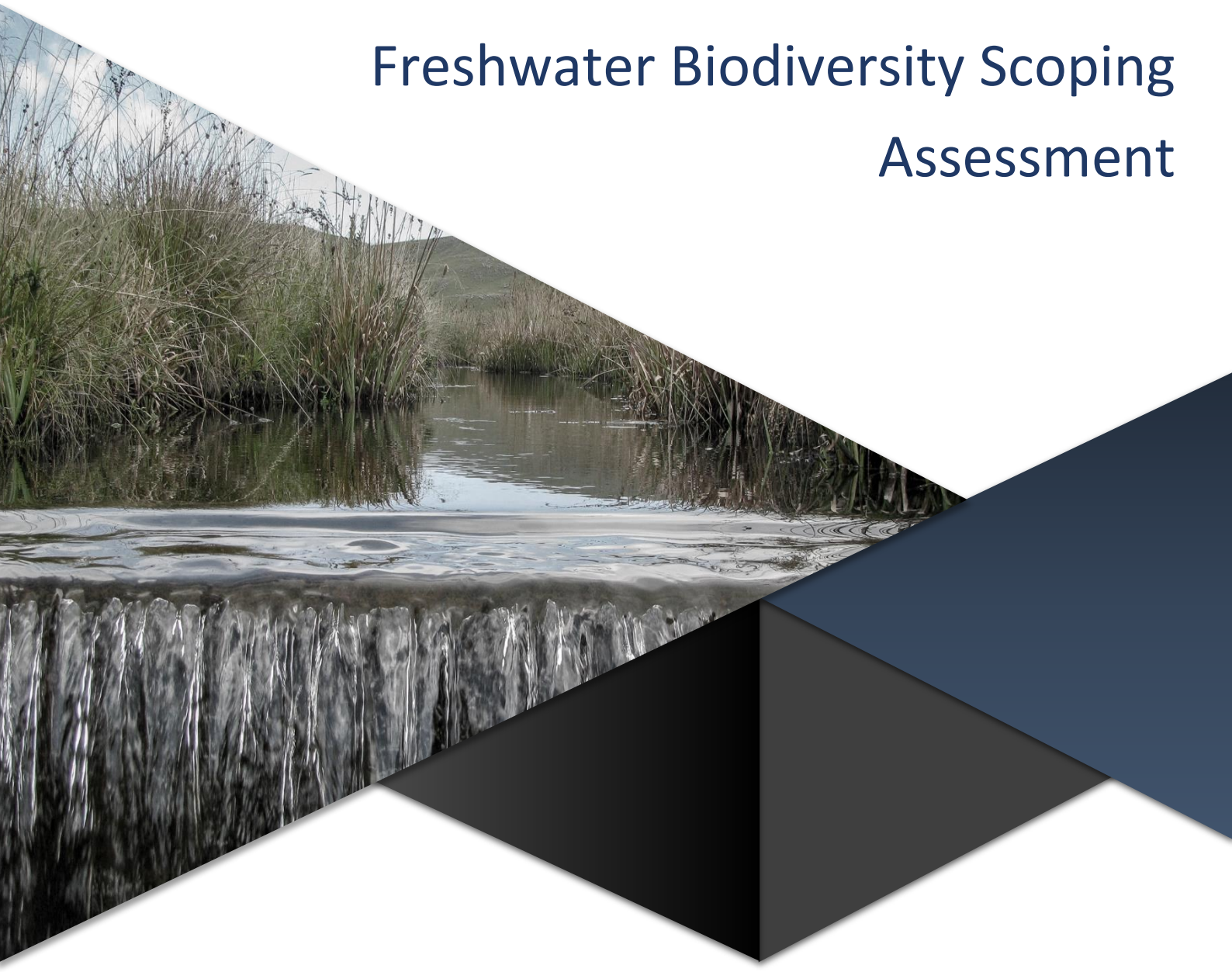
Nomamix (Pty) Ltd: Vygenhoek Platinum Mine

Freshwater Biodiversity Scoping Assessment



Ecology International
Sustainability through Collaboration

FRESHWATER BIODIVERSITY SCOPING ASSESSMENT

Nomamix (Pty) Ltd: Vygenhoek Platinum Mine

Project Ref No. 200055

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July 2020

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Declaration of Independence by Specialist

I, **BYRON GRANT**, in my capacity as a specialist consultant, hereby declare that I -

- act as an independent consultant;
- 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;
- declare that there are no circumstances that may compromise my objectivity in performing such work;
- do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act, 1998 (Act 107 of 1998);
- have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act, 1998 (Act No. 107 of 1998), regulations and any guidelines that have relevance to the proposed activity;
- based on information provided to me by the project proponent and in addition to information obtained during the course of this study, have presented the results and conclusion within the associated document to the best of my professional ability;
- undertake to have my work peer reviewed on a regular basis by a competent specialist in the field of study for which I am registered; and
- as a registered member of the South African Council for Natural Scientific Professions, will undertake my profession in accordance with the Code of Conduct of the Council, as well as any other societies to which I am a member.

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21 July 2020

Date

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ACRONYMS

CBA	Critical Biodiversity Area
CR	Critically Endangered
CSIR	Council for Scientific and Industrial Research
DD	Data Deficient
DEA	Department of Environmental Affairs
DWS	Department of Water and Sanitation
EN	Endangered
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Area
IUCN	International Union for Conservation of Nature
LC	Least Concern
MBA	National Biodiversity Assessment
MPSP	Mpumalanga Biodiversity Sector Plan
NFEPA	National Freshwater Ecosystem Priority Areas project
NPAES	National Protected Area Expansion Strategy
NT	Near Threatened
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SWSA	Strategic Water Source Area
TWI	Topographical Wetness Index
VU	Vulnerable
WMA	Water Management Area

1. INTRODUCTION

1.1 Project Description

Environmental Management Assistance (Pty) Ltd appointed Ecology International (Pty) Ltd to conduct a freshwater scoping study for proposed Nomamix (Pty) Ltd Vygenhoek Platinum Mine, Mpumalanga. The purpose of the study was for the determination of freshwater ecosystem characteristics and sensitivities of the proposed project area to be identified for the purposes of inclusion into a Scoping Assessment.

In order to inform the Scoping Assessment, extensive use was to be made of available literature and the latest spatial databases associated with the area of interest in order to identify threats and opportunities regarding freshwater ecosystem features relating to the proposed mining activities. Such databases would include (but not limited to) the latest provincial conservation plan, National Freshwater Ecosystem Priority Areas (NFEPA), Global Biodiversity Information Facility database, national and provincial freshwater ecosystem databases, as well as any other recent academic studies or national/provincial assessments associated with the area of interest. In addition to the use of available information pertaining to wetlands within the study area, a Topographical Wetland Index (TWI) model and flow accumulation model would be developed for the extent of the study area in order to identify any possible additional areas that might support wetland features and/or drainage features not captured on relevant national or regional inventories.

In addition to the above, a high-level impact assessment will be conducted to determine the potential for impacts on the associated freshwater ecosystems.

1.2 Assumptions and Limitations

Given the desktop nature of the present study, the results presented relied upon the availability of desktop spatial information pertaining to the natural features associated with the study area. The accuracy of the information presented is thus strongly dependant on the accuracy of the spatial datasets interrogated, as well as interpretation of vegetation units from available aerial imagery.

2. PHYSICAL CHARACTERISTICS

2.1 Location

The proposed Vygenhoek Platinum Mine is located approximately 45km north of the town of Dullstroom, approximately 30km north of the town of Lydenburg, and approximately 25km south of the town of Steelpoort, in the province of Mpumalanga. More specifically, the proposed mine is located on Portion 3 and Portion 7 of the farm Vygenhoek 10 JT, Mpumalanga, and encompasses as area of approximately 778ha in extent (Figure 1).

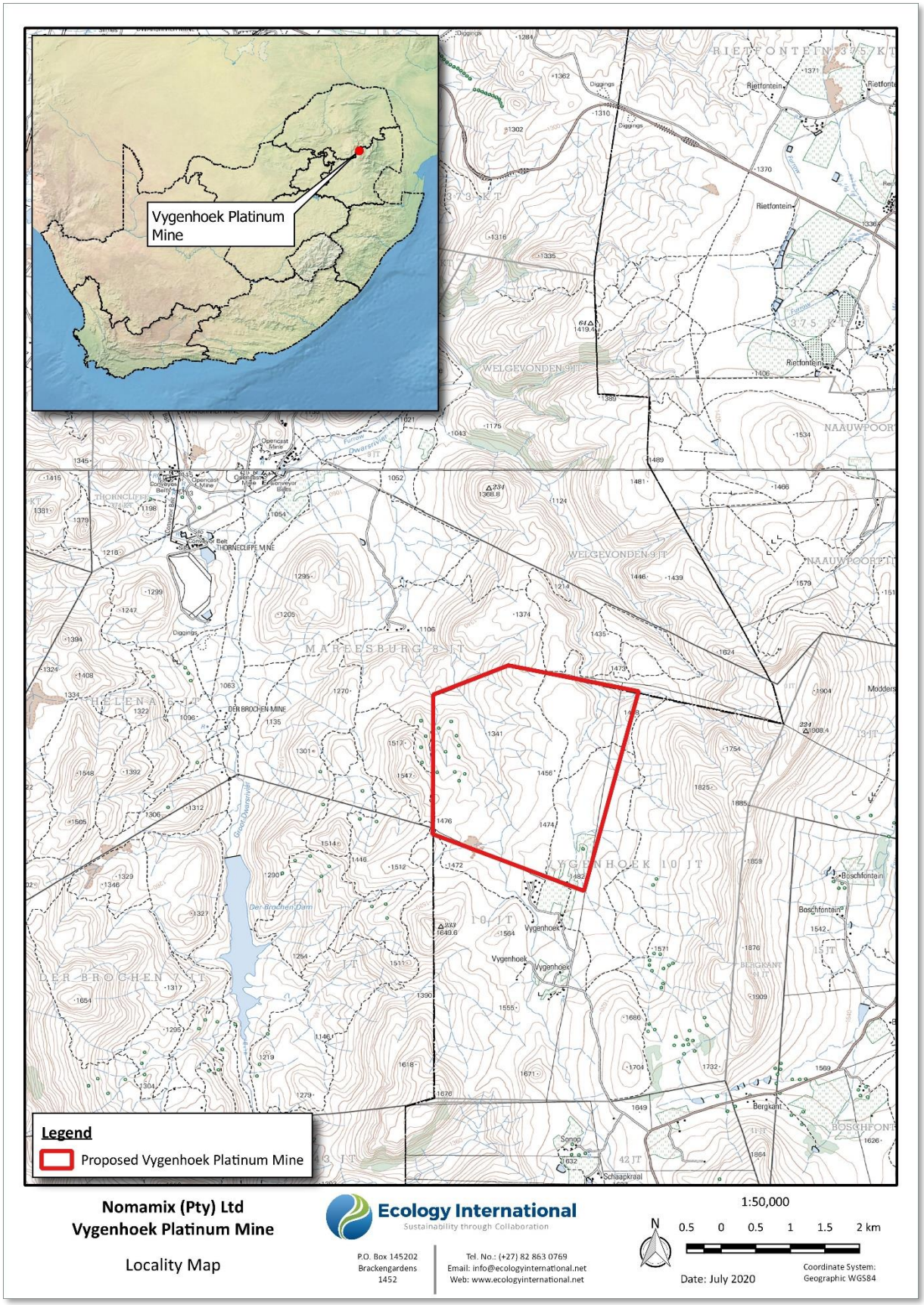

Figure 1: Location of the proposed Vygenhoek Platinum Mine study area

2.2 Climate

The area is characterised with early- to mid-summer rainfall, receiving a mean annual rainfall of approximately 650mm/annum. Mean annual temperatures within the area range from 10°C to 22°C, with potential evaporation of approximately 1,992mm/annum and a mean annual surface runoff of approximately 34mm/annum (Kleynhans et al., 2007; Macfarlane et al., 2008).

2.3 Geology & Soils

The proposed Vygenhoek Platinum Mine study area is underlain by elements of the Bushveld Igneous Complex, which is a massive mafic-ultramafic layered intrusion and an associated suite of granitoid rocks, which have intruded into the early Proterozoic Transvaal Sequence within the Kaapvaal Craton. The ultramafic-mafic layered rocks of the Rustenburg Layered Suite occur in four main complexes or limbs, namely the Western, Eastern, Northern and Southern Limbs. The Vygenhoek Project is located towards the southern end of the Eastern Limb of the Bushveld Complex (Nieuwoudt, n.d.). Quaternary elements dominate the south-eastern portions of the study area while isolated exposures of sandstones from the Steenkampsberg Formation of the Transvaal Supergroup occur in the south-eastern and northern extents of the study area.

The primary land type associated with the Vygenhoek Platinum Mine study area includes the Ab29 land type within the eastern portion of the study area, while the Ib31 and Ib154 land types are located within the north-western and western portions of the study area, respectively. The Ab29 land type is expected to be associated with gabbro and norite of the Rustenburg Layered Suite, Bushveld Complex, and as such is expected to support red-yellow apedal, freely-drained soils that are dystrophic and/or mesotrophic that are likely to be >750mm in depth. In contrast, the Ib31 land type is expected to be associated with gabbro, norite, anorthosite, pyroxenite, bronzitite and harzburgite of the Rustenburg Layered Suite, with rocky areas with miscellaneous soils that are likely to be 450-750mm in depth. The Ib154 land type is similarly expected to be associated with gabbro, norite, pyroxenite and anorthosite of the Rustenburg Layered Suite, with rocky areas with miscellaneous soils that are likely to be <450mm in depth.

3. FRESHWATER ECOSYSTEM CHARACTERISTICS

3.1 Protected Areas

According to the Department of Environmental Affairs' Protected Area Database (DEA, 2019), no formally Protected Areas are associated with the proposed Vygenhoek Platinum Mine study area. However, the De Hoop Private Nature Reserve (declared in 1959) and the De Hoop Protected Environment (declared in 2019) are located approximately 15km west of the proposed Vygenhoek Platinum Mine study area, while the J.M. Beetge Private Nature Reserve (declared in 1956) is located approximately 11km east of the proposed Vygenhoek Platinum Mine study area and the Davel Private Nature Reserve (declared in 1965) is located approximately 15km south of the proposed Vygenhoek Platinum Mine study area. In addition, the Verloren Valei Nature Reserve international Ramsar Site is located approximately 20km south of the proposed Vygenhoek Platinum Mine study area.

The proposed Vygenhoek Platinum Mine study area is however located within a National Protected Area Expansion Strategy focus area, namely the Mesic Highveld Grasslands focus area (Figure 2).

Focus areas for land-based protected area expansion are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008 (NPAES). They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for fine-scale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities (Government of South Africa, 2008).

3.2 Mining and Biodiversity Guidelines

Published in 2013, the Mining and Biodiversity Guidelines provides a tool to facilitate the sustainable development of South Africa's mineral resources in a way that enables regulators, industry and practitioners to minimise the impact of mining on the country's biodiversity and ecosystem services. It provides the mining sector with a practical, user-friendly manual for integrating biodiversity considerations into the planning processes and managing biodiversity during the operational phases of a mine, from exploration through to closure. From a business perspective, the document explains the value for mining companies of adopting a risk-based approach to managing biodiversity. The early identification and assessment of mining impacts on biodiversity provides an opportunity to put in place environmental management plans and actions that reduce risks to biodiversity, people and business (Department of Environmental Affairs et al., 2013).

The purpose of the Mining and Biodiversity Guidelines was to identify and categorize biodiversity priority areas sensitive to the impacts of mining to support mainstreaming of biodiversity issues in decision making in the mining sector. In order to do this, a composite raster layer was developed based on a large number of individual biodiversity spatial datasets held by SANBI, distinguishing between four categories of biodiversity priority areas in relation to their importance from a biodiversity and ecosystem service point of view as well as the implications for mining in these areas. The guidelines therefore provide explicit direction in terms of where mining-related impacts are legally prohibited, where biodiversity priority areas may present high risks for mining projects, and where biodiversity may limit the potential for mining. The spatial outputs of the guidelines associated with the proposed Vygenhoek Platinum Mine study are presented in Figure 3.

Based on the outputs of the Mining and Biodiversity Guidelines, the proposed Vygenhoek Platinum Mine study area falls almost entirely within areas classified as being of highest biodiversity importance, and thus posing the highest risk for the proposed activity from a biodiversity perspective. This category includes biodiversity priority areas where mining is not legally prohibited, but where there is a very high risk that due to their potential biodiversity significance and importance to

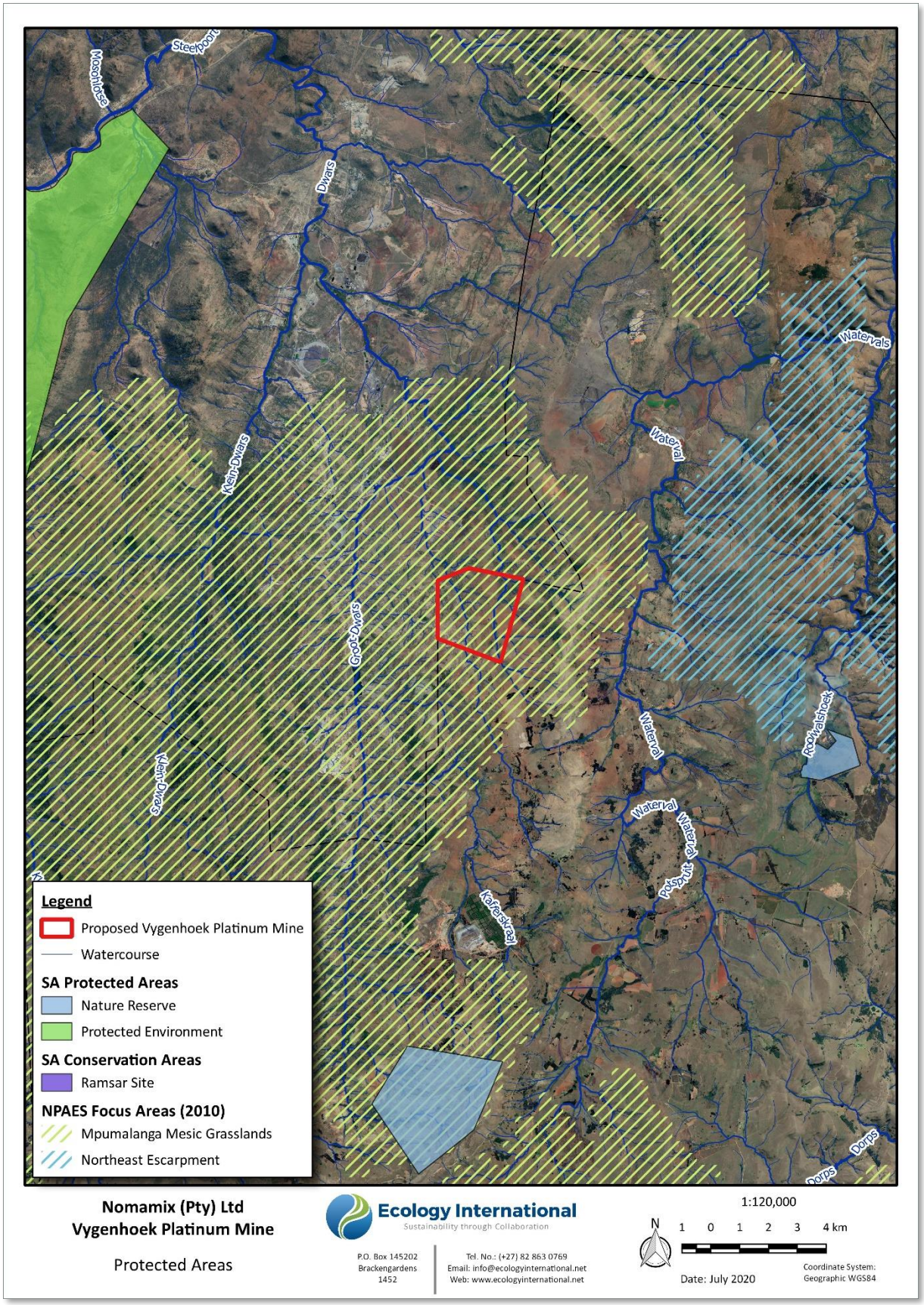

Figure 2: Protected Areas and Protected Area Expansion Strategy focus areas associated with the proposed Vygenhoek Platinum Mine study area

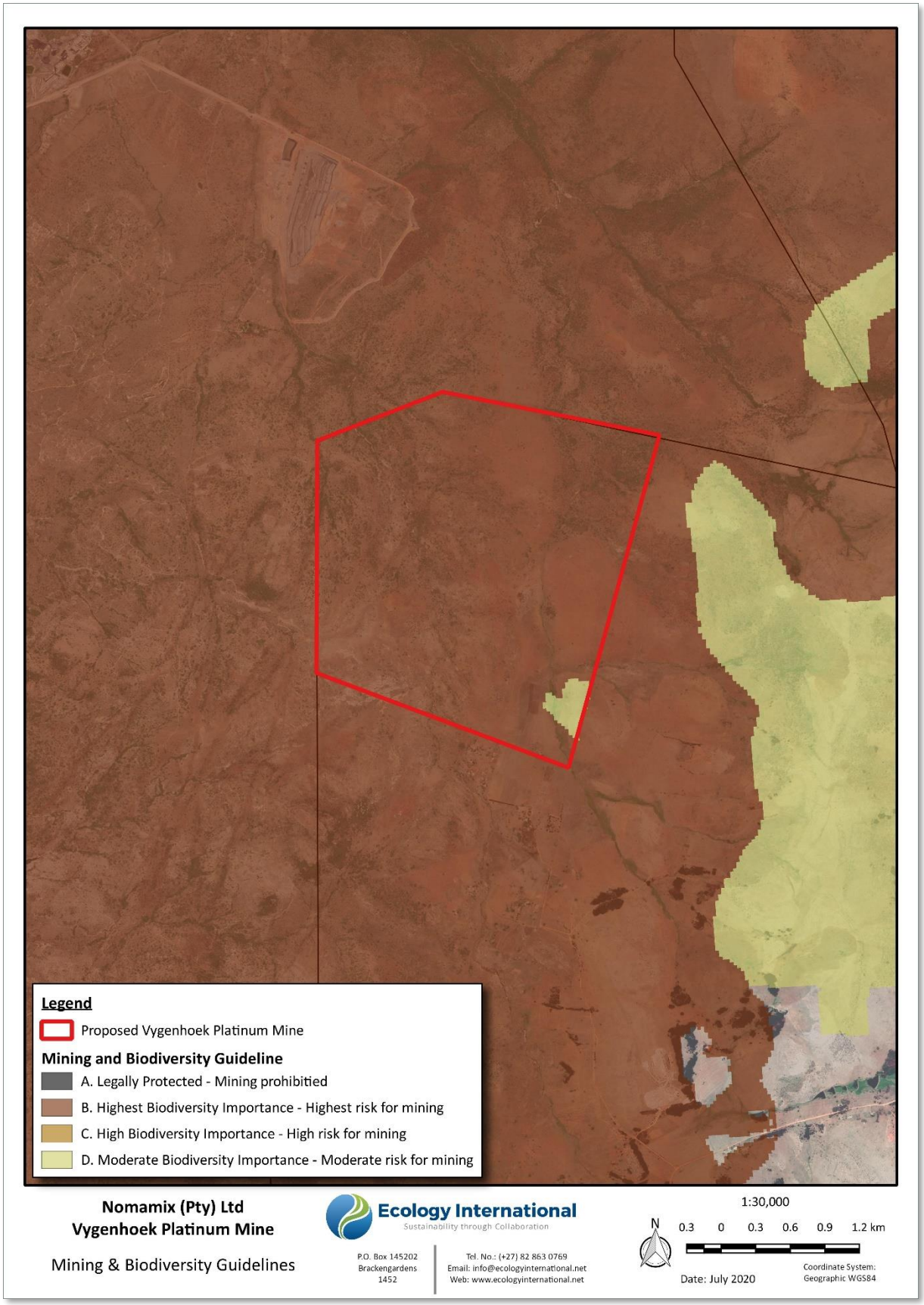

Figure 3: Outputs of the Mining and Biodiversity Guidelines associated with the proposed Vygenhoek Platinum Mine study area

ecosystem services (e.g. water flow regulation and water provisioning) that mining projects will be significantly constrained or may not receive necessary authorisations. These areas include (Department of Environmental Affairs et al., 2013):

I. Critically endangered (CR) and endangered (EN) ecosystems, recognised as threatened ecosystems in terms of the Biodiversity Act.
II. Critical Biodiversity Areas (CBAs), (or areas of equivalent status such as irreplaceable and highly significant areas) from provincial spatial biodiversity plans.
III. River and wetland Freshwater Ecosystem Priority Areas (FEPAs), and a 1km buffer of these specific river and wetland FEPAs.
IV. Ramsar sites.

The importance of the biodiversity features in these areas and the associated ecosystem services (e.g. water flow regulation and water provisioning) is sufficiently high that, if their existence and condition are confirmed, the likelihood of a fatal flaw for new mining projects is very high. These areas are viewed as necessary to ensure protection of biodiversity, environmental sustainability, and human well-being. Mining in such areas may be out of place within the framework of national environmental management policies, norms and standards (Department of Environmental Affairs et al., 2013).

3.3 Aquatic Biodiversity

3.3.1 Freshwater Ecoregions of the World

The proposed Vygenhoek Platinum Mine study area is located within the Southern Temperate Highveld freshwater ecoregion, which is delimited by the South African interior plateau sub-region of the Highveld aquatic ecoregion, of which the main habitat type, in terms of watercourses, is regarded as Savannah-Dry Forest Rivers. Aquatic biotas within this bioregion have mixed tropical and temperate affinities, sharing species between the Limpopo and Zambezi systems. The Southern Temperate Highveld freshwater ecoregion is considered to be bio-regionally outstanding in its biological distinctiveness and its conservation status is regarded as Endangered. The ecoregion is defined by the temperate upland rivers and seasonal pans (Nel et al., 2004; Darwall et al., 2009; Scott, 2013).

3.3.2 National Ecoregional Typing

Ecoregional typing at a national level based on spatially variable combinations of causal factors including physiography, climate, geology, soils and potential natural vegetation. Accordingly, the study area is located primarily within the Eastern Bankenveld Ecoregion, and more specifically within Level II Ecoregion 9.02.

3.3.3 Associated Water Resources

The NWRS-1 (National Water Resource Strategy, Version 1) originally established 19 Water Management Areas (WMAs) within South Africa and proposed the establishment of the 19 Catchment Management Agencies to correspond to these areas. In rethinking the management model, and based on viability assessments with respect to water resources management, available funding, capacity, skills and expertise in regulation and oversight, as well as to improve integrated water systems management, the original 19 designated WMAs have been consolidated into 9 WMAs.

As such, the proposed Vygenhoek Platinum Mine is located within the newly revised Olifants WMA, which now also includes the Letaba River catchment. Accordingly, the main rivers include the Elands River, the Wilge River, the Steelpoort River, the Olifants River, and the Letaba River. The Olifants River originates to the east of Johannesburg and flows in a northerly direction before gently turning to the east. It is joined by the Letaba River before it enters into Mozambique. More specifically, the proposed Vygenhoek Platinum Mine is located within Quaternary Catchment B41G which encompasses the Dwars River and the Klein-Dwars River and their tributaries. Watercourses specifically associated with the proposed Vygenhoek Platinum Mine include two unnamed tributaries of the Dwars River, both of which are considered to be non-perennial in nature (Figure 4). According to the topography of the watercourses, the reach of the western-most tributary present within the study area is classified as mountain stream, with elements of transitional and mountain headwater streams also present (Figure 5). Of additional relevance is that watercourses associated with the western portion of the proposed Vygenhoek Platinum Mine are classified within the latest National Biodiversity Assessment as being Critically Endangered and Endangered and are largely not sufficiently protected (Van Deventer et al., 2019) (Figure 6).

According to the Department of Water and Sanitation (2014), the reach of the watercourse located within the western portion of the study area is considered to be in a pristine ecological state (Ecological Category A), whereas the ecological importance and the ecological sensitivity are estimated to be high and very high, respectively. Table 1, Table 2 and Table 3 provide a summary of the determinants of the Present Ecological State, ecological importance and ecological sensitivity of the western-most watercourse within the proposed Vygenhoek Platinum Mine study area. Given the scale of the assessment utilised by the Department of Water and Sanitation (2014), the watercourse located within the eastern portion of the proposed Vygenhoek Platinum Mine study area was not assessment.

Table 1: Present Ecological State of watercourses associated with proposed Vygenhoek Platinum Mine study area, according to the Department of Water and Sanitation (2014)

Present Ecological State	
Instream habitat continuity modification	Small
Rip/wetland zone continuity modification	Small
Potential instream habitat mod act.	Moderate
Riparian-wetland zone mod	Small
Potential flow mod act.	Moderate
Potential physico-chemical mod activities	Small
Default Ecological Category	**A (Pristine)**

Table 2: Ecological importance of watercourses associated with proposed Vygenhoek Platinum Mine study area, according to the Department of Water and Sanitation (2014)

Ecological Importance	
Invert representivity (per secondary catchment)	Very high
Invert rarity (per secondary catchment)	Very high
Fish representivity (per secondary catchment)	Low

Fish representivity (per secondary catchment)	Low
Fish rarity (per secondary catchment)	Moderate
Ecological importance: riparian-wetland-instream vertebrates (excl. fish)	High
Riparian-wetland natural veg rating based on % natural veg in 500m	Very high
Riparian-wetland natural veg importance based on expert rating	Low
Ecological importance: riparian-wetland-instream vertebrates (excl. fish)	High
Riparian-wetland zone migration link	Very high
Habitat diversity	High
Habitat size (length)	Low
Instream migration link	Very high
Instream habitat integrity class	High
Riparian-wetland zone habitat integrity class	Very high
Mean Ecological Importance Rating Class	**High**

Table 3: Ecological sensitivity of watercourses associated with proposed Vygenhoek Platinum Mine study area, according to the Department of Water and Sanitation (2014)

Ecological Sensitivity	
Fish physico-chemical sensitivity	Very High
Fish no-flow sensitivity	Very High
Invertebrate physico-chemical sensitivity	Very High
Invertebrate velocity sensitivity	Very High
Riparian-wetland-instream vertebrates (excl. fish) intolerance to water level/flow changes	High
Stream size sensitivity to modified flow/water level changes	Very High
Riparian-wetland vegetation intolerance to water level changes	Low
Mean Ecological Sensitivity Rating Class	**Very High**

3.3.4 Associated Wetland Features

The majority of the proposed Vygenhoek Platinum Mine study area further falls within the Mesic Highveld Group 7 wetland vegetation group, while the north-western extent of the site falls within the Central Bushveld 1 wetland vegetation group. According to Macfarlane et al. (2014), wetlands within the Mesic Highveld Group 7 wetland vegetation group is considered to be Endangered, whereas wetlands within the Central Bushveld 1 wetland vegetation group is considered to be Critically Endangered. Review of data within the National Wetland Map (Version 5) suggests that no wetland features are located within the proposed Vygenhoek Platinum Mine study area, although one wetland (a seepage wetland) is located upslope (south) of the study area. However, wetland mapping confidence for the associated sub-quaternary catchments is acknowledged by Van Deventer et al. (2018) as having a low to medium confidence, and as such the further identification of wetland features within the study area is likely.

The probability of further wetland features being associated with the study area was determined through the development of a Topographical Wetness Index (TWI) model based on 5m contour data obtained from the Department of Rural Development and Land Reform, which quantifies topographic control on hydrological processes within the study area. Given that the model is a function of both the slope and the upstream contributing area per unit width orthogonal to the flow direction, the model is primarily designed for hillslope catenas. Based on the results obtained (Figure 7), it can be determined that there is a high probability of several additional wetland areas occurring within the study area other than those identified within the National Wetland Map (Version 5), and as such the actual extent of wetland areas associated with the study area is expected to be far greater than that captured within existing databases. Such wetlands are likely to include valley-bottom wetlands as well as seepage wetlands that are supported through hillslope hydrological processes as well as those that may be expressed due to geological control.

3.3.5 Strategic Water Source Areas

Strategic Water Source Areas (SWSAs) are landscapes where a relatively large volume of runoff produces water for the majority of South Africa. Strategic water source areas can be regarded as natural 'water factories', supporting growth and development needs that are often a far distance away. Deterioration of water quality and quantity in these areas can have a disproportionately large negative effect on the functioning of downstream ecosystems and the overall sustainability of growth and development in the regions they support (Nel et al., 2013)

Based on available spatial data, the proposed Vygenhoek Platinum Mine study area is not within any identified SWSA. Based on available data, it was determined that the Mpumalanga Drakensberg surface water SWSA is located approximately 21km south and approximately 36km east of the proposed Vygenhoek Platinum Mine study area, whereas the Northern Lowveld Escarpment groundwater SWSA and the Northern Highveld groundwater SWSA are located approximately 45km east and approximately 50km south-west of the proposed Vygenhoek Platinum Mine study area, respectively.

3.3.6 National Freshwater Ecosystem Priority Areas

The National Freshwater Ecosystem Priority Areas (NFEPA) project represents a multi-partner project between the Council for Scientific and Industrial Research (CSIR), South African National Biodiversity Institute (SANBI), Water Research Commission (WRC), Department of Water Affairs (DWA; now Department of Water and Sanitation, or DWS), Department of Environmental Affairs (DEA), WWF, South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks). More specifically, the NFEPA project aims to:

- Identify Freshwater Ecosystem Priority Areas (hereafter referred to as 'FEPAs') to meet national biodiversity goals for freshwater ecosystems; and
- Develop a basis for enabling effective implementation of measures to protect FEPAs, including free-flowing rivers.

The first aim uses systematic biodiversity planning to identify priorities for conserving South Africa's freshwater biodiversity, within the context of equitable social and economic development. The second aim comprises a national and sub-national component. The national component aims to align DWS and DEA policy mechanisms and tools for managing and conserving freshwater ecosystems. The sub-national component aims to use three case study areas to demonstrate how NFEPA products should be implemented

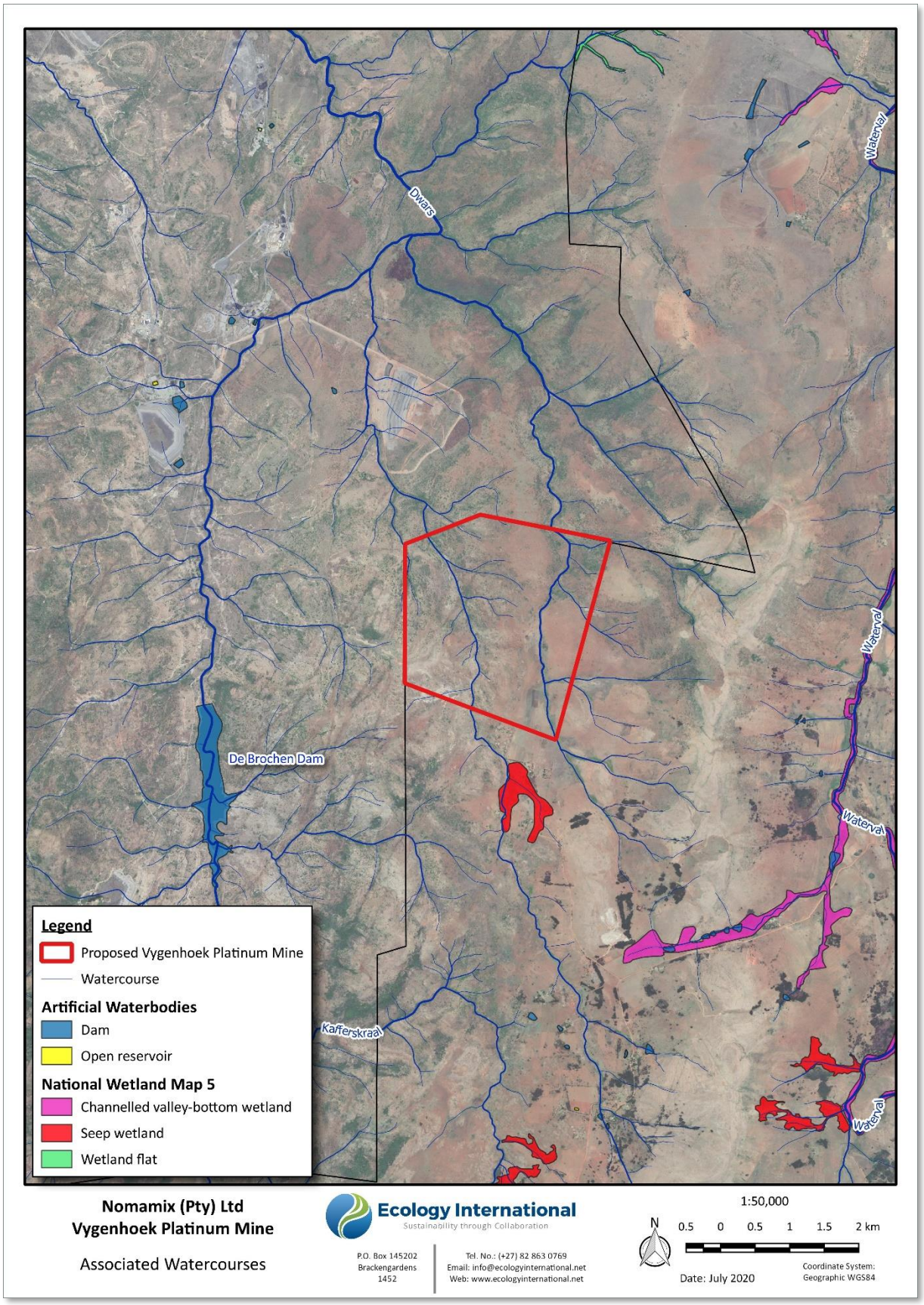

Figure 4: Water resources associated with the proposed Vygenhoek Platinum Mine study area

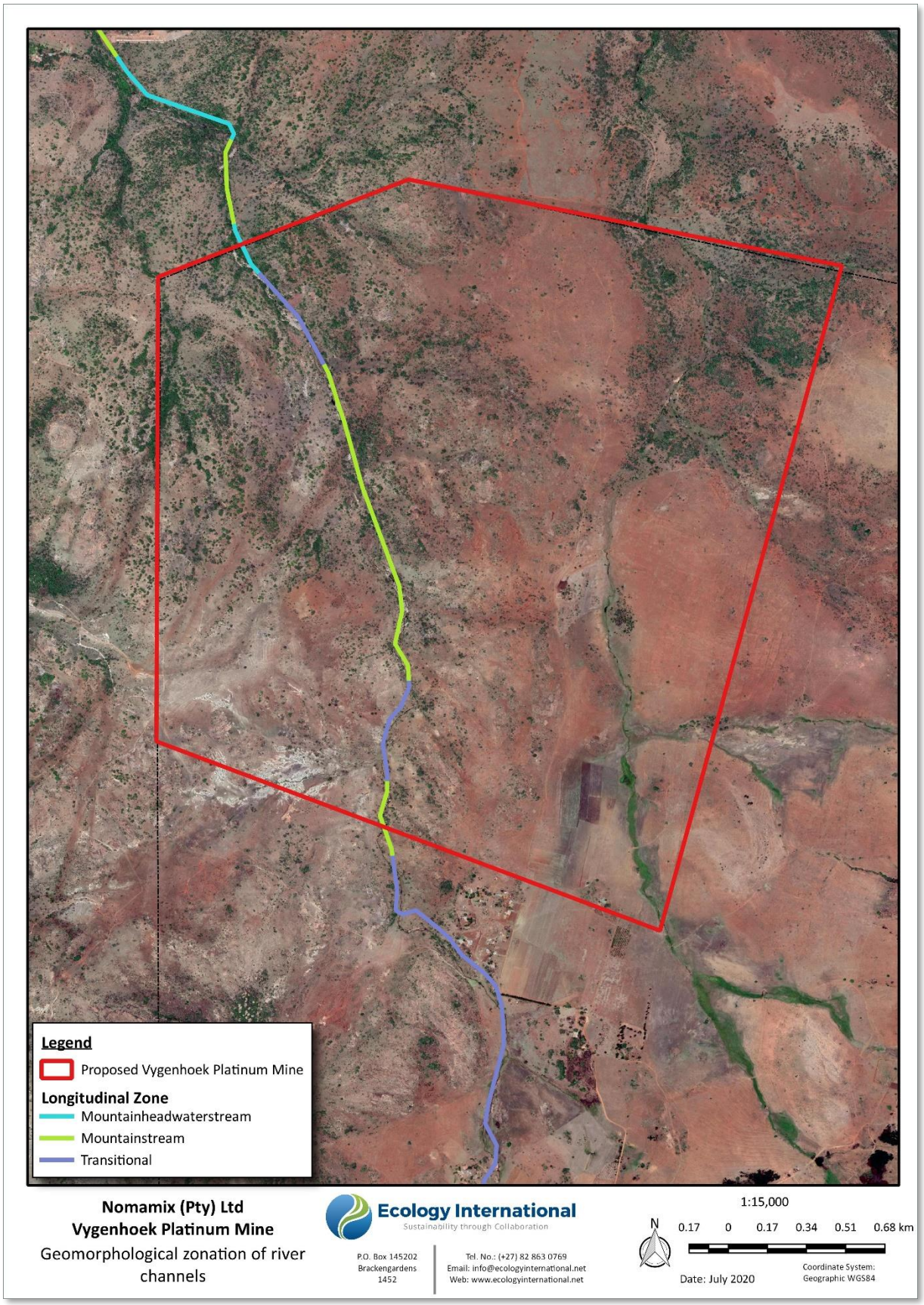

Figure 5: Geomorphic zonation of watercourse associated with the proposed Vygenhoek Platinum Mine study area

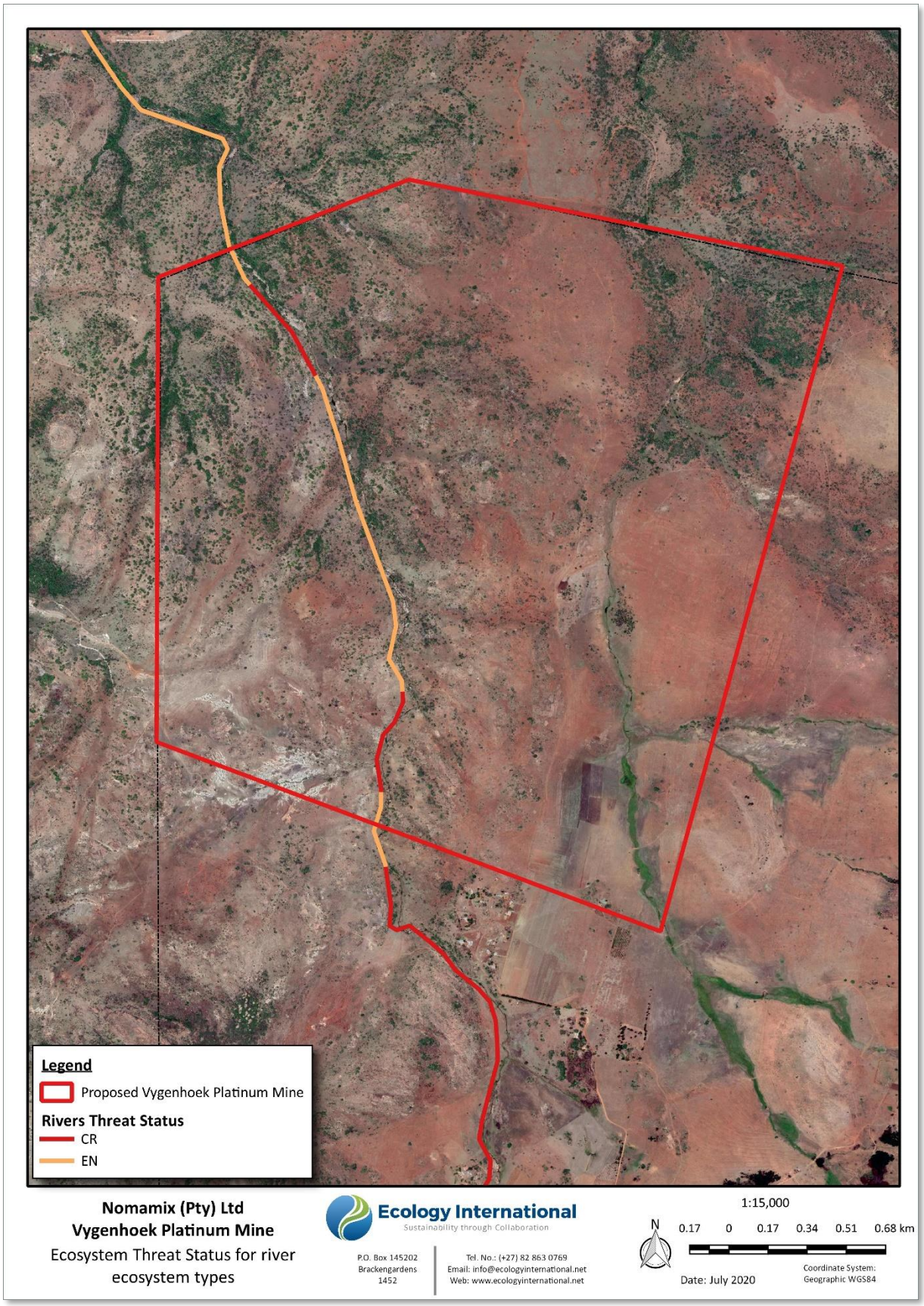

Figure 6: Ecosystem Threat Status for river ecosystem types associated with the proposed Vygenhoek Platinum Mine study area (Van Deventer et al., 2019)

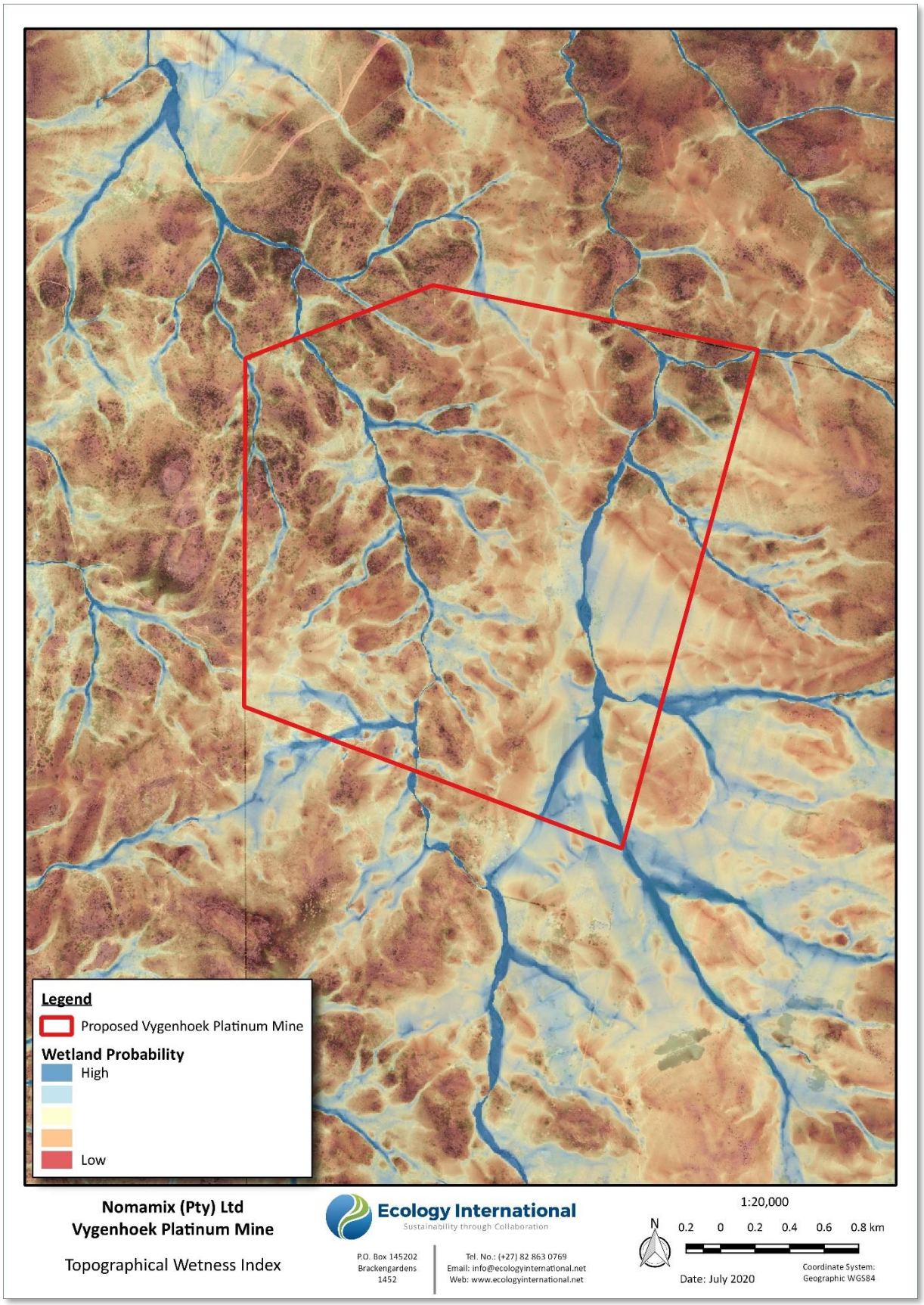

Figure 7: Topographical Wetness Index model developed for the study area based on 5m contour data, indicating a high probability of wetland features to occur within the proposed Vygenhoek Platinum Mine study area based on topographical drivers

to influence land and water resource decision-making processes at a sub-national level (Driver et al., 2011). The project further aims to maximize synergies and alignment with other national level initiatives such as the National Biodiversity Assessment (NBA) and the Cross-Sector Policy Objectives for Inland Water Conservation.

Based on current outputs of the NFEPA project (Nel et al., 2011; Figure 8), the catchments within which the proposed Vygenhoek Platinum Mine study area falls are classified as a FEPA catchment on the basis of the presence of river ecosystem types and the potential presence of *Opsaridium peringueyi* (Southern Barred Minnow; considered Vulnerable at a provincial level). The closest confirmed location of the species to the study area is however the Steelpoort River approximately 20km from the study area, although its presence within the Dwars River cannot be ruled out.

FEPA catchments such as those associated with the present study area achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species, and were identified in rivers that are currently in a good condition (Ecological Category A or B), and their FEPA status indicates that they should remain in a good condition in order to contribute to national biodiversity goals and support sustainable use of water resources (Driver et al., 2011). River ecosystem types comprise distinct combinations of Level 1 ecoregions, flow descriptions, and slope categories, and are used for representing the diversity of rivers across the country. Within the context of the NFEPA project, river ecosystem types were regarded as coarse-filter surrogates of biodiversity, conserving the diversity of many common and widespread species, and their associated habitats.

No FEPA-classified wetlands or wetland clusters were noted to be associated with the proposed Vygenhoek Platinum Mine study area.

3.3.7 Mpumalanga Biodiversity Sector Plan

The Mpumalanga Biodiversity Sector Plan (MBSP) is a comprehensive environmental inventory and spatial plan that is intended to guide conservation and land use decisions in support of sustainable development (Lötter & Ferrar, 2006; Lötter 2014; Mpumalanga Tourism and Parks Agency, 2014). The MBSP maps the distribution of the Province's known biodiversity into several categories for both the terrestrial and freshwater realms. These are ranked according to ecological and biodiversity importance and their contribution to meeting the quantitative targets set for each biodiversity feature.

According to the latest revision of the freshwater component of provincial biodiversity sector plan (Mpumalanga Tourism and Parks Agency, 2019), the watercourse located within the western portion of the study area is classified as a Critical Biodiversity Area (CBA), whereas the remainder of the study area is classified as an Ecological Support Area (ESA) on the basis of being an important sub-catchment (Figure 9).

In an attempt to make the land-use guidelines of the MBSP more useful to the broader planning community (particularly those in the municipal system), the categories obtained by the MBSP were integrated with the existing zonation definitions used in other planning schemes, so far as possible, making it easier for biodiversity priorities to be adequately represented in existing spatial planning systems, including the Spatial

Planning and Land Use Management Act (Act 16 of 2013). Based on the land-use guidelines of the MBSP, opencast mining is expected to compromise the biodiversity objective determined for the are in question, and according to Mpumalanga Tourism and Parks Agency (2014) is not permissible (Figure 10). In contrast, underground mining within the area adjacent to the watercourse, while still considered to potentially compromise the biodiversity objective, are only permissible under certain conditions, although proximity to the associated watercourse needs to be taken into consideration due to identified sensitivities (Mpumalanga Tourism and Parks Agency, 2014) (Figure 11).

3.3.8 Aquatic Fauna

Data pertaining to the presence of aquatic faunal species potentially associated with the proposed Vygenhoek Platinum Mine study area was obtained from Darwall et al. (2009), Department of Water and Sanitation (2014), and various scientific collection databases including the Global Biodiversity Information Facility, Freshwater Biodiversity Information System, South African Institute for Aquatic Biodiversity, Albany Museum, and from the provincial records of Mpumalanga Tourism and Parks Agency. Based on the results obtained, the following is the estimated aquatic faunal diversity that could be associated with the proposed Vygenhoek Platinum Mine study area (Appendix A):

- Approx. 12 species of fish, two of which are of conservation concern either at a national or provincial level, and a further one is considered to be Data Deficient;
- Approx. 106 species of Odonata (Dragonflies and Damselflies), five of which are of conservation concern;
- Approx. two species of crab, neither of which of conservation concern; and
- Approx. 16 species of mollusc, one of which is listed as Data Deficient.

Table 3 provides a list of aquatic species of conservation concern occurring or potentially occurring within the proposed Vygenhoek Platinum Mine study area.

It should be noted that two of the fish species identified as potentially being associated with the proposed Vygenhoek Platinum Mine study area represent undescribed species, namely *Enteromius sp. nov. 'South Africa'* (Sidespot Barb; currently regarded as Near Threatened) and *Enteromius sp. 'Ohrigstad'* (Ohrigstad Barb; currently regarded as Data Deficient).

Similar to *Enteromius neefi* Greenwood, 1962 which was described from the Kabompo River in northern Zambia, populations of the southern *Enteromius sp. nov. 'South Africa'* occur in headwater streams of the Limpopo system south to the Phongolo River and south-west into the Vaal River in South Africa and Swaziland. The taxonomic status of the southern *Enteromius sp. nov. 'South Africa'* still needs to be determined, but it is presently regarding as an undescribed species. Although the geographical distribution of *Enteromius sp. nov. 'South Africa'* is regarded as being fairly widespread within the Limpopo System in South Africa, many subpopulations are isolated and are severely impacted on by threats. In Swaziland, only a single record was found in over 200 collection sites and it was assessed as regionally Critically Endangered in Swaziland (Bills et al., 2004). The species is experiencing continuous threats such as forestry and associated sedimentation and river crossings preventing fish movement as well as stream regulation and mining with associated pollution. Although, it is known from a large number of locations and is still widespread, the

Table 4: Aquatic species of special concern potentially associated with the proposed Vygenhoek Platinum Mine study area

Species	Common Name	Red List Category	Assessment	Endemism
Mollusca				
Burnupia caffra	-	DD	Regional - South Africa	Not endemic
Odonata				
Diplacodes pumila	Dwarf Percher	EN	Regional - South Africa	Endemic
Gomphidia quarrei	Southern Fingertail	NT	Regional - South Africa	Not endemic
Phyllomacromia monoceros	Black Cruiser	NT	Regional - South Africa	Not endemic
Pseudagrion assegaii	Spearhead Sprite	VU	Regional - South Africa	Not endemic
Pseudagrion makabusiense	Green-striped Sprite	NT	Regional - South Africa	Not endemic
Fish				
Enteromius sp. 'Ohrigstad'	Ohrigstad Barb	DD	N/A	#N/A
Enteromius sp. nov south africa	Sidespot Barb	NT	Global	Endemic
Oreochromis mossambicus	Mozambique Tilapia	VU	Global	Not endemic

* EN = Endangered; DD = Data Deficient; LC = Least Concern; NT = Near Threatened; VU = Vulnerable;

impacts of the multiple threats for the species could lead to its decline and it is thus assessed as Near Threatened within the latest IUCN Red List Assessment, although is it acknowledged that this species should be monitored to assess the impacts of these threats (Roux & Hoffman, 2017).

Similarly, it is recognised that many records currently ascribed to *Enteromius motebensis* and *Enteromius anoplus* in the eastern Lowveld may be synonymous with a new species *Enteromius sp. nov. "Ohrigstad"* proposed by Engelbrecht & Van Der Bank (1996), which was assessed previously as taxonomically Data Deficient by Darwall et al. (2009). This confusion between the various species identified is largely due to the overlap of morphological characteristics exists between *Enteromius anoplus* and *Enteromius sp. 'Ohrigstad'* that makes separation between the species difficult from a macroscopic perspective. Nonetheless, given the taxonomic uncertainty surrounding the 'Ohrigstad' lineage, all records from the Eastern Lowveld catchments were recognised as *Enteromius anoplus* for the purpose of the latest IUCN Red List Assessment, accepting that a taxonomic revision of this group is required (Woodford, 2017). Although treated as separate species for the present study, the *Enteromius anoplus* and *Enteromius sp. 'Ohrigstad'* species potentially present within the catchments associated with the present study area are likely to represent a single undescribed lineage of the Chubbyhead Barb complex, although further detailed taxonomic studies are required to inform this likelihood. For the purpose of the present study however, these species are listed separately based on available collection records.

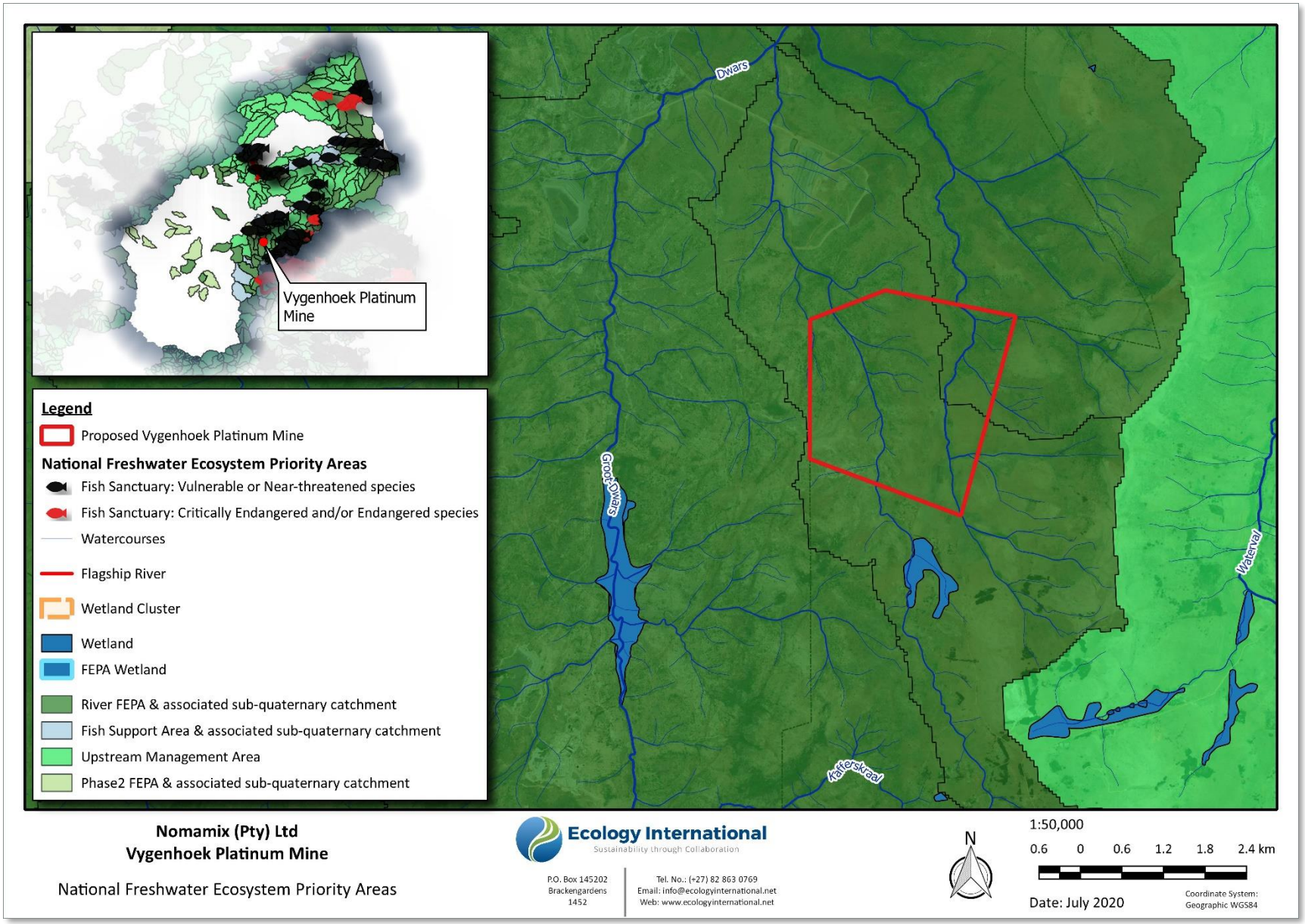

Figure 8: National Freshwater Ecosystem Priority Areas associated with the proposed Vygenhoek Platinum Mine study area (Nel et al., 2011)

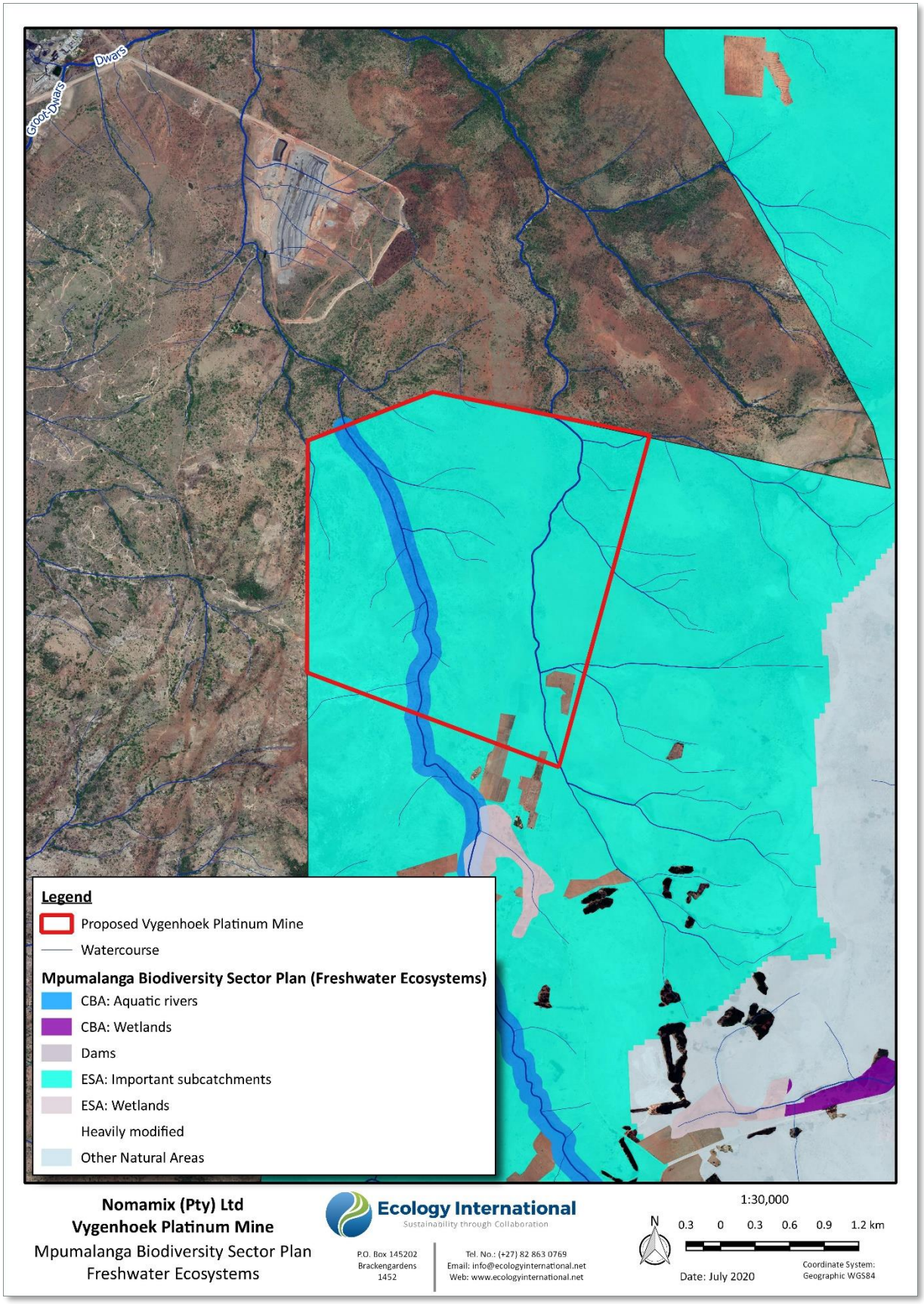

Figure 9: Mpumalanga Biodiversity Sector Plan outputs for freshwater ecosystems associated with the proposed Vygenhoek Platinum Mine study area (Mpumalanga Tourism and Parks Agency, 2014; updated 2019)

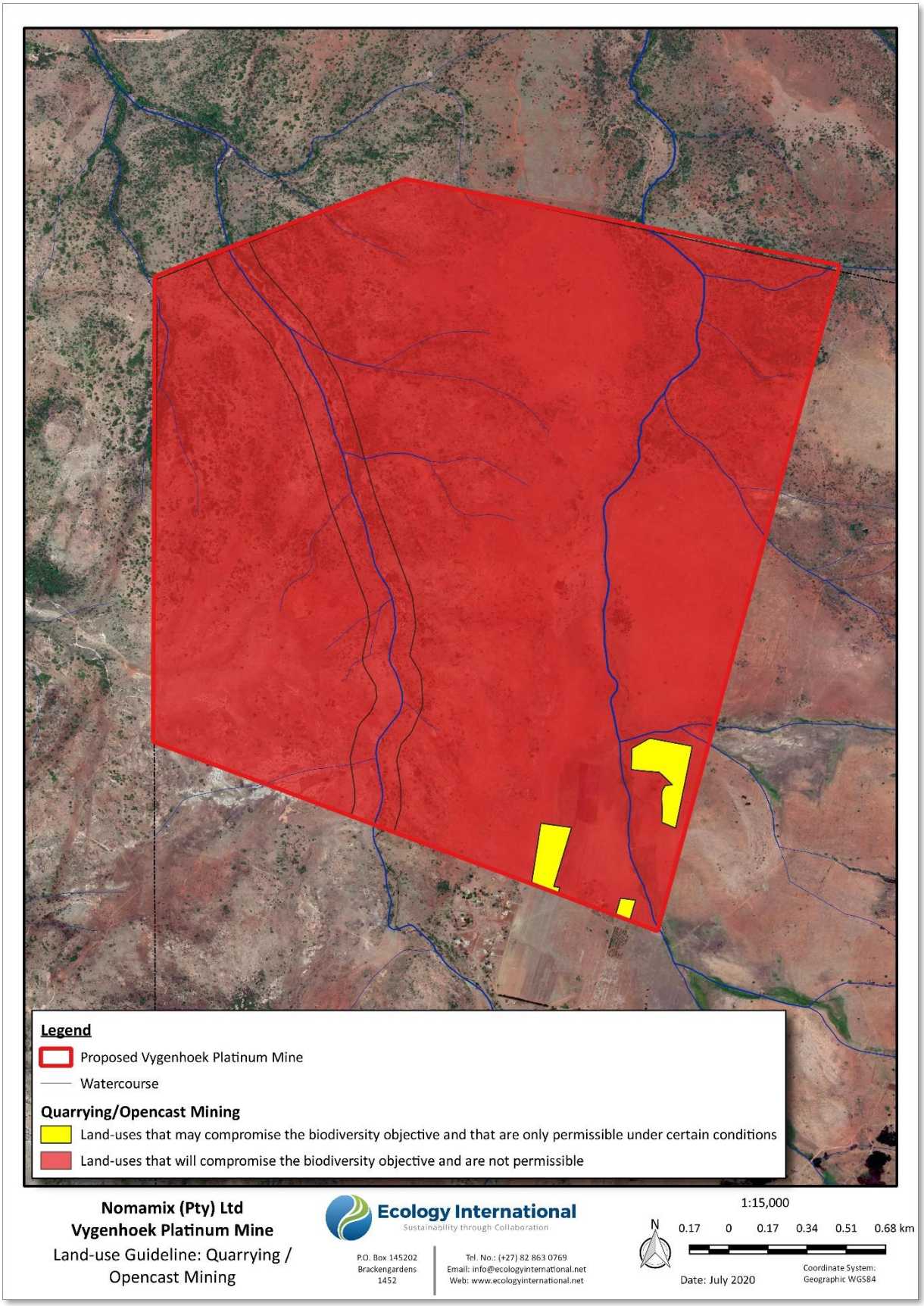

Figure 10: Mpumalanga Biodiversity Sector Plan land-use guidelines for quarrying and opencast mining associated with the proposed Vygenhoek Platinum Mine study area, based on freshwater ecosystem outputs (Mpumalanga Tourism and Parks Agency, 2014)

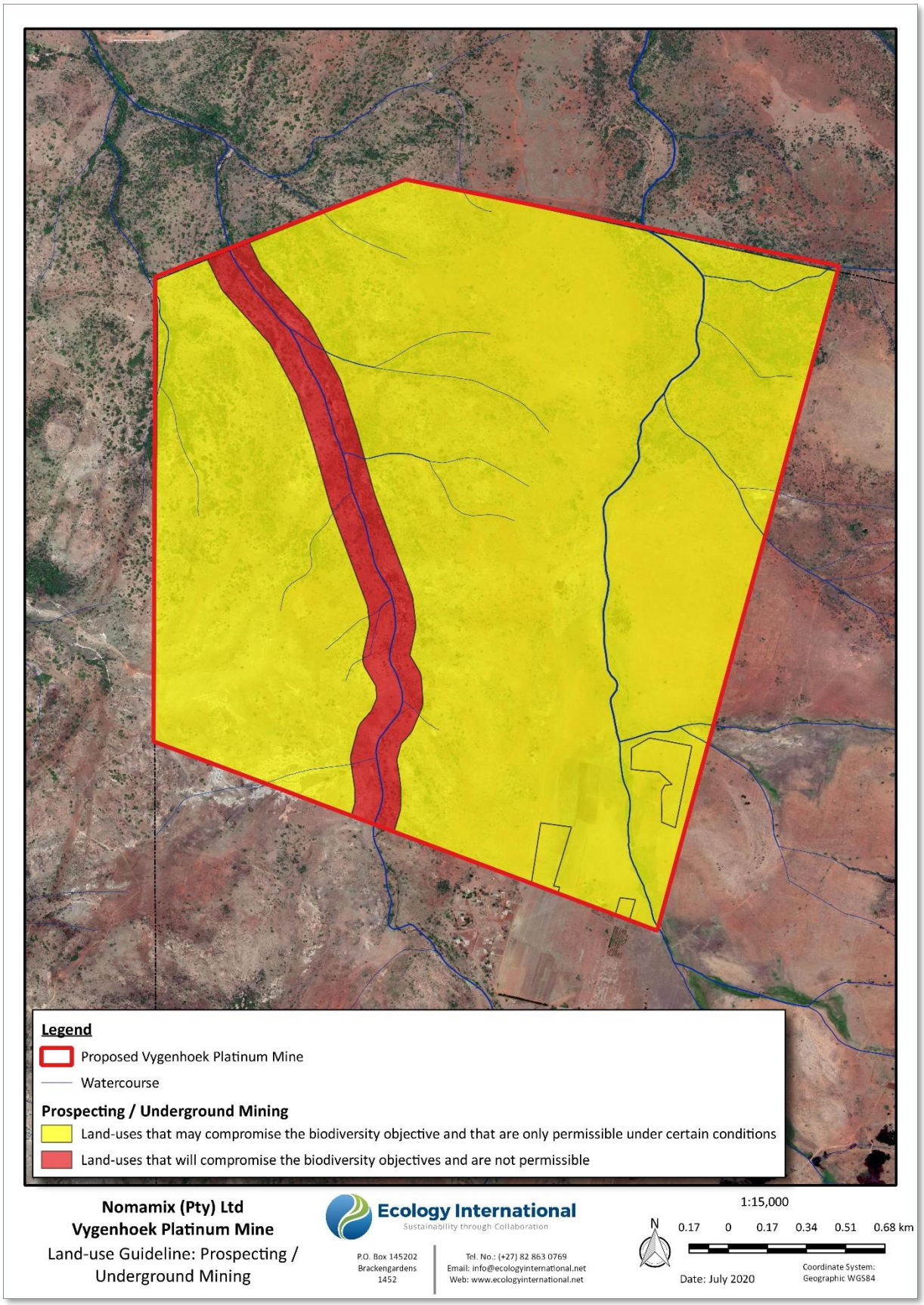

Figure 11: Mpumalanga Biodiversity Sector Plan land-use guidelines for prospecting and underground mining associated with the proposed Vygenhoek Platinum Mine study area, based on freshwater ecosystem outputs (Mpumalanga Tourism and Parks Agency, 2014)

4. PROVISIONAL IDENTIFICATION & DESCRIPTION OF POTENTIAL IMPACTS

Any activities associated with a natural system, whether historic, current, or proposed, will impact on the surrounding environment, usually in a negative way. The purpose of this phase of the study was to identify potential impacts associated with the .

Site establishment, mining and its related activities can have the following types of impacts:

- *Direct impacts* are those impacts directly linked to the project (e.g. clearing of land). These can be temporary or remain as residual impacts;
- *Indirect impacts* are those impacts resulting from the project that may occur beyond or downstream of the boundaries of the project site and/or after the project activity has ceased (e.g. migration of pollutants from road surfaces);
- *Induced impacts* are impacts that are not directly attributable to the project, but are anticipated to occur because of the presence of the project (e.g. impacts of associated expansion of residential settlements with increased pressure on biodiversity);
- *Cumulative impacts* are those impacts from the project combined with the impacts from past, existing and reasonably foreseeable future projects that would affect the same biodiversity or natural resources (e.g. a number of roads in the same catchment or ecosystem type collectively affected water quality or flow).

Many of the above impacts are not only a result of the direct impact on a particular species, but rather due to what is known as the '*Edge Effect'*, which can be explained as follows: Ecosystems consist of a mosaic of many different patches. The size of natural patches affects the number, type and abundance of species they contain. At the periphery of natural patches, influences of neighbouring environments become apparent; this then is the '*Edge Effect'*. Patch edges may be subjected to degradation due factors such as increased levels of heat, dust, desiccation, disturbance, invasion of exotic species and other negative agents. Edges seldom contain species that are rare, habitat specialists or species that require larger tracts of undisturbed core habitat to survive in the long term. Fragmentation due to development reduces core habitat and greatly extends edge habitat, which causes a shift in the species composition, which in turn puts great pressure on the dynamics and functionality of ecosystems (Perlman & Milder, 2005).

4.1 Nature of Impacts

4.1.1 Direct loss of wetland features

The potential presence of wetland features with the proposed mining area is likely to result in the direct loss of potential wetland features present. The proposed activity is further expected to result in impacts to drivers of wetland features adjacent to and/or downstream of the proposed mining areas, resulting in the degradation and loss of ecosystem services provided by wetlands.

4.1.2 Erosion and sedimentation of wetlands and watercourses adjacent to and downstream of proposed mining activities

While the placement of various infrastructure associated with the propose mine may not result in the direct loss of wetland habitat, activities associated with the establishment of the mine is likely to impact the adjacent and downstream watercourses through the clearing of natural vegetation, altered overland flow and sediment transport. Further, the use of heavy machinery within the construction footprint will lead to soil compaction, which increases the runoff of water over the topsoil and the reduction in stormwater infiltration into the soil profile, therefore increasing the likelihood of erosion gully formation and the deposition of sediment within associated watercourses. In addition, the presence of bare soil associated with stockpiles during mining activities will result in a change in the stormwater runoff volume and velocity entering adjacent wetland systems.

4.1.3 Water quality deterioration

Mismanagement of mine-generated waste and pollutants (including hydrocarbons, construction waste, hazardous chemicals, etc.) is likely to result in these substances or their derivatives entering and polluting the sensitive aquatic environments either directly through surface runoff during rainfall events, or subsurface water movement. An increase in pollutants will lead to changes in the water quality of the wetlands and watercourses, affecting their ability to act as ecological corridors within the development landscape. The linked nature of the wetland systems to downstream water resources will result in pollutants being carried downstream from the mine construction site having consequences on further downstream users.

Various stockpiles will be likely be located within the area, including overburden, topsoil, throw out and emergency stockpiles, and will be characterised by bare soil and steep side slopes that generate significant surface run-off. Run-off from these stockpiles is likely to be sediment rich, while carbonaceous stockpiles (if any) might also generate acid rock drainage as pyrites in the overburden are exposed to oxygen. Where run-off from these stockpiles enters adjacent wetlands, water quality deterioration is likely to result, including increases in turbidity, sulphates, and metal concentrations (e.g. aluminium and Iron), and a drop in pH.

4.1.4 Loss of Biodiversity

Mining activities, including blasting, is expected to result in the loss of biodiversity features within the immediate area, as result in a depauperate aquatic biodiversity assemblage downstream of the proposed mining activities. This impact is of particular relevance given that currently-undescribed fish species of conservation concern are known to be present within the watercourses downstream of the study area, and may utilise the watercourses associated with the proposed mine for spawning or breeding purposes. The blasting associated with mining therefore has the potential to disrupt spawning or breeding behaviour through generation of vibrations and movement of aquatic habitat. Noise generated through mining activities is further expected to result in a localised decrease in amphibian species as a result of decreased mate attraction during breeding periods.

4.1.5 Invasive alien plant species encroachment

Alien invasive trees and shrubs are expected to increase within the area as the tend to invade areas that have been disturbed (e.g. on stockpiles and excavated or eroded areas). Such disturbed areas are likely to act as seed areas that will ultimately facilitate the invasion of associated watercourses and riparian areas. Alien species generally out-compete indigenous species for water, light, space and nutrients as they are adaptable to changing conditions and are able to easily invade a wide range of ecological niches, posing an ecological threat as they alter habitat structure, lower biodiversity (both number and "quality" of species), change nutrient cycling and productivity, and modify food webs.

4.1.6 Impact on Provincial Freshwater Conservation Targets

The proposed activity is expected to impact on national protected areas targets as well as provincial freshwater conservation targets, both of which are expected to be cumulative in the impact is to be considered with other regional impacts that have or are expected to have on such areas.

5. CONCLUSION AND RECOMMENDATIONS FOR ENVIRONMENTAL IMPACT ASSESSMENT

5.1.1 Possible Red Flags / Fatal Flaws

Maintaining biodiversity patterns and ecological processes, and the ecosystem services derived from these, requires integrated management over large areas of land. In this regard, Mpumalanga Tourism and Parks Agency undertook a planning exercise to incorporate biodiversity priorities into land-use planning and decision-making by multiple land-use sectors, ultimately resulting in a set of land-use guidelines. The overall purpose of these land-use guidelines is to promote the effective management of biodiversity as required in Section 41(a) of the Biodiversity Act (Act 10 of 2004, as amended) and in terms of the National Environmental Management Act (Act 107 of 1998, as amended). The guidelines provide advice on which land-uses and activities are most compatible with maintaining the ecological integrity of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs), and other parts of the landscape, based on the desired management objectives for the land and the anticipated impact of each land-use activity on biodiversity patterns and ecological processes. These guidelines are intended primarily to guide planning and decision-making in terrestrial and freshwater CBAs and ESAs on land outside of protected areas (Mpumalanga Tourism and Parks Agency, 2014).

In review of the biodiversity categories developed by the Mpumalanga Tourism and Parks Agency from the perspective of freshwater ecosystems, the designation of the watercourse associated with the western portion of the area under study as being a CBA with the remainder of the study area being classified as an ESA in the form of an important sub-catchment and Fish Support Area poses several challenges to the activity proposed (i.e. opencast platinum mining). Based on the land-use guidelines of the MBSP, opencast mining is expected to compromise the biodiversity objective determined for the area in question, and accordingly is not permissible by the Mpumalanga Tourism and Parks Agency (2014).

Of further relevance to be present study would be the potential and/or confirmed presence of undescribed fish species within the watercourses associated with and downstream of the study area. These species, once considered extensions of as known species, have recently been acknowledged to be novel species that are yet to be described taxonomically, and their distribution and relationship with other similar species determined. As underestimation of species diversity has been identified as a major impediment to the implementation of effective conservation strategies to prevent biodiversity loss (see Bickford et al., 2007), failure to consider such species within the context of the proposed activity is likely to pose a significant flaw to the environmental application process.

5.1.2 Specialist Terms of Reference

Based on the results obtained during the present study, it was determined that both aquatic and wetland specialist studies will be required to inform the Environmental Impact Assessment. In this regard, all aquatic and wetland studies are to ensure compliance with the procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (Act 107 of 1998) and Water Use Licence Application process. Given the high sensitivities of the freshwater ecosystem associated with the proposed mine, it was further determined that such specialist studies are to be conducted at a detailed level, and that an aquatic and/or wetland compliance statement are not deemed to be applicable on the basis of the sensitivities identified during the present exercise.

A detailed Terms of Reference for the aquatic and wetland assessments is provided below, and should be ready together with the minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (Act 107 of 1998), as well as the Natural Scientific Professions Act (Act 27 of 2003).

5.1.3 Aquatic Specialist Assessment

In addition to the general requirements for specialist studies, the following are deemed applicable to aquatic specialist assessments:

- Ideally, two seasonal aquatic studies are to be conducted for the purpose of establishing a baseline for the associated aquatic ecosystem and to inform a monitoring approach to be undertaken should the proposed mine receive authorisation. Where the aquatic assessment is to be conducted during a single season only, a single comprehensive aquatic ecosystem assessment is to be conducted following sufficient summer rainfall and inundation of the associated watercourses for a period of at least six (6) weeks prior to the study commencing. As such, it is expected that unless significant early summer rainfall occurs within the upper catchment, studies of the associated aquatic ecosystem are expected to take place within the middle part of the summer period (i.e. December to February);
- Aquatic macroinvertebrates sampled within the study area, specifically Mollusca and Odonata, are to be identified to the lowest possible taxonomic level (i.e. lower than Family level) in order to determine the possible presence of species of conservation concern;
- An assessment of the adult Odonata associated with the study area is to be undertaken;
- A detailed ichthyofaunal assessment is to be undertaken within the watercourses adjacent to and downstream of the proposed mining area. During the assessment, the relative density and diversity

of fish species is to be investigated for each site, with specific attention given to the presence of species of conservation concern and as-yet undescribed species;

- All aquatic data collection is to be done in a manner that is non-destructive, unless the relevant permits are obtained from the Mpumalanga Tourism and Parks Agency. Any samples collected on-site are to be lodged with the South African Institute for Aquatic Biodiversity (SAIAB);
- Potential spawning habitat for identified species of conservation concern, Protected and/or endemic species is to be identified, and the potential impact of blasting activities thereon determined;
- Determination of the Present Ecological State of the associated watercourses is to be determined by the EcoStatus approach (i.e. by means of the Macro-Invertebrate Response Assessment Index, Fish Response Assessment Index, etc.);
- A detailed monitoring programme is to be developed as part of the assessment, that will take effect immediately upon authorisation so as to allow for collection of suitable pre-mining data that will inform the monitoring of potential impacts;
- The aquatic specialist must provide input into a biodiversity management plan to be developed for the mine, with specific consideration given to the identified sensitivities;
- The identified aquatic specialist who is to conduct the aquatic assessment is to have expertise in aquatic macroinvertebrate identification below family level, have expertise in fish taxonomy and identification, and have expertise in the application of the EcoStatus suite of indices.
- Ideally, the identified aquatic specialist is to have >10 years' experience in conducting aquatic assessments. Where this is not possible, the specialist is to have at least 5 years' experience in conducting specialist aquatic assessments, with proven competence in freshwater fish assessments.

5.1.4 Wetland Specialist Assessment

In addition to the general requirements for specialist studies, the following are deemed applicable to wetland specialist assessments:

- Wetland within the study area as well as within 1km of the study area are to be delineated using the guidelines as published by the DWAF (2005) entitled "A Practical Field Procedure for Identification and Delineation of Wetlands and Riparian Areas". However, a pragmatic approach should be taken if any problematic soil types are encountered, and the delineated of wetlands in such soil types supported;
- The wetland delineation component of the specialist report should include the following information as a minimum:
    - A description of how and when the delineation was done;
    - A description of the catchment, landscape, landscape position, topography (slopes – concave, convex, flat etc., and slope changes), vegetation, soils and hydrological conditions including a summary of the available information used to determine the extent of wetland habitat;
    - Review of historical imagery and anecdotal evidence;
    - Where appropriate, the incorporation of field datasheets as appendices which should include a description of site conditions of representative sample points that adequately describe the delineation. In some cases, particularly for difficult sites, the sample points should be described from both inside and outside the delineated wetland boundary;

  - Site maps identifying the boundary of the wetland within the study area, plus an indication if the wetland extends outside the site boundary, albeit only at a desktop level if access is restricted or difficult in those areas, and the location of all data collection points recorded during the study. This should also include Information on the type and date of imagery used to support the delineation;
  - All sample points used by the delineator to determine the boundary of the wetland must be recorded using a Global Positioning System (GPS). The GPS used during the study and the accuracy of the GPS should be stipulated in the reporting to highlight potential inaccuracies in the boundaries presented on the map;
- All delineated wetlands are to be classified according to Ollis et al. (2013);
- All delineated wetlands to be assessed in terms of health and functionality (hydrological, ecological and ecosystem services) using recognised tools (e.g. Wet-Health, Wet-EcoServices, Wet-IHI, etc.), taking cognisance of recent findings regarding the limitations of such tools on certain hydrogeomorphic types. Where wetlands are transformed, the assessment needs to include potential levels of functionality that could be expected with iterative levels of rehabilitation;
- Consideration should at all times be given to the drivers and responses of wetland formation/support for delineated wetlands when considering potential impacts associated with the proposed activity. In this regard, the wetland specialist is to take cognisance of the findings obtained from the hydropedological assessment of the site in determining the potential impact on landscape-level wetland drivers;
- The wetland specialist must provide input into a biodiversity management plan to be developed for the mine, with specific consideration given to the identified sensitivities;
- Ideally, the identified wetland specialist conducting the assessment is to have >10 years' experience in conducting aquatic assessments. Where this is not possible, the specialist is to have at least 5 years' experience in conducting specialist wetland assessments. Additional expertise in soil science is mandatory given the potential for problematic soils to be present within the study area.

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APPENDIX A: FRESHWATER FAUNAL SPECIES POTENTIALLY ASSOCIATED WITH THE STUDY AREA

Molluscs

Species	Common Name	Red List Category	Assessment	Endemism
Biomphalaria pfeifferi		LC	Regional - South Africa	Not endemic
Bulinus africanus		LC	Regional - South Africa	Not endemic
Bulinus forskalii		LC	Regional - South Africa	Not endemic
Bulinus reticulatus		LC	Regional - South Africa	Not endemic
Bulinus tropicus		LC	Regional - South Africa	Not endemic
Burnupia caffra		DD	Regional - South Africa	Not endemic
Ceratophallus natalensis		LC	Regional - South Africa	Not endemic
Chambardia wahlbergi		LC	Regional - South Africa	Not endemic
Corbicula fluminalis		LC	Regional - South Africa	Not endemic
Lymnaea columella		Introduced	Regional - South Africa	Not endemic
Lymnaea natalensis		LC	Regional - South Africa	Not endemic
Lymnaea trunculata		LC	Regional - South Africa	Not endemic
Melanoides tuberculata		LC	Regional - South Africa	Not endemic
Melanoides tuberculata		LC	Regional - South Africa	Not endemic
Melanoides victoriae		LC	Regional - South Africa	Endemic
Unio caffra		LC	Regional - South Africa	Endemic

Crabs

Species	Common Name	Red List Category	Assessment	Endemism
Potamonautes unispinus	Single Spined River Crab	LC	Regional - South Africa	Endemic
Potamonautes sidneyi	Natal/Sidney's River Crab	LC	Regional - South Africa	Endemic

Odonata

Species	Common Name	Red List Category	Assessment	Endemism
Acisoma panorpoides	Asian Pintail	LC	Global	Not endemic
Aethriamanta rezia	Pygmy Basker	LC	Global	Not endemic
Africallagma glaucum	Swamp Bluet	LC	Global	Not endemic
Africallagma sapphirinum	Sapphire Bluet	LC	Global	Endemic

Agriocnemis exilis	Little Wisp	LC	Global	Not endemic
Agriocnemis pinheyi	Pinhey's Wisp	LC	Global	Not endemic
Allocnemis leucosticta	Goldtail	LC	Global	Endemic
Anaciaeschna triangulifera	Evening Hawker	LC	Global	Not endemic
Anax ephippiger	Vagrant Emperor	LC	Global	Not endemic
Anax imperator	Emperor Dragonfly	LC	Global	Not endemic
Anax speratus	Orange Emperor	LC	Global	Not endemic
Anax tristis	Black Emperor	LC	Global	Not endemic
Azuragrion nigridorsum	Sailing Azuret	LC	Global	Not endemic
Brachythemis lacustris	Red Groundling	LC	Global	Not endemic
Brachythemis leucosticta	Banded Groundling	LC	Global	Not endemic
Bradinopyga cornuta	Flecked Wall-skimmer	LC	Global	Not endemic
Ceratogomphus pictus	Common Thorntail	LC	Global	Not endemic
Ceriagrion glabrum	Common Waxtail	LC	Global	Not endemic
Chlorocypha consueta	Southern Red Jewel	RE	Regional - South Africa	Not endemic
Chlorolestes fasciatus	Mountain Malachite	LC	Global	Endemic
Crenigomphus hartmanni	Clubbed Talontail	LC	Global	Not endemic
Crocothemis divisa	Slender Scarlet	LC	Global	Not endemic
Crocothemis erythraea	Common Scarlet-darter	LC	Global	Not endemic
Crocothemis sanguinolenta	Little Scarlet	LC	Global	Not endemic
Diplacodes lefebvrii	Black Percher	LC	Global	Not endemic
Diplacodes luminans	Barbet Percher	LC	Global	Not endemic
Diplacodes pumila	Dwarf Percher	EN	Regional - South Africa	Endemic
Elattoneura glauca	Grey Threadtail	LC	Global	Not endemic
Gomphidia quarrei	Southern Fingertail	NT	Regional - South Africa	Not endemic
Hemistigma albipunctum	African Pied-spot	LC	Global	Not endemic
Ictinogomphus ferox	Common Tiger	LC	Global	Not endemic
Ischnura senegalensis	Tropical Bluetail	LC	Global	Not endemic

Lestes dissimulans	Cryptic Spreadwing	LC	Global	Not endemic
Lestes pallidus	Pallid Spreadwing	LC	Global	Not endemic
Lestes plagiatus	Highland Spreadwing	LC	Global	Not endemic
Lestes tridens	Spotted Spreadwing	LC	Global	Not endemic
Lestes virgatus	Smoky Spreadwing	LC	Global	Not endemic
Lestinogomphus angustus	Spined Fairytail	LC	Global	Not endemic
Mesocnemis singularis	Savanna Brook-damsel	LC	Global	Not endemic
Nesciothemis farinosa	Eastern Blacktail	LC	Global	Not endemic
Notiothemis jonesi	Eastern Elf	LC	Global	Not endemic
Notogomphus praetorius	Yellowjack Longlegs	LC	Global	Not endemic
Olpogastra lugubris	Bottletail	LC	Global	Not endemic
Onychogomphus supinus	Gorge Claspertail	LC	Global	Not endemic
Orthetrum abbotti	Abbott's Skimmer	LC	Global	Not endemic
Orthetrum caffrum	White-lined Skimmer	LC	Global	Not endemic
Orthetrum chrysostigma	Epaulet Skimmer	LC	Global	Not endemic
Orthetrum guineense	Guinea Skimmer	LC	Global	Not endemic
Orthetrum hintzi	Dark-shouldered Skimmer	LC	Global	Not endemic
Orthetrum icteromelas	Spectacled Skimmer	LC	Global	Not endemic
Orthetrum julia	Julia Skimmer	LC	Global	Not endemic
Orthetrum machadoi	Highland Skimmer	LC	Global	Not endemic
Orthetrum stemmale	Bold Skimmer	LC	Global	Not endemic
Orthetrum trinacria	Long Skimmer	LC	Global	Not endemic
Palpopleura deceptor	Deceptive Widow	LC	Global	Not endemic
Palpopleura jucunda	Yellow-veined Widow	LC	Global	Not endemic
Palpopleura lucia	Lucia Widow	LC	Global	Not endemic
Palpopleura portia	Portia Widow	LC	Global	Not endemic
Pantala flavescens	Globe Wanderer	LC	Global	Not endemic

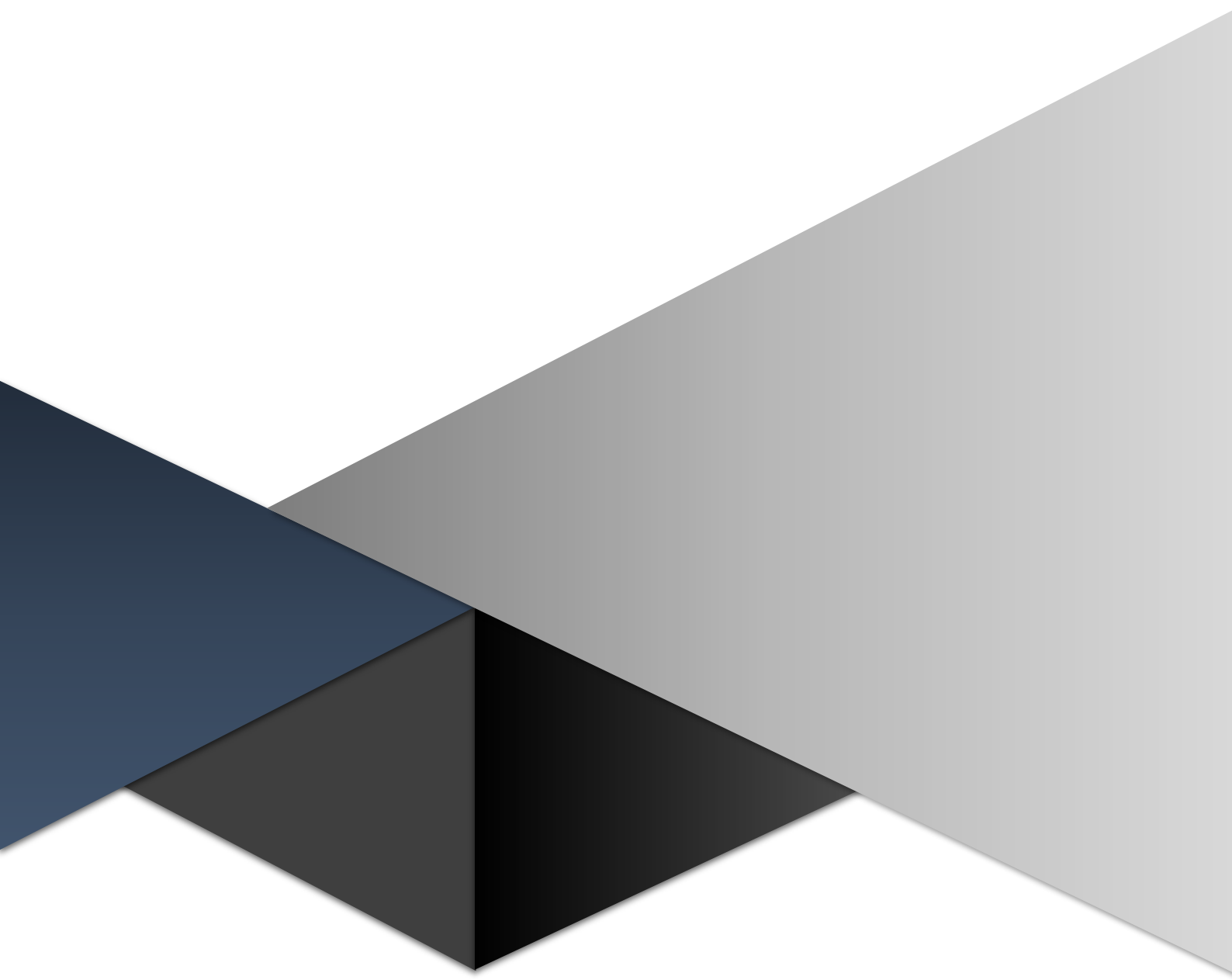
Paragomphus cognatus	Boulder Hooktail	LC	Global	Not endemic
Paragomphus elpidius	Corkscrew Hooktail	LC	Global	Not endemic
Paragomphus genei	Common Hooktail	LC	Global	Not endemic
Paragomphus sabicus	Flapper Hooktail	LC	Global	Not endemic
Phaon iridipennis	Glistening Demoiselle	LC	Global	Not endemic
Phyllogomphus selysi	Bold Leaftail	LC	Global	Not endemic
Phyllomacromia contumax	Two-banded Cruiser	LC	Global	Not endemic
Phyllomacromia monoceros	Black Cruiser	NT	Regional - South Africa	Not endemic
Phyllomacromia picta	Darting Cruiser	LC	Global	Not endemic
Pinheyschna subpupillata	Stream Hawker	LC	Global	Not endemic
Platycypha caligata	Dancing Jewel	LC	Global	Not endemic
Pseudagrion assegaii	Spearhead Sprite	VU	Regional - South Africa	Not endemic
Pseudagrion caffrum	Springwater Sprite	LC	Global	Endemic
Pseudagrion citricola	Yellow-faced Sprite	LC	Global	Endemic
Pseudagrion coelestis	Catshead Sprite	LC	Global	Not endemic
Pseudagrion commoniae	Black Sprite	LC	Global	Not endemic
Pseudagrion gamblesi	Great Sprite	LC	Global	Not endemic
Pseudagrion hageni	Painted Sprite	LC	Global	Not endemic
Pseudagrion hamoni	Swarthy Sprite	LC	Global	Not endemic
Pseudagrion kersteni	Powder-faced Sprite	LC	Global	Not endemic
Pseudagrion makabusiense	Green-striped Sprite	NT	Regional - South Africa	Not endemic
Pseudagrion massaicum	Masai Sprite	LC	Global	Not endemic
Pseudagrion salisburyense	Slate Sprite	LC	Global	Not endemic
Pseudagrion spernatum	Upland Sprite	LC	Global	Not endemic
Pseudagrion sublacteum	Cherry-eye Sprite	LC	Global	Not endemic
Pseudagrion sudanicum	Blue-sided Sprite	LC	Global	Not endemic
Rhyothemis semihyalina	Phantom Flutterer	LC	Global	Not endemic
Sympetrum fonscolombii	Red-veined Darter	LC	Global	Not endemic

Tholymis tillarga	Evening Skimmer	LC	Global	Not endemic
Tramea basilaris	Keyhole Glider	LC	Global	Not endemic
Tramea limbata	Voyaging Glider	LC	Global	Not endemic
Trithemis aconita	Halfshade Dropwing	LC	Global	Not endemic
Trithemis annulata	Violet-marked Darter	LC	Global	Not endemic
Trithemis arteriosa	Red-veined Dropwing	LC	Global	Not endemic
Trithemis donaldsoni	Twig Dropwing	LC	Global	Not endemic
Trithemis dorsalis	Lake Dropwing	LC	Global	Not endemic
Trithemis furva	Navy Dropwing	LC	Global	Not endemic
Trithemis hecate	Silhouette Dropwing	LC	Global	Not endemic
Trithemis kirbyi	Kirby's Dropwing	LC	Global	Not endemic
Trithemis pluvialis	Russet Dropwing	LC	Global	Not endemic
Trithemis stictica	Jaunty Dropwing	LC	Global	Not endemic
Urothemis assignata	Red Basker	LC	Global	Not endemic
Urothemis edwardsii	Blue Basker	LC	Global	Not endemic
Zosteraeschna minuscula	Friendly Hawker	LC	Global	Not endemic
Zygonoides fuelleborni	Southern Riverking	LC	Global	Not endemic
Zygonyx natalensis	Blue Cascader	LC	Global	Not endemic
Zygonyx torridus	Ringed Cascader	LC	Global	Not endemic

Fish

Species	Common Name	Red List Category	Assessment	Endemism	Provincial
Amphilius uranoscopus	Stargazer Mountain Catfish	LC	National	Not endemic	LC
Chiloglanis pretoriae	Shortspine Suckermouth	LC	Global	Not endemic	LC
Clarias gariepinus	Sharptooth Catfish	LC	National	Not endemic	LC
Enteromius anoplus	Chubbyhead Barb	LC	Global	Endemic	LC
Enteromius sp. 'Ohrigstad'	Ohrigstad Barb	DD	N/A	#N/A	DD
Enteromius sp nov south africa	Sidespot Barb	NT	Global	Endemic	DDT

Enteromius toppini	Eastcoast Barb	LC	National	Not endemic	LC
Enteromius trimaculatus	Threespot Barb	LC	Global	Not endemic	LC
Labeo molybdinus	Leaden Labeo	LC	Global	Not endemic	LC
Labeobarbus marequensis	Lowveld Largescale	LC	Global	Not endemic	LC
Oreochromis mossambicus	Mozambique Tilapia	VU	Global	Not endemic	NT
Synodontis zambezensis	Brown Squeaker	LC	Global	Not endemic	LC



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