water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

PROPOSED UMKHOMAZI WATER PROJECT PHASE 1

Raw Water Component

ADDENDUM TO
FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

DRAFT

July 2018

DEA Ref. No.:	• Smithfield Dam - **14/12/16/3/3/3/94** • Water Conveyance Infrastructure - **14/12/16/3/3/3/94/1** • Balancing Dam - **14/12/16/3/3/3/94/2**

EXECUTIVE SUMMARY

The uMkhomazi Water Project Phase 1 proposes the transfer of water from the undeveloped uMkhomazi River to the existing Integrated Mgeni Water Supply System to fulfil the long-term water requirements of this system. The uMkhomazi Water Project Phase 1 consists of both Raw Water and Potable Water components, which are being undertaken by the Department of Water and Sanitation and Umgeni Water, respectively.

The uMkhomazi Water Project Phase 1 Raw Water Component consists of the following proposed infrastructure:

- Smithfield Dam on the uMkhomazi River;
- The uMkhomazi – uMlaza Tunnel;
- The Tunnel – Balancing Dam – Baynesfield Pipeline; and
- Langa Balancing Dam on the Mbangweni River.

The uMkhomazi Water Project Phase 1 Potable Water Component consists of the following proposed infrastructure:

- Water Treatment Works and water reservoir in the uMlaza River valley; and
- Gravity pipeline.

The process for seeking Environmental Authorisation for the proposed uMkhomazi Water Project Phase 1 in terms of the National Environmental Management Act (Act No. 107 of 1998) is being undertaken in accordance with the Environmental Impact Assessment Regulations of 2010 (Government Notice No. R. 543 of 18 June 2010). This Document serves as an Addendum to the Final Environmental Impact Assessment Report for the proposed uMkhomazi Water Project Phase 1 Raw Water Component. It aims to provide additional information requested by the Department of Environmental Affairs following the review of the Final Environmental Impact Assessment Report, to allow for the decision-making process to be completed.

A letter (dated 13 February 2017) was received from the Department of Environmental Affairs that rejected the Final Environmental Impact Assessment Report (November, 2016) for uMkhomazi Water Project Phase 1 Raw Water and requested additional information. In response, the following additional work was undertaken, which is presented in this Addendum to the Final Environmental Impact Assessment Report, to address the comments received from the Department of Environmental Affairs:

- The following additional specialist studies were undertaken, based on the project's potential to cause adverse impacts to species of conservation significance –
  - The **Noise Impact Assessment** determined the ambient sound levels in the area, potential worst-case noise rating levels and the potential noise impacts that the project may have on the surrounding sound environment (with a focus on Blue Swallows) and identified mitigation measures.

- The **Vibration Impact Assessment** evaluated the background vibrations, identified and described the key sensitive receptors (with a focus on Blue Swallows), explained ground vibration mechanisms, compared ground vibration thresholds against expected values and discusses mitigation measures.
- The **Avifauna Bridging Study** built on the initial Avifauna Specialist Study that was undertaken as part of the Environmental Impact Assessment. It primarily addressed several areas of concern and uncertainty identified during the initial Avifauna Specialist Study, especially as relates to the 'Critically Endangered' Blue Swallows. These areas of concern mainly relate to: (1) the location of the balancing dam options on Baynesfield Estate, and their impact on Blue Swallow mist-belt grassland habitat in the eastern part of the project area; (2) potential negative impacts caused by vibration from tunnel drilling on Blue Swallow nests; and (3) the impact of re-aligning Provincial Road R617 at Smithfield Dam in the western part of the project area on the nearby Impendle Nature Reserve and its breeding Blue Swallow population. The Avifauna Bridging Study also critically assessed the Noise and Vibration Impact Assessments.
- The **Invertebrate Impact Assessment** was undertaken to determine the presence of the endangered Pennington's Protea Butterfly and the endemic Riverine Keeled Millipede along suitable habitat within the dam basin of the proposed Smithfield Dam and below its Full Supply Level, and the R617 deviation. This study further assessed the potential impacts of the proposed project on these threatened invertebrate species and suggested suitable mitigation measures.

❖ A **Biodiversity Offset Study** was undertaken to determine the feasibility of compensating for significant residual adverse biodiversity impacts arising from the proposed uMkhomazi Water Project Phase 1 Raw Water Component. The Biodiversity Offset Study investigated the offsets required (including ratios, recipient sites and budgets) for the loss of riparian zones, wetlands, Critical Biodiversity Areas and habitat for faunal Species of Conservation Concern associated with the proposed Smithfield Dam and balancing dam options. The Biodiversity Offset Study concluded with a Biodiversity Offset Implementation Plan, which consists of the institutional arrangements, offset and compensation budget, implementation plan as well as specific implementation measures (amongst others).

❖ Additional Engineering Investigations were undertaken regarding the re-alignment options of the R617 with the objective of identifying other route options that do not encroach into the Impendle Nature Reserve. Three (3) new route options were identified and investigated taking into account the topography, river crossings, the affected communities, as well as sensitive environmental features. A motivation is provided for seeking authorisation for a corridor for the R617 realignment, with accompanying environmental conditions and measures to safeguard, or manage, impacts to sensitive environmental features that may be encountered within the proposed R617 realignment corridor;

❖ A comparative analysis was undertaken of the alternatives for the following proposed project components –

- R617 deviation;
- Raw Water Conveyance Tunnel; and

- Balancing Dam on the Baynesfield Estate.

The Pre-Construction and Construction Environmental Management Programme was amended, as necessary, to include the mitigation measures that emanated from the required additional investigations and specialist studies.

This Addendum to the Final Environmental Impact Assessment Report culminates with conclusions and recommendations, based on the key outcomes of the additional work that was undertaken.

TITLE AND APPROVAL PAGE

Project Name:	***Proposed uMkhomazi Water Project Phase 1 - Raw Water Component***
Report Title:	***Addendum to Final Environmental Impact Assessment Report***
Authors:	***D. Henning, N. Naidoo***
Authority reference no.:	• Smithfield Dam - **14/12/16/3/3/3/94** • Water Conveyance Infrastructure - **14/12/16/3/3/3/94/1** • Balancing Dam - **14/12/16/3/3/3/94/2**
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AMENDMENTS PAGE

Date	Nature of Amendment	Amendment No.	Signature
05 July 2018	Draft for Authorities and Public Review	0	

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LIST OF ACRONYMS & ABBREVIATIONS

BID	Background Information Document
BPEO	Best Practicable Environmental Option
CBA	Critical Biodiversity Area
DEA	Department of Environmental Affairs
DEADP	Department of Environmental Affairs and Development Planning
DRDLR	Department of Rural Development and Land Reform
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
EARES	Enviro-Acoustic Research
ECBA	Economic Cost Benefit Analysis
EDTEA	Economic Development, Tourism and Environmental Affairs
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EIS	Ecological Importance and Sensitivity
EKZNW	Ezemvelo KZN Wildlife
EMPr	Environmental Management Programme
ESAs	Ecological Support Areas
EWT	Endangered Wildlife Trust
FSL	Full Supply Level
GN	Government Notice
GPS	Global Positioning System
I&APs	Interested and Affected Parties
IEM	Integrated Environmental Management
KZN	KwaZulu-Natal
LSU	Large Stock Unit
MOL	Minimum Operating Level
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystems Priority Areas
NGOs	Non-governmental Organisations
NPAES	National Protected Areas Expansion Strategy
NT	National Treasury
PES	Present Ecological State
PPP	Public Participation Process
PSP	Professional Services Provider
RAP	Relocation Action Plan

REC	Recommended Ecological Category
RFP	Relocation Framework Plan
RL	Reduced Level
SA	South Africa
SANBI	South African National Biodiversity Institute
SANS	South African National Standard
SCC	Species of Conservation Concern
SIA	Social Impact Assessment
SWOT	Strength Weakness Opportunity Threat
TCTA	Trans-Caledon Tunnel Authority
ToR	Terms of Reference
TBM	Tunnel Boring Machine
uMWP	uMkhomazi Water Project
uMWP-1	uMkhomazi Water Project Phase 1
URV	Unit Reference Value
VAT	Value Added Tax
WSS	Water Supply System
WULA	Water Use Licence Application
WWF	World Wildlife Fund
WTW	Water Treatment Works

LIST OF UNITS AND SYMBOLS

dBA	Decibel (expression of the relative loudness of the A-weighted sound level in air)
Ha	Hectare
kg	Kilogram
km	Kilometer
km/h	Kilometer per hour
m	Metre
m^3	Cubic metres
m^3/s	Cubic metres per second
masl	Metres above sea level
mm/s	Millimeter per second
PPV	Peak Particle Velocity
R	Rand (South African)

1 PURPOSE OF THIS DOCUMENT

This Document serves as an Addendum to the Final Environmental Impact Assessment (EIA) Report (November, 2016) for the proposed uMkhomazi Water Project Phase 1 (uMWP-1) Raw Water Component. It aims to provide additional information requested by the Department of Environmental Affairs (DEA) following the review of the **Final EIA Report**, to allow for the decision-making process to be completed in terms of the National Environmental Management Act (NEMA) (Act No. 107 of 1998).

2 PROJECT BACKGROUND & OVERVIEW

The current water resources of the Integrated Mgeni Water Supply System (WSS) in KwaZulu-Natal (KZN) are insufficient to meet the long-term water requirements of the system. The uMWP-1 proposes the transfer of water from the undeveloped uMkhomazi River to the existing Mgeni WSS. This transfer scheme is deemed to be the most viable option to provide a large volume of water to fulfil the long-term water requirements of the Mgeni WSS.

The uMWP-1 consists of both Raw Water and Potable Water components, which are being undertaken by the Department of Water and Sanitation (DWS) and Umgeni Water, respectively (refer to a simplified diagrammatic representation of the overall transfer scheme in **Figure 1** below). Nemai Consulting was appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA for both components of the uMWP-1. This Document only focuses on the uMWP-1 Raw Water Component, as the DEA has not provided any comments yet on the **Final EIA Report** for the uMWP-1 Potable Water Component due to its interrelatedness with uMWP-1 Raw Water.

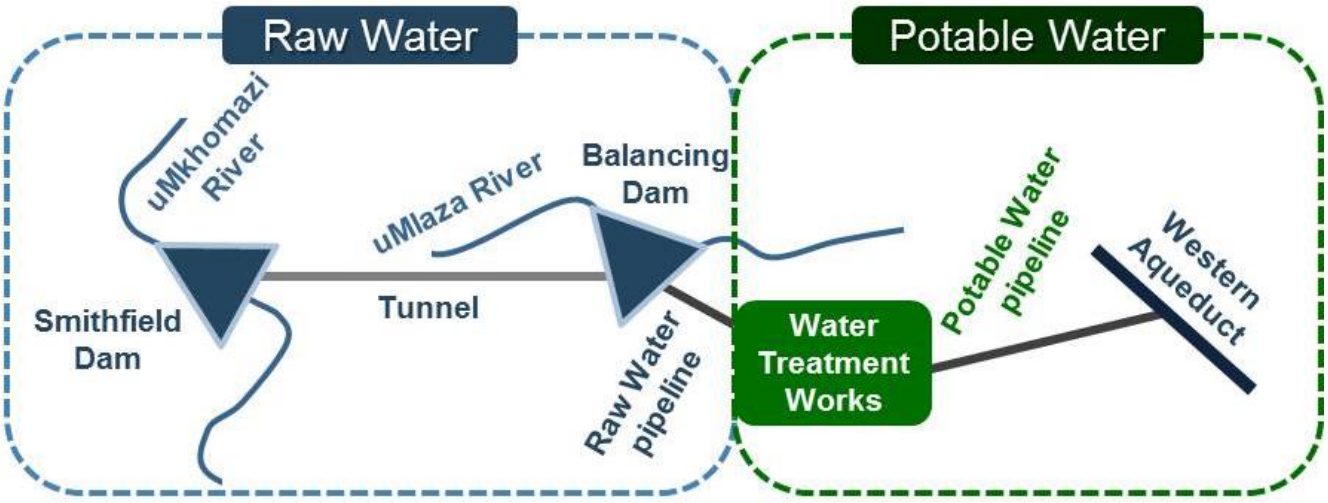

Figure 1: **Simplified Diagram of uMWP-1 Components**

The proposed uMWP-1 Raw Water Component consists of the following, based on the outcomes of the Feasibility Study undertaken by the DWS:

- Smithfield Dam (81 m high) on the uMkhomazi River, near Bulwer in KZN, with a Full Supply Level (FSL) of 930 masl;
- The uMkhomazi – uMlaza Tunnel, with a finished internal diameter of 3.5 m and a length of approximately 32.5 km;
- The Tunnel – Balancing Dam – Baynesfield Pipeline, with two sections of 2.6 and 1.6 m diameters and 5.2 and 1.3 km lengths, respectively; and
- Langa Balancing Dam (46.60 m high) on the Mbangweni River, with a FSL of 923 masl.

The proposed uMWP-1 Potable Water Component consists of the following, based on the outcomes of the Feasibility Study undertaken by Umgeni Water:

- Water Treatment Works (WTW) and water reservoir in the uMlaza River valley; and
- Gravity pipeline.

A detailed Technical and Financial Due Diligence Study will, however, be undertaken prior to project implementation, which will confirm the dam types, heights, crest lengths, FSLs, etc. The dimensions and specific information regarding the project infrastructure should thus be regarded as approximate, which may be refined and optimised as part of the final design phase. Nonetheless, the technical information presented in the **Final EIA Report (November, 2016)** and this Addendum was adequate to undertake an accurate and representative EIA. If any changes occur to the project design at a later stage the proponent will need to establish in consultation with the competent authority whether there are any substantive implications in terms of the receiving environment, as well as confirm the requirements of the relevant authorities in terms of the prevailing environmental governance framework.

3 PROJECT DOCUMENTATION

The following documentation is available on the DWS Project Website for uMWP-1 (http://www6.dwa.gov.za/iwrp/uMkhomazi/documents.aspx):

- Previous Studies –
  - Water Reconciliation Strategy Study for the KZN Coastal Metropolitan Areas, 2011;
  - Mkomazi/Mooi-Mgeni Transfer Scheme Pre-feasibility Study, 1999;
  - Umgeni Water Infrastructure Master Plan, 2010/11; and
  - Classification Study.
- Module 1: Technical Feasibility Study: Raw Water –
  - All reports compiled as part of the Technical Feasibility Study: Raw Water, including the reports used to source technical information for the purposes of the EIA;
- Module 2: Environmental Impact Assessment –
  - Raw Water – **Final EIA Report (November, 2016)**;
  - Potable Water – Final EIA Report (November, 2016);

- Module 3: Technical Feasibility Study: Potable Water –
  - All reports compiled as part of the Technical Feasibility Study: Potable Water, including the reports used to source technical information for the purposes of the EIA.

4 OVERVIEW OF THE EIA PROCESS

4.1 The Environmental Assessment to Date

The process for seeking Environmental Authorisation (EA) for the uMWP-1 in terms of NEMA is being undertaken in accordance with the EIA Regulations of 2010 (Government Notice (GN) No. R. 543 of 18 June 2010). Based on the types of activities involved, which include activities listed in GN No. R. 544, R. 545 and R. 546 of 18 June 2010, the requisite Environmental Assessment for the uMWP-1 is a Scoping and EIA Process. An outline of the EIA Process is provided in **Figure 2** below. In terms of NEMA the lead decision-making authority for the EIA is the DEA, as the project proponent (DWS) is a national department.

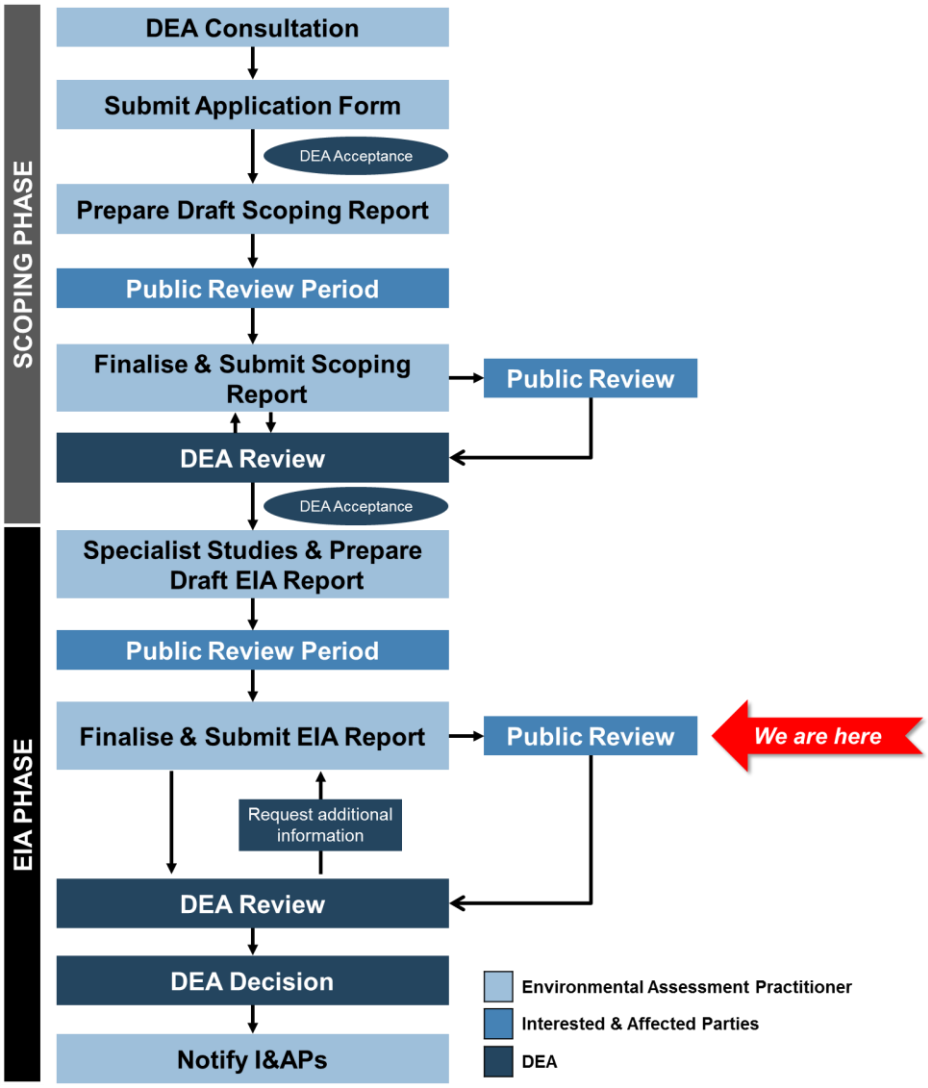

Figure 2: Outline of Scoping and EIA Process

Although separate EIAs are being conducted for the uMWP-1 Raw Water and Potable Water components, a combined Public Participation Process (PPP) was adopted due to the interrelationship between these two components and to provide Interested and Affected Parties (I&APs) with a holistic perspective of the overall project.

The following milestones have been reached as part of the Environmental Assessment to date:

1. A Pre-Application Consultation Meeting was convened with the DEA on 21 January 2013.
2. An initial Environmental Authorities Meeting and site visit were held on 14 February 2013.
3. An Integrated Application Form for Scoping and EIA was originally submitted to the DEA on 30 August 2013. Thereafter, it was deemed more appropriate to rather submit three (3) separate Integrated Application Forms for the following components of the uMWP-1 (DEA reference numbers provided) -
    - Smithfield Dam - 14/12/16/3/3/3/94;
    - Water Conveyance Infrastructure - 14/12/16/3/3/3/94/1; and
    - Balancing Dam - 14/12/16/3/3/3/94/2.
4. The uMWP-1 was announced through the distribution of a Background Information Document (BID), Reply Form and notification of I&APs via onsite notices, newspaper advertisements and public meetings in October 2014.
5. Amended Integrated Applications Forms, which re-considered the original list of activities applied for under the GN No. R. 544, 545 and 546 of 18 June 2010 and the new waste management activities under GN No. 921 of 29 November 2013, were appended to the Scoping Report.
6. A Draft Scoping Report, which conformed to Regulation 28 of GN No. R. 543 of 18 June 2010, was compiled. This document included the following salient information (amongst others):
    a. A Scoping-level impact assessment to identify potentially significant environmental issues for detailed assessment during the EIA Phase;
    b. Screening and investigation of feasible alternatives to the uMWP-1 for further appraisal during the EIA Phase; and
    c. A Plan of Study, which explained the approach to be adopted to conduct the EIA for the proposed uMWP-1.
7. Notification of review of the Draft Scoping Report was undertaken in July 2014. The Draft Scoping Report was lodged for review from 29 July - 08 September 2014.
8. Various public meetings were held in August 2014 to present the Draft Scoping Report.
9. An Environmental Authorities Meeting was held on 03 September 2014 to provide an overview of the draft Scoping Report.
10. A site visit was held with the DEA on 04 September 2014.

11. A Comments and Response Report was compiled (which was updated during the execution of the Scoping Process), which summarised the issues raised by I&APs and the Project Team's response to these matters.
12. The DEA issued approval for the Scoping Report on 26 March 2015, which allowed the commencement of the EIA Phase.
13. The Draft EIA Report was lodged for authorities' and public review from 04 July – 15 August 2016.
14. Various public meetings were held in July 2016 to present the Draft EIA Report.
15. The Final EIA Reports (Raw Water and Potable Water) were submitted to the DEA on 10 November 2016.
16. A Blue Swallow Working Group was established and the first meeting was convened on 12 September 2016. This group included the following parties:
    a. DEA;
    b. KZN Department of Economic Development, Tourism and Environmental Affairs (EDTEA);
    c. Ezemvelo KZN Wildlife (EKZNW);
    d. Birdlife SA;
    e. Endangered Wildlife Trust (EWT);
    f. Landowners (Baynesfield Estate and Trewirgie Farm);
    g. DWS;
    h. EIA Avifaunal Specialist; and
    i. EAP.
17. A follow-up meeting was held with the Biodiversity Working Group (name changed from "Blue Swallow Working Group" to cover a broader scope of biodiversity) on 07 December 2016.
18. A letter (dated 13 February 2017) was received from the DEA that rejected the **Final EIA Report (November, 2016)** for uMWP-1 Raw Water and requested additional information.
19. Various meetings were subsequently held with the environmental authorities, which included the following:
    a. Meeting held with environmental authorities on 24 March 2017 to clarify the DEA's comments on the **Final EIA Report (November, 2016)**;
    b. Following various internal meetings with the DWS and Umgeni Water, as well as the EIA Team and the environmental specialists, a meeting was held with the DEA on 11 August 2017 to present the approach and way forward for addressing the DEA's comments on the **Final EIA Report (November, 2016)**, based on engagements with the relevant environmental authorities;
    c. Meeting held with the environmental authorities on 06 September 2017 to discuss the following:
        i. Biodiversity Offset Design Process;

ii. Information required to enable decision-making;
iii. Roles and responsibilities;
iv. Terms of Reference for the Biodiversity Offset Study;

d. Meetings held with the environmental authorities (KZN EDTEA and EKZNW) on 06 December 2017 and the DEA on 19 January 2017 to discuss the following:
   i. Approach to the Biodiversity Offset Study;
   ii. Authorities' Requirements; and
   iii. Way Forward for the EIA.
e. Meeting held with the environmental authorities on 15 June 2018 to present the key findings of the additional specialist studies conducted to address the DEA's comments on the Final EIA Report.

4.2 DEA's Rejection of the Final EIA Report

4.2.1 Prescribed Process

As mentioned in **Section 1** above, a letter (dated 13 February 2017) was received from the DEA that rejected the **Final EIA Report (November, 2016)** for uMWP-1 Raw Water and requested additional information. A copy of the aforementioned letter is contained in **Appendix A**.

The following are noted with regards to the prescribed process within GN No. R. 543 of 18 June 2010 in terms of the rejection of an EIA Report:

- Regulation 34(2)(b)(ii) – The competent authority must, within 60 days of receipt of an EIA Report, in writing reject the report if it does not substantially comply with regulation 31(2) and request the applicant to make such amendments to the report as the competent authority may require for acceptance of the EIA Report;
- Regulation 34(4)(a) – an EIA Report that is rejected may be amended and resubmitted by the EAP for consideration by the DEA and the Department has 60 days to accept or reject the report; and
- Regulation 56(1-3) – registered I&APs are entitled to comment in writing on the new information before submission to the DEA. A timeframe of 21 days was set for this review by the DEA in the letter in question.

In terms of the regulated process, the rejection of an EIA Report is thus a means by which the DEA may request additional information. It is thus not an outright rejection of the EIA, but rather a mechanism to address outstanding issues to allow for decision-making to be concluded once the information has been received by the DEA, in accordance with GN No. R. 543 of 18 June 2010.

4.2.2 Addressing the DEA's Reasons for Rejecting the Final EIA Report

The reasons stipulated in the DEA's letter (dated 13 February 2017) for the rejection of the **Final EIA Report (November, 2016)** are given in **Table A** below. **Table A** also indicates the approach adopted to address these matters and provides a reference to the relevant sections in this report where the information is provided.

Table A: Reasons stipulated by the DEA for the rejection of the Final EIA Report

No.	The DEA's Reasons for Rejection	Actions Undertaken
A1	*As currently proposed, the project has the potential to inflict detrimental impacts upon species of conservation significance.*	The species of conservation significance include the following: • *Hirundo atrocaerulea* (Blue Swallows); • *Capys penningtoni* (Pennington's Protea Butterfly); and • *Gnomeskelus fluvialis* (Riverine Keeled Millipede). In response, the following additional specialist studies were undertaken and are included in the Addendum to the EIA Report: • Noise Impact Assessment (refer to **Section 6.2.1** and **Appendix B2**); • Vibration Impact Assessment (refer to **Section 6.2.2** and **Appendix B3**); • Avifauna Bridging Study (refer to **Section 6.3** and **Appendix B4**); and • Invertebrate Impact Assessment (refer to **Section 7** and **Appendix B5**). Note that the combined Terms of Reference (ToR) for the Noise and Vibration Impact Assessment were first circulated to the environmental authorities (including DEA, KZN EDTEA and EKZNW) for comments.
A2	*The proposed development has the potential to result in the species becoming locally extinct in South Africa and this is of National and International relevance. The final EIR report and specialist avifaunal study are considered not to provide sufficient information on potential impacts on Blue Swallows or potential mitigation and remedial measures that will allow for an informed decision making on the proposed development.*	
A3	*Furthermore, insufficient information is provided in respect of the potential loss of forage areas within the basin of the proposed balancing dam and what impact this could have on the breeding success of this critically endangered species.*	
A4	*Insufficient attention has been given to the consideration of the three alternative locations for the proposed balancing dam and tunnel alignment.*	• Balancing Dam – ○ A more detailed motivation for discarding the Baynesfield Balancing Dam Option during the Scoping phase is provided in **Section 9.4.2.1** below. ○ A comparison of the Mbangweni and Langa Balancing Dam Options is provided in **Section 9.4.2.2** below. • Tunnel Alignment – ○ Two additional tunnel routes (Option B and Option C) were identified, as well as a tunnel corridor. Refer to **Section 9.3.3** below. ○ A comparison of the tunnel options is provided in **Section 9.3** below.
A5	*Equally important, the portions of the proposed site support populations of Capys penningtoni (Pennington's Protea butterfly) and Gnomeskelus fluvialis (Riverine Keeled Millipede) this is of high biodiversity concerns given that the species occur*	See response to item A1 above. A dedicated Invertebrate Impact Assessment was undertaken (refer to **Section 7** below and **Appendix B5**).

No.	The DEA's Reasons for Rejection	Actions Undertaken
	in and around Mkomazi River Valley Region of KwaZulu Natal and nowhere else in the world. In the absence of appropriate mitigation measures, the proposed development would result in habitat destruction and extinction of the species.	
A6	*The recommendations in the Aquatic Impact Assessment are deemed incomplete as they do not adequately quantify and assess the cumulative and residual impact of the proposed development on aquatic species as well as wetland habitats, on and around the proposed site.*	The response from the Aquatic Specialist is contained in **Appendix D**. The loss of wetland habitat is addressed in the Biodiversity Offset Study (refer to **Section 8** below and **Appendix B6**).
A7	*The re-alignment of the R617 a regionally important Provincial Road, would require that portions of the Impendle Nature Reserve would need to be de-proclaimed in order to accommodate this re-alignment. This triggers requirements in terms of the NEM: Protected Areas Act.*	Additional engineering investigations were undertaken for the re-alignment of Provincial Road R617 with the objective of identifying other route options that do not encroach into the Impendle Nature Reserve, whilst trying to accommodate the requirements of the KZN Department of Transport (refer to **Section 5** below and **Appendix B1**).
A8	*There is lack of clarity as to the location and acceptability of potential offset sites to compensate the residual impact of the proposed development. It also remains unclear if the proposed offsets would be feasible, practical and lawful.*	In response, a dedicated Biodiversity Offset Study was undertaken to build upon the information contained in the **Final EIA Report** (refer to **Section 8** below and **Appendix B6**).

4.2.3 Addressing the DEA's Request for Additional Information

The request for additional information stipulated in the DEA's letter (dated 13 February 2017) pertaining to the **Final EIA Report (November, 2016)** is outlined in **Table B** below. Furthermore, **Table B** below also indicates the approach adopted to address these matters and provides a reference to the relevant sections in this report where the information is provided.

Table B: Additional Information requested by the DEA

No.	The DEA's Request for Additional Information	Actions Undertaken
B1	*The Geological Study done by an independent geologist to investigate the vibration and noise impacts on the Blue Swallows and their nesting sites. The geologist must investigate the vibration effect on the nest within the geological formation present in the study area, taking into consideration the time of the year that the birds nest as well as the position underground.*	The following additional specialist studies were subsequently conducted and are included in the Addendum to the EIA Report: • Noise Impact Assessment (refer to **Section 6.2.1** below and **Appendix B2**); • Vibration Impact Assessment (refer to **Section 6.2.2** below and **Appendix B3**); and • Avifauna Bridging Study (refer to **Section 6.3** below and **Appendix B4**). The combined ToR for the Noise and Vibration Impact Assessment were first circulated to the environmental authorities (including DEA, KZN EDTEA and EKZNW) for comments. A key requirement of this study, which was stipulated in the ToR, was the need for the Acoustics Specialists (noise and

No.	The DEA's Request for Additional Information	Actions Undertaken
		vibration) to work closely with the Avifauna Specialist. The Acoustics Specialists were instructed to consider the geology of the study area, based on information contained in the Geotechnical Report from the Feasibility Study. Note that the Noise and Vibration Studies were separated in the proposals received from the bidding specialists, due to the nature of the technical investigations. However, the specialists appointed for these studies worked closely with another in terms of understanding the ambient acoustics and interpreting their respective findings, and also engaged with the Avifauna Specialist.
B2	*The binding agreement between the applicant and relevant provincial authority in respect of de-proclamation of portions of the Impendle Nature Reserve.*	Additional engineering investigations were undertaken for the re-alignment of Provincial Road R617 with the objective of identifying other route options that do not encroach into the Impendle Nature Reserve, whilst trying to accommodate the requirements of the KZN Department of Transport (refer to **Section 5** below and **Appendix B1**). Based on the findings there may not be a need to undertake a De-proclamation Process as the preferred R617 route options (included in a corridor) do not traverse the Impendle Nature Reserve, which would be taken into the final design phase (if authorisation is granted).

B3	*The analysis of the balancing dam, tunnel and road alignments alternatives that includes a through, comparable and independent consideration of these alternatives taking into account the social, economic and environmental costs and benefits in addition to technical aspects.*	• Balancing Dam –
		  ○ A more detailed motivation for discarding the Baynesfield Balancing Dam Option during the Scoping phase is provided in **Section 9.4.2.1** below.
		  ○ A comparison of the Mbangweni and Langa Balancing Dam Options is provided in **Section 9.4.2.2** below.
		
		• Tunnel Alignment –
		  ○ Two additional tunnel routes (Option B and Option C) were identified, as well as a tunnel corridor. Refer to **Section 9.3.3** below.
		  ○ A comparison of the tunnel options is provided in **Section 9.3** below.
		
		• R617 Re-alignment –
		  ○ Additional route options were identified, as well as a road corridor.
		  ○ See response to item B2 above.

B4	*The Offset Feasibility Assessment which includes the following:* • *Wetland offsets, once identified, need to meet DWS Standards, as set out in the Wetland Offset Guideline.*	The requirements of the Biodiversity Offset Study were clarified with the environmental authorities during various meetings held after the DEA's comments were received on the **Final EIA Report**. These requirements were

No.	The DEA's Request for Additional Information	Actions Undertaken

	• *Methodology for assessing residual impacts and targets (using available national and international best practice guidelines and policies).*
	• *Identification of residual impacts and targets (the assessment must provide quantification of identified residual impacts and offset targets).*
	• *Offset aims, objectives and indicators.*
	• *Offset site selection and prioritization (a suitable site of sites must be selected and evaluated in terms of suitability for offsetting, land ownership, efficiency and effectiveness).*
	• *Land-owner engagement (proof of engagement with landowner/s on each of the sites identified, and the outcomes of such engagement).*
	• *Budgeting:*
	  ○ *Budget for detailed planning and legal approvals;*
	  ○ *Establishment costs;*
	  ○ *Rehabilitation costs;*
	  ○ *Long term management costs; and*
	  ○ *Employment opportunities.*
	• *Governance framework:*
	  ○ *Finance sources and structures; and*
	  ○ *Institutional structures and arrangements.*
	• *Legal compliance requirements (WULA, EIA etc.).*
	• *Monitoring, evaluation and reporting.*
		incorporated into the ToR for the Biodiversity Offset Study.
		
		Refer to **Section 8** below for a summary of the Biodiversity Offset Study (as contained in **Appendix B6**).

B5	*The catchment management plan. This is the most logical mitigation measure to ensure the lifespan of the dam.*	Catchment management is a function of the DWS, as imposed by the National Water Act (Act. No. 36 of 1998). Based on discussions held with the DEA during a meeting on 24 March 2017 it was deemed that this comment is a recommendation, with no direct bearing on decision-making in terms of the EIA.
B6	*The amended EMPr to include measures dictated by new investigation and to provide sound and appropriate mitigation measures regarding the highlighted impacts of the proposed development on the environment.*	The Environmental Management Programme (EMPr) (contained in **Appendix E**) has been amended, as necessary, to include the mitigation measures that emanated from additional investigations and specialist studies.

Sections 5 – 11 below aim to address the DEA's request for additional information.

5 REALIGNMENT OF PROVINCIAL ROAD R617

5.1 Introduction

The R617 connects Howick and Kokstad in KZN. A portion of the R617 would be inundated by the proposed Smithfield Dam. As part of the Technical Feasibility Study a deviation of the R617 was proposed, which traverses the Impendle Nature Reserve in two areas (shown in **Figure 3** below). This proposed route was included in the **Final EIA Report (November, 2016)**.

Due to concerns raised, additional engineering investigations were undertaken for the re-alignment of the R617 with the objective of identifying other route options that do not encroach into the Impendle Nature Reserve, whilst trying to accommodate the requirements of the KZN Department of Transport. The findings of these investigations are provided in **Section 5.2** below.

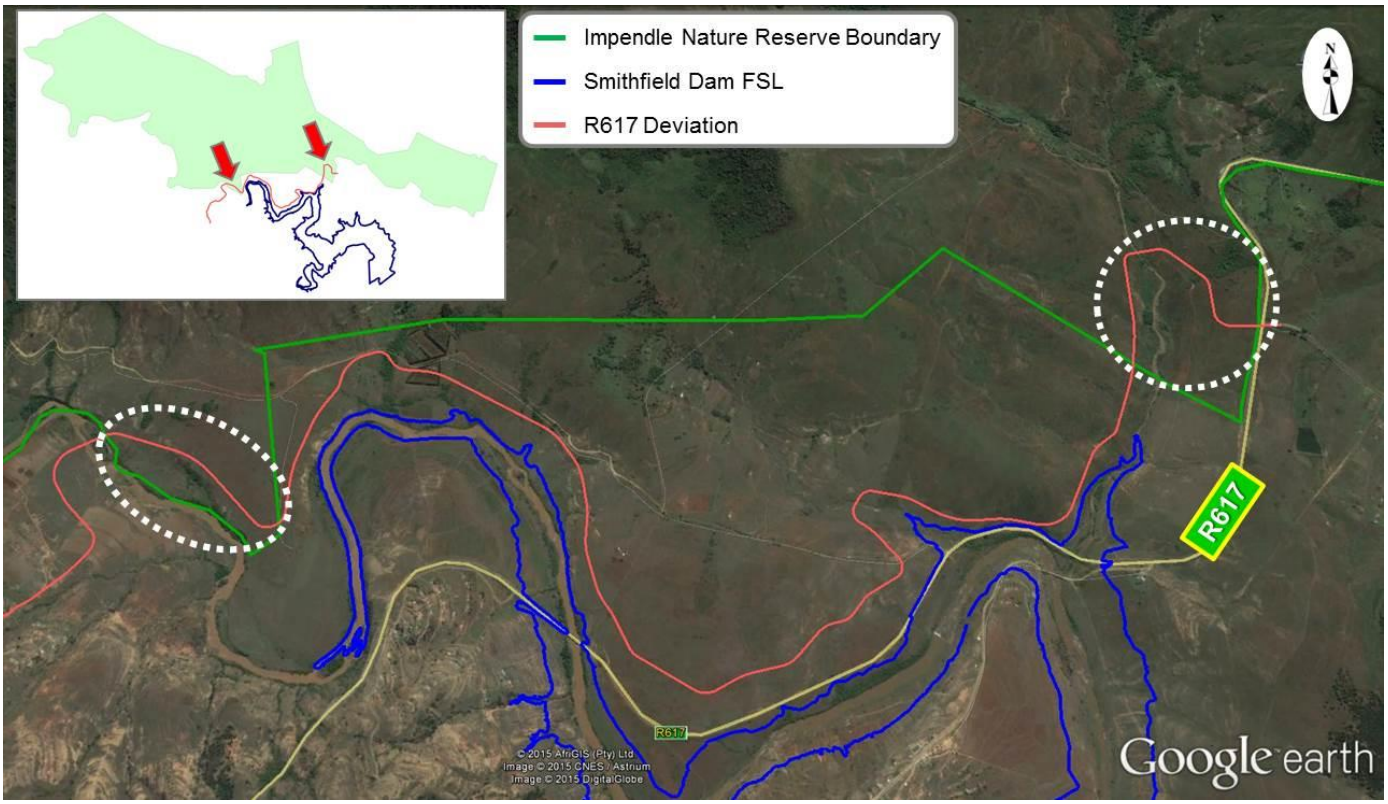

Figure 3: **Encroachment of the original R617 deviation into the Impendle Nature Reserve**

5.2 Summary of Engineering Investigation

Knight Piésold was appointed to undertake Engineering Investigation for the Realignment of the R617 as part of the proposed uMWP-1. The report is contained in **Appendix B1**.

Three (3) route options were investigated taking into account the topography, river crossings and the affected communities, as well as sensitive environmental features (Impendle Nature Reserve and habitat for conservation worthy species). These options (shown in **Figure 4** below) were

assessed for adherence to the applicable design standards of the KZN Department of Transport and best practice.

Option 1 is about 6.43 km long and is located south of the existing R617. Starting on the eastern side, Option 1 peels away from the existing R617 east and south of the Lundy's Hill Supply Store where after it crosses the uMkhomazi River (future Smithfield Dam) approximately 170 m south of the existing old Deepdale Bridge (built 1896). From here the alignment follows the existing D1212 for about 2 km. At this point Option 1B separates from Option 1A and heads in a north-westerly direction towards the Mdayane Village. After passing the southern part of Mdayane Village, the road makes an about turn and heads in a south-westerly direction where it re-joins the existing D1212 / R617 intersection *en-route* to Hlanganai. Option 1A continues to follow the existing D1212 alignment until it ties back in to the existing R617 in the vicinity of the existing D1212 / R617 intersection.

Option 2 is the route furthest to the north slotting in below the Impendle Nature Reserve and is the longest route at 8,25 km long. The challenge on this route is the mountainous terrain. The uMkhomazi River will be crossed with a medium-sized yet substantial bridge to the north of the existing bridge on the R617. The alignment traverses over a mountain/hill and down again, crossing a stream before re-joining the existing R617. An additional smaller bridge would be required to cross the stream. A bridge servicing pedestrians and cattle would be required near the old Deepdale Bridge on the D1212.

Option 3 is about 7,75 km long and aims to follow the existing R617 as far as possible. The uMkhomazi River would be crossed with via a medium-sized yet substantial bridge to the north of the existing bridge on the R617. The alignment then hugs the contours whilst staying fairly parallel with the existing R617road but on higher ground in order to stay clear of the high floodline and purchase line of the proposed Smithfield Dam. As per Option 2, a small stream is crossed before re-joining the existing R617. An additional smaller bridge would be required to cross the stream. A bridge servicing pedestrians and cattle would be required near the old Deepdale Bridge on the D1212. The challenge on Option 3 is the mountainous terrain where the road will run parallel to the existing road but on a higher level against a steep slope. This slope will require stabilisation and the road could potentially require a form of cantilever as it passes the steep slopes.

A detailed cost estimate was prepared for Option 1 using unit rates from recently completed, similar projects. From this a cost per kilometre rate was calculated and applied to each of Options 1A, 1B, 2 and 3 respectively. Advantages and disadvantages of each of the options were compiled with consideration for cost, environmental and social impacts, practicality and adherence to the road design standards and good practice. On comparison of the various options, **Options 1A** and **1B** are the only options that convincingly adhere to, or exceed, the aforementioned requirements. Based on the findings of this study, Option 1B is the preferred route for the realignment of the R617.

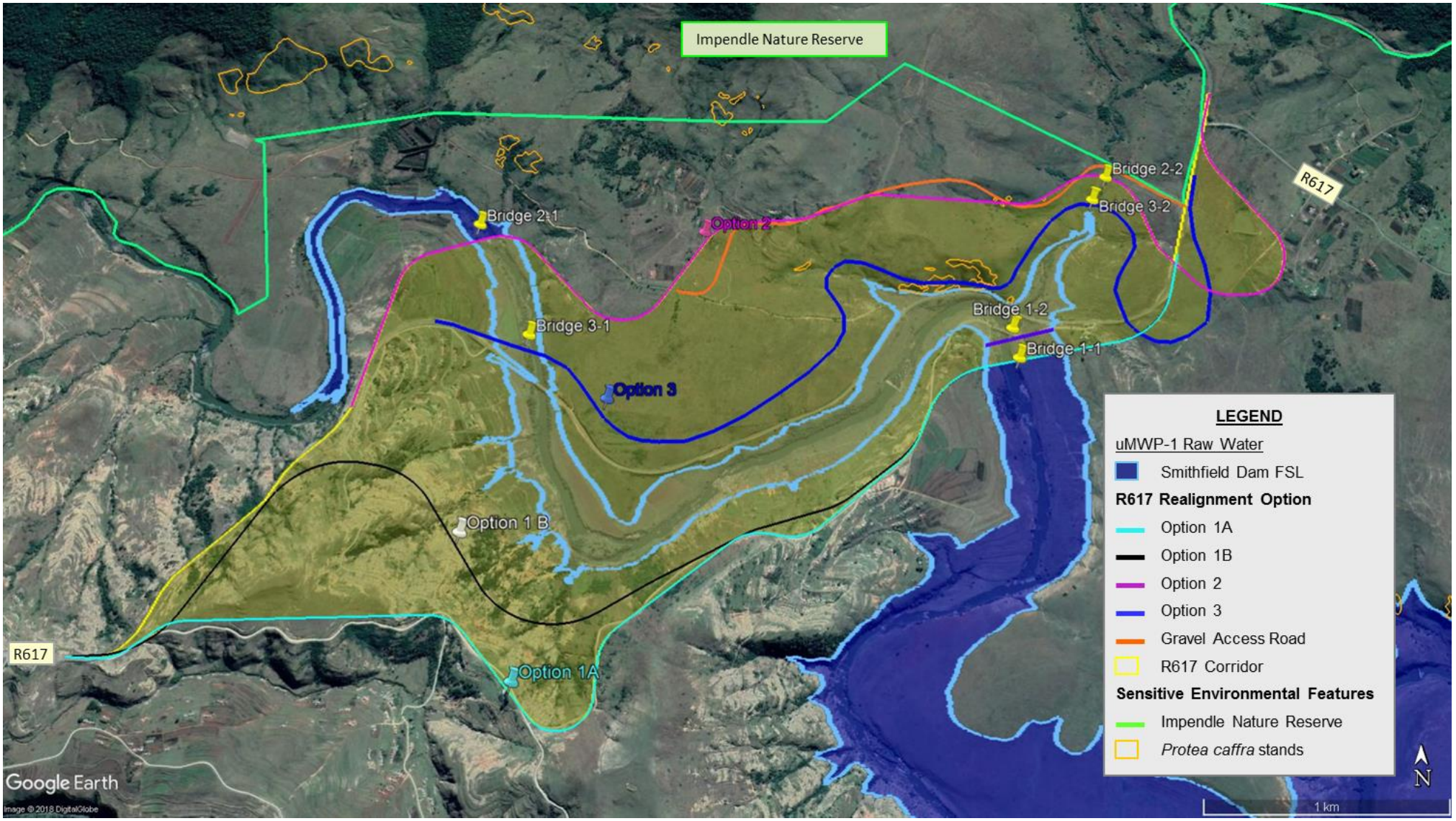

Figure 4: **R617 Realignment Options**

With the selection of **Option 1B** as the preferred realignment of the R617, access to land located to the north of the uMkhomazi River would be cut off by the proposed Smithfield Dam, since the old bridges would be submerged. Provision is made for a new gravel access road and a small bridge as shown in **Figure 4** above.

Options 1A and 1B will require a large bridge structure in the region of 400-500 m long to cross the Smithfield Dam Basin (see **Figure 5** below). The old bridge structure, that would be submerged by the proposed Smithfield Dam, is used by pedestrians as well as by cattle to reach their grazing areas across the river. In addition to providing vehicular passage over the dam basin, the new bridge will have to accommodate pedestrians and cattle. To achieve this, the bridge could potentially be made wider, or it could have a separate carriageway for cattle and pedestrians. Another option is to provide a separate bridge structure for the cattle and pedestrians – this in the interest of safety for all.

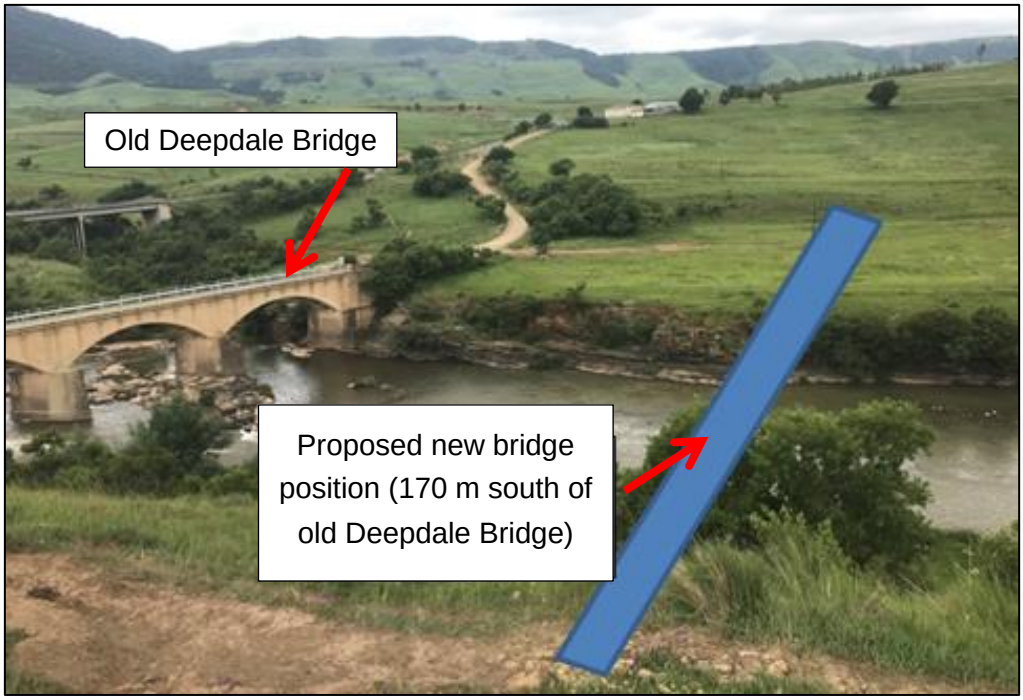

Figure 5: **Proposed bridge required for R617 Realignment Option 1A and 1B**

Realigning the R617 using Option 1A or 1B will divide existing settlements in places (refer to **Figure 6** below). In mitigation it is recommended that affected communities be relocated to more suitable and safe locations either in the village or elsewhere. As the uMWP-1 is only at a feasibility stage, a Relocation Framework Plan (RFP) (see ***Section 11.1.10*** of the **Final EIA Report, November 2016**) was developed to inform the EIA. Detailed social consultation with the affected communities will take place during the Implementation Phase of the uMWP-1 when a Relocation Action Plan (RAP) is developed. The RAP will include arrangements for resettling and compensating each household that has to be relocated as a consequence of the proposed uMWP-1 (including land acquisition within Smithfield Dam's purchase line and the deviation of the R617).

An overview of the Public Participation conducted for the new R617 realignment options is provided in **Section 9.2.3.2** below.

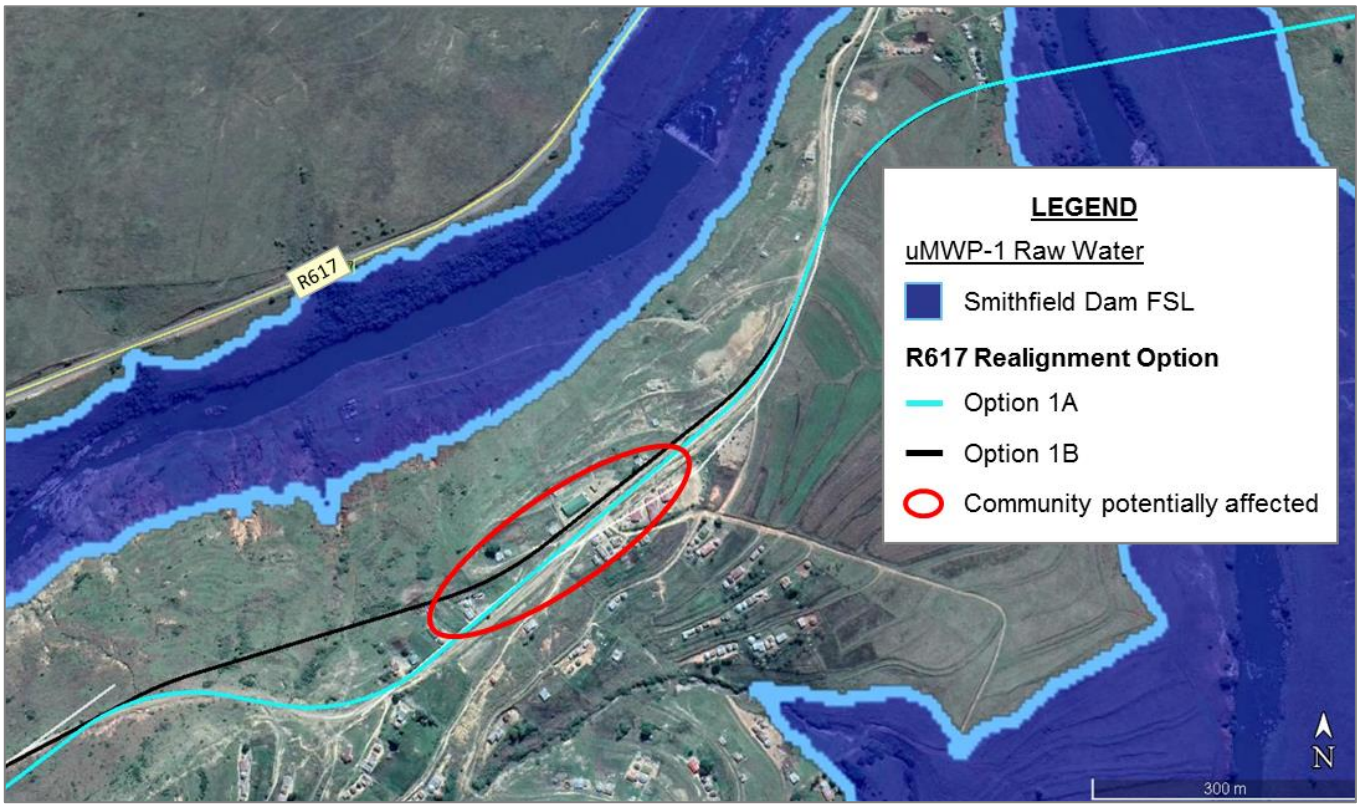

Figure 6: **Community in proximity to Option 1B where relocation will need to be considered**

6 BLUE SWALLOWS

6.1 Introduction

The uMWP-1 is situated in an area of generally high avifaunal sensitivity with the Blue Swallow as the primary bird species of concern, since there are so few breeding pairs left in South Africa, and it is a species known to be susceptible to disturbance. The uMWP-1 is also located in a core area for the species.

It is noted that in terms of the project life-cycle, environmental factors were considered as part of the uMkhomazi-Mgeni Transfer Scheme Pre-Feasibility Study (DWAF, 1999) during the appraisal of alternatives for augmentation schemes. In addition, the DWS made provision for Environmental Screening (DWA, 2012) as part of the Feasibility Study, which examined potential risks associated with the uMWP-1 in terms of the biophysical, social and economic environment, as well as risks in terms of environmental legislation. These environmental assessments that were undertaken as part of the Pre-Feasibility and Feasibility Studies did, however, not identify the uMWP-1 to be fatally flawed in terms of risks to Blue Swallows. However, they did not include an investigation by an Avifauna Specialist.

An Avifaunal Study was undertaken during the EIA and concerns in terms of Blue Swallows were identified for the following components of the uMWP-1 (Wildskies, 2015), which were examined further as part of the additional specialist studies discussed in **Sections 6.2** and **6.3 below**:

- Loss of habitat and risks posed by noise and vibration associated with the deviation of the R617 into the Impendle Nature Reserve;
- Risks posed by noise and vibration associated with the tunnel underneath Blue Swallow nest sites; and
- Loss of habitat and risks posed by noise and vibration associated with the balancing dam.

6.2 Acoustics

Noise and Vibration Impact Assessments were undertaken, based on the concerns identified pertaining to Blue Swallows. The combined ToR for these Noise and Vibration Impact Assessments Studies were reviewed by the environmental authorities (including the DEA, KZN EDTEA and EKZNW).

A key requirement of the Noise and Vibration Impact Assessments was the need for the Acoustics Specialists to work closely with the Avifauna Specialist. The Avifauna Bridging Study (see **Section 6.3** below) assessed the impacts to Blue Swallows in light of the findings of the acoustics' studies.

6.2.1 Noise Impact Assessment

6.2.1.1 Introduction

Enviro-Acoustic Research (EARES) was appointed to determine the potential noise impact on the surrounding environment due to the proposed uMWP-1. The report is contained in **Appendix B2**. An extract from the aforementioned report is given in ***6.2.1.2*** to ***6.2.1.9*** below.

The Environmental Noise Impact Assessment Report describes ambient sound levels in the area, potential worst-case noise rating levels and the potential noise impacts that the uMWP-1 may have on the surrounding sound environment, highlighting the methods used, potential issues identified, findings and recommendations. This study considered local regulations and both local and international guidelines, using the ToR as proposed by SANS 10328:2008 to allow for a comprehensive Environmental Noise Impact Assessment Report.

6.2.1.2 Current Environmental Sound Character

The existing soundscape was assessed by means of an audible judgement and sound measurements during a site visit in January 2018 that consisted of a number of 10 minute measurements. The sound measurement locations are shown in **Figure 7** below.

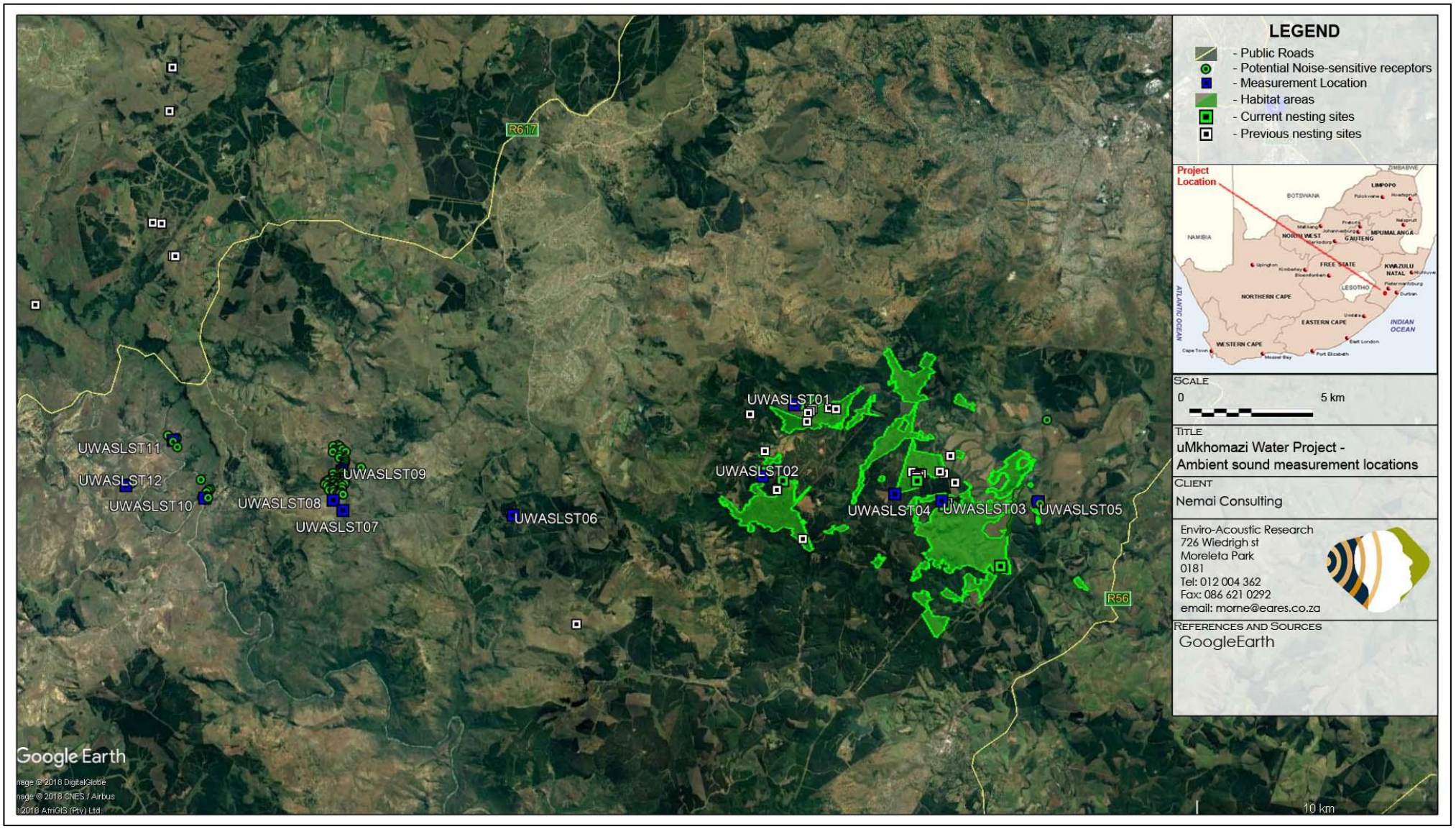

Figure 7: **Localities where ambient sound levels were measured - overview (De Jager, 2018)**

All the measurements indicated an area with a very complex sound character. Areas away from roads and the communities are very quiet, though wind-induced noises did influence the measurements significantly as the wind speeds increased. Measurement locations close to the houses and communities indicate higher ambient sound levels, mainly due to typical noises associated with residential dwellings (voices, domestic animals, mechanical noise and other anthropogenic sounds).

6.2.1.3 Potential Sources of Noise: Construction

The following are the likely main construction related sources of noise that could add to the existing noises (existing operational activities) in the area:

- Vegetation removal and the stripping of topsoil at the quarries, borrow areas, adit, ventilation shafts and the embankment areas. Equipment that may operate simultaneously;
- Drilling of hard rock to prepare for blasting;
- Initial drilling of the tunnel with the Tunnel Boring Machine (TBM) (as it enters the tunnel noise levels will reduce);
- Blasting activities;
- Loading of blasted rock using excavators and dump trucks;
- Continued activities supporting the TBM;
- Excavation of trenches and foundations;
- Formwork, engineering, concrete mixing and pouring; and
- Rehabilitation and landscaping

Excluding the noises from the ventilation fans, once the TMBs are located within the tunnel, noise from the tunnel boring activities would be minimal, mainly relating to ancillary activities. The ventilation fans may be audible during the operational phase. The main source of traffic noise during the construction phase relate to construction traffic in and around the uMWP-1 project area.

6.2.1.4 Methods: Noise Impact Assessment and Significance

From past studies and literature the following can be concluded (references included in the Noise Impact Assessment Report in **Appendix B2**):

- Animals respond to impulsive (sudden) noises (higher than 90 dBA) by running away. If the noises continue, animals would try to relocate;
- Animals start to respond to increased noise levels with elevated stress hormone levels and hypertension at exposure levels of 55 – 60 dBA;
- Animals of most species exhibit adaptation with noise, including impulsive noises, by changing their behavior;
- More sensitive species would relocate to a more quiet area, especially species that depend on hearing to hunt or evade prey, or species that makes use of sound/hearing to locate a suitable mate; and

- Noises associated with helicopters, motor- and quad bikes significantly impact on animals is due to the related sudden and significant increase in noise levels.

Though the author of the Noise Impact Assessment Report made an effort to source available data with regard to noise impacts on Blue Swallows, there is no information, guidelines or studies covering the subject of noise impacts on this bird species. However, audibility curves are available for various other avifauna species. Considering the audibility curves (which includes the absolute thresholds and bandwidths) for a number of birds in the order Passeriformes (perching birds), it is assumed that the audibility curve would be similar for the Blue Swallows. Considering the absolute audibility threshold for humans (from the Equal-loudness contours as defined by ISO 226:2003), it would be acceptable to conclude that the absolute audibility threshold of the Blue Swallows would be less sensitive than that of humans (humans are more sensitive to sound than the Passeriformes species). As such, assuming noise limits as set for humans would be proposed for the Blue Swallow communities in the vicinity of the project area (noise level exceeding 35 dBA). This is a highly precautious approach, because if Avifauna (specifically the Blue Swallows) respond to noise levels similar as humans do, they may only be disturbed at higher noise levels (40 – 45 dBA), although it is not known how the Blue Swallows may respond to increased noise levels, neither how increased noise levels may impact on nesting birds.

There are a number of criteria that are of concern for the assessment of noise impacts. These can be summarised in the following manner:

- Increase in noise levels: People or communities often react to an increase in the ambient noise level they are used to, which is caused by a new source of noise. With regards to the Noise Control Regulations, an increase of more than 7 dBA is considered a disturbing noise;
- Zone Sound Levels: It sets acceptable noise levels for various areas; and
- Absolute or total noise levels: Depending on their activities, people generally are tolerant to noise up to a certain absolute level, e.g. 65 dBA. Anything above this level is considered to be unacceptable.

SANS 10103:2008 addresses the issues concerning environmental noise in South Africa. It provides the equivalent ambient noise levels (referred to as Rating Levels), $L_{Req,d}$ and $L_{Req,n}$, during the day and night respectively to which different types of developments may be exposed. SANS 10103:2008 also provides a guideline for estimating community response to an increase in the general ambient noise level caused by an intruding noise.

6.2.1.5 Projected Construction Noise Levels

The projected noise rating level contours in the eastern part of the project area (based on proximity to Blue Swallow breeding sites) are presented in **Figure 8** below (daytime) and **Figure 9** below (night-time) for the conceptual scenario.

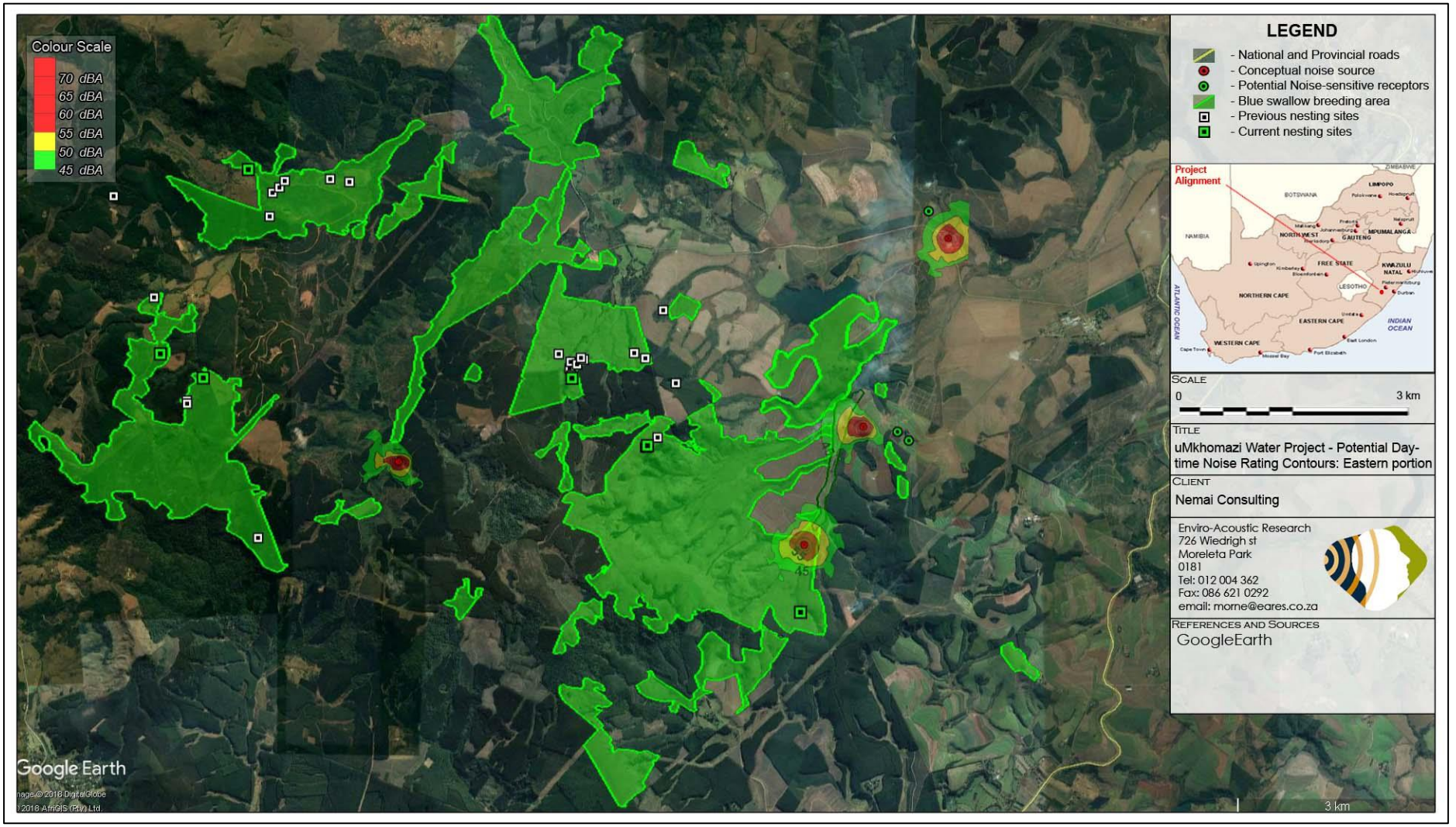

Figure 8: **Projected conceptual daytime construction activities - contours of noise rating levels (eastern part of the uMWP-1) (De Jager, 2018)**

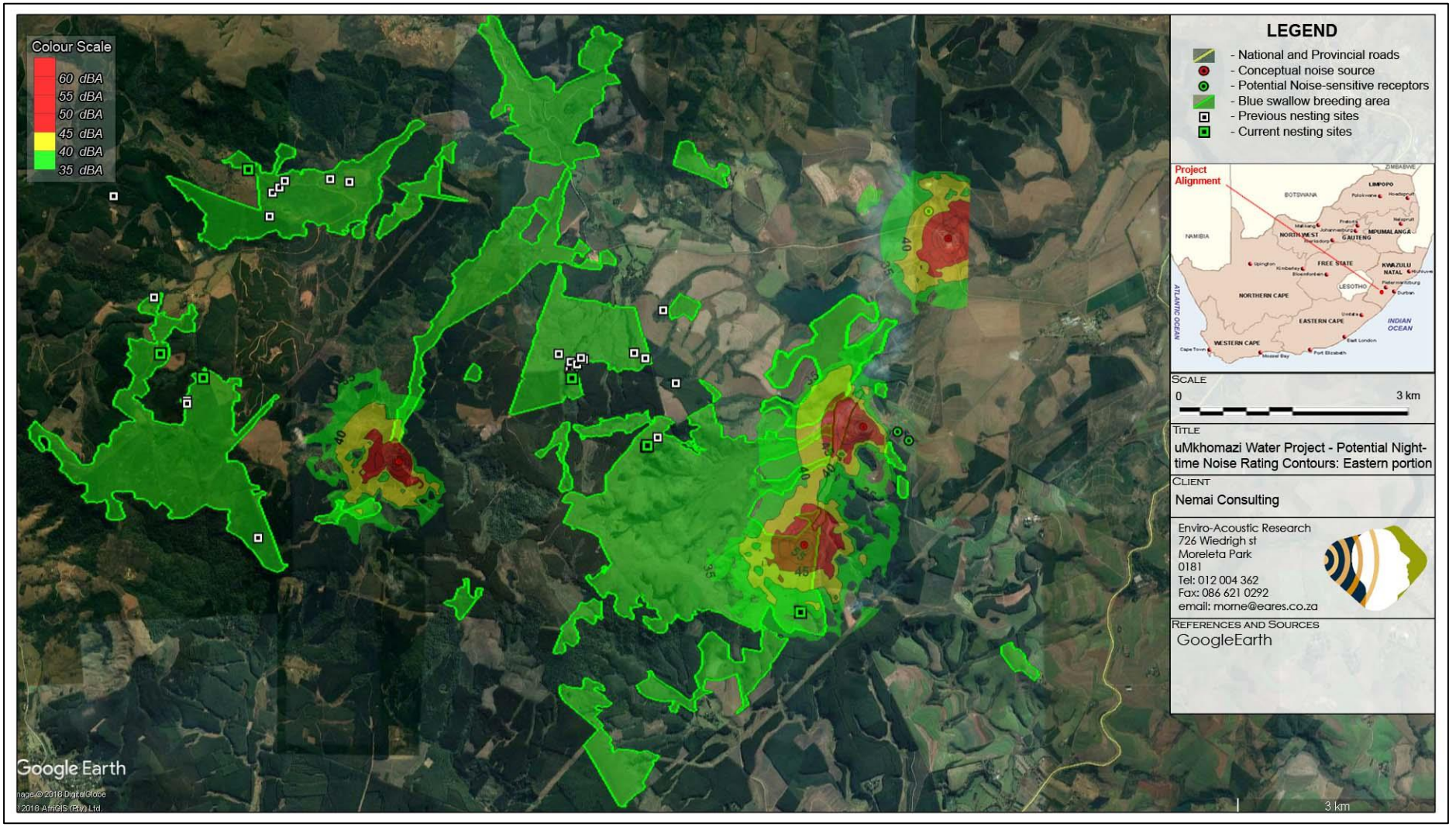

Figure 9: **Projected conceptual night-time construction activities - contours of noise rating levels (eastern part of the uMWP-1) (De Jager, 2018)**

6.2.1.6 Construction Phase Noise Impact

The following extract from the Noise Impact Assessment focuses on Blue Swallows, as this is the primary trigger for this study.

The Noise Impact Assessment considered the potential worst-case noise impact, with conceptual noise generating activities taking place close to the breeding areas of the Blue Swallows. Furthermore, the Noise Impact Assessment used the noise emission characteristics of typical construction equipment that may be expected for such a project.

The significance of the potential noise impacts on the Blue Swallows is defined in **Table C** below for the daytime scenario and in **Table D** below for the night-time scenario.

Table C: Noise Impact Assessment: Daytime Construction Activities in Eastern Area (Avifauna)

Impacts: Increases in noise levels in the habitat of the Blue Swallows (assuming that the Blue Swallows would detect a change in ambient sound levels of more than 5 dBA – precautionary approach).		
Sensitivity Analysis: Very quiet area with daytime ambient sound levels ($L_{Aeq,i}$) of 30 – 36 dBA and $L_{Aeq,f}$ levels of 25 – 36 dBA. It is assumed that the Blue Swallows would be used to daytime ambient sound of 35 dBA. Noise levels less than 35 dBA would not change the daytime foraging activities. If the Blue Swallows may detect the change in ambient sound levels exceeding 5 dB (40 dBA total), noise levels may impact on less than 7% of their habitat. If this increase in noise level impacts on the foraging activities, the Blue Swallows may avoid the areas where construction activities take place.		
Issue	**Nature of Impact**	**Extent of Impact**
Increase in ambient sound levels at the habitat of the Blue Swallows.	Increased noise levels may impact on ambient sound levels for less than 7% of the Blue Swallows habitat.	Depending on the topography, multiple construction activities taking place simultaneously may impact on the Blue Swallow habitat up to 1,500m away from the construction activities
Description of Expected Significance of Impact: The probability of a noise impact taking place is **definite** and therefore the Blue Swallows will avoid construction activities during foraging. This may be due to increased noise levels as well as people and vehicular movement. The potential zone of influence is, however, less than 7% of the available habitat area and the potential of noise levels impacting on the foraging activities of the Blue Swallow is considered **improbable** for the larger area. The significance of the noise impact is therefore considered to be **low**.		
Gaps in Knowledge: It is not known what level of noise will impact on the Blue Swallows. As such this Study took a precautious approach and assumed that a noise level exceeding 40 dBA may affect their foraging activities.		
Comments: High confidence in the assessment.		
Mitigation Measures: Mitigation is not required.		

Table D: Noise Impact Assessment: Night-time Construction Activities in Eastern Area (Avifauna)

<table>
<tr><td colspan="3">Impacts:
Increases in noise levels at the nesting sites of the Blue Swallows (assuming that the Blue Swallows would detect a change in ambient sound levels of more than 5 dBA – precautionary approach).</td></tr>
<tr><td colspan="3">Sensitivity Analysis:
Very quiet area and considering ambient sound levels measured in similar locations at night, ambient sound levels ($L_{Aeq,i}$) could range between 30 – 35 dBA, although these low levels are considered unfeasible (Blue Swallows would be nesting in an area where there is adequate food. As such it is assumed that there would be significant insects in the area that would raise the night-time noise level). Considering an acceptable ambient sound level of 35 dBA, a change of 5 dB may be detectable and noise levels exceeding 40 dBA may impact on the Blue Swallows nesting sites in the area (very precautious approach). If noise levels are higher than 40 dBA when the Blue Swallows return to select a nesting site, they may select a different nesting site in a quieter area. If noise levels increase higher than 40 dBA the Blue Swallows may abandon their existing nesting sites.</td></tr>
<tr><td>Increase in ambient sound levels at the Blue Swallows nesting sites.</td><td>Increased noise levels may reduce the available nesting sites, or result in the abandonment of existing nesting sites.</td><td>Depending on the topography, multiple construction activities taking place simultaneously may impact on the Blue Swallows nesting sites up to 1,500m away from the construction activities</td></tr>
<tr><td colspan="3">Description of Expected Significance of Impact:
The probability of a noise impact taking place is considered to be improbable and the significance of the potential noise impact would be low on the Blue Swallows.</td></tr>
<tr><td colspan="3">Gaps in Knowledge:
Exact construction activities, or their locations, were not defined and this assessment considered a potential worst-case scenario as conceptualized. Various activities can take place during the construction phase and it may be possible that an activity was not considered. It is therefore recommended that no night-time construction activities are permitted within 1,500 m from any active Blue Swallow nesting sites.

Insert: note that this is not technically viable in terms of the continuous removal of tunnel muck and spoiling of this material in the construction of the dam wall of the balancing dam (refer to Section 9.3.3.1). It may, however, be viable for foundation preparation work and some quarrying. Available Blue Swallow nest sites within the 1,500 m, as well as the accessibility of these nest (e.g. overgrown or unusable), need to be taken into consideration.</td></tr>
<tr><td colspan="3">Comments:
High confidence in the assessment.</td></tr>
<tr><td colspan="3">Mitigation Measures:
If viable, it is recommended that no night-time construction activities are permitted within 1,500m from any active Blue Swallow nesting site.</td></tr>
</table>

6.2.1.7 Mitigation of Construction Activities

General mitigation measures that may assist in reducing events where increased noises may affect surrounding receptors include the following:

- Construct berms to serve as acoustical screens, where possible, between the construction activities and surrounding noise-sensitive receptors to break the line of sight as soon as possible. These berms should ideally be constructed during the daytime using minimal construction equipment. If these berms are correctly constructed, they can significantly reduce the noise impacts on the surrounding receptors;

- Convene meetings with the affected communities and other stakeholders to discuss the anticipated noise levels as well as to identify viable mitigation measures;
- The use the smaller and less noisier equipment when operating near receptors;
- Where possible, only operate during daytime;
- During night-time construction activities, the operations should not be closer than 600 m from any receptors in order to prevent noise levels exceeding 45 dBA at the receptors. The specific use of acoustic screens (soil or spoil pile berms or even temporary screens) between receptors and construction activities (receptors closer than 600 m from the construction activities) are recommended to reduce noise levels;
- Ensure that no night-time construction activities take place closer than 1,500 m from active Blue Swallow nesting sites. If acoustic screens are developed between the nesting area and the construction activities the noise levels would be less, but if night-time activities are planned this must be confirmed with noise measurements or noise propagation modelling;
- Ensure that all equipment is well maintained and fitted with the correct and appropriate noise abatement measures; and
- Transporting of equipment and material during daytime periods where possible.

Provision is also made for an Environmental Noise Monitoring Plan in the Noise Impact Assessment Report.

6.2.1.8 Conditions for Inclusion in the Environmental Authorisation

Conditions that should be included in the EA include the following:

- No night-time construction activities must be permitted closer than 1,500 m to any active Blue Swallow nesting sites. *Insert: note that this is not technically viable in terms of the continuous removal of tunnel muck and spoiling of this material in the construction of the dam wall of the balancing dam (refer to Section **9.3.3.1**). It may, however, be viable for foundation preparation work and some quarrying*;
- The Contractor must investigate any reasonable and valid noise complaint if registered by a receptor residing within 1,000 m from any construction activity, and
- Both the Implementing Agent and Contractor should be able to indicate that they considered the various mitigation measures proposed as part of the Noise Impact Assessment, as well as to give reasons in these mitigation measures could not be implemented, or why they might not be feasible.

6.2.1.9 Conclusions

The following conclusions were drawn as part of the Noise Impact Assessment:

- There is a risk of medium significance noise impacts (tunnel adit and western ventilation shafts construction activities), which can be mitigated and reduced with the magnitude of the reduction depending on the selected options as well as the way in which construction and other activities are managed;

- The uMWP-1 will not introduce any potential fatal flaws in terms of acoustics, and
- With the selection of the required mitigation options, projected noise levels can be managed and the EA can be granted.

6.2.2 Vibration Impact Assessment

6.2.2.1 Introduction

Enterprises University of Pretoria was appointed to determine the potential vibration impact on the surrounding environment due to the proposed uMWP-1. The Vibration Impact Assessment Report is contained in **Appendix B3**. An extract from the aforementioned report is given in ***6.2.2.2*** to ***6.2.2.6*** below.

The Vibration Impact Assessment Report describes the background vibrations, identifies and describes the key sensitive receptors, explains ground vibration mechanisms, compares ground vibration thresholds against expected values and discusses mitigation measures.

The measurement protocol followed the procedures and requirements of the ISO 4866:2010 Standard.

6.2.2.2 Potential Receptors

Figure 10 below illustrates where the Blue Swallow nesting sites can be observed in relation to anticipated sources of ground-borne vibration. The following legend applies:

- Green pin markers - measurement locations;
- Yellow pin markers - locations of possible blasting;
- Red pin markers - active- or recently active Blue Swallow nests;
- Green shaded polygons - habitat suitable for Blue Swallows on the Baynesfield property;
- Green outlined (no shading) polygons - habitat suitable for Blue Swallows on the Trewirgie property;
- Black and white squares - nesting sites from EKZNW historical data;
- Blue line - tunnel Option A;
- Green line - tunnel Option B;
- Pink line - Tunnel Option C; and
- Shaded blue polygons on the eastern side of the study area - possible locations for the balancing dam.

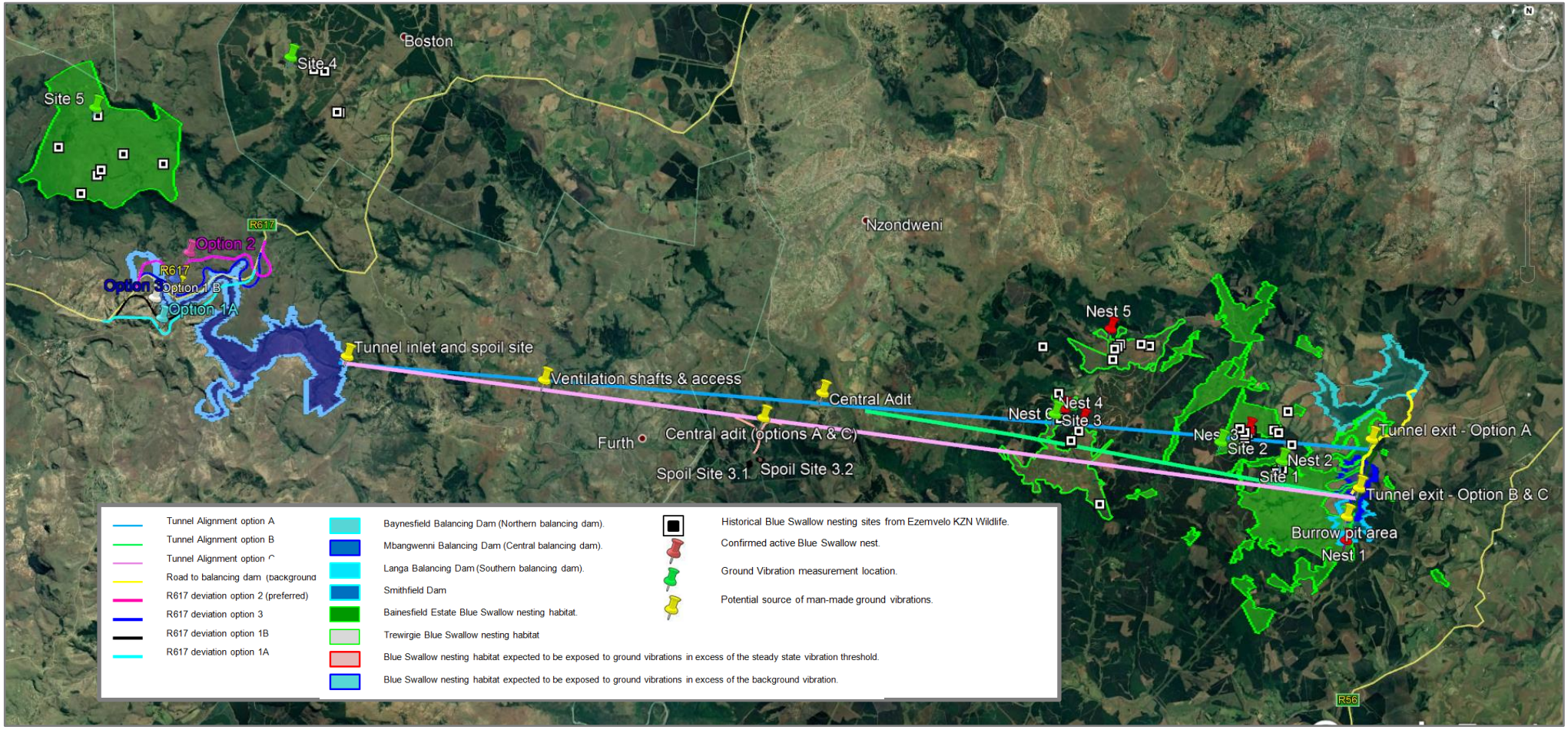

Figure 10: Study Area for the Vibration Impact Assessment (Kroch & Heyns 2018)

Table E below summarises the relevant details of the identified key sensitive receptors related to the proposed uMWP-1.

Table E: Key sensitive receptors with standoff distances to nearest anticipated source of ground-borne vibration (Kroch & Heyns 2018)

Key sensitive receptor location number	Description	Distance to boundary	Disturbance	Distance to nearest nest
1	North-eastern boundary of Baynesfield Blue Swallow nesting habitat	0 m	Tunnel Option A outlet	2.5 km
2	South-eastern boundary of Baynesfield Blue Swallow nesting habitat	200 m	Tunnel Option B and C outlet	1.7 km
3	South-eastern boundary of Baynesfield Blue Swallow nesting habitat	0 m	Borrow Pit Area A	750 m
4	South-western boundary of Baynesfield Blue Swallow nesting habitat	< 50 m	Onrust ventilation shaft	2.5 km
5	Southern boundary of Impendle Nature Reserve Blue Swallow nesting habitat	2 100 m	R617 deviation	3.7 km
6	Southern boundary of Impendle Blue Swallow nesting habitat	7 700 m	Tunnel inlet area	8.8 km

6.2.2.3 Ground-Borne Vibration Impact Assessment

Tables F and **G** below present the results of the assessment of the ground-borne vibration impacts on Blue Swallows. Every considered source of ground-borne vibration is treated separately.

Table F: Environmental significance before mitigation (Kroch & Heyns 2018)

(M - Magnitude; D - Duration; S - Scale; P - Probability; SP - Significance; H - High; M - Moderate; L - Low)

Activity disturbing the birds' nesting and breeding behaviour	Environmental significance prior to mitigation					
	M	D	S	P	SP	Rating
Blasting	10	3	2	4	60	H
Construction	8	3	2	4	52	M
Tunnelling	8	2	2	4	48	M

Table G: Environmental significance after mitigation (Kroch & Heyns 2018)

(M - Magnitude; D - Duration; S - Scale; P - Probability; SP - Significance; M - Moderate; L - Low)

Activity disturbing the birds' nesting and breeding behaviour	Environmental significance after mitigation					
	M	D	S	P	TOT	Rating
Blasting	10	3	2	2	30	M
Construction	8	3	2	2	26	L
Tunnelling	8	2	2	2	24	L

6.2.2.4 Mitigation

The ground vibrations due to blasting are expected to infringe approximately 1,200 m into the Blue Swallow habitat, at the Borrow Pit Area A (within Langa Balancing Dam Basin). Blue Swallow Nest 1 is expected to be affected, in addition to as yet undiscovered nests, or nests that may be established, at this location in the future. Borrow Pit Area A is located 740 m at its closest point to Nest 1. Refer to **Figure 11** below.

If blasting is required all year around at Borrow Pit Area A, a maximum instantaneous blast charge of 35 kg per delay is advised when the Blue Swallows are present. If this is not feasible, a higher rate of excavation may be considered, in order to stockpile enough material for use in the time when the Blue Swallows are present and conventional blasting is not possible. Alternative, non-explosive, methods of rock breaking may lastly be considered during the time when the Blue Swallows are present. It is advised to schedule the blasting at the tunnel outlet portal during the times when the Blue Swallows are away on migration.

However, tunnelling will occur beneath the Blue Swallow nesting habitats near the exit of tunnel alignments. As the tunnel alignments emerge from the surface at these locations, they are necessarily close to the surface. At these levels it is possible that the disturbances would register above the background- and threshold Peak Particle Velocity (PPV). Refer to **Figure 12** below.

Hiller (2011) noted that the ground vibrations due to TBM operations are primarily a function of the soil type. As such, there is little that can be done apart from scheduling the tunnelling so that the TBMs operate beneath the Blue Swallow habitat near the tunnel outlet portals during their migration times.

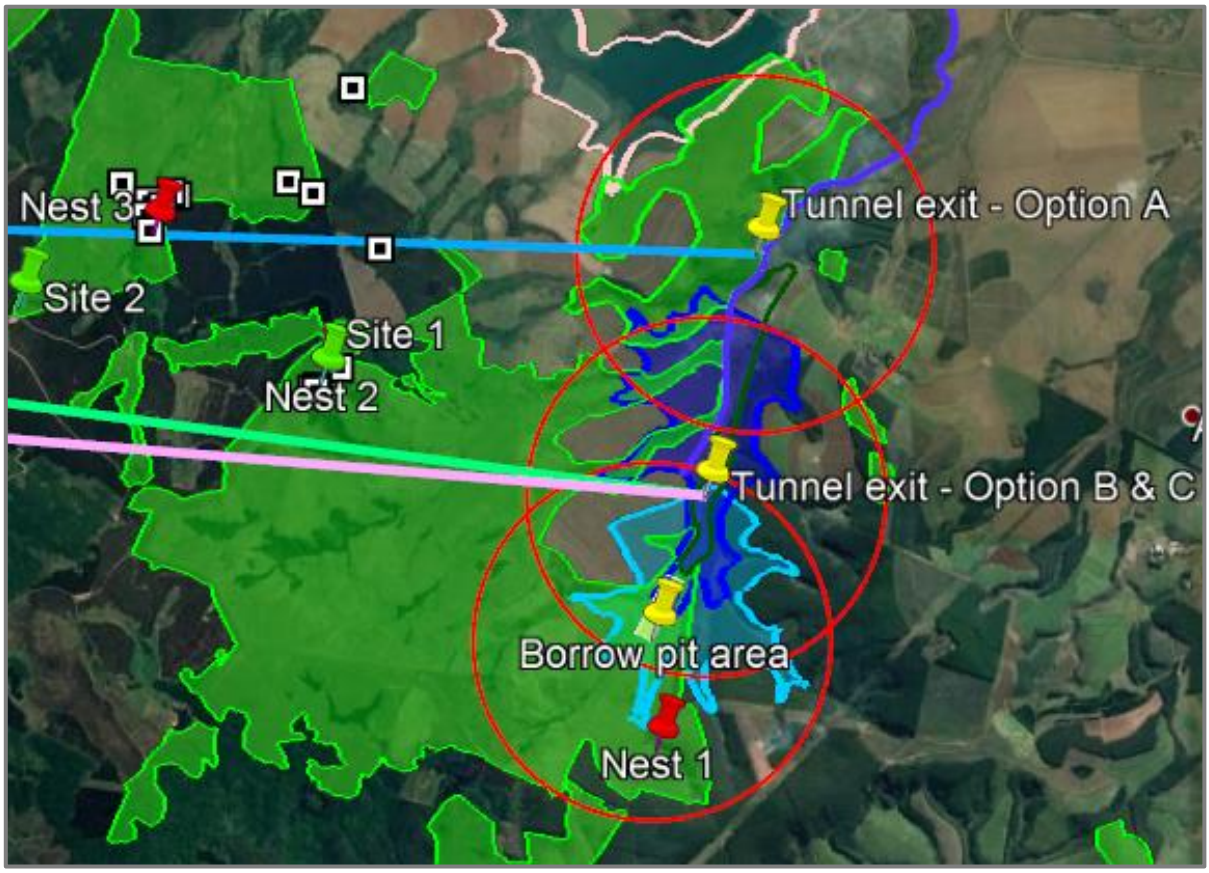

Figure 11: **Expected blasting locations and threshold radii on the eastern side of the study area (Kroch & Heyns 2018)**

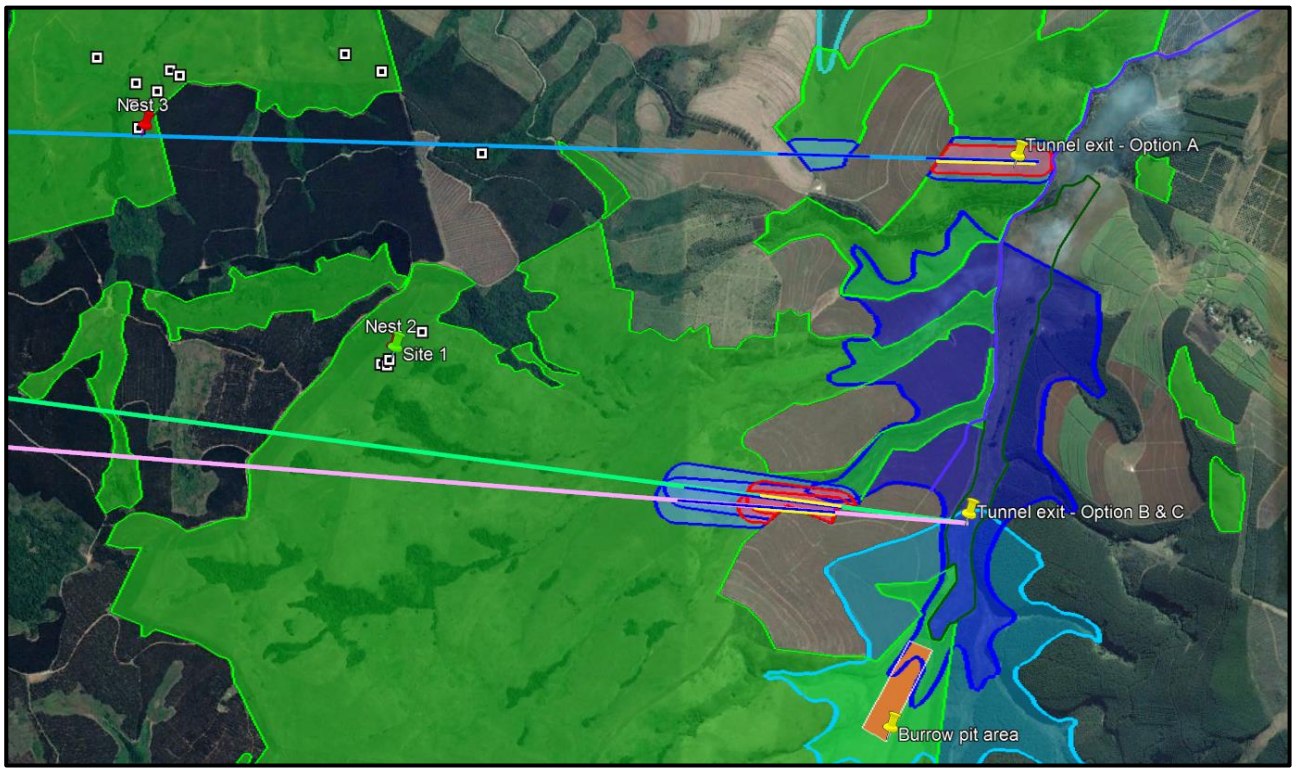

Figure 12: **Positions along the tunnelling alignment which lies within the TBM vibration radius of influence (Kroch & Heyns 2018)**

6.2.2.5 Monitoring

Due to the uncertainties in predicting the vibration levels generated by the TBMs and blasting work, a careful Ground-borne Vibration Monitoring Programme is advised. Such a programme will provide more certainty to the actual levels of vibration generated by the TBMs and blasting work and the reaction of the Blue Swallows to the ground vibration levels.

It is envisaged that information pertaining to the vibration propagation characteristics may be useful in future project planning. It is acknowledged that if the vibrations measured as part of a Monitoring Programme are equivalent to what are predicted (or higher), there is little that can be done at that stage. However, if it is found that the ground-borne vibrations are less than predicted, the reduced level of ground-borne vibration may open possibilities in the scheduling of blasting, construction and tunnelling.

In addition, the behaviour of the Blue Swallows should be monitored as the TBMs approach their nesting zones.

The monitoring should therefore involve seismic recording equipment, but would also necessitate a consulting Avifaunal Specialist to closely monitor the behaviour of the Blue Swallows.

6.2.2.6 Conclusions

During this Ground-borne Vibration Impact Assessment, the current background vibration levels were measured at five (5) of the most vulnerable sites within the nesting habitat of the Blue Swallows. These sites included two locations in Baynesfield Estate, as well as one location each at Trewirgie, Mount Shannon and Impendle Nature Reserve.

The background vibrations were processed to yield the PPV for impulsive ground vibrations, as well as steady state ground vibrations, since the Blue Swallows may respond differently to each of these phenomena. The maximum steady-state and impulsive PPV values observed during the measurement exercise were found to be 0.056 mm/s and 0.57 mm/s respectively.

As the background vibration is at a very low level, due to the environment being free of human activities, it was anticipated that taking the observed levels as a threshold may yield overly conservative results. This was confirmed by the Avifaunal Specialist and more reasonable thresholds were estimated.

The thresholds used in this Ground-borne Vibration Impact Assessment were based on the expected ground vibrations at a known Blue Swallow nest caused by forestry vehicles driving on a road 50 m away on a forestry road. This threshold is 0.1 mm/s PPV, and is

taken as the steady-state vibration threshold. The impulsive vibration threshold is taken to be 0.57 mm/s, which is equivalent to the impulsive background vibration. The aforementioned figure was adopted after a field measurement campaign was undertaken to measure the vibrations of a bridge as would typically be used be Blue Swallows to make a nest (as encountered in Tanzania). It was found during these tests that the maximum PPV measured on the bridge equated to 0.4 mm/s. As this was lower than the maximum ambient impulsive PPV measured in the Blue Swallow habitat zone, the ambient value was adopted.

The vibration threshold obtained was compared to the expected vibration levels of blasting, general construction vibration and tunnelling. Regarding construction vibration, a section of the Blue Swallow habitat (a section with a radius of 100 m) is expected to be subjected to ground vibration levels exceeding the recommended threshold. However, it is not known whether active nests are located within this area of disturbance.

Blasting vibration is expected to have a more significant impact, as it is expected that the recommended impulsive vibration threshold would be exceeded within 1,200 m of the blasting site (for a maximum instantaneous charge of 90 kg per delay). At the Borrow Pit Area A located within the Langa Balancing Dam Basin, this would imply that Blue Swallow Nest 1 (located south-west of the Langa Balancing Dam) would be disturbed as it is located 740 m from the nearest point of Borrow Pit Area A.

There remains uncertainty as to the precise magnitude of vibrations that a TBM will cause. Sources in the open and scientific literature were consulted, with the predictions typically differing by an order of magnitude at the depths expected. The calculations are based on soil models most closely matching the soil characteristics described in the uMWP-1 Feasibility Study: Geotechnical Report (DWA, 2014), which indicates that mostly soft soil will be encountered.

Due to some uncertainty still remaining, a comprehensive Monitoring Programme is suggested. This Monitoring Programme should serve the purposes of precisely characterising the vibrations generated by the TBMs and blasts. The result of this Monitoring Programme would be used to improve the Soil Vibration Attenuation Model and thereby more accurately predict the expected ground-borne vibration. If it is found that the soil attenuates the vibration better than predicted by the soil models, the strict scheduling timeframes of blasting and tunnelling could be relaxed. The Monitoring Programme should also involve an Avifaunal Specialist to understand the effects that ground-borne vibration has on the behaviour of the Blue Swallows.

Based on the expected tunnelling- and blasting induced ground-borne vibrations, Tunnel Options B or C are slightly more favourable. The reason being that a marginally smaller section of the Blue Swallow habitat is expected to be affected by tunnelling than for

Tunnel Option A. In support of this, the disturbance due to tunnelling through Tunnel Options A, B and C will last 3.5 weeks, 3 week and 2.8 weeks in total respectively. The ground-borne vibration due to the blasting required for the exit of Tunnel Option A will, however, cause ground-borne vibration within a part of the Blue Swallow habitat to exceed the impulsive ground vibration threshold, a factor that is less of a concern for Tunnel Options B and C. However, if blasting activities are scheduled when the Blue Swallows are migrating, there is no preference.

The risks involved could likely be mitigated if preparation tunnel blasting is undertaken during the Blue Swallow migration time, since they are only present from October to March. Borrow Pit Area A represents the most serious concern with regard to blasting, as Blue Swallow Nest 1 is located 740 m away. Mitigation measures proposed include blast design of less than 35 kg instantaneous charge per delay, or increased material extraction for stockpiling when the Blue Swallows are present (6 months of the year). If neither of these are possible, non-explosive techniques may need to be considered.

Therefore, with monitoring and mitigation measures in place, it is believed that the EA could be granted for the construction and operation of the uMWP-1.

6.3 Avifauna Bridging Study

6.3.1 Overview of Study

David Allan, a professional ornithologist with 40 years of experience and curator of Birds at the Durban Natural Science Museum, was appointed to undertake the Avifauna Bridging Study. This bridging study aimed to provide additional crucial information in assessing the potential impacts of the proposed uMWP-1's components on the local populations of the Blue Swallow. Furthermore, this bridging study also aimed to examine potential mitigation, management and monitoring measures in this regard. The Avifauna Bridging Study Report is contained in **Appendix B4**. An extract from the aforementioned report is given below.

The Avifauna Bridging Study served to build on the initial Avifauna Specialist Study conducted as part of the EIA. It primarily addressed several areas of concern and uncertainty identified during the initial Avifauna Specialist Study, especially as relates to the 'Critically Endangered' Blue Swallow *Hirundo atrocaerulea*. These areas of concern mainly relate to: (1) the location of the proposed balancing dam options on Baynesfield Estate and its impact on Blue Swallow mist-belt grassland habitat in the eastern part of the project area; (2) potential negative impacts caused by vibration from tunnel drilling on Blue Swallow nests; and (3) the impact of re-routing the R617 at Smithfield Dam in the western part of the project area on the nearby Impendle Nature Reserve and its breeding Blue Swallow population.

Existing knowledge of the locations and history of Blue Swallow breeding sites and foraging areas in the project area was obtained from past and present staff of EKZNW. Fieldwork for this Avifauna

Bridging Study was focused in the eastern part of the project area, centred on the Baynesfield Estate and Trewirgie Farms, as well as also extending to the directly adjacent properties where relevant. This focus on the eastern part of the project area was because the primary causes of concern relevant to Blue Swallows, i.e. issues related to tunnelling and the balancing dams, were concentrated in this region. On both the Baynesfield Estate and Trewirgie Farm the Blue Swallows breed only on the two largest habitat patches present at both properties (the two largest habitat patches on Baynesfield are colloquially known as 'Zinty' and the 'Amphitheatre' (refer to **Figures 13 to 16** below).

Figure 13: **View from Lower Zinty looking up to Upper Zinty on Baynesfield (Allan, 2018)**

Figure 14: **View from Upper Zinty looking down to Lower Zinty on Baynesfield (Allan, 2018)**

Figure 15: **View of the Amphitheatre on Baynesfield (Allan, 2018)**

Figure 16: **View of one of the two large blocks of primary mist-belt grassland on Trewirgie (Allan, 2018)**

Additional fieldwork, however, was also undertaken in other parts of the project area. For example, around Smithfield Dam to determine the potential impact of the construction of the dam and the associated diversion of the R617 on the Blue Swallows breeding in the adjacent Impendle Nature Reserve (and Mount Shannon), as well as relevant to potential impacts on other Red Data bird species. All fieldwork was undertaken during the period from November 2017 to January 2018. This was during the peak period when the migratory Blue Swallow is present and breeding in the sub-region, i.e. September – April (primarily October – March).

The assessment as part of the Avifauna Bridging Study showed that the Langa and Mbangweni Balancing Dam options are situated such that they are not complaint with buffer zones stipulated by conservation authorities on Blue Swallows as necessary for the protection of this species and its breeding and foraging habitat. The primary concern in this regard stems from habitat issues (refer to **Figure 17** below), but also potential noise and vibration matters, and general disturbance from such balancing dams during and post construction. The location of the Baynesfield Balancing Dam

Option by contrast is compliant with these buffer requirements. According to Allan (pers. comm., 2018), a small patch of grassland would also be lost to inundation by the Baynesfield Balancing Dam Option (south-central side of dam), lying (just) within or partially within the 4 km buffer around Blue Swallow Nest Sites 2 and 3. This patch, however, lies beyond the 1.5 km habitat buffer for all three Blue Swallow Nests 1, 2 and 3. The area of grassland is very small, and it is relatively distant from the main Amphitheatre and Zinty grassland blocks where the Blue Swallows breed.

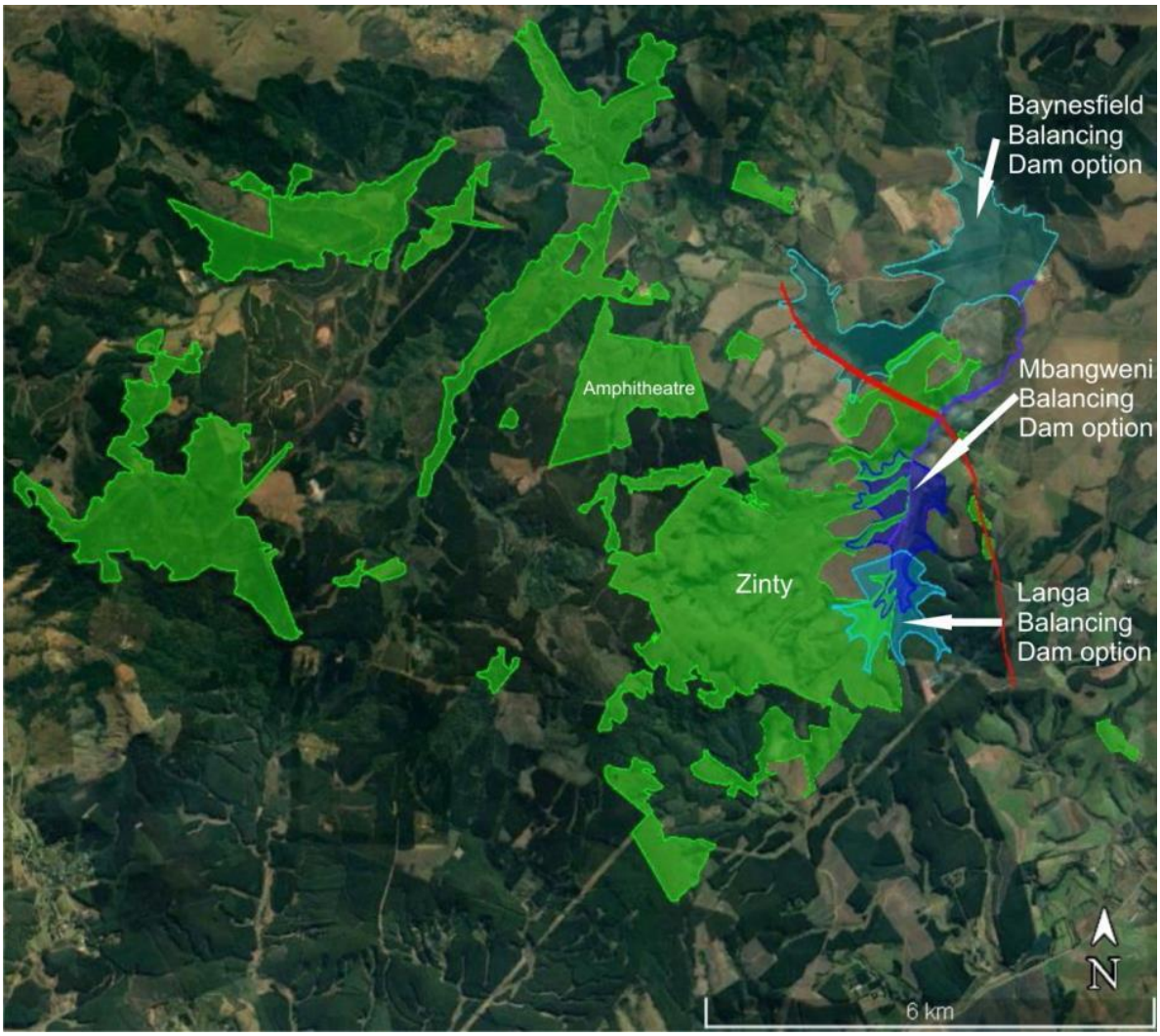

Figure 17: The 1.5 km buffer (red line) around the outer boundaries of the breeding Blue Swallow habitat patches (Zinty and Amphitheatre) (green polygons) supporting Nesting Localities 1, 2 and 3 relevant to the locations of the three balancing dam options (Allan, 2018)

Four (4) realignment options were developed relevant to the deviation of the R617 at the proposed Smithfield Dam subsequent to the original EIA and the proposed road corridor assessed at that time (refer to **Section 9.2** below). Some of these realignment options, and apparently the now preferred options, are situated south of the originally proposed route and are of less concern relevant to any impact on Impendle Nature Reserve and its associated breeding Blue Swallows. It should also be noted that the Blue Swallow habitat at Impendle Nature Reserve is not just situated relatively distant from the uMWP-1's components in this area but is also located at a higher altitude, i.e. 'perched' on a plateau above the low-lying uMkhomazi River Valley.

The Avifauna Bridging Study also reviewed the Vibration Impact Assessment (refer to **Section 6.2.2** above) from an avifaunal perspective. The Vibration Impact Assessment confirms the reality of vibration of two types from three sources (impulse, from blasting, and steady-state, from construction and tunnelling) as a potential threat to breeding Blue Swallows in the project area. Essentially only the extreme eastern section of the project area is impacted, especially the Zinty breeding Blue Swallow grassland block on the Baynesfield Estate. Blasting comprises the greatest vibration threat, followed by tunnelling vibrations, with vibration from construction being a relatively minor, but still unacceptable given the critically endangered status of this bird, source of vibration threat. Relevant to blasting, the key mitigation measures recommended relevant to the proposed Langa Balancing Dam Borrow Pit Area A is to restrict blasting to the period when the birds are not present (April – September), limit the amount of explosive used per blast, or to use non-explosive methods of rock breaking. Relevant to both blasting and drilling at the tunnel outlet areas, it is recommended that both be restricted to the period when the Blue Swallows are absent.

The Avifauna Bridging Study also reviewed the Noise Impact Assessment (refer to **Section 6.2.1** above) from an avifaunal perspective. The Noise Impact Assessment confirms the reality of noise as a potential threat to breeding Blue Swallows in the project area. During daytime construction activities up to 7% of the area of Blue Swallow habitat at Zinty would be potentially at risk from disturbance by noise from construction activities, although this disturbance is apparently not considered significant. Such disturbance, however, should be considered unacceptable from an avifaunal perspective given the critically endangered status of this bird. The Noise Impact Assessment offers no mitigation measures relevant to daytime noise, presumably because none are considered necessary. The Noise Impact Assessment predicts that a far larger proportion of Blue Swallow habitat would be potentially impacted by night-time construction activities. The Noise Impact Assessment recommends as mitigation that no night-time construction activities should be permitted within 1,500 m of any active Blue Swallow nesting sites. It would have been preferred had this buffer be applied to Blue Swallow breeding habitat rather than their actual nesting sites.

A key point, however, relevant to both vibration and noise is that essentially no development at all, even if vibration-free and silent, should be considered within the buffer zones stipulated by conservation authorities as necessary for the protection of Blue Swallows. Vibration and noise also serve as examples of elements contributing to potential cumulative effects of such proposed developments, rendering the strict implementation of these conservation buffers as imperative.

All of the uMWP-1 Raw Water Component would appear acceptable for EA from an avifaunal perspective, subject to the recommended mitigation measures being implemented, except for the Langa and Mbangweni Balancing Dam Options, which should be considered as fatally flawed primarily based on habitat destruction. 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 Dam Options from an avifaunal perspective cannot be mitigated for as they involve permanent destruction of

irreplaceable critical Blue Swallow habitat. Nor would any offset approach seem appropriate for the same reason. In addition, any offset would require the rehabilitation of an unrealistically large extent of previous Blue Swallow habitat – a highly specialized habitat type that is essentially not known to be amenable to rehabilitation once destroyed. The rigid preservation of the entire limited amount of remaining habitat of this species would appear the only hope of avoiding the imminent extinction of this critically endangered species in South Africa.

6.3.2 Way Forward

The Avifauna Bridging Study found the Langa and Mbangweni Balancing Dam Options to be fatally flawed due to the associated impacts to Blue Swallow habitat. Although it was found that the Baynesfield Balancing Dam Option was an acceptable alternative from an avifaunal perspective, this option was discarded for reasons stated in **Section 9.4.2.1** below. In addition, the option of a second parallel tunnel, which would negate the need for a balancing dam, was also found to be unfeasible, as discussed in **Section 9.3.3.3** below.

The risks posed by the uMWP-1 to Blue Swallows were discussed with the DEA during a biodiversity offsets meeting held on 19 January 2018. According to Peter Lukey from the DEA's Environmental Advisory Services Branch (Lukey pers. comm., 2018), the Draft National Biodiversity Offset Policy makes provision for "biodiversity compensation" in the case where a fatally flawed project is considered essential for pressing socio-economic needs, which are of national interest or significance. Extracts from the **Final EIA Report (November, 2016)**, which explain the strategic importance of uMWP-1, follow:

- The proposed uMWP-1 aims to increase the yield of the Integrated Mgeni WSS, which is the main water source that supplies more than five (5) million people and industries in the uMgungundlovu District Municipality, eThekwini Metropolitan Municipality and Msunduzi Local Municipality incorporating the greater Pietermaritzburg and Durban Metropolitan Areas. This is the third largest economic hub in South Africa with the second most people living in it; and
- An Economic Impact Assessment (refer to *Section 11.2.1* and *Appendix H10* of the **Final EIA Report, November 2016**) was conducted for the proposed uMWP-1, which produced an Economic Cost Benefit Analysis (ECBA) that found that the uMWP-1 is anticipated to have a net benefit of R58 370 million in 2014 Rand terms, and retains a positive discounted rate for net present value rates up to 25%. It was further found that if 2022 is used as the critical tipping point for water scarcity in the Mgeni WSS, then the foregone economic production (i.e. the opportunity cost to the economy from 2022 until 2044) equates to R13.3 billion in constant 2005 year Rands. This would have the consequence of foregone business sales for KZN of R13 227 458 in 2005 Rand terms; a loss of R1 222 866 in 2005 Rands of gross geographic production; an absolute loss of 376 055 employment opportunities over the 19 year period and a loss of income and wages of R1 717 103 in 2005 Rands.

In light of the above, the approach identified was to pursue biodiversity compensation in accordance with the Draft National Biodiversity Offset Policy, which is discussed further in **Section 8.2.3** as well as in **Sections 8.2.11** and **8.2.12** below.

7 PENNINGTON'S PROTEA BUTTERFLY AND RIVERINE KEELED MILLIPEDE

7.1 Introduction

Pachnoda Consulting CC was appointed to undertake an Invertebrate Assessment for the proposed Smithfield Dam and R617 realignment corridor (referred to in the report as the "invertebrate corridor"), as part of the uMWP-1. The Invertebrate Assessment Report is contained in **Appendix B5**. An extract from the aforementioned report is given in **Sub-section 7.2** below.

The scope of work for the Invertebrate Assessment included the following:

- A review of the Terrestrial Fauna and Flora Assessment Report undertaken as part of the EIA;
- Confirm the presence of the endangered *Capys penningtoni* (Pennington's Protea Butterfly) and the endemic *Gnomeskelus fluvialis* (Riverine Keeled Millipede) along suitable habitat within the FSL of the proposed Smithfield Dam and along the route options for the realignment of the R617;
- Generate records of findings during fieldwork, including GPS co-ordinates and photographs;
- Assess the potential impacts of the proposed uMWP-1 on threatened invertebrate species, and suggest suitable mitigation measures; and
- Compile a report documenting the findings.

7.2 Overview of the Invertebrate Assessment

7.2.1 Field Surveys

A site visit was undertaken from 15 to 19 November 2017 to search for *C. penningtoni,* and again from 11 to 15 November 2017 and from 19 to 22 February 2018 to search for *G. fluvialis*. Due to the timing of the study the Invertebrate Assessment was undertaken during the post-activity period (ca. post October) of the imago stage (adults) of *C. penningtoni*, hence the field surveys focused primarily on the identification, delineation and mapping of suitable host plant habitat (c. *Protea caffra* stands) within the FSL of the proposed Smithfield Dam and the "invertebrate corridor".

A total of 30 sites consisting of forested or vegetated woody stands were sampled during the *G. fluvialis* searches. The sampling sites were chosen to correlate for environmental, biophysical and topographical variability since information on the ecology of *G. fluvialis* is scant. Therefore, the sampling sites differ in terms of aspect, slope, dominant woody plant composition, canopy height, basal herbaceous cover, altitude, soil texture (clay, loam and sandy soils) as well as the presence/absence of livestock.

7.2.2 Occurrence of Capys penningtoni in the Study Area

Major findings and conclusions reached during the survey for *C. penningtoni* included:

- *C. penningtoni* was not observed during the respective site visits, although the probability for this species to occur on the "invertebrate corridor" as well as the higher-lying areas (c. 1200 – 136 masl) north of the Deepdale Road (in close proximity to Lundy's Hill) was **very high to definite**.
- Adults of *C. penningtoni* were recently observed (c. September 2017) during another independent survey at *Protea* stands in close proximity to the R617 corresponding Lot 93 1821.
- All natural and untransformed habitat (excluding forested areas) within the "invertebrate corridor" were classified a highly sensitive. The *Protea* stands were regarded as an important habitat component in ensuring high fecundity rates of this threatened butterfly species.
- According to a sensitivity analysis pertaining to the "invertebrate corridor" (refer to **Figure 18** below), it was evident that 474.58 Ha (c. 35% of the total surface area of the "invertebrate corridor") was represented by sensitive habitat (high and very high sensitivity). In addition, habitat of medium to high sensitivity and low-medium habitat covered respectively 159.8 Ha (12%) and 707.76 Ha (52%) of the total surface area of the "invertebrate corridor".

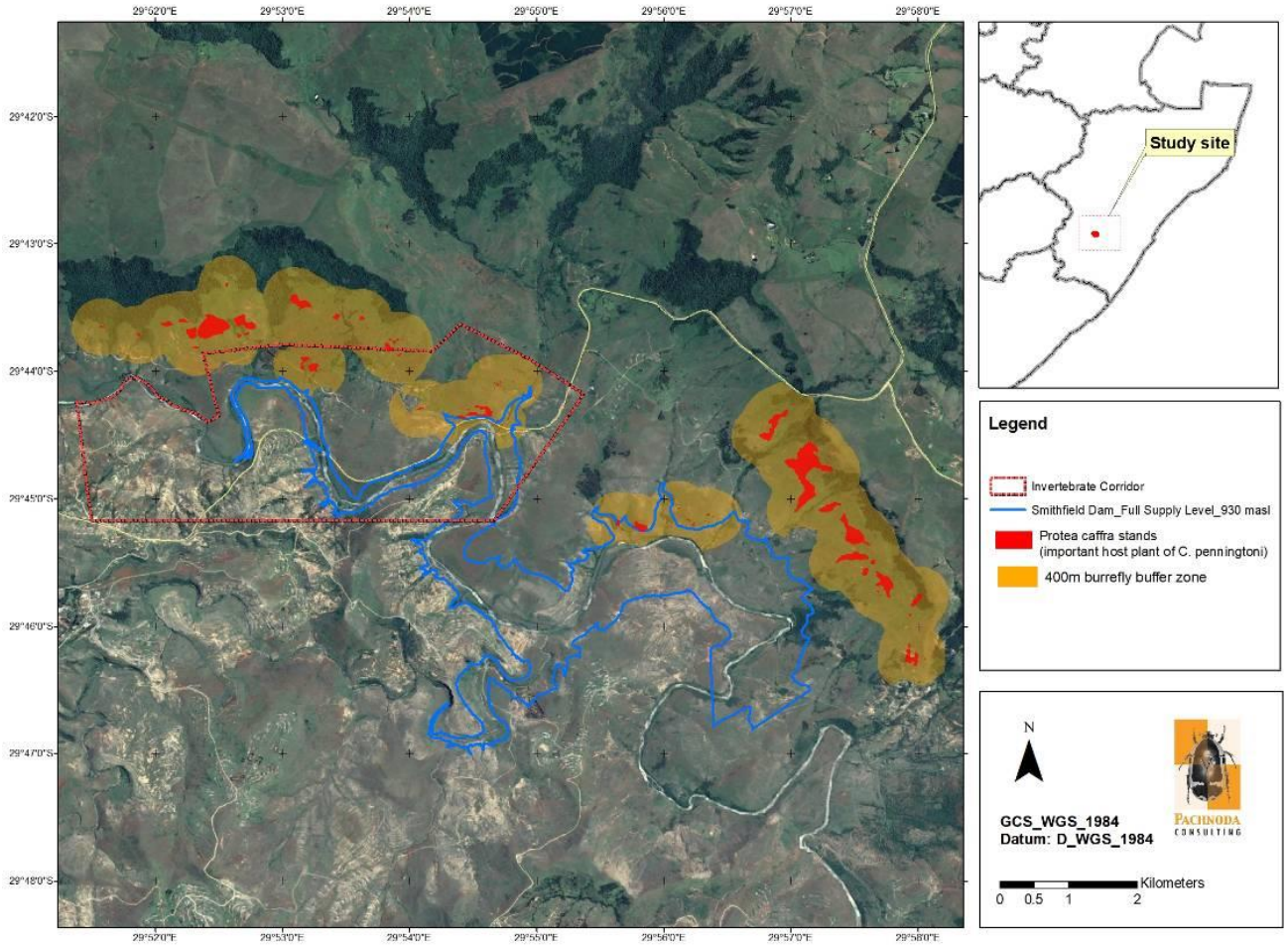

Figure 18: Spatial position of potential breeding habitat (*Protea caffra* stands) for *Capys penningtoni*. A 400 m buffer zone is included and modified where it occurs with habitat that is either transformed or unsuitable for occupancy (Niemand, 2018)

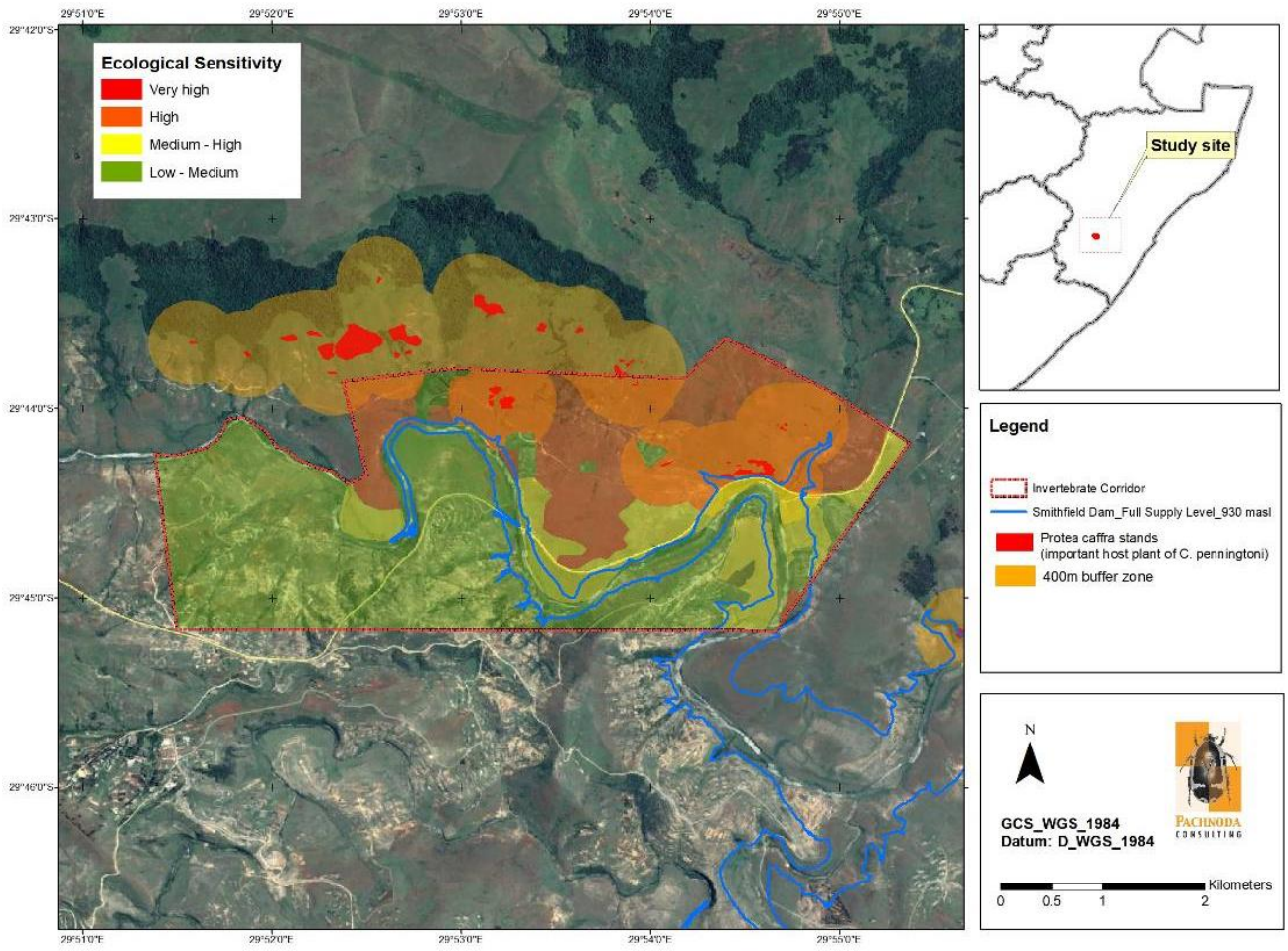

Figure 19: Sensitivity map of "invertebrate corridor". Note that most of the untransformed grassland is earmarked with a "high sensitivity", while the *Protea* stands have a "very high" sensitivity (with buffer zone) (Niemand, 2018)

7.2.3 Occurrence of Gnomeskelus fluvialis in the Study Area

Major findings and conclusions reached during the survey for *G. fluvialis* included:

- *G. fluvialis* was not observed on the study area even during intensive searching within a variety of habitat types. The occurrence of *G. fluvialis* was regarded as **probable** (low confidence) on the study area.
- The absence of *G. fluvialis* could not be ruled out since it was known to occur in the area based on historical records (*c*. 1959), potential suitable habitat was 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 was possible that this species were either easily overlooked and/or highly specialised whereby it may have already declined due to habitat degradation and inappropriate grazing regimes in the area.
- Important habitat units for *G. fluvialis* along the uMkhomazi River were perceived as units with a high probability to sustain moderate to high numbers of polydemoid millipedes. Such habitat units occurred near Deepdale, which is not below the proposed Smithfield Dam's FSL, near the

bridge where the existing R617 crosses a tributary of the uMkhomazi River and in forest types along the river with a steep slope on southern aspects.

- Four (4) other polydesmoid millipede species were sampled. Most of these species are endemic to KZN and some were previously only known from their type localities.

7.2.4 Potential Impacts and Proposed Recommendations

All impacts are summarised in **Table H** below and discussed in **Sections 7.2.4.1 to 7.2.4.5** below.

Table H: A Summary Table of the Anticipated Impacts (Niemand, 2018)

Area	Nature	Extent	Duration	Intensity	Probability	Status	Significance with mitigation	Significance without mitigation
Re-alignment of R617 - **Option 1**	Loss of *C. penningtoni* breeding habitat Dispersal and "barrier "effects Changes to local temperature regime Changes to local floristic structure and composition owing to defective storm water management	Site	Short-term	Low	Likely	Negative	Low	Medium
Re-alignment of R617 - **Option 2**		Site	Long term	High	Definite	Negative	Medium to High	High
Re-alignment of R617 - **Option 3**		Site	Permanent	High	Definite	Negative	High	High
Access Road	Loss of *C. penningtoni* breeding habitat Dispersal and "barrier "effects Changes to local temperature regime Changes to local floristic structure and composition owing to defective storm water management	Site	Long term	High	Definite	Negative	Medium to High	High
FSL of dam	Loss of habitat during inundation: *C. penningtoni*	Local	Long term	High	Highly Probable	Negative	Medium to High	High
FSL of dam	Loss of habitat during inundation: *G. fluvialis*	Local	Permanent	High	Probable	Negative	Medium to High	High

7.2.4.1 Re-alignment of the R617

The R617 needs to be re-aligned since it will become inundated by the proposed Smithfield Dam (refer **Section 5** above). It is obvious from the sensitivity analysis that Option 1 will transverse habitat of low to medium sensitivity, while Options 2 and 3 will traverse through habitat of high sensitivity (see **Figure 20** below). In addition, the spatial

locality of both Options 2 and 3 are in line with the allocated buffer zone, while both routes traverse *Protea* stands. Option 3 will traverse a large stand of *Protea caffra* habitat where *C. penningtoni* was recently observed. It is thus evident that Option 1 is the most preferred route option.

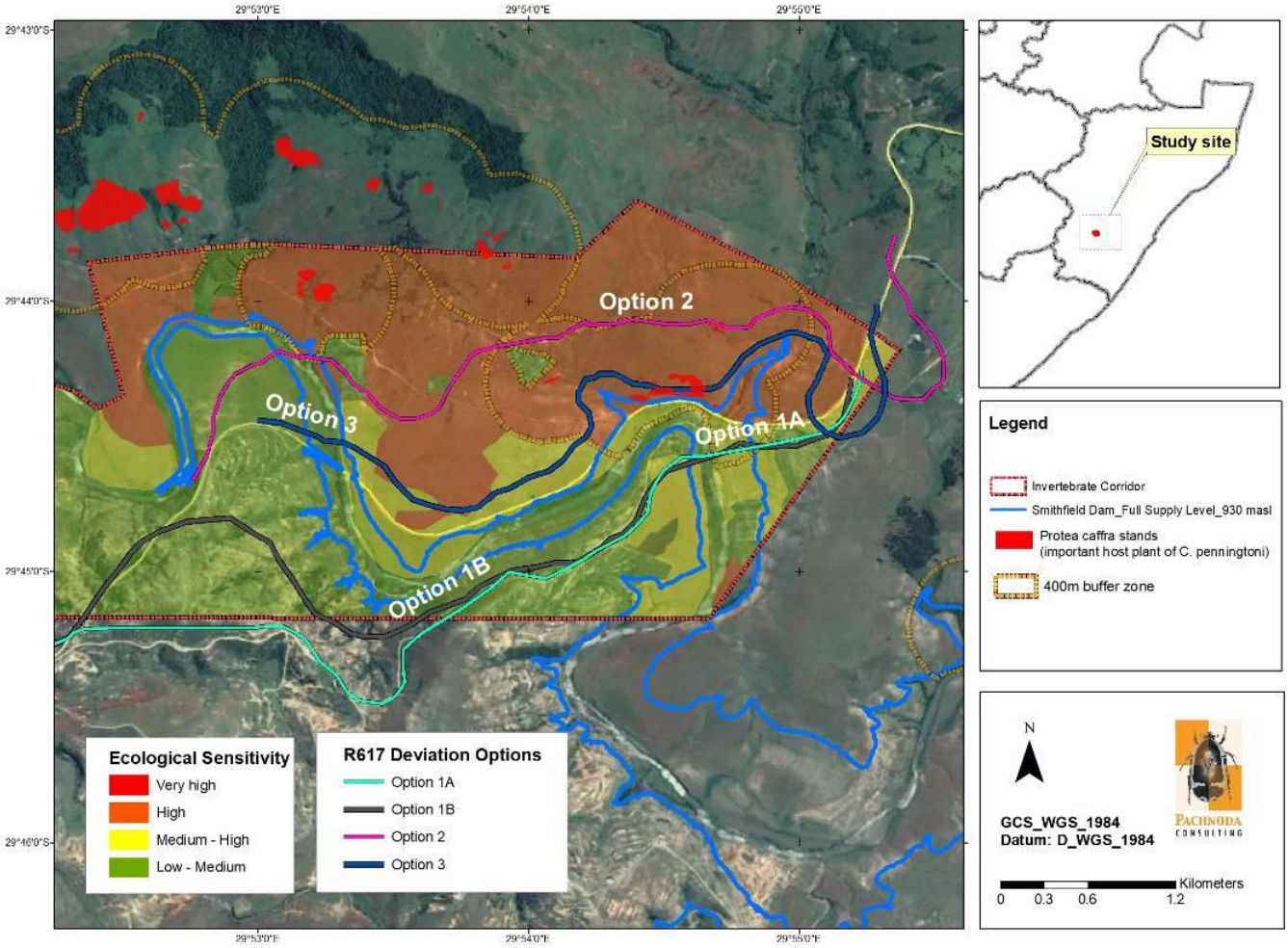

Figure 20: **Map illustrating the proposed R617 realignment options corresponding to the "invertebrate corridor" (Niemand, 2018)**

7.2.4.2 Gravel Access Road

A gravel access road is planned to provide incoming-outgoing access to the residents who live/farm within the "invertebrate corridor" (see **Figure 21** below). The potential impacts of this road are considered to be similar to the aforementioned discussion on the R617 deviation, although the magnitude and severity of the impacts are lower (e.g. the temperature gradient on gravel roads is less intense when compared to hard surfaced roads). However, the planned gravel access road will traverse sensitive grassland, including a patch of *Protea* stands. Therefore, construction activities could result in the loss of the *Protea* stands and the road reserve itself is likely to fragment the *Protea* trees.

In addition, stormwater run-off could result in erosion and further deterioration of the grassland habitat in the area. It is also possible that airborne dust during the construction and operation of the road could settle on the *Protea* flower buds, which could impair or deter *C. penningtoni* ovipositing on the *Protea* buds.

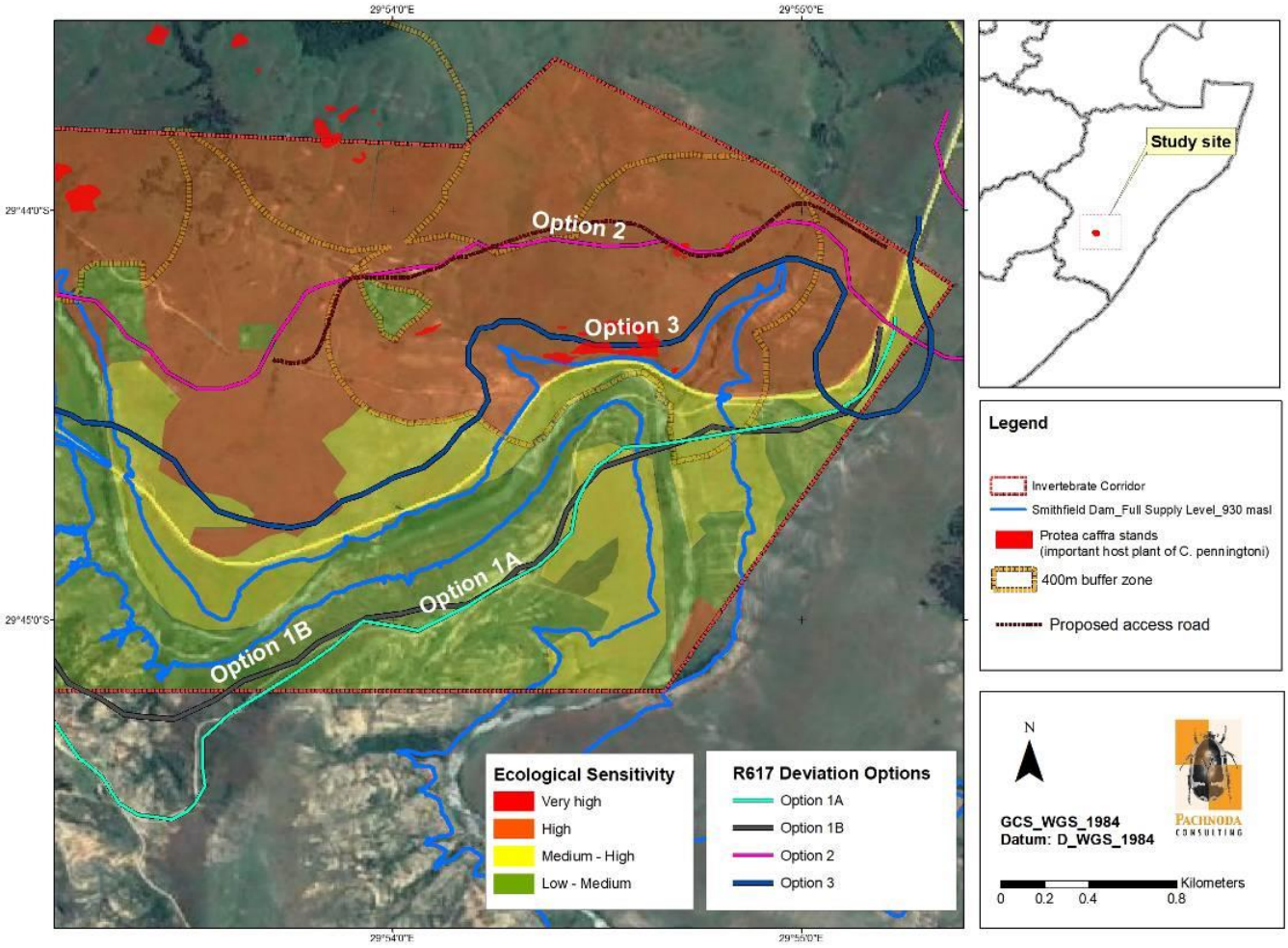

Figure 21: Map illustrating proposed gravel access road corresponding to the "invertebrate corridor" (Niemand, 2018)

It is difficult to mitigate against the impacts of the gravel access road on the area of high sensitivity (see **Figure 21** above), besides the implementation of an effective storm water drainage system. However, it is strongly recommended that the road alignment be revised to avoid the dissection of the *Protea* stands.

7.2.4.3 Loss of Habitat During Inundation: *Capys penningtoni*

Inundation and rising water levels in the dam basin of the proposed Smithfield Dam could potentially result in the loss of *Protea* stands which occur in close proximity to the FSL of the proposed Smithfield Dam. Excessive inundation and moisture over time could result in the drowning and die-back of individual *Protea* trees. According to **Figures 22** and **23** below it is evident that two particular areas corresponding to a large stand of *Protea* trees

on the "invertebrate corridor" and on the eastern part of the study area are at risk of drowning. The probability of drowning of *Protea* stands on the eastern part is definite since these occur within the FSL of the proposed Smithfield Dam. However, the number of trees associated with these stands are low (c. only a few individuals).

Nevertheless, the stand of *Protea* trees (corresponding to the "invertebrate corridor") is large and it was also at this particular stand where *C. penningtoni* was observed during September 2017. The probability that these trees would drown is lower, but the risk is eminent or high during exceptional flood events where the water levels could exceed the proposed Smithfield Dam's FSL.

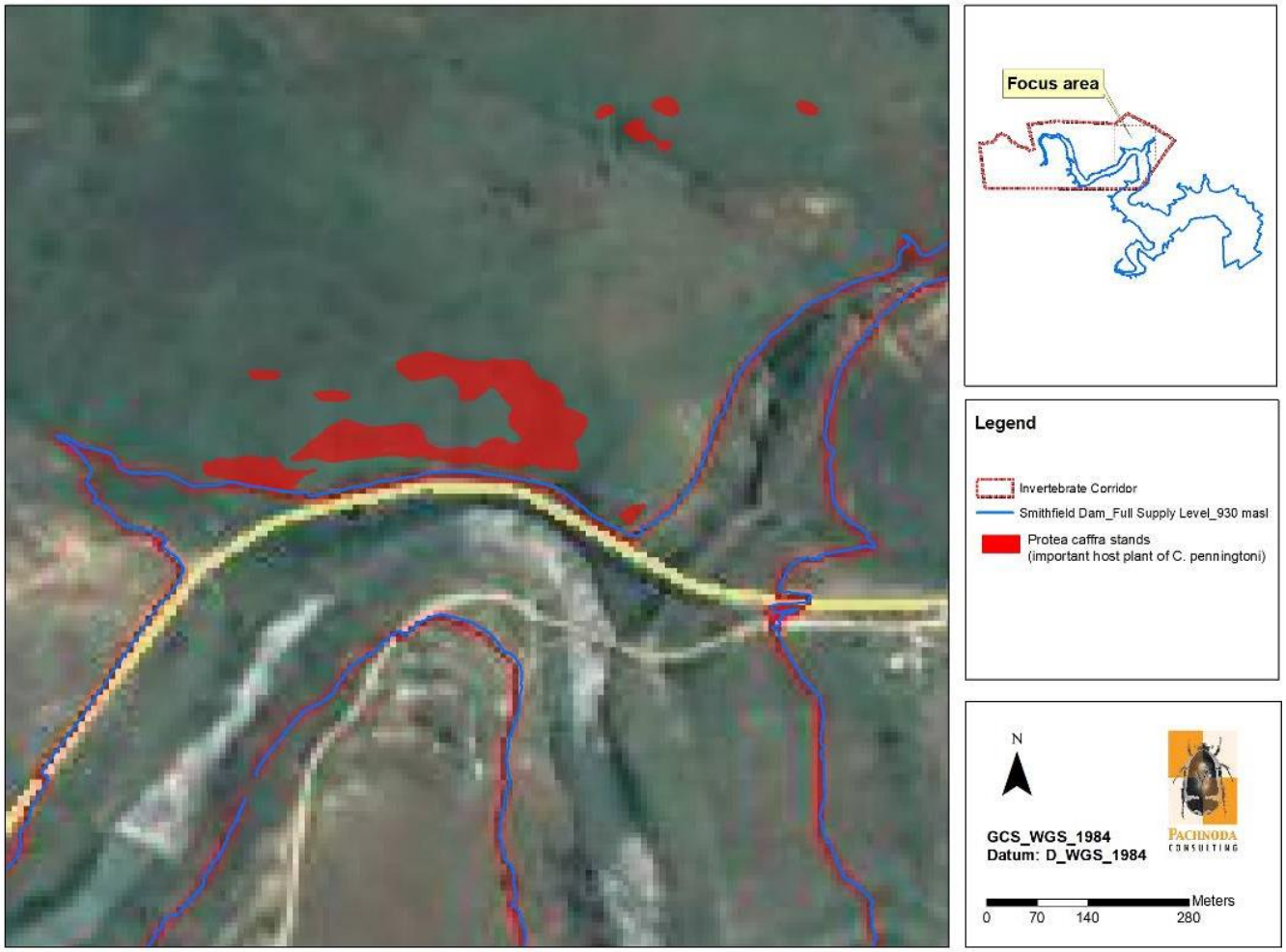

Figure 22: **Map illustrating the spatial position of a *Protea* stand on the "invertebrate corridor" in close proximity to the FSL of the proposed Smithfield Dam (Niemand, 2018)**

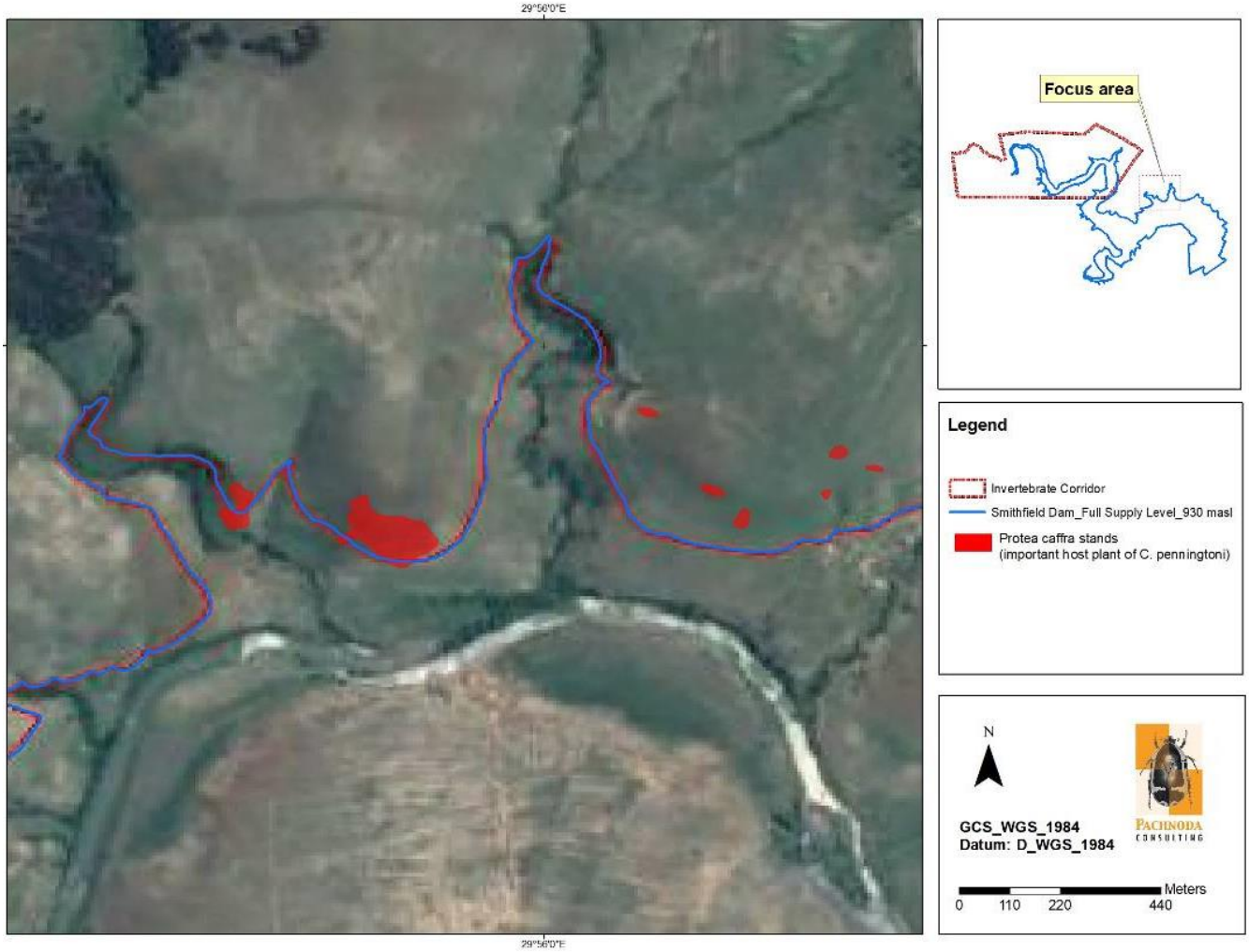

Figure 23: Map illustrating the spatial position of *Protea* stands on the eastern parts of the study site corresponding to the FSL of the proposed Smithfield Dam (Niemand, 2018)

The Invertebrate Assessment recommended that a buffer zone be created for the proposed Smithfield Dam to safeguard against accidental flooding of *Protea* stands or against the unexpected rise in water levels above the dam's FSL. *Insert: It is noted that the DWS' policy for the safe operation of a dam is to create a buffer zone (as part of the purchase line) around a dam that includes the greater of the horizontal distance for a height of 1.5 m above the 1:100 year recurrence interval backwater level, or 15 m horizontally from the 1:100 year recurrence interval backwater level. The purchase line encompasses certain of the Protea stands, that fall within the aforementioned zone. However, the two large clusters of Protea stands, as shown in* ***Figures 22*** *and* ***23*** *above, are mostly located in steeper areas that are outside of the purchase line*.

The Invertebrate Assessment further recommended that the lost *Protea* trees be replaced with *ex situ* individuals either purchased from a nearby nursery (e.g. within 50 km radius of the project area), or reared from seed harvested from individuals occurring within the

project area. It is important to maintain the genetic integrity of the *Protea* population in the area, whereby the preferred method of sourcing would be to harvest seed from *Proteas* in the area. A Reproductive Plant Biologist should be consulted during the rearing of *Protea* plants by seed. The locality for in-planting should be determined in consultation with a Terrestrial Ecologist, and preferably also with a representative from EKZNW. Implanting should avoid areas of untransformed montane grassland since soil disturbances could result in erosion over time.

7.2.4.4 Loss of Habitat During Inundation: *Gnomeskelus fluvialis*

Inundation and rising water levels could potentially result in the loss of *G. fluvialis* habitat. Several areas were identified with moderate to high numbers of millipedes which will become inundated after construction of the proposed Smithfield Dam.

The following is recommended:

- It is not possible to mitigate against the loss of habitat due to inundation. As a precautionary principle, it is recommended to identify habitat holding high numbers of Keeled Millipedes downstream (e.g. Deepdale) and upstream (e.g. Bulwer Area) of the proposed Smithfield Dam and incorporate these habitat patches into an offset or conservation area. *Insert: The Biodiversity Offset Study (see **Section 8.2** below) identified riparian areas up- and downstream of the proposed Smithfield Dam to be rehabilitated and managed.*
- An extensive searching and collection excursion for *G. fluvialis* and other polydemoid taxa should be initiated of the area confined to the inundation zone (the proposed Smithfield Dam's Basin). Collected material could contribute towards a better understanding of the distribution of Keeled Millipedes and the scientific knowledge and taxonomy of Polydesmoid Millipedes, which is in dire need of revision. Members of the scientific community and entomologists with an interest in Diplopoda (in particular the Natal Museum) are invited to collect material for scientific use. *Insert: note that provision is made in the EMPr for the search, rescue and relocation of red data, protected and endangered species, which includes Riverine Keeled Millipede and other polydemoid taxa within the Smithfield Dam inundation area.*

7.2.4.5 Other Compensatory Recommendations

The following recommendations are of a compensatory nature with the intent to promote and/or facilitate *inter alia* butterfly and invertebrate conservation in the area:

- Extent the boundaries of the Impendle Nature Reserve southwards to the area of the "invertebrate corridor" immediately north of the uMkhomazi River. *Insert: this may not be a viable mitigation measure for the project to pursue due to complications with current encroachments (e.g. dwellings and grazing) into the southern part of the reserve*;

- Procure and distribute funds to assist with local (on site), as well as regional monitoring of *Capys penningtoni* as currently undertaken by staff of EKZNW. 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;
- Procure and distribute funds to assist with synecological and autecological studies/research of *C. penningtoni* and *Gnomeskelus fluvialis* at a tertiary (e.g. universities) or statutorily level (in liaising with EKZNW);
- Apply funding to the taxonomic revision and phylogenetic relationship of polydesmoid millipedes, in particular the genus *Gnomeskelus*; and
- Assist with a strategy and develop an Adaptive Management Guideline for Grazing and Burning Practices in the area with the intent to optimise the ecological condition of the montane grassland. Typical examples would include the development of a Comprehensive and Practical Grazing Capacity Management Plan and a Fire Management Plan.

8 BIODIVERSITY OFFSET STUDY

8.1 Introduction

According to the DEA's comments on the **Final EIA Report (November, 2016)**, there was lack of clarity as to the location and acceptability of potential offset sites to compensate 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, and the DEA provided a list of requirements of this study (refer to **Table B** under ***4.2.3*** above).

Scientific Aquatic Services was appointed to undertake the Biodiversity Offset Study for the proposed uMWP-1. The report is contained in **Appendix B6**. An extract from the aforementioned report is given in **Sub-section 8.2** below.

8.2 Overview of the Study

8.2.1 Background to Biodiversity Offsets

In March 2017, a Draft National Biodiversity Offset Policy was published for public comment. According to this document (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".

According to the EKZNW's Concise Guideline: Biodiversity Offsets in KZN (2013), broadly speaking, biodiversity offsets should not be considered when the residual impacts are of 'very high' significance (e.g. if an irreversible impact would occur within an area designated as a Critical Biodiversity Areas (CBA)), however, as in the Draft National Biodiversity Offset Policy (2017), the aforementioned 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.

According to the DEA (2017) and the Department of Environmental Affairs and Development Planning (DEADP) (2011), offsets need to be undertaken according to various ratios based on the ecological importance and sensitivity and vulnerability of the ecosystem. It should, however, be noted that according to the Draft National Biodiversity Offset Policy (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.

Due to the above, an investigation into the required wetland, biodiversity offset and faunal Species of Conservation Concern (SCC) offset was launched for only the proposed Smithfield Dam and balancing dam located at Baynesfield Estate.

The offset ratios as defined by the DEADP (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. It provides hectare (Ha) equivalents representative of the wetland that requires an offset.

The Wetland Offset Calculator was used during the determination of the wetland offsets required for the proposed Smithfield Dam and both balancing dam options (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 in the Concise Guideline: Biodiversity Offsets in KZN (EKZNW, 2013). Taking the aforementioned into consideration, the following offset ratios were determined for the various ecosystems that would be impacted by the proposed development (the uMWP-1):

- 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 uMWP-1 would achieve this ratio. Therefore, it was 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 offset initiative. This wetland offset ratio of 5:1 is almost double that of the precedent set by the Spring Grove Dam Biodiversity Offset Programme. Furthermore, it is also the opinion of the Biodiversity Offset Specialist that a ratio of 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.

8.2.2 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).

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

1. Only wetland loss was quantified utilizing available tools. Instream and riparian resource loss was not included in the calculated quantum but has been taken into account on a “like for like” basis;
2. To achieve a “net gain” offset for wetlands and terrestrial areas considered to be of irreplaceable or high biodiversity value;
3. To give due consideration to the relevant national and provincial offset ratio guidelines;

4. 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;
5. To ensure, as far as practicable and feasible, that perceived "fatal flaws" in terms of impacts on faunal SCC are compensated for; and
6. 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.

8.2.3 Species of Conservation Concern (Blue Swallows and Invertebrates)

The Avifauna Bridging Study (refer **Sub-section 6.3** above) identified the Langa and Mbangweni Balancing Dam options to be fatally flawed due to the associated impacts to Blue Swallow habitat (refer to **Section 6.3.1** above). This matter was discussed (amongst others) with the DEA during a meeting held on 19 January 2018. Based on the Draft National Biodiversity Offset Policy, which was discussed with the DEA during the aforementioned meeting, offsetting is not appropriate where a project is fatally flawed. However, in instances where a fatally flawed project is considered essential for pressing socio-economic needs, which are of national interest or significance, biodiversity compensation can be considered compensate for the loss of biodiversity that will occur (Lukey pers. comm., 2018). 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.

Provisions in terms of biodiversity compensation for Blue Swallows are discussed further in ***8.2.11*** and ***8.2.12*** below.

The uMWP-1's most significant ecological impact would be during first filling of the proposed Smithfield Dam and the balancing dam (Langa and Mbangweni Balancing Dam options), since it would 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;
   b. Optimal CBAs; and
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, alternatives were investigated to avoid, or minimize, the impact of the uMWP-1. 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 (see **Section 9.4.2.1** below);
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 in the area, an 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 uMWP-1 (see **Section 9.3.3.3** below); and
3. The realignment of the R617, since the original proposed re-alignment would have posed a very significant risk to Pennington's Protea Butterfly and would have directly impacted on the Impendle Nature Reserve. The deviation of the R617 has subsequently been re-evaluated (see **Section 5** above) and a revised proposed re-alignment option has been recommended which will negate the impact on Pennington's Protea Butterfly.

No mitigatory options are available to avoid, or minimise, the potential risk to the Riverine Keeled Millipede, which may occur within the riparian zone of the uMkhomazi River that would be affected by the first filling of the proposed Smithfield Dam, except for rescue and relocation of this species to identified areas of riparian forest above Smithfield Dam's FSL.

8.2.4 Results of Baseline Freshwater Resource Assessments

A Freshwater Resource Delineation and Assessment were undertaken as part of the EIA, during August and September 2015. According to Enviross CC (2016), numerous seep zones and valley bottom wetlands are located beneath the FSL of the proposed Smithfield Dam's footprint, and the results of the assessment correlate with the National Freshwater Ecosystems Priority Areas (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 services to the surrounding communities.

Several wetlands were also identified by Enviross CC (2016) within the Smithfield Dam Area and Baynesfield Area where the proposed Balancing Dam options are located.

In summary, it can be concluded that the wetlands affected by both of the proposed Smithfield Dam and balancing dam options 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 filling of the proposed Smithfield Dam is associated with the uMkhomazi River and its small tributaries confluencing within the proposed Smithfield Dam's Basin. The total loss of riparian habitat due to inundation would be 135 Ha. This area of riparian habitat occurs along a stretch of the uMkhomazi River of approximately 16.8 km in length. It also includes riparian habitat associated with small drainage features (tributaries) that 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.

It can be concluded that the riparian habitat which would 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.

8.2.5 Results of Baseline Terrestrial Ecological Assessments

The most prevalent vegetation types present in the study area includes Southern KZN Moist Grassland in the west surrounding the proposed Smithfield Dam, Midlands Mistbelt Grassland and Drakensberg Foothill Moist Grassland along the raw water conveyance route (the 32.5 km long tunnel and 5.1 km long pipeline), and Ngongoni Veld in the east at Baynesfield (Mucina & Rutherford, 2006).

The proposed uMWP-1's footprint is identified as being a preferred habitat for avifaunal SCC, with special mention of Blue Swallow. Two other faunal SCC namely Pennington's Protea Butterfly and Riverine Keeled Millipede were also identified to be negatively impacted as preferred habitat would be lost due to the proposed uMWP-1's footprint.

8.2.6 Offset Quantum Requirements

Table I below summarises the offset quantum for the riparian zone offset, the wetland and watercourse offset initiative as well as the grassland and CBA offset initiative. These requirements guided the further investigations of the study.

Table I: Summary of offset requirements using relevant national and provincial guidelines (van Staden *et al*, 2018)

Wetland habitat: Offset Ratio 20:1 advocated by the DEA (2017) and the DEADP (2011)		
Dam	**Habitat loss (Ha)**	**Offset target (Ha)**
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	

8.2.7 Landowner Engagement for Stewardship Sites

Four (4) broad offset target areas (shown in **Figure 24** below) were identified by using desktop methods, which seemed to provide the required biodiversity characteristics to use as offset.

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 as "Smithfield 1 (S1), Smithfield 2 (S2) and Smithfield 3 (S3)".

Only one area was identified around the proposed balancing dam options, namely the Baynesfield Recipient Site, which has ample wetland and CBA habitat, was identified in this vicinity to meet the offset requirements if the Langa Balancing Dam Option is selected. Initial investigations indicate that the landowners in this area are, in principle, accommodating to the proposed offset and faunal SCC compensation initiatives.

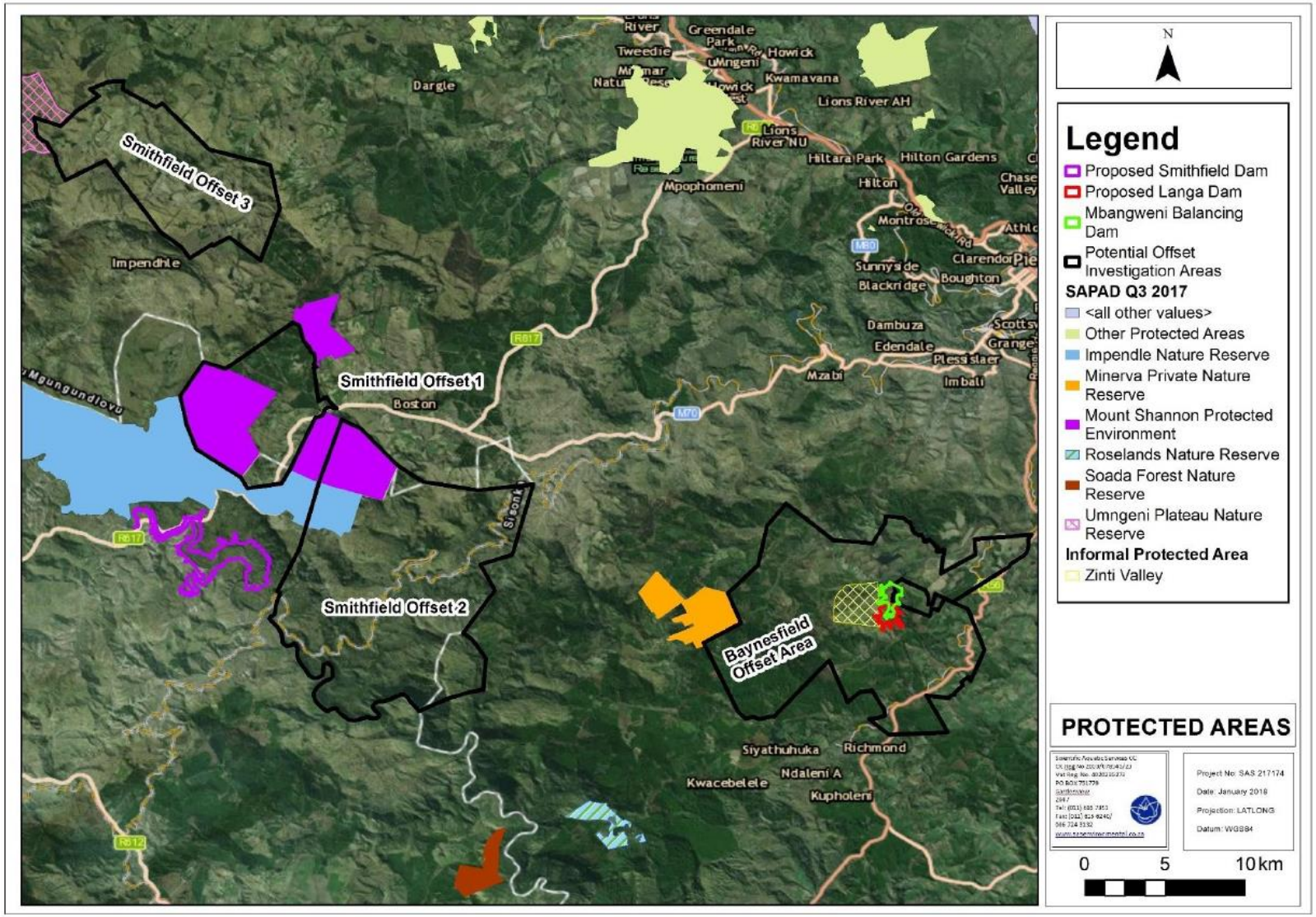

Figure 24: **The proposed offset target areas for investigation, in relation to the uMWP-1 footprint and surrounding protected areas (van Staden *et al*, 2018)**

Within the four (4) main target areas various farms were identified as potentially suitable offset sites. 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. In addition, the following information was provided to the landowners:

- A BID;
- Additional maps indicating identified wetlands and terrestrial CBAs of the target area within which their properties are located; and
- 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. 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. Of the landowners who were contacted, approximately 45% have indicated their willingness in principle to participate in such a programme. This feedback was utilised to estimate the extent of wetland and CBA habitat, which is likely to be realistically available to achieve a successful offset, by overlaying the delineated watercourses and terrestrial CBA datasets on the farm portions belonging to those landowners who have indicated a willingness to participate.

8.2.8 SWOT Analyses Findings

As part of the process of identifying potential sites for conservation and rehabilitation offsets, and conservation compensations, a Strength Weakness Opportunity Threat (SWOT) Analyses was undertaken.

Taking into consideration the final offset requirements 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) advise that offsets should preferably be within a single area, but 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 (under the DEA Natural Resource Management) 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, which include Blue Swallows, Pennington's Protea Butterfly and Riverine Keeled Millipede. Thus, the compensation initiatives around these species have a significant possibility of being

unsuccessful and thus the offset and compensation plan could be regarded as a failure, should this occur;

- Many of the land portions in this area are subject to land claims. This was discussed with the DRDLR and the understanding is that a conservation-based servitude on claimed land would be treated the same as any other encumbrances in the Title Deed of state-owned land, such as servitudes for infrastructure;
- Privately owned land – obtaining final agreement from landowners may be a challenge. It is likely that land owners will stipulate that 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.

Procedural risk is best mitigated by ensuring that extensive engagement with the relevant stakeholders, in particular Provincial Authorities (including KZN EDTEA and EKZNW), landowners and the surrounding communities.

The primary risk associated with procurement for biodiversity offsets and compensation 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 offset 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.

8.2.9 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 assessment are summarised in **Table J** below.

Table J: Summary of the results of the assessments of the various freshwater resources within the target recipient sites (van Staden et al, 2018)

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 offset initiative.

In addition to the areas identified for the wetland offset initiative alike for like riparian zone offset initiative was developed. Riparian areas have been identified in three areas adjacent to the Smithfield Dam for rehabilitation at three (3) strategic points around the proposed Smithfield Dam.

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 (Luhane River) of the uMkhomazi River; and
- A length of the uMkhomazi River of 4.5 km upstream of the proposed Smithfield Dam's FSL.

8.2.10 Recipient Site Characterisation – Grasslands and CBAs

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 area 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 but are not limited to possible fencing off areas, custodian Programmes 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 offset 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.

8.2.11 Compensation – Blue Swallows

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 selected balancing dam option, 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 options, 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:

- 2 969 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 Avifauna Bridging Study Report (Allen, 2018) would be lost. At a commensurate ratio of 1:30 as mandated, this equates to a total of approximately 1 350 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 Programme will encompass only mistbelt grasslands, it can be concluded that a significant area of mistbelt grasslands in the region would be placed under stewardship as part of the Offset and Compensation Initiative. Whilst the rehabilitation of land that has been under commercial forestry 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 (2007) 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 the Langa or Mbangweni Balancing Dam options) and rehabilitation of existing wetlands will inherently increase these preferential ecotonal foraging areas for Blue Swallows. Evans & Bouwman (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.

Further information is provided in the Biodiversity Offset Report with regards to the ecological objectives and design criteria for the Burning and Grazing Management Plans. In addition, provision is made for Monitoring Programmes.

8.2.12 Offset and Compensation Intervention Overview

Based on results of the engagement with the landowners, the following offset extents could be achieved:

- The overall target of 84.7 functional Ha equivalents (based on an offset ratio of 11:1, and as calculated for the proposed Smithfield Dam and Langa Balancing Dam only) can realistically be achieved, and exceeded by 13.3 functional Ha equivalents;
- The overall target of 920.8 ecosystem conservation Ha equivalents will not be met, and will fall short by 281.6 conservation Ha equivalents;
- Offset targets for CBA Irreplaceable and CBA Optimal habitat for both the proposed Smithfield Dam and Langa Balancing Dam can potentially be exceeded;
- The management of 17 km of riparian areas upstream and downstream of the proposed Smithfield Dam. This intervention is in line with the requirements defined by the DWS Sub-Directorate: Instream Water Use. This initiative also serves the additional purpose of (as best possible) ensuring that, on a like for like basis, riparian areas are conserved. This includes the area nearest to the Lundy's Hill population of *Gnomeskelus fluvialis* that will not be affected by the proposed Smithfield Dam.

Based on the consideration of the impacts of the proposed uMWP-1, 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 Ha equivalent targets:

- Riparian vegetation restoration initiative both upstream and downstream of the proposed Smithfield Dam on the uMkhomazi River, as well as on the major tributary flowing into the proposed Smithfield Dam including alien vegetation management and 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;

- Various initiatives for the SCC Compensation, including:
  - Riverine Keeled Millipede rescue and relocation;
  - Planting of *Protea caffra* (food source for Pennington's Protea Butterfly);
  - Research, habitat creation and conservation management for Blue Swallow; and
  - Provision of budget for these three afore-mentioned species of conservation concern.

8.2.13 Biodiversity Offset Implementation Plan

The Biodiversity Offset Implementation Plan consists of the following key sections (amongst others):

- Institutional Arrangements –
  - Funding Model and Sources of Funding
  - Management and Implementation Structures
- Roles and Responsibilities on the Ground;
- Offset and Compensation Budget;
- Implementation Plan Process Overview –
  - Step 1 – Planning;
  - Step 2 – Rehabilitation of the Watercourses and Grassland Areas;
  - Step 3 – Clearing of Alien Invasive Plants;
  - Step 4 – Revegetation;
  - Step 5 – Monitoring;
- Freshwater Offset Specific Implementation;
- CBA and Grassland Offset Specific Implementation; and
- SCC Compensation Specific Implementation.

8.2.14 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 the Biodiversity Offset 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 *inter alia* the following budgets (refer to breakdown in Table 29 in the Biodiversity Offset Report, which is contained in Appendix B6):

- Execution and maintenance for three (3) year period of Wetland Offset and Compensation Initiative: **R38,000,000 (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: **R15,500,000 (rounded and including VAT)**;
- Execution and maintenance for three (3) year period of Grassland and CBA Offset and Compensation Initiative: **R38,000,000 (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): **R40,500,000 (rounded and Incl VAT)**. This is split between the three SCC.

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 development, 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 offsets as well as compensation initiatives. In this regard, the proponent is obliged to ensure that the proposed dams are sustainably managed for the life of the uMWP-1 (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 Offset 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 through the engagement process with the landowners, the level of interest showed "proof of concept" that with more effort, the Biodiversity Offset and Compensation Plan could be successfully rolled out. The conservative approach taken to budgeting and the contingency included in the budget should address required further interactions.

8.2.15 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 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 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 institutional arrangements are discussed in Section 11.1.1 of the Biodiversity Offset Implementation Plan.

8.2.16 Conclusion and Reasoned Opinion

The Biodiversity Offset Report must be submitted to the competent authority as part of the EIA. If the EA is issued, the Biodiversity Offset Report becomes binding and all aspects of the associated rehabilitation and mitigation recommendations must be adhered to by the proponent and the appointed Implementing Agent/s.

The objective of this Biodiversity Offset 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 the EIA phase. This allows for the EAP and the relevant authorities to apply the principles of Integrated Environmental Management (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 would be made in support of the principle of sustainable development.

9 ASSESSMENT OF ALTERNATIVES

9.1 Scheme Layout

9.1.1 Contextualisation of the uMWP-1 Option

Various options to meeting the uMWP-1's objectives were considered during previous studies (including the Pre-Feasibility Study of 1999), which eventually lead to the identification of alternatives to be investigated as part of the DWS Technical Feasibility Study that was concluded in 2015. Refer to further discussion on screened alternatives under *Section 9.1* of the **Final EIA Report (November, 2016**).

The Pre-feasibility Study followed on from the Mgeni River System Analysis Study that was undertaken between 1991 and 1994, which identified the uMkhomazi River as a potentially viable source of water for augmentation of the Mgeni System. It also followed on from the Mooi-Mgeni Transfer Feasibility Study that was undertaken in 1995, in which the first phase scheme to augment the Mgeni System from the Mooi River was investigated in detail and possible second phase schemes were identified. The Pre-feasibility Study included *inter alia* a pre-feasibility investigation of augmentation schemes on the uMkhomazi River preceded by scheme identification and reconnaissance investigations. In the Scheme Identification Phase various alternative schemes were identified. An extract from the Pre-feasibility Study's appraisal of these schemes is included in *Section 9.1.5* of the **Final EIA Report (November, 2016)**. The Pre-feasibility Study recommended that the Smithfield Scheme (the uMWP-1) be taken forward to the next phase of investigation in a Detailed Feasibility Study.

The uMWP-1's scheme configuration (layout) takes future water demands into account (water for more than a 20-year horizon). The uMWP-1 must deliver water to Umlaas Road where it will tie into the Mgeni System aligning with and supplementary to existing infrastructure. If a dam is constructed on the lower reaches of the uMkhomazi River (that is if there is a possible site) the critical tie in point, at Umlaas Road, could only be reached if a large pump station and long pipelines are constructed. This implies very high operational, energy and extra capital costs. The other option would be to construct a dam higher up in the uMkhomazi River Catchment, for example at the proposed Impendle Dam Site. If Impendle Dam is constructed the Mgeni System's yield will not increase, unless a new tunnel or aqueduct, parallel to the existing tunnel, from Howick bypassing Pietermaritzburg is constructed, since the existing tunnel is already utilized to its full capacity. The cost to construct the longer Impendle- Midmar Tunnel and an additional tunnel from Howick to Umlaas Road would be substantial higher. This option was found considerably less feasible from a financial and socio-economic point of view. The current high growth in demand is in the Lower Mgeni System (Durban and surroundings) and not in the Upper Mgeni System (Pietermaritzburg and surroundings).

In addition to the above to find the best possible dam sites the DWS has gone through and incremental optimization processes. Pre-feasibility work, which included Environmental Screening,

found that the Smithfield Dam Site on the uMkhomazi River at the Farm Smithfield was to be investigated further at feasibility level of detail. During the Technical Feasibility Study the first task completed by the appointed technical Professional Services Provider (PSP) was the Environmental Screening Task, which was then followed by the review of the conveyance infrastructure (tunnel and pipeline). The then BKS, which is now part of AECOM, concluded that Smithfield Site remained the best option to be taken forward.

SRK Consulting undertook a Comparative Operational Reliability Assessment of the two proposed transfer options (scheme layouts) for the uMWP during 1998/1999 on behalf of the then Department of Water Affairs and Forestry (DWAF) (DWAF Report Number PB1 U100-00-1499). The two Proposed Transfer Options were the Smithfield Option, which is the preferred option in terms of its layout as well as its infrastructure components, and the Impendle Option. The identified risk events associated with these two transfer options were assessed in terms of their probabilities of failure. These risk events were based on storage failures, failure of the raw water conveyance infrastructure (tunnels and pipelines) and the possible lack of water supply to the Mgeni System.

The estimated overall risk of failure for the Smithfield Option is 0,65% as opposed to 1,01% for the Impendle Option. The Smithfield Option (scheme layout) is therefore more reliable than the Impendle Option for water supply to the Mgeni System. Furthermore the Smithfield Option only has six (6) major infrastructure components as opposed to the ten (10) major infrastructure components of the Impendle Option, meaning that less can go wrong with the Smithfield Option. Considering the risk, the Comparative Operational Reliability Assessment Report recommended that Smithfield Option should be taken forward.

9.1.2 uMWP-1 Layout Options

The layout of the following proposed components of uMWP-1 Raw Water were changed based on comments received from the environmental authorities and I&APs on the **Final EIA Report (November, 2016)**, as well as the subsequent investigations:

- R617 deviation; and
- Conveyance Tunnel.

The changes are explained in **Sections 9.2** (R617 deviation) and **9.3** (conveyance tunnel) below. To provide context to the tunnel alignment and to address comments from the DEA (refer to **No. B3** in **Table B**, **Section 4.2.3** above), a discussion on the balancing dam alternatives is also included in **Section 9.4** below.

The revised layout of uMWP-1, based on additional options identified, is shown in **Figures 25** and **26** below.

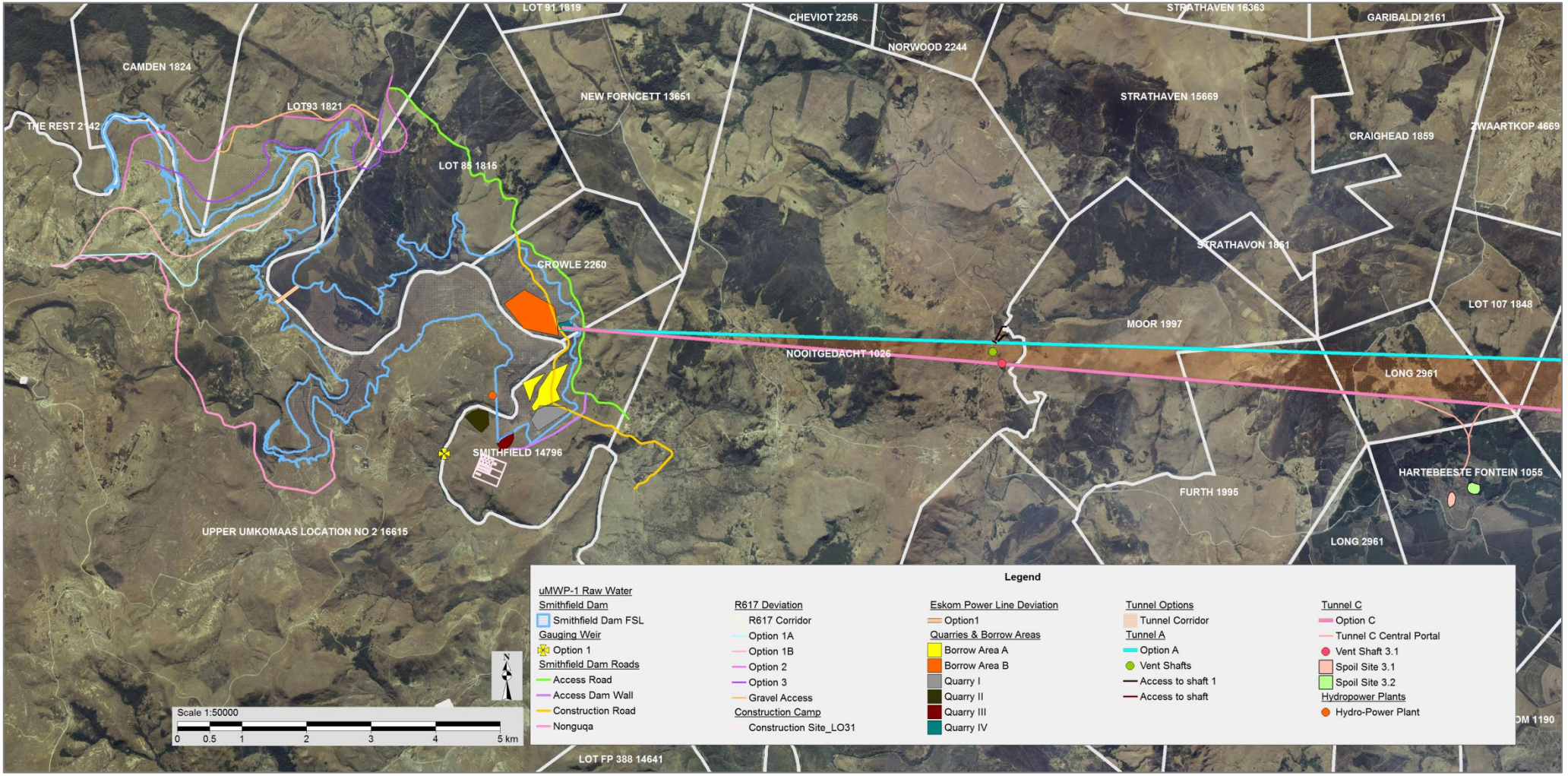

Figure 25: Revised Layout of uMWP-1 Raw Water (Western Side)

(Note: cadastral farm portions not shown due to scale)

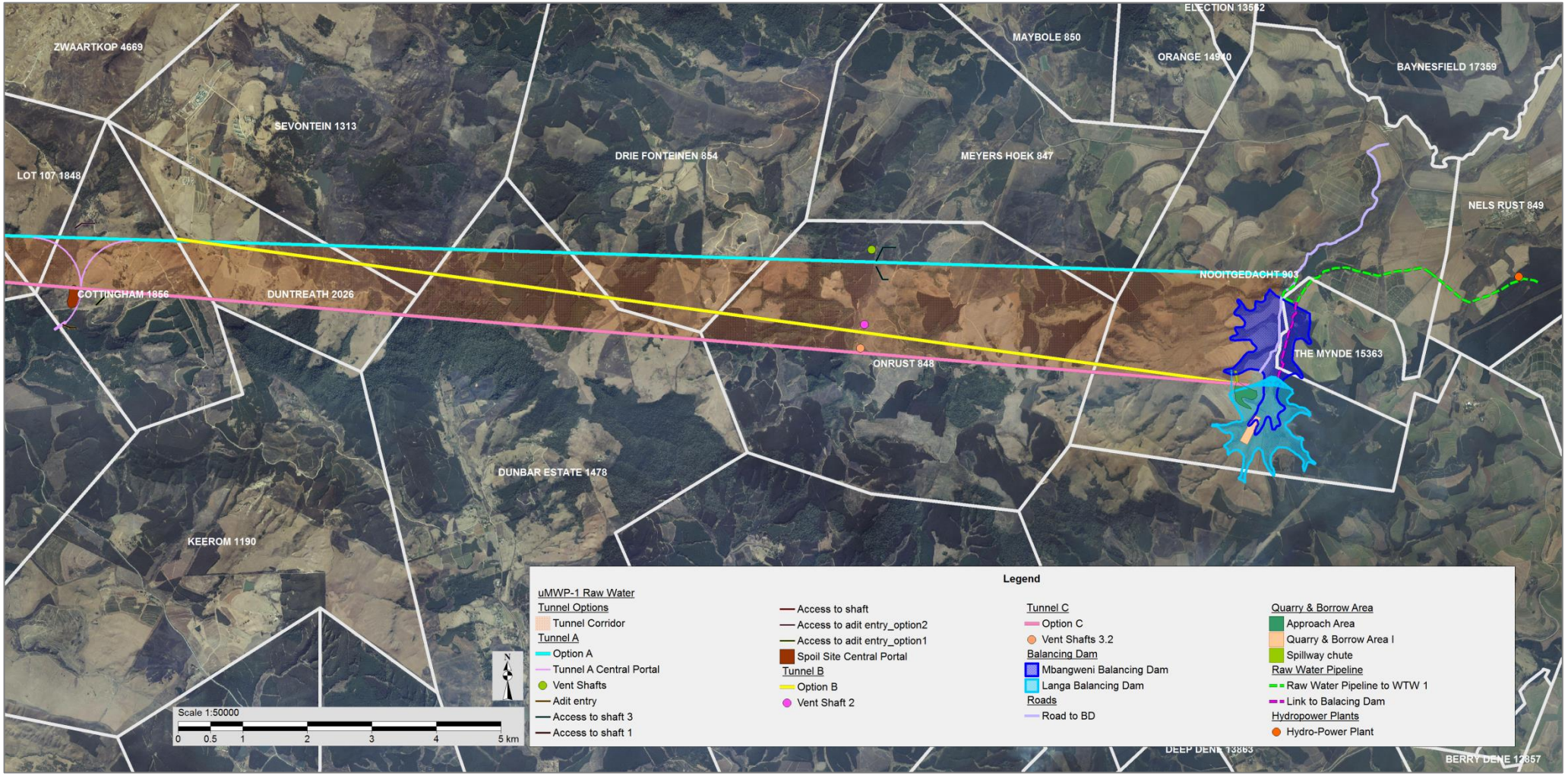

Figure 26: **Revised Layout of uMWP-1 Raw Water (Eastern Side)**
(Note: cadastral farm portions not shown due to scale)

9.2 Provincial Road R617 Deviation

9.2.1 Overview

The options for the realignment of the R617, as a result of the proposed Smithfield Dam, include the original alternative route that encroaches into the Impendle Nature Reserve (see **Section 9.2.2** below) or the new alternative routes for the R617 that were identified as part of the additional work undertaken to address the DEA's comments on the **Final EIA Report (November, 2016)** (see **Section 5.2** above and **Section 9.2.3** below). A corridor was created that is based on the new alternatives for the R617 realignment, which is discussed in **Section 9.2.4** below.

9.2.2 Encroachment into Impendle Nature Reserve

As part of the Technical Feasibility Study a deviation of the R617 was proposed, which traverses the Impendle Nature Reserve in two areas (shown in **Figure 3**, see **5.1** above). This proposed route was included in the **Final EIA Report (November, 2016)**. If this route was to be pursued as the preferred alternative, the DEA indicated that a binding agreement would be required between the Applicant (the DWS) and relevant Provincial Authority (EKZNW) in respect of de-proclamation of portions of the Impendle Nature Reserve. De-proclamation would also need to undergo a formal process to approve the changing of the boundaries of the Impendle Nature Reserve.

The approach adopted after the receipt of the DEA's comments on the **Final EIA Report (November, 2016)** entailed avoiding the Impendle Nature Reserve altogether, as the encroachment of infrastructure into a formally protected area is not supported by EKZNW (based on comments received during the Biodiversity Working Group on 07 December 2016).

9.2.3 New Alternative Route Alignments

In response to the comments received on the **Final EIA Report (November, 2016)** an Engineering Investigation was undertaken to identify new alternative route alignments for the R617. A summary of the investigations is included in **Section 5.2** above and this Engineering Investigation Report is contained in **Appendix B1**.

An appraisal of the new alternative route alignment options follows in **Sections 9.2.3.1** to **9.2.3.3** below.

9.2.3.1 Comparison

Alternative route alignments for the R617 deviation were identified taking into consideration the following criteria:

- Avoid encroachment into the Impendle Nature Reserve;
- The requirements of the KZN Department of Transport;
- Habitat for conservation worthy species;
- Topography (steep slope);

- River crossings; and
- The affected community from the KwaBhidla Traditional Authority (including the movements of pedestrians and livestock).

Three (3) route options were identified and investigated as part of the Engineering Investigation, as shown in **Figure 4** above (see **5.2** above). A comparison of these options is contained in **Table K** below.

Table K: Comparison of R617 Deviation Options (Knight Piésold Consulting, 2018)

Option	Advantages	Disadvantages
1A & 1B	• Shortest route 6,43 km. • Least disruptive to communities in terms of access to the R617 and public transport facilities. • Does not have an impact on endangered and protected species. • Some communities will gain better access than what they currently experience. • Preferred option in terms of compliance with the Geometric Design Standards, including: ○ Acceptable grades (max. 7.85%), which assist in providing a better level of service for road users, particularly heavy vehicles that would otherwise have difficulty maintaining speed up hills and have deceleration and braking challenges on steep downhills. ○ Larger horizontal radii allowing for better increased safety, visibility, and a higher comfort value as the route flows better than one with smaller, tighter radii. ○ Through the use of larger horizontal radii, the need for superelevation is reduced considerably, which in turn is safer for slow moving heavy vehicles which have been known to tip onto their sides when negotiating high superelevation on curves at low speed.	• A disadvantage of this realignment option is that access to the farms north of the uMkhomazi River would be cut off by the dam basin, since old bridges would be submerged. Access will then have to be provided by means of a new gravel access road and a small bridge (refer to **Figure 4** and discussion in **Section 5.2** above). • Realigning the R617 using Option 1 will divide existing settlements in places. In mitigation it is recommended that affected communities be relocated to more suitable and safe locations either in the village or elsewhere. • More expensive that original preferred route.
2	• A few currently isolated communities will gain better access than what they currently experience. • During construction the existing R617 and the D1212 will not be affected.	• Longest route 8,250km. • Option 2 is in close proximity to the environmentally sensitive Impendle Nature Reserve. • It is understood that the Impendle Nature Reserve is home to endangered / protected birdlife and positioning the road to close could be detrimental to said birdlife. • Positioning the route so far north from the R617's current alignment will negatively affect most of the communities and villages in the project area. • Option 2 is located too far from most communities. Additional access roads would

Option	Advantages	Disadvantages
		be required. • Three (3) new bridges would be required for this alignment, which will add substantial costs to the realignment on the road. • This option is not recommended in terms of non- compliance with the Geometric Design Standards, including: ○ Steeper grades (max. 9.02%), which will result in heavy vehicles having difficulty maintaining speed up hills and have deceleration and braking challenges on steep downhills. Slower moving heavy vehicles affect the level of service experienced by other road users that get stuck behind said vehicles. ○ Some horizontal radii are substandard for an emax =8% (recommended) at a design speed of 100 km/h. To counter this, 80 km/h speed restrictions over these sections would be required which is undesirable on roads such as the R617. ○ If the superelevation rate is increased beyond that recommended above, slow moving heavy vehicles may be at risk of tipping over.
3	• Little disruption to communities in terms of access to the R617 and public transport facilities. • A few currently isolated communities will gain better access than what they currently experience. • During construction the existing R617 and the D1212 will not be affected too significantly.	• Fails to meet Geometric Design Standards for a preferred 100 km/h design speed. • Design speed will need to be reduced to between 60 km/h and 80 km/h to achieve minimum design standard compliance. • From an environmental perspective, Option 3 should not be considered due to falling within the habitat of the near critically endangered and protected invertebrate Pennington Protea Butterfly, whose larvae are hosted in the *Protea Caffra* plants. • Additional bridges would be required for this alignment, which will add substantial costs to the realignment of the road. • Steep side slopes will require stabilisation and specialist rock anchoring, or similar. • A form of cantilever may be required to support the road as it traverses alongside steep slopes, i.e. hugging steep contour lines.

On comparison of the various options, Option 1B was found to be the preferred route for the realignment of the R617. Options 1A and 1B are sufficiently clear of the habitat of the near critically endangered and protected invertebrate Pennington Protea Butterfly, whose larvae are hosted in the *Protea Caffra* plants. Options 1A and 1B are also sufficiently clear of the nest sites of the endangered Blue Swallows. Option 1B is preferred over Option 1A in terms of its geometrics, shorter length and because much of the route can be constructed whilst still maintaining access to villages using the D1212. A corridor was

created that is based on the new alternatives for the R617 realignment, which is discussed in **Section 9.2.4** below, and is proposed for authorisation.

9.2.3.2 Public Participation

On 09 January 2018, officials from the DWS and KZN Department of Transport, as well as representatives from Knight Piésold, met on site to discuss and investigate route options for the realignment of the R617. The requirements of the KZN Department of Transport were taken into consideration as part of the Engineering Investigation.

The area to be affected by the R617 realignment corridors falls under the KwaBhidla Traditional Authority, which is administered by the Ingonyama Trust Board. There were a meeting and site visits with representatives of the KwaBhidla Traditional Council on 10 January 2018 pertaining to the new R617 corridor (refer to photographs in **Figure 27** below and a copy of the minutes of this meeting is contained in **Appendix F**).

Figure 27: Site visit with representatives of the KwaBhidla Traditional Council (10 January 2018)

Additional discussions were held on 22 February 2018 with Inkosi DT Dlamini of the KwaBhidla Traditional Council (refer to photograph in **Figure 28** below) as well as with members of the community that would be affected by the proposed alignment of Option 1A and 1B. The principles associated with the relocation of the community members as a result of the proposed new R617 route, as well as the intended RAP, were conveyed during these engagements.

Figure 28: Discussions with Inkosi DT Dlamini of the KwaBhidla Traditional Council (22 February 2018)

Follow-up meetings were held with the KwaBhidla Traditional Council, and the parties to be potentially affected by the R617 corridor on 24 May 2018 (refer to photographs in **Figure 29** below and a copy of the minutes of this meeting contained in **Appendix F**). These meetings served to present the findings of the engineering investigations

Figure 29: Meetings with representatives of the KwaBhidla Traditional Council (24 May 2018)

9.2.3.3 Updated Specialist Studies

The new alternatives for the R617 route alignments were assessed by the respective EIA Environmental Specialists (Terrestrial Ecologist, Aquatic Ecologist, Agricultural Specialist,

Heritage Specialist and Social Specialist) to determine whether there are any additional adverse impacts that need to be evaluated and mitigated. Their findings are presented in **Table L** and their supplementary reports are included in **Appendix C**.

Table L: Findings of EIA Specialists for new R617 deviation options

No.	Specialist Study	Key Findings
1.	Terrestrial Ecological Impact Assessment	• CBA: Irreplaceable Areas – ○ A very small section (± 48 m) of the route Options 1A and 1B fall within the CBA: Irreplaceable Areas; however, these sections are along the road servitude with little or no natural vegetation remaining; ○ ± 1.5 km of the route Option 2 falls within the CBA: Irreplaceable Areas; ○ ± 4 km of the route Option 3 falls within the CBA: Irreplaceable Areas; and ○ The proposed gravel access road required to maintain access to dwellings to the north of the R617 (associated with Options 1A and 1B) traverses CBA: Irreplaceable Areas for approximately 650 m. • CBA: Optimal Areas – ○ A very small section (± 28 m) of the route Options 1A and 1B fall within the CBA: Optimal Areas; ○ Only ± 200 m of the route Option 2 falls within the CBA: Optimal Areas; ○ Only ± 800 m of the route Option 3 falls within the CBA: Optimal Areas; and ○ The proposed gravel access road (associated with Options 1A and 1B) traverses ± 200 m of CBA: Optimal areas. • Ecological Support Areas (ESAs) – ○ A very small section (± 6 m) of the route Options 1A and 1B fall within an ESA; ○ ± 2.6 km and ± 1.2km of the route Option 2 and Option 3 fall within an ESA, respectively; and ○ The proposed gravel access road (associated with Options 1A and 1B) traverses ± 2 km of an ESA. • Option 1A is most preferred from a terrestrial ecological perspective (almost the entire route follows the existing gravel road, with less natural areas), followed by Option 1B, Option 2 and lastly Option 3.
2.	Aquatic Impact Assessment	Evaluation of the various alternatives showed that Option 1A is the preferred alternative, but with only a marginal preference over Option 1B. Option 2 and Option 3 both have a greater association with watercourses and would therefore impose more significant impacts on the surface water ecosystems. Erosion risks, due to there being a greater association with steep-gradient watercourses, would be greater with the development of either of these options as well.
3.	Agricultural Impact Assessment	• Options 1A and 1B are on eroded land with little grazing value, and they do not affect agriculture. • Option 2 will lead to a loss of 3,64 Ha of high potential land and some grazing land. • Option 3 will lead a loss of 3,0 Ha of high potential arable land and further traverse grazing land. • The position of Option 1A is preferred because it will follow the existing secondary road and as a result will cause the least disruption.
4.	Heritage Impact Assessment	• Option 1A is the preferred route as much of its length is situated along the existing D1212 road which is a disturbed environment meaning that there is a lower risk of the proposed alignment impacting on intact heritage resources than if it crossed large areas of undisturbed land.

No.	Specialist Study	Key Findings
		• It is recommended that the alignment is moved 15 m further south of Lundy's Hill Store in case there are graves situated around the buildings. It is also recommended that the alignment is moved at least 15 m south of the dwellings that are encountered just after crossing the uMkhomazi River to avoid impacting on graves (if any) that may be found close to these dwellings. An inspection of the alignment followed by Option 1B just after it separates from Option 1A is recommended as the alignment is situated very close to several homesteads where the potential for impacting graves is high. *Note that the R617 corridor makes provision for route optimisation during the design phase. The EMPr includes search, rescue and relocation of heritage resources and graves (based on area of influence of the construction activities), and for prior approval to be obtained from Amafa aKwaZulu-Natali.* • The corridor option in terms of the realignment of the R617 is supported with caution as long as heritage resources are avoided by the route alignment that is eventually decided upon.
5.	Social Impact Assessment (SIA)	• There are no obvious fatal flaws identified at a social level. It is most likely that the associated social impacts would be similar to those identified in the original SIA undertaken for the uMWP-1 and that the mitigation measures as suggested in the SIA Report will apply to all suggested technical adjustments. • In respect of the realignment of the R617 it is important, on a social basis, to consider sensitive areas such as residential settlements associated with access to commercial and business facilities, schools, clinics, transport, crops and grazing areas. In this regard the preferred social option to emerge is Option 1B in support of the finding of Knight Piésold and based on the following: ○ Being the least disruptive to communities in respect of access to the R617 and public transport. ○ In some cases potentially providing better access to some communities. ○ On a technical basis Option 1B adheres best to Geometric Design Standards and best practice philosophies. This is important on a social basis as it will reduce the risk of crashes and personal injury and death to road users. AECOM's Traffic Impact Assessment, which was undertaken in 2015, indicated an average daily traffic count ranging between ±7 800 vehicles close to Howick and ±2 000 vehicles close to Smithfield Dam of which between 400 and 600 were classified as trucks. ○ Option 1B is the least expensive option and, although it is recognised by Knight Piésold that " … recommending a particular option based purely on price would not be sensible", the fact that it is the least expensive option, considered together with the other benefits listed above, it will also have a positive social implication. This is based on the premise that if all else is equal the financial saving is likely to convert to a social benefit, albeit limited in this instance. ○ The Agricultural Specialist pointed out that although Options 1A and 1B are located on communal grazing land, this land is eroded with little grazing value and the loss thereof would not affect agriculture. • If, however, Option 1B is selected there would be a need to provide access to areas north of the uMkhomazi River that will be cut off by the relocation of the R617 and the Smithfield Dam Basin. In this respect it would be the socially preferred option that consideration is given to constructing the required bridge/s in such a manner that vehicular, pedestrian and animal traffic are distinctly separated. The best option is a separate bridge for

No.	Specialist Study	Key Findings
		vehicular traffic to that of pedestrian and animal traffic. • The realignment of the R617 will result in the separation of existing communities, which may require the relocation of certain dwellings and structures. In this regard it is important that the affected area is surveyed, and that the affected people are consulted along with the host community in which these people would be resettled. Towards this end a RAP will needs to be developed, which has already been alluded to in the original SIA Report in respect of the inundation of the Smithfield Dam Basin. • With the realignment of the R617, which carries a relatively high traffic volume, through what is currently a quiet rural setting it would be important to undertake a Traffic Awareness and Safety Programme amongst affected communities, well prior to the opening of the re-aligned road. It would also be important to ensure that such a Programme is implemented in schools within the affected area, and that the Programme continues after the opening of the re-aligned road.
6.	Avifauna Bridging Study	Of the four (4) options most recently suggested for the R617 road deviation, those that occur furthest from Impendle Nature Reserve are the most preferred from an avifaunal perspective.

Option 1 was consistently identified as the preferred alternative, which corroborated with the findings of the Engineering Investigation, with differences of opinion in terms of Options 1A and 1B amongst the specialists. There were no fatal flaws identified for either of the aforementioned alternatives.

9.2.4 R617 Corridor

The DEA was notified (refer to letter contained in **Appendix G**) that approval would be sought for a corridor rather than a set alignment for the R617 realignment. The proposed R617 realignment corridor (shown in **Figures 25** and **26** above) comprises the most northern and southern sections of the new Options 1, 2 and 3 identified by Knight Piésold. A corridor for the R617 allows for the route to be realigned to avoid sensitive areas (such as the Impendle Nature Reserve and *Protea Caffra* stands), and to minimise impacts to pedestrians and members of the local communities from reaching the main road and public amenities (e.g. schools). As the DWS project life-cycle is only in the Feasibility Stage, there may be changes to the layout of the infrastructure as the uMWP-1 advances through the detailed design stage, if the EA is obtained. A corridor allows for deviations to take place as part of the technical optimisation of the R617 without having to seek an amended to the EA.

The following is noted with regards to the proposed R617 corridor:

- A corridor approach allows for the R617 realignment to be optimised during the detailed design phase, based on geotechnical investigations and other technical factors; and
- The R617 corridor includes the same landowners who were notified during the EIA Process to date. Additional public participation was conducted with the KwaBhidla Traditional Authority (see **Section 9.2.3.2** above).

The following environmental conditions are related to the R617 corridor, which include measures to safeguard or manage impacts to sensitive environmental features that may be encountered within the proposed corridor:

- Minimise the encroachment into CBAs and ESAs that are not transformed;
- Avoid *Protea caffra* stands and patches of forest on the slopes to the north of the R617 deviation;
- Minimise the need for the relocation of dwellings and other existing structures. Include unavoidable dwellings in the RAP;
- Minimise the number of watercourse (rivers and streams) crossings and make suitable provision for erosion protection;
- Undertake search, rescue and relocation of Red Data, protected and endangered species, medicinal plants, as well as heritage resources and graves. Obtain permits from the relevant authorities if avoidance is not possible; and
- Undertake a Traffic Awareness and Safety Programme amongst the affected communities.

9.3 Raw Water Conveyance Infrastructure

9.3.1 Overview

The Raw Water Conveyance Infrastructure (tunnel and pipelines) is required to convey the raw water from Smithfield Dam to the proposed WTW in the Baynesfield Valley. This includes a proposed transfer tunnel which extends from the intake tower at Smithfield Dam to the Baynesfield Area. The shortest route through the mountain range between the two valleys (Smithfield and Baynesfield) was identified during the Technical Feasibility Study based on a comparative analysis between pumping schemes and the selected gravity conveyance system. The transfer tunnel will be connected with a pressure pipeline from the tunnel end to the site of the proposed WTW. Refer to *Section 9.5.1* of the **Final EIA Report (November, 2016)** for further details pertaining to the transfer tunnel.

9.3.2 Tunnel Options identified during the Technical Feasibility Study

The tunnel options considered as part of the Technical Feasibility Study included pumping at the Smithfield Dam into a free flow tunnel or a pressure tunnel. Due to a higher Unit Reference Value (URV) (common measure in South Africa to assess the economic efficiency of proposed water projects), and the need for pumping, the option for pumping via a free flow tunnel was not investigated further as part of the technical studies.

The following two options were identified during the Technical Feasibility Study for the alignment of the tunnel:

- Tunnel Option A: Tunnel to the proposed Langa Balancing Dam Option (± 34 km in length); and
- Tunnel Option B: Tunnel to the proposed Baynesfield Balancing Dam Option (± 33 km in length).

Tunnel Option B was discarded due to environmental and technical constraints associated with the Baynesfield Balancing Dam (refer to **Section 9.4.2.1** below). Tunnel Option A was further assessed in the **Final EIA Report (November, 2016)**.

9.3.3 New Tunnel Alternatives

New Tunnel Options B and C for the tunnel alignment were subsequently identified, based on comments received on the **Final EIA Report (November, 2016)**, which are shown in **Figures 25** and **26** above. In addition, the option of a second tunnel was also explored to negate the need for a balancing dam. These new options are explained under **Sections 9.3.3.1** to **9.3.3.3** below.

9.3.3.1 New Tunnel Option B

New Tunnel Option B's alignment follows the route of Tunnel Option A for approximately 17 km before turning south-east to end at the dam wall of the proposed Langa Balancing Dam Option.

As explained in *Section 9.10* of the **Final EIA Report (November, 2016)**, large volumes of excavated material would be produced during the tunnel boring exercise. To prevent the impacts associated with creating a spoil area at the tunnel outlet on the Baynesfield Estate (including loss of prime agricultural land, proximity to watercourses and objection from landowner), the intention is to use the spoil material in the construction of the dam wall of the balancing dam (applicable to both Langa and Mbangweni Balancing Dam options). With the new Tunnel Option B the hauling distance to transport the spoil material to the balancing dam wall is significantly minimised, which will have cost benefits as well as minimising the use of the access road with related impacts (e.g. road safety, condition of the road, dust).

The location of the western ventilation shaft for the New Tunnel Option B is the same as for Tunnel Option A. The eastern shaft for the New Tunnel Option B is located in a timber plantation and provision is made for an access road to this point.

9.3.3.2 New Tunnel Option C

New Tunnel Option C commences at the same point as Tunnel Option A, from the intake tower at Smithfield Dam, and then follows a more south-easterly direction. The location of the outlet portal is the same as for the new Tunnel Option B and offers the same benefits in terms of decreasing the hauling distance to use the spoil material in the dam wall of the balancing dam (relevant to both the Langa and Mbangweni Balancing Dam options).

Ventilation Shafts 3.1 and 3.2 associated with the new Tunnel Option C are located on communal grazing land (under a Traditional Authority), and an open space between timber plantations (privately owned), respectively. Provision is also made for access roads to these two points.

The Central Access Adits of New Tunnel Option C (as with Tunnel Option A) (shown in **Figure 30** below) are required for accessing the main tunnel during excavation, and for maintenance under operation. These adits span 5 m to provide sufficient space for machines to access the tunnel and transporting components of the TBMs. The areas affected by these adits include grasslands and forested areas

The excavated material from the central portal of New Tunnel Option C could be hauled and dumped at two (2) new proposed spoil sites (shown in **Figure 30** below), which are both located on a privately-owned property (Portion 1 of the Farm Cottingham 1856). Spoil Sites 3.1 and 3.2 impact on approximately 2.3 Ha of cultivated land and on 2.8 Ha of forestry, respectively. These two spoil sites will only be operational for the duration of construction of the uMWP-1, and would be rehabilitated after construction through shaping, application of topsoil and planting of indigenous vegetation. In order to adhere to the classification requirements, discussed in *Section 9.10.2* of the **Final EIA Report (November, 2016)**, no unpermitted waste (e.g. domestic waste) may be disposed of at these sites.

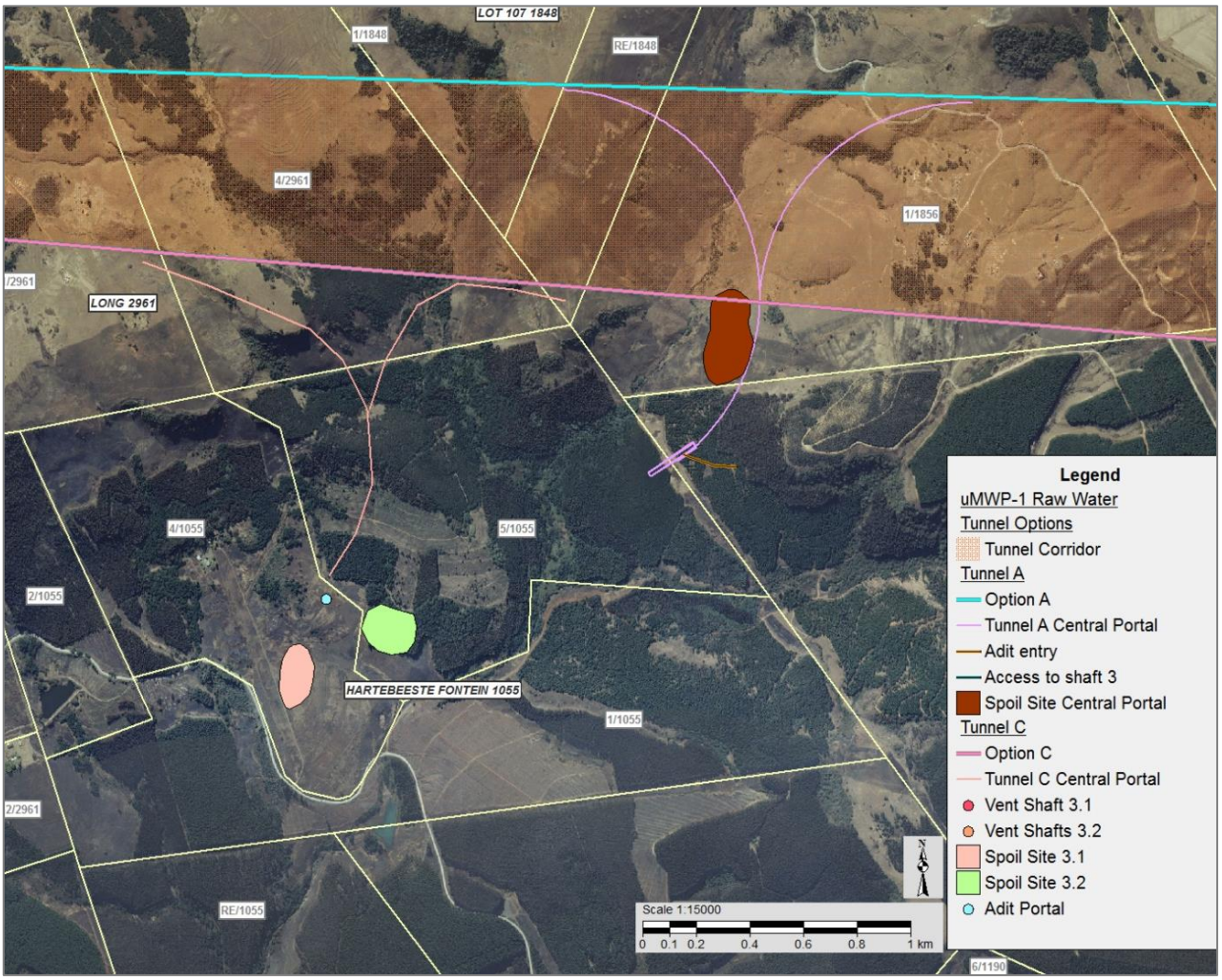

Figure 30: Tunnel Options A and New Tunnel Option C Adits and Spoil Sites

9.3.3.3 Second Tunnel

The uMWP Phase 2 (uMWP-2) proposed the construction of the Impendle Dam further upstream on the uMkhomazi River to release water to the downstream Smithfield Dam, as well as a second 3.5 m internal diameter tunnel parallel to the first tunnel (the uMWP-1 tunnel). The uMWP-2 is intended to be implemented to address the long-term deficit in water supply in the Integrated Mgeni WSS after 2048. If it is decided to proceed with the uMWP-2, the uMWP-2 will need to comply with the prevailing legislation at that time.

Following the identification of the fatal flaws related to the proposed Langa and Mbangweni Balancing Dam options, as part of the Avifauna Bridging Study, the option to construct the second tunnel as part of the uMWP-1 was explored. A balancing dam would not be required if a second tunnel was constructed, as it could be used to continue delivering water when maintenance work is required on the first tunnel and versa-visa. The simultaneous construction of an additional, or a second, tunnel as part of the uMWP-1 will eliminate the option to construct the second tunnel directly from the proposed Impendle Dam to Midmar Dam (alternative configuration). However, the decision of the final configuration should only be taken once the Mgeni WSS matures and more information becomes available.

The Economic Impact Assessment that was undertaken for uMWP-1 found that 63% of the end-users that depend on the Mgeni WSS for their potable water supply earn less than R3 000 per household per month. Therefore, the majority of users are price sensitive and cannot afford substantial water tariff increases.

The uMWP-1 will increase the available water to the Mgeni WSS by about 50% from a system perspective. Furthermore, the uMWP-1 is a mega project requiring large infrastructure components, e.g. dams, tunnels and bulk raw water pipelines, with their associated capital costs. The majority of end-users will find it difficult to absorb the cost increases even without the construction of an additional, or second, tunnel. It is estimated that an additional, or second, tunnel from the proposed Smithfield Dam will cost more than R10 billion. This will increase the uMWP-1's capital cost from the current estimated cost of about R24 billion (2018 cost estimate) to more than R30 billion, which is a capital cost increase of about 30%. If an additional, or second, tunnel is constructed the additional cost of water to the end-users will also increase by about 30%.

National Treasury (NT) is currently experiencing substantial fiscal constraints, and is extremely critical of additional fiscal contributions, new borrowings and issuance of explicit and implicit guarantees. Financial undertakings impact directly on the country's credit rating and all efforts are applied to increase the country's credit rating to investment grade. Additional fiscal pressure, either through direct obligations (fiscal transfers) or through indirect obligations, such as implicit guarantees to back borrowings raised through institutions on behalf of the end-users, impacts negatively on the country's ability

to recover. Credit ratings impact directly on the cost of funding, which in turn impact on the cost of the uMWP-1 and tariffs to be borne by the end-users. It will therefore already be difficult for the Implementing Agent/s to obtain borrowing approval for the uMWP-1 without the additional cost of a second tunnel. The uMWP-1's scheme configuration (layout) should therefore not only consider affordability of water for the end-users, but also the funding constraints and government's ability to assume risk.

As explained in **Section 9.3.3.1** above, large volumes of excavated material would be produced during the tunnel boring exercise, and the intention is to use the spoil material in the construction of the dam wall of the balancing dam (relevant to both the Langa and Mbangweni Balancing Dam options). This is to prevent impacts associated with creating a spoil area at the tunnel outlet on Baynesfield Estate (including *inter alia* loss of prime agricultural land). The volume of material would be significantly increased with the construction of a second tunnel. If no balancing dam is required, one or more spoil site/s would be required, and therefore need to be created, for the excavated material from both the tunnels, which will have impacts on the surrounding land use.

Due to the exorbitant costs of the second tunnel, and the associated financial impacts on the end-users, funding constraints and government's ability to assume risk, as well as the additional volumes of excavated material that would be generated and managed, this was not deemed to be a viable option.

9.3.4 Public Participation – Tunnel Options B and C

Apart from the inlet, central and outlet portals, shafts for ventilation purposes, spoil sites as well as the access roads, the tunnel will be below ground level.

The landowner of Portion 4 of the Farm Hartebeeste Fontein 1055 was notified of the uMWP-1 and the proposed footprint thereof on the affected property. He was also afforded the opportunity to comment on this Addendum to the EIA Report.

9.3.5 Updated Specialist Studies– Tunnel Options B and C

The New Tunnel Options B and C were assessed by the respective EIA Environmental Specialists (Terrestrial Ecologist, Aquatic Ecologist, Agricultural Specialist, Heritage Specialist and Social Specialist) to determine whether there are any additional adverse impacts that need to be evaluated and mitigated. Their findings are presented in **Table M** below**,** and their supplementary reports are contained in **Appendix C**.

Table M: Findings of EIA Specialists for the New Tunnel Options B and C

No.	Specialist Study	Key Findings
1.	Terrestrial Ecological Impact Assessment	• The outlets of New Tunnel Options B and C do not fall within any CBAs or ESAs, whereas the outlet of Tunnel Option A is located within a CBA Irreplaceable Area. • The adits of Tunnel Option A and New Tunnel Option C are located within CBA Irreplaceable Areas. Despite timber plantations that occur in these areas, there are also watercourses that need to be safeguarded. • Tunnel Option A is least preferred. • No preference between the New Tunnel Options B and C.
2.	Aquatic Impact Assessment	Analysis of the various tunnel route alternatives showed that the preferred option, together with the infrastructure services (adit routes, ventilation shafts and spoil sites) is that of Tunnel Option A. This option will have the least overall footprint within wetland habitat, making mitigation of associated impacts more readily achievable.
3.	Agricultural Impact Assessment	• In terms of agricultural impacts associated with spoil sites, the order of preference is as follows: 1) Tunnel Option A / New Tunnel Option B (loss of 4,9 Ha grazing due to spoil site at central portal); and 2) The new Tunnel Option C (loss of 2,3 Ha cultivated land due to spoil site 3.1; loss of 2,8 Ha plantations due to Spoil Site 3.1). • Tunnel Option A / New Tunnel Option B is preferred. The position of the spoil will determine the preference. Option A / New Tunnel B will only impact animal grazing. At a grazing capacity of 3 Ha/Large Stock Unit (LSU), the land that would be lost will be sufficient for only one livestock unit. The new Tunnel Option C's spoil positions are on arable land, or plantations, and are therefore less desirable. It must be noted, however, that the impact even of the New Tunnel Option C is relatively small.
4.	Heritage Impact Assessment	• There is no preferred tunnel option. It is recommended that any surface work (such as the portals, vent shafts, spoil sites and access routes) be assessed as part of a Phase 2 Heritage Impact Assessment. • In terms of archaeology, none of the tunnel route options pose a danger to any known archaeological sites. However, there are concerns regarding the many indigenous forests that the proposed tunnel passes beneath from a 'living heritage' perspective. If any of the forests are to be affected by surface operations (roads, spoil sites, etc.), a ground survey with community involvement would be required in order to ascertain the heritage significance of these forests. • The palaeontology for the central and eastern section of the uMWP-1's Raw Water Component falls in an area of moderate fossil sensitivity. It was recommended by the Palaeontologist that no further studies were necessary for the aforementioned section of the uMWP-1 because there are no records of fossils from the area.
5.	SIA	• There are no obvious fatal flaws identified at a social level. It is most likely that the associated social impacts would be similar to those identified in the original SIA undertaken for the uMWP-1, and that the mitigation measures as suggested in the SIA Report will apply to all suggested technical adjustments. • With agricultural activities and tunnel construction activities being in relatively close proximity, some 400 m apart, this may result in the two workforces coming into contact with each other and/or people other than construction workers coming on to the construction site. Related mitigation measures are proposed.
6.	Vibration Impact	• Based on the expected tunnelling- and blasting induced ground-borne

No.	Specialist Study	Key Findings
	Assessment	vibrations, the New Tunnel Option B or C are slightly more favourable. The reason being that a marginally smaller section of the Blue Swallow habitat is expected to be affected by Tunnel Option A. In support of this, the disturbance due to tunnelling through Tunnel Option A, and New Tunnel Options B and C, will last 3.5 weeks, 3 week and 2.8 weeks in total respectively. The ground-borne vibration due to the blasting required for the exit of Tunnel Option A will, however, cause ground-borne vibration within a part of the Blue Swallow habitat to exceed the impulsive ground vibration threshold, a factor that is less of a concern for the new Tunnel Options B and C. However, if blasting activities are scheduled when the Blue Swallows are migrating, there is no preference.
7.	Avifauna Bridging Study	• Outlet of Tunnel Option A – ○ Situated in primary grassland within 4km of an active Blue Swallow nest; ○ Lies outside the 1.5 km buffer of the closest existing active Blue Swallow nest; ○ Lies within the 1.5 km buffer that is relevant to the boundary of the actual Blue Swallow breeding habitat block; and ○ Lies outside the boundaries of the Zinty breeding Blue Swallow primary grassland habitat patch. • Outlet of the new Tunnel Options B and C – ○ Situated outside primary grassland; ○ Lies outside the 1.5 km buffer of the closest existing active Blue Swallow nest; ○ Lies within the 1.5 km buffer that is relevant to the boundary of the actual Blue Swallow breeding habitat block. • Since the Baynesfield Balancing Dam Option is the obvious choice pertaining to the balancing dam options, Tunnel Option A is the obvious choice in that regard as its outlet is closest to the Baynesfield Balancing Dam Option. From an avifaunal perspective, Tunnel Option A's outlet is also the most distant from the main Zinty Blue Swallow breeding habitat patch, as well as from Nesting Locality 1, compared with the outlet for the new Tunnel Options B and C. Unfortunately, the outlet for Tunnel Option A is within the 1.5 km Blue Swallow breeding habitat buffer, although the outlet for the new Tunnel Options B and C is even further within this buffer. • The tunnel options (A, B and C), although of concern relevant to Blue Swallows, should not be viewed as fatal flaws in themselves. Implemented with extreme care to limit the footprint of their outlets, they could be acceptable from an avifaunal perspective.

The specialists did not all agree on the same preferred tunnel route. Even so, only the Vibration Impact Assessment and Avifauna Bridging Study identified significant impacts associated with the tunnel options (linked to Blue Swallows). Mitigation measures were suggested to address potential impacts to sensitive environmental features, as captured in **Table M** above.

9.3.6 Tunnel Corridor

As with the R617 realignment (refer to **Section 9.2.4** above), the DEA was notified (refer to letter contained in **Appendix G**) that approval would be sought for a corridor (shown in **Figures 25** and **26** above) rather than a set alignment for the tunnel route.

The following is noted with regards to the proposed tunnel corridor:

- A corridor approach allows for the tunnel alignment to be optimised during the detailed design phase, based on geotechnical investigations and other technical factors; and
- The tunnel corridor mostly includes the same landowners that were notified during the EIA process to date. The new affected landowners were identified and notified of the opportunity to comment on this Addendum to the EIA Report.

The following environmental conditions are related to the tunnel corridor, which include measures to safeguard or manage impacts to sensitive environmental features that may be encountered within the proposed corridor:

- Surface impacts (related to portals, shafts, spoil sites and access roads) –
  - Minimise the encroachment into CBAs and ESAs that are not transformed;
  - Avoid encroachment into delineated watercourses (riparian habitats and wetlands) as far as possible, with suitable buffers (minimum of 32 m) and mitigation measures in place (contained in the EMPr);
  - Minimise the encroachment into high potential agricultural land;
  - Undertake search, rescue and relocation of Red Data, protected and endangered species, medicinal plants, as well as heritage resources and graves. Obtain permits from the relevant authorities if avoidance is not possible;
  - In the case of impacts to Blue Swallow habitat, such as at the tunnel outlet, the approach to pursue biodiversity compensation in accordance with the Draft National Biodiversity Offset Policy must be adopted;
  - Where there is a risk of impacts to Blue Swallows from an acoustics perspective as a result of tunnel construction related to the outlet and shafts in the eastern part of the project area, the mitigation measures recommended in the by the Noise or Vibration Specialist Studies will apply, as relevant;
  - Ensure proper access control and that all construction vehicles use only dedicated access routes to construction sites. Prevent unlawful access to the construction domain;
- Subsurface impacts –
  - Geological and hydrogeological conditions to be assessed as part of the detailed geotechnical investigations to be undertaken during the design phase; and
  - Suitable protection of groundwater during excavations.

9.4 Balancing Dam

9.4.1 Overview

Operational requirements for inspection and maintenance of long water conveyance tunnels include the provision of balancing dams on the downstream side. These balancing dams store water for the supply during down time periods required for inspection and maintenance periods of water conveyance tunnels. Refer to *Section 9.6* of the **Final EIA Report (November, 2016)** for further details pertaining to the proposed balancing dam.

9.4.2 Alternatives

As explained in *Section 9.6.4.1* of the **Final EIA Report (November, 2016)**, the following balancing dam options were initially considered as part of the Technical Feasibility Study (refer to **Figure 31** below):

- Baynesfield Balancing Dam –
  - Raise the existing Baynesfield Dam to provide the necessary storage capacity required;
- Mbangweni Balancing Dam –
  - Construct a new dam on the Mbangweni River approximately 250 m upstream from the existing Mbangweni Dam; and
- Langa Balancing Dam –
  - Construct a new dam on the Mbangweni River, where the impoundment will be located on Portion 8 of the Farm Nooitgedacht 903.

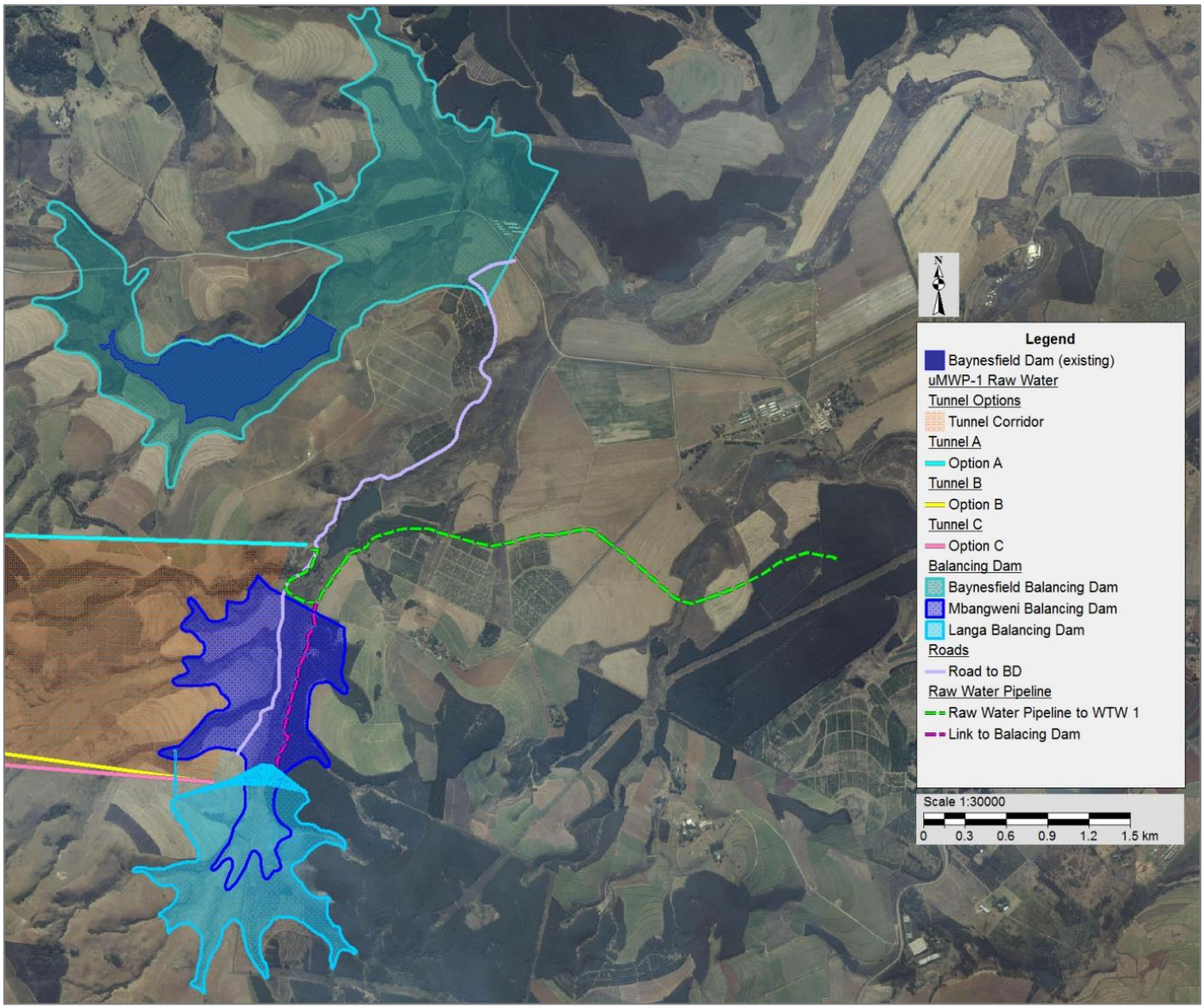

Figure 31: Proposed Balancing Dam Options

9.4.2.1 Baynesfield Balancing Dam Option

The FSL of any balancing dam considered for the uMWP-1 cannot exceed RL (Reduced Level) 923 masl given the hydraulic requirements, which are based on Smithfield Dam's FSL at RL 930 masl. The proposed Langa Balancing Dam was designed to supply the proposed Baynesfield WTW under gravity, thus no pumping and electricity would be required. The proposed Langa Balancing Dam's storage capacity is about 14.82 million m³. In order to achieve 24 days of supply to the Baynesfield WTW, Langa Dam's Minimum Operating Level (MOL) should be RL 898 masl.

The selection process that was followed during the Technical Feasibility Study will be discussed hereafter.

If the existing Baynesfield Dam is raised to a FSL at RL of 923 masl, the tunnel would day-light below this raised dam's FSL. It would then not be possible to drain the tunnel for maintenance purpose, or emergencies.

The raised Baynesfield Balancing Dam Option would not supply the required volume of water (24 days of supply) for emergency situations and/or during planned maintenance periods, taking the FSL and required MOL into account. It was then decided to investigate a balancing dam with a dam wall lower downstream where a dam could be constructed, with the required storage volume.

In addition to the above, the MOL of the Baynesfield Balancing Dam Option would be very low, about RL 840 masl. Because of hydraulic constraints, extensive pumping would be required to supply water to the Baynesfield WTW. Furthermore, mega pumps, pumping water at a flow rate in excess of 7 m^3/s and more than 20 m high will only be used, if needed. The probability that these pumps would not even be used over an extended period, more than a six (6) year period, is high. If the afore-mentioned pumps are not used consistently they will fail once they are started, e.g. seals hardening, lubrication issues, electrical damage (fluting), pitting or cratering of a bearing, etc. This is the nature of mechanical equipment, and problems could also be expected with the supply of spare parts because the pumps will not be used often.

If water cannot be pumped during the short and critical period when required, e.g. during emergencies when the tunnel cannot deliver water to the Baynesfield WTW, the risk of the Mgeni System failure would be very high and this is unacceptable to the DWS. The assurance of supply in the Mgeni System is 99% for most users.

Additional technical problems associated with the Baynesfield Balancing Dam Option include the following:

- The integrity of the existing Baynesfield Dam Wall;

- The balancing dam will need to be constructed to provide for the correct levels to gravitate, which will result in a dead storage of about 50% of the Baynesfield Balancing Dam Option's volume;
- Current users will need to be accommodated, resulting in detailed management of the Baynesfield Balancing Dam Option, which might result in conflicting operating rules; and
- The raw water pipeline around the proposed Baynesfield Balancing Dam Option would have encountered problems when laying the pipeline in high ground on the right side of the dam, and in saturated conditions.

All three (3) the balancing dam options are located on Baynesfield Estate. The Baynesfield Estate has a large agricultural concern operated by the company, Joseph Baynes Estate (Pty) Ltd. The Baynesfield Balancing Dam Option will have a substantially larger footprint than the Langa and Mbangweni Balancing Dam Options (refer to **Figure 31** above). As shown in **Table N** and **Figure 32** below, the total loss of land used for farming purposes associated with the Baynesfield Balancing Dam Option is 287.90 Ha, which far exceeds the loss associated with the Langa Balancing Dam Option (144.47 Ha) and Mbangweni Balancing Dam Option (184.93 Ha). The following significant environmental impacts associated with the Baynesfield Balancing Dam Option were highlighted by the Managing Director of the Baynesfield Estate (van Deventer pers. comm., 2018):

- The farming operations on the Baynesfield Estate are in balance in terms of the maize produced and required for the piggery, which is the core business of the Estate. Loss of cultivated land and the associated socio-economic impacts will thus not be acceptable to the Estate, as maize would need to be sourced elsewhere;
- The piggery, as well as the associated infrastructure such as the effluent handling facility, would need to be relocated. This will have substantial financial impacts and be disruptive to the farming operations; and
- Additional impacts include the relocation of a school and the inundation of approximately 1.8 km of a district road (P334) that would need to be relocated and realigned, respectively.

Table N: Comparison of Farming Areas Affected by the Balancing Dam Options

Balancing Dam Options	Sugarcane (Ha)	Field Crops (Ha)	Forestry (Ha)	Horticulture (Ha)	Grazing (Ha)	TOTAL (Ha)
Mbangweni	1.54	48.61	50.59	0	84.19	184.93
Langa		27.64	53.02	0	63.81	144.47
Baynesfield		80.60	31.00	3.80	172.50	287.90

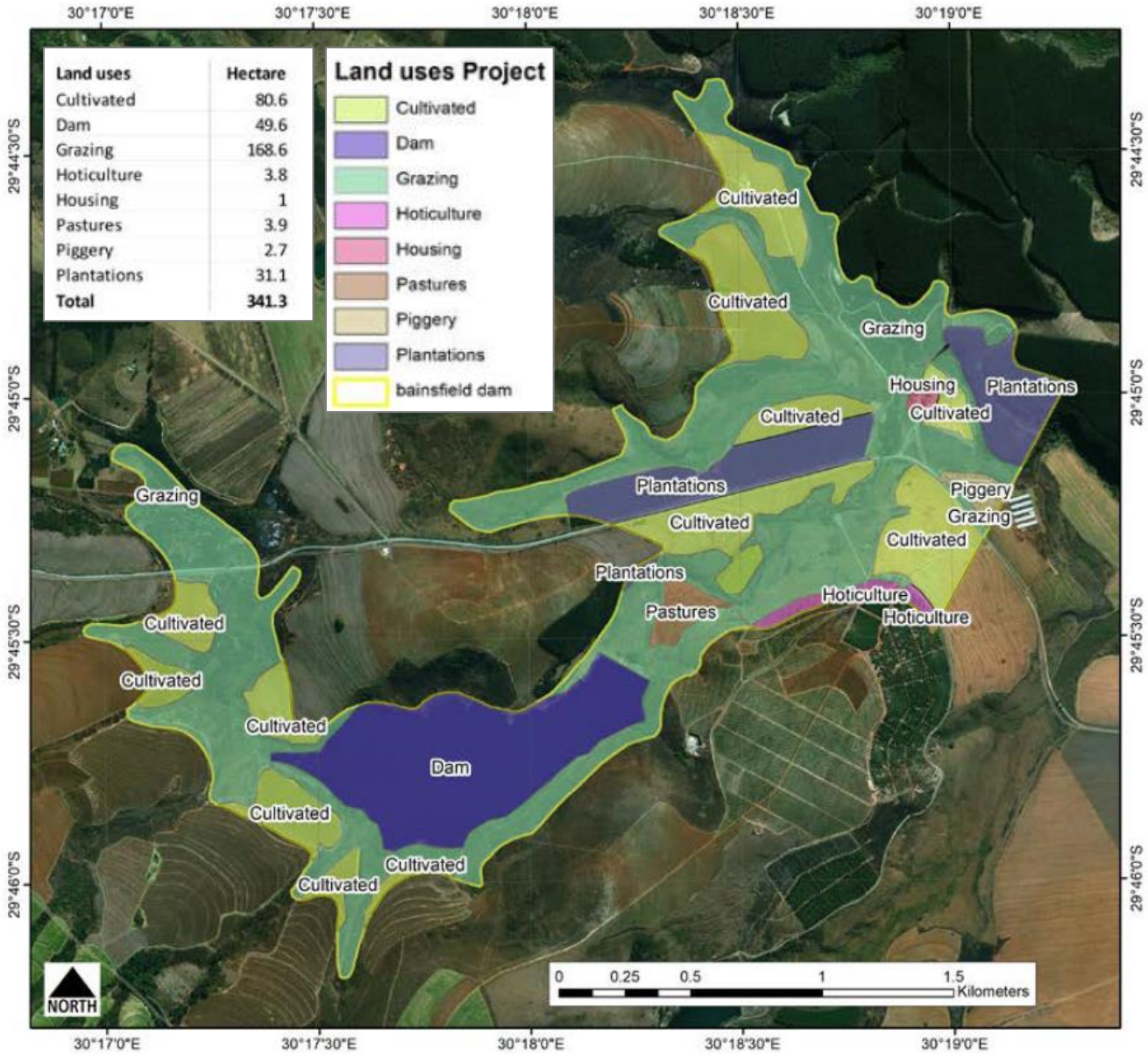

Figure 32: **Loss of land use associated with Baynesfield Balancing Dam Option**

The Baynesfield Balancing Dam Option was therefore discarded from a risk perspective and socio-economic impacts on the Baynesfield Estate. Although the Avifauna Bridging Study found that the Baynesfield Balancing Dam Option was an acceptable alternative from an avifaunal perspective (refer to **Section 6.3.1** above), this option was discarded for the reasons mentioned above. On the basis of biodiversity compensation, in accordance with the Draft National Biodiversity Offset Policy, the Langa and Mbangweni Balancing Dam options were considered further as part of the Biodiversity Offset Study.

9.4.2.2 Langa and Mbangweni Balancing Dam Options

An analysis of the Langa and Mbangweni Balancing Dam options is included in *Section 13* of the **Final EIA Report (November, 2016)**. This is based on independent perspectives received from the Environmental Specialists, as well as technical inputs from the

Engineering Team. This was independently assessed by the EAP within *Section 13* of the EIA Report to identify a Best Practicable Environmental Option (BPEO) for the relevant components of the uMWP-1. An extract follows below:

- Specialist Studies –
  - The Mbangweni Balancing Dam Option was identified as the preferred option in the Terrestrial Ecological Impact Assessment, Avifauna Study and the Heritage Impact Assessment. The Terrestrial Ecological Impact Assessment and Avifauna Study preferred this option as it is in a generally more transformed area with less natural vegetation;
  - The Langa Balancing Dam Option was identified as the preferred option in the Agricultural Impact Assessment (inundates smaller area of high potential agricultural land), Visual Impact Assessment (less viewshed onto Zinti Valley) and Technical Feasibility Study (less excavation required and better foundation conditions).
- Comparative Impacts – **Table O** below compares the Langa and Mbangweni Balancing Dam options based on potential impacts to the receiving environment. The findings of the additional specialist studies were included in order to provide an update of the similar table that was included in *Section 13.5.4* of the **Final EIA Report (November, 2016)**.

Table O: Comparative Adverse Impacts - Balancing Dam Alternatives

(*Note that the green highlighted blocks indicate the preferred option for each environmental feature*)

Environmental Feature / Attribute	Mbangweni Balancing Dam	Langa Balancing Dam
Land Use	Situated on Baynesfield Estate. Inundates larger area (185 Ha). Land uses affected include cultivated land, timber plantation and vacant areas.	Situated on Baynesfield Estate. Inundates smaller area (144 Ha). Land uses affected include cultivated land, timber plantation and vacant areas.
Geology & Soils	Wider valley section within river. Deeper foundations need to be excavated.	Materials confirmed to be available within the dam basin for dam type. Less excavation required – better foundations conditions.
Surface Water	Inundates a larger area of the Mbangweni River System. Loss of 59 Ha of wetland habitat.	Smaller footprint in terms of affected watercourses. Loss of 44 Ha of wetland habitat.
CBA Irreplaceable Areas	Loss of 15.59 Ha of CBA Irreplaceable habitat.	Loss of 14.76 Ha of CBA Irreplaceable habitat.
Avifauna	Part of Mbangweni Balancing Dam Basin also lies within the 1.5 km buffer area around Blue Swallow Nesting Locality 1. Several areas of primary grassland that would be inundated by this dam lie within the 4 km buffer areas of all three of the Blue Swallow Nesting Localities 1, 2 and 3.	Most of Langa Balancing Dam Basin lies within the 1.5 km buffer area around Blue Swallow Nesting Locality 1. In addition, an area of primary grassland that would be inundated by this dam lies within the 4 km buffer area around Blue Swallow Nesting Locality 2 and even slightly around Blue Swallow Nesting Locality 3.
	The dam basins of both the Langa and Mbangweni Balancing Dam Options lie entirely within the 1.5 km buffer zone around the outer boundaries of the main Blue Swallow breeding habitat patches (Zinty and Amphitheatre) supporting Blue Swallow Nesting Localities 1, 2 and 3.	
Agriculture	Inundates 101 Ha of high potential	Inundates 81 Ha of high potential land.

Environmental Feature / Attribute	Mbangweni Balancing Dam	Langa Balancing Dam
	land. Increases net impact on agricultural land on the Baynesfield Estate.	
Heritage Resources	Existing access roads thus limiting need for new access roads.	Outer reaches of dam impact on undisturbed land which increases potential for impacting heritage resources.
Socio-Economic Aspects	Similar types of potential impacts.	
Existing Structures & Infrastructure	Similar built environment, where both balancing dams impact on private farm roads (access roads to cultivated areas and timber plantations) and possibly farming-related infrastructure (e.g. irrigation pipelines).	
Road Network & Access		
Visual Quality	Higher visibility.	Less viewshed onto Zinti Valley.
Technical	Wider valley section within river. Deeper foundations need to be excavated.	Less excavation required – better foundations conditions.

Both of the Langa and Mbangweni Balancing Dam options are associated with loss of Blue Swallow habitat and were identified to be fatally flawed by the Avifauna Specialist, which lead to the identification of compensation measures as part of the Biodiversity Offset Study. The Langa Balancing Dam Option was identified as the BPEO following a balanced appraisal of all the remaining environmental and technical factors. Where the Mbangweni Balancing Dam Option was found to be more favourable, the residual impacts (apart from impacts to Blue Swallows) following the recruitment of suitable mitigation measures were not regarded as sufficiently significant or overriding to sway the ultimate selection of the BPEO for this component of the uMWP-1.

10 UPDATED ENVIRONMENTAL MANAGEMENT PROGRAMME

An EMPr represents a detailed plan of action prepared to ensure that recommendations for enhancing positive impacts and/or managing negative environmental impacts are implemented during the life-cycle of a project.

The scope of the uMWP-1's EMPr is as follows:

- Establish management objectives in order to enhance benefits and manage adverse environmental impacts;
- Provide targets for management objectives, in terms of desired performance;
- Describe actions required to achieve management objectives;
- Outline institutional structures and roles required to implement the EMPr;
- Provide legislative framework; and
- Describe the requirements for record keeping, reporting, review, auditing and updating of the EMPr.

The Pre-Construction and Construction EMPr for uMWP-1 Raw Water (contained in **Appendix E**) was amended, as necessary, to include the mitigation measures that emanated from additional investigations and specialist studies captured within this Addendum to the EIA Report.

11 PUBLIC PARTICIPATION

11.1 Introduction

The DEA stipulated in their letter dated 13 February 2017 that in terms of Regulation 56 (1) of GN No. R. 543 of 18 June 2010, registered I&APs are entitled to comment in writing on all written submissions. In addition, it was stated that in terms of sub-regulation (2), before a final report compiled in terms of the Regulations is submitted to the Competent Authority, I&APs need to be given access to and opportunity to comment on the report in terms of sub-regulation (3)(e) and (g). According to Regulation 56, sub-regulation (1)(a)(i), a timeframe of 21 days has been set for this review by the DEA. This period was, however, extended to cover 30 days to cover a full month.

11.2 Engagements during the Compilation of the Draft Addendum to the EIA Report

Various targeted engagements took place during the compilation of the information requested by the DEA. This included discussions and meetings with the Environmental Authorities to clarify their requirements with regards to the additional work that needed to be undertaken to address the DEA's comments on the **Final EIA Report (November, 2016)**. Meetings related to certain of the additional studies were also held, such as a site visit with the KZN Department of Transport for the realignment options of the R617. Topic specific meetings were also held, which included meetings with the DRDLR to discuss Biodiversity Offsets and with the KwaBhidla Traditional Council, as well as community members to present the R617 deviation options.

11.3 Review of Draft Addendum to the EIA Report

11.3.1 Notification of Review

The I&APs were notified as follows of the opportunity to review the Draft Addendum to the EIA Report:

1. A notification letter was forwarded to the I&APs on the database via email;
2. Bulk SMSs were sent to the I&APs where mobile telephone numbers were available;
3. Legal notices were placed in the following newspapers:
   a) The Star (English);
   b) The Witness (English); and
   c) Isolezwe (Zulu).

11.3.2 Accessing the Draft Addendum to the EIA Report

Copies of the Draft Addendum to the EIA Report were placed at the locations provided in **Table P** below for a 30-day review period (from 26 July to 27 August 2018).

Table P: Locations for Review of Draft Addendum to the EIA Report

Copy	Location	Address	Tel. No.
1.	Baynesfield Club	Baynesfield	082 920 8499
2.	Bulwer Public Library	189 Jackson Street, Bulwer	039 832 0181
3.	Richmond Public Library	57 Harding Street, Richmond	033 212 2155

Copies of the Draft Addendum to the EIA Report were provided to the following parties, which include key regulatory and commenting authorities:

- DEA;
- KZN EDTEA;
- EKZNW;
- DWS KZN Regional Office;
- Amafa aKwaZulu-Natali;
- Department of Agriculture, Forestry and Fisheries;
- KZN Department of Transport;
- Harry Gwala District Municipality;
- Dr Nkosazana Dlamini Zuma Local Municipality;
- uMgungundlovu District Municipality
- Richmond Local Municipality;
- The Msunduzi Local Municipality;
- Traditional Authorities -
  - Emaqadini Traditional Council;
  - KwaZashuke Traditional Council;
  - KwaBhidla Traditional Council; and
- Mpendle Tenant Forum

The Draft Addendum to the EIA Report was also uploaded to the DWS' Project Website for downloading purposes and can be accessed at the following link: http://www6.dwa.gov.za/iwrp/uMkhomazi/documents.aspx.

11.3.3 Commenting on the Draft Addendum to the EIA Report

Comments on the Draft Addendum to the EIA Report need to be provided in writing to the EAP, whose contact details are as follows:

Contact Person: *Donavan Henning*
Tel: *(011) 781 1730*
Fax: *(011) 781 1731*
Email: *donavanh@nemai.co.za*
Postal Address: *PO Box 1673, Sunninghill, 2157*

12 CONCLUSIONS AND RECOMMENDATIONS

The comments received from the DEA on the **Final EIA Report (November, 2016)** for the proposed uMWP-1's Raw Water Component necessitated the need to undertake additional specialist studies, and to investigate specific components of the uMWP-1 in order to assess possible alternatives.

Due to concerns raised, additional Engineering Investigations were undertaken for the re-alignment of Provincial Road R617, with the objective of identifying alternative route options that do not encroach into the Impendle Nature Reserve, whilst trying to accommodate the requirements of the KZN Department of Transport. Three (3) route options were identified (refer **Section 5.2** above) and investigated taking into account the topography, river crossings, the affected communities, as well as sensitive environmental features (Impendle Nature Reserve and habitat for conservation worthy species). Based on the findings, Option 1B was identified as the preferred option for the realignment of the R617. Provision was made for pedestrians and cattle to be accommodated in the design of the bridge of the realigned Provincial Road R617, as well as for a new gravel access road and a small bridge to access land to the north of the uMkhomazi River. The RAP will include arrangements for resettling and compensating each household that has to be relocated as a consequence of the uMWP-1 (including land acquisition within the dam's purchase line and the deviation of the R617).

The Avifauna Bridging Study found the Langa and Mbangweni Balancing Dam options to be fatally flawed due to the associated loss of Blue Swallow habitat. A fatal flaw implies that the EA cannot be granted under normal circumstances (Lukey pers. comm., 2018). The Draft National Biodiversity Offset Policy, however, makes provision for "biodiversity compensation" in the case where a fatally flawed project is considered essential for pressing socio-economic needs, which are of national interest or significance. The strategic nature of the uMWP-1, and its importance from a socio-economic perspective were explained in the **Final EIA Report (November, 2016)** within the context of the need and desirability of the scheme, as well as the implications of the no-go option and the associated water deficits in the Integrated Mgeni WSS. Other options for the uMWP-1's scheme configuration (layout) that would prevent, or minimise, the impacts to the Blue Swallows related to the balancing dam, such as the Baynesfield Balancing Dam Option and a second parallel tunnel, were explored and found to be unfeasible. The Baynesfield Balancing Dam option was discarded from a risk perspective and due to unacceptable socio-economic impacts on the Baynesfield Estate. The second tunnel was discarded due to exorbitant costs and the associated financial impacts on the end-users, funding constraints and government's ability to assume risk, as well as the additional volumes of excavated material that would be generated and managed. The Biodiversity Offset Study thus examined and identified compensation measures that strive to achieve nett conservation benefits for Blue Swallows. Amongst others, this included site-specific compensation measures (e.g. managing grasslands and creating additional habitat, placing tracts of mistbelt grassland under stewardship, supporting monitoring programmes) as well as a Provincial Blue Swallow Compensation Initiative.

Potential impacts to Blue Swallows were identified as part of the Noise and Vibration Impact Assessments, as a result of uMWP-1's construction activities. Mitigation measures to address and manage the noise and vibration levels were proposed. From a noise perspective, the Noise Specialist recommended that no night-time construction activities are permitted within 1,500 m from any active Blue Swallow nesting sites. However, this is not technically viable given the continuous removal of tunnel muck and spoiling of this material in the construction of the dam wall of the proposed balancing dam (refer to **Section 9.3.3.1** above). It may, however, be viable for foundation preparation work and some quarrying.

The Invertebrate Impact Study identified sensitive areas for *Capys penningtoni* (Pennington's Protea Butterfly), based on the presence of suitable host plant habitat (c. *Protea caffra* stands), and found Option 1 (A and B) of the R617 deviation to be most favourable from an invertebrate perspective. Inundation and rising water levels associated with Smithfield Dam could potentially result in the loss of Protea stands, which occur in close proximity to the dam's FSL as well as *G. fluvialis* habitat. Certain recommendations are provided to manage these impacts.

The offset quantum, based on the drowning of habitats by Smithfield Dam and the balancing dam, was calculated for the riparian zone, wetland, grassland and CBAs, which guided the further investigations of the Biodiversity Offset Study. Within the four (4) main target areas various farms were identified as potentially suitable offset sites. The landowners, which includes the DRDLR, were engaged with to determine their willingness for offsets to be considered on their properties. Based on their feedback, the achievability of offset targets was estimated. The Wetland Functional and Conservation Hectare Equivalents achieved for Smithfield Dam was 110% and 80%, respectively. In the case of the Langa Balancing Dam (smaller wetland area lost that for Mbangweni Balancing Dam), the Wetland Functional and Conservation Hectare Equivalents achieved was 123% and 54%, respectively. It was further found that the rehabilitation and conservation initiatives of the CBAs and grassland areas would satisfy the related offset targets. A Biodiversity Offset Implementation Plan was developed, which makes provision for the institutional arrangements, roles and responsibilities, stages of offset implementation, budgetary requirements and specific offset measures. It is believed that the work produced demonstrates the feasibility of offsets and compensation for the uMWP-1 and provides the necessary basis upon which to roll out the next phase of the Biodiversity Offset Study (post-EIA, if authorisation is granted).

The DEA was notified that approval would be sought for corridors rather than set alignments for the tunnel route and R617 realignment (based on new alternatives identified). This approach will allow for the routes of these linear components of the uMWP-1 to be optimised during the detailed design phase, based on geotechnical investigations and other technical factors. Various environmental conditions related to the R617 and tunnel corridors are provided, which include measures to safeguard or manage impacts to sensitive environmental features that may be encountered within the proposed corridors.

The Pre-Construction and Construction EMPr for uMWP-1 Raw Water Component was amended, as necessary, to include the mitigation measures that emanated from additional investigations and specialist studies captured within this Addendum to the EIA Report.

Based on the overall findings of the various specialists, technical considerations and the comparison of the impacts during the EIA and subsequent additional investigations, the following options were identified as the BPEOs for the related uMWP-1's components:

- Smithfield Dam Area -
  - **Relocation of Eskom Transmission Line -** Option 1 (across the dam basin);
  - **Gauging Weir -** Option 1; and
  - **R617 deviation** - Corridor;
- Raw Water Conveyance Infrastructure -
  - **Raw Water Pipeline** - Route to Baynesfield WTW Option 1;
  - **Spoil Site** – Tunnel Outlet - Option 2, spoil to be used in the balancing dam wall; and
  - **Tunnel** – Corridor;
- Balancing Dam Area -
  - **Balancing Dam -** Langa Balancing Dam Option; and
  - **Road – Balancing Dam -** Option 1.

With the selection of the BPEOs, the adoption of the mitigation measures included in the Final EIA Report and the Addendum to the EIA Report, as well as the dedicated implementation of the EMPr and the Biodiversity Offset Implementation Plan, it is believed that the significant environmental aspects and impacts associated with the uMWP-1 can be suitably mitigated. In the case of the loss of Blue Swallows' habitat, which cannot be adequately mitigated in terms of the mitigation hierarchy or through offsets, the approach that was adopted in terms of biodiversity compensation followed the Draft National Biodiversity Offset Policy for strategic projects. It is believed that the information contained within this Addendum to the EIA Report adequately addresses the DEA's comments and will allow for informed decision-making to take place.

The following key recommendations, which may also influence the conditions of the Environmental Authorisation (where relevant), emanated from the additional work undertaken to address the DEA's comments on the **Final EIA Report (November, 2016)**:

- The RAP is to make suitable provision for the relocation of any dwellings and structures affected by the realignment of the R617, which must include the restitution of livelihoods of the affected parties.
- The new gravel access road, which is required to provide access to land located to the north of the uMkhomazi River (associated with R617 realignment Option 1) requires an effective storm water drainage system. It also needs to be routed so as to avoid the *Protea* stands.
- Biodiversity Offsets –
  - Secure landowner agreements;

- Design site-specific rehabilitation and compensation programme;
- Seek the relevant environmental approvals for the site-specific offset interventions;
- Implement site-specific interventions and compensation programmes; and
- Undertake Monitoring and Evaluation.

❖ A number of grave sites and structures older than 60 years were identified within the project area. The final locations of all heritage and cultural features would be confirmed as part of the Phase 2 Heritage Impact Assessment.

❖ Comply with the environmental conditions related to the R617 corridor (see **Section 9.2.4** above) and tunnel corridor (see **Section 9.3.6** above), which include measures to safeguard or manage impacts to sensitive environmental features that may be encountered within these proposed corridors.

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