STRATEGIC ENVIRONMENTAL ASSESSMENT
FOR EXPANSION OF ELECTRICITY GRID
INFRASTRUCTURE IN SOUTH AFRICA

Visual Assessment Report

STRATEGIC ENVIRONMENTAL ASSESSMENT FOR THE EXPANSION OF ELECTRICITY GRID INFRASTRUCTURE IN SOUTH AFRICA

Draft v3 Specialist Assessment Report for Stakeholder Review

VISUAL ASSESSMENT SPECIALIST REPORT

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ABBREVIATIONS AND ACRONYMS

CAA	Civil Aviation Authority
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DEM	Digital Elevation Model
ECO	Environmental Control Officer
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Areas
NGI	National Geospatial Information
NHRA	National Heritage Resources Act
OSM	Open Street Maps
PGWC	Provincial Government of the Western cape
PV	Photovoltaic
SANBI	South African National Biodiversity Institute
SAHRA	South African Heritage Resources Agency
SAPAD	South African Protected Areas Database
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SRTM	Shuttle Radar Topography Mission
VIA	Visual Impact Assessment

1 SUMMARY

The Visual Specialist Chapter focuses on the identification of features of visual or scenic value, as well as sensitive receptors within the two expanded Electricity Grid Infrastructure corridors. The purpose of this report is to determine overall visual sensitivity within the corridors in the context of electricity grid infrastructure and to identify typical visual impacts associated with the proposed type of development. Management actions are provided with a view to avoiding or minimising the potential negative impacts of transmission lines and related infrastructure.

The scope of the visual assessment includes scenic, aesthetic and amenity values, relating to both the natural and cultural landscape. The study therefore includes heritage resources where these are prone to visual impacts.

The strategic visual assessment was conducted at a regional scale in order to determine optimum powerline routes and environmental management measures, including norms or standards, for the provision of the linear electricity grid infrastructure. The objectives are therefore different to that of an Environmental Impact Assessment at the local project scale.

The landscape characteristics of each of the two corridors was based on desktop studies using available information, and no fieldwork or ground-truthing was required or was carried out.

A standardised report format was prescribed by the CSIR, which is reflected in the approach and methodology used in the strategic visual assessment, and which facilitates integration with other specialist studies.

Furthermore it was considered important that there be consistency in the approach and criteria used in the visual assessment with that of the Phase 1 Strategic Environmental Assessment for electricity grid infrastructure.

The purpose of the strategic visual assessment was to be pro-active in terms of determining opportunities and constraints for future possible grid development within the two corridors. The main findings for the expanded Western and Eastern EGI Corridors are given in the table below, based on the visual sensitivity mapping at the regional scale.

Corridor	Overall Suitability	Comment
Expanded Western EGI Corridor	Moderate to good suitability for powerline infrastructure development in visual/scenic terms. Potential transmission routes exist along the coastal plain or inland plateau areas where these avoid major scenic or heritage resources. Some pinch-points present a severe constraint.	Low visual sensitivity areas are those with relatively even topography and adequate distance from visually sensitive features or receptors. Medium and high visual sensitivity areas in the corridor are those within reasonable viewing distance of proposed transmission development, as indicated by the recommended buffers for various sensitive features and receptors. Very high visual sensitivity areas are those scenic resources and sensitive receptors that are in close proximity to, or could be compromised by proposed transmission lines. These tend to include national parks and visually sensitive topographic features. Potential use of the plateau area would possibly benefit from a slight widening of the Western Corridor to the east.
Expanded Eastern EGI Corridor	Moderate suitability for powerline infrastructure development in visual/scenic terms.	Low visual sensitivity areas are those with relatively even topography with adequate distance from visually sensitive features or receptors.

Corridor	Overall Suitability	Comment
	Potential transmission routes exist slightly inland of the coast. The complex topography and cultural landscape features further inland present numerous constraints.	Medium and high visual sensitivity areas are those within close range of any proposed transmission development, as indicated by buffers used in the mapping. Very high visual sensitivity areas are those scenic resources and sensitive receptors that are in close proximity to, or could be compromised by proposed transmission lines. These tend to include game reserves, heritage sites and settlements. Consideration could be given to widening the Eastern Corridor to the west to create more possible opportunities for transmission routes.

2 INTRODUCTION

2.1 Background to the Study

This Visual Assessment study is one of a series of specialist studies, which form part of a Strategic Environmental Assessment (SEA) to identify suitable routing corridors for the effective expansion of key strategic transmission infrastructure. The SEA, which has been commissioned by the Department of Environmental Affairs (DEA), is being conducted by the Council for Scientific and Industrial Research (CSIR), working in association with the South African National Biodiversity Institute (SANBI).

In the previous SEA study of 2016, a visual assessment of five national transmission infrastructure corridors was undertaken, and has recently been gazetted. The current visual study is for the expansion of the Western and Eastern Corridors (see Figure 2).

2.2 Scenic Value in the Context of Transmission Lines

Landscape qualities, particularly scenic resources, have important economic value in the form of tourism for most regions, including the Western and Eastern Expanded Electricity Grid Infrastructure (EGI) corridors currently being assessed.

Transmission lines and related infrastructure, such as substations, tend to have an industrial connotation and could potentially compromise the value of scenic resources, particularly in pristine or protected environments, while they tend to be less of an issue in industrial or mining landscapes.

Transmission lines could in addition detract from the amenity value of recreation or resort areas, and certainly affect property values in many cases, all of which could affect the economy of a region. On the other hand, transmission lines in the right location are necessary for the regional economy.

2.3 Perceptions relating to Transmission Lines

Although large sections of the population see transmission lines as a major visual detraction or eye-sore, there are others, mainly among the context of South Africa's working classes, who may regard them as a sign of progress and service delivery.

Habituation is another consideration, where transmission lines have been in place over a length of time and are hardly noticed or seen as a disturbance any longer. This appears to have been the case with communication masts, which initially caused visual concern, but to which people have grown accustomed.

The implications of these considerations are that the ‘context’ of both the landscape (the receiving environment) and the community (the receptor) is important in the siting of transmission infrastructure.

3 SCOPE OF THE VISUAL STRATEGIC ASSESSMENT

3.1 Definition of 'Visual'

A visual assessment broadly includes visual, scenic, aesthetic and amenity values, which contribute to an area's overall 'sense of place', and which encompass both natural and cultural landscape characteristics (Oberholzer, 2005).

3.2 The Basis of Visual Assessments

Sense of place is determined by the regional characteristics of the place including, but not restricted to, landscape features, geological structure, vegetation patterns, agricultural activities, settlement forms and vernacular architecture, as well as more intangible characteristics, such as traditions and beliefs. Seen as a whole, these qualities constitute the essential 'genius loci' or spirit of the place.

Often great value is attached to those landscapes where visual, scenic, cultural and heritage characteristics are intact, also described as the level of 'landscape integrity'. This concept is useful in providing a baseline for visual impact assessments.

A further consideration in establishing 'visual sensitivity', which involves a degree of interpretation, is where landscape features are pronounced, clustered or overlap within a defined area, adding to 'landscape complexity'.

No standardised scenic resource mapping exists for the country as a whole, nor the rating of scenic resources in terms of their value or sensitivity. This is seen as a major drawback in establishing a common baseline for visual impact assessments.

Finally, given that the study is strategic in nature, covering a fairly broad area, the level of information and mapping is necessarily regional in scale and does not, for example, include individual viewsheds, which only become significant at the local project scale.

4 APPROACH AND METHODOLOGY

4.1 Study Methodology

The visual assessment, together with accompanying maps, is based primarily on interpreting existing information, and uses recognised visual assessment criteria. The format and approach of the study follows that of the earlier 2016 Visual Assessment for purposes of consistency and continuity.

The methodology incorporates the terms of reference for the visual assessment including the following:

- Identify areas or features of visual or scenic value and sensitive receptors within each of the proposed corridors;
- Use this information to determine the overall sensitivity value within each corridor in the context of EGI;
- Describe additional information and assessment required in each sensitivity category before authorization should be considered; and
- Assess the corridor in terms of potential visual impacts and outline proposed management actions to enhance benefits and avoid, reduce or offset negative impacts.

The methodology for this visual assessment involved three basic steps, outlined below:

Step 1: Visual Resource Mapping (descriptive)
The first step involves a description and identification of visual and scenic features to provide a baseline for each of the corridors. It is a classification method in which following aspects are considered:

- Differentiation of the corridor into landscape types (see **Section 6** below);
- An inventory and mapping of visual / scenic features (see also **Appendix 1**);
- Identification of cultural landscapes and heritage sites, using available data.

Step 2: Visual Sensitivity Mapping (interpretive)

The second step involves interpretation, using criteria that influence the value of visual / scenic resources, and therefore their 'significance'. The criteria are spatialised by means of buffers, based on the scale of the EGI development, as well as the relative sensitivity of the feature or receptor. Four levels of visual sensitivity have been prescribed for the study, namely very high sensitivity, high sensitivity, medium sensitivity and low sensitivity. This step relies to a certain degree on judgement in which the following criteria are considered:

- Visually sensitive landforms, (e.g. ridgelines, cliffs, scarps, outcrops);
- Proclaimed or protected areas, (e.g. nature reserves);
- Visually sensitive receptors, (e.g. settlements, routes); and
- Heritage importance (e.g. national, provincial or local significance).

Step 3: Visual Resource Management (prescriptive)

The third step involves the design of strategies for the protection and management of visual / scenic resources to increase benefits and minimise impacts. This step involves prescription in which the following measures are considered:

- Additional information or assessment requirements;
- Permit requirements as part of authorization;
- Management actions to avoid, reduce or offset impacts; and
- Input into development protocol document.

4.2 Data Sources

A list and description of data sources on which the visual assessment was based is given below (Table 1) and a detailed list for each feature is given in **Section 7.2.** The data sources form part of the descriptive or classification stage in Step 1 of the methodology above.

Table 1: Description of Data Sources used in the Visual Assessment

Data title	Source and date of publication	Data Description
1:2 000 000 Simplified Geological Map of South Africa, Lesotho and Swaziland	Council for Geoscience, 2008.	Geological stratigraphy and lithology.
1:500 000 and 1:250 000 topographical maps of South Africa	Surveys and Mapping (several sheets with various dates).	Topographical and cadastral information.
South African Protected Areas Database	DEA, Q4, 2017.	National Parks and Protected Areas.
Inventory of Heritage Sites for SA	SAHRA, Dec. 2017.	Heritage sites.
Map Studio	Road Atlas of South Africa	Scenic routes and mountain passes

4.3 Assumptions and Limitations

A list and description of study limitations and assumptions in the Visual Assessment report are given below (Table 2).

Table 2: Description of Assumptions and Limitations applicable to the Visual Assessment

Limitation	Included in the scope of this study	Excluded from the scope of this study	Assumption
Level of mapping detail	1: 500 000 topographical maps, and 1:2 000 000 geological survey maps.	1:250 000 and 1:50 000 topographical maps.	1:500 000 mapping considered adequate for a regional scale study. 1:50 000 scale maps would be required for micro corridor selection.
Information on scenic resources	1:500 000 topographical maps and available shape files of water features and steep slopes.	Detailed survey of scenic features at a more detailed local scale.	Additional scenic resource mapping would be required on an individual project basis in the absence of a scenic resource data base.
Information on heritage sites	Information obtained from South African Heritage Resources Agency (SAHRA) / CSIR	Detailed analysis of local areas using historical airphotos or Google Earth imagery.	Additional heritage assessment would be required on an individual project basis in terms of the National Heritage Resources Act (NHRA).
Information on private reserves, game/ guest farms and resorts.	Information was included where these facilities were known.	Detailed survey of private reserves / game farms.	Detailed information would be needed on an individual project basis.
Viewsheds of National Parks and nature reserves		No viewsheds have been included for individual features.	Assumed that individual viewsheds would need to be prepared on an individual project basis.
Residual activities such as access roads, borrow pits etc. relating to transmission lines.	Some management actions are included in Section 9.	Visual criteria or buffers for access roads, borrow pits etc. not included in the study.	Consideration of access roads etc. would need to be given at the project scale, in terms of NHRA.

4.4 Relevant Regulatory Instruments

A list and description of relevant regulatory instruments associated with visual and scenic resources at international, national and provincial scale for each focus area, is given below (Table 3).

Table 3: Description of Relevant Regulatory Instruments

Instrument	Key objective	Application to Expanded Corridors
International Instrument		
Ramsar Convention (The Convention of Wetlands of International Importance (1971 and amendments)	Protection and conservation of wetlands, particularly those of importance to waterfowl and waterfowl habitat.	Both expanded corridors have Ramsar sites, i.e. Orange River Mouth Wetland, St Lucia Wetland and Kosi Bay Wetland, which formed part of the sensitivity mapping.
National Instrument		
National Environmental Management: Protected Areas Act, 2003	No development, construction or farming may be permitted in a nature reserve without the prior written approval of the management authority (Section 50 (5)). Also in a 'protected environment' the Minister or MEC may restrict or regulate development that may be inappropriate for the area given the purpose for which the area was declared (Section 5).	There are a number of Protected Areas within the two expanded corridors, including national parks, nature reserves and mountain catchments. These, together with visual buffers, have been included in the sensitivity mapping.
Integrated Coastal Management Act (ICM Act) (Act 24 of 2008)	Protection of the coastal zone including land within 1 km of the High Water Mark (HWM) to 'protect the ecological integrity, natural character and the economic, social and aesthetic value of coastal public property'.	Both expanded corridors have coastlines and the legislated buffers for these have been included in the sensitivity mapping.
NHRA (Act 25 of 1999)	Includes protection of national and provincial heritage sites, as well as areas of environmental or cultural value, and proclaimed scenic routes.	Graded heritage sites occur in both expanded corridors and have been included in the sensitivity mapping.
Provincial and Municipal Instruments		
Spatial Development Frameworks (SDFs), zoning schemes and municipal by-laws.	Local authority zoning schemes can be used to protect natural and cultural heritage resources through 'Conservation Areas', 'Heritage Overlay Zones' and 'Scenic Overlay Zones' including scenic routes.	Provincial and municipal SDFs generally identify special or heritage protected areas within the expanded corridors.

5 IMPACT CHARACTERISATION

The potential footprint and visual implications of the proposed powerline grid have been partly derived from the previous EGI SEA (CSIR, 2016).

Eskom anticipates that a number of new transmission lines (≥ 400kV) and substations will be required within each of the expanded corridors. The precise number of lines will be dependent on which generation scenario unfolds in the future. Substations are considered as anchor points in the context of the SEA Process.

The design of the pylons could be a number of types, such as self-supporting lattice towers, guyed towers, or monopole structures, the selection of which could have fairly important implications at the local landscape or townscape scale, but not that pertinent for the current corridor alignment study.

However, the servitude and development envelope of the powerline, including the area of vegetation to be cleared could have some significance in terms of the visual footprint.

Using a worst case scenario of a large scale 765 kV powerline, the servitude width (project footprint) would need to be 80m and the development envelope 180m. Parallel 765 kV transmission lines need to be 80m apart, but less for smaller kV lines.

Typical activities relating to powerlines and substations that could have a visual effect on scenic resources are listed in the table below (Table 4).

Table 4: Typical activities relating to powerlines and substations that could have a visual effect on scenic resources

Activity	Footprint	Comments
Development envelope	180m wide	For 765 kV lines. Less for smaller lines.
Servitude	80m wide	For 765 kV lines. Less for smaller lines. About half of this is cleared of vegetation.
Access roads	4m wide	Required for construction and maintenance. Roads on steep or uneven slopes may require cut and fill resulting in more disturbance.
Pylons	Approximately 1000m^2	1 ha disturbed area during construction, including assembly area.
Substations	Up to 70 ha	Would include communication masts, fencing etc. May also require access road.
Construction camps	Varies	Would include batching plants and temporary laydown areas.
Borrow pits	Varies	Could make use of existing borrow pits in the area, or require new borrow pits.

The potential visibility of a large scale pylon at a range of distances is given in Figure 1 below, pylons being particularly visible when seen on the skyline. The degree of visibility is one of the parameters used to determine buffers in the visual sensitivity mapping in Section 8.

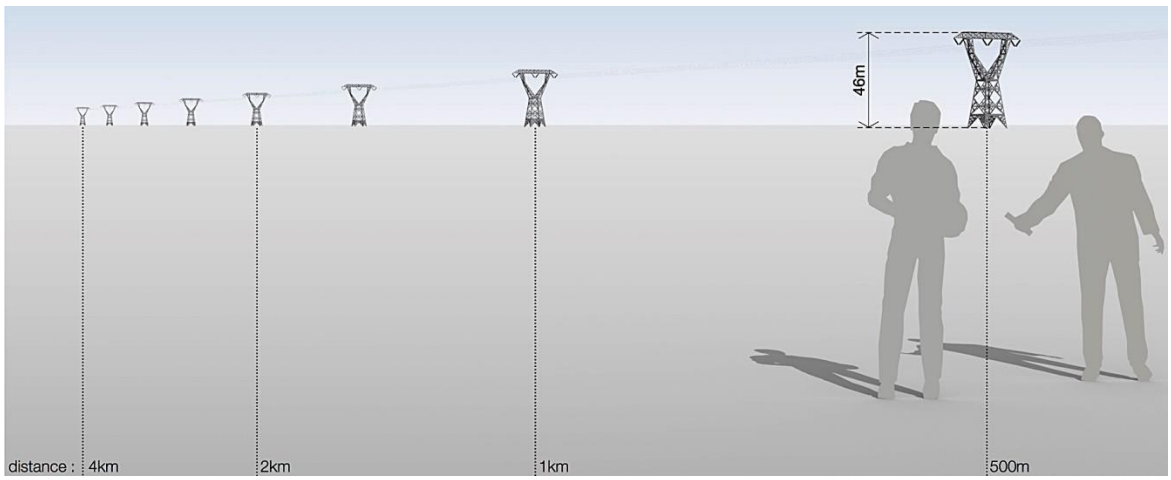

Figure 1: Degree of visibility of pylons at a range of distances from the viewer.

A location plan of the five previously assessed EGI corridors that have been gazetted as well as the two expanded corridors is given in Figure 2 below. Figure 2 also shows the proposed gas pipeline corridors that are being assessed separately as part of the SEA for the development of a Phased Gas Pipeline Network and Energy Corridors. The assessment of the gas pipeline corridors falls outside the scope of this Visual Assessment, as the pipelines will be underground and thus not expected to result in significant visual impacts during the operational phase.

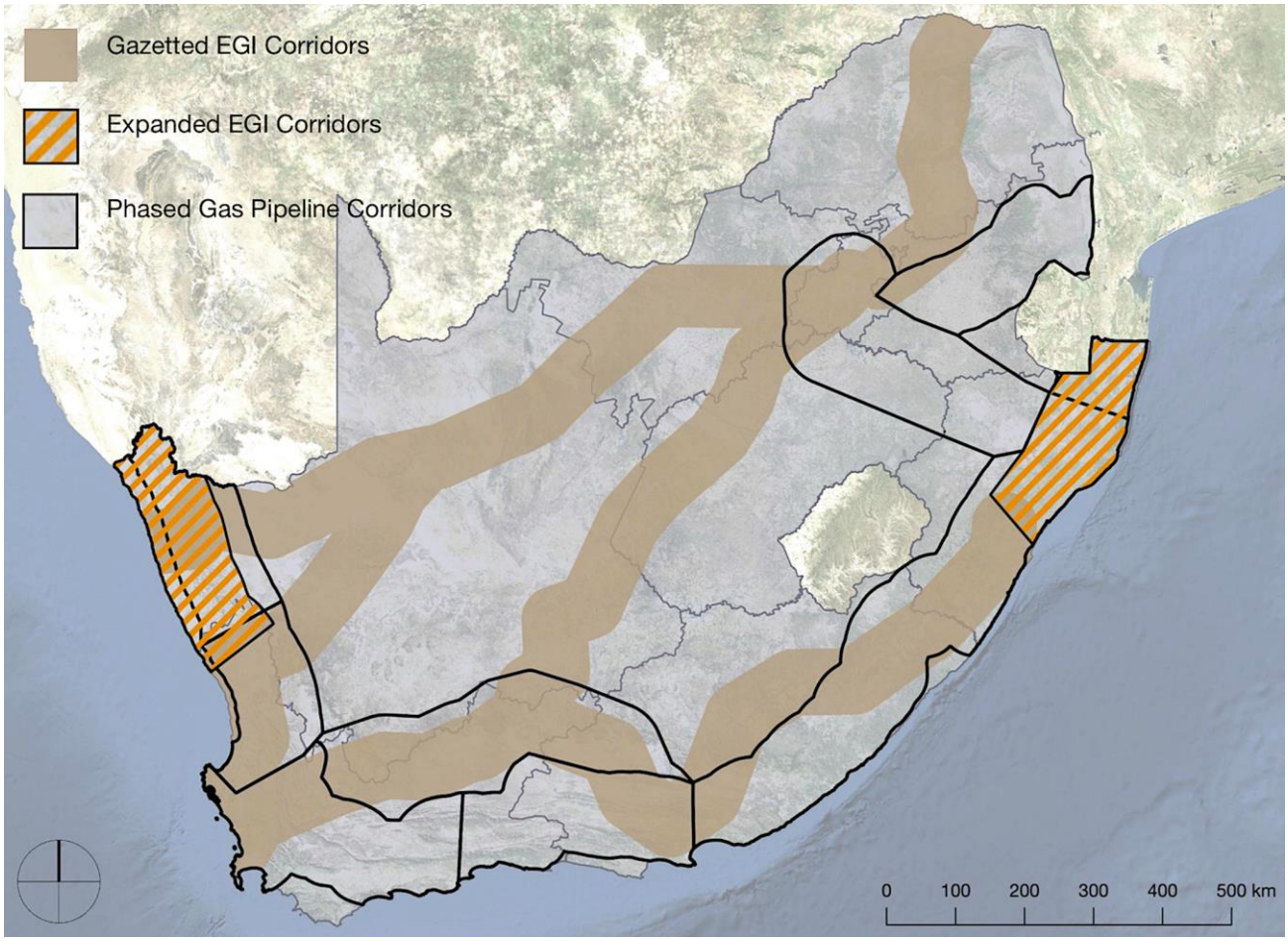

Figure 2: Expanded Western and Eastern EGI Corridors, and Gazetted EGI Corridors in relation to Gas Pipeline Corridors

6 CORRIDOR DESCRIPTION

Landscape characteristics for each of the expanded corridors were based on desktop studies, and the experience of the authors with previous visual assessment studies in those areas.

As landforms are the dominant landscape features at the regional scale, these play a major role in determining scenic resources. A description of the landforms was based on the geomorphology of the landscape. A useful publication in this regard was Norman and Whitfield (2006), where the correlation between geology and landscape or scenic features within the expanded corridors is explained, as illustrated in the transects.

Descriptions, with maps and transects, of the two expanded corridors are illustrated in the Figures that follow.

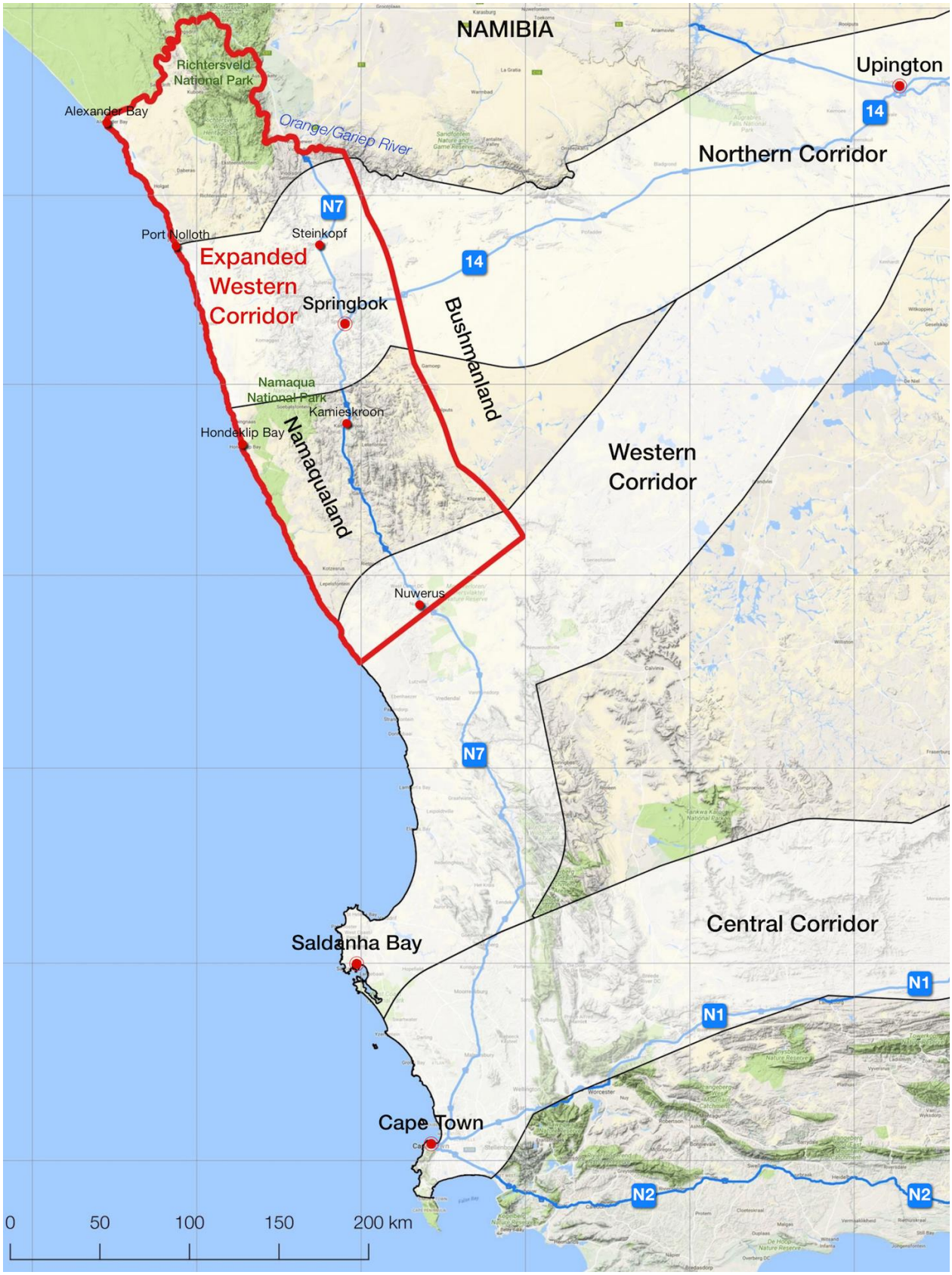

Figure 3: Expanded Western Corridor in relation to the gazetted EGI corridors

Figure 4: Expanded Eastern Corridor in relation to the gazetted EGI corridors

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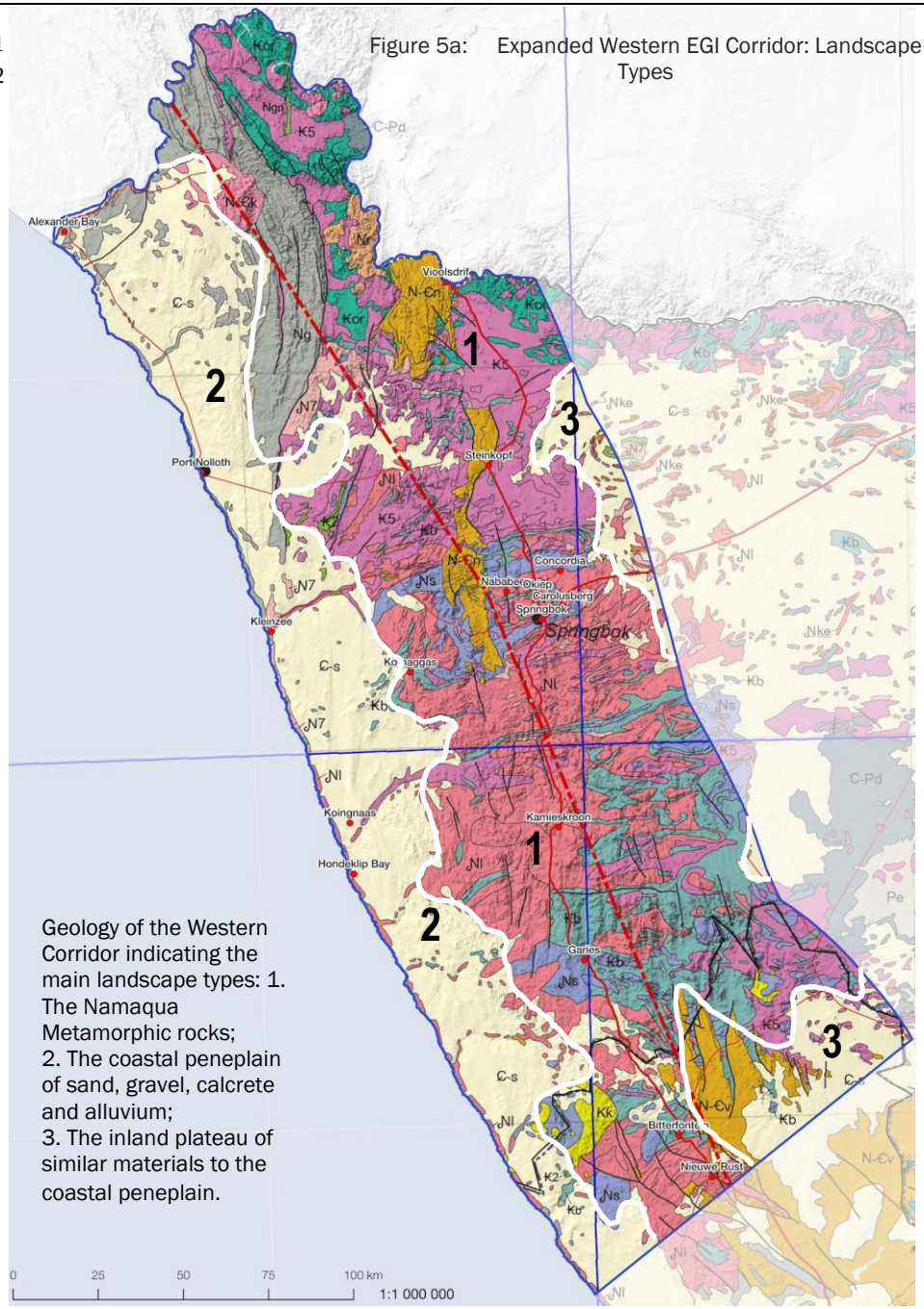
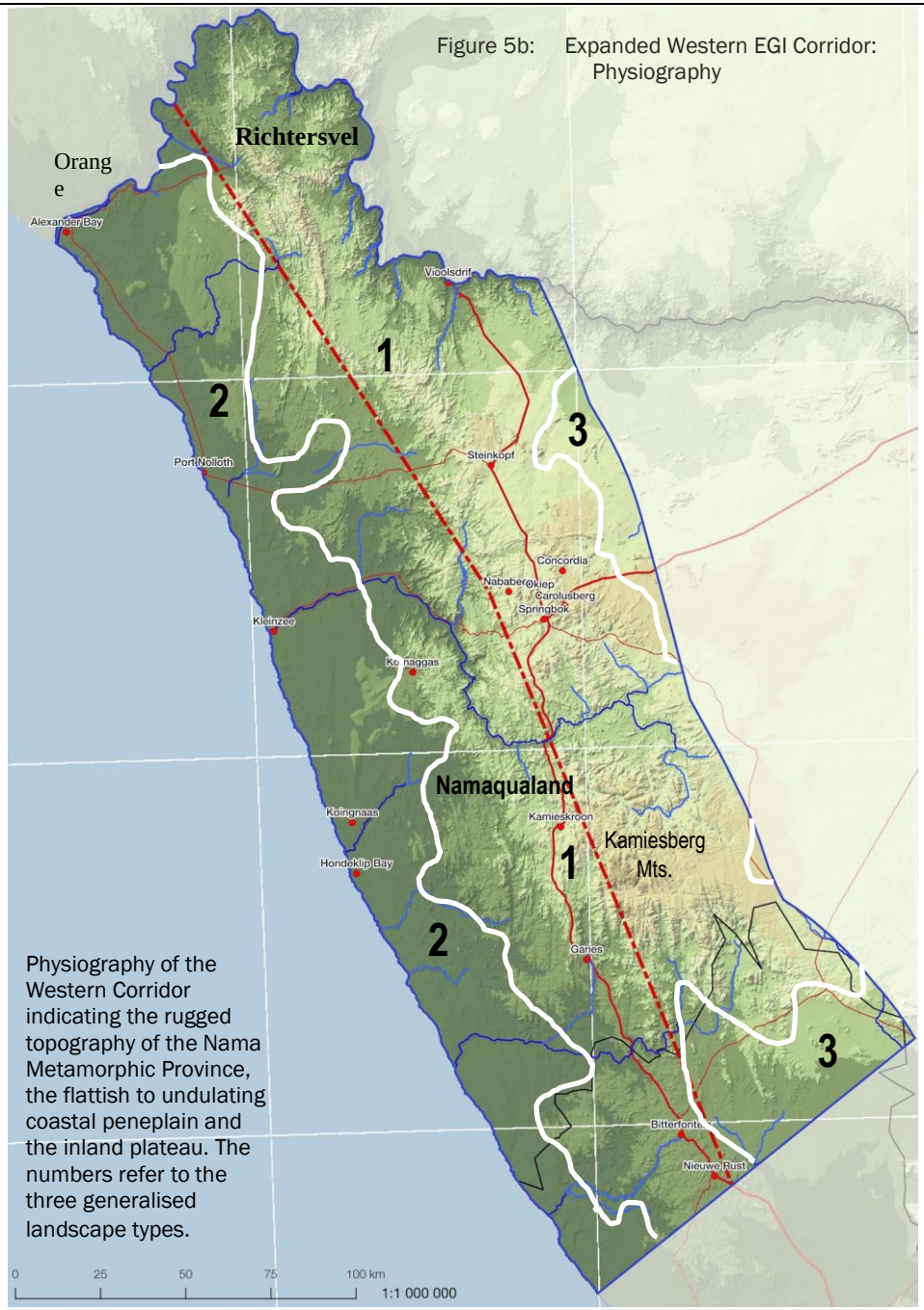
2

Figure 5a: Expanded Western EGI Corridor: Landscape Types



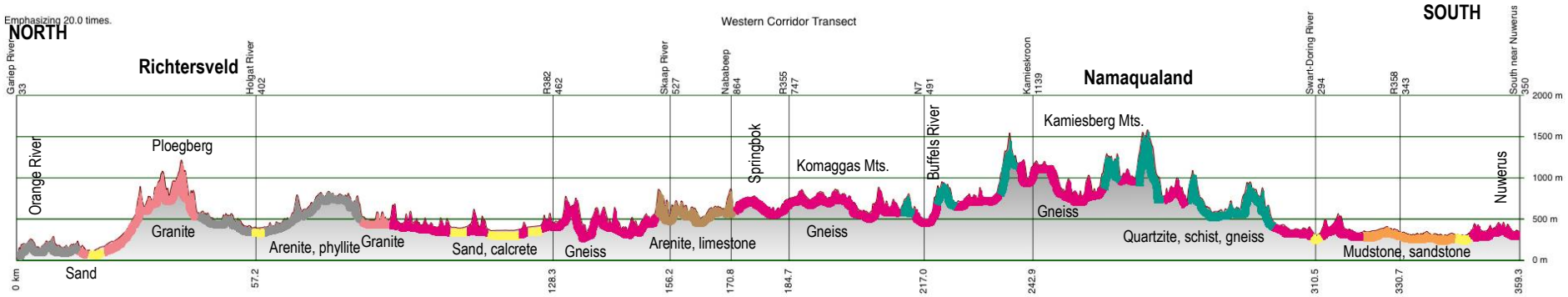
Geology of the Western Corridor indicating the main landscape types: 1. The Namaqua Metamorphic rocks; 2. The coastal peneplain of sand, gravel, calcrete and alluvium; 3. The inland plateau of similar materials to the coastal peneplain.

Figure 5b: Expanded Western EGI Corridor: Physiography



Physiography of the Western Corridor indicating the rugged topography of the Nama Metamorphic Province, the flattish to undulating coastal peneplain and the inland plateau. The numbers refer to the three generalised landscape types.

Figure 5c: Transect through the Expanded Western EGI Corridor



Regional context:
The expanded Western Corridor stretches from Nuwerus in the south to the Orange River (Gariep R.) in the north, and from the Namaqua coastline to about 120km inland. It forms part of the Namaqua Metamorphic Province, an arid, mountainous landscape, very different in character to the humid climate of the Natal Metamorphic Province of the expanded Eastern Corridor. Rivers are few and dry for most of the year. Except for the few towns clustered around the copper mining area, settlements tend to be small and scattered far apart. Nababeep, Okiep and Concordia, north of Springbok, are all historical mining towns. Most of the copper has been mined out and the mines abandoned. Diamond mining has taken place along the coastline, both offshore and onshore, although the latter has dwindled in recent years.

Geomorphology:
Within the three generalised landscape types shown in Figure 5a, the largest is the Namaqua metamorphic landscape, including gneiss, schist and quartzite. Gneiss and granite domes and outcrops are a feature of the area, particularly the weathered 'stacks' seen in the southern portion. Besides the general gneissic topography of the area, there are also arenites, a type of sandstone, of the Nama and Gariep Groups, to the north. The whole region has been faulted and incised by rivers, resulting in the rugged topography. The second landscape type is the coastal peneplain, consisting of sand, gravel, alluvium and calcrete, along with abandoned diamond diggings. To the east, a small section of the plateau is included in the Corridor, being about 1000m above sea level and consisting of similar sand and calcrete deposits as the coastal plain.

Landscape features:
In the south of the corridor, the Kamiesberg Mountains are particularly scenic, although much of the escarpment between the coastal plain and the inland plateau has scenic value, e.g. when viewed from the Spektakel Pass between Springbok and the coast. The Namaqua National Park, west of Kamieskroon, and the Goegap Nature Reserve near Springbok are known for their spring flowers. In the far north of the Corridor, the Richtersveld Transfrontier Park, part of which is a World Heritage Site (listed as the Richtersveld Cultural and Botanical Landscape). The Corridor is bounded in the north by the Orange River (Gariep R.), itself a major scenic and recreational attraction - a green corridor in a desert landscape.

Landscape Type 1: Namaqua metamorphic landscape with typical gneiss rocky domes, such as those near Kamieskroon.

Landscape Type 2: Featureless coastal peneplain of sand, gravel and calcrete, with abandoned diamond diggings in places.

Landscape Type 3: Inland plateau landscape of flat sandy plains with granitic gneiss rock features

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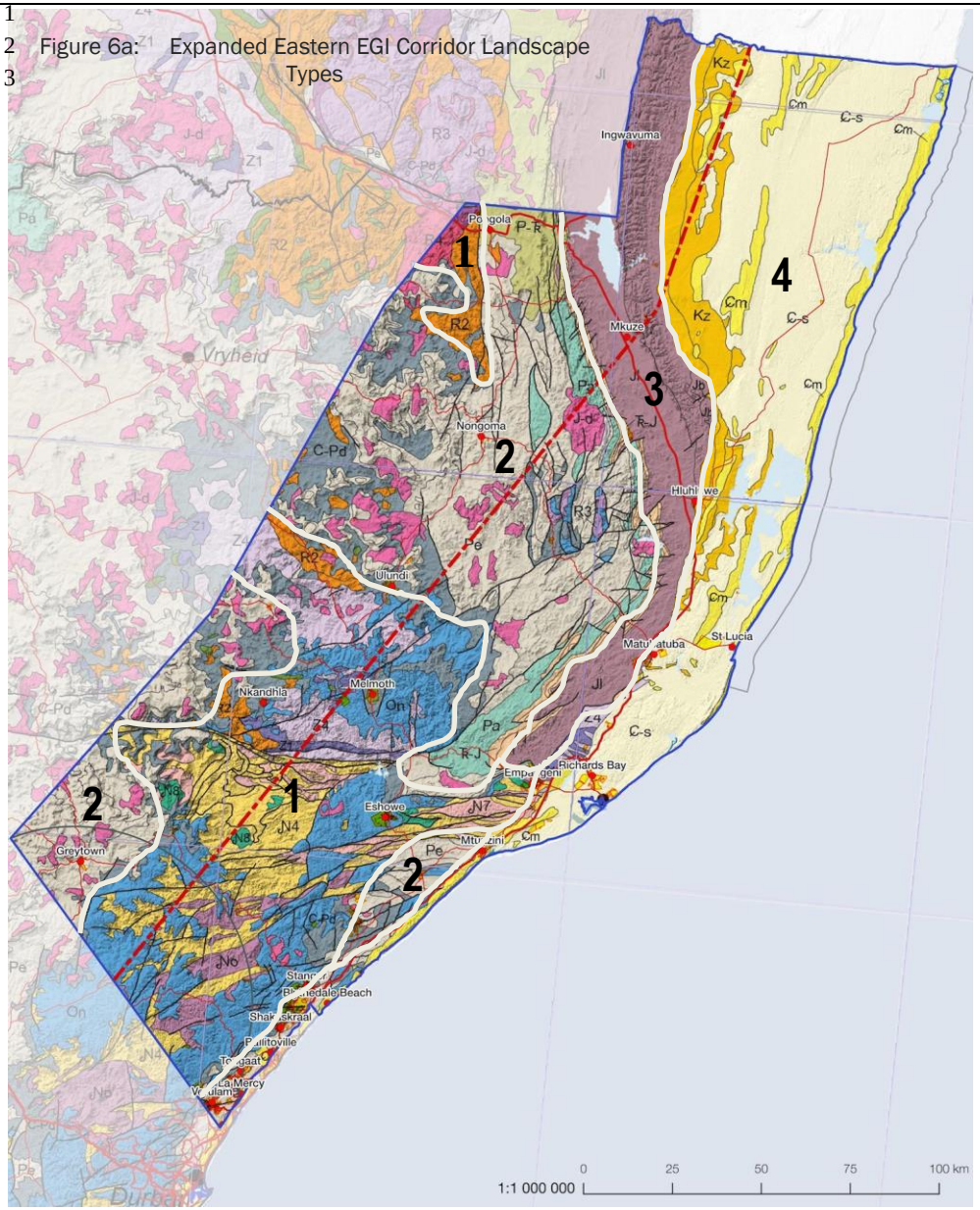
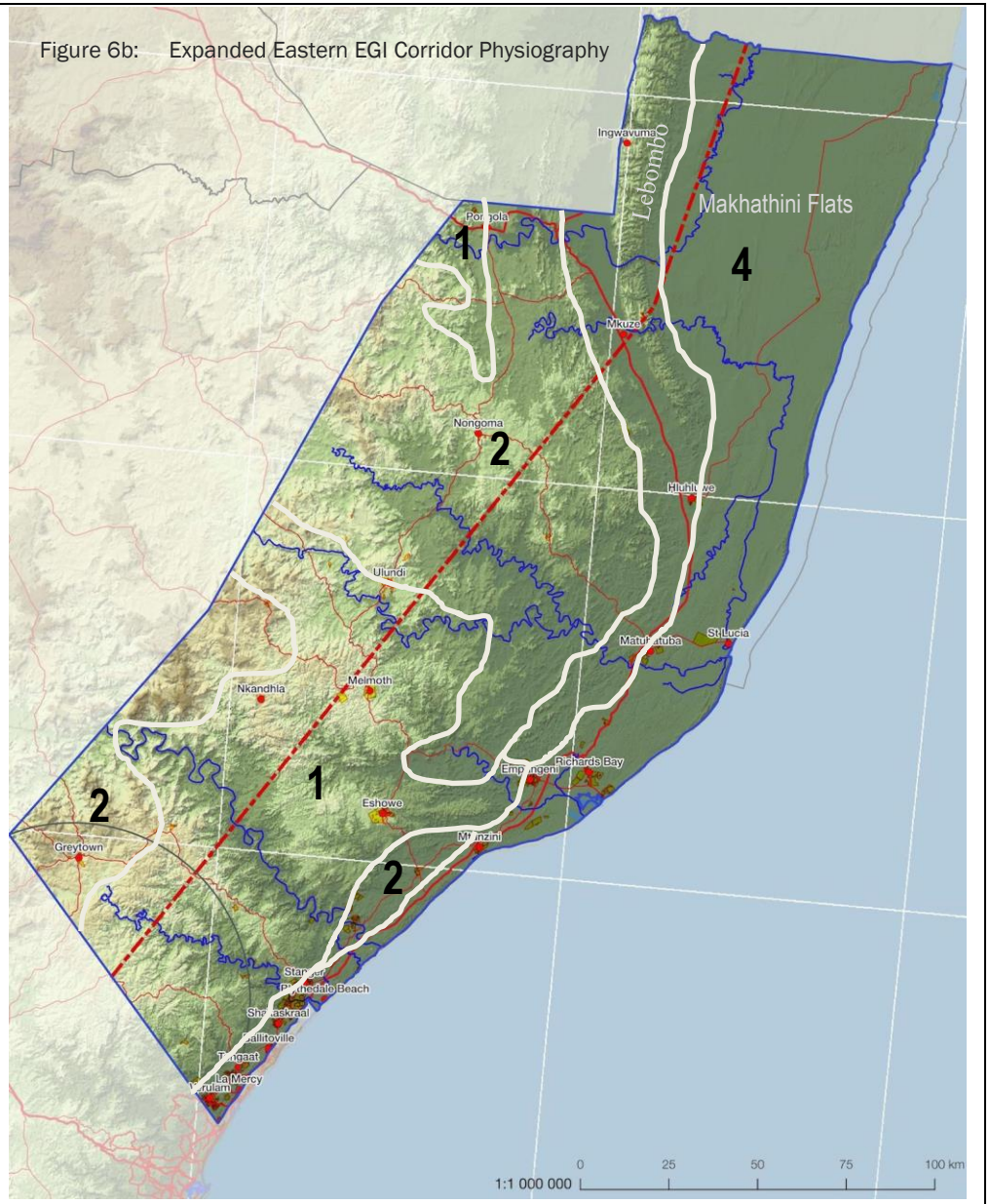
Figure 6a: Expanded Eastern EGI Corridor Landscape Types



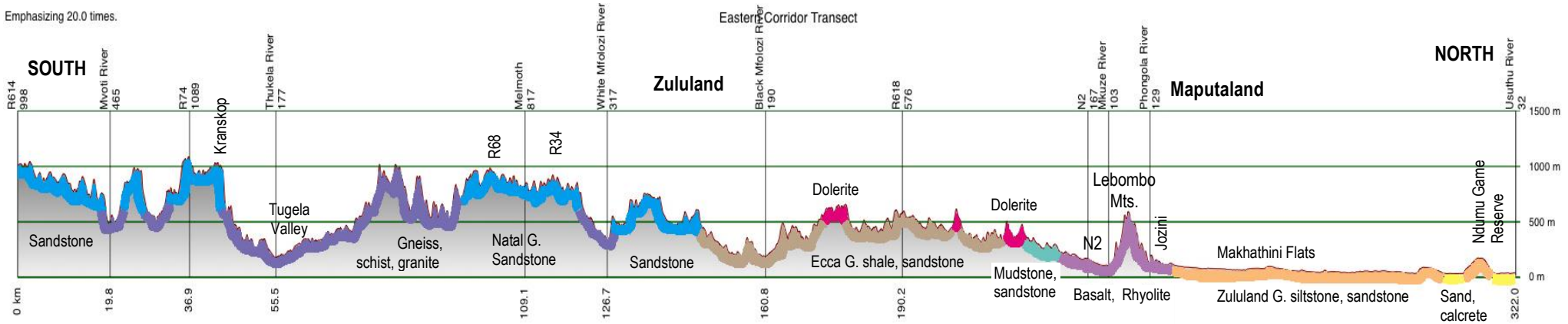
Geology of the Eastern Corridor indicating the main landscape types: 1. The Natal Metamorphic rocks overlaid by the Natal Sandstones (in blue); 2. The Karoo Ecca Group shales and sandstones intruded by dolerite (in pink); 3. The basalt band and rhyolite of the Lebombo Mountains; and 4. The wide coastal plain of sand, calcrete and limestone, becoming narrower to the south.

Figure 6b: Expanded Eastern EGI Corridor Physiography



Physiography of the Eastern Corridor indicating the highly dissected landscape, where rivers and their tributaries have cut down to form steep sided valleys and remnant ridges in the interior. The low-lying coastal plain forms the broad Makhathini Flats in the north, becoming a narrower coastal belt in the south. The four main landscape types are indicated.

Figure 6c: Transect through Eastern Corridor



Regional context:
The expanded Eastern EGI Corridor stretches from north of Durban to the Mozambican border, and from the coastal belt to about 100km inland. The corridor is a geologically and topographically complex landscape. Interestingly, although the Eastern EGI corridor consists partly of rocks similar to those of the Namaqua Metamorphic Province in the Western EGI Corridor, the landscape is completely different owing to the humid, wet climate of Zululand. Here, instead of desert, the landscape is covered with grassy hills and densely forested valleys. Numerous rural settlements straddle the hillsides. The southern portion of the corridor is characterised by cattle farming, sugar cane, timber and wattle plantations. Further north is prime bird and wildlife country, with a large concentration of game reserves.

Geomorphology:
Within the four landscape types shown in the transect above, the southern section of the corridor consists mainly of Natal Group sandstones, underlain by metamorphic gneiss and schist, as well as granites. It is a deeply dissected landscape, where the rivers have cut down to the gneiss and granite basement rocks, combined with considerable faulting, resulting in numerous ridges and valleys, sometimes with steep cliffs. The meandering Thukela River (Tugela R.), one of the biggest in the area, has cut a deep and wide valley.

The central portion of the corridor consists of Ecca Group shales and sandstones, the softer rocks resulting in a more subdued topography. These are intruded in places by Karoo dolerites, (in pink on the transect above), which tend to form the peaks. Just north and east of this is a broad, flattish band of basalt, along which the N2 National Road has been located, avoiding the generally rugged landscape of the adjacent area. Alongside the band of basalt, the Lebombo Mountains, consisting of more durable rhyolite, ranges all the way to the Mozambique border and beyond.

Finally the eastern and northern parts of the corridor forms a flat coastal plain, more than 50km wide in the north. The plain consists mainly of sand, calcrete and limestone, with siltstone and sandstone further inland. The transect above illustrates how the various rock types dictate the topography and the character of the landscape. A good explanation of the geology, and its highlights, are given in Norman and Whitfield's book 'Geological Journeys' (2006).

Landscape features:
The area owes its scenery mainly to the sandstone table-lands and doleritic landforms. Scenically prominent features of the corridor include the mountainous terrain around Greytown, Kranskop and Nkandla, the deep, steep-sided river gorges, the high dunes with coastal forest, and the famous St Lucia wetlands, which have been declared a World Heritage Site. To the north, scenic features include the Lebombo Mountains, Pongolopoort Dam (Lake Jozini), Lake Sibaya, and Kosi Lake.

Landscape Type 1: Natal metamorphic landscape of gneiss, schist and granite, similar to the Namaqua metamorphic region, but with a humid climate.

Landscape Type 2: Ecca Group shales and sandstones, intruded in places by dolerite, and incised by rivers, such as the Mfolozi

Landscape Type 3: A basalt region viewed from the N2 National Road, with the Lebombo Range of rhyolite in the background.

Landscape Type 4: The flat, sandy coastal plain, with lakes, wetlands and coastal forest, such as that at St. Lucia.

7 FEATURE SENSITIVITY MAPPING

7.1 Feature sensitivity criteria

Criteria normally used for determining visual sensitivity, along with the reasoning for these, are listed in Table 5 below. The criteria are divided into inherent scenic resources of the expanded corridors, along with potential sensitive receptors.

Table 5: Criteria for Determining Visual Sensitivity

Scenic Resource	Contributing Factors
Topographic features	Landscape features in the area contribute to scenic and natural heritage value. These include features that provide visual interest or contrast in the landscape such as peaks, scarps, ridges, steep slopes and geological features. Intact wilderness or rural landscapes tend to have higher scenic value and therefore increased sensitivity.
Water Features	Water bodies, such as rivers, estuaries, large dams and wetlands, generally have aesthetic, scenic, recreational and amenity value. Coastal shorelines, particularly promontories, tend to be visually sensitive. Sensitivity generally relates to their national, regional or local significance.
Cultural landscapes	Cultural landscapes, often along fertile river valleys, tend to have rural scenic value and historical or cultural significance. These need to be correlated with heritage data.
Sensitive Receptors	**(includes residents, commuters, visitors and tourists)**
Protected Areas	These include national parks and nature reserves, which have wilderness and scenic attributes in addition to their biological conservation role, serving as important visitor / tourist destinations. Visual significance is increased by their protection status.
Game reserves / resorts	Private nature reserves, game farms, recreation resorts and tourist accommodation are important for the local economy, and tend to be sensitive to loss or degradation of scenic quality.
Human settlements	Towns, villages and farmsteads, particularly historical settlements, residential and resort areas, tend to be sensitive to visual intrusions, including an effect on property values and tourism.
Scenic routes and arterial roads	Scenic and arterial routes, such as national roads, mountain passes and *poorts*, tend to have historical, recreational and tourism importance, and are therefore visually sensitive.
Heritage sites	These form part of the heritage study, but could have visual implications.

A list of the key visual / scenic features considered during the visual assessment of the EGI corridors is given in Table 6 below. At the project scale, the viewshed, as well as viewing distances and visual absorption capacity of the landscape, would be additional criteria that are used to quantify potential visual impacts.

Table 6: Information sources for sensitive features and receptors in both corridors

Sensitivity Feature Class	Data Source + Date of Publications	Data Description, Preparation and Processing
Topographic features	1: 500 000 topographic map series; Google Maps with terrain (2018); and steep slopes data.	Topographic maps for prominent elevations, ridgelines, scarps, ravines and geological features, particularly where these occur in combination with steep slopes to create complex landscapes.
Steep slopes	SRTM DEM v4.1, 2014.	Two categories of slopes used: steeper than 1:5 and 1:5 - 1:10. Areas with a high geographic density of steep slopes. Steep slopes have been combined with topographic features for mapping purposes.
Major rivers and water bodies	1: 500 000 topographic map series, and National Freshwater Ecosystem Priority Areas (NFEPA)	Mainly perennial rivers are included, except where a seasonal river is a major feature. Water bodies include lagoons, lakes, wetlands, pans and dams where these constitute a potential scenic resource.
Ramsar sites	DEA SAPAD Q4 2017.	Mapped as indicated in the database.
Coastal zone	1: 500 000 topographic map series, and NGI shapefiles.	A 1km strip of coastline is mapped.
National Parks	DEA SAPAD Q4 2017.	Mapped according to current boundaries, plus buffers as indicated.
Protected Areas	DEA SAPAD Q4 2017.	Includes proclaimed / protected nature reserves, game reserves and wilderness areas, plus buffers as indicated.
Private reserves and game farms	DEA SAPAD Q4 2017. Google Maps / Earth 2018.	Where known these include guest farms, resorts and tourism destinations.
Cultural landscapes	Google Earth 2018.	Includes historically or socially important agricultural areas.
Heritage sites	SAHRA heritage sites of SA, 2017.	Includes archaeological sites, battle sites, cemeteries, etc. where these have heritage significance.
Historical towns and villages	AfriGIS Towns, 2017 On Route in South Africa 3rd Edition, Sunbird Publishers	Lists of towns and villages for each corridor. General information and dates for listed towns and villages, (where available).
National Roads	National Geospatial Information (NGI) and Open Street Maps (OSM).	As marked on maps, plus buffers as indicated.
Provincial Roads	NGI and OSM	Includes main arterial routes. As marked on maps, plus buffers as indicated.
Scenic routes	1: 500 000 topographic map series; Google Maps with terrain (2018).	Includes mountain passes and poorts, and coastal routes with intact landscapes.
Passenger rail lines	NGI and OSM	Actively used passenger rail lines (Historic abandoned rail line in the case of the Expanded Western Corridor).
Airfields	Civil Aviation Authority (CAA) Google Earth 2018	CAA website. Relates to aircraft safety.

The criteria listed above are spatialised by means of buffers, based on the scale of the EGI development, as well as the relative sensitivity of the feature or receptor, (very high, high, moderate or low sensitivity) as indicated in Table 7 below and the sensitivity mapping in Section 8. The recommended buffers are consistent with those used in the Phase 1 EGI SEA (2016). The buffers could vary at the project scale depending on viewshed mapping and site conditions. The actual footprint and height of the proposed electrical facilities needs to be taken into account.

Table 7: Nominal buffer distances between EGI development and sensitive features / receptors for regional mapping purposes

Feature Type	Very high Sensitivity	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Topographic features including steep slopes	250 m	500 m	1 km	-
Major rivers	500 m	1 km	2 km	-
Water bodies, dams, wetlands, pans	500 m	1 km	2 km	-
Ramsar Sites	1 km	2 km	3 km	-
Coastal zone	1 km	2 km	3 km	-
National Parks, World Heritage Sites	2 km	3 km *	4 km *	-
Protected Areas - Nature Reserves	1 km	2 km *	4 km *	-
Private reserves and game farms	n/a	1 km *	2 km *	-
Cultural landscapes	250 m	500 m *	1 km *	-
Heritage sites	250 m	500 m *	1 km *	-
Towns / villages / settlements	500 m	1 km	2 km	-
National roads	500 m	1 km *	2 km *	-
Provincial routes	250 m	500 m *	1 km *	-
Scenic routes	1 km	2 km *	3 km *	-
Passenger rail lines	250 m	500 m *	1 km *	-
Airfields	3 km	-	8 km	-

Note 1: * Viewsheds to be taken into account at the project scale. Buffers could be reduced if proposed transmission infrastructure is outside the viewshed or in a view shadow.

Note 2: Buffers are based on a 400kV transmission line 30 to 60m high, and substations of about 1 ha or more. Buffers could be reduced where towers are less than 20m high, or where substations are less than 1 000m².

Note 3: Buffers are in response to potential visibility of the proposed transmission infrastructure as indicated below based on field observations. Visibility would be increased by development on ridges or skylines:

High visibility:	Clearly noticeable within the observer's viewframe 0 to 0.5 km.
Moderate visibility:	Noticeable feature within observer's viewframe 0.5 to 1 km.
Marginal visibility:	Partially noticeable within observer's viewframe 1 to 2 km.
Low visibility:	Hardly visible unless pointed out to observer 2 to 4 km+.

Where sensitivities overlap no cumulative sensitivity has been allocated, the highest sensitivity value being the prevailing one. Visual sensitivity maps for each of the corridors are given in Section 8, and in Figures 9 and 10.

7.2 Feature Maps

7.2.1 Expanded Western EGI Corridor

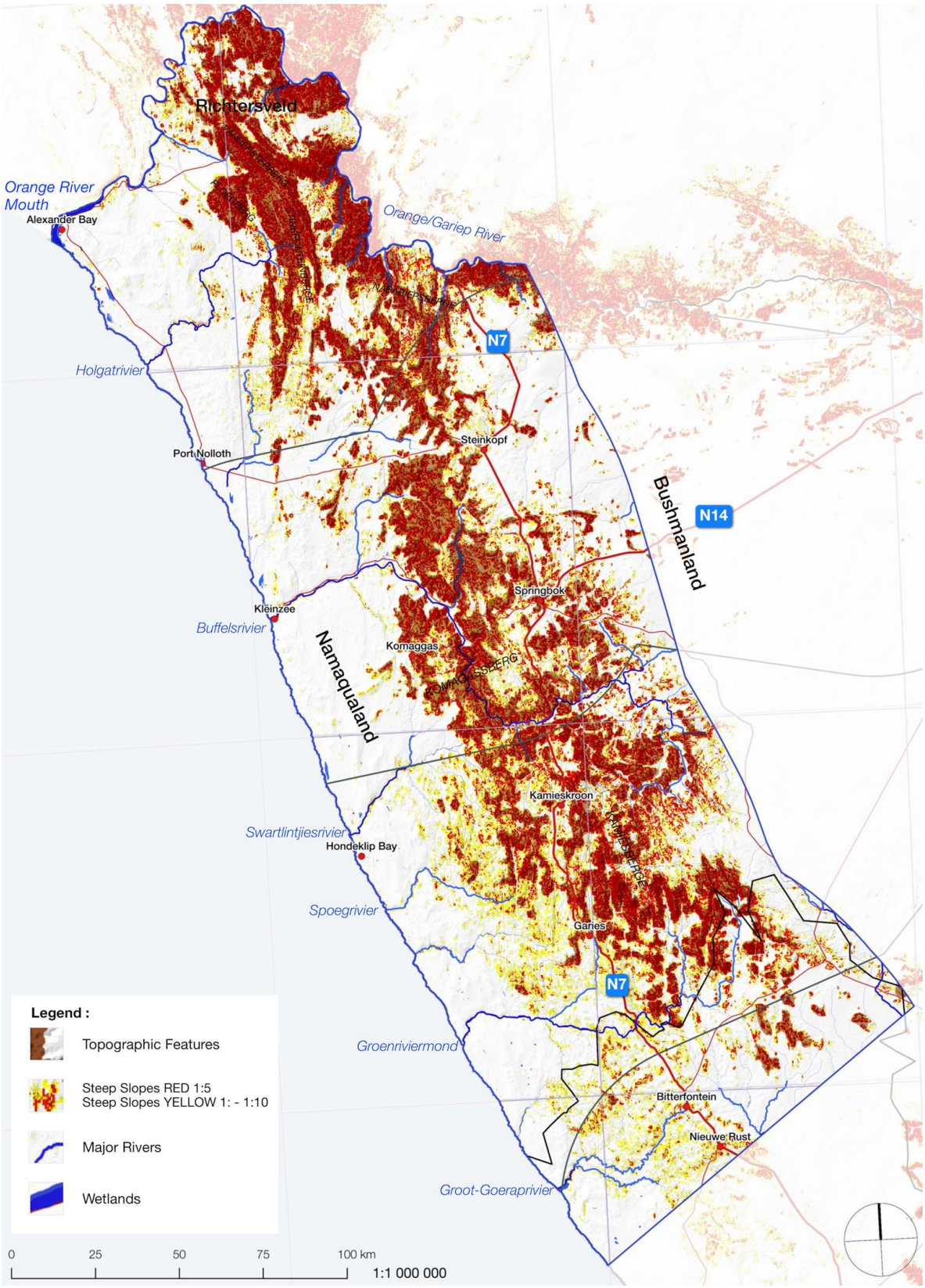


Figure 7a: Expanded Western Corridor: topographic and natural landscape features

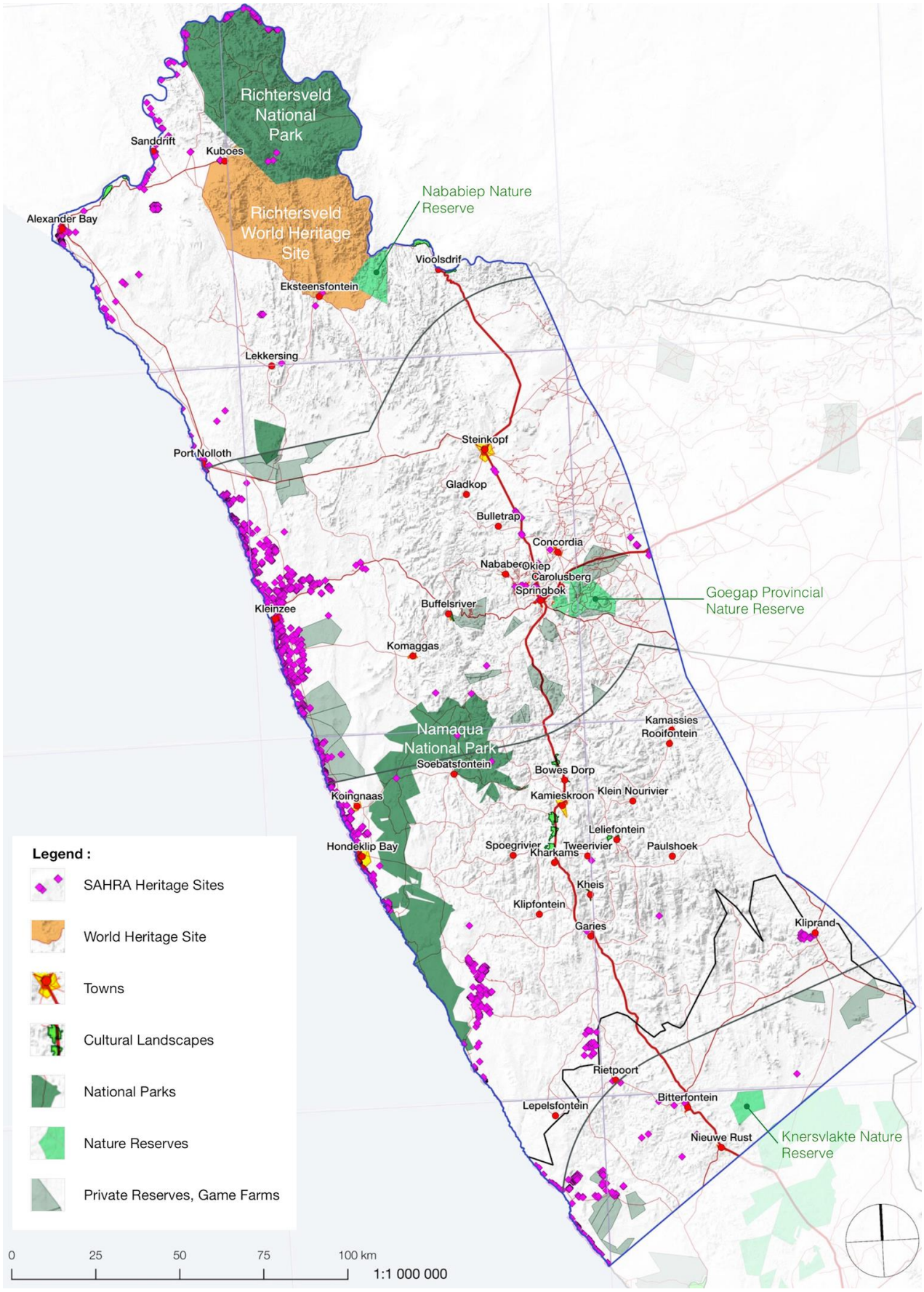


Figure 7b: Expanded Western Corridor: protected areas and heritage features

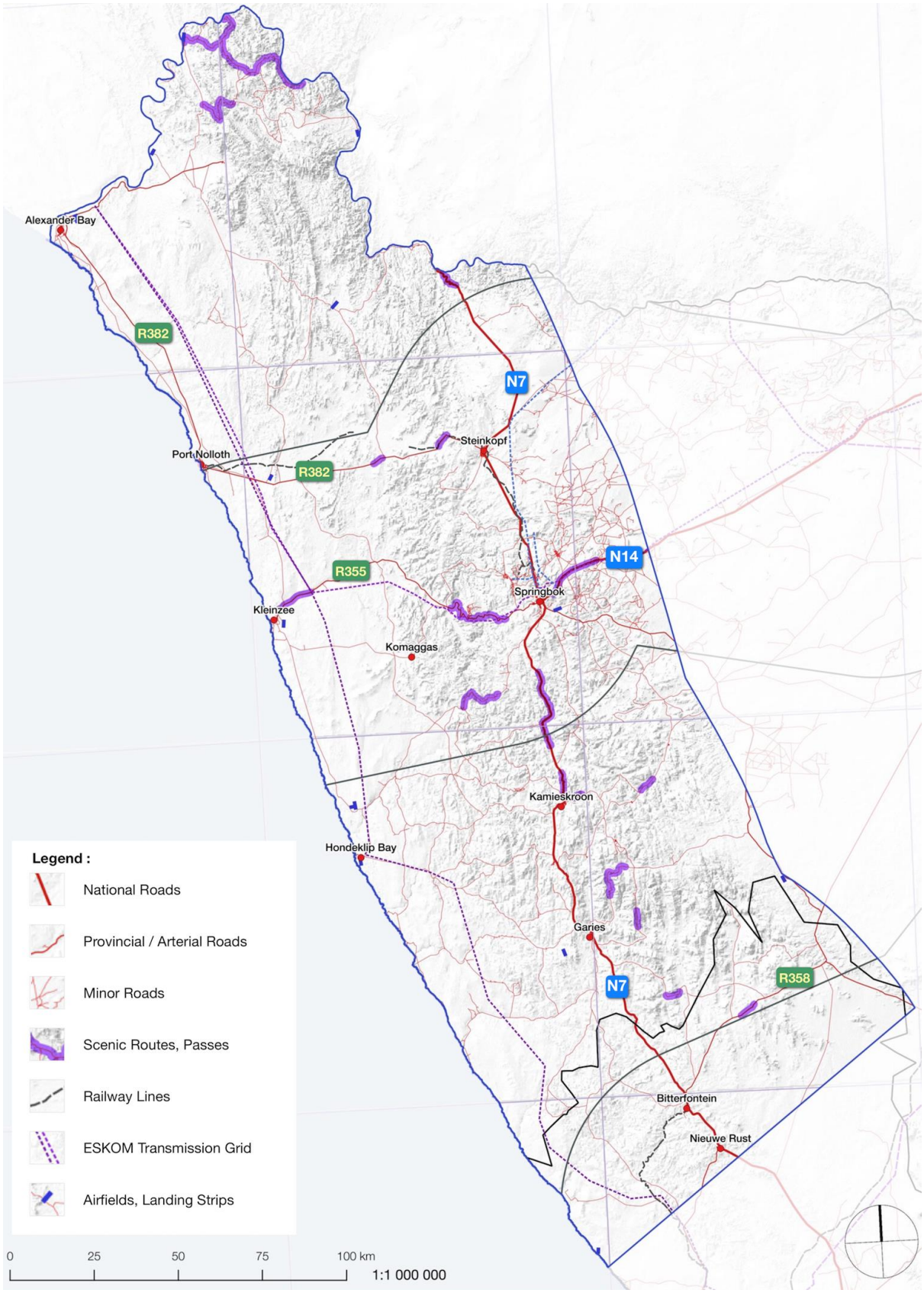


Figure 7c: Expanded Western Corridor: routes and transmission lines

7.2.2 Expanded Eastern Corridor

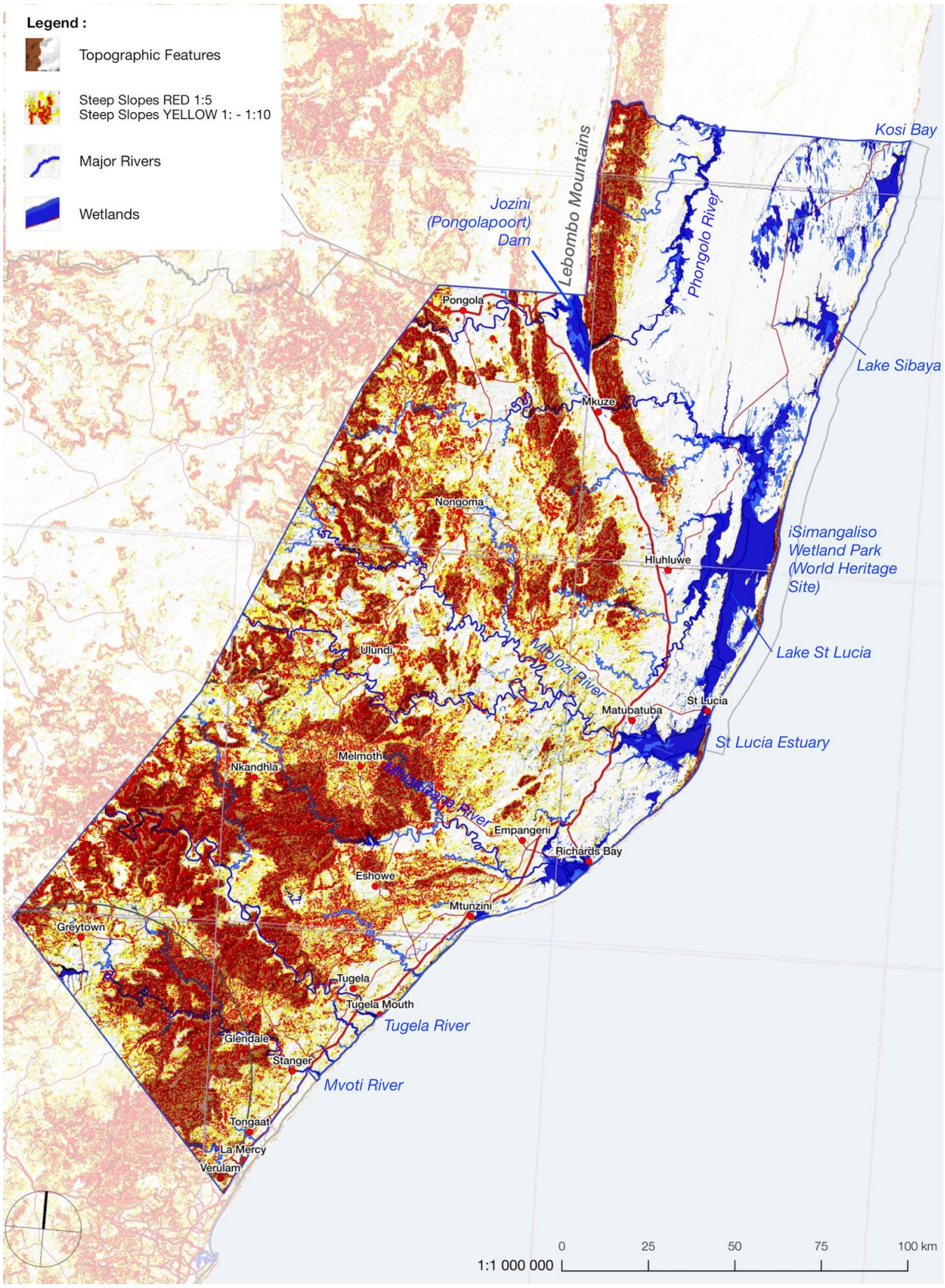


Figure 8a: Expanded Eastern Corridor: topographic and natural landscape features

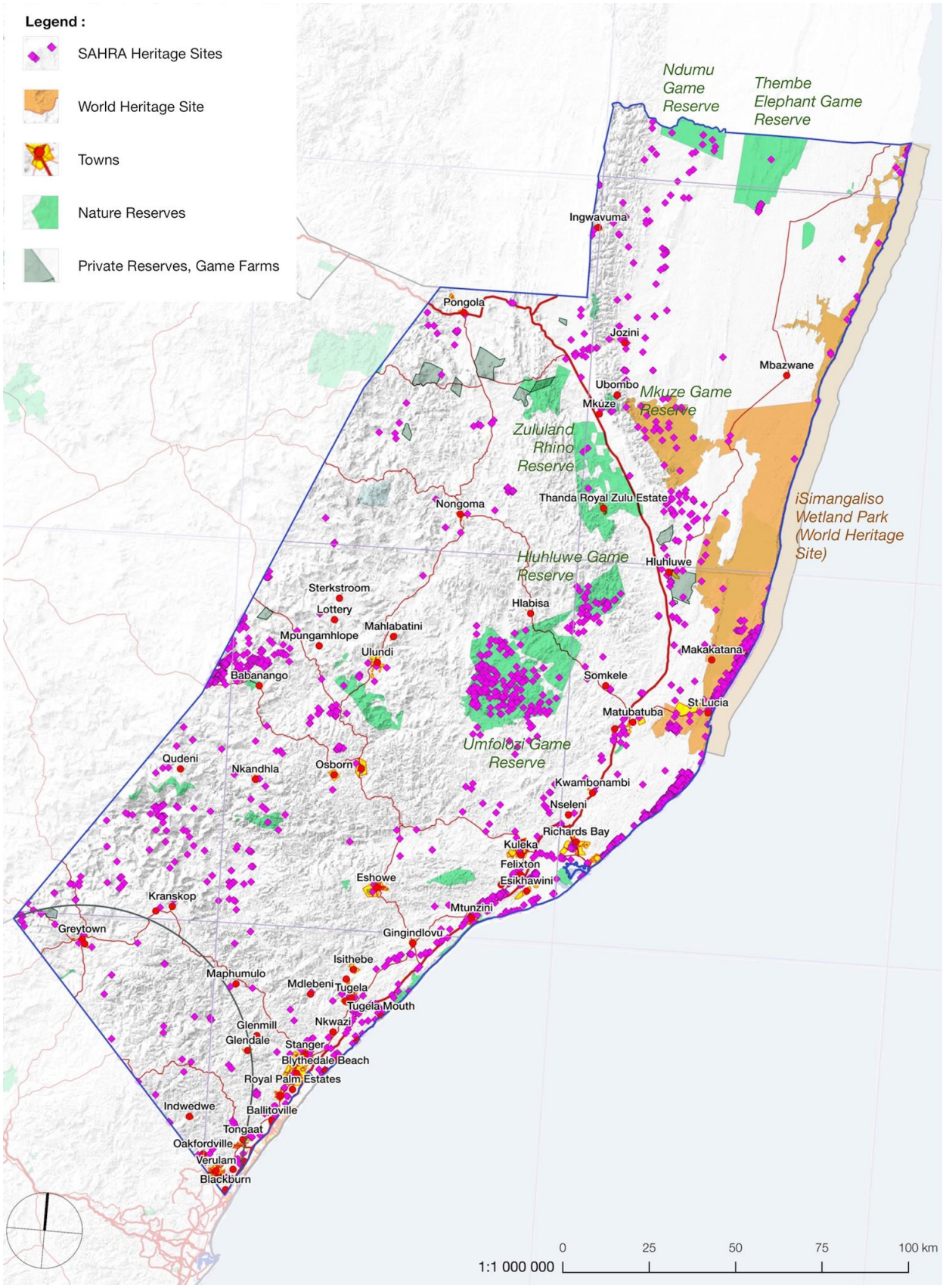


Figure 8b: Expanded Eastern Corridor: protected areas and heritage features

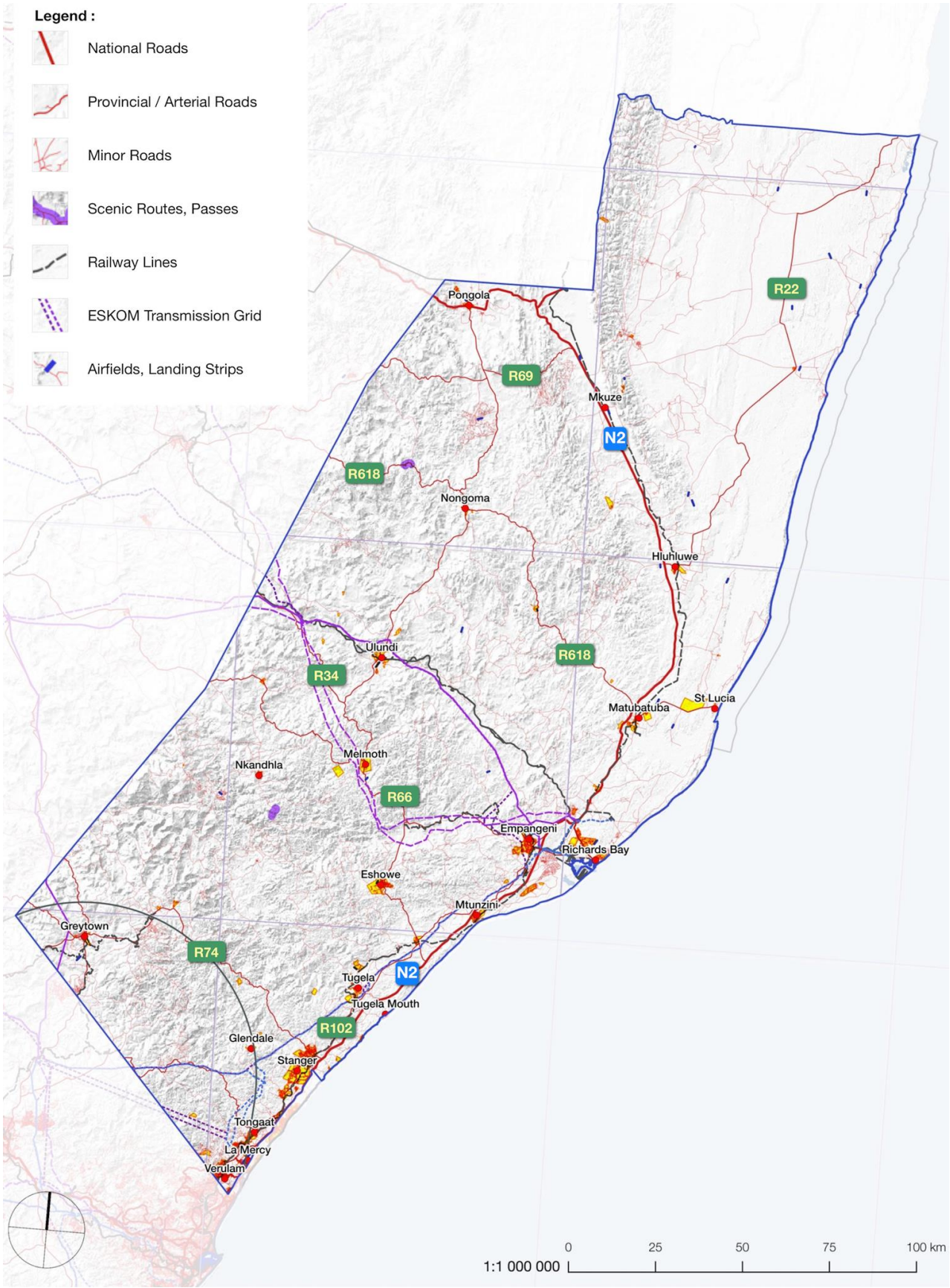


Figure 8c: Expanded Eastern Corridor: routes and transmission lines

8 FOUR- TIER SENSITIVITY MAPPING

8.1 Four Tier Sensitivity Maps

8.1.1 Expanded Western EGI Corridor

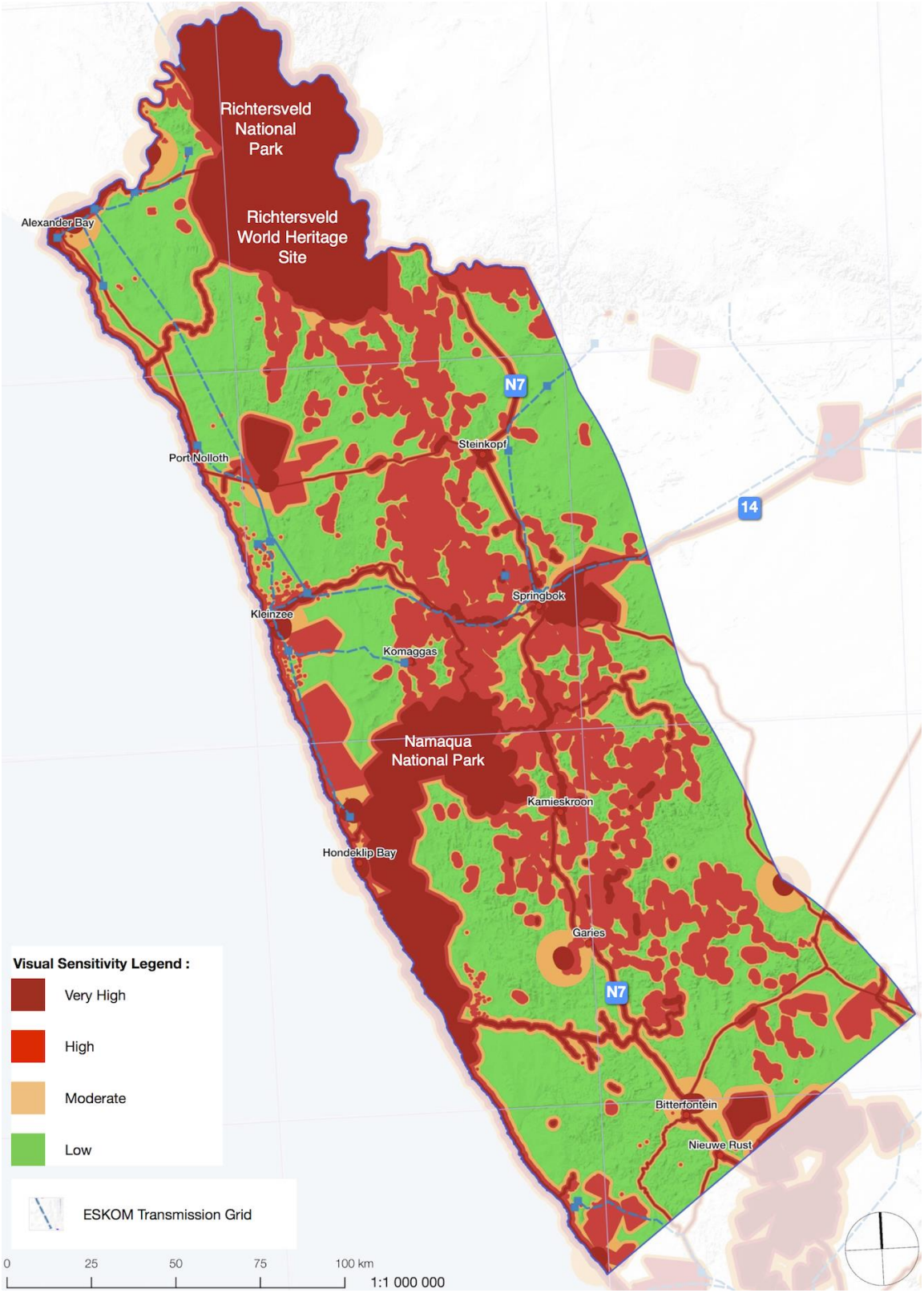


Figure 9: Expanded Western Corridor: visual sensitivity

8.1.2 Expanded Eastern EGI Corridor

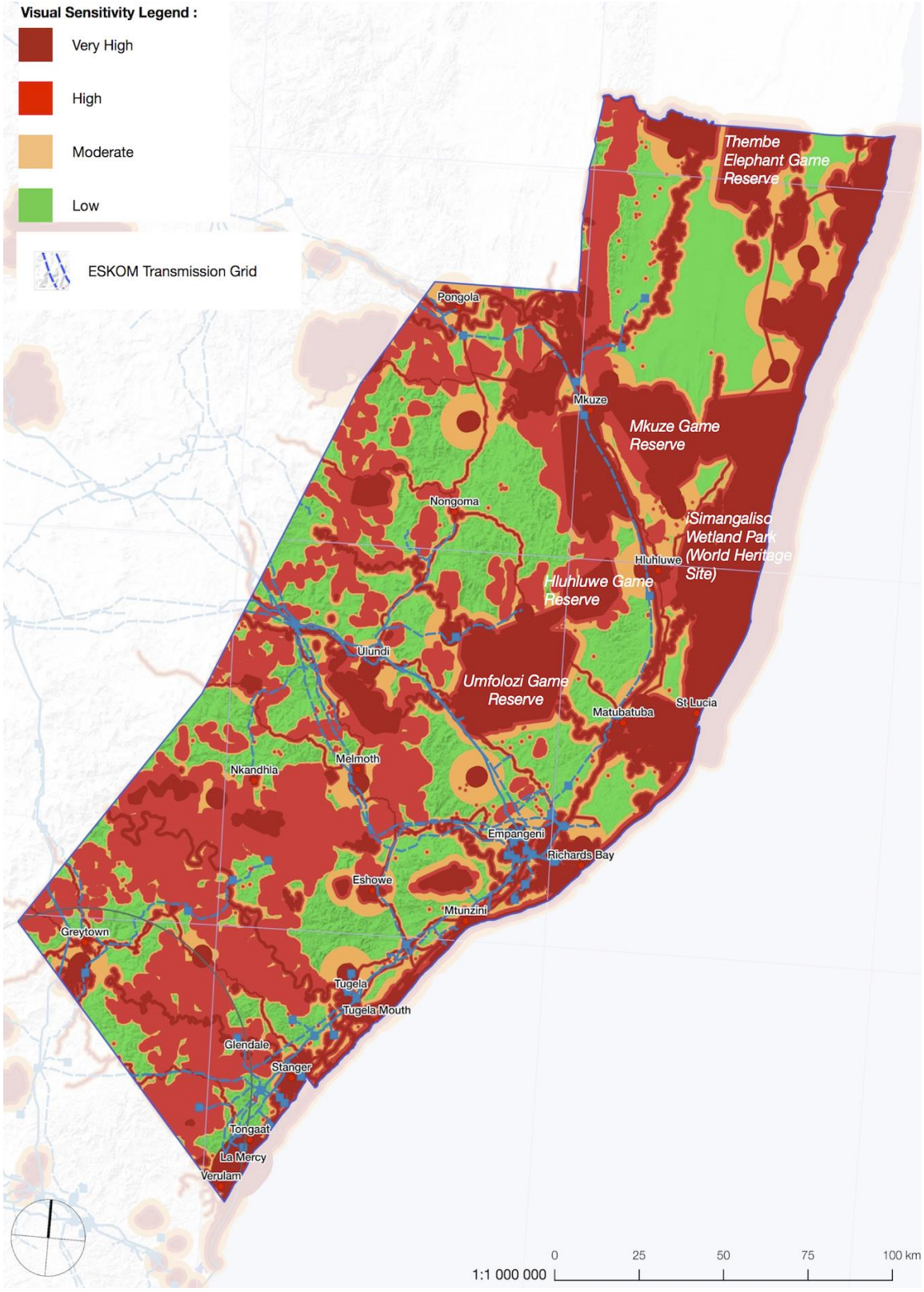


Figure 10: Expanded Eastern Corridor: visual sensitivity

9 KEY POTENTIAL VISUAL IMPACTS AND MANAGEMENT ACTIONS

The tables below for the Expanded Western and Eastern EGI Corridors provide avoidance mitigation measures to identify ideal routing of transmission lines at the regional corridor scale. Where avoidance is not feasible, a range of mitigation measures is given in **Section 10: Best Practice Visual Guidelines** at the local project scale.

Table 8: Key Impacts, Possible Effects and Management Actions for the Expanded Western EGI Corridor

Corridor	Key Impacts	Site Specific Descriptions	Possible Effect	Management Actions
Expanded Western EGI Corridor	Potential visual intrusion on scenic mountain ranges, escarpment and granite outcrops.	Kamiesberg Mountains in the south, Komaggas Mountains, mountain peaks around Springbok and the rugged Richtersveld mountains.	Loss of mountain wilderness character, recreation amenity and tourism value.	Avoid development on visually sensitive mountain peaks, ridge skylines and steep slopes.
	Potential visual impact on national parks, nature reserves, and their related wilderness experience.	Namaqua National Park and related wild flower reserve, Richtersveld Transfrontier Park and World Heritage Site, Goegap Nature Reserve	Visual effect on conservation areas, pristine landscapes, recreation amenity and tourism economy.	Avoid development within viewshed of protected landscapes. Screen substations from view.
	Potential visual impact on private reserves, game farms and tourism facilities.	Private reserves, game farms and tourism facilities are indicated in the various maps included in Appendix 1.	Visual effect on wilderness / rural character, recreation amenity and tourism economy.	Avoid development where scenic resources or tourism facilities would be compromised.
	Potential visual impact on river corridors, which often form green oases in the arid landscape.	Orange River (Gariep R.), Holgat River, Buffels River, Spoeg River, Bitter River, Groen River.	Visual effect on green valleys which bring visual relief to the arid landscape and provide scenic / recreational amenity.	Although river crossings are inevitable, avoid scenic gorges or ravines.
	Potential visual impact on mission settlements, historical towns and other heritage sites.	Steinkopf, Rietpoort mission settlements, historical mining towns (Nababeep, Okiep, Concordia) and other historical settlements / sites.	Negative visual effect on historical settlements and sites of heritage value and their surrounding context.	Avoid powerlines and substations intruding on historical settlements and sites. Maintain recommended visual buffers.
	Potential visual impact on national / arterial and scenic routes / mountain passes. Also historical rail lines.	N7, particularly between Kamieskroon and Springbok, parts of the N14 east of Springbok, Spektakel Pass west of Springbok, and other smaller routes or passes.	Visual effect on major arterial routes, scenic routes and mountain passes which have scenic and tourism value.	Avoid powerlines crossing or running adjacent to scenic routes / passes. Locate substations away from routes and screen where necessary.

1 Table 9: Key Impacts, Possible Effects and Management Actions for the Expanded Eastern EGI Corridor

Corridor	Key Impacts	Site Specific Descriptions	Possible Effect	Management Actions
Expanded Eastern EGI Corridor	Potential visual intrusion on scenic mountain ranges, ridgelines, scarp edges, dolerite koppies and high coastal dunes.	Lebombo and Ubombo Mountains in the north. Mountainous areas around Greytown, Nkandla and Ulundi. High dunes along the coast.	Visual intrusion on mountain scenery, loss of wilderness experience, recreation amenity and tourism value.	Avoid development on visually sensitive mountain ridge skylines, scarp edges, dolerite koppies, dunes and steep slopes.
	Potential visual impact on game reserves, nature reserves, wilderness areas and tourism facilities, including their wilderness experience.	Ndumi Game Reserve, Tembe Elephant Reserve and Mkuze Game Reserve in the north. Hluhluwe/ Umfolozi Game Reserves further south. St Lucia Game Reserve and World heritage Site at the coast.	Visual effect on conservation areas, pristine wilderness landscapes, recreation amenity and tourism economy.	Avoid development within viewshed of protected landscapes. Screen substations from view.
	Potential visual impact on river valleys, gorges, ravines, waterfalls, estuaries and wetlands.	Primarily the St Lucia wetland system. Lake Sibayi and Kosi Lake to the north. The large Jozini Dam (Pongolopoort Dam). The Tugela River Valley and tributaries.	Visual effect on the rural and scenic value of river valleys and ravines, and on recreation amenity and tourism economy.	Although river crossings are inevitable, avoid scenic ravines and estuaries.
	Potential visual impact on historic towns and settlements, and heritage sites including battle sites and gravesites.	Numerous traditional settlements. Towns, villages and heritage sites are indicated in the various maps included in Appendix 1.	Visual effect on historical towns and heritage sites, and their surrounding context.	Avoid powerlines intruding on historic settlements and battle sites. Maintain recommended visual buffers.
	Potential visual impact on national, arterial and scenic routes, and passenger rail lines.	The N2, particularly along the coast and across estuaries. The Pongola *poort* to Jozini. Numerous scenic routes and passes in rural areas.	Visual effect on scenic routes and passes, on their heritage value and tourism economy.	Avoid powerlines crossing or running adjacent to scenic routes / passes. Locate substations away from routes and screen where necessary.

2

9.1 Project Level Assessments

During the project specific stage, potential visual impacts are expected to be defined as follows:

Very high potential visual impact:

- Significant visual effect on wilderness / rural quality or scenic resources;
- Fundamental change in visual character of the area;
- Creates a major precedent for development in the area.

High potential visual impact:

- Intrusion on intact landscape or scenic resources;
- Noticeable change in visual character of the area;
- Creates a new precedent for development in the area.

Moderate potential visual impact:

- Some effect on intact landscape or scenic resources;
- Some change in visual character of the area;
- Adds to development in the area.

Minimal potential visual impact:

- Low level of intrusion on landscapes or scenic resources;
- Limited change in visual character of the area;
- Similar in nature or compatible with existing development.

The Guideline *for Involving Visual and Aesthetic Specialists in Environmental Impact Assessment Processes*. CSIR Report No. ENV-S-C 2005 053, (Oberholzer, B. 2005) indicates that Powerlines would fall under Type A assessments, being large in area extent and involving natural or rural landscapes. A visual specialist would preferably have qualifications in landscape architecture or environmental planning, or alternatively, recognised expertise and experience in the field of visual assessments.

10 BEST PRACTICE VISUAL GUIDELINES AND MONITORING REQUIREMENTS

The visual effect of transmission lines, in particular the pylons, are difficult to screen or mitigate visually because of their construction and size, as well as the long distances of powerline routes. Numerous transmission lines, in parallel, potentially add to the cumulative visual impact, which together with substations, could result in an industrial landscape. A number of best-practice measures are indicated below.

10.1 Planning Phase

- At the macro scale transmission lines should be aligned with the grain, or flow, of the landscape, following longitudinal valleys rather than cutting across crests, ridges and scarps.
- In agricultural landscapes transmission lines should adhere to the rectilinear pattern of fields by following fence lines and hedgerows rather than awkwardly cutting across field patterns.
- Transmission lines should where possible be located in industrial or mining areas, where these occur, in preference to recreation or resort areas.
- Transmission lines should be located in existing disturbed or degraded areas, as far as possible, in preference to pristine landscapes.
- Transmission lines could share corridors with other compatible linear routes or utilities, reducing the amount of servitudes required, and reducing the number of new corridors that fragment the landscape.
- Similarly, new transmission lines should be located near existing powerline corridors, except where the existing ones are in sensitive areas, or where the cumulative visual impact would be too high.

- Transmission lines should be located against a background of either topography or vegetation, such as treebelts, as much as possible. The objective is to avoid seeing powerlines in silhouette against the skyline if possible.
- Where appropriate, direct connection of users to self generating energy sources could help to eliminate the need for transmission lines in certain instances.
- Substations should ideally be located in unobtrusive low-lying positions, rather than on hill crests, preferably away from roads and settlements. Where this is not possible, they must be screened by means of earth berms and/or tree planting.

10.2 Construction Phase

- In new development areas, consideration could be given to burying transmission lines underground, for example in tandem with new road construction. (Underground cables are usually only considered in urban areas and over short distances, where visual impacts would be significant).
- Strategically placed foreground planting can be used to screen views from sensitive viewpoints or receptors.
- Careful consideration should be given to the selection of pylon design, such as use of the more modern mono-pole and T-pylon, as used in Europe, which create less visual 'clutter' than lattice type towers.
- The use of different pylon types should be avoided, where possible, particularly where these are in visual proximity to each other.
- Buildings that form part of substations should be in keeping with their local context, and should be in sympathy with the regional or vernacular architecture.
- Maintenance roads required for transmission lines and substations should use existing access roads or farm roads as far as possible.
- Access roads should be sympathetically aligned with the grain of the topography and layout of agricultural fields. Roads should be diagonally aligned up slopes to minimise cut and fill.
- Areas disturbed by construction should be revegetated to match the surrounding flora or agricultural crops.
- Lighting related to substations should be fixed to walls or buildings and fitted with reflectors to avoid light spillage. Low-level bulkhead or bollard type lighting is preferred. High mast lighting should be avoided.
- Signage, if essential, should be discrete and confined to entrance gates. No corporate or advertising signage should be permitted.

10.3 Operations Phase

There are no special visual management actions that are applicable during the operational phase once the transmission infrastructure has been installed, except for the standard maintenance of revegetation work as part of an Environmental Management Programme (EMPr).

10.4 Rehabilitation and Post-closure

- All above-ground structures should be removed, safely disposed of or possibly recycled for use elsewhere.
- The affected area should be regraded to pre-development topographic conditions, unless the area is required for new specific uses.
- Compacted areas, including access or maintenance roads that are no longer required, should be scarified and exposed areas re-vegetated or re-seeded.
- Vegetation used for the restoration should match that of the surrounding veld, unless new uses are planned for the site.
- Re-vegetation should be according to an EMPr provided by a rehabilitation ecologist.

10.5 Monitoring Requirements

- Monitoring of the construction and rehabilitation phases should be carried out by an Environmental Management Team, including an Environmental Control Officer (ECO), who would be responsible for regular reporting during construction and rehabilitation.
- Visual monitoring by the ECO would include photographic records of the pre-construction and post-construction stages.

11 CONCLUSIONS AND FURTHER RECOMMENDATIONS

11.1 Expanded Western EGI Corridor

The visual sensitivity mapping for the Expanded Western Corridor (Figure 9) reveals that essentially two north-south development routes to the Namibian border are possible from a visual perspective.

The first follows the broad coastal plain, where a number of wind energy farms are at the proposal stage. The even topography lends itself to the construction of transmission lines, plus the fact that there are already a number of existing power lines in the area. Furthermore, the arid landscape is sparsely populated, and has been previously disturbed by diamond diggings along the coast. The main pinch-point is at the Namaqua National Park west of Kamieskroon, where the wild flower reserve is of national significance and a major tourist attraction.

The second possible development route is the inland plateau area along the eastern edge of the corridor, which also has relatively even topography and few visual constraints. The main pinch-point is at the Orange River in the north where rugged mountains, and the river itself, are important features of scenic value. In addition, picturesque granite and gneiss koppies, scattered across the plateau, have scenic value and need to be avoided. The arid plateau area, like the coastal plain, is sparsely populated. However, pylons would tend to be visible over long distances in the flat plateau landscape, particularly from the N7 and N14 National Routes.

If transmission lines on the inland plateau are considered, then the Expanded Western EGI Corridor study area may need to be marginally widened towards the east to provide more opportunity for powerline development.

The mountainous escarpment running down the centre of the Expanded Western EGI Corridor and ending in the Richtersveld Park / World Heritage Site, would be unsuitable for transmission line development because of the area's rugged topography and high scenic, botanical and cultural value.

11.2 Expanded Eastern EGI Corridor

The Expanded Eastern EGI Corridor is almost the converse of the Expanded Western EGI Corridor despite having similar metamorphic basement rocks. The difference is the humid, moist subtropical climate of the Eastern Corridor, resulting in a completely different landscape character of green hills, perennial rivers and densely forested ravines, compared to the arid landscape of the Western Corridor.

The visual sensitivity mapping for the Expanded Eastern Corridor (Figure 10) reveals a large number of pinch-points that would need to be negotiated by any proposed Transmission development routes.

The KwaZulu-Natal North Coast has a relatively narrow coastal belt with sensitive estuaries, which besides being densely populated, is a popular recreation and tourism destination. Further north, the coastal plain, with its even topography, widens in Maputaland, while the protected St Lucia wetland system and the large number of game reserves have immense wilderness, conservation and tourism value.

The inland areas of the Eastern Corridor have a complex topography, carved out by the many rivers with their steep-sided ravines, such as those of the Tugela Basin, resulting in visually sensitive landscapes. Added to this is the scatter of numerous rural settlements.

The wooded valleys, along with the Eucalyptus and wattle plantations would help to provide some visual screening for transmission lines, while sugar cane fields are not considered to be particularly visually sensitive.

Importantly, this inland area of Zululand is considered to have major cultural and historical importance, full of battle sites and memorials relating to South Africa's earlier history, and therefore called the 'Land of Rembrance'.

Given the relatively high frequency of visually and culturally sensitive features outlined above, consideration could be given to marginal widening of the Eastern Corridor towards the west, into the Natal coal belt, which is more industrial in character, and therefore less sensitive to the introduction of transmission lines.

11.3 General Conclusion

With regard to the existing corridors, the visual sensitivity mapping revealed that opportunities do exist in both of the expanded corridors for the alignment of transmission lines, although a number of pinch-points need to be negotiated. The recommended best practice visual guidelines could therefore play an important role at these pinch-points at the local project scale.

Existing Eskom transmission lines were not considered in the determination of the visual sensitivity maps, the intention being the identification of inherently suitable corridors for future transmission development, particularly as some of the existing transmission lines occur in sensitive zones. In areas that are not visually sensitive it may well be appropriate to locate future transmission lines in existing powerline corridors.
Given that the visual study has of necessity been carried out at a fairly coarse regional scale, more fine-scale mapping at the local scale, together with fieldwork, would help to identify both smaller scale features, as well as opportunities for powerline alignments, particularly where pinch-points occur.

The varied nature of the landscape in the two expanded EGI corridors, and widespread occurrence of scenic and heritage resources, will require that careful micro-siting of powerlines and substations at the project level will be essential, using the guidelines provided in this chapter.

A general finding of the visual study is that both the Expanded Western and Eastern EGI Corridors may need to be marginally widened in places, into less sensitive areas, to create more opportunities for transmission line routes.

12 REFERENCES

CSIR, 2016. Electricity Grid Infrastructure Strategic Environmental Assessment. Prepared for the Department of Environmental Affairs.

Erasmus, B.P.J. 1995. On Route in South Africa: Explore South Africa Region by Region. Jonathan Ball Publishers. Third Edition 2014, Sunbird Publishers.

Norman, N. and Whitfield, G. 2006. Geological Journeys: A Traveller's Guide to South Africa's Rocks and Landforms. Struik Publishers and De Beers.

Oberholzer, B. 2005. Guideline for involving visual and aesthetic specialists in EIA processes. CSIR Report No. ENV-S-C 2005 053. Provincial Government of the Western Cape, DEADP.

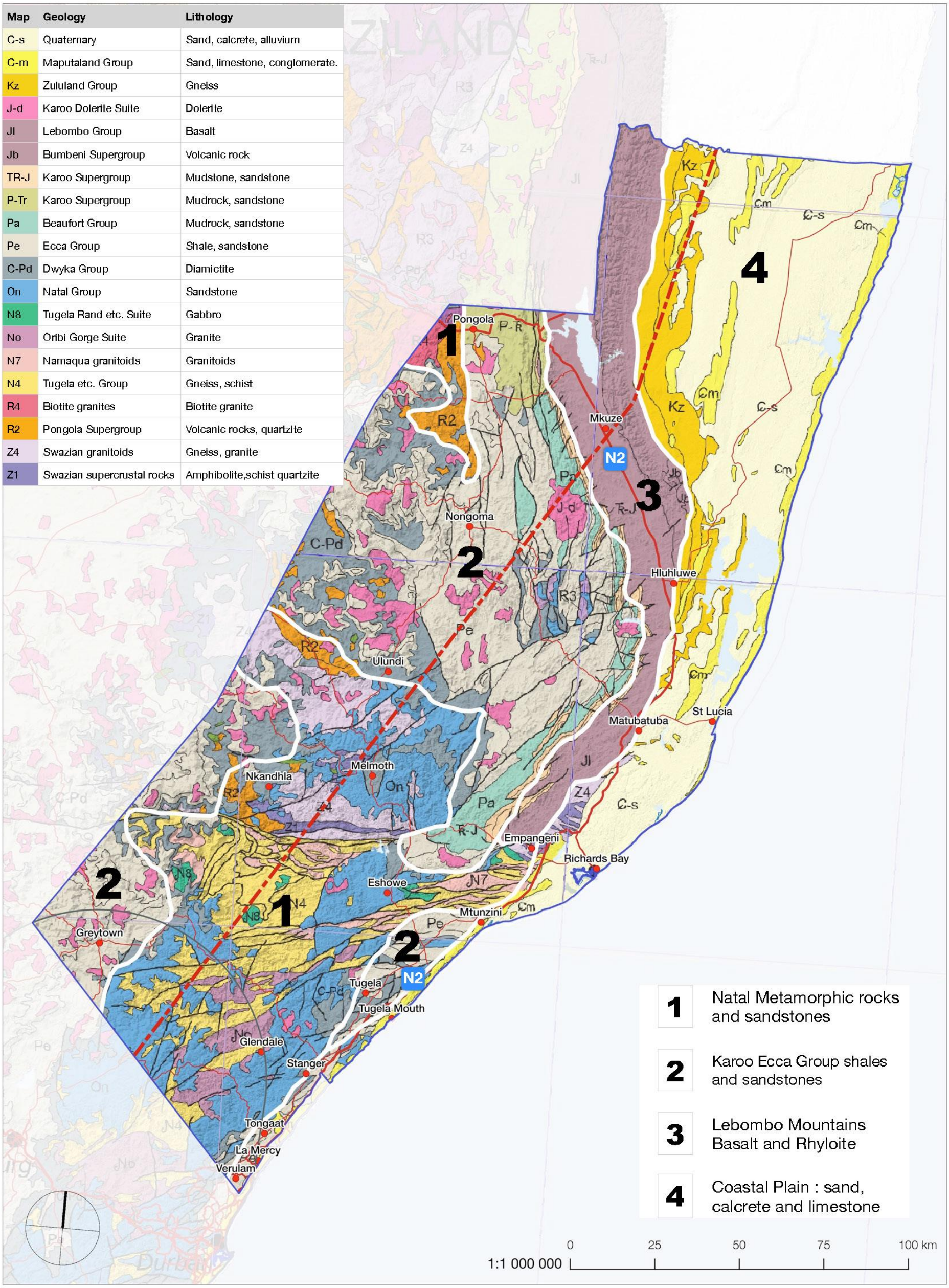
Appendix 1: Feature Maps and Sensitivity Maps

(See A3 folio of maps, and shape files provided under separate cover).

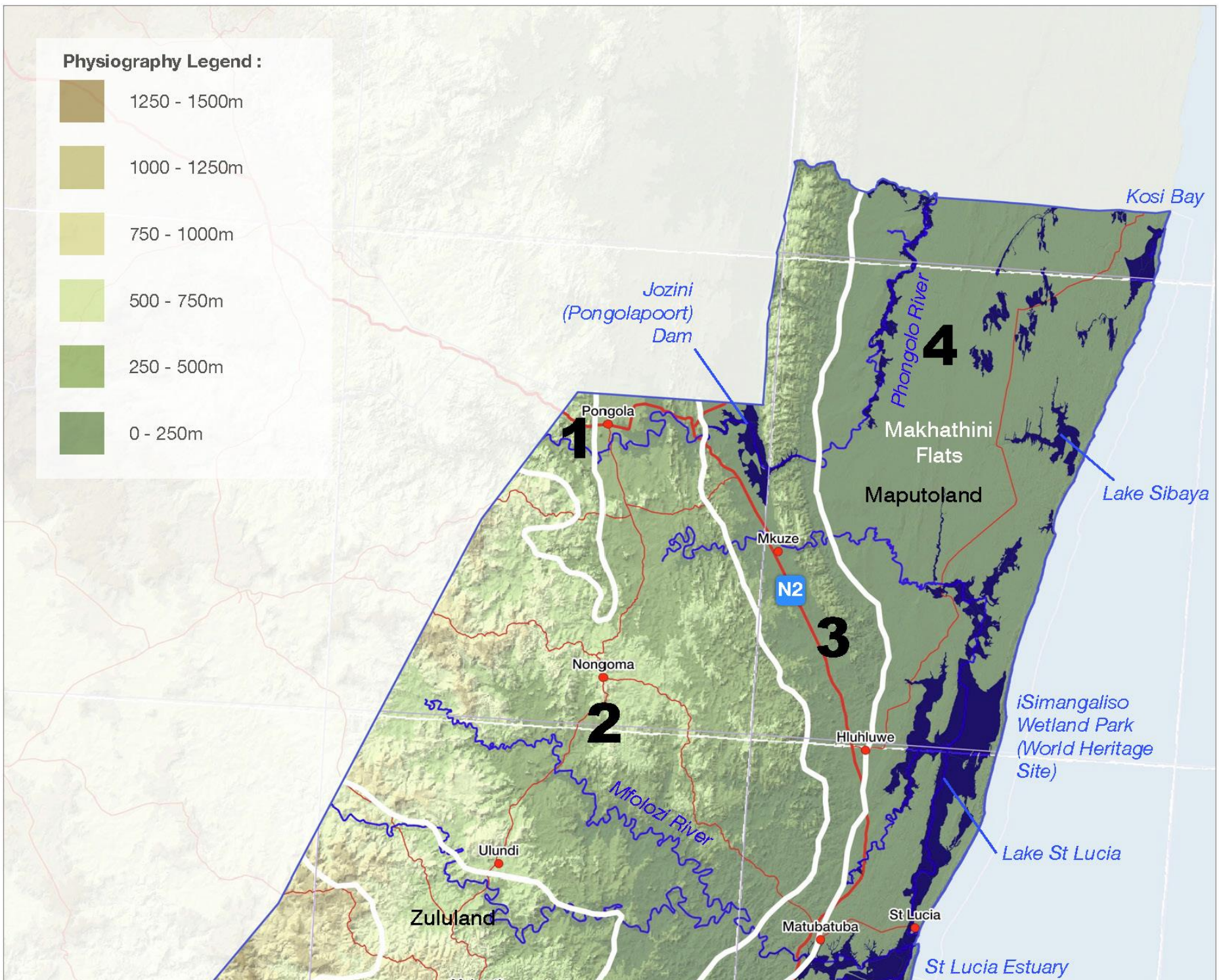
Map E1 :	Expanded Eastern Corridor: Location indicating gazetted EGI corridors
Map E2 :	Expanded Eastern Corridor: Geology
Map E3 :	Expanded Eastern Corridor: Physiography
Map E4 :	Expanded Eastern Corridor: Topographic and Natural Features
Map E5 :	Expanded Eastern Corridor: Heritage and Protected Areas
Map E6 :	Expanded Eastern Corridor: Routes and Transmission Lines
Map E7 :	Expanded Eastern Corridor: Composite Feature Map
Map E8 :	Expanded Eastern Corridor: Visual Sensitivity
Map E9 :	Expanded Eastern Corridor: Visual Sensitivity (with existing Eskom grid)
Map W1 :	Expanded Western Corridor: Location indicating gazetted EGI corridors
Map W2 :	Expanded Western Corridor: Geology
Map W3 :	Expanded Western Corridor: Physiography
Map W4 :	Expanded Western Corridor: Topographic and Natural Features
Map W5 :	Expanded Western Corridor: Heritage and Protected Areas
Map W6 :	Expanded Western Corridor: Routes and Transmission Lines
Map W7 :	Expanded Western Corridor: Composite Feature Map
Map W8 :	Expanded Western Corridor: Visual Sensitivity
Map W9 :	Expanded Western Corridor: Visual Sensitivity (with existing Eskom grid)

Map E1 • Expanded Eastern Corridor : **Location** indicating gazetted EGI corridors

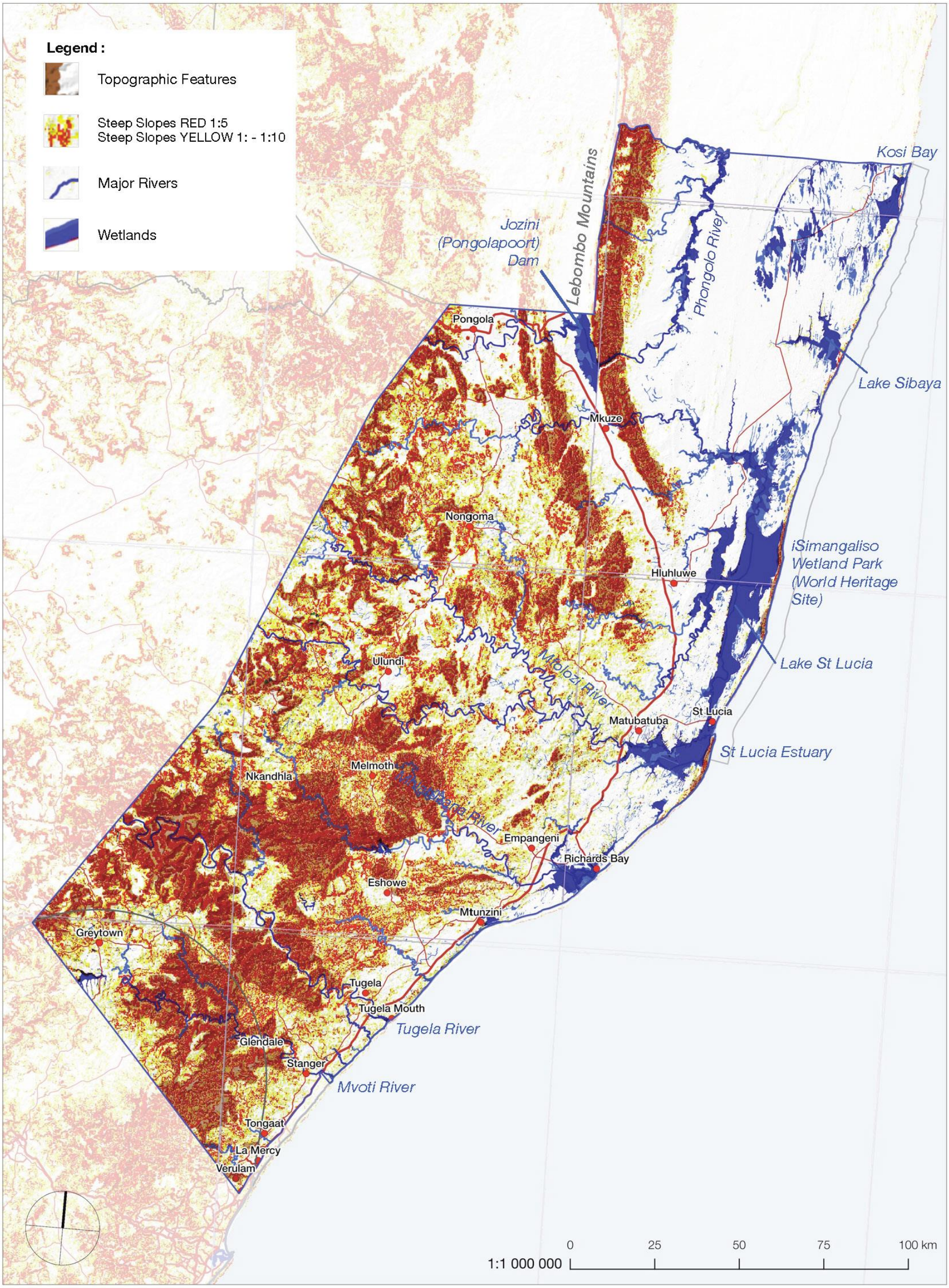
Map	Geology	Lithology
C-s	Quaternary	Sand, calcrete, alluvium
C-m	Maputaland Group	Sand, limestone, conglomerate.
Kz	Zululand Group	Gneiss
J-d	Karoo Dolerite Suite	Dolerite
Jl	Lebombo Group	Basalt
Jb	Bumbeni Supergroup	Volcanic rock
TR-J	Karoo Supergroup	Mudstone, sandstone
P-Tr	Karoo Supergroup	Mudrock, sandstone
Pa	Beaufort Group	Mudrock, sandstone
Pe	Ecca Group	Shale, sandstone
C-Pd	Dwyka Group	Diamictite
On	Natal Group	Sandstone
N8	Tugela Rand etc. Suite	Gabbro
No	Oribi Gorge Suite	Granite
N7	Namaqua granitoids	Granitoids
N4	Tugela etc. Group	Gneiss, schist
R4	Biotite granites	Biotite granite
R2	Pongola Supergroup	Volcanic rocks, quartzite
Z4	Swazian granitoids	Gneiss, granite
Z1	Swazian supercrustal rocks	Amphibolite,schist quartzite



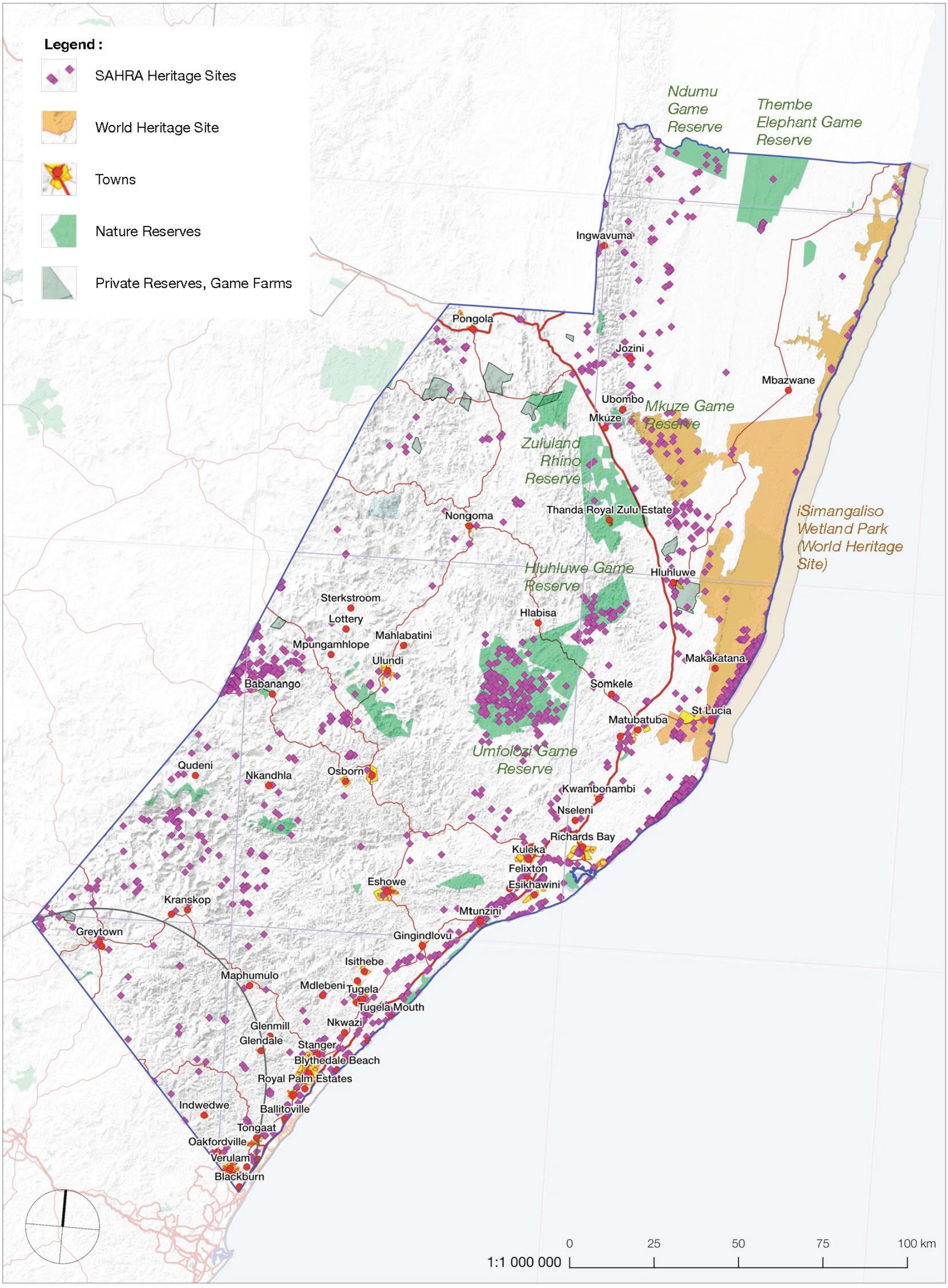
Map E2 • Expanded Eastern Corridor : **Geology and Landscape Types**



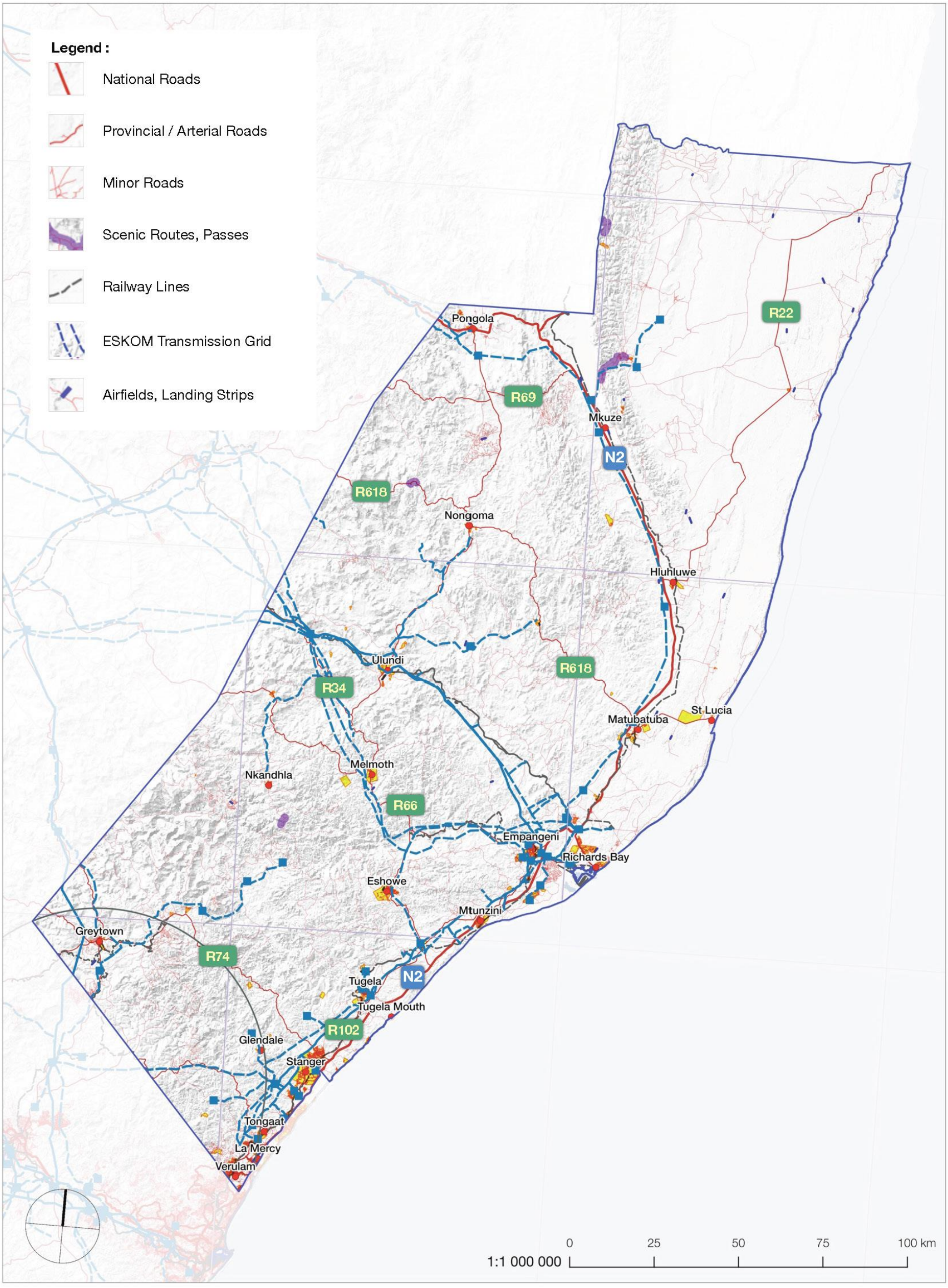
Map E3 • Eastern Corridor : **Physiography**



Map E4 • Expanded Eastern Corridor : **Topographic and Natural Features**

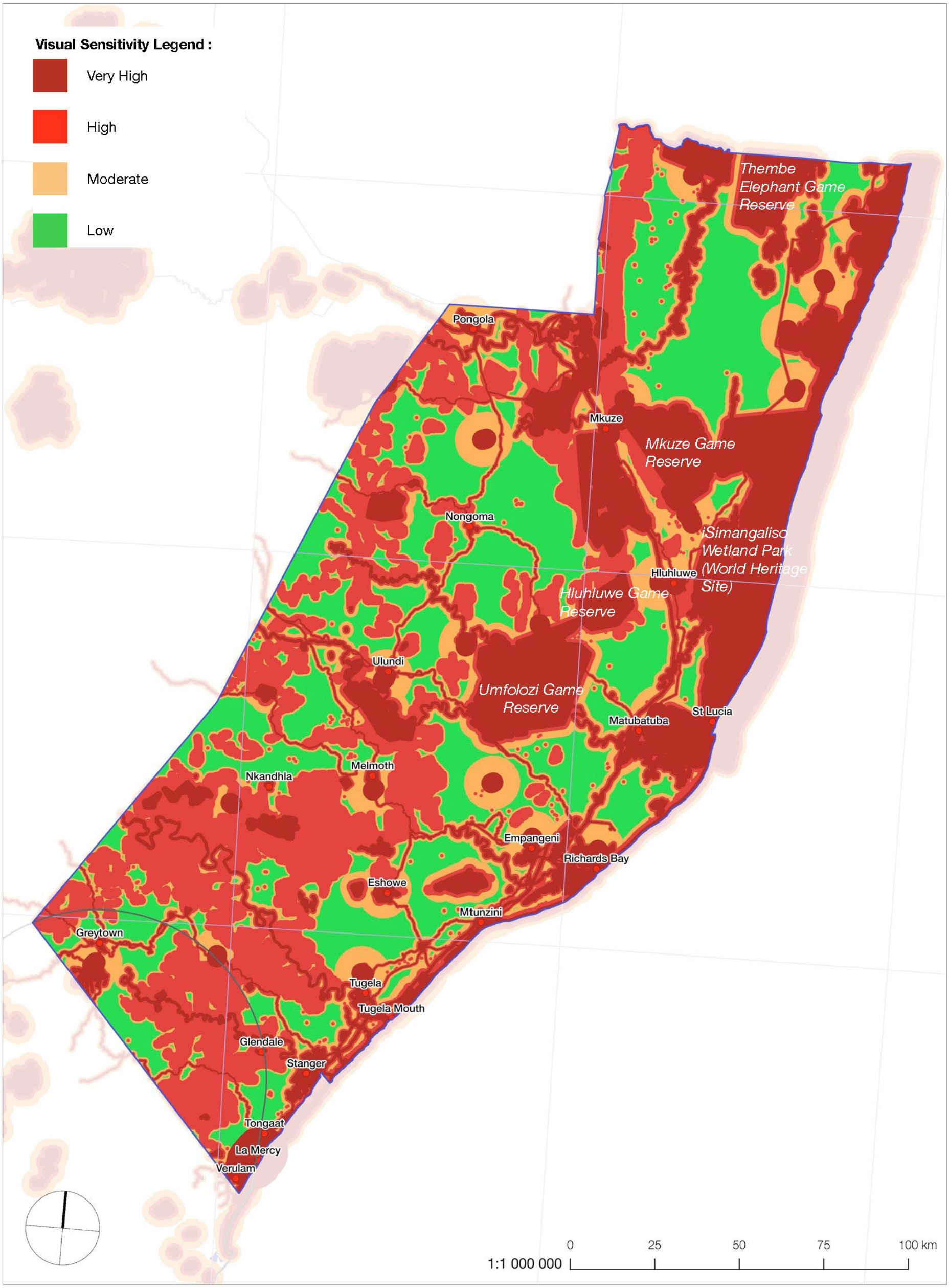


Map E5 • Expanded Eastern Corridor : **Heritage and Protected Areas**

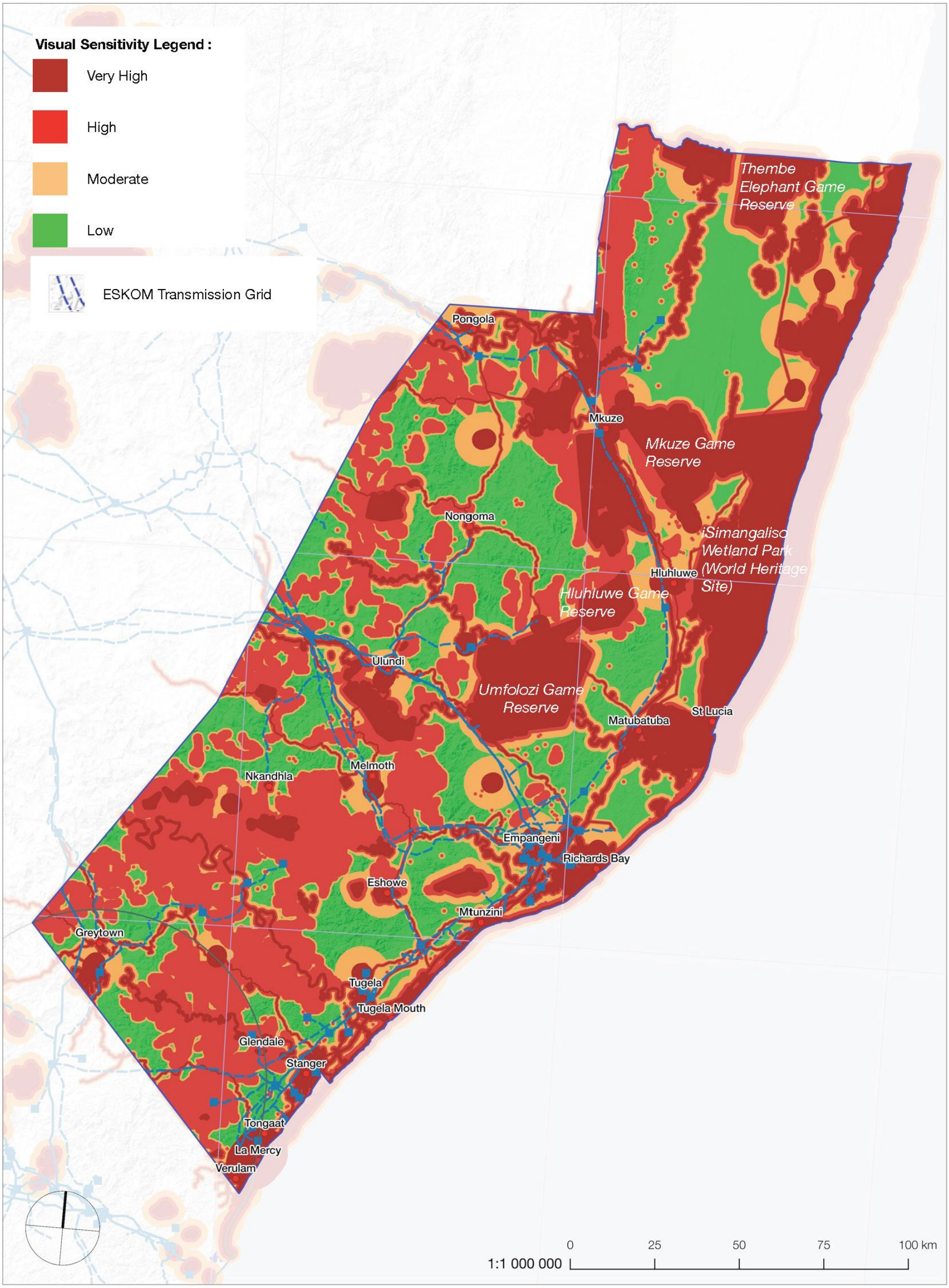


Map E6 • Expanded Eastern Corridor : **Routes and Transmission Lines**

Map E7 • Expanded Eastern Corridor : **Composite Feature Map**

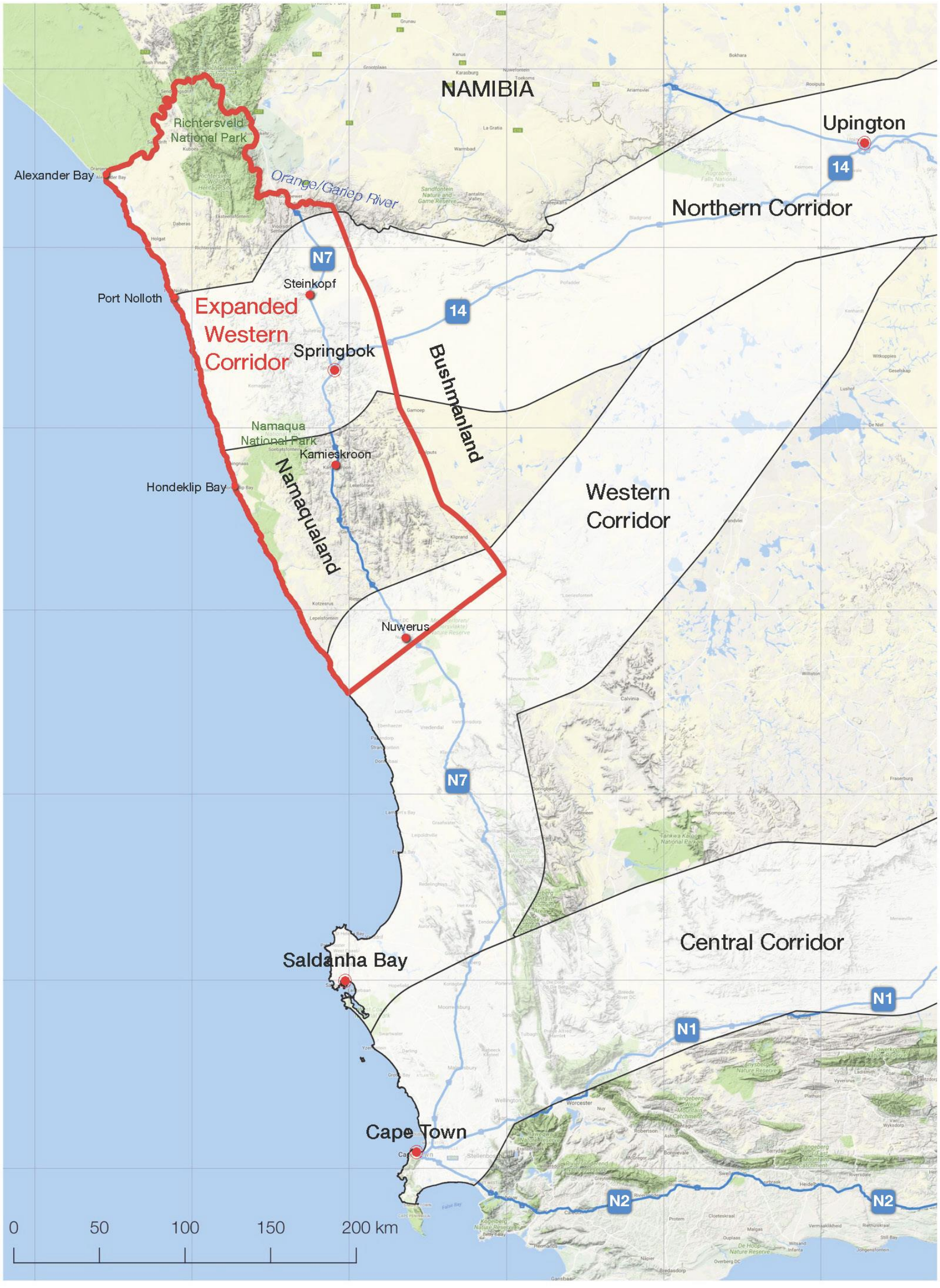


Map E8 • Expanded Eastern Corridor : **Visual Sensitivity**

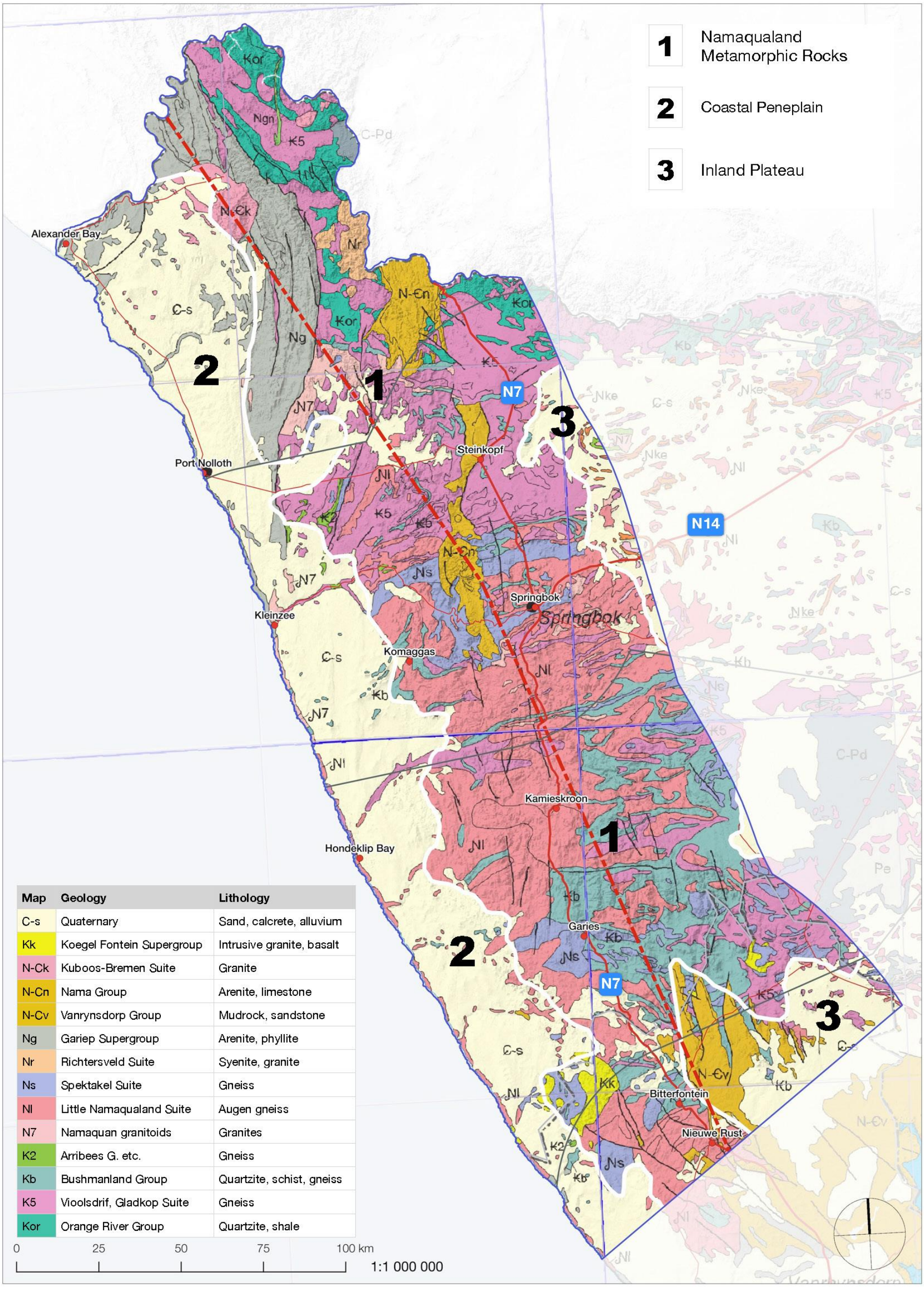


Source : CSIR / ESKOM TDP Substations and MTS Lines 2018

Map E9 • Expanded Eastern Corridor : **Visual Sensitivity** (showing existing ESKOM Grid 2018)

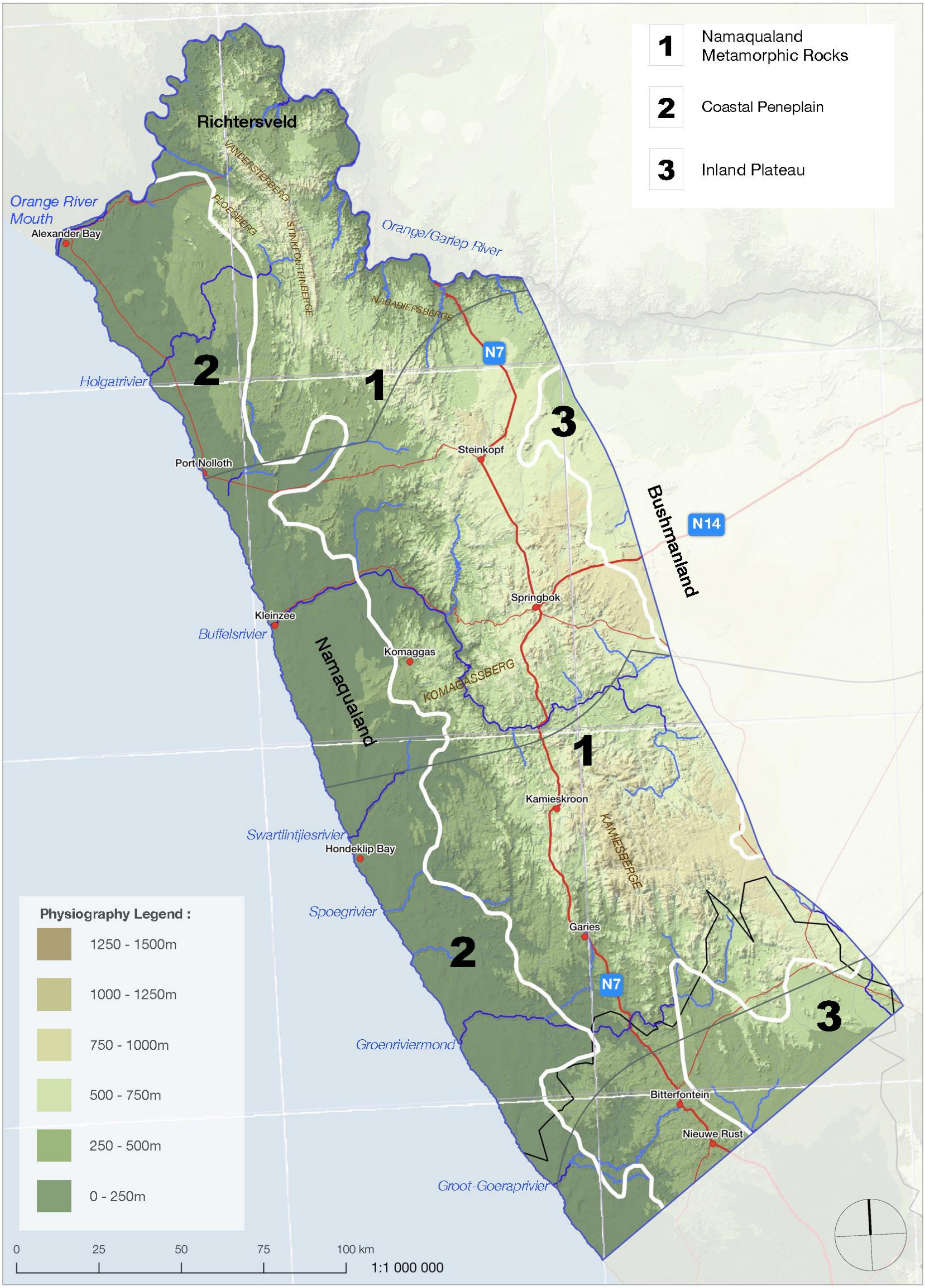


Map W1 • Expanded Western Corridor : **Location** indicating gazetted EGI corridors

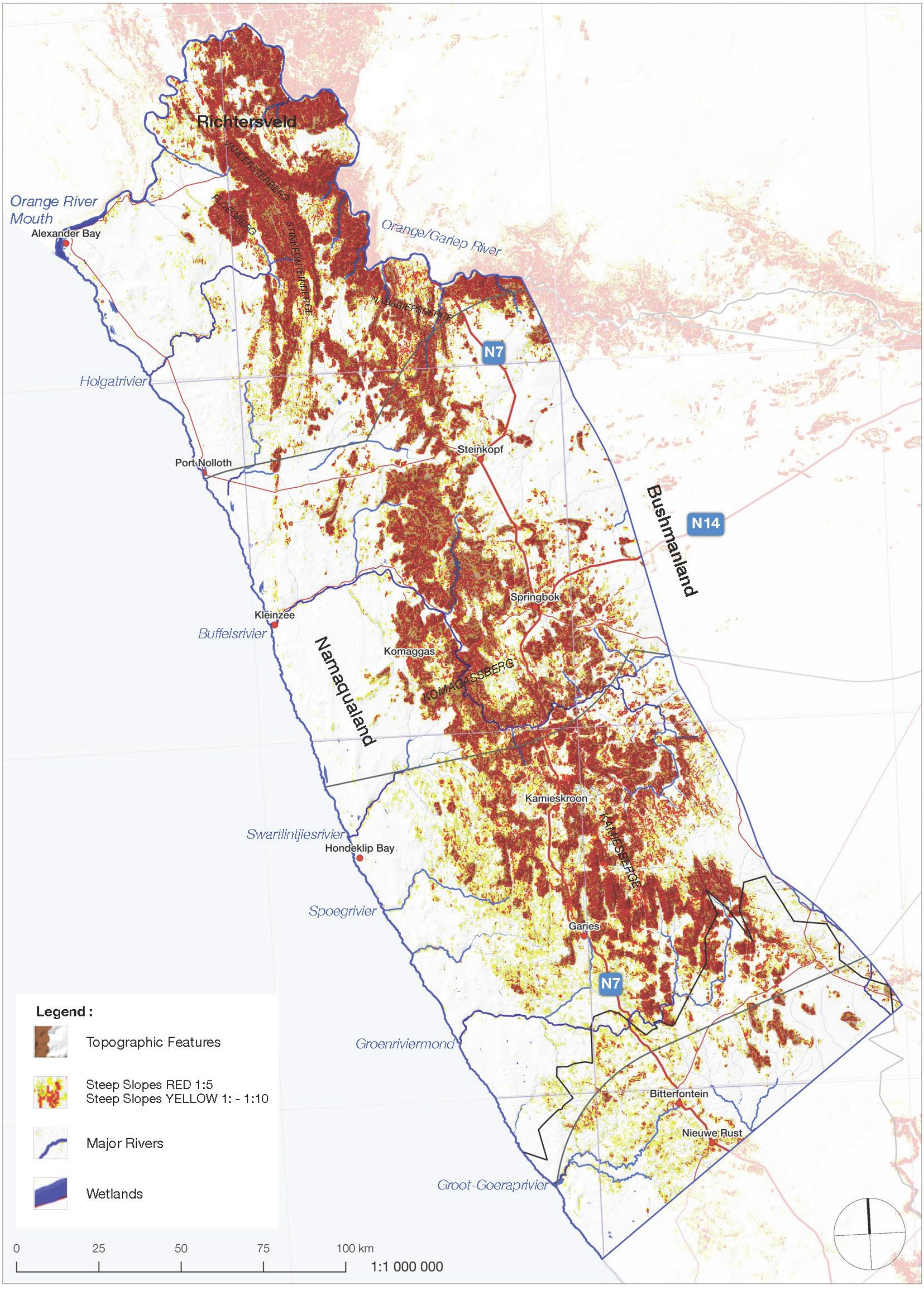


Map	Geology	Lithology
C-s	Quaternary	Sand, calcrete, alluvium
Kk	Koegel Fontein Supergroup	Intrusive granite, basalt
N-Ck	Kuboos-Bremen Suite	Granite
N-Cn	Nama Group	Arenite, limestone
N-Cv	Vanrynsdorp Group	Mudrock, sandstone
Ng	Gariep Supergroup	Arenite, phyllite
Nr	Richtersveld Suite	Syenite, granite
Ns	Spektakel Suite	Gneiss
Nl	Little Namaqualand Suite	Augen gneiss
N7	Namaquan granitoids	Granites
K2	Arribees G. etc.	Gneiss
Kb	Bushmanland Group	Quartzite, schist, gneiss
K5	Vioolsdrif, Gladkop Suite	Gneiss
Kor	Orange River Group	Quartzite, shale

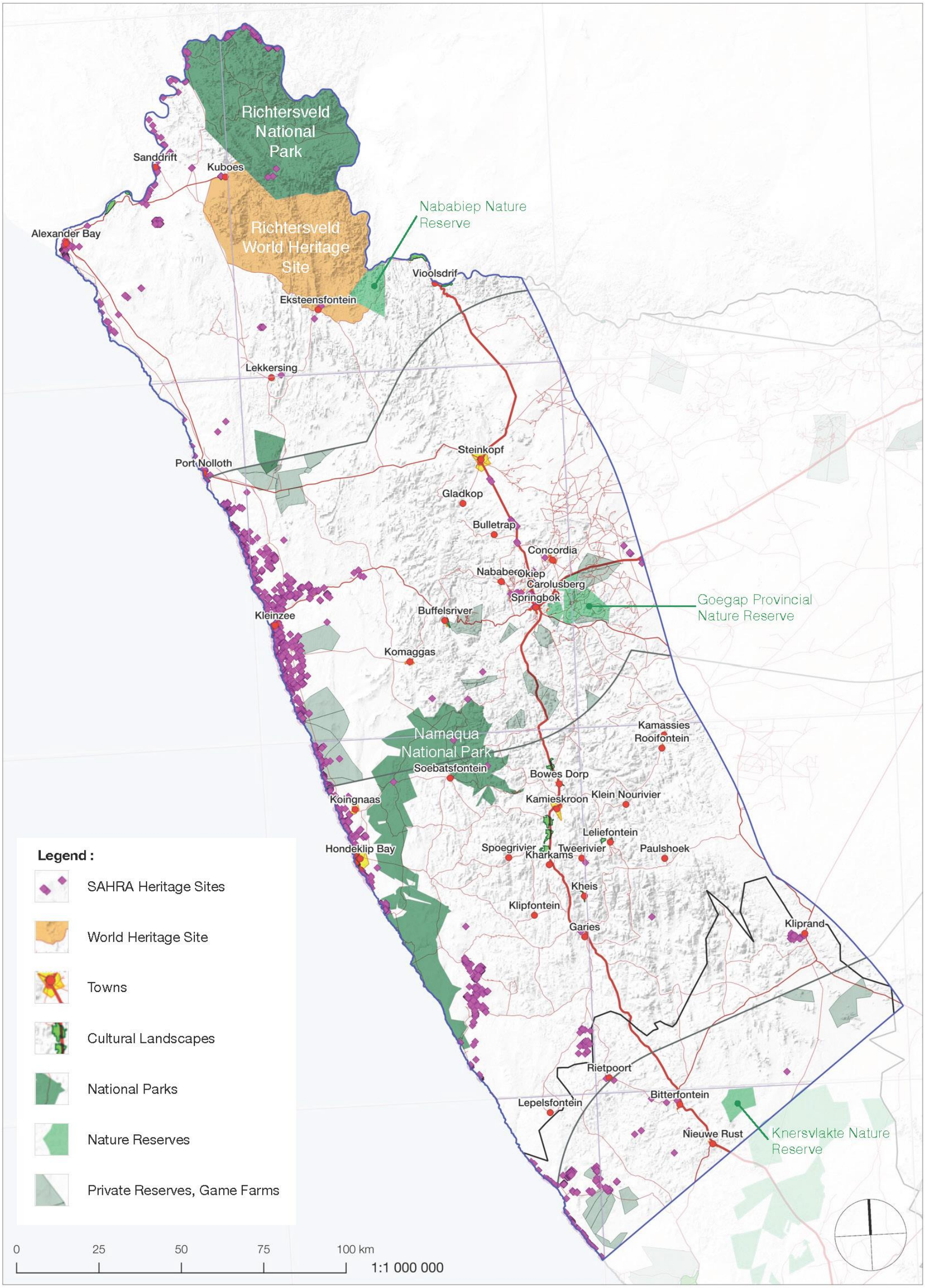
Map W2 • Expanded Western Corridor : **Geology and Landscape Types**



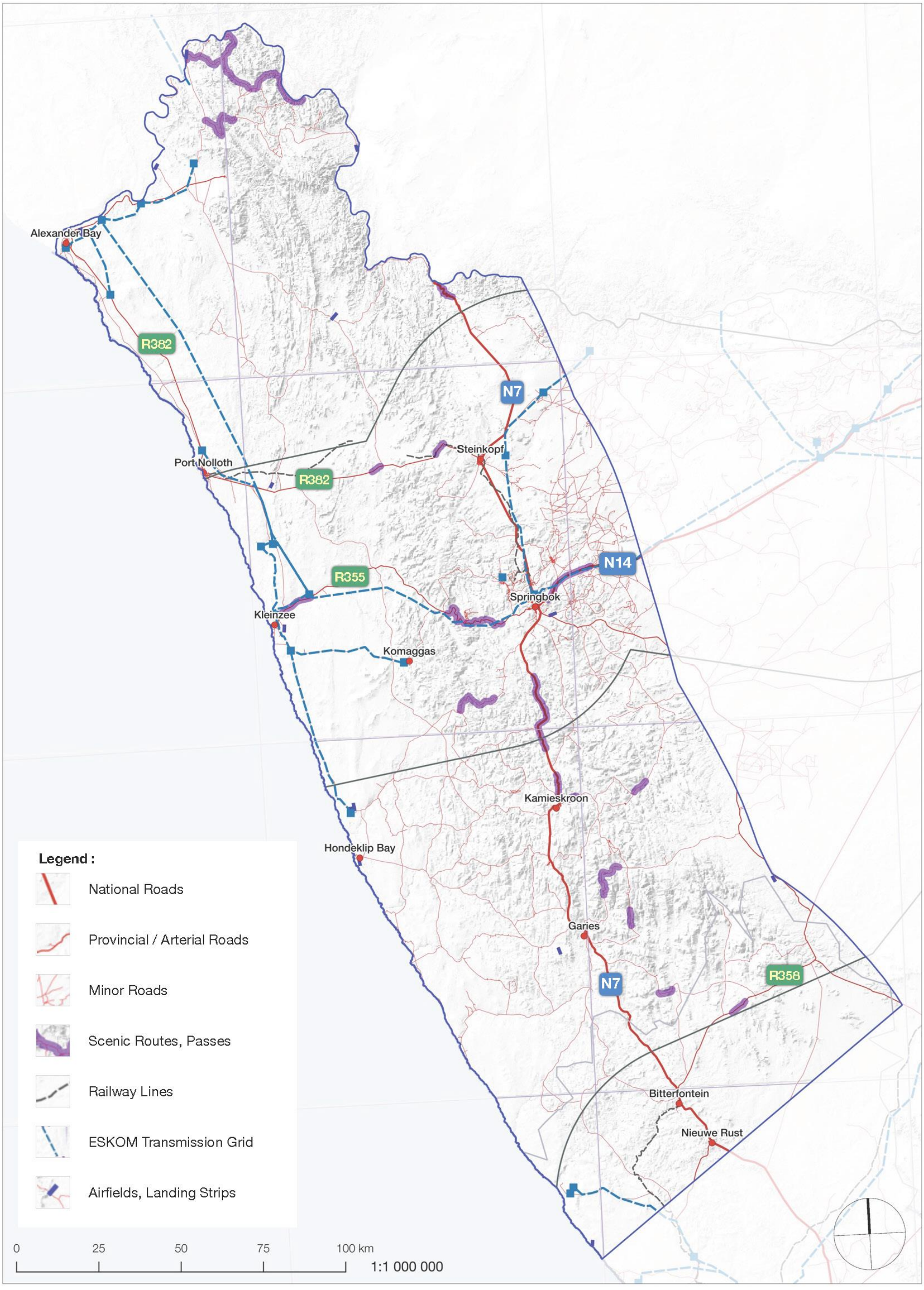
Map W3 • Expanded Western Corridor : **Physiography and Landscape Types**



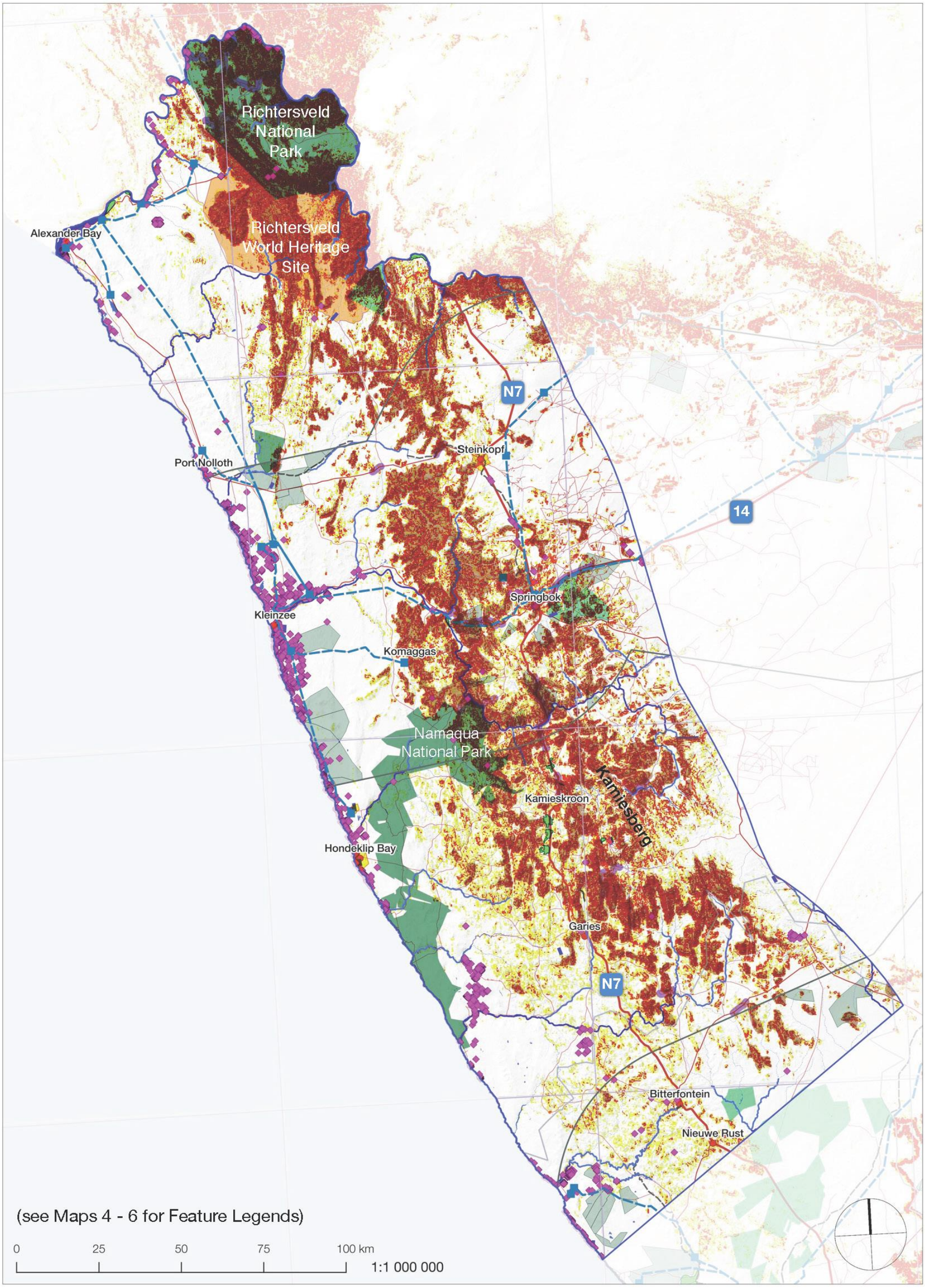
Map W4 • Expanded Western Corridor : **Topographic and Natural Features**



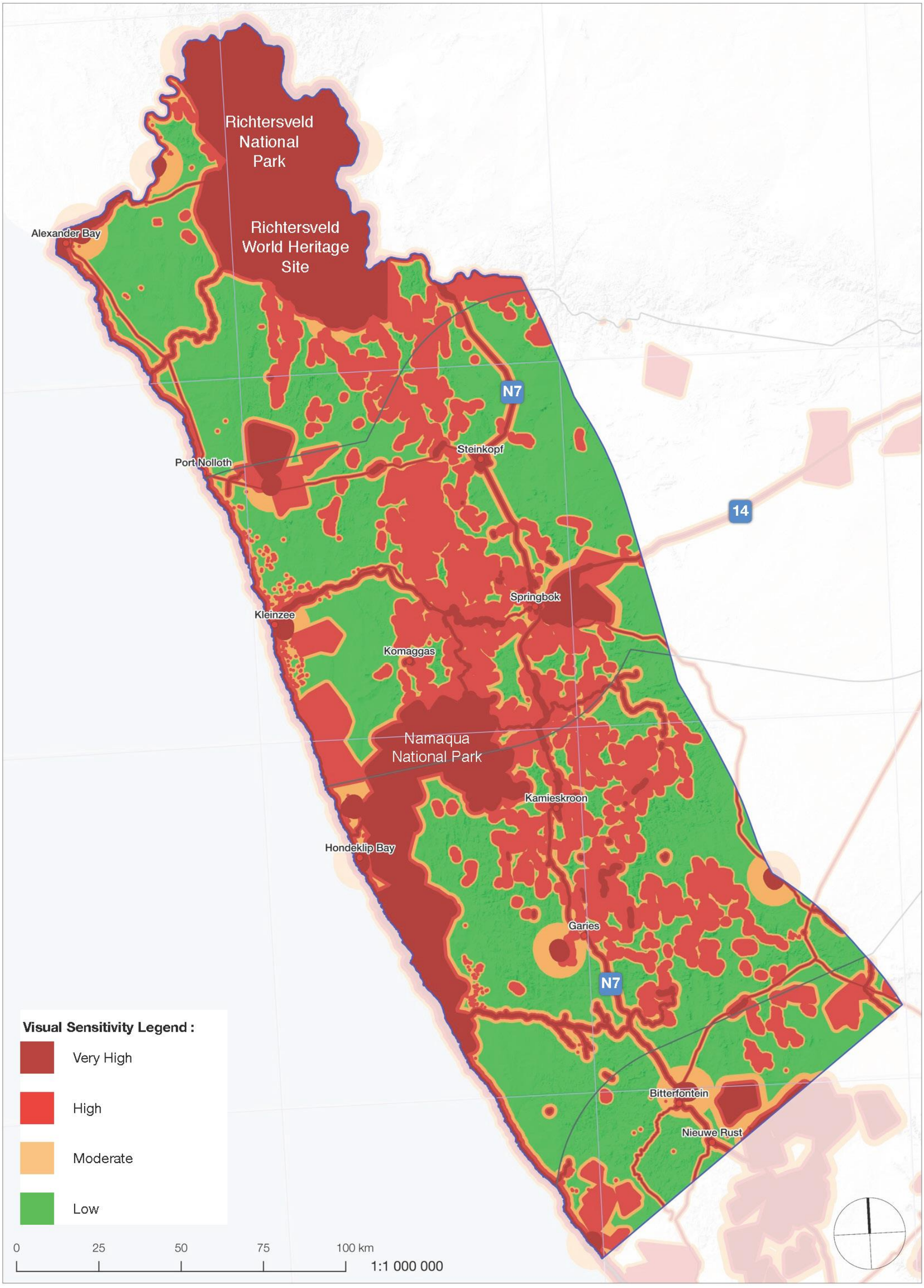
Map W5 • Expanded Western Corridor : **Heritage and Protected Areas**



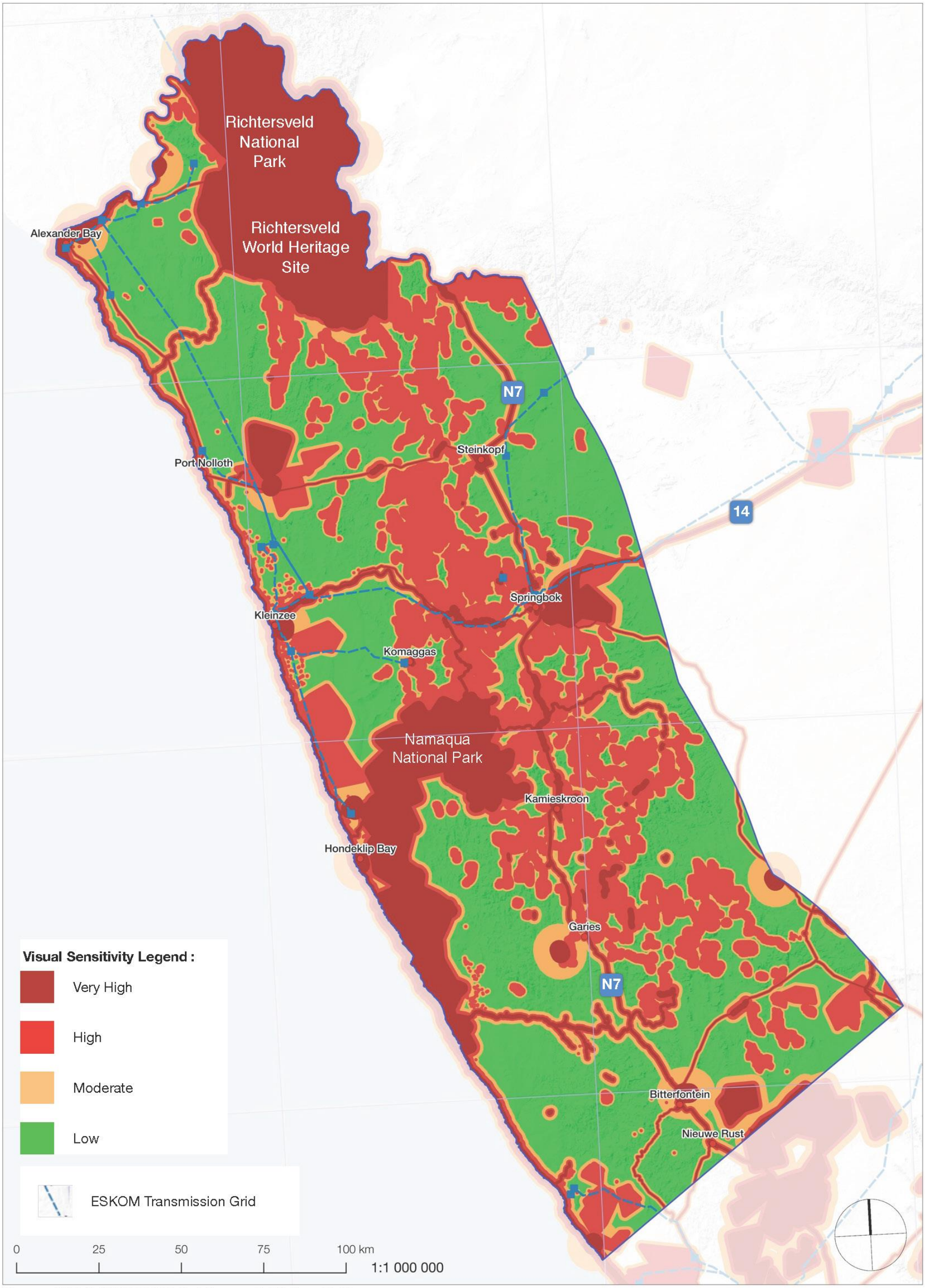
Map W6 • Expanded Western Corridor : **Routes and Transmission Lines**



Map W7 • Expanded Western Corridor : **Composite Feature Map**



Map W8 • Expanded Western Corridor : **Visual Sensitivity**



Source : CSIR / ESKOM TDP Substations and MTS Lines 2018

Map W9 • Expanded Western Corridor : **Visual Sensitivity** (showing existing ESKOM Grid 2018)