Sibanye-Stillwater's biodiversity footprint 2022 update

As per the Biological Diversity protocol

Group-level consolidated report

April 2023 Final

Prepared by the Endangered Wildlife Trust

Highlights

Sibanye-Stillwater undertook an initial biodiversity footprint assessment aligned with the Biological Diversity Protocol (BD Protocol)[1] in 2021. This assessment focused on the direct biodiversity impacts of Sibanye-Stillwater's direct operations. The aim was to complete a desktop assessment with the existing information, including identifying the gaps that need to be addressed going forward. Committed to a process of continual improvement and annual updates, until post mine closure or until a mine has been sold, Sibanye-Stillwater undertook an annual revision of its biodiversity footprint in 2022.

This report compiles the periodic changes to Sibanye-Stillwater's biodiversity footprint:

- Identifying any changes in the state of ecosystem assets, both in terms of extent and condition / integrity, which occurred in 2022,
- Recording the associated biodiversity gains and losses against the 2021 baseline assessment,
- Updating the Biodiversity Footprints (Total, Negative and Positive) of the Sibanye-Stillwater group, organising data per operation as well as per ecosystem asset category,
- Providing guidance on improvements going forward.

This assessment included the direct biodiversity impacts of Sibanye-Stillwater for its direct operations:

South African (SA) operations		United States of America (USA) operations
Beatrix	Ezulwini	East Boulder Mine (EBM)
Blueridge	Kloof	Stillwater Mine (SWM)
Burnstone	Kroondal	Columbus Metallurgical Complex (CMC).
Driefontein	Marikana	
Rand Uranium	Rand Platinum Mines (RPM)	

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[1] URL: https://www.nbbnbdp.org/bd-protocol.html

As per the BD Protocol, business impacts on biodiversity includes impacts on ecosystems and material species. As for the 2021 baseline assessment, this 2022 update report[2] compiles the net ecosystem impacts of both SA and USA operations.

Sibanye-Stillwater's ecosystem asset register / impact inventory now holds 44 ecosystem types, six more than identified during the 2021 baseline assessment. For SA operations, there are now 25 ecosystem types, one more than in 2021 (i.e. Norite Koppies Bushveld identified within the Marikana operations), with six as threatened as per the National List of Threatened Ecosystems. For USA operations, there are now 19 ecosystem types on the ecosystem asset register, five more than for the 2021 baseline assessment.

Furthermore, for this 2022 update assessment (current state in 2021 / 2022), the Total Biodiversity Footprint increased to 52 186,10 Ha, with around 85% of Negative Biodiversity Footprint (44 137,95 Ha eq.) and 15% of Positive Biodiversity Footprint (8 048,15 Ha eq.). From the 2021 baseline, Sibanye-Stillwater has seen its Total Biodiversity Footprint (TBF) increase by 2 257,80 Ha (4,52% growth), its Positive Biodiversity Footprint (PBF) increase by 1 624,03 Ha eq. (25,28% growth in the PBF / TBF ratio) and its Negative Biodiversity Footprint (NBF) increase by 633,77 Ha eq. (1,46% increase in the PBF / TBF ratio). This is primarily explained by the inclusion of new properties, whose ecosystems were assessed to be mostly in excellent or pristine, within the ecosystem asset register of USA operations.

Recommendations are organised around three main topics: completing and improving the biodiversity asset register, disclosure requirements and opportunities and target setting. Material changes to the 2021 baseline assessment recommendations relate to completing and improving the biodiversity asset register.

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[2] Preferred citation: Houdet, J., Teren, G., Nelson, B., 2023. Sibanye-Stillwater's consolidated biodiversity footprint. Update assessment as per the Biological Diversity protocol – Group level consolidated report. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater.

Contents

1. Key terms

Biodiversity (Biological Diversity

The international Convention on Biological Diversity (CBD 1992) defines "biodiversity" as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part. This includes diversity within species (genetic diversity), between species, and of ecosystems. Biodiversity is a critical component of natural capital.

Biological Diversity Protocol (BD Protocol)

The BD Protocol is the first standardised accounting framework that enables any organisation to identify, measure, record, compile and disclosure its biodiversity impacts. The BD Protocol focuses on impacts on ecosystems and material species. Genetic diversity is excluded at this stage.

Direct impact

In the BD Protocol, direct impacts refer to the changes in the state of biodiversity that can be directly correlated to the activities of your business. Indirect impacts involve third party, for instance in the broader landscape or down in the supply chain.

Direct operations

All operations that an organisation owns and / or has control over.

Biodiversity impact (or impact on biodiversity

The negative and / or positive effect of a business activity on the state of biodiversity (e.g. change in the extent and condition / integrity of ecosystems).

Biodiversity impact inventory /asset register

A list of all ecosystems and material species within the scope of a biodiversity footprint and accounting process, including information about their location, extent, condition/quality and other relevant factors.

Biodiversity Footprint (BF)

A Biodiversity Footprint is the sum of positive and negative impacts of an organisation on biodiversity over a given organisational and value chain boundary. The BD Protocol specifies that the *Total Biodiversity Footprint (TBF)* is made of a *Positive Biodiversity Footprint (PBF)* and a *Negative Biodiversity Footprint (NBF)*. For impacts on ecosystem, this sum equals the surface areas of ecosystems within the BF assessment boundary.

Positive Biodiversity Footprint (PBF)

Sum of surface areas of ecosystems adjusted for condition / integrity with the BF assessment boundary.

Negative Biodiversity Footprint (NBF)

Difference or gap between the reference or pristine state of all surface area (TBF) and the Positive Biodiversity Footprint (surface areas adjusted for condition).

Material species

The taxa (species and sub-species) that are important to internal and/or external stakeholders (e.g. regulators, lenders, NGOs, local communities).

Hectare equivalents (Ha eq.)

Hectare equivalents is a generic metric of ecosystem state, which is expressed as the extent (surface area) adjusted for integrity, condition or health. There are many other metrics of ecosystem state, which can be converted into Ha eq. through conversion tables.

Mitigation hierarchy

The hierarchy refers to the sequence of actions taken to (a) anticipate and avoid impacts on biodiversity; (b) minimise or reduce impacts where avoidance is not possible; (c) rehabilitate or restore when impacts have occurred; and (d) compensate or offset significant residual impacts. This concept is widely used throughout the world and is often embedded into national legislation as regards to environmental permitting.

2. Introduction and aims

The BD Protocol aims to enable any organisation, from any sector, to identify, measure, account for and consolidate its impacts on biodiversity for various business applications, from site management and internal reporting to external mandatory and/or voluntary disclosures, notably voluntary biodiversity commitments or targets for the Kunming-Montreal Global Biodiversity Framework of the Convention on Biological Diversity (CBD) adopted in December 2022[3].

Sibanye-Stillwater undertook an initial biodiversity footprint assessment aligned with the Biological Diversity Protocol (BD Protocol)[4] in 2021. This assessment focused on the direct biodiversity impacts of Sibanye-Stillwater's direct operations. The aim was to complete a desktop assessment with the existing information, including identifying the gaps that need to be addressed going forward. Committed to a process of continual improvement and annual updates, until post mine closure or until a mine has been sold, Sibanye-Stillwater undertook an annual revision of its biodiversity footprint in 2022.

This report hence focuses on compiling the periodic changes to Sibanye-Stillwater's biodiversity footprint. The intended goals were as follows:

- Identifying any changes in the state of ecosystem assets, both in terms of extent and condition / integrity, which occurred in 2022,
- Recording the associated biodiversity gains and losses against the 2021 baseline assessment,
- Updating the Biodiversity Footprints (Total, Negative and Positive) of the Sibanye-Stillwater group, organising data per operation as well as per ecosystem asset category,
- Providing guidance on improvements going forward.

This report is organised as follows:

- Section 3: Methodology,
- Section 4: Results,
- Section 5: Discussions and recommendations going forward.

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[3] URL: https://www.cbd.int/article/cop15-final-text-kunming-montreal-gbf-221222
[4] URL: https://www.nbbnbdp.org/bd-protocol.html

3. Methodology

As per the BD Protocol, assessing the biodiversity footprint of an organisation involves three main activities: (a) Setting organisational and value chain boundaries, (b) developing the biodiversity impact inventory (or asset register) development and (b) biodiversity accounting. The full methodology is presented in the consolidated 2021 biodiversity footprint assessment and its associated individual reports for each operation, listed in alphabetical order as follows:

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's **consolidated biodiversity footprint**. Pilot assessment as per the Biological Diversity protocol – Group level consolidated report. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater.

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: **Beatrix**. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater;

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: **Blueridge**. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater;

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: **Burnstone**. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater;

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: **Driefontein**. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater;

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: **Ezulwini**. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater;

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: **Kloof**. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater;

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: **Kroondal**. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater;

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: **Marikana**. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater;

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: **Rand Uranium**. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater;

- Houdet, J., Teren, G., 2022. Sibanye-Stillwater's biodiversity footprint. Pilot assessment as per the Biological Diversity protocol: **Rand Platinum Mines**. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater;

- KC Harvey Environmental, LLC, 2021. Biodiversity Impact Assessment. **US PGM Operations;**

- KC Harvey Environmental, LLC, 2022. Biodiversity Impact Assessment. **US PGM Operations.**

This report focuses on updating the biodiversity footprint of Sibanye-Stillwater for 2022. This involved:

- Understanding changes to the organisational and value chain boundaries (section 4.1),

- Identifying / recording changes to the biodiversity impact inventory (section 4.2),

- Accounting for new baseline impacts (for new ecosystem assets) (section 4.3),

- Accounting for biodiversity gains and losses from the 2021 baseline impact inventor (section 4.4).

3.1   Changes to organisational and value chain boundaries

When defining the organisational boundary of a biodiversity impact inventory, two approaches are available as per the BD Protocol: the equity share and control approaches. For companies with joint entities, the organisational boundary and the resulting biodiversity impact inventory may differ depending on the approach used. In both wholly owned and joint entities, the choice of approach may change how biodiversity impacts are categorised when value chain boundaries are set.

Sibanye-Stillwater elected to focus on the direct impacts[5] of the direct operations[6] it has control over in its 2021 baseline assessment. Sibanye-Stillwater's baseline biodiversity footprint assessment covered:

- South African (SA) operations: Beatrix, Blueridge, Burnstone, Driefontein, Ezulwini, Kloof, Kroondal, Marikana, Rand Uranium and Rand Platinum Mines (RPM)

- United States of America (USA) operations[7]: East Boulder Mine (EBM), Stillwater Mine (SWM) and Columbus Metallurgical Complex (CMC).

For this 2022 update, Kwezi was added to Kroondal, part of SA operations while two categories of properties were added to the USA operations: (1) SMC deeded properties located outside the operating boundaries and used primarily for ancillary activities by US PGM Operations, and (2) SMC deeded properties located outside the operating boundaries and designated as conservation easements. A baseline biodiversity footprint assessment was required for the direct biodiversity impacts of all these new properties.

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[5] As per the BD Protocol "For biodiversity impact accounting and reporting within the context of the BD Protocol, direct impacts constitute changes in the state of biodiversity which are caused directly by your business activities. In other words, direct impacts involve business impact drivers which can be traced to specific, verifiable biodiversity features, that is direct causal link between your company's actions (e.g. land clearing or ecosystem restoration measures) and a change in the state of ecosystems or taxa (e.g. decrease/increase in ecosystem condition, habitat loss/gain for several species). These impacts may be temporary (short-term or long-term), recurrent (e.g. seasonal, every time a specific activity is undertaken) or permanent impacts (e.g. built-up properties, such as office buildings or parking areas). For instance, the direct land footprint of your business operations leads to verifiable, on the ground changes in biodiversity. Similarly, water emissions may lead to verifiable changes in the state of freshwater ecosystems which can be attributed solely to your company, for instance when streams or wetlands are wholly contained within its direct operations or where it is the only significant polluter within the catchment."

[6] The value chain boundaries of the BD Protocol differ from the three scopes of the GHG Protocol. In line with the Natural Capital Protocol (Natural Capital Coalition 2016, the BD Protocol first recognises three major parts of the value chain:
• Direct operations (gate-to-gate), which cover activities over which your business holds ownership or control;
• Upstream (cradle-to-gate), which covers the activities of suppliers;
• Downstream (gate-to-grave), which covers activities linked to the purchase, use, re-use, recovery, recycling, and final disposal of your business' products and services.

[7] KC Harvey Environmental, LLC, 2022. Biodiversity Impact Assessment. US PGM Operations.

3.2   Identifying and recording changes to the biodiversity impact inventory

As per the BD Protocol, compiling the biodiversity impact inventory of Sibanye-Stillwater involves identifying and recording the biodiversity components, or features, which are impacted by Sibanye-Stillwater's activities at the site. The BD Protocol recognises two main types of biodiversity impact accounts:

- Those that record impacts on ecosystems, and
- Those that record impacts on taxa (species and sub-species).

In other words, building Sibanye-Stillwater's biodiversity impact inventory means listing the ecosystem types and taxa (species and sub-species) that Sibanye-Stillwater interacts with at each site within its chosen organisational and value chain boundaries. Two main direct impact drivers were identified from operations: land use and water emissions.

For both the 2021 baseline and 2022 update assessments, the direct operational footprint of operations and relevant biodiversity state assessments (e.g., wetland assessments, species surveys) were supplied by Sibanye-Stillwater. No site verification was undertaken (i.e. only desktop assessments were performed). For any eventual assurance process, the title deeds of owned and leased landholdings would need to be checked. Full methodological details for the 2021 baseline assessment are available in the individual reports for each operation, listed in section 4 above.

3.2.1 Changes to the ecosystem impact inventory for 2022

For impacts on ecosystems, key input data include:

- Extent of ecosystem assets, including transformed areas using historical data (e.g., historical vegetation maps); expressed in surface area metrics (i.e. hectares in SA and acres in USA operations).
- The state of these ecosystem assets, as per various condition or integrity rating methods; expressed in surface area adjusted for condition metrics (i.e. hectares equivalents in SA and acres equivalents in USA operations).

The 2022 update assessment, changes to the ecosystem impact inventory of SA operations included:

- The inclusion of Kwezi operations into Kroondal[8],

- The update of wetland delineation and PES scores for Marikana, Kroondal and RPM,

- The rehabilitation of pits for Middelvlei (Rand Uranium),

The direct operational footprints were updated through refined analysis of overlap with the National Vegetation Map. Additionally, we refined delineation of wetland ecosystems and surrounding terrestrial areas which were previously delineated from satellite imagery including a large buffer. The updated wetland delineations were shapefiles supplied from Sibanye-Stillwater, with data coming from new assessments: i.e. SA Platinum Operations Ecologically Sensitive Areas Delineation- Wetlands: Sibanye-Stilllwater October 2022. WCS Scientific (Pty.) Ltd.: Kroondal Operations; Marikana (Big) Operations; Marikana (Small) Operations; RPM Operations.

With respect to water emissions, direct impacts on wetlands (i.e. spatial footprints of water emissions from Sibanye-Stillwater) were assessed through the analysis of specialist reports and satellite imagery where available.

For Marikana (Big), the updated wetland delineation for the Marikana operations did not cover a section of the Sterkstroom which flows through the assessment boundary. We used the North-West Biodiversity Spatial Plan 2015 Aquatic CBA1 layer to delineate this section. Provided artificial water sources were included as transformed terrestrial areas.

The delineation of ecosystems was then carried out through GIS using QGIS V3.28; available specialist reports and the following public datasets:

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[8] WCS Scientific 2022. Sibanye-Stillwater SA Platinum Operations. Ecologically Sensitive Areas Delineation. Work Package 3 – Other Sensitive Features KROONDAL.

- **Google Earth:** Satellite Imagery provide by Google. Imagery Date 2021-2022 (site dependent) (Maxar Technologies).

- **The National Veg Map 2018**: The Vegetation Map of South Africa, Lesotho and Swaziland (Mucina, L., Rutherford, M.C. and Powrie, L.W. (Editors). This layer produced by SANBI for the 2018 National Biodiversity Assessment and released in June 2019 contains at its finest scale a map of the distribution of 459 vegetation types within South Africa. Vegetation Types are defined as "*a complex of plant communities ecologically and historically occupying habitat complexes at the landscape scale*". Shapefiles were downloaded off the BGIS website http://bgis.sanbi.org/Projects.

- **NFEPA River Network 2011**: Council for Scientific and Industrial Research. NFEPA rivers 2011 [vector geospatial dataset] 2011. Available from the Biodiversity GIS website. This GIS layer summarizes the river condition, river ecosystem types and free-flowing river information that were used in deriving Freshwater Ecosystem Priority Areas (FEPAs) for river ecosystems.

- **National List of Threatened Ecosystems 2011.** South African National Biodiversity Institute. Available from the Biodiversity GIS website. The Biodiversity Act (Act 10 of 2004) provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), vulnerable (VU) or protected. The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems.

- North West Planning Units 2015. North West Province of Rural, Environment and Agriculture Department. 2015 North West Planning Units [Vector] 2015. Available from the Biodiversity GIS – website.

For USA operations, details regarding changes to the impact inventory are available in KC Harvey Environmental, LLC, 2022. Biodiversity Impact Assessment. **US PGM Operations.**

Various ecosystem or habitat condition or integrity rating methods are available throughout the world. Some may only be appropriate for specific ecosystems, depending on the context and the best available science. Two different ecosystem condition rating methodologies were used in the Biodiversity Footprint assessment of Sibanye-Stillwater SA operations, one for terrestrial bushveld

and wetland areas. A simple qualitative system was used for terrestrial ecosystems (Table A). For wetland ecosystems, the Wet-Health methodology[9] was selected (Table B) where available. For US operations, the NatureServe EIA method[10] and the approach to rapid field-based EIA[11] were adapted for ecological system condition scoring[12].

In the end, conversion tables were used to:

- Convert scores from various condition or integrity rating methods into numerical values (e.g., Wet-Health present state categories or scores range from A to F), ranging from 0 (completely transformed) to an appropriate maximum value (reference or pristine state),

- Adjust ecosystem asset surface areas for their condition or integrity (i.e. multiplying extent by the assessed condition / integrity value divided by the reference / pristine state value),

- Convert these different metrics of surface areas adjusted for condition / integrity into a single metric for group level consolidation purpose, in this case hectares equivalents (i.e. hectares equivalents or Ha eq.) and

- Sum them up to show the positive biodiversity footprint of Sibanye-Stillwater, which can also be expressed as a percentage of the total biodiversity footprint (see section 4.3 for more information on the total, negative and positive biodiversity footprints).

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

[10] Faber-Langendoen, D., W. Nichols, J. Rocchio, K. Walz, and J. Lemly (2016) An Introduction to NatureServe's Ecological Integrity Assessment Method. July 2016.

[11] Rocchio, F.J., T. Ramm-Granberg, and R.C. Crawford (2020) Field Manual for Applying Rapid Ecological Integrity Assessments in Upland Plant Communities of Washington State (Version 1.3). Report Number 2020-05. Washington Natural Heritage Program, Washington Department of Natural Resources, Olympia, Washington. October 2020.

[12] See more details in KC Harvey Environmental, LLC, 2022. Biodiversity Impact Assessment. US PGM Operations.

Table A: Terrestrial condition scoring system for SA operations

Rating		Description
0	Transformed	Complete losses of natural ecosystem structure, biota and basic ecosystem functions.
1	Seriously Modified	Extensive losses of natural ecosystem structure, biota and basic ecosystem functions have occurred.
2	Largely Modified	Large losses of natural ecosystem structure, biota and basic ecosystem functions have occurred.
3	Moderately Modified	Losses and changes of natural ecosystem structure and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
4	Largely Natural	Small changes in natural ecosystem structure and biota may have taken place, but the ecosystem function is essentially unchanged.
5	Natural	No change in natural ecosystem structure, processes and biota have occurred.

Table B: Wetland condition scoring system derived from WET-Health[8]

Impact category	Description	Impact score range	Present State category	Condition score for biodivesity footprint
None	Unmodified, natural.	0 -0.9	A	5
Small	Largely natural with few modifications. A slight change in ecosystem processes is discernable and a small lost of natural habitat and biota may have taken place.	1-1.9	B	4
Moderate	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact.	2-3.9	C	4
Large	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4-5.9	D	2
Serious	The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	E	1
Critical	Modifications have reached a critical level and the ecoystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8-10	F	0

3.2.2 Changes to the species impact inventory

As per the BD Protocol, not all species should be included in the impact inventory, only priority species for the business context. While USA operations completed this process for the 2021 baseline assessment, for SA operations we only identified potentially material species (no species accounts were produced).

Once material species are determined, it is important to note that key input data include (alongside corresponding GIS data) either:

- The actual and target[13] population size of each material species (expressed in numbers, such as numbers of breeding individuals or breeding pairs), or
- The actual and target[14] habitat size of each material species (expressed in surface area metrics, such as acres or hectares).

This choice of method and metric will depend on the species and context, notably monitoring costs.

For USA operations, it involved rating the species as per five criteria: 1) conservation status, 2) potential to occur, 3) ease of assessment, 4) likelihood of impacts and 5) severity of impacts[15]. The sum of individual species scores determined the importance of the species in the context of US operations while a threshold score (superior to 10) defined the species eventually included in the impact inventory.

For the 2022 update assessment, the species materiality process has yet to be completed for SA operations while US operations refined their baseline species impact inventory and associated accounts[16].

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[13] The target population size of a species depends on the threat status and the business context.
[14] The target habitat size of a species depends on the threat status and the business context.
[15] See table B-1 in KC Harvey Environmental, LLC, 2021. Biodiversity Impact Assessment. US PGM Operations.
[16] See more details in KC Harvey Environmental, LLC, 2022. Biodiversity Impact Assessment. US PGM Operations.

3.3 Accounting for net biodiversity impacts

Biodiversity accounting is the systematic process of identifying, measuring, recording, summarising and reporting the periodic and accumulated net changes to the biophysical state of biodiversity assets. It requires:

- Developing an asset inventory comprised of ecosystems and material species,
- Employing measurement techniques that use spatially explicit data,
- Measuring net change (gains minus losses) in each asset category by applying the principle of ecological equivalency (like-for-like),
- Using recording rules based on double-entry bookkeeping from financial accounting,
- Compiling asset-specific biophysical statements of performance and position,
- Distinguishing accounts according to organisational and value chain boundaries.

Detailed accounting rules are presented in section 3.3 of the BD Protocol. Here are the highlights (Also presented in Table C):

- Any change, positive or negative, in the biodiversity impact inventory needs to be accounted for. The BD Protocol builds from the foundations of financial accounting through two simple equations, adapted from double-entry bookkeeping (DEBK), which ensures that the total biodiversity impacts of a company are equal to the sum of its accumulated positive and negative impacts[17]. Accounting for net biodiversity impacts thus revolves around the following equations:
- Statement of Biodiversity Position: (A accounts) total impacts on biodiversity features = (B accounts) accumulated positive impacts on biodiversity + (C accounts) accumulated negative impacts on biodiversity (for all periods to date);
- Statement of Biodiversity Performance: (X accounts) net biodiversity impacts on biodiversity features over the accounting period = (Y accounts) periodic positive biodiversity impacts or gains - (Z accounts) periodic biodiversity negative impacts or losses.

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[17] See theoretical foundations in Houdet, J., Ding H., Quétier F., Addison, P.F.E., Deshmukh, P. (2020). Adapting double-entry bookkeeping to renewable natural capital: an application to corporate net biodiversity impact accounting and disclosure. *Ecosystem Services 45,* 101104, ISSN 2212-0416, https://doi.org/10.1016/j.ecoser.2020.101104

Table C: Double Entry Bookkeeping enables the definition of periodic gains and losses and accumulated positive and negative impacts for ecosystems and species

| | Statement of Position | | - | Statement of Performance | |
	Ecosystems	Species		Ecosystems	Species
Total impacts (A)	Sum of accumulated positive and negative impacts expressed in surface area	Target population (e.g. number of breeding or mature individuals) or habitat size (e.g., ha /Km2) of a species	Periodic net impacts	Gains minus losses (can be consolidated across asset categories)	Gains minus losses (per species)
Accumulated positive impacts (P)	Actual areas (A) of ecosystem assets multiplied by their current condition/ integrity score (1), divided by the maximum potential condition score (J), or P=AX (I/J).	Actual/current population (e.g. number of breeding or mature individuals) or habitat size (e.g., ha/km2) of a species.	Periodic gains (G)	An increase in the condition of the ecosystem assets, in area equivalents (e.g. ha eq., MSA eq.).	An increase in the population (e.g. number of breeding or mature individuals) or habitat size (e.g., ha /km2) of a species.
Accumulated negative impacts (N)	Difference between the actual areas (A) of ecosystem assets and their condition/integrity adjusted extent (P), also expressed in area equivalents (e.g. hectare equivalents): N=A-P.	Gap to target population (e.g. number of breeding or mature individuals) or habitat size (e.g., ha /Km2) of a species (i.e. N=A-P)	Periodic losses (L)	A decrease in the condition of the ecosystem assets, in area equivalents (e.g. ha eq., MSA eq.).	A decrease in the population (e.g. number of breeding or mature individuals) or habitat size (e.g., ha/km2) of a species.

The Biodiversity Accounting Framework of the BD Protocol[18] recognises six main biodiversity-related account categories, namely:

- Asset accounts: Accounts in the Statement of Biodiversity Position equation (A), representing the total biodiversity impacts on each feature of the biodiversity impact inventory of your organisation;

- Accumulated positive impact accounts: Accounts in the Statement of Biodiversity Position equation (B), representing the accumulated positive impacts on each feature of the biodiversity impact inventory of your organisation, though not necessarily implying actual conservation measures. This could be presented as the biodiversity contributions to society of your business;

- Accumulated negative impact accounts: Accounts in the Statement of Biodiversity Position equation (C), representing the accumulated negative impacts on each feature of the biodiversity impact inventory of your organisation, with no financial liability implied;

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[18] Houdet, J, Teren, G. 2022. Quality Biodiversity Footprint Assessments in Practice: Why Organisational Biodiversity Accounting Matters. A Position Paper of the Biodiversity Disclosure Project (BDP). National Biodiversity and Business Network, Endangered Wildlife Trust, South Africa. URL: https://407264.p3cdn1.secureserver.net/wp-content/uploads/2022/11/BDP-Quality-Biodiversity-Footprints.pdf

- Net impact accounts: Accounts in the Statement of Biodiversity Performance equation (X), representing the net impacts (gains minus losses) on each feature of the biodiversity impact inventory of your organisation in the reporting period.

- Gain accounts: Accounts in the Statement of Biodiversity Performance equation (Y), representing the gains for each feature of the biodiversity impact inventory of your organisation in the reporting period;

- Loss accounts: Accounts in the Statement of Biodiversity Performance equation (Z), representing the losses for each feature of the biodiversity impact inventory of your organisation in the reporting period.

Furthermore, key concepts for impacts on ecosystems include:

- *Total Biodiversity Footprint:* Sum of surface areas of ecosystems within the impact inventory (not assessed for condition; hence it would be equal to the reference or pristine state of all surface areas).

- *Positive Biodiversity Footprint*: Sum of surface areas adjusted for condition.

- *Negative Biodiversity Footprint*: Difference or gap between the Total Biodiversity Footprint (reference or pristine state of all surface areas) and the Positive Biodiversity Footprint (surface areas adjusted for condition).

Finally, key concepts for impacts on species include:

- *Total Biodiversity Footprint:* Target population / habitat size within impact inventory.

- *Positive Biodiversity Footprint:* Current population / habitat size.

- *Negative Biodiversity Footprint:* The difference or gap between its current population / habitat size and the target / ideal population / habitat size (as determined by science and business context).

3.4   Assurance process

For the BD Protocol, an assurance process should be based on its seven accounting and reporting principles, defined as follows:

- *Relevance*: Ensure the biodiversity impact inventory appropriately reflects the biodiversity impacts of the company and its value chain. It shall serve the decision-making needs of users, both internal and external to the company.

- *Equivalency*: Ensure the notion of equity in the type of biodiversity (i.e. ecological equivalency or like-for-like principle) is integral to biodiversity impact inventory development and accounting. Undertake net impact accounting only for equivalent biodiversity losses (negative impacts) and gains (positive impacts).

- *Completeness*: Account for, and report on, all impacts on ecosystems but only impacts on material taxa, within the chosen organisational and value chain boundaries. Disclose and justify any exclusion.

- *Consistency*: Use consistent methods to allow for meaningful comparisons of biodiversity impacts over time. Transparently document any changes to the data, inventory boundary, methods or any other relevant factors in the time series.

- *Transparency*: Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the data collection and estimation methods used.

- *Accuracy*: Ensure the measurement of biodiversity impacts is systematically accurate, as far as can be judged, notably by reducing uncertainties as far as is practicable. Achieve suitable accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information. When no direct observation is possible, estimate impacts on the basis that they are reasonably likely to occur, recording all methodological limitations.

- *Time period assumption*: Account for biodiversity impacts consistently across business reporting periods.

The recommendation section of this study highlights the progress to date and gaps in adhering to these accounting and reporting principles.

4. Results: The 2022 Biodiversity Footprint assessment of Sibanye-Stillwater

This section focuses on updating the group-level (SA and USA operations) results for impacts on ecosystems:

- Consolidated Biodiversity Footprint,

- Biodiversity Footprint broken down per operation,

- Biodiversity Footprint broken down per ecosystem.

For SA operations, the Biodiversity Footprint assessment is currently limited to its ecosystem impact inventory. Details for all the changes to the 2021 baseline Biodiversity Footprint assessment (e.g., updated ecosystem asset registers, maps, accounting journal entries, statements of performance and position) are available in the annextures of this report for the operations concerned (i.e. Kroondal (including Kwezi), Marikana, RPM and RU). No change was identified for the other operations so that the associated asset registers and accounts remain unchanged[19]. For USA operations, the Biodiversity Footprint assessment covers both impacts on ecosystems and impacts on material species. Details of changes to the ecosystem and species accounts are recorded an updated biodiversity impact report[20].

4.1 Consolidated 2022 Biodiversity Footprint

Table D presents the Total Biodiversity Footprint (TBF), Positive Biodiversity Footprint (PBF) and Negative Biodiversity Footprint (NBF) of Sibanye-Stillwater (a) at acquisition, (b) for the 2021 baseline assessment and (c) for the 2022 update assessment. It also shows the net changes from the 2021 assessment. Overall, the Total Biodiversity Footprint of Sibanye-Stillwater was 49 913,71 Ha at date of acquisition of various assets, with around 86% of Negative Biodiversity Footprint (43 160,26 Ha eq.) and 14% of Positive Biodiversity Footprint (6 753,45 Ha eq.). For the 2021 baseline

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[19] See details in the individual report of each operation (section 4).
[20] KC Harvey Environmental, LLC, 2021. Biodiversity Impact Assessment. US PGM Operations.

assessment (current state in 2020 / 2021), the Total Biodiversity Footprint increased to 49 928,30 Ha, with around 87% of Negative Biodiversity Footprint (43 504,18 Ha eq.) and 13% of Positive Biodiversity Footprint (6 424,12 Ha eq.). For the 2022 update assessment (current state in 2021 / 2022), the Total Biodiversity Footprint increased to 52 186,10 Ha, with around 85% of Negative Biodiversity Footprint (44 137,95 Ha eq.) and 15% of Positive Biodiversity Footprint (8 048,15 Ha eq.).

From the 2021 baseline, Sibanye-Stillwater has seen its Total Biodiversity Footprint (TBF) increase by 2 257,80 Ha (4,52% growth), its Positive Biodiversity Footprint (PBF) increase by 1 624,03 Ha eq. (25,28% growth in the PBF / TBF ratio) and its Negative Biodiversity Footprint (NBF) increase by 633,77 Ha eq. (1,46% increase in the NBF / TBF ratio). This is primarily explained by the inclusion of new properties, whose ecosystems were assessed to be mostly in excellent or pristine, within the ecosystem asset register of USA operations[21].

Table D: The consolidated Total Biodiversity Footprint (TBF), Positive Biodiversity Footprint (PBF) and Negative Biodiversity Footprint (NBF) of Sibanye-Stillwater (a) at acquisition, (b) for the 2021 baseline assessment and (c) for the 2022 update assessment;

	Total Biodiversity Footprint (TBF, in Ha)	TBF / TBF	Positive Biodiversity Footprint (PBF, in Ha eq.)	PBF / TBF	Negative Biodiversity Footprint (NBF, in Ha eq.)	NBF / TBF
At acquisition (different dates)	49913.71	100.00%	6753.45	13.5%	43160.26	86.47%
2021 baseline	49928.30	100.00%	6424.12	12.9%	43504.18	87.13%
2022 update	52186.10	100.00%	8048.15	15.4%	44137.95	84.58%
Changes from 2021 assessment	2257.80	4.52%	1624.03	25.3%	633.77	1.46%

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[21] KC Harvey Environmental, LLC, 2021. Biodiversity Impact Assessment. US PGM Operations.

4.2   Biodiversity Footprint broken down per operation

In this section, the Total Biodiversity Footprint (TBF), Positive Biodiversity Footprint (PBF) and Negative Biodiversity Footprint (NBF) of Sibanye-Stillwater (a) at acquisition, (b) for the 2021 baseline assessment and (c) for the 2022 update assessment are broken down per operation (and in some case sub-units as is the case for Beatrix, Driefontein and Kloof).

For SA operations, Figures 1 and 2 show this breakdown at acquisition, Figures 3 and 4 present the results for the 2021 baseline assessment while Figure 5 and 6 show the accounts for the 2022 update assessment. Figure 7 shows the net changes in the TBF, PBF and NBF from the 2021 baseline assessment. Overall, there was an increase of 500,91 Ha of TBF, 36,01 Ha eq. of PBF and 464,90 Ha eq. of NBF. This was due primarily to the addition of the Kwezi property to the Kroondal operation. The maps of the ecosystem extent and condition for each operation where changes have occurred (i.e. Kroondal – including Kwezi, Marikana, RPM and RU) are available in the annexes of this report.

Figures 8 and 9 shows the TBF, PBF and NBF breakdown per operation at acquisition, Figures 10 and 11 for the 2021 baseline assessment and Figures 12 and 13 for the 2022 update assessment. Figure 14 shows the net changes in the TBF, PBF and NBF from the 2021 baseline assessment. Overall, there was an increase of 1 756,89 Ha of TBF, 1 588,02 Ha eq. of PBF and 167,87 Ha eq. of NBF. The significant increases in the TBF of each operation is due to the inclusion of new properties. These were mostly conservation easements owned by Sibanye-Stillwater, whose associated PBF was relatively high (excellent or pristine ecosystem condition, with notably an additional 953,18 Ha eq. of PBF at Stillwater Mine), hence the concomitant increase in the PBF / TBF ratio for USA operations.

	Total Biodiversity Footprint (TBF, in Ha)	Positive Biodiversity Footprint (PBF, in Ha eq.)	Negative Biodiversity Footprint (NBF, in Ha eq.)
Beatrix - Rietpan	1,463.34	302.52	1,160.83
Beatrix 123 shafts	2,789.31	216.56	2,572.75
Beatrix 4 Shaft	2,441.43	121.74	2,319.7
Blueridge	1,085.54	418.8	666.74
Burnstone	1,031.25	212.83	818.42
Driefontein - Abe Bailey Extension	881.18	250.02	631.16
Driefontein - North of Gatsrand	6,459.13	636.06	5,823.07
Driefontein - South of Gatsrand	1,922.53	456.92	1,465.61
Ezulwini	870.14	49.19	820.95
Kloof - Main, 4 & 7#	3,438.46	353.75	3,084.71
Kloof - 8#	331.31	13.62	317.69
Kloof - No 3 Shaft	32.4	0	32.4
Kloof - Libanon	493.12	19.91	473.21
Kloof - Venterspost	1,571.63	176.57	1,395.06
Kroondal	686.04	45.79	640.25
Marikana	11,472.55	1,181.35	10,291.19
Rand Uranium	5,952.38	292.15	5,660.23
RPM	5,262.91	438.42	4,824.5

Figure 1: The TBF, PBF and NBF of SA operations at acquisition (different dates)

	Positive Biodiversity Footprint	Negative Biodiversity Footprint
Beatrix - Rietpan	20.67%	79.33%
Beatrix 123 shafts	7.76%	92.24%
Beatrix 4 Shaft	4.99%	95.01%
Blueridge	38.58%	61.42%
Burnstone	20.64%	79.36%
Driefontein - Abe Bailey Extension	28.37%	71.63%
Driefontein - North of Gatsrand	9.85%	90.15%
Driefontein - South of Gatsrand	23.77%	76.23%
Ezulwini	5.65%	94.35%
Kloof - Main, 4 & 7#	10.29%	89.71%
Kloof - 8#	4.11%	95.89%
Kloof - No 3 Shaft	0.00%	100.00%
Kloof - Libanon	4.04%	95.96%
Kloof - Venterspost	11.23%	88.77%
Kroondal	6.67%	93.33%
Marikana	10.30%	89.70%
Rand Uranium	4.91%	95.09%
RPM	8.33%	91.67%

Figure 2: The TBF and NBF of SA operations as a proportion of the TBF at acquisition (different dates)

	Total Biodiversity Footprint (TBF, in Ha)	Positive Biodiversity Footprint (PBF, in Ha eq.)	Negative Biodiversity Footprint (NBF, in Ha eq.)
Beatrix - Rietpan	1,463.34	302.52	1,160.83
Beatrix 123 shafts	2,789.31	216.56	2,572.75
Beatrix 4 Shaft	2,441.43	121.74	2,319.7
Blueridge	1,085.54	418.8	666.74
Burnstone	1,045.85	213.65	832.21
Driefontein - Abe Bailey Ext	881.18	250.02	631.16
Driefontein - North of Gatsrand	6,459.13	636.06	5,823.07
Driefontein - South of Gatsrand	1,922.53	456.92	1,465.61
Ezulwini	870.14	49.19	820.95
Kloof - Main, 4 & 7#	3,438.46	353.75	3,084.71
Kloof - 8#	331.31	13.62	317.69
Kloof - No 3 Shaft	32.4	0	32.4
Kloof - Libanon	493.12	19.91	473.21
Kloof - Venterspost	1,571.63	176.57	1,395.06
Kroondal	686.04	45.79	640.25
Marikana	11,472.55	1,181.35	10,291.19
Rand Uranium	5,952.38	292.15	5,660.23
RPM	5,262.91	438.42	4,824.5

Figure 3: The TBF, PBF and NBF of SA operations (2021 baseline)

	Percentage of PBF / TBF (%)	Percentage of NBF / TBF (%)
Beatrix - Rietpan	20.67%	79.33%
Beatrix 123 shafts	7.76%	92.24%
Beatrix 4 Shaft	4.99%	95.01%
Blueridge	38.58%	61.42%
Burnstone	20.43%	79.57%
Driefontein - Abe Bailey Ext	28.37%	71.63%
Driefontein - North of Gatsrand	9.85%	90.15%
Driefontein - South of Gatsrand	23.77%	76.23%
Ezulwini	5.65%	94.35%
Kloof - Main, 4 & 7#	10.29%	89.71%
Kloof - 8#	4.11%	95.89%
Kloof - No 3 Shaft	0.00%	100.00%
Kloof - Libanon	4.04%	95.96%
Kloof - Venterspost	11.23%	88.77%
Kroondal	6.67%	93.33%
Marikana	10.30%	89.70%
Rand Uranium	4.91%	95.09%
RPM	8.33%	91.67%

Figure 4: The TBF and NBF of SA operations as a proportion of the TBF at 2021 baseline

Figure 3: The TBF, PBF and NBF of SA operations (2022 update)

Figure 4: The TBF and NBF of SA operations as a proportion of the TBF (2022 update)

Figure 5: Net changes in the Total Biodiversity Footprint (TBF, in Ha), Positive Biodiversity Footprint (PBF, in Ha eq.) and Negative Biodiversity Footprint (NBF, in Ha eq.) from the 2021 baseline assessment

	Total Biodiversity Footprint (TBF, in Ha)	Positive Biodiversity Footprint (PBF, in Ha eq.)	Negative Biodiversity Footprint (NBF, in Ha eq.)
East Boulder Mine (EBM)	416.70	362.25	54.45
Stillwater Mine (SWM)	1296.05	1197.33	98.72
Columbus Metallurgical Complex (CMC)	16.30	7.67	8.63

Figure 6: The TBF, PBF and NBF of USA operations at acquisition (different dates)

	Percentage of PBF / TBF (%)	Percentage of NBF / TBF (%)
East Boulder Mine (EBM)	86.93%	13.07%
Stillwater Mine (SWM)	92.38%	7.62%
Columbus Metallurgical Complex (CMC)	47.07%	52.93%
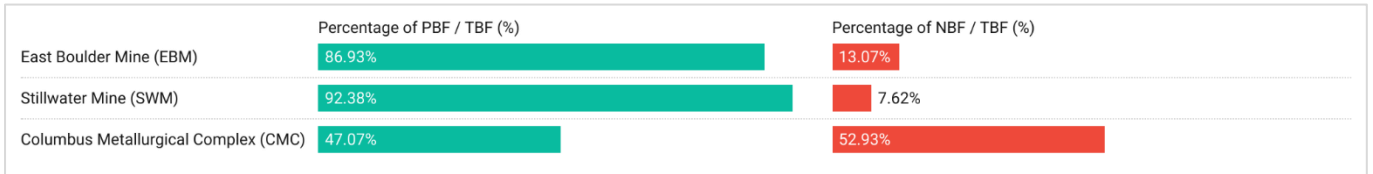
Figure 7: The TBF and NBF of USA operations as a proportion of the TBF at acquisition (different dates)

	Total Biodiversity Footprint (TBF, in Ha)	Positive Biodiversity Footprint (PBF, in Ha eq.)	Negative Biodiversity Footprint (NBF, in Ha eq.)
East Boulder Mine (EBM)	416.70	275.40	141.30
Stillwater Mine (SWM)	1296.04	960.27	335.77
Columbus Metallurgical Complex (CMC)	16.30	1.44	14.86

Figure 8: The TBF, PBF and NBF of USA operations (2021 baseline)

	Percentage of PBF / TBF (%)	Percentage of NBF / TBF (%)
East Boulder Mine (EBM)	66.09%	33.91%
Stillwater Mine (SWM)	74.09%	25.91%
Columbus Metallurgical Complex (CMC)	8.84%	91.16%
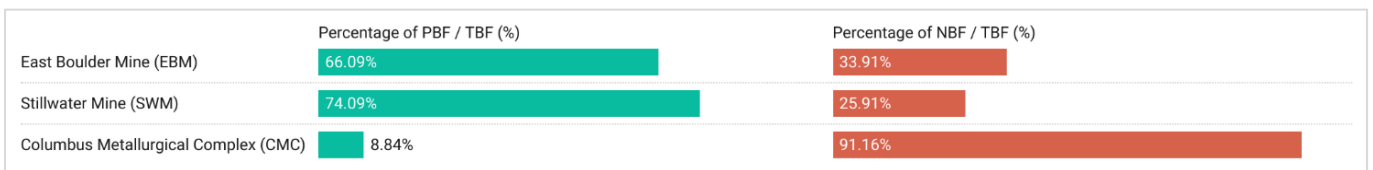
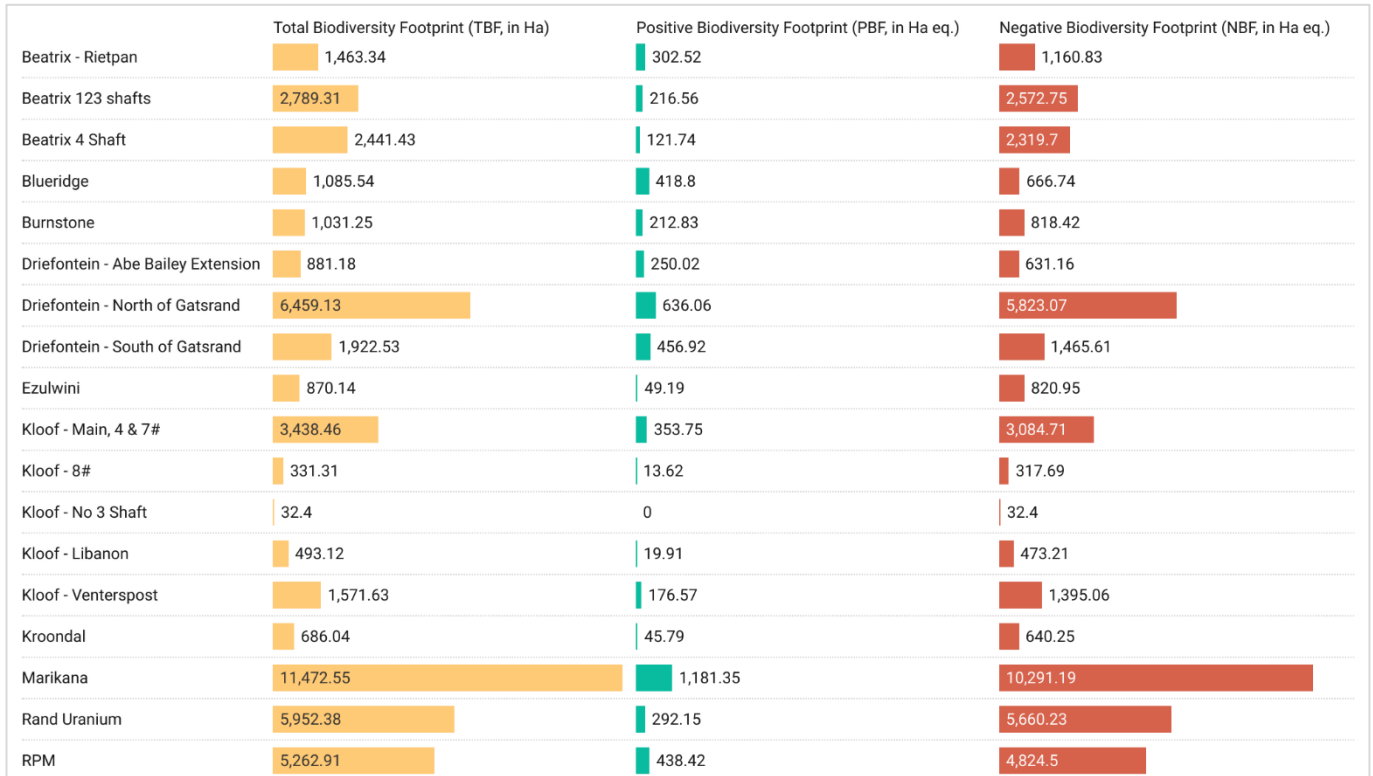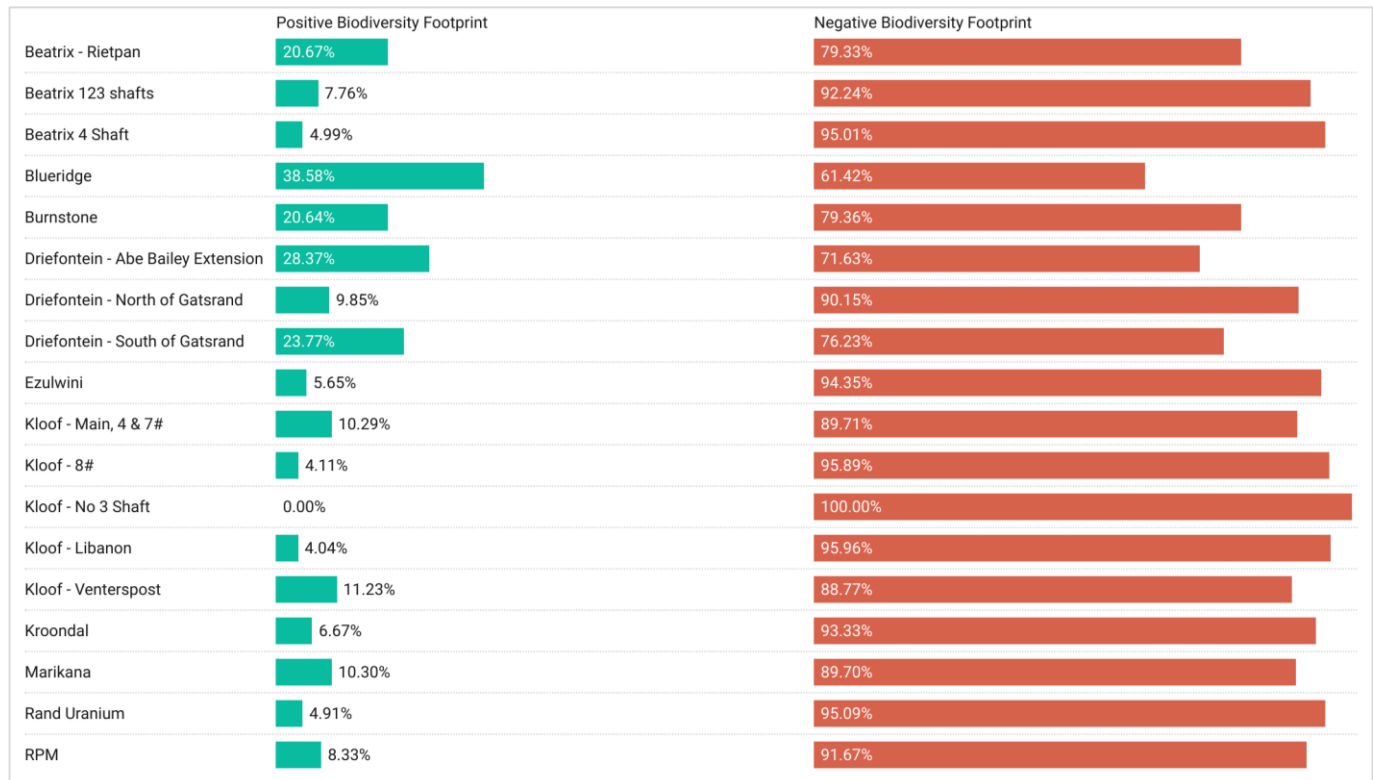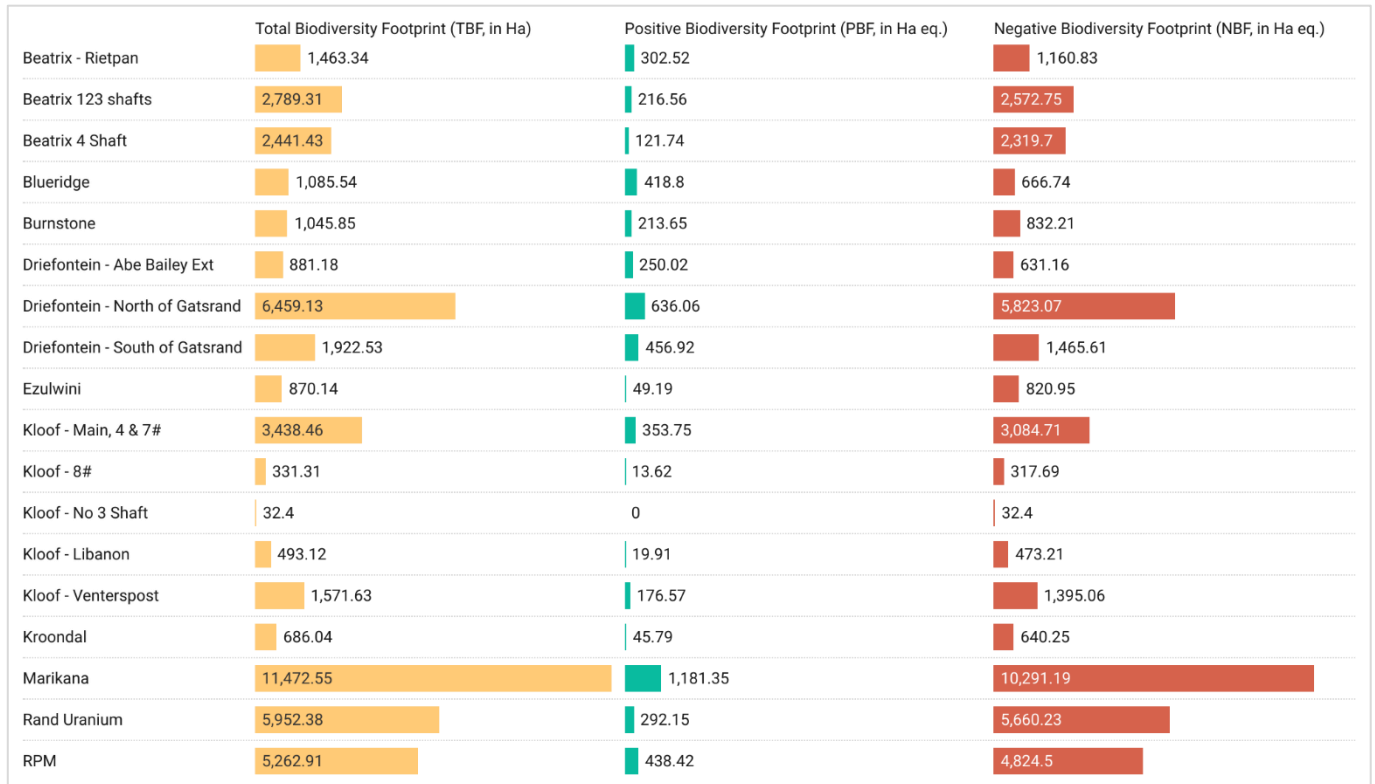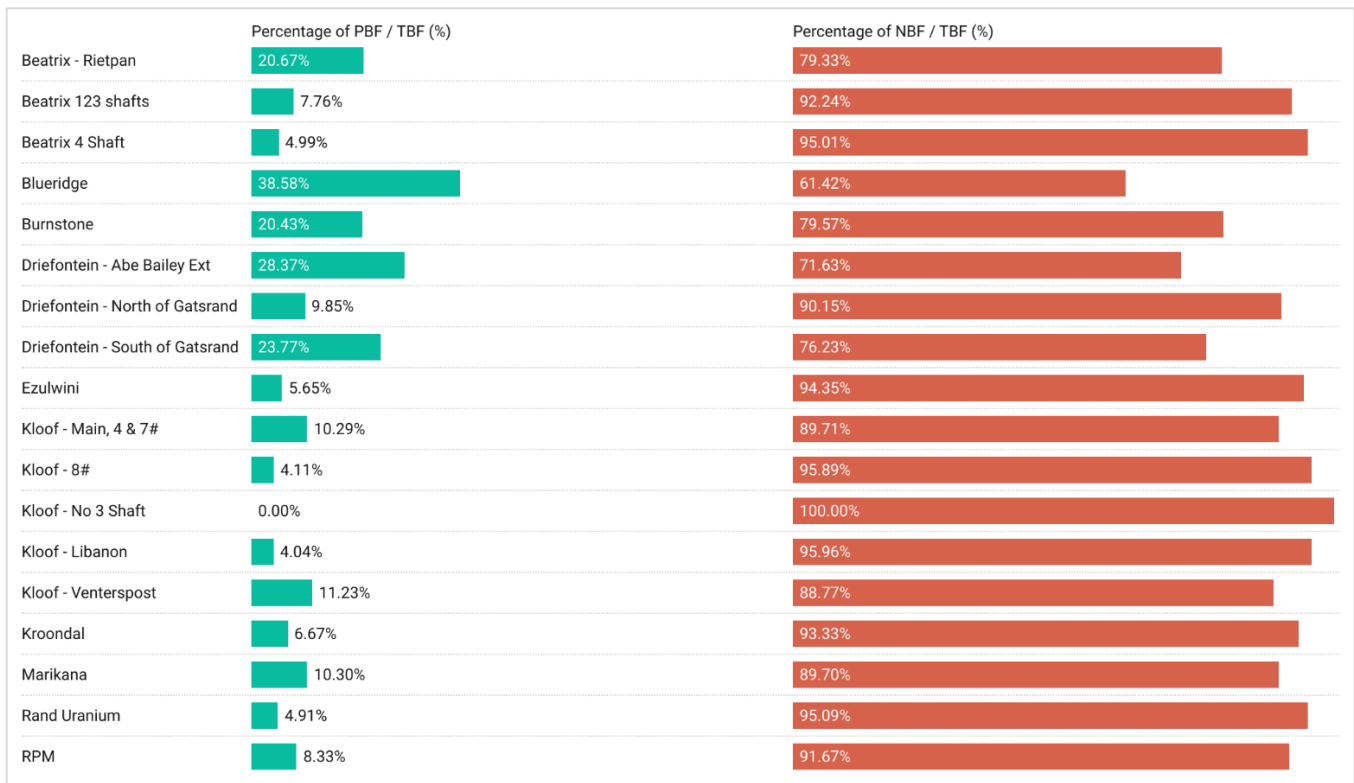Figure 9: The TBF and NBF of USA operations as a proportion of the TBF at 2021 baseline
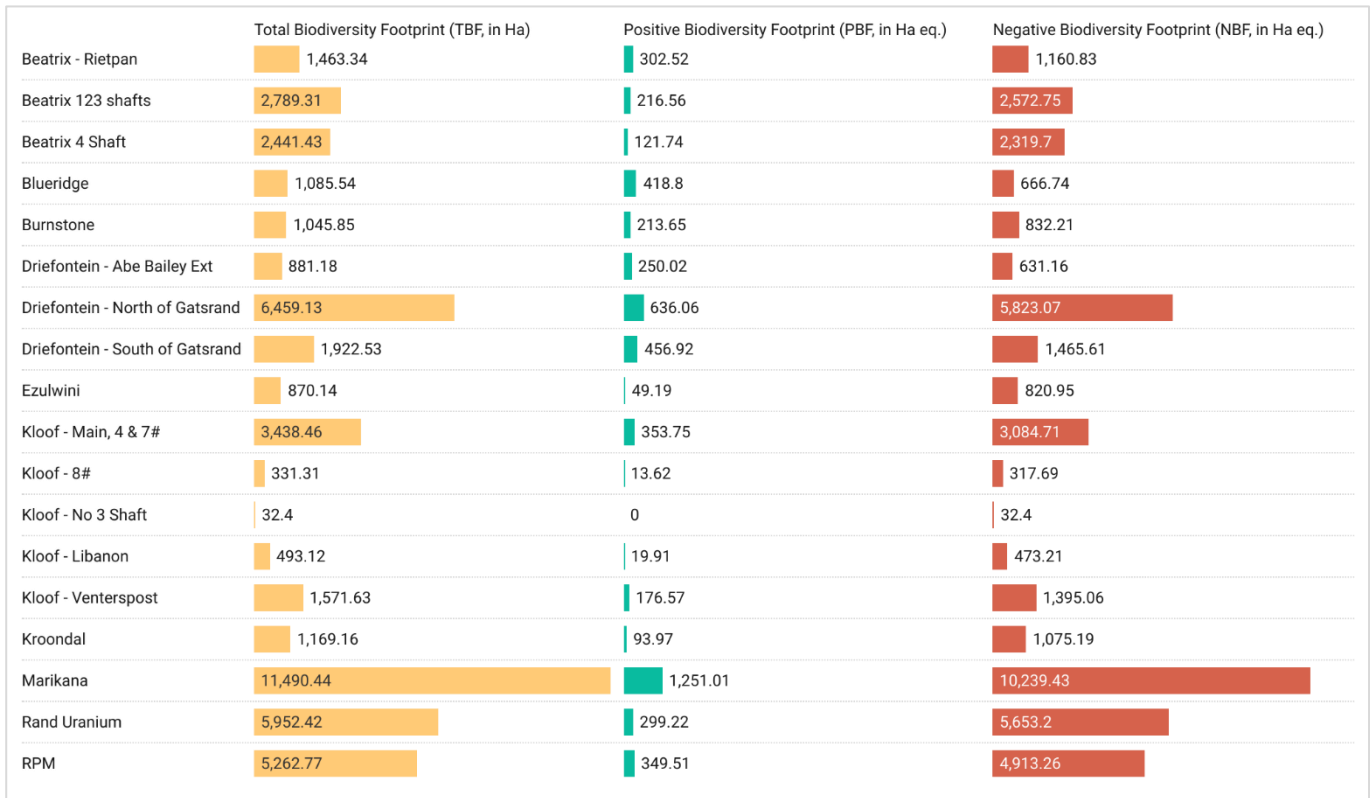
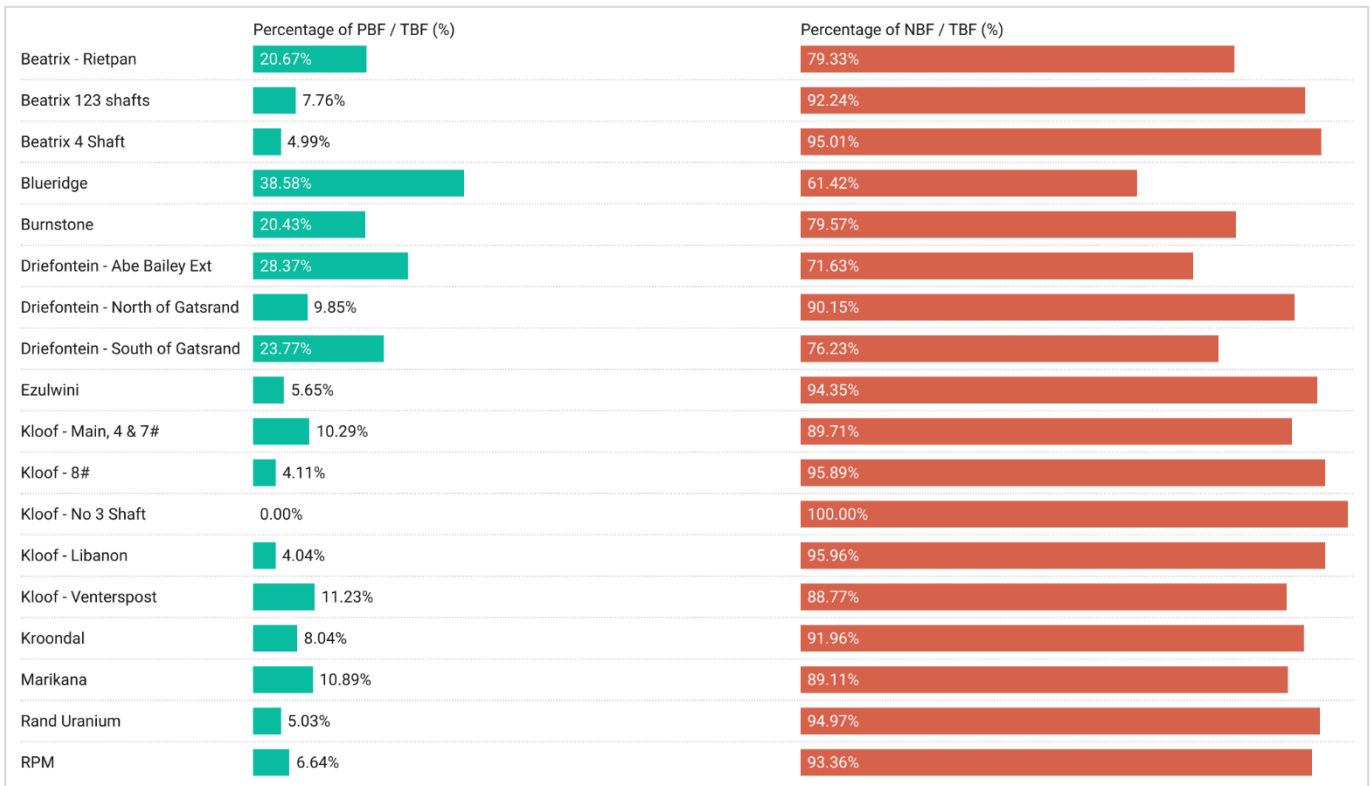**Figure 10:** The TBF, PBF and NBF of USA operations (2022 update)
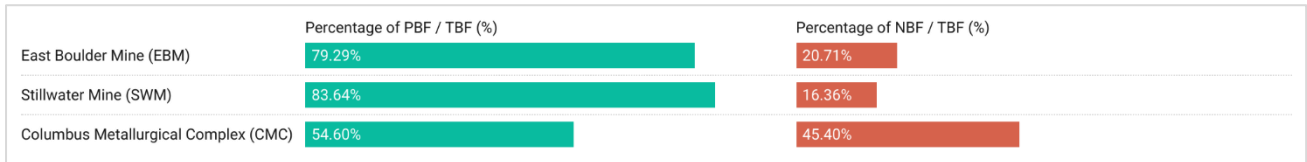
Figure 11: The TBF and NBF of USA operations as a proportion of the TBF (2022 update)
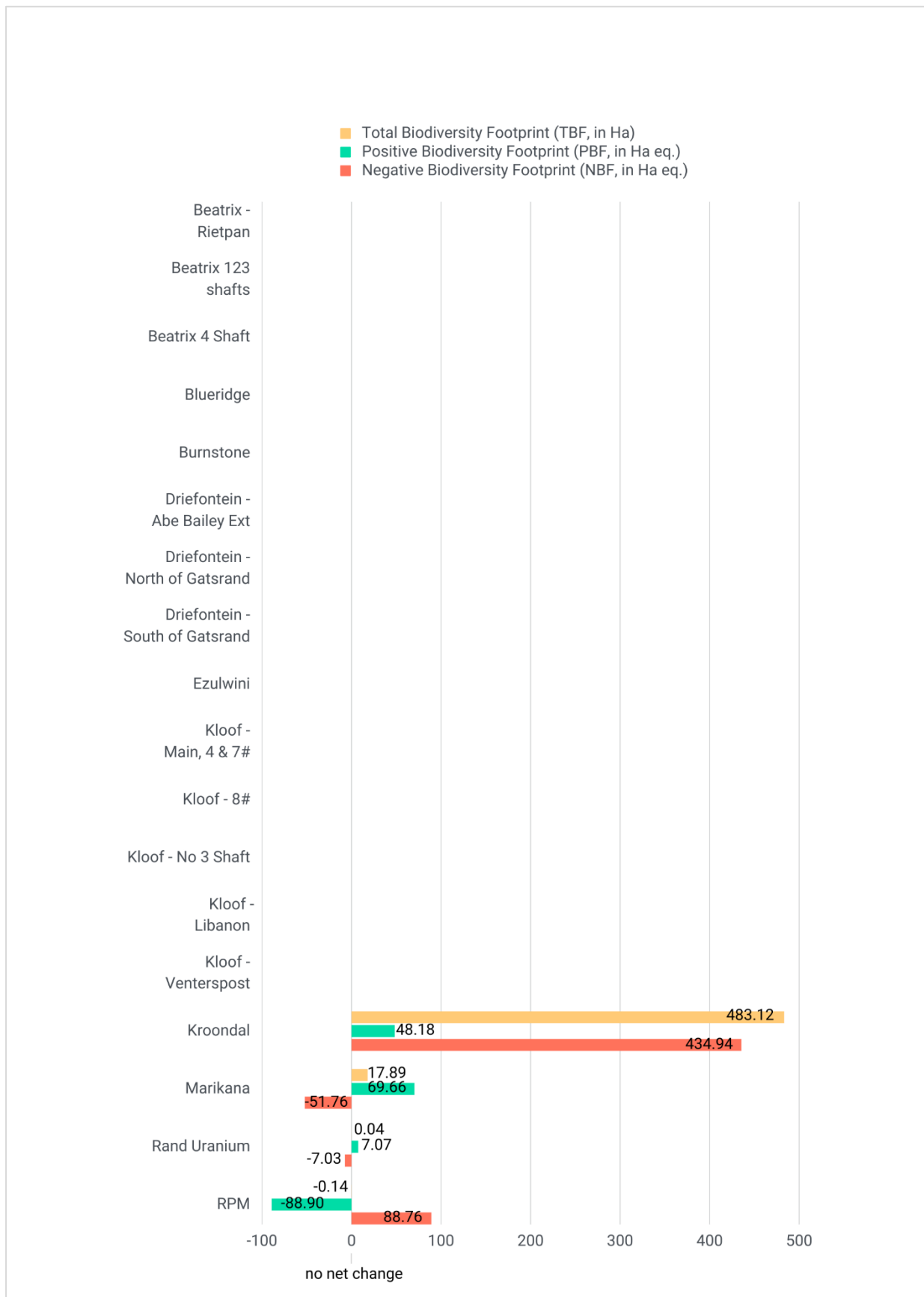

Figure 12: Net changes in the Total Biodiversity Footprint (TBF, in Ha), Positive Biodiversity Footprint (PBF, in Ha eq.) and Negative Biodiversity Footprint (NBF, in Ha eq.) from the 2021 baseline assessment for USA operations
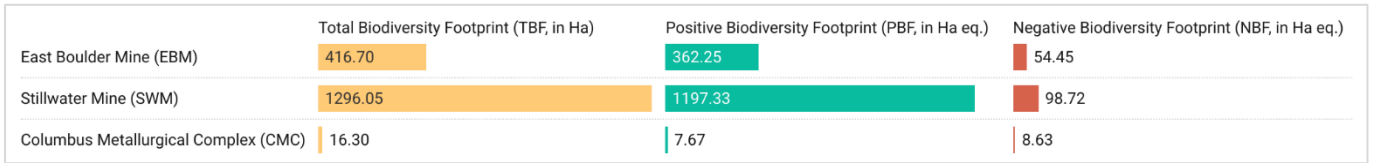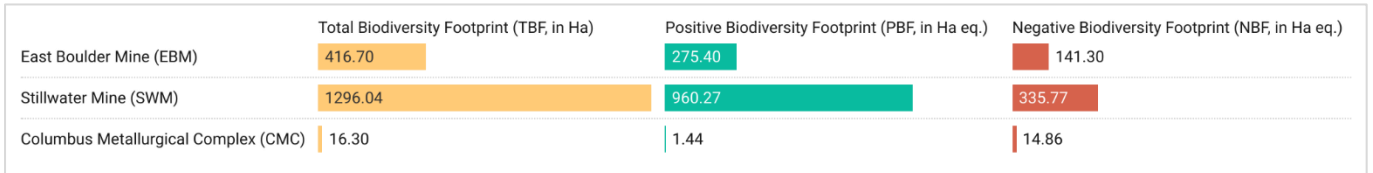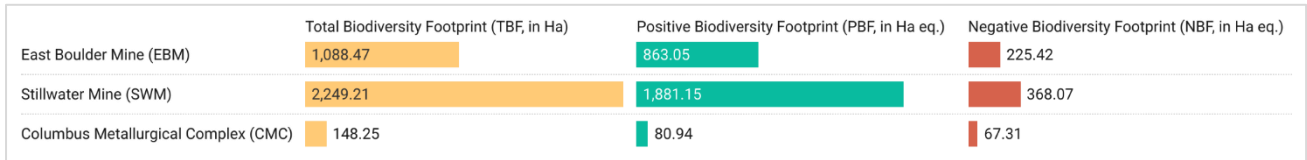
4.3 Biodiversity Footprint broken down per ecosystem

In this section, the Total Biodiversity Footprint (TBF), Positive Biodiversity Footprint (PBF) and Negative Biodiversity Footprint (NBF) of Sibanye-(a) at acquisition, (b) for the 2021 baseline assessment and (c) for the 2022 update assessment is broken down per ecosystem asset category. This breakdown is critical to understand the impacts of Sibanye-Stillwater on biodiversity, as it helps inform decision-making for each ecosystem asset at the group level (i.e. several sites hold the same ecosystem types).

For SA operations, Figures 15, 16, 17, 19, and 20 show these results, respectively, a) at acquisition (Fig. 15 and 16), (b) for the 2021 baseline assessment and (Fig. 17 and 18) (c) for the 2022 update assessment (Fig. 19 and 20).). Figure 21 shows the net changes in the TBF, PBF and NBF from the 2021 baseline assessment. The Marikana Thornveld retains the biggest TBF with 15 752,49 Ha, an increase of 1 009,95 Ha since 2021 due to a combination of ecosystem boundary adjustments (concomitant loss of Marikana Thornveld Wetland areas) and new properties added as part of the organisation boundary (i.e. Kwezi at Kroondal). Furthermore, the Loskop Mountain Bushveld Wetland and Loskop Thornveld Wetland ecosystems still hold the largest proportion of PBF (60,00% of the TBF) and the Gold Reef Mountain Bushveld ecosystem the lowest (0% of the TBF) at the time of 2022 update assessment. There are now 25 ecosystem types, one more than in 2021 (i.e. Norite Koppies Bushveld identified within the Marikana operations), with 6 are threatened as per the National List of Threatened Ecosystems[22]: Marikana Thornveld (VU) and Marikana Thornveld Wetland (VU), of which 55% is remaining natural area and 0% of original area (253 000 ha) protected; Soweto Highveld Grassland (VU), and Soweto Highveld Grassland Wetland (VU) of which 54% is remaining natural area and 0% of original area (1 451 000 ha) protected; Vaal-Vet Sandy Grassland (EN), and Vaal-Vet Sandy Grassland Wetlands (EN) of which 36% is remaining natural area, and less than 1% of original area (2 274 000 ha) protected.

Figures 22, 23, 24, 25, 26 and 27 show the TBF, PBF and NBF breakdown per operation, respectively, a) at acquisition (Fig. 22 and 23), (b) for the 2021 baseline assessment (Fig. 24 and 25)

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[22] The National List of Threatened Ecosystems for South Africa (2011) (National Gazette No 34809 of 9 December, 2011).

and (c) for the 2022 update assessment (Fig. 26 and 27). Figure 28 shows the net changes in the TBF, PBF and NBF from the 2021 baseline assessment. There are now 19 ecosystem types on the ecosystem asset register, 5 more than for the 2021 baseline assessment. While the Rocky Mountain Lower Montane, Foothill, and Valley Grassland ecosystem has the largest TBF (1 408,01 Ha, up from 699,88 Ha in 2021) most other ecosystem assets have a proportion of PBF superior to 80,00% of the TBF. Only the Great Plains Mixedgrass Prairie ecosystem has a medium proportion of PBF (47 % of the TBF, up from 9% of the TBF in 2021), which highlights that mining activities have mostly occurred in this ecosystem.
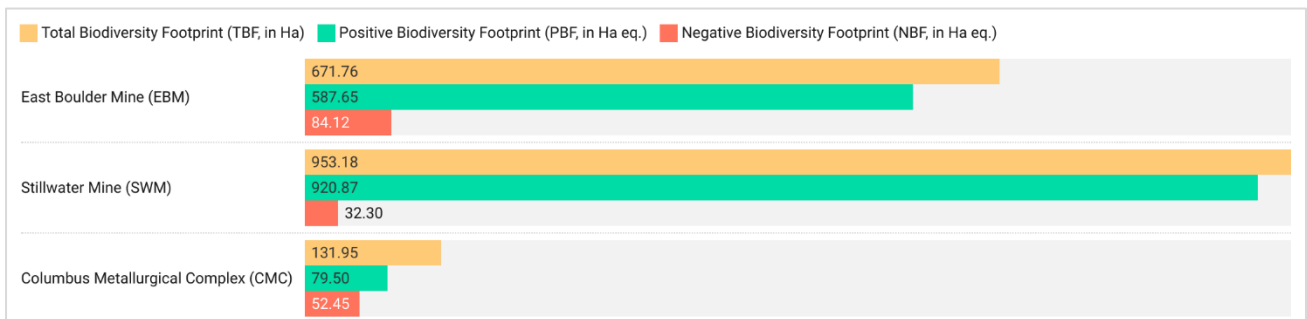
	Total Biodiversity Footprint (TBF, in Ha)	Positive Biodiversity Footprint (PBF, in Ha eq.)	Negative Biodiversity Footprint (NBF, in Ha eq.)
Carletonville Dolomite Grassland	8915.86	676.16	8239.70
Carletonville Dolomite Grassland Wetland	1055.49	317.24	738.26
Central Free State Grassland Wetlands	306.24	96.85	209.39
Gauteng Shale Mountain Bushveld	5561.27	622.80	4938.47
Gauteng Shale Mountain Bushveld Wetland	686.13	204.21	481.92
Gold Reef Mountain Bushveld	10.92	0.00	10.92
Highveld Alluvial Vegetation	441.79	49.78	392.02
Highveld Alluvial Vegetation Wetlands	246.22	55.42	190.81
Highveld Salt Pan	556.69	115.77	440.93
Loskop Mountain Bushveld	382.27	137.06	245.22
Loskop Mountain Bushveld Wetland	158.24	94.94	63.30
Loskop Thornveld	470.93	142.33	328.59
Loskop Thornveld Wetland	74.10	44.46	29.64
Marikana Thornveld	14742.54	1122.82	13619.72
Marikana Thornveld Wetland	1299.94	471.53	828.41
Moot Plains Bushveld	1357.17	66.83	1290.34
Moot Plains Bushveld Wetland	10.93	4.37	6.56
Norite Koppies Bushveld	0.00	0.00	0.00
Rand Highveld Grassland	2756.59	176.78	2579.81
Rand Highveld Grassland Wetland	416.70	166.68	250.02
Soweto Highveld Grassland	2986.85	59.46	2927.39
Soweto Highveld Grassland Wetland	604.66	237.70	366.96
Vaal-Vet Sandy Grassland	4717.93	229.13	4488.80
Vaal-Vet Sandy Grassland Wetlands	19.90	3.98	15.92
Western Free State Clay Grassland	405.31	89.89	315.41

Figure 13: The TBF, PBF and NBF of SA operations at acquisition (different dates, as broken down per ecosystem asset

	Percentage of PBF / TBF (%)	Percentage of NBF / TBF (%)
Carletonville Dolomite Grassland	7.58%	92.42%
Carletonville Dolomite Grassland Wetland	30.06%	69.94%
Central Free State Grassland Wetlands	31.63%	68.37%
Gauteng Shale Mountain Bushveld	11.20%	88.80%
Gauteng Shale Mountain Bushveld Wetland	29.76%	70.24%
Gold Reef Mountain Bushveld	0.00%	100.00%
Highveld Alluvial Vegetation	11.27%	88.73%
Highveld Alluvial Vegetation Wetlands	22.51%	77.49%
Highveld Salt Pan	20.80%	79.20%
Loskop Mountain Bushveld	35.85%	64.15%
Loskop Mountain Bushveld Wetland	60.00%	40.00%
Loskop Thornveld	30.22%	69.78%
Loskop Thornveld Wetland	60.00%	40.00%
Marikana Thornveld	7.62%	92.38%
Marikana Thornveld Wetland	36.27%	63.73%
Moot Plains Bushveld	4.92%	95.08%
Moot Plains Bushveld Wetland	40.00%	60.00%
Norite Koppies Bushveld		
Rand Highveld Grassland	6.41%	93.59%
Rand Highveld Grassland Wetland	40.00%	60.00%
Soweto Highveld Grassland	1.99%	98.01%
Soweto Highveld Grassland Wetland	39.31%	60.69%
Vaal-Vet Sandy Grassland	4.86%	95.14%
Vaal-Vet Sandy Grassland Wetlands	20.00%	80.00%
Western Free State Clay Grassland	22.18%	77.82%

Figure 14: The TBF and NBF of SA operations as a proportion of the TBF at acquisition, broken down per ecosystem asset

	Total Biodiversity Footprint (TBF, in Ha)	Positive Biodiversity Footprint (PBF, in Ha eq.)	Negative Biodiversity Footprint (NBF, in Ha eq.)
Carletonville Dolomite Grassland	8,915.86	676.16	8,239.7
Carletonville Dolomite Grassland Wetland	1,055.49	317.24	738.26
Central Free State Grassland Wetlands	306.24	96.85	209.39
Gauteng Shale Mountain Bushveld	5,561.27	622.8	4,938.47
Gauteng Shale Mountain Bushveld Wetland	686.13	204.21	481.92
Gold Reef Mountain Bushveld	10.92	0	10.92
Highveld Alluvial Vegetation	441.79	49.78	392.02
Highveld Alluvial Vegetation Wetlands	246.22	55.42	190.81
Highveld Salt Pan	556.69	115.77	440.93
Loskop Mountain Bushveld	382.27	137.06	245.22
Loskop Mountain Bushveld Wetland	158.24	94.94	63.3
Loskop Thornveld	470.93	142.33	328.59
Loskop Thornveld Wetland	74.1	44.46	29.64
Marikana Thornveld	14,742.54	1,122.82	13,619.72
Marikana Thornveld Wetland	1,299.94	471.53	828.41
Moot Plains Bushveld	1,357.17	66.83	1,290.34
Moot Plains Bushveld Wetland	10.93	4.37	6.56
Norite Koppies Bushveld	0	0	0
Rand Highveld Grassland	2,756.59	176.78	2,579.81
Rand Highveld Grassland Wetland	416.7	166.68	250.02
Soweto Highveld Grassland	2,986.85	59.46	2,927.39
Soweto Highveld Grassland Wetland	619.26	238.52	380.74
Vaal-Vet Sandy Grassland	4,717.93	229.13	4,488.8
Vaal-Vet Sandy Grassland Wetlands	19.9	3.98	15.92
Western Free State Clay Grassland	405.31	89.89	315.41

Figure 15: The TBF, PBF and NBF of SA operations (2021 baseline), as per ecosystem asset

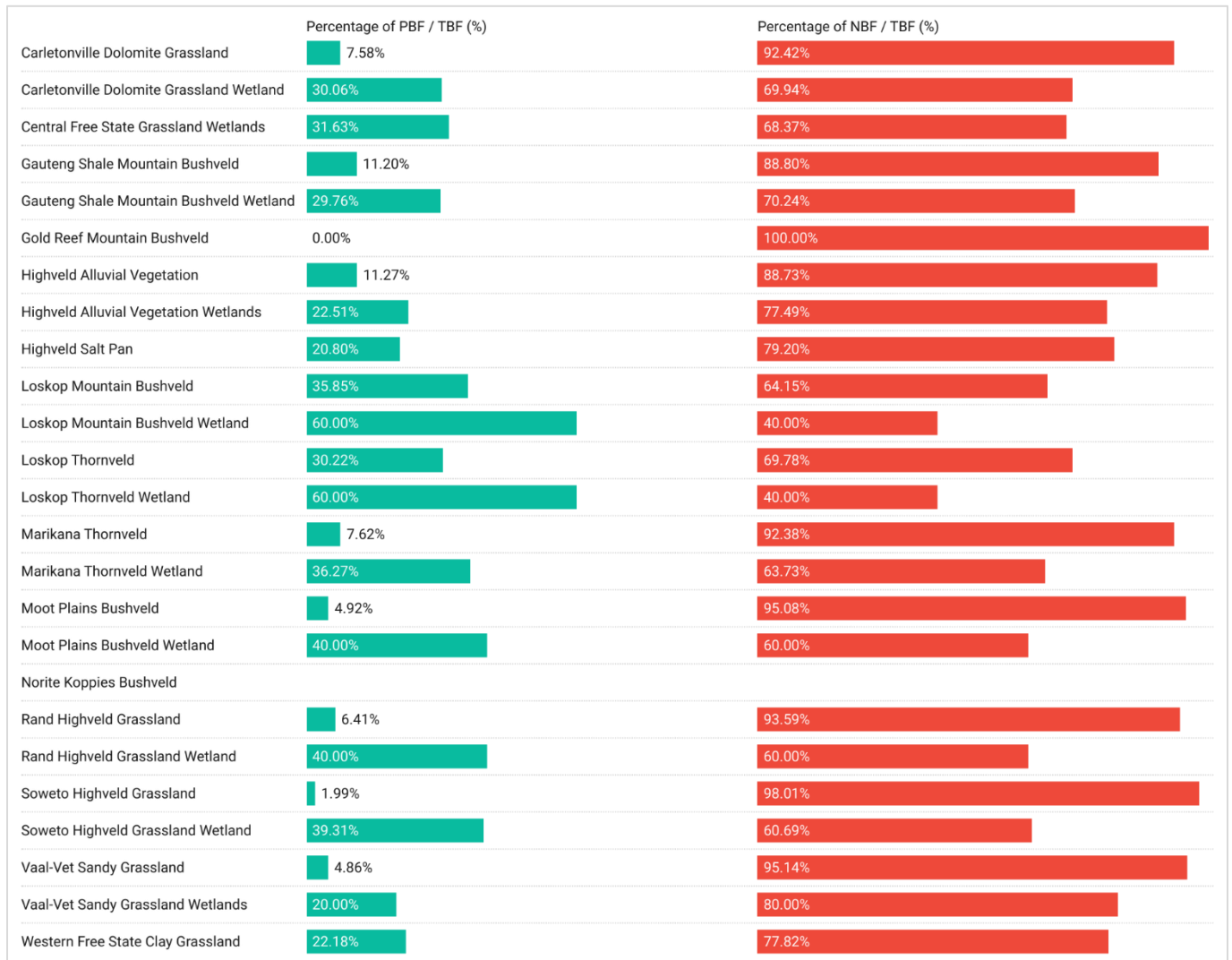| Ecosystem Asset	Percentage of PBF / TBF (%)	Percentage of NBF / TBF (%)
Carletonville Dolomite Grassland	7.58%	92.42%
Carletonville Dolomite Grassland Wetland	30.06%	69.94%
Central Free State Grassland Wetlands	31.63%	68.37%
Gauteng Shale Mountain Bushveld	11.20%	88.80%
Gauteng Shale Mountain Bushveld Wetland	29.76%	70.24%
Gold Reef Mountain Bushveld	0.00%	100.00%
Highveld Alluvial Vegetation	11.27%	88.73%
Highveld Alluvial Vegetation Wetlands	22.51%	77.49%
Highveld Salt Pan	20.80%	79.20%
Loskop Mountain Bushveld	35.85%	64.15%
Loskop Mountain Bushveld Wetland	60.00%	40.00%
Loskop Thornveld	30.22%	69.78%
Loskop Thornveld Wetland	60.00%	40.00%
Marikana Thornveld	7.62%	92.38%
Marikana Thornveld Wetland	36.27%	63.73%
Moot Plains Bushveld	4.92%	95.08%
Moot Plains Bushveld Wetland	40.00%	60.00%
Norite Koppies Bushveld		
Rand Highveld Grassland	6.41%	93.59%
Rand Highveld Grassland Wetland	40.00%	60.00%
Soweto Highveld Grassland	1.99%	98.01%
Soweto Highveld Grassland Wetland	38.52%	61.48%
Vaal-Vet Sandy Grassland	4.86%	95.14%
Vaal-Vet Sandy Grassland Wetlands	20.00%	80.00%
Western Free State Clay Grassland	22.18%	77.82%

Figure 16: The TBF and NBF of SA operations as a proportion of the TBF at 2021 baseline, broken down per ecosystem asset

	Total Biodiversity Footprint (TBF, in Ha)	Positive Biodiversity Footprint (PBF, in Ha eq.)	Negative Biodiversity Footprint (NBF, in Ha eq.)
Carletonville Dolomite Grassland	8,915.86	676.16	8,239.7
Carletonville Dolomite Grassland Wetland	1,055.49	317.24	738.26
Central Free State Grassland Wetlands	306.24	96.85	209.39
Gauteng Shale Mountain Bushveld	5,561.27	622.8	4,938.47
Gauteng Shale Mountain Bushveld Wetland	686.13	204.21	481.92
Gold Reef Mountain Bushveld	10.84	0	10.84
Highveld Alluvial Vegetation	441.79	49.78	392.02
Highveld Alluvial Vegetation Wetlands	246.22	55.42	190.81
Highveld Salt Pan	556.69	115.77	440.93
Loskop Mountain Bushveld	382.27	137.06	245.22
Loskop Mountain Bushveld Wetland	158.24	94.94	63.3
Loskop Thornveld	470.93	142.33	328.59
Loskop Thornveld Wetland	74.1	44.46	29.64
Marikana Thornveld	15,752.49	1,314.24	14,438.25
Marikana Thornveld Wetland	770.63	304.32	466.31
Moot Plains Bushveld	1,353.71	65.98	1,287.73
Moot Plains Bushveld Wetland	14.25	5.7	8.55
Norite Koppies Bushveld	0.84	0.34	0.5
Rand Highveld Grassland	2,756.59	176.78	2,579.81
Rand Highveld Grassland Wetland	416.7	166.68	250.02
Soweto Highveld Grassland	2,986.89	66.53	2,920.36
Soweto Highveld Grassland Wetland	619.26	238.52	380.74
Vaal-Vet Sandy Grassland	4,717.93	229.13	4,488.8
Vaal-Vet Sandy Grassland Wetlands	19.9	3.98	15.92
Western Free State Clay Grassland	405.31	89.89	315.41

Figure 17: The TBF, PBF and NBF of SA operations (2022 update), as per ecosystem asset

	Percentage of PBF / TBF (%)	Percentage of NBF / TBF (%)
Carletonville Dolomite Grassland	7.58%	92.42%
Carletonville Dolomite Grassland Wetland	30.06%	69.94%
Central Free State Grassland Wetlands	31.63%	68.37%
Gauteng Shale Mountain Bushveld	11.20%	88.80%
Gauteng Shale Mountain Bushveld Wetland	29.76%	70.24%
Gold Reef Mountain Bushveld	0.00%	100.00%
Highveld Alluvial Vegetation	11.27%	88.73%
Highveld Alluvial Vegetation Wetlands	22.51%	77.49%
Highveld Salt Pan	20.80%	79.20%
Loskop Mountain Bushveld	35.85%	64.15%
Loskop Mountain Bushveld Wetland	60.00%	40.00%
Loskop Thornveld	30.22%	69.78%
Loskop Thornveld Wetland	60.00%	40.00%
Marikana Thornveld	8.34%	91.66%
Marikana Thornveld Wetland	39.49%	60.51%
Moot Plains Bushveld	4.87%	95.13%
Moot Plains Bushveld Wetland	40.00%	60.00%
Norite Koppies Bushveld	40.00%	60.00%
Rand Highveld Grassland	6.41%	93.59%
Rand Highveld Grassland Wetland	40.00%	60.00%
Soweto Highveld Grassland	2.23%	97.77%
Soweto Highveld Grassland Wetland	38.52%	61.48%
Vaal-Vet Sandy Grassland	4.86%	95.14%
Vaal-Vet Sandy Grassland Wetlands	20.00%	80.00%
Western Free State Clay Grassland	22.18%	77.82%

Figure 18: The TBF and NBF of SA operations as a proportion of the TBF (2022 update), as per ecosystem asset
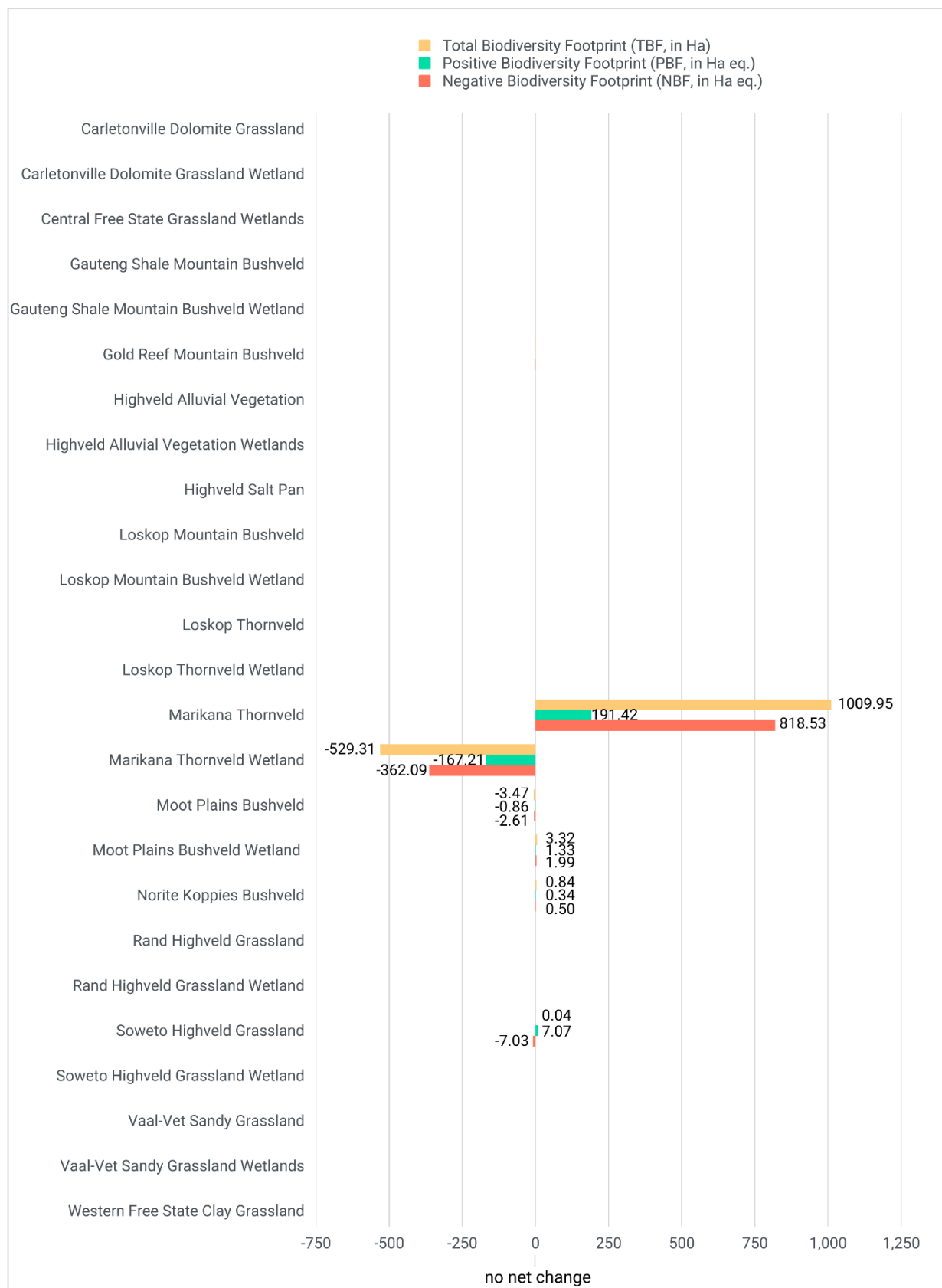
Figure 19: Net changes in the Total Biodiversity Footprint (TBF), Positive Biodiversity Footprint (PBF) and Negative Biodiversity Footprint (NBF) from the 2021 baseline assessment for SA operations

	Total Biodiversity Footprint (TBF, in Ha)	Positive Biodiversity Footprint (PBF, in Ha eq.)	Negative Biodiversity Footprint (NBF, in Ha eq.)
Alpine-Montane Wet Meadow	1.28	1.06	1.44
Aspen Forest and Woodland	48.16	47.08	14.86
Big Sagebrush Steppe	3.82	3.82	16.30
Great Plains Floodplain	0.00	0.00	7.67
Great Plains Mixedgrass Prairie	16.30	7.67	8.63
Great Plains riparian	0.00	0.00	16.30
Montane Sagebrush Steppe	162.98	141.68	1.44
Open Water	3.40	3.39	14.86
Rocky Mountain Cliff, Canyon and Massive Bedrock	20.99	20.61	0.00
Rocky Mountain Foothill Limber Pine - Juniper Woodland	10.26	10.26	0.00
Rocky Mountain Lodgepole Pine Forest	191.59	189.28	0.00
Rocky Mountain Lower Montane, Foothill, and Valley Grassland	699.88	589.59	0.00
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland	14.81	14.20	0.00
Rocky Mountain Montane Douglas-fir Forest and Woodland	480.87	467.73	0.00
Rocky Mountain Montane-Foothill Deciduous Shrubland	56.93	53.18	0.00
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	17.78	17.72	0.00
Rocky Mountain Subalpine-Montane Mesic Meadow	0.00	0.00	0.00
Rocky Mountain Subalpine-Upper Montane Grassland	0.00	0.00	0.00
Rocky Mountain Subalpine Woodland and Parkland	0.00	0.00	0.00

Figure 20: The TBF, PBF and NBF of USA operations at acquisition (different dates, as broken down per ecosystem asset

	Percentage of PBF / TBF (%)	Percentage of NBF / TBF (%)
Alpine-Montane Wet Meadow	83.10%	112.59%
Aspen Forest and Woodland	97.77%	30.85%
Big Sagebrush Steppe	100.00%	426.59%
Great Plains Floodplain		
Great Plains Mixedgrass Prairie	47.07%	52.93%
Great Plains riparian		
Montane Sagebrush Steppe	86.93%	0.88%
Open Water	99.64%	437.05%
Rocky Mountain Cliff, Canyon and Massive Bedrock	98.19%	0.00%
Rocky Mountain Foothill Limber Pine - Juniper Woodland	100.00%	0.00%
Rocky Mountain Lodgepole Pine Forest	98.79%	0.00%
Rocky Mountain Lower Montane, Foothill, and Valley Grassland	84.24%	0.00%
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland	95.88%	0.00%
Rocky Mountain Montane Douglas-fir Forest and Woodland	97.27%	0.00%
Rocky Mountain Montane-Foothill Deciduous Shrubland	93.40%	0.00%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	99.64%	0.00%

Figure 21: The TBF and NBF of USA operations as a proportion of the TBF at acquisition, broken down per ecosystem asset

	Total Biodiversity Footprint (TBF, in Ha)	Positive Biodiversity Footprint (PBF, in Ha eq.)	Negative Biodiversity Footprint (NBF, in Ha eq.)
Alpine-Montane Wet Meadow	1.28	1.06	0.22
Aspen Forest and Woodland	48.16	46.87	1.29
Big Sagebrush Steppe	3.82	3.33	0.49
Great Plains Floodplain	0	0	0
Great Plains Mixedgrass Prairie	16.3	1.44	14.86
Great Plains riparian	0	0	0
Montane Sagebrush Steppe	162.98	141.29	21.69
Open Water	3.4	3.39	0.01
Rocky Mountain Cliff, Canyon and Massive Bedrock	20.99	19.96	1.03
Rocky Mountain Foothill Limber Pine - Juniper Woodland	10.26	9.84	0.43
Rocky Mountain Lodgepole Pine Forest	187.49	104.56	82.93
Rocky Mountain Lower Montane, Foothill, and Valley Grassland	699.88	373.63	326.25
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland	14.8	13.98	0.83
Rocky Mountain Montane Douglas-fir Forest and Woodland	484.96	447.45	37.52
Rocky Mountain Montane-Foothill Deciduous Shrubland	56.93	52.61	4.32
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	17.78	17.72	0.06
Rocky Mountain Subalpine-Montane Mesic Meadow	0	0	0
Rocky Mountain Subalpine-Upper Montane Grassland	0	0	0
Rocky Mountain Subalpine Woodland and Parkland	0	0	0

Figure 24: The TBF, PBF and NBF of USA operations (2021 baseline), as per ecosystem asset

	Percentage of PBF / TBF (%)	Percentage of NBF / TBF (%)
Alpine-Montane Wet Meadow	83.10%	16.90%
Aspen Forest and Woodland	97.32%	2.68%
Big Sagebrush Steppe	87.29%	12.71%
Great Plains Floodplain		
Great Plains Mixedgrass Prairie	8.84%	91.16%
Great Plains riparian		
Montane Sagebrush Steppe	86.69%	13.31%
Open Water	99.64%	0.36%
Rocky Mountain Cliff, Canyon and Massive Bedrock	95.09%	4.91%
Rocky Mountain Foothill Limber Pine - Juniper Woodland	95.84%	4.16%
Rocky Mountain Lodgepole Pine Forest	55.77%	44.23%
Rocky Mountain Lower Montane, Foothill, and Valley Grassland	53.38%	46.62%
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland	94.42%	5.58%
Rocky Mountain Montane Douglas-fir Forest and Woodland	92.26%	7.74%
Rocky Mountain Montane-Foothill Deciduous Shrubland	92.41%	7.59%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	99.64%	0.36%

Figure 25: The TBF and NBF of USA operations as a proportion of the TBF at 2021 baseline, broken down per ecosystem asset

	Total Biodiversity Footprint (TBF, in Ha)	Positive Biodiversity Footprint (PBF, in Ha eq.)	Negative Biodiversity Footprint (NBF, in Ha eq.)
Alpine-Montane Wet Meadow	8.92	8.92	0
Aspen Forest and Woodland	77.79	74.72	3.07
Big Sagebrush Steppe	429.44	386.8	42.64
Great Plains Floodplain	17.54	13.72	3.82
Great Plains Mixedgrass Prairie	51.83	24.51	27.32
Great Plains riparian	16.18	16.18	0
Montane Sagebrush Steppe	246.84	244.1	2.74
Open Water	13.79	13.79	0
Rocky Mountain Cliff, Canyon and Massive Bedrock	30.45	28.65	1.81
Rocky Mountain Foothill Limber Pine - Juniper Woodland	61.45	61	0.45
Rocky Mountain Lodgepole Pine Forest	192.26	106.55	85.71
Rocky Mountain Lower Montane, Foothill, and Valley Grassland	1,408.01	960.51	447.5
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland	67.44	63.12	4.33
Rocky Mountain Montane Douglas-fir Forest and Woodland	715.9	677.66	38.25
Rocky Mountain Montane-Foothill Deciduous Shrubland	78.57	76.4	2.17
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	29.01	28.88	0.13
Rocky Mountain Subalpine-Montane Mesic Meadow	0.18	0.18	0
Rocky Mountain Subalpine-Upper Montane Grassland	19.1	18.68	0.42
Rocky Mountain Subalpine Woodland and Parkland	21.21	20.79	0.43

Figure 26: The TBF, PBF and NBF of USA operations (2022 update), as per ecosystem asset

	Percentage of PBF / TBF (%)	Percentage of NBF / TBF (%)
Alpine-Montane Wet Meadow	100.00%	0.00%
Aspen Forest and Woodland	96.05%	3.95%
Big Sagebrush Steppe	90.07%	9.93%
Great Plains Floodplain	78.21%	21.79%
Great Plains Mixedgrass Prairie	47.29%	52.71%
Great Plains riparian	100.00%	0.00%
Montane Sagebrush Steppe	98.89%	1.11%
Open Water	99.99%	0.01%
Rocky Mountain Cliff, Canyon and Massive Bedrock	94.07%	5.93%
Rocky Mountain Foothill Limber Pine - Juniper Woodland	99.27%	0.73%
Rocky Mountain Lodgepole Pine Forest	55.42%	44.58%
Rocky Mountain Lower Montane, Foothill, and Valley Grassland	68.22%	31.78%
Rocky Mountain Lower Montane-Foothill Riparian Woodland and Shrubland	93.59%	6.41%
Rocky Mountain Montane Douglas-fir Forest and Woodland	94.66%	5.34%
Rocky Mountain Montane-Foothill Deciduous Shrubland	97.24%	2.76%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	99.54%	0.46%
Rocky Mountain Subalpine-Montane Mesic Meadow	100.00%	0.00%
Rocky Mountain Subalpine-Upper Montane Grassland	97.80%	2.20%
Rocky Mountain Subalpine Woodland and Parkland	97.98%	2.02%

Figure 27: The TBF and NBF of USA operations as a proportion of the TBF (2022 update), as per ecosystem asset

ENDANGERED WILDLIFE TRUST
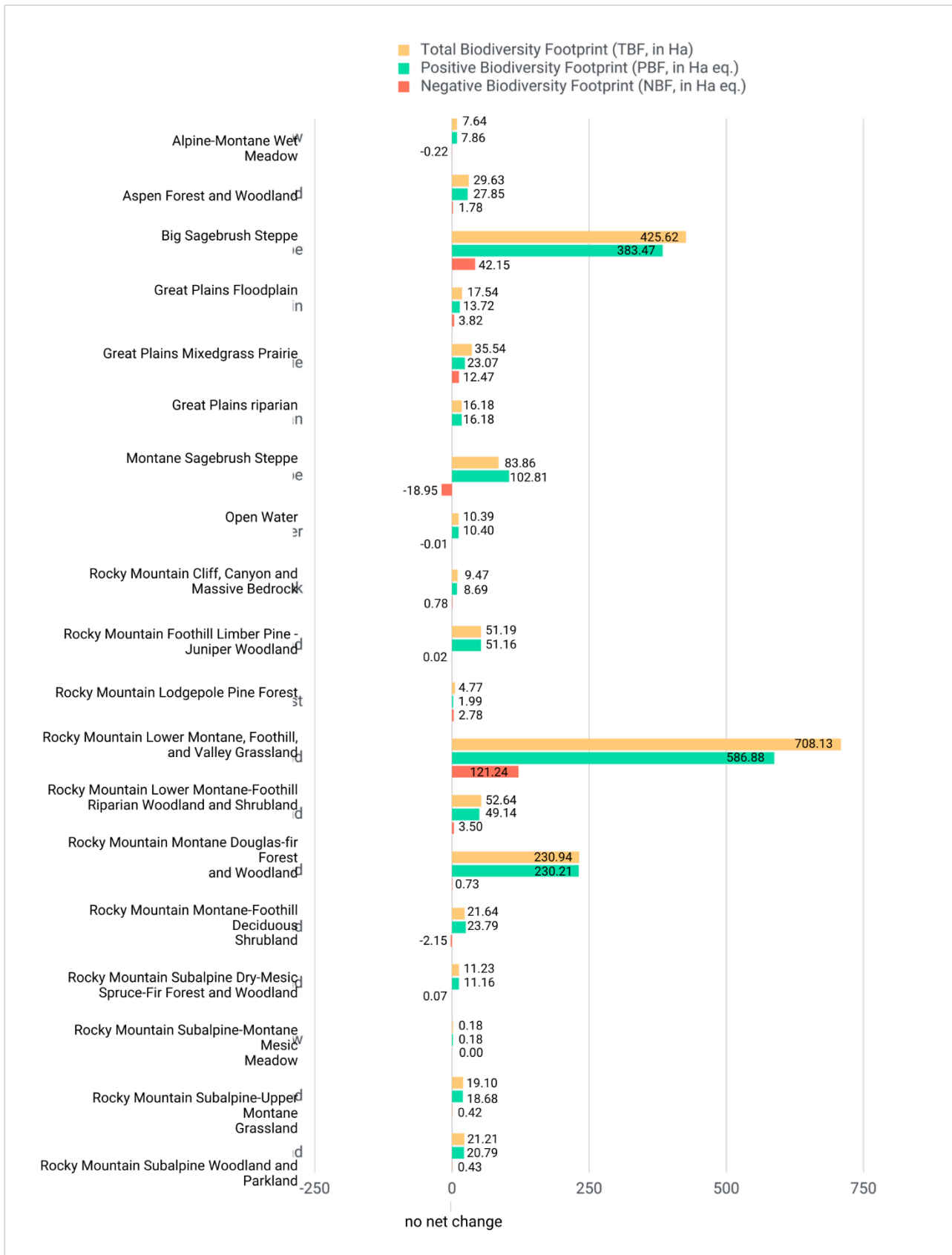Protecting forever, together.

Figure 22: Net changes in the Total Biodiversity Footprint (TBF), Positive Biodiversity Footprint (PBF) and Negative Biodiversity Footprint (NBF) from the 2021 baseline assessment for USA operations

5. Discussions and recommendations going forward

This section focuses on compiling group-level recommendations for Sibanye-Stillwater. These recommendations are organisations around three broad topics: (a) completing and improving the biodiversity asset registry, (b) disclosure requirements and opportunities and (c) target setting.

5.1 Completing and improving the biodiversity asset register

Since the focus on this year's update assessment was limited to recording changes in the impact inventory / asset register, the same gaps remain (i.e. lack of ecosystem-specific condition monitoring protocols for SA operations, doubts over quality of species accounts for USA operations, lack of species accounts for SA operations). These are detailed in: Houdet, J., Teren, G., 2022. Sibanye-Stillwater's consolidated biodiversity footprint. Pilot assessment as per the Biological Diversity protocol – Group level consolidated report. National Biodiversity & Business Network – Endangered Wildlife Trust / Sibanye-Stillwater.

In addition, two issues arose during this year's assessment:

- While the use of a detailed, quantitative ecosystem rating methodology for USA operations is welcomed, the criteria embedded in the index are not directly linked to core ecosystem properties (e.g., species mix, structure, ecosystem functions) but almost exclusively based on impact drivers / threat levels. Assuming that reduced anthropogenic pressures is directly correlated with species / ecosystem recovery can be misleading[23]. This calls for a potential revision of the rating system.
- The 2022 USA operations assessment involved re-doing the accounts from the beginning, notably using new approaches to ecosystem condition rating and rewriting all the accounting entries from the baseline assessment. Going forward, this should not be done. Correcting (not deleting)

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[23] Houdet, J, Teren, G. 2022. Quality Biodiversity Footprint Assessments in Practice: Why Organisational Biodiversity Accounting Matters. A Position Paper of the Biodiversity Disclosure Project (BDP). National Biodiversity and Business Network, Endangered Wildlife Trust, South Africa. URL: https://407264.p3cdn1.secureserver.net/wp-content/uploads/2022/11/BDP-Quality-Biodiversity-Footprints.pdf

past accounting journal records is appropriate, alongside explanations / rationale for the changes, when updating accounts. This helps make sure the accounting process is fully transparent so that any third party can fully trace changes made over time. This avoids any misunderstandings that could arise from accounts that cannot be matched over time (e.g., shifting baseline syndrome).

5.2   Disclosure requirements and opportunities

There were no meaningful changes for this year's update assessment with respect to disclosure requirements and opportunities. The BD Protocol recommends that a quality biodiversity disclosure includes:

- Narratives about your company's approach to managing biodiversity, notably:
    - Its biodiversity policies, strategies, action plans, targets, and key performance indicators, notably with regards to implementing the mitigation hierarchy of each component of its biodiversity impact inventory.
    - Its actual and planned contributions to international and national biodiversity targets (e.g. CBD's Kunming-Montreal Global Biodiversity Framework, SDG 15 "Life on Land" and SDG 14 "Life under Water"); for instance, its contributions (including cost savings) to society realised through either the management or control of biodiversity assets (or, ideally, through long-term positive biodiversity gains (i.e. the establishing and managing of a private protected area, formally declared under the applicable legislation).

- Quantitative, non-monetary information about the scale of your biodiversity positive and negative impacts, as per the Biodiversity Accounting Framework of the BD Protocol, which implies producing Statements of Position and Performance segregated as follows:
    - Per accounting period;
    - Per selected value chain boundary (i.e. direct operations, upstream and/or downstream);
    - Per type of impact (i.e. direct, indirect and/or future);
    - Per biodiversity feature (i.e. aggregable ecosystem accounts and distinct accounts for each material taxon).

- Financial information on its expenses and liabilities associated with the implementation of the mitigation hierarchy, notably no-net-loss/ net-gain legal requirements (e.g. capital and operation expenditures of offset requirements); which may be expressed in any relevant currency as per International Financial Reporting Standards and generally accepted accounting practices, and broken down per biodiversity asset category (e.g. ZAR or US $ / ha of ecosystem type or taxon);

Given the progress to date, Sibanye-Stillwater should disclose its:

- Draft ecosystem impact inventory / asset register, including total surface area and residual condition-adjusted surface area, broken down per mining operation and ecosystem asset type,
- Key methodology aspects, as per the BD Protocol, notably the selected organisational and value chain boundaries, the selected impact category (i.e. direct impacts), the reliance on site-based state data, the use of different condition rating methods for different ecosystem types and the reliance on double-entry bookkeeping to record changes in the state of biodiversity assets (see section 3);
- Draft Total, Positive & Negative Biodiversity Footprints overall for SA and USA operations, as well as overall for the group.
- Progress towards full adhere to the BD Protocol accounting and reporting principles (self-assessment via an internal review process):
  - **Relevance**: Full adherence. All direct impacts of operations assessed.
  - **Equivalency**: Full adherence. Identification of all ecosystem types at national / state level and gains / losses recorded separately for each asset category; through further work (site surveys) may lead to further refinements.
  - **Completeness:** Partial adherence. All direct impacts on ecosystems have been included (land use and water emissions); though further site-surveys regarding the direct impacts of water emissions are required for several sites. The material species register needs to be completed (SA operations) and refined (USA operations).
  - **Consistency**: Full adherence. Consistent methods per similar biodiversity asset have been used throughout operations.
  - **Transparency**: Full adherence. All assumptions and limitations have been documented.
  - **Accuracy**: Varying levels of accuracy for the ecosystem impact inventory (depends on the ecosystem type and operation).

NB: No SMART target should be disclosed yet (see section 5.3).

5.3   Target setting

As for disclosure requirements and opportunities, there was no meaningful changes for this year's update assessment with respect to target setting. As per the BD Protocol, target setting within a biodiversity accounting context must apply to each component of the asset register / inventory, separately. It may be influenced or dictated by policies, specific procurement rules, standards and / or jurisdictional laws or regulations, for instance no-net-loss requirements for specific biodiversity assets (e.g., protected species, wetlands). Furthermore, targets can be framed from two perspectives:

- A periodic impact perspective, whereby targets are based on expected or desired positive (net positive / net gain), neutral (no net loss) or negative (net loss) changes in the state of biodiversity assets over a given period (e.g., one or several years),

- From an accumulated impact perspective, whereby targets are based as the expected or desired share of the Total Biodiversity Footprint, per biodiversity asset category, which is positive (Positive Biodiversity Footprint) or negative (Negative Biodiversity Footprint).

In the baseline assessment, all operations have explored scenarios of changes in the context of Sibanye-Stillwater's biodiversity policy (i.e. *achieving a "no net loss" for new/greenfield operations and a "net gain" in biodiversity for existing operations; see section 3.4).* The details of each scenario and associated expected changes in the Total, Positive and Negative Biodiversity Footprints of each operation / ecosystem asset can be found in the individual mine report listed in section 3.2.

In summary, minimum PBF requirements have been set per ecosystem type and mine. These typically correspond to the residual state (extent adjusted for condition) at the time of acquisition. In some cases, further losses have occurred since acquisition, which implies investing in restoration measures.

However, given the gaps identified in section 5.1, it is premature to finalize and disclose any target(s). As explained, two key activities are required going forward:

- Completing and refining the material species impact inventory / asset register;

- Developing ecosystem-specific condition monitoring protocols.

As for the baseline assessment, the need to better understand local spatial heterogeneity and recovery potential of various ecosystems at different sites, coupled to an analysis of landscape-level conservation opportunities (i.e. beyond the legal boundaries of Sibanye-Stillwater's operations), has preventing the development of SMART target articulated around the mitigation hierarchy for this update assessment.

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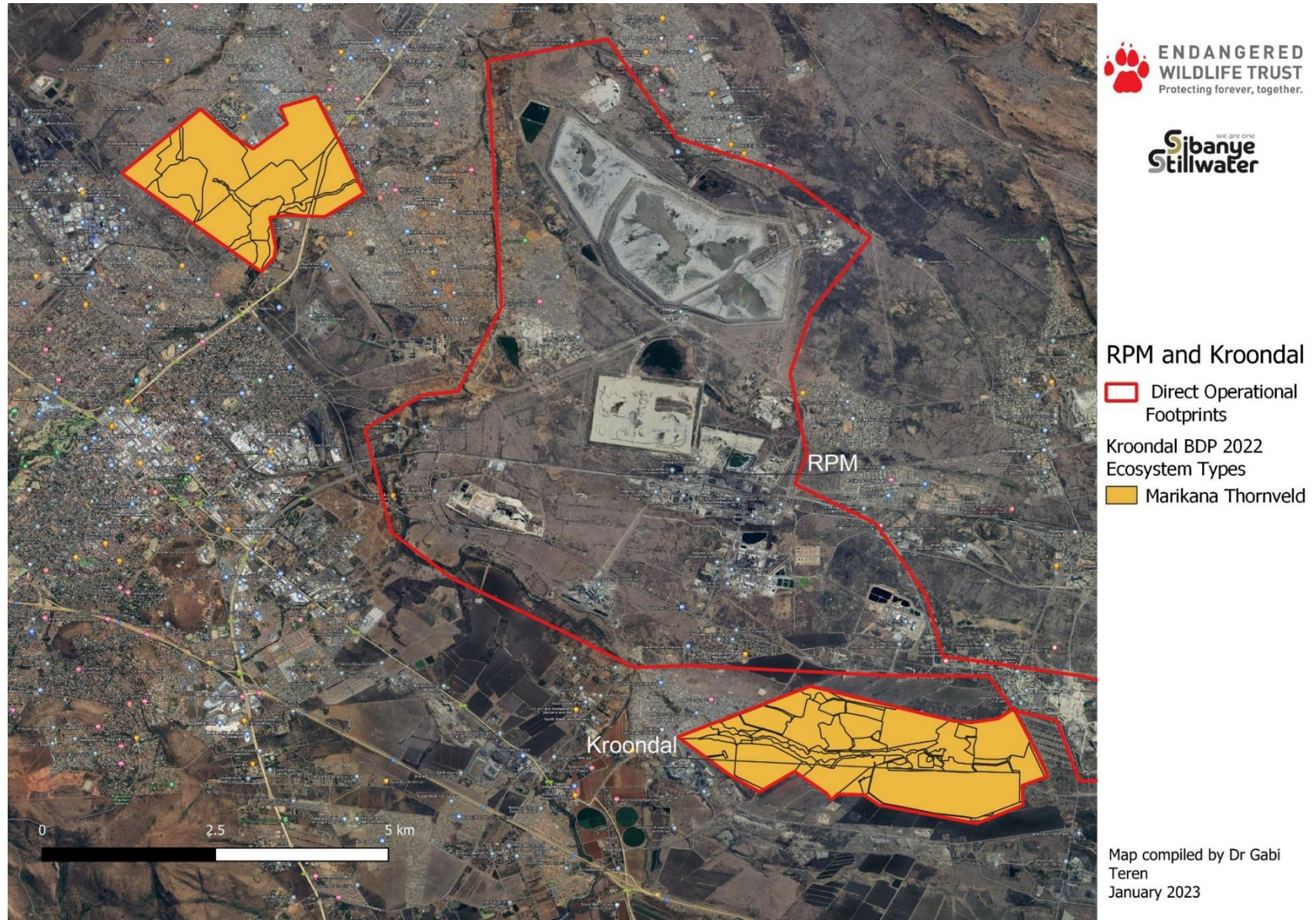Brad Nelson, Biodiversity Disclosure Project Coordinator, NBBN, EWT
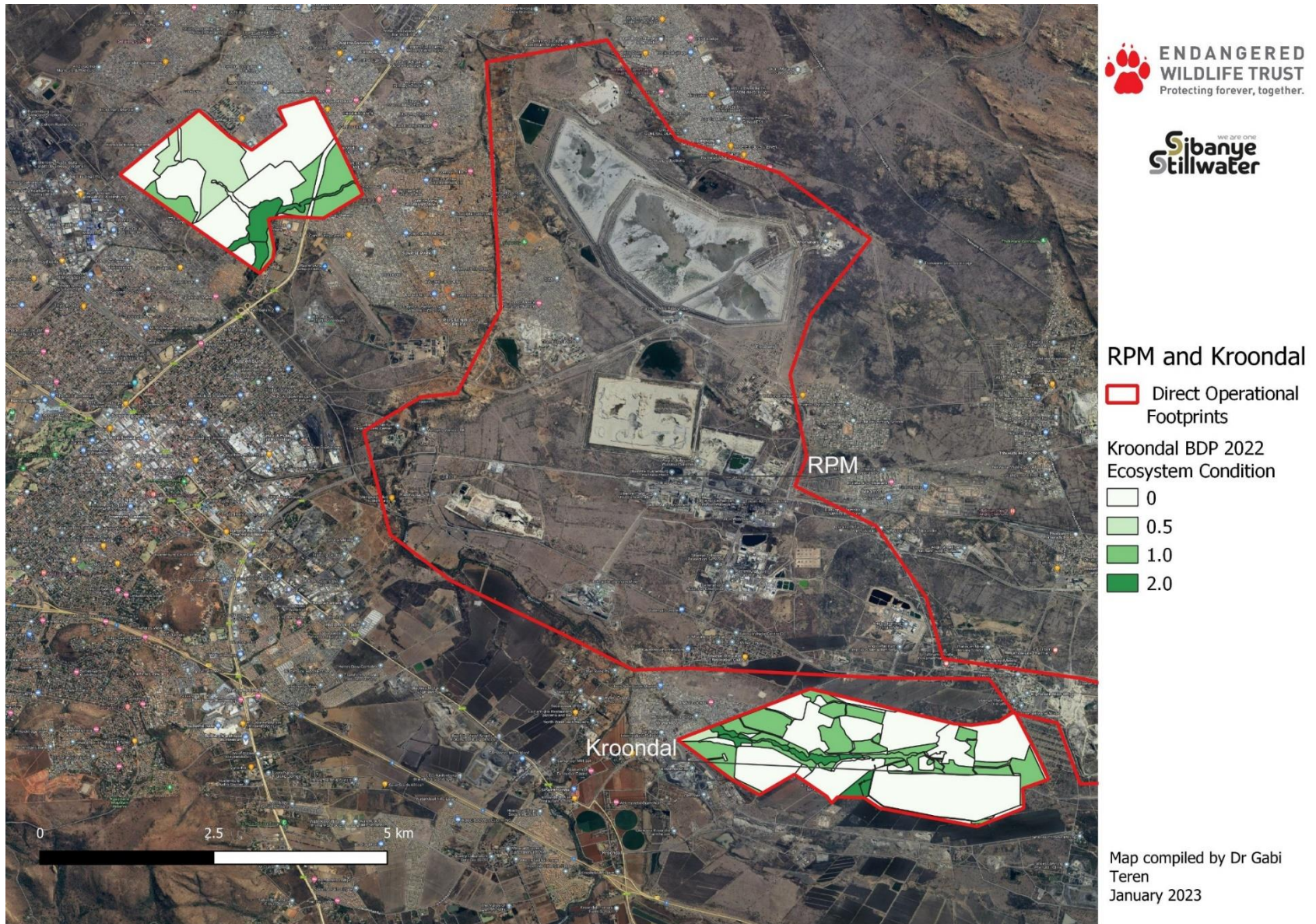
BradN@ewt.org.za

6. Annexes

The annexes present the complete records (asset register – maps of extent and condition, accounting journal entries, statements of performance and position) of changes in ecosystem assets for SA operations.

1. Maps of extent and condition of ecosystem assets for 2022 changes	2. Accounting journal entries for 2022 changes
1.1: Kroondal (all) Updated Ecosystem extents 2022	2.1: 2022 Kroondal accounting journal entries
1.2: Kroondal (all) Updated Ecosystem Condition 2022	2.2: 2022 Marikana accounting journal entries
1.3: Kroondal (additional Kwezi section) Ecosystem Condition 2022	2.3: 2022 Rand Uranium accounting journal entries
1.4: Kroondal (main section) Ecoystem Condition as per 2021 Assessment	2.4:2022 RPM accounting journal entries
1.5: Kroondal (main section) Updated Ecosystem Condition 2022.	
1.6: Marikana (large) Updated Ecosystem Extents 2022.	**3. Statements of Performance for 2022 changes**
1.7: Marikana (large) Ecosystem Condition as per 2021 Assessment	3.1: 2022 Kroondal Statement of Performance
1.8: Marikana (large) Updated Wetland Delineation and Scores 2022 (Provided)	3.2: 2022 Marikana Statement of Performance
1.9: Marikana (large) Updated Ecosystem Condition 2022	3.3: 2022 Rand Uranium Statement of Performance
1.10: RPM Updated Ecosystem Extents 2022 (Moot Plains Bushveld tiny section on the far western boundary)	3.4: 2022 RPM Statement of Performance
1.11: Annex 1.11 RPM Ecosystem Condition as per 2021 Assessment	
1.12: RPM Updated Wetland Delineation and Scores 2022 (Provided)	**4. Statements of Position for 2022 changes**
1.13: RPM Updated Ecosystem Condition 2022	4.1: 2022 Kroondal Statement of Position
1.14: Rand Uranium Ecosystem Extents 2022	4.2: 2022 Marikana Statement of Position
1.15: Rand Uranium (Middelvlei section) Ecosystem Condition as per 2021 Assessment.	
1.16: Rand Uranium (Middelvlei section) Updated Ecosystem Condition 2022	4.3: 2022 Rand Uranium Statement of Position
	4.4: 2022 RPM Statement of Position
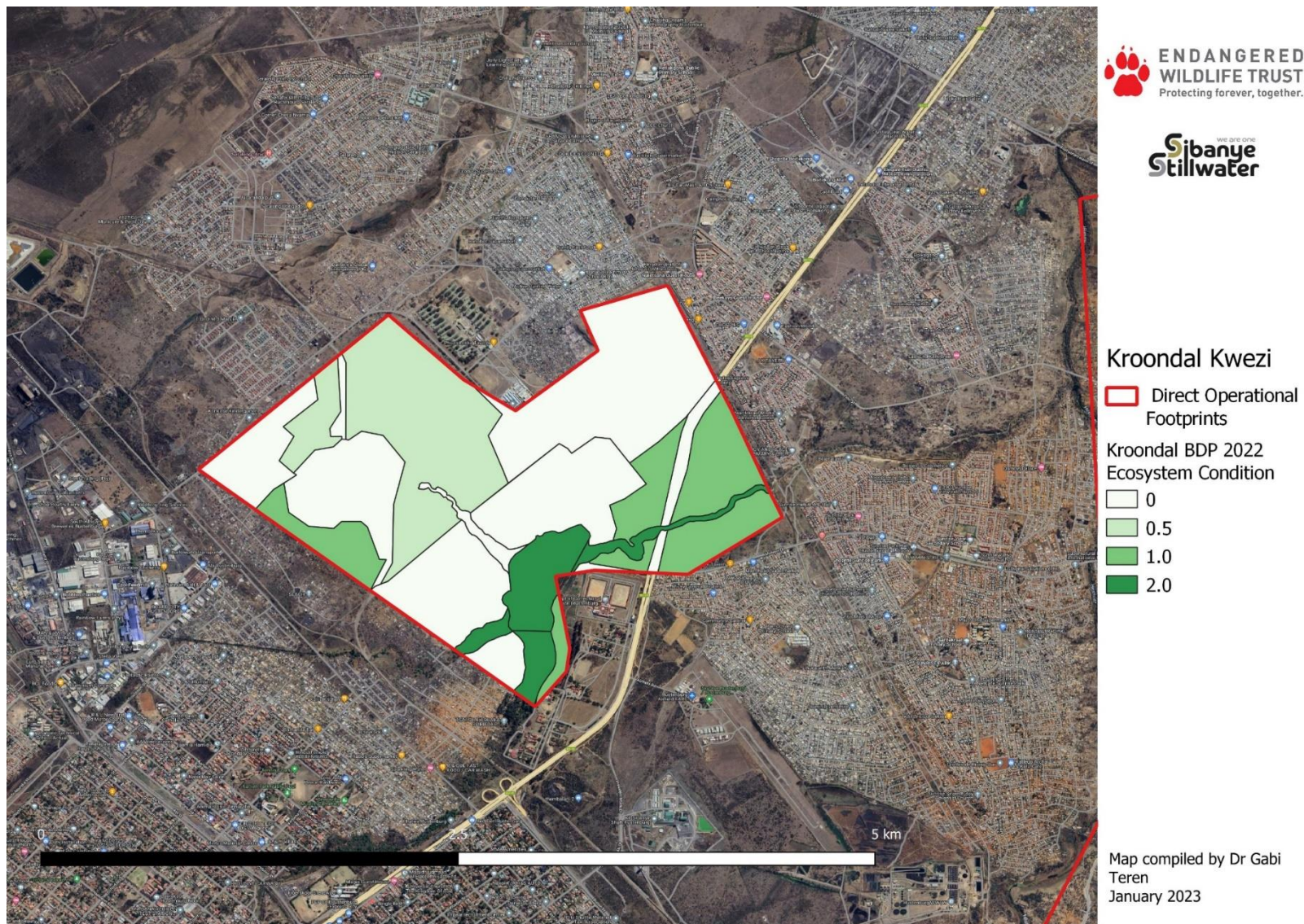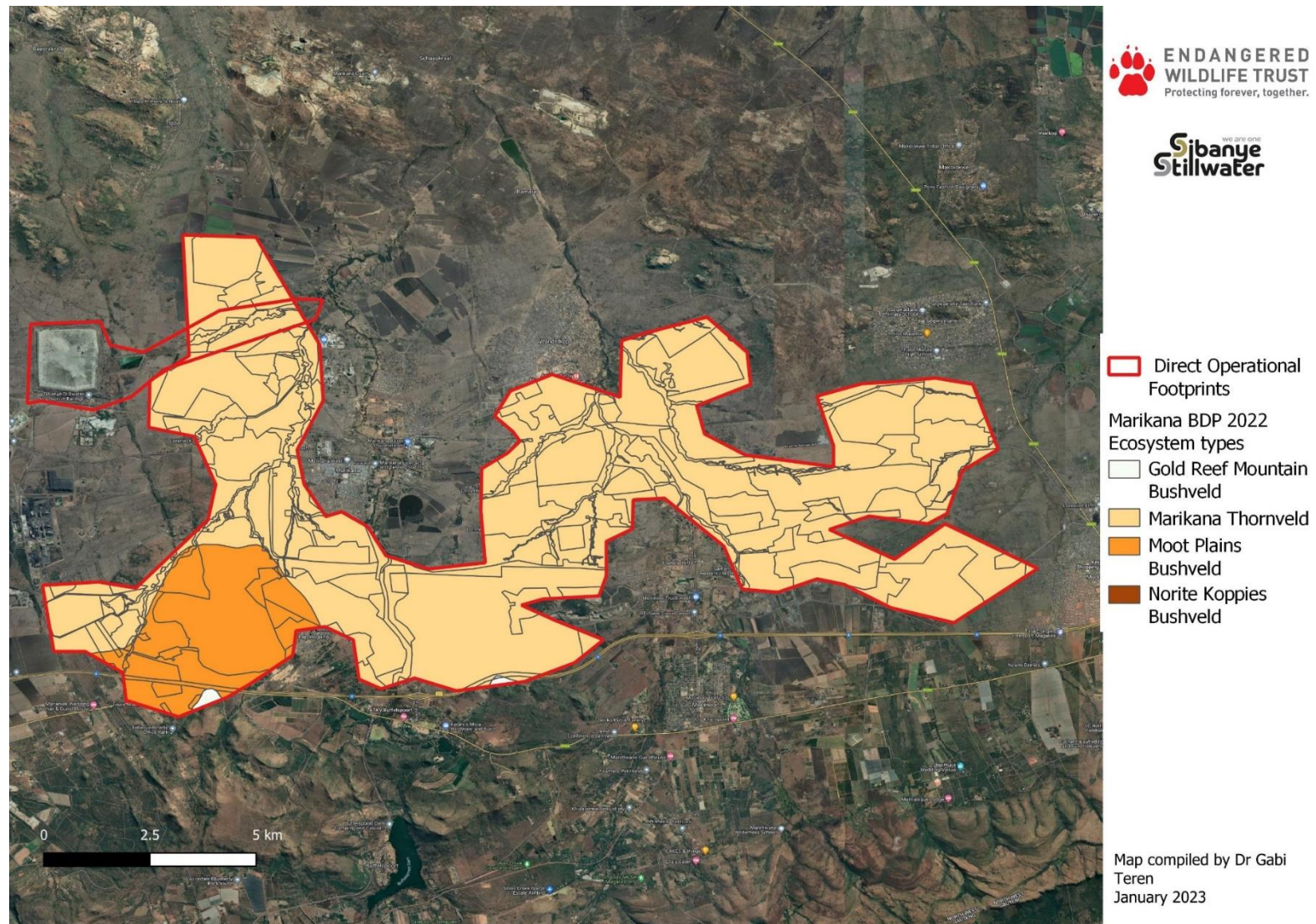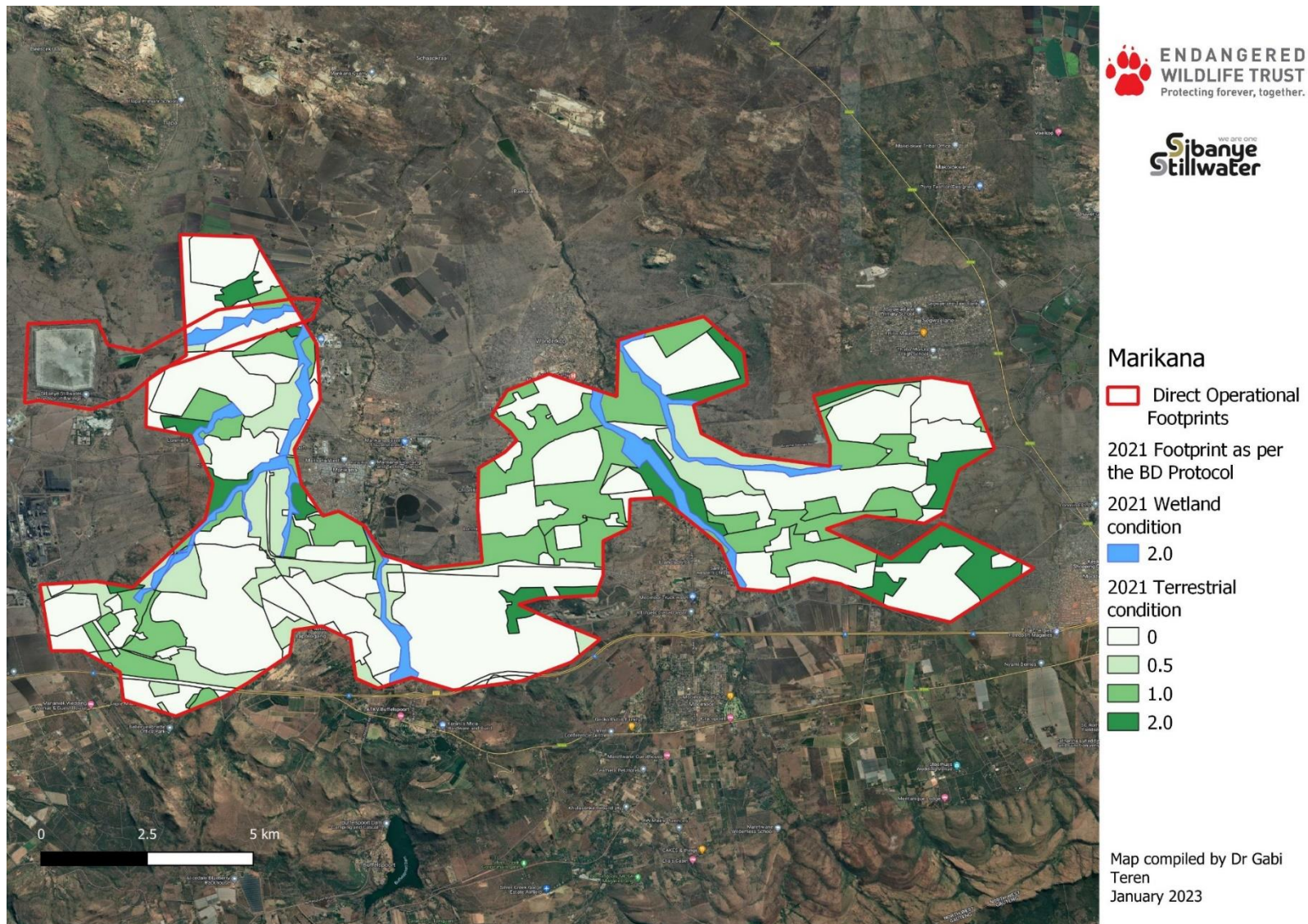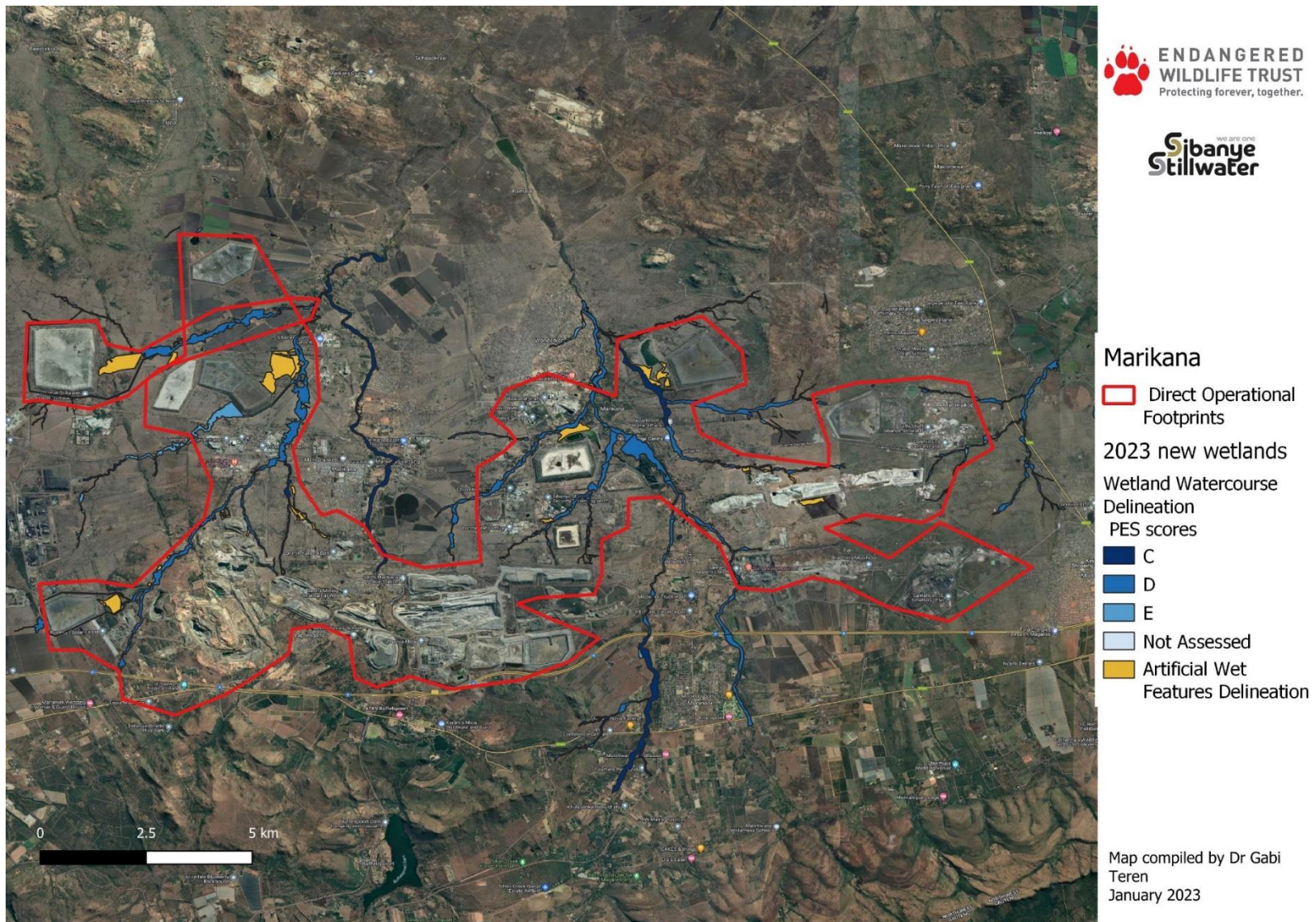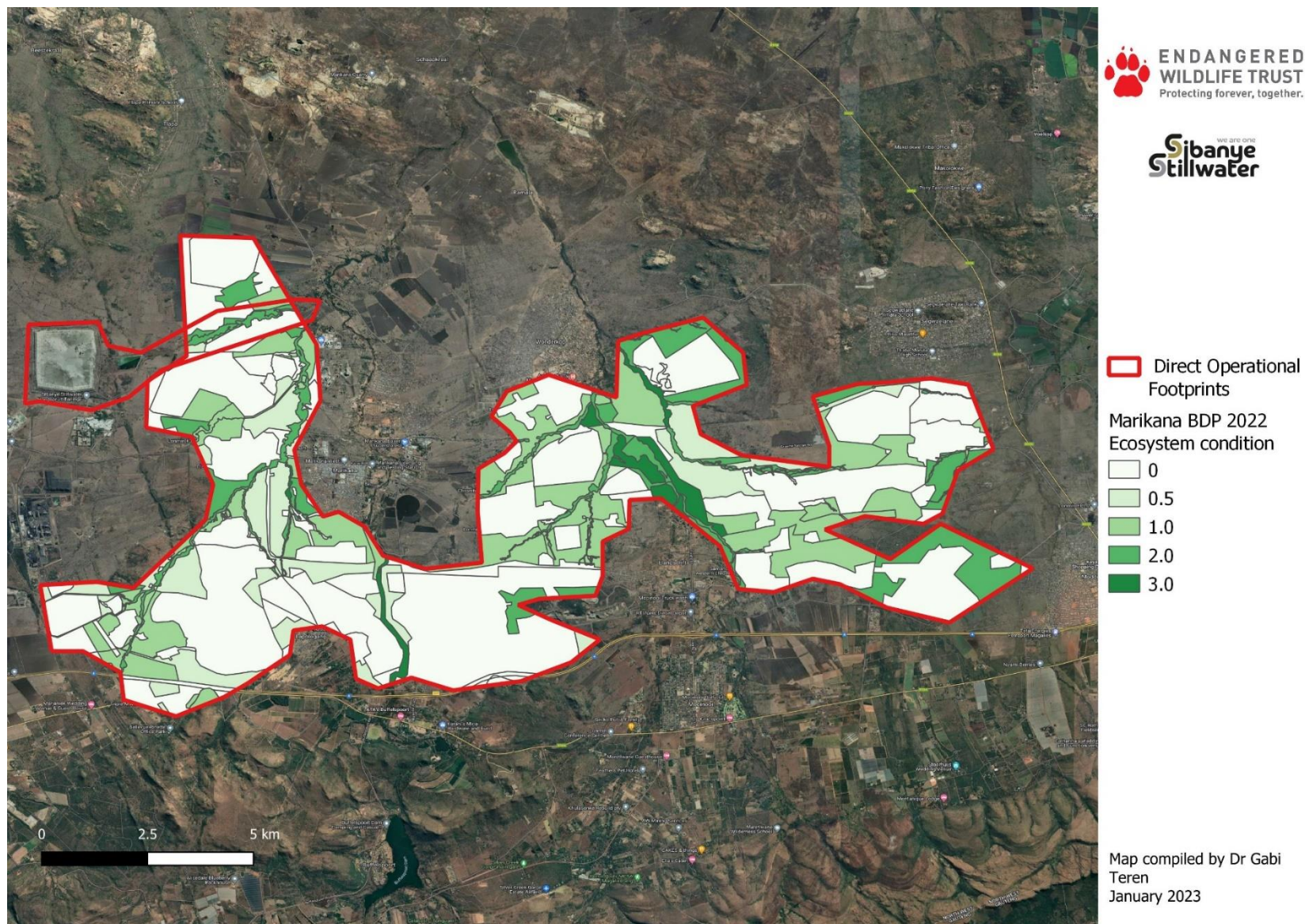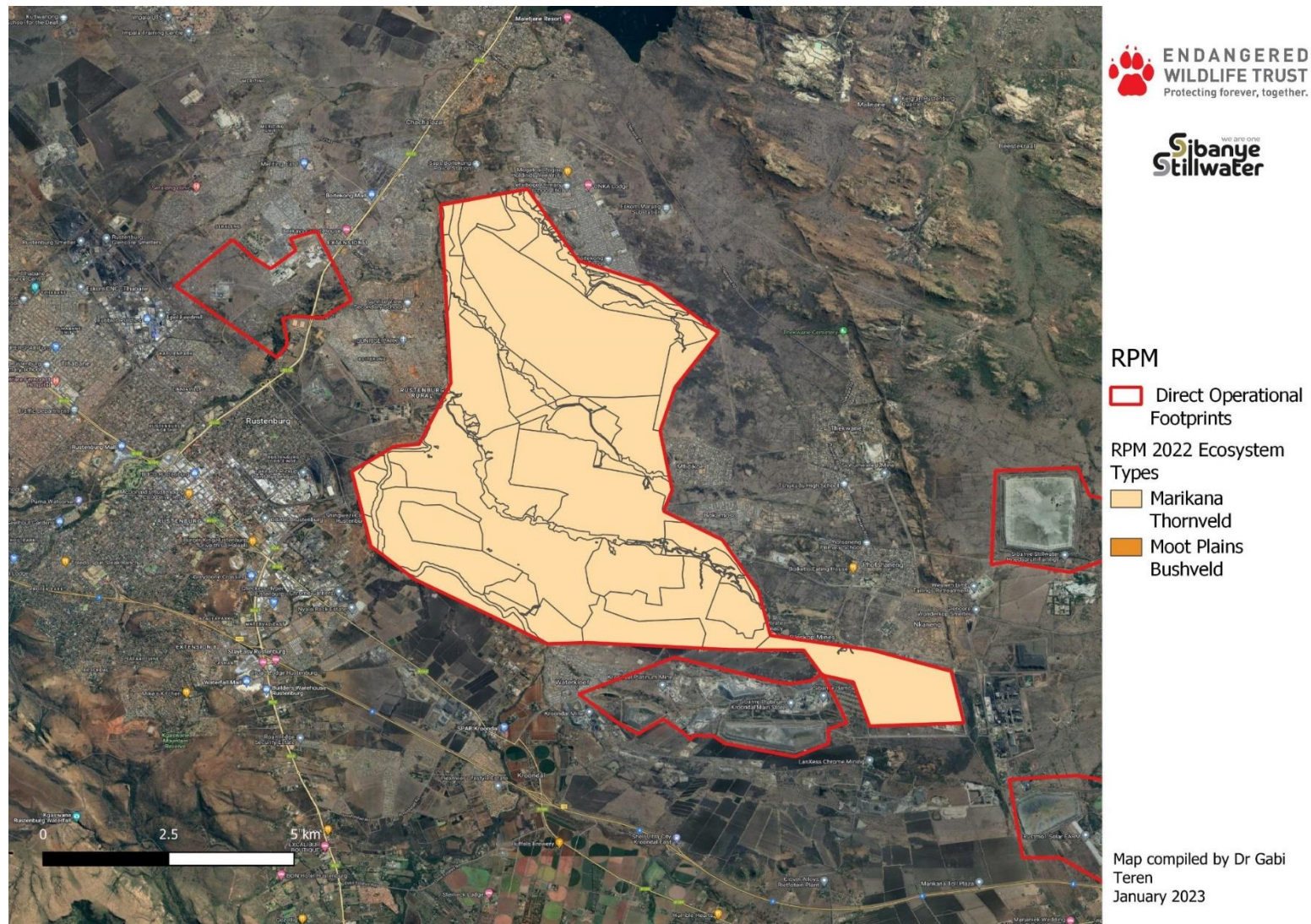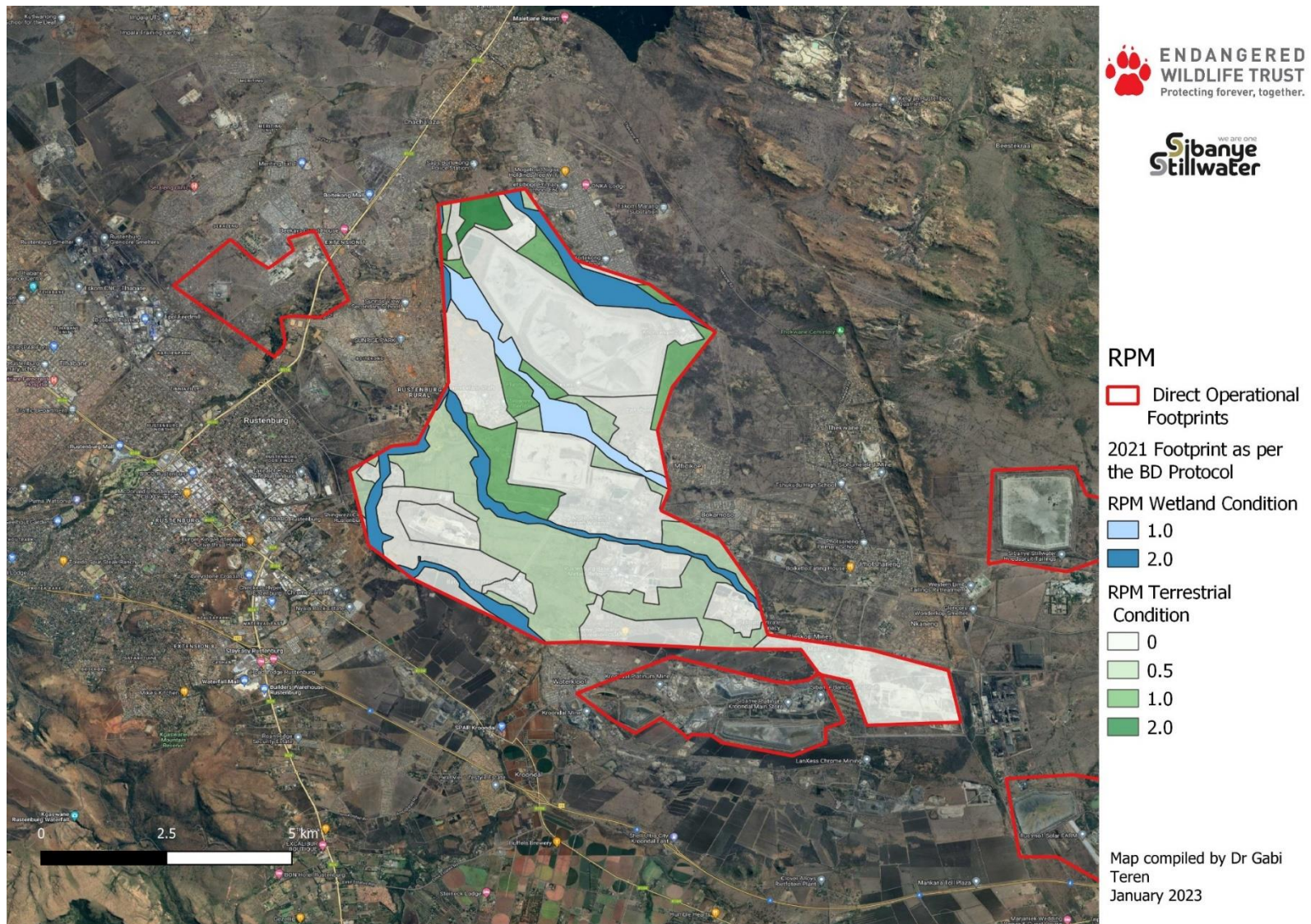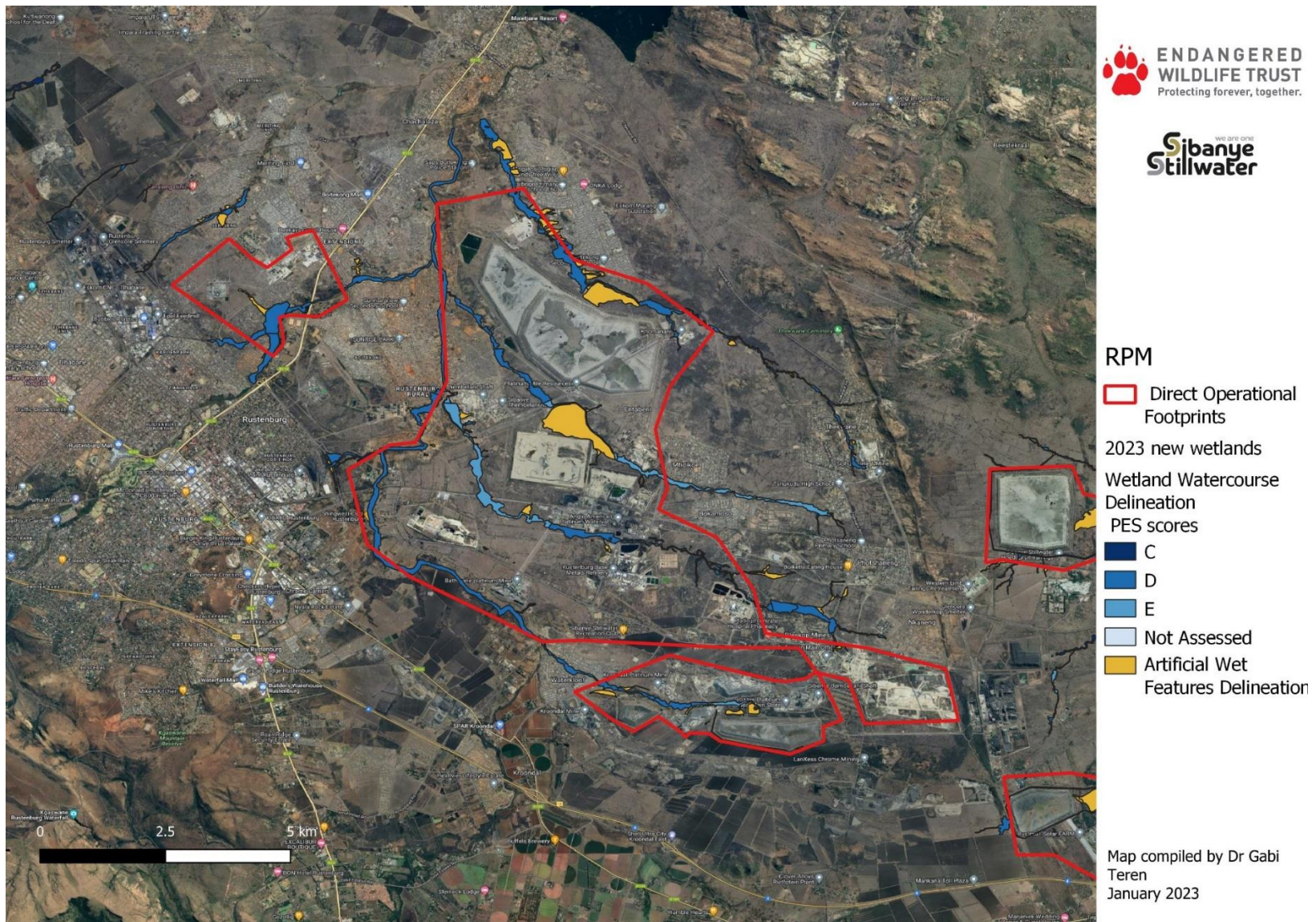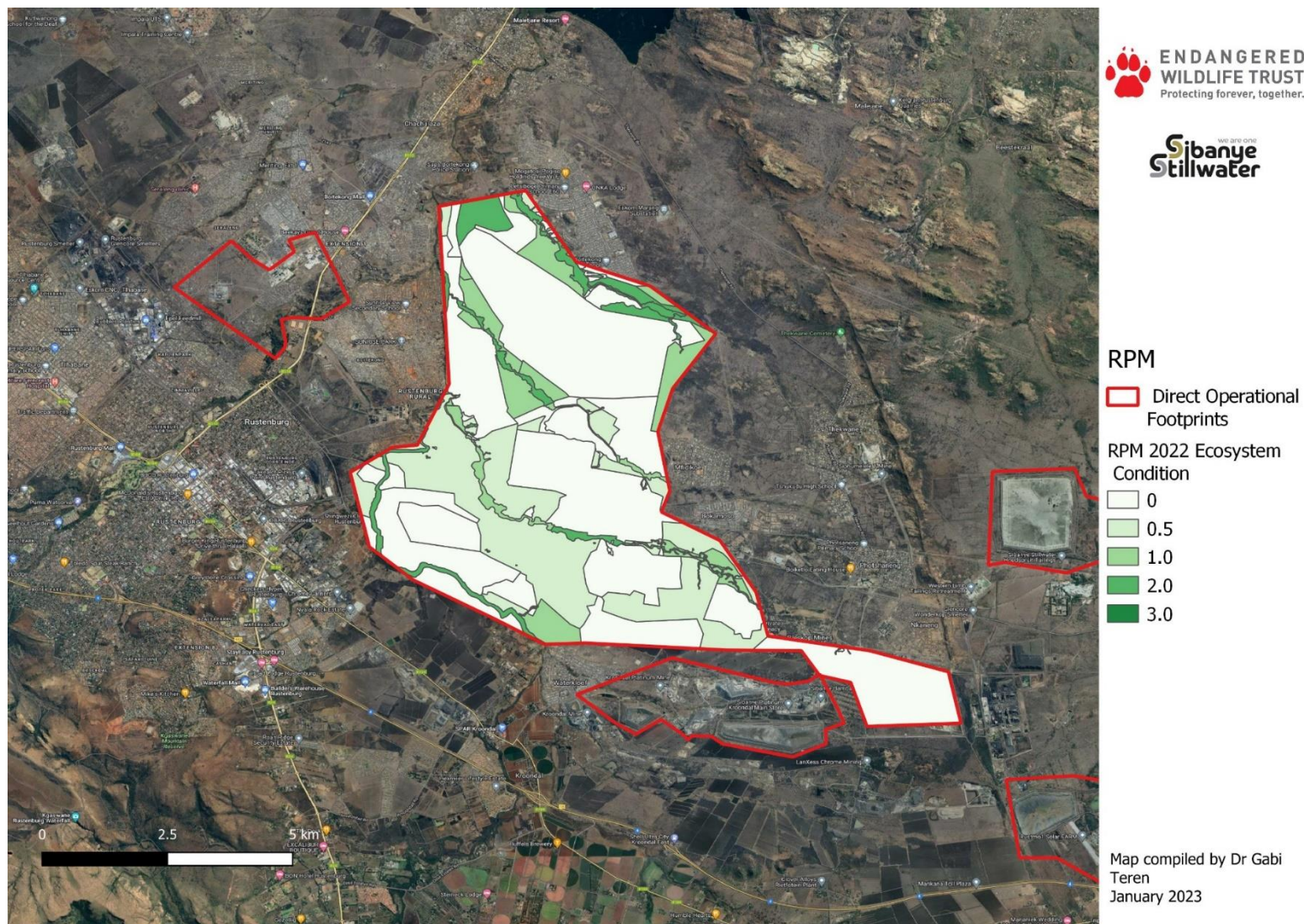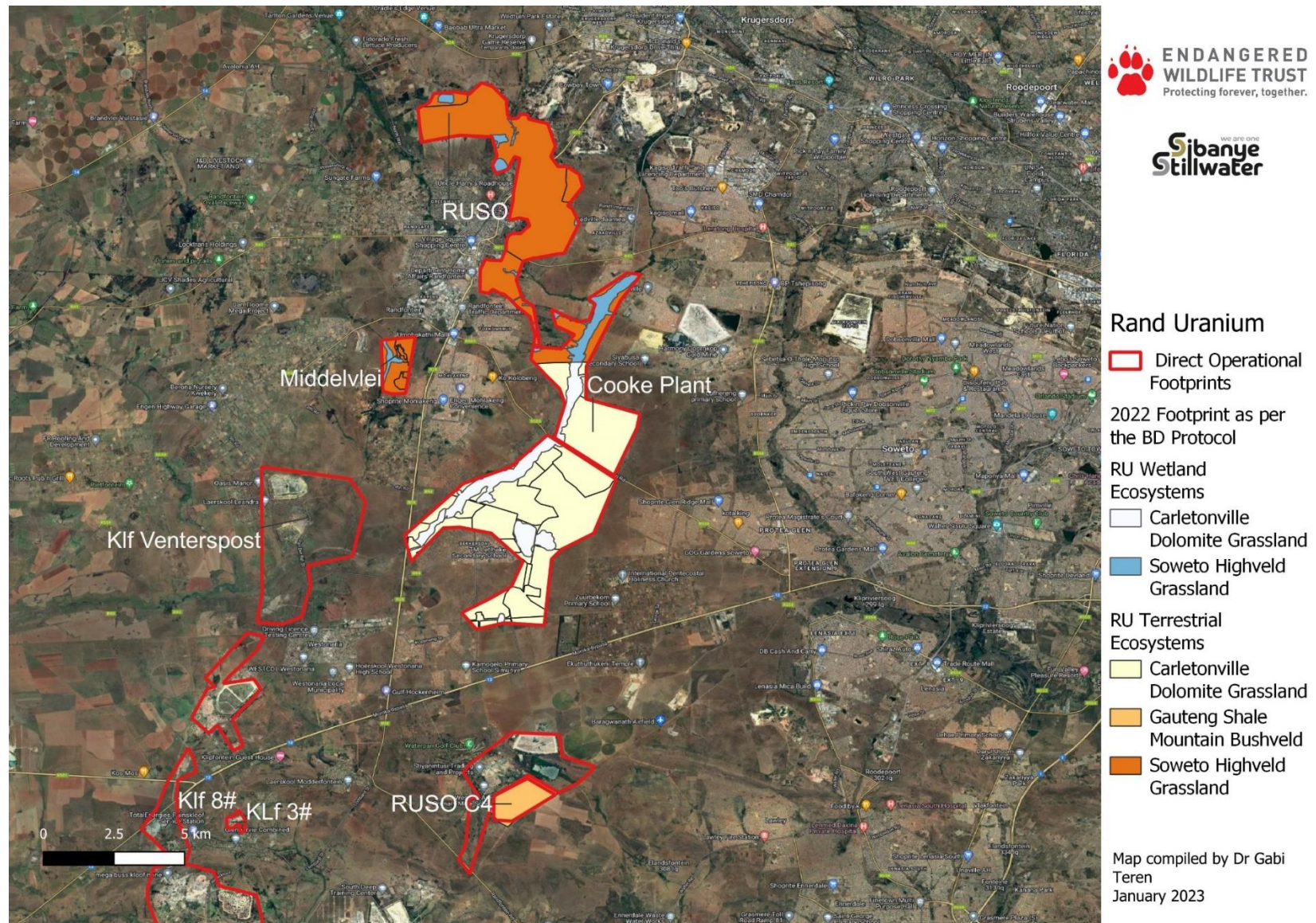
RPM and Kroondal

Direct Operational Footprints

Kroondal BDP 2022 Ecosystem Types

Marikana Thornveld

RPM

Kroondal

Map compiled by Dr Gabi Teren
January 2023

RPM and Kroondal

Direct Operational Footprints

Kroondal BDP 2022 Ecosystem Condition

0
0.5
1.0
2.0

Map compiled by Dr Gabi Teren
January 2023

Kroondal Main

☐ Direct Operational
  Footprints

2021 Footprint as per
the BD Protocol

Kroondal Wetland
Condition
■ 1.0

Kroondal Terrestrial
Condition
☐ 0
■ 1.00

Map compiled by Dr Gabi
Teren
January 2023

Kroondal Main

▭ Direct Operational Footprints

Kroondal BDP 2022 Ecosystem Condition

- 0
- 0.5
- 1.0
- 2.0

Map compiled by Dr Gabi Teren January 2023

Direct Operational Footprints

Marikana BDP 2022 Ecosystem types

Gold Reef Mountain Bushveld

Marikana Thornveld

Moot Plains Bushveld

Norite Koppies Bushveld

Map compiled by Dr Gabi Teren
January 2023

ENDANGERED
WILDLIFE TRUST
Protecting forever, together.

Sibanye
Stillwater
we are one

Marikana

☐ Direct Operational
Footprints

2021 Footprint as per
the BD Protocol

2021 Wetland
condition

■ 2.0

2021 Terrestrial
condition

☐ 0

0.5

1.0

■ 2.0

Map compiled by Dr Gabi
Teren
January 2023

Direct Operational Footprints

Marikana BDP 2022 Ecosystem condition
- 0
- 0.5
- 1.0
- 2.0
- 3.0

Map compiled by Dr Gabi Teren
January 2023

RPM

Direct Operational Footprints

RPM 2022 Ecosystem Types

Marikana Thornveld

Moot Plains Bushveld

Map compiled by Dr Gabi Teren
January 2023

RPM

Direct Operational Footprints

2021 Footprint as per the BD Protocol

RPM Wetland Condition
1.0
2.0

RPM Terrestrial Condition
0
0.5
1.0
2.0

Map compiled by Dr Gabi Teren
January 2023

0   2.5   5 km

Annex 1.12. RPM Updated Wetland Delineation and Scores 2022 (Provided)

Map compiled by Dr Gabi
Teren
January 2023

Rand Uranium
Middelvlei

Direct Operational Footprints

2021 Footprint as per the BD Protocol

RU Wetland condition
1.00

RU Terrestrial condition
0
0.5
1.0

Map compiled by Dr Gabi Teren
January 2023

Rand Uranium
Middelvlei

Direct Operational Footprints

2022 Footprint as per the BD Protocol

RU Wetland Condition
1.00

RU Terrestrial Condition
0
0.5
1.0

Map compiled by Dr Gabi Teren
January 2023

Journal entry	Accounting events	Account	Account category	Ecosystem Asset	Condition score	DR	CR
			(a) Reference state				
1	Accounting for reference state of new ecosystem assets (boundary adjustments), which underpins their subsequent condition scoring	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Marikana Thornveld	5	440.35	
				Marikana Thornveld Wetland	5	42.77	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Marikana Thornveld	5		440.35
				Marikana Thornveld Wetland	5		42.77
			(b) At time of assessment				
2	Stock tacking of Marikana Thornveld assets, according to their condition scores (increase in asset sizes due to boundary adjustments)	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Marikana Thornveld	0	257.54	
					0.5	107.64	
					1	61.09	
					2	14.08	
					5		440.35
3	Stock tacking of Marikana Thornveld Wetland assets, according to their condition scores (increase in asset sizes due to boundary adjustments)	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Marikana Thornveld Wetland	0	1.58	
					1		15.46
					2	56.66	
					5		42.77
4	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Marikana Thornveld	5	440.35	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Marikana Thornveld	0		257.54
					0.5		96.88
					1		48.87
					2		8.45
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Marikana Thornveld	0.5		10.76
					1		12.22
					2		5.63
5	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld Werland assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Marikana Thornveld Wetland	5	42.77	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Marikana Thornveld Wetland	0		1.58
					1	12.37	
					2		33.99
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Marikana Thornveld Wetland	1	3.09	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Marikana Thornveld Wetland	2		22.66
6	Closing the Statement of Biodiversity Perfomance	Net periodic gains (Ha eq.)	X (Statement of Biodiversity Performance)	Net impact		48.18	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Marikana Thornveld	0.5		10.76
					1		12.22
					2		5.63
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Marikana Thornveld Wetland	1	3.09	
					2		22.66

Journal entries	Accounting events	Account	Account category	Ecosystem Asset	Condition score	DR	CR
(a) Reference state							
1	Accounting for reference state of new ecosystem assets (boundary adjustments), which underpins their subsequent condition scoring	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Marikana Thornveld	5	156.70	
				Gold Reef Mountain Bushveld	5	19.53	
				Moot Plains Bushveld Wetland	5	3.32	
				Norite Koppies Bushveld	5	0.84	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Marikana Thornveld	5		156.70
				Gold Reef Mountain Bushveld	5		19.53
				Moot Plains Bushveld Wetland	5		3.32
				Norite Koppies Bushveld	5		0.84
(b) At time of assessment							
2	Stock tacking of Marikana Thornveld assets, according to their condition scores (increase in asset sizes due to boundary adjustments)	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Marikana Thornveld	0	41.84	
					0.5	16.30	
					1		206.77
					2	125.58	
					3	179.75	
					5		156.70
3	Stock tacking of Gold Reef Mountain Bushveld assets, according to their condition scores (increase in asset sizes due to boundary adjustments)	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Gold Reef Mountain Bushveld	0		0.08
					1	19.61	
					5		19.53
4	Stock tacking of Moot Plains Bushveld Wetland assets, according to their condition scores (increase in asset sizes due to boundary adjustments)	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Moot Plains Bushveld Wetland	2	3.32	
					5		3.32
5	Stock tacking of Norite Koppies Bushveld assets, according to their condition scores (increase in asset sizes due to boundary adjustments)	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Norite Koppies Bushveld	2	0.84	
					5		0.84
6	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Marikana Thornveld	5	156.70	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Marikana Thornveld	0		41.84
					0.5		14.67
					1	165.42	
					2		75.35
					3		71.90
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Marikana Thornveld	0.5		1.63
			Z (Statement of Biodiversity Performance)	Marikana Thornveld	1	41.35	
			Y (Statement of Biodiversity Performance)	Marikana Thornveld	2		50.23
					3		107.85
7	Recording condition-adjusted losses and gains associated to 2022 condition scores of Moot Plains Bushveld assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Moot Plains Bushveld	0	0.56	
					0.5		1.72
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Moot Plains Bushveld	1	4.19	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Moot Plains Bushveld	0.5		0.19
		Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Moot Plains Bushveld	1	1.05	
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Moot Plains Bushveld	0		0.56
					0.5	1.91	
					1		5.24

Journal entries	Accounting events	Account	Account category	Ecosystem Asset	Condition score	DR	CR
(b) At time of assessment							
8	Recording condition-adjusted losses and gains associated to 2022 condition scores of Gold Reef Mountain Bushveld assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Gold Reef Mountain Bushveld	5	19.53	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Gold Reef Mountain Bushveld	0	0.08	
					1		15.69
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Gold Reef Mountain Bushveld	1		3.92
9	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld Wetland assets	Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Marikana Thornveld Wetland	1		26.45
					2	164.88	
					3		33.25
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Marikana Thornveld Wetland	1		6.61
			Z (Statement of Biodiversity Performance)	Marikana Thornveld Wetland	2	109.92	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Marikana Thornveld Wetland	3		49.88
		Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Marikana Thornveld Wetland	1	33.06	
					2		274.80
					3	83.13	
10	Recording condition-adjusted losses and gains associated to 2022 condition scores of Moot Plains Bushveld Wetland assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Moot Plains Bushveld Wetland	5	3.32	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Moot Plains Bushveld Wetland	2		1.99
			Y (Statement of Biodiversity Performance)	Moot Plains Bushveld Wetland	2		1.33
11	Recording condition-adjusted losses and gains associated to 2022 condition scores of Norite Koppies Bushveld assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Norite Koppies Bushveld	5	0.84	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Norite Koppies Bushveld	2		0.50
			Y (Statement of Biodiversity Performance)	Norite Koppies Bushveld	2		0.34
12	Closing the Statement of Biodiversity Perfomance	Net periodic gains (Ha eq.)	X (Statement of Biodiversity Performance)	Net impact		69.66	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Marikana Thornveld	0.5		1.63
					1	41.35	
					2		50.23
					3		107.85
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Moot Plains Bushveld	0.5		0.19
					1	1.05	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Gold Reef Mountain Bushveld	3		3.92
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Marikana Thornveld Wetland	1		6.61
					2	109.92	
					3		49.88
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Moot Plains Bushveld Wetland	2		1.33
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Norite Koppies Bushveld	2		0.34

Journal entries	Accounting events	Account	Account category	Ecosystem Asset	Condition score	DR	CR
(a) Reference state							
1	Accounting for reference state of new ecosystem assets (boundary adjustments), which underpins their subsequent condition scoring	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Soweto Highveld Grassland	5	0.04	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Soweto Highveld Grassland	5		0.04
(b) 2022 assessment							
2	Stock tacking of Soweto Highveld Grassland assets, according to their condition scores (increase in asset sizes due to boundary adjustments)	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Soweto Highveld Grassland	0		49.54
					0.5	28.45	
					1	21.13	
					5		0.04
3	Recording condition-adjusted losses and gains associated to 2022 condition scores of Soweto Highveld Grassland assets (including 0,04 Ha increase of surface area due to border adjustments)	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Soweto Highveld Grassland	5	0.04	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Soweto Highveld Grassland	0	49.54	
					0.5		25.61
					1		16.90
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Soweto Highveld Grassland	0.5		2.85
					1		4.23
4	Closing the Statement of Biodiversity Perfomance	Net periodic gains (Ha eq.)	X (Statement of Biodiversity Performance)	Net impact		7.07	
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Soweto Highveld Grassland	0.5		2.85
					1		4.23

Journal entries	Accounting events	Account	Account category	Ecosystem Asset	Condition score	DR	CR
(a) Reference state							
1	Accounting for reference state of new ecosystem assets (boundary adjustments), which underpins their subsequent condition scoring	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Moot Plains Bushveld	5	0.42	
				Marikana Thornveld	5	412.90	
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Moot Plains Bushveld	5		0.42
				Marikana Thornveld	5		412.90
(b) At time of assessment							
2	Stock tacking of Marikana Thornveld assets, according to their condition scores (increase in asset sizes due to boundary adjustments)	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Marikana Thornveld	0	197.30	
					0.5	108.67	
					1	45.95	
					2	60.98	
					5		412.90
3	Stock tacking of Moot Plains Bushveld assets, according to their condition scores (new asset category)	Ecosystem asset (Ha)	A (Statement of Biodiversity Position)	Moot Plains Bushveld	0	0.42	
					5		0.42
4	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Marikana Thornveld	5	412.90	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Marikana Thornveld	0		197.30
					0.5		97.80
					1		36.76
					2		36.59
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Marikana Thornveld	0.5		10.87
					1		9.19
					2		24.39
5	Recording condition-adjusted losses and gains associated to 2022 condition scores of Moot Plains Bushveld assets	Periodic losses (Ha eq.)	Z (Statement of Biodiversity Performance)	Moot Plains Bushveld	5	0.42	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Moot Plains Bushveld	0		0.42
6	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thorndveld Wetland assets (including decreases in asset sizes due to boundary adjustments and overall of 0,14 Ha contraction of surface area)	Accumulated positive Impacts (Ha eq.)	A (Statement of Biodiversity Position)	Marikana Thornveld Wetland	1		156.84
					2		259.95
					3	3.32	
		Accumulated negative Impacts (Ha eq.)	C (Statement of Biodiversity Position)	Marikana Thornveld Wetland	1	125.47	
					2	155.97	
					3		1.33
		Periodic gains (Ha eq.)	Y (Statement of Biodiversity Performance)	Marikana Thornveld Wetland	3		1.99
					1	31.37	
		Periodic gains (Ha eq.)	Z (Statement of Biodiversity Performance)	Marikana Thornveld Wetland	2	103.98	
7	Closing the Statement of Biodiversity Perfomance	Net periodic gains (Ha eq.)	X (Statement of Biodiversity Performance)	Net impact			88.90
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Marikana Thornveld	0.5		10.87
					1		9.19
					2		24.39
		Accumulated positive Impacts (Ha eq.)	B (Statement of Biodiversity Position)	Marikana Thornveld Wetland	1	31.37	
					2	103.98	
					3		1.99

Journal entries	Periodic gains (Y)		Condition score	Hectares equivalents (Ha eq.)
1	Accounting for reference state of new ecosystem assets (boundary adjustments), which underpins their subsequent condition scoring	Marikana Thornveld	5	440.35
		Marikana Thornveld Wetland	5	42.77
4	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld assets	Marikana Thornveld	0.5	10.76
		Marikana Thornveld	1	12.22
		Marikana Thornveld	2	5.63
5	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld Werland assets	Marikana Thornveld Wetland	2	22.66
		Sub-total periodic gains (Y)		534.39

Journal entries	Periodic losses (Z)		Condition score	Hectares equivalents (Ha eq.)
4	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld assets	Marikana Thornveld	5	440.35
5	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld Werland assets	Marikana Thornveld Wetland	1	3.09
		Marikana Thornveld Wetland	5	42.77
		Sub-total periodic losses (Z)		486.21
		Net ecosystem impacts (X = Y - Z)		48.18

Journal entries	Periodic gains (Y)		Condition score	Hectares equivalents (Ha eq.)
1	Accounting for reference state of new ecosystem assets (boundary adjustments), which underpins their subsequent condition scoring	Marikana Thornveld	5	156.70
		Gold Reef Mountain Bushveld	5	19.53
		Moot Plains Bushveld Wetland	5	3.32
		Norite Koppies Bushveld	5	0.84
6	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld assets	Marikana Thornveld	0.5	1.63
		Marikana Thornveld	2	50.23
		Marikana Thornveld	3	107.85
7	Recording condition-adjusted losses and gains associated to 2022 condition scores of Moot Plains Bushveld assets	Moot Plains Bushveld	0.5	0.19
8	Recording condition-adjusted losses and gains associated to 2022 condition scores of Gold Reef Mountain Bushveld assets	Gold Reef Mountain Bushveld	1	3.92
9	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld Wetland assets	Marikana Thornveld Wetland	1	6.61
		Marikana Thornveld Wetland	3	49.88
10	Recording condition-adjusted losses and gains associated to 2022 condition scores of Moot Plains Bushveld Wetland assets	Moot Plains Bushveld Wetland	2	1.33
11	Recording condition-adjusted losses and gains associated to 2022 condition scores of Norite Koppies Bushveld assets	Norite Koppies Bushveld	2	0.34
		Sub-total periodic gains (Y)		402.37

Journal entries	Periodic losses (Z)		Condition score	Hectares equivalents (Ha eq.)
6	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld assets	Marikana Thornveld	5	156.70
		Marikana Thornveld	1	41.35
7	Recording condition-adjusted losses and gains associated to 2022 condition scores of Moot Plains Bushveld assets	Moot Plains Bushveld	1	1.05
8	Recording condition-adjusted losses and gains associated to 2022 condition scores of Gold Reef Mountain Bushveld assets	Gold Reef Mountain Bushveld	5	19.53
9	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld Wetland assets	Marikana Thornveld Wetland	2	109.92
10	Recording condition-adjusted losses and gains associated to 2022 condition scores of Moot Plains Bushveld Wetland assets	Moot Plains Bushveld Wetland	5	3.32
11	Recording condition-adjusted losses and gains associated to 2022 condition scores of Norite Koppies Bushveld assets	Norite Koppies Bushveld	5	0.84
		Sub-total periodic losses (Z)		332.71
		Net ecosystem impacts (X = Y - Z)		69.66

Journal entries	Periodic gains (Y)		Condition score	Hectares equivalents (Ha eq.)
1	Accounting for reference state of new ecosystem assets (boundary adjustments), which underpins their subsequent condition scoring	Soweto Highveld Grassland	5	0.04
3	Recording condition-adjusted losses and gains associated to 2022 condition scores of Soweto Highveld Grassland assets (including 0,04 Ha increase of surface area due to border adjustments)	Soweto Highveld Grassland	0.5	2.85
		Soweto Highveld Grassland	1	4.23
		Sub-total periodic gains (Y)		7.11

Journal entries	Periodic losses (Z)		Condition score	Hectares equivalents (Ha eq.)
3	Recording condition-adjusted losses and gains associated to 2022 condition scores of Soweto Highveld Grassland assets (including 0,04 Ha increase of surface area due to border adjustments)	Marikana Thornveld	5	0.04
		Sub-total periodic losses (Z)		0.04
		Net ecosystem impacts (X = Y - Z)		7.07

Journal entries	Periodic gains (Y)		Condition score	Hectares equivalents (Ha eq.)
1	Accounting for reference state of new ecosystem assets (boundary adjustments), which underpins their subsequent condition scoring	Moot Plains Bushveld	5	0.42
		Marikana Thornveld	5	412.90
4	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld assets	Marikana Thornveld	0.5	10.87
		Marikana Thornveld	1	9.19
		Marikana Thornveld	2	24.39
6	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thorndveld Wetland assets (including decreases in asset sizes due to boundary adjustments and overall of 0,14 Ha contraction of surface area)	Marikana Thornveld Wetland	3	1.99
		Sub-total periodic gains (Y)		459.77

Journal entries	Periodic losses (Z)		Condition score	Hectares equivalents (Ha eq.)
4	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thornveld assets	Marikana Thornveld	5	412.90
5	Recording condition-adjusted losses and gains associated to 2022 condition scores of Moot Plains Bushveld assets	Moot Plains Bushveld	5	0.42
6	Recording condition-adjusted losses and gains associated to 2022 condition scores of Marikana Thorndveld Wetland assets (including decreases in asset sizes due to boundary adjustments and overall of 0,14 Ha contraction of surface area)	Marikana Thornveld Wetland	1	31.37
		Marikana Thornveld Wetland	2	103.98
		Sub-total periodic losses (Z)		548.67
		Net ecosystem impacts (X = Y - Z)		-88.90

ASSETS (A ACCOUNTS)	(b) At acquisition (2016)		(c) Current state (2021)		(c) 2022 assessment		Net change (2022 - 2021)
Ecosystem type	Condition score	Surface area (Ha)	Condition score	Surface area (Ha)	Condition score	Surface area (Ha)	Surface area (Ha)
Marikana Thornveld	0.0	457.10	0.0	457.10	0.0	714.64	257.54
Marikana Thornveld	0.5	0.00	0.5	0.00	0.5	107.64	107.64
Marikana Thornveld	1.0	208.34	1.0	208.34	1.0	269.43	61.09
Marikana Thornveld	2.0	0.00	2.0	0.00	2.0	14.08	14.08
Marikana Thornveld Wetland	0.0	0.00	0.0	0.00	0.0	1.58	1.58
Marikana Thornveld Wetland	1.0	20.60	1.0	20.60	1.0	5.14	-15.46
Marikana Thornveld Wetland	2.0	0.00	2.0	0.00	2.0	56.66	56.66
		686.04		686.04		1169.16	

ACCUMULATED POSITIVE IMPACTS (B ACCOUNTS)	(b) At acquisition (2016)		(c) Current state (2021)		(c) 2022 assessment		Net change (2022 - 2021)
Ecosystem type	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Condition-adjusted surface area (Ha eq.)	Condition-adjusted surface area (Ha eq.)
Marikana Thornveld	0.5	0.00	0.5	0.00	0.5	10.76	10.76
Marikana Thornveld	1.0	41.67	1	41.67	1.0	53.89	12.22
Marikana Thornveld	2.0	0.00	2	0.00	2.0	5.63	5.63
Marikana Thornveld Wetland	1.0	4.12	1	4.12	1.0	1.03	-3.09
Marikana Thornveld Wetland	2.0	0.00	2	0.00	2.0	22.66	22.66
		45.79		45.79		93.97	

ACCUMULATED NEGATIVE IMPACTS (C ACCOUNTS)	(b) At acquisition (2016)		(c) Current state (2021)		(c) 2022 assessment		Net change (2022 - 2021)
Ecosystem type	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Condition-adjusted surface area (Ha eq.)	Condition-adjusted surface area (Ha eq.)
Marikana Thornveld	0.0	457.10	0.0	457.10	0.0	714.64	257.54
Marikana Thornveld	0.5	0.00	0.5	0.00	0.5	96.88	96.88
Marikana Thornveld	1.0	166.67	1.0	166.67	1.0	215.54	48.87
Marikana Thornveld	2.0	0.00	2.0	0.00	2.0	8.45	8.45
Marikana Thornveld Wetland	0.0	0.00	0.0	0.00	0.0	1.58	1.58
Marikana Thornveld Wetland	1.0	16.48	1.0	16.48	1.0	4.11	-12.37
Marikana Thornveld Wetland	2.0	0.00	2.0	0.00	2.0	33.99	33.99
		640.25		640.25		1075.19	

Totals	(b) At acquisition (2016)		(c) Current state (2021)		(c) 2022 assessment		Net change (2022 - 2021)	
ASSETS (TOTAL BIODIVERSITY FOOTPRINT) (Ha)	686.04	100.00%	686.04	100.00%	1169.16	100.00%	483.12	70.42%
ACCUMULATED POSITIVE IMPACTS (POSITIVE BIODIVERSITY FOOTPRINT) (Ha eq.)	45.79	6.67%	45.79	6.67%	93.97	8.04%	48.18	1.36%
ACCUMULATED NEGATIVE IMPACTS (NEGATIVE BIODIVERSITY FOOTPRINT) (Ha eq.)	640.25	93.33%	640.25	93.33%	1075.19	91.96%	434.94	-1.36%

ASSETS (A ACCOUNTS)	At acquisition (2019)		2022 assessment		Net change
Ecosystem type	Condition score	Surface area (Ha)	Condition score	Surface area (Ha)	Surface area (Ha)
Marikana Thornveld	0	5583.01	0	5624.85	41.84
Marikana Thornveld	0.5	892.71	0.5	909.01	16.30
Marikana Thornveld	1	2131.22	1	1924.45	-206.77
Marikana Thornveld	2	878.85	2	1004.43	125.58
Marikana Thornveld	3	0.00	3	179.75	179.75
Moot Plains Bushveld	0	879.59	0	879.03	-0.56
Moot Plains Bushveld	0.5	286.82	0.5	288.73	1.91
Moot Plains Bushveld	1	190.76	1	185.52	-5.24
Gold Reef Mountain Bushveld	0	10.92	0	10.84	-0.08
Gold Reef Mountain Bushveld	1	0.00	1	19.61	19.61
Marikana Thornveld Wetland	1	0.00	1	33.06	33.06
Marikana Thornveld Wetland	2	607.73	2	332.93	-274.80
Marikana Thornveld Wetland	3	0.00	3	83.13	83.13
Moot Plains Bushveld Wetland	2	10.93	2	14.25	3.32
Norite Koppies Bushveld	2	0.00	2	0.84	0.84
		11472.55		11490.44	17.89

ACCUMULATED POSITIVE IMPACTS (B ACCOUNTS)	At acquisition (2019)		2022 assessment		Net change
Ecosystem type	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Condition-adjusted surface area (Ha eq.)	Condition-adjusted surface area (Ha eq.)
Marikana Thornveld	0.5	89.27	0.5	90.90	1.63
Marikana Thornveld	1	426.24	1	384.89	-41.35
Marikana Thornveld	2	351.54	2	401.77	50.23
Marikana Thornveld	3	0.00	3	107.85	107.85
Moot Plains Bushveld	0.5	28.68	0.5	28.87	0.19
Moot Plains Bushveld	1	38.15	1	37.10	-1.05
Gold Reef Mountain Bushveld	1	0.00	1	3.92	3.92
Marikana Thornveld Wetland	1	0.00	1	6.61	6.61
Marikana Thornveld Wetland	2	243.09	2	133.17	-109.92
Marikana Thornveld Wetland	3	0.00	3	49.88	49.88
Moot Plains Bushveld Wetland	2	0.00	2	5.70	5.70
Norite Koppies Bushveld	2	4.37	2	0.34	-4.04
		1181.35		1251.01	69.66

ACCUMULATED NEGATIVE IMPACTS (C ACCOUNTS)	At acquisition (2019)		2022 assessment		Net change
Ecosystem type	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Condition-adjusted surface area (Ha eq.)	Condition-adjusted surface area (Ha eq.)
Marikana Thornveld	0	5583.01	0	5624.85	41.84
Marikana Thornveld	0.5	803.44	0.5	818.11	14.67
Marikana Thornveld	1	1704.98	1	1539.56	-165.42
Marikana Thornveld	2	527.31	2	602.66	75.35
Marikana Thornveld	3	0.00	3	71.90	71.90
Moot Plains Bushveld	0	879.59	0	879.03	-0.56
Moot Plains Bushveld	0.5	258.14	0.5	259.86	1.72
Moot Plains Bushveld	1	152.61	1	148.42	-4.19
Gold Reef Mountain Bushveld	0	10.92	0	10.84	-0.08
Gold Reef Mountain Bushveld	1	0.00	1	15.69	15.69
Marikana Thornveld Wetland	1	0.00	1	26.45	26.45
Marikana Thornveld Wetland	2	364.64	2	199.76	-164.88
Marikana Thornveld Wetland	3	0.00	3	33.25	33.25
Moot Plains Bushveld Wetland	2	6.56	2	8.55	1.99
Norite Koppies Bushveld	2	0.00	2	0.50	0.50
		10291.19		10239.43	-51.76

Totals	At acquisition (2019)		2022 assessment		Net change (2022 - 2021)	
ASSETS (TOTAL BIODIVERSITY FOOTPRINT) (Ha)	11472.55	100.00%	11490.44	100.00%	17.89	0.16%
ACCUMULATED POSITIVE IMPACTS (POSITIVE BIODIVERSITY FOOTPRINT) (Ha eq.)	1181.35	10.30%	1251.01	10.89%	69.66	0.59%
ACCUMULATED NEGATIVE IMPACTS (NEGATIVE BIODIVERSITY FOOTPRINT) (Ha eq.)	10291.19	89.70%	10239.43	89.11%	-51.76	-0.59%

ASSETS (A ACCOUNTS)	(b) At acquisition (2013)		(c) Current state (since management take over in 2014)		(d) 2022 assessment		Net change (2022 - 2014)
Ecosystem type	Condition score	Surface area (Ha)	Condition score	Surface area (Ha)	Condition score	Surface area (Ha)	Surface area (Ha)
Carletonville Dolomite Grassland	0	1732.02	0	1732.02	0	1732.02	0.00
Carletonville Dolomite Grassland	0.5	738.37	0	738.37	0	738.37	0.00
Carletonville Dolomite Grassland	1	145.10	1	145.10	1	145.10	0.00
Soweto Highveld Grassland	0	2117.26	0	2117.26	0	2067.72	-49.54
Soweto Highveld Grassland	0.5	42.69	0.5	42.69	0.5	71.14	28.45
Soweto Highveld Grassland	1	91.56	1	91.56	1	112.69	21.13
Gauteng Shale Mountain Bushveld	0	251.84	0	251.84	0	251.84	0.00
Carletonville Dolomite Grassland Wetland	1	524.80	1	524.80	1	524.80	0.00
Soweto Highveld Grassland Wetland	1	308.75	1	308.75	1	308.75	0.00
		5952.38		5952.38		5952.42	0.04

ACCUMULATED POSITIVE IMPACTS (B ACCOUNTS)	(b) At acquisition (2013)		(c) Current state (since management take over in 2014)		(d) 2022 assessment		Net change (2022 - 2014)
Ecosystem type	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Surface area (Ha)	Condition-adjusted surface area (Ha eq.)
Carletonville Dolomite Grassland	0.5	73.84	0.5	73.84	0.5	73.84	0.00
Carletonville Dolomite Grassland	1	29.02	1	29.02	1	29.02	0.00
Soweto Highveld Grassland	0.5	4.27	0.5	4.27	0.5	7.11	2.85
Soweto Highveld Grassland	1	18.31	1	18.31	1	22.54	4.23
Riparian Carletonville Dolomite Grassland	1	104.96	1	104.96	1	104.96	0.00
Riparian Soweto Highveld Grassland	1	61.75	1	61.75	1	61.75	0.00
		292.15		292.15		299.22	7.07

ACCUMULATED NEGATIVE IMPACTS (C ACCOUNTS)	(b) At acquisition (2013)		(c) Current state (since management take over in 2014)		(d) 2022 assessment		Net change (2022 - 2014)
Ecosystem type	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Surface area (Ha)	Condition score	Surface area (Ha)	Condition-adjusted surface area (Ha eq.)
Carletonville Dolomite Grassland	0	1732.02	0	1732.02	0	1732.02	0.00
Carletonville Dolomite Grassland	0.5	664.53	0.5	664.53	0.5	664.53	0.00
Carletonville Dolomite Grassland	1	116.08	1	116.08	1	116.08	0.00
Soweto Highveld Grassland	0	2117.26	0	2117.26	0	2067.72	-49.54
Soweto Highveld Grassland	0.5	38.42	0.5	38.42	0.5	64.03	25.61
Soweto Highveld Grassland	1	73.25	1	73.25	1	90.15	16.90
Gauteng Shale Mountain Bushveld	0	251.84	0	251.84	0	251.84	0.00
Carletonville Dolomite Grassland Wetland	1	419.84	1	419.84	1	419.84	0.00
Soweto Highveld Grassland Wetland	1	247.00	1	247.00	1	247.00	0.00
		5660.23		5660.23		5653.20	-7.03

Totals	(b) At acquisition (2013)		(c) Current state (since management take over in 2014)		(d) 2022 assessment		Net change (2022 - 2014)	
ASSETS (TOTAL BIODIVERSITY FOOTPRINT) (Ha)	5952.38	100.00%	5952.38	100.00%	5952.42	100.00%	0.04	0.00%
ACCUMULATED POSITIVE IMPACTS (POSITIVE BIODIVERSITY FOOTPRINT) (Ha eq.)	292.15	4.91%	292.15	4.91%	299.22	0.05	7.07	0.12%
ACCUMULATED NEGATIVE IMPACTS (NEGATIVE BIODIVERSITY FOOTPRINT) (Ha eq.)	5660.23	95.09%	5660.23	95.09%	5653.20	0.95	-7.03	-0.12%

ASSETS (A ACCOUNTS)	At acquisition (2021)		2022 assessment		Net change
Ecosystem type	Condition score	Surface area (Ha)	Condition score	Surface area (Ha)	Surface area (Ha)
Marikana Thornveld	0	3063.53	0	3260.82	197.30
Marikana Thornveld	0.5	1060.14	0.5	1168.81	108.67
Marikana Thornveld	1	394.86	1	440.81	45.95
Marikana Thornveld	2	72.78	2	133.76	60.98
Marikana Thornveld Wetland	1	221.62	1	64.78	-156.84
Marikana Thornveld Wetland	2	449.98	2	190.04	-259.95
Marikana Thornveld Wetland	3	0.00	3	3.32	3.32
Moot Plains Bushveld	0	0.00	0	0.42	0.42
		5262.91		5262.77	-0.14

ACCUMULATED POSITIVE IMPACTS (B ACCOUNTS)	At acquisition (2021)		2022 assessment		Net change
Ecosystem type	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Condition-adjusted surface area (Ha eq.)	Condition-adjusted surface area (Ha eq.)
Marikana Thornveld	0.5	106.01	0.5	116.88	10.87
Marikana Thornveld	1	78.97	1	88.16	9.19
Marikana Thornveld	2	29.11	2	53.50	24.39
Marikana Thornveld Wetland	1	44.32	1	12.96	-31.37
Marikana Thornveld Wetland	2	179.99	2	76.01	-103.98
Marikana Thornveld Wetland	3	0.00	3	1.99	1.99
		438.42		349.51	-88.90

ACCUMULATED NEGATIVE IMPACTS (C ACCOUNTS)	At acquisition (2021)		2022 assessment		Net change
Ecosystem type	Condition score	Condition-adjusted surface area (Ha eq.)	Condition score	Condition-adjusted surface area (Ha eq.)	Condition-adjusted surface area (Ha eq.)
Marikana Thornveld	0	3063.53	0	3260.82	197.30
Marikana Thornveld	0.5	954.13	0.5	1051.93	97.80
Marikana Thornveld	1	315.89	1	352.65	36.76
Marikana Thornveld	2	43.67	2	80.26	36.59
Marikana Thornveld Wetland	1	177.30	1	51.82	-125.47
Marikana Thornveld Wetland	2	269.99	2	114.02	-155.97
Marikana Thornveld Wetland	3	0.00	3	1.33	1.33
Moot Plains Bushveld	0	0.00	0	0.42	0.42
		4824.50		4913.26	88.76

Totals	At acquisition (2021)		2022 assessment		Net change (2022 - 2021)	
ASSETS (TOTAL BIODIVERSITY FOOTPRINT) (Ha)	5262.91	100.00%	5262.77	100.00%	-0.14	0.00%
ACCUMULATED POSITIVE IMPACTS (POSITIVE BIODIVERSITY FOOTPRINT) (Ha eq.)	438.42	8.33%	349.51	6.64%	-88.90	-1.69%
ACCUMULATED NEGATIVE IMPACTS (NEGATIVE BIODIVERSITY FOOTPRINT) (Ha eq.)	4824.50	91.67%	4913.26	93.36%	88.76	1.69%