



**ASSESSMENT OF THE WETLANDS AND  
WATERCOURSES IN THE VICINITY OF A  
PROPOSED NEW DOLERITE MINE NEAR  
PIETERMARITZBURG, KWAZULU-NATAL**

**MARCH 2021  
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**SYNOPSIS**

Assessment of the wetlands and watercourses in the vicinity of a proposed dolerite mine. In addition to this, recommendations towards the management of the wetlands and watercourses in the vicinity of the project area have also been provided.

**KEY WORDS:**

Wetlands, Watercourses, Assessment, Management Recommendations.

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**QUALITY VERIFICATION**

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO 9001: 2015 which has been independently certified by DEKRA Certification.



Verification	Capacity	Name	Signature	Date
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## **1. INTRODUCTION**

Greenmined Environmental is undertaking the various processes of application for environmental authorisation in relation to a new dolerite mine, located in the Mshwati Local Municipality, near Pietermaritzburg, KwaZulu-Natal. The applications are required in terms of the National Environmental Management Act (Act 107 of 1998) and Sections 21 (c) and 21 (i) of the National Water Act (Act 36 of 1998). Earlier specialist studies have been completed and submitted (Amanzi Aquatics, 2020) and, as a result, the Department of Water Affairs and Sanitation (DWS) has requested further information in relation to the aquatic environment at the mine site and further downstream in the affected catchment area.

JG Afrika (Pty) Ltd has been appointed by Greenmined (Pty) Ltd to undertake the necessary studies on the aquatic features (wetlands and watercourses) in the vicinity of the proposed mine and to answer the queries raised by the DWS.

## **2. LOCALITY AND ACCESS ROUTE**

The site of the proposed mine is located approximately 10 km to the northeast of the Pietermaritzburg Central Business District, as presented in Figure 1. Access is along the Greytown Road (R33) off the Chota Motala Road out of the city centre. From the intersection at the Northdale Mall follow the road for some 10 km and then turn off to the right at the crossroad. Proceed some 450 m and turn right opposite the brick sales shop. A track which is obscure in places leads from there to the mine site.

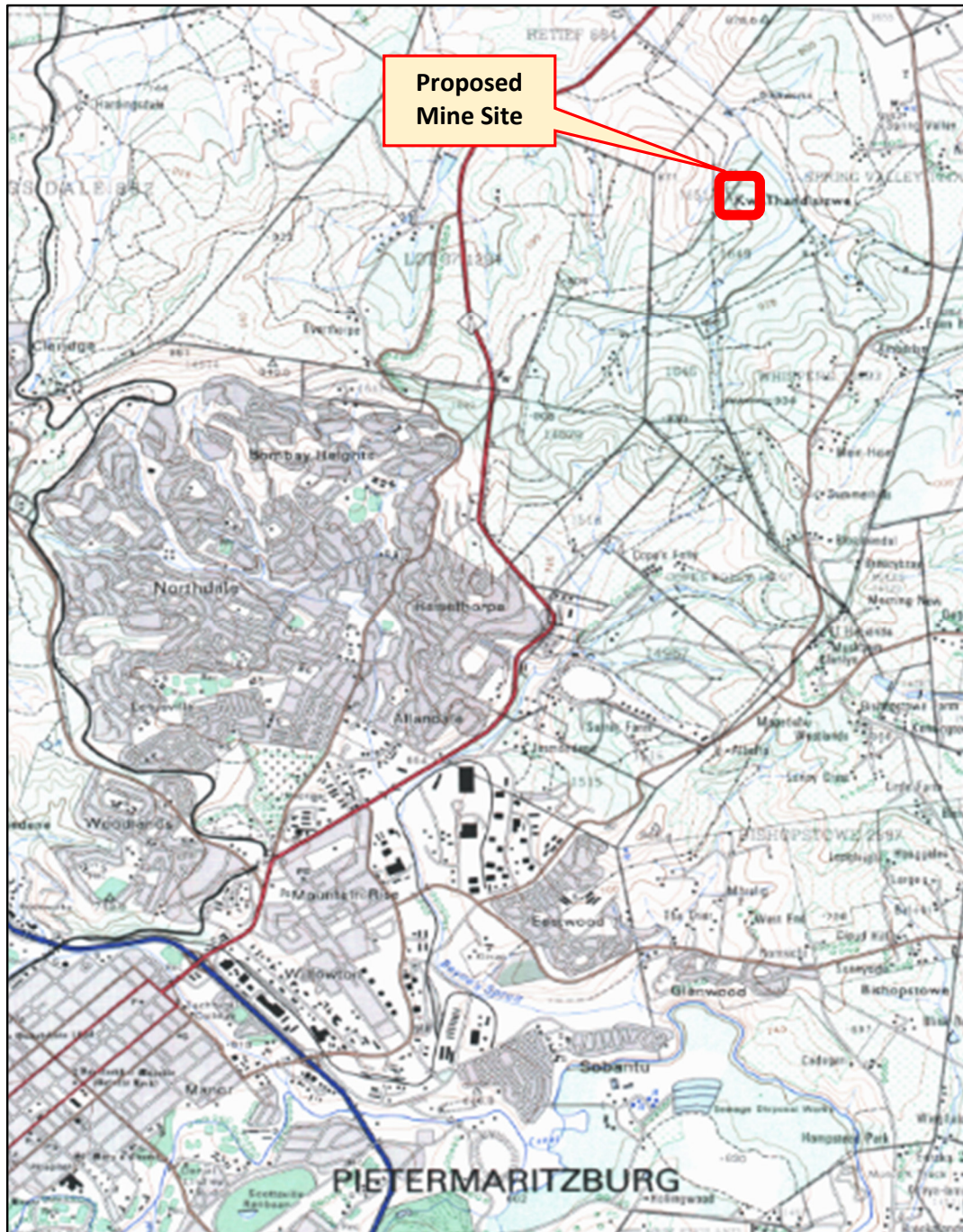
## **3. TERMS OF REFERENCE TO BE ADDRESSED**

Based on the terms of reference, the following will be addressed in the following report:

- Assessment of the watercourses in the vicinity of the proposed mine with particular reference to potential impacts on the Umgeni River, and
- Assessment of the wetlands in the vicinity of the proposed mine with reference to compliance with the National Water Act (Act No. 36 of 1998)

In order to meet the Terms of Reference, the study area was set out with two objectives. These were as follows:

- To consider the characteristics of the various stream and river channels in the vicinity of the mine and between the mine and the Umgeni River; and
- To consider the possibility of the mine impacting on any wetlands which might be in its vicinity.



**Figure 1:** Locality of the proposed dolerite mine

To meet these objectives, the definitions of the regulated areas of a watercourse and a wetland, as set out under the National Water Act (Act No. 36 of 1998), were referred to. The requirements below are relevant.

*The “General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as defined in Section 21(c) and (i)”, Notice 509 of 2016, specifies that the “regulated area of a watercourse” is to mean:*

- (a) The outer edge of the 1 in 100 year flood line and / or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;
- (b) In the absence of a determined 1 in 100 year flood line or riparian area, the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or
- (c) A 500m radius from the delineated boundary (extent) of any wetland or pan.

The National Water Act defines wetlands and watercourses as follows:

“Wetland” means -

Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which in normal circumstances supports or would support vegetation typically adapted to life in saturated soils.

“Watercourse” means –

- a) a river or spring,
- b) a natural channel in which water flows regularly or intermittently,
- c) a wetland, lake or dam into which, or from which, water flows, and
- d) any collection of water which the Minister may, by notice in the Gazette to declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

In order to meet these requirements, the study area for this investigation consists of a strip of land extending outwards 500 m from the given edges of the proposed mine area. However, since the terms of reference make reference to the Umgeni River, the course of the stream which passes close to the mine down to its confluence with the Umgeni River was also included, as shown in Figure 2. However, the greatest attention to detail was to be in the 500 m wide area surrounding the proposed mine.

#### **4. EXPERTISE OF THE SPECIALIST**

In brief, Mr Alletson is a registered natural scientist with the South African Council of Natural Scientific Professions (Ecological Scientist No. 125697) and has a BSc degree in Biological Sciences from the University of Natal, Durban and a BSc Honours degree in Zoology from Rhodes University. He served as a freshwater ecologist and conservation planner for 21 years in the (then) Natal Parks Board and has a further 24 years of experience as a consulting aquatic and terrestrial ecologist. During that time, he has undertaken numerous wetland and biodiversity assessments for clients ranging from private landowners to state-owned entities such as Transnet and the South African National Roads Agency (SANRAL).

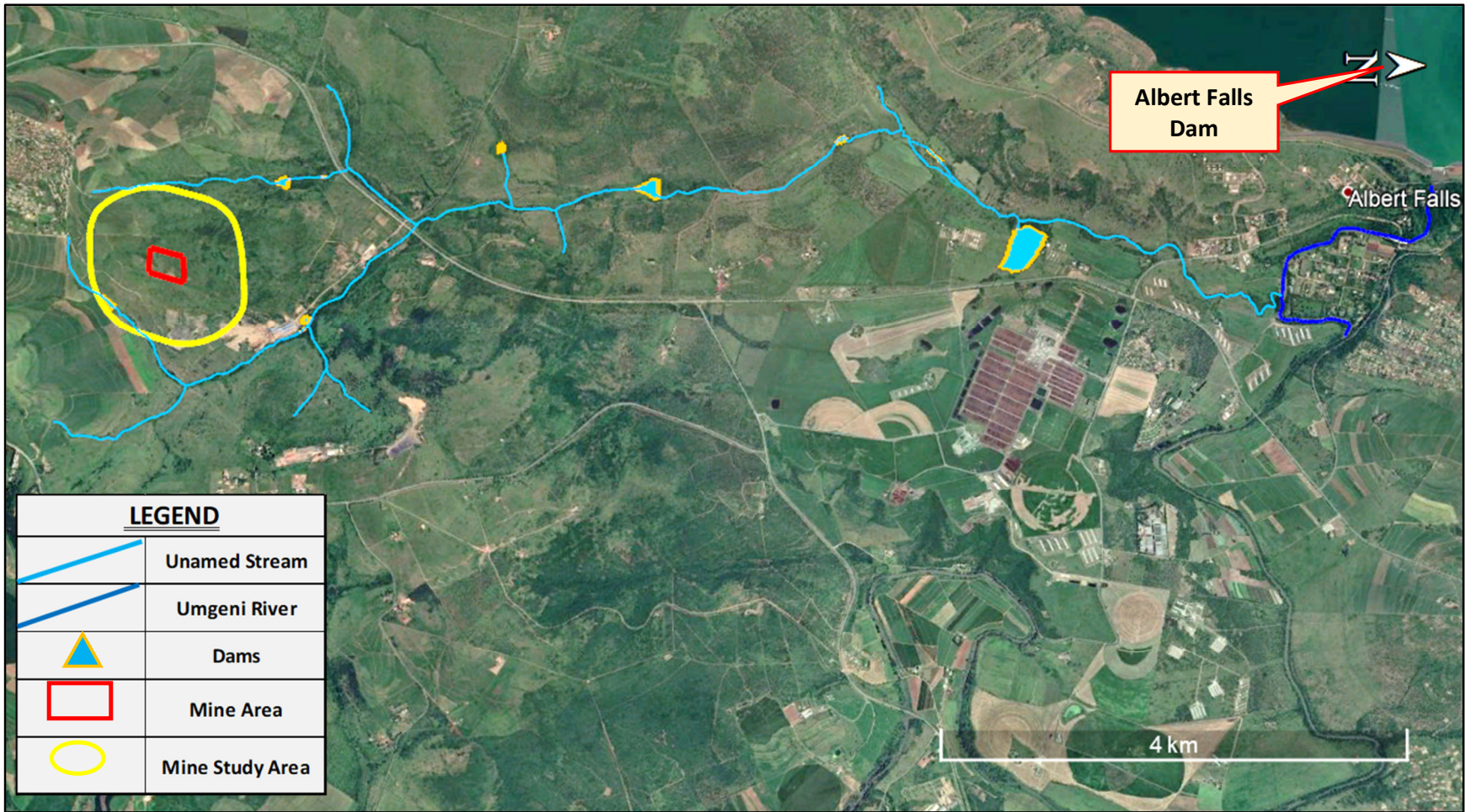


Figure 2: Project Study Area

## 5. AIMS AND OBJECTIVES

The primary aim of the investigation was to identify and analyse of any possible impacts of the dolerite mine on the Umgeni River. Since the river is NFEPA listed and is a critical component of the social and economic well-being of the greater Pietermaritzburg – Durban Corridor, as well as being an important water source for a wider area, it is clear that any further degradation of the river system is undesirable. Since a mine can be a source of sediments and other contaminants, including hydrocarbons (fuels and oils) the possibility of impacts on the Umgeni River must be considered.

The key objectives in considering the risk of impacts on the Umgeni River are as follows:

- To determine the state of the intervening watercourses which link the mine and the Umgeni River;
- To determine the possibility and probability of any contaminants from the mine reaching the Umgeni river;
- To determine the possibility of the mine adversely impacting on aquatic biodiversity in the local rivers and streams; and
- To recommend means by which the possible contamination may be reduced or, preferably, eliminated.

A second aim of the study consists of investigating the possibility of any impacts on wetlands within 500 m of the mine, which might also lead to degradation of the Umgeni River. The possible risks of impacts are much the same for wetlands as for the Umgeni River and are as follows:

- To confirm the presence or absence of any wetlands within 500 m of the mine;
- To determine the state of any such wetlands;
- To determine the possibility and probability of any contaminants from the mine affecting the wetlands and their associated watercourses;
- To determine the possibility of the mine adversely impacting on aquatic biodiversity in the local rivers and streams; and
- To recommend means by which the possible contamination may be reduced or, preferably, eliminated.

## 6. METHODOLOGY

In order to meet the stated Aims and Objectives, the following actions were to be undertaken:

### 6.1 Investigation of Watercourses

- The presence of all watercourses in the mine area and flowing from it was to be determined and the channels were to be delineated. Publicly available datasets, including NFEPA and Surveyor General mapping, and Google Earth imagery, were to be used; and
- The characteristics of the watercourses were to be determined and, if possible to be assessed by means of SASS5 surveys.



## 6.2 Investigation of Wetlands

In order to meet the stated Aims and Objectives the following actions were to be undertaken:

- A search was to be made for any wetlands located within 500 m of the mine periphery. A desktop survey using NFEPA and Ezemvelo KZN Wildlife wetland mapping would be undertaken and a search for wetland traces in Google Earth imagery would be carried out;
- Wetlands which might be affected by the mine were to be delineated in accordance with the Department of Water and Forestry Guidelines of 2005; and
- Delineated wetlands would have their Present Ecological State and their functionality determined by means of the WET-Health and WET-Ecoservices models.

## 7. RESULTS

### 7.1 Watercourses

The results of the watercourse identification and mapping are shown in Figure 3. While Surveyor General mapping was used for most of the channels, and accorded with the Google Earth imagery, the alignment of the watercourse which originates near the mine area was problematic, as the detail of its lower reaches have been lost as a result of the development of a shale quarry. The changes started in the late 1900s as a part of a now-defunct brickworks and by 2006 the watercourse was being affected. An aerial image dated 2013 shows the shale quarry to be well developed. As the present brickworks was initiated in 2016 it is likely that it had no role in the earlier changes.

Despite the foregoing, the impacts on the watercourse originating at the proposed quarry, are not believed to be of any significance as the channel is ephemeral (i.e. it only flows only in direct response to precipitation). Even at the end of the above-average rainfalls of the 2020 – 2021 season no trace of water could be found between rainfall events. Two small dam walls have been raised across the stream (as shown in Figure 4), but it appears that they serve no function in regard to water retention or storage.

As part of separate studies, the channel originating from the proposed mining area was included in biodiversity studies, undertaken for the brickworks in 2018 and again in 2020. During these studies, the drainage line was found to be completely dry, despite the fact that the studies were done during the summer rainy season. It is therefore concluded that the drainage line originating from the area of the proposed mine quarry is no more than a surface runoff channel that carries water only after major rainfall events.

The distance from the brickworks area where the mine watercourse originally joined the unnamed stream, to the confluence with Umgeni River, is approximately 11 km. See Figure 2

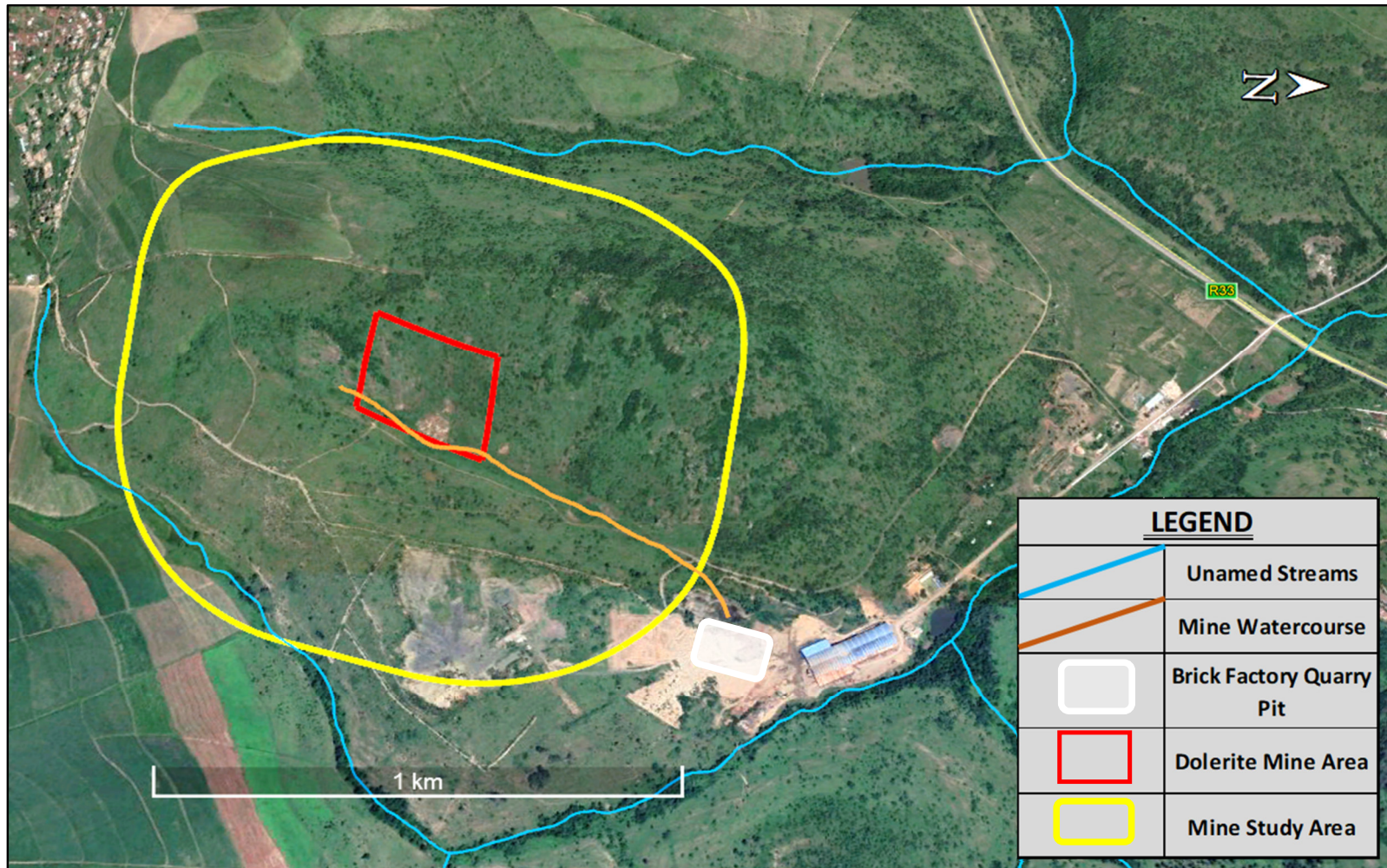


Figure 3: Watercourses in the vicinity of the dolerite mine

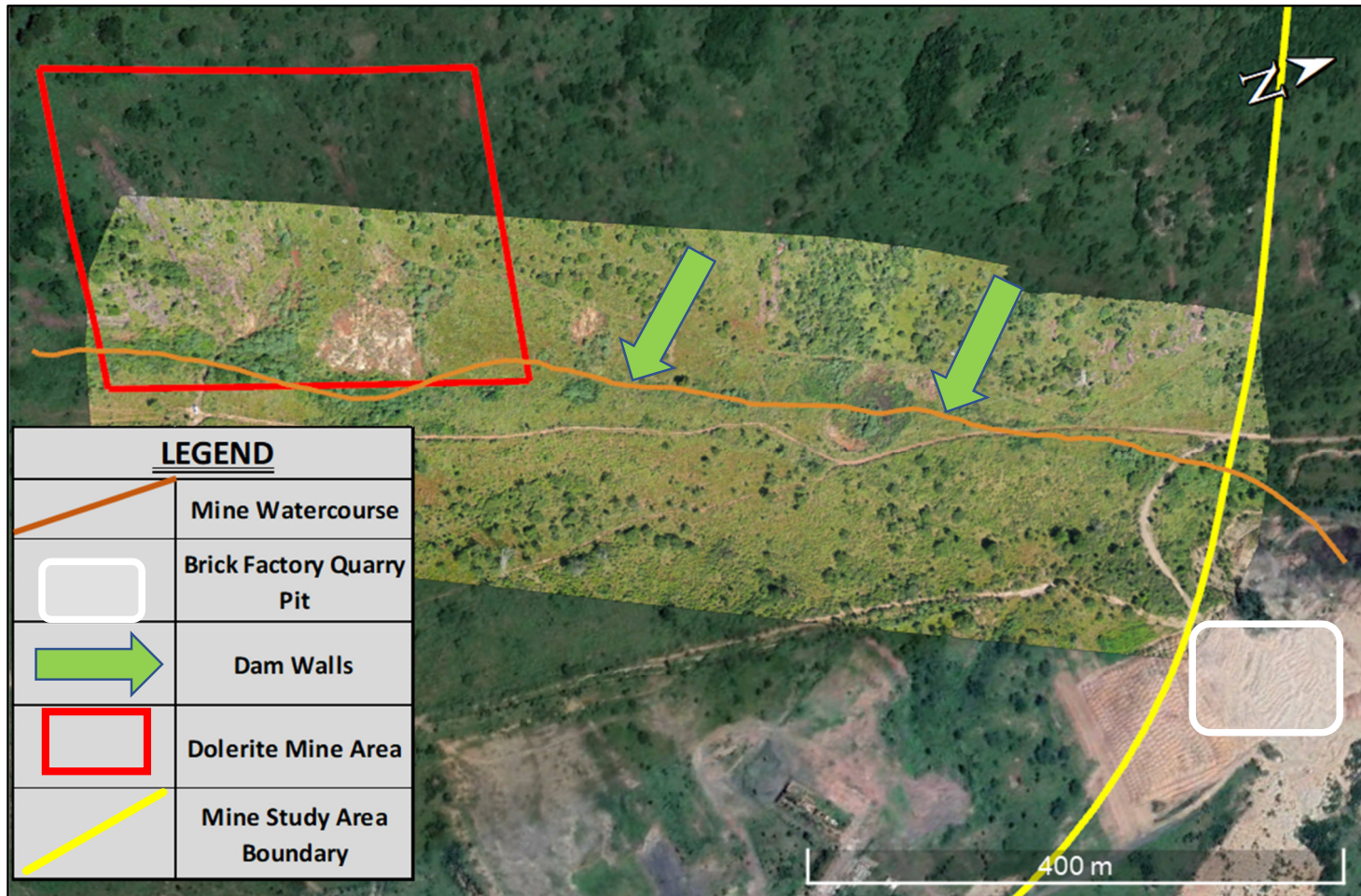


Figure 4: Recent aerial image of the mine watercourse



**Plate 1:** View downstream toward the brickworks along the mine watercourse valley



**Plate 2:** View upstream along the mine watercourse



**Plate 3:** View over the brickworks quarry area showing the pit where the mine watercourse now ends



**Plate 4:** View of the unnamed watercourse downstream of Road R33

above. A short distance downstream from the brickworks site the stream channel appears to have been canalised at some time in the past. The reason for this and the time of it happening are both unknown. The stream is joined by numerous tributaries and so is a third order system by the time it reaches the larger river. Along its length it passes through six small farm dams which will be serving as sediment traps. The gradient is generally low and so much of the channel is very densely vegetated and wetland conditions appear in places, especially in the lower reaches. These too will also be capable of trapping suspended solids and assimilating dissolved nutrients or toxicants. A large right bank dam located some 3km from the Umgeni confluence receives runoff from an animal feedlot and was at one time severely eutrophic as a result. The outflow contaminated the lower stream at that time but it is believed to have been at least partially rectified now.

Upstream of the brickworks, much of the unnamed stream channel passes through farmland although the headwaters of some tributaries are partially in the Copesville residential area. The primary crop produced in the catchment area at present is sugar cane, although mealies were grown in the past. Areas of open veld are used for rough grazing of livestock. Much of the channel appears to have been filled in with sediment and wetland conditions are present along many sections. See also Section 8.2 below. It is suspected that the sediment has been derived from the crop fields on the surrounding slopes, and that fertilisers are contributing to the excessive plant growths.

The planned SASS survey of the stream at some point near the dolerite mine could not be undertaken as the channel was nearly dry at the time of the field survey and no suitable sampling site could be found. Therefore, the condition of the river is based on observations made both in the course of the present and past studies, and on professional experience and opinion.

**Table 1: Present Ecological State (PES) of the unnamed watercourse adjacent to the brickworks**

Section	Latitude	Longitude	Present Ecological State (PES)	Drivers
Upstream of Brickworks	29°31'18.57"S	30°26'34.07"E	C Moderately Modified	Sediment Inputs Nutrient inputs Alien trees on banks
Downstream of Brickworks	29°30'33.42"S	30°25'51.70"E	C/D Moderately/Largely Modified	Canalisation of channel Alien trees on banks Farm dams

The aquatic biodiversity in the area is not known to hold any species of conservation concern which might be affected by the mine. The Mocambique Tilapia (*Oreochromis mossambicus*) is present in the area and is Red Data listed. However, the listing is due to corruption of genetic integrity as a result of hybridisation with Nile Tilapia (*O. niloticus*) and will not be affected by the mine. Water quality is not likely to change in either the Umgeni River or the

unnamed stream since the mine watercourse is normally dry and mitigatory measures may be taken for those times when there are flows.

The condition of the unnamed stream is probably stable now with there being no noticeable changes anticipated unless there is a significant change in catchment or climatic conditions.

### *7.2 Wetlands*

Neither the desktop study nor the field survey revealed any wetlands within the 500 m wide surrounding strip whose presence was not already known. The wetlands in the vicinity of the mine are shown in the NFEPA and Ezemvelo KZN Wildlife wetland databases, as indicated in Figure 5. Only one such wetland exists and it is located along the unnamed stream to the east of the mine area. It is on the extreme edge of the 500 m wide strip mandated for wetlands under the National Water Act (Section 4 above) and is shown in further detail in Figure 6. In accordance with Ollis *et al* (2013) it is a Channelled Valley Bottom Wetland.

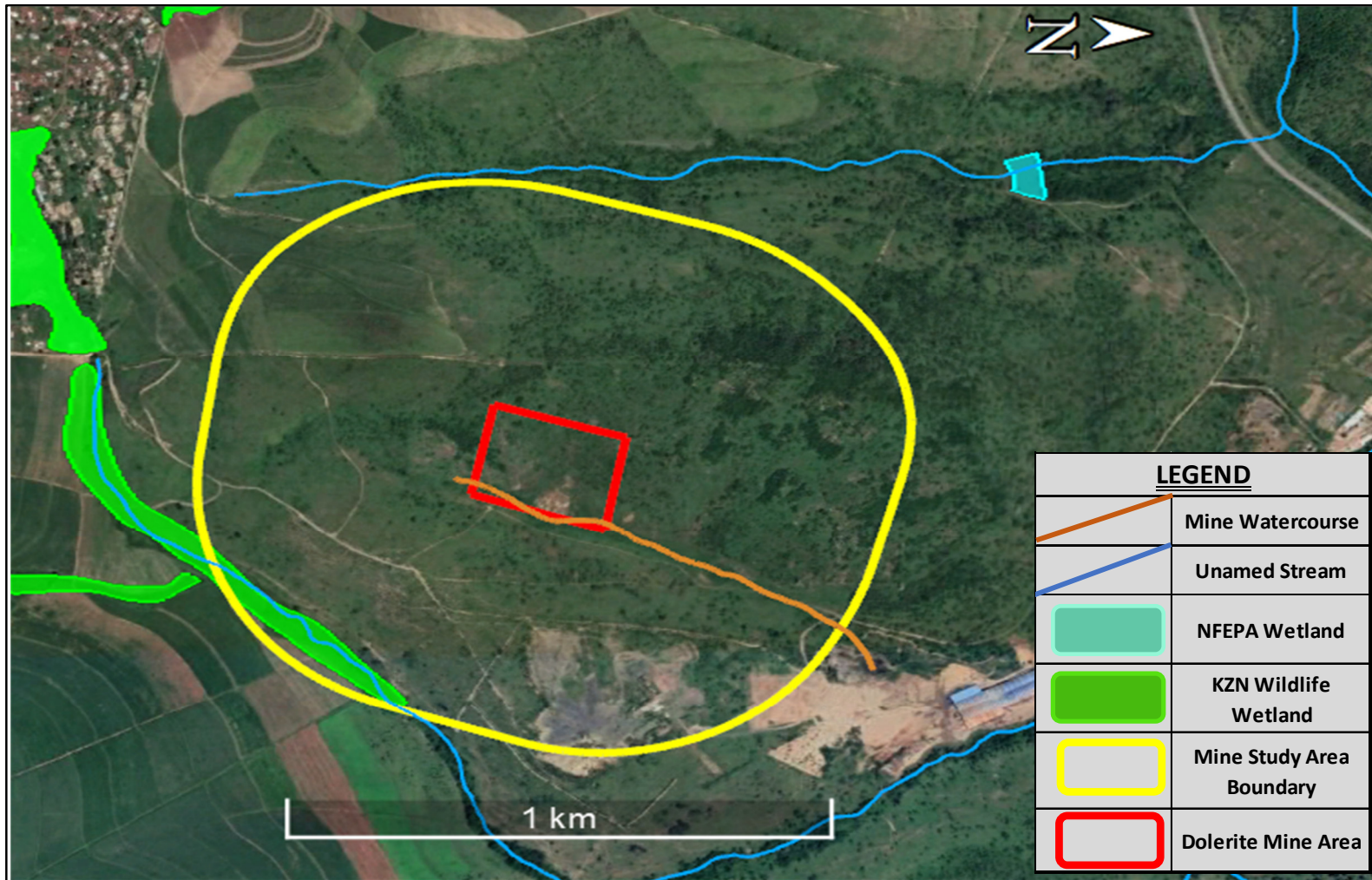


Figure 5: Wetlands located in the vicinity of the dolerite mine



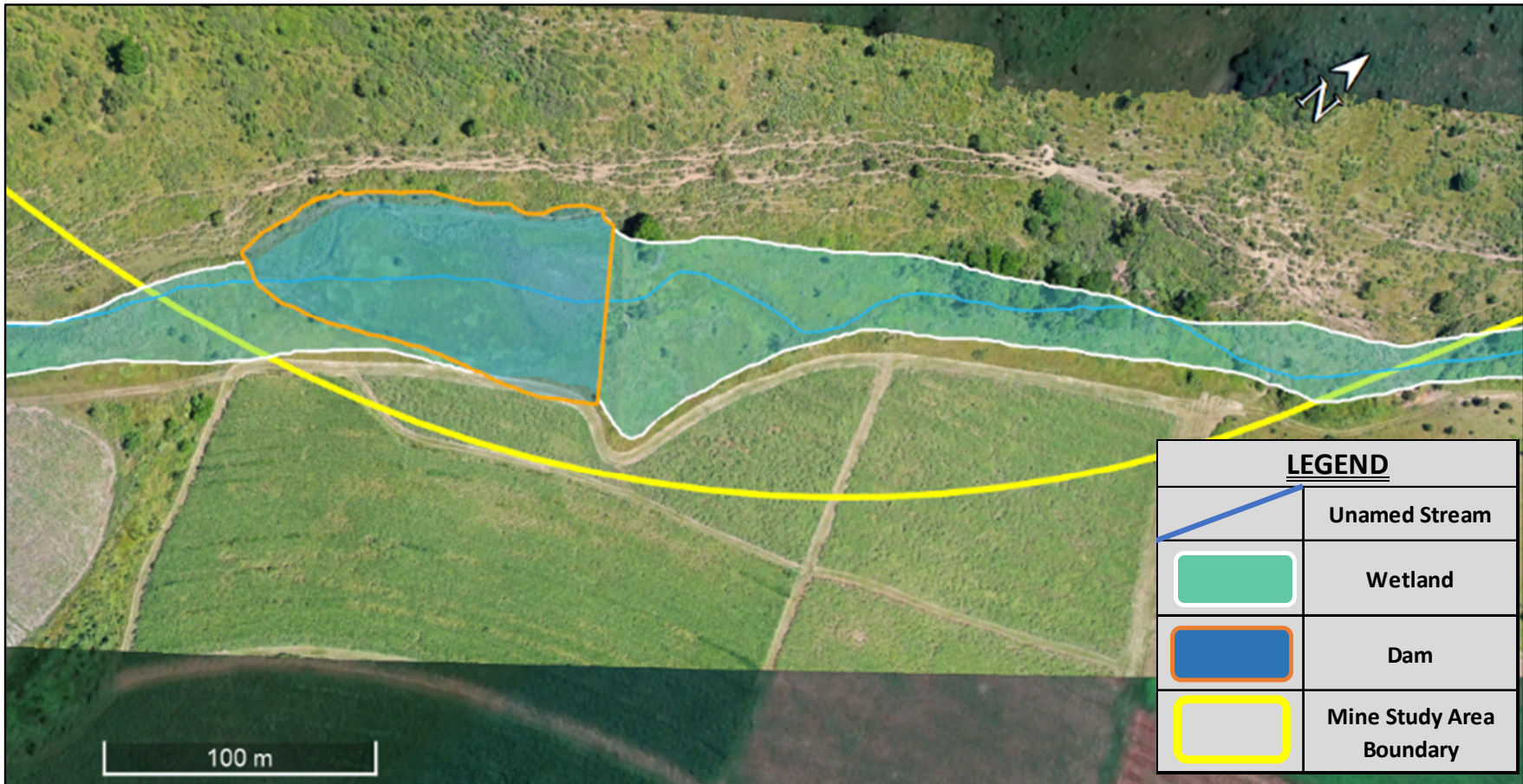


Figure 6: Portion of the wetland, including a dam, located within 500 m wide strip around the dolerite mine



**Plate 5:** View upstream over the unnamed stream wetland with the dam basin in the Foreground



**Plate 6:** View downstream along the unnamed watercourse

The outline of a small dam may be seen within it but it appears to have either been filled with sediment or to be leaking as no water was visible, and the basin area contained wetland vegetation. The condition of the wetland is indicated in Table 2 below. As with the assessment of the watercourse, the wetland was not actually delineated and modelled but the condition is based on observations made both in the course of the present and past studies, and on professional experience and opinion.

**Table 2:** Present Ecological State (PES) of the Channelled Valley Bottom wetland.

HGM Unit	Ha	Extent (%)	Hydrology		Geomorphology		Vegetation	
			Impact Score	Change Score	Impact Score	Change Score	Impact Score	Change Score
Channelled Valley Bottom	1.9	100	2.5	0	5.0	0	1,2	0
<b>PES Category per driver</b>			<b>C</b>	→	<b>D</b>	→	<b>B</b>	→
<b>Overall PES Category of the site</b>			<b>2.8 Category C (Moderately Modified.</b> A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.)					

The wetland is not known to hold any species of conservation concern although the area has a rich bird diversity. This is not likely to be impacted on by the mine other than as a result of blasting disturbance. Experience at other sites suggests that the birds will soon become habituated to this and so will not be affected.

The wetland is to be stable for now and so is unlikely to change very much unless there are catchment or climatic changes.

However, despite the wetland being partially within the 500 m wide strip around the mine site it is most unlikely that it will be affected by the mine as it is in a separate catchment area. Figure 7 shows the catchment divides between the mine area and the closest wetlands. It is apparent that the watercourse at the mine area lies in a sub catchment which is separate from the unnamed stream to the east. The two do eventually join but well downstream from the wetland area. Similarly, the two wetlands, which are actually dams, on the watercourse which flows to the west of the mine site, are on the opposite side of a ridge and so will not be affected.

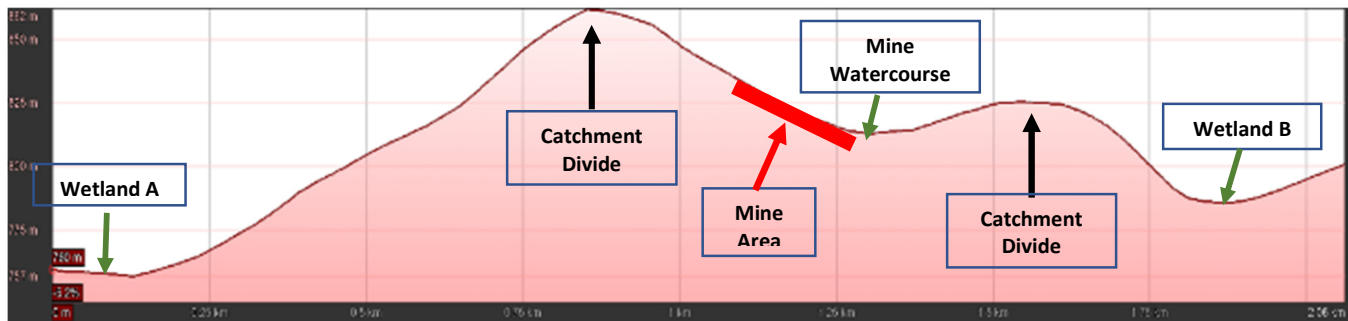
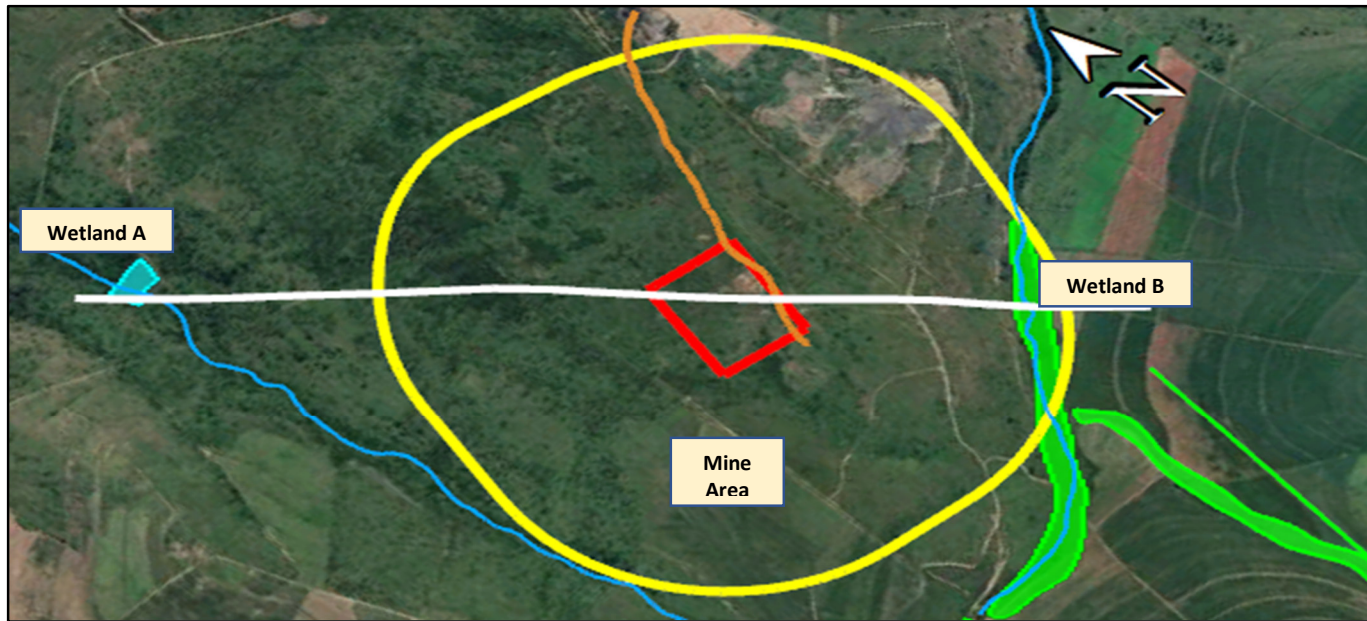


Figure 7: Longitudinal profile through the mine area showing wetlands, watercourse, mine area, and catchment divides

## 8. CONCLUSION AND RECOMMENDATIONS

The terms of reference for this study call for an investigation into the possibilities that the proposed dolerite mine may impact on watercourses, with particular reference to the Umgeni River and/or wetlands located within 500 m of the site. In the course of addressing these concerns, attention has been given to the linkages between the mine and the various aquatic systems in its proximity. The findings are summarised below.

### 8.1 Watercourses

It was determined that the proposed mine will not have any effect on the Umgeni River. This conclusion was based on the following reasons:

- The watercourse which proceeds from the mine site is dry for the greater part of the year and has not been seen to be carrying water even after heavy rainfall periods;
- The watercourse which proceeds from the mine site no longer discharges directly into the unnamed stream, which flows northwards to join the Umgeni River. The lower part of the channel has, for many years, been diverted as the result of development of a quarry which yields shale for brick making. The original lower course is now not distinguishable on the ground and, instead, the watercourse flows into a disused part of the shale quarry where any surface water could accumulate;
- The unnamed stream, after it bypasses the mine area in its natural channel, flows approximately 11 km before reaching the Umgeni River, downstream of the Albert Falls Dam. On the way it passes through an agricultural landscape which is characterised with low gradients. As a result, the channel is often heavily overgrown by vegetation and has occasional patches of wetland vegetation. These conditions serve to filter out suspended solids and to assimilate plant nutrients or toxicants; and
- The stream channel passes through six small farm dams which will also trap sediments and nutrients.

On the basis of the above, it is highly unlikely that the dolerite mine will have any effect on the water quality of the Umgeni River.

### 8.2 Wetlands

It was concluded that the proposed mine will have no impact on wetlands. This is based on the following reasons:

- The channel of the watercourse which flows from the dolerite mine area is dry and contains no wetlands;
- There is only one wetland within 500 m of the mine site. It is a Channelled Valley Bottom system and is associated with the unnamed stream which flows in the vicinity of the project area. The shortest distance between this wetland and the mine site is approximately 460 m;
- The wetland is in a separate sub catchment and so is hydrologically isolated from the mine, as shown in Figure 7 above; and

- The stream to the west of the mine site which has two NFEPA wetlands (farm dams) is on the opposite side of a large ridge and is more than 500 m from the closest point of the mine.

Thus, as long as the mine or its associated infrastructure do not cross the divides between the various sub catchments there will be no associated impacts on the wetlands in the area.

### 8.3 Mitigatory Measures and Recommendations

In relation to wetlands and watercourses the greatest threats that the mine poses are the following:

- Sedimentation of the watercourses by surface movement of material

Sedimentation of the aquatic systems would probably occur as a result of soil or rock material being transported into the various waterways directly from the mine or its associated working areas. In order to mitigate against this impact, the following actions are recommended:

- ✓ The two dams in the channel of the mine watercourse must be repaired and brought up to a suitable safety standard. Included in this requirement are wall strength and construction and a suitable spill way.
- ✓ The vegetation along the mine watercourse must be cleared of alien weed species with especial reference to Castor Oil Bush (*Ricinis comunis*), Bugweed (*Solanum mauritianum*), and Lantana (*Lantana camara*). The locally present grasses must be encouraged to develop their density so as to act as a sediment trap.

- Indirect sedimentation of the watercourses by dust or from runoff from the access road(s)

Blown dust or spillage of rock material from vehicles can lead to indirect sedimentation of watercourses. In order to mitigate against this impact, the following actions are recommended:

- ✓ The roads should be routed as far as possible from any wetlands or watercourses. At the time of writing, the current access road alignment is good in this regard.
- ✓ Dust suppression measures, including water sprays and vehicle bin covers, should be used.

- Threat of hydrocarbon (fuels and oils) contamination from spills or leakage

Leakage of hydrocarbons into aquatic ecosystems will result in severe loss of aquatic biodiversity. In order to mitigate against this impact, the following actions are recommended:

- ✓ All stores of bulk fuels and oils must be within bunded areas that have at least 110% of the capacity of the substances being stored.
- ✓ Areas where vehicles and machines and plant are repaired and serviced must have impermeable floors from which spills can be collected for proper disposal.

- ✓ Storage bins with stoppers must be on hand for holding used oils prior to their proper disposal at an approved facility.
  - ✓ Any spills within the mine area or along roads or other open spaces must be collected immediately and be placed in sealable bins prior to proper disposal at an approved facility.
  - ✓ Hazmat clean-up kits of suitable capacity must be available at all times for cleaning up hydrocarbon or other hazardous substances that may have been spilled.
- Risk of contamination from improperly treated waste water

Waste water which enters the open environment has the potential to contaminate wetlands and watercourses. In order to mitigate against this impact, the following actions are recommended:

- ✓ The mine must have properly designed and constructed waste water disposal facilities.
  - ✓ Any water running to the open environment from a water treatment plant or from spaces such as workshops must pass through an oil trap and the trap must be cleaned regularly.
  - ✓ Waste water which may have percolated from ablution or toilet facilities should be tested quarterly for coliforms and phosphates.
- Disposal of solid wastes, either domestic or industrial

The mine will generate quantities of solid wastes including plastics, paper, food containers, cardboard, workshop wastes, cement bags, and the like. These must not be allowed to enter the open environment as they are unsightly and may be transported into aquatic systems. In order to mitigate against this impact, the following actions are recommended:

- ✓ The material must be collected at those sites around the mine where the waste is generated. Appropriate bins, preferably with lids, must be made available, and these must be emptied on a regular basis of short intervals.
- ✓ The collected material must then be taken to a central holding point which should be in an enclosed space. The material may then be sorted for recycling or disposal as may be appropriate and be removed from site.
- ✓ No waste disposal or burning of waste may be done on site at the mine.

The above recommendations are summaries of standard procedures. Further detail is available in the draft mine EMP and should be referred to for greater detail. It is the author's professional opinion that, if the management and mitigatory measures are properly implemented, then the proposed dolerite mine will have no effect of the Umgeni River and no effect on the wetlands in its general vicinity.

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