Vegetation and Wetland Assessment for the pipelines, pump station and product staging area at Sibanye Stillwater

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Executive Summary

Introduction

Kyllinga Consulting was appointed by EcoPartners to conduct a vegetation and wetland assessment for the proposed new pipelines and powerlines, pump station and production staging area for the Sibanye Stillwater mining activities, Marikana, North-West.

Methods

Vegetation present along the proposed routes were noted and vegetation units were identified.

The wetlands on site were delineated as per the DWA wetland and riparian delineation guidelines. The following indicators were used in the delineation:

- *Vegetation*
- *Topography*
- *Soil*

The Present Ecological State (PES) was determined using Wet-Health (Macfarlane et al. 2009) and the Ecological Importance and Sensitivity (EIS) were calculated as per the method developed by Rountree et al. (2008).

Results

Several vegetation types are present in along the proposed routes and development areas. These vegetation units include:

- *Wetlands*
  - *Natural wetlands*
  - *Artificial wetlands*
- *Terrestrial*
  - *Marikana Thornveld*
  - *Modified Marikana Thornveld*
  - *Disturbance*
  - *Rocky Outcrops*

Please refer to the summary in Table 4, Table 9 and Table 10 in the main report.

Conclusion

The following conclusions are reached regarding the proposed upgrades:

- *The site is located in the Marikana Thornveld, which is Endangered.*
- *Only a small portion of the Marikana Thornveld will be affected, the majority of the activities will take place along existing disturbances and adjacent to existing roads.*
- *Natural and artificial wetland areas are present on site.*
- *Crossings over the wetland areas will utilise existing access roads.*
- *The proposed activities are expected to have a low impact on the vegetation and wetland units on site.*
- *The proposed development is supported.*

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1 Introduction

Kyllinga Consulting was appointed by EcoPartners to conduct a vegetation and wetland assessment for the proposed new pipelines and powerlines, pump station and production staging area for the Sibanye Stillwater mining activities, Marikana, North-West.

The following is included in the assessment:

- Vegetation and plant species assessment:
  - Identification of plant communities / habitat types on site;
  - Compilation of a species list of the community;
  - Determining if the vegetation is primary or secondary and identify disturbances;
  - Search for Red Data plant species and species of conservation importance on site;
  - Determining the sensitivity and conservation importance of the vegetation on site;
  - Impact assessment and proposed mitigation measures.
- Wetland assessment:
  - Desktop delineation of the watercourses within 500m of the site on aerial photographs;
  - Field delineation of any watercourses on site according to the Department of Water Affairs (DWA) delineation guidelines;
  - Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) assessments of the wetland on site;
  - Buffer zone recommendations (excluding hydropedological assessment);
  - Risk assessment and proposed mitigation measures.

1.1 Limitations

The site assessment is limited to the site and the provided routes. The delineation and assessment of wetland areas in the surroundings are largely based on desktop assessments and the supplied information. In addition, the assessment of the wetland is mainly confined to the specific crossings and not to the entire wetland unit.

The site visit took place at the end of the growing season, during a wet season with late rains. It is therefore possible that early flowering species and species with early dormancy were missed. The assessment was also confined to the provided routes.

2 Site

2.1 Location and description

Several routes were provided for the proposed pipelines and powerlines in the Sibanye Stilwater area. Please see the map for the location of the proposed routes (Figure 1). Most of the proposed routes are located adjacent to existing access routes and pipelines. The Sibanye Stilwater mine is located to the north-west of Marikana and east of Photshaneng. The area is located approximately 14km to the east of Rustenburg and 7km north of the N4. The area is mainly used for mining and mining related activities. Some grazing is also taking place in the area. The area is located in a flat to slightly undulating terrain and is mostly underlain by dark turf soils.

3 Background information

3.1 Water resources

The majority of the routes are located in quaternary catchment A21K. The northernmost extension of the proposed new pipeline from the K4 return water to RWD 280 is located in quaternary catchment A22J.

No wetland areas are indicated along the proposed routes or sites in the National Wetland Map 5 (NWM5). A seep is indicated to the east of the site and a channelled valley bottom wetland area is indicated to the north of the site. In addition, a river is indicated approximately 1.5km to the east of the proposed route in the NBA2018 database.

The wetlands on site and in the surroundings were delineated by WCS Scientific in 2022. The assessment covered the entire study area and included the assessment of the wetlands along all the routed. A map of the delineation is included in Figure 4 below.

3.2 North-West C-Plan and vegetation

Most of the site are listed as a Critical Biodiversity Area (CBA) 2 area. In this case it is due to the presence of an Endangered vegetation type, the Marikana Thornveld. Some of the transformed areas are excluded from the CBA assessment (Figure 5). The National Biodiversity Assessment (NBA) (Driver *et al* 2018) indicates portions of remnant terrestrial vegetation on site (Figure 6).

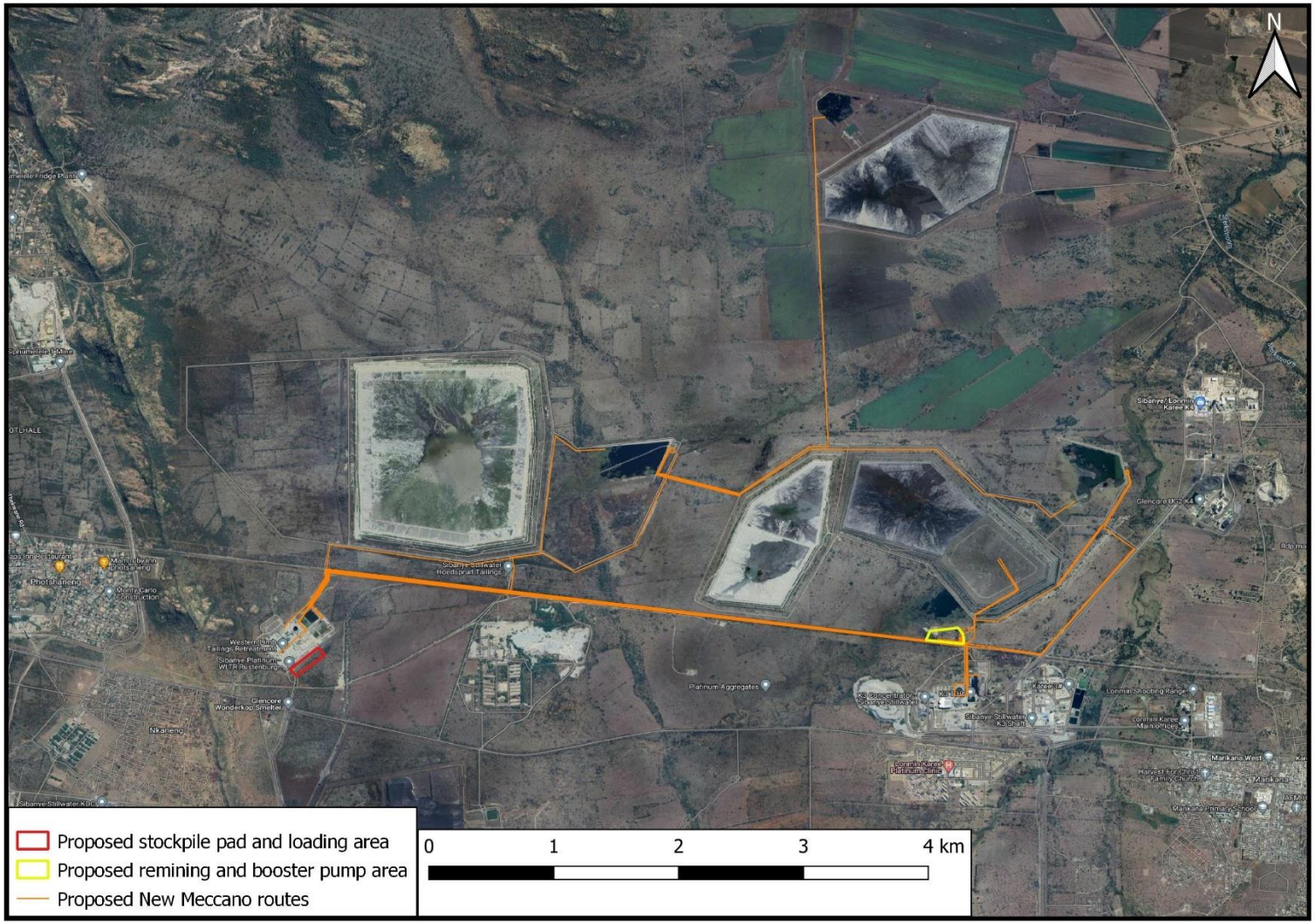

Figure 1: Location of the site in relation to Marikana and Photshaneng.

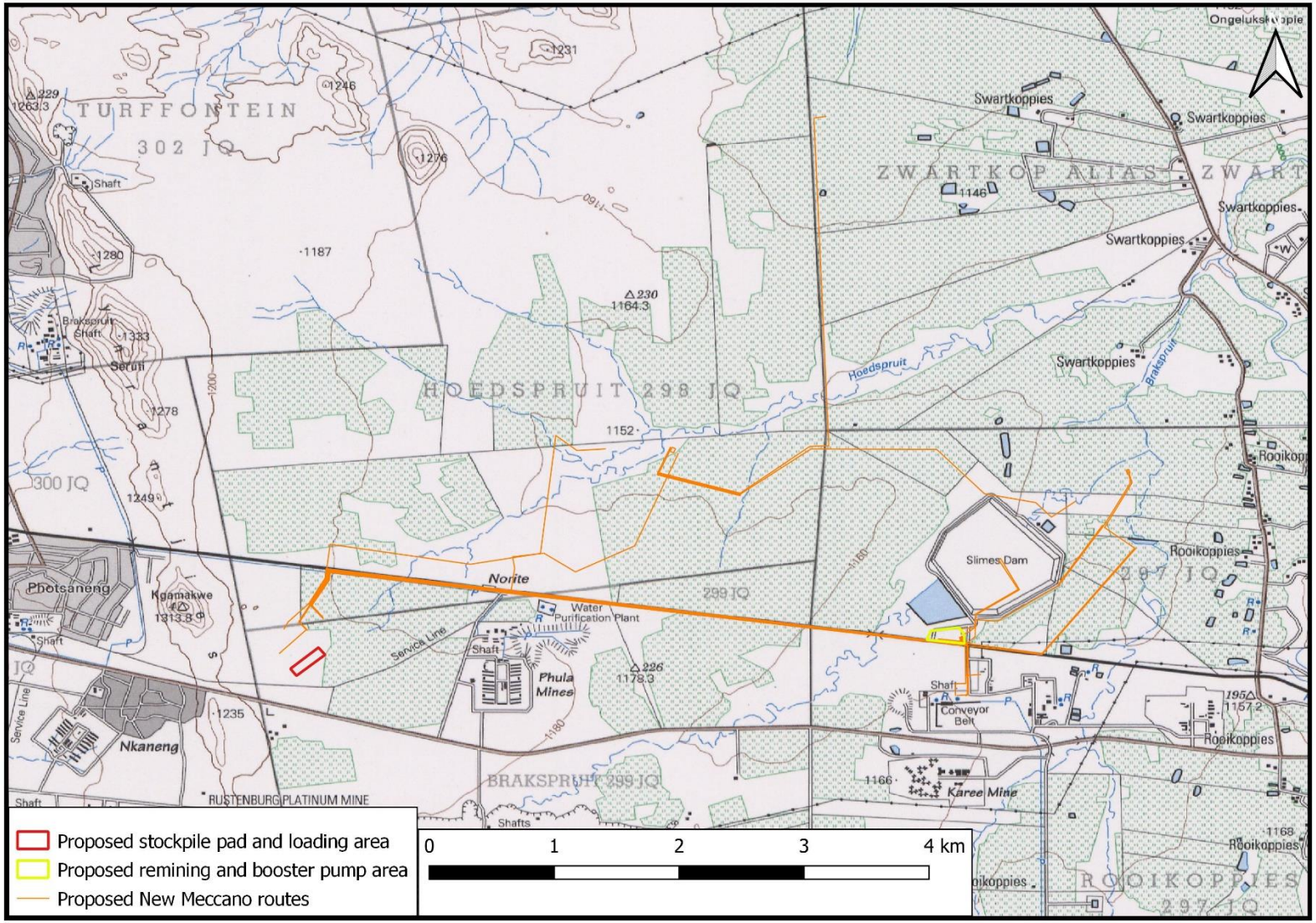

Figure 2: The proposed pipelines and powerlines on the 2527CB topographical map of the site.

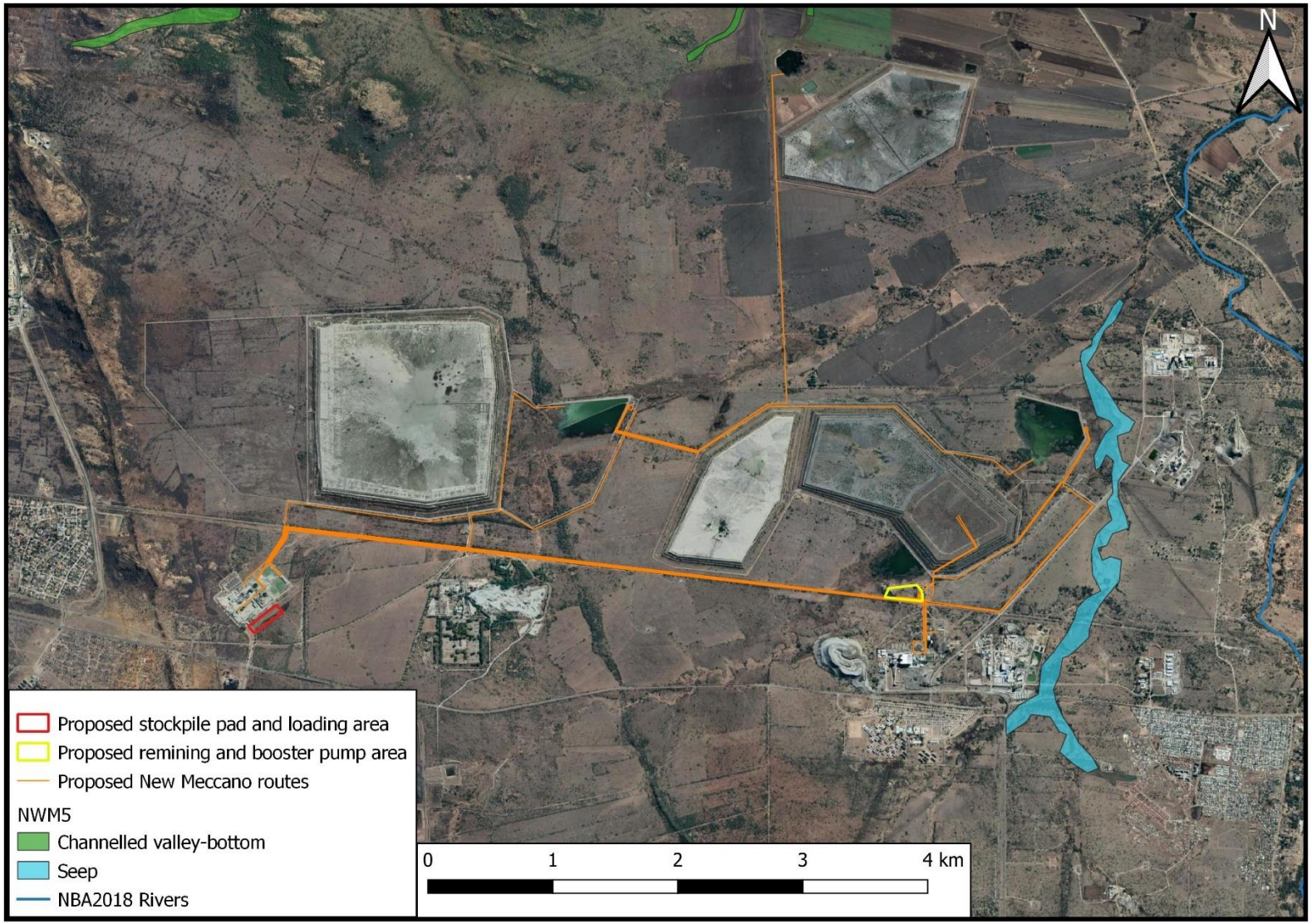

Figure 3: Wetland areas on site and in the surroundings according to the National Wetland Map 5.

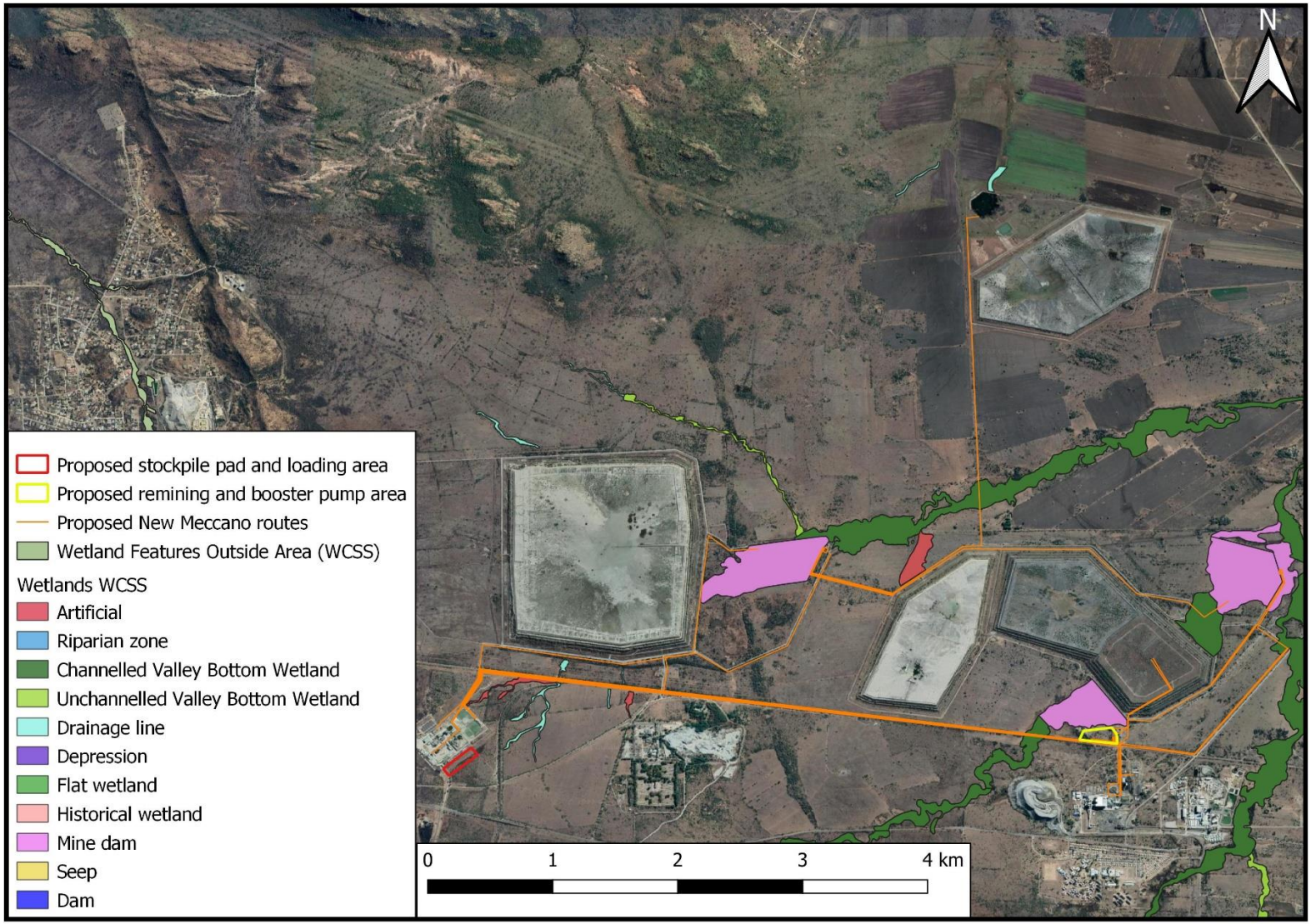

Figure 4: Wetland areas delineated by WCSS during 2022.

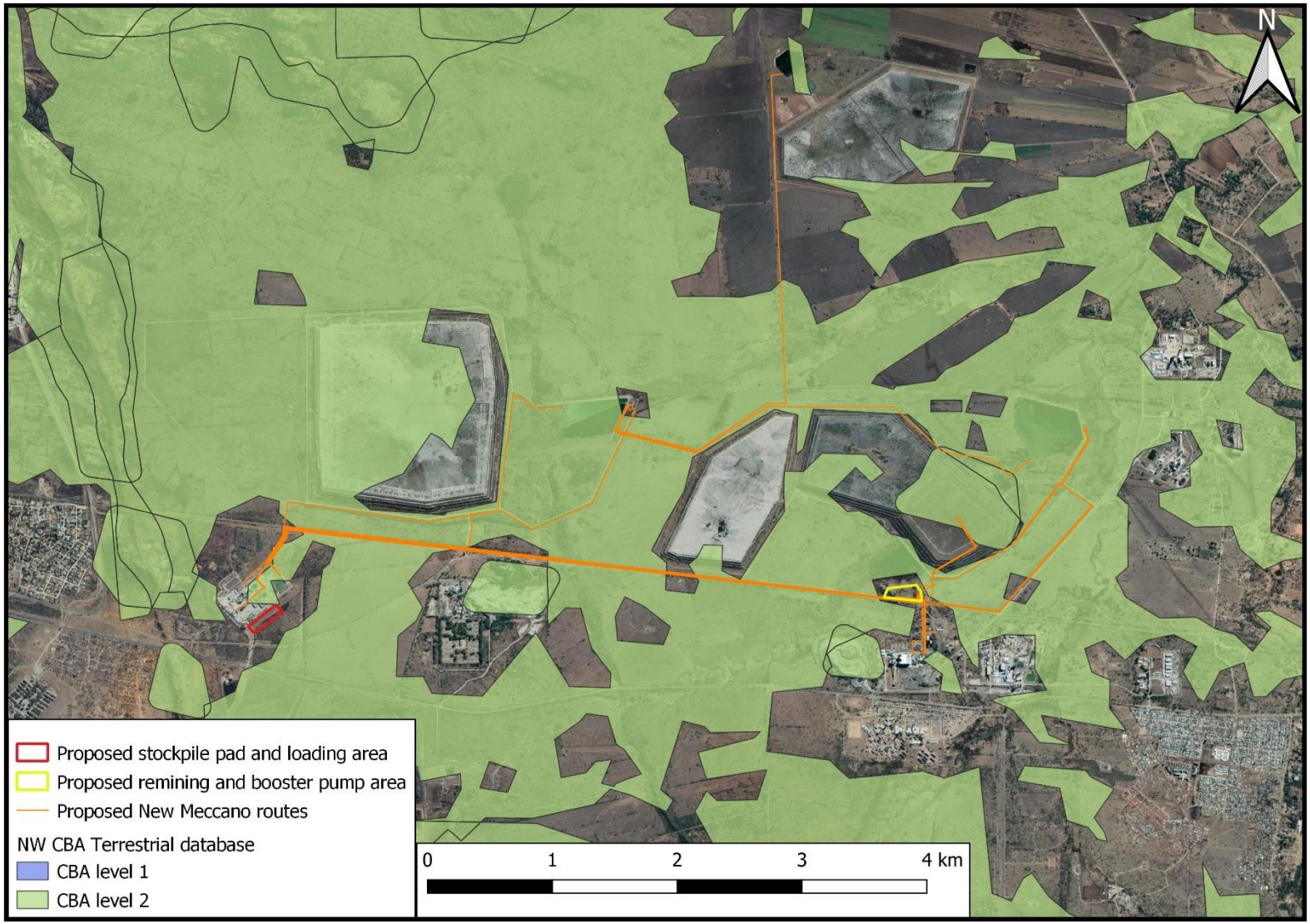

Figure 5: Critical Biodiversity Areas (CBAs) according to the North-West C-Plan.

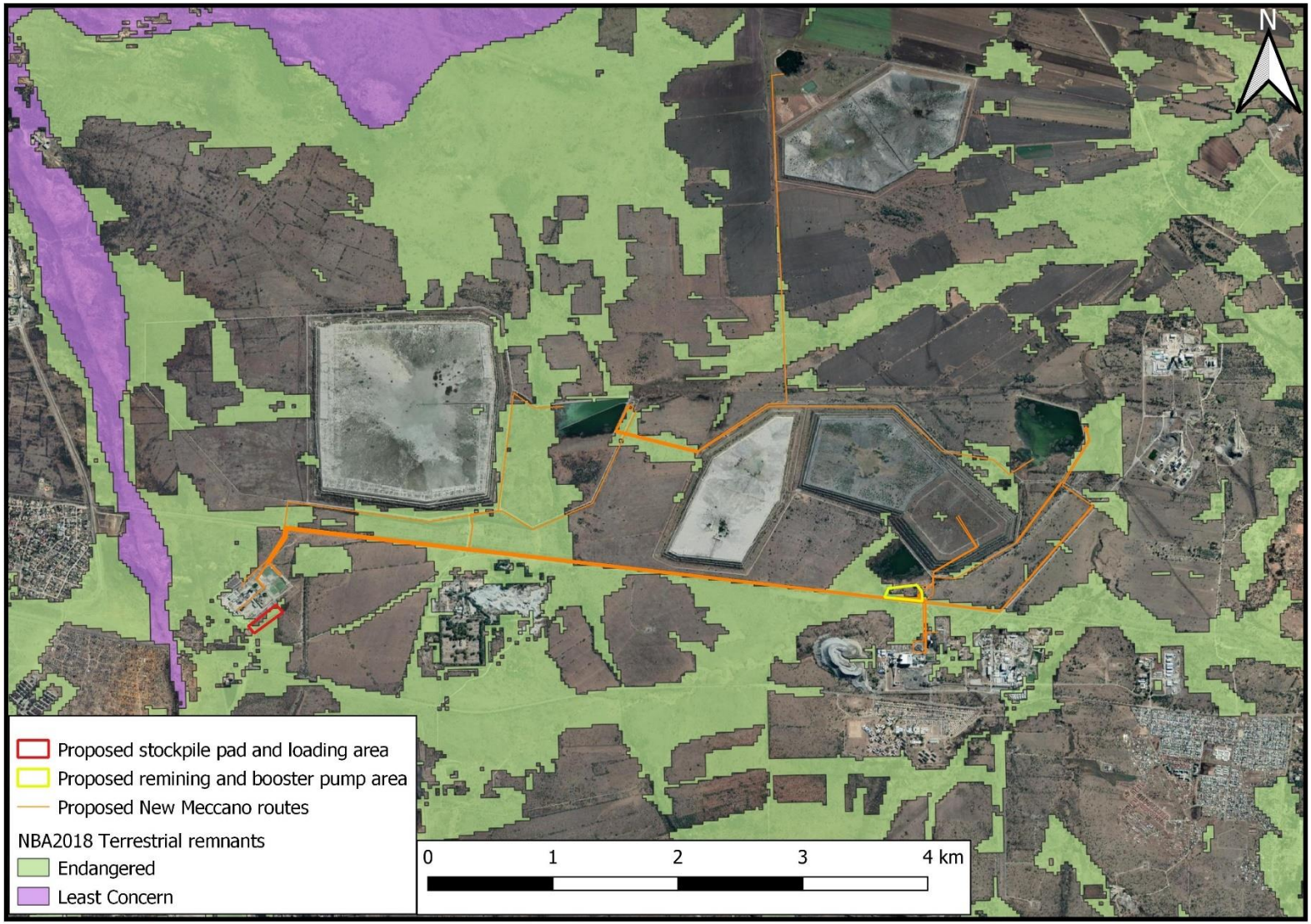

Figure 6: Remnant vegetation on site according to the National Biodiversity Assessment (2018).

3.1 Annotations on the National Web-Based Environmental Screening Tool

Regulation 16(1)(v) of the Environmental Impact Assessment Regulations, 20145 (EIA Regulations) provides that an applicant for Environmental Authorisation is required to submit a report generated by the Screening Tool as part of its application. On 5 July 2019, the Minister of Environmental Affairs, Forestry and Fisheries published a notice in the Government Gazette giving notice that the use of the Screening Tool is compulsory for all applicants to submit a report generated by the Screening Tool from 90 days of the date of publication of that notice.

The Screening Tool is intended to allow for pre-screening of sensitivities in the landscape to be assessed within the EA process. This assists with implementing the mitigation hierarchy by allowing developers to adjust their proposed development footprint to avoid sensitive areas. The Screening Tool report will indicate the (preliminary) environmental sensitivities that intersect with the proposed development footprint as defined by the applicant as well as the relevant Protocols.

As the Screening Tool contains datasets that are mapped at a national scale, there may be areas where the Screening Tool erroneously assigns, or misses, environmental sensitivities because of mapping resolution and a high paucity of available and accurate data. Broad-scale site investigations will provide for an augmented and site-specific evaluation of the accuracy and 'infilling' of obvious and large-scale inaccuracies. Information extracted from the National Web-based Environmental Screening Tool (Department of Environmental Affairs, 2020), indicated that the study site holds a **low sensitivity** with respect to the relative plant species protocol and a **very high sensitivity** relative to the biodiversity theme (report generated 06/06/2023).

The very high sensitivity is due to:

Sensitivity	Features
Very High	CBA 1
Very High	ESA 1
Very High	ESA 2
Very High	National Protected Area Expansion Strategy (NPAES)
Very High	Marikana Thornveld (Endangered)

4 Methods

4.1 Vegetation Assessment

Plant species were recorded along the proposed pipeline routed as provided by the client, as well as the proposed locations for the pump station and staging area. The vegetation units along the routes were identified.

4.2 Wetland Delineation

Aerial photographs of the site were investigated prior to the site visit. Google Earth images from 2023 were used. In addition, a recent wetland delineation is available for the area and covers the areas crossed by the pipelines. The existing delineation was verified during the site visit.

The site visit took place on 3 May and 7 June 2023. The wetlands on site are delineated according to the Department of Water Affairs (DWA) wetland delineation guideline (DWAF, 2005). Several wetland indicators are used to delineate the wetland area.

The wetland indicators used are the:

- Vegetation indicator;
- Terrain unit indicator; and
- Soil wetness indicator.

4.3 Present Ecological State

The Present Ecological State (PES) of the wetland was calculated using the WET-Health assessment (Macfarlane *et al.* 2009). This assessment evaluates the change from natural to the hydrology, geomorphology and vegetation of the wetland and gives a score for each of these assessments. From this, a PES class is assigned. A summary of the PES classes is attached in Table 1. A combined score of the three can be calculated for the wetland, although this is not recommended. For the purposes of this study, the level 1 assessment was used.

Table 1: PES categories (from Macfarlane et al. 2009).

Description	Combined impact score	PES Category
Unmodified, natural.	0-0.9	A
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1-1.9	B
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2-3.9	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4-5.9	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	E
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 - 10	F

4.4 Ecological Importance and Sensitivity

A draft Ecological Importance and Sensitivity (EIS) tool has been developed for wetlands by Rountree *et al.* (2008). The EIS assessment tool gives a score between 0 and 4, with 0 a very low score and 4 very high. In general, most wetlands have a score between 1 and 2.5. Very disturbed wetlands have a low score. Wetlands with a score higher than 2.5 have some very special and distinctive features and are normally unique wetlands.

Table 2: Classification of the EIS categories based on score.

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

5 Results and Discussion

5.1 Vegetation Assessment

5.1.1 Description

Several vegetation types are present in along the proposed routes and development areas. These vegetation units include:

- Wetlands
  - Natural wetlands
  - Artificial wetlands
- Terrestrial
  - Marikana Thornveld
  - Modified Marikana Thornveld
  - Disturbance
  - Rocky Outcrops

5.1.1.1 Wetlands

The natural and artificial wetland areas on site have a very similar species composition. The wetland areas are mainly dominated by *Cyperus sexangularis,* which often forms a monostand in the wetland areas. Several other sedge species and other wetland species are also present in lower dominance, mainly along the outer edges of the wetland areas and along road crossings. The proposed pipeline and powerline crossings are therefore mainly located along the edges with a greater species diversity. In the artificial seep wetland areas, a wider zone of grass and forb species are present and the dominance of *Cyperus sexangularis* is lower. The vegetation diversity in both the natural and artificial wetland units are low.

Figure 7: Vegetation in one of the natural (left) and artificial (right) wetland areas.

5.1.1.2 Terrestrial

There are four sub-units in the terrestrial vegetation unit:

- Marikana Thornveld
- Modified Marikana Thornveld
- Disturbances
- Rocky Outcrops

The Marikana Thornveld vegetation unit most closely resembles the Marikana Thornveld vegetation type as described in Musina and Rutherford (2006). Although this vegetation unit has the second highest species diversity, most of it indigenous, the diversity is relatively low. The low diversity may be due to the season of the site assessment, or the relatively small area visited. A greater diversity of forbs and geophytes are expected earlier in the growing season. The low species diversity may also be a function of the high grazing pressures in the area. Only a small section of Marikana Thornveld vegetation unit is affected by the proposed activities, with the vegetation unit only present at the proposed stockpile pad and loading area.

Figure 8: Images of the Marikana Thornveld vegetation unit (left) and the Modified Marikana Thornveld vegetation unit (right).

The Modified Marikana Thornveld vegetation unit has a higher species diversity than the Marikana Thornveld vegetation unit, mainly due to the higher number of alien and invasive plant species. This vegetation unit is present in areas where some disturbance took place in the past, including ploughing or heavy grazing, and the vegetation has recovered to resemble the Marikana Thornveld vegetation type, but with several indicators of disturbance present. Indicators of disturbance include

a higher density of pioneer species, alien and invasive plant species or higher densities of bush encroachers such as *Dichrostachys lycoides.* Species such a *Ziziphus mucronata* and *Searcia leptodictya* is also present in much lower densities and individuals of *Vachellia karroo and Vachellia tortillis* are all of similar age and size. The vegetation unit is dominant at the proposed remining and booster pump area and along most of the routes away from the existing roads and pipelines. This is also the dominant vegetation type along the proposed access road 2.

Numerous disturbances are present in the area, mainly associated with the mining activities. This includes existing dams and pump stations, several pipelines and powerlines, roads, tailings facilities, clean water canals and other infrastructure. These disturbances result in patches bare of vegetation and allow for the establishment of pioneer vegetation in the disturbed areas. Most of the proposed pipelines and powerlines are along disturbed areas, which significantly decreases the impact of the proposed activities on the environment.

Figure 9: Images of the disturbances on site.

The Rocky Outcrop vegetation type is less common in the area and is present along the proposed New Access Route 1 and in the south-western corner of the Remining and booster pump area. The soil in these areas is very rocky and more sandy, as opposed to the dark turf present throughout the rest of the site. These areas have a greater woody component, with a small herbaceous component. The species observed in the unit is fairly common and widespread and nothing of particular conservation importance were noted.

Figure 10: Images of the Rock Outcrop.

5.1.2 Invasive species

A list of alien and invasive species has been published in the Government Gazette of 1 August 2014 in the Alien and Invasive Species Regulations (AIS) under the National Environmental Management Biodiversity Act (Act 10 of 2004). Invasive species are divided into the following four categories:

- "Category 1a: Invasive species which must be combatted and eradicated. Any form of trade or planting is strictly prohibited.
- Category 1b: Invasive species which must be controlled and wherever possible, removed and destroyed. Any form of trade or planting is strictly prohibited.
- Category 2: Invasive species, or species deemed to be potentially invasive, in that a permit is required to carry out a restricted activity. Category 2 species include commercially important species such as pine, wattle and gum trees. Plants in riparian areas are Category 1b.
- Category 3: Invasive species which may remain in prescribed areas or provinces. Further planting, propagation or trade, is however prohibited. Plants in riparian areas are Category 1b."

It is the responsibility of the landowner to control invasive species on site. A list of invasive species recorded on site are included in Table 3 below.

Table 3: Invasive species recorded on site.

Species	Growth form	Class	Natural Wetlands	Artificial Wetlands	MT	Modified MT	Disturbances	Rocky outcrop
Araujia sericifolia	Forb	Class 1b			x	x		x
Cirsium vulgare	Forb	Class 1b	x	x				
Ricinus communis	Shrub	Class 1b	x			x		
Tamarix chinensis	Shrub	Class 1b		x				
Tecoma stans	Tree	Class 1b				x		
Verbena bonariensis	Forb	Class 1b		x		x		
Verbena braziliensis	Forb	Class 1b					x	
Xanthium spinosum	Shrub	Class 1b				x		
Xanthium strumarium	Shrub	Class 1b	x			x	x	

5.1.3 Species of conservation importance

No threatened plant species were observed on site during the site visit. No threatened plant species are listed in the screening report as potentially occurring on site and no threatened plant species are expected in the area.

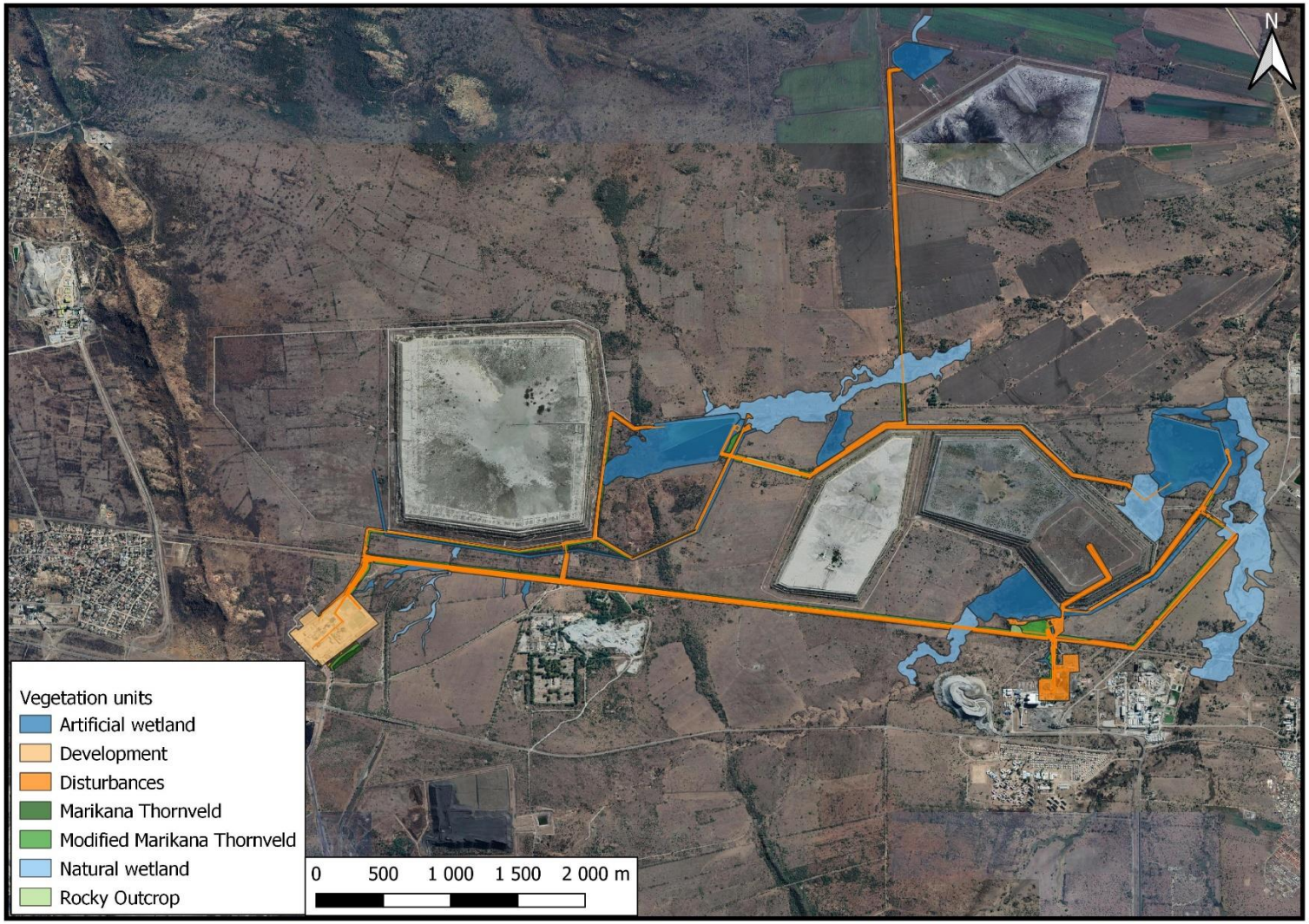

Figure 11: Vegetation units associated with the proposed developments.

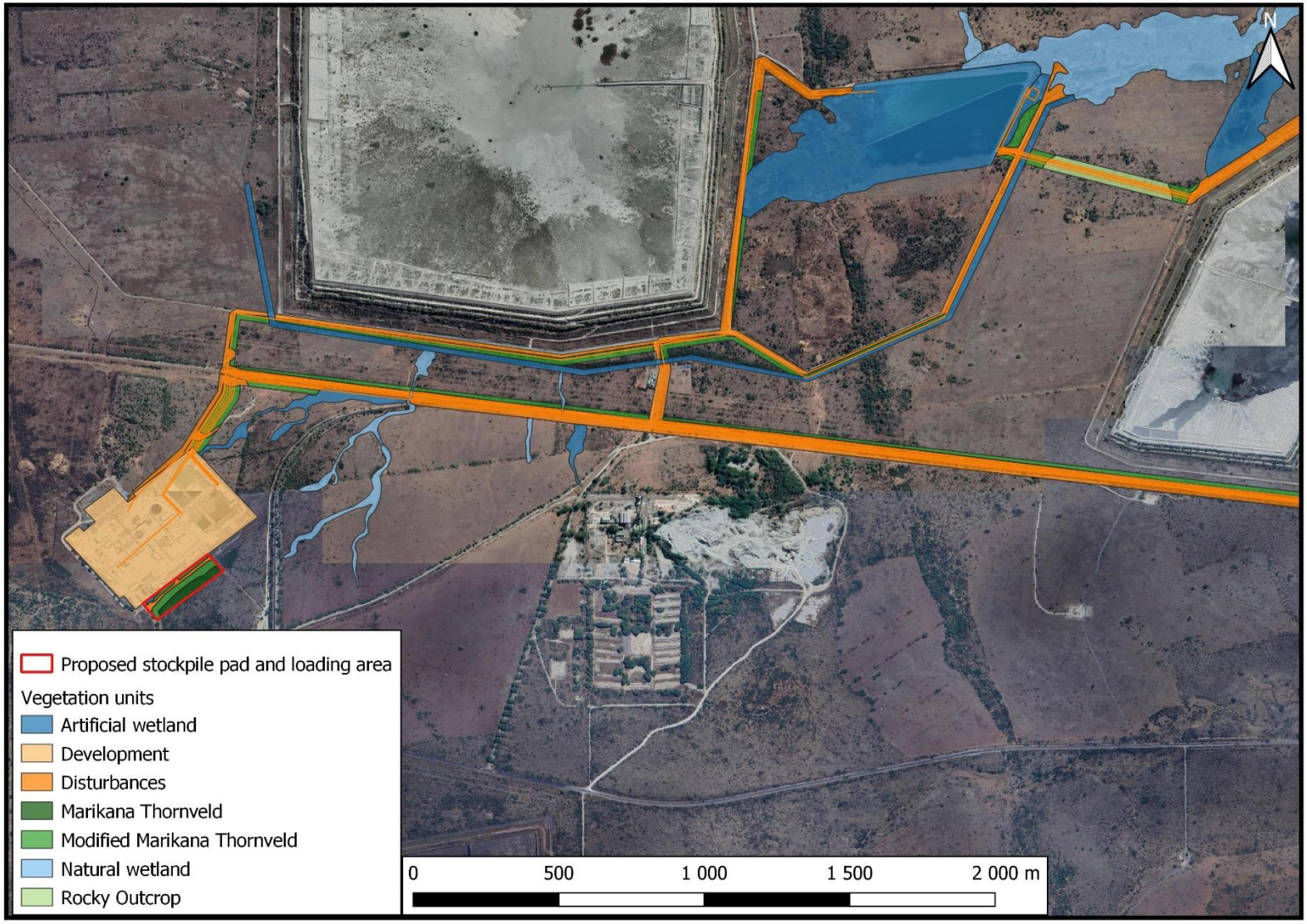

Figure 12: Vegetation unit on the western portion of the site.

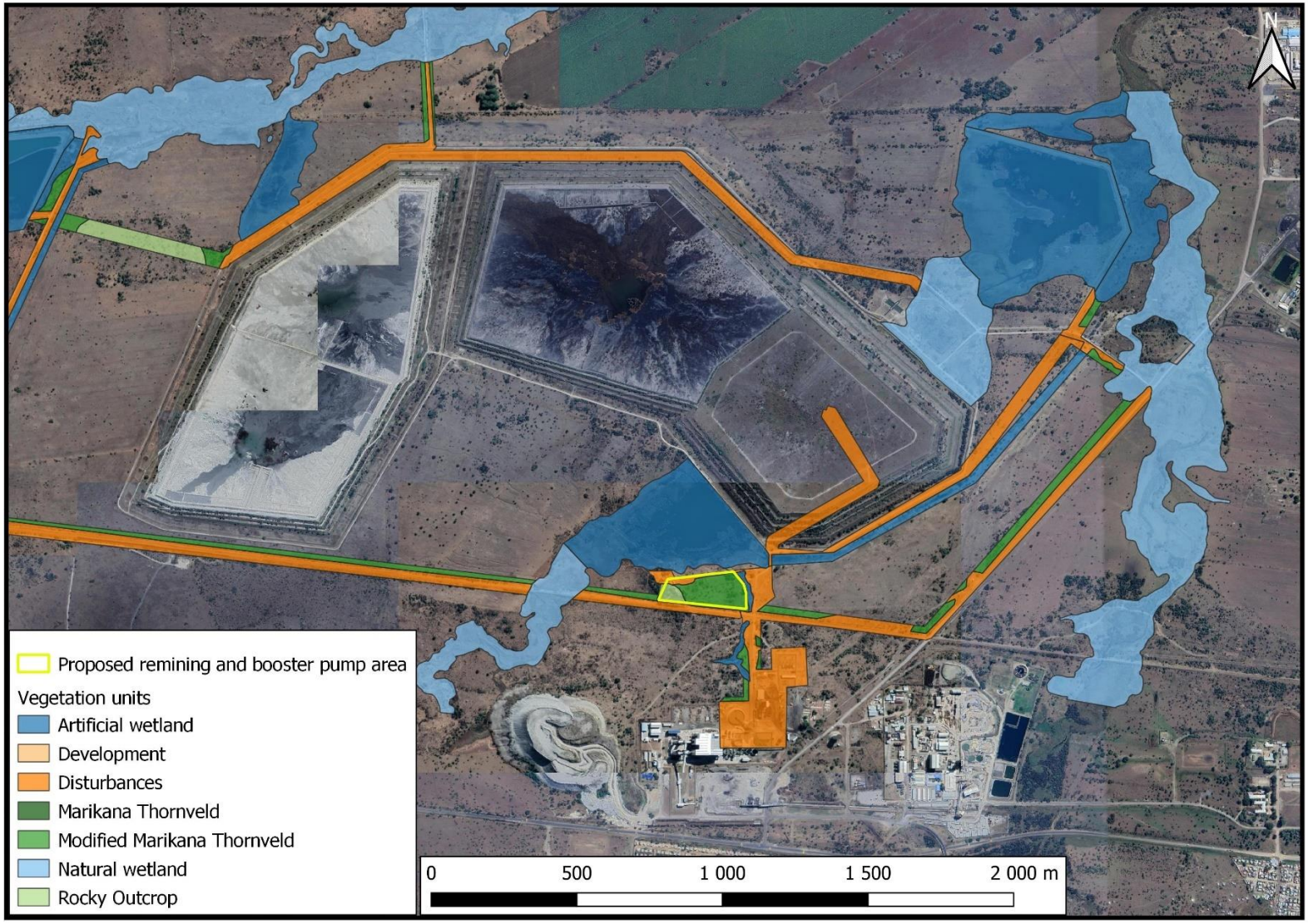

Figure 13: Vegetation units on the eastern portion of the site.

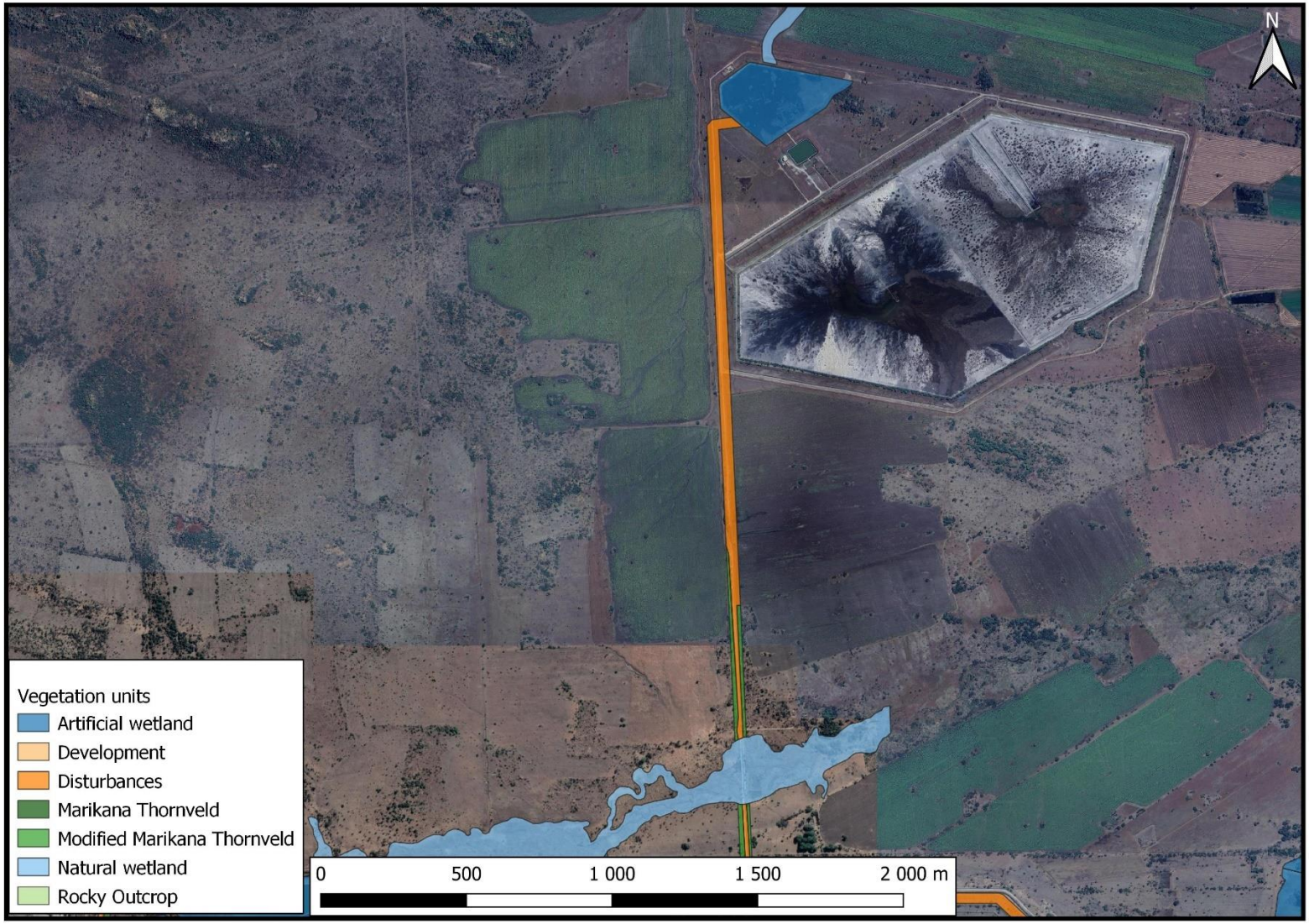

Figure 14: Vegetation units on the northern portion of the site.

Figure 15: Vegetation units present at the proposed stockpile pad and loading area.

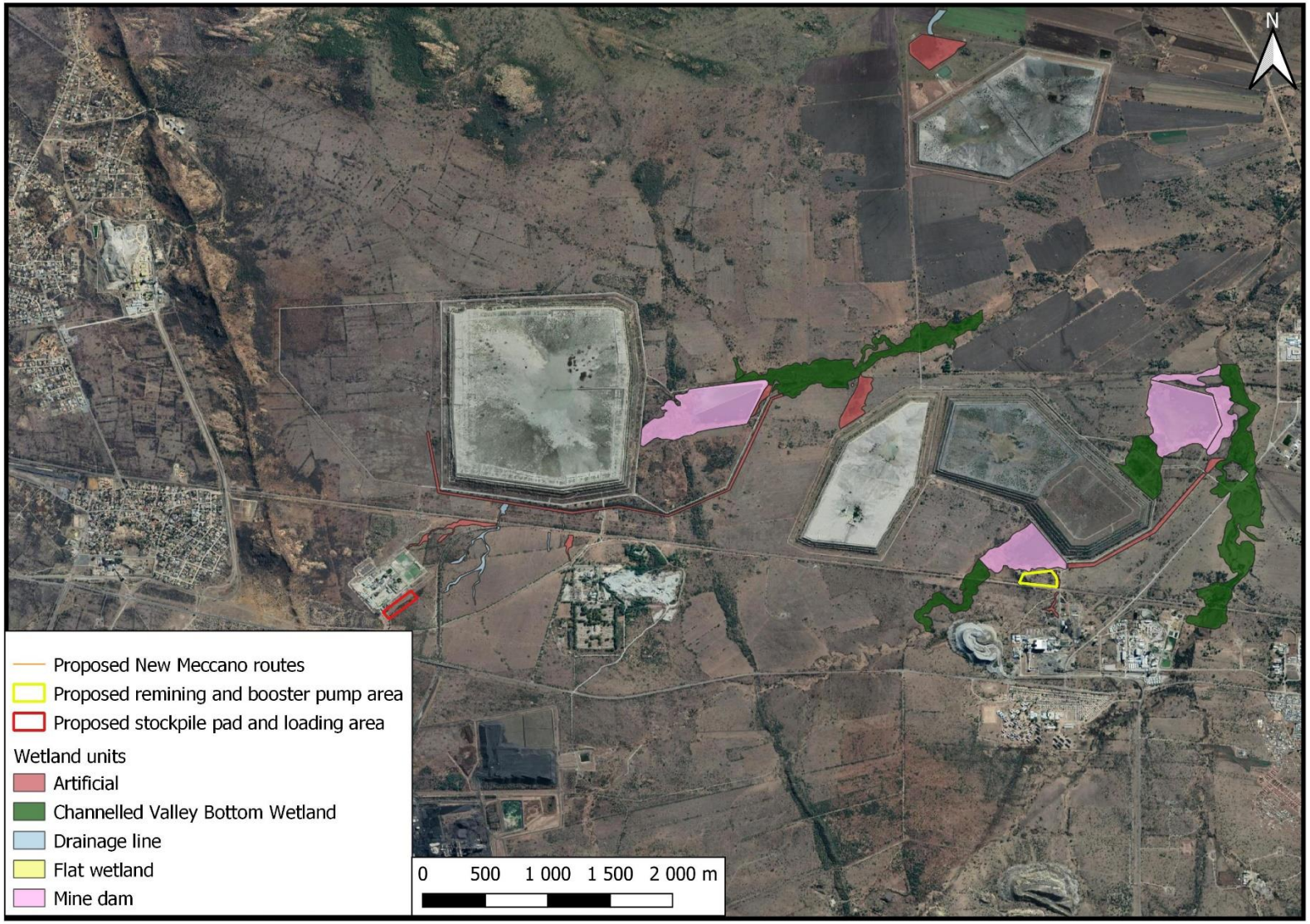

Figure 16: Natural and Artificial wetland areas present on site.

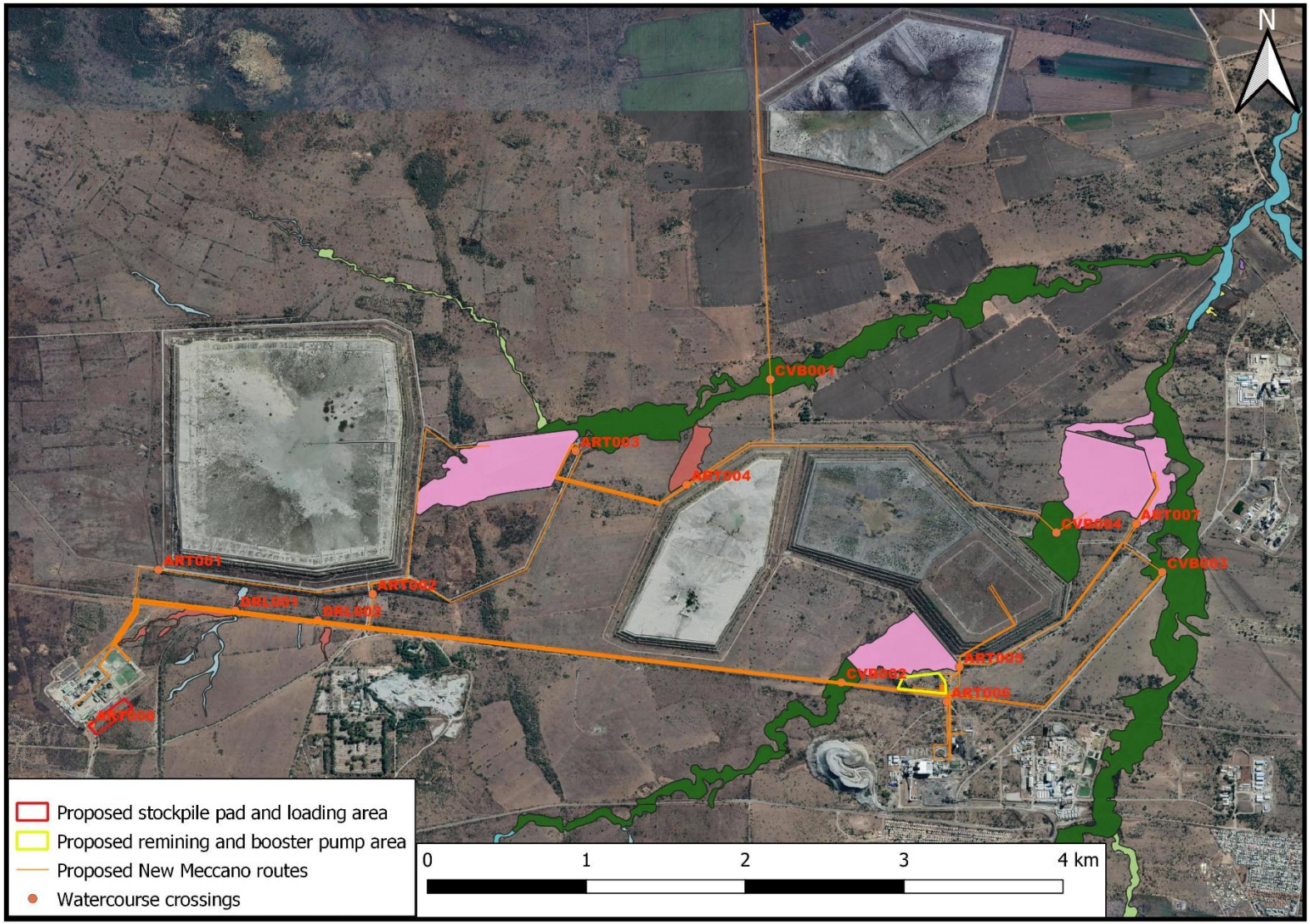

Figure 17: Numbered watercourse crossings (natural and artificial) on site.

5.2 Watercourse Delineation and Assessment

5.2.1 Description and geomorphological type

The topography of the site and the associated wetland unit are highly impacted by the current and historical mining activities on site. Due to the various impacts on site, several artificial wetland units are present, including clean and dirty water mine dams, clean and dirty water canals and artificial seepage from mine dams. The tailings facilities have also been constructed in some of the watercourses, which resulted in a diversion of the watercourses into the clean water canals around the sites.

5.2.2 Delineation

5.2.2.1 Soil

The soil in the natural wetland areas consists of a dark turf clay with red mottles transitioning to a grey clay in the areas with permanent wetness. The soil is similar in many of the artificial wetland areas, but in some of the artificial wetlands, the soil has been imported into the site.

5.2.2.2 Vegetation

The vegetation in both the natural and artificial wetland areas are dominated by sedge species and closely resembles other wetlands in the areas. The dominant species in most of the wetland areas are *Cyperus sexangularis*. The vegetation is an excellent indicator of wetland conditions in the area. In the case of the Drainage Lines, the vegetation and topography are the main indicators used in the delineation of the watercourse.

5.2.2.3 Topography

The wetland areas are located in the valley bottoms and along artificial depressions or canals. The wetlands in this landscape are mostly located in the valley bottom areas and the wetlands located along the routes are therefore located where wetland areas are expected. Some of the artificial wetland areas are however located on slopes where seepage would not have taken place without the placement of artificial sources of water in the area.

5.2.3 Watercourse crossings

The proposed routes cross numerous natural and artificial watercourses. The crossings are short and located adjacent to existing access routes. No temporary access routes are therefore required at the wetland crossings. A description of the proposed crossings is located in Table 4 below and the locations of the proposed crossings are included in Figure 17.

Table 4: Description of watercourse crossings along the proposed development.

Watercourse crossing	Watercourse type	Routes	Notes	Existing crossings	PES	EIS
ART001	Artificial canal	New M2 Return Water line 280 HDPE.	The crossing is located on the same artificial canal as ART002. The canal appears to be a clean water canal.	Crossed by pipelines and a road.	N/A	N/A
ART002	Artificial canal	New Powerline feeding the Hoedspruit RW pumps.	The crossing is located on the same artificial canal as ART001. The canal appears to be a clean water canal.	Crossed by pipelines and a road.	N/A	N/A
ART003	Seepage from RWD	New Powerline feeding the Hoedspruit RW pumps. New Return Water pumps (Hoedspruit). New K4 Return Water to RWD. New K3B Return Water pipeline to RWD. New Access Road.	The wetland is an artificial seep associated with the RWD. Located upslope of the CVB001.	Crossed by pipelines and a road.	N/A	N/A
ART004	Seepage from canal next to tailings	New K4 Return Water to RWD. New K3B Return Water pipeline to RWD.	The wetland is an artificial seep associated with the tailings dam. This system is upstream of the CVB001 crossing.	Crossed by pipelines and a road.	N/A	N/A

Watercourse crossing	Watercourse type	Routes	Notes	Existing crossings	PES	EIS
ART005	Artificial canal	New Hydromining Water Feed Line from K3B RWD. New Hydromining Pulp Slurry Line. New Hydromining Feed Lines.	This crossing is located between the dam in the CVB, against the tailings, and the artificial clean water canal passing around the tailings.	Crossed by pipelines and a road.	N/A	N/A
ART006	Artificial canal	New Powerline from K3. New 50mm potable water line. New Tailings Pipe Option to divert K4 to K3B Concentrator.	This an artificial canal associated with the drainage culvert under the railway.	Crossed by pipelines and a road.	N/A	N/A
ART007	Seepage from RWD	New K3B Return Water Pumps Area. New Powerline to feed K3 RW pumps. New Hydromining Water Feed Line from K3B RWD.	This artificial wetland is the seep zone associated with the K3 RWD. The RWD was constructed in a CVB that are impacted by the tailings and RWD facilities.	Crossed by pipelines and a road.	N/A	N/A
ART008	Leaking pump station	Proposed stockpile pad and loading area.	The pump station in this location is leaking resulting in a small artificial wetland area.	Located adjacent to a road.	N/A	N/A
CVB001	Channelled valley bottom	New K4 Return Water to RWD.	This crossing is located on a CVB downstream of crossings ART003 and ART004. The Hoedspruit tailings and RWD were constructed on the upper portions of the CVB.	Crossed by pipelines and a road.	D	Moderate

Watercourse crossing	Watercourse type	Routes	Notes	Existing crossings	PES	EIS
CVB002	Channelled valley bottom	New Overhead Line Feed from WLTR. New K3B Live Tailings combined with Hydromining. New K4 Live Tailings. New Hydromining Water Feed Line A. New Hydromining Water Feed Line B.	The CVB originates to the south-west. The proposed crossing is located directly downstream of the railway line and adjacent to the service road. A dam and tailings are constructed on the wetland downstream of the proposed crossing.	Crossed by road and railway.	E	Moderate
CVB003	Channelled valley bottom	New Powerline to feed K3 RW pumps. New K4 Live Tailings.	The CVB originates to the south of the crossing and pass several mine related activities, as well as a residential area. The proposed powerline and pipeline pass through the outer edge of the CVB wetland. Several disturbances are present, including soil disturbances and heavy grazing by livestock.	Crossed by road, pipelines and powerlines.	D	Moderate
CVB004	Channelled valley bottom	New K3B Return Water pipeline to RWD.	This section of the CVB is located between the tailings and RWD. The tailings were constructed over the CVB, significantly impacting the health of the system.	Crossed by road, and pipelines. The Tailings and RWD is located on the CVB.	E	Moderate

Watercourse crossing	Watercourse type	Routes	Notes	Existing crossings	PES	EIS
DRL001	Drainage line	New Overhead Line Feed from WLTR. New K3B Live Tailings combined with Hydromining. New K4 Live Tailings. New Hydromining Water Feed Line A. New Hydromining Water Feed Line B.	The system originates to the south of the railway line. The tailings were constructed on top of the drainage line, and the drainage line therefore terminates in the clean water canal around the tailings.	Crossed by road and railway. Tailings is located on downstream portion.	C	Low
DRL002	Drainage line	New Overhead Line Feed from WLTR. New K3B Live Tailings combined with Hydromining. New K4 Live Tailings. New Hydromining Water Feed Line A. New Hydromining Water Feed Line B.	The system originates a short distance to the south of the railway line. The tailings were constructed on top of the drainage line, and the drainage line therefore terminates in the clean water canal around the tailings.	Crossed by road and railway. Tailings is located on downstream portion.	C	Low

6 Buffer recommendations

A buffer zone is intended as an area to mitigate the impact of the development on sensitive features on site. Several buffer sizes are recommended for wetland units in the various provinces. The buffer zone tool was developed to assist in determining the appropriate buffer zone for wetland area. This tool is not sufficient to determine the buffer zone to mitigate soil water and groundwater impacts (Macfarlane *et al.* 2014). Due to the nature of linear developments, no buffer zone is applicable to the pipeline, powerline and road construction activities.

The proposed stockpile pad and loading area are located more than 200m away from the closest watercourse, which is located opposite a railway line. Although a small artificial wetland is present on site, it is present due to a leak at the pump station and will disappear if the leak is fixed. No buffer zone recommendation is therefore needed for this development.

The proposed remining and booster pump area is located in proximity to a clean water dam in a channelled valley bottom (CVB) wetland. The existing tailings facility was constructed on top of the CVB wetland directly downstream of the dam and a clean water canal pass around the tailings facility to the east. According to the buffer tool, a buffer of 50m wetland buffer is required around the remining and booster pump area. No buffers are required for the vegetation units.

7 Results of the Environmental Screening Tool

7.1 Plant species theme

The site is listed as having low sensitivity and no threatened plant species are listed for the site in the screening tool. This has been verified during the site visit.

7.2 Terrestrial biodiversity theme

The entire area is indicated with a very high sensitivity, mainly due to the presence of a threatened vegetation type, which resulted in its listing as a critical biodiversity area and a potential area for protected area expansion. Please refer to Section 5.1 of this report for a discussion of the vegetation type.

7.3 Aquatic biodiversity theme

Some areas are indicated as having very high sensitivity due to the presence of wetlands, while the remainder are indicated with a low sensitivity. Please refer to Section 5.2 of this report for the wetland delineation and assessment.

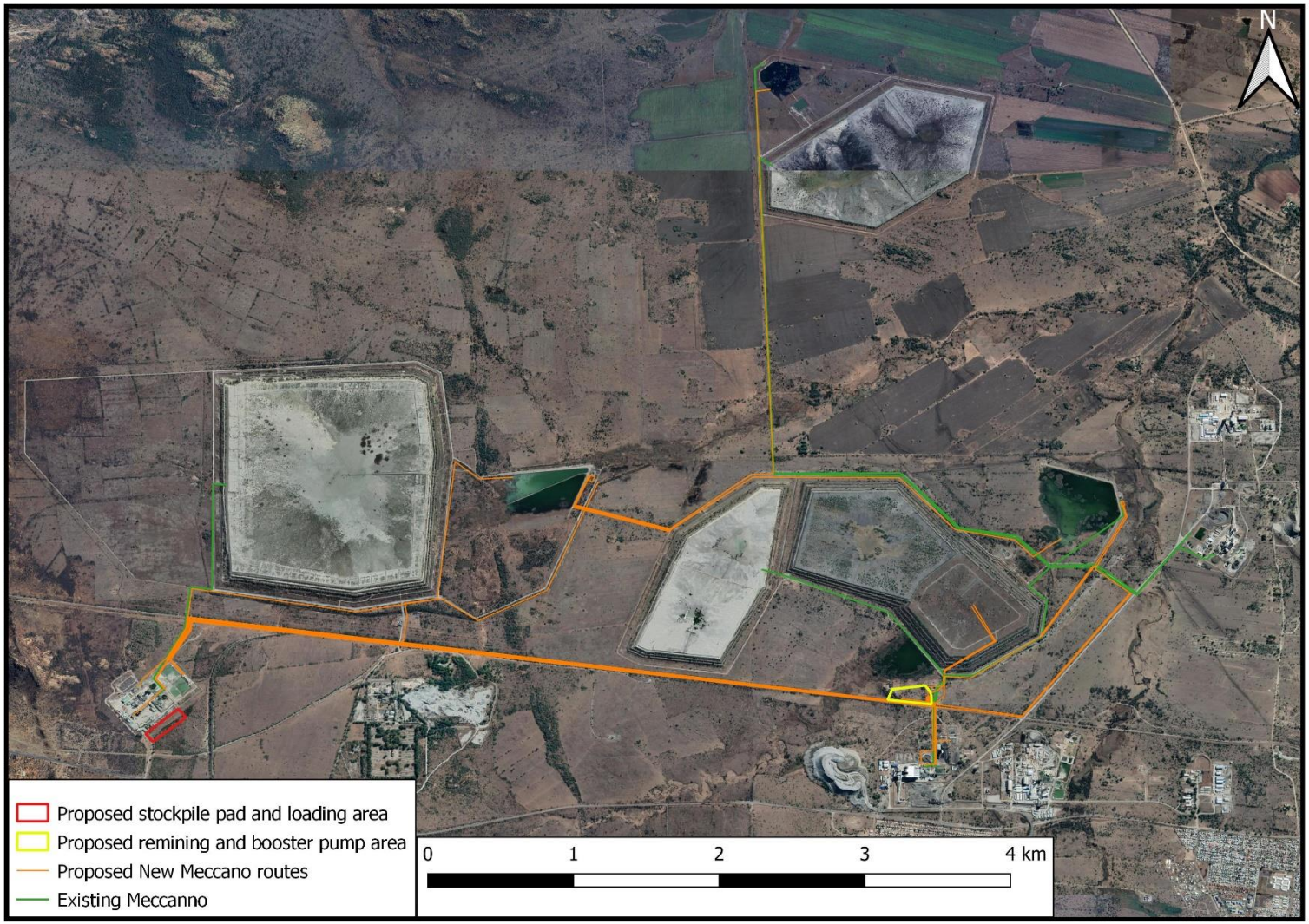

Figure 18: Proposed activities on site.

8 Impact Assessment on the Vegetation affected by the proposed development

The impact assessment for the proposed development (Table 5 to Table 8) is based on the provided layout map. Should any changes to the layout take place the impact assessment will have to be amended. Please also refer to a summary of the impacts and affected areas in Table 9 and Table 10 below.

Table 5: Impact Assessment table for the proposed Sibanye Stilwater linear developments, excluding new access routes.

Nature	Extent	Duration	Intensity	Probability	Status	Significance without mitigation	Extent	Duration	Intensity	Probability	Status	Significance with mitigation
Loss of primary vegetation	Site	Long term	Low	Unlikely	Negative	No Impact	Footprint	Short term	Low	Unlikely	Negative	No Impact
Loss of habitat for plant species of conservation importance	Site	Long term	Low	Unlikely	Negative	No Impact	Footprint	Short term	Low	Unlikely	Negative	No Impact
Loss of wetland habitat	Footprint	Long term	Medium	Possible	Negative	Low	Footprint	Medium term	Medium	Possible	Negative	Low
Ecological corridors	Local	Long term	Low-Medium	Possible	Negative	Low	Local	Medium term	Low	Possible	Negative	Low
Infestation by invasive plant species	Local	Permanent	High	Highly likely	Negative	Medium to High	Site	Medium term	Low	Likely	Negative	Low
Erosion and Sedimentation	Local	Long term	Medium-High	Likely	Negative	Medium	Site	Short term	Low-Medium	Possible	Negative	Low

Table 6: Impact Assessment table for the proposed new access routes.

Nature	Extent	Duration	Intensity	Probability	Status	Significance without mitigation	Extent	Duration	Intensity	Probability	Status	Significance with mitigation
Loss of primary vegetation	Site	Long term	Low	Likely	Negative	Low	Footprint	Long term	Low	Likely	Negative	Low
Loss of habitat for plant species of conservation importance	Site	Long term	Low	Unlikely	Negative	No Impact	Footprint	Short term	Low	Unlikely	Negative	No Impact
Loss of wetland habitat	Footprint	Long term	Medium	Possible	Negative	Low	Footprint	Medium term	Medium	Possible	Negative	Low
Ecological corridors	Local	Long term	Low-Medium	Possible	Negative	Low	Local	Medium term	Low	Possible	Negative	Low
Infestation by invasive plant species	Local	Permanent	High	Highly likely	Negative	Medium to High	Site	Medium term	Low	Likely	Negative	Low
Erosion and Sedimentation	Local	Long term	Medium-High	Likely	Negative	Medium	Site	Short term	Low-Medium	Possible	Negative	Low

Table 7: Impact assessment for the proposed stockpile pad and loading area.

Nature	Extent	Duration	Intensity	Probability	Status	Significance without mitigation	Extent	Duration	Intensity	Probability	Status	Significance with mitigation
Loss of primary vegetation	Site	Permanent	Low	Likely	Negative	Medium	Footprint	Permanent	Low	Likely	Negative	Low
Loss of habitat for plant species of conservation importance	Site	Long term	Low	Unlikely	Negative	No Impact	Footprint	Short term	Low	Unlikely	Negative	No Impact
Loss of wetland habitat	Footprint	Long term	Medium	Possible	Negative	Low	Footprint	Medium term	Medium	Possible	Negative	Low
Ecological corridors	Local	Long term	Low-Medium	Possible	Negative	Low	Local	Medium term	Low	Possible	Negative	Low
Infestation by invasive plant species	Local	Permanent	High	Highly likely	Negative	Medium to High	Site	Medium term	Low	Likely	Negative	Low
Erosion and Sedimentation	Local	Long term	Medium-High	Likely	Negative	Medium	Site	Short term	Low-Medium	Possible	Negative	Low

Table 8: Impact assessment table for the proposed remining and booster pump area.

Nature	Extent	Duration	Intensity	Probability	Status	Significance without mitigation	Extent	Duration	Intensity	Probability	Status	Significance with mitigation
Loss of primary vegetation	Site	Long term	Low	Possible	Negative	Low	Footprint	Medium term	Low	Unlikely	Negative	No Impact
Loss of habitat for plant species of conservation importance	Site	Long term	Low	Unlikely	Negative	No Impact	Footprint	Short term	Low	Unlikely	Negative	No Impact
Loss of wetland habitat	Local	Long term	Medium	Possible	Negative	Medium	Footprint	Medium term	Medium	Possible	Negative	Low
Ecological corridors	Local	Long term	Low-Medium	Possible	Negative	Low	Local	Medium term	Low	Possible	Negative	Low
Infestation by invasive plant species	Local	Permanent	High	Highly likely	Negative	Medium to High	Site	Medium term	Low	Likely	Negative	Low
Erosion and Sedimentation	Local	Long term	Medium-High	Likely	Negative	Medium	Site	Short term	Low-Medium	Possible	Negative	Low

Table 9: Summary of proposed watercourse crossings and the potential impacts associated with each.

Watercourse crossing	Watercourse type	Routes	Impacts
ART001	Artificial canal	New M2 Return Water line 280 HDPE.	The impact on the crossing is negligible. No new roads are required, and the pipeline will be installed adjacent to existing pipelines.
ART002	Artificial canal	New Powerline feeding the Hoedspruit RW pumps.	The impact on the crossing is negligible. No new roads are required, and the proposed powerline is expected to be an overhead line.
ART003	Seepage from RWD	New Powerline feeding the Hoedspruit RW pumps. New Return Water pumps (Hoedspruit). New K4 Return Water to RWD. New K3B Return Water pipeline to RWD.	Although the proposed new pumps and pipelines will be located on the artificial seep, the impact will be minimal and can be mitigated with correct management and rehabilitation. The seep flows into a CVB downstream of the RWD. There is therefore a potential for pollution, however the risk is not larger than for the existing infrastructure in place.
ART004	Seepage from canal next to tailings	New K4 Return Water to RWD. New K3B Return Water pipeline to RWD.	The impact from the proposed pipelines is expected to be negligible. The pipelines will be constructed next to an existing road.
ART005	Artificial canal	New Hydromining Water Feed Line from K3B RWD. New Hydromining Pulp Slurry Line. New Hydromining Feed Lines.	The impact on the crossing is negligible. No new roads are required, and the pipeline will be installed adjacent to existing pipelines.

Watercourse crossing	Watercourse type	Routes	Impacts
ART006	Artificial canal	New Powerline from K3. New 50mm potable water line. New Tailings Pipe Option to divert K4 to K3B Concentrator.	The impact on the crossing is negligible. No new roads are required, and the pipeline will be installed adjacent to existing pipelines.
ART007	Seepage from RWD	New K3B Return Water Pumps Area. New Powerline to feed K3 RW pumps. New Hydromining Water Feed Line from K3B RWD.	This crossing is along the existing road and dam wall of the RWD. The impact of the proposed pipelines and powerline is expected to be negligible.
ART008	Leaking pump station	Proposed stockpile pad and loading area.	The wetland is due to a leak at the pump and the impact of the proposed development is therefore negligible.
CVB001	Channelled valley bottom	New K4 Return Water to RWD.	The impact on the crossing is negligible. No new roads are required, and the pipeline will be installed adjacent to existing pipelines.
CVB002	Channelled valley bottom	New Overhead Line Feed from WLTR. New K3B Live Tailings combined with Hydromining. New K4 Live Tailings. New Hydromining Water Feed Line A. New Hydromining Water Feed Line B.	The impact on the wetland would be small, the proposed pipelines will be constructed adjacent to an existing service road and railway.
CVB003	Channelled valley bottom	New Powerline to feed K3 RW pumps. New K4 Live Tailings.	The impact on the crossing is negligible. No new roads are required, and the pipeline and powerline will be installed adjacent to existing pipelines.

Watercourse crossing	Watercourse type	Routes	Impacts
CVB004	Channelled valley bottom	New K3B Return Water pipeline to RWD.	The impact on the wetland would be small, the proposed pipelines will be constructed adjacent to an existing service road and railway.
DRL001	Drainage line	New Overhead Line Feed from WLTR. New K3B Live Tailings combined with Hydromining. New K4 Live Tailings. New Hydromining Water Feed Line A. New Hydromining Water Feed Line B.	The impact on the wetland would be small, the proposed pipelines will be constructed adjacent to an existing service road and railway.
DRL002	Drainage line	New Overhead Line Feed from WLTR. New K3B Live Tailings combined with Hydromining. New K4 Live Tailings. New Hydromining Water Feed Line A. New Hydromining Water Feed Line B.	The impact on the wetland would be small, the proposed pipelines will be constructed adjacent to an existing service road and railway.

Table 10: Summary of watercourse crossings and affected vegetation units per proposed development.

Routes	Watercourse crossing	Vegetation units	Notes
New 50mm potable water line.	ART006	Disturbances. Modified Marikana Thornveld. Artificial wetlands.	The proposed pipeline follows existing routes and disturbances. Although the line pass through the Modified Marikana Thornveld vegetation type the activities will mostly be confined to existing disturbed areas and the impact will therefore be negligible.
New Hydromining Feed Lines.	ART005	Disturbances. Modified Marikana Thornveld. Artificial wetlands.	The proposed pipeline follows existing routes and disturbances. Although the line pass through the Modified Marikana Thornveld vegetation type the activities will mostly be confined to existing disturbed areas and the impact will therefore be negligible.
New Hydromining Pulp Slurry Line.	ART005	Disturbances. Modified Marikana Thornveld. Artificial wetlands.	The proposed pipeline follows existing routes and disturbances. Although the line pass through the Modified Marikana Thornveld vegetation type the activities will mostly be confined to existing disturbed areas and the impact will therefore be negligible.
New Hydromining Water Feed Line A.	CVB002 DRL001 DRL002	Disturbances. Modified Marikana Thornveld. Rocky outcrop. Natural wetlands.	The proposed pipeline follows existing routes and disturbances, including the existing railway line and service road and a portion of existing pipeline routes. Although the line pass through the Modified Marikana Thornveld vegetation type the activities will mostly be confined to existing disturbed areas and the impact will therefore be negligible.

Routes	Watercourse crossing	Vegetation units	Notes
New Hydromining Water Feed Line B.	CVB002 DRL001 DRL002	Disturbances. Modified Marikana Thornveld. Rocky outcrop. Natural wetlands.	The proposed pipeline follows existing routes and disturbances, including the existing railway line and service road and a portion of existing pipeline routes. Although the line pass through the Modified Marikana Thornveld vegetation type the activities will mostly be confined to existing disturbed areas and the impact will therefore be negligible.
New Hydromining Water Feed Line from K3B RWD.	ART005 ART007	Disturbances. Modified Marikana Thornveld. Artificial wetlands.	The impacts will largely be confined to existing disturbances, with a 1.15km stretch passing through the Modified Marikana Thornveld vegetation unit and requiring a new access road. The vegetation in this area is modified and have a lower species diversity than the original Marikana Thornveld vegetation type. The impact is therefore low.
New K3B Live Tailings combined with Hydromining.	CVB002 DRL001 DRL002	Disturbances. Modified Marikana Thornveld. Rocky outcrop. Natural wetlands.	The proposed pipeline follows existing routes and disturbances, including the existing railway line and service road and a portion of existing pipeline routes. Although the line pass through the Modified Marikana Thornveld vegetation type the activities will mostly be confined to existing disturbed areas and the impact will therefore be negligible.
New K3B Return Water pipeline to RWD.	ART003 ART004 CVB004	Disturbances. Rocky outcrop. Modified Marikana Thornveld. Artificial wetlands.	This pipeline mostly follows existing roads and pipeline routes and are confined to existing disturbances in these areas. The pipeline will however cross an undeveloped Rocky Outcrop between K3 and K4, which will require a new access route. This area is currently used for grazing and seems to have very high grazing pressure with several pioneer and alien species present. The impact of the pipeline and access road can therefore largely be mitigated.

Routes	Watercourse crossing	Vegetation units	Notes
New K3B Return Water Pumps Area.	ART007	Artificial wetlands.	The proposed location for the new RW pumps is directly adjacent to the existing pumps to the south-east. This area is highly modified and receiving artificial seepage from the return water dam adjacent to the pumps. Due to the modifications to the vegetation the impact of the proposed pumps on the vegetation is minimal.
New K4 Live Tailings.	CVB002 CVB003 DRL001 DRL002	Disturbances. Modified Marikana Thornveld. Rocky outcrop. Natural wetlands.	The proposed pipeline follows existing routes and disturbances, including the existing railway line and service road and a portion of existing pipeline routes. Although the line pass through the Modified Marikana Thornveld vegetation type the activities will mostly be confined to existing disturbed areas and the impact will therefore be negligible.
New K4 Return Water to RWD.	ART003 ART004 CVB001	Disturbances. Rocky outcrop. Modified Marikana Thornveld. Artificial wetlands.	This pipeline mostly follows existing roads and pipeline routes and are confined to existing disturbances in these areas. A large portion of the pipeline pass between cultivated fields. The pipeline will however cross an undeveloped Rocky Outcrop between K3 and K4, which will require a new access route. This area is currently used for grazing and seems to have very high grazing pressure with several pioneer and alien species present. The impact of the pipeline and access road can therefore largely be mitigated.
New M2 Return Water line 280 HDPE.	ART001	Disturbances. Artificial wetlands. Modified Marikana Thornveld.	The proposed pipeline follows existing pipelines and access road for the entire route. The impact of the proposed pipeline is therefore negligible.

Routes	Watercourse crossing	Vegetation units	Notes
New Overhead Line Feed from WLTR.	CVB002 DRL001 DRL002	Disturbances. Modified Marikana Thornveld. Rocky outcrop. Natural wetlands.	The proposed powerline follows existing routes and disturbances, including the existing railway line and service road and a portion of existing pipeline routes, as well as a portion of the existing overhead line route. Although the line pass through the Modified Marikana Thornveld vegetation type the activities will mostly be confined to existing disturbed areas and the impact will therefore be negligible.
New Powerline feeding the Hoedspruit RW pumps.	ART002 ART003	Disturbance. Artificial wetland.	The proposed powerline follows an existing road and pipeline route. The line is therefore located along existing disturbances and the impact of the route on the environment is negligible.
New Powerline from K3.	ART006	Disturbances. Modified Marikana Thornveld. Artificial wetlands.	The proposed powerline follows an existing road and pipeline route. The line is therefore located along existing disturbances and the impact of the route on the environment is negligible.
New Powerline to feed K3 RW pumps.	ART007 CVB003	Disturbances. Modified Marikana Thornveld. Artificial wetlands.	The proposed powerline follows an existing road and pipeline route. The line is therefore located along existing disturbances and the impact of the route on the environment is negligible.
New Return Water pumps (Hoedspruit).	ART003	Artificial wetlands.	The proposed location for the new RW pumps is directly adjacent to the existing pumps to the south. This area is highly modified with several soil disturbances present and receiving artificial seepage from the return water dam adjacent to the pumps. Due to the modifications to the vegetation the impact of the proposed pumps on the vegetation is minimal.

Routes	Watercourse crossing	Vegetation units	Notes
New Tailings Pipe Option to divert K4 to K3B Concentrator.	ART006	Disturbances. Modified Marikana Thornveld. Artificial wetlands.	The proposed pipeline follows existing pipelines and access road for the entire route. The impact of the proposed pipeline is therefore negligible.
New Access Road 2		Modified Marikana Thornveld.	The proposed access road will pass through a portion of the Modified Marikana Thornveld vegetation type that are subjected to heavy grazing by cattle. The proposed access route is located between various other disturbances and the impact of the route construction can therefore be mitigated.
New Access Road	ART003	Rocky Outcrop. Artificial wetland.	The construction of two of the pipeline options will require a new access route over an undeveloped Rocky Outcrop between K3 and K4. This area is currently used for grazing and seems to have very high grazing pressure with several pioneer and alien species present. The impact of the pipeline and access road can therefore largely be mitigated.
Proposed remining and booster pump area		Rocky Outcrop. Modified Marikana Thornveld.	The entire area is modified, with soil disturbances and modifications to the topography in several areas. A rocky outcrop is present in the south-western portion of the area. Although it is evident that the area receives runoff from artificial canals to the south, no wetland area is present on the site. A large dam is present to the north of the site is a historical Channelled Valley Bottom wetland.

Routes	Watercourse crossing	Vegetation units	Notes
Proposed stockpile pad and loading area.	ART008	Disturbances. Artificial wetlands. Modified Marikana Thornveld. Marikana Thornveld.	The site is located adjacent to the existing tailings retreatment facility. An existing small pump station is present in the western corner of the area. This pump appears to have been leaking for some time and an artificial wetland became established in this area as a result. The leak at the pump station must be repaired. Approximately half of the proposed area consists of Disturbances and Modified Marikana Thornveld, while the second half remains Marikana Thornveld. The division between these two halves pass through the length of the proposed area. The portion of Marikana Thornveld which will be disturbed and therefore the most disturbed portion of the vegetation unit.

9 Risk Assessment for the potential impact on the wetland areas

The risk assessments were only completed for the proposed remining and booster pump area and a combined risk assessment for the proposed linear activities on the natural wetland areas.

Table 11: Risk assessment table for the proposed remining and booster pump area.

Phase	Activity	Aspect	Impact	Severity				Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Physico & Chemical	Habitat	Biota												
Construction	Construction of infrastructure	Clearing of vegetation	Loss of wetland habitat and functions	1	1	2	2	1,5	1	1	3,5	2	2	5	1	**10**	**35**	**L**	Refer to the mitigation measures included in this report
		Infestation by alien and invasive species		1	1	2	2	1,5	1	1	3,5	2	2	5	1	**10**	**35**	**L**	
		Pollution of water sources		1	2	2	1	1,5	1	1	3,5	1	1	5	3	**10**	**35**	**L**	
		Soil pollution		1	2	2	1	1,5	1	1	3,5	1	1	5	3	**10**	**35**	**L**	
		Erosion		2	2	1	1	1,5	1	1	3,5	2	1	5	1	**9**	**32**	**L**	
		Sedimentation		1	1	2	2	1,5	1	1	3,5	2	1	5	2	**10**	**35**	**L**	
		Trampling and / or unauthorised vehicle access		2	1	2	2	1,8	1	1	3,8	1	1	5	1	**8**	**30**	**L**	
Operational	Operation of the pumps	Infestation by alien and invasive species	Loss of wetland habitat and functions	1	1	2	2	1,5	1	1	3,5	2	2	5	1	**10**	**35**	**L**	Refer to the mitigation measures included in this report
		Pollution of water sources		1	2	2	2	1,8	1	1	3,8	3	3	5	3	**14**	**53**	**L**	
		Soil pollution		1	2	2	2	1,8	1	1	3,8	1	2	5	3	**11**	**41**	**L**	
		Erosion		2	2	1	1	1,5	1	1	3,5	2	1	5	1	**9**	**32**	**L**	
		Sedimentation		1	1	2	2	1,5	1	1	3,5	2	1	5	2	**10**	**35**	**L**	
		Trampling and / or unauthorised vehicle access		2	1	2	2	1,8	1	1	3,8	1	1	5	1	**8**	**30**	**L**	

Table 12: Risk assessment for the proposed linear activities across the natural wetland areas.

Phase	Activity	Aspect	Impact	Severity				Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
				Flow Regime	Physico & Chemical	Habitat	Biota												
Construction	Construction of infrastructure	Clearing of vegetation	Loss of wetland habitat and functions	1	1	2	2	1,5	1	1	3,5	2	2	5	1	**10**	**35**	**L**	Refer to the mitigation measures included in this report
		Infestation by alien and invasive species		1	2	2	2	1,8	1	1	3,8	2	2	5	1	**10**	**38**	**L**	
		Pollution of water sources		1	2	2	2	1,8	1	1	3,8	1	1	5	3	**10**	**38**	**L**	
		Soil pollution		1	2	2	2	1,8	1	1	3,8	1	1	5	3	**10**	**38**	**L**	
		Erosion		2	2	1	1	1,5	1	1	3,5	2	1	5	1	**9**	**32**	**L**	
		Sedimentation		1	1	2	2	1,5	1	1	3,5	2	1	5	2	**10**	**35**	**L**	
		Trampling and / or unauthorised vehicle access		2	1	2	2	1,8	1	1	3,8	1	1	5	1	**8**	**30**	**L**	
Operational	Operation of the pumps	Infestation by alien and invasive species	Loss of wetland habitat and functions	1	1	2	2	1,5	1	1	3,5	2	2	5	1	**10**	**35**	**L**	Refer to the mitigation measures included in this report
		Pollution of water sources		1	2	2	1	1,5	1	1	3,5	3	3	5	3	**14**	**49**	**L**	
		Soil pollution		1	2	2	1	1,5	1	1	3,5	1	2	5	3	**11**	**39**	**L**	
		Erosion		2	2	1	1	1,5	1	1	3,5	2	1	5	1	**9**	**32**	**L**	
		Sedimentation		1	1	2	2	1,5	1	1	3,5	2	1	5	2	**10**	**35**	**L**	
		Trampling and / or unauthorised vehicle access		2	1	2	2	1,8	1	1	3,8	1	1	5	1	**8**	**30**	**L**	

10 Mitigation

10.1 Loss of indigenous plant species and habitat for species of conservation importance

The site falls within the Endangered Marikana Thornveld vegetation type. However, only a small portion of the vegetation type is present at the proposed stockpile pad and loading area. The majority of the affected area is disturbed or transformed, with most of the activities taking place along existing disturbances and access routes. The impact on the vegetation type is therefore low. Please refer to Table 10 above for more information on each proposed development.

No plant species of conservation importance were observed on site during the site visit, and none are expected. No impact on plant species of conservation importance is therefore expected.

Mitigation:

- Control invasive species across the site.
- Ensure that no pollution enters the wetland units on site, including polluted runoff.
- Apply erosion and sediment control.
- Utilise existing roads and infrastructure as far as possible.
- Good vegetation cover must be maintained in all areas not used for infrastructure.
- All mitigation measures included in this report must be adhered to.

10.2 Infestation by invasive plant species

Invasive plant species tend to establish in and around disturbed areas. Several alien and invasive species were observed on site during the site visit. These species must be controlled on site. The control of invasive species is a requirement of the National Environmental Management: Biodiversity Act.

Mitigation:

- Compile an alien and invasive species control and monitoring plan.
- Populations of invasive species on site must be controlled.
- The spread of invasive and weedy species from the site must be prevented.
- Several alien and invasive species resemble indigenous species, especially as seedlings. Care must be taken not to control indigenous species during the control of invasive species.

10.3 Erosion & sedimentation

Erosion and sedimentation are associated with disturbed or bare soil and / or altered flow. This is especially relevant to the areas cleared of vegetation, including roads and new construction areas. Small erosion features are present in the wetland unit, which can be exacerbated by unmitigated runoff.

Mitigation:

- Monitor the entire site for signs of erosion.
- All erosion features must be rehabilitated as soon as possible.
- Implement sediment fences around erosion prone areas.

10.4 Pollution of the soil and water resources

Construction activities may lead to pollutants such as hydrocarbon and litter entering the water resources. This impact is however fairly easy to mitigate by implementing basic guidelines to prevent the pollution.

Some of the proposed pipelines included in the proposed upgrade will transport water containing waste. It is possible that pipeline and pumpstations may leak from time to time by the impact of the leak can be mitigated with proper maintenance and regular inspections.

Mitigation:

- All hydrocarbons, including fuel and oil must be stored off-site in an area approved for the storage.
- Vehicles must be properly maintained and free of leaks.
- All vehicle maintenance must take place at an approved facility.
- All pipelines and pump stations must be inspected regularly to ensure that no leaks are present.
- Leaks must be repaired as soon as possible.

11 Conclusion

The following conclusions are reached regarding the proposed upgrades:

- The site is located in the Marikana Thornveld, which is Endangered.
- Only a small portion of the Marikana Thornveld will be affected, the majority of the activities will take place along existing disturbances and adjacent to existing roads.
- Natural and artificial wetland areas are present on site.
- Crossings over the wetland areas will utilise existing access roads.
- The proposed activities are expected to have a low impact on the vegetation and wetland units on site.
- The proposed development is supported.

12 References & further reading

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Kyllinga CONSULTING

Addendum A – CV

CURRICULUM VITAE

Name:	**Catharina Elizabeth Venter** trading as Kyllinga Consulting
Position:	Senior Ecologist and Wetland Scientist
Date of Birth:	29 December 1979
Nationality:	South African
Languages:	Afrikaans, English

EDUCATIONAL QUALIFICATIONS

- M.Sc (Botany), University of Pretoria (2003)
- B.Sc Hons (Botany), University of Pretoria (2001)
- B.Sc (Environmental Sciences), University of Pretoria (2000). Majored in Geography and Botany
- Matriculated, Sasolburg High School (1997)

Additional

- Introduction to ArcGIS 1 (2006)
- Bringing your data into ArcGIS (2006)
- Introduction to ArcView 3.x (2003).

FIELDS OF EXPERTISE

- **Ecological Assessment:**
  Ecological Assessments as part of the Environmental Impact Assessment Process
- **Wetland Assessment:**
  Wetland Assessments as part of the Environmental Impact Assessment Process and Water Use Applications, as well as rehabilitation plans for wetlands, including planning or the Working for Wetlands programme. Large scale wetland assessments (catchment scale).
- **GIS:**
  Compilation of maps for submission as part of Environmental Impact Assessment Process. Creating spatial databases and large scale wetland maps (catchment scale). Projection conversions and matching/overlaying different format GIS maps.
- **Environmental Impact Assessment**
  Undertaken numerous Environmental Scoping Reports, as required by the Environment Conservation Act, 1989 (Act 73 of 1989), the National Environmental Management Act, 1998 (Act 107 of 1998), as amended and the Development Facilitation Act, 1995 (Act 67 of 1995). Project experience includes the establishment of various housing typologies, golf courses, commercial and industrial projects, infrastructure development (roads), resorts and/or game lodges as well as filling stations.
- **Public Participation:**
  Undertaken numerous public participation processes, ranging from basic to extensive, as required by relevant environmental legislation.

MEMBERSHIP IN PROFESSIONAL SOCIETIES

- Professional Natural Scientist (Pr.Sci.Nat) in the fields of Botanical Science and Ecological Science (Reg no. 400048/08)
- Member of the Botanical Society of South Africa

EMPLOYMENT HISTORY EXPERIENCE

Kyllinga Consulting (July 2015 - present)

Senior Ecologist responsible for wetland and ecological specialist assessments.

Spatial Ecological Consulting (February 2010 – June 2015)

Senior Ecologist responsible for wetland and ecological specialist assessments.

- Wetland Related Assessments

More than 40 wetland assessments conducted between 2010 and 2015.

- Vegetation Assessments

Approximately 16 vegetation assessments between 2010 and 2015.

- Management Plans

Completed two ecological management plans.

MSA Group Services (previously Exigent Environmental CC) (August 2004 – January 2010)

Environmental Scientist responsible for ecological and wetland assessments and the compilation of maps. Also conducted various scoping and EIA applications and EMPRs.

- Ecological Assessments

  In excess of 50 ecological assessments conducted between 2004 and 2010, including managing the inclusion of the fauna specialist assessments.

- Wetland Assessments

  More than 60 wetland verification projects, wetland delineations and wetland assessments, completed between 2004 and 2010.

- As well as:

  Rehabilitation Projects; Fatal Flaw / Screening Assessments; National Department of Agriculture Authorisations; Mining Related Assessments; Private, Public Partnership Projects; Resource Management Plans (RMP); Environmental Management Plans; Environmental Management Programme; Environmental Exemption Processes; Basic Assessments; Environmental Impact Assessments

Part-time employment (2002-2004)

Tutor for botany practicals; Assisting Wildlife management students with Braun-Blanquette analysis; Researcher for a project on the vegetation communities and ecology of the Kruger National Park; Research assistant for the analysis of street trees in Tshwane urban forest; Various part time projects related to vegetation and wetlands

COUNTRIES OF WORK EXPERIENCE

- South Africa
- Lesotho
- Botswana
- Mozambique

PAPERS AND PUBLICATIONS

Co-author and data contributor to: SIEBEN, E. *et al*. The vegetation of inland wetlands with salt-tolerant vegetation in South Africa: description, classification and explanatory environmental factors, submitted to the South African Journal of Botany for review in Feb 2015.

Co-author and data contributor to: SIEBEN, E. *et al*. The herbaceous vegetation of subtropical freshwater wetlands in South Africa: description, classification and explanatory environmental factors, submitted to the South African Journal of Botany for review in Feb 2015.

Co-author and data contributor to: SIEBEN, E. *et al*. The vegetation of grass lawn wetlands of floodplains and pans in semi-arid regions of South Africa: description, classification and explanatory environmental factors, submitted to the South African Journal of Botany for review in Jan 2015.

Co-author of several vegetation descriptions in: MUCINA, L. & RUTHERFORD, M.C. (eds) 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

VENTER, C.E. & BREDENKAMP, G.J. In prep. Major plant communities on the Mfabeni swamp, St Lucia. *Bothalia.*

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PRESENTATIONS

Venter, C.E.; Bredenkamp, G.J. & Grundling, P-L. 2003. Plant community types, and their association with habitat factors as ecosystem driving forces, of Mfabeni Swamp. *Environment of the St Lucia Wetland: Processes of Change*, Cape Vidal, September 4th- 7th, 2003.

Poster Presentations

Venter, C.E.; Bredenkamp, G.J.; Grundling P-L. 2002. Baseline vegetation surveys of rehabilitated peatland on Rietvlei Nature Reserve. SAAB Converence. Grahamstown.

Venter, C.E.; Bredenkamp, G.J.; Grundling P-L. 2003. Vegetation change on rehabilitated peatland on Rietvlei Nature Reserve. SAAB Converence. Pretoria.

Addendum B – Declaration of Independence

Specialist:	Ina Venter, trading as Kyllinga Consulting		
Nature of specialist study compiled:	Wetland Assessment		
Contact person:	Ina Venter		
Postal address:	53 Oakley street, Rayton		
Postal code:	1001	**Cell:**	083 370 0850
Telephone:	012 734 5642	**Fax:**	
E-mail:	i.venter@telkomsa.net		
Qualifications & relevant experience:	M.Sc. Botany		
Professional affiliation(s) (if any)	South African National Association of Scientific Professions		

I, CE Venter (Ina) , declare that -

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in Regulation 8;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of specialist:

Ina Venter, trading as Kyllinga Consulting

Name of company:

10 May 2023

Date: