Tronox KZN Sands (Pty) Ltd

INTEGRATED ENVIRONMENTAL AUTHORISATION FOR THE PORT DURNFORD MINE, KWAZULU-NATAL

Wetland Baseline and Impact Assessment

OUR REF. 41106008-REP-00008
MARCH 2025

PUBLIC

Tronox KZN Sands (Pty) Ltd

INTEGRATED ENVIRONMENTAL AUTHORISATION FOR THE PORT DURNFORD MINE, KWAZULU-NATAL

Wetland Baseline and Impact Assessment

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 41106008

OUR REF. NO. OUR REF. 41106008-REP-00008

DATE: MARCH 2025

WSP

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

Phone: +27 11 254 4800

WSP.com

QUALITY CONTROL

Issue/revision	First issue
Remarks	
Date	March 2025
Prepared by	Bhavna Ramdhani
Signature	Digitally signed by Ramdhani, Bhavna (ZABR05615) Date: 26.03.2025
Checked by	Shavaughn Davis
Signature	Davis, Shavaughn (ZASD05655) 27.03.2025
Authorised by	Brent Baxter
Signature	
Project number	41106008
Report number	41106008-REP-00008

CONTENTS

EXECUTIVE SUMMARY

1. INTRODUCTION 1

1.1. PROJECT LOCATION AND EXTENT 1
1.2. PURPOSE OF THIS REPORT 2
1.3. SCOPE OF WORKS 3

2. PROJECT DESCRIPTION 3

2.1. PROJECT BACKGROUND 3
2.2. PROPOSED MINING INFRASTRUCTURE 4
2.3. PHASE 1 OF THE PROPOSED MINE 5
2.3.1. PHASE 1 LOCATION 5
2.3.2. PHASE 1 MINE PLAN AND PROCESS 7
2.3.3. PHASE 1 INFRASTRUCTURE 8
2.4. PHASE 2 OF THE PROPOSED MINE 11
2.4.1. LOCATION AND OVERVIEW 11
2.4.2. THE PHASE 2 MINING OPERATION 13
2.4.3. PHASE 2 MINERAL PROCESSING 17
2.4.4. SUPPORTING INFRASTRUCTURE 21
2.4.5. EMPLOYMENT 21
2.4.6. WASTE STREAMS 21
2.4.7. COARSE SAND TAILS DISPOSAL 22
2.4.8. TOPSOIL MANAGEMENT 23
2.4.9. FINE RESIDUE DEPOSITION 24
2.5. PROJECT ACTIVITIES FOR EACH PHASE OF THE PROJECT 29
2.6. END LAND USE AND TOPOGRAPHY 29

3. BACKGROUND TO THE WETLAND ASSESSMENT 30

3.1. WETLAND CHARACTERISTICS 30
3.2. IMPORTANCE OF WETLANDS 30
3.3. APPLICABLE SOUTH AFRICAN LEGISLATION, POLICY AND STANDARDS 31

4. ASSUMPTIONS AND LIMITATIONS 31

5. DETAILS AND DECLARATIONS OF THE SPECIALISTS 33

6. ENVIRONMENTAL SCREENING TOOL 35

7. METHODOLOGY 36

7.1. DESKTOP STUDY 36
7.2. FIELD VERIFICATION 36
7.3. WETLAND DELINEATION 36
7.4. WETLAND CONDITION AND VALUE 38
7.4.1. WETLAND PRESENT ECOLOGICAL STATE (PES) 38
7.4.2. ECOSYSTEM SERVICE PROVISION (ECOLOGICAL GOODS AND SERVICES) 39
7.4.3. WETLAND IMPORTANCE AND SENSITIVITY (IS) 40
7.5. WETLAND RISK ASSESSMENT 41
7.6. IMPACT ASSESSMENT 41

8. REGIONAL SETTING 43

8.1. CLIMATE 43
8.2. CATCHMENTS 43
8.3. STRATEGIC WATER SOURCE AREAS 43
8.4. SOILS 46
8.4.1. TERRESTRIAL SOILS 46
8.4.2. WETLAND SOILS 46
8.5. VEGETATION 47
8.6. CRITICAL BIODIVERSITY AREAS (CBA) 50
8.7. NATIONAL WETLAND MAP VERSION 5 53

9. SITE-BASED FINDINGS 55

9.1. WETLAND DELINEATION, CLASSIFICATION AND CHARACTERISTICS 55

9.2. WETLAND PRESENT ECOLOGICAL STATE (PES) 66

9.2.1. HYDROLOGICAL IMPACTS AFFECTING PES 66

9.2.2. GEOMORPHOLOGICAL IMPACTS AFFECTING PES 66

9.2.3. WATER QUALITY IMPACTS AFFECTING PES 66

9.2.4. VEGETATION IMPACTS AFFECTING PES 66

9.3. WETLAND FUNCTIONAL ASSESSMENT 69

9.4. WETLAND IMPORTANCE AND SENSITIVITY ASSESSMENT 69

9.5. RECOMMENDED ECOLOGICAL CATEGORY (REC) AND WATER RESOURCE MANAGEMENT OBJECTIVES 72

10. WETLAND IMPACT ASSESSMENT 75

10.1. CURRENT IMPACTS 75

10.2. PROJECT ACTIVITIES AND ASSOCIATED POTENTIAL IMPACTS 75

10.3. IMPACT MITIGATION AND MANAGEMENT HIERARCHY 77

10.4. PRE-CONSTRUCTION PHASE 78

10.4.1. BUFFER ZONES 78

10.5. CONSTRUCTION PHASE 79

10.5.1. ANTICIPATED IMPACT DESCRIPTION 79

10.5.2. MITIGATION AND MANAGEMENT RECOMMENDATIONS 80

10.6. OPERATIONAL PHASE 83

10.6.1. ANTICIPATED IMPACT DESCRIPTION 83

10.6.2. MITIGATION AND MANAGEMENT RECOMMENDATIONS 87

10.7. DECOMMISSIONING AND CLOSURE PHASE 100

10.7.1. ANTICIPATED IMPACT DESCRIPTION 100

10.7.2. MITIGATION AND MANAGEMENT RECOMMENDATIONS 100

10.8. CUMULATIVE IMPACTS 102

10.9. OFFSET OF SIGNIFICANT RESIDUAL IMPACTS TO WETLANDS 102

10.9.1. WHAT ARE BIODIVERSITY AND WETLAND OFFSETS? 102

10.9.2. PROJECT-RELATED DETERMINATION OF WETLAND OFFSET TARGETS 103
10.10. MONITORING RECOMMENDATIONS 106
11. CONCLUSION 109
11.1. REASONED OPINION WHETHER THE PROJECT SHOULD PROCEED 110
12. REFERENCES 111

TABLES

Table 2-1 - Sand Tails Deposition Schedule (Tronox, 2024) 22
Table 7-1 - Classification of plants according to occurrence in wetlands (DWAF, 2008) 37
Table 7-2 - Present Ecological Status (PES) score categories for describing the integrity of wetlands 38
Table 7-3 - Ecosystem services classes and descriptions (Kotze *et al*., 2020). 39
Table 7-4 - Ecological importance and sensitivity categories. 40
Table 7-5 – The impact assessment aspects and scoring system applied. 42
Table 7-6 - Description of Impact Assessment Scores 42
Table 8-1 - CBA Descriptions adapted from Escott et al., 2012 50
Table 9-1 - HGM unit types present within the study site (DWAF, 2008; Ollis et al., 2013) 55
Table 9-2 - Summary of Wetland characteristics for systems within the Mineral Rights Area (MRA) boundary. 56
Table 9-3 - The grouping of wetland units based on surrounding landscape 62
Table 9-4 - PES/EIS derived Matrix for the Determination of REC and Management Objectives for Water Resources. 72
Table 9-5 - REC and Management Objectives for the assessed wetlands 72
Table 10-1 - Recommended wetland buffer distances to be adopted for the proposed development 79
Table 10-2 – Wetland Impact Assessment: Construction Phase (Phase 1 and Phase 2) 82
Table 10-3 - Anticipated wetland loss (hectares) associated with the Port Dunford Mine. 83
Table 10-4 – Wetland Impact Assessment – Operational Stage (Phase 1). 92
Table 10-5 – Wetland Impact Assessment – Operational Stage (Phase 2). 95

Table 10-6 – Wetland Impact Assessment – Decommissioning and Closure Phase. 101
Table 10-7 - Summary of the wetland offset requirements – Wetland Functional Target. 104
Table 10-8 - Summary of the wetland offset requirements – Wetland Functional and Ecosystem Conservation Targets. 105
Table 10-9 - Summary of proposed nature, timing and frequency of wetland monitoring for the Port Dunford Mine. 107

FIGURES

Figure 1-1 - Location of the Port Durnford Mining Rights Application area 2
Figure 2-1 - Proposed Phase 1 infrastructure development for the Port Dunford study area 6
Figure 2-2 - 3D visualisation of the Phase 1 Layout 7
Figure 2-3: Phase 1 Process flow diagram 8
Figure 2-4 - Proposed Haulage Routes from Port Durnford to Fairbreeze. 10
Figure 2-5 - Proposed Phase 2 infrastructure development for the Port Dunford study area 12
Figure 2-6 - Proposed Phase 2 Life of Mine (LOM) Plan 14
Figure 2-7 - Proposed Phase 2 mining block plan showing 5-year mining windows 15
Figure 2-8: A typical dozer trap mining unit (DTMU) showing the trap on the LHS into which material is dozed and an associated pump unit on the RHS 17
Figure 2-9: Proposed Phase 2 PWP Layout 18
Figure 2-10: Proposed Phase 2 Summary Process Block Diagram 19
Figure 2-11 - PWP location and inset detail of the PWP site 20
Figure 2-12: Typical RSF Drainage Design Sections 25
Figure 2-13: RSF Site 9 General Arrangement Design indicating Impoundment walls and inundation Area 27
Figure 2-14: RSF Site C General Arrangement Design indicating impoundment walls and inundation area 28
Figure 2-15: Pre mining (LHS) and Post Mining (RHS) Topography 30
Figure 6-1 - Screening report highlighting very high sensitivity for the aquatic biodiversity theme 35

Figure 7-1 - Cross sectional diagram of a wetland, indicating how the soil moisture and vegetation indicators change as one moves along a gradient of decreasing wetness, from the middle to the edge of the wetland (Author, 2024). 37

Figure 7-2 - Wetland ecological goods and services assessed by the WET-EcoServices tool 39

Figure 8-1 - Strategic Water Source Area in relation to the Port Dunford study area and surrounds. 45

Figure 8-2 - The typical formation of a redoximorphic feature within the soil profile (adapted from Jackson et al, 2014) 47

Figure 8-3 - Vegetation types of the proposed Port Dunford study area and surrounds. 49

Figure 8-4 - Critical Biodiversity Areas (CBA) for the Port Dunford study area and surrounds. 52

Figure 8-5 - National Wetland Map 5 in relation to the Port Dunford study area and surrounds. 54

Figure 9-1 – Extent and classification of wetland HGM units identified within the proposed Port Dunford study area boundary and a 500m buffer thereof. 57

Figure 9-2 - Gully formation occurring within seepage wetland (A), Dominant vegetation consists of smaller sedges (B), Seepage wetland surrounded by *Eucalyptus* plantation. 58

Figure 9-3 - The main channel that runs through the central regions of the system (A), Dominant vegetation includes *Phragmites australis* (B) and *Typha capensis* (C) 59

Figure 9-4 - Swamp forest undergrowth (A), Soil profile extracted (B), Alien invasive vegetation infiltrating within swamp forest (C), Distinct organic rich soils (D) 60

Figure 9-5 - Approximate extent of delineated swamp forest habitat within the broader wetland HGM extent. 61

Figure 9-6- Wetland grouping based on surrounding landuse 64

Figure 9-7 - The proposed infrastructure at Port Dunford in relation to the wetland groups on site. 65

Figure 9-8 - PES of the wetlands within the proposed Port Dunford site. 68

Figure 9-9 – Importance and Sensitivity of the wetlands within the proposed Port Dunford study area 71

Figure 9-10 - The REC for the wetlands within the Port Dunford study area 74

Figure 10-1 - Diagram illustrating the ‘mitigation hierarchy’ (DEA et al., 2013) 78

Figure 10-2 - Wetland habitat loss within the Port Dunford Mine footprint 84

Figure 10-3 - RSF facility dam breach model, highlighting possible inundated regions 87

Figure 10-4 - Wetland HGM units proposed for inclusion in the wetland monitoring programme for Port Dunford Mine. 108

APPENDICES

APPENDIX A

WETLAND HYDROGEOMORPHIC UNITS

APPENDIX B

DETAILED WETLAND PES RESULTS

APPENDIX C

WET-ECOSERVICES RESULTS

APPENDIX D

WETLAND IMPORTANCE AND SENSITIVITY RESULTS

APPENDIX E

RESULTS OF THE WETLAND OFFSET CALCULATIONS

EXECUTIVE SUMMARY

WSP Group Africa (Pty) Ltd. was commissioned by Tronox KZN Sands (Pty) Ltd. to conduct a wetland baseline and impact assessment as part of the Environmental Authorisation (EA) process to obtain the mining rights to mine heavy mineral sands within the proposed Port Dunford study area. The proposed Port Dunford project site covers an extent of approximately 4682 Ha (taking into account excluded areas) and is situated in the KwaZulu-Natal province, approximately 16km southwest of Richards Bay.

The proposed infrastructure development includes construction of a Primary Wet Plant (PWP), water control dams, Residue Fine Tailings (RSF) facilities, demarcated Sand Tails mounds and topsoil stockpiles. Therefore, a specialist wetland assessment was required to identify the location and extent of wetlands within the study site; determine the functionality and health status of the wetlands and identify the impacts of the proposed activity on the surrounding wetlands.

The wetland delineation and baseline assessment were informed by both desktop and infield investigations. Extensive wetland habitat was found to occur within the Port Dunford project site, including both channelled valley bottom and hillslope seepage wetlands. Within areas of extended saturation within both wetland types, critically endangered swamp forest was identified. Wetland habitat was found to vary widely in terms of its current condition, ranging from largely natural to seriously modified. Land uses that have significantly influenced current wetland condition include sugarcane cultivation, *Eucalyptus* plantation forestry and urban developments. The wetlands provide a range of important ecosystem services including streamflow regulation, flood attenuation and biodiversity support. Given the presence of the swamp forest habitat and species of conservation concern (SCC) that it is likely to support, such as the Pickersgill's reed frog, the wetland habitats' role in biodiversity maintenance is elevated. The ecological importance and sensitivity of wetlands in the project area ranges from moderate to very high.

The proposed Port Dunford Mine facilities will have a series of potential impacts that need to be managed, particularly during the life of the mine. These mostly relate to the physical disturbance of the footprint of the mining operations and associated activities, such as *inter* alia vegetation removal, vehicle movements, excavations for pits, creation of facilities on site and earth moving activities. These activities are likely to have a negative impact on wetland habitat both directly within the footprint of the proposed development and downstream within affected catchments. Although impacts will be most severe and quantifiable within the Port Dunford boundary, certain impacts may translate to wetland habitat beyond the site boundary. Anticipated direct and indirect impacts include loss of wetland habitat (approximately 124 hectares) and wetland habitat degradation as a consequence of hydrological and geomorphological changes, water quality deterioration, and vegetation compositional changes. The impacts associated with the construction, operation, decommissioning and closure phases of the proposed project were rated predominantly moderate prior to implementation of mitigative measures. However, with the implementation of the recommended mitigative measures, the impacts were mostly reduced to moderate to low significance. The exception is the anticipated loss of wetland habitat within the mine infrastructure footprints. The loss of wetland habitat will occur even with implementation of the mitigation measures recommended in this report and represents a residual, negative wetland impact. Therefore,

application of the mitigation hierarchy indicates that significant residual, negative impact, such as the unavoidable loss of wetland habitat, requires an offset. It is therefore recommended that some form of wetland offset, or compensatory mitigation strategy be developed to address the residual wetland impact - the permanent loss of wetland habitat. The wetland offset developed must be aligned with the National Biodiversity Offset Guideline (GN3569, 2023, Issued under Stion 24J of the National Environmental Management Act), and the SANBI wetland offset guidelines (SANBI & DWS, 2016).

Contact name Bhavna Ramdhani

Email: Bhavna.Ramdhani@wsp.com

1. INTRODUCTION

WSP Group Africa (Pty) Ltd. was commissioned by Tronox KZN Sands (Pty) Ltd. (herein referred to as Tronox) to conduct a wetland impact assessment as part of the Environmental Authorisation (EA) process to obtain the mining rights to mine heavy mineral sands within the proposed Port Dunford study area. The proposed Port Dunford project site is situated in the KwaZulu-Natal province, approximately 16km southwest of Richards Bay.

Tronox currently operates the Fairbreeze mine where heavy mineral sands are mined south-west of Mtunzini in the greater Richards Bay area. This is supported by a Tronox Mineral Separation Plant (MSP) and Smelter (collectively known as the Central Processing Complex (CPC)) in the Empangeni area (see Figure 1-1). Tronox's previous mining operation, Hillendale is currently in the mine closure phase.

Tronox KZN Sands (Pty) Ltd (Tronox) is applying for a mining right for the following tenements:

- A renewed prospecting right (KZN 30/5/1/1/2/10708 PR) covering the following farms: Remainder of the farm Richards 16802, Remainder of the farm Birkett 16832 and Ruth 16833 (known as the Port Durnford lease area),
- Waterloo prospecting right (DMRE Ref: KZN30/5/1/1/2/296 PR) located on the following farms: Portion 1,2 and Rem of Lot 131 uMlalazi 14098; Rem of Lot 103 uMlalazi 13880 and Rem of Lot 104 uMlalazi 13853, and
- Penarrow located on the following farms: Remainder of Lot 132 uMlalazi 13602 and Portion 1 of Lot 132 uMlalazi 13602.

1.1. PROJECT LOCATION AND EXTENT

The study area is situated in the uMhlathuze Local Municipality that falls under the King Cetshwayo District Municipality. It is located approximately 16km south-west of Richards Bay and is adjacent to the following settlements/towns at different points along the boundary:

- Mtunzini- 200m South-West
- Port Dunford – 60m South-South-East
- Esikhawini – 200m South-East
- Gobandlovu – 200m North-East

The N2 highway as well as the R102 traverse the length of the orebody (Figure 1-1). The R102 being located to the northwest and the N2 running through the centre. There is also a railway line just south of the N2 that also traverses the mining right area. The proposed mining right area is approximately 4682 ha (taking into account excluded areas), however only 996 ha are earmarked for development for the initial phase of mining.

The project area includes the southern areas of Waterloo (KZN30/5/1/1/2/296 PR), as well as the Penarrow area (KZN30/5/1/1/2/279 PR) that has a lapsed prospecting right.

Mondi plc is currently leasing the majority of properties under the prospecting rights for commercial forestry purposes.

Figure 1-1 - Location of the Port Durnford Mining Rights Application area

1.2. PURPOSE OF THIS REPORT

All forms of development impact on the natural environment to some extent. In general, the rapid rate of urbanisation, for instance, has allowed for the progressive degradation and elimination of wetland ecosystems due to direct and indirect human induced activities. Therefore, in order to protect these pristine natural resources, responsibility falls to the relevant government authorities which enforce national legislation (e.g. NWA and NEMA). Such legislation generally calls for landowners to ensure the protection, utilisation, development, conservation and if necessary, the rehabilitation of such valuable ecosystems.

Tronox is currently planning on applying for a consolidated Mining Right for all of the above listed areas and seeking environmental authorisation (EA) to support this. A full Scoping and Environmental Impact Reporting (S&EIR) Process is required in support of the application for EA for the project. WSP has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the Scoping and EIR (S&EIR) Process.

WSP was requested to provide a specialist wetland assessment to identify the location of extent of potential wetlands within the consolidated Phase 1 & 2 Tronox Mining Right in Port Durnford. The wetland assessment will also determine the functionality of the systems, calculate the health status of "at risk" wetlands and identify the impacts of the proposed activity on the surrounding wetlands. This report, after taking into consideration the findings and recommendation provided by the specialist herein, should inform and guide the EAP and regulatory authorities, enabling informed decision making with regards to the proposed activity.

1.3. SCOPE OF WORKS

The aim of this wetland impact assessment was to identify, delineate and assess the wetland environments within the proposed study site and a 500m buffer thereof (to give effect to the regulated area of a wetland as per GN4167). The details pertaining to the scope of work include the following:

Wetland Delineation, incorporating the following:

- To identify and delineate potential wetland environments within the study site and 500m buffer based on aerial photography and available wetland coverages via a desktop survey.
- To conduct a comprehensive field survey to identify and delineate wetlands using the Department of Water Affairs & Forestry guideline manual (DWAF, 2005).
- To classify and describe the wetland areas affected by the proposed development using the National Wetland Classification System for Wetlands and other Aquatic Ecosystems in South Africa (Ollis et al., 2013).
- To undertake a rapid desktop aquatic screening and risk assessment to determine which of the desktop delineated wetlands are likely to be affected by the proposed development.
- For wetlands assessed to be 'at risk' of the proposed development:
  - To establish the present Ecological State (PES) of the affected wetlands using a Level 1 WET-Health assessment tool (Macfarlane et al., 2020).
  - To assess the importance of the affected wetland areas in providing ecosystem goods and services using a Level 2 WET-EcoServices assessment tool (Kotze et al., 2020).
  - To assess the Ecological Importance and Sensitivity (EIS) of the affected wetland areas (Kleynhans, 1999).
- To identify and describe the potential aquatic ecological impacts associated with the proposed development, using the risk assessment tool (DWS, 2015 updated 2024).
- To provide wetland buffer zone recommendations based on best-practice guidelines and available buffer zone guidelines (Macfarlane & Bredin, 2017).
- To determine the significance of impacts identified for the proposed project (DEAT, 2014) and.
- To provide suitable recommendation and mitigation measures for the wetland environments to maintain and ideally improve the wetland ecological health status and provision of eco-services.

2. PROJECT DESCRIPTION

2.1. PROJECT BACKGROUND

This project was conceptually planned from 2007 and formally scheduled in 2015 when Tronox commissioned Hatch (Pty) Ltd (Hatch) to complete a concept study for the development of a mining operation at Port Durnford. Following the concept study, Tronox commissioned Hatch to conduct a Pre-Feasibility Study1 (PFS) on the Port Durnford site which was concluded in November 2020. The concept study assessed multiple mining options and rates. The technical and financial evaluations determined that the Port Durnford mining operation should be a stand-alone operation, mined in two phases (Phase 1 and Phase 2).

- Phase 1 would last 10 years from 2025-2035 at a low production rate of 70,400 tons per annum with operation only occurring on five working days in the month, whilst,
- Phase 2 lasts 33 years from 2036-2069 at a design production rate of 3000 tonnes per hour, 24 hours per day, 365 days a year.

The PFS study project description sought to maximise the mining area. The PFS informed the original Environmental and Social Impact Assessment (ESIA) project description, detailed in the original Draft Scoping Report, circulated in the public domain in November 2022.

Baseline specialist studies conducted on the site after the previous scoping period, identified additional sensitive areas overlapping with aspects of the project, as originally proposed.

Tronox has revised both the mine plan and mining schedule to avoid these identified highly sensitive areas, where possible. Since changing the mine plan, it was necessary to rerun the materials balance which informs the volumes of coarse and fine sand tailings (the new amounts that require to be handled and disposed of). Consequently, changes were needed to the Residue Storage Facility (RSF) and sand tails concept designs and location studies. The timeframes for this reconfiguration and specialist assessment thereof, could not be accommodated in the original stipulated ESIA timeframes.

For this reason, the scoping phase and ESIA Process are being re-run. This is a new ESIR Process in support of a revised mining rights application by Tronox lodged in May 2024 and subsequently formally accepted by the DMRE on the 19th of July 2024 under DMRE Ref: KZN 30/5/1/2/2/10133MR. The project description presented in this report is the culmination of previous assessment, planning and specialist baseline findings.

The scope of the proposed Port Durnford mining project is described in this section. No changes are anticipated to be needed at Fairbreeze (which receives Phase 1 run-of-mine (ROM)) or at the Tronox Mineral Separation Plant (MSP) located at the Central Processing Complex (CPC) in Empangeni (which receives the Phase 2 concentrate).

2.2. PROPOSED MINING INFRASTRUCTURE

The proposed Tronox KZN sands, Port Dunford Mining development area covers and extent of approximately 4787Ha.

The mine plan consists of the following proposed infrastructure:

- **PWP: Primary Wet Plant**
  - This facility will be constructed on site to separate the fine and coarse sediment from the mined slurry mixture.
- **RSF Facilities: Residue Fine Tailings**
  - These facilities will contain the “residual” fine sediment after extraction of heavy minerals have taken place at the Empangeni Smelter Complex (mineral separation plant off-site).
  - The RSF facilities will not be lined.
  - It should be noted that RSF C will first be used as an open mining pit (compartmentalised). Once mining has concluded the area will be converted into a RSF and will eventually be backfilled with Sand Tailings from the PWP and the excess “residual fine sediment”

- **Water Control Dams**
  - These dams will be used to store/manage water required for the hydraulic mining process.
  - These facilities will also be used as a storing point for excess water collected after separation process at the PWP.
- **Sand Tails: Sand Tailing**
  - These areas are designated to store the coarse sediment that was processed at the PWP.
  - Given, the approximately 40% bulking factor when compared with previously stripped/processed material, these sites will accumulate the additional sand tailings after the walls of the RSF have been constructed using cyclone technology.
- **Topsoil/ Overburden**
  - These selected areas will contain the topsoil that has been extracted during the creation of the open pit mines.
  - The soil will be stored separately as it will be used later for rehabilitation processes.
- **LOM: Life of Mine**
  - This is the current planned/proposed mining areas and infrastructure that will be adapted/refined in the future.

2.3. PHASE 1 OF THE PROPOSED MINE

The mine plan for Phase 1 has not changed between the release of the initial Scoping Report in 2022/2023 and the second Scoping Report in 2024.

2.3.1. PHASE 1 LOCATION

The Phase 1 mining operations will be situated on the Remainder of Richards 16802. This land is currently under commercial forestry, leased by Mondi, owned by the Phalani Community Trust. The proposed location for the Phase 1 operation and infrastructure is indicated in Figure 2-1, while a 3D visualisation of the site is provided in Figure 2-2

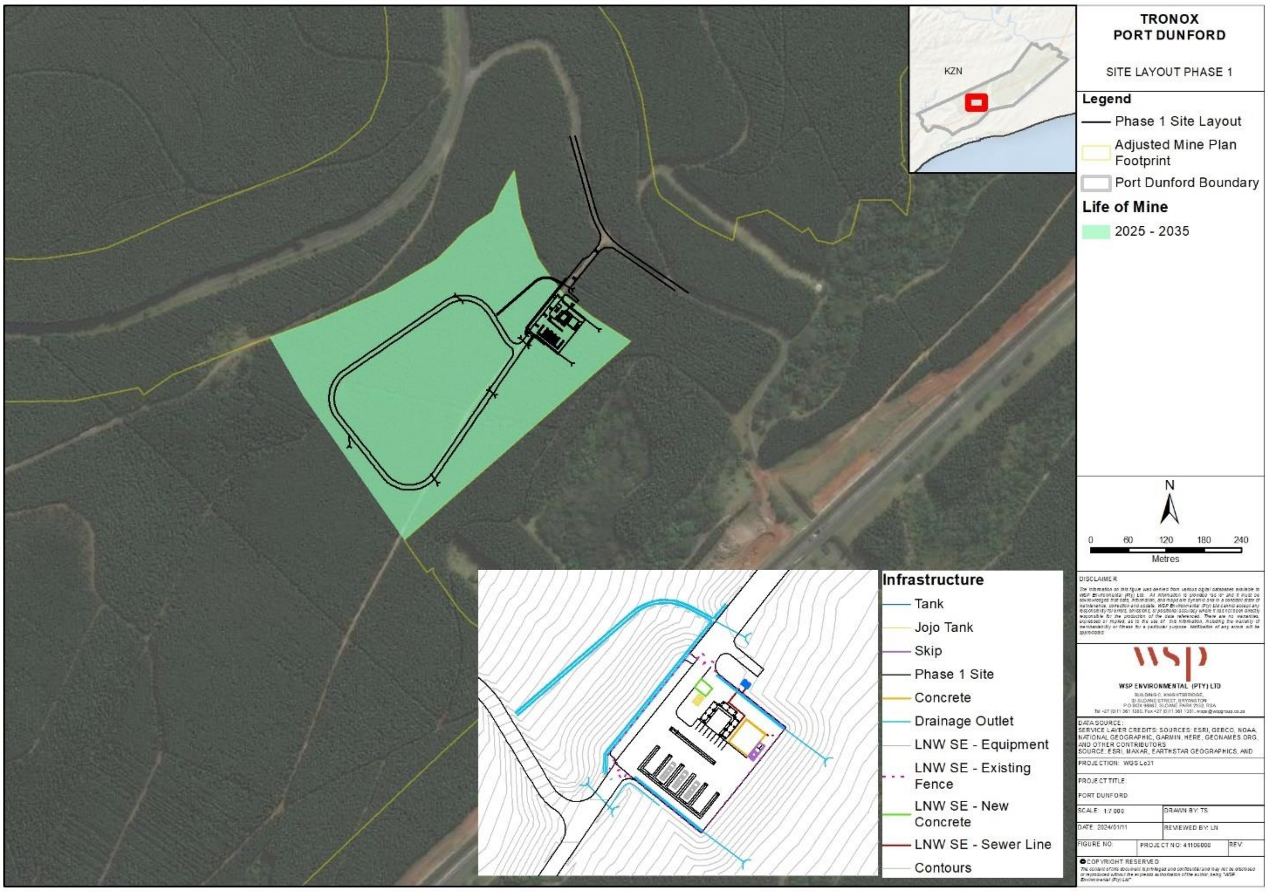


Figure 2-1 - Proposed Phase 1 infrastructure development for the Port Dunford study area

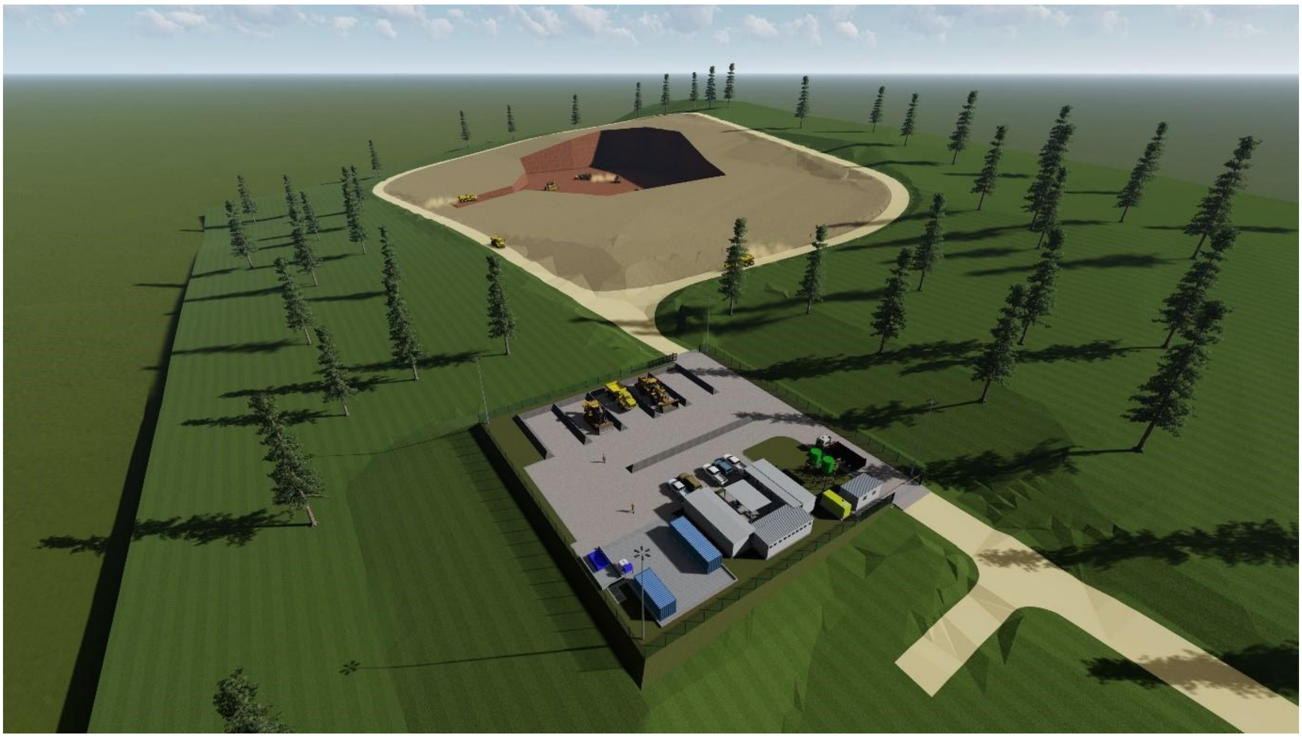


Figure 2-2 - 3D visualisation of the Phase 1 Layout

2.3.2. PHASE 1 MINE PLAN AND PROCESS

Phase 1 will have a mine pit footprint of 4.8 ha and a surface infrastructure footprint of 1.9 ha, will be located on Portion 1 of Richard 16802, and will span over a ten (10) year period, between 2025-2035. The mining will operate at a rate of 100 tph, 70 400t pa. Active mining will take place five (5) days a week per month, for 12 hours a day.

The run-of-mine (ROM) material will be mined mechanically and hauled via trucks to the Fairbreeze mine for stockpile and processing. No processing on site is proposed for the Phase 1 mining operation. ROM will be transported to Fairbreeze mine by truck on public roads (the R102 and N2) for further processing. It is expected that 4 x 30t Trucks will be used to transport the mined material from Port Durnford to Fairbreeze Mine. It is anticipated that 9 truck cycles will be used per day for the 5 days each month that the site is being actively mined. See Section 1.3.3.5 for further description of the transport routes and alternatives considered for Phase 1.

The mined-out ore bodies at Fairbreeze mine will be used for pit infill from the Port Durnford Phase 1 operation for the first 11 years of mining. The hydraulic mining process at the Fairbreeze mine will continue as per current practice at Fairbreeze, to process the stockpiled material. Hydraulically reclaimed ROM slurry will be pumped to the existing Fairbreeze Primary Wet Plant (PWP) for processing.

The processed material will then be trucked to the existing Mineral Separation Plant (MSP) located at the Central Processing Complex (CPC) in Empangeni as part of the Fairbreeze product. Figure 2-3 illustrates the process flow during Phase 1 operations.

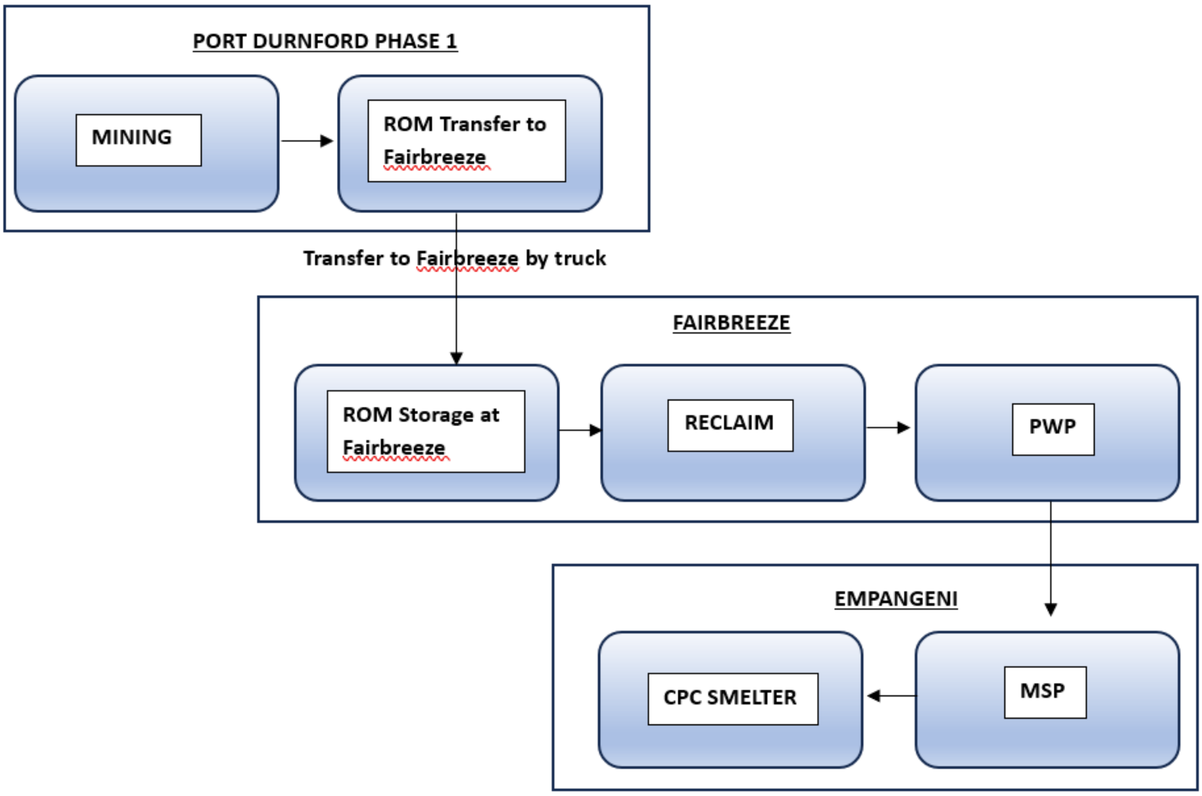


Figure 2-3: Phase 1 Process flow diagram

2.3.3. PHASE 1 INFRASTRUCTURE

2.3.3.1. Site Camp and Laydown Yard Infrastructure

With reference to Figure 2-1, the infrastructure associated with the Phase 1 laydown yard will include the following aspects:

- Conservancy Septic tank system – 2 x 6000l JoJo tanks placed under ground.
- Mining equipment parking area (Gravel with 2 x layers & in situ).
- Workshop laydown area (Concrete stand with 2 x steel containers).
- Water storage tanks (2 x 10 kL tanks).
- Internal water reticulation (Reticulation to offices & ablutions).
- Offices and ablution and septic tank (2 x 12 m units & 1 x 9 m unit).
- Internal electrical reticulation (Estimated ADMD to be 14.7 kW).
- External lighting.
- LDV parking area (1 x G6 layer with RIP & compacted base).
- Guard house (Concrete stand with 1 x steel container).
- Security fence (2.1 m high fence & 1.2m parameter fence).
- A gravel access road (200 m access road) to connect the laydown yard to the District Road which connects to the R102.
- A general and hazardous waste storage area; and
- Fuel and lubricant storage: Fuel tanks will be supported on a concrete surface bed with edge thickenings. A concrete bund wall will be constructed surrounding the fuel tanks. It is anticipated

that a 23 m^3 storage tank will be provided and it is estimated that 153 422 litres will be utilised per annum.

This laydown yard will have no hard stand stockpile area. The mined material will be mined, loaded and transported directly to Fairbreeze.

2.3.3.2. Water Supply

The primary water use on site will be dust suppression. It is anticipated that 4 800 m^3 per annum will be required for this phase of the project.

With the options to connect to the nearest Municipal Supply point, install a borehole or utilise water carts to supply the Phase 1 site. Tronox have opted to utilise 10-18 kl water trucks to cart 6 kl of municipal water to the site, to be stored in 2 x10kl JoJo tanks. The JoJo tanks will be elevated on a steel structure. The municipal water supply points considered are:

- Potable water sourced from the PD Clinic: 28°54'57.15"S 31°49'42.06"E – 2.3km from the Phase 1 laydown yard.
- Alton bulk water point: 28°44'45.38"S 32° 1'29.68"E – 34km from Phase 1 laydown yard; and
- Empangeni Bulk water Point: 28°44'58.29"S 31°53'6.88"E – 23km from Phase 1 laydown yard.

2.3.3.3. Electrical Supply

Power will be required to service the administration offices. The average monthly consumption required for the laydown yard is expected to be 2 741kWh. Tronox plan to utilise and Eskom Overhead Power line connection with an inverter and batteries for backup power supply.

A miniature substation (MSS) will be required for stepping down the Eskom 22kV to 400V for the mine offices distribution.

2.3.3.4. Employment

It is currently estimated that there will be 25 employment opportunities created through the Phase 1 mining operation.

2.3.3.5. Haulage Routes

Three possible transport routes were considered for the Phase 1 operation for transporting mined material between the mining area and Fairbreeze Mine. All three routes follow the same route from the Phase 1 site to the Hely Hutchinson Road intersection. Consequently, this comment section is described for Route 1 below. For the subsequent two route options the alternative is only described from this interchange onwards.

Route 1 (illustrated in red in Figure 2-4 below), is the preferred route. This route makes use of existing public roads. From the Port Durnford mining area and laydown yard the trucks would take the R102 road, westbound for 10km to the Hely Hutchinson Road intersection. Turning left at this intersection and then right (passing through the Mtunzini Tollgate) onto the N2 south bound for 6 km until the #290 Bridge #4 Fairbreeze Mine off-ramp. The Phase 1 ROM material will be offloaded at Fairbreeze at a site approximately 400 m from the offramp where Fairbreeze mining is taking place. The total distance travelled would be 18.7km, at an average estimated speed of 53km/hr. The average anticipated trip time would be 21 minutes in one direction. Route 1 is the preferred alternative for travel time, road maintenance and accounting for risk.

Route 2 (illustrated in yellow in Figure 2-4) follows the common route to the Hely Hutchinson interchange. The route to then also turns towards Mtunzini but rather than accessing the N2, the route would by-pass the N2 south bound turnoff and continue towards Mtunzini. At the approach to the town the route would turn to the right onto existing dirt roads (which would need upgrading) to run along the edge of the town to connect with existing Fairbreeze mine roads. Approximately 1.8km of gravel road would need to be upgraded between Hely Hutchinson Road and the Fairbreeze mining operation. The total distance of this route is 20.9km. An average of speed of 43km/hr is estimated and the average trip time is estimated to be 23 minutes, in each direction.

Route 3 (illustrated in blue in Figure 2-4) follows the common route to the Hely Hutchinson interchange. However, instead of turning towards Mtunzini at that point the route continues along the R103 for 12.5km before turning to the left onto privately owned farm roads for approximately 5 km. The N2 would be crossed by means of an existing single lane overhead bridge to connect with existing Fairbreeze haul roads east of the N2 highway. From here the trucks would travel a further 2.3km to the identified or offloading area. This route is 20.6km long, would have an average estimated speed of 43km/hr, and have an average trip time of 23 minutes in one direction.

Note: This transport route will be used for the first 10 years of mining during Phase 1. Once Phase 2 commences, all ROM will be processed at the Port Durnford PWP which will have been constructed by that time.

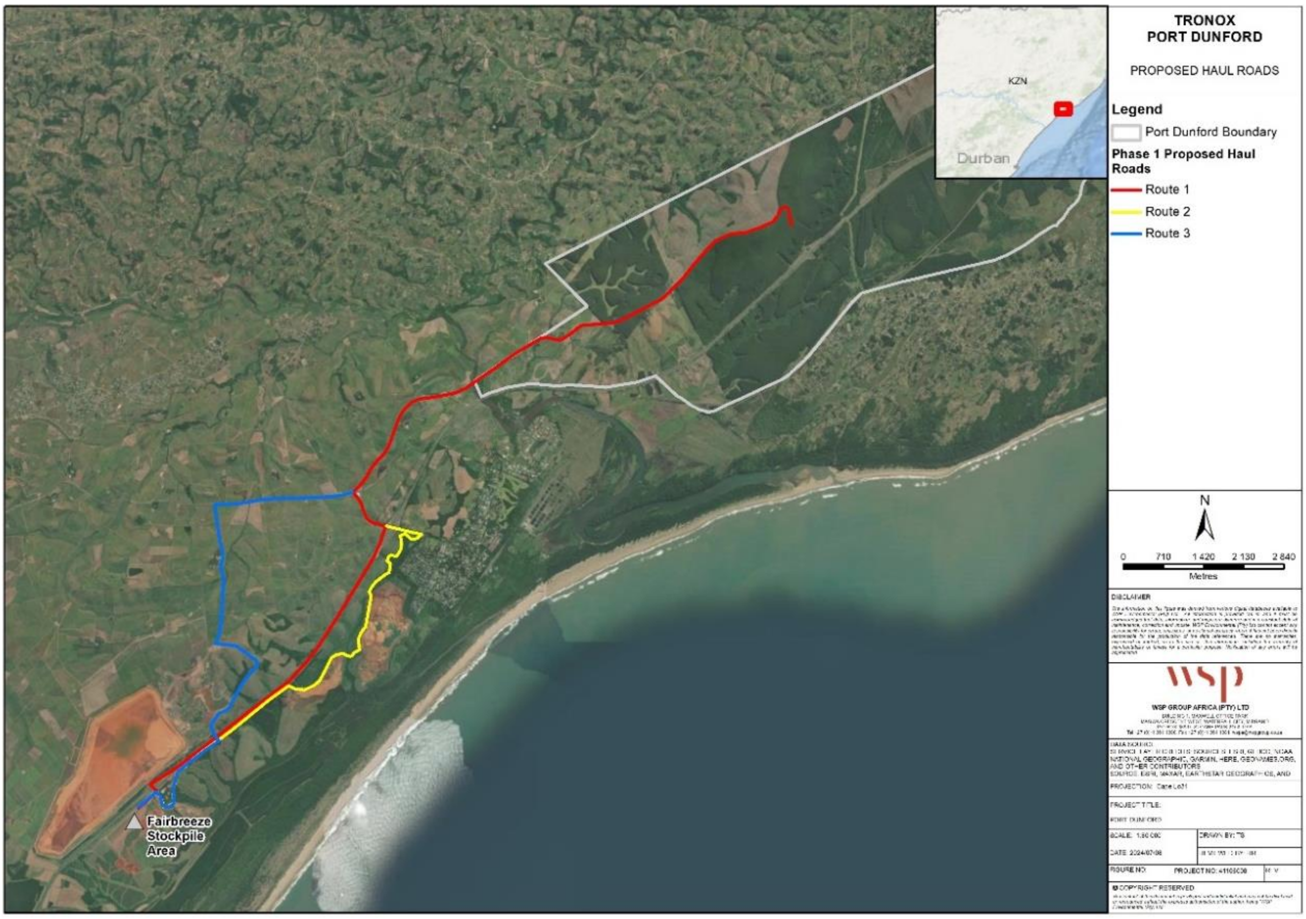


Figure 2-4 - Proposed Haulage Routes from Port Durnford to Fairbreeze.

2.4. PHASE 2 OF THE PROPOSED MINE

2.4.1. LOCATION AND OVERVIEW

The infrastructure for Phase 2 will be constructed during the Phase 1 mining period (2025-2036), however, mining and processing for Phase 2 will only commence in 2036.

The proposed Phase 2 operation comprises opencast mining, on-site processing of ROM material in a Primary Wet Plant (PWP), the on-site backfill and disposal of both coarse and fine sand tailings from the PWP and the transport of heavy mineral concentrate to the existing Tronox mineral separation plant (MSP) located in Empangeni within the Tronox central processing complex (CPC).

At the MSP the concentrate is further beneficiated to yield the target minerals. Coarse sand tailings that are not separated out at the PWP and are thus transported to the MSP as part of the concentrate, but which do not yield product, are returned to the mine and are reintroduced into the coarse sand tailings backfill stream.

The Port Durnford mining footprint is 1 152 hectares which will be mined over a 33-year period, between 2036-2069. The planned rate of mining will be 3,000 tph, 24 hours a day, 365 days a year.

The revised Phase 2 layout is presented in Figure 2-5. Key changes in the layout of flag below and discussed in more detail as part of the project description in the sections which follow. In summary:

- The mine plan has been revised to avoid sensitive habitats to the extent possible. No mining takes place south of the railway line or N2 in the revised mine plan. This has shortened the life of mine by approximately five years,
- Similarly, the sand tailings deposition areas have been moved from areas south of the railway line that are largely comprised of wetlands. Additional sand tailings areas have been identified and are indicated. Some of these (A1, A2, A3 complex and 8B) are located on unmined land. Sand dumps 3, 4 and 5 will largely be developed over the backfilled pit areas although some extension beyond the pit limit does occur for sand dump 5,
- The return water dam for RSF 9 has been moved to the southern side of the dam to minimise impact to a natural forest area north of RSF 9,
- The PWP position has moved slightly to the west to accommodate siting of a return water dam for RSF C,
- RSF C has been expanded through inclusion of a fourth compartment on its eastern side, labelled P4 below, and
- The locations of enabling and support infrastructure are better defined including on-site roads and the positions of topsoil stockpiles

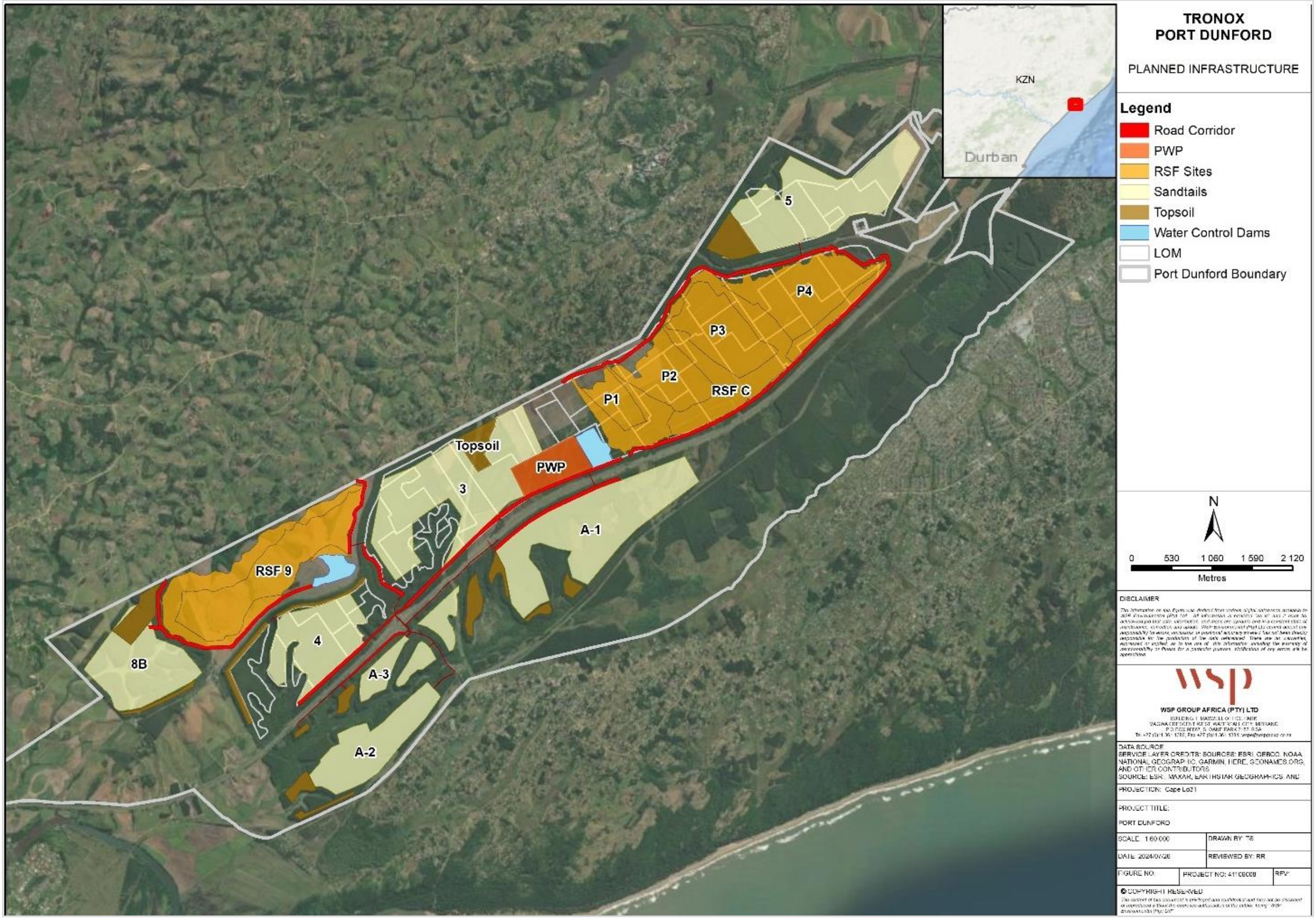


Figure 2-5 - Proposed Phase 2 infrastructure development for the Port Dunford study area

2.4.2. THE PHASE 2 MINING OPERATION

2.4.2.1. Mine plan

The planned mining schedule (mine block plan including time sequencing) is presented below Figure 2-6. The mining schedule is also presented (Figure 2-7) with mining blocks grouped into 5-year units for ease of interpretation of mine progress through time. On this plan, the position of the fine Residue Storage Facilities (RSF's in orange outline) and the sand dumps (in beige outline) are also indicated together with the position of the PWP (orange rectangle).

Mining commences in Phase 2 in 2036 at the site of the Phase 1 pit to complete mining that block. Thereafter, the active mining window moves to a position immediately east to the PWP and sequentially progresses in an easterly direction until the eastern extent of the mine is reached in 2061.

In 2051, mining is also initiated in the western extent of the proposed mining footprint and progresses in an easterly direction back towards the PWP, with the final block which lies immediately north of the PWP, being mined in 2069.

wsp

Figure 2-6 - Proposed Phase 2 Life of Mine (LOM) Plan

Figure 2-7 - Proposed Phase 2 mining block plan showing 5-year mining windows

From Figure 2-7, it can be seen that RSF 9 in the west of the site will be developed on unmined ground while RSF C, in the east of the site, will be developed sequentially on the pit floor as each corresponding five-year mining block has been completed space becomes available. During these periods the washed sand tailings cannot be backfilled into the pit and consequently must at times be deposited on surface. All pit areas will be backfilled with either coarse sand tailings or fine residue (within the RSF). The sand dump positions (beige outline) reflect where a sand dump will be developed above the current ground surface and will remain as a permanent aboveground feature on the post mining landscape. Similarly, RSF Site C will also end at a height above the current ground surface (see section on post mining topography).

2.4.2.2. Sequence of mining activities

The basic sequence of mining activities is as follows:

- Before mining starts a minimum of 0.3 m of topsoil will be stripped. This material will preferably be placed directly onto an area available for rehabilitation. If that is not possible, it will be placed on a stockpile for later use (see Section 2.4.8 on topsoil management),
- Then, the *in situ* sands are mined. In the Port Durnford mine, the sands are mineralised from surface to the base of the economic mining limit within the pit. Consequently, there is mineralisation even in the topsoil that is set aside (see Section 2.4.2.3 which describes the mining method).
- After a pit has reached the economic limit for mining it becomes available to be backfilled. Backfill material comprises the washed course tailings.
- Once the pit is backfilled to the design height, it becomes available for rehabilitation and topsoil is replaced, and
- The topsoiled areas are revegetated following this approach described in Section 2.4.8.

2.4.2.3. Mining method

The proposed Port Durnford heavy mineral sands mine is in opencast sand mine, not dissimilar to the current Tronox Fairbreeze operation. The mining method will however differ. At Port Durnford mobile skid mounted dozer trap mining units (DTMUs) will be used within the active mining areas. The mining process entails dozing the sand material down to the DTMU's where it is combined with water and pumped to the PWP. Each DTMU is anticipated to be fed by two D11 dozers and a CAT390 excavator. A DTMU is equipped with a vibrating screen to separate oversize material and accompanied by a primary pump. Each DTMU is connected to a raw water feed pipeline, a ROM slurry delivery pipeline, and a power connection.

A typical DTMU is shown in Figure 2-8 for visual reference.

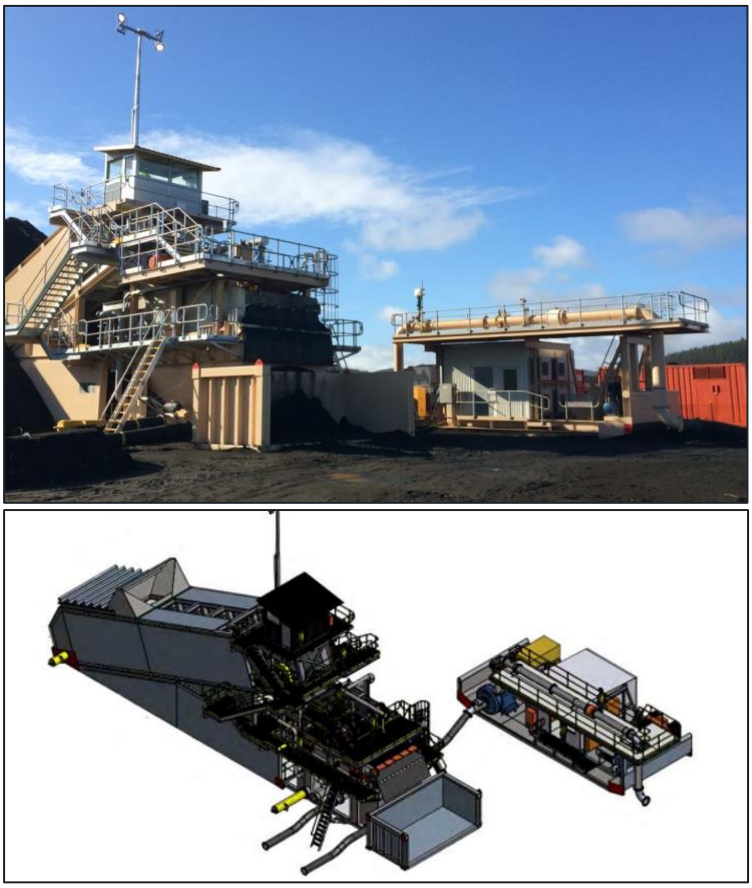


Figure 2-8: A typical dozer trap mining unit (DTMU) showing the trap on the LHS into which material is dozed and an associated pump unit on the RHS

2.4.3. PHASE 2 MINERAL PROCESSING

The ROM material is processed at the primary wet plant (PWP) to remove fine material from the plant feed and separate the non-mineralised sand fraction to produce a heavy mineral concentrate. The ROM feed at Port Durnford is typically comprised of 76% coarse sand tails, and 20% sand tail fines with the remaining 4% being the heavy mineral concentrate (HMC) which is then transported off site to the Tronox mineral separation plant (MSP) in Empangeni.

The primary processing entails:

- Mined material is deslimed and placed through a spiral circuit to separate out the coarse sand tailings (+45 µm),
- The coarse sand tailings will be used for backfilling and for the establishment of the walls of the RSF facilities,
- The spiral concentrate is put through a magnetic separation circuit to remove the reject magnetite, which is fed back into the coarse tailings circuit,
- The non-magnetic material forms the Heavy Metal Concentrate (HMC), and
- The fine tailings (-45 µm) are collected from the desliming process, a thickener is added and process water retrieved before disposal on the residue storage facilities.

The PWP will be designed to process 22,866,000 t/annum ROM at a nominal rate of 3,000 t/h. The process will produce the following output streams:

The PWP layout is indicated in Figure 2-9 (Hatch 2020) and the process flow for Phase 2 activities is presented in Figure 2-10 (Tronox 2022). The PWP layout includes:

- ROM feed preparation and fines removal area.
- Gravity and magnetic separation areas.
- Fine tails dewatering, treatment and pumping area.
- 33kV sub-station and power factor correction (PFC) Yards and Eskom Yard.
- Raw and process water storage and distribution area: Raw water will be stored in a single 10,000 m^3 raw water dam. Process water will be stored in two 7,500 m^3 dams connected by a common overflow sump.
- Compressed air plant: The PWP will be serviced by a single compressed air facility comprising of two compressors, two air receivers and two air dryers.
- Potable water treatment plant: A standalone packaged potable water plant capable of supplying sufficient water for the total estimated personnel compliment.
- Sewage treatment plant: a plant will be developed to accommodate the onsite personnel. Processed effluent from this treatment plant will be pumped to the process water dam.
- Workshop and stores.
- HMC dewatering, stockpiling and reclaim area.
- MSP tails handling where non-mineralised sand tails returning from the MSP are received to be reincorporated into the course tailings backfill stream.
- Gypsum plant.
- Mine Complex including administration offices with parking, control room, change house, mess, security office, laboratory and sample room; and
- A fit for purpose and legally compliant fire water pumping station and distribution system at the PWP to be fed directly from the raw water dam.

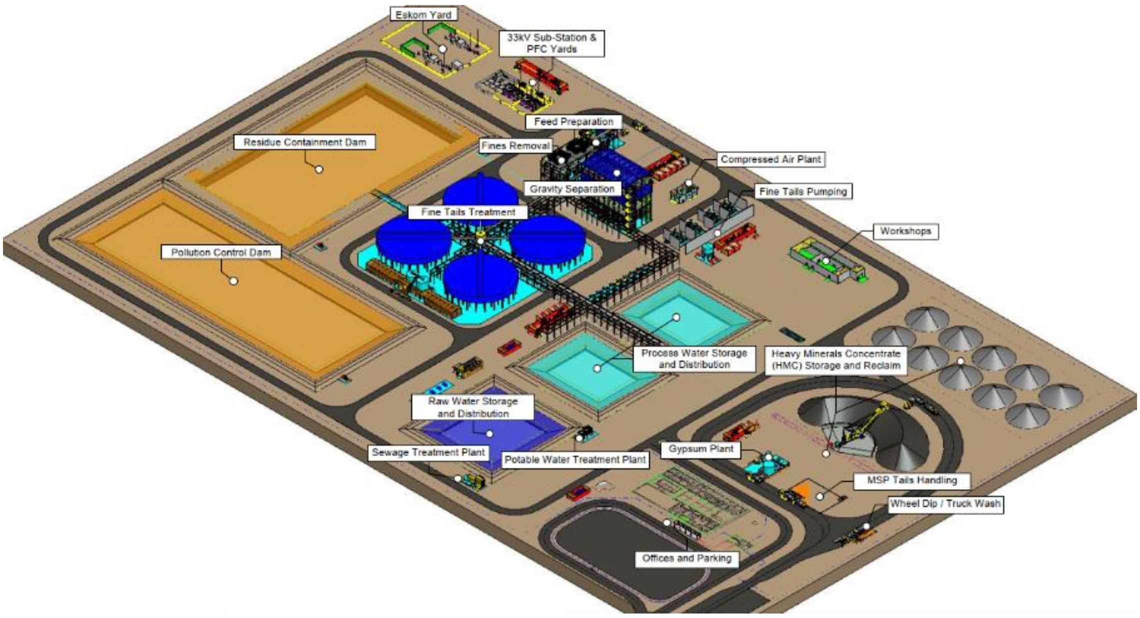


Figure 2-9: Proposed Phase 2 PWP Layout

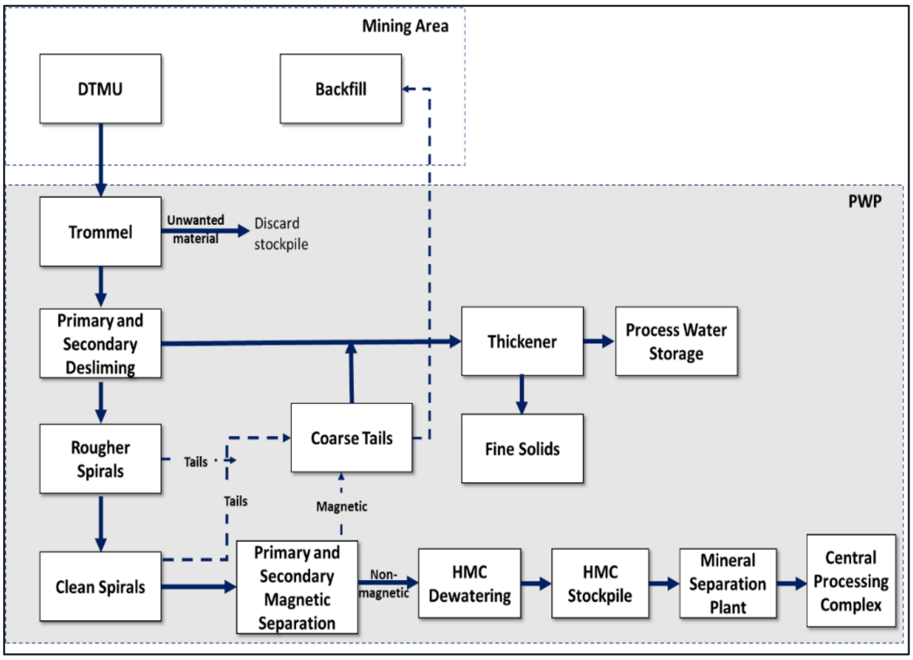


Figure 2-10: Proposed Phase 2 Summary Process Block Diagram

Figure 2-11 - PWP location and inset detail of the PWP site

2.4.4. SUPPORTING INFRASTRUCTURE

2.4.4.1. Water Supply

Raw water will be supplied to Port Durnford from the existing uMhlathuze bulk water supply station directly to the PWP raw water dam via a take-off from the main pipeline currently supplying water to Fairbreeze.

2.4.4.2. Power Supply

The power supply to the site will be from the adjacent Eskom grid via two 88 KV incoming overhead lines to the Port Durnford 33kV substation passing through two 88/32kv stepdown transformers. From the substation power will be distributed to points within the site where it is needed via pre-existing local powerlines.

2.4.5. EMPLOYMENT

The Phase 2 mining operation at Port Durnford will be of similar scale to the current Fairbreeze operation (with 322 employees) and largely act as a replacement reserve as production tails off at Fairbreeze. Consequently, there will be few new job opportunities created however the Port Durnford operation provides opportunity for transition of the Fairbreeze workforce to the new operation.

2.4.5.1. Internal Haulage routes

Twenty-four kilometres (24km) of haulage routes have been conceptually designed within the Mining Boundary. These haulage routes have been given a 40m wide road servitude. They cater for haulage within the mining areas and pipeline service infrastructure. Where possible, existing haulage routes will be used and upgraded to accommodate the larger road servitudes. Where the haulage routes cross water courses, crossing structures will be designed and built across the water course.

2.4.6. WASTE STREAMS

Three “waste streams” are produced from the proposed mining operation, coarse sand tails, fine residue and gypsum filter cake. The following tails products are received from the CPC (Empangeni) for disposal with the various tails products at the PWP at Port Durnford:

- MSP coarse tails are received by tip truck from the MSP in Empangeni. These are tipped directly into a slurry hopper where it is slurried before pumping directly into the rougher sand tails tank for disposal with the sand tails at the PWP at Port Durnford. It is expected that total MSP tails received for disposal will be between 260 and 330 kt/annum (15.6 -18.5 million tonnes per annum. Approximately 678 Mt of sand tails will be deposited during the planned LOM. Large sand tail stockpiles will be utilised for sand tails disposal from 2036 within the Port Durnford mining boundary.
- Gypsum filter cake from the MSP in Empangeni is received via truck from the CPC. The gypsum cake is fed into a materials handling facility for re-slurrying before being fed to the thickener underflow tank for disposal together with the fines to the RSF. It is estimated that between 4,800 and 9,600 t/annum of gypsum will be disposed of into the RSF feed stream each year.

2.4.7. COARSE SAND TAILS DISPOSAL

2.4.7.1. Material Balance

It is anticipated that the Port Durnford mining operation will have a sand tails material balance of approximately 678 Mt over the full LOM; thus between 15.6-18.5 million tons of sand per annum requiring handling and management. All 678 Mt of coarse sand tails over a planned 34-year mining period has been accounted for in the current mine plan.

Approximately 63Mt of coarse sand tailings will be used for RSF dam wall construction and the remaining 615.2 Mt will be used for pit backfill, for RSF capping or will be permanently deposited onto sand dumps.

Motivated by the presence of sensitive wetland and vegetation, the original sand tails location south of the N2 were largely removed from the mining plan. Tronox assessed different sand tails disposal alternatives and propose the following sand tails disposal for the Port Durnford mining operation:

- For the first 7 years of mining in Phase 2 (2036-2047), while opening and mining the pit area for the first compartment of RSF Site C, coarse sand tails (57Mt) will be used in containment wall construction at RSF 9 or deposited outside of the mining pit footprint (sand dump sites A1, A2, and A3 south of the N2) or later used in RSF C compartment 1 wall construction.
- For 5 years (1948-1953) Backfill Area 8 will be used for the deposition of 89Mt of sand tails.
- In years 2049-2051, approximately 21Mt of sand tails will be used in further wall construction for RSF Site C Phase 3.
- In years 2053 to 2059, 117Mt of sand tails will be deposited in backfill Area 4; and
- In years 2064, 2.7Mt of sand tails will be stockpiled in backfill area 3.

Table 2-1 presents the proposed sand tails deposition schedule over the LOM. In this schedule the identified sand deposition areas have been called sand “backfill” areas. These are not necessarily pit backfill areas but rather sites for permanent sand placement which will remain in the post mining landscape.

Table 2-1 - Sand Tails Deposition Schedule (Tronox, 2024)

Sand tails	Capacity (Mt)	2036-2038	2039-2047	2045-2046	2047-2055	2054-2064	Post 2064
Backfill A1, A2, A3	150			-	-	-	
RSF Site 9	18			-	-	-	
RSF Site C (Phase 1)	18						
RSF Site C (Phase 2)	21						
Backfill 8	89						
RSF Site C (Phase 3)	21						
Backfill 4	117						
RF Site C (Phase 4)	4						
Backfill 5	96						
Backfill 3 (post 2064)	133	-		-	-	-	

The sand tails material will be transported to the sand tails stockpiles through feed pipelines which will run alongside roads on site. Cyclones will help deposit the sand tails on the top of each stockpile area, and a return water pipeline will recycle the water back to the PWP. The existing road infrastructure will be utilized for the pipeline routing as far as possible. A topsoil berm will surround each sand tail dump to contain the sand tails and storm water runoff.

The following information will apply to the sand tails deposition strategy:

- The sand tails stockpiles have been designed with a 1:3 vertical height. Each stockpile will have a 100 m buffer from the stockpile to the nearest public infrastructure (roads, railways and residential areas) and a 30 m buffer to the nearest environmental sensitive area. A key recommendation of the EIA has been that slopes do not exceed 1:5 vertical height adjacent to wetlands, which has been accepted by the client and will carry to the detailed design during final feasibility.
- Sand tailings stockpiles will vary in height from approximately 25 to 28 above mean natural ground surface.
- Capping the RSF facilities with coarse sand will be subject to RSF stability and surface bearing capacity, which will be determined during detailed design and subsequent operational monitoring.
- The mined-out pits volumes are included in the available airspace calculation for backfill areas 3,4, and 5. In these areas, sand deposition will also occur above the original ground surface within the identified areas indicated below; and
- Utilising co-disposal of fines and coarse sand mix will be explored with this operation. There are reports of positive results with in-pit mixing with the aid of re-flocculation in deposition piping. This could result in better consolidation and water recovery resulting in higher densities of the deposited residue and overall space saving.

A total of 396 ha have been identified for coarse sand tails disposal within the Port Durnford Boundary, 136 ha within pit disposal, and 259 ha outside the mined-out areas as indicated on the Phase 2 layout (Figure 2-5).

2.4.8. TOPSOIL MANAGEMENT

For all areas that will be used for mining and mine infrastructure at Port Durnford, 0.3 m of topsoil within the "project footprint" will be removed and kept aside for rehabilitation. This standard practice is applicable to the RSF Site 9, the mining footprint, sand tails dump areas and the PWP plant site. Wherever possible within the mining areas topsoil will be stripped and placed directly on areas available for rehabilitation. When space has been depleted in the designated 44 ha of topsoil stockpile areas, topsoil will be stockpiled and used as stormwater runoff berms around the sand tail deposition areas.

Prior to mining or stockpiling, the top 0.3 m of soil will be stripped and stockpiled in designated topsoil stockpile sites within the Port Durnford mining right boundary (see Figure 2-5 where topsoil stockpiles are indicated in brown).

The topsoil stockpiles will be afforded a 30 m buffer from the edge of the nearest wetland or delineated sensitive environmental area. Each topsoil stockpile area will be cleared of large trees or tree stumps prior to placement of soil. The height of stockpiles should not exceed 3 m wherever possible and stockpiles will be protected from stormwater erosion by use of diversion berms. No road development over the surface of the topsoil stockpiles will be permitted in order to avoid unintended compassion of the valuable topsoil resource.

The topsoil stockpiles will be grassed with a mix of indigenous grass seed, containing the following grass types:

- *Eragrostis tef* (Teff).
- *Eragrostis curvula* (Weeping lovegrass).
- *Cynodon dactylon* (Bermuda grass).
- *Cenchrus ciliaris* (Bloubuffels grass).
- *Panicum maximum* (Guinea grass).
- *Chloris gayana* (Rhodes grass).
- *Digitaria eriantha* (Smuts finger grass); and
- *Paspalum notatum* (Bahia grass).

A vegetation canopy cover of 30-50% will be achieved on the topsoil stockpiles.

2.4.9. FINE RESIDUE DEPOSITION

Fine residue will need to be managed throughout the life of mine. The RSF capacity for Port Durnford has been designed for a 28-year LOM between 2036 and 2064. It is understood that RSF capping and shaping of the sand tails dump sites with the remaining sand tails will take place between 2064 and 2069.

The RSF facilities will be constructed in a phased approach. The RSF dam walls will be constructed with coarse sand tails from the mining operation and be compacted. The dam walls will be erected to the designed heights to create a “holding shell” for the incoming fine residue. Each RSF facility has a determined lifespan of RSF disposal. Each RSF site will have a maximum height and storage capacity. Once the RSF facility has reached its design capacity (design capacity in terms of storage volume and height) the facilities will be capped with coarse sand tailings and vegetated.

The RSF infill is considered a “Class 3 waste” for purpose of design. Class 3 waste facilities require lining. The design assumes that a double layer containment barrier, made up of a 1500-micron geomembrane and a geosynthetic clay liner will be installed in the RSF dams to prevent environmental contamination. The materials will be classified to confirm their waste class, which will inform subsequent detailed designs.

RSF Site 9 will have a Water Control Dam (WCD) to receive water from the RSF dams and intercepted stormwater falling within the managed RSF area. Excess water will be recovered from the surface of the RSF and under drainage system and returned for reuse in mining. The RSF dams will use a barge/turret system for excess water removal. The RSF sites will be installed with herringbone, toe, and blanket drainage systems to assist in dewatering the fine tailings in order to aid stability and manage seepage and control the phreatic surface within RSF.

Stormwater control berms and trenches will be used to manage external water, with toe paddocks to control material which has been eroded from the RSF outer slopes. The fine residues disposal concept study and supporting concept designs has been updated (Epoch, 2023). The typical drainage and design detail has been provided in Figure 3-12, below and RSF specific general arrangements provided in the sub sections which follow.

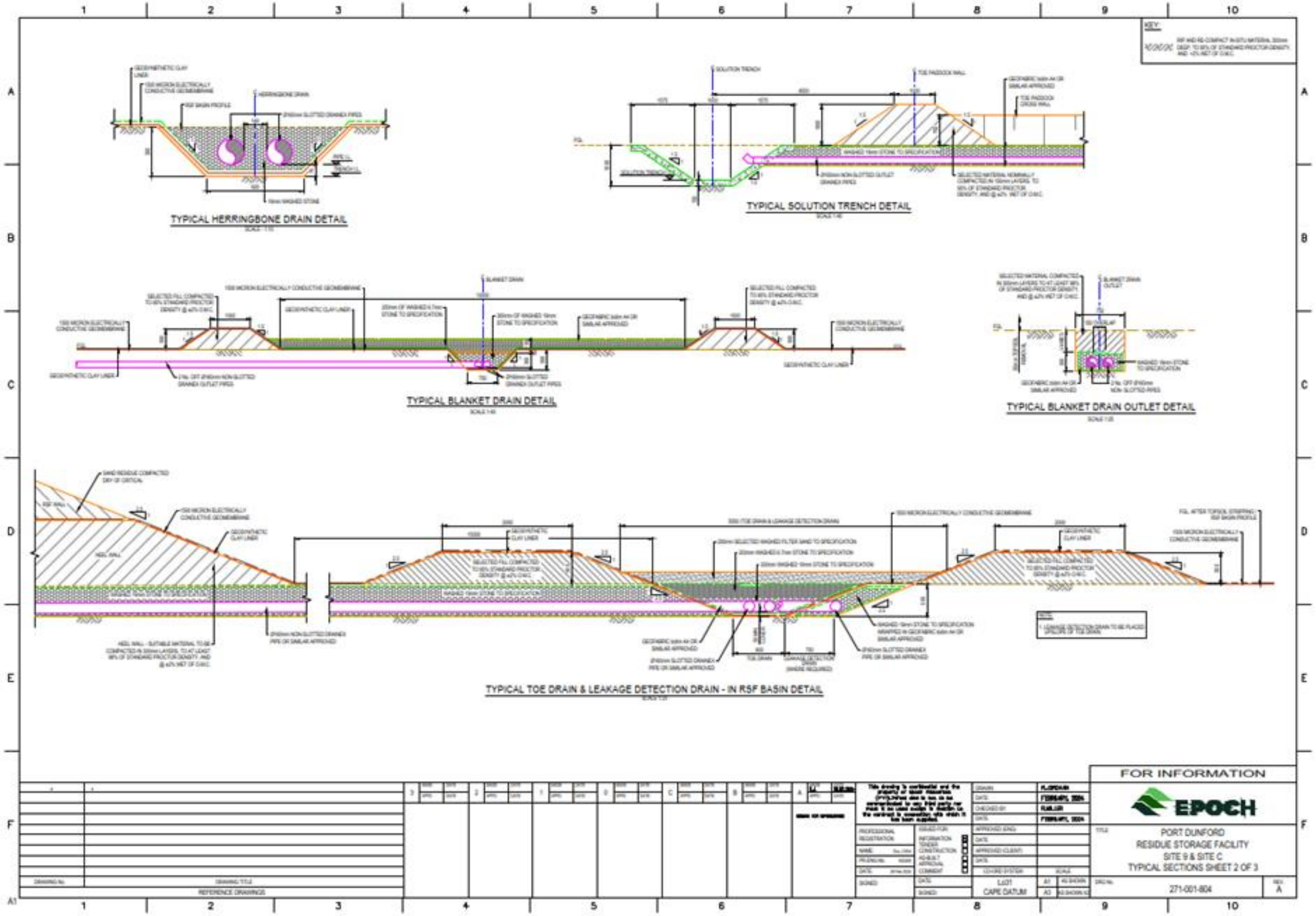


Figure 2-12: Typical RSF Drainage Design Sections

2.4.9.1. RSF Site 9

RSF Site 9 will be built from the sand tailings material from the Phase 2 mining activity. After the 11 years of Phase 1 mining, Phase 2 mining will start adjacent to the then constructed PWP plant in 2037. The sand tails that are produced in the first block of Phase 2 mining will be used to construct the dam walls of RSF Site 9. RSF Site 9 will be situated in the southwestern side of the proposed mining footprint, on Portion 1/13602 and remaining portion of 13602 of Lot 132. This property is leased by Mondi and owned by the Philani Community Trust. This RSF facility will be used for the first 6 years of mining in Phase 2. RSF Site 9 will be 268 ha in size and have a final height of approximately 55 m above average ground level. The facility will be designed to store up to 26.9Mt of Fines residue and 18.2Mt of Sands residue.

The terminal Rate of Rise for Site 9 is 3.3m/yr, meaning that the RSF facility can safely increase in height by 3.3m per year.

2.4.9.2. Supporting Infrastructure

The water control dam for RSF Site 9 was redesigned to avoid environmental sensitive areas. This dam will be approximately 19 ha in extent and have an 870 000 m^3 storage capacity. A barge / turret system will be used to transport water from the RSF to the Water Control Dam.

2.4.9.3. RSF Closure

It is anticipated that RSF Site 9 will be operational for 6 years and reach full capacity in 2042. Thereafter, capping of the RSF surface with coarse sand tailings will commence in 2046 assuming that the surface of the RSF has dried out and stabilised sufficiently by that stage. Once backfilled the site will be topsoiled in 2048. Outer slopes of the RSF will be topsoiled and vegetated as areas become available in order to stabilise the side slopes against erosion. The RSF will be returned to the landowner once Tronox is satisfied that the facility, and the chosen vegetation cover, has stabilised.

A conceptual design has been provided in Figure 2-13 below.

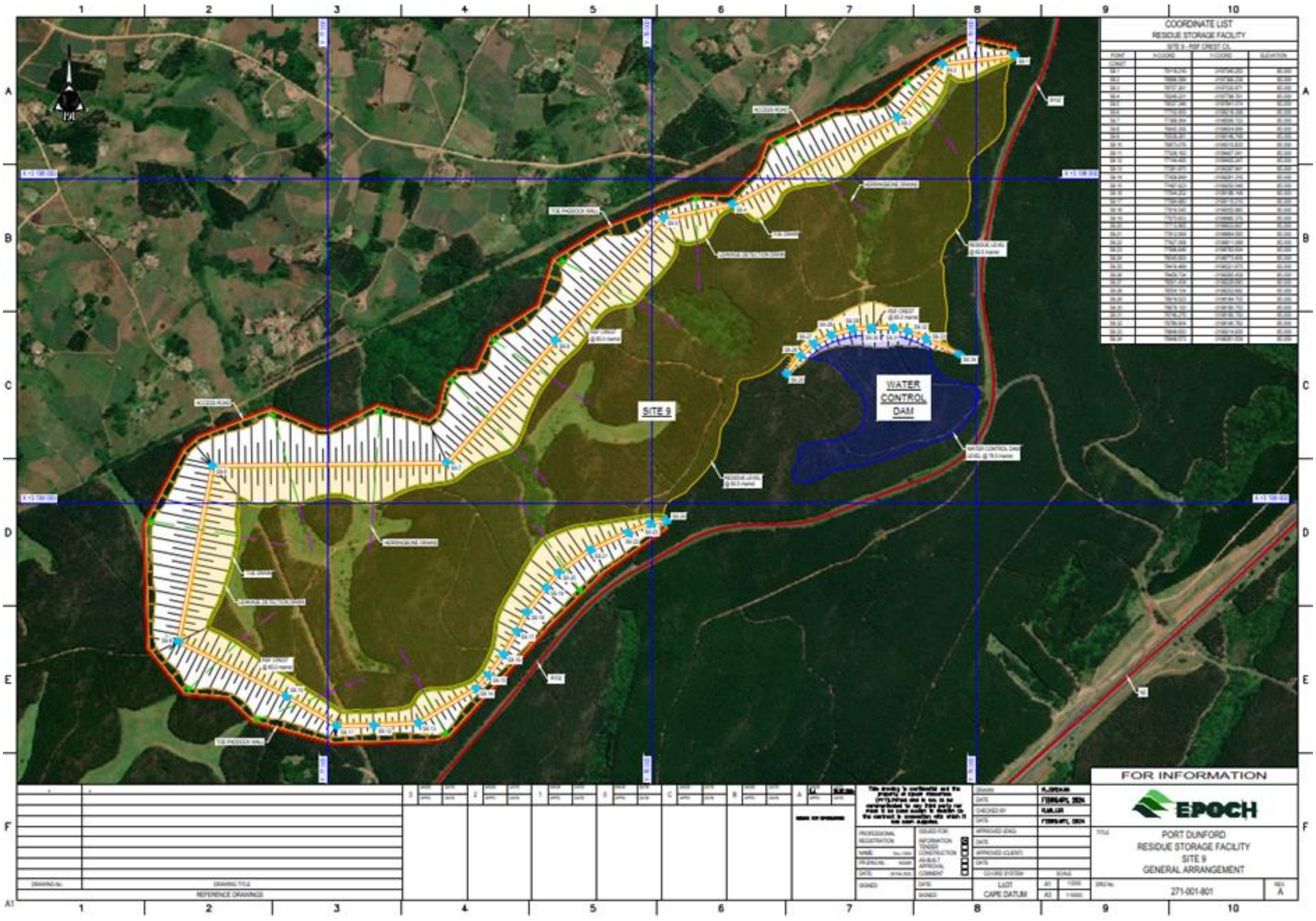


Figure 2-13: RSF Site 9 General Arrangement Design indicating Impoundment walls and inundation Area

2.4.9.4. RSF Site C

RSF Site C will be utilised during the Phase 2 mining activity. It will be located immediately east of the PWP plant. It will be built in sequential phases (Phase 1-4). RSF Site C will utilise mined-out pits for RSF dam storage capacity. Mining here is expected to last approximately 27.5 years before Phases 1- 4 are completed. The four planned RSF cells for RSF Site C will be converted to RSF storage space as each RSF cell reaches capacity. The phased development of RSF Site C is as follows:

- Phase 1 is expected to operate for 2.9 years and store 12.7 Mt of fines and 18 Mt of sand tails. Phase 1 will be approximately 78 ha in size. This facility will be built at a Rate of Rise (RoR) of 9.8 m/yr.
- Phase 2 is expected to operate for 8.1 years and store 35.2 Mt of fines and 21 Mt of sand tails. Phase 2 will be approximately 121ha in size. This facility will be built at a RoR of 5.1 m/yr.
- Phase 3 is expected to operate for 8.1 years and store 40.2 Mt of fines and 21 Mt of sand tails. Phase 2 will be approximately 147ha in size. This facility will be built at a RoR of 5 m/yr; and
- Phase 4 is expected to operate for 8.3 years and store 39.1 Mt of fines and 4 Mt of sand tails. Phase 2 will be approximately 162ha in size. This facility will be built at a RoR of 3.5 m/yr.

RSF Site C will be designed to store up to 127.3Mt of Fines residue and 64.5Mt of Sands residue. The total footprint area of RSF Site C is expected to be 670 ha and will have a final height of approximately 50 m above the current average ground level.

2.4.9.5. Supporting Infrastructure

A 13.75 ha, 540 000 m^3 Return Water Dam has been planned for RSF Site C. The dam will be located between RSF Site C's Phase 1 RSF Dam and the PWP plant. The dam will be 500 m long, 275 m wide and will be 9 m high at its highest point (Figure 2-14).

2.4.9.6. RSF Closure

It is anticipated that RSF Site C will be operational for 27.5 years and reach full capacity in 2064. Thereafter, the site will be backfilled in 2069, affording the facility 4 years to dry out and stabilise. Once backfilled the site will be rehabilitated with topsoil and returned to the Landowner (lessee) thereafter.

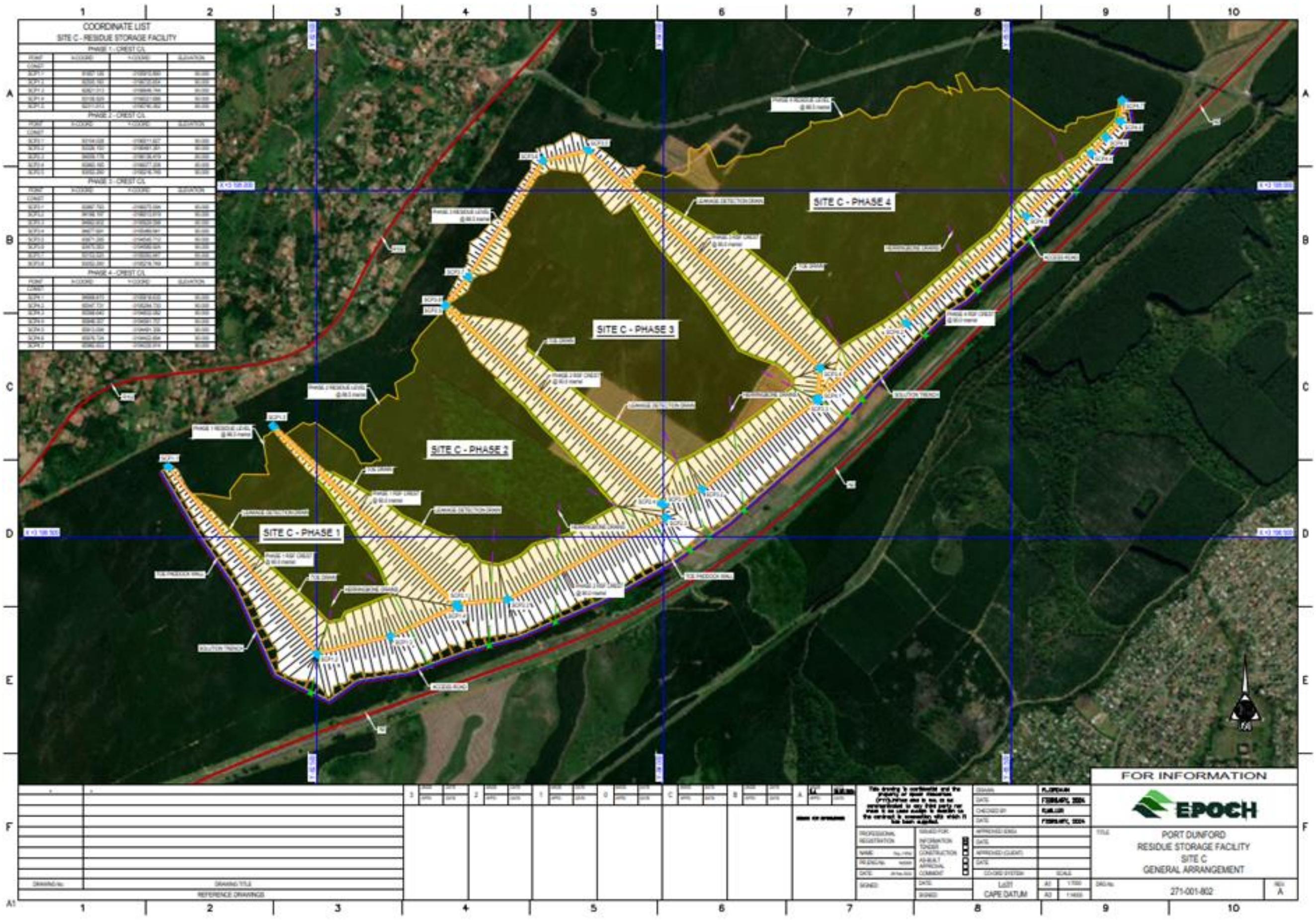


Figure 2-14: RSF Site C General Arrangement Design indicating impoundment walls and inundation area

2.5. PROJECT ACTIVITIES FOR EACH PHASE OF THE PROJECT

The following activities are anticipated for each phase of the project:

- **Construction Phase:**
  - Obtaining the rights to mine the lease.
  - Prior to site establishment all authorisations need to be in place.
  - Forestry activities on the site to cease.
  - Bush clearing will then commence two years prior to production.
  - Bulk earthworks (in case of Phase 2).
  - Development of required service infrastructure on the site.
  - Development and improvement of access roads.
  - Site establishment.
  - Topsoil stripping; and
  - Construction of project components
- **Operational Phase:**
  - Mining to commence. One DTMU mines a 200 m by 100 m block at a time. Progressive backfilling and rehabilitation will then take place. It is anticipated that 4 years post the commencement of mining in a block, the mined area will be subject to rehabilitation. The RSF areas, the exception. These blocks will be rehabilitated post mining, once the RSF has completed its lifespan.
  - Ongoing processing and supporting activities; and
  - Disposal of wastes from the mining process.
- **Decommissioning Phase:**
  - Plant to be demolished and materials to be removed.
  - Termination of all services to the area; and
  - Rehabilitation of all areas to be completed sufficiently to meet relevant commitments of the closure plan.
- **Closure and post closure**
  - Ongoing monitoring of post-closure impacts and success of rehabilitation as required in terms of the closure plan; and
  - Monitoring programs to continue post-closure, where applicable.

2.6. END LAND USE AND TOPOGRAPHY

Once mining is complete and the mined-out areas rehabilitated, the land will be returned to the landowner. It is anticipated that some land will be used for forestation, and others for crops and informal grazing land. The topography of the mined-out areas within the broader mining rights area is expected to change substantially. The RSF sites and sand tails deposition areas will leave permanent elevated features on the landscape.

The pre-mining and post mining topographic surface is presented in Figure 2-15. The natural valleys and peaks are depicted by green and red respectively.

Figure 2-15: Pre mining (LHS) and Post Mining (RHS) Topography

The elevated RSF dam walls and sand tails deposition areas become prominent features in the post mining landscape.

3. BACKGROUND TO THE WETLAND ASSESSMENT

3.1. WETLAND CHARACTERISTICS

Wetlands can be described as areas of inundated land or saturated for extended periods of time. They are intermediate zones between terrestrial lands and aquatic ecosystems, usually occurring when the water table is located just below the surface. Certain plants have adapted to wetland conditions such as growing in anaerobic soil (Ramachandra and Kumar, 2008). The space that exists between soils particles usually become filled with water due to the soil becoming increasingly wet. A typical characteristic of wetlands is their ability to store water and allow drainage to occur at an extremely slow rate, hence they are often waterlogged. Anaerobic conditions usually occur in waterlogged wetland soils due to the rapid usage of oxygen by organisms and plant roots. Wetlands are therefore characterized by soil saturation together with redoxymorphic features; high clay and organic matter content in soils; a suite of characteristic wetland vegetation types and particular topographic settings in which they occur.

Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation and other factors, including human disturbance. In the identification of wetland areas more than one distinguishing characteristic must be present before positive identification of wetlands is accomplished.

3.2. IMPORTANCE OF WETLANDS

Wetlands are considered to be one of the most valued and important ecosystems as they provide a plethora of benefits, not only to the natural environment, but to humans as well (Ramsar Convention on Wetlands, 2018). In particular, wetlands have been studied to improve water quality, often referred to as the 'kidneys of the Earth' and serve as reservoirs which allow for the gradual stable release of water throughout the year. This also proves as an added benefit during flood occurrences as wetlands play a vital role in mitigating flooding by decreasing their initial velocity by absorbing excess flood waters, as well as trapping suspended solids.

3.3. APPLICABLE SOUTH AFRICAN LEGISLATION, POLICY AND STANDARDS

This wetland assessment report took cognisance of the requirements of specific applicable national and provincial legislation and associated regulations that are pertinent to wetland biodiversity. These were used to guide this assessment, and include:

- National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) – Section 24 (1)(a) and (b) states that "the potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment must be considered, investigated and assessed before their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) – The NEM:BA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act regulates the protection of species and ecosystems that require national protection and considers the management of alien and invasive species.
- National Water Amendment Act (Act No. 27 of 2014) (NWA) – The NWA aims to protect, use, develop, conserve, manage and control water resources including rivers, dams, wetlands, the surrounding land, groundwater, as well as human activities that influence them. The NWA intends to protect these water resources against over exploitation and to ensure that there is water for social and economic development and water for the future.
- National Water Act (Act 36 of 1998) – Part 5 of chapter 3 deals with pollution of water resources following an emergency incident, such as an accident involving the spilling of a harmful substance that finds or may find its way into a water resource. The responsibility for remedying the situation rests with the person responsible for the incident or the substance involved. If there is a failure to act, the relevant catchment management agency may take the necessary steps and recover the costs from every responsible person.

4. ASSUMPTIONS AND LIMITATIONS

- This study is considered as a once off assessment, which can only take into consideration the current condition with some speculation of historical events based on evidence observed in field and with the aid of satellite imagery. As vegetation and habitats often vary temporally and spatially, there must be recognition of the fact that certain aspects or features may not have been present during the periods of the site surveys.
- Field verification of wetland boundaries was limited to the area indicated in figures as the Port Dunford boundary and therein focus was placed on verifying wetlands in close proximity to project infrastructures and activities.
- The wetland Present Ecological State (PES), ecosystem service provision (Ecoservices) and Importance and Sensitivity (IS) assessments were based on a combination of desktop information and datasets, and the findings of the site survey.

- Hydrogeomorphic units on site and in the buffer were assessed in their entirety, even if it included sections of wetland that were inaccessible; the latter would be assessed from aerial imagery with limited infield verification.
- All delineation verification is done using a GPS system. The precision of such systems is generally limited to 5m and therefore this error must be taken into account when utilising the GPS coordinates.
- Whilst the assessment techniques applied in this report are used in order to standardise and 'objectify' the assessment of the systems' function, potential impacts and services, it must be noted that much of the information is subjectively collected based on the assessor's experience and training. The assessor will, if additional information or counter arguments are provided and verified, hold the right to amend the report if need be.
- Monitoring and management of any wetland impacts/ remediation/ rehabilitation are advised in accordance with best practice.

5. DETAILS AND DECLARATIONS OF THE SPECIALISTS

DETAILS OF THE SPECIALISTS

Task	**Wetland delineation and infield verification**
Full Name	Brad Graves
Title/Position	Senior Wetland Ecologist
Qualification	BSc Honours, Geography
Professional Affiliations	South African Council for Natural Scientific Professions (SACNASP)
	Pr.Sci.Nat. Reg Number 400041/17 (Ecological Science)

Task	**Wetland assessments and report compilation**
Full Name	Bhavna Ramdhani
Title/Position	Wetland Ecologist
Email	bhavna.ramdhani@wsp.com
Qualification	MSc Environmental Science

Task	**Report review and revision**
Full Name	Shavaughn Davis
Title/Position	Senior Wetland Ecologist
Email	shavaughn.davis@wsp.com
Qualification	MSc Zoology
Professional Affiliations	South African Council for Natural Scientific Professions (SACNASP)
	Pr.Sci.Nat. Reg Number 115025 (Ecological Science, Zoological Science)

DECLARATION OF INDEPENDENCE BY SPECIALIST

I, Shavaughn Davis, a duly authorised representative of WSP (Pty) Ltd, declare that I –

- Act as the independent specialist in this application.
- 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; and
- 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.

DECLARATION OF INDEPENDENCE BY SPECIALIST

I, Bhavna Ramdhani, a duly authorised representative of WSP (Pty) Ltd, declare that I –

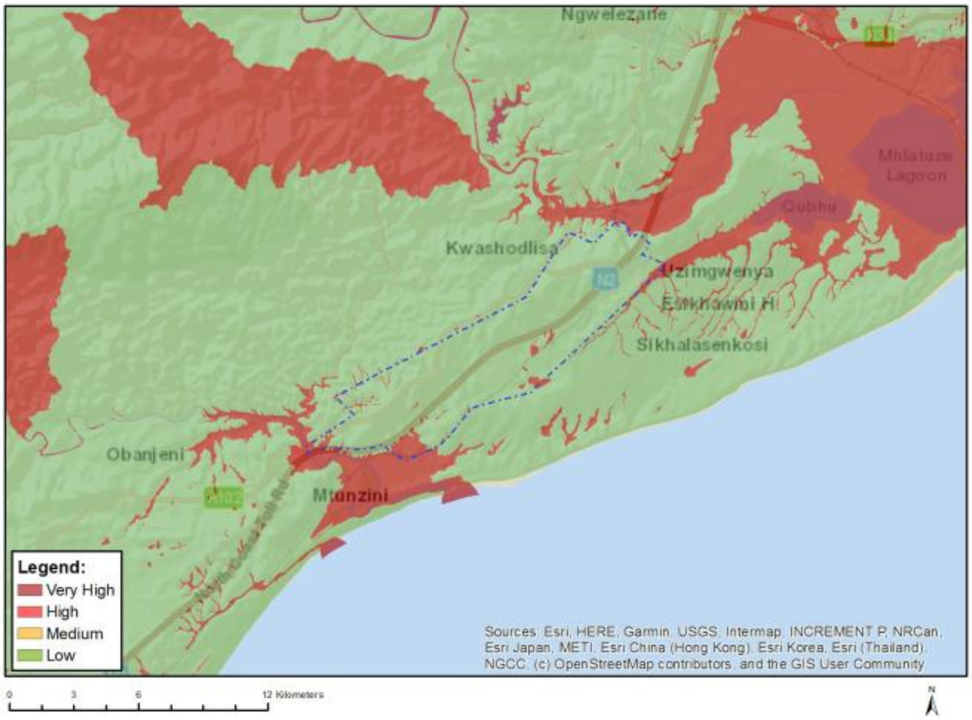
- Act as the independent specialist in this application.
- Do not have and will not have any financial interest in the undertaking of the activity, other than
- remuneration for work performed.
- Do not have nor will have a vested interest in the proposed activity proceeding.
- Have no, and will not engage in, conflicting interests in the undertaking of the activity; and
- 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.

Digitally signed by
Ramdhani, Bhavna
(ZABR05615)
Date: 26.03.2025

6. ENVIRONMENTAL SCREENING TOOL

The study area was assessed at desktop level using the National Web-based Environmental Screening Tool. According to the Tool, the Aquatic Biodiversity Theme for the study area is rated ‘Very High Sensitivity’ due to the presence of sensitive features such as wetland and estuaries as well as being located within an area mapped as a Strategic Water Source Areas (Figure 8-1).

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY



Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
X			

Sensitivity Features:

Sensitivity	Feature(s)
Low	Low sensitivity
Very High	Estuary_uMhlathuze
Very High	Estuary_uMlalazi
Very High	Rivers_C
Very High	Wetlands_(Estuary)
Very High	Wetlands_Indian Ocean Coastal Belt Bioregion (Depression)
Very High	Wetlands_Indian Ocean Coastal Belt Bioregion (Floodplain)
Very High	Wetlands_Indian Ocean Coastal Belt Bioregion (Seep)
Very High	Wetlands_Indian Ocean Coastal Belt Bioregion (Valley-bottom)

Figure 6-1 - Screening report highlighting very high sensitivity for the aquatic biodiversity theme

7. METHODOLOGY

The current wetland biodiversity study takes cognisance of Government Notice No. 320, published in 2020 under the National Environmental Management Act (1998) concerning 'Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Theme in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (1998), when applying for Environmental Authorisation'.

7.1. DESKTOP STUDY

A desktop study was initially undertaken to garner as much prior understanding of the general physiographic characteristics of the study area as possible. This was achieved by sourcing and utilizing all relevant GIS data available, such as data on the topographical layout, vegetation characteristics, fluvial hydrology, ecoregion classification, Critical Biodiversity Areas (CBA), National Wetland Map Version 5 (NWM5) and land uses occurring in the region. The details of these various desktop datasets are presented in Section 7. Further desktop assessment was thereafter conducted of the study area to identify potential wetland areas of interest within the site. This was accomplished via satellite imagery from Google Earth Pro ® and shapefiles obtained from the South African National Biodiversity Institute (SANBI). The delineation of the wetland boundaries was therefore first conducted at desktop level and later verified via a comprehensive field survey.

7.2. FIELD VERIFICATION

Wetland habitat surrounding the development footprint, and initially delineated at a desktop level, was then verified in the field as part of a comprehensive wetland field survey undertaken during November 2022, with an additional site visit undertaken in June 2024 to address project changes. As such, the initial survey aligned with the wet, spring-summer season, and the later survey in 2024 aligned with the drier, winter season.

The field survey, conducted by the WSP team, comprised of augering and logging of sediment cores to 50cm or slightly greater depths, assessing targeted areas identified from aerial photographs and on-site visual identification. The field survey thus included identifying wetland habitat, delineating the outer boundaries, and collecting data relevant to the classification of the wetlands and determination of their current condition and importance and sensitivity.

It should be noted that areas not accessible were delineated at a desktop level using the best available spatial data.

7.3. WETLAND DELINEATION

Four specific wetland indicators were used to identify/verify wetland areas:

- Terrain unit,
- Vegetation (further detail provided in Table 7-1),
- Soil: texture (sand & clay), colour (hue, chroma & value), and organic matter.
- Degree of saturation.

The wetland delineation procedure identifies the outer edge of the temporary wetland zone, marking the boundary between the aquatic and adjacent terrestrial areas. The wetland delineation field verification began at the lower lying areas of a given wetland and proceeded outwards from the permanent, through the seasonal and ultimately to the outermost temporary zone. To identify the outer edge of the temporary wetland zone, wetland vegetation indicators were noted, and a soil auger was used to extract and observe sediment cores. The sediment samples were evaluated on-site for typical redoxymorphic soil features such as mottling, and gleying, as illustrated along a wetness gradient in Figure 7-1. The wetland boundaries were determined utilising the initially developed desktop delineation, and refined according to the findings of the site survey and observations made.

Wetland systems may comprise of one or more hydrogeomorphic (HGM) units. The wetland habitat identified and delineated was then classified according to the National Wetland Classification System developed by the South African National Biodiversity Institute (SANBI) (Ollis et al., 2013) and DWAF (2008). The HGM classification system uses the geomorphological and hydrological features of the delineated wetland unit to determine its classification. The features that are assessed relate to the way in which water behaves in the wetland system.

Table 7-1 - Classification of plants according to occurrence in wetlands (DWAF, 2008)

TYPE	DESCRIPTION
Obligate Wetland Species	Almost always grow in wetlands (> 99% of occurrences)
Facultative Wetland Species	Usually grow in wetlands (67%-99% of occurrences) but occasionally are found in non-wetland areas
Facultative Species	Are equally likely to grow in wetlands and non-wetland areas (34%-66% of occurrences)
Facultative Dry-land Species	Usually grow in non-wetland areas but sometimes grow in wetlands (1%- 34% of occurrences)

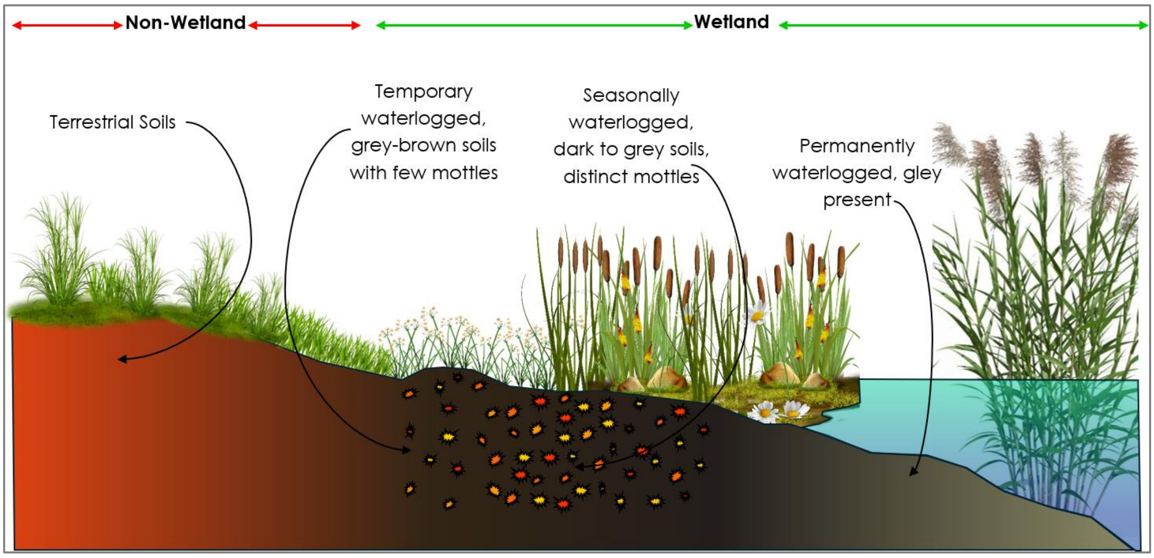


Figure 7-1 - Cross sectional diagram of a wetland, indicating how the soil moisture and vegetation indicators change as one moves along a gradient of decreasing wetness, from the middle to the edge of the wetland (Author, 2024).

7.4. WETLAND CONDITION AND VALUE

The current condition and value of wetlands at risk of being compromised as a consequence of the proposed development activity were assessed through a suite of tools specific to wetland habitat assessments.

7.4.1. WETLAND PRESENT ECOLOGICAL STATE (PES)

The WET-Health Level 1 assessment was undertaken to ascertain the Present Ecological State (PES) of the wetland environments affected by the proposed development (Macfarlane *et al*. 2009). The state of the four main functional aspects of the wetland is considered for the WET-Health index. These include: (1) hydrology, (2) geomorphology (3) water quality and (4) vegetation. Each of these functional aspects follows a broadly similar approach and is used to determine which anthropogenic impacts have affected the health status of the wetland. The overall score is integrated and expressed as a PES category. In addition, the trajectory of change of the wetland health is also assessed and is expressed as a change symbol.

Table 7-2 - Present Ecological Status (PES) score categories for describing the integrity of wetlands

Impact Category	Health Category	Description	Range
None	A	Unmodified/natural	0 – 0.9
Small	B	Mostly Natural with a few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1 – 1.9
Moderate	C	Moderately modified. A moderate change in the ecosystem processes and the loss of natural habitats has taken place but the natural habitat remains predominantly intact	2 – 3.9
Large	D	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4 – 5.9
Serious	E	A very large change in ecosystem processes and loss of natural habitat and biota but some of the remaining natural habitat features are still recognizable.	6 – 7.9
Critical	F	The modification has reached a critical level, and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota	8 – 10

7.4.2. ECOSYSTEM SERVICE PROVISION (ECOLOGICAL GOODS AND SERVICES)

A WET-EcoServices Level 2 assessment evaluates the "ecological goods and services" provided by HGM units potentially affected by the proposed development. The tool provides information on the importance of wetlands in delivering different ecosystem services under several different categories (Kotze *et al.*, 2009). These categories are illustrated in Figure 7-2.

Figure 7-2 - Wetland ecological goods and services assessed by the WET-EcoServices tool

This highlights the importance rating calculated and the description in terms of the wetland ecoservices (Table 7-3).

Table 7-3 - Ecosystem services classes and descriptions (Kotze *et al.*, 2020).

Importance Category		Description
Very Low	0-0.79	The importance of services supplied is very low relative to that supplied by other wetlands.
Low	0.8 – 1.29	The importance of services supplied is low relative to that supplied by other wetlands.
Moderately Low	1.3 – 1.69	The importance of services supplied is moderately-low relative to that supplied by other wetlands.
Moderate	1.7 – 2.29	The importance of services supplied is moderate relative to that supplied by other wetlands.

Importance Category		Description
Moderately High	2.3 – 2.69	The importance of services supplied is moderately-high relative to that supplied by other wetlands.
High	2.7 – 3.19	The importance of services supplied is high relative to that supplied by other wetlands.
Very High	3.2 - 4.0	The importance of services supplied is very high relative to that supplied by other wetlands.

7.4.3. WETLAND IMPORTANCE AND SENSITIVITY (IS)

The IS scores were calculated using the **Resource Directed Measures** *for Protection of Water Resources* (Kleynhans, 1999) methods. This approach provides information on the ecological importance of the HGM unit in terms of unique biodiversity and sensitivity, which refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (resilience).

Table 7-4 - Ecological importance and sensitivity categories.

EIS Category	Ecological Management Class[1]	Description	Range of Median
Very High	**A**	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	**B**	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	**C**	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

EIS Category	Ecological Management Class[1]	Description	Range of Median
Low/marginal	D	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.	>0 and <=1

7.5. WETLAND RISK ASSESSMENT

The risk assessment developed as part of the amendment GA for section 21 (c) and (i) water uses, which was published in the Government Gazette (No 49833 Pg 208 Notice 4167) on 8 December 2023 is frequently applied to assess the risk to water resources in terms of Section 21 (c) and (i) water uses, and the applicable authorisation process, either a general authorisation (GA) or a Water Use Licence (WUL). **However, according to GN4167 Section 3 (Exclusions to the notice), Paragraph (h), the notice does not apply to any section 21 (c) or (i) water use associated with mining activities and associated infrastructure unless it falls within appendix D1 or D2 of the notice. The proposed Port Dunford mine does not, in its entirety, fall within appendix D1 or D2. As such, a full WUL would be the applicable authorisation process, and a GN4167 risk assessment matrix was not included in this report.**

7.6. IMPACT ASSESSMENT

The significance (quantification) of potential environmental impacts identified during the assessment have been assessed as per the "Guideline Documentation on EIA Regulation" (Department of Environmental Affairs and Tourism, 2014). To determine the significance of impacts identified for a project, there are several parameters that need to be assessed. These include four factors, which, when inserted into a formula, will give a significance score. The five parameters are described as follows:

- **Duration**, which is the relationship of the impact to temporal scale. This parameter determines the timespan of the impact and can range from very short term (less than a year) to permanent.
- **Extent**, which is the relationship of the impact to spatial scales. Each impact can be defined as occurring in minor extent (limited to the footprint of very small projects) to International, where an impact has global repercussions (an example could be the destruction of habitat for an IUCN Critically Endangered listed species).
- **Magnitude**, which is used to rate the severity of impacts. This is done with and without mitigation, so that the residual impact (with mitigation) can be rated. The Magnitude, although usually rated as negative, can also be positive.
- **Probability**, which is the likelihood of impacts taking place. These include unlikely impacts (such as the rate of roadkill of frogs, for example) or definite (such as the loss of vegetation within the direct construction footprint of a development).

- **Impact Reversibility**, which is the ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change

Each of the abovementioned aspects are rated according to Table 7-5 below.

Table 7-5 – The impact assessment aspects and scoring system applied.

Based on impact significance criteria determined by DEAT, 1998					
CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	**Very low**	**Low**	**Medium**	**High**	**Very high**
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	**Site:** Site only	**Local:** Inside activity area	**Regional:** Outside activity area	**National:** National scope or level	**International:** Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	**Reversible:** Recovery without rehabilitation		**Recoverable:** Recovery with rehabilitation		**Irreversible:** Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	**Immediate:** On impact	**Short term:** 0-5 years	**Medium term:** 5-15 years	**Long term:** Project life	**Permanent:** Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	**Improbable**	**Low Probability**	**Probable**	**Highly Probably**	**Definite**
ENVIRONMENTAL SIGNIFICANCE = (MAGNITUDE + EXTENT + REVERSIBILITY + DURATION) x PROBABILITY					
TOTAL SCORE	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
ENVIRONMENTAL SIGNIFICANCE RATING	**Very low**	**Low**	**Moderate**	**High**	**Very High**

The results of the assessment are then interpreted using the below rating system which categorises the scores into 5 categories ranging from low to very high impact significance. A description of each category is provided in Table 7-6.

Table 7-6 - Description of Impact Assessment Scores

Label	Motivation
Negligible	The impact is very small to absent
Low	where this impact would not have a direct influence on the decision to develop in the area
Medium	where the impact could influence the decision to develop in the area unless it is effectively mitigated
High	where the impact must have an influence on the decision process to develop in the area
Very high	Where the impact may constitute a fatal flaw for the project

Each impact was assessed based on the methodology above, and a table produced, indicating the scores and the overall significance rating both without and with mitigation. Where relevant, mitigation measures are recommended.

8. REGIONAL SETTING

8.1. CLIMATE

Climate generally describes inter alia, the temperature and moisture conditions of a particular area over a period of time. Climate plays a significant role in the formation of soil properties. For instance, soils that are found in warmer or moist climates are more developed as compared to soils found in cooler or drier climates.

The proposed activity site lies within the summer rainfall region of South Africa. The study area is located in close proximately to the Indian Ocean, which acts as a climate regulating factor along the KZN coast. This region is influenced by the Agulhas Current resulting in the high humidity experienced in the area. The study site is situated in the sub-tropical rainfall region of South Africa, which experiences a strongly seasonal rainfall occurring in the summer months from November to mid-April. The lowest rainfall is experienced during the winter months from May to August (Hunter, 2007). Mean annual precipitation is approximately 973 mm and mean annual potential evaporation is 1650 mm. The mean annual minimum and maximum temperatures are 15°C and 29°C, respectively.

8.2. CATCHMENTS

The study area is located within the W12F and W13B quaternary catchments of the Usuthu-Mhlathuze Water Management Area. The W12F covers the northeast section of the study area while the W13B covers the southwest section of the study area. The area is characterised by two prominent perennial rivers, the Mlalazi and the Mhlathuze, that drain into the Indian Ocean. Floodplain wetlands and estuaries are situated along the lower reaches of the Mlalazi and Mhlathuze rivers. The Mhlathuze River flows past the northern boundary of the project area and its tributaries drain the northwestern areas, whilst the Mzingwenya River flows along a section of the eastern boundary of the project area and drains the area northeast towards Qhubu Lake. The tributaries of the Mlalazi River drain the Penarrow and Waterloo areas, and a portion of the Port Durnford area. The Amanzamnyama River, situated in the central to southern section of the project development area and the southern boundary of the Waterloo area, drain south and southeast towards the Mlalazi River. The Mlalazi River flows past the southwestern and southern boundaries of the Waterloo area.

8.3. STRATEGIC WATER SOURCE AREAS

Holland, Smith-Adao, Nel, Maherry, and Witthüser, (2018) as part of a Water Research Commission Project (Report No. TT 743/1/18) and are defined by the authors “as areas of land that either: (a) supply a disproportionate (i.e. relatively large) quantity of mean annual surface water runoff in relation to their size and so are considered nationally important; or (b) have high groundwater recharge and where the groundwater forms a nationally important resource; or (c) areas that meet both criteria (a) and (b).”

Figure 8-1 below shows project study area in relation to the delineated Strategic Water Source Areas (Le Maitre *et al*., 2018). The project study area falls within the Zululand Coast & Richards Bay Groundwater Fed Estuary Strategic Water Source Area. This highlights the area as being nationally important due to a high groundwater availability and due to the fact that the available groundwater forms an important resource for water supply. This water resource is a key resource in the supply of water to downstream economies and urban centres (WWF, 2013) (Figure 8-1).

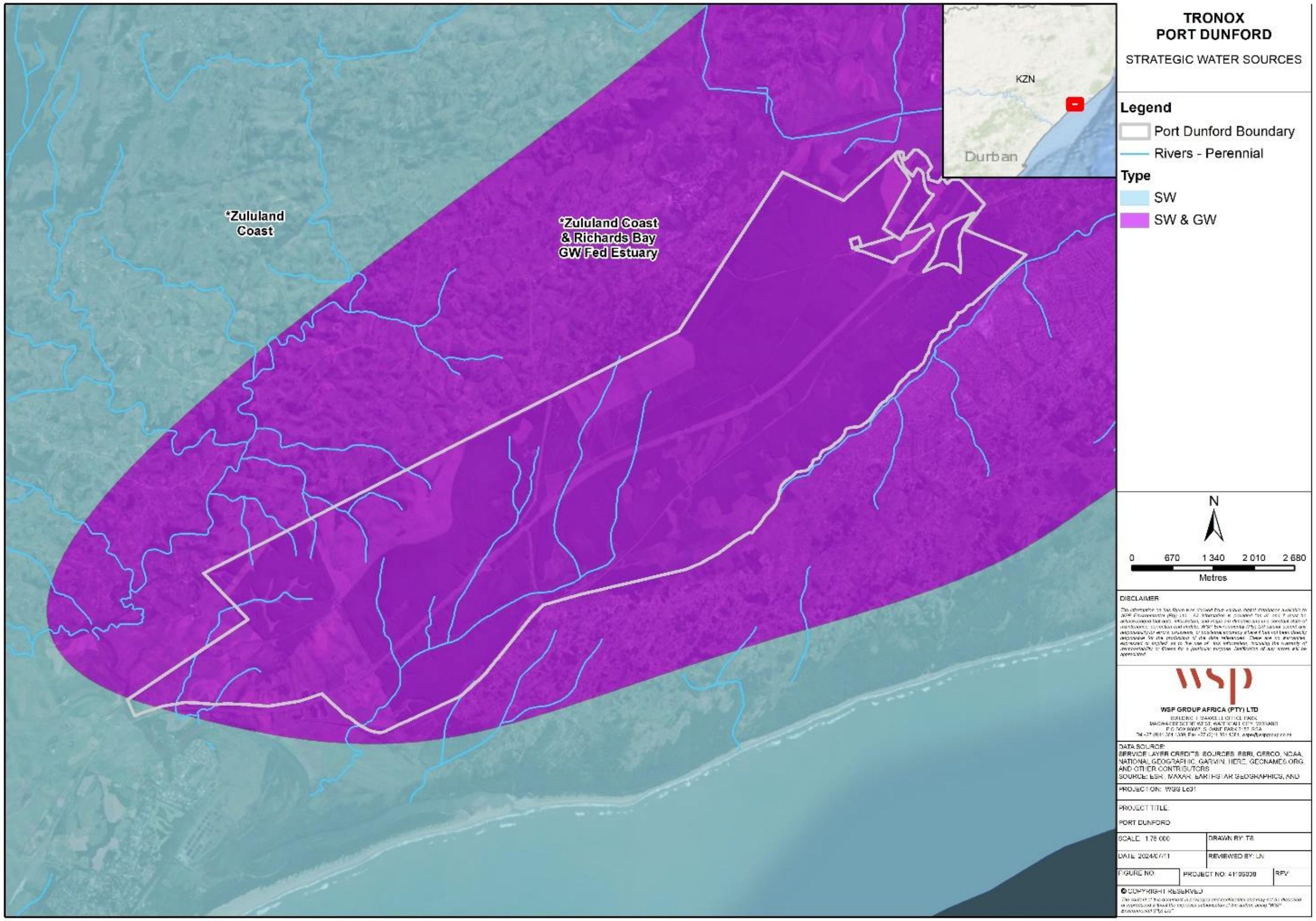


Figure 8-1 - Strategic Water Source Area in relation to the Port Dunford study area and surrounds.

8.4. SOILS

8.4.1. TERRESTRIAL SOILS

A number of different lithologies occur within the study area. Lithologies of the of the Natal Metamorphic Province outcrop west and north of the Port Durnford mining area and consist mainly of ultramafic rocks and gneiss. This is overlain by sedimentary rocks of the Natal Group which outcrop in the north-west and south-west. This is in turn overlain by shales and sandstones of the Ecca Group, Karoo Supergroup which are found south-west of the site. Rocks of the Ecca Group are finally overlain by Quaternary deposits of the Maputaland Group which form the coastal dune deposits in the area (GCS, 2020). These lithologies weather to produce soils with differing physical and chemical properties. These include sandy and clayey soils derived from weathered sand of the Berea Red Sand dune complex, as well as varied-textured soils derived from weathering of Sandstone, Quartzite and Gneiss (Red Earth, 2025). According to Snyman (2008) as referenced in Red Earth (2025), the soils within a large proportion of the Port Dunford study area (Port Dunford Plantation in particular) can be characterised as follows:

- Alluvium associated within and adjacent to channels gives rise to alluvial soils. These deposits occupy narrow strips parallel to channels.
- Quaternary grey-brown sands occur in the east. Derived soils are typically sandy in texture with hydromorphic properties common.
- Brownish red weathered material (.... Berea Formation) occupies the central and western area. Derived soils have red hues and sandy-loam to sandy-clay-loam textures. Other Quaternary sand Aeolian material often blankets the weathering material providing sandy topsoils on top of the clay-loam textured underlying horizons.
- Gneiss of the Intuzi Formation, Matigulu Group occurs at the south-western corner of the study area. Typical derived soils are lithosols (gravelly shallow soils) with clayey textures.

8.4.2. WETLAND SOILS

The main difference of wetland soils from terrestrial soils, is that they are typically anaerobic. This absence of oxygen produces distinct characteristic differences in soil colour and texture. When soils are flooded, oxidized Fe^{3+} (ferric) is reduced to Fe^{2+} (ferrous) chemically and by microbes to support respiration, and result in soil changes from the basic yellow, orange, or red to a recognizable grey colour (Refer to Figure 8-2 below) (Vepraskas, 1994). Mineral soils that are continuously inundated or saturated may display uniform grey colour, also known as gley. Sometimes, soil takes on hues of green or blue that indicates complete reduction of Fe^{3+} in the soil matrix. In wetlands that dry down periodically, reduced Fe can re-oxidize and the soil may take on a mottled colour, with areas of red (oxidized Fe) and grey (reduced Fe) (Craft, 2015).

Figure 8-2 - The typical formation of a redoximorphic feature within the soil profile (adapted from Jackson et al, 2014)

8.5. VEGETATION

The National Vegetation Map Project (VEGMAP) delineates, classifies, maps and samples the vegetation of South Africa, Lesotho and Swaziland which was produced and revised throughout the years by Mucina and Rutherford (2006/2012). The purpose of creating this project was to map the extent of various vegetation types across the country, which would aid in establishing their individual conservation status. Therefore, these refined datasets were subsequently used to determine the natural state of the proposed study area. Thus, a comparison could thereafter be conducted between the present state and recorded natural state of the vegetation units, which would provide insight on the range of impacts induced on the vegetation cover. Note that these classifications are done on a broad scale and at a desktop level.

The VEGMAP indicates that the study area is predominately consistent of the Maputaland Coastal Belt vegetation. The eastern extends contain swamp forest whilst the central regions indicate pockets of Northern Coastal Forest type vegetation. The western extremities are dominated by the KwaZulu-Natal Coastal Belt Grassland with regions of Subtropical Alluvial Vegetation type.

The Maputaland Coastal Belt is a range of flat coastal plain originally probably densely forested in places with a wide range of interspersed non-forest plant communities including dry grasslands, hygrophilous grasslands and thicket groups. Today the vegetation landscape is composed of pockets of various forest types (separated into different vegetation units), thickets, primary and secondary grasslands, with the intrusion of extensive *Eucalyptus* plantations and cane fields. The vegetation unit is given an Endangered status with moderate protection (Jewitt, 2018).

The Swamp Forest vegetation is typically described as 12-15 m tall forests with 2 main strata (canopy and shrub layers). The dominating trees include *Ficus trichopoda, Barringtonia racemosa, Casearia gladiiformis, Cassipourea gummiflua, Syzygium cordatum, Phoenix reclinata* and *Raphia australis*. Understorey is poorly developed. Some ferns such as *Microsorum punctatum* and *Nephrolepsis bisserata* are of importance and orchids (*Eulophia horsfallii*) occur frequently. It should be noted that this vegetation is regarded as Critically Engaged and receives moderate protection status (Jewitt, 2018). The vegetation was identified on site and aligns with the dataset.

The Subtropical Alluvial Vegetation can be described as flat alluvial riverine terraces supporting an intricate complex of macrophytic vegetation (channel of flowing rivers and river-fed pans), marginal reed belts (in sheltered oxbows and along very slow-flowing water courses) as well as extensive flooded grasslands, ephemeral herblands and riverine thickets. The entire study area is located in close proximity to the Mlalazi Estuary and therefore the western portions exhibit this type of vegetation distribution. The Subtropical Alluvial Vegetation type is regarded as vulnerable however is afforded full protection (Jewitt, 2018).

The KwaZulu-Natal Coastal Belt vegetation unit occurs as a long strip along the coast from Mtunzini in the north to just short of Port Edward in the south, with an altitudinal range of about 20-450 m. The overall landscape is carved by rivers which drain eastwards across KwaZulu-Natal resulting in undulating coastal plains which extensively included various types of subtropical coastal forest. Some primary grassland dominated by *Themeda triandra* still occurs in hilly, high-rainfall areas where pressure from natural fire and grazing regimes prevail. This vegetation unit is affected by array of anthropogenic pressures i.e., extensive sugarcane fields, *Eucalyptus* plantations and coastal holiday resorts, with interspersed secondary *Aristida* grasslands (*A. junciformis subsp. galpinii*), thickets and patches of coastal thornveld. The national land cover and supplementary provincial and metropolitan land cover data show that KwaZulu-Natal Coastal Belt Grassland has experienced extensive spatial declines of approximately 89% since 1750. KwaZulu-Natal Coastal Belt Grassland is narrowly distributed with high rates of habitat loss in the past 28 years (1990-2018), placing the ecosystem type at risk of collapse (DFFE, 2022). It should be noted that this vegetation is regarded as Critically Engaged and receives nominal protection status (Jewitt, 2018).

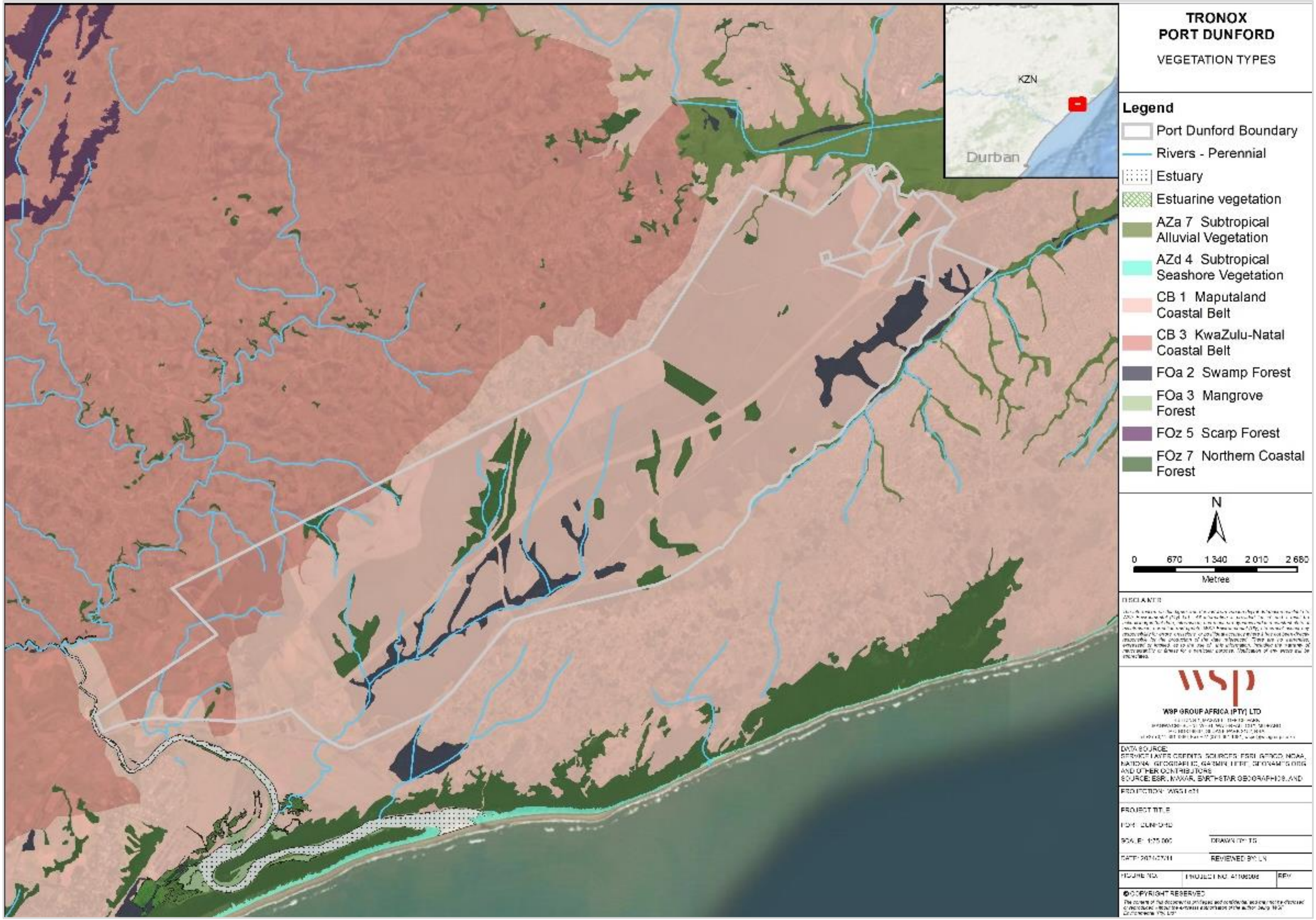


Figure 8-3 - Vegetation types of the proposed Port Dunford study area and surrounds.

8.6. CRITICAL BIODIVERSITY AREAS (CBA)

Ezemvelo KwaZulu-Natal Wildlife developed and implemented the KwaZulu-Natal Biodiversity Plan to assist with development, protected areas expansion and conservation with the province (Ezemvelo Wildlife, 2016). The plan identified areas as Critical Biodiversity Areas (CBAs) which cannot be lost if conservation goals are to be met. Furthermore, Ecological Support Areas (ESAs) were also established as these areas are required to support the functioning of CBAs and ecosystems. The guidelines of the KwaZulu-Natal Biodiversity Plan for each CBA and ESA category are outlined in Table 8-1.

Table 8-1 - CBA Descriptions adapted from Escott et al., 2012

CBA	DESCRIPTION
Critical Biodiversity Area: Irreplaceable	These regions are identified as having an Irreplaceability value of 1, these areas represent the only localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved, i.e. there are no alternative sites available. Hence are considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of ecosystems.
Critical Biodiversity Area: Optimal	Areas that represent an optimised solution to meet the required biodiversity conservation targets while avoiding high-cost areas as much as possible (Category driven primarily by process but is informed by expert input).
Ecological Support Areas	Functional but not necessarily entirely natural terrestrial or aquatic areas that are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the Critical Biodiversity Areas. The area also contributes significantly to the maintenance of Ecosystem Services.
Modified Areas	Areas with no significant natural vegetation remaining and therefore regarded as having a low biodiversity value (e.g. sugarcane plantation areas or highly developed areas with no connectivity to natural environment).
Protected Area	A specifically delineated area that is both designated and managed to achieve the conservation of the indigenous state and the maintenance of associated ecosystem services and cultural values, through legal or other effective means.

The CBA associated with the proposed activity is CBA irreplaceable and pockets of Optimal at a desktop level (Figure 8-4). This means that the proposed operation occurs in areas considered critical for meeting biodiversity targets and thresholds, which are required to ensure the persistence of viable populations of species and the functionality of ecosystems.

It must be noted that the aforementioned CBA type was identified at a desktop level. However, the CBA type is justifiable, as it highlights the multiple swamp forest regions towards the east and central portions (these areas were verified in field) and identified the Mlalazi EFZ that is considered to have extremely high importance (high biodiversity and providing human benefits). This report provides insight towards the sensitive wetland environments identified within the study area that should be preserved to maintain biodiversity integrity.

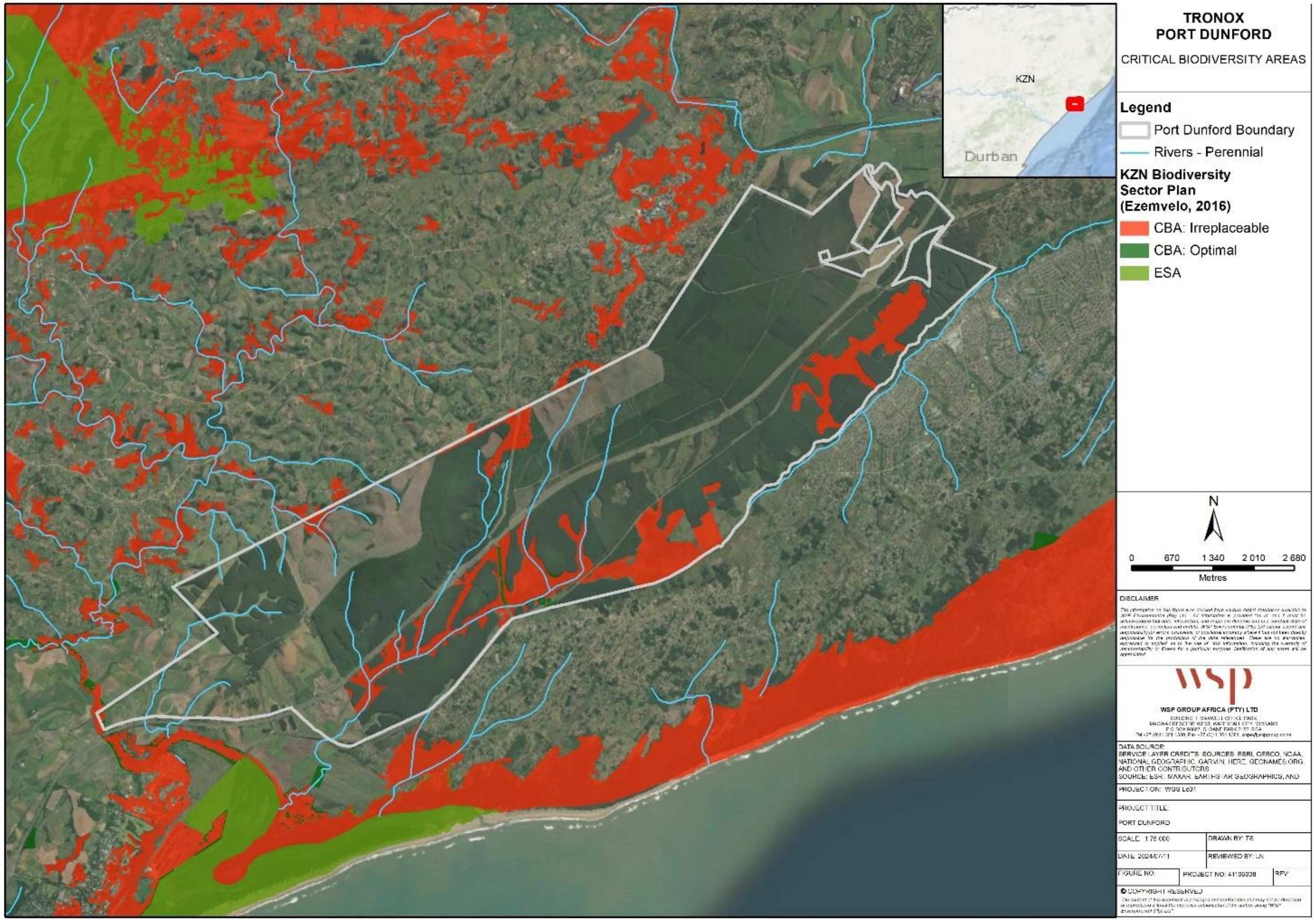


Figure 8-4 - Critical Biodiversity Areas (CBA) for the Port Dunford study area and surrounds.

8.7. NATIONAL WETLAND MAP VERSION 5

The South African National Wetland Map version 5 (NWM5) portrays the spatial extent and ecosystem types of two of the three broad aquatic ecosystems, namely, estuarine and inland aquatic (freshwater) ecosystems. The NWM5 is aimed at improving the representation of spatial extent and type of inland wetland and estuarine ecosystem types of South Africa (Van Deventer et al., 2019).

The National Wetland Map version 5 (NWM5) (Van Deventer *et al.*, 2019), was consulted to provide an indication on the occurrence of wetland habitat on site and within the immediate area. The NWM5 indicates the presence of unchanneled Valley Bottom (UVB) wetland, seep wetland, floodplain and depression wetlands as well as an estuarine functional zone within the proposed development footprint (Figure 8-5). The NWM5 categorises the UVB wetland as a *Largely/Critically modified* wetland in terms of its Present Ecological Status (PES) (Figure 8-5), which infers that the wetland has suffered a large loss of natural habitat and its basic ecosystem function. The NWM5 is the most up-to-date and accurate representation of spatial extent and type of inland wetland ecosystem types at desktop level in South Africa. However, it is noted that the National Wetland Map 5 dataset is based predominantly on desktop and/or remote sensing data and as such must be considered Low Confidence data, especially at the scale of an individual project site. Field verification (refer to Section 9 below) is thus always required to provide a more accurate representation of wetland extent and types on site.

An earlier version of the National Wetland Map was included in the National Freshwater Ecosystem Priority Areas Project (NFEPA), which culminated in the Atlas of Freshwater Ecosystem Priority Areas (Nel *et al,* 2011). That report provided a series of maps detailing strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. Freshwater Ecosystem Priority Areas (FEPAs) were identified through a systematic biodiversity planning approach that incorporated a range of biodiversity aspects such as ecoregion, current condition of habitat, presence of threatened vegetation, fish, frogs and birds, and importance in terms of maintaining downstream habitat. According to the FEPA wetlands dataset, of the wetlands indicated as extending into the Port Dunford study area, only the Mlalazi Estuary is considered to be a FEPA wetland.

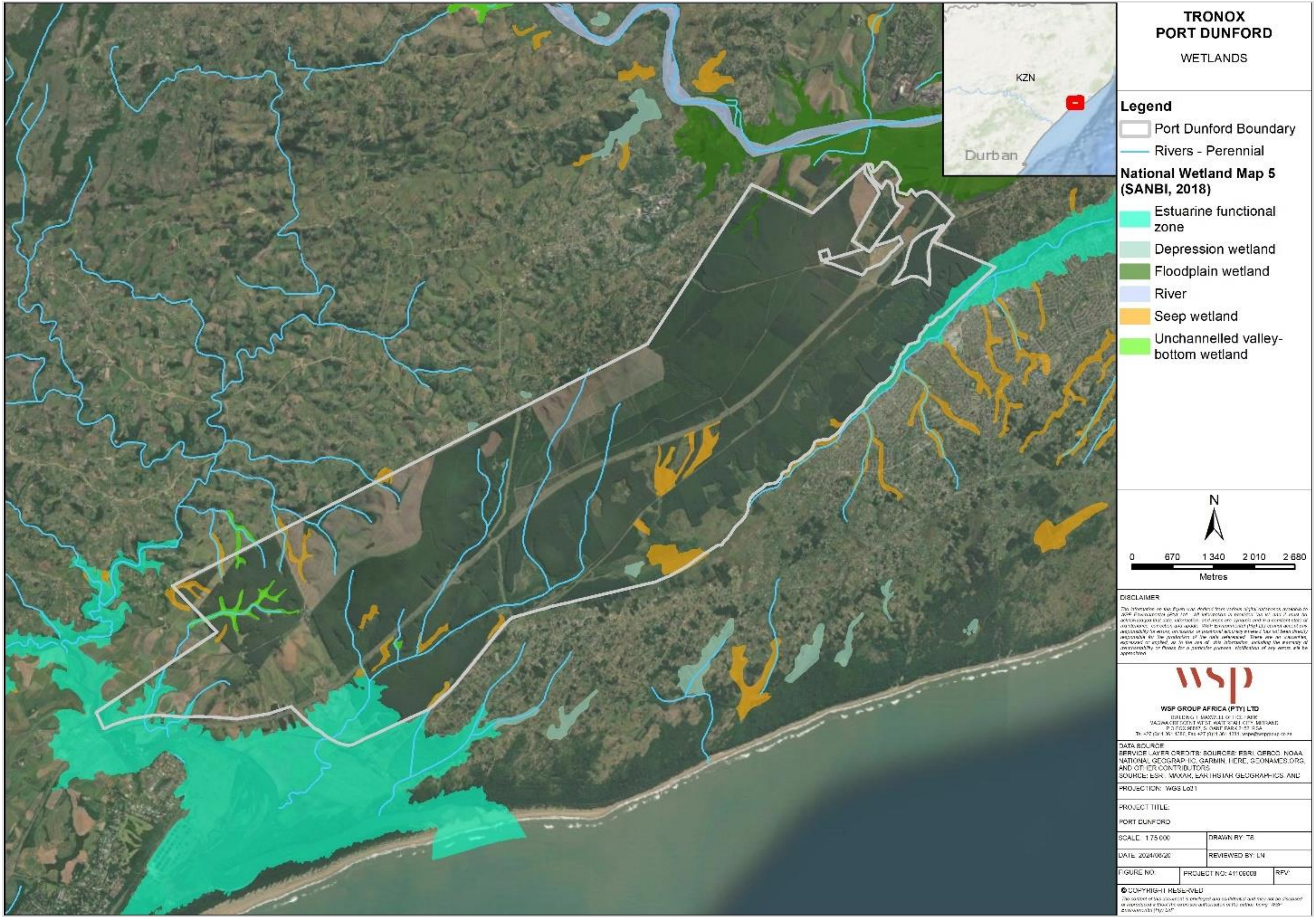


Figure 8-5 - National Wetland Map 5 in relation to the Port Dunford study area and surrounds.

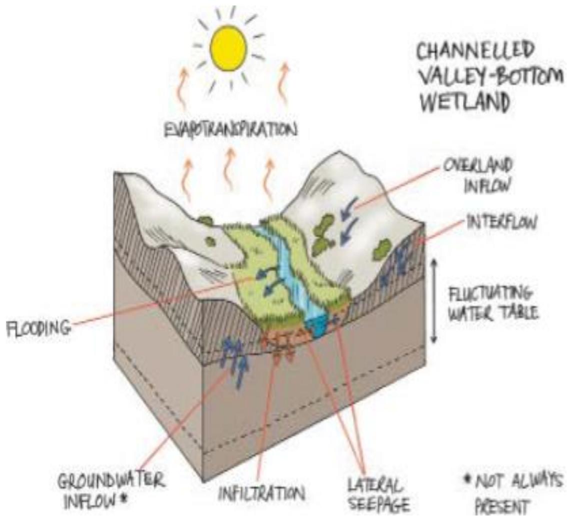
9. SITE-BASED FINDINGS

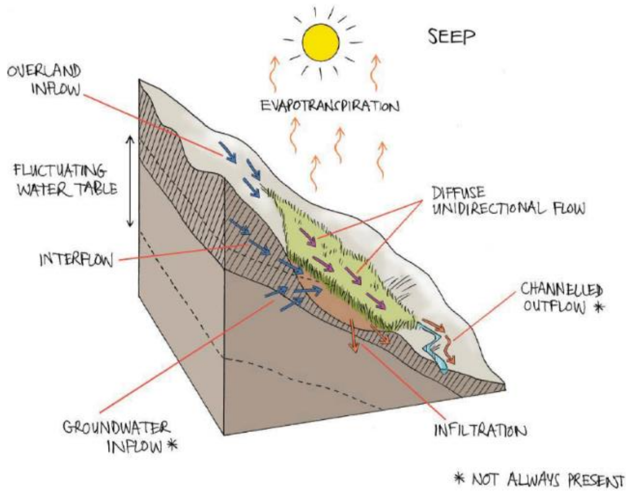
9.1. WETLAND DELINEATION, CLASSIFICATION AND CHARACTERISTICS

The study area presents a unique setting in which the watershed between two catchments dissects the Port Dunford boundary. This results in two distinct drainage areas (west and east) which have naturally developed due to the topography – Mlalazi River and tributaries to the west, draining to the Mlalazi Estuary, and the Mhlathuze River and tributaries to the east, draining to the Mhlathuze estuary).

The desktop evaluation, and subsequent field survey revealed the presence of sixty (60) HGM units, falling into two wetland HGM types: channelled valley bottom and hillslope seepage wetlands. In addition, three (3) estuarine regions are also present within the local landscape and are the focus of a separate estuarine assessment study. For further understanding of the freshwater HGM units occurring within the project area, DWAF (2008) and Ollis et al. (2013) have provided broad descriptions which are shown in Table 9-1.

Table 9-1 - HGM unit types present within the study site (DWAF, 2008; Ollis et al., 2013)

Classification	Illustration	Description
Channelled Valley Bottom		Channelled valley-bottom wetlands must be considered as wetland ecosystems that are distinct from, but sometimes associated with, the adjacent river channel itself, which must be classified as a 'river'. These valley-bottom wetlands are characterised by their location on valley floors, the absence of characteristic floodplain features and the presence of a river channel flowing through the wetland.

Classification	Illustration	Description
Hillslope Seepage Wetland		Wetland area situated on a gentle to steep sloping land that facilitates the dominance of colluvial, unidirectional movement of material and water (mainly in the form of interflow) downslope. Water inputs are primarily via subsurface flows from an up-slope direction. Seeps are characterised by their association with geological formations (lithologies) and topographic positions that either cause groundwater to discharge to the land surface or rain-derived water to 'seep' down-slope as subsurface interflow.

A summary of the wetland HGM types identified and delineated within the area of assessment is provided in Table 9-2 and illustrated in Figure 9-1.

Table 9-2 - Summary of Wetland characteristics for systems within the Mineral Rights Area (MRA) boundary.

CATCHMENT	WETLAND TYPE	EXTENT (Ha)
W12F	Channelled Valley Bottom	346.5
	Hillslope Seepage	384.68
W13B	Channelled Valley Bottom	105.77
	Hillslope Seepage	243.73
	Estuary (Mlalazi Estuary Estuarine Functional Zone (EFZ))	194.59
Grand Total		1275.27

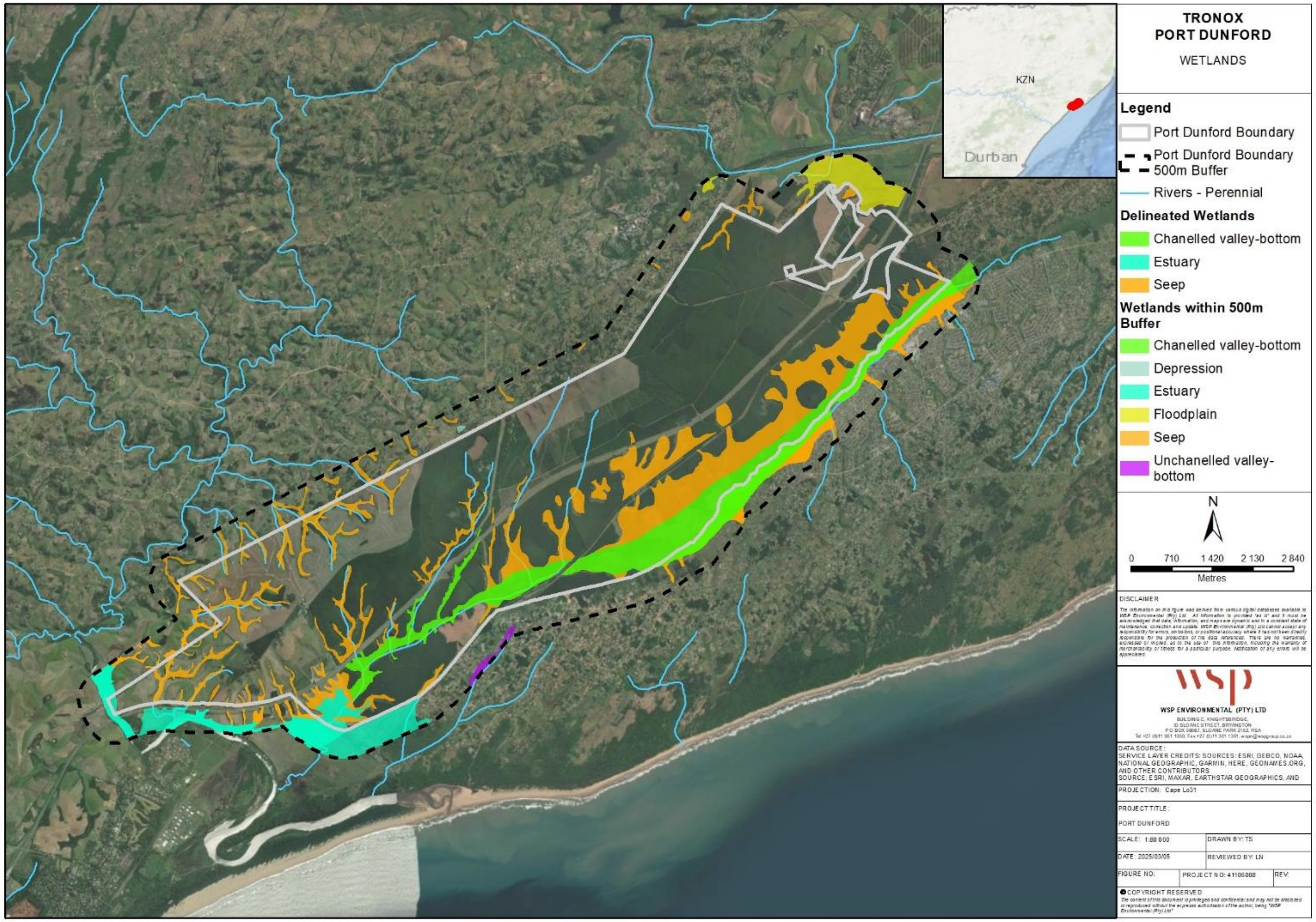


Figure 9-1 – Extent and classification of wetland HGM units identified within the proposed Port Dunford study area boundary and a 500m buffer thereof.

According to the surface water report compiled for the Tronox Port Dunford Project (WSPa, 2025), "*the surface water resources, including rivers, wetlands and lakes, are largely fed by groundwater sources. Therefore, groundwater plays a significant role in the hydrological dynamics of the catchments. Based on a report compiled for the Zulti-South Project, located to the immediate east of the Port Durnford Project Area, it was found that due to the high permeability of the upper unconsolidated sediments in the area, groundwater effective recharge is estimated to range from approximately 450 to 750 mm/year. This equates to approximately 50% of the annual rainfall*." As such, groundwater base flow plays an important role in sustaining the regional wetlands, particularly during drier periods when surface runoff contributions are limited. This characteristic of the wetlands is important in later discussions around the potential mine impacts.

Seepage wetlands

The seepage wetlands were identified throughout the study area and are largely situated within sugarcane fields and *Eucalyptus* plantation regions. These seepage wetlands are expected to be saturated due to lateral and subsurface water input from the catchment and linkage to groundwater. Some of the impacts observed in field included gully formation within the seepage wetlands, caused by channelized flows increasing flow velocity and erosion potential (Figure 9-2A & C). The wetland vegetation within these seepage systems consists of small sedges (*Cyperus sp*.) and lacked robust obligatory vegetation i.e. *Typha capensis* and *Phragmites australis* especially within agricultural landscapes (Figure 9-2B).

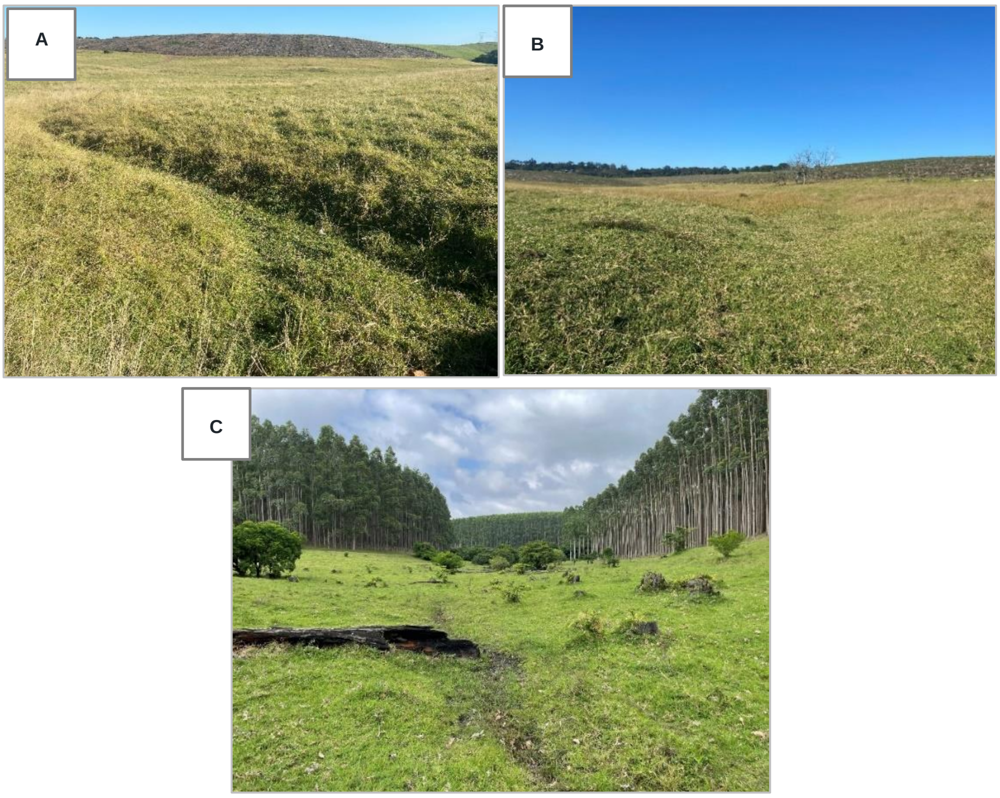


Figure 9-2 - Gully formation occurring within seepage wetland (A), Dominant vegetation consists of smaller sedges (B), Seepage wetland surrounded by *Eucalyptus* plantation.

Channelled Valley Bottom

The channelled valley bottom wetland (CVB) identified within the proposed Port Dunford study area has an extent of approximately 463ha. The system spans across the W12F and W13B catchments. The wetland is situated just south of the railway (Figure 9-1). The CVB system is fed from northern reaches via a vast network of seepage wetlands. The CVB wetland has a main channel system that runs through the central regions of the wetland. The site presents a unique setting as the western portion of the wetland drains towards the Mlalazi Estuary whilst the east drains towards the Qhubu Lake (also referred to as Cubhu Lake) which eventually connects with the Mhlathuze Estuary (Figure 9-3A). Due to fluctuations in discharge related to rainfall, the course of the channel within the valley bottom may change over short periods, with the extent of open water varying seasonally. The wetland is dominated by dense stands of *Phragmites australis* (Figure 9-3B) and *Typha capensis* (Figure 9-3C).

Figure 9-3 - The main channel that runs through the central regions of the system (A), Dominant vegetation includes *Phragmites australis* (B) and *Typha capensis* (C)

Swamp Forest

A swamp is a wetland permanently saturated with water and dominated by trees. There are two main types of swamps: freshwater swamps and saltwater swamps. Freshwater swamps are common in inland areas. Saltwater swamps protect coasts from the open ocean. The freshwater swamp forest habitats identified during the field survey contain a high species richness but are dominated by *Barringtonia racemose*. The swamp forest habitat was found to occur across both the seep and valley bottom wetland habitats but was largely confined to wetter areas within these larger wetland systems. Figure 9-5 gives an indicative extent of the larger bodies of swamp forest within the study area wetlands, though swamp forest habitat was also noted in the narrower seep wetlands in the west of the study area. Wetland W12F-04 was considered relatively pristine with the exception of minor encroachment of *Eucalyptus* forestry and infilling (Figure 9-4A). The soil profile extracted displays bleached horizons around 35cm which is indicative of wetland soils (Figure 9-4B). The swamp forest within W12-07B was significantly degraded and lacks the majority of the common canopy cover as a consequence of anthropogenic influence within the wetland region. The ground cover observed was predominantly sedges (*Cyperus sp.* and *Eleocharis sp.*) with pockets of alien invasives noted i.e., *Solanum mauritianum* and *Arundo donax* (Figure 9-4C). The soil sample displays rich organic matter (darker in colour) and grades into a distinct bleached horizon (Figure 9-4D).

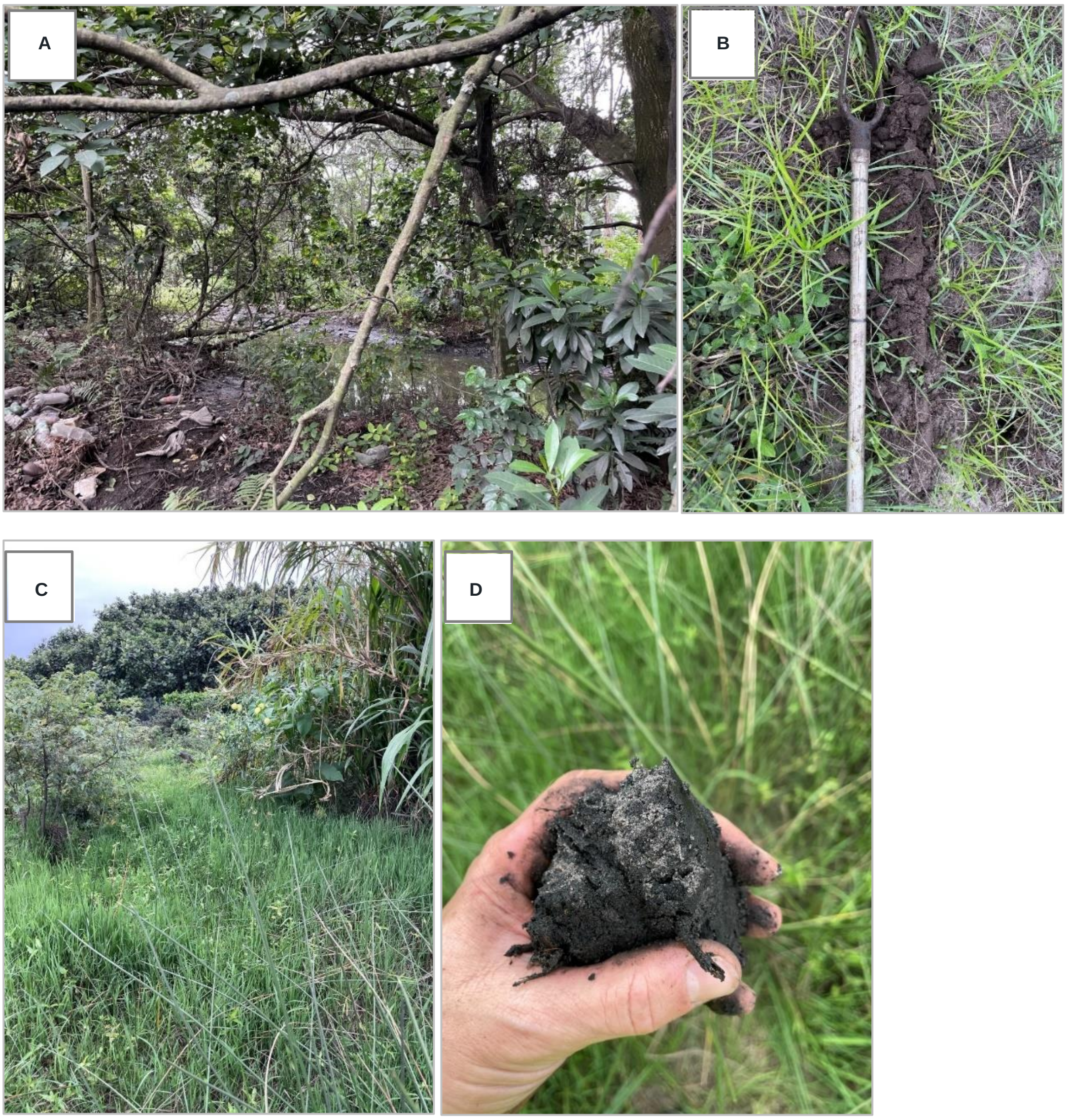


Figure 9-4 - Swamp forest undergrowth (A), Soil profile extracted (B), Alien invasive vegetation infiltrating within swamp forest (C), Distinct organic rich soils (D)

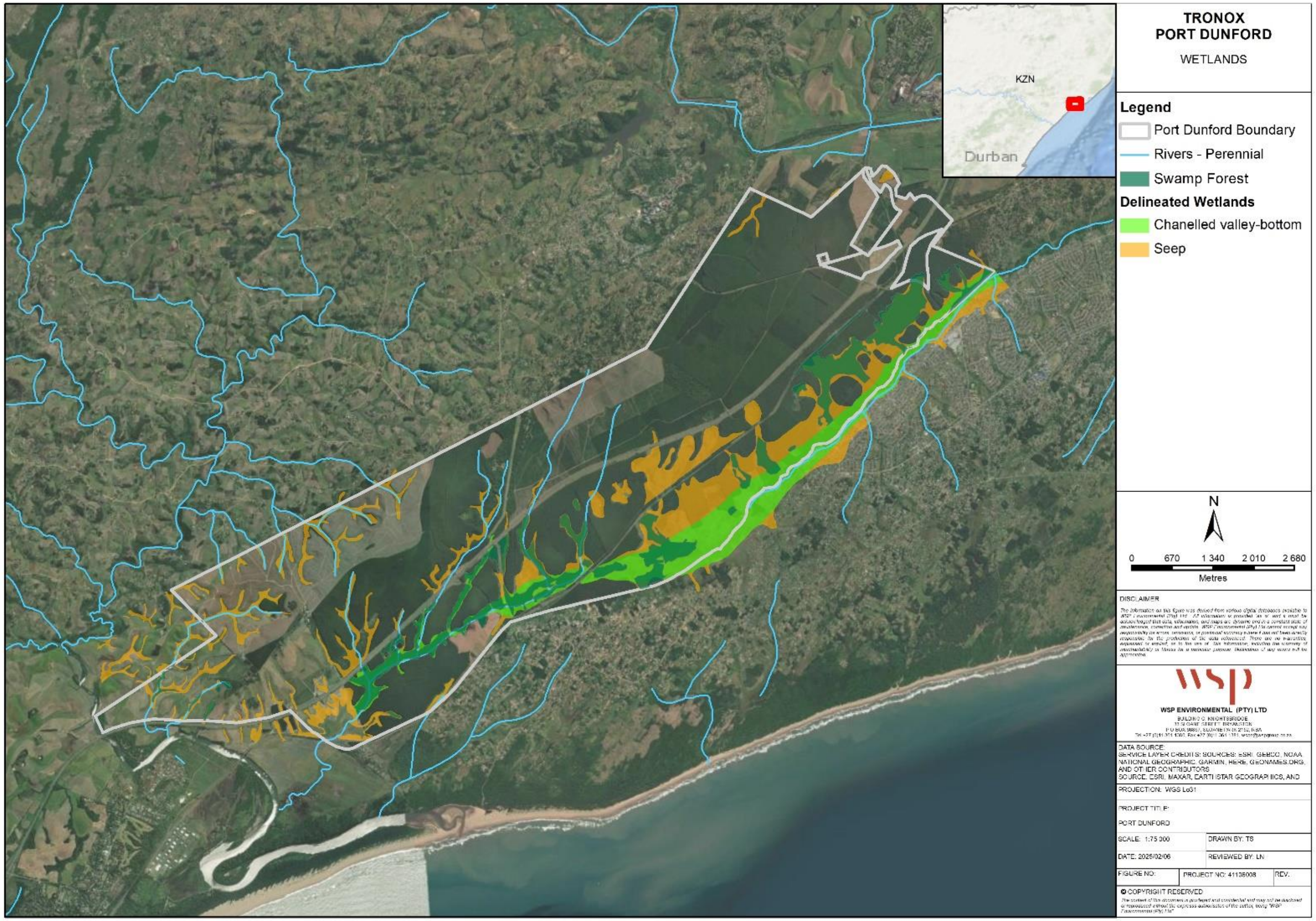


Figure 9-5 - Approximate extent of delineated swamp forest habitat within the broader wetland HGM extent.

Historically, the HGM units in this study area would have formed large, uninterrupted networks of wetland habitat linked to the drainage networks. However, with the rapid rate of anthropogenic change within the local landscape, the wetlands have become fragmented in places. To aid in the assessment of the wetlands and for ease of explanation, the wetlands have been subdivided into groupings in this report. Individual wetland HGM units have been placed into groups as per Table 9-3 and Figure 9-6 Figure 9-7 shows the wetland extent and grouping in relation to the proposed Port Dunford Mine infrastructure.

Table 9-3 - The grouping of wetland units based on surrounding landscape

Groups	Wetland Units
1 **(spit between catchments)** **Swamp forest surrounded by *Eucalyptus* plantation**	W12F-02 W12F-07 W12F-11 W12F-12 W12F-13 W12F-16
	W13B-18 W13B-41 W13B-42 W13B-43 W13B-44
2 **Relatively pristine swamp forest surrounded by *Eucalyptus* plantation**	W13B-16 W13B-17
3 **Fragmented swamp forest surrounded by *Eucalyptus* plantation**	W13B-13 W13B-15
4 **(split between catchments)** **Swamp forest surrounded by *Eucalyptus* plantation**	W12F-01
	W13B-01 W13B-10 W13B-12
5 **Highly impacted by anthropogenic impacts (housing developments)**	W12F-03 W12F-05 W12F-06 W12F-08 W12F-09 W12F-10
6 **Reed-dominated wetland adjacent to *Eucalyptus* plantation**	W13B-06 W13B-14

Groups	Wetland Units
7 **Relatively pristine swamp forest surrounded by *Eucalyptus* plantation**	W13B-05 W13B-07 W13B-08 W13B-09 W13B-11
8 **Wetland within sugarcane agricultural fields**	W13B-33 W13B-36 W13B-37 W13B-38 W13B-39 W13B-40
9 **Wetlands impacted by sugarcane agriculture and *Eucalyptus* plantations**	W12F-14 W12F-15
	W13B-02 W13B-03 W13B-19 W13B-20
10 **Wetland within sugarcane agricultural fields**	W13B-04 W13B-21 W13B-22 W13B-23 W13B-28 W13B-30 W13B-31 W13B-32
11 **Intact pockets of swamp forest within sugarcane agricultural fields**	W13B-24 W13B-29 W13B-35
12 **Fragmented swamp forest within sugarcane agricultural fields**	W13B-25 W13B-26 W13B-27 W13B-34
13 **Swamp forest surrounded by *Eucalyptus* plantations**	W12F-04

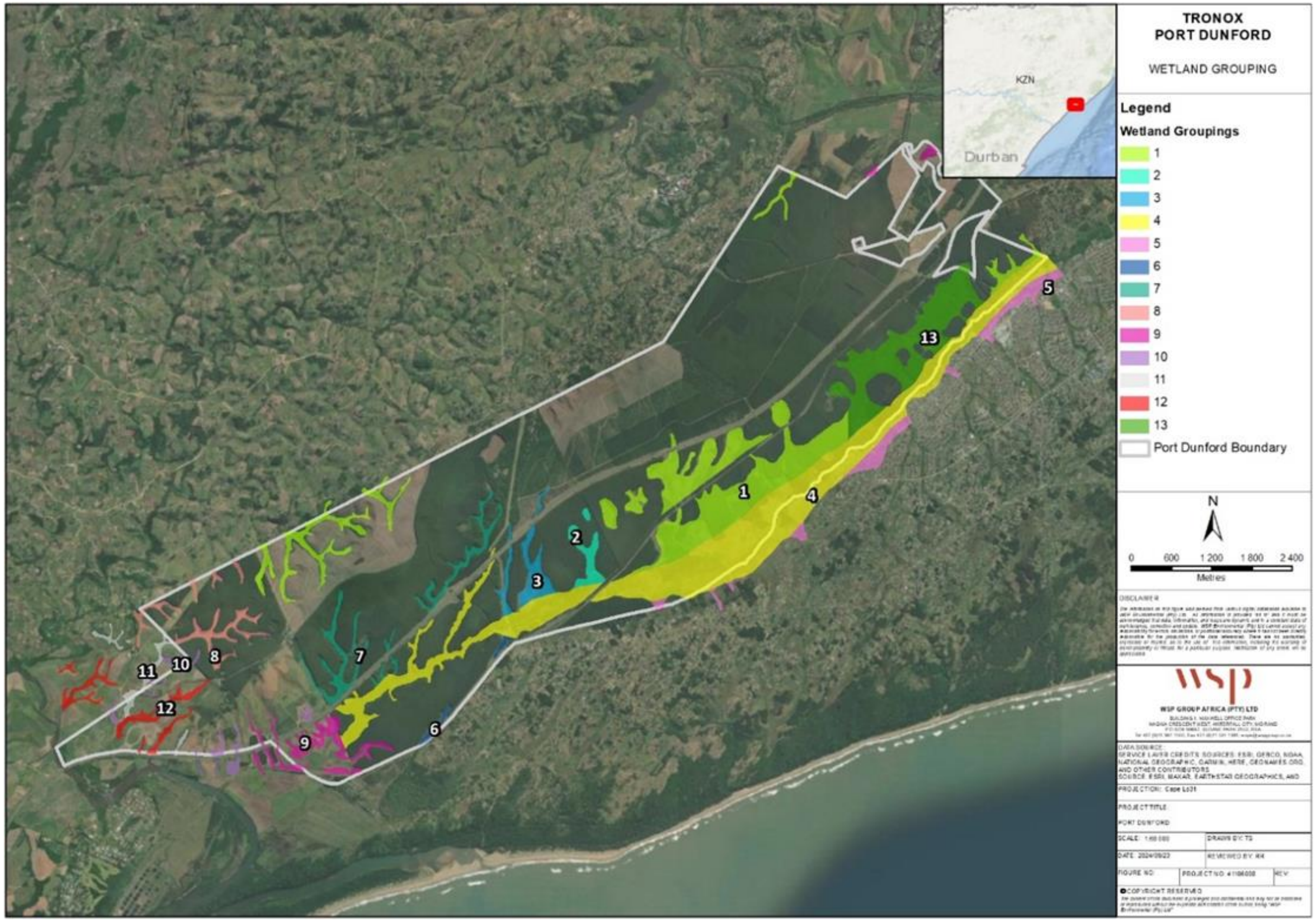


Figure 9-6- Wetland grouping based on surrounding landuse

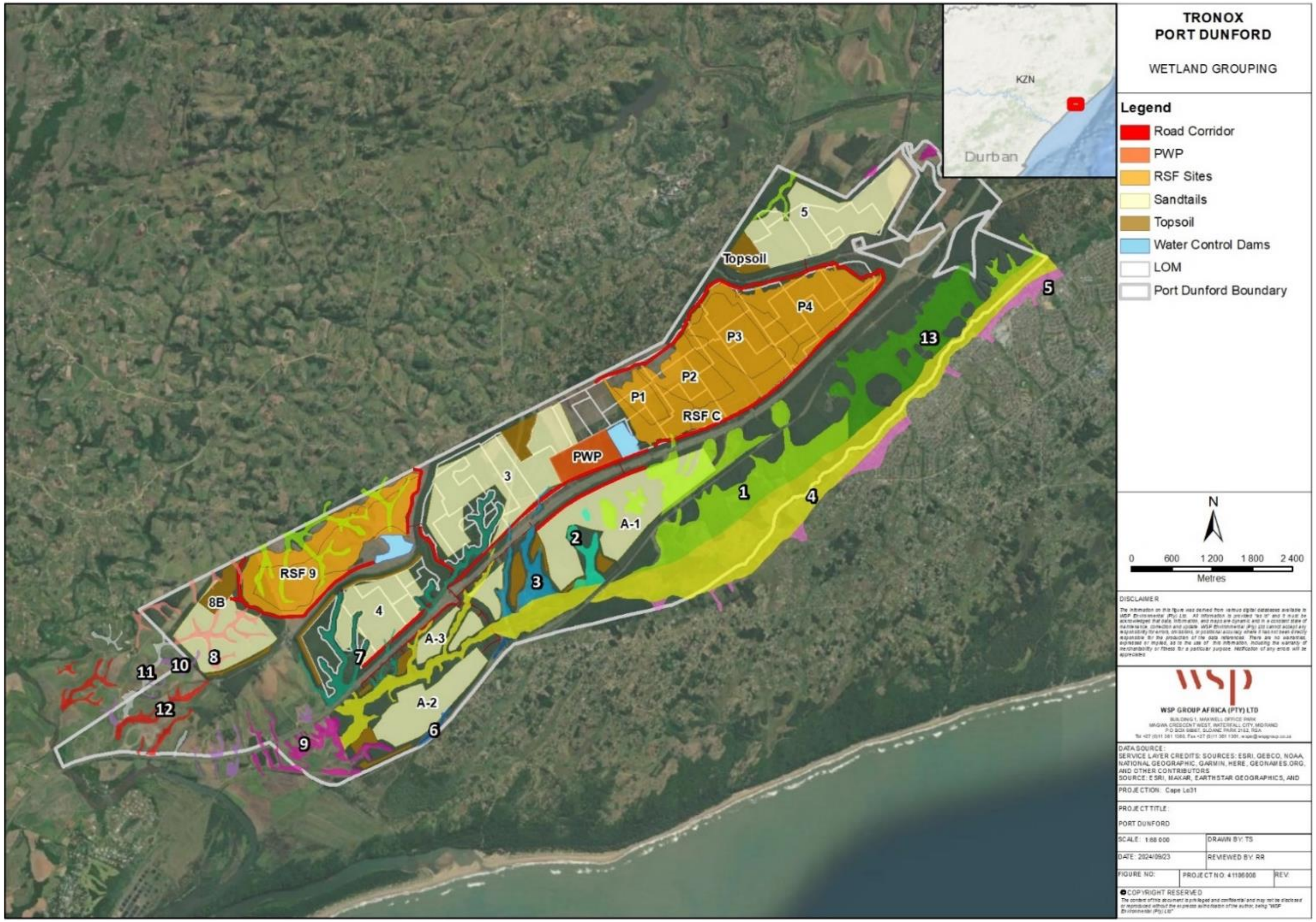


Figure 9-7 - The proposed infrastructure at Port Dunford in relation to the wetland groups on site.

9.2. WETLAND PRESENT ECOLOGICAL STATE (PES)

The state of the four main functional aspects of the wetland is considered for the WET-Health index. These are: (1) hydrology, (2) geomorphology, (3) water quality and (4) vegetation. The assessment of the ecological status of each of these functional aspects follows a broadly similar approach and is used to determine which impacts have affected the health status of the wetland. The assessment of the PES for these wetlands is presented below.

9.2.1. HYDROLOGICAL IMPACTS AFFECTING PES

Hydrological impacts experienced by the wetland groups relate to the presence of extensive *Eucalyptus* plantations, sugarcane agriculture, and road networks within the catchments. Roads that are located in close proximity to, or within, wetlands create preferential flow paths for surface runoff after rains, resulting in an increase in lateral and longitudinal soil erosion and mobilisation of sediment. Another impact identified due to roads is the impoundment and pooling of water at road crossings. Agricultural activities surrounding the wetlands also have a negative indirect impact on the hydrology of the systems. Sugarcane plantations can result in reduced flows into the wetlands as a consequence of surface water abstraction for irrigation purposes, as well as altered flow patterns due to trenching and flow diversion through cultivated footprints. *Eucalyptus* plantation forestry has been a dominant landuse within the study area boundary for a prolonged period of time (>50 years), and its presence is expected to have had a long-term impact on the wetlands through higher evapotranspiration of *Eucalyptus* trees over indigenous vegetation resulting in reduced runoff and catchment yield to the wetlands. In spite of this prolonged impact to the wetlands' supporting hydrology, areas of largely natural wetland habitat were still found to occur.

9.2.2. GEOMORPHOLOGICAL IMPACTS AFFECTING PES

Major geomorphological impacts on the wetland are associated with erosion gullies in the wetlands which have altered the geomorphological template and processes operating within the affected wetlands. Eroded sediments are transported into downstream areas leading to sedimentation and altered geomorphological structure.

9.2.3. WATER QUALITY IMPACTS AFFECTING PES

Observations made during the site visit suggest that while the clarity of the water flowing through the open water systems was high (i.e. low turbidity), there was evidence of nutrient loading with large amounts of algae thriving within the primary flow path of some of the wetlands. This suggests that the existing surrounding land uses, which include agricultural activities, are producing runoff that contains nitrates, and possibly phosphates. This has had a negative effect on the overall score for the water quality component of the PES assessments, especially for the wetlands found directly within the sugarcane plantations.

9.2.4. VEGETATION IMPACTS AFFECTING PES

Vegetation impacts to the wetland relate to reduced surface roughness/reduced vegetation cover, changes in vegetation species composition in the wetland resulting from overgrazing and the presence of alien invasive species. Additional impacts on wetland vegetation are those associated with *Eucalyptus* plantations and sugarcane agriculture which have occupied viable wetland habitat and reduced species diversity.

The above-described impacts and noted changes to the wetland habitat drivers (hydrology and geomorphology) and responders (water quality and vegetation) have caused the assessed wetlands to deviate from their assumed natural state. The outcomes of the PES assessment found the wetlands to currently lie along a spectrum of modification, ranging from largely natural (PES category B) to seriously modified (PES category E). The results of the PES assessment are illustrated in Figure 9-8, and detailed PES results per grouping are provided in Appendix 1 `

.

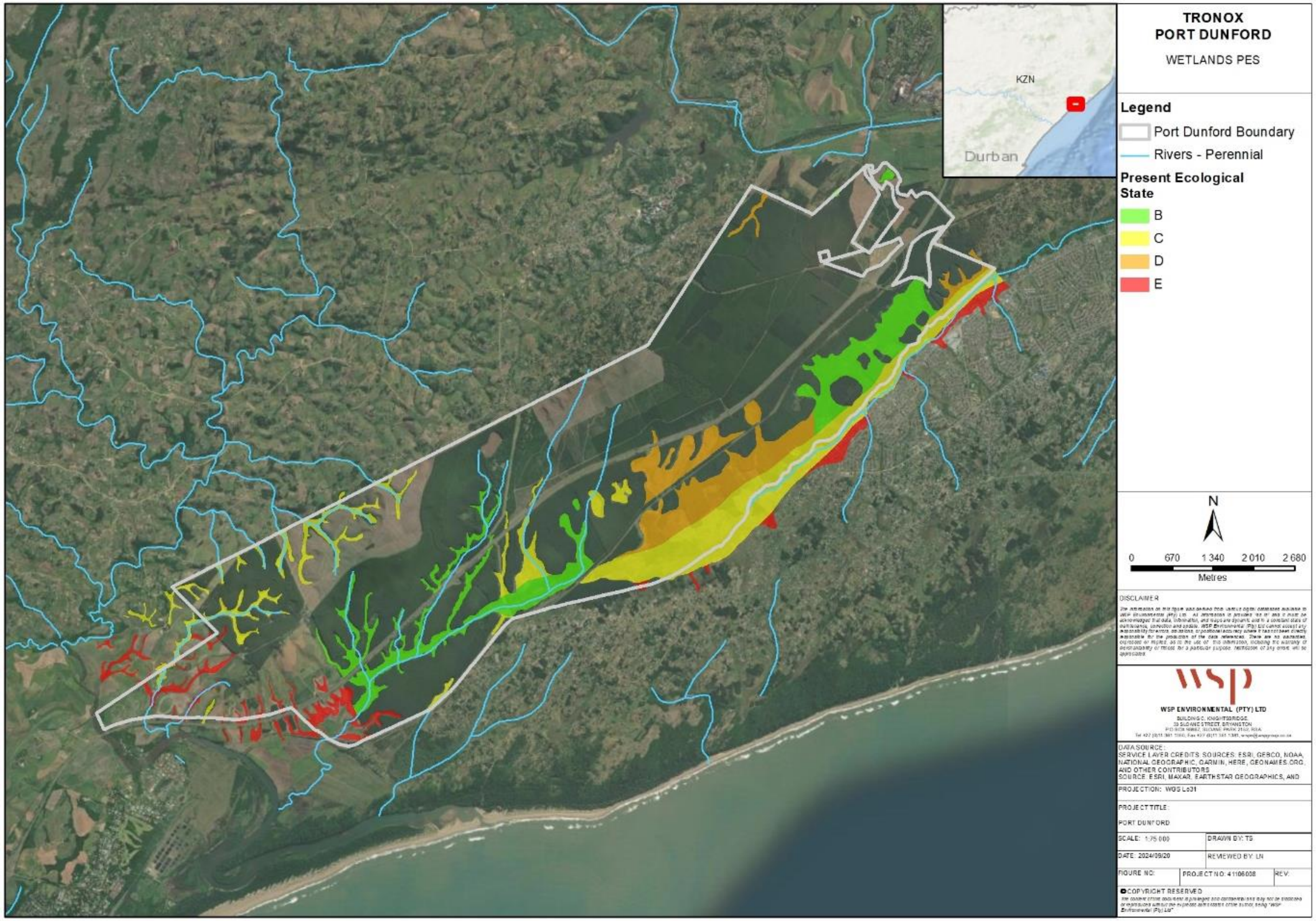


Figure 9-8 - PES of the wetlands within the proposed Port Dunford site.

9.3. WETLAND FUNCTIONAL ASSESSMENT

The WET-EcoServices assessment provides guidelines for scoring the importance of an HGM unit in delivering fifteen different ecosystem goods and services (Kotze *et al*., 2009). Ecosystem services include flood attenuation, streamflow regulation, sediment trapping, phosphate trapping, nitrate removal, toxicant removal, erosion control, carbon storage, maintenance of biodiversity, water supply for human use, natural resources, cultivated foods, cultural significance, tourism and recreation and education and research (Kotze *et al*., 2009).

The WET-Ecoservices assessments were undertaken for all of the wetland groups identified within the site boundary (refer to Appendix 3 for the detailed results of the ecosystem services assessments). Given that the various wetlands assessed are located in close proximity to each other in similar landscape settings and surrounded by the same land uses, results of the different wetland units assessed are largely similar.

The swamp forest wetlands, which exist as a mosaic within the larger HGM units, received scores that were moderate for streamflow regulation and sediment trapping, and high scores for biodiversity maintenance due to the variety of microhabitats provided by the swamp forests and noted important species identified in these habitats, such as Pickersgill's reed frog (*Hyperolius pickersgilli)*.

The seep wetlands are mostly situated within highly transformed agricultural lands and therefore reflect low scores, with a distinct pattern of water quality enhancing benefits due to filtering pesticides from adjacent farms.

The channelled valley bottom systems obtained moderate to high scores for streamflow regulation. These systems also displayed higher scores in biodiversity maintenance and direct provisional benefits such as water for human consumption.

9.4. WETLAND IMPORTANCE AND SENSITIVITY ASSESSMENT

The ecological importance of a wetland is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. Ecological sensitivity refers to the system's ability to tolerate disturbance and its capacity to recover from disturbance once it has been impacted (Kleynhans *et al.*, 1998). The EIS considers biodiversity, rarity, uniqueness and fragility of the resource. The intrinsic ecological value of the resource and its importance to the functioning of neighbouring ecosystems are the main concerns. Further considerations that informed the EIS assessment include:

- The location of the study area within a vegetation type - Maputaland Coastal Belt vegetation and swamp forests that are considered as critically endangered habitats, and which are afforded moderate protection.
- The Critical Biodiversity Area has identified the swamp forests within the site as irreplaceable status.
- The loss of natural vegetation and habitats due to current and past cultivation within the wetlands.
- Species of conservation concern (SCC) were identified within the Port Dunford site boundary (i.e. *Hyperolius pickersgilli* (Pickersgill's reed frog) – Critically Endangered).
- The wetlands towards the western portion of the site form part of the Estuarine Functional Zone of the Mlalazi estuary.

- The wetlands within the southeastern portion have been transformed as a consequence of residential developments.

The EIS assessment for the study area wetlands was conducted for all impacted HGM units with the results illustrated in Figure 9-9 and Appendix 4.

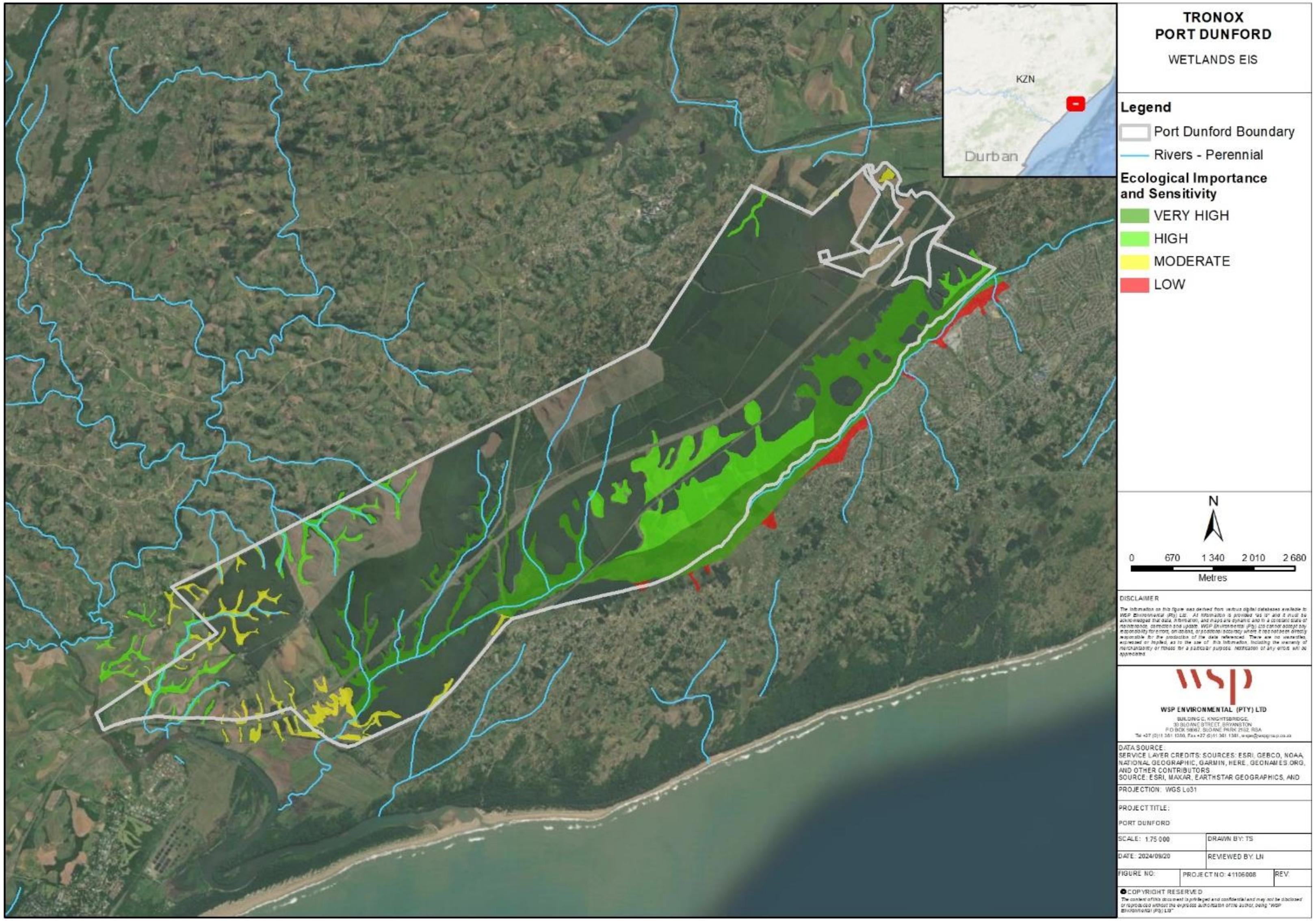


Figure 9-9 – Importance and Sensitivity of the wetlands within the proposed Port Dunford study area

9.5. RECOMMENDED ECOLOGICAL CATEGORY (REC) AND WATER RESOURCE MANAGEMENT OBJECTIVES

The future management of the freshwater ecosystems within the project area should be informed by the Recommended Ecological Category (REC) and associated recommended management objectives for the water resources. The REC is the target or desired state of resource units required to meet water resource management objectives and quality targets. It is determined through the consideration of the PES, EIS and realistic opportunities to improve the PES that is driven by the context / setting (Table 9-4). These results need to be interpreted in terms of the viability / feasibility of improvement and the desired characteristics of the wetlands based on the context of the catchment in terms of existing impacts/threats and future development pressures.

Table 9-4 - PES/EIS derived Matrix for the Determination of REC and Management Objectives for Water Resources.

			EIS			
			Very High	High	Moderate	Low
PES	A	Pristine/Natural	A Maintain	A Maintain	A Maintain	A Maintain
	B	Largely Natural	A Improve	A/B Improve	B Maintain	B Maintain
	C	Good - Fair	B Improve	B/C Improve	C Maintain	C Maintain
	D	Poor	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	Very Poor	D Improve	E/F Improve	E/F Maintain	E/F Maintain

Based on this matrix and the catchment context, the minimum recommended management objective for the assessed wetlands is listed in Table 9-5 Below:

Table 9-5 - REC and Management Objectives for the assessed wetlands

Groups	PES	EIS	REC
1: W12F	D	HIGH	C/D IMPROVE
1: W13B	C	HIGH	B/C IMPROVE
2	B	VERY HIGH	A IMPROVE
3	C	VERY HIGH	B IMPROVE
4: W12F	C	VERY HIGH	B IMPROVE
4: W13B	B	VERY HIGH	A IMPROVE
5	E	LOW	E/F MAINTAIN
6	C	MODERATE	C MAINTAIN
7	B	VERY HIGH	A IMPROVE
8	C	MODERATE	C MAINTAIN
9: W12F	B	MODERATE	B MAINTAIN

Groups	PES	EIS	REC
9: W13B	E	MODERATE	E/F MAINTAIN
10	E	MODERATE	E/F MAINTAIN
11	C	HIGH	B/C IMPROVE
12	E	HIGH	E/F IMPROVE
13	B	VERY HIGH	A IMPROVE

The above REC's for the wetlands are determined based on a generic matrix that does not taken into consideration the context of the wetlands being considered. Given the ongoing land uses within the landscape that supports these wetlands, it is highly unlikely that a PES category of A can be achieved in any of the wetland systems. A more realistic target would be to maintain the current PES of the wetlands in the long term or allow for limited and managed decline in PES in systems where activities known to affect wetland integrity are authorised.

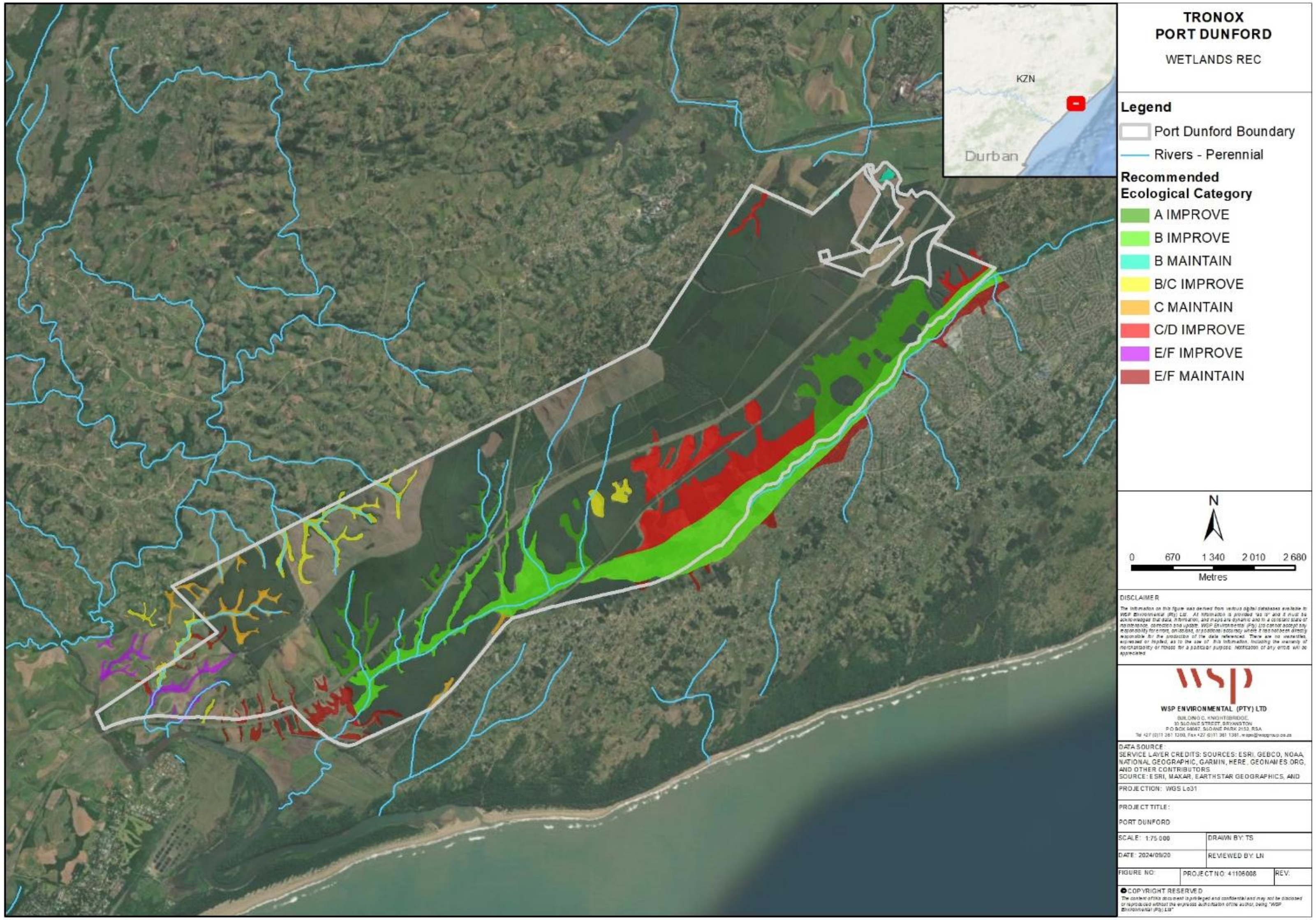


Figure 9-10 - The REC for the wetlands within the Port Dunford study area

10. WETLAND IMPACT ASSESSMENT

10.1. CURRENT IMPACTS

During the field survey, the current impacts that are having a negative impact on the sensitive wetland habitats were identified and are listed below. The effect of these impacts on the wetland ecosystems is discussed in the section detailing the PES of the wetlands.

- Dumping of litter in the wetland area
- Construction of a road network and bridges that traverse the wetland habitat.
- Rail network that crosses the wetland habitat
- Housing developments built within/close proximity to wetland habitats
- Alien Invasive Plants (AIPs)
- Sugarcane agriculture
- Extensive *Eucalyptus* plantations

10.2. PROJECT ACTIVITIES AND ASSOCIATED POTENTIAL IMPACTS

The proposed Port Dunford Heavy Mineral Mining operation will include the construction of the following infrastructure and designated regions:

- PWP,
- Open pit mining areas,
- RSF facilities,
- Water control dams,
- Sand Tails mounds
- Topsoil mounds and,
- Watercourse crossing infrastructure (pipelines, haulage road bridges, etc)

The proposed mining activities to be considered as part of the impact assessment are detailed in Section 2.2 and summarised below as follows:

- Phase 1 would last 10 years, from 2025 to 2035. The mining will operate at a low production rate of 100 tons per hour (tph) and 70 400 tons per annum (tpa). Active mining will occur five (5) days a week per month, 12 hours a day. The run-of-mine (ROM) material will be mined mechanically and hauled to the Fairbreeze mine via trucks for stockpile and processing. No processing on site is proposed for the Phase 1 mining operation. The infrastructure for Phase 2 will be constructed during the Phase 1 mining period.
- Phase 2 would last 33 years, from 2036 to 2069. The planned mining rate will be 3,000 tph, 24 hours a day, 365 days a year, at a design production rate of 3000 tonnes per hour. Phase 2 operation comprises opencast mining, on-site processing of ROM material in a primary wet plant (PWP), the on-site backfill and disposal of both coarse and fine sand tailings from the PWP and the transport of heavy mineral concentrate to the existing Tronox MSP located in Empangeni within the Tronox CPC.

Like any development, the proposed Port Dunford Mine facilities will have a series of potential impacts that need to be managed, particularly during the life of the mine. These mostly relate to the physical disturbance of the footprint of the mining operations and associated activities, such as *inter* alia vegetation removal, vehicle movements, excavations for pits, creation of facilities on site and earth moving activities. These activities are likely to have a negative impact on wetland habitat both directly within the footprint of the proposed development and downstream within affected catchments. Although impacts will be most severe and quantifiable within the Port Dunford boundary, certain impacts may translate to wetland habitat beyond the site boundary.

The project description and findings of the baseline wetland assessment were used to identify and quantify the potential impacts using the impact assessment approach detailed in Section 7.6. Additionally, the findings of the following studies were consulted to assist in the assessment of potential impacts to wetland habitats:

- Integrated Environmental Authorisation for the Port Durnford Mine, Kwazulu-Natal: Surface Water Baseline and Impact Assessment (WSP, 2025)
- Port Durnford Mine Hydrogeological Investigation (WSP, 2025)
- Soils, Land Capability, Land Use, and Hydropedology of the Port Durnford Mining Development (Red Earth, 2025).

To understand some of the potential hydrological impacts to wetlands posed by the proposed mine, there needs to be an understanding of certain key infrastructures and how they interact hydrologically with the environment, and therefore, the wetlands. The following can be stated based on a review of the surface water, and hydrogeological studies:

- The RSF material will be deposited as a slurry with 28% solids and 72% water and are expected to be a source of recharge to groundwater.
- The coarse sand tailings will be deposited as a slurry with 50% solids and 50% water and are expected to be a source of recharge to groundwater
- During operations, the groundwater levels are decreased due to mining activity (showing a drawdown) and increased due to deposition of wet sand tailings (showing a water level recovery).
- Although vegetation will be removed during the operational phase, the ore body areas will be contained resulting in a decrease in surface run-off and a potentially reduced catchment yield. This, however, will be for the short term as the mined ore body will be rehabilitated and the ground sloped to drain back to the original catchments. There is, however, currently forestry in the areas that are going to be mined. Forestry reduces runoff potential as it intercepts and uptakes rainfall and groundwater within areas that contribute to flow. Therefore, the areas to be occupied by mining and its associated infrastructure were already not contributing to the surface runoff. The baseflow simulation indicated that the mining activity will not impact the water quantities due to the reduction in baseflow in the catchments; instead, over time, the catchments will experience a slight increase in water quantities as the rivers are recharged as opposed to water being lost to evapotranspiration under the current land use.
- The findings of the surface water study regarding changes in base flow as a consequence of mining are relevant to the discussion of wetland hydrological impacts, as baseflow is considered to be an important driver of many of the wetlands, particularly during drier periods. Key findings are summarised below:

- KwaGugushe, Msasandla and Ojinjini Rivers (west of the Project Area) show an insignificant reduction in baseflow. The increase in baseflow is more significant due to the wet backfill/sand tailings.
- Baseflow to the Mhlatuze River (north of the Project Area) is limited as the area contributing to the Mhlathuze catchment is insignificant. Baseflow reduces from 2036, and the largest effect is seen from 2058 to 2061 during the mining of the north block. However, the wet backfill has a counter effect, and from 2061 to 2064, there is a significant increase in baseflow.
- Baseflow to the Mzingwenya River and the wetlands south of Lake Cubhu (northeast of the Project Area) is limited. It reduced slightly from 2036 to the end of mining. However, it increases from 2062 to 2064.
- Baseflow to the Amanzamnyama and Mlalazi Rivers and estuary (south of the Project Area) shows an insignificant reduction in baseflow from 2036. The baseflow reduction is significant from 2054 to 2058 and again from 2062 to 2065. An increase in baseflow due to deposition is evident for the following periods:
  - From 2037 to 2052 - due to deposition of sand tailings A1, A2 and A3.
  - From 2056 to 2058 - due to backfill in area 4.
  - From 2066 to 2067 - due to backfill in area 3.

10.3. IMPACT MITIGATION AND MANAGEMENT HIERARCHY

According to the NEMA, sensitive, vulnerable, highly dynamic or stressed ecosystems (such as wetlands and rivers) require specific attention in management and planning procedures, especially where they are subject to significant resource and development pressure. A risk-averse and cautious approach which considers the limits of current knowledge about the consequences of decisions and actions is therefore required, and the precautionary principle of ‘no-net-loss’ therefore applies. Cost-effective measures must be implemented to pro-actively prevent degradation of the region’s water resources. The protection of ecosystems and associated biodiversity predictably begins with the mitigation of risks and avoidance of negative impacts, and where avoidance is not feasible; to apply appropriate and practical actions that minimize or reduce impacts. Mitigation therefore requires proactive planning that is enabled by following the mitigation hierarchy (Figure 10-1).

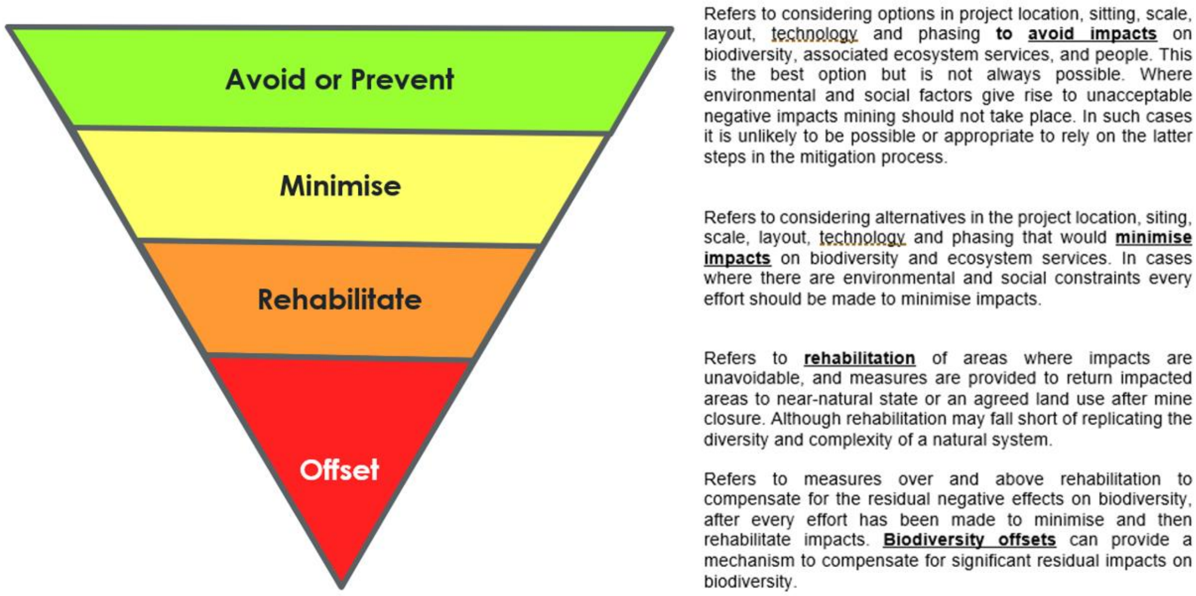


Figure 10-1 - Diagram illustrating the 'mitigation hierarchy' (DEA et al., 2013)

10.4. PRE-CONSTRUCTION PHASE

No impacts to wetlands are anticipated during the pre-construction phase, however, to limit the risk and significance of certain impacts to wetlands, it is proposed that scientifically determined buffers around wetland habitats be applied where feasible and practical. The proposed buffers should be integrated into the environmental planning and design of the project, and as far as possible, project activities and infrastructures should remain outside of these buffers.

10.4.1. BUFFER ZONES

Water resource buffer zones have been shown to perform a wide range of functions and have therefore been adopted as a standard measure to protect water resources and associated biodiversity (Macfarlane & Bredin, 2017a). Some of these key functions include:

- Maintaining basic aquatic processes.
- Reducing impacts on water resources from upstream activities and adjoining land uses.
- Providing habitat for aquatic and semi-aquatic species.
- Providing habitat for terrestrial species.
- A range of ancillary societal benefits.

However, though buffer zones can potentially provide some, or all, of the above-mentioned functions, not all water resource related problems can be addressed simply by applying a buffer zone, and they should ideally be implemented with a range of complementary mitigation and management measures (Macfarlane & Bredin, 2017a). Notable impacts or threats to water resources that cannot necessarily be addressed through the application of a buffer zone alone include:

- Point-source discharges (such as sewage outflows),
- Hydrological changes caused by stream flow reduction, and

- Groundwater contamination or use

The wetland buffer tool identified buffer distances for wetlands based on the type of mineral sand deposits that will be in close proximity of the wetlands, as per Table 10-1 below. However, it must be noted that in many instances, according to the current mine plan, infrastructure will overlap with the wetlands, leaving no opportunity for buffers to be effectively applied. Where infrastructures that could act as a sediment source intersect wetland habitat, as will be the case with RSF9, and several of the larger sand tails mounds, other mitigation measures, as proposed in Section 10.6.2.3, would be more appropriate and effective in minimising impacts to wetland habitat. The LOM has already been amended in places to avoid large (though not all) areas of wetland habitat and a 30m buffer. Where possible within the project constraints, it is suggested that the footprints of the topsoil and sand tails mounds be revised slightly to avoid intersecting with wetland habitats and remaining outside of a 30m buffer thereof. Other anticipated impacts, such as hydrological changes, are specifically not addressed through the application of buffers, and therefore application of these buffers would do little to minimise any hydrological changes. Buffer areas recommended by other specialists to address impacts to specific wetland SCC's may be more applicable in this instance.

It is important to note that application of the buffer zones, and exclusion of project activities from within the buffer zone where feasible, should be seen as part of a suite of mitigation and management tools required to minimise impact to the aquatic environment as a result of proposed development. Therefore, application of the buffer zones does not exempt the user from effectively and fully applying other recommended mitigation and management measures considered necessary to protect the wetland habitats from impact.

Table 10-1 - Recommended wetland buffer distances to be adopted for the proposed development

Buffer Tool	
Wetlands adjacent to Residue Fine Tailings (RSF)	45m
Wetlands adjacent to Sand Tails & Topsoil/Overburden material	30m

10.5. CONSTRUCTION PHASE

10.5.1. ANTICIPATED IMPACT DESCRIPTION

The construction phase will encompass construction of the Phase 1 infrastructure area, and preconstruction of the phase 2 PWP during the period 2025 to 2035. The construction phase will include vegetation clearance, topsoil and overburden removal of the Phase 1 mine area, construction of proposed infrastructure and general construction activities, including use of the road network, handling of potentially polluting materials and waste.

No wetland habitat lies within the Phase 1 mine footprint or the PWP footprint, therefore no direct loss of wetland habitat is anticipated during construction. Construction activities could result in wetland habitat degradation within adjacent or downstream wetlands through altered geomorphology of the wetlands, water quality deterioration, or changes to the hydrological regime supporting the wetlands.

The wetland systems potentially affected by these impacts are the seepage wetlands draining southwards across the N2, which drain towards the Amanzamnyama River, and to a lesser extent, the seepage wetlands draining to the southeast below the N2 towards the Mzingwenya River. Potential impacts include the following:

10.5.1.1. Altered wetland geomorphology

During site clearance undertaken as part of construction, areas of bare soils will be exposed to erosion during rainfall events. Earthworks and the stockpiling of topsoil represent further erosion risks and sediment sources. Where existing roads are expanded or upgraded, there is also a risk of flow concentration, erosion and sedimentation. Run-off from these areas is likely to be sediment-rich and could enter the adjacent wetlands, leading to increased sedimentation in the wetlands, increased turbidity and suspended sediment loads, as well as changes to the wetlands substrate where the sediment is deposited. If sediment originating from these activities and infrastructures does reach the wetlands, these changes will impact on the biodiversity of the wetland, potentially with short-term, negative effects.

10.5.1.2. Water quality deterioration

Water quality deterioration with the receiving wetlands could take place during the construction phase predominantly due to increased turbidity and suspended solids derived from soil erosion on the bare soil surfaces exposed during construction. In addition, use of hazardous substances such as oil, diesel, cement, etc. during the construction process could lead to pollution of water resources through spillages and leakages.

10.5.1.3. Altered hydrological regime

Vegetation clearing, soil compaction and an increased extent of hardened surfaces could lead to reduced flow infiltration to the soil profile in favour of surface runoff. In addition to increasing the risk of erosion, as discussed above, increased surface runoff may alter the hydrological regime of the downstream wetlands, which are largely supported by groundwater. However, given the small areas being affected by construction activities, it is unlikely that the reduction in groundwater recharge experienced will significantly affect the wetlands.

10.5.2. MITIGATION AND MANAGEMENT RECOMMENDATIONS

The following mitigation and management measures are recommended to limit wetland habitat degradation outside the footprints of the construction activities:

- Site preparation for the proposed infrastructure should be confined to demarcated footprint areas to minimise soil disturbance and the probability of sedimentation of receiving wetlands.
- Construction should be undertaken during the dry season to minimise soil erosion by overland flow and subsequent sedimentation in nearby watercourses since there will be minimal to no rainfall during this period.
- Road upgrades at watercourse crossings should be undertaken during the dry season and design and construction activities should not lead to flow impoundment upstream of the crossing, or flow concentration through the crossing. Measures should be put in place to limit concentrated surface runoff from the road surface and sediment runoff into the watercourses.
- A construction stormwater management plan must be developed and implemented prior to the commencement of large-scale vegetation clearing activities or construction activities and be

maintained until the end of the construction phase. Such a plan should aim to minimise the transport of sediment off site as well as prevent the discharge of high velocity flows into downslope wetlands. Sediment traps and sediment barriers should be installed where necessary, and clean water discharge points should be protected against erosion and incorporate energy dissipaters.

- Sediment transport off the site must be minimised through the establishment of perimeter sediment controls. This can be achieved through the installation of sediment fences along downslope verges of the construction site. Where channelled or concentrated flow occurs, reinforced sediment fences or other sediment barriers such as sediment basins should be used.
- Implement erosion management at construction sites to reduce the velocity of water flowing downslope. This can be done by implementing a series of berms across the construction site after vegetation clearance, which can be removed as construction progresses.
- Disturbed areas remaining after construction activities should be rehabilitated timeously, i.e., rip soils and revegetate (if required).
- All hazardous substances used on site (including all diesel, oil, explosives, cement etc.) should be stored in designated, bunded areas, and spill kits should be in place. Onsite personnel should be trained to use spill kits to contain and clean up any leakages or spills of fuels, oils, and grease. No surface run-off from these areas may be allowed to enter any clean water run-off or the wetlands on site.
- Regularly monitor TSS, TDS, turbidity, oils, and grease in surface waters upstream and downstream of construction activities to facilitate the prompt implementation of remedial actions, if necessary.
- Vehicle and machinery should be inspected, washed, and serviced regularly in designated areas to avoid accidental leaks and spills.
- Administer timely clean-ups in the event of spillages occurring.

Table 10-2 – Wetland Impact Assessment: Construction Phase (Phase 1 and Phase 2)

							Pre-Mitigation								Post-Mitigation						
Impact number	Aspect	Feature	Phase	Project Stage	Impact Description	Character	Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating	Mitigation Measures	Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating
1	Wetlands	Vegetation clearance and earthworks (Phase 1 area, Phase 2 PWP)	Phase 1 and start of Phase 2	Site Establishment	Wetland habitat degradation through altered geomorphological characteristics (sedimentation & erosion) in downstream wetlands	Negative	3	2	3	3	3	33	N3	Site preparation for the proposed infrastructure should be confined to demarcated footprint areas to minimise soil disturbance and the probability of sedimentation of receiving wetlands. Construction should be undertaken during the dry season to minimise soil erosion by overland flow and subsequent sedimentation in nearby watercourses since there will be minimal to no rainfall during this period. Road upgrades at watercourse crossings should be undertaken during the dry season and design and construction activities should not lead to flow impoundment upstream of the crossing, or flow concentration through the crossing. Measures should be put in place to limit concentrated surface runoff from the road surface and sediment runoff into the watercourses. A construction stormwater management plan must be developed and implemented prior to the commencement of large-scale vegetation clearing activities or construction activities and be maintained until the end of the construction phase. Such a plan should aim to minimise the transport of sediment off site as well as prevent the discharge of high velocity flows into downslope wetlands. Sediment traps and sediment barriers should be installed where necessary, and clean water discharge points should be protected against erosion and incorporate energy dissipaters. Sediment transport off the site must be minimised through the establishment of perimeter sediment controls. This can be achieved through the installation of sediment fences along downslope verges of the construction site. Where channelled or concentrated flow occurs, reinforced sediment fences or other sediment barriers such as sediment basins should be used. □Implement erosion management at construction sites to reduce the velocity of water flowing downslope. This can be done by implementing a series of berms across the construction site after vegetation clearance, which can be removed as construction progresses. Disturbed areas remaining after construction activities should be rehabilitated timeously, i.e., rip soils and revegetate (if required). All hazardous substances used on site (including all diesel, oil, explosives, cement etc.) should be stored in designated, bunded areas, and spill kits should be in place. Onsite personnel should be trained to use spill kits to contain and clean up any leakages or spills of fuels, oils, and grease. No surface run-off from these areas may be allowed to enter any clean water run-off or the wetlands on site. Regularly monitor TSS, TDS, turbidity, oils, and grease in surface waters upstream and downstream of construction activities to facilitate the prompt implementation of remedial actions, if necessary. Vehicle and machinery should be inspected, washed, and serviced regularly in designated areas to avoid accidental leaks and spills. Administer timely clean-ups in the event of spillages occurring.	2	1	1	3	2	14	N1
						Significance	N3 - Moderate								N1 - Very Low						
2	Wetlands	Vegetation clearance and earthworks (Phase 1 area, Phase 2 PWP)	Phase 1 and start of Phase 2	Site Establishment	Wetland habitat degradation through water quality deterioration	Negative	3	3	3	3	3	36	N3		2	1	1	3	2	14	N1
						Significance	N3 - Moderate								N1 - Very Low						
3	Wetlands	Construction of proposed infrastructure	Phase 1 and start of Phase 2	Site Establishment	Wetland habitat degradation through altered hydrological regime supporting downstream wetlands	Negative	2	2	1	4	2	18	N2		2	2	1	4	1	9	N1
						Significance	N2 - Low								N1 - Very Low						

10.6. OPERATIONAL PHASE

10.6.1. ANTICIPATED IMPACT DESCRIPTION

The operational phase will be split between Phase 1 (Year 2025-2035) and Phase 2 (2036-2069. Potential impacts include the following:

10.6.1.1. Direct wetland habitat loss

Complete loss of wetland habitat will occur wherever project footprints (opencast pits, RSF facilities, topsoil and sand tails stockpiles, dams, and other supporting infrastructures) overlap directly with wetland habitat. This loss of wetland habitat is conservatively assumed to be permanent.

The originally proposed Port Dunford mine plan intersected considerably with sensitive habitats, such as wetlands, and to reduce the environmental impact, the mine plan has been revised prior to this point to avoid sensitive environmental habitats to a greater extent. The original mining footprint presented in the scoping phase has been reduced significantly to exclude environmentally sensitive areas, including delineated wetlands, CBA and areas comprised of indigenous vegetation. Although not all wetlands are now excluded from the mine plan, where the Life of Mine (LOM) has been amended to avoid wetland habitat, a 30m buffer has also been applied around excluded wetlands. This effort to avoid impact to wetlands to a greater extent illustrates an effort to apply the mitigation hierarchy through impact avoidance.

The currently proposed mine plan does still infringe on wetland habitat, though to a lesser degree. The total extent of direct wetland habitat loss under the current mine plan is approximately 124 hectares (see Table 10-3 and the areas of wetland loss illustrated in Figure 10-2). The RSF9 facility in the west of the mine boundary, and sand tails stockpiles in the west (Stockpile 8B) and in the centre (Stockpile 1A) of the mine boundary will result in the largest loss of wetland habitat, which is largely classified as hillslope seepage wetland containing areas of swamp forest habitat.

Table 10-3 - Anticipated wetland loss (hectares) associated with the Port Dunford Mine.

Infrastructure	Wetland Loss Area (Ha)
LOM/RSF C	3.45
Road Corridor	2.15
RSF 9	35.86
Sandtails/Topsoil	82.14
Grand Total	123.6

Figure 10-2 - Wetland habitat loss within the Port Dunford Mine footprint

10.6.1.2. Wetland habitat degradation through alteration of the hydrological regime

As discussed in Section 10.2, the proposed mining activities will influence the hydrology driving the wetlands (both base flow and surface runoff) in the following ways:

- Mine areas will remove areas of the catchments of wetlands downslope within the same catchments, potentially reducing surface water catchment yield to the wetlands.
- However, the planned mining will replace current *Eucalyptus* forestry, thereby potentially increasing surface water (and base flow) availability to the wetlands through reduced evapotranspiration.
- During mining, groundwater level will be temporarily depressed below and surrounding active mining pits, and base flow to rivers will be reduced temporarily. This depression in groundwater and base flow reduction will be of short duration (generally periods of <5 years) for any given area. The wetland systems affected will depend on the area actively being mined at that time.
- Backfill of the mine pits with sand tails, deposition of RSF fill, and placement of additional sand tails mounds below the N2 and west of RSF 9 will increase recharge to groundwater and base flow sustaining the wetlands, as well as expected toe seepage contributing to surface water runoff along the lower margins of sand tails in some instances.

The above indicates that the proposed mining is likely to affect the hydrological regime of the wetlands remaining within the Port Dunford area and may translate some distance downstream to wetlands beyond the mine boundary. However, quantification of this impact, given the opposing forces contributing to potential increase versus decrease in surface runoff and groundwater recharge, is challenging. Base flow is thought to be important in sustaining the wetlands during drier periods, while surface runoff will play an important role in driving seasonality during high rainfall periods. It is expected that the spatially shifting drawdown cone (depressing groundwater level) will drive localised and temporarily (<2 years) drier conditions within the wetlands which could result in shifts in the wetland vegetation community in response. Swamp forest vegetation communities are largely limited to permanently saturated (waterlogged) conditions, therefore catchment hydrological changes that may result in reduced baseflow to the wetlands could result in alteration of one of the key drivers maintaining this vegetation type and potentially resulting in change. However, as already described, these potentially drier periods will be offset by periods of increased recharge, elevated baseflow, and likely wetter conditions in downstream wetlands. These potentially drier and wetter conditions may drive localised vegetation community shifts within the wetlands that could be advantageous to species that thrive in unstable conditions, such as pioneer and alien invasive species. However, the overall impact is temporary and the wetlands, at an HGM unit scale are unlikely to be significantly impacted.

10.6.1.3. Wetland habitat degradation through alteration of geomorphological processes

Sediment transport into wetland habitat and erosion of wetland soils can have significant effects on wetland integrity, having knock-on effects to flow patterns, vegetation composition and structure, and water quality.

There is anticipated to be increased sediment loads from mining areas and coarse and fine sand tailings disposal facilities, including sand dumps. Mining will potentially expose sediment and runoff from exposed areas during the operational phase, depositing these sediments into the wetlands, especially during heavy rainfall events. This can lead to vegetation smothering, increased turbidity of open water, and altered geomorphological structure of the wetlands. Wetlands can act as valuable sediment traps limiting sediment transport to downstream rivers. However, there is the risk that this capacity could be exceeded and that the wetland habitat could become degraded as a consequence.

Wetland erosion could occur at any point source flow discharge locations, or at flow concentration points, such as road or linear infrastructure crossings through wetlands, where concentrated, higher velocity flow has a greater erosive energy.

10.6.1.4. Wetland habitat degradation through water quality degradation

Water quality within the wetlands can be impacted through point sources discharges and diffuse pollution. No point source discharges are planned from the proposed operations. Therefore, potential impacts will arise from accidental point sources and diffuse sources. Accidental point source pollution can arise from the following activities,

- Spills from pipelines (slurry) and vehicles (fuel, oil, grease, ore).
- Flooding causing mixing of clean and dirty waters, including RSF breach.
- Discharges or spillage of surplus stormwater.

Diffuse pollution, which is often more difficult to manage, can arise from:

- Seepage from the open pits and sand dumps (directly to surface waters and indirectly via groundwater) affected by geochemical changes and process reagents.
- Unmanaged stormwater runoff from contaminated surfaces.
- Runoff from exposed areas, including sand dumps, carrying increased sediment load which can increase turbidity in receiving watercourses.

10.6.1.5. Wetland habitat degradation through vegetation disturbances

Wetland vegetation, including areas of swamp forest present in both the seep and valley bottom wetlands, may be disturbed through changes in hydrology that create drier or wetter conditions that cause a shift in species composition, sediment deposition that leads to physical burial of vegetation, or encroachment of alien invasive and pioneer species that establish in areas of disturbance. A key driver of invasion by alien plants is high disturbance. Exotic species are often more prevalent near infrastructural disturbances than further away. Typical consequences of this include the loss of indigenous vegetation, change in vegetation structure and habitat, increased water consumption and impaired wetland functioning. Swamp forest vegetation communities are largely limited to permanently saturated (waterlogged) conditions, therefore catchment hydrological changes that may result in reduced baseflow to the wetlands could result in alteration of one of the key drivers maintaining this vegetation type and potentially resulting in change.

10.6.1.6. RSF Dam Breach

Residue Storage Facilities (RSF) provide a cost-effective means of storing large volumes of waste slurry over the productive phases of mine life allowing for the discontinuation of other detrimental waste-management practices, such as riverine tailings disposal, where tailings are piped directly into river system. However, owing to their size, tailings dams are considered a major hazard that can pose risks to local people and the environment. Breaches near watercourses have been shown to be detrimental to aquatic ecosystems functioning, and the tailings can intermix with natural soil/sediment and result in long term impacts to stream chemistry (Byrne et al., 2018; Marais et al., 2024).

Based on the Dam Breach and Flow Slide (DBFS) analysis report (Epoch Resources, 2025), which was aimed at estimating potential outflow volumes associated with potential breaches in the RSFs, It was determined that should the RSF facilities breach, though considered to be of low probability, a significant volume of residue is expected to be released from the RSFs in the event of a failure (approximately 20.5% and 20% of stored material could potentially breach from Sites 9 and C, respectively)(Epoch, Resources, 2025) and will affect a considerable portion of the downstream wetland regions, including but not limited to hillslope seep and channelled valley bottom wetlands associated with the Mzingwenya River, and wetlands associated with the KwaGugushe and Mlalazi Rivers (Groups 1, 4, 5, 8, 9, 10, 11, 12 and 13) (Figure 10-3).

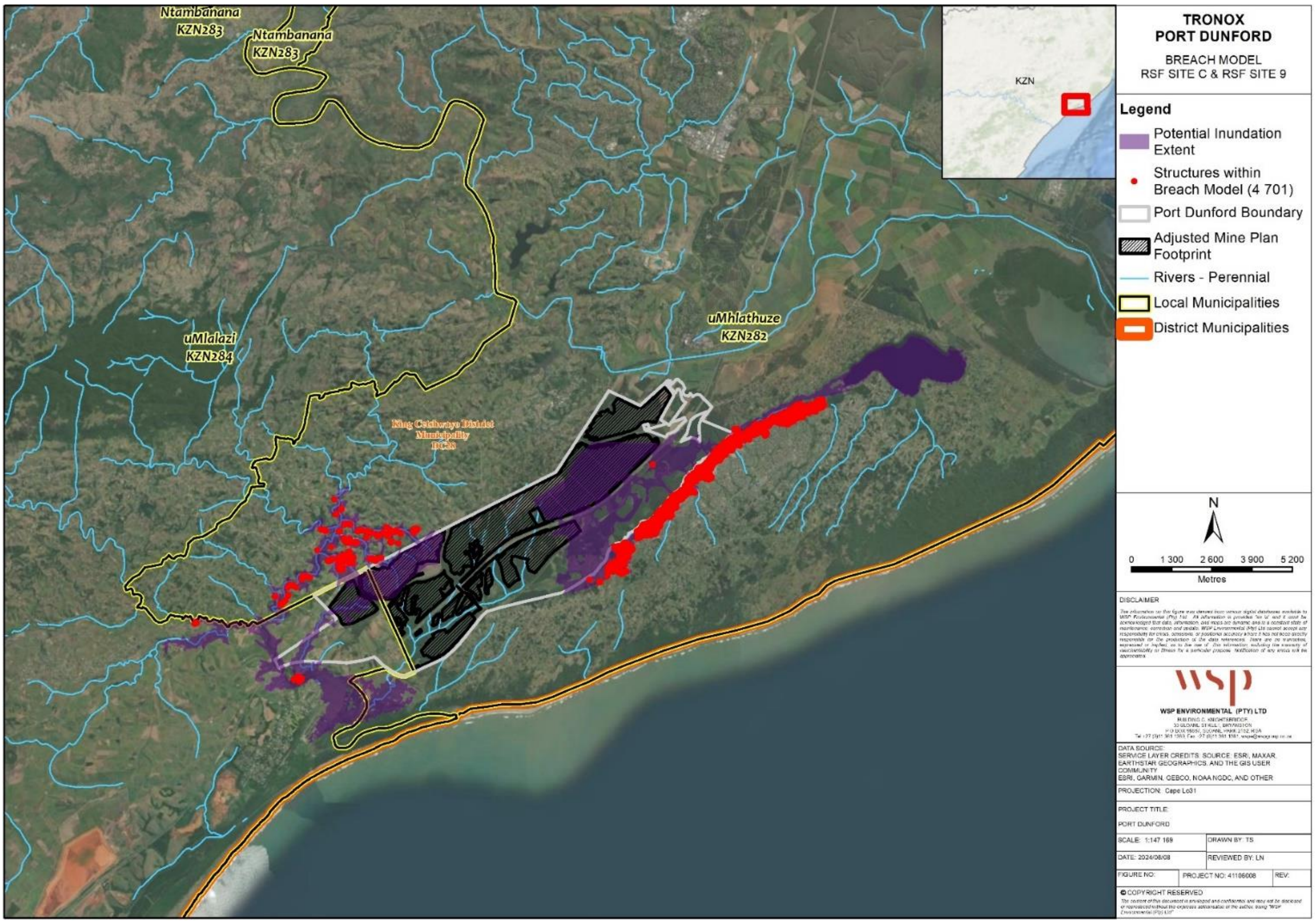


Figure 10-3 - RSF facility dam breach model, highlighting possible inundated regions

10.6.2. MITIGATION AND MANAGEMENT RECOMMENDATIONS

10.6.2.1. Wetland Habitat Loss

Wetland loss is unavoidable within the footprint of approved activities. The following avoidance and minimisation measures are recommended:

- It is suggested that the sand tails and topsoil stockpiles below the N2 be reshaped slightly to avoid intersecting marginally with wetland habitats, and wherever possible, a 30m buffer. This will realise a small reduction in wetland loss.

- All construction activities must be limited to the smallest area possible by remaining fully within authorised and clearly demarcated areas.
- No stockpiles should be placed in wetland habitat, except where expressly authorised.

However, the loss of wetland habitat will occur even with implementation of the mitigation measures recommended in this report and represents a residual, negative wetland impact.

The LOM will be rehabilitated concurrently with mining, and the various stockpiles and storage facilities will be shaped and revegetated prior to closure. However, the topography of the landscape will be permanently altered, and it is assumed that wetland habitat lost within these footprints cannot be reinstated in the post mining landscape, at least not with any degree of certainty. Therefore, application of the mitigation hierarchy indicates that significant residual, negative impact, such as the unavoidable loss of wetland habitat, requires an offset. It is therefore recommended that some form of wetland offset, or compensatory mitigation strategy be developed to address the residual wetland impact - the permanent loss of wetland habitat. The wetland offset developed must be aligned with the National Biodiversity Offset Guideline (GN3569, 2023, Issued under Stion 24J of the National Environmental Management Act), and the SANBI wetland offset guidelines (SANBI & DWS, 2016). Further discussion around the wetland offset requirements, and preliminary quantification of the wetland offset requirement is provided in Section 10.9.

10.6.2.2. Wetland habitat degradation through alteration of the hydrological regime

Lowering of groundwater levels is temporary (generally 2 years), and backfilling into the pits will add water to the aquifer, reducing the duration of the impact to wetlands. Reduced surface catchment yield to wetlands is expected to be offset to a degree through a reduction in evapotranspiration associated with removal of forestry from the mine footprint. The following additional measures are proposed:

- The post mining landscape will be returned to plantation forestry; however, it is recommended that re-establishment of plantation forestry be limited to the areas falling outside of all delineated wetland habitats and a 50m buffer thereof to limit edge effects and provide a natural buffer zone for diffuse impacts between the wetlands and future landuse.
- Implement monitoring of potentially affected wetlands, as detailed in Section 10.10, to identify any negative effects that arise and allow for adaptive management.

10.6.2.3. Wetland habitat degradation through alteration of geomorphological processes

Mitigation will be aimed at limiting the opportunity for sediment mobilisation, or wetland erosion, and placing barriers to entry for sediments into potentially receiving wetlands. The following is proposed:

- It is recommended that the topsoil and sand tails mounts have a maximum side slope of 1:5 to limit the risk of erosion of the side slopes and sediment transport to the wetlands.
- The design of the coarse and fine sand tailings disposal facilities must include concurrent rehabilitation and perimeter runoff and sediment management infrastructure.
- A comprehensive sediment management plan and stormwater management plan must be developed for the life of the project. Generation of runoff and transport of sediment off site must be controlled and minimised through appropriate stormwater management and the use of sediment controls or barriers, such as sediment fences or similar and as appropriate to the nature of the potential sediment source. The project engineers should advise on the best sediment control option based on the nature and magnitude of the potential sediment source and loads. Unvegetated earth

berms should not be considered sufficient to act as barriers between active mine areas and the remaining, adjacent natural environment, as they are prone to erosion and can act as an additional sediment source to the wetlands if breached.

- Bare surfaces downstream from the mine where sediment traps are not an option should be vegetated to limit erosion and runoff that might be carrying contaminants.
- Sediment mobilization off the RSF dam wall should be minimized through re-vegetation of the dam wall with suitable grass cover as soon as possible, as well as establishment of sediment fences/barriers along the downslope edge of the dam wall. Such sediment barriers must be regularly inspected by an appropriately qualified engineer and repaired if damaged or showing signs of erosion.
- It is proposed that the mining infrastructures (RSF, sand tails mounds, LOM boundary) and downslope habitat should be monitored during operation for any signs of erosion. Any erosion issues arising should be addressed immediately. Appropriate means of addressing any erosion will depend on the specific situation and should be referred to an environmental engineer or wetland ecologist to address.
- Topsoil stockpiles to be maintained and managed as per the mine rehabilitation plan guidelines. To protect stockpiles from erosion, particularly those exceeding 2m in height, the stockpiles should be vegetated.
- Limit the storage time of topsoil to as short a time period as possible. If stockpiling is longer than 1 year, the topsoil stockpiles should ideally be re-vegetated with locally occurring indigenous vegetation.
- Do not burn, cut or remove natural vegetation outside of authorised and designated areas of the development as this may expose soils to erosion.
- Do not allow activities which result in soil compaction to occur outside of authorized and designated areas, e.g., storing of heavy machinery, driving or dumping of materials.
- Areas inadvertently compacted must be ripped with a small machine (agricultural) to alleviate compaction.
- Any road crossings established through wetland habitat must be designed such that they do not cause any flow impoundment or concentration that could lead to erosion of the downstream areas.
- Any areas where concentrated flow is anticipated to discharge must be protected against erosion through the application of appropriate erosion protection mechanisms appropriate to the situation.

10.6.2.4. Wetland habitat degradation through water quality degradation

The aim of mitigation will be to limit the sources of potential pollutants to the environment, and address polluting events efficiently and effectively if they do occur.

- Runoff from dirty areas should be directed to the stormwater management infrastructure and not be allowed to flow into the natural environment. Stormwater should be contained and pumped to the plant over time.
- Minimise the footprint or catchment of the dirty area as much as possible and maximize the clean areas within the site to ensure minimal water quality impact on the generated site runoff.
- Any infrastructure used in the storage or transport (e.g., pipelines) of potentially hazardous materials or slimes, must be regularly inspected to ensure proper functioning and identify any maintenance or repair issues that should be addressed.
- It is recommended that a Hazardous Material Management Plan and Waste Management Plan (aligned to the requirements of international best practice) be developed and implemented at the

site prior to initiation of the construction and operational activities. Handling of hazardous substances should be kept to a minimum within the development activity site. Additionally, thorough training should be administered to site personnel regarding handling of the aforementioned substances.

- All measures to limit erosion and increased sedimentation within wetland habitat to be applied to limit increased turbidity of the water column in receiving wetlands.
- Measures must be implemented to prevent runoff or dust from dirty water areas, such as the PWP and other surface infrastructure areas, from entering the aquatic system. This can be achieved by ensuring that such infrastructure remains outside of all wetland and aquatic systems, ensuring effective clean and dirty water separation, managing and disposing of any contaminated runoff or potential pollutants in an appropriate manner and ensuring these do not enter the aquatic system, and by implementing (if necessary) a dust control system.
- No dumping of any materials or storage of any equipment should be allowed within the sensitive areas, particularly the wetlands.
- During all phases of the development activity, all waste should be removed to an appropriate waste facility and under no circumstance should waste materials or contaminants be discharged into the environment or buried.
- Washing and cleaning of equipment should be done within berms or bunds, in order to trap any pollutants/sediment and prevent excessive soil erosion. These sites must be re-vegetated after development activity has been completed.
- Proactive measures should be enforced to ensure that work vehicles are up to standard regarding maintenance and function. These measures should include routine leak checks prior to development activity and decommissioning of vehicles and machinery not up to par. Dripping during the aforementioned leak checks and maintenance must be accommodated for by the provision of drip trays.
- Regarding sanitation – portable chemical toilets should be made available to site personal as needed and should be located more than 30m away from sensitive environments. Waste from the toilets should be collected and disposed of appropriately by a waste contractor.
- Fuels, chemicals and other hazardous substances should be stored in the appropriate, marked containers with closed lids.
- Where leaks and spillages from storage facilities or pipelines occur, these need to be contained and repaired as soon as possible. All spillages or contaminations are to be immediately reported to the Site Manager and Environmental Control Officer so that appropriate clean up measures may be enacted. An emergency “clean up kit” containing spillage clean up materials should be readily available on site to be used in event of a spill.

10.6.2.5. Wetland habitat degradation through vegetation disturbances

- Disturbance of indigenous vegetation must be kept to a minimum.
- Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible.
- Soil stockpiles should not be translocated from areas with alien plants into the site and within the site alien plants on stockpiles must be controlled to avoid the development of a soil seed bank of alien plants within the stockpiled soil.
- An Alien Invasive Management Plan must be compiled and implemented for the Port Dunford Mine. This should divide the area of control into logical management units, have clear objectives for detection and control, and include regular monitoring throughout the life of the project. Non-compliance should result in real and enforceable significant consequences. The AIP management

plan must extend to cover all wetland habitats within the Port Dunford boundary, and not only infrastructure areas.

- Any alien plants must be immediately controlled to avoid establishment of a soil seed bank that would take decades to remove.
- An ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens.
- Apply all measures aimed at minimising sediment transport into wetland habitats.
- The removal of alien vegetation should be undertaken manually by hand near sensitive areas such as wetlands. The use of heavy machinery or potentially harmful chemicals should be kept to a minimum near sensitive environments.
- An ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens.
- Implement the wetland monitoring plan proposed, inclusive of vegetation monitoring.

10.6.2.6. Burial of wetland habitat and loss of wetland biota downstream of the RSFs due to RSF failure

No mitigation measures are available to further reduce the risk or significance of this impact. However, the following measures are proposed to ensure that the risk of this impact occurring remain minimal:

- Throughout operation and continuing post-closure, the stability of the RSFs must be regularly monitored to ensure that the potential for dam wall failure or exceedance is avoided.
- Emergency preparedness and response plan (EPRP) for the RSF should be prepared based on a credible RSF breach analysis taking the impacts of climate change into consideration.
- Conducting a stability assessment on the RSFs - geotechnical data
- Quarterly inspections and monitoring data with an experienced tailings operator

Table 10-4 – Wetland Impact Assessment – Operational Stage (Phase 1).

Impact number	Aspect	Feature	Phase	Project Stage	Impact Description	Character	Pre-Mitigation								Post-Mitigation						
							Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating		Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating
Impact 1:	Wetlands	LOM Opencast pit	Phase 2	Operational	Wetland habitat degradation through altered hydrological regime supporting downstream wetlands	Negative	3	2	3	4	4	**48**	**N3**	Lowering of groundwater levels is temporary (generally 2 years). Backfilling into the pits will add water to the aquifer, reducing the duration of the impact to wetlands. Reduced surface catchment yield to wetlands is expected to be offset to a degree through a reduction in evapotranspiration associated with removal of forestry from the mine footprint Implement monitoring of potentially affected wetlands to identify any negative effects that arise and allow for adaptive management.	2	2	3	3	3	**30**	**N2**
						Significance	**N3 - Moderate**								**N2 - Low**						
Impact 2:	Wetlands	Opencast Mining and associated infrastructure	Phase 1	Operational	Wetland habitat degradation through altered geomorphological characteristics (sedimentation & erosion) in downstream wetlands	Negative	2	2	3	3	3	**30**	**N2**	A comprehensive sediment management plan and stormwater management plan must be developed for the life of the project. Generation of runoff and transport of sediment off site must be controlled and minimised through appropriate stormwater management and the use of sediment controls or barriers, such as sediment fences or similar and as appropriate to the nature of the potential sediment source. The project engineers should advise on the best sediment control option based on the nature and magnitude of the potential sediment source and loads. Unvegetated earth berms should not be considered sufficient to act as barriers between active mine areas and the remaining, adjacent natural environment, as they are prone to erosion and can act as an additional sediment source to the wetlands if breached. It is proposed that the mining infrastructures (LOM boundary, surface infrastructure) and downslope habitat should be monitored during operation for any signs of erosion. Any erosion issues arising should be addressed immediately. Appropriate means of addressing any erosion will depend on the specific situation and should be referred to an environmental engineer or wetland ecologist to address. Do not burn, cut or remove natural vegetation outside of authorised and designated areas of the development as this may expose soils to erosion. Do not allow activities which result in soil compaction to occur outside of authorized and designated areas, e.g., storing of heavy machinery, driving or dumping of materials. Areas inadvertently compacted must be ripped with a small machine (agricultural) to alleviate compaction. Any road crossings established through wetland habitat must be designed such that they do not cause any flow impoundment or concentration that could lead to erosion of the downstream areas. Any areas where concentrated flow is anticipated to discharge must be protected against erosion through the application of appropriate erosion protection mechanisms appropriate to the situation.	2	2	3	3	2	**20**	**N2**
						Significance	**N2 - Low**								**N2 - Low**						

Impact number	Aspect	Feature	Phase	Project Stage	Impact Description	Character	Pre-Mitigation								Post-Mitigation						
							Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating		Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating
Impact 3:	Wetlands	Opencast Mining	Phase 1	Operational	Wetland habitat degradation through changes in vegetation composition and increase in AIP's	Negative	3	2	3	3	4	**44**	**N3**	Disturbance of indigenous vegetation must be kept to a minimum. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. Soil stockpiles should not be translocated from areas with alien plants into the site and within the site alien plants on stockpiles must be controlled to avoid the development of a soil seed bank of alien plants within the stockpiled soil. An Alien Invasive Management Plan must be compiled and implemented for the Port Dunford Mine. This should divide the area of control into logical management units, have clear objectives for detection and control, and include regular monitoring throughout the life of the project. Non-compliance should result in real and enforceable significant consequences. The AIP management plan must extend to cover all wetland habitats within the Port Dunford boundary, and not only infrastructure areas. Any alien plants must be immediately controlled to avoid establishment of a soil seed bank that would take decades to remove. An ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens. Apply all measures aimed at minimising sediment transport into wetland habitats. The removal of alien vegetation should be undertaken manually by hand near sensitive areas such as wetlands. The use of heavy machinery or potentially harmful chemicals should be kept to a minimum near sensitive environments. An ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens. Implement the wetland monitoring plan proposed, inclusive of vegetation monitoring.	2	2	3	3	2	**20**	**N2**
						Significance	**N3 - Moderate**								**N2 - Low**						

Impact number	Aspect	Feature	Phase	Project Stage	Impact Description	Character	Pre-Mitigation								Post-Mitigation						
							Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating		Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating
Impact 4:	Wetlands	Opencast Mining	Phase 1	Operational	Wetland habitat degradation through water quality deterioration	Negative	3	2	3	3	3	**33**	**N3**	Runoff from dirty areas should be directed to stormwater management infrastructure designed to ensure effective management of stormwater, and maintenance of effective clean and dirty water separation. Dirty water should not be allowed to flow into the natural environment. Design of stormwater infrastructure for Phase 1 is in progress. Design for Phase 2 will be developed during the Phase 1 period. All design of such infrastructure should aim to achieve the above-mentioned goal of ensuring effective clean and dirty water separation and limiting dirty water discharge to the environment. Minimise the footprint or catchment of the dirty area as much as possible and maximize the clean areas within the site to ensure minimal water quality impact on the generated site runoff. Any infrastructure used in the storage or transport (e.g., pipelines) of potentially hazardous materials or slimes, must be regularly inspected to ensure proper functioning and identify any maintenance or repair issues that should be addressed. It is recommended that a Hazardous Material Management Plan and Waste Management Plan (aligned to the requirements of international best practice) be developed and implemented at the site prior to initiation of the construction and operational activities. All measures to limit erosion and increased sedimentation within wetland habitat to be applied to limit increased turbidity of the water column in receiving wetlands. Ensure effective clean and dirty water separation, manage and dispose of any contaminated runoff or potential pollutants in an appropriate manner and ensuring these do not enter the aquatic system, and implement (if necessary) a dust control system. No dumping of any materials or storage of any equipment should be allowed within the wetlands. During all phases of the development activity, all waste should be removed to an appropriate waste facility. Washing and cleaning of equipment should be done within berms or bunds, in order to trap any pollutants/sediment and prevent excessive soil erosion. Proactive measures should be enforced to ensure that work vehicles are up to standard regarding maintenance and function. Portable chemical toilets should be made available to site personal as needed and should be located more than 30m away from sensitive environments. Fuels, chemicals and other hazardous substances should be stored in the appropriate, marked containers with closed lids. Where leaks and spillages from storage facilities or pipelines occur, these need to be contained and repaired as soon as possible. An emergency “clean up kit” containing spillage clean up materials should be readily available on site to be used in event of a spill.	2	2	3	3	3	**30**	**N2**
						Significance	**N3 - Moderate**								**N2 - Low**						

Table 10-5 – Wetland Impact Assessment – Operational Stage (Phase 2).

Impact number	Aspect	Feature	Phase	Project Stage	Impact Description	Character	Pre-Mitigation								Post-Mitigation						
							Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating		Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating
Impact 1:	Wetlands	LOM Opencast pit, RSF, Topsoil and Course Tails Stockpiles, Road Corridors	Phase 2	Operational	Wetland habitat loss within the footprint of surface infrastructure, LOM, RSFs, stockpiles. Total of 124 ha to be lost.	Negative	5	2	5	5	5	**85**	**N5**	It is suggested that the sand tails and topsoil stockpiles below the N2 be reshaped slightly to avoid intersecting marginally with wetland habitats, and wherever possible, a 30m buffer. This will realise a small reduction in wetland loss of approximately 4 hectares. All construction activities must be limited to the smallest area possible by remaining fully within authorised and clearly demarcated areas. No stockpiles should be placed in wetland habitat, except where expressly authorised. A wetland offset strategy must be developed and implemented to address remaining residual negative impact	5	2	5	5	5	**85**	**N5**
						Significance	**N5 - Very High**								**N5 - Very High**						
Impact 2:	Wetlands	LOM Opencast pit, RSF, Topsoil and Course Tails Stockpiles	Phase 2	Operational	Wetland habitat degradation through altered hydrological regime supporting downstream wetlands	Negative	3	2	3	4	4	**48**	**N3**	Lowering of groundwater levels is temporary (generally 2 years). Backfilling into the pits will add water to the aquifer, reducing the duration of the impact to wetlands. Reduced surface catchment yield to wetlands is expected to be offset to a degree through a reduction in evapotranspiration associated with removal of forestry from the mine footprint Implement monitoring of potentially affected wetlands to identify any negative effects that arise and allow for adaptive management.	2	2	3	3	3	**30**	**N2**
						Significance	**N3 - Moderate**								**N2 - Low**						

Impact number	Aspect	Feature	Phase	Project Stage	Impact Description	Character	Pre-Mitigation								Post-Mitigation						
							Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating		Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating
Impact 3:	Wetlands	Topsoil and Course Tails Stockpiles, Road Corridors	Phase 2	Operational	Wetland habitat degradation through altered geomorphological characteristics (sedimentation & erosion) in downstream wetlands	Negative	3	2	3	3	4	**44**	**N3**	It is recommended that the topsoil and sand tails mounts have a maximum side slope of 1:5 to limit the risk of erosion of the side slopes and sediment transport to the wetlands. The design of the coarse and fine sand tailings disposal facilities must include concurrent rehabilitation and perimeter runoff and sediment management infrastructure. A comprehensive sediment management plan and stormwater management plan must be developed for the life of the project. Generation of runoff and transport of sediment off site must be controlled and minimised through appropriate stormwater management and the use of sediment controls or barriers, such as sediment fences or similar and as appropriate to the nature of the potential sediment source. The project engineers should advise on the best sediment control option based on the nature and magnitude of the potential sediment source and loads. Unvegetated earth berms should not be considered sufficient to act as barriers between active mine areas and the remaining, adjacent natural environment, as they are prone to erosion and can act as an additional sediment source to the wetlands if breached. Sediment mobilization off the RSF dam wall should be minimized through re-vegetation of the dam wall with suitable grass cover as soon as possible, as well as establishment of sediment fences/barriers along the downslope edge of the dam wall. Such sediment barriers must be regularly inspected by an appropriately qualified engineer and repaired if damaged or showing signs of erosion. It is proposed that the mining infrastructures (RSF, sand tails mounds, LOM boundary) and downslope habitat should be monitored during operation for any signs of erosion. Any erosion issues arising should be addressed immediately. Appropriate means of addressing any erosion will depend on the specific situation and should be referred to an environmental engineer or wetland ecologist to address. Topsoil stockpiles to be maintained and managed as per the mine rehabilitation plan guidelines. To protect stockpiles from erosion, particularly those exceeding 2m in height, the stockpiles should be vegetated. Limit the storage time of topsoil to as short a time period as possible. If stockpiling is longer than 1 year, the topsoil stockpiles should ideally be re-vegetated with locally occurring indigenous vegetation. Do not burn, cut or remove natural vegetation outside of authorised and designated areas of the development as this may expose soils to erosion. Do not allow activities which result in soil compaction to occur outside of authorized and designated areas, e.g., storing of heavy machinery, driving or dumping of materials. Areas inadvertently compacted must be ripped with a small machine (agricultural) to alleviate compaction. Any road crossings established through wetland habitat must be designed such that they do not cause any flow impoundment or concentration that could lead to erosion of the downstream areas. Any areas where concentrated flow is anticipated to discharge must be protected against erosion through the application of appropriate erosion protection mechanisms appropriate to the situation.	3	2	3	3	3	**33**	**N3**
						Significance	**N3 - Moderate**								**N3 - Moderate**						

Impact number	Aspect	Feature	Phase	Project Stage	Impact Description	Character	Pre-Mitigation								Post-Mitigation						
							Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating		Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating
Impact 4:	Wetlands	Mining and associated infrastructures	Phase 2	Operational	Wetland habitat degradation through changes in vegetation composition and increase in AIP's	Negative	3	3	3	3	4	**48**	**N3**	Disturbance of indigenous vegetation must be kept to a minimum. Where disturbance is unavoidable, disturbed areas should be rehabilitated as quickly as possible. Soil stockpiles should not be translocated from areas with alien plants into the site and within the site alien plants on stockpiles must be controlled to avoid the development of a soil seed bank of alien plants within the stockpiled soil. An Alien Invasive Management Plan must be compiled and implemented for the Port Dunford Mine. This should divide the area of control into logical management units, have clear objectives for detection and control, and include regular monitoring throughout the life of the project. Non-compliance should result in real and enforceable significant consequences. The AIP management plan must extend to cover all wetland habitats within the Port Dunford boundary, and not only infrastructure areas. Any alien plants must be immediately controlled to avoid establishment of a soil seed bank that would take decades to remove. An ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens. Apply all measures aimed at minimising sediment transport into wetland habitats. The removal of alien vegetation should be undertaken manually by hand near sensitive areas such as wetlands. The use of heavy machinery or potentially harmful chemicals should be kept to a minimum near sensitive environments. An ongoing monitoring programme should be implemented to detect and quantify any aliens that may become established and provide information for the management of aliens. Implement the wetland monitoring plan proposed, inclusive of vegetation monitoring.	2	2	3	2	3	**27**	**N2**
						Significance	**N3 - Moderate**								**N2 - Low**						

Impact number	Aspect	Feature	Phase	Project Stage	Impact Description	Character	Pre-Mitigation						S Rating		Post-Mitigation						S Rating
							Magnitude	Extent	Reversibility	Duration	Probability	Significance			Magnitude	Extent	Reversibility	Duration	Probability	Significance	
Impact 5:	Wetlands	Mining and associated infrastructures	Phase 2	Operational	Wetland habitat degradation through water quality deterioration	Negative	3	2	3	2	4	**40**	**N3**	Runoff from dirty areas should be directed to the stormwater management infrastructure and not be allowed to flow into the natural environment. Minimise the footprint or catchment of the dirty area as much as possible and maximize the clean areas within the site to ensure minimal water quality impact on the generated site runoff. Any infrastructure used in the storage or transport (e.g., pipelines) of potentially hazardous materials or slimes, must be regularly inspected to ensure proper functioning and identify any maintenance or repair issues that should be addressed. It is recommended that a Hazardous Material Management Plan and Waste Management Plan (aligned to the requirements of international best practice) be developed and implemented at the site prior to initiation of the construction and operational activities. All measures to limit erosion and increased sedimentation within wetland habitat to be applied to limit increased turbidity of the water column in receiving wetlands. Ensure effective clean and dirty water separation, manage and dispose of any contaminated runoff or potential pollutants in an appropriate manner and ensuring these do not enter the aquatic system, and implement (if necessary) a dust control system. No dumping of any materials or storage of any equipment should be allowed within the wetlands. During all phases of the development activity, all waste should be removed to an appropriate waste facility. Washing and cleaning of equipment should be done within berms or bunds, in order to trap any pollutants/sediment and prevent excessive soil erosion. Proactive measures should be enforced to ensure that work vehicles are up to standard regarding maintenance and function. Portable chemical toilets should be made available to site personal as needed and should be located more than 30m away from sensitive environments. Fuels, chemicals and other hazardous substances should be stored in the appropriate, marked containers with closed lids. Where leaks and spillages from storage facilities or pipelines occur, these need to be contained and repaired as soon as possible. An emergency "clean up kit" containing spillage clean up materials should be readily available on site to be used in event of a spill.	2	2	3	2	3	**27**	**N2**
						Significance	**N3 - Moderate**								**N2 - Low**						
Impact 6:	Wetlands	RSF9	Phase 2	Operational	Wetland habitat degradation or burial due to RSF breach or exceedance	Negative	5	2	3	4	2	**28**	**N2**	No mitigation measures are available to further reduce the risk or significance of this impact. However, the following measures are proposed to ensure that the risk of this impact occurring remain minimal: Global Industry Standard on Tailings Management requirements should be met in terms of the design of RSF facilities. Throughout operation and continuing post-closure, the stability of the RSFs must be regularly monitored to ensure that the potential for dam wall failure or exceedance is avoided. Emergency preparedness and response plan (EPRP) for the RSF should be prepared based on a credible RSF breach analysis taking the impacts of climate change into consideration. Conducting a stability assessment on the RSFs - geotechnical data Quarterly inspections and monitoring data with an experienced tailings operator	5	2	3	4	2	**28**	**N2**

Impact number	Aspect	Feature	Phase	Project Stage	Impact Description	Character	Pre-Mitigation								Post-Mitigation						
							Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating		Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating
						Significance	N2 - Low								N2 - Low						

10.7. DECOMMISSIONING AND CLOSURE PHASE

10.7.1. ANTICIPATED IMPACT DESCRIPTION

The decommissioning and closure phase will involve the decommissioning and removal of infrastructure, and rehabilitation activities, including spreading of topsoil and revegetation of disturbed footprints. Anticipated impacts are expected to be of a similar nature to those experienced during the construction phase. Decommissioning and closure should not lead to the loss of any additional wetland habitat, though it may cause degradation of wetland habitat near related activities. Potential impacts include the following:

10.7.1.1. Altered wetland geomorphology

During demolition undertaken as part of closure, areas of bare soils will be exposed to erosion during rainfall events. Earthworks represent a further erosion risk and sediment sources. Run-off from these areas is likely to be sediment-rich and could enter the adjacent wetlands, leading to increased sedimentation in the wetlands, increased turbidity and suspended sediment loads, as well as changes to the wetlands substrate where the sediment is deposited. If sediment originating from these activities and infrastructures does reach the wetlands, these changes will impact on the biodiversity of the wetland, potentially with short-term, negative effects.

10.7.1.2. Water quality deterioration

Water quality deterioration with the receiving wetlands could take place during the decommissioning and closure phase predominantly due to increased turbidity and suspended solids derived from soil erosion on the bare soil surfaces exposed during demolition and rehabilitation of disturbance footprints. In addition, use of hazardous substances such as oil, diesel, etc. during the demolition and rehabilitation process could lead to pollution of water resources through spillages and leakages.

10.7.1.3. Vegetation disturbance through spread of AIP's

Wetland vegetation may be disturbed through encroachment of alien invasive and pioneer species that establish in areas of disturbance. A key driver of invasion by alien plants is high disturbance. Exotic species are often more prevalent near infrastructural disturbances than further away. Typical consequences of this include the loss of indigenous vegetation, change in vegetation structure and habitat, increased water consumption and impaired wetland functioning.

10.7.2. MITIGATION AND MANAGEMENT RECOMMENDATIONS

The following mitigation and management measures are recommended to limit wetland habitat degradation outside the footprints of the decommissioning and demolition activities:

- Re-profile the rehabilitated landscapes to suit the desired post mining land use as much as is practically possible.
- Demolition should be undertaken during the dry winter period to reduce risk of sediment transport into adjacent wetland
- Ensure all cleared areas are revegetated successfully immediately.
- Minimise future plantation forestry to outside of wetlands and a 50m buffer.
- Implement mitigation measures proposed for the construction phase to minimise pollution sources, and vegetation disturbance.

Maintain the AIP management plan throughout decommissioning and closure

Table 10-6 – Wetland Impact Assessment – Decommissioning and Closure Phase.

Impact number	Aspect	Feature	Phase	Project Stage	Impact Description	Character	Pre-Mitigation								Post-Mitigation						
							Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating		Magnitude	Extent	Reversibility	Duration	Probability	Significance	S Rating
Impact 1:	Wetlands	Decommissioning and removal of infrastructure Rehabilitation activities including spreading of topsoil and revegetation of disturbed footprints.	Phase 1 & 2	Decommissioning & Closure	Wetland habitat degradation due to erosion, sedimentation, water quality deterioration and spread of AIP	Negative	3	2	3	3	3	**33**	**N3**	Re-profile the rehabilitated landscapes to suit the desired post mining land use as much as is practically possible. Demolition should be undertaken during the dry winter period to reduce risk of sediment transport into adjacent wetland Ensure all cleared areas are revegetated successfully immediately. Implement mitigation measures proposed for the construction phase to minimise pollution sources, and vegetation disturbance. Maintain the AIP management plan throughout decommissioning and closure	2	1	3	2	3	**24**	**N2**
						Significance	**N3 - Moderate**								**N2 - Low**						

10.8. CUMULATIVE IMPACTS

The predominant land-use within the Port Dunford study area is currently dominated by *Eucalyptus* plantations and sugar cane agriculture. The peripheral regions along the southeast are also highly transformed by residential development. The current major impacts to the surrounding wetland environment are reduction in flows as a consequence of forestry and farming practices. Furthermore, a complete lack of wetland vegetation within residential areas and in cultivated farm portions. Although the wetland has experienced impacts from surrounding land-uses, there are pockets of largely natural swamp forest within the wetlands of the central regions of the site and south of the N2 freeway.

Current landuse in the region includes mining, cultivation and plantation forestry and urban development. These landuses contribute towards ongoing wetland habitat loss and fragmentation, and deterioration of wetland habitat due to changes in water quantity and quality, and encroachment of alien invasive species. The Port Dunford Mine, if approved, will add to these negative, cumulative impacts, contributing towards ongoing wetland habitat loss, and loss of potential SCC's that they support.

10.9. OFFSET OF SIGNIFICANT RESIDUAL IMPACTS TO WETLANDS

10.9.1. WHAT ARE BIODIVERSITY AND WETLAND OFFSETS?

A useful and widely accepted definition of biodiversity offsets is provided by the Business and Biodiversity Offsets Programme (BBOP):

> "Biodiversity offsets are 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. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity." (BBOP, 2018).

Wetland offsets fall under the broader umbrella of biodiversity offsets, and from the definition above, the goal of wetland offsets can be said to achieve a measurable "**No Net Loss**" or "**Net Gain**" in conservation outcomes as a means of compensating for residual adverse impacts to wetlands. The requirement for biodiversity offsets and the approach to achieving them is detailed in the gazetted National Biodiversity Offset Guideline (GN3569, 2023, Issued under Stion 24J of the National Environmental Management Act).

Within the broader context of the approach detailed in the National Biodiversity Offset Guideline, the SANBI wetland offset guidelines (SANBI & DWS, 2016), which have undergone several iterations since their first release in 2012, are a specific guideline proposing an approach and methodology to wetland offsets in South Africa. This document has been published by the Water Research Commission and is endorsed by the DWS as "*an official guideline to aid the development of appropriate wetland offsets in situations where an offset is required*".

The "**No Net Loss**" principle requires that the gains provided by an offset program equal or exceed the losses that have occurred as a result of the project impacts. There is thus a need for an accounting system to accurately quantify and calculate the losses and gains – in the SANBI Guidelines and this is achieved through the use of hectare equivalents. The gains provided by the offset should be equivalent to the losses in terms of type (e.g. wetland type or condition), time and space. What this means for wetland offsets is that generally, the following concepts apply:

- Offsets should be like for like (e.g. the loss of a pan would require a pan as offset, while offsetting a highly degraded wetland system to compensate for the loss of a pristine system would not generally be acceptable).
- Ideally, offset gains should materialise before, or at the same time, as wetland losses.
- All values of the lost wetland system should be targeted (e.g. if a wetland supports African Grass Owls and plays an important role in flow regulation, both these functions should be provided for in the offset target. This might require increasing the offset target area to cater for both functions).
- To ensure that "No Net Loss" is realised, an offset strategy needs to be accompanied by rehabilitation and enhancement of the target functions and values, as protection alone does not provide the gains that count towards "No Net Loss". Where offsets are done on a 1:1 basis (i.e. 1ha of a wetland is offset to compensate for the loss of 1ha of wetland), a net loss of 50 % would result, unless interventions are put in place to enhance the functions and values of the offset target.
- Offset multipliers are generally applied to take into account risks and uncertainties about the success or performance of planned offset measures.

The SANBI guidelines recognise five types of offsets:

- Protection-based offset: Refers to the implementation of legal mechanisms (e.g. declaration of a Protected Environment or Nature Reserve under the National Environmental Management: Protected Areas Act, a legally binding conservation servitude, or a long-term Biodiversity Agreement under NEMA) and putting in place appropriate management structures and actions to ensure that conservation outcomes are secured and maintained in the long-term.
- Averted loss offset: Refers to physical activities which prevent the loss or degradation of an existing wetland system and its biodiversity, where there is a clearly demonstrated threat of decline in the system's condition.
- Rehabilitation/restoration offset: Refers to activities which result in an improvement in wetland condition, functions, and associated biodiversity. Rehabilitation/restoration involves the manipulation of the physical, chemical, and/or biological characteristics of a degraded wetland system in order to repair or improve wetland integrity and associated ecosystem services. By increasing the condition of a wetland system and its biodiversity, a positive contribution is made towards the goal of no net loss.
- Wetland establishment: This involves the development (i.e. creation) of a new wetland system where none existed before by manipulating the physical, chemical, and/or biological characteristics of a specific site.
- Direct compensation: Direct compensation involves directly compensating affected parties for the ecosystem services lost as a result of development activities. This is ideally done by providing an equivalent substitute form of asset or in some cases may take the form of monetary compensation. This form of offset action is generally most relevant to direct services.

10.9.2. PROJECT-RELATED DETERMINATION OF WETLAND OFFSET TARGETS

The proposed project will lead to the direct and permanent loss of approximately 124 hectares of wetland habitat, which cannot be avoided under the current mine plan, fully minimised or reversed through rehabilitation. In order to ensure full application of the mitigation hierarchy, a wetland offset will be required to address this significant residual impact to important and sensitive wetland habitat.

The specifications of the required offset will need to be determined as part of a detailed wetland offset plan that accurately quantifies the required offset, identifies appropriate wetland offsets and details a strategy to realise the offset targets set. However, a preliminary determination of the wetland offset target is provided here to guide further revision of the mine plan, if feasible, and act as a starting point for development of the wetland offset plan.

The SANBI & DWS (2016) wetland offset calculator was applied for the determination of the functional offset targets, using the wetland assessment data and the current mine plan as input data. For the purpose of determining the required offset targets, direct wetland loss will occur in areas where wetlands will be completely lost within the footprints of mining and surface infrastructures. Importantly, the wetlands affected fall within a strategic water source area (SWSA) as detailed in Section 8.3. In light of this, the wetland offset calculator attracts a Functional Importance Ratio multiplier of 1.5 that increases the wetland functional target. Table 10-7 provides a summary of the wetland offset targets, in terms of the functional offset target component only. The wetland losses/target are split according to the infrastructure type that will cause the wetland loss, and the wetland types that will be affected. The target is represented as both the actual hectares to be lost and the "hectare equivalents" that will need to be achieved through the offset exercise. A total of approximately 124 hectare-equivalents (ha.eq.) will need to be met through rehabilitation and protection of targeted offset wetland systems. Table 10-8 provides the summarised functional and ecosystem conservation offset targets associated with the anticipated wetland losses. The ecosystem conservation target determination is informed by the condition of the wetland vegetation in wetlands to be lost, as well as factors such as the wetland vegetation group protection and threat status, priority of the wetlands as defined in regional and national conservation plans, biodiversity value, level of connectivity in the landscape. It is important to note that these two offset targets can be achieved in the same wetland systems if the target wetlands meet the various offset criteria for each component. The detailed results of the wetland offset calculations are provided in Appendix 5.

The most significant wetland losses will be associated with Sandtails stockpiles A-1 (56 ha lost, Seep wetlands, Largely natural to Largely modified, High to Very High EIS), and 8B (23 ha lost, Seep wetlands, Moderately modified, Moderate EIS), and the RSF9 (36 ha lost, Seep wetlands, Moderately modified, High EIS). Most of the wetlands affected will be seep wetlands (122 hectares, 98.5%). 94% of wetlands lost are currently in a moderately to largely modified condition (PES categories C and D), and 93% are of moderate to high importance and sensitivity.

Table 10-7 - Summary of the wetland offset requirements – Wetland Functional Target.

Infrastructure Type	**Channelled Valley Bottom Wetland**		**Seep Wetland**		**Total**	
	Hectares	Hectare Equivalents	Hectares	Hectare Equivalents	Hectares	**Hectare Equivalents**
LOM - Phase 2			2.13	2.11	2.13	2.11
LOM - Phase 2/RSF C			0.29	0.26	0.29	0.26
LOM - Phase 2/Sand tails			1.03	1.25	1.03	1.25

Infrastructure Type	Channelled Valley Bottom Wetland		Seep Wetland		Total	
	Hectares	Hectare Equivalents	Hectares	Hectare Equivalents	Hectares	**Hectare Equivalents**
Road Corridor	0.42	0.54	1.73	2.00	2.15	2.54
RSF 9			35.86	39.78	35.86	39.78
Sand tails	1.34	1.71	77.90	72.10	79.24	73.81
Sand tails/Topsoil			0.42	0.39	0.42	0.39
Topsoil	0.16	0.20	2.32	2.63	2.48	2.83
Total	1.92	0.20	121.68	120.52	123.59	**122.97**

Table 10-8 - Summary of the wetland offset requirements – Wetland Functional and Ecosystem Conservation Targets.

Infrastructure Type	Wetland Area Lost	Functional Offset Target	Ecosystem Conservation Offset Target
	Hectares	**Hectare Equivalents**	**Hectare Equivalents**
LOM - Phase 2	2.13	2.11	11.23
LOM - Phase 2/RSF C	0.29	0.26	1.01
LOM - Phase 2/Sand tails	1.03	1.25	15.60
Road Corridor	2.15	2.54	19.86
RSF 9	35.86	39.78	253.98
Sand tails	79.24	73.81	346.58
Sand tails/Topsoil	0.42	0.39	1.97
Topsoil	2.48	2.83	19.08
Total	**123.59**	**122.97**	**669.30**

According to the offset concepts (both for biodiversity and wetland offsets), the wetland offset should aim to achieve No Net Loss, meaning that the calculated loss (123 ha.eq functional/669 ha.eq ecosystem conservation)) must be met in full, and should be achieved through a Like-for-Like approach wherein the wetlands targeted should be of a similar type to those lost. In this instance, this would mean targeting mostly seep wetlands as part of the offset. Both biodiversity offsets and wetland offsets will be required for the Port Dunford Mine project, and according to the National Biodiversity Offset Guideline, "*where offsets are required for terrestrial ecosystems as well as wetland ecosystems and/ or forest ecosystems, the specialist or specialists and the EAP should strive to integrate these different requirements in the Biodiversity Offset Report, and select candidate offset areas which would meet all offset requirements, where at all possible.*" In line with this, it is recommended that the wetland offset plan and targets be integrated into the larger biodiversity offset to ensure opportunities for target sites to contribute to both targets are not missed. The functional wetland target requires that target offset wetlands are not only protected but also rehabilitated to improve their functional capacity to offset the wetland functionality lost as a result of the project. The National Biodiversity Offset Guideline further states with regards to wetland offsets that "*selecting areas with good potential for rehabilitation and restoration within recognised freshwater priority areas (FEPAs) or SWSAs may be advantageous. Those areas should be located in the same local or quaternary catchment, unless there are good reasons why they are not*."

The Mlalazi Estuary lies to the southwest of the mine boundary and is a potential receiving environment for indirect impacts from the project, such as changes in flow inputs, and inputs of fine sediment. These impacts will largely be temporary (hydrological changes) or minimised through effective implementation of mitigation and management measures (erosion and sedimentation). However, the estuary has been put forward as a potentially valuable addition to the biodiversity/wetland offset strategy. The EFZ, where the Amanzamnyama River enters the estuary, is currently under intensive sugar cane cultivation, which is associated with a complete conversion of natural habitat and the maintenance of a trenched drainage system to diverts flow through the sugar cane fields. Rehabilitation of this modified area of the estuary back to natural vegetation, and closure of the drainage system would be valuable, not only in increasing the extent of available natural habitat within the EFZ, but also in terms of increasing this part of the estuaries capacity to trap any ultrafine sediment originating from the Port Dunford Mine, and preventing such sediment from reaching the estuary mouth and potentially affecting the geomorphology and hydrology of the estuary. Including estuarine rehabilitation in the wetland offset would not fulfil the like-for-like offset requirement but could perhaps be motivated as a like-for-better offset. The next step would be to further develop the biodiversity and wetland offset strategy to determine how such estuarine rehabilitation and protection could contribute to the offset targets, and whether further areas would need to be targeted to satisfy the offset requirements.

10.10. MONITORING RECOMMENDATIONS

It is recommended that a wetland monitoring plan be developed to facilitate long term monitoring of a selection of potentially affected wetlands. The monitoring plan should span the construction, operation, and decommissioning phases of the project, with the intention of identifying any changes in wetland condition that may result from secondary, indirect impacts, such as altered hydrological regime, sediment transport or water quality deterioration. Ongoing monitoring allows for both expected and unexpected impacts to be identified, and adaptive management applied where appropriate, through the project lifespan. The wetland units suggested for inclusion in the monitoring plant are illustrated in Figure 10-4. Given the large extent of wetlands across the mine area, a subset of wetland units is proposed for monitoring. These systems represent wetlands expected to be affected by the various activities. Additional wetlands may be added to the monitoring plan based on infield observations during routine monitoring or audit of the mine's authorisations.

For the purpose of monitoring of the Port Dunford Mine wetlands, it is recommended that the wetland rehabilitation monitoring tool – WETRehabEvaluate (Walters et al., 2019) be used to guide the selection of appropriate monitoring tools and monitoring intervals. Based on the WETRehabEvaluate guideline document, the wetland monitoring approach is detailed in Table 10-9.

Table 10-9 - Summary of proposed nature, timing and frequency of wetland monitoring for the Port Dunford Mine.

MONITORING ACTIVITES	TOOL	TIMING	FREQUENCY	RESPONSIBLE PERSON
Wetland Condition (PES) monitoring	WetHealth V2 Level 1B or 2	Not Applicable	At a minimum 3-year interval	Wetland Ecologist
Erosion and sedimentation monitoring	Visual inspection and fixed-point photographic record maintained at locations of potential sediment erosion and transport	Late spring/Summer	Annually	Wetland Ecologist
Wetland vegetation monitoring	As per WETRehabEvaluate approach	Late spring/Summer	At a minimum 3-year interval	Wetland Ecologist

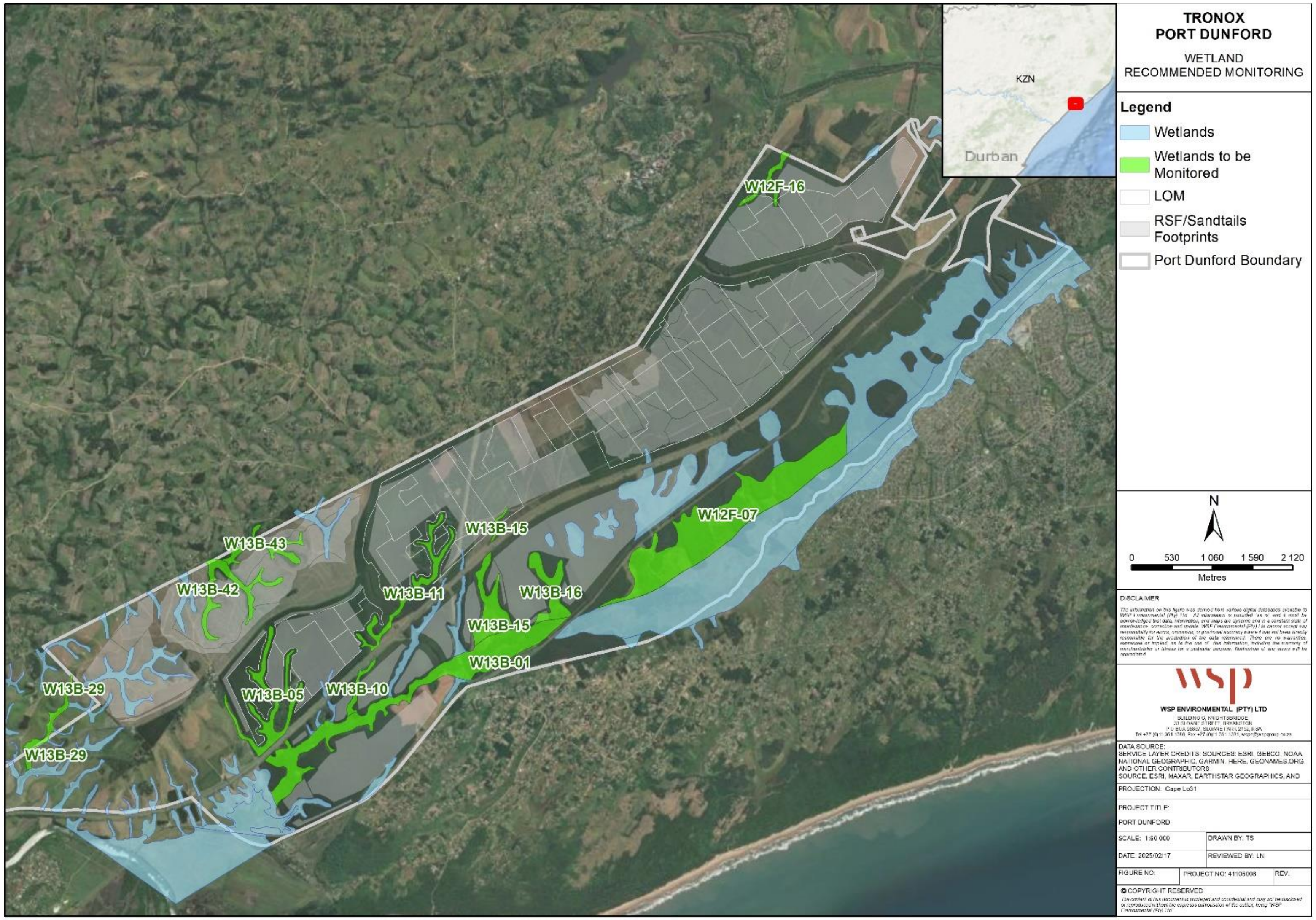


Figure 10-4 - Wetland HGM units proposed for inclusion in the wetland monitoring programme for Port Dunford Mine.

11. CONCLUSION

WSP was commissioned by Tronox KZN Sands (Pty) Ltd. to conduct a wetland baseline and impact assessment as part of the EA process to obtain the mining rights to mine heavy mineral sands within the proposed Port Dunford study area. The proposed Port Dunford project site covers an extent of approximately 4787Ha and is situated in the KwaZulu-Natal province, approximately 16km southwest of Richards Bay.

The proposed infrastructure development includes construction of aPWP, water control dams, RSF , demarcated Sand Tails mounds and topsoil stockpiles. Therefore, a specialist wetland assessment was required to identify the location and extent of wetlands within the study site; determine the functionality and health status of the' wetlands and identify the impacts of the proposed activity on the surrounding wetlands.

The wetland delineation and baseline assessment were informed by both desktop and infield investigations. Extensive wetland habitat was found to occur within the Port Dunford project site, including both channelled valley bottom and hillslope seepage wetlands. Within areas of extended saturation within both wetland types, critically endangered swamp forest was identified. Wetland habitat was found to vary widely in terms of its current condition, ranging from largely natural to seriously modified. Landuses that have significantly influenced current wetland condition include sugarcane cultivation, *Eucalyptus* plantation forestry and urban developments. The wetlands provide a range of important ecosystem services including streamflow regulation, flood attenuation and biodiversity support. Given the presence of the swamp forest habitat and SCC that it is likely to support, such as the Pickersgill's reed frog, the wetland habitats' role in biodiversity maintenance is elevated. The ecological importance and sensitivity of wetlands in the project area ranges from moderate to very high.

The proposed Port Dunford Mine facilities will have a series of potential impacts that need to be managed, particularly during the life of the mine. These mostly relate to the physical disturbance of the footprint of the mining operations and associated activities, such as *inter* alia vegetation removal, vehicle movements, excavations for pits, creation of facilities on site and earth moving activities. These activities are likely to have a negative impact on wetland habitat both directly within the footprint of the proposed development and downstream within affected catchments. Although impacts will be most severe and quantifiable within the Port Dunford boundary, certain impacts may translate to wetland habitat beyond the site boundary. Anticipated impacts include loss of wetland habitat (approximately 124 hectares) and wetland habitat degradation as a consequence of hydrological and geomorphological changes, water quality deterioration, and vegetation changes. The impacts associated with the construction, operation, decommissioning and closure phases of the proposed project were rated predominantly moderate prior to implementation of mitigative measures. However, with the implementation of the recommended mitigative measures, the impacts were mostly reduced to moderate to low significance. The exception is the anticipated loss of wetland habitat within selected mine infrastructure footprints. The loss of wetland habitat will occur even with implementation of the mitigation measures recommended in this report and represents a residual, negative wetland impact. Therefore, application of the mitigation hierarchy indicates that significant residual, negative impact, such as the unavoidable loss of wetland habitat, requires an offset. It is therefore recommended that some form of wetland offset, or compensatory mitigation strategy be developed to address the residual wetland impact - the permanent loss of wetland habitat. The wetland offset developed must be aligned with the National Biodiversity Offset Guideline (GN3569, 2023, Issued under Stion 24J of the National Environmental Management Act), and the SANBI wetland offset guidelines (SANBI & DWS, 2016).

11.1. REASONED OPINION WHETHER THE PROJECT SHOULD PROCEED

Although the mine plan has been revised to avoid sensitive wetland habitats where feasible, some wetlands will be permanently lost as a consequence of the development, including areas of important swamp forest, and possible habitat for species of conservation concern. However, the revised mine plan does place much of the major infrastructure and mine operations predominately within highly transformed lands. Significant negative impacts to wetland habitat could occur, however, if the proposed mitigation, management and monitoring measures are fully applied, most impacts can be reduced to "Low" negative significance.

It is the professional opinion of the Wetland Specialists that the proposed project could go ahead under the condition that the recommendations, mitigation, and monitoring measures as set out in this report are adhered to in full and included in the Environmental Management and Monitoring Plan for the mine, and significant residual impacts (unavoidable wetland loss) is fully addressed through the compilation of a detailed offset strategy that aligns with both SANBI & DWS (2014) and General Notice 3569 of 2023 (National Biodiversity Offset Guideline) to mitigate loss of wetland habitat and functionality. This offset plan must be submitted to the competent authority for review and approval prior to authorisation and implementation of the mine project.

12. REFERENCES

Craft, C. (2015). Creating and Restoring Wetlands: From Theory to Practice, 1st edition, Environmental Management, Elsevier, Amsterdam, Netherlands, pp.358.

Department of Water Affairs 2010. National Water Act, 1998 (Act No 36 of 1998) S21(c) & (i) Water Uses. Version: February 2010. Training Manual

DWAF. (2005). A practical field procedure for the identification and delineation of wetlands and riparian areas.

DWAF. (2008). Updated manual for the Identification of Wetlands and Riparian Areas. Prepared by: Rountree, M. Batchelor, MacKenzie, J. & Hoare, D. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa.

Epoch Resources (Pty) Ltd. 2025. RSF Conceptual Design. Prepared for Tronox KZN Sands. Report Number: 271-001-REP-2025-02-06.

GCS (2020). Baseline hydrogeological assessment for the proposed Tronox Port Dunford Mining Right Area: Final Report. GCS Project No.: 20-0472.

Jackson, C.R., Thompson, J.A. and Kolka, R.K., 2014. Wetland soils, hydrology and geomorphology. In: Batzer, D.; Sharitz, R., eds. Ecology of freshwater and estuarine wetlands. Berkeley, CA: University of California Press: 23-60. Chapter 2., pp.23-60.

Jewitt, D., 2018. Vegetation type conservation targets, status and level of protection in KwaZulu-Natal in 2016. Bothalia-African Biodiversity & Conservation, 48(1), pp.1-10.

Kleynhans, C. J. (1999). A procedure for the determination of the ecological reserve for the purposes of the national water balance model for South African Rivers. Institute for Water Quality Studies. Department of Water Affairs and Forestry, Pretoria.

Kleynhans, C. J., Thirion, C., & Moolman, J. (2005). A level I river ecoregion classification system for South Africa, Lesotho and Swaziland. Pretoria: Department of Water Affairs and Forestry.

Kotze, C., Ellery, W., Rountree, M., Grenfell, M., Marneweck, G., Nxele, Z., and Sieben, E. (2009). WET-RehabPlan. Guidelines for planning wetland rehabilitation in South Africa. Water Research Commission Report. Pretoria: Water Research Commission Report TT, 336(09).

Macfarlane, D. M. and I. Bredin. 2017a. Buffer Zone Guidelines for Rivers, Wetlands and Estuaries Part 1: Technical Manual. WRC Report No. TT 715-1-17.

Macfarlane, D. M. and I. Bredin. 2017b. Buffer Zone Guidelines for Wetlands, Rivers and Estuaries Part 2: Practical Guide. WRC Report No. TT 715/2/17.

Macfarlane, D. M., Ollis, D. J., and Kotze, D. C. 2020. WET-Health (Version 2.0) – A refined suite of tools for assessing the present ecological state of wetland ecosystems: Technical guide. WRC Report No. TT 820/20. South Africa: WRC.

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

Nel, J.L., Driver, A., Strydom, W.F., Maherry, A., Petersen, C., Hill, L., Roux, D.J., Nienaber, S., van Deventeer, H., Swartz, E. & Smith-Adao, L.B. (2011). Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources. Water Research Commission, WRC Report No. TT 500/11.

Ollis, D., Snaddon, K., Job, N., & Mbona, N. (2013). Classification System for Wetlands and Other Aquatic Ecosystems in South Africa: User Manual: Inland Systems. South African National Biodiversity Institute.

Ramanchandra, T.V., and Kumar, U., (2008). Wetland of Greater Bangelore, India: Automatic Delineation through Pattern Classification. Electronic Green Journal, 1(26), pp.1076-1975.

Ramsar Convention on Wetlands. (2018). Global Wetland Outlook: State of Worlds Wetlands and their Services to People. Gland, Switzerland: Ramsar Convention Secretariat.

Red Earth. 2025. Soils, Land Capability, Land Use, and Hydropedology of the Port Durnford Mining Development. Unpublished specialist report.

Red List of terrestrial Ecosystems of South Africa. (2021). SANBI and DFFE.

SANBI & DWS. 2014. Wetland Offsets: a best-practice guideline for South Africa. South African National Biodiversity Institute and the Department of Water Affairs. Pretoria. 69 pages.

Snyman, K. 2008. Port Durnford Pre-Feasibility Mining Study Report on the Soils, Sites, Land Capability and Land Use. Produced for Exxaro KZN Sands. By Keith Snyman & Associates. 202 Pages.

South African National Biodiversity Institute (SANBI). 2018. The Vegetation Map of South Africa, Lesotho and Swaziland, Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors), Online, http://bgis.sanbi.org/SpatialDataset/Detail/18, Version 2018. South African National Biodiversity Institute, Pretoria, South Africa.

Van Deventer, H., van Niekerk, L., Adams, J., Dinala, M. K., Gangat, R., Lamberth, S.J., Lotter, M., Mbona, N., MacKay, F., Nel, J.L., Ramjukadh, C-L., Skowno, A. and Weerts, S. P. (2019). National Wetland Map 5 – An improved spatial extent and representation of inland aquatic and estuarine ecosystems in South Africa. bioRxiv preprint first posted online May. 17, 2019; doi: http://dx.doi.org/10.1101/6404

Vepraskas, M.J. (1994). Redoximorphic Features for Identifying Aquatic Conditions. Tech. Bulletin 301, North Carolina, Agricultural Research Service, North Carolina State University, Raleigh, North Carolina.

Walters, D., Kotze, D., Cowden, C., Browne, M., Grewcock, M., Janks, M., & F Eggers. 2019. Wet-Rehabevaluate Version 2: An Integrated Monitoring and Evaluation Framework to Assess Wetland Rehabilitation In South Africa. Water Research Commission. WRC Report No. 2344/1/19.

WSPa. 2025. Integrated Environmental Authorisation for the Port Durnford Mine, Kwazulu-Natal: Surface Water Baseline and Impact Assessment. Unpublished specialist report.

WSPb. 2025. Port Durnford Mine Hydrogeological Investigation. Unpublished specialist report.

Appendix A

WETLAND HYDROGEOMORPHIC UNITS

A summary table of the area of each wetland HGM unit per catchment is provided below

Summary of Wetland characteristics

HGM UNIT	WETLAND TYPE	EXTENT (Ha)
	CATCHMENT W12F	
W12F – 01	CVB	346.50
W12F – 02	HS	12.91
W12F – 03	HS	24.58
W12F – 04	HS	148.20
W12F – 05	HS	2.5
W12F – 06	HS	19.46
W12F – 07	HS	150.80
W12F – 08	HS	4.16
W12F – 09	HS	0.9 & 1.85
W12F – 10	HS	2.39
W12F – 11	HS	8.46 & 3.25
W12F – 12	HS	1.1 & 68.82
W12F – 13	HS	7.61
W12F – 14	HS	3.17
W12F – 15	HS	1.71
W12F – 16	HS	7.19
	CATCHMENT W13B	
W13B – 01	CVB	100.50
W13B – 02	HS	36.28
W13B – 03	HS	1.74 & 1.35
W13B – 04	HS	2.43
W13B – 05	HS	27.57
W13B – 06	HS	5.28
W13B – 07	HS	0.56
W13B – 08	HS	0.88
W13B – 09	HS	1.6 & 1.5
W13B – 10	CVB	5.27
W13B – 11	HS	20.06
W13B – 12	CVB	0.36 & 11.14
W13B – 13	HS	0.87 & 7.08
W13B – 14	HS	2.46
W13B – 15	HS	1.80 & 24.94
W13B – 16	HS	18.88
W13B – 17	HS	1.61

HGM UNIT	WETLAND TYPE	EXTENT (Ha)
W13B – 18	HS	8.42
W13B – 19	HS	2.41 & 1.82
W13B – 20	HS	1.93
W13B – 21	HS	2.14 & 3.61
W13B – 22	HS	3.37 & 0.75
W13B – 23	HS	0.48 & 0.74
W13B – 24	HS	2.13
W13B – 25	HS	5.98
W13B – 26	HS	0.95
W13B – 27	HS	15.29
W13B – 28	HS	1.03 & 1.61
W13B – 29	HS	9.05 & 2.51
W13B – 30	HS	0.61
W13B – 31	HS	0.82
W13B – 32	HS	4.62
W13B – 33	HS	22.06
W13B – 34	HS	1.82 & 13.10
W13B – 35	HS	3.55
W13B – 36	HS	0.20
W13B – 37	HS	7.03
W13B – 38	HS	1.78
W13B – 39	HS	1.73
W13B – 40	HS	1.87
W13B – 41	HS	7.79
W13B – 42	HS	19.40
W13B – 43	HS	12.54
W13B – 44	HS	9.02
Estuarine Functional Zone (EFZ)	**DESCRIPTION**	**EXTENT (Ha)**
CATCHMENT W13B		
EFZ1	Mlalazi Estuary	45.47
EFZ2	Mlalazi Estuary	124.80
EFZ3	Mlalazi Estuary	24.32

HGM – Hydrogeomorphic, CVB – Channelled Valley Bottom, HS – Hillslope Seepage

Appendix B

DETAILED WETLAND PES RESULTS

PES for the impacted Group 1 (W12F) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	5.1	1.8	1.8	7.0
Ecological Class	D	B	B	E
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	4.1			
Combined Ecological Score	D			

PES for the impacted Group 1 (W13B) wetland units of the proposed activity

GROUP 2	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	2.6	1.9	1.8	3.9
Ecological Class	C	B	B	C
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	2.6			
Combined Ecological Score	C			

PES for the impacted Group 2 (W13B) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	2.0	0.9	1.8	2.6
Ecological Class	B	A	B	C
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	1.8			
Combined Ecological Score	B			

PES for the impacted Group 3 (W13B) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	2.6	2.0	1.8	3.6
Ecological Class	C	C	B	C
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	2.5			

Combined Ecological Score	C

PES for the impacted Group 4 (W12F) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	4.9	2.3	1.8	5.6
Ecological Class	D	C	B	D
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	3.8			
Combined Ecological Score	C			

PES for the impacted Group 4 (W13B) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	1.6	0.5	1.8	2.1
Ecological Class	B	A	B	C
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	1.5			
Combined Ecological Score	B			

PES for the impacted Group 5 (W12F) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	6.9	5.8	3.5	8.0
Ecological Class	E	D	C	F
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	6.3			
Combined Ecological Score	E			

Table 12-9 - PES for the impacted Group 6 (W13B) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	3.7	2.8	1.8	5.8
Ecological Class	C	C	B	D
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	3.6			

Combined Ecological Score	C

PES for the impacted Group 7 (W13B) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	1.8	0.7	1.8	2.0
Ecological Class	B	A	B	C
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	1.6			
Combined Ecological Score	B			

PES for the impacted Group 8 (W13B) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	3.9	3.4	1.8	6.0
Ecological Class	C	C	B	D
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	3.8			
Combined Ecological Score	C			

PES for the impacted Group 9 (W12F) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	1.7	1.2	1.8	2.3
Ecological Class	B	B	B	C
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	1.7			
Combined Ecological Score	B			

Table 12-13 - PES for the impacted Group 9 (W13B) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	7.4	3.9	5.6	9.1
Ecological Class	E	C	D	F
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	**6.8**			
Combined Ecological Score	**E**			

PES for the impacted Group 10 (W13B) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	7.9	4.0	6.1	9.5
Ecological Class	E	D	E	F
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	**7.2**			
Combined Ecological Score	**E**			

PES for the impacted Group 11 (W13B) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	3.5	1.7	2.2	3.8
Ecological Class	C	B	C	C
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	**2.9**			
Combined Ecological Score	**C**			

PES for the impacted Group 12 (W13B) wetland units of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	7.1	3.6	5.4	8.5
Ecological Class	E	C	D	F
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	**6.5**			
Combined Ecological Score	**E**			

PES for the impacted Group 13 (W12F-04) wetland unit of the proposed activity

GROUP 1	PES			
	Hydrology	Geomorphology	Water Quality	Vegetation
Impact Score	1.9	1.3	1.8	1.5
Ecological Class	B	B	B	B
Trajectory of Change	↓	↓	↓	↓
Combined PES Score	**1.7**			
Combined Ecological Score	**B**			

Appendix C

WET-ECOSERVICES RESULTS

Ecoservices provided by Group 1 and 2 wetlands

Wetland Unit					Group 1 W12F	Group 1 W13B	Group 2
Ecosystem services supplied by wetland	Indirect Benefits	Regulating & Supporting Benefits	Flood attenuation		0.0	0.0	0.0
			Streamflow Regulation		2.0	2.0	1.5
			Water quality enhancement benefits	Sediment trapping	2.0	2.0	1.2
				Erosion Control	0.5	0.2	1.2
				Phosphate assimilation	1.0	1.0	0.7
				Nitrate assimilation	1.0	1.0	0.6
				Toxicant assimilation	1.1	1.1	0.7
			Carbon storage		0.0	0.0	0.9
	Direct Benefits	Biodiversity Maintenance			3.1	2.2	3.1
		Provisional Benefits	Water for human use		1.5	1.5	0.9
			Harvestable resources		0.0	0.0	0.5
			Cultivated foods		1.0	1.0	1.0
		Cultural benefits	Tourism and recreation		0.0	0.0	0.0
			Education and Research		0.0	0.0	0.0
			Cultural heritage		0.0	0.0	0.0

Ecoservices provided by Group 3 and 4 wetlands

Wetland Unit					Group 3	Group 4 W12F	Group 4 W13B
Ecosystem services supplied by wetland	Indirect Benefits	Regulating & Supporting Benefits	**Flood attenuation**		0.0	0.0	0.0
			Streamflow Regulation		1.5	2.0	1.7
			Water quality enhancement benefits	Sediment trapping	1.0	1.5	2.0
				Erosion Control	0.8	0.0	1.1
				Phosphate assimilation	0.5	0.7	0.6
				Nitrate assimilation	0.5	0.6	0.0
				Toxicant assimilation	0.6	0.5	0.4
			Carbon storage		0.9	0.0	0.4
	Direct Benefits	**Biodiversity Maintenance**			2.2	2.4	3.3
		Provisional Benefits	Water for human use		0.0	1.7	1.7
			Harvestable resources		0.0	1.5	1.5
			Cultivated foods		1.0	1.0	1.0
		Cultural benefits	Tourism and recreation		0.0	0.0	0.0
			Education and Research		0.0	0.0	0.0
			Cultural heritage		0.0	0.0	0.0

Ecoservices provided by Group 5, 6 and 7 Wetlands

Wetland Unit					Group 5	Group 6	Group 7
Ecosystem services supplied by wetland	Indirect Benefits	Regulating & Supporting Benefits	**Flood attenuation**		0.0	0.0	0.0
			Streamflow Regulation		1.2	1.5	1.5
			Water quality enhancement benefits	Sediment trapping	0.0	0.0	1.4
				Erosion Control	0.0	0.6	1.3
				Phosphate assimilation	0.0	0.0	0.9
				Nitrate assimilation	0.0	0.0	0.8
				Toxicant assimilation	0.0	0.1	0.9
			Carbon storage		0.0	0.5	0.9
	Direct Benefits	**Biodiversity Maintenance**			0.0	0.7	3.1
		Provisional Benefits	Water for human use		0.0	0.0	0.9
			Harvestable resources		0.0	1.0	0.5
			Cultivated foods		1.5	1.0	1.0
		Cultural benefits	Tourism and recreation		0.0	0.0	0.0
			Education and Research		0.0	0.0	0.0
			Cultural heritage		0.0	0.0	0.0

Ecoservices provided by Group 8 and 9 wetlands

Wetland Unit					Group 8	Group 9 W12F	Group 9 W13B
Ecosystem services supplied by wetland	Indirect Benefits	Regulating & Supporting Benefits	**Flood attenuation**		0.0	0.0	0.0
			Streamflow Regulation		1.5	1.5	1.5
			Water quality enhancement benefits	Sediment trapping	0.8	0.5	0.8
				Erosion Control	0.0	0.8	0.0
				Phosphate assimilation	0.3	0.0	1.3
				Nitrate assimilation	0.4	0.0	1.4
				Toxicant assimilation	0.4	0.0	0.4
			Carbon storage		0.0	0.8	0.0
	Direct Benefits	**Biodiversity Maintenance**			0.2	2.1	0.0
		Provisional Benefits	Water for human use		0.0	0.0	0.0
			Harvestable resources		0.0	1.0	0.0
			Cultivated foods		1.0	1.0	1.0
		Cultural benefits	Tourism and recreation		0.0	0.0	0.0
			Education and Research		0.0	0.0	0.0
			Cultural heritage		0.0	0.0	0.0

Ecoservices provided by Group 10, 11 and 12 wetlands

Wetland Unit					Group 10	Group 11	Group 12
Ecosystem services supplied by wetland	Indirect Benefits	Regulating & Supporting Benefits	**Flood attenuation**		0.0	0.0	0.0
			Streamflow Regulation		1.5	1.5	1.5
			Water quality enhancement benefits	Sediment trapping	0.8	1.2	1.0
				Erosion Control	0.0	0.5	0.3
				Phosphate assimilation	1.3	1.7	1.5
				Nitrate assimilation	1.4	1.6	1.5
				Toxicant assimilation	0.4	0.7	0.6
			Carbon storage		0.0	0.9	0.9
	Direct Benefits	**Biodiversity Maintenance**			0.0	1.7	1.7
		Provisional Benefits	Water for human use		0.0	0.1	0.1
			Harvestable resources		0.0	0.5	0.5
			Cultivated foods		1.0	1.0	1.0
		Cultural benefits	Tourism and recreation		0.0	0.0	0.0
			Education and Research		0.0	0.0	0.0
			Cultural heritage		0.0	0.0	0.0

Ecoservices provided by Group 13 (W12F-04) wetland

Wetland Unit					Group 13
Ecosystem services supplied by wetland	Indirect Benefits	Regulating & Supporting Benefits	**Flood attenuation**		0.0
			Streamflow Regulation		1.7
			Water quality enhancement benefits	Sediment trapping	1.9
				Erosion Control	1.2
				Phosphate assimilation	1.2
				Nitrate assimilation	1.0
				Toxicant assimilation	0.9
			Carbon storage		0.7
	Direct Benefits	**Biodiversity Maintenance**			3.3
		Provisional Benefits	Water for human use		4.0
			Harvestable resources		0.5
			Cultivated foods		1.2
		Cultural benefits	Tourism and recreation		0.0
			Education and Research		0.0
			Cultural heritage		0.0

Appendix D

WETLAND IMPORTANCE AND SENSITIVITY RESULTS

Importance and sensitivity of the wetland groups

GROUP 1: W12F	Importance
Ecological Importance & Sensitivity	2.9
Hydrological/Functional Importance	1.0
Direct Human Benefits	0.4
GROUP 1: W13B	**Importance**
Ecological Importance & Sensitivity	2.9
Hydrological/Functional Importance	1.0
Direct Human Benefits	0.4
GROUP 2	**Importance**
Ecological Importance & Sensitivity	3.4
Hydrological/Functional Importance	0.8
Direct Human Benefits	0.4
GROUP 3	**Importance**
Ecological Importance & Sensitivity	3.1
Hydrological/Functional Importance	0.7
Direct Human Benefits	0.2
GROUP 4: W12F	**Importance**
Ecological Importance & Sensitivity	3.2
Hydrological/Functional Importance	0.7
Direct Human Benefits	0.7
GROUP 4: W13B	**Importance**
Ecological Importance & Sensitivity	3.4
Hydrological/Functional Importance	0.7
Direct Human Benefits	0.7
GROUP 5	**Importance**
Ecological Importance & Sensitivity	1
Hydrological/Functional Importance	0.2
Direct Human Benefits	0.2
GROUP 6	**Importance**
Ecological Importance & Sensitivity	1.5
Hydrological/Functional Importance	0.3
Direct Human Benefits	0.3
GROUP 7	**Importance**

Ecological Importance & Sensitivity	3.1
Hydrological/Functional Importance	1.0
Direct Human Benefits	0.4
GROUP 8	**Importance**
Ecological Importance & Sensitivity	1.3
Hydrological/Functional Importance	0.4
Direct Human Benefits	0.4
GROUP 9: W12F	**Importance**
Ecological Importance & Sensitivity	2.3
Hydrological/Functional Importance	0.5
Direct Human Benefits	0.3
GROUP 9: W13B	**Importance**
Ecological Importance & Sensitivity	1.3
Hydrological/Functional Importance	0.7
Direct Human Benefits	0.2
GROUP 10	**Importance**
Ecological Importance & Sensitivity	1.3
Hydrological/Functional Importance	0.7
Direct Human Benefits	0.2
GROUP 11	**Importance**
Ecological Importance & Sensitivity	2.8
Hydrological/Functional Importance	1.0
Direct Human Benefits	0.3
GROUP 12	**Importance**
Ecological Importance & Sensitivity	2.6
Hydrological/Functional Importance	0.9
Direct Human Benefits	0.3
GROUP 13 (W12F-04)	**Importance**
Ecological Importance & Sensitivity	3.4
Hydrological/Functional Importance	1.0
Direct Human Benefits	1.0

Appendix E

RESULTS OF THE WETLAND OFFSET CALCULATIONS

					PRIOR TO DEVELOPMENT			POST DEVELOPMENT			WETLAND FUNCTIONAL TARGETS				
Infrastructure Type	Wetland ID	HGM	Area (HA)	EIS	PES Category	Wetland Integrity (%)	Habitat Intactness (%)	PES Category	Wetland Integrity (%)	Habitat Intactness (%)	Change in Functional Value (%)	Preliminary Development Impact (Functional ha.eq)	Triggers for Potential Adjustment in Exceptional Circumstances	Functional Importance Ratio	Final Functional Offset Target (ha.eq)
LOM	W12F-12	Seep	0.0556817	HIGH	D	59	30	F	0	0	59	0.032852181	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.05**
LOM	W12F-16	Seep	1.1477524	HIGH	D	59	30	F	0	0	59	0.677173944	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**1.02**
LOM	W13B-13	Seep	0.1138146	VERY HIGH	C	75	64	F	0	0	75	0.085360915	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.13**
LOM	W13B-15	Seep	0.7965301	VERY HIGH	C	75	64	F	0	0	75	0.597397544	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.90**
LOM	W13B-09	Seep	0.0141771	VERY HIGH	B	84	80	F	0	0	84	0.011908767	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.02**
LOM/RSF C	W12F-12	Seep	0.289988	HIGH	D	59	30	F	0	0	59	0.171092931	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.26**
LOM/Sandtails	W13B-13	Seep	0.1057677	VERY HIGH	C	75	64	F	0	0	75	0.079325784	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.12**
LOM/Sandtails	W13B-15	Seep	0.2107014	VERY HIGH	C	75	64	F	0	0	75	0.158026014	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.24**
LOM/Sandtails	W13B-09	Seep	0.7118844	VERY HIGH	B	84	80	F	0	0	84	0.597982927	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.90**
Road Corridor	W12F-12	Seep	0.1774104	HIGH	D	59	30	F	0	0	59	0.104672151	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.16**
Road Corridor	W13B-13	Seep	0.0120386	VERY HIGH	C	75	64	F	0	0	75	0.009028984	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.01**
Road Corridor	W13B-15	Seep	0.0228668	VERY HIGH	C	75	64	F	0	0	75	0.017150089	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.03**
Road Corridor	W13B-13	Seep	0.0014681	VERY HIGH	C	75	64	F	0	0	75	0.001101101	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.00**
Road Corridor	W13B-15	Seep	0.0151824	VERY HIGH	C	75	64	F	0	0	75	0.011386787	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.02**
Road Corridor	W13B-01	CVB	0.0807315	VERY HIGH	B	85	79	F	0	0	85	0.068621776	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.10**
Road Corridor	W13B-10	CVB	0.264373	VERY HIGH	B	85	79	F	0	0	85	0.224717092	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.34**
Road Corridor	W13B-12	CVB	0.0784107	VERY HIGH	B	85	79	F	0	0	85	0.066649067	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.10**
Road Corridor	W13B-11	Seep	0.9338735	VERY HIGH	B	84	80	F	0	0	84	0.784453704	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**1.18**
Road Corridor	W13B-09	Seep	0.2355284	VERY HIGH	B	84	80	F	0	0	84	0.197843817	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.30**
Road Corridor	W13B-05	Seep	0.0004229	VERY HIGH	B	84	80	F	0	0	84	0.00035521	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.00**
Road Corridor	W13B-09	Seep	0.0167778	VERY HIGH	B	84	80	F	0	0	84	0.014093311	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.02**
Road Corridor	W13B-40	Seep	0.3061623	MODERATE	C	62	40	F	0	0	62	0.189820619	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.28**

					PRIOR TO DEVELOPMENT			POST DEVELOPMENT			WETLAND FUNCTIONAL TARGETS				
Infrastructure Type	Wetland ID	HGM	Area (HA)	EIS	PES Category	Wetland Integrity (%)	Habitat Intactness (%)	PES Category	Wetland Integrity (%)	Habitat Intactness (%)	Change in Functional Value (%)	Preliminary Development Impact (Functional ha.eq)	Triggers for Potential Adjustment in Exceptional Circumstances	Functional Importance Ratio	Final Functional Offset Target (ha.eq)
Road Corridor	W13B-33	Seep	0.0082385	MODERATE	C	62	40	F	0	0	62	0.005107846	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.01**
RSF 9	W13B-44	Seep	7.0326143	HIGH	C	74	61	F	0	0	74	5.204134604	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**7.81**
RSF 9	W13B-42	Seep	14.376336	HIGH	C	74	61	F	0	0	74	10.63848889	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**15.96**
RSF 9	W13B-41	Seep	6.8511825	HIGH	C	74	61	F	0	0	74	5.069875024	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**7.60**
RSF 9	W13B-43	Seep	7.4739704	HIGH	C	74	61	F	0	0	74	5.530738121	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**8.30**
RSF 9	W13B-40	Seep	0.1244478	MODERATE	C	62	40	F	0	0	62	0.077157619	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.12**
Sandtails	W12F-13	Seep	7.615554	HIGH	C	59	30	F	0	0	59	4.493176873	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**6.74**
Sandtails	W13B-18	Seep	8.4242666	HIGH	C	74	61	F	0	0	74	6.233957267	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**9.35**
Sandtails	W12F-12	Seep	37.910821	HIGH	D	59	30	F	0	0	59	22.36738419	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**33.55**
Sandtails	W13B-32	Seep	0.6010022	MODERATE	E	28	5	F	0	0	28	0.168280604	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.25**
Sandtails	W13B-17	Seep	1.6192499	VERY HIGH	B	82	74	F	0	0	82	1.327784939	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**1.99**
Sandtails	W13B-01	CVB	0.0184873	VERY HIGH	B	85	79	F	0	0	85	0.015714244	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.02**
Sandtails	W13B-10	CVB	0.0047131	VERY HIGH	B	85	79	F	0	0	85	0.004006095	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.01**
Sandtails	W13B-12	CVB	1.3147415	VERY HIGH	B	85	79	F	0	0	85	1.117530284	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**1.68**
Sandtails	W13B-06	Seep	0.3054415	MODERATE	C	64	42	F	0	0	64	0.195482583	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.29**
Sandtails	W13B-39	Seep	0.3037261	MODERATE	C	62	40	F	0	0	62	0.188310163	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.28**
Sandtails	W13B-33	Seep	21.117733	MODERATE	C	62	40	F	0	0	62	13.09299446	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**19.64**
Sandtails/Topsoil	W13B-39	Seep	0.3669211	MODERATE	C	62	40	F	0	0	62	0.227491085	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.34**
Sandtails/Topsoil	W13B-33	Seep	0.0557879	MODERATE	C	62	40	F	0	0	62	0.034588472	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.05**
Topsoil	W13B-16	Seep	1.5584672	VERY HIGH	B	82	74	F	0	0	82	1.277943131	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**1.92**
Topsoil	W13B-15	Seep	0.2470278	VERY HIGH	C	75	64	F	0	0	75	0.185270833	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.28**
Topsoil	W13B-01	CVB	0.1414158	VERY HIGH	B	85	79	F	0	0	85	0.12020342	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.18**
Topsoil	W13B-10	CVB	0.0165072	VERY HIGH	B	85	79	F	0	0	85	0.01403109	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.02**

					PRIOR TO DEVELOPMENT			POST DEVELOPMENT			WETLAND FUNCTIONAL TARGETS				
Infrastructure Type	Wetland ID	HGM	Area (HA)	EIS	PES Category	Wetland Integrity (%)	Habitat Intactness (%)	PES Category	Wetland Integrity (%)	Habitat Intactness (%)	Change in Functional Value (%)	Preliminary Development Impact (Functional ha.eq)	Triggers for Potential Adjustment in Exceptional Circumstances	Functional Importance Ratio	Final Functional Offset Target (ha.eq)
Topsoil	W13B-09	Seep	0.0265237	VERY HIGH	B	84	80	F	0	0	84	0.022279873	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.03**
Topsoil	W13B-40	Seep	0.3668411	MODERATE	C	62	40	F	0	0	62	0.227441512	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.34**
Topsoil	W13B-39	Seep	0.0029564	MODERATE	C	62	40	F	0	0	62	0.001832995	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.00**
Topsoil	W13B-02	Seep	0.118463	MODERATE	E	32	9	F	0	0	32	0.037908171	Wetland loss in a strategic water resource area which could compromise water regulation / supply	1.5	**0.06**
			123.59498												**122.97**

					PRIOR TO DEVELOPMENT		POST DEVELOPMENT		ECOSYSTEM CONSERVATION TARGETS											
Infrastructure Type	Wetland ID	HGM	Area (HA)	EIS	PES Category	Habitat Intactness (%)	PES Category	Habitat Intactness (%)	Wetland Ecosystem Group	Threat Status	Protection Level	Ecosystem Status Mulipier	Priority of Wetland as Defined in Regional and National Conservation Plans	Regional & National Context Multiplier	Uniqueness and Importance of Biota Present in the Wetland	Biodiversity Value Score	Local Connectivity	Local Context Multiplier	Ecosystem Conservation Ratio	Ecosystem Conservation Target (ha.eq)
LOM	W12F-12	Seep	0.0556817	HIGH	D	30	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.19**
LOM	W12F-16	Seep	1.1477524	HIGH	D	30	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**4.00**
LOM	W13B-13	Seep	0.1138146	VERY HIGH	C	64	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.85**
LOM	W13B-15	Seep	0.7965301	VERY HIGH	C	64	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**5.93**
LOM	W13B-09	Seep	0.0141771	VERY HIGH	B	80	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	High Importance	1.00	High biodiversity value	1.00	Moderate connectivity	0.78	23.25	**0.26**
LOM/RSF C	W12F-12	Seep	0.289988	HIGH	D	30	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**1.01**
LOM/Sandtails	W13B-13	Seep	0.1057677	VERY HIGH	C	64	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.79**
LOM/Sandtails	W13B-15	Seep	0.2107014	VERY HIGH	C	64	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**1.57**
LOM/Sandtails	W13B-09	Seep	0.7118844	VERY HIGH	B	80	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	High Importance	1.00	High biodiversity value	1.00	Moderate connectivity	0.78	23.25	**13.24**
Road Corridor	W12F-12	Seep	0.1774104	HIGH	D	30	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.62**
Road Corridor	W13B-13	Seep	0.0120386	VERY HIGH	C	64	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.09**
Road Corridor	W13B-15	Seep	0.0228668	VERY HIGH	C	64	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.17**

					PRIOR TO DEVELOPMENT		POST DEVELOPMENT		ECOSYSTEM CONSERVATION TARGETS											
Infrastructure Type	**Wetland ID**	**HGM**	**Area (HA)**	**EIS**	**PES Category**	**Habitat Intactness (%)**	**PES Category**	**Habitat Intactness (%)**	**Wetland Ecosystem Group**	**Threat Status**	**Protection Level**	**Ecosystem Status Muliplier**	**Priority of Wetland as Defined in Regional and National Conservation Plans**	**Regional & National Context Multiplier**	**Uniqueness and Importance of Biota Present in the Wetland**	**Biodiversity Value Score**	**Local Connectivity**	**Local Context Multiplier**	**Ecosystem Conservation Ratio**	**Ecosystem Conservation Target (ha.eq)**
Road Corridor	W13B-13	Seep	0.0014681	VERY HIGH	C	64	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.01**
Road Corridor	W13B-15	Seep	0.0151824	VERY HIGH	C	64	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.11**
Road Corridor	W13B-01	CVB	0.0807315	VERY HIGH	B	79	F	0	Indian Ocean Coastal Belt Group 2_Channelled valley-bottom wetland	CR	Poorly protected	15.00	High Importance	1.00	High biodiversity value	1.00	Good connectivity	0.80	12.00	**0.77**
Road Corridor	W13B-10	CVB	0.264373	VERY HIGH	B	79	F	0	Indian Ocean Coastal Belt Group 2_Channelled valley-bottom wetland	CR	Poorly protected	15.00	High Importance	1.00	High biodiversity value	1.00	Good connectivity	0.80	12.00	**2.51**
Road Corridor	W13B-12	CVB	0.0784107	VERY HIGH	B	79	F	0	Indian Ocean Coastal Belt Group 2_Channelled valley-bottom wetland	CR	Poorly protected	15.00	High Importance	1.00	High biodiversity value	1.00	Good connectivity	0.80	12.00	**0.74**
Road Corridor	W13B-11	Seep	0.9338735	VERY HIGH	B	80	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**8.69**
Road Corridor	W13B-09	Seep	0.2355284	VERY HIGH	B	80	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	High Importance	1.00	High biodiversity value	1.00	Moderate connectivity	0.78	23.25	**4.38**
Road Corridor	W13B-05	Seep	0.0004229	VERY HIGH	B	80	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.00**
Road Corridor	W13B-09	Seep	0.0167778	VERY HIGH	B	80	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	High Importance	1.00	High biodiversity value	1.00	Moderate connectivity	0.78	23.25	**0.31**
Road Corridor	W13B-40	Seep	0.3061623	MODERATE	C	40	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**1.42**
Road Corridor	W13B-33	Seep	0.0082385	MODERATE	C	40	F	0	Indian Ocean Coastal Belt	CR	Not protected	30.00	Not specifically	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.04**

					PRIOR TO DEVELOPMENT		POST DEVELOPMENT		ECOSYSTEM CONSERVATION TARGETS											
Infrastructure Type	Wetland ID	HGM	Area (HA)	EIS	PES Category	Habitat Intactness (%)	PES Category	Habitat Intactness (%)	Wetland Ecosystem Group	Threat Status	Protection Level	Ecosystem Status Muliplier	Priority of Wetland as Defined in Regional and National Conservation Plans	Regional & National Context Multiplier	Uniqueness and Importance of Biota Present in the Wetland	Biodiversity Value Score	Local Connectivity	Local Context Multiplier	Ecosystem Conservation Ratio	Ecosystem Conservation Target (ha.eq)
									Group 2_Seep				identifed as important							
RSF 9	W13B-44	Seep	7.0326143	HIGH	C	61	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**49.87**
RSF 9	W13B-42	Seep	14.376336	HIGH	C	61	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**101.95**
RSF 9	W13B-41	Seep	6.8511825	HIGH	C	61	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**48.58**
RSF 9	W13B-43	Seep	7.4739704	HIGH	C	61	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**53.00**
RSF 9	W13B-40	Seep	0.1244478	MODERATE	C	40	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.58**
Sandtails	W12F-13	Seep	7.615554	HIGH	C	30	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**26.56**
Sandtails	W13B-18	Seep	8.4242666	HIGH	C	61	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**59.74**
Sandtails	W12F-12	Seep	37.910821	HIGH	D	30	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**132.21**
Sandtails	W13B-32	Seep	0.6010022	MODERATE	E	5	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.35**
Sandtails	W13B-17	Seep	1.6192499	VERY HIGH	B	74	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**13.93**
Sandtails	W13B-01	CVB	0.0184873	VERY HIGH	B	79	F	0	Indian Ocean Coastal Belt Group 2_Channelled valley-bottom wetland	CR	Poorly protected	15.00	High Importance	1.00	High biodiversity value	1.00	Good connectivity	0.80	12.00	**0.18**
Sandtails	W13B-10	CVB	0.0047131	VERY HIGH	B	79	F	0	Indian Ocean Coastal Belt Group	CR	Poorly protected	15.00	High Importance	1.00	High biodiversity value	1.00	Good connectivity	0.80	12.00	**0.04**

					PRIOR TO DEVELOPMENT		POST DEVELOPMENT		ECOSYSTEM CONSERVATION TARGETS											
Infrastructure Type	Wetland ID	HGM	Area (HA)	EIS	PES Category	Habitat Intactness (%)	PES Category	Habitat Intactness (%)	Wetland Ecosystem Group	Threat Status	Protection Level	Ecosystem Status Mulipier	Priority of Wetland as Defined in Regional and National Conservation Plans	Regional & National Context Multiplier	Uniqueness and Importance of Biota Present in the Wetland	Biodiversity Value Score	Local Connectivity	Local Context Multiplier	Ecosystem Conservation Ratio	Ecosystem Conservation Target (ha.eq)
									2_Channelled valley-bottom wetland											
Sandtails	W13B-12	CVB	1.3147415	VERY HIGH	B	79	F	0	Indian Ocean Coastal Belt Group 2_Channelled valley-bottom wetland	CR	Poorly protected	15.00	High Importance	1.00	High biodiversity value	1.00	Good connectivity	0.80	12.00	**12.46**
Sandtails	W13B-06	Seep	0.3054415	MODERATE	C	42	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**1.49**
Sandtails	W13B-39	Seep	0.3037261	MODERATE	C	40	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**1.41**
Sandtails	W13B-33	Seep	21.117733	MODERATE	C	40	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**98.20**
Sandtails/Topsoil	W13B-39	Seep	0.3669211	MODERATE	C	40	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**1.71**
Sandtails/Topsoil	W13B-33	Seep	0.0557879	MODERATE	C	40	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.26**
Topsoil	W13B-16	Seep	1.5584672	VERY HIGH	B	74	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**13.41**
Topsoil	W13B-15	Seep	0.2470278	VERY HIGH	C	64	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**1.84**
Topsoil	W13B-01	CVB	0.1414158	VERY HIGH	B	79	F	0	Indian Ocean Coastal Belt Group 2_Channelled valley-bottom wetland	CR	Poorly protected	15.00	High Importance	1.00	High biodiversity value	1.00	Good connectivity	0.80	12.00	**1.34**
Topsoil	W13B-10	CVB	0.0165072	VERY HIGH	B	79	F	0	Indian Ocean Coastal Belt Group 2_Channelled valley-	CR	Poorly protected	15.00	High Importance	1.00	High biodiversity value	1.00	Good connectivity	0.80	12.00	**0.16**

					PRIOR TO DEVELOPMENT		POST DEVELOPMENT		ECOSYSTEM CONSERVATION TARGETS											
Infrastructure Type	Wetland ID	HGM	Area (HA)	EIS	PES Category	Habitat Intactness (%)	PES Category	Habitat Intactness (%)	Wetland Ecosystem Group	Threat Status	Protection Level	Ecosystem Status Mulipiler	Priority of Wetland as Defined in Regional and National Conservation Plans	Regional & National Context Multiplier	Uniqueness and Importance of Biota Present in the Wetland	Biodiversity Value Score	Local Connectivity	Local Context Multiplier	Ecosystem Conservation Ratio	Ecosystem Conservation Target (ha.eq)
									bottom wetland											
Topsoil	W13B-09	Seep	0.0265237	VERY HIGH	B	80	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	High Importance	1.00	High biodiversity value	1.00	Moderate connectivity	0.78	23.25	**0.49**
Topsoil	W13B-40	Seep	0.3668411	MODERATE	C	40	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**1.71**
Topsoil	W13B-39	Seep	0.0029564	MODERATE	C	40	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.01**
Topsoil	W13B-02	Seep	0.118463	MODERATE	E	9	F	0	Indian Ocean Coastal Belt Group 2_Seep	CR	Not protected	30.00	Not specifically identifed as important	0.50	High biodiversity value	1.00	Moderate connectivity	0.78	11.63	**0.12**
			123.59498																	**669.30**

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

wsp.com