DIGBY WELLS
ENVIRONMENTAL

Environmental Authorisation and Integrated Water Use Licence Applications for the Proposed Active Water Treatment Plant at the Klipspruit Colliery, Mpumalanga Province

Visual Impact Assessment

Project Number:

SOU5014

Prepared for:

South32 SA Coal Holdings (Pty) Ltd

July 2018

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I, Alistair John Main as duly authorised representative of Digby Wells and Associates (South Africa) (Pty) Ltd., hereby confirm my independence (as well as that of Digby Wells and Associates (South Africa) (Pty) Ltd.) and declare that neither I nor Digby Wells and Associates (South Africa) (Pty) Ltd. have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of the South 32 Water Treatment Plant and Associated Infrastructure Project, located near Ogies, Mpumalanga Province.

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EXECUTIVE SUMMARY

Introduction

Digby Wells Environmental (hereinafter Digby Wells) has been appointed by South 32 SA Coal Holdings (Pty) Ltd (hereinafter South32) to undertake a Visual Impact Assessment (VIA) as part of the Environmental Impact Assessment (EIA) of the proposed Klipspruit Colliery active Water Treatment Plant (WTP), located in Mpumalanga Province.

The significance of the long term visual impacts of a proposed development will determine the acceptability of the development to receptors. An understanding of the visual/aesthetic character of a landscape allows the sensitivity of the landscape to be determined. This in turn indicates the ability of the landscape to accommodate visual change. A VIA is performed to identify the potential visual impacts of a proposed project on the receiving environment.

This report constitutes the VIA required as part of the EIA process and describes the visual/aesthetic character of the receiving environment and the expected visual impacts of the proposed Project. The impacts are described and rated, and mitigation/management actions proposed to reduce the negative visual impacts of the Project.

Methodology

A desktop study was conducted to evaluate the topography of the receiving environment and aerial photography of the area was examined to determine the surface features. Available vector GIS data was used to determine the relative location of the features surrounding the Project area.

A topographical model was created using ArcGIS 3D Analyst Extension. The topographical model was used to create viewshed models using the Viewshed Tool of the ArcGIS 3D Analyst Extension. These viewshed models illustrate the areas from which the Project will potentially be visible, taking into account the estimated height of the proposed infrastructure.

Theoretical viewshed models were created for the Project for the existing infrastructure, both the existing and proposed infrastructure and only the proposed infrastructure. 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. No site visit was undertaken to verify the findings and this report is based on desktop results only.

Baseline and Findings

The Project comprises the construction and operation of a WTP and ancillary infrastructure. The potential visual receptors within the theoretical viewshed include residents of the Ogies and Phola settlements, and motorists along the N12 national road and R545 regional road.

The “Guideline for involving visual and aesthetic specialists in EIA processes” document by Oberholzer (2005) identifies medium-scale infrastructure as a Category 4 development. The receiving environment of the Project is an area of disturbed scenic, cultural or historical

significance as the Project area has been degraded by existing mining and agricultural activities. The Project area and surrounds are characterised by undulating topography and Eastern Highveld Grassland vegetation offering moderate visual screening. The predominant surrounding land use is mining and agriculture. A Category 4 development in this area is expected to have minimal visual impact. The findings of this VIA concur with this categorisation; however, the WTP area will have a moderate visual impact. With the mitigation proposed, the visual impact significance rating from the VIA is reduced to moderate or minor in most instances. It should be noted that Oberholzer's categorisation differs from the impact assessment methodology and as a result the expected visual impact according to Oberholzer and the visual impact significance ratings from the VIA may differ.

No significant change in land use will result from the Project due to the infrastructure falling within a footprint already disturbed by mining.

Mitigation

General mitigation/management actions that should be implemented where possible include:

- As much existing natural vegetation as possible should be retained, specifically bushes and trees, if present. This will assist to conceal the development;
- Areas susceptible to dust should be frequently wetted by means of a water bowser during the construction phase;
- Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible;
- Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used;
- Natural vegetation screens are recommended around the perimeter of the Project footprint;
- The pipelines can have a minimal impact if they are buried below surface, however, that may not be practical from an engineering perspective; and
- An appropriate grievance mechanism should be developed to respond to grievances from receptors that relate to visual aspects.

Conclusion

The Project will remain for the lifespan of the mine resulting in a project duration minimal negative visual impact on the receiving environment. However, with the proposed mitigation measures, the visual impact significance rating from the VIA will be reduced to moderate or minor in most instances.

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3D	Three-Dimensional
CD:NGI	Chief Directorate: National Geospatial Information
CSIR	Council for Scientific and Industrial Research
cm	centimetres
CV	Curriculum Vitae
DEA	Department of Environmental Affairs
DEM	Digital Elevation Model
Digby Wells	Digby Wells Environmental
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
GIS	Geographical Information System
GISSA	Geo-Information Society of South Africa
ha	hectares
km	kilometres
km²	kilometres squared
m	metres
m.a.m.s.l.	metres above mean sea level
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEM: PAA	National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
Project	Water Treatment Plant Project
SAPAD	South African Protected Areas Database
ToR	Terms of Reference
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
WTP	Water Treatment Plant

1 Introduction

Digby Wells Environmental (hereinafter Digby Wells) has been appointed by South 32 SA Coal Holdings (Pty) Ltd (hereinafter South32) to undertake a Visual Impact Assessment (VIA) as part of the Environmental Impact Assessment (EIA) of the proposed Klipspruit Colliery (KPS) active Water Treatment Plant (WTP), located in Mpumalanga Province.

This report constitutes the VIA as part of the EIA process and describes the visual/aesthetic character of the receiving environment and the expected visual impacts of the proposed Project. The impacts are described and rated, and mitigation/management actions proposed to reduce the negative visual impacts of the Project.

1.1 General

“Visual, scenic and cultural components of the environment can be seen as a resource, much like any other resource, which has a value to individuals, to society and to the economy of the region. In addition, this resource may have a scarcity value, be easily degraded, and is usually not replaceable” (Oberholzer, 2005).

The significance of the long-term visual impacts of a proposed development will determine the acceptability of the development to receptors. An understanding of the visual/aesthetic character of a landscape allows the sensitivity of the landscape to be determined. This in turn indicates the ability of the landscape to accommodate visual change. A VIA is performed to identify the potential visual impacts of a proposed project on the receiving environment. The level of impact assessment required is determined in Section 7 of this assessment.

1.2 Project Background

The Project comprises the construction and operation of a WTP and ancillary infrastructure including a feed water pipeline and discharge water pipeline in the existing KPS Mining Right Area (MRA). The proposed infrastructure lies within the existing mining activities’ footprint area.

1.3 Project Description and Site Location

The Project includes the development and operation of a WTP and ancillary infrastructure comprising of the following:

- The plant area comprising of surface infrastructure, refer to Figure 1-1;
- A temporary laydown area that will be used for the storage of construction equipment; and
- A feed water line, a return water line and a discharge line in the form of High-density polyethylene (HDPE) pipelines.

The full extent and location of the proposed infrastructure is detailed in Figure 1-2 below.

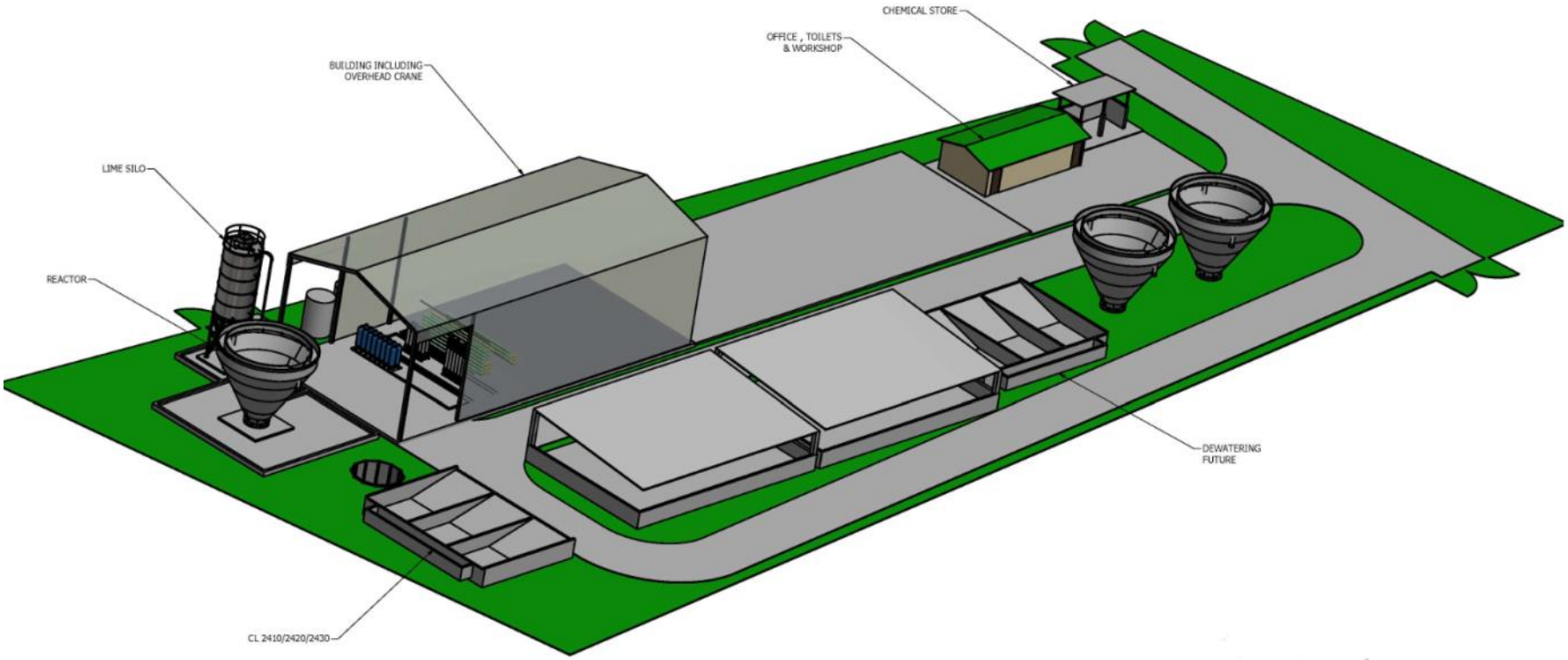

Figure 1-1: Proposed Plant Area Surface Infrastructure Layout

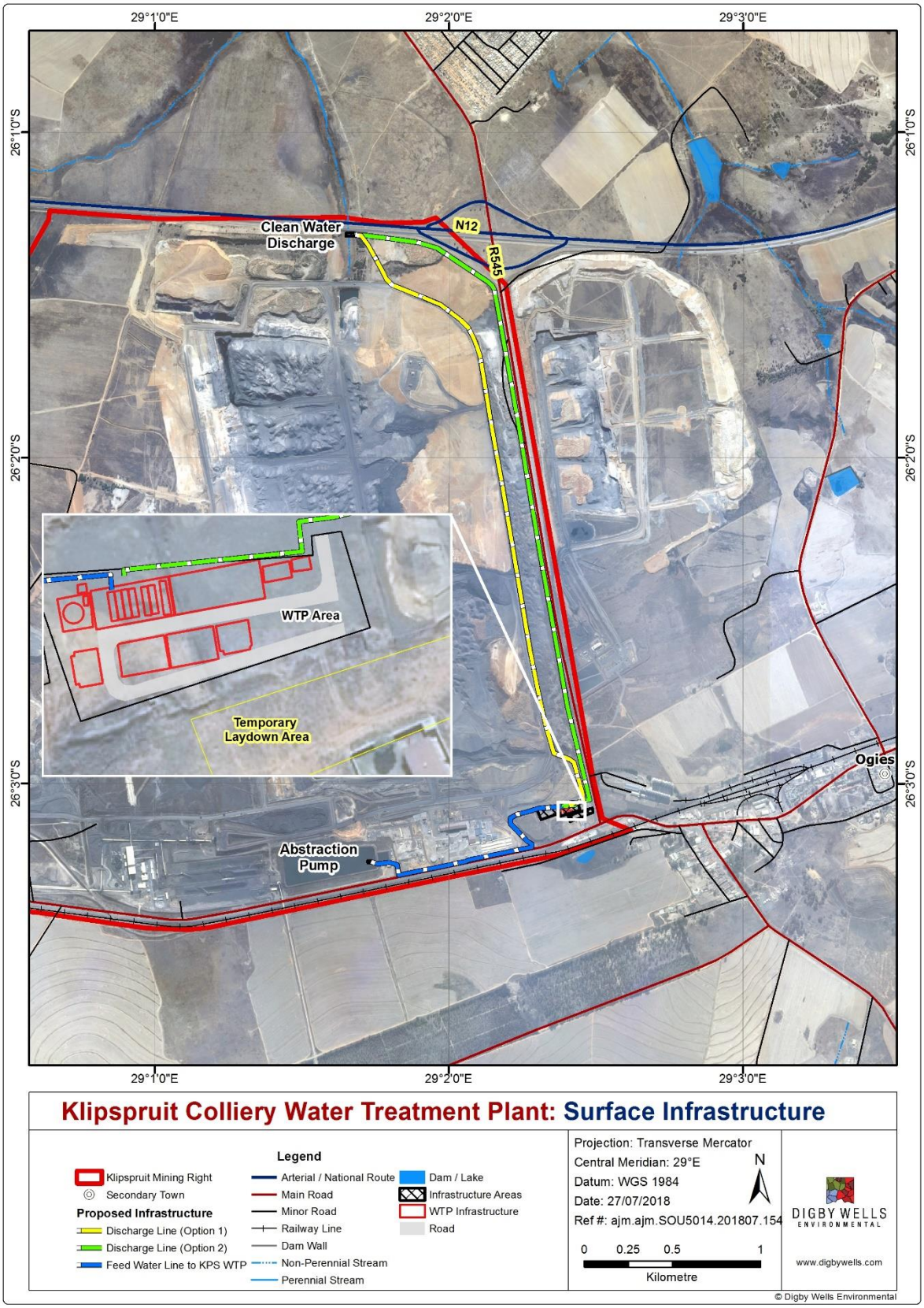

Figure 1-2: Proposed Surface Infrastructure

1.4 Terms of Reference

The Terms of Reference (ToR) for this study are to compile a VIA to determine the expected visual impact of the Project on the receiving environment.

2 Details of Specialist

A Curriculum Vitae (CV) is attached in Appendix A.

Alistair Main is the Environmental GIS Specialist Digby Wells. Alistair has worked in the consulting industry since graduating with a BA degree in Geography and Environmental Science from Monash University South Africa in 2007. His main focus is providing specialist GIS consulting and support services to the environmental, mining, exploration, and agricultural sectors, specifically for environmental management, engineering, locational planning and management objectives.

He has over five years of experience specifically in VIAs. Alistair has completed numerous VIAs in South Africa and Africa, based on both South African requirements and international IFC and World Bank Standards.

Alistair's key experience includes the application of GIS to specialist studies including VIAs, site selections, and bathymetric studies. His GIS experience includes GIS mapping, data acquisition, and specialist assessments for over 15 countries in Africa. He is a member of GISSA (Geo-Information Society of South Africa).

3 Relevant Legislation

The following international, national and regional documents form part of the legislative and policy framework of the visual assessment.

3.1 National Legislation and Policy

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

- Regulations in Chapter 5 (Integrated Environmental Management) of the National Environmental Management Act, 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;
- Section 23(1)(d) of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA), where it is mentioned that a mining right will be granted if "the mining will not result in unacceptable pollution, ecological degradation or damage to the environment". Visual pollution is a form of environmental pollution and therefore needs to be considered under this section. Holders of rights granted in terms of the MPRDA must at all times give effect to the general objectives of

integrated environmental management laid down in Chapter 5 of the NEMA. The Regulations promulgated in terms of the NEMA, with which holders of rights must comply, provide for the assessment and evaluation of potential impacts, and the setting of management plans to mitigate such impacts.

- 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.

3.2 Guidelines

The "Guideline for involving visual and aesthetic specialists in Environmental Impact Assessment (EIA) processes" document by Oberholzer (2005) has been used as a best practice guideline for this 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).

4 Aims and Objectives

The aims of this VIA are to determine the nature of the Project area and the impact of the Project on the visual/aesthetic character of the surrounding landscape. The following objectives were identified to achieve these aims:

- Examine aerial photography available for the Project area;
- Create and analyse a topographical model in ArcGIS 3D Analyst Extension;
- Create and analyse viewshed models in ArcGIS 3D Analyst Extension;
- Describe the topography and visual/aesthetic character of the receiving environment using available GIS datasets at a desktop level;
- Describe the current and post development visual aspects of the Project area;
- Identify sensitive visual receptors and key public viewpoints that will be impacted on by the Project;

- Identify the impacts, pre- and post-mitigation that the proposed infrastructure will have on the topographical and visual landscape, by rating the scale, duration, severity and probability of the impacts occurring; and
- Provide mitigation measures and recommendations in an attempt to reduce the potential visual impacts.

5 Assumptions and Limitations

A VIA is open to subjectivity. This subjectivity is due to the different opinions receptors may have of a proposed project. Oberholzer (2005) defines receptors as “individuals, groups or communities who are subject to the visual influence of a particular project”. A receptor may be partial to the fact that a proposed project is occurring in an area, which becomes a source of economic upliftment for a community, whereas another receptor may view a proposed project as a negative factor which could hamper tourism or recreational activities.

Many factors can enhance or reduce the visual impact of a proposed project. Vegetation near a receptor’s viewpoint can greatly reduce that receptor’s view of a proposed project. Other factors such as weather/climatic conditions and seasonal change can also affect a receptor’s view of a proposed project.

It is, therefore, difficult to determine the visual impact of the Project from the viewpoint, as well as perspective, of each individual receptor. Consequently, this report focuses on the size of the viewshed area as an indication of the significance of the visual impacts of the Project.

The topographical model was created using a combination of mine survey contours at a resolution of 50cm, and the available 5m contour relief data from Chief Directorate: National Geo-Spatial Information (CD:NGI). This data is generalised in the surrounding area outside of the MRA and some of the topography detail is lost. *It must be noted that vegetation and existing surface infrastructure was not included in the topographical model*.

Due to the nature and extent of the of the Project, and based on the Guidelines for Assessment by Oberholzer, 2005, it was determined that the proposed activities fall under a Category 4 development with a **Minimal Visual Impact Expected**, and would therefore require a **Type B Assessment**. A site visit was not conducted as it was not included in the scope of work due to the existing information available and the knowledge of the project area from other specialist site visits.

6 Project Area

The Project area falls within the Emalahleni Local Municipality of the Nkangala District. The immediate footprint area includes 1.5 hectares (ha) of surface footprint areas, including the Temporary Laydown Area, and approximately 5km of surface pipelines. The extended zone of visual influence, including a 5km zone of influence around the proposed surface infrastructure, is approximately 12,600ha.

The nearest major town is KwaGuqa located 20km north-east of the Project area. The residential areas in the surrounding area are potential visual receptors of the Project. The towns/settlements within 5km of the proposed infrastructure, as well as their direct distance and direction from the proposed infrastructure, are summarised in Table 6-1. All distances are straight line distances measured from the centre of the towns/settlements to the closest edge of the proposed infrastructure (i.e. the shortest distance).

Table 6-1: Closest Towns and Settlements

Name	Type	Direct Distance	Infrastructure	Direction
Ogies	Secondary Town	1.6 km	WTP	East
Phola	Settlement	1.8 km	Discharge Line	North-East

Road and railway users in the Project area and surrounds are also potential visual receptors. The N12 national road runs adjacent to the northern extent of the KPS MRA. The R555 regional road runs adjacent to the southern extent of the MRA, whilst the R545 regional road runs southward from the town of Ogies. A railway line also runs adjacent to the southern extent of the MRA.

The Project area and surrounds have been heavily disturbed by existing mining and agricultural activities. Numerous mines operate in and around the Project area and this has heavily impacted on the natural character and sense of place of the immediate Project area and surrounds.

Protected areas such as nature reserves and recreational and tourism areas are considered sensitive visual receptors. There are no protected areas within the Project area. The nearest protected area is the John Cairns Private Nature Reserve (DEA, 2018a) located 15km north-east of the town of Ogies, and 17km east to north-east of the closest proposed infrastructure as shown in Figure 6-1 below.

Oberholzer (2005) defines sense of place as “the unique quality or character of a place, whether natural, rural or urban”. Sense of place “relates to uniqueness, distinctiveness or strong identity” and is “sometimes referred to as *genius loci* meaning *spirit of the place*” (Oberholzer, 2005). The Project area and surrounds have a largely disturbed sense of place.

The affected visual receptors will be determined in the investigation to follow (refer to Section 8.2.2).

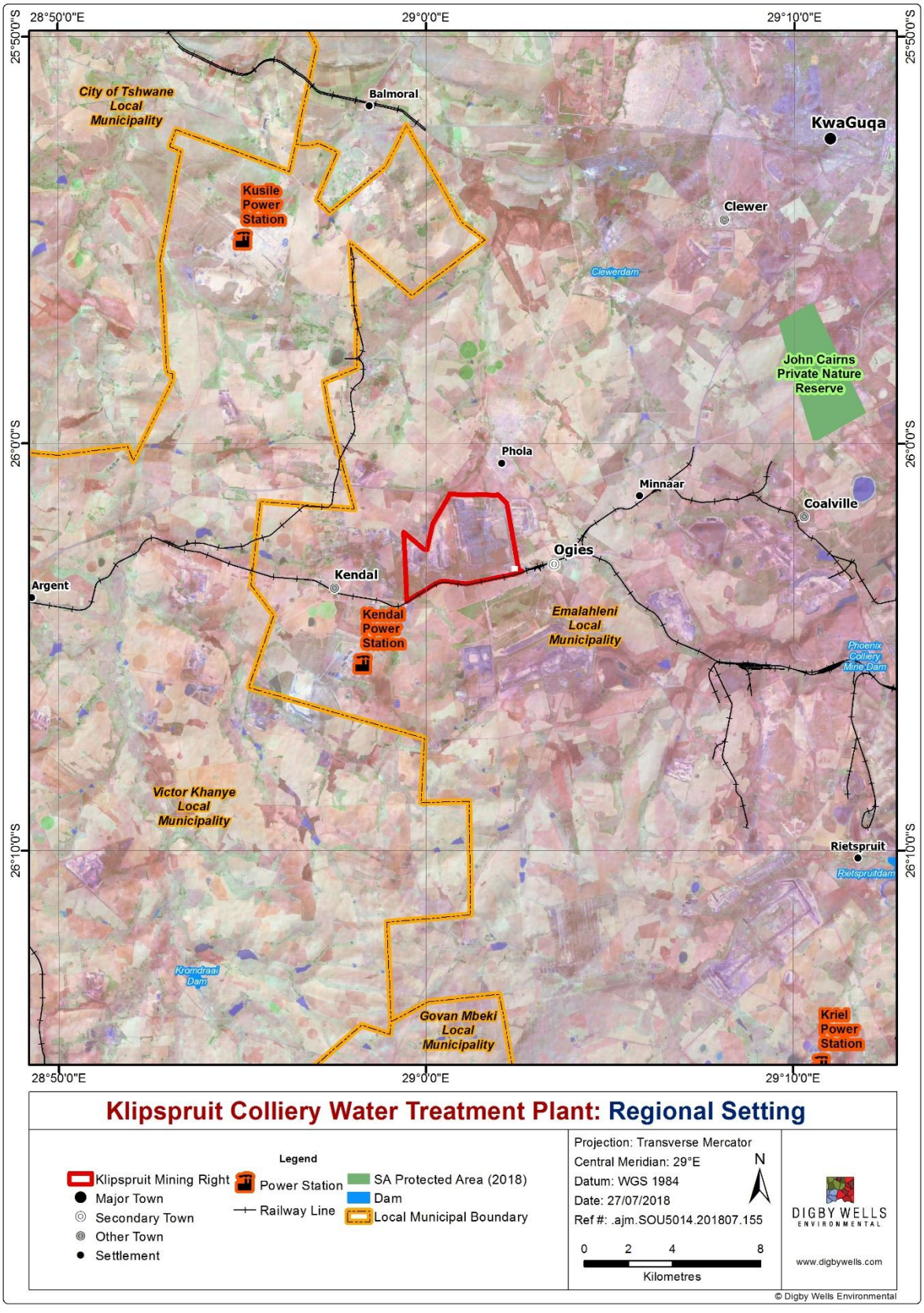

Figure 6-1: Regional Setting

7 Methodology

The VIA was performed using surveyed geographically referenced information and aerial photography, together with the professional opinion of an experienced visual impact assessor.

The study identified and evaluated the surface features using ArcGIS 3D Analyst Extension to create a topographical model, and viewshed models.

7.1 Characterisation 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 7-2 (Oberholzer, 2005). This 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 the classification system of Oberholzer (2005), the Project is classed as a **Category 4 development** (Table 7-1). The receiving environment can be described as **disturbed or degraded sites/run down urban areas / wasteland** due to the largely disturbed, industry and mining heavy sense of place of the project area. The Project area and surrounds are characterised by mixed land-use of heavily industrialised mining and agriculture. It is therefore expected that the Project will have a **minimal visual impact** on the receiving environment. This will be verified in the investigation to follow.

Table 7-1: 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 7-2: 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 **minimal** visual impact is expected, Oberholzer (2005) recommends that a Level 2 visual assessment be conducted. A Level 2 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; and
- Brief indication of potential visual impacts, and possible mitigation measures.

7.2 Visual/Aesthetic Character and Topography

A desktop study was conducted to evaluate the topography of the receiving environment and aerial photography of the area was examined to determine the surface features. Available vector GIS data was used to determine the relative location of the features surrounding the Project area.

A topographical model (refer to Figure 7-1) was created using ArcGIS 3D Analyst Extension. The model was created using the 5 metre contour relief data available from CD:NGI and 50cm mine survey data within the MRA provided by the client.

The resultant topographical model was then used to create a three viewshed models to identify the resulting visibility of the proposed infrastructure. Due to the presence of existing mining operations on the proposed site, the following viewsheds were created:

- A viewshed to detail the visibility of existing mining operations of KPS;
- A viewshed to detail the visibility of the proposed infrastructure.
- A viewshed to detail the visibility the visibility of the proposed new infrastructure only, excluding areas where current mining operations are visible.

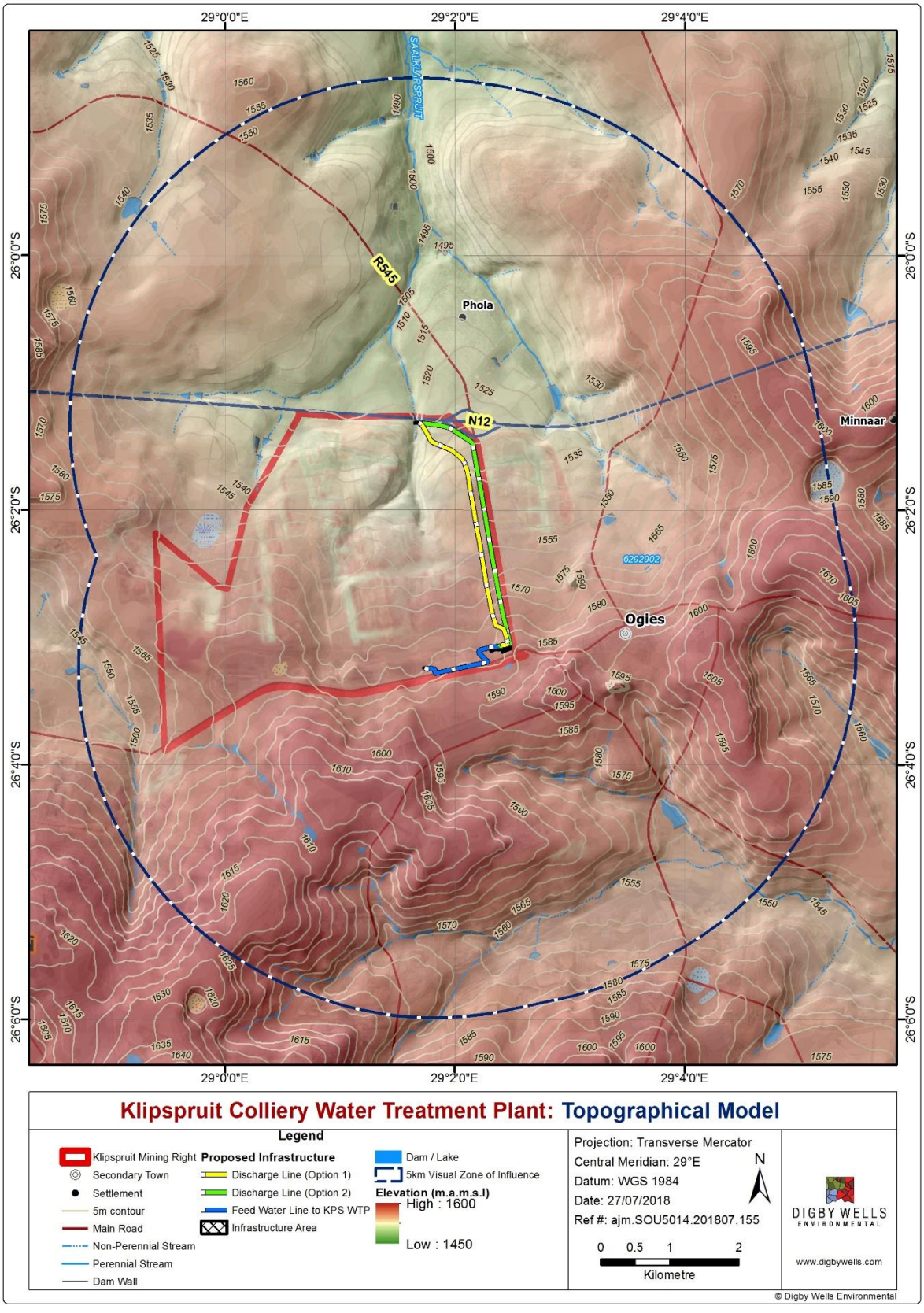

Figure 7-1: Topographical Model

7.3 Viewshed Analysis

The resultant topographical model was used to create a viewshed model using the Viewshed Tool of the ArcGIS 3D Analyst Extension. This viewshed model illustrates the areas from which the Project will potentially be visible, taking into account the estimated height of the proposed infrastructure (Table 7-3). The infrastructure is illustrated on Figure 1-2.

Table 7-3: Infrastructure Heights for Viewshed Modelling

Infrastructure	Height	Source
WTP : Building and Overhead Crane	14 m	WTP Design Drawing (Prentec, 2018)
WTP: Lime Silo	14 m	WTP Design Drawing (Prentec, 2018)
WTP : Reactors	8 m	WTP Design Drawing (Prentec, 2018)
WTP : Ancillary Building, Offices and Stores	5 m	WTP Design Drawing (Prentec, 2018)
Temporary Laydown Area	5 m	Average height of single storey building with pitched roof
Feed Water and Discharge Lines	2 m	Assumed based on height of other surface HDPE pipelines
Access roads	0 m	Ground level

The concept of viewshed modelling is depicted in Figure 7-2. The topography denotes whether or not a development will be visible from a receptor. In Figure 7-2 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.

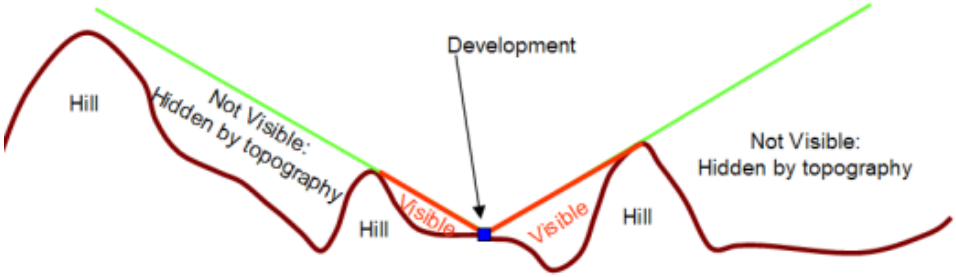

Figure 7-2: Theoretical Background of Viewshed Modelling

Only theoretical viewshed models were created for daytime conditions. 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. Most of the natural Eastern Highveld Grassland vegetation of the Project area and surrounds is disturbed by current mining and industrial

activities, facilitating a degree of visual screening. The primary source of visual screening comes from the anthropogenic mining and agricultural activities already present in the surrounding environment.

The theoretical viewshed models were used to quantify the worst-case scenario. Visual exposure and the visual impact of a development diminish exponentially with distance (Oberholzer, 2005).

Based on the visibility of the existing infrastructure and the location of the main sensitive receptors, and based on the heavily disturbed peripheral environment, the zone of influence was determined to be within 5km for the purpose of the study.

Based on the findings of desktop work conducted, the following categories were used for the theoretical viewshed model:

- 0 – 1 km: Potentially high visual exposure;
- 1 – 2 km: Potentially moderate visual exposure; and
- 2 – 5 km: Potentially low visual exposure.

8 Findings

The findings include a description of the visual/aesthetic character and topography, the results of the viewshed analysis, and the identification of the sensitive receptors of the Project area.

8.1 Visual/Aesthetic Character and Topography

This section provides the results obtained from the analysis of the topographical model created in ArcGIS.

The Project area and surrounds area is generally undulating with elevations ranging from 1,600 metres above mean sea level (m.a.m.s.l.) in the southern part of the zone of influence on the ridge forming the catchment boundary between the Saalklapspruit to the north and the Saaiwaterspruit River to the south, to 1,500m.a.m.s.l in the low lying valleys. The elevation of the proposed infrastructure ranges from 1,510m.a.m.s.l. at the clean water discharge point at the northern extent of the proposed pipelines to 1,580m.a.m.s.l. at the WTP Area, refer to Figure 7-1 and Figure 8-1 below. The topography does form a moderate level of visual screening with topographic screening at the ridge to the south of the Project area screening views to the south of the ridge. Low lying areas in the valleys of the rivers also provide a level of visual screening.

Figure 8-1: Example of Undulating Topography of the Project Area

According to Mucina and Rutherford (2012) the dominant vegetation types in the Project area and surrounds are Eastern Highveld Grassland and Rand Highveld Grassland. The natural vegetation is low and provides very little visual screening. There is, however, an abundance of alien invasive trees and bush that are a result of mining and industrial activities in the Project area and surrounds. There are existing rows of alien invasive plants/trees planted near some farm residences as windbreaks/vegetation screens. Such trees/wind breaks provide a form of visual screening however, the majority of the Project area has low visual screening vegetation. Refer to Figure 8-2 and Figure 8-3 below. In summary, the scenery can be described as undulating with scenic rolling hills and pans in the Project area and surrounds. The distinct presence of existing anthropogenic activities, in the form of mining and industrial activities, diminish from the area's sense of place. There is very little tourism potential in the area and no major protected areas or tourist attractions are in proximity of the existing mining activities or the proposed infrastructure.

Figure 8-2: Example of Low Screening Vegetation looking South from Phola Towards the Proposed Infrastructure (Google Streetview, 2009)

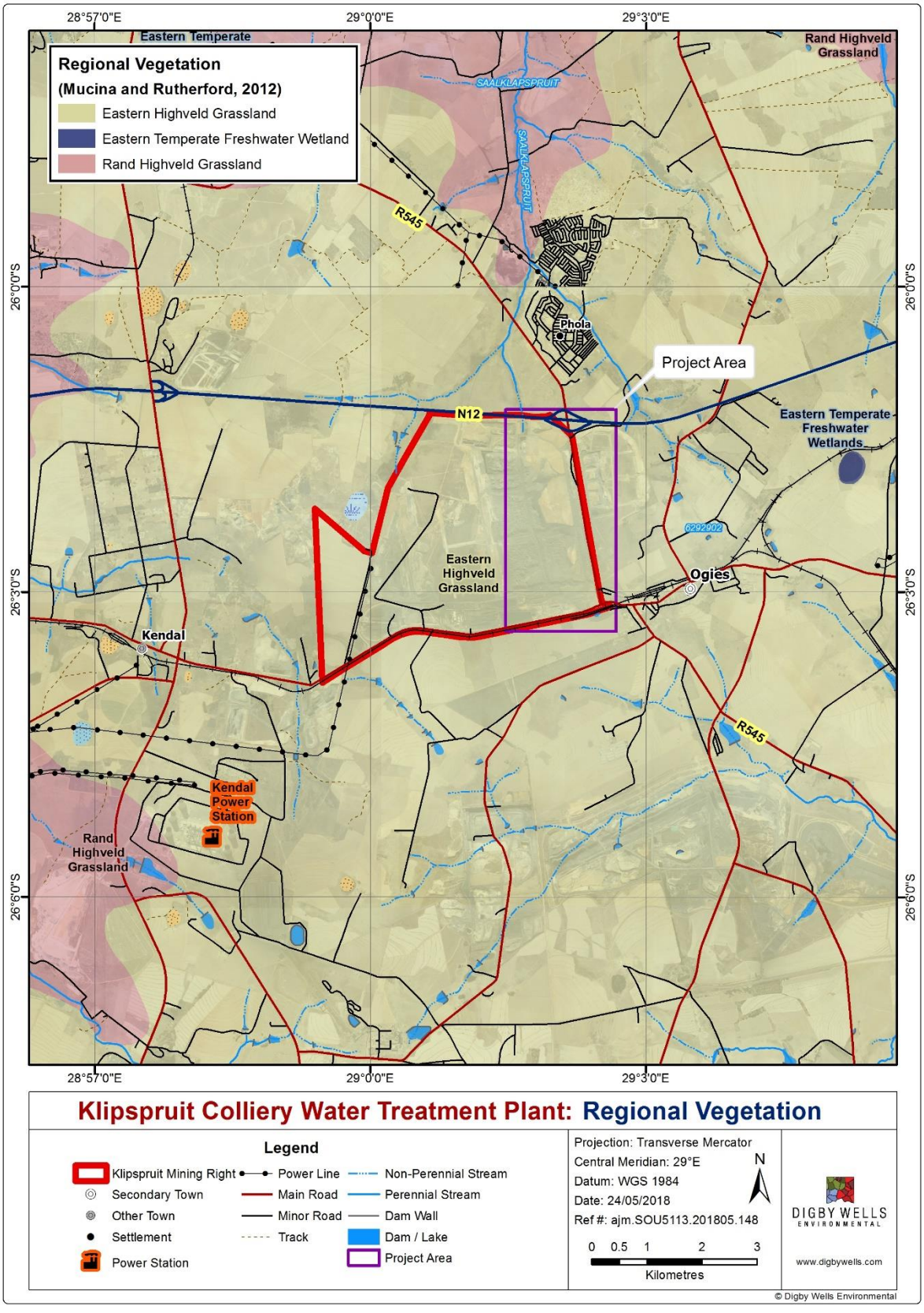

Figure 8-3: Regional Vegetation (Mucina and Rutherford, 2012)

8.2 Viewshed Model

Three viewshed models were run to quantify the visibility of the proposed infrastructure. A viewshed was run to determine the visibility of the existing mining activities within KPS, the proposed infrastructure, and a model to determine areas where only the proposed new infrastructure will be visible in order to quantify the impact of only the newly proposed infrastructure.

These theoretical viewshed models were based on the topography only and do not take the screening effect of vegetation into account. These viewshed models depict the worst-case scenario and show the areas from which the Project may potentially be visible.

8.2.1 Existing Infrastructure

The theoretical viewshed model was refined to a daytime viewshed model (Figure 8-4) with a buffer of 5km around the existing mining infrastructure and divided into areas that are likely to experience different categories of visual exposure. Due to the disturbed nature of the receiving environment, it is noted that the visual impact of the existing infrastructure is minimal outside of this 5km zone of influence. The daytime viewshed model depicts the area from which the Project may potentially be visible during the day. This daytime viewshed model covers an area of approximately 76.69km^2. The viewshed areas for the categories are listed in Table 8-1 below.

Table 8-1: Viewshed Area per Category (Existing Infrastructure)

Category	Impact	Viewshed Area
0 – 1 km	Potentially Very High Visual Exposure	13.16km^2
1 – 2 km	Potentially Moderate Visual Exposure	14.71km^2
2 – 5 km	Potentially Low Visual Exposure	51.82km^2

8.2.2 Proposed Infrastructure

The theoretical viewshed model was refined to a daytime viewshed model (Figure 8-4) with a buffer of 5km around the proposed infrastructure and divided into areas that are likely to experience different categories of visual exposure. Due to the disturbed nature of the receiving environment it is noted that the visual impact of the existing infrastructure is minimal outside of this 5km zone of influence. The daytime viewshed model depicts the area from which the Project may potentially be visible during the day. This daytime viewshed model covers an area of approximately 50.14km^2. The viewshed areas for the different categories are listed in Table 8-2 below.

Table 8-2: Viewshed Area per Category (Proposed Infrastructure)

Category	Impact	Viewshed Area
0 – 1 km	Potentially Very High Visual Exposure	6.82km^2
1 – 2 km	Potentially Moderate Visual Exposure	6.78km^2
2 – 5 km	Potentially Low Visual Exposure	36.54km^2

8.2.3 Proposed Infrastructure Only

The theoretical viewshed model was defined by removing the viewshed of the existing infrastructure from the proposed infrastructure in an attempt to quantify the direct viewshed of the proposed infrastructure only (Figure 8-4). The same parameters and buffers were used as for the existing and proposed viewshed. This net daytime theoretical viewshed model covers an area of approximately 3.86 km^2. The viewshed areas for the categories are listed in Table 8-3 below.

Table 8-3: Viewshed Area per Category (Proposed Infrastructure Only)

Category	Impact	Viewshed Area
0 – 1 km	Potentially Very High Visual Exposure	0.34km^2
1 – 2 km	Potentially Moderate Visual Exposure	0.99km^2
2 – 5 km	Potentially Low Visual Exposure	2.52km^2

8.3 Sensitive Receptors

The visual sensitivity of receptors is dependent on the nature of the receptors (Oberholzer, 2005). Receptors in residential areas or nature reserves have a high sensitivity while receptors in industrial or mining areas have a low sensitivity. This section identifies the sensitive visual receptors in each category of the daytime theoretical viewshed models.

8.3.1 Existing Infrastructure

The potential visual receptors identified within the daytime viewshed model of the Project include residents of the Ogies and Phola settlements, and motorists travelling along the N12 and R545. Table 8-4 below lists the sensitive receptors by category.

Table 8-4: Sensitive Receptors per Category (Existing Infrastructure)

Category	Impact	Receptors
0 – 1 km	Potentially Very High Visual Exposure	Phola southern extent, Ogies (partial), N12, R545
1 – 2 km	Potentially Moderate Visual Exposure	Phola, Ogies (partial), N12, R545
2 – 5 km	Potentially Low Visual Exposure	Phola, Ogies, N12, R545

8.3.2 Proposed Infrastructure

The potential visual receptors identified within the daytime theoretical viewshed model of the Project include residents of the Ogies and Phola settlements, and motorists travelling along the N12 and R545.

Table 8-5 below lists the sensitive receptors by category.

Table 8-5: Sensitive Receptors per Category (Proposed Infrastructure)

Category	Impact	Receptors
0 – 1 km	Potentially Very High Visual Exposure	Phola southern extent, Ogies (partial), N12, R545
1 – 2 km	Potentially Moderate Visual Exposure	Phola, Ogies (partial), N12, R545
2 – 5 km	Potentially Low Visual Exposure	Phola, Ogies, N12, R545

8.3.3 Proposed Infrastructure Only

The potential visual receptors identified within the daytime theoretical viewshed model of the Project include residents of the Ogies and Phola settlements, and motorists travelling along the N12 and R545.

Table 8-6 below lists the sensitive receptors by category.

Table 8-6: Sensitive Receptors per Category (Proposed Infrastructure Only)

Category	Impact	Receptors
0 – 1 km	Potentially Very High Visual Exposure	Ogies
1 – 2 km	Potentially Moderate Visual Exposure	Phola, Ogies, R545
2 – 5 km	Potentially Low Visual Exposure	Phola, Ogies

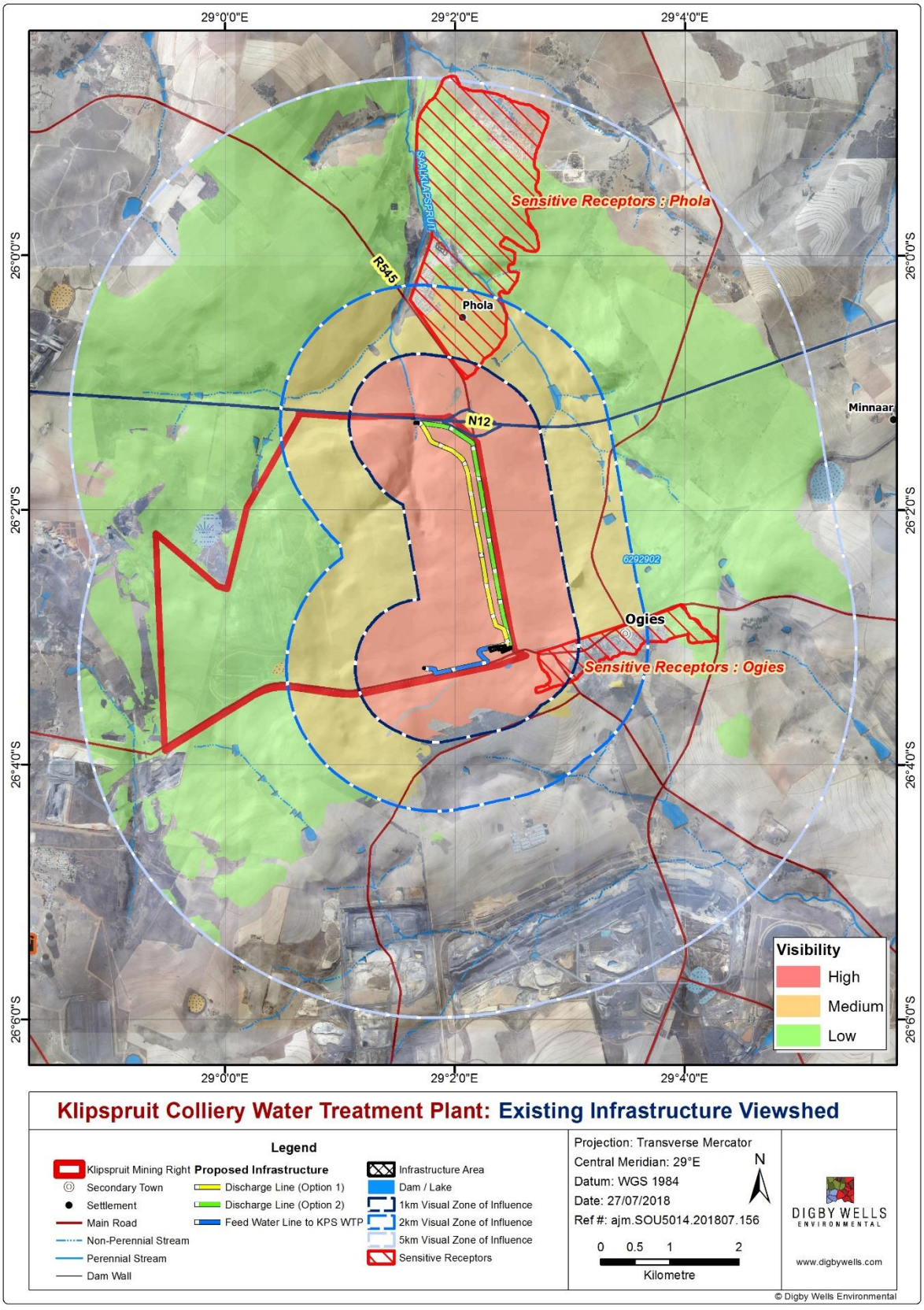

Figure 8-4: Existing Infrastructure Viewshed

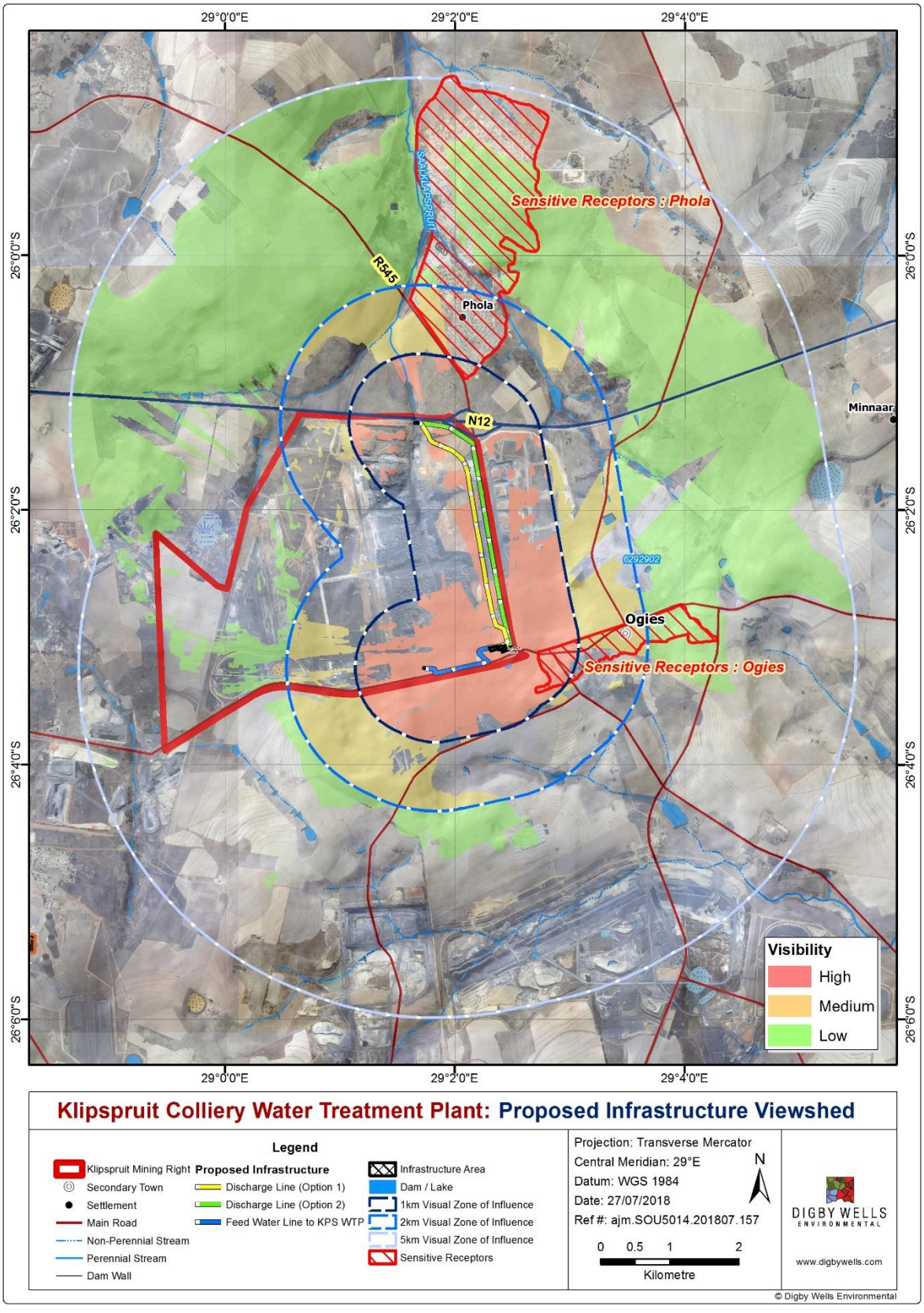

Figure 8-5: Proposed Infrastructure Viewshed

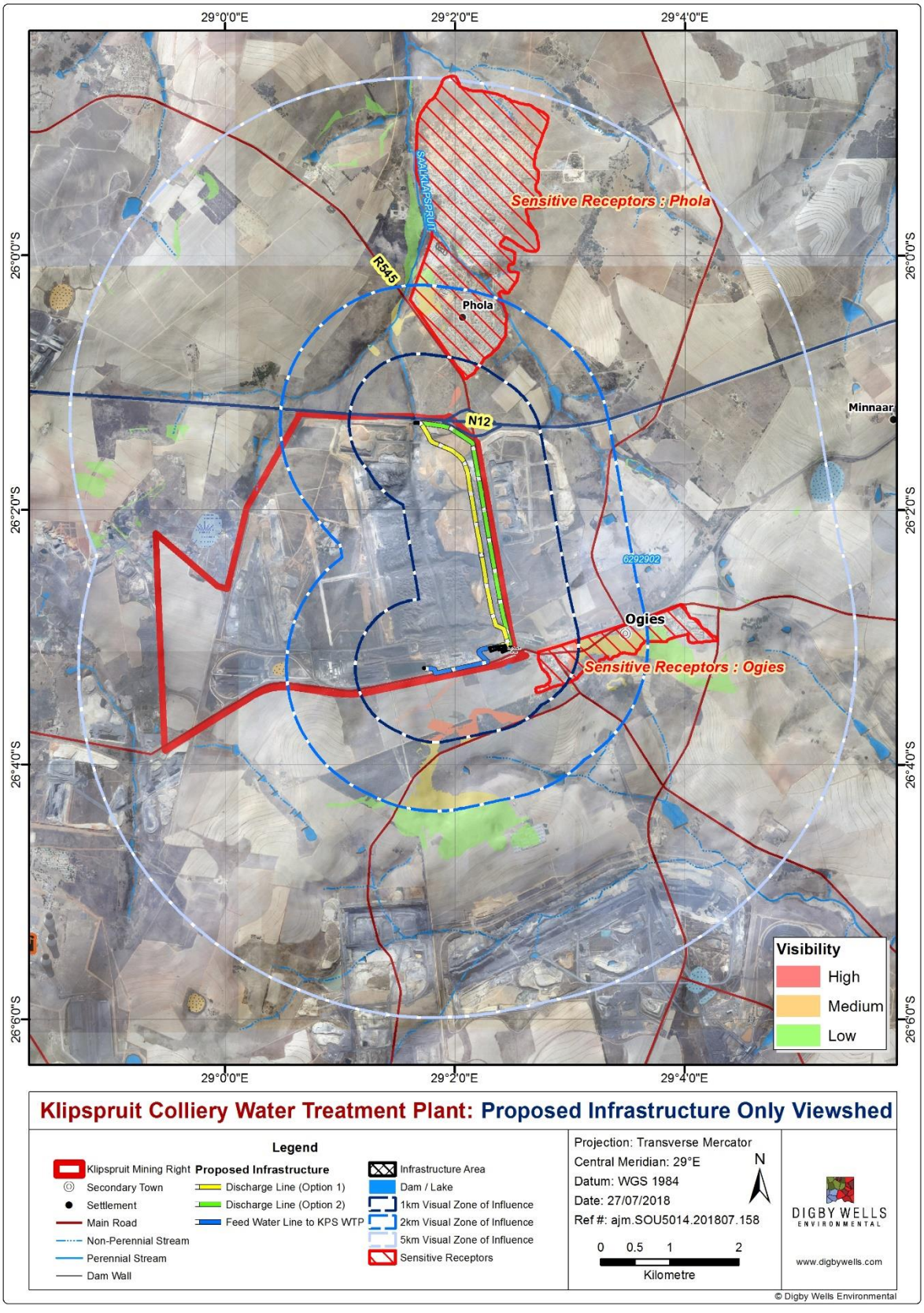

Figure 8-6: Proposed Infrastructure Only Viewshed

9 Discussion

The Project will have a moderate visual impact on the receiving environment. The most significant daytime visual impact will be from the WTP area. The WTP and pipelines will be visible to sensitive receptors in the form of residents and motorists. This impact is, however, negligible when one looks at the direct new impact of the proposed infrastructure on the undisturbed surrounding environment.

The impacts will be restricted to daytime as the plant will be mainly visible during daytime with limited lighting at night. No lighting information was provided and therefore lighting has not been modelled in this assessment.

Oberholzer (2005) provides a number of criteria related specifically to VIAs (Table 9-1) and suggests that a proposed project should be assessed against these criteria before conducting the impact assessment. Table 9-1 provides a summary of the criteria and they are discussed in more detail in Sections 9.1 to 9.6 below.

Table 9-1: Specific Criteria for VIAs (adapted from Oberholzer, 2005)

Criteria	Rating	Description
Visibility of the project	High visibility	Visible from a large area (e.g. several square kilometres)
	Moderate visibility	**Visible from an intermediate area (e.g. several hectares)**
	Low visibility	Visible from a small area around the project site
Visual exposure	High exposure	Dominant or clearly noticeable
	Moderate exposure	Recognisable to the viewer
	Low exposure	**Not particularly noticeable to the viewer**
Visual sensitivity of the area	High visual sensitivity	Highly visible and potentially sensitive areas in the landscape
	Moderate visual sensitivity	Moderately visible areas in the landscape
	Low visual sensitivity	**Minimally visible areas in the landscape**
Visual sensitivity of receptors	**High sensitivity**	**Residential areas, nature reserves and scenic routes or trails**
	Moderate sensitivity	Sporting or recreational areas, or places of work
	Low sensitivity	Industrial, mining or degraded areas
Visual absorption capacity (VAC)	High VAC	Effective screening by topography and vegetation
	Moderate VAC	**Partial screening by topography and vegetation**

Criteria	Rating	Description
	Low VAC	Little screening by topography or vegetation
Visual intrusion	High visual intrusion	Results in a noticeable change or is discordant with the surroundings
	Moderate visual intrusion	Partially fits into the surroundings, but clearly noticeable
	Low visual intrusion	**Minimal change or blends in well with the surroundings**

9.1 Visibility of the Project

The visibility of the project refers to the viewshed area and is also related to the number of receptors affected (Oberholzer, 2005). The Project has a **moderate visibility** as it is visible from an intermediate area [defined by Oberholzer (2005) as several square hectares] with numerous visual receptors.

The daytime viewshed model of the proposed infrastructure covers an area of approximately 50.14 km^2. The potential visual receptors within the daytime viewshed include residents of the Ogies and Phola settlements, and road users along the N12 national Road and R545 regional road.

9.2 Visual Exposure

Visual exposure is “based on the distance from the infrastructure area to selected viewpoints” and “tends to diminish exponentially with distance” (Oberholzer, 2005). The Project has a **low exposure** as it will not be particularly noticeable in the landscape to receptors within the viewshed area considering the receptors have been visually impacted upon by larger and more intrusive mining operations.

9.3 Visual Sensitivity of the Area

The visual sensitivity of the area refers to “the inherent visibility of the landscape, usually determined by a combination of topography, landform, vegetation cover and settlement pattern” (Oberholzer, 2005). The receiving environment of the Project has a **low visual sensitivity** as there are minimally visible areas in the landscape.

The Project area and surrounds are characterised by undulating topography and low screening vegetation, however the surrounding landscape is currently heavily disturbed by existing mining and industrial landforms. The receiving environment has a largely mining and agricultural sense of place. The undulating topography is expected to provide partial screening of the proposed infrastructure while the natural Grassland vegetation of the Project area and surrounds is expected to provide minimal visual screening of the Project.

9.4 Visual Sensitivity of Receptors

The visual sensitivity of receptors is dependent on the nature of the receptors (Oberholzer, 2005). Receptors in residential areas or nature reserves have a high sensitivity while receptors in industrial or mining areas have a low sensitivity. The identified receptors (residents of the settlements of Ogies and Phola, and road users) of the Project have a **high visual sensitivity** as they include residential receptors.

9.5 Visual Absorption Capacity

The Visual Absorption Capacity (VAC) refers to "the potential of the landscape to conceal the proposed project" (Oberholzer, 2005). The receiving environment of the Project has a **moderate VAC** because there is partial screening by the topography.

9.6 Visual Intrusion

The visual intrusion of the project refers to "the level of compatibility or congruence of the project with the particular qualities of the area, or its sense of place". Visual intrusion is "related to the idea of context and maintaining the integrity of the landscape or townscape" (Oberholzer, 2005). The Project has a **low visual intrusion** as there will be a minimal change in the existing land use and the Project will therefore blend in well with the surroundings.

10 Impact Assessment

10.1 Impact Assessment Methodology

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

The matrix calculates the rating out of 147, whereby intensity, extent, duration and probability are each rated out of seven as indicated in Table 10-1. 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 10-2). The description of the significance ratings is presented in Table 10-3.

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 10-1: Impact Assessment Parameter Ratings

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Major negative change to receiving environment with high to very high value.	Major positive change to receiving environment with high to very high value.	International The effect will occur across international borders.	Permanent The impact will permanently alter or change the receiving environment.	Certain/Definite Happens frequently. The impact will occur regardless of the implementation of any preventative or corrective actions.
6	Moderate negative change to receiving environment with high to very high value.	Moderate positive change to receiving environment with high to very high value.	National Will affect the entire country.	Beyond Project Life The impact will reduce over time after project life.	Highly Probability Happens often. It is most likely that the impact will occur.
5	Minor negative change to receiving environment with high to very high value.	Minor positive change to receiving environment with high to very high value.	Province/Region Will affect the entire province of region.	Project Life The impact will cease after project life.	Likely Could easily happen. The impact may occur.
4	Major negative change to receiving environment with medium to medium high value.	Major positive change to receiving environment with medium to medium high value.	Municipal Area Will affect the whole municipal area.	Long Term The impact will remain for more than 50% of the project life.	Probable Could occur. Has occurred here or elsewhere.
3	Moderate negative change to receiving environment with medium to medium high value.	Moderate positive change to receiving environment with medium to medium high value.	Local Local extending only as far as the development site area.	Medium Term The impact will remain for between 10% and 50% of the project life.	Unlikely/Low Probability Has not happened yet but could happen once in the lifetime of the project. There is a possibility that the impact will occur.

Rating	Intensity		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
2	Minor negative change to receiving environment with medium to medium high value.	Minor positive change to receiving environment with medium to medium high value.	Limited Limited to the site and its immediate surroundings.	Short Term The impact will remain for less than 10% of the project life.	Rare/Improbable Conceivable, but only in extreme circumstances. Has not happened during the lifetime of the project but has happened elsewhere. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures.
1	No change to receiving environment with values of medium of higher, or any negative change to receiving environment with low value.	No change to receiving environment with values of medium of higher, or any positive change to receiving environment with low value.	Site Specific Limited to specific isolated parts of the site.	Immediate The impact may be sporadic/limited in duration and can occur at any time.	Highly Unlikely/None Expected never to happen. Impact will not occur

Table 10-2: 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																																						

Table 10-3: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact which may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change.	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long term positive change to the (natural and/or social) environment.	Major (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long term effects on the natural and/or social environment.	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and/or social environment.	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and/or social environment.	Negligible (negative) (-)
-36 to -72	A minor negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long term effects on the natural and/or social environment.	Minor (negative) (-)
-73 to -108	A moderate negative impact which may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long term change to the (natural and/or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact which may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

10.2 Project Activities and Infrastructure

The activities or items of infrastructure associated with the Project and applicable to this VIA are listed in Table 10-4 below.

Table 10-4: Project Activities

Category	Activity or Item of Infrastructure
Infrastructure	▪ WTP – Building and Overhead Crane; ▪ WTP – Lime Silo; ▪ WTP – Reactors; ▪ WTP – Ancillary Building, Offices and Stores; ▪ Feed Water, Discharge Lines and dissipation structures, and ▪ Access Roads.

10.3 Visual Impact Assessment

The Project activities and items of infrastructure listed in Table 10-4 will be rated according to the visual impact they will have on the receiving environment, i.e. the environment before 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.

10.3.1 Construction Phase

The construction phase is characterised by site development and infrastructure construction. This includes site clearing, vegetation removal, topsoil removal, construction of the WTP and associated surface infrastructure, temporary construction laydown area, access roads, and a transformer. The establishment of infrastructure and the related site clearing and construction activities will draw attention to the Project area making receptors aware of the Project. The construction phase will have negative visual impacts on the receiving environment.

10.3.1.1 Activity 1: Site Clearing

Site clearing will have a minor negative visual impact on sensitive receptors considering the proposed footprint areas for both the WTP and the laydown area are already disturbed and cleared of natural vegetation. The slight change of land use will contribute to the cumulative impacts of industry and development on the regional environment.

The receiving environment is characterised by undulating, disturbed vegetation and terrain. Site clearing and vegetation removal will have a minor negative visual impact on the receiving environment. The Project area will, however, become noticeable to nearby receptors as it will contrast the surrounding areas. Topsoil removal will have a negative visual impact on the receiving environment. Dust from site clearance will also have a negative visual impact. The impacts of site clearing are summarised in Table 10-5.

Table 10-5: Potential Impacts of Site Clearance

<table>
<tr><td colspan="5">IMPACT DESCRIPTION: Site Clearance and removal of vegetation have a minor visual impact on the receiving environment.</td></tr>
<tr><th>Dimension</th><th>Rating</th><th colspan="3">Motivation</th></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Medium Term (3)</td><td>The impact will occur during the construction phase.</td><td rowspan="3">Consequence: Slightly detrimental (-8)</td><td rowspan="4">Significance: Minor - negative (-48)</td></tr>
<tr><td>Extent</td><td>Local (3)</td><td>Site clearing activities will be visible from the area surrounding the construction site.</td></tr>
<tr><td>Intensity x type of impact</td><td>Minor - negative (-2)</td><td>Site clearing is expected to cause a moderate visual disturbance. The Project Area is already disturbed and devoid of natural vegetation.</td></tr>
<tr><td>Probability</td><td>Certain (7)</td><td colspan="2">The impact will likely occur.</td></tr>
<tr><td colspan="5">MITIGATION:</td></tr>
<tr><td colspan="5">■ Only remove vegetation within the infrastructure areas;
■ Only remove topsoil within the infrastructure areas; and
■ Apply dust suppression techniques to limit dust generated from the topsoil stockpiles.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Medium Term (3)</td><td>The impact will occur during the construction phase.</td><td rowspan="2">Consequence: Highly detrimental (-7)</td><td rowspan="2">Significance: Minor – negative (-42)</td></tr>
<tr><td>Extent</td><td>Limited (2)</td><td>The extent of the impact will be reduced by implementing the mitigation actions listed above.</td></tr>
</table>

IMPACT DESCRIPTION: Site Clearance and removal of vegetation have a minor visual impact on the receiving environment.				
Dimension	**Rating**	**Motivation**		
Intensity x type of impact	Minor - negative (-2)	The visual disturbance will be reduced by implementing the mitigation actions above.		
Probability	Highly Probable (6)	It is most likely that the impact will occur.		

10.3.1.2 Activity 2: Construction of Infrastructure

The Project consists of the following components:

- WTP – Building and Overhead Crane;
- WTP – Lime Silo;
- WTP – Reactors;
- WTP – Ancillary Building, Offices and Stores;
- Feed Water, Discharge Lines and dissipation structures, and
- Access Roads (limited to WTP).

Construction of infrastructure is expected to have a moderate negative visual impact on the receiving environment. The surface infrastructure will change the sense of place slightly due to the addition of light industrial infrastructure. Construction activities are not expected to take place at night. The impacts of construction of infrastructure are summarised in Table 10-6 and Table 10-7.

Table 10-6: Potential Impacts of Construction of the WTP on the Receiving Environment

IMPACT DESCRIPTION: Construction of the WTP is expected to have a moderate negative visual impact on the receiving environment.				
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Project Life (5)	The impact will cease after project life.	Consequence: Moderately detrimental (-11)	Significance: Moderate – negative (-77)
Extent	Local (3)	The viewshed model indicates that the Project will be visible from a maximum distance of 5 km during the day.		

<table>
<tr><td colspan="5">IMPACT DESCRIPTION: Construction of the WTP is expected to have a moderate negative visual impact on the receiving environment.</td></tr>
<tr><td>Dimension</td><td>Rating</td><td colspan="2">Motivation</td><td></td></tr>
<tr><td>Intensity x type of impact</td><td>Moderate - negative (-3)</td><td>Construction of the WTP is expected to cause a moderate visual disturbance.</td><td></td><td rowspan="2"></td></tr>
<tr><td>Probability</td><td>Certain (7)</td><td colspan="2">The impact will definitely occur.</td></tr>
<tr><td colspan="5">MITIGATION:</td></tr>
<tr><td colspan="5">■ Ensure the WTP infrastructure does not exceed the proposed heights;
■ Where possible, surface infrastructure must be painted natural hues so that it blends into the surrounding landscape;
■ Limit the footprint area of the surface infrastructure;
■ Pylons and metal structures must be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, a neutral matt finish must be used; and
■ Avoid construction activities at night. If construction activities take place at night then only areas where these activities are taking place should be lit and the number of lights and brightness must not exceed the minimum requirements for safety and security. Down lighting and low-pressure sodium light sources must be implemented to minimise light pollution. Lights should be directed inwards towards the Project area and not outwards from the Project area.</td></tr>
<tr><td colspan="5">POST-MITIGATION</td></tr>
<tr><td>Duration</td><td>Project Life (5)</td><td>The impact will cease after project life.</td><td rowspan="3">Consequence: Slightly detrimental (-9)</td><td rowspan="4">Significance: Minor – negative (-54)</td></tr>
<tr><td>Extent</td><td>Limited (2)</td><td>The extent of the impact will be reduced by implementing the mitigation actions listed above.</td></tr>
<tr><td>Intensity x type of impact</td><td>Moderate - negative (-3)</td><td>The visual disturbance will be reduced by implementing the mitigation measures above.</td></tr>
<tr><td>Probability</td><td>Highly probable (6)</td><td colspan="2">It is most likely that the impact will occur.</td></tr>
</table>

Table 10-7: Potential Impacts of Construction of Pipelines on the Receiving Environment

IMPACT DESCRIPTION: Construction of Pipelines is expected to have a minor-negative visual impact on the receiving environment.				
Dimension	**Rating**	**Motivation**		
PRE-MITIGATION				
Duration	Project Life (5)	The impact will cease after project life.	Consequence: Moderately detrimental (-10)	Significance: Minor - negative (-70)
Extent	Local (3)	The pipelines will be visible from the surrounding area.		
Intensity x type of impact	Low - negative (-2)	Construction of the pipelines is expected to have a low visual disturbance.		
Probability	Certain (7)	The impact will definitely occur.		
MITIGATION:				
■ Limit the footprint area of pipelines where possible; ■ Limit the height of pipelines and any service paths/roads; and ■ If possible, bury the pipelines to remove any long-term visual impact.				
POST-MITIGATION				
Duration	Project Life (5)	The impact will cease after project life.	Consequence: Moderately detrimental (-8)	Significance: Minor - negative (-36)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation actions listed above.		
Intensity x type of impact	Low - negative (-2)	The visual disturbance will remain, but be reduced by implementing the mitigation actions above.		
Probability	Probable (4)	It is most likely that the impact will occur. The burying of the pipeline will remove any long term impacts associated with the pipelines.		

10.3.2 Operational Phase

The operational phase is characterised by operation of the WTP and associated pipelines. The operational phase is expected to have negative visual impacts on the receiving environment.

10.3.3 Closure and Decommissioning

The closure and decommissioning phase is characterised by the removal of the WTP and all associated pipelines and infrastructure. The closure and decommissioning phase is expected to have minimal visual impacts on the receiving environment.

<table>
<tr><td colspan="5">IMPACT DESCRIPTION: Closure of the WTP, pipelines and associated infrastructure is expected to have a moderate negative visual impact on the receiving environment during the day.</td></tr>
<tr><th>Dimension</th><th>Rating</th><th colspan="3">Motivation</th></tr>
<tr><td colspan="5">PRE-MITIGATION</td></tr>
<tr><td>Duration</td><td>Permanent (2)</td><td>The impact will remain permanently.</td><td rowspan="3">Consequence: Moderately detrimental
(-4)</td><td rowspan="4">Significance: Minor – negative
(-16)</td></tr>
<tr><td>Extent</td><td>Very Limited (1)</td><td>The removal of all surface infrastructure will mean that any remaining visual impact will be very limited to the immediate area.</td></tr>
<tr><td>Intensity x type of impact</td><td>Very low – negative
(-1)</td><td>A very low impact is expected after the removal of surface infrastructure. Re-vegetation and resurfacing must take place to limit any remaining landscape scarring.</td></tr>
<tr><td>Probability</td><td>Probable (4)</td><td colspan="2">Their will likely remain an impact even after closure due to slight alteration to the landscape and land use.</td></tr>
</table>

11 Cumulative Impacts

The cumulative impact on the surrounding environment and receptors is low due to the large scale existing degradation caused by numerous mines and mining activities in the project area and surrounds.

12 General Mitigation/Management

According to Brush *et al*. (1979), vegetation screening is the best mitigation/management action to conceal a development. Figure 12-1 illustrates the screening effect of vegetation. It is recommended that any natural vegetation which may potentially conceal the proposed development be left undisturbed, especially on the Project boundary. Vegetation left undisturbed along the perimeter of the Project has the ability to conceal the proposed infrastructure from nearby receptors. Figure 12-2 illustrates the effect of cleared vegetation allowing direct views of the proposed infrastructure.

The natural vegetation of the Project area and surrounds is Highveld Grassland and does not contain many large tree species. The existing rows of plants/trees planted near some farm residences as windbreaks/vegetation screens are alien invasive species. Ecological input has suggested that the planting of the indigenous karee tree, and Searsia lancea, for potential screening along the perimeter of the Project.

Figure 12-1: Screening Effect of Vegetation

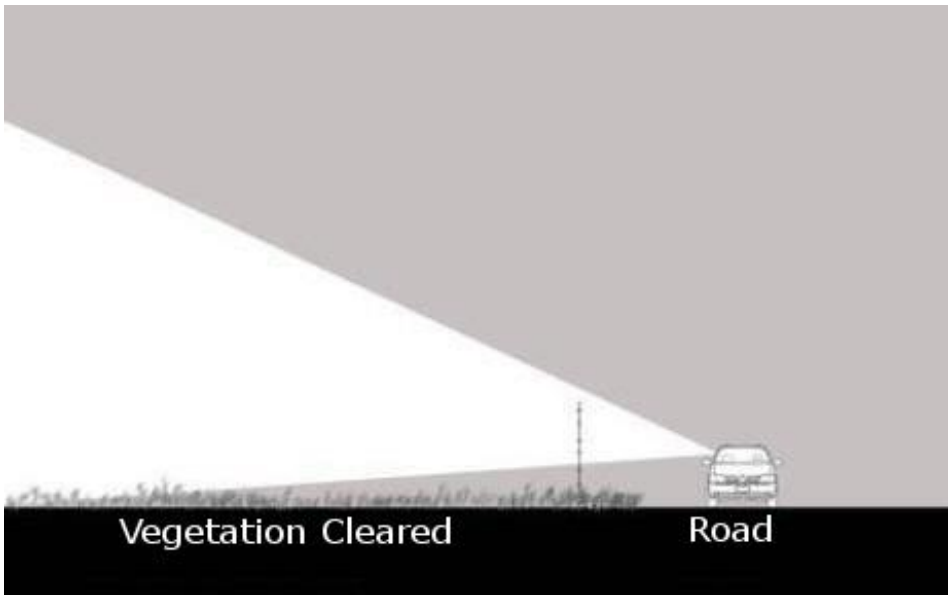

Figure 12-2: Effect of Cleared Vegetation

Other general mitigation/management actions that should be implemented where possible include:

- As much existing natural vegetation as possible should be retained, specifically bushes and trees if present. This will assist to conceal the development;
- Areas susceptible to dust should be frequently wetted by means of a water bowser during the construction phase. It is extremely important to suppress the visual aspects of dust to avoid creating the impression of a polluting industry;
- Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible;
- Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used;
- Where possible avoid construction and operational activities at night. If construction and operational activities take place at night, then only areas where these activities are taking place should be lit and the number of lights and brightness must not exceed the minimum requirements for safety and security. Down lighting and low-pressure sodium light sources must be implemented to minimise light pollution. Lights should be directed inwards towards the Project area and not outwards from the Project area;
- An appropriate grievance mechanism should be developed to respond to grievances from receptors that relate to visual aspects.

13 Recommendations

It is recommended that the mitigation/management actions in Sections 10.3 and 12 are implemented to reduce the impact that the Project will have on the visual character of the receiving environment. The Project will have a moderate high visual impact on the receiving environment and will be visible for a distance of 5km during the day. This visual impact will remain until closure and remediation.

14 Conclusion

The Project comprises the construction and operation of a WTP and ancillary infrastructure. Theoretical viewshed models were created for the Project. 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.

The potential visual receptors within the theoretical viewshed include residents of the Ogies and Phola settlements, and motorists along the N12 national road and R545 regional road.

The “Guideline for involving visual and aesthetic specialists in EIA processes” document by Oberholzer (2005) identifies large-scale infrastructure as a Category 4 development. The receiving environment of the Project is an area of disturbed scenic, cultural or historical significance as the Project area has been degraded by exiting mining and agricultural activities. The Project area and surrounds are characterised by undulating topography and Highveld Grassland vegetation. The predominant surrounding land use is mining and agriculture. A Category 4 development in this area is expected to have a minimal visual impact. The findings of this VIA concur with this categorisation, however, the WTP Area will have a moderate visual impact. With the mitigation proposed, the visual impact significance rating from the VIA is reduced to moderate or minor in most instances. (It should be noted that Oberholzer’s categorisation differs from the impact assessment methodology and as a result the expected visual impact according to Oberholzer and the visual impact significance ratings from the visual impact assessment may differ).

No significant change in land use will result from the Project due to the infrastructure falling within a footprint already disturbed by mining.

The WTP and associated infrastructure will remain for the lifespan of the mine resulting in a project duration negative visual impact on the receiving environment. However, with the proposed mitigation measures, the visual impact significance rating from the visual impact assessment will be reduced to moderate or minor in most instances.

15 References

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Cartographica, 2010: GIS Data Classifications in Cartographica. Available online: http://blog.cartographica.com/blog/2010/8/16/gis-data-classifications-in-cartographica.html (Accessed: 2016/03/30).

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Appendix A: Specialist CV

Mr. Alistair Main

GIS Specialist

GIS

Digby Wells Environmental

1 Biography

Alistair has worked in the consulting environment since graduating with a BA degree in Geography and Environmental Science from Monash University South Africa in 2007. His main focus is providing specialist GIS consulting and support services to the environmental, mining, exploration, and agricultural sectors, specifically for environmental management, engineering, locational planning and management objectives. Professional ambitions include development as a GIS Professional providing specialist input into large mining and infrastructure projects; and focusing on GIS system design and implementation to improve workflow and information management; with particular focus on developing markets where access to high-level GIS information and services is critical to successful project implementation.

Key experience includes the application of GIS to specialist studies including Visual Assessments, Site Selections, and Bathymetric studies. GIS experience includes GIS mapping, data acquisition, and specialist assessments for over 15 countries in Africa.

2 Education

Bachelor of Arts - Geography and Environmental Science [Monash University South Africa]

3 Language Skills

English

4 Employment

Environmental GIS Specialist – Digby Wells Environmental

GIS Specialist - Geosemantic Solutions

GIS Technologist - GCS (Pty) Ltd

GIS Operator - The MSA Group

5 Project Experience

MAPPING

Johannesburg Roads Agency – Mapping of various assets, movable and immovable for the Johannesburg Roads Agency. Included temporal updates of their street centerlines, bridge assets, roads and stormwater assets, traffic signals and intersections, and spatial tracking of movable assets such as technicians, vehicles and heavy duty equipment;

Total Coal South Africa – GIS database management and mapping for Total Coal SA operations in Mpumalanga including Forzando North, South and West; Dorstfontein Coal Mine, and Eloff Prospecting Area;

Exxaro Resources – GIS database management and mapping for the Matla Colliery in Mpumalanga;

Sasol – GIS database management and mapping of Sasol petrol stations in Gauteng, North-West, Limpopo and Mpumalanga as a part of the Sasol Groundwater Contamination Study;

Kangra – GIS database management and mapping of Kangra Coal operations in Mpumalanga and Kwazulu Natal;

Johannesburg Roads Agency – Update of City of Johannesburg street centerline dataset, including all attribute data; and

Implementation of the mobile and web Smart Traffic system for the Johannesburg Roads Agency, including training, documentation, and procedures for the system.

VISUAL IMPACT ASSESSMENTS

Dwarsrivier Chrome Mine (Assmang Chrome) – Comprehensive VIA for proposed Tailings Storage Facility;

Springlake Colliery (Shanduka Coal) – Comprehensive VIA for proposed Opencast Pits and new Boxcut Facility;

Witkop Colliery (Slater Coal) - Comprehensive VIA for proposed Colliery, including Discard dump, Stockpiles, Office and Plant area;

Matla Colliery (Exxaro Resources) - Comprehensive VIA for proposed Brine Ponds and Water Treatment Plant and proposed Opencast Pits and associated dumps and ancillary infrastructure;

Schoongezicht Colliery (Umthombo Resources) - Comprehensive VIA for Schoongezicht Colliery;

Wits Gold DGM Mine (Wits Gold) - Comprehensive VIA for proposed Gold Mine operations, including a Tailings Storage Facility, Shaft headgear, and Processing Plant;

Two Rivers Platinum Mine (African Rainbow Minerals) - Comprehensive VIA for proposed Tailings Storage Facility;

Molo Graphite Mine (Energizer Resources) – Comprehensive VIA for proposed Graphite Mine operations, including an Open Pit, Process Plant, Tailings Storage Facilities and three alternative Water Supply Dams; and

De Aar Visual Impact Assessments – Scoping and Comprehensive VIA for proposed solar parks in the Northern Cape of South Africa.

6 Publications

SA SURVEYORS AND GEOMATICS INDABA (SASGI) 2013 - Geomatics in Mining: The Need for Consolidated Geodatabases for Improved Planning and Decision-Making.