Additional Issues
(Agriculture, Defence, Civil Aviation and Heritage)

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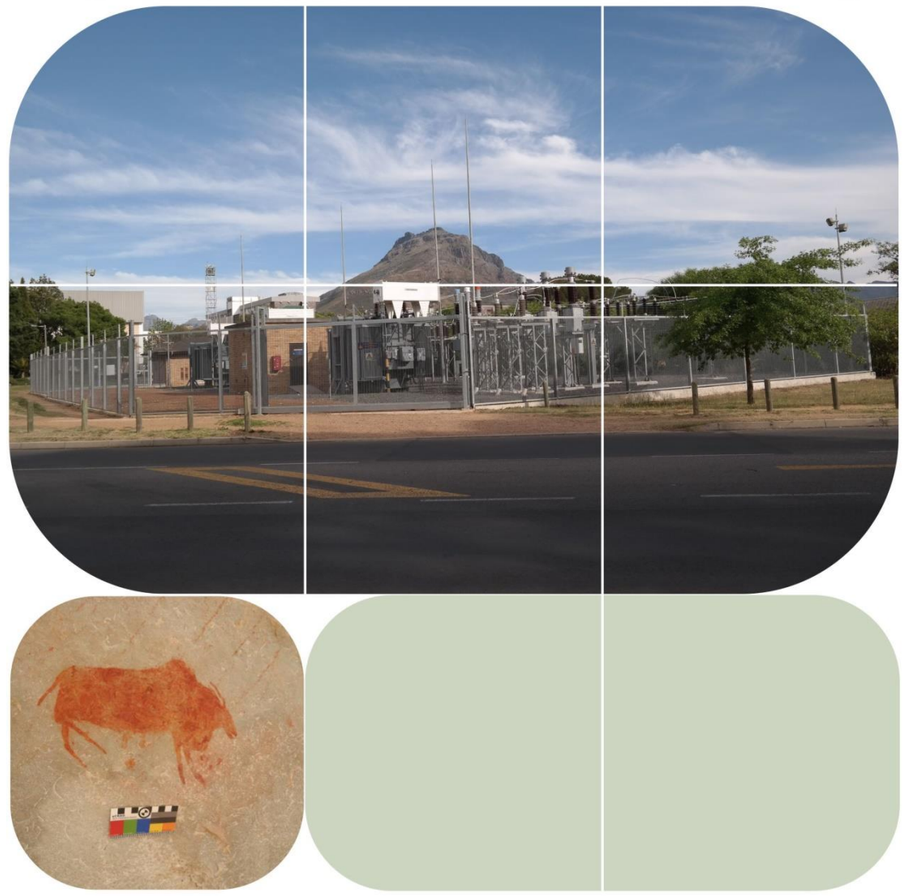


MAPS

2.1 Introduction

This chapter covers additional issues such as the potential impacts on agriculture, defence, civil aviation and heritage, associated with the development of a phased gas pipeline within the proposed corridors. The approach to the sensitivity analysis and the assessment of impacts relating to agriculture, defence, civil aviation and heritage as part of this Strategic Environmental Assessment (SEA) is similar to that undertaken for the 2016 Electricity Grid Infrastructure (EGI) SEA (DEA, 2016) considering the similar linear nature of the projects.

The subsequent sections are therefore predominantly based on the following scoping level assessments undertaken as part of the 2016 EGI SEA (DEA, 2016):

- Agriculture Assessment (Appendix C.1 of the 2016 EGI SEA Report);
- Civil Aviation Assessment (Part 3, Chapter 6: Civil Aviation of the 2016 EGI SEA Report);
- Defence Assessment (Part 3, Chapter 7: Defence of the 2016 EGI SEA Report); and
- Heritage Assessment (Appendix C.4 of the 2016 EGI SEA Report).

The above assessments were desktop based and focused mainly on the interpretation of existing data.

2.2 Agriculture

2.2.1 Introduction and Scope

In addition to being based on the Agriculture Assessment undertaken for the 2016 EGI SEA (Appendix C.1 of the 2016 EGI SEA Report), this section is also informed by discussions with relevant authorities (such as the Department of Agriculture, Forestry and Fisheries (DAFF) and the Agricultural Research Council (ARC)) and an Agricultural Specialist. It includes the identification of existing agricultural resources and agricultural potential within the proposed gas pipeline corridors.

The data sources and the rationale used to identify agricultural features and assign a sensitivity to each of them are described in sections 2.2.3 and 2.2.5 respectively. The assumptions and limitations applicable to this study are listed in Table 1.

Table 1: Assumptions and Limitations to the Agricultural Study

Limitation	Included in the scope of this study	Excluded from the scope of this study	Assumption
Resource availability	Only existing, published datasets used with limited desktop verification	Field verification of datasets and outcomes, and extensive local expert consultation	Reasonable accuracy of data layers used. Field verification will take place on a site by site basis linked to development proposals.
Data accuracy	Use of existing data sets only.	Confirmation of on the ground situation in cases where data sets overlap	Areas of overlap with field crop boundaries and plantations were categorised as the former because of the greater accuracy of those data sets compared to the forestry data set.

2.2.2 Relevant Legislation

The following legislation is considered relevant to the proposed gas pipeline development:

- The Conservation of Agricultural Resources Act (Act 43 of 1983) (CARA):
  - The objective of this Act is the protection of natural agricultural resources including soils. The Act applies to all agricultural land (grazing and cultivated). It manages rehabilitation after disturbances to agricultural land. Any disturbance to soil conservation works such as contour banks requires permission in terms of this Act.
- Subdivision of Agricultural Land Act (Act 70 of 1970) (SALA):
  - The objective of this Act is the preservation of agriculturally viable farm portions. Consent use or change of land use (re-zoning) for developments on agricultural land need to be approved in terms of this Act. This means that any servitude or use of an agriculturally zoned piece of land for non-agricultural purposes requires approval from the DAFF in terms of the SALA.
- DAFF Guidelines for the Evaluation and Review of Applications pertaining to Renewable Energy on Agricultural Land, dated September 2011:
  - These guidelines were compiled with the main objective of the preservation of arable land through prohibition of the development of renewable energy facilities (wind and solar) on cultivated and high potential agricultural land. These guidelines were not produced to be applicable to linear infrastructure such as pipelines, but may have some relevance in terms of DAFF's general concerns about loss of agricultural land.
- Draft Preservation And Development Of Agricultural Land Framework Bill
  - This Act, once promulgated, will repeal SALA and replace the DAFF Guidelines noted above. The Bill seeks to improve DAFF's fulfilment of its mandate to protect agricultural land for agricultural production. One of its aims is to ensure that development does not lead to an inappropriate loss of land that may be valuable for agricultural production. Any use of agricultural land for non-agricultural purposes will require authorisation in terms of this Act.

2.2.3 Data Sources

The list of updated data used in this current Gas Pipeline SEA is indicated in Table 2 below.

Table 2: Agricultural Data used in the 2018 Gas Pipeline SEA as part of the Environmental Sensitivity Analysis

Dataset	Source and Date of Publication	Data Description
Field Crop Boundaries	DAFF, 2017	Delineates the boundaries of all cultivated land, based on satellite and aerial imagery. Five different categories of cultivated land are distinguished. These are irrigated areas (pivot agriculture); horticulture; viticulture; shadenet; and other cultivated areas.
National Land Cover and Habitat Modification Layer (improved land cover)	DEA, 2013/2014 SANBI, 2017	Delineates natural areas, modified areas, and old fields (mapped from imagery)
Land Cover (Sugar Cane Farming) KwaZulu-Natal Land Cover Sugar Cane Farming and Emerging Farming Data	KZN Provincial land cover, Ezemvelo KZN Wildlife, 2011	Delineates all sugar cane fields, including emerging farmers in Kwazulu-Natal.
Land Cover (Viticulture)	Western Cape DEADP (Cape Nature), 2014.	Raster data indicating viticulture as a land cover category.

Dataset	Source and Date of Publication	Data Description
Agricultural Land Capability	DAFF, 2016	Categorises all land nationally into 15 different classes of agricultural land capability. The classification is based on soil, terrain and climate parameters.
Demarcated High Value Agricultural	DAFF, outstanding	Preservation and Development of Agricultural Land Bill (PDALB) requires the demarcation of high value agricultural areas which is a combination of land capability; crop suitability, agricultural land uses etc. on a priority rating of A, B, C and D (not yet released).

2.2.4 Corridor Descriptions

This section describes the main characteristics of each section of the proposed phased gas pipeline corridors. Refer to Maps 1 and 2 for an indication of the type of Field crops and land capability classes within the various corridors.

- Phase 1:

There is diverse and productive agriculture across the Phase 1 corridor. The most important agricultural enterprises are deciduous fruit and wine and winter small grains (wheat). The corridor is a winter rainfall area. Mean annual rainfall varies between approximately 600 mm and 150 mm in the drier northern parts, although much higher rainfall occurs in the mountainous areas. Grazing capacity varies from 6 hectares per large stock unit on the southern coast to 54 in the north and even lower (to 108) in some of the mountainous areas. Land capability varies from 1 in mountainous areas to as high as 10 near Cape Town and in the Boland.

- Phase 2:

There is diverse and productive agriculture across the southern part of the Phase 2 corridor, but the northern part is constrained by arid conditions. The most important agricultural enterprises are cattle and dairy, deciduous fruit and vegetables. The northern part is restricted to sheep farming. The corridor is predominantly a winter rainfall area. Mean annual rainfall varies from > 1000 mm along the coastal mountains to approximately 180 mm in the drier northern parts. Grazing capacity varies from 6 in the east to 60 hectares per large stock unit in the west and even lower (to 140) in some of the mountainous areas. Land capability varies from 1 in mountainous areas to as high as 11 along the southern coast.

- Phase 3:

There is productive agriculture across the Phase 3 corridor. The most important agricultural enterprises are maize and cattle. The corridor is a summer rainfall area. Mean annual rainfall varies between approximately 550 in the west and 1000 mm in the east. Grazing capacity is high and varies mostly between 3.5 and 7 hectares per large stock unit, although it is as low as 20 in small parts in the west. Land capability is mostly greater than 8 and goes up to 12, although in some isolated areas it drops as low as 2.

- Phase 4:

The Phase 4 corridor is not a highly productive agricultural area. The most important agricultural enterprises are cattle in the southern parts, with subsistence farming in the north. There is some forestry in the north-west. The corridor is a summer rainfall area. Mean annual rainfall varies between approximately 500 and 1000 mm. Grazing capacity is high and varies between 4 and 20 hectares per large stock unit. Land capability is mostly greater than 8 and goes up to 10, although in the more mountainous terrain it drops as low as 2.

- Phase 5:

There is diverse and productive agriculture across the southern part of the Phase 5 corridor, but the northern part is constrained by arid conditions. The most important agricultural enterprises in the south are citrus fruit, table grapes, and winter grains. The northern part is restricted to sheep farming. The corridor is a winter rainfall area. Mean annual rainfall varies between approximately 400 mm in the south and 150 mm in the north. Grazing capacity is low and varies from 28 hectares per large stock unit to 75 and even lower (to 120) in some of the mountainous areas. Land capability varies from 1 in mountainous areas to as high as 9 in the extreme south, but is mostly around 5.

- Phase 6:

The agricultural potential of the entire Phase 6 corridor is severely constrained by limited climatic moisture availability making it unsuitable for most agriculture other than the extensive sheep farming which is almost the only agricultural land use throughout the corridor. Rainfall generally decreases northwards in the corridor from a high of approximately 200 mm per annum to as low as 30 mm per annum in the Richtersveld in the north. Grazing capacity is low and varies from a high of 42 hectares per large stock unit in the south to 120 hectares per large stock unit in the north. Land capability varies between 5 and 1.

- Phase 7:

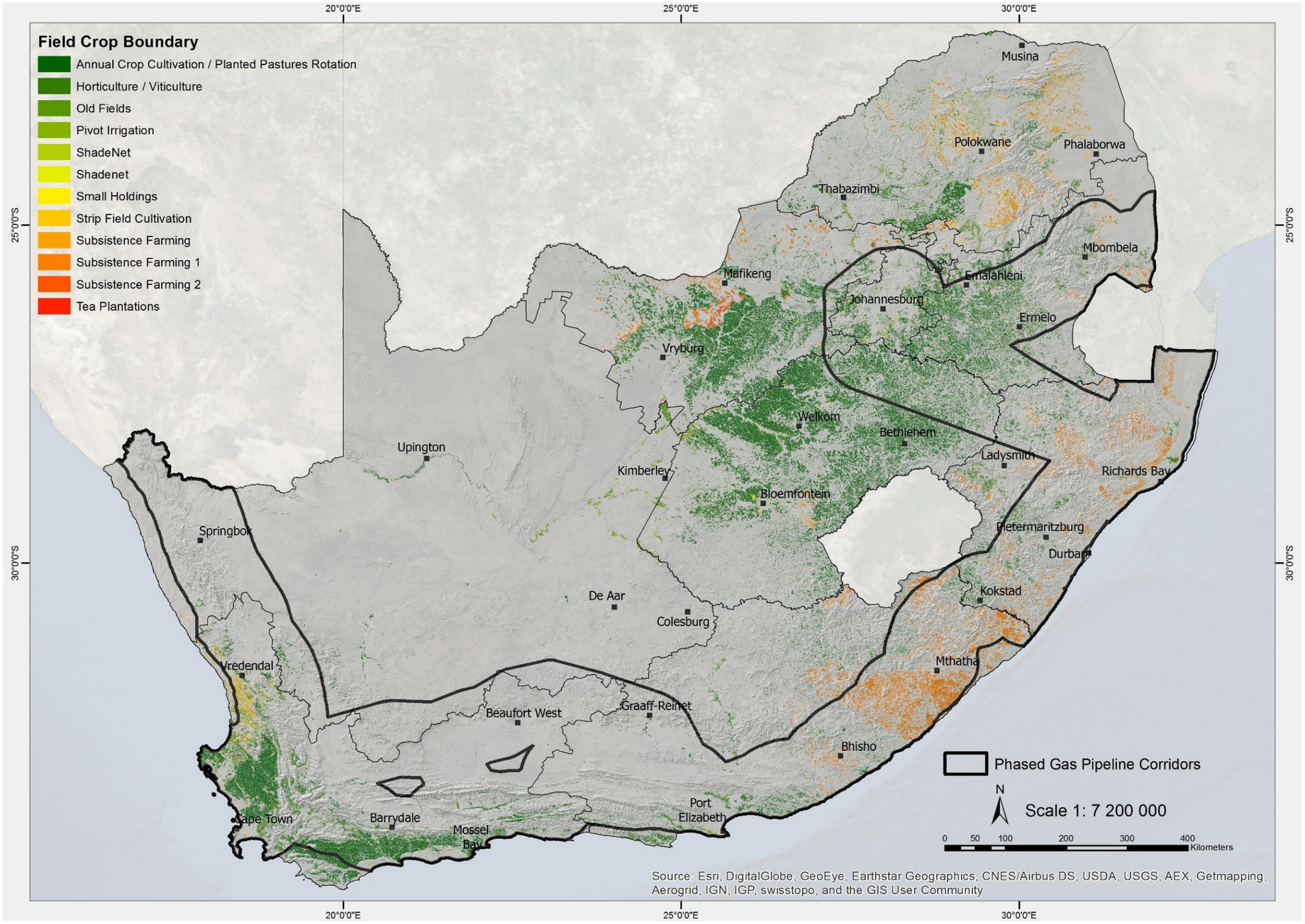
There is very diverse agriculture across the Phase 7 corridor, which varies greatly from the south to the north. The most important agricultural enterprises in the south are subsistence farming and cattle. In the north it is sugar and subsistence farming, with some forestry. The corridor is a summer rainfall area. Mean annual rainfall varies mostly from approximately 500 mm to >1000 mm, but is lower in some isolated parts. Grazing capacity is high and varies between 3 and 20 hectares per large stock unit. Land capability is mostly greater than 7 and goes as high as 15 in some places, although in the more mountainous terrain it drops as low as 2.

- Phase 8 (Rompco Pipeline Corridor):

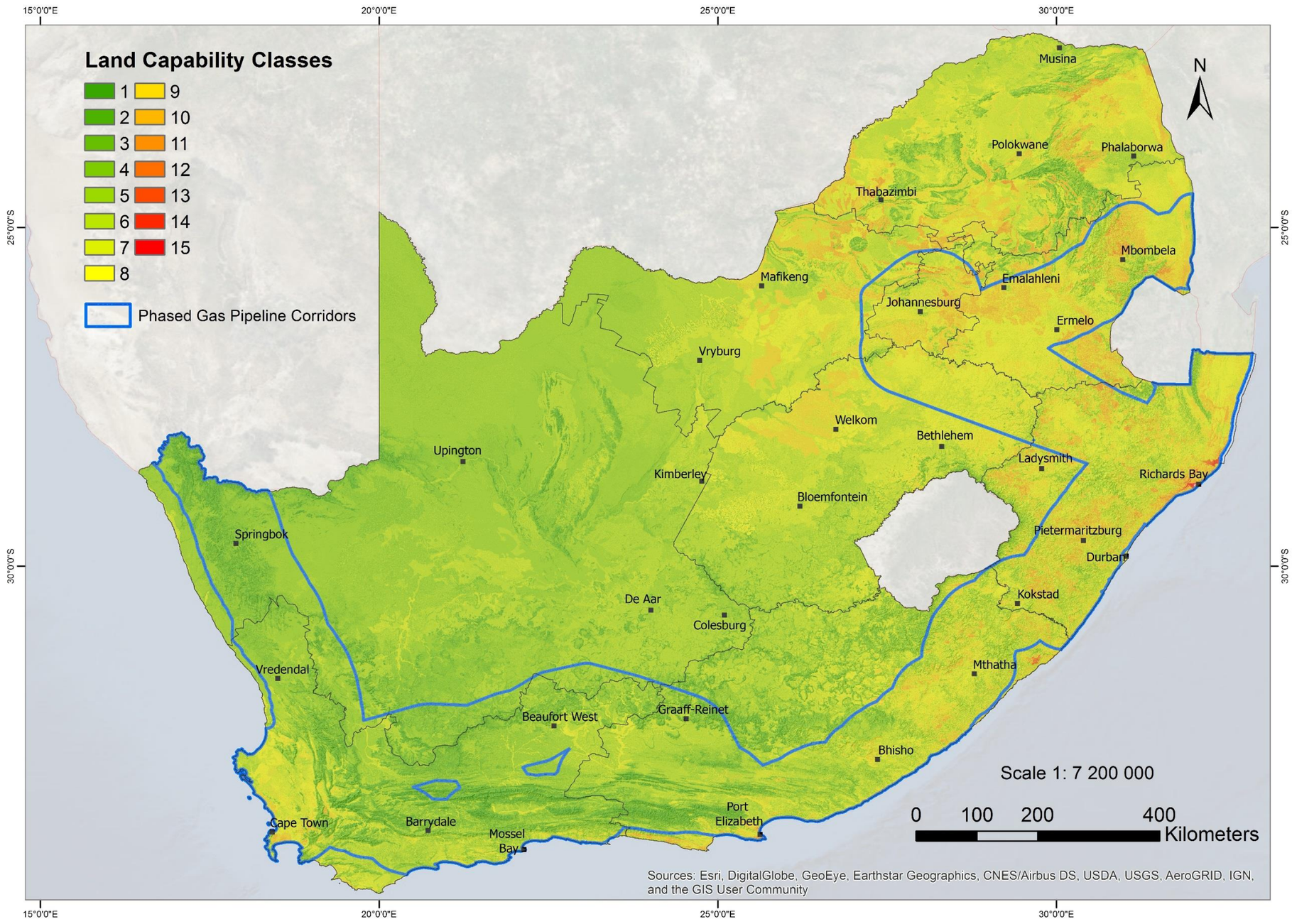
There is diverse and productive agriculture across this Phase 8 (Rompco Pipeline Corridor). On the Highveld portion of the corridor, the most important agricultural enterprises are maize and cattle. On the Lowveld it is fruit and sugar, with forestry on the escarpment. The corridor is a summer rainfall area. Mean annual rainfall varies between approximately 650 in the west and >1000 mm on the escarpment, with some areas of lower rainfall in the eastern Lowveld. Grazing capacity is high and varies between 4 and 11 hectares per large stock unit. Land capability is mostly greater than 8 and goes up to 13, although in some isolated areas it drops as low as 2

- Inland Corridor:

The agricultural potential of the entire Inland corridor is severely constrained by limited climatic moisture availability making it unsuitable for most agriculture other than the extensive sheep farming which is almost the only agricultural land use throughout the corridor. Rainfall varies from approximately 450 in isolated parts to 180 mm per annum. Grazing capacity is low and varies from a high of 12 hectares per large stock unit in the east to mostly around 55 in the west, but goes as low as 140 hectares per large stock unit in the extreme west. Land capability varies from 1 in mountainous areas to 8.



Map 1: Field Crop Boundaries Map for the Phased Gas Pipeline Development



Map 2: Land Capability Map for the Phased Gas Pipeline Development

2.2.5 Sensitivity Analysis

The agricultural features that would be impacted by gas pipeline development are indicated in Table 3. The following three factors were identified in the 2016 Agriculture Assessment Report (DEA, 2016) to determine the sensitivity of the agricultural features as a result of EGI development, and it is understood to apply to the gas pipeline due to its similar linear nature:

- Factor 1: The first is the reduction of the potential agricultural productivity (per unit area and unit time) of the affected land;
- Factor 2: The proportion of agricultural land that is affected; and
- Factor 3: The degree of disturbance that will occur. This axis increases from zero disturbance through minor alterations to agricultural activity and on to total prevention of agriculture equating to a loss of agricultural production on a particular piece of land. It also includes any alterations that a particular agricultural activity would impose on the standard gas pipeline.

The following sensitive agricultural features have been determined:

- Pivot irrigation: In terms of the three factors discussed above pivot lands are high on the first axis, but not on the second two. The proportion of land affected is confined to the linear construction line of the pipe. The degree of disturbance is not high because after effective rehabilitation, crop production can continue above the buried pipeline. These areas are classified as **Very High** environmental sensitivity.

- Areas of viticulture, horticulture have been classified as **Very High** environmental sensitivity features as agricultural productivity is generally high in these areas, which makes it sensitive to disturbance.

- Shadenet areas are a highly productive, irrigated, cultivated piece of farmland with a high level of infrastructure established on it. This makes it sensitive to disturbance. These areas are therefore classified as **Very High** environmental sensitivity.

- Other cultivated areas represented under Field crop boundaries are also classified as **High** environmental sensitivity. In addition, short-term and long-term crops have been respectively rated as Medium and Very High constraints from an engineering perspective. Deep rooted crops (i.e. with those that have roots extending beyond the pipeline depth) will not be permissible within the operational pipeline servitude due to the risk of damage to the infrastructure. However, other shallow rooted crops are permissible within the servitude, whereby restrictions and ploughing mechanisms will be specified in the servitude agreement with the landowner and pipeline developer.

- Timber plantations are lower productivity enterprises in comparison horticultural areas and vineyards, but larger areas are impacted with a greater level of disturbance in that deep rooted trees are excluded from the entire servitude width (as described above). These areas would therefore be completely avoided due the risk the deep roots pose to the below ground gas pipeline infrastructure.

- Land Capability Classes 11 – 15 and 8[1] - 10 have been included in the **Very High** and **High** environmental sensitivity categories respectively given that within the context of South Africa's very limited agricultural land resources, the entirety of these high potential lands should be preserved for agricultural production as far as possible, and these are also to be earmarked for agricultural expansion.

- Areas demarcated as high value agricultural areas are earmarked for agricultural expansion to support food security, as described further below:
  - Very high potential agricultural lands (priority rating of A and B) will be classified as **Very High** sensitivity once this data will become available.
  - Areas with a priority rating of C and D have been classified as **High** sensitivity once this data will become available.
  - The DAFF also recommended that the demarcated high value agricultural areas need to have an additional feature with an E and F rating.

- The agricultural impact of the construction of a gas pipeline on all other land is low. The actual footprint of impact is small and agriculture can continue largely undisturbed above gas pipelines (with the exception of deep rooted crops). However there are some differences between different agricultural features and for this reason certain features have been identified as **Medium** sensitivity, i.e. land capability classes 6 - 7 that should also be preserved for agricultural production where possible.

- Sugar cane fields may pose a risk to the gas pipelines as a result of the frequent burning undertaken, which might lead to safety concerns should the pipeline integrity be compromised.

- In terms of land cover, natural areas, modified areas and old fields have been rated with a **Low** sensitivity. Natural areas are “Other natural areas”, which are available for sustainable development. Modified areas are not an environmental priority and are preferred for development. Old fields are formerly ploughed areas that are degraded, and are more favourable than natural areas for development.

- All agricultural land not included in the categories above is therefore classified as **Low** sensitivity (i.e. Land Capability Class 1 – 5).

- Soil erosion was not included in the categorisation of agricultural sensitivity. There are several reasons for this:
  - Mitigation measures for erosion should be implemented across all gas pipeline developments, regardless of their status according to large scale erosion risk data. Mitigation strategies are largely generic for all developments but the detailed level of required mitigation will vary from site to site and therefore cannot be usefully informed by large scale data.
  - Erosion risk is primarily a function of slope steepness which is already taken into account in terms of engineering constraints but could also be a risk in areas that have or are poorly managed and have lots of existing dongas/ rills/ gullies. The risk of erosion is higher in these areas as the surfaces are already impacted.

2.2.6 Sensitivity Maps

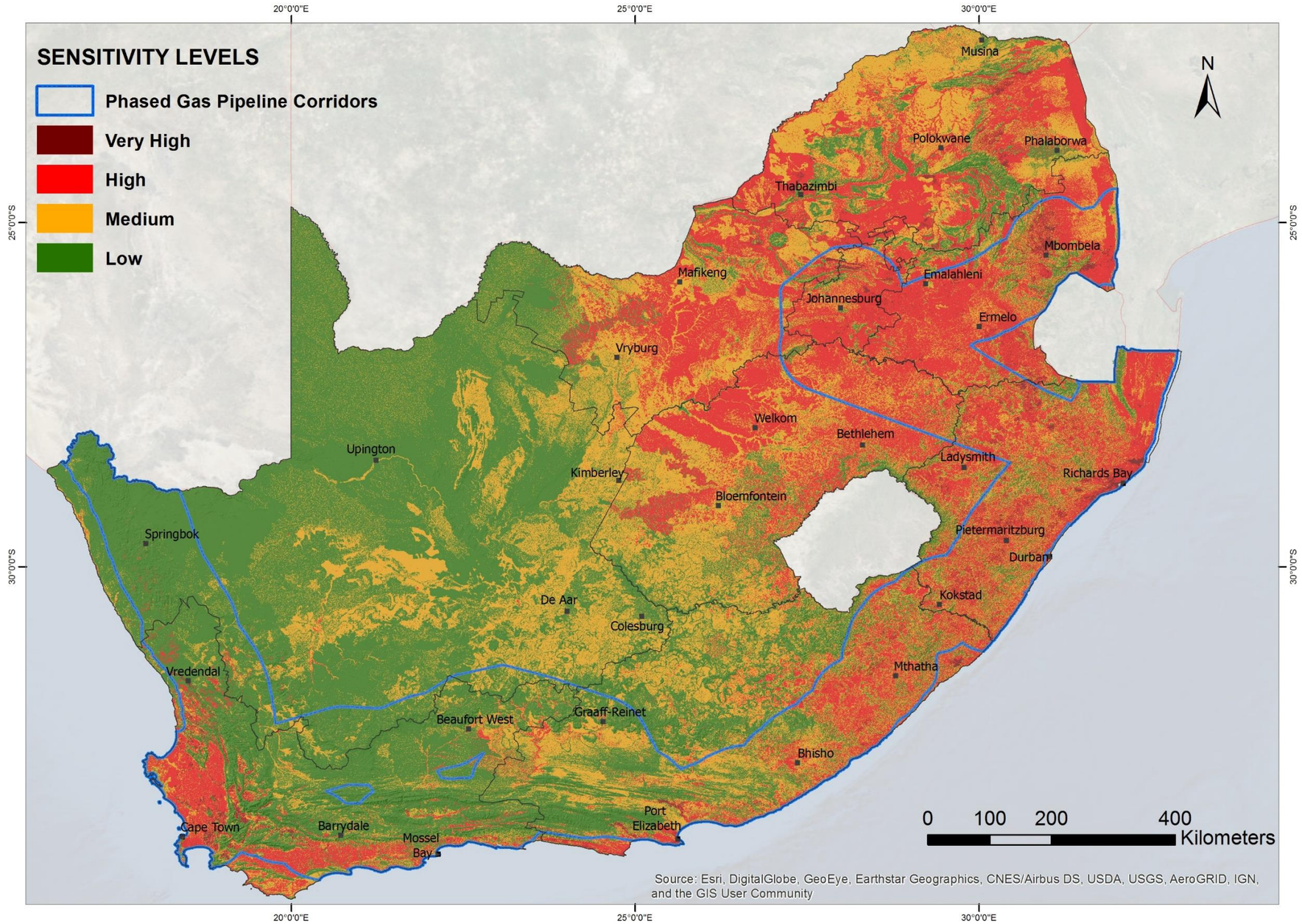
A sensitivity map (Map 3) were produced for the Gas Pipeline corridors according to the criteria set out in Table 3 to classify agricultural sensitivity spatially into four tiers namely, Very High, High, Medium and Low.

[1] DAFF requested that Land Capability Class 8 be classified as high sensitivity as most of the viable long-term farming takes place on Land Capability Class 8. In the 2016 Agriculture Assessment Report (DEA, 2016), Class 8 was classified as Medium sensitivity.

Table 3: Summary of Datasets used per Agricultural Feature in the Gas Pipeline SEA as part of the Environmental Sensitivity Analysis

Sensitivity Feature	Data Source + Date of Publications	Data Preparation and Processing	Sensitivity
Pivots (Irrigated Areas)	Field Crop Boundaries, DAFF, 2017	Extracted from field crop data.	Very High
Shadenet	Field Crop Boundaries, DAFF, 2017	Extracted from field crop data.	Very High
Horticulture	Field Crop Boundaries, DAFF, 2017	Extracted from field crop data.	Very High
Viticulture	Field Crop Boundaries, DAFF, 2017 Land Cover (Viticulture), DEADP, 2014	Union process between field crop data and Land cover (viticulture) data.	Very High
Land Capability Class 11 - 15	Land Capability, DAFF, 2016	Extracted from the Agricultural Land Capability data.	Very High
Other cultivated fields/areas	Field crop boundaries, DAFF, 2017	Extracted from field crop data.	High
Land Capability Class 8 - 10	Land Capability, DAFF, 2016	Extracted from the Agricultural Land Capability data.	High
Sugar Cane	KwaZulu-Natal Land Cover Sugar Cane Farming and Emerging Farming Data, 2011	Union process between Land Cover Sugar Cane Farming and Emerging Farming Data.	Medium
Land Capability Class 6 - 7	Land Capability, DAFF, 2016	Extracted from the Agricultural Land Capability data.	Medium
Land Capability Class 1 - 5	Land Capability, DAFF, 2016	Extracted from the Agricultural Land Capability data.	Low
Natural Areas	National Land Cover, DEA, 2013/2014 Habitat Modification Layer (improved land cover), SANBI, 2017	Extracted from the land cover classes in the habitat modification layer representing natural features/ ecosystems.	Low
Modified Areas	National Land Cover, DEA, 2013/2014 Habitat Modification Layer (improved land cover), SANBI, 2017	Extracted from the land cover classes in the habitat modification layer representing modified areas (e.g. urban areas, mining areas, industrial areas).	Low
Old Fields	Habitat Modification Layer (improved land cover), SANBI, 2017	Extracted from Habitat Modification Layer. Old fields were mapped using aerial photographs to identify areas that were ploughed and left fallow before the 1990 land cover reference point.	Low

Note: These agricultural features are listed in their order of sensitivity.



Map 3: Combined Agriculture Sensitivity Map for the Phased Gas Pipeline Development

2.2.7 Impact Description and Mitigation

Agricultural impact is understood as “any impact that translates into reduced agricultural production (including forestry). This may occur by way of a degradation of the agricultural resource base or by way of a direct disturbance to agricultural activities”. The significance of agricultural impacts increases as the agricultural productivity of the lands (its agricultural sensitivity), the surface area of disturbed land and the level of disturbance increases. In the case of a Gas pipeline, even if the sensitivity is high, impact is generally of low to medium significance because both the surface area of disturbed land and the level of disturbance is moderately low. In most cases, agriculture (with the exception of deep rooted plants) can continue to grow after the pipeline is installed, provided that rehabilitation measures are suitably and adequately adopted. Since the gas pipeline will be below ground, there will be minimal above ground disturbance during the operational phase (i.e. this will be limited to pigging stations, block valves and access roads). The main activity that is predicted to have an impact on agriculture is the trenching required during the pipeline installation, which results in potential disturbance of the soil profile and change of soil composition, which in turn may result in changes to the agricultural potential of the soil. Therefore, it is vital that mitigation measures are adopted to ensure that the soil is adequately rehabilitated and returned to its pre-disturbance land capability.

During the construction phase, a 30 – 50 m wide area will be cleared for the construction right-of-way. This area will be reduced to a 10 m wide servitude during the operational phase. The rest of the disturbed area will be rehabilitated in line with best practice recommendations and the Environmental Management Programme (EMPr). A servitude agreement will be entered into between the landowner and the pipeline developer. This agreement will specify all requirements that the landowner needs to consider and abide by as a result of having an operational gas pipeline on their property. For example, if the gas pipeline were to be constructed on a property containing crops, then the servitude agreement will specify the type of crops that can be grown within the servitude (i.e. no deep rooted crops). In addition, the agreement should also include the developer’s responsibilities, such as expected rehabilitation levels, access to the land etc.

In general, the significance of the impacts increases as the agricultural productivity of the land, the surface area of the land and the level of disturbance increases.

The potential negative impacts of gas pipeline development on agriculture are listed below:

- Loss of agricultural land use, caused by direct occupation of land by the footprint of gas pipeline infrastructure, which removes the affected land portions from agricultural production.
    - Mitigation measure: Plan the fine-scale positioning of pipelines, block valves, pigging stations, access roads and construction camps to have minimal disturbance on agricultural activities and agricultural land. The gas pipeline infrastructure should be positioned on existing boundaries or edges of agricultural units of land wherever possible, so as not to interfere with agricultural activities within a unit.
- Loss of agricultural land use due to fragmentation of agricultural land as a result of the gas pipeline infrastructure, which can cause the division of fields and isolation of land portions into non-viable small areas for cultivation. Such fragmentation leads to an effective additional loss of agricultural land over and above that lost to the direct footprint.
    - Mitigation measure: As above.
- Limitation to the existence of deep rooted plants and trees, plantation trees and wind break trees within the operational servitude as a result of the risk posed to the below ground pipeline. Exclusion of wind breaks has the effect of reducing the environmental suitability and therefore agricultural potential of affected land for horticultural crops.
    - Mitigation measure: All deep rooted areas, including forest areas should be avoided in terms of gas pipeline development.
- Soil erosion caused by alteration of run-off characteristics due to vegetation removal and surface disturbance and compaction, particularly on access roads and construction camps. The disturbance of existing contour banks and drainage systems used for erosion control, by construction activities on or near them, can also cause erosion. Erosion causes loss and deterioration of soil resources.
    - Mitigation measure: Implement an effective system of run-off control, where it is required, that collects and safely disseminates run-off water from all hardened surfaces and prevents potential down slope erosion. Soil surface stabilising measures must be used if necessary on all areas that are highly susceptible to erosion. Plan the fine-scale positioning of gas pipelines, block valves, pigging stations, access roads and construction camps to avoid land that has contour banks. If any contour banks are disturbed, fully restore their integrity and that of the run-off system of which they are a part, after disturbance. The effectiveness of the run-off control system and the occurrence of any erosion on site or downstream must be monitored. Corrective action must be implemented to the run-off control system in the event of any erosion occurring.
- Degradation of vegetation and compaction of soil beyond the direct footprint due to construction disturbance, dust and vehicle trampling.
    - Mitigation measure: Restrict all vehicle traffic within the footprint of disturbance and control dust during construction. Ensure that the site is rehabilitated following construction.
- Loss of topsoil due to poor topsoil management (burial, erosion, etc.) during construction, related soil profile disturbance (levelling, excavations, road surfacing etc.) and resultant decrease in the capability of that soil to support plant growth.
    - Mitigation measure: Since the construction activity will mechanically disturb below surface areas, it is important that any available topsoil should first be stripped from the entire surface to be disturbed and stockpiled separately for re-spreading during rehabilitation. Topsoil stockpiles must be conserved against losses through erosion by establishing vegetation cover on them. Dispose of all subsurface spoils from excavations where they will not impact on undisturbed land. During rehabilitation, the stockpiled topsoil must be evenly spread over the entire disturbed surface. Erosion must be controlled where necessary on newly topsoiled areas, which are likely to be susceptible to erosion. During discussions with the DAFF, it was recommended that in areas with high and very high land capability, and where the excavations disturb the below surface, then the soil layers need to be excavated and stockpiled separately and then re-instated in the order in which they were removed during infilling.
- Disturbance to agricultural practices and management during construction.
    - Mitigation measure: Not possible.

2.2.8 Gas Pipeline Development and Agricultural Consent

As noted above, according to the new Draft Preservation and Development of Agricultural Land Framework Bill, as it is currently proposed, authorisation of all gas pipeline servitudes will be required in terms of the Bill. Authorisation will require ministerial approval and a comprehensive process if it involves any cultivated land, and a slightly less rigorous process if it only involves grazing land. The new Bill requires a fairly high minimum level of assessment for all levels of risk to agricultural land. The registration of the servitude needs to be done per farm portion. Long gas pipelines will more often than not traverse many portions, each of which would need a separate agricultural authorisation. This is likely to complicate and significantly lengthen the time required for gas pipeline servitude approval.

With the foregoing in mind and due to the low to medium significance impact of gas pipeline development on agriculture, particularly within the Power corridors as the proposed corridors are positioned to avoid agriculturally important areas where there was a pinch point for very high sensitivity, this section of the report recommends, for gas pipeline development, an alternative process for agricultural assessment to that proposed in the Draft Preservation and Development of Agricultural Land Framework Bill.

The Bill may therefore need to make provision for such a process for gas pipeline development.

This report recommends that the process of agricultural authorisation for gas pipeline development inside the corridors triggering either a Basic Assessment or Environmental Impact Assessment process in terms of National Environmental Management Act 107 of 1998 (as amended) is done in terms of an exemption from the requirements stipulated in the Bill, and that an Agricultural Compliance Statement be prepared by a soil scientist/agricultural specialist registered with the South African Council for Natural and Scientific Professions (SACNASP), on the site being submitted as the preferred development site. The compliance statement must indicate whether or not the proposed development will have an unacceptable negative impact on the agricultural production capability of the site. Such a statement should also focus on and clearly highlight, only the essential aspects that are important for the preservation of agriculturally productive land within gas pipeline developments rather than insist, as the Bill does, on a detailed agro-ecosystem report, much of which might be irrelevant under conditions of low agricultural productivity. These essential aspects making up the recommended way forward are briefly presented in Table 4 and will be included in the decision support outputs currently under development as part of this SEA.

2.2.9 Interpretation of Sensitivity Maps

Table 4 provides information on the interpretation of the agricultural sensitivity and associated assessment requirements inside the Gas Pipeline Corridors.

Table 4: Interpretation of Agricultural Sensitivity and associated Assessment Requirements inside of the Gas Pipeline Development Corridors

Sensitivity Class	Interpretation of Sensitivity	Further assessment requirements for Gas Pipeline Developments
Very High Land capability evaluation values 11 – 15; all irrigated land; horticulture and viticulture; demarcated high value agricultural areas with a priority rating of A and/or B.	These areas are potentially unsuitable for development owing to: • high agricultural value and preservation importance • high production capability • high capital investment made • unique agricultural land attributes.	It is recommended that an Agricultural Compliance Statement be prepared by a soil scientist/agricultural specialist registered with the SACNASP, on the site being submitted as the preferred development site and indicates whether or not the proposed gas pipeline development will have an unacceptable negative impact on the agricultural production capability of the site. The Agricultural Compliance Statement must contain, as a minimum, the following information: 1. Details and relevant expertise as well as the SACNASP registration number of the soil scientist/agricultural specialist preparing the statement including a curriculum vitae; 2. A signed statement of independence by the specialist; 3. A map showing the proposed development footprint (including supporting infrastructure) with a 50 m buffered development envelope, overlaid on the agricultural sensitivity map generated by the national web based environmental screening tool; 4. Calculations of the total development footprint area for each land parcel as well as the total footprint area of the development (including supporting infrastructure); 5. Confirmation from the specialist that all reasonable measures have been taken through micro-siting to avoid or minimize fragmentation and disturbance. A substantiated statement from the soil scientist/agricultural specialist on the acceptability of the development and a recommendation on the approval or not of the development (i.e. impacts to the agricultural resource are temporary and the land in the opinion of the soil scientist/agricultural specialist based on the mitigation and remedial measures, can be returned to the current land capability within two years of the completion of construction phase); 6. Any conditions to which the statement is subjected; 7. Where required, proposed impact management outcomes or any monitoring requirements for inclusion in the EMPr; and 8. A description of the assumptions made and any uncertainties or gaps in knowledge or data. If this statement is subject to any conditions these must also be clearly stated; and where required, proposed mitigation measures for inclusion in the EMPr.
High Land capability evaluation values 8 - 10 including all cultivated areas including sugar cane areas and demarcated high value agricultural areas with a priority rating of C and/or D.	Avoid where possible because it will lead to some disturbance and loss of existing or potential agricultural (or forestry) production. High sensitivity areas are still preservation worthy since they include land with an agricultural production potential and suitability for specific crops.	
Medium Land capability evaluation values 6 – 7. Likely to be very marginal arable land.	Re-route onto lower sensitivity agricultural land (where possible and where all other factors are equal) because it will lead to very minor disturbance and loss of existing or potential agricultural production.	
Low Land capability evaluation values 1 – 5.	Insignificant impact on agriculture. Likely to be non-arable land, and is therefore land onto which most development should be steered.	

2.3 Defence and Civil Aviation

2.3.1 Introduction and Scope

The South African National Defence Force (SANDF) uses an extensive system of military airspace and land assets in order to prepare and train combat-ready forces. Furthermore, it also operates radar systems designed to protect the sovereignty of the national borders and to detect threats to national security. The SANDF falls under the Department of Defence (DoD) and comprises four armed services, namely: Army, Air Force, Navy and Military Health Service.

Civil aviation on the other hand is governed by the Civil Aviation Act (Act 13 of 2009) and the South African Civil Aviation Authority (SACAA) is mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. All proposed developments or activities in South Africa that potentially could affect civil aviation must thus be assessed by SACAA in terms of the South African Civil Aviation Regulations (SACARs) and South African Civil Aviation Technical Standards (SACATS) in order to ensure aviation safety. The Obstacle Evaluation Committee (OEC) which consists of members from both the SACAA and South African Air Force (SAAF) fulfils the role of streamlining and coordinating the assessment and approval of proposed developments or activities that have the potential to affect civil aviation, military aviation, or military areas of interest. With both being national and international priorities, the OEC is responsible for facilitating the coexistence of aviation and gas pipeline development, without compromising aviation safety.

The sensitivity analysis of defence and civil aviation features towards the development of gas pipelines is primarily a desktop study based on the Defence study and Civil aviation study undertaken as part of the 2016 EGI SEA (Part 3: Chapters 6 & 7 (DEA, 2016)). It has also been supplemented with information gathered from discussions and meetings with the DoD, ARMSCOR and SANDF.

The various defence and civil aviation features to be taken into consideration when locating gas pipelines are listed in Table 5 below.

2.3.2 Sensitivity Analysis and Mapping

In accordance with discussions with the military, DoD, ARMSCOR and the SANDF, areas of interest were mapped and appropriately buffered as shown in Table 5. Sensitivity maps (Maps 4 and 5) were delineated according to these criteria. Most of the sensitivity features noted in Table 5 below are military areas, where access is limited, and have been highlighted as a result of the potential impact of gas pipelines on these features.

2.3.3 Impact Description

Impacts of gas pipelines on defence and civil aviation activities could result from interference with surveillance radars and communication systems. The nature of gas pipeline infrastructure may lead to the blocking and cluttering of surveillance and communication signals. Any interference with SANDF surveillance radar would compromise the safeguarding of coastlines, national borders, military airspace or other militarily sensitive areas.

In addition, the impact of certain defence features, such as bombing ranges and military training facilities, may have an impact on the below ground gas pipeline (in terms of ground vibrations and shock waves).

Correspondence with the SANDF has led to the identification of 15 possible sites of significance that coincide with the draft refined gas pipeline corridors. According to the SANDF, these 15 sites are those that could pose a risk to gas pipeline infrastructure in their immediate vicinity. There are other military facilities that coincide with the proposed draft refined gas pipeline corridors, but these were deemed benign in terms of their possible impact on gas pipeline infrastructure in the vicinity. However, the presence of these sites will emerge in future site specific assessments when particular phases of the pipeline are planned for actual construction.

These 15 sites are all accompanied by either 1) a weapons range; 2) an ammunition stockpiling facility; or 3) both. All of these sites, excluding one, are military facilities. In addition, three of the identified sites are no longer in use but may still be contaminated with unexploded ordnance despite rigorous clean-up before the military vacated these sites, which means that it would still be of significance to the sensitivity survey.

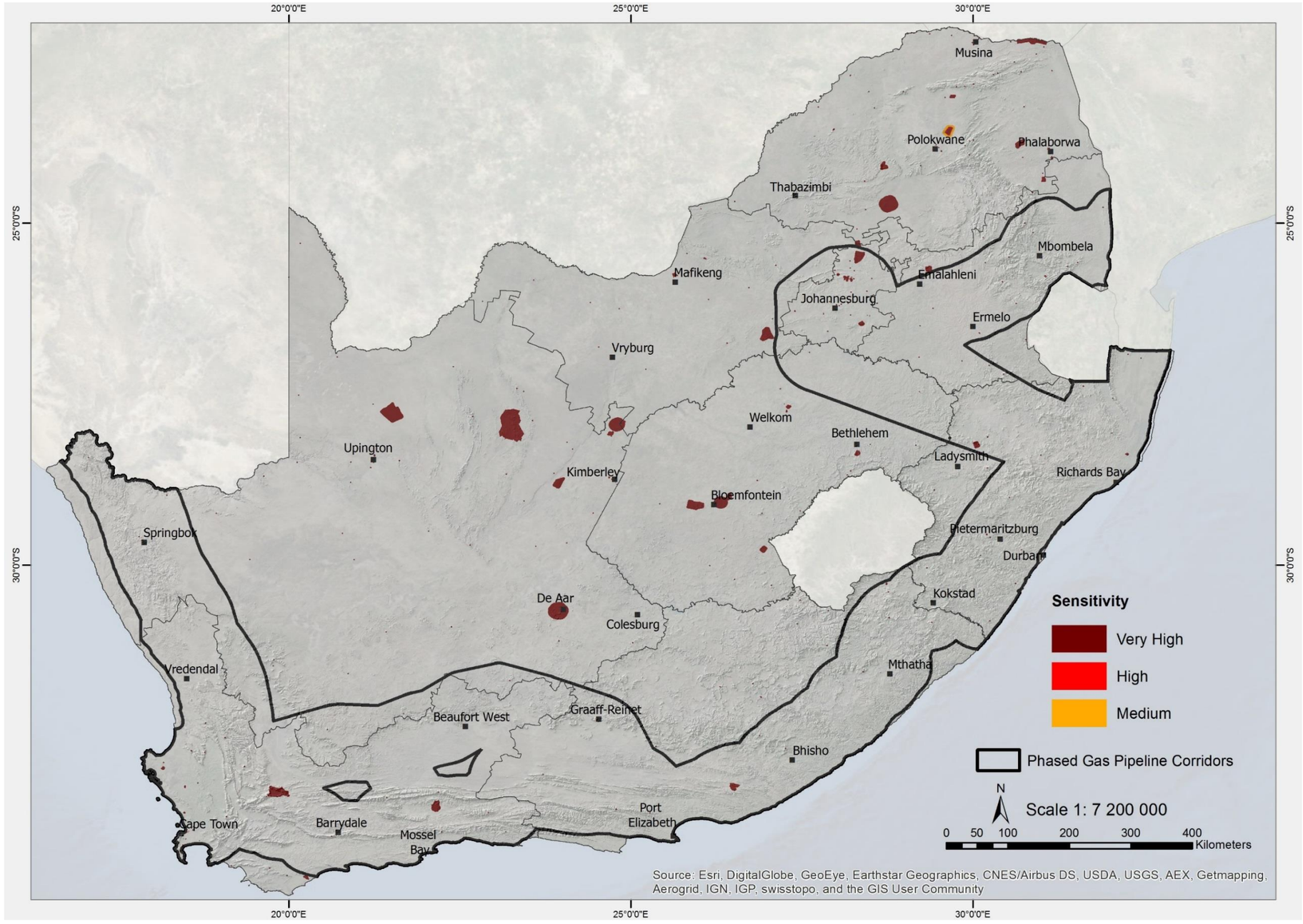
The SANDF have identified safety footprints of the heaviest calibre weapons in use, stockpiled or fired at each of the 15 above-mentioned sites. Small arms ranges are also of concern, particularly at sites where tracer rounds are used (as this can have a similar or worse outcome on the pipeline and surrounding area than an artillery round). All such ranges, military or civilian, are accredited by law, by the SA Police Service (SAPS). A register of all such SAPS-accredited small arms shooting ranges is available online. Tracer rounds would be allowed as part of this accreditation, and for purposes of sensitivity analysis, it must be assumed therefore, that such munitions are in use at each of these ranges, and could hold risk to any gas pipeline infrastructure in the vicinity.

The Seismicity Assessment study conducted as part of the Gas Pipeline SEA mentions that seismicity in South Africa arises from both natural sources (e.g. plate tectonic forces, buoyant uplift of the continent after erosion) and human-induced sources (e.g. rock failure caused by mining-induced stresses, slip on faults causes by changes in load and pore fluid pressure during the filling of reservoirs, and vibrations produced by blasting for open pit mining, civil excavation and the disposal of expired munitions). The report further notes that ground vibrations produced by the disposal of expired munitions have been investigated by Grobbelaar (2017).

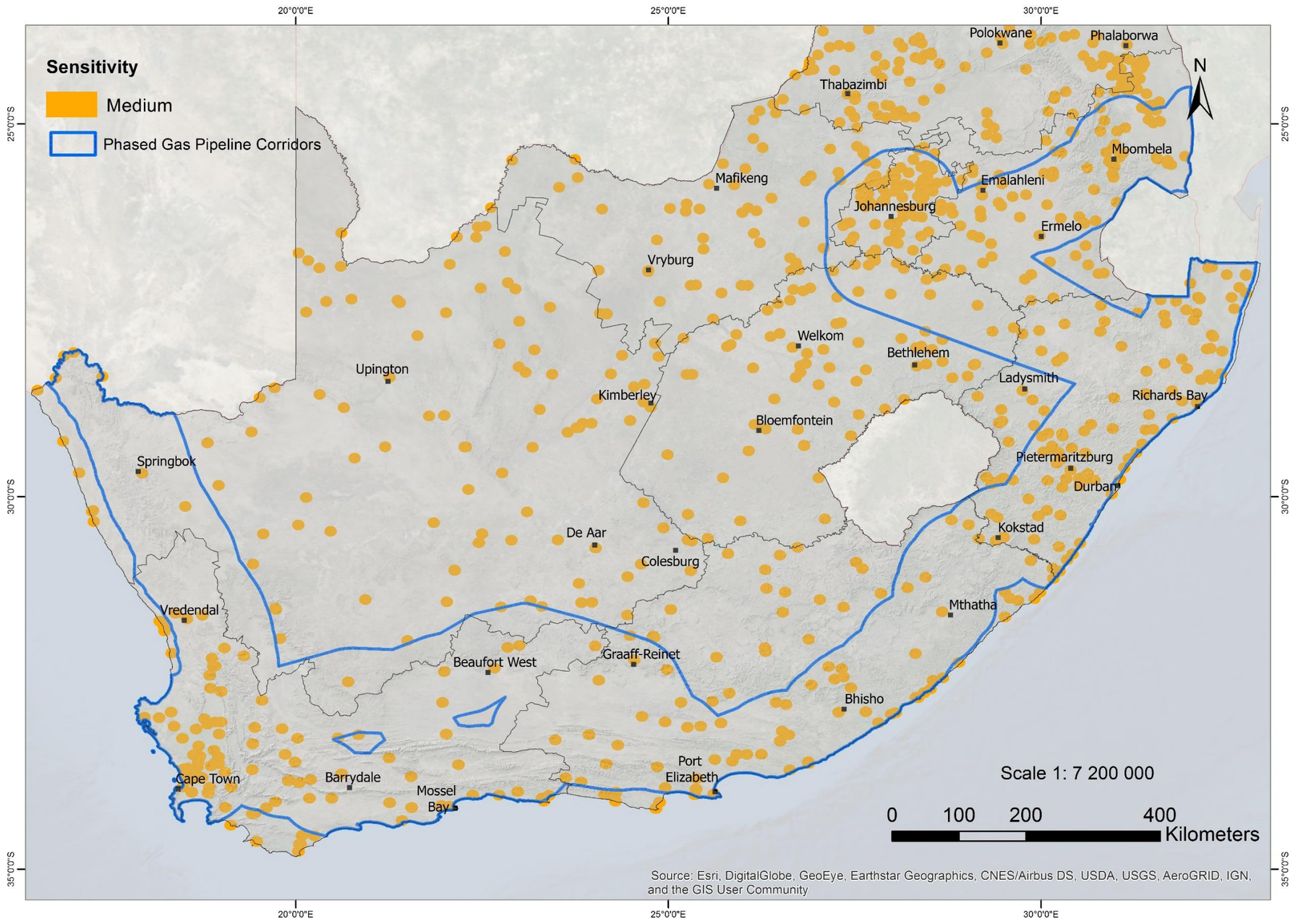
Ground vibrations may also be produced by blasting in open pit mines and for civil excavations (e.g. road cuttings), and the disposal of expired military explosives. The effect of these blasts is local. Intensities strong enough to cause damage to sensitive structures are usually limited to distances of tens to hundreds of meters, or at most a kilometre or two from the source. Expired munitions are usually detonated on the surface, so relatively little energy is transmitted into the earth and little damage done. However, the shock wave travelling through the air may cause alarm, discomfort, and in some cases damage. The Seismicity Assessment includes additional information provided by the Council for Geoscience in terms of measurements of the ground motion produced by military explosives detonated on surface and their effects on buildings (B Manzunzu, pers. Comm., 2018).

Table 5: Defence Sensitivity Criteria

Sensitivity Feature	Data Source	Sensitivity Mapping Application
Defence		
Forward Airfields	SANDF, 2017	Very High – 1 km buffer
Air Force Bases -including air force training ranges	SANDF, 2017	Very High – 1 km buffer
High Sites	SANDF, 2017	Very High – 1 km buffer
Operational Military Bases	SANDF, 2017	Very High – 1 km buffer
Military Training Areas	SANDF, 2017	Very High – 2 km buffer
Bombing Ranges	SANDF, 2017	Very High – 1 km buffer High – 2 km buffer Medium – 5 km buffer
Shooting Ranges	SANDF, 2017	Very High - 1 km
Border Posts	SANDF, 2017	Very High – 1 km buffer
Ammunition Depot	SANDF, 2017	Very High - 10 km
All Other DoD features (including Naval Bases, Housing, Offices etc.)	SANDF, 2017	Very High – 1 km buffer
Civil aviation		
Major Airports	SA CAA	Medium – 8 km buffer
Other Civil Aviation Aerodromes (Small Aerodromes)	SA CAA	Medium – 8 km buffer



Map 4: Defence Sensitivity Map for the Phased Gas Pipeline Development in the Proposed Corridors



Map 5: Civil Aviation Sensitivity Map for the Phased Gas Pipeline Development in the Proposed Corridors

2.3.4 Interpretation of Sensitivity Maps

The OEC, under the chairmanship of the Senior Staff Officer Air Traffic Management of the Air Force, is responsible for streamlining and coordinating the approvals for the construction of potential aviation obstacles in the vicinity of military areas of interest. The OEC consists of members from both the Air Force and the SACAA, and is mandated to make final recommendations to the Deputy Chief of the Air Force regarding the approval of obstacles that might affect Air Force activities. Due to the complexity of impacts potentially posed by obstacles on aviation, surveillance, communication, and other military activities, all proposed gas pipeline infrastructure must be evaluated by this committee. Even in instances where the distance from the nearest area of military interest may seem far enough for it not to have an impact, there is still potential for interference with communication, surveillance, or other military services.

Therefore without being able to guarantee that any development will not be found to have an unacceptable impact on military features without confirmation by OEC, the sensitivity maps illustrated in this section (Maps 4 and 5) do not indicate where development can or cannot proceed. Instead, the main objective of this section is to identify high risk areas for development in the context of defence features. This way, developers are able to plan to avoid sensitive defence related features at the earliest stage of development planning, and in so doing, minimise the risk of a negative decision, project delays or increased project costs as a result of the potential interference of the proposed development with defence services.

Therefore the initial assessment requirements for gas pipeline projects located anywhere within the country are the same, as specified in Table 6 below, regardless of the sensitivity. However developers are encouraged to plan development in low sensitivity areas to reduce the risk of encountering a defence related issue when seeking approval from the OEC.

Table 6: Interpretation of Defence and Civil Aviation Sensitivity Maps

Sensitivity Class	Interpretation	Recommendations at project level
Very High (dark red)	In Very High sensitivity areas there is a high likelihood for significant negative impacts on the defence installation. In-depth assessment of the potential impacts and mitigation measures is likely to be required before development can be considered in these areas.	Proponents intending to develop gas pipeline anywhere in South Africa that triggers the need for an environmental assessment process must ensure that the proposed development will not have an unacceptable negative impact on defence and civil aviation activities. In order to do so, the proponent must request a comment in writing from the OEC and/or from the SACAA, which may include inputs from the OEC confirming no unacceptable impact on military areas of interest. Inputs from the OEC/SACAA, if provided within prescribed timeframes in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, will be considered by the relevant competent authority for decision making. If no inputs are provided by the OEC within the prescribed timeframes, then the EAP must provide evidence of engagement with the relevant officials at the OEC and timeous requests for inputs. Proponents must receive authorisation for the proposed development from the OEC and/or SACAA.
High (red)	In High sensitivity areas there is potential for negative impacts on the defence installation that can potentially be mitigated. Further assessment may be required to investigate potential impacts and mitigation measures.	
Medium (orange)	In Medium sensitivity areas there is a low potential for negative impacts on the defence installation, and if there are impacts there is a high likelihood of mitigation. Further assessment of the potential impacts may not be required.	
Low (green)	No significant impacts are expected in low sensitivity areas. It is unlikely for further assessment and mitigation measures to be required.	

2.4 Heritage

2.4.1 Introduction and Scope

As for the above two issues, the sensitivity analysis of heritage features was mainly founded on the Heritage Assessment Report (Appendix C.4 of the 2016 EGI SEA Report) (DEA, 2016). Information was mainly sourced from the latest heritage resources dataset (December 2018) provided by South African Heritage Resources Agency (SAHRA). Further consultations with relevant authorities such as the SAHRA was undertaken to confirm applicable buffers and sensitivities.

2.4.2 Approach: Data Sources, Legislation, Assumptions and Limitations

The main source of information is data on heritage sites provided by SAHRA in February 2019. This data includes national and provincial data, as well as local data up to December 2018. The list of updated data used in this current Gas Pipeline SEA is indicated in Table 7 below. Assumptions and limitations applicable to this assessment are provided in Table 8.

Table 7: Heritage Datasets

Data title	Source and date of publication	Data Description
Mapped Heritage Features	SAHRA, 2018	Heritage sites and features curated by SAHRA
World Heritage Sites and related buffer zones	South African Protected Areas Database (SAPAD) - Q4, 2017	World Heritage sites
Geological Features and Substrates of Palaeontological Importance, Geology layer	Council for Geosciences, 2014	Specific geological types of potential heritage importance

Table 8: Assumptions and limitations

Limitation	Included in the scope of this study	Excluded from the scope of this study	Assumption
Data availability.	Latest dataset provided by SAHRA was used (data up to December 2018) but a large amount of published and unpublished data	Field verification of datasets and outcomes, and extensive local expert consultation – study area widely	Data provided by SAHRA comprise the majority of the data potentially available.
	has not been uploaded.	scattered.	
Unavailability of the palaeosensitivity map to include in the sensitivity analysis	-	Further field assessment and/or desktop work to verify and correct the sensitivity levels described	The palaeosensitivity map contains the most updated information and currently needs to be accessed online.

The relevant regulatory instruments are listed in Table 9 below.

Table 9: Applicable Legislation for the Heritage Assessment

Instrument	Key Objective	Feature
International Instrument		
UNESCO Convention on the Protection of World Cultural and Natural Heritage, 1972 (applicable in all corridors)	Protection of natural and cultural heritage sites which demonstrate importance for all the people of the world.	Declared World Heritage Sites: • Fossil Hominid Sites of South Africa (also known as the Cradle of Humankind) • Vredefort Dome • Cape Floral Region Protected Areas[2]
National Instrument		
National Heritage Resources Act 25 of 1999 (applicable in all corridors)	Identification, management, protection, conservation and promotion of the national heritage resources within the country	All heritage sites except for World Heritage Sites
National Environmental Management: Protected Areas Act 57 of 2003	Protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascape	World Heritage Sites
Integrated Coastal Management Act 24 of 2008	Promotion, conservation and sustainable development of the coastal environment	
National Environmental Management Act 107 of 1998, as amended (NEMA)	Environmental governance within the country	Heritage sites identified during the environmental process
Provincial Instrument		
KwaZulu-Natal Heritage Act 4 of 2008 (Applicable to the relevant sections of the Phase 3, 4 and 7 corridors)	Conservation, protection and administration of both the physical and the living or intangible heritage resources of the Province of KwaZulu-Natal	Heritage sites falling within the boundaries of KZN

[2]The Cape Floral Region Protected Areas is declared as a 'natural' heritage site by UNESCO but it is not subjected to the same treatment as other heritage sites in South Africa by Heritage Western Cape and SAHRA.

The National Heritage Resources Act (Act 25 of 1999) (NHRA) is considered most relevant, as it protects many heritage resources as follows:

- Section 34: structures older than 60 years;
- Section 35: palaeontological, prehistoric and historical material (including ruins) more than 100 years old;
- Section 36: graves and human remains older than 60 years and located outside of a formal cemetery administered by a local authority; and
- Section 37: public monuments and memorials.

Section 38 (1) of the NHRA states the following:

- "Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as:
  - (a) the construction of a road, wall, powerline, **pipeline**, canal or other similar form of linear development or barrier exceeding 300m in length;
  - (b) the construction of a bridge or similar structure exceeding 50 m in length;
  - (c) any development or other activity which will change the character of a site — (i) exceeding 5 000 m² in extent; or (ii) involving three or more existing erven or subdivisions thereof; or (iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or (iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
  - (d) the re-zoning of a site exceeding 10 000 m² in extent; or
  - (e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority;

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development."

Section 38 (2a) states that if there is reason to believe that heritage resources will be affected then an impact assessment report must be submitted by the Applicant to the relevant Heritage Authority. This is usually the case for gas pipeline development. Therefore, since a specific HIA will be required prior to development of the gas pipeline on a project specific basis, a dedicated HIA was not undertaken at this SEA level. Instead, a review of existing literature captured for the previous SEAs, as well as a general sensitivity analysis has been undertaken for this current SEA.

Grading of sites is necessary for heritage management as it is a legal requirement towards the formal protection of sites and informs the requirements for the management of generally protected sites. Any heritage site which is part of the national estate as defined in Section 3 of the NHRA should be graded according to its significance. In South Africa, grading has three associated components, namely the geographical range of a site's significance (international, national, provincial/regional or local), the level of significance (High, Medium or Low) and the heritage authority with the delegated powers to manage the site. The grading of heritage sites which form part of the national estate is specified in Section 7 of the NHRA as follows:

- (a) Grade I: Heritage resources with qualities so exceptional that they are of special national significance;
- (b) Grade II: Heritage resources which, although forming part of the national estate, can be considered to have special qualities which make them significant within the context of a province or a region; and
- (c) Grade III: Other heritage resources worthy of conservation.

SAHRA is the national authority and manages Grade I sites only; Provincial Heritage Resources Authorities (PHRAs) manage Grade II and Grade III sites. Only one municipality, the City of Cape Town Metropolitan Municipality, has obtained limited powers to manage Grade III resources from Heritage Western Cape. Grade III sites have three subcategories according to their level of local significance. IIIa (high), IIIb (medium) and IIIc (low). These sites are significant at the local level and the type of mitigation allowed at these sites varies from destruction (IIIc) or extensive mitigation (IIIb) to general avoidance and minimal modification (IIIa). Grade IIIa sites are of such a high local significance that they should be protected and retained. Grade IIIb sites are heritage resources rated with medium local significance. They should preferably be retained where possible, but, where developments cannot be realigned or moved, mitigation is normally allowed. Grade IIIc sites are of low local significance. These resources must be recorded satisfactorily before destruction is allowed.

The majority of the Provincial Heritage Sites were declared as National Monuments under the National Monuments Act of 1969. These sites are mainly buildings located within the urban edge of various towns and cities across the country.

There are two useful guides which explain the grading process in more detail:

- the Heritage Western Cape Short Guide to and Policy Statement on Grading issued in 2012[3]; and
- the SAHRA Minimum Standards for Archaeological and Palaeontological Impact Assessments issued in 2007[4].

Refer to Section 5 of the 2016 Heritage Assessment Report (DEA, 2016) for a detailed description of the study methodology, assumptions and limitations undertaken as part of the 2016 SEA. It must be noted that detailed sensitivity analysis was not undertaken as part of this current SEA given that, regardless of the sensitivity of the site, the developer will be required to carry out, at least, a Phase 1 HIA.

The list of data used in this current Gas Pipeline SEA is indicated in Table 7.

2.4.3 Impact Description and Mitigation

The information presented in this section is based on the 2016 Heritage Assessment Report (DEA, 2016).

The integrity and significance of heritage resources can be jeopardized in two ways i.e. by natural forces such as erosion or anthropogenic forces such as development activities. Gas pipeline developments have the potential to impact on heritage resources through physical disturbance during construction or by changing the wider landscape context.

Physical impacts to heritage resources in the context of gas pipeline development can take the form of excavations for pipelines, pigging stations, block valves and in some cases new roads. The potential physical impacts are greatly dependent on the micro-siting of the infrastructure. Although it is possible to identify and protect known and above ground heritage resources (e.g. cultural sites and historical structures), it is more challenging to assess the potential impacts on unknown and underground heritage resources (e.g. the potential presence of fossils or middens). Even at a project level it is difficult to identify and confirm such heritage resources prior to excavation.

2.4.4 Sensitivity Analysis and Mapping

Given the diverse nature of impacts presented by gas pipelines to heritage resources, heritage sensitivity inside the Gas Pipeline Corridors was delineated according to two heritage categories, namely: 1) Palaeontological and 2) Non-Palaeontological (referring to archaeology and other heritage resources e.g. graves). The heritage features that would be impacted by gas pipeline development and their relative sensitivities are indicated in Tables 10 and 11.

Palaeontological resource sensitivity was largely inferred through the use of geological maps depicting formations likely to contain fossils. Features taken into consideration to create the four-tier sensitivity map are:

- Palaeontological sites with buffers as indicated below; and
- SAHRIS palaeosensitvity map consisting of a range of six sensitivity levels and related recommendations.

The occurrence of Non-Palaeontological resources is much less predictable and cannot be discounted through desktop assessment alone, unless the area has already undergone a detailed HIA. Features taken into consideration to create the four-tier sensitivity map are:

- The heritage sites (excluding palaeontological sites) as provided by SAHRA (February 2019).

Natural features such as rivers, wetlands and pans; as well as Koppies, mountainous areas and coastlines are often foci of prehistoric and historic settlement and may therefore contain important heritage resources. These natural features, although potentially important location for heritage resources, have not been included in this sensitivity map given that the proposed sensitivity zones (buffers) around those natural features were found to be of similar magnitude (and often smaller) than those set as part of the environmental sensitivity analysis.

On 9 May 2018, the SAHRA provided the following feedback with regards to sensitivity zones for heritage sites to be used for the Gas Pipeline SEA mapping exercise. The feedback from SAHRA serves as guidance for the delineation of the Gas Pipeline SEA project with regards to sensitivity zones surrounding heritage resources, and does not constitute a legal exclusion zone as per Sections 27, 28, 29, 31, 34, 35, 36 and 37 of the NHRA. In addition, the recommended buffer zones noted below only apply to heritage resources under the jurisdiction of SAHRA. SAHRA has recommended that guidance on sensitivity buffer zones for heritage resources that fall under the jurisdiction of the PHRAs must be sought from the relevant PHRAs.

[3] https://www.westerncape.gov.za/other/2012/9/grading_guide_&_policy_version_5_app_30_may_2012.pdf

[4] http://www.sahra.org.za/sahris/sites/default/files/website/articledocs/ASG2-2%20SAHRA%20A%26PIAs%20MIN%20STDS%20Ph1-2%2016May07.pdf

The proposed sensitivity zones for heritage resources apply to:

- officially graded heritage resources as per Section 7 of the NHRA;
- officially declared sites as per Section 27 of the NHRA; and
- sites provided a field rating as per the 2007 SAHRA Minimum Standards: Archaeological and Palaeontological components of Impact Assessments.

The proposed sensitivity zones around identified heritage resources, as recommended by SAHRA, are as follows:

- Grade 1: 2 km from either the official point or official boundary of the site;
- Grade 2: 1 km from either the official point or official boundary of the site;
- Grade 3a: 150 m from the provided point;
- Grade 3b: 100 m from the provided point;
- Grade 3c: 50 m from the provided point; and
- Ungraded/no field rating provided: 100 m from the provided point.

According to SAHRA, the above sensitivity zones do not exclude development occurring within those areas however, should development be planned to occur in the area, more intensive mitigation measures may be necessary. Depending on the sensitivity of the heritage resources, the development in or near the proposed buffer zones will be subject to footprint amendments based on the findings of a HIA.

SAHRA noted that the various heritage site taxonomy i.e. archaeological sites, palaeontological sites, built environment sites, burial grounds and monuments, underwater heritage sites, were not used to further separate the categories of heritage, as the variable involved with the sites are too large to employ at the current high-level mapping exercise.

The Gas Pipeline Corridors were mapped separately for Palaeontological sensitivity and Non-Palaeontological sensitivity. The two mapping outputs were then integrated into a combined mapping output, by retaining the highest sensitivity rating between the two sensitivity maps for all areas within the corridors. The combined sensitivity map (Map 6) is symbolic of overall heritage sensitivity inside of each Gas Pipeline Corridor.

Sensitivity maps (Palaeontological resources and non-palaeontological resources) were produced for the corridors according to the criteria set out in Tables 10 and 11 to classify heritage sensitivity spatially into four tiers namely, Very High, High, Medium and Low.

From a heritage perspective, Grade 1, 2, and 3 sites have been considered as sites that have a mapped heritage feature present, and these areas will be avoided during gas pipeline design, construction and maintenance.

Table 10: Summary of sensitive heritage (including palaeontology) features, datasets and process of preparing data, and sensitivity assignment

Sensitivity Feature	Data Source and Date of Publications	Data Preparation and Processing	Sensitivity
World Heritage Sites and related buffer zones	South African Protected Areas Database (SAPAD) - Q4, 2017	Union between World heritage sites as part of SAHRA, 2018 layer and South African Protected Areas Database (SAPAD) - Q4, 2017 Buffer and core areas used as in data set	Very High - within defined buffer zone
Grade I sites	Mapped Heritage Features, SAHRA, 2018	As extracted from the SAHRA, 2018 Layer Buffer and core areas used as in data set	Very high – 2 km buffer
Grade II sites	Mapped Heritage Features, SAHRA, 2018		Very high – 1 km buffer
Grade IIIa sites	Mapped Heritage Features, SAHRA, 2018		High – 150 m buffer
Grade IIIb sites	Mapped Heritage Features, SAHRA, 2018		High – 100 m buffer
Grade IIIc sites	Mapped Heritage Features, SAHRA, 2018		High – 50 m buffer
Ungraded sites	Mapped Heritage Features, SAHRA, 2018		Very High – 100m buffer
Battlefields (Grade IIIb)	Mapped Heritage Features, SAHRA, 2018		Very high – 5 km buffer
SAHRIS PalaeoSensitivity map - Formations of very high sensitivity (red)	SAHRIS PalaeoSensitivity Map	These features will be included in the sensitivity map as soon as it is made available to the SEA Project Team. Currently only available online (SAHRIS website)	Very High
SAHRIS PalaeoSensitivity map - Formations of high sensitivity (orange/yellow)			High
SAHRIS PalaeoSensitivity map - Formations of moderate and unknown sensitivity (Green/white)			Medium
SAHRIS PalaeoSensitivity map - Formations of low (blue)			Low
Palaeontological Substrate and Heritage Resources: High Sensitivity Areas: • ADELAIDE • ASBESTOS HILLS • BOEGOEBERG DAM • BOTHAVILLE • BRULSAND • CAMPBELL RAND • CLARENS • DRAKENSBERG • DWYKA • ECCA • KOEGAS • KUIBIS • MATSAP • MOLTENO • PRINCE ALBERT • RIETGAT • ELLIOT • ENON • GHAAP • SCHMIDTSDRIF • SCHWARZRAND • STALHOEK • SULTANAOORD • TARKASTAD • VRYBURG • WITTEBERG • KAMEELDOORNS	Geology – Known to potentially have Palaeontological features from previous assessments Council for Geosciences, 2014	As extracted from geology layer	High

Sensitivity Feature			Data Source and Date of Publications	Data Preparation and Processing	Sensitivity
Palaeontological Substrate and Heritage Resources: Medium Sensitivity Areas:			Geology – Known to potentially have Palaeontological features from previous assessments	As extracted from geology layer	Medium
• ACHAB • ALLANRIDGE • BIDOUW • BREDASDORP • CERES • CONCORDIA GRANITE • DWYKA • FORT BROWN • GESELSKAPBANK • GLADKOP • GRAHAMSTOWN • HARTEBEEST PAN • GRANITE	• KOOKFONTEIN • KORRIDOR • MESKLIP GNEISS • MODDERFONTEIN • GRANITE/GNEISS • NAAB • NABABEEP GNEISS • HOOGOOR • KALAHARI • KAMIESKROON GNEISS • KAROO DOLERITE • KHURISBERG • KONKYP GNEISS	• NAKANAS • NARDOUW • NUWEFONTEIN • GRANITE • RIETBERG GRANITE • SKOORSTEENBERG • STINKFONTEIN • STYGER KRAAL • SYENITE • TABLE MOUNTAIN • TIERBERG • VOLKSRUST • WATERFORD			

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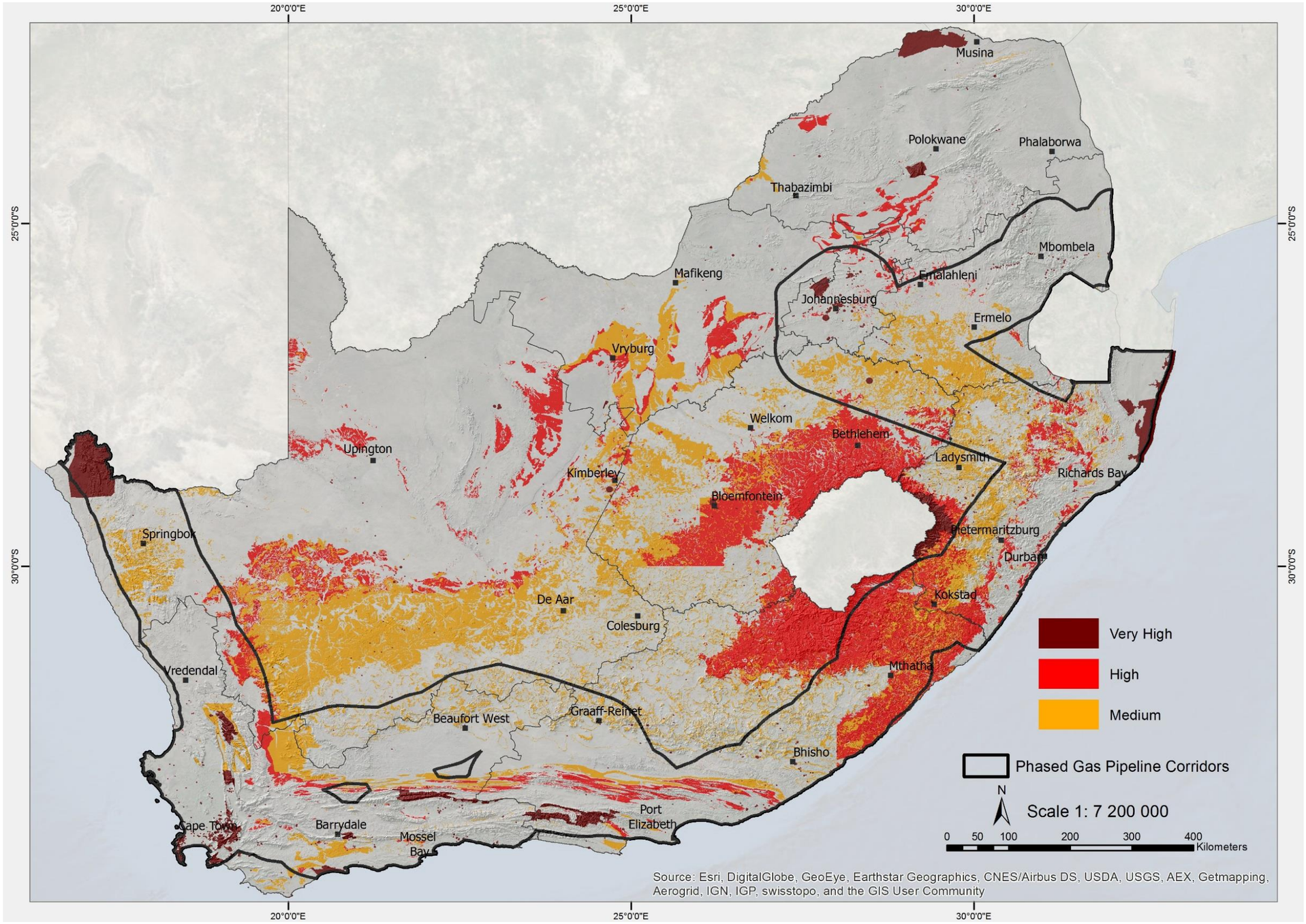

Map 6: Heritage (Palaeontology and non-palaeontology) sensitivity map for Gas Pipeline Development in the corridors

2.4.5 Interpretation of Sensitivity Maps

The four-tier sensitivity map (Map 6) identified the presence of known heritage resources and the areas in which the likelihood of longer and more expensive HIAs involving mitigation of heritage resources is higher. It should be noted that a HIA is required when it is anticipated that there will be impacts on significant heritage resources for a particular development proposal. This differs from a heritage survey which identifies, records and grades heritage resources with no particular development proposal in mind. Given the large size of South Africa, most HIAs incorporate a heritage survey but the two activities are not necessarily synonymous. The four-tier sensitivity map does not account for areas already thoroughly surveyed (either through research or during HIAs). Depending on the development proposal, a HIA may or may not be required in these areas (DEA, 2016). Here below is a short summary of the explanation of the combined four-tier sensitivity map.

Table 11: Interpretation of Heritage Sensitivity Maps

Sensitivity Class	Interpretation	Implementation and additional assessments at project level (*)	Permit requirements (if any)
Very High	This category includes • Grade I and II Heritage sites; • World, National and Provincial Heritage Sites with their related buffer zones, i.e. a buffer zone of 2 km and 1 km implemented around these sites respectively. World Heritage Sites have their own defined buffer zones; • The proposed site is located on areas of Very High sensitivity as indicated by the SAHRIS palaeontological sensitivity map (red areas). These areas are formally protected areas under the NHRA and the World Heritage Convention Act (Act No. 49 of 1999) and should be avoided.	Areas of very high sensitivity are areas which are formally protected under the NHRA and the World Heritage Convention. An Archaeological/Palaeontological Impact Assessment must be undertaken within these areas and their prescribed buffer zones. Areas of very high palaeosensitivity require a PIA during the design phase, inclusive of a field assessment.	Permit required under Section 27 of NHRA from: • SAHRA for any possible impact on Grade I National Heritage Sites; and • PHRAs for impact on Grade II Provincial Heritage Sites. Additional permit from the Management Authority of the Fossil Hominid Sites of South Africa. Additional permit from SANParks, where required.
High	High sensitivity represents areas which are or have the potential to be highly sensitive in terms of heritage resources because either: • Previous assessment of the area has identified palaeontological/archaeological heritage resources which are classified as being of high significance; or • The proposed site is located on areas of High sensitivity as indicated by the SAHRIS palaeontological sensitivity map (orange/yellow areas); or • There is a high probability of encountering a significant heritage resource; or • There is the potential to include cultural heritage resources which will require conservation or lengthy mitigation.	A general avoidance strategy should be taken but mitigation might be allowed under certain circumstances if avoidance is not possible. It is expected that HIAs or PIAs will then be required for proposed developments in these areas and that some sites may be identified which will require mitigation, thereby increasing costs and lengthening the timeframes of the applications. PIA: Desktop study during design phase. Walk through orange areas of selected route and report before excavation activities (by respective specialist)	Note no permits are required for surveys. For sites of significance identified during future surveys, permits under Section 35 of the NHRA will normally be required from the relevant heritage authority if impacts are envisaged[5].
	Sites of high significance: IIIa sites with 150m buffer zone.		For significant sites already recorded or identified during future surveys, permits will normally be required from the relevant heritage authority if impacts are envisaged.

[5]See previous footnote about HWC's process for handling the permitting process under Section 38 of the NHRA. Note that Heritage Western Cape currently does not require 'permits' for generally protected heritage resources under the NHRA when developments trigger Section 38 of the NHRA. Instead, a work plan is required which is very similar to a permitting process.

Sensitivity Class	Interpretation	Implementation and additional assessments at project level (*)	Permit requirements (if any)
Medium	Medium sensitivity represents areas which are, or have the potential to be, sensitive to development in terms of heritage resources because either: • Previous assessment of the area has identified heritage resources which are considered to be of medium significance; or • The proposed site is located on areas of moderate and unknown sensitivity in the SAHRIS palaeontological sensitivity map (green/white areas); or • There is a moderate probability of encountering significant heritage resources.	It is expected that HIA/PIA will be required for proposed developments in these areas and that some sites may be identified which will require mitigation, thereby increasing costs and lengthening the timeframes of the applications. However, such sites are expected to be less sensitive or extensive than in high sensitivity areas. Areas of moderate and unknown palaeontological sensitivity will require desktop studies during the design phase.	Note no permits are required for surveys. For sites of significance identified during future surveys, permits under Section 35 of the NHRA will normally be required from the relevant heritage authority if impacts are envisaged.
	Sites of medium significance: IIIb sites with 100m buffer zone.		For significant sites already recorded or identified during future surveys, permits will normally be required from the relevant heritage authority if impacts are envisaged.
Low	Low sensitivity represents areas which are not likely to be sensitive to development in terms of heritage resources because either: • Previous assessment has revealed the area to contain no resources or resources of low significance; or • The proposed site is located on formations of low sensitivity in the SAHRIS palaeontological sensitivity map (blue areas); or • There is a low probability of encountering significant heritage resources.	For sites known to contain no resources, no further assessment is necessary for the proposed development in these areas. In areas where there is a low chance of finding heritage material of significance (the majority of the lowlands and areas already fully assessed), a HIA is required but it is expected that no material of significance requiring extensive mitigation will be identified. In areas of low palaeontological sensitivity, a palaeontological chance find procedure should be requested to be included in the EMPr and reviewed by a specialist.	For sites of significance identified during future surveys, permits will normally be required from the relevant heritage authority if impacts are envisaged.
	Sites of low significance: IIIc sites with 50 m buffer zone.	Where Grade IIIc sites occur the sites have generally been recorded sufficiently and are of low significance – no further mitigation is normally required for these sites.	No permit is required for development to proceed in these areas.

(*) NOTE: Motivating for exemption from a PIA/HIA - A PIA/HIA may not be required if such motivation is included in the initial notification prepared by a competent heritage specialist. In order to motivate for a PIA/HIA not to be required the inputs from a heritage specialist is required as part of the notification. Site visits to inform the notification may also be necessary to motivate for a PIA/HIA not to be required, and are up to the discretion of the specialist providing input to the notification. In most cases, it will be sufficient for only the heritage specialist preparing the notification to visit the site before an exemption from further assessment can be motivated. If exemption from further assessment is motivated, the notification must contain proposed mitigation measures for inclusion in the EMPr.

2.4.6 Conclusions and General Recommendations

The following general recommendations for the management of heritage resources have been identified, and additional detail will be provided in the EMPr:

- In general, important heritage sites that are small in spatial extent need to be protected through implementation of buffers, as noted above.

- Where significant subsurface heritage resources occur, Environmental Control Officers (ECOs) will need to be appointed and need to be made aware of and become familiar with identifying such heritage, in order to prevent loss of highly significant palaeontological, archaeological and palaeoanthropological resources.

- Carry out general monitoring of excavations for potential fossils, artefacts and material of heritage importance. Monitoring of excavations, especially in highly sensitive fossil areas, will prevent loss of data and greatly contribute to the scientific understanding of these heritage resources.

- In general, following the routes of existing linear infrastructure servitudes (where possible) will reduce cultural landscape impacts to a degree (however the findings of all relevant specialist studies need to be taken into consideration in order to determine if potential cumulative impacts are acceptable).

- Shell middens and artefact scatters are not visually sensitive but have scientific value and should be avoided during gas pipeline and associated infrastructure construction. Contrastingly rock art sites, historic farmhouse complexes, and built environment and historic sites are much more visually sensitive and should be buffered. Such buffering will ensure protection of the sites and their contexts.

- Farmsteads and other structures older than 60 years may be located in rural areas. These will also require assessment and possibly buffering.

- Identify, demarcate and prevent impact to all known sensitive heritage features on site.

- All work must cease immediately, if any human remains and/or other archaeological, palaeontological and historical material are uncovered. Such material, if exposed, must be reported to the nearest museum, archaeologist/ palaeontologist (or the South African Police Services), so that a systematic and professional investigation can be undertaken. Sufficient time should be allowed to remove/collect such material before development recommences.

- During the construction phase, consultation with affected and surrounding communities will be important in terms of grave finds and management of heritage sites. It is also important to consult with affected communities during the planning stage to identify the location of any informal burial grounds.