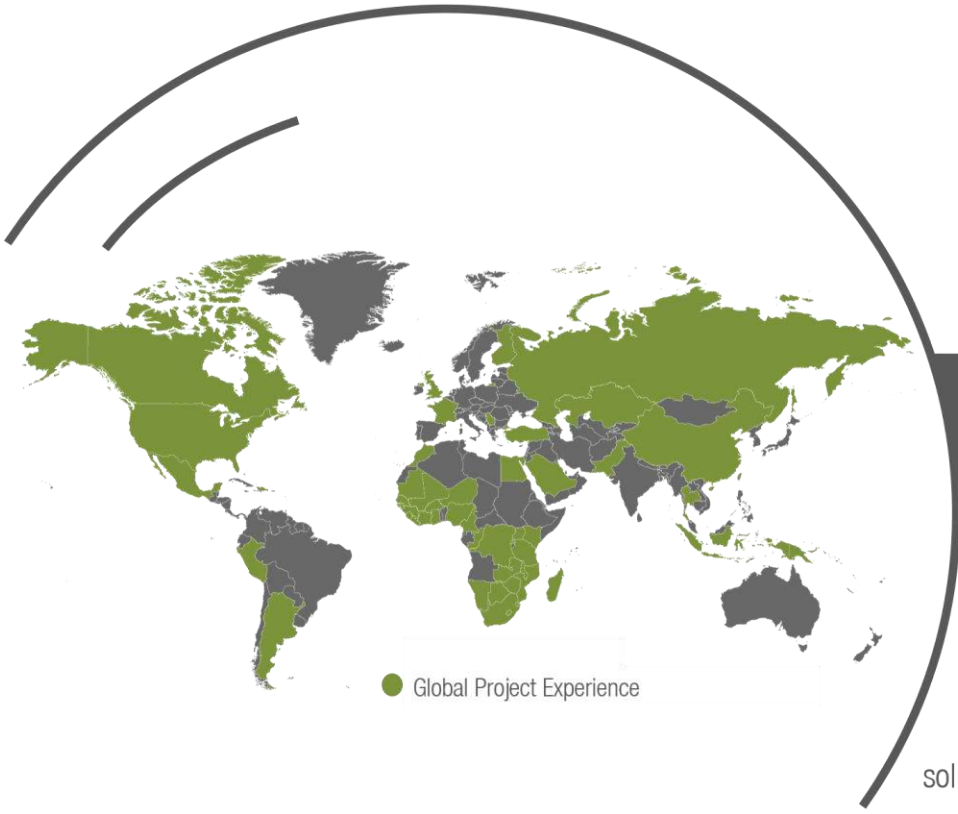

DIGBY WELLS
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Arnot South Environmental Authorisation and Water Use License Application

Visual Impact Assessment

Prepared for:
Universal Coal PLC

Project Number:
UCD6802

August 2021

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This document has been prepared by Digby Wells Environmental.

Report Type:	Visual Impact Assessment
Project Name:	Arnot South Environmental Authorisation and Water Use License Application
Project Code:	UCD6802

Name	Responsibility	Signature	Date
Prevlan Chetty	GIS and Remote Sensing Specialist		August 2021
Alistair Main	Technical Review		August 2021
Xan Taylor	Project Manager		August 2021

EXECUTIVE SUMMARY

Digby Wells Environmental (hereafter Digby Wells) has been requested to submit a Visual Impact Assessment for Arnot South's Environmental Authorisation (EA) and Water Use Licence (WUL) application to authorise the proposed underground Arnot South operation. The Prospecting Right, MP 30/5/1/1/2360 PR was issued to Exxaro Resources, and the Applicant for this process will be Exxaro Coal Mpumalanga (Pty) Ltd to mine coal on various farms covering approximately 16,000 (ha) in extent.

As part of the authorisation process, a Visual Impact Assessment (VIA) was conducted on the current operation design to determine the potential visual impacts that could arise from the development of the project on the surrounding environment. Digby Wells has applied a series of quantitative modelling techniques to determine the potential magnitude and spatial distribution of the visual impacts. The approach adopted by Digby Wells includes a characterisation of the project area in terms of its existing sense of place which is a critical factor in determining the relative influence that a coal-mining project has on an area. Once the sense of place was established, the potential receptors within a 20-kilometre zone of influence were identified and categorised. Multiple viewsheds were then run on the most prominent components that have been proposed, included the discard and overburden dumps, product stockpiles, plant, box-cut, vent shaft, pollution control dam and supporting ancillary infrastructure (workshops, offices, etc.).

The findings from the viewshed analysis indicate that the discard dump will potentially have the largest visual impact influence on the surrounding environment, followed by the overburden dump extending up to 18-kilometres away from the project development site. Importantly, the effective visual screening offered by the surrounding hills restricts the remainder of the viewshed modelling results across the mines various other infrastructure elements to the immediate project area within ten-kilometres of the project development site.

The VIA indicates that with specific regards to motorists, the N11 and R38 have limited sections of visual exposure, from which mitigation measures have been suggested to minimise visual impacts. Homestead and farming related structures that are within the high visual exposure zones have been identified, and mitigation measures are suggested to minimise the anticipated visual impact from the Project development. An effective method of mitigation would be in the form of treelines which should be placed closer to the location of the identified receptors. It must however be noted that due to the height of the proposed infrastructure the suggested mitigation measures are likely to reduce but not completely negate any potential visual impact. The remainder of receptors in the region are dispersed settlements occurring on the farms in and around the project development site. The existing sense of place was found to be characterised by open-cast coal mines in the surrounding area, with the Arnot power station 18-kilometres away. In relation to the open-cast coal mining operations that are found in the region, it is anticipated that the visual impact from a underground based coal mine would be significantly lower than that of an open-cast operation.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1. Introduction

Digby Wells Environmental (hereafter Digby Wells) has been requested by Universal Coal PLC undertake the environmental-legal application processes to authorise the proposed underground Arnot South operation. The Prospecting Right, MP 30/5/1/1/2360 PR was issued to Exxaro Resources, and the Applicant for this process will be Exxaro Coal Mpumalanga (Pty) Ltd. As part of the Environmental Impact Assessment (EIA) process, the Visual Impact Assessment (VIA) assesses the potential visual consequences that may follow from the proposed development. This specialist VIA report has been compiled in terms of Appendix 6 of the National Environmental Management Act (NEMA) EIA regulations, 2014 (as amended).

2. Project description

The proposed Arnot South Project is located within the Witbank Coalfield of Mpumalanga Province. The Project area lies on the eastern margin of the Witbank Coalfield and comprises sediments of the coal-bearing Ecca Group of the Karoo Basin. The Witbank Coalfield falls within the Vryheid Formation of the Ecca Group. Exxaro proposes to extract coal through underground mining methods with a confirmed Life of Mine (LoM) of 17 years. The mineral reserve consists of one economically mineable underground block (No. 2 coal seam), producing approximately 2.4 million tonnes per annum (Mtpa) of Run of Mine (ROM) coal for approximately 17 years. Further drilling will be required to confirm a resource to the south of the Mining Right area. The potential future resource of the remaining ROM coal is approximately 32,912,300 tonnes, allowing an additional mining period of approximately 13 years.

The Arnot South Prospecting Area is approximately ten kilometres (km) east of Hendrina, 25 km west of Carolina, and 50 km southeast of Middelburg. The Project is near two of Eskom's power stations, namely Hendrina and Arnot. There are five farm homesteads situated within the planned underground mining area, and a small watercourse runs in a northeast direction across the northern half of the mining area. The land is currently mainly used for game farming. The target area for mining lies mainly on the farms Weltevreden 174 IS, Mooiplaats 165 IS, Vlakfontein 166 IS, and Schoonoord 164 IS.

The Prospecting Right was renewed in September 2017 and lapsed on 10 September 2020. However, a Mining Right Application (MRA) and Mine Works programme (MWP) for underground mining were submitted to the Department of Mineral Resources and Energy (DMRE) prior to the lapsing date (on 8 September 2020). The Applicant was issued reference number MP 30/5/1/2/2/10292 MR.

The Mining Right boundary includes the following farms:

- Groblersrecht 175 IS
- Mooiplaats 165 IS
- Schoonoord 164 IS
- Vlakfontein 166 IS

- Tweefontein 203 IS
- Vaalwater 173 IS
- Weltevreden 174 IS
- Nooitgedacht 493 JS
- Leeuwpan 494 JS
- Vryplaats 163 LQ
- Helpmakaar 168 IS
- Op Goeden Hoop 205 IS
- Klipfontein 495 JS

The target area for mining and mining-related infrastructure lies mainly on the farms Weltevreden 174 IS, Mooiplaats 165 IS, Vlakfontein 166 IS, and Schoonoord 164 IS. The farms are located within the jurisdictions of Steve Tshwete Local Municipality (STLM) and Chief Albert Luthuli Local Municipality (CALLM), situated in the Nkangala District Municipality (NDM) and Gert Sibanda District Municipality (GSDM), respectively, in the Mpumalanga Province. Figure 2-1 shows the regional location of the proposed project, while Figure 2-2 shows the local setting of the project with the affected and surrounding farm boundaries.

2.1. Proposed infrastructure and activities

The construction, operation and decommissioning phases of the Project shall comprise of the activities in Table 2-1. These Project activities will be used for the impact assessment.

Table 2-1: Project Phases and Associated Activities

Project Phase	Activity
Construction Phase	Removal of vegetation / topsoil for establishment of mining and linear infrastructure
	Diesel storage and explosives magazine
	Construction of additional infrastructure, and ventilation fans (Noise generation/ increased noise level)
	Construction of access road and haul roads
	Stockpiling of soils, rock dump and discard dump establishment.
Operational Phase	Ventilation fans and infrastructure area containing stockpile areas
	Underground blasting
	Maintenance of haul roads, pipelines, machinery, water, effluent and stormwater management infrastructure and stockpile areas.
	Removal of rock(blasting)
	Concurrent rehabilitation as mining progresses
	Demolition and removal of infrastructure

Project Phase	Activity
Decommissioning Phase	Post-closure monitoring and rehabilitation
	Closure of the underground mine

Figure 2-3 shows the proposed infrastructure layout for the operation.

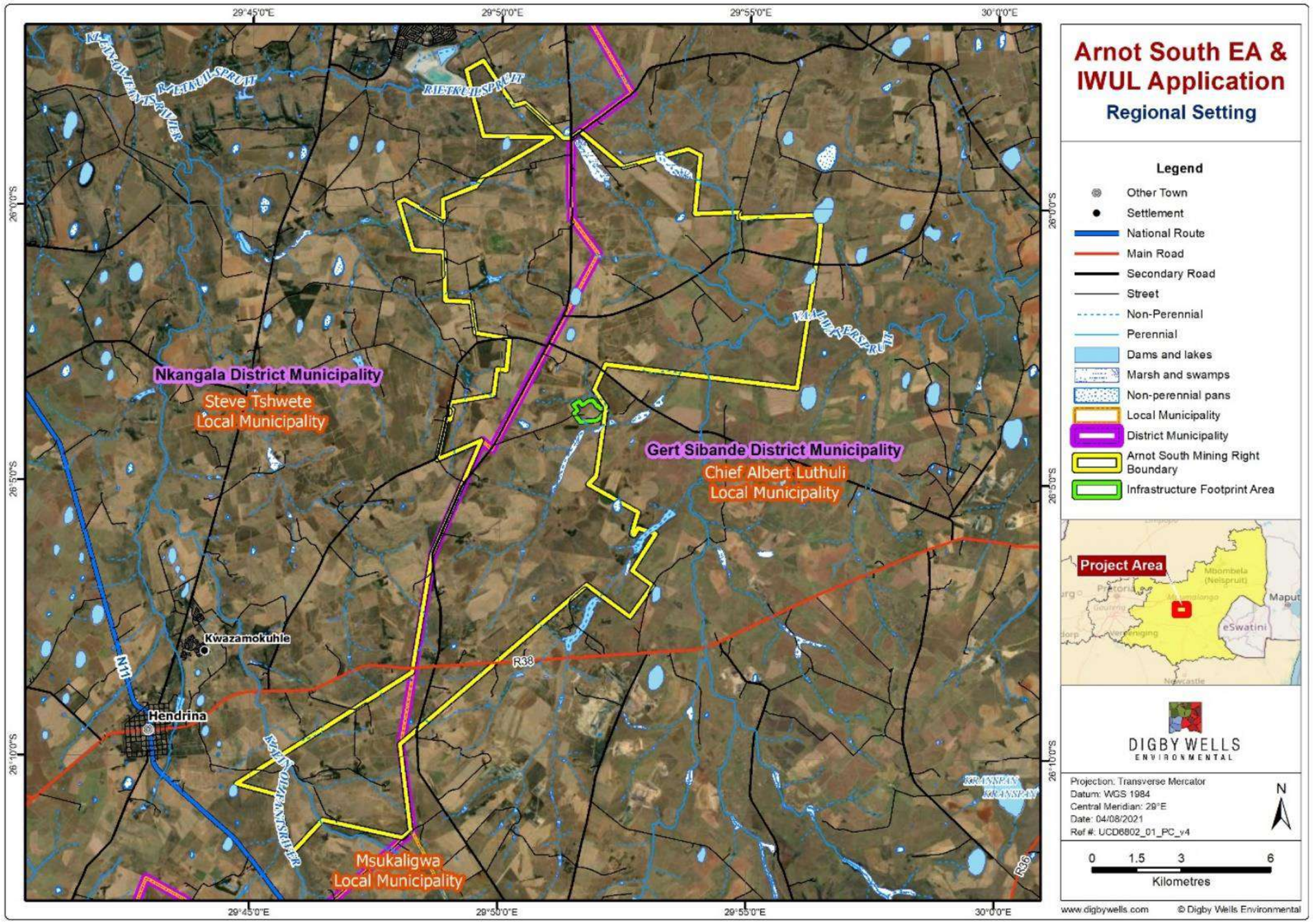

Figure 2-1: Regional setting

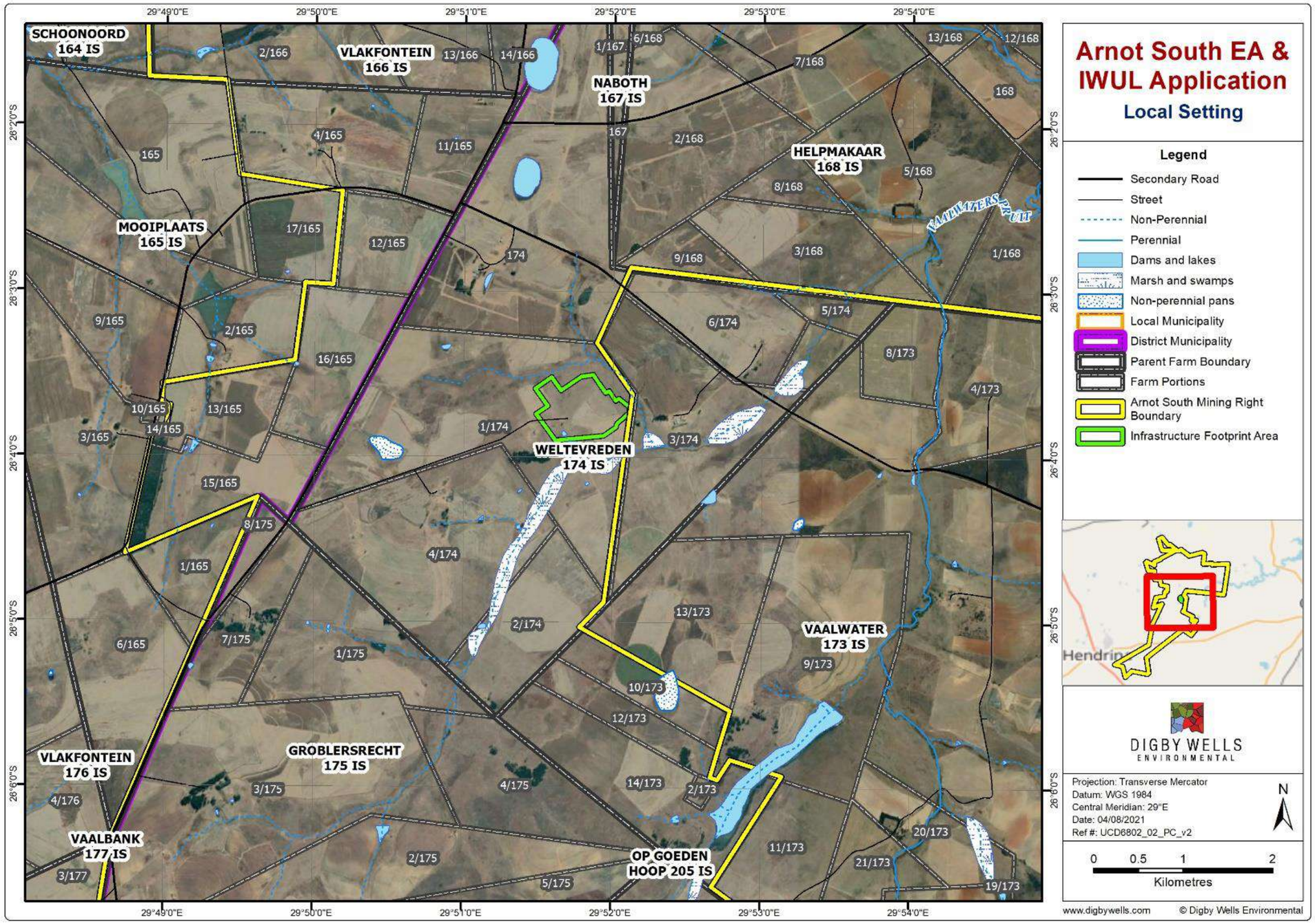

Figure 2-2: Local setting

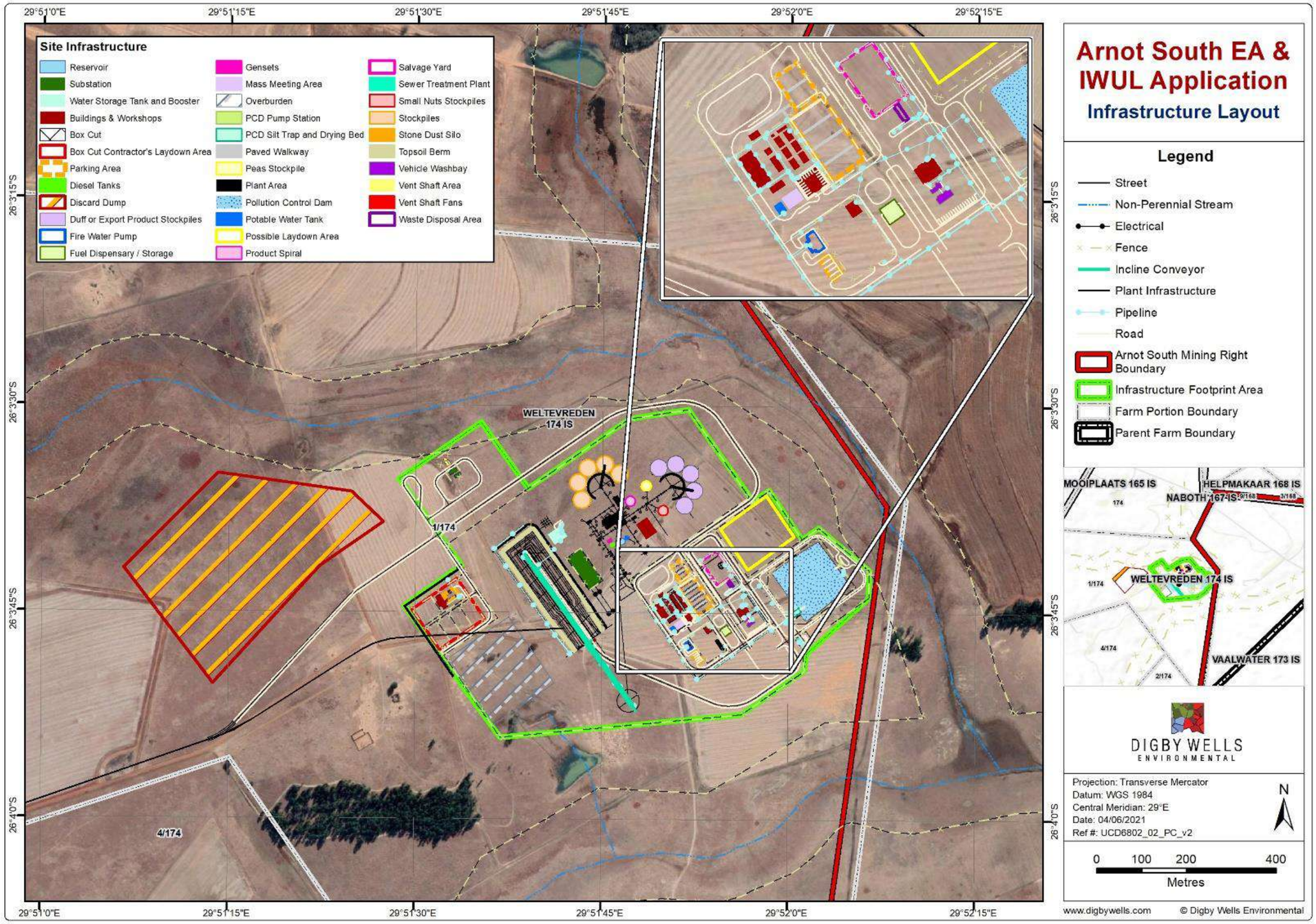

Figure 2-3: Infrastructure layout

2.2. Topography

A desktop study was conducted to evaluate the topography of the receiving environment along with an evaluation of aerial and satellite imagery. Figure 2-5 provides an overview of the regional topography for the region, which indicates an elevation range from 1,565 metres above mean sea level (m.a.m.s.l.) in the Klein-Olifants River to 1,745 m.a.m.s.l., which characterises the area as a moderate undulating terrain with low hills and pan depressions. The hills in the region have an elevation range between 60 and 100 meters, which is conducive to moderate-to-high visual screening. Figure 2-6 provides a cross sectional view along profiles drawn from a North-South and East-West orientation.

2.3. Vegetation

The regional vegetation is classified as Eastern Highveld grassland, defined by highveld short dense grass land (Arsitida, Digitaria, Erafrostsis, Themeda, Tristachya etc.). Woody species are sporadically distributed throughout the region. The regional vegetation characterisation is not conducive to high visual screening, with the exception of the sporadic woody species. Figure 2-7 provides an overview of the regional vegetation in the area.

The immediate project areas field investigation that was conducted in April 2021 by DWE concluded that the vegetation habitats within the Project Area include, grasslands, wetlands, outcrops of sandstone and ferricrete and modified areas. Project Area comprises of Wetlands, Grasslands (Primary and Secondary), Rocky Outcrops (Sandstone Sheaths and Ferricrete Outcrops) and Cultivated (transformed and/or modified) units.

Figure 2-4 shows the regional vegetation characterisation, looking towards the project area from a north-easterly direction.

Figure 2-4: Regional vegetation field photo

2.4. Existing environment

The Gert Sibande District Municipality is the largest of three districts in Mpumalanga, with numerous strategic national roads passing through it. The mining and manufacturing sectors are the strongest economic drivers in the municipality. The region is relatively sparsely populated when compared to the economic hubs and regional services centres such as Emalahleni and Middleburg. Within the immediate and surrounding area to the proposed development area, there are no large aggregates of community settlements, but rather disperse settlement patterns that are associated with the farms in the region.

The VIA focuses on a 20-kilometre zone of influence around the proposed development area, which is characterised by open-cast coal mining activity, with the closest coal mine within ten kilometres of the development site (Goedehoop). Coal mining operations in the region are relatively small when compared to the Witbank coal-fields and operate with an open-cast mining method. In terms of supporting infrastructure, the region contains roads, electrical power supply and railway lines. The closest coal fired power station is within 15-kilometres of the proposed development.

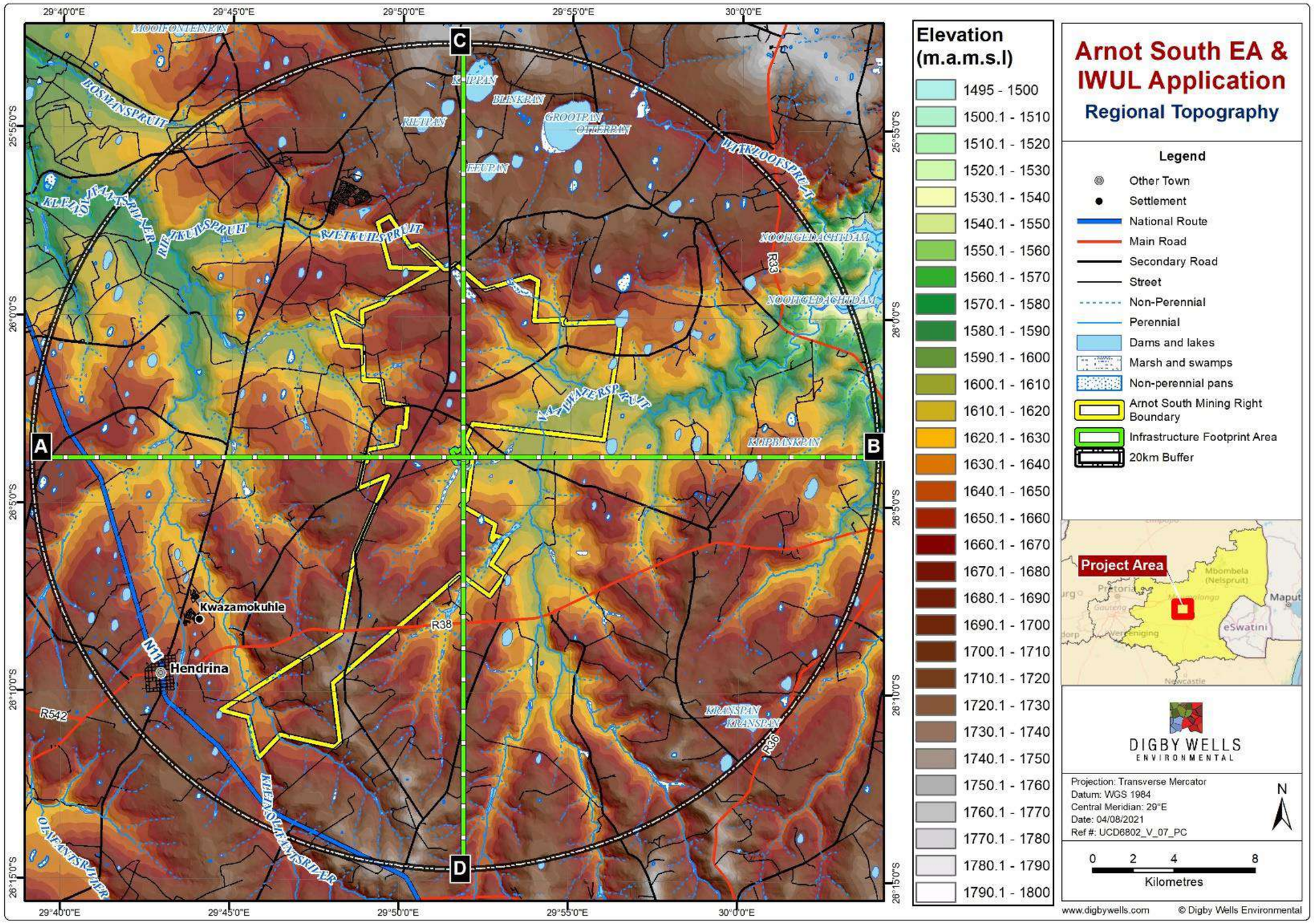

Figure 2-5: Regional topography

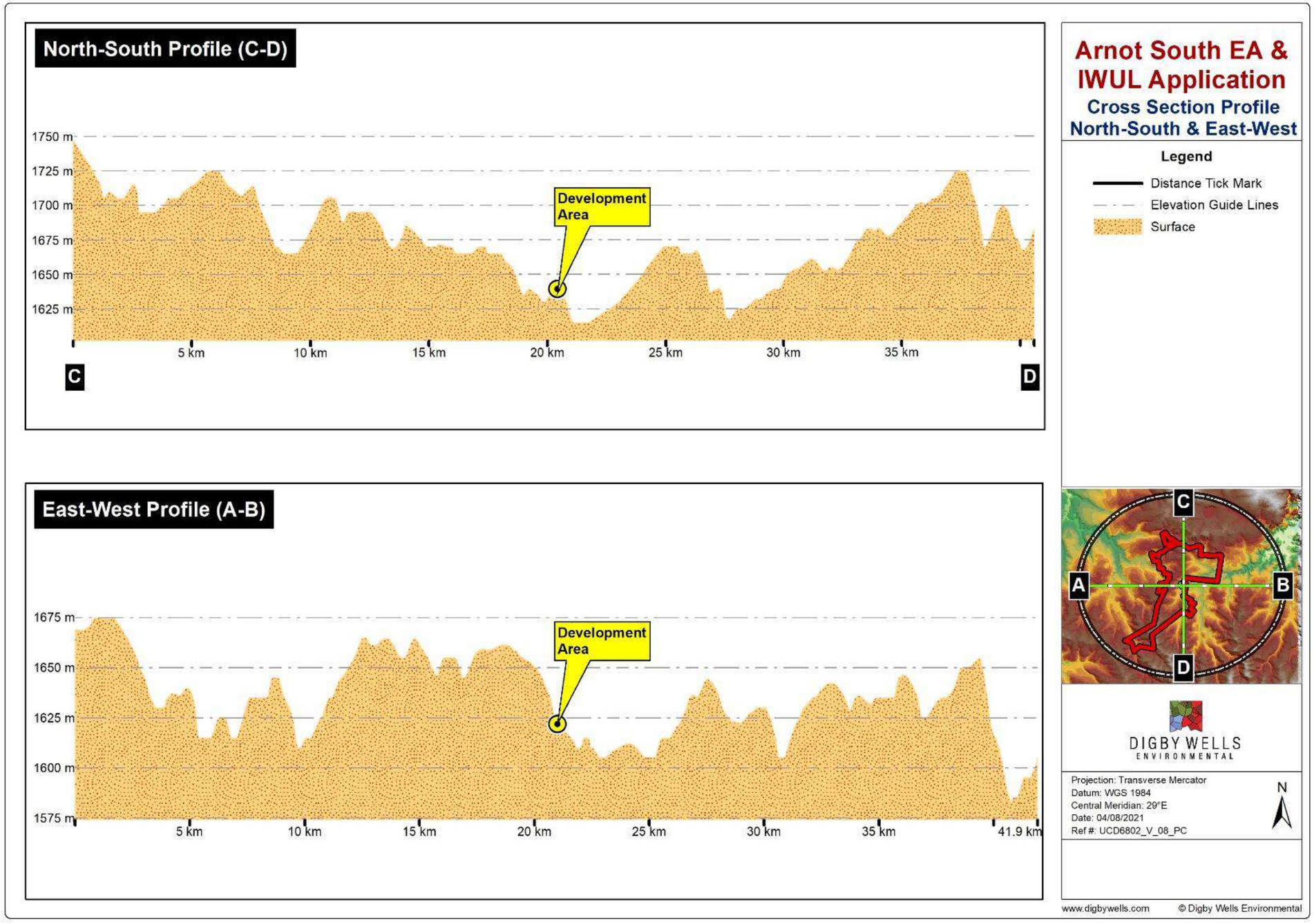

Figure 2-6: Regional cross sectional profiles

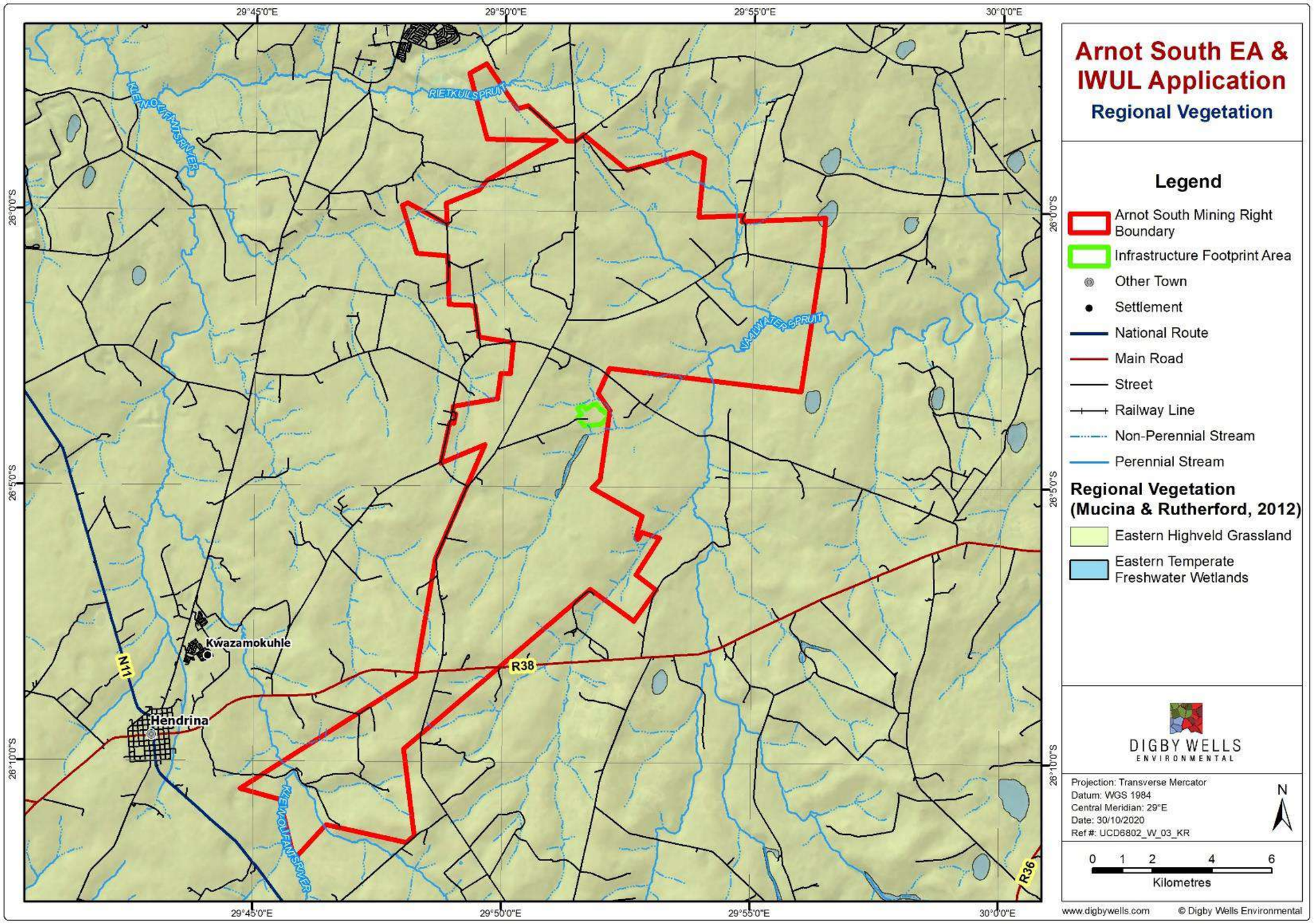

Figure 2-7: Regional vegetation

2.5. Alternatives considered

2.5.1. Technology alternatives

The proposed mine will be an underground mine and bord and pillar mining with continuous miners and shuttle cars will be used. There are two main types of washing processing technology which could be used for coal beneficiation, namely: dry processing and wet washing. The preferred technology for the Arnot South Project is wet washing. The coal shall be beneficiated through a double-stage dense medium washing plant to produce export and Eskom products. The washing plant feed conveyor shall feed a 3.0 m by 6.0 m single deck horizontal desliming screen where the 50 mm by zero mm shall be wet screened on a 1.0 mm deck.

2.5.2. The “no-go alternative”

The No-go alternative is the option of not mining coal in the area. This option also means that all potential negative impacts associated with the proposed mine and its associated infrastructure would not occur. However, the potential benefits associated with the Project would also not occur. According to the Nkangala District Environmental Management Framework, the area within which the proposed Project falls has been earmarked for mining and power generation development as these two sectors currently drive the economic value of production in the Project area. If the Project were not to proceed, the additional economic activity, skills development and available jobs would not be created, the coal reserve would remain unutilised and the economic activities would continue as at present, with little economic growth developing in the region. With the proven coal reserve in the Witbank Coalfield, prohibiting the Project from proceeding will not only impede valuable socio-economic opportunities in the Arnot South Project area but South Africa as a whole.

3. Terms of reference

The Terms of Reference (ToR) for the VIA are to:

- Describe the baseline visual characteristics of the proposed Project site and surrounding area.
- Identify, describe, and assess the expected significance of potential visual impacts that may arise due to the implementation of the project.
- Recommend appropriate mitigation measures and management actions to avoid or minimise potential negative impacts with the proposed project.

4. Relevant legislation, standards and guidelines

The VIA has been completed in terms of NEMA Environmental Impact Assessment (EIA) Regulations, 2014 (as amended) Appendix 6: Specialist Reports. Where applicable, the Report uses references from the International Finance Corporation’s (IFC) Performance Standards.

At a national level, the following legislative documents potentially apply to the visual assessment:

- Regulations in Chapter 5 (Integrated Environmental Management) of the NEMA, 1998 (Act No. 107 of 1998) (NEMA) and the Act in its entirety. The Act states that "the State must respect, protect, promote and fulfil the social, economic and environmental right of everyone…" Landscape is both moulded by, and moulds, social and environmental features;
- The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) and related provincial regulations – in some instances there are policies or legislative documents that give rise to the protection of listed sites. The NHRA states that it aims to promote "good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed for future generations". A holistic landscape whose character is a result of the action and interaction and/or human factors has strong cultural associations as societies and the landscape in which they live are affected by one another in many ways; and
- Section 17 of the National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEM: PAA) sets out the purposes of the declaration of areas as protected areas which includes the protection of natural landscapes. Landscapes are defined by the natural, visual and subjectively perceived landscape; these aspects of a landscape are intertwined to form a holistic landscape context.

In addition, the VIA utilises the "Guideline for involving visual and aesthetic specialists in EIA processes" document by Oberholzer (2005) has been used as a best practice guideline for this Visual Impact VIA. Although these guidelines were developed for the Western Cape province of South Africa they are relevant for this VIA as "the guidelines promote the principles of EIA best practice without being tied to specific legislated national or provincial EIA terms and requirements" (Oberholzer, 2005).

5. Assumptions, limitations and exclusions

The constraints and limitations to the impact assessment are presented in Table 5-1 below.

Table 5-1: Applicable Constraints and Limitations and their Consequences

Constraint or Limitation	Consequence
At the time of the compilation of the report, the infrastructure heights associated with the project design were unavailable. To effectively model the potential visual impact, assumptions were drawn using existing UCD facilities as a baseline.	Attempts were made to model the "worst-case" scenario. As such, the modelling outputs are limited to the assumed heights that were used at the time of the study.

6. Data

The datasets utilised as part of this assessment are presented in Table 6-1 below.

Table 6-1: Datasets utilised

Dataset	Description	Application
5m National Geospatial Institute (NGI) Contours	The 5 m-resolution contour dataset from the DRDLR is generated by the Intergraph Dual Mass Camera (DMC) which captures stereo imagery at a GSD of 0.5 m (NGI, 2018). The NGI also contracts service providers with similar cameras to acquire data owing to the scale of the operation. Currently, the NGI aims to capture 40% of the country every 3 years and the remaining areas every 5 years. The dataset included in this research is the 5 m contour dataset (referred to as the NGI dataset), which was last updated 8 December 2009, for the study area	The 5m NGI contours were used to generate a continuous representation of the earths surface over the project area and its surroundings.
Client provided infrastructure layout	Infrastructure designs were provided to DWE in CAD format representing the various infrastructure components and footprints.	The CAD data was converted to a GIS-native format (Shapefile) which formed the basis of the areas to be modelled.
Open Street Map (OSM) datasets	OSM datasets are community driven, publically available datasets representing spatial points of interest. This includes roads and spatial points of interest such as tourist attractions and accommodation.	The OSM data was utilized to identify potential receptors.
Satellite Imagery – Google Earth Platform	Google Earth provided access to satellite imagery over the project site. The latest imagery date over the regional project area is dated to the 30/06/2020.	The satellite imagery was utilized to interpret receptor locations.

7. Methodology

This section of the report describes the methodology adopted in determining the status quo of the visual environment on the various Project sites.

7.1. Determining the baseline environment

Determinations of the baseline environment are critical in characterising the existing sense of place for the study area. The sense of place is composed of the topography, the regional vegetation and the existing environment. As per the Oberholzer environment categorisation, the project area is best described as an area of medium scenic, cultural or historical significance.

7.2. Receptor identification

Potential receptors were identified using the 2018 national land use data as distributed by the Department of Forestry, Fisheries and the Environment. In addition, Digby Wells identified the locations of disperse settlements which characterise the region using the available satellite and aerial imagery in conjunction with Open Street Map datasets which includes the distribution of road networks and other points of significant interest. Receptors that are regarded as sensitive to visual impacts include residents, tourists and motorists.

7.3. Viewshed Modelling

The topographical representation of the project area was derived using the 5m NGI contour dataset, which was interpolated to represent a continuous raster surface. Using geospatial modelling techniques, a series of viewsheds were then run using individual infrastructure features which commonly have the largest visual prominence. The viewshed modelling techniques applied utilise a combination of ArcGIS and GlobalMapper software environments to identify areas from which the proposed development will be potentially visible. The procedure then also categorises the magnitude of visual impact which is determined by the distance from the development and how much of the infrastructure is visible to the receptor area. Visual exposure and the visual impact of a development diminish exponentially with distance (Oberholzer, 2005).

The concept of viewshed modelling is depicted in Figure 7-1: Theoretical background of viewshed modelling. The topography denotes whether a development will be visible from a receptor. In Figure 7-1 the development is only visible from the receptors within the valley and on the slopes of the hills facing it. The development will be hidden from all receptors beyond the first hills.

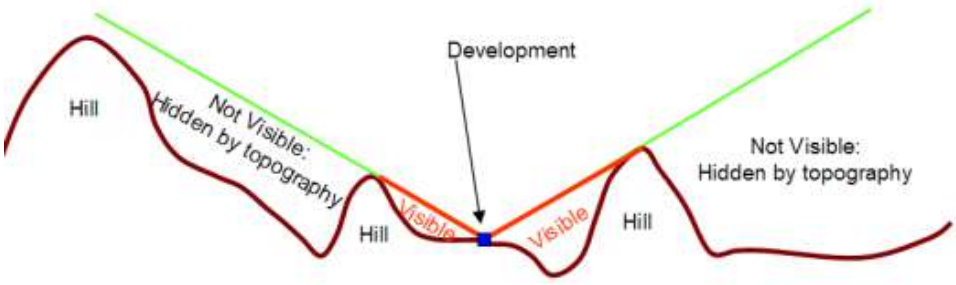

Figure 7-1: Theoretical background of viewshed modelling

Viewshed models were created for daytime conditions only. These viewshed models are based on the topography only and do not take the screening effect of vegetation into account. The viewshed models depict worst case scenarios and show the areas from which the Project may potentially be visible.

Based on findings from the field work, along with the sense of place categorisation for this project, the zone of influence was determined to be within 20-kilometre. Table 7-1 below lists the various infrastructure elements that were run as part of the assessment.

Table 7-1: Infrastructure viewshed modelling parameters

Infrastructure	Offset Height
Discard Dump	30-meter
Box-cut & Berm	5-meter
Overburden Stockpile	20-meter
Vent Shaft	5-meters
Product Stockpiles & Plant	10-meter
Workshops, Offices & PCD Area	5-meter

7.4. Impact assessment methodology

Impacts and risks have been identified based on a description of the activities to be undertaken. Once impacts have been identified, a numerical environmental significance rating process will be undertaken that utilises the probability of an event occurring and the severity of the impact as factors to determine the significance of a particular environmental impact.

The severity of an impact is determined by taking the spatial extent, the duration and the severity of the impacts into consideration. The probability of an impact is then determined by the frequency at which the activity takes place or is likely to take place and by how often the type of impact in question has taken place in similar circumstances.

Following the identification and significance ratings of potential impacts, mitigation and management measures will be incorporated into the Environmental Management Plan (EMP).

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an impact occurring

And

Nature = Positive (+1) or negative (-1) impact

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts.

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 7-2. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation has been applied; post-mitigation is referred to as the residual impact. The significance of an impact is determined and categorised into one of eight categories (Table 7-2). The descriptions of the significance ratings are presented in Table 7-3.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, (i.e., there may already be some mitigation included in the engineering design). If the specialist determines the potential impact is still too high, additional mitigation measures are proposed.

Table 7-2: Impact assessment parameter ratings

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Irreplaceable loss or damage to biological or physical resources or highly sensitive environments. Irreplaceable damage to highly sensitive cultural/social resources.	Noticeable, on-going natural and/or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent The impact is irreversible, even with management, and will remain after the life of the project.	Definite There are sound scientific reasons to expect that the impact will definitely occur. > 80% probability
6	Irreplaceable loss or damage to biological or physical resources or moderate to highly sensitive environments. Irreplaceable damage to cultural/social resources of moderate to high sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond Project Life The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost Certain/Highly Probable It is most likely that the impact will occur. < 80% probability

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
5	Serious loss and/or damage to biological or physical resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/Region Will affect the entire province of region.	Project Life (> 15 years) The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely The impact may occur. < 65% probability
4	Serious loss and/or damage to biological or physical resources or moderately sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures/items of cultural significance.	Average to intense natural and/or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long Term 6-15 years and the impact can be reversed with management.	Probable Has occurred here or elsewhere and could therefore occur. < 50% probability

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
3	Moderate loss and/or damage to biological or physical resources or low to moderately sensitive environments, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium Term 1-5 years and the impact can be reversed with minimal management.	Unlikely Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. < 25% probability
2	Minor loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experienced by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short Term Less than 1 year and is reversible.	Rare/Improbable Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. < 10% probability

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to common place structures.	Some low-level natural and/or social benefits felt by a very small percentage of the baseline.	Site Specific Limited to specific isolated parts of the site.	Immediate Less than 1 month and is completely reversible without management.	Highly Unlikely/None Expected never to happen. < 1% probability

Table 7-3: Probability/Consequence matrix

Probability	Significance																																						
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	-21	**-20**	**-19**	**-18**	**-17**	**-16**	**-15**	**-14**	**-13**	**-12**	**-11**	**-10**	**-9**	**-8**	**-7**	**-6**	**-5**	**-4**	**-3**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
Consequence																																							

8. Results

8.1. Categorisation of Visual Impacts

The expected visual impact of the Project was categorised based on the type of receiving environment and the type of development as detailed in Table 8-1 (Oberholzer, 2005). The table provides an indication of the visual impacts that can be expected for different types of developments in relation to the nature of the receiving environment. Following this classification system, the Project is classed as a **Category 5 development**. The receiving environment is best described as an **area of medium scenic, cultural or historical significance**. It is therefore expected that the Project will potentially have a **high visual impact** on the receiving environment as shown in Table 8-2.

Table 8-1: Key to Categorisation of Development (adapted from Oberholzer, 2005)

Type of Development	Examples of Development
Category 1	Nature reserves, nature related recreation, camping, picnicking, trails and minimal visitor facilities.
Category 2	Low-key recreation/resort/residential type development, small-scale agriculture/nurseries, narrow roads and small-scale infrastructure.
Category 3	Low density resort/residential type development, golf or polo estates, low to medium-scale infrastructure.
Category 4	Medium density residential development, sports facilities, small-scale commercial facilities/office parks, one-stop petrol stations, light industry, medium-scale infrastructure.
Category 5	High density township/residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, large-scale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

Table 8-2: Categorisation of Expected Visual Impact (adapted from Oberholzer, 2005)

Type of Environment	Type of Development (Low to High Intensity)				
	Category 1 Development	**Category 2 Development**	**Category 3 Development**	**Category 4 Development**	**Category 5 Development**
Protected/wild areas of international, national or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high, scenic, cultural or historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural or historical significance	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites/run down urban areas/wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

For projects where a high or very high visual impact is expected, Oberholzer (2005) recommends that a Level 4 visual assessment be conducted. A Level 4 visual assessment includes the following:

- Identification of issues raised in the scoping phase, and site visit;
- Description of the receiving environment and the proposed project;
- Establishment of view catchment area, view corridors, viewpoints and receptors;
- Indication of potential visual impacts using established criteria;
- Description of alternatives, mitigation measures and monitoring programmes; and
- Complete 3D modelling and simulations, with and without mitigation.

8.2. Receptor identification

An analysis of the various datasets used for the receptor identification indicates the following categories of receptors shown in Table 8-3.

Table 8-3: Receptor categorisation

Identified Receptor Category	Description	Distance from proposed development
Disperse settlements	The project area is characterized by disperse settlements which are located throughout the surrounding farms.	Ranging from immediate vicinity to 20 km.
Town Settlements	Jonkerville (Kwazamakuhle)	14.45 km
	Hendrina	17.23 km
	Rietkuil	13.2 km
	Arnot	16.26 km
	Nazareth	15.46 km
Nature Reserve	Nooitgedacht Dam Nature Reserve	17.00 km
Motorists	N11	17.50 km
	R38	8.4 km
Surrounding Coal Mine Operations	Various active and inactive coal mines around the region	Ranging from 8.8 km to 20 km.

Figure 8-1 provides a spatial representation of the various potential sensitive receptors that have been identified.

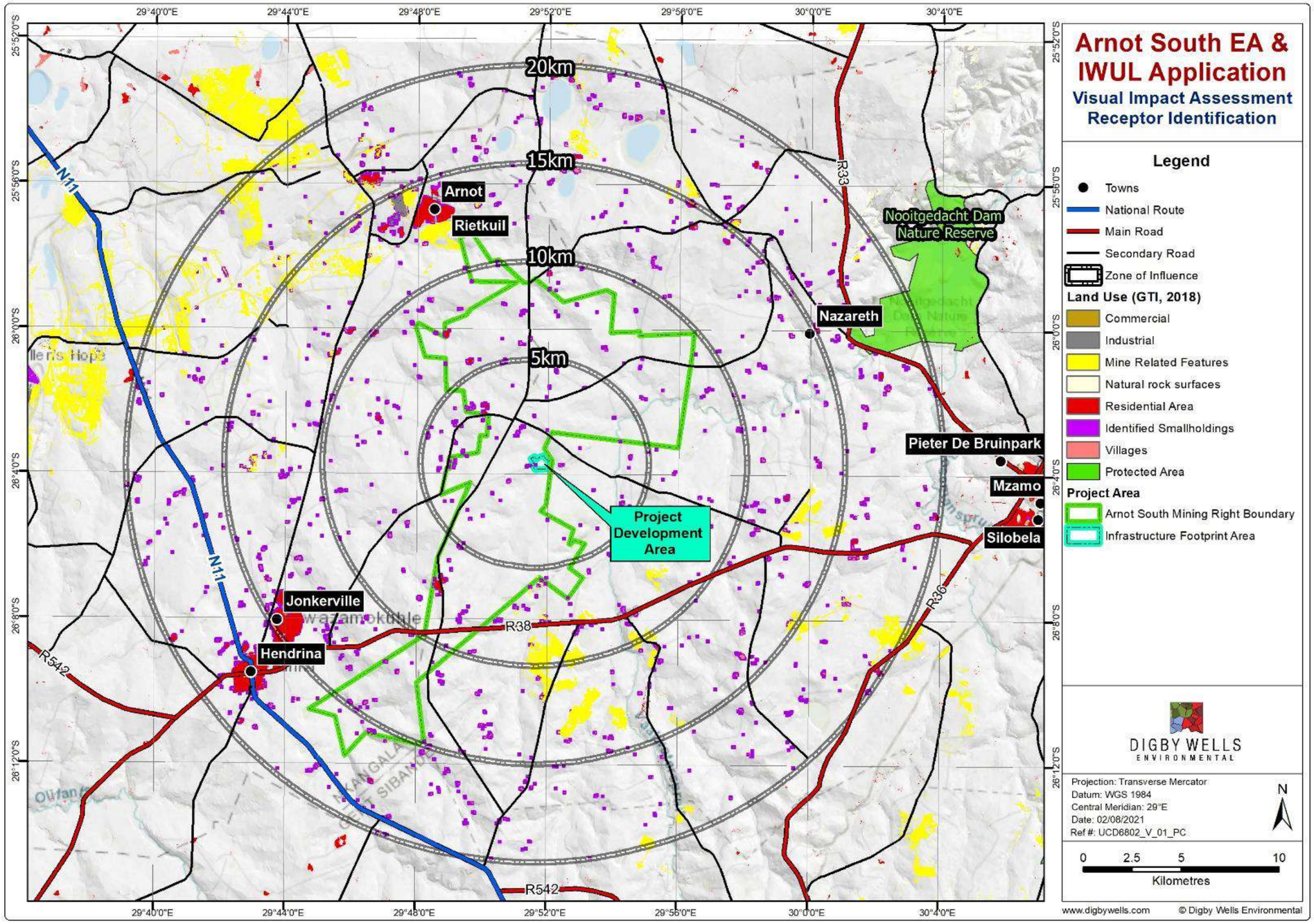

Figure 8-1: Receptor identification and distribution

8.3. Viewshed assessment

The results from the viewshed modelling process are presented in this section, where individual viewsheds were run to model the potential impact of the most significant infrastructure features as detailed in table Table 7-1.

8.3.1. Discard dump viewshed results

The results indicate that the discard dump will have the largest potential for visual impact based on the area of visibility. Very high visual exposure is limited to the region within five kilometres of the development area. The results also show that the majority of the visual impact is anticipated to occur to the Eastern side of the project area, owing to the visual screening from the topographical variation. Sections along the R38 main road are affected by moderate levels of visual exposure. Figure 8-2 shows the extent of the viewshed modelling results from the discard dump. The large contribution is due to the vertical offset of 30-meters, which is anticipated to be the highest feature from the operational phase of the mine.

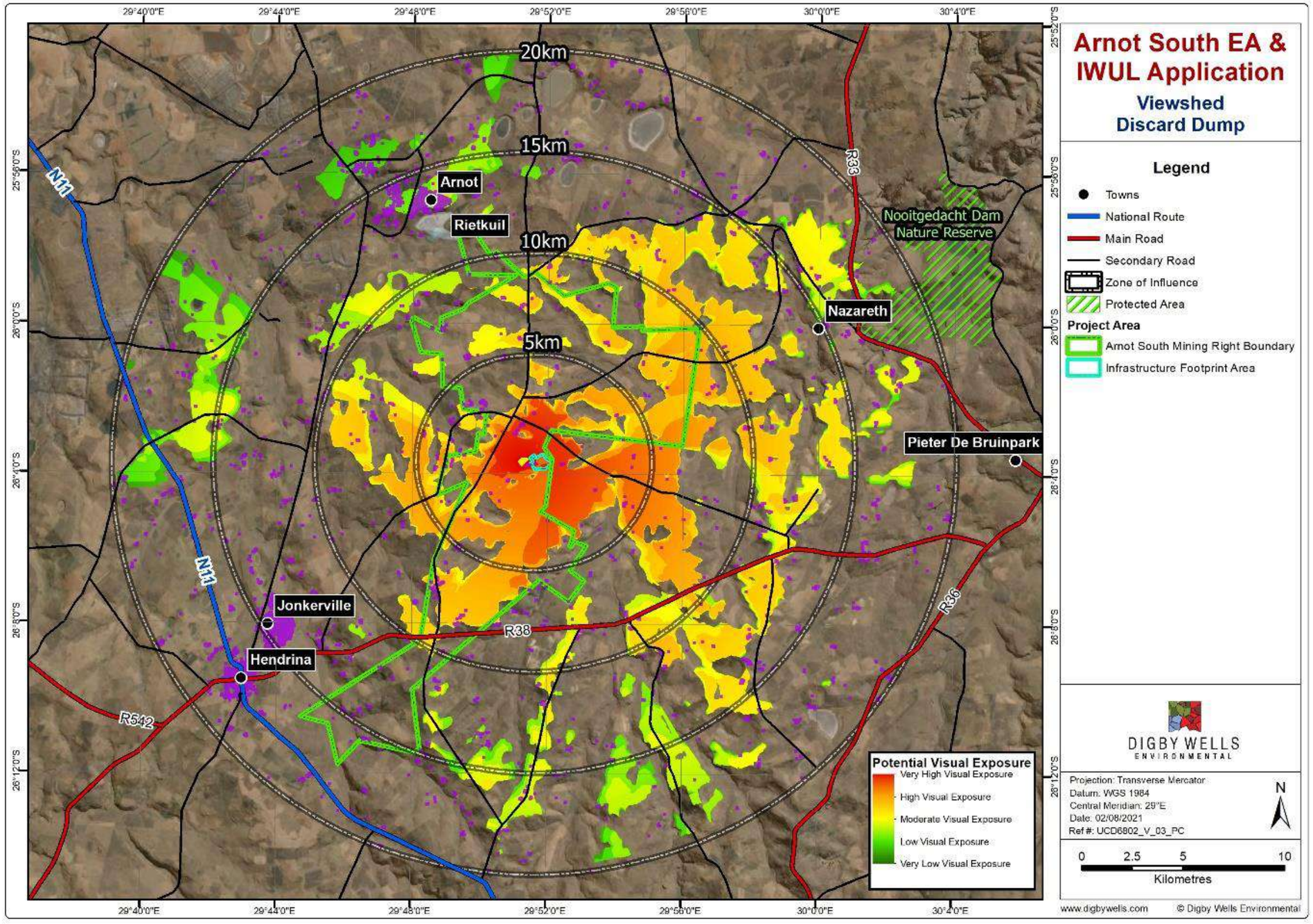

Figure 8-2: Viewshed results - Discard dump

8.3.2. Box-cut & berm viewshed results

The results from the box-cut and surrounding berm's viewshed analysis indicate that most of the visual exposure is expected to be restricted to the immediate region, within ten kilometres of the proposed development area. The highest degrees of visual exposure are anticipated to occur to the immediate north-west of the project development area, within a four-kilometre area. Extensions of moderate level exposure are seen towards the south-west of the project development area, which will likely be screened by the placement of the overburden dump. A potential moderate visibility location is identified along the R38. Figure 8-3 shows the extent of the viewshed modelling results from the box-cut and its associated two-meter-high berm.

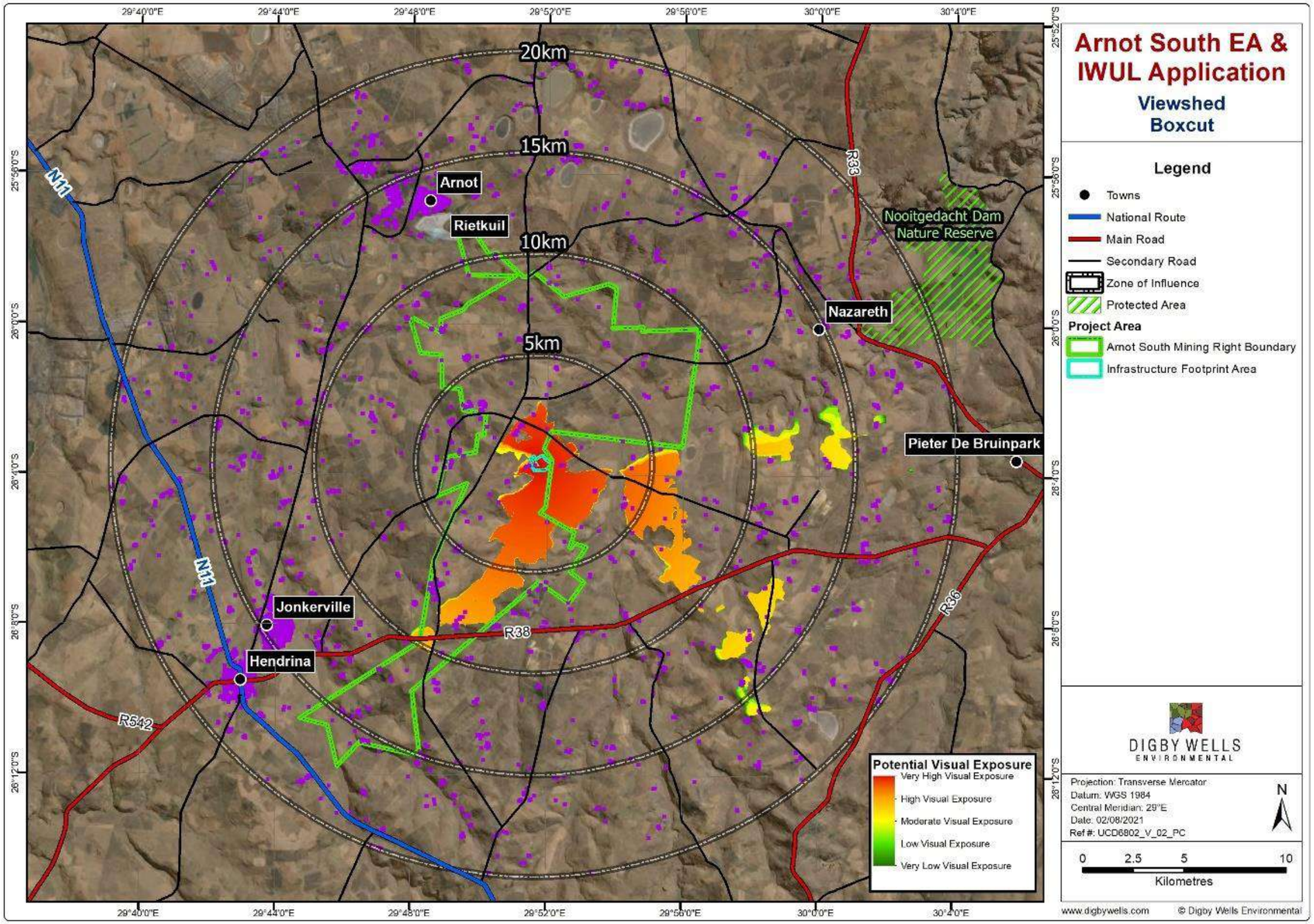

Figure 8-3: Viewshed results – Box cut & Berm

8.3.3. Overburden dump viewshed results

The results from the overburden dump share a similar viewshed distribution to the discard dump, but with a smaller area of visual impact to the west of the project development area due to the topographical screening (the overburden dump being ten-meters lower than the discard dump). The majority of high to very high visual exposure is anticipated to occur within the five-kilometre radius from the project development area. Figure 8-4 shows the extent of the viewshed modelling results from the overburden dump.

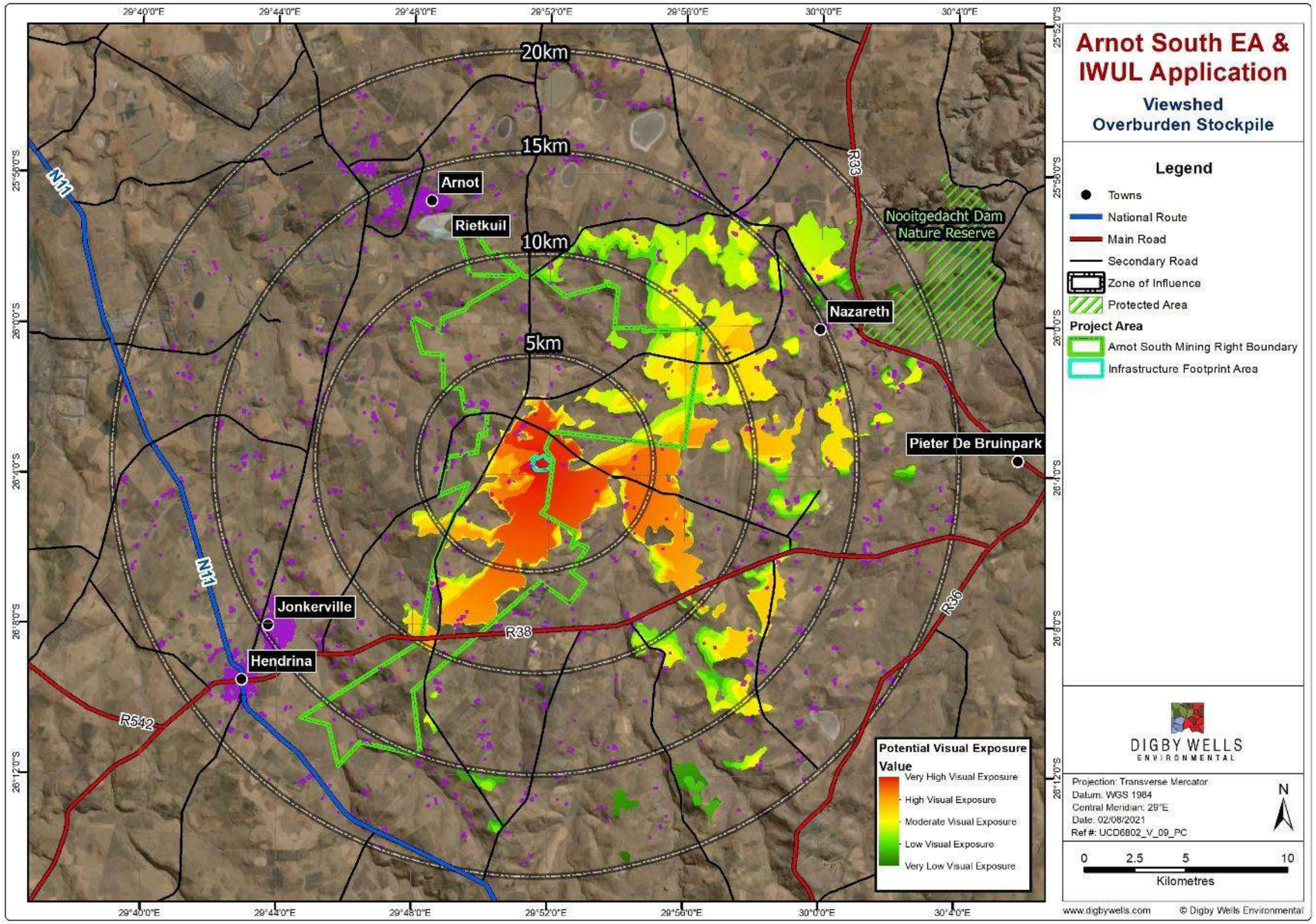

Figure 8-4: Viewshed results - Overburden stockpile

8.3.4. Vent shaft

The results from the vent shaft viewshed analysis indicate that most of the visual exposure from the overhead gear is expected to be restricted to the immediate region, within ten kilometres of the proposed development area. The highest degrees of visual exposure are anticipated to occur to the immediate north-west of the project development area, within a two-kilometre area. Figure 8-5 shows the extent of the viewshed modelling results from the vent shaft.

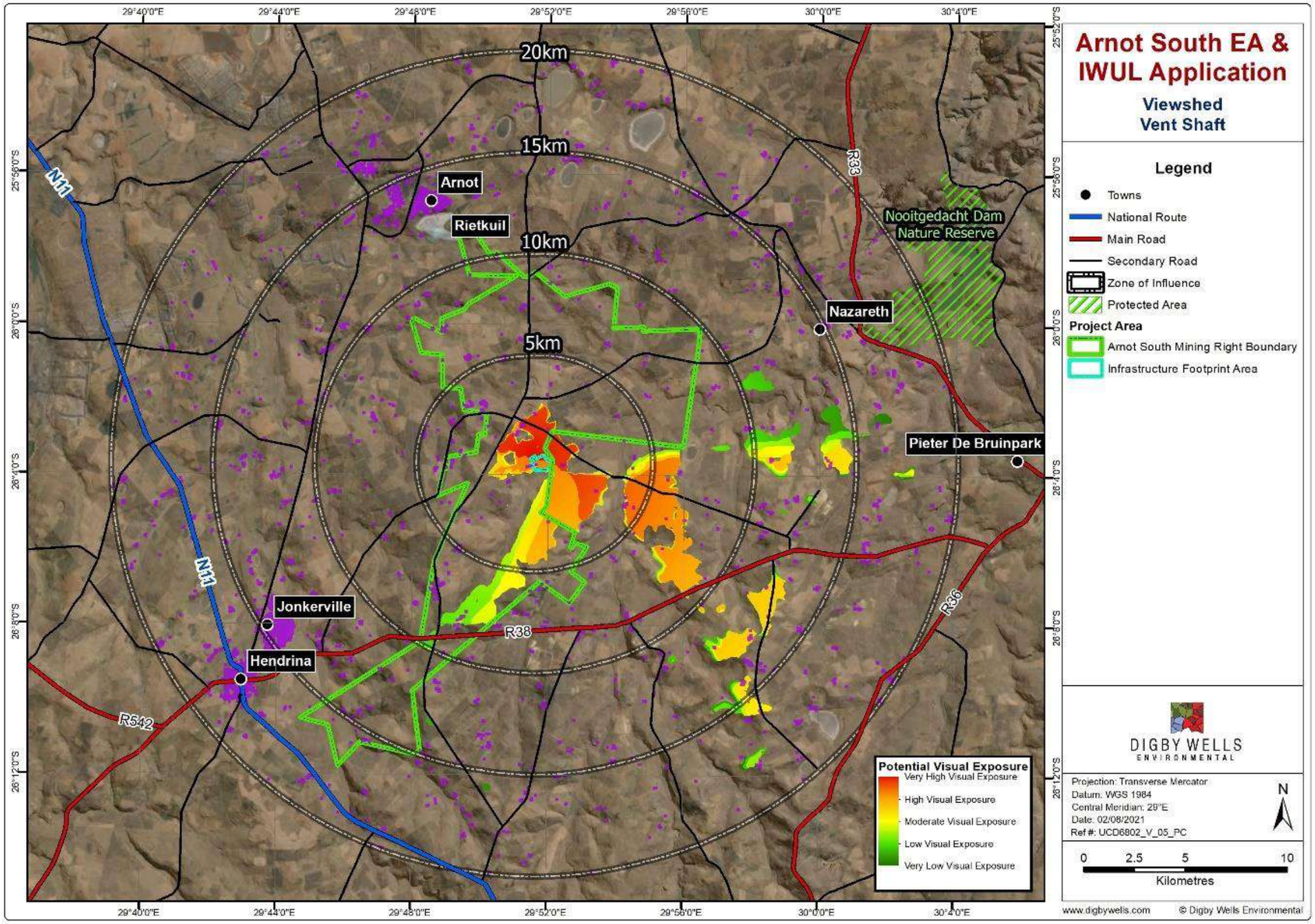

Figure 8-5: Viewshed results - Vent shaft

8.3.5. Product stockpiles and plant

The results from the product stockpiles and adjacent plant's viewshed analysis indicate that most of the visual exposure is expected to be restricted to the immediate region, within ten kilometres of the proposed development area. Extensions of moderate level exposure are seen towards the south-west of the project development area, which will likely be screened by the placement of the overburden dump. The highest degrees of visual exposure are anticipated to occur to the immediate north-west of the project development area, within a two-kilometre area. Figure 8-6 shows the extent of the viewshed modelling results from the product stockpiles and plant.

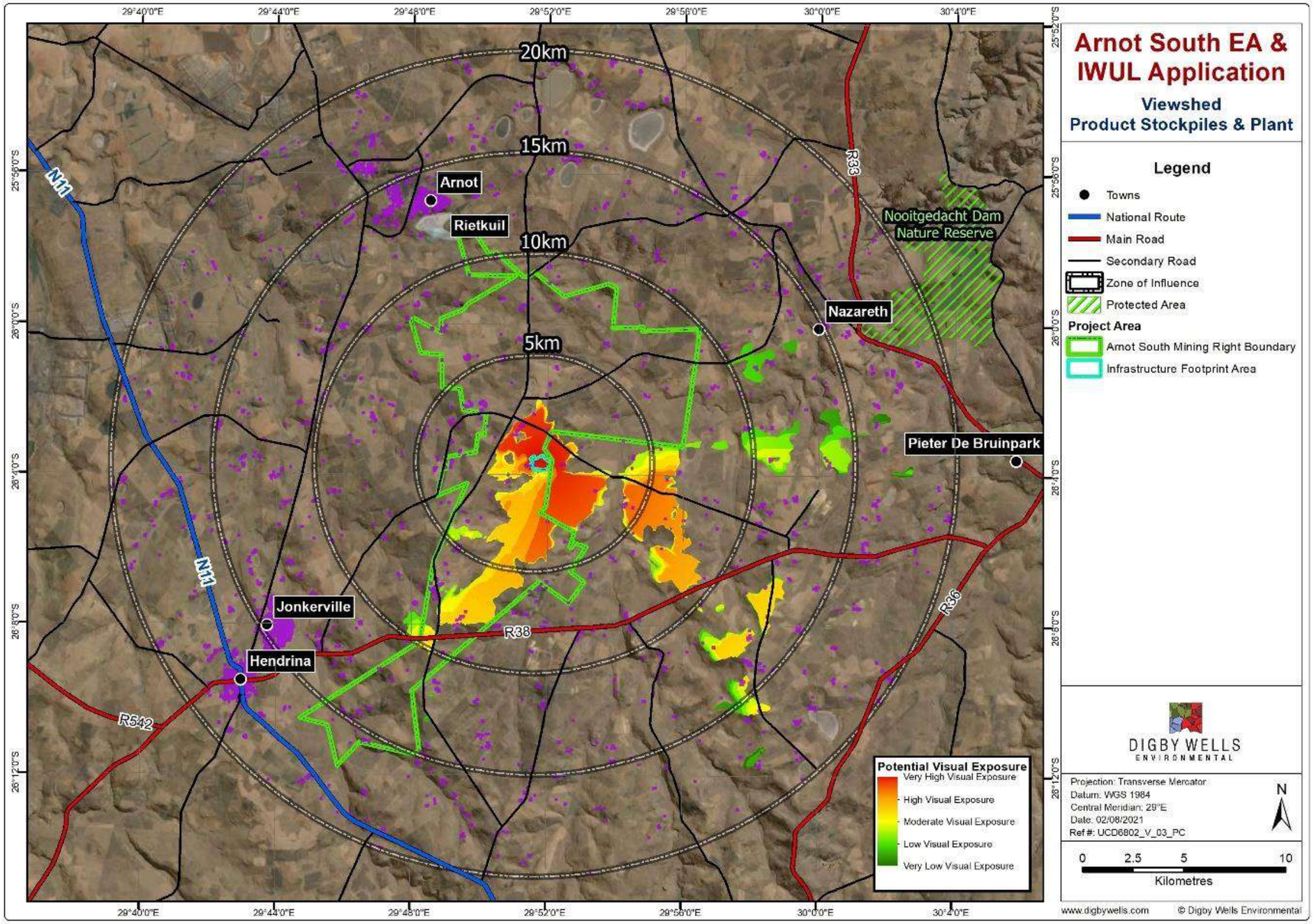

Figure 8-6: Viewshed results - Product stockpiles & plant

8.3.6. Workshops, offices and PCD area

The results from the ancillary structures (workshops, offices, etc) and PCD's viewshed analysis indicate that most of the visual exposure is expected to be restricted to the immediate region, within ten kilometres of the proposed development area. Extensions of moderate level exposure are seen towards the south-west of the project development area, which will likely be screened by the placement of the overburden dump. The highest degrees of visual exposure are anticipated to occur to the immediate north-west of the project development area, within a two-kilometre area. Figure 8-7 shows the extent of the viewshed modelling results from the product stockpiles and plant.

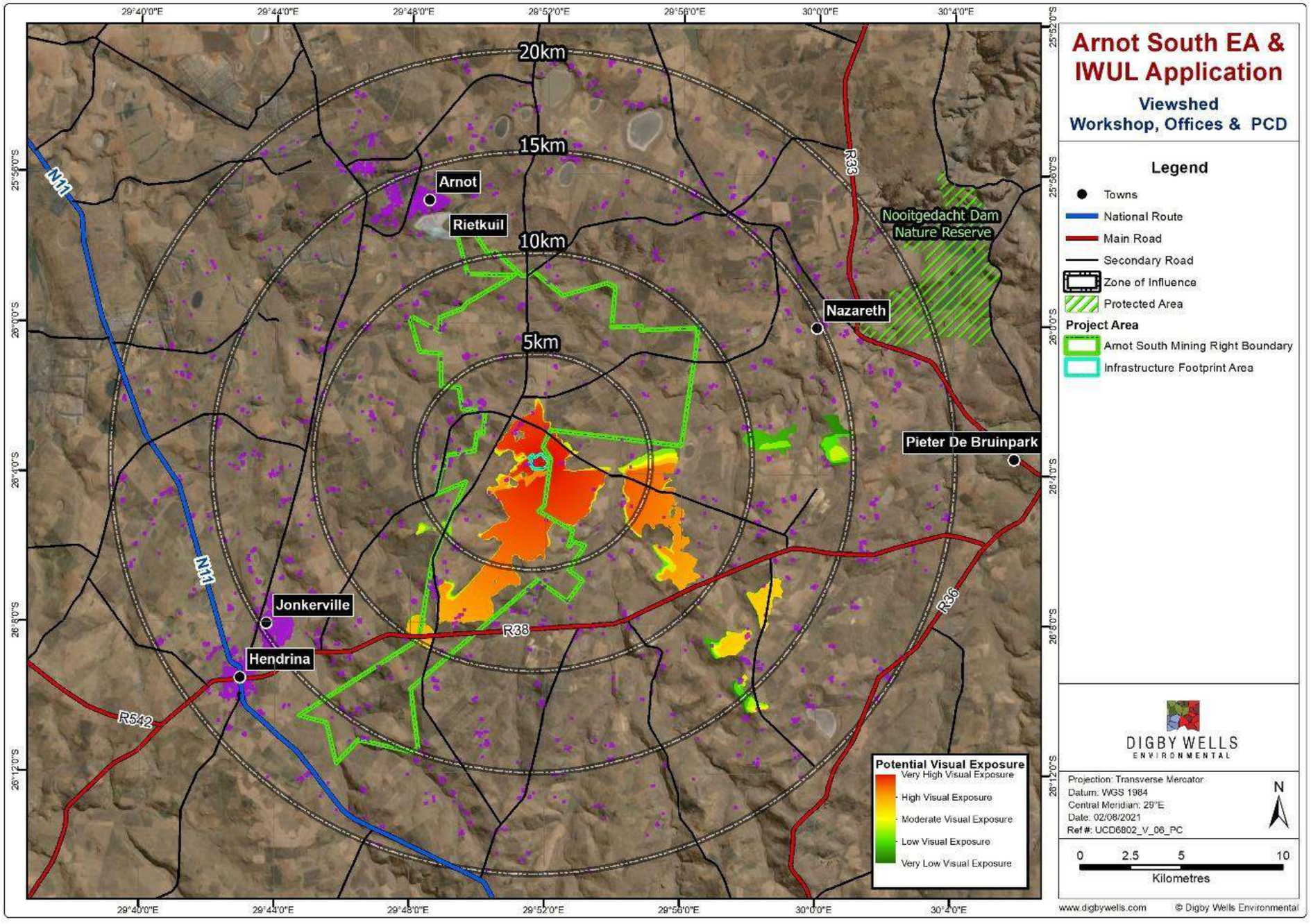

Figure 8-7: Viewshed results - Workshops, offices & PCD

9. Sensitive receptor identification and suggested mitigation

The results from the viewshed modelling process suggest that the large majority of potential high to very high visual exposure impacts are expected to occur within 5-kilometers of the Project's development area. Figure 9-1 provides an overview of the identified receptors within the 5-kilometer zone of influence. Based on the cumulative impacts from the viewshed analysis, each identified receptor within the 5-kilometer zone of influence has an associated level of potential visual impact.

Table 9-1 provides details on the locations of the identified receptors and provides suggested mitigation measures for the short-listed receptors that would potentially have a high to very high visual impact.

Table 9-1: Receptors within 5-kilometer zone of influence

Map ID	Receptor Categorisation	Parent Farm	Farm Portion	Longitude	Latitude	Mitigation Suggestion
1	Homestead & Farming Related Structures	MOOIPLAATS 165 IS	RE 165	29° 49' 16.5033" E	26° 02' 38.1939" S	Very Low Visual Impact - No mitigation suggested
2	Homestead & Farming Related Structures	VAALWATER 173 IS	4/173	29° 54' 31.9521" E	26° 03' 30.9149" S	High Visual Exposure - Suggested mitigation
3	Homestead	MOOIPLAATS 165 IS	13/165	29° 49' 10.8094" E	26° 03' 42.8119" S	Very Low Visual Impact - No mitigation suggested
4	Homestead & Farming Related Structures	WELTEVREDEN 174 IS	RE 174	29° 51' 04.4585" E	26° 02' 52.2573" S	High Visual Exposure - Suggested mitigation
5	Homestead	MOOIPLAATS 165 IS	2/165	29° 49' 24.4777" E	26° 03' 23.4778" S	Very Low Visual Impact - No mitigation suggested
6	Homestead & Farming Related Structures	WELTEVREDEN 174 IS	3/174	29° 52' 25.9137" E	26° 03' 46.3146" S	High Visual Exposure - Suggested mitigation
7	Homestead & Farming Related Structures	VAALWATER 173 IS	7/173	29° 54' 15.8210" E	26° 04' 49.2274" S	High Visual Exposure - Suggested mitigation
8	Homestead	HELPMAKAAR 168 IS	6/168	29° 52' 15.8346" E	26° 01' 11.1325" S	Unaffected - No Mitigation suggested
9	Homestead & Farming Related Structures	MOOIPLAATS 165 IS	4/165	29° 50' 02.5425" E	26° 02' 07.5883" S	Unaffected - No Mitigation suggested
10	Disperse Settlement	MOOIPLAATS 165 IS	4/165	29° 49' 37.2565" E	26° 02' 13.4543" S	Very Low Visual Impact - No mitigation suggested
11	Disperse Settlement	MOOIPLAATS 165 IS	2/165	29° 49' 10.6666" E	26° 03' 09.0413" S	Very Low Visual Impact - No mitigation suggested
12	Disperse Settlement	GROBLERSRECHT 175 IS	1/175	29° 49' 38.0104" E	26° 05' 16.3713" S	Moderate to Low Visual Impact - No mitigation suggested

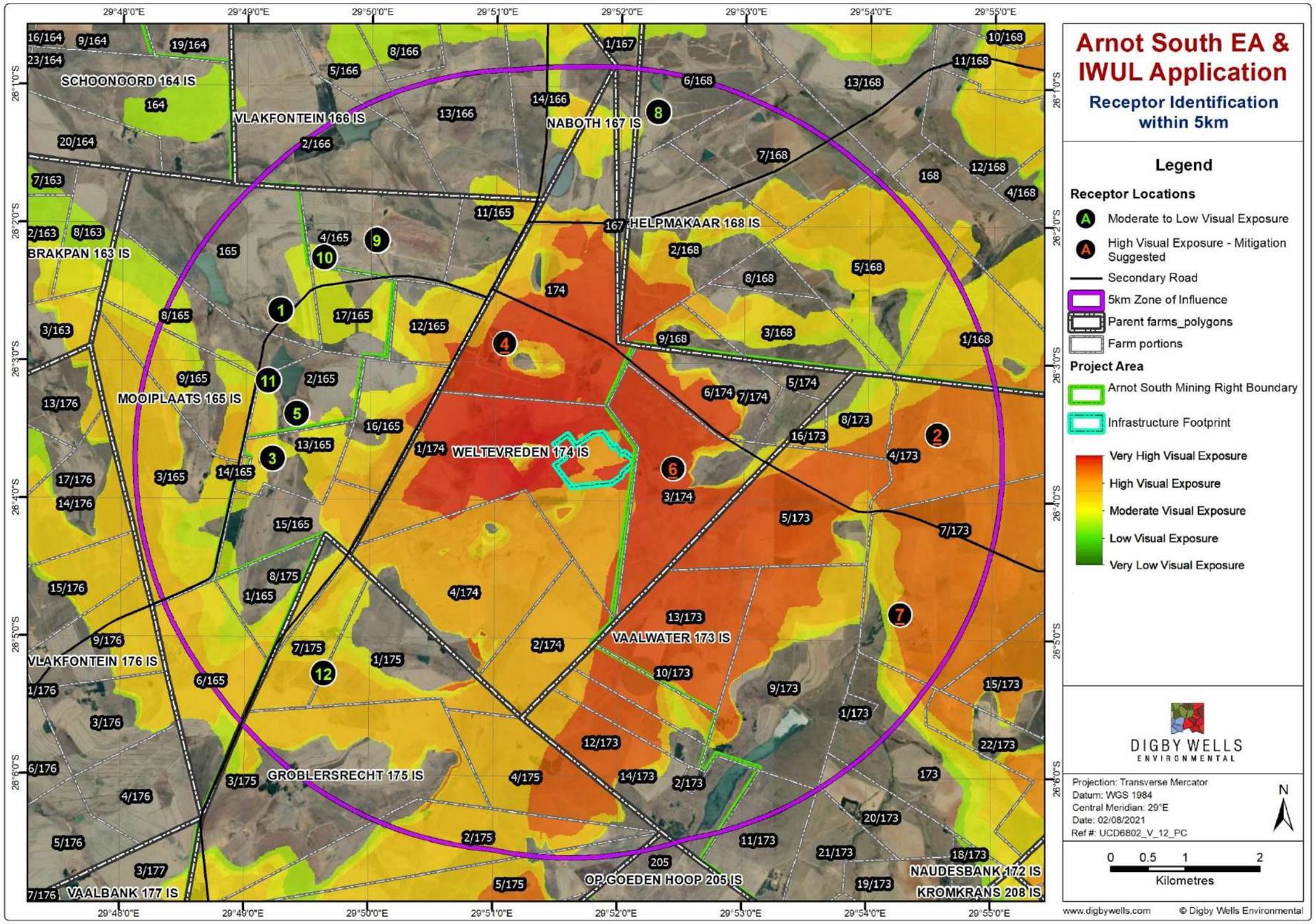

Figure 9-1: Identified receptors within 5-kilometer zone of influence

10. Impact assessment

The Project activities and infrastructure will be rated according to the visual impact they will have on the receiving environment, i.e. the environment before potential development. Negative visual impacts decrease the visual character of the pre-development environment. Neutral visual impacts assist to minimise the negative visual impacts of a development but do not result in a positive visual impact. A positive visual impact only occurs when an area is rehabilitated to a state that is better than the state of the pre-development environment, e.g. an infrastructure project area on previously agricultural land is rehabilitated to an area of natural vegetation and all visible signs of agriculture and infrastructure are removed. Positive visual impacts may only occur during the decommissioning and closure phase.

10.1. Construction phase

Activities during the construction phase that may have potential visual impacts are listed in Table 10-1.

Table 10-1: Interactions and impacts - Construction phase

Interaction	Impact
Removal of vegetation / topsoil for establishment of mining and linear infrastructure, along with box cut establishment	• Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation.
Stockpiling of soils, rock dump and discard dump establishment.	• Alteration of natural topography of the area, changing its baseline sense of place.

During the construction phase, the removal of the natural vegetation and alteration of land use is anticipated to have a visual impact on the immediate and surrounding region.

10.1.1. Impact ratings – Construction phase

Impacts associated with the construction phase are detailed below in Table 10-2.

Table 10-2: Impact rating - Construction phase

Activity, and Interaction: Removal of vegetation / topsoil for establishment of surface infrastructure and box cutting.
• Removal of all vegetation within the localised infrastructure area alters the aesthetics of the immediate area and creates a contrast between the stripped area and the surrounding vegetation.
Prior Mitigation

Dimension	Rating	Motivation	Significance
Duration	6	The impact of the vegetation clearance will occur during the life of the project, although reduced during the decommissioning phase.	Moderate -84
Extent	3	Vegetation removal will occur within mining and linear infrastructure areas as well as proposed road, where the viewshed results indicate a local area extension for impacts.	
Severity	5	Significant change to the original visual character, which also creates a sharp contrast which is visually obtrusive during the construction phase.	
Probability	6	Definite probability of vegetation clearing particularly in the infrastructure areas, and areas cleared for box cutting.	
Nature	Negative		
Mitigation measures			
• Keep site clearing to a minimal, and restrict vehicle movement to dedicated areas; • Make use of existing roads to encourage minimal impacts/footprint; • The footprint of the mine should be as compact as possible from a design point of view; and			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	If mitigated the impact will cease after the operational life span	Minor -66
Extent	2	Vegetation removal will occur within mining and linear infrastructure areas as well as proposed roads. The visual area may however be reduced with effective mitigation to the south west in the form of a tree line.	
Intensity	4	The impact extent can be reduced which in turn will reduce the severity from a sensitive receptor perspective.	
Probability	6	There is a definite probability that the impact will occur if mitigation measures are not implemented.	
Nature	Negative		
Activity, and Interaction: Stockpiling of soils, rock dump and discard dump establishment			
• Alteration to the baseline visual environment by creating sharp topographic variation over a relatively moderately undulating terrain.			

• Includes removal of natural vegetation which creates a sharp contrast.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impact of the vegetation clearance and stockpiling will last as long as the mine is in operation.	Moderate -84
Extent	3	The impacts of the stockpiles are shown to have the potential to extend as far as 17km.	
Severity	4	The viewshed results indicate that the stockpiles are likely to have the largest relative effect on the surrounding area from a visual perspective.	
Probability	7	The creating of stockpiles are very likely to occur to make way for the box cut.	
Nature	Negative		
Mitigation measures			
• Stockpiles should be created with a rehabilitation design which details a favorable slope; • Bare land surfaces must be vegetated to limit soil erosion from surface runoff associated with stockpiles and dumps. Revegetate disturbed areas immediately after construction;			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impact will occur during the life of the project.	Moderate -77
Extent	2	By specifically designing the dump facilities, the extent of the visual impact can be reduced to a more immediate area.	
Intensity	4	Due to the height of the discard dump, it remains a relatively high intensity	
Probability	7	High probability that the impact will continue to occur.	

10.2. Operational phase

Activities identified during the operational phase that are anticipated to have a visual impact are shown in Table 10-3.

Table 10-3: Interactions and impacts - Operational phase

Interaction	Impact
Establishment and upkeep of Mine related structures along with the box cut	• Alteration of the natural visual character
Establishment and operation of the stockpile region during operations	• Alteration of natural topography of the area, changing its baseline sense of place. Coal stockpiles have a contrast to the surrounding natural vegetation.
Lighting of mine infrastructure at night	• Alterations on the natural illumination in the area which can draw attention.

10.2.1. Impact ratings – Operations phase

Impacts associated with the construction phase are detailed below in Table 10-4

Table 10-4: Impact ratings - Operations phase

Activity, and Interaction: Establishment and upkeep of Mine related structures along with the box cut			
• Alterations of the natural visual character of the region • Long term vegetation loss • Land cover and land use changes.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	6	The impact of the vegetation clearance will occur during the life of the project, although reduced during the decommissioning phase	Moderate -91
Extent	3	The viewshed results indicate that the potential area of influence from the mine infrastructure is restricted to a local area around the site. .	
Severity	4	The majority of high visual exposure is restricted to the immediate project area – The severity is therefore considered moderate to high.	
Probability	7	The operations on the mine are dependent on the development and maintenance of the supporting infrastructure.	
Nature	Negative		

Mitigation measures			
• As far as possible, preserve the natural vegetation to reduce the visual impact; • Sensitive receptors should be mitigated from the visual impact by a strategic usage of tree-lines and on site berm features which integrate with effective landform design. • Buildings on site should be kept to a colour that does not bear a large contrast to the existing natural vegetation and landscape.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	If mitigated the impact will cease after the operational life span	Minor -60
Extent	2	Effective mitigation by using visual screens such as tree-lines and purpose driven landform designs such as berms which utilise overburden material have the potential to reduce the area of visual impact.	
Intensity	3	Moderate loss, and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning.	
Probability	6	There is a definite probability that the impact will occur if mitigation measures are not implemented.	
Nature	Negative		
Activity, and Interaction: Establishment and operation of the stockpile and plant region during operations			
• Constant topographical changes to the stockpiles, which also have a sharp contrast to the natural landcover in the region;			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impact of the stockpiles and plant will occur during the life of the project	Moderate -84
Extent	3	The area of potential visual exposure is limited to the immediate project area, with small areas of encroachment to the local surrounding region.	
Severity	4	Due to the contrasting nature of the stockpiles, the severity is regarded as moderately high.	
Probability	7	The operation of the product stockpile and plant are necessary for the operation of the mine.	
Nature	Negative		

Mitigation measures			
• Visual screens be placed in the form of tree-lines, particularly along highly sensitive areas along the R38.			
Post-Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	5	The impact will occur during the life of the project.	Moderate -77
Extent	2	Visual screens have the potential to reduce the area of impact – Particularly from sensitive receptor locations such as the R38.	
Intensity	4	Due to the contrasting nature of the stockpiles, the severity is regarded as moderately high.	
Probability	7	High probability that the impact will continue to occur.	
Nature	Negative		
Activity, and Interaction: Lighting of mine infrastructure at night			
• The mine site would contain lighting for security and operational safety purposes. • The artificial lighting could provide a source of distraction to receptors in the region.			
Prior Mitigation			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	4	While the lighting will apply to the duration of the mines life, the lighting impacts are limited to night, and therefore the receptors are also reduced.	Negligible -40
Extent	2	Loss of fauna and flora will only occur within the impacted area and its near surroundings	
Severity	2	If not mitigated serious loss will occur to the moderately sensitive environment.	
Probability	4	Site clearance has to take place for construction of the access and haul roads, so vegetation removal is inevitable.	
Nature	Negative		
Mitigation measures			
• Focus the lights towards components of the mine that require specific lighting to avoid light dispersal; • Consider utilizing lower lumen lighting that does now spill outside of the mine region.			
Post-Mitigation			

Dimension	Rating	Motivation	Significance
Duration	4	The impacts will occur during the life of the project.	Slightly Detrimental -24
Extent	1	Loss of fauna and flora is limited only to the footprint of the access and haul roads, exposed areas due to mitigation measures being implemented, such as limit vehicle movement, and restrict movement to specific sites.	
Intensity	2	Moderate loss, and/or effects to biological or physical resources or moderately sensitive environments, limiting ecosystem functioning.	
Probability	4	Likely probability that the impact will continue to occur.	

11. Conclusion and recommendations

The results from the VIA indicate that proposed development features with the highest potential visual impact are the Discard and Overburden Dumps due to their heights of 30 and 20-meters respectively. The surrounding topography acts as an effective visual screen which restricts the visibility of the infrastructure component of the mine to receptors that are within ten-kilometres of the proposed development.

Identified sensitive receptors include the motorists travelling on the R38 and N11, but exposure to the proposed development from these transport routes is limited to specific locations which can be mitigated with the use of visual screens such as tree-lines. Homestead and farming related structures that are within the high visual exposure zones have been identified, and mitigation measures are suggested to minimise the anticipated visual impact from the Project development. An effective method of mitigation would be in the form of tree-lines which should be placed closer to the location of the identified receptors. It must however be noted that due to the height of the proposed infrastructure the suggested mitigation measures are likely to reduce but not completely negate any potential visual impact.

The majority of human settlements that are within the greater modelled viewshed output regions are dispersed settlement holdings, who have a sense of place characterised by the regions surrounding open cast coal mines. In contrast to open-cast coal mining, the box-cut approach that is planned for this project is anticipated to have a relatively lower impact than the surrounding open-cast operations that characterise the area.

It is recommended that landform design principles be implemented for the design parameters of the various dumps which is designed at both streamlining the rehabilitation approach for the operation along with maximising the slope angle to ensure that a gentle gradient is achieved which will have a lower visual influence when compared to a dump with steep edges that contrasts to the surrounding environment.

It is recommended that should the final design of the project differ in location and assumed heights significantly from this assessment, an update of the viewshed modelling be performed to quantitatively assess the anticipated visual impacts.

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