/ shaping of areas where steep banks are present to 1:4 slopes prior to covering with erosion control blanket	m²	15000	R 450.00	R 6,750,000.00
1.5	Ripping of areas to be planted and reseeded: *Loosening of the soil to a depth of 300mm*	m²	937500	R 1.25	R 1,171,875.00
1.6	Scarifying all compacted and cleared areas to be planted and reseeded: *Roughening of the surface of the soil to a depth of approximately 150mm*	m²	937500	R 0.90	R 843,750.00
	Total Preparation				**R14,001,875.00**
	SECTION 2 : PLANTING				
2.1	*Hydroseed with indigenous veldgrass mixture suitable for wetland areas*	m²	952500	R 4.50	R 4,286,250.00
	Total Planting				**R4,286,250.00**
	SECTION 3: OTHER				
3.1	Erosion control blanket/ geofabric on slope including staking vertical strips (500m²)	roll	150	R 500.00	R 75,500.00
	Total Other				**R75,500.00**
	SECTION 4: MAINTENANCE (rate per annum for a period of three years)				
4.1	Annual follow up of alien vegetation control in the form of weeding of recruits	ha	1406	R 7,000.00	R 9,842,000.00
4.2	Follow up reseeding where required *An acceptable cover means that not less than 75% of the re-vegetated area is to be covered with indigenous species and that there will be no bare patches of more than 500 x 500 mm in maximum dimension.*	m²	142875	R 12.00	R 1,714,500.00
	Total Maintenance				**R11,556,500.00**
	Sub Total (ex VAT)				**R 29,920,125.00**
	Preliminaries and General				R 1,496,006.25
	Contingencies				R 1,496,006.25
	Total (ex VAT)				**R 32,912,137.50**
	Total (incl. VAT)				**R 37,848,958.13**

NOTES:
1. The rates are to include site establishment as well as the supply of all plant, labour and materials to carry out the work.
2. Hydroseeding and planting is not to take place during the KZN growing season only.

3. Water to be made available for the initial establishment phase of revegetated areas.

Table 35: Implementation costs for the implementation of the riparian Offset Initiative.

	BUDGET COST ESTIMATE AS FOR THE IMPLEMENTATION OF THE BIODIVERSITY OFFSET AND COMPENSATION INITIATIVE FOR THE UMKHOMAZI PHASE 1 PROJECT				
	RIPARIAN VEGETATION RESTORATION				
	REVISION 0				**May 2018**
	DESCRIPTION	**UNIT**	**QTY.**	**RATE**	**TOTAL**
	SECTION 1 : PREPARATION				
1.1	Alien and invasive species removal	ha	68	R 4,500.00	R 303,750.00
1.2	Removal of any waste and litter from wetland areas	sum			R 15,000.00
1.3	Temporary stormwater management measures including sediment traps	sum			R 60,000.00
1.4	Resloping/ shaping of areas where steep banks are present to 1:4 slopes prior to covering with erosion control blanket	m²	10200	R 450.00	R 4,590,000.00
1.5	Ripping of areas to be planted and reseeded: *Loosening of the soil to a depth of 300mm*	m²	20000	R 1.25	R 25,000.00
1.6	Scarifying all compacted and cleared areas to be planted and reseeded: *Roughening of the surface of the soil to a depth of approximately 150mm*	m²	20000	R 0.90	R 18,000.00
	Total Preparation				**R5,011,750.00**
	SECTION 2 : PLANTING				
2.1	*Revegetate with shrubs and trees from 1-4L containers suitable for terrestrial areas*	m²	10500	R 250.00	R 2,625,000.00
2.2	*Hydroseed with indigenous veldgrass mixture suitable for wetland areas*	m²	20000	R 5.00	R 100,000.00
	Total Planting				**R2,725,000.00**
	SECTION 3: OTHER				
3.1	Erosion control blanket/ geofabric on slope including staking of vertical strips (775m²)	roll	70	R 500.00	R 35,500.00
	Total Other				**R35,500.00**
	SECTION 4: MAINTENANCE (rate per annum for a period of three years)				
4.1	Annual follow up of alien vegetation control in the form of weeding of seedlings	ha	34.00	R 7,500.00	R 255,000.00
2.1	Additional planting to replace failed vegetation	m²	3400	R 750.00	R 2,550,000.00
4.3	Follow up reseeding where required *An acceptable cover means that not less than 75% of the re-vegetated area is to be covered with indigenous species and that there will be no bare patches of more than 500 x 500 mm in maximum dimension.*	m²	2000	R 15.00	R 30,000.00
4.4	Follow up replanting where required	sum			R 525,000.00
4.4	Employment of River Keeper 3 year Period but to be extended for 30 years	Annual salary	9.00	R 120,000.00	R 1,080,000.00
	Total Maintenance				**R4,440,000.00**
	Sub Total (ex VAT)				**R 12,212,250.00**
	Preliminaries and General				R 610,612.50
	Contingencies				R 610,612.50
	Total (ex VAT)				**R 13,433,475.00**
	Total (incl. VAT)				**R 15,448,496.25**
	NOTES:				
	1. The rates are to include site establishment as well as the supply of all plant, labour and materials to carry out the work.				
	2. Hydroseeding and planting is not to take place during the KZN growing season only.				
	3. Water to be made available for the initial establishment phase of revegetated areas.				

The following assumptions were made to obtain the above presented budget:

- The rates are inclusive of site establishment, supply of all plants, labour and materials;
- Various fractions were used to define the amount of intervention required as to the entire area is affected by factors such as alien vegetation encroachment;
- A further fraction was then used for maintenance assuming that some areas of maintenance will need to be revisited;
- No allowance has been made for inflation and figures are based on estimates the time of writing;
- Water is made available for the initial establishment (i.e. plants to be watered through the first winter until established); and
- All planting and hydro-seeding is to take place during the Kwa Zulu Natal growing season. It is strongly advised that larger specimens be planted in late spring before the rainy season while smaller saplings only be planted in early spring (to reduce the risk of drowning);

11.3 *CBA and Grassland Offset specific implementation*

Following on from the assessment of the CBA and Grassland Assessment (Appendix J of this report), rehabilitation, management and monitoring measures were developed specific to the CBA and grassland areas as part of the overall implementation plan for the Offset and Compensation Initiative. The Implementation Plan is applicable to the grassland areas within the proposed recipient sites, as part of the required Biodiversity Offset and Compensation Initiative. These calculations are based on the findings of the CBA and Grassland Assessment (Appendix J of this report) and can be summarised as follows:

Table 36: Summary of terrestrial biodiversity conservation and trade off calculations for the proposed Smithfield dam.

	Smithfield Dam Offset requirements					
			Smithfield 1	Smithfield 2		
	Total Potential Loss	Offset Target	Actual Ha Available	Actual Ha Available	Total Potential Available CBA Recipient site	Potential additional area
Irreplaceable	29.45	382.85	701.33	135.47	837.07	454.22
Optimal	129.22	1421.42	-	2513.33	2513.33	1091.91

Table 37: Summary of terrestrial biodiversity conservation and trade off calculations for the proposed balancing dams.

Balancing Dam Offset Requirements					
Proposed Balancing Dams	Type of *CBA	Total Potential Loss	Baynesfield Actual Ha Available	Total Potential Available *CBA Recipient site	Potential additional area
Langa	Irreplaceable	14.76	1737.52	1737.52	1235.68
	Optimal	-	44.74		
Mbangweni	Irreplaceable	15.59	1737.52	1737.52	1207.46
	Optimal	-	44.74		

*If the Langa Balancing dam is used as the preferred option.

The location of the proposed recipient sites was strategically selected to accommodate the like-for-like requirement as stipulated in the Business and Biodiversity Offsets Programme (BBOP) Handbook (2009) which states *"…offset the biodiversity components to be impacted, by targeting the same biodiversity components elsewhere (an 'in-kind' offset)"*. Furthermore, in the case of future development potential for the offset site, development can be planned around the wetland and included in the Spatial Development Framework, incorporating these areas within planned open spaces. However, it should be noted that such developments may not necessarily include generally high-impact activities such as housing or forestry.

11.3.1 CBA and Grassland Rehabilitation and Species-Specific Compensation Activities

In order to improve the PES of the CBAs and grassland areas by rehabilitation, various activities need to be undertaken. This includes the re-shaping / re-sloping and stabilisation of incised embankments, clearing of alien vegetation and re-vegetation of disturbed areas with indigenous vegetation once rehabilitation is completed. Table 39 below provides the rehabilitation measures to be implemented in addition to alien vegetation control (refer to Section 11.3).

Table 38: Rehabilitation and control measures to be implemented with rehabilitation of the CBA and grasslands.

Objective/ Requirement	Control Measures
Indigenous Vegetation	➢ Where possible, any indigenous vegetation, specifically any endangered species, should be rescued and relocated prior to the commencement of any earthworks (associated with embankment re-shaping) and housed at a dedicated nursery, for re-instatement during the revegetation stage (Step 4);

Objective/ Requirement	Control Measures
	➢ Should the Contractor not have the expertise to identify and rescue such species, they will need to appoint a suitably qualified botanist to assist in order to ensure that plants are harvested correctly for maximum survival; and ➢ Any permits that may be required for the rescue and harvesting of these species should be in place prior to any earthworks.
Earthworks	➢ All rehabilitation work should be done during the drier winter months (May to September) to reduce contamination of surface water, increased sedimentation and erosion; ➢ Should the implementing agent not have the relevant expertise, it is recommended that the rehabilitation be overseen by a suitably qualified wetland specialist to ensure maximum service provision is achieved over the long-term in terms of hydrology, geomorphology, water quality and biota; ➢ Footprint areas for equipment must be kept as small as possible; ➢ Where necessary steep banks should be re-sloped to prevent erosion, specifically: • Embankments to be re-sloped to a maximum of a 1:3 ratio; • All embankments should be earthed banks and landscaped with indigenous wetland vegetation, and if necessary to provide further stability, with a commercially available product such as BioMac®, coir logs, Geojute, or MacMat-R®, all of which provide erosion control whilst simultaneously supporting the establishment of vegetation (Picture examples below); • Any topsoils moved during re-sloping activities should be stockpiled and re-instated after re-sloping as indigenous vegetation seeds will be present within the soil.
Erosion prevention and Topsoil Management	➢ Any area where active erosion is observed must be immediately rehabilitated in such a way as to ensure that the hydrology of the area is re-instated to conditions which are as natural as possible; ➢ Exposed slopes along the edge of the rehabilitated wetland are highly prone to erosion, particularly given the naturally erodible nature of the soils. Drainage control features such as earth berms or perimeter berm/swales (see below) must be used to intercept and convey runoff from above disturbed areas to suitable dispersal areas or drainage systems. This helps to reduce the sedimentation from exposed areas**.** Walker, D. 1999 et al. and USEPA. 2005 have identified the following methods: • **Brush layering** is when branches are placed perpendicular to the slope contour. This method is effective for earth reinforcement and mass stability. Brush layers break up the slope length, preventing surface erosion, and reinforce the soil with branch stems and roots, providing resistance to sliding or shear displacement. Brush layers also trap debris, aid infiltration on dry slopes, dry excessively wet sites, and mitigate slope seepage by acting as horizontal drains. Brush layers facilitate vegetation establishment by providing a stable slope and a favourable microclimate for growth of vegetation. USEPA 2005 • **Live gully repair** is a technique that is similar to branch packing but is used to repair rills and gullies. Live gully repairs offer immediate reinforcement and reduce the velocity of concentrated flows. They also provide a filter barrier that reduces further rill and gully erosion and must be used where gully erosion is taking place on the project footprint. USEPA 2005. ➢ Ensure that no further incision or canalisation occurs within the rehabilitated grassland. If incision is identified, remediation must commence immediately, and the surrounding area is to be reprofiled to a 1:3 slope, covered with a commercially available geotextile as described above, which is to be staked to the surface of the slopes until indigenous wetland vegetation can be re-instated (Step 4 below). ➢ Actions to be taken to prevent any further erosion from occurring within the rehabilitated areas are as follows: • Re-vegetating the disturbed and rehabilitated areas (Step 4 below); • Stabilise the soil through the use of geotextiles, especially effective with growing vegetation; and • Apply a layer of mulch to the rehabilitated areas to allow the soil to slowly soak up the water and reduce the impact of rain on bare soil.
Stormwater Management	➢ Storm water management systems must be put into place prior to vegetation clearing; ➢ Storm water must be managed within the area;

Objective/ Requirement	Control Measures
	➢ Management measures should include berms, silt fences, hessian curtains, pebbling and that stormwater be diverted away from areas susceptible to erosion. Care must be taken to avoid additional disturbance during the implementation of these measures; and ➢ Re-profile the disturbed areas as soon as work has been completed, to ensure that runoff and stormwater drains into the soil.

11.3.2 Step 3: AIP Clearing

A low diversity of AIP diversity was present within the proposed offset sites. Main AIP species which were observed include *Acacia mearnsii* (2), *Melia azedarach* (1b, 3 in urban areas), *Rubus cuneifolius* (1b), *Populus alba* (2), *Solanum mauritianum* (1b), and *Cirsium vulgare* (1b). Category 1b species must be removed and destroyed as they have high invasive potential. Category 2 are commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread. The extent of these species within the recipient sites are currently limited an AIP plan was developed as part of the Biodiversity Offset and Compensation Initiative.

11.3.3 Step 4: Revegetation

The last stage of the rehabilitation activities should be to re-instate indigenous vegetation within the rehabilitation areas. Purchasing of the required herbaceous species should have been undertaken as part of the Planning (Step 1) and must be ready and available for revegetation as soon as re-sloping and stabilisation of embankments and clearing of alien vegetation activities have been completed. The following points are of key importance for re-vegetation:

- Planting must start as soon as possible after re-sloping to minimise the duration of bare ground being exposed which could lead to further erosion and sedimentation of the area, and to establish ecological habitats. Furthermore, all disturbed areas as part of the rehabilitation, as well as where AIP have been removed will also be re-instated with indigenous vegetation;
- Re-instatement of indigenous vegetation will be undertaken in early spring (September). This will ensure that vegetation is allowed to become established prior to the onset of the hot summer months, and prior to the onset of the cold winter period, which will maximize growth and early establishment;
- Should the Contractor not have the relevant expertise on planting of specimens, they will appoint a suitably qualified botanist to assist with the re-vegetation; and
- It is strongly recommended that a Community Liaison Officer be appointed to assist with developing and implementing education programs within the communities that utilise the recipient site for grazing of domestic livestock, with the primary purpose of imparting the importance for sustainable grazing (and burning) practices.

It is recommended that the following grass mixture is used for rehabilitation purposes, as the species will aid in soil stabilisation and restoration of the rehabilitated grassland area:

Sour Bushveld Reclamation Mixture (Mayford - BIOSOME) will be used for revegetation purposes, as the grass mixture used is specific for the area. The Sour Bushveld Mixture comprises of the following grass species:

- *Eragrostis curvula*;
- *Panicum maximum*;
- *Chloris gayana*; and
- *Cynodon dactylon.*

It is important to note that the Contractor must ensure the recommendations is followed as per recommendations from the supplier of the grass mixture. When bare areas are identified where seed gemination is not taken place, reseeding needs to take place. No one specific species should be allowed to completely dominate the rehabilitation area.

11.3.4 Step 5: Monitoring

Prudent monitoring of the rehabilitation areas is of utmost importance to ensure success and to provide a continual flow of data, enabling all parties involved to accurately assess and manage water resource related progress and issues. To ensure the accurate gathering of data, the following techniques and guidelines should be followed:

- The ECO must ensure that all aspects as stipulated in this implementation plan are being adhered to and that the rehabilitation and implementation is being undertaken according to good grassland management principles.
- Site walk through surveys should be applied as the preferred method of monitoring with specific focus on:
  - AIP clearing activities and proliferation;
  - Burn sites;
  - Erosion monitoring;
  - Grassland rehabilitation;
  - Waste and litter problems; and
  - Vegetation regrowth.
- The rehabilitation areas must be inspected for erosion after all significant rainfall events;
- Areas where re-vegetation has taken place, must be monitored annually to ensure vegetation becomes established, and that no new AIP establish;

- All data gathered should be measurable (qualitative and quantitative);
- Monitoring actions should be repeatable and temporally and spatially comparable;
- Data should be auditable;
- Data gathered should be an accurate representation of the various floral communities and habitat units represented by each monitoring site;
- Data, when compared to previous sets, should show spatial and temporal trends; and
- Reports should present and interpret the data obtained.

Table 39 below summarises data capturing for the monitoring plan.

Table 39: Monitoring actions for the proposed offset site.

Aspect	Monitoring Location	Frequency of sampling	Frequency of Reporting
AIP control	➢ Screening of the entire rehabilitation area(s); ➢ Logging locations of any newly coppiced species to be treated/removed.	➢ Before the initial AIP clearing, a baseline assessment should be taken to indicate densities and species; ➢ After the initial AIP clearing densities should be re-recorded, including all methods and chemicals used; ➢ Quarterly assessment during the first-year post rehabilitation. Densities and locations of newly coppiced AIPs to be recorded; and ➢ Annually during the growing season for the second and third year, post rehabilitation to ensure long-term maintenance measures are effective.	➢ Before and after AIP clearing report should be compiled; ➢ Quarterly report during the first-year post AIP clearing; and ➢ Annually during each growing season, for at least 3 years post rehabilitation – report should include information from before and after mobilisation of follow-up clearing teams.
Grazing and burning program	➢ All grassland areas affected by grazing and burning within the proposed recipient sites.	➢ Annual assessment of the condition of the vegetation within the grassland to identify problem areas as to lower the grazing/burning within the area; ➢ Phytomass assessment to assess the fuel load of the area for burning should be done before any burning takes place.	Annually during each growing season, for at least 5 years to ensure the grasslands present ecological state is improving.
Waste and litter problems	All areas which are frequently traversed by personnel during the rehabilitation.	Monitoring of waste or litter problems should occur daily where rehabilitation and AIP clearing are taking place. The Contractor is to ensure that no staff litter on site.	Monthly monitoring report compiled by the appointed Implementing agent.
Erosion	➢ All rehabilitated areas; and ➢ All areas disturbed by rehabilitation activities.	➢ Weekly during rehabilitation activities; ➢ After every major rainstorm and / flood for the first wet season post rehabilitation.	Monthly monitoring report compiled by the appointed Implementing agent.
Re-vegetation	All areas rehabilitated as part of the offset.	➢ Monthly for 6 months after re-instatement of vegetation; ➢ Annually during the growing season for at least three (3) years post rehabilitation to ensure plant survival and to ensure that no AIPs are outcompeting indigenous species.	➢ Before commencement of rehabilitation activities, a report should be compiled listing existing species as well as any endangered species that may need to be rescued. Should the Contractor not have the expertise to undertake this list, they are to appoint a suitable botanist to assist; ➢ Monthly for 6 months after the re-instatement; and ➢ Annually during each growing season, for at least 3 years post rehabilitation.

An example of a field form which is to be completed by the relevant Contractor and/or the implementing agent is available in Appendix K of this report. This form should be completed during the annual follow-up prior to mobilisation of any clearing teams in order to inform the planning of equipment, personnel and thus required funding.

11.3.5 Budgetary Allowances

In order for any conservation initiative to be successful, adequate funding needs to be put in place to ensure follow through of the project. A budget estimate was developed considering both initial planning work and specifically the development of specific grazing and fire management plans per offset recipient site. Budget was then allocated to initial site preparation work including but not limited to:

- Alien and invasive species removal;
- Removal of waste and rubble;
- Re-sloping and erosion intervention;
- Preparation for revegetation; and revegetation.

Allowance has also been made for ongoing maintenance and management for a period of three years. Since after this period the amount of ongoing maintenance is difficult to ascertain, no budgetary allowance has been made beyond a three-year period. It must however be noted that budget for overall ongoing management and maintenance has been made for a period of 30 years.

It is estimated that **R38, 181,000 (rounded and Incl. VAT at 15%)** will be required to execute the Grassland Offset and maintain it for a three-year period. The following table provides a budget breakdown for each task in the grassland CBA rehabilitation maintenance and monitoring program.

Table 40: Implementation costs for the rehabilitation and maintenance of terrestrial CBA Habitat.

BUDGET COST ESTIMATE AS FOR THE IMPLEMENTATION OF THE BIODIVERSITY OFFSET AND COMPENSATION INITIATIVE FOR THE UMKHOMAZI PHASE 1 PROJECT

GRASSLAND STEWARDSHIP

	REVISION 0				**May 2018**
	DESCRIPTION	**UNIT**	**QTY.**	**RATE**	**TOTAL**
	SECTION 1 : PREPARATION				
1.1	Develop Portion specific Grazing and fire management plans	land parcels	35	R 85,000.00	R 2,975,000.00
1.2	Alien and invasive species removal	ha	2213.00	R 3,500.00	R 7,745,500.00
1.3	Removal of any rubble and litter from habitat areas	sum			R 25,000.00
1.4	Resloping/ shaping of areas where erosion has occurred	m²	345000	R 45.00	R 15,525,000.00
1.5	Ripping of areas to be planted and reseeded: *Loosening of the soil to a depth of 300mm*	m²	345000	R 1.25	R 431,250.00
1.6	Scarifying all compacted and cleared areas to be planted and reseeded: *Roughening of the surface of the soil to a depth of approximately 150mm*	m²	345000	R 0.90	R 310,500.00
	Total Preparation				**R27,012,250.00**
	SECTION 2 : PLANTING				
2.1	*Revegetate with shrubs and groundcovers from 1-4L containers suitable for terrestrial areas*	m²	3450	R 160.00	R 552,000.00
2.2	*Hydroseed with indigenous veldgrass mixture suitable for wetland areas*	m²	345000	R 4.00	R 1,380,000.00
	Total Planting				**R1,932,000.00**
	SECTION 3: OTHER				
3.1	Erosion control blanket/ geofabric on slope including staking vertical strips (500m²)	roll	100	R 450.00	R 45,500.00
3.2	Temporary barrier fence around required rehabilitated areas to prevent access	roll	200	R 300.00	R 60,000.00
	Total Other				**R105,500.00**
	SECTION 4: MAINTENANCE (rate per annum for a period of three years)				
4.1	Annual follow up of alien vegetation control in the form of weeding of seedlings	ha	213	R 3,500.00	R 745,500.00
4.2	Follow up hydroseeding where required for three years	m²	34500	R 9.00	R 310,500.00
4.4	Follow up replanting where required	sum			R 77,280.00
	Total Maintenance				**R1,133,280.00**
	Sub Total (ex VAT)				**R 30,183,030.00**
	Preliminaries and General				R 1,509,151.50
	Contingencies				R 1,509,151.50
	Total (ex VAT)				**R 33,201,333.00**
	Total (incl. VAT)				**R 38,181,532.95**

NOTES:
1. The rates are to include site establishment as well as the supply of all plant, labour and materials to carry out the work.
2. Hydroseeding and planting is not to take place during the KZN growing season only.

3. Water to be made available for the initial establishment phase of revegetated areas.

The following assumptions were made to obtain the above presented budget:

- The rates are inclusive of site establishment, supply of all plants, labour and materials;
- It is assumed that 35 individual fire and grazing management plans will need to be developed, however that there will be substantial overlap between them;
- It is assumed that of the CBA areas under stewardship 47% of the area will require alien vegetation control and intervention with an annual follow up on 10% of that area in each of three years;
- Erosion control, earth preparation and revegetation will be required on 0.5% of the CBA areas with an annual follow up on approximately 10% of that area in each of three years;
- No allowance has been made for inflation and figures are based on estimates the time of writing;
- Water is made available for the initial establishment (i.e. plants to be watered through the first winter until established); and
- All planting and hydro-seeding is to take place during the Kwa Zulu Natal growing season. It is strongly advised that larger specimens be planted in late spring before the rainy season while smaller saplings only be planted in early spring (to reduce the risk of drowning).

11.4 *Species of Conservation Concern Compensation specific implementation*

The Implementation Plan is applicable to the areas where preferred habitat areas for the identified Species of Conservation Concern within the proposed recipient sites, as part of the required Biodiversity Offset and Compensation Initiative.

11.4.1 *Gnomeskelus fluvialis* (Riverine Keeled Millipede)

Protection of riparian forest which is planned on a like for like basis will address the need to compensate for the potential impacts on *Gnomeskelus fluvialis*. Protection of the preferred habitat for the *Gnomeskelus fluvialis* (Riverine Keeled Millipede) will be implemented through the offset of watercourses within identified offset recipient sites which equates to approximately 135 ha of habitat for the species which will be managed under the stewardship program.

As part of the Stewardship program, the riparian habitat will not only be conserved but through programs such as Working for Water the condition of these forest areas can be improved by means of:

- Alien and invasive vegetation removal;
- Revegetation with indigenous riparian trees;
- The re-establishment of riparian forest and associated leaf litter which provides the required habitat for *Gnomeskelus spp.*

Protection of the preferred habitat for the *Gnomeskelus fluvialis* (Riverine Keeled Millipede) will be implemented. This will be achieved with the help of existing programs such as Working for Water Program that will assist in clearing AIP and also increases work opportunities for the local community. Riparian areas have been identified in three areas adjacent to the Smithfield Dam for rehabilitation at three strategic points around the dam. Refer to Figure 16. These areas can be summarised as follows:

- A length of the uMkhomazi River of 9 km downstream of the proposed dam wall;
- A length of 3 km on a tributary of the uMkhomazi River to the south of and entering the proposed dam; and
- A length of the uMkhomazi River of 4.5 km upstream of the full supply level of the dam.

The above intervention is in line with the requirements defined by the Department of Water and Sanitation - Sub-Directorate: Instream Water Use (Mr. P. Ackerman Pers. comm. 2017) where the upstream and downstream ecology of the river is re-instated.

This initiative serves the additional purpose of as best possible ensuring that on a like for like basis riparian areas are conserved and that the area nearest to the Lundy's Hill population of *Gnomeskelus fluvialis,* that will not be affected by the proposed dam, will be rehabilitated and managed for the life of the dam.

Very little information exists on the relocation of millipedes and terrestrial molluscs and there is only one published study on the relocation of one millipede species in Kenya, and two published studies on terrestrial mollusc relocation in North America. Endemic species or those that are rare are often limited by their dependence on specific habitat characteristics such as the soil chemistry and composition, as well as by vegetation, moisture, shading and temperature characteristics of a particular habitat. This means relocation to a habitat that lacks a particular suite of characteristics is unlikely to be successful (Hammer; 2017).

The effort required to collect sufficiently large numbers of millipedes for relocation is large relative to the return on this effort. This is especially true for rare species. The use of large pitfall traps rather than active searching is unlikely to improve the return. No individuals of the priority mollusc species were collected.

Prior to first flooding of the dam a team of suitably trained individuals and overseen by a suitably qualified specialist consultant to oversee the work will undertake rescue and relocation surveys to rescue and relocate all *Gnomeskelus spp.* The rescue and relocation must be undertaken as follows:

Before millipedes are moved, the millipede and mollusc diversity and population in the sites to which they are to be introduced will be assessed. Two to five people will be needed for this exercise (Hammer; 2017). The “Release” sites will consist of 2x4 m areas considered to include ideal habitat, i.e. with trees, shade and leaf litter. The GPS co-ordinates of the site and description of the vegetation and habitat characteristics will be recorded. The site number will be spray painted onto the largest tree within the sampling area to assist with future location.

Millipedes and terrestrial molluscs must be harvested from the area (recommended 20X20m plots) in which target species is likely to occur. These areas each must be searched with an effective 16 man hours of effort per 400 square meter area. To collect individuals, soil must be dug up around the base of trees and under fallen logs or Aloes, and at the base of grass tufts.

Once collected, the millipedes and molluscs harvested have been harvested they will be held in large plastic trunks and buckets (Fig. 6) with soil and vegetation from the plots from which they are collected. They will be sorted according to species and will be sexed and counted and divided into lots to be released to the “Release” sites. The number of each species and where possible, the number of each gender, adults and juveniles will be recorded for each of the “Release” sites.

Marking of individual millipedes or molluscs that are relocated is not recommended because it may have a negative impact on survival, and it is unlikely to last sufficiently long to allow monitoring over time. It is likely that the introduced individuals disperse away from the sites where they are released and so measuring actual impact is a challenge without extensive sampling. Including a larger number of sites and increasing sampling effort would improve measurement of impact of relocation, but this would result in disturbance of a large area, which would not be acceptable in areas allocated for conservation. Monitoring will be undertaken every two years following the same initial screening method for the recipient sites to reduce impact on the receiving environment.

Funds will be made available to assist with synecological and autecological studies/research of *Gnomeskelus fluvialis* at a tertiary (e.g. universities) or statutorily level (in liaison with

Ezemvelo KZN Wildlife). Funding will also be made available for the Taxonomic revision and the phylogenic relationship of Polydesmoid millipedes, with special mention of the genus *Gnomeskelus*.

11.4.2 *Capys penningtoni* (Pennington's Protea Butterfly)

Larger habitat areas and linkages of the host plants *Protea caffra* and *P. simplex* can be established by replanting of the Protea stands. This could likely address the need to compensate for the potential loss of the host plant for *C. penningtoni* within the fully supply level of the proposed Smithfield Dam. It is anticipated that a ratio of 30:1 will be sufficient to compensate for the loss of the Protea stands occurring within the full supply level footprint of the Smithfield dam.

Another factor that contributed towards the decline in *C. penningtoni* species is the regular burning of *Protea* savanna. The proliferation of bracken fern (*Pteridium aquilinum*) and bramble (*Rubus* species) in the undergrowth of the Protea savanna causes fire to pass through the habitat and burn more intensely, causing more damage or even death to Protea stands. This in turn has had an impact on the butterfly population.

The alien invasive harlequin or multicoloured Asian ladybird beetle *Harmonia axyridis* also causes a decline in populations of *C. penningtoni*. This was observed and verified during numerous site visits by Ezemvelo KZN Wildlife (A. Armstrong, African Butterfly News, Addition November / December 2017-6). The *Harmonia* species has been shown to consume the eggs and larvae of certain Lepidoptera. It is therefore recommended that an alien invasive and control plan be developed and implemented in conjunction with Ezemvelo KZN Wildlife to promote habitat and species availability though:

- A phased approach of alien invasive floral removal – avoid large cleared areas causing erosion and soil disturbance.
- Possible removal of *Harmonia axyridis* from the environment by developing a pheromone trap. Such a trap might work by attracting the beetles from afar using vertical, contrastingly-coloured objects, then by causing them to aggregate at the traps when they are close by via a synthetic version of the beetle's aggregation pheromone, and finally by the removal of the beetles from the environment. Whether such a trap could indeed be used to reduce the high numbers of this beetle species in the environment is unknown at present.

11.4.2.1 Detailed Implementation compensation plan for *Capys penningtoni* (Pennington's Protea Butterfly)

Since very little information, distribution and habitat requirements are available for C. penningtoni, a management plan or guidelines for the conservation of these butterfly species does not exist. It is therefore recommended that a compensation plan be developed and that measures stipulated in this plan must be implemented.

11.4.2.2 Planting of Protea caffra and P. simplex

The compensation plan will consist of four (4) phases for the replanting of *Protea* species:

1. Determining the number of host tree individuals lost

- *Protea caffra* and *P. simplex* is the main food source for the protected *Capys penningtoni* (Pennington's Protea Butterfly). Marking of all the *Protea* species (irrelevant of the size or status) associated with the full supply level of the dam and that will be lost, must be marked with a handheld GPS. The number of trees to be lost will be used in the compensation calculation of 30:1 i.e. Planting of 30 trees for every one that is likely to be destroyed or die out;
- Markings will take place within all seasons to ensure that all possible species lost are recorded;
- A marking sheet will be developed containing the date, time, season, weather conditions, areas surveyed, and species recorded. All recordings will be kept as part of the planning, implementation and monitoring phases. These records will be used as part of the audit during the monitoring of the success of reestablishment of habitat lost.

2. *Mapping of suitable habitat*

- During the planning phase of the compensation plan, all suitable areas containing *Protea* stands in close proximity of Smithfield dam will be mapped out (micro mapping).
- This is essential to show the extent of existing suitable habitat and possible linkages between the *Protea* stands. This will aid in determining the replanting areas of species that will be lost to re-establish linkages.

3. Propagation

- To maintain genetic integrity of Protea stands, seed harvesting from plants within the proposed Smithfield Dam FSL footprint and surrounds and propagation within a dedicated nursery is preferred to replanting Protea species purchased from local nurseries with different habitat and climate conditions. This is to retain the specific genetic phenotypes of the local *Protea spp.* populations which may potentially be crucial to supporting the population of *C. penningtoni*;

- It is preferred that transplanting any *Protea* species from the surrounding areas should not be attempted as it has a very low probability of success due to their root sensitivity, i.e. any disturbance to the soil close to the roots will inhibit successful growth. Proteas can be cultivated from both seed and cuttings.
  - Seed propagation advantage: plant will develop a good root system;
  - Seed propagation disadvantage: summer rainfall Proteas, such as *P. caffra* and *P. simplex*, are very difficult to cultivate from seed (Carstens 2013). One of the reasons could be due to the very specific conditions required for seedlings to germinate where, for *Protea* species, this is triggered by fire events. Moreover, many protea species produce seeds that tend to remain dormant for years and will require the use of fire or smoke to trigger germination or scarification of the seed cote which, if done carelessly, can damage the seeds;
  - Cutting propagation advantage: higher success rate than seed propagation and does not have special germination requirements such as fire/smoke triggers; and
  - Cutting propagation disadvantage: plants propagated as cuttings do not develop as strong a tap root as they might if originating as a seedling. Cutting grown plants can become top heavy and fall over, thus they may require support to ensure stability.
- The cultivated *P. caffra* and *P. simplex* will be planted above the full supply level of the Smithfield dam, within areas that have not been transformed by grazing activities;
- Proteas are best harvested early in the morning or late afternoon when temperature starts to drop. Harvesting should not be done when flowers are wet, as this increases incidence of leaf blackening.
- Cutting propagation would entail:
  - Cuttings must be from healthy, disease-ridden plants[10];
  - Cutting must be harvested from December to end of April;
  - Shoot ends must be used for the production of cuttings;
  - Cuttings should not be subjected to heat or drought stress and should therefore harvested in the morning and kept cool thereafter;
  - The leaves on the lower half (50%) of each cutting must be removed (but some leaves should remain on the cutting) and the end dipped into a growth hormone.

[10] No harvesting may be done from plants that display any symptoms of disease.

The cuttings must then be placed in transparent growing bags with holes that are filled with a mixture of coarse sand and peat, for root development;

- Cuttings must receive hourly mist sprays on a daily basis and the cuttings should not be subjected to any heat or drought stresses;
- Cuttings cultivated in the ground must be kept sturdy to ensure wind does not blow the plant over as this will cause damage to the roots and lead to unsuccessful cultivation; and
- Successful cuttings must have roughly the same number of roots as it has foliage before attempting to move it (if required). This normally takes about three to four months to occur.

➢ Seed propagation would entail:

- Seedbuds must be harvested approximately 9 – 12 months after plants have flowered, i.e. should be during the time when the plant flowers again;
- Seeds that have been harvested must be kept dry and cool to avoid any fungal infections. Seeds must remain cool and dry until sown in autumn (recommended time: March - May);
- The DAFF Proteas Production Guideline (2014) recommends: "Seeds are best sown in a seedbed than in plastic bags and containers. They should not be spread on the seedbed, but sow seeds sparsely (at least 4 cm apart). Sowing depth will depend on a particular species being sown"; and
- Important considerations for seed propagation is the method used for germination. The summer rainfall Proteas are serotinous and require fire for germination to be triggered. There are various ways to trigger this response which can include the use of fire, smoke, or scarification of the seed cote. Triggering germination should be done with great care and it is recommended that a horticulturist be employed for this purpose.

If cuttings are cultivated in the ground, it will be essential to wet the soil before digging up the plant. This will avoid damaging the roots. Further guidelines on soil propagation, fertilisation, irrigation and weed control can be found at in the DAFF Protea Production Guidelines (2014).

The table below highlights key factors to consider when propagating protea species.

Table 41: Key factors for Protea cultivation and growth (Vogts 1954 & 1962).

Water	Frequent watering: especially important in the germination and seedling phases, but also important for the first two years of their life – more specifically, the first two summers. Thereafter, watering is only required in extreme drought conditions.
Soil and soil pH	Well-drained, unfertilised acidic soils
Fire	Important for germination
Environmental conditions	Require full sun. Some species are sensitive to frost.

11.4.2.3 Management of Burning Regime

Most Protea seedlings require fire to trigger the germination process. The proliferation of bracken fern (*Pteridium aquilinum*) and bramble (*Rubus* spp.) in the undergrowth of the Protea savanna causes fire to pass through the habitat and burn more intensely, causing more damage or even death to Protea stands. Therefore, burning is a natural process, but frequent and intense fires tend to decline the number of species, therefore declining the food source and numbers of *C. penningtoni* occurring.

11.4.2.4 Research project on methods to control alien invasive species

The alien invasive harlequin or multicoloured Asian ladybird beetle *Harmonia axyridis* is likely to be present and in large numbers, flying between and landing on and walking over the common sugarbushes, including the flower buds where female butterflies lay their eggs. Research done on the harlequin ladybird beetle elsewhere in the world has yielded information that is relevant to the current situation. The species has been shown to consume the eggs and larvae of certain Lepidoptera. The beetle flies towards prominent objects on the horizon and is particularly attracted to contrastingly-coloured, vertical objects. It therefore appears to be attracted to common sugarbushes as they are the most common trees in the predominantly grassy habitat of the Pennington’s Protea Butterfly.

It is proposed to develop a device, such as a pheromone trap, to reduce the number of this beetle in the habitat identified for *C. penningtoni*. The method and device to control these beetles need to be investigated as part of a research project between Ezemvelo KZN Wildlife and the other Universities in South Africa.

11.4.2.5 Monitoring

The majority of South Africa’s protea species (approximately 92%) are found on a narrow, mountainous belt along the south and south-western coasts of the country (Vogts, 1982), which explains their comparatively complicated, and very specific, propagation needs. The summer-rainfall proteas that are found in the eastern and northern parts of the country are, for the most part, more wide-spread and adaptable than the winter-rainfall proteas. Cultivation of South African *Proteas* have a long history and Vogts (1952) states that it is by no means impossible to cultivate species from the Proteaceae family, but rather that it just requires a strict treatment regime and ongoing attention for a desired outcome. Important to note is that growing proteas in a garden setting, where natural competition and environmental stressors can be closely monitored and controlled, is greatly different from propagating them in the wild where these species will be exposed to a broad range of environmental stressors, including competition for light and nutrients.

A monitoring plan will be developed to determine the success rate of the replanting of *Protea* species within the selected areas. Since no management plan is available or was previously developed, trial runs will be a vital component to determine the best methods of propagation, maintenance, conservation and habitat establishment. The DAFF Protea Production Guidelines (2014) stipulates control measures for disease and pest control. Alien invasive floral species control will also be vital for the success of habitat re-establishment and health of the replanted species (refer to Section 10.1.3 for guidelines pertaining to alien vegetation control).

11.4.3 *Hirundo atrocaerulea* (Blue Swallow)

11.4.3.1 Site-Specific Blue Swallow Compensation Initiative

The proposed Offset Plan will result in a number of mistbelt grasslands currently located in existing CBAs being offset as part of the overall Biodiversity Offset and Compensation Initiative. The offsetting of these areas, notably where likely and known breeding localities of the Blue Swallow occur, will greatly enhance the overall conservation effort of this species. However, the extent of these conservation efforts will hinge on the overall outcome of balancing dam selection, as this will either have a greater or lesser impact on these efforts. In instances where developments have been assessed to be fatally flawed, as in the case of the Langa and Mbangweni Balancing Dam (Allan, 2018), but are nonetheless likely to be authorised in national interest, then the areas lost need to be compensated at a commensurate ratio of 1:30. As part of the Biodiversity Offset and Compensation Initiative, irreplaceable and optimal CBAs where land owner consent has been given, the potential area available for use in this Initiative have been calculated at:

- 2969 ha for the Smithfield target recipient sites; and
- 640 ha for the Baynesfield target recipient sites.

Initial calculations for the proposed Langa Balancing Dam indicate that approximately 45 ha of Blue Swallow habitat as identified in the bridging report (Allen, 2018) will be lost. At a commensurate ratio of 1:30 as mandated, this equates to a total of approximately 1350 ha of Blue Swallow habitat that needs to be offset to comply with habitat compensation as mentioned above. Although in the immediate area only 640 ha is available, when adding in the available recipient sites at Smithfield, the required offset ratio is achieved. In line with such compensation activities, the proponent must ensure that protection is provided for the compensation area for at least 99 years and provide for the effective management of the compensation area over a minimum period of 30 years.

Although not all the CBAs that have been secured under the envisaged Stewardship Program will encompass only mistbelt grasslands, it can be concluded that a significant area of mistbelt grasslands in the region will be placed under stewardship as part of the Offset and Compensation Initiative. Whilst the rehabilitation of land which has been under commercial foresty cultivation (e.g. wattle and pine species) is difficult to rehabilitate due to altered soil chemistry, the possibility of rehabilitating cultivated crop lands, especially those adjacent or in close proximity to existing mistbelt grasslands should be considered. This would not only increase the availability of foraging habitat, but may also contribute to reinstating large areas of currently fragmented mistbelt grassland.

This opens up the possibility of new habitat being made available to Blue Swallows through habitat rehabilitation and cogent grassland management measures. Furthermore, Wakelin *et al* (2018) indicated that Blue Swallows spent a significant time foraging over grasslands and wetland habitats, and preferentially used the ecotones as forage zones, likely owing to an increase in insect mass and abundance in these areas. As such, it is likely that the establishment of the proposed Smithfield and Balancing Dams (either Langa Dam or Mbangweni Dam) and rehabilitation of existing wetlands will inherently increase these preferential ecotonal foraging areas for Blue Swallows. Evans *et al.* (2010) further indicated that the rehabilitation of areas back to a grassland/wetland mosaic would rather quickly support foraging of Blue Swallows, and eventually breeding.

Rehabilitation measures as part of the Biodiversity Offset and Compensation Initiative will aim to rehabilitate and manage the recipient sites. The implementation of such management measures as well as alien plant removal will serve to extend and make available new foraging and nesting areas for Blue Swallows through appropriate management of grazing and burning regimes.

11.4.3.1.1 Site-specific Ecological Objectives and Design Criteria for the Burning and Grazing Management Plans

Fire management Plan:

- In conjunction with the Blue Swallows Working Group and relevant authorities (e.g. EKZNW), a relevant and implementable burning program needs to be developed for mistbelt grasslands that will form part of the recipient sites;

- When developing the fire management plan, cognisance must be taken that Blue Swallows breeding success rates are impacted by both extremes, either too frequent or infrequent veld burning. Infrequency results in the build-up of moribund material and limits nesting site access, whilst too frequent burning leads to the overexposure of the nesting sites to the elements and predators, as well as decreased aerial insect abundance i.e. food resources for the Blue Swallows;
- Burning regimes should steer away from the traditional block burning methodologies of old, rather favouring that of patch mosaic burning which will stimulate varying sward heights and density in the grassland habitat, allowing for increased insect abundances and nesting opportunities;

Grazing management

- Overgrazing of the grassland areas leads to low herbaceous cover, and the overexposure of Blue Swallow nests to the elements, resulting in a lower nesting rate;
- Undergrazing much like infrequency of fire serves to create too much moribund material, leading to decreased nesting opportunities; and
- Grazing management must ensure that a high basal cover and sward height of <50cm is ideally maintained in grassland areas supporting Blue Swallows.

11.4.3.1.2 Site-specific Monitoring

As discussed in the Blue Swallow bridging report (Allan, 2018), a total of 147 holes were identified that may be utilised by nesting pairs, however at the time of the assessment it was noted that in many instances these holes had become overgrown and were not favourable to nesting pairs.

In conjunction with tertiary and statutory institutions such as UKZN and Ezemvelo KZN Wildlife, existing and new monitoring programs will be initiated/supported. These monitoring programs will serve to quantify population numbers, breeding pair, hole/burrow utilisation, as well as indicating increases or declines in population numbers associated with implemented management measures. All possible nesting sites (burrows/holes) in the recipient sites over and above those that have been marked already, will be identified and marked and their suitability as nesting sites ranked as per the Blue Swallow bridging report. Annual monitoring will be undertaken in order to quantify the effectiveness of veld management measures. When monitoring is taking place, the following information must be recorded as stipulated by David Allan, to ensure continuity with previous studies:

- Record the date and time that the hole was examined;

- The geographical co-ordinates of the hole using a GPS unit;
- Each hole must be photographed;
- The compass orientation of the hole (‘aspect’) using a GPS unit. Sinkholes typically lack such orientation, however, having vertical sides;
- The hole type (antbear burrow, sinkhole or artificial hole);
- Whether the entrance to the hole was overgrown with vegetation or not. Holes overgrown with vegetation are typically unusable by the swallows as they cannot easily access the interior of the holes;
- Each hole is to be ranked on a scale of 1 – 5 relevant to its subjective suitability for use by nesting Blue Swallows, with 1 representing the least suitability and 5 the highest suitability. Aspects considered in assigning such a ranking included the dimensions and depth of the hole (older holes tend to silt up and/or collapse), and the extent to which the entrance is overgrown with vegetation;
- Any evidence of Blue Swallow nests in the burrow interior. The interior is to be carefully examined using a small hand-held torch. The state and, where relevant, contents of all nests located must be recorded and each nest photographed using flash photography; and
- Each hole examined must be allocated a unique number.

With the inception of the Blue Swallow habitat management initiatives, it is recommended that land owners sign up to the Endangered Wildlife Trust’s Blue Swallow custodian program. This initiative has three key benefits:

- Firstly, to recognize and show appreciation to those landowners/ managers who have actively participated in and contributed to the conservation of the Blue Swallow and its grassland habitat in KwaZulu-Natal;
- Secondly, to encourage further participation in Blue Swallow conservation amongst other landowners/ managers who may have Blue Swallows and / or suitable grassland habitat on their properties;
- And thirdly, to create a greater awareness of the Blue Swallow and its importance, amongst residents and visitors to the area, neighbouring communities as well as passing motorists and tourists.

In order for a landowner to “qualify” or “earn” custodianship, the following criteria should be closely followed:

- Have Blue Swallows breeding on the property;
- Implement management practices that encourage Blue Swallows to return year after year, for example:

- Implementation of a sustainable grassland management programme which allows the harmonious co-existence of the necessary farming practices as well as Blue Swallows (and possibly other fauna and flora) on the property;
- Maintenance of high basal cover and short sward height (< 50cm) in grassland areas supporting Blue Swallows, through either one or more of the following: burning, grazing or mowing;
- Maintenance of existing breeding holes i.e. ensuring entrances to holes remain free of overgrown vegetation, opening up silted / collapsed holes etc.; and
- Removal / control of encroaching alien vegetation on grassland areas and breeding sites;

➢ Make positive contributions to the conservation of the Blue Swallow, for example:
- Monitoring the breeding progress of Blue Swallows on the property;
- Creating awareness about the Blue Swallow amongst neighbouring landowners; and
- Rehabilitation of transformed grassland areas back to their natural state.

➢ Custodians should have an excellent “Blue Swallow-Friendly” attitude and should be willing to:
- Report regularly to the KZN Programme coordinator on the progress and status of the Blue Swallows on the property;
- Inform and involve the KZN Programme coordinator of any proposed developments that may impact on the Blue Swallows; and
- Be willing to carry out management recommendations that will enhance / benefit Blue Swallow populations.

Furthermore, during the bridging study (Allan, 2018) a number of other Red Data bird species were identified; these include the African Marsh Harrier, Black-rumped Buttonquail, Blue Crane, Bush Blackcap, Cape Vulture, Crowned Eagle, Grey Crowned Crane, Lanner Falcon, Secretarybird, Short-tailed Pipit, Southern Bald Ibis, Southern Ground Hornbill, Striped Flufftail and Wattled Cranes. These species were observed within varying habitats including old maize fields, wetlands, alongside dams and in natural grasslands. The offset plans will not only benefit the Blue Swallows in terms of habitat conservation and extension, but also all of the above listed species. Although this cannot be considered a like-for-like offset as per the offset definition, it does carry considerable weight in terms of offset compensation, where even in the worst-case scenario that the current Blue Swallow population does not increase as a result of the management and offset measures, the knock-on effects from these activities will have a definite and positive impact on other Red Listed bird species in the region.

11.4.3.2 Provincial Blue Swallow Compensation Initiative

In addition to the proposed site-specific compensation measures outlined in Section 11.4.3.2 above, a R24 Million (0.1% of Capex) allocation will be set aside to compensate for the loss of Blue swallow habitat and acknowledge the loss that the project would cause. This addition budget of R24 million is in addition to that allocated to the community swallow monitoring project, as well as the grassland and wetland restoration, the total of which is R77.7 Million Rand.

Tenders will be sent out to appropriate organisations specialising in avifaunal conservation initiatives to design and implement a Blue Swallow conservation initiative in Kwa Zulu Natal. The bids will be adjudicated by KZN EZemvelo Wildlife, the DEA and the DWS. The allocated funds will be made available to the winning bidder to execute the Blue Swallow compensation initiative that has been proposed. The progress and performance on the initiative will be audited as part of the overall Offset Audit process to be submitted to the DEA.

The Blue Swallow Working Group was requested to provide guidance with regards to the essential key conservation actions that are required to ensure the continued survival of the remaining Blue Swallow populations in South Africa, with specific reference to those occurring in KZN. It must be noted that the contribution of the BSWG to this Biodiversity Offset and Compensation Initiative document does not imply tacit approval of, or support for, the proposed Project. Moreover, the feedback provided below must not be viewed as a formal comment from either EKZNW or the BSWG but was provided in response to the Biodiversity Offset specialists' request for information.

As acknowledged in Section 9.1.4 above, the Langa and Mbangweni Balancing Dam options should be considered as fatally flawed based on the level of habitat destruction and proximity to known nesting sites. These inherent fatal flaws cannot be mitigated due to the permanent nature of the destruction of critical habitat, thus, the measures provided below must not be viewed as "mitigation measures", but as essential conservation measures needed to ensure the ongoing survival of the South African populations of Blue Swallow. The following key conservation measures were provided by the BSWG (Brent Coverdale[11], 2018, *Pers. Comm*) and are reproduced here as received via email:

[11] Refer to Appendix L.

Brent Coverdale	EKZNW	Animal Scientist: Mammals and Birds **EZEMVELO KZN WILDLIFE** **Biodiversity Research and Assessment**	T: 033 845 1449 C: 082 560 9769 E: Brent.Coverdale@kznwildlife.com

- Secure all remaining nest sites through the appropriate mechanisms which would ensure that no further loss occurs and such sites are managed into perpetuity. Nest sites refer to not only the actual nest but the entire area required for foraging. Such protection must however be in perpetuity.
- Implement appropriate management actions at such sites which favour the persistence of the species. Ideally this should be done through an approved management plan and would include *inter alia* alien plant control, conservation specific veld management (grazing and burning) and monitoring during the breeding season of the species.
- Secure potential nesting areas, through the mechanism identified in point 1 above, as identified in the Blue Swallow habitat model for KwaZulu-Natal. Such sites would then require to be managed as per point 2 above.

It is the recommendation of the Biodiversity Offset specialists that the above key conservation measures form the basis of the Terms of Reference for the proposed tender process as discussed above.

11.4.4 Budgetary Allowances for species specific compensation

In order for any conservation initiative to be successful, adequate funding needs to be put in place to ensure follow through of the project. A budget estimate was developed considering initial work such as:

1. Recuse and relocation of *Gnomeskelus fluvialis* (should further specialist studies locate populations beneath the Smithfield Dam FSL); and
2. Planting of *Protea caffra* (Food source *for Capys penningtoni*) at a ratio of 30:1 for each individual at risk of being inundated during the first impoundment of the proposed Smithfield Dam.

Budget has been defined for maintenance as required. In addition, budget has been defined for ongoing monitoring most applicable to each species of conservation concern. Budget has also been defined for specific research largely based on recommendations by the relevant specialists.

It is estimated that **R12, 876,435 (rounded and Incl VAT).** Will be required to provide for the compensation for impact on these species in addition to the **R107, 900,000** (**rounded Incl VAT)** budget for grassland and wetland rehabilitation and offsetting (**Budget for initial works and 3 years of monitoring and maintenance only**). This budget does however include management of the Biodiversity Offset and Compensation Initiative for a 30 year period. It must be noted that these costs were based on current rates and not escalated with inflation.

Table 42: Implementation costs for compensation for *Capys penningtoni* (Pennington's Protea Butterfly)

BUDGET COST ESTIMATE AS FOR THE IMPLEMENTATION OF THE BIODIVERSITY OFFSET AND COMPENSATION INITIATIVE FOR THE UMKHOMAZI PHASE 1 PROJECT

PROTEA CAFFRA/CAPYS PENNINGTONI COMPENSATION

	REVISION 0				**May 2018**
	DESCRIPTION	**UNIT**	**QTY.**	**RATE**	**TOTAL**
	SECTION 1 : PREPARATION				
1.1	Development of propagation nursery	sum			R 50,000.00
1.3	Harvesting of seeds	Months	3	R 14,000.00	R 42,000.00
1.4	Nursery Curator	m²	60	R 8,500.00	R 510,000.00
1.5					
	Total Preparation				**R602,000.00**
	SECTION 2 : PLANTING AND MAINTENANCE				
2.1	Planting propagated plants and trials	years	5	R 8,500.00	R 42,500.00
2.2	*Maintenance and replanting*	years	5	R 15,000.00	R 75,000.00
	Total Planting and maintenance				**R75,000.00**
	SECTION 2 : MONITORING INITIATIVE				
2.2	*Annual monitoring program (Biannual (Breeding and on breeding period))for 30 years*	years	30	R 60,000.00	R 1,800,000.00
	Total Planting				**R1,800,000.00**
	SECTION 3: RESEARCH AND DEVELOPMENT: PHEROMONE TRAP				
3.1	Research on Capys penningtoni research Masters Level	years	3	R 180,000.00	R 540,500.00
3.2	Research on Capys penningtoni research PhD Level	years	4	R 250,000.00	R 1,000,500.00
	Total Research				**R1,541,000.00**
	Sub Total (ex VAT)				**R 4,018,000.00**
	Preliminaries and General				R 200,900.00
	Contingencies				R 200,900.00
	Total (ex VAT)				**R 4,419,800.00**
	Total (incl. VAT)				**R 5,082,770.00**

Table 43: Implementation costs for compensation for *Hirundo atrocaerulea* (Blue Swallow).

	BUDGET COST ESTIMATE AS FOR THE IMPLEMENTATION OF THE BIODIVERSITY OFFSET AND COMPENSATION INITIATIVE FOR THE UMKHOMAZI PHASE 1 PROJECT				
	BLUE SWALLOW COMPENSATION (Hirundo atrocaerulea)				
	REVISION 0				**May 2018**
	DESCRIPTION	**UNIT**	**QTY.**	**RATE**	**TOTAL**
	SECTION 1 : COMMUNITY SWALLOW MONITORING INITIATIVE				
1.1	Training by a specialist consultant	hours	45	R 1,200.00	R 54,000.00
1.1	*Annual monitoring program (Biannual (Breeding and on breeding period))for 30 years*	hours	300	R 150.00	R 1,350,000.00
	Total Budget				**R1,350,000.00**
	Sub Total (ex VAT)				**R 1,350,000.00**
	SECTION 2 : COMMUNITY SWALLOW MONITORING INITIATIVE				
2.1	Provincial Blue Swallow Compensation Initiative				**R24,000,000.00**
	Preliminaries and General				R 67,500.00
	Contingencies				R 67,500.00
	Total (ex VAT)				**R 25,485,000.00**
	Total (incl. VAT)				**R 29,307,750.00**

Table 44: Implementation costs for compensation for *Gnomeskelus fluvialis (*Riverine Keeled Millipede Compensation)

BUDGET COST ESTIMATE AS FOR THE IMPLEMENTATION OF THE BIODIVERSITY OFFSET AND COMPENSATION INITIATIVE FOR THE UMKHOMAZI PHASE 1 PROJECT

Riverine Keeled Millipede Compensation (Gnomeskelus fluvialis)

	REVISION 0				**May 2018**
	DESCRIPTION	**UNIT**	**QTY.**	**RATE**	**TOTAL**
	SECTION 1 : RESCUE AND RELOCATION				
1.1	Target relocation site analyses	Hours	100	R 900.00	R 90,000.00
1.3	Collection of invertebrates from sites prior to first flooding	Hours	400	R 900.00	R 360,000.00
1.4	Relocation and preparation for monitoring	Hours	50	R 900.00	R 45,000.00
	Total Preparation				**R495,000.00**
	SECTION 2 : PLANTING AND MAINTENANCE				
2.1	Monitoring of recipient sites for 30 years	years	3000	R 900.00	R 2,700,000.00
2.2	Maintenance and replanting	years	5	R 15,000.00	R 75,000.00
	Total Planting				**R2,775,000.00**
	SECTION 3: RESEARCH AND DEVELOPMENT				
3.1	Research on Gnomeskelus fluvialis research Masters Level	years	3	R 180,000.00	R 540,500.00
3.2	Research on Gnomeskelus fluvialis research PhD Level	years	4	R 250,000.00	R 1,000,500.00
	Total Other				**R1,541,000.00**
	Sub Total (ex VAT)				**R 4,811,000.00**
	Preliminaries and General				R 240,550.00
	Contingencies				R 240,550.00
	Total (ex VAT)				**R 5,292,100.00**
	Total (incl. VAT)				**R 6,085,915.00**

12 THE WAY FORWARD

A number of steps remain to be taken, first in finalizing the detailed offset design, and then in actual implementation of the biodiversity offset, rehabilitation and compensation work. The DWS could appoint a single implementing agent to co-ordinate and manage wetland rehabilitation and offsets (e.g. EWT, Wildlands Conservation Trust or WWF). This agent would be appointed on contract to work with relevant government agencies and authorities to ensure that the detailed wetland rehabilitation and offset plans were prepared and implemented according to schedule. The agent could, where appropriate, sub-contract work to contractors and/or consultants. This arrangement would be the least complex from DWS' perspective. Alternatively, DWS could request a number of different government agencies, who in turn could appoint contractors or consultants, to undertake the detailed design and planning for wetland rehabilitation and offsets, secure authorization for the detailed plans, establish and secure protection for offset sites, and/or implement or oversee the long-term management of the offset sites and compensation programs. This arrangement would be relatively complex and could place a higher demand on DWS, particularly since neither ecosystem rehabilitation nor biodiversity management are their core functions. The overall plan for institutional arrangement rollout is presented in the sections below:

12.1 *Securing Landowner agreements*

It is necessary to secure agreement with the landowners to establish the confidence to undertake detailed planning. This step would best be undertaken by the conservation NGOs government departments and consultants currently working with the landowners in an area whom have been engaging landowners in the vicinity of the two project footprint areas. They would require technical support contracted through the finances provided by DWS. The DWS could appoint the NGOs directly or, alternatively, an environmental consulting firm could be appointed. The agreements to be obtained would require a high level of confidence in the anticipated restrictions, benefits and the selection of the mechanism for securing the site.

Establishing the offsets involves either signing stewardship agreements and/or registering conservation servitudes. Many of the offset site landowners are likely to opt for a stewardship arrangement, either a Nature Reserve or Protected Environment (Protected Area) in terms of the National Environmental Management Protected Areas Act (NEMPAA) following the required declaration and notarial registration process, and preparing a Management Plan, incorporating the explicit recommendations of detailed planning of the rehabilitation works for the rehabilitation and offset areas.

Biodiversity Management Agreements would also be acceptable provided that there is at minimum a 30 year buy-in on the part of the landowner and, preferably, the conservation commitment is reflected on the title deed of the property or through some notarial process the commitment is reflected for a 99-year period.

12.2 *Site specific Rehabilitation and compensation program design*

It is recommended that this activity be undertaken by an independent service provider working in close collaboration with the various government agencies (EKZNW, DEDEA, NRM Programmes) and NGOs who are likely to be involved in implementation. The principles as defined in this offset program design, as presented in this document, should be used as a high level guide as to the approach to be taken and the objectives to be achieved.

12.3 *Environmental and Water Use Authorisation for the proposed site-specific interventions*

It is possible that some of the offset activities, particularly with regard to physical/mechanical interventions for wetland rehabilitation, will require EA and/or a water use license. These authorizations would need to be obtained before the listed activities could be implemented. It is proposed that Working for Wetlands should be responsible for managing the authorization process for any EIAs and/or water use licenses. This proposal is based on the following reasons:

- The activities likely to require authorization are wetland rehabilitation; and
- Working for Wetlands have standing agreements with the competent authorities for streamlining these processes, and they have experience in managing environmental assessment practitioners in undertaking EIAs for their projects (Cox and Brownlie, 2015).

12.4 *Implementation of site-specific interventions and compensation programs*

Rehabilitation and management of the offset sites (including initial invasive alien plant clearing, remedying erosion gullies, and revegetation for example) is essential to their long-term success and required to meet functional hectare equivalent targets. A variety of organizations could be responsible for undertaking initial rehabilitation activities, including the EKZNW Stewardship Programme, the relevant NRM programmes and/or private specialist contractors or NGOs. Ongoing management would best be undertaken by an independent service provider or appropriate NGO working in close collaboration with the various government agencies (EKZNW, DEDEA, NRM Programmes).

12.5 *Monitoring, Evaluation, Auditing and Compliance*

Monitoring and evaluation (M&E) is focused on ensuring that the objectives and intended outcomes of the wetland rehabilitation and biodiversity offsets are achieved, thereby satisfying the conditions of EA. M&E requirements, and adaptive management informed by the results of M&E, will be guided by the Management Plan (MP) which sets out the management objectives, criteria, outcomes or targets within specific timeframes, and performance indicators for each site. The focus of monitoring and evaluation would be on assessing the adequacy of implementation of required wetland rehabilitation/offset activities, as well as the response of the target systems to the rehabilitation and management activities in relation to defined outcomes/management targets. Indicators could include, for example:

- Monitoring vegetation structure and diversity;
- Monitoring of recruitment and abundance of alien invasive species;
- Improvement in wetland structure and overall ecostatus;
- Continued use and new use of nest sites by *Hirundo atrocaerulea*;
- Presence of good indigenous leaf litter in riparian forests and the presence of *Gnomeskelus spp*; and
- Survival of *Protea caffra* stands augmented by additional planting.

Given the long-term nature of offsets, it is important to check on their performance at regular intervals to ensure compliance with the conditions of EA. It is proposed that an independent compliance audit be undertaken on an annual basis considering both technical and financial performance. Further detail is provided in the sections below:

12.5.1 Technical/Biodiversity Performance Assessment

A suite of appropriately qualified and experienced specialists are appointed to evaluate progress with implementing the various components of the Biodiversity Offset and Compensation Initiative. The audit should verify, initially progress with achieving targets and ultimately that offset requirements have been met. The audit would draw extensively on the M&E records of the parties responsible for managing these sites, as well as feedback from the provincial conservation agency’s stewardship programme with regard to performance of the wetland rehabilitation and offset sites. The audit report must be submitted to DWS, DEDEA, EKZNW and DEA, and should highlight any specific areas of concern and/or requiring attention. The DEA, as the competent authority, should use this report as the basis for any corrective action.

12.5.2 Financial Performance Assessment

An appropriately qualified and experienced auditor should be appointed to track and verify that the transfer of funds from DWS to appointed agents has occurred according to the required schedule of financial provision provided in the detailed planning (to be undertaken in the next phase of work), in order to satisfy the requirements of the Biodiversity Offset and

Compensation Initiative. Furthermore, the audit should track and evaluate the expenditure of the funds on specific interventions as specified in detailed plans. This audit report should be submitted to DWS and DEA. The findings of this report should provide the basis for any adaptive or corrective action as required.

13 CONCLUSION

Based on the findings of this offset requirements assessment the need for a Biodiversity Offset and Faunal SCC Compensation Initiative have been determined.

Significant progress has been made and viable options for the biodiversity offset and compensation have been determined at a high level. While this high-level Biodiversity Offset and Compensation Initiative planning process has elicited in principle agreement of various strengths or merely interest by many landowners it should be noted that there are no guaranteed outcomes at present. Nevertheless, the overall risk of not being able to meet the wetland target is considered to be reasonably low since in through the engagement process, the level of interest showed “proof of concept” that with more effort, the Biodiversity Offset and Compensation Initiative could be successfully rolled out. The conservative approach taken to budgeting and the contingency included the budget should address required further interactions.

The work done to date is deemed successful and indicates that the Biodiversity Offset and Compensation Initiative is viable.

This Biodiversity Offset and Compensation Initiative and Implementation Plan document must be submitted to the competent authority as part of the environmental assessment and Authorisation process. On approval, this document becomes binding and all aspects of the proposed rehabilitation and mitigation recommendations made herein must be adhered to by the proponent and appointed implementing agent/s.

14 REFERENCES

African Butterfly News. Early Summer Addition: November / December 2017-6. The lepidopterist' Society of Africa. Written by A. Armstrong. Is Pennington's Protea Butterfly *Capys penningtoni* on the verge of extinction.

Allan, D., April 2018: uMkhomazi Water Project Environmental Impact Assessment: Avifauna Bridging Study.

Bromilow, C. 2001. Revised Edition, First Impression. Problem Plants of South Africa. Briza Publications, Pretoria, RSA.

Business and Biodiversity Offsets Programme (BBOP). 2009. Biodiversity Offset Design Handbook. BBOP, Washington, D.C.

Carstens, W. 2013. The appeal of Proteas: feature. Veld & Flora, 99(4), 198-199.

Cooke, G.D. 1999. Ecosystem rehabilitation. Lake and Reserv. Manage. 15(1):1-4.

Cox, D. and Brownlie, S. for the **Institute of Natural Resources.** 2015. MOOI-MGENI TRANSFER SCHEME PHASE II: SPRING GROVE DAM. Preliminary Planning of Wetland Rehabilitation and Biodiversity Offsets

Department of Agriculture, Forestry and Fisheries (DAFF), 2014. Proteas production Guideline.

Department of Environmental Affairs and Development Planning. 2011. Information Document on Biodiversity Offsets, EIA Guideline and Information Document Series. Western Cape Department of Environmental Affairs & Development Planning.

Department of Environmental Affairs and Development Planning. 2007. Provincial Guideline on Biodiversity Offsets. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Tow

Department of Environmental Affairs. 2017. Draft National Biodiversity Offset Policy. Government Gazette No. 40733.

Department of Water Affairs (DWA). South Africa Version 1.0 of Resource Directed Measures for Protection of Water Resources, 1999 [Appendix W3].

Department of Water Affairs (DWA). 2005. "A practical field procedure for identification and delineation of wetlands and riparian areas

Department of Water and Sanitation (DWS). 2014. A Desktop Assessment of the Present Ecological State, Ecological Importance and Ecological Sensitivity per Sub Quaternary Reaches for Secondary Catchments in South Africa. Secondary: U1, U6 and U7 Compiled by RQIS-RDM: Online available: https://www.dwa.gov.za/iwqs/rhp/eco/peseismodel.aspx as retrieved in February 2018

Department of Water Affairs and Forestry (DWAF). 2008. Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas, prepared by M. Rountree, A. L. Batchelor, J. MacKenzie and D. Hoare. Report no. X. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa.

Ezemvelo KwaZuluNatal Wildlife. 2010. Terrestrial Systematic Conservation Plan: Minimum Selection Surface (MINSET) 2010 Version 1.2. Unpublished GIS Coverage [tscp_minset_dist_2010_v1_2_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.

Enviross CC, 2016. Proposed uMkhomazi Water Project. Raw Water Component, Kwazulu-Natal. Aquatic & Wetland Baseline Ecological Integrity & Potential Impact Surveys.

Erwin, K. L. 2009. Wetlands and global cimate change: the role of wetland restoration in a changing world. Wetlands Ecol Manage (2009) 17: 71. https://doi.org/10.1007/s11273-008-9119-1

EKZNW (2010) Terrestrial Systematic Conservation Plan: Minimum Selection Surface (MINSET) 2010 Version 1.2. Unpublished GIS Coverage [tscp_minset_dist_2010_v1_2_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.

Evans, S.W., & Bouwman, H. 2010. Habitat selection by Blue Swallows *Hirundo atrocaerulea* Sundevall, 1850 breeding in South Africa and its implications for conservation. *African Journal of Ecology* 48: 871–879.

Ezemvelo KZN Wildlife. 2016. KZN Biodiversity Spatial Planning Terms and Processes, Version 3.3 Unpublished Report, Biodiversity Spatial Planning and Information Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202

Hammer, M. December 2017. Report on the relocation of millipede and terrestrial mollusc species at Bhubesi Industrial Area, Lynfield Park.

Henning G.A., Terblanche R.F. and Ball J.B.;2009. South African Red Data Book: Butterflies. SANBI Biodiversity Series 13. South African National Biodiversity Institute, Pretoria**.**

IEM, 2013. Concise Guideline: Biodiversity Offsets in KwaZulu Natal

International Finance Corporation. 2012. Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.

Jewitt, D and Escott, B.J. 2011. Conservation targets for vegetation types October 2011. Unpublished GIS Coverage [kznveg05v2_0_11_public_oct2011_constats_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202

Little, I.T. & Theron C. 2014. Guidelines for custodianship in South Africa, rewarding conservation friendly farming. Unpublished report of the Endangered Wildlife Trust.

Kleynhans C.J., Thirion C. and Moolman J. 2005. A Level 1 Ecoregion Classification System for South Africa, Lesotho and Swaziland. Report No. N/0000/00/REQ0104. Resource Quality Services, Department of Water Affairs and Forestry, Pretoria

Kotze D.C., Marneweck G.C., Batchelor A.L., Lindley D.S. and Collins N.B. 2009. WET-EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands. WRC Report No. TT 339/09. Water Research Commission, Pretoria.

Macfarlane D.M., Kotze D.C., Ellery W.N., Walters D., Koopman V., Goodman P. and Goge C. 2008. *WET-Health: A technique for rapidly assessing wetland health.* WRC Report No. TT 340/08. Water Research Commission, Pretoria.

Mecenero, S, Ball, J.B., Edge, D.A., Hamer, M.L., Henning, G.A., Krüger, M., Pringle, E.L., Terblanche, R.F. & Williams, M.C. (Eds.) 2013. Conservation assessment of butterflies of South Africa, Lesotho and Swaziland: Red list and atlas. Saftronics (Pty) Ltd., Johannesburg & Animal Demography Unit, Cape Town.

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

Macfarlane, D., Holness, S.D., von Hase, A., Brownlie, S. Dini, J., & Kilian, V. 2016. Wetland offsets: a best-practice guideline for South Africa. South African National Biodiversity Institute, Department of Water Affairs and the Water Research Commission. Pretoria. WRC Report TT 660/16.

Macfarlane, D., Holness, S.D., von Hase, A., Brownlie, S. & Dini, J., 2014. Wetland offsets: a best-practice guideline for South Africa. South African National Biodiversity Institute and the Department of Water Affairs. Pretoria.

Mbona, N., Job, N., Smith, J., Nel, J., Holness, S., Memani, S., and Dini, J. 2015. Supporting better decisionmaking around coal mining in the Mpumalanga Highveld through the development of mapping tools and refinement of spatial data on wetlands. Pretoria. WRC Report TT614/14.

National Environmental Management Act (NEMA) 107 of 1998

National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

National Water Act (NWA) 36 of 1998

Nel, JL; Murray, KM; Maherry, AM; Petersen, CP; Roux, DJ; Driver, A; Hill, L; van Deventer, H; Funke, N; Swartz, ER; Smith-Adao, LB; Mbona, N; Downsborough, L & Nienaber, S. 2011. Technical report for the freshwater ecosystem priority areas project: WRC Report No 1801/2/11. Water Research Commission, Pretoria

Nemai, 2016. Proposed Umkhomazi Water Project Phase 1 Potable Water Component - Terrestrial Fauna and Flora Assessment Report.

Nemai, 2016. Proposed Umkhomazi Water Project Phase 1 Raw Water Component: EIA Report for Environmental Authorisation.

Nemai, 2017. Terms of Reference: Biodiversity Offset Study. uMKHOMAZI WATER PROJECT PHASE 1 ENVIRONMENTAL IMPACT ASSESSMENT

NFEPA: Driver, A., Nel, J.L., Snaddon, K., Murruy, K., Roux, D.J., Hill, L., Swartz, E.R., Manuel, J. and Funke, N. 2011. Implementation Manual for Freshwater Ecosystem Priority Areas. Water Research Commission. Report No. 1801/1/11. Online available: http://bgis.sanbi.org/nfepa/project.asp

Ollis, DJ; Snaddon, CD; Job, NM & Mbona, N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African Biodiversity Institute, Pretoria

Pachnoda Consulting, 2018: uMkhomazi Water Project, Smithfield, Kwazulu-Natal: Invertebrate Assessment.

Protea Atlas Project. https://www.proteaatlas.org.za/sugar11.htm

Rountree, M.W. and Kotze, D.C. 2013. Appendix A3: Ecological Importance and Sensitivity Assessment. In: Rountree, M. W., Malan, H.L., and Weston, B.C. Eds. *Manual for the Rapid Ecological Reserve Determination of Inland Wetlands (Version 2.0)*. WRC Report No. 1788/1/12. Pretoria.

South African National Biodiversity Institute; 2004. National Spatial Biodiversity Assessment

(South African) National Development Plan 2030: Our Future-make it work. 2012. ISBN: 978-0-621-41180-5. Retrieved from https://www.gov.za/sites/default/files/NDP-2030-Our-future-make-it-work_r.pdf January 2018.

SANBI, 2014. Grazing and Burning Guidelines: Managing Grasslands for Biodiversity and Livestock Production. Compiled by Lechmere-Oertel, R.G. South African National Biodiversity Institute, Pretoria.

The South African National Biodiversity Institute - Biodiversity GIS (BGIS) *[online].* Retrieved 2013/03/11 URL: http://bgis.sanbi.org

Threatened Ecosystems: National Environmental Management Biodiversity Act: National List Of Ecosystems That Are Threatened And In Need Of Protection (G 34809, GoN 1002). 2011. Department of Environmental Affairs. Online available: http://bgis.sanbi.org/ecosystems/project.asp

Taylor. M.R, Peacock. F, Wanless, R.M (eds), 2015. The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland. BirdLife South Africa. Johannesburg, South Africa.

Van Ginkel, C.E., Glen, R.P., Gornon-Gray, K.D., Cilliers, C.J., Muasya, M., van Deventer, P.P. 2011. *Easy identification of some South African Wetland Plants*. Water Research Commission TT 479/10.

Vogts, M. M. (1954). Growing Proteaceae in the summer-rainfall area. Veld & Flora, 40(1), 18.

Vogts, M. M. (1962). The cultivation of the Proteaceae. Marie M. Vogts (Research Officer, Botanical Research Institute of South Africa. Veld & Flora, 48(1), 8.

Vogts, M. M. (1982). South Africa's Proteaceae: know them and grow them. Cape Town, C. Struik.

Wakelin, J., Oellermann, C.G., Wilson, A., Downs, C.T., Hill, T.R. 2007. Habitat use by the critically endangered Blue Swallow in KwaZulu-Natal, South Africa. *Bothalia - African Biodiversity & Conservation*, Volume 48 Number 1, Apr 2018, p. 1 – 9.

Wakelin, J. & Hill, T.R. 2007. The impact of land transformation on breeding Blue Swallows *Hirundo atrocaerulea* Sundevall, in KwaZulu-Natal, South Africa. *Journal for Nature Conservation* 15, 245-255

WildSkies Ecological Services, 2015. uMkhomazi Water Project 1 Raw Water Component Environmental Impact Assessment Draft Avifaunal Specialist Study.

APPENDIX A: INDEMNITY

INDEMNITY AND TERMS OF USE OF THIS REPORT

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken and SAS CC and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing research or further work in this field or pertaining to this investigation.

Although SAS CC exercises due care and diligence in rendering services and preparing documents, SAS CC accepts no liability and the client, by receiving this document, indemnifies SAS CC and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expensed arising from or in connection with services rendered, directly or indirectly by SAS CC and by the use of the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

APPENDIX B: LEGISLATION

LEGISLATIVE REQUIREMENTS

National Environmental Management Act (NEMA) (Act No. 107 of 1998)	The NEMA (Act 107 of 1998) provides the framework and principles for sustainable development and sets national norms and standards for integrated environmental management (Section 24) where all spheres of Government and all organs of State must co-operate, consult and support one another. Section 28 of the Act also imposes a duty of care and remediation of environmental damage on any person who causes, has caused or may cause significant pollution or degradation of the environment. The guiding principles of NEMA refer specifically to biodiversity management in the following Clause: (4) (a) *Sustainable* development requires the consideration of all relevant factors including the following: (i) That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied. NEMA (Act 107 of 1998) and the associated 2017 Regulations (Listing No R. 325, No R. 326 and R. 327) as amended, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment process or the EIA process depending on the nature of the activity and scale of the impact. This Maintenance and Management Plan has been developed in fulfilment of the requirements as defined in the Environmental Impact Assessments EIA Regulations, 2014 (No. R. 982) and adopted in No. R. 326 where a "maintenance management plan" is defined as a management plan for maintenance purposes defined or adopted by the competent authority.
National Environmental Management Biodiversity Act, 2004 (NEMBA, Act 10 of 2004)	The objectives of this act are (within the framework of the National Environmental Management Act) to provide for: ➢ the management and conservation of biological diversity within the Republic of South Africa and of the components of such diversity; ➢ the use of indigenous biological resources in a sustainable manner; ➢ the fair and equitable sharing among stakeholders of benefits arising from bio prospecting involving indigenous biological resources; ➢ to give effect to 'ratified international agreements' relating to biodiversity which are binding to the Republic; ➢ to provide for co-operative governance in biodiversity management and conservation; and ➢ to provide for a South African National Biodiversity Institute to assist in achieving the objectives of this Act. This act alludes to the fact that management of biodiversity must take place to ensure that the biodiversity of surrounding areas is not negatively impacted upon, by any activity being undertaken, in order to ensure the fair and equitable sharing among stakeholders of benefits arising from indigenous biological resources. Furthermore, a person may not carry out a restricted activity involving either: a) a specimen of a listed threatened or protected species; b) specimen of an alien species; or c) a specimen of a listed invasive species without a permit. Permits for the above may only be issued after an assessment of risks and potential impacts on biodiversity is carried out. Before issuing a permit, the issuing authority may in writing require the applicant to furnish it, at the applicant's expense, with such independent risk assessment or expert evidence as the issuing authority may determine. The Minister may also prohibit the carrying out of any activity, which may negatively impact on the survival of a listed threatened or protected species or prohibit

	the carrying out of such activity without a permit. Provision is made for appeals against the decision to issue/refuse/cancel a permit or conditions thereof.
National Environmental Management Biodiversity Act (NEMBA) (Alien and Invasive Species Regulations, 2014)	NEMBA is administered by the Department of Environmental Affairs and aims to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA. In terms of alien and invasive species. This act in terms of alien and invasive species aim to: ➢ Prevent the unauthorized introduction and spread of alien and invasive species to ecosystems and habitats where they do not naturally occur, ➢ Manage and control alien and invasive species, to prevent or minimize harm to the environment and biodiversity; and ➢ Eradicate alien species and invasive species from ecosystems and habitats where they may harm such ecosystems or habitats. Alien species are defined, in terms of the National Environmental Management: Biodiversity Act, 2004 (Act no 10 of 2004) as: (a) a species that is not an indigenous species; or (b) an indigenous species translocated or intended to be translocated to a place outside its natural distribution range in nature, but not an indigenous species that has extended its natural distribution range by natural means of migration or dispersal without human intervention.
Restricted activities (GN R598 National Environmental Management: Biodiversity Act 10 of 2004)	The following activities, applicable to this project, are defined as restricted activities: ➢ The spread or allowing the spread of, any specimen of a listed invasive species; and ➢ Releasing any specimen of a listed invasive species.
Exempted Alien Species (R.509 National Environmental Management: Biodiversity Act 10 of 2004)	Species that are exempted from the provisions of section 65 of NEMBA include: ➢ Dead specimens of alien species; ➢ Alien species legally introduced to South Africa prior to the Regulations coming into effect, and which are not on the National List of Invasive Species, including species imported for agricultural purposes; and ➢ Alien species that are also indigenous species, including those regulated in terms of the Threatened and Protected Species (TOPS) Regulations promulgated under NEMBA; and ➢ Alien species that are regulated in terms of the Conservation of Agricultural Resources Act (CARA; Act 43 of 1983) as weeds and invader plants.
Categories According to NEMBA (Alien and Invasive Species Regulations, Notice number 864 of 29 July 2016 in Government Gazette 40166)	➢ **Category 1a: Invasive species that require compulsory control.** Invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. These species need to be controlled and removed from all areas, including private property and officials from the Department of Environmental Affairs (DEA) must be allowed access to monitor or assist with control. ➢ **Category 1b: Invasive species that require control by means of an invasive species management programme**. Invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove. All Category 1b species must be contained, and in many cases, they already fall under a government sponsored management program. ➢ **Category 2: Commercially used plants that may be grown in demarcated areas, provided that there is a permit and that steps are taken to prevent their spread.** Category 2 species are invasive species that can remain in private gardens, but only with a permit, which is granted under very few circumstances. These species should be monitored and controlled to prevent spread to areas outside of permitted areas. Any Category 2 plants outside permitted areas should be dealt with as stipulated in Category 1b. ➢ **Category 3: Ornamentally used plants that may no longer be planted.** These are invasive species that may remain in private gardens. However, these species may not be sold or propagated and must be controlled. In riparian zones (within 32 metres of the edge of a river, lake, dam, wetland or estuary, or within the

	1:100 year floodline, whichever is the greater) or wetlands all Category 3 plants fall within Category 1b.
Conservation of Agricultural Resources Act, 1983 (CARA, Act 43 of 1983)	Amendments to regulations under the Conservation of Agricultural Resources Act (CARA), 1983 (Act No. 43 of 1983) ensures that landowners are legally responsible for the control of invasive alien plants on their properties. The CARA legislation divides alien plants into weeds and invader plants, with *weeds* regarded as alien plants with no known useful economic purpose, while *invader plants* may serve useful purposes as ornamentals, as sources of timber and may provide many other benefits, despite their aggressive nature. The CARA Regulations have been superseded by the National Environmental Management: Biodiversity Act, 2004 (Act no. 10 of 2004) – Alien and Invasive Species (AIS) Regulations, which became law on 1 October 2014 (http://www.arc.agric.za, retrieved 09062016).
The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (1947)	The Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act 36 of 1947) is administered by the Department of Environmental Affairs (DEA), and is focused on the registration, importation, sale, acquisition disposal or use of fertilisers, farm feeds and agricultural remedies, as well as the registration of sterilising pest and plant control operators. For the purpose of this report and this Act, herbicides are classified as agricultural remedies. An agricultural remedy (herbicide) needs to comply with the following criteria in order to be accepted for registration: ➢ It should be suitable and sufficiently effective for the purpose it is intended; ➢ It has to comply with all the prescribed requirements; ➢ It should not transgress against the public interest; and ➢ The factory in which it is manufactured should comply with certain requirements. The following specifications must be adhered to during the use of herbicides: ➢ The use or recommendation of a herbicide during the course of any trade, industry or business, may only be used or recommended for the purpose, in the manner that is specified on the container of the herbicide; ➢ Only a registered pest control operator, or a person working under the supervision of a registered pest control operator, are allowed to use or recommend any herbicides for application in any industry, trade or business; ➢ The minister of Agriculture is entitled to prohibit or regulate, the sale, use or acquisition of a herbicide within a specific area/s or by certain persons or groups of persons; and ➢ When herbicides are applied by the request of the owner or person in control of the area concerned, the operator first needs to notify the owner or person in control of the purpose of the application, the registered name and number of the herbicide, the necessary precautions as well as the number of the registration certificate of the operator. The notification can be verbally; however, it should be put in writing no later than three days after application.
Occupational Health and Safety Act (OHSA; Act 85 of 1993)	The Occupational Health and Safety Act (OHSA; Act 85 of 1993) was administered by the Department of Labour and aim to provide: ➢ Health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; ➢ Protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; and Establish an advisory council for occupational health and safety, which must provide for matters connected therewith.
The National Veld and Forest Fire Act (NVFFA), 1998 (Act No. 101 of 1998)	The purpose of the National Veld and Forest Fire Act, 1998 (Act No.101 of 1998) is to prevent and combat veld, forest and mountain fires throughout South Africa. The Act places the duty on every land owner on whose land a veld fire may start or burn, or from whose land it may spread, to prepare and maintain firebreak(s) on his/her side of the boundary between his/her land and the adjoining land. Fires causing damage to neighbouring land may result in claims against the landowner if the requirements of

	this Act are not adequately implemented. Furthermore this Act makes provision for the establishment of Fire Protection Associations, which are designed to administer minimum standards to be maintained by members in relation to all aspects of veld fire prevention and readiness for firefighting; and to regulate prescribed burning to conserve ecosystems and reduce fire danger. The following Sections pertain to the abovementioned Chapter 4 in the Act regarding firebreaks: ➢ Section 12 sets out the conditions for preparing and maintaining firebreaks. ➢ Section 12 (2) to (10) contains conditions on burning for the preparation and maintenance of any firebreaks. ➢ Section 15 involves the exemption from the duty to prepare and maintain firebreaks. ➢ Section 16 indicates the actions that can be taken to minimize negative environmental impacts when preparing and maintaining firebreaks. (6) **Contravention Categories and its associated penalties according to the NVFFA** ➢ **Category 1**: Any person who lights, uses or maintains a fire in the open air in a region where the fire danger is high or extreme. Such a person may be liable on conviction for a fine, or two year imprisonment, or both. ➢ **Category 2**: Any person who does the following is guilty of a second category offence. Such a person is liable for a fine, or two year imprisonment, or both: • Fails to prepare a firebreak when obliged to do so • Fails to give notice of intention to burn a firebreak • Burns a firebreak when a Fire Protection Officer has objected to it • Fails to inform adjoining land owners • Fails to meet the standards of readiness for firefighting • Refuses to assist a Fire Protection Officer • Hinders/obstructs a Fire Protection Officer • Smokes where smoking is by notice prohibited • Leaves a fire unattended which he/she lit before that fire has been extinguished properly • Lights, uses, or maintains a fire with or without permission from the landowner, or spreads a fire, causing damage/injury. • Throws, puts down/drops a burning match or burning material of any kind. • Uses material capable of self-ignition to make a fire which spreads and causes injury and damage. ➢ **Category 3**: Any owner, occupier or person in control of land on which a fire occurs who fails to take reasonable steps to extinguish the fire or to prevent it from spreading, or who fails to prevent it from causing damage to property or adjoining land, is guilty of a third category offence. Such a person is liable for a fine, or six months imprisonment or both. Any person who prevent a Fire Protection Officer or any other officer (police official/forest ranger) from doing his/her work or interferes with the above when doing his/her work, is guilty of a Category 3 offence and is liable for a fine, or six months imprisonment, or both.
Govan Mbeki Municipality Draft By-Laws relating to Fire Brigade Services	The Council of Govan Mbeki Municipality has in terms of section 156 of the Constitution, 1996 (Act No. 108 of 1996), read in conjunction with sections 11 and 98 of the Local Government: Municipal Systems Act, 2000, (Act No. 32 of 2000), made the following By-laws which are applicable to this project: **Section 12:** 1. No person shall make a fire, or cause, or permit a fire to be made in such a place or in such a manner as to endanger any building, premises or property. 2. Subject to the provisions of any other law, no person shall, without the written permission of the Chief Fire Officer, burn any rubbish, wood, straw or other material in the open air or cause or permit it to be done, except for the purpose of preparing food.

	3. Any permission granted in terms of subsection (2) shall be subject to such conditions as are imposed by the Chief Fire Officer.
National Water Act (NWA) (Act No. 36 of 1998)	The National Water Act (NWA) (Act 36 of 1998) recognises that the entire ecosystem and not just the water itself in any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the Department of Water and Sanitation (DWS). Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) & (i).
General Notice 509 as published in the Government Gazette 40229 of 2016 as it relates to the NWA (Act 36 of 1998)	In accordance with Regulation GN509 of 2016, a regulated area of a watercourse for section 21c and 21i of the NWA, 1998 is defined as: a) The outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; b) In the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or c) A 500 m radius from the delineated boundary (extent) of any wetland or pan. This notice **replaces GN1199** and may be exercised as follows: i) Exercise the water use activities in terms of Section 21(c) and (i) of the Act as set out in the table below, subject to the conditions of this authorisation; ii) Use water in terms of section 21(c) or (i) of the Act if it has a low risk class as determines through the Risk Matrix; iii) Do maintenance with their existing lawful water use in terms of section 21(c) or (i) of the Act that has a LOW risk class as determined through the Risk Matrix; iv) Conduct river and stormwater management activities as contained in a river management plan; v) Conduct rehabilitation of wetlands or rivers where such rehabilitation activities have a LOW risk class as determined through the Risk Matrix; and vi) Conduct emergency work arising from an emergency situation or incident associated with the persons' existing lawful water use, provided that all work is executed and reported in the manner prescribed in the Emergency protocol. A General Authorisation (GA) issued as per this notice will require the proponent to adhere with specific conditions, rehabilitation criteria and monitoring and reporting programme. Furthermore, the water user must ensure that there is a sufficient budget to complete, rehabilitate and maintain the water use as set out in this GA. Upon completion of the registration, the responsible authority will provide a certificate of registration to the water user within 30 working days of the submission. On written receipt of a registration certificate from the Department, the person will be regarded as a registered water user and can commence within the water use as contemplated in the GA.

APPENDIX C: METHODS OF ASSESSMENT

FRESHWATER RESOURCE METHOD OF ASSESSMENT

FRESHWATER RESOURCE OFFSET CALCULATOR: PRELIMINARY GUIDANCE

C. 1. *Functional Value Calculation*

C.1.1. Assessing Residual Impact to Wetland Functioning

An assessment of the loss in the functional value provided by the wetland is necessary to determine wetland functionality targets. To undertake this assessment, appropriate assessments such as WET-Health (Macfarlane *et. al.,* 2008) and WET-Ecoservice (Kotze *et al.*, 2007) were used to obtain an indication of the functional value of the wetland (i) prior to and (ii) post-development. Functional "hectare equivalents" were then calculated by multiplying the change in functional value (%) by the wetland area.

The change in functional value was expressed as a percentage (%). Given that wetland condition is typically expressed as a value from 0-10, a table has been provided to illustrate the relationship between a typical condition score and functional value (%). To calculate the change in functional value, the post-development score was simply subtracted from the pre-development score and expressed as a percentage (%). The resultant score was then multiplied by wetland area to obtain a measure of the loss in the functional value.

Table C.1: Descriptions of the A – F ecological categories.

HEALTH CATEGORY	DESCRIPTION	Condition Score	Functional Value (%)
A	Unmodified, natural.	0 – 0.9	90 - 100%
B	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1 – 1.9	80 - 90%
C	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2 – 3.9	60 - 80%
D	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4 – 5.9	40 - 60%
E	The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6 – 7.9	20 - 40%
F	Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 – 10	0 - 20%

C.1.2. Calculating Functional Offset Ratios

In situations where the loss of wetland functioning is particularly significant due to local or regional circumstances, there may be a motivation to increase offset requirements by applying a ratio to functional offset targets. Undertaking this assessment requires a sound understanding of the catchment context and the importance of wetlands in meeting water resource management objectives. Typically, a 1:5 ratio is applicable.

C.1.3. Calculation of Final Functional Offset Target

Calculation of the final functional offset target was done by multiplying the development impact (expressed as functional hectare equivalents) by any applicable offset ratio.

C.2. Determining Ecosystem Conservation Targets

C.2.1. Assessing Residual Impacts to Wetland Habitat

An assessment of the impact that wetland loss will have on wetland habitat and the ability to meet wetland conservation targets is necessary to determine ecosystem protection requirements. To

undertake this assessment, the vegetation module of WET-Health was used to assess habitat intactness (condition) of the wetland (i) prior to and (ii) post-development. The residual impact was then calculated by comparing the pre- and post-impact scenarios.
The selected habitat intactness measure was expressed as a percentage (%). A wetland supporting completely natural habitat would therefore score 100% while a wetland that has been completely destroyed and lacks any natural habitat would score 0%. To calculate the change in functional value, the post-development score was subtracted from the pre-development score. The resultant score was then multiplied by wetland area to obtain a measure of the loss in wetland habitat.

C.2.2. Calculating Ecosystem Conservation Ratios
Ecosystem conservation ratio was calculated based on a suite of wetland characteristics that are regarded as important in determining conservation value. These include (i) ecosystem status; (ii) regional and national conservation context and (iii) local site attributes. The ecosystem status multiplier acts as the starting point but should be adjusted downwards where the wetland has not been prioritised at regional or national level and where local site attributes that affect biodiversity value are sub-optimal.

C.2.3. Calculating Final Ecosystem Conservation Targets
The ecosystem conservation ratio was first calculated by calculating a weighted average of the (i) Ecosystem Status Multiplier; (ii) Regional and National Context Multiplier and (iv) Local Context Multiplier. The final ecosystem conservation target (expressed as habitat hectare equivalents) was then calculated by multiplying the development impact by the ecosystem conservation ratio.

C.3.1 Calculating Species Conservation Targets
In the case that threatened or protected faunal or floral species is present on the site for which an offset is required the species conservation targets needs to be determined in order to set appropriate species targets. The wetland features that will be lost due to the proposed runway re-alignment are not considered important in terms of species of conservation concern therefore the calculation was not included in the assessment.

TERRESTRIAL BIODIVERSITY APPROACH & METHODOLOGY

1. Biodiversity Value Determination
A scoring process to quantitatively determine the biodiversity value of a defined area was implemented to determine the Biodiversity Value of the respective biodiversity management units. The biodiversity of an area is a combination of its variety of species and habitats, its ecological processes and functional value. This can be captured in two broader categories namely conservation status and functional status. The conservation status encompasses species diversity, habitat diversity and ecological processes. The functional status encompasses ecological services and human use services. Due to the number of variables to be considered, the following scoring system is used to first determine the value of each of the components namely conservation status and functional status, from which the overall biodiversity value is determined (Coombs & Stacy, 2003). This process is further described below:

1.1 Conservation Status (CS)
The CS of a specific management unit is influenced by several factors, namely:

A. How much of the larger vegetation type or system of which the defined area is a representative example, still exists?
   - Only a small area still exists (< 500 km^2) 7
   - A moderate area still exists (500 to 1000 km2) 5
   - A large area still exists (> 1000 km^2) 3

B. What is (based on a qualitative assessment) the species and habitat diversity of the defined area?
   - Noticeably high 7
   - Difficult to assess 5
   - Obviously low 3

C. What is the condition (qualitative assessment) of the defined area?
   - Pristine and largely undisturbed 7
   - Moderately disturbed 5
   - Highly disturbed 3

The possible results for the conservation status of the defined area are based on a combination of the attributes, as follows:

➢ A (Size) + B (diversity) + C (condition) = Conservation Status

Based on the above, the average score obtained is interpreted as follows:

ESI level	Score	Description
Very high CS	19 - 21	Very high conservation status, largely undisturbed, needs to be maintained
High CS	15 - 18	High conservation status, moderately disturbed, needs to be maintained and where necessary improved
Moderate CS	12 - 14	Moderate conservation status, heavily disturbed and will require improvement
Low CS	9 - 11	Low conservation status, heavily reduced and of limited value

1.2 Functional Status (FS)

The FS of a specific management unit is influenced by several factors, namely:

A. Are there currently any signs of obvious recreational use of the area, such as walking/hiking, bird watching, mountain biking, fishing, etc?
- Obvious signs of regular use 7
- Signs of periodic use 5
- No noticeable signs of use 3

B. Does the area carry out any ecological service, such as water purification, flood attenuation, riverbank stabilisation, soil stabilisation, etc?
- Has an obvious functional role 7
- Difficult to determine its functional role 5
- Clearly has no to very limited functional role 3

C. Does the area serve an aesthetic role?
- Forms part of a larger landscape that is widely visible and has a high aesthetic appeal 7
- Forms part of a landscape that has high aesthetic appeal, but which is not widely visible 5
- Forms part of a landscape that has low aesthetic appeal 3

The possible results for the functional status of the defined area are based on a combination of the attributes, as follows.

➢ A (recreational use) + B (ecological service) + C (aesthetic value) = Functional Status

Based on the above, the average score obtained is interpreted as follows:

FS level	Score	Description
Very high FS	19 - 21	Optimise FS with emphasis on preservation of ecosystems and sustainable use of natural resources.
High FS	15 - 18	FS important, but emphasis must be placed on conservation and enhancement of ecosystems
Moderate FS	12 - 14	FS moderately important, emphasis leaning towards conservation and limiting of interference by humans
Low FS	9 - 11	No FS, system must be preserved with minimal interference by humans.

1.3 Biodiversity Value (BV)

The perceived biodiversity value of an area to human development is not always easy to describe, but it includes the natural system and its variety of species, the ecological processes and the service or functional value that it provides. The combination of the conservation status and functional status scores provides a ranking of the overall biodiversity value for a defined area, as shown in the following matrix:

Table C2: Biodiversity Value (BV) Combination Matrix.

	Functional status			
Conservation status	Very high service value	High service value	Moderate service value	Low service value
Very high	Very high	Very high	Very high	High
High	Very high	High	High	Moderate
Moderate	High	Moderate	Moderate	Low
Low	Moderate	Low	Low	Low

Once the BV has been calculated for a specific system, objectives are set by which the system can be managed to improve its BV. These objectives are further explained in the table below:

Table C3: Biodiversity Value and Specific Objectives.

Very high BV	To maintain and where necessary improve the variation and complexity of species and ecological processes; OR ecological OR human services
High BV	To maintain and improve the variation and complexity of species and ecological processes and the human use value
Moderate BV	To maintain the variation and complexity of species and ecological processes and optimise the human use value.
Low BV	To optimise the human use value of the area and maintain and where practical improve the species diversity.

2. Determining Terrestrial Conservation Targets

2.1. Calculating Terrestrial Conservation Ratios

Terrestrial conservation ratios were calculated based on the vegetation type ratio as per the Ezemvelo KZN Wildlife Vegetation Types for KwaZulu-Natal, present within the proposed development area that will be impacted upon. The required offset ratio depends on the particular vegetation type(s) impacted e.g. Near Threatened (Up to 3:1), Vulnerable (Up to 5:1), Endangered (Up to 25:1) and Critically Endangered or within a CBA, priority or irreplaceable (Up to 30:1) (IEM, 2013).

APPENDIX D: FRESHWATER ECOLOGY METHOD OF ASSESSMENT

FRESHWATER RESOURCE ASSESSMENT APPROACH

Literature Review

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

- National Freshwater Ecosystem Priority Areas (NFEPAs, 2011);
  - NFEPA water management area (WMA);
  - FEPA (sub)WMA % area;
  - Sub water catchment area FEPAs;
  - Water management area FEPAs;
  - Fish sanctuaries;
  - Wetland ecosystem types;
- Mpumalanga Biodiversity Sector Plan (2014)

National Freshwater Ecosystem Priority Areas (NFEPA; 2011)

The NFEPA project is a multi-partner project between the Council of Scientific and Industrial Research (CSIR), Water Research Commission (WRC), South African National Biodiversity Institute (SANBI), Department of Water Affairs (DWA), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). The project responds to the reported degradation of freshwater ecosystem condition and associated biodiversity, both globally and in South Africa. It uses systematic conservation planning to provide strategic spatial priorities of conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development.

The NFEPA project aims to identify a national network of freshwater conservation areas and to explore institutional mechanisms for their implementation. Freshwater ecosystems provide a valuable, natural resource with economic, aesthetic, spiritual, cultural and recreational value. However, the integrity of freshwater ecosystems in South Africa is declining at an alarming rate, largely as a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (competition between stakeholders for utilisation) and institutional (building appropriate governance and co-management mechanisms).

The NFEPA database was searched for information in terms of conservation status of rivers, wetland habitat and wetland feature present within the study area.

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

The freshwater feature was classified as wetland habitat based on the characteristics as defined by the NWA No 36 of 1998, provided below:

- Wetland habitat is land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil (NWA; Act No. 36 of 1998).

The wetland feature encountered within the study area assessed using the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems, hereafter referred to as the "Classification System" (Ollis *et. al*., 2013). A summary on Levels 1 to 4 of the classification system are presented in the tables below.

Table D1: Classification System for Inland Systems, up to Level 3.

WETLAND / AQUATIC ECOSYSTEM CONTEXT		
LEVEL 1: SYSTEM	LEVEL 2: REGIONAL SETTING	LEVEL 3: LANDSCAPE UNIT
Inland Systems	DWA Level 1 Ecoregions OR NFEPA WetVeg Groups OR Other special framework	Valley Floor
		Slope
		Plain
		Bench (Hilltop / Saddle / Shelf)

Table D2: Hydrogeomorphic (HGM) Units for the Inland System, showing the primary HGM Types at Level 4A and the subcategories at Level 4B to 4C.

FUNCTIONAL UNIT		
LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	**B**	**C**
River	Mountain headwater stream	Active channel
		Riparian zone
	Mountain stream	Active channel
		Riparian zone
	Transitional	Active channel
		Riparian zone
	Upper foothills	Active channel
		Riparian zone
	Lower foothills	Active channel
		Riparian zone
	Lowland river	Active channel
		Riparian zone
	Rejuvenated bedrock fall	Active channel
		Riparian zone
	Rejuvenated foothills	Active channel
		Riparian zone
	Upland floodplain	Active channel
		Riparian zone
Channelled valley-bottom wetland	(not applicable)	(not applicable)
Unchannelled valley-bottom wetland	(not applicable)	(not applicable)
Floodplain wetland	Floodplain depression	(not applicable)

FUNCTIONAL UNIT		
LEVEL 4: HYDROGEOMORPHIC (HGM) UNIT		
HGM type	Longitudinal zonation/ Landform / Outflow drainage	Landform / Inflow drainage
A	**B**	**C**
	Floodplain flat	(not applicable)
Depression	Exorheic	With channelled inflow
		Without channelled inflow
	Endorheic	With channelled inflow
		Without channelled inflow
	Dammed	With channelled inflow
		Without channelled inflow
Seep	With channelled outflow	(not applicable)
	Without channelled outflow	(not applicable)
Wetland flat	(not applicable)	(not applicable)

Level 1: Inland systems

From the classification system, Inland Systems are defined as **aquatic ecosystems that have no existing connection to the ocean**[12] (i.e. characterised by the complete absence of marine exchange and/or tidal influence) but **which are inundated or saturated with water, either permanently or periodically.** It is important to bear in mind, however, that certain Inland Systems may have had a historical connection to the ocean, which in some cases may have been relatively recent.

Level 2: Ecoregions & NFEPA Wetland Vegetation Groups

For Inland Systems, the regional spatial framework that has been included in Level 2 of the classification system is that of the DWA's Level 1 Ecoregions for aquatic ecosystems (Kleynhans *et. al.,* 2005). There is a total of 31 Ecoregions across South Africa, including Lesotho and Swaziland. DWA Ecoregions have most commonly been used to categorise the regional setting for national and regional water resource management applications, especially in relation to rivers.

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina & Rutherford, 2006) groups' vegetation types across the country, according to Biomes, which are then divided into Bioregions. To categorise the regional setting for the wetland component of the NFEPA project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting Bioregions into smaller groups through expert input (Nel *et al*., 2011). There are currently 133 NFEPA WetVeg Groups. It is envisaged that these groups could be used as a special framework for the classification of wetlands in national- and regional-scale conservation planning and wetland management initiatives.

Level 3: Landscape Setting

At Level 3 of the classification system for Inland Systems, a distinction is made between four Landscape Units (Table C1) on the basis of the landscape setting (i.e. topographical position) within which an HGM Unit is situated, as follows (Ollis *et. al.,* 2013):

---

[12] Most rivers are indirectly connected to the ocean via an estuary at the downstream end, but where marine exchange (i.e. the presence of seawater) or tidal fluctuations are detectable in a river channel that is permanently or periodically connected to the ocean, it is defined as part of the estuary.

- **Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley;
- **Valley floor:** The base of a valley, situated between two distinct valley side-slopes;
- **Plain:** an extensive area of low relief characterised by relatively level, gently undulating or uniformly sloping land; and
- **Bench (hilltop/saddle/shelf):** an area of mostly level or nearly level high ground (relative to the broad surroundings), including hilltops/crests (areas at the top of a mountain or hill flanked by down-slopes in all directions), saddles (relatively high-lying areas flanked by down-slopes on two sides in one direction and up-slopes on two sides in an approximately perpendicular direction), and shelves/terraces/ledges (relatively high-lying, localised flat areas along a slope, representing a break in slope with an up-slope one side and a down-slope on the other side in the same direction).

Level 4: Hydrogeomorphic Units

Seven primary HGM Types are recognised for Inland Systems at Level 4A of the classification system (Table C2), on the basis of hydrology and geomorphology (Ollis *et. al*., 2013), namely:

- **River:** a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water;
- **Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it;
- **Unchannelled valley-bottom wetland:** a valley-bottom wetland without a river channel running through it;
- **Floodplain wetland:** the mostly flat or gently sloping land adjacent to and formed by an alluvial river channel, under its present climate and sediment load, which is subject to periodic inundation by over-topping of the channel bank;
- **Depression:** a landform with closed elevation contours that increases in depth from the perimeter to a central area of greatest depth, and within which water typically accumulates;
- **Wetland Flat:** a level or near-level wetland area that is not fed by water from a river channel, and which is typically situated on a plain or a bench. Closed elevation contours are not evident around the edge of a wetland flat; and
- **Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend into a valley floor.

The above terms have been used for the primary HGM Units in the classification system to try and ensure consistency with the wetland classification terms currently in common usage in South Africa. Similar terminology (but excluding categories for “channel”, “flat” and “valleyhead seep”) is used, for example, in the recently developed tools produced as part of the Wetland Management Series including WET-Health (Macfarlane *et. al*., 2008), WET-IHI (DWAF, 2007) and WET-EcoServices (Kotze *et. al*., 2009).

Wet-Ecoservices (2009)

“The importance of a water resource, in ecological, social or economic terms, acts as a modifying or motivating determinant in the selection of the management class” (DWA, 1999). The assessment of the ecosystem services supplied by the identified wetland was conducted according to the guidelines as described by Kotze *et al.* (2009). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the service is provided:

- Flood attenuation;
- Stream flow regulation;
- Sediment trapping;
- Phosphate trapping;
- Nitrate removal;

- Toxicant removal;
- Erosion control;
- Carbon storage;
- Maintenance of biodiversity;
- Water supply for human use;
- Natural resources;
- Cultivated foods;
- Cultural significance;
- Tourism and recreation; and
- Education and research.

The characteristics were used to quantitatively determine the value, and by extension sensitivity, of the wetland. Each characteristic was scored to give the likelihood that the service is being provided. The scores for each service were then averaged to give an overall score to the wetland.

Table D3: Classes for determining the likely extent to which a benefit is being supplied.

Score	Rating of the likely extent to which the benefit is being supplied
<0.5	Low
0.6-1.2	Moderately low
1.3-2	Intermediate
2.1-3	Moderately high
>3	High

WET-Health

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

Level of Evaluation

Two levels of assessment are provided by WET-Health:

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

Framework for the Assessment

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

Units of Assessment

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

Quantification of Present State of a wetland

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

Table D4: Impact scores and categories of Present State used by WET-Health for describing the integrity of wetlands.

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

Assessing the Anticipated Trajectory of Change

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

Table D5: Trajectory of Change classes and scores used to evaluate likely future changes to the present state of the wetland.

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

Overall health of the wetland

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

Ecological Importance and Sensitivity (EIS) (Rountree & Kotze, 2013)

The purpose of assessing the importance and sensitivity of water resources is to identify those systems that provide higher than average ecosystem services, biodiversity support functions or are especially sensitive to impacts. Water resources with higher ecological importance may require managing such water resources in a better condition than the present to ensure the continued provision of ecosystem benefits in the long term (Rountree & Kotze, 2013).

In order to align the outputs of the Ecoservices assessment (i.e. ecological and socio-cultural service provision) with methods used by the DWA (now the DWS) used to assess the EIS of other watercourse types, a tool was developed using criteria from both WET-Ecoservices (Kotze, et, al, 2009) and earlier DWA EIA assessment tools. Thus, three proposed suites of important criteria for assessing the Importance and Sensitivity for wetlands were proposed, namely:

- Ecological Importance and Sensitivity, incorporating the traditionally examined criteria used in EIS assessments of other water resources by DWA and thus enabling consistent assessment approaches across water resource types;
- Hydro-functional importance, taking into consideration water quality, flood attenuation and sediment trapping ecosystem services that the wetland may provide; and
- Importance in terms of socio-cultural benefits, including the subsistence and cultural benefits provided by the wetland system.

The highest of these three suites of scores is then used to determine the overall Importance and Sensitivity category (Table D6) of the wetland system being assessed.

Table D6: Ecological Importance and Sensitivity Categories and the interpretation of median scores for biota and habitat determinants (adapted from Kleynhans, 1999).

EIS Category	Range of Mean	Recommended Ecological Management Class
Very high Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications.	>3 and <=4	A
High Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these wetlands may be sensitive to flow and habitat modifications.	>2 and <=3	B
Moderate Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications.	>1 and <=2	C
Low/marginal Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these wetlands is ubiquitous and not sensitive to flow and habitat modifications.	>0 and <=1	D

Recommended Ecological Category (REC)

"A high management class relates to the flow that will ensure a high degree of sustainability and a low risk of ecosystem failure. A low management class will ensure marginal maintenance of sustainability, but carries a higher risk of ecosystem failure" (DWA, 1999).

The REC (table below) was determined based on the results obtained from the PES, reference conditions and EIS of the resource (sections above), and is followed by realistic recommendations, mitigation, and rehabilitation measures to achieve the desired REC.

A wetland may receive the same class for the PES as the REC if the wetland is deemed in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as enhance the PES of the wetland feature.

Table D7: Description of REC classes.

Class	Description
A	Unmodified, natural
B	Largely natural with few modifications
C	Moderately modified
D	Largely modified

Wetland Delineation

The wetland delineation took place according to the method presented in the "Updated manual for the identification and delineation of wetland and riparian areas" published by DWAF in 2008. The foundation of the method is based on the fact that wetlands and riparian zones have several distinguishing factors including the following:

- The presence of water at or near the ground surface;
- Distinctive hydromorphic soils;
- Vegetation adapted to saturated soils; and
- The presence of alluvial soils in stream systems.

By observing the evidence of these features in the form of indicators, wetlands and riparian zones can be delineated and identified. If the use of these indicators and the interpretation of the findings are applied correctly, then the resulting delineation can be considered accurate (DWA, 2008).

A wetland can be divided into three zones (DWA, 2005). The permanent zone of wetness is nearly always saturated. The seasonal zone is saturated for a significant part of the rainy season and the temporary zone surrounds the seasonal zone and is only saturated for a short period of the year, but is saturated for a sufficient period, under normal circumstances, to allow for the formation of hydromorphic soils and the growth of wetland vegetation. The object of this study was to identify the outer boundary of the temporary zone and then to identify a suitable buffer zone around the wetland area.

APPENDIX E: RESULTS OF THE FRESHWATER AND TERRESTRIAL RESOURCES: DESKTOP ANALYSIS

The following section contains data accessed as part of the desktop assessment and are presented as a "dashboard" report below (Tables E1 to E4). The dashboard report aims to present concise summaries of the data on as few pages as possible in order to allow for integration of results by the reader. Where required, further discussion and interpretation is provided, and information that was considered to be of particular importance was emboldened.

It is important to note that although all data sources used provide useful and often verifiable, high quality data, the various databases used do not always provide an entirely accurate indication of the study area's actual site characteristics but do provide an extremely valuable starting point.

Table E1: Desktop data relating to the character of watercourses and terrestrial ecology within the Smithfield 1 recipient site and surrounding region using National Data.

Aquatic ecoregion and sub-regions in which Smithfield recipient site 1 is located	
Ecoregion	South Eastern Uplands
Catchment	Mkomazi
Quaternary Catchment	U10F & U10G
WMA	Mvoti to Umzimkulu
subWMA	Mkomazi

Dominant characteristics of the South Eastern Uplands Ecoregion (Level II 16.01) (Kleynhans *et al.*, 2007)	
Dominant primary terrain morphology	Closed Hills; Mountains, moderate and high relief; Lowlands; Hills and Mountains, moderate and high relief; Low Mountains; Strongly Undulating Lowlands with Hills; Undulating Hills.
Dominant primary vegetation types	North-eastern Mountain Grassland; Subarid Thorn Bushveld; Afromontane Forest, Short Misbelt Grassland; Valley Thicket; Coast-Hinterland Bushveld; Moist Upland Grassland; Alti Mountain Grassland.
Altitude (m a.m.s.l)	1100-1900
MAP (mm)	600 - 800
Coefficient of Variation (% of MAP)	<20 - 25
Rainfall concentration index	50 - 60
Rainfall seasonality	Mid-summer
Mean annual temp. (°C)	12 - 18
Winter temperature (July) (°C)	0 - 20
Summer temperature (Feb) (°C)	12 - 26
Median annual simulated runoff (mm)	30 - 260

Details of the Recipient site 1 in terms of KZN Vegetation Types (2011)	
Vegetation Type (Figure E6)	Various vegetation types are associated with recipient site 1. The Mooi River Highland Grassland is dominated within the northern portion, while Mistlands Mistbelt Grassland falls within the western and southern portion, and the Southern Kwa-Zulu Natal Grasslands is associated with the eastern portion. The Eastern Mistbelt Forest, Eastern Temperate Wetlands and Temperate Alluvial Vegetation are scattered throughout recipient site 1

Detail of Smithfield recipient site 1 in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database	
FEPACODE	The Smithfield Offset 1 area is located within a SubWMA considered to be a Freshwater Ecosystem Priority Area (FEPACODE 1) and a Fish Support Area (FEPACODE 2).
NFEPA Wetlands	According to the NFEPA database there are both natural and artificial wetlands within the Smithfield Offset 1 recipient site.
Wetland Vegetation Type	The Smithfield Offset 1 recipient site is located in Sub-Escarpment Grassland Groups 3 and 5 (Critically Endangered and Endangered respectively).
NFEPA Rivers	According to the NFEPA Database, the Elands River traverses the northern portion of the Smithfield Offset 1 area.

Ecological Status of the most proximal sub-quaternary reach (DWS, 2014)	
Sub-quaternary reach	U10G-04388
Proximity to study area	Runs adjacent to eastern boundary of recipient site
Assessed by expert?	Yes
PES Category Median	C
Mean Ecological Importance (EI) Class	High
Mean Ecological Sensitivity (ES) Class	Very High
Default Ecological Class (based on median PES and highest EI or ES mean)	Very High (Class A)

Terrestrial importance of the Recipient site 1: Various datasets	
National Threatened Ecosystems (Figure E7)	Various areas within the southwestern portion of recipient site 1 is considered to form part of remaining extent of the Impendle Highveld Grasslands Endangered Ecosystems. Various sections associated with the western boundary forms part of the vulnerable Midlands Mistbelt Grassland Ecosystem, while sections of the northeastern and northwestern boundaries form part of the remaining extent of the Vulnerable Impendle Lowland Grasslands Ecosystem.

Terrestrial importance of the recipient site 1: Various datasets		SAPAD (2018), and NPAES (2009) (Figure E9)	According to the SAPAD (Q1, 2018) dataset the Mount Shannon Protected Environment falls within the southwestern portion of recipient site 1, as well as immediately to the east, and northeast of recipient site 1. SAPAD (2018) and NPAES (2009) also indicate the Impendle Nature Reserve immediately to the south of recipient site 1
Important Bird and Biodiversity Areas (2015) (Figure E8)	The KwaZulu-Natal Mistbelt Grasslands IBA falls within the central section of the southern portion of Recipient site 1, as well as immediately northwest of the northwestern boundary. The Impendle Nature Reserve is situated immediately south of recipient site 1.		

Detail of Smithfield Recipient site 1 in terms of the Draft KwaZulu-Natal Biodiversity Spatial Planning Terms and Processes (2016)	
Critical Biodiversity Area (CBA) Irreplaceable	A number of areas within Smithfield recipient site 1 are considered to be CBA Irreplaceable, particularly within the eastern portion of the focus area. CBAs are areas considered critical to meet biodiversity targets and thresholds, which are required to ensure the persistence of viable populations of species and the functionality of ecosystems.CBA Irreplaceable areas are areas that are irreplaceable or near-irreplaceable for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with these areas.
Ecological Support Area (ESA)	A small portion along the southern boundary of the focus area is considered an ESA. Ecological Support Areas are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services.

Table E2: Desktop data relating to the character of watercourses and terrestrial ecology within the Smithfield 2 recipient site and surrounding region using National Data.

Aquatic ecoregion and sub-regions in which Smithfield recipient site 2 is located		
Ecoregion	South Eastern Uplands	
Catchment	Mkomazi	
Quaternary Catchment	U10F, U10G & U10H	
WMA	Mvoti to Umzimkulu	
subWMA	Mkomazi	
Dominant characteristics of the South Eastern Uplands Ecoregion (Kleynhans *et al.*, 2007)		
	(16.01)	(16.03)
Dominant primary terrain morphology	Closed Hills; Mountains, moderate and high relief; Lowlands; Hills and Mountains, moderate and high relief;	Low Mountains
Dominant primary vegetation types	North-eastern Mountain Grassland; Subarid Thorn Bushveld; Afromontane Forest, Short Misbelt Grassland; Valley Thicket; Coast-Hinterland Bushveld; Moist Upland Grassland; Alti Mountain Grassland.	Afromontane Forest; Valley Thicket; Short Misbelt Grassland; North-eastern Mountain Grassland.
Altitude (m a.m.s.l)	1100-1900	300-1100
MAP (mm)	600 - 800	700-800
Coefficient of Variation (% of MAP)	<20 - 25	20-30
Rainfall concentration index	50 - 60	30-50
Rainfall seasonality	Mid-summer	Mid-summer
Mean annual temp. (°C)	12 - 18	16-18
Winter temperature (July) (°C)	0 - 20	4-22
Summer temperature (Feb) (°C)	12 - 26	14-28
Median annual simulated runoff (mm)	30 - 260	30-180

Detail of Smithfield recipient site 2 in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database	
FEPACODE	Smithfield recipient site 2 is located within a SubWMA considered to be a Freshwater Ecosystem Priority Area (FEPACODE 1), a Fish Support Area (FEPACODE 2) and an Upstream Management Catchment (FEPACODE 4).
NFEPA Wetlands	According to the NFEPA database there are both natural and artificial wetlands within Smithfield recipient site 2.
Wetland Vegetation Type	The Smithfield recipient site 2 is located in Sub-Escarpment Grassland Groups 3 and 5 and Sub-Escarpment Savanna
NFEPA Rivers	According to the NFEPA Database, the Elands River traverses the middle of Smithfield 2 recipient site, and the Mkomazi River runs along the southern boundary.

Ecological Status of the most proximal sub-quaternary reach (DWS, 2014)			
Sub-quaternary reach	U10G-04473	U10F-04528	U10H-04638
Proximity to study area	Traversing the central portion of the recipient site (north/south)	Running along the southern boundary of the recipient site (west)	Running along the southern boundary of the recipient site (east)
Assessed by expert?	Yes	Yes	Yes
PES Category Median	B	B	B
Mean Ecological Importance (EI) Class	High	High	High
Mean Ecological Sensitivity (ES) Class	Very High	High	Very High
Stream Order	2	3	3
Default Ecological Class (based on median PES and highest EI or ES mean)	Very High (Class A)	High (Class B)	Very High (Class A)

Details of the Recipient site 2 in terms of KZN Vegetation Types (2011)	
Biome	Four biomes are associated with the recipient site 2 namely Grassland, Savanna, Forest and Azonal Vegetation (Wetland) Biomes
Vegetation Type (Figure E6)	Various vegetation types are associated with recipient site 2. The majority of the recipient site falls within the, Southern Kwa-Zulu Natal Grasslands. The majority of the northern and western portion falls within the Midlands Mistbelt Grassland. The southern boundary falls within the KwaZulu-Natal Hinterland Thornveld (left) and Eastern Valley Bushveld (Right). Various scattered patches of Eastern Mistbelt Forest also falls within recipient site 2.

Terrestrial importance of the recipient site 2: Various datasets	
Important Bird and Biodiversity Areas (2015) (Figure E8)	The Impendle Nature Reserve IBA falls within the northwestern portion of Recipient site 2. The KwaZulu-Natal Mistbelt Grasslands IBA is situated approximately 1.5 km west of recipient site 2.

Terrestrial importance of the recipient site 2: Various datasets	
National Threatened Ecosystems (Figure E7)	Various areas within northwestern portion of recipient site 2 is considered to form part of remaining extent of the Impendle Highveld Grasslands Endangered Ecosystems. Various sections associated with the eastern portion forms part of the vulnerable Midlands Mistbelt Grassland Ecosystem.
SAPAD (2018), and NPAES (2009) (Figure E9)	According to the SAPAD (Q1, 2018) dataset the Mount Shannon Protected Environment falls within the northwestern corner of Recipient site 2. SAPAD (2018) and NPAES (2009) also indicate the Impendle Nature Reserve within the northwestern portion of recipient site 2, immediately south of the Mount Shannon Protected Environment.

Detail of Smithfield recipient site 2 in terms of the Draft KwaZulu-Natal Biodiversity Spatial Planning Terms and Processes (2016)	
Critical Biodiversity Area (CBA) Irreplaceable	A number of areas within Smithfield 2 recipient site are considered to be CBA Irreplaceable, particularly within the northern portion of the focus area. CBAs are areas considered critical to meet biodiversity targets and thresholds, which are required to ensure the persistence of viable populations of species and the functionality of ecosystems. CBA Irreplaceable areas are areas that are irreplaceable or near-irreplaceable for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with these areas.
Critical Biodiversity Area (CBA) Optimal	A number of areas within Smithfield 2 recipient site are considered to be CBA Optimal, particularly within the eastern and southern portion of the focus area. CBAs: are areas considered critical to meet biodiversity targets and thresholds, which are required to ensure the persistence of viable populations of species and the functionality of ecosystems. CBA Optimal areas are areas that have been selected as the best option for meeting biodiversity targets, based on complementarity, efficiency, connectivity and/or avoidance of conflict with other land or resources uses.
Ecological Support Area (ESA)	A large portion of the focus area, particularly around the centre, are defined as ESAs. Ecological Support Areas are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services.

Table E3: Desktop data relating to the character of watercourses and terrestrial ecology within the Smithfield 3 recipient site and surrounding region using National Data.

Aquatic ecoregion and sub-regions in which Smithfield 3 recipient site is located	
Ecoregion	South Eastern Uplands Eastern Escarpment Mountains
Catchment	Mkomazi
Quaternary Catchment	U20A & U10G
WMA	Mvoti to Umzimkulu
subWMA	Mkomazi & Mgeni

Dominant characteristics of the South Eastern Uplands and Eastern Escarpment Mountains Ecoregions (Kleynhans *et al.,* 2007)		
	(15.07)	(16.01)
Dominant primary terrain morphology	Closed Hills; Mountains, moderate and high relief; High Mountains	Closed Hills; Mountains, moderate and high relief; Lowlands; Hills and Mountains, moderate and high relief; Low Mountains; Strongly Undulating Lowlands with Hills; Undulating Hills.
Dominant primary vegetation types	South-eastern Mountain Grassland; North-eastern Mountain Grassland; Afromontane Forest; Natal Central Bushveld	North-eastern Mountain Grassland; Subarid Thorn Bushveld; Afromontane Forest, Short Misbelt Grassland; Valley Thicket; Coast-Hinterland Bushveld; Moist Upland Grassland; Alti Mountain Grassland.
Altitude (m a.m.s.l)	1100-2100	1100-1900
MAP (mm)	700-800	600 - 800
Coefficient of Variation (% of MAP)	<20-25	<20 - 25
Rainfall concentration index	45-60	50 - 60
Rainfall seasonality	Mid-summer	Mid-summer
Mean annual temp. (°C)	10-16	12 - 18
Winter temperature (July) (°C)	>10-22	0 - 20
Summer temperature (Feb) (°C)	8-26	12 - 26
Median annual simulated runoff (mm)	510-1120	30 - 260

Terrestrial importance of the recipient site 3: Various datasets	
National Threatened Ecosystems (Figure E7)	The majority of recipient site 3 is considered to form part of the remaining extent of the Vulnerable Drakensberg Foothill Wattled Crane Habitat Ecosystem, with the southeastern corner falling within the Impendle Lowlands Grasslands Vulnerable Ecosystems.

Detail of Smithfield 3 recipient site in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database	
FEPACODE	Smithfield 3 recipient site is located within a SubWMA considered to be both a Freshwater Ecosystem Priority Area (FEPACODE 1) and a Fish Support Area (FEPACODE 2).
NFEPA Wetlands	According to the NFEPA database there are both natural and artificial wetlands within Smithfield 3 recipient site.
Wetland Vegetation Type	The Smithfield 3 recipient site is located in Sub-Escarpment Grassland Group 5
NFEPA Rivers	According to the NFEPA Database, no NFEPA rivers are found within the focus area, although the Elands River runs adjacent to the eastern boundary.

Ecological Status of the most proximal sub-quaternary reach (DWS, 2014)	
Sub-quaternary reach	U10G-04388
Proximity to study area	Runs adjacent to eastern boundary of recipient site
Assessed by expert?	Yes
PES Category Median	C
Mean Ecological Importance (EI) Class	High
Mean Ecological Sensitivity (ES) Class Stream Order	Very High 1
Mean Ecological Importance (EI) Class	High
Default Ecological Class (based on median PES and highest EI or ES mean)	Very High (Class A)

Details of the Recipient site 3 in terms of KZN Vegetation Types (2011)	
Biome	Three biomes are associated with the recipient site 3 namely Grassland, Forest and Azonal Vegetation (Wetland) Biomes
Vegetation Type (Figure E6)	Various vegetation types are associated with recipient site 3. The majority of recipient site 3 falls within the Mooi River Highland Grassland, while a large section of the western portion falls within the Freshwater Wetlands: Drakensberg Wetlands Vegetation Type. The Eastern Mistbelt Forest, Eastern Temperate Wetlands and Temperate Alluvial vegetation are scattered throughout recipient site 3.

		Terrestrial importance of the recipient site 3: Various datasets

SAPAD (2018), SACAD (2018) and NPAES (2009) (Figure E9)	According to the SACAD (Q1, 2018) dataset the Umgeni Vlei Nature Reserve (a RAMSAR Site) is situated immediately northwest of Recipient site 3, while the SAPAD (Q1, 2018) dataset indicate the Umngeni Plateau Nature Reserve is situated immediately to the west. This NPAES (2009) dataset corresponds with these protected areas.	Important Bird and Biodiversity Areas (2015) (Figure E8)	The Umgeni Vlei Nature Reserve IBA is situated immediately northwest of Recipient site 3, while the Kwa-Zulu-Natal Mistbelt Grasslands IBA is situated immediately to the southeast.
Detail of Smithfield Recipient site 3 in terms of the Draft KwaZulu-Natal Biodiversity Spatial Planning Terms and Processes (2016)			
Critical Biodiversity Area (CBA) Irreplaceable	The majority of Smithfield recipient site 3 is defined as CBA Irreplaceable, particularly within the eastern and southern portion of the focus area. CBAs are areas considered critical to meet biodiversity targets and thresholds, which are required to ensure the persistence of viable populations of species and the functionality of ecosystems. CBA Irreplaceable areas are areas that are irreplaceable or near-irreplaceable for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with these areas.		

Table E4: Desktop data relating to the character of watercourses and terrestrial ecology within the Baynesfield recipient site and surrounding region using National Data.

Aquatic ecoregion and sub-regions in which the Baynesfield recipient site is located		
Ecoregion	South Eastern Uplands	
Catchment	Mkomazi	
Quaternary Catchment	U60A, U70A, U60B & U70B	
WMA	Mvoti to Umzimkulu	
subWMA	Mgeni	
Dominant characteristics of the South Eastern Uplands Ecoregion (Kleynhans *et al.*, 2007)		
	(16.01)	(16.03)
Dominant primary terrain morphology	Closed Hills; Mountains, moderate and high relief; Lowlands; Hills and Mountains, moderate and high relief; Low Mountains; Strongly Undulating Lowlands with Hills; Undulating Hills.	Low Mountains
Dominant primary vegetation types	North-eastern Mountain Grassland; Subarid Thorn Bushveld; Afromontane Forest, Short Misbelt Grassland; Valley Thicket; Coast-Hinterland Bushveld; Moist Upland Grassland; Alti Mountain Grassland.	Afromontane Forest; Valley Thicket; Short Misbelt Grassland; North-eastern Mountain Grassland.
Altitude (m a.m.s.l)	1100-1900	300-1100
MAP (mm)	600 - 800	700-800
Coefficient of Variation (% of MAP)	<20 - 25	20-30
Rainfall concentration index	50 - 60	30-50
Rainfall seasonality	Mid-summer	Mid-summer
Mean annual temp. (°C)	12 - 18	16-18
Winter temperature (July) (°C)	0 - 20	4-22
Summer temperature (Feb) (°C)	12 - 26	14-28
Median annual simulated runoff (mm)	30 - 260	30-180

Detail of the Baynesfield recipient site in terms of the National Freshwater Ecosystem Priority Area (NFEPA) (2011) database	
FEPACODE	The Baynesfield recipient site is located within a SubWMA considered to be both a Fish Support Area (FEPACODE 2) and an Upstream Management Catchment (FEPACODE 4), with a small portion of the recipient site considered of no importance in terms of Freshwater Ecosystem Priority Areas.
NFEPA Wetlands	According to the NFEPA database there are both natural and artificial wetlands within the Baynesfield recipient site.
Wetland Vegetation Type	The Baynesfield recipient site is located in Sub-Escarpment Grassland Groups 3 and 5 and Sub-Escarpment Savanna
NFEPA Rivers	According to the NFEPA Database, the Mkuzane River enters the mid-eastern boundary of the recipient site and traverses approximately two-thirds of the recipient site, and an unnamed river enters the southern boundary towards the west and traverses approximately one third of the recipient site.

Ecological Status of the most proximal sub-quaternary reach (DWS, 2014)			
Sub-quaternary reach	U60A-04533	U60B-04614	U70A-04618
Proximity to study area	Traverses the northern portion	Traverses the central portion from the eastern boundary	Traverses the south-western portion from the southern boundary
Assessed by expert?	Yes	Yes	Yes
PES Category Median	C	C	C
Mean Ecological Importance (EI) Class	High	High	Moderate
Mean Ecological Sensitivity (ES) Class	Very High	High	Very High
Stream Order	1	1	1
Default Ecological Class (based on median PES and highest EI or ES mean)	Very High (Class A)	High (Class B)	Very High (Class A)

Details of the Baynesfield Recipient site in terms of KZN Vegetation Types (2011)	
Biome	Three biomes are associated with the Baynesfield recipient site namely Grassland, Forest and Azonal Vegetation (Wetland) Biomes

Terrestrial importance of the Baynesfield recipient site: Various datasets	
National Threatened Ecosystems (Figure E7)	Various areas within the eastern portion of the Baynesfield recipient site is considered to form part of remaining extent of the Pietermaritzburg South Endangered Ecosystem. Various sections associated with the northeastern boundary forms part of the vulnerable Ngoni Veld Ecosystem, while section of the southern portion form part of the remaining extent of the Vulnerable Midlands Mistbelt Grassland Ecosystem.
SAPAD (2018), and NPAES (2009) (Figure E9)	According to the SAPAD (Q1, 2018) dataset the Minerva Private Nature Reserve is situated immediately west of the Baynesfield recipient site. According to the NPAES (2009) dataset is situated within the central portion of the Baynesfield recipient site.

Vegetation Type (Figure E6)	Various vegetation types are associated with the Baynesfield recipient site. The majority of the Baynesfield recipient site falls within the Midlands Mistbelt Grassland, while the northwestern is situated within the Moist Coast Hinderland Grassland. The Eastern Mistbelt Forest, Eastern Temperate Wetlands and Temperate Alluvial vegetation are scattered throughout the Baynesfield Recipient site.

Terrestrial importance of the Baynesfield recipient site: Various datasets	
Important Bird and Biodiversity Areas (2015) (Figure E8)	The KwaZulu-Natal Mistbelt Grasslands IBA falls within the northwestern portion of the Baynesfield recipient site.

Detail of the Baynesfield recipient site in terms of the Draft KwaZulu-Natal Biodiversity Spatial Planning Terms and Processes (2016)	
Critical Biodiversity Area (CBA) Irreplaceable	A number of areas within the Baynesfield recipient site are considered to be CBA Irreplaceable, particularly within the northern and central portions of the focus area. CBAs are areas considered critical to meet biodiversity targets and thresholds, which are required to ensure the persistence of viable populations of species and the functionality of ecosystems. CBA Irreplaceable areas are areas that are irreplaceable or near-irreplaceable for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with these areas.
Critical Biodiversity Area (CBA) Optimal	Very few isolated areas within the Baynesfield recipient site are considered to be CBA Optimal, particularly within the eastern and southern portion of the focus area. CBAs: are areas considered critical to meet biodiversity targets and thresholds, which are required to ensure the persistence of viable populations of species and the functionality of ecosystems. CBA Optimal areas are areas that have been selected as the best option for meeting biodiversity targets, based on complementarity, efficiency, connectivity and/or avoidance of conflict with other land or resources uses.

CBA = Critical Biodiversity Areas; DWS = Department of Water and Sanitation; EI = Ecological Importance; ES = Ecological Sensitivity; ESA = Ecological Support Area; m.a.m.s.l = Meters Above Mean Sea Level; MAP = Mean Annual Precipitation; NFEPA = National Freshwater Ecosystem Priority Areas; PES = Present Ecological State; WMA = Water Management Area

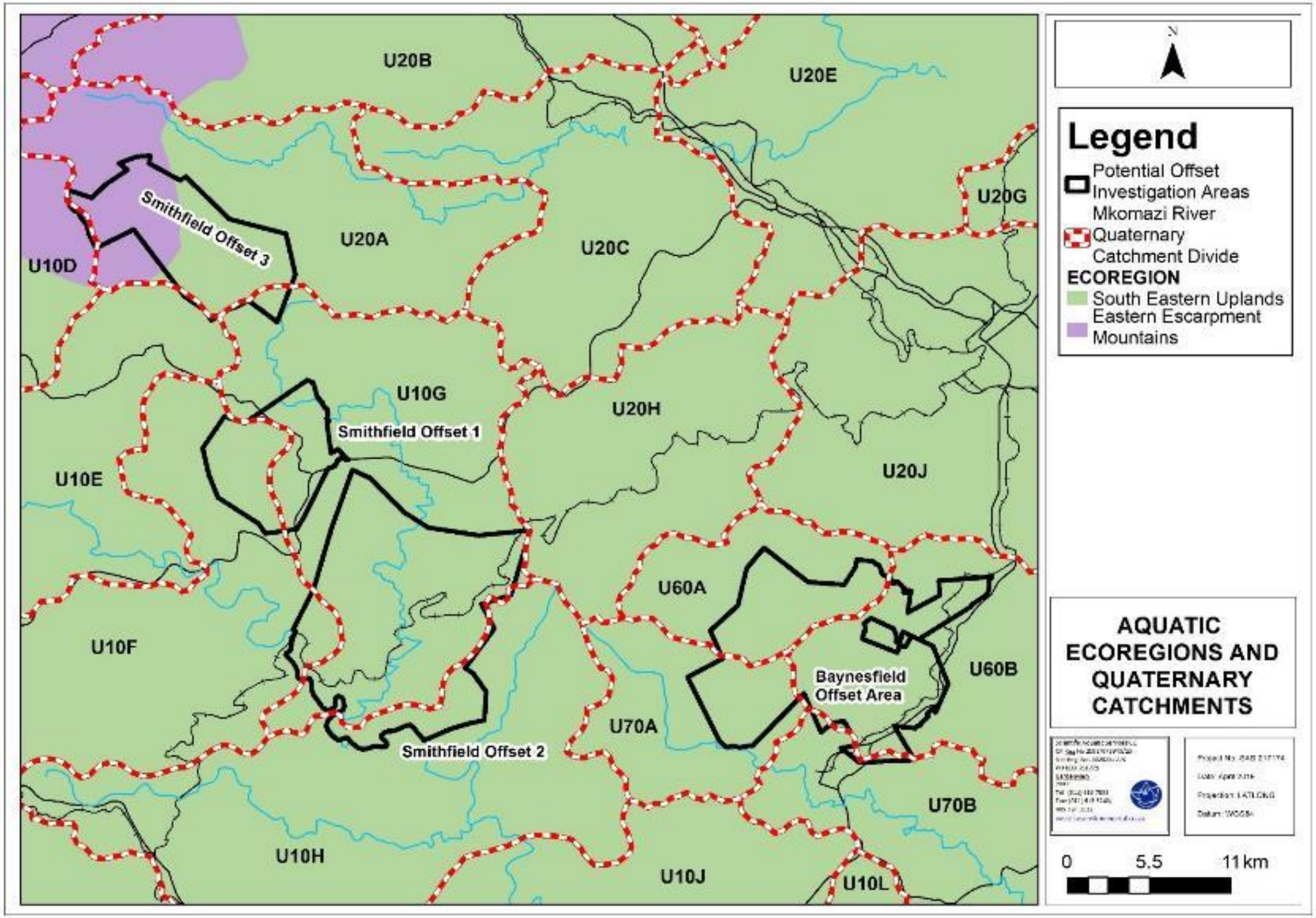


Figure E1: Aquatic ecoregions and quaternary catchments associated with the four recipient sites.

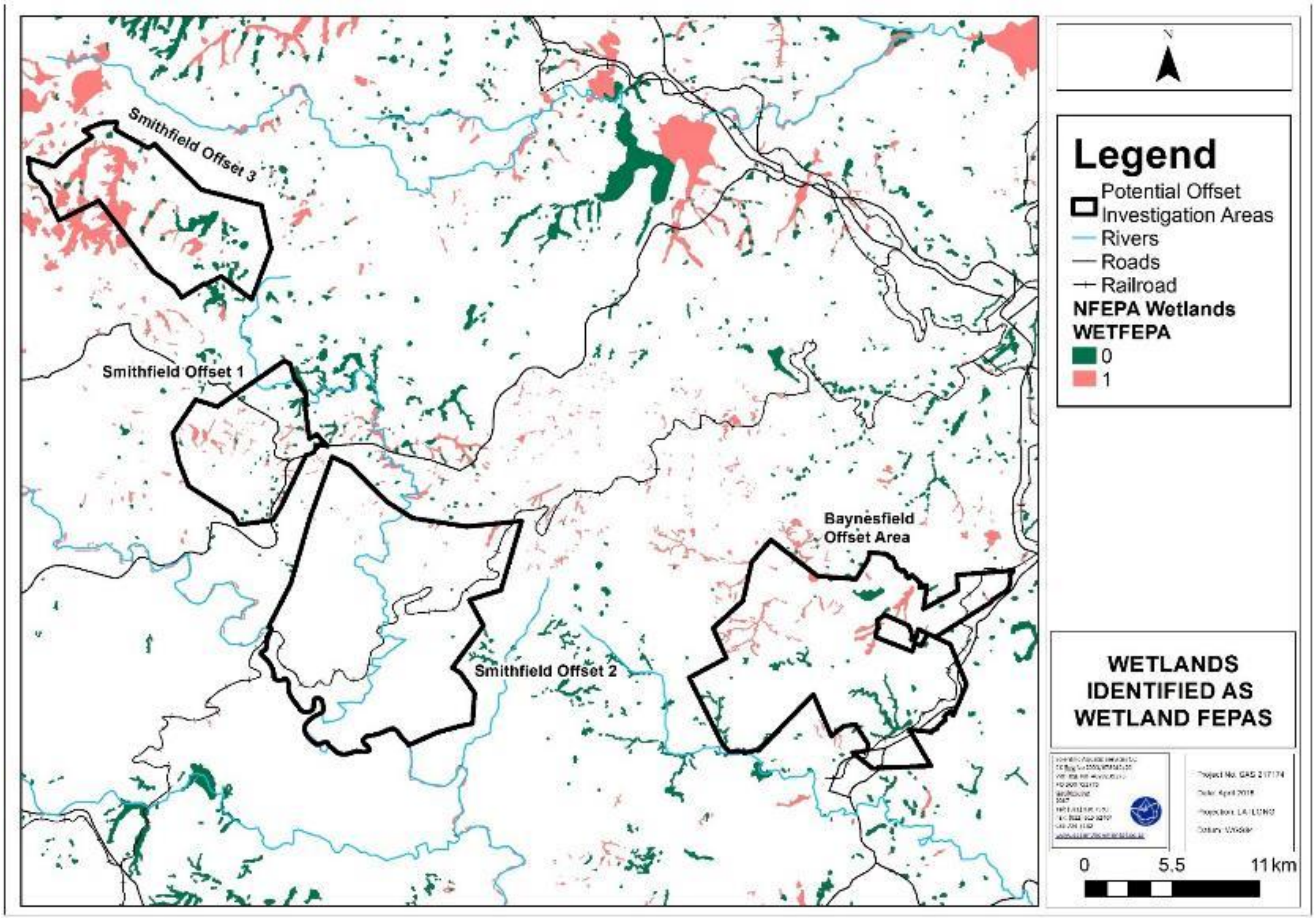


Figure E2: NFEPA wetlands associated with the four recipient sites

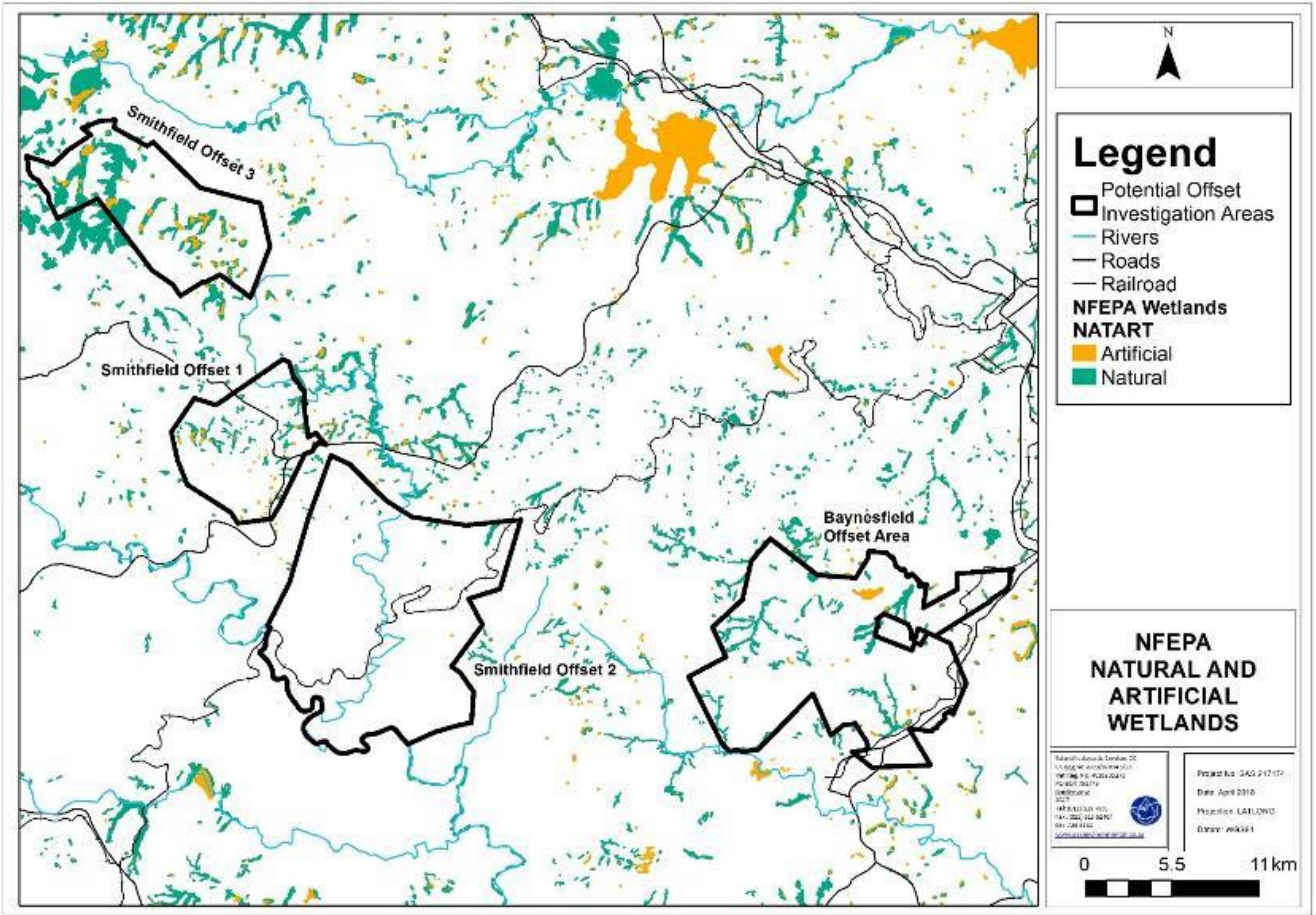


Figure E3: Natural and artificial NFEPA wetlands associated with the four recipient sites.

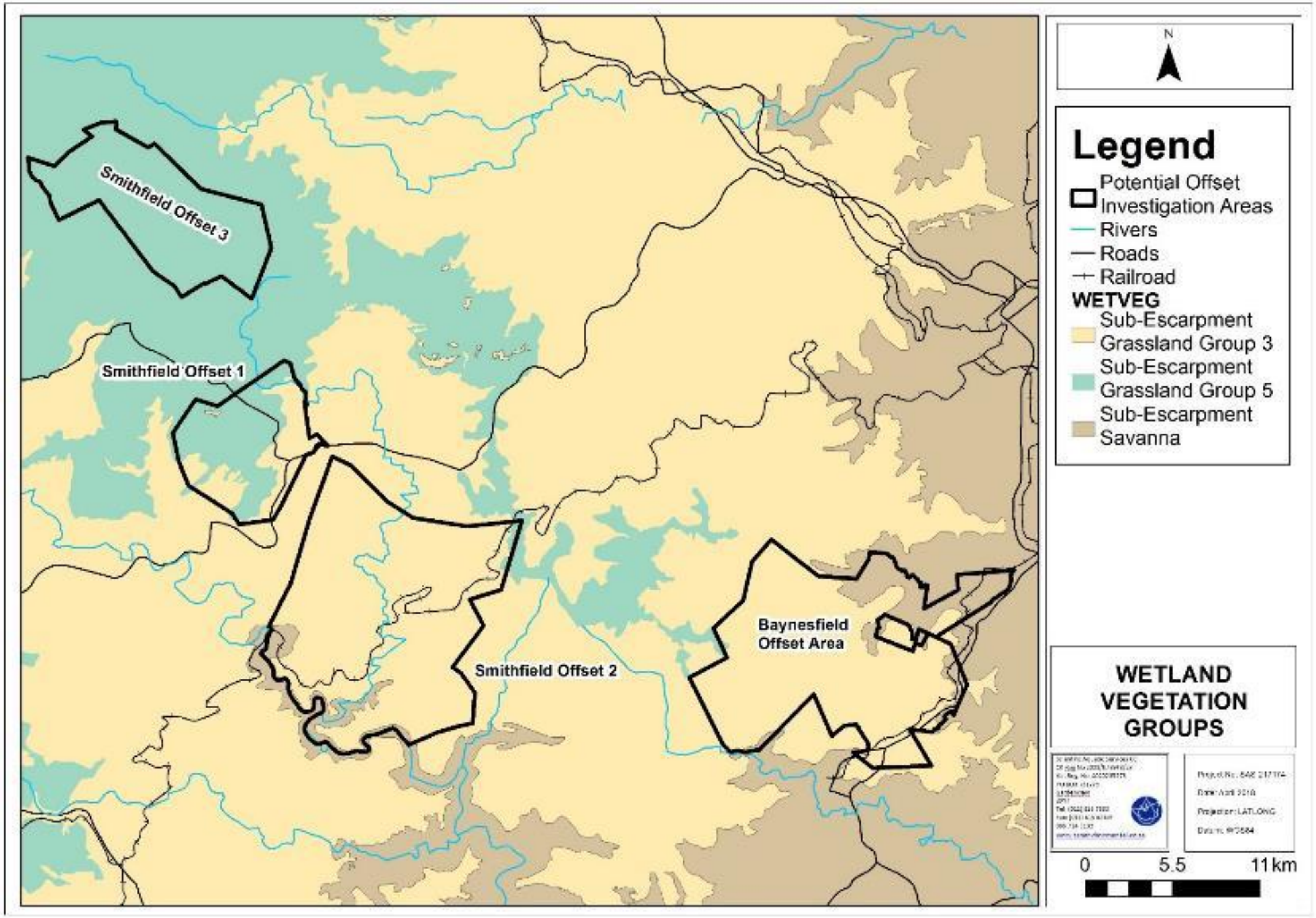


Figure E4: Wetland vegetation types associated with the four recipient sites.

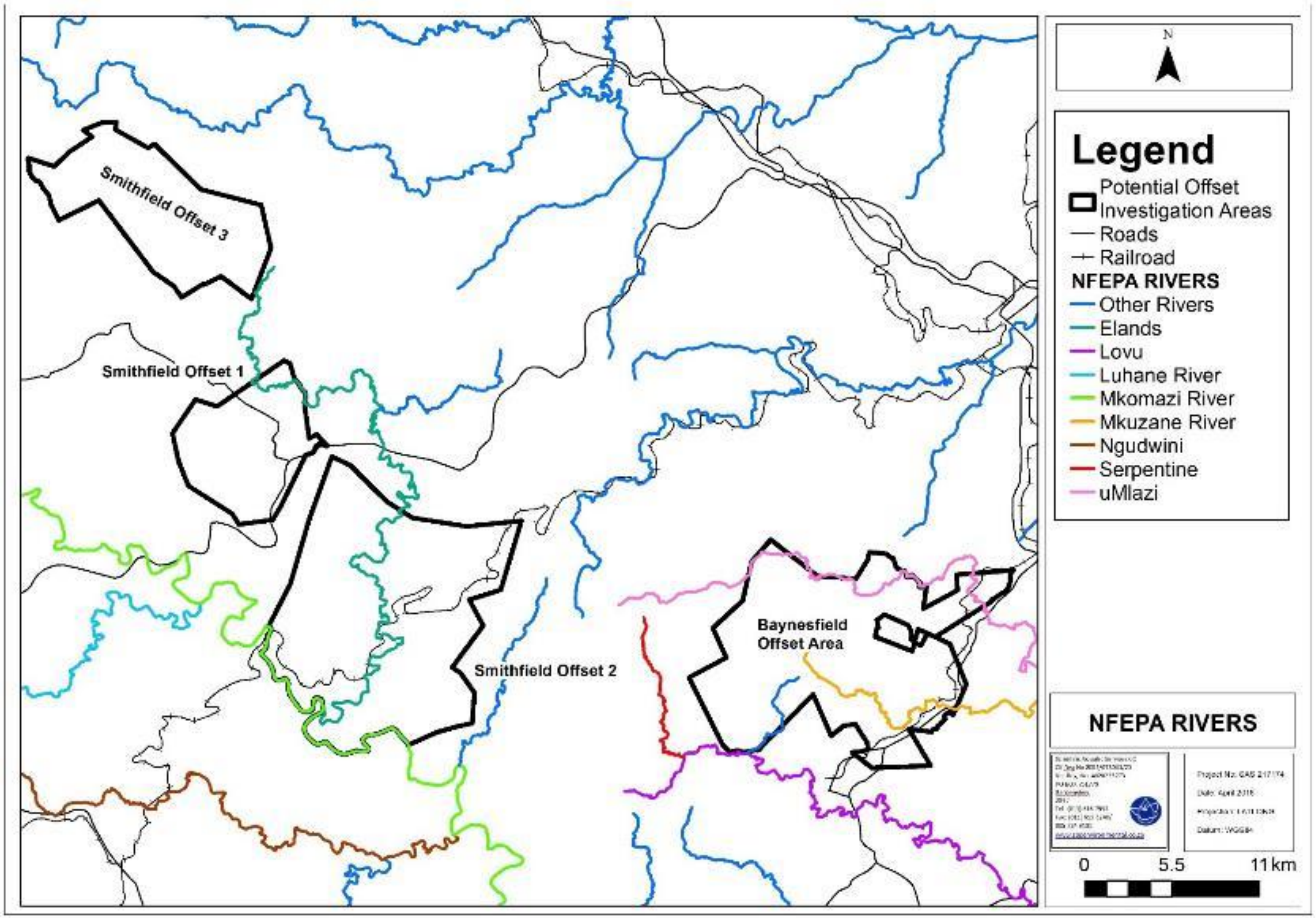


Figure E5: NFEPA rivers associated with the four recipient sites.

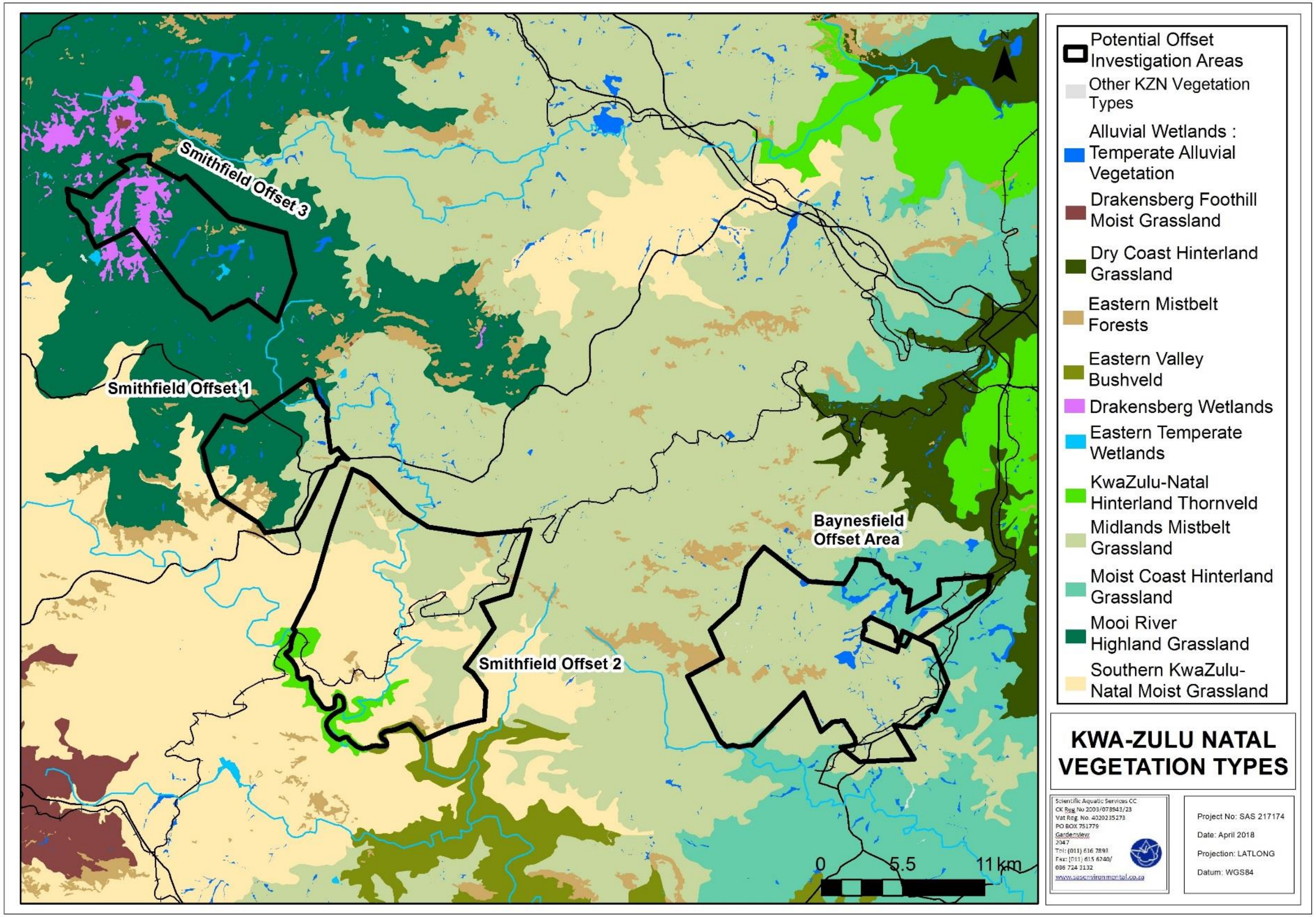
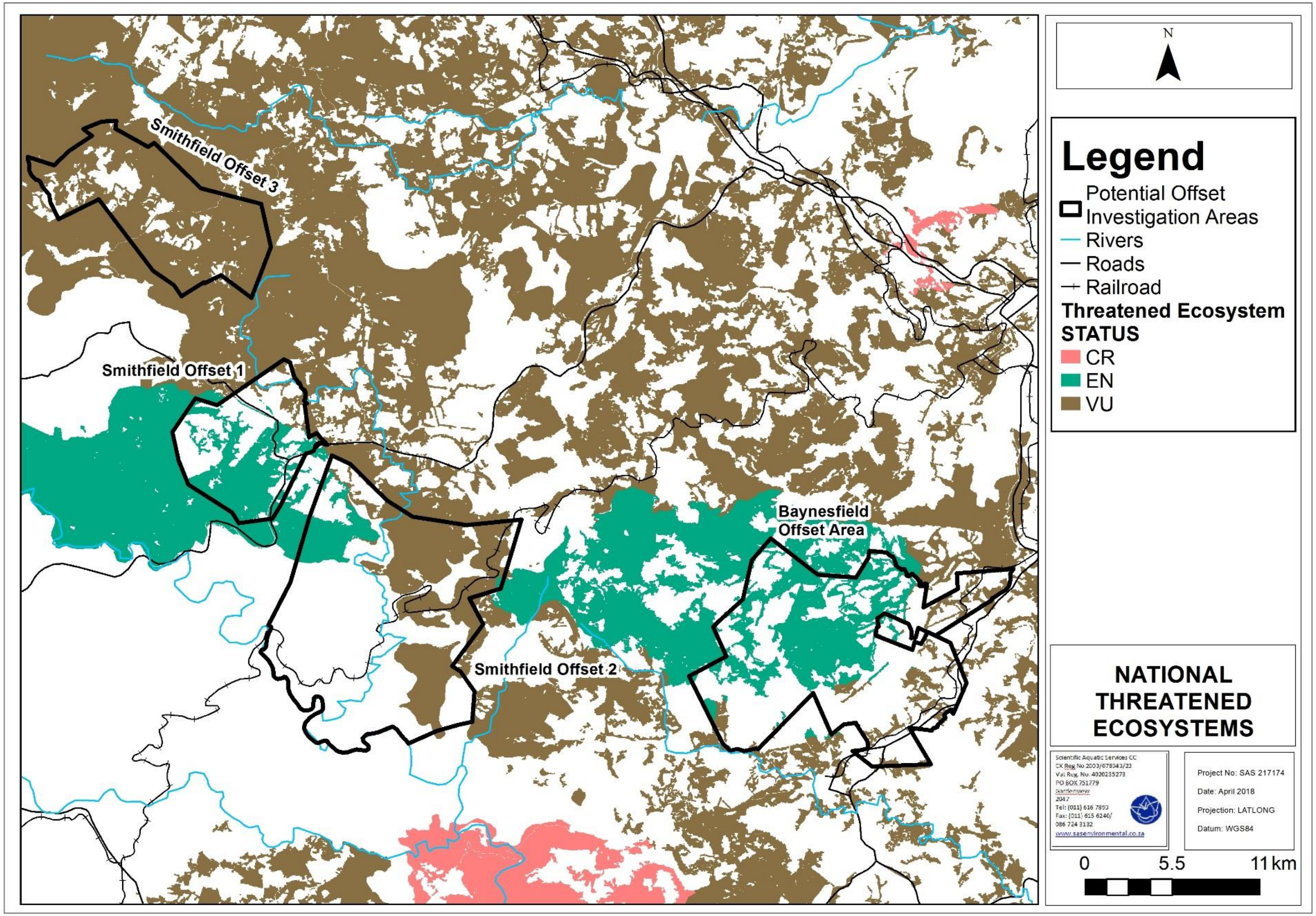
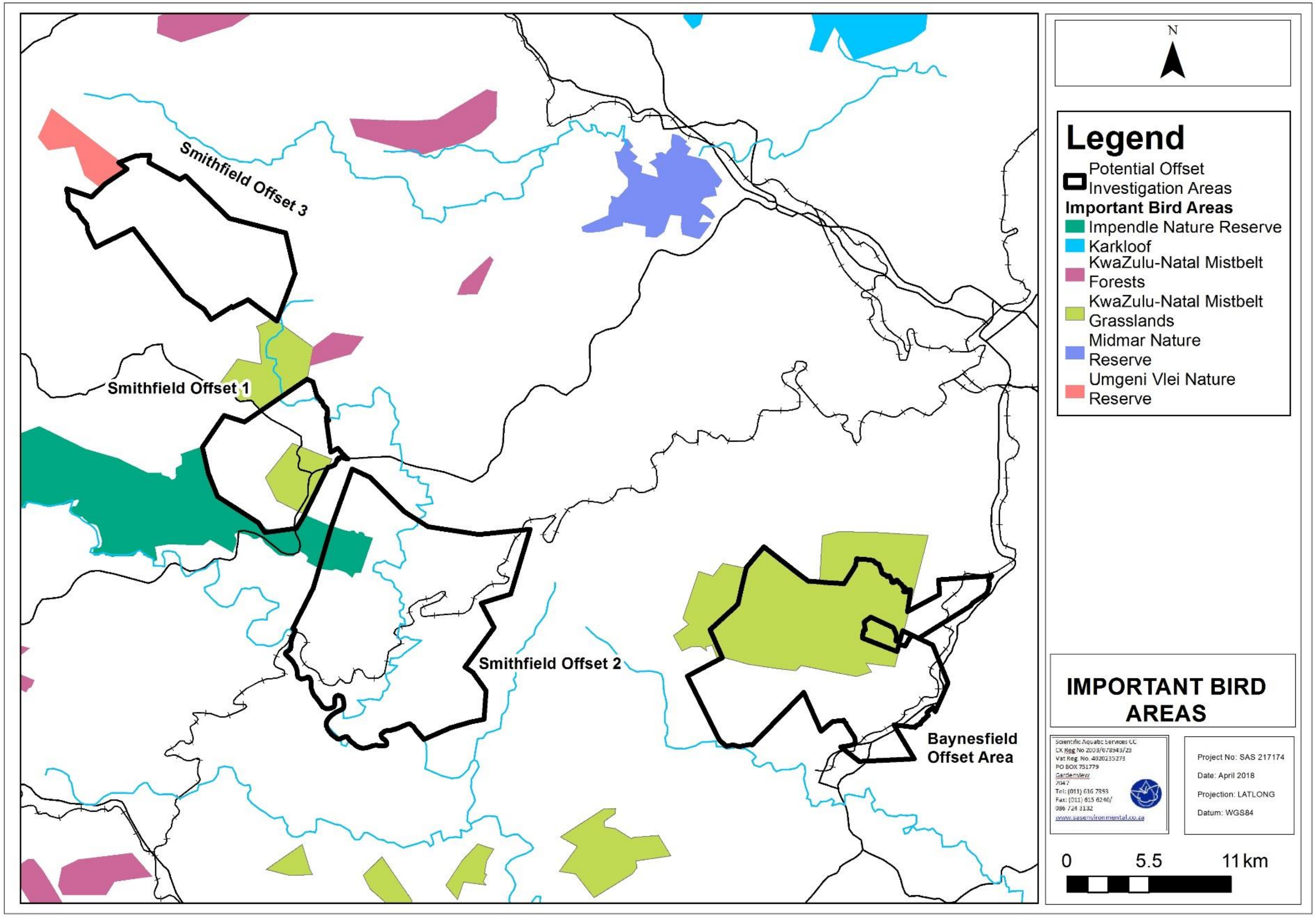


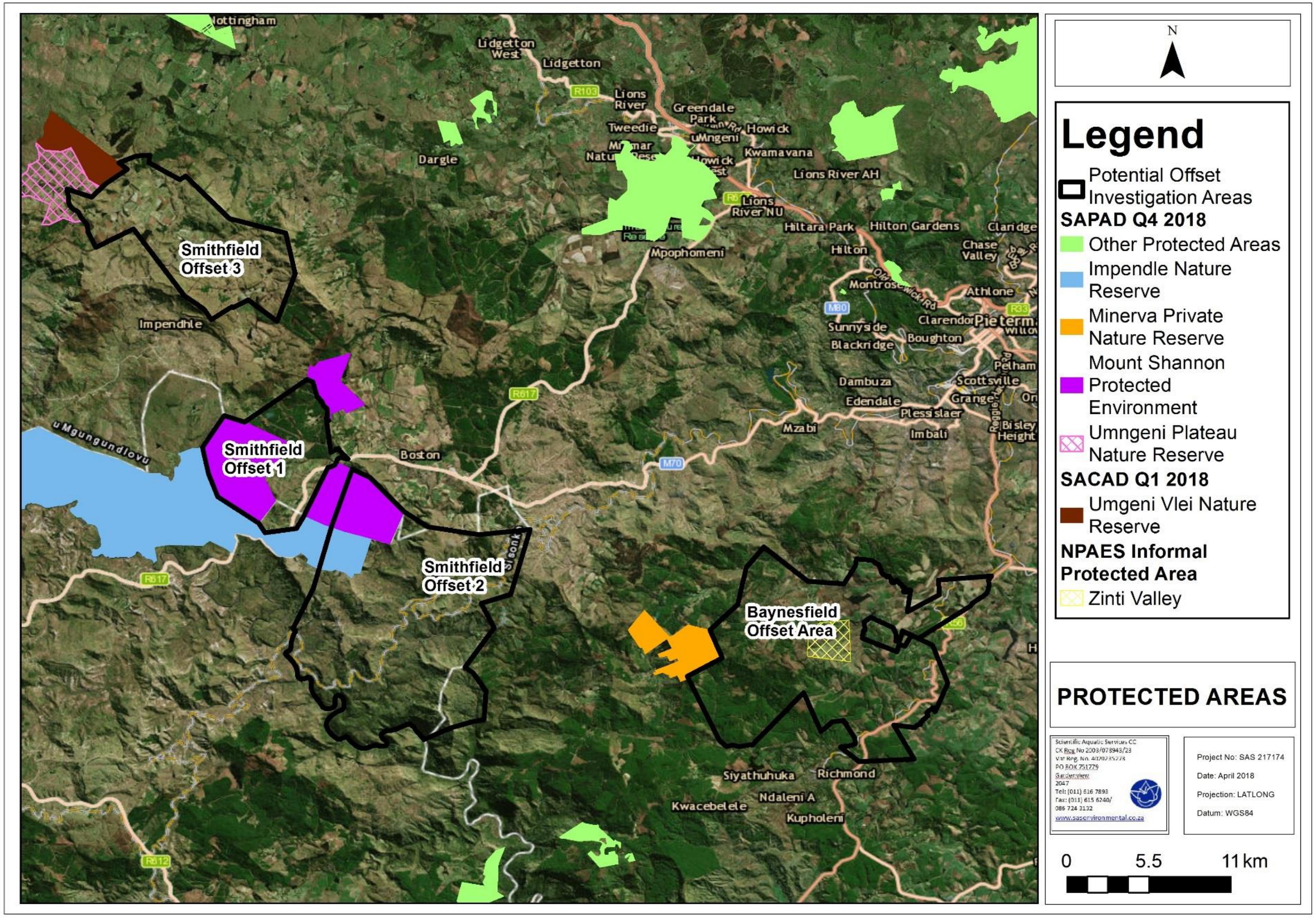
Figure E6: Kwa-Zulu Natal Vegetation Types associated with the Various Recipient sites



E7: Threatened Ecosystems associated with the various Recipient sites (National Threatened Ecosystems, 2011)



E8: Important Bird and Biodiversity Areas associated with the Recipient sites (IBA, 2015)



E9: Protected Areas situated within or adjacent to the various recipient sites

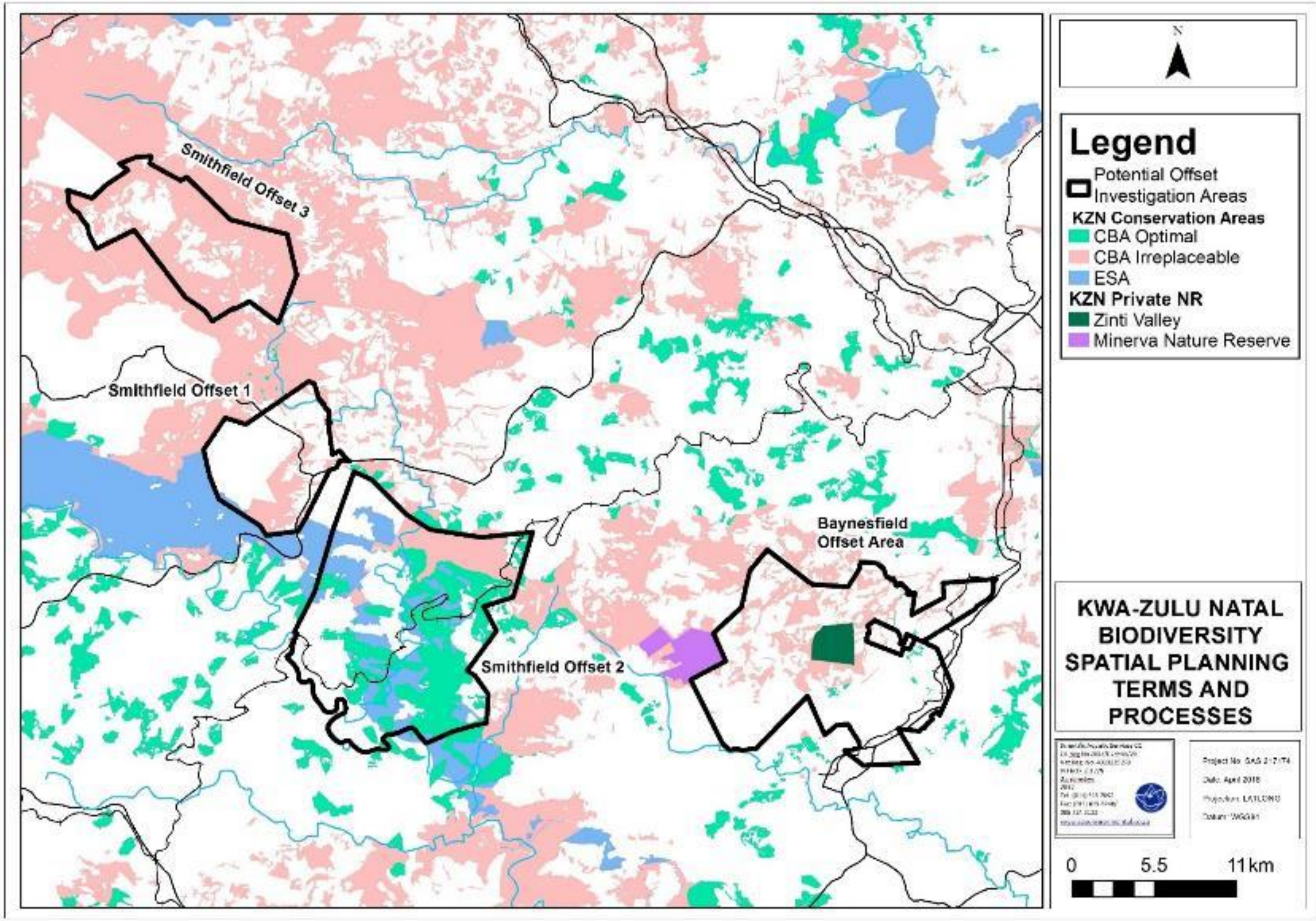


Figure E10: CBAs, ESAs and private nature reserves associated with the four recipient sites.

APPENDIX F: SUMMARY OF ECOLOGICAL STATUS OF SUB-QUATERNARY CATCHMENTS DATA

The PES/EIS database, as developed by the DWS RQIS department, was utilised to obtain additional background information on the project area. The PES/EIS database has been made available to consultants since mid-August 2014. The information from this database is based on information at a sub-quaternary catchment reach (SQR) level. Descriptions of the aquatic ecology is based on information collated by the DWS RQIS department from available sources of reliable information, such as SA RHP sites, Ecological Water Requirements (EWR) sites and Hydro Water Management system (WMS) sites.

In this regard, information for the SQRs of Rivers traversing the various assessment areas were obtained. The assessment areas with river crossings and their applicable SQR Points are as follows (Figure F1 below):

- Recipient site 1: U10G-04388 (Elands River);
- Recipient site 2: U10G-04473 (Elands River);
  U10F-04528 (Mkomazi River)
  U10H-04638 (Mkomazi River)
- Baynesfield Recipient site: U60A-04533 (uMlazi River);
  U60B-04614 (Mkuzane River)
  U70A-04618

Key information on fish species, invertebrates and background conditions, associated with the above listed assessment areas, as contained in this database and pertaining to the Present Ecological State (PES), ecological importance and ecological sensitivity for the rivers, are tabulated in Tables F1 to F3 below.

Table F1: Summary of the ecological status of the sub-quaternary catchment (SQ) reaches associated with the various assessment areas based on the DWS RQS PES/EIS database

	Recipient site 1	Recipient site 2			Baynesfield Recipient site		
	U10G-04388 (Elands River)	U10G-04473 (Elands River)	U10F-04528 (Mkomazi River)	U10H-04638 (Mkomazi River)	U60A-04533 (uMlazi River)	U60B-04614 (Mkuzane River)	U70A-04618
Synopsis							
PES Category Median	Moderately modified	Largely natural	Largely natural	Largely natural	Moderately modified	Moderately modified	Moderately modified
Mean EI class	High	High	High	High	High	High	Moderate
Mean ES class	Very High	Very High	High	Very High	Very High	High	Very High
Length	26.50	44.46	20.64	15.77	43.22	26.81	7.08
Stream order	1	2	3	3	1	1	1
Default EC[4]	A (Very High)	A (Very High)	B (High)	A (Very High)	A (Very High)	B (High)	A (Very High)
PES Details							
Instream habitat continuity MOD	Small	Small	None	None	Moderate	Small	Small
RIP/wetland zone continuity MOD	Small	Small	None	None	Moderate	Moderate	Moderate
Potential instream habitat MOD activities	Small	Small	Small	Small	Small	Small	Moderate
Riparian/wetland zone MOD	Large	Moderate	Small	Small	Moderate	Moderate	Large
Potential flow MOD activities	Large	Large	Small	Moderate	Large	Moderate	Large
Potential physico-chemical MOD activities	Moderate	Small	Small	Small	Moderate	Moderate	Small
EI Details							
Fish spp/SQ	5	5	4	7	9	9	6
Fish average confidence	3.00	4.20	4.50	3.00	3.22	2.56	2.67
Fish representivity per secondary class	Low	Low	Very Low	Low	Low	Low	Low
Fish rarity per secondary class	Moderate	Moderate	Very Low	Moderate	Very Low	Very Low	Very Low
Invertebrate taxa/SQ	86	86	64	74	81	81	70
Invertebrate average confidence	3.00	3.44	3	3.00	4.21	3.00	3.00
Invertebrate representivity per secondary class	Very High	Very High	High	Very High	Very High	Very High	Very High
Invertebrate rarity per secondary class	Very High	Very High	Moderate	High	Moderate	Moderate	High
EI importance: riparian-wetland-instream vertebrates (excluding fish) rating	Very High	Very High	Very High	Very High	Very High	High	N/A

	Recipient site 1	Recipient site 2			Baynesfield Recipient site		
	U10G-04388 (Elands River)	U10G-04473 (Elands River)	U10F-04528 (Mkomazi River)	U10H-04638 (Mkomazi River)	U60A-04533 (uMlazi River)	U60B-04614 (Mkuzane River)	U70A-04618
Habitat diversity class	Moderate	Very High	Low	Low	Moderate	Moderate	Moderate
Habitat size (length) class	Low	Moderate	Low	Very Low	High	Moderate	Very Low
Instream migration link class	Very High	Very High	Very High	Very High	High	Very High	Very High
Riparian-wetland zone migration link	Very High	Very High	Very High	Very High	High	High	High
Riparian-wetland zone habitat integrity class	Moderate	High	Very High	Very High	High	High	Moderate
Instream habitat integrity class	Very High	Very High	Very High	Very High	Very High	Very High	High
Riparian-wetland natural vegetation rating based on percentage natural vegetation in 500m	High	High	Very High	Very High	Moderate	Moderate	Very Low
Riparian-wetland natural vegetation rating based on expert rating	Very High	Very High	Very High	Very High	Very High	Very High	Very High
ES Details							
Fish physical-chemical sensitivity description	Very High	Very High	Very High	Very High	Very High	Very High	Very High
Fish no-flow sensitivity	Very High	Very High	Very High	Very High	Very High	Very High	Very High
Invertebrates physical-chemical sensitivity description	Very High	Very High	Very High	Very High	Very High	Very High	Very High
Invertebrates velocity sensitivity	Very High	Very High	Very High	Very High	Very High	Very High	Very High
Riparian-wetland-instream vertebrates (excluding fish) intolerance water level/flow changes description	Very High	Very High	High	Very High	Very High	High	N/A
Stream size sensitivity to modified flow/water level changes description	High	Low	Low	Low	Low	Low	High
Riparian-wetland vegetation intolerance to water level changes description	High	High	High	High	High	High	High

[1] PES = Present Ecological State; confirmed in database that assessments were performed by expert assessors;
[2] EI = Ecological Importance;
[3] ES = Ecological Sensitivity
[4] EC = Ecological Category; default based on median PES and highest of EI or ES means.

Table F2: Fish species previously collected from or expected in the various SQR monitoring points associated with the various assessment areas

	Recipient site 1	Recipient site 2			Baynesfield Recipient site		
	U10G-04388	U10G-04473	U10F-04528	U10H-04638	U60A-04533	U60B-04614	U70A-04618
Amphilius natalensis	X	X	X	X	X	X	X
Anguilla mossambica	X	X	X	X	X	X	X
Barbus anoplus	X	X	X	X			
Barbus gurneyi				X	X	X	
Barbus natalensis	X	X	X	X	X	X	X
Barbus pallidus					X	X	
Barbus viviparus					X	X	
Clarias gariepinus				X	X	X	X
Oreochromis mossambicus					X	X	X
Tilapia sparrmanii	X	X		X	X	X	X

Table F3: Invertebrates previously collected from or expected at the various SQR monitoring points associated with the various assessment areas.

	Recipient site 1	Recipient site 2			Baynesfield Recipient site		
	U10G-04388	U10G-04473	U10F-04528	U10H-04638	U60A-04533	U60B-04614	U70A-04618
Aeshnidae	X	X	X	X	X	X	X
Amphipoda	X	X			X	X	
Ancylidae	X	X	X	X	X	X	X
Athericidae	X	X	X	X	X	X	X
Atyidae	X	X	X	X	X	X	X
Baetidae 2 Sp	X	X	X	X	X	X	X
Belostomatidae	X	X	X	X	X	X	X
Blephariceridae	X	X			X	X	
Bulininae	X	X			X	X	
Caenidae	X	X	X	X	X	X	X
Calopterygidae	X	X		X	X	X	X
Ceratopogonidae	X	X	X	X	X	X	X
Chironomidae	X	X	X	X	X	X	X
Chlorocyphidae	X	X	X	X	X	X	X
Coelenterate	X	X		X	X	X	X
Coenagrionidae	X	X	X	X	X	X	X
Corbiculidae	X	X			X	X	
Corduliidae	X	X	X	X	X	X	X
Corixidae	X	X	X	X	X	X	X
Corydalidae	X	X	X	X	X	X	X
Crambidae (Pyralidae)	X	X		X	X	X	X
Culicidae	X	X	X	X	X	X	X
Dipseudopsidae	X	X					
Dixidae	X	X	X	X	X	X	X
Dytiscidae	X	X	X	X	X	X	X

	Recipient site 1	Recipient site 2			Baynesfield Recipient site		
	U10G-04388	U10G-04473	U10F-04528	U10H-04638	U60A-04533	U60B-04614	U70A-04618
Ecnomidae	X	X	X	X	X	X	X
Elmidae/Dryopidae	X	X	X	X	X	X	X
Empididae	X	X		X	X	X	X
Ephemeridae			X	X			
Ephydridae					X	X	
Gerridae	X	X	X	X	X	X	X
Gomphidae	X	X	X	X	X	X	X
Gyrinidae	X	X	X	X	X	X	X
Haliplidae	X	X	X	X	X	X	X
Helodidae	X	X			X	X	X
Heptageniidae	X	X	X	X	X	X	X
Hirudinea	X	X	X	X	X	X	X
Hydracarina	X	X	X	X	X	X	X
Hydraenidae	X	X					
Hydrometridae	X	X			X	X	
Hydrophilidae	X	X	X	X	X	X	X
Hydropsalpingidae	X	X			X	X	
Hydropsychidae 2 Sp	X	X	X	X	X	X	X
Hydroptilidae	X	X	X	X	X	X	X
Lepidostomatidae	X	X	X	X			X
Leptoceridae	X	X	X	X	X	X	X
Leptophlebiidae	X	X	X	X	X	X	X
Lestidae	X	X	X	X	X	X	X
Libellulidae	X	X	X	X	X	X	X
Limnichidae	X	X			X	X	
Lymnaeidae	X	X	X	X	X	X	X
Muscidae	X	X	X	X	X	X	X
Naucoridae	X	X	X	X	X	X	X
Nepidae	X	X	X	X	X	X	X
Notonectidae	X	X	X	X	X	X	X
Notonemouridae		X	X	X	X	X	
Oligochaeta	X	X	X	X	X	X	X
Oligoneuridae	X	X		X	X	X	X
Palaemonidae	X	X	X	X			
Perlidae	X	X	X	X	X	X	X
Petrothrincidae	X	X					
Philopotamidae	X	X	X	X	X	X	X
Physidae	X	X	X	X	X	X	X
Planorbinae	X	X	X	X	X	X	X
Platycnemidae	X	X	X	X	X	X	X
Pleidae	X	X	X	X	X	X	X
Polycentropodidae	X	X		X	X	X	X
Polymitarcyidae	X	X	X	X	X	X	
Porifera	X	X	X	X	X	X	X

	Recipient site 1	Recipient site 2			Baynesfield Recipient site		
	U10G-04388	U10G-04473	U10F-04528	U10H-04638	U60A-04533	U60B-04614	U70A-04618
Potamonautidae	X	X	X	X	X	X	X
Prosopistomatidae	X	X	X	X	X	X	X
Protoneuridae	X	X	X	X	X	X	X
Psephenidae	X	X	X	X	X	X	X
Psychodidae	X	X		X	X	X	X
Psychomyiidae/Xiphocentronidae	X	X					
Sialidae	X	X	X	X	X	X	
Simuliidae	X	X	X	X	X	X	X
Spaeriidae	X	X	X	X	X	X	X
Synlestidae/Chlorolestidaea	X	X	X	X	X	X	X
Syrphidae	X	X		X	X	X	X
Tabanidae	X	X	X	X	X	X	X
Teloganodidae	X	X			X	X	
Thiaridae	X	X		X	X	X	X
Tipulidae	X	X	X	X	X	X	X
Tricorythidae	X	X	X	X	X	X	X
Turbellaria	X	X	X	X	X	X	X
Unionidae	X	X		X	X	X	X
Veliidae/Mesoveliidae	X	X	X	X	X	X	X

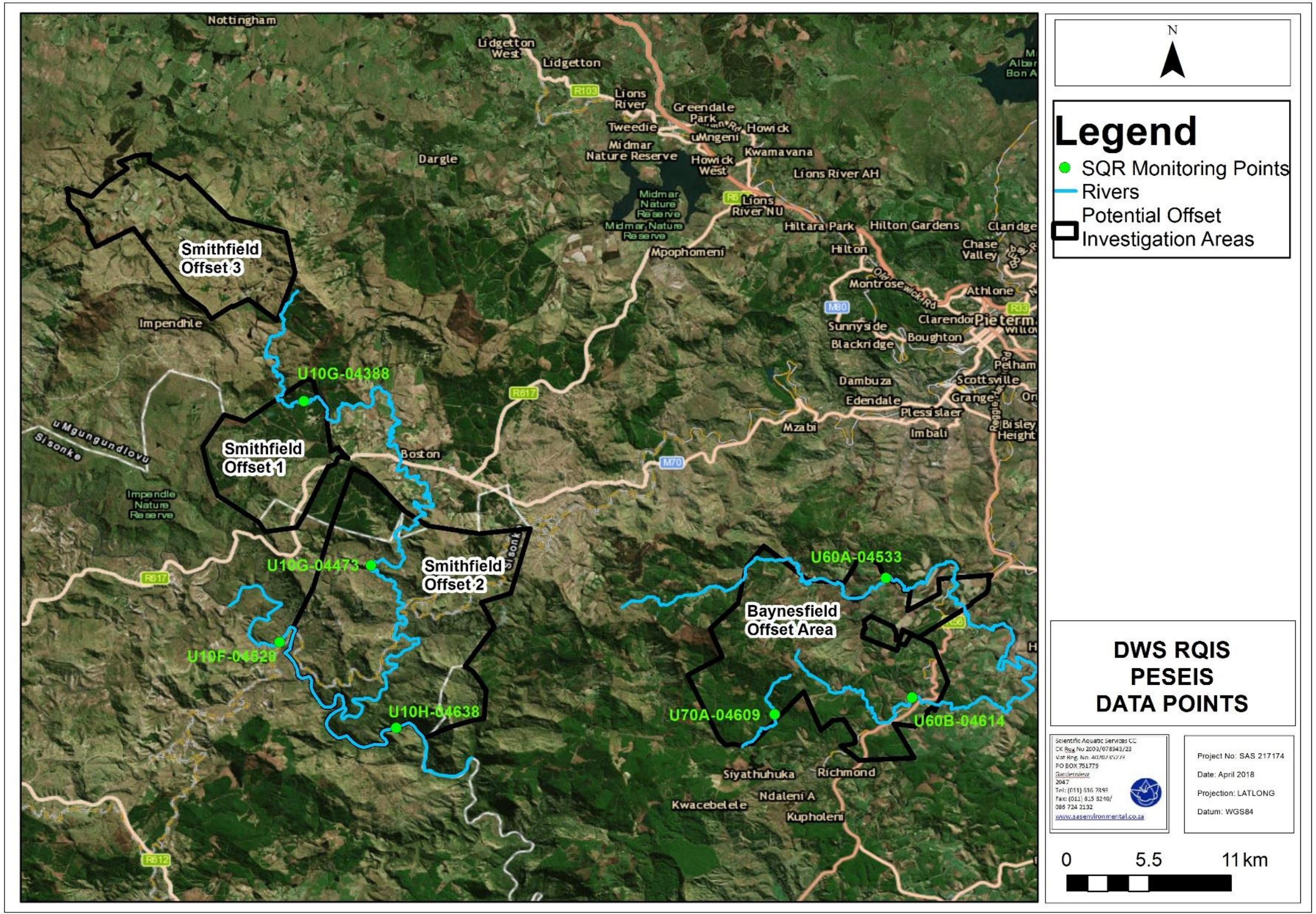


Figure F1: DWS PESEIS data points associated with the four recipient sites.

APPENDIX G: WETLAND AND WATERCOURSE OFFSET ASSESSMENT

Project Scope as it Pertains to the Ecological Assessment of Freshwater Resources for Offset Purposes

- A background study of relevant national, provincial and municipal datasets (such as National Freshwater Ecosystem Priority Areas [NFEPA] and the DWS RQS PES/EIS database) was undertaken to aid in defining the EIS of the freshwater resources;
- Freshwater resources were delineated according to "DWAF, 2008: A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones". Aspects such as soil morphological characteristics, vegetation types and wetness were used to delineate the various zones of wetness (permanent and temporary) according to the guidelines;
- Define extent of freshwater resources within each of the target offset sites;
- The classification assessment of the freshwater resources was undertaken according to the Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis *et al*., 2013);
- The EIS of the freshwater resources were determined according to the method described by Rountree & Kotze, (2013);
- The services provided by the freshwater resources within the study area were assessed according to the method of Kotze *et al* (2009) in which services to the ecology of the site as well as services to the people of the area were defined;
- PES of the freshwater resources was assessed according to the resource directed measures guideline as advocated by Macfarlane *et al*., (2008); and
- The freshwater resources were mapped in relation to the study area.

Offset Target Wetland Assessment Approach

For the purposes of this investigation, the definition of watercourses, wetlands and riparian systems was taken as per that in the National Water Act (1998). The definitions are as follows:

(a) a river or spring

(b) a natural channel in which water flows regularly or intermittently;

(c) a wetland, lake or dam into which, or from which, water flows; and

(d) any collection of water which the Minister may, by notice in the *Gazette,* declare to be a watercourse and a reference to a watercourse includes, where relevant, its bed and banks;

Wetland habitat is "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

Riparian habitat includes the physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterized by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure **distinct** from those of adjacent areas.

As mentioned in Section 1.1 use was made of historical aerial photographs, historical and current digital satellite imagery, topographic maps and available provincial and national wetland databases to aid in the delineation of the freshwater resources within the target recipient sites both prior to and following the field assessment. The following was taken into consideration when utilizing the above during delineation:

- Hydrophytic and riparian vegetation: a distinct increase in density, changes in species composition, as well as tree size near drainage lines;
- Hue: with wetlands, riparian areas and drainage lines displaying varying chroma created by varying vegetation cover and soil conditions in relation to the adjacent terrestrial areas; and
- Texture: with wetland and riparian areas displaying various textures which are distinct from the adjacent terrestrial areas, created by varying vegetation cover and soil conditions within the watercourse.

The freshwater resource delineations which were verified in the field took place according to the method presented in the "Updated manual for the identification and delineation of wetland and riparian resources" published by DWAF in 2008. The foundation of the method is based on the fact that wetlands have several distinguishing factors including the following:

- The presence of water at or near the ground surface;
- Distinctive hydromorphic soils;
- Vegetation adapted to saturated soils; and
- The presence of alluvial soils in stream systems.

A single site visit was undertaken in March 2018 during which the presence of any wetland or riparian characteristics as defined by DWAF (2008) or a wetland as defined by the NWA were noted. In addition to the delineation process, a detailed assessment of the delineated resources was undertaken, at which time factors affecting the integrity of the resources were taken into consideration and aided in the determination of the functioning as well as the provision of ecological and socio-cultural services by the resources.

A detailed explanation of the methods of assessment is provided in **Appendix D** of this report.

Results of the Desktop Analysis of Offset Target Areas

A desktop analysis of the target recipient sites was undertaken. The results of the desktop analysis are presented in Appendix E of this report.

Offset Target Freshwater Resource Identification, Classification and Characterisation

A total of four potential recipient sites were identified during Phase 1 of the biodiversity offset study, and during a single field assessment undertaken in March 2018, key areas were selected for ground-truthing and refinement of watercourse delineations. Numerous watercourses were identified on a desktop level prior to the field assessment, however, due to the extent of the target recipient sites, the watercourses within these recipient sites and access constraints associated with the terrain and land ownership, it should be noted that limited field verification was possible. Thus, the watercourses were delineated where practical in the field, according to the procedure defined by DWAF (2008), and where necessary the remaining delineations were undertaken with the aid of historical and current digital satellite imagery, aerial photographs and topographic maps. Nonetheless, for the purposes of this study, the delineations presented in this report are considered sufficiently accurate to allow of informed decision making to take place.

It should also be noted that due to the extent, quantity, relatively homogeneous characteristics and similarity of impacts on the assessed watercourses, the watercourses were assessed on a systems level within the confines of each target recipient site, and not on an individual basis.

The identified watercourses were categorised according to the Classification System (Ollis *et al*, 2013) and classified as either wetland or riparian habitat based on the characteristics as defined by the National Water Act, 1998 (Act 36 of 1998), as described in **Appendix D** of this report. The locality of the identified watercourses is indicated in Figures G1 to G4 following the discussion below.

Table G1: Classification of the fresh water resources located within the study area according to Ollis *et. al*, 2013.

<table>
<tr><th>Target recipient site</th><th>Level 3: Landscape unit</th><th>Level 4: Hydrogeomorphic (HGM) unit</th></tr>
<tr><td>Smithfield 1</td><td>Valley floor: The base of a valley, situated between two distinct valley side-slopes</td><td>Channelled valley-bottom wetland: a valley-bottom wetland with a river channel running through it; and
Unchannelled valley-bottom wetland: a valley-bottom wetland without a river channel running through it.</td></tr>
<tr><td>Smithfield 2 (north)</td><td rowspan="2">Valley floor: The base of a valley, situated between two distinct valley side-slopes; and
Slope: an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley.</td><td rowspan="2">River: a linear landform with clearly discernible bed and banks, which permanently or periodically carries a concentrated flow of water;
Unchannelled valley-bottom wetland: a valley-bottom wetland without a river channel running through it; and
Seep: a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend into a valley floor.</td></tr>
<tr><td>Smithfield 2 (south)</td></tr>
</table>

Target recipient site	Level 3: Landscape unit	Level 4: Hydrogeomorphic (HGM) unit
Smithfield 3	**Valley floor:** The base of a valley, situated between two distinct valley side-slopes; and **Slope:** an included stretch of ground that is not part of a valley floor, which is typically located on the side of a mountain, hill or valley	**Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it; **Unchannelled valley-bottom wetland:** a valley-bottom wetland *without* a river channel running through it; and **Seep:** a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Seeps are often located on the side-slopes of a valley, but they do not, typically, extend into a valley floor.
Baynesfield	**Valley floor:** The base of a valley, situated between two distinct valley side-slopes	**Channelled valley-bottom wetland:** a valley-bottom wetland with a river channel running through it; and **Unchannelled valley-bottom wetland:** a valley-bottom wetland *without* a river channel running through it.

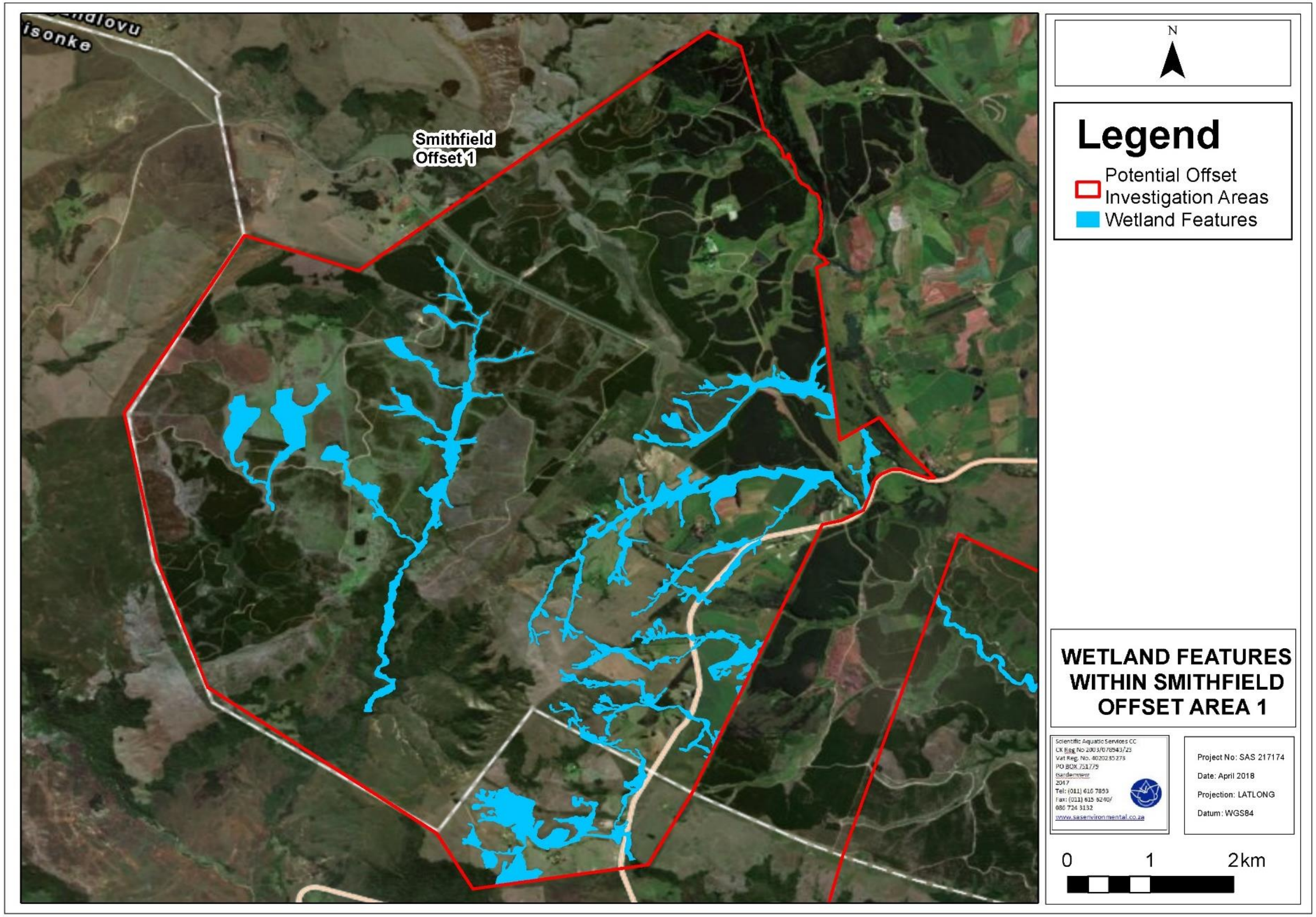


Figure G1: The extent of freshwater resources identified within the Smithfield 1 recipient site.

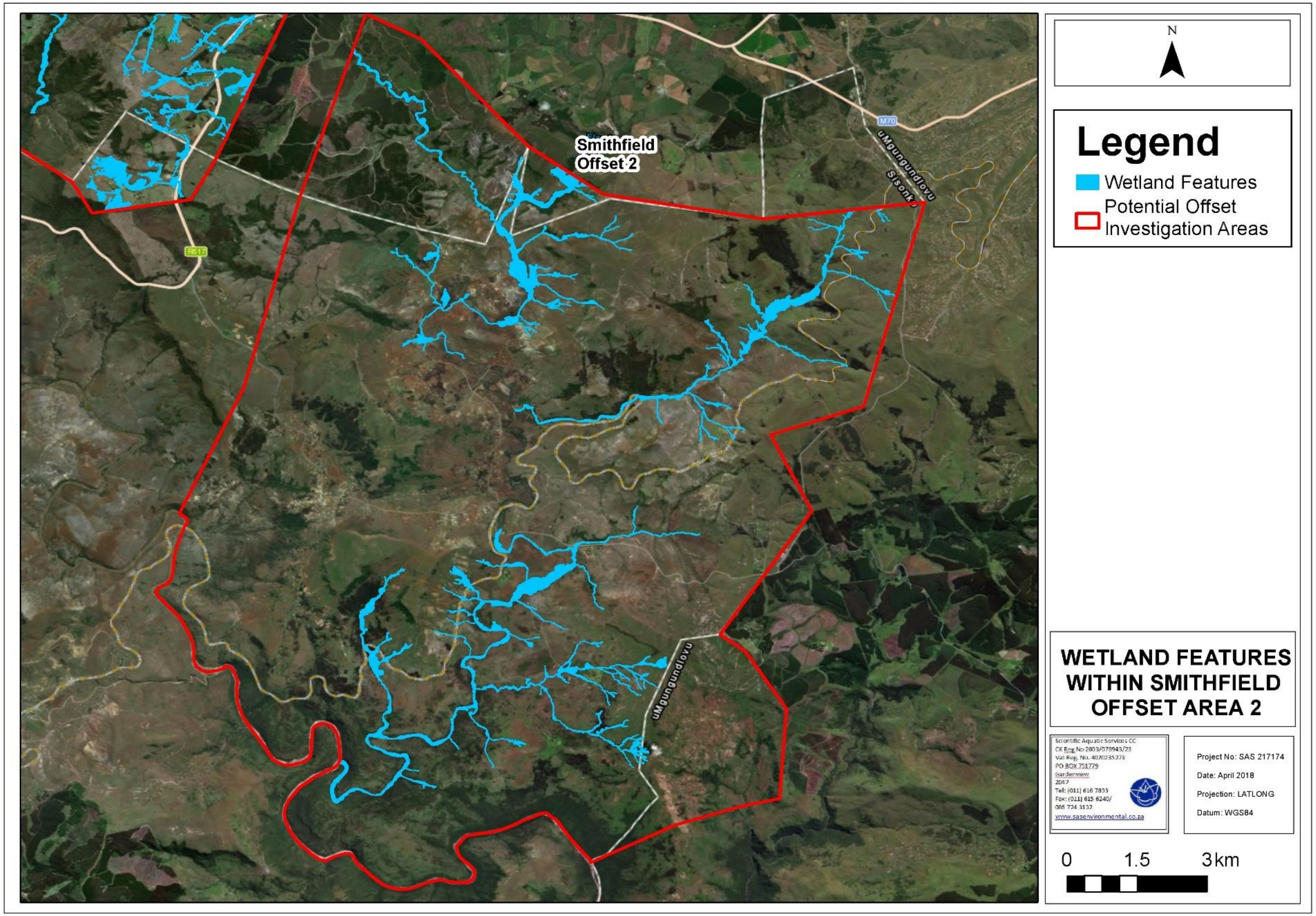


Figure G2: The extent of freshwater resources identified within the Smithfield 2 recipient site.

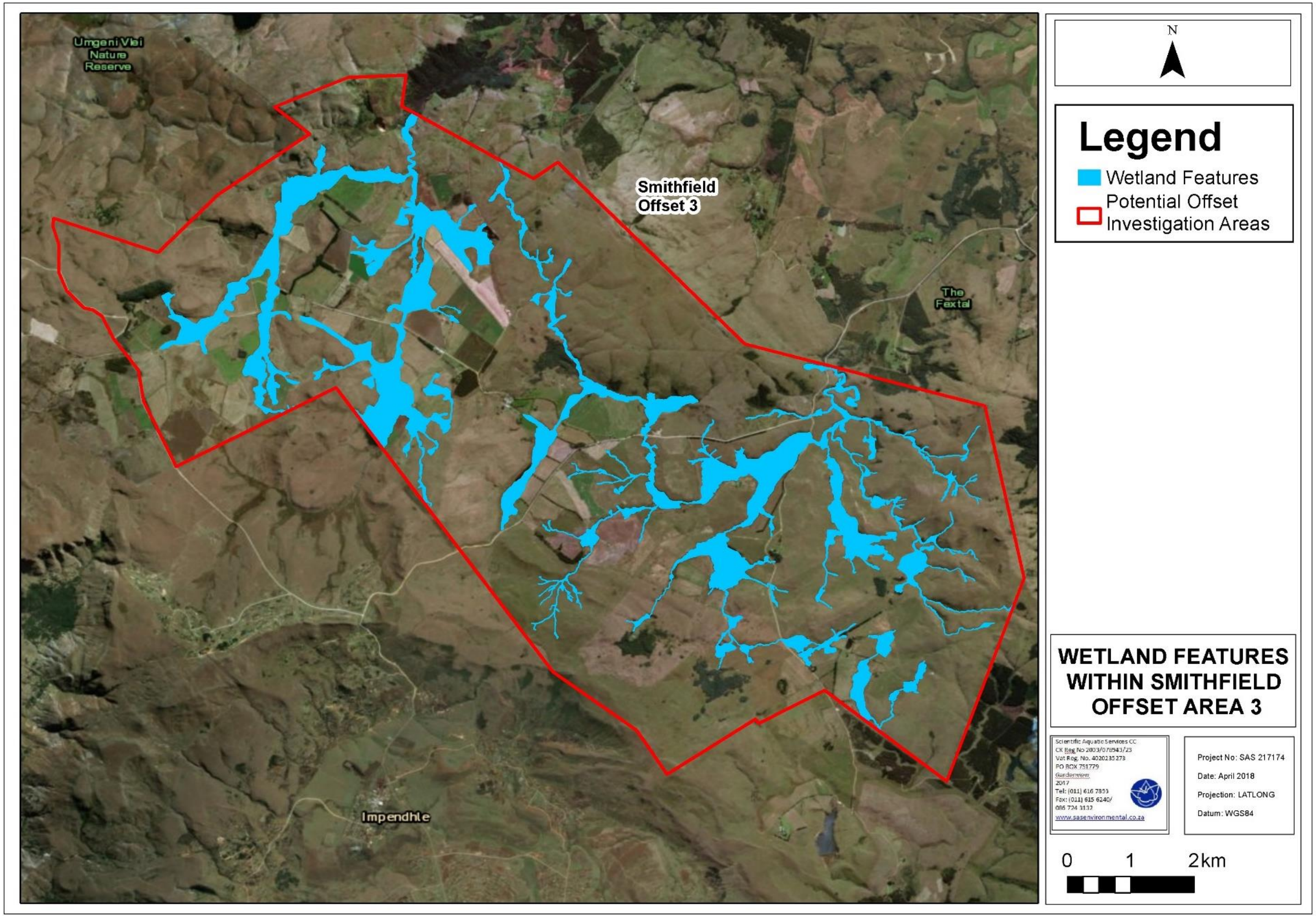


Figure G3: The extent of freshwater resources identified within the Smithfield 3 recipient site.

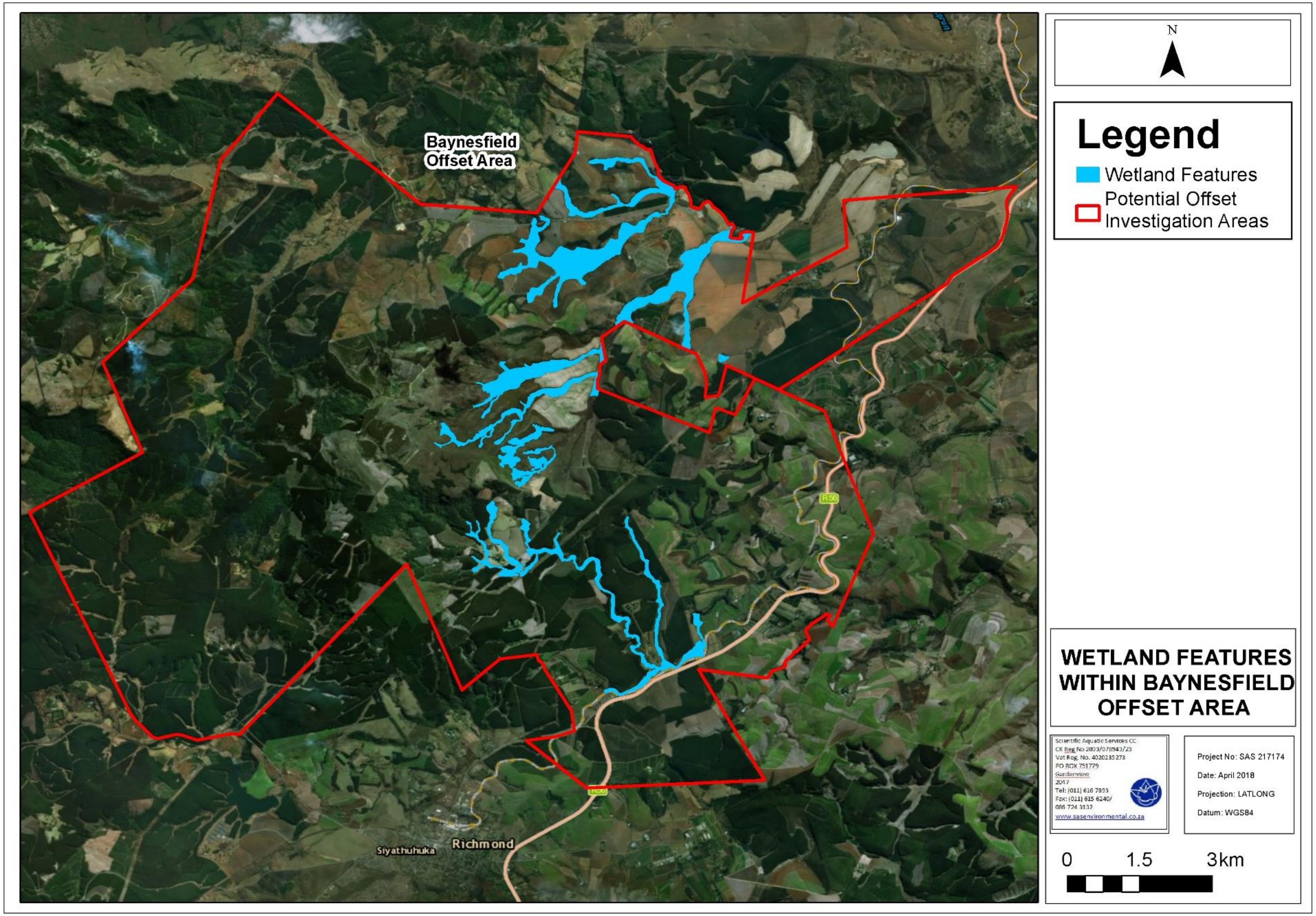


Figure G4: The extent of freshwater resources identified within the Baynesfield recipient site.

Watercourse Delineation

The wetland temporary zones and riparian zones were delineated according to the guidelines advocated by DWAF (2008). The delineations as presented in this report are regarded as a best estimate of the wetland and riparian zones boundaries based on the site conditions present at the time of assessment.

During the assessment, the following indicators were used in order to determine the boundary of the freshwater features within the study area:

- Terrain units were used to determine in which parts of the landscape the freshwater resources were most likely to occur;
- Obligate and facultative wetland species were utilised in conjunction with terrain units when delineating wetland features, whilst riparian vegetation, which displayed distinct changes in vegetation composition and structure was utilised when delineating riparian features. In wetland areas, the distinct change in vegetation composition coincided with soil morphological indicators;
- The soil form indicator was used to determine the presence of soils that are associated with prolonged and frequent saturation with key indicators including gleying, mottling, organic streaking and increased clay content within the wetland areas; and

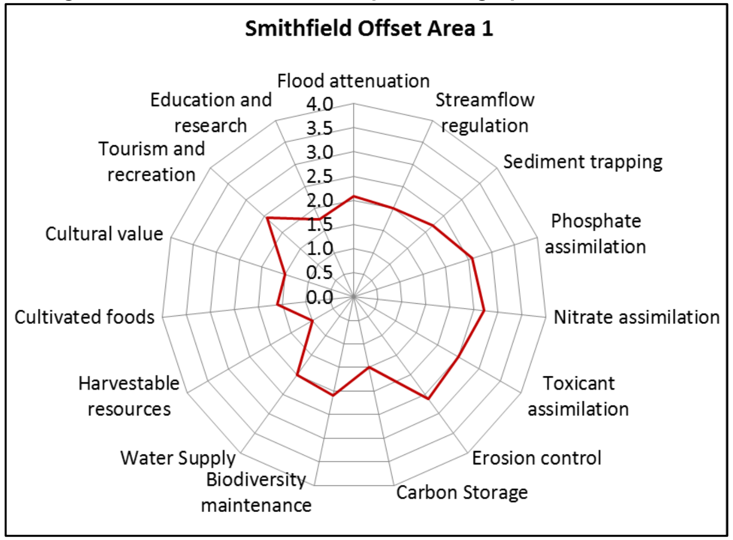
Due to the extent of both features and access restrictions as noted in Section 1.4, use was made of historical aerial photographs and historical and current digital satellite imagery to delineate the boundaries of wetland and riparian features throughout all three proposed recipient offset sites.

Characterisation of the Freshwater Resources within potential recipient sites

A single field assessment was undertaken in March 2018 to determine the extent and ecological characteristics of freshwater resources within each of the four target recipient sites.

Table G2: Summary of results of the assessment of the assessment of freshwater resources within the Smithfield 1 target recipient site.

Ecological & socio-cultural service provision graph:



Photograph notes	Typical valley bottom wetland systems within the Smithfield 1 recipient site, depicting modifications such as impoundments and commercial plantations.

PES discussion	**Category: C (Moderately modified)** Modifiers to these systems include: several impoundments, multiple road crossings, proximity of commercial plantations, removal of indigenous vegetation and in some areas, proliferation of alien vegetation. The effects that these modifications have or may have on the systems is discussed in more detail under the "watercourse characteristics" section of this table.
Ecoservice provision	**Intermediate** Important ecological services provided by these systems include streamflow regulation, flood attenuation, assimilation of nutrients and toxicants, erosion control and to a lesser extent, carbon storage. Biodiversity maintenance is an important ecological aspect provided by these systems. Although no wetland-dependent fauna was observed during the site assessment, a breeding population of *Bucorvus leadbeateri* (Southern Ground Hornbill) were observed within this area during the site assessment; thus it is possible that other wetland-dependent threatened species may occur. Although situated within a rural area, much of the land on which these systems are located is privately owned, thus

Watercourse characteristics:

a) Hydraulic regime

Hydrological processes within these systems have been altered by the creation of numerous in-channel impoundments, increased on-site water use (abstraction for agricultural purposes, commercial plantations and increased proliferation of alien vegetation, in particular *Acacia mearnsii* and *A. dealbata,* in disturbed areas.). In addition, several of these systems are traversed by the R617 and Impendle roads as well as numerous informal farm roads, thus increased runoff into the systems and flow modifications due to the presence of culverts is anticipated. However, the magnitude of these impacts is not considered severe at this time.

b) Water quality

Whilst comprehensive water quality testing did not form part of the scope of work of this study, where surface water was present, it was generally inaccessible due to access restrictions relating to property ownership. Therefore, basic parameters such as pH and Electrical Conductivity (EC) could not be ascertained. Nevertheless, water quality is likely to be relatively unimpacted, although some contamination as a result of agricultural return flows and runoff from roads which may contain hydrocarbons is anticipated.

c) Geomorphology and sediment balance

The geomorphological processes of the majority of these systems has been modified by the creation of the impoundments referred to above. Increased sediment inputs are expected due to disturbances of soils relating to agricultural activities (including forestry) in the catchment areas

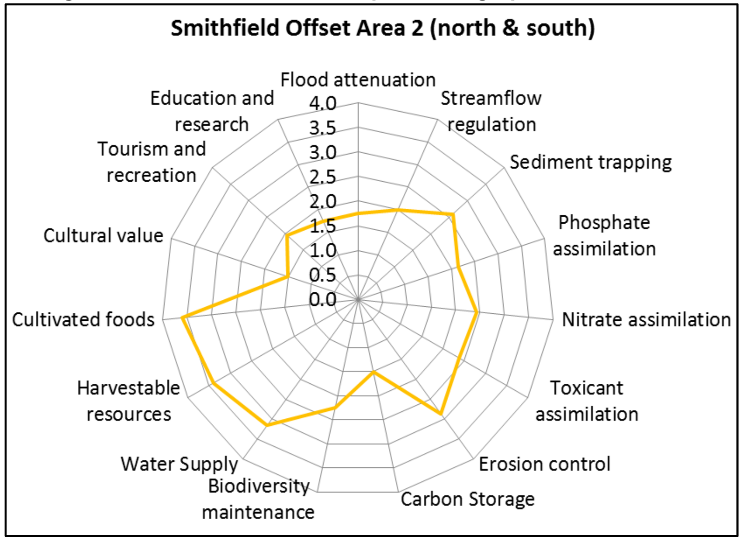
<table>
<tr>
<td></td>
<td>the potential to provide certain socio-cultural benefits (e.g. crop cultivation) is limited, although there is much potential for the systems to provide educational, recreational and tourism opportunities.</td>
<td rowspan="3">of the freshwater resources, and sediment laden runoff originating from the roads. Few erosional features were identified during the site visit or on digital satellite imagery, and no significant channel straightening or other modifications could be discerned.

d) Habitat and biota
The most significant impact on habitat is the proliferation of alien and invasive floral species within the freshwater resources (and the surrounding terrestrial areas). Species identified include (but are not limited to) A. mearnsii, A. dealbata, Solanum mauritanium, and Seriphium plumosum. However, the extent of invasion by alien and invasive vegetation appears to be limited to heavily disturbed areas and was not evident throughout. Whilst no wetland-dependent faunal Species of Conservation Concern (SCC) were observed during the site assessment, the general area is known to host a number of faunal SCC and the systems provide suitable breeding and foraging habitat for such species.</td>
</tr>
<tr>
<td>EIS discussion</td>
<td>High
The freshwater resource systems within the Smithfield Offset 1 target area are largely in moderately good ecological condition and are likely to provide ample breeding and foraging habitat for a number of wetland-dependent faunal species including avifauna, amphibians and mammals. Additionally, the systems are considered important for the provision of various ecological services such as nutrient and toxicant assimilation and streamflow regulation. Furthermore, the potential for provision of direct socio-cultural benefits relating to educational and recreational activities is moderately high. Thus, the systems are considered to be of high Ecological Importance and Sensitivity.</td>
</tr>
<tr>
<td>REC Category</td>
<td>Category B/C (Largely Natural / Moderately Modified)
The focus of the biodiversity offset as it pertains to watercourses should aim to improve the ecological condition of the freshwater resources within the target recipient sites. Within this target area, alien vegetation control is considered a high priority, since control of these species will improve hydraulic functioning and increase habitat suitability and availability. Hydraulic connectivity can be improved by ensuring that all existing road crossings are suitably maintained and where necessary, crossing types changed (e.g. from round pipes to box culverts to improve flow through the culverts and reduce the possibility of blockages).</td>
</tr>
</table>

Table G3: Summary of results of the assessment of the freshwater resources within the northern and southern portions of the Smithfield 2 target recipient site.

<table>
<tr><td colspan="2">

Ecological & socio-cultural service provision graph:



</td><td colspan="2">

</td></tr>
<tr><td>**PES discussion**</td><td>

Category: C (Moderately modified)

Whilst the freshwater resources within the northern and southern portions of the Smithfield 2 target recipient site were assessed separately, the results are discussed within one dashboard since the results are largely similar. These freshwater resources, comprising both valley bottom wetland and riparian habitat, are located in remote rural areas characterised by informal settlements. Modifiers are largely limited to trampling and grazing by domestic livestock, proliferation of alien vegetation (especially within riparian zones), crop cultivation within floodplains and possible alteration to water quality due to discharge of domestic effluent. Natural erosional processes are also extensive within the catchment, contributing to altered channel competency and increased sedimentation.

</td><td>**Photograph notes**</td><td>Examples of typical wetland and riparian freshwater resources occurring within the Smithfield 2 target recipient site.</td></tr>
<tr><td>**Ecoservice provision**</td><td>

Moderately High

Whilst the freshwater resources within the recipient site are considered to provide intermediate to moderately high ecological services such as streamflow regulation and flood

</td><td colspan="2">

Watercourse characteristics:

a) Hydraulic regime

The hydraulic regime of many of the watercourses is largely unimpacted. No impoundments are present within these systems, and flow-altering infrastructure is limited to a few informal road crossings, culverts and bridge support structures. Some abstraction is anticipated however it is unlikely to be significant volumes due to the lack of infrastructure in the vicinity. Gully formation in some areas (see point d below) may have an impact on hydraulic processes as they may convey water into, or out of, freshwater resources. Proliferation of water-loving woody species, in particular *A. dealbata* and *A. mearnsii* especially in riparian zones may contribute to increased on-site water use.

b) Water quality

Water quality is likely to be relatively unimpaired due to the remote locality although lack of sanitation services in the settled areas means that discharge of domestic effluent into the watercourses is highly likely although not in significant volumes. Sedimentation may be relatively high due to natural erosional processes in the catchment, which are exacerbated in some areas by regular foot traffic and trampling by domestic livestock.

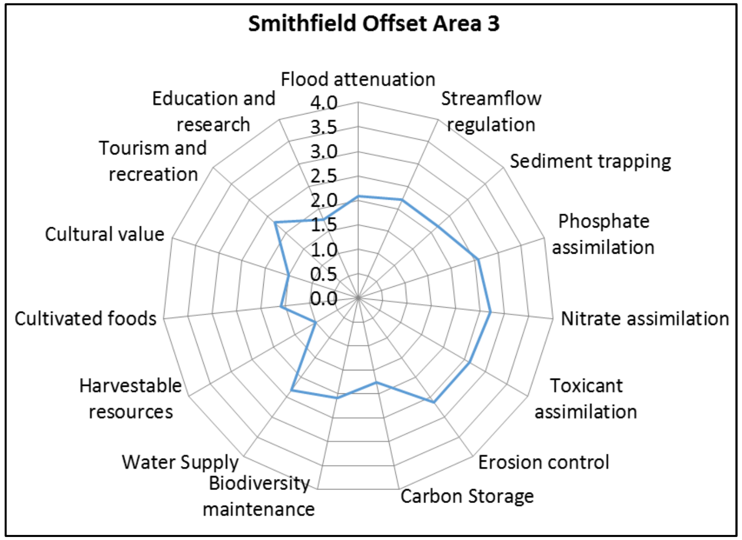
c) Geomorphology and sediment balance

</td></tr>
</table>

	attenuation, they are also deemed important for the provision of direct benefits to the community. Of particular importance is the provision of water for domestic and subsistence agricultural purposes, as well as provision of harvestable resources and crop cultivation within the fertile floodplain soils. Whilst no activities linked to traditional cultural / religious beliefs were observed during the site assessment it is likely that the riverine resources in particular are utilised for religious purposes.	Erosional processes in the catchment have in some areas altered channel competency and contribute to increased sediment loads entering the freshwater systems. Additionally, these erosional processes have caused the formation of gullies which may impact hydraulic processes as discussed above. **d) Habitat and biota** Proliferation of alien vegetation particularly within the riparian zones is considered a significant habitat modifier, out-competing indigenous floral species and causing a reduction in suitable habitat for faunal species. Nevertheless, the various freshwater resources provide good connectivity and migratory corridors to other, less disturbed natural areas.
EIS discussion	**High** The remote locality and connectivity to surrounding natural areas increases the importance of these systems in terms of biodiversity maintenance, as they are deemed to provide important faunal migratory corridors and habitat. However, the systems were also considered important for the hydrological processes provided as well as for socio-cultural benefits.	
REC Category	**Category B/C (Largely Natural / Moderately Modified)** Control of alien vegetation, in particular *Acacia spp.* should form the focus of rehabilitation activities within the Smithfield 2 target recipient site. Removal of these water-loving species will contribute significantly to re-balancing hydrological processes and allow for natural vegetation to re-establish thus improving habitat. Erosion control within the entire catchment is not practical, however since the soils are naturally erodible, ensuring that road crossings are stabilised and soils in those areas are protected will aid in reducing sedimentation of the systems as well as contributing towards the longevity of the infrastructure itself.	

Table G4: Summary of results of the assessment of the freshwater resources within the Smithfield 3 target recipient site.

Ecological & socio-cultural service provision graph:



Photograph notes	Typical channelled (left) and unchannelled (right) valley bottom wetlands occurring within the Smithfield 3 target recipient site.

PES discussion	**Category: C (Moderately modified)** Modifiers to the freshwater systems within the Smithfield 3 target recipient site are largely related to hydraulic processes (extensive networks of drainage channels, large impoundments and numerous road crossings). With the exception of impoundments, the geomorphological processes remain largely intact. Floral community structure and composition has been altered as a result of agriculture (commercial crop cultivation) and proliferation of alien vegetation as a result of disturbances.
Ecoservice provision	**Moderately high** Despite the reduced ecological integrity of these systems, they are nevertheless considered important providers of ecological services such as flood attenuation, sediment trapping, streamflow regulation and assimilation of nutrients and toxicants. Suitable habitat exists for a number of wetland-dependent faunal SCC, thus the systems are considered important for biodiversity maintenance. In terms of socio-cultural value, the freshwater systems are considered

Watercourse characteristics:

a) Hydraulic regime

Hydrological processes within these systems has been significantly altered over decades as a result of extensive networks of drainage channels and numerous impoundments, resulting in altered flow patterns and distribution of water within the wetland systems. Abstraction of water for agricultural purposes occurs, and although precise volumes are not known, it is likely to be high since crop cultivation is the primary land use in the area. Several low-lying bridge crossings were noted during the assessment; these are likely to result in obstruction of flow during high rainfall events as well as causing accumulation of debris during such events leading to further flow obstruction even during low-flow periods. In addition, some road crossings have inadequate culvert systems which are likely to result in blockages particularly during high rainfall events.

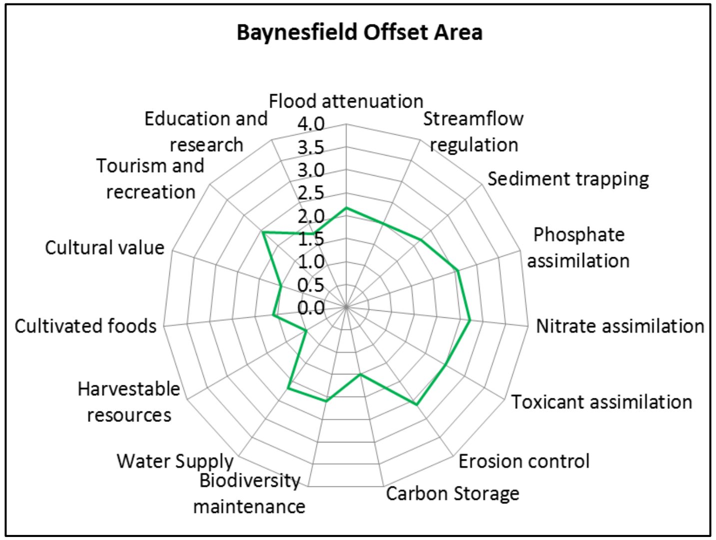
b) Water quality

Although testing of basic water quality parameters did not take place, it is likely that water quality is largely unimpacted although agricultural return flows are anticipated and are likely to contribute to increased salts and nutrients. Increased turbidity in slow-flowing systems is also anticipated due to the extent of agricultural activities in the catchment areas, although the impoundments and generally high vegetation cover may reduce sediment loads in the systems.

	important for provision of water for human use, tourism and recreation, and educational purposes.	**c) Geomorphology and sediment balance** Geomorphology has been altered largely due to the impoundments. Although not directly observed during the site assessment, some channel straightening could be discerned during analysis of digital satellite imagery although it is not extensive and is unlikely to have had a significant impact on the overall systems. Increased sedimentation is expected as discussed above although this may be mitigated by vegetation and impoundments. **d) Habitat and biota** Alien vegetation is largely only present in heavily disturbed areas such as at road crossings, and diversity of indigenous floral species is relatively low. However, due to the remote locality of the freshwater systems, and the connectivity to other natural areas, they are considered to provide important faunal migratory corridors, and as noted in the EIS discussion, are known to provide important breeding and foraging habitat for faunal SCC.
EIS discussion	**Very High** Known breeding populations of the threated *Bugeranus carunculatus* (= *Grus carunculatus;* Wattled Crane) occur in the vicinity (as observed during the site assessment), and connectivity to other natural areas is high, thus these systems are considered very ecological important. Additionally, as they provide moderately high levels of ecological service relating to hydraulic processes (e.g. flood attenuation) and are relatively important from a socio-cultural perspective, these systems are considered to be of very high EIS.	
REC Category	**Category B/C (Largely Natural / Moderately Modified)** The core focus of rehabilitation within these systems should be on the restoration of hydraulic processes. Wherever possible, drainage canals must be removed to allow water to follow natural paths of movement through the landscape. Low-lying bridge crossing should be raised, and flow obstructions relating to road crossings adjusted to allow for improved flow patterns and reduction of blockages. Alien vegetation control also forms a critical component of rehabilitation efforts. It should be noted that Working for Wetlands are already active in the vicinity (on the farm Ivanhoe).	

Table G5: Summary of results of the assessment of the freshwater resources within the Baynesfield target recipient site.

Ecological & socio-cultural service provision graph:



PES discussion	**Category: C (Moderately modified)** Modifiers to these systems are largely related to agricultural activities, and include several impoundments, abstraction of water and drainage canals, increased water inputs due to increased impermeable surfaces in the catchment areas, road crossings (and associated culverts), and altered vegetation profiles (alien vegetation and clearing for crops/plantations).
Ecoservice provision	**Moderately high** Despite the lowered ecological integrity of these systems, ecological service provision is considered moderately high, largely due to good vegetation cover (although alien vegetation is rife within some systems it nevertheless contributes to increased surface roughness) which allows for the provision of services such as flood attenuation, sediment trapping and nutrient and toxicant assimilation. Additionally, these systems are considered important as they provide water for commercial crop cultivation and have high tourism and educational potential. Direct benefits to local communities are however considered limited, as the assessed portions of the freshwater systems are located on privately-owned land.

Photograph notes	Representative photographs of wetland systems within the Baynesfield target recipient site, indicating proliferation of alien vegetation (left) and relatively natural vegetation (right).

Watercourse characteristics:

a) Hydraulic regime

Hydraulic processes have been modified as a result of several in-channel impoundments on these systems, which are largely utilised for the supply of water for commercial agriculture. This in turn will have an effect on water balance within the systems as large volumes of water are likely to be abstracted. Several road crossings and low-lying bridges are present, which may obstruct flow, particularly if debris is allowed to accumulate upstream of such crossings.

b) Water quality

Water quality is likely to be slightly impaired, due to the extent of agriculture within the catchment areas. Agricultural return flows are likely to contribute to increased salt and nutrient loads as well as increased sediment inputs. However, significant impacts on water quality are not expected.

c) Geomorphology and sediment balance

Geomorphological processes remain largely intact with the exception of impoundments (thus altering the channels within which the impoundments are located), increased sediment loads due to disturbances within the catchment areas, and some erosion of streambanks, although no severe incision was observed.

EIS discussion	**Very High** The freshwater systems within the Baynesfield target recipient sites are considered to be of very high ecological importance, despite the reduced ecological integrity, largely due to the presence of known breeding sites for the Critically Endangered *Hirundo atrocaerulea (*Blue Swallow) within the recipient site. In addition, the systems are considered important for maintenance of hydraulic processes.	**d) Habitat and biota** Habitat availability has been greatly reduced as a result of encroachment of crop cultivation and commercial forestry, and also as a result of proliferation of alien vegetation within wetland areas. Unlike many of the systems in the Smithfield recipient sites, alien vegetation within freshwater systems in the Baynesfield target recipient site is greater in extent and severity and is not limited to disturbed sites. Nevertheless, faunal migratory connectivity remains, although suitable breeding and foraging habitat for faunal SCC such as *H. atrocaerulea* is limited.
REC Category	**Category B/C (Largely Natural / Moderately Modified)** The focus of rehabilitation activities within this target recipient site should be on the removal of alien vegetation and reinstatement of indigenous graminoid species, in order to improve habitat availability and condition. In addition, low-lying bridges should be raised and poorly constructed culverts re-designed or regularly maintained to improve flow.	

Legislative Requirements and National Guidelines pertaining to the application of Regulation and Buffer Zones

According to Macfarlane *et al.* (2015) the definition of a buffer zone is variable, depending on the purpose of the buffer zone, however in summary, it is considered to be "a strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another". Buffer zones are considered to be important to provide protection of basic ecosystem processes (in this case, the protection of aquatic and wetland ecological services), reduce impacts on water resources arising from upstream activities (e.g. by removing or filtering sediment and pollutants), provision of habitat for aquatic and wetland species as well as for certain terrestrial species, and a range of ancillary societal benefits (Macfarlane *et. al,* 2015). It should be noted, however, that buffer zones are not considered to be effective mitigation against impacts such as hydrological changes arising from stream flow reduction, impoundments or abstraction, nor are they considered to be effective in the management of point-source discharges or contamination of groundwater, both of which require site-specific mitigation measures (Macfarlane *et. al,* 2015).

Legislative requirements were also taken into consideration when determining a suitable buffer zone for the freshwater resources assessed. The definition and motivation for a regulated zone of activity as well as buffer zone for the protection of the freshwater resource can be summarised as follows:

Table G5: Articles of Legislation and the relevant zones of regulation applicable to each article.

Regulatory authorisation required	Zone of applicability
Water Use License Application in terms of the NWA (1998).	In accordance with GN509 of 2016 as it relates to the NWA, a regulated area of a watercourse for section 21c and 21i of the NWA (1998) is defined as: • the outer edge of the 1 in 100 year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; • in the absence of a determined 1 in 100 year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or • a 500m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation, as well as General Notice no. 509 of 2016 as it relates to the NWA.
Listed activities in terms of the NEMA (1998) EIA Regulations as amended in April 2017 must be taken into consideration if any infrastructure is to be placed within the applicable zone of regulation. This must be determined by the Environmental Assessment Practitioner (EAP) in consultation with the relevant authorities.	32m from the edge of a watercourse

A 50m conservation buffer was also designated around all systems as part of the Offset and Compensation Initiative, as this will assist in achieving the objectives of the offset. For example, a suitable buffer between terrestrial areas and the watercourse will increase contact duration of runoff thereby increasing potential for sediment trapping and assimilation of excess nutrients, thus improving water quality to downstream users.

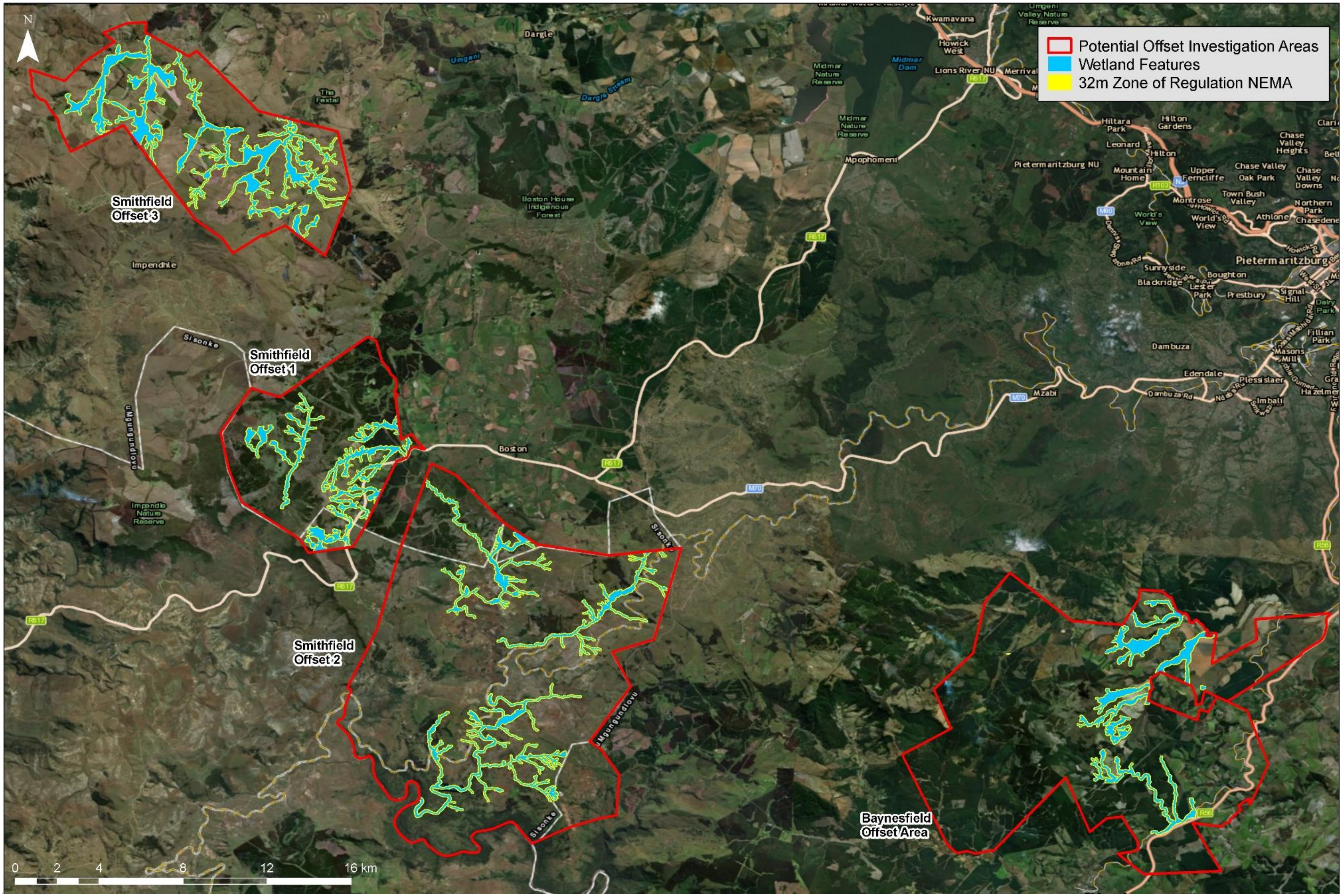


Figure G5: Conceptual depiction of the 32m zone of regulation in terms of NEMA in relation to the assessed freshwater resources.

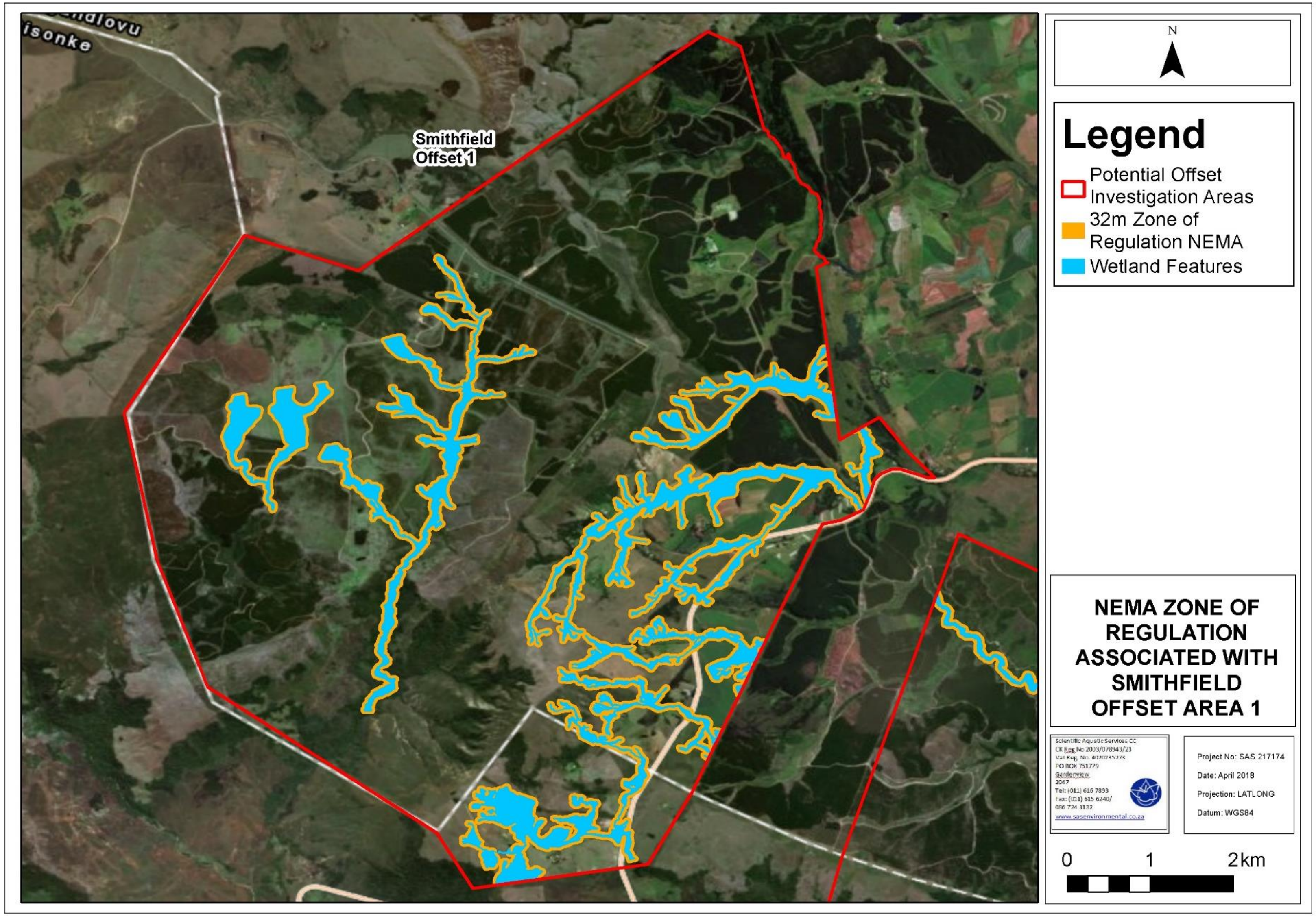


Figure G6: Conceptual depiction of the 32m zone of regulation in terms of NEMA in relation to the assessed freshwater resources within the Smithfield 1 target recipient site.

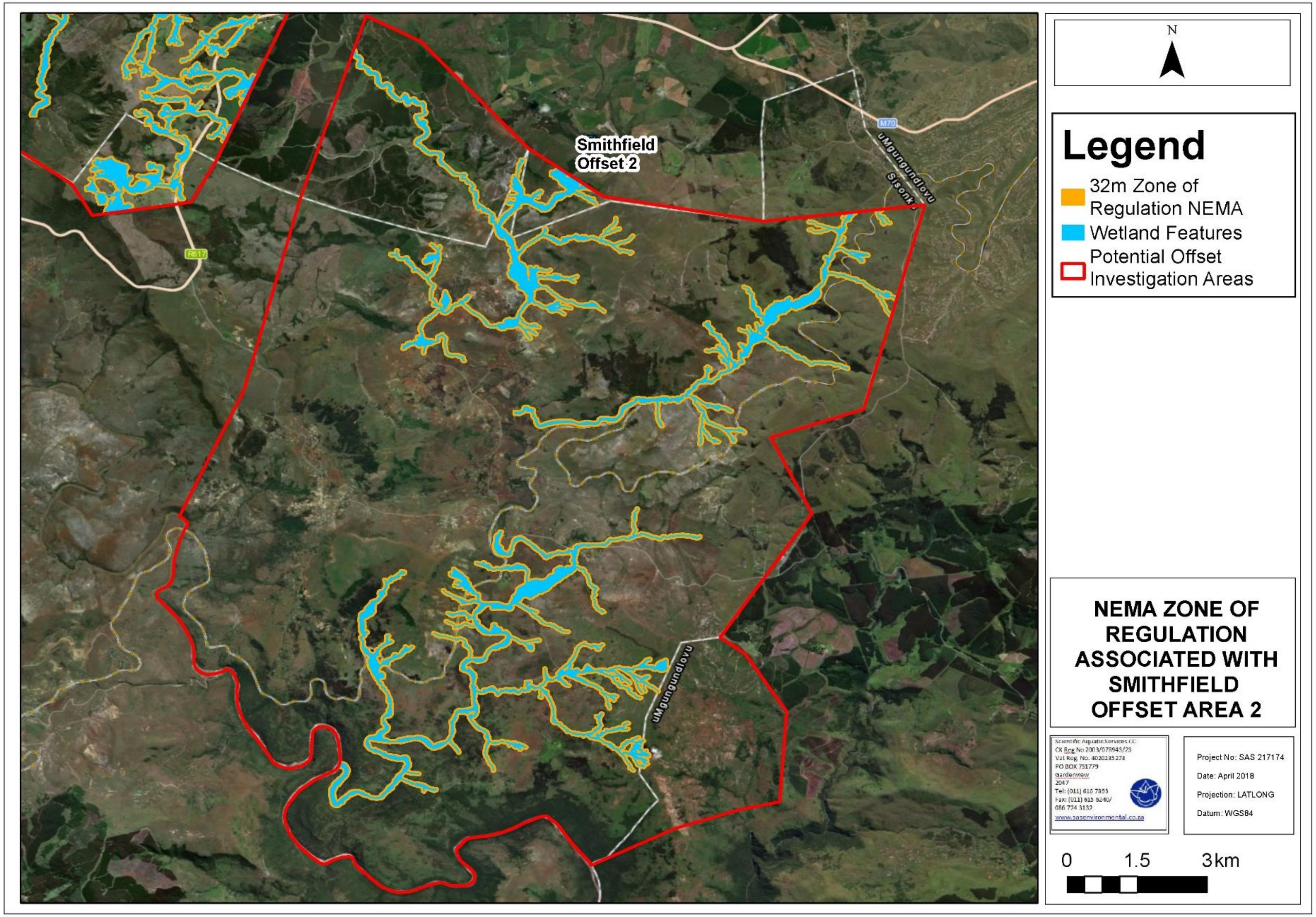


Figure G7: Conceptual depiction of the 32m zone of regulation in terms of NEMA in relation to the assessed freshwater resources within the Smithfield 2 target recipient site.

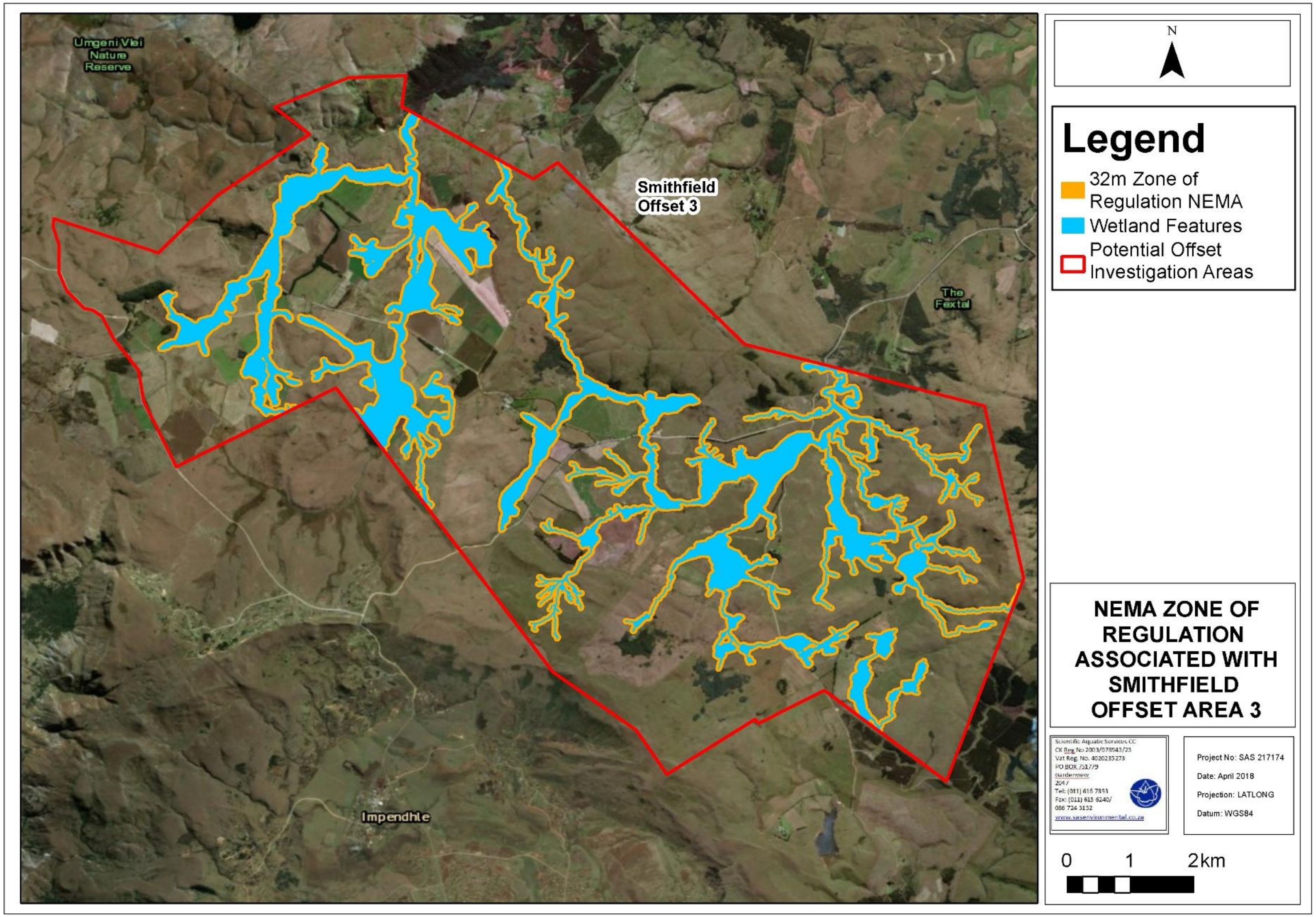


Figure G8: Conceptual depiction of the 32m zone of regulation in terms of NEMA in relation to the assessed freshwater resources within the Smithfield 3 target recipient site.

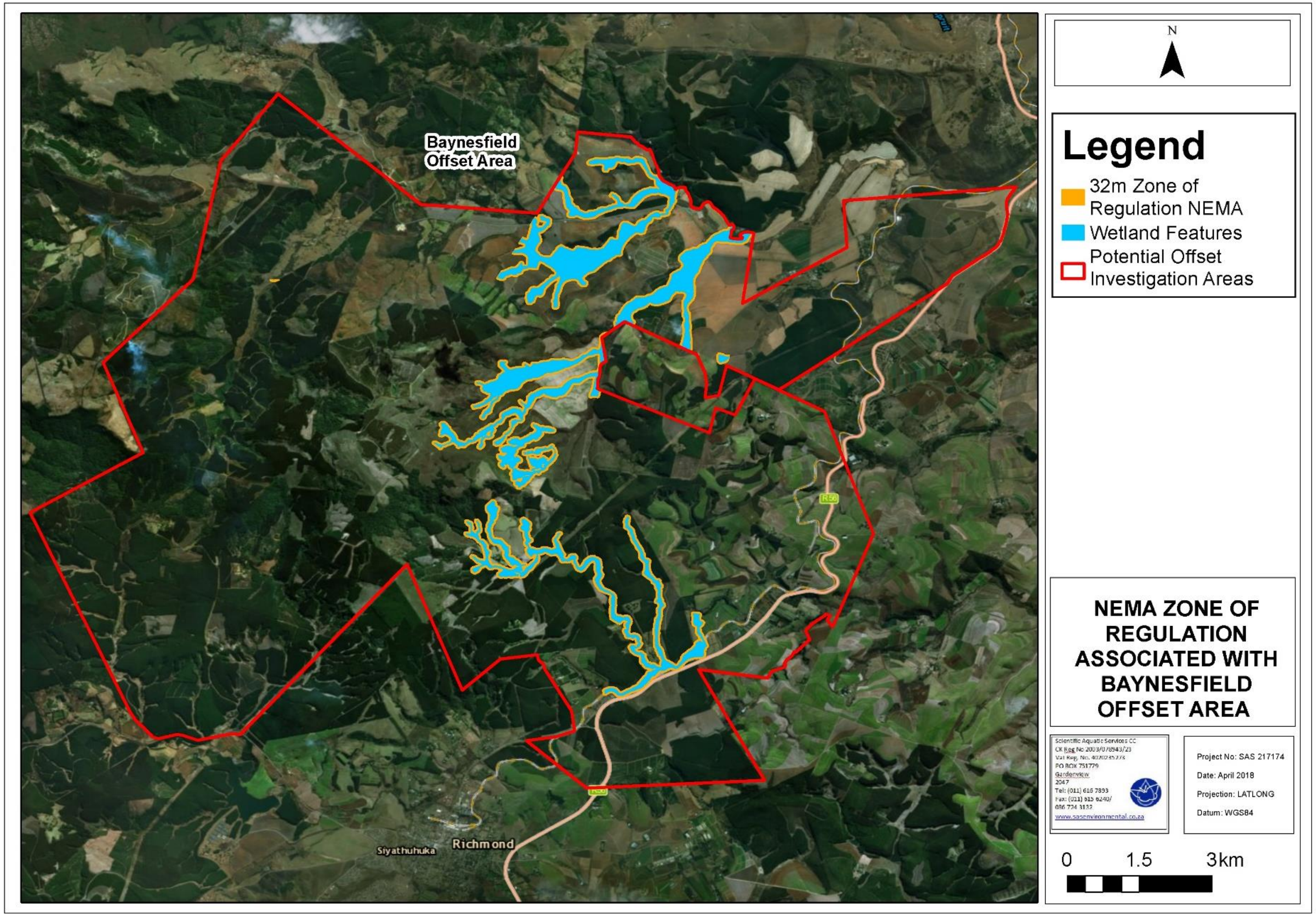


Figure G9: Conceptual depiction of the 32m zone of regulation in terms of NEMA in relation to the assessed freshwater resources within the Baynesfield target recipient site

APPENDIX H: RESULTS OF THE FIELD ASSESSMENT: WETLAND CHARACTERISATION

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

Table H1: Presentation of the results of the WET-Health assessment applied to the freshwater resources in the various recipient sites

	Hydrology		Geomorphology		Vegetation		Overall PES Category
	PES category	Trajectory of change	PES category	Trajectory of change	PES category	Trajectory of change	
Offset 1	C	→	A	→	C	↓	C
Offset 2 North	B	→	B	→	D	↓	C
Offset 2 South	B	→	A	→	D	↓	C
Offset 3	D	→	A	→	C	↓	C
Baynesfield	D	→	A	→	D	↓	C

Table H2: Presentation of the results of the Ecoservices assessments applied to the freshwater resources

Ecosystem service	S1	S2 south	S2 north	S3	Baynesfield
Flood attenuation	2.1	1.8	1.8	2.1	2.2
Streamflow regulation	2.0	2.0	2.0	2.2	2.0
Sediment trapping	2.2	2.6	2.6	2.2	2.2
Phosphate assimilation	2.6	2.1	2.1	2.6	2.6
Nitrate assimilation	2.7	2.4	2.4	2.7	2.7
Toxicant assimilation	2.5	2.4	2.4	2.6	2.5
Erosion control	2.6	2.9	2.9	2.6	2.6
Carbon Storage	1.5	1.5	1.5	1.8	1.5
Biodiversity maintenance	2.1	2.3	2.3	2.1	2.1
Water Supply	2.0	3.2	3.2	2.3	2.2
Harvestable resources	1.0	3.4	3.4	1.0	1.0
Cultivated foods	1.6	3.6	3.6	1.6	1.6
Cultural value	1.5	1.5	1.5	1.5	1.5
Tourism and recreation	2.4	1.9	1.9	2.3	2.4
Education and research	1.8	1.8	1.8	1.8	1.8
SUM	**30.6**	**35.3**	**35.3**	**31.3**	**30.8**
Average score	**2.0**	**2.4**	**2.4**	**2.1**	**2.1**
Rating class	**Intermediate**	**Moderately High**	**Moderately High**	**Moderately High**	**Moderately High**

Table H3: Presentation of the results of the EIS assessment applied to the Smithfield Recipient site 1

Ecological Importance and Sensitivity			Score (0-4)	*Confidence (1-5)*
Biodiversity support			A (average)	(average)
			3.00	4.00
Presence of Red Data species			3	4
Populations of unique species			3	4
Migration/breeding/feeding sites			3	4
Landscape scale			B (average)	(average)
			2.40	4.00
Protection status of the wetland			3	4
Protection status of the vegetation type			3	4
Regional context of the ecological integrity			2	4
Size and rarity of the wetland type/s present			2	4
Diversity of habitat types			2	4
Sensitivity of the wetland			C (average)	(average)
			1.67	4.00
Sensitivity to changes in floods			2	4
Sensitivity to changes in low flows/dry season			2	4
Sensitivity to changes in water quality			1	4
ECOLOGICAL IMPORTANCE & SENSITIVITY			**(max of A,B or C)**	*(average of A, B or C)*
Fill in highest score:			**A**	**3.00**
Hydro-Functional Importance			Score (0-4)	*Confidence (1-5)*
Regulating & supporting benefits	**Flood attenuation**		2	4
	Streamflow regulation		2	4
	Water Quality Enhancement	***Sediment trapping***	2	4
		Phosphate assimilation	3	4
		Nitrate assimilation	3	4
		Toxicant assimilation	2	4
		Erosion control	3	4
	Carbon storage		1	4
HYDRO-FUNCTIONAL IMPORTANCE			2	4
Direct Human Benefits			Score (0-4)	*Confidence (1-5)*
Subsistence benefits	***Water for human use***		2	4
	Harvestable resources		1	4
	Cultivated foods		2	4
Cultural benefits	***Cultural heritage***		1	4
	Tourism and recreation		2	4
	Education and research		2	4
DIRECT HUMAN BENEFITS			1.67	4

Table H4: Presentation of the results of the EIS assessment applied to the Smithfield Recipient site 2 North

Ecological Importance and Sensitivity	Score (0-4)	*Confidence (1-5)*
Biodiversity support	A (average)	(average)
	2.33	#DIV/0!
Presence of Red Data species	2	
Populations of unique species	2	
Migration/breeding/feeding sites	3	
Landscape scale	B (average)	(average)
	1.60	#DIV/0!
Protection status of the wetland	0	
Protection status of the vegetation type	3	
Regional context of the ecological integrity	2	
Size and rarity of the wetland type/s present	2	
Diversity of habitat types	1	
Sensitivity of the wetland	C (average)	(average)
	1.67	#DIV/0!
Sensitivity to changes in floods	2	
Sensitivity to changes in low flows/dry season	2	
Sensitivity to changes in water quality	1	
ECOLOGICAL IMPORTANCE & SENSITIVITY	**(max of A,B or C)**	*(average of A, B or C)*
Fill in highest score:	**A**	**2.33**

		Hydro-Functional Importance	Score (0-4)	*Confidence (1-5)*
Regulating & supporting benefits	**Flood attenuation**		2	4
	Streamflow regulation		2	4
	Water Quality Enhancement	***Sediment trapping***	3	4
		Phosphate assimilation	2	4
		Nitrate assimilation	2	4
		Toxicant assimilation	2	4
		Erosion control	3	4
	Carbon storage		1	4
HYDRO-FUNCTIONAL IMPORTANCE			2	4

	Direct Human Benefits	Score (0-4)	*Confidence (1-5)*
Subsistence benefits	***Water for human use***	3	4
	Harvestable resources	3	4
	Cultivated foods	4	4
Cultural benefits	***Cultural heritage***	1	4
	Tourism and recreation	2	4
	Education and research	2	4
DIRECT HUMAN BENEFITS		2.50	4

Table H5: Presentation of the results of the EIS assessment applied to the Smithfield Recipient site 2 South

Ecological Importance and Sensitivity			Score (0-4)	*Confidence (1-5)*
Biodiversity support			A (average)	(average)
			2.33	4.00
Presence of Red Data species			2	4
Populations of unique species			2	4
Migration/breeding/feeding sites			3	4
Landscape scale			B (average)	(average)
			1.60	4.00
Protection status of the wetland			0	4
Protection status of the vegetation type			3	4
Regional context of the ecological integrity			2	4
Size and rarity of the wetland type/s present			2	4
Diversity of habitat types			1	4
Sensitivity of the wetland			C (average)	(average)
			1.67	4.00
Sensitivity to changes in floods			2	4
Sensitivity to changes in low flows/dry season			2	4
Sensitivity to changes in water quality			1	4
ECOLOGICAL IMPORTANCE & SENSITIVITY			**(max of A,B or C)**	*(average of A, B or C)*
Fill in highest score:			**A**	**2.33**
Hydro-Functional Importance			Score (0-4)	*Confidence (1-5)*
Regulating & supporting benefits	**Flood attenuation**		2	4
	Streamflow regulation		2	4
	Water Quality Enhancement	***Sediment trapping***	3	4
		Phosphate assimilation	2	4
		Nitrate assimilation	2	4
		Toxicant assimilation	2	4
		Erosion control	3	4
	Carbon storage		1	4
HYDRO-FUNCTIONAL IMPORTANCE			2	4
Direct Human Benefits			Score (0-4)	*Confidence (1-5)*
Subsistence benefits	***Water for human use***		3	4
	Harvestable resources		3	4
	Cultivated foods		4	4
Cultural benefits	***Cultural heritage***		1	4
	Tourism and recreation		2	4
	Education and research		2	4
DIRECT HUMAN BENEFITS			2.50	4

Table H6: Presentation of the results of the EIS assessment applied to the Smithfield Recipient site 3

Ecological Importance and Sensitivity			Score (0-4)	*Confidence (1-5)*
Biodiversity support			A (average)	(average)
			3.67	4.00
Presence of Red Data species			4	4
Populations of unique species			3	4
Migration/breeding/feeding sites			4	4
Landscape scale			B (average)	(average)
			2.40	4.00
Protection status of the wetland			3	4
Protection status of the vegetation type			3	4
Regional context of the ecological integrity			2	4
Size and rarity of the wetland type/s present			2	4
Diversity of habitat types			2	4
Sensitivity of the wetland			C (average)	(average)
			1.67	4.00
Sensitivity to changes in floods			2	4
Sensitivity to changes in low flows/dry season			2	4
Sensitivity to changes in water quality			1	4
ECOLOGICAL IMPORTANCE & SENSITIVITY			**(max of A,B or C)**	*(average of A, B or C)*
		Fill in highest score:	**A**	**3.67**
		Hydro-Functional Importance	Score (0-4)	*Confidence (1-5)*
Regulating & supporting benefits	**Flood attenuation**		2	4
	Streamflow regulation		2	4
	Water Quality Enhancement	***Sediment trapping***	2	4
		Phosphate assimilation	3	4
		Nitrate assimilation	3	4
		Toxicant assimilation	3	4
		Erosion control	3	4
	Carbon storage		2	4
		HYDRO-FUNCTIONAL IMPORTANCE	3	4
		Direct Human Benefits	Score (0-4)	*Confidence (1-5)*
Subsistence benefits	***Water for human use***		2	4
	Harvestable resources		1	4
	Cultivated foods		2	4
Cultural benefits	***Cultural heritage***		1	4
	Tourism and recreation		2	4
	Education and research		2	4
		DIRECT HUMAN BENEFITS	1.67	4

Table H7: Presentation of the results of the EIS assessment applied to the Baynesfield Recipient site 2

Ecological Importance and Sensitivity			Score (0-4)	*Confidence (1-5)*
Biodiversity support			A (average)	(average)
			4.00	4.00
Presence of Red Data species			4	4
Populations of unique species			4	4
Migration/breeding/feeding sites			4	4
Landscape scale			B (average)	(average)
			2.60	4.00
Protection status of the wetland			3	4
Protection status of the vegetation type			3	4
Regional context of the ecological integrity			3	4
Size and rarity of the wetland type/s present			2	4
Diversity of habitat types			2	4
Sensitivity of the wetland			C (average)	(average)
			1.67	4.00
Sensitivity to changes in floods			2	4
Sensitivity to changes in low flows/dry season			2	4
Sensitivity to changes in water quality			1	4
ECOLOGICAL IMPORTANCE & SENSITIVITY			**(max of A,B or C)**	*(average of A, B or C)*
Fill in highest score:			**A**	**4.00**
Hydro-Functional Importance			Score (0-4)	*Confidence (1-5)*
Regulating & supporting benefits	**Flood attenuation**		2	4
	Streamflow regulation		2	4
	Water Quality Enhancement	***Sediment trapping***	2	4
		Phosphate assimilation	3	4
		Nitrate assimilation	3	4
		Toxicant assimilation	2	4
		Erosion control	3	4
	Carbon storage		1	4
HYDRO-FUNCTIONAL IMPORTANCE			2	4
Direct Human Benefits			Score (0-4)	*Confidence (1-5)*
Subsistence benefits	***Water for human use***		2	4
	Harvestable resources		1	4
	Cultivated foods		2	4
Cultural benefits	***Cultural heritage***		1	4
	Tourism and recreation		2	4
	Education and research		2	4
DIRECT HUMAN BENEFITS			1.67	4

APPENDIX I: WETLAND FUNCTION AND HABITAT HECTARE EQUIVALENT CALCULATIONS

Table I1: Target Wetland Offset Hectare Equivalents for Smithfield Recipient site 1

<table>
<tr><th colspan="5">Contribution Towards Wetland Functionality Targets</th></tr>
<tr><th>Wetland attributes</th><td colspan="2">Wetland Reference</td><th colspan="2">Smithfield 1 Target Offset area</th></tr>
<tr><th rowspan="4">Alignment with site selection guidelines</th><th>Criterion</th><th>Relevance</th><th>Site attributes</th><th>Acceptability Guidelines</th></tr>
<tr><td>Wetland type</td><td>Targeted wetlands should typically be of the same type to ensure that similar services to those impacted are improved through offset activities.</td><td>Wetland is of the same type as the impacted wetland.</td><td>Ideal</td></tr>
<tr><td>Key services targeted</td><td>Targeted wetlands should be prioritised and selected based on their ability to compensate for key regulating and supporting services impacted by the proposed development.</td><td>Selected wetland is reasonably placed to improve key regulating and supporting services identified.</td><td>Acceptable</td></tr>
<tr><td>Offset site location relative to impacted wetland</td><td>Targeted wetlands should ideally be located as close to the impacted site as possible.</td><td>Selected wetland is located within the same quaternary catchment.</td><td>Acceptable</td></tr>
<tr><th rowspan="5">Preliminary Offset Calculation</th><th rowspan="2">Prior to offset activities</th><td>Wetland size (ha)</td><td colspan="2">75.75</td></tr>
<tr><td>Functional value (%)</td><td colspan="2">65</td></tr>
<tr><th rowspan="2">Following successful offset implementation</th><td>Functional value (%)</td><td colspan="2">80</td></tr>
<tr><td>Change in functional value (%)</td><td colspan="2">15</td></tr>
<tr><th colspan="2">Preliminary Offset Contribution (Functional hectare equivalents)</th><th colspan="2">11.4</th></tr>
<tr><th rowspan="3">Final Offset Calculation</th><th>Criterion</th><th>Relevance</th><th>Offset activity</th><th>Adjustment factor</th></tr>
<tr><td>Types of offset activities proposed</td><td>The risk of offset failure is linked to the type of offset activity planned with wetland establishment considered less preferable and more risky than rehabilitation or averted loss activities.</td><td>Rehabilitation & Protection</td><td>0.66</td></tr>
<tr><th colspan="2">Final Offset Contribution (Functional hectare equivalents)</th><th colspan="2">7.5</th></tr>
</table>

Contribution Towards Ecosystem Conservation Targets				
Wetland attributes	Wetland Reference		Smithfield offset 1	
	Wetland Vegetation Group (or type based on local classification)		Sub-Escarpment Grassland Group Group 5	
	Threat status of wetland		Threat status	**EN**
Alignment with site selection guidelines	**Criterion**	**Relevance**	**Site attributes**	**Acceptability Guidelines**
	Like for Like	Targeted wetlands should be aligned with "like-for-like" criteria to ensure that gains associated with wetland protection are commensurate with losses.	Wetland is of an alternative wetland type of the same or higher threat status as the impacted wetland, within the same wetland vegetation group	Acceptable
	Landscape planning	To what degree is wetland selection aligned with Regional and National Conservation Plans	Wetlands have been identified as moderately important in landscape planning	Acceptable
	Wetland condition	The habitat condition of the wetland should ideally be as good / better that that of the impacted site prior to development (or at least B PES Category in the case of largely un-impacted wetlands)	Final habitat condition is likely to be as good as that of the impacted wetland.	Acceptable
	Local biodiversity value	Wetlands that are unique or that are recognised as having a high local biodiversity value should be prioritised for wetland protection.	The wetland is characterised by habitat and / species of high biodiversity value.	Ideal
	Viability of maintaining conservation values	Connectivity and consolidation with other intact ecosystems together with the potential for linkage between existing protected areas is preferable.	The wetland is well connected to other intact natural areas	Acceptable
Preliminary Offset Calculation	Wetland areas to be secured	Wetland size (ha)	**75.8**	
		Habitat intactness (%)	**62**	
		Wetland habitat contribution (hectare equivalents)	**47.0**	
	Buffer zones to be secured	Area of wetland buffer zone included in the wetland offset site	**50**	
		Integrity of buffer zone	**0.5**	
		Buffer zone hectare equivalents	**6.3**	
		Buffer zone contribution (hectare equivalents)	**6.3**	
Final Offset Calculation	**Criterion**	**Relevance**	**Site attributes**	**Adjustment factor**
	Security of tenure	Offset activities that formally secure offset sites for longer than the minimum requirement are more likely to be maintained in the long-term and are therefore preferred.	Minimum acceptable security of tenure for shortest acceptable period	1
	Offset Contributions	Wetland habitat contribution (hectare equivalents)	47.0	
		Buffer zone contribution (hectare equivalents)	6.3	
		Functional Offset Contribution (hectare equivalents)	**53.2**	

Table I2: Target Wetland Offset Hectare Equivalents for Smithfield Recipient site 2 (North and South)

Contribution Towards Wetland Functionality Targets				
Wetland attributes	Wetland Reference		**Smithfield Offset 2 (north and South)**	
Alignment with site selection guidelines	**Criterion**	**Relevance**	**Site attributes**	**Acceptability Guidelines**
	Wetland type	Targeted wetlands should typically be of the same type to ensure that similar services to those impacted are improved through offset activities.	Wetland is of the same type as the impacted wetland.	Ideal
	Key services targeted	Targeted wetlands should be prioritised and selected based on their ability to compensate for key regulating and supporting services impacted by the proposed development.	Selected wetland is well placed to contribute meaningfully towards improving key regulating and supporting services identified.	Ideal
	Offset site location relative to impacted wetland	Targeted wetlands should ideally be located as close to the impacted site as possible.	Selected wetland is located within the same quaternary catchment.	Acceptable
Preliminary Offset Calculation	**Prior to offset activities**	Wetland size (ha)	378.21	
		Functional value (%)	75	
	Following successful offset implementation	Functional value (%)	85	
		Change in functional value (%)	10	
	Preliminary Offset Contribution (Functional hectare equivalents)		**37.8**	
Final Offset Calculation	**Criterion**	**Relevance**	**Offset activity**	**Adjustment factor**
	Types of offset activities proposed	The risk of offset failure is linked to the type of offset activity planned with wetland establishment considered less preferable and more risky than rehabilitation or averted loss activities.	Rehabilitation & Protection	0.66
	Final Offset Contribution (Functional hectare equivalents)		**25.0**	

Contribution Towards Ecosystem Conservation Targets				
Wetland attributes	Wetland Reference		Smithfield Offset 2 (north and South)	
	Wetland Vegetation Group (or type based on local classification)		Sub-Escarpment Grassland Group - Group 5	
	Threat status of wetland		Threat status	EN
Alignment with site selection guidelines	**Criterion**	**Relevance**	**Site attributes**	**Acceptability Guidelines**
	Like for Like	Targeted wetlands should be aligned with "like-for-like" criteria to ensure that gains associated with wetland protection are commensurate with losses.	Wetland is of an alternative wetland type of the same or higher threat status as the impacted wetland, within the same wetland vegetation group	Acceptable
	Landscape planning	To what degree is wetland selection aligned with Regional and National Conservation Plans	Wetlands have not been specifically identified as important in landscape planning	May be acceptable
	Wetland condition	The habitat condition of the wetland should ideally be as good / better that that of the impacted site prior to development (or at least B PES Category in the case of largely un-impacted wetlands)	Final habitat condition is likely to be as good as that of the impacted wetland.	Acceptable
	Local biodiversity value	Wetlands that are unique or that are recognised as having a high local biodiversity value should be prioritised for wetland protection.	The wetland is characterised by habitat and / species of moderate biodiversity value.	Acceptable
	Viability of maintaining conservation values	Connectivity and consolidation with other intact ecosystems together with the potential for linkage between existing protected areas is preferable.	The wetland is well connected to other intact natural areas	Acceptable
Preliminary Offset Calculation	Wetland areas to be secured	Wetland size (ha)	**378.2**	
		Habitat intactness (%)	**46**	
		Wetland habitat contribution (hectare equivalents)	**174.0**	
	Buffer zones to be secured	Area of wetland buffer zone included in the wetland offset site	**50**	
		Integrity of buffer zone	**0.5**	
		Buffer zone hectare equivalents	**6.3**	
		Buffer zone contribution (hectare equivalents)	**6.3**	
Final Offset Calculation	**Criterion**	**Relevance**	**Site attributes**	**Adjustment factor**
	Security of tenure	Offset activities that formally secure offset sites for longer than the minimum requirement are more likely to be maintained in the long-term and are therefore preferred.	Minimum acceptable security of tenure for shortest acceptable period	1
	Offset Contributions	Wetland habitat contribution (hectare equivalents)	174.0	
		Buffer zone contribution (hectare equivalents)	6.3	
		Functional Offset Contribution (hectare equivalents)	**180.2**	

Table I3: Target Wetland Offset Hectare Equivalents for Smithfield Recipient site 3

Contribution Towards Wetland Functionality Targets				
Wetland attributes	Wetland Reference		**Smithfield Offset 3**	
Alignment with site selection guidelines	**Criterion**	**Relevance**	**Site attributes**	**Acceptability Guidelines**
	Wetland type	Targeted wetlands should typically be of the same type to ensure that similar services to those impacted are improved through offset activities.	Wetland is of the same type as the impacted wetland.	Ideal
	Key services targeted	Targeted wetlands should be prioritised and selected based on their ability to compensate for key regulating and supporting services impacted by the proposed development.	Selected wetland is well placed to contribute meaningfully towards improving key regulating and supporting services identified.	Ideal
	Offset site location relative to impacted wetland	Targeted wetlands should ideally be located as close to the impacted site as possible.	Selected wetland is located within the same quaternary catchment.	Acceptable
Preliminary Offset Calculation	**Prior to offset activities**	Wetland size (ha)	278.67	
		Functional value (%)	68	
	Following successful offset implementation	Functional value (%)	80	
		Change in functional value (%)	12	
	Preliminary Offset Contribution (Functional hectare equivalents)		**33.4**	
Final Offset Calculation	**Criterion**	**Relevance**	**Offset activity**	**Adjustment factor**
	Types of offset activities proposed	The risk of offset failure is linked to the type of offset activity planned with wetland establishment considered less preferable and more risky than rehabilitation or averted loss activities.	Rehabilitation & Protection	0.66
	Final Offset Contribution (Functional hectare equivalents)		**22.1**	

Contribution Towards Ecosystem Conservation Targets				
Wetland attributes	Wetland Reference		Smithfield Offset 3	
	Wetland Vegetation Group (or type based on local classification)		Sub-Escarpment Grassland Group - Group 5	
	Threat status of wetland		Threat status	**EN**
Alignment with site selection guidelines	**Criterion**	**Relevance**	**Site attributes**	**Acceptability Guidelines**
	Like for Like	Targeted wetlands should be aligned with "like-for-like" criteria to ensure that gains associated with wetland protection are commensurate with losses.	Wetland is of an alternative wetland type of the same or higher threat status as the impacted wetland, within the same wetland vegetation group	Acceptable
	Landscape planning	To what degree is wetland selection aligned with Regional and National Conservation Plans	Wetlands have not been specifically identified as important in landscape planning	May be acceptable
	Wetland condition	The habitat condition of the wetland should ideally be as good / better that that of the impacted site prior to development (or at least B PES Category in the case of largely un-impacted wetlands)	Final habitat condition is likely to be as good as that of the impacted wetland.	Acceptable
	Local biodiversity value	Wetlands that are unique or that are recognised as having a high local biodiversity value should be prioritised for wetland protection.	The wetland is characterised by habitat and / species of moderate biodiversity value.	Acceptable
	Viability of maintaining conservation values	Connectivity and consolidation with other intact ecosystems together with the potential for linkage between existing protected areas is preferable.	The wetland is well connected to other intact natural areas	Acceptable
Preliminary Offset Calculation	Wetland areas to be secured	Wetland size (ha)	**278.7**	
		Habitat intactness (%)	**69**	
		Wetland habitat contribution (hectare equivalents)	**192.3**	
	Buffer zones to be secured	Area of wetland buffer zone included in the wetland offset site	**50**	
		Integrity of buffer zone	**0.5**	
		Buffer zone hectare equivalents	**6.3**	
		Buffer zone contribution (hectare equivalents)	**6.3**	
Final Offset Calculation	**Criterion**	**Relevance**	**Site attributes**	**Adjustment factor**
	Security of tenure	Offset activities that formally secure offset sites for longer than the minimum requirement are more likely to be maintained in the long-term and are therefore preferred.	Minimum acceptable security of tenure for shortest acceptable period	1
	Offset Contributions	Wetland habitat contribution (hectare equivalents)	192.3	
		Buffer zone contribution (hectare equivalents)	6.3	
		Functional Offset Contribution (hectare equivalents)	**198.5**	

Table I4: Target Wetland Offset Hectare Equivalents for Baynesfield Recipient site

Contribution Towards Wetland Functionality Targets				
Wetland attributes	Wetland Reference		**Baynesfield**	
Alignment with site selection guidelines	**Criterion**	**Relevance**	**Site attributes**	**Acceptability Guidelines**
	Wetland type	Targeted wetlands should typically be of the same type to ensure that similar services to those impacted are improved through offset activities.	Wetland is of the same type as the impacted wetland.	Ideal
	Key services targeted	Targeted wetlands should be prioritised and selected based on their ability to compensate for key regulating and supporting services impacted by the proposed development.	Selected wetland is reasonably placed to improve key regulating and supporting services identified.	Acceptable
	Offset site location relative to impacted wetland	Targeted wetlands should ideally be located as close to the impacted site as possible.	Selected wetland is located within the same quaternary catchment.	Acceptable
Preliminary Offset Calculation	**Prior to offset activities**	Wetland size (ha)	386.57	
		Functional value (%)	63	
	Following successful offset implementation	Functional value (%)	80	
		Change in functional value (%)	17	
	Preliminary Offset Contribution (Functional hectare equivalents)		**65.7**	
Final Offset Calculation	**Criterion**	**Relevance**	**Offset activity**	**Adjustment factor**
	Types of offset activities proposed	The risk of offset failure is linked to the type of offset activity planned with wetland establishment considered less preferable and more risky than rehabilitation or averted loss activities.	Rehabilitation & Protection	0.66
	Final Offset Contribution (Functional hectare equivalents)		**43.4**	

<table>
<tr><th colspan="5">Contribution Towards Ecosystem Conservation Targets</th></tr>
<tr><td rowspan="3">Wetland attributes</td><td colspan="2">Wetland Reference</td><td colspan="2">Baynesfield</td></tr>
<tr><td colspan="2">Wetland Vegetation Group (or type based on local classification)</td><td colspan="2">Sub-Escarpment Grassland Group - Group 5</td></tr>
<tr><td colspan="2">Threat status of wetland</td><td>Threat status</td><td>EN</td></tr>
<tr><td rowspan="6">Alignment with site selection guidelines</td><td>Criterion</td><td>Relevance</td><td>Site attributes</td><td>Acceptability Guidelines</td></tr>
<tr><td>Like for Like</td><td>Targeted wetlands should be aligned with "like-for-like" criteria to ensure that gains associated with wetland protection are commensurate with losses.</td><td>Wetland is of an alternative wetland type of the same or higher threat status as the impacted wetland, within the same wetland vegetation group</td><td>Acceptable</td></tr>
<tr><td>Landscape planning</td><td>To what degree is wetland selection aligned with Regional and National Conservation Plans</td><td>Wetlands have been identified as moderately important in landscape planning</td><td>Acceptable</td></tr>
<tr><td>Wetland condition</td><td>The habitat condition of the wetland should ideally be as good / better that that of the impacted site prior to development (or at least B PES Category in the case of largely un-impacted wetlands)</td><td>Final habitat condition is likely to be as good as that of the impacted wetland.</td><td>Acceptable</td></tr>
<tr><td>Local biodiversity value</td><td>Wetlands that are unique or that are recognised as having a high local biodiversity value should be prioritised for wetland protection.</td><td>The wetland is characterised by habitat and / species of high biodiversity value.</td><td>Ideal</td></tr>
<tr><td>Viability of maintaining conservation values</td><td>Connectivity and consolidation with other intact ecosystems together with the potential for linkage between existing protected areas is preferable.</td><td>The wetland is well connected to other intact natural areas</td><td>Acceptable</td></tr>
<tr><td rowspan="7">Preliminary Offset Calculation</td><td rowspan="3">Wetland areas to be secured</td><td>Wetland size (ha)</td><td colspan="2">386.6</td></tr>
<tr><td>Habitat intactness (%)</td><td colspan="2">52</td></tr>
<tr><td>Wetland habitat contribution (hectare equivalents)</td><td colspan="2">201.0</td></tr>
<tr><td rowspan="4">Buffer zones to be secured</td><td>Area of wetland buffer zone included in the wetland offset site</td><td colspan="2">50</td></tr>
<tr><td>Integrity of buffer zone</td><td colspan="2">0.5</td></tr>
<tr><td>Buffer zone hectare equivalents</td><td colspan="2">6.3</td></tr>
<tr><td>Buffer zone contribution (hectare equivalents)</td><td colspan="2">6.3</td></tr>
<tr><td rowspan="5">Final Offset Calculation</td><td>Criterion</td><td>Relevance</td><td>Site attributes</td><td>Adjustment factor</td></tr>
<tr><td>Security of tenure</td><td>Offset activities that formally secure offset sites for longer than the minimum requirement are more likely to be maintained in the long-term and are therefore preferred.</td><td>Minimum acceptable security of tenure for shortest acceptable period</td><td>1</td></tr>
<tr><td rowspan="3">Offset Contributions</td><td>Wetland habitat contribution (hectare equivalents)</td><td colspan="2">201.0</td></tr>
<tr><td>Buffer zone contribution (hectare equivalents)</td><td colspan="2">6.3</td></tr>
<tr><td>Functional Offset Contribution (hectare equivalents)</td><td colspan="2">207.3</td></tr>
</table>

APPENDIX J: CBA AND GRASSLAND OFFSET IDENTIFICATION AND ASSESSMENT

Project Scope as it Pertains to the Ecological Assessment of CBA and Grassland for Offset Purposes

Specific outcomes in terms of this assessment are as follows:

- A background study of relevant national, provincial and municipal datasets (such as National Threatened Ecosystems [NTE], National Protected Areas Expansion Strategy [NPAES], South African Protected Areas Database [SAPAD] and Important Bird Area [IBA]were undertaken to aid in defining the CBA areas;
- CBA's were identified by utilising the Biodiversity Spatial Planning Terms and Processes database (KZN BSPT&P, 2016) data base. The CBA's are not distinguished as terrestrial or freshwater resource, and freshwater resource vegetation type was removed from the identified CBA's to obtain the terrestrial CBA's
- The grasslands are present throughout the study area and have been affected by various agricultural activities, including forestry activities;
- The target CBA ang grassland were mapped in relation to the proposed recipient sites.

General Approach

For the purposes of this investigation, the grasslands present within the proposed recipient sites were looked at. The majority of the grassland present had good herbaceous cover, with sections where AIP were present.

As mentioned in the main report use was made of historical aerial photographs, historical and current digital satellite imagery, topographic maps and available provincial conservation plan databases to aid in the identification of the CBA within the target recipient sites both prior to and following the field assessment. The following was taken into consideration when utilizing the above during delineation:

- Open areas between forestry areas;
- Grassland areas that are used for grazing by farmers; and
- Grassland areas surrounding identified wetland areas that are not under cultivation of afforestation.

A single site visit was undertaken in March 2018 during which the characteristics of CBA grasslands in the general area were noted. In addition, alien and invasive vegetation within the areas were noted, to ensure that the proposed mitigatory measures were well informed to aid in grassland management to improve the present ecological state of these areas and to improve the value to specific species of concern and most notably Blue Swallows (*Hirundo atrocaerulea*).

Offset Target Grassland Resource Characterisation

A total of four potential recipient areas were identified during Phase 1 of the biodiversity offset study, and during a single field assessment undertaken in March 2018, key areas were selected for ground-truthing. Numerous CBA's were identified using desktop methods prior to the field assessment, however, due to the extent of the target recipient sites, the grasslands within these recipient sites and access restraints associated with the terrain and land ownership, it should be noted that limited field verification was possible. Thus, the CBA's were identified on a desktop level and where necessary the remaining delineations were undertaken with the aid of the Biodiversity Spatial Planning Terms and Processes database (KZN BSPT&P, 2016), by excluding the extent of the freshwater resources (wetlands) from the CBA and just utilising the terrestrial side of the CBA.

It should also be noted that due to the extent, quantity, relatively homogeneous characteristics and similarity of impacts on the assessed CBA's and grasslands, they were assessed on whether habitats were intact and what the level of alien and invasive vegetation investigation is.

Characterisation of Offset Target Grassland Resources

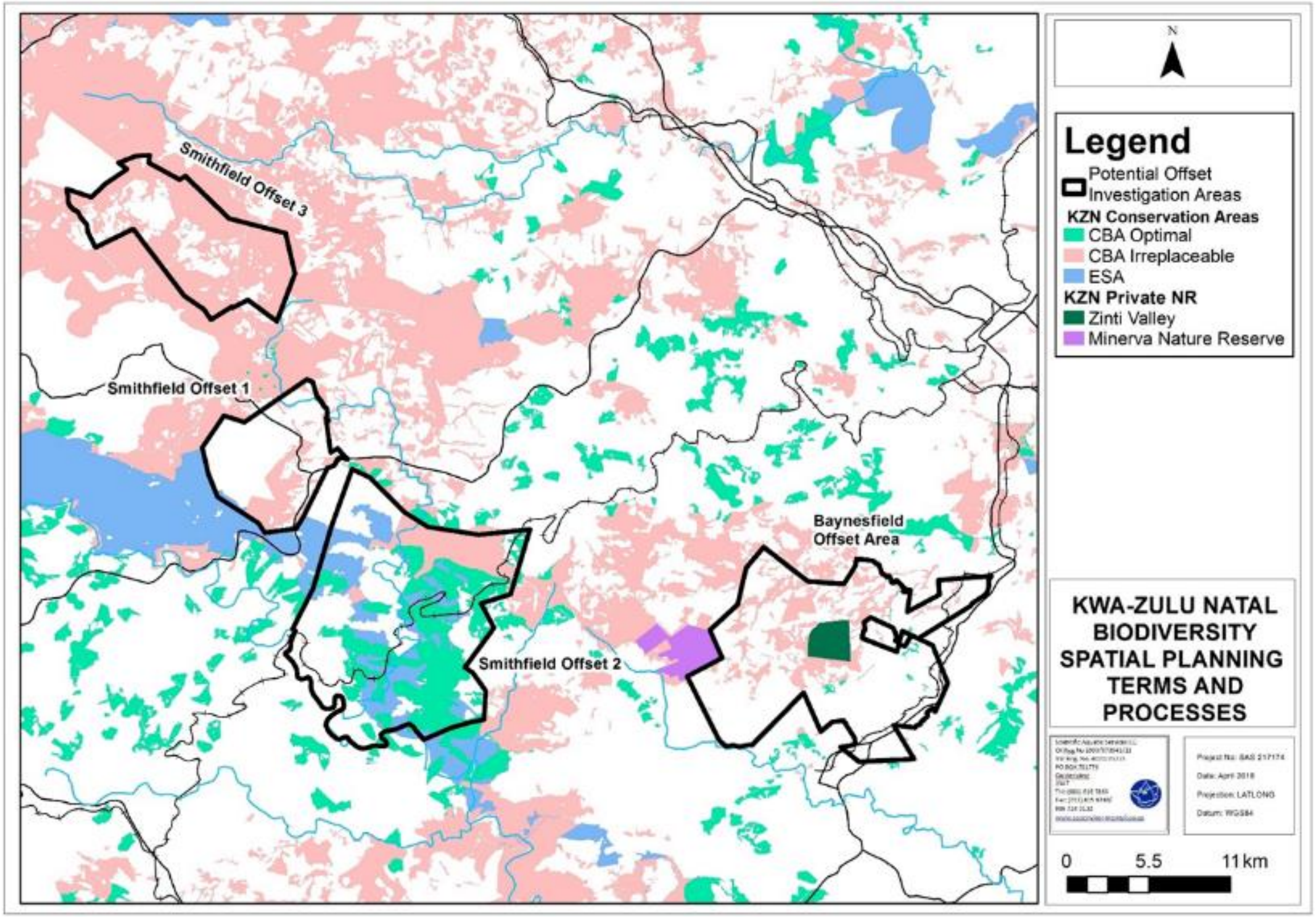
A single field assessment was undertaken in March 2018 to determine the extent and ecological characteristics of grasslands within each of the four target recipient areas through observation of as many areas as possible.

The majority of the grassland areas present within the proposed recipient sites were not in an overgrazed state especially grasslands present within privately owned land. Grasslands that were present within communal land were more severely impacted upon as grazing and burning is not as regulated. Alien and invasive vegetation was present throughout the areas where disturbance was present, however, only a few species were identified and noted from previous studies to be of concern e.g. *Rubus cuneifolius* (American Brumble, Category **1b**)

The grazing, burning and AIP proliferation impact on identified CBA's and grasslands were assessed within the proposed recipient sites and is summarised in the table below.

Table J1: Assessment results on the impact of grazing, burning and AIP proliferation on the identified CBA's and grasslands located within the proposed recipient sites.

Target recipient site	Notes on identified impacts
Smithfield 1	The majority of the area is privately owned and very few areas were observed having excessive bare ground. Grazing and burning is done in a controlled way as the herbaceous layer present was in good condition. Patches of AIP proliferation were present in sections where disturbance was noted.
Smithfield 2	The majority of the area is within community land and even though the herbaceous layer was intact, signs of overgrazing and erosion were present. Grazing and burning is done is not always done in a controlled way as burning is done to promote herbaceous regrowth potentially in the wrong time period and not left to rest. Areas are grazed by leaving the animals to roam freely and this creates problems as animals will selectively feed on more palatable grass and bare ground areas will be created. Patches of AIP proliferation were present in sections were disturbance was noted.
Smithfield 3	The majority of the area is privately owned and very few areas were observed having excessive bare ground. Grazing and burning is done in a controlled way as the herbaceous layer present was in good condition. Patches of AIP proliferation were present in sections where disturbance was noted. Existing custodianship programs are present in the area.
Baynesfield	The majority of the area is privately owned and very few areas were observed having excessive bare ground. Grazing and burning is done in a controlled way as the herbaceous layer present was in good condition. Patches of AIP proliferation were present in sections where disturbance was noted.



FigureJ1: The potential offset portions indicating the CBA and ESA present in proposed recipient sites and in the surrounding areas.

APPENDIX K: PROPOSED FIELD FORM FOR REPORT CONTENT FOR ALIEN INVASIVE VEGETATION MONITORING

Proposed field form for report content.

<table>
<tr><td>Date:</td><td colspan="2"></td><td>Name of recorder:</td><td colspan="3"></td></tr>
<tr><td>Sensitive area:</td><td colspan="2"></td><td>GPS point:</td><td colspan="2"></td><td></td></tr>
<tr><td>AIP control present:</td><td>YES</td><td>NO</td><td>AIP regrowth present:</td><td>YES</td><td>NO</td><td></td></tr>
<tr><td colspan="3">Description of Infestation:
(Species, Diversity, Abundance, Density, Extent, level of recruitment and trends.)</td><td colspan="4">Photo of infestation:</td></tr>
</table>

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

I, Stephen van Staden, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct

----

Signature of the Specialist

APPENDIX L: EMAIL COMMUNICATIONS WITH EKZNW REGARDING BLUE SWALLOWS

BC

Thu 6/28/2018 4:02 PM

Brent Coverdale <Brent.Coverdale@kznwildlife.com>

RE: Blue Swallow Working Group contact details (uMWP-1)

To Amanda Mileson

You replied to this message on 6/28/2018 4:29 PM.
This message is part of a tracked conversation. Click here to find all related messages or to open the original flagged message.

Good afternoon Amanda

It must be noted that the following comments are written without prejudice and in no manner suggests support or likewise of the proposed development of the Smithfield Dam and associated infrastructure. Furthermore, what is provided herein does in no way represent formal comment from either Ezemvelo KwaZulu-Natal Wildlife, or the members of the Blue Swallow Working Group regarding the proposed development and is provided in response to the request as to what is needed to ensure the survival of the Blue Swallow. At this stage, the final specialist reports have not been made available, but one issue that cannot be debated is that the loss of either Blue Swallow nesting areas or foraging range cannot be mitigated and thus the information below should not be considered as mitigation measures for the proposed development.

In order to ensure that conservation of this Critically Endangered species, the following would need to be undertaken:

1. Secure all remaining nest sites through the appropriate mechanisms which would ensure that no further loss occurs and such sites are managed into perpetuity. Nest sites refer to not only the actual nest but the entire area required for foraging. Such protection must however be in perpetuity.
2. Implement appropriate management actions at such sites which favour the persistence of the species. Ideally this should be done through an approved management plan and would include *inter alia* alien plant control, conservation specific veld management (grazing and burning) and monitoring during the breeding season of the species.
3. Secure potential nesting areas, through the mechanism identified in point 1 above, as identified in the Blue Swallow habitat model for KwaZulu-Natal. Such sites would then require to be managed as per point 2 above.

Should you wish to discuss this further, please do not hesitate to contact me.

Regards
Brent

Brent Coverdale| Animal Scientist: Mammals and Birds
Chair: Oribi Working Group |Chair: KZN – Leopard Hunting Advisory Forum
EZEMVELO KZN WILDLIFE
Biodiversity Research and Assessment
Queen Elizabeth Park |1 Peter Brown Drive | Montrose | Pietermaritzburg |3201
PO Box 13053|Cascades| 3202 | Republic of South Africa |

AM

Wed 9/3/2014 5:39 PM

Athol Marchant <Athol.Marchant@kznwildlife.com>

RE: uMkhomazi Water Project Phase 1

To Donavan Henning

Swallow Blue 7a3. Copyright A. Marchant.JPG
1 MB

Swallow Blue 8 Copyright A. Marchant.JPG
860 KB

Swallow Blue 39a Copyright A. Marchant.JPG
3 MB

Status of Blue Swallow in KZN 2 2000-2001 to 2012-2013 Draft 2 Vers 2.doc
1 MB

Hi Donovan

Good to meet you, and thanks for the feedback session today - I certainly learnt a lot.

Just to recap about my 'off-the-top-of-my-head' suggestion re offsets. It would be fantastic if the rehab of, say, a plantation area adjacent to an existing Blue Swallow site could be used as an offset. It's not always possible to replace like for like (e.g. wetland for wetland), & thus I believe this rehab option would be a very worthwhile and important option.

As I mentioned, the Blue Swallow is Critically Endangered in South Africa with only 24 pairs left - all of which now occur only in KZN! The Blue Swallows in Limpopo are now extinct, and the swallows in Mpumalanga are extinct as a breeding bird (there used to be a very healthy breeding population at Kaapse Hoop near Nelspruit) with only about 2 or 3 birds being seen.

In KZN they are restricted to Natal Mistbelt Grassland (Endangered grassland), of which over 90% has been transformed, and only 0,3% is formally conserved. In addition, the mistbelt grasslands are terribly fragmented and widely spaced. In these grasslands Oribi (Endangered) also occur although they are not restricted to Mistbelt grassland. Many other special Red Data animals are connected to these grasslands as well e.g. Serval, Striped Polecat, & Denham's Bustard to name but a few.

Thus, to acquire & rehab an area (e.g. of timber) back to grassland and adjacent to an existing Blue Swallow site would be a MAJOR coup for nature conservation - Blue Swallow, Oribi, Bustards, & Natal Mistbelt Grassland, by extending the habitat. In addition, this will also have a positive impact on water production & quality.

For your interest I enclose a report of mine re Blue Swallow monitoring in KZN (I haven't yet added in the figures for the 2013/2014 breeding season). I also attach 3 pics I took of this magnificent bird at Impendle NR - just to whet your appetite!

Regards

Athol

APPENDIX M: PROJECT TEAM, DECLARATION AND SPECIALISTS' C.V.S

Contact details of the responsible person(s) for implementation of the Biodiversity Offset and Compensation Initiative, including the Wetland Rehabilitation Plan and Alien and Invasive Plant Management Plan.

Table L1: Contact details of the person(s) responsible for implementation of the WRP and AIPMP.

Client		
Consultant who compiled this Implementation Plan	Scientific Aquatic Services Environmental CC: Stephen van Staden (Pri.Sci.Nat) Amanda Mileson	Phone: 011 616 7893 Email: stephen@sasenvgroup.co.za

DETAILS, EXPERTISE AND CURRICULUM VITAE OF SPECIALISTS

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

Stephen van Staden	MSc (Environmental Management) (SACNASP 400134/05)
Amanda Mileson	N.Dip Nature Conservation
Hennie De Beer	N.Dip Nature Conservation
K. Marais	BSc Hons. Zoology (Herpetology) (SACNASP 117137/17)

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

Company of Specialist:	Scientific Aquatic Services		
Name / Contact person:	Stephen van Staden		
Postal address:	29 Arterial Road West, Oriel, Bedfordview		
Postal code:	2007	Cell:	083 415 2356
Telephone:	011 616 7893	Fax:	011 615 6240/ 086 724 3132
E-mail:	stephen@sasenvironmental.co.za		
Qualifications	MSc (Environmental Management) (University of Johannesburg) BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg) BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)		
Registration / Associations	Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP) Accredited River Health practitioner by the South African River Health Program (RHP) Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum		

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF STEPHEN VAN STADEN

PERSONAL DETAILS

Position in Company	Managing member, Ecologist, Aquatic Ecologist
Date of Birth	13 July 1979
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2003 (year of establishment)
Other Business	Trustee of the Serenity Property Trust

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered Professional Scientist at South African Council for Natural Scientific Professions (SACNASP)

Accredited River Health practitioner by the South African River Health Program (RHP)

Member of the South African Soil Surveyors Association (SASSO) Member of the Gauteng Wetland Forum

Member of IAIA South Africa

EDUCATION

Qualifications

MSc (Environmental Management) (University of Johannesburg)	2003
BSc (Hons) Zoology (Aquatic Ecology) (University of Johannesburg)	2001
BSc (Zoology, Geography and Environmental Management) (University of Johannesburg)	2000
Tools for wetland Assessment short course Rhodes University	2016

COUNTRIES OF WORK EXPERIENCE

South Africa – All Provinces

Southern Africa – Lesotho, Botswana, Mozambique, Zimbabwe Zambia

Eastern Africa – Tanzania Mauritius

West Africa – Ghana, Liberia, Angola, Guinea Bissau, Nigeria, Sierra Leona

Central Africa – Democratic Republic of the Congo

SELECTED PROJECT EXAMPLES

Client	Project	Project Description	Area
		BIODIVERSITY OFFSETS	
Pan African Resources: Evander Gold Mines (PTY) LTD	Elikhulu Project	Wetland Offset Design and Implementation Plan	Evander, Mpumalanga
SRK Consulting (PTY) Ltd on Behalf of Tichards Bay Port authority	South Dunes Precinct	Biodiversity Offset Design and Implementation Plan	Richards Bay Kwa Zulu Natal
SRK Consulting (PTY) Ltd on behalf of the Airports Company of South Africa	Cape Town International Runway upgrade project	Wetland Offset Design and Implementation Plan	Cape Town Western Cape
		RESIDENTIAL	
GIBB (PTY) LTD	Bloemwater Knelpoort Project	Full ECO Assessment	Free State
DLC Town Plan (Pty) Ltd	Bongwini and Toekomsrus Project Gold 1	Environmental Sensitivity Analyses as part of the development of site Development Plans and Precinct Planning on the outskirts of Takoradi Ghana (2000 ha)	Randfontein
SRK Consulting (PTY) Ltd	Skoenmaker River	Wetland, Aquatic & ECO Assessment	Somerset East
Century Property Development	The Hills Eco Estate	Wetland delineation and ecological assessment, and rehabilitation plan	Midrand, Gauteng
		ROADS, PIPELINES, POWERLINES AND OTHER LINEAR DEVELOPMENTS	
Delta Built Environment Consultants	Lesotho Border Road Project	Soil & Land Capability Assessment, full wetland ecological assessment and aquatic assessment as part of the EIA process	Lesotho
Spoor Environmental	Thabazimbi Waste Water Treatment Works; Upgrade of Sewer Pipeline	Freshwater resource ecological assessment and rehabilitation and management plan	Limpopo
Royal Haskoning DHV (Pty) Ltd	N11 Ring Road	Freshwater Ecological Assessment	Limpopo
Chameleon Environmental	N7 Road Upgrade Cederberg & Kransvleikloof	Floral RDL scan and delineation of the wetland areas along the proposed N7 road upgrade between Clanwilliam and Citrusdal	Western Cape
Iliso Consulting (Pty Ltd)	N3TC De Beers Pass Route	Variation order for additional work on N3TC De Beers pass route and existing N3 route	Kwa-Zulu Natal
		MINING	
Anglo Platinum	Der Brochen Mine	Ongoing bi-annual seasonal aquatic biomonitoring from 2011 to present	Steelpoort Limpopo
Anglo Platinum	Der Brochen Mine	Wetland Ecological Assessment (2014) Full terrestrial, wetland and aquatic ecological assessment, soil and land capability assessment (2018)	Steelpoort, Limpopo
Bokoni Platinum Mine	Bokoni Platinum Mine	Annual Soil Monitoring & Soil Contamination	Free State
GIBB (PTY) LTD	Rustenburg Bridges	Aquatic Biomonitoring Assessment	Rustenburg, North West
Assmang Chrome Machadodorp	Assmang Chrome Machadodorp Works	Biomonitoring & Toxicological Monitoring for the 2015 period	Machadodorp, Mpumalanga
Globesight Advisory, Consulting & Training	Sabie TGME Project	Freshwater Ecological Assessment as part of the environmental assessment and authorization process for the proposed development (gold mining project – pre-mined residue and hard rock mining near Sabie)	Mpumalanga

Ikwezi Mining (Pty) Ltd	Ikwezi Doornkop Colliery	Develop freshwater resource rehabilitation and management plans, and conduct ecological biomonitoring in fulfillment of the water use licensing process for the Ikwezi Doornkop Colliery near Newcastle	Newcastle
Sappi Southern Africa (Pty) Ltd	Blesbokspruit Enstra Mill	Biomonitoring studies, whole effluent toxicity (WET) studies, bioaccumulation assessment and sediment heavy metal contaminant analyses	Johannesburg
Stibium Mining	Malati Opencast	Freshwater ecological assessment, risk assessment and freshwater rehabilitation and management plan and plant species plan as part of the water use authorization process for a proposed Malati opencast near Tzaneen	Limpopo
EXM Advisory Services	Heuningkranz Mine	Freshwater assessment, soil and land capability assessment done for Sishen Iron Ore Company (Pty) Ltd part of Kumba Iron Ore limited as part of the environmental management services for the Heuningkranz project	Northern Cape
Shangoni Management Services (Pty) Ltd	Leslie Colliery	Project manager, freshwater ecological assessment as part of the environmental impact assessment process for the underground coal mine to determine the status of the freshwater resources within the proposed mining area	Mpumalanga
SLR Consulting (Africa) (Pty) Ltd	Commissiekraal Colliery	Full Ecological investigation, including a terrestrial fauna and flora assessment as well as an assessment of the wetland and aquatic PES and wetland ecoservices on the site.	Kwa-Zulu Natal
Jacana Environmental CC	Leandra Colliery	Full Ecological Assessment, including a terrestrial fauna and flora assessment as well as an assessment of the wetland and aquatic PES and wetland ecoservices on the site.	Mpumalanga
SRK Consulting (PTY) Ltd	Marula Platinum Mine	Freshwater resource ecological assessment. Development of a plant species plan in line with the project's rehabilitation objectives	Burgersfort
Jacana Environmental CC	Donkerhoek Dam development	Full ecological assessment (Fauna, floral, wetland and aquatic assessment) as part of the EIA process	Mpumalanga
EXM Advisory Services	Evander Gold Mining (Pty) Ltd	Determination of the Wetland Offset Requirements for the proposed expansion of the Elikhulu Tailings Storage Facility	Mpumalanga
EXM Advisory Services	Canyon Coal - Witfontein mining project	Delineate and characterize the wetland and aquatic resources for the Witfontein mining project located by the farms Holfontein and Witrand near Bethal	Mpumalanga

SRK Consulting (South Africa) (PTY) Ltd	The Sierra Rutile Mine	Specialist terrestrial ecology, aquatic ecology and wetland ecology studies	Moyamba District - Sierra Leona
INFRASTRUCTURE			
GIBB (Pty) Ltd	Bronkhorstspruit Feeder Line	Monthly Aquatic Biomonitoring as part of the environmental assessment and authorization process for the proposed conversion of the Bronkhorstspruit plots feeder from 6.6kv to 22kv	Bronkhorstspruit
SRK Consulting (PTY) Ltd	South Dunes Precinct Project	Full Ecological Assessment	Richards Bay
SRK Consulting (PTY) Ltd	Braamfonteinspruit Rehabilitation	Terrestrial, Freshwater and Aquatic Ecological Assessment as part of the rehabilitation and management plan for the Braamfonsteinspruit, Johannesburg	Johannesburg
Iliso Consulting (Pty Ltd)	City of Johannesburg	Aquatic Ecological Assessment, monitoring and managing the ecological state of rivers in the City Of Johannesburg Metropolitan area	Johannesburg
Maanakana Projects and Consulting (Pty) Ltd	Lethabo Pump Station	Aquatic present ecological state assessment of the Vaal river	Vereeniging
SRK Consulting	CTIA runway re-alignment project – Wetland Offset	Determination of the Wetland offset requirements for Cape Town international Airport runway realignment, identification of a suitable offset location and compilation of relevant baseline assessments (Wetland and faunal), Khayelitsha. (2017)	Cape Town
GIBB (Pty) Ltd	Musami Dam	Determination of the draft environmental water quality requirements for the project	Zimbabwe
Nemai Consulting (PTY) Ltd	uMkhomazi Water Project	Determination of the Wetland and Terrestrial Biodiversity Offset Requirements for the proposed uMkhomazi Water Project	Richmond - KZN
POWER GENERATION			
Iliso Consulting	Mzimvubu Dam	Full Terrestrial (Flora and Faunal), Wetland and Aquatic Baseline Ecological Assessment	Eastern Cape
WKN-Wind current SA C/O Alan Wolfromm	HGA HAGA WEF	Hydrological Assessment	Eastern Cape
SRK Consulting (PTY) Ltd	RPM Crossing	Wetland Delineation	Free State
SRK Consulting (Pty) Ltd	Eskom Denova Powerline and sub-station	Freshwater assessment as part of the EIA process for the proposed Eskom powerline (1, 75 km in length) and sub-station (132kV) near Denova, Western Cape. (2014)	Western Cape
CSIR Consulting & Analytical Services	Sutherland WEF	Freshwater Ecological Assessments	Northern Cape
CSIR Consulting & Analytical Services	Victoria West WEF	Freshwater Ecological Assessments	Northern Cape

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF AMANDA MILESON

PERSONAL DETAILS

Position in Company	Ecologist
Date of Birth	15 February 1978
Nationality	Zimbabwean
Languages	English
Joined SAS	2013

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Member South African Wetland Society

Member Gauteng Wetland Forum

EDUCATION

Qualifications

N.Dip Nature Conservation (UNISA)	2017
Tools for Wetland Assessment (Rhodes University)	2016
Wetland Rehabilitation short learning programme (UFS)	2015

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, Northern Cape, Eastern Cape

Zimbabwe

SELECTED PROJECT EXAMPLES

Wetland Assessments

- Wetland assessment as part of the environmental authorisation process for the Anglo Platinum Der Brochen Project, Limpopo Province
- Wetland assessment as part of the environmental authorisation process for the proposed Tharisa North eastern waste rock dump, North West Province
- Wetland assessment as part of the environmental authorisation process for the proposed Yzermyn Coal Mining Project near Dirkiesdorp, Mpumalanga
- Wetland assessment as part of the environmental authorisation process for the Mzimvubu Water Project, Eastern Cape
- Wetland assessment as part of the environmental authorisation process for the proposed expansion of mining operations at the Langkloof Colliery, Mpumalanga

• Wetland assessment as part of the proposed water management process at the Assmang Chrome Machadodorp Works, Mpumalanga • Wetland assessment as part of the water use licencing process for the proposed development in Rooihuiskraal Ext 24, Centurion, Gauteng • Wetland assessment as part of the environmental authorisation process for the proposed road crossings on The Hills EcoEstate, Midrand, Gauteng • Wetland ecological assessment as part of the Section 24G application process for the Temba Water Purification Plant • Wetland assessment and offset studies for the Optimum Colliery Kwagga North Project, Mpumalanga • Wetland assessment and delineation as part of the environmental authorisation process for the proposed development of a mall adjacent to the M10 Road in Mahube Valley, Mamelodi, Gauteng • Wetland assessment as part of the environmental authorisation process for the proposed construction of a sewer system in Ekangala Township, Gauteng
Terrestrial Assessments • Investigation of specialist biodiversity aspects required by GDARD in the vicinity of the Apies River, downstream of the proposed construction of new outlet works at the Kudube (Leeuwkraal) Dam in Temba, Gauteng • Terrestrial Ecological Scan as part of the environmental authorisation process for three proposed bridge upgrades near Edenvale, Gauteng • Terrestrial Ecological Scan as part of the environmental authorisation process for the proposed Dalpark Ext 3 filling station development, Gauteng
Rehabilitation Projects • Wetland rehabilitation and management plan for The Hills EcoEstate, Midrand, Gauteng • Riparian rehabilitation and management plan for The Diepsloot River, Riversands, Gauteng • Riparian rehabilitation and management plan for the Apies River in the vicinity of the proposed construction of new outlet works at the Kudube (Leeuwkraal) Dam in Temba, Gauteng
Environmental Control Officer • Monthly specialist Environmental Control Officer (ECO) function for the monitoring of riparian crossings at Riversands Country Estate Development, Gauteng

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF HENNIE DE BEER

PERSONAL DETAILS

Position in Company	Ecologist – Focusing on Avifaunal species
Date of Birth	20 October 1986
Nationality	South African
Languages	English, Afrikaans
Joined SAS	2014

EDUCATION

Qualifications

National Diploma Nature Conservation (Tshwane University of Technology) 2008

COUNTRIES OF WORK EXPERIENCE

South Africa – Gauteng, Mpumalanga, North West, Limpopo, KwaZulu-Natal, Eastern Cape, Western Cape, Northern Cape and Freestate

Mozambique

SELECTED PROJECT EXAMPLES

Faunal

- **Leandra Colliery (2015) –** Faunal assessment as part of the environmental assessment and authorisation process for the proposed the Leandra Coal Project, Gauteng and Mpumalanga Provinces;
- **Siyanda Chrome Smelter (2015) -** Faunal assessment as part of the environmental assessment and authorisation process for a proposed construction of a ferrochrome smelter, Limpopo province;
- **Lace Diamond Mine (2015) –** Faunal assessment as part of the environmental assessment and authorisation process for the lace diamond mine near Kroonstad, free state province;
- **Duhva Solar Plant (2015)** – Avifaunal as part of the Environmental Impact Assessment and authorisation process for the proposed solar photovoltaic power plant with associated infrastructure at the Duvha Coal Fired Power Station, Mpumalanga province;
- **Arnot Solar Plant** – Avifaunal Assessment as part of the Environmental Impact Assessment and authorisation process for the proposed solar photovoltaic power plant with associated infrastructure at the Arnot coal fired power station, Mpumalanga Province;
- **Braakfontein Colliery** – Faunal Assessment as part of the Environmental Assessment and authorisation process for the proposed Braakfontein Coal Mine near Newcastle, KwaZulu-Natal Province;
- **Kekana Powerline** – Faunal Ecological Assessment as part of the Environmental Assessment and authorisation process for the proposed Kekana and Wonderboom 132kv powerlines and substations, Hammanskraal, Gauteng;
- **Samrand Phase 3 / Olievenhoutbosch** – Floral, Faunal and Wetland Ecological Assessment as part of the Environmental Assessment and authorisation process for the proposed development of the Kosmosdal township on the remainder of portion 2 of the farm Olievenhoutbosch no. 389-jr, Gauteng Province;

- **Jeanette Gold Mine** – Faunal Assessment as part of the Environmental assessment and authorisation process for Jeanette expansion project at the Taung Gold International mine near Welkom within the Free State Province; and
- **PTN 38 Elandspruit Farm** – Faunal Assessment as part of the Environmental Assessment and authorisation process for the proposed mining development on portion 38 of the Elandspruit farm. Mpumalanga Province.

Terrestrial scan:

- **K77 (2014)** - Terrestrial scan Assessment as part of the Environmental Impact Assessment and authorisation process for the proposed development of the Provincial road K77, Gauteng highlands: Elizabeth road to K154; and
- **Blue Hills EXT 39** - Biodiversity Assessment Fauna and Flora.

Alien Vegetation Monitoring Plan:

- **Bokoni Platinum Mine (2015)** - Alien vegetation study.

Maintenance and Management Plans:

- **Levendal Pearl Valley Phase 2 Roads Bar** – Maintenance and Management Plan;
- **Sanbona Wildlife Reserve/Dwyka Lodge** – Maintenance and Management Plan;
- **Pearl Valley Bulk Services** – Maintenance and Management Plan;
- **Ariadne Eros Powerline** – Maintenance and Management Plan; and
- **Rhodes Drive/Constantia** – Maintenance and Management Plan.

Wetland:

- **R40 Ring Road Bushbuck Ridge** – Wetland delineation and field work.

Previous Work Experience

- Eradication of aquatic plants from water canals using chemicals.
- Junior Research Technician National Rangeland Monitoring Program (NRMP) at Agriculture Research Council (ARC) doing Vegetation Condition Assessment for cattle farmers in the Vryheid area. Also did the following work for the Savanna Ecosystem Project: Vegetation Condition Assessments, Carrying Capacity, and annual game counts were done on 24 reserves in the Lowveld area, also at Gorongoza Mozambique. Rehabilitation monitoring of the mine dumps for Phalaborwa Mining Company.
- Assisted in the following programs doing practical year at Timbavati Private Nature Reserve:
  - Ringing of Ground Hornbill chicks on the reserve;
  - Monitoring project on nesting sites of White backed Vultures at Timbavati Private Nature Reserve by using game census data and visiting the sites to see if the nesting sites were still active or not;
  - Burning programs;
  - Anti-poaching;
  - Hunting;
  - Culling;
  - Bush thinning of *Colophospermum mopane (*Mopane); and
  - Started a Lion identification key for all the Male lions on the reserve.

SCIENTIFIC AQUATIC SERVICES (SAS) – SPECIALIST CONSULTANT INFORMATION

CURRICULUM VITAE OF KIM DALHUIJSEN

PERSONAL DETAILS

Position in Company	Consultant
Date of Birth	28 February 1989
Nationality	The Netherlands
Languages	English, Afrikaans
Joined SAS	2015 - Present

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Registered member of the South African Affiliation of the International Association of Impact Assessment (IAIAsa)

EDUCATION

Qualifications

Certificate in Environmental Law for Environmental Managers (CEM)	2014
Certificate for Introduction to Environmental Management (CEM)	2013
BSc (Hons) Zoology (Herpetology) (University of the Witwatersrand)	2012
BSc (Zoology and Environment, Ecology and Conservation) (University of Witwatersrand)	2011

COUNTRIES OF WORK EXPERIENCE

South Africa – All Provinces

West Africa – Uganda

PREVIOUS EMPLOYMENT

Position	Junior Environmental Scientist
Company	ILISO Consulting (Pty) Ltd
Employment	2013 - 2015

SELECTED PROJECT EXAMPLES

Wetland delineation and wetland function assessment • Wetland Assessment for the sewage Bulk Service System for the Val de Vie development, Paarl, Western Cape. • Wetland Assessment for the Riverfarm Development for the Val de Vie development, Paarl, Western Cape • Wetland Assessment for the development of three agricultural dams for irrigation of crops, Cape Farms, Western Cape. • Wetland Assessment for the Willow Wood Estate Sewage pipeline upgrade, D'Urbanvale, Western Cape • Wetland Assessment for the rectification of infilling of a freshwater feature, D'Urbanvale, Western Cape. • Freshwater Assessment for the stabilisation of the Franschhoek River embankment, Leeu Estates, Franschhoek, Western Cape.
Water Use Authorisations • WUA for the SANRAL N3 De Beers Pass Section within the Free State and KwaZulu-Natal. • Assistance with the WULA for the Mzimvubu Water Project, Eastern Cape. • WUA for the Excelsior Wind Energy Farm and associated powerline infrastructure, Swellendam, Western Cape. • WUA for the Golden Valley Phase II Wind Energy Facility, Eastern Cape. • WUA for the sewage Bulk Service system for the Val de Vie Polo and Lifestyle Estate, Paarl, Western Cape. • WUA for the Riverfarm Development for the Val de Vie Polo and Lifestyle Estate, Paarl, Western Cape. • WUA for the Pearl Valley II development for the Val de Vie Polo and Lifestyle Estate, Paarl, Western Cape. • WUA for the Levendal Village for the Val de Vie Polo and Lifestyle Estate, Paarl, Western Cape. • WUA for a residential development, Klapmuts, Western Cape.
Public Participation and Environmental Impact Assessments • Public Participation for the Environmental Impact Assessment for the Eskom Photovoltaic Plant at Arnot and Duvha Power Station. • Eskom Hendrina to Gumeni sub-stations 400 kV Powerline. Co-ordination of Heritage and Ecological Assessment and updating the Construction and Operation Environmental Management Plan. • Public Participation Team Leader for the Mzimvubu Dam Environmental Impact Assessment. • Public Participation Process for Eskom Exemption from and Postponement of Air Emission Licence Applications. • EIA for Eskom Vierfontien to Wawielpark 22 kV Transmission line refurbishing. • Junior Environmental Scientist for the Hartbeespoort Waste Charge Discharge System. • Public Participation Process for City of Tshwane's Bus Rapid Transit from Pretoria Station to Rainbow Junction. • EIA for the Rwengaaju Model Village Irrigation Scheme in Kabarole District, Uganda. • EIA for tte Water supply and Sanitation system in Moroto, Bugaddem Kacheri-Lokona, Nakapelimoru and Kotido, Uganda. • EIA for the Farm Income Enhancement and Forestry Conservation Project: Irrigation Scheme for Katete, Kibimba and Mubuku II, Uganda.

APPENDIX N: OFFSET RECIPIENT LANDOWNER ENGAGEMENT

LANDOWNER ENGAGEMENT REPORT
for the Wetland and Biodiversity offset requirements are part of the Smithfield Dam and associated infrastructure, Kwa-Zulu Natal

Prepared for

NEMAI Consulting (Pty) Ltd

July 2018

Prepared by:	**Scientific Aquatic Services**
Report collaborators:	**K. Marais (Pri. Sci. Nat)**
	B. Mzila
Report reviewer:	**S. van Staden (Pr. Sci. Nat)**
Report Reference:	**SAS 217174**
Date:	**July 2018**

Scientific Aquatic Services CC
CC Reg No 2003/078943/23
Vat Reg. No. 4020235273
PO Box 751779
Gardenview
2047
Tel: 011 616 7893
Fax: 086 724 3132
E-mail: admin@sasenvgroup.co.za

1 INTRODUCTION

The current water resources of the Integrated Mgeni Water Supply System (WSS) in KwaZulu-Natal (KZN) are insufficient to meet the long-term requirements of the system. The uMkhomazi Water Project - Phase 1 (uMWP-1) proposes the transfer of water from the undeveloped uMkhomazi River to the existing Mgeni system to address these water requirements.

The proposed infrastructure associated with uMWP-1 project comprises, amongst others, of a new dam at Smithfield (± 80m high wall) on the uMkhomazi River, water conyenace infrastructure, including ±32,5 km long tunnel and pipeline to a balancing dam (preferred option referred to as the Langa Dam) at Baynesfield Estate.

The project area is situated in the southern part of KZN. The majority of the project area falls within the uMgungundlovu District Municipality (including the Impendle Local Municipality, The Msunduzi Local Municipality, Richmond Local Municipality and Mkhambathini Local Municipality). Smithfield Dam falls under Traditional Authority and state- owned land. The eastern part of the project area, which includes the balancing dam, is privately owned.

Nemai Consulting (Pty) Ltd is undertaking the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) (DEA Ref: 14/12/16/3/3/3/94 – Smithfield Dam; 14/12/16/3/3/3/94/2 – balancing dam; 14/12/16/3/3/3/94/1 – water conveyance infrastructure). An Integrated Water Use Licence Application (IWULA) will be submitted to the Department of Water and Sanitation (DWS) in due course.

In consideration of the various specialist studies, the need for a wetland and biodiversity offset and biodiversity compensation plan was identified. Scientific Aquatic Services (SAS) was appointed to initiate the Biodiversity Offset Study in November 2017 and completed preliminary investigations in early 2018.

Based on these findings the need was identified to engage landowners in the area to identify areas to host the offset. The mechanism of how the offset is to be secured for example through an stewardship program for example, would be established, on a land parcel specific basis in negotiation with the DWS once the project has been approved for development.

This report documents the identification of and correspondence with landowners located within target areas that were identified to be suitable for the required wetland and biodiversity offsets as part of the Environmental Authorisation process for the proposed Smithfield Dam and associated infrastructure. This document focuses solely on identification and initial engagement with landowners within the identified target areas and does not replace the Public Participation requirements as part of the EIA.

Persons and entities as identified within this report have indicated interest in further discussions with the Department of Water and Sanitation or have requested further information and may be interested in entering into a stewardship programme going forward. This information was then sued to as part of the assessment of the Offset and Compensation Initiative and risks associated with the project.

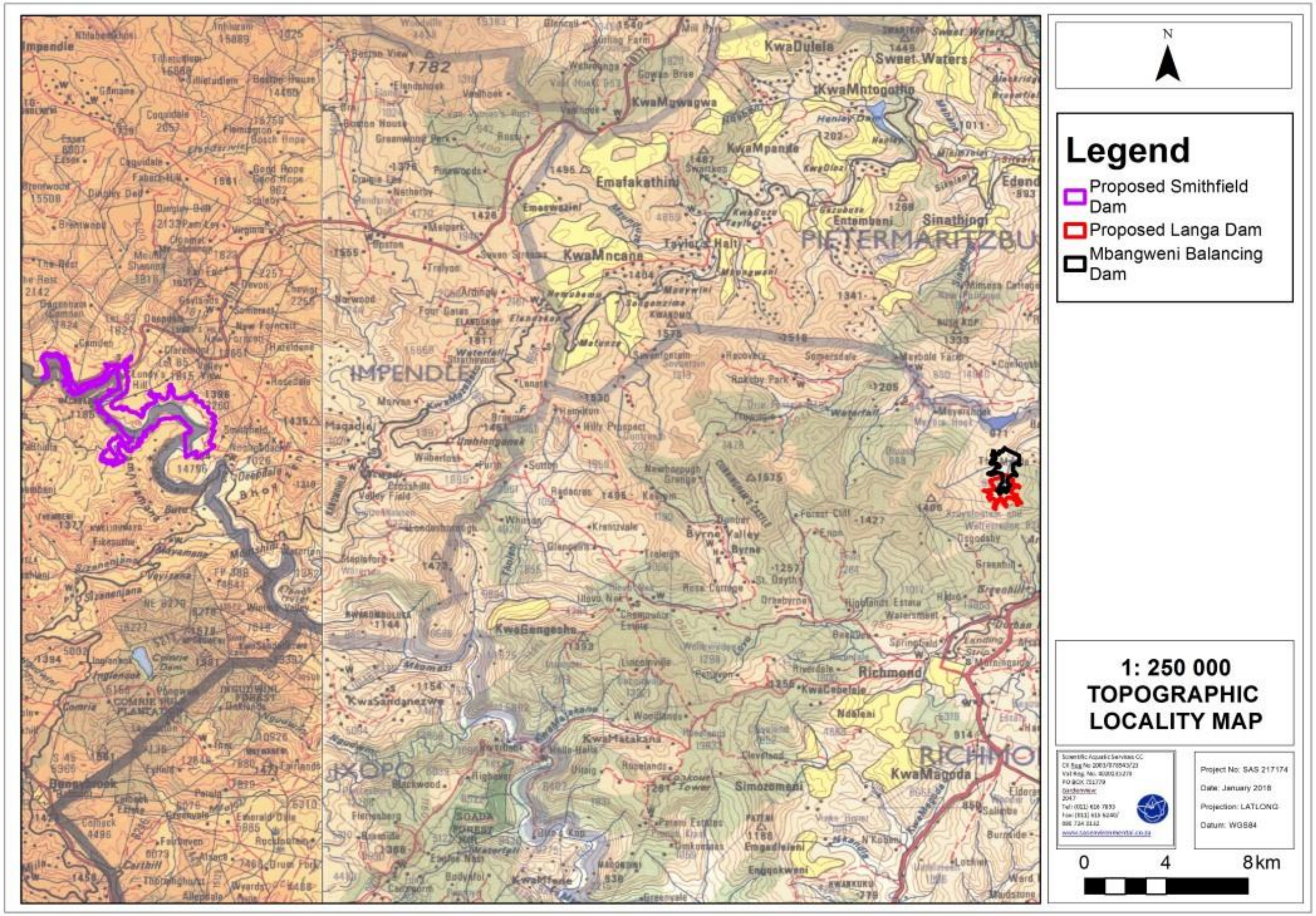


Figure N1: 1:250 000 topographical map indicating the proposed Smithfield dam as well as the proposed Langa and Mbangweni balancing dams.

1.1 Scope of this report

This report documents the identification of and correspondence with landowners located within target areas that were identified to be suitable for the required wetland and biodiversity offsets as part of the Environmental Authorisation process for the proposed Smithfield Dam and associated infrastructure. This document focuses solely on identification and initial engagement with landowners within the identified target areas and does not replace the Public Participation requirements as part of the Environmental Impact Assessment process (EIA).

Persons and entities as identified within this report have indicated interest in further discussions with the Department of Water and Sanitation or have requested further information and may be interested in entering into a stewardship programme going forward.

With the above information this document aims to assess the degree of willingness of landowners to form part of the stewardship program and based on the outcome, present a "proof of concept" that there is sufficient interest and willingness by landowners to achieve at the least, the minimum goals set by the biodiversity Offset and Compensation Initiative or at least a figure that indicates that the minimum target set is achievable with further consultation. Should the interest be deemed insufficient, either further investigation of offset alternatives will be required, or the project will be considered fatally flawed since the requirement for an appropriate biodiversity offset can then not be met.

1.2 Assumptions and Limitations

The following assumptions and limitations are applicable to this report:

- This report documents communication via email and telephone only. No meetings were held in the area to identify additional interested parties at the time of this draft report for comment being prepared.
- Landowners as identified in this report are those that contact details were obtained through database searches as well during site visits and provided by other landowners. This list is as comprehensive as was possible within the ability to obtain contact information from public sources and other landowners and within the available timeframes and does not represent the entire area targeted for offsetting. It is deemed the responsibility of the proponent to further investigate other landowners during the implementation phase of the offset should additional offset requirements be needed.
- The contact details provided in this report are those that are operational in April 2018. SAS cannot be held responsible should contact details change going forward.

1.3 Indemnity and Terms of use of this Report

The opinions expressed in this report have been based on the information supplied to SAS by NEMAI Consulting, the Department of Water and Sanitation as well as the relevant landowners. The opinions in this report are provided in response to a specific request from the DWS to engage with potential interested landowners with regards to the offset requirements only. SAS has exercised all due care in reviewing the supplied information.

Whilst SAS has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. As is the case with contact details, SAS does not take responsibility for any actions that arise from landowners that were not contacted as a result of details not being available during the timeframe that this report was compiled. SAS has, however, exercised due diligence in obtaining as much information as possible within the available timeframes. SAS does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SAS's investigations, and those reasonably foreseeable, for the biodiversity and wetland offset requirements only. These opinions do not necessarily apply to conditions and features that may arise after the date of this report, about which SAS had no prior knowledge nor had the opportunity to evaluate.

2 APPROACH TO LANDOWNER ENGAGEMENT

2.1 Background Information provided

A Background Information Document (BID) was emailed to all landowners after a telephonic conversation to introduce the project. The BID provided a summary of the following information:

1. Basic Background on the need for the Smithfield Dam;
2. The EIA and WULA Process being undertaken by NEMAI Consulting (Pty) Ltd;
3. Offset Requirements:
   a. Watercourse Offset requirements;
   b. Biodiversity offset requirements; and
   c. Species specific Offsets.
4. Summary of Phase 2 of the Watercourse and Biodiversity study; and
5. Contact details for SAS as well as NEMAI Consulting (Pty) Ltd.

Please find a copy of the BID available in **Addendum 1.**

2.2 I&AP identified and correspondence log

Three main target Areas were identified for the Wetland Offsets as well as the Biodiversity offsets. These target areas were identified as follows:

1. Smithfield Offset Land Parcel 1 (Preferred Option for Smithfield Dam);
2. Smithfield Offset Land Parcel 2;
3. Smithfield Offset Land Parcel 3; and
4. Baynesfield Offset land Parcel (Preferred Option for Langa and Mbengweni balancing dams)

The following Section provides the maps of each identified land parcel as well as a table providing a comprehensive summary of all landowner detail as well as communications held.

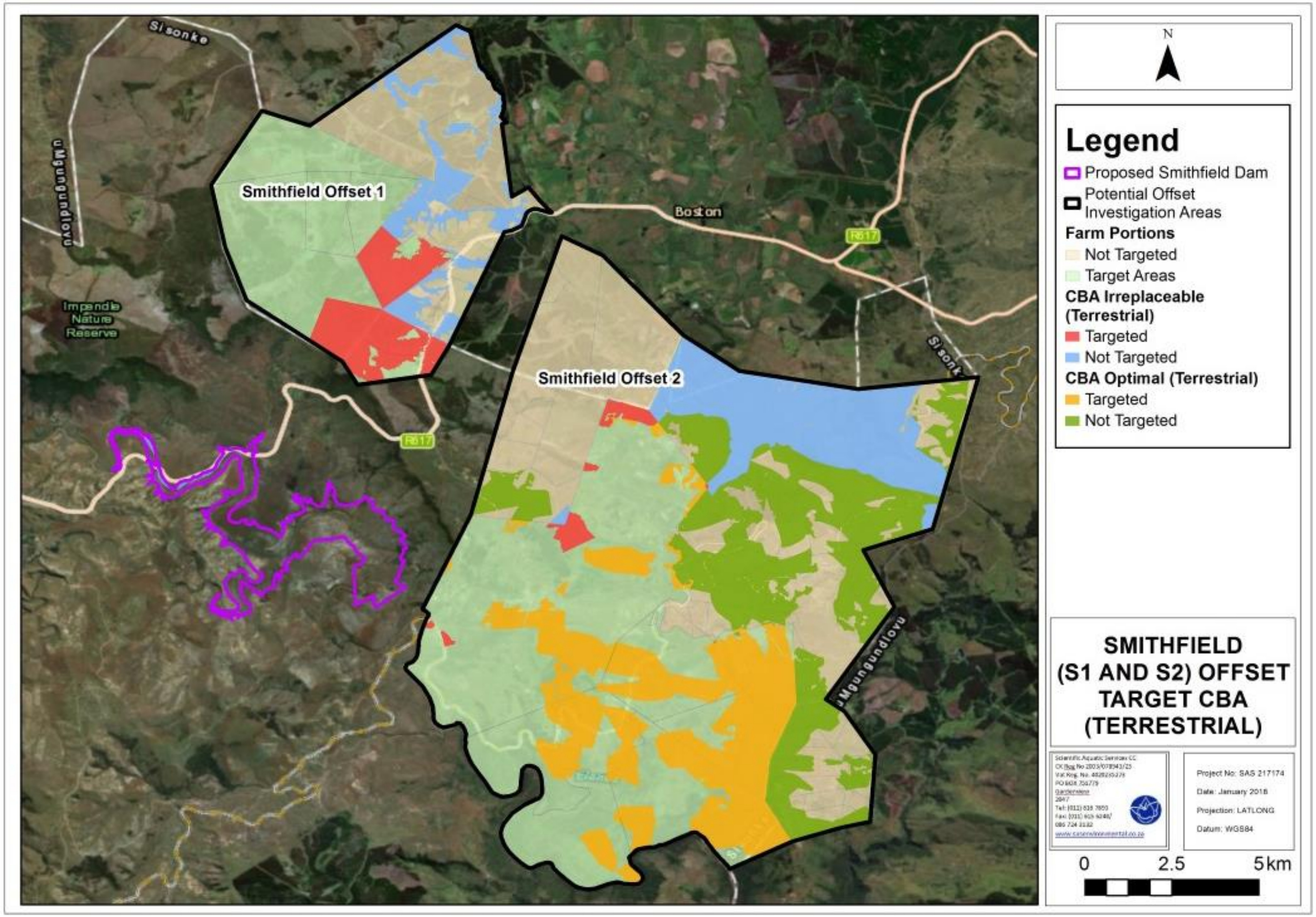


Figure N2: Identified biodiversity target areas within Smithfield target recipient sites 1 and 2.

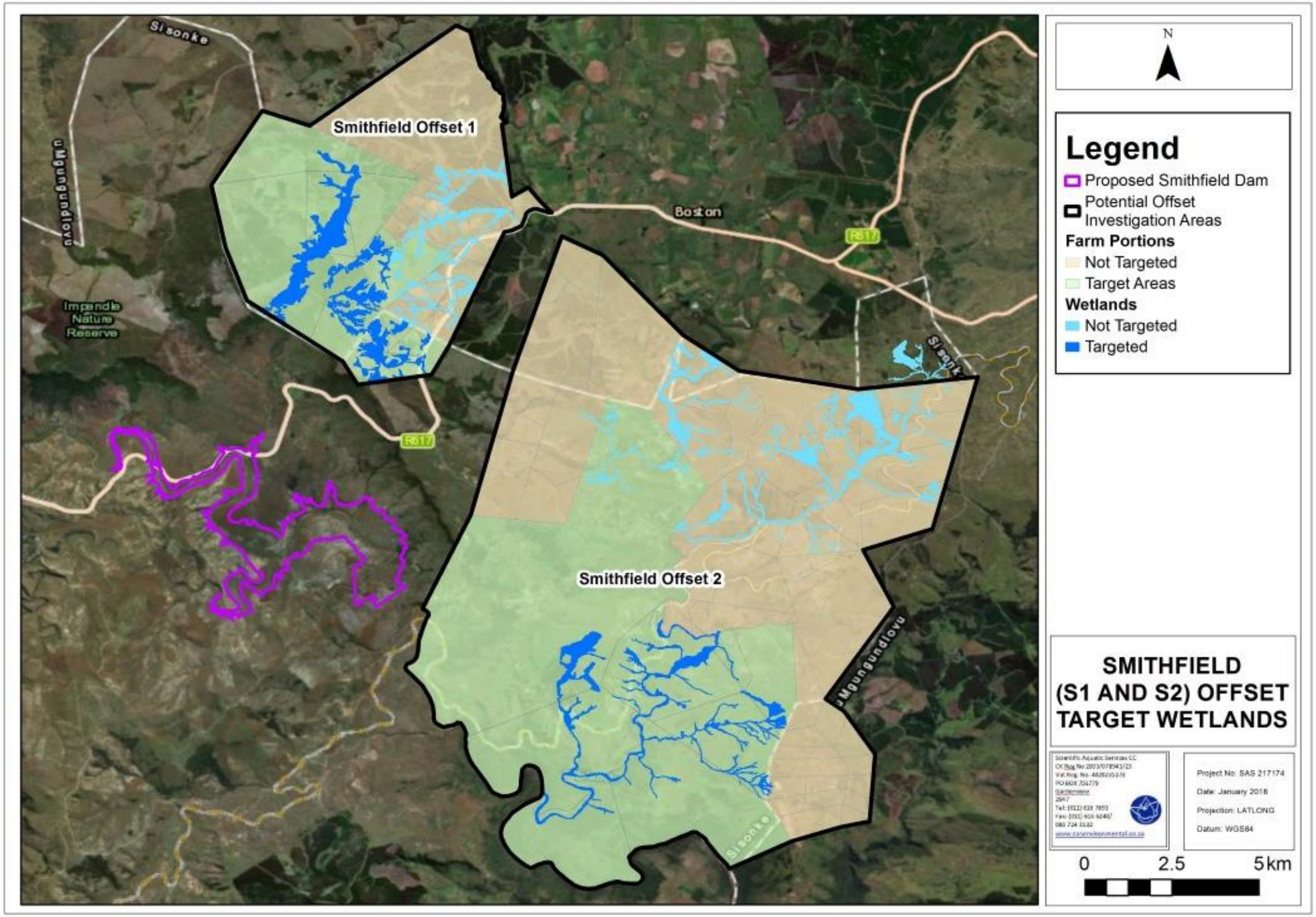


Figure N3: Identified wetland target areas within Smithfield target recipient sites 1 and 2.

Table N1: Summary of landowner details and correspondence log for landowners in Smithfield 1

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
	Smithfield Offset Land Parcel 1 – PREFERRED OFFSET AREA FOR SMITHFIELD DAM				
1.	Mount Shannon, 1816/FS (Pietermaritzburg Deeds Office)	Mondi Limited	Mondi Group Pietermaritzburg Patrick Belebese 033 329 5449 083 446 5589 Patrick.belebese@mondigroup.com	**Email sent 24 April 2018** Indicated that they are definitely interested and would also assist where possible on property owned by Mondi within the proposed offset area.	**Email received 25 April 2018** In an email from Mr Patrick Belebese, and in a subsequent telephonic conversation, it was indicated that Mondi are definitely interested and would also assist where possible in areas where the Mondi land holdings lie. Note from Lize van der Merwe – Mondi is starting a project about grazing and community cattle in the Greytown area in collaboration with another organisation which could be useful in grassland management and offsetting.
2.	Portion 4 Of Virginia, 1823/FS (Pietermaritzburg Deeds Office)	Vilakazi Petros Mimi	Vilakazi Petros 033 386 2977, 082 515 8602	**Telephonic – 11h23 and 11h32 on 17 April 2018** Service unavailable on both numbers, however consultant will keep trying to get in contact with this land owner **Telephonic - 10h31 on 20 April 2018** Service still unavailable on both numbers. **Telephonic – 10h04 on 03 May 2018** Service still unavailable on both numbers.	Contact details provided are considered to be incorrect.
3.	Portion 10 & 20 Of Virginia,	Sirela Trading CC	Protus Francis Mhawukelwa 082 454 7299	**Telephonic - 11h10 on 17 April 2018.**	**Email response received on 3 May 2018**

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
	1823/FS (Pietermaritzburg Deeds Office)		Email: jason@ecocycle.co.za	Communication was held with the land manager (Jason) who indicated that he will relay the information to the landowner. He requested that information be emailed through to him at the provided email address. **Initial Email 17/04/18:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam as well as offset target areas.	Mr Jason (Land manager) indicated that he was still waiting for the land owner's response, with all the public holidays they have not had the opportunity to discuss. He indicated that he would revert back as soon as possible.
4.	Portion 21 & 24 Of Virginia, 1823/FS (Pietermaritzburg Deeds Office)	Dlanyaza Farming CC	Zibuyile Makola, Kwenzokuhle Majola 033 326 1279, 033 326 1185	**Telephonic – 11h20 on 17 April 2018** Service unavailable on both numbers, however consultant will keep trying to get in contact with these land owners. **Telephonic – 11h36 on 18 April 2018** Service unavailable on both numbers, however consultant will keep trying to get in contact with this land owner **Telephonic – 10h33 on 20 April at 10** Service unavailable on both numbers **Telephonic- 10h00 on 3 May 2018** Service unavailable on both numbers	Contact details provided are considered to be incorrect.

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
5.	Portion 3 Of Virginia, 1823/FS (Pietermaritzburg Deeds Office)	Mckerrow Caroline Anne	Caroline McKerrow 074 192 7787 Email: caroline@eastcoast.co.za	**Telephonic – 13h20 on 17 April 2018** Ms. McKerrow indicated that she had no previous knowledge of the Smithfield Dam and has had no further communication on this. She requested additional information via email. She mentioned she runs a horse trail farm (www.stormyhill.co.za) on her property and has access to Mondi's property which she utilises for the trail rides. She stated that she has a good area or terrestrial habitat with wild orchids that flower annually and would be very interested and enthusiastic to partake in a stewardship process going forward as well as be registered as a I&AP for all future notifications. **Initial Email 17/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam as well as offset target areas.	**Email follow-up sent 25 April 2018** Ms. McKerrow put the consultants in contact with Dr. Lize van der Merwe who has been extremely helpful in providing ideas for the Stewardship. **Email received 26 April 2018** Email response from Ms. McKerrow with the following concerns: ➢ Why has my place been taregeted and not the farms bordering the R617? ➢ Will they then have access to my land and be able to tell me what I can and can't do? ➢ Do they purchase a stake in my land? ➢ How can you replace the land you are going to destroy with taking over land which is already there? ➢ Who gets stewardship-the government, the water resources people? ➢ Why do we all not know about this? Furthermore, she spoke to the secretary of the Boston Farmers Association (see below details) who seemed to think that the dam was at Richmond. They will be bringing this matter up at their next meeting next month.
6.		Boston Farmers Association	Kirsten Cromhout 082 485 1982 Email: boston.garage@yahoo.com	Received the consultant details from Caroline McKerrow.	**Email received 26 April 2018** Requested further detail. Had a telephonic conversation with Mr. S. van Staden and the following key points were discussed: ➢ Mr. S. van Staden summarised the background to the project including where it was located as well as the need for the dam and the need for the Biodiversity offset. Furthermore, it was explained what the biodiversity offset would entail and that it

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
					would most likely take the form a of a stewardship program where the commitments of each landowner would be recorded in a Memorandum Of Understanding or some other legal instrument. Mr. S. van Staden tried to highlight the potential opportunities and constraints that would be placed on the land owners. Ms. Cromhout asked what the stewardship program would mean in terms of land claims to which Mr Van Staden indicated that there was a meeting to take place with the Department of Rural Development and Land Reform on the 23rd of May and with as meeting scheduled for the potential landowners interested in the offset for that afternoon.
7.	Portion 13 Of Virginia, 1823/FS (Pietermaritzburg Deeds Office)	Walsh Mark Colbert	Mark Walsh ~~033 997 0784~~	**Contact number not operational**	
8.	Portion 9 Of Virginia, 1823/FS (Pietermaritzburg Deeds Office) Portion 1 of Mount Shannon, 1823/FS (Pietermaritzburg Dees office)	Mhlungu Senzele Johnson	Mhlungu Senzele 082 371 8340 Email: Senzelem@umpheme.co.za	**Telephonic – 11h00 on 17 April 2018** The landowner indicated that he would be interested in the proposed program but would like to know which portions of his land will be affected. He requested that further information be emailed to him so that he clearly understands what is required of him. **Initial Email 17/04/17:** Email was sent including the BID document as well as a	**Telephonic – 10h05 on 03 May 2018** The land owner confirmed that he received the BID document and accompanying maps which we sent to him via email, and he apologised for not responding to the email. He indicated he is very interested in the stewardship program and gave assurance that we have his full cooperation as he believes it's a good initiative.

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
				locality map of the proposed Smithfield Dam as well as offset target areas.	
9.	Portion 12 Of Virginia, 1823/FS (Pietermaritzburg Deeds Office)	Mouton Jacobus Johannes	Mouton Jacobus 031 464 7801 moutonkobus1@gmail.com	**Initial Email 03/05/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam as well as offset target areas.	**<u>Telephonic – 11h00 on 3 May 2018</u>** Mr Mouton indicated that he is 100% in agreement and happy to enter a stewardship agreement as part of the Biodiversity Offset Program.
10.	Portion 27 Of Virginia, 1823/FS (Pietermaritzburg Deeds Office)	Ahir Ramdhani Sewraj	Ahir Ramdhani 082 725 7682 Email: nirvanaahir25@gmail.com	**<u>Telephonic – 15h55 on 18 April 2018</u>** Was aware of the Smithfield dam but indicated there is no wetlands on his property. Very soft spoken so consultant struggled to hear him. They agreed to look through the documentation via email and to respond accordingly. **Initial Email 18/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and Smithfield offset target areas.	**<u>Email received on 24 April 2018</u>** Landowner expressed interest in future engagement.
11.	Portion 11 Of Virginia, 1823/FS (Pietermaritzburg Deeds Office)	Watt Lorraine	Lorraine Watt 082 452 8934 Email: norcor@telkomsa.net	**<u>Telephonic – 16h30 on 18 April 2018</u>** Was not aware of the Smithfield dam. She queried the location as she stated it is quite a flat area. She indicated she would be interested to receive additional information and	**<u>Follow-up email sent to landowner on 2 May 2018</u>** Request for comment on email and any concerns. **<u>Telephonic- 14h00 on 3 May 2018</u>** Ms Lorraine indicated that she had received all the documentation but wanted her husband to review it before responding. She

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
				would send through details of any other neighbours should she think of anyone. **Initial Email 18/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and Smithfield offset target areas.	wasn't entirely sure of what was required of them or if they could be of service as their property is small (43 hectares) and they do not have any wetlands/ natural grassland areas. The farm is not their permanent residence and is more of a 'hobby' with few livestock and some vegetable growing. She indicated she would be interested in attending a meeting to find out more.
		Barbara Bullock	Barbara Bullock 084 352 9864	**Telephonic – 16h00 on 3 May 2018** Service unavailable, however, consultant will keep trying to get in contact with this land owner	
12.		NRF Green Economy post-doctoral fellow	Dr Lize van der Merwe 082 650 9814 Email: lizejoubert@gmail.com	Received our details from Caroline McKerrow.	**Email on 23 April 2018, following key issues highlighted**: ➢ At the moment it appears to be an "all win" for land owners that become involved, no information on the landowners responsibilities should they decide to become stewards. ➢ Requested more information on the legal framework within which this stewardship would fall. ➢ SAS responded on 24 April 2018 and requested a telephonic discussion and provided a list of discussion points per below: See below some information requests and the discussion points: **Information requests** ➢ A contact number for Nicky Brighton so SAS can explain what is being done. SAS is avoiding cold call emails without a telephonic introduction first; ➢ A contact number and email address for Christeen and Philip Grant as their input could add a lot of value with the process;

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
					➢ Any other persons that may be keen as SAS has a huge task of finding enough land to undertake this offset and are struggling to get contact details of potentially willing people. **<u>Email on 24 April 2018, following key issues highlighted:</u>** ➢ Indicated that this is a very well-informed community in Boston area. ➢ The community already understand how to burn their lends correctly. ➢ The community already understand grazing cycling. The problem of uncontrolled grazing comes from the neighbouring rural community (e.g. iMpendle). ➢ The main alien and invasive plant in the area is the American bramble. This species can be controlled with herbicides, but treatment is only effective during a very small window of opportunity - when it flowers in spring. ➢ Enquired about the capacity within the DWS to deliver on the promised benefits to the landowners. Worst case is the community will be bound by stewardship agreements but do not get the benefits as the DWS do not have the capacity to assist. ➢ Enquired about land claims and if the stewardship could help safe guard properties against land claims? This could be a real benefit to land owners. ➢ Enquired about the compatibility of stewardship agreements with the potential loss of land from private ownership (I.e. when private land is transferred to a community). Asked if there is a way to secure private ownership. ➢ Transferral of stewardship agreements if land is sold? ➢ Indicated that she feels any stewardship programme is domed for failure if if the rural neighbouring communities are not engaged with. There needs to be a measurable change in the wat rural communities deal with cattle. Recommended a Grazing Education School. ➢ **SAS responded telephonically on 25 April 2018 at 08:30 am.**

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
					Discussion points for telephonic conversation held on 25 April 2018 1. How farms/farm portions were targeted. 2. Good practice by landowners reducing stress. 3. Discussion on what value the DWS could bring as the Steward Partner - Especially a. Monitoring data; b. Alien Control (it is critical we understand these time constraints so it can be built it into the management plans for the Offset roll out plan); and c. Grazing School. 4. Land claim issues and the way forward. 5. DWS capacity and commitments and how things will be structured. **<u>Email sent 25 April 2018, following key issues highlighted:</u>** ➢ Provided details for the Dargle conservancy. ➢ Provided details for the individual who has been working with the Blue Swallow monitoring. ➢ Provided details for Ezemvelo Wildlife Trust, KZN Wildlife trust and Department of Rural and Agricultural Development. ➢ Mentioned that a fish species previously thought to be extinct was found in the area of the dam and is believed to benefit from dams as it impedes the movement of known predator fish species. **<u>Email sent 26 April 2018, following key issues highlighted:</u>** Suggested that as a benefit to the landowners entering the stewardship, the following might be considered: ➢ Trade 1: Electricity exemption from ESKOM to landowners. Landowners currently pay a fixed amount of ~R2500 per month for line rental / maintenance of powerlines. Then, their actual usage is added on top of that (another R500, depending on usage rate). A real benefit to landowners

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
					agreeing to land stewardship could be that they are exempted from this fixed amount (R2500) as long as the stewardship agreement stands. This would mean that they pay for their electricity usage at rates that are in line / similar / representative of electricity rates in the rest of the country. ➢ Trade 2: Stewardship from farmers to DWS. ➢ Trade 3: Electricity generation from DWS to ESKOM, with hydro-power. Because the Smithfield dam is at a greater elevation than the balancing dam at Bainesfield, this can perhaps work. ➢ **SAS responded indicating this will all be captured and recommended to the client.**

Table N2: Summary of landowner details and correspondence log for landowners in Smithfield 2

	Property Description	Owner	Contact Details	Comments
Smithfield Offset Land Parcel 2 – SECOND TARGET AREA				
1.	Portion 2 Of Waterton, 1352/FT (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	In the meeting between NEMAI Consulting, the DWS and the Department of Rural Development and Land Redistribution (DRDLR), Ms. Z. Molefe stated that in the spirit of intergovernmental relations, the DRDLR is willing to let biodiversity offsets be considered on land administered by this Department. She indicated that a formal response in this regard would be forthcoming from the DRDLR once the information had been received. A further Meeting has been scheduled for 23 May 2018.
2.	Waterton, 1352/FT (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	
3.	Portion 3 of Nooitgedacht, 1026/FS (Pietermaritzburg Deeds Office)	Ngcobo Mazonjani Alpheus	Contact details not required	
4.	Portion 1 Of Waterton, 1352/FT (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	
5.	Portion 3 Of Gunzenhausen, 6223/FT (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	

6.	Portion 5 Of Gunzenhausen, 6223/FT (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	
7.	Portion 1 Of Gunzenhausen, 6223/FT (Pietermaritzburg Deeds Office) Portion 6 Of Gunzenhausen, 6223/FT (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	
8.	Portion 4 Of Moor, 1997/FT (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	
9.	Portion 1 Of Moor, 1997/FT (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	
10.	Portion 4 Of Furth, 1995/FT (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	
11.	Furth, 1995/Ft (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	
12.	Gunzenhausen, 6223/FT (Pietermaritzburg Deeds Office)	Department of Rural Development and Land Redistribution	Contact details not required	

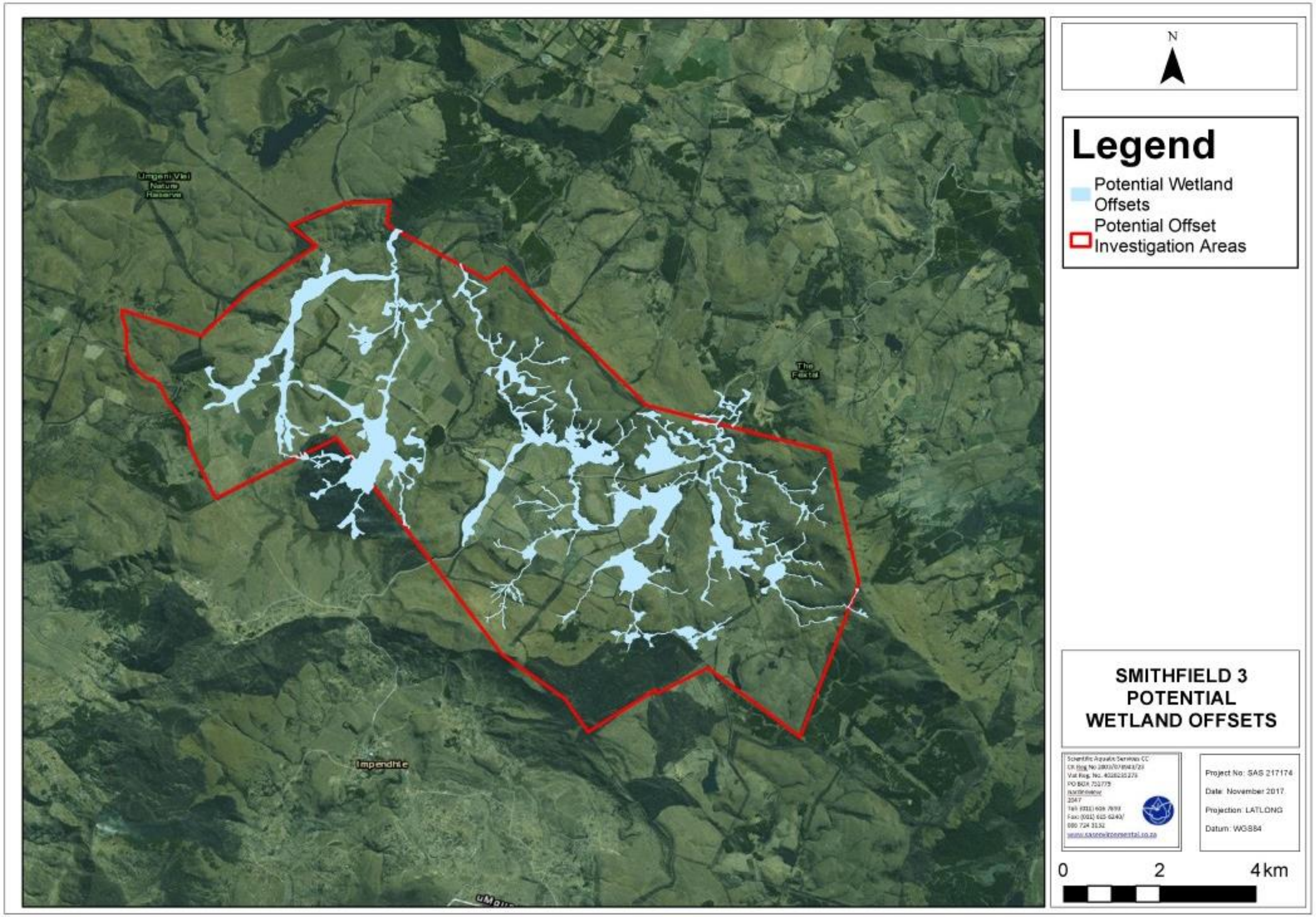


Figure N4: Identified wetland target areas within Smithfield target recipient site 3.

Table N3: Summary of landowner details and correspondence log for landowners in Smithfield 3

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
	Smithfield Offset Land parcel 3 – LEAST PREFERRED OPTION				
1.	Runnymeade, 15577/FS (Pietermaritzburg Deeds Office) Lot D 2, 5425/FS (Pietermaritzburg Deeds Office) & others	Ivanhoe Farming Co Pty Ltd	Manager: John Campbell 082 415 2708 Email: Ivanhoe-dargle@vodamail.co.za	**Telephonic – 16h10 on 18 April 2018** Has already put 800 ha of his property into a stewardship from the Ezemvelo development and therefore most of this land is already protected as it was joined with an adjacent reserve, however, he mentioned there is additional property that could be utilised for this project. He indicated he would provide additional landowner details for others via email. **Initial Email 18/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and identified potential wetlands within Smithfield 3.	**Follow-up email sent to landowner on 2 May 2018** Request for comment on email and any concerns. **Telephonic – 15h45 on 3 May 2018** Mr Campbell acknowledged receipt of the documentation and stated he is interested. He requested that he be notified of the upcoming meeting. He further indicated that his neighbours are mainly communcal area and therefore cannot think of any other farmers who may be interested in such a venture.
2.	Portion 1 Of Welton, 2108/FS (Pietermaritzburg Deeds Office)	Glen Douglas Martin	Douglas Martin 011 708 6449, 079 037 4075 Email: douglas.glen@standardbank.co.za	**Telephonic – 15h10 on 17 April 2018** Indicated he was not aware of the Smithfield dam. Requested a map and additional background information be sent to him. He indicated he would be open and willing for further discussions regarding stewardship.	**Email received on 24 April 2018** Landowner expressed interest in future engagement.

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
				Initial Email 17/04/17: Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and identified potential wetlands within Smithfield 3.	
3.	Portion 1 Of Inhluzani Mount, 5303/FS (Pietermaritzburg Deeds Office)	Francis Simon John	Simon Francis 083 255 4852 Email: SJFhome@gmail.com	**Telephonic – 15h30 on 17 April 2018** Indicated he would like additional information on the proposed protection and planning around the offsets and how this would be addressed. He stated that he would provide us with contact details for Rainbow Lakes (Pty) Ltd and indicated that he would be keen to enter into a stewardship but buy-in from downstream properties would be required. **Email 17/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam.	**Follow-up email sent to landowner on 2 May 2018** Request for comment on email and any concerns. **Email received on 2 May 2018** Indicated he did receive our information and that he was interested but wished to discuss further with Ivanhoe Farming as well as Rainbow lakes. Details were provided for Dr O'Connor from Rainbow Lakes.
4.		Rainbow Lakes	David O' Connor 0742398165 Email: doconnor68@gmail.com	**Telephonic- 16h00 on 3 May 2018** Mr O' Connor indicated he is one of 12 board members who handle the Rainbow Lakes farms. He stated that they have a fairly large property which is utilised for trout farming as well as some grass for bailing. He stated that	**Telephonic – 16H00 on 3 May 2018** Mr O' Connor expressed interest in further engagement and stated he would pass the information on to all other stakeholders at Rainbow Lakes. A member will definitely attend the meeting to be held in the near future.

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
				the site has two large dams, both with substantial wetland habitat below/above. **Initial Email 03/05/18**: Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam.	
5.	Portion 6 Of Inhluzani Mount, 5303/FS (Pietermaritzburg Deeds Office)	Comrie Robert Cecil Marshall (ID 5703085081085)	Cecil Marshall ~~032 230 5163~~, 072 206 9250	**No answer – call again later (goes straight to voicemail)**	
Other recommended stakeholders					
5.		uMgeni Plateau Nature reserve	Conservation Outcomes Steve Mckean 082 722 1193 Email: steve@conservation-outcomes.org Web: www.conservation-outcomes.org Kevin McCann Email: kevin@conservation-outcomes.org Greg Martindale Email: greg@conservation-outcomes.org	**Telephonic – 11h20 on 18 April 2018** Indicated he had spoken with Stephen already but had not received any information by email. He requested this information as he will be unavailable from tomorrow for the next week. **Email 18/04/17**: Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and Smithfield offset target areas.	**Various email correspondence – 18 April 2018** Works for a company called conservation outcomes who specialise in dealing with protected area expansion with stewardships being the key mechanism. Have extensive experience in implementing offsets, with Spring Grove Dam being a key project the assisted with. Would be happy to engage further with the DWS and assist in implementation of the required offset.

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
6.		Dargle Conservancy.	Nikki Brighton Email: Chairman@dargleconservancy.org.za	Chairperson of the conservancy. This conservancy is well connected with some of the other conservation movements (e.g. Mphophomeni environmental education). Dargle have demonstrated effectiveness in collaborating with other organisations. **Email 25/04/17**: Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and Smithfield offset target areas.	No response as of yet and no contact number available for telephonic follow-up.

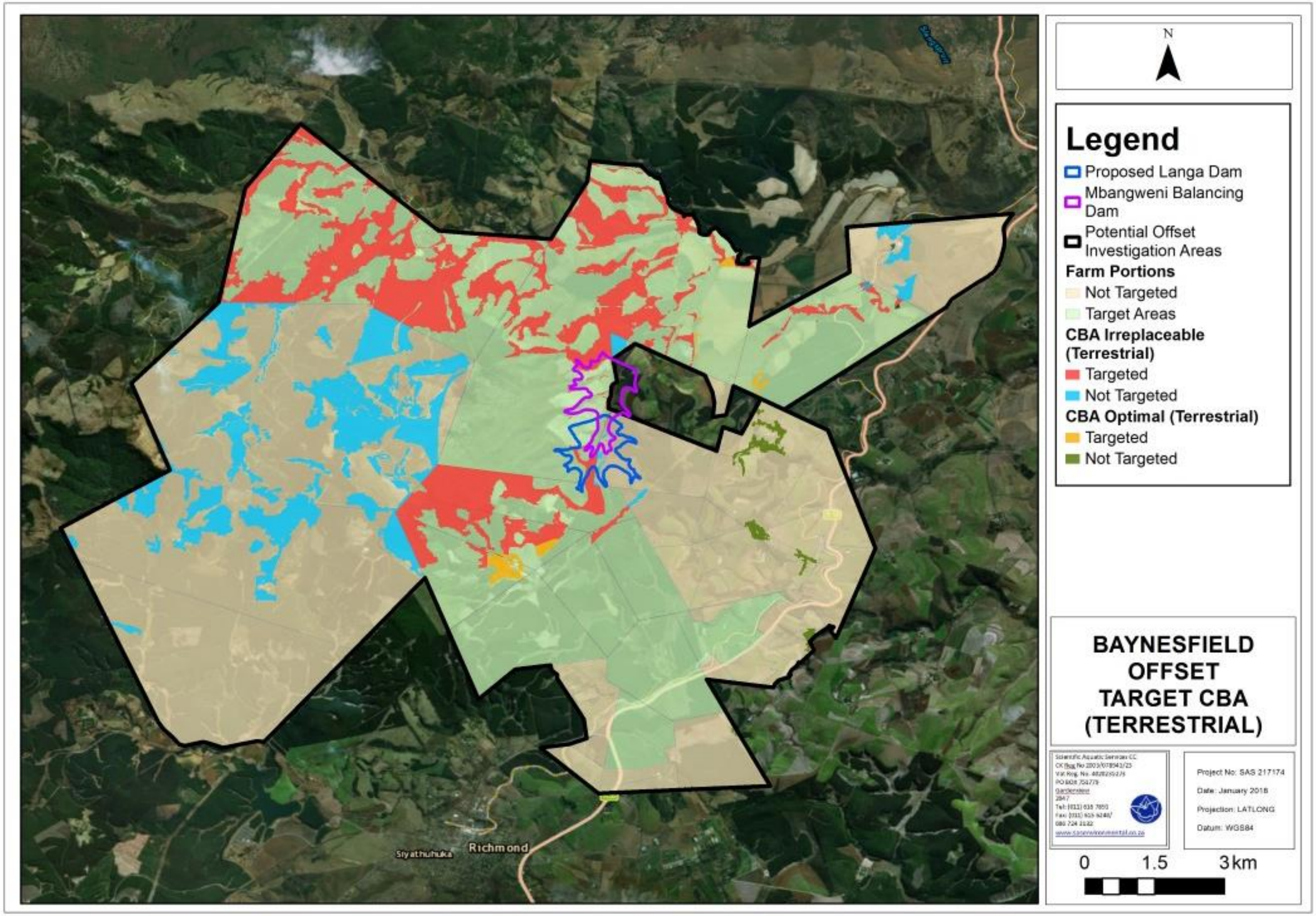


Figure N5: Identified biodiversity target areas within Baynesfield Land Parcel

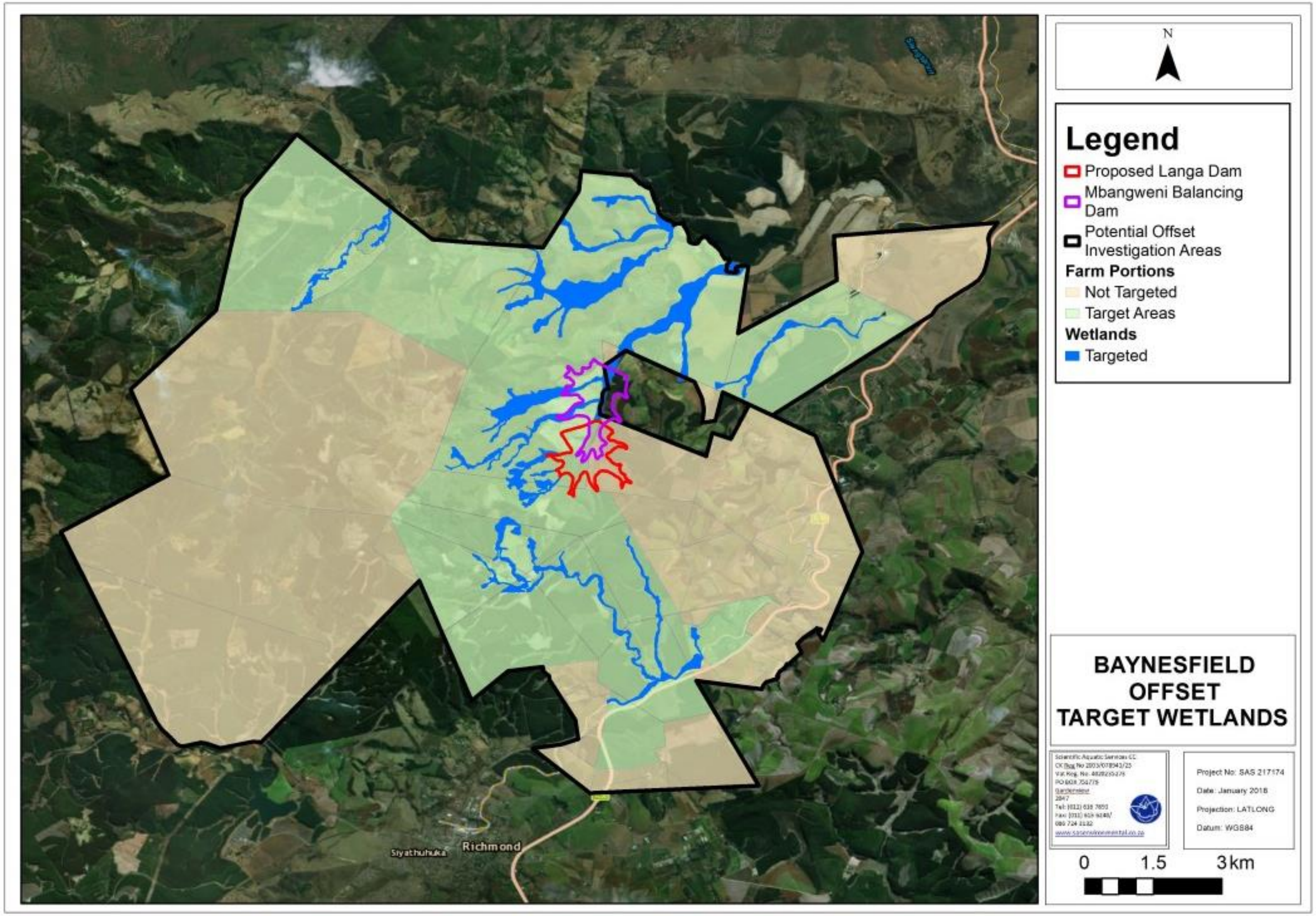


Figure N6: Identified wetland target areas within Baynesfield target recipient site.

Table N3: Summary of landowner details and correspondence log for landowners in Baynesfield Land Parcel

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
Baynesfield Offset Land Parcel					
1.	Portion 15 Of Kruys Fontein & Weltevreden, 826/FT (Pietermaritzburg Deeds Office)	Osgodsby Trust-Trustees	Owner: Ashley McKenzie Manager: Gordon Strachan 072 498 8666 Email: gord.strachan@gmail.com	**Telephonic – 15h45 on 18 April 2018** Spoke to Gordon, the farm manager. He was aware of the requirements as had communicated with Amanda on site. Requested that the information be emailed, and he would communicate with the landowner. He stated that they do already look after the wetlands they have on site but would be open to further communications. **Initial Email 18/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and Baynesfield target areas.	**Follow-up email sent on 26 April 2018** Request for comment on email and any concerns. No response received. **Telephonic – 16h30 on 3 May 2018** Mr. G Strachan indicated that he has not yet had feedback from the landowner as they have been away. Indicated he is interested to attend the meeting to get further details.
2.	Portion 12 Of Kruys Fontein & Weltevreden, 826/FT (Pietermaritzburg Deeds Office)	Mkhuzane Communal Property Trust	Mondi Knighty – 072 614 2652 / Dwayne Marx (Idube Forestry) 082 878 0126 or Mr Obet 082 695 8720	**Email sent on 24 April 2018** Indicated that they are definitely interested and would also assist where possible on property owned by Mondi within the proposed offset area.	**Email recieved 25 April 2018** In an email from Mr Patrick Belebese, and in a subsequent telephonic conversation, indicated that Mondi are definitely interested and would also assist where possible in areas where the Mondi land holdings lie. Note from Lize van der Merwe – Mondi is starting a project about grazing and community

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
					cattle in the Greytown area in collaboration with another organisation which could be useful in grassland management and offsetting.
3.	Portion 17 Of Kruys Fontein & Weltevreden, 826/FT (Pietermaritzburg Deeds Office)	Eric Lewis Family Trust-Trustees	Eric Lewis 082 511 3700 Email: admin@lewisfarming.co.za	**Telephonic – 11h45 on 17 April 2018** Spoke to Amanda Mileson on site. He has steep areas, and not sure if his property is suitable for additional offsetting since the proposed Langa Dam will be within his property. Indicated that Baynesfield is next door which will likely have better biodiversity opportunities, but he would be open to further discussions. Property currently utilised for mixed use farming, including some crops as well as cattle. **Email 17/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and Baynesfield target areas.	**Email response received 25 April 2018** Indicated that he would only be interested to assist if he could get water rights for irrigation in exchange.
4.	Portion 12 Of Nooitgedacht, 903/FT (Pietermaritzburg Deeds Office)	Joseph Baynes Estate Board of Administration	Managing Director: Myles van Deventer 082 849 1568	**Meeting – 6 December 2017** A meeting was held with Mr. M van Deventer as well as Mr. D. Henning from NEMAI Consulting, Mr. S. Van Staden from Scientific Aquatic Services, and Mr. Kobus Bester fo the DWS.	M. van Deventer noted that their Board had found the Stewardship Programme to be too draconian. Mr. M. van Deventer reiterated that offsets cannot affect grazing. He indicated that the Estate employs a high impact grazing strategy. He stated that if there is no hindrance to grazing then offsets for wetlands and terrestrial biodiversity can be considered on Baynesfield Estate. He noted that they will not

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
				In the meeting the project was re-explained and the need for a biodiversity offset presented along with the basic concepts around the offset.	farm within wetlands and the grasslands on the Estate in any case, and they can thus commit to offsets. He further stated that there is also a hunting concession on the farm, which will need to be taken into consideration.
5.	Portion 5 Of Kruys Fontein & Weltevreden, 826/FT (Pietermaritzburg Deeds Office)	Anthony Herbert Morris	Antony Morris Owner: ~~033 212 3270~~, 083 599 8212 Email: carolinemorris2017@gmail.com	**<u>Telephonic – 12h00 on 17 April 2018</u>** Fully aware of the Smithfield Dam and happy to be involved with conservation initiatives, he is just unsure how viable his property would be to the offset as he has only one wetland linked to his dams. No CBA/grassland area left as it has all been converted to pastures and arable land. Made mention that Mondi next door to him has a large wetland. He provided additional contact numbers as listed below. **Email 17/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and Baynesfield target areas.	**<u>Follow-up email sent on 2 May 2018</u>** Request for comment on email and any concerns. Landowner indicated that does not feel his property would be of value to the offset programme as he has no wetland habitat or CBA areas.
6.	Portion 41 & 42 Weltevreden and Kruysfontein (stands to be corrected)	Cottonwood Family Trust	Claus Coulthard 082 695 8720 Email: cottonwood@absamail.co.za	**<u>Telephonic – 14h50 on 17 April</u>** Aware of the Smithfield dam and the proposed balancing dams within the area. Happy to enter into discussions going forward about	**<u>Follow-up email sent on 2 May 2018</u>** Request for comment on email and any concerns.

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
				potential stewardship agreements for wetlands on his property. **Initial Email 17/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and Baynesfield target areas.	Landowner indicated he is happy to have further discussions about the stewardship.
7.	Woodlands farm (we can email liaise if this is not correct).		Graham Wilson 082 945 7352 Email: pen2806@hotmail.com	**Telephonic – 12h15 on 17 April 2018** Open and willing to further discussions. Was aware of the Smithfield dam but not the Offset requirements. Will send through the BID document for background context and he has expressed interest in attending a meeting to discuss further. Has already had engagement with Working of Water which has started clearing aliens in the surrounding area. Requested a copy of the BID document. **Initial Email 17/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and Baynesfield target areas.	**Follow-up email sent on 2 May 2018** Request for comment on email and any concerns. **Telephonic – 08h30 on 4 May 2018** Enquired as to why we were engaging with landowners so far from the Smithsfield dam. Consultant indicated that due to the large area required for the offsetting a broader area was being investigated, however, his area was focused on offsetting for the balancing dams. Mr. Wilson indicated he is very keen to leanr more and discuss a future stewardship. He requested to be informed about any upcoming meetings.
8.	Brooklyn and Altyn farms	Altyn – Bruce family trust	David Bruce 083 984 7207 Email: d-bruce@iafrika.com	**Telephonic – 12h45 on 17 April 2018** Open and willing to find out more about the potential stewardship. Requested the BID	**Follow-up email sent on 2 May 2018** Request for comment on email and any concerns.

	Property Description	Name/Owner	Contact Details	Comments	Follow-up comments/questions
		Brooklyn and Altyn farms (Pty) Ltd		document. Suggested it may be worthwhile to hold a meeting at the clubhouse for all the landowners to attend and get a better understanding of what is required. **Initial Email 17/04/17:** Email was sent including the BID document as well as a locality map of the proposed Smithfield Dam and Baynesfield target areas.	Landonwer to be informaed about the proposed meeting as he wishes to get a better understanding of the requirements of the offset programme.
9.	REM/847 of Meyershoek FT	Joseph Baynes Timber Trust	Joseph Bluett Kennedy 033 251 0171 Managing Director: Myles van Deventer 082 849 1568	**Meeting – 6 December 2017** A meeting was held with Mr. M van Deventer as well as Mr. D. Henning from NEMAI Consulting, Mr. S. Van Staden from Scientific Aquatic Services, and Mr. Kobus Bester fo the DWS. In the meeting the project was re-explained and the need for a biodiversity offset presented along with the basic concepts around the offset.	M. van Deventer noted that their Board had found the Stewardship Programme to be too draconian. Mr. M. van Deventer reiterated that offsets cannot affect grazing. He indicated that the Estate employs a high impact grazing strategy. He stated that if there is no hindrance to grazing then offsets for wetlands and terrestrial biodiversity can be considered on Baynesfield Estate. He noted that they will not farm within wetlands and the grasslands on the Estate in any case, and they can thus commit to offsets. He further stated that there is also a hunting concession on the farm, which will need to be taken into consideration.

3 MAIN ISSUES AND CONCERNS IDENTIFIED

The following main concerns were identified by the relevant stakeholders:

- Suitable legal framework and how this will relate to future selling of properties or landowners wishing to withdraw from the stewardship programme.
- The Deparmtent of Water and Sanitation's capacity to follow through with commitments made during the stewardship agreements.
- Limited time period during which the Alien and Invasive plant American Bramble (*Rubus cuneifolius)* can be treated and the capacity to treat the plants during this timeframe.
- Due to the considerable growth of the rural communities, including increased livestock, education and co-operation from the surrounding rural communities is imperative with regards to sustainable grazing habits for their cattle.
- Other suitable benefits for the landowners other than grazing and alien clearing.

4 NEXT STEPS IN THE PROCESS

The following key meetings have been scheduled in order to further engage with landowners as well as relevant Departments and Traditional Councils:

	Date	Venue	Meeting Attendees
1.	23 May 2018 (Morning)	TBC	Department of Rural Development and Land Reform (DRDLR). Biodiversity Offset Study to be presented and determine what is needed to obtain their buy-in in terms of the offsets on state-owned land.
2.	23 May 2018 (afternoon)	TBC	Combined meeting with the landowners to present the offset syudy and gain further inputs.
3.	24 May 2018 (Morning)	TBC	KwaBhidla Traditional Council – present R617 realignment options.

5 ACKNOWLEDGEMENTS

The Project team wish to acknowledge Dr. Lize van der Merwe for her assistance and ideas for the offset as well as Ms. Kirsten Cromhout of the Boston Farmers Association in assisting with landowner Liason.

ADDENDUM 1 – BACKGROUND INFORMATION DOCUMENT



uMKHOMAZI WATER PROJECT

BIODIVERSITY & WETLAND OFFSET STUDY

uMKHOMAZI WATER PROJECT PHASE 1 (uWMP-1)

BACKGROUND INFORMATION DOCUMENT

Compiled by: Scientific Aquatic Services

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

BACKGROUND

The current water resources of the Integrated Mgeni Water Supply System (WSS) in KwaZulu-Natal (KZN) are insufficient to meet the long-term requirements of the system. The uMkhomazi Water Project - Phase 1 (uMWP-1) proposes the transfer of water from the undeveloped uMkhomazi River to the existing Mgeni system to address these water requirements.

The proposed infrastructure associated with uMWP-1 project comprises, amongst others, of a new dam at Smithfield (± 80m high wall) on the uMkhomazi River, water conyenace infrastructure, including ±32,5 km long tunnel and pipeline to a balancing dam (preferred option referred to as the Langa Dam) at Baynesfield Estate.

The project area is situated in the southern part of KZN. The majority of the project area falls within the uMgungundlovu District Municipality (including the Impendle Local Municipality, The Msunduzi Local Municipality, Richmond Local Municipality and Mkhambathini Local Municipality). Smithfield Dam, falls under Traditional Authority and state-owned land. The eastern part of the project area, which includes the balancing dam, is privately owned.

EIA and WULA PROCESS

Nemai Consulting (Pty) Ltd is undertaking the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) (DEA Ref: 14/12/16/3/3/3/94 – Smithfield Dam; 14/12/16/3/3/3/94/2 – balancing dam; 14/12/16/3/3/3/94/1 – water conveyance infrastructure). An Integrated Water Use Licence Application (IWULA) will be submitted to the DWS in due course.

In consideration of the various specialist studies, the need for a wetland and biodiversity offset and biodiversity compensation plan was identified. Scientific Aquatic Services was appointed to initiate the Biodiversity Offset Study in November 2017 and completed preliminary investigations in early 2018.

Contents of this Document

BIODIVERSITY OFFSETTING DEFINED

According to the Department of Environmental Affairs (2017) biodiversity offsets are defined as *"conservation measures designed to remedy the residual negative impacts of development on biodiversity and ecological infrastructure, once the first three groups of measures in the mitigation sequence have been adequately and explicitly considered (i.e. to avoid, minimise and rehabilitate / restore impacts). Offsets are the 'last resort' form of mitigation, only to be implemented if nothing else can mitigate the impact."*

1

OFFSET REQUIREMENTS

PHASE ONE

Based on the initial specialist studies undertaken as part of the EIA, as well as well as the further species-specific specialist studies, it was determined that the following offsets are required:

- Wetland, riparian and instream (collectively referred to as "watercourse") offsets.
- Terrestrial biodiversity offsets of areas designated as Critical Biodiversity Areas.
- Species-specific compensation (for loss of habitat).

WATERCOURSE OFFSET REQUIREMENTS

The recommended offset ratios as advocated by DEA (2017) (20:1 ratio) is considered onerous due to the inherent risks associated with securing sufficient land, thus a target wetland offset ratio of 11:1 with a commitment to a minimum offset ratio of 5:1 has been proposed to the competent authority. This will result in the following:

a. For **Smithsfield Dam** the wetland target is 11:1 with a minimum offset ratio of 5:1 which will lead to the conservation of 248 ha.
b. For the **Langa Balancing Dam** the wetland target is 11:1 with a minimum offset ratio of 5:1 which will lead to the conservation of 176 ha.
c. For the **Mbangweni Balancing Dam** the wetland target is 11:1 with a minimum offset ratio of 5:1 which will lead to the conservation of 236 ha.
d. Since no guidelines are available with respect to **offsetting riverine systems** and their associated riparian zones, it is proposed that the portion of the uMkhomazi River which will be affected by the Smithfield Dam be offset on a like for like basis with active and ongoing management and rehabilitation of 17km of the uMkhomazi River and larger tributaries in the area.

A minimum of 660 hectares of wetland habitat to be conserved.
Total of 17 km of River to be rehabilitated.

BIODIVERSITY OFFSET REQUIREMENTS

The following offset ratios have been proposed to the competent authority – a 13:1 ratio for irreplaceable Critical Biodiversity Areas (CBAs), a 11:1 ratio for all Optimal CBAs within the Smithsfield Dam and a 34:1 ratio for all irreplaceable CBAs within the Baynesfield area:

a. For the **Smithfield Dam** the CBA terrestrial habitat (29,45 ha irreplaceable CBA and 129,22 ha optimal CBA) target is will lead to the conservation of 1804 ha.
b. For the **Langa Balancing Dam** the CBA terrestrial habitat (14,76 irreplaceable only) will lead to the conservation of 501 ha.
c. For **Mbangweni Balancing Dam** the CBA terrestrial habitat (15,59 irreplaceable only) will lead to the conservation of 530 ha.

Total of 2 836 hectares of terrestrial habitat to be conserved.

SPECIES SPECIFIC OFFSETS

Protea caffra

a. *Protea caffra* is the main food source for the protected *Capys penningtoni* (Pennington's Protea butterfly) thus conservation of these trees is important.
b. The proposed compensation for lost *P. caffra* will be to cultivate these plants from seeds collected from the area and/or cuttings to a ratio of 30:1 for every individual that is lost.
c. The cultivated *P. caffra* will be planted above the full supply level of the dam and in areas where no further disturbance will take place.
d. Funding and a monitoring program will be implemented to monitor the effective rehabilitation.

Hirundo atrocaerulea

a. Nesting sites for *Hirundo atrocaerulea* (Blue Swallows) have been identified and will be lost.
b. Surrounding areas as part of the offset will be utilized and managed in such a way as to promote preferred nesting habitat for this species and to support their foraging. This will include, but not be limited to:
   - Extending the purchase line of the Langa or Mbangwini Balancing Dam to include known breeding and foraging areas.

- Extension of existing protected areas where these species occur.
- Funding can be donated to existing projects that aim to protect and conserve *H. atrocaerulea* habitat.
- Existing landowners can be guided to improve the preferred habitat by managing grazing plans for cattle and to prevent areas from being burnt too frequently or infrequently.

Gnomeskelus fluvialis

- The protection of riparian forest which is planned on a like for like basis will address the potential impacts on *Gnomeskelus fluvialis* (Riverine Keeled Millipede).
- Not only will these riparian forests be conserved, but through programs such as Working for Water the condition of these areas can be improved and leaf litter which is utilized by this species be maintained.

WATERCOURSE AND BIODIVERSITY STUDY

PHASE TWO

During Phase 2 of the Biodiversity Offset study, four potential target sites will be further investigated to ascertain the overall viability of each site for the above mentioned offset requirements. This investigation will include the following:

1	Landowner engagement and project buy-in.
2	Potential offset target site investigation of the opportunities and constraints of the proposed offset sites
3	A high-level risk assessment for these sites, and formulation of a strategy to reduce risks
4	Define site-level objectives, targets and interventions for the offset strategy
5	Define measurable outcomes and a monitoring program for the offsets
6	Develop time frames and budget estimates for the offset strategy
7	Establish performance auditing and reporting requirements

All information pertaining to the rollout of the offset as part of Phase 2 will be compiled into one report and submitted to the relevant authorities for comment and approval. All proposed project outcomes and interventions will be presented to the key authority stakeholders for comment before submission.

Furthermore, we hereby invite any Interested and Affected Parties (I&APs) to address any queries or comments to the contact persons defined below.

FOR MORE INFORMATION CONTACT:

Scientific Aquatic Services
Stephen van Staden
011 678 7893
083 415 2356
Stephen@sasenvgroup.co.za
website
www.sasenvironmental.co.za

Nemai Consulting (Pty) Ltd
Donavan Henning
011 781 1730
082 891 0604
donavanh@nemai.co.za
website
www.nemai.co.za

ADDENDUM 2 – EMAIL CORRESPONDENCE

Example of Email to Landowners

Dear Mr Mouton,

Thank you for your time on the phone earlier.
Please find attached the Background Information Document for the offset requirements for the proposed Smithfield Dam as well as the land balancing dam to be undertaken by the Department of Water and Sanitation (Please see attached 1:250 000 Topographical Map).

As discussed, we are currently commencing with the investigation of areas that can form part of the required **660 hectares of wetland habitat** and **2,836 hectares of terrestrial habitat** that forms part of the Offset requirements (a scaling up of between 5:1 through to 34:1 is applicable based on the relevant legislative requirements) for the inundation of 131,9 hectares of wetland habitat and 189 hectares of terrestrial habitat lost with the inundation of the proposed Smithfield Dam, Langa and Mbangweni Balancing Dams. Your property has been identified as a target site for wetland and terrestrial conservation initiatives in stewardship with the Department of Water and Sanitation.

The input from the Stewards will assist with Grassland and wetland management which will have the following benefits to you as the landowner:

- Assistance (financially and with labour and technical resources) to manage alien vegetation;
- Fire Control;
- Training on sustainable land use practice and especially grazing practice ;
- Expansion of grazing land by reducing the extent of alien vegetation and improving veld condition in some areas;
- Improvement of wetland conditions which increase water quality and quantity; and
- Potential increased opportunities for eco-tourism.

Based on today's discussion you expressed interest in potentially forming part of this stewardship and indicated you would be willing to engage further with the Department of Water and Sanitation on this matter in the near future.
Please could you response to this email if you are interested so we can include you to our offset contact list, which will be provided to the Department of Water and Sanitation.

We request that you please respond confirming your willingness to take place as soon as possible.

Stephen van Staden

Emails from Landowners and IAPS

From: Lewis Farming <admin@lewisfarming.co.za>
Sent: 25 April 2018 07:43 AM
To: Kim Marais <kim@sasenvgroup.co.za>
Subject: Re: Smithsfield Dam offset requirements - 17 April 2018

Hi Kim

I would be able to assist with the Offset requirements only if we were to get water rights for irrigation use in exchange.

Regards

Eric Lewis
Lewis Farming

NA

Tue 4/24/2018 7:48 AM

Nirvana Ahir <nirvanaahir25@gmail.com>

Re: Smithsfield Dam offset requirements - 18 April 2018

To Kim Marais

You forwarded this message on 4/24/2018 9:06 AM.

image001.jpg
.jpg File

I am interested.

On Wed, 18 Apr 2018, 16:00 Kim Marais <kim@sasenvgroup.co.za> wrote:

GD

Tue 4/24/2018 12:04 PM

Glen, Douglas DM <Douglas.Glen@standardbank.co.za>

RE: Smithsfield Dam offset requirements - 17 April 2018

To Kim Marais

Dear Kim,

I confirm that I would be interested in the stewardship and would like to be included in the contact list.

Regards,

Douglas Glen.

Dear Stephen,

Thank you very much for your email. It was very informative, and put my mind at ease about some of the questions I had about stewardship.

If you are open to suggestions / criticism, I would like to make a few. Throughout, I shall provide reasons for my suggestions / criticism so that you can decide whether they are good / bad ideas.

1) I recommend that you try to get hold of Nikki Brighton (chairman@dargleconservancy.org.za) - the chairperson of the Dargle Conservancy. The Boston / Dargle community is very small, and already organized into groups. The Dargle Conservancy is one of them, and so is the Bostom Farmers' Association. The same people are in both groups. So I think it is fine to only contact one of them.

This conservancy is well connected with some of the other conservation movements - e.g. Mphophomeni environmental education. They have illustrated their efectiveness when they collaborated with other organizations to combat the whole fracking movement in the area. So in short - they stand together and get things done.

2) You are dealing with an extremely well-informed community. Here, I am specifically talking about the commercial farming community. I cannot say the same about the rural black community, simply because I do not know them.

Dealing with a well-informed community can be a good and bad thing. The good thing is that you do not have to rationalize or convince them that what you are doing (stewardship, among other things) is a good thing. They know we need water. (So yes, we need a dam.) They know we need conservation. They are aware of Blue Swallows - and one of the community members (Wendy Bullock - maiden name, married in the meantime) is actively involved in monitoring their nests.

Unfortunately for you, their 'well-informed-ness' can also make your life very difficult. The reason for this is because the benefits that you offer are (for the most part) not benefits that they need. I do not say this to offend you, and apologize if it does. Specific points are raised below.

Burning - this community generally know how and when to burn. Where there is too frequent or no fires, it is because of economic considerations, e.g. fire risk to forestry plantations or to neighbouring properties.

Grazing - they know how to graze. Where there is uncontrolled / unsustainable grazing, it is not lack of knowledge that it is the problem. Rather, it is uncontrolled grazing from neighbouring communities (e.g. iMpendle), the drought (lower grassland productivity, less grazing, lower carrying capacity), and too small farm sizes. There are people trying to make a living off a piece of land that is too small to sustain them, i.e. the farms are not economic units. Having said that, not all small farms should be excluded from consideration. For example, Christeen and Philip Grant own a property directly adjacent the iMpendle Road that they already manage as a Wildflower Reserve. I think they would be good potential stewards.

Alien invasive control - the main invasive plant in this area is American Bramble. This species can be controlled with herbicides, but treatment is only effective during a very small window of opportunity - when it flowers in spring. Again, I do not wish to insult you. But it is not knowledge about alien invasive species that is the problem. It is the small window of opportunity during which it needs to be treated. Frankly, I do not know if you have the capacity to treat alien invasive species during this window of opportunity. If you cannot treat bramble during this window, land owners will not extract a measurable benefit from alien control under stewardship agreements.

3) With all due respect, you are the consultants, but not the eventual entity (DWS) that this community will have to deal with. The question that is raised in my mind is whether DWS will have the capacity to deliver promised benefits into the future. A worst-case scenario in my mind is that the community will be bound by stewardship agreements, but not get any benefits simply because DWS does not have the capacity (expertise / financial resources) to help them. I respect the work that DWS does, but this is perhaps something to consider when drafting the Memorandums of Understanding.

What I do not see in the current documentation are the following:

1) Land claims. Do you have a record of them? Have you considered them? **Can stewardship help safeguard properties against land claims?** This can be a real benefit for land owners. I have heard rumors (unsubstantiated, but from legitimate sources) that there are Land Claims on iMpendle Nature Reserve and Mt Shannon Forestry Estate, among others. If these land claims go through, compliance with stewardship agreements is going to be the least of your problems.

2) The iMpendle (town) has increased by an order of magnitude in the last 10 years, and will probably continue to grow in the years to come. This has two implications: 1) uncontrolled grazing by community's cattle, and 2) more and more land claims on neighboring land.

Consider the example of the land opposite the tar road from Mphophomeni. This property was a commercial farm. For years, the owner struggled with illegal and uncontrolled (and uncontrollable) grazing by community cattle. I am not even sure who possesses that land any more. But for all practical extents and purposes, the farm was abandoned and it is now communal land ... even without the necessary legal processes. There is a very real possibility that the same can happen in iMpendle (town). Where does this leave stewardship agreements?

According to my understanding, stewardship agreements can only work where there is private land ownership. How compatible are stewardship agreements with the potential loss of land from private ownership, i.e. when private land is transferred to a community? If stewardship can only work on privately owned land, **is there a way to secure private land ownership?**

Also, will stewardship agreements be transferred when property exchanges hands, i.e. when a property (with a stewardship agreement in place) is sold to another private land owner?

3) Is there scope for an Grazing Education School, but operating and focusing on iMpendle (town) and other rural communities that are sources of free-roaming cattle along road verges? I honestly believe that the stewardship programme is doomed for failure if you do not engage neighbouring rural (black) communities too. There needs to be a measurable change to the way in which rural communities think about cattle (= wealth). Cattle numbers need to be reduced by selling them onto the open market, within a willing seller-willing buyer context.

I am asking these questions, because they are potentially some of the questions that could be raised by the Boston community. I do not want to cause trouble, or be difficult. I am in favour of stewardship of private land. I wish it can happen more often. But I see a disconnect between what is happening in planning offices, and the practical reality of what is happening on the ground. Without addressing practical challenges, stewardship will only be another piece of paper ending up in a drawer... without any real changes on the ground.

I wish you all the best with this endeavor.

Kindest regards,
Lise

Hi Stephen,

Thank you for the info and we are definitely interested and would also assist where possible in areas where our land holdings lie. I'm Looking forward to having a chat with you guys around the project.

Also please note my contact details below.

Kind regards

Patrick Belebese
Environmental Specialist - BU Midlands
Technical Department
South Africa Division

Mondi
Mondi House
380 Old Howick Road, Hilton, 3245
P.O. Box 39, Pietermaritzburg, 3200, South Africa
Tel: +27 (0)33 329 5449

Hi Stephen,

Thanks so much for getting back to me, I appreciate you taking the time.

I have just got off the phone with Caroline now and she's much happier and seems to have a better understanding of things. She seemed to know that the dam wasn't coming anywhere near Boston so I think she had just gotten a bit excited when I first spoke to her or maybe I completely misunderstood her seen as she was so agitated.

I have encouraged her to carry on telling her neighbours about the project but rather from the point of trying to get them involved.

I have explained that she can remain a interested party for now without making a permanent commitment and I suggested she email Kim and say just that. And I have also said that she can just say no. She also had these visions of people basically helping themselves to her property and gaining access whenever it suited them and pretty much just doing what they wanted when they wanted.

I did mention that there will be more information sharing opportunities in the future and that she would be able to have all her questions answered.

If you are able to let me know who else you have already contacted in the Boston area it would be very helpful.

The names that Lize had provided of Rob and Celia Speirs and Philip and Christeen Grant are very good suggestions. They are all very passionate and soil conservation is currently on Robs radar.

Please could you send me any relevant information to this project and I will see that it gets sent out to all our members as well as other landowners in the area.

Regards,
Kirsten Cromhout
Boston Farmers Association

Thu 5/3/2018 8:55 PM

moutonkobus1@gmail.com

Re:Smithfield Dam Biodiversity Offset and Stewardship Program

To Stephen van Staden

You replied to this message on 5/3/2018 9:13 PM.

Ma y thanks kobus

Sent from my Huawei Mobile

ADDENDUM 3 – MINUTES OF MEETINGS WITH DRDLR

NEMAI CONSULTING	**DRAFT MINUTES** **Department of Rural Development and Land Reform (DRDLR) Meeting**	**Queries:**	Donavan Henning ☎ 011 781 1730 🖷 011 781 1731 ✉ donavanh@nemai.co.za
Client Details:	water & sanitation	**Project Name:**	uMkhomazi Water Project Phase 1: Raw Water
Date:	23 February 2018	**Time:**	09:30 – 11:00
Chairperson:	Zama Molefe	**Venue:**	DRDLR Offices, 188 Hoosen Haffejee Street (Berg Street), Pmb

Note: These minutes are not intended as a verbatim transcript of the meeting, but rather as a summary of the salient discussions which took place.

Attendance
Refer to the completed Attendance Register contained in Appendix A.

Item.	**Description**	**Action**	**Target Date**
1.	**Welcome & Introduction**		
1.1	The meeting commenced at approximately 09:30. Z. Molefe facilitated the meeting and welcomed everyone present.	-	-
2.	**Adoption of the Agenda**		
2.1	The agenda was accepted without any amendments.	-	-
3.	**Purpose of the Meeting**		
3.1	D. Henning explained that the purpose of the meeting was to discuss the potential for considering Biodiversity Offsets on land administered by DRDLR, as required for the proposed uMkhomazi Water Project Phase 1 (uMWP-1). The meeting formed part of the Environmental Impact Assessment (EIA) for the aforementioned project.	-	-
4.	**uMWP-1 Biodiversity Offset**		
4.1	K. Bester presented the project background and provided an overview of the following infrastructure that forms part of the proposed uMWP-1 Raw Water component: • Smithfield Dam on the uMkhomazi River, near Bulwer in KZN; • uMkhomazi – uMlaza Tunnel; • Raw water pipeline; and • Balancing Dam on the Mbangweni River.	-	-
4.2	K. Bester mentioned that a Political Steering Committee and Technical Committee have been established for uMWP-1.	-	-
4.3	K. Bester indicated that the Final EIA Report for uMWP-1 Raw Water was submitted to the Department of Environmental Affairs (DEA) and it was subsequently rejected and additional information was requested. D. Henning explained that the reasons for the rejection primarily pertained to biodiversity concerns and the assessment of alternatives. He indicated that various additional specialist studies were initiated and	-	-

Item.	**Description**	**Action**	**Target Date**
	are underway to address DEA's concerns.		
4.4	D. Henning noted that DEA also requested that an Offset Feasibility Assessment be undertaken as part of the EIA, which needed to include (amongst others): • Identification of suitable offset sites for the loss of biodiversity associated with the proposed uMWP-1 Raw Water; • Offset measures to be implemented to allow for protection into perpetuity; • Proof of engagement with landowner/s and buy-in in terms of offsets; and • Budgeting requirements. He mentioned that in response a Biodiversity Offset Study was initiated for uMWP-1.	-	-
4.5	K. Gillit mentioned that land claims need to be taken into consideration. K. Bester explained the project life-cycle and indicated that land acquisition will be undertaken in accordance with the prevailing legislation.	-	-
4.6	D. Henning indicated that the following information pertaining to biodiversity offsets will be sent to DRDLR: • Description of biodiversity offsets; • Copy of presentation on biodiversity offset; and • Details of the properties administered by DRDLR, which are targeted for offsets.	D. Henning	01/03/18
4.7	Z. Molefe asked what would happen in those cases where there are settlements on the land under consideration for offsets. D. Henning indicated that in such instances the offsets could only focus on the wetlands on these properties, which could be secured through conservation servitudes. Wetlands are in any way protected and should not be encroached on by settlements. The remainder of the property would thus not be burdened by offsets. Z. Molefe indicated that a formal approval process would then need to be pursued if any changes were to be contemplated in the conservation servitude.	-	-
4.8	L. Steyn explained his understanding of offsets and that the Title Deeds of the earmarked properties would be encumbered by the offsets. D. Henning indicated that this allows for the formal protection of the offsets.	-	-
4.9	K. Gillit noted that the DRDLR administers the land where Smithfield Dam and the related infrastructure is to be built. D. Henning indicated that representatives from DRDLR were also notified during the EIA process.	-	-
4.10	Z. Molefe explained the concept of "beneficial occupiers", which are those people residing on the land that want full recognition of ownership.	-	-

Item.	Description	Action	Target Date
	K. Bester and D. Henning described the Public Participation conducted to date with regards to the Traditional Councils and occupiers of the land affected by the proposed project.		
4.11	Z. Molefe indicated that all information can be sent to her and that K. Gillit is to be copied in on all correspondence. She noted that they will await further information regarding biodiversity offsets and will then indicate what is required from DRDLR to take offsets further and the associated timeframes.	Z. Molefe	TBC
4.12	Z. Molefe stated that a letter needs to be provided by the project team which requests access to the DRDLR properties to undertake the fieldwork for the biodiversity offsets.	D. Henning	01/03/18
4.13	Z. Molefe stated that in the spirit of intergovernmental relations, the DRDLR is willing to let biodiversity offsets be considered on land administered by this Department. She indicated that a formal response in this regard would be forthcoming from the DRDLR once the information had been received.	Z. Molefe	TBC
5	**Other Matters**		
5.1	Z. Molefe provided an overview of the legal mandate and functions of the DRDLR.	-	-
6	**Closure**		
6.1	The meeting was concluded as approximately 11:00. K. Bester expressed his gratitude to the representatives from the DRDLR for the fruitful discussions.	-	-

APPROVAL OF MINUTES

Minutes approved by: Department of Rural Development and Land Reform

________________ ________________

(Zama Molefe) Date

Minutes compiled by: Nemai Consulting

________________ 26 April 2018

(D. Henning) Date

APPENDIX A

COMPLETED ATTENDANCE REGISTER

rural development
& land reform

Department:
Rural Development and Land Reform
REPUBLIC OF SOUTH AFRICA

ATTENDANCE REGISTER

23rd FEBRUARY 2018

MEETING REGARDING UMKHOMAZI WATER PROJECT

Held at Department of Rural Development and Land Reform, 188 Hoosen Haffejee Street, Pietermaritzburg

NO.	NAME:	DEPARTMENT:	CONTACT DETAILS:	E-MAIL ADDRESS:	SIGNATURE:
1.	Lucas Steyn	DRDLR	033 3554323	lucas.steyn@drdlr.gov.za	
2.	Kevin Gillitt	DRDLR	033 [illegible]	kevin.gillitt@drdlr.gov.za	
3.	Kobus Bester	DWS	012 3368071	besterk@dws.gov.za	
4.	Donovan Henning	Nemai Consulting	[illegible]	donovanh@nemai.co.za	
5.	Zama Molefe	DRDLR	0825715712	zama.molefe@drdlr.gov.za	
6.					
7.					
8.					
9.					
10.					
11.					

NEMAI CONSULTING	**DRAFT MINUTES** **Department of Rural Development and Land Reform Follow-Up Meeting**	**Queries:**	Donavan Henning ☎ 011 781 1730 🖷 011 781 1731 ✉ donavanh@nemai.co.za
Client Details:	water & sanitation Department: Water and Sanitation REPUBLIC OF SOUTH AFRICA	**Project Name:**	uMkhomazi Water Project Phase 1 (uMWP-1): Raw Water
Date:	23 May 2018	**Time:**	09:30 – 10:30
Chairperson:	Zama Molefe	**Venue:**	DRDLR Offices, 188 Hoosen Haffejee Street (Berg Street), Pmb

<u>Note:</u> *These minutes are not intended as a verbatim transcript of the meeting, but rather as a summary of the salient discussions which took place.*

Attendance
Refer to the completed Attendance Register contained in Appendix A.

Item.	Description	Action	Target Date
1.	**Welcome & Introduction**		
1.1	The meeting commenced at approximately 09:30. Z. Molefe facilitated the meeting and welcomed everyone present.	-	-
2.	**Adoption of the Agenda**		
2.1	The agenda was accepted without any amendments.	-	-
3.	**Purpose of the Meeting**		
3.1	D. Henning explained that the aims of the meeting were as follows: 1. To present the findings of the Biodiversity Offset Study for the proposed uMkhomazi Water Project Phase 1 (uMWP-1). The meeting formed part of the Environmental Impact Assessment (EIA) for the aforementioned project; and 2. To determine what is needed to obtain buy-in from the Department of Rural Development and Land Reform (DRDLR) for offsets to take place on land administered by this Department.	-	-
4.	**Confirmation of Previous Minutes – 23 February 2018**		
4.1	The status of the actions arising from the previous meeting held on 23 February 2018 is captured below.	-	-

Item No.	Description	Action	Status
4.6	Provide information pertaining to biodiversity offsets to DRDLR.	D. Henning	Closed
4.11	Indicate what is required from DRDLR to take offsets further, with an indication of the associated timeframes.	Z. Molefe	Open
4.12	Provide a letter which requests access to the DRDLR properties to undertake the fieldwork for the biodiversity offsets.	D. Henning	Closed
4.13	Formal response required from DRDLR in terms of offsets.	Z. Molefe	Open

Item.	Description	Action	Target Date
4.2	D. Henning indicated that items no. 4.11 and 4.13 mentioned in the above table would form part of the way forward following the meeting.	-	-
4.3	The minutes were approved and signed off by Z. Molefe.	-	-
5.	**Update on uMWP-1 Biodiversity Offsets**		
5.1	D. Henning indicated that the Addendum to the Final EIA Report for uMWP-1 Raw Water is currently being compiled, which aims to address the comments received from the Department of Environmental Affairs (DEA).	-	-
5.2	S. van Staden presented an overview of the Biodiversity Offset Study for uMWP-1. He explained the measures and interventions that are planned as part of the offsets to improve the conservation value of the recipient sites. He stated that the offset targets areas are based on the loss of Critical Biodiversity Areas, Ecological Support Areas, wetlands, riparian areas and habitat for species of conservation concern as a result of the proposed uMWP-1. He further mentioned that the mechanism to secure the offsets is to seek Stewardship status of the earmarked land, which would require agreements to be entered into with the affected landowners. He noted that the offset areas needed to be managed for 30 years and protected for 99 years.	-	-
5.3	K. Bester explained that the offset would be similar to a 'soft' servitude.	-	-
5.4	S. van Staden indicated that the advantages of offsets to DRDLR and the occupants of the land include the following: • The offset areas can serve as firebreaks; • The offset would contribute towards erosion control; • As part of the offsets, invasive alien species could be controlled; and • Support could be provided for sustainable grazing practices.	-	-
5.5	Z. Molefe stated that the status of the land claims relevant to specific properties needed to be considered. S. van Staden indicated that the land claims for proposed offset areas were confirmed by DRDLR. D. Henning indicated that the study assumed that offsets could still be considered for properties that are subject to land claims. Z. Molefe confirmed that this land could still be considered, however, due process still needed to be followed.	-	-
5.6	D. Henning indicated that further information will be provided to DRDLR in terms of the specific properties targeted and the implications of offsets.	SAS Environmental	TBC
5.7	D. Henning emphasised the need to obtain a formal response from DRDLR indicating the Department's agreement in principle for biodiversity offsets to be considered for land under their administration, as well as a list of their requirements in this regard.	DRDLR	TBC
5.8	Z. Molefe asked how state-owned land would be acquired for the proposed Smithfield Dam. K. Bester explained that land acquisition will take place in terms of the	DWS & DRDLR	TBC

Item.	Description	Action	Target Date
	prevailing legislation. He noted that in the case of dwellings that needed to be relocated as a result of the dam, all affected parties needed to be the same or better off following resettlement. Z. Molefe stated that an agreement was required between DWS and DRDLR in terms of the disposal of land for the purposes of the project. K. Bester mentioned that if approval is granted, the project will be handed over to an Implementing Agent who would undertake the requisite land acquisition process. He noted that he would enquire with the DWS Land Matters unit regarding the process of acquiring land from another Department.		
5.9	S. van Staden mentioned that a meeting is scheduled with private landowners in the Boston area to discuss potential offsets on their land. He noted that they may enquire about the influence of offsets on land claims. Z. Molefe indicated that the land claims will remain in place regardless of the offsets. She stated that the conservation servitude would then be registered to the Title Deed, as with other servitudes. L. Steyn mentioned that if you intended to change a servitude you needed to follow the appropriate process, which would also apply to the offset area.	-	-
6	**Other Matters**		
6.1	No other matters were discussed.	-	-
7	**Closure**		
7.1	The meeting was concluded as approximately 10:30.	-	-

APPROVAL OF MINUTES

Minutes approved by: Department of Rural Development and Land Reform

(Zama Molefe) Date

Minutes compiled by: Nemai Consulting

4 June 2018

(D. Henning) Date

APPENDIX A

COMPLETED ATTENDANCE REGISTER

rural development
& land reform

Department:
Rural Development and Land Reform
REPUBLIC OF SOUTH AFRICA

ATTENDANCE REGISTER

23rd MAY 2018

FOLLOW UP MEETING REGARDING UMKHOMAZI WATER PROJECT

Held at Department of Rural Development and Land Reform, 188 Hoosen Haffejee Street, Pietermaritzburg

NO.	NAME:	DEPARTMENT:	CONTACT DETAILS:	E-MAIL ADDRESS:	SIGNATURE:
1.	Donavan Henry	Nemai	082 791 0604	donavanh @ nemai.co.za	
2.	Manisha Maharaj	DWS	031 3362750	maharajm@dws.gov.za	
3.	Kobus Bester	DWS	012 3368071	~~kobus~~ besterk @ dws.gov.za	
4.	stephen van Staden	SAS	011 616 7893	stephan@sasenvgroup.co.za	
5.	Zama Molefe	DRDLR	0825775712	zama.molefe@ drdlr.gov za	
6.	Karin Gillitt	DRDLR	033-3554300	karin.gillitt@drdlr. gov za	
7.	Lucas Steyn	DRDLR	033 3554322	lucas.steyn @ drdlr.gov.za	
8.					
9.					
10.					
11.					

ADDENDUM 4 – RECORDAL OF MEETINGS WITH POTENTIAL OFFSET LOCALITY OWNERS

The following points summarise the discussions and outcomes of the meeting at A on the 23rd of May at 2:00pm at the Boston Country club between the consultants and potential offset target site land owners.

- In the meeting the need for the Smithfield and associated balancing dam was presented along with the findings of the Biodiversity and compensation initiative to date;
- Several questions were raised considering how the offset initiatives were arrived at and how the roll out of the offset and compensating initiative would be rolled out;
- Queries on alternatives besides supply management such as demand management were raised;
- These questions were addressed as best possible;
- The key outcomes of the meeting were that the land owners wanted to understand the benefits and the risks to them if they consent to the landowners. This was discussed and it was agreed that each landowner would receive a map of their property indicating the targeted wetlands and CBA's for offsetting along with a presentation of information indicating the advantages and disadvantages of each landowner for partially hosting the offset.

Scientific Aquatic Services
Applying science to the real world

29 Arterial Road West, Oriel, Bedfordview, 2007
Tel 011 616 7893
Fax 011 615-6240
admin@sasenvgroup.co.za
www.sasenvgroup.co.za

Attendance register

Project name: __________
Type of meeting: __________
Date: __________
Meeting Venue: __________

Name	Department / Company	Contact number	Email address	Signature
Kobus Bester	DWS	012 336 8071	bestk@dws.gov.za	[illegible]
Manisha Maharaj	DWS	031 336 2750	maharajm@dws.gov.za	[illegible]
Donavan Henry	NCPW	032 9411 0604	donavanh@ncpw.co.za	[illegible]
Karin Gillitt	DRDLR	033 3554300	karin.gillitt@drdlr.gov.za	[illegible]
Lucas Steyn	DRDLR	033 3554322	lucas.steyn@drdlr.gov.za	[illegible]
Zama Molefe	DRDLR	033-355 4300	zama.molefe@drdlr.gov.za	[illegible]
Stephen van Staden	SAS	011 616 7893	stephan@sasenvgroup.co.za	[illegible]

Scientific Aquatic Services

Applying science to the real world

29 Arterial Road West, Oriel, Bedfordview, 2007
Tel 011 616 7893
Fax 011 615-6240
admin@sasenvgroup.co.za
www.sasenvgroup.co.za

Attendance register

Project name:
Type of meeting:
Date:
Meeting Venue:

Name	Department / Company	Contact number	Email address	Signature
CAROLINE McKERROW	STORMY HILL HORSE TRAILS	0741927787	CAROLINE@EASTCOAST.CO.ZA	
Peter Price	Rainbow Lakes	084-6222274	peterprince@telkomsa.net	
Noel McLean	Elvesida Farm	0722592081	info@elvesida.co.za	
Donavan Henry	Nemai Consulting	082 841 0604	donavanh@nemai.co.za	
Kirsten Cronshaw	BFA / Booth George	082 488 9982	kirsten.george@yahoo.com	
Greg Martindale	Conservation Outcomes	082 804 4412	greg@conservation-outcomes.org	

Scientific Aquatic Services
Applying science to the real world

29 Arterial Road West, Oriel, Bedfordview, 2007
Tel 011 616 7893
Fax 011 615-6240
admin@sasenvgroup.co.za
www.sasenvgroup.co.za

Attendance register

Project name: ____________________
Type of meeting: ____________________
Date: ____________________
Meeting Venue: ____________________

Name	Department / Company	Contact number	Email address	Signature
SENZELE MHLUNGU	KWETHU	082 371 8340	SENZEM@UMPHEME.CO.ZA	
ELIZABETH MHLUNGU	KWETHU	0822138908	elizabethm@umpheme.co.za	
Kobus Beyer	DWS	012 336 8071	beyerk@dws.gov.za	
SUE BRIGHTON	LAND OWNER - BOSTN	083 6560979	btparty@telkomsa.net	
Steve McKean	Conservation Outcomes	082 7221193	steve@conservation-outcomes.org	
Rob Speirs	Representing JWD Challerton	072 6959100	speirsrob@gmail.com	
Manisha Maharaj	DWS	031 336 2750	maharajm@dws.gov.za	
R.P. GELDART	BOSTON VIEW FARM	082 5277573	rgeldart@vodamail.co.za	
G.R. BULLOCK	HARMONY - BOSTON	084 3049842	gr.bullock@telkomsa.net	
W. R. MULLER	FAIRVIEW - BOSTON	0837089748	WRMULLER@NKAGRI.COM	
PHILIP GRANT	SITAMANI - BOSTON	082 4179163/2	pjcsgrant@gmail.com	
Ntokozo Sosibo	Umgeni Water	073 902 8804	ntokozo.sosibo@umgeni.co.za	
KHOLEKILE MBANGA	FARMER	0829972657	cosmokem@gmail.com	

REVISED BID DOCUMENT SENT TO LAND OWNERS

uMKHOMAZI WATER PROJECT Phase 1

BIODIVERSITY & WETLAND OFFSET INITIATIVE

uMKHOMAZI WATER PROJECT PHASE 1 (uWMP-1)

INFORMATION DOCUMENT

Compiled by: Scientific Aquatic Services

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

BACKGROUND

The current water resources of the Integrated Mgeni Water Supply System (WSS) in KwaZulu-Natal (KZN) are insufficient to meet the long-term requirements of the system. The uMkhomazi Water Project - Phase 1 (uMWP-1) proposes the transfer of water from the undeveloped uMkhomazi River to the existing Mgeni system to address these water requirements.

The proposed infrastructure associated with uMWP-1 project comprises, amongst others, of a new dam at Smithfield (± 80m high wall) on the uMkhomazi River, water conyenace infrastructure, including ±32,5 km long tunnel and pipeline to a balancing dam (preferred option referred to as the Langa Dam) at Baynesfield Estate.

The project area is situated in the southern part of KZN. The majority of the project area falls within the uMgungundlovu District Municipality (including the Impendle Local Municipality, The Msunduzi Local Municipality, Richmond Local Municipality and Mkhambathini Local Municipality). Smithfield Dam falls under Traditional Authority and state-owned land. The eastern part of the project area, which includes the balancing dam, is privately owned.

EIA PROCESS

Nemai Consulting (Pty) Ltd is undertaking the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) (DEA Ref: 14/12/16/3/3/3/94 – Smithfield Dam; 14/12/16/3/3/3/94/2 – balancing dam; 14/12/16/3/3/3/94/1 – water conveyance infrastructure).

In consideration of the various specialist studies, the need for a wetland and biodiversity offset and biodiversity compensation plan was identified. Scientific Aquatic Services was appointed to initiate the Biodiversity Offset Study in November 2017 and completed preliminary investigations in early 2018.

Contents of this Document

BIODIVERSITY OFFSETTING DEFINED

According to the Department of Environmental Affairs (2017) biodiversity offsets are defined as *"conservation measures designed to remedy the residual negative impacts of development on biodiversity and ecological infrastructure, once the first three groups of measures in the mitigation sequence have been adequately and explicitly considered (i.e. to avoid, minimise and rehabilitate / restore impacts). Offsets are the 'last resort' form of mitigation, only to be implemented if nothing else can mitigate the impact."*

OFFSET REQUIREMENTS

PHASE ONE

Based on the initial specialist studies undertaken as part of the EIA, as well as well as the further species-specific specialist studies, it was determined that the following offsets are required:

- Wetland, riparian and instream (collectively referred to as "watercourse") offsets.
- Terrestrial biodiversity offsets of areas designated as Critical Biodiversity Areas.
- Species-specific compensation (for loss of habitat).

WATERCOURSE OFFSET REQUIREMENTS

The recommended offset ratios as advocated by DEA (2017) (20:1 ratio) is considered onerous due to the inherent risks associated with securing sufficient land, thus a target wetland offset ratio of 11:1 with a commitment to a minimum offset ratio of 5:1 has been proposed to the competent authority. This will result in the following:

a. For **Smithfield Dam** the wetland target is 11:1 with a minimum offset ratio of 5:1 which will lead to the conservation of 248 ha.
b. For the **Langa Balancing Dam** the wetland target is 11:1 with a minimum offset ratio of 5:1 which will lead to the conservation of 176 ha.
c. For the **Mbangweni Balancing Dam** the wetland target is 11:1 with a minimum offset ratio of 5:1 which will lead to the conservation of 236 ha.
d. Since no guidelines are available with respect to **offsetting riverine systems** and their associated riparian zones, it is proposed that the portion of the uMkhomazi River which will be affected by the Smithfield Dam be offset on a like for like basis with active and ongoing management and rehabilitation of 17km of the uMkhomazi River and larger tributaries in the area.

A minimum of 660 hectares of wetland habitat to be conserved. Total of 17 km of River to be rehabilitated.

BIODIVERSITY OFFSET REQUIREMENTS

The following offset ratios have been proposed to the competent authority – a 13:1 ratio for irreplaceable Critical Biodiversity Areas (CBAs), a 11:1 ratio for all Optimal CBAs within the Smithfield Dam and a 34:1 ratio for all irreplaceable CBAs within the Baynesfield area:

a. For the **Smithfield Dam** the CBA terrestrial habitat (29,45 ha irreplaceable CBA and 129,22 ha optimal CBA) target is will lead to the conservation of 1804 ha.
b. For the **Langa Balancing Dam** the CBA terrestrial habitat (14,76 irreplaceable only) will lead to the conservation of 501 ha.
c. For **Mbangweni Balancing Dam** the CBA terrestrial habitat (15,59 irreplaceable only) will lead to the conservation of 530 ha.

Total of 2 836 hectares of terrestrial habitat to be conserved.

SPECIES SPECIFIC OFFSETS

Pennington's Protea Butterfly

a. *Protea caffra* is the main food source for the protected *Capys penningtoni* (Pennington's Protea butterfly) thus conservation of these trees is important.
b. The proposed compensation for lost *P. caffra* will be to cultivate these plants from seeds collected from the area and/or cuttings to a ratio of 30:1 for every individual that is lost.
c. The cultivated *P. caffra* will be planted above the full supply level of the dam and in areas where no further disturbance will take place.
d. Funding and a monitoring program will be implemented to monitor the effective rehabilitation.

Blue Swallow

a. Nesting sites for *Hirundo atrocaerulea* (Blue Swallows) have been identified and will be lost.
b. Surrounding areas as part of the offset will be utilized and managed in such a way as to promote preferred nesting habitat for this species and to support their foraging. This will include, but not be limited to:
   - Extending the purchase line of the Langa or Mbangwini Balancing Dam to include known breeding and foraging areas.

- Extension of existing protected areas where these species occur.
- Funding can be donated to existing projects that aim to protect and conserve *H. atrocaerulea* habitat.
- Existing landowners can be guided to improve the preferred habitat by managing grazing plans for cattle and to prevent areas from being burnt too frequently or infrequently.

Riverine Keeled Millipede

- The protection of riparian forest which is planned on a like for like basis will address the potential impacts on *Gnomeskelus fluvialis* (Riverine Keeled Millipede).
- Not only will these riparian forests be conserved, but through programs such as Working for Water the condition of these areas can be improved and leaf litter which is utilized by this species be maintained.

WHAT THIS MEANS FOR YOU AS A LANDOWNER

ADVANTAGES

1. Funded development of site specific ecological management plans by technically skilled personnel;
2. Funding, technical knowledge and manpower for erosion management and stabilisation of river banks;
3. Funding, technical knowledge and manpower for alien vegetation control;
4. Funding, technical knowledge and equipment to improve grazing land quality;
5. Assistance on implementing sustainable yet (more) profitable grazing;
6. Improved Eco-tourism opportunities;
7. If correctly proclaimed can lead to rates and taxes rebates;
8. The Conservation servitudes over the land will assist in protection against other land uses such as mining as well as potentially discouraging land claims on properties; and
9. An opportunity to do good for the environment and contribute to sustainable development and species conservation

DISADVANTAGES

1. Within areas under stewardship only low impact, low density development can take place. No intensive agriculture or forestry can take place;
2. Landowners will be required to allow access to their property for persons undertaking physical work which may be a source of irritation and has a low risk of posing a safety risk;
3. Potential damage to fences and grazing land (trampling) although this is contrary to the objective; and
4. Some disagreement over sustainable grazing practices within the CBAs may occur.

THE WAY FORWARD

With this notice a map of the areas targeted on each land portion has been highlighted (both wetlands and CBAs). Once approval for the project has been obtained, the Biodiversity Offset Program will be initiated and the MOUs developed with each landowner along with the Management Plan. The agreements will be largely generic but land parcel specific conditions can be implemented.

We hereby invite all landowners considering participation in the stewardship program to confirm willingness to form part of the Stewardship program on the attached form or address any queries or comments to the contact persons defined below.

FOR MORE INFORMATION CONTACT:

Scientific Aquatic Services
Stephen van Staden
011 678 7893
083 415 2356
Stephen@sasenvgroup.co.za
website
www.sasenvironmental.co.za

Nemai Consulting (Pty) Ltd
Donavan Henning
011 781 1730
082 891 0604
donavanh@nemai.co.za
website
www.nemai.co.za