DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

To facilitate compliance and sustainability during the upgrade and development of an access road to the Sun Central Cluster 1 Solar PV facility

SolarAfrica Energy (Pty) Ltd

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

File Reference Number:

Project Title:

Upgrading & Development of an Access Road from the N10/'Burgerville' District Road (2448) Turn-Off into the Farm Riet Fountain No. 39C and to the Switching Station and Main Transmission Substation on Sun Central Cluster 1 (300 MW) Solar PV Facility between De Aar & Hanover, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape Province, South Africa.

Prepared for:

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(Draft_02)

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat., Reg. EAP)
Reg: 2006/023163/23

DOCUMENT CONTROL

Table 1. Document Control.

Compiled by	Status	Revision	Signature	Date
Shannon Farnsworth (*Reg. EAP*)	Draft	00		10 March 2023
Reviewed by	**Status**	**Revision**	**Signature**	**Date**
Shaun MacGregor (*Reg. EAP*)	Draft	02		20 March 2023

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CHECKLIST

An environmental management programme (EMPr) must comply with section 24N of the NEMA, 1998, as amended and contain those requirements prescribed in the EIA Regulations, 2014, as amended, including regulation 23 and Appendix 4. The full suite of requirements (listed in **Table 2**) has dictated the layout and content of this EMPr.

Table 2. Environmental Management Programme Checklist.

Content of Environmental Management Programme	Checked
1. (1) An EMPr must comply with section 24N of the Act and include-	✓
(a) details of	✓
(i) the EAP who prepared the EMPr; and	✓
(ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	✓
(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	✓
(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	✓
(d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-	✓
(i) planning and design;	✓
(ii) pre-construction activities;	✓
(iii) construction activities;	✓
(iv) rehabilitation of the environment after construction and where applicable post closure; and	✓
(v) where relevant, operation activities;	✓
(f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraph (d) will be achieved, and must, where applicable, include actions to -	✓
(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	✓

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(ii) comply with any prescribed environmental management standards or practices;	
(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and	N/A
(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	N/A
(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	
(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	
(i) an indication of the persons who will be responsible for the implementation of the impact management actions;	
(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	
(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	
(l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	
(m) an environmental awareness plan describing the manner in which-	
(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and	
(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	
(n) any specific information that may be required by the competent authority.	
(2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	N/A

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ABBREVIATIONS / ACRONYMS AND DEFINITIONS

Table 3. List of terms for abbreviations used in this document.

Abbreviation / Acronym	Term
BA	Basic Assessment
CA	Competent Authority
CAR	Corrective Action Report
CLO	Community Liaison Officer
CRE	Chief Resident Engineer
DAEARD&LR	Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform
DFFE	Department of Forestry, Fisheries and Environment
DMRE	Department of Mineral Resources & Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAPASA	Environmental Assessment Practitioners Association of South Africa
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment as provided for in NEMA (Act 107 of 1998) and EIA Regulations (2014), as amended.
EIR	Environmental Impact Assessment Report
EMPr	Environmental Management Programme
ELU	Existing Lawful Use as per Part 3 of the National Water Act (Act 36 of 1998)
EM	Environmental Manager
IEA	Independent Environmental Auditor
GA	General Authorisation as per Section 39 of the National Water Act (Act 36 of 1998)
HSO	Health and Safety Officer
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
LA	Listed Activity (EIA Regulations, 2014)
LN1	Listing Notice 1: GN. No. R. 983, 4 December 2014, as amended in GN. No. R. 327, 7 April 2017.

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LN2	Listing Notice 2: GN R. 984, 4 December 2014, as amended in GN. No. R. 325, 7 April 2017.
LN3	Listing Notice 3: GN R. 985, 4 December 2014, as amended in GN. No. R. 324, 7 April 2017.
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
MS	Method Statement
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998)
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SDF	Spatial Development Framework
SEO	Site Environmental Officer
SO	Social Officer
SOP	Standard Operating Procedure
WUL	Water Use License

Table 4. Definitions of some terms used in this document.

Term	Source	Definition
Aspect (environmental)	ISO 14001: 2015	Element of an organisation's activities or products or services that interacts or can interact with the environment. An environmental aspect can cause (an) environmental impact(s). A significant environmental aspect is one that has or can have one or more significant environmental impact(s).
Corrective Action	ISO 14001: 2015	Action to eliminate the cause of a non-conformity (or non-compliance in the case of an EMPr) and prevent recurrence.
Development	EIA Regulations (2014)	Means the building, erection, construction or establishment of a facility, structure or infrastructure, including associated earthworks or borrow pits, that is necessary for the undertaking of a listed or specified activity, but excludes any modification, alteration or expansion of such a facility, structure or infrastructure, including associated earthworks or borrow pits, and excluding the redevelopment of the same

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		facility in the same location, with the same capacity and footprint.
Environmental Impact	ISO 14001: 2015	Change to the environment, whether adverse or beneficial, wholly or partially resulting an organisation's environmental aspects.
Maintenance	EIA Regulations (2014)	Means actions performed to keep a structure or system functioning or in service on the same location, capacity and footprint.
Performance	ISO 14001: 2015	Measurable unit. Performance can relate either to quantitative or qualitative findings.
Regulated Area of a watercourse	National Water Act (Act 36 of 1998)	(a) The outer edge of the 1:100-year flood line and /or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; (b) In the absence of a determined 1 in 100-year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or (c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.
Significant impact	EIA Regulations (2014)	Means an impact that may have a notable effect on one or more aspects of the environment or may result in non-compliance with accepted environmental quality standards, thresholds or targets and is determined through rating the positive and negative effects of an impact on the environment based on criteria such as duration, magnitude, intensity and probability of occurrence.
Watercourse	EIA Regulations (2014)	(a)A river or spring; (b)A natural channel in which water flows regularly or intermittently; (c)A wetland, pan, lake or dam into which, or from which, water flows; and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse as defined in the National Water Act, 1998 (Act No. 36 of 1998); and A reference to a watercourse includes, where relevant, its beds and banks.

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Section 1: DETAILS AND EXPERTISE OF EAP AND APPLICANT

Details of –

(i) The EAP who prepared the report;

Environmental Assessment Practitioner	Ecoleges Environmental Consultants
Contact Person	Shannon Farnsworth
Postal Address	P.O. Box 516, Machadodorp, 1170
Office phone	+27(0)72 654 8202
Cell phone	+27(0)72 654 8202
E-mail	shannon@ecoleges.co.za

Details of the Applicant;

Project Applicant	SolarAfrica Energy (Pty) Ltd
Trading Name (if any)	SolarAfrica Energy (Pty) Ltd
Contact Person	David McDonald (CEO)
Physical Address	49 Via Salara, Irene Corporate Corner Nellmapius Drive Irene Farm Villages Centurion
Postal Address	49 Via Salara, Irene Corporate Corner Nellmapius Drive Irene Farm Villages Centurion
Postal Code	0133
Telephone	012 881 4800
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Fax	-
Email	david@solarafrica.com

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(ii) The expertise of the EAP to prepare the EMPr, including a curriculum vitae.

Abbreviated Curriculum Vitae of **Shannon Farnsworth**	
Specialisations	Key Fields: environmental/ecological management plans, environmental auditing, Environmental Impact & Basic Assessment, PA Management
Qualifications & Courses Attended	**2009 – 2011** BSc: Environmental Management & Geography, University of Kwa-Zulu Natal. **2012 – 2019** • Firearm training in the handle and use of handgun, shotgun, manual and self-loading operated rifle and carbine. • Environmental Management Inspector [EMI] basic training course for government officials conducted by the national Department of Environmental Affairs [DEA]. designated by the hon. MEC in KwaZulu-Natal for Economic Development, Tourism and Environmental Affairs, Mr. Sihle Zikalala, as a grade 2 environmental management inspector • Wetland wet-heath and Wet-ecoservices training provided by WESSA and UKZN • Certificate of successful completion of: basic Geographic Information Systems [GIS] arc 10 training course • Mini-SASS [stream assessment scoring system] by Duzi Umgeni Conservation Trust [DUCT] and the then Department of Agriculture and Environmental Affairs [DAEA] • Certificate of attendance issued by Maccaferri Africa for hydraulics: introduction to river protection and for hydraulics: introduction to coastal protection • Ecological infrastructure training workshop by WESSA
Memberships & Registrations	**2013 - Present** Registered member of the South African Council for Natural Scientific Professions [SACNASP] as a Certified Natural Scientist in the field of Environmental Science. Registration Number: 200215/13 **2020 - Present** Registered as a professional Environmental Assessment Practitioner [EAP] with the Environmental Assessment Practitioners Association of South Africa [EAPASA]. Registration Number: 2020/176
Career Summary	**September 2021 – Current** Environmental Assessment Practitioner – Ecoleges Environmental Consultants **December 2020 – Current** Member of the Mopani District Municipal Planning Tribunal – Env Portfolio **February 2020 – November 2020** Operational Management - African Dawn Safaris **April 2019 – December 2019** Manager: Env Mgt Unit at Msunduzi Municipality **January 2012 – March 2019** Environmental Scientist: Env Mgt Unit at Msunduzi Municipality

Full Curriculum Vitae available if required.

Section 2: DESCRIPTION OF THE ACTIVITY

(b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description.

Project Title

Upgrading & Development of an Access Road from the N10/'Burgerville' District Road (2448) Turn-Off into the Farm Riet Fountain No. 39C and to the Switching Station and Main Transmission Substation on Sun Central Cluster 1 (300 MW) Solar PV Facility between De Aar & Hanover, Emthanjeni Local Municipality, Pixley Ka Seme District Municipality, Northern Cape Province, South Africa.

Detailed Project Description

Eskom has agreed to the construction of a Main Transmission Substation (MTS) to deliver electricity to the Eskom system, specifically the existing 400 kV Hydra-Poseidon overhead transmission line (Line 2 initially and possibly even Line 1 in future) via a new Loop-In, Loop-Out 400 kV electricity transmission line. Eskom stated in the user requirements specification that the MTS is to be designed with a capacity up to 2 GW, so that it has the capacity to receive electricity generated by the applicant's (Solar Africa Energy (Pty) Ltd) 300 MW Solar PV facility (Sun Central Cluster 1) and any future electricity generation facilities that would apply to feed into the grid at the same location.

The 2 GW MTS includes *inter alia* sufficient feeder bays for up to four (4) 500 MVA transformers. Each transformer must be transported on a 270 tonne, 40 m to 60 m-long truck and trailer combination. Given the weight and length of the trailer delivering the abnormal loads to site (e.g., the turning circle will be a minimum of 24m) the access road must meet the minimum Eskom specifications to ensure the safe delivery of equipment to site during construction and during future maintenance and operations, if ever required.

Equipment will be transported to site using the left, north-bound lane of the N10 from Hanover and then turn right on to the dedicated access road.

Access Road

The access road can be divided into three sections:

(1) an existing **public** 'Burgerville' District Road (2448),

(2) existing **private** farm tracks, and

(3) a new road to the Switching Station and MTS. The portion of new road is required as Eskom needs unrestricted access to both substations, that is without traversing the fenced Sun Central Cluster 1 development footprint.

The SALA application for the entire access road refers to a 19 m-wide Right of way servitude. The statutory road reserve width for the **public** 'Burgerville' District Road is 20 m. Where the fence line width

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on the Divisional Road is less than 20 m, this will be realigned to 20 m to ensure the proper road reserve is maintained and the upgrading can take place unhindered. The section of private farm tracks that will be widened and the section of new road to be built (from the boundary of Farm Riet Fountain No. 39C to the MTS) will be fenced on either side for construction purposes at 19 m width for the entire section. Gates will be provided, to allow livestock transfer between fences in appropriate position. This fence will remain in place as a permanent fixture as the IPP and ESKOM will require regular, constant, and unhindered access to their respective plants.

1. Existing Public 'Burgerville' District Road (2448)

The section of public 'Burgerville' District Road (2448) that needs to be upgraded extends from its intersection with the N10, through the Remainder of Farm Blaauwbosch Kuilen Outspan No. 37, the Remainder of Farm Barends Kuilen No. 38, and ends at the boundary of Farm Riet Fountain No. 39C (**Figure 1**). This road is classed as an R4 rural collector road (TRH 26 South African Road Classification and Access Management Manual).

Figure 1. Properties intersected by the section of public 'Burgerville' District Road (2448) from its intersection with the N10 (pink line) to the farm boundary of Riet Fountain No. 39C (yellow line).

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Several potential watercourses (**Figure 2**), including an existing pipe culvert crossing, will be affected by the proposed upgrade.

Figure 2. Section of existing public 'Burgerville' District Road (2448) from its intersection with the N10 **(1)** to its intersection with the existing private road (farm track) at the boundary of Farm Riet Fountain 39C **(2)**. Red lines indicate flood plain soils (possible watercourses).

The bellmouth design at the N10/ 'Burgerville' District Road (2448) turn-off must be widened to accommodate an abnormal load to safely turn off the N10 on to the gravel road. The N10 will not be widened. The reshaping or re-design applies to the 'Burgerville' District Road (2448) only. The intersection adjoining the N10 will be widened from an existing width of approximately 25,7 m (**Figure 3**) to approximately 60 m (measured along the top of the road) (**Figure 3**) to accommodate the required turning circle from both directions and then gradually taper along a length of 20 m to the specified 7 m shoulder width.

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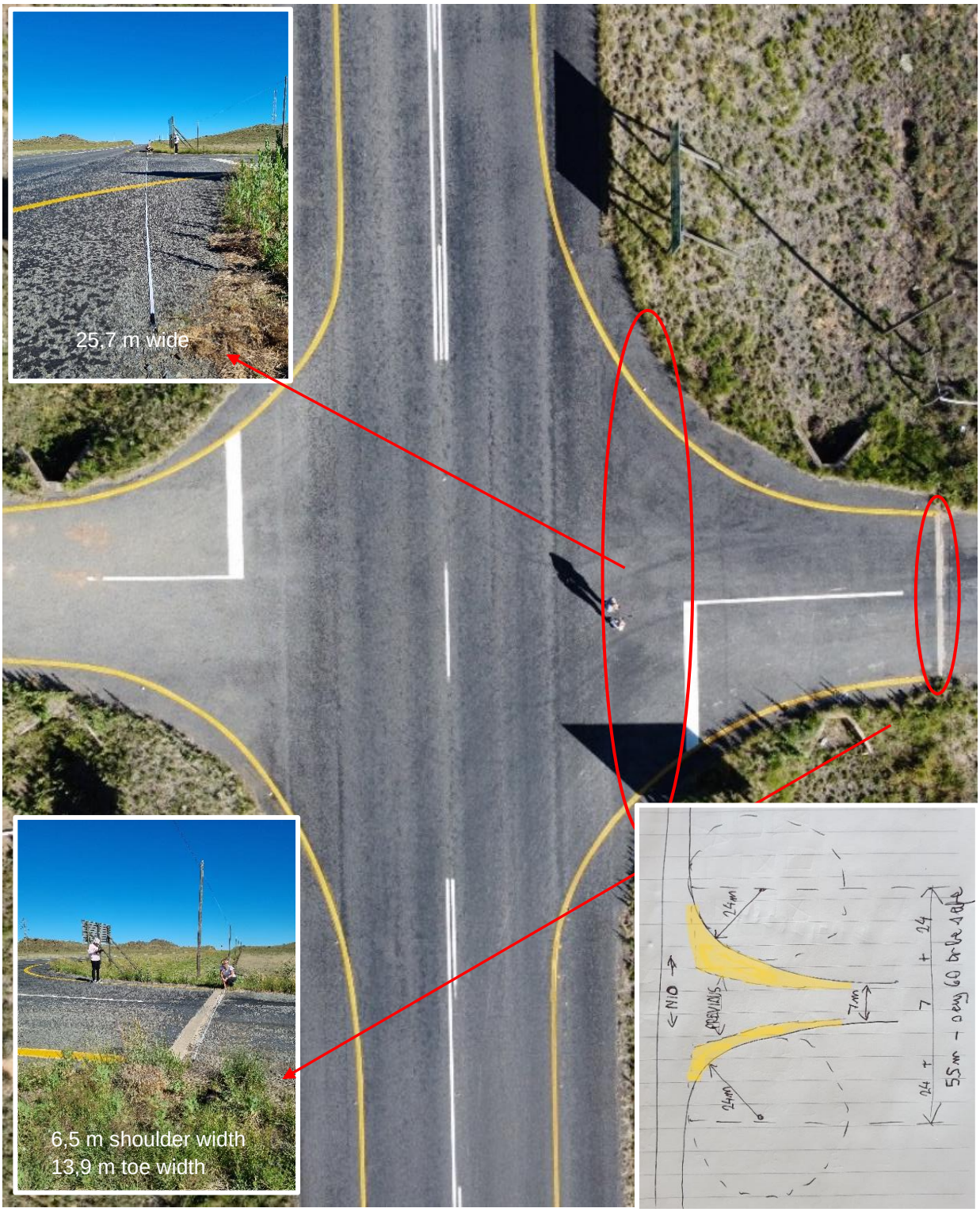

Figure 3. The Bellmouth Design of the N10/'Burgerville' District Road (2448), including a sketch of its planned widening (indicated by the yellow shading). The current turning circle is approximately 17 m, so will require widening to a minimum of 24 m (see sketch).

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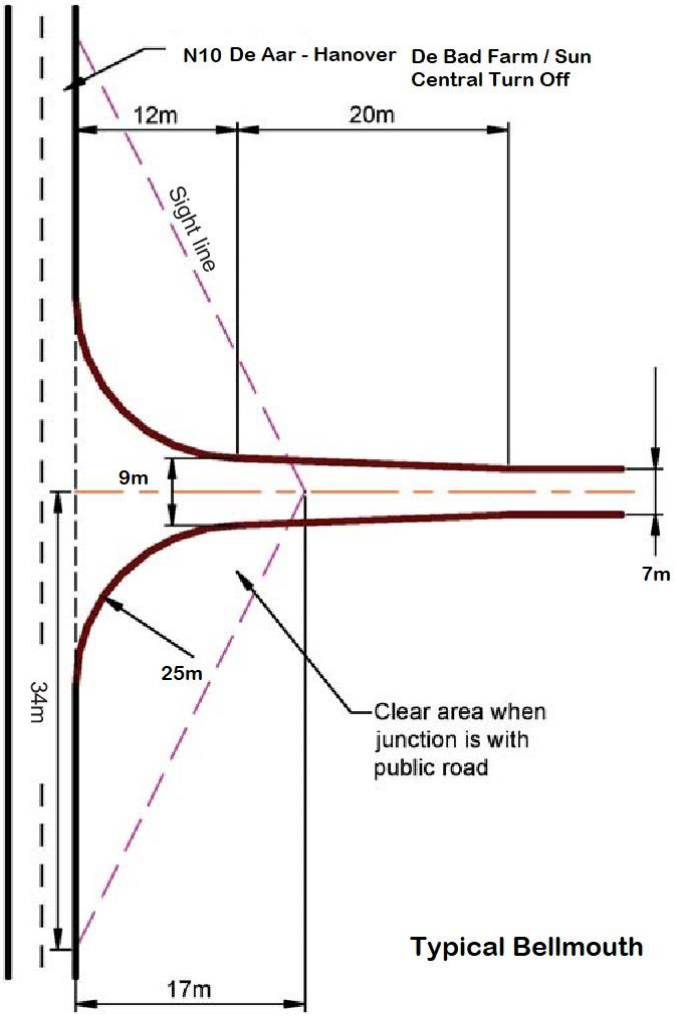

Figure 4. Specified widths (m) of the Bellmouth Design of the N10/'Burgerville' District Road (2448).

Except for the N10/district road turn-off, the current smallest turning circle along the public road is approximately 50 m. Both bends/corners after the turn-off from the N10 are within parameter, e.g., they do not need to be widened. Besides, the standard required width of the road will stay the same in a corner, e.g., 7 m, as the 24 m turning circle just refers to the inner radius that the road takes.

The length of the gravel road will require subgrade and subbase reconstruction in all areas, where stormwater runoff needs to be improved. These are all low-lying areas where water ponding occurs and has softened the layer works to the point where deep rutting occurs due to wheel tracks from traffic on the roads. The balance of the road may only require top layer reconstruction. This however will be investigated in more detail with a Geotechnical Assessment, but it is very likely that the entire road will be reconstructed.

Although the 'Type 6 District Road Standard' for an R4 rural collector road (TRH 26 South African Road Classification and Access Management Manual) (**Figure 5**) is similar in geometry to the Eskom Standard (**Figure 6**), the more stringent ESKOM Standard shall be adopted for the reconstruction (and construction) of the proposed access road.

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(i) Type 6 District Road Standard

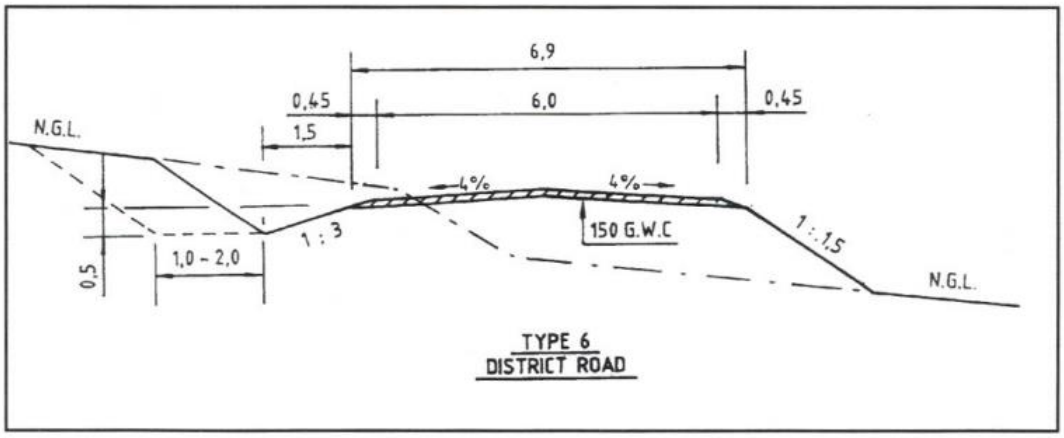

Figure 5. Typical Standard Design for an R4 rural collector road.

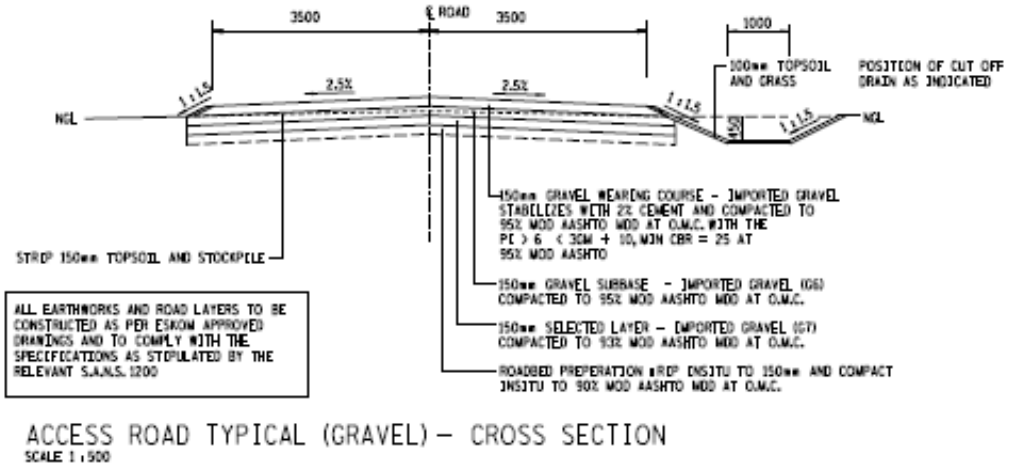

Figure 6. The minimum ESKOM Standard for access roads for extra heavy loads into ESKOM facilities (taken from ESKOM Typical Access Road Cross Section Drawing).

The maximum "box-cut" will be 300 mm with an additional 150 mm rip *in situ* and recompact (**Figure 6**). Dependent on whether a cut or fill area.

IQ/22/0349: Quick query re interpretation of road width

Dear Shaun

For the purposes of the EIA Regulation, 2014, the following applies w.r.t. a road -

For purposes of the EIA Regulations a road includes the surface of the road and its shoulders.

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The following does not form part of the road and should not be considered in the determination of the relevant threshold –

- Verge,
- Cut and fill slopes,
- Drainage systems, stormwater management systems, stabilisation measures such as geofabric and hydroseeded areas, rip rap or gabions etc.
- Pavements and pedestrian walkways.

Kind regards

Chantal (Chantal Engelbrecht <CENGELBRECHT@dffe.gov.za>)

The average toe-to-toe width of the district road is 12,6 m (the average fence line width is 19 m) (**Table 5**). The road in question is a Divisional Road 2448 (DR2448). According to Roads Ordinance No. 19 of 1976, the statutory road reserve width for divisional road is 20 m (pers. comm. Rabele Matsoso, r.matsoso@vodamail.co.za). The affected district road is approximately 5.2 km long and will be rebuilt to a width of 8 m, allowing for the roadbed preparation including the surface of the road and its shoulders, and excluding up to 3 m for the side/cut-off drain.

Table 5. Approximate width(s) (m) of the Burgerville District Road (2448).

Statistic	**Top width** (Including the surface of the road)	**Toe width** (Including the surface of the road and its shoulders)	**Fence line width**
Average	7,71 m	12,59 m	19 m
Range	6,2 m to 10 m	11,2 to 13,6 m	16,6 m to 40 m

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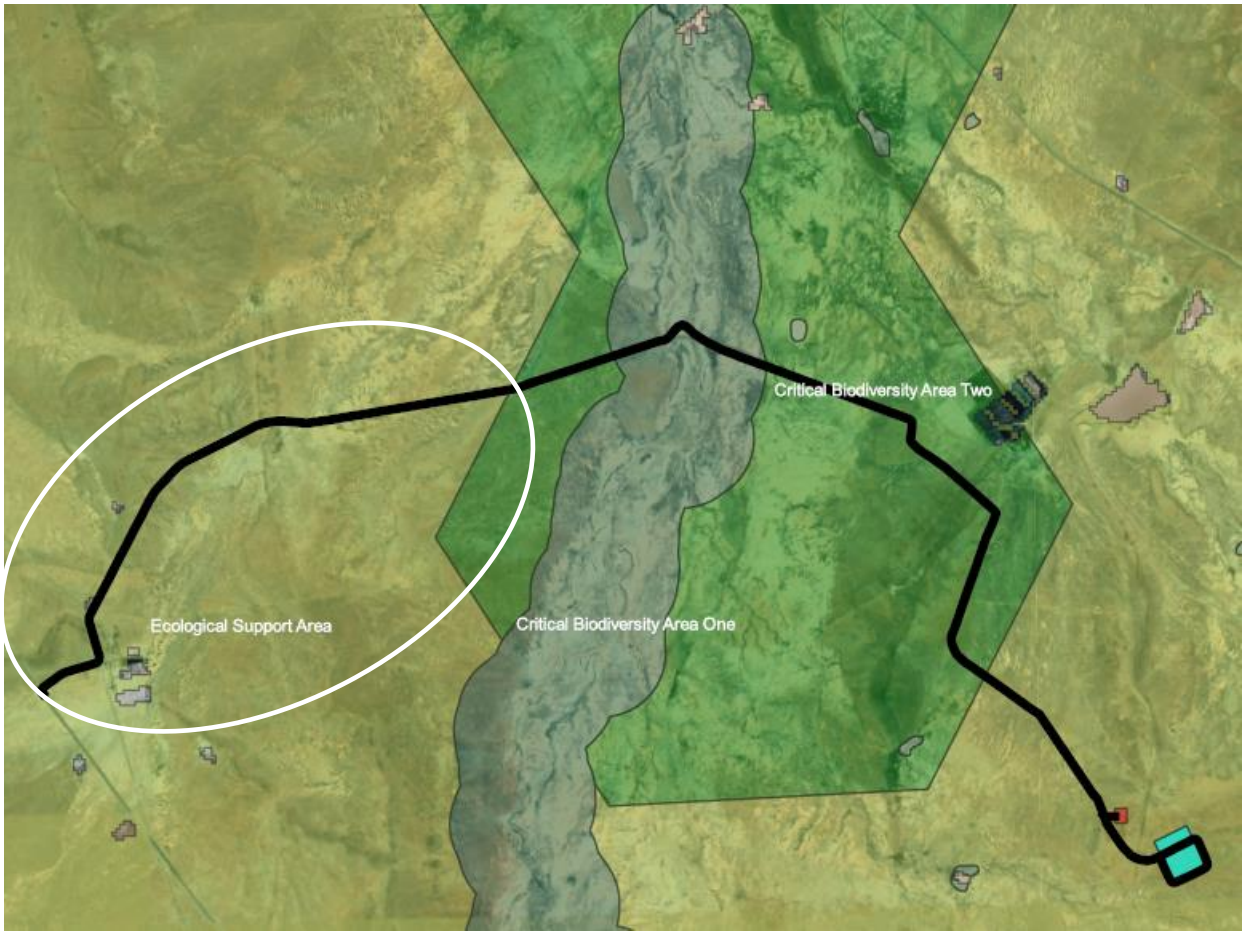

Figure 7. The section of existing public road is in an Ecological Support Area (ESA) only.

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2. Existing private road where the District Road intersects the boundary of Farm Riet Fountain No. 39C and continues to the western boundary fence of Sun Central Cluster 1 (300 MW) Solar PV Facility

Works to the existing private road section shall involve widening an existing ± 2,6 m-wide farm track, which commences at its intersection with the public district road on the boundary of Farm Riet Fountain No. 39C and continues approximately 6,25 km to the perimeter fence of Sun Central Cluster 1 (300 MW) Solar PV Facility (**Figure 8**). This length of farm track will be widened by approximately 5,4 m to 8 m (excluding the side/cut-off drain), but by 8,4 m to 11 m (including the side/cut-off drain) resulting in a loss of ± 5,25 ha of agricultural land. This section of road will require a full rebuild as it is highly unlikely that it will conform to ESKOM specification.

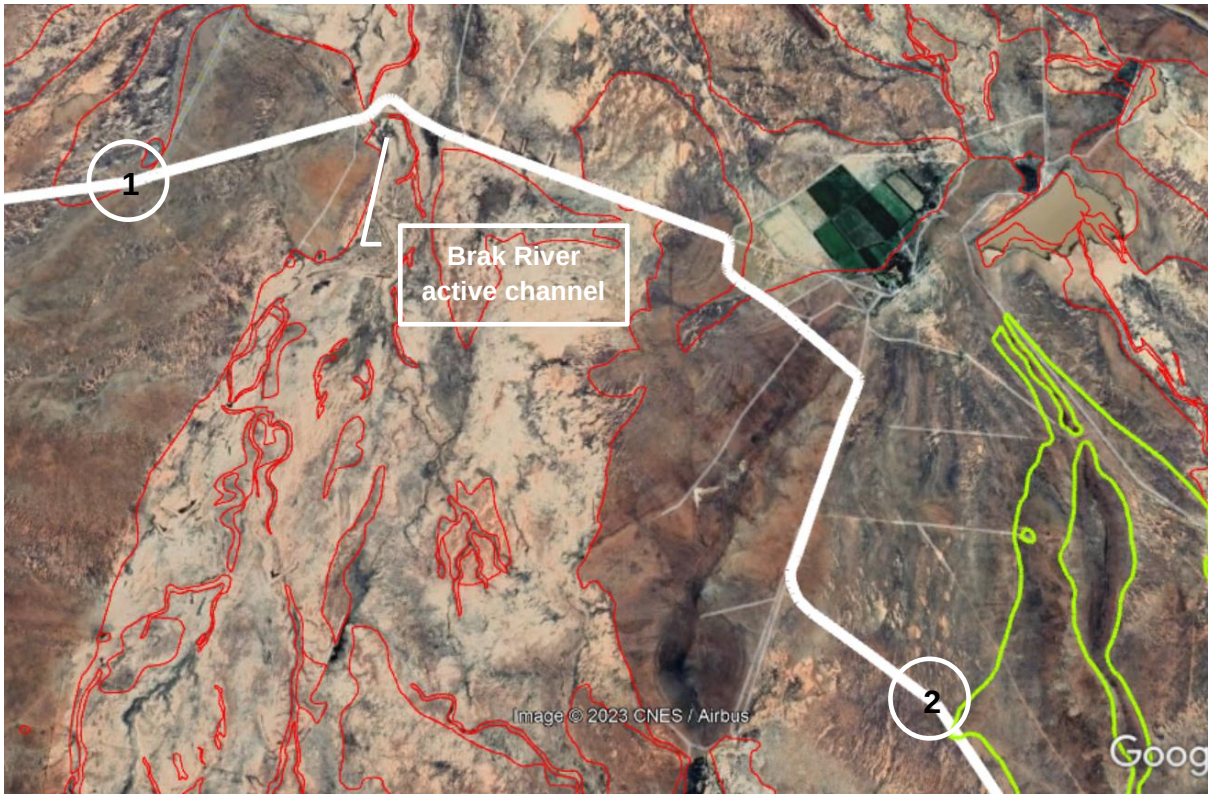

Figure 8. Section of existing private road from its intersection with the 'Burgerville' District Road (2448) at the farm boundary **(1)** to its intersection with the new road **(2)**. Red lines indicate flood plain soils, including the Brak River. Green lines indicate the solar field footprint (Cluster 1).

There are four sections where the centre line of the proposed alignment is further than 5,5 m from existing farm tracks. These four road sections are therefore assumed to constitute development of infrastructure (instead of expansion). They are approximately:

- New road section 1: ± 43 m long (start: 30° 51' 28,52'' S & 24° 17' 43,92" E, middle: 30° 51' 29,02'' S & 24° 17' 44,35" E, end: 30° 51' 29,59'' S & 24° 17' 44,44" E) (**Figure 9**),

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- New road section 2: ± 32 m long (start: 30° 51' 33,34'' S & 24° 17' 43,82" E, middle: 30° 51' 33,89'' S & 24° 17' 43,90" E, end: 30° 51' 34,28'' S & 24° 17' 44,19" E) (**Figure 9**),

Figure 9. Road sections 1 and 2 where the centre line of the proposed alignment is further than 5,5 m from existing farm tracks.

- New road section 3: ± 236 m long (start: 30° 51' 35,82'' S & 24° 17' 45,88" E, middle: 30° 51' 38,23'' S & 24° 17' 49,81" E, end: 30° 51' 40,68'' S & 24° 17' 53,67" E) (**Figure 10**), and

Figure 10. Road section 3 where the centre line of the proposed alignment is further than 5,5 m from existing farm tracks.

- New road section 4: ± 1,2 km long (start: 30° 51' 56,81'' S & 24° 18' 06,53" E, middle: 30° 52' 13,67'' S & 24° 17' 58,87" E, end: 30° 52' 29,99'' S & 24° 17' 58,02" E) (**Figure 11**).

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Figure 11. Road section 4 where the centre line of the proposed alignment is further than 5,5 m from existing farm tracks.

The distance to the fence line (verge) on either side of the 11 m-wide road (with side/cut-off drain) will be 4 m as the proposed Right of way servitude for the access road from where the public road ends at the boundary of Farm Riet Fountain No. 39C to the MTS will be 19 m wide.

This section of existing private road traverses several potential watercourse crossings, including the Brak River. The watercourse crossing over the Brak River is likely to be a drift with rock fill (**Figures 12 & 13**) to spread the surface water into a broadly distributed sheet whilst maintaining unrestricted subterranean flow. The drift shall be 5 m wide, 100 m long (exact length to be determined on site), and 2 – 2,55 m deep, resulting in the infilling of 1 275 m^3 of concrete or gravel wearing course (GWC) and rock fill.

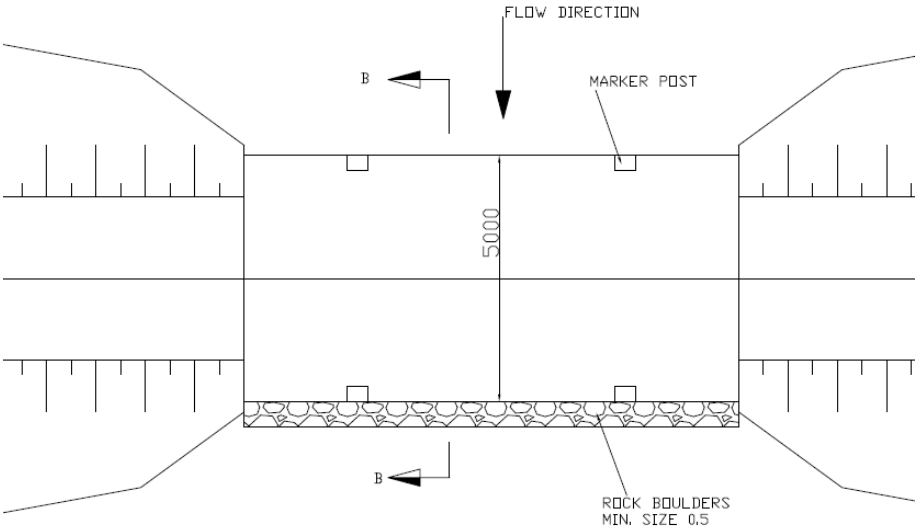

Figure 12. Aerial plan of a rock fill drift.

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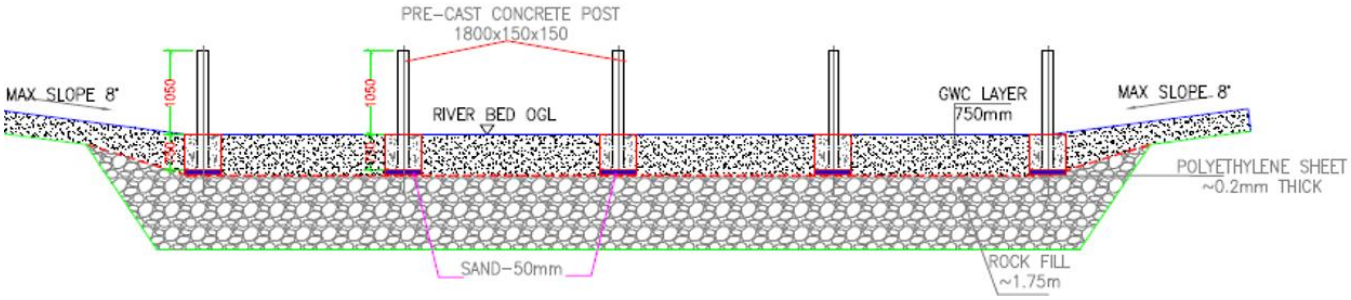

Figure 13. A typical Concrete drift section with rock fill, which permits subterranean flow.

The Brak River has been identified as having FEPA River Ecosystem Type status according to the **Freshwater Ecosystem Protected Areas (FEPA) map for the area**. *(Phase 1 Aquatic Report October 2017).* All FEPA prioritised wetlands and rivers have a minimum category of CBA 1 (Avifauna Final EIA Report prepared by Sam Laurence of Enviro-Insight cc, dated October 2022) (**Figure 14**).

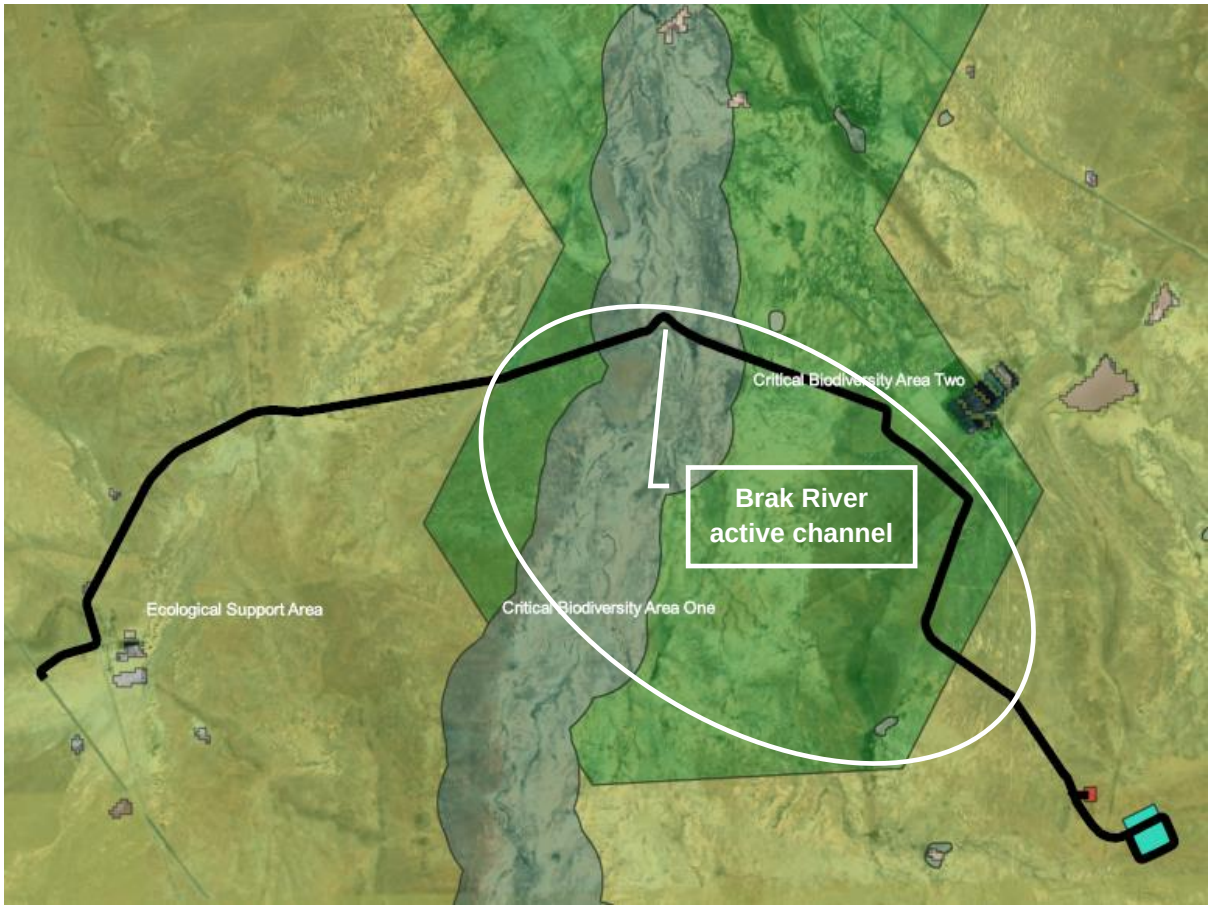

Figure 14. The section of existing private road is in Critical Biodiversity Areas (CBA1 and CBA2), and an Ecological Support Area (ESA).

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3. Development of a new road to the Switching Station and Main Transmission Substation

The length and width of the new road build will be ± 2,65 km and 8 m (excluding the side/cut-off drain), but 11 m (including the side/cut-off drain) resulting in a loss of ± 2,9 ha of agricultural land.

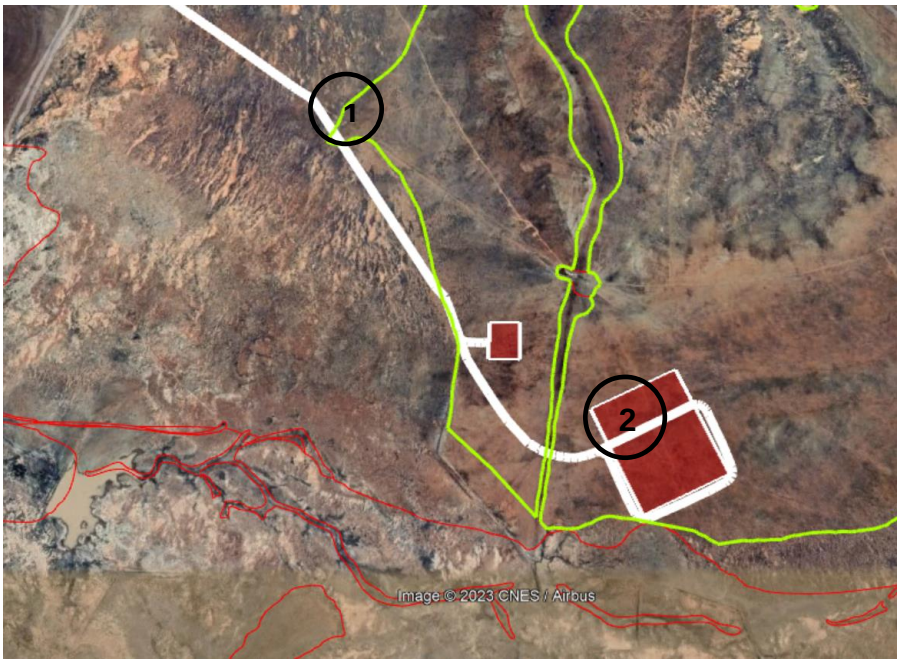

Figure 15. Section of new road from its intersection with the existing private road/farm track **(1)** to the Main Transmission Substation **(2)** inside the solar field footprint (green lines). A short access road to the Switching Station (Dx) will also be developed. Red lines indicate flood plain soils (possible watercourse).

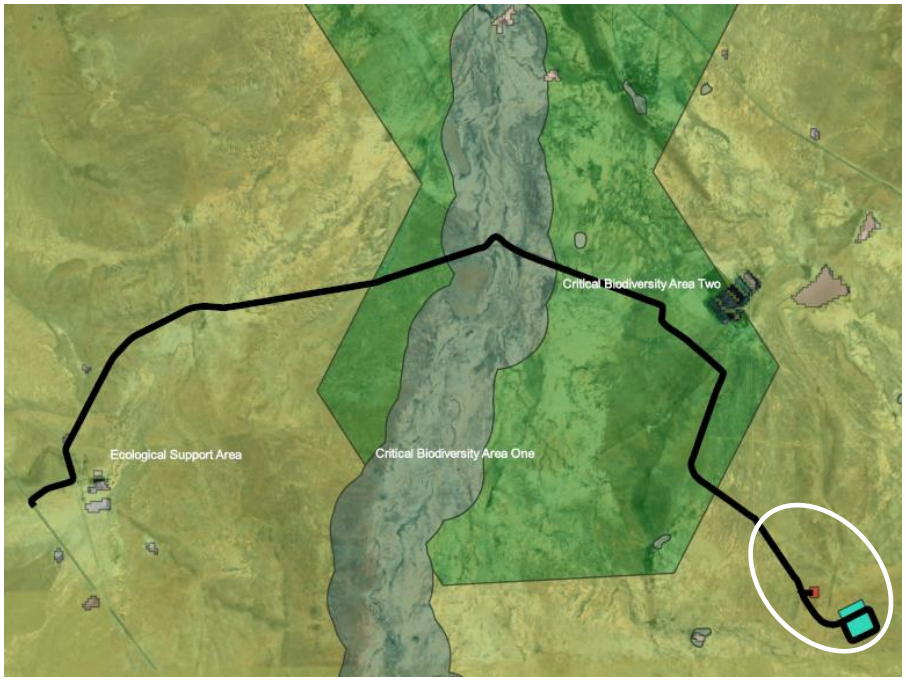

Figure 16. The section of new road is in an Ecological Support Area (ESA) only.

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Working corridor & passing lanes

The contractor will need an adjacent and parallel working width of 3 m for the movement of construction vehicles and/or providing a diversion lane for the public on the district road section. All construction activities, including the diversion lane, will remain within the fenced road servitude, whereas several 30 m-long passing lanes will be strategically placed (detail to be provided as ideal positioning not identified yet) along the private and new road sections to allow for passing of farm traffic should this be required during construction. The 3 m wide passing lanes will be further than 32 m from the edge of a watercourse.

The average width of the existing district road (including the surface of the road and its shoulders) is 12,6 m, and the average fence line width is 19 m. Consequently, the average width of servitude covered by indigenous vegetation is 19 m – 12,6 m = 6,4 m or 3,2 m on either side of the road. The affected district road is approximately 5.2 km long. If a 3 m wide passing lane is constructed within the road reserve to always provide access for the public, then it would result in the temporary clearance of 15 600 m^2 or 1,56 ha.

About 6,25 km of private roads (± 2,6 m wide farm tracks) shall be widened by approximately 8,4 m to 11 m (including the side/cut-off drain) resulting in a loss of ± 5,25 ha of agricultural land, excluding additional temporary clearance for 3 m-wide and 30 m-long passing lanes if required during construction.

The length and width of the new road build will be ± 2,65 km and 11 m, respectively or ± 2,9 ha, excluding additional temporary clearance for 3 m-wide and 30 m-long passing lanes if required during construction.

Spoil

Existing excavated material is to be re-used if suitable. Spoil material will be stockpiled and used for rehabilitation where possible. If not possible, the spoil will be removed from site to a suitable and approved location by the contractor under his contract. Unsightly spoil stockpiles must not be left behind on site when construction is complete.

Aggregate

Road material or aggregate will be purchased from a licensed commercial source.

Construction camp & staging area

SolarAfrica Energy will be working with one or more EPC contractor, so the construction camp will be shared by all construction fronts, including the MTS, Dx, Overhead powerlines, solar field and access road.

Consequently, the contractor(s) appointed to rebuild and build the access road will use the same construction camp, including laydown area, material and aggregate stockpiles, parking, offices, and ablutions, as set aside for the Sun Central Cluster 1 Solar PV facility. The ± 4 ha construction camp footprint will be in the 'open' area(s) not earmarked for the solar field, around and between the Switching Station (Dx) and Main Transmission Substation (MTS), but within the low ecologically sensitive footprint of the authorised Sun Central Cluster 1 Solar PV facility (EA reference: 14/12/16/3/3/2/998 dated 16th April 2018 as amended).

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The construction camp shall include such facilities as:

- Sanitation system(s) (except for portable toilets following the work front),
- Waste storage (except for dustbins following the work front),
- Fuel storage tanks,
- Hazardous substance storage,
- Wash bay (except the wash bay for concrete slurry),
- Maintenance/service/repair bay, and
- Parking (overnight or outside business hours).

The concrete batching plant, which may or may not be in the construction camp, shall contain a washing facility for containing only the waste concrete slurry cleaned out of the discharge chute(s) and rotating mixing drums of concrete mixer trucks. This washing facility shall contain two adjacent wash bays to allow for continuous operations and minimise the risk of overflow or work stoppage when a bay has reached its capacity and must be emptied.

Accommodation will not be provided at the construction camp.

The authorised ± 1 ha staging area (EA reference: 14/12/16/3/3/2/998/AM4 dated 25th November 2022), adjoining the district road, but inside the farm boundary of Portion 1 of Farm Riet Fountain No. 39C (30°51'13,89"S & 24°15'57,88"E) may be used as an access control point as well as for parking plant, material/aggregate stockpiles and as a laydown area.

Timing and Employment

Construction must commence as soon as possible as the access road is required to deliver equipment to site for the construction of the Sun Central Cluster 1 Solar PV facility, Dx and MTS. Construction of the access road should take 6 to 8 weeks from start to finish. The construction may be split in 2 stages, initial roadworks will be sufficient for normal construction with the final layers being done in time for the MTS transformer delivery, approximately 12 months after start of project. During this period there will be approximately 45 employment opportunities (mainly unskilled and semi-skilled) (**Table 6**).

Table 6. Breakdown of estimated labour force for the rebuilding/building the access road.

Unskilled	30
Semi-skilled	10
Skilled	5
Total	45

The bulk of the earthworks for the construction of the access road will be completed in the first 2 months for sections **(2)** and **(3)** of the ± 18 month-long construction period for the generation facility and its integration into the Eskom grid as the road must be brought to specification prior to its use during the construction of the Solar PV facility.

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Continued use during construction of the Solar PV facility will require a maintenance aspect and on handover the road will receive a final makeover to make it presentable as a new road. However, maintenance of access roads during construction of the Solar PV facility will fall under the scope of the authorisation for the Sun Central Cluster 1 Solar PV facility (EA reference: 14/12/16/3/3/2/998 dated 16th April 2018 as amended).

It would be safe to say that at peak construction of the Solar PV facility (after the access road is rebuilt/built to specification), the number of people on site could reach 400 with overlapping work fronts, e.g., MTS, DX, and Solar field activities. This would be a peak only, generally the peak is in earlier construction (civils) and tapers off when specialist work is required towards the latter part of the project.

Construction Equipment

It is anticipated that the construction equipment will include at least:

- Water bowsers/tankers,
- Graders,
- Tipper trucks,
- Grid-roller,
- Excavators,
- Trench digger,
- Road rollers,
- TLBs,
- Concrete mixers,
- Compaction equipment,
- Light delivery vehicles, and
- Heavy delivery vehicles.

Electricity and fuel during construction

Electricity for the construction camp will be sourced from two (2) 50 kVA (minimum) mobile generators with an integrated diesel tank (fuel capacity ± 200 litres), e.g., one can be used as backup during service periods and allow the other to rest. The integrated diesel tanks will be supplied fuel from a bunded 5 to 10 m^3 aboveground diesel tank. A filling station alongside the aboveground diesel tank and/or a mobile fuel bowser will supply plant on site for general use. The generators, aboveground fuel tank and filling station will be located at the construction camp.

Water

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Borehole No. 13 and/or 14 (in sub-catchment HRU4) and Solar Borehole No. 5 (in sub-catchment HRU5) have been identified for water use during the construction of the access road and Cluster 1.

Boreholes No. 13 and/or 14

Boreholes No. 13 and/or No. 14 will be used to supply water for the construction of the access road (e.g., road stabilisation and dust suppression), concrete batching, various other construction activities taking place, and may also be used to supplement potable water at the construction camp.

Given the proximity (± 60 m) of Boreholes No. 13 & 14, they probably feed off the same aquifer – called Hydrological Response Unit No. 4 (or HRU4). Consequently, the sustainable yield that was determined for BH13 should also apply to BH14. However, there is a risk that comes with their proximity - borehole interference may occur as the fractures are simultaneously dewatered, and over-production may lead to fracture failures which will lead to borehole collapse. So, although they should not be utilised at the same time, it may be prudent to authorise both in case something happens to the one e.g., borehole collapses, pump fails, etc.

Borehole No. 13 (30°51'35.47"S & 24°19'4.47"E) and Borehole No. 14 (30°51'33.81"S & 24°19'3.30"E) are located on Portion 1 of Farm Kwanselaars Hoek 40C. This property falls within quaternary catchment D62D. The General Authorisation or GA (GN 538, GG 40243, 02nd September 2016) allows for the abstraction of 2 000 m^3 per property per year of surface water (at a maximum rate of 1L/s), and 45 m^3 per hectare per year of groundwater (but no more than 40 000 m^3 of ground water may be taken per year on a property). This farm is 595,4 hectares. Consequently, the landowner is entitled to abstract no more than 26 793 m^3 of groundwater per year (or **73,4 m^3 per day**) on Portion 1 of Farm Kwanselaars Hoek 40C – under the GA.

It is possible to abstract from Boreholes No. 13 and/or 14 under the abovementioned General Authorisation as both boreholes are further than a "*100-metre radius from the delineated riparian edge of a water course …*", specifically unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) (**Figure 14**).

According to the Land-Use Decision Support Tool (LUDS) the FEPA River ecosystem type of D62D – 05610 is either an "Upper Nama Karoo_Channelled valleybottom wetland", "Upper Nama Karoo_Flat" or an "Upper Nama Upper Nama Karoo_Unchannelled valleybottom wetland". However, the field assessment revealed that drainage line D62D – 05610 SQ is discernible only as a slightly shallow depression with no clear associated vegetation and slightly clayey soils. Dwarf karroid scrub and tufted grass are the only vegetation present in this drainage area. It is in a good condition despite some weirs and diversion walls in the catchment (Aquatic Assessment prepared by Andrew Deacon, October 2017).

Although the same GA excludes groundwater abstraction from "*within a 500-metre radius from the boundary of a wetland…*", both boreholes are in either alluvial floodplains, washes, or fans, and not a wetland (**Figure 14**). These alluvial fans are usually bare soil flats or conduits, with dwarf karroid scrub and tufted grass colonising higher lying portions of ground. These broader aquatic systems are difficult to classify, as their hydrological characteristics (the way water flows into, through and out of these features) are difficult to determine (Aquatic Assessment prepared by Andrew Deacon, October 2017).

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They are characterised by multiple channels that traverse a floodplain, valley floor or alluvial fan. Surface water may flow along a particular channel in one year but owing to little topographic definition or gradient across the landscape, a parallel channel may be eroded the following year, leading to a network of channels. These areas will only be briefly inundated with surface water during summer rainfall events and the surface water will be rapidly transported to the low-lying depressions and streambeds of the system (Aquatic Assessment prepared by Andrew Deacon, October 2017). These depressions create ponded flood occurrence zones, in the absence of clearly defined drainage channels or streams (Hydrological Assessment prepared by Hendrik Botha, 09 January 2023). This is due to the micro-catchment style drainage associated with the project area. Sheet flow from micro-sub catchments towards lower topographical areas or isolated depressions form temporarily flooded areas.

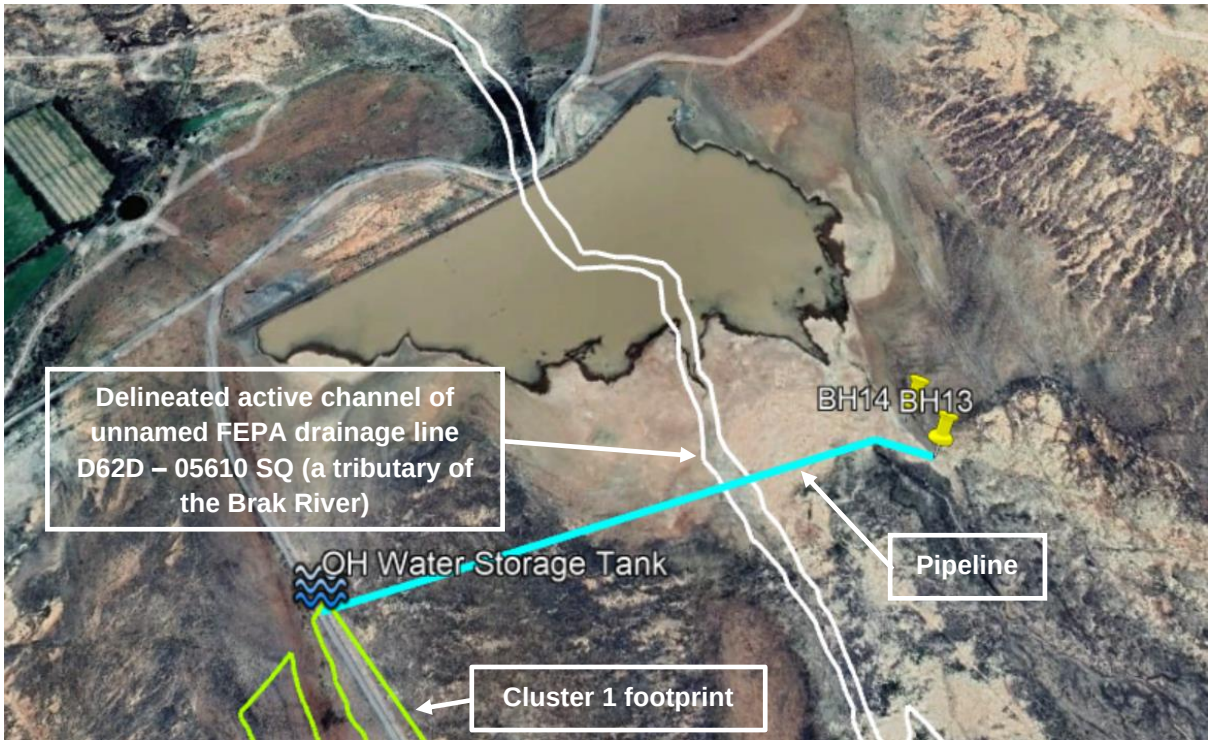

Figure 17. Route alignment of the underground 110 mm uPVC pressure pipe (blue line) from Boreholes No. 13 and/or 14 (BH13 & BH14) to the Overhead (OH) water storage tank inside the Cluster 1 footprint (delineated by the green lines).

An approximately 800 m long underground 110 mm uPVC pressure pipe will be laid from BH13 (and/or BH14) to the point of abstraction alongside a farm track and inside the Cluster 1 footprint (**Figure 17**). A trench digger will provide a 300 mm wide trench to rock strata – 400 to 600 mm below ground. The length of the watercourse intersected by the trench is ± 35 m.

A typical overhead (OH) pressed steel tank made up of 1 m panels (circa 3 m wide x 4 m long and 3 m high), providing storage of ± 36 m^3, will be installed inside the Cluster 1 footprint. The tank will be off the ground on column supports to allow gravity filling into water bowsers. The groundwater abstracted from

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BH13 (or BH14) will be treated with a deionisation (or other suitable) treatment plant if it is going to be used for domestic use and/or cleaning solar panels.

Solar Borehole No. 5

Potable water will be supplied by the contractor(s) from a commercial source and/or it will be supplied by Solar Borehole No. 5. The borehole will supply the construction camp and the O&M facility during operation of the Sun Central Cluster 1 Solar PV facility.

Solar Borehole No. 5 (30°53'3.90"S & 24°18'52.67"E) is located on Portion 4 of Farm Taaibosch Fontein 41C. This property falls within quaternary catchment D62D. The General Authorisation or GA (GN 538, GG 40243, 02nd September 2016) allows for the abstraction of 2 000 m^3 per property per year of surface water (at a maximum rate of 1L/s), and 45 m^3 per hectare per year of groundwater (but no more than 40 000 m^3 of ground water may be taken per year on a property). This farm is 1 142,5 hectares. Consequently, the landowner is entitled to abstract no more than 40 000 m^3 of groundwater per year (or **109,6** m^3 per day) on Portion 4 of Farm Taaibosch Fontein 41C – under the GA.

However, Borehole No. 5 is located within a wetland (**Figure 18**), and "*No groundwater that is taken in terms of this (general) authorisation may be taken within a 500-metre radius from the boundary of a wetland or estuary, within a 100-metre radius from the delineated riparian edge of a water course or …*"

Consequently, authorisation for the abstraction of groundwater (**S21(a)**) from Borehole No. 5 during construction (and operational phases) must be sought via an Integrated Water Use License Application.

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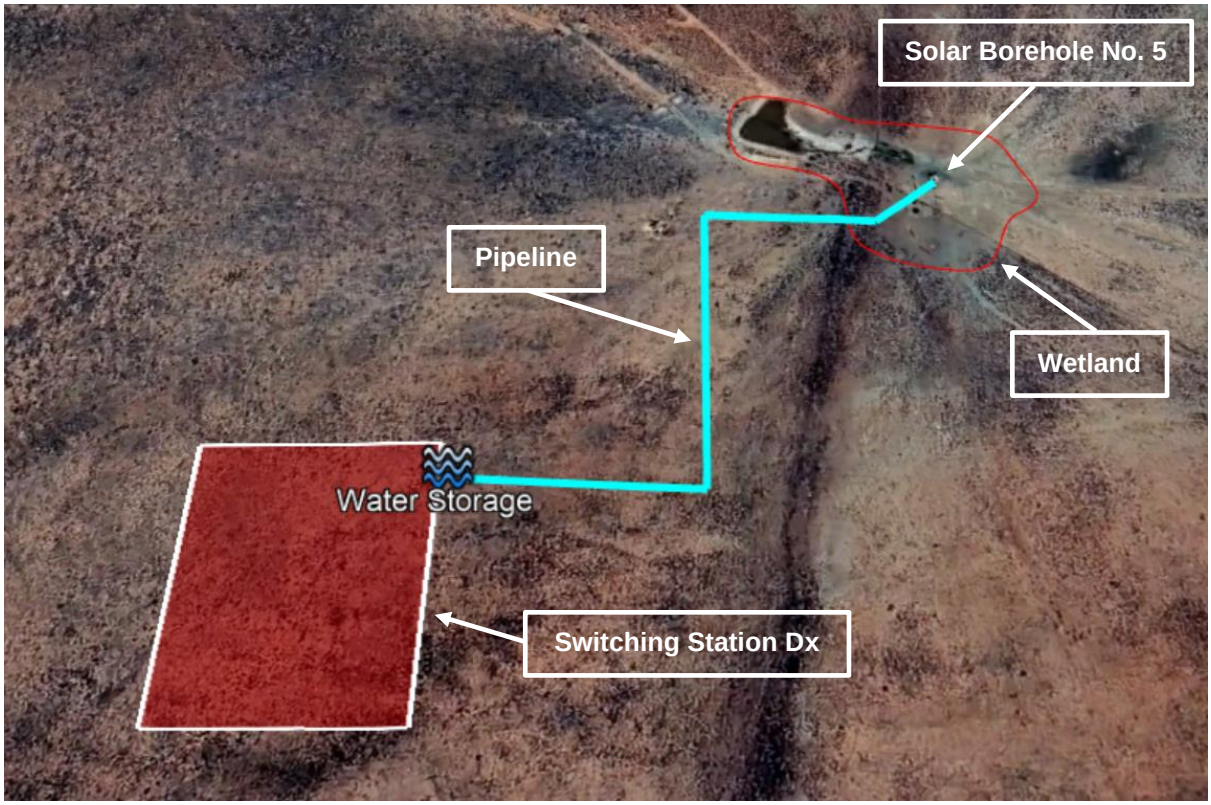

Figure 18: Route alignment of the underground 80 mm UPVC or HDPE pipe (blue line) from Solar Borehole No. 5, which is in a wetland (red line), to the water storage tank on the Switching Station Dx platform.

An approximately 400 m long underground 80 mm UPVC or HDPE pipe will be laid from BH5 to the point of abstraction on the Switching Station Dx platform inside the Cluster 1 footprint. The exact position is still to be determined A trench digger will provide a 300 mm wide trench to rock strata – 400 to 600 mm below ground. The length of the wetland intersected by the trench is ± 48 m.

Water will be stored in several 5 m^3 or 10 m^3 JOJO (or similar) tanks, as required by demand. It may be necessary to include a form of water treatment, e.g., osmosis.

Solar Borehole No. 4

Solar Borehole No. 4 may supply the O&M facility during operation of the Sun Central Cluster 1 Solar PV facility.

Solar Borehole No. 4 (30°52'17.66"S & 24°18'38.12"E) is located on Portion 1 of Kwanselaars Hoek 40C. Solar Borehole No. 4 is located within a wetland (**Figure 19**), and "*No groundwater that is taken in terms of this (general) authorisation may be taken within a 500-metre radius from the boundary of a wetland or estuary, within a 100-metre radius from the delineated riparian edge of a water course or …*"

Consequently, authorisation for the abstraction of groundwater (**S21(a)**) from Solar Borehole No. 4 during construction (and operational phases) must be sought via an Integrated Water Use License Application.

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Figure 19. Location of Solar Borehole No. 4 inside an artificial wetland within the Cluster 1 footprint.

An underground 80 mm UPVC or HDPE pipe will be laid from Solar BH4 to the point of abstraction inside the Cluster 1 footprint. The exact position is still to be determined. A trench digger will provide a 300 mm wide trench to rock strata – 400 to 600 mm below ground. The length of the wetland intersected by the trench is < 50 m.

Water will be stored in several 5 m^3 or 10 m^3 JOJO (or similar) tanks, as required by demand. It may be necessary to include a form of water treatment, e.g., osmosis.

Groundwater Quality for BH No. 13 and Solar BH No. 5

According to the DWAF 1996 Target Water Quality Range (TWQR) for potable use, the groundwater from BH13 is suitable for domestic use, having a pH of 6.9. Only the EC of 75.5 mS/m and dissolved Calcium of 89 mg Ca/l exceed the DWAF TWQR (0 – 70 mS/m and 0 – 32 mg Ca/l, respectively).

Similarly, the groundwater abstracted from Solar Borehole No. 5 is suitable for domestic use with a pH of 6.7. Four water quality parameters exceeded the DWAF TWQR, specifically EC (82.7 mS/m > 70 mS/m DWAF TWQR), TDS (466 mg/l > 450 mg/l DWAF TWQR), Dissolved Ca (94 mg Ca/l > 32 mg Ca/l DWAF TWQR) and Dissolved Mg (37 mg Ca/l > 30 mg Ca/l DWAF TWQR).

The groundwater can be described as Ca-HCO3 and is typical of shallow fresh groundwater types or recently recharged groundwater. High EC indicates a high salt load (dominated by Ca, Mg, Cl, NO3 and HCO3 ions), which could result in scaling in piping exposed to heat, or in utensils used to boil water.

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Consequently, water softeners or deionisation plants will be required for the treatment of groundwater that will be used for domestic use or cleaning solar panels.

A deionization (or other suitable) treatment plant may therefore be included at the point of abstraction, dependent on construction needs, and the need to remove brackish solids from the groundwater if this facility is going to be used for potable water and/or washing solar panels during operation.

Estimated Yields

The sustainable yield of BH13 in sub-catchment/HRU 4 is 6.64 l/sec (for 8hrs per 24hr day of pumping only), which is equivalent to **191.23 m³/day** or 5 736.96 m³/month.

The sustainable yield of Solar Borehole No. 5 in sub-catchment/HRU 5 is 0.23 l/sec (for 8hrs per 24hr day of pumping only), which is equivalent to 6.62 m³/day or 198.72 m³/month.

The sustainable abstraction yield from both boreholes for Cluster 1 is therefore 197 m³ (Geohydrological Assessment Report Version – Final Rev 4 prepared by GCS Water and Environmental Consultants, dated 20th December 2022, GCS Project Number: 22-0401)

BH13 is in HRU4. So, assuming there is no Base Flow and Basic Human Needs are met by Existing Groundwater Abstraction, then there is a surplus amount of 98 450.63 m³/yr (**269.73 m³/day**) available, after the allocation of the proposed PU (which is the sustainable yield of BH13; 191,23 m3/day).

Solar BH No. 5 is in HRU5. So, assuming there is no Existing Use, Basic Human Needs and Base Flow, then there is a surplus amount of 416 010.85 m³/yr (**1 139.76 m³/day**) available, after the allocation of the proposed PU (which is the sustainable yield of BH5; 6.62 m³/day).

There is therefore enough groundwater available on a sub-catchment level to sustain the proposed 8-hour abstraction from the designated boreholes and the sub-catchments they fall in.

Estimated Water Demand (during construction)

The pump test data generated from BH13 in sub-catchment/HRU 4 indicates a total abstraction of **191.23 m³/8hr day**, and the pump test data from Solar Borehole No. 5 in sub-catchment/HRU 5 indicates a total abstraction of **6.62 m³/day**.

Abstraction may not exceed the sustainable abstraction yield at the recommended pumping rate of 8 hrs per day for BH13, that is 6,64 l/s @ 8hrs (or **191.23 m³/8hr day**).
Abstraction may not exceed the sustainable abstraction yield at the recommended pumping rate of 8 hrs per day for Solar BH5, that is 0,23 l/s @ 8hrs (or **6.62 m³/8hr day**).

Consequently, cumulative water demand during construction of the access road should not exceed **197.85 m³/8hr day**, unless there is another borehole to supplement water usage for other projects (limited to the surplus groundwater reserve in the respective sub-catchments; HRU4 and HRU5) or SolarAfrica Energy staggers other construction projects, e.g., MTS, Dx and solar field, to reduce the total water demand on BH13 and Solar BH5 at any one time.

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It is estimated that approximately **211 m³/day** of groundwater will be required during construction of the access road. Water use during construction includes:

- Road Stabilisation (**118 m³/day**),
- Concrete mixing (watercourse crossings and MTS) (**25 m³/day**),
- Domestic use for workers (drinking, washing hands, and sanitation) (**2,25 m³/day**), and
- Dust suppression (spraying once per day and using a soil binding agent) (**65,8 m³/day**).

The estimated demand* (**211 m³/day**) exceeds the available groundwater yields (**197.85 m³/8hr day**), creating a potential deficit of **13,15 m³/day**. Water saving strategies will need to be implemented on site to ensure sufficient water during the construction of the access road. For example, construction of the access road may be done in 2 stages, which will lessen the peak demand.

***** *The estimated demand was calculated for peak periods using available data and assumptions where no data was provided, such findings may change at any time should any further information be made available, or adjustments are made to suit site conditions*.

Road stabilisation
"4 725 m³ water required for full construction (spread over 40 days) = use approximately **118 m³ per day**" (pers. comm. Frank Sprung, Construction Manager, SolarAfrica Energy).
Mixing Concrete
"Watercourse crossings will be included in road construction. However, some MTS platform work may be required initially, use additional 25 m³ daily for this purpose. As explained above, there will be platform work for the MTS and DX - included in total above." (pers. comm. Frank Sprung, Construction Manager, SolarAfrica Energy)
Potable usage (construction – toilets, washing hands and drinking)
The National Norms and Standards for Domestic Water and Sanitation (Government Gazette No. 411011, 08th September 2017) refers: • Free basic water supply is affordable ongoing services to at least the basic volume of water for indigent households, e.g., the provision of a minimum of 25 litres of potable water per person per day, or as prescribed by the Minister responsible for water supply. However, "45 people at 70 l per day – use 3m³ daily (excludes MTS and solar field)" (pers. comm. Frank Sprung, Construction Manager, SolarAfrica Energy). Consequently, the demand for potable water during construction (no accommodation shall be provided on site), shall be estimated using 50 l/p/day.

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Assuming 45 construction staff during peak construction, and the provision of 50 litres of potable water per person per day, the estimated demand shall be 2 250 L/day or **2,25 m³/day** during peak construction.

Dust control (suppression)

The principal sources of dust have been identified as those graded/cleared roads that will be used regularly to access key areas during construction, including:

The access road from the N10 to the Main Transmission Substation is approximately **14,1 km.** However, it is assumed that dust control would only be required on two thirds of the access road at any one time during its construction.

In total, dust control will be required on an estimated 9,4 km of 7 m-wide dirt road, covering a surface area of 65 800 m².

Outdoor dust control operations in typically dry areas require "about four litres of water on every square meter, every day." Applying this formula, a road roughly 14,1 km long and 7 m wide would require the use of roughly 263 200 L or **263 m³** of water for every spraying (https://blog.midwestind.com/water-is-a-poor-dust-control-method/).

Using water as a form of dust control is an ineffective, wasteful, and short-term solution. Regular, light watering is better than infrequent, heavy watering. However, alternative dust control products or palliatives are recommended. Another effective mitigation is to reduce speed to 30 km/hr, and good road drainage (maintenance), and restricting the width of the dirt road.

Some environmentally friendly soil binders, such as Roadtech™ can reduce water use to less than 1000 ml of water per sqm. Roads with continuous daily traffic would still need to maintained daily (pers. comm. Willem Schaap, FlowCentric Mining Technology (flowcentric-mining.com)). If the same or a similar binding agent is used, then water consumption per spraying can be reduced to **65,8 m³**.

The use of on-site supplementary water sources such as grey water could reduce the Average Annual Daily Demand (AADD) requirement from the borehole water supply system (underground aquifer). The potential reduction in AADD to be supplied by the underground aquifer depends on the extent that such measures can be implemented for construction demand. Only one potential source of non-potable water that can be re-used for certain construction activities has been identified, namely wastewater generated by the washing of the concrete mixer trucks and/or in the production of concrete (**Table 7**).

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Table 7. Breakdown of assumed construction water use and the potential for supplementary water use.

Construction			
Type of usage	**Activity**	**Supplementary water use**	
		Potential Saving	**Source**
Non-potable usage	Road stabilisation (compaction)	✗	Domestic wastewater will either be pumped from a conservancy tank or disposed of on-site via a septic tank-soakaway system.
	Dust control/suppression (regular and extensive)	✗	Domestic wastewater will either be pumped from a conservancy tank or disposed of on-site via a septic tank-soakaway system.
	Mixing concrete	✓ **Unknown**	*Wastewater generated by the washing of the concrete mixer trucks and/or in the production of concrete.
	Toilet flushing	✗	Domestic wastewater will either be pumped from a conservancy tank or disposed of on-site via a septic tank-soakaway system.
Potable usage	Taps/basins • Hand washing • Drinking • Preparing food • Washing dishes	✗	

The Sewerage flow contribution as a percentage of Average Annual Daily Demand (AADD) for business, commercial, industrial land use categories is 80% (DHS Redbook, Section K, Table K.4).

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DHS Redbook, Section K, Sanitation, The Neighbourhood Planning and Design Guide, Part II, Planning and design guidelines, developed by Department of Human Settlements, published by the South African Government ISBN: 978-0-6399283-2-6, version 1.1, printed January 2019.

The water saving from reusing residual water in the Ready Mix Concrete (RMC) or other concrete waste is not known but will be encouraged none the less.

*Botton, Julia & Lucas, Lindomar & Gheller, Rafael & Mello, Josiane & Dalconton, Francieli & Onofre, Sideney. (2018). Reuse of the Concrete Mixer Truck Wash Water in the Production of Concrete - A Clean Production Proposal. International Journal of Advanced Engineering Research and Science. 5. 4-10. 10.22161/ijaers.5.3.2

Abstract

Concrete is a material used on a large scale in civil construction. In concrete plants, it is manufactured by concrete mixer trucks and this process consumes a large quantity of drinking water. In addition to the production of concrete, the water used to wash the concrete mixer trucks should also be considered, since this also generates a considerable amount of residual water that cannot be disposed of without prior treatment. As such, the objective of this study is to **reuse the wastewater generated by the washing of the mixer trucks in the production of concrete, thus avoiding the consumption of drinking water, considering that the reuse of this wastewater doesn't require chemical treatment**. Three compositions were developed: A reference composition produced with drinking water; a composition with 50% drinking water and 50% residual water; and a composition with 100% of residual water. To analyse the concrete, its properties were checked in the fresh and the hardened state, assessing the workability through the slump test and its compressive strength at 14 days and 28 days. In total, 9 test specimens were moulded in accordance with age, which meant 3 specimens per composition. The results showed that the concrete produced with the residual water presented the same compression strength as the concrete that used drinking water. It is estimated that a replacement of up to 50% should be used, since the composition containing 50% of residual water showed the greatest gains in strength in relation to the other compositions.

Mitigation: Any residual water in the Ready Mix Concrete (RMC) or other concrete waste can be re-used by replacing domestic water for making new mortar or concrete. It is estimated that a replacement of up to 50% should be used to achieve the greatest gains in strength in relation to either 100% domestic water or 100% residual water.

Water demand or usage can be reduced by implementing the following mitigations:

- Alternative dust control products such as environmentally friendly soil binders must be used.
- Any residual water in the Ready Mix Concrete (RMC) or other concrete waste should be re-used by replacing domestic water for making new mortar or concrete. It is estimated that a replacement of up to 50% should be used to achieve the greatest gains in strength in relation to either 100% domestic water or 100% residual water.

Water Storage

Groundwater during construction

Water from Boreholes No. 13 and/or No. 14 will be stored in a ± **36 m³** and overhead (OH) pressed steel tank.

Water from Solar Boreholes No. 5 and 4 will be stored in one **5 m³** or **10 m³** JOJO (or similar) tank, but the number of tanks for each borehole may be increased by an additional 2 tanks (up to 3 tanks in total) to cater for water from Boreholes No. 13 or 14.

One additional tank (up to **10 m³**) will be installed at the construction camp to supply domestic water to the offices and staff.

Untreated Effluent (concrete slurry from e.g., concrete mixer trucks) during construction

The concrete batching plant, which may or may not be in the construction camp, shall contain a washing facility for containing only the waste concrete slurry cleaned out of the discharge chute(s) and rotating mixing drums of concrete mixer trucks. This washing facility shall contain two adjacent wash bays to allow for continuous operations and minimise the risk of overflow or work stoppage when a bay has reached its capacity and must be emptied. The volume (**m³**) of the wash bays will be used to store concrete slurry for reuse or disposal is not known at this stage.

Contaminated Soil

Storing contaminated soil for reuse (bioremediation and rehabilitation) and/or disposal: a **10 m³** container will be made available for the storage and bioremediation of soil contaminated with hydrocarbon spills or storage and collection for disposal at a licensed hazardous waste landfill site.

Waste Management

Domestic Wastewater (wastewater arising from domestic and commercial activities and premises and may contain sewage)

Assuming the estimated demand for potable water is **2,25 m³/day** during construction (45 staff and the provision of 50 litres of potable water per person per day) and the sewerage flow contribution as a percentage of Average Annual Daily Demand (AADD) for business, commercial, industrial land use categories is 80% (DHS Redbook, Section K, Table K.4), then **± 1,8 m³** of "domestic wastewater" shall be generated each day.

DHS Redbook, Section K, Sanitation, The Neighbourhood Planning and Design Guide, Part II, Planning and design guidelines, developed by Department of Human Settlements, published by the South African Government ISBN: 978-0-6399283-2-6, version 1.1, printed January 2019.

During peak construction of Cluster 1, the labour force should reach 400 employees, thereby generating **16 m³** of "domestic wastewater" each day. However, the access road project will be completed within 6 to 8 weeks and will therefore not contribute towards (cumulative) wastewater generation during peak construction.

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"**on-site disposal**" refers to the disposal of wastewater on individual properties not permanently linked to a central waste collection, treatment, and disposal systems, such as septic tank systems, conservancy tank systems, soakaway systems, french drains, pit latrines, some package plants and related activities (GA for Section 21(g), 2013).

The sanitation system adopted by the contractor(s) at the construction camp will be a containerised system whereby domestic wastewater will be stored in a conservancy tank(s) for safe disposal elsewhere and/or a package plant for the on-site disposal, using a septic tank-soakaway system.

Storage for disposal elsewhere (using a conservancy tank system)

In terms of section 3.8 of the GA for Section 21(g) (2013), a person who lawfully occupies property registered in the Deeds Office or lawfully has access to land on which the use of water takes place, may store up to **10 000 m^3** of domestic wastewater per property for the purpose of disposal if the storing of the wastewater does not impact on a water resource or on any other person's water use, property or land, and is not detrimental to the health and safety of the public in the vicinity of the activity.

A person who stores wastewater in terms of the GA for Section 21(g) (2013) must submit a registration form for registration of the water use before commencement of storage if **more than 1 000 m^3** are stored for disposal. Given the unlikelihood of all contractors (combined) storing more than 1 000 m^3 of domestic wastewater at the construction camp for disposal, this water use will not need to be registered, but is subject to the limits and conditions contained therein.

Risk:
Given the large volumes for storage above, DWS may interpret "storage" as wastewater storage dams, and not a conservancy tank system, particularly since a conservancy tank system is included in the definition of "on-site disposal."
In other words, the storage of domestic wastewater using conservancy tanks for the purpose of disposal may not be permissible under the abovementioned section (3.8) of the General Authorisation, requiring an application for a Water Use License.

On-site Disposal (to a conservancy tank or septic tank-soakaway system)

Alternatively, section 3.9 of the same GA for Section 21(g) (2013), allows a person who lawfully occupies property registered in the Deeds Office or lawfully has access to land on which the use of water takes place, to dispose of domestic wastewater to a communal conservancy tank serving no more than 50 households or domestic wastewater generated by a single household not permanently linked to a central waste collection, treatment and disposal system to an on-site disposal facility.

A person who disposes of wastewater in terms of the GA for Section 21(g) (2013) must submit a registration form for registration of the water use before the commencement of the disposal if more than 50 m^3 of domestic wastewater is disposed of on any given day. Given the unlikelihood of all contractors

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(combined) disposing more than 50 m^3 of domestic wastewater on any given day at the construction camp, this water use will not need to be registered.

Risk:
DWS may interpret a conservancy tank system and a septic tank-soakaway system as on-site disposal, considering both systems are included in the definition of "on-site disposal."
However, section 3.9 of the GA for Section 21(g) (2013) refers to a communal conservancy tank serving no more than **50 households** and domestic wastewater generated by **a single household**. Consequently, DWS may not consider domestic wastewater generated by 45 labourers for the road contractor (**± 1,8 m^3**), or by 400 labourers for all contractors combined during peak construction (**± 16 m^3**), permissible under the abovementioned section (3.9) of the General Authorisation, requiring an application for a Water Use License.

The sanitation system will be supplemented by portable chemical toilets or e-loos for use by the work front further away from the construction camp. Wastewater shall be collected by a supplier for disposal at a licensed municipal Wastewater Treatment Works (WWTW).

Waste

It is anticipated that both general and hazardous waste types will be generated during construction (**Table 8**). Except for domestic wastewater (**1,8 m^3/day**), volumes cannot be known. The principal sanitation system during construction shall either be containerised toilets connected to a conservancy tank and/or a sewerage treatment package plant, as well as chemical toilets.

Table 8. Identification of construction waste types and proposed management methods.

Source	Waste type	Proposed Control Method(s)
Concrete mixing	Rubble (Inert)	Solid concrete rubble will be re-used as fill material and/or disposed at the De Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).
	Wet Slurry (Hazardous) dry Slurry (General waste)	Slurry from the concrete mixing will be recycled in concrete production or once hardened, reused as fill material and/or disposed at the De Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).

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	Residual wastewater (Hazardous)	Reuse residual wastewater by replacing borehole water for making new mortar or concrete, and/or allowed to evaporate.
Construction plant	Used motor oil (Hazardous)	Collected by a registered collector or mechanic (during emergency repairs) for recycling.
	Contaminated soil (Hazardous)	Bioremediation and/or collected for disposal at a licensed hazardous waste landfill site.
Containerised toilet blocks, staff welfare area/ kitchens connected to a wastewater treatment package plant (septic tank-soakaway system)	Domestic wastewater	Domestic wastewater will be disposed of via a sub-surface soakaway.
	Sludge	The sludge from septic tanks will be disposed of in accordance with the "Guidelines for the Utilisation and Disposal of Wastewater Sludge: Volume 3: Requirements for the on-site and off-site disposal of sludge."
Conservancy tank systems and Chemical toilets	Domestic wastewater	Collected by supplier for disposal at a licensed private or municipal Wastewater Treatment Works (WWTW).
Office	Paper (General waste)	Collected for recycling.
	Stationary (General waste)	Separated for re-use and/or recycling, and/or collected for disposal at the De Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).
	Ink cartridges (Hazardous)	Transferred to or collected by supplier for recycling.
Staff Welfare area	Organic (food) waste (General waste)	Collected for disposal at the De Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).
	Food/drink packaging	Separated for re-use and/or recycling, and/or collected for disposal at the De

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	(General waste)	Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).
Packaging	Cardboard, plastic, wood, cement bags (Inert)	Collected for re-use and/or recycling.
Unsuitable road material or aggregate	Spoil (inert)	Reused as fill material, during rehabilitation of the site and/or removed from site to a suitable and approved location by the contractor under his contract.

Listed and Specified Activities

An application for an EA has been submitted to the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD&LR) in terms of the EIA Regulations, 2014 as amended to undertake listed activities 12, 19, 24, 48 and 56 of **Listing Notice 1** (GG No. 40772, GN No. 327, 07th April 2017) and listed activities 4, 14, 18, and 23 of **Listing Notice 3** (GG No. 40772, GN No. 324, 07 April 2017) (**Table 9**).

Table 9. All listed and specified activities triggered and being applied for.

Listed activity as described in GN R.327 and 324.	**Description of project activity that triggers listed activity**
GN R 327 Item 12 (ii) (a) and (c): The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	This listed activity relates to the development of crossing/drainage structures (items 1 to 4) and infrastructure (items 5 to 8). **1. The Brak River Drainage System:** 30°51'6.74"S 24°16'32.57"E and 30°51'9.48"S 24°16'48.11"E The crossing over the Brak River is likely to be a Drift with rock fill to spread the surface water into a broadly distributed sheet whilst maintaining unrestricted subterranean flow. The Drift shall be 5 m wide, 100 m long (final length to be determined on site), so the physical footprint will be **circa 500 m²**. Start: 30°51'6.74"S 24°16'32.57"E (macro-channel bank)

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Middle:	30°51'4.71"S; 24°16'39.98"E
End:	30°51'9.48"S 24°16'48.11"E (macro-channel bank)
Distance (m)	± 531 m (between banks) ± 100 m long (length of Drift)
Width (m)	The drift shall be 5 m wide
Area (m^2) of Drift	± **500 m^2**

2. **Section 2.3 (Small Ephemeral Tributary):** 30°51'15.66"S 24°17'4.51"E

   Road Section 2.3 crosses a small ephemeral drainage line that originates on the Brak River floodplain. There is a small dam in the upstream drainage. The engineers must decide on the nature of the drainage design (e.g., using riprap, gabion mattresses, and/or other permeable material) that is needed to prevent the elevated road from (a) obstructing surface and sub-surface flow through the system, and (b) prevent pooling on the upstream edge of the road.

Start:	30°51'14.77"S; 24°17'3.84"E
Middle:	30°51'15.15"S; 24°17'4.87"E
End:	30°51'15.47"S; 24°17'5.83"E
Distance (m)	± 57 m
Width (m)	8 m road plus 3 m drain
Area (m^2)	**± 77 m^2**

3. **Section 2.5 (Headwater Drainage):** 30°51'38.05"S 24°17'49.25"E

   At Road Section 2.5, the road crosses a 70 m-wide floodplain area, which is draining an area containing headwater drainage with floodplain flats, into an area with alluvial fans. The engineers must decide on the nature of the drainage design (e.g., using riprap, gabion mattresses, and/or other permeable material) that is needed to prevent the elevated road from (a) obstructing

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surface and sub-surface flow through the system, and (b) prevent pooling on the upstream edge of the road.

Start:	30°51'37.00"S; 24°17'47.74"E
Middle:	30°51'37.64"S; 24°17'48.83"E
End:	30°51'38.29"S; 24°17'49.93"E
Distance (m)	± 70 m
Width (m)	8 m road plus 3 m drain
Area (m^2)	± 770 m^2

4. **Earth Dam (Farm track):** 30°51'57.84"S; 24°18'6.75"E

   A 117 m section of the farm track occurs within 32 m of an earth dam. A Drift with rock fill or similar design structure may need to be adopted to protect the access road from seepage and/or overflow from the earth dam.

Start:	30°51'55.87"S; 24°18'7.02"E
Middle:	30°51'57.81"S; 24°18'6.40"E
End:	30°51'59.30"S; 24°18'5.17"E
Distance (m)	± 117 m
Width (m)	A Drift shall be ±5 m wide
Area (m^2)	**± 585 m^2**

5. An approximately 800 m long underground 110 mm uPVC pressure pipe will be laid from Borehole No. 13 and/or 14 to the point of abstraction alongside a farm track and inside the Cluster 1 footprint. The length (35 m) and width (0,3 m) of the trench within the watercourse (unnamed FEPA drainage line D62D – 05610 SQ) will cover a surface area of **10.5 m^2**.

Start:	30°51'36.40"S; 24°18'55.92"E
Middle:	30°51'36.60"S; 24°18'55.29"E
End:	30°51'36.79"S; 24°18'54.65"E
Distance (m)	± 35 m
Width (m)	300 mm wide trench

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Area (m^2)	**± 10.5 m^2**

6. An approximately 400 m long underground 80 mm UPVC or HDPE pipe will be laid from Solar BH5 to the point of abstraction on the Switching Station Dx platform inside the Cluster 1 footprint. The exact position is still to be determined. A trench digger will provide a 300 mm wide trench to rock strata – 400 to 600 mm below ground. The length of the wetland intersected by the trench is ± 48 m, making the physical footprint **14.4 m^2**.

Start:	30°53'3.90"S & 24°18'52.67"E
Middle:	30°53'4.41"S; 24°18'52.00"E
End:	30°53'4.65"S; 24°18'51.19"E
Distance (m)	± 48 m
Width (m)	300 mm wide trench
Area (m^2)	**14.4 m^2**

7. An underground 80 mm UPVC or HDPE pipe will be laid from Solar BH4 to the point of abstraction inside the Cluster 1 footprint. The exact position is still to be determined. A trench digger will provide a 300 mm wide trench to rock strata – 400 to 600 mm below ground. The length of the wetland intersected by the trench is ± 50 m, making the physical footprint **15 m^2**.

Solar BH4	30°52'17.66"S & 24°18'38.12"E
Distance (m)	± 50 m
Width (m)	300 mm wide trench
Area (m^2)	**15 m^2**

8. There are four sections where the centre line of the proposed alignment is further than 5,5 m from existing farm tracks, and therefore assumed to constitute development of infrastructure (instead of expansion):

New road section 3 is ± 236 m long (start: 30° 51' 35,82'' S & 24° 17' 45,88" E, middle: 30° 51' 38,23'' S & 24° 17' 49,81" E, end: 30° 51' 40,68'' S & 24° 17' 53,67" E), but

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<table>
<tr>
<td></td>
<td>it crosses Section 2.5 (Headwater Drainage): 30°51'38.05"S 24°17'49.25"E. At Road Section 2.5, the road crosses a 70 m-wide floodplain area, which is draining an area containing headwater drainage with floodplain flats, into an area with alluvial fans.
<table>
<tr><td>Start:</td><td>30°51'37.00"S; 24°17'47.74"E</td></tr>
<tr><td>Middle:</td><td>30°51'37.64"S; 24°17'48.83"E</td></tr>
<tr><td>End:</td><td>30°51'38.29"S; 24°17'49.93"E</td></tr>
<tr><td>Distance (m)</td><td>± 70 m</td></tr>
<tr><td>Width (m)</td><td>8 m road plus 3 m drain</td></tr>
<tr><td>Area (m^2)</td><td>± 770 m^2</td></tr>
</table>
New road section 4 is ± 1,2 km long (start: 30° 51' 56,81'' S & 24° 18' 06,53" E, middle: 30° 52' 13,67'' S & 24° 17' 58,87" E, end: 30° 52' 29,99'' S & 24° 17' 58,02" E), but 85 m of the 11 m wide new road section 4 (935 m^2) occurs within 32 m of an earth dam.
<table>
<tr><td>Start:</td><td>30°51'56.81''S; 24°18'06.53"E</td></tr>
<tr><td>Middle:</td><td>30°51'58.06"S; 24°18'5.89"E</td></tr>
<tr><td>End:</td><td>30°51'59.30"S; 24°18'5.17"E</td></tr>
<tr><td>Distance (m)</td><td>± 85 m</td></tr>
<tr><td>Width (m)</td><td>8 m road plus 3 m drain</td></tr>
<tr><td>Area (m^2)</td><td>± 935 m^2</td></tr>
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<tr>
<td>GN R 327 Item 19: The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;</td>
<td>Sections of existing road occurring within watercourses will be reconstructed. The affected district road will be rebuilt to a width of 11 m (allowing 8 m for the roadbed preparation, and up to 3 m for the side/cut-off drain). The maximum "box-cut" will be 300 mm with an additional 150 mm rip in situ and recompact (dependent on whether a cut or fill area). Consequently, every 1 m length of road occurring within a watercourse will result in the moving of 4,95 m^3 of soil (11 m x 0,45 m x 1 m).
1. Section 1.2 (Small Ephemeral Tributary): 30 51 59.1 S; 24 13 49.7 (Alt. 1311 m)</td>
</tr>
</table>

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A small ephemeral drainage line reaches the road, flows along the left shoulder of the road up to the coordinates above, where it crosses the road.

Start:	30°52'3.61"S; 24°13'46.94"E
Middle:	30°52'1.25"S; 24°13'48.43"E
End:	30 51 59.1 S; 24 13 49.7
Distance (m)	± 162 m
Width (m)	8 m road plus 3 m drain
Volume (m^3)	**± 802 m^3**

2. **Section 1.3 (Large Ephemeral Tributary):** 30 51 42.6 S; 24 14 00.5 E (Alt. 1315 m)

   Where the large ephemeral tributary reaches the road, it is dammed by the presence of the road and start draining down the left shoulder of the road. The floodwater then crosses the road to enter the downstream drainage and later joins the original drainage line. The area along the road is scoured due to periodic flows, and where the flows cross the road to the downstream catchment, flow damage to the road is evident.

Start:	30°51'46.87"S; 24°13'57.58"E
Middle:	30°51'45.51"S; 24°13'58.46"E
End:	30°51'44.14"S; 24°13'59.35"E
Distance (m)	± 96 m
Width (m)	8 m road plus 3 m drain
Volume (m^3)	± 475 m^3

3. **Section 1.4 (Headwater Drainage Line):** 30 51 29.3 S; 24 14 23.7 E (Alt. 1314 m)

   Road Section 1.4 indicates the section of the road where the road cross over a headwater drainage area. The road obstructs seepage from the small headwater drainage catchment and sedges appear in the wetter clay soil next to the road. It seems that drainage water does not flow over

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the road (no damage or pooling on the road). Downstream of the road the drainage area is covered with shrub growth.

Start:	30°51'30.15"S; 24°14'21.38"E
Middle:	30°51'29.16"S; 24°14'23.82"E
End:	30°51'28.16"S; 24°14'26.20"E
Distance (m)	± 142 m
Width (m)	8 m road plus 3 m drain
Volume (m^3)	**± 703 m^3**

4. **Section 1.5 (Large Ephemeral Tributary):** 30 51 25.7 S; 24 14 12.3 E and 30 51 25.8 S; 24 14 47.1 E (Altitude 1309 m)

   Road Section 1.5 indicates the section of the road where the road cross over two drainage lines: a) the start of a short tributary of the main local drainage line and b) a large ephemeral drainage line crosses the road through a culvert bridge.

Start:	30°51'25.28"S; 24°14'40.02"E
Middle:	30°51'25.28"S; 24°14'40.09"E
End:	30°51'25.28"S; 24°14'40.18"E
Distance (m)	± 4 m
Width (m)	8 m road plus 3 m drain
Volume (m^3)	**± 20 m^3**

Start:	30°51'25.67"S; 24°14'45.41"E
Middle:	30°51'25.70"S; 24°14'46.55"E
End:	30°51'25.60"S; 24°14'47.61"E
Distance (m)	± 59 m
Width (m)	8 m road plus 3 m drain
Volume (m^3)	**± 292 m^3**

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Apart from the access road crossing through the abovementioned large ephemeral drainage line, there is also an existing pipe culvert (9 m wide shoulder width) on the public district road section, which will be kept in place or reconstructed to a similar or better design, but within the same footprint. Assuming a length of at least 4 m and a depth of at least 1 m, then reconstruction of this culvert will result in moving **36 m^3** of soil (9 m x 1 m x 4 m).

Sections of existing private road (farm tracks) occurring within watercourses will be reconstructed. The existing ± 2,6 m wide farm tracks will be widened to 11 m (allowing 8 m for the roadbed preparation, and up to 3 m for the side/cut-off drain). The maximum "box-cut" will be 300 mm with an additional 150 mm rip in situ and recompact (dependent on whether a cut or fill area). Consequently, **every 1 m length of road occurring within a watercourse will result in the moving of 4,95 m^3 of soil** (11 m x 0,45 m x 1 m).

5. **The Brak River Drainage System:** 30°51'6.74"S 24°16'32.57"E and 30°51'9.48"S 24°16'48.11"E

   The crossing over the Brak River is likely to be a Drift with rock fill to spread the surface water into a broadly distributed sheet whilst maintaining unrestricted subterranean flow. The Drift shall be 5 m wide, 100 m long (final length to be determined on site) and 2 – 2,55 m deep, resulting in the infilling of **1 275 m^3** of concrete or gravel wearing course (GWC) and rock fill. Similar design structures may need to be adopted as required, still to be identified, e.g., if there are watershed areas that may need protection.

Start:	30°51'6.74"S 24°16'32.57"E (macro-channel bank)
Middle:	30°51'4.71"S; 24°16'39.98"E
End:	30°51'9.48"S 24°16'48.11"E (macro-channel bank)
Distance (m)	± 531 m (between banks) ± 100 m long (length of Drift)

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Width (m) Depth (m)	The drift shall be 5 m wide The drift shall be 2,55 m deep
Volume (m^3) of Drift Volume(m^3) of Road	**± 1 275 m^3** **± 2 628.45 m^3**

6. **Section 2.3 (Small Ephemeral Tributary):** 30°51'15.66"S 24°17'4.51"E

   Road Section 2.3 crosses a small ephemeral drainage line that originates on the Brak River floodplain. There is a small dam in the upstream drainage and after it crosses the road, a series of short berms which manipulate the flows, probably to protect the road and distribute the water into the floodplain.

Start:	30°51'14.77"S; 24°17'3.84"E
Middle:	30°51'15.15"S; 24°17'4.87"E
End:	30°51'15.47"S; 24°17'5.83"E
Distance (m)	± 57 m
Width (m)	8 m road plus 3 m drain
Volume (m^3)	**± 282 m^3**

7. **Wetland:** 30°51'22.09"; 24°17'24.76"E

   The access road runs along the edge of a wetland.

Start:	30°51'21.63"S; 24°17'23.28"E
Middle:	30°51'22.09"; 24°17'24.76"E
End:	30°51'22.60"S; 24°17'26.18"E
Distance (m)	± 83 m
Width (m)	8 m road plus 3 m drain
Volume (m^3)	**± 411 m^3**

8. **Section 2.5 (Headwater Drainage):** 30°51'38.05"S; 24°17'49.25"E

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At Road Section 2.5, the road crosses a floodplain area, 70 m wide, which is draining an area containing headwater drainage with floodplain flats, into an area with alluvial fans.

Start:	30°51'37.00"S; 24°17'47.74"E
Middle:	30°51'37.64"S; 24°17'48.83"E
End:	30°51'38.29"S; 24°17'49.93"E
Distance (m)	± 70 m
Width (m)	8 m road plus 3 m drain
Volume (m^3)	**± 346.5 m^3**

9. An approximately 800 m long underground 110 mm uPVC pressure pipe will be laid from Borehole No. 13 and/or 14 to the point of abstraction alongside a farm track and inside the Cluster 1 footprint. The length (35 m), width (0,3 m) and depth (0,6 m) of the trench within the watercourse (unnamed FEPA drainage line D62D – 05610 SQ) will result in the moving of **6.3 m^3** of soil.

Start:	30°51'36.40"S; 24°18'55.92"E
Middle:	30°51'36.60"S; 24°18'55.29"E
End:	30°51'36.79"S; 24°18'54.65"E
Distance (m)	± 35 m
Width (m) Depth (m)	300 mm wide trench 0.6 m
Volume (m^3)	**± 6.3 m^3**

10. An approximately 400 m long underground 80 mm UPVC or HDPE pipe will be laid from BH5 to the point of abstraction on the Switching Station Dx platform inside the Cluster 1 footprint. The exact position is still to be determined A trench digger will provide a 300 mm wide trench to rock strata – 400 to 600 mm below ground. The length (48 m), width (0,3 m) and depth (0,6 m) of the trench within the wetland will result in the moving of **8,64 m^3** of soil.

Start:	30°53'3.90"S & 24°18'52.67"E
Middle:	30°53'4.41"S; 24°18'52.00"E

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	<table><tr><td>End:</td><td>30°53'4.65"S; 24°18'51.19"E</td></tr><tr><td>Distance (m)</td><td>± 48 m</td></tr><tr><td>Width (m) Depth (m)</td><td>300 mm wide trench 0.6 m</td></tr><tr><td>Volume (m^3)</td><td>**± 8,64 m^3**</td></tr></table> **11.** An underground 80 mm UPVC or HDPE pipe will be laid from Solar BH4 to the point of abstraction inside the Cluster 1 footprint. The exact position is still to be determined. A trench digger will provide a 300 mm wide trench to rock strata – 400 to 600 mm below ground. The length (50 m), width (0,3 m) and depth (0,6 m) of the trench within the wetland will result in the moving of 9 m^3 of soil. <table><tr><td>Solar BH4</td><td>30°52'17.66"S & 24°18'38.12"E</td></tr><tr><td>Distance (m)</td><td>± 50 m</td></tr><tr><td>Width (m) Depth (m)</td><td>300 mm wide trench 0.6 m</td></tr><tr><td>Volume (m^3)</td><td>**9 m^3**</td></tr></table>
GN R 327 Item 24 (ii): The development of a road – (ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres;	**Existing private road where the District Road intersects the boundary of Farm Riet Fountain No. 39C and continues to the western boundary fence of Sun Central Cluster 1 (300 MW) Solar PV Facility** The original proposed alignment along this section of private roads (farm tracks) has been revised to use existing farm tracks as far as is possible. Construction therefore constitutes expansion, not development. However, there are four sections where the centre line of the proposed alignment is further than 4 m from existing farm tracks. These sections are approximately: • New road section 1: ± 43 m long (start: 30° 51' 28,52'' S & 24° 17' 43,92" E, middle: 30° 51' 29,02'' S & 24° 17' 44,35" E, end: 30° 51' 29,59'' S & 24° 17' 44,44" E), • New road section 2: ± 32 m long (start: 30° 51' 33,34'' S & 24° 17' 43,82" E, middle: 30° 51' 33,89'' S & 24° 17' 43,90" E, end: 30° 51' 34,28'' S & 24° 17' 44,19" E),

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	• New road section 3: ± 236 m long (start: 30° 51' 35,82" S & 24° 17' 45,88" E, middle: 30° 51' 38,23" S & 24° 17' 49,81" E, end: 30° 51' 40,68" S & 24° 17' 53,67" E), and • New road section 4: ± 1,2 km long (start: 30° 51' 56,81" S & 24° 18' 06,53" E, middle: 30° 52' 13,67" S & 24° 17' 58,87" E, end: 30° 52' 29,99" S & 24° 17' 58,02" E). It can be argued that these four sections of 8 m-wide road constitute new development in which case they trigger this activity as the proposed Right of way servitude will be 19 m wide. Three (3) or more 3 m-wide and 30 m-long passing lanes may be required during construction. These passing lanes will remain within the fenced road servitude. **Development of a new road to the Switching Station and Main Transmission Substation** The length and width of the new road build will be ± 2,65 km and 8 m (excluding the side/cut-off drain), but 11 m (including the side/cut-off drain) and the proposed Right of way servitude will be 19 m wide.
GN R 327 Item 48 (i) (a) and (c): The expansion of – (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; where such expansion occurs - (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;	**Existing 'Burgerville' District Road (2448)** • The N10/ 'Burgerville' District Road (2448) intersection will be widened from an existing width of approximately 25,7 m to approximately 60 m (measured along the top of the road). The outer edge of the turnoff is currently ± 40 m from the edge of a headwater drainage line, and should be ± 22.85 m from the edge of the headwater drainage line once widened by an additional ± 17.15 m: **Section 1.1 (Headwater Drainage Line):** 30 52 32.0 S; 24 13 26.9 (Alt. 1322 m) The headwater drainage is on the edge of an extensive floodplain area, extending eastwards along the southern fence line of the turn-off from the N10. It is evident that the road does not interfere with any of the drainage line functions. **Existing private road where the District Road intersects the boundary of Farm Riet Fountain No. 39C and continues to the western boundary fence of Sun Central Cluster 1 (300 MW) Solar PV Facility**

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There are no existing structures, so this listed activity applies only to the existing infrastructure, specifically farm tracks.

1. **The Brak River Drainage System:** 30°51'6.74"S 24°16'32.57"E and 30°51'9.48"S 24°16'48.11"E

   Apart from the 5 m-wide and 100 m long Drift, the existing ± 2,6 m wide farm track through the Brak River will be widened by approximately 8,4 m to 11 m (allowing 8 m for the roadbed preparation, and up to 3 m for the side/cut-off drain). Consequently, the expansion of existing farm tracks (less 100 m for the Drift) occurring within the Brak River will result in the expansion of at least 3 620.4 m^2 of road (431 m x 8,4 m).

Start:	30°51'6.74"S 24°16'32.57"E (macro-channel bank)
Middle:	30°51'4.71"S; 24°16'39.98"E
End:	30°51'9.48"S 24°16'48.11"E (macro-channel bank)
Distance (m)	± 531 m (between banks) ± 100 m long (length of Drift)
Width (m)	The drift shall be 5 m wide 8 m road plus 3 m drain
Expansion of Road (m)	**± 3 620.4 m^2**

2. **Section 2.3 (Small Ephemeral Tributary):** 30°51'15.66"S 24°17'4.51"E

   Road Section 2.3 crosses a small ephemeral drainage line that originates on the Brak River floodplain. The existing ± 2,6 m wide farm track through the small ephemeral tributary will be widened by approximately 8,4 m to 11 m (allowing 8 m for the roadbed preparation, and up to 3 m for the side/cut-off drain). Consequently, the expansion of existing farm tracks occurring within the small ephemeral tributary will result in the expansion of **± 478.8 m^2** of road (57 m x 8,4 m).

Start:	30°51'14.77"S; 24°17'3.84"E

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Middle:	30°51'15.15"S; 24°17'4.87"E
End:	30°51'15.47"S; 24°17'5.83"E
Distance (m)	± 57 m
Width (m)	8 m road plus 3 m drain
Expansion (m^2)	**± 478.8 m^2**

3. **Wetland:** 30°51'22.09"; 24°17'24.76"E

   The access road runs along the edge of a wetland. The existing ± 2,6 m wide farm track along the edge of the wetland will be widened by approximately 8,4 m to 11 m (allowing 8 m for the roadbed preparation, and up to 3 m for the side/cut-off drain). Consequently, the expansion of existing farm tracks occurring within the wetland will result in the expansion of **± 697,2 m^2** of road (83 m x 8,4 m).

Start:	30°51'21.63"S; 24°17'23.28"E
Middle:	30°51'22.09"; 24°17'24.76"E
End:	30°51'22.60"S; 24°17'26.18"E
Distance (m)	± 83 m
Width (m)	8 m road plus 3 m drain
Expansion (m^2)	**± 697 m^2**

4. **Earth Dam (Farm track):** 30°51'57.84"S; 24°18'6.75"E

   A 117 m section of the farm track occurs within 32 m of an earth dam. New road section 4 is ± 1,2 km long (start: 30° 51' 56,81'' S & 24° 18' 06,53" E, middle: 30° 52' 13,67'' S & 24° 17' 58,87" E, end: 30° 52' 29,99'' S & 24° 17' 58,02" E), but 85 m of the 11 m wide new road section 4 (**935 m^2**) occurs within 32 m of an earth dam. The remaining 32 m of existing ± 2,6 m wide farm track within 32 m of the earth dam will be widened by approximately 8,4 m to 11 m (allowing 8 m for the roadbed preparation, and up to 3 m for the side/cut-off drain). Consequently, the expansion of existing farm track occurring within 32 m of the earth dam will result in the expansion of **± 269 m^2** of road (32 m x 8,4 m).

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<table>
<tr><td></td><td><table>
<tr><td>Start:</td><td>30°51'55.87"S; 24°18'7.02"E</td></tr>
<tr><td>Middle:</td><td>30°51'56.34"S; 24°18'6.78"E</td></tr>
<tr><td>End:</td><td>30°51’56.81’’S; 24°18’06.53”E</td></tr>
<tr><td>Distance (m)</td><td>± 32 m</td></tr>
<tr><td>Width (m)</td><td>8 m road plus 3 m drain</td></tr>
<tr><td>Expansion (m^2)</td><td>± 269 m^2</td></tr>
</table></td></tr>
<tr><td>GN R 327 Item 56 (ii): The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre -

(i) where the existing reserve is wider than 13,5 meters; or

(ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.</td><td>Existing ‘Burgerville’ District Road (2448)

The N10/ ‘Burgerville’ District Road (2448) intersection will be widened from an existing width of approximately 25,7 m to approximately 60 m (measured along the top of the road) to accommodate the required turning circle from both directions and then gradually taper along a length of 20 m to the specified 7 m shoulder width. The existing district road reserve should be 19 or 20 m wide as the average fence line width is 19 m.</td></tr>
<tr><td>GN R 324 Item 4 (g) (ii) (ee): The development of a road wider than 4 metres with a reserve less than 13,5 metres.

g. Northern Cape

ii. Outside urban areas

(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</td><td>Existing private road where the District Road intersects the boundary of Farm Riet Fountain No. 39C and continues to the western boundary fence of Sun Central Cluster 1 (300 MW) Solar PV Facility

The original proposed alignment along this section of private roads (farm tracks) within the CBA2 has been revised to use existing farm tracks as far as is possible. Construction therefore constitutes expansion, not development. However, there are four sections where the centre line of the proposed alignment is further than 4 m from existing farm tracks. These sections are approximately:

• New road section 1: ± 43 m long (start: 30° 51’ 28,52’’ S & 24° 17’ 43,92” E, middle: 30° 51’ 29,02’’ S & 24° 17’ 44,35” E, end: 30° 51’ 29,59’’ S & 24° 17’ 44,44” E),

• New road section 2: ± 32 m long (start: 30° 51’ 33,34’’ S & 24° 17’ 43,82” E, middle: 30° 51’ 33,89’’ S & 24° 17’ 43,90” E, end: 30° 51’ 34,28’’ S & 24° 17’ 44,19” E),</td></tr>
</table>

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<table>
<tr><td></td><td>

New road section 3: ± 236 m long (start: 30° 51' 35,82'' S & 24° 17' 45,88" E, middle: 30° 51' 38,23'' S & 24° 17' 49,81" E, end: 30° 51' 40,68'' S & 24° 17' 53,67" E), and
New road section 4: ± 1,2 km long (start: 30° 51' 56,81'' S & 24° 18' 06,53" E, middle: 30° 52' 13,67'' S & 24° 17' 58,87" E, end: 30° 52' 29,99'' S & 24° 17' 58,02" E).

It can be argued that these four sections of 8 m-wide road constitute new development in which case they trigger this activity as they all occur within a CBA2, but the proposed Right of way servitude will be 19 m wide. Three (3) or more 3 m-wide and 30 m-long passing lanes may be required during construction. These passing lanes will remain within the road servitude.
</td></tr>
<tr><td>
GN R 324 Item 14 (ii) (a) and (c) (g) (ii) (ff): The development of –

(ii) infrastructure or structures with a physical footprint of 10 square metres or more;

where such development occurs -

(a) within a watercourse;

(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;

g. Northern Cape

ii. Outside urban areas:

(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.
</td><td>
The full length (14.1 km) of the access road falls within Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs). This listed activity relates to the development of crossing/drainage structures (items 1 to 9) and infrastructure (items 10 to 13).

1. Section 1.2 (Small Ephemeral Tributary): 30 51 59.1 S; 24 13 49.7 (Alt. 1311 m)

A small ephemeral drainage line reaches the road, flows along the left shoulder of the road up to the coordinates above, where it crosses the road. The engineers must decide on the nature of the drainage design (e.g., using riprap, gabion mattresses, and/or other permeable material) that is needed to prevent the elevated road from (a) obstructing surface and sub-surface flow through the system, and (b) prevent pooling on the upstream edge of the road.
<table>
<tr><td>Start:</td><td>30°52'3.61"S; 24°13'46.94"E</td></tr>
<tr><td>Middle:</td><td>30°52'1.25"S; 24°13'48.43"E</td></tr>
<tr><td>End:</td><td>30 51 59.1 S; 24 13 49.7</td></tr>
<tr><td>Distance (m)</td><td>± 162 m</td></tr>
<tr><td>Width (m)</td><td>8 m road plus 3 m drain</td></tr>
<tr><td>Area (m^2)</td><td>maximum 1 782 m^2</td></tr>
</table>
</td></tr>
</table>

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2. **Section 1.3 (Large Ephemeral Tributary):** 30 51 42.6 S; 24 14 00.5 E (Alt. 1315 m)

   Where the large ephemeral tributary reaches the road, it is dammed by the presence of the road and drains down the left shoulder of the road. The floodwater then crosses the road to enter the downstream drainage and later joins the original drainage line. The area along the road is scoured due to periodic flows, and where the flows cross the road to the downstream catchment, flow damage to the road is evident. This large ephemeral tributary (synonymous with Crossing C8 in the Hydrological Assessment Report) requires permanent box culverts.

Start:	30°51'46.87"S; 24°13'57.58"E
Middle:	30°51'45.51"S; 24°13'58.46"E
End:	30°51'44.14"S; 24°13'59.35"E
Distance (m)	± 96 m
Width (m)	8 m road plus 3 m drain
Area (m^2)	**maximum 1 056 m^2**

3. **Section 1.4 (Headwater Drainage Line):** 30 51 29.3 S; 24 14 23.7 E (Alt. 1314 m)

   Road Section 1.4 indicates the section of the road where the road cross over a headwater drainage area. The road obstructs seepage from the small headwater drainage catchment and sedges appear in the wetter clay soil next to the road. It seems that drainage water does not flow over the road (no damage or pooling on the road). Downstream of the road the drainage area is covered with shrub growth. The engineers must decide on the nature of the drainage design (e.g., using riprap, gabion mattresses, and/or other permeable material) that is needed to prevent the elevated road from (a) obstructing surface and sub-surface flow through the system, and (b) prevent pooling on the upstream edge of the road.

Start:	30°51'30.15"S; 24°14'21.38"E
Middle:	30°51'29.16"S; 24°14'23.82"E

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End:	30°51'28.16"S; 24°14'26.20"E
Distance (m)	± 142 m
Width (m)	8 m road plus 3 m drain
Area (m^2)	**maximum 1 562 m^2**

4. **Section 1.5 (Large Ephemeral Tributary):** 30 51 25.7 S; 24 14 12.3 E and 30 51 25.8 S; 24 14 47.1 E (Altitude 1309 m)

   Road Section 1.5 indicates the section of the road where the road cross over two drainage lines: a) the start of a short tributary of the main local drainage line and b) a large ephemeral drainage line crosses the road through an existing pipe culvert. The engineers must decide on the nature of the drainage design (e.g., using riprap, gabion mattresses, and/or other permeable material) across the start of the short tributary of the main local drainage line, and which is needed to prevent the elevated road from (a) obstructing surface and sub-surface flow through the system, and (b) prevent pooling on the upstream edge of the road.

Start:	30°51'25.28"S; 24°14'40.02"E
Middle:	30°51'25.28"S; 24°14'40.09"E
End:	30°51'25.28"S; 24°14'40.18"E
Distance (m)	± 4 m
Width (m)	8 m road plus 3 m drain
Area (m^2)	**± 44 m^2**

5. **Earth Dam (District Road):** 30°51'25.63"S and 24°14'56.91"E

   An 83 m section of district road occurs within 32 m of an earth dam. A Drift with rock fill or similar design structure may need to be adopted to protect the access road from seepage and/or overflow from the earth dam.

Start:	30°51'25.00"S; 24°14'55.18"E
Middle:	30°51'24.84"S; 24°14'56.71"E

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End:	30°51'24.59"S; 24°14'58.25"E
Distance (m)	± 83 m
Width (m)	8 m road plus 3 m drain
Area (m^2)	**maximum 913 m^2**

6. **Section 2.2 (The Brak River Drainage System):** 30°51'6.74"S 24°16'32.57"E and 30°51'9.48"S 24°16'48.11"E

   The crossing over the Brak River is likely to be a Drift with rock fill to spread the surface water into a broadly distributed sheet whilst maintaining unrestricted subterranean flow. The Drift shall be 5 m wide, 100 m long (final length to be determined on site), so the physical footprint will be **circa 500 m^2**.

Start:	30°51'6.74"S 24°16'32.57"E (macro-channel bank)
Middle:	30°51'4.71"S; 24°16'39.98"E
End:	30°51'9.48"S 24°16'48.11"E (macro-channel bank)
Distance (m)	± 531 m (between banks) ± 100 m long (length of Drift)
Width (m)	The drift shall be 5 m wide
Area (m^2) of Drift	**± 500 m^2**

7. **Section 2.3 (Small Ephemeral Tributary):** 30°51'15.66"S 24°17'4.51"E

   Road Section 2.3 crosses a small ephemeral drainage line that originates on the Brak River floodplain. There is a small dam in the upstream drainage. The engineers must decide on the nature of the drainage design (e.g., using riprap, gabion mattresses, and/or other permeable material) that is needed to prevent the elevated road from (a) obstructing surface and sub-surface flow through the system, and (b) prevent pooling on the upstream edge of the road.

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Start:	30°51'14.77"S; 24°17'3.84"E
Middle:	30°51'15.15"S; 24°17'4.87"E
End:	30°51'15.47"S; 24°17'5.83"E
Distance (m)	± 57 m
Width (m)	8 m road plus 3 m drain
Area (m^2)	**maximum 627 m^2**

8. **Section 2.5 (Headwater Drainage):** 30°51'38.05"S 24°17'49.25"E

   At Road Section 2.5, the road crosses a 70 m-wide floodplain area, which is draining an area containing headwater drainage with floodplain flats, into an area with alluvial fans. The engineers must decide on the nature of the drainage design (e.g., using riprap, gabion mattresses, and/or other permeable material) that is needed to prevent the elevated road from (a) obstructing surface and sub-surface flow through the system, and (b) prevent pooling on the upstream edge of the road.

Start:	30°51'37.00"S; 24°17'47.74"E
Middle:	30°51'37.64"S; 24°17'48.83"E
End:	30°51'38.29"S; 24°17'49.93"E
Distance (m)	± 70 m
Width (m)	8 m road plus 3 m drain
Area (m^2)	**maximum 770 m^2**

9. **Earth Dam (Farm Track)**: 30°51'57.84"S; 24°18'6.75"E

   A 117 m section of the farm track occurs within 32 m of an earth dam. A Drift with rock fill or similar design structure may need to be adopted to protect the access road from seepage and/or overflow from the earth dam.

Start:	30°51'55.87"S; 24°18'7.02"E
Middle:	30°51'57.81"S; 24°18'6.40"E
End:	30°51'59.30"S; 24°18'5.17"E

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Distance (m)	± 117 m
Width (m)	A Drift shall be ±5 m wide
Area (m^2)	**585 m^2**

10. There are four sections where the centre line of the proposed alignment is further than 5,5 m from existing farm tracks, and therefore assumed to constitute development of infrastructure (instead of expansion):

New road section 3 is ± 236 m long (start: 30° 51' 35,82'' S & 24° 17' 45,88" E, middle: 30° 51' 38,23'' S & 24° 17' 49,81" E, end: 30° 51' 40,68'' S & 24° 17' 53,67" E), but it crosses **Section 2.5 (Headwater Drainage):** 30°51'38.05"S 24°17'49.25"E. At Road Section 2.5, the road crosses a 70 m-wide floodplain area, which is draining an area containing headwater drainage with floodplain flats, into an area with alluvial fans.

Start:	30°51'37.00"S; 24°17'47.74"E
Middle:	30°51'37.64"S; 24°17'48.83"E
End:	30°51'38.29"S; 24°17'49.93"E
Distance (m)	± 70 m
Width (m)	8 m road plus 3 m drain
Area (m^2)	**± 770 m^2**

New road section 4 is ± 1,2 km long (start: 30° 51' 56,81'' S & 24° 18' 06,53" E, middle: 30° 52' 13,67'' S & 24° 17' 58,87" E, end: 30° 52' 29,99'' S & 24° 17' 58,02" E), but 85 m of the 11 m wide new road section 4 (**935 m^2**) occurs within 32 m of an earth dam.

Start:	30°51'56.81''S; 24°18'06.53"E
Middle:	30°51'58.06"S; 24°18'5.89"E
End:	30°51'59.30"S; 24°18'5.17"E
Distance (m)	± 85 m
Width (m)	8 m road plus 3 m drain
Area (m^2)	± **935 m^2**

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11. An approximately 800 m long underground 110 mm uPVC pressure pipe will be laid from Borehole No. 13 and/or 14 to the point of abstraction alongside a farm track and inside the Cluster 1 footprint. The length (35 m) and width (0,3 m) of the trench within the watercourse (unnamed FEPA drainage line D62D – 05610 SQ) will cover a surface area of **10.5 m²**.

Start:	30°51'36.40"S; 24°18'55.92"E
Middle:	30°51'36.60"S; 24°18'55.29"E
End:	30°51'36.79"S; 24°18'54.65"E
Distance (m)	± 35 m
Width (m)	300 mm wide trench
Area (m²)	**± 10.5 m²**

12. An approximately 400 m long underground 80 mm UPVC or HDPE pipe will be laid from BH5 to the point of abstraction on the Switching Station Dx platform inside the Cluster 1 footprint. The exact position is still to be determined A trench digger will provide a 300 mm wide trench to rock strata – 400 to 600 mm below ground. The length of the wetland intersected by the trench is ± 48 m, making the physical footprint **14.4 m²**.

Start:	30°53'3.90"S & 24°18'52.67"E
Middle:	30°53'4.41"S; 24°18'52.00"E
End:	30°53'4.65"S; 24°18'51.19"E
Distance (m)	± 48 m
Width (m)	300 mm wide trench
Area (m²)	**14.4 m²**

13. An underground 80 mm UPVC or HDPE pipe will be laid from Solar BH4 to the point of abstraction inside the Cluster 1 footprint. The exact position is still to be determined. A trench digger will provide a 300 mm wide trench to rock strata – 400 to 600 mm below ground. The length of the wetland intersected by the trench is ± 50 m, making the physical footprint **15 m²**.

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<table>
<tr>
<td></td>
<td>
<table>
<tr><td>Solar BH4</td><td>30°52'17.66"S & 24°18'38.12"E</td></tr>
<tr><td>Distance (m)</td><td>± 50 m</td></tr>
<tr><td>Width (m)</td><td>300 mm wide trench</td></tr>
<tr><td>Area (m^2)</td><td>15 m^2</td></tr>
</table>
</td>
</tr>
<tr>
<td>GN R 324 Item 18 (g) (ii) (ee) (ii): The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.

g. Northern Cape

ii. Outside urban areas:

(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;

(ii) Areas within a watercourse or wetland; or within 100 metres from the edge of a watercourse or wetland;</td>
<td>
Existing 'Burgerville' District Road (2448)

• The N10/ 'Burgerville' District Road (2448) intersection will be widened from an existing width of approximately 25,7 m to approximately 60 m (measured along the top of the road) to accommodate the required turning circle from both directions and then gradually taper along a length of 20 m to the specified 7 m shoulder width. The existing reserve is likely to be wider than 13,5 m as the average fence line width is 19 m.

Although the site is located within an ESA (not a CBA), it is within 100 m from the edge of the following watercourse:

Section 1.1 (Headwater Drainage Line): 30 52 32.0 S; 24 13 26.9 (Alt. 1322 m)
This is the turn-off from the N10, going eastwards on the northern perimeter of a wide floodplain area. The water resource type nearest to the road consists of headwater drainage on the edge of the extensive floodplain. It is evident that the road does not interfere with any of the drainage line functions.
However, the intersection adjoining the N10 will be widened from an existing width of approximately 25,7 m to approximately 60 m (measured along the top of the road). The outer edge of the turnoff is currently ± 40 m from the edge of the headwater drainage line, and should be ± 22.85 m from the edge of the headwater drainage line once widened by an additional ± 17.15 m.

Existing private road where the District Road intersects the boundary of Farm Riet Fountain No. 39C and continues to the western boundary fence of Sun Central Cluster 1 (300 MW) Solar PV Facility

• The existing ± 2,6 m wide farm tracks will be widened by approximately 5,4 m to 8 m (excluding up to 3 m for the side/cut-off drain). Consequently, the expansion of existing farm tracks within the CBAs 1 and 2, as well as those
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<table>
<tr><td></td><td>occurring within 100 m of a watercourse will trigger this activity, including:
- Wetland (old borrow pit): 30°51'13.38"S, 24°15'51.07"E (centre)
- Section 2.2 Brak River Drainage System: 30°51'6.74"S 24°16'32.57"E and 30°51'9.48"S 24°16'48.11"E,
- Section 2.3 Small Ephemeral Tributary: 30°51'15.66"S 24°17'4.51"E
- Wetland: 30°51'22.09"; 24°17'24.76"E (centre)
- Section 2.5 Headwater Drainage: 30°51'38.05"S; 24°17'49.25"E
- Earth dam: 30°51'57.84"S; 24°18'6.75"E (centre)</td></tr>
<tr><td>GN R 324 Item 23 (bb) (ii) (a) and (c) (g) (ii) (ee): The expansion of—

(bb) dams or weirs where the dam or weir is expanded by 10 square metres or more; or

(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs—

(a) within a watercourse;

(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.

g. Northern Cape

ii. Outside urban areas:

(ee) Critical biodiversity areas as identified in systematic biodiversity</td><td>Existing private road where the District Road intersects the boundary of Farm Riet Fountain No. 39C and continues to the western boundary fence of Sun Central Cluster 1 (300 MW) Solar PV Facility

There are no existing structures, so this activity applies only to the existing infrastructure, specifically existing farm tracks within a watercourse AND the CBAs 1 and 2.

1. The Brak River Drainage System: 30°51'6.74"S 24°16'32.57"E and 30°51'9.48"S 24°16'48.11"E

Apart from the 5 m-wide and 100 m long Drift, the existing ± 2,6 m wide farm track through the Brak River will be widened by approximately 8,4 m to 11 m (allowing 8 m for the roadbed preparation, and up to 3 m for the side/cut-off drain). Consequently, the expansion of existing farm tracks (less 100 m for the Drift) occurring within the Brak River will result in the expansion of at least 3 620.4 m^2 of road (431 m x 8,4 m).

<table><tr><td>Start:</td><td>30°51'6.74"S 24°16'32.57"E (macro-channel bank)</td></tr><tr><td>Middle:</td><td>30°51'4.71"S; 24°16'39.98"E</td></tr><tr><td>End:</td><td>30°51'9.48"S 24°16'48.11"E (macro-channel bank)</td></tr><tr><td>Distance (m)</td><td>± 531 m (between banks)</td></tr></table></td></tr>
</table>

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plans adopted by the competent authority or in bioregional plans;	

	± 100 m long (length of Drift)
Width (m)	The drift shall be 5 m wide 8 m road plus 3 m drain
Expansion of Road (m^2)	**± 3 620.4 m^2**

2. **Section 2.3 (Small Ephemeral Tributary):** 30°51'15.66"S 24°17'4.51"E

   Road Section 2.3 crosses a small ephemeral drainage line that originates on the Brak River floodplain. The existing ± 2,6 m wide farm track through the small ephemeral tributary will be widened by approximately 8,4 m to 11 m (allowing 8 m for the roadbed preparation, and up to 3 m for the side/cut-off drain). Consequently, the expansion of existing farm tracks occurring within the small ephemeral tributary will result in the expansion of **± 478.8 m^2** of road (57 m x 8,4 m).

Start:	30°51'14.77"S; 24°17'3.84"E
Middle:	30°51'15.15"S; 24°17'4.87"E
End:	30°51'15.47"S; 24°17'5.83"E
Distance (m)	± 57 m
Width (m)	8 m road plus 3 m drain
Expansion (m^2)	**± 478.8 m^2**

5. **Wetland:** 30°51'22.09"; 24°17'24.76"E

   The access road runs along the edge of a wetland. The existing ± 2,6 m wide farm track along the edge of the wetland will be widened by approximately 8,4 m to 11 m (allowing 8 m for the roadbed preparation, and up to 3 m for the side/cut-off drain). Consequently, the expansion of existing farm tracks occurring within the wetland will result in the expansion of **± 697,2 m^2** of road (83 m x 8,4 m).

Start:	30°51'21.63"S; 24°17'23.28"E
Middle:	30°51'22.09"; 24°17'24.76"E
End:	30°51'22.60"S; 24°17'26.18"E

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Distance (m)	± 83 m
Width (m)	8 m road plus 3 m drain
Expansion (m^2)	**± 697 m^2**

3. **Earth Dam (Farm track):** 30°51'57.84"S; 24°18'6.75"E

   A 117 m section of the farm track occurs within 32 m of an earth dam. New road section 4 is ± 1,2 km long (start: 30° 51' 56,81'' S & 24° 18' 06,53" E, middle: 30° 52' 13,67'' S & 24° 17' 58,87" E, end: 30° 52' 29,99'' S & 24° 17' 58,02" E), but 85 m of the 11 m wide new road section 4 (**935 m^2**) occurs within 32 m of an earth dam. The remaining 32 m of existing ± 2,6 m wide farm track within 32 m of the earth dam will be widened by approximately 8,4 m to 11 m (allowing 8 m for the roadbed preparation, and up to 3 m for the side/cut-off drain). Consequently, the expansion of existing farm track occurring within 32 m of the earth dam will result in the expansion of **± 269 m^2** of road (32 m x 8,4 m).

Start:	30°51'55.87"S; 24°18'7.02"E
Middle:	30°51'56.34"S; 24°18'6.78"E
End:	30°51'56.81''S; 24°18'06.53"E
Distance (m)	± 32 m
Width (m)	8 m road plus 3 m drain
Expansion (m^2)	**± 269 m^2**

Section 24E of NEMA requires that every EA must ensure that adequate provision is made for the ongoing management and monitoring of impacts of the activity on the environment throughout the life cycle of the activity. The life cycle of the activity is determined by the scope of the activity. If the activity requires EA for development only, the development phase is the scope of the activity. If the activity requires EA for development and operation, the development and operational phases make up the scope of the activity (Environmental Authorisation Validity Period Explanatory Document, 2018). Only when the activity includes such an operational component, the relevant Scoping and Environmental Impact Assessment, the Environmental Authorisation (including any conditions thereto) and the EMPr can include aspects regarding the operation scope of the activity e.g., mitigation actions for the operational phase (Environmental Authorisation Validity Period Explanatory Document, 2018).

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None of the listed and/or specified activities that are triggered, and which require environmental authorisation, specifically include the term '*and related operation*' (**Table 9**). Consequently, the scope of the activities pertaining to this project does not have an operational (or decommissioning) component.

The activities and associated environmental aspects, or elements of the contractor's activities that interact or can interact with the environment, are identified below (**Table 10**).

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Table 10. Detailed Description of the Phases, Activities and Environmental Aspects of the Development (and that will be managed by this EMPr).

PHASES, ACTIVITIES, SERVICES & PRODUCTS ON PREFFERED FOOTPRINT	SUB-ACTIVITY	ENVIRONMENTAL ASPECT
PLANNING & DESIGN		
LEGAL COMPLIANCE - Acquiring authorisations, permits and/or licenses for activities/uses undertaken during construction	Protected Species	NPNCA, 2009/NFA, 1998/NEMBA 2004
	Invasive Species	NEMBA, 2004
	Water Care Work Registration	Water Act, 1956
	Water Use S21(c) and (i)	NWA, 1998
	Water Use S21 (a)	NWA, 1998
	Water Use S21 (b)	NWA, 1998
	Water Use S21 (g)	NWA, 1998
	Eskom 400 kV servitude (Line 1 and 2)	Servitude Agreement and Letter of Consent
	SANRAL	Permission
	Department of Roads & Public Works	Permission
	Department of Mineral Resources and Energy	Permission
	Department of Agriculture, Land Reform and Rural Development (DALR&RD)	Permission
	District and Local Municipality	Permission
	Emthanjeni Local Municipality	Permission
	Compliance Monitoring (ECO Appointment)	Environmental Authorisation
CONSIDERATION OF ALTERNATIVES - including Location, Layout and Design, Magnitude, etc.	Alternative Sites	NA
	Alternative Technologies	NA
CHANGE LAND USE	Rezoning Land use application for a "Renewable Energy Plants Zone" submitted through the Emthanjeni LM for a decision by the District Municipal Planning Tribunal	SPLUMA and the ELM Land Use Scheme 2022
	Uncertainty (SIA)	Fires

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	Repair and rebuilding District Gravel Road	Congestion and delays to local farmers and residents.
PLANNING	Commencement & Construction times	
	Labour	Job Creation
	Dust suppression	Water Usage
	Quarry	
	Space	Magnitude of physical disturbance
LAYOUT & DESIGN	Installing Servitude Fence and Access Control	Security
		Terrestrial barrier
	Repairing and rebuilding access road including within 100 m of a watercourse or 500 m of a wetland/pan	Surface water hydrology (run-off)
		Interfering with ecological processes and biodiversity pattern
	Effluent Infrastructure (Sanitation)	Effluent disposal
	Water infrastructure (Supply)	Groundwater abstraction, pipeline, purification and storage
	Roads, Crossings & Stormwater outlets	
	Buffers	Specialist Assessment Reports
	Flood lines	
Pre-construction		
Planning	Social Impact Management Plan	Social Impact Management Plan
	Stakeholder Engagement	Communication
		Grievance Mechanism
		Compensation and Claims
	Recruitment	Recruitment
	Procurement	Procurement
	Traffic Management Plan	Traffic

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	Fire Management Plan	
	Dust Monitoring	
	Surface Water Monitoring Plan	
	Heritage Management Plan	
	Stormwater Mgt Plan	
	Rehabilitation Plan	
	Waste Management Plan	
Contractor Readiness	Awarding of preferred bidder	
	Acquiring permits, licenses, Letters of consent and permissions	ESKOM
		SANRAL
		DMRE
		Other approvals
	Employment of labour	Appointment
		Training
	Development of Method Statements	
	Commencement & Construction times	
Site Establishment (Layout)	Site Selection	
	Site Area (size)	
	Access Restricted Areas	
	Perimeter/boundary fence	
	Construction Camp	Site Offices
		Lighting
		Flammable and other hazardous substance stores
		Laydown areas
		Machinery Parking Area

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		Maintenance and workshop areas
		Waste storage
		Generators
		Fuel storage and refuelling area
		Vehicle wash bays
		Sanitation/Ablutions
		Eating/Rest Areas
		Accommodation
		Kitchen
	Staging Area	
	Batching plant/Cement-mixing area	Washing Facility
Construction		
Employee Management	Communicating	Noise generation
	Eating (lunch breaks)	organic and inorganic waste arisings
	Abluting	Land contamination
	Keeping warm or cooking	Starting fires
	Harvesting muthi plants, collecting firewood and/or poaching	Removal of medicinal plants, dead wood and/or wildlife
Plant Management	Driving & Transport	Speed (en route to & from site)
		Generating emissions incl. noise and dust
		Congestion for other road users/Disruption to landowners
		Damage to the roads or environment
	Operating & Parking Plant	Generating emissions incl. noise and dust
		Causing spills
	Maintenance	Contamination
	Washing plant	Contamination

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Water management (abstraction, storage and use)	Monitoring	
	Pumping from a borehole	Use of natural resources
	Storage in tanks	Overflow and surface water run-off
	Treatment	
	Dust suppression	Use of natural resources
		Surface water run-off
General and Hazardous Waste Management	Wastewater Treatment Plant/ Disposal of domestic wastewater	Contamination
	Handling and Collection (incl. chemical toilets & concrete slurry)	Contamination
	Reuse, Recycle	Health and safety
	Storage	Contamination
		Unpleasant odours
	Transport	Contamination
	Disposal	Contamination
Handling Hazardous Substances	Fuel Storage	Contamination
	Refuelling	Causing spills
	Cement Storage	Contamination
	Mixing concrete on site	Effluent (cement slurry) discharges and contamination
	Importing Ready Mix/ Concrete Batching Plant	Contamination, emitting
	Explosives	Land contamination
	Paint	Contamination
	Lubricant, oil	Contamination
	Oil-contaminated water Storage and Disposal	Contamination
Alien Plant Management	Disturbance to natural areas	Favourable conditions for alien plant/animal recruitment.

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Fire Management	Wildfires	
Stormwater management and erosion control		
Chance Find Protocol		
Security		Influx of contractors and workers into the area.
Health and Safety		
Sourcing materials (aggregate) for roads and concrete	Importing aggregate	
Linear Infrastructure Crossings	Roads	Grading existing & new roads/Removal of Vegetation /Sedimentation
		Importing material/ Shaping/Diversion Works/Sedimentation /Erosion
		Installing culverts/Watercourse contamination
	Underground Pipelines	Clearing & Grubbing/Removal of Vegetation/Sedimentation
		Importing material/ Trenching/Diversion Works/Sedimentation /Erosion
		Installing pipes/Watercourse contamination
Clearing/Grubbing and Grading	Access Road, pipeline, construction camp & staging area	Removal of vegetation
		Creating bare surfaces susceptible to erosion, corrugations, potholes and puddles.
Earthworks	Excavations/Trenching	
Blasting		Dust, Noise & Flyrock generation
Stockpiling and Storing (Laydown)	Mulch, topsoil, aggregate, spoil and infrastructure	Burying, smothering, impeding, sedimentation, emitting
Post-construction (incl. Construction)		
Rehabilitation	Disturbed areas - terrestrial	Temporary structures and infrastructure
		Soil contamination (hydrocarbon spills)
		Surface water hydrology (run-off)
		Bare ground

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		Compaction
		Compromised topsoil
		Overgrazing
	Disturbed areas - aquatic	Temporary structures and infrastructure
		Soil contamination (hydrocarbon spills)
		Reshaped bed and banks
		Bare ground
		Compromised topsoil
		Overgrazing
Maintenance and Monitoring		Erosion
		Dust
		Water Quality/Quantity
		Compromised topsoil
		Revegetation
		Alien plant recruitment

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Section 3: LAYOUT MAP OF PROPOSED ACTIVITY

(c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers.

"The Environmental Management Programme (EMPr) to be submitted as part of the EIAr must include the following:
ii. The final site layout map.
iv. An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process.
v. A map combining the final layout map superimposed (overlain) on the environmental sensitivity map."

Refer to **Figures 20 – 22** below.

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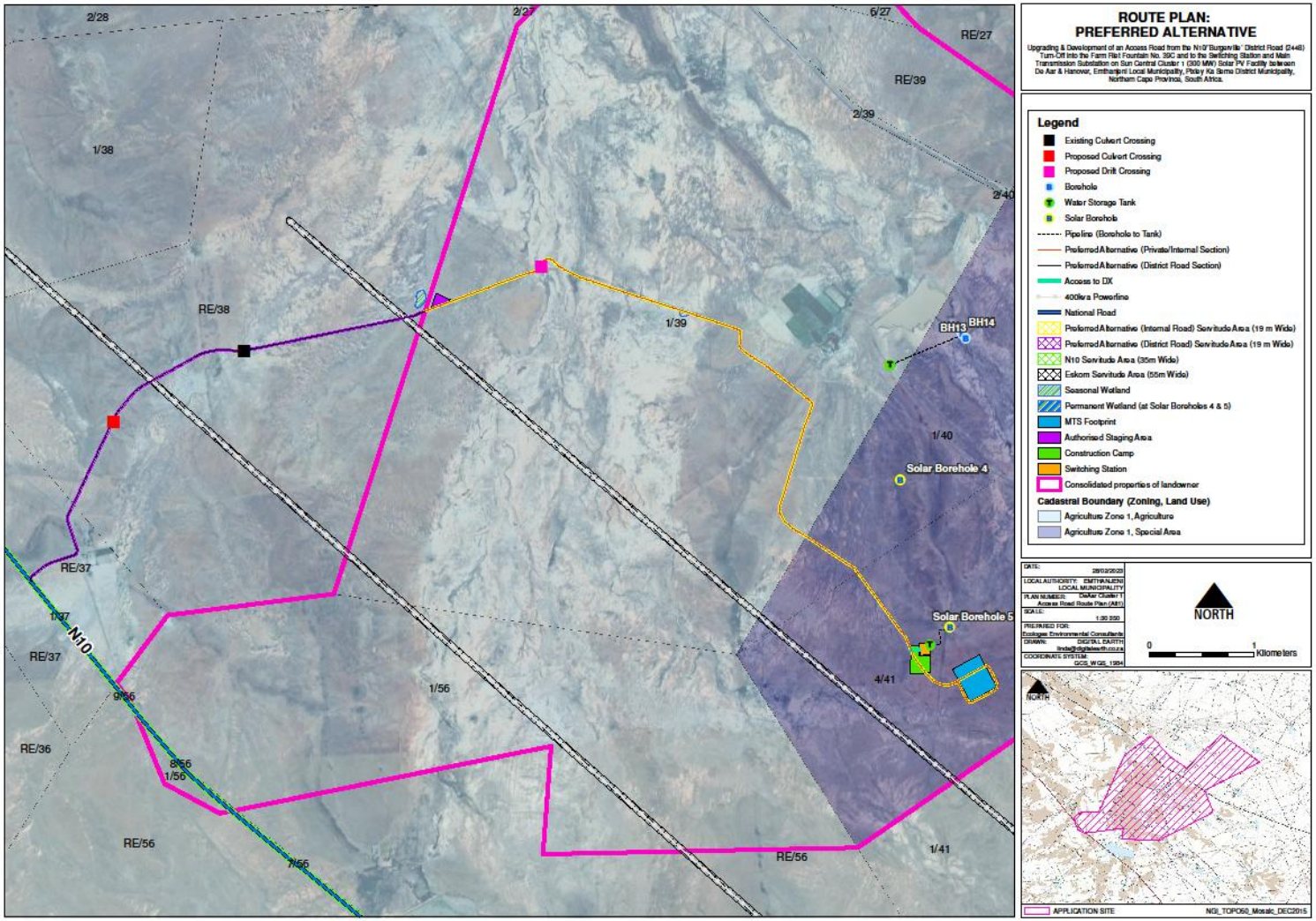

Figure 20: Layout map of the access road.

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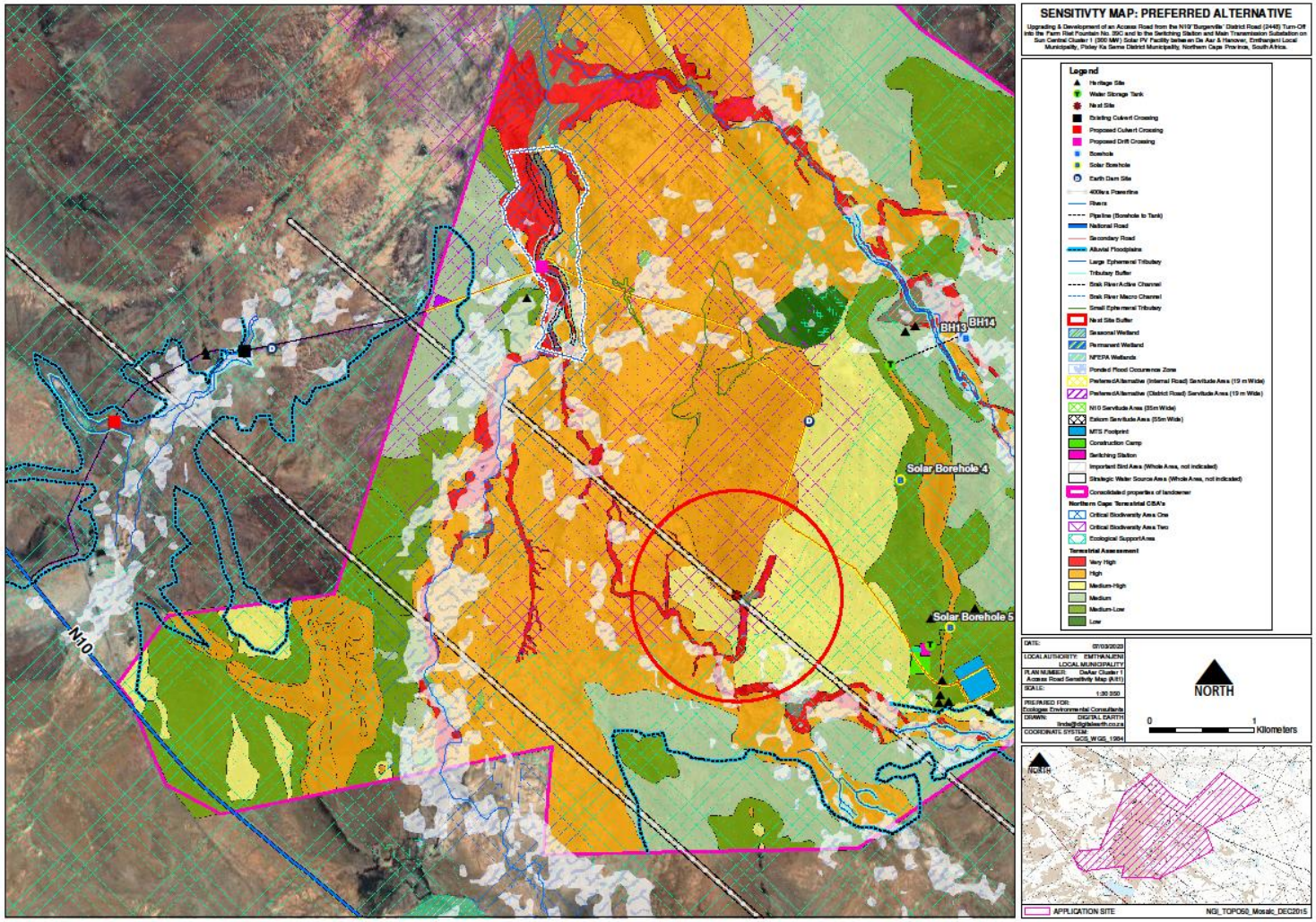

Figure 21: Layout and sensitivity map for the access road.

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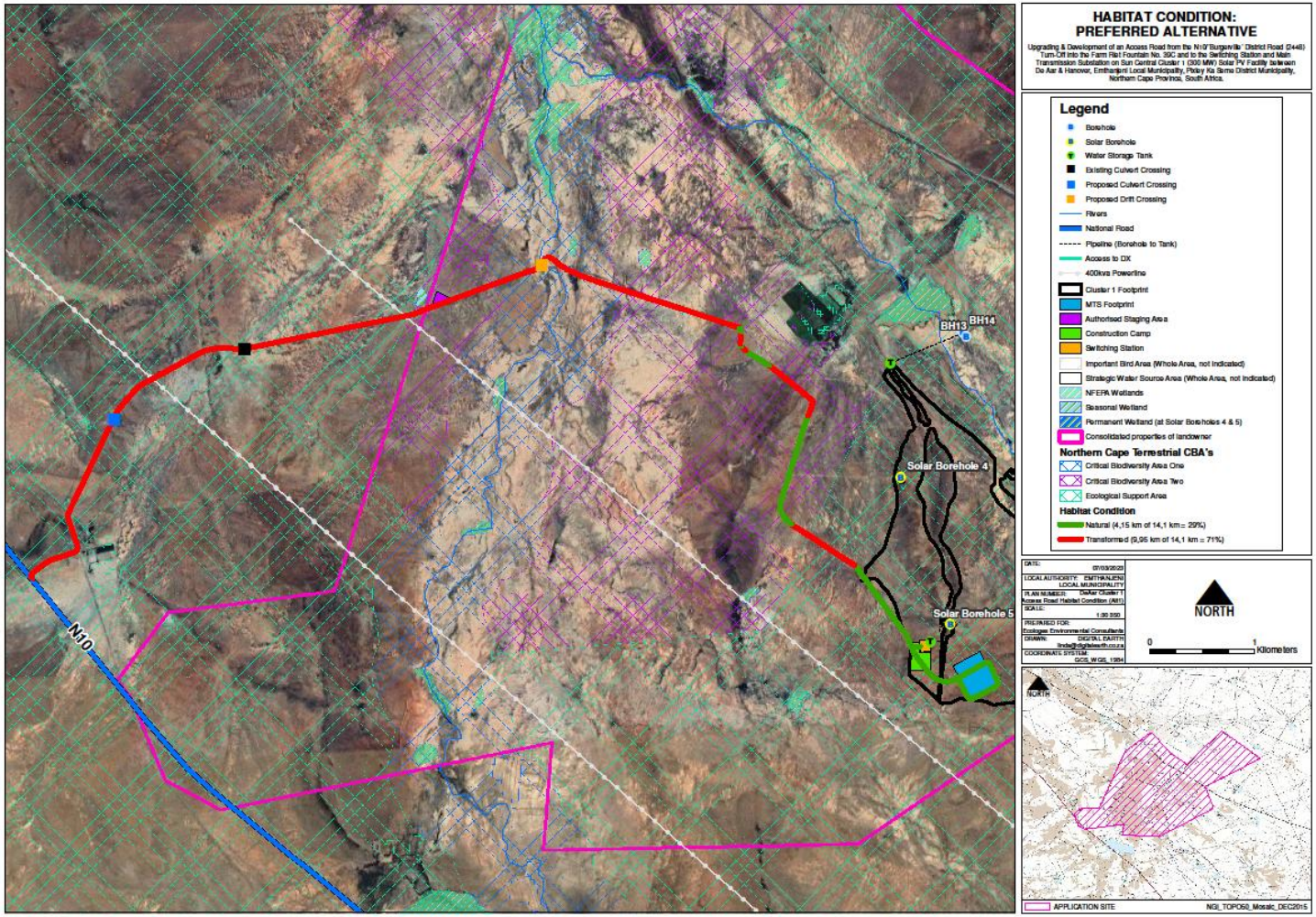

Figure 22: Habitat condition for the access road.

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Section 4: ROLE PLAYERS AND RESPONSIBILITIES

The approved EMPr shall be printed, completed, and kept in an on-site file designated for all matters pertaining to environmental management. Co-operation is required between the applicant, engineer, contractor, and ECO to ensure that activities are managed in an amicable and responsible manner and in accordance with the philosophies of environmental legislation and principles of the EMPr.

This EMPr is predominantly compiled for the management of construction activities associated with the upgrade and development of the access road, once the Planning and Authorisation phases are complete. The tabulated management protocols assign responsibilities to one or more role players. Those responsibilities and accountabilities are described in more detail below to avoid any uncertainty.

Applicant

The applicant remains ultimately accountable for ensuring that the development is implemented according to the requirements of the EMPr. Although the applicant delegates specific responsibilities to role players to perform functions on his / her behalf, the ultimate accountability cannot be delegated. The applicant is responsible for ensuring that sufficient resources (time, financial, manpower, equipment, etc.) are available to ensure the effective and efficient implementation of any management actions that fall under his/her responsibility. The responsibility of restoring the environment in the event of any negligence, which leads to damage of the environment, also falls on the applicant.

The applicant must ensure that the EMPr (and EA) are included in tender documents and the contracts of appointment so that the appointed engineer and contractor are legally bound to the conditions of the EMPr (and EA).

The applicant must appoint an Environmental Control Officer (ECO) prior to commencement of construction, to help identify conditions that need to be fulfilled prior to commencement and avoid any unnecessary delays.

The applicant must, for the period during which the EMPr (and EA) remain valid, (a) ensure that compliance with the conditions of the EMPr (and EA) is audited by an independent person with the relevant environmental auditing expertise (IEA); and (b) submit an environmental audit report to the DAEARD&LR at intervals stipulated in the EA, alternatively in accordance with Regulation 54A(3) of the EIA Regulations (2014), as amended.

The applicant must notify all potential and registered I&APs of the submission of an environmental audit report within 7 days of the date of submission to the DAEARD&LR and make such report immediately available (a) to anyone on request; and (b) on a publicly accessible website, if the applicant has such a website.

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If the findings of the environmental audit report indicate (a) insufficient mitigation of environmental impacts associated with the undertaking of the activity; or (b) insufficient levels of compliance with the EMPr (and EA), the applicant must, when submitting the environmental audit report to the DAEARD&LR, submit recommendations to amend the EMPr to rectify the shortcomings identified in the environmental audit report.

Such recommendations must have been subjected to a public participation process, which process has been agreed to by the DAEARD&LR and was appropriate to bring the proposed amendment of the EMPr to the attention of potential and registered I&APs, including organs of state which have jurisdiction in respect of any aspect of the relevant activity and the competent authority, for approval by the DAEARD&LR.

Engineer

The engineer, as the applicant's agent on site, is bound to the conditions of the EMPr through his/her contract with the applicant and is responsible for ensuring their effective and efficient implementation. The Engineer is responsible for ensuring that sufficient resources (time, financial, manpower, equipment, etc.) are available to ensure the effective and efficient implementation of any management actions that fall under his/her responsibility.

Contractor

The contractor, as the applicant's agent on site, is bound to the conditions of the EMPr through his/her contract with the applicant and is responsible for ensuring their effective and efficient implementation. The contractor shall be responsible for the actions undertaken by all their employees including sub-contractors. The contractor must thoroughly familiarise him/herself with the EMPr requirements before coming onto site and must request clarification on any aspect of these documents, should they be unclear. The contractor is responsible for ensuring that sufficient resources (time, financial, manpower, equipment, etc.) are available to ensure the effective and efficient implementation of any management actions that fall under his/her responsibility. The contractor must comply with all instruction (whether verbal or written) given by the environmental manager, project manager or site engineer in terms of the EMPr.

Site Environmental Officer (SEO)

The Site Environmental Officer (SEO) shall be appointed by the contractor to implement and monitor implementation of the EMPr daily. Findings relating to any impacts resulting from current construction activities will be recorded in a site diary.

The SEO shall also ensure that all construction activities are implemented according to the relevant conditions of the EMPr by establishing Standard Operating Procedures (SOPs)/Method Statements for each construction activity (or "management categories".

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The SEOs development of SOPs has been facilitated by assigning management categories to each of the management actions identified in the management protocols (**Section 7**).

The management categories include:

1. Legal Compliance
2. Change Land Use
3. Planning (Planning & Design Phase)
4. Layout & design
5. Planning (Pre-construction Phase)
6. Contractor Readiness
7. Site Establishment (Layout)
8. Employee Management
9. Plant Management
10. Water management (abstraction, storage and use)
11. General and Hazardous Waste Management
12. Handling Hazardous Substances
13. Alien Plant Management
14. Fire Management
15. Stormwater management and erosion control
16. Chance Find Protocol
17. Security
18. Health and Safety
19. Sourcing materials (aggregate) for roads and concrete
20. Linear Infrastructure Crossings
21. Clearing/Grubbing and Grading
22. Earthworks
23. Blasting
24. Stockpiling and Storing (Laydown)
25. Rehabilitation
26. Maintenance and Monitoring

The SEO shall also be responsible for (a) training the workforce on how to carry out their tasks according to the applicable SOPs, as well as (b) preparing and presenting environmental inductions.

Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is appointed by the applicant as a compliance monitor of the implementation of the EMPr. He/she must form part of the project management team and be involved in all aspects of decision-making that can influence environmental compliance on the site.

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The ECO must conduct site inspections to assess compliance with the EMPr (and EA), attend relevant project management meetings, and provide feedback on any findings associated with the development. In addition, the ECO is responsible for:

- Liaising with relevant authorities;
- Liaising with contractors regarding environmental management; and
- Appointing a competent person / institution to be responsible for any specialist monitoring (if required).

Monitoring must track past findings and, on a sampled basis, confirm compliance using verifiable evidence, such as existing documentation, conducting interviews with managers and personnel, and observing activities on site.

The ECO has the right to enter the site and undertake monitoring at any time, subject to compliance with health and safety requirements applicable to the site (wearing safety boots, head gear, mouth mask etc.).

Independent Environmental Auditor (IEA)

The IEA is appointed by the applicant to conduct audits and submit environmental audit reports to the DAEARD&LR at intervals as indicated in the EA.

The environmental audit report must –

(a) provide verifiable findings, in a structured and systematic manner, on (i) the level of compliance with and performance against the provisions of the EMPr (and EA); and (ii) the ability of the measures contained in the EMPr to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an ongoing basis; and

(b) contain all information set out in Appendix 7 of the EIA Regulations (2014), as amended.

If the findings of the environmental audit report indicate (a) insufficient mitigation of environmental impacts associated with the undertaking of the activity; or (b) insufficient levels of compliance with the EMPr (and EA), the IEA should propose recommendations to amend the EMPr to rectify the shortcomings identified in the environmental audit report.

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Section 5: COMPLIANCE MONITORING

(k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);

(l) a program for reporting on compliance, considering the requirements as prescribed by the Regulations;

Mechanism for Monitoring Compliance

The SEO shall maintain a site diary to record any environmental impacts, that is any change to the environment, whether adverse or beneficial, wholly, or partially resulting from construction activities.

The ECO and IEA will be responsible for monitoring and reporting on compliance for the life cycle of the activity.

Site inspections shall be a systematic and documented process of gathering verifiable evidence to objectively determine the extent to which the audit criteria are complied with. The audit criteria (or reference conditions) against which compliance is assessed, includes the management actions contained in this EMPr and the conditions of the EA.

The Environmental Compliance or Audit Reports shall identify the actual and potential transgressions, describe the impacts, provide verifiable evidence (photographs, records, or statements) and recommend corrective and preventive actions (including completion dates). Environmental Compliance Reports prepared by the ECO shall measure the applicant/contractor's level of compliance with the aforesaid criteria, whereas Environmental Audit Reports prepared by the IEA shall measure the level of compliance with and performance against the provisions of the EMPr (and EA).

The project management team should engage in bi-weekly or monthly site meetings so that the ECO can give regular feedback, and any identified concerns can be addressed timeously.

A Programme for Reporting on Compliance

A Site Environmental Officer (SEO) is appointed by the contractor to *inter alia* monitor implementation of the EMP daily, and record findings relating to any impacts resulting from construction activities in a site diary.

An Environmental Control Officer (ECO) is appointed by the applicant to monitor compliance with the EMPr (and EA). The ECO shall undertake bi-weekly site inspections, and submit Environmental Compliance Reports to the DAEARD&LR within 14 days of the site inspection, unless otherwise specified in the EA.

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An Independent Environmental Auditor (IEA) is appointed by the applicant to conduct audits and submit Environmental Audit Reports to the DAEARD&LR at intervals as indicated in the EA. The applicant must notify all potential and registered I&APs of the submission of an environmental audit report within 7 days of the date of submission to the DAEARD&LR. If the applicant submits recommendations to amend the EMPr to rectify any shortcomings identified in the environmental audit report, then such recommendations must have been subjected to a public participation process.

Mechanism for Resolving Non-compliance

The EMPr is a legally binding document and should form part of the contract. Should the contractor fail to comply with the EMPr (or EA) the following steps are suggested:

Step 1. The ECO or IEA meets with the contractor and points out the deviation from the EMPr either during the site inspection or closure meeting. The ECO or IEA and Contractor verbally agree on a solution and deadline, depending on the nature and severity of the finding.

Step 2. The non-compliance is recorded by the ECO or IEA in the Environmental Compliance/Audit Report, as well as the proposed corrective action and the time within which it needs to be implemented. In the absence of a prescribed deadline or completion date, findings shall, as far as is practical, be corrected or prevented immediately upon being found to occur.

Step 3. Should the non-compliance not be corrected within the required timeframe the Chief Resident Engineer (CRE) or Project Manager (PM) shall order the contractor to suspend construction in that specific area or the project until the activity at variance with the EMPr is corrected and or remedial actions taken. Any cost incurred by such action shall be for the account of the contractor.

Step 4. Where there is non-compliance with the EMPr and no evidence of the contractor intending to comply, the applicant may terminate the contract due to non-compliance (breach of contract). Such termination does not negate any legal proceedings that may result from the non-compliance.

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Section 6: ENVIRONMENTAL AWARENESS PLAN

The EMPr needs to include, *inter alia*:

(m) an environmental awareness plan describing the manner in which-

(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and

(ii) risks must be dealt with to avoid pollution or the degradation of the environment; and

(n) any specific information that may be required by the competent authority.

This section of the report is included to comply with Section 24N(3)(c) of the NEMA and the EIA Regulations (2014), as amended.

Ongoing environmental awareness training should be provided to all employees to promote the effective implementation of the EMPr's management actions throughout the life cycle of the activity/project. The applicant shall ensure that the project team, including the engineer, contractor, and any sub-contractors are adequately trained on the implementation of the EMPr, (and EA) prior to commencing with construction through environmental inductions, as well as during construction through regular toolbox talks. Refresher environmental awareness training should be made available as and when required.

Environmental Inductions

The SEO shall be responsible for preparing and presenting environmental inductions. A slideshow can be developed using visual aids to explain the potential impacts and their management. Inductions shall be undertaken prior to the commencement of construction. If any new personnel will be contracted or arrive on site during the construction period, they should attend an environmental induction beforehand. Inductions shall be targeted at two distinct levels of employment: management (applicant, architect, engineer, contractor / site agent) and labourers (including the site foreman). Where possible the presentation will be conducted in the language of the employees.

The Environmental induction for management shall include mitigations that are relevant to or require management's involvement prior to implementation including, but not limited to, measures required during the planning and design phase and pre-construction phase, e.g., site establishment.

The Environmental induction for the contractor's labourers and foreman shall include a synopsis of key management actions including the environmental impacts they are meant to avoid and the desired management outcomes, such as:

- Staff conduct including, noise, poaching, handling dangerous fauna such as snakes and movement;

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- The steps to be taken should any archaeological artefacts be located or unearthed;
- Procedures to be followed when working near or within sensitive areas;
- No-go areas;
- Wastewater management procedures;
- Water usage and conservation;
- Solid waste management procedures;
- Sanitation procedures;
- Fire prevention;
- Disease prevention; and
- (generic) Emergency procedures.

Training

The SEO is responsible for making staff aware of their individual roles and responsibilities in achieving compliance with the EMPr (and EA) by preparing and presenting training to the workforce on standard operating procedures (SOPs)/Method Statements linked to their construction activities (e.g., waste management, mixing concrete, operating equipment, etc.). The training shall include:

- A description of significant environmental impacts, actual or potential, related to their work activities and mitigation measures to be implemented when carrying out those activities; and
- Any adopted Emergency Response Plans (see **Appendix G**).

The SEO must allow for sufficient sessions to train all personnel with no more than 20 personnel attending each course.

Toolbox Talks

The SEO and ECO shall undertake an informal training needs analysis throughout construction to identify appropriate environmental topics and the appropriate labourers to target. The analysis shall be informed by the findings contained in the site diary and compliance reports. Applicable toolbox talks shall be prepared and given by the SEO.

The SEO shall keep records (e.g., signed attendance registers) of environmental inductions, training and toolbox talks in an on-site file designated for all matters pertaining to environmental management.

Posters

It is recommended that posters are developed and placed in highly visible areas at the construction or contractor's camps to provide a constant awareness of key environmental issues, any required information, such as emergency numbers, and remind employees of their duties regarding environmental protection.

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Section 7: IMPACT MANAGEMENT

(d) a description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed, and mitigated as identified through the environmental impact assessment process for all phases of the development including-

(i) planning and design;

(ii) pre-construction activities;

(iii) construction activities;

(iv) rehabilitation of the environment after construction and where applicable post closure; and

(v) where relevant, operation activities;

(e) a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d),

(f) a description of proposed impact management actions, identifying the way the impact management objectives and outcomes contemplated in paragraph (d) and (e) will be achieved, and must, where applicable, include actions to -

(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;

(ii) comply with any prescribed environmental management standards or practices;

(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and

(iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;

(g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);

(h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);

(i) an indication of the persons who will be responsible for the implementation of the impact management actions;

(j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;

Ecoleges set out to identify, predict and evaluate impacts and risks firstly by identifying the activities that are to be undertaken during the development of the listed or specified activity(ies). The activities were used to identify environmental aspects, which are defined as elements of an

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organisation's activities, products or services that interact or can interact with the environment (ISO 14001). The environmental aspects were used to identify environmental impacts, which are defined as any change to the environment, whether adverse or beneficial, wholly, or partially resulting from an organisation's environmental aspects (ISO 14001). Finally, management actions were sought and tailored to achieve measurable targets (quantitative and qualitative) and ensure desired environmental outcomes that are dictated by legal requirements, scientific standards, social acceptability and/or environmental best practice.

Management protocols have been prepared for each attribute of the receiving environment, including (1) Legal System, (2) Terrestrial fauna, (3) Terrestrial flora, (4) Aquatic fauna, (5) Aquatic flora, (6) Soil and Rock, (7) Ground and Surface Water, (8) Atmosphere, (9) Terrestrial and Avian ecosystem, (10) Aquatic ecosystem, (11) Economical, (12) Social, (13) Property, (14) Land use, (15) Health and Safety, (16) Security, (17) Public services, (18) Visual aesthetics and (19) Heritage and Culture.

Each management protocol provides management actions to avoid, mitigate or remedy various construction-related impacts and achieve stated targets that will ensure desired outcomes for an attribute of the receiving environment. Indicators are used to measure the level of compliance, whereas targets (and outcomes) are used to measure the level of performance.

However, if this EMPr is to be effectively and efficiently implemented by the applicant and contractor, they must develop Standard Operating Procedures (SOPs)/Method Statements for the different activities.

The SEOs development of SOPs on behalf of the contractor has been facilitated by assigning management categories to each of the management actions identified in the management protocols (**Section 7**).

Although impacts and management actions have been addressed under the various project development phases, they are not intended to be mutually exclusive, and impacts from one phase may occur in subsequent phases.

Any appendices to this EMPr form part of the EMPr and must be implemented accordingly.

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PLANNING AND DESIGN PHASE

Table 11. Management Protocol for Legal System

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
01	Legal Compliance	Picking a protected, specially protected, or where applicable indigenous plants, without the applicable permits and/or license constitutes an offence.	Lawful activities involving any threatened or protected flora.	A license under the NFA, 1998, a permit under NCNCA, 2009 and/or a permit under NEMBA, 2004.	Vegetation clearance may not commence without the applicable permit(s) and/or license to carry out a restricted activity involving, or cutting, disturbing, damaging or destroying any protected or specially protected plants, as well as picking indigenous plants on a public road, on land next to a public road within 100 m from the centre of the road, and within 100 m from the middle of a natural watercourse, whether wet or dry, on either side of the natural water course.	Holder, Contractor	Prior to commencement of clearing and grubbing.	Compliance to be verified by ECO and IEA.
01	Legal Compliance	Picking a protected, specially protected, or where applicable indigenous plants, without the applicable permits and/or license constitutes an offence.	Lawful activities involving any threatened or protected flora.	A license under the NFA, 1998, a permit under NCNCA, 2009 and/or a permit under NEMBA, 2004.	Only apply for permit(s) and/or a license to "pick" a threatened or protected plant if it is not possible to relocate the footprint.	Holder Engineer	Pre-construction Once-off	Compliance to be verified by ECO and IEA.
01	Legal Compliance	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) – Section 73(2) "A person	Lawful activities involving any listed invasive species	Notification in terms of NEMBA, 2004	The holder of the Environmental Authorisation must notify the Minister (DFFE) and/or MEC (DAEARD&LR), in writing, of the listed invasive species occurring in the project area.	Holder	Prior to commencement	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		who is the owner of land on which a listed invasive species occurs must- (a) notify any relevant competent authority, in writing, of the listed invasive species occurring on that land; (b) take steps to control and eradicate the listed invasive species and to prevent it from spreading; and (c) take all the required steps to prevent or minimise harm to biodiversity."						
01	Legal Compliance	Water Care Works must be registered with the Director-General of the Department of Water Affairs.	Compliance	A registration certificate from the Director-General of the Department of Water Affairs.	Apply for the registration of a Water Care Work (wastewater treatment plant) to the Director-General of the Department of Water Affairs on a form obtained from him before it is commissioned.	Holder Contractor	Prior to operation of Water Care Works	Compliance to be verified by ECO and IEA.
01	Legal Compliance	Water Care Works must be registered with the Director-General of the Department of Water Affairs.	Compliance	A registration certificate from the Director-General of the Department of Water Affairs.	The owner of the Water Care Work must display in a prominent place on that work a copy of the certificate of registration.	Holder Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
01	Legal Compliance	Water Care Works must be registered with the Director-General of the Department of Water Affairs.	Compliance	A registration certificate from the Director-General of the Department of Water Affairs.	The owner of the Water Care Work must employ the minimum number of persons of the classes prescribed in Schedule IV of the Regulations for the Erection, Enlargement, Operation & Registration of Water Care Works (1985), as amended.	Holder Contractor	Prior to operation of Water Care Works	Compliance to be verified by ECO and IEA.
01	Legal Compliance	Water Care Works must be registered with the Director-General of the Department of Water Affairs.	Compliance	A registration certificate from the Director-General of the Department of Water Affairs.	The owner of the Water Care Work must notify the Director-General in writing during January of each year, of the employment of any person referred to in Schedule III of the Regulations for the Erection, Enlargement, Operation & Registration of Water Care Works (1985), as amended, during the past year.	Holder Contractor	January of each year	Compliance to be verified by ECO and IEA.
01	Legal Compliance	Any unauthorised activity within the Department's (DWS) regulated area of a watercourse constitutes an offence. Those activities associated with the development which require a S21(c) and (i) authorisation, include: 1. Repairing and rebuilding an	Lawful Water Use S21(c) and (i) NWA, 1998	Water use license for section 21 (c) and (i)	Construction may not commence within the DWS regulated area without a water use authorisation (a General Authorisation or Water Use License) for Section 21(c) and (i) water uses.	Holder	Prior to commencement of those construction activities relating to S21 (c) and (i) water uses.	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		access road including where applicable drainage structures across eight (8) watercourses and within 100 m of two earth dams; and 2. Installing underground water pipelines across the active channel of unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River), and an artificial wetland surrounding Solar Borehole No. 4 and No.5.						
01	Legal Compliance	Taking of water without a license for purposes other than reasonable domestic use and livestock watering, and which exceed the limits provided in the General Authorisation, constitutes an offence.	Lawful Water Use S21(a) NWA, 1998	Water Use License for section 21(a)	Abstraction of groundwater may not commence from identified boreholes without a water use authorisation (a General Authorisation or Water Use License) for Section 21(a) water use	Holder	Prior to commencement of those construction activities relating to a S21(a) water use, e.g., taking water for mixing concrete, dust suppression and potable water usage.	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
01	Legal Compliance	Storing water without a license for purposes other than rainfall run-off from a roof, and which exceed the limits provided in the General Authorisation, constitutes an offence.	Lawful Water Use S21(b) NWA, 1998	Water Use License for section 21(b)	Storage of groundwater may not commence without a water use authorisation (a General Authorisation or Water Use License) for Section 21(b) water use and only if the proposed storage tanks exceed the permissible storage volume for the property (in terms of the GA) when combined with existing storage on the same property.	Holder	Prior to commencement of those construction activities relating to S21(b) water uses, e.g., installing storage tanks.	Compliance to be verified by ECO and IEA.
01	Legal Compliance	The unauthorised disposal of waste in a manner which may detrimentally impact on a water resource, and storage of domestic and biodegradable industrial wastewater for the purpose of re-use, constitutes an offence.	Lawful Water Use S21(g) NWA, 1998	Water Use License for section 21(g)	The disposal and storage of wastewater may not commence without a water use authorisation (a General Authorisation or Water Use License) for Section 21(g) water use.	Holder	Prior to commencement of those construction activities relating to S21(g) water uses, e.g., installing an on-site disposal facility and storage tanks for treated effluent.	Compliance to be verified by ECO and IEA.
01	Legal Compliance	The unauthorised disposal of waste in a manner which may detrimentally impact on a water resource, and storage of domestic and biodegradable industrial	Lawful Water Use S21(g) NWA, 1998	Water Use License for section 21(g)	Similarly, the storage of waste for reuse or disposal, e.g., untreated effluent, such as concrete slurry from concrete mixer trucks during construction and contaminated soil, may not commence without a water use authorisation (a General Authorisation or Water Use	Holder	Prior to commencement of those construction activities relating to S21(g) water uses, e.g., installing an	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		wastewater for the purpose of re-use, constitutes an offence.			License) for Section 21(g) water use.		on-site disposal facility and storage tanks for treated effluent.	
01	Legal Compliance	The unauthorised disposal of waste in a manner which may detrimentally impact on a water resource, and storage of domestic and biodegradable industrial wastewater for the purpose of re-use, constitutes an offence.	Lawful Water Use S21(g) NWA, 1998	Water Use License for section 21(g)	If treated effluent (wastewater) will be used to supplement the demand for water to control dust, then it too may not commence without a water use authorisation (a General Authorisation or Water Use License) for Section 21(g) water use or other water use as determined by the Responsible Authority.	Holder	Prior to commencement of those construction activities relating to S21(g) water uses, e.g., installing an on-site disposal facility and storage tanks for treated effluent.	Compliance to be verified by ECO and IEA.
01	Layout and Design	Unsafe disposal - soil contamination and water pollution.	Lawful Water Use S21(g) NWA, 1998	Water Use License for section 21(g)	Any person who stores or disposes of domestic wastewater are subject to (must comply with) the limits and conditions set out in the General Authorisation for Section 21(g) Disposing of waste in a manner which may detrimentally impact on a water resource published in GN No. 665 of Government Gazette No. 36820 on 06th September 2013 or alternatively, the conditions contained in the water use license.	Holder, Contractor	Prior to commencement of those construction activities relating to S21(g) water uses, e.g., installing an on-site disposal facility and storage tanks	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
							for treated effluent.	
01	Legal Compliance	Borrow pit licensing is classified as small-scale mining under the Mineral and Petroleum Resources Development Act, 28 of 2002 (Act No. 28 of 2002) and is administered by the Department of Minerals and Energy, through whom any permit applications must be lodged.	Compliance with MPRDA, 2002	Mining permit or license	Material (aggregate) for road construction will be imported from a licensed commercial source(s).	Holder, Engineer, Contractor	Continuous	Compliance to be verified by ECO and IEA.
01	Legal Compliance	Repairing and rebuilding the Burgerville District Road will impact Eskom's 400 kV powerline servitudes (Line 1 and Line 2). Construction without permission will constitute an offence in terms of the relevant legislation. (Section 27(3) of Electricity Act, 1987	Compliance with Eskom requirements	Eskom 400 kV servitude (Line 1 and 2) Servitude Agreement and Letter of Consent	The applicant must provide a formal application letter to Eskom on its company letter head detailing the proposed work within Eskom's 400 kV overhead Hydra-Poseidon Transmission line servitudes (Line 1 and 2).	Holder	At least 30 days before the intended date of commencing with constriction within Eskom's servitude.	Compliance to be verified by ECO and IEA.

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		(Act No. 41 of 1987), as amended in 1994) - repealed by Electricity Regulation Act, 2006 (Act No. 4 of 2006) as amended.						
01	Legal Compliance	Repairing and rebuilding the Burgerville District Road will impact Eskom's 400 kV powerline servitudes (Line 1 and Line 2). Construction without permission will constitute an offence in terms of the relevant legislation. (Section 27(3) of Electricity Act, 1987 (Act No. 41 of 1987), as amended in 1994) - repealed by Electricity Regulation Act, 2006 (Act No. 4 of 2006) as amended.	Compliance with Eskom requirements	Eskom 400 kV servitude (Line 1 and 2) Servitude Agreement and Letter of Consent	Furthermore, for road applications underneath Eskom Tx lines, please ensure to provide the following information: 1. Need location of new road crossing, which line and towers affected. 2. Need final designs for road, showing the final elevation and road surface level. 3. Need construction methodology for road. 4. Need details on how surface will be made, graders, blasting etc. 5. Need timelines for road construction. 6. Need applicant to conduct survey to gather current conductor positions of line being crossed and current surface levels of servitude.	Holder	At least 30 days before the intended date of commencing with constriction within Eskom's servitude.	Compliance to be verified by ECO and IEA.
01	Legal Compliance	Repairing and rebuilding the Burgerville District Road will impact Eskom's 400 kV	Compliance with Eskom requirements	Eskom 400 kV servitude (Line 1 and 2) Servitude Agreement	The application should be submitted to Nomzamo Mdunyelwa ST(SA)0991, Senior Advisor Audit and Investigation, Servitude and Land Management,	Holder	At least 30 days before the intended date of commencing	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		powerline servitudes (Line 1 and Line 2). Construction without permission will constitute an offence in terms of the relevant legislation. (Section 27(3) of Electricity Act, 1987 (Act No. 41 of 1987), as amended in 1994) - repealed by Electricity Regulation Act, 2006 (Act No. 4 of 2006) as amended.		and Letter of Consent	Asset Management - Transmission Division, Eskom (Tel: 053 830 5947, Mobile: 081 046 5341, Email: MdunyeNC@eskom.co.za) at least 30 days before the intended date of commencement to prevent any unnecessary delays.		with constriction within Eskom's servitude.	
01	Legal Compliance	Any services that need to be constructed over or under a national road, (in this case the N10) or within 60 m measured from the road reserve fence will have an impact on SANRAL *(pers. comm. Nicole Abrahams, Environmental Coordinator, Western Region,*	Compliance with SANRAL requirements	Written permission from SANRAL prior to commencement of work within 60 m of the road reserve fence.	Apply for a written permission from South African National Roads Agency SOC Limited (SANRAL) before any work is carried out at the N10/Burgerville District Road intersection, and specifically within 60 m from the road reserve fence (wrstatutory@nra.co.za).	Holder	Prior to commencement	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		AbrahamsN@nra.co.za).						
01	Legal Compliance	Permission may be required to repair and rebuild a rural (District) road that falls under the jurisdiction of a road authority/Consent may be necessary from the Northern Cape Department of Roads and Public Works under the Northern Cape Roads Ordinance, 19 of 1976 for the upgraded district access road, including a formal wayleave.	Compliance with road authority requirements	Written permission from the Northern Cape Department of Roads and Public Works before repairing and rebuilding the district road.	Obtain written permission, including a formal wayleave, if necessary, from the Northern Cape Department of Roads and Public Works before any work is carried out on the 'Burgerville' District Road (DR2448.	Holder	Prior to commencement	Compliance to be verified by ECO and IEA.
01	Legal Compliance	Permission may be required from DMRE to use the land surface for an access road as the establishment of a formal servitude could detrimentally affect the mining of mineral resources on that parcel of land.	Compliance with DMRE requirements	Written approval from the Minister of DMRE in terms of section 53.	Apply for a written approval from the Minister of the DMRE to use the surface of the land for an access road in terms of Section 53 of the MPRDA, 2002, before the commencement of construction, particularly on the private properties (e.g., not the district road section). Submit the application using the online application portal on the Department's website. Check for SAMRAD applications and follow	Holder	Prior to commencement	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					the steps to create your profile. Select land use application which is section 53 (*pers. comm. Mmboneni Mutheiwana, MMboneni.Mutheiwana@dmre.gov.za*).			
01	Legal Compliance	Existing by-laws may regulate aspects of the project and require consent.	Compliance	Written approval(s) where applicable from the Municipal Manager of the District and/or Local Municipality.	Obtain written approval(s) from the Municipal Manager of the District and/or Local Municipality to undertake any regulated activity that requires consent in terms of the applicable By-Law(s).	Holder	Prior to commencement	Compliance to be verified by ECO and IEA.
01	Legal Compliance	Permission may be required from Emthanjeni Local Municipality (ELM) to use water services from a source other than a water services provider nominated by the water services authority having jurisdiction in the area.	Compliance	Written approval from the Municipal Manager of ELM.	Obtain written approval from the Municipal Manager of the Emthanjeni Local Municipality to supply groundwater from permissible boreholes on Cluster 1 for sanitation services and industrial use under Sections 6 and 7 of the Water Services Act, 1997 before the intended use of that water for construction.	Holder	Prior to commencement	Compliance to be verified by ECO and IEA.
01	Legal Compliance	Permits or exception may be required from the Department of Agriculture, Land Reform and Rural	Compliance	Written permissions from the executive officer (of the DALR&RD)	Obtain, if necessary, a written permission from the executive officer (of the DALR&RD) to 'cultivate virgin soil' by expanding existing farm tracks and constructing a new road on virgin	Holder	Prior to commencement	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		Development (DALR&RD) under provisions of the CARA Regulations including permission under regulation 2(2) of the CARA Regulations to construct an access road on virgin soil.			soil, in terms of CARA Regulation 2.			
01	Legal Compliance	• Permits or exception may be required from the Department of Agriculture, Land Reform and Rural Development (DALR&RD) under provisions of the CARA Regulations including permission under regulation 7(1) of the CARA Regulations for the drainage of a vlei, marsh or floodplain, relating to	Compliance	Written permissions from the executive officer (of the DALR&RD)	Obtain, if necessary, a written permission(s) from the executive officer (of the DALR&RD) to divert surface water run-off through designed engineering structures, such as box culverts, drifts or other permissible designs at the identified watercourse crossings and where applicable alluvial floodplains or wetlands in terms of CARA Regulations 7 and 8.	Holder	Prior to commencement	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		construction of access road within the floodplain of the Brak River. • Permits or exception may be required from the Department of Agriculture, Land Reform and Rural Development (DALR&RD) under provisions of the CARA Regulations including changing the flow pattern of runoff water (Regulation 8) related to the upgrades of the access road across the Brak River watercourse.						

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Table 12. Management Protocol for Terrestrial Fauna

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
02	Planning	Disturbance to breeding or destruction of bird roosts.	Ensure least impact on breeding, e.g., bird roosts and nests are not disturbed.	Construction in watercourse crossings between May and August.	As far as possible, limit construction within sensitive flood plains, watercourses and associated buffers to May, June, July, and August to avoid breeding periods of Avian species.	Holder, Engineer, Contractor.	Construction Phase	Compliance to be verified by ECO and IEA.
02	Planning	Disturbance to breeding or destruction of bird roosts.	Ensure least impact on breeding, e.g., bird roosts and nests are not disturbed.	No active construction within 1.5 km buffer from April to July, and preferably August.	As far as possible, schedule work in the vicinity of nests or roosts of species of conservation concern outside of the breeding season of the nesting bird; construction of that portion of the preferred Alternative Route No. 1 that is within the 1.5 km buffer of the Verreaux Eagle's nest should be completed outside its breeding season, which is from April to July, and preferably August as well.	Contractor	Continuous during construction phase	SEO to monitor 1.5 km buffer. Compliance to be verified by ECO and IEA.
02	Layout and Design	Tortoises and other animals become stuck against fences and are electrocuted to death.	No harm to wildlife.	No animal mortalities from electrocution.	If the road reserve is to be electrically fenced, then the live strands should be on the inside of the fence or more than 30 cm from the ground. Alternatively, a guard wire set at 20 cm can be used to keep larger tortoises away from the fence.	Holder, Contractor	Planning & Design Phase, and Construction Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
02	Layout and Design	Tortoises and other animals become stuck against fences and are electrocuted to death.	No harm to wildlife.	No animal mortalities from electrocution.	Where gates are installed in jackal proof fencing, a suitable reinforced concrete sill must be provided beneath the gate.	Holder, Contractor	Planning & Design Phase, and Construction Phase	Compliance to be verified by ECO and IEA.
02	Layout and Design	Tortoises and other animals become stuck against fences and are electrocuted to death.	No harm to wildlife.	No animal mortalities from electrocution.	Original tension must be maintained in the fence wires.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
02	Layout and Design	Tortoises and other animals become stuck against fences and are electrocuted to death.	No harm to wildlife.	No animal mortalities from electrocution.	Any temporary fencing to restrict the movement of livestock must only be erected with the permission of the landowner	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
02	Planning and Layout and design	Bird mortalities during the construction phase due to vehicle collisions or collisions with infrastructure. Disturbance to breeding or destruction of bird roosts during the construction phase.	Ensure the protection of Aves. Ensure least impact on breeding, e.g., bird roosts and nests are not disturbed.	New roads are outside avifaunal-specific highly sensitive areas.	Avoid the construction of new roads in avifaunal-specific highly sensitive areas and their associated buffers, such as within the 1 km buffer of the Verreaux Eagle's nest, as well as flood plains, watercourses (e.g., drainage lines and wetlands), large impoundments, borehole pans and rocky koppies.	Holder, Engineer, Contractor	Planning and Design and construction phase	SEO to monitor 1 km buffer. Compliance to be verified by ECO and IEA.

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Table 13. Management Protocol for Terrestrial Flora

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
03	Change in Land Use	Risk of veld fires caused by workers during the construction of the facility decreases grazing capacity	Fire management plan	No run-away (uncontrolled) fires - no open fires	Undertake a risk analysis to determine *inter alia* the probability and frequency of a wildfire during construction and operation and prepare a fire management plan accordingly.	Holder	Planning and Design	Compliance to be verified by ECO and IEA.

Table 14. Management Protocol for Soil and Rock

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
04	Layout and Design	Supplying services via trenches in dispersive soils can cause tunnel erosion.	Minimise the risk of tunnel erosion in dispersive soils.	No signs of tunnel erosion.	If trenching is to be undertaken in potentially dispersive soils (e.g., bare patches) then implement the 'Trenching in Dispersive Soils Protocol' (**Appendix B1**)	Contractor	Planning and Design	Compliance to be verified by ECO and IEA.
04	Layout and Design	Constructing roads and culverts in dispersive soils can cause erosion.	Minimise the risk of erosion on dispersive soils	No signs of soil erosion.	If roads and culverts are to be constructed in potentially dispersive soils (e.g., bare patches) then implement the 'Roads & Culverts in Dispersive Soils Protocol' (**Appendix B2**)	Contractor	Planning and Design	Compliance to be verified by ECO and IEA.

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Table 15. Management Protocol for Ground and Surface Water

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
05	Change of land use	Water demand for fighting wildfires may temporarily jeopardise available water reserves for development or operational requirements.	Maintain the integrity of the groundwater reserve(s).	Minimise water usage.	Consider alternative firefighting technologies such as CAFS (Compressed Air Foam Systems), which can multiply water use efficiency by as much as 11 times (pers. comm. Stefan Schlimmer 072 474 3155).	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
05	Planning	Using water as a form of dust control is an ineffective, wasteful, and short-term solution.	Maintain the integrity of the groundwater reserve(s).	Minimise water usage.	Reduce the need for dust suppression or control, particularly along the access road from the N10 to the MTS by providing construction staff (and employees) with a prearranged taxi or bus charter service.	Holder, Contractor	Planning and Design and Construction phase	Compliance to be verified by ECO and IEA.
05	Layout and Design	Increased demand for groundwater during construction for road stabilisation, dust control, and provide staff with potable/drinking water, may stress groundwater reserves	Maintain the integrity of the groundwater reserve(s).	Minimise water usage.	Reduce the quantity of groundwater and frequency of applications required for dust suppression on gravel access roads by adding environmentally friendly soil binding agents. This would require the necessary storage tanks complete with Programmable Logic Controller (PLC) and pump systems required for dosage purposes.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		(exceed the rate at which reserves are naturally replenished).						
05	Layout and Design	Increased demand for groundwater during construction for road stabilisation, dust control, and provide staff with potable/drinking water, may stress groundwater reserves (exceed the rate at which reserves are naturally replenished).	Maintain the integrity of the groundwater reserve(s).	Water meters installed.	Install suitable water meters to ensure that the abstracted volumes are measured on a daily basis (DEA Generic EMPr).	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
05	Layout and Design	Impact on the aquifer reserve and borehole pump lifespan.	Maintain the integrity of the groundwater reserve(s).	Water storage tanks installed for a water reserve	Groundwater should be pumped from the boreholes to dedicated water storage tanks to build up a reserve, whereafter the boreholes are only used to top up the storage tanks.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
06	Layout and Design	Groundwater is vulnerable to pollution from effluent disposal	Safe drinking water.	Avoidance of groundwater pollution: Show compliance with Annexure	If a wastewater treatment package plant is installed at the construction camp, then: Comply with the National Standards on septic tank systems provided in SANS 10252-2 Water	Holder, Engineer	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
				A of SANS 10252-2.	Supply and Drainage for Buildings: Part 2 Drainage installations for buildings (relevant information is included in Annexure A of SANS 10252-2.			
06	Layout and Design	Groundwater is vulnerable to pollution from effluent disposal	Safe drinking water.	Avoidance of groundwater pollution: Show compliance with Guidelines for the Utilisation and Disposal of Wastewater Sludge.	If a wastewater treatment package plant is installed at the construction camp, then: Sludge from septic tanks should be disposed of in accordance with the "Guidelines for the Utilisation and Disposal of Wastewater Sludge: Volume 3: Requirements for the on-site and off-site disposal of sludge."	Holder	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
06	Layout and Design	Groundwater is vulnerable to pollution from effluent disposal	Safe drinking water.	Avoidance of groundwater pollution: Show compliance with National Building Regulations SANS 10400	If a wastewater treatment package plant is installed at the construction camp, then: The design of a soakaway must comply with the guidelines given in the National Building Regulations SANS 10400.	Holder, Engineer	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
06	Layout and Design	Groundwater is vulnerable to pollution from effluent disposal	Safe drinking water.	Avoidance of groundwater pollution: Sampling records	If a wastewater treatment package plant is installed at the construction camp, then: Treated effluent must be sampled and monitored at the points of ingress to the effluent plants and at the points of reuse or discharge.	Holder	Continuous	Compliance to be monitored by SEO and verified by ECO and IEA.
06	Layout and Design	Groundwater is vulnerable to pollution from effluent disposal	Safe drinking water.	Avoidance of groundwater pollution: A suitably qualified operator.	If a wastewater treatment package plant is installed at the construction camp, then: The success of a wastewater treatment package plant is dependent on correct operation and maintenance. Therefore, a suitably qualified operator (the "process	Holder	Continuous	Compliance to be monitored by SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
					controller") should be trained and/or appointed prior to commissioning.			
06	Layout and Design	Groundwater is vulnerable to pollution from effluent disposal	Safe drinking water.	Avoidance of groundwater pollution: Grease traps are present in kitchens. FOG's no more than 10 mg/L	If a wastewater treatment package plant is installed at the construction camp, then: Fats, oils and greases (FOG's) should be treated at the source with grease/fat traps in the kitchens (during construction and operation) and shall be no more than 10 mg/L before entering the effluent plant.	Holder, Engineer	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
06	Layout and Design	Unsafe disposal - soil contamination and water pollution	Responsible disposal of domestic wastewater.	Avoidance of groundwater pollution	Wastewater disposal sites, including conservancy tanks, must be located- (a) outside of a watercourse; (b) above the 1:100-year flood line or riparian habitat whichever is the greatest, or alternatively at least 100 m from a water resource whichever is the greatest or at least further than a 500 m radius from a borehole that is utilised for drinking water or stock watering; (c) at least outside a 500 m radius from the boundary of a wetland; and (d) on land that is not, or does not, overlie, a major aquifer (identification of a major aquifer will be provided by the responsible authority upon written request).	Holder, Engineer	Planning and Design	Compliance to be verified by ECO and IEA.
06	Layout and Design	Groundwater is vulnerable to pollution	Safe drinking water.	Avoidance of groundwater pollution	Boreholes for domestic use should be positioned at least 30 m to 50 m away from potential pollution sources, such as on-site toilets, and site-specific conditions should be considered to determine the appropriate distance.	Holder	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
					The direction of the aquifer flow is also an important consideration.			
06	Layout and Design	Groundwater is vulnerable to pollution	Safe drinking water.	Avoidance of groundwater pollution	To prevent aquifer pollution, the installation of a sanitary seal is required.	Holder, Engineer	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
06	Layout and Design	Groundwater is vulnerable to pollution	Safe drinking water.	Avoidance of groundwater pollution	An employee should be trained to maintain the borehole and borehole pump and to alert management when major breakdowns occur.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
07	Layout and Design	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas, where there will be an activity that could alter the natural conditions of the rivers/streams, which could lead to sedimentation	Minimise ponding, erosion, and sedimentation of watercourses.	Construction during dry months	Construction should to the extent possible take place during dry months, with a decreased probability of storm events.	Holder, Contractor	Planning and Design Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		and erosion if storm events occur during the construction phase.						
07	Layout and Design	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas, where there.	Minimise ponding, erosion, and sedimentation of watercourses.	Protection and restoration of a Strategic Water Source Area	Culverts and stormwater outlets associated with any watercourse crossing should be designed in such a way so as not to cause erosion of the bed or banks by incorporating such stabilisation mechanisms as terracing, boulder and rock placement, minor gabion basket work construction, reno mattresses and/or rock pitching.	Holder, Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.
07	Layout and Design	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas, where there.	Minimise ponding, erosion, and sedimentation of watercourses.	Protection and restoration of a Strategic Water Source Area	All storm water drainage discharge points should be provided with outlet structures, designed with adequate erosion protection, to ensure that storm water is discharged from formal structures onto the natural ground at a safe and acceptable velocity.	Engineer, Contractor	Planning and Design Phase and Construction Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
07	Layout and Design	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas, where there.	Minimise ponding, erosion, and sedimentation of watercourses.	Protection and restoration of a Strategic Water Source Area	No stormwater runoff must be allowed to discharge directly into any water course along roads, and flows should thus be allowed to dissipate over a broad area covered by natural vegetation.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
07	Layout and Design	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas, where there.	Minimise ponding, erosion, and sedimentation of watercourses.	Protection and restoration of a Strategic Water Source Area	Ensure stormwater systems are sized by a professional engineer to accommodate at least 1:100 yr flood events. Stormwater infrastructure, particularly Crossings C1 and C8, should be sized to handle the minimum stormwater peak flow estimates (given in Table 6.2 of the Hydrological Assessment Report).	Engineer, Contractor	Planning and Design Phase	Compliance to be verified by ECO and IEA.
07	Layout and Design	Two ephemeral drainage line crossings, associated with the proposed road development	Minimise ponding, erosion, and sedimentation of watercourses.	Protection and restoration of a Strategic Water Source Area	Crossing C1 (-30.85154438; 24.27633442) – Due to the size of the Brak River flood plain, and the predicted irregular flood generation it is proposed that a concrete drift crossing be developed to allow for overflow and passage through the river flood plain.	Engineer, Contractor	Planning and Design Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		can be considered critical stormwater management areas, where there.			Refer to Figure 6.1 "Typical plan of a drift crossing" and Figure 6.4 "Conceptual stormwater management system (Crossing 1 – Brak River)" of the Hydrological Assessment Report.			
07	Layout and Design	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas, where there.	Minimise ponding, erosion, and sedimentation of watercourses.	Protection and restoration of a Strategic Water Source Area	Crossing C8 (-30.86251539; 24.23307474) – The road will cross an ephemeral drainage line, and hence, a permanent box culvert under the roadway will be required. Preliminary calculations suggest a rectangular culvert with a diameter of 3 m, design depth of 10 m and slope of 0.057 (m/m) should be able to handle a maximum flow volume of 207 m^3/sec (the calculated peak flows range from 90 to 105 m^3/sec), with a flow depth efficiency of 55%. The intakes should be stabilised by a reno mattress, and the outlet should have energy-dampening systems in place. Refer to Figure 6.2 "Typical energy dampening for box culvert outlet" and Figure 6.3 "Conceptual stormwater management system (Crossing 8)" of the Hydrological Assessment Report.	Engineer, Contractor	Planning and Design Phase	Compliance to be verified by ECO and IEA.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat., Reg. EAP)
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Table 16. Management Protocol for Atmosphere

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
08	Planning	The generation of excessive wind-blown dust could 'choke' the ecologically sensitive ephemeral drainage line system.	Minimise dust generation.	Construction during dry months.	The construction of linear infrastructure across parts of the ephemeral drainage system, should to the extent possible be restricted to the dry winter months (e.g., May to September), that is commence with such activities as clearing or grading, excavating and importing material at the end of the wet season/beginning of the dry season whilst the soil is still moist to reduce dust and as far as is practical, be completed in, the dry winter months with a decreased probability of storm events.	Holder, Contractor	Planning and Design Phase and dry months	Compliance to be verified by ECO and IEA.

Table 17. Management Protocol for Terrestrial Ecosystem

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
10	Planning	The construction equipment and materials needed to repair and rebuild the access road will require a substantial area for parking and storing resulting in a loss of habitat.	Minimize habitat loss	Sun Central Cluster 1 Solar PV facility construction camp and staging area used.	The contractor(s) appointed to rebuild and build the access road will use the same construction camp, and staging area as set aside for the authorised Sun Central Cluster 1 Solar PV facility.	Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
10	Planning	The construction equipment and materials needed to repair and rebuild the access road will require a substantial area for parking and storing resulting in a loss of habitat.	Minimize habitat loss	Construction camp location as per EA reference: 14/12/16/3/3/2/998 dated 16th April 2018 as amended.	The ± 4 ha construction camp footprint will be in the 'open' area(s) not earmarked for the solar field, around and between the Switching Station (Dx) and Main Transmission Substation (MTS), but within the low ecologically sensitive footprint of the authorised Sun Central Cluster 1 Solar PV facility (EA reference: 14/12/16/3/3/2/998 dated 16th April 2018 as amended).	Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.
10	Planning	The construction equipment and materials needed to repair and rebuild the access road will require a substantial area for parking and storing resulting in a loss of habitat.	Minimize habitat loss	Staging area location as per EA reference: 14/12/16/3/3/2/998/AM4 dated 25th November 2022	The authorised ± 1 ha staging area (EA reference: 14/12/16/3/3/2/998/AM4 dated 25th November 2022), adjoining the district road, but inside the farm boundary of Portion 1 of Farm Riet Fountain No. 39C (30°51'13,89''S & 24°15'57,88''E) may be used as an access control point as well as for parking plant, material/aggregate stockpiles and as a laydown area.	Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.
10	Layout and Design	Fencing causes fragmentation of the landscape	Minimise Fragmentation by fencing.	Working servitude fence is a cattle fence.	The servitude fence must be a cattle fence, not unlike existing farm fences on the surrounding farms.	Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.
10	Layout and Design	Fencing causes fragmentation of the landscape	Minimise Fragmentation by fencing.	No razor wire.	The use of razor wire as fencing must be avoided.	Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
10	Layout and Design	The physical footprint of the access road will result in a loss of local terrestrial habitat.	Minimize habitat loss.	No observed construction creep.	The clearance of indigenous vegetation shall be restricted to the physical footprint of the road and side/cut-off drain (with the exception of temporary clearance and/or disturbance associated with 'normal' construction-related activities).	Contractor	Continuous	Compliance to be verified by ECO and IEA.
10	Layout and Design	The physical footprint of the access road will result in a loss of local terrestrial habitat.	Minimize habitat loss.	Rehabilitation Plan	The clearance or disturbance of indigenous vegetation resulting from 'normal' construction-related activities shall be rehabilitated immediately upon the completion of those activities on the road verge, in accordance with a rehabilitation plan and/or the Bare Patch Restoration Protocol (**Appendix C**).	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
10	Layout and Design	Loss of terrestrial habitat.	Zero disturbance outside the existing District Road servitude.	No construction creep outside fenced servitude	All construction on the district road section, including access for the public, will remain within the 19 m-wide servitude.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
10a	Layout and Design	Loss and fragmentation of ecologically sensitive habitats from infrastructure installation (roads, fences, and sub surface pipes).	Preserve aquatic ecosystem structure and function as well as riparian habitat.	Existing farm roads have been incorporated into the route alignment.	As far as possible utilize or upgrade existing farm roads as opposed to constructing new roads in undisturbed areas.	Engineer, Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
10a	Layout and Design	Loss and fragmentation of ecologically sensitive habitats from infrastructure installation (roads, fences, and sub surface pipes).	Preserve aquatic ecosystem structure and function as well as riparian habitat.	Minimise impact on low dolerite ridge classified as Hills and Slopes (High ecological sensitivity).	Ensure the alignment of the new road section within the authorised solar field footprint is approximately perpendicular to the low dolerite ridge to minimise the physical extent of the Hills and Slopes habitat that will be disturbed.	Engineer, Contractor	Planning and Design Phase	Compliance to be verified by ECO and IEA.
10a	Layout and Design	Loss and fragmentation of ecologically sensitive habitats from infrastructure installation (roads, fences, and sub surface pipes).	Maintain the provision of supporting ecological processes along ecological process pathways, e.g., spatially explicit corridors, such as ridges.	Avoid fragmentation of ecological pathways (and associated habitats).	Ensure the water pipeline from Solar Borehole No. 5 takes the shortest route practically possible through the (High sensitivity) dolerite ridge/Hills and Slope habitat.	Engineer, Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.
10a	Layout and Design	Loss and fragmentation of ecologically sensitive habitats from infrastructure installation (roads, fences, and sub surface pipes).	Maintain the provision of supporting ecological processes along ecological process pathways, e.g., spatially explicit corridors, such as ridges.	Avoid fragmentation of ecological pathways (and associated habitats).	Ensure the temporary passing lanes are not within the (High sensitivity) dolerite ridge/Hills and Slope habitat.	Engineer, Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.

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Table 18. Management Protocol for Aquatic Ecosystem

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
11	Layout and Design	Sedimentation in wetlands and watercourses.	Minimal sedimentation of watercourses	Preserve river channel hydrological pattern	All storm water drainage discharge points should be provided with outlet structures, designed with adequate erosion protection, to ensure that storm water is discharged from formal structures onto the natural ground at a safe and acceptable velocity.	Engineer, Contractor	Planning and Design Phase Construction	Compliance to be verified by ECO and IEA.
11	Layout and Design	Sedimentation in wetlands and watercourses.	Minimal sedimentation of watercourses	Preserve river channel hydrological pattern	Disturbance of the natural topography and vegetation cover should be minimised. The natural contours should be preserved as far as is practical in order to preserve the existing site drainage patterns as far as possible.	Contractor	Planning and Design Phase Construction	Compliance to be verified by ECO and IEA.
11	Layout and Design	Sedimentation in wetlands and watercourses.	Minimal sedimentation of watercourses	Preserve river channel hydrological pattern	Natural, dispersed, drainage should be encouraged, by maintaining the natural drainage characteristics of the land as far as possible, thereby minimising the concentration of flows and consequently the risk of erosion.	Engineer, Contractor	Planning and Design Phase Construction	Compliance to be verified by ECO and IEA.
11	Layout and Design	Loss of riparian systems and disturbance of the alluvial water courses.	Riparian systems and alluvial water courses are maintained as far as possible.	Preserve river channel hydrological pattern	Minimise the cumulative physical footprint of linear infrastructure crossings (roads, pipes) by as far as is possible coinciding/combining such infrastructure.	Engineer, Contractor	Planning and Design Phase Construction	Compliance to be verified by ECO and IEA.
11	Layout and Design	Roads/pipelines can transform wetland areas altering hydrology and ecosystem	Persistence of aquatic ecosystems in good ecological condition.	Limit transformation of aquatic ecosystem	Wetlands must be avoided or, where wetland crossing is unavoidable, the road/pipeline should be routed over the narrowest part of the wetland.	Engineer, Contractor	Planning and Design Phase Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
11	Layout and Design	Overflow from water storage tanks can cause erosion of receiving environment.	Protection and Restoration of a Strategic Water Source Area/ Preservation of aquatic ecosystem, composition, structure, and function.	Avoid erosion from water storage tanks: no muds, Water storage tanks are on a solid foundation, platform or stand.	Place water tanks on solid foundations, platforms or stands to ensure that they are level, will not fall over and are above the ground in order to build up the necessary water pressure for the outlet.	Holder, Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.
11	Layout and Design	Overflow from water storage tanks can cause erosion of receiving environment.	Protection and Restoration of a Strategic Water Source Area/ Preservation of aquatic ecosystem, composition, structure, and function.	Avoid erosion from water storage tanks: Water storage tanks are fastened to the platform or stand.	The platform or stand for water storage tanks must be level and must have hooks onto which the tank can be anchored or fastened.	Holder, Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.
11	Layout and Design	Overflow from water storage tanks can cause erosion of receiving environment.	Protection and Restoration of a Strategic Water Source Area/ Preservation of aquatic ecosystem, composition, structure, and function.	Avoid erosion from water storage tanks: Water pipes are visibly secured.	The pipes leading to and from the water storage tanks should also be anchored to prevent them from breaking, cracking and leaking.	Holder, Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.
11	Layout and Design	Overflow from water storage tanks can cause erosion	Protection and Restoration of a Strategic Water Source Area/ Preservation of	Avoid erosion from water storage tanks: no muds, Design includes an	Each water storage tank or series of water storage tanks should have an overflow pipe to prevent water being forced out of the inlet when the tank	Holder, Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		of receiving environment.	aquatic ecosystem, composition, structure, and function.	overflow pipe to a soakaway.	is full. The overflow pipe should be diverted to a soakaway.			
11	Layout and Design	Overflow from water storage tanks can cause erosion of receiving environment.	Protection and Restoration of a Strategic Water Source Area/ Preservation of aquatic ecosystem, composition, structure, and function.	Avoid erosion from water storage tanks: no muds, puddles or signs of erosion around water storage tanks.	If water storage tanks are placed on a raised platform or stand, then a layer of gravel should be placed around and/or under the platform or stand to ensure good drainage and to prevent forming mud and puddles.	Holder, Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.
11	Layout and Design	Loss of riparian systems and disturbance of the alluvial water courses.	Riparian systems and alluvial water courses are maintained as far as possible.	Limit transformation of aquatic ecosystem	The 3 m wide passing lanes must be further than 32 m from the edge of a watercourse.	Engineer, Contractor	Planning and Design Phase	Compliance to be verified by ECO and IEA.
11	Layout and Design	Loss and fragmentation of ecologically sensitive habitats from infrastructure installation (underground pipelines).	Maintain the provision of supporting ecological processes along ecological process pathways, e.g., spatially explicit corridors, such as large ephemeral tributaries.	Minimise impact on the large ephemeral tributary classified as River (Very High ecological sensitivity). Avoid fragmentation of ecological pathways (and associated habitats).	Ensure the water pipeline from Borehole No. 13 and/or 14 takes the shortest route practically possible through the (Very High sensitivity) River and associated (High sensitivity) Mesic Wash habitats	Holder, Contractor	Planning and Design Phase Dry season	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
11	Planning	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure installation (underground pipelines).	Sensitive avifauna habitats are protected and maintained	Construction during dry months	Schedule the road and pipeline construction during the season least damaging to the stream or wetland system (e.g., dry season).	Holder, Contractor	Planning and Design Phase Dry season	Compliance to be verified by ECO and IEA.
11	Planning	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure installation (underground pipelines).	Sensitive avifauna habitats are protected and maintained.	Pipelines do not impede surface or subsurface flows	All underground pipelines bisecting sensitive habitats must be placed below the subsurface flow of the ephemeral wetlands with the linear construction pits subjected to full rehabilitation to maintain normal subsurface flow.	Engineer, Contractor	Planning and Design Phase and Construction	Compliance to be verified by ECO and IEA.
11	Planning	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure installation (underground pipelines).	Sensitive avifauna habitats are protected and maintained.	Pipelines do not impede surface or subsurface flows	All pipeline crossings must be engineered not to impede surface or subsurface flow in any way.	Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
11	Planning	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure installation (underground pipelines).	Sensitive avifauna habitats are protected and maintained.	Construction during dry season	Schedule pipeline construction during the season least damaging to the stream or wetland system (e.g., dry season).	Contractor	Planning and Design Phase Dry season	Compliance to be verified by ECO and IEA.
11	Planning	Habitat loss and fragmentation due to displacement because of infrastructure installation (roads, fences, and sub surface pipes).	Preserve aquatic ecosystem structure and function as well as riparian habitat.	Existing farm roads have been incorporated into the route alignment.	As far as possible utilize or upgrade existing farm roads as opposed to constructing new roads in undisturbed areas.	Engineer, Contractor	Planning and Design Phase And continuous	Compliance to be verified by ECO and IEA.
11	Layout & Design	Habitat loss and fragmentation due to displacement because of infrastructure installation (roads, fences, and sub surface pipes).	Preserve aquatic ecosystem structure and function as well as riparian habitat.	Avoid fragmentation of surface water and groundwater pathways (and associated habitats	The final design will be determined during the detailed design stage and shall be subject to compliance with the following requirements or outcomes: • Ensure that any dedicated stream crossings use road crossing designs, such as box culverts or concrete drifts with rock fill, which spread the surface water into a broadly distributed sheet whilst maintaining unrestricted subterranean flow. • Road crossing designs, such as box	Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					culverts or concrete drifts with rock fill, should be sized to accommodate at least 1:100 yr flood events. • Road crossings and stormwater outlets associated with any watercourse crossing should be designed in such a way so as not to cause erosion of the bed or banks by incorporating such stabilisation mechanisms as terracing, boulder and rock placement, minor gabion basket work construction, reno mattresses and/or rock pitching, especially at the downstream side to dissipate energy and reduce scour. • Pipe culvert road crossings are prohibited. • Road crossing designs, such as box culverts or concrete drifts with rock fill, shall spread the surface water into a broadly distributed sheet whilst maintaining unrestricted subterranean flow, across the width of the active channel(s).			
11	Layout & Design	Habitat loss and fragmentation due to displacement because of infrastructure installation (roads, fences, and sub surface pipes).	Preserve aquatic ecosystem structure and function as well as riparian habitat.	Avoid fragmentation of surface water and groundwater pathways (and associated habitats	Avoid or minimise any restriction to subsurface water flow by constructing the surface of the road crossings at or above (not below) natural ground level (NGL) and, where applicable, retaining the in-situ topsoil with vegetation root mass (or mat). In the case of building road crossings above NGL, and if the natural vegetation is cleared, then ensure that the grader does not penetrate the	Engineer, Contractor	Planning and Design Phase and construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					abovementioned root mat and maintains a flat surface. Topsoil removed from other infrastructure placement sites can be added below the road surface to protect the vegetative binding below.			
11	Layout and Design	Loss and fragmentation of ecologically sensitive habitats from infrastructure installation (roads, fences, and sub surface pipes).	Preserve aquatic ecosystem structure and function as well as riparian habitat.	Avoid fragmentation of surface water and groundwater pathways (and associated habitats).	All road crossings must be engineered not to impede surface or subsurface flow in any way.	Engineer, Contractor	Planning and Design Phase	Compliance to be verified by ECO and IEA.
11	Layout and Design	Habitat loss and fragmentation due to displacement because of infrastructure installation (roads, fences, and sub surface pipes).	Maintain the provision of supporting ecological processes along ecological process pathways, e.g., spatially explicit corridors, such as watercourses.	Avoid fragmentation of surface water and groundwater pathways (and associated habitats	Limit or restrict the construction of fill roads. All fill roads must use a permeable fill material (such as gravel or crushed rock) for at least the first layer of fill to maintain the natural flow regimes of subsurface water.	Engineer, Contractor	Planning and Design Phase And construction	Compliance to be verified by ECO and IEA.
11	Layout and Design	Habitat loss and fragmentation due to displacement because of	Maintain the provision of supporting ecological processes along	Avoid fragmentation of surface water and groundwater pathways (and	It is preferable to eliminate fill roads and utilise raised bridges and culverts with adequate sizing and spacing of water crossing structures, proper choice of the type of crossing structure, and installation of drainage	Engineer, Contractor	Planning and Design Phase and construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		infrastructure installation (roads, fences, and sub surface pipes).	ecological process pathways, e.g., spatially explicit corridors, such as watercourses.	associated habitats	structures at a depth adequate to pass subsurface flow.			
12	Layout and Design	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system, large ephemeral tributaries, small ephemeral tributaries, alluvial floodplains, and headwater drainage lines by ensuring connectivity and avoiding fragmentation.	A 15 m buffer is implemented.	The Brak River drainage system (Section 2.2: 30°51'6.74"S 24°16'32.57"E and 30°51'9.48"S 24°16'48.11"E) and large ephemeral tributaries (Section 1.3: 30 51 42.6 S; 24 14 00.5 E, Section 1.5: 30 51 25.7 S; 24 14 12.3 E and 30 51 25.8 S; 24 14 47.1 E), including their buffers, are no-go areas except for linear infrastructure crossings, e.g., access road. A 15 m-wide buffer is required on both sides of the delineated Brak River drainage system and large ephemeral tributaries during the construction and operational phases to protect their current condition from any degradation.	Holder, Engineer, Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
12	Layout and Design	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system, large	A 15 m buffer is implemented.	This buffer width is conditional upon ensuring (1) the least possible flow impediment due to the low water drift structure, and (2) the management of surface water runoff (e.g., storm water management system) from the crossings within the Brak River	Engineer, Contractor	Planning and Design Phase and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
			ephemeral tributaries, small ephemeral tributaries, alluvial floodplains, and headwater drainage lines by ensuring connectivity and avoiding fragmentation.		drainage system and large ephemeral tributaries.			
12	Layout and Design	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system, large ephemeral tributaries, small ephemeral tributaries, alluvial floodplains, and headwater drainage lines by ensuring connectivity and avoiding fragmentation.	Road crossings do not impede flow.	Where new watercourse crossings are required, the engineering team must provide an effective means to minimise the potential up- and downstream effect of erosion and sedimentation (erosion protection) as well as minimise the loss of riparian vegetation (reduce footprint as much as possible).	Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
12	Layout and Design	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system, large ephemeral tributaries, small ephemeral tributaries, alluvial floodplains, and headwater drainage lines by ensuring connectivity and avoiding fragmentation.	Crossing structure designs include stormwater management and erosion control systems (where applicable).	Where diversion berms create concentrated flows, particularly in steep and/or sensitive areas, the use of swales, silt fences or other effective erosion control measures is recommended to attenuate runoff.	Engineer, Contractor	Planning and Design Phase and construction	Compliance to be verified by ECO and IEA.
12	Layout and Design	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system, large ephemeral tributaries, small ephemeral tributaries, alluvial floodplains, and headwater	Crossing structure designs include stormwater management and erosion control systems (where applicable).	The Brak River Drainage System (synonymous with Crossing C1 in the Hydrological Assessment Report) will require a concrete (or similar) drift crossing.	Engineer, Contractor	Planning and Design Phase And construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
			drainage lines by ensuring connectivity and avoiding fragmentation.					
12	Layout and Design	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system, large ephemeral tributaries, small ephemeral tributaries, alluvial floodplains, and headwater drainage lines by ensuring connectivity and avoiding fragmentation.	Road crossings do not impede flow.	The large ephemeral tributaries crossed by the access road, specifically Section 1.3 (synonymous with Crossing C8 in the Hydrological Assessment Report) and Section 1.5 require permanent box culverts (there is already an existing pipe culvert crossing at Section 1.5). All crossings must not impede flow within the large ephemeral tributaries and should be constructed perpendicular to the channels.	Engineer, Contractor	Planning and Design Phase And construction.	Compliance to be verified by ECO and IEA.
12	Layout and Design	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system, large ephemeral tributaries, small	Road crossings do not impede surface and sub-surface flow. Crossing structure designs include stormwater management	The small ephemeral tributaries, alluvial floodplains, headwater drainage lines and seasonal wetland (30°51'22.09"; 24°17'24.76"E) can rely on free drainage. However, these low-lying areas are prone to ponding to the point where softening and deep rutting occurs. These road failures and associated impacts on the adjacent drainage systems must be	Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
			ephemeral tributaries, alluvial floodplains, and headwater drainage lines by ensuring connectivity and avoiding fragmentation.	and erosion control systems (where applicable).	addressed when the road is repaired and rebuilt. The engineers must decide on the nature of the drainage design (e.g., using riprap, gabion mattresses, and/or other permeable material) that is needed to prevent the elevated road from (1) obstructing surface and sub-surface flow through the system, and (2) prevent pooling on the upstream edge of the road.			
12	Layout and Design	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system, large ephemeral tributaries, small ephemeral tributaries, alluvial floodplains, and headwater drainage lines by ensuring connectivity and avoiding fragmentation.	Road crossings do not impede flow.	All road crossing designs must not lead to the concentration of surface flow, by, where possible, designing structures, such as culverts, that span the entire width of surface aquatic ecosystems, ensuring connectivity and avoiding fragmentation.	Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat., Reg. EAP)
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Table 19. Management Protocol for Economical

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
13	Change Land use	Potential congestion and delays on the road network. Damage to vehicles.	Minimise risk of congestion and delays to local residents and farmers.	Stagger traffic movements	Stagger and schedule peak construction periods with an expected increase in vehicle movement outside of the peak traffic periods.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
13	Change Land use	Potential congestion and delays on the road network. Damage to vehicles.	Minimise risk of congestion and delays to local residents and farmers.	Passing lanes	Ensure adequate passing lanes (inside the road servitude) for local farmers and residents.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
13	Change Land use	Potential congestion and delays on the road network. Damage to vehicles.	Minimise risk of congestion and delays to local residents and farmers.	Stop and Goes	Implement "Stop and Goes".	Contractor	Continuous	Compliance to be verified by ECO and IEA.
13	Change Land use	Potential congestion and delays on the road network. Damage to vehicles.	Minimise risk of congestion and delays to local residents and farmers.	Good passing lane condition	The applicant shall maintain any deterioration to the passing lanes.	Holder Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
13	Change Land use	Potential congestion and delays on the road network. Damage to	Minimise risk of congestion and delays to local residents and farmers.	Minimal corrugations	Corrugations shall be removed as soon as is reasonably practical (e.g., within 5 working days of being reported).	Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		vehicles.						
13	Change Land use	Potential congestion and delays on the road network. Damage to vehicles.	Minimise risk of congestion and delays to local residents and farmers.	Minimal potholes	Potholes and puddles will be filled in and compacted as soon as is reasonably practical (e.g., within 5 working days of being reported).	Contractor	Continuous	Compliance to be verified by ECO and IEA.
13	Layout and Design	Unstable roadbed and wearing course	Good road condition	Subgrade and subbase reconstruction of the road	It is proposed that the length of the gravel road will require subgrade and subbase reconstruction in all areas where stormwater runoff needs to be improved. The balance of the road may only require top layer reconstruction.	Engineer, Contractor	Planning and Design And Continuous	Compliance to be verified by ECO and IEA.
15	Layout and Design	High Electroconductivity levels of abstracted borehole water reflects a high salt content.	Groundwater for domestic use falls within DWAF's TWQR (1996). Prolong the lifespan of pipes, appliances, etc.	Water alkalinity and hardness results	Determine the alkalinity and hardness of new water sources as these aspects have an effect on the treatability of the water, as well as on infrastructure. Typical concerns relate to pH stability and whether the water will lead to excessive scaling in or aggressive attack of pipework.	Holder, Contractor	Planning and Design	Compliance to be verified by ECO and IEA.
15	Layout and Design	High Electroconductivity levels of abstracted borehole water reflects a high salt content.	Groundwater for domestic use falls within DWAF's TWQR (1996).	Water abstraction from Boreholes No. 13/14, 4 and/or 5.	Potable water will be supplied by the contractor(s) from a commercial source or permissible boreholes: Borehole No. 13, Borehole No. 14, Solar Borehole No.4 and/or Solar Borehole No. 5.	Engineer, Landowner, Contractor	Planning and Design And Continuous	Compliance to be verified by ECO and IEA.
15	Layout and Design	High Electroconductivity levels of	Groundwater for domestic use falls within	Deionisation plant	Treat the groundwater abstracted from boreholes with a deionisation (or other suitable) treatment plant if	Engineer, Contractor	Planning and Design	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		abstracted borehole water reflects a high salt content.	DWAF's TWQR (1996). Prolong the lifespan of pipes, appliances, etc.		it is to be used for domestic use and/or cleaning solar panels. Groundwater need not be treated if it will only be used for road construction, e.g., road stabilisation or dust suppression.		And Continuous	
16	Layout and Design	Construction in flood occurrence zones could lead to damage to property.	Minimize damage to property	Flood protection measures in place.	Care should be taken in areas where development does take place within the likely flooding zones. For these areas, proper flooding protocols (e.g., ensure drainage and stormwater systems are put in place to minimize flooding potential) and erosion prevention measures should be implemented.	Engineer, Contractor	Planning and Design And Continuous	Compliance to be verified by ECO and IEA.

Table 20. Management Protocol for Social

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
17	Planning	Noise increase at the boundary of the project footprint and at the abutting houses during construction activities.	Minimize noise disturbance to noise receptors/farmhouses.	Construction during daytime only.	Topsoil stripping and construction activities should be limited to daytime only.	Contractor	Planning and Design Phase Construction	Compliance to be verified by ECO and IEA.
17	Layout and Design	Decrease in the "sense of place" as it	Minimize change in sense of place.	Existing roads used as far as possible.	Construction of new roads should be minimised, and existing roads should be used where possible.	Engineer, Contractor	Planning and Design Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		relates to noise, visual and light pollution.					Construction	

Table 21. Management Protocol for Property

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
18	Change in Land Use	Risk of veld fires caused by workers during the construction of the facility decreases grazing capacity	Fire management plan	No run-away (uncontrolled) fires - no open fires	Undertake a risk analysis to determine *inter alia* the probability and frequency of a wildfire during construction and operation and prepare a fire management plan accordingly.	Holder	Planning and Design	Compliance to be verified by ECO and IEA.

Table 22. Management Protocol for Health and Safety

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
19	Layout and Design	Groundwater may be unfit for human consumption.	Safe drinking water.	Potable water is treated to standard: Total hardness preferably 50 - 100 mg/• as $CaCO_3$	Test the quality of any water source that is to be used for potable water.	Holder, Engineer	Planning and Design Phase.	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
19	Layout and Design	Groundwater may be unfit for human consumption.	Safe drinking water.	Potable water is treated to standard: Water quality results compare favourably with standard.	Potable water must comply with SANS 241-1 (water used in sanitation systems does not have to), which prescribes health-based water quality requirements.	Holder, Engineer	Planning and Design Phase.	Compliance to be verified by ECO and IEA.
19	Layout and Design	Groundwater may be unfit for human consumption.	Safe drinking water.	Potable water is treated to standard: Water quality results compared with standard.	The raw water quality data should be compared against the potable water quality standards to determine the overall treatment requirements.	Holder, Engineer	Planning and Design Phase.	Compliance to be verified by ECO and IEA.
19	Layout and Design	Groundwater may be unfit for human consumption.	Safe drinking water.	Potable water is treated to standard: Appropriate treatment technology is adopted.	The treatment technologies selected should focus on those specific parameters in the raw water that do not meet the potable water quality standards (SANS 241-1).	Holder, Engineer	Planning and Design Phase.	Compliance to be verified by ECO and IEA.
20	Layout and Design	Collapse of the road section crossing the Brak River due to poor stormwater management.	Good road condition.	A pioneer layer within the drainage and floodplain area of the Brak River.	It is recommended that a pioneer layer of G2/G3 material be placed along the section underlain by Profile 3, the transported fluvial deposits within the drainage and floodplain area (Brak River). The pioneer layer must be placed before the foundation and the layer works of the road and culverts are constructed.	Engineer, Contractor	Planning and Design Phase and construction	Compliance to be verified by ECO and IEA.
20	Layout and Design	Collapse of the road section crossing the Brak River due to poor	Good road condition.	A pioneer layer within the drainage and floodplain area	Culverts and stormwater control measures must be above the pioneer layer.	Engineer, Contractor	Planning and Design Phase and construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		stormwater management.		of the Brak River.				
20	Layout and Design	Collapse of the road section crossing the Brak River due to poor stormwater management.	Good road condition.	A pioneer layer within the drainage and floodplain area of the Brak River.	The road layer works should be placed and compacted so that the road alignment is above the 1:50 year flood elevation.	Engineer, Contractor	Planning and Design Phase and construction	Compliance to be verified by ECO and IEA.
20	Layout and Design	Collapse of the road section crossing the Brak River due to poor stormwater management.	Good road condition.	A pioneer layer within the drainage and floodplain area of the Brak River.	Where the road cross level ground provision for adequate drainage on both sides of the road should be provided.	Engineer, Contractor	Planning and Design Phase and construction	Compliance to be verified by ECO and IEA.
20	Layout and Design	Unstable roadbed and wearing course, development of standing water on the roads causing potholes over time.	Good road condition.	Pioneering layer added to deeper sand in Section 3 of the road alignment (on Profiles 1 and 2).	When grading the invert for the road layer works, the areas where deeper sand is encountered, in Section 3 of the road alignment on Profiles 1 and 2 (see Figure 13 Geotechnical Investigation Report for Sun Central PV Project Near De Aar, Northern Cape Province – BRC/RP/31/2022 prepared by Bare Rock Consulting (Pty) Ltd dated December 2022), can be cut a bit deeper and a pioneering layer added and compacted.	Engineer, Contractor	Planning and Design Phase and construction	Compliance to be verified by ECO and IEA.
20	Layout and Design	Unstable roadbed and wearing course, development of standing water on the roads	Good road condition.	Pioneering layer and foundations in the road sections underlain by Profile 3 where	Pioneering layer and foundations are essential in the road sections underlain by Profile 3 where the thicker 0.6 to 4.2 m thick transported soil layers overlie the siltstone bedrock (see Figure 13	Engineer, Contractor	Planning and Design Phase and construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		causing potholes over time.		the thicker 0.6 to 4.2 m thick transported soil layers overlie the siltstone bedrock.	Geotechnical Investigation Report for Sun Central PV Project Near De Aar, Northern Cape Province – BRC/RP/31/2022 prepared by Bare Rock Consulting (Pty) Ltd dated December 2022).			

Table 23. Management Protocol for Security

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
21	Planning	An influx of job seekers and construction workers into the area could increase the potential for criminal activity.	A safe local farming community	Reduce risk of criminal activity	No accommodation shall be provided for contractors, sub-contractors, and their workers on the construction site.	Holder, Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
21	Planning	An influx of job seekers and construction workers into the area could increase the potential for criminal activity.	A secure construction area.	Reduce risk of criminal activity	Security during construction will be mitigated by erecting the servitude fence at the onset of construction to prevent any movement out of the development footprint.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
21	Layout and Design	Increased potential for criminal activity, including theft of and damage	A secure construction area.	Reduce risk of criminal activity	Security shall be appointed throughout construction to discourage criminal elements. Site security will be required at all times.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat., Reg. EAP)
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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		to infrastructure.						
21	Layout and Design	Increased potential for criminal activity, including theft of and damage to infrastructure.	A secure construction area.	Reduce risk of criminal activity	Use existing gates provided to gain access to all parts of the area authorised for development, where possible.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
21	Layout and Design	Increased potential for criminal activity, including theft of and damage to infrastructure.	A secure construction area.	Reduce risk of criminal activity	Existing and new gates to be recorded and documented in photographic record.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
21	Layout and Design	Increased potential for criminal activity, including theft of and damage to infrastructure.	A secure construction area.	Reduce risk of criminal activity:	All gates must be fitted with locks and be kept locked at all times during the development phase, unless otherwise agreed with the landowner.	Contractor, Landowner	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
21	Layout and Design	Increased potential for criminal activity, including theft of and damage to infrastructure.	A secure construction area.	Reduce risk of criminal activity	Care must be taken that the gates must be so erected that there is a gap of no more than 100 mm between the bottom of the gate and the ground.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
21	Layout and Design	Increased potential for criminal activity, including theft of and damage	A secure construction area.	Reduce risk of criminal activity	All demarcated fencing and barriers must be maintained in good working order for the duration of the development activities.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		to infrastructure.						
21	Layout and Design	Increased potential for criminal activity, including theft of and damage to infrastructure.	A secure construction area.	Reduce risk of criminal activity	Fencing must be erected around the camp, batching plants, hazardous storage areas, and all designated access restricted areas, where applicable.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
21	Layout and Design	Increased potential for criminal activity, including theft of and damage to infrastructure.	A secure construction area.	Reduce risk of criminal activity	All fencing must be developed of high-quality material bearing the SABS mark.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.
21	Layout and Design	Increased potential for criminal activity, including theft of and damage to infrastructure.	A secure construction area.	Reduce risk of criminal activity	Fenced areas with gate access must remain locked after hours, during weekends and on holidays if staff is away from site. Site security will be required at all times.	Contractor	Planning and Design Phase Continuous	Compliance to be verified by ECO and IEA.

Table 24. Management Protocol for Public Services

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
22	Change land use	Increased traffic can result in corrugations and potholes on roads.	Good road conditions.	No corrugations or potholes in access road.	Construction of the N10/Burgerville Road intersection; and upgrading of Burgerville Road up to the access point (approximately 5.2 km) at	Engineer, Contractor	Planning and Design Phase	Compliance to be verified by ECO and IEA.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat., Reg. EAP)
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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					Farm Riet Fountain No. 39C.			
22	Layout and Design	Transport of abnormal roads could be delayed.	Safe (unobstructed) delivery of abnormal loads to site.	Investigation	The appointed engineers should investigate the route to the site to ensure that the abnormal loads are not obstructed at any point by geometric, height and width limitations along the route.	Engineer	Planning and Design Phase	Compliance to be verified by ECO and IEA.

Table 25. Management Protocol for Heritage and Culture

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
23	Layout and Design	Disturbance to or destruction of sites 19, 20 and 21 during construction.	Protection and preservation of heritage resources.	Road servitude is outside the 30 m buffer	The access road must be aligned in such a way that the outside edge (fence) of the 19 m-wide servitude remains outside the 30 m buffer from Heritage Sites 19, 20 and 21 [GPS Coordinates: S30.89076 E24.31306 (19); S30.89010 E24.31322 (20) & S30.88885 E24.31347 (21)].	Engineer, Contractor	Planning and Design And Construction.	Compliance to be monitored by the SEO and verified by ECO and IEA.
23	Layout and Design	Disturbance to or destruction of sites 19, 20 and 21 during construction.	Protection and preservation of heritage resources.	30 m buffer from Heritage Sites	Heritage sites 19 (S30.89076 E24.31306), 20 (S30.89010 E24.31322) & 21 (S30.88885 E24.31347) and their 30 m buffers are no-go areas for the purposes of this project.	Engineer, Contractor	Planning and Design And Construction.	Compliance to be monitored by the SEO and verified by ECO and IEA.

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PRE-CONSTRUCTION PHASE

Table 26. Management Protocol for Legal System

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
01	Contractor Readiness	An EMP designed to manage different aspects or attributes of the environment may be difficult for a contractor to implement.	Compliance with EMPr	Method Statement	The contractor should develop method statement for each "management category" by incorporating the applicable management actions identified in this EMP to mitigate various aspects of the receiving environment, prior to the commencement of construction	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.
01	Contractor Readiness	Lack of environmental awareness: Significant environmental impacts	Environmentally sensitive and responsible conduct by employees	Signed attendance register of Environmental Awareness training	All contractors, sub-contractors and their workers shall participate in an Environmental Awareness Training before being allowed to enter site. Refresher environmental awareness training is available as and when required.	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.
01	Contractor Readiness	Lack of environmental awareness: Significant environmental impacts	Environmentally sensitive and responsible conduct by employees	Signed attendance register of Environmental Awareness training	The Contractor must allow for sufficient sessions to train all personnel with no more than 20 personnel attending each course.	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.
01	Contractor Readiness	Lack of environmental awareness: Significant environmental impacts	Environmentally sensitive and responsible conduct by employees	Course outline of Environmental Awareness training	All staff are aware of the conditions and controls linked to the EA and within the EMPr and made aware of their individual roles and responsibilities in achieving compliance with the EA and EMPr;	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.
01	Contractor Readiness	Lack of environmental awareness:	Environmentally sensitive and responsible	Course outline of Environmental	Environmental awareness training must include as a minimum the following:	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		Significant environmental impacts	conduct by employees	Awareness training	a) Description of significant environmental impacts, actual or potential, related to their work activities; b) Mitigation measures to be implemented when carrying out specific activities; c) Emergency preparedness and response procedures; d) Procedures to be followed when working near or within sensitive areas; e) Wastewater management procedures; f) Water usage and conservation; g) Solid waste management procedures; h) Sanitation procedures; i) Fire prevention; and j) Disease prevention.			
01	Contractor Readiness	Lack of environmental awareness: Significant environmental impacts	Environmentally sensitive and responsible conduct by employees	Signed attendance register of Environmental Awareness training	A record of all environmental awareness training courses undertaken as part of the EMPr and staff attendance registers must be available	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.
01	Contractor Readiness	Lack of environmental awareness: Significant environmental impacts	Environmentally sensitive and responsible conduct by employees	Course outline of Environmental Awareness training	Course material must be available and presented in appropriate languages that all staff can understand.	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.
01	Contractor Readiness	Contractor is unaware of EA	Compliance with the EA and EMPr	Contractor has an environmental	Contractor must be provided with a copy of the EA and EMPr.	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat., Reg. EAP)
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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		and EA and EMP.		file on site including the EA and EMPr				
01	Contractor Readiness	Failure to obtain approvals, licenses or permits.	Compliance	Approvals/Permits	Obtain where applicable the approvals identified in the Planning and Design Phase (under "Legal Compliance") prior to commencing construction.	Holder	Pre-construction	Compliance to be verified by ECO and IEA.
01	Contractor Readiness	Conditions of EA and EMP are not enforced or penalised through contracts	Reduced occurrence of EPC being non-compliant with EA and EMPr	Clause within EPC contract relating to a penalty system for incidences of non-compliance with the EA and EMPr	Contractor should include in EPC contract a penalty system regarding incidences of non-compliance with the EA and EMPr, e.g., littering should be a finable offence.	Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
01	Site establishment	Non-compliance with regards to dangerous goods (fuel) storage	Lawful dangerous goods storage	Fuel storage is below 30 cubic meters	Combined fuel storage capacity must remain below 30 cubic meters	Contractor, ECO	Pre-construction	Compliance to be verified by ECO and IEA.
01	Site establishment	Unsafe disposal - soil contamination and water pollution.	Compliance	Section 21 (g) authorization	Any person who stores or disposes of domestic wastewater are subject to (must comply with) the limits and conditions set out in the General Authorisation for Section 21(g) Disposing of waste in a manner which may detrimentally impact on a water resource published in GN No. 665 of Government Gazette No. 36820 on 06th September 2013 or alternatively, the conditions contained in the water use license.	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat., Reg. EAP)
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Table 27. Management Protocol for Terrestrial Fauna

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
02	Planning	Farm gates being left open, or not being closed properly by construction teams.	Minimize disturbance to local famers	Signed attendance register of Environmental Awareness training	The construction teams must be educated about the closing/locking farm gates, through toolbox talks.	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.
02	Planning	Farm gates being left open, or not being closed properly by construction teams.	Minimize disturbance to local famers	No vehicle incidences with livestock	Livestock must have right of way.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
02	Planning	Farm gates being left open, or not being closed properly by construction teams.	Minimize disturbance to local famers	No vehicle incidences with livestock	Construction vehicles must wait for the animals to cross before they continue with their journey.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
02	Planning	The construction of a solar electricity generating facility and its associated infrastructure will lead to a change of land use and livelihoods.	Minimize change in livelihoods of surrounding communities	Construction programme provide to affected farmers	The farmers must be given a construction programme with sufficient leeway to ensure that they can move their livestock before construction activities commence.	Holder, Contractor.	Pre - Construction Phase	Compliance to be verified by ECO and IEA.
03	Contractor Readiness	Loss of fauna/	Ensure the protection of	No poaching (snares etc.)	SolarAfrica Energy must have a zero-tolerance policy regarding poaching, and make it clear what	Contractor, ECO	Continuous	Compliance to be verified by ECO and IEA.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat., Reg. EAP)
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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		livestock through poaching	fauna and livestock		the punishment and consequences would be.			
03	Contractor Readiness	Lack of environmental awareness training	Ensure the protection of fauna and livestock	Signed attendance register of Environmental Awareness training	The contractor's staff must be made aware of the prohibitions relating to wild animals in an induction, specifically: No wild animal may under any circumstance be handled, removed, or be interfered with unless done so by a trained handler. No wild animal may be fed on site. No wild or domesticated animal may under any circumstance be hunted, snared, injured or killed.	Contractor, SEO	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
03	Contractor Readiness	Lack of environmental awareness training	Ensure the protection of fauna and livestock	Environmental Awareness training course material	Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas, fauna and in particular awareness about not harming or collecting species such as snakes, tortoises and owls which are often persecuted out of superstition etc.	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.
03	Contractor Readiness	Bird mortalities during the construction phase due to vehicle collisions	Ensure the protection of Aves.	Minimal bird injuries & mortalities recorded.	As far as possible, limit construction within sensitive flood plains, watercourses and associated buffers to May, June, July, and August to avoid breeding periods of	Holder, Contractor	Pre-construction and Dry season	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		or collisions with infrastructure. Disturbance to breeding or destruction of bird roosts during the construction phase	Ensure least impact on breeding, e.g., bird roosts and nests are not disturbed.	Least impact on breeding, e.g., bird roosts and nests are not disturbed.	Avian species.			
03	Contractor Readiness	Bird mortalities during the construction phase due to vehicle collisions or collisions with infrastructure. Disturbance to breeding or destruction of bird roosts during the construction phase	Ensure the protection of Aves. Ensure least impact on breeding, e.g., bird roosts and nests are not disturbed.	Minimal bird injuries & mortalities recorded. Least impact on breeding, e.g., bird roosts and nests are not disturbed.	As far as possible, schedule work in the vicinity of nests or roosts of species of conservation concern outside of the breeding season of the nesting bird; construction of that portion of the preferred Alternative Route No. 1 that is within the 1.5 km buffer of the Verreaux Eagle's nest should be completed outside its breeding season, which is from April to July, and preferably August as well.	Contractor	Pre-construction and outside of the breeding season of the nesting bird.	SEO to monitor 1.5 km buffer. Compliance to be verified by ECO and IEA.
03	Site establishment	Sedentary mammals or nesting birds could be injured or killed, resulting in a direct loss of terrestrial animals or aves from construction	Compliance	Preservation of Species of Conservation Concern (SCC).	Pre-construction walk-through of the access road, pipeline routes and other construction footprints (e.g., camp and staging areas) in order to locate species of conservation concern (e.g., endemic, threatened and/or protected fauna), particularly local sedentary or burrowing fauna as well as ground nesting birds that can be translocated.	Contractor, Specialist, SEO	Pre-construction prior to clearing.	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		footprint.						
03	Site establishment	Sedentary mammals or nesting birds could be injured or killed, resulting in a direct loss of terrestrial animals or aves from construction footprint.	Compliance	Preservation of Species of Conservation Concern (SCC).	If any sedentary animals or ground nesting birds are found, then these are to be relocated to a suitable distance and habitat by the Specialist or appropriately qualified environmental officer, and only if it is not possible to relocate the footprint.	Contractor, Specialist, SEO	Pre-construction prior to clearing.	Compliance to be verified by ECO and IEA.
03	Site establishment	Sedentary mammals or nesting birds could be injured or killed, resulting in a direct loss of terrestrial animals or aves from construction footprint.	Compliance	Preservation of Species of Conservation Concern (SCC).	Vegetation clearing to commence only after walk through has been conducted, the necessary permits and/or license have been obtained, and/or sedentary animals/aves have been safely translocated.	Contractor, Specialist SEO	Pre-construction prior to clearing.	Compliance to be verified by ECO and IEA.
03	Site establishment	Sedentary mammals or nesting birds could be injured or killed, resulting in a direct loss of	Compliance	Preservation of Species of Conservation Concern (SCC).	SEO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas.	SEO	Pre-construction prior to clearing.	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		terrestrial animals or aves from construction footprint.						
03	Site Establishment	Animals may enter the contraction camp and have access to waste, hazardous substances, equipment, etc.	Ensure the protection of fauna	No incidents of animals entering the construction camp	Erect and maintain a barrier (e.g., shade cloth fence) around the perimeter of the construction camp.	Contractor	Continuous	Compliance to be verified by ECO and IEA.

Table 28. Management Protocol for Terrestrial Flora

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
04	Planning	Risk of veld fires caused by workers during the construction of the facility decreases grazing capacity	No run-away (uncontrolled) fires	Fire management plan	Undertake a risk analysis to determine *inter alia* the probability and frequency of a wildfire during construction and operation and prepare a fire management plan accordingly.	Holder	Pre-construction	Compliance to be verified by ECO and IEA.
04	Contractor Readiness	Risk of veld fires caused by workers during the construction of the facility.	No run-away (uncontrolled) fires	Appointed person/agent to deal with fires	Appoint a responsible person (or agent) who will extinguish a fire or assist in doing so.	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
04	Contractor Readiness	Risk of veld fires caused by workers during the construction of the facility.	No run-away (uncontrolled) fires	Trained firefighting personal	If no agent is appointed, a team of designated firefighting personal shall be trained and readily available to immediately deal with any runaway veld fires.	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
04	Contractor Readiness	Picking a protected, specially protected, or where applicable indigenous plants, without the applicable permits and/or license constitutes an offence.	Lawful activities involving any threatened or protected flora.	A license under the NFA, 1998, a permit under NCNCA, 2009 and/or a permit under NEMBA, 2004.	Vegetation clearance may not commence without the applicable permit(s) and/or license to carry out a restricted activity involving, or cutting, disturbing, damaging or destroying any protected or specially protected plants, as well as picking indigenous plants on a public road, on land next to a public road within 100 m from the centre of the road, and within 100 m from the middle of a natural watercourse, whether wet or dry, on either side of the natural water course.	Holder, Contractor	Prior to commencement of clearing and grubbing.	Compliance to be verified by ECO and IEA.
04	Contractor Readiness	Picking a protected, specially protected, or where applicable indigenous plants, without the applicable permits and/or license constitutes an offence.	Lawful activities involving any threatened or protected flora.	A license under the NFA, 1998, a permit under NCNCA, 2009 and/or a permit under NEMBA, 2004.	Only apply for permit(s) and/or a license to "pick" a threatened or protected plant if it is not possible to relocate the footprint.	Holder Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
04	Contractor Readiness	Direct loss of terrestrial plants from construction activities on land.	Preserve protected plant species that may not have been identified during the EIA Phase	Signed register of attendance, and content of induction.	The contractor's staff must be made aware of the prohibition on harvesting any plant or plant part.	Contractor, SEO.	Continuous	Compliance to be verified by ECO and IEA.
04	Site Establishment (Layout)	Direct loss of terrestrial plants from construction camp footprint.	Compliance	Preservation of Species of Conservation Concern (SCC) Protected plant permits (if applicable)	Preconstruction walk-through of the access road, pipeline routes and other construction footprints (e.g., camp and staging areas) in order to locate species of conservation concern (e.g., endemic, threatened and/or protected flora) that can be translocated.	Contractor, Specialist, SEO.	Prior to site establishment.	Compliance to be verified by ECO and IEA.
04	Site Establishment (Layout)	Direct loss of terrestrial plants from construction camp footprint.	Compliance	Preservation of Species of Conservation Concern (SCC) Protected plant permits (if applicable)	High visibility flags must be placed near endemic, threatened or protected plants that will not be translocated to avoid any damage or destruction of these species.	Contractor, SEO.	Prior to site establishment.	Compliance to be verified by ECO and IEA.
04	Site Establishment (Layout)	Direct loss of terrestrial plants from construction camp footprint.	Compliance	Preservation of Species of Conservation Concern (SCC) Protected plant permits (if applicable)	Any restricted activity involving, or picking, or cutting, disturbing, damaging or destroying any protected, specially protected, or indigenous plants within 100 m from the middle of a river on either side of the natural water courses, must comply with the applicable permit and/or license conditions.	Holder, Contractor	Prior to site establishment.	Compliance to be verified by ECO and IEA.
04	Site Establishment (Layout)	Direct loss of terrestrial plants from	Compliance	Preservation of Species of Conservation	Vegetation clearing to commence only after walk through has been conducted, the necessary permits	Contractor	Prior to site establishment.	Compliance to be verified

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		construction camp footprint.		Concern (SCC) Protected plant permits (if applicable)	and/or license have been obtained, and the visibility flags have been erected and/or applicable plants have been safely translocated.			by ECO and IEA.
04	Site Establishment (Layout)	Direct loss of terrestrial plants from construction camp footprint.	Compliance	Preservation of Species of Conservation Concern (SCC) Protected plant permits (if applicable)	SEO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas.	SEO.	Prior to site establishment.	Compliance to be verified by ECO and IEA.

Table 29. Management Protocol for Soil and Rock

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
05	Contractor Readiness	Spills from vehicles undergoing maintenance can contaminate the topsoil.	Control or contain soil pollution	Emergency protocol in place	An emergency protocol must be developed that deals with accidents and spills. This must include methods for absorbing chemical spills, as well as the transport and on-site bioremediation or disposal of all contaminated material at a licensed hazardous waste site.	Contractor, SEO	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
05	Site Establishment (Layout)	Construction plant can contaminate the topsoil in the construction	Preserve Topsoil	Topsoil stockpiles	Topsoil must be removed from the construction camp and staging area footprints and stockpiled separately within the respective areas for reinstatement during rehabilitation of both sites.	Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		camp and staging area.						
05	Site Establishment (Layout)	Leaks or spills from the hazardous substance store can contaminate the topsoil.	Responsible storage of hazardous substances	No hazardous substances within 100m of watercourse	No storage of hazardous substances (e.g., fuel, oil, etc.) is permitted within 100 m of the edge of any wetlands or watercourses.	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
05	Site Establishment (Layout)	Leaks or spills from the hazardous substance store can contaminate the topsoil.	Responsible storage of hazardous substances	Bund capacities displayed	The total bund capacities will be displayed on bund wall.	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
05	Site Establishment (Layout)	Leaks or spills from the hazardous substance store can contaminate the topsoil.	Responsible storage of hazardous substances	Bund with locked valve and sump	The bund must have a draining valve and a sump at the lowest point of the bund area; the draining valve must be closed and locked at all times.	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
05	Site Establishment (Layout)	Leaks or spills from the hazardous substance store can contaminate the topsoil.	Responsible storage of hazardous substances	Bund wall is protected	Where practical or necessary the bund wall must have protective barriers to prevent mobile equipment and vehicles from colliding with the walls and damaging it	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
05	Site Establishment (Layout)	Vehicles in poor condition are more prone to breakdowns and/or leaks (Risk).	Avoid contamination of soil from leaking machinery	Maintenance area is bunded and roofed	If a maintenance/service/repair facility for construction plant (vehicles, machines, or equipment) is required, then it will be in the construction camp. The maintenance/service/repair bay shall be bunded, roofed to prevent ingress of rain, include a stormwater diversion system to prevent the ingress of surface water run-off (e.g., a 'speed bump' at the entrance to the bunded service bay), and designed with an oil-water separator to remove hydrocarbons (oil, grease, fuel, hydraulic fluid, etc.).	Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
05	Site establishment (Layout)	Rain accumulation on waste storage areas can cause leaching.	To reduce the amount of soil pollution	A designated waste storage area is contained – waste is not in direct contact with the ground.	Designate and contain a temporary waste storage area within the construction camp (e.g., covered skips, scavenger proof bins, etc.)	Contractor	Pre-construction and Continuous	Compliance to be verified by Compliance to be verified by ECO and IEA
05	Site establishment (Layout)	Rain accumulation on waste storage areas can cause leaching.	To reduce the amount of soil pollution	A designated waste storage area is contained – bunded and roofed	The hazardous waste storage bay shall be fenced, bunded, roofed to prevent ingress of rain and include a stormwater diversion system to prevent the ingress of surface water run-off (e.g., a 'speed bump' at the entrance to the bunded storage bay).	Contractor	Pre-construction and Continuous	Compliance to be verified by Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
05	Site establishment (Layout)	Spills or leaks from the generators can contaminate the topsoil. Contaminated rainwater may be released from the bund into the environment	Avoid contamination of soil from leaking machinery	Generators with diesel tanks stored correctly	Generators with integrated diesel tanks must be located on an impervious bund capable of containing 110% of the volume of the integrated fuel storage tanks. The generators and bund shall be roofed to prevent ingress of rain.	Contractor	Pre-construction and Continuous	Compliance to be verified by Compliance to be verified by ECO and IEA
05	Site establishment (Layout)	Spills from fuel storage and refuelling in camp can contaminate the topsoil: Contaminated rainwater may be released from the bund into the environment	Responsible storage of fuel	Fuel tank is bunded to 110%	The above ground fuel storage tank must be located on an impervious bund capable of containing 110% of the volume of the fuel storage tank. The fuel tank and bund shall be roofed to prevent ingress of rain.	Engineer, Contractor	Pre-construction	Compliance to be verified by Compliance to be verified by ECO and IEA
05	Site establishment (Layout)	Spills from fuel storage and refuelling in camp can contaminate the topsoil: Contaminated rainwater may be released from the bund	Responsible storage of fuel	Refuelling station is bunded	The refuelling station alongside the aboveground diesel tank shall be bunded, include a stormwater diversion system to prevent the ingress of surface water run-off (e.g., a 'speed bump' at the entrance and exit) and designed with an oil-water separator to remove hydrocarbons (oil, grease, fuel, hydraulic fluid, etc.). If	Engineer, Contractor	Pre-construction	Compliance to be verified by Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		into the environment			practical, the refuelling station should be roofed to prevent ingress of rain.			
05	Site establishment (Layout)	Spills from fuel storage and refuelling in camp can contaminate the topsoil: Contaminated rainwater may be released from the bund into the environment	Responsible storage of fuel	Mobile fuel bowser parking area is bunded to 110%	A mobile fuel bowser must be parked (when not being used) on an impervious bund capable of containing 110% of the volume of the fuel bowser. The bund for parking the bowser shall be roofed to prevent ingress of rain and include a stormwater diversion system to prevent the ingress of surface water run-off (e.g., a 'speed bump' at the entrance to the bunded bay).	Engineer, Contractor	Pre-construction	Compliance to be verified by Compliance to be verified by ECO and IEA
05	Site establishment (Layout)	Concrete slurry from the batching plant or RMC trucks can contaminate the ground.	Responsible storage of concrete slurry waste for re-use or disposal.	No contamination of land (with waste concrete slurry)	The concrete batching plant shall have a washing facility, which shall only be used for washing the waste concrete slurry from the discharge chute(s) and rotating mixing drums of concrete mixer trucks.	Engineer, Contractor	Pre-construction	Compliance to be verified by Compliance to be verified by ECO and IEA
05	Site establishment (Layout)	Concrete slurry from the batching plant or RMC trucks can contaminate the ground.	Responsible storage of concrete slurry waste for re-use or disposal.	No contamination of land (with waste concrete slurry)	This washing facility shall contain two adjacent bays to allow for continuous operations and minimise the risk of overflow or work stoppage when a bay has reached its capacity and must be emptied. The wash bays shall be bunded and include a stormwater diversion system to prevent the ingress of surface water run-off (e.g., a 'speed bump' at the entrance to the bunded wash bay).	Engineer, Contractor	Pre-construction	Compliance to be verified by Compliance to be verified by ECO and IEA

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Table 30. Management Protocol for Ground and Surface Water

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
06	Site Establishment (Layout)	Hydrocarbons from washing plant can contaminate the ground.	Responsible storage of effluent for re-use or disposal.	No contamination of land (with effluent)	If a washing facility for construction plant (vehicles, machines, or equipment) is required, then it will be in the construction camp. The wash bay shall be bunded, roofed to prevent ingress of rain, include a stormwater diversion system to prevent the ingress of surface water run-off (e.g., a 'speed bump' at the entrance to the bunded wash bay), and designed with an oil-water separator to remove hydrocarbons (oil, grease, fuel, hydraulic fluid, etc.). If detergents are used, then they must be biodegradable.	Engineer, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
06	Site Establishment (Layout)	Groundwater is vulnerable to pollution from on-site effluent disposal facilities	Safe drinking water.	Complaint wastewater treatment works	If a wastewater treatment package plant is installed at the construction camp, then: Comply with the National Standards on septic tank systems provided in SANS 10252-2 Water Supply and Drainage for Buildings: Part 2 Drainage installations for buildings (relevant information is included in Annexure A of SANS 10252-2)	Engineer, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
06	Site Establishment (Layout)	Groundwater is vulnerable to pollution from on-site effluent disposal facilities	Safe drinking water.	Complaint wastewater treatment works	If a wastewater treatment package plant is installed at the construction camp, then: Sludge from septic tanks will be disposed of in accordance with the "Guidelines for the Utilisation and Disposal of Wastewater Sludge:	Engineer, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
					Volume 3: Requirements for the on-site and off-site disposal of sludge."			
06	Site Establishment (Layout)	Groundwater is vulnerable to pollution from on-site effluent disposal facilities	Safe drinking water.	Complaint wastewater treatment works	If a wastewater treatment package plant is installed at the construction camp, then: The design of a soakaway must comply with the guidelines given in the National Building Regulations SANS 10400.	Engineer, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
06	Site Establishment (Layout)	Groundwater is vulnerable to pollution from on-site effluent disposal facilities	Safe drinking water.	Wastewater treatment works monitoring results	If a wastewater treatment package plant is installed at the construction camp, then: Treated effluent must be sampled and monitored at the points of ingress to the effluent plants and at the points of reuse or discharge.	Holder, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
06	Site Establishment (Layout)	Groundwater is vulnerable to pollution from on-site effluent disposal facilities	Safe drinking water.	Complaint wastewater treatment works	If a wastewater treatment package plant is installed at the construction camp, then: Fats, oils and greases (FOG's) should be treated at the source with fat traps and shall be no more than 10 mg/L before entering the effluent plant.	Holder, Engineer, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
06	Site Establishment (Layout)	Groundwater is vulnerable to pollution from on-site effluent disposal facilities	Safe drinking water.	Suitable wastewater treatment works operator appointed	If a wastewater treatment package plant is installed at the construction camp, then: The success of a wastewater treatment package plant is dependent on correct operation and maintenance. Therefore, a suitably qualified operator (the "process controller") should be trained and/or appointed prior to commissioning.	Holder, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
06	Site Establishment (Layout)	Unsafe disposal - soil contamination and water pollution.	Responsible disposal of domestic wastewater. Avoid soil contamination and water pollution from the handling and disposal of domestic wastewater.	Location of Wastewater treatment works including conservancy tanks.	Wastewater disposal sites, including conservancy tanks, must be located- (a) outside of a watercourse; (b) above the 1:100-year flood line or riparian habitat whichever is the greatest, or alternatively at least 100 m from a water resource whichever is the greatest or at least further than a 500 m radius from a borehole that is utilised for drinking water or stock watering; (c) at least outside a 500 m radius from the boundary of a wetland; and (d) on land that is not, or does not, overlie, a major aquifer (identification of a major aquifer will be provided by the responsible authority upon written request).	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
06	Site Establishment (Layout)	Potential pollution due to effluent from infrastructure, e.g., Concrete slurry from the batching plant can contaminate surface water flows.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	No potential or actual effluent contamination of ground and vadose zone	Ensure correct placing of concrete batching plants and vehicle servicing areas etc. to avoid areas susceptible to soil and water pollution. Water runoff from the sites should be controlled as far as possible to prevent adverse effects. The seasonal drainage line should be protected from an increased inflow of poor-quality water.	Engineer	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
06	Site Establishment (Layout)	Potential pollution due to effluent from infrastructure, e.g., Concrete slurry from the batching plant can contaminate surface water flows.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	No potential or actual effluent contamination of ground and vadose zone	Contain the concrete batching plant by deflecting surface water runoff on the up-and down-slope side using, for example, sandbags.	Engineer, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
07	Contractor Readiness	Construction of linear infrastructure across the ephemeral drainage system will involve temporary diversion works, changing the surface water hydrology or flow patterns.	Minimise ponding, erosion, and sedimentation of watercourses.	Construction during dry months.	Construction should to the extent possible take place during dry months, with a decreased probability of storm events.	Holder, Contractor	Pre-construction Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
07	Planning	Increase in surface water runoff causing erosion.	Quick response to and remediation of any disturbance to watercourses in the area.	Preserve aquatic ecosystem structure and function.	Implement the Surface Water Monitoring Plan (**Appendix D** of EMP) during the construction phase only for both the proposed stormwater systems and surface water resources identified in the area.	Contractor	Construction Phase	Compliance to be verified by ECO and IEA.
07	Planning	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas, where there will be an activity that could alter the natural conditions of the rivers/streams, which could lead to sedimentation and erosion if	Minimise ponding, erosion, and sedimentation of watercourses.	Stormwater Management Plan	Create a Stormwater Management Plan by taking the following stormwater considerations into account: 1. Assess the site constraints and any site-specific concerns, including: • Specific vegetation that may need to be identified and/or isolated from the site disturbance. • Highly erodible soils may require additional erosion control measures. • The type of construction should consider landform. Avoid slab-on-ground construction on steep site. • Up-slope drainage catchments that may need to be diverted around the work site. • Workspace limitations may require site-specific sediment control measures and/or the extensive use of skips or bins for material storage and waste management. • Expected rainfall intensity during	Holder, Engineer, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		storm events occur during the construction phase.			the period of disturbance (wet season vs dry season). 2. Stabilise the site entry/exit points • A stabilised site access must be established and if possible, limited to one point only. The access allows for the construction vehicles to enter the work area of goods while preventing the unnecessary tracking of sediment onto the nearby environment from multiple locations. A stabilised entry/exit point normally consists of a stabilised rock pad. 3. Prevent erosion and manage stockpiles • Suitable material storage areas must be located up-slope of the main sediment barrier (e.g., sediment fence). • Stockpiles kept on site for more than two weeks will require an impervious cover (e.g., builder's plastic or geofabric) to protect against raindrop impact. Stockpiles of sandy material located behind a sediment fence will only need a protective cover if the stockpiles are likely to be exposed to strong winds. • On steep sites and sites with limited available space, erodible materials may need to be stored in commercial-sized bins or mini skips before use. 4. Manage Site Waste • Adequate waste receptacles must			

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
					be provided on-site and maintained in a way that potential and actual environmental harm resulting from such material waste is minimised.			

Table 31. Management Protocol for Atmosphere

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
08	Planning	Increase in ambient PM10 concentrations and dust fallout from construction activities.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.	Implement a dust monitoring programme for the access road and construction sites. Dust Monitoring Units are recommended to be installed.	Holder, Contractor	Planning and Design Phase and Continuous	Compliance to be verified by ECO and IEA.

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Table 32. Management Protocol for Terrestrial Ecosystem

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
09	Contractor Readiness	Clearance of vegetation near watercourses increases risk of erosion.	Maintain the Present Ecological State of the Brak River drainage system and large ephemeral tributaries.	Sensitivity of watercourse crossings included in inductions.	The operating teams responsible for construction within the watercourse crossings and 15 m buffers on both sides of the large ephemeral drainage systems must be (in their induction) exposed to the importance and sensitivity of the drainage systems they will be working in. All construction activities should be conducted with care inside the buffered drainage area.	Contractor, SEO	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
09	Contractor Readiness	Clearance of vegetation near watercourses increases risk of erosion.	Maintain the Present Ecological State of the Brak River drainage system and large ephemeral tributaries.	Sensitivity of watercourse crossings included in inductions.	Construction within the watercourse crossings and buffers must be overseen by project management.	Contractor, SEO	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
09	Contractor Readiness	Disturbed or exposed sites are vulnerable to erosion.	Minimise erosion of disturbed sites from storm water run-off.	Construction during dry months	Construction, particularly of linear infrastructure across parts of the ephemeral drainage system, should to the extent possible be restricted to the dry winter months (e.g., May to September), that is commence with such activities as clearing or grading, excavating and importing material at the end of the wet season/beginning of the dry season whilst the soil is still moist to reduce	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
					dust and as far as is practical, be completed in, the dry winter months with a decreased probability of storm events.			
10	Contractor Readiness	Transformation of ecosystems and construction camp creep	Minimize habitat loss.	Method statement	A method statement must be provided by the contractor prior to any onsite activity that includes the layout of the construction camp in the form of a plan showing the location of key infrastructure and services (where applicable), including but not limited to offices, overnight vehicle parking areas, stores, stockpile and lay down areas, hazardous materials storage areas (including fuels), the batching plant (if one is located at the construction camp), designated access routes, equipment cleaning areas, cooking and ablution facilities, waste and wastewater management	Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
10	Planning	Pollution due to accidental releases of contaminated liquids.	Ensure legal compliance with the prevailing and pertinent legislation. Avoid pollution. Reduce the amount of waste disposed to landfill.	Integrated Waste Management Plan	Develop and implement an integrated waste management plan that: (a) adopts the cradle-to-grave approach extending from waste prevention and minimization to generation, storage, collection, transportation, treatment, and final disposal of waste, (b) incorporates all aspects of the waste management hierarchy, and (c) is aligned with the Waste Classification and Management	Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
					Regulations (GN No. 634 of 23rd August 2013).			
10	Site Establishment (Layout)	Disturbance of terrestrial habitat	Minimize habitat loss	Sun Central Cluster 1 Solar PV facility construction camp and staging area used.	The contractor(s) appointed to rebuild and build the access road will use the same construction camp as set aside for the authorised Sun Central Cluster 1 Solar PV facility.	Holder, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
10	Site Establishment (Layout)	Disturbance of terrestrial habitat	Minimize habitat loss	Construction camp location as per EA reference: 14/12/16/3/3/2/998 dated 16th April 2018 as amended.	The construction camp footprint will be in the 'open' area(s) not earmarked for the solar field, around and between the Switching Station (Dx) and Main Transmission Substation (MTS), but within the low ecologically sensitive footprint of the authorised Sun Central Cluster 1 Solar PV facility (EA reference: 14/12/16/3/3/2/998 dated 16th April 2018 as amended), above the 1:100-year flood line or further than 100 m from the edge of a watercourse (buffer zone), whichever is greatest.	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
10	Site Establishment (Layout)	Disturbance of terrestrial habitat	Adequate construction camp	Construction camp is operational	The construction camp shall include such facilities as: • Sanitation system(s) (except for portable toilets following the work front), • Waste storage (except for dustbins following the work front), • Fuel storage tanks, • Hazardous substance storage, • Wash bay (except the wash bay for concrete slurry),	Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
					•Maintenance/service/repair bay, and • Parking (overnight or outside business hours).			
10	Site Establishment (Layout)	The physical footprint of certain construction activities will result in a loss of local terrestrial habitat.	Minimize habitat loss.	Construction camp is 4ha and Staging area is 1ha	The construction camp and staging area shall not exceed 4 ha and 1 ha in size, respectively.	Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
10	Site Establishment (Layout)	Environmentally sensitive areas are disturbed due to uncontrolled access.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Servitude and buffers are clearly fenced off or demarcated. No activities in no-go areas	Install fences along the boundary of the road servitude before working on the access road. Areas outside the fence line are access restricted (no-go) areas.	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.
10	Site Establishment (Layout)	Environmentally sensitive areas are disturbed due to uncontrolled access.	Maintain the Present Ecological State of the Brak River drainage system, large and small	Servitude and buffers are clearly fenced off or demarcated. No activities in no-go areas	Erect and maintain a temporary barrier on either side of the pipeline corridors where they intersect a floodplain, ephemeral tributary and wetland. Areas outside the barrier are access restricted (no-go) areas.	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
			ephemeral tributaries, alluvial floodplains, and headwater drainage lines.					
10	Site Establishment (Layout)	Environmentally sensitive areas are disturbed due to uncontrolled access.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	No activities in no-go areas	Unauthorised access and development related activity inside access restricted areas is prohibited.	Contractor, SEO	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
10	Site Establishment (Layout)	The physical footprint of certain construction activities will result in a loss of local terrestrial habitat.	Minimize habitat loss.	Laydown area within construction camp/staging area	Laydown areas are restricted to the construction camp and/or staging area.	Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
10	Site Establishment (Layout)	The physical footprint of certain construction activities will result in a loss	Minimize habitat loss.	No overnight parking outside of the construction camp/staging area	Overnight parking areas are restricted to the construction camp and/or staging area.	Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		of local terrestrial habitat.						
10	Site Establishment (Layout)	The construction equipment and materials needed to repair and rebuild the access road will require a substantial area for parking and storing resulting in a loss of habitat.	Minimize habitat loss	Staging area location as per EA reference: 14/12/16/3/3/2/998/AM4 dated 25th November 2022	The authorised ± 1 ha staging area (EA reference: 14/12/16/3/3/2/998/AM4 dated 25th November 2022), adjoining the district road, but inside the farm boundary of Portion 1 of Farm Riet Fountain No. 39C (30°51'13,89''S & 24°15'57,88''E) may be used as an access control point as well as for parking plant, material/aggregate stockpiles and as a laydown area.	Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.
10	Site Establishment (Layout)	Artificial lighting threatens biodiversity by disrupting the night behaviour of organisms affecting survivorship and or reproduction, e.g., by attracting insects and their predators from frogs to bats.	Minimise the effects of artificial light on wildlife (and humans).	Lighting is minimized	Any outside lighting should be minimised, positioned at or below roof height and directed away from highly sensitive areas, e.g., downwards.	Engineer, Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
10	Site Establishment (Layout)	Artificial lighting threatens biodiversity by disrupting the night behaviour of organisms affecting survivorship and or reproduction, e.g., by attracting insects and their predators from frogs to bats.	Minimise the effects of artificial light on wildlife (and humans).	No fluorescent or mercury lighting	Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible.	Engineer, Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.
10	Site Establishment (Layout)	Artificial lighting threatens biodiversity by disrupting the night behaviour of organisms affecting survivorship and or reproduction, e.g., by attracting insects and their predators from frogs to bats.	Minimise the effects of artificial light on wildlife (and humans).	LEDs and smart control lighting	Adopt LEDs and smart control technologies (such as motion sensors and timers) to control and manage the effects of artificial light on wildlife and 'sense of place'.	Engineer, Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.
10	Site Establishment (Layout)	Artificial lighting threatens biodiversity by	Minimise the effects of artificial light on	Best practise lighting	Incorporate the following best practice lighting design principles into the design of lighting: (a) Start	Engineer, Contractor	Planning and Design Phase	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		disrupting the night behaviour of organisms affecting survivorship and or reproduction, e.g., by attracting insects and their predators from frogs to bats.	wildlife (and humans).		with natural darkness and only add light for specific purposes, (b) Use adaptive light controls to manage light timing, intensity and colour, (c) Light only the object or area intended – keep lights close to the ground/mounting fixtures as low as possible, directed and shielded to avoid light spill, (d) Use the lowest intensity lighting appropriate for the task, (e) Use non-reflective, dark-coloured surfaces, and (f) Use lights with reduced or filtered blue, violet and ultra-violet wavelengths/Use lights with longer wavelengths, e.g., a white 2 700 K LED light (as opposed to a 5 000 K LED light) (National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds, Commonwealth of Australia 2020)			
10	Site Establishment (Layout)	Artificial lighting threatens biodiversity by disrupting the night behaviour of organisms affecting survivorship and or reproduction, e.g., by attracting insects and their predators.	Minimise the effects of artificial light on wildlife (and humans).	Watercourses are not lit up	Watercourses shall not be lit up or affected by light spillage where practical.	Engineer, Contractor	Planning and Design Phase and continuous	Compliance to be verified by ECO and IEA.

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Table 33. Management Protocol for Aquatic Ecosystem

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
11	Planning	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads, fences and sub surface pipelines).	Sensitive avifauna habitats are restored.	Rehabilitation Plan for watercourse crossings	A rehabilitation plan for all watercourse crossings (roads and pipelines) must be commissioned before construction commences.	Holder	Pre-construction	Compliance to be verified by ECO and IEA.
11	Planning	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads, fences and sub surface pipelines).	Sensitive avifauna habitats are restored.	Rehabilitation of watercourse crossings	All topsoil harvesting must take place in the dry season.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	Planning	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads, fences and sub surface pipelines).	Sensitive avifauna habitats are restored.	Rehabilitation of watercourse crossings	Returning the wetlands to their original grade must take place as minor differences in the final surface elevation can produce significant impacts on the type of vegetation that re-establishes itself (alien invasive species).	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	Planning	Habitat loss and fragmentation	Sensitive avifauna	Rehabilitation of watercourse crossings	When topsoil is salvaged and returned, it is anticipated without reseeding so that dense vegetative	Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		of watercourse areas because of infrastructure installation (roads, fences and sub surface pipelines).	habitats are restored.		communities of native species can regenerate within two growing seasons.			
11	Planning	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads, fences and sub surface pipelines).	Sensitive avifauna habitats are restored.	Rehabilitation of watercourse crossings	As emergent wetlands will recover more quickly than others, artificial seeding is not advised as it creates competition for reestablishment of native facultative and obligate wetland vegetation.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	Contractor Readiness	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure installation (underground pipelines).	Sensitive avifauna habitats are protected and maintained.	Road and pipeline construction during dry season	To the extent possible, schedule the road and pipeline construction during the season least damaging to the stream or wetland system (e.g., dry season).	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
11	Site Establishment (Layout)	Fuel spillage can contaminate a watercourse	Preserve aquatic ecosystem structure and function.	Fuel storage tanks outside 100m from watercourse	Fuel storage tanks shall be placed more than 100 m from the edge of a watercourse	Engineer, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
11	Site Establishment (Layout)	Environmentally sensitive areas are disturbed due to uncontrolled access.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Servitude and buffers are clearly fenced off or demarcated.	No temporary structures, such as camps, water treatment facilities, portable toilets, stores or stockpiles should be established inside the 15 m buffered area on both sides of the large ephemeral drainage systems. stored and the actual footprint of the development to prevent access to sensitive areas.	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
12	Site Establishment (Layout)	Construction activities in or near to ephemeral drainage systems can alter surface water flow patterns, e.g., changing sheet flow (natural open system) to concentrated flows leads to erosion.	Preserve ephemeral drainage systems.	No construction activities in no-go areas/15 m buffer outside the servitude	Disturbance near to drainage lines should be avoided and any drainage areas near to the access roads and construction activities should demarcated as no-go areas (excluding areas within the designated servitude).	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
12	Site Establishment (Layout)	Vegetation clearance of the project footprint for the access road and	Maintain the Present Ecological State of the Brak River	Construction Method Statements for crossings.	A construction method statement should be compiled and approved prior to the commencement of construction activities within all water	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		underground pipelines close to watercourses will be subject to erosion.	drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.		resource types and where applicable their buffers.			

Table 34. Management Protocol for Economical

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
13	Planning	Damage to farm infrastructure	Minimize damage to farm infrastructure	A grievance mechanism.	SolarAfrica Energy must develop a grievance mechanism using the Grievance Mechanism Protocol.	Holder	Pre-construction	Compliance to be verified by ECO and IEA.
13	Planning	Damage to farm infrastructure	Minimize damage to farm infrastructure	A grievance mechanism.	Appoint a contact person that can deal with enquiries from local residents.	Holder	Pre-construction	Compliance to be verified by ECO and IEA.
13	Planning	Damage to farm infrastructure	Minimize damage to farm infrastructure	A grievance mechanism.	The grievance mechanism must be in place and shared with all the stakeholders before the construction commences.	Holder	Pre-construction	Compliance to be verified by ECO and IEA.
13	Planning	Damage to farm infrastructure	Minimize damage to farm infrastructure	A grievance mechanism.	The grievance mechanism must include a complaints procedure that allows the landowners to log their grievance and submit a claim for damages.	Holder	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
13	Planning	Damage to farm infrastructure	Minimize damage to farm infrastructure.	Fences are clear of debris	Affected landowners must be compensated for losses resulting from any damage to farm infrastructure when caused by Project personnel or as a result of the Project.	Holder	Pre-construction and continuous	Compliance to be verified by ECO and IEA.
13	Contractor Readiness	Damage to farm infrastructure	Minimize damage to farm infrastructure.	Toolbox talks include damage to farm infrastructure.	The construction teams must be educated about the impact of damages to fences, water troughs and farm gates, through toolbox talks.	Contractor, ECO	Pre-construction	Compliance to be verified by ECO and IEA.
14	Planning	Transport of abnormal roads could be delayed.	Safe (unobstructed) delivery of abnormal loads to site.	Investigation	The appointed engineers should investigate the route to the site to ensure that the abnormal loads are not obstructed at any point by geometric, height and width limitations along the route.	Engineer	Pre-construction	Compliance to be verified by ECO and IEA.
15	Site Establishment (Layout)	Energy wastage.	Energy efficiency	HPS or LED/MH bulbs	If colour discrimination is not important, choose energy- efficient fixtures utilising yellowish high-pressure sodium (HPS) bulbs. If "white" light is needed, fixtures using LEDs, compact fluorescent or metal-halide (MH) bulbs are more energy-efficient than those using incandescent, halogen, or mercury-vapour bulbs.	Engineer, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
15	Site Establishment (Layout)	Energy wastage.	Energy efficiency	Never replace candescent bulbs with alternatives that use the same or more watts.	When purchasing energy efficient alternatives to traditional energy consumptive lighting, remember that they use less watts to produce the same amount of light (measured in lumens). So, never replace candescent bulbs with alternatives that use the same or more watts.	Holder, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.

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Table 35. Management Protocol for Social

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
16	Planning	Cumulative social impacts as it relates to social ills such as increases in crimes, theft, HIV rates, unemployment levels etc.	Minimize social impacts.	Social Impact Management Plan	Implement the Social Impact Management Plan during all phases of the project (**Appendix F**). The social impact management plan does not replace the social mitigation measures but must be implemented in addition to the suggested mitigation measures.	Holder	Pre-construction	Compliance to be verified by ECO and IEA.
16	Planning	Cumulative social impacts as it relates to social ills such as increases in crimes, theft, HIV rates, unemployment levels etc.	Minimize social impacts.	Social Impact Management Plan	A community liaison officer that is trusted by the community and has the necessary skills must be appointed before construction commences to interface and build trust between the contractor(s) and the landowners.	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
16	Planning	Cumulative social impacts as it relates to social ills such as increases in crimes, theft, HIV rates, unemployment levels etc.	Minimize social impacts.	Social Impact Management Plan	The community liaison officer must be bilingual with a solid knowledge of Afrikaans, as it is the language that most stakeholders are comfortable with (excluding the local government, where English would be sufficient).	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
16	Planning	Damage to farm infrastructure	Minimize damage to farm infrastructure.	A grievance mechanism.	The grievance mechanism must be communicated to the affected communities.	Holder, SEO	Pre-construction	Compliance to be verified

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
								by ECO and IEA.
16	Planning	Damage to farm infrastructure	Minimize damage to farm infrastructure.	A grievance mechanism.	SolarAfrica Energy should check in with the direct neighbours once a month to ensure all grievances are dealt with and that the different parties remain informed about any planned activities.	Holder, SEO	Once a month	Compliance to be verified by ECO and IEA.
16	Planning	The proposed project will create positive economic impacts in the area. The most direct impact on a community level is job creation.	Maximize benefits to the local community.	A recruitment policy.	As far as possible local labour must be used for the road construction.	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
16	Planning	The proposed project will create positive economic impacts in the area. The most direct impact on a community level is job creation.	Maximize benefits to the local community.	A recruitment policy.	SolarAfrica Energy must develop a recruitment policy and liaise with the Local Economic Development section of the municipality, local leaders, and NGOs during its development to ensure it is in line with the local practices and taps into existing knowledge.	Holder	Pre-construction	Compliance to be verified by ECO and IEA.
16	Planning	The proposed project will create positive economic impacts in the	Maximize benefits to the local community.	A recruitment policy.	The recruitment policy must set reasonable targets for the employment of local people and women.	Holder.	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		area. The most direct impact on a community level is job creation.						
16	Planning	The proposed project will create positive economic impacts in the area. The most direct impact on a community level is job creation.	Maximize benefits to the local community.	A procurement policy.	Workers from outside the area must be provided with a list of local service providers for their accommodation and other social needs.	Holder, Contractor, Landowner	Pre-construction, and Continuous	Compliance to be verified by ECO and IEA.
16	Planning	The proposed project will create positive economic impacts in the area. The most direct impact on a community level is job creation.	Maximize benefits to the local community.	A procurement policy.	As far as possible materials must be procured locally.	Contractor	Pre-construction, and Continuous	Compliance to be verified by ECO and IEA.
16	Planning	Potential congestion and delays on the surrounding road network.	Minimise risk of congestion and delays to local farmers.	Delivery trips outside peak traffic periods.	Stagger delivery trips and schedule deliveries outside of the peak traffic periods.	Contractor	Pre-construction, and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
16	Planning	Potential congestion and delays on the surrounding road network.	Minimise risk of congestion and delays to local farmers.	Delivery trips outside peak traffic periods.	Staff trips should also occur outside of the peak hours where possible.	Contractor	Pre-construction, and Continuous	Compliance to be verified by ECO and IEA.
16	Contractor Readiness	Vulnerable group's susceptible to negative influences in society such as prostitution, relationships with minors, alcohol and drug abuse, gambling and fighting due to the presence of people from outside the area.	Community protection	Signed Code of Conduct	Any person that does any work on site must sign the Code of Conduct and presented with a copy.	Contractor, SEO	Pre-construction, and Continuous	Compliance to be verified by ECO and IEA.
16	Contractor Readiness	Vulnerable group's susceptible to negative influences in society such as prostitution, relationships with minors, alcohol and drug abuse, gambling and	Community protection	Code of Conduct	The Code of Conduct must include the following aspects: • Respect for local residents, their customs and property. • Respect for farm infrastructure and agricultural activities. • No hunting or un-authorised taking of products or livestock. • Zero tolerance of illegal activities by construction personnel including: prostitution; illegal sale or purchase of alcohol; sale, purchase or	Contractor, SEO	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		fighting due to the presence of people from outside the area.			consumption of drugs; illegal gambling or fighting. • Compliance with the Traffic Management Plan and all road regulations; and • Description of disciplinary measures for violation of the Code of Conduct and company rules.			
16	Contractor Readiness	Vulnerable group's susceptible to negative influences in society such as prostitution, relationships with minors, alcohol and drug abuse, gambling and fighting due to the presence of people from outside the area.	Community protection	Signed Code of Conduct	If workers are found to be in contravention of the Code of Conduct, which they will be required to sign at the beginning of their contract, they will face disciplinary procedures that could result in dismissal. Stock theft should be noted as a dismissible offence.	Contractor, SEO	Pre-construction, and Continuous	Compliance to be verified by ECO and IEA.
16	Contractor Readiness	Vulnerable group's susceptible to negative influences in society such as prostitution, relationships with minors, alcohol and	Community protection	Induction Programme	Develop an induction programme that includes a Code of Conduct for all workers (including sub-contractors). The induction programme must include HIV/AIDS awareness, substance abuse programmes and education about alcohol abuse and gender-based violence.	Contractor, SEO	Pre-construction, and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		drug abuse, gambling and fighting due to the presence of people from outside the area.						
16	Contractor Readiness	Noise increase at the boundary of the project footprint and at the abutting houses during construction activities.	Minimize noise disturbance to noise receptors/farmhouses.	Construction during daytime only.	Topsoil stripping and construction activities should be limited to daytime only.	Contractor	Pre-construction and Construction	Compliance to be verified by ECO and IEA.
16	Site Establishment (Layout)	Decrease in the "sense of place" as it relates to noise, visual and light pollution.	Minimize change in sense of place.	Night lighting at construction camp kept to a minimum	Night lighting of the construction sites should be minimised within requirements of safety and efficiency.	Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

Table 36. Management Protocol for Land Use

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
17	Planning	The construction of an access road will lead to a change of	Minimize change in livelihoods of surrounding communities.	No harm to livestock	Livestock must have right of way.	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		land use and livelihoods.						
17	Planning	The construction of an access road will lead to a change of land use and livelihoods.	Minimize change in livelihoods of surrounding communities.	No harm to livestock	Construction vehicles must wait for the animals to cross before they continue with their journey.	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
17	Planning	The construction of an access road will lead to a change of land use and livelihoods.	Minimize change in livelihoods of surrounding communities.	In the case of harm to or loss of livestock, the farmer is compensated according to accepted protocols and procedures.	The contractor must compensate the farmer for any losses of livestock due to irresponsible behaviour by the construction teams.	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
17	Planning	The construction of an access road will lead to a change of land use and livelihoods.	Minimize change in livelihoods of surrounding communities.	In the case of harm to or loss of livestock, the farmer is compensated according to accepted protocols and procedures.	A protocol on compensation must be agreed upon and be in place before construction commences.	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
17	Planning	The construction of an access road will lead to a change of	Minimize change in livelihoods of surrounding communities.	In the case of harm to or loss of livestock, the farmer is compensated	A claims procedure must be in place and shared with all the stakeholders before the construction commences.	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		land use and livelihoods.		according to accepted protocols and procedures.				
17	Planning	The construction of a solar electricity generating facility and its associated infrastructure will lead to a change of land use and livelihoods.	Minimize change in livelihoods of surrounding communities.	Locals including neighbouring landowners are used for services where possible.	The principle of "locals first" should where practical be used to ensure that neighbouring landowners benefit from requirements for accommodation or any other services that they can deliver, e.g., road maintenance and dust suppression activities.	Holder, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
17	Planning	The construction of a solar electricity generating facility and its associated infrastructure will lead to a change of land use and livelihoods.	Minimize change in livelihoods of surrounding communities.	Locals including neighbouring landowners are used for services where possible.	If possible, local service providers must be used for road construction, maintenance, and dust suppression activities.	Holder, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.

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Table 37. Management Protocol for Health and Safety

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
18	Planning	Traffic accidents at primary access location off the N10.	To ensure the safe exit of Single-Unit Trucks (SU) and especially Single-Unit Truck plus Trailers (SU+T) at the junction of the N10 with the existing Burgerville (District) Road.	Traffic accommodation on eastern approach of N10 and flagman	Place appropriate traffic accommodation on the eastern approach of the N10, indicating a construction access ahead with a possible flagman to alert drivers and slow them down.	Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
18	Contractor Readiness	Lack on environmental and OHS awareness	To ensure effective Health and Safety implementation	CV of appointed HSO	Appoint a suitably qualified Health and Safety Officer (HSO) to implement OHSA (Act 85 of 1993)	Contractor	Pre-Construction	Compliance to be verified by ECO and IEA.
19		During the clearing of the site this may pose a risk to the workers and during the operation there may also be snake encounters.	Safe working environment	Toolbox talks	Workers and contractors must be educated about safety aspects in areas where there are wild animals. This could be done through toolbox talks.	Contractor, SEO	Pre-Construction	Compliance to be verified by ECO and IEA.
19		During the clearing of the site this may pose a risk to the workers and during the operation there may also	Safe working environment	One trained person on site to deal with snakes	At least one person on site needs to be trained to relocate venomous snakes.	Contractor, SEO	Pre-Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		be snake encounters.						
19		During the clearing of the site this may pose a risk to the workers and during the operation there may also be snake encounters.	Safe working environment	One trained person on site to deal with snakes	The person responsible for first aid must be trained in dealing with snake bites.	Contractor	Pre-Construction	Compliance to be verified by ECO and IEA.

Table 38. Management Protocol for Security

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
20	Contractor Readiness	Increases in stock theft and other crimes.	A safe local farming community	Induction Programme and Code of Conduct	SolarAfrica Energy and its contractors must develop an induction programme that includes a Code of Conduct for all workers (including sub-contractors).	Holder, Contractor	Pre-Construction	Compliance to be verified by ECO and IEA.
20	Site Establishment (Layout)	Increased potential for criminal activity, including stock theft, game poaching, property theft, emotional and/or physical harm to victims, etc.	A secure construction area.	Reduce risk of criminal activity	Security during construction will be mitigated by erecting the servitude fence at the onset of construction to prevent any movement out of the development footprint.	Contractor	Pre-Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
20	Site Establishment (Layout)	Impact: Increased potential for criminal activity, including stock theft, game poaching, property theft, emotional and/or physical harm to victims, etc.	A safe local farming community	Reduce risk of criminal activity	No accommodation shall be provided for contractors, sub-contractors, and their workers on the construction site.	Holder, Contractor	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.

Table 39. Management Protocol for Public Services

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
21	Planning	Stakeholders are concerned about the quality of the roads, increases in traffic and traffic safety. **Consequence:** Increase in accidents, longer time periods in transportation of goods.	Good traffic and road management.	A Traffic Management Plan	SolarAfrica Energy and/or other responsible authorities (e.g., IPPs, Eskom, Northern Cape Department of Roads and Public Works) must maintain the access road for the life of the project.	Holder and/or other responsible authorities	Continuous	Compliance to be verified by ECO and IEA.
21	Planning	Stakeholders are concerned about the quality of the roads, increases in	Good traffic and road management.	A Traffic Management Plan	SolarAfrica Energy must have a Traffic Management Plan to address the flow of traffic and road safety. Aspects such as speeding, driving while tired, transport of	Holder	Pre-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		traffic and traffic safety.			passengers, driving on un-tarred roads and general road safety must be included in the plan and in the induction of workers.			
21	Contractor Readiness	Transport of abnormal roads could be delayed.	Safe (unobstructed) delivery of abnormal loads to site.	Permit(s)	The applicable permits to transport the abnormal loads should be obtained.	Holder	Pre-construction	Compliance to be verified by ECO and IEA.

Table 40. Management Protocol for Visual Aesthetics

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
22	Planning	Decrease in the "sense of place" as it relates to noise, visual and light pollution.	Minimize change in sense of place.	Residents are notified when applicable	Residents near the development site should be notified 24 hours prior to any planned activities that will be visible.	Holder, Contractor	24 hours prior to any planned activities that will be visible.	Compliance to be verified by ECO and IEA.
22	Planning	Decrease in the "sense of place" as it relates to noise, visual and light pollution.	Minimize change in sense of place.	Contact person appointed to deal with grievances.	Develop a grievance mechanism and appoint a contact person that can deal with enquiries from local residents.	Holder, Contractor	Pre-construction	Compliance to be verified by ECO and IEA.
22	Site Establishment (Layout)	Excessive signage on the District gravel road can be visually obtrusive to local receptors (farmers).	Retain aesthetic values and sense of place.	Road signage is not excessive or visually overwhelming.	Signage on the main access and local farm roads should be moderated.	Contractor	Pre-constriction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
22	Site Establishment (Layout)	Short-term landscape change from the current rural agricultural sense of place to the semi-industrial RE landscape - Loss of site landscape character due to the operation of the PV structures and associated infrastructure - Lights at night have the potential to significantly increase the visual exposure of the proposed project.	Minimise the effects of artificial light on humans (and wildlife).	Low light spillage	Implement measures to reduce light spillage (e.g., choose "full-cut-off shielded" fixtures that keep light from going up or sideways, locate the light source closer to the operation, use directed LED technology, and aim fixtures either down or to maximise their impact on the targeted area whilst minimizing their impact elsewhere).	Engineer, Contractor	Pre-constriction and Continuous	Compliance to be verified by ECO and IEA.
22	Site Establishment (Layout)	Short-term landscape change from the current rural agricultural sense of place to the semi-industrial RE landscape - Loss of site landscape character due to the operation of the PV structures and associated infrastructure - Lights at night have the potential to significantly	Minimise the effects of artificial light on humans (and wildlife).	No overhead lighting	No overhead lighting to be used for security purposes.	Holder, Contractor	Pre-constriction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		increase the visual exposure of the proposed project.						

Table 41. Management Protocol for Heritage and Culture

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
23	Planning	Damage to heritage site 36, as well as stone-walled enclosures (kraals) and homesteads at GPS Coordinates S30 51 25.58 E24 14 33.51 (stone-walled enclosure/kraal; S30 51 25.58 E24 14 33.51 (homestead remains) along the public access road route.	Preservation of cultural heritage resources.	Cultural Management Plan	The stone-walled enclosure/kraal (S30 51 25.58 E24 14 33.51) and homestead remains (S30 51 25.58 E24 14 33.51) should be included in the Cultural Heritage Management Plan for the Sun Central Cluster 1 Solar PV Facility.	Holder	Pre-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
23	Site Establishment (Layout)	Disturbance to or destruction of a scatter of low-density stone tools at heritage site 18. Disturbance to or destruction of sites 19, 20 and 21 during construction. Damage to heritage site 36, as well as	Preservation of heritage resources.	19 m-wide servitude	Construction activities on the access road to the MTS shall be restricted to the 19 m-wide servitude	Contractor	Pre-construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		stone-walled enclosures (kraals) and homesteads at GPS Coordinates S30 51 25.58 E24 14 33.51 (stone-walled enclosure/kraal; S30 51 25.58 E24 14 33.51 (homestead remains) along the public access road route.						
23	Site Establishment (Layout)	Disturbance to or destruction of a scatter of low-density stone tools at heritage site 18. Disturbance to or destruction of sites 19, 20 and 21 during construction. Damage to heritage site 36, as well as stone-walled enclosures (kraals) and homesteads at GPS Coordinates S30 51 25.58 E24 14 33.51 (stone-walled enclosure/kraal; S30 51 25.58 E24 14 33.51 (homestead remains) along the public access road route.	Preservation of heritage resources.	No-go areas	Those heritage sites alongside the district road, including Site 36 (S30.85412 E24.27465), the stone-walled enclosure/kraal (S30 51 25.58 E24 14 33.51) and homestead remains (S30 51 25.58 E24 14 33.51), heritage site 18 (S30.89070 E24.31404), located approximately 70 m south of the proposed access road, as well as sites 19 (S30.89076 E24.31306), 20 (S30.89010 E24.31322) & 21 (S30.88885 E24.31347) and their 30 m buffers are no-go areas for the purposes of this project.	Contractor, SEO	Pre-construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
23	Site Establishment (Layout)	Disturbance to or destruction of a scatter of low-density stone tools at heritage site 18. Disturbance to or destruction of sites 19, 20 and 21 during construction. Damage to heritage site 36, as well as stone-walled enclosures (kraals) and homesteads at GPS Coordinates S30 51 25.58 E24 14 33.51 (stone-walled enclosure/kraal; S30 51 25.58 E24 14 33.51 (homestead remains) along the public access road route.	Preservation of heritage resources.	5 m-wide working corridors for pipelines	Construction activities on the water pipelines between Boreholes No. 13/14, No. 4 and No. 5, and their respective storage tanks, shall be restricted to a 5 m-wide working corridor.	Contractor	Pre-construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.
23	Site Establishment (Layout)	Disturbance to or destruction of a scatter of low-density stone tools at heritage site 18. Disturbance to or destruction of sites 19, 20 and 21 during construction. Damage to heritage site 36, as well as stone-walled	Preservation of heritage resources.	No go area	Heritage site 1 (GPS Coordinates of site 1: S30 51 32.10 E24 18 43.00), located approximately 230 m north of the proposed pipeline route, is a no-go area for the purposes of this project.	Contractor, SEO	Pre-construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		enclosures (kraals) and homesteads at GPS Coordinates S30 51 25.58 E24 14 33.51 (stone-walled enclosure/kraal; S30 51 25.58 E24 14 33.51 (homestead remains) along the public access road route.						

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CONSTRUCTION PHASE

Table 42. Management Protocol for Legal System

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
01	General and Hazardous Waste Management	Risk of non-compliance	Compliance with waste handling and storage	Integrated waste management plan.	Waste shall be managed in accordance with the integrated waste management plan.	Contractor, SEO	Construction and continuous	Compliance to be verified by ECO and IEA.
01	General and Hazardous Waste Management	Risk of non-compliance	Compliance with waste handling and storage	Registration with SAWIS, if required.	The contractor(s) must determine whether he/she needs to register a waste management activity on the South African Waste Information System (SAWIS) using the South African Waste Information Centre's website, e.g., generators of hazardous waste in excess of 20kg per day must register.	Contractor	Construction	Compliance to be verified by ECO and IEA.
01	General and Hazardous Waste Management	Risk of non-compliance	Compliance with waste handling and storage	Records of waste management.	The waste generator must keep accurate and up to date records of the management of the waste they generate including records that reflect: • The classification of the wastes (General waste, including domestic, business, building and demolition waste not containing hazardous waste/chemicals is listed in Annexure 1 of the Waste Classification and Management Regulations, 2013 and therefore do not require formal classification and assessment in terms of the same Regulations); • The quantity of each waste generated, expressed in tons or	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					cubic metres per month; • The quantities of each waste that has either been reused, recycled, recovered, treated, or disposed of; and • By whom the waste was managed.			
01	General and Hazardous Waste	Risk of non-compliance	Compliance with waste handling and storage	Waste is separated	Separate waste into recyclable (glass, metals, paper, plastic) and non-recyclable waste.	Contractor	Construction and continuous	Compliance to be verified by ECO and IEA
01	General and Hazardous Waste	Risk of non-compliance	Compliance with waste handling and storage	Labelled waste storage	Any container or storage impoundment holding waste must be labelled. If labelling is not possible, then records must be kept.	Contractor	Construction and continuous	Compliance to be verified by ECO and IEA
01	General and Hazardous Waste	Risk of non-compliance	Compliance with waste handling and storage	Records of waste storage	Labels and records need to reflect: (a) The date on which the waste was first placed into the container; (b) The date on which the last bit of waste was placed into the container before it was filled, closed, sealed or covered; (c) The dates when, and quantities of, waste added, and waste removed from containers or storage impoundments (if relevant); (d) The specific category or categories of waste in the container or storage impoundment as identified in terms of the National Waste Information Regulations (2012); and (e) The classification of the waste once it has been completed.	Contractor	Construction and continuous	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
01	General and Hazardous Waste	Risk of non-compliance	Compliance with waste handling and storage	Licensed service provider used	Given the overwhelming legal requirements governing the transport of Hazardous Chemical Substances (HCS) or dangerous goods, and therefore hazardous waste, it is recommended that the services of a licensed service provider be employed to undertake this activity. None the less, the consignor or person who dispatches the hazardous waste remains responsible to ensure that hazardous waste is packaged, transported, treated and disposed of in terms of the legal requirements and that there is an auditable record of the steps involved in storing, collecting and transporting the waste.	Contractor	Construction and continuous	Compliance to be verified by ECO and IEA
01	General and Hazardous Waste	Risk of non-compliance	Compliance with waste handling and storage	Safety Data Sheets	A Safety Data Sheet (SDS) and Waste Manifest must accompany a load of hazardous waste transported from the point of generation to the waste management facility.	Contractor	Construction and continuous	Compliance to be verified by ECO and IEA
01	General and Hazardous Waste	Risk of non-compliance	Compliance with waste handling and storage	Waste classification	Waste transporters may not accept waste that has not been classified in terms of SANS10234, unless it is listed in Annexure 1 of the Waste Classification and Management Regulations, 2013.	Contractor	Construction and continuous	Compliance to be verified by ECO and IEA
01	General and Hazardous Waste	Risk of non-compliance	Compliance with waste handling and storage	Waste does not accumulate longer than 18 months.	Waste generators must ensure that their waste is reused, recycled, recovered, treated and/or disposed of within 18 months of generation.	Contractor	Within 18 months of generation.	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
01	Health and Safety	Illegal mining of road material (aggregate).	Compliance	A copy of the mining permit or license.	If Road material or aggregate will be purchased from a commercial source, then it must be licensed.	Contractor	Construction	Compliance to be verified by ECO and IEA
01	Stockpiling and storing (laydown)	Blasting without a permit.	Compliance	Licensed contractor	Any blasting activity must be conducted by a suitably licensed blasting contractor.	Contractor	Construction	Compliance to be verified by ECO and IEA
01	Stockpiling and storing (laydown)	Blasting without a permit.	Compliance	Permit	The contractor carrying out the blasting work shall hold and be in possession of a permit authorizing such use in terms of the Explosives Act, 2003 (Act No. 15 of 2003), unless the activity relates to occupational health or occupational safety, in which case the matter is regulated under the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).	Contractor	Construction	Compliance to be verified by ECO and IEA
01	Stockpiling and storing (laydown)	Blasting without a permit.	Compliance	Written approval from the chief inspector of occupational health and safety	If the explosive to be used is defined in terms of the Occupational Health and Safety Act, 1993 (any substance or article as listed in Class 1: Explosives in the South African Bureau of Standards Code of Practice for the Identification and Classification of Dangerous Substances and Goods, SABS 0228), the contractor carrying out the blasting work shall apply in writing to the chief inspector of occupational health and safety for written approval to use the explosive in the workplace.	Contractor	Prior to blasting	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
01	Stockpiling and storing (laydown)	Blasting without a permit.	Compliance	Bylaws are applied.	Adhere to any local bylaws and regulations regarding the generation of noise.	Contractor	Construction	Compliance to be verified by ECO and IEA

Table 43. Management Protocol for Terrestrial Fauna

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
02	Plant Management	Disturbance during operation of plant can cause active mammals to temporarily emigrate from the area.	Ensure least impact on animal behaviour.	Low noise levels	Turn off all equipment when not in use.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
02	Plant Management	Disturbance during operation of plant can cause active mammals to temporarily emigrate from the area.	Ensure least impact on animal behaviour.	Low noise levels	Ensure that all equipment is kept in good working order.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
02	Plant Management	Disturbance during operation of plant can cause active mammals to temporarily emigrate from the area.	Ensure least impact on animal behaviour.	Low noise levels	Operate all equipment within specifications and capacity.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
02	Plant Management	Disturbance during operation of plant can cause active mammals to temporarily emigrate from the area.	Ensure least impact on animal behaviour.	Low noise levels	Adhere to any local bylaws and regulations regarding the generation of noise.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
02	Employee Management	Disturbance during construction can cause active mammals and birds to temporarily evade or emigrate from the area.	Ensure least impact on animal behaviour.	Low noise levels	Keep noise levels as low as practically possible when working, e.g., no unnecessary shouting, loud music or revving of engines.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
02	General and Hazardous Waste Management	Burning of waste as a disposal method increases the risk of veld fires caused by workers during the construction of the facility.	Ensure least impact on animal behaviour.	No waste is burned	Burning of waste is prohibited.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
02	General and Hazardous Waste Management	Loss of fauna if inorganic waste is ingested.	Good waste storage and management	No litter	General waste, such as food packaging and cement bags shall be immediately disposed of in the designated receptacles, e.g., scavenger proof bins, and removed from the construction site overnight.	Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
02	General and hazardous waste management	Cement bags disposed of around the site where fauna could come into contact with the waste.	Good waste storage and management	Waste storage area	Designate and contain a temporary waste storage area within the construction camp (e.g., covered skips, scavenger proof bins, etc.)	Contractor	Construction	Compliance to be verified by ECO and IEA.
02	General and hazardous waste management	Cement bags disposed of around the site where fauna could come into contact with the waste.	Good waste storage and management	No empty cement bags on site	Empty cement bags should be collected and removed from site to the designated waste storage area in the construction camp at the end of each workday.	Contractor, SEO	Construction and Continuous	Compliance to be verified by ECO and IEA.
02	General and hazardous waste management	Loss of fauna if inorganic waste is ingested.	Good waste storage and management	No waste on site	No waste or waste receptacles must remain on the construction site overnight, but returned to the designated waste storage area in the construction camp at the end of each workday.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
02	Plant Management	Loss of sedentary or active fauna when driving.	Minimize Road collisions with fauna.	A low-speed limit (30km/h max) is implemented	All vehicles accessing the site should adhere to a low-speed limit (30km/h max) to avoid collisions with susceptible species such as snakes and tortoises.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
02	Plant management	Bird mortalities during the construction phase due to vehicle collisions or collisions with infrastructure. Disturbance to	Ensure the protection of Aves.	Minimal bird injuries & mortalities recorded.	Drivers must adhere to the speed limit (30 km/hr) and slow down when approaching animals. This is to be included in the induction.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		breeding or destruction of bird roosts during the construction phase.						
02	Plant management	Bird mortalities during the construction phase due to vehicle collisions or collisions with infrastructure. Disturbance to breeding or destruction of bird roosts during the construction phase.	Ensure the protection of Aves.	Minimal bird injuries & mortalities recorded.	Drivers must be vigilant and on the lookout for animals.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
02	Plant management	Bird mortalities during the construction phase due to vehicle collisions or collisions with infrastructure. Disturbance to breeding or destruction of bird roosts during the construction phase.	Ensure the protection of Aves.	Minimal bird injuries & mortalities recorded.	A log should be kept detailing all fauna-related incidences or mortalities that occur on site, including roadkill, electrocutions etc. during construction and operation. These should be reviewed annually and used to inform operational management and mitigation measures.	Holder, Contractor, SEO, ECO	Continuous and reviewed annually	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
02	Plant Management	Disturbance (including of nesting SCC) due to noise, such as machinery movements and maintenance operations, causing active mammals and birds to temporarily evade or emigrate from the area.	Ensure the protection of Aves.	No unnecessarily loud noise that is a nuisance to wildlife	Construction plant, machinery and equipment must be regularly serviced and well maintained to reduce noise levels.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
02	Plant Management	Disturbance (including of nesting SCC) due to noise, such as machinery movements and maintenance operations, causing active mammals and birds to temporarily evade or emigrate from the area.	Ensure least impact on behaviour and breeding, e.g., bird roosts and nests are not disturbed.	Least impact on breeding, e.g., bird roosts and nests are not disturbed.	If work is to be undertaken in the vicinity of nest or roosts of species of conservation concern the scheduling of work should as far as practical be planned outside of the breeding season of the nesting bird and/or buffers to be observed.	Contractor, SEO	Construction outside of the breeding season of the nesting bird.	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
02	Plant Management	Disturbance (including of nesting SCC) due to noise, such as machinery movements and maintenance operations, causing active mammals and birds to temporarily evade or emigrate from the area.	Ensure the protection of Aves.	No unnecessarily loud noise that is a nuisance to wildlife	Keep noise levels as low as practically possible when working, e.g., no unnecessary shouting, loud music or revving of engines.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
02	Linear Infrastructure and Earthworks	Direct loss of fauna through earthworks during construction activities by falling into open excavations. Animals such as tortoises could get trapped inside trenches.	No harm to wildlife.	Trenches are not left open for extended periods.	If trenches need to be dug for water supply or other infrastructure, these should not be left open for extended periods of time as fauna may fall in and become trapped in them.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
02	Linear Infrastructure and Earthworks	Direct loss of fauna through earthworks during construction activities by falling into open	No harm to wildlife.	Trenches are not left open for extended periods.	Fill open excavations as soon as possible after excavation.	Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		excavations. Animals such as tortoises could get trapped inside trenches.						
02	Linear Infrastructure and Earthworks	Direct loss of fauna through earthworks during construction activities by falling into open excavations. Animals such as tortoises could get trapped inside trenches.	No harm to wildlife.	Trenches are not left open for extended periods.	Check excavations daily for trapped animals and release them. Do not kill any animal.	Contractor, SEO	Continuous and daily	Compliance to be verified by ECO and IEA.
02	Linear Infrastructure and Earthworks	Direct loss of fauna through earthworks during construction activities by falling into open excavations. Animals such as tortoises could get trapped inside trenches.	No harm to wildlife.	Trenches are not left open for extended periods.	Demarcate open excavations with preferably netting, construction fencing or similar to prevent any persons or animals falling in the excavations.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
02	Linear Infrastructure and Earthworks	Direct loss of fauna through earthworks during construction activities by	No harm to wildlife.	Trenches are not left open for extended periods.	If an animal is trapped, construct an earthen (soil) ramp at both ends of the excavation to allow trapped animals to escape.	Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		falling into open excavations. Animals such as tortoises could get trapped inside trenches.						
02	Clearing/Grubbing and Grading	Sedentary mammals or nesting birds could be injured or killed, resulting in a direct loss of terrestrial animals or aves from construction footprint.	Compliance	Preservation of Species of Conservation Concern (SCC).	Pre-construction walk-through of the access road, pipeline routes and other construction footprints (e.g., camp and staging areas) in order to locate species of conservation concern (e.g., endemic, threatened and/or protected fauna), particularly local sedentary or burrowing fauna as well as ground nesting birds that can be translocated.	Contractor, Specialist, SEO	Continuous	Compliance to be verified by ECO and IEA.
02	Clearing/Grubbing and Grading	Sedentary mammals or nesting birds could be injured or killed, resulting in a direct loss of terrestrial animals or aves from construction footprint.	Compliance	Preservation of Species of Conservation Concern (SCC).	If any sedentary animals or ground nesting birds are found, then these are to be relocated to a suitable distance and habitat by the Specialist and only if it is not possible to relocate the footprint.	Contractor, Specialist, SEO	Pre-construction and Continuous	Compliance to be verified by ECO and IEA.
02	Clearing/Grubbing and Grading	Sedentary mammals or nesting birds	Compliance	Preservation of Species of Conservation	Vegetation clearing to commence only after walk through has been conducted, the necessary permits	Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		could be injured or killed, resulting in a direct loss of terrestrial animals or aves from construction footprint.		Concern (SCC).	and/or license have been obtained, and sedentary animals/aves have been safely translocated.			
02	Clearing/Grubbing and Grading	Sedentary mammals or nesting birds could be injured or killed, resulting in a direct loss of terrestrial animals or aves from construction footprint.	Compliance	Preservation of Species of Conservation Concern (SCC).	SEO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas.	SEO	Continuous	Compliance to be verified by ECO and IEA.
02	Stockpiling and storing (Laydown)	Direct loss of local sedentary or burrowing fauna and Aves through burial.	Ensure least impact to animals	Search for fauna prior to stockpiling	Undertake a search for local sedentary or burrowing fauna as well as ground nesting birds on the area designated for stockpiles prior to stockpiling.	Contractor, SEO	Prior to stockpiling	Compliance to be verified by ECO and IEA.
02	Stockpiling and storing (Laydown)	Direct loss of local sedentary or burrowing fauna and Aves through burial.	Ensure least impact to animals	Relocate fauna	If any sedentary animals or ground nesting birds are found, then these are to be relocated to a suitable distance and habitat by the Specialist, and only if it is not possible to relocate the footprint.	Contractor, Specialist, SEO	Prior to stockpiling	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
03	Employee Management	Economic losses due to theft of livestock or game through poaching. Loss of fauna and/or injury to construction staff caused by potentially dangerous animals such as snakes.	No harm to wildlife and people.	No hunting or harvesting of fauna	The collection, hunting or harvesting of any animals at the site is strictly forbidden.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
03	Employee Management	Economic losses due to theft of livestock or game through poaching. Loss of fauna and/or injury to construction staff caused by potentially dangerous animals such as snakes.	No harm to wildlife and people.	No poaching	SolarAfrica Energy must have a zero-tolerance policy regarding poaching, and make it clear what the punishment and consequences would be.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
03	Employee Management	Economic losses due to theft of livestock or game through poaching. Loss of fauna and/or injury to construction staff caused by	No harm to wildlife and people.	SAPS Case number	All poaching incidences must be reported to the local police.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		potentially dangerous animals such as snakes.						
03	Employee Management	Economic losses due to theft of livestock or game through poaching. Loss of fauna and/or injury to construction staff caused by potentially dangerous animals such as snakes.	No harm to wildlife and people.	No construction creep	Except for the designated staging area and construction camp, all other construction activities are restricted to within the fenced road servitude.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
03	Employee Management	Economic losses due to theft of livestock or game through poaching. Loss of fauna and/or injury to construction staff caused by potentially dangerous animals such as snakes.	No harm to wildlife and people.	Potentially dangerous animals are safely removed from the construction site.	Any potentially dangerous fauna such as snakes or fauna threatened by the construction activities should be removed to a safe location by an experienced handler.	Contractor, SEO, Snake handler	Continuous	Compliance to be verified by ECO and IEA.
03	Plant Management	The construction of an access road will lead to an increase in roadkill	Minimize change in livelihoods of surrounding	No harm to livestock or other fauna	Livestock must have right of way.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
			communities.					
03	Plant Management	The construction of an access road will lead to an increase in roadkill	Minimize change in livelihoods of surrounding communities.	No harm to livestock or other fauna	Construction vehicles must wait for the animals to cross before they continue with their journey.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
03	Plant Management	The construction of an access road will lead to an increase in roadkill	Minimize change in livelihoods of surrounding communities.	Logbook	A log should be kept detailing all fauna-related incidences or mortalities that occur on site, including roadkill, electrocutions etc. during construction and operation. These should be reviewed annually and used to inform operational management and mitigation measures.	Contractor, SEO, ECO	Continuous and reviewed annually	Compliance to be verified by ECO and IEA.
03	Plant Management	The construction of an access road will lead to an increase in roadkill	Minimize change in livelihoods of surrounding communities.	No harm to livestock or other fauna.	Except for the designated staging area and construction camp, all other construction activities are restricted to within the fenced road servitude or pipeline.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
03	Plant Management	The construction of an access road will lead to an increase in roadkill	Minimize change in livelihoods of surrounding communities.	In the case of harm to or loss of livestock, the farmer is compensated according to accepted protocols and procedures.	The contractor must compensate the farmer for any losses of livestock due to irresponsible behaviour by the construction teams.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
03	Security	Farm gates being left open, or not being	Minimize loss of livestock.	Boundary gates are closed/locked.	Farm gates being left open, or not being closed properly by construction teams.	Contractor	Continuous and daily inspections	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
		closed properly by construction teams.			Inspections of boundary gates (must be closed/locked) should be done on a daily basis in areas where there are activities.			

Table 44. Management Protocol for Terrestrial Flora

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
04	Employee Management	Risk of veld fires caused by workers during the construction of the facility.	Minimise risk of runaway fires	No open fires.	Open fires are prohibited.	Contractor	Construction	Compliance to be verified by ECO and IEA.
04	Employee Management	Collection or harvesting of flora.	No illegal harvesting of flora or fauna	Illegal harvesting is forbidden	The collection or harvesting of any plant or plant part, irrespective of whether it is dead or alive, is strictly prohibited.	Contractor, SEO, ECO	Construction	Compliance to be verified by ECO and IEA.
04	Plant Management	Increase in sedimentation/dust covering flora species.	Minimize dust generation	Vehicles are covered	Vehicles transporting dispersive materials shall be covered.	Contractor	Construction	Compliance to be verified by ECO and IEA.
04	Plant Management	Increase in sedimentation/dust covering flora species.	Minimize dust generation	No offloading in windy conditions	Offloading of dispersive materials should be avoided during windy conditions.	Contractor	Construction	Compliance to be verified by ECO and IEA.
04	Plant Management	Trampling and removal of vegetation Loss in plant basal cover	Minimize damage to vegetation and potential for soil erosion.	No construction creep	Avoid moving too far from the access road or pipeline trench with vehicles during the construction period.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
04	Plant Management	Trampling and removal of vegetation Loss in plant basal cover	Minimize damage to vegetation and potential for soil erosion.	Limited new routes	Limit the number of new routes through the veld, especially with the development of the digging of the trenches for the pipelines to reduce the mechanical impact on the veld.	Contractor	Construction	Compliance to be verified by ECO and IEA.
04	Plant Management	Trampling and removal of vegetation Loss in plant basal cover	Minimize damage to vegetation and potential for soil erosion.	No signs of off-road driving	All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.	Contractor, SEO, ECO	Construction	Compliance to be verified by ECO and IEA.
04	General and Hazardous waste	Burning of waste as a disposal method increases the risk of veld fires caused by workers during the construction of the facility.	Responsible waste management	No burning of waste.	Burning of waste is prohibited.	Contractor	Construction	Compliance to be verified by ECO and IEA.
04	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Membership of the local Fire Protection Association	Join the local Fire Protection Association if there is one and abide by their minimum requirements, as well as any agreements entered into with the Minister or other FPAs to provide mutual assistance in fighting and extinguishing fires.	Holder	Continuous	Compliance to be verified by ECO and IEA.
04	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	PPE	Obtain the necessary PPE for firefighting personnel.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
04	Fire management	Risk of veld fires caused by	Fire management	Firefighting equipment	Obtain such firefighting equipment as would be reasonably required in the	Holder, Contractor	Continuous	Compliance to be verified

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		workers during the construction of the facility.			circumstances, that is proportional to the risk.			by ECO and IEA.
04	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Maintained firefighting equipment	Firefighting equipment shall be maintained and readily available during construction (and operation) - regularly test and service equipment	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
04	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Responsible person appointed	Appoint a responsible person (or agent) who will extinguish a fire, or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant Fire Protection Association, if any.	Holder, Contractor	Construction	Compliance to be verified by ECO and IEA.
04	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Firefighting personal	If no agent is appointed, a team of designated firefighting personal shall be trained and readily available to immediately deal with any runaway veld fires.	Holder, Contractor	Construction	Compliance to be verified by ECO and IEA.
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	No construction creep	Vehicular or pedestrian access is prohibited in natural areas beyond the demarcated (fenced) boundary of the construction site (road servitude or pipeline corridor).	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from construction	Avoid the unnecessary loss of or harm to terrestrial	Search for protected flora	Perform a search for any threatened and/or protected flora in those areas that will be disturbed by the road and pipeline alignments and associated	Contractor, Specialist, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		activities on land, including clearing and grubbing.	plants, particularly SCC, e.g., endemic, threatened and/or protected plants.		construction activities, including but not limited to the construction camp and staging area.			
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Permit/s	Only apply for permit(s) and/or a license to "pick" a threatened or protected plant if it is not possible to relocate the physical footprint.	Holder Engineer	Construction	Compliance to be verified by ECO and IEA.
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	SCC translocated	Any plant Species of Conservation Concern (SCC) within the development footprint area must be translocated to safety and returned to the road verge during rehabilitation of the site or replanted to the same or similar micro habitat.	Contractor, Specialist, SEO	Construction	Compliance to be verified by ECO and IEA.
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from	Avoid the unnecessary loss of or harm	Vegetation sods removed and stored	Vegetation cover can be removed as sods (for rehabilitation) and stored within transformed vegetation (alien	Contractor, SEO	Construction	Compliance to be verified

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat., Reg. EAP)
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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		construction activities on land, including clearing and grubbing.	to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.		invasive vegetation must be removed prior to storing the grassland sods).			by ECO and IEA.
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Correct removal, replanting and storage of sods	The sods should preferably be removed during the winter months and be replanted by latest springtime. The sods should not be stacked on top of each other.	Contractor, SEO	Construction Removed during the winter months and replanted by latest springtime	Compliance to be verified by ECO and IEA.
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Walk through	Vegetation clearing to commence only after walk through has been conducted, the necessary permits and/or license have been obtained, and the visibility flags have been erected and/or applicable plants have been safely translocated in line with permits obtained.	Contractor, Specialist, SEO	After walk through	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Supervision by ECO	SEO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near drainage areas.	SEO	Construction	Compliance to be verified by ECO and IEA.
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Stockpiles of cleared vegetation	Cleared vegetation from the construction camp, staging area and other footprints shall be stockpiled separately within the same areas for use as mulch during rehabilitation.	Contractor	Construction	Compliance to be verified by ECO and IEA.
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or	Active rehabilitation	Conduct active rehabilitation during the construction activities according to a rehabilitation plan and/or implement the Bare Patch Restoration Protocol (**Appendix C**) that will restore the natural vegetation to what it was prior to construction so that the long-term impact could be negligible.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
			protected plants.					
04	Clearing/grubbing and Grading	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	No-go areas are cordoned off	Cordon off areas under rehabilitation as "no-go areas" to prevent vehicular, pedestrian and livestock access.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
04	Stockpiling and Storing (Laydown)	Direct loss of terrestrial plants from construction activities on land, including stockpiling.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly protected or threatened plants	Search for protected flora	Perform a search for any threatened or protected flora in those areas that will be disturbed by stockpiling material.	Contractor, Specialist, SEO.	Prior to stockpiling material	Compliance to be verified by ECO and IEA.
04	Stockpiling and Storing (Laydown)	Direct loss of terrestrial plants from construction activities on land, including stockpiling.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly protected or threatened plants	Alternative areas to avoid sensitive areas/species	Identify alternative areas in order to avoid plants of conservation concern, significant vegetation communities, natural features and sites of cultural and historical significance that are located within the route. These deviations must be approved by the ECO.	Contractor, ECO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
05	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Preserve SCC	Roads and pipelines avoid sensitive areas/species	Slight deviations of roads and other route alignments must be permitted in order to avoid plants of conservation concern, significant vegetation communities, natural features and sites of cultural and historical significance located within the route. These deviations must be approved by the ECO.	Contractor, ECO	Continuous	Compliance to be verified by ECO and IEA.
05	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Preserve SCC	No construction creep	The width of the construction corridor should be kept to a minimum.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
05	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Preserve SCC	Unused roads are rehabilitated.	Where new roads need to be constructed, the existing road infrastructure should be rationalised and any unnecessary roads decommissioned and rehabilitated to reduce the disturbance of the area in the river beds.	Engineer, Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
06	Alien Plant Management	Alien invasive plants: Prevent the cleared areas from degrading, as invasive non-native plants will spread into degraded areas.	Reduce invasive alien plant recruitment	No alien invasive species	Clearing of invasive alien plants must take place coupled with the sowing of seeds of indigenous species to stabilise disturbed habitats. Re-vegetation with appropriate indigenous species (to prevent dust and erosion, as well as establishment of alien species).	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
06	Alien Plant Management	Alien invasive plants: Prevent the cleared areas from degrading, as invasive non-native plants will spread into degraded areas.	Reduce invasive alien plant recruitment	Bare areas are loosened and protected	Compacted bare ground should be loosened and pitted and covered with branches or stones. This will improve the ability of the surfaces to trap seeds and to absorb rainwater, thereby hastening vegetation recovery.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

Table 45. Management Protocol for Aquatic Fauna

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
07	Linear Infrastructure crossings	A direct loss of aquatic macro and microfauna by construction activities in a watercourse.	Ensure the protection of aquatic fauna	Construction during dry winter months	The construction of linear infrastructure across parts of the large ephemeral tributary and wetlands, should to the extent possible be restricted to the dry winter months (e.g., May to September), that is commence with such activities as clearing or grading, excavating and importing material at the end of the wet season/beginning of the dry season whilst the soil is still moist and as far as is practical, be completed in, the dry winter months.	Holder, Contractor	Construction during dry winter months	Compliance to be verified by ECO and IEA.
07	Linear Infrastructure crossings	A direct loss of aquatic macro and microfauna by construction activities in a watercourse.	Ensure the protection of aquatic fauna	No unnecessary physical harm to aquatic fauna	The SEO shall undertake a cursory inspection of the physical footprint prior to clearing and when grading or excavating in the large ephemeral tributary and wetlands for signs of frogs, and if found, relocate them to a suitable habitat out of harms way.	SEO	Prior to clearing, grubbing or grading	Compliance to be verified by ECO and IEA.

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Table 46. Management Protocol for Aquatic Flora

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	No construction creep	The width of the construction corridor should be kept to a minimum.	Contractor, SEO, ECO	Construction	Compliance to be verified by ECO and IEA.
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Boundaries are respected	Vehicular or pedestrian access is prohibited in natural areas beyond the demarcated (fenced) boundary of the construction site (pipeline corridor).	Contractor	Construction	Compliance to be verified by ECO and IEA.
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including	Avoid the unnecessary loss of or harm to terrestrial plants, particularly	Search undertaken	Perform a search for any threatened and/or protected flora in those areas that will be disturbed by the pipeline alignments and associated construction activities, including but not limited to the construction camp and staging area.	Contractor, SEO, ECO	Construction prior to clearing/grubbing	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		clearing and grubbing.	SCC, e.g., endemic, threatened and/or protected plants.					
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Roads and pipelines avoid sensitive areas/species.	Slight deviations of pipeline route alignments must be permitted in order to avoid plants of conservation concern, significant vegetation communities, natural features and sites of cultural and historical significance that are located within the route. These deviations must be approved by the ECO.	Contractor, ECO	Construction	Compliance to be verified by ECO and IEA.
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Permit/s	Only apply for permit(s) and/or a license to "pick" a threatened or protected plant if it is not possible to relocate the physical footprint.	Holder	Construction prior to clearing/grubbing	Compliance to be verified by ECO and IEA.
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from	Avoid the unnecessary loss of or	SCC translocated	Any plant Species of Conservation Concern (SCC) within the development footprint area must be translocated to	Contractor, Specialist, SEO	Construction	Compliance to be verified

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		construction activities on land, including clearing and grubbing.	harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.		safety and returned to the road verge during rehabilitation of the site or replanted to the same or similar micro habitat.			by ECO and IEA.
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Vegetation sods removed and stored	Vegetation cover can be removed as sods (for rehabilitation) and stored within transformed vegetation (alien invasive vegetation must be removed prior to storing the grassland sods).	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or	Correct removal, replanting and storage of sods	The sods should preferably be removed during the winter months and be replanted by latest springtime. The sods should not be stacked on top of each other.	Contractor, SEO	Construction Removed during the winter months and replanted by latest springtime	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
			protected plants.					
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Walk through	Vegetation clearing to commence only after walk through has been conducted, the necessary permits and/or license have been obtained, and the visibility flags have been erected and/or applicable plants have been safely translocated in line with permits obtained.	Contractor, Specialist, SEO	After walk through	Compliance to be verified by ECO and IEA.
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Supervision by ECO	SEO to provide supervision and oversight of vegetation clearing activities within sensitive areas such as dolerite ridges, the large ephemeral tributary, and wetlands.	SEO	Construction	Compliance to be verified by ECO and IEA.
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including	Avoid the unnecessary loss of or harm to terrestrial plants, particularly	Stockpiles of cleared vegetation	Cleared vegetation from the construction camp, staging area and other footprints shall be stockpiled separately within the same areas for use as mulch during rehabilitation.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		clearing and grubbing.	SCC, e.g., endemic, threatened and/or protected plants.					
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	Active rehabilitation	Conduct active rehabilitation during the construction activities according to a rehabilitation plan and/or implement the Bare Patch Restoration Protocol (**Appendix C**) that will restore the natural vegetation to what it was prior to construction so that the long-term impact could be negligible.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
08	Linear Infrastructure Crossings	Direct loss of terrestrial plants from construction activities on land, including clearing and grubbing.	Avoid the unnecessary loss of or harm to terrestrial plants, particularly SCC, e.g., endemic, threatened and/or protected plants.	No-go areas are cordoned off	Cordon off areas under rehabilitation as "no-go areas" to prevent vehicular, pedestrian and livestock access.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

MEMBERS: J.A. Bowers (M Tech, Pr.Sci.Nat.) & S.D. MacGregor (M.Sc., Pr.Sci.Nat., Reg. EAP)
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Table 47. Management Protocol for Soil and Rock

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
09	Employee Management	Use of land/surrounding areas for ablutions could result in microbiological pollutants to soil.	Avoid contamination of soil	No use of the natural areas as ablutions	Washing and going to the toilet in the wilderness is strictly forbidden	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
09	Plant Management	Spills from machinery can contaminate the topsoil.	Avoid contamination of soil	No leaking equipment on site	Any construction plant, machinery, and equipment which leaks shall not be permitted on site. Undertake visual inspections for any leakages that may emanate from any vehicle accessing the site - all vehicles must be in good working order when entering the site.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
09	Plant Management	Spills from machinery can contaminate the topsoil.	Avoid contamination of soil	No overnight parking within 100m of watercourses	No overnight parking of plant (e.g., outside business hours) is permitted within 100 m of the edge of any wetlands or watercourses.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
09	Plant Management	Spills from machinery can contaminate the topsoil.	Avoid contamination of soil	Drip trays	Drip trays must be placed under all stationary construction plant and equipment that can leak, such as, for example, TLBs, compressors and generators. The volume (litres) of drip trays must be sized according to their application and should be sufficient to hold 110% of the capacity of the reservoir holding the contaminant, e.g., a 100 cm (L) x 100 cm (W) x 10 cm (D) will hold	Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
					100 litres. A plastic liner that is at least twice the length and width of the drip tray shall be placed underneath it to the extent that the liner fits comfortably underneath the tray holding the containment.			
09	Plant Management	Spills from machinery can contaminate the topsoil.	Avoid contamination of soil	Drip trays are not overflowing	Drip trays must be inspected regularly and emptied into containers designated for the temporary storage of hazardous waste. Hydrophobic hydrocarbon absorbent material is recommended to avoid contaminated rainwater from overflowing during rainfall events.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
09	Plant Management	Spills from machinery can contaminate the topsoil.	Avoid contamination of soil	Enough drip trays	Enough drip trays must be available for all construction plant.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
09	Plant Management	Spills from machinery can contaminate the topsoil.	Avoid contamination of soil	Spill response kits	Provide accidental spill response kits at the construction camp and each work front with plant on site.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
09	Plant Management	Spills from machinery can contaminate the topsoil.	Avoid contamination of soil	Waybills	In the event of a spill, immediately remove the contaminated soil to the depth of penetration and temporarily store in a sealed container within the designated waste storage area for on-site bioremediation or disposal at a licensed hazardous waste landfill.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
09	Plant Management	Vehicles in poor condition are more prone	Avoid contamination of soil	No servicing/repai r of	No maintenance/service/repair of construction plant is permitted on the construction site (except emergency	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		to breakdowns and/or leaks (Risk). Spills from vehicles undergoing maintenance can contaminate the topsoil.		construction plant on site.	repairs) or on land outside of the Sun Central Cluster 1 footprint.			
09	Plant Management	Vehicles in poor condition are more prone to breakdowns and/or leaks (Risk). Spills from vehicles undergoing maintenance can contaminate the topsoil.	Avoid contamination of soil	Avoid emergency repairs within 100m of a watercourse	As far as practical no emergency maintenance/service/repair is permitted within 100 m of the edge of any wetlands or watercourses.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
09	Plant Management	Vehicles in poor condition are more prone to	Avoid contamination of soil	Emergency protocol	An emergency protocol must be developed that deals with accidents and spills. This must include methods for absorbing chemical spills, as well as the transport and on-site bioremediation or	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		breakdowns and/or leaks (Risk). Spills from vehicles undergoing maintenance can contaminate the topsoil.			disposal of all contaminated material at a licensed hazardous waste site.			
09	Plant Management	Vehicles in poor condition are more prone to breakdowns and/or leaks (Risk). Spills from vehicles undergoing maintenance can contaminate the topsoil.	Avoid contamination of soil	Drip trays with plastic liners and spill kits	Emergency breakdowns must be addressed with immediate and adequate pollution containment measures including but not limited to drip trays with plastic liners and spill kits.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
09	Plant Management	Hydrocarbons from washing plant can contaminate the ground.	Responsible storage of effluent for re-use or disposal.	No contamination of terrestrial or aquatic ecosystems (with effluent).	No washing of plant is permitted on the construction site, within 100 m of the edge of any wetlands or other watercourses, and on land outside of the Sun Central Cluster 1 footprint.	Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
09	General and Hazardous waste Management	Use of land/surrounding areas for ablutions could result in microbiological pollutants to soil. Oil-water separators may overflow and contaminate the land.	Responsible storage of hazardous waste	Inspection of oil separators	Oil-water separators must be inspected regularly and emptied into containers designated for the temporary storage of hazardous waste, unless the clean water from the oil-water separator at the wash bay can be re-used for washing plant.	Contractor	Construction	Compliance to be verified by ECO and IEA.
09	General and Hazardous Waste Management	Hydrocarbon spills can contaminate topsoil.	Avoid contamination of soil through proper waste management	Contaminated soil is treated on site	Soil contaminated with hydrocarbons should as far as is possible be treated on site by bioremediation so that it can be reused for rehabilitation.	Contractor	Construction	Compliance to be verified by ECO and IEA
09	General and Hazardous Waste Management	Hydrocarbon spills can contaminate topsoil.	Avoid contamination of soil through proper waste management	Waste storage of contaminated soil is intact and away from the watercourse	The storage and bioremediation of contaminated soil should take place in intact, impervious, not corroded receptacles within the designated waste storage area of the construction camp at least 100 m away from the outer edge of the ecological buffer.	Contractor	Construction	Compliance to be verified by ECO and IEA
09	General and Hazardous Waste Management	Hydrocarbon spills can contaminate topsoil.	Avoid contamination of soil through proper waste management	Storage complies with the conditions of the GA for S21(g) in GN 665 of 06	The temporary storage of contaminated/treated soil for re-use (or rehabilitation) must comply with the limits and conditions of the GA for S21(g) in GN 665 of 06 September 2013, particularly those provisions relating to	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
				September 2013	the location of the waste storage receptacle and incidence reporting.			
09	General and Hazardous Waste Management	storage of waste in an unbunded area could result in pollution to soil.	Avoid contamination of soil through proper waste management	Designated waste storage area	Designate and contain a temporary waste storage area within the construction camp (e.g., covered skips, scavenger proof bins, etc.).	Contractor	Construction	Compliance to be verified by ECO and IEA
09	General and Hazardous Waste Management	storage of waste in an unbunded area could result in pollution to soil.	Avoid contamination of soil through proper waste management	Waste containers are in good condition.	Take steps to ensure that the containers where waste is stored are intact and not corroded and are fit for the storage of waste.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA
09	General and Hazardous Waste Management	storage of waste in an unbunded area could result in pollution to soil.	Avoid contamination of soil through proper waste management	Waste storage area is well managed	Adequate measures must be taken to prevent: • Accidental spillage or leaking. • Waste from blowing away. • Nuisances such as foul odour; visual impact and breeding of vectors. • The pollution of the environment and harm to health.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA
09	General and Hazardous Waste Management	Contamination of soil with hydrocarbons.	Avoid contamination of soil from servicing	Waybill(s) from registered collector.	Any waste oil shall be collected by a registered collector for recycling and reuse or appropriate disposal.	Contractor	Continuous	Compliance to be verified by ECO and IEA
09	Handling Hazardous Substances	Contaminated rainwater may be released from the	Avoid contamination of soil	Fuel tank is bunded to 110% and roofed	The above ground fuel storage tank must be located on an impervious bund capable of containing 110% of the volume of the fuel storage tank. The fuel	Engineer, Contractor	Construction	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		bund into the environment.			tank and bund shall be roofed to prevent ingress of rain.			
09	Handling Hazardous Substances	Contaminated rainwater may be released from the bund into the environment.	Avoid contamination of soil	Mobile fuel bowser parked on bunded area (capacity of 110%) and roofed	A mobile fuel bowser must be parked (when not being used) on an impervious bund capable of containing 110% of the volume of the fuel bowser. The bund for parking the bowser shall be roofed to prevent ingress of rain and include a stormwater diversion system to prevent the ingress of surface water run-off (e.g., a 'speed bump' at the entrance to the bunded bay).	Engineer, Contractor	Construction	Compliance to be verified by ECO and IEA
09	Handling Hazardous Substances	Spills from mobile fuel bowser can contaminate the topsoil.	Avoid contamination of soil	Refuelling station is bunded	The refuelling station alongside the aboveground diesel tank shall be bunded, include a stormwater diversion system to prevent the ingress of surface water run-off (e.g., a 'speed bump' at the entrance and exit) and designed with an oil-water separator to remove hydrocarbons (oil, grease, fuel, hydraulic fluid, etc.). If practical, the refuelling station should be roofed to prevent ingress of rain.	Engineer, Contractor	Construction	Compliance to be verified by ECO and IEA
09	Handling Hazardous Substances	Spills from mobile fuel bowser can contaminate the topsoil.	Avoid contamination of soil	Spill kit	An emergency response spill kit must be available at the refuelling station.	Contractor	Construction	Compliance to be verified by ECO and IEA
09	Handling Hazardous Substances	Spills from mobile fuel bowser can contaminate the topsoil.	Avoid contamination of soil	Drip tray	Always use a drip tray when refuelling with a mobile fuel bowser.	Contractor	Construction	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
09	Handling Hazardous Substances	Spills from mobile fuel bowser can contaminate the topsoil.	Avoid contamination of soil	Contaminated soil is removed and stored correctly	In event of a spill, immediately remove the contaminated soil to the depth of penetration and temporarily store in a sealed container within the designated waste storage area for on-site bioremediation or disposal at a licensed hazardous waste landfill.	Contractor, SEO,	Construction	Compliance to be verified by ECO and IEA
09	Handling of hazardous substances	Concrete slurry from the batching plant can contaminate the topsoil and form a hardpan layer	Avoid contamination of soil from concrete	No observed hard pan layers of concrete.	Mix concrete on a mixing tray and not on open ground.	Contractor	Construction	Compliance to be verified by ECO and IEA
09	Handling of hazardous substances	Cleaning residual ready-mixed concrete (RMC) from truck mixers can create hardpan layers.	Avoid contamination of soil from concrete	No residual RMC dumped on site	Mixer trucks should return any residual RMC to their batching plant after the delivery.	Contractor	Construction	Compliance to be verified by ECO and IEA
09	Handling of hazardous substances	Cleaning residual ready-mixed concrete (RMC) from truck mixers can create hardpan layers.	Avoid contamination of soil from concrete	Residual RMC stored in a temporary waste storage facility at the workshop area	If it is not possible for mixer trucks to return the residual RMC to their batching plant after the delivery, then the residual RMC within the truck mixers shall be disposed in a temporary waste storage facility designated for this purpose at the construction camp. Temporary storage means a once off storage of waste for a period not exceeding 90 days.	Contractor	Construction	Compliance to be verified by ECO and IEA

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09	Handling of hazardous substances	Cleaning residual ready-mixed concrete (RMC) from truck mixers can create hardpan layers.	Avoid contamination of soil from concrete	A designated and contained, impervious waste storage area	Designated RMC waste storage facilities shall be contained, that is impervious, and shall not detrimentally impact on a water resource (surface and groundwater).	Contractor	Construction	Compliance to be verified by ECO and IEA
09	Handling of hazardous substances	Cleaning residual ready-mixed concrete (RMC) from truck mixers can create hardpan layers.	Avoid contamination of soil from concrete	Compliance with conditions of the GA for S21(g) in GN 665 of 06 September 2013	The temporary storage of residual RMC for re-use (or disposal) must comply with the limits and conditions of the GA for S21(g) in GN 665 of 06 September 2013, particularly those provisions relating to the location of the wastewater storage facility and incidence reporting.	Contractor	Construction	Compliance to be verified by ECO and IEA
09	Handling of hazardous substances	Cleaning residual ready-mixed concrete (RMC) from truck mixers can create hardpan layers.	Avoid contamination of soil from concrete	Waste temporarily stored has been removed (by recycling/re-use)	Temporarily stored waste shall be re-used, recycled, and/or disposed of within a period not exceeding 90 days.	Contractor	Construction	Compliance to be verified by ECO and IEA
09	Handling of hazardous substances	Cleaning residual ready-mixed concrete (RMC) from truck mixers can create	Avoid contamination of soil from concrete	Residual water is re-used	Any residual water in the RMC waste can be re-used, where possible by replacing domestic water for making new mortar or concrete.	Contractor	Construction	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		hardpan layers.						
09	Handling of hazardous substances	Cleaning residual ready-mixed concrete (RMC) from truck mixers can create hardpan layers.	Avoid contamination of soil from concrete	Hardened cement has been removed (by recycling/re-use)	Once hardened, solid waste arising from the concrete mixer truck washing can also be recycled or reused as fill material and/or disposed at the De Aar licensed landfill site.	Contractor	Construction	Compliance to be verified by ECO and IEA
09	Handling of hazardous substances	Cleaning residual ready-mixed concrete (RMC) from truck mixers can create hardpan layers.	Avoid contamination of soil from concrete	Washing the waste concrete slurry from the discharge chute(s) and rotating mixing drums of concrete mixer trucks	The washing facility at the concrete batching plant shall only be used for washing the waste concrete slurry from the discharge chute(s) and rotating mixing drums of concrete mixer trucks.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA
09	Handling of hazardous substances	Cleaning residual ready-mixed concrete (RMC) from truck mixers can create hardpan layers.	Avoid contamination of soil from concrete	Re-use concrete slurry	Concrete slurry from concrete mixing operations should as far as is possible be reused for mixing future batches of concrete.	Contractor	Construction	Compliance to be verified by ECO and IEA
09	Clearing/grubbing and grading	Trampling and hydrocarbon or other	Preserve topsoil.	Topsoil stockpiled separately from cleared	Wherever excavation is necessary, topsoil should be removed (to a depth of 100 mm), set aside and replaced after construction to encourage natural	Contractor, SEO,	Construction	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		hazardous material spills can damage or contaminate the topsoil Insufficient topsoil in areas outside floodplains and drainage lines		and excavated areas.	regeneration of the local indigenous species.			
09	Clearing/grubbing and grading	Trampling and hydrocarbon or other hazardous material spills can damage or contaminate the topsoil Insufficient topsoil in areas outside floodplains and drainage lines	Preserve topsoil.	Topsoil stockpiled separately from cleared and excavated areas.	Topsoil must be removed from the new road sections, passing lanes, pipeline trench, construction camp and staging area and stockpiled separately within the same areas to be reinstated during rehabilitation of the site	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA
09	Clearing/grubbing and grading	Trampling and hydrocarbon or other	Preserve topsoil.	Topsoil stockpiled separately from cleared	Topsoil should be stored in berms not wider than 2 m or higher than 1 m.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		hazardous material spills can damage or contaminate the topsoil Insufficient topsoil in areas outside floodplains and drainage lines		and excavated areas.				
10	Earthworks	Areas cleared or disturbed around site might be affected by erosion of topsoil.	Minimize loss of topsoil	No unnecessary removal of vegetation and soil	Vegetation and soil should be retained in position for as long as possible and should only be removed immediately ahead of construction / earthworks in any specific area so that cleared areas are not unnecessarily exposed to erosion for extended periods prior to working in those areas.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA
10	Earthworks	Areas cleared or disturbed around site might be affected by erosion of topsoil.	Minimize loss of topsoil	No unnecessary removal of vegetation and soil	Vegetation clearance must be restricted to the physical footprints of the construction camp, staging area, permanent and temporary roads within the road servitude, and the pipeline corridors only.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA
10	Earthworks	Areas cleared or disturbed around site might be	Minimize loss of topsoil	Active rehabilitation and revegetation	In areas where construction activities have been completed and no further disturbance is anticipated, rehabilitation and re-vegetation should commence as soon as possible.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		affected by erosion of topsoil.						
10	Earthworks	Areas cleared or disturbed around site might be affected by erosion of topsoil.	Minimize loss of topsoil	Repair erosion	Any erosion channels developing during or after the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition similar to the condition before the erosion occurred.	Contractor	Continuous	Compliance to be verified by ECO and IEA
10	Stormwater Management and Erosion Control	There is a potential for erosion and sedimentation of the surroundings or ephemeral drainage lines.	Preserve topsoil	Construction during dry months	Construction should to the extent possible be restricted to the dry winter months (e.g., May to September), that is commence with such activities as clearing or grading, excavating and importing material at the end of the wet season/beginning of the dry season whilst the soil is still moist to reduce dust and as far as is practical, be completed in, the dry winter months with a decreased probability of storm events.	Contractor	Construction during dry winter months	Compliance to be verified by ECO and IEA
10	Stormwater Management and Erosion Control	There is a potential for erosion and sedimentation of the surroundings or ephemeral drainage lines.	Preserve topsoil	Minimise vegetation removal	All development footprint areas must remain as small as possible and vegetation clearing to be limited to what is essential.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA
10	Stormwater Management	There is a potential for	Preserve topsoil	No bare patches	Retain as much indigenous vegetation as possible and re-vegetate cleared or	Contractor, SEO	Construction	Compliance to be verified

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
	and Erosion Control	erosion and sedimentation of the surroundings or ephemeral drainage lines.			eroded areas to reduce stormwater peak flows.			by ECO and IEA
10	Stormwater Management and Erosion Control	There is a potential for erosion and sedimentation of the surroundings or ephemeral drainage lines.	Preserve topsoil	Sandbags and berms	It is recommended that sandbags and temporary berms be used, to manage stormwater runoff and control erosion.	Contractor	Construction	Compliance to be verified by ECO and IEA
10	Stormwater Management and Erosion Control	There is a potential for erosion and sedimentation of the surroundings or ephemeral drainage lines.	Preserve topsoil	No exposed soils	Exposed soils to be protected using a suitable covering, e.g., mulch.	Contractor	Construction	Compliance to be verified by ECO and IEA
10	Stormwater Management and Erosion Control and Stockpiling	There is a potential for erosion and sedimentation of the surroundings	Preserve topsoil	Covered stockpiles	Where required, cover soil stockpiles with a temporary liner or sandbag berms to prevent erosion and contamination.	Contractor	Construction	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
	and Storing (Laydown)	or ephemeral drainage lines.						
10	Water management (abstraction, storage and use)	Water storage tanks can topple over, leak or overflow.	Avoid erosion from water storage tanks.	Water storage tanks are on a solid foundation, platform or stand.	Place water tanks on solid foundations, platforms or stands to ensure that they are level, will not fall over and are above the ground in order to build up the necessary water pressure for the outlet.	Contractor	Construction	Compliance to be verified by ECO and IEA.
10	Water management (abstraction, storage and use)	Water storage tanks can topple over, leak or overflow.	Avoid erosion from water storage tanks.	Water storage tanks are fastened to the platform or stand.	The platform or stand for water storage tanks must be level and must have hooks onto which the tank can be anchored or fastened.	Contractor	Construction	Compliance to be verified by ECO and IEA.
10	Water management (abstraction, storage and use)	Water storage tanks can topple over, leak or overflow.	Avoid erosion from water storage tanks.	Water pipes are visibly secured.	The pipes leading to and from the water storage tanks should also be anchored to prevent them from breaking, cracking and leaking.	Contractor	Construction	Compliance to be verified by ECO and IEA.
10	Water management (abstraction, storage and use)	Water storage tanks can topple over, leak or overflow.	Avoid erosion from water storage tanks.	Design includes an overflow pipe to a soakaway.	Each water storage tank or series of water storage tanks should have an overflow pipe to prevent water being forced out of the inlet when the tank is full. The overflow pipe should be diverted to a soakaway.	Contractor	Construction	Compliance to be verified by ECO and IEA.
10	Water management (abstraction, storage and use)	Water storage tanks can topple over, leak or overflow.	Avoid erosion from water storage tanks.	No signs of erosion around water storage tanks.	If water storage tanks are placed on a raised platform or stand, then a layer of gravel should be placed around and/or under the platform or stand to ensure good drainage and to prevent forming mud and puddles.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
10	Linear Infrastructure Crossings and Earthworks	Constructing roads and culverts in dispersive soils can cause erosion.	Minimise the risk of erosion on dispersive soils	Implementation of 'Roads & Culverts in Dispersive Soils Protocol' (Appendix B2).	If roads and culverts are to be constructed in potentially dispersive soils (e.g., bare patches) then implement the 'Roads & Culverts in Dispersive Soils Protocol' (**Appendix B2**).	Contractor	Construction	Compliance to be verified by ECO and IEA.
10	Linear Infrastructure Crossings and Earthworks	Supplying services via trenches in dispersive soils can cause tunnel erosion.	Minimise the risk of tunnel erosion in dispersive soils.	Implementation of 'Trenching in Dispersive Soils Protocol' (Appendix B1).	If trenching is to be undertaken in potentially dispersive soils (e.g., bare patches) then implement the 'Trenching in Dispersive Soils Protocol' (**Appendix B1**).	Contractor	Construction	Compliance to be verified by ECO and IEA.

Table 48. Management Protocol for Ground and Surface Water

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
11	Handling Hazardous Substances	Potential pollution due to effluent from infrastructure, including concrete slurry from mixing operations	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains,	No potential or actual effluent contamination of ground and vadose zone.	Batching operations and the storage of concrete slurry from concrete mixing or should take place in intact, impervious, not corroded receptacles outside the outer edge of the 15 m ecological buffer on both sides of the large ephemeral drainage systems.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
			and headwater drainage lines.					
11	Handling Hazardous Substances	Potential pollution due to effluent from infrastructure, including concrete slurry from mixing operations	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	No potential or actual effluent contamination of ground and vadose zone.	Ensure correct placing of concrete batching plants and vehicle servicing areas etc. to avoid areas susceptible to soil and water pollution. Water runoff from the sites should be controlled as far as possible to prevent adverse effects. The seasonal drainage line should be protected from an increased inflow of poor-quality water.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
11	Water management (abstraction, storage and use) and General and Hazardous Waste Management	Dust suppression with chemical additives or treated effluent may contaminate a watercourse.	Groundwater for domestic use falls within DWAF's TWQR (1996).	Water for dust suppression is treated	Treated effluent used for dust suppression must be treated to General or Special Wastewater Limit Values as prescribed in the General Authorisation for the discharge of waste or water containing waste into a water resource and/ or IWULA, whichever is applicable.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	Water management (abstraction, storage and use) and	Dust suppression with chemical additives or treated effluent may	Groundwater for domestic use falls within DWAF's TWQR (1996).	Environmentally friendly soil binding agents	Soil binding agents used for dust suppression shall be biodegradable, environmentally friendly, non-phototoxic and must not harm flora or fauna (e.g., local wildlife and livestock).	Holder, Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
	General and Hazardous Waste Management	contaminate a watercourse.						
11	General and Hazardous Waste Management	Concrete slurry can contaminate surface water run-off.	Avoid contamination of run-off	No residual RMC dumped on site	Mixer trucks should return any residual RMC to their batching plant after the delivery.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Concrete slurry can contaminate surface water run-off.	Avoid contamination of run-off	Residual RMC stored in a temporary waste storage facility at the workshop area	If it is not possible for mixer trucks to return the residual RMC to their batching plant after the delivery, then the residual RMC within the truck mixers shall be disposed in a temporary waste storage receptacle designated for this purpose at the Workshop Area within the construction camp. Temporary storage means a once off storage of waste for a period not exceeding 90 days.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Concrete slurry can contaminate surface water run-off.	Avoid contamination of run-off	A designated and contained, impervious waste storage area	Designated RMC waste storage receptacles shall be covered and contained, that is impervious, and shall not detrimentally impact on a water resource (surface and groundwater) outside the outer edge of the ecological buffer.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Unsafe disposal, leaking /overflowing chemical toilets can contaminate soil and surface water	Avoid soil contamination a water pollution from the handling and disposal of domestic wastewater.	Chemical toilets have drip tray	Portable chemical toilets shall be in good working order and the holding tank shall be contained within a drip tray or other impermeable containment structure.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		causing soil and water pollution.						
11	General and Hazardous Waste Management	Unsafe disposal, leaking /overflowing chemical toilets can contaminate soil and surface water causing soil and water pollution.	Responsible disposal of domestic wastewater.	Waybill	The sewerage shall be removed regularly (dependant on usage) from the holding tank of portable chemical toilet and conveyed to a licensed private or municipal treatment or disposal facility.	Contractor	Construction	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Unsafe disposal, leaking /overflowing chemical toilets can contaminate soil and surface water causing soil and water pollution.	Responsible disposal of domestic wastewater.	Waybill	The appointed service provider shall dispose of the domestic wastewater at a licensed private or municipal Wastewater Treatment Works (WWTW) that has the capacity to receive it, and provide evidence of safe disposal, e.g., retain a copy of the waste manifest document completed by the manager of waste, confirming that the hazardous waste load was accepted and managed.	Contractor	Construction	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Waste not stored longer than 90 days	Temporarily stored waste shall be re-used, recycled, and/or disposed of within a period not exceeding 90 days.	Contractor	Continuous, No more than 90 days	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Separate waste	Paper and stationary waste (from the offices) should be separated for re-use, recycling, and/or collected for disposal at the De Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Waybills for ink cartridges	Ink cartridges (from the offices) should be transferred to or collected by the supplier for recycling.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Waybill	Organic food waste (from the staff welfare area) should be collected for disposal at the De Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Waste is separated	Food/drink packaging (from the staff welfare area) should be separated for re-use, recycling, and/or collected for disposal at the De Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Waste is separated	Packaging (Cardboard, plastic, wood, cement bags, etc.) should be collected for re-use and/or recycling. Packaging may not be 'donated' for reuse in the townships as its addition to houses is illegal and creates a fire hazard.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	General and Hazardous	Waste, such as concrete	Compliance with waste	Aggregate reused	Excavated road material or aggregate should be reused if possible. If	Engineer, Contractor	Construction	Compliance to be verified

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	Waste Management	slurry, can contaminate surface water run-off.	handling and storage		unsuitable, the spoil material is to be used as fill material, for rehabilitation of the site and/or removed from site to a suitable and approved location by the contractor under his contract.			by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Waybill	Used motor oil should be collected by a registered collector or mechanic for recycling.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Recycle water	As far as is practical, reuse the clean water from the oil-water separator at the wash bay, for washing plant.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Reuse rubble	Solid concrete rubble will be re-used as fill material and/or disposed at the De Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).	Contractor	Construction	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Reuse concrete slurry	Concrete slurry from concrete mixing operations should as far as is possible be reused for mixing future batches of concrete or once hardened, reused as fill material and/or disposed at the De Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).	Contractor	Construction	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate	Compliance with waste handling and storage	Reuse residual RMC wastewater	Reuse residual RMC wastewater by supplementing/replacing borehole water for making new mortar or concrete,	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		surface water run-off.			and/or allow the wastewater to evaporate.			
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Residual RMC is stored correctly	The temporary storage of residual RMC for re-use (or disposal) must comply with the limits and conditions of the GA for S21(g) in GN 665 of 06 September 2013, particularly those provisions relating to the location of the wastewater storage facility and incidence reporting.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
11	General and Hazardous Waste Management	Waste, such as concrete slurry, can contaminate surface water run-off.	Compliance with waste handling and storage	Concrete solid waste is reused	Once hardened, solid waste arising from the concrete mixer truck washing can be recycled in concrete production, reused as fill material and/or disposed at the De Aar licensed landfill site, unless capacity constraints necessitate the use of an alternative licensed landfill site(s).	Contractor	Construction	Compliance to be verified by ECO and IEA.
11	Water management (abstraction, storage and use)	Hard water is aesthetically unpleasant for domestic use and can result in scaling in piping exposed to heat, or in utensils used to boil water.	Groundwater for domestic use falls within DWAF's TWQR (1996).	Potable water supply	Potable water will be supplied by the contractor(s) from a commercial source or permissible boreholes: Borehole No. 13, Borehole No. 14, Solar Borehole No.4 and/or Solar Borehole No. 5.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
11	Water management (abstraction, storage and use)	Hard water is aesthetically unpleasant for domestic use and can result in scaling in piping	Groundwater for domestic use falls within DWAF's TWQR (1996).	Deionisation plant	Treat the groundwater abstracted from boreholes with a deionisation (or other suitable) treatment plant if it is to be used for domestic use and/or cleaning solar panels. Groundwater need not be treated if it will only be used for road	Holder, Contractor.	Continuous	Compliance to be verified by ECO and IEA.

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		exposed to heat, or in utensils used to boil water.			construction, e.g., road stabilisation or dust suppression.			
11	Stormwater Management Control	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas.	Minimise ponding, erosion, and sedimentation of watercourses.	Spill kits	Have fuel/oil spill kits on-site, for immediate clean-up of any hydrocarbons during the proposed activities.	Contractor.	Continuous	Compliance to be verified by ECO and IEA.
11	Stormwater Management and Erosion Control	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas.	Minimise ponding, erosion, and sedimentation of watercourses.	Dedicated parking areas with drip trays	Park vehicles in dedicated areas, with drip trays to manage potential leakages.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
11	Linear Infrastructure Crossings	Installation of road culverts may cause	Minimise ponding, erosion, and	No unnecessary	Limit vegetation clearing to the physical footprint of the road and the minimum	Contractor, SEO	Construction	Compliance to be verified

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		temporary sedimentation after storm events.	sedimentation of watercourses.	vegetation clearance	width required for the operation of machinery to install the culverts.			by ECO and IEA.
12	Stormwater Management and Erosion Control	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas.	Minimise ponding, erosion, and sedimentation of watercourses.	One point for access to watercourse crossings	Ensure access to watercourse crossings is limited to one point to prevent sedimentation.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Stormwater Management and Erosion Control	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas.	Minimise ponding, erosion, and sedimentation of watercourses.	Temporary stormwater systems in place	Temporary stormwater systems, such as sandbags, berms or shallow channels should be used to stabilise work areas and manage stormwater runoff at watercourse crossings.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Stormwater Management	Two ephemeral drainage line	Minimise ponding, erosion, and	Implement stormwater	Ensure a stormwater management plan is implemented.	Contractor, SEO	Continuous	Compliance to be verified

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	and Erosion Control	crossings, associated with the proposed road development can be considered critical stormwater management areas.	sedimentation of watercourses. Quick response to and remediation of any disturbance to watercourses in the area.	management plan				by ECO and IEA.
12	Stormwater Management and Erosion Control	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas.	Minimise ponding, erosion, and sedimentation of watercourses. Quick response to and remediation of any disturbance to watercourses in the area.	Stormwater systems are not blocked	Ensure that all stormwater systems are kept clean of any debris to reduce flooding risk.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Stormwater Management and Erosion Control	Two ephemeral drainage line crossings, associated with the proposed road development can be considered	Minimise ponding, erosion, and sedimentation of watercourses. Quick response to and remediation of	No rivulets on site.	Conduct regular inspections and maintenance of the site to ensure that vegetation cover is adequate, and no rivulets are generated.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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		critical stormwater management areas.	any disturbance to watercourses in the area.					
12	Stormwater Management and Erosion Control and Linear Infrastructure Crossings	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management areas.	Quick response to and remediation of any disturbance to watercourses in the area.	Implementation of the Surface Water Monitoring Plan (Appendix D of EMP)	Implement the Surface Water Monitoring Plan (**Appendix D** of EMP) during the construction phase only for both the proposed stormwater systems and surface water resources identified in the area.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Linear infrastructure crossings	Alter surface water hydrology.	Maintain the Present Ecological State of the Brak River drainage system and large ephemeral tributaries in a good ecological condition.	Natural hydrology is retained.	Disturbance of the natural topography and vegetation cover should be minimised.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Linear infrastructure crossings	Alter surface water hydrology.	Maintain the Present Ecological	Natural hydrology is	The natural contours should be preserved as far as is practical to preserve the existing site drainage	Contractor, SEO	Construction	Compliance to be verified

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			State of the Brak River drainage system and large ephemeral tributaries in a good ecological condition.	retained.	patterns.			by ECO and IEA.
12	Linear infrastructure crossings	Alter surface water hydrology.	Maintain the Present Ecological State of the Brak River drainage system and large ephemeral tributaries in a good ecological condition.	Natural hydrology is retained.	Natural, dispersed, drainage should be encouraged, by maintaining the natural drainage characteristics of the land as far as possible.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Linear infrastructure crossings	Alter surface water hydrology.	Maintain the Present Ecological State of the Brak River drainage system and large ephemeral tributaries in a	Erosion controls are in place.	Manage surface water runoff during construction of pipeline crossings within the large ephemeral tributaries and wetlands.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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			good ecological condition.					
12	Linear infrastructure crossings	Alter surface water hydrology.	Maintain the Present Ecological State of the Brak River drainage system and large ephemeral tributaries in a good ecological condition.	Records of monitoring for signs of erosion.	Monitor for signs of erosion during construction of pipeline crossings within the large ephemeral tributaries and wetlands.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Linear infrastructure crossings and Earthworks	Mixed soil horizons	Preserve topsoil	Soil horizons are separated.	Do not mix the different soil horizons. Keep topsoil separate from the subsoil horizons, e.g., first remove the topsoil and stockpile/windrow it along the one side of the trench, then excavate the subsoil and stockpile/windrow it along the opposite side of the trench.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Linear infrastructure crossings and Earthworks	Mixed soil horizons	Preserve topsoil	Backfilling by repacking separate soil horizons	Backfill trenches by repacking the separately stockpiled/windrowed soil horizons in the same sequence that they naturally occur within the ground.	Contractor, SEO, ECO	Construction	Compliance to be verified by ECO and IEA.
12	Linear infrastructure crossings	Construction of linear infrastructure across the dolerite ridge,	Preserve in-stream hydrological pattern	No signs of sand mining	Sand mining in the ephemeral drainage system is prohibited.	Contractor.	Continuous	Compliance to be verified by ECO and IEA.

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		ephemeral drainage system or wetlands will reshape the ridge, bed and banks of the drainage line or wetland.						
12	Linear infrastructure crossings	Construction of linear infrastructure across the dolerite ridge, ephemeral drainage system or wetlands will reshape the ridge, bed and banks of the drainage line or wetland.	Preserve in-stream hydrological pattern	Fill roads of gravel/crushed rock.	Limit or restrict the construction of fill roads. All fill roads must use a permeable fill material (such as gravel or crushed rock) for at least the first layer of fill in order to maintain the natural flow regimes of subsurface water.	Contractor.	Construction	Compliance to be verified by ECO and IEA.
12	Linear infrastructure crossings	Construction of linear infrastructure across the dolerite ridge, ephemeral drainage system or wetlands will reshape the ridge, bed and banks of the	Preserve in-stream hydrological pattern	Shaped to natural forms during operations.	Re-instatement of the original landscape levels must be done concurrent with construction activities.	Contractor, SEO	Concurrent with construction	Compliance to be verified by ECO and IEA.

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		drainage line or wetland.						
12	Linear infrastructure crossings	Construction of linear infrastructure across the dolerite ridge, ephemeral drainage system or wetlands will reshape the ridge, bed and banks of the drainage line or wetland.	Preserve in-stream hydrological pattern	Final grading does not alter flow characteristics	The final grading of the crossing area should not significantly alter the flow characteristics of the ridge, ephemeral drainage system or wetland during periods of high flows, e.g., shaped to natural forms that blend in with pre-construction topography.	Contractor, SEO	Concurrent with construction	Compliance to be verified by ECO and IEA.
12	Linear Infrastructure Crossings	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system and large ephemeral tributaries.	Erosion controls are in place.	Manage surface water runoff during construction of crossings within the Brak River drainage system (Section 2.2: 30°51'6.74"S 24°16'32.57"E and 30°51'9.48"S 24°16'48.11"E) and large ephemeral tributaries (Section 1.3: 30 51 42.6 S; 24 14 00.5 E, Section 1.5: 30 51 25.7 S; 24 14 12.3 E and 30 51 25.8 S; 24 14 47.1 E.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Linear Infrastructure Crossings	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system and large	Erosion controls are in place.	Manage surface water runoff during construction of crossings within or within proximity to smaller ephemeral tributaries (Section 1.2: 30 51 59.1 S; 24 13 49.7, Section 2.3: 30°51'15.66"S 24°17'4.51"E, Section 2.5: 30°51'38.05"S; 24°17'49.25"E), alluvial floodplains (Section 1.6: 30 51 24.3 S; 24 14 59.3 E, Section 1.7:	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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			ephemeral tributaries.		30°51'23.25"S; 24°15'7.15"E, Section 1.8: 30°51'20.34"S; 24°15'34.11"E, Section 2.1: 30°51'13.13"S 24°16' 8.41"E and 30°51'7.53"S 24°16'30.31"E, Section 2.4: 30°51'16.23"S 24°17'6.43"E to 30°51'24.52"S 24°17'31.11"E), and headwater drainage lines (Section 1.1: 30 52 32.0 S; 24 13 26.9, Section 1.4: 30 51 29.3 S; 24 14 23.7 E).			
12	Linear Infrastructure Crossings	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system and large ephemeral tributaries.	Records of monitoring for signs of erosion.	Monitor for signs of erosion during construction of crossings within the Brak River drainage system and large ephemeral tributaries, as well as within or within proximity to the smaller ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Linear Infrastructure Crossings	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage system and large ephemeral tributaries.	Vegetation is not cleared from the road verge.	Vegetation clearance must be restricted to the physical footprints of the construction camp, staging area, permanent and temporary roads within the road servitude, and the pipeline corridors only.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Linear Infrastructure Crossings	Erosion and sedimentation	Maintain the Present Ecological State of the Brak River drainage	Project management supervision	Construction within the watercourse crossings and buffers must be overseen by the project management.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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			system and large ephemeral tributaries.					
12	Linear Infrastructure Crossings	Construction of linear infrastructure across the ephemeral drainage system and wetlands may involve temporary diversion works, changing the surface water hydrology or flow patterns.	Preserve in-stream hydrological pattern	Construction takes place during dry months	The construction of linear infrastructure across parts of the large ephemeral drainage system and wetlands should to the extent possible be restricted to the dry winter months (e.g., May to September), that is commence with such activities as clearing or grading, excavating and importing material at the end of the wet season/beginning of the dry season whilst the soil is still moist and as far as is practical, be completed in, the dry winter months.	Holder, Contractor	Construction during dry months	Compliance to be verified by ECO and IEA.
12	Linear Infrastructure Crossings	Construction of linear infrastructure across the ephemeral drainage system and wetlands may involve temporary diversion works, changing the surface water	Preserve in-stream hydrological pattern	In-stream diversion.	Any diversion works must remain inside the active channel or permanent zone, e.g., the works may not extend into the active channel bank or temporary or seasonal zones. The location of the active channel bank or permanent zone must be verified by the ECO.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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		hydrology or flow patterns.						
12	Linear Infrastructure Crossings	Construction of linear infrastructure across the ephemeral drainage system and wetlands may involve temporary diversion works, changing the surface water hydrology or flow patterns.	Preserve in-stream hydrological pattern	No erosion of banks or bars.	Any diversion works, and their outlets must be designed in such a way so as not to cause scouring of any bank, mid-channel bar or wetland. The works must be monitored regularly by the SEO for signs of scouring.	Engineer, Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Linear Infrastructure Crossings	Construction of linear infrastructure across the ephemeral drainage system and wetlands may involve temporary diversion works, changing the surface water hydrology or flow patterns.	Preserve in-stream hydrological pattern	No erosion of banks or bars.	Any signs of scouring caused by the diversion works must be immediately rectified and remediated.	Contractor, SEO	Construction and immediately	Compliance to be verified by ECO and IEA.

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12	Linear Infrastructure Crossings and Stockpiling and Storing (Laydown)	Construction activities may alter the physical characteristics of the terrain, and surface water hydrology	Preserve topsoil	Erosion is repaired	Monitor for signs of channelled surface water run-off, e.g., rills and gullies, caused by construction activities, and if observed, take actions necessary to immediately re-instate the original ground level and sheet flow across the affected site.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Earthworks	Construction activities may alter the physical characteristics of the terrain	Preserve topsoil, control soil erosion.	Access routes are in good condition	Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage by repairing ruts and potholes and maintaining stormwater control mechanisms.	Contractor	Construction	Compliance to be verified by ECO and IEA.
12	Earthworks	Construction activities may alter the physical characteristics of the terrain	Preserve topsoil, control soil erosion.	Erosion is repaired	Any erosion problems observed to be associated with the project infrastructure should be rectified as soon as possible and monitored thereafter to ensure that it does not re-occur.	Contractor	Construction	Compliance to be verified by ECO and IEA.
12	Earthworks	Construction activities may alter the physical characteristics of the terrain	Preserve topsoil, control soil erosion.	Roads are returned to a usable state.	Ensure that all access roads utilised during construction (which are not earmarked for closure and rehabilitation) are returned to a usable state and / or a state no worse than prior to construction.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Earthworks	Disturbing vadose zone during excavations.	Minimise disturbance to the vadose zone soils.	No construction creep	All development footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential.	Contractor, SEO.	Construction	Compliance to be verified by ECO and IEA.
12	Earthworks	Disturbing vadose zone during excavations.	Minimise disturbance to the vadose zone soils.	No construction creep	Only excavate / clear areas applicable to the project area.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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12	Earthworks	Disturbing vadose zone during excavations.	Minimise disturbance to the vadose zone soils.	No unnecessary vegetation clearing	Retain as much indigenous vegetation as possible / re-vegetate.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
12	Earthworks	Disturbing vadose zone during excavations.	Minimise disturbance to the vadose zone soils.	No unprotected exposed soils	Exposed soils are to be protected using a suitable covering or sandbags or berms to control erosion.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
13	Water management (abstraction, storage and use)	Natural Resource depletion - Construction Dust suppression using only water is a wasteful use (decrease) of a limited resource.	Improve water use efficiency by reducing water volumes used for dust suppression.	Reduce the quantity of water used for each spray (e.g., 1 000 ml per sqm) and the frequency of spraying (e.g., less frequent than daily).	Reduce the quantity of groundwater and frequency of applications required for dust suppression on gravel access roads by adding environmentally safe/friendly soil binding agents.	Contractor.	Continuous	Compliance to be verified by ECO and IEA.
13	Water management (abstraction, storage and use)	Natural Resource depletion - Construction Dust suppression using only water is a wasteful use (decrease) of a limited resource.	Improve water use efficiency by reducing water volumes used for dust suppression.	Reduce the quantity of water used for each spray (e.g., 1 000 ml per sqm) and the frequency of spraying (e.g., less frequent than daily).	Monitor the amount of water used for suppressing dust on gravel roads.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
13	Water management (abstraction,	Natural Resource depletion -	Improve water use efficiency by reducing	Reduce the quantity of water used for	Regular, light watering of gravel roads is better than infrequent, heavy watering.	Contractor.	Continuous	Compliance to be verified

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	storage and use)	Construction Dust suppression using only water is a wasteful use (decrease) of a limited resource.	water volumes used for dust suppression.	each spray (e.g., 1 000 ml per sqm) and the frequency of spraying (e.g., less frequent than daily).				by ECO and IEA.
13	Water management (abstraction, storage and use)	Uncontrolled abstraction can lead to over pumping boreholes, reduced borehole life, pump failure and depletion of the underground aquifer.	Avoid over pumping boreholes, decreasing the life of a borehole, pump failure and unsustainable rates of abstraction.	Storage tanks with groundwater	Water should be pumped from the boreholes to dedicated storage tanks to build up a reserve, whereafter the boreholes are only used to top up the storage tanks.	Holder	Continuous	Compliance to be verified by ECO and IEA.
13	Water management (abstraction, storage and use)	Over-production from a series of boreholes that are drilled in the same contact, and close to each other (<500 m), may lead to fracture failures as the fractures are	Avoid risk of fracture failures and borehole collapse.	Avoid over production and declining abstraction yields from project boreholes if unsustainable rates of abstraction deplete the groundwater reserve faster	If both BH13 and BH14 are made operational, they should not be dewatered simultaneously. The Groundwater abstraction from either borehole shall not exceed the sustainable yield. The sustainable yield for BH13 is 6.64 l/sec (for 8hrs per 24hr day of pumping only), which is equivalent to 191.23 m3/day or 5 736.96 m3/month. The Expected yield for BH14 (not pump tested) is 6 l/sec for 8 hours/day (172.8 m³/day). recommended.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.

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		simultaneously dewatered.		that it can recharge.				
13	Water management (abstraction, storage and use)	Over-production from a series of boreholes that are drilled in the same contact, and close to each other (<500 m), may lead to fracture failures as the fractures are simultaneously dewatered.	Avoid decreasing borehole yields of other water users within the actual radius of influence.	Field assessment results	Undertake monthly field assessments of borehole groundwater for pH, Electrical Conductivity (EC)/Total Dissolved Solids (TDS), temperature and groundwater level.	Holder, Contractor	Monthly	Compliance to be verified by ECO and IEA.
13	Water management (abstraction, storage and use)	Over-production from a series of boreholes that are drilled in the same contact, and close to each other (<500 m), may lead to fracture failures as the fractures are simultaneously dewatered.	Avoid decreasing borehole yields of other water users within the actual radius of influence.	Sample results	Undertake annual laboratory samples of borehole groundwater for pH, EC/TDS, COD, Turbidity, Major cations, and anions (Ca, Mg, Na, K, Cl, NO3, SO4, PO4, F) and Microbes (E. coli, total coliforms, and standard plate count).	Holder, Contractor	Annually	Compliance to be verified by ECO and IEA.
13	Water management (abstraction,	Over-production from a series	Avoid decreasing borehole	Flow meters	Install flow meters on any pipeline between a borehole and the point of abstraction to ensure usage remains	Holder, Contractor, SEO	Continuous	Compliance to be verified

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	storage and use)	of boreholes that are drilled in the same contact, and close to each other (<500 m), may lead to fracture failures as the fractures are simultaneously dewatered.	yields of other water users within the actual radius of influence.		within the sustainable yield determined in the Geohydrological Assessment Report. The sustainable yield of BH13 is 6.64 l/sec for 8hrs per 24hr day of pumping only, which is equivalent to 191.23 m3/day or 5 736.96 m3/month. The sustainable yield for Solar BH No. 5 is 0.23 l/sec (for 8hrs per 24hr day of pumping only), which is equivalent to 6.62 m3/day or 198.72 m3/month.			by ECO and IEA.
13	Water management (abstraction, storage and use)	Over-production from a series of boreholes that are drilled in the same contact, and close to each other (<500 m), may lead to fracture failures as the fractures are simultaneously dewatered.	Avoid decreasing borehole yields of other water users within the actual radius of influence.	Abstraction rate records	Monitor abstraction rates (in litres and/or m3) and pumping periods (duration in minutes and/or hours) from BH13 & Solar BH5 daily.	Holder, Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
13	Water management (abstraction, storage and use)	Over-production from a series of boreholes that are drilled in the same contact, and close to each	Avoid decreasing borehole yields of other water users within the actual radius of influence.	Logbook	Conduct multi borehole water level logging, to ensure that no cumulative dewatering impacts are taking place for boreholes which may be in the same contact zones, e.g., downstream and within HRU4.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		other (<500 m), may lead to fracture failures as the fractures are simultaneously dewatered.						
13	Water management (abstraction, storage and use)	Over-production from a series of boreholes that are drilled in the same contact, and close to each other (<500 m), may lead to fracture failures as the fractures are simultaneously dewatered.	Avoid decreasing borehole yields of other water users within the actual radius of influence.	Water level monitoring results	Undertake water level monitoring of boreholes within a 1.5 km radius of the pumping borehole. If a decline in water levels is noted in all boreholes, because of pumping, the abstraction rate should be lowered to prevent aquifer depletion.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
13	Water management (abstraction, storage and use)	Over-production from a series of boreholes that are drilled in the same contact, and close to each other (<500 m), may lead to fracture failures as the fractures are	Avoid decreasing borehole yields of other water users within the actual radius of influence.	Complaints register	Evaluate any complaints by landowners about declining yields which may relate to the project.	Holder, Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		simultaneously dewatered.						
13	Water management (abstraction, storage and use)	Natural Resource depletion (groundwater reserve) - Construction will require the abstraction of water from boreholes for road stabilisation, etc.	Maintain the integrity of the groundwater reserve(s).	Avoid over production and declining abstraction yields from project boreholes if unsustainable rates of abstraction deplete the groundwater reserve faster that it can recharge.	Do not overproduce from boreholes used as part of the project: 8 hours of pumping per day is recommended.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
13	Water management (abstraction, storage and use)	Natural Resource depletion (groundwater reserve) - Construction will require the abstraction of water from boreholes for road stabilisation, etc.	Maintain the integrity of the groundwater reserve(s).	Avoid over production and declining abstraction yields from project boreholes if unsustainable rates of abstraction deplete the groundwater reserve faster that it can recharge.	Groundwater abstraction from BH13 shall not exceed its sustainable yield, that is 6.64 l/sec (for 8hrs per 24hr day of pumping only), which is equivalent to 6.62 m3/day or 198.72 m3/month.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
13	Water management (abstraction, storage and use)	Natural Resource depletion (groundwater reserve) - Construction will require the abstraction of water from boreholes for road stabilisation, etc.	Maintain the integrity of the groundwater reserve(s).	Avoid declining abstraction yields from boreholes belonging to other water users (within the zone of influence).	Cumulative water demand during construction of the access road should not exceed 197.85 m3/8hr day, unless there is another borehole to supplement water usage for other projects (limited to the surplus groundwater reserve in the respective sub-catchments; HRU4 and HRU5) or SolarAfrica Energy staggers other construction projects, e.g., MTS, Dx and solar field, to reduce the total water demand on BH13 and Solar BH5 at any one time.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
13	Water management (abstraction, storage and use)	Natural Resource depletion (groundwater reserve) - Construction will require the abstraction of water from boreholes for road stabilisation, etc.	Maintain the integrity of the groundwater reserve(s).	Minimise water usage.	Continually investigate and implement water-saving strategies and technologies or alternatives, including design to ensure sufficient groundwater during the construction of the access road.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
13	Water management (abstraction, storage and use)	Natural Resource depletion (groundwater reserve) - Construction will require the abstraction of water from boreholes for road stabilisation, etc.	Maintain the integrity of the groundwater reserve(s).	Avoid abstracting more groundwater than is available (e.g., the estimated surplus) on a sub-catchment level.	If the adopted water saving strategies and technologies are insufficient to curb demand, then SolarAfrica Energy should use another borehole to supplement water usage for this and/or other projects (limited to the surplus groundwater reserve in the respective sub-catchments; HRU4 and HRU5 and subject to additional	Holder,	Continuous	Compliance to be verified by ECO and IEA.
13	Water management (abstraction, storage and use)	Natural Resource depletion (groundwater reserve) - Construction will require the abstraction of water from boreholes for road stabilisation, etc.	Maintain the integrity of the groundwater reserve(s).	Avoid over production and declining abstraction yields from project boreholes if unsustainable rates of abstraction deplete the groundwater reserve faster that it can recharge.	Groundwater abstraction from Solar BH No. 5 shall not exceed its sustainable yield, that is 0.23 l/sec (for 8hrs per 24hr day of pumping only), which is equivalent to 6.62 m3/day or 198.72 m3/month.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
13	Alien plant management	Disturbance of terrestrial habitat can favour the recruitment of pioneer	Reduce invasive alien plant recruitment	No signs of alien plants on site	Immediately control any alien invasive plant in its entirety (including roots and propagating material) upon being identified on site, using preferably mechanical control methods as opposed to chemical spraying.	Holder, Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		species and alien invasive plants, threatening individuals, habitats and alter the composition, structure and functioning of ecosystems.						
13	Linear Infrastructure Crossing	Removal of vegetation and disturbing topsoil by laying underground pipelines at watercourse crossings.	Preserve topsoil	Erosion control on site	Implement source-directed erosion controls.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA
13	Linear Infrastructure Crossing	Removal of vegetation and disturbing topsoil by laying underground pipelines at watercourse crossings.	Preserve topsoil	Buffer zones are maintained	Maintain buffer zones to trap sediments.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA
13	Linear Infrastructure Crossing	Removal of vegetation and disturbing topsoil by laying underground	Preserve topsoil	Stormwater management on site	Implement appropriate stormwater management around the excavation areas to prevent the ingress of run-off into the excavation trenches.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		pipelines at watercourse crossings.						

Table 49. Management Protocol for Atmosphere

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
14	Blasting	Vibrations, dust, noise and flyrock from blasting.	Minimal noise generated by blasting	No blasting in windy conditions	Blasting shall not occur during windy conditions.	Contractor	Construction	Compliance to be verified by ECO and IEA.
14	Blasting	Vibrations, dust, noise and flyrock from blasting.	Minimal noise generated by blasting	Use of minimum magnitude and amount of 'explosive' material.	The contractor carrying out the blasting work shall apply the absolute minimum magnitude and amount of 'explosive' material.	Contractor	Construction	Compliance to be verified by ECO and IEA.
14	Blasting	Vibrations, dust, noise and flyrock from blasting.	Minimal noise generated by blasting	Blast mat in use	The contractor carrying out the blasting work shall use a blast mat (not soil) to reduce noise/fly rock.	Contractor	Construction	Compliance to be verified by ECO and IEA.
14	Blasting	Vibrations, dust, noise and flyrock from blasting.	Minimal noise generated by blasting	No blasting after hours or on weekends	Blasting should be done during work hours and during weekdays only.	Contractor	Construction	Compliance to be verified by ECO and IEA.
14	Blasting	Vibrations, dust, noise and flyrock from blasting.	Minimal noise generated by blasting	Dust suppressants	Dust suppressant must be prioritised for the blasting periods.	Contractor	Construction	Compliance to be verified by

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
								ECO and IEA.
14	Blasting	Vibrations, dust, noise and flyrock from blasting.	Minimal noise generated by blasting	Comply with bylaws and regulations	Adhere to any local bylaws and regulations regarding the generation of noise.	Contractor	Construction	Compliance to be verified by ECO and IEA.
14	Earthworks	Increase in ambient PM10 concentrations and dust fallout from construction activities.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.	Implement a dust monitoring programme for the construction sites, including the installation of dust monitoring units.	Contractor, Specialist, SEO	Construction	Compliance to be verified by ECO and IEA.
14	Earthworks	Increase in ambient PM10 concentrations and dust fallout from	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations	Wetting of open areas and erection of wind shields, where necessary.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		construction activities.		(40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.				
14	Handling of hazardous substances	Increase in ambient PM10 concentrations, Total Suspended Particulate (TSP) and dust fallout emitted from the concrete batching plant.	Minimise dust generation.	Responsible storage of fine aggregate	Store fine aggregate materials such as cement and sand in a manner so as to avoid or minimize dust generation, with water also being used as a dust suppressant.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
14	Handling of hazardous substances	Increase in ambient PM10 concentrations, Total Suspended Particulate (TSP) and dust	Minimise dust generation.	Cement silos are in good condition	Fit cement silos with alarms to prevent over filling, airtight inspection hatches and automatic cut-off switches on the filler lines where appropriate.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		fallout emitted from the concrete batching plant.						
14	Handling of hazardous substances	Increase in ambient PM10 concentrations, Total Suspended Particulate (TSP) and dust fallout emitted from the concrete batching plant.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.	To minimize dust generation the following measures are recommended: • Drop heights from haulage trucks into bins and onto conveyors should be minimised as far as possible. • Work surfaces should be kept clean. • Duct work must be airtight as far as possible. • Vehicle movement and loading areas should be enclosed as much as is practicable. • Aggregate spills should be cleaned up. • Conveyor belts and hoppers must be covered or enclosed where practical and appropriate.	Holder, Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.
14	Plant Management	Dust and noise pollution caused by increased traffic. Air pollution or reduced air quality due to increased	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour	Stagger delivery trips.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		ambient PM10 concentrations and dust fallout.		ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/day) and residential (600 mg/m2/day) areas.				
14	Plant Management	Dust and noise pollution caused by increased traffic. Air pollution or reduced air quality due to increased ambient PM10 concentrations and dust fallout.	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/day) and residential (600	As far as possible, reduce the number of vehicle trips by transporting staff in busses instead of 15-seater taxis.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
				mg/m2/day) areas.				
14	Plant Management	Dust and noise pollution caused by increased traffic. Air pollution or reduced air quality due to increased ambient PM10 concentrations and dust fallout.	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/day) and residential (600 mg/m2/day) areas.	Implement and enforce speed limits on project-controlled roads. Reduce speed to 30 km/hr. Enforce speed control through speed limit road signage and fines.	Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.
14	Plant Management	Dust and noise pollution caused by increased traffic. Air pollution or reduced air quality due to increased ambient PM10 concentrations and dust fallout.	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3).	Effective implementation of the National Dust Control Regulations to ensure that the dust fallout does not exceed the acceptable limits.	Holder, Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
				Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/day) and residential (600 mg/m2/day) areas.				
14	Plant Management	Dust and noise pollution caused by increased traffic. Air pollution or reduced air quality due to increased ambient PM10 concentrations and dust fallout.	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/day) and residential (600 mg/m2/day) areas.	The contractor should take into consideration predicted wind speeds from the local weather station when planning construction-related activities with a high risk of generating dust, such as adding cement to the road.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
14	Plant Management	Dust and noise pollution caused by increased traffic. Air pollution or reduced air quality due to increased ambient PM10 concentrations and dust fallout.	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/day) and residential (600 mg/m2/day) areas.	Implement dust control measures on gravel access roads, including watering, but only in combination with an environmentally friendly (organic) soil binding agent/dust suppressant (to reduce wasteful water consumption).	Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.
14	Plant Management	Dust and noise pollution caused by increased traffic. Air pollution or reduced air quality due to increased ambient PM10 concentrations and dust fallout.	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the	Implement a scheduled watering program by tanker.	Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
				National Dust Standard for non-residential (1 200 mg/m2/day) and residential (600 mg/m2/day) areas.				
14	Plant Management	Dust and noise pollution caused by increased traffic. Air pollution or reduced air quality due to increased ambient PM10 concentrations and dust fallout.	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/day) and residential (600 mg/m2/day) areas.	Increase frequency of road wetting during times of high expected traffic loads.	Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.
14	Plant Management	Dust and noise pollution caused by increased traffic.	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual	Keep a record of spraying roads with water including frequency, duration, volumes, as well as length and width of road sprayed.	Contractor	Construction and Continuous	Compliance to be verified by

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		Air pollution or reduced air quality due to increased ambient PM10 concentrations and dust fallout.		ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/day) and residential (600 mg/m2/day) areas.				ECO and IEA.
14	Plant Management	Dust and noise pollution caused by increased traffic. Air pollution or reduced air quality due to increased ambient PM10 concentrations and dust fallout.	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200	Implement and maintain good drainage on all (permanent or temporary) gravel roads within the road servitude, including a schedule of maintenance activities to reduce potholes and rough areas that could increase dust generation.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
				mg/m2/day) and residential (600 mg/m2/day) areas.				
14	Plant Management	Dust and noise pollution caused by increased traffic. Air pollution or reduced air quality due to increased ambient PM10 concentrations and dust fallout.	Minimise dust and noise generated by traffic.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/day) and residential (600 mg/m2/day) areas.	Ensure that vehicles always use the approved route and do not take shortcuts that may result in excess dust generation.	Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.
14	General and Hazardous Waste Management	Burning of waste as a disposal method increases the risk of veld fires caused by workers during	Minimise smoke generation from Veld fires	No waste is burned	Burning of waste is prohibited.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		the construction of the facility.						
14	Clearing/grubbing and grading	Increase in ambient PM10 concentrations and dust fallout from construction activities, including excessive dust from clearing and grubbing.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.	Avoid the unnecessary clearance of indigenous vegetation by restricting construction activities within the road servitude to the existing footprints and/or road design specifications (8 m wide plus 3 m for side/cut-off drain), as well as designated (30 m-long & 3 m-wide) passing lanes.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
14	Clearing/grubbing and grading	Increase in ambient PM10 concentrations and dust fallout from construction activities, including excessive dust from clearing and grubbing.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3).	Encourage natural vegetation growth in areas where a large area of soils is exposed to the elements to reduce the amount of potential loose soil especially close to sensitive receptors.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
				Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.				
14	Clearing/grubbing and grading	Increase in ambient PM10 concentrations and dust fallout from construction activities, including excessive dust from clearing and grubbing.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.	Adopt dust suppression such as watering in areas of the worksites in close proximity to dust sensitive receptors where earthworks have been completed.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
14	Clearing/grubbing and grading	Increase in ambient PM10 concentrations and dust fallout from construction activities, including excessive dust from clearing and grubbing.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.	Re-vegetate open areas with indigenous plants as soon as practicably possible to minimize the risk of wind erosion and dust generation.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
14	Clearing/grubbing and grading and Earthworks	Increase in ambient PM10 concentrations and dust fallout from construction activities, including excessive dust from clearing and grubbing.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the	The contractor should take into consideration predicted wind speeds from the local weather station when planning construction-related activities with a high risk of generating dust, such as clearing and grubbing.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
				National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.				
14	Stockpiling and Storing (Laydown)	Increase in ambient PM10 concentrations, Total Suspended Particulate (TSP) and dust fall out emitted from storage and stockpiles.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.	Additional control measures may include enclosures and covering or increasing the moisture content of the material.	Contractor	Construction	Compliance to be verified by ECO and IEA.
14	Stockpiling and Storing (Laydown)	Increase in ambient PM10 concentrations, Total	Minimise dust generation.	Avoid exceeding NAAQS annual	Dampen the stockpiles during dry or windy conditions where aggregate materials are exposed and located close to sensitive	Contractor, SEO	Construction during dry or windy conditions	Compliance to be verified by

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		Suspended Particulate (TSP) and dust fall out emitted from storage and stockpiles.		ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.	receptors.			ECO and IEA.
14	Stockpiling and Storing (Laydown)	Increase in ambient PM10 concentrations, Total Suspended Particulate (TSP) and dust fall out emitted from storage and stockpiles.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200	Restrict the height of stockpiles of topsoil and dry materials and gently shape these as far as practicable to minimize wind erosion and dust generation.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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				mg/m2/da) and residential (600 mg/m2/day) areas.				
14	Stockpiling and Storing (Laydown)	Increase in ambient PM10 concentrations, Total Suspended Particulate (TSP) and dust fall out emitted from storage and stockpiles.	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.	Remove materials first from the bottom of the piles to minimize the generation of dust.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
14	Stockpiling and Storing (Laydown)	Increase in ambient PM10 concentrations, Total Suspended Particulate (TSP) and dust fall out emitted	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour	Keep the hatches on material storage containers closed when not in use.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		from storage and stockpiles.		ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas.				

Table 50. Management Protocol for Terrestrial and Avian Ecosystem

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
15	Handling hazardous substances	Hydrocarbon spills can contaminate the environment.	Preserve ecosystem function.	Accidental spills are remediated.	Drip trays should be placed under any activity requiring active lubrication or oiling.	Contractor	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
15	Handling hazardous substances	Hydrocarbon spills can contaminate the environment.	Preserve ecosystem function.	Accidental spills are remediated.	Spill clean-up kits should be available on site for immediate remediation of any spills and removal of contaminated soils.	Contractor	Construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
15	Handling hazardous substances	Cement can contaminate fauna and flora	Preserve ecological processes.	Storage of hazardous materials is contained.	All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.	Contractor	Construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.
15	Handling hazardous substances	Hydrocarbon spills can contaminate the environment.	Preserve ecosystem function.	Accidental spills are remediated.	Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	Contractor	Construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.
15	Handling hazardous substances	Hydrocarbon spills can contaminate fauna and flora	Preserve ecological processes.	Storage of hazardous materials is contained.	All hazardous materials should be stored in the appropriate manner to prevent contamination of the site.	Contractor	Construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.
15	General and hazardous waste management	Pollution of waste material	Good waste management	No signs of dumping	No illegal dumping of waste.	Contractor	Construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.
15	General and hazardous waste management	Pollution of waste material	Good waste management	No litter	No littering.	Contractor	Construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.
15	General and hazardous waste management	Pollution of waste material	Good waste management	Waybills	General Waste shall be disposed of at a licensed municipal landfill, whereas hazardous waste will be disposed of at a licensed hazardous waste disposal facility.	Contractor	Construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.
15	General and hazardous	Unsanitary conditions surrounding	Sanitary conditions and	No signs of unsanitary conditions or	Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all	Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
	waste management	infrastructure promoting the establishment of alien plants and/or invasive rodents.	good waste management.	of increased rodent populations	waste be removed from site on a weekly basis to prevent rodents and pests entering the site.			
15	General and hazardous waste management	Windblown litter from transporting waste can contaminate the environment.	Sanitary conditions and good waste management.	Covered trucks	Trucks transporting waste must be covered.	Contractor	Construction and Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.
15	General and hazardous waste management	Illegal dumping	Responsible disposal of waste spoil.	No illegal dumping	Excavated material or aggregate is to be re-used if suitable.	Engineer, Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.
15	General and hazardous waste management	Illegal dumping	Responsible disposal of waste spoil.	No illegal dumping	If the material cannot be re-used, the spoil should be used as fill material, rehabilitation of the site, or removed from site to a suitable and approved location (a licensed waste disposal facility) by the contractor under his contract.	Contractor	Construction	Compliance to be verified by ECO and IEA.
15	General and hazardous waste management	Illegal dumping	Responsible disposal of waste spoil.	No illegal dumping	All spoil from earthworks or excavations should be re-used or removed from the site as soon as is practically possible.	Contractor	Construction	Compliance to be verified by ECO and IEA.
15	Alien Plant Management	Herbicides can introduce toxic chemicals into the food	Adopt an integrated pest management (IPM) approach to avoid the use of chemical	No alien plants on site	Immediately control any alien invasive plant in its entirety (including roots and propagating material) upon being identified on site, using preferably mechanical control methods as opposed to chemical spraying.	Contractor, SEO	Construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		chain.	pesticides and minimize risks to human health and the environment while maintaining economically viable management.					
15	Alien Plant Management	Herbicides can introduce toxic chemicals into the food chain.	Adopt an integrated pest management (IPM) approach to avoid the use of chemical pesticides and minimize risks to human health and the environment while maintaining economically viable management.	Integrated Weed Management (IWM) plan.	Develop an integrated approach to weed management, combining all appropriate weed control options into an integrated weed management (IWM) plan. Methods of control include herbicide application, mechanical removal, mulch or weed mat, shading, manual control, slashing, ring barking, and controlled grazing.	Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.
15	Alien Plant Management	Herbicides can introduce toxic chemicals into the food chain.	Adopt an integrated pest management (IPM) approach to avoid the use of chemical pesticides and minimize risks to human	FSC Pesticides Policy adopted	Adopt the FSC Pesticides Policy (FSC-POL-30-001 V3-0 EN) to regulate the use of chemical pesticides, if after having considered all available pest management strategies, the use of chemical pesticides may be identified as the most suitable control.	Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
			health and the environment while maintaining economically viable management.					
15	Alien Plant Management	Herbicides can introduce toxic chemicals into the food chain.	Adopt an integrated pest management (IPM) approach to avoid the use of chemical pesticides and minimize risks to human health and the environment while maintaining economically viable management.	Best practise is used when undertaking alien plant control	Give preference, as a matter of principle, to: (a) non-chemical methods over chemical pesticides, (b) chemical pesticides not listed in the FSC lists of Highly Hazardous Pesticides (HHPs) over those listed in the FSC lists of HHPs, and (c) FSC restricted HHPs over FSC highly restricted HHPs.	Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.
15	Alien Plant Management	Recruitment of alien invasive plants.	Prevent and control alien plant recruitment.	No alien invasive infestations in or from construction footprint.	Regular monitoring for alien plants within the road footprint as well as adjacent areas which receive runoff from the road as these are also likely to be prone to invasion problems.	Contractor, SEO	Construction and Continuous	Compliance to be verified by ECO and IEA.
15	Alien Plant Management	Recruitment of alien invasive plants.	Prevent and control alien plant recruitment.	No alien invasive infestations in or from construction footprint.	Regular alien clearing should be conducted using the best-practice methods for the species concerned. The use of herbicides should be avoided as far as possible.	Contractor, SEO	Construction and Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
16	Clearing/grubbing and grading	The physical footprint of the access road will result in a loss of local terrestrial habitat	Zero disturbance outside the existing District Road servitude.	No construction creep outside fenced servitude.	All construction on the district road section, including access for the public, will remain within the fenced road reserve.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
16	Clearing/grubbing and grading	The physical footprint of the access road will result in a loss of local terrestrial habitat	Zero disturbance outside the existing District Road servitude.	No construction creep outside fenced servitude.	The road servitude shall not be cleared in its entirety. The clearance of indigenous vegetation shall be restricted to the physical footprint of the road and side/cut-off drain and associated infrastructure, such as passing lanes (with the exception of temporary clearance and/or disturbance associated with 'normal' construction-related activities).	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
16	Clearing/grubbing and grading	The physical footprint of the access road will result in a loss of local terrestrial habitat	Minimize habitat loss.	No construction creep outside fenced servitude.	The clearance or disturbance of indigenous vegetation resulting from 'normal' construction-related activities shall be rehabilitated immediately upon the completion of those activities on a site, in accordance with a rehabilitation plan and/or the Bare Patch Restoration Protocol (**Appendix C**).	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
16	Stockpiling and Storing (Laydown)	Stockpiled topsoil left for extended period.	Prevent and control alien plant recruitment.	No alien plants on stockpiles	Alien plant growth on stockpiled topsoil must be uprooted manually by hand.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
17	Clearing/grubbing and grading	Removal of vegetation causing soil erosion.	Promote post-disturbance recovery of cleared areas.	Vegetated patches retain in cleared	A low cover of vegetation should be left intact wherever possible within the construction footprint to bind the soil, prevent erosion, create a seed source for adjacent cleared areas and promote post-	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		Loss of indigenous seed source due to vegetation clearing.		areas (where possible).	disturbance recovery of an indigenous ground cover.			
17	Clearing/grubbing and grading	Removal of vegetation causing soil erosion. Loss of indigenous seed source due to vegetation clearing.	Promote post-disturbance recovery of cleared areas.	Vegetated patches retain in cleared areas (where possible).	These vegetated patches should be clearly demarcated and physically protected from any disturbance.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

Table 51. Management Protocol for Aquatic Ecosystem

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
18	Alien Plant Management	Spreading invasive non-native plants into degraded areas.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Weed and invasive alien species control plan	A weed and alien invasive species control plan should be implemented during the contract period.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
18	Alien Plant Management	Spreading invasive non-native plants into degraded areas.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	No mature (bearing seed) alien invasive plants observed within the road servitude, staging area or construction camp.	Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Alien Plant Management	Spreading invasive non-native plants into degraded areas.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	No mature (bearing seed) alien invasive plants observed within the road servitude, staging area or construction camp.	Any materials brought into construction sites should be from sources free of invasive alien species.	Contractor	Construction	Compliance to be verified by ECO and IEA.
18	Alien Plant Management	Spreading invasive non-native plants into degraded areas.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	No mature (bearing seed) alien invasive plants observed within the road servitude, staging area or construction camp.	Clearing of invasive alien plants must take place coupled with the sowing of seeds of indigenous species to stabilise disturbed habitats.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
18	Alien Plant Management	Water and soil pollution by chemicals Herbicides can enter waterbodies either directly through spray or spray drift, or they can move into waterbodies via surface water run-off or leaching and sub-surface draining.	Avoid spillage onto soil or into water while mixing or using chemicals. Prevent contamination of ecologically sensitive environments. Prevent loss of biodiversity and non-targeted plant species (damage to indigenous trees).	Best practise is used when undertaking alien plant control	Minimise the use of herbicides near waterways by considering other techniques that can be alternatives to, or complementary with, herbicides.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Alien Plant Management	Water and soil pollution by chemicals Herbicides can enter waterbodies either directly through spray or spray drift, or they can move into waterbodies via surface water run-off or leaching and sub-	Avoid spillage onto soil or into water while mixing or using chemicals. Prevent contamination of ecologically sensitive environments. Prevent loss of biodiversity and non-targeted plant species (damage to indigenous trees).	Best practise is used when undertaking alien plant control	If chemical spraying is adopted: (a) use only approved herbicides prescribed by the Working for Water guidelines. (b) Staff using chemicals are trained and aware of the risks of using chemicals. (c) Chemicals are mixed on impermeable and level surfaces as per the manufacturer's instructions. (d) All waste material and containers are safely and properly removed after use. (e) Chemicals are stored, mixed and used in demarcated areas. (f) Do not apply foliar hand spray chemical applications under	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		surface draining.			conditions where chemical drift may impact non-targeted species (as indicated on the manufacturer's directions for use on the herbicide label).			
18	General Hazardous Waste Management	Altered aquatic ecosystem structure and function.	Responsible waste storage and management	Waste storage area	The designated temporary waste storage area must be contained (e.g., covered skips and scavenger proof bins) and fenced with a diamond mesh fence to prevent rainfall accumulation or wind-blown litter.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	General Hazardous Waste Management	Chemical pollution of the water resources.	No incidents of chemical pollution of watercourses.	Waste is disposed of correctly	No illegal dumping of waste.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	General Hazardous Waste Management	Chemical pollution of the water resources.	No incidents of chemical pollution of watercourses.	No litter	No littering. Windblown litter should be cleared regularly.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	General Hazardous Waste Management	Chemical pollution of the water resources.	No incidents of chemical pollution of watercourses.	Waybills	General Waste shall be disposed of at a licensed municipal landfill, whereas hazardous waste will be disposed of at a licensed hazardous waste disposal facility.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Handling hazardous substances	Chemical pollution of the water resources.	No incidents of chemical pollution of watercourses	Responsible refuelling	Refuelling of construction plant may only take place at a designated and permitted (from local Fire Chief) fuel storage tank or using a mobile fuel bowser, under the guidance of a Specific Operating Procedure (SOP) that minimises the risk of spillage and addresses remedial actions in	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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					the event of a spillage. The Contractor's Site Environmental Officer (SEO) shall be responsible for compiling the SOP, which must be approved by the Environmental Control Officer (ECO).			
18	Handling hazardous substances	Chemical pollution of the water resources.	No incidents of chemical pollution of watercourses	Spill kit on the mobile fuel bowser	An emergency response spill kit must accompany the mobile fuel bowser.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Handling hazardous substances	Chemical pollution of the water resources.	No incidents of chemical pollution of watercourses	Refuelling using the mobile fuel bowers outside of sensitive areas	Refuelling with a mobile fuel bowser shall take place 100 m away from the ecological buffer, as well as any boreholes and soakaways.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Handling hazardous substances	Chemical pollution of the water resources.	No incidents of chemical pollution of watercourses	Concrete batching is outside of sensitive areas	No concrete batching shall take place within the delineated riparian zone or within the ecological buffer of a watercourse.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Plant Management	Operation of heavy equipment in a channel bed can directly destroy spawning habitat for fish and macro-invertebrate habitat and produce increased turbidity (lower dissolved	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	No vehicles outside of demarcated construction servitudes	Vehicles and other machinery are prohibited from accessing the ecologically sensitive wetlands or ephemeral drainage system and its ecological buffer unless confined to the demarcated construction servitudes associated with the construction of linear infrastructure crossings.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		oxygen) and increased suspended sediment downstream.						
18	Plant Management	Operating construction equipment within a watercourse and floodplain can cause water pollution/contamination from accidental chemical releases associated leaking machinery or spills.	Maintain the unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) in a good ecological condition.	Washing plants are outside 100 m watercourse buffer	No washing of plant is permitted on the construction site, within 100 m of the edge of any wetlands or other watercourses, and on land outside of the Sun Central Cluster 1 footprint.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Plant Management	Operating construction equipment within a watercourse and floodplain can cause water pollution/contamination from accidental chemical releases	Maintain the unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) in a good ecological condition.	No repairs on site except under an emergency	No maintenance/service/repair of construction plant is permitted on the construction site (except emergency repairs) or on land outside of the Sun Central Cluster 1 footprint.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		associated leaking machinery or spills.						
18	Plant Management	Operating construction equipment within a watercourse and floodplain can cause water pollution/contamination from accidental chemical releases associated leaking machinery or spills.	Maintain the unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) in a good ecological condition.	Emergency protocol	An emergency protocol must be developed that deals with accidents and spills. This must include methods for absorbing chemical spills, as well as the transport and on-site bioremediation or disposal of all contaminated material at a licensed hazardous waste site.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Plant Management	Operating construction equipment within a watercourse and floodplain can cause water pollution/contamination from accidental chemical releases associated	Maintain the unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) in a good ecological condition.	Drip trays at emergency repairs	Emergency breakdowns must be addressed with immediate and adequate pollution containment measures including but not limited to drip trays with plastic liners and spill kits.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		leaking machinery or spills.						
18	Plant Management	Operating construction equipment within a watercourse and floodplain can cause water pollution/contamination from accidental chemical releases associated leaking machinery or spills.	Maintain the unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) in a good ecological condition.	Spill kits	A spill kit should accompany the work front.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Plant Management	Operating construction equipment within a watercourse and floodplain can cause water pollution/contamination from accidental chemical releases associated leaking	Maintain the unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) in a good ecological condition.	Avoid emergency repairs within 100m of a watercourse	As far as practical no emergency maintenance/service/repair is permitted within 100 m of the edge of any wetlands or watercourses.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		machinery or spills.						
18	Plant Management	Operating construction equipment within a watercourse and floodplain can cause water pollution/contamination from accidental chemical releases associated leaking machinery or spills.	Maintain the unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) in a good ecological condition.	No overnight parking within 100m of watercourse	No overnight parking of plant (e.g., outside business hours) is permitted within 100 m of the edge of any wetlands or watercourses.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Plant Management	Operating construction equipment within a watercourse and floodplain can cause water pollution/contamination from accidental chemical releases associated leaking	Maintain the unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) in a good ecological condition.	Refuel area have a bund to 110% volume	Refuelling and fuel storage areas should be located on an impervious bund capable of containing 110% of the volume of the fuel storage tank(s).	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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		machinery or spills.						
18	Plant Management	Operating construction equipment within a watercourse and floodplain can cause water pollution/contamination from accidental chemical releases associated leaking machinery or spills.	Maintain the unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) in a good ecological condition.	Drip trays	Drip trays must be placed under all stationary construction plant and equipment that can leak, such as, for example, TLBs, compressors and generators. The volume (litres) of drip trays must be sized according to their application and should be sufficient to hold 110% of the capacity of the reservoir holding the contaminant, e.g., a 100 cm (L) x 100 cm (W) x 10 cm (D) will hold 100 litres. A plastic liner that is at least twice the length and width of the drip tray shall be placed underneath it.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Plant Management	Operating construction equipment within a watercourse and floodplain can cause water pollution/contamination from accidental chemical releases associated leaking	Maintain the unnamed FEPA drainage line D62D – 05610 SQ (a tributary of the Brak River) in a good ecological condition.	Drips trays are not overflowing	Drip trays must be inspected regularly and emptied into containers designated for the temporary storage of hazardous waste. Hydrophobic hydrocarbon absorbent material is recommended to avoid contaminated rainwater from overflowing during rainfall events.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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		machinery or spills.						
18	Stormwater management and Erosion control and Security	Damage to farm infrastructure	Minimize damage to farm infrastructure.	Fences are clear of debris	Inspections of boundary fences should be done daily in areas where there are activities.	Contractor, SEO	Daily	Compliance to be verified by ECO and IEA.
18	Stormwater management and Erosion control	Damage to farm infrastructure	Minimize damage to farm infrastructure.	Fences are clear of debris	All fences should be inspected and be kept clear of debris, especially in the rainy season.	Contractor, SEO	Construction and Continuous	Compliance to be verified by ECO and IEA.
18	Stormwater management and Erosion control	Damage to farm infrastructure	Minimize damage to farm infrastructure.	Fences are clear of debris	Damaged fences must be repaired immediately.	Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.
18	Clearing/grubbing and grading	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads, fences and sub surface pipelines).	Sensitive avifauna habitats are restored.	Topsoil is removed during dry season	All topsoil harvesting must take place in the dry season.	Contractor, SEO	Construction (dry season)	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Poorly maintained vehicles can result in hydrocarbon spills.	Preserve aquatic ecosystem structure and function, as well as riparian habitat.	No leaking plant, machinery or equipment on site	Any construction plant, machinery, and equipment which leaks shall not be permitted on site. Undertake visual inspections for any leakages that may emanate from any vehicle accessing the site - all vehicles	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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					must be in good working order when entering the site (Hydrology Assessment).			
18	Linear Infrastructure Crossings	Poorly maintained vehicles can result in hydrocarbon spills.	Preserve aquatic ecosystem structure and function, as well as riparian habitat.	No parking outside of designated areas	All vehicles must be parked with drip trays in designated areas outside ecological buffer areas and if overnight, then preferably in the construction camp (Hydrology Assessment).	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Poorly maintained vehicles can result in hydrocarbon spills.	Preserve aquatic ecosystem structure and function, as well as riparian habitat.	Drip trays	Enough drip trays must be available for all construction plant.	Contractor	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Poorly maintained vehicles can result in hydrocarbon spills.	Preserve aquatic ecosystem structure and function, as well as riparian habitat.	Spill response equipment	Provide accidental spill response equipment at the construction camp.	Contractor	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Poorly maintained vehicles can result in hydrocarbon spills.	Preserve aquatic ecosystem structure and function, as well as riparian habitat.	No exposed contaminated soil on site	In event of a spill, immediately remove the contaminated soil to the depth of penetration and temporarily store in a sealed container within the designated waste storage area for on-site bioremediation or disposal at a licensed hazardous waste landfill.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	The crossing alignments will result in the loss of aquatic or river habitat	Contain construction and avoid the unnecessary loss of aquatic habitat.	No vehicles or pedestrian access beyond demarcated areas	Vehicular/machinery or pedestrian access is prohibited in natural areas beyond the demarcated (fenced) boundary of the construction site (road servitude or pipeline corridor),	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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		equivalent to the size of the development footprint or in the case of construction creep, greater.			including working servitudes across the ephemeral drainage system or wetlands.			
18	Linear Infrastructure Crossings	The crossing alignments will result in the loss of aquatic or river habitat equivalent to the size of the development footprint or in the case of construction creep, greater.	Contain construction and avoid the unnecessary loss of aquatic habitat.	No unnecessary vegetation clearing	Limit vegetation clearing to the physical footprint of the road and the minimum width required for the operation of machinery to install the culverts.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	The crossing alignments will result in the loss of aquatic or river habitat equivalent to the size of the development footprint or in the case of construction creep, greater.	Contain construction and avoid the unnecessary loss of aquatic habitat.	Vegetation removed only prior to earthworks/construction	Vegetation and soil should be retained in position for as long as possible and should only be removed immediately ahead of construction / earthworks in any specific area so that cleared areas are not unnecessarily exposed to erosion for extended periods prior to working in those areas.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
18	Linear Infrastructure Crossings	The crossing alignments will result in the loss of aquatic or river habitat equivalent to the size of the development footprint or in the case of construction creep, greater.	Contain construction and avoid the unnecessary loss of aquatic habitat.	Active rehabilitation	Conduct active rehabilitation during the construction activities according to a rehabilitation plan or implement the Bare Patch Restoration Protocol (Appendix C) that will restore the natural vegetation to what it was prior to the construction of road/pipeline crossings, so that the long-term impact could be negligible.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	The crossing alignments will result in the loss of aquatic or river habitat equivalent to the size of the development footprint or in the case of construction creep, greater.	Contain construction and avoid the unnecessary loss of aquatic habitat.	Rehabilitated areas are cordoned off.	Cordon off areas under rehabilitation as "no-go areas" to prevent vehicular, pedestrian and livestock access.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads).	Sensitive avifauna habitats are protected and maintained.	Use of existing farm roads	As far as possible utilize or upgrade existing farm roads as opposed to constructing new roads in undisturbed areas.	Engineer	Construction	Compliance to be verified by ECO and IEA.

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18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads).	Sensitive avifauna habitats are protected and maintained.	Roads do not impeded flow	All road crossings must be engineered not to impede surface or subsurface flow in any way.	Engineer	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads).	Sensitive avifauna habitats are protected and maintained.	Construction during dry season	Schedule road construction during the season least damaging to the stream or wetland system (e.g., dry season).	Holder, Contractor	Construction during dry season	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads).	Sensitive avifauna habitats are protected and maintained.	Limited fill roads	Limit or restrict the construction of fill roads. All fill roads must use a permeable fill material (such as gravel or crushed rock) for at least the first layer of fill to maintain the natural flow regimes of subsurface water.	Engineer	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas because of infrastructure	Sensitive avifauna habitats are protected and maintained.	Raised bridges and culverts	It is preferable to eliminate fill roads and utilise raised bridges and culverts with adequate sizing and spacing of water crossing structures, proper choice of the type of crossing structure, and installation of drainage structures at	Engineer	Construction	Compliance to be verified by ECO and IEA.

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		installation (roads).			a depth adequate to pass subsurface flow.			
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads).	Sensitive avifauna habitats are protected and maintained.	Layout down area more than 35m from wetland	During construction, laydown areas must be a minimum of 35 metres from the wetland edge.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads).	Sensitive avifauna habitats are protected and maintained.	No unnecessary equipment within the wetland	Construction equipment used while working in wetlands is limited to only those pieces that are essential and non-essential equipment is allowed to travel through wetlands only once during deployment and once during extraction.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads).	Sensitive avifauna habitats are protected and maintained.	Silt fences	During vegetation clearing, sediment barriers such as silt fences must be installed and maintained adjacent to wetlands.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse	Sensitive avifauna habitats are protected and maintained.	Responsible topsoil removal	Overall, topsoil is first removed and stored separately from the subsoil as well as topsoil from adjacent terrestrial habitats. Where wetland	Contractor, SEO	Construction and during the dry season	Compliance to be verified by ECO and IEA.

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		areas because of infrastructure installation (roads).			soils are saturated, segregating topsoil is not possible.			
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads).	Sensitive avifauna habitats are protected and maintained.	Timber mats	Large timber mats placed ahead of the construction equipment can provide a stable working platform and protect wetland soils by spreading the weight of the construction equipment over a broad area.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure installation (underground pipelines).	Sensitive avifauna habitats are protected and maintained.	Pipelines are below subsurface flows	All underground pipelines bisecting sensitive habitats must be placed below the subsurface flow of the ephemeral wetlands with the linear construction pits subjected to full rehabilitation to maintain normal subsurface flow.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure	Sensitive avifauna habitats are protected and maintained.	Zero interruption to flow	All pipeline crossings must be engineered not to impede surface or subsurface flow in any way.	Engineer	Construction	Compliance to be verified by ECO and IEA.

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		installation (underground pipelines).						
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure installation (underground pipelines).	Sensitive avifauna habitats are protected and maintained.	Pipeline construction during dry season	Schedule pipeline construction during the season least damaging to the stream or wetland system (e.g., dry season).	Contractor, SEO	Construction during dry season	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure installation (underground pipelines).	Sensitive avifauna habitats are protected and maintained.	Pipeline corridors are no more than 5m wide	All pipeline corridors should be implemented to a maximum width of 5 metres through wetlands during construction.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure installation (underground	Sensitive avifauna habitats are protected and maintained.	Method statement	The method of pipeline construction used in wetlands depends on the stability of the soils. Overall, topsoil is first removed and stored separately from the subsoil as well as topsoil from adjacent terrestrial habitats. All topsoil harvesting must take place in the dry season (late dry season). Where wetland soils	Contractor	Construction	Compliance to be verified by ECO and IEA.

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		pipelines).			are saturated, segregating topsoil is not possible.			
18	Linear Infrastructure Crossings	Habitat loss and fragmentation of watercourse areas due to displacement because of infrastructure installation (underground pipelines).	Sensitive avifauna habitats are protected and maintained.	Topsoil is backfilled din the correct order.	If topsoil is segregated from subsoil, then subsoil is backfilled first. The trench is backfilled to the proper grade to maintain wetland hydrology and grades are restored to the original elevation.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	River diversion works may result in sedimentation and increased turbidity of the ephemeral drainage system.	Preserve aquatic ecosystem structure and function, as well as riparian habitat.	No surplus spoil stored on site	All surplus spoil material from the trenching (e.g., not used as backfill) should be removed from the site as soon as is practically possible.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	River diversion works may result in sedimentation and increased turbidity of the ephemeral drainage system.	Preserve aquatic ecosystem structure and function, as well as riparian habitat.	No construction creep.	If it is practical to do so, construct river diversion works on the perimeter of the working servitude before clearing the in-situ material.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
18	Linear Infrastructure Crossings	River diversion works may result in sedimentation	Preserve aquatic ecosystem structure and	Aggregate is protected from any flowing water	Aggregate used in the construction of river diversion works shall not be in direct contact with flowing water,	Contractor	Construction	Compliance to be verified by ECO and IEA.

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		and increased turbidity of the ephemeral drainage system.	function, as well as riparian habitat.		by using for example, plastic sheets, sandbags, culverts, or pipes.			
18	Linear Infrastructure Crossings	River diversion works may result in sedimentation and increased turbidity of the ephemeral drainage system.	Preserve aquatic ecosystem structure and function, as well as riparian habitat.	No dispersive soils used	Aggregate used in the construction of river diversion works shall not include dispersive soils.	Contractor	Construction	Compliance to be verified by ECO and IEA.
19	Plant Management	Altered surface water flow patterns, e.g., changing sheet flow (natural open system) to concentrated flows leads to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	No off-road driving immediately after rainfall	There should be reduced activity at the site after rainfall events when the soils are wet. No driving off from hardened roads should occur immediately following large rainfall events until soils have dried out and the risk of bogging down has decreased.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Plant Management	Altered surface water flow patterns, e.g., changing sheet flow (natural open system) to concentrated flows leads to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and	No off-road driving immediately after rainfall	No off-road driving in wet conditions, and for two weeks afterwards. No driving in veld should take place on clay or fine-textured soils following rain	Contractor, SEO	Wet conditions and two weeks after	Compliance to be verified by ECO and IEA.

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			headwater drainage lines.					
19	Stormwater management and Erosion control	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Stormwater management measures in place and good working order.	Where diversion berms create concentrated flows, particularly in steep and/or sensitive areas, the use of swales, silt fences or other effective erosion control measures is recommended to attenuate runoff.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Stormwater management and Erosion control	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Stormwater management measures in place and good working order.	All storm water management measures should be regularly maintained.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Stormwater management and Erosion control	Vegetation clearance of the project footprint for the access road and underground	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral	Stormwater management measures in place and good working order.	Implement appropriate stormwater management around the excavated trenches to prevent the ingress of surface water run-off.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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		pipelines close to watercourses will be subject to erosion.	tributaries, alluvial floodplains, and headwater drainage lines.					
19	Earthworks	Clearing of vegetation for the construction of access roads can cause sediment load in the water courses before the cleared areas can be stabilized.	Reduce sedimentation of watercourses	No vegetation clearing during rainfall season	Clearing of vegetation should preferably be done outside the main rainfall periods.	Contractor, SEO	Construction (outside of rainfall season)	Compliance to be verified by ECO and IEA.
19	Earthworks	Clearing of vegetation for the construction of access roads can cause sediment load in the water courses before the cleared areas can be stabilized.	Reduce sedimentation of watercourses	No unnecessary vegetation clearing	Keep as much of the original vegetation intact as possible.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Earthworks	Clearing of vegetation for the construction of access roads	Reduce sedimentation of watercourses	No bare areas	Rehabilitate areas where the original vegetation was cleared or severely disturbed (e.g., bare patches).	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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		can cause sediment load in the water courses before the cleared areas can be stabilized.						
19	Earthworks	Clearing of vegetation for the construction of access roads can cause sediment load in the water courses before the cleared areas can be stabilized.	Reduce sedimentation of watercourses	Stormwater control measures	The applicant shall in response to bank erosion at road crossings either maintain existing or implement new storm water control measures as soon as is reasonably practical (e.g., within 5 working days of being noticed).	Contractor	Construction (within 5 working days of being noticed)	Compliance to be verified by ECO and IEA.
19	Earthworks	Clearing of vegetation for the construction of access roads can cause sediment load in the water courses before the cleared areas can be stabilized.	Reduce sedimentation of watercourses	Rehabilitation	The applicant shall rehabilitate any erosion of river or stream banks at road crossings as soon as is reasonably practical (e.g., within 5 working days of being noticed)	Contractor	Construction (within 5 working days of being noticed)	Compliance to be verified by ECO and IEA.
19	Linear Infrastructure Crossings	Vegetation clearance of the project footprint for	Maintain the Present Ecological State of the Brak River	Construction Method Statements for	A construction method statement should be compiled and approved prior to the commencement of construction activities within all	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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		the access road and underground pipelines close to watercourses will be subject to erosion.	drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	crossings.	water resource types and where applicable their buffers.			
19	Linear Infrastructure Crossings	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	No cleared areas exposed for extended periods.	Vegetation and soil should be retained in position for as long as possible and should only be removed immediately ahead of construction / earthworks in any specific area.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Linear Infrastructure Crossings	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Vegetation is not cleared from the road verge.	Vegetation clearing (and the area of disturbance) is to be kept to a minimum. No unnecessary vegetation to be cleared.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Linear Infrastructure Crossings	Vegetation clearance of the project	Maintain the Present Ecological State	Active rehabilitation	In areas where construction activities have been completed and no further disturbance is anticipated,	Contractor, SEO	Construction	Compliance to be verified

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		footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.		rehabilitation and re-vegetation should commence as soon as possible.			by ECO and IEA.
19	Linear Infrastructure Crossings	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	New routes are minimal (only where necessary) and plans are approved by the ECO.	Existing roads and tracks should be used for access as far as possible, rather than creating new routes.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Linear Infrastructure Crossings	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	New routes are minimal (only where necessary) and plans are approved by the ECO.	Any additional routes and turning areas required by the contractor must be approved by the ECO, in the form of an amended ESM&R Plan indicating the position and extent of the proposed route / area.	Contractor, ECO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
19	Linear Infrastructure Crossings	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Construction Method Statements for crossings.	Roads that cross the large flood plains and severe gulley erosion should be planned well to reduce soil erosion.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Linear Infrastructure Crossings	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Roads are returned to a usable state	Ensure that all access roads utilised during construction (which are not earmarked for closure and rehabilitation) are returned to a usable state and / or a state no worse than prior to construction.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Linear Infrastructure Crossings	Disturbed or exposed sites are vulnerable to erosion.	Minimise erosion of disturbed sites from storm water run-off.	Construction during dry winter months	Construction, particularly of linear infrastructure across parts of the ephemeral drainage system, should to the extent possible be restricted to the dry winter months (e.g., May to September), that is commence with such activities as clearing or grading, excavating and importing material at the end of the wet season/beginning of the dry season whilst the soil is still moist to reduce	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					dust and as far as is practical, be completed in, the dry winter months with a decreased probability of storm events.			
19	Stockpiling and storing (Laydown)	Stockpiles and overburden left in the river or floodplain can alter channel hydraulics during high flows, e.g., by deflecting water to the other side of the riverbank.	Avoid sedimentation of watercourses.	Stockpiles are stored correctly	Aggregate (sand) stockpiles (except for trenches) must be stored in the construction camp or staging area and outside the ecological buffer of the Brak River and large ephemeral drainage systems, including the 1:100-year flood line and delineated riparian habitat.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Stockpiling and storing (Laydown)	Erosion and sedimentation of watercourses due to unforeseen circumstances (i.e., bad weather).	Avoid sedimentation of watercourses.	Stockpiles are covered	Cover soil stockpiles with a temporary liner to prevent sedimentation (where required and visually determined).	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
19	Stockpiling and storing (Laydown)	There is a potential for erosion and sedimentation of the surroundings or ephemeral drainage lines	Avoid soil movement from designated stockpiles.	Sediment traps (if applicable)	Sediment traps may be necessary to prevent erosion and soil movement if there are topsoil or other stockpiles present during the wet season.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Table 52. Management Protocol for Economical

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
20	Plant Management	Damage to farm infrastructure	Minimize damage to farm infrastructure.	Fences are clear of debris	Affected landowners must be compensated for losses resulting from any damage to farm infrastructure.	Holder, Contractor	Construction and Continuous	Compliance to be verified by ECO and IEA.
20	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Membership of the local Fire Protection Association	Join the local Fire Protection Association if there is one and abide by their minimum requirements, as well as any agreements entered into with the Minister or other FPAs to provide mutual assistance in fighting and extinguishing fires.	Holder, Contractor	Construction	Compliance to be verified by ECO and IEA.
20	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	PPE	Obtain the necessary PPE for firefighting personnel.	Contractor	Construction	Compliance to be verified by ECO and IEA.
20	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Firefighting equipment	Obtain such firefighting equipment as would be reasonably required in the circumstances, that is proportional to the risk.	Contractor	Construction	Compliance to be verified by ECO and IEA.
20	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Maintained firefighting equipment	Firefighting equipment shall be maintained and readily available during construction (and operation) - regularly test and service equipment	Contractor	Continuous	Compliance to be verified by ECO and IEA.
20	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Person appointed to control fires	Appoint a responsible person (or agent) who will extinguish a fire, or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant Fire Protection Association, if any.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
20	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Trained firefighting personnel	If no agent is appointed, a team of designated firefighting personal shall be trained and readily available to immediately deal with any runaway veld fires.	Contractor	Construction	Compliance to be verified by ECO and IEA.
20	Stormwater management and erosion control	Flooding in the predicted "ponded flood occurrence zones" (Hydrology Assessment Report) could cause damage to property	Minimize damage to farm infrastructure.	Flooding protocols are in place	Implement where applicable, prescribed flooding protocols (e.g., drainage and stormwater systems to minimize flooding potential) and erosion prevention measures in the predicted "ponded flood occurrence zones" (Hydrology Assessment Report).	Holder, Engineer	Continuous	Compliance to be verified by ECO and IEA.
20	Stormwater management and erosion control	Poor stormwater management during construction of the road.	Good stormwater management.	Roads are free draining, e.g., no ponding or pooling of surface water.	During construction of the roads the roads must always be free draining.	Contractor	Construction	Compliance to be verified by ECO and IEA.
21	Earthworks	Damage to vehicles.	Good road condition	District gravel road is maintained	The applicant shall maintain any deterioration to the district gravel road resulting from increased traffic during construction.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
21	Earthworks	Damage to vehicles.	Good road condition	Corrugations are repaired	Corrugations shall be removed as soon as is reasonably practical (e.g., within 5 working days of being noticed).	Holder, Contractor	Continuous (within 5 working days of being noticed)	Compliance to be verified by ECO and IEA.
21	Earthworks	Damage to vehicles.	Good road condition	Potholes and puddles repaired	Potholes and puddles will be filled in and compacted as soon as is reasonably practical (e.g., within 5 working days of being noticed).	Contractor	Continuous	Compliance to be verified by ECO and IEA.
21	Earthworks	Damage to vehicles.	Good road condition	Photographs of private road condition	In circumstances where private roads must be used, the condition of those roads must be recorded in	Holder, Contractor	Prior to private road use	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					accordance with section 4.9: photographic record; prior to use and the condition thereof agreed by the landowner, the DPM, and the contractor (DEA Generic EMPr)			
21	Earthworks	Damage to vehicles.	Good road condition	Environmentally friendly soil binders are used	Apply environmentally friendly soil binding agents to the road surface to reduce ripple and pothole occurrences as well as help production machines last longer.	Contractor	Continuous	Compliance to be verified by ECO and IEA.

Table 53. Management Protocol for Social

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
23	General and hazardous waste management	Large amounts of stored waste can cause unpleasant odours	Reduce odours with good waste management	No odours	Waste receptacles must not be overfilled. General waste shall be disposed of at the nearest licensed landfill.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
23	General and hazardous waste management	Large amounts of stored waste can cause unpleasant odours	Reduce odours with good waste management	Waybill	It is recommended that all waste be removed from the temporary waste storage area within the construction camp and be disposed of at the nearest licensed landfill on a weekly basis to prevent it from accumulating and 'rotting'.	Contractor, SEO	Construction (weekly removal of waste)	Compliance to be verified by ECO and IEA.
23	Plant Management	Stakeholders are concerned about the quality of the roads, increases in	Good traffic and road management.	Access to individual properties is maintained.	Road maintenance and access to individual properties is especially important in the construction phase.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		traffic and traffic safety.						
23	Plant Management	Traffic noise from the development of corrugations, potholes and puddles play an important role on the noise levels along roads or some distance from roads.	Minimize noise disturbance to noise receptors/ farmhouses.	Good road condition.	Road maintenance must be done on a regular basis to avoid the creation of potholes.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
23	Plant Management	Construction traffic to and from the site would create a temporary linear noise source.	Minimize noise disturbance to noise receptors/ farmhouses	No unacceptable noise	Equipment and/or machinery which will be used must comply with the manufacturer's specifications on acceptable noise levels and during daytime only.	Contractor	Construction	Compliance to be verified by ECO and IEA.
23	Plant Management	Construction traffic to and from the site would create a temporary linear noise source.	Minimize noise disturbance to noise receptors/ farmhouses	No speeding	The speed limit to be always adhered to.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
23	Plant Management	Potential congestion and delays on the road network.	Minimise risk of congestion and delays to local residents and farmers.	Delivery trips outside peak traffic periods	Where possible, stagger and schedule peak construction periods, delivery and staff trips, as well as any other trips with an expected increase in vehicle movement outside of the peak traffic periods.	Contractor	Construction	Compliance to be verified by ECO and IEA.
23	Plant Management	Potential congestion and delays on the	Minimise risk of congestion and delays to local	Passing lanes	Ensure adequate passing lanes for local farmers and residents	Contractor	Construction	Compliance to be verified

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		road network.	residents and farmers.					by ECO and IEA.
23	Plant Management	Potential congestion and delays on the road network.	Minimise risk of congestion and delays to local residents and farmers.	Stop and Go's	Implement "Stop and Go's".	Contractor	Construction	Compliance to be verified by ECO and IEA.
23	Clearing/ grubbing and Grading	Noise increase at the boundary of the project footprint and at the abutting houses during construction activities.	Minimize noise disturbance to noise receptors/ farmhouses.	Construction during daytime only.	Topsoil stripping and construction activities should be limited to daytime only.	Contractor	Construction	Compliance to be verified by ECO and IEA.

Table 54. Management Protocol for Property

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
25	Blasting	Fly rock and vibrations from blasting	Prevent damage caused by blasting	Use of minimum magnitude and amount of 'explosive' material.	The contractor carrying out the blasting work shall apply the absolute minimum magnitude and amount of 'explosive' material.	Contractor	Construction	Compliance to be verified by ECO and IEA.
25	Blasting	Fly rock and vibrations from blasting	Prevent damage caused by blasting	Blast mat in use	The contractor carrying out the blasting work shall use a blast mat (not soil) to reduce fly rock.	Contractor	Construction	Compliance to be verified by ECO and IEA.
25	Blasting	Fly rock and vibrations from	Prevent damage	Neighbours are advised	The applicant shall at least 7 days prior to the commencement of blasting advise	Contractor	At least 7 days prior to the	Compliance to be verified

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		blasting	caused by blasting	regarding blasting	owners and occupiers of neighbouring properties.		commencement of blasting	by ECO and IEA.
25	Blasting	Fly rock and vibrations from blasting	Prevent damage caused by blasting	Survey results and photographs	Buildings within the potential damaging zone of the blast will be surveyed with the presence of the owner, or a representative nominated by the owner, and any cracks or latent defects will be pointed out and recorded using photographs.	Contractor	Prior to blasting	Compliance to be verified by ECO and IEA.
25	Blasting	Fly rock and vibrations from blasting	Prevent damage caused by blasting	Method statement	The contractor carrying out the blasting work will prepare a method statement prior to blasting. The aforesaid method statement will include: A locality plan of the blast site; The zones of influence of the ground and air shockwaves; Expected limits of fly rock; and Each dwelling, structure, service and water source within the zones of influence.	Contractor	Construction	Compliance to be verified by ECO and IEA.
25	Blasting	Fly rock and vibrations from blasting	Prevent damage caused by blasting	Logbook	The contractor carrying out the blasting work shall log the blasting activities.	Contractor	Construction	Compliance to be verified by ECO and IEA.

Table 55. Management Protocol for Health and Safety

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
26	Plant Management	Stakeholders are concerned about the quality of the roads,	Good traffic and road management.	Vehicles are marked and road signage is erected.	Vehicles must be clearly marked, and the necessary road signage must be erected on the affected roads to warn road users about the construction activities and traffic.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		increases in traffic and traffic safety.						
26	Plant Management and Health and Safety	Traffic accidents at primary access location off the N10.	To ensure the safe exit of Single-Unit Trucks (SU) and especially Single-Unit Truck plus Trailers (SU+T) at the junction of the N10 with the existing Burgerville (District) Road.	Traffic accommodation on eastern approach of N10 and flagman	Place appropriate traffic accommodation on the eastern approach of the N10, indicating a construction access ahead with a possible flagman to alert drivers and slow them down.	Contractor	Construction	Compliance to be verified by ECO and IEA.
27	Health and Safety	Improper safety procedures followed when refuelling.	Avoid injury or fatality amongst staff.	Safety posters	The Contractor must erect and maintain information posters at key locations on site, and the posters must include the following information as a minimum: a) Safety notifications	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
27	Health and Safety	Improper safety procedures followed when refuelling.	Avoid injury or fatality amongst staff.	All staff have PPE	Implement the following restrictions on all staff operating on the site: (a) No work may be done without the use of PPE (b) No alcohol or illegal substance use on site (c) No firearms permitted on site.	Contractor	Construction	Compliance to be verified by ECO and IEA.
27	Health and Safety	Improper safety procedures followed when refuelling.	Avoid injury or fatality amongst staff.	First Aid kit	A first aid kit must always be accessible on site and must include the number of the local emergency service.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
27	Health and Safety	Improper safety procedures followed when refuelling.	Avoid injury or fatality amongst staff.	Smoking areas	Set up and enforce use of designated smoking area(s)	Contractor	Construction	Compliance to be verified by ECO and IEA.
27	Health and Safety	Improper safety procedures followed when refuelling.	Avoid injury or fatality amongst staff.	First Aid certificate	At least one person within each working team must have a valid First Aid Certificate and a First Aid Kit that is adequate to deal with the range of possible life-threatening injuries.	Contractor	Construction	Compliance to be verified by ECO and IEA.
27	General and hazardous waste management	Overuse of chemical toilets can be unhygienic.	Responsible sanitary conditions	Adequate number of chemical toilets	Sufficient chemical toilets (1 toilet for 15 or less staff) shall be provided for staff at the different work fronts.	Contractor	Construction	Compliance to be verified by ECO and IEA.
27	General and hazardous waste management	Reuse of certain containers may be harmful to people.	Responsible waste management	No containers which held a Hazardous Chemical Substance (HCS) are being reused	Reusable containers which held a Hazardous Chemical Substance (HCS) may not be donated to any person for reuse, and preferably returned to the supplier to be cleaned and decontaminated, otherwise if that is not possible then punctured and disposed of at a licensed hazardous waste disposal facility.	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.
27	Earthworks	Collapsing sidewalls of excavated trenches.	Minimize collapsing trenches.	Side walls of trenches battered back to a 1:1.5 grade slope	Sidewalls of excavated trenches will be stable in the overburden material, but it is recommended that the sidewalls excavated be battered back to a 1:1.5 grade slope or shored in excavations deeper than 1.5 m to comply with minimum safety regulations.	Contractor	Construction	Compliance to be verified by ECO and IEA.
28	Fire management	Risk of veld fires caused by workers during the	Fire management	Membership of the local Fire Protection Association	Join the local Fire Protection Association if there is one and abide by their minimum requirements, as well as any agreements entered into with the Minister or other FPAs to provide mutual	Holder, Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		construction of the facility.			assistance in fighting and extinguishing fires.			
28	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	PPE	Obtain the necessary PPE for firefighting personnel.	Contractor	Construction	Compliance to be verified by ECO and IEA.
28	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Firefighting equipment	Obtain such firefighting equipment as would be reasonably required in the circumstances, that is proportional to the risk.	Contractor	Construction	Compliance to be verified by ECO and IEA.
28	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Maintained firefighting equipment	Firefighting equipment shall be maintained and readily available during construction (and operation) - regularly test and service equipment	Contractor	Continuous	Compliance to be verified by ECO and IEA.
28	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Person appointed to control fires	Appoint a responsible person (or agent) who will extinguish a fire, or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant Fire Protection Association, if any.	Contractor	Construction	Compliance to be verified by ECO and IEA.
28	Fire management	Risk of veld fires caused by workers during the construction of the facility.	Fire management	Trained firefighting personnel	If no agent is appointed, a team of designated firefighting personal shall be trained and readily available to immediately deal with any runaway veld fires.	Contractor	Construction	Compliance to be verified by ECO and IEA.
29	Blasting	Fly rock from blasting	Avoid injury or fatality amongst staff.	Copy of license to blast	Any blasting activity must be conducted by a suitably licensed blasting contractor.	Contractor	Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
29	Blasting	Fly rock from blasting	Avoid injury or fatality amongst staff.	Notification of neighbour's	Notification of surrounding landowners, emergency services site personnel of blasting activity 24 hours prior to such activity taking place on Site.	Contractor, SEO	24 hours prior to blasting	Compliance to be verified by ECO and IEA.
29	Blasting	Fly rock from blasting	Avoid injury or fatality amongst staff.	No rock more than 150mm outside the working area	Fly rock from blasting activity must be minimised and any pieces greater than 150 mm falling beyond the Working Area, must be collected and removed.	Contractor	Construction	Compliance to be verified by ECO and IEA.

Table 56. Management Protocol for Security

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
30	Employee Management	Increases in stock theft and other crimes.	A secure construction site	Staff wear photo ID cards	All contractors and employees need to wear photo identification cards.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
30	Plant Management	Increases in stock theft and other crimes.	Movement of vehicles in the area is controlled.	Vehicles are marked	Vehicles should be clearly marked as construction vehicles and should have SolarAfrica Energy, or the contractor's logo clearly exhibited.	Contractor	Continuous	Compliance to be verified by ECO and IEA.
30	Security	Increases in stock theft and other crimes.	A secure construction site	Controlled entry and exit to site	Entry and exit points of the site should be controlled.	Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Table 57. Management Protocol for Public Services

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
31	Plant Management	Increased traffic can result in corrugations and potholes on roads.	Good road conditions.	No corrugations or potholes in access road.	Undertake regular maintenance of access road by the contractor.	Contractor	Continuous	Compliance to be verified by ECO and IEA.

Table 58. Management Protocol for Visual Aesthetics

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
32	Alien plant management	Disturbance of aquatic or terrestrial habitat can favour the recruitment of alien invasive plants, threatening individuals, habitats and alter the composition, structure and functioning of ecosystems.	Retain aesthetic values and sense of place.	No alien invasive plant infestations.	Immediately control any alien invasive plant in its entirety (including roots and propagating material) upon being identified on site, using preferably mechanical control methods as opposed to chemical spraying.	Contractor, SEO	Continuous	Compliance to be verified by ECO and IEA.
32	Clearing/ grubbing and grading	Short-term landscape change from the current rural agricultural sense of place to the semi-industrial RE landscape - Possible soil erosion from temporary roads.	Retain aesthetic values and sense of place.	No uncontrolled erosion.	Soil erosion measures along the construction roads need to be adequately implemented, maintained, and routinely monitored by the SEO (monthly).	Contractor, SEO	Construction	Compliance to be verified by ECO and IEA.

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Table 59. Management Protocol for Heritage and Culture

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
33	Chance Find Protocol and Clearing/ Grubbing and Grading	Earthmoving activities could damage or destroy artefacts or fossils.	Protection and preservation of heritage resources.	No unnecessary damage or destruction of heritage resources.	The bulk of archaeological and palaeontological remains are normally located beneath or near the soil surface, so please be especially vigilant when clearing and grubbing, and excavating.	Contractor, SEO.	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
33	Chance Find Protocol and Clearing/ Grubbing and Grading	Earthmoving activities could damage or destroy artefacts or fossils.	Protection and preservation of heritage resources.	No unnecessary damage or destruction of heritage resources.	The SEO must give a cursory inspection of the soil surface for Stone Age open-air surface scatters (cores, waste-flakes, more formal tools such as blades, scrapers and broken points) before clearing, and of the bedrock after clearing and before excavating undisturbed areas, in this case for small marine invertebrates and/or trace fossils (e.g., footprints, trails, burrows, etc.).	SEO.	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
33	Chance Find Protocol and Clearing/ Grubbing and Grading	Earthmoving activities could damage or destroy artefacts or fossils.	Protection and preservation of heritage resources.	Adequate supervision when clearing and grubbing, stripping topsoil, and excavating.	The SEO shall supervise all clearing and grubbing, as well as excavation activities: (1) Examples of cultural or archaeological objects include inter alia (a) Stone Age open-air surface scatters (e.g., cores, waste-flakes, more formal tools such as blades, scrapers and broken points), and (b) stone cairns.	SEO.	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					(2) Examples of palaeontological objects (fossils) include inter alia (a) Rare vertebrate bones and teeth, (b) petrified wood and other plant material, (c) Trace fossils within Beaufort Group sediments, (d) Fossil mammal bones, teeth, horn cores, freshwater molluscs, plant material in Late Caenozoic alluvium and pan deposits, and (d) Blocks of reworked silicified wood within surface gravels and older alluvium.			
33	Chance Find Protocol and Clearing/ Grubbing and Grading	Earthmoving activities could damage or destroy artefacts or fossils.	Protection and preservation of heritage resources.	No unnecessary damage or destruction of heritage resources.	If any evidence of archaeological sites or artefacts (e.g., remnants of stone-made structures or artefacts, indigenous ceramics, bones, stone cairns, ostrich eggshell fragments, charcoal, and ash concentrations), fossils or other categories of heritage resources are found or uncovered by construction staff during construction: 1. IMMEDIATELY cease the construction activity, 2. notify the ECO, and 3. don't tamper with the finds.	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
33	Chance Find Protocol	Earthmoving activities could damage or	Protection and preservation of heritage	Site of discovery has been	The site of discovery must be cordoned off and demarcated a	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
	and Clearing/ Grubbing and Grading	destroy artefacts or fossils.	resources.	cordoned off.	no-go area with security tape / fence / sandbags if necessary. Access to construction staff shall be prohibited until further notice by the ECO.			and verified by ECO and IEA.
33	Chance Find Protocol and Clearing/ Grubbing and Grading	Earthmoving activities could damage or destroy artefacts or fossils.	Protection and preservation of heritage resources.	No unnecessary damage or destruction of heritage resources.	A professional archaeologist or palaeontologist, depending on the nature of the finds, must be contracted as soon as possible to inspect the heritage resource and assess the significance of the findings and advise on further actions.	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
33	Chance Find Protocol and Clearing/ Grubbing and Grading	Earthmoving activities could damage or destroy artefacts or fossils.	Protection and preservation of heritage resources.	A written response from the South African Heritage Resources Agency (SAHRA) and where applicable, the local police (SAPS).	In the case of unmarked human burials, the ECO shall also alert the local police.	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
33	Chance Find Protocol and Clearing/ Grubbing and Grading	Earthmoving activities could damage or destroy artefacts or fossils.	Protection and preservation of heritage resources.	No unnecessary damage or destruction of heritage resources.	If any substantial fossil remains (e.g., vertebrate bones, teeth) are exposed by surface clearance or excavations during the construction phase of the development, the Chance Fossils	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					Finds Protocol must be fully implemented.			
33	Chance Find Protocol and Clearing/ Grubbing and Grading	Earthmoving activities could damage or destroy artefacts or fossils.	Protection and preservation of heritage resources.	A written response from the South African Heritage Resources Agency (SAHRA) and where applicable, the local police (SAPS). Permits issued by SAHRA.	If the newly discovered heritage resources prove to be of archaeological or paleontological significance, a Phase 2 rescue operation may be required subject to permits issued by SAHRA.	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
33	Chance Find Protocol and Clearing/ Grubbing and Grading	Earthmoving activities could damage or destroy artefacts or fossils.	Protection and preservation of heritage resources.	Site of discovery has been cordoned off.	Ensure the heritage site remains safeguarded until clearance is given by the Heritage Specialist and/or SAHRA for work to resume.	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
33	Linear Infrastructure Crossings	Damage to rocky outcrop with engravings at heritage site 1 during construction.	Preservation of cultural heritage resources.	5 m-wide working corridors for pipelines	Construction activities on the water pipeline between borehole No. 13 (and/or 14) and the OH water storage tank on the solar field (Cluster 1) footprint shall be restricted to a 5 m-wide working corridor.	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
33	Linear Infrastructure Crossings	Damage to rocky outcrop with engravings at	Preservation of cultural heritage resources.	No go area	Heritage site 1 (GPS Coordinates of site 1: S30 51 32.10 E24 18 43.00), located approximately 230 m north of the proposed pipeline	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO and verified

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		heritage site 1 during construction.			route, is a no-go area for the purposes of this project.			by ECO and IEA.
33	Linear Infrastructure Crossings	Disturbance to or destruction of a scatter of low-density stone tools at heritage site 18. Disturbance to or destruction of sites 19, 20 and 21 during construction. Damage to heritage site 36, as well as stone-walled enclosures (kraals) and homesteads at GPS Coordinates S30 51 25.58 E24 14 33.51 (stone-walled enclosure/kraal; S30 51 25.58 E24 14 33.51 (homestead remains) along the public access road route.	Preservation of heritage resources.	19 m – wide road servitude	Construction activities on the access road to the MTS shall be restricted to the fenced 19 m-wide road servitude.	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
33	Linear Infrastructure Crossings	Disturbance to or destruction of a scatter of low-density stone tools at heritage site 18. Disturbance to or destruction of sites 19, 20 and 21 during construction.	Preservation of heritage resources.	No-go areas	Those heritage sites alongside the district road, including Site 36 (S30.85412 E24.27465), the stone-walled enclosure/kraal (S30 51 25.58 E24 14 33.51) and homestead remains (S30 51 25.58 E24 14 33.51), heritage site 18 (S30.89070 E24.31404), located	Contractor, SEO, ECO	Construction	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		Damage to heritage site 36, as well as stone-walled enclosures (kraals) and homesteads at GPS Coordinates S30 51 25.58 E24 14 33.51 (stone-walled enclosure/kraal; S30 51 25.58 E24 14 33.51 (homestead remains) along the public access road route.			approximately 70 m south of the proposed access road, as well as sites 19 (S30.89076 E24.31306), 20 (S30.89010 E24.31322) & 21 (S30.88885 E24.31347) and their 30 m buffers are no-go areas for the purposes of this project.			

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POST-CONSTRUCTION PHASE

Table 60. Management Protocol for Terrestrial Fauna

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
01	Rehabilitation	The retention of temporary structures and infrastructure (including roads) will change the habitat to the benefit or detriment of various faunal species.	Restoration of ecological functioning or biodiversity pattern.	No temporary structures left on site	Remove all temporary man-made structures and infrastructure including buildings, fences, barriers, and other demarcations, e.g., danger tape, associated with the construction site.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
01	Rehabilitation	The retention of temporary structures and infrastructure (including roads) will change the habitat to the benefit or detriment of various faunal species.	Restoration of ecological functioning or biodiversity pattern.	Fence uprights removed completely	The contractor must ensure that all fence uprights are appropriately removed, ensuring that no uprights are cut at ground level but rather removed completely.	Contractor	Post-construction	Compliance to be verified by ECO and IEA.
01	Rehabilitation	The retention of temporary structures and infrastructure (including roads) will change the habitat to the benefit or detriment of	Restoration of ecological functioning or biodiversity pattern.	Closed access routes are re-vegetated	Any access route deviation from that in the written agreement must be closed and re-vegetated immediately, at the contractor's expense.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		various faunal species.						

Table 61. Management Protocol for Terrestrial Flora

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
02	Rehabilitation	Rehabilitation with non-local plants will change the local Karoo ecosystem structure, function and resilience.	Preserve locally indigenous vegetation.	Locally indigenous plant species are used in rehabilitation.	All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.	Contractor, SEO	Post-construction and Continuous	Compliance to be verified by ECO and IEA.
02	Rehabilitation	New growth will be selected for by grazers resulting in overgrazing, which can weaken plant vigour or its capacity to recover.	Restoration of provisioning services, particularly food or grazing for livestock, and regulating services such as erosion control.	Re-vegetation areas are protected from grazers	Protect vegetation recruitment from grazers by packing brush from legitimate bush clearing operations onto topsoiled and/or reseeded areas.	Contractor, SEO	Post-construction and Continuous	Compliance to be verified by ECO and IEA.
02	Rehabilitation	New growth will be selected for by grazers resulting in overgrazing, which can weaken plant vigour or its capacity to recover.	Restoration of provisioning services, particularly food or grazing for livestock, and regulating services such	No livestock in rehabilitation areas for 1 year after rehabilitation commenced	Domestic livestock should be excluded from areas under rehabilitation for at least the first year of recovery. Do not allow sheep into rehabilitated areas during the first growing season.	Holder, Landowner	Post-construction and the first-year post rehabilitation	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
			as erosion control.					

Table 62. Management Protocol for Aquatic Flora

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
03	Rehabilitation	Rehabilitation with non-local plants will change the local Karoo ecosystem structure, function and resilience.	Preserve locally indigenous vegetation.	Locally indigenous plant species are used in rehabilitation.	All cleared areas should be revegetated with indigenous perennial grasses from the local area. These can be cut when dry and placed on the cleared areas if natural recovery is slow.	Contractor, SEO	Post-Construction	Compliance to be verified by ECO and IEA.
03	Rehabilitation	New growth will be selected for by grazers resulting in overgrazing, which can weaken plant vigour or its capacity to recover. A direct loss of local aquatic plants by construction activities in a watercourse.	Restoration of provisioning services, particularly food or grazing for livestock, and regulating services such as erosion control. Reinstate the 'riparian' habitat.	Rehabilitated area is cordoned off	Cordon off areas under rehabilitation as "no-go areas" to prevent vehicular, pedestrian and livestock access.	Contractor, SEO	Post-Construction	Compliance to be verified by ECO and IEA.
03	Rehabilitation	New growth will be selected for by grazers resulting	Restoration of provisioning	Re-vegetation areas are	Protect vegetation recruitment from grazers by packing brush from	Contractor, SEO	Post-Construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		in overgrazing, which can weaken plant vigour or its capacity to recover. A direct loss of local aquatic plants by construction activities in a watercourse.	services, particularly food or grazing for livestock, and regulating services such as erosion control. Reinstate the 'riparian' habitat.	protected from grazers	legitimate bush clearing operations onto topsoiled and/or reseeded areas.			
03	Rehabilitation	New growth will be selected for by grazers resulting in overgrazing, which can weaken plant vigour or its capacity to recover. A direct loss of local aquatic plants by construction activities in a watercourse.	Restoration of provisioning services, particularly food or grazing for livestock, and regulating services such as erosion control. Reinstate the 'riparian' habitat.	No livestock in rehabilitation areas for 1 year after rehabilitation commenced	Domestic livestock should be excluded from areas under rehabilitation for at least the first year of recovery. Do not allow sheep into rehabilitated areas during the first growing season.	Holder, Landowner	Post-construction and the first-year post rehabilitation	Compliance to be verified by ECO and IEA.

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Table 63. Management Protocol for Soil and Rock

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
04	Rehabilitation	The driving and parking of vehicles, for example, will compact the ground increasing surface water run-off and erosion.	Restoration of ecological functioning or ecosystem services.	No compacted soil.	Break the crust on bare compacted areas to enhance vegetation establishment.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
04	Rehabilitation	The driving and parking of vehicles, for example, will compact the ground increasing surface water run-off and erosion.	Restoration of ecological functioning or ecosystem services.	Areas are ripped	All compacted surfaces from construction activities must be ripped to a minimum depth of 250 mm in two directions at right angles.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
04	Rehabilitation	The driving and parking of vehicles, for example, will compact the ground increasing surface water run-off and erosion.	Restoration of ecological functioning or ecosystem services.	Areas are ripped	Alternatively, smaller compacted or bare areas can be tilled using a hand-held hoe to a depth of 150 – 200 mm, and perpendicular to the prevailing slope.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
04	Rehabilitation	Insufficient topsoil	Restoration of ecological functioning or ecosystem services.	Ripped areas	All ripped areas must be left rough to facilitate binding of topsoil.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
04	Rehabilitation	Insufficient topsoil	Restoration of ecological functioning or ecosystem services.	Topsoil reinstated	Reinstate 150mm – 200mm of topsoil on the ripped subsoil.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
04	Rehabilitation	Insufficient topsoil	Restoration of ecological functioning or ecosystem services.	Erosion control measures	Topsoil replaced on steep slopes that are particularly susceptible to erosion must be stabilised with erosion control fabric, mats, netting, or blankets made of natural fibres (proper installation is critical to success).	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
04	Rehabilitation	Insufficient topsoil	Restoration of ecological functioning or ecosystem services.	Brush packing stockpiled mulch	Reinstated topsoil must be stabilised by brush packing the stockpiled mulch from the clearing operations (good mulch-to-soil contact is critical to success).	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
04	Maintenance and Monitoring	Erosion of rehabilitated areas.	Preserve topsoil, control erosion	No erosion in rehabilitated areas	Regularly monitor rehabilitated areas for signs of erosion in the form of visual inspections, especially watercourse crossings after intense rainfall and runoff events.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
04	Maintenance and Monitoring	Erosion of rehabilitated areas.	Preserve topsoil, control erosion	Erosion is repaired	Any erosion problems observed on-site should be rectified as soon as possible using the appropriate stormwater management and erosion control measures.	Contractor,	Post-construction	Compliance to be verified by ECO and IEA.
04	Maintenance and Monitoring	Erosion of rehabilitated areas.	Preserve topsoil, control erosion	Responsible stormwater management	Stormwater management and erosion control measures shall adhere to the following principles:	Contractor	Post-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
				and erosion control	(a) Identify and control the source of the erosion. (b) Diffuse any concentrated flows. (c) Encourage infiltration of surface water runoff (e.g., good mulch-to-soil contact). (d) Avoid releasing stormwater directly into a watercourse. (e) Repair and stabilise the site of erosion.			
04	Maintenance and Monitoring	Natural revegetation may not be sufficient to bind and protect the topsoil from erosion.	Restoration of ecological functioning or ecosystem services.	Revegetated areas must achieve at least 75% of the aerial cover of adjacent undisturbed areas within the first growing season.	Rehabilitated areas are to be re-seeded by hand with locally indigenous plants if sufficient aerial cover has not been achieved after the first growing season.	Holder, Contractor	Post-construction after first growing season	Compliance to be verified by ECO and IEA.
05	Rehabilitation	Hydrocarbon spills can contaminate soil resulting in soil pollution	Good quality soil for reinstatement.	No signs of pollution on site	Remove all signs of pollution from site, e.g., hydrocarbon spills, slurry, concrete hardpan layers, etc. to the depth of penetration for disposal at an appropriate licensed landfill.	Contractor	Post-construction	Compliance to be verified by ECO and IEA.
05	Rehabilitation	Hydrocarbon spills can contaminate soil resulting in soil pollution	Good quality soil for reinstatement.	No waste on site	Remove all waste from site, e.g., litter, concrete debris or rubble, used oil, etc. for collection by a registered collector and/or disposal at an appropriate licensed landfill.	Contractor	Post-construction	Compliance to be verified by ECO and IEA.
05	Rehabilitation	Topsoil that has been stockpiled	Restoration of ecosystem services.	Stockpile test results and ameliorated	If the topsoil has been stockpiled for two or more growing seasons, then it shall be tested for pH, nutrients, colloidal matter,	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		for too long may lose its viability.			microbes, etc. to determine its viability, and ameliorated accordingly, prior to its reinstatement on disturbed areas.			

Table 64. Management Protocol for Ground and Surface Water

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
06	Rehabilitation	Reshaping could alter river or stream channel hydraulics during high flows.	Preserve river channel hydrological pattern.	Shaped to natural forms.	The final grading of the disturbed areas within the bed and banks should not significantly alter the flow characteristics of the river during periods of high flows, e.g., shaped to natural forms that blend in with pre-construction topography.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
06	Rehabilitation	Reshaping could alter river or stream channel hydraulics during high flows.	Preserve river channel hydrological pattern.	Shaped to natural forms.	Culverts or stormwater outlets associated with any watercourse crossing shall not cause erosion of the bed or banks by incorporating such stabilisation mechanisms as terracing, boulder and rock placement, minor gabion basket work construction, reno mattresses and/or rock pitching.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
06	Rehabilitation	Two ephemeral drainage line crossings, associated with the proposed road development can be considered	Minimise ponding, erosion, and sedimentation of watercourses.	No open excavations or unrehabilitated areas	Don't leave excavations open or the area unrehabilitated before a rainfall month occurs.	Contractor, SEO	Post-construction (before rainfall season)	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		critical stormwater management areas, where there will be an activity that could alter the natural conditions of the rivers/streams.						
06	Rehabilitation	Areas cleared or disturbed around site might be affected by erosion of topsoil. Consequence: Increased turbidity and siltation in watercourses.	Minimize loss of topsoil	No signs of exposed erosions channels	Any erosion channels developing after the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition similar to the condition before the erosion occurred.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
06	Rehabilitation	Areas cleared or disturbed around site might be affected by erosion of topsoil. Consequence: Increased turbidity and siltation in watercourses.	Minimize loss of topsoil	Shaped to natural forms.	Site rehabilitation should as far as is feasible aim to restore surface draining patterns, natural soil and vegetation.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
06	Rehabilitation	The retention of foreign temporary structures and materials could alter river or stream channel	Preserve stream or river channel hydrological pattern.	No structures left on site	Remove all temporary man-made structures, e.g., river diversion works and materials, e.g., sandbags, plastic sheets, etc. from within the watercourse.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		hydraulics during high flows.						
06	Rehabilitation	Change the visual aesthetics of the Nama Karoo.	Retain aesthetic values and sense of place or restore ecosystem cultural services.	Shaped to natural forms indicative of the site's location within the landscape (catena).	All disturbed areas must be reshaped to blend in with the natural surrounding landforms.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
06	Rehabilitation	Altered surface water flow pattern causing ponding or erosion.	Preserve landscape hydrological pattern.	Shaped to natural forms indicative of the site's location within the landscape (catena).	All disturbed areas should be reshaped to retain landscape hydrological pattern, that is the natural functioning of the site (as a source, transfer, sink or any combination of these) relating to the redistribution of surface water and sediment.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
06	Rehabilitation	Altered surface water flow pattern causing ponding or erosion.	Preserve landscape hydrological pattern.	Shaped to natural forms indicative of the site's location within the landscape (catena).	Revegetate denuded areas as soon as possible to maintain ground cover across the site. (Hydrology Assessment)	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
06	Maintenance and Monitoring	Two ephemeral drainage line crossings, associated with the proposed road development can be considered critical stormwater management	Minimise ponding, erosion, and sedimentation of watercourses.	Stormwater management systems are inspected annually	Stormwater management systems must be inspected annually to ensure they are operating as per the design criteria.	Holder	Annually	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
		areas, where there will be an activity that could alter the natural conditions of the rivers/streams.						

Table 65. Management Protocol for Atmosphere

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
07	Maintenance and Monitoring	Increase in ambient PM10 concentrations, Total Suspended Particulate (TSP) or dust fallout emitted from vehicle entrainment	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600	Implement a dust monitoring programme for the access road.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				mg/m2/day) areas				
07	Maintenance and Monitoring	Increase in ambient PM10 concentrations, Total Suspended Particulate (TSP) or dust fallout emitted from vehicle entrainment	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10 concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas	Increase frequency of road wetting during times of high expected traffic loads.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.
07	Maintenance and Monitoring	Increase in ambient PM10 concentrations, Total Suspended Particulate (TSP) or dust fallout emitted from vehicle entrainment	Minimise dust generation.	Avoid exceeding NAAQS annual ambient PM10 concentrations (40 µg/m3) and 24-hour ambient PM10	Reduce vehicle speeds.	Holder, Contractor	Continuous	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsibility	Timeframe / Frequency	Monitoring
				concentrations (75 µg/m3). Avoid exceeding the National Dust Standard for non-residential (1 200 mg/m2/da) and residential (600 mg/m2/day) areas				

Table 66. Management Protocol for Terrestrial Ecosystem (& Avifauna)

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
08	Rehabilitation	Disturbed areas and Overgrazing.	Ameliorate poor soil conditions.	Restore veld to at least good veld condition classes.	The following intervention is recommended for the rehabilitation of bare (e.g., where topsoil has eroded) and disturbed areas within the terrestrial environment: • The stored topsoil must be used to cover the landscaped area once construction in that area is complete. • Soil pH is satisfactory, and no lime application is recommended. • Broadcast 150 kg/ha 3:2:0(32) +Zn directly before planting and work in 5cm.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
					• Topdress 120 kg/ha LAN six weeks after planting. • Organic matter in the form of manure and/or humic products can be used with the chemical fertilisers to ameliorate the soil and improve soil health. These potential actions must be coordinated with the grazing recommendations.			
08	Rehabilitation	Disturbed areas and Overgrazing.	Ameliorate poor soil conditions.	Restore veld to at least good veld condition classes.	Revegetate bare (e.g., where topsoil has eroded) and disturbed areas whether treated or not. The fenced servitude will give the rehabilitated plants a chance to establish. Once established, further restoration can be achieved through kraaling (see below).	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Rehabilitation	Disturbed areas and Overgrazing.	Ameliorate poor soil conditions.	Restore veld to at least good veld condition classes.	The above potential actions should as far as is practical be coordinated with the following grazing recommendations: • Apply kraaling with sheep to severely degraded areas (e.g., where grass cover is poor and to areas where topsoil has already been eroded) for a night only. Grazers are removed to natural grazing areas after each kraaling period. • In areas where kraaling by sheep cannot be done, reseeding must be with locally indigenous species, especially grasses. • The kraaled area is afterwards temporary excluded from grazing for	Contractor, SEO	Post-construction (Kraaled area is afterwards temporary excluded from grazing for two years)	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
					two years, to enable seed deposited through dung to germinate and for grass to develop roots. • Thereafter, a holistic approach must be followed in terms of veld management where a balance must be found between planned rest and grazing rather than excluding grazing. A grazing management plan should be prepared, specifically for the vegetated verges along access road servitude.			
08	Rehabilitation	Bare patches (or areas where the original vegetation was cleared or severely disturbed) are susceptible to erosion.	Improve surface water infiltration and minimise erosion.	Revegetation and Rehabilitation Plan	Develop a revegetation and rehabilitation plan	Holder, Contractor	Prior to Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Rehabilitation	Bare patches (or areas where the original vegetation was cleared or severely disturbed) are susceptible to erosion.	Improve surface water infiltration and minimise erosion.	Active rehabilitation	Conduct active rehabilitation during the construction activities according to a rehabilitation plan or implement the Bare Patch Protocol (**Appendix C**) that will restore the natural vegetation to what it was prior to the construction of, for example, underground pipeline and cable routes, so that the long-term impact could be negligible.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
08	Rehabilitation	Bare patches (or areas where the original vegetation was cleared or severely disturbed) are susceptible to erosion.	Improve surface water infiltration and minimise erosion.	Stored sods use in rehabilitation and watered weekly	Once construction is completed, those sods that were removed during the clearing operation and stored, should be used to rehabilitate the disturbed areas from where they were removed. In the absence of timely rainfall, the sods should be watered well after planting and at least twice more over the next 2 weeks.	Contractor, SEO	Post-construction (watering at least twice over 2 weeks)	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Rehabilitation	Loss of terrestrial habitat.	Minimise ecological degradation.	Restore ecological function to degraded sites.	Where new roads need to be constructed, the existing road infrastructure should be rehabilitated, and any unnecessary roads decommissioned and rehabilitated.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Rehabilitation	Loss of terrestrial habitat.	Minimise ecological degradation.	Restore ecological function to degraded sites.	All temporary passing lanes inside the 19 m-wide road servitude must be rehabilitated.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Maintenance and Monitoring	Revegetation may not be sufficient to bind and protect the topsoil from erosion.	Restoration of ecological functioning or ecosystem services. Preserve topsoil, control erosion	Successful rehabilitation	Monitor the effectiveness of revegetation on the rehabilitated areas, and if necessary, implement appropriate corrective measures.	Contractor	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Maintenance and Monitoring	Revegetation may not be sufficient to bind and protect the topsoil from erosion.	Restoration of ecological functioning or ecosystem services. Preserve topsoil, control erosion	Annual vegetation surveys	Monitoring should include annual vegetation surveys, measuring at least plant density, species composition and richness, vegetation cover and growth stage (seedling, vegetative and reproductive).	Holder, SEO	Annual	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
08	Maintenance and Monitoring	Revegetation may not be sufficient to bind and protect the topsoil from erosion.	Restoration of ecological functioning or ecosystem services. Preserve topsoil, control erosion	Vegetation survey results	The results of the vegetation surveys should inform the need for and nature of any further interventions, which may include bringing in additional topsoil, reseeding, mulching and/or additional brush packing depending on the reasons for the failure of the original re-vegetation methods.	Holder, Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Maintenance and Monitoring	Revegetation may not be sufficient to bind and protect the topsoil from erosion.	Restoration of ecological functioning or ecosystem services. Preserve topsoil, control erosion	Vegetation cover	A vegetation cover that at least matches the natural, pre-development cover, should be maintained at all times along the road verge and rehabilitated pipeline trenches.	Holder, Contractor, SEO	Continuous	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Maintenance and Monitoring	Revegetation may not be sufficient to bind and protect the topsoil from erosion.	Restoration of ecological functioning or ecosystem services. Preserve topsoil, control erosion	Restored areas	Interventions and vegetation surveys may cease once the site has been restored to the same or a better condition than the adjacent remnant vegetation, e.g., species richness, vegetation cover and plant density are comparable or better, and seedling, vegetative and reproductive growth stages of all species are recorded.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Maintenance and Monitoring	Recruitment of alien invasive plants.	Reduce invasive alien plant recruitment.	No alien invasive plants on site	The rehabilitated construction site must be monitored regularly for the presence of alien invasive plant species.	Holder, Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible Person(s)	Timeframe / Frequency	Monitoring
08	Maintenance and Monitoring	Recruitment of alien invasive plants.	Reduce invasive alien plant recruitment.	No alien invasive plants on site	Immediately control alien invasive plants upon being identified, using preferably mechanical control methods.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Maintenance and Monitoring	Recruitment of alien invasive plants.	Reduce invasive alien plant recruitment.	No chemical drift	Do not apply foliar hand spray chemical applications under conditions where chemical drift may impact non-targeted species (as indicated on the manufacturer's directions for use on the herbicide label)	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
08	Maintenance and Monitoring	Recruitment of alien invasive plants.	Reduce invasive alien plant recruitment.	Working for Water approved herbicides are used	Use Working for Water guidelines for approved herbicides.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.

Table 67. Management Protocol for Aquatic Ecosystem

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
09	Rehabilitation	A direct loss of local aquatic plants by construction activities in a watercourse Areas cleared or disturbed around site might be	Reinstate the 'riparian' habitat. Minimize loss of topsoil	Replanting at the end of the dry season	Replanting activities should be undertaken at the end of the dry season (middle to end September) to ensure optimal conditions for germination and rapid vegetation establishment.	Contractor, SEO, ECO	Post-construction (end of dry season)	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		affected by erosion of topsoil.						
09	Rehabilitation	A direct loss of local aquatic plants by construction activities in a watercourse Areas cleared or disturbed around site might be affected by erosion of topsoil.	Reinstate the 'riparian' habitat. Minimize loss of topsoil	Sowing of grass seeds with chemical and mechanical water infiltration	The sowing of grass seeds in combination with the chemical and mechanical water infiltration improvement measures should also be considered for highly degraded areas.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Rehabilitation	A direct loss of local aquatic plants by construction activities in a watercourse Areas cleared or disturbed around site might be affected by erosion of topsoil.	Reinstate the 'riparian' habitat. Minimize loss of topsoil	Active rehabilitation	Conduct active rehabilitation during the construction activities according to a rehabilitation plan or implement the Bare Patch Protocol (**Appendix C**) that will restore the natural vegetation to what it was prior to the construction of, for example, underground pipeline and cable routes, so that the long-term impact could be negligible.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Rehabilitation	A direct loss of local aquatic plants by construction activities in a watercourse Areas cleared or disturbed around site might be affected by erosion of topsoil.	Reinstate the 'riparian' habitat. Minimize loss of topsoil	Stored sods are used and watered weekly	Once construction is completed, those sods that were removed during the clearing operation and stored, should be used to rehabilitate the disturbed areas from where they were removed. In the absence of timely rainfall, the sods should be watered well after planting and at least twice more over the next 2 weeks.	Contractor, SEO	Post-construction (watering at least twice over 2 weeks)	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
09	Rehabilitation	A direct loss of local aquatic plants by construction activities in a watercourse Areas cleared or disturbed around site might be affected by erosion of topsoil.	Reinstate the 'riparian' habitat. Minimize loss of topsoil	New plant material is provided if rehabilitation was unsuccessful	Should plants not successfully establish within two growing seasons after the first planting, new plant material should be provided.	Holder, Contractor, SEO	Post-construction after two growing seasons	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Rehabilitation	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads, fences and sub surface pipelines).	Sensitive avifauna habitats are restored.	Rehabilitation Plan	A rehabilitation plan for all watercourse crossings (roads and pipelines) must be commissioned before construction commences.	Holder, Contractor, SEO	Pre-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Rehabilitation	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads, fences and sub surface pipelines).	Sensitive avifauna habitats are restored.	Wetlands shaped to natural forms	Returning the wetlands to their original grade must take place as minor differences in the final surface elevation can produce significant impacts on the type of vegetation that re-establishes itself (alien invasive species).	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Rehabilitation	Habitat loss and fragmentation of watercourse areas because of infrastructure installation	Sensitive avifauna habitats are restored.	Regeneration of native species within two growing seasons	When topsoil is salvaged and returned, it is anticipated without reseeding so that dense vegetative communities of native species can regenerate within two growing seasons.	Contractor, SEO	Post-construction after two growing seasons	Compliance to be monitored by the SEO and verified by

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
		(roads, fences and sub surface pipelines).						ECO and IEA.
09	Rehabilitation	Habitat loss and fragmentation of watercourse areas because of infrastructure installation (roads, fences and sub surface pipelines).	Sensitive avifauna habitats are restored.	No artificial seeding	As emergent wetlands will recover more quickly than others, artificial seeding is not advised as it creates competition for reestablishment of native facultative and obligate wetland vegetation.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Rehabilitation	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Rehabilitation is underway where applicable.	Any areas disturbed during the construction phase should be rehabilitated as fast and effective as possible.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Rehabilitation	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial	Rehabilitation is underway where applicable.	Any erosion channels developing during or after the construction period should be appropriately backfilled (and compacted where relevant) and the areas restored to a condition like the condition before the erosion occurred.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
			floodplains, and headwater drainage lines.					
09	Rehabilitation	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Rehabilitation is underway where applicable.	A vegetation rehabilitation plan should be prepared and implemented for areas where the original vegetation was cleared or severely disturbed.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Rehabilitation	Vegetation clearance of the project footprint for the access road and underground pipelines close to watercourses will be subject to erosion.	Maintain the Present Ecological State of the Brak River drainage system, large and small ephemeral tributaries, alluvial floodplains, and headwater drainage lines.	Rehabilitated sites conform to the plan, surrounding landforms and plant communities.	Site rehabilitation should as far as feasible aim to restore surface draining patterns, natural soil, and vegetation to what it was prior to construction.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Rehabilitation	Disturbed areas and Overgrazing.	Ameliorate poor soil conditions.	Restore veld to at least good veld condition classes.	The following intervention is recommended for the rehabilitation of bare (e.g., where topsoil has eroded) and disturbed areas within the alluvial floodplains. The stored topsoil	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					must be used to cover the landscaped area once construction in that area is complete. Undertake top and subsurface soil samples in alluvial floodplain areas that are to be rehabilitated and analyse for soil sodicity. If severe sodic conditions (high Na & SAR) potentially inhibit plant growth, then: • Apply 2 ton/ha gypsum and work in 15 cm two weeks before planting (good drainage is a requirement for gypsum treatment). • It is recommended that these soils should be allowed to drain and sodium leached out of the soil profile. • Rip against contour, cut-off drains, and artificial drains might be needed. • Broadcast 200 kg/ha Superphosphate and 200 kg/ha Ammonium sulphate directly before planting and work in 5 cm. • Organic matter in the form of manure and/or humic products can be used with the chemical fertilisers to ameliorate the soil and improve soil health.			
09	Rehabilitation	Disturbed areas and Overgrazing.	Ameliorate poor soil conditions.	Restore veld to at least good veld condition classes.	Revegetate bare (e.g., where topsoil has eroded) and disturbed areas whether treated or not. The fenced servitude will give the	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
					rehabilitated plants a chance to establish. Once established, further restoration can be achieved through kraaling (see below).			
09	Rehabilitation	Disturbed areas and Overgrazing.	Ameliorate poor soil conditions.	Restore veld to at least good veld condition classes.	The above actions should as far as is practical be coordinated with the following grazing recommendations: • Apply kraaling with sheep to severely degraded areas (e.g., where grass cover is poor and to areas where topsoil has already been eroded) for a night only. Grazers are removed to natural grazing areas after each kraaling period. • The kraaled area is afterwards temporary excluded from grazing for two years, to enable seed deposited through dung to germinate and for grass to develop roots. • Thereafter, a holistic approach must be followed in terms of veld management where a balance must be found between planned rest and grazing rather than excluding grazing. A grazing management plan should be prepared, specifically for the vegetated verges along access road servitude.	Holder, Contractor, SEO	Post-construction (Kraaled area is afterwards temporary excluded from grazing for two years)	Compliance to be verified by ECO and IEA.
09	Rehabilitation	Disturbed areas and Overgrazing.	Ameliorate poor soil conditions	A record of VCAs	Follow-up grazing assessments and annual monitoring of veld	Holder	Follow-up grazing	Compliance to be verified

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
			and restore veld to at least good veld condition classes.		condition is recommended to determine the progress of the recovery process on the disturbed and rehabilitated areas. Veld Condition Assessment (VCA) points are especially recommended in the sensitive floodplains and drainage lines affected by the rehabilitated access road servitude and pipeline corridors.		assessments and annual monitoring.	by ECO and IEA.
09	Maintenance and Monitoring	Recruitment of alien invasive plants.	Reduce invasive alien plant recruitment.	No alien invasive plants on site	The rehabilitated construction site must be monitored regularly for the presence of alien invasive plant species.	Holder, Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Maintenance and Monitoring	Recruitment of alien invasive plants.	Reduce invasive alien plant recruitment.	No alien invasive plants on site	Immediately control alien invasive plants upon being identified, using preferably mechanical control methods.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.
09	Maintenance and Monitoring	Recruitment of alien invasive plants.	Reduce invasive alien plant recruitment.	No chemical drift	Do not apply foliar hand spray chemical applications under conditions where chemical drift may impact non-targeted species (as indicated on the manufacturer's directions for use on the herbicide label)	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.

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Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
09	Maintenance and Monitoring	Recruitment of alien invasive plants.	Reduce invasive alien plant recruitment.	Working for Water approved herbicides are used	Use Working for Water guidelines for approved herbicides.	Contractor, SEO	Post-construction	Compliance to be monitored by the SEO and verified by ECO and IEA.

Table 68. Management Protocol for Social

Impact No.	Mgt Category	Identified Impacts and Risks	Impact Management Outcomes	Targets & Indicators	Management Actions & Mitigation Measures	Responsible person(s)	Timeframe / Frequency	Monitoring
10	Rehabilitation	Decrease in the "sense of place" as it relates to noise, visual and light pollution	Minimize change in sense of place.	Successful rehabilitation	Sense of place is a personal experience, but successful rehabilitation will go a long way in recreating a rural sense of place.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
10	Rehabilitation	Noise increase at the boundary of the project footprint and at the abutting houses during decommissioning.	Minimize noise disturbance to noise receptors/ farmhouses	Rehabilitation undertaken during daytime only.	Removal of infra-structure and replanting of vegetation should be limited to daytime only.	Contractor, SEO	Post-construction	Compliance to be verified by ECO and IEA.
10	Rehabilitation	Noise increase at the boundary of the project footprint and at the abutting houses during decommissioning.	Minimize noise disturbance to noise receptors/ farmhouses	No excessively noisy machinery on site.	Equipment and/or machinery which will be used must comply with the manufacturer's specifications on acceptable noise levels and during daytime only.	Contractor	Post-construction	Compliance to be verified by ECO and IEA.

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Appendix A - CHANCE FINDS PROTOCOL

<table>
<tr><th colspan="4">CHANCE FOSSIL FINDS PROTOCOL FOR SUN CENTRAL CLUSTER 1 AND ASSOCIATED INFRASTRUCTURE ON VARIOUS FARMS NEAR HANOVER</th></tr>
<tr><td>Province & region:</td><td colspan="3">Northern Cape: Pixley Ka Seme District</td></tr>
<tr><td>Responsible Heritage Resources Agency</td><td colspan="3">SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Phone: +27 (0)21 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za).</td></tr>
<tr><td>Rock unit(s)</td><td colspan="3">Middle Permian Adelaide Subgroup (Lower Beaufort Group, Karoo Supergroup), Late Caenozoic alluvium, pan sediments, surface gravels, soils</td></tr>
<tr><td rowspan="3">Potential fossils</td><td colspan="3">Rare vertebrate bones and teeth, petrified wood and other plant material, trace fossils within Beaufort Group sediments.</td></tr>
<tr><td colspan="3">Fossil mammal bones, teeth, horn cores, freshwater molluscs, plant material in Late Caenozoic alluvium and pan deposits.</td></tr>
<tr><td colspan="3">Blocks of reworked silicified wood within surface gravels and older alluvium.</td></tr>
<tr><td rowspan="8">ECO protocol</td><td colspan="3">1. Once alerted to fossil occurrence(s): alert site foreman, stop work in area immediately (N.B. safety first!), safeguard site with security tape / fence / sand bags if necessary.</td></tr>
<tr><td colspan="3">2. Record key data while fossil remains are still in situ:</td></tr>
<tr><td colspan="3">• Accurate geographic location – describe and mark on site map / 1: 50 000 map / satellite image / aerial photo</td></tr>
<tr><td colspan="3">• Context – describe position of fossils within stratigraphy (rock layering), depth below surface</td></tr>
<tr><td colspan="3">• Photograph fossil(s) in situ with scale, from different angles, including images showing context (e.g. rock layering)</td></tr>
<tr><td colspan="2">3. If feasible to leave fossils in situ:</td><td>3. If not feasible to leave fossils in situ (emergency procedure only):</td></tr>
<tr><td colspan="2">• Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation</td><td>• Carefully remove fossils, as far as possible still enclosed within the original sedimentary matrix (e.g. entire block of fossiliferous rock)</td></tr>
<tr><td colspan="2">• Ensure fossil site remains safeguarded until clearance is given by the Heritage Resources Agency for work to resume</td><td>• Photograph fossils against a plain, level background, with scale</td></tr>
<tr><td colspan="2"></td><td>• Carefully wrap fossils in several layers of newspaper / tissue paper / plastic bags</td></tr>
</table>

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		• Safeguard fossils together with locality and collection data (including collector and date) in a box in a safe place for examination by a palaeontologist
		• Alert Heritage Resources Agency and project palaeontologist (if any) who will advise on any necessary mitigation
	4. If required by Heritage Resources Agency, ensure that a suitably-qualified specialist palaeontologist is appointed as soon as possible by the developer.	
	5. Implement any further mitigation measures proposed by the palaeontologist and Heritage Resources Agency	
Specialist palaeontologist	Record, describe and judiciously sample fossil remains together with relevant contextual data (stratigraphy / sedimentology / taphonomy). Ensure that fossils are curated in an approved repository (*e.g.* museum / university / Council for Geoscience collection) together with full collection data. Submit Palaeontological Mitigation report to Heritage Resources Agency. Adhere to best international practice for palaeontological fieldwork and Heritage Resources Agency minimum standards.	

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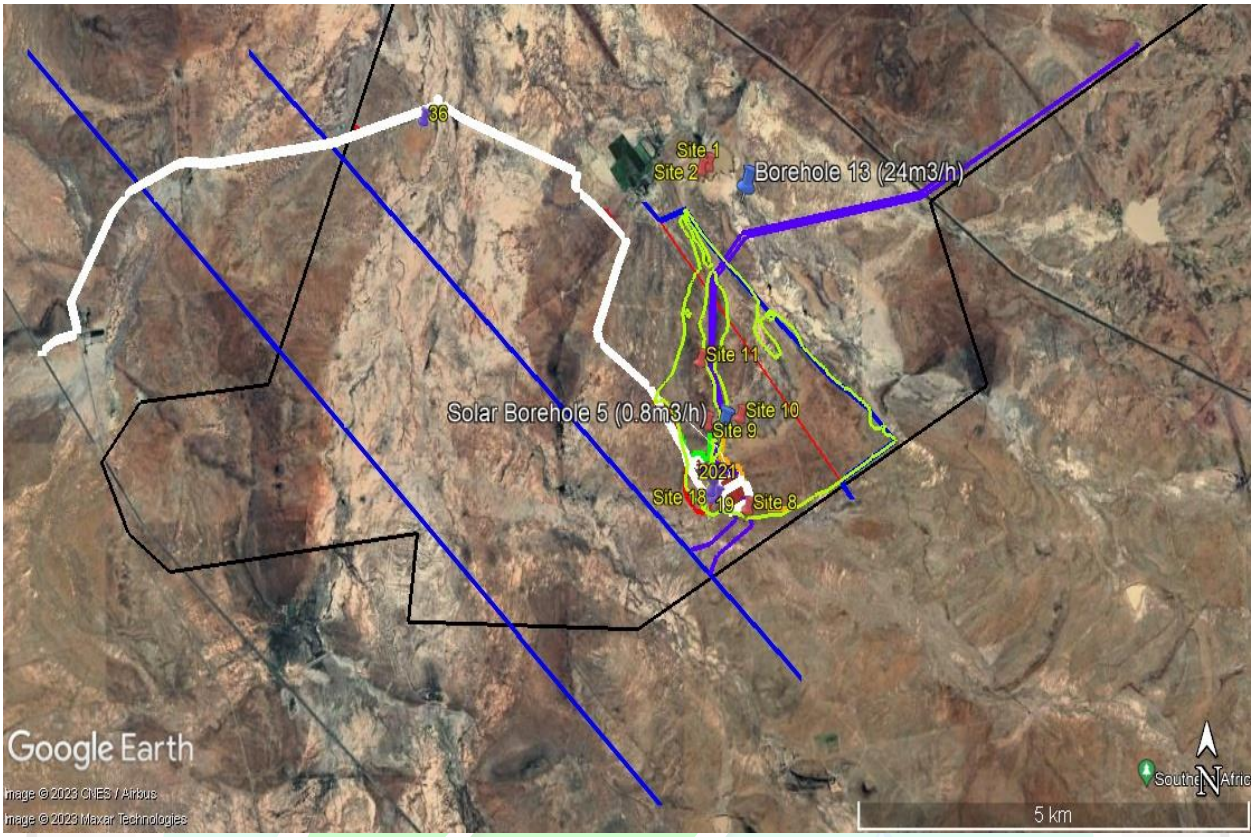

Figure 23: Map showing the location of heritage sites in close proximity to the study & development area (Google Earth 2023). The sites indicated with blue pins were recorded in 2017, with those in red in 2022.

Site 18 (access road)

Site 18 is a scatter of low-density stone tools, as well as some ostrich eggshell fragments. The site was given a Medium Heritage Significance rating, and it was recommended that the site be mitigated before destruction. This site is included under SAHRA Permit for Phase 2 Mitigation.

GPS Coordinates: S30.89070 E24.31404.

Sites 19, 20 & 21 (access road)

The sites were given a Medium Significance Rating and it was recommended that they should be recorded in detail before destruction. The sites are on the banks of watercourse and development exclusion zone and a 30m no-go buffer zone was therefore recommended. These sites are also included under a SAHRA Permit for archaeological mitigation.

GPS Coordinates: S30.89076 E24.31306 (19); S30.89010 E24.31322 (20) & S30.88885 E24.31347 (21).

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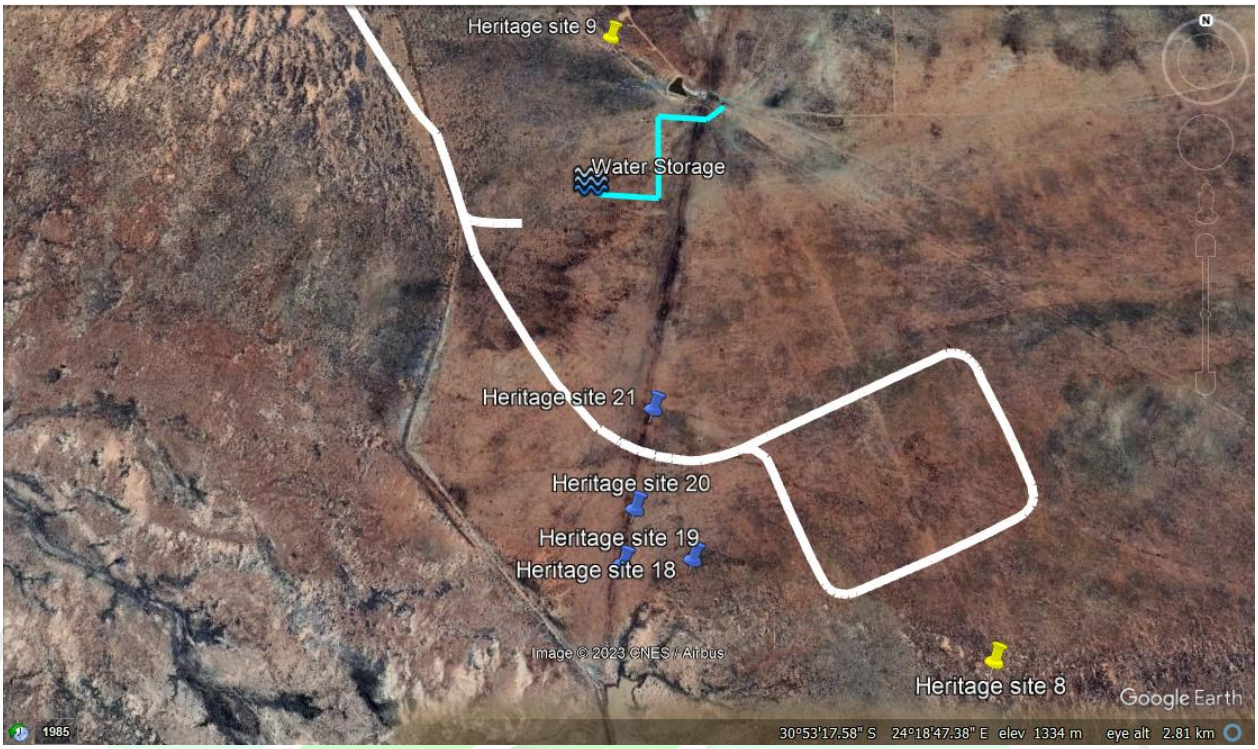

Figure 24: Location of Sites 18 – 21 relative to the proposed new road access to the Main Transmission Station.

Site 36 (near to access road)

Site 36 is represented by 3 shallow "excavations", circular in shape, into the bedrock. These features were identified as possible dried-up dams or water reservoirs at the time. The site was given a Medium Heritage Significance Rating. No further mitigation measures were recommended in the 2017 report.

GPS Coordinates: S30.85412 E24.27465.

Site 1 (not impacted on by access road and water pipelines)

Site 1 is rocky outcrop with a number of rocks containing possible engravings in the form of various striations and lines. Although the age of the engravings could not be determined without a doubt, it could be related to proto-historic pastoralists that moved through the area. Stone Age material (tools/flakes) was also identified in the general proximity of the site. Should the site be negatively impacted by the proposed development activities it was recommended that Phase 2 Archaeological mitigation work be undertaken. This will entail the detailed mapping, photographic recording and drawing of the site and the individual engravings (through detailed rubbings) to ensure the capturing of the information contained on the site before destruction. The site was given a Medium to High Heritage Significance Rating.

GPS Coordinates: S30 51 32.10 E24 18 43.00.

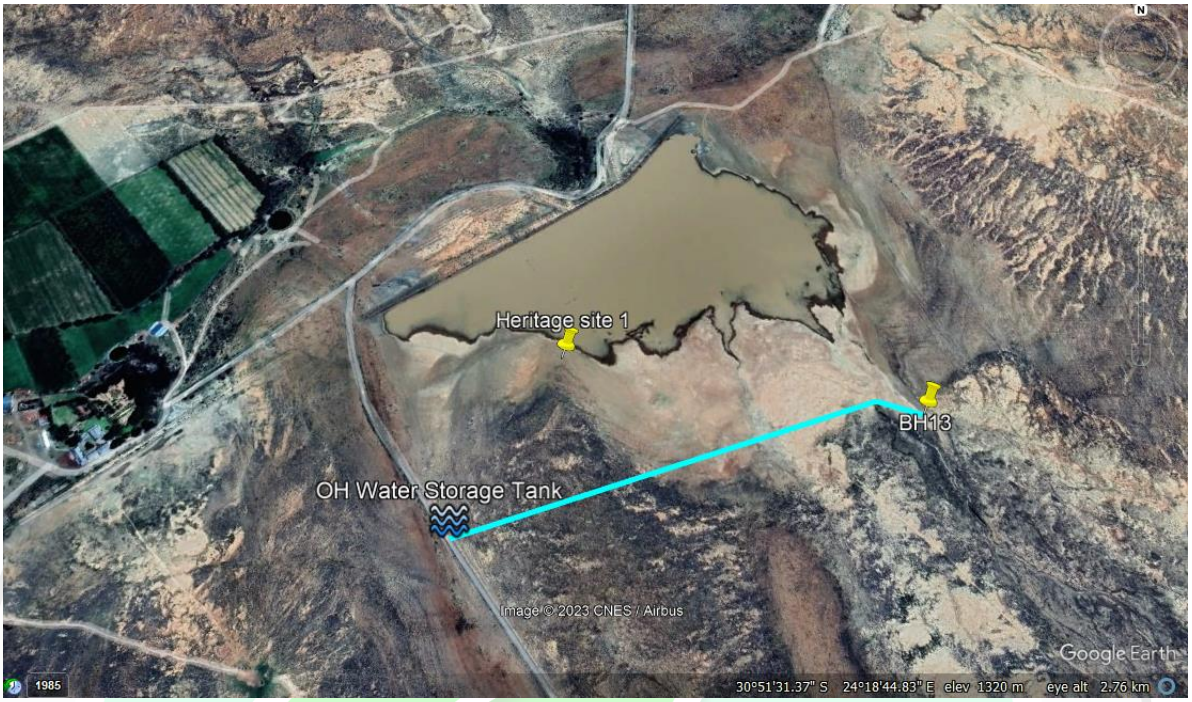

Figure 25: Site 1 is located approximately 230 m away from the water pipeline between Borehole 13 and the OH water storage tank.

Figure 26: View of Site 1 with rock engravings.

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Historical farming-related settlement - stone-walled enclosures (kraals) and homesteads. The remains of recent historical farming-related settlement are located in the area close to and around the access road. This includes stone-walled enclosures (kraals) and homesteads. Cultural material associated with these remains were found that included fragments of decorated ceramics dating the sites to between the late 19th and early 20th centuries. These sites are given a Medium to High Heritage Significance Rating and should they be impacted directly be the development activities should be mitigated through archaeological measures that will include detailed mapping and drawing, as well as limited excavations. If they can be avoided then these sites should be included in the Cultural Heritage Management Plan for the Solar PV development.

GPS Coordinates for finds made by Ecoleges: S30 51 25.58 E24 14 33.51 (stone-walled enclosure/kraal; S30 51 25.58 E24 14 33.51 (homestead remains);

Figure 27: View of stone-walled enclosure/kraal next to the Main Access Road looking south (courtesy Ecoleges).

Stone Age material, similar to those found on other sites during previous assessments, also occur here. It is envisaged that more of these scatters of material (individual and denser concentrations of tools) will be present in the area as well. These finds and sites will be given a Low to Medium Heritage Significance rating. As many similar sites in the area are already forming the focus of detailed archaeological mitigation work, no further mitigation is required.

S30 51 25.73 E24 14 33.78 (decorated ceramics) and S30 57 22.08 E24 21 05.70 (stone tool).

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Figure 28: Homestead remains next to the Main Access Road looking north (courtesy Ecoleges).

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Appendix B1 - TRENCHING IN DISPERSIVE SOILS PROTOCOL

Activity
Trenching for underground cables and/or pipelines
Management Outcome
Minimise the risk of tunnel erosion in dispersive soils.
Source
Hardie M. (2009), "Dispersive Soils and their Management, Technical Reference Manual." Department of Primary Industries and Water, State of Tasmania, Australia (ISBN 978-0-7246-6774-1)
Impact
Supplying services via trenches in dispersive soils can cause tunnel erosion.
Consequence
Trenches may be used to supply services such as water and electricity, however in dispersive soils, the increased porosity of repacked soil within the trench can lead to tunnel erosion and damage to pipes and cables. Any degradation of the soil-terrain complex that undermines its capacity to function - from storing water and recycling nutrients to resisting erosion - will lead to a decline in primary production and diminish energy flow to higher trophic levels. Primary production is an ecosystem supporting service that maintains other ecosystem services, so its harm can lead to ecosystem collapse.
Mitigations
1. Identify areas with dispersive subsoils – determine if any affected bare patches are potential sodic sites by performing a chemical analysis, such as Exchangeable Sodium Percent (ESP) or Sodium Absorption Ratio (SAR) to relate the relative abundance of exchangeable cations to aggregate stability and dispersion.
2. As far as is practical, avoid disturbance to areas with dispersive subsoils.
3. Minimise excavation of dispersive soils or where possible do not remove or disturb topsoil or vegetation.
4. Undertake chemical amelioration. Undertake soil analyses to determine appropriate application rates for gypsum (calcium sulphate) or lime (calcium carbonate) to treat sodic soils.
5. Perform precise compaction. A high degree of compaction reduces soil permeability, restricting the movement of water and dispersed clay through the soil matrix, which decreases the severity of dispersion and restricts tunnel development.
6. Reshape the surface. The surface of the repacked material should be finished with a convex shape to ensure runoff is not able to pond on top of the reclaimed area.

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7. Install sand blocks/barriers. • Sand blocks trap entrained sand and silt, blocking the exit of the tunnel and preventing further tunnel development. • Install a sand block perpendicular to the trench every 20 m down the slope. Secure geotextile to the cable or pipeline to prevent water flowing past the sand block. • The depth of the sand block is determined by the depth of dispersive soils or tunnel erosion. • The span length of the structure is determined by the width of the tunnelling. • Extremities should be curved upslope to prevent the structure from being by-passed. • Install geotextile on the downslope wall to prevent collapse or removal of sand following settlement or erosion. • Apply gypsum (around 5% by weight) to act as an electrolyte source for water infiltrating into the sand block and prevent further dispersion. • Construct an earth mound upslope of the structure to prevent run-on entering the sand blocks.
8. Apply topsoil and revegetate. • Cover exposed dispersive subsoils with at least 150 mm of non-dispersive topsoil. • Sow with an appropriate mix of grass and/or shrub species. • In some cases, it will be necessary to protect the topsoil from erosion with 'jute' cloth or similar product.

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Appendix B2 - ROADS AND CULVERTS IN DISPERSIVE SOILS

Activity
Construction of roads and culverts
Management Outcome
Minimise the risk of erosion.
Source
Hardie M. (2009), "Dispersive Soils and their Management, Technical Reference Manual." Department of Primary Industries and Water, State of Tasmania, Australia (ISBN 978-0-7246-6774-1)
Impact
Constructing roads and culverts in dispersive soils can cause erosion.
Consequences
Construction of roads on dispersive soils is difficult due to their low bearing capacity when wet. Concentrating water in roadside culverts and drains which have been excavated into dispersive soils often leads to erosion and collapse of the road batter adjacent embankments.
Any degradation of the soil-terrain complex that undermines its capacity to function - from storing water and recycling nutrients to resisting erosion - will lead to a decline in primary production and diminish energy flow to higher trophic levels. Primary production is an ecosystem supporting service that maintains other ecosystem services, so its harm can lead to ecosystem collapse.
Mitigations
1. Identify areas with dispersive subsoils – determine if any affected bare patches are potential sodic sites by performing a chemical analysis, such as Exchangeable Sodium Percent (ESP) or Sodium Absorption Ratio (SAR) to relate the relative abundance of exchangeable cations to aggregate stability and dispersion.
2. As far as is practical, avoid disturbance to areas with dispersive subsoils.
3. Minimise excavation of dispersive soils or where possible do not remove or disturb topsoil or vegetation.
4. Consider carting non-sodic soil to create appropriate road surfaces without the need for excavation.
5. Undertake chemical amelioration. Undertake soil analyses to determine appropriate rates of application rates for gypsum (calcium sulphate) or lime (calcium carbonate) to treat sodic soils.
6. Perform precise compaction. A high degree of compaction reduces soil permeability, restricting the movement of water and dispersed clay through the soil matrix, which decreases the severity of dispersion and restricts tunnel development.
7. Consideration should be given to spreading topsoil, applying gypsum and re-vegetating either side of the roadway to ensure runoff doesn't initiate further tunnelling.
8. In most cases managing runoff without excavating culverts is the best means of reducing the erosion risk.
9. Road design needs to ensure runoff is spread out and dissipated over wide, well vegetated areas.
10. Consider carting non-sodic soil to create appropriate drains without the need for excavation, e.g., alternative road design using road bars and diversion mounds (instead of mitre drains) to shed water into stable areas.

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11. If possible do not discharge runoff from hard areas into areas with dispersive soils or excavate culverts and drains in dispersive soils.
12. Ensure that culverts and drains excavated into dispersive subsoils are capped with non-dispersive clays mixed with gypsum, topsoiled, and vegetated. • Treat exposed subsoil with gypsum or hydrated lime. • Cover/cap treated subsoil with a thick layer (e.g., 200-300mm) of non-dispersive clay preferably also mixed with either gypsum or hydrated lime. • Sow with an appropriate mix of grass species. • In some cases, it will be necessary to protect the topsoil from erosion with 'jute' cloth or similar product.

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Appendix C - BARE PATCH RESTORATION PROTOCOL

Impact
The development of bare patches is a degradation process that can be attributed to overgrazing and patch selection, usually in combination with drought conditions.
Consequences
Bare patches are like open wounds in the landscape, which can fester leading to dysfunctional landscapes, and a loss of ecosystem services, including diminished carrying capacity (supporting service through primary production) and farm income (provisioning service through livestock sales).
Diminished climate change resilience.
Source
N Visser, C Morris, MB Hardy and JC Botha (2007) Restoring bare patches in the Nama-Karoo of South Africa, African Journal of Range and Forage Science, 24:2, 87 – 96
Assumptions
• Bare patches in the Nama-Karoo can be successfully revegetated with tillage treatments providing for rapid recolonisation of plants as reflected in significantly higher plant density and species richness when compared with no-till alternatives in the short term (over 2 years) (Visser *et al*. 2007). • The addition of branches and seeds only to bare areas in the Nama-Karoo has the potential to result in revegetating the bare areas to the same plant density as tillage treatments in the medium term (5 years); it's just a slower process than when combined with tillage (Visser *et al*. 2007). • Tillage not only breaks the soil crust, allowing the germinated seeds of sown species to take root, but also allows the rapid establishment of plants from the underlying seedbank, thereby increasing species richness compared with no-till treatments (Visser *et al*. 2007). • If branches are readily available, they should be used together with tillage to protect the soil, trap water and nutrients, and provide shelter for seedlings, increasing the chance of survival and overall success rate of the restoration action (Visser *et al*. 2007).
Mitigations
1. Determine if the bare patches are potential sodic sites by performing a chemical analysis, such as Exchangeable Sodium Percent (ESP) or Sodium Absorption Ratio (SAR) to relate the relative abundance of exchangeable cations to aggregate stability and dispersion.
2. Restoration works should be undertaken in late autumn or early spring at the beginning of the rain season.
3. If the soils are sodic, then undertake chemical amelioration by applying appropriate application rates for gypsum (calcium sulphate) or lime (calcium carbonate) to treat sodic soils.
4. Till the bare patch using a hand-held hoe to a depth of 150 – 200 mm, simultaneously working the lime or gypsum into the soil (if applicable).
5. Tilled rows should be perpendicular to the prevailing slope.
6. Spread topsoil thinly over the tilled area prior to sowing seed using the stockpiled topsoil saved from construction activities.

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7. Sow seed into the tilled rows, using a combination of palatable locally indigenous Karoo dwarf shrubs (or 'bossies') and grasses at a seeding density or rate of 5 to 15 kg of seed mixture per hectare.
8. Brush pack the tilled, topsoiled, and sown area. Lay down cut brunches (from legitimate bush clearing operations, for example) along the fetch or inter-patch zones whilst ensuring there is good contact with the ground. Not only would these branches provide the necessary obstructions to impede run-off, but, and particularly thorny branches, protect recruitment (emerging plants) from grazers or browsers, giving them an opportunity to become established.
9. If brush packing is not possible due to the absence of trees, lightly mulch the surface with stockpiled organic matter saved from construction activities.
10. Fence off the restored areas to prevent grazing by livestock.
11. The fence should extend beyond the edge of the bare patch and encompass at least 2 m of remnant vegetation adjacent to the bare patches being restored as they potentially provide propagules of desirable species that could enhance the restoration process.
12. The restored bare patches should be rested for 4 years before removing the fence.
13. Undertake vegetation surveys of rehabilitated bare patches annually, measuring at least plant density, species composition and richness, vegetation cover and growth stage (seedling, vegetative and reproductive).
14. The results of the vegetation surveys should inform the need for and nature of any further interventions.
15. Interventions and vegetation surveys may cease once the fence has been removed after 4 years and the site has been restored to the same or a better condition than the adjacent remnant vegetation, e.g., species richness, vegetation cover and plant density are comparable or better, and seedling, vegetative and reproductive growth stages of all species are recorded.
Management Outcome
Ecological restoration to improve climate change resilience and increase the production potential for improved grazing capacity.
Targets
The seedling, vegetative and reproductive growth stages of all species, including palatable or preferred grazing species are recorded in follow-up vegetation surveys (post-treatment monitoring), indicating the successful establishment of the species, and providing evidence that the restoration intervention was sustainable.

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Appendix D - SURFACEWATER MONITORING PROTOCOL

Source
Hydrological Assessment, Version – Final 1, prepared by Hendrik Botha and dated 10 January 2023 (GCS Ref – 22 - 1054).
Mitigations:
• Five (5) proposed monitoring points where visual inspections are recommended, upstream and downstream of the crossings, are listed in Table 8.1 and shown in Figures 6.3 to 6.7 of the Hydrological Assessment Report. • Regular (e.g., weekly) visual inspections of the proposed stormwater systems, surface water resources identified in the area, active excavations and equipment / heavy machinery parking areas need to be undertaken. • If there are visual signs of pollution, laboratory samples must be taken to screen for hydrocarbons (BTEXN). • If erosion and sedimentation are noted, then efforts should be made to stabilise and rehabilitate the eroded areas (e.g., use temporary sandbags, earth berms, vegetation, or riprap). • Placement and monitoring of drip trays underneath parked construction vehicles will help to determine which vehicles need to be repaired/taken off-site to prevent contamination while in service. • Monitoring during the construction phase only. No monitoring is proposed for the operational phase of this project.

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Appendix E - GRIEVANCE MECHANISM PROTOCOL

Impact
Damage to farm infrastructure
Decrease in the "sense of place" as it relates to noise, visual and light pollution.
Consequences
Economic costs in replacing damaged infrastructure.
Higher rates of crimes, HIV rates.
Lower aesthetic values enjoyed by the community.
Reference
Social Impact Assessment Report prepared by Ilse Aucamp of Equispectives Research & Consulting Services dated August 2022.
Recommendations
• In accordance with international good practice SolarAfrica Energy should establish a specific mechanism for dealing with grievances. A grievance is a complaint or concern raised by an individual or organisation that judges that they have been adversely affected by the project during any stage of its development. Grievances may take the form of specific complaints for actual damages or injury, general concerns about project activities, incidents and impacts, or perceived impacts. The IFC standards require Grievance Mechanisms to provide a structured way of receiving and resolving grievances. Complaints should be addressed promptly using an understandable and transparent process that is culturally appropriate and readily acceptable to all segments of affected communities and is at no cost and without retribution. The mechanism should be appropriate to the scale of impacts and risks presented by a project and beneficial for both the company and stakeholders. The mechanism must not impede access to other judicial or administrative remedies. • The grievance mechanism should be based on the following principles: o Transparency and fairness. o Accessibility and cultural appropriateness. o Openness and communication regularity. o Written records. o Dialogue and site visits; and o Timely resolution. o Based on the principles described above, the grievance mechanism process involves four stages: o Receiving and recording the grievance. o Acknowledgement and registration. o Site inspection and investigation; and o Response. • The Grievance Mechanism should be communicated to all stakeholders.

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Appendix F – SOCIAL IMPACT MANAGEMENT PLAN

SOCIAL IMPACT MANAGEMENT PLAN				
Phase	**Management action**	**Timeframe for implementation**	**Responsible party for implementation (frequency)**	**Responsible party for monitor/audit/review (frequency)**
Planning and Design Phase	Develop social impact management plan	As soon as project enters public domain	Applicant (involve municipality where appropriate)	CLO *Internal once appointed* Social expert *External but not legally required*
	Appoint appropriately qualified community liaison officer (CLO) to deal with social aspects of the project throughout the life of the project	Before consultation with stakeholders start (excluding EIA consultation)	Applicant Appointment for the life of the project	Not required apart from usual HR processes
	Develop community relations and stakeholder engagement strategy	Before consultation with stakeholders start (excluding EIA consultation)	Applicant Continued for the life of project 	CLO *Internal* *No external review required*
	Develop safety plan, access protocols, grievance mechanism and compensation policy	In consultation with stakeholders	Applicant Continued for the life of project 	CLO *Internal* *No external review required*
		Throughout construction	Applicant (CLO)	Management

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Construction and Rehabilitation Phases	Monitoring of social mitigation and management measures		Continued for the life of project	*Once a year or as required*
	Implementation of community relations	Throughout construction	Applicant (CLO)	Management
			Continued for the life of project	*Once a year or as required*
	Implement safety plan, access protocols, grievance mechanism and compensation policy	Throughout construction	Applicant (CLO)	Management
			Continued for the life of project	*Once a year or as required*

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Appendix G - EMERGENCY RESPONSE PLANS

Definition of an Incident

An "Incident" is an unexpected, sudden, and uncontrolled (loss of containment) release of a hazardous substance, including from a major emission, fire or explosion, that causes, has caused or may cause significant (have noticeable effects) harm to the environment, human life or property (definition in Section 30(1) of NEMA).

Procedure

The contractor shall ensure that emergencies are reported and controlled in accordance with the sequence of events prescribed for spillages in a watercourse, spillages on land and fire, including:

- Action to be taken
- Clean-up and remediation measures to be implemented
- Internal and external communication plan
- Prescribed reporting procedure

The contractor shall ensure that their employees are adequately trained to react to environmental emergencies in accordance with this procedure.

The SEO shall complete the table of contact numbers, erect them in a conspicuous place within the construction camp and make its whereabouts known to all of the contractor's staff.

Equipment

The following equipment is required to successfully implement this procedure. It must be ensured that the equipment is supplied to or is readily available for all living quarters, site offices, kitchen areas, workshop areas, stores and on site.

1. A spill kit including absorbent fibres, mats, and booms
2. A net
3. A whistle
4. Adequate lighting for night shifts
5. Spades
6. Sandbags
7. Designated hazardous waste drums
8. (Trained personnel with) protective clothing for extinguishing fires
9. Fire extinguishers
10. Fire beaters
11. Water carts/tankers with pumps and hoses

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12. Water pumps and pipes (for fires started at the watercourse crossings)

Hazardous Substances

A "hazardous substance" is a solid, liquid, vapour, gas or aerosol, or combination thereof, which is a source of danger to persons and to the environment, by reason of its toxic, corrosive, irritant, strongly sensitizing or flammable nature, or because it generates pressure through decomposition, heat, or other means.

The contractor must consult the Safety Data Sheets of all substances stored on site and/or used during construction to identify which substances are listed as hazardous in the "Guidelines on the Administration of Incidents" published by DEA (2019) and update the table below (**Table 65**) to reflect applicable substances including their Reportable Quantity (RQ) in either kg (for solids) or litres (for liquids).

Table 65. List of hazardous substances and their reportable quantities (RQs).

Substance	RQ (kg or l)
Benzene	5
brake fluid, hydraulic	10
Battery fluid	10
Chlorine	5
Coal	1000
Creosote	0.5
Diesel fuel	100
Gasoline	100
Lubricating oil	5000
Paraffin	100
Petrol	100
Petroleum crude oil	10
Petroleum thinners (turpentine)	100
Printing ink, flammable	10
Urea	1000

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Contact Numbers

Organisation	Name	Cell phone and Email
Project Personnel		
Applicant		
Landowner		
Engineer		
Contractor		
HSO		
SEO		
ECO		
Interested and Affected Parties		
Adjacent Landowner		
Adjacent Landowner		
Adjacent Landowner		
Emergency Services		
Spill Clean-up Service Provider		
Fire Department		
Chief Fire Officer (Fire Chief)		
SA Police Services		
Disaster Management Centre		
Local Municipality		
District Municipality		
Irrigation Board		
Water Catchment Management Agency		

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Water Treatment Works		
DWS (Regional Head of Department / Chief Director)		
DWS (Regional Director: Water sector Regulation & Use)		
Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform		
DFFE (Provincial Head of Department)		
DFFE (Director: Environmental Impact Management)		
South African Heritage Resource Agency (SAHRA)		111 Harrington Street, Cape Town Phone: +27 (0)21 462 4502 Fax: +27 (0)21 462 4509

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SPILLAGE IN A WATERCOURSE

ACTION TO BE TAKEN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person responsible for, or who discovers, a hazardous substance spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. ● Note that the SEO will take control of all relevant actions once he/she arrives on the scene.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
Supervisor / SEO	Initial investigation	Determine the amount of hazardous substance that was released, if it exceeds the RQ and whether it is reportable in terms of the definition of an incident, e.g., was it an unexpected, sudden, and uncontrolled (loss of containment) release? Determine the extent of the spill, e.g., its boundaries, by observing for the following: 1. Any visual indication of pollution, 2. Any odours or emissions detected, 3. Any indication of the source of pollution, 4. Any sign of damage to the natural system. ● The Supervisor / SEO should provide lighting if working at night.
Supervisor / SEO	Co-ordination	Sound an alarm/whistle. ● The designated response team consisting of area specific personnel and including the environmental leader, will congregate at the spill kit. ● All other employees who do not have specific duties to perform are to evacuate the affected area to a location designated by the Supervisor / SEO.

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Supervisor / SEO	Co-ordination	Minimise the effects of the incident on the environment and persons by removing the source of the spill at least 100m away from the watercourse or cut-off the supply of the spill if the source is not moveable.
Supervisor / SEO	Co-ordination	Contain the spill by laying an absorbent sock or boom across the width of the watercourse at a predetermined location downstream of the construction area (spill). ● A series of parallel booms may be required.
Supervisor / ECO	Co-ordination	Secure the affected area with danger tape.
HSO	Co-ordination	The site shall not be disturbed, and no article or substance may be removed (without the consent of the inspector) if there is or likely to be a death, or if there is a loss of limb or part of a limb. However, action can be taken to prevent a further accident, to remove the injured or dead or rescue persons from danger.
Engineer / SEO / HSO	Decision-making	The Engineer will assess the situation in consultation with the SEO and HSO and act as required. ● The risk involved shall be assessed before anyone approaches the scene of the incident. ● The HSO will consult the MSDSs. ● The scale of the spill will dictate whether the spill will be cleaned up by using the on-site spill kit and in the prescribed manner, or by contacting a Spill Clean-Up Service Provider for assistance. ● The SEO will take photographs of the affected area. ● No person shall be allowed to approach a spill unless he/she is equipped with the personal protective clothing.
SEO	Directions	If a Spill Clean-Up Service Provider is used, assist the emergency services by clearly marking the route to be taken to the spill site.
SEO	Co-ordination	Take such measures as the Catchment Management Agency may either verbally or in writing direct within the time specified by such institution.

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SPILLAGE IN A WATERCOURSE

CLEAN-UP AND REMEDIATION MEASURES TO BE IMPLEMENTED		
Personnel	**Responsibility**	**Action**
SEO	Co-ordination	Remove the contaminated sock or boom from the surface of the water. If lose fibres were scattered on the surface to capture hydrocarbons in shallow (still) pools, 'fish' it out with a net.
SEO	Co-ordination	Remove the contaminated soil from the banks of the watercourse to the depth of penetration using a spade or shovel.
SEO	Co-ordination	Temporarily store the contaminant in the designated hazardous waste storage facility at the construction camp.
SEO	Co-ordination	Contact a licensed hazardous waste service provider to collect and transport the waste to a licensed hazardous waste landfill site.
SEO	Co-ordination	Rehabilitate the banks of the watercourse by replacing the topsoil and planting indigenous plants.
SEO	Monitoring	Immediately follow any known spillage of toxic substances into a stream or river with monitoring of the receiving streams or rivers and public health to assess the immediate and long-term effects on these sensitive receptors.
SEO	Co-ordination	Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice must be sought for appropriate treatment and remedial procedures to be followed.
SEO	Monitoring	Take photographs of the affected area during rehabilitation.

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SPILLAGE IN A WATERCOURSE

INTERNAL & EXTERNAL COMMUNICATION PLAN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person responsible for, or who discovers, a hazardous waste spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
SEO	Reporting	Report the incident to the Site Agent and / or Manager and the ECO or Reserve Manager.
SEO	Reporting	If the spill is too big for the spill kit, contact a Spill Clean-Up Service Provider.
SEO	Reporting	If the spill is going to affect downstream users, inform the Landowner, the Irrigation Board and water treatment works (if applicable). ● Provide the following information to the water treatment works: 1. The exact location of the spillage, 2. The time of the spillage, 3. As much information about the nature of the pollution, 4. The name and telephone number of the person contacting them. ● Irrigation Boards control river structures and may be able to divert/or impound the river to protect 'water supply intakes'.

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SEO	Reporting	The responsible person or the employer of the responsible person must generate an Alarm Report immediately and without delay. The Alarm Report must be submitted by the responsible person to the following relevant authorities: 1. DEA (Director General), 2. DWS, Kimberley (Director General and Chief Director), 3. SA Police Services, 4. Emergency Services or Fire Department, 5. Catchment Management Agency, 6. Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD&LR) - provincial Head of Department or Local Municipality, and 7. Any persons whose health may be affected by the incident, e.g., neighbours and/or downstream water users.
SEO	Reporting	The Alarm Report must contain the following information: • The nature of the incident, • Any risks posed by the incident to public health, safety and property, • The toxicity of substances or by-products released by the incident, • Any steps that should be taken to avoid or minimise the effects of the incident on public health and the environment, • Responsible person name, location, organisation, and telephone number, • Name and address of the party responsible for the incident, • Date and time of the incident, • Location of the incident, • Medium (e.g., land, water) affected by release or spill,

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		• Number and types of injuries or fatalities (if any), • Weather conditions at the incident location, • Name of the carrier or vessel, the railcar/truck number, or other identifying information, • Whether an evacuation has occurred, • Other departments notified or about to be notified, and • Any other information that may help emergency personnel respond to the incident.
ECO / Applicant / Site Agent / CRE	Reporting	If the nature of the impact constitutes a gross violation of the EA or any legislation: ● The ECO must report the incident to the applicant. ● The applicant must report the incident to the Local Municipality, Northern Cape DAEARD&LR , and DWS (Kimberley/Upington). ● The Site Agent and / or Manager must report the incident to their Environmental Group Manager, Divisional MD and CEO. ● The Resident Engineer must report the incident to his Superiors.

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SPILLAGE IN A WATERCOURSE

PRESCRIBED REPORTING PROCEDURE		
Incident Reporting		
Personnel	**Responsibility**	**Action**
SEO	Investigation	Investigate, including interviews, and record all details of the incident. ● The cause must be investigated.
SEO	Reporting	Complete an Incident Report and forward it to all key project personnel, with the exception of the Emergency Services. ● An Incident Report Template is provided in the "Guidelines on the Administration of Incidents" published by DEA (2019)
SEO	Reporting	The responsible person or his or her employer, must, within 14 days of the incident, submit the Incident Report to the following authorities. 1. DEA (Director General), 2. Northern Cape Department of Agriculture, Environmental Affairs, Riral Development and Land Reform (DAEARD&LR - Provincial Head of Department), 3. Local Municipality, 4. DWS, Upington (Regional Director).

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SEO	Reporting	The Incident Report shall include the following information: 1. The nature of the incident, 2. The substances involved, and an estimation of the quantity released and their possible acute effect on persons & the environment & data needed to assess these effects, 3. Initial measures to minimise impacts, 4. Causes of the incident, whether direct or indirect including equipment, technology, system or management failure, and 5. Measures taken & to be taken to avoid a recurrence of such incident.
SEO	Reporting	Submit an action plan within 14 days, or a shorter period, if specified by the Regional Director (DWS).
SEO	Reporting	The action plan must include the following information: 1. A detailed time schedule of measures taken to: 1.1 Correct the impacts resulting from the incident; 1.2 Prevent the incident from causing any further impact; and 1.3 Prevent a recurrence of a similar incident.
Progress reporting		
SEO	Revising Procedures	Identify methods for preventing the incident from re-occurring and revise method statements and/or procedures for implementing as early as possible.
SEO	Training	Conduct either a toolbox talk or environmental awareness training/re-induction to the all employees and include additional mitigations to avoid a re-occurrence. ● Keep the program, including a signed attendance register, in the on-site environmental file.

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SPILLAGE ON LAND

ACTION TO BE TAKEN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person responsible for, or who discovers, a hazardous substance spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. ● Note that the SEO will take control of all relevant actions once he/she arrives on the scene.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
Supervisor / SEO	Initial investigation	Determine the amount of hazardous substance that was released, if it exceeds the RQ and whether it is reportable in terms of the definition of an incident, e.g., was it an unexpected, sudden, and uncontrolled (loss of containment) release? Determine the extent of the spill, e.g., its boundaries, by observing for the following: ● Any visual indication of pollution, ● Any odours or emissions detected, ● Any indication of the source of pollution, ● Any sign of damage to the natural system. The Supervisor / SEO should provide lighting if working at night.
Supervisor / SEO	Co-ordination	Sound an alarm/whistle. ● The designated response team consisting of area specific personal and including the environmental leader, will congregate at the spill kit. ● All other employees who do not have specific duties to perform are to evacuate the affected area to a location designated by the Supervisor / SEO.

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Supervisor / SEO	Co-ordination	Minimise the effects of the incident on the environment and persons by removing the source of the spill at least 100m away from the watercourse or cut-off the supply of the spill if the source is not moveable.
Supervisor / ECO	Co-ordination	Contain the spill to a confined area to prevent the spreading of the spilled chemical or substance. ● Use sandbags or construct earth berms. ● If relevant, close off all storm water drains with absorbent mats. ● Do not wash the spill with water as it will cause the spill to spread.
Supervisor / ECO	Co-ordination	Secure the affected area with danger tape.
HSO	Co-ordination	The site shall not be disturbed, and no article or substance may be removed (without the consent of the inspector) if there is or likely to be a death, or if there is a loss of limb or part of a limb. However, action can be taken to prevent a further accident, to remove the injured or dead or rescue persons from danger.
Engineer / SEO / HSO	Decision-making	The Engineer will assess the situation in consultation with the SEO and HSO and act as required. ● The risk involved shall be assessed before anyone approaches the scene of the incident. ● The HSO will consult the MSDSs. ● The scale of the spill will dictate whether the spill will be cleaned up by using the on-site spill kit and in the prescribed manner, or by contacting a Spill Clean-Up Service Provider for assistance. ● The SEO will take photographs of the affected area. ● No person shall be allowed to approach a spill unless he/she is equipped with the personal protective clothing.
SEO	Directions	If a Spill Clean-Up Service Provider is used, assist the emergency services by clearly marking the route to be taken to the spill site.

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SPILLAGE ON LAND

CLEAN-UP AND REMEDIATION MEASURES TO BE IMPLEMENTED		
Personnel	**Responsibility**	**Action**
SEO	Co-ordination	Remove the contaminated soil to the depth of penetration using a spade or shovel.
SEO	Co-ordination	Temporarily store the contaminant in the designated hazardous waste facility at the construction camp.
SEO	Co-ordination	Contact a licensed hazardous waste service provider to collect and transport the waste to a licensed hazardous waste landfill site.
SEO	Co-ordination	Rehabilitate the area cleared of hazardous waste by replacing the topsoil and planting indigenous plants.
SEO	Monitoring	Immediately follow any known spillage of toxic substances with monitoring of the receiving environment, and public health to assess the immediate and long-term effects on these sensitive receptors.
SEO	Monitoring	Take photographs of the affected area during rehabilitation.

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SPILLAGE ON LAND

INTERNAL & EXTERNAL COMMUNICATION PLAN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person responsible for, or who discovers, a hazardous waste spill must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
SEO	Reporting	Report the incident to the Site Agent and/or Manager and the ECO or Reserve Manager.
SEO	Reporting	If the spill is too big for the spill kit, contact a Spill Clean-Up Service Provider.
SEO	Reporting	The responsible person or the employer of the responsible person must generate an Alarm Report immediately and without delay. The Alarm Report must be submitted by the responsible person to the following relevant authorities: 1. DEA (Director General), 2. South African Police Services, 4. Emergency Services or Fire Department, 5. Catchment Management Agency, 6. Northern Cape Department of Agriculture, Environmental Affairs, Riral Development and Land Reform (DAEARD&LR - Provincial Head of Department) or Local Municipality, and 7. Any persons whose health may be affected by the incident, e.g., neighbours and/or downstream water users.

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SEO	Reporting	The Alarm Report must contain the following information: • The nature of the incident, • Any risks posed by the incident to public health, safety and property, • The toxicity of substances or by-products released by the incident, • Any steps that should be taken to avoid or minimise the effects of the incident on public health and the environment, • Responsible person name, location, organisation, and telephone number, • Name and address of the party responsible for the incident, • Date and time of the incident, • Location of the incident, • Medium (e.g., land, water) affected by release or spill, • Number and types of injuries or fatalities (if any), • Weather conditions at the incident location, • Name of the carrier or vessel, the railcar/truck number, or other identifying information, • Whether an evacuation has occurred, • Other departments notified or about to be notified, and Any other information that may help emergency personnel respond to the incident.
ECO / Applicant / Site Agent / RE	Reporting	If the nature of the impact constitutes a gross violation of the EA or any legislation: ● The ECO must report the incident to the applicant. ● The applicant must report the incident to the Local Municipality and Northern Cape DAEARD&LR ● The Site Agent and/or Manager must report the incident to their Environmental Group Manager, Divisional MD and CEO. ● The Resident Engineer must report the incident to his Superiors.

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SPILLAGE ON LAND

PRESCRIBED REPORTING PROCEDURE		
Incident recording		
Personnel	**Responsibility**	**Action**
SEO	Investigation	Investigate, including interviews, and record all details of the incident. ● The cause must be investigated.
SEO	Reporting	Complete an Incident Report and forward it to all key project personnel, except for the Emergency Services. ● An Incident Report Template is provided in the "Guidelines on the Administration of Incidents" published by DEA (2019)
SEO	Reporting	The responsible person or his or her employer, must, within 14 days of the incident, submit the Incident Report to the following authorities. 1. DEA (Director General), 2. Northern Cape Department of Agriculture, Environmental Affairs, Riral Development and Land Reform (DAEARD&LR - Provincial Head of Department), 3. Local Municipality.
SEO	Reporting	The Incident Report shall include the following information: 1. The nature of the incident, 2. The substances involved, and an estimation of the quantity released and their possible acute effect on persons & the environment & data needed to assess these effects, 3. Initial measures to minimise impacts, 4. Causes of the incident, whether direct or indirect including equipment, technology, system or management failure, and 5. Measures taken & to be taken to avoid a recurrence of such incident.
Progress reporting		

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SEO	Revising Procedures	Identify methods for preventing the incident from re-occurring and revise method statements and/or procedures for implementing as early as possible.
SEO	Training	Conduct either a toolbox talk or environmental awareness training/re-induction to the employee(s) responsible for the spill and include additional mitigations to avoid a re-occurrence. ● Keep the program, including a signed attendance register, in the on-site environmental file.

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FIRE

ACTION TO BE TAKEN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person who starts or discovers a fire must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. ● Note that the SEO will take over co-ordination of all relevant actions once he/she arrives on the scene.
SEO	Reporting	If there is potential for a fire to spread and endanger life, property, or the environment, alert the landowner and Fire Department.
Landowner	Reporting	Alert the owners of adjacent land.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
Supervisor / SEO	Co-ordination	Sound an alarm/whistle. ● The designated response team consisting of area specific personnel and including the environmental leader, will congregate at the fire-fighting equipment. ● All other employees who do not have specific duties to perform are to evacuate the affected area to a location designated by the Supervisor / SEO.
SEO	Directions	Assist the Fire Department by clearly marking the route to be taken to the fire.
SEO	Co-ordination	Stop the spread of the fire.
SEO	Co-ordination	Extinguish the fire or assist in doing so.
SEO	Co-ordination	Aid a fire protection officer or forest officer if they take control over the fighting of a fire.

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HSO	Co-ordination	The site shall not be disturbed, and no article or substance may be removed (without the consent of the inspector) if there is or likely to be a death, or if there is a loss of limb or part of a limb. However, action can be taken to prevent a further accident, to remove the injured or dead or rescue persons from danger.

FIRE

REMEDIATION MEASURES TO BE IMPLEMENTED		
Personnel	**Responsibility**	**Action**
SEO	Assessment	Immediately follow any fire with an assessment of the effects on the environment, public health, safety, and property.
SEO	Search	Search the scorched earth for reptiles and other creatures that can be rehabilitated and saved. ● Use only a licensed rehabilitation facility.
SEO	Monitoring	Monitor for signs of erosion after the first few rains and new flush. ● Manage erosion resulting from a loss in plant basal or aerial cover. ● Ensure that the control measures are not destructive.
SEO	Managing	No Vehicles or plant are permitted to drive through burnt areas.

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FIRE

INTERNAL & EXTERNAL COMMUNICATION PLAN		
Personnel	**Responsibility**	**Action**
Employee	Reporting	The person who starts or discovers a fire must report the incident to their immediate Supervisor.
Supervisor	Reporting	Report the incident to the SEO, HSO and Resident Engineer. ● Note that the SEO will take control over all relevant actions once he/she arrives on the scene.
SEO	Reporting	Report the incident to the Site Agent and/or Manager and the ECO or Reserve Manager.
SEO	Reporting	If there is potential for a fire to spread and endanger life, property, or the environment, alert the landowner, Fire Department, and the South African Police Service.
Landowner	Reporting	Alert the owners of adjacent land, e.g., neighbours.
HSO	Reporting	Report the incident to an Inspector (designated under section 28 of the Occupational Health & Safety Act, 1993) within the prescribed period and manner.
ECO / Applicant / Site Agent / RE	Reporting	If the nature of the impact constitutes a gross violation of the EA or any legislation: ● The ECO must report the incident to the applicant. ● The applicant must report the incident to the Local Municipality, Northern Cape Department of Agriculture, Environmental Affairs, Riral Development and Land Reform (DAEARD&LR) and DWS. ● The Site Agent and / or Manager must report the incident to their Environmental Group Manager, Divisional MD and CEO. ● The Resident Engineer must report the incident to his Superiors.

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FIRE

PRESCRIBED REPORTING PROCEDURE		
Incident recording		
Personnel	**Responsibility**	**Action**
SEO	Investigation	Investigate, including interviews, and record all details of the incident. ● The cause must be investigated.
SEO	Reporting	Complete an Incident Report and forward it to all key project personnel, except for the Emergency Services.
SEO	Reporting	The Incident Report must include the following information: 1. The nature of the incident, 2. Initial measures to minimise impacts, 3. Causes of the incident, whether direct or indirect including equipment, technology, system, or management failure, and 4 Measures taken & to be taken to avoid a recurrence of such incident.
Progress reporting		
SEO	Revising Procedures	Identify methods for preventing the incident from re-occurring and revise method statements and/or procedures for implementing as early as possible.
SEO	Training	Conduct either a toolbox talk or environmental awareness training/re-induction to the employee(s) responsible for the spill and include additional mitigations to avoid a re-occurrence. ● Keep the program, including a signed attendance register, in the on-site environmental file.

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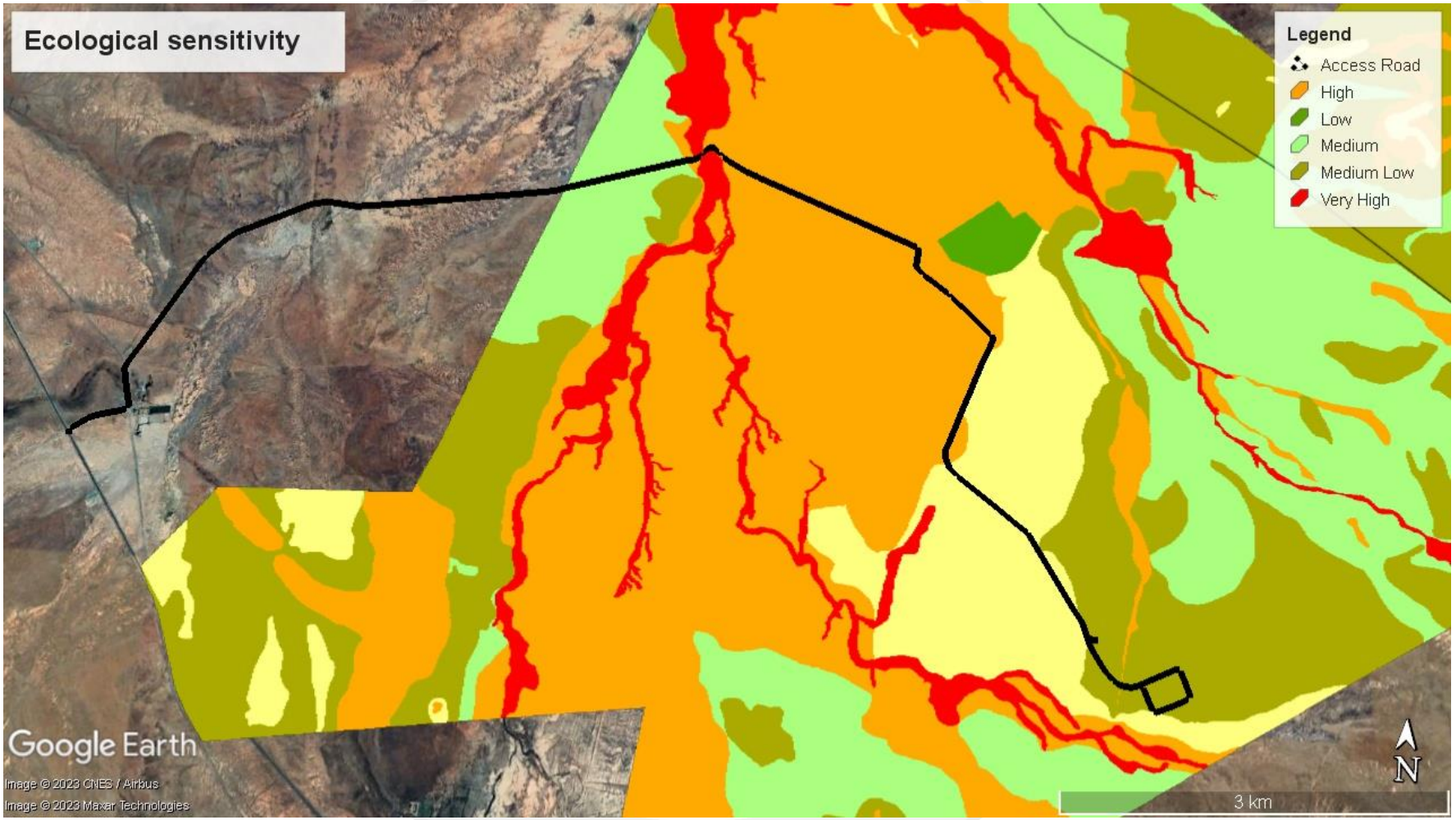
Appendix H – TERRESTRIAL BIODIVERSITY ECOLOGICAL SENSITIVITY MAP



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Appendix I – ESKOM REQUIREMENTS FOR WORK IN OR NEAR ESKOM SERVITUDES

TO WHOM IT MAY CONCERN

Eskom requirements for work in or near Eskom servitudes.

1. Eskom's rights and services must be acknowledged and respected at all times.
2. Eskom shall at all times retain unobstructed access to and egress from its servitudes.
3. Eskom's consent does not relieve the developer from obtaining the necessary statutory, land owner or municipal approvals.
4. Any cost incurred by Eskom as a result of non-compliance to any relevant environmental legislation will be charged to the developer.
5. If Eskom has to incur any expenditure in order to comply with statutory clearances or other regulations as a result of the developer's activities or because of the presence of his equipment or installation within the servitude restriction area, the developer shall pay such costs to Eskom on demand.
6. The use of explosives of any type within 500 metres of Eskom's services shall only occur with Eskom's previous written permission. If such permission is granted the developer must give at least fourteen working days prior notice of the commencement of blasting. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued in terms of the blasting process. It is advisable to make application separately in this regard.
7. Changes in ground level may not infringe statutory ground to conductor clearances or statutory visibility clearances. After any changes in ground level, the surface shall be rehabilitated and stabilised so as to prevent erosion. The measures taken shall be to Eskom's satisfaction.
8. Eskom shall not be liable for the death of or injury to any person or for the loss of or damage to any property whether as a result of the encroachment or of the use of the servitude area by the developer, his/her agent, contractors, employees, successors in title, and assignees. The developer indemnifies Eskom against loss, claims or damages including claims pertaining to consequential damages by third parties and whether as a result of damage to or interruption of or interference with Eskom's services or apparatus or otherwise. Eskom will not be held responsible for damage to the developer's equipment.
9. No mechanical equipment, including mechanical excavators or high lifting machinery, shall be used in the vicinity of Eskom's apparatus and/or services, without prior written permission having been granted by Eskom. If such permission is granted the developer must give at least seven working days' notice prior to the commencement of work. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued by the relevant Eskom Manager

   Note: Where and electrical outage is required, at least fourteen work days are required to arrange it.

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10. Eskom's rights and duties in the servitude shall be accepted as having prior right at all times and shall not be obstructed or interfered with.
11. Under no circumstances shall rubble, earth or other material be dumped within the servitude restriction area. The developer shall maintain the area concerned to Eskom's satisfaction. The developer shall be liable to Eskom for the cost of any remedial action which has to be carried out by Eskom.
12. The clearances between Eskom's live electrical equipment and the proposed construction work shall be observed as stipulated by *Regulation 15* of the *Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993).*
13. Equipment shall be regarded electrically live and therefore dangerous at all times.
14. In spite of the restrictions stipulated by Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993), as an additional safety precaution, Eskom will not approve the erection of houses, or structures occupied or frequented by human beings, under the power lines or within the servitude restriction area.
15. Eskom may stipulate any additional requirements to highlight any possible exposure to Customers or Public to coming into contact or be exposed to any dangers of Eskom plant.
16. It is required of the developer to familiarise himself with all safety hazards related to Electrical plant.
17. Any third-party servitudes encroaching on Eskom servitudes shall be registered against Eskom's title deed at the developer's own cost. If such a servitude is brought into being, its existence should be endorsed on the Eskom servitude deed concerned, while the third party's servitude deed must also include the rights of the affected Eskom servitude.

Contact:
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