REPORT

Wetland Impact Assessment for the Belfast Expansion Project

EXXARO COAL MPUMALANGA (PTY) LTD

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Distribution List

1 x electronic copy to Exxaro Coal Mpumalanga (Pty) Ltd.

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Executive Summary

Exxaro Coal Mpumalanga Proprietary Limited (Exxaro) proposes to expand their current Belfast Implementation Project by implementing an expansion project, Belfast Expansion Project (BEP). The BEP includes the expansion of the existing Belfast Implementation Project (BIP) opencast mine and underground mine, construction and operation of a decline shaft and its associated infrastructure, construction and operation of a conveyor/haul road, and the establishment of a discard dump. These infrastructure and associated activities are located adjacent to watercourses, and some cross wetlands. Due to these activities being located in wetland areas or within a 500 m buffer of wetlands, Exxaro is required to apply for an Integrated Water Use License Application (IWULA) and an Integrated Water and Waste management Plan (IWWMP), Exxaro has therefore appointed Golder Associates Africa (Pty) Ltd. (Golder) to provide assistance in acquiring authorisation to mine through some of the wetlands on site. This report documents the impact assessment for the wetlands located within 500m buffer of the proposed BEP activities.

The proposed BEP project is located within the existing Exxaro MRA and is proposed to be an extension to the existing Belfast Implementation Project. Exxaro MRA is dominated by undeveloped agricultural land and semi-natural and natural grassland. The proposed BEP covers an area of approximately 5 819 ha and includes the development of an opencast mine, decline shaft and its associated infrastructure, construction of a conveyor/haul road and the establishment of a discard dump at Pan 07. These activities are located adjacent to a number of wetlands in the study area. The majority of these wetlands are in a moderately modified present ecological state, which infers that there has been a moderate change in ecosystem processes and loss of natural habitat has taken place, but natural habitat remains predominately intact. Similarly, most wetlands have a moderate Ecological Importance and Sensitivity, in the context of the surrounding cultivated landscape.

The key Project impacts with respect to the proposed mining activity are direct loss of wetland habitat, indirect loss of wetland habitat and degradation of remaining wetland habitat primarily as a result of interruption in hydrological and hydropedological systems supporting those remaining wetlands. Significant (moderate-high) residual impacts remain on wetland ecosystems as a result of the direct loss of wetland habitat to the opencast mining footprint and infrastructure, as the outright loss of these habitats cannot be mitigated (i.e., avoided, minimised, rehabilitated). The implementation of a wetland rehabilitation and management plan for the Project to give effect to an approved wetland offset strategy is therefore necessary to address significant residual impacts and ensure that any areas specifically set aside for biodiversity conservation (including on-site wetland offsets, and any off-site mitigation / offset areas) are protected and managed accordingly.

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ACRONYMS AND ABBREVIATIONS

Abbreviation	Explanation
BEP	Belfast Expansion Project
BIP	Belfast Implementation Project
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EIS	Environmental Importance and Sensitivity
EMPr	Environmental Management Programme
IWUL	Integrated Water Use License Application
IWWMP	Integrated Water and Waste management Plan
LOM	Life of Mine
MTPA	Mpumalanga Tourism and Parks Agency
MRA	Mining Rights Area
PES	Present Ecological State
ROM	Run-of-Mine
WCS	Wetland Consulting Services
WUL	Water Use Licence

DETAILS OF THE SPECIALIST

Specialist Information	
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Qualifications:	■ Master's in environmental management– University of the Free State ■ SACNASP Registered Cand.Sci.Nat. – Environmental Science

Qualifications of specialist

Education

Master's in Environmental Management– University of the Free State

BSc. Hons. Environmental Management – University of South Africa

Career enhancing courses.

Introduction to Wetland Delineation and Assessment- University of Free State, 2017

Professional Affiliations

SACNASP Registered Cand.Sci.Nat. – Environmental Science

Summary of past experience

Lufuno Nemakhavhani is a wetland ecologist with seven years working experience. Her role within Golder Associates Africa includes conducting wetland delineation and assessment, wetland health monitoring, environmental audits and environmental permitting. She has been involved in projects both locally and internationally, in the African continent.

Declaration of Independence by Specialist

I, Lufuno Nemakhavhani, declare that I –

- Act as the independent specialist for the undertaking of a specialist section for the proposed BEP Project
- Do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed;
- Do not have nor will have a vested interest in the proposed activity proceeding;
- Have no, and will not engage in, conflicting interests in the undertaking of the activity;
- Undertake to disclose, to the competent authority, any information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document.

APPENDIX 6 OF THE EIA REGULATIONS

Where applicable, this baseline report has been written in compliance with Appendix 6 of the EIA Regulations.

Section	Requirements	Section addressed in report
1.(1)	A specialist report prepared in terms of these Regulations must contain	
(a)	Details of	
(i)	the specialist who prepared the report; and	See preceding page
(ii)	the expertise of that specialist to compile a specialist report including a curriculum vitae	See preceding page
(b)	a declaration that the specialist is independent in a form as may be specified by the competent authority	See preceding page
(c)	an indication of the scope of, and the purpose for which, the report was prepared;	Section 1.0
(cA)	an indication of the quality and age of base data used for the specialist report;	Section 4.1
(cB)	a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 6.0
(d)	the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 4.2
(e)	a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 4.0
(f)	details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	Sections 5.2 and 5.3
(g)	an identification of any areas to be avoided, including buffers;	Section 7.1
(h)	a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 2 and Figure 3
(i)	a description of any assumptions made and any uncertainties or gaps in knowledge;	Sections 4.1 and 4.5
(j)	a description of the findings and potential implications of such findings on the impact of the proposed	Section 6.0

Section	Requirements	Section addressed in report
	activity **(including identified alternatives on the environment)** or activities;	
(k)	any mitigation measures for inclusion in the EMPr;	Section 7.0
(l)	any conditions for inclusion in the environmental authorisation;	Section 10.1
(m)	any monitoring requirements for inclusion in the EMPr or environmental authorisation;	Section 8.0
(n)	a reasoned opinion—	
(i)	**(as to)** whether the proposed activity, activities or portions thereof should be authorised;	Section 10.0
(iA)	regarding the acceptability of the proposed activity or activities; and	
(ii)	if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Section 7.0
(o)	a description of any consultation process that was undertaken during the course of preparing the specialist report;	-
(p)	a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	
(q)	any other information requested by the competent authority.	-
2.	Where a government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	-

1.0 INTRODUCTION AND BACKGROUND

The Exxaro Coal Mpumalanga Proprietary Limited (Exxaro) proposes to expand the existing mining operation at Belfast. The proposed expansion is referred to as the Belfast Expansion Project (BEP). The BEP includes the expansion of the existing Belfast Implementation Project (BIP) opencast mine, construction and operation of a decline shaft and its associated infrastructure, construction and operation of a conveyor and/or haul road, and the establishment of a discard dump. These infrastructure and associated activities are located adjacent to watercourses, and some cross wetlands.

Exxaro has appointed Golder Associates Africa (Pty) Ltd. (Golder) to provide assistance with the Integrated Water Use License Application (IWULA), Integrated Water and Waste management Plan (IWWMP) and associated specialist studies, including a wetland baseline and impact assessment study, for the proposed BEP operation.

1.1 Purpose of the report

This report documents the findings of the wetland baseline and impact assessment study for the proposed BEP Development. It describes the results of the baseline wetland assessment, and the outcome of the assessment of the potential impacts of the proposed Project. It provides recommended measures for the mitigation of any negative impacts to inform the Integrated Water Use Licence Application, as well as recommendations for additional conservation actions that may be required in order to address any significant residual impacts.

2.0 PROJECT LOCATION AND EXTENT

The Belfast Expansion Project (BEP) area forms part of the Belfast resource, which is situated in the province of Mpumalanga, 10 km south east of eMakazeni (Belfast) on the farms Leeubank, Zoekop and Blyvooruitzicht (Figure 1). It is approximately 5 819 ha in extent and mostly comprises undeveloped agricultural land and semi-natural and natural grassland and lies adjacent to the recently developed Belfast Implementation Project (BIP) opencast mine.

2.1 Project Description

The Belfast Expansion Project is an expansion to the existing Belfast Implementation Project. The existing BIP has an approved Water Use License (WUL) number 05/X11D/ABCFGIJ/2613. Proposed infrastructure and activities which are being applied for as part of the current BEP WULA includes:

- Development of the BEP Opencast Mine footprint;
- Development of the BEP underground mine footprint;
- Development of the Decline shaft and associated infrastructure;
- Construction of the Conveyor and/or haul road; and
- Establishment of the Discard dump.

The locations of the proposed infrastructure and activities are shown on Figure 2.

2.2 Study Area

The Study Area for the assessment was defined as all wetland systems occurring within a 500 m radius of the proposed BEP development footprint (the Study Area), since this constitutes the ‘regulated zone’ of a watercourse, as defined by the National Water Act. The Study Area is shown in Figure 3.

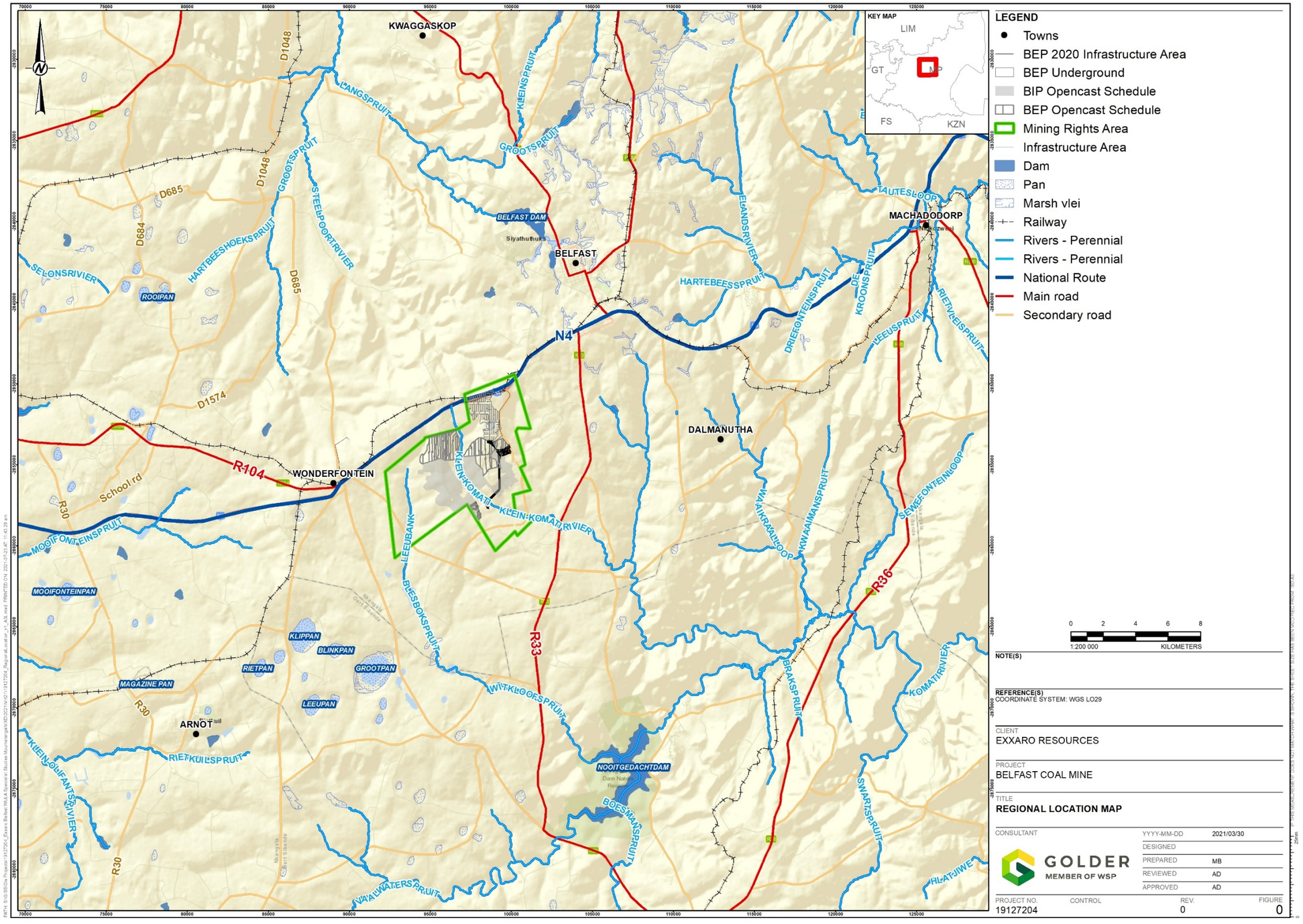

Figure 1: Regional setting of the BEP Mining Rights Area

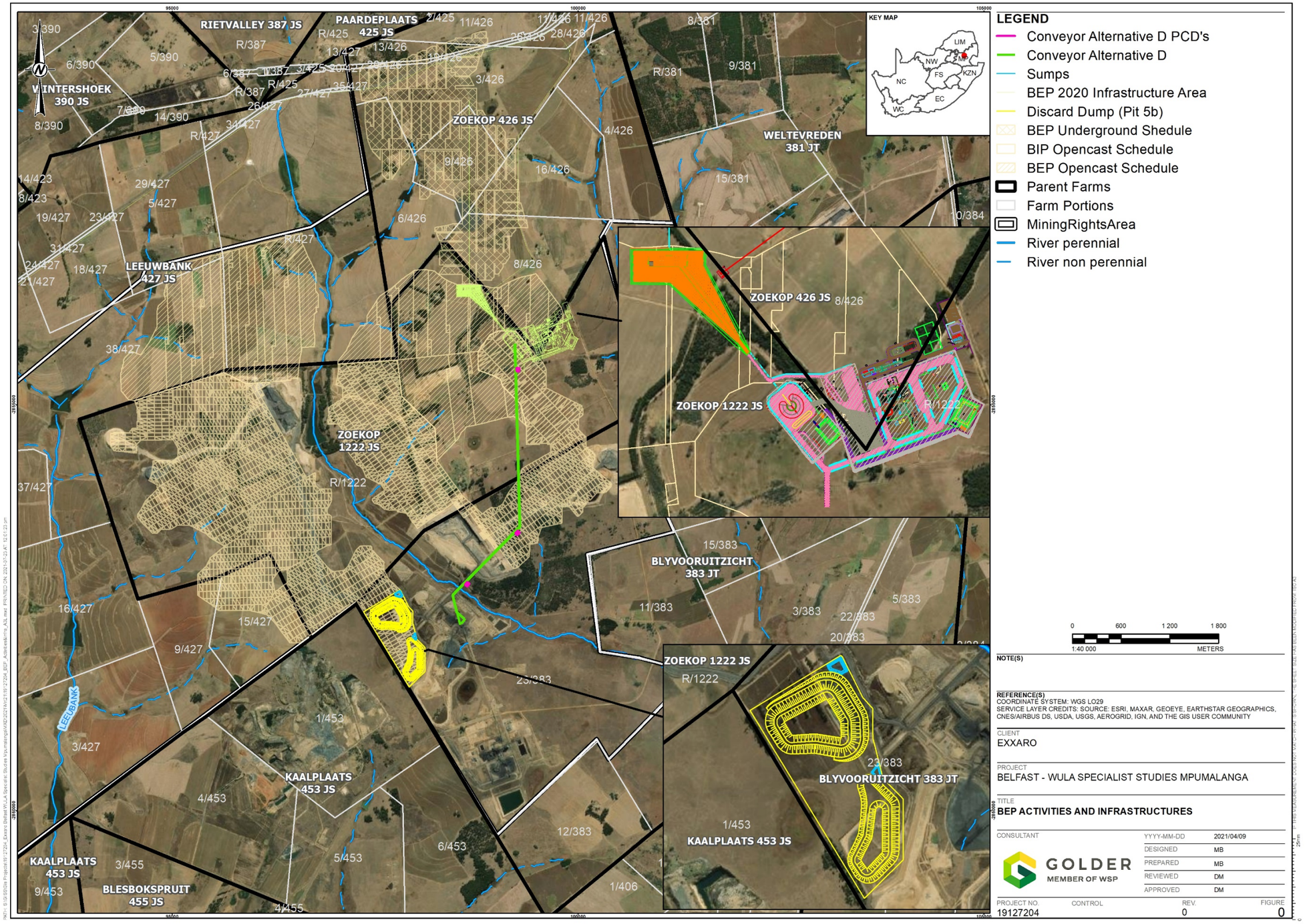

Figure 2: Proposed BEP activities and Infrastructure

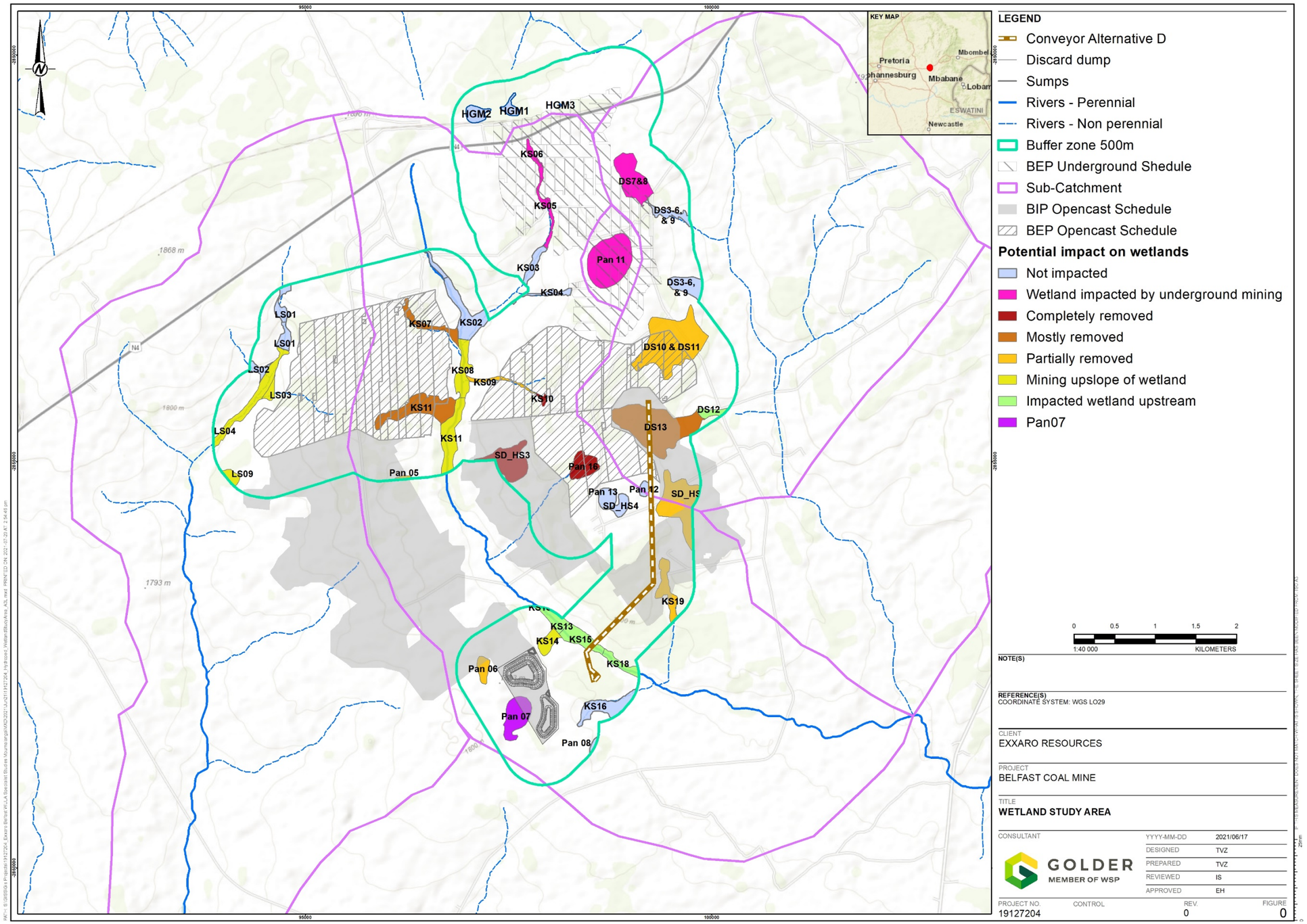

Figure 3: BEP wetland study area

3.0 APPLICABLE LEGISLATION, GUIDELINES AND STANDARDS

3.1 National Legislation

The national legislation governing watercourses in South Africa is the National Water Act, 1998 (Act No. 36 of 1998) (NWA). In terms of the NWA, wetlands are defined as "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*".

The 'regulated zone' of a watercourse includes the area lying within 500 m of that watercourse, and this was the basis for the definition of the Study Area, i.e., any wetlands lying within 500 m of the proposed development footprint (see Section 2.2).

3.2 National Guidelines

The National Wetland Offset Guidelines (Macfarlane *et al*., 2014) provide guidance on a comprehensive approach for reducing potential impacts on wetlands, and includes methodologies for wetland offset site selection, compensation ratios and hectare equivalents used to determine the size and functionality of wetland offset. These guidelines have been considered in the development of appropriate mitigation measures for the potential impacts of the proposed mining activity at BEP.

4.0 METHODS

4.1 Literature Review and Gap Analysis

A literature review was conducted to gain an overview of the proposed project background, wetlands conditions (status quo) and associated impacts. The literature review and gap analysis focussed on the information sources discussed as follows.

Previous Studies

The wetlands of the MRA were initially delineated by WCS (2014). The wetlands of the BIP MRA has since been the subject of extensive pre-construction baseline monitoring surveys, and subsequent follow up monitoring surveys which have the objective of detecting any change in wetland health, importance and/or sensitivity, as a result of the existing BIP mining operation. Some of these wetlands overlap with the BEP study area; the most recent monitoring results for these wetlands (Golder, 2021c) were therefore used to inform the baseline assessment for the current study. Key data sources used to inform the baseline characterisation and impact assessment presented in this report include:

- Wetland Consulting Services (2014) Wetland Mitigation Strategy for Belfast Opencast Coal Mine, Mpumalanga Province.
- Wetland Consulting Services (2016). Belfast Implementation Project Environmental Baseline Monitoring. Wetland Monitoring Ref No. 1132-2015.
- GroundTruth (2016). Exxaro: Belfast Implementation Project. Wetland Rehabilitation Baseline Monitoring Report. Reference: GTW413-270516-02.
- GroundTruth (2017). Biodiversity Relocation and Offset Strategy for the Exxaro Belfast Coal Mine, Mpumalanga.
- Golder (2021a). Wetland Mitigation and Management Strategy for the Belfast Expansion Project.
- Golder (2021b). Hydropedological specialist study for the Integrated Water Use Licence Application for Belfast Expansion Project.

- Golder (2015-2020). Belfast Implementation Project Wetland Monitoring Reports.
- Golder (2011). NBC Belfast Ecological Baseline and Impact Assessment. Report number 12135-9383-2 submitted to Exxaro Resources Ltd.

4.2 Field Survey

A field survey of wetlands in the Study Area was conducted from 15 - 17 March 2021, and from 02 - 04 June 2021. During the field visits, all wetlands within the Study Area were surveyed, including those wetlands that will be completely or partially lost as a result of the proposed BEP mine activities, and wetlands that will be unaffected by the proposed mining activities and as such would be the subject of the wetland mitigation strategy for the Project (Golder, 2021a). During the field survey, data on existing wetland impacts and indicators of ecological condition was gathered, to inform the assessment of the wetland's Present Ecological Status (PES), Ecological Importance and Sensitivity (EIS), and role in delivery of ecosystem services.

The wetlands of the MRA were originally delineated and classified as part of the NBC Belfast Ecological Baseline and Impact Assessment (Golder, 2011), and updated by WCS (2014). This dataset has been in use since that time and no revision of the delineation or classification was considered necessary for this assessment.

4.3 Data Analysis

4.3.1 Present Ecological Status (PES)

A PES assessment was conducted for those hydro-geomorphic wetland units in the Study Area that had not been monitored as part of the ongoing BIP monitoring programme, in order to establish a baseline of the current state of the wetlands, and to provide an indication of the conservation value and sensitivity of the wetlands.

The Level 2 WET-Health assessment as described in Macfarlane *et al.* (2008) was applied for the determination of the PES score for each wetland unit. The PES score is reflected in the placement of each wetland unit into a PES category. A description of the PES scores and linked impact categories is provided in Table 1.

Table 1: Impact scores and categories of Present Ecological State used by WET-Health for describing the integrity of wetlands (Macfarlane *et al*., 2008)

Impact Category	Description	Impact Score Range	Present Ecological State Category
None	Unmodified, or approximates natural condition	0 – 0.9	A
Small	Largely natural with few modifications, but with some loss of natural habitats	1 – 1.9	B
Moderate	Moderately modified, but with some loss of natural habitats	2 – 3.9	C
Large	Largely modified. A large loss of natural habitat and basic ecosystem function has occurred	4 – 5.9	D
Serious	Seriously modified. The losses of natural habitat and ecosystem functions are extensive	6 – 7.9	E
Critical	Critically modified. Modification has reached a critical level and the system has been modified completely with almost complete loss of natural habitat	8 – 10.0	F

4.3.2 Ecological Importance and Sensitivity (EIS)

The EIS was determined using the methodology developed by Rountree *et al.* (2013). It is a rapid scoring system to evaluate:

- Ecological Importance and Sensitivity;
- Hydrological Functions; and
- Direct Human Benefits.

The scoring assessment incorporates:

- EIS score derived using aspects of the original Ecological Importance and Sensitivity assessments developed for riverine assessments (DWAF, 1999);
- Hydro-function importance score derived from the WET-EcoServices tool for the assessment of wetland ecosystem services Kotze *et al.* (2009); and
- Direct human benefits score derived from the WET-EcoServices tool for the assessment of wetland ecosystem services Kotze *et al.* (2009).

The highest score of the three derived scores (each with range 0 – 4) was then used to indicate the overall importance category of the wetland (Table 2).

Table 2: Ecological importance and sensitivity categories

Ecological Importance and Sensitivity Category Description	Range of EIS score
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers	> 3 and ≤ 4
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	> 2 and ≤ 3
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers	> 1 and ≤ 2
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	> 0 and ≤ 1

4.4 Impact Assessment

The significance of identified impacts was determined using the approach outlined below (terminology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998). This approach incorporates two aspects for assessing the potential significance of impacts, namely occurrence and severity, which are further subdivided as follows (Table 3):

Table 3: Impact Assessment Factors

Occurrence		Severity	
Probability of occurrence	Duration of occurrence	Scale/extent of impact	Magnitude of impact

The four ranking scales used to assess the factors for each impact are outlined in Table 4.

Table 4: Impact assessment scoring scales

Magnitude	Duration
10- Very high/unknown	5- Permanent (>10 years)
8- High	4- Long-term (7 - 10 years, impact ceases after site closure has been obtained)
6- Moderate	3- Medium-term (3 months- 7 years, impact ceases after the operational life of the activity)
4- Low	2- Short-term (0 - 3 months, impact ceases after the construction phase)
2- Minor	1- Immediate
Scale	**Probability**
5- International	5- Definite/Unknown
4- National	4- Highly Probable
3- Regional	3- Medium Probability
2- Local	2- Low Probability
1- Site Only	1- Improbable
0- None	0- None

The following definitions are applicable to the ranking scales outlined above:

- **Magnitude**: is a measure of the degree of change in a measurement or analysis (e.g., the area of pasture or the concentration of a metal in water compared to the water quality guideline value for the metal), and is classified as none/negligible, low, moderate or high. The categorisation of the impact magnitude may be based on a set of criteria (e.g., health risk levels, ecological concepts and professional judgement) pertinent to each of the discipline areas and key questions analysed. The various levels of magnitude, as applicable to this study, are summarised in Table 5. Appropriate, widely recognised standards are to be used as a measure of the level of impact;
- **Scale/Geographic extent:** refers to the area that could be affected by the impact and is classified as site, local, regional, national, or international;
- **Duration**: refers to the length of time over which an environmental impact may occur i.e. immediate/transient, short-term (0 to 7 years), medium-term (8 to 15 years), long-term (greater than 15 years with impact ceasing after closure of the project), or permanent; and
- **Probability of occurrence:** is a description of the probability of the impact actually occurring as improbable (less than 5% chance), low probability (5% to 40% chance), medium probability (40% to 60% chance), highly probable (most likely, 60% to 90% chance) or definite (impact will definitely occur).

Table 5: Magnitude definition for wetland impact assessment

Magnitude	Wetland Context
Minor	Very slight change from the existing baseline condition. Change barely distinguishable, approximating to the 'no change' situation
Low	Minor shift away from existing baseline conditions. Change arising from the loss/disturbance will be discernible, but underlying character, composition and/or attributes of the baseline condition will be similar to pre-development circumstances or patterns. Having a minor effect on the known extent or condition of a wetland habitat.
Moderate	Loss or alteration to one or more key elements/features of the existing baseline conditions, such that the post-development character, composition and/or attributes will be partially changed. Loss of a moderate proportion of the known extent or condition of wetland habitat.
High	Major alteration to key elements/ features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed. Loss of a high proportion of the known extent or condition of wetland habitat.
Very High / Unknown	Total loss of key elements/ features of the existing baseline conditions such that the post-development character, composition and/or attributes will be fundamentally changed. Total loss of the known known extent or condition of wetland habitat.

Once these factors are ranked for each impact, the significance of the two aspects, occurrence and severity, is assessed using the following formula:

Significance Points= (Magnitude + Duration + Scale) x Probability.

The maximum value is 100 significance points (SP). The impact significance will then be rated as follows:

Points	Significance	Description
SP>60	High environmental significance	An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.
SP 30 - 60	Moderate environmental significance	An impact or benefit which is sufficiently important to require management, and which could have an influence on the decision unless it is mitigated.
SP<30	Low environmental significance	Impacts with little real effect and which will not have an influence on or require modification of the project design.
+	Positive impact	An impact that is likely to result in positive consequences/effects.

4.5 Study Limitations

No limitations were experienced. Access to all areas was facilitated by Exxaro's estate management department, and no constraints to data-gathering were encountered.

5.0 BASELINE DESCRIPTION

The Study Area is approximately 3,126 ha and is characterised by undulating topography dominated by agricultural cultivation and pasture land uses, interspersed with remnant areas of valley bottom wetlands, hillslope seepages, and dry grasslands, within which cultivation is not possible due to wet conditions or shallow soils.

Exxaro Belfast MRA is located in the Inkomati-Usuthu Water Management Area (WMA3) within quaternary catchments X11C and X11D. Three riparian systems flow through the MRA namely: the Klein-Komati (KS-system), Leeubankspruit (LS-system) and the Driehoekspruit (DS-system).

A hydropedology assessment of the wetlands of the Study Area has been completed (Golder, 2021b) and should be read in conjunction with this wetland ecology baseline and impact assessment report.

5.1 Wetland Classification

Wetlands in the Study Area are associated with the three main riparian systems and are named based on their association with the relevant system. All of the wetlands that have been delineated and classified within the original Belfast (BIP and BEP) mining right area (Golder, 2011) are shown on Figure 4, and include the following wetland types, or HGM units:

- Valley bottom with a channel;
- Valley bottom without a channel;
- Hillslope seepage (linked to a stream channel);
- Isolated hillslope seepage; and
- Pans and Depressions, the distinction being that a pan has a discernible basin.

Since the impact of loss/disturbance of some wetlands that currently lie within the Study Area has already been authorised for the existing BIP project (see Figure 3 for wetlands that coincide with the BIP opencast area). These wetlands are DS13, KS19, KS14, SDHS3, KS11 (Main), and Pan 05, and were therefore not included as receptors in this study.

The current study therefore focussed only on those wetlands located within 500 m of the proposed BEP infrastructure and activities (Figure 3), excluding those already authorised for BIP, and are listed in Table 6 overleaf.

Table 6: Wetlands located within 500 m of BEP infrastructure (Figure 3)

System	Wetland Name	Wetland type	Project activity within 500 m
Driehoekspruit	DS Main (03, 06, 09)	Channelled valley bottom	Underground mine within 500 m
	DS3-6, & 9 - HS	Hillslope seepage	Underground mine within 500 m
	DS07	Hillslope seepage	Underground mine
	DS08	Pan	Underground mine
	DS10, DS11	Isolated hillslope seepage	Opencast mine, underground mine and Decline shaft
	DS 12	Hillslope seepage	Opencast mine and Decline shaft
Klein-Komati	KS02 (main)	Channelled valley bottom	Opencast mine within 500 m
	KS03 (main)	Channelled valley bottom	Underground mine
	KS04	Hillslope seepage	Underground mine
	KS05	Unchannelled valley-bottom	Underground mine
	KS06	Hillslope seepage	Underground mine
	KS07	Unchannelled valley-bottom	Opencast mine
	KS08	Channelled valley bottom	Opencast mine
	KS09	Unchannelled valley-bottom	Opencast mine
	KS10	Hillslope seepage	Opencast mine
	KS 11	Hillslope seepage	Opencast mine
	KS15	Channelled valley bottom	Conveyor and/or haul road
Leeubankspruit	LS02	Hillslope seepage	Opencast mine within 500 m
	LS03	Hillslope seepage	Opencast mine within 500 m
	LS04 (Main)	Channelled valley bottom	Opencast mine within 500 m
	LS09	Hillslope seep	Opencast mine within 500 m
Pans	Pan11	Pan	Underground mine
	Pan12	Pan	Conveyor option D (preferred option)
	Pan13	Pan	Opencast mine within 500 m
	Pan16	Pan	Opencast mine
	Pan06	Pan	Discard dump
	Pan07	Pan	Discard dump
	Pan08	Pan	Discard dump
Resettlement village	HGM1	Hillslope seepage	Underground mine within 500 m
	HGM2	Isolated hillslope seep	Underground mine within 500 m
	HGM3	Depression	Underground mine within 500 m

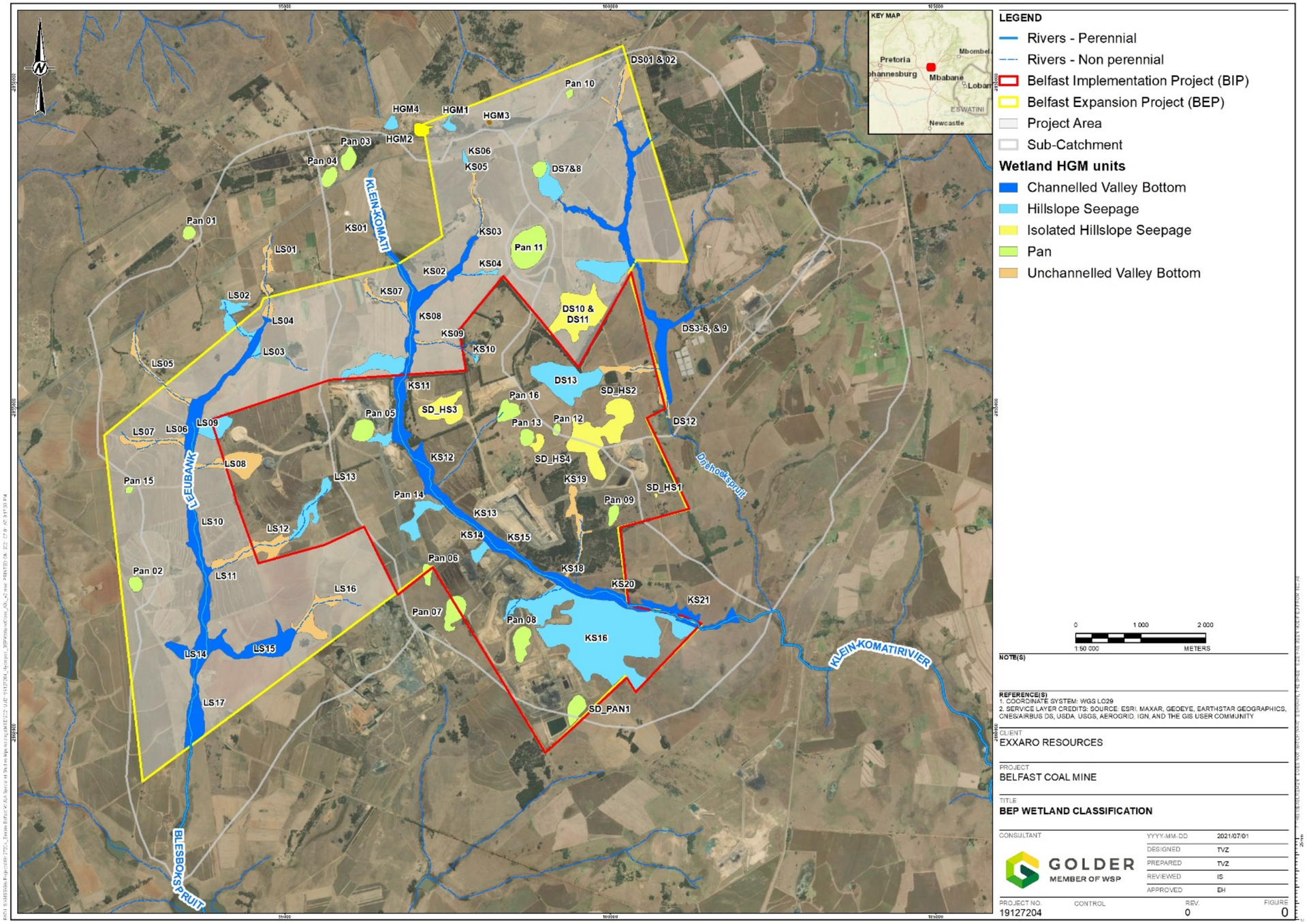

Figure 4: Wetland classification (HGM units) within Belfast MRA

5.2 Present Ecological Status

The wetlands within the Study Area exist in a landscape that is highly transformed. The majority of the wetland's catchments have been modified through intensive agricultural cultivation practises, and more recently, some have been affected by opencast mining in the BIP project area.

The bulk of the wetlands within the Study Area are in a Moderately Modified (PES C) to Largely Modified (PES D) condition, with just three pans considered to be in Good (PES B) to Pristine (PES A/B) condition (Table 7). The distribution of the wetlands in the Study Area, in relation to their PES score, is shown in Figure 5.

The degradation of wetland habitat that has occurred in these systems is mostly associated with the intensive cultivation practises in the catchments of the wetlands and in some instances in the wetlands themselves, large impoundments as a result of farm dams and less intense impoundments as a result of farm access tracks, drainage gullies and subsequent erosion, plantations of eucalyptus and wattle, and in-wetland infestations by alien and invasive weed species.

The relatively steep valley-side gradient of parts of the study area make the hillslope seep and unchannelled valley bottom wetlands susceptible to erosion, especially where those wetlands are also subject to grazing by livestock, partially dammed, or traversed by dirt tracks. These factors lead to the formation of preferential flow paths, resulting in desiccation of adjacent wetland habitat.

Table 7: PES scores and categories, 2021

Wetland HGM Unit	Area	PES Score	PES Category
DS Main, upstream of DS09 (including 03-06, and 09)	59.24	3.3	C
DS3-6, & 9 - HS	18.84	2.95	C
DS07	12.0	3.7	C
DS08	4.39	3.0	C
DS10, DS11	41.7	3.3	C
DS12	15.11	4.4	D
KS02 (Main)	16.02	4.6	D
KS03 (Main)	7.72	3.8	C
KS04	2.61	5.4	D
KS05	4.66	2.8	C
KS06	2.25	3.9	C
KS07	6.39	5.3	D
KS08	8.82	4.5	D
KS09	2.77	4.6	D
KS10	0.95	3.2	C
KS11	19.32	3.6	C
KS15	8.76	2.95	C
LS02	10.67	3.2	C
LS03	2.11	3.1	C
LS09	18.84	2.95	C

Wetland HGM Unit	Area	PES Score	PES Category
LS04 (Main)	24.36	4.1	D
Pan11	27.79	1.45	B
Pan12	1.87	1.45	B
Pan13	4.76	2.95	C
Pan16	8.59	4.95	D
Pan06	3.86	2.95	C
Pan07	12.51	0.95	A/B
Pan08	11.04	2.95	C
HGM1	2.72	5.5	D
HGM2	4.4	4.3	D
HGM3	0.4	2.2	C

5.3 Ecological Importance and Sensitivity

The EIS of the wetlands in the Study Area varies widely (Table 8), largely as a function of their size and ecological integrity, which affects their capacity to deliver biodiversity and water-related ecosystem services, and subsequently the ability of people to benefit from those services. The distribution of the wetlands in the Study Area, in relation to their EIS score, is shown in Figure 6.

The channelled valley bottom wetlands associated with the main channels of the three riparian systems are of moderate to high importance and sensitivity, largely due to their hydro-functional importance which relates to the role they play in flood attenuation, sediment trapping, and nitrate, phosphate and toxicant assimilation from their adjoining cultivated catchment areas.

The hillslope seeps and unchanneled valley bottoms that form tributaries to the main systems are generally of low/marginal to moderate importance and sensitivity, which is typically a function of their small size, and the extent to which they have been dammed or subjected to crop encroachment, which limits their capacity to supply ecosystem services.

With the exception of the pan at DS08, which has been partially dammed, and Pan 16, which has been impacted by cultivation, all other pans within the study area are of high or very high ecological importance or sensitivity – primarily as a result of their role in delivery of biodiversity-related ecosystem services, that is, support of threatened plant species or populations of unique species, migration/feeding/breeding sites for fauna, and the regional context of their ecological integrity given the extent of loss/modification of pan systems in the region.

Table 8: EIS scores and categories, 2021

Wetland HGM Unit	Wetland type	Area (ha)	EIS Score	EIS Category
DS Main, upstream of DS09 (including 03-06, and 09)	Channelled valley bottom	59.24	2	High
DS3-6, & 9	Hillslope seepage	18.84	1	Low/marginal
DS07	Hillslope seepage	12	1.6	Moderate
DS08	Pan	4.39	1.9	Moderate
DS10, DS11	Isolated hillslope seepage	41.7	1	Low/marginal

Wetland HGM Unit	Wetland type	Area (ha)	EIS Score	EIS Category
DS12	Hillslope seepage	15.11	2	Moderate
KS02 (Main)	Channelled valley bottom	16.02	1.9	Moderate
KS03 (Main)	Channelled valley bottom	7.72	1.9	Moderate
KS04	Hillslope seepage	2.61	1	Low/marginal
KS05	Unchannelled valley-bottom	4.66	1.9	Moderate
KS06	Hillslope seepage	2.25	1	Low/marginal
KS07	Unchannelled valley-bottom	6.39	1	Low/marginal
KS08	Channelled valley bottom	8.82	1.8	Moderate
KS09	Unchannelled valley-bottom	2.77	1	Low/marginal
KS10	Hillslope seepage	0.95	1.2	Low/marginal
KS11	Hillslope seepage	19.32	0.9	Low/marginal
KS15 (Main)	Channelled valley bottom	8.76	2	High
LS02	Hillslope seepage	10.67	1	Low/marginal
LS03	Hillslope seepage	2.11	1.4	Moderate
LS04 (Main)	Channelled valley bottom	24.36	1.8	Moderate
LS09	Hillslope seep	18.84	1	Low/marginal
Pan11	Pan	27.79	2	High
Pan12	Pan	1.87	2	High
Pan13	Pan	4.76	3	Very high
Pan16	Pan	8.59	1	Low/marginal
Pan06	Pan	3.86	2	High
Pan07	Pan	12.51	3	Very high
Pan08	Pan	11.04	3	Very high
HGM1	Hillslope seepage	2.72	1.4	Low/marginal
HGM2	Isolated hillslope seep	4.4	1.4	Low/marginal
HGM3	Depression	0.4	1.2	Low/marginal

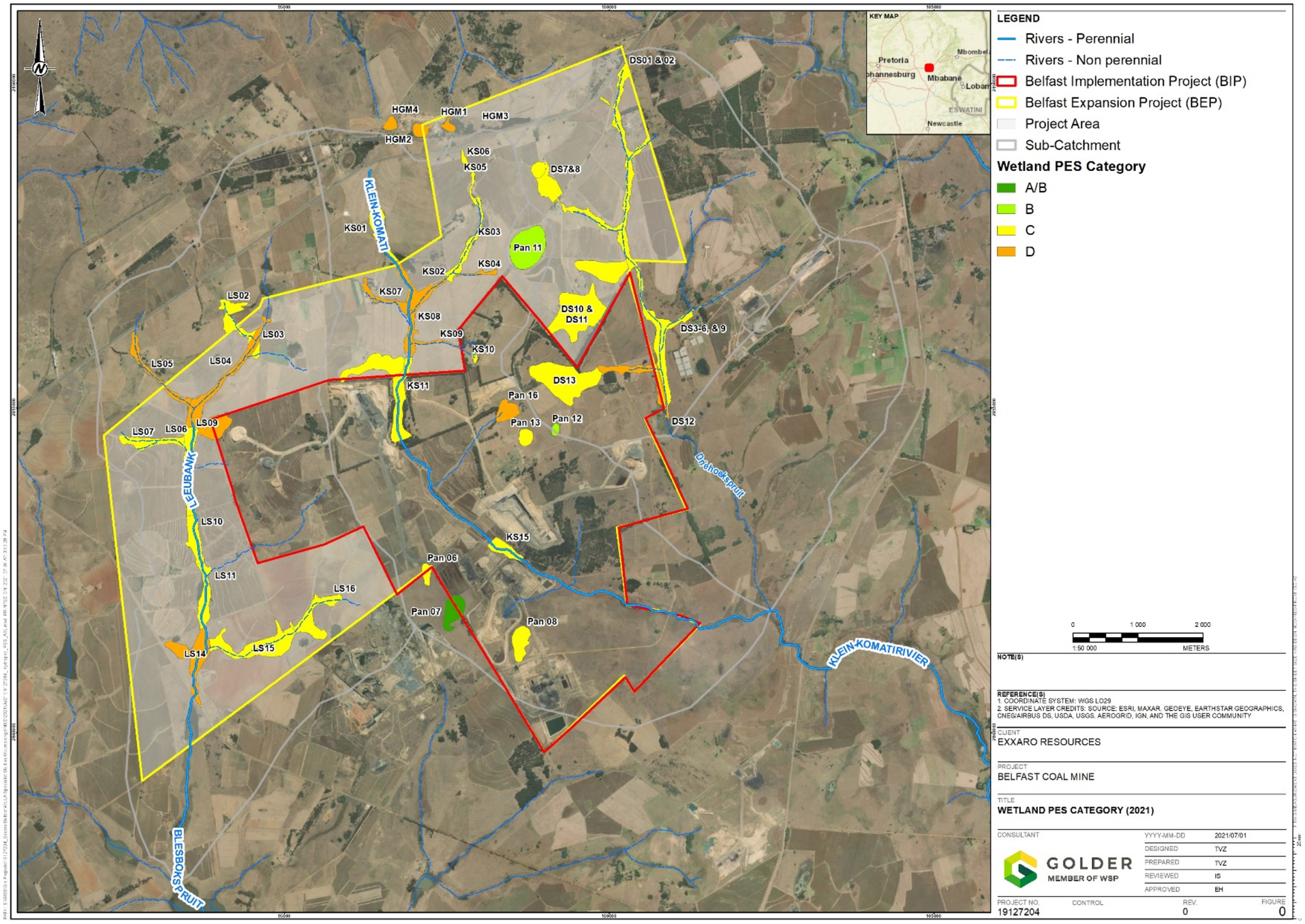

Figure 5: Wetland Present Ecological Status (PES)

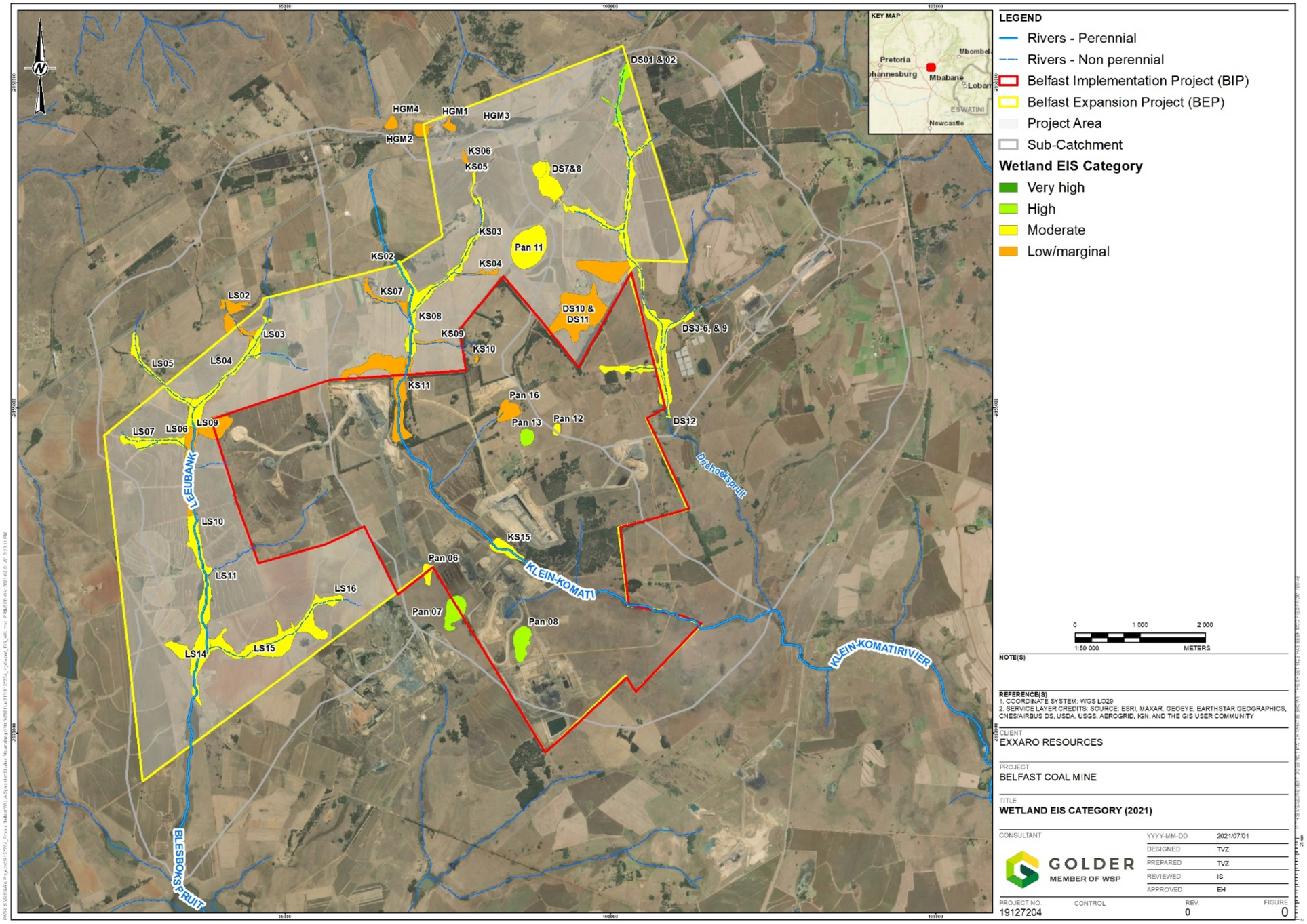

Figure 6: Wetland Ecological Importance and Sensitivity (EIS)

6.0 IMPACT ASSESSMENT

Construction and operation of the BEP infrastructure will result in the direct loss of wetland habitat due to vegetation and topsoil removal, followed by opencast mining. Indirect effects on adjacent wetland habitat include interruption in hydrology to systems downstream of opencast mining areas, effects on water quality in affected systems, and erosion. Underground mining and construction/operation of the decline shaft also has the potential to reduce the groundwater supply to wetland systems.

Since construction and operation of the mine will take place according to a rolling schedule throughout its lifetime, impacts on wetlands are discussed according to the specific impact in question, and reference to the impact's occurrence in the context of the relevant phase (construction or operation) plan is made in the text.

6.1 Loss of wetland habitat

6.1.1 BEP Opencast

Construction and operation of the BEP opencast area will result in the direct loss of approximately 31.38 ha of wetland habitat (Table 9), and disturbance of adjacent wetland habitats by construction activities and machinery.

Table 9: Direct wetland loss as a result of the Belfast Expansion Project opencast pits

Wetland HGM Unit	Total area	Wetland type	PES Score	PES	Area of loss (ha)	Loss (Ha-eq)
Pan 16	8.59	Pan	4.95	D	8.60	4.34
KS10	0.95	Hillslope seepage	3.2	C	0.95	0.65
KS09	2.77	Unchannelled valley bottom	4.6	D	1.16	0.63
DS10, DS11	41.7	Isolated hillslope seep	3.3	C	22.00	14.74
DS13	40.62	Hillslope seepage	2.95	D	0.02	0.01
KS07	6.39	Unchannelled valley bottom	5.3	D	4.70	2.21
KS11	19.32	Hillslope seepage	3.6	C	13.74	8.80
		Total			**51.17**	**31.38**

The significance of the direct loss of wetland habitat and disturbance of adjacent wetland habitats is **high** prior to mitigation, as although local in extent, the duration of the impact is permanent, and outright loss cannot be mitigated.

It is therefore recommended that the direct loss of wetlands be avoided or minimised, in so far as is possible, to reduce the resultant offset obligation. It is also noted that the BEP mining area was identified as a potential off-site offset target area for the existing BIP project, which is required to secure an additional 38.85 ha-eq of wetland functional area (WCS, 2014).

Assuming that the wetlands cannot be avoided within the confines of the mining plan, the loss will remain as an impact of **high** significance post-mitigation. Additional measures will be required to address significant residual impacts i.e. compensate or offset the permanent loss of wetland habitat (Golder, 2021a), and will also need to take into account the residual offsite offset requirement for the BIP project (38.85 ha-eq), amounting to a total required area of 31.38 ha-eq.

6.1.2 Conveyor Alternatives

Four alternative options for the proposed conveyor are currently being considered (Figure 7).

Construction and operation of the conveyor will result in the direct loss of between 0.39 and 1.02 ha of wetland habitat (Table 9) depending on the selected option, and disturbance of adjacent wetland habitats by construction activities and machinery.

Table 10: Direct wetland loss as a result of the Belfast Expansion Project opencast / conveyors

Conveyor Option	Wetland HGM Unit	Wetland type	PES Score	PES	Area of loss (ha)	Ha eq	Total loss	Total ha-eq loss
Conveyor A	KS18	Channelled valley bottom	2.95	C	0.29	0.20	0.83	**0.62**
	SD_HS2	Isolated hillslope seep	2.2	C	0.54	0.42		
Conveyor B	KS16	Hillslope seepage	4.4	D	0.23	0.13	1.02	**0.73**
	KS18	Channelled valley bottom	2.95	C	0.21	0.15		
	SD_HS2	Isolated hillslope seep	2.2	C	0.58	0.45		
Conveyor C	KS18	Channelled valley bottom	2.95	C	0.24	0.17	0.79	**0.60**
	SD_HS2	Isolated hillslope seep	2.2	C	0.55	0.43		
Conveyor D	KS15	Channelled valley bottom	2.95	C	0.39	0.28	0.39	**0.28**

As is the case for direct loss to the opencast pit, additional measures will be required to address significant residual impacts i.e. compensate or offset the permanent loss of wetland habitat. As such, conveyor D is a preferred option from a wetland perspective.

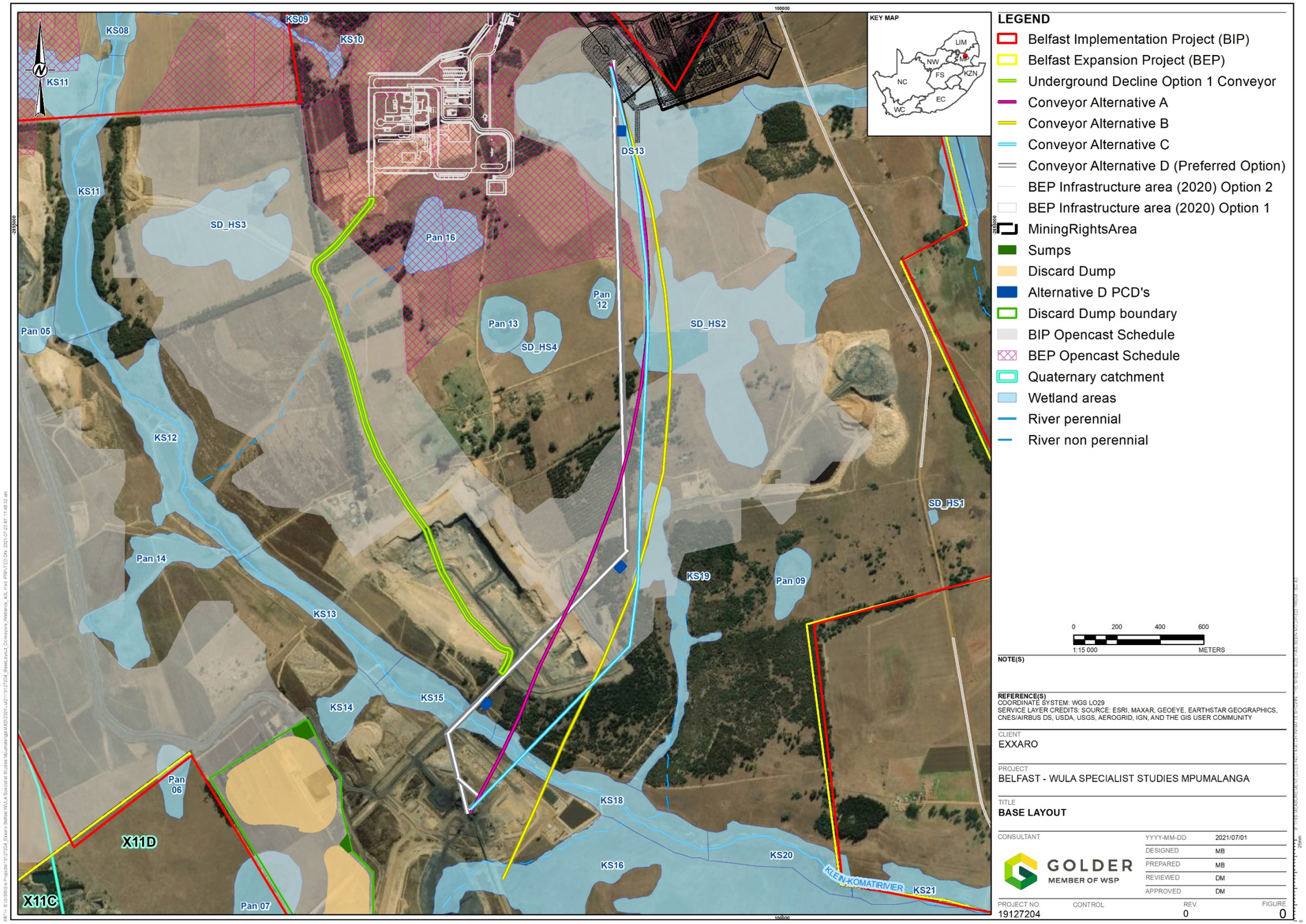

Figure 7: Conveyor options

6.2 Indirect loss of wetland habitat

6.2.1 Wetlands downstream of opencast

The remaining wetland systems downstream of those being mostly/partially lost as a result of proposed opencast mining activities will suffer a loss in water supply form recharge/interflow soils (Table 11), which is anticipated to have a negative effect on their ecological integrity (PES score) (Golder, 2021b). Using the broad assumption that the PES scores of those remnant wetlands would drop by one PES category, the predicted ha-eq of the remaining wetlands is 40.85. Since the currently remaining area has a ha-eq value of 47.06, an estimated additional 6.21 ha-eq (47.06 – 40.85) of wetland functional loss could occur due to the interruption of hydrology/hydropedology as a result of opencast mining upslope.

Table 11: Indirect wetland losses as a result of opencast mining in catchment of affected wetlands

Wetland HGM Unit	Total area	Wetland type	PES Score	Remaining area	Remaining area ha-eq	Predicted PES score	Predicted ha-eq
KS09	2.77	Unchannelled valley bottom	4.6	1.61	0.87	6	0.644
DS10, DS11	41.7	Isolated hillslope seep	3.3	19.7	13.20	4	11.82
DS13	40.62	Hillslope seepage	2.95	40.6	28.62	4	24.36
KS07	6.39	Unchannelled valley bottom	5.3	1.69	0.79	6	0.676
KS11	19.32	Hillslope seepage	3.6	5.58	3.57	4	3.348
					47.06		**40.85**

The potential significance of such impacts on the affected wetlands is determined to be **high**, as effects would be permanent, local in extent and could affect a larger area of wetland downstream of the opencast area. Provided that the recommended mitigation measures (specifically supplementation of the remnant wetland areas with treated mine water pumped from the opencast pit) are implemented on a phased basis once mining commences - the impact magnitude can be reduced, resulting in a residual impact of **moderate** significance post-mitigation. This notwithstanding, additional measures to mitigate the indirect loss of wetland function as a result of reduced wetland integrity due to water losses may be required, and will be incorporated in the wetland mitigation and management strategy (Golder, 2021a).

6.2.2 Underground mining

The construction and operation of the decline shaft (and presumed requirement for ongoing dewatering) could create a cone of depression in groundwater systems that could reduce the supply of water to nearby wetland systems. However, the potential for additional impacts on wetlands as a result of this potential effect is considered limited, since the decline shaft will be constructed within the opencast pit, once that has been mined out.

The proposed BEP underground schedule will directly undermine Pan 11, KS 05 and KS 06, and parts of the western extent of Pan DS07, and DS08. Other systems in close proximity to the undermining footprint include HGM1, HGM2 and HGM3 at the resettlement village, as well as the hillslope seep DS 3-6 & 9.

Dewatering associated with underground mining is predicted to result in reduction in streamflow in the below-listed systems (Golder, 2021d):

- Klein-komati upper eastern tributary (KS06 to KS03), with knock-on effects on Klein-komati main system;
- KS04 hillslope seep, with knock-on effects on the Klein-komati main system; and
- DS7 hillslope seep and downstream tributary (DS3-6 hillslope seep) of the Driehoekspruit main system.

The cone of depression due to mining changes over time based on the mining schedule. At the end of mining (2042) the cone of depression is at its largest and include the underground mining area. The groundwater model (Golder, 2021d) indicates that the drawdown extends to the shallow aquifer, which is expected for the opencast mining areas, but limited information is available on the impact from underground mining. The numerical model assumes direct linkages between the two aquifers, and therefore the drawdown in the underground mining area should be viewed as a worst-case scenario. The predicted effect of drawdown on wetlands associated with underground mining is shown on Figure 8.

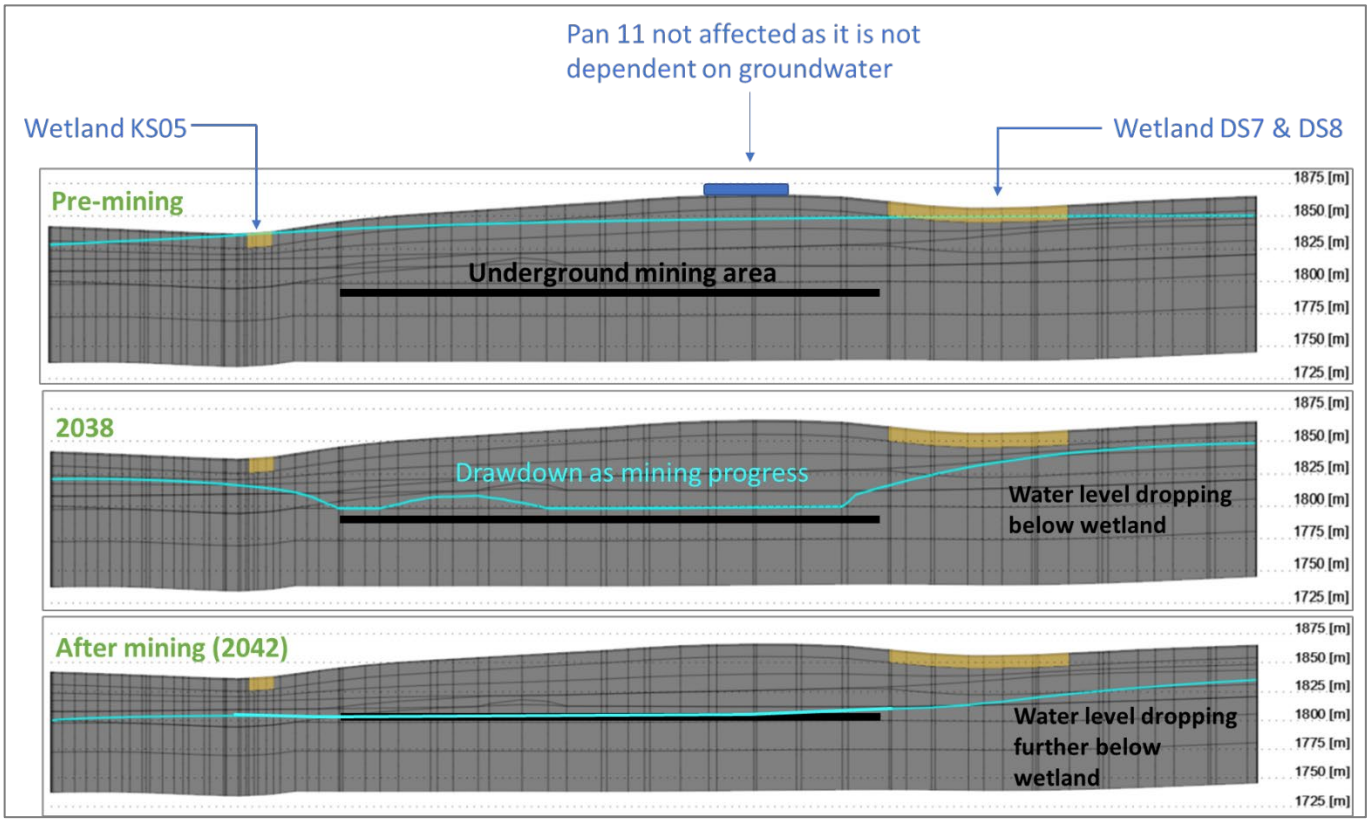

Figure 8: Section through underground mining area

This indicates that in the worst-case scenario, drawdown from the underground mining combined could potentially affect water levels in Pan DS08; however, Pan 11 will not be affected since it is not dependent on groundwater. in real terms the effect of drawdown on these systems is expected to be minimal due to the separation between the upper and lower aquifers, and the accumulation of sediments (in Pan 11 in particular).

The reduction in streamflow effects on wetlands DS07 and DS08 are therefore likely to result in additional indirect loss of wetland habitat. At present, the magnitude of that impact cannot be quantified. Prior to commencement of underground mining, a detailed baseline dataset on water levels, stream flows, and rainfall in the affected wetlands must be gathered, against which the predicted water losses can be quantified and the exact nature of the impact determined. This will then inform the requirement for supplementation of the systems in which water losses will be experienced with treated mine water to offset the loss.

The potential significance of such impacts on the affected wetlands is determined to be **high**, as the magnitude is currently unknown, effects would be long-term, lasting for the duration of the LOM, local in extent and could affect a larger area of wetland downstream of the underground mining area. Provided that the recommended mitigation measures (specifically supplementation of the remnant wetland areas with treated mine water pumped from the opencast pit) are implemented on a phased basis once mining commences - the impact magnitude can be reduced, resulting in a residual impact of **moderate** significance post-mitigation.

This notwithstanding, additional measures to mitigate the indirect loss of wetland function as a result of reduced wetland integrity due to water losses will likely be required. The intensity of the required measures will only become apparent once the losses are quantified, and as such these will need to be incorporated in future revisions of the currently proposed wetland mitigation and management strategy (Golder, 2021a).

6.3 Interruption of wetland hydrology/hydropedology

The excavation of foundations for the conveyor/haul road and subsequent presence of that infrastructure for the duration of operation will also interrupt surface and/or subsurface flows in wetlands being crossed, potentially leading to flow concentration (downstream of the crossings), changes in flow pathways, flow impoundment (upstream of the crossings), increased surface water runoff and increased risk of erosion within the wetland via gullies.

The potential significance of such impacts on the affected wetlands is determined to be **high**, as effects would be permanent, local in extent and could affect a larger area of wetland downstream of the opencast area, the decline shaft and the conveyor/haul road, resulting in a High magnitude score. Provided that the mitigation measures are implemented prior to commencement of construction and are maintained for the operational lifetime of the Project, the extent of impact and impact magnitude can be reduced, resulting in a residual impact of **moderate** significance post-mitigation.

Additional measures to mitigate the indirect loss of wetland function as a result of reduced wetland integrity due to water losses will be required, and will be incorporated in the wetland mitigation and management strategy (Golder, 2021a).

6.4 Wetland water quality deterioration

6.4.1 Construction Phase

During construction, the water quality in the wetland may deteriorate as a consequence of vegetation removal and increased risk of eroded soils and sediments being transported after rainfall events. Contaminants from machinery and materials being used for opening of the box cut and construction of the decline shaft and conveyor/haul road could enter the wetland and contribute to water quality changes.

Potential impacts on water quality in the wetlands have a **moderate** impact score without mitigation, as the effects will last for the duration of the construction which will roll out on a phased basis over the LOM and as such will be long-term, would occur on a local scale and result in a moderate magnitude of deterioration as a result of entry of coal and other contaminants to the wetlands and subsequently the downstream water courses. The implementation of the recommended mitigation measures is required to avoid and minimise adverse impacts on water quality of wetlands and associated downstream riparian systems. Provided that the mitigation measures are implemented, the extent of potential impacts can be reduced to a site-only scale; the duration of impacts can be reduced to the length of construction activities, and the probability of the impact ever occurring can be reduced to **low**. In this scenario, a post-mitigation impact of low significance is predicted.

6.4.2 Operation Phase

During operation, materials handling and transport activities such as loading, hauling, and placement of topsoil and overburden and coal may cause the entry of sediment-loaded and otherwise contaminated stormwater runoff from the operational area surfaces to the wetlands that lie adjacent to the opencast mine and/or the decline shaft, as well as those wetlands that will be crossed or intercepted by the conveyor/haul road. The discard dump extension has the potential to contaminate shallow groundwater and decant to rivers (Golder, 2021d), and this seepage from the discard dump to the adjoining pan habitats could thus compromise the integrity of the remnant wetland area and impact their ability to support flora species of concern.

Potential impacts on water quality in the wetlands have a **moderate** impact score without mitigation, as the effects may be long-term, would occur on a local scale and result in a high magnitude of deterioration as a result of entry of coal and other contaminants to the wetlands and subsequently the downstream water courses. The implementation of the recommended mitigation measures is required to avoid and minimise adverse impacts on water quality of wetlands and associated downstream riparian systems. Provided that the mitigation measures are implemented, the extent of potential impacts can be reduced to a site-only scale; the duration of impacts can be reduced to the length of operation activities, and the probability of the impact occurring can be reduced to **low**. In this scenario, a post-mitigation impact of low significance is predicted.

6.5 Wetland erosion

Erosion of wetland soils could occur as a result of vegetation and topsoil removal during construction, which could result in additional loss of the remaining wetland habitat, particularly the remaining areas of wetlands that will be partially or mostly removed, as well as wetlands being intercepted by the conveyor/haul road. Vegetation clearance and removal will lead to reduced surface roughness within the remaining wetlands which could further exacerbate soil erosion.

Erosion of wetland soils will lead to habitat deterioration and changes in the natural wetland hydrology. These effects may be expressed as flow concentrations, lowering of the water table and possible desiccation in hillslope seepage and valley bottom wetlands. In affected pan systems, erosion of wetland soils could lead to the development of channels in the pan basin as a result of flow concentrations, with associated increased transport of sediment to the pan floor.

The impact on soil erosion has a **moderate** impact significance before mitigation. With the application of the recommended mitigation measures, the magnitude of change in wetland health as a result of erosion can be reduced to minor, effects can be restricted to the site only, and the duration of effects will be in the medium term, lasting for the duration of construction and operation. The overall impact post-mitigation is predicted to be one of **low** significance.

6.6 Loss of wetland biodiversity

The construction of the BEP opencast mine will lead to a direct loss of wetland habitat and vegetation communities within the footprint and disturbance of adjacent communities, which is likely to affect flora and fauna species relying on these habitats, as well as cause fragmentation of their habitats.

The wetlands that will be traversed by the proposed conveyor/haul route are *moderately* to *largely* modified, with only the main Klein-komati channel considered to be of high Ecological Importance and Sensitivity due to its hydrofunctional importance in the landscape.

The discard dump extension on the authorised BIP opencast pit will not result in additional wetland loss; however, uncontrolled stormwater runoff, or seepage of contaminated water from the dump, has the potential to affect Pan 06 and Pan 07, which lie adjacent to the proposed discard dump, and both of which will be partially lost to the existing authorised BIP opencast pit. Pan 07 is known to support populations of *Khadia carolinensis*, which is considered to be of conservation concern (Golder, 2021e). The EIS of Pan 06, which also lies adjacent to the proposed discard dump, is also considered high on the basis of its role in biodiversity support.

The potential significance of the loss of biodiversity is assessed as being **moderate** prior to mitigation, since partial loss of , with effects being permanent and occurring on a local scale to the Project. The implementation of the recommended mitigation measures, in particular, the implementation of a wetland mitigation and management strategy to address wetland loss, reduces the magnitude of the impact and the extent of potential impacts to the site only, resulting in a residual impact of **low** significance post-mitigation.

Table 12: Wetland Impact Assessment table

Anticipated impact	Pre-mitigation					Post-mitigation				
	Magnitude	Duration	Geographic Extent	Probability	Significance	Magnitude	Duration	Geographic Extent	Probability	Significance
Direct loss of wetland habitat.	10	5	2	5	High 85	10	5	2	5	High 85
Indirect loss of wetland habitat due to water losses sustained as a result of opencast mining upslope	8	5	2	5	High 75	6	5	2	4	Moderate 52
Indirect loss of wetland habitat due to undermining	10	5	2	5	High 85	6	5	2	3	Moderate 39
Interruption of wetland hydrology/hydropedology as a result of excavations of conveyor foundations during construction	6	2	1	5	Moderate 45	4	2	1	3	Low 21
Wetland water quality deterioration as a result of construction activities.	6	2	2	4	Moderate 40	6	2	1	2	Low 18
Wetland water quality deterioration as a result of operation activities activities.	8	4	2	5	High 70	6	4	1	4	Moderate 44
Vegetation clearance and removal will lead to reduced surface roughness within the remaining wetlands which could further exacerbate soil erosion and lead to habitat deterioration and changes in natural wetland hydrology.	8	4	2	4	Moderate 56	6	3	1		Low 20
Direct loss of wetland habitat and vegetation communities within the BEP footprint and disturbance of adjacent communities due to construction and operation of the BEP mine.	6	5	2	3	Moderate 39	4	4	1	3	Low 27

7.0 RECOMMENDED MITIGATION MEASURES

The mitigation measures for the proposed BEP are summarised in the sections that follow.

7.1 Areas to be avoided (including buffers)

- Vegetation and soil clearing should be restricted to the immediate construction footprint only. A 100 m buffer around wetlands must be clearly demarcated with semi-permanent fencing and maintained throughout the lifetime of the project to enable construction and operation workers to avoid the wetland areas outside the construction footprint, and minimise the risk of disturbance impacts on wetland ecosystems arising from construction activities as well as the physical presence of Project infrastructure (other than road or other infrastructure crossings) in the catchments.
- Avoid the placement of stockpiles and supporting mine infrastructure on wetlands.

7.2 Measures to minimise identified impacts

- The conveyor and haul road route should be selected to use the existing crossing of the Klein-komati to minimise additional wetland loss.
- All construction roads and supporting infrastructure in or adjacent to the wetland habitat shall be minimised, and shall be aligned and managed to ensure uninterrupted flow both upstream and downstream of infrastructure which crosses the wetness zones and/or in-stream habitats.
- Construction should be done in the dry season and completed by the wet season, so that appropriate water management systems are in place for stormwater management.
- Pollution prevention measures for the protection of wetlands, rivers and streams from contamination with hydrocarbons, sediments and other chemicals to be implemented.
- Design and planning of all proposed activities in the wetlands or adjacent to or in the vicinity of rivers, streams and wetlands shall consider the following measures:
  - Erosion control and protection measures installed as part of the construction of the project will be adapted for the specific area and situation where signs of erosion appear.
  - Clean water intercepted and diverted around the actively mined areas, to be reintroduced into the adjacent and downstream wetlands which will be partially/mostly lost, to supplement the flow lost as a result of removal of upstream/upslope recharge/interflow soils. The supplementation of clean water to these systems must be engineered in a way that avoids erosion of the watercourse and which aids in dispersion across most of the width of the downstream wetlands and should form part of the overall wetland rehabilitation/offset strategy for the Study Area.
  - Soil compacted in non-operational areas during construction activities should be ripped to break up the compacted soil surface and re-vegetated to aid infiltration and decrease run-off.
  - Topsoil stockpiles to be re-vegetated with non-invasive vegetation, in order to stabilise the soil, reduce run-off and minimise erosion into adjacent and downstream wetlands.
- No protected plants to be disturbed without the necessary permits in place.

7.3 Rehabilitation/restoration recommendations

- Develop a wetland rehabilitation and management plan for the remaining wetlands in the Study Area;

- Rehabilitation of disturbed wetlands should be implemented as soon as construction is completed. For areas that have already been rehabilitated along the KS- system, regular inspection and maintenance should be implemented.
- Vegetation establishment of bare soils after construction should be done using indigenous grass species found naturally in the area, which should be detailed as part of the wetland rehabilitation and management plan.
- The re-vegetation programme shall take cognisance of the climatic and seasonal conditions but should generally be undertaken annually starting in spring and early summer.
- Develop an alien and invasive plant management program to pro-actively strive towards the eradication and control of alien invasive species within the mining right area. Alien and invasive species management in remaining wetland areas should be prioritised for the following areas:
  - Areas where wetland vegetation cover is disturbed.
  - Wetland areas where soils imported from external sources are applied.
  - All rehabilitated wetland areas.
  - 100 metres upstream and downstream of stream and wetland crossings along the conveyor/haul road route.

7.4 Additional measures required for significant residual impacts

Several significant residual impacts, associated with direct and indirect loss of wetland habitat, remain outstanding. The known losses are addressed in the currently proposed BEP Wetland Mitigation and Management Strategy; however, some of the losses will only become apparent following the development of a long-term monitoring strategy to measure streamflow reduction, pan water level effects, and determine the subsequent effects on wetland ecological integrity. As such the following additional measures are recommended:

- A detailed baseline dataset on pan water levels, stream flows, and rainfall in the affected wetlands must be gathered (effective immediately), against which the predicted water losses can be quantified once underground mining commences (planned in 2037) and the exact nature of the impact determined. This will then inform the requirement for supplementation of the systems in which water losses will be experienced with treated mine water to offset the loss.
- The proponent (in consultation with the Department of Water and Sanitation, Mpumalanga Parks and Tourism Agency, South African National Biodiversity Institute, Working for Wetlands, as relevant.) to update and revise the currently proposed wetland rehabilitation and offset plan which describes appropriate and feasible measures to address direct and indirect loss of wetland habitat as a result of mining activities, such as the establishment of a protection area to mitigate wetland impacts, and rehabilitation of remaining wetlands in the MRA. Revisions should take into account updated information on predicted wetland losses derived from the monitoring dataset mentioned in the preceding bullet point.

8.0 MONITORING REQUIREMENTS

The following monitoring tasks are recommended for the BEP Study Area to ensure the efficacy of the recommended mitigation measures and detect the necessity for additional measures as necessary.

- The current annual wetland monitoring programme (measuring PES and EIS of wetlands in the study area) that is in place for the Exxaro BIP opencast should be extended to include all of the wetlands in the upper catchment which will now be subjected to impacts from the proposed BEP.

- Additional monitoring points should be placed in wetlands will now be subjected to impacts from the proposed BEP to ensure that residual impacts are properly quantified and addressed accordingly.
- Water levels in Pan 11 and Pan DS07, and stream flows in the Klein-komati and Driehoekspruit tributaries that will be affected by streamflow reductions, must be monitored using permanent piezometers and reported annually. Reports for each year should present the cumulative results and identify any trends in flows/water levels, in order to develop a baseline against which losses as a result of underground mining can be measured.
- Regular inspection and maintenance of the wetland crossings at the conveyor and/or haul road to ensure that subsurface drains are in working order, and no confinement or impoundment of water is establishing.
- The efficiency of erosion control and protection measures installed as part of the construction of the project will be monitored specifically after high rainfall events.

9.0 CUMULATIVE IMPACTS

The loss and fragmentation of the wetland ecosystems within the BEP study area will add to cumulative impacts on these ecosystems in the landscape in combination with the currently operating BIP opencast mine; reducing their extent, degradation of their condition, and subsequently limiting their ability to deliver ecosystem services. The direct losses of wetlands cannot be mitigated outright, and as such the BEP will contribute to the cumulative rate of loss of wetlands and particularly pan habitats in the Mpumalanga Highveld ecoregion.

The effective implementation of the recommended mitigation measures, and in particular, the continual wetland monitoring and commitment to update the existing wetland offset strategy (WCS, 2014) to address the additional direct and indirect wetland losses that will be incurred as a result of the BEP development, will be key in ensuring that the Project's contribution to cumulative effects on wetlands are minimised, through protecting and conserving currently unprotected wetland habitat in off-site offsets as necessary, and rehabilitating remaining wetlands within the MRA to improve their condition and thus enhance their level of functioning and supply of ecosystem services in the landscape.

10.0 CONCLUSION

The proposed BEP project is located within the existing Exxaro MRA and is proposed to be an extension to the existing Belfast Implementation Project. Exxaro MRA is dominated by undeveloped agricultural land and semi-natural and natural grassland. The proposed BEP covers an area of approximately 5 819 ha and includes the development of an opencast mine, decline shaft and its associated infrastructure, construction of a conveyor/haul road and the establishment of a discard dump at Pan 07. These activities are located adjacent to a number of wetlands in the study area. The majority of these wetlands are in a moderately modified present ecological state, which infers that there has been a moderate change in ecosystem processes and loss of natural habitat has taken place, but natural habitat remains predominately intact. Similarly, most wetlands have a moderate Ecological Importance and Sensitivity, in the context of the surrounding cultivated landscape.

The key Project impacts with respect to the proposed mining activity are direct loss of wetland habitat, and degradation of remaining wetland habitat primarily as a result of interruption in hydrological and hydropedological systems supporting those remaining wetlands. Significant (moderate-high) residual impacts remain on wetland ecosystems as a result of the direct loss of wetland habitat to the opencast mining footprint and infrastructure, as the outright loss of these habitats cannot be mitigated (i.e., avoided, minimised, rehabilitated). The implementation of a wetland rehabilitation and management plan for the Project to give effect to the proposed wetland offset strategy that Golder has developed for Exxaro (see Golder, 2021a) will therefore be necessary to address significant residual impacts and ensure that any areas specifically set aside

for biodiversity conservation (including on-site wetland offsets, and any off-site mitigation / offset areas) are protected and managed accordingly.

10.1 Conditions for inclusion in the environmental authorisation

The following conditions for inclusion in the environmental authorisation are recommended:

- The current annual wetland monitoring programme (measuring PES and EIS of wetlands in the study area) that is in place for the Exxaro BIP opencast should be extended to include all of the wetlands in the upper catchment which will now be subjected to impacts from the proposed BEP.
- Additional monitoring points should be placed in wetlands will now be subjected to impacts from the proposed BEP to ensure that residual impacts are properly quantified and addressed accordingly.
- Water levels in Pan 11 and Pan DS07, and stream flows in the Klein-komati and Driehoekspruit tributaries that will be affected by streamflow reductions, must be monitored using permanent piezometers and reported annually. Reports for each year should present the cumulative results and identify any trends in flows/water levels, in order to develop a baseline against which losses as a result of underground mining can be measured.
- Revise the existing wetland rehabilitation and management strategy for wetlands within the entire Belfast MRA as new information on losses becomes apparent based on the monitoring data gathered prior to commencement of underground mining and develop additional comprehensive on-site and off-site offset measures as required, addressing ways in which additional wetland loss can be compensated.

11.0 REFERENCES

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APPENDIX A

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