Ecological Compensation for Mining in the Blyde River Headwaters

A rehabilitation programme for addressing catchment threats to biodiversity and hydrological functioning around protected areas in Pilgrims Rest.

Proposed as part of the required ecological compensation for listed activities requiring environmental authorisation and conditions for the continued exploitation of existing underground mines by Theta Gold Mines.

Mark Botha - April 2022

The Morgenzon Forest Nature Reserve as it was in 1937 and 2021 showing Clewer – Dukes Hill – Morgenzon mining complex. The gravel Robber's pass (now the R533) orientates the viewer.

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Declaration: I am an independent specialist service provider engaged by TGME to quantify, design and cost this ecological compensation. I have no interest in Theta Gold Mines or TGME or its agents or operations, beyond fair remuneration for services rendered and declare that I act independently and without influence from any party. This report attempts to comply with the National Biodiversity Offset Guideline recently issued by DFFE for comment, and provides specific proposals and conditions for consideration by any competent environmental or other licencing authority.

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1. Summary

TGME proposes restarting several underground gold mines around Pilgrims Rest in the upper Blyde River catchment. The receiving environment is sensitive, rich in threatened biodiversity and a crucial part of a strategic water source area. However, large areas are also severely degraded, primarily through the expansion of invasive alien plants, uncontrolled/deliberate wildfires, and the legacy over 140 years of unrehabilitated mining. Recently, illegal mining is proving a direct threat to meeting ecological and water resource quality objectives in the catchment.

Protected Areas overly or have recently been declared over some of existing underground mines. Pre-existing, lawful mining may only continue in protected areas subject to any conditions imposed by the Environment Minister, in conjunction with the Minister for Mineral Resources. Apart from ethical obligations to address legacy impacts, continued operations in a protected area also require ecological compensation, commensurate with the risk of potential impact, importance of the area and its role in the conservation estate, environmental heritage and ecosystem services provided to the region. Current policy direction and Ministerial targets indicate an imperative to "secure" strategic water source areas and attendant critical biodiversity areas, and a guideline on ecological compensation and biodiversity offsetting is currently being developed by the Department for Forestry, Fisheries, and the Environment (DFFE).

The compensation and the conditions for continued mining proposed here are not intended to replace or circumvent a full EIA process, requisite mitigation and offset requirements for any further identified, eligible, and/or residual impacts. However, as the current mine plans are almost entirely restricted to using existing footprints, access, and roads, and an upgraded processing and metallurgical process, no pre-identified impacts requiring a biodiversity offset are deemed likely. The terrestrial and geohydrological assessments note only medium to low significance impacts on biodiversity and hydrology (STS 2022, MvB consulting 2022). The Freshwater Assessment highlights a medium significance risk of potential impacts on sedimentation and PES, and that this needs careful design and engineering mitigation as well as supportive catchment-level measures to pursue attainment of RQOs (SAS 2022). <u>If further assessment, commenting, and authorisation processes identify further impacts requiring additional mitigation including offsets, then this compensation programme would need to be augmented accordingly</u>.

This report sets out the rationale (Section 5) for determining the appropriate type and quantum of ecological compensation and the outcomes of this determination that should be considered. It focuses on identifying and mitigating the current threats to biodiversity, water resources, and ecosystem functioning in the Upper Blyde catchment. It is hampered by the fact that there is no "footprint" impact in the FNR to use to calibrate an appropriate area-based metric, and also by the fact that almost all remaining land in this part of the catchment is either protected (but unmanaged) or under timber. This implies that appropriate compensation focus on rehabilitating the catchment through improving management and not increasing protection *per se*.

By providing a defensible quantification of the requisite outcomes for compensation investments, this work establishes a set of reasonable, measurable, pragmatic milestones and targets to be achieved to address most of the biophysical threats. The compensation is aimed at current threats to biodiversity, hydrological performance and physico-chemical water quality emanating from the nearby protected areas, state land and land adjacent to the mine operations. These compensation activities do not fall into the 'duty of care' or prior licence conditions that should have been adhered to by TGME in any event and can thus be considered "additional". This additionality is a key principle of ecological compensation.

The risks to address, objectives to aim for, and the metrics to gauge outcomes, that should be used to determine an equitable level of compensation are:

1- To Replenish TGME's licenced annual abstraction volume (469025m^3 or whatever future amount may be licenced by DWS) as far as feasible through removing equivalent evapo-transpiration by clearing sufficient area of invasive trees.
2- Prevent incipient infestations of invasive trees from expanding and nullifying the gains made above, by controlling Silver Wattle or other evergreen invasive trees, thus improving riparian ecosystem integrity down the Blyde River to the boundary of the Bourke's Luck area, a river run distance of around 44km.
3- Ameliorate the loss of dry season flow and pool and riffle habitat in the Blyde River to protect threatened river biota, especially endangered fish species, by slowing and reversing soil erosion and subsequent sedimentation, through indigenous revegetation of 370ha of cleared areas and the reduction of illegal riparian and instream damage.
4- Manage the key remaining threat to indigenous forests and grassland biodiversity in the area by improving effective fire management in Morgenzon Forest Nature Reserve and a section managed as part of Blyde River Canyon Nature Reserve through implementing 11km of fire belts.

The primary compensation objective (Section 6) is the effective clearing and subsequent control of at least 273 condensed hectares (from a total focus area of 370ha[1]) of invasive alien trees, primarily Silver and Black Wattle, Blackwood, and Eucalyptus. A further requirement is to maintain the areas for 5 years after initial control, to a alien tree density of <0,5% with no adult, seeding individuals present. Control is a long-term process, requiring several years of effective follow-up operations and long-term combating of reproduction and spread of the invasive plants. Fortunately, there is substantial scope for using invasive biomass as a fuel source for the district, as composted growth medium in the required revegetation and mine dump rehabilitation, and other potential secondary uses. This has long term economic and enterprise development potential, aligned with TGME's social and labour plans and the municipal IDP.

[1] Earlier drafts and discussions with officials included additional areas for clearing on land owned by York timbers (around 100ha). This not appropriate for TGME to do due to liability issues. Also, York has statutory and certification obligations to control these invasive alien trees,

Allied to this would be the requirement to clear all adult, seeding invasive trees within 100m of the centre line of the Blyde River, to a density of not more than 1 individual per 1km along the length of the river to Bourke's Luck. Lastly, to ensure the gains are maintained in the long term, additional complementary measures are proposed, including investment in a destructive bio-control agent(s) for Silver Wattle.

The second compensation objective is the revegetation with indigenous species of the areas cleared of invasive trees, to establish a canopy cover of 100% of native grass within 10 years of initial control. This is a key part of the rehabilitation of the catchment for many reasons: good grass cover slows soils loss and erosion; grass cover inhibits re-invasion by alien and invasive species; wildfires in grasslands are more easily and cheaply contained; and grass cover increases slow-release water runoff and infiltration to the local water table. Although expensive and labour intensive, there are opportunities for improved grazing on revegetated areas[2], and they reduce manage costs in protected areas.

The third compensation objective is the establishment and maintenance of a system of fire belts between the two protected areas, TGME operations, and built-up areas. It is assumed all timber companies will maintain fire belts around their plantations.

An indication of the forecast costs (Total R64,2 million comprised of R5,9 capex and R58,3 opex) to achieve the three primary compensation objectives is provided to TGME and authorities to inform appropriate financial provision. To be effective and durable, the compensation activities should be contextualised in a catchment rehabilitation plan that provides synergy with neighbours' efforts and avoids conflicts or duplication. A quaternary catchment scale plan would seem to be the appropriate scale and would also provide a useful platform on which to build the required protected area management plans for Morgenzon Forest Nature Reserve and Graskop Grasslands Unique Community that are being protected and restored. These catchment plans would also provide a forum for landowner engagement around common objectives, a vehicle for FPA activities and a structure for the Catchment Management Forum or other body to determine effectiveness of rehabilitation.

Certain institutional arrangements are proposed (Section 7) to cater for the necessary improved collaboration in ecological rehabilitation and transparency regarding the progress to achieve the outcomes. In particular, the use of professional, experienced entities is required to ensure effective, efficient, and agile rehabilitation and auditing of outcomes. Lastly, conditions are proposed for continued mining (Section 8), as well as for mining environmental authorisations and water use licences, to reference these Ecological Compensation outcomes. Performance guarantees for the estimated cost of the compensation measures are needed to ensure environmental objectives are achieved.

[2] There is a need to improve grazing management in the wider catchment, especially the CPA owned land between Pilgrims Rest and Moremela. The compensation program could assist in pursuing this.

Contents

2. Acronyms, abbreviations etc

83MR	Mining Right 83		MPRDA	Mineral & Petroleum Resources Development Act (Act 28 of 2002)
BNR	Blyde River Canyon Nature Reserve		MRA	Mining Rights Area
CBA	Critical Biodiversity Area		MTPA	Mpumalanga Tourism & Parks Agency
CDM	Clewer-Dukes-Morgenzon mine complex		NEMA	National Environmental Management Act (Act 101 of 1998)
CMF	Catchment Management Forum		NEMBA	NEM: Biodiversity Act (Act 10 of 2004)
CPA	Community Property Association		NEMPA	NEM: Protected Areas Act (Act 57 of 2003)
CR	Critically Endangered		NWA	National Water Act (Act 36 of 1998)
DARDLEA	Dept Agriculture, Rural Development, Land and Environmental Affairs		PA	Protected Area
DFFE	Dept Forestry, Fisheries & Environment		PBO	Public Benefit Organisation
DMRE	Dept Mineral Resources & Energy		PES	Present Ecological State
DWS	Dept Water & Sanitation		RQO	Resource Quality Objectives
EA	Environmental Authorisation		SAFCOL	South African Forestry Company ltd
EIR	Environmental Impact Report		SANBI	South African National Biodiversity Institute
EMF	Environmental Management Framework		SWSA	Strategic Water Source Area
FEPA	Freshwater Ecosystem Priority Area		TGME	Transvaal Gold Mining Estates/Theta Gold Mines
FNR	Forest Nature Reserve (Morgenzon)		WfW (NRM)	Working for Water – now a part of the Natural Resource Management in DFFE
FPA	Fire Protection Association		WUA	Water User Association
IAPs	Invasive Alien Plants		WULA	Water Use Licence Application
K2C	Kruger to Canyons Biosphere Reserve		WWTW	Wastewater Treatment Works

3. Background & Rationale

3.1 Historical mining and prior approaches by TGME on MR83

Over 140 years of mining have left scars on the upper Blyde River catchment around Pilgrims Rest. Significant erosion, rock dumps, invasive plant infestations, river diversions and channelling have all taken their toll on natural ecosystem functioning and stability. Recently, illegal mining and unmanaged wildfires have exacerbated environmental decline in the area (SAS 2022).

TGME (under previous ownership of Simmers & Jack) received an abstraction permit (1351N in May 1991) for 469 025m^3 and a Water Use Licence (Section 21(a), (c), (g)) in 2011 for a range of activities adjacent to the Blyde and to divert several unnamed tributaries. An EMPr for MR83 was issued in 2013. With the curtailment of underground mining in 2015, TGME turned their attention to three potential open cast operations to extract gold. The scale of these pits, and associated infrastructure and dumps, would have resulted in significant biodiversity impacts. Although a detailed offset and compensation study was undertaken (Botha, Steyn & van Staden 2020), TGME prudently opted to shelve the open pit plans in favour of restarting the existing underground workings.

In parallel to the planning for underground mining, MTPA and DFFE identified certain areas in this Strategic Water Source Area (SWSA) for declaration as Forest Nature Reserves. One of these (the addition to the Morgenzon Forest Nature Reserve – declared October 2021) overlapped substantially with some of the surface infrastructure of TGME's mines, and a sizeable portion of the underground workings of the existing Beta, Clewer & Dukes Hill mines. While legal advice indicated that mining could continue, notwithstanding the declaration, TGME recognised that specific conditions must accompany any consent by the Minister to continue mining. After several discussions and presentations to relevant officials, TGME contracted me to develop the proposed

conditions as well as scope out a rehabilitation programme as a key measure of ecological compensation to form part of the conditions for continued mining in this sensitive area.

The prior specialist and biodiversity offset work for the Theta open cast EA and WULA provided a basis for developing the proposed compensation programme (see also Botha *et al* 2020). Additional studies for the listed activities associated with restarting underground mining that require authorisation, State Forest permits and/or water use licences may further inform the proposed conditions, and any requisite mitigation and/or compensation measures.

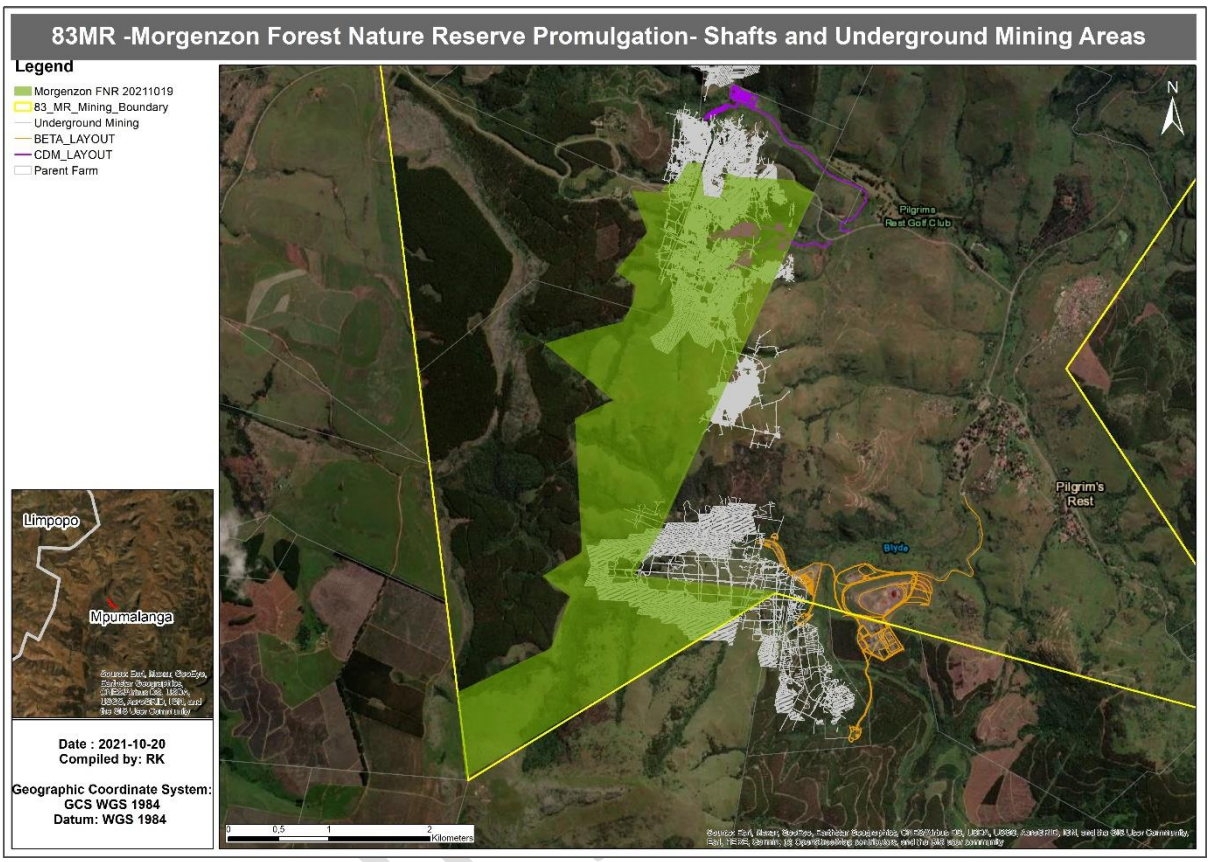

Figure 1. The overlap of the proposed addition to Morgenzon Forest Nature Reserve with the existing surface and underground portions of Beta and CDM mines of TGME. (courtesy OMI/TGME).

3.2 Underground plan for Beta, CDM, & Frankfort Mines

In 2021 TGME commissioned a range of scoping studies to understand the biophysical and other constraints as well as likely impacts from their proposed restarting of Beta, Frankfort, and the Clewer-Dukes Hill-Morgenzon (CDM) cluster of mines.

Due to extensive historical development, as well as recent illegal mining activity, it seems possible to restart these mines without any new significant impacts on biodiversity, groundwater, or hydrological function. In fact, as explained below, it may well be that restarting the underground mines is beneficial for biodiversity protection and management, as well as river flow. For the purposes of this report, *I must assume that there will not be any significant negative impacts on biodiversity and that mitigation, and the recommendations of the relevant specialists will be adhered to*. The detailed EIA studies seem to confirm this assumption and do not point to additional offset-type mitigation measures that need to be considered.

Morgenzon mine, while outside of the recently declared Forest Nature Reserve (FNR), has a relatively large existing disturbed footprint, and legacy buildings from which to redevelop the mine (see purple layout in Figure 1). Although the stream and forest are in proximity, the fact that the mine was able to operate until relatively recently without grave visible impacts on these systems implies that high significance negative impacts are unlikely.

Frankfort was one of the more recently operating mines, and while located in a relatively steep, well wooded valley, it seems that it should be possible to restart operations without any significant additional footprint impacts on biodiversity, especially of the indigenous forests or in the rivers. Additional mitigation measures are required to ensure low to no impact, but it is not envisaged that any offset-type mitigation or removal of indigenous forest[3] will be required.

3.3 Protected Areas in the receiving environment

Several protected areas have been formally declared in the region over the last few decades. This is important to factor in as mining is not permitted in (or under) Nature Reserves, and only permitted in Protected Environments with the approval of the Ministers of Environment and Mineral Resources. Lawful mining can continue but under conditions to be set by the Minister in consultation with the Minister responsible for Mineral Resources. Activities and impacts in protected areas should entail ecological compensation IF they are allowed to proceed at all.

Mt Sheba Private Nature Reserve was proclaimed in 1965 and is deemed to be a Nature Reserve under Section 12 and 23(5) of NEMPAA. Although the Blyde River Canyon Nature Reserve (BNR) has a complicated proclamation history, much of this reserve has been regularised and validated as recently as 2019. The farms Desire 564KT and Graskop 563KT (along with portions of farms Berlyn, Maliedyke & Lisbon) were declared in 2005 as a "Unique Community" under the Mpumalanga Nature Conservation Act (Act 10 of 1998). This protected area should properly be deemed to be a Protected Environment under Section 28 of the NEMPA and appears to be reflected as such by DFFE in the Protected Areas Register and Database. This Unique Community is managed by MTPA as the 'Stanley Bush Kop' section of BNR – although its actual status is better assessed as Protected Environment.

Morgenzon Forest Nature Reserve (FNR) was declared under the National Forest Act (NFA) in 2013. A notice of intention to add a further area to Morgenzon FNR was published in 2019, and the addition was declared in October 2021. This addition coincides with some of TGMEs MR83 mining right and historical mines, and the locus of the listed activities being pursued.

3.4 Permitting & Licence Requirements for continued mining

While it is not the intent of this report to set out the full permitting requirements for CDM, Beta and Frankfort (this is being done elsewhere), this section is meant to contextualise regulatory, compliance and enforcement options of the proposed compensation measures.

All mines are in State Forests or adjacent state land, except the South addit of Beta mine, which is located on private afforested land. This implies that they will require a licence under Section 23 of the National Forests Act (Act 84 of 1998) to continue with various activities. The activities and application for these licences must meet several criteria, among which are:

- The licence can be issued for a maximum of 10 years but is renewable.
- The licence may be issued with conditions, among which appear to be a requirement for an accompanying rehabilitation plan (I van der Merwe, (DFFE official) *pers. comm August 2021*).

[3] A few individual trees may need to be trimmed or removed where they have regrown over old mine workings and access.

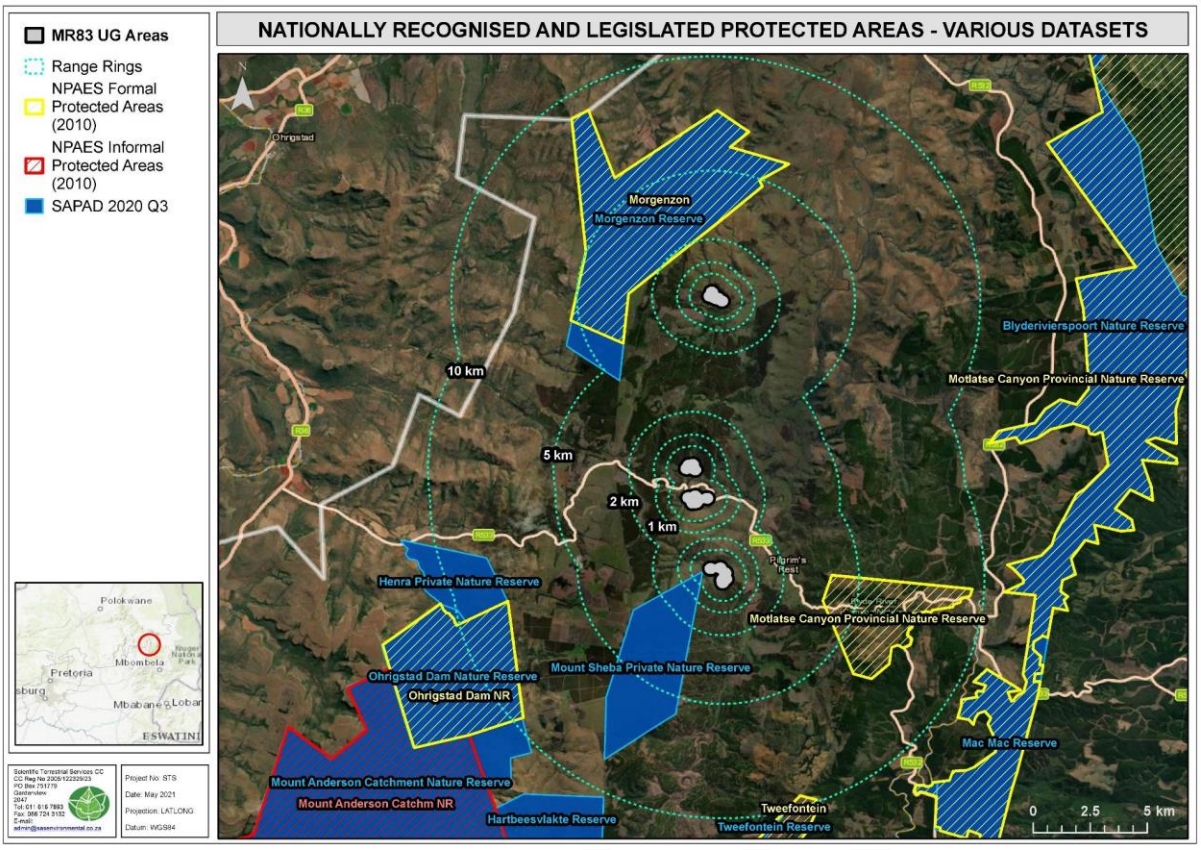

Figure 2. Protected Areas around TGME MR83 Underground mines. Note this map does not depict the recently declared extension to Morgenzon State Forest, over CDM and Beta Central which is shown in Figure 1. (Source: STS 2021).

- The activities do not frustrate the achievement of the objects for which a state forest has been set aside as a protected area (There are no additional explicit objects published in the Notice gazetting Morgenzon Forest Nature Reserve – (Government Notice 45345 – published 19 October 2021)).

The NFA application process is rather perfunctory and does not provide significant guidance on what the minimum requirements for a rehabilitation or compensation programme that accompany a licence application should require. This report then presents a first attempt at circumscribing what may be appropriate in this regard.

To restart the mines, there are also several activities planned which trigger the need for Environmental Authorisations under National Environmental Management Act (Act 107 of 1998 – NEMA), as well as Water Use Licences under the National Water Act (Act 36 of 1998 - NWA). The 1991 abstraction permit needs to be brought into the modern era under section 21(a) of NWA, and the 2011 WUL needs to be reviewed and augmented for section 21(b, c, g, f & i). Some of the historical conditions of these licences do not seem possible to comply with, in part as they are poorly framed[4], and there is an opportunity for the compensation measures proposed in this report to contribute significantly to compliance with these conditions. Patchy historical compliance also provides a rationale for the approach to institutional and financial arrangements in Section 7.

While the full scoping, impact assessment and application processes is underway, TGME has opted to develop this Compensation Programme to specifically address known impacts and certain risks which may emanate from its proposed restarting of the mines to align with emerging policy guidance. The compensation should not be seen as only counterbalancing planned impacts from the various restarting activities, but rather to mitigate the various catchment-wide threats to

[4] E.g. "3.5.2 *Alien and invader vegetation must not be allowed to further colonise the area, and all new alien vegetation recruitment must be eradicated or controlled in a sustainable manner*"

biodiversity and ecosystem function which currently reign (Botha et al, 2020, STS 2022, SAS 2022) and which prevent the SWSA from being "secured[5]".

It is hoped that providing a coherent, measurable, and specific rehabilitation programme addressing issues and impacts not caused by or attributable to TGME, and referring to this programme in:

- State Forest licences,
- conditions for continued mining in a Protected Area,
- as an accompaniment to the other rehabilitation and mitigation required in any Environmental Authorisation, and
- in the potential conditions under new Water Use Licences

provides a robust way for all authorities to ensure that outcomes will be achieved, are independently verified, and are acceptable to the other authorities regulating the process. The programme is intended to be synergistic with other activities and rehabilitation work planned in the wider catchment.

3.5 Significant additional Impacts from proposed 83MR Underground activities

The terrestrial, waste classification and geohydrological assessments note only medium to low significance impacts on biodiversity and hydrology (STS 2022, MvB consulting 2022). The Freshwater Assessment highlights that there is a medium significance risk of potential impacts on sedimentation and PES, and that this needs careful design and engineering mitigation as well as supportive catchment-level measures to pursue attainment of RQOs (SAS 2022). My assessment is the specific biodiversity offset mitigation measures are not triggered, but that there is an argument for ecological compensation for activities in a PA and a Class 1 water resource.

If the EIA and WUL processes determine that there may be additional impacts of a scale and nature which would justify specific use of offsets (for vegetation types, forest ecosystems, or other features), then these requirements would need to be addressed and would be additional to this Ecological Compensation Programme.

The primary known impact is going to be:

- the annual abstraction[6] of up to 469 025m^3 from the Blyde River as per TGME's 1991 abstraction permit, and the concomitant reduction in flow and dilution that this will cause, for the in-stream biota as well as downstream water users and ecosystem requirements.

Potential environmental impacts from the proposed mining include:

- continuation of mining in a Nature Reserve, with the attendant issues and challenges that that might elicit.

- risks associated with a mining, processing, and beneficiation operation in a SWSA adjacent to a Class 1 water resource.

- the (low and admittedly mitigation-reduced) risk associated with accidental or weather induced failure of any waste rock dump, water storage or tailings facility, or any other mine operations, that results in discharge to or sedimentation of the Blyde River. Please see the EIA and WULA specialist studies for further detail on potential or additional impacts.

3.6 Some Impacts require Ecological Compensation – not Biodiversity Offsets

As a note on terminology and conceptual approach to this work, the revised Guideline on Biodiversity Offsets (DFFE 2021) references the broader concept of Ecological Compensation. The specific case of Ecological compensation is effectively a Biodiversity Offset for features where there are still options to meet the accepted scientific targets for conservation of those features.

[5] The current DFFE Medium Term Strategic Framework has a target to secure 50% of the SWSAs.
[6] More recent calculations suggest that actual abstraction is likely to be only half this amount.

Biodiversity Offset type mitigation is not applicable as there is no "footprint" impact in the FNR or elsewhere attributable to the listed activities to use to calibrate an appropriate area-based metric. Moreover, almost all remaining land in this part of the catchment is either protected (but unmanaged) or under timber. This implies that applicable compensation should be focused on improving management through ecological rehabilitation and not increasing protection *per se*. For any impacts (in the case of these mines restarting – *potential* impacts) on protected areas or irreplaceable biodiversity features, it is rather appropriate to refer to appropriate mitigation as "**ecological compensation**"[7].

As there is likely to be only a trivial new footprint impact from restarting the mines, and the primary impacts are likely due to the abstraction of water from the Blyde system and risks from mobilised sediment (from mining, invasive alien plants (IAP) control and other actors in the catchment), Ecological Compensation is going to focus on the replenishment of the currently licenced abstraction volume (see section 6.1) and addressing catchment scale, extraneous threats to water ecosystems and RQOs, including sedimentation & erosion (section 6.2) and wildfires (section 6.3).

4. The Receiving Environment

4.1 Nature in the Blyde River Valley

The Blyde River upper catchment has long been recognised as a key area for conserving biodiversity. It is a listed Class A catchment, being the highest priority to retain in its natural state (SAS 2021). It is a recognised SWSA and vital contributor to the environmental flows maintaining the health and functioning of the Blyde River, and the downstream Olifants River, especially in the dry season (AWARD 2020). The hydrological contribution of the Blyde River also maintains key industries and economies in the lowveld as well as the central Kruger National Park's iconic tourism sites. The catchment is also listed as a River Freshwater Ecosystem Priority Area as well as a Fish Sanctuary for endangered (EN) and critically endangered (CR) species.

SAS (2019, 2022) noted that "*due to the sensitivity of the watercourses in the region… a very high level of mitigation… will be required to ensure that the sensitive and important receiving environment is not unacceptably impacted. Implementation of such mitigation measures along with general ecologically sensitive mining and construction methods are deemed essential to ensure that the ecological integrity of the highly important and sensitive freshwater resources in the vicinity of mining activities is not compromised to such a degree that the Resource Quality Objectives for these drainage systems cannot be met, there is a change in EcoStatus and that long term and/or irreversible impacts on the watercourses of the area occur. Consideration may need to be given to offsets…, although it should be noted that some impacts, such as impacts on water quality for example cannot be offset*."

The remaining natural terrestrial habitat portions are almost covered by designation as Critical Biodiversity Area and the portion in which TGME intends to re-establish mining is also identified as a key climate adaptation corridor (MBSP 2021). The area comprises a significant extent of the Malmani Karstlands - an ecosystem listed as Endangered under NEMBA. The Blyde River valley houses numerous remnant indigenous forests and many protected plant species. For a full description of the unique biodiversity, please see STS (2020, 2022) and SAS (2022).

Any proposed operations of a potentially damaging industry (such as mining) would need to demonstrate the highest level of corporate responsibility and stewardship.

[7] It is currently unclear what appropriate terminology should apply to replenishment of abstracted water. It was referred to as an "Environmental Offset" in 2018 discussion documents form DFFE. However, until the DWS publishes its perspective or a formal position is adopted, this report will use "ecological compensation" and "replenishment" to describe the return of water to a natural system through nature-based actions.

4.2 Landowners and lessees' Stewardship (as a baseline)

Unfortunately, many land parcels around Pilgrim's Rest and MR83 are rather degraded and infested. Much of the land is owned by government – held by the Mpumalanga Departments of Public Works, Roads & Transport. These parcels host significant and increasing infestations of IAPs, especially on the farms Ponieskrans 543, Driekop 546; Desire 563 and Graskop 564.

While some state- and privately-owned timber land is well managed, with reasonable containment of IAPs and little transgression into water courses, there are some significant infestations and riparian invasions in natural areas that are not being addressed. Without improved management focus, coordination, budget, and alignment with a burning program, it is difficult to see how IAPs can be effectively controlled, and their water- and fire-risk reduced over the medium term. Damage to infrastructure from forestry debris and serious erosion and sedimentation was visible in February 2022 downstream of York plantations, for 44km to Bourke's Luck.

Picture 1. The Blyde river above Pilgrim's rest, 21 February 2022 after a 20mm rainfall event, showing the impact of forestry clear felling operations on turbidity. Repeated erosion has compromised the revetment to this causeway.

The Maorabjang CPA has had a large area between Pilgrim's Rest and Bourke's Luck, previously seemingly well managed by Barloworld Farms, restored to them. While levels of infestation across most of these parcels are currently low, and they represent a unique opportunity to have their watershed, biodiversity and climate adaptation services secured, there is little obvious active management. The incipient invasions, especially along the mainstem of the Blyde River, are expanding fast. Combined with almost annual fires (presumably set for improving grazing), the declining ecological integrity, and increasing risk management costs associated with expanding infestations and lax fire control, pose huge risks to all adjacent land users, infrastructure, and downstream water users.

Despite enquiries, it is unclear if any local structure or platform exists for landowners and land managers to share information and plans for environmental management.

4.3 Extent of IAP infestations

It is beyond the scope of this work to definitively assess and map invasive plant infestations in the region. Instead, specific major infestations near to the CDM and Beta mines and adjoining protected areas have been delineated onscreen. Although there are some IAPs present around Frankfort mine, these pose no immediate threats to ecological integrity. They will need to be controlled in the medium term.

This delineation of current infestations around CDM, Beta, and adjoining areas allows:

1- An estimation of the opportunity for replenishment
2- The engagement of neighbours to assist and collaborate
3- A snapshot baseline to gauge improvement of land condition and management cost reduction to benefit the state
4- Costing of the liability for legacy impacts of IAPs around old mines
5- The reduction of risks to TGME and other operations and infrastructure.

The areas of major infestation identified by different landownership type are shown in Figure 3.

4.4 Grassland & canopy cover

In this biome, one of the most important components of effective watershed services and hydrological outcomes is the persistence of grass cover (as opposed to trees which evapo-transpire significantly more water, especially in the dry season). A key metric of health of grassland systems is the extent of basal and canopy cover[8] (SANBI 2013). Canopy cover is seemingly the more important metric to track for improving sediment retention and infiltration. 100% canopy cover is a worthwhile target, and imminently achievable in moist grasslands within 5 years of rehabilitation (*Tony Swemmer – SAEON, pers. comm February 2022)*.

Canopy cover Is a good proxy for retaining sediments and slowing quick flows after storms. This has multiple benefits, keeping stream pools clear and riffle habitats open, and slowing down dam sedimentation. IAP infestation reduces basal and canopy cover through allelopathy and shading effects. Damage to topsoil from wildfires in IAP stands impacts soil structure and exacerbates loss, retarding infiltration, and grass cover regrowth.

Both historical and more recent unauthorised prospecting roads have exacerbated the risks from runoff and sedimentation. Recurrent fires and trampling from unattended stock and human foot traffic (primarily illegal miners and herders) have caused increasing erosion in FNR and BNR.

4.5 Existing threats to biodiversity and hydrological function in the Blyde upper reaches.

Previous work in the immediate area revealed substantial pressures on biodiversity and threats to ecosystem function (Botha et al, 2020, STS 2020, STS 2022, SAS 2020, SAS 2022, N Theron *K2C (pers comm October 2021)*). Analysis of aerial and satellite imagery over the period 1937 – 1954 - 1970 – 1987 – 2004 - 2021 indicates an expansion of IAP canopy coverage every year. Resolution constraints prevent identifying seedlings and sapling to species, but the pattern of spread is indisputable – despite occasional control operations on state land funded by the Natural Resource Management Programme of DFFE (WfW NRM).

Imagery from 2017 – 2021 indicates that some or most of the land parcels covered by MR83 burn annually, with certain (presumably hot or wind-assisted) fires burning far into the margins of indigenous forests, and facilitating the establishment of more flammable invasive species such as *Acacia dealbata, A. mearnsii, A. melanoxylon* and *Eucalyptus spp.* Annual burning throughout the landscape, compounded by heavy human and livestock trampling around mine addits and stock routes, result in significant erosion scars, which have got visibly worse since 2017.

Much illegal mining (wash tables constructed and operated) takes place in the Blyde River and tributaries, which requires clearing of riparian trees and wholesale damage to river and stream profiles. This causes the ingress of massive sediment loads, branches and debris, and faecal and Mercury pollution into the Blyde River. Sediment smothers benthic biota and threatens endangered fish and habitats, while the branches and debris threaten the causeways, culverts and

[8] Basal cover is the percentage of grass tussock or plants base area over a given area. It is different from canopy cover and foliar cover which tend to be higher values and more important for grazing indices.

infrastructure downstream. Together, these pressures prevent the RQOs from being met in the Blyde and don't bode well for water security in the catchment.

5. Approach to developing conditions for continued mining and a compensation program

There does not appear to be any precedent for conditions for continued mining in nature reserves that this author could find or that interviewed officials knew of. This report acknowledges that the primary opportunity for improved environmental (and specifically biodiversity, water quality and hydrological) outcomes is to require TGME to invest substantially in ecological compensation towards these objectives as the main condition for continued mining. This compensation needs to go beyond required mitigation and even good corporate duty of care, to alleviate the burden on the state to maintain the public benefit values of the upper Blyde River catchment. However, it is not possible to shift the entire burden of managing state protected areas or the attainment of RQOs in the Blyde catchment onto TGME. The approach to determining a reasonable and achievable level of ecological compensation elaborated on and quantified in the following section.

5.1 Clarifying the differences between Rehabilitation of legacy impacts, Mine closure objectives & the Compensation Programme

For clarity on liabilities, biodiversity duty-of-care activities required in legislation, good practice stewardship and to contextualise the additionality of the compensation programme, I propose that rehabilitation requirements be conceptualised in three specific ways:

1. The rehabilitation of impacts that would be required in terms of closure planning under the MPRDA and NEMA – for which Financial Provision needs to be scoped and set aside in terms of S24P. This is being done by OMI.
2. The rehabilitation of legacy[9] mining impacts and removal of redundant infrastructure (old concrete works, weirs, railways etc that cannot be successfully recommissioned) within 1km of the proposed new mines. This includes restoring the unauthorised prospecting roads constructed on Theta and Iota hills. The exact quantification of the physical infrastructure removal is being done by OMI - the IAP control portion being estimated. In practice is may be difficult to separate the IAP control in the rehabilitation and closure plan from invasive alien tree control on adjacent properties for catchment restoration and protection of water resources.
3. The rehabilitation of dense IAP infestations on State Forests on MR83, adjacent areas on MR341, the riparian zone of the Blyde river from Beta Mine to the Bourke's Luck potholes, and the Farms Desire 564 KT and Graskop 563 KT managed as a protected area by MTPA, including:
    a. clearing and follow-up maintenance work of IAPs for at least 5 years on any cleared site,
    b. sediment control and indigenous revegetation on cleared areas will be pursued to stabilise the soil and slopes,
    c. fire belt implementation on the periphery of protected areas, state forests, or where wildfires are likely to spread threatening property or infrastructure.

All the areas that TGME proposes to clear IAPs on are not its legal responsibility under NEMBA or any existing WUL or EA/EMPr. In terms of the regulations under NEMBA, the state is responsible for controlling the infestations in light blue and purple in Figure 3, and York Timbers is responsible for

[9] The liability for these legacy impacts is unclear as most are many decades old, although some mines only stopped working very recently. It is proposed that TGME assumes responsibility for impacts within 1km of active mines in MR83. This radius is proposed for discussion but covers almost all the legacy impacts of Beta and CDM mines.

those in yellow. At the least, the state (in the form of the Mpumalanga Department of Public Works, Roads & Transport) should have submitted a Control Plan under Section 76 of NEMBA to the Minister responsible for Environment and SANBI. Any investment by TGME to rehabilitate these areas therefore forms a valuable, additional activity that is justifiably framed as ecological compensation.

5.2 Rationale for compensation to underpin conditions for continued mining

The logic underpinning the compensation program rests on:

1- A judgment from the Mabola Protected Environment case (Gauteng High Court; Case no 50779/2017) which is the nearest analogue[10] to the current situation known. This judgement indicates (among other things) the need, in novel decision-making procedures, to exercise significant caution and risk aversion, be mindful of sufficient rehabilitation and the financial provision therefor, and to ensure the objectives of key acts are upheld, especially considering the environmental right enshrined in the Constitution.
2- The recognition explained above in Section 3 that in this specific catchment, rehabilitation is preferred over increasing protection (without adequate management investment). A proactive intervention is therefore proposed addressing the primary threats to biodiversity and ecological functioning in the upper Blyde River catchment. The objective of this are a) Replenishment of the licenced abstraction volume, b) curtailing erosion and sedimentation and riparian damage as demanded by the RQOs, and c) improving fire belt implementation and management (to safeguard replenishment and revegetation/ sediment management investments).

There are few mechanisms to quantify appropriate levels of compensation in the absence of a physical aerial footprint impact extent. Most useful is to scale the level of investment from TGME in IAP control to that required to replenish the licenced volume of water abstracted from the Blyde River (see section 6 below for specific detail). Further, in exchange for continued mining, especially on state land and state protected areas, arguments can be advanced that the applicants should be required to ensure that any land handed back to the state will be in an improved condition that is cheapest to maintain. This can be done through investment in programs to hold on to the gains made through clearing by: i) controlling incipient infestations before they become exceedingly expensive, ii) funding a biocontrol program that keeps the priority invasive species (*Acacia dealbata)* under long term control; iii) managing fires to benefit biodiversity and not IAPs, and iv) revegetating the cleared areas to indigenous grass cover.

The other risks to biodiversity in and ecological integrity of this SWSA are the potential loss of pool and riffle habitat (especially in the dry season) through sedimentation of the river (resulting from illegal miners, unmanaged wildfires, poor forestry operations and road maintenance). Proactive revegetation with indigenous grass (and potentially trees in specific niches) is the appropriate objective under all the cleared areas and after rehabilitation of the unauthorised prospecting roads on Iota and Theta hills (and other potentially erodible zones on MR83). This has the multiple benefits of slowing down rainfall runoff, increasing infiltration and dry season flows, and resisting further invasive by alien species. Revegetation with low growing indigenous grass and forbs also makes fire management significantly less costly and dangerous, and less prone to catastrophic wildfires.

The primary risk to indigenous forests (at which the declaration of the FNR is aimed) in the area is the combined synergistic effect of invasive alien plants infestations fuelling damaging wildfires and over-frequent deliberate or accidental burning. Whereas most indigenous forests are relatively invulnerable to infrequent, cool natural fires, the almost yearly hot fires driven by high winds and excessive flammable IAP biomass low have caused significant loss of indigenous forest. These are further set out below in the following section.

[10] The Mabola and TGME cases are obviously not the same – however they deal with similar issues.

6. Quantifying and calibrating Compensation requirements

Defensible, reasonable, sufficiently accurate and enforceable measures for compensation are required to protect both regulatory authorities and applicants. This section sets out how the measures and metrics were quantified for each of the specific interventions. These metrics inform the costing of the compensation program, the objectives to be achieved, and the monitoring identified in the proposed conditions of authorisation, licencing and other official permits.

6.1 Replenishment of Licenced abstraction volumes through catchment-scale IAP control

6.1.1 Clearing condensed hectares that equate to annual licenced offtake

Table 1, below, sets out the main infestations requiring control. These have been identified and planned in a desktop exercise, with each site visited or inspected from the nearest access point to ground truth the parameters. This level of data is sufficient for the purpose of broadly indicating landscape priorities, confirming sufficiency for replenishment, and to provide a rough estimate costing to assess the liability of TGME towards ecological compensation. More detailed mapping, planning, and costing would need to be done for implementation planning and contracting with service providers, but these figures should be sufficient for the competent and commenting authorities to make informed decisions.

A total of 370 ha of invasions have been mapped (equating to 273 condensed ha) at different densities. Most of this (211 ha) is on the farms Desire and Graskop, declared as a unique Natural Community and managed by MTPA as part of Blyde River Canyon Nature Reserve. This is also adjacent to York and SAFCOL timber. 156ha is on other State Land or State Forest land adjacent to the Morgenzon FNR (and thus a threat of wildfires and future invasions) or adjacent to MTPA managed protected areas (and SAFCOL timber).

Clearing these 273 condensed ha would return over 365 000m^3 to the Blyde River system annually[11] through the removal of evapotranspiration by the alien trees (see Table 1). This additional water is even more useful than the actual volume suggests in that it is most likely to materialise in the dry season when stream flow is lowest and tree transpiration (especially eucalypts and *Acacia*) is still active. Although this does not quite replenish the entire licenced abstraction volume (>480 000m^3), it is a substantial contribution to the instream flow requirements and ecological reserve of the River in this reach, and TGME will likely not require this larger volume due to mine water being able to make up the balance (MvB consulting 2022). If the entire licenced volume needs to be replenished, additional areas will need to be identified with state agencies and forestry companies, or a compulsory water use licencing process embarked on for the two affected quaternary catchments.

The specific objectives for this clearing, against which the effectiveness of the compensation program can be judged, could be framed as: "*Invasive Alien Plant infestations in these mapped areas, would need to be controlled to a level of no adult, seeding trees, and with four successive annual follow up operations conducted within 5 years of commencement, with the aim to achieve control over the entire area in 10 years*."

6.1.2 Strategic control of riparian and incipient infestations

A subsequent contribution to improving catchment level outcomes for the Blyde River catchment is to proactively remove the incipient invasion by *Acacia* in the riparian Zone of the Blyde River. Currently, there are rather low levels on infestations which are cheap and easy to control, and for

[11] The incremental benefit of evapotranspiration gains made by switching from IAPs to indigenous grass is not precisely quantified. Natural grassland will transpire in the growing season so the total replenishment may be slightly less than that calculated. However, wet season runoff is not yet a limiting factor in this catchment.

which concerted action would yield quick returns. Although the infestations are not extensive enough to contribute meaningfully to the replenishment, they are a risk if left unmanaged. If these infestations are left to expand (which seems to be the trajectory with no control visible by the landowners - primarily the Maorabjang CPA) this will reverse the outcomes from the replenishment actions in 6.1.1, and contribute to the unnecessary degradation of the river. Current containment is relative cheap but will be increasingly expensive if left unmanaged.

Maintaining riverbank stability by retaining indigenous riparian forests is also crucial to ensure that excessive sedimentation does not destroy ecological niches and water storage capacity downstream. Annual sweeps to control all invasive species in riparian zones from the 44 km river section from the TGME abstraction point to the border of Bourke's Luck would play a substantial part in this maintenance.

The likely additional replenishment contribution from this riparian rehabilitation is small and not quantified or recognised in the calculations in 6.1.1 and Table 1. Suitable method statements for control operations in the riparian zone must form a part of the Implementation agreement for the Compensation Program.

6.1.3 Investment in catchment-wide biocontrol development and release program.

A key component of successful IAP control and rehabilitation is the ongoing follow-up of seedlings and resprouting stumps. Hard won gains can be easily lost through thinking the initial control is all that is required. While effective planning can address this follow-up a more important contribution would be the development and release of a biocontrol agent to tackle the most severe invasive species which has no commercial value (and is thus unlikely to attract any resistance). Silver Wattle (*A. dealbata*) is almost certainly the most extensive and damaging IAP and has no commercial value beyond firewood. Release of a destructive biocontrol agent (likely a rust in the *Uromycladium* and/or *Endoraecium* group) would almost certainly be a crucial step in the long-term containment of Silver Wattle, especially in conjunction with a seed-feeding or flower-galling agent. This is also the most cost-effective potential contribution to reducing long term management costs of these areas to the state and other landowners.

It is impossible to stipulate ecological outcomes that would need to be achieved, as there are too many contingencies involved in biocontrol. At most, compensation required could be to fund the development, testing, release, and culture of one destructive agent. Previous engagements with the few officials working on the biocontrol of these *Acacia* species has indicated that a modest investment of R2m would be sufficient to locate, assess, develop, and release suitable control agents.

6.2 Curtailing erosion & sedimentation

6.2.1 Prevent further loss of topsoil, water holding capacity, and sedimentation

A key risk to biodiversity from mining activities is the siltation of streams and rivers. There is a chance that sedimentation will be exacerbated by controlling IAPS, especially on steep slopes, if done injudiciously and without assisted natural revegetation post-clearing. Not only do mobilised sediments pose a biodiversity and water security threat, but they also represent a loss of catchment soil water holding capacity. Loss of soil water holding capacity and reduced infiltration is a serious issue in these high rainfall catchments, especially when there is great reliance on downstream dry-season flow.

The compensation programme needs to achieve improved (i.e., better than baseline) siltation reduction through stabilising soil and runoff in the 370ha of mapped areas for rehabilitation and revegetation. Ideally this should be verified through in-stream turbidity (or dedicated sediment) measurements before, during and after control operations outlined in Section 6.1.1..

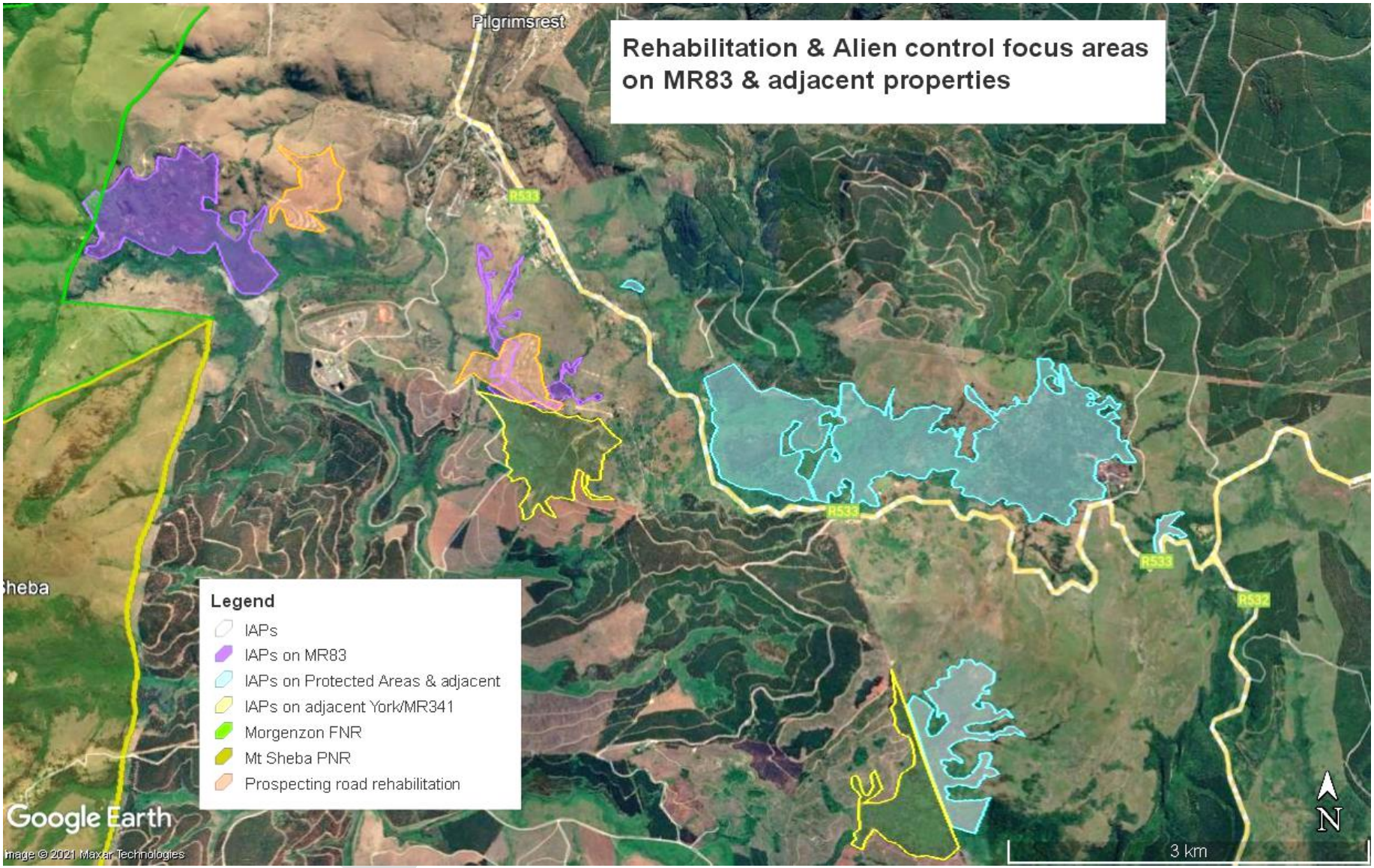

Figure 3. Approximate location of unauthorised prospecting roads and main sites of IAP infestation on old mine areas, protected areas and adjoining private timber land intersecting with MR83, MR341 and MR 10167 of Theta Gold Mines. These areas will be rehabilitated under this proposed Compensation Programme and the rehabilitation commitments for legacy impacts from mining.

Table 1. The 9 dense infestations of Invasive Alien Plants occurring on MR83, and adjacent properties. These were assigned a tree coverage density class, and dominant species from aerial imagery and ground-truthed in Jan 2020 and October 2021. Estimated water use rates per hectare for Acacia and Eucalyptus From (Phiri 2020) were applied to these condensed areas to determine the likely volume of evapotranspiration in each polygon. It is assumed that this volume would return to the Blyde River once the stands were cleared, especially in the dry season, thus replenishing the abstraction by TGME.

Polygon	Status	IAPs	Tree Density	Total Area (ha)	Condensed Area (ha)	Eucalyptus (ha)	Wattle (ha)	Mean Annual Water Use (m3)
1. BNR 164ha	Protected	100% Acacia	95%	164,0	155,8		155,8	226 993
6. BNR East forest scrub 44 ha	Protected	50% Acacia & 50% Indigenous	70%	44,0	30,8		15,4	20 930
8. Above ZurAltenMyn B&B 3,6ha	Protected	100% Acacia	75%	3,7	2,7		2,7	3 861
5. Peach Tree Stream Forest 67,4ha	State Forest	100% Acacia	50%	67,4	33,7		33,7	44 400
2. Ponieskrans 68,6ha	State Forest?	100% Acacia	50%	68,6	34,3		34,3	45 622
3. Pilgrim's creek <1ha	State Land	100% Acacia	95%	0,9	0,9		0,9	1 235
9. Theta 21 ha	State Land	75% Acacia & 25% Eucalyptus	70%	21,0	14,7	3,7	11,0	22 766
			Total	**369,55**	**272,9**	**3,7**	**253,8**	**365 808**

Acacia water use per ha	1410[12]
Eucalyptus water use per ha	1960

[12] This is an average value. As noted previously, although there will be water use by indigenous vegetation re-established after control, this will be significantly less (around 20%) of the total lost to invasive alien evergreen trees

Specific care will be needed to ensure that less damaging but still undesirable invasive species (e.g. Bracken – Pteridium spp; Bramble – Rubus spp.) do not simply occupy the cleared areas, and that conducive conditions are maintained for native grass establishment through repeated follow ups

6.2.2 Stabilising water courses, especially those damaged by illegal mining

Aside from intensive forestry and alien clearing operations, a key source of sediment seems to be the constant stream bank damage caused by wash table construction and use during illegal mining. It will be important to prevent ongoing sedimentation from stream bank erosion by removing the illegal mining and implementing carefully thought through mitigation. Regardless of whether the required mitigation forms part of the rehabilitation and closure planning or this compensation plan (I would argue that it should be as it is a valuable contribution) some form of stream stabilisation is almost certainly going to be required for TGME to access Beta Central. This is the subject of a Section 21 (c & i) licence under the NWA. There are other eroding or damage water courses in the region that need assessment and amelioration. Ideally, a specialist report on this mitigation should be procured, with DWS and MTPA input into the Terms of Reference.

6.3 Fire belt implementation & management

6.3.1 Control regeneration of IAPs through judicious fire management

A significant driver of IAP spread (especially of *Acacia* spp.) is the regular wildfire incursions through infestations and into the fringes of indigenous forest. This can be clearly tracked through aerial imagery of the Peachtree Stream since 1970. Seed can remain viable for decades. However, fires can flush out IAPs by stimulating seed germination in recently cleared areas reducing long term seed load, chances of reinfestation and thus future clearing costs. It will be very difficult to control IAPs in this landscape, especially in the rehabilitated areas and old dumps without managing fires to reduce the seedbank, kill saplings and stimulate tussock forming indigenous grasses. Prudent controlled burns can act as a cost-effective means of controlling IAPs and to create short term fire belts protecting neighbouring plantations, infrastructure and TGME's workings. TGME should support relevant authorities and landowners with their burning programs.

It is difficult to scope out the likely compensation for fire prevention and controlled burns as these need to be approved by the relevant FPA, and more carefully planned in the detailed rehabilitation planning. However, if would be prudent to require a triennial burn (in normal years, less in wet years), in an appropriate season on suitably low-risk days, in cleared areas if this is acceptable to relevant authorities and fits in with regional fire planning.

6.3.2 Protect existing forests and protected areas through fire belt maintenance

The primary threat to and constraint on indigenous forest margins in this region is the prevalence of deliberately set wildfires. Any fire originating from the surrounding, expanding settlements, or deliberately set by arsonists, can halt mining activities, and burn out valuable timber – and increases the landowner's liabilities if they burn across areas without adequate fire prevention measures – especially fire belts. It will be very difficult to manage and maintain the integrity of the Morgenzon FNR and the Stanley Bush Kop section of the BNR with proactive fire belt implementation by competent teams – even if hired from local timber companies for the purpose.

Preliminary desktop analysis indicates that 11km of sufficiently wide fire belts need to be constructed along key risk areas, as a complement to the fire belts that should be implemented by neighbouring landowners and lessees.

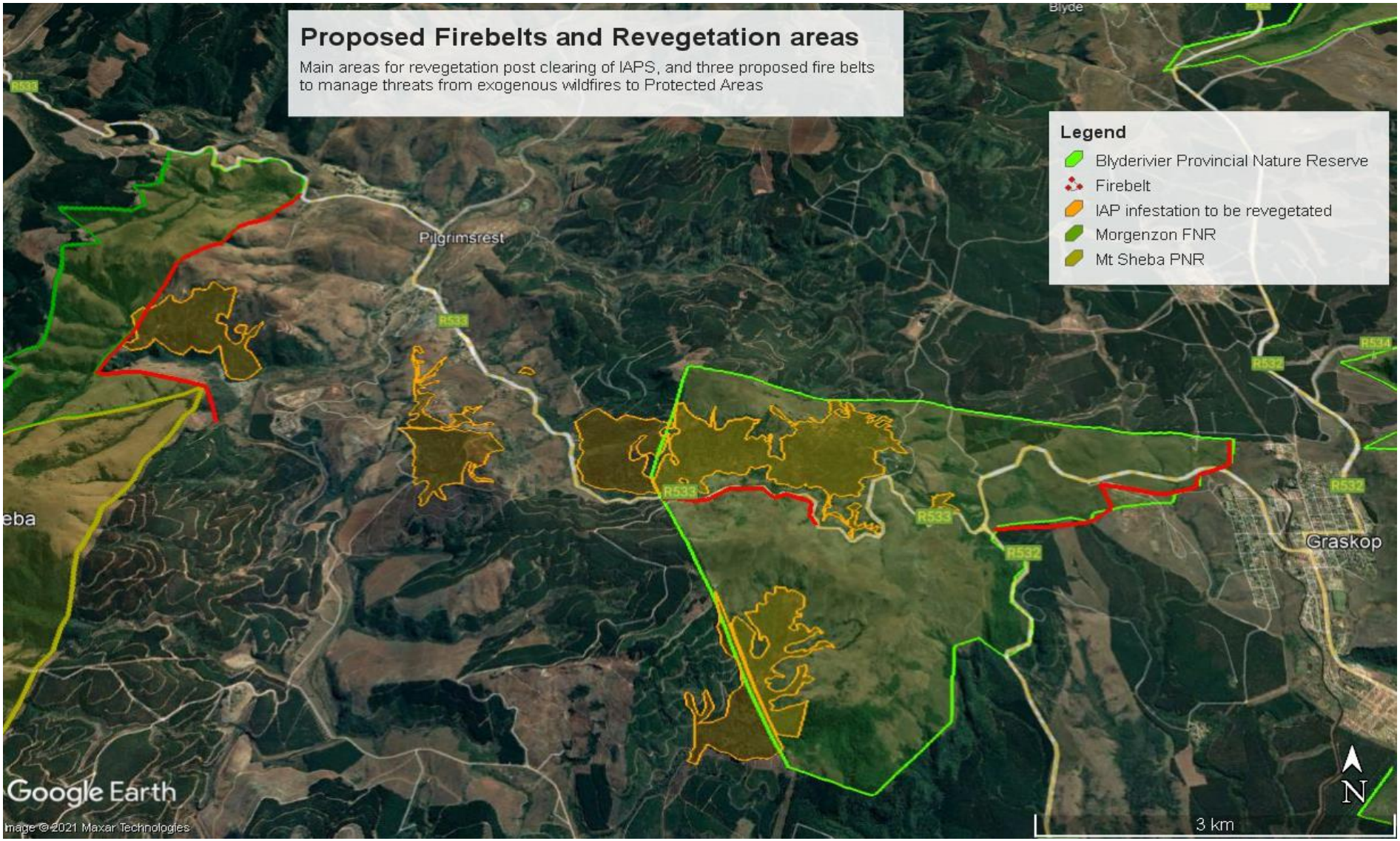

Figure 4. The main areas for revegetation of areas cleared of IAPs and Suggested locations for fire belt implementation.

6.4 Scope of Ecological Compensation Programme for Beta, CDM & Frankfort

The table below sets out a preliminary costing of the requisite ecological compensation, as well as proving some metrics to confirm the scope and means of verification. This will be important for compliance management by the DMRE, DFFE and DWS, should this programme be accepted and included as a condition for continued mining and for environmental authorisation and/or water use licencing.

Table 2. The scope, cost and means of verification of initial compliance with the ecological compensation programme for TGME's proposed operations at Beta and CDM mining complexes. It is not possible at this stage to provide detailed costing for any interventions to stabilise water courses or implement controlled burns to assist in IAP management as these likely require official endorsement, licences or permits from DWS or District Fire Officers.

Item	***Scope & Quantum***	***Indicative cost[13]***	***Means of verification***
6.1.1 Replenish licenced volume	Control 370ha Invasive alien tree infestation (= 273 condensed hectares)	R9,9 million	Funding agreement with IAP control specialist & Instream flow meters at abstraction point and where pilgrim's Creek joins Blyde River.
6.1.2 Clear riparian area	Annual sweep of 44,3km river section from Pilgrims to Bourke's Luck.	R1,8 million	Annual inspection audit
6.1.3 Biocontrol	Fund the development, testing, release, & culture of at least 1 destructive agent	R2 million	Funding agreement with suitable Biocontrol institution
6.2.1 Sediment & erosion control & revegetation	Initial revegetation/ hydroseeding and 2 years maintenance of 470 cleared hectares	R40,6 million	Funding Agreement with revegetation specialists & annual basal cover audit
6.2.2 Stabilise water courses	Remove source of impact & repair damage	?	WUL S21(c&i) conditions & annual audit
6.3.1 Fire for rehabilitation management	IAP seed inducing burns on cleared & revegetated areas 3 yrs	?	FPA/ District permit conditions & annual seedling density audit
6.3.2 Fire belt implementation	Implement annual fire belts before season	R1,7 million	FPA permit and annual performance audit
Institutional arrangements, implementation overheads	An annual provision for engaging a PBO/trust to oversee the compensation work, fund coordination	R6 million[14]	Funding agreement with PBO/Trust for Compensation programme coordination
Total		**R60,1 million**	

In addition to the operational costs set out in Table 2, TGME should also cater for the likely capital expense and once-off initiation costs. These costs include specific detailed catchment rehabilitation planning (R400 000), installing requisite flow meters or gauging weirs (R500 000), and establishment of invasive biomass processing facilities, compost making and seed collection, and related expenses (R2 million) as well as a contingency amount of R1 million.

[13] Over the 10 -12-year timeframe of the Compensation Programme, including inflation at 6%.
[14] This is insufficient to cover the full administration overheads of NGO implementation. It assumes some co-finance from elsewhere. This amount cant be stipulated upfront, but must be agreed by implementing parties.

7. Proposed Institutional and Implementation arrangements for Compensation Programme

7.1 Institutional arrangements for implementation

There are three broad functional areas to propose institutional arrangements for: 1) the catchment coordination and planning of clearing, fire management and revegetation operations; 2) implementation of rehabilitation measures; and 3) the monitoring, measurement or auditing of outcomes. While it is not proper for a consultant (or a regulator) to dictate which service provider should be used for a specific function, there is merit in providing guidance as to which might be best placed, have demonstrated competency and ability to deliver in the recent past, or might otherwise be key for a successful intervention.

As outlined in Botha et al (2020), there is a need to improve coordination between role-players involved in natural resource management and rehabilitation in the Blyde River Catchment. Collaboration with neighbours is vital in planning effective IAP control and fire prevention and management interventions. There are synergies to be gained and costs to be avoided by planning control and rehabilitation across catchments as well as from working with ecological realities and not property boundaries. Although the role of coordination and planning would ideally be played by a governmental agency, historical issues, mandate differences and entrenched roles have made this all but impossible over the last two decades. Private groups, especially PBOs, with little vested interest except effective rehabilitation outcomes, are better placed to provide this coordination function (unless policy or mandate issues are resolved in coming years).

Contrary to most people's initial perception, ecological rehabilitation is not easy or achieved without close and full-time attention. There is strong evidence for the benefits of using specialist, contracted expertise to develop the requisite rehabilitation plans and strategies, and to implement these with guaranteed, predictable funding over the medium to long term. Even natural resource management companies (like neighbouring forestry operations) tend to treat alien control as ancillary to silviculture, with part time teams or intermittent operations. The evidence of the failure of this approach is apparent around Pilgrim's Rest and the wider Blyde Catchment. Mining companies tend not to have the right expertise, approach or systems to pursue effective ecological rehabilitation. The use of dedicated service provides is strongly encouraged.

Some functions may well have sole source imperatives as there may only be one group with the appropriate expertise, or one organisation that is ideally placed to provide that role in the broader catchment. Private or PBOs implementers can pursue this much more easily that the state. The constraints imposed by the PFMA, especially on procurement, BBBEE prescriptions, and the short contract time frames and budget inflexibility, imply that no statutory agency is well placed to physically implement most of the rehabilitation. Indeed, data from the Southern and Eastern Cape has shown that private and NGO groups are usually 50 – 70% cheaper than state implemented or WfW NRM funded projects. Moreover, if the state were to be indicated as the preferred implementer to receive rehabilitation funds from TGME, a player/referee problem would be created. For the best chance of effective rehabilitation, it is crucial that privately sourced funds be directed through public benefit type organisations and through

implementation agreements governed by contractual law and clear ecological outcomes. It is not appropriate to transfer compensation resources to state entities[15].

While it is likely that some of the licence or authorisation conditions will require TGME to monitor and report on a range of parameters of environmental performance, there might be some that need to be independently assessed and audited. Given the sensitivity of the Blyde River catchment, and for risk aversion and a higher duty of care, it would seem appropriate for key metrics to be subject to frequent independent performance auditing. TGME will need to fund and maintain some key equipment, especially two river flow meters and turbidity or sediment measuring devices to determine the outcomes of the replenishment activities, and to be used for monitoring and auditing.

Table 3. The various functions to be discharged for effective rehabilitation as ecological compensation, the likely scope of those functions, and which organisations are well placed to deliver them for TGME.

Function	***Scope***	***Proposed Institution***
Coordination	Manage process to develop catchment rehabilitation plans, coordinate landowner forums, engage with FPA, CMF. Provide compliance information and recommendations to DFFE (& DWS).	K2C, reporting to the FPA and CMF (or sub-committee)
Implementation of IAP control, revegetation, fire belts	Source and train IAP control and rehabilitation teams. Execute clearing plans, integrated with fire management and biocontrol.	Private or NGO service provider. K2C could also play this role.
Biocontrol Program	Locate, select, develop, apply for approval and release of suitable destructive biocontrol agent for Silver Wattle. Mange release and maintenance project with DFFE NRM.	UCT/UKZN (with ARC PPRI researchers)
Monitoring	Collect data from instream flow meters, progress and efficacy of clearing and follow up operations. Monitoring success of erosion control and revegetation actions. Report to TGME and Catchment Management Forum (including DWS and DFFE)	SAEON and/or Consultants
Auditing	Audit progress with more detailed catchment rehabilitation plans, and work of other implementing agents	K2C or Consultants
Assume oversight in case of TGME breach	Take over the roles and responsibilities for overseeing the compensation programme. Ensure financial guarantee or other funds disbursed to implementers, and implementers pursue objectives and compensation program targets.	Catchment Management Forum (including CMA reps, the WUAs, SANParks)
Technical Compliance monitoring	Ensure various conditions are adhered to by TGME, and specific terms of Implementation Agreement for Compensation Program are not breached	DMRE, DFFE & DWS coordination

7.2 Financial Provisions

Effective rehabilitation will only be successful with guaranteed and committed resources. In the medium to long term. Ten years is the minimum sensible programme horizon to achieve a modest gain of ecological condition and function in this landscape. It is likely impossible to effectively control pernicious IAPs in a shorter period. While the climate is generally mesic, it is still

[15] Any private funds flowing to statutory departments may also trigger other anti-corruption measures and further complicate compliance management and enforcement.

not easy to establish good indigenous grass cover in a shorter period. What follows are some considerations for effectively funding the required ecological compensation.

7.2.1 Financial provisions under S24P of NEMA – Legacy & Closure

It is unclear whether the proposed rehabilitation would fall into the ambit of Section 24P of NEMA which defines what activities must be catered for and the suite of options available to mining companies. If it is beneficial from a tax and financial planning perspective to treat the required activities and funds as 24P compliant, then an argument can be advanced to do so.

However, there is a serious constraint on the implementation mechanism of the financial provisions if for some reason TGME fails to deliver on its program. The DMRE (and indeed most regulatory departments) would almost certainly not be able to deliver on the implementation outcomes for the same cost if they were to call on the guarantees. Moreover, there is jeopardy and potential for unintended consequences should the financial provisions be made available to any organ of state. This might cloud the ability for any regulator to provide critical oversight of achieving the outcomes. And private funding flows to government entities create a situation encouraging budget substitution which may weaken the imperatives of government to play its statutory role in protecting, maintaining and improving the Blyde River catchment and surrounding protected areas. For these reasons, it would be prudent to rather place the guarantee in the name of a dedicated PBO that is focused on ecological rehabilitation of catchments, and which may be able to leverage the guaranteed resources to achieve the requisite outcomes.

The Financial Provision report for section 24P of NEMA references this compensation plan, and does not duplicate the financial guarantee in favour of the implementer to ensure the ecological compensation is achieved.

7.2.2 Funding the Compensation Programme – Guarantee/Performance Bond

The compensation programme will require once-off investments and ongoing costs for over a decade. Once-off costs are required for set up, planning, some expensive technology items (that need to be itemised) and the outsourced biocontrol programme. It is envisaged that these costs are incurred in the first year of operation on receipt of final regulatory approval.

Table 4. Capital and once-off costs to facilitate effective rehabilitation. Some of these costs will be required for standard mine rehabilitation practices anyway but can serve for landscape rehabilitation too.

Capital/ once off costs		**Cost per unit**
Outsourced		
Catchment	B60B Rehabilitation, Clearing & Fire Plan	R 200 000
Catchment	B60A Rehabilitation Clearing & Fire Plan	R 200 000
Biocontrol Program	Locate, assess, approve, release at least 1 agent	R 2 000 000
Stream flow meters	X2 downstream of Pilgrims creek junction	R 500 000
Inhouse		
Nursery set up	For dump rehabilitation, revegetation, biocontrol housing and production etc	R 2 000 000
Contingency		R 1 000 000
Total		**R 5 900 000**

Ongoing rehabilitation costs can be separated into institutional costs (funding an organisation to coordinate and audit the rehabilitation programme) and the actual likely implementation costs

for the various activities. The totals (including inflation) for these cost items are set out in Table 5. These have been developed in a detailed spreadsheet with a range of assumptions, and indicative scheduling to spread out the major activities into annually achievable work packages. This spreadsheet is to be interrogated and used for indicative purposes only – more detailed implementation plans will be required for contracting between TGME and specific service providers.

Table 5. A summary of operational costs (inflated at CPIX of 6%) for the ecological compensation programme over the full 12 years of implementation, broken down by component.

Rehabilitation costs 12 Year program	Institutional overheads Administration	Rehabilitation Revegetation	Rehabilitation Fire belt	Rehabilitation IAP control & biocontrol	Summary All operations
Total outlay	**R 5 988 657**	**R 39 121 458**	**R 1 713 607**	**R 9 924 769**	**R 58 245 655**

To provide the requisite surety that the compensation measures will be delivered over the 12-year term of the programme, a guarantee is required. The simplest means to quantify this guarantee is to use a net present function to quantify the remaining funds identified for the activities. To do this, TGME could secure/extend its existing financial guarantees to include the costs of the rehabilitation – which implies a variable guarantee amount (and one that declines over 11 years). If TGME is in unrectified breach of any of its commitments or conditions of authorisation/licencing or continued mining, then the entire amount applicable in that would become payable to the PBO who would be bound to implement it. This would need to be overseen by the CMF or a suitable structure in the catchment.

Alternatively, TGME could opt to invest the entire upfront sum with a suitable PBO or structure that has been established to oversee rehabilitation of the Blyde catchment.

Table 6. A breakdown of the likely annual costs for effective rehabilitation, indicating the cash flow impacts and Net Present Value of the remaining costs of the compensation programme. Based on 2021 values.

Compensation Annual costs				
		Compensation		NPV
Yr1	R	3 050 892	R	44 344 299
Yr2	R	11 693 102	R	44 968 521
Yr3	R	7 648 521	R	36 236 931
Yr4	R	10 376 919	R	31 132 779
Yr5	R	9 142 951	R	22 603 132
Yr6	R	8 091 059	R	14 658 137
Yr7	R	2 044 436	R	7 151 548
Yr8	R	2 053 042	R	5 561 645
Yr9	R	1 379 125	R	3 820 869
Yr10	R	1 461 872	R	2 659 060
Yr11	R	1 303 737	R	1 303 737
Total Operations	**R**	**58 245 655**		

8. Proposed Conditions for Water Use Licences and Environmental Authorisations

The following measures are proposed as a fundamental part of the conditions that should be imposed on TGME for the right to continue mining in a nature reserve and to operate in the listed Malmani Karstlands ecosystem and the Blyde River Catchment Freshwater Ecosystem Priority Area and class 1 Water Resource. They are not necessarily exclusive or meant to displace any other required mitigation and are designed to address the primary bio- and geo-physical threats to ecosystem integrity and function. If sections 8.1, 8.2 and 8.3 are effectively and comprehensively dealt with in the Mine Rehabilitation and Closure Plan, then they can be omitted from conditions of authorisation.

8.1 Removal of legacy infrastructure & amelioration of historical impacts

As a commitment to addressing legacy impacts, and pursuing good corporate stewardship in and around the addition to Morgenzon FNR, TGME should:

- Control all invasive alien plants (IAPs) within 1km of the existing mining operations that it intends to continue mining on under MR83, including Frankfort, Clewer-Dukes Hill – Morgenzon mine complex, Beta Mine complex, as well as within 1km of the Processing plant, as per Diagram 1.
- Where appropriate and legally permissible, rework and reshape the existing mining waste rock dumps and tailings deposits at the above mining operations, with a view to returning the waste rock underground, to leave the landforms and Peach Tree Stream in a stable state that permits the continued functioning of natural geomorphological processes.
- Where appropriate and legally permissible, remove and repurpose all redundant, broken, and unusable mining infrastructure from the above mining operations.
- Rehabilitate, subject to any required licences or permits, the existing river crossings on the Blyde River and Peach Tree stream.
- Incorporate the above activities into the mine closure objectives, plan, and reports, subject to compliance with rehabilitation and closure laws.

8.2 Rehabilitation of prospecting roads at Iota & Theta

TGME should, in addition to the revegetation of currently alien infested land noted in section 8.4:

- Repair and rehabilitate as far as technically feasible all the prospecting and access roads constructed on the Iota and Theta hills, as per the attached Diagram (Diagram 2). The objective of this rehabilitation is to restore the natural landform to substantially replicate what existed prior to this disturbance, to prevent soil erosion, to inhibit the establishment of alien and invasive species, and to allow the natural regeneration of indigenous biodiversity.
- Revegetate the disturbed areas with a suitable mix of indigenous species as approved by the MTPA.

8.3 Delineation & Management Plan of addition to Morgenzon Forest Nature Reserve

TGME should:

Provide technical assistance as may be required, to the statutory entity responsible for the Morgenzon FNR, to effectively delineate its current and future intended mining operations, provide for any other zonation required, and to draft a Management Plan for the effective management and rehabilitation of the FNR.

8.4 Implementation of the Compensation Programme

As a requirement of the Ecological Compensation Report in the EIA process, the following must be included as specific conditions of authorisation. To comply with required mitigation and their commitment to good corporate stewardship in the Blyde Catchment, TGME must:

8.4.1 Within 6 (six) months of issue of the final regulatory approval for the listed activities, commence implementation of a comprehensive Ecological Compensation Programme, aimed at rehabilitating the ecological and hydrological functioning of parts of the upper portions of the Blyde River Catchment (in quaternary catchments B60A and B60B), and replenishing the licenced abstraction volume as provided for under N permit reference 1351N or any subsequent licence issued under Section 21(a) of the NWA (Act 36 of 1998) (such replenishment being not less than 300 000m^3 per year) by *inter alia* funding the planning, coordination and implementation of invasive alien tree (IAP) control efforts, revegetation, and fire belt implementation, as set out in the Ecological Compensation Programme (set out in more detail below);

8.4.1.1 Provide, to an appropriate organisation with the requisite expertise and experience related to developing, assessing, and releasing biocontrol agents, an amount of R2 million (Two million Rand) to pursue the development, release and augmentation of an effective destructive biological control agent for Silver Wattle (*Acacia dealbata*).

8.4.1.2 Control at least 273 condensed hectares (an area equivalent to 100% dense infestation) of invasive alien trees located within and immediately adjacent to the Farms Ponieskrans 543 KT, Morgenzon 525 KT, Peach Tree 544 KT, Grootfontein 562 KT in and around the addition to Morgenzon Forest Nature Reserve (FNR), and Graskop 564 KT (portion 25) and Desire 563 KT (designated as the Graskop Grasslands Unique Natural Community and managed by MTPA), and the immediate surrounding land parcels (shown in Figure 3). This control must be to a level of no seeding adult trees, and an IAP canopy coverage less than 1%, within 7 years of issue of the final regulatory approval for the listed activities subject to this authorisation.

8.4.1.3 Control, through regular and repeated reconnaissance and control measures, all invasive alien trees within the riparian Zone of the Blyde River, from the applicant's water offtake point on the Farm Grootfontein 562 KT, down to the boundary of the Provincial Blyde River Canyon Nature Reserve at Bourke's Luck Potholes. Where there is doubt as to the boundary of the riparian zone, it can be defined as the land within 100m of the centre line of the Blyde River.

8.4.1.4 Implement annually at least 11km of a fire belt and a related control measures program, in conjunction with affected adjacent landowners, MTPA and the Lowveld Escarpment Fire Protection Association, on the 2021 addition to Morgenzon FNR and the Graskop Grasslands Unique Natural Community. Where required in writing to do so by a statutory management authority, the applicant must as far as reasonably possible support fire suppression and/or controlled burning regimes through the provision of labour, equipment, and in-kind support on these areas.

8.4.1.5 Implement erosion and sediment control operations on all areas (at least 370 ha) cleared of invasive alien trees and other susceptible areas, by revegetating all cleared areas with indigenous plant species (especially grasses native to the region) to the level of a cover of at least 15% within 10 years, with the objective of removing unnatural levels of sediment input into the Blyde River system.

8.4.2 TGME must use its best endeavours to, within 6 (six) months of the date of authorisation, conclude an implementation agreement with a suitable service provider that has experience and expertise in invasive alien tree control and

ecological rehabilitation in the region, preferably including statutory nature reserves. This implementation agreement shall cover, amongst other things set out in any applicable statutory guideline, the following:

8.4.2.1 the objectives and specific targets for the Ecological Compensation Program set out herein (and provided in more detail in the Report on "*Ecological Compensation in the Blyde River Headwaters*" by Mark Botha dated 13 April 2022)

8.4.2.2 clearly defined areas for control and rehabilitation, and time frames and milestones for achieving the required ecological compensation targets (including the biocontrol program), and a detailed activity plan that must be submitted to the Regional Office of the Natural Resource Management Program of the DFFE, the Head: Water Regulation in the regional office of the DWS, and the Director for Conservation: MTPA

8.4.2.3 institutional arrangements for implementation, monitoring, auditing, oversight, alignment, and coordination with other relevant parties,

8.4.2.4 provisions for managing breach, rectification, withdrawal, arbitration, and penalties

8.4.2.5 financial arrangements for the investment of an amount of not less than R58,3 million (fifty-eight comma three million rand), being the estimated amount of operational costs necessary for delivering the ecological compensation over the planned 11-year Compensation Program, <u>and</u> financial guarantees for this amount in favour of the implementing agent.

8.4.3 TGME shall notify this office, and the DFFE, DWS and MTPA of:

8.4.3.1 Conclusion of the implementation agreement and financial guarantee provision;

8.4.3.2 progress with implementation at least annually, especially regarding the measurement of replenishment and sediment reduction objectives;

8.4.3.3 the emergence of any issues frustrating implementation that may require authorities' action, intervention, and/or enforcement functions;

8.4.3.4 the outcomes of all independent audit reports;

8.4.3.5 the successful completion of the Ecological Compensation Program.

8.4.4 This authorisation shall be of no force and effect until such time as the Implementation Agreement is concluded with a suitable party, <u>and</u> the financial guarantee or other arrangements acceptable to the implementing party is in place, and both agreement and guarantee submitted to this office, DWS, DFFE and MTPA.

8.5 Mine closure objectives

If not already effectively incorporated in mine rehabilitation and closure plans, TGME shall include, as a component of the Mine closure objectives for listed activities, the following:

- Recognising the need to secure the Blyde River catchment as the heart of a strategic water source area, the closure objective should be to return all the disturbed areas to a stable landform that is not subject to excessive erosion or subsequent invasion by invasive alien trees
- Leave the surface area of the Morgenzon Forest Nature Reserve and the rehabilitated section of the 'Graskop Grasslands Unique Community' in at least a maintenance phase regarding the control of IAPs, with no seeding adult trees, and an invasive alien tree canopy coverage less than 1%, and a canopy cover of indigenous vegetation of at least 100%. The objective should be to leave a landscape that supports achieving the gazetted Resource Quality Objectives of the Blyde River.

9. Record of consultations

It is not possible to capture all the detail of discussions, minutes and outcomes of the consultations held. The EAP holds the recordings and/or minutes of these meetings should they be required.

7 July 2020. Initial engagement with DWS on appropriate mitigation, resource directed measures, replenishment and pursuit of RQOs. OMI offices Pretoria.

5 October 2020. Initial engagement in DFFE offices (Forestry, Protected Area and Biodiversity branches) on appropriate mitigation, and conditions for continued mining.

19-21 October 2021. Field visit with DFFE, MTPA, K2C, SANParks, DARDLEA to impact and compensation sites

20 -21 February 2022. Presentation of Compensation Program outline to NGO partners in Hoedspruit- CSA, TNC, K2C.

9 March 2022. Ecological Compensation Program report circulated to MTPA, DARDLEA, DFFE, DWS, SANParks, K2C, SAFCOL and LEFPA for comment and input.

3-4 March 2022. Site visit & Workshop with Forestry Branch DFFE, on National Forest Act permits, impact management, compensation objectives, and alignment of authorisation processes.

1 April 2022. Online presentation of Ecological Compensation Program to DWS (Region & National offices) to elicit comments.

12 April 2022. Online presentation of Ecological Compensation Program to Blyde Water Users Association and MTPA scientific services to elicit comments.

This Ecological Compensation Program and the proposed Conditions for Continued Mining were circulated to a wide range of stakeholders (DFFE, SANParks, DARDLEA and commenting authorities, SAFCOL and LEFPA) on 9 March 2022 and recirculated on 1 April 2022.

10. Comments & Response table

#	***MTPA – Brian Morris***	***Response***
M1.	I do believe that this is a sound proposal in general and that the proposal will require further refinement as regulatory processes proceed. I am in full support of the focus on clearing IAPs and on restoring the Blyde River up to Bourkes Luck potholes as well as the other heavily infested areas (Peach Tree, Ponieskrans, Pilgrims Creek)	Noted & agreed
M2	With regard to the revegetation of areas cleared of IAP. I do acknowledge that the greatest effort in terms of clearing will be focused on Silver Wattle, however one should not under-estimate the impact of Bramble/Bracken and the extent of Bramble infestation within the same areas where Wattle is to be controlled. Working on similar sites within the Kaapsehoop area for the past four years where rehabilitation was conducted on clear felled forestry compartments as well as areas which were 100% infested with Wattle/Pine stands. Clearing of many of these areas if left unchecked will result in colonization by other invader plants such as Bramble as well as Bracken fern which	Noted and concur. There are revegetation protocols that have been developed for other mesic grasslands to manage reinvasion by bracken and bramble. Indeed, it might be necessary to introduce closely managed high intensity grazing by goats – which has proven to be the most effective and cost-efficient method of control in the Eastern Cape. However, the Program indicates that the specifics of the approach must be developed by the implementer, and approved by MTPA (and other regulatory authorities in the Steering committee). There is budget for 4 years of post-clearing follow up and 2 years of post-revegetation follow up. If these

	eventually will negate any rehabilitation efforts (such as re-seeding of natural grasses). An approach which restores the area to natural vegetation (re-seeding grasses / indigenous trees and shrubs) is highly likely to fail unless the areas is also cleared/kept clear of Bramble/Bracken and other pioneer plants. There are good examples in Kaapsehoop area (similar environment to Blyde Quartzite grasslands) which have been rehabilitated and which require constant hands-on approach to ensure that these areas remain at 'maintenance level' ito alien plants.	are insufficient, please advise us and suggest appropriate funding requirements.
M3	I also agree that implementation of such a compensation package would be best done through a independent and appropriate NGO or private contractor with the requisite experience with regard alien invasive clearing and rehabilitation work.	Agreed.
#	***MTPA – Frans Krige (12 Apr 2022) online input***	***Response***
F1	TGME needs to make additional plans regarding sustainability to ensure that the lessons of past WfW alien clearing are not repeated, and that a sustainable outcome is reached.	Noted. However, it is not TGME's responsibility or liability to ensure the full rehabilitation and sustainable management of state protected areas. Any conditions of authorisation must pass the administrative justice and reasonability tests. TGME can contribute to initial rehabilitation and leave the PAs in a low-cost maintenance phase for the state to manage. But it is the State's responsibility to proactively protect and manage the protected areas and water resources of the Blyde Catchment and not just rely on regulation.
F2	TGME needs to combine dedicated patch burning requirements in the rehabilitated areas to assist with IAP control, and promote grass establishment.	This would be ideal. However, as they are not the landowner, it is not possible to require TGME to contract with WoF to undertake controlled burns on State PAs, and this introduces an additional layer of liability that they should not assume. The Compensation Program will create a robust platform for additional state and other landowner investment in key actions – such as patch mosaic burning or controlled burns to manage regeneration.
#	***Dr P Ackerman and echoed by Dr W Roets – Professional & not formal DWS input***	***Response***
W1	Herewith my own view, not necessarily that of our Section. Rehabilitation and compensation to focus on all watercourse characteristics namely surface flow, interflow, groundwater flow, water quality, geomorphology, habitat, biota.	Noted Rehabilitation of impacted areas is pursued separately through the EMP/EMPr. Compensation Program focuses on IAP control, revegetation, fire and sediment control. These are mostly upland interventions for which no additional WUL or EIA will be required. It is unclear how the focus on the suggested additional characteristics could be approached or achieved.
W2	Naomie Fourie section can assist with the forestry stream flow/ rehabilitation/ buffer issues. As far as I am concerned there should not be forestry in protected areas.	Appreciated.
W3	Alternatives must be investigated as mandatory requirement for any WULA. One alternative must be closure/ rehabilitation. Another can be less intensive much smaller scale mining with participation of tourists, another can be nature conservation and tourism. Alternatives should also be compared with long term	Assessing alternatives is being done as part of the EIA and WUL. Note that the long-term sustainability of conservation/ tourism is in jeopardy as there are no dedicated budgets for the former (except in private Mt Sheba PNR), and the latter is under threat of

	sustainability in mind like nature conservation/ tourism and compatibility with a SWSA.	failing infrastructure and security concerns in the region.
W4	Decant areas & Plan of Treatment of decant pollution to be shown	To be done in WUL
W5	• Influx of people and crime and WWTW to be addressed. • Police to deal with illegal miners	WWTW has been recently upgraded, but river *E. coli* still indicate significant faecal pollution. Although there have been several actions against illegal miners, there is no evidence of the state's ability to control the problem sufficiently, or to prevent access to the mineral resource. Allowing formal, regulated mining is the ONLY mechanism that has been shown to work elsewhere in SA.
W6	The economic impact to protected areas because of visual impacts to Sense of Place also to be considered. • At this stage I don't think the gold mining is compatible with such a sensitive river as the Blyde, a SWSA or in Protected areas and this good principle is applied by SANPARKS for National Parks and I think other conservation authorities, protected areas, DWS SWSA should follow suit.	Recall that the region has >140 years of mining impact. Restarting underground operations will not increase this impact. Greater impacts on sense of place result from heavy infestations of invasive trees, illegal mining and clearing of riparian forests, soil erosion and general lawlessness. More importantly is that Gold mining is underway and will continue regardless of TGME being licenced or not. While it is agreed that mining and protected areas are generally incompatible, in this instance the mining came first, and it would seem that regulated mining is able to provide resources to rehabilitate the Blyde without undue new impacts. Otherwise, the burden of rehab and control of illegal activity will fall entirely on the state, and there is no evidence that funds are being made available, or enforcement being effective.
#	***Dr P Meulenbeld comment to Mr S Macavele 28 March 2022***	***Response***
P1	Background on this application was gained during a meeting, site visit (September 2019), meeting on 8 July 2020 and the documentation review. The following documentation was reviewed: 1. TGME Limited letter to DFFE, of 8 March 2022 titled Declaration of certain state forests properties in Mpumalanga Province as forest nature reserves 2. Ecological compensation for mining in a sensitive environment report by Conservation Strategy Tactics & Insight, dated February 2022. The fact that the area has been mined for gold since 1873 is recognized and the authorized water uses for the current operation. The threat of uncontrolled, illegal mining can only meaningfully be mitigated through responsible mining.	Noted
P2	The benefit of alien vegetation control on the hydrology of the various watercourses must be assessed through the installation of continuous monitoring weirs at various strategic locations in collaboration with the DWS. Various meteorological stations must be established in these catchments to correlate the weather with flow patterns.	Agreed. This is planned for – see comment above regarding outsourcing to SAEON.
P3	Resource quality objectives of the upper Blyde River to be met.	It is impossible for TGME to meet this on their own. Ecological Compensation Program is a Key opportunity to assist the broader catchment
P4	Water quality must be analysed at strategic points as per WUL set parameters and conditions. Biomonitoring on a frequency of twice a year is critical in the various catchments.	Noted and incorporated in recommendations – aligned with aquatic report

P5	Provide a method statement how alien vegetation will be controlled along watercourses as oil, petrol and pesticide pollution is evident at other localities and projects.	Preferred Implementing partner to provide this as part of Rehabilitation Plan funded by Compensation Program. TGME will require adherence to best practice and minimum norms & standards of contracted partner.
P6	• Siltation of water courses must be prevented. No direct discharges into the watercourses and adequate erosion protection on alien vegetation cleared slopes. Provide detail how this will be achieved.	Preferred Implementing partner to provide this as part of Rehabilitation Plan funded by Compensation Program. TGME will require adherence to best practice and minimum norms & standards of contracted partner. Discharge is a WUL issue.
P7	When underground mines are re-opened, many of these will be flooded and how this water will be dealt with must be provided in full detail.	Issue dealt with in WUL submission.
P8	• Water treatment is an essential requirement. Underground water, return water dam, excess process water, and other surplus water must be treated according to DWS set standards and released as per aquatic specialist requirements. Freeboard must be maintained at low risk levels in this ecological sensitive area. Recent river pollution incidents in South Africa demands stricter control, management and preventative measures.	Agreed. issue dealt with in WUL submission. There is an opportunity to discharge the treated water to the river (dry season) to mitigate EWR and RQOs, or to groundwater (wet season) to allow longer term release and dam yield.
#	***SANParks – Dr E Riddel, Dr M Coetzee***	***Response***
	Detailed comments and edits submitted in the document which have been addressed and/or incorporated. Summarised below	
S1	Intended community beneficiation aspects arising from the compensation strategy were not clear and should be made explicit. Include reference to biomass enterprise opportunities	Noted. Apart from the significant work and job opportunities created, there is planned beneficiation of biomass into useable growing medium for revegetation, firewood for the informal market, charcoal for the formal market, and biochar for wastewater amelioration and soil amendments. This is being considered in the Social and Labour Plan and the Closure Plans.
S2	Align the Compensation Program with the DFFE Guideline on Implementation of Biodiversity Offsets and Ecological Compensation	Noted. It is aligned to the best of our knowledge. Although this emerging policy field is rife with differing perspectives and a robust community of practice and regulatory approach is yet to emerge
S3	Agreed with approach of clearing IAPs and especially Silver Wattle in Riparian areas due to the EvapoTranspiration demand of the species - however care will also need to be taken should this species now also be providing a socio-ecosystem service to locals e.g. firewood - this may require further socio-compensation considerations	Noted. Silver wattle not depended on for firewood due to remote location from Moremela. However, cleared biomass will be made available to locals.
S4	As discussed during the field visit 2021, there may be opportunity in the sedimentation (upstream regions) to create wetland conditions that provide assimilation and provision further baseflows (enhance current EGS within existing footprints)	The wetland specialists were not optimistic about this, as the karst is so porous, wetlands aren't easy to build and maintain. however, there might be options to install some physical structures to trap sediment
S5	Grazing of revegetated areas in PAs by wildlife, livestock? only if there is a good rangeland and grazing management plans	An idea submitted to the emerging Catchment Investment Program (K2C) is a herding for health project on the rehabilitated areas outside of the NRs and on the rest of the CPA land to get a grazing (mixed game/stock) return on top of improved hydrological outcomes. The current grazing regime is not tenable in a Class 1 catchment with open access grazing and unlimited fires
S6	Agree that there should be regular feedback to the Lower Olifants CMF. However due to the technical	Agreed. This Compensation Program has recommended such as technical forum, but it is up

	nature of this strategy it's important that a technical compliance sub-committee of the forum be established similar to that in Phalaborwa (the Inter-Company Water & Waste Management Committee, chaired by DWS). Having DFFE and DMR within this committee important.	to the 3 primary regulators to adopt it and meet regularly.
S7	An annual plan of operations required and reported to the technical compliance committee as mentioned previously	The Implementation Agreement caters for the APO and reporting to the technical compliance committee. Not possible to require this approach here as the departments demand their own M&E approaches are adopted and are unlikely to be dictated to by specialist reports
S8	High temporal resolution aquatic bio-monitoring required to determine impacts of mine and compensation activities.	The Aquatic report (SAS) indicates the sensitivity and the temporal and spatial resolution for monitoring that must be compiled. DWS insists on rigorous flow and sediment monitoring.
S9	So the onus on this compensation strategy is to also ensure that the government sectors play their part? in addition to TGME - will their be measurable targets for this aspect also?	The Program proposes planning alignment and encouragement /budgeting to ensure government agencies are also meeting their duties of care. It is, however, unlikely that TGME can push its regulators to collaborate and discharge their environmental stewardship obligations.
S10	Presuming the offset strategy will motivate for cooler controlled fire to mitigate the risk from opportunistic invader species - who will be responsible for this TGME or the state?	TGME is not the landowner. (and has little experience with implementing burns). It is likely that MTPA and SAFCOL will be engaged to do the required patch mosaic burns under low-risk conditions and to help with the rehabilitation. TGME is merely providing resources to put fire belts in place prior to burning or as safeguards.
S11	As region moves into a regional climatic wet cycle the infestation potential will be increased - but what happens beyond life-of-mine (7 years) – will the follow up of control areas persist?	This Program is 11 years. ie. 4 yrs post LoM. however, if TGME is permitted to pursue phase 2a and 2b and even phase 3, there is likely 35 years of LoM to see through a wider scope of rehab and revegetation.
S12	We appreciate (*the potential investment in rehabilitation and the reduction in long term management costs*), state entities will need to make a commitment to maintain this program after life-of-mine (or to be included the proposed Catchment Investment Program)	Agreed
S13	Consider continuous monitoring required both through hydro observation and remote sensing (SEBS or SEBAL model or similar). And in-stream turbidity monitoring	Likely SAEON will be contracted to do flow, sediment, and catchment hydro modelling. and build it into a longer-term baseline for the catchment investment program.
S14	Key that legal/institutional due diligence is dovetailed with the financial due diligence. Should align with M&E, and contractual arrangements around that. Require independent performance auditing.	The 3 depts will have to ensure their legal due diligence and CM&E. However, they should not get too involved in the financial due diligence (for legal and mandate reasons). The financial auditing should be between TGME and its implementers and be transparent to regulators - but their role is one of noting only. Compliance auditing should be restricted to the physical outcomes, not finances.
S15	It is unclear if the CMF would have the powers or mandate to do any oversight over the Compensation Program (7.2.2). Propose a technical subcommittee with DWS, DMRE & DFFE	Noted. The role would be of transparency and accountability to water users in the catchment, and not one of legal compliance monitoring – which is the prerogative of DMRE, DWS, and DFFE.
S16	Agree that TGME should consider upfront lodging of suitable financial provision or guarantee with an implementing PBO.	Supported and required in authorisation conditions proposed.
S17	Support the proposed closure objectives in 8.5	Noted.

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