

**AfriSam (Properties) (Pty) Ltd:
Dudfield Cement Factory**

**Basic Assessment report in support of an
Environmental Authorisation Application for a
proposed solar plant**

Date: June 2021

Reference no: 14/12/16/3/3/1/2361



Stewards



Problem Solvers



Team Players

*Influencing decisions since 2000 through identification, quantification and
mitigation of environmental, safety, health and compliance risks*

Executive Summary

AfriSam (Properties) (Pty) Ltd: Dudfield Cement Factory (hereafter referred to as “the applicant”) is located near Lichtenburg on Portion 18 of Farm Dudfield in the Northwest Province. The mine proposes to construct a photovoltaics (“PV”) solar plant adjacent to the existing cement factory for power supply to the cement factory. The proposed project will extend approximately 35 ha in size. The proposed project includes the construction of a PV solar plant on the eastern side of the existing cement factory. PV inverters will be installed as well as a 230 m long 6.6 kV line that will connect into the grid. A portion (630 m) of the existing road leading to the solar plant is proposed to be upgraded. Minor details of the construction methodology will be refined upon appointment of the contractors. Due to the extent and nature of the activities associated with the proposed project, the Environmental Assessment Practitioner (“EAP”) has identified that a Basic Assessment (“BA”) process is required in terms of the NEMA EIA Regulations, GN R.982 dated 2014, as amended.

This Basic Assessment Report (“BAR”) has investigated and assessed the significance of the predicted, potential positive and negative direct, indirect, and cumulative impacts associated with the proposed solar plant project, with mitigation and management actions included in the Environmental Management Programme report (“EMPr”) in Part B of this BAR.



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WCS Scientific (Pty.) Ltd. May 2021. *Wetland Delineation and GN 509 Water Use Risk Assessment for The Dudfield Solar Project.*



PART A:

SCOPE OF ASSESSMENT AND BASIC ASSESSMENT REPORT

1 Details of project applicant and environmental assessment practitioner

1.1 Details of project applicant

Name of operation	Dudfield Cement Factory
Applicant	AfriSam (Properties) (Pty) Ltd
Postal address	Po Box 6367 Weltevredenpark 1715 South Africa
Responsible person	Hannes Meyer
Telephone no.	011 670 5597
e-mail address	hannes.meyer@za.afrisam.com
Company registration no.	2006/005910/07

1.2 Details of the environmental assessment practitioner

EAP	Shangoni Management Services (Pty) Ltd.: Lesley Keay and Renate Steffens
Tel No	(012) 807 7036
Fax No	(012) 807 1014
e-mail Address	lesley@shangoni.co.za renate@shangoni.co.za

1.3 Expertise of the environmental assessment practitioner

Name and Surname	Qualifications and summary of experience
Lesley Keay	Lesley is a junior environmental consultant. She obtained her B.Sc. Hons in Environmental Science with Aquatic Ecosystem Health from the North West University. Lesley assists with the compilation of various reports required as part of Environmental Authorisation processes, including amongst other; Basic Assessments and Environmental Management Programmes. She also has experience in Water Quality Assessment and translating public documentation.
Renate Steffens	Renate Steffens is a senior environmental consultant with more than 6 years' experience in drafting Basic Assessment Reports, Scoping Reports, Environmental Impact Assessments ("EIA"s), Environmental Management Programme Reports ("EMPr"s), Integrated Water and Waste Management Plans ("IWWMP"s) and Integrated Water Use



Name and Surname	Qualifications and summary of experience
	Licence Applications ("IWULA"s). Renate also has the following experience in auditing: External Water Use Licence audits, Environmental Authorisation audits and Environmental Management Programme audits. Renate has also gained valuable experience in Geographic Information Systems ("GIS") in compiling regional, locality and infrastructure maps and mine plans.
Brian Hayes	Brian has for the past 29 years been actively involved in environmental management and engineering primarily in the mining, FMCH and petrochemical industries. A registered professional engineer (Chemical) with a master's degree in environmental engineering, Brian is responsible for quality assurance within the environmental department whilst also actively involved in consulting to clients on aspects and projects related to environmental assurance.

2 Description of the property

Farm name	Dudfield 35 IP Portion 18
Application area (ha)	35 ha
Magisterial district	Ditsobotla Local Municipality ("DLM")
Distance and direction from nearest town	Dudfield is approximately 18 km west of Lichtenburg and 64 km east-south-east of Mafikeng in the North-West Province.
21-digit Surveyor General code for each farm portion	T0IP00000000003500018

3 Locality of the proposed project

Province	North-West
District municipality	Ngaka Modiri Molema District
Local municipality	Ditsobotla Local Municipality
Department of Forestry, Fisheries and Environment ("DFFE"), Competent Authority ("CA")	Head Office, Pretoria
Department of Water and Sanitation ("DWS") Local Office	Mmabatho
Catchment zone	Harts River Catchment Area
Water Management Area ("CMA")	Lowe Vaal Water Management Area (WMA) 10
Quaternary catchment	C31B



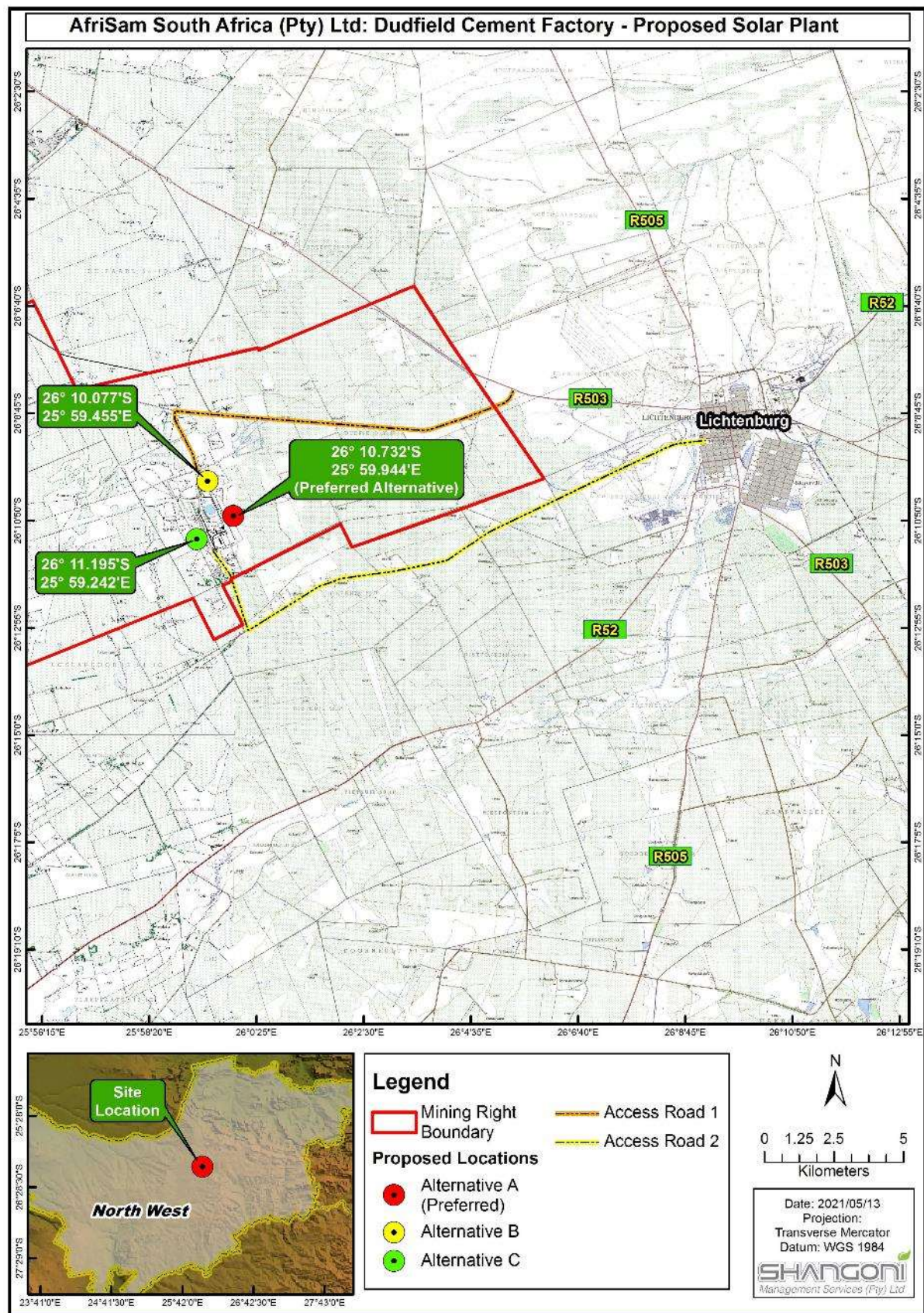


Figure 1: Locality Map

4 Description of the scope of the proposed overall activity

AfriSam Properties (Pty) Ltd: Dudfield Cement Factory (“Dudfield”) is an existing mine and cement factory located within the North-West Province in South Africa and falls under the jurisdiction of the Ditsobotla Local Municipality (“DLM”). The mine lies approximately 18 km west of Lichtenburg and 64 km south-east of Mafikeng.

Dudfield proposes to construct a photovoltaics (“PV”) solar plant on the eastern side of the existing cement factory, which falls within the approved Mining Right Area (“MRA”). The proposed area (35 ha) for this project is located partially within a rehabilitated ploughed pasture consisting of secondary grasslands (16.3 ha), a portion that is disturbed due to mining activities (6.2 ha) and a portion that is invaded by invasive Eucalyptus trees (12.5 ha). For the proposed solar plant, PV panels will be used to capture the solar energy and convert it into an electrical current. A set of PV inverters will be installed to convert the variable direct current (“DC”) output of the PV solar panels into a utility frequency alternating current that will feed into a 230 m long, 6.6 kV line. The electricity output of the solar plant will be less than 20 MW. Transformers will be installed to increase the voltage coming from the inverters.

The PV modules that are going to be used, consist of thin film solar module technology certified for use in 1000 V DC systems. The PV modules are manufactured off site and certified for reliability and safety by international institutes.

The existing internal gravel road, proposed to be upgraded, extends approximately 630 m in length and 6 m in width. The existing gravel road will be regraded, levelled (using limestone) and compacted. The upgrade activities are proposed to remain within the existing gravel road footprint.

The site will be fenced, and security facilities will be erected to reduce the risk of theft.

Minor details of the construction methodology will be refined upon appointment of the contractors. It is not anticipated that any changes to the scope of the activity will occur. If any amendments constituted in Section 29 or Section 31 of the NEMA EIA Regulations are anticipated after receipt of the Environmental Authorisation, the necessary amendment application will be submitted.



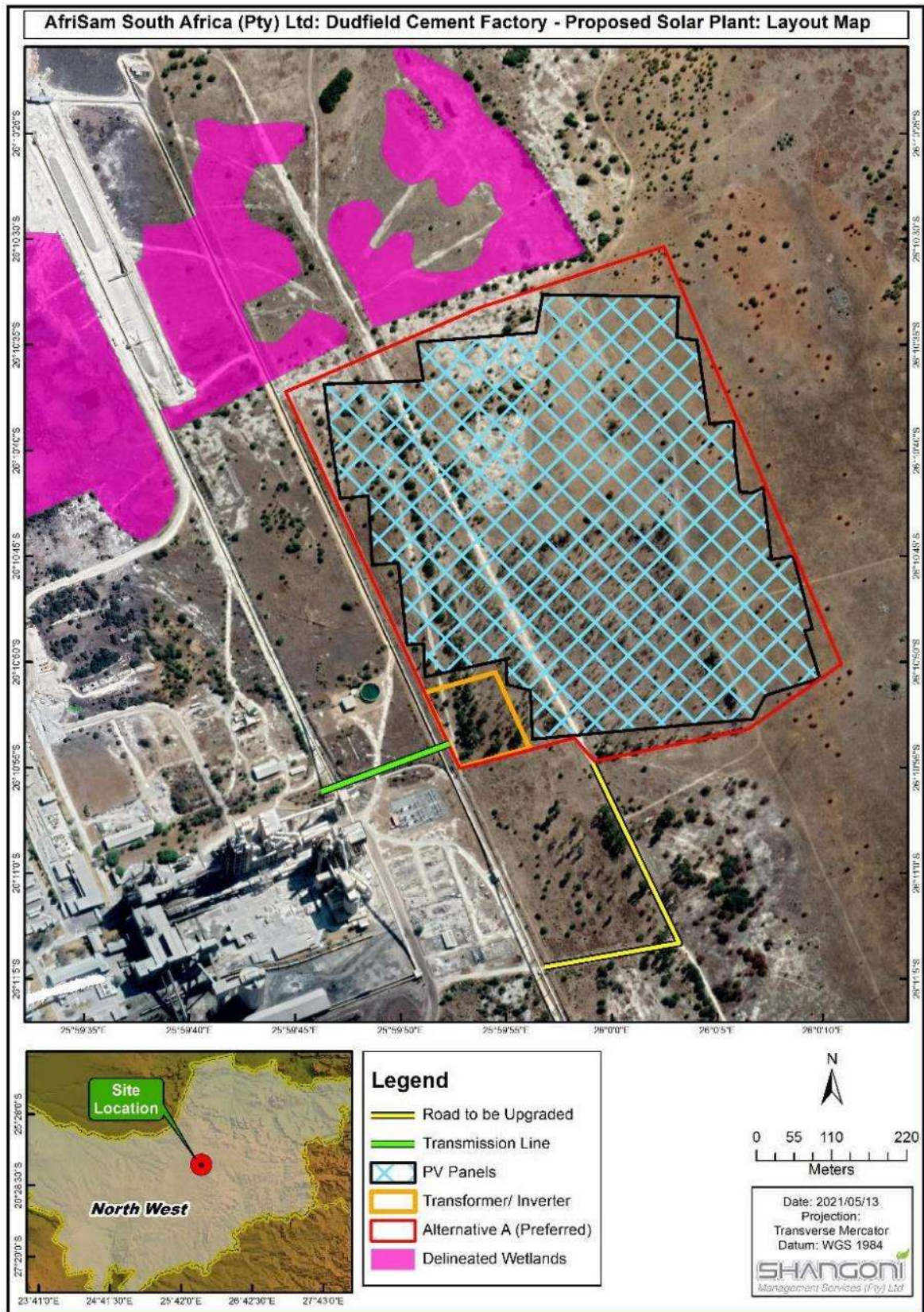


Figure 2: Layout map



4.1 Listed and specified activities

The proposed solar plant ("the proposed project") will trigger the following authorisations:

- An Environmental Authorisation ("EA") for listed activities contained in the Environmental Impact Assessment Regulations Listing Notices of 2014, as amended and published in terms of Sections 24(2), 24 (5), 24D, 44 and 47(A) (1) (b) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) ("NEMA"), as amended.
- A General Authorisation ("GA") for activities in terms of the National Water Act (Act No. 36 of 1998) ("NWA").

For the EA, a Basic Assessment ("BA") is conducted in accordance with the NEMA and the Environmental Impact Assessment Regulations, 2014 (GN R982 of 4 December 2014) ("GN R982"), as amended. Listed activities have been identified and provided in Table 1.

A GA in terms of the NWA will be separately applied for due to the proximity of the proposed project to a delineated wetland (approximate distance of 40 metres).

Table 1: Activities and listed activities associated with the proposed project.

Name of activity	Aerial extent of the activity (Ha or m ²)	Listed activity. Mark with an x where applicable or affected.	Applicable listing notice (GNR 983, GNR 984 or GNR 985)
The development of a solar plant	35 ha	X	<u>Activity 1(i) of Listing Notice 1 (GNR 983 of 4 December 2014, as amended):</u> <i>1. The development of facilities or infrastructure for the generation of electricity from a renewable resource where— (i) the electricity output is more than 10 megawatts but less than 20 megawatts; or (ii) the output is 10 megawatts or less but the total extent of the facility covers an area in excess of 1 hectare;</i>
Clearance of vegetation	35 ha	X	<u>Activity 12 of Listing Notice 3 (GNR 983 of 4 December 2014, as amended):</u> <i>The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</i>
Clearance of vegetation	35 ha	X	<u>Activity 27 of Listing Notice 1 (GNR 983 of 4 December 2014, as amended):</u> <i>The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous</i>



Name of activity	Aerial extent of the activity (Ha or m ²)	Listed activity. Mark with an x where applicable or affected.	Applicable listing notice (GNR 983, GNR 984 or GNR 985)
Installation of transmission lines	230 m		<i>vegetation, except where such clearance of indigenous vegetation is required for—</i> <i>(i) the undertaking of a linear activity; or</i> <i>(ii) maintenance purposes undertaken in accordance with a maintenance management plan.</i>
Upgrading the existing access road to the solar plant	630 m		Upgrading of the existing gravel road does not trigger any listed activities.

5 Policy and legislative context

Table 2: Policy and legislative context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT
The Constitution of the Republic of South Africa (1996).	The Constitution of the Republic of South Africa was considered and applied throughout the Basic Assessment Report ("BAR"), as the Constitution states that everyone has the right; (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that; (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.
The Promotion of Access to Information Act, 2000 (Act No. 2 of 2000).	Without access to information, a person may be unable to determine whether or not his or her right to just administrative action (or to an environment not harmful to human health or wellbeing or, for that matter, any other Constitutional right) has been infringed. The purpose of the Promotion of Access to Information Act ("PAIA") is to give effect to the Constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights, and to provide for matters connected therewith. In addition to providing access to information, cognisance should be taken that PAIA also makes provision for the refusal of access to information that is deemed to be of a sensitive, confidential or classified nature. This is captured under Chapter 4 of part 2 and 3 of PAIA.
The Environmental Impact Assessment Regulations (GN R982 dated 2014, as amended).	The BAR was compiled in terms of the requirements of Appendix 2 of the Environmental Impact Assessment ("EIA") Regulations (GN R.982 dated 2014, as amended).
The Environmental Impact Assessment Regulation. Listing Notice 1. (GN R983 dated 2014, as amended).	Activity 1 and 27 of Listing Notice 1 are applied for as part of the proposed project.
The Environmental Impact Assessment Regulation. Listing	None applicable.



APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE LEGISLATION AND POLICY CONTEXT
Notice 2. (GN R984 dated 2014, as amended).	
The Environmental Impact Assessment Regulation. Listing Notice 3. (GN R985 dated 2014, as amended).	Activity 12 of Listing Notice 3 are applied for as part of the proposed project.
Guideline on Need and Desirability in terms of the Environmental Impact Assessment ("EIA") Regulations, 2010. Government Notice 891 of 2014	The need and desirability were assessed for the proposed solar plant and are discussed in terms of the required format contained in the Guideline on Need and Desirability (GN 891 of 2014).
The National Water Act (Act No. 36 of 1998, as amended).	The proposed solar plant will require a General Authorisation ("GA") due to the proximity to a delineated wetland (approximately 40 metres), as per the outcome of the GN 509 Risk Assessment that was undertaken. The GA will be applied for separately.
The National Environmental Management: Biodiversity (Act 10 of 2004, as amended).	Biodiversity disturbance related to the proposed solar plant were taken into account when the sites were selected.
Alien and Invasive Species Regulations (GN R598 dated 2014).	The occurrence of alien and invasive species was assessed in accordance with these regulations. The proposed area falls within a rehabilitated ploughed pasture consisting of secondary grasslands, a disturbed mining area and areas invaded with Eucalyptus trees.
Conservation of Agricultural Resources (Act 43 of 1983).	Erosion potential will be assessed and mitigated (in accordance with this act) during the construction and operational phases of the proposed solar plant.
SABS Code of Practice 0103 of 2008: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication. SABS Code of Practice 0328 of 2008: Environmental Noise Impact Assessments.	The SABS Code of Practice 0103 will be taken into account when the mitigation measures for the project are identified
National Heritage Resources Act (Act No. 25 of 1999, as amended).	The proposed solar plant is not located near a heritage site and will have no impact on historical areas.

6 Need and desirability of the project

6.1 Need and Desirability in terms of the Guideline on Need and Desirability, 2017

In 2017, the then Department of Environmental Affairs published an Integrated Environmental Management Guideline, the Guideline on Need and Desirability. The following provides information on how the guideline requirements were considered in this BAR and should be read in conjunction with the guideline.



6.1.1 How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?¹

- The ecological integrity of the area has been assessed as part of the specialist assessments (wetland impact assessment) with the baseline environmental description provided in section 7.4. Chapter E, F and L. The potential impacts that have been identified and may occur because of the proposed activities will be discussed in section 7.5 of this document.
- The proposed solar plant promotes sustainable development and will reduce the mine's carbon footprint through reducing coal-fired electricity usage and supplementing with renewable energy and with no negative impact on non-renewable natural resources. Refer to section 1.4.4 of Part B for the mitigation measures to be applied.
- Alternatives have been identified to limit the impact to natural resources Refer to section 7.1 in Part A of this document for the alternative locations and section 7.7 for the advantage as disadvantages of these alternatives.
- The proposed solar plant will be constructed in an area that does not have an impact on the nation's cultural heritage.
- With our current knowledge the level of risk associated with the limits of can be considered low Refer to section 16 of Part A in this document. The potential risks have been identified in section 7.5 and will be further assessed in detail in Section 8 and in the Environmental Management Programme section of Part B of this document.

6.1.2 Promoting justifiable economic and social development²

- The Ditsobotla Local Municipality ("DLM") Integrated Development Plan ("IDP") 2020/2021 indicates that the second highest GDP contributing sectors in the municipality is that of the manufacturing sector (17%) followed by mining and finance (13%). The IDP also indicate that "good land use planning will ensure sustainable development". The proposes solar plant will contribute to sustainable development in the area that can attract investors. The mining and manufacturing sector will continue to contribute to the socio-economy in the area as it will continue to provide job opportunities and education for the local community.
- A conservative approach was followed in terms of the identification and assessing of environmental impacts associated with the proposed solar plant.
- No negative impacts on the socio-economy as a result of the proposed solar plant have been identified. Refer to section 7.7 of this report for the identification of positive impacts. This application will continue to contribute to the socio-economy in the area.
- The needs of the community will be determined through the public participation process of this BAR with the results of the public participation process presented in the Public Participation Report. The public participation process that has been conducted aims to ensure that all I&APs are provided with

¹ Section 24 of the Constitution and section 2(4)(a)(vi) of NEMA refer.

² Section 24 of the Constitution refers.



an opportunity of access to information regarding the proposed solar plant and to raise any concerns or provide any comments on the project.

- New solar plants can be seen as a facility of which construction and operation will stimulate the local economy. There is an increasing number of studies that compare the socio-economic impacts of multiple renewable energy sources. The construction and operation of a renewable energy facility create job opportunities and promote investments.
- Dudfield will ensure that the financial liability associated with the rehabilitation of the proposed activities of the solar plant is provided for as part the closure liability of Dudfield Cement Factory.

7 Motivation for the overall preferred site, activities and technology alternative including a full description of the process followed to reach the proposed preferred alternatives within the site

7.1 Details of the development footprint alternatives considered

Specialist input was obtained in order to identify alternatives associated with the proposed project. The following categories of alternatives have been identified:

- Location alternatives, and
- No-go alternative.

No technology or renewable energy alternatives, including biomass, hydro energy and wind energy were found appropriate to the location and assessed for this project.

The section below is a summary of the alternatives considered. Detailed advantages and disadvantages of each alternative are described in section 7.7 of this report.

7.1.1 Location alternatives

Preferred location:

The preferred location referred to as “Option A” (35 ha) is located on the east side of the cement factory within the Mining Right Area (“MRA”) and is approximately 8.7 km and 9.5 km from the regional roads R52 and R503 respectively. The preferred location comprise of:

- A rehabilitated ploughed pasture consisting of secondary grasslands.
- A disturbed mining area.
- An area invaded with Eucalyptus trees.

.

Alternative locations:



The alternative location referred to as “Option B” (35 ha) is located on the northern side of the cement factory and north-east of the active mining area and is characterised by extensive disturbances and past excavations.

A second alternative location, “Option C” (35 ha) is located west of the cement factory and south of the active mining area and is regarded as the least disturbed area. This location is also located next to the railway.

No-go option for the proposed activities:

The no-go option would be the status quo whereby the mine remains reliant on the national grid, without supplementing electricity supply from renewable resources.



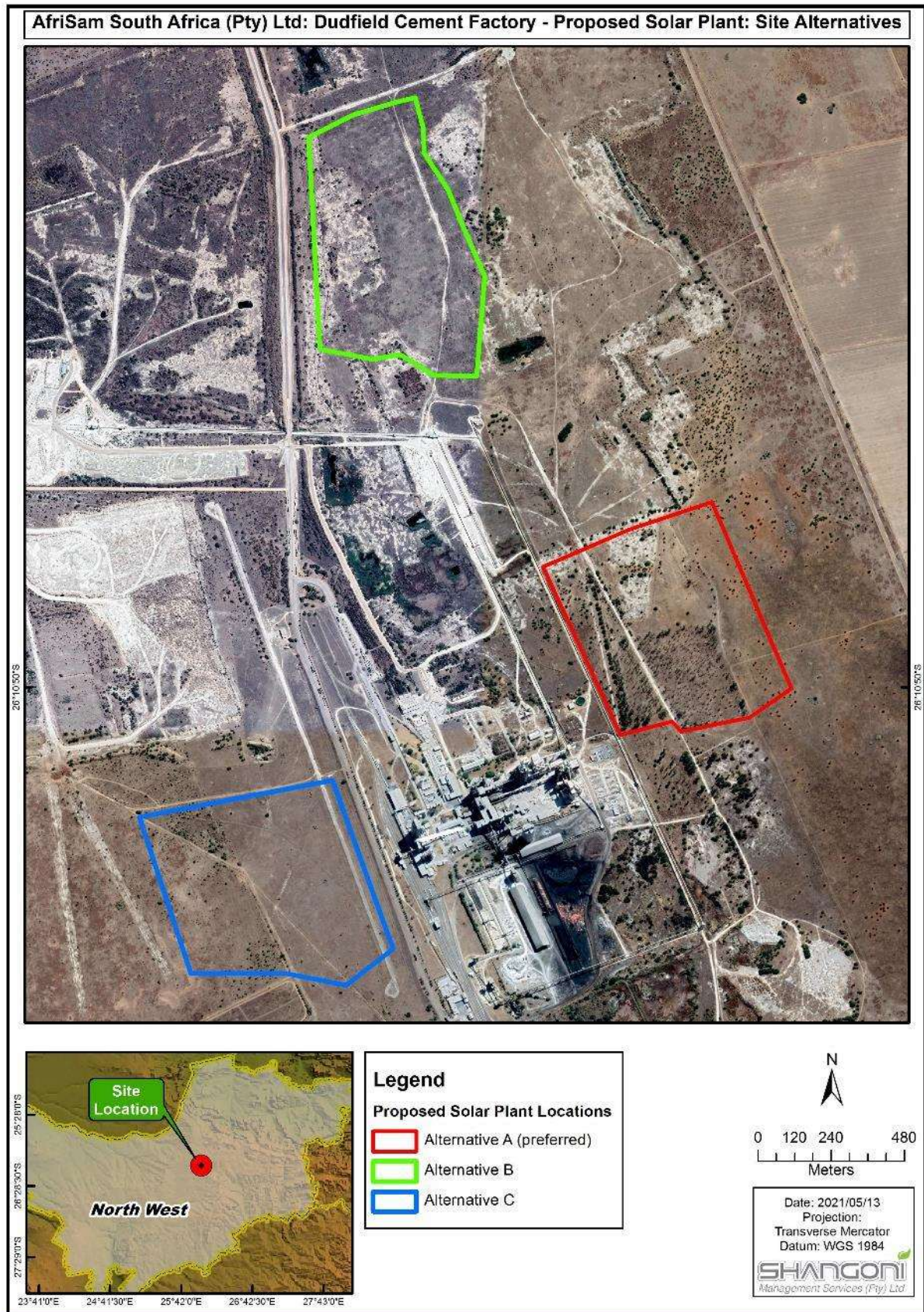


Figure 3: Proposed alternative locations for the construction of the solar plant within the MRA.



7.2 Details of the Public Participation Process followed

The public participation process for this project was conducted in terms of:

- The procedures and provisions in terms of the NEMA.
- Chapter 6 of the 2014 EIA Regulations.
- GN 807 of 2012; Public Participation Guideline.
- Other relevant legislation such as the Promotion of Access to Information Act (“PAIA”), 2000.

A detailed public participation process was undertaken, and included the following:

- Key Stakeholder identification.
- Method of notifications, e.g. advertisements, site notices, Background Information Document (“BID”), email notifications.
- Registration of Interested and Affected Parties (“I&APs”) and key stakeholders.
- Access and opportunity to comment on the draft BAR by I&APs.
- Consultation with the relevant authorities.

The following key stakeholder were identified and notified of the proposed project:

- Landowner/s.
- Lawful occupier/s of the land.
- Landowners or lawful occupiers on adjacent properties.
- Municipal councillor.
- Municipality.
- Organs of state.
- Communities.
- Other Competent Authorities affected.

The following notification and consultation methods are used:

- A newspaper advertisement was placed in the Noordwester on the 16 July 2021.
- Site notices were placed around the proposed project site at different, noticeable and conspicuous places on the 13th of July 2021; Background Information Document (“BID”) was sent to key stakeholders with email notifications.
- The potential key stakeholders were notified of the proposed project and have been provided with the opportunity to register as an I&AP.

The draft BAR was made available to the public for review for a period of thirty (30) days, from 16 July 2021 to 16 August July 2021. An electronic copy of the BAR was also posted on the Shangoni’s website (www.shangoni.co.za) for public comment for the same period of thirty days.

After the I&APs comments have been addressed, the final BAR will be submitted to the Department of Forestry, Fisheries and the Environment (“DFFE”) for review. Once the DFFE has made a decision, registered stakeholders will be notified of the decision.



7.3 Summary of issues raised by I&APs

The table below will be completed when the final BAR is compiled and will provide a summary of the comments and issues raised and reaction to those responses.

INTERESTED AND AFFECTED PARTIES	DATE COMMENTS RECEIVED	ISSUES RAISED	EAPS RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND RESPONSE WERE INCORPORATED	AND THIS OR WERE
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To be completed upon completion of the public participation process.

7.4 The Environmental attributes associated with the baseline environment

7.4.1 Type of environment affected by the proposed activity.

A baseline description or “status quo” of the present environmental situation is provided in this part of the document. The following attributes / aspects have been described in detail, in the following respective chapters:

- Chapter A: Geology
- Chapter B: Climate
- Chapter C: Topography
- Chapter D: Soil, land use and land capability
- Chapter E: Vegetation
- Chapter F: Fauna
- Chapter G: Surface water
- Chapter H: Groundwater
- Chapter I: Air Quality
- Chapter J: Noise
- Chapter K: Archaeology and Cultural History
- Chapter L: Sensitive Landscapes
- Chapter M: Visual Aspects
- Chapter N: Regional socio-economic structures

As informed by various specialist studies and other public documents (e.g. IDP):

- Aurecon. June 2019. AfriSam Dudfield Stormwater Review.
- Ditsobotla Local Municipality 2020 *The Revised IDP for 2020 MTREF*.
- Golder Associates. December 2016. AfriSam Dudfield Groundwater Development Study.
- MojaTerre. December 2016. Biodiversity Management Plan: Dudfield Cement Factory.
- Shangoni Management service. February 2019. AfriSam (South Africa) Properties (Pty) Ltd. Dudfield Cement Factory: Air quality impact assessment.



- Shangoni Management services (Pty) Ltd. November 2016. AfriSam (South Africa) Properties (Pty) Ltd. Dudfield Operation- Rehabilitation, decommissioning and mine closure plan.
- Umhlaba Environmental Consulting CC, 2009. Updated Environmental Impact Assessment & Environmental Management Programme.
- WCS Scientific (Pty.) Ltd. May 2021. Wetland Delineation and GN 509 Water Use Risk Assessment for The Dudfield Solar Project.

Chapter A: Geology

The proposed project area lies on the southwestern edge of the Central Transvaal Basin. The geology comprises the Black Reef Quartzite formation, to the south, overlain by the Malmani Subgroup, comprising chert free and chert rich dolomites of the Oaktree, Monte Christo and Lyttelton formations.

The sequence dips gently towards the NNW at approximately 10°. The Malmani strata unconformably overlies an eroded surface of Andesitic lava and sediments of the Ventersdorp. An unconformable cover of argillaceous sediments of the Karoo Supergroup rests on the older rocks.

Surface deposits comprising calcrete, gravel, alluvium, chert rubble, clay and red soils form a covering over a large portion of the area, (extrapolated from the 1:250,000 geological maps 2624 Vryburg and 2626 West Rand).

The area is intruded by dolerite dykes of younger pre-Karoo age trending ENE – WSW, NNW – SSE, NE – SW and S - N forming variable degrees of compartmentalisation of the dolomite. The Hendriksdal and Blaauwbank dykes are considered to be impermeable while the upper portions of the Elizabeth, Greefslaagte and Paarl dykes are considered moderately permeable dykes, allowing groundwater flow, when relatively shallow, to migrate between adjacent compartments. There are no major structural lineaments (faults) traversing the area. Where dykes are seen to be offset, these are inferred to be caused by possible localised structural features.

Chapter B: Climate

The proposed project area is characterised as having semi-arid climate conditions with the mean annual precipitation of 547 mm/a. Rainfall occurs primarily during the mid-summer months (December - March). The winter months are typically cool and dry with frost incidents that range from less than 20- to more than 100 days in a year. During the summer months (November to March), the temperatures lie between 13 °C and 30 °C, while in winter (June to August) they vary between 2 °C and 18 °C. The predominant wind direction for this region arises from a northerly direction.

Chapter C: Topography

The topography of the proposed project area slopes from east (1530 masl) to northwest (1480 masl) and east to southwest (1465 masl) (See Figure 4). No major rivers or drainages occur within the area.



Chapter D: Soil, land use and land capability

Soils associated with the proposed solar plant project is illustrated in Figure 4. The soil at the proposed site characteristically is a reddish sandy to loamy soil ranging in depth from 0 to 0.8 m, occasionally attaining a depth of 2 m in fissures or cavity areas of the underlying limestone. The interface zone between the base of the soil and the underlying limestone is characterised by a gradational mixture of loamy to clayey soil and nodules of calcrete.

The soil characteristics of the rehabilitated area of Dudfield are dominated by Witbank Soil form close to the plant area and Prieska Soil form in the eastern and northern sections. The soils are neutral to alkaline with the calcium levels reflecting the calcareous nature of the parent material. The P values (especially in the topsoils) reflect the fact that fertilizer has been added in the past. The area has been found to be suitable for the following agricultural uses (Figure 6):

- Grazing for cattle.
- Cultivation of maize and other grain crops where soil depth permits. Only where the soil horizon is deeper than 50 cm is it suitable for maize farming.
- In case of crop-cultivation, inorganic fertilisation is necessary.
- The land use of the project area is characterised by mining activities. Although the project area is currently rehabilitated, the area is not used for any mining or farming purposes.

Chapter E: Vegetation

The proposed project area is situated on the featureless and flat Highveld Grassland plains in the Lichtenburg District, specifically within the Western Highveld Sandy Grassland vegetation unit as defined by Mucina and Rutherford (2006). However, the property has over decades been transformed by either heavy and unremitting grazing, by some tilling for growing maize, by opencast mining for limestone and opencast rehabilitation in most cases.

The following areas were identified within the Mining Right Area: Fallow fields and historically cultivated areas with grassland species re-establishing, secondary wooded grassland, rehabilitated mined areas and two small portions of grassland. The proposed project area comprise only of Secondary Vegetation.



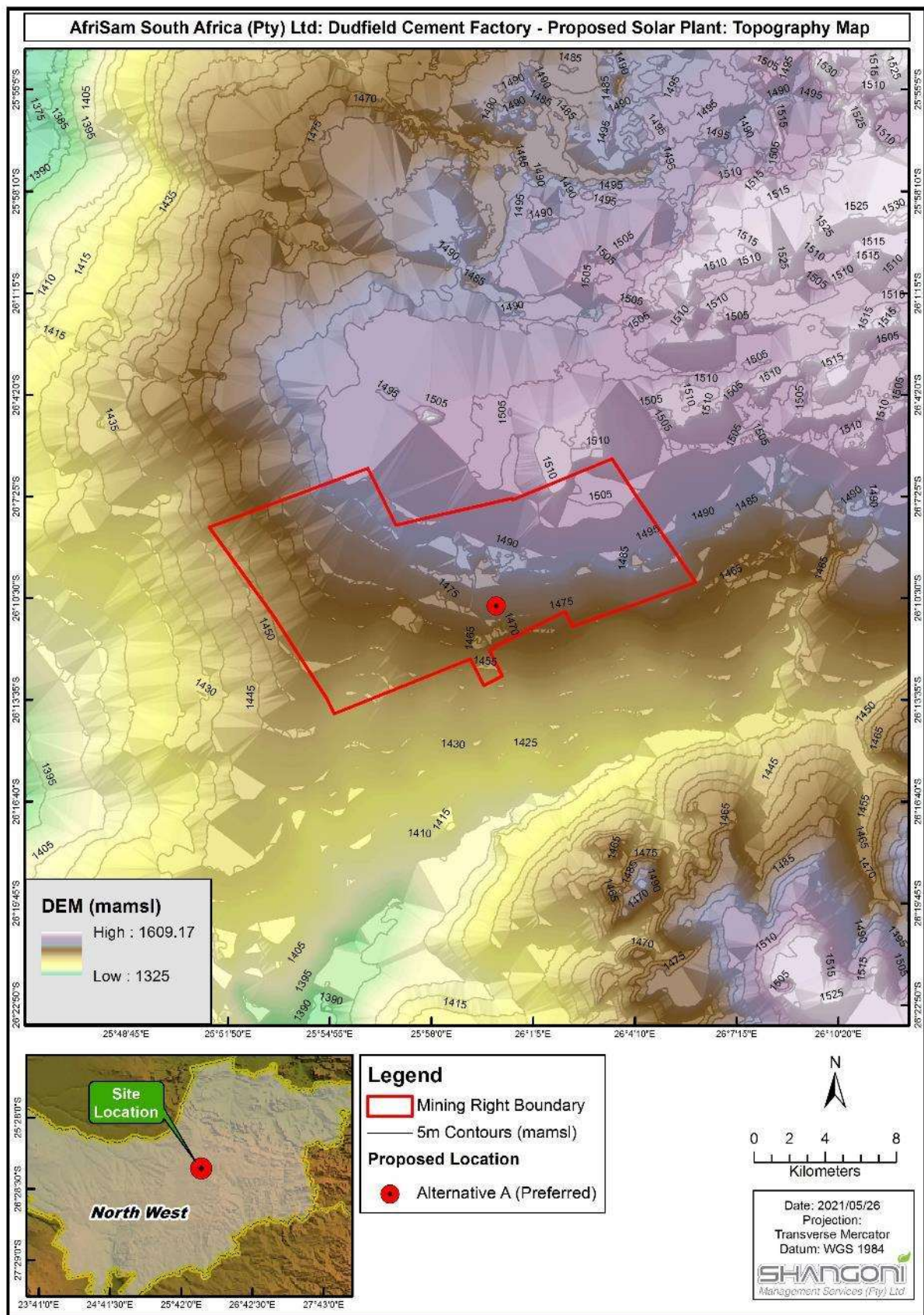


Figure 4: Topography map associated with the project area.

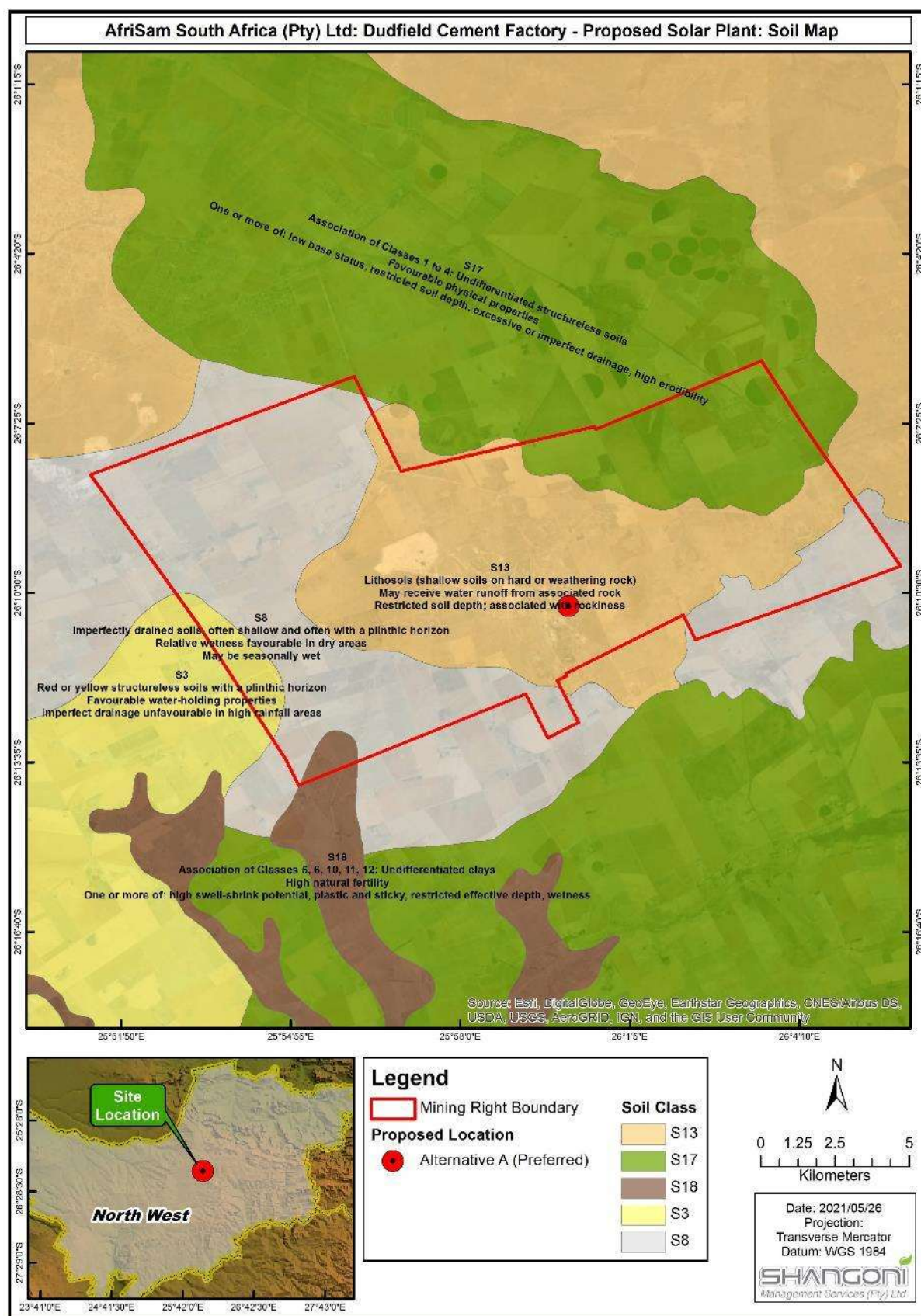


Figure 5: Soil map associated with the project area.

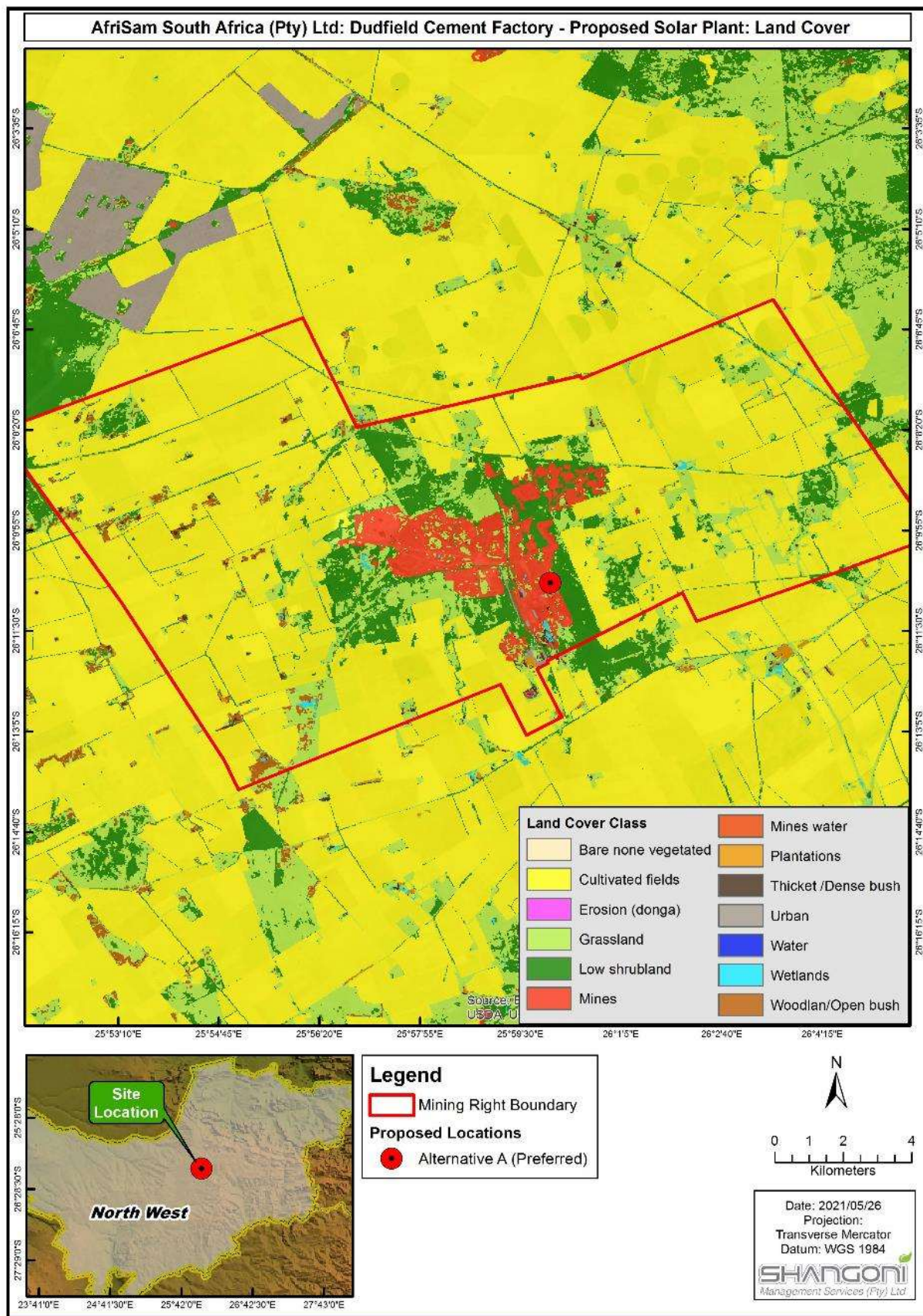


Figure 6: Land cover map associated with the project area

After an area is mined, secondary vegetation develop where the primary vegetation was removed. The rehabilitated areas had a low species richness in December 2016 but might have changes over the past 5 years; no sensitive species were identified but Graminoids species, threes and weeds were observed (Figure 7).



Figure 7: Example of the vegetation in the rehabilitated areas



Figure 8: Rehabilitated quarry northwest of the Dudfield Village

A mined quarry that has been partially rehabilitated is situated north-west of the Dudfield village (Figure 8). The area is well vegetated with the grass layer dominated by *Eragrostis* species and *Hyparrhenia hirta* (thatch grass) and the tree layer comprising a mixture of indigenous species (dominated by *Searsia lancea*) and invasive species such as *Spartium junceaum* (spanish broom) and *Tamarix ramosissima* (pink tamarisk). The tree layer is more dominant in depressions and around the edge of the quarry, likely due to the accumulation of water and nutrients in these areas.

Secondary grassland

The proposed project area was historically cultivated and not been ploughed for several years, which is now dominated by pioneer grasses and weedy pioneer forb species. Pasture was included within the secondary grassland. Depending on the time lapse since last cultivated as well as grazing intensity, the secondary grasslands varied from grass dominated to areas where the shrub *Asparagus larcinus* or *Gomphocarpus fruticosus* was prominent. Small portions of grassland that was not historically cultivated, but severely degraded due to grazing and edge effects of mining was also included in the secondary vegetation. Species richness in this area is low to medium where species diversity ranged from 8 to 25.



Listed and protected plant species

The following three species were historically recorded within the greater study area and could occur at the proposed project area:

- *Crinum macowanii* (Declining).
- *Vachellia erioloba* (Declining).
- *Nananthus vittatus* (Data Deficient Taxonomic).

Only *Vachellia erioloba* (camel thorn) was noted on the Dudfield premises (factory area) but not within areas sampled. The small pockets of grassland vegetation are likely the only areas where any of the above listed species, except *Vachellia erioloba*, could persist.

Chapter F: Fauna

The local occurrences of mammals are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. Two of the major habitat types represented on the Mining Right Area, i.e., terrestrial and wetlands.

Relative high species richness is due to the extensive size of the remaining natural areas on the site, of adjoining natural areas, and the rehabilitated game camp immediately bordering the factory. The high species richness of the combined surface areas is enhanced by a high connectivity allowing near-to-natural migration.

Most of the species identified in this area are common and widespread (viz. scrub hares, mole rats, grass mice, multimammate mice, gerbil, the listed bats, genets, yellow and slender mongooses, duiker, steenbok and others). However, others are not common: some large mammals have been reintroduced and there are several Red Data mammals.

No less than 18 species were confirmed to be residents on and near the Mining Right Area. This is possible given the extensive character of the site and surrounding areas, and especially the re-introduction of herds of large herbivores in the game enclosure where introductions thrive together with naturally occurring duiker and steenbok. Scrub hares and rodent moles are common and widespread and have a remarkable ability to flourish in disturbed conditions. The genet and mongoose species are equally robust and are often found even in close proximity of human activities and/or occupation in rural areas.

Threatened species

Of the 54 species concluded to occur within and in the vicinity of the Mining Right Area, seven are IUCN Red Listed (Friedmann and Daly, 2004); five species have Data Deficient rankings, and two are Near Threatened.

Avifauna

The predominant avian habitats identified within the Mining Right Area are the Highveld grassland and the rehabilitated quarry. Previously a total of 294 species were identified where 68 were confirmed as present and 31 identified on photos. It should be noted that several species confirmed as present will



most likely only be found in the Dudfield plant gardens. These include common species such as Common Mynahs, White-browed Sparrow-Weavers, Rock Doves and Karoo Thrush.

Threatened species

The Mining Right Area does hold several threatened species; however, most of these have a low likelihood of occurrence as most are nomadic and heavily dependent on suitable habitat. A total of 18 Red-listed bird species have been recorded in the area considered during the desktop survey. However, the presence of only one species was confirmed during the surveys (Secretary bird). Despite this, six of the 18 species are considered likely to occur in the area. The most significant impact related to threatened species identified during the surveys involves the heavy grazing impact on the grassland biome. Many of the species make use of habitat with tall grass, and some species depend exclusively on this habitat type (African Grass-owl).

Herpetofauna

The local occurrences of reptiles and amphibians are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. Only three of the four major habitats are naturally present on the study site, namely terrestrial, arboreal and wetland-associated vegetation cover.

Of the 52 reptile species which may occur on the study site, one was confirmed during the site visit and of the 17 amphibian species which may possibly occur on the study site; none were confirmed during the site visit.

The species assemblage is typical of what can be expected of habitat that is severely disturbed, but with sufficient habitat to sustain populations. Most of the species of the resident diversity are common and widespread (viz. the common dwarf gecko, Cape gecko, common house snake, mole snake, Cape skink, eastern ground agama, puff adder, red toad, guttural toad and Boettger's caco). The species richness is fair due to the three habitat types occurring on the study site.

Threatened species

The Dudfield Mining Right Area contains temporary water bodies, which are potential breeding places for giant bullfrogs. It is important to note that the giant bullfrog's status has changed officially from Near Threatened to Least Concern in South Africa.

Chapter G: Surface water

Catchment Area Characteristics

The proposed solar plant is located within the C31B quarterly catchment (Figure 9). There are no discernible water courses detailed on the 1:50 000 toposheet. However, a man-made drainage feature is located on the farm Dudfield 8 km east of the plant, with the purpose to drain flood waters from the lands to the Harts River, which is located some 10 km to the south of Dudfield. A shallow natural drainage feature occurs to the west on the farms Kalkfontein and Bethlehem. The feature is dry for the most part of the year.



Occasional shallow pans characterise the entire Mining Right Area. Only in periods of prolonged intense rain and flooding does there appear to be any significant surface runoff. In such times, surface rills and sheet wash tend to flow in a south westerly direction over the farms Dudfield, Kalkfontein, and Bethlehem.

No surface water bodies are located within the proposed project area (Figure 10).

Surface water quality

The Harts River lies 10 km to the south of Dudfield. Subsequently, the only surface water occurring on or near the Dudfield Mine and subsequent project area is limited to the occasional shallow pans scattered around the area. Due to the arid weather conditions characteristic of the area, these pans are dry for most of the year. Any run-off water emanating from the works and/or workings is channelled into the existing excavations and there is no evidence of any run-off water flowing off the respective mining properties towards the Harts River. The mine undertakes monthly water quality analysis at a number of points at the mine which provides both an indication of the quality of the surface water bodies at the mine and the ground water extracted from a number of boreholes.

Surface water use

Due to the general lack of surface water in the area, the only known user in the area is the mine itself. Surface water, which has collected in old workings, is utilised on-site for dust suppression purposes on haul roads. This water is sourced from run-off water from the plant area and natural precipitation into the workings.

Chapter H: Groundwater

Depth of the water table

Dudfield comprise of a high ground water table (± 6 m). Two aquifers of importance exist; a calcrete aquifer that is on average 20 m thick, underlain by a dolomitic aquifer of which a 50 m thick zone contribute to ground water flow. The two aquifers are separated by an impermeable aquitard layer. It is the upper calcrete aquifer that restricts the depth of mining to between 6 m – 11 m.

Groundwater quality

Water quality tests conducted on three water boreholes on Tevrede (North), grain co-op site (South), and an independent farm (South) have all indicated that the operations occurring at Dudfield have no impact on ground water quality in the region. Due to the natural hardness of the water, Dudfield who makes use of groundwater from process purposes has to soften the water prior to use.

Groundwater use

Groundwater use in the local area is restricted to the mine and the neighbouring farmers. Consumption by the local farming community is for domestic consumption, irrigation and animal watering. Due to the strength of the groundwater compartment, water has always been available for all users.



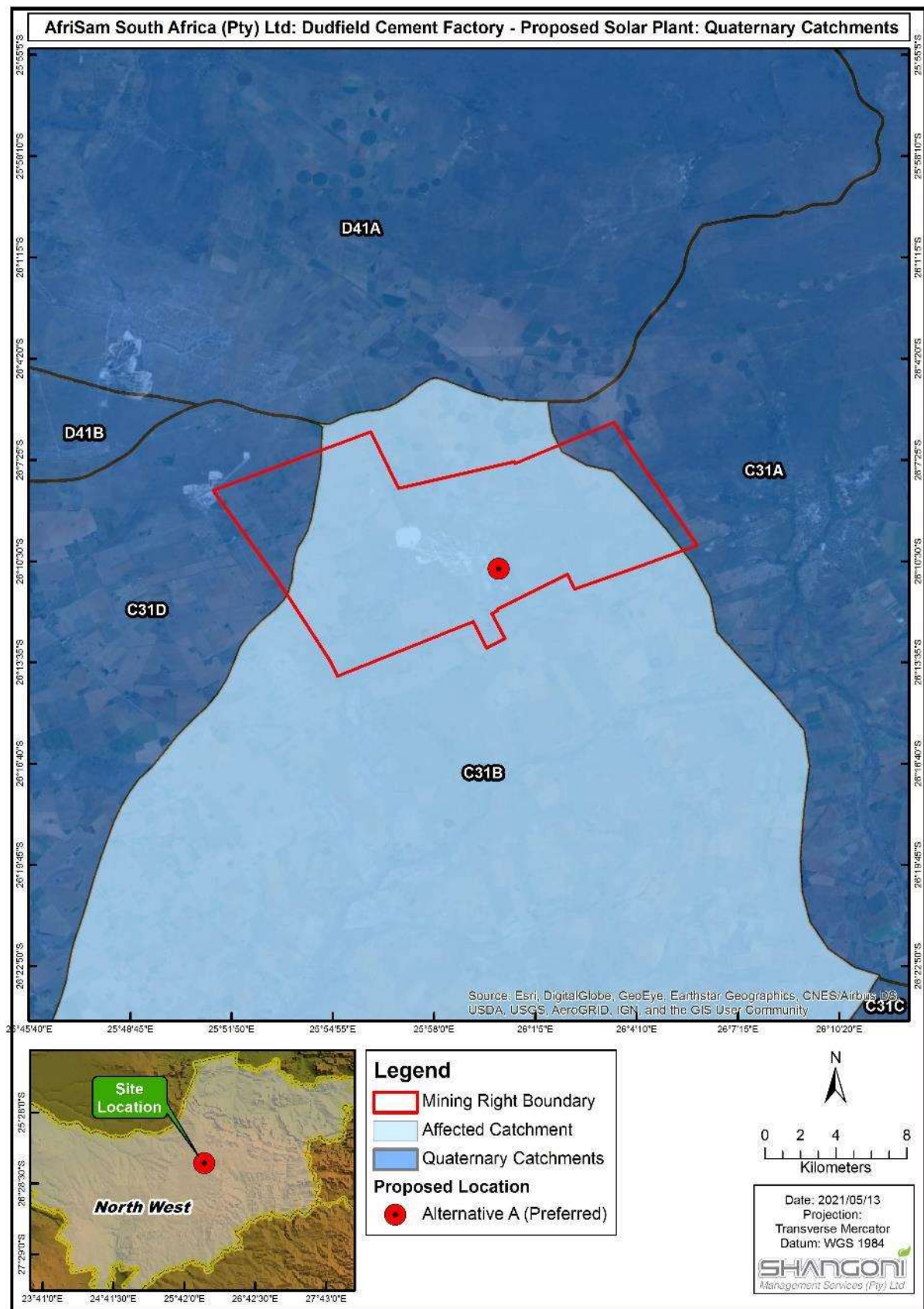


Figure 9: Quaternary catchment map for the project area.

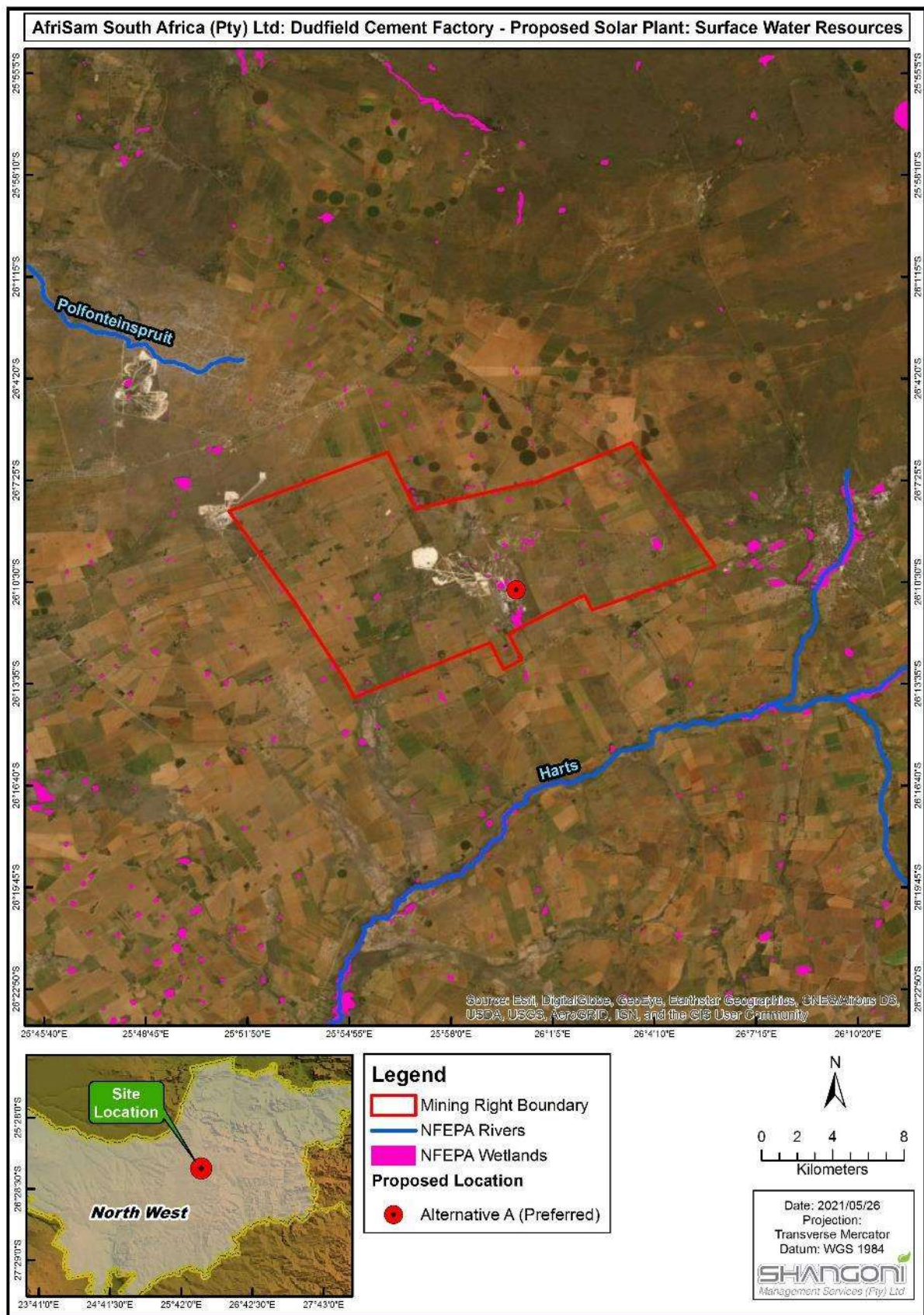


Figure 10: Surface water resources map associated with the project area.



Chapter I: Air Quality

Dudfield falls outside South Africa's three declared airshed priority areas; the Vaal Triangle Air-shed Priority Area, the Highveld Priority Area; and the Waterberg Bojanala Priority Area. Dudfield has two main impacts on the air quality namely, dust generation resulting from mining activities, cement manufacturing activities, vehicle entrainment on dusty surface and an impact resulting from the kiln emission.

Two ambient air quality monitoring stations were identified to monitor the impact of cement industry around the community of Boikhutsong and other areas in Lichtenburg and the impact of cement industries and traffic around the community of Mahikeng, respectively. The one is situated in Lichtenburg and the other in Mahikeng.

The ambient air quality monitoring results for both sites show the average hourly NO₂ levels (~15 to 20 ppb, ~28.5 to 38 µg/m³) to fall below the National Ambient Air Quality Standards ("NAAQS") for hourly NO₂ levels (106 ppb, 200 µg/m³). The average daily NO₂ levels is approximately 7 ppb (13.3 µg/m³) for both Lichtenburg and Mahikeng.

The ambient air quality monitoring results for Lichtenburg show the average daily PM₁₀ levels (~ 40 µg/m³) to fall below the NAAQS for daily PM₁₀ levels (75 µg/m³). The ambient air quality monitoring results show periodic exceedances of both the daily and annual NAAQS for PM₁₀ levels.

The ambient air quality station in Mahikeng shows the average daily PM₁₀ levels (~ 50 µg/m³) to fall below the NAAQS for daily PM₁₀ levels (75 µg/m³), with the average monthly PM₁₀ levels (~38 µg/m³) very close to the NAAQS for annual PM₁₀ levels (40 µg/m³). The ambient air quality monitoring results show periodic exceedances of both the daily and annual NAAQS for PM₁₀.

The ambient air quality monitoring results for both Lichtenburg and Mahikeng show the average daily PM_{2.5} levels (~ 20 µg/m³) to fall below the National Ambient Air Quality Standards (NAAQS) for daily PM_{2.5} levels (40 µg/m³) and the average monthly PMPM_{2.5} levels (~15 µg/m³) to fall below the NAAQS for annual PM_{2.5} levels (20 µg/m³). The ambient air quality monitoring results show periodic exceedances of the annual NAAQS for PM_{2.5} levels.

Chapter J: Noise

The results of noise monitoring indicate that the noise levels around Dudfield fall within the category "*Urban districts with some workshops, with business premises and with main roads*". The peak levels recorded during the survey were due to wildlife and traffic. Due to the distance between the operations at Dudfield and the nearest resident not within the Dudfield village, noise from the plant will dissipate to below the levels for sub-urban limits.

Chapter K: Archaeology and Cultural History

There are no graves, or any Archaeology and Cultural history identified and associated with the proposed project site.



Chapter L: Sensitive Landscape

Numerous old quarries / excavations that support wetland habitat on site varied in depth and durations of inundation, as well as likely source of water. Deeper excavations appear to intersect the shallow groundwater table, and as a consequence show a more stable water level and near permanent saturation / inundation. Around the perimeter of these more permanent wetland areas, as well as in shallower excavations and areas of disturbance, seasonal and temporary wetland habitat occurs. These areas are typically saturated and/or inundated by accumulation of surface water during periods of higher rainfall (Figure 11). It is uncertain if these man-made wetland features will continue to exist into the future or if these areas will be shaped and rehabilitated as part of mine closure activities. Under a scenario where these old quarries and excavations remain features of the landscape after mine closure and continue to support wetland habitat, they should be considered as part of the post-mining landscape and as such as watercourses protected under the NWA.

Chapter M: Visual aspects

Due to the flat terrain, very little of the mining activities are visible from the surrounding public roads such as the R503 from Lichtenburg to Mafikeng. The proposed project area is not on a main tourist route. Due to the extended period, with mining occurring for over 50 years, residents do not regard the mine as an obtrusive visual impact.

Chapter N: Regional socio-economic structure.

Population

The Total population of Ditsobotla Local Municipal ("DLM") was 194000 in 2018 with an average annual growth of 1.66%. The Ditsobotla Local Municipality increased, in terms of population, with an average annual growth rate of 1.7% from 2008. Of the total Population in DLM there are 93421(51%) men and 88444 (49%) women. According to the Revised IDP for 2020 the population breakdown for this area indicates a predominant presence of Black Africans (91%) followed by Whites (7%) and Coloured (2%).

Education

According to the Community Survey 2016, there is a significant improvement in the proportion of people with access to education in the secondary schooling category (from 50.2% to 60.7%). There is a downward trend in the category of people with primary education, which shows a decline from 28.6% to 4.2% and seems to correlate with an increase in the number of people without any schooling (from 14.7% to 21.2% during the same period). The figures also show a 2.7% decrease in the category of people with some form of higher education between the same periods. The spatial distribution of the education figures reveals low skills and education levels mostly in the rural parts of the municipality. The highest education and skills levels are concentrated in the urban areas of Lichtenburg and Coligny. A significant proportion of the population in these areas have received tertiary education and the proportion of the population who have not received any form of schooling are relatively low in these areas. The percentages of population who have not received any form of schooling are found in most of the villages.



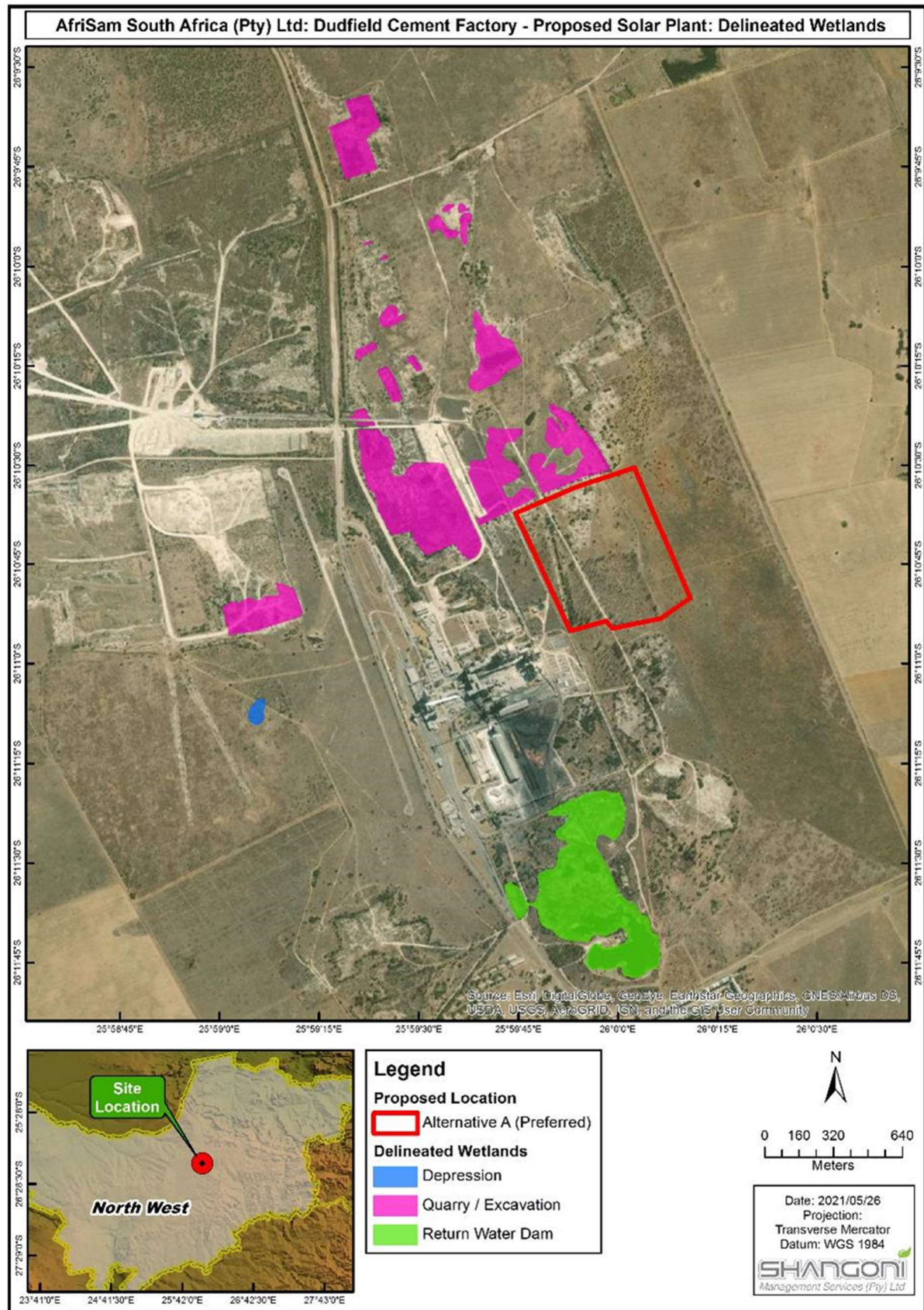


Figure 11: Wetland Delineation map for the project area

Household income

Approximately 13% of the households in DLM have no income. Most households earn in the range of R10 000 – R20 000 and R20 000 - R40 000 per annum.

Municipality Services

Households with access to piped water stands are at 43 162 and about 11% of the households are without access to safe drinking water.

There is also an increase in the number of households with access to sanitation services. A comparative analysis reveals that households with access to flush/chemical toilets increased between 2011 and 2016 from 21 303 to 30 882. The category of households using other types of sanitation facilities also increased from 19 118 to 20 948 during the same period. The total backlog reduced significantly during the same period from 4 079 to 2 384. The use of pit latrines is mostly prevalent in the villages and rural parts of the municipality.

The Ditsobotla Local Municipality has approximately 48 201 (Community Survey, 2016) households connected to the electricity grid which is a significant increase from the 32 933 recorded during Census 2011. Approximately 192 households are reliant on other sources of energy while 5 759 do not have access to electricity. Based on the information 89% of the households have access to electricity. The remaining 11% dependant on alternative sources and or not having access to electricity largely fall within the category of “infills”. The backlog is also reflective of the informal settlements in Itekeng, Blydeville and Tlhabologang Extension 8. The municipality has already submitted electrification proposal for the latter two areas to Eskom for feasibility studies and inclusion in its electrification plans.



7.5 Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts

Table 3: Determination of potential impacts.

Environmental Component	Activity	Impact Description	Duration	Pre-mitigation			Reversible (Yes/No)	Irreplaceable Loss (Yes/No)	Avoided/Managed/Mitigated	
				Probability	Magnitude	Significance				
Geology	Construction and utilisation of the proposed solar plant and upgrading of the existing road	The proposed activities associated with the solar plant and road upgrade are not anticipated to have an impact on Geology of the project area.								
Topography	Construction and utilisation of the proposed solar plant	The proposed area is located on a flat surface where little to none of the physical features will be impacted.	Construction Operational	1	1	L	Yes	No	Manage / Mitigate	
	The upgrading of the existing access road									
Soils	Construction and utilisation of the proposed solar plant	Constructing a solar plant involves grading, digging, and burying. During these processes, the disturbance can cause erosion if proper planning is not done. Due to the flat surface, mitigation measures will have to be implemented to prevent loss of remaining topsoil. Construction vehicles accessing the site, turning, offloading materials on site could possibly result in hydrocarbon spills. Old damaged solar panels can leach out harmful substances.	Construction Operational	2	2	L	Yes	No	Manage / Mitigation	
	The upgrading of the existing access road	Topsoil loss could potentially occur due to the upgrading of the existing access road. Construction vehicles accessing the site, turning, offloading materials on site could possibly result in hydrocarbon spills.	Construction Operational	2	2	L				
Land use and land capability	Construction and utilisation of the proposed solar plant	The proposed location for the solar plant is on rehabilitated land. The use of this location for the solar plant will result in a change in land use from rehabilitated mining (in future) to renewable energy. This is seen to be positive impact, due to the higher monetary income yield per surface area for the land to be used.	Construction Operational	and	Positive impact.					
	The upgrading of the existing access road.	The road already exists, and the upgrade will not result in any additional impacts on land use and land capability.								
Fauna and Flora	Construction and utilisation of the proposed solar plant	A portion of a rehabilitated area will be disturbed and as a result will have an impact on established fauna and flora within the area. A section of the proposed project area falls within a CBA that is considered as a sensitive area. The habitat can also become less inhabitable for plants and wildlife that have previously occupied the area.	Construction Operational	and	3	3	M	Yes	No	Mitigate
	The upgrading of the existing access road.	No significant biodiversity impacts are expected as a result of the upgrading of the existing road.								



Environmental Component	Activity	Impact Description	Duration	Pre-mitigation			Reversible (Yes/No)	Irreplaceable Loss (Yes/No)	Avoided/Managed/Mitigated
				Probability	Magnitude	Significance			
Surface water	Construction and utilisation of the proposed solar plant.	<p><u>Surface water quality</u></p> <p>There may be a decrease in surface water quality when any surface water run-off comes into contact with dust, eroded soil, or other pollutants generated during the construction phase.</p> <p>The sediment load within surface water runoff may increase if not prevented or mitigated if no vegetation re-establishes underneath the solar panels.</p> <p>Spillages of hazardous materials (i.e., oil, fuel, grease and / or cement) used during the construction of the proposed project may impact on the surrounding clean water environment.</p> <p>There is a possible impact for contamination of surface water when dust and other particles are washed from the solar collectors.</p> <p><u>Water Quantity</u></p> <p>The proposed solar plants may require water for the cleaning of the solar collectors. Which can have a slight increase in water demand that could have an impact on the available water resources.</p>	Construction	1	2	L	Yes	No	Manage / Mitigation
	The upgrading of the existing access road.	There is a possibility that spillages of hazardous materials (i.e., oil, fuel) used during the upgrading of the road, may impact on the surrounding clean water environment.							
Groundwater	Construction and utilisation of the proposed solar plant	<p>The impacts on groundwater quality are primarily related to the management of materials, and spills from construction operations.</p> <p>Contamination of groundwater may also arise due to incorrect handling and disposing of solar collector materials and cement. Due to the short exposure and small scale of these possible spills, the impacts will be negligible during the construction phase.</p>	Construction and operational	2	2	L	Yes	No	Manage / Mitigation
	The upgrading of the existing access road.	No impacts to groundwater were identified.							
Wetlands	Construction and utilisation of the proposed solar plant.	The proposed project could lead to a disturbance of wetland vegetation, increased sediment movement into wetlands, spillage of contaminants leading to water quality impacts and an increase in alien vegetation. Spills, leaks or incorrect disposal of cement, hydrocarbons or waste could also negatively impact wetlands. In addition, there could be a disturbance to wetland biota due to noise and light pollution.	Construction and operational	2	2	L	Yes	No	Manage / Mitigation
Air quality	Construction and utilisation of the proposed solar plant.	There may be impacts on the air quality of the area as dust fallout will increase during the clearance of vegetation for the construction of the solar plant. There may be a chance that dust, and diesel fumes generated by machinery and vehicles could affect the air quality of the area.	Construction	2	2	L	Yes	No	Manage / Mitigation
	The upgrading of the existing access road.	There may be impacts on the air quality of the area as dust fallout impacts relate to nuisance impacts as a result during the upgrading of the road.	Construction and Operational	2	2	L			
Noise	Construction and utilisation of the proposed solar plant.	Elevated noise levels are anticipated as a result of the construction of the proposed activities. Due to the distance of the nearest town and formal / informal residents the activities are not likely to have a significant impact on the direct community or Lichtenburg.	Construction and Operational	2	1	L	Yes	No	Manage / Mitigation
	The upgrading of the existing access road.			2	1	L			



Environmental Component	Activity	Impact Description	Duration	Pre-mitigation			Reversible (Yes/No)	Irreplaceable Loss (Yes/No)	Avoided/Managed/Mitigated
				Probability	Magnitude	Significance			
Visual	Construction and utilisation of the proposed solar plant.	Due to the flat terrain, very little of the operational activities are expected to be visible from the surrounding regional roads. Thus, the visual impact will be minimal during the operational phase	Construction and Operational	2	2	L	Yes	No	Manage
	Upgrading of the existing access road.	Construction activities associated with the road upgrade can have a visual impact.	Construction	1	1	L	Yes	No	Manage
Sites of Archaeological and Cultural Importance	Construction of the proposed solar plant.	No archaeological and cultural sites are within or near the preferred location.							
	Upgrading of the existing access road.								
Socio-economic	Construction and utilisation of the proposed solar plant.	Where possible, local contractors will be used for the construction and operation of the proposed solar plant. This will lead to a positive impact on the socio-economic aspect of the area that can create jobs opportunities and promote investments.	Construction and Operational	Positive impact					
		Beyond the project boundaries: <ul style="list-style-type: none">• Generating electricity that produces no greenhouse gas emissions.• Diversifying electricity supply and reducing dependence on carbon-based fuels.• Creating economic development and jobs in manufacturing and installation.							
	Upgrading of the existing access road.	A local contractor can be appointed to upgrade the access road.							



7.6 Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks.

Table 4 and **Error! Reference source not found.** indicate the methodology used in order to assess the probability and magnitude of the impact. Table 5 provides the risk matrix used to plot the probability against the magnitude in order to determine the severity of the impact.

Table 4: Determination of Probability of Impact.

Score	Frequency of Aspect / Unwanted Event	Availability of Pathway from the source to the receptor	Availability of Receptor
1	Never known to have happened, but may happen	A pathway to allow for the impact to occur is never available	The receptor is never available
2	Known to happen in industry	A pathway to allow for the impact to occur is almost never available	The receptor is almost never available
3	< once a year	A pathway to allow for the impact to occur is sometimes available	The receptor is sometimes available
4	Once per year to up to once per month	A pathway to allow for the impact to occur is almost always available	The receptor is almost always available
5	Once a month - Continuous	A pathway to allow for the impact to occur is always available	The receptor is always available

Step 1: Determine the **PROBABILITY** of the impact by calculating the average between the Frequency of the Aspect, the Availability of a pathway to the receptor and the availability of the receptor.

Table 5: Determination of severity of the impact.

Environmental Impact Rating / Priority					
Probability	Magnitude				
	1 Minor	2 Low	3 Medium	4 High	5 Major
5 Almost Certain	Low	Medium	High	High	High
4 Likely	Low	Medium	High	High	High
3 Possible	Low	Medium	Medium	High	High
2 Unlikely	Low	Low	Medium	Medium	High
1 Rare	Low	Low	Low	Medium	Medium

Step 3: Determine the **SEVERITY** of the impact by plotting the averages that were obtained above for Probability and Magnitude in the table below.



Table 6: Determination of magnitude of impact

Score	SOURCE				RECEPTOR	
	Duration of impact	Extent	Volume / Quantity / Intensity	Toxicity / Destruction Effect	Reversibility	Sensitivity of environmental component
1	Lasting days to a month	Effect limited to the site. (metres);	Very small quantities / volumes / intensity (e.g. < 50 ℓ or < 1 ha)	Non-toxic (e.g. water) / Very low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes will remain unaltered.	Current environmental component(s) are largely disturbed from the natural state. Receptor of low significance / sensitivity
2	Lasting 1 month to 1 year	Effect limited to the activity and its immediate surroundings. (tens of metres)	Small quantities / volumes / intensity (e.g. 50 ℓ to 210 ℓ or 1 ha to 5 ha)	Slightly toxic / Harmful (e.g. diluted brine) / Low potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be negligibly altered or enhanced / Still reversible	Current environmental component(s) are moderately disturbed from the natural state. No environmentally sensitive components.
3	Lasting 1 – 5 years	Impacts on extended area beyond site boundary (hundreds of metres)	Moderate quantities / volumes / intensity (e.g. > 210 ℓ < 5000 ℓ or 5 – 8 ha)	Moderately toxic (e.g. slimes) Potential to create damage or destruction to the environment	Bio-physical and/or social functions and/or processes might be notably altered or enhanced / Partially reversible	Current environmental component(s) are a mix of disturbed and undisturbed areas. Area with some environmental sensitivity (scarce / valuable environment etc.).
4	Lasting 5 years to Life of Organisation	Impact on local scale / adjacent sites (km's)	Very large quantities / volumes / intensity (e.g. 5000 ℓ – 10 000 ℓ or 8 ha– 12 ha)	Toxic (e.g. diesel & Sodium Hydroxide)	Bio-physical and/or social functions and/or processes might be considerably altered or enhanced / potentially irreversible	Current environmental component(s) are in a natural state. Environmentally sensitive environment / receptor (endangered species / habitats etc.).
5	Beyond life of Organisation / Permanent impacts	Extends widely (nationally or globally)	Very large quantities / volumes / intensity (e.g. > 10 000 ℓ or > 12 ha)	Highly toxic (e.g. arsenic or TCE)	Bio-physical and/or social functions and/or processes might be severely/substantially altered or enhanced / Irreversible	Current environmental component(s) are in a pristine natural state. Highly Sensitive area (endangered species, protected habitats etc.)

Step 2: Determine the **MAGNITUDE** of the impact by calculating the average of the factors above



7.7 The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.

The positive and negative implications of the proposed solar plant and the alternatives identified have been provided below and assessed in terms of the following four categories:

- Environmental.
- Technical/Engineering.
- Economical.
- Social.

Table 7: Advantages and disadvantages of the proposed activities and preliminary identified alternatives.

Alternative	Advantages	Disadvantages
Option A (Preferred Alternative)	<p>Environmental: A large section of the preferred location is part of a <i>Eucalyptus</i> plantation (Blue Gum Trees) and as a result a smaller area of the preferred location is considered as a sensitive area. Minimal loss of the landscape character will occur.</p> <p>Technical/Engineer: Suitable for the area with less to non-complications for the construction to occur. The preferred location is close to the cement factory with easy access to the electrical grid.</p> <p>Economical: No advantages as compared to alternative locations.</p> <p>Social: No advantages as compared to alternative locations</p>	<p>Environmental: Sixteen hectares of indigenous grass species will be disturbed resulting in the loss of habitat during the construction of the solar plant.</p> <p>Technical/Engineer: The preferred location is located further away from the nearest access road.</p> <p>Economical: No disadvantages as compared to alternative locations.</p> <p>Social: No disadvantages as compared to alternative locations.</p>
Option B (Alternative 2)	<p>Environmental: Option B is located to the North is within already disturbed mining area. Minimal new environmental disturbance will occur.</p> <p>Technical/Engineer: This location is located closer to the R503, with easy access to the proposed solar plant.</p> <p>Economical: No advantages as compared to alternative locations</p> <p>Social: No advantages as compared to alternative locations</p>	<p>Environmental: Due to previous mine works, numerous areas of wetland characteristics formed that will be disturbed by the development.</p> <p>Technical/Engineer: This site is the furthest away from the cement factory requiring longer over-hanging cables and can have an impact on the amount of voltage generated vs received.</p> <p>Economical: Cost implication due to longer cables and a longer portion of the existing road will have to be upgraded</p> <p>Social: No disadvantages as compared to alternative locations.</p>
Option C (Alternative 3)	<p>Environmental: None</p> <p>Technical/Engineer: Close to the access road.</p>	<p>Environmental: Option C was identified as the least disturbed area with mix grass species and trees such as <i>Ziziphus mucronate</i> (Buffalo thorn) and <i>Searsia</i></p>

Alternative	Advantages	Disadvantages
	<p>Economical: No benefits (as compared to alternative locations).</p> <p>Social: No benefits (as compared to alternative locations).</p>	<p>/ancea (Karee). The solar collector will also have to be washed more regularly due to risk of more dust accumulation.</p> <p>Technical/Engineer: This location is located next to the railway; thus, the overhead cables will have to go over the railway and the access road.</p> <p>Economical: The costs will be higher, due to the construction and installation of a longer overhead line.</p> <p>Social: No disadvantages as compared to alternative locations.</p>

No-go option: The proposed solar plant is a trial to promote sustainable development and to reduce the mine's dependency on non-renewable energy. This alternative would result in no additional environmental impacts on the site or surrounding local area, however, some of the disadvantages that will arise from this option include:

- No new investment opportunities.
- No benefits will be derived from the implementation of an additional land use.
- No alternative source of electricity will be generated or supplied through means of renewable energy resources by this project at this location.
- The local economy will not benefit from the opportunities.
- There will be no opportunity for additional employment in an area where job creation is identified as a key priority (the construction of the proposed solar power plant will be undertaken by local contractors).
- There will be lost opportunity for skills transfer and education/training of local communities.
- The positive socio-economic impacts likely to result from the project such as increased local spending and the creation of local employment opportunities will not be realised.

7.8 The possible mitigation measures that could be applied and the level of risk.

The impact management measures, and level of risk have been included under section 7.5 of Part A.

7.9 Motivation where no alternative sites were considered.

Alternatives sites were considered as previously discussed.

7.10 Statement motivating the alternative development location within the overall site.

Refer to section 7.1 for the description of the process undertaken to identify, assess and rank the impacts and risks of the activity at the preferred location (in respect of the final site layout plan) through the life of the activity.

All impacts and associated significance as identified are contained within section 7.5. As further provided, is an indication of the extent to which the impacts can be avoided or addressed by the adoption of mitigation measures. The methodology applied in assessing and ranking the impacts at the preferred site and associated preferred alternatives is described in section 7.6. The results of this assessments are provided below.

8 Assessment of each identified potentially significant impact and risk

Table 8: Risk assessment results including post mitigation significance

Environmental Component (Aspects affected)	Activity	Impact description	Phase (Construction/Operational/ Decommissioning/ Closure/Post Closure	Pre-Mitigation Significance	Mitigation Type Modify/Remedy/Control/Stop	Post Mitigation Significance.
Geology	Construction and utilisation of the proposed solar plant and upgrading of the existing road.	The proposed activities associated with the solar plant and road upgrade are not anticipated to have an impact on Geology of the project area.				
Topography	Construction and utilisation of the proposed solar plant	The proposed location is located on a flat surface where little to none of the physical features will be impacted.	Construction and operational	L	Control	L
	Upgrading of the existing road.					
Soils	Construction and utilisation of the proposed solar plant	Constructing a solar plant involves grading, digging, and burying. During these processes, the disturbance can cause erosion if proper planning is not done. Due to the flat surface, mitigation measures will have to be implemented to prevent loss of remaining topsoil. Construction vehicles accessing the site, turning, offloading materials on site could possibly result in hydrocarbon spills. Old damaged solar panels can leach out harmful substances. .	Construction and operational	L	Control	L
	The upgrading of the existing access road.	Topsoil loss could potentially occur due to the upgrading of the existing access road. Construction vehicles accessing the site, turning, offloading materials on site could possibly result in hydrocarbon spills.	Construction and operational	L	Control	L
Land use and land capability	Construction and utilisation of the proposed solar plant	The proposed location for the solar plant is on rehabilitated land. The use of this location for the solar plant will result in a change in land use from rehabilitated mining (in future) to renewable energy. This is seen to be positive impact, due to the higher monetary income yield per surface area for the land to be used.	Positive impact.			
	The upgrading of the existing access road.	The road already exists, and the upgrade will not result in any additional impacts on land use and land capability.				
Fauna and Flora	Construction and utilisation of the proposed solar plant	A portion of a rehabilitated area will be disturbed and as a result will have an impact on established fauna and flora within the area. A section of the proposed project area falls within a CBA that is considered as a sensitive area. The habitat can also become less inhabitable for plants and wildlife that have previously occupied the area.	Construction and operational	M	Control	L
	The upgrading of the existing access road.	No significant biodiversity impacts are expected as a result of the upgrading of the existing road.				
Surface Water	Construction and utilisation of the proposed solar plant.	<u>Surface water quality</u> There may be a decrease in surface water quality when any surface water run-off comes into contact with dust, eroded soil, or other pollutants generated during the construction phase. The sediment load within surface water runoff may increase if not prevented or mitigated if no vegetation re-establishes underneath the solar panels. Spillages of hazardous materials (i.e., oil, fuel, grease and / or cement) used during the construction of the proposed project may impact on the surrounding clean water environment. <u>Water Quantity</u> The proposed solar plants may require water for the cleaning of the solar collectors. Which can have a slight increase in water demand that could have an impact on the available water resources. .	Construction	L	Control	L



Environmental Component (Aspects affected)	Activity	Impact description	Phase (Construction/Operational/ Decommissioning/ Closure/Post Closure)	Pre-Mitigation Significance	Mitigation Type Modify/Remedy/Control/Stop	Post Mitigation Significance.
	The upgrading of the existing access road.	There is a possibility that spillages of hazardous materials (i.e., oil, fuel) used during the upgrading of the road, may impact on the surrounding clean water environment..		L	Control	L
Groundwater	Construction and utilisation of the proposed solar plant	The impacts on groundwater quality are primarily related to the management of materials, and spills from construction operations. Contamination of groundwater may also arise due to incorrect handling and disposing of solar collector materials and cement. Due to the short exposure and small scale of these possible spills, the impacts will be negligible during the construction phase.	Construction and operational	L	Control	L
	The upgrading of the existing access road.	No impacts to groundwater were identified.				
Wetlands	Construction and utilisation of the proposed solar plant	The proposed project could lead to a disturbance of wetland vegetation, increased sediment movement into wetlands, spillage of contaminants leading to water quality impacts and an increase in alien vegetation. Spills, leaks or incorrect disposal of cement, hydrocarbons or waste could also negatively impact wetlands. In addition, there could be a disturbance to wetland biota due to noise and light pollution.	Construction and Operational	L	Control	L
Air quality	Construction and utilisation of the proposed solar plant	There may be impacts on the air quality of the area as dust fallout will increase during the clearance of vegetation for the construction of the solar plant. There may be a chance that dust, and diesel fumes generated by machinery and vehicles could affect the air quality of the area	Construction and operational	L	Control	L
	The upgrading of the existing access road.	There may be impacts on the air quality of the area as dust fallout impacts relate to nuisance impacts as a result during the upgrading of the road		L		L
Noise	Construction and utilisation of the proposed solar plant.	Elevated noise levels are anticipated as a result of the construction of the proposed activities. Due to the distance of the nearest town and formal / informal residents the activities are not likely to have a significant impact on the direct community or Lichtenburg.	Construction and operational	L	Control	L
	The upgrading of the existing access road.			L		L
Visual	Construction and utilisation of the proposed solar plant.	Due to the flat terrain, very little of the operational activities are expected to be visible from the surrounding regional roads. Thus, the visual impact will be minimal during the operational phase	Construction and operational	L	Control	L
	Upgrading of the existing access road.	Construction activities associated with the road upgrade can have a visual impact.	Construction	L		L
Sites of Archaeological and Cultural Importance	Construction of the proposed solar plant.	No archaeological and cultural sites are within or near the preferred location.				
	Upgrading of the existing access road.					
Socio-economic	Construction and utilisation of the proposed solar plant.	Where possible, local contractors will be used for the construction and operation of the proposed solar plant. This will lead to a positive impact on the socio-economic aspect of the area that can create jobs opportunities and promote investments.	Construction and operational	Positive impact		
		Beyond the project boundaries: <ul style="list-style-type: none"> Generating electricity that produces no greenhouse gas emissions. Diversifying electricity supply and reducing dependence on carbon-based fuels. Creating economic development and jobs in manufacturing and installation. 				
	Upgrading of the existing access road.	A local contractor can be appointed to upgrade the access road.				



9 Summary of specialist reports

Specialist study	Recommendations of specialist reports	Reference to applicable section of the report
<i>Wetland Delineation and water use risk assessment, compiled by WCS Scientific (Pty) Ltd, dated 2021.</i>	It is uncertain if the man-made wetland features will continue to exist into the future or if these areas will be shaped and rehabilitated as part of mine closure activities. Under a scenario where these old quarries and excavations remain features of the landscape after mine closure and continue to support wetland habitat, they should be considered as part of the post-mining landscape and as such as watercourses protected under the National Water Act. However, if the intention is to close and rehabilitate old quarries and excavations resulting from mining activities during closure, then the current wetland habitat cannot be considered as more than a temporary feature of the landscape that will again disappear during mine closure.	Section 1.4.4 of Part B. Rehabilitation of the area has been completed and there will be no additional disturbances to the wetland habitat.
	The project entails the development of a roughly 29 ha PV facility with associated transformer and inverters, as well as a powerline to link the PV facility to the factory. The entire development footprint will be located outside any delineated wetland habitat and that no natural wetland habitat falls within 500 m of the proposed development footprint. No direct impact to wetland habitat is therefore expected from the construction and operation of the PV facility.	Section 7.5 Impacts and risks identified
	Extensive wetland habitat occurs just to the north of the preferred area within old quarries and excavations. These are of course man-made features and, based on the general lay of the land and a very gentle slope (0.5 %) towards the south (refer to Figure 19 in specialist report), are located upslope of the proposed development and thus unlikely to be directly impacted by runoff. Any runoff generated is likely to be directed towards the existing Return Water Dam located to the south of the preferred site and the existing factory.	Section 7.5 Impacts and risks identified
	A Water Use Risk Assessment was undertaken for the proposed PV facility and associated infrastructure as per the methodology required by GN 509 of 2016, which relates to General Authorisations for Water Uses 21 (c) and (i). All identified risks were assessed as being of LOW significance with scores under 56. It is therefore recommended that the proposed project activities are authorised under a General Authorisation.	Section 7.5 Impacts and risks identified

10 Environmental impact statement

10.1 Summary of the key findings of the environmental impact assessment

The methodology utilised to undertake the impact assessment has incorporated, amongst other skills, professional experience and specialists, relevant literature and local knowledge of the site and surrounding area.

It is the EAP's opinion that based on the process that has been followed and the findings of the impact assessment, in conjunction with the proposed mitigation measures, that no unmanageable adverse impacts are expected to occur, and that significant positive impacts are expected.



11 Final Locality Map

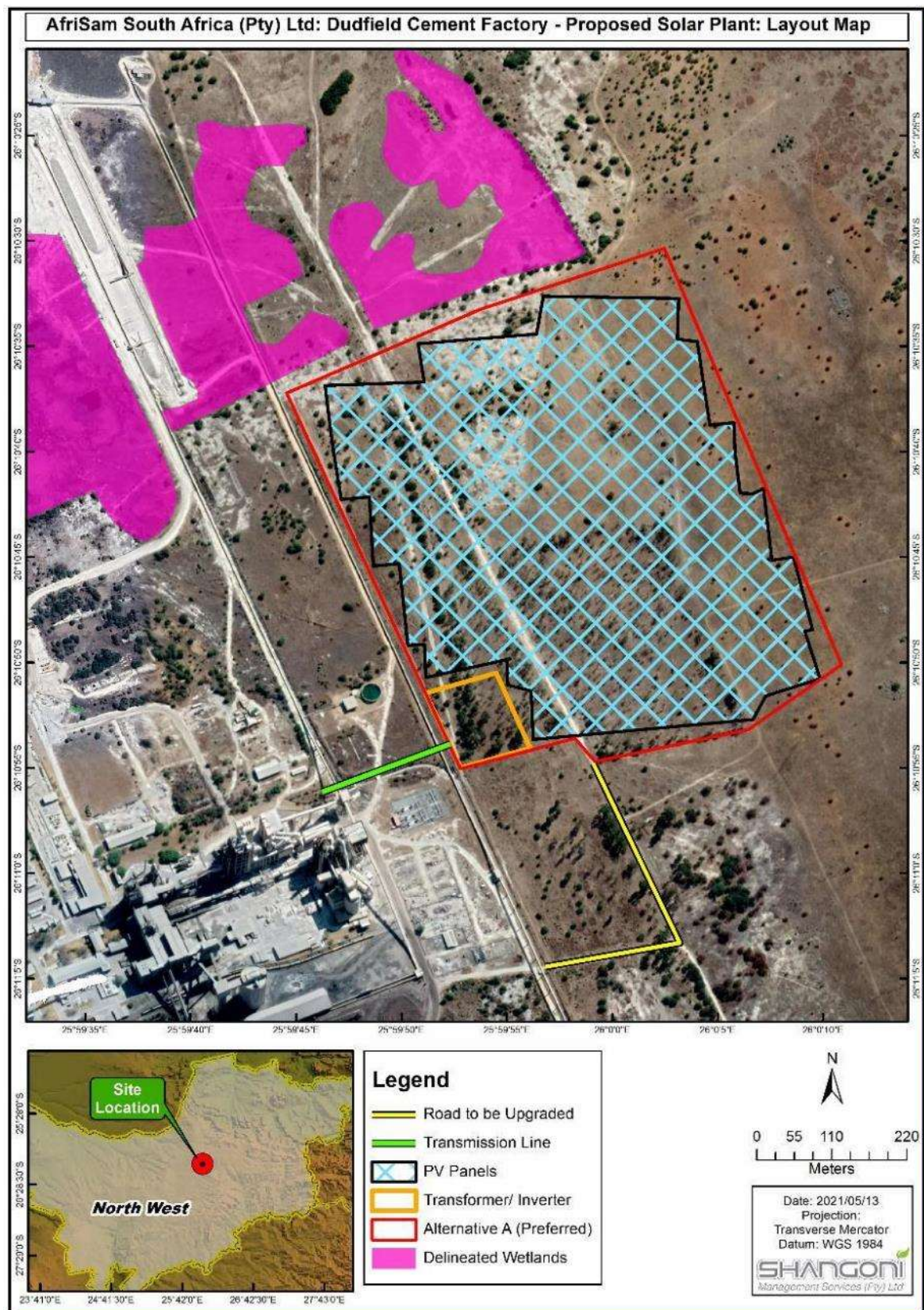


Figure 12: Final locality layout map

12 Summary of the positive and negative impacts and risks of the proposed activity and identified alternatives

Table 9: Summary of environmental impacts (negative), after mitigation.

Environmental Aspect	Significance Post Mitigation
TOPOGRAPHY	
The proposed area is located on a flat surface where little to none of the physical features will be impacted.	L
SOIL	
Constructing a solar plant involves grading, digging, and burying. During these processes, the disturbance can cause erosion if proper planning is not done. Due to the flat surface, mitigation measures will have to be implemented to prevent loss of remaining topsoil. Construction vehicles accessing the site, turning, offloading materials on site could possibly result in hydrocarbon spills. Old damaged solar panels can leach out harmful substances. Topsoil loss could potentially occur due to the upgrading of the existing access road. Construction vehicles accessing the site, turning, offloading materials on site could possibly result in hydrocarbon spills.	L
FAUNA and FLORA	
A portion of a rehabilitated area will be disturbed and as a result will have an impact on established fauna and flora within the area. A section of the proposed project area falls within a CBA that is considered as a sensitive area. The habitat can also become less inhabitable for plants and wildlife that have previously occupied the area.	M
SURFACE WATER	
Surface water quality There may be a decrease in surface water quality when any surface water run-off comes into contact with dust, eroded soil, or other pollutants generated during the construction phase. The sediment load within surface water runoff may increase if not prevented or mitigated if no vegetation re-establishes underneath the solar panels. Spillages of hazardous materials (i.e., oil, fuel, grease and / or cement) used during the construction of the proposed project may impact on the surrounding clean water environment. There is a possible impact for contamination of surface water when dust and other particles are washed from the solar collectors. Water Quantity The proposed solar plants may require water for the cleaning of the solar collectors. Which can have a slight increase in water demand that could have an impact on the available water resources. There is a possibility that spillages of hazardous materials (i.e., oil, fuel) used during the upgrading of the road, may impact on the surrounding clean water environment.	L



Environmental Aspect	Significance Post Mitigation
GROUNDWATER	
<p>The impacts on groundwater quality are primarily related to the management of materials, and spills from construction operations.</p> <p>Contamination of groundwater may also arise due to incorrect handling and disposing of solar collector materials and cement. Due to the short exposure and small scale of these possible spills, the impacts will be negligible during the construction phase.</p>	L
AIR QUALITY	
<p>There may be impacts on the air quality of the area as dust fallout will increase during the clearance of vegetation for the construction of the solar plant. There may be impacts on the air quality of the area as dust fallout will increase during the clearance of vegetation for the construction of the solar plant. There may be a chance that dust, and diesel fumes generated by machinery and vehicles could affect the air quality of the area.</p>	L
NOISE	
<p>Elevated noise levels are anticipated as a result of the construction of the proposed activities. Due to the distance of the nearest town and formal / informal residents the activities are not likely to have a significant impact on the direct community or Lichtenburg.</p>	L
VISUAL ASPECTS	
<p>Visual impacts are anticipated due to the increase in vehicles and dust as a result of construction activities.</p> <p>Due to the flat terrain, very little of the operational activities are expected to be visible from the surrounding regional roads. Thus, the visual impact will be minimal during the operational phase.</p>	L
SENSITIVE LANDSCAPES (INCLUDING WETLANDS)	
<p>The proposed project could lead to a disturbance of wetland vegetation, increased sediment movement into wetlands, spillage of contaminants leading to water quality impacts and an increase in alien vegetation. Spills, leaks or incorrect disposal of cement, hydrocarbons or waste could also negatively impact wetlands. In addition, there could be a disturbance to wetland biota due to noise and light pollution.</p>	L

The proposed project will result in several positive impacts that relate to climate change, socio-economic and job creation as reflected in the table below.

Table 10: Summary of significant environmental impacts (positive), after mitigation.

Environmental Aspect	Significance Post Mitigation
SOCIO ECONOMIC	
<p>Where possible, local contractors will be used for the construction and operation of the proposed solar plant. This will lead to a positive impact on the socio-economic aspect of the area which can create jobs opportunities and promote investments.</p> <p>Beyond the project boundaries:</p> <ul style="list-style-type: none"> Generating electricity that produces no greenhouse gas emissions. Diversifying electricity supply and reducing dependence on carbon-based fuels. Creating economic development and jobs in manufacturing and installation. 	Positive



Environmental Aspect	Significance Post Mitigation
LAND USE AND LAND CAPABILITY	
The proposed location for the solar plant is located within a rehabilitated area. The construction of the solar plant will result in a change in land use (from rehabilitated mining area) to renewable energy. This is seen to be positive impact, due to the higher monetary income yield per surface area for the land to be used.	Positive

13 Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr

Based on the assessment and where applicable the recommendations from specialist reports, the table below summarises the impact management objectives and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

Table 11: Impact management objectives and the impact management outcomes

Environmental Aspect	Objective	Summary of impact management outcome
Topography	None	Minimise disturbance by remaining to the demarcated footprint.
Air Quality	Prevent the deterioration of air quality	Dudfield is currently implementing dust fallout monitoring (monthly). Dust impacts will be minimised during the construction phase by means of dust suppression. Where possible, construction activities must take place outside of windy seasons. The proposed solar plant will not have an impact on air quality during the operational phase.
Land use and capability	To prevent major disturbances within the site area during construction.	The disturbance area for the construction will be kept at a minimum and in the designated areas as per the approved layout plans.
Flora and Fauna	To prevent the proliferation and the increase of alien invasive plant species within disturbed areas.	Dudfield has a programme in place to control alien invasive species. To re-establish the vegetation underneath the solar plant for erosion after construction.
Sensitive Landscapes (including wetlands)	Prevent impact to sensitive landscapes	Apply for a GA under the Water Use Act. for Water Uses 21 (c) and (i).
Surface water	To prevent quality deterioration of surface water quality.	To continue with the monthly water quality monitoring of surface water bodies. Where accidental spillages may occur, the mine should apply their existing Standard Operating Procedures ("SOP") to mitigate spillages.
Groundwater	To limit degeneration of groundwater quality and quantity.	To continue with the monthly water quality monitoring of ground water in the surrounding areas and to use water frugal when cleaning the solar collectors. To



Environmental Aspect	Objective	Summary of impact management outcome
		dispose of solar panels in the right manner when it needs to be replaced, in which case a certificate of safe disposal should be issued.
Noise	To minimise the amount of noise generated during the construction phase of the proposed project.	Compliance with SABS Code of Practice 0328 of 2008: Environmental Noise Impact Assessments and adherence to the Mine Health and Safety Act.
Visual aspects	To limit the visual impact of the proposed solar plant.	Due to the flat terrain, the visual impact is small. There is a probability that the solar plant can be visible depending on the rotation and the intensity of the glare.
Sites of archaeological and cultural importance	Prevent the destruction of and loss of sites of cultural and archaeological importance.	No archaeological and cultural importance sites are within the proposed location for the constructing of the solar plant.
Socio-economic aspects	Enhance the positive socio-economic impacts.	Implementation of approved Social and Labour Plan.

14 Aspects for inclusion as conditions of authorisation

Should the DFFE grant authorisation for this project, it should be subject to the following conditions:

- The proposed project should remain in full compliance with the requirements of the BAR and with all regulatory requirements;
- The BAR should be implemented by qualified environmental personnel who have the competence and credibility to interpret the requirements of the BAR. Such persons must be issued with a written mandate by mine management to provide guidance and instructions to employees and contractors; and
- Stakeholder engagement must be maintained during all phases of the proposed project.

15 Description of any assumptions, uncertainties and gaps in knowledge

In terms of the EIA Regulations GN R982 Appendix 1(3)(o), the Environmental Assessment Practitioner ("EAP") must provide a description of any assumptions, uncertainties and gaps in knowledge upon which the impact assessment has been based. The table below provides the assumptions and limitations applicable to the wetland specialist assessment.

Table 12: Specialist assumptions and limitations

Specialist	Assumptions and Limitations
Wetland Delineation and water use risk assessment,	<ul style="list-style-type: none"> • Wetland boundaries reflect the ecological boundary where the interaction between water and plants influences the soils, but more importantly the plant



Specialist	Assumptions and Limitations
compiled by WCS Scientific (Pty) Ltd, dated May 2021.	<p>communities. The depth to the water table where this begins to influence plant communities is approximately 50 centimetres. This boundary, based on plant species composition, can vary depending on antecedent rainfall conditions, and can introduce a degree of variability in the wetland boundary between years and/or sampling period. Due to the scale of the remote imagery used (1:10 000 orthophotos and Google Earth Imagery), as well as the accuracy of the handheld GPS unit used to delineate wetlands in the field, the delineated wetland boundaries cannot be guaranteed beyond an accuracy of about 15m on the ground. Should greater mapping accuracy be required, the wetlands would need to be pegged in the field and surveyed using conventional survey techniques.</p> <ul style="list-style-type: none"> It is recognised that the passage of time may affect the information and assessment provided in this report. WCSS's opinions are therefore based upon the information that was made available to WCSS and which existed at the time of compiling this report.

16 Reasoned opinion as to whether the proposed activity should or should not be authorised

From the impact assessment undertaken, no significant environmental impacts were identified, if the mitigation measures are adequately implemented and the project remains within the presented footprint for development. The most significant environmental risk is the disturbance of the 16 ha portion of vegetation during the construction of the plant. The benefits that will arise from the proposed solar plant is the generation electricity from a truly renewable energy source, a clean and silent process, reducing the mine's dependence on fossil fuel derived electricity.

In terms of collectively considering ecological, social and economic impacts, the EAP is of opinion that the proposed activities should be allowed, provided that the management objectives and management measures as presented in this BAR are implemented to effectively manage, prevent, control and / or stop environmental impacts from occurring.

17 Period for which the Environmental Authorisation is required

The current Life of Mine ("LoM") of Dudfield has been calculated as 20 years (from 2016), as per the approved mining right. The proposed solar plant is expected to remain until closure. Therefore, the period for which environmental authorisation is required is at least 20 years (from the date of approval provided by the DFFE).



18 Undertaking

The undertaking by the EAP is provided in Section 2 of Part B (Environmental Management Programme) below. This undertaking confirms: the correctness of the information provided in the reports, the inclusion of comments and inputs from stakeholders and I&APs (where received), the inclusion of inputs and recommendations from available specialist and monitoring reports, where relevant, and the acceptability of the proposed project in relation to the finding of the assessment and level of mitigation proposed.

19 Financial provision

19.1 Explain how the aforesaid amount was derived.

The following steps were taken to determine the closure liability for the proposed project:

- The proposed activities or infrastructure associated with the PV plant were classified according to the relevant demolition and rehabilitation rate categories.
- The quantities were obtained from the project description provided by AfriSam.
- Demolition and rehabilitation rates were obtained from quotes provided by companies in the country with ability to work on similar scale project.
- The following assumptions were made as part of the calculation:
 - Cost for disposal of the PV panels were excluded from the liability calculation for the following reasons:
 - The life of PV panels is 20 – 50 years. It is assumed that, at the time of decommissioning, adequate recycling options will be available for disposal of the panels.
 - Should the PV plant be decommissioned before the end of the lifespan of the PV panels, the panels will be transferred to a third party for re-use instead of being disposed of as hazardous waste.
 - In the absence of detailed designs, measurements for the components were taken from Google Earth. The closure liability will be updated when designs are available to improve on the accuracy of the calculation.

The liability calculation includes Preliminary and General costs at 12% and contingencies at 10% of the subtotal. VAT is excluded.

Table 13: AfriSam Dudfield Operation closure cost calculation

Item	Rate category	Quantity	Unit	Rate	Total
Remove Cable rack & wiring	Cable rack - general	5 543.00	m	R32.11	R177 985.73
Remove transformers	Infrastructure: Transformers	1.00	no	R13 589.37	R13 589.37
Breakup and Remove Concrete Pads and Ballasts	400mm concrete structure	5 223.60	m ³	R503.85	R2 631 910.86



Item	Rate category	Quantity	Unit	Rate	Total
Remove Power Poles	Infrastructure: Powerlines	230.00	m	R57.80	R13 294.00
Remove Fence	Dismantling fences 2.1m Elec.	2 350.00	m	R28.26	R66 411.00
Rip access road	Ripping	3 780.00	m ²	R4.95	R18 711.00
Seed access road	Seeding	3 780.00	m ²	R5.39	R20 374.20
Ripping PV plant area	Ripping	350 000.00	m ²	R4.95	R1 732 500.00
Seed Disturbed Areas (PV plant area)	Seeding	350 000.00	m ²	R5.39	R1 886 500.00
Sub-total 1					R6 561 276.16
P&G				12%	R787 353.14
Contingency				10%	R656 127.62
Grand-total					R8 004 756.92

20 Specific Information required by the competent Authority

20.1 Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the BAR report must include the:

20.1.1 Impact on the socio-economic conditions of any directly affected person.

Results of investigation, assessment and evaluation of impact on any directly affected person	Reference to where mitigation is reflected
<p>Dudfield indicates that it strives to:</p> <ul style="list-style-type: none"> Promote employment and advance the social and economic welfare of all employees; Contribute to the transformation of the industry; and Be actively involved in the community whereby funds are made available for the development of local infrastructure and social upliftment. 	Part A Section 7.5

20.2 Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

Results of investigation, assessment and evaluation of impact on any national estate	Reference to where mitigation is reflected
There are no archaeological and cultural sites of importance identified on the proposed location. No national estates will be impacted on as a result of the proposed project.	Part A Section 7.5



21 Other matters required in terms of sections 24(4)(a) and (b) of the Act.

No other matters have been identified for inclusion, but will be included should any additional matters arise.



PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME

REPORT

1 Environmental Management Programme

1.1 Description of the aspects of the activity

The requirement to describe the aspects of the activity that are covered by the environmental management programme is included in Part A, section 4.

1.2 Details of the EAP

The requirements for the provision of the detail and expertise of the EAP are included in Part A, section 1.2.

1.3 Composite Map

Refer to **Error! Reference source not found.** for the master layout plan.

1.4 Description of impact management objectives including management statements

1.4.1 Determination of closure objectives.

The existing closure objectives as per the *Rehabilitation, decommissioning and mine closure plan, for Afrisam (South Africa) properties (Pty) Ltd. -Dudfield Operation* (Shangoni Management Services (Pty) Ltd. Reference no NW 354 MR) will apply to the proposed solar plant and upgrading of the existing road.

The following overarching goals and objectives will be used to generate the detailed closure plans for Dudfield upon closure of the mine:

- The relevant legislation at the time of closure will be adhered to.
- The safety and health of humans and animals are safeguarded from hazards resulting from the mining operations.
- Final closure plans will be formulated to align with the integrated development plan of the region at the time of closure.
- Dudfield will ensure that a detailed consultation process is undertaken with all interested and affected parties and the view raised by the interested and affected parties will be considered when finalising closure plans.
- The land is rehabilitated to, as far as is practicable, it's natural state where by it can sustain grazing and does not represent a source of pollution which will include:



- Where possible natural surface water runoff will be encouraged.
- Erosion will be prevented by re-establishing drainage channels.
- All alien vegetation will be destroyed on site and a management plan will be implemented to ensure the continued eradication of alien vegetation.
- The mine will be closed efficiently and cost effectively.
- The cost of implementing closure will be covered by the financial provision set aside during the life of the mine.
- Dudfield recognise the socio-economic impacts associated with mine closure. As the mine draws closer to closure, the social and labour plan will place more emphasis on future sustainable projects in the region and the multi-skilling of the workforce to minimise the socio-economic impacts associated with closure.
- All disturbed land created as a result of the open cast mining and land exposed through the demolishing of buildings and roads will be rehabilitated back to a state to where it can either sustain grazing use or used as a pan / wetland that will attract a variety of bird life and act a source of water for grazing cattle.

1.4.2 Volumes and rate of water use required for the operation.

Water tankers will be used for dust suppression, if required. Water will also be used to clean the solar collectors. The water will be obtained from the existing operations and in accordance with the quantities as specified in the existing Water Use Licence.

1.4.3 Has a water use licence been applied for?

The proposed solar plant will require a General Authorisation ("GA") due to the proximity to a delineated artificial wetland (approximately 40 metres), as per the outcome of the GN 509 Risk Assessment that was undertaken. The GA will be applied for separately.



1.4.4 Impacts to be mitigated in their respective phases

Table 14: Measures to mitigate the impacts associated with the proposed solar plant.

Environmental Aspects	Activities	Phases	Scale of disturbances (Volumes, tonnage and hectares or m ²)	Mitigation Measures	Compliance with standards	Time period for implementation
Geology	Construction of the solar plant.	The proposed activities associated with the solar plant and road upgrade are not anticipated to have an impact on Geology of the project area.				
Topography	Construction of the solar plant.	Construction and operational	35 ha	The disturbance area for the construction will be kept at a minimum and in the designated areas as per the approved layout plans.	The disturbance area for the construction will be kept at a minimum and in the designated areas as per the approved layout plans.	Construction
	The upgrading of the existing access road.		630 m			
Soils	Construction of the solar plant.	Construction and operational	35 ha	Alien vegetation should be removed from the stockpiles. Disturbed surface areas will be kept as small as possible.	In compliance with principles contained in the NEMA, 1998.	Construction and operational
	The upgrading of the existing access road.		630 m	Disturbed land use areas must be covered with topsoil to a similar depth as prior to the proposed project. Soil that has been contaminated by oil, grease or hydraulic fluid spills will be cleaned up by removing and disposing thereof in an appropriate waste disposal receptacle.		
Land Use and Land Capacity	Construction of the solar plant.	Construction and operational	35 ha	All vehicle and equipment usage should be limited to designated areas only. Manage oil and fuel by storing it in designated bunded areas (if any storage will occur at the site). Cement must be placed in designated areas.	In compliance with principles contained in the NEMA, 1998.	Construction
	The upgrading of the existing access road.		630 m	No dumping or impounding of rubble, litter, garbage or discards of any description, whether solid or liquid, shall take place on the site other than in the demarcated areas.		
Flora and Fauna	Construction of the solar plant.	Construction and operational	35 ha	The disturbance area for construction will be kept at a minimum and in the designated areas as per the approved layout plans.	General implementation of activities taking Biodiversity Guidelines into account. Development and implementation of Alien vegetation management plan.	Construction
	The upgrading of the existing access road.		630 m	Speed limits of the vehicles must be ≤40 km/hr, to minimise any risk of collision with fauna. Indigenous floral species must be replanted on the site that is not affected by the construction and operation of the proposed activities.		
Surface Water	Construction of the solar plant.	Construction	35 ha	Activities taking place during the construction must be limited to the designated areas only, and not outside of the designated areas as specified in the layout map. Soil stockpile must be kept in designated areas.	In line with the DWS Best Practice Guidelines and Regulations there under and amendments thereto.	Construction
	The upgrading of the existing access road.			All vehicle and equipment usage should be limited to designated areas only. Manage oil and fuel by storing it in designated bunded areas. Cement must be placed in designated areas. Treat all hydrocarbon spills as hazardous, and dispose of accordingly.		
Surface Water	Construction of the solar plant.	Operational	35 ha	Current water quality monitoring of surface water in the surrounding areas will continue. Water will be used frugally.	In line with the DWS Best Practice Guidelines and Regulations there under and amendments thereto.	Construction and Operational
	The upgrading of the existing access road.		630 m			
Groundwater	Construction of the solar plant.	Construction and operational	35 ha	Prevent or contain contamination from spilling and oil leaks from vehicles and other equipment.	In line with the DWS Best Practice Guidelines (and Regulations there under and amendments thereto).	Construction



Environmental Aspects	Activities	Phases	Scale of disturbances (Volumes, tonnage and hectares or m ²)	Mitigation Measures	Compliance with standards	Time period for implementation
	The upgrading of the existing access road.			Construction activity management should ensure that any materials handling does not pose a material risk to soil, surface water and groundwater pollution.		
Wetlands	Construction of the solar plant.	Construction and Operation	35 ha	<ul style="list-style-type: none"> Prior to the commencement of vegetation clearing activities on site, the required construction footprint should be fenced off and all activities, including all laydown areas and vehicle parking areas, should be located within the fenced off area. No vegetation disturbance to take place outside the fenced off area. A minimum 20 m buffer should be maintained between the artificial wetland habitat to the north of the site and the construction footprint. Design and implement a site-specific construction stormwater management plan that aims to minimise sediment transport off site. <p>Minimise area of vegetation clearing and phase vegetation clearing activities as far as possible to limit the area exposed at any one time.</p> <p>Where practically possible, the major earthworks should be undertaken during the dry season to limit erosion due to rainfall runoff.</p> <p>Install the construction stormwater management system prior to the onset of vegetation clearing activities.</p> <p>Discharge stormwater into well vegetated areas outside wetland habitat.</p> <p>Cleared areas outside direct development footprint should be re-vegetated and seeded (where necessary) as soon as possible following disturbance. Priority should be given to harvesting seeds from the surrounding grasslands for seeding purposes. In the absence of such seed being available, commercial seed mixes suitable for the area should be utilised and applied via hydro-seeding.</p> <ul style="list-style-type: none"> Regular monitoring and inspections at rehabilitated sites should be undertaken to ensure successful rehabilitation. No stormwater to be discharged into the wetland habitat to the north of the development site. Ensure the existing Return Water Dam can adequately cater for any additional stormwater inputs. Limit the extent of hardened and compacted surfaces within the development footprint. Ideally short grass cover should be maintained in between the PV arrays as far as possible. To prevent water quality deterioration, all potentially harmful substances used on site should be stored in bunded areas so that spills and leaks can be contained and no contamination of soils or surface runoff occurs. All waste to be disposed of offsite in designated facilities. 	In line with the DWS Best Practice Guidelines, and Regulations there under and amendments thereto.	Construction and Operational
	The upgrading of the existing access road.		630 m			
Air quality	Construction of the solar plant.	Construction and operational	35 ha	Dust suppression along the gravel road, and other disturbed areas.	Dust suppressing methods to reduce dust to comply with the Dust Control Regulations GNR 827 of 2013 and NEM: AQUA, 2004.	Construction
	The upgrading of the existing access road.		630 m	Dust fallout monitoring plan is already being done within the vicinity of the proposed site. Effective maintenance of diesel driven vehicles to manage the greenhouse gases.		



Environmental Aspects	Activities	Phases	Scale of disturbances (Volumes, tonnage and hectares or m ²)	Mitigation Measures	Compliance with standards	Time period for implementation
Noise	Construction of the solar plant.	Construction	35 ha	All equipment and vehicles must be regularly serviced to prevent excessive noise. Vehicles and equipment generating excessive noise should be fitted with appropriate noise abatement measures.	SABS Code of Practice 0103 of 2008: The measurement and rating of environmental noise with respect to land use, health, annoyance and to speech communication. SABS Code of Practice 0328 of 2008: Environmental Noise Impact Assessments. Adherence to the Mine Health and Safety Act.	Construction
	The upgrading of the existing access road.		630 m	Personal Protective Equipment ("PPE") must be worn at all times during construction of the proposed activities. PPE register to be kept.		
Visual	Construction of the solar plant	Construction and operational	35 ha	Remove inoperative equipment and maintain good housekeeping.	A solar plant is an investment in sustainable development and may be maintained after LoM to provide the local community with power.	Construction and operational
	The upgrading of the existing access road.		630 m			
Sites of Archaeological and Cultural Importance	Construction of the solar plant	Construction	35 ha	The proposed project area falls within a rehabilitated area that was previously part of a quarry. It is therefore not anticipated that any sites of archaeological and cultural importance exist on site. If any palaeontological material is exposed during construction activities, all construction activities must cease, a 30 m no-go barrier constructed and SAHRA contacted for further investigation.	In compliance with the National Heritage Resources Act (Act No. 25 of 1999)	Construction
	The upgrading of the existing access road.		630 m	The area should be demarcated in order to prevent any further work there until an investigation has been completed. An archaeologist should be contacted immediately to provide advice on the matter.		Construction
Socio-economic	Construction of the solar plant	Construction and operational	Local and regional	Where possible, skilled and unskilled workers, should be sourced from the local communities, towns and surrounding areas. Implementation of development training will help low-skilled labourers to get experience and advance skills, thus be able to work on other mines in future.	Continued implementation of approved Social and Labour Plan.	Construction and operational



1.5 Mechanisms for monitoring compliance with and performance assessment against the environmental management programme

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

- Monitoring of Impact Management Actions;
- Monitoring and reporting frequency;
- Responsible persons;
- Time period for implementing impact management actions; and
- Mechanism for monitoring compliance

Source Activity	Impacts Requiring Monitoring	Functional Requirements for Monitoring	Roles and Responsibilities (For the Execution of The Monitoring Programmes)	Monitoring and Reporting Frequency and Time Periods for Implementing Impact Management Actions
Spills/Incidents	Spillages of hazardous chemicals or oil spills from vehicles or equipment.	Site must be inspected on a weekly basis to ensure that no incidents have occurred. Accidents and incidents will continue to be reported as per the mines current procedure. In the event of a spill, the internal environmental department must be informed of such.	Site officer to ensure that all incidents are recorded and reported to the Environmental Practitioner during the construction phase. SHE Manager to ensure that employees are trained on spills management.	As specified by the Environmental Department
Air quality	Dust generated from the construction of the proposed activities.	Dust fallout monitoring must continue as per the Air Quality Monitoring Plan at the mine.	SHE Manager to ensure that monitoring on site is conducted by the specialist.	Dust monitoring (monthly)
Health and safety	Structural risk associated with the construction and operation of the proposed activities.	SHE inspections must be undertaken by the Safety Practitioner to ensure structural stability during the construction and operation of the proposed project.	Safety practitioner must ensure that the SHE inspections are undertaken for the duration of the activity.	Weekly.
Noise	Noise associated with the construction vehicles accessing the site, turning, offloading materials on site etc. Also, the noise of machines to be used when constructing the proposed infrastructure.	Correct PPE to be worn.	Site officer to ensure that PPE is issued to all employees/contractors during the construction phase.	As specified by the Environmental Department at the mine.
Wetland destruction	Disturbance of wetland vegetation, increased sediment movement into wetlands, spillage of contaminants leading to water quality impacts. Increase in alien vegetation. Spills, leaks or incorrect disposal of cement, hydrocarbons or waste. Disturbance to wetland biota due to noise and light pollution.	Wetland Monitoring programme. Development and implementation of alien vegetation management plan.	SHE Manager to ensure that monitoring on site is conducted by the specialist.	Wetland Monitoring programme as described in GA from the Department of Water and Sanitation
Soil contamination	Construction vehicles accessing the site, turning, offloading materials could possibly result in hydrocarbon spills.	Site inspection must occur on a weekly basis to ensure that no incidents have occurred. Vehicles and machinery equipment must be regularly serviced. A spills incident register must be kept by the contractor on site during the construction phase, all the incident recorded during the construction phase will then be logged unto SAP.	SHE Manager to ensure that monitoring is done accordingly and only at the workshop.	As specified by the Environmental Department at the mine.



1.6 Indicate the frequency of the submission of the performance assessment/ environmental audit report.

An environmental audit should be conducted monthly during the construction phase of the project and submitted to the Department of Environment, Forestry and Fisheries monthly.

1.7 Environmental Awareness Plan

1.7.2 Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.

The following Environmental Awareness Training will be implemented by Dudfield in order to inform employees and contractors of the environmental risk that may result from their work, or the risk of their interaction with the environment. The training will be conducted as part of the induction process for all new employees (including contractors) that will perform work in terms of the proposed activities. Proof of all training provided must be kept on-site.

The Environmental Training Procedure applies to all persons who work on behalf of or for Dudfield whose work may create a significant impact on the environment.

For this project the following objectives of the Environmental Training Procedure are as follows:

- To identify environmental training needs as required by the Environmental Management System ("EMS") Standard ISO14001.
- To ensure that any person, on behalf of Dudfield, performing tasks which have the potential to cause a significant impact upon the environment is competent on the basis of appropriate education, training or experience and will retain associated records.

1.7.3 Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

Responsibilities

The Environmental Practitioner is the Master of the Environmental Training Procedure. The Training Manager is the Activity Manager for this procedure and is responsible for keeping this Standard Procedure up to date as well as to ensure that the relevant persons, who have responsibilities under the procedure, follow the instructions in this Standard Procedure.

Responsibilities of the Training Superintendent include:

- The development, reviewing and updating of this procedure,
- Implementation of the training procedure,
- Conducting of training as specified, and
- Keeping this procedure and its supporting documentation up to date.

Responsibilities of the Environmental Practitioner include:



- Ensuring that the environmental induction module is regularly updated and presented at weekly induction, and
- To identify new environmental training needs and facilitate the training process by developing training programmes and providing materials and information.

Activity procedures

The Environmental Practitioner, in conjunction with the Training Manager, will identify Dudfield's environmental training needs of all persons working for or on behalf of Dudfield, taking the following into consideration:

- Analysis of non-conformances and incidents
- In-task observation of performance,
- Significant Environmental Impacts, and
- Environmental Aspect Register.

Training needs may change due to additions to the scope in services provided or due to the updating of procedures (quality, technical and administrative) and will be updated accordingly.

The induction / ex-leave training can be described as follows:

- All employees attend induction training when initially employed and upon returning from annual leave. All contractors attend Dudfield's induction training before commencing work and, should they remain on site, annually thereafter,
- The Environmental Coordinator / delegate conducts a presentation on environmental management at Dudfield during the induction programme,
- Resource conservation, environmental reporting and general environmental awareness for mine related issues are included in induction,
- Training attendance forms are completed for each candidate and recorded both electronically and manually. Records of attendance are maintained by the Training Department, and
- A Computer Based Assessment is completed after the environmental training to confirm understanding of training content.

Department specific / on-the-job training

A job specific training programme is developed for each department, concentrating on the major risk and impact areas identified in the EMS workshops. The training focuses on the following:

- Waste prevention and control.
- Water usage.
- Energy consumption.
- Storage and handling of the solar panels,
- Storage and handling of petroleum products.
- Pollution control.
- Spillages and clean-up of spillages.
- Rehabilitation.



The Environmental Co-ordinator and the Training Superintendent, in liaison with the Training Course Co-ordinator, will co-ordinate the training.

Environmental awareness and EMS training

All personnel

All persons working for or on behalf of AfriSam undergo induction, a part of which is environmental awareness training. After the training the personal is obligated to write a test. If they fail the test the attendee must reschedule and redo induction. Currently, induction is presented by the appointed security contractor and the results are sent to the planning department and HR department respectively

The content of the environmental portion of the induction programme is updated as necessary, but in general includes topics such as: an overview of environmental legislation, with an emphasis on the rights of the employee and incident management; roles and responsibilities regarding the EMS; the most common environmental impacts and their mitigation; environmental emergencies and response; and the communication of incidents

Visitors

All visitors to any controlled access areas of Dudfield will undertake a shorter "visitor's induction", which highlights the main safety and environmental aspects relevant to short-term visitors at the mine.

Evaluation

The SHE personnel, together with the team leaders, will carry out evaluation of awareness and competency training via planned job observations. Awareness and competence will also be assessed during audits via incident reporting and planned job observations.

Managerial training

The Environmental Co-ordinator will conduct or schedule management training, covering the contents and aims of ISO14001 on an ad hoc basis. Attendance records of such training will be kept and supplied to the Training Centre for entry on individual training records.

Training material development review

Training material is updated by the Environmental Practitioner as and when changes to procedures, policy or legislation occur.

Documents and reports checklists records

The records and reports that will be maintained in the employees' training file are indicated in Table 15: Records and reports maintained in employees training .

Table 15: Records and reports maintained in employees training file.

Report title	Type of report / document	Reporting frequency
Personnel qualifications	Certificates	As required
Training needs	Matrix / audits	As required
Certificates	Course certificates	As required



Report title	Type of report / document	Reporting frequency
Training programmes/ courses attended	Attendance records	As required
Staff induction	Attendance records	Annually

1.8 Specific information required by the Competent Authority

The following information in Table 16 will be required by the competent authority.

Table 16: Information required by the competent authority

Information	Frequency of submission
Quantum of Financial Provision	Annually
Environmental Audit Report on approved BAR.	Annually or as per auditing timeframe indicated in authorisation(s)

2 Undertaking

The EAP herewith confirms

- the correctness of the information provided in the reports ☒
- the inclusion of comments and inputs from stakeholders and I&APs ; ☐
- the inclusion of inputs and recommendations from the specialist reports where relevant; ☒ and
- the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

Signature of EAP

Date

3 Declaration of independence

Shangoni hereby declares that it is an independent auditor in that it has no business, financial, personal or other interest in this project in respect of which Shangoni is appointed. Furthermore, no circumstances exist that may compromise the objectivity of Shangoni, excluding fair remuneration for work performed in connection with this project.

Report compiled
by:

Report reviewed by:

Lesley Keay
(Cand.Sci.Nat)

Brian Hayes (Pr Eng)



