DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT - SUBMITTED TO THE NORTHERN CAPE DEPARTMENT OF AGRICULTURE, ENVIRONMENTAL AFFAIR, RURAL DEVELOPMENT AND LAND REFORM

Thaya Trading Enterprise

SUBMITTED TO THE NORTHERN CAPE DEPARTMENT OF AGRICULTURE, ENVIRONMENTAL AFFAIR, RURAL DEVELOPMENT AND LAND REFORM

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DRAFT ENVIRONEMNTAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED FARM MARSH HYDROPONICS SYSTEMS PROJECT, JOHN TAOLO DISTRICT, NORTHERN CAPE.

FOR REVIEW, COMMENT & SUBSEQUENT AMENDMENT

SUBMITTED FOR INTEGRATED ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE PROPOSED AGRICULTURAL DEVELOPMENT.

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FILE REFERENCE NUMBER NCDAEARDLR:

I. Acronyms

AEL	Atmospheric Emission License
AQMP	Air Quality Management Plan
BAR	Basic Assessment Report
BPG	Best Practice Guideline
CA	Competent Authority
CMA	Catchment Management Agency
CMS	Catchment Management Strategy
COMSA	Chamber of Mines South Africa
CPA	Communal Property Association
CRLR	Commission on Land Restitution of Land Rights
CRR	Comments and Responses Report
DEFF	Department of Environment, Forestry and Fisheries
DENC	Department of Environment and Nature Conservation
DARDLR	Department of Agriculture, Rural Development and Land Reform
DMRE	Department of Mineral Resources and Energy
DMR	Department of Mineral Resources
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
DWAF	Department of Water Affairs and Forestry
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
ECO	Environmental Control Officer
EI	Ecological Importance
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EMS	Environmental Management System
ES	Ecological Sensitivity
ESMS	Environmental and Social Management System
FIER	Final Environmental Impact Report
FEPA	Freshwater Ecosystem Priority Areas
FSR	Final Scoping Report

GDP	Gross Domestic Product
GHG	Green House Gas
GN	Government Notice
Ha	Hectares
HDPE	High Density Polyethylene
I&AP's	Interested and Affected Parties
IDP	Integrated Development Plan
IEA	Integrated Environmental Authorisation
IEMPr	Integrated Environmental Management Programme
ISO	International Organisation for Standardisation
IWRM	Integrated Water Resources Management
IWULA	Integrated Water Use License Application
IWWMP	Integrated Water and Waste Management Plan
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MPRDA	Mineral and Petroleum Resources Development, 2002 (Act No. 28 of 2002)
MR	Mining Right
MSDS	Material Safety Data Sheet
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NFEPA	National Freshwater Ecosystem Priority Areas
NCDAEARDLR	Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NWA	National Water Act, 1998 (Act No. 36 of 1998) [as amended]
NWRS	National Water Resource Strategy
PCO	Pest Control Officer
PES	Present Ecological Status

PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 µm
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 µm
PPP	Public Participation Process
RWD	Return water dam
SABS	South African Bureau of Standards
SACAA	South African Civil Aviation Authority
SACNASP	South African Council for National Scientific Professions
SAHRA	South African Heritage Resources Agency
SANAS	South African National Accreditation System
SANBI	South African National Biodiversity Institute
SANS	South African National Standard
SAWQG	South African Water Quality Guidelines
SDF	Spatial Development Framework
S&EIR	Scoping and Environmental Impact Report
SHE	Safety, Health and Environment
SHEQ	Safety, Health, Environment and Quality
SIA	Social Impact Assessment
SR	Scoping Report
TDS	Total Dissolved Salts
TOPS	Threatened or Protected Areas
ToR	Terms of Reference
TSS	Total Suspended Solids
VOC	Volatile Organic Compound
WARMS	Water Authorisation Registration and Management System
WCDM	Water Conservation and Demand Management
WESSA	Wildlife and Environmental Society of South Africa
WMA	Water Management Area
WMP	Waste Management Plan
WRC	Water Research Commission
WUL	Water Use License

II. SOME DEFINITIONS

Catchment - The area from which any rainfall will drain into the watercourse or watercourses or part of the water course, through surface flow to a common point or common points

Constitution – Refers to the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996).

Domestic waste - Waste, excluding hazardous waste that emanates from premises that are used wholly or mainly for residential, educational, health care, sport or recreation purposes;

Effective Management of Waste or Spills - Means the taking of all practicable steps to ensure that waste is managed in a manner that will protect health, property and the environment;

Environment – The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group; these circumstances include biophysical, social, economic, historical, cultural and political aspects. Environment means the surroundings within which humans exist and that are made up of-

(i) the land, water and atmosphere of the earth;

(ii) micro-organisms, plant and animal life;

(iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and

(iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Impact Assessment - An environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of any proposed project, plan, programme or policy which requires authorisation of permission by law and which may significantly affect the environment. The EIA includes an evaluation of alternatives. As well as recommendations for appropriate mitigation measures for minimising or avoiding negative impacts, measures enhancing the positive aspects of the proposal and environmental management and monitoring measures.

Existing Lawful use - An existing lawful use means a water use which has taken place at any time during a period of two years immediately before the date of commencement of the National Water Act 1998, (Act 36 of 1998) or which has been declared an existing

lawful water use under section 33 and which was authorised by or under any law which was in force immediately before the date of commencement of the National Water Act.

Groundwater Recharge - The inflow of water into a groundwater reservoir from the surface, e.g. infiltration of precipitation and its movement to the water table.

General waste - Means waste that does not pose an immediate hazard or threat to health or to the environment, and includes-

(a) domestic waste;

(b) building and demolition waste;

(c) business waste; and

(d) inert waste.

Hazardous waste - Means any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment

Hydrogeological –The study of distribution and movement of groundwater.

Hydrological – The study of movement, distribution and quality of surface water and groundwater.

Inert waste - Means waste that-

(a) does not undergo any significant physical, chemical or biological transformation after disposal;

(b) does not burn, react physically or chemically biodegrade or otherwise adversely affect any other matter or environment with which it may come into contact; and

(c) does not impact negatively on the environment, because of its pollutant content and because the toxicity of its leachate is insignificant;

Monitoring programme - means a programme for taking regular measurements of the quantity and/or quality of a water resource, waste or wastewater discharge at specified intervals and at specific locations to determine the chemical, physical and biological nature of the water resource, waste or wastewater discharge.

Public Participation Process – A process of involving the public in order to identify issues and concerns, and obtain feedback on options and impacts associated with a proposed project, programme or development. Public Participation Process in terms of NEMA refers to: a process in which potential interested and affected parties are given an opportunity to comment on, or raise issues relevant to specific matters.

Red Data Book (South African) – An inventory of rare, endangered, threatened or vulnerable species of South African plants and animals.

Recycle - Means a process where waste is reclaimed for further use, which process involves the separation of waste from a waste stream for further use and the processing of that separated material as a product or raw material.

Reserve - means the quantity and quality of water required –

(a) to satisfy basic human needs by securing a basic water supply, as prescribed under the Water Services Act, 1997 (Act No. 108 of 1997), for people who are now or who will, in the reasonably near future, be -

(i) relying upon;

(ii) taking water from; or

(iii) being supplied from, the relevant water resource; and

(b) to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource.

Re-use - Means to utilise articles from the waste stream again for a similar or different purpose without changing the form or properties of the articles;

The Act - The National Water Act, (NWA) (Act 36 of 1998)

Tributaries - A stream or river which flows directly into a larger river or stream.

Waste - Means any substance, whether or not that substance can be reduced, re-used, recycled and recovered-

(a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;

(b) which the generator has no further use of for the purposes of production;

(c) that must be treated or disposed of; or

(d) that is identified as a waste by the Minister by notice in the Gazette, and includes waste generated by the mining, medical or other sector,

but –

(i) a by-product is not considered waste; and

(ii) Any portion of waste, once re-used, recycled and recovered, ceases to be waste.

Hazardous waste must be classified in terms of SANS 10228 class.

Class 1: Explosives

Class 2: Gases

Class 3: Flammable liquids

Class 4: Flammable solids

Class 5: Oxidising substances and organic peroxides

Class 6: Toxic and infectious substances

Class 7: Radioactive substances

Class 8: Corrosives

Class 9: Other miscellaneous substances

If not listed in SANS 10228 - consult DHSWS prior to classification.

Watercourse means -

(a) a river or spring;

(b) a natural channel in which water flows regularly or intermittently;

(c) a wetland, lake or dam into which, or from which, water flows; and

(d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Water quality means the physical, chemical, toxicological, biological (including microbiological) and aesthetic properties of water that determine sustained (1) healthy functioning of aquatic ecosystems and (2) fitness for use (e.g. domestic, recreational, agricultural, and industrial). Water quality is therefore reflected in (a) concentrations or loads of substances (either dissolved or suspended) or micro-organisms, (b) physico-chemical attributes (e.g. temperature) and (c) certain biological responses to those concentrations, loads or physico-chemical attributes.

Water Resource - A water resource includes any watercourse, surface water, estuary or aquifer. Watercourses include rivers, springs, and natural perennial and non-perennial channels. Wetlands, lakes, dams, or any collection identified as such by the Minister in the Government Gazette.

Water use license - An authorisation from the Department to a designated water user to use water. The authorisation will provide details on the time-frames and conditions for the designated water use

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III. Objective of the Environmental Impact Assessment process

The objective of the environmental impact assessment process is to, through a consultative process—

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the [preferred location] development footprint on the approved site as contemplated in the accepted scoping report;

(c) identify the location of the development footprint within the [preferred] approved site as contemplated in the accepted scoping report based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the—

  (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

  (ii) degree to which these impacts—

    (aa) can be reversed;

    (bb) may cause irreplaceable loss of resources; and

    (cc) can be avoided, managed or mitigated;

(e) identify the most ideal location for the activity within the [preferred] development footprint of the approved site as contemplated in the accepted scoping report based on the lowest level of environmental sensitivity identified during the assessment;

(f) identify, assess, and rank the impacts the activity will impose on the [preferred location] development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity;

(g) identify suitable measures to avoid, manage or mitigate identified impacts; and

(h) identify residual risks that need to be managed and monitored.

Executive Summary

Sishen Iron Ore Company (Pty) Ltd [herein, after referred to as the "SIOC"] proposes to develop a Farm Marsh Hydroponics Systems Project.

The construction-related activities of the proposed Farm Marsh Hydroponics Systems Project include the following:

- Vegetation clearance, removal of topsoil to a nominal depth of 150 mm and levelling;
- Construction and operation of a Solar powered Submersible Pump system;
- Construction and operation of Solar powered Pump station;
- Procurement of Agricultural equipment;
- Construction and operation of Hydroponic Systems 25 Ha and associated resources, equipment, infrastructure and activities;
- Construction and operation of a Solar power plant (50 MW) to provide power to the Hydroponic Systems and associated resources, equipment, infrastructure and activities;
- Construction and operation of Irrigation System including Storage tanks;
- Construction of Clear view fencing; and
- Construction and operation of bee harvesting and honey processing facility and associated beeswax product-related manufacturing facility.

SIOC has a Consolidated Integrated Water Use Licence (IWUL) (File No.: 27/2/2/D941/5/5; License No.: 10/D41J/BCGI/2643), issued in terms of the National Water Act, 1998 (Act No. 36 of 1998) [as amended] (NWA), for the Mining Right (Reference: NC30/5/1/2/2/059MRC). The Remaining Extent of Farm Marsh 467 falls within the Mining Right area. SIOC now proposes an Agricultural Development Project on the Remaining Extent of Farm Marsh 467, John Taolo Gaetsewe District, Northern Cape Province. In order to support the proposed Farm Marsh Hydroponics Systems Project, the SIOC is in the process of lodging a Water Use License Application with the Department of Human Settlements, Water and Sanitation. The area of application covers approximately 35 hectares in size. The area of interest is situated approximately 10 Km North of town of Kathu, Northern Cape. **Figure 1** shows the locality map of John Taolo Gaetsewe District Municipality.

Thaya Trading Enterprise [herein, after referred to as “TTE”], is an independent environmental consultant who was appointed by the Applicant, Sishen Iron Ore Company (Pty) Ltd in order to complete both the Environmental Authorisation and Water Use License Application processes.

South Africa is a developing country within a global space where environmental impacts may not be ignored any longer. The need for sustainable development in a State such as South Africa is accompanied by numerous obligations. Some of these obligations include developing the economy and protecting the environment. In an attempt to protect the environment through impact management in many ways, the international community has entered into agreements and treaties in order to address matters relating to impacts associated with development among others. As a consequence, South Africa is a signatory to a number of international treaties. Some of these treaties include the Paris Agreement on Climate Change. In order to meet the objectives of the Paris Agreement, South Africa is currently promoting renewable energy generation.

Currently, South Africa relies more on coal for energy supply than it relies on any other energy source even though the country is well resourced with renewable energy sources that offer sustainable alternatives to use of fossil fuels. Renewable energy such as solar, biomass, ocean current, hydro, wind, tidal wave and geothermal or a combination of some of these do not get depleted. South Africa is endowed with all these energy resources. However, Solar Energy has proven to be relatively economical and environmentally friendly.

The economy of South Africa also relies largely on both mining and agricultural activities. The Northern Cape Province in particular relies on agriculture among other things; however, the province is relatively dry with high evaporation rate. In some instances the soil types in the Northern Cape are not suitable for crop farming. Alternative methods to practice agriculture are necessary to explore because of limited availability of suitable soil types in some parts of the province.

Environmental Impact Assessment (EIA) plays a vital role in informing prospecting farmers of sustainable methods of practising farming. If properly implemented, EIAs assist in ensuring optimal use of available resources, productivity increase and sustainability. South Africa should consider the conservation of productive agricultural land and embrace the use of latest technology and alternative methods that are available in the agriculture field. The Northern Cape in particular has to consider alternative methods to practice agriculture because of climate, land capability and soil among other factors.

Sishen Iron Ore Company (Pty) Ltd proposes to develop a Farm Marsh Hydroponics Systems Project. The proposed phased in agricultural development project comprises of Hydroponics Systems (25 Ha) and related equipment, tools and infrastructure that are going to utilise Photovoltaic Plant and related or associated infrastructure as power source. The power generation capacity of the proposed Photovoltaic Plant is estimated at 50 Megawatts.

The project is going to utilise Photovoltaic Plant (PV) energy generation facilities as a power source in phases and associated electrical infrastructure on Farm Marsh 467. The application area covers approximately 35 hectares in size. It is located in the John Taolo Gaetsewe District, Northern Cape Province, South Africa.

The proposed Farm Marsh Hydroponics Systems Project, using Photovoltaic Plant energy generation facility as a power source is expected to be located on a particular site after consideration of socio-economic and environmental impacts. Generally, an irrigation project requires sufficient availability of water for sustainability. The planned study is going to consider all necessary factors in order to investigate potential impacts of the proposed development against the triple bottom-line of social, economic and environmental impacts.
The objectives of the proposed Farm Marsh Hydroponics Systems Project include the following:

- Construction and operation of a Solar powered Submersible Pump system;
- Construction and operation of Solar powered Pump station;
- Construction of adequate fencing around the perimeter of feedlot facility;
- Procurement of Agricultural equipment as per Pricing sheet;
- Construction and operation of Hydroponic Systems 25 Ha;
- Construction and operation of a Solar power plant to provide power to the Hydroponic Systems;
- Construction of Irrigation System including Storage tanks;
- Construction of Clear view fencing;
- Construction and operation of bee harvesting and honey processing facility and associated beeswax product-related manufacturing

The concept of sustainable development provides a framework for reconciling socio-economic development and environmental protection. The constitutional framework: Sustainable development is recognised in the Bill of Rights (s 24(b) of the Constitution). In terms of this section, the government must give effect to this right through reasonable

legislative and other measures. The Constitution also provides for cooperative governance, which facilitates the implementation of sustainable development.

Sustainable development forms the basis of environmental policy. The White Paper on Environmental Policy states that sustainable development is an overarching goal. The National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended is the framework legislation for the environment and it contains uniform norms and standards applicable to all environmental legislation. One of these norms is sustainable development. NEMA defines sustainable development as “the integration of social, economic and environmental factors into planning, implementation and decision-making to ensure that development serves present and future generations”. Sustainable development underpins many principles and objectives of environmental management set out in NEMA. NEMA also provides the framework for compliance with and the enforcement of environmental legislation. Sustainable development is included in sectorial legislation relating to the environment (i.e. the National Water Act, 1998 (Act No. 36 of 1998), the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) and the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000)).

The proposed development, intrinsically, requires the implementation of procedures and mechanisms to facilitate co-operative environmental governance. Chapter 3 of the NEMA deals with such procedures. Section 11 of NEMA makes provision for environmental implementation plans and management plans. Every national department listed in Schedule 2 must prepare an environmental management plan. The provinces and departments must further ensure that these environmental implementation or management plans are consistent. The purpose and objectives of these plans are to:

- coordinate and harmonise the environmental policies, plans, programmes and decisions of the various listed national departments and of provincial and local spheres of government, which must be done to minimise the duplication of procedures and functions and to promote consistency;
- give effect to the principle of cooperative government in Chapter 3 of the Constitution;
- secure the protection of the environment across the country as a whole;

- prevent unreasonable actions by provinces in respect of the environment, which actions are prejudicial to the economic or health interests of other provinces or the country as a whole; and
- enable the Minister to monitor the achievement, promotion and protection of a sustainable environment.

As part of the proposed project, Sishen Iron Ore Company (Pty) Ltd is funding at least two (2) co-operatives that comprise of local community members in the proposed Farm Marsh Hydroponics Systems Project. The names of two (2) beneficiaries of the prosed project are Gamagara Agricultural and Heuningpot Honey Co-operatives at the moment.

Need and desirability

Irrigation Systems

The United Nations Development Programme suggests that Farmers have lost their markets, supply chains have been disrupted, consumer demand has plummeted, and even food safety monitoring is being interrupted. Climate Change and environmental degradation contribute to food insecurity. The World Food Programme estimates 135 million people face crisis levels of hunger, and another 130 million are on the edge of starvation as a result of the coronavirus (UNDP, 2020). Climate Action, as one of the 17 Sustainable Development Goals affects the planning of any developmental project currently and in the future. The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. The 17 SDGs are integrated—that is, they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability (UNDP – Sustainable Development Goals, 2015).

Renewable Energy Independent Power Producers Programme (REIPPPP) and Integrated Resource Plan (2010)

Renewable energy generation plants and associated hybrid technologies such as storage and the associated industrial value-chain activities will help alleviate poverty and through an increase in job opportunities.

The REIPPPP is one of South African government's important initiatives aimed at increasing the country's power generation capacity. The REIPPPP objectives include securing private sector investment in order to finance or fund proposed development on new electricity generation capacity that is diverse as proposed in the 1998 White Paper on Energy Policy of South Africa. These kinds of initiatives contribute to broader national developmental objectives such as socio-economic development and transformation through broadening of economic participation.

The proposed Farm Marsh Hydroponics Systems Project is going to utilise renewable energy as power source, Photovoltaic energy generation facility.

National Development Plan 2030

At the core of the Nation Development Plan is the aim to ensure the achievement of a "decent standard of living" for all South Africans by 2030. A "decent standard of living" entails the following core elements as enshrined in the Bill of Rights:

- Housing, water, electricity and sanitation;
- Safe and reliable public transport;
- Quality education and skills development;
- Safety and security;
- Quality health care;
- Social protection;
- Employment;
- Recreation and leisure;
- Clean environment; and
- Adequate nutrition

South Africa's National Development Plan (NDP) 2030 was adopted by Government in year 2012.

Strategic Infrastructure Projects (SIPs)

The South African Government adopted a National Infrastructure Plan in year 2012. The National Infrastructure Plan is at transforming the economic landscape of South Africa, create a formidable amount of new jobs, and improve the delivery of basic community

services. The plan outlines the challenges and proposed solutions to these challenges to which South Africa needs to respond in order to build and develop infrastructure.

Seventeen Strategic Infrastructure Projects (SIPs) that fall within the Green Energy SIP have been, authorised, developed and approved in order to support socio-economic development in the poorest parts of South Africa.

Public Participation Process

The pre-application consultation with the Department of Agriculture, Land Reform and Rural Development that recently merged with the Department of Environment and Nature Conservation in Northern Cape Province was initiated. Another pre-application consultation meeting was conducted with the Department of Human Settlements, Water and Sanitation, Kimberley, Northern Cape. The Public Participation Process pertaining to Environmental Authorisation and Integrated Water Use License Applications were conducted jointly.

The key stakeholders include the following:

- **National and Provincial Government Representatives:**
    - Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARDLR);
    - Department of Human Settlement, Water & Sanitation (DHSWS);
    - Department of Public Enterprises;
    - Department of Trade and Industry (DTI);
    - Department of Mineral Resources and Energy (DMRE);
    - National Environmental Standards and Regulations Enforcement Agency (NESRA);
    - South African Civil Aviation Authority (SACAA); and
    - South African Heritage Resources Agency (SAHRA).
- **Relevant Local and District Municipalities;**
    - John Taolo Gaetsewe District Municipality;

- Gamagara Local Municipality;
- Joe Morolong Local Municipality; and
- Ga-segonyana Local Municipality

- **State-owned Entities:**
  - Transnet;
  - SANRAL; and
  - ESKOM

- **Landowner and neighbours**

Copies of Scoping Report and Environmental Impact Assessment were uploaded on the website of Consultant for accessibility and public review at www.thayatrading.co.za

Some Findings of EIA

Some findings of the study on Farm Marsh Hydroponics Systems Project are presented in Table 1.

Table 1: Assessment of Significant Impacts and Risks

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Geology	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Sterilisation of mineral resources	Construction Operational Decommissioning	Low	• Management through best practises • Ensure that minimal quantity of commodity of economic value is sterilised.	Low	Can be managed/mitigated to acceptable levels
Topography	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Changes to surface topography due to topsoil removal, construction and placement of infrastructure and development of agricultural project.	Construction Operational Decommissioning	Medium – High	• Ensure access control; • Employ effective rehabilitation strategies to restore surface topography of topsoil removal, placement of agriculture-related infrastructure; and • remedy through emergency response procedures	Low - Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Vegetation Clearance	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Destruction of natural vegetation, including listed and / or protected species	Construction Operational Decommissioning	Low – Medium	• Ensure vegetation clearance occurs within the area of application; • Ensure that permits and authorisations are obtained before removing protected species.	Low – Medium	Can be managed/mitigated to acceptable levels
Soil Preparation	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Disturbance of natural state of topsoil.	Construction Operational Decommissioning	Medium – High	• Remove topsoil if it is necessary to do so only; • Stockpile or conserve removed topsoil for rehabilitation purposes.	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Soil and land capability	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Loss of soil resources and land capability through contamination; loss of soil fertility; Soil erosion by water and wind on disturbed; potential for dust production and soil microbial degradation.	Construction Operational Decommissioning	Low	• Employ appropriate management strategies to preserve soil resources; • Monitor soil preparation; • Spray water on the surface regularly to avoid or minimise erosion; • Control through waste management practices; • control through rehabilitation; • control through appropriate design; and • remedy through emergency response procedures Manage through limiting the project footprint; • manage through soil conservation procedures; and • manage through closure planning and rehabilitation • Restore the natural state of soil and land capability as much as reasonably practicable.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Biodiversity	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Physical destruction of biodiversity; the clearance of vegetation; potential loss of listed & protected species; potential loss of ecosystem function; Displacement of fauna; The loss, damage and fragmentation of floral and faunal habitats.	Construction Operational Decommissioning	Low – Medium	• Management though biodiversity action plan and offset; • managing through limiting the project footprint; • management through rehabilitation; and • control through permits for removal; • Employ protection, rescue and / or rehabilitation strategies; • Apply for necessary permits and obtain necessary authorisation to remove protected species	Low – Medium	Can be managed/mitigated to acceptable levels
	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity.	General disturbance of biodiversity; Displacement of fauna; The loss, damage and fragmentation of floral and faunal habitats; potential loss of ecosystem function.	Construction Operational Decommissioning	Low – Medium	• Management through alien invasive species programme; • management through training; • management through monitoring; • management through appropriate design; and • Employ proper protection, rescue and / or rehabilitation strategies.	Low – Medium	Can be managed/mitigated to acceptable levels

	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Contamination of surface water resources resulting in deterioration.	Construction Operational Decommissioning	Low – Medium	• Management through waste management practises; • management through monitoring; • Management through storm water control; • management through compensation; and • remedy through emergency response procedures	Low	Can be managed/mitigated to acceptable levels
Groundwater	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution / Contamination of groundwater resources; Lowering of groundwater levels and reducing availability if water table is reached.	Construction Operational Decommissioning	Medium – High	• Construction of measures to prevent seepage into the groundwater by biological and engineering means. Implementation of the necessary management programs to ensure the integrity of ground water resources. • management through treatment & monitoring; • management through compensation; • management through appropriate design; and • remedy through emergency response procedures	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Air quality and odour	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Air pollution and Global Warming (Climate Change); Sources of atmospheric emission associated with the proposed operations are likely to include fugitive dust from materials handling operations, lose soils, gases, wind erosion and vehicle entrainment of road dust.	Construction Operational Decommissioning	High	• Manage through air quality controls, monitoring and reporting; • Ensure facility is properly maintained; • Maintain cool temperature conditions in the greenhouse facilities; • Effective soil management; identification of the required control efficiencies in order to maintain dust generation within acceptable levels.	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Noise & Vibration	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Increase in continuous noise levels; the disruption of current ambient noise levels; and the disruption of sensitive receptors by means of increased noise and vibration, especially from neighbouring mining, industrial and civil aviation operations.	Construction Operational Decommissioning	Low – Medium	• Manage through vibration and noise controls and once-off sampling • Due to Global Warming-related uncertainties as to how the climate will affect the project, it is recommended that independent support structures for solar panels should be erected, especially for solar panels that are placed on the roof of the greenhouse tunnels; • Ensure effective communication with nearby mining operation stakeholders; request them to limit generation of excessive noise and vibration, if necessary; Or at least communicate blasting period that is scheduled; Ensure all vehicles and equipment is in a good working order.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Visual Amenity	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Visual impact of the infrastructure; visibility of dust	Construction Operational Decommissioning	Low	• Manage through limiting project footprint, rehabilitation and visual controls; • Effective planning of the location of Infrastructure and operations to minimise visual impact; wet soils regularly; Ensure effective communication with Civil Aviation Authority.	Low	Can be managed/mitigated to acceptable levels
Heritage/cultural and palaeontological resources	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Loss of heritage/cultural and palaeontological resources; Deterioration of sites of cultural and Heritage importance.	Construction Operational Decommissioning	Medium – High (Heritage) Very low (Palaeontology)	• Control through avoidance; and • remedy through emergency response procedures • Follow Chance-Find Protocol, if applicable; • Preserve, protect and / or rescue Heritage and Cultural resources identified within a no go zone; further resources uncovered during operations need to be reported to SAHRA and to a suitably qualified Heritage Specialist.	Low Very low	Can be managed/mitigated to acceptable levels Can be managed through implementation of Chance-Find Protocol

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Socio-economic	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Loss of agricultural potential; influx of workers to the area increases health risks and loitering (resulting in lack of security and safety); negative impact of employment loss during closure of project.	Construction Operational	Low – Medium	• Control through the monitoring of living conditions of employees, recruitment processes, disease management; and • remedy through emergency response procedures	Low – Medium	Can be managed/mitigated to acceptable levels
	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Poverty Alleviation; Employment Opportunities; Revenue Collection by the State; Indirect benefits by relatives of beneficiaries;	Construction Operational Decommissioning	Medium – High	• Control through good communication, recruitment and procurement processes; • Ensure Compliance with legislation, including food production and applicable regulations.	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Health and Safety	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Health and Safety impact; Loss of income. COVID-19; Bee attacks	Construction Operational Decommissioning	Low – Medium	• Implement provisions of the Mine Health and Safety Act, and Occupational Health and Safety Act; • Adhere to COVID-19 Government Regulations; • Ensure continuous and transparent communication with I&Aps • All personnel must undergo induction & training to manage bees	Low	Can be managed/mitigated to acceptable levels
Land use	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Interference with land Uses; Change in current land uses	Construction Operational Decommissioning	Medium – High	• Ensure the area is zoned for agriculture as well; • Enter into amicable agreements with landowner; • Management through effective communication; • Implement effective rehabilitation strategies.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Use of Herbicides	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution of soil and water resources.	Operational Decommissioning	Low	• Control and monitor the use of Herbicides.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Use of Pesticides	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution of soil and water resources.	Operational Decommissioning	Low	• Control and monitor the use of Pesticides.	Low	Can be managed/mitigated to acceptable levels
Civil Aviation	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Impact on the operations of the nearby airport.	Construction Operational Decommissioning	Low – Medium	• Ensure effective communication with the relevant Government Department and airport stakeholders; • Obtain necessary authorisations, if necessary.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Roads	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure.	Destruction of natural state of biodiversity.	Construction Operational Decommissioning	Low – Medium	• Maintain good or acceptable condition of road surfaces; • Control dust generation.	Low – Medium	Can be managed/mitigated to acceptable levels
Traffic	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Road disturbance and traffic safety; Potential negative impacts on traffic safety; And deterioration of the existing road networks	Construction Operational Decommissioning	Low – Medium	• Manage through road maintenance; • Apply for speed reduction signage to be displayed on R380 when approaching main entrance of Farm Marsh 467, if possible; • Adherence to speed limit; and • remedy through emergency response procedures • Implement measures to ensure adherence to traffic rules.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Waste	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution	Construction Operational Decommissioning	Medium – High	• Manage through the principle of waste separation at source; • Implement the waste National Waste Management Strategy and Waste Hierarchy; • Ensure effective Waste Management Plan and environmentally friendly use of chemicals, pesticides and herbicides on-site.	Low – Medium	Can be managed/mitigated to acceptable levels
Alien invasive plants	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Proliferation of alien invasive plant species.	Construction Operational Decommissioning	Low – Medium	• Compile weed/alien plant management programme in consultation with NCDAEARDLR; • Implement the compiled weed/alien management programme effectively; • Eradicate, and control the spread, of alien invasive species.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Disturbance of wildlife due to increased human presence and possible use of machinery and/or	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Potential negative impacts on wildlife	Construction Operational Decommissioning	Low – Medium	• Enter into amicable agreements that will promote wellbeing and protection of wildlife; • Ensure proper fence is erected to limit access; • Should there be necessity to relocate wild animals, that exercise should be undertaken in sustainable, environmentally friendly and safe manner.	Low - Medium	Can be managed/mitigated to acceptable levels
Impacts on Mining Activities	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Potential negative impacts on mining activities	Construction Operational Decommissioning	Low	• Enter into amicable agreements that will promote wellbeing and protection of on-going mining activities.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Wetlands and / or pans	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Disturbance of wetland and / or pan and riparian zone	Construction Operational Decommissioning	Low – Medium	• Design and implement a storm water management plan;	Low	Can be managed/mitigated to acceptable levels

IV. PART A
ENVIRONEMNTAL IMPACT ASSESSMENT REPORT

1. Details of the EAP

1.1. Details of the Environmental Assessment Practitioner who prepared the report

The particulars of the EAP(s) involved in this study are presented in Table 2.

Table 2: Details of the EAP

Name of Consultancy:	Thaya Trading Enterprise CC
Name of EAP	Andisiwe Stuurman and Kwindla Nobaza
Physical Address	9705 Eerste Laan Rooisand Kathu 8446
Contact Number:	071 959 9207
E-mail	kwindla.nobaza@thayatrading.co.za
Contact Person:	Kwindla Handy Nobaza
Title	Scoping and Environmental Impact Assessment for the proposed Farm Marsh Hydroponics Systems Project, John Taolo Gaetsewe District, Northern Cape, South Africa.
Experience:	Andisiwe holds a M.Sc. degree in Geography and Environmental Resources from Southern Illinois University, Carbondale. Before joining EIMS in August 2015 as an Environmental Scientist, she worked in Research and Development at Johnson & Johnson. To date, Andisiwe has worked on several aspects of environmental management including: Environmental Impact Assessments, Basic Assessments, Geographic Information Systems (GIS), Environmental Compliance Monitoring, Environmental Awareness Training, Water Use Licence Applications, Prospecting Right Applications and Integrated Waste and Water Management Plans (IWWMP). Andisiwe is registered as a Professional Natural Scientist with the South African Council of Natural Scientific Professions. She has successfully completed the Environmental Management System Auditor/Lead Auditor course based on ISO 14001:2015 offered by Bureau Veritas in 2016. This course is certified by the International Register for Certificated Auditors (IRCA). To date, Andisiwe has worked on several aspects of environmental management including basic assessments, water quality monitoring and environmental compliance audits. Kwindla is the founding member of Thaya Trading Enterprise. He completed an M. Sc. degree in Chemistry with the University of Johannesburg; currently, he is studying towards an LLB degree through UNISA. The Director of Thaya Trading Enterprise has completed courses with the University of South Africa, such as: “Interpretation of Statutes” and “Environmental Law”. Based on completion of the course on Interpretation of Statutes, it is noteworthy that the company (TTE) is under the leadership of an individual who understands the contextual approach to interpretation of all pieces of legislation in South Africa. That includes the Mine Health and Safety Act; Mineral and Petroleum Resources Development, 2002 (Act No. 28 of 2002); National Environmental Management Waste Act, 2008 (Act No. 59 of 2008), National Water Act, 1998 (Act No. 36 of 1998) [as amended], among others. Kwindla is registered as a Professional Natural Scientist with the South African Council for Natural Scientific Professions. He has been involved in EIA’s for three (3) years.

1.2. Expertise of the EAP

The qualifications and summary of expertise of the Environmental Assessment Practitioner are also presented in Table 2. Further information on the expertise of EAP, please see Appendix 1.

2 Property Description

2.1 Property Information

Some details on the property description are presented in Table 3.

Table 3: Description of Property

Farm Name:	Farm Marsh 467 (Remaining Extent), John Taolo Gaetsewe District, Northern Cape.
Application area (Ha)	Approximately 35 Ha
Magisterial district:	Kathu, John Taolo Gaetsewe
Distance and direction from nearest town	The application area is located approximately 10 Km North West of Kathu, Northern Cape
21 digit Surveyor General Code for each farm portion	0000C04100000000467000001

2.2 Locality Map

The Farm Marsh Hydroponics Systems Project is located within an area that is zoned for mining. The area of application is does not within a protected area and is therefore relatively less threatened. The findings of the proposed Biodiversity Assessment to be conducted will provide guidance of what trees are protected within the application area.

Two (2) wetland pans occur in the proximity of the proposed development. Locality of the proposed development is depicted in **Figure 1**.

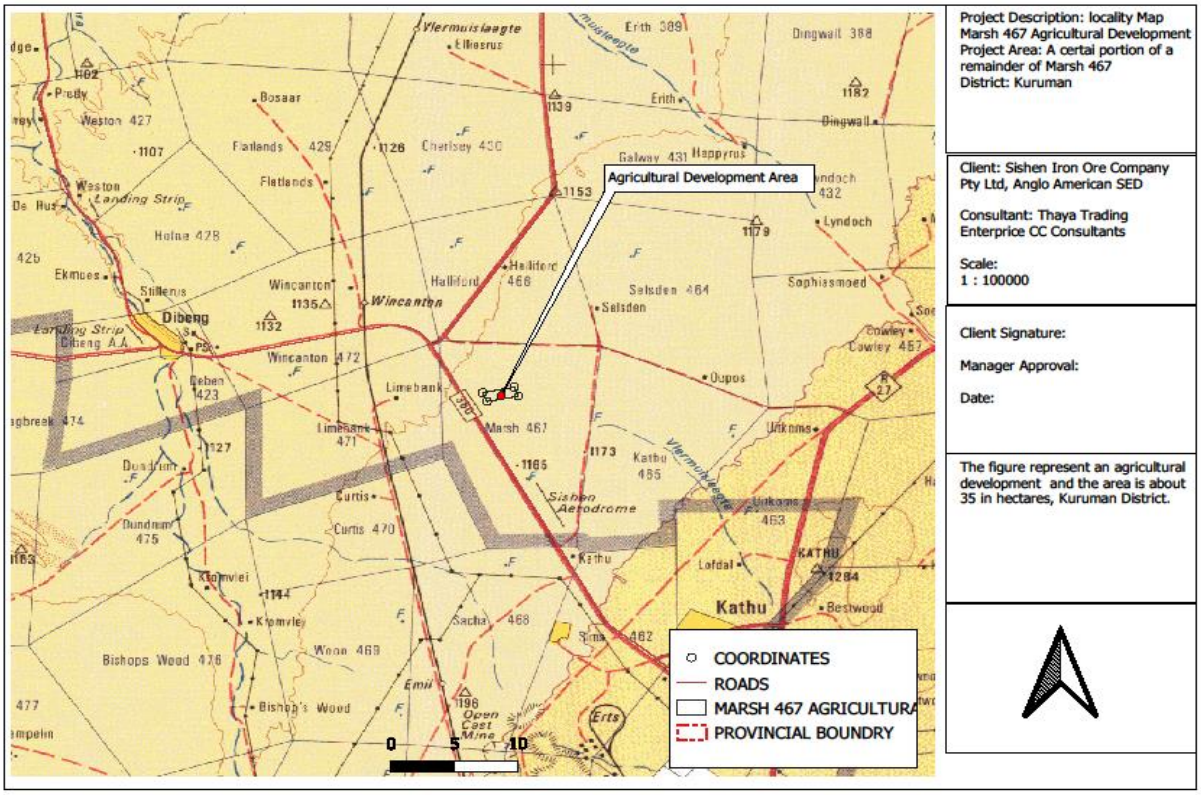

Figure 1: Locality Map John Taolo Gaetsewe District

3 Description of the Scope of Activity

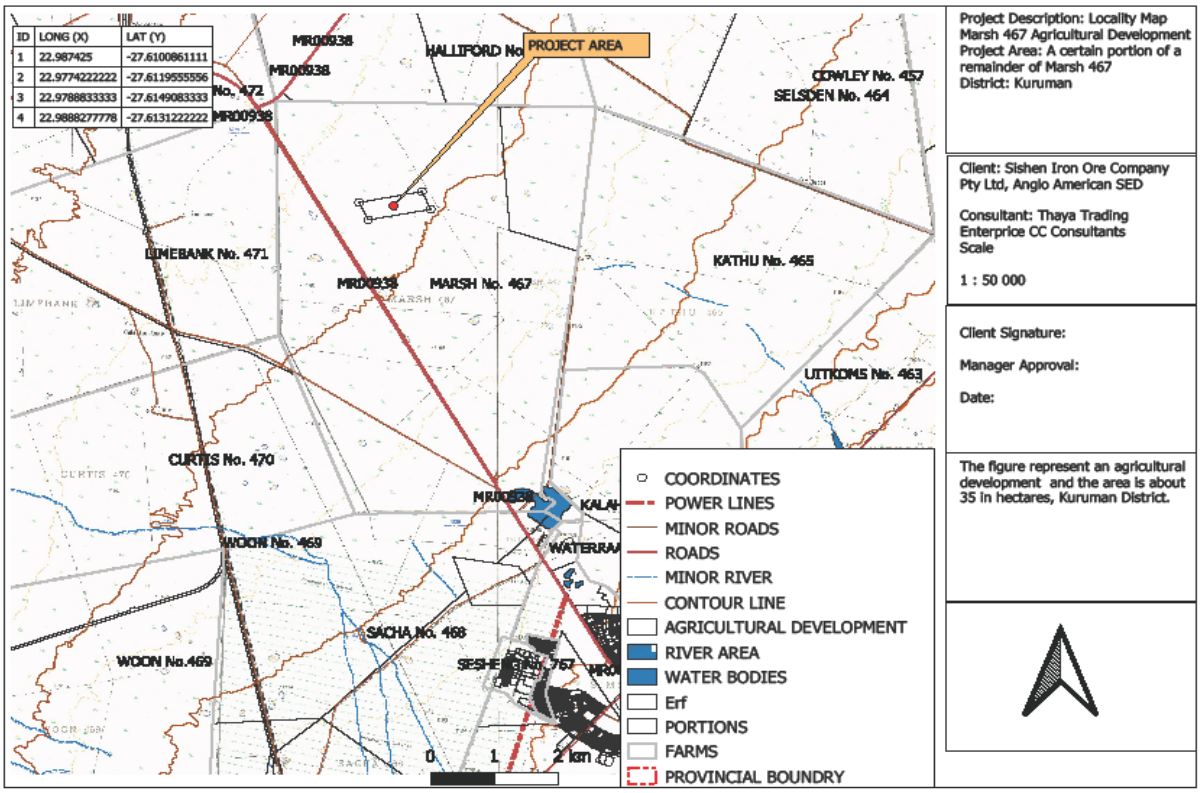

Figure 2: Map shows the location, and area (hectares) of all the aforesaid main and listed activities

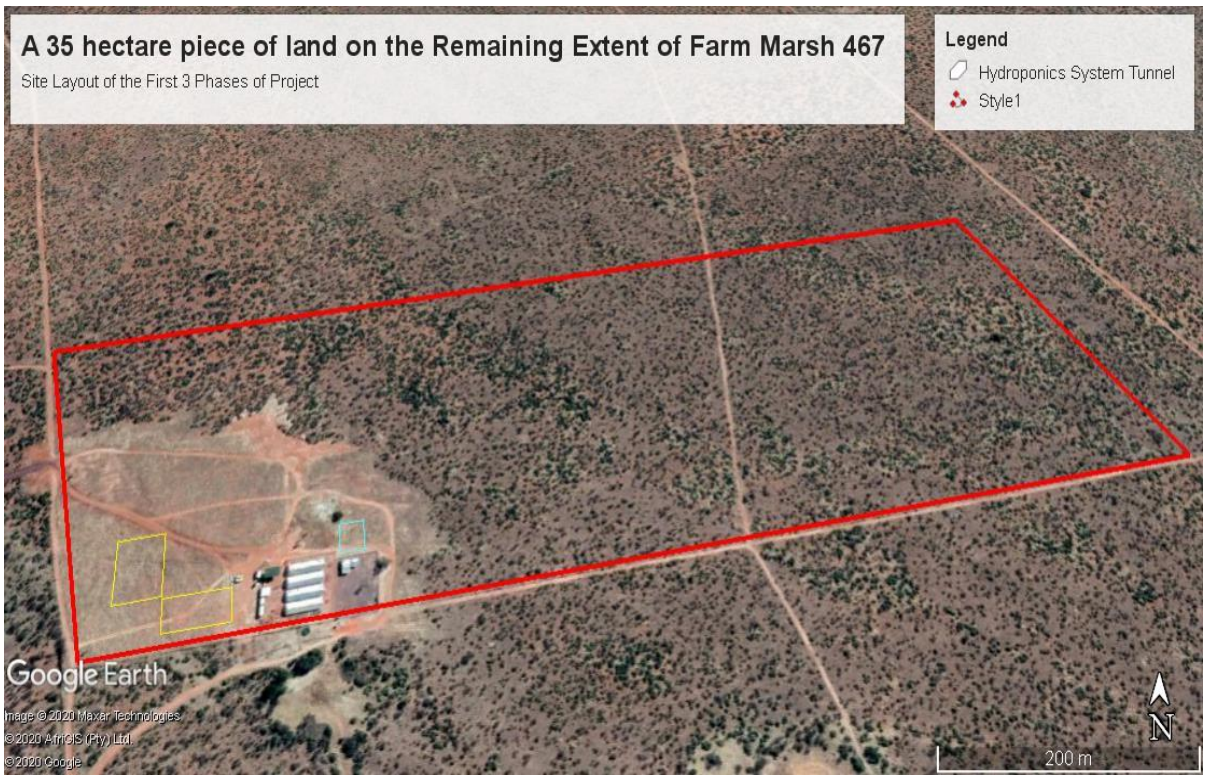

Figure 3: Map shows the location and infrastructure (To Be Revised Upon receipt of Further Details)

3.1 Listed Activities

The listed and specified activities potentially triggered by the proposed agricultural development are indicated in Table 4.

Table 4: Listed and Specified Activities

Listed Activities		
Government Notice Regulation 325 – Listing Notice 2		
Activity Name	**Stated (Description)**	**Applicability**
1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more, excluding where such development of facilities or infrastructure is for photovoltaic installations and occurs — (a) within an urban area; or (b) on existing infrastructure.	The capacity of the proposed photovoltaic facility is estimated at 50 megawatts and it occurs outside an urban area.
15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for— (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	The total area that is going to be developed for agricultural use is 35 hectares of land in size. Natural vegetation of the entire 35 hectare area is going to be cleared.
Listed Activities		
Government Notice Regulation 327 – Listing Notice 1		
Activity Name	**Stated (Description)**	**Applicability**
8	The development and related operation of hatcheries or agri-industrial facilities outside industrial complexes where the development footprint covers an area of 2 000 square metres or more.	The total area that is going to be developed for agricultural use is 35 hectares of land in size.
9	The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water— (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where— (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or (b) where such development will occur within an urban area.	Infrastructure in excess of 1 000 metres in length for bulk transportation of water with an internal diameter of 0,36 meters may be developed to feed the 3 Ha Pivot from Reservoir may be necessary. However, this is going to be confirmed with the applicant.
10	The development and related operation of infrastructure exceeding 1 000 metres in length for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes – (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more;	Infrastructure in excess of 1 000 metres in length for bulk transportation of process water or return water with an internal diameter of 0,36 meters may be developed to feed the 3 Ha Pivot from Reservoir may be necessary. However, this is going to be confirmed with the applicant.

11	The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; or (ii) inside urban areas or industrial complexes with a capacity of 275 kilovolts or more; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	It is anticipated that infrastructure for transmission and distribution of electricity is going to be developed. However the capacity is yet to be confirmed if it is more than 33 kilovolts.
45	The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure— • has an internal diameter of 0,36 metres or more; or • has a peak throughput of 120 litres per second or more; and (a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion— (aa) relates to transportation of water or storm water within a road reserve or railway line reserve; or (bb) will occur within an urban area.	The expansion of infrastructure in excess of 1 000 metres in length for bulk transportation of water with an internal diameter of 0,36 meters may be developed to feed the 3 Ha Pivot from Reservoir around the 1 Ha area that has been developed already may be necessary. However, this is going to be confirmed with the applicant. The throughput capacity of the facility or infrastructure will be increased by 10% or more.
46	The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure— • has an internal diameter of 0,36 metres or more; or • has a peak throughput of 120 litres per second or more; and (a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion— (aa) relates to the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes within a road reserve or railway line reserve; or (bb) will occur within an urban area.	The expansion of infrastructure in excess of 1 000 metres in length for bulk transportation of process water, return water with an internal diameter of 0,36 meters may be developed to feed the 3 Ha Pivot from Reservoir around the 1 Ha area that has been developed already may be necessary. However, this is going to be confirmed with the applicant.
48	The expansion of— [	The existing canals are going to be expanded by more than 100

	(i) canals where the canal is expanded by 100 square metres or more in size; (ii) channels where the channel is expanded by 100 square metres or more in size; (iii) bridges where the bridge is expanded by 100 square metres or more in size; (iv) dams, where the dam, including infrastructure and water surface area, is expanded by 100 square metres or more in size; (v) weirs, where the weir, including infrastructure and water surface area, is expanded by 100 square metres or more in size; (vi) bulk storm water outlet structures where the bulk storm water outlet structure is expanded by 100 square metres or more in size; or (vii) marinas where the marina is expanded by 100 square metres or more in size;] (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more; where such expansion [or expansion and related operation] occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding— (aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such expansion occurs within an urban area; or (ee) where such expansion occurs within existing roads, road reserves or railway line reserves.	square metres or more.
49	[The expansion of - (i) jetties by more than 100 square metres; (ii) slipways by more than 100 square metres; (iii) buildings by more than 100 square metres; (iv) boardwalks by more than 100 square metres; or (v) infrastructure or structures where the physical footprint is expanded by 100 square metres or more;	The hydroponics system that is already developed on a 1 hectare area is going to be expanded by more than 100 square metre physical footprint.

	where such expansion or expansion and related operation occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding (aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such expansion occurs within an urban area; or (ee) where such expansion occurs within existing roads or road reserves.] …	
56	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.	The roads are going to be lengthened by more than 1 kilometre where no reserve exists on the remaining extent of Farm Marsh 467.
67	Phased activities for all activities— (i) listed in this Notice, which commenced on or after the effective date of this Notice [;] or [(ii)] similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices; [where any phase of the activity may be below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold;]	All processes of the proposed Farm Marsh Hydroponics Systems Project are going to be introduced taking a phased in approach.
Listed Activities		
NEM:WA - Government Notice Regulation 921 – 29 November 2013		
	Handling of General Waste (The waste licensing process for listed activities under Schedule 1 in the National Environment Management Waste Act 2008 is as defined in the environmental impact assessment (EIA) regulations made under section 24(5) of the National Environment Management Act 2008 (NEMA) No. 107 of 1998. This is a Category A Waste License Application for listed activities under Schedule 1 in the National Environment Management Waste Act 2008.)	Waste is going to be generated during both construction and operational phases of the proposed project.

An application for Environmental Authorisation has been lodged with the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform.

3.2 Description of the Activities

3.2.1 Project Overview

Sishen Iron Ore Company (Pty) Ltd, Anglo American SED proposes to develop a Farm Marsh Hydroponics Systems Project. The proposed agricultural project is going to be powered using Photovoltaic Plant and related or associated infrastructure. The power generation capacity of the proposed Photovoltaic Plant is estimated at 50 Megawatts.

The project is going to utilise Photovoltaic Plant (PV) energy generation facilities as a power source in phases and associated electrical infrastructure on Farm Marsh 467. The application area covers approximately 35 hectares in size. It is located in the John Taolo Gaetsewe District, Northern Cape Province, South Africa.

The proposed Farm Marsh Hydroponics Systems Project, using Photovoltaic Plant energy generation facility as a power source is expected to be located on a particular site after consideration of socio-economic and environmental impacts. Generally, an irrigation project requires sufficient availability of water for sustainability. The planned study is going to consider all necessary factors in order to investigate potential impacts of the proposed development against the triple bottom-line of social, economic and environmental impacts.

The concept of sustainable development provides a framework for reconciling socio-economic development and environmental protection. The constitutional framework: Sustainable development is recognised in the Bill of Rights (s 24(b) of the Constitution). In terms of this section, the government must give effect to this right through reasonable legislative and other measures. The Constitution also provides for cooperative governance, which facilitates the implementation of sustainable development.

Sustainable development forms the basis of environmental policy. The White Paper on Environmental Policy states that sustainable development is an overarching goal. The National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended is the

framework legislation for the environment and it contains uniform norms and standards applicable to all environmental legislation. One of these norms is sustainable development. NEMA defines sustainable development as “the integration of social, economic and environmental factors into planning, implementation and decision-making to ensure that development serves present and future generations”. Sustainable development underpins many principles and objectives of environmental management set out in NEMA. NEMA also provides the framework for compliance with and the enforcement of environmental legislation. Sustainable development is included in sectorial legislation relating to the environment (i.e. the National Water Act, 1998 (Act No. 36 of 1998), the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) and the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000)).

The proposed development, intrinsically, requires the implementation of procedures and mechanisms to facilitate co-operative environmental governance. Chapter 3 of the NEMA deals with such procedures. Section 11 of NEMA makes provision for environmental implementation plans and management plans. Every national department listed in Schedule 2 must prepare an environmental management plan. The provinces and departments must further ensure that these environmental implementation or management plans are consistent. The purpose and objectives of these plans are to:

- coordinate and harmonise the environmental policies, plans, programmes and decisions of the various listed national departments and of provincial and local spheres of government, which must be done to minimise the duplication of procedures and functions and to promote consistency;
- give effect to the principle of cooperative government in Chapter 3 of the Constitution;
- secure the protection of the environment across the country as a whole;
- prevent unreasonable actions by provinces in respect of the environment, which actions are prejudicial to the economic or health interests of other provinces or the country as a whole; and
- enable the Minister to monitor the achievement, promotion and protection of a sustainable environment.

The Northern Cape Province is, by enlarge, a semi-arid part of South Africa. The limited Surface Water resources in the province impact negatively on the possibility of developing agricultural projects. However, an alternative solution to the challenge exists. Water for irrigation projects could be sourced from groundwater resources. The soil type is also another factor to consider when planning or proposing an agricultural development project. In order to achieve sustainable irrigation of soils, the appropriate soils need to be identified, to prevent water logging and salinization. During irrigation, considerable amounts of salts are applied with the water. When water is absorbed by plant roots through transpiration, the salts are precipitated in the soil and a long-term result is the increased concentration of salts called salinization. Salinization in the soil can hamper crop growth and in extreme cases salinization will render the soil non-vegetative. These effects can be negated with proper management on soils with specific properties. For this reason, the Department of Agriculture; Northern Cape, has provided guidelines to which soil properties must adhere before a ploughing license can be granted. A ploughing license is one of the requirements, which must be fulfilled before the Department of Water, and Sanitation will grant water rights for irrigation. An irrigation potential soil survey will investigate the morphological, physical and chemical properties of soils related to drainage, salinization and sodicity, and indicate the areas where the soils are suitable for irrigation.

Farmers in the Northern Cape Province were some of the hardest hit by factors affecting the agricultural sector (such as drought) throughout our country in the past four (4) years. Some of these factors were beyond the powers of South Africa's government as they included the global trends. Among global trends, were the shrinking economies, the volatility of the currencies including the rand, posing risks with regard to imported production inputs and related equipment, whilst benefiting the produce export industry. There is some direct correlation between the strength of our currency and the costs of seed, fertilizer, equipment and oil or fuel.

The increase in population growth that was experienced globally in the past century continued to create challenges as well as opportunities for various sectors of our economy, including the agricultural sector. An increase in population growth is directly proportional to an increase in the market for the farming and agro-processing sector. If this direct proportionality between population growth and the market is not properly catered for,

increasing population may also present an increased state of household food insecurity and destabilise the necessary balance that has to be sustained between population growth and food security. The unemployment rate in South Africa is reaching alarming levels. The Northern Cape Province is no exception to having high unemployment rate. A need does exist for projects that create jobs to be developed. In order to attempt to meet the need for job creation among other things in the John Taolo Gaetsewe, the Department of Rural Development and Land Reform commissioned a Master Plan to inform way forward with the John Taolo Gaetsewe District Municipality Agri-Park initiative in year 2016. The overall purpose of agricultural and rural economic transformation is to improve the quality of life of rural households, enhancing food security, creating jobs, alleviate poverty and address the skewed economic landscape through a broader base of rural industrial and agricultural production and exploiting the varied economic potential of each rural district municipality. The proposed development is thus in line with the JTG DM Agri-Park Master Plan.

"If available, accurate site specific measurements using soil water sensors that represent the whole field could be preferable over model predicted irrigation requirements. In the absence of such measuring devices, site specific calendars can be developed without considering rainfall using the SWB crop growth model. These calendars should be modified when rain falls by subtracting rainfall from the recommended irrigation amount. Therefore, irrigators can follow different strategies for making a decision on when and how much to irrigate depending on particular situations" *WRC – Irrigation Guidelines for Mixed Pastures and Lucerne - 2016*.

South Africa is exposed to some of the highest intensities of solar radiation in the World. The average daily solar radiation in South Africa varies between 4.5 and 6.5 kWh/m^2 (16 and 23 MJ/m^2). The Northern Cape Province experiences even more intense solar radiation than the other parts of South Africa (**Figure 4**) which is indicative of high solar resource potential for solar water heating applications, solar photovoltaic and solar thermal power generation.

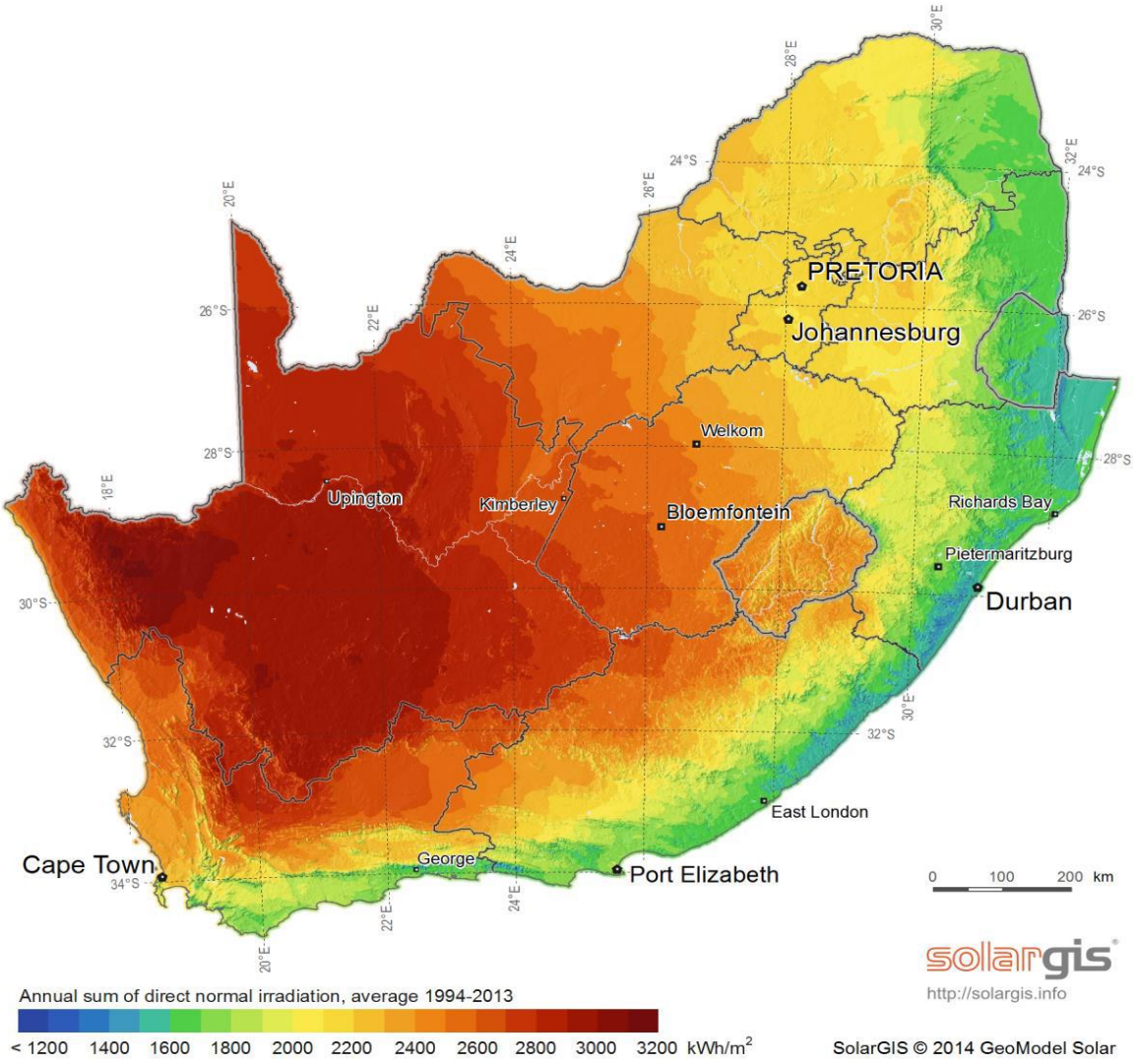

Figure 4: Annual incoming short wave radiation for South Africa (SolarGIS)

This piece of work focuses on the construction and operation Farm Marsh Hydroponics System Project, using Photovoltaic Plant as power source and related or associated infrastructure.

3.2.2 Status Quo

The site is located between, Kathu, Northern Cape & Stokkiesdraai T-junction towards Hotazel on the Farm MARSH. Part of the area is cleared and levelled.

Total Hectares that will be developed for Agriculture use will be 35 hectares of Land.

3.1.1.1.1 Construction of a Solar powered Submersible Pump system

- Procurement of Submersible Pump & Pipes (60 m); and

- Pump must be solar powered.

3.1.1.1.2 Construction of game fence

- 620 m Game Fencing 2.4 m high.

3.1.1.1.3 Procurement of Agricultural equipment

- Construction of Facilities.

3.1.1.1.4 Construction of Hydroponic Systems

- All Phases from 1 to 25 will consist of 6 Hydroponic structures/tunnels and will cover an area of 1ha of land per phase totalling to 25ha of land; and
- Currently only phase 1 is being developed and impacts the use of 1 hectare of land.

3.1.1.1.5 Hydroponic Development Phases

- Phase 1 to 25 scope of works will be as per above point 1.3.6.2.8 and points below; and
- The activities for development of the 25 hectares for all 25 phases will be as follows:

    - Clearing of site to the total of 1 hectare of land per phase will consist of the removal of all trees and topsoil to the nominal depth of 150mm for agricultural Development purposes;
    - Deep excavations for footing of structures and underground water tank to the maximum depth of 2.5 metres; and
    - Construction of Tunnels, underground water tanks and Solar systems.

- Construction and operation of bee harvesting and honey processing facility and associated beeswax product-related manufacturing.

Hydroponics crop production is relatively more expensive than the conventional field crop irrigation, especially at construction phase. Highly specialised and affordable resources are needed for the operations of hydroponics systems in order improve economic viability of a project. In an attempt to reduce Capital Cost, among other benefits, climate-controlled greenhouse structures are generally erected when a prospective farmer intends to produce high yields of crops of high value. This is applicable even to the production of vegetables (cucumbers, tomatoes) and herbs. Generally, the fresh produce of hydroponics systems is harvested continuously (weekly / bi-weekly). A balance may need to be established between the production yields, period of growth, capability to meet weekly / bi-weekly targets and value.

Additionally, the proposed project includes the construction and operation of bee harvesting and honey processing facility and associated beeswax product-related manufacturing.
Honey has been used for human consumption for centuries. The health benefits associated with the consumption of honey have been known for centuries too. However, honey remains relatively of lesser demand to consumers than sugar. This may be attributed to the fact that honey is more expensive to purchase than sugar. The producer of honey may need to target specific groups for market. The by-products of bee-harvesting and / or honey processing process include the potential use of beeswax in the manufacturing of exotic soaps, hair-care products, garden products and candles among many others.

Despite the fact that a soil survey was conducted, it would seem that neither field grazing nor on soil irrigation is planned to be undertaken at this stage by the applicant.

3.2.3 Irrigation Project

3.2.3.1 The Brief History of Irrigation Development in South Africa

The development of irrigation schemes may be divided into two (2) categories. These categories are the commercial sector and the smallholder irrigation schemes (SIS) (WRC, 2008).

In the fourth quota of the 19th Century, in 1876, ostriches were 22 000 in number. This number increased significantly from that period to reach 726 000 ostriches by 1911. As the number of ostriches increased, the number of ostrich feathers also increased. By 1909, the export of feathers increased to £ 2.1 million. As a consequence, there was a need to grow feed for ostriches as their numbers increased. The need to grow lucerne resulted in a spurt in the growth of irrigation. However, there was a significant drop in the ostrich feather market between 1913 and 1914. This decline in market was due to the fact that World War - I broke out in 1914. This resulted in the stagnation of irrigation development. In addition, the Cape Province suffered a drought between 1914 and 1916 that saw the first shift from flood irrigation to more conservation-based techniques (WRC, 2008).

During the great depression in the 1930s, there was a tremendous loss of jobs and money. Urbanisation took place. In an effort to reverse this urbanisation, the then government of the day established a number of government irrigation economy schemes where farmers could be settled. In this period, the Vaalharts and the Loskop Irrigation Schemes were established, which remain the two largest government irrigation schemes in the country (WRC, 2008).

Smallholder irrigation schemes have the potential to make a significant local socio-economic impact by contributing to improved food security, poverty alleviation and increased employment. Indeed, in many instances, they are the main economic activities in their areas. Unfortunately, a large number of smallholder irrigation schemes have collapsed while the rest are suffering reduced efficiency due to various reasons. Due to the importance of these schemes, their effective revitalization is extremely important.

A number of irrigation revitalization initiatives have previously, and are currently, being undertaken in South Africa. These initiatives range from rehabilitation initiatives to the more

broad-based initiatives, with multi-disciplinary teams tackling the wide-ranging issues linked to agriculture production in smallholder irrigation schemes. However, the main intervention practiced currently in South Africa at present, has focused on the rehabilitation of infrastructure and not on the more holistic development philosophy of revitalization. In some instances, after rehabilitation interventions were undertaken, black farmers were encouraged to enter into joint ventures and 'strategic partnerships' as a means of promoting entry into an agricultural commercial enterprise. However, this has rendered many beneficiary farmers to become landowners who only collect rent.

The literature review on experiences from both local and international initiatives has shown that infrastructure–centred intervention alone, or as a dominant part of the intervention, are highly unlikely to succeed. Farmers in smallholder schemes need support systems that go far beyond just the irrigation system if they are to improve their livelihoods significantly. Irrigation farming is a highly complex mix of social, agricultural, market and technical parameters, which are in a state of influx and interconnectedness. Thus, it is imperative that the multi-sectorial interests and dynamics are integrated into the planning of each revitalization project.

The main issue at stake is how to change deeply-rooted agricultural development philosophies, many which stick to modernist paradigms (infrastructure and mainstream agricultural production approaches) and to consider the merits of other ways of addressing the complexity of the revitalization of small holder irrigation schemes. The challenge lies in finding strategies that can steer the systems to implement the multi–sectorial revitalization programs and resist the pressure to drive the easy, but almost certain, road to failure of infrastructure-centred projects

3.2.4 Hydroponics Systems

Hydroponics can be described as the cultivation of plants without using soil. Hydroponic plants, vegetables, herbs, and flowers are planted in inert media that suitable for growth. As a requirement, nutrient-rich solutions, water and oxygen are supplied to the system. This system enables rapid growth, relatively higher yields, and superior quality. Contrary to conventional methods of growing plants in media where roots of plants perpetually search for nutrients that are necessary for growth and development, hydroponics systems do not

utilise the soil. In conventional plant growth methods, the plant root system is exposed directly to water and nutrition, the plant does not have to exert any energy in sustaining itself. In hydroponics systems, the energy the roots would have expended acquiring food and water can be redirected into the plant's maturation. As a result, leaf growth flourishes as does the blooming of fruits and flowers.

Plants sustain themselves through a process of photosynthesis. Plants capture sunlight with chlorophyll (a green pigment present in their leaves). They use the light's energy to split water molecules they've absorbed via their root system. The hydrogen molecules combine with carbon dioxide to produce carbohydrates, which plants use to nourish themselves. Oxygen is then released into the atmosphere, a crucial factor in preserving our planet's habitability. Plants do not need soil to photosynthesize. They need the soil to supply them with water and nutrients. When nutrients are dissolved in water they can be applied directly to the plant's root system by flooding, misting, or immersion. Hydroponic innovations have proven direct exposure to nutrient-filled water can be a more effective and versatile method of growth than traditional irrigation.

Hydroponic systems work by allowing minute control over environmental conditions like temperature and pH balance and maximized exposure to nutrients and water. Hydroponics operates under a very simple principle: provide plants exactly what they need when they need it. Hydroponics supply nutrient solutions tailored to the needs of the particular plant being grown. They allow you to control exactly how much light the plants receive and for how long. pH levels can be monitored and adjusted. In a highly customized and controlled environment, plant growth accelerates.

A simplified hydroponics system is shown in **Figure 5**.

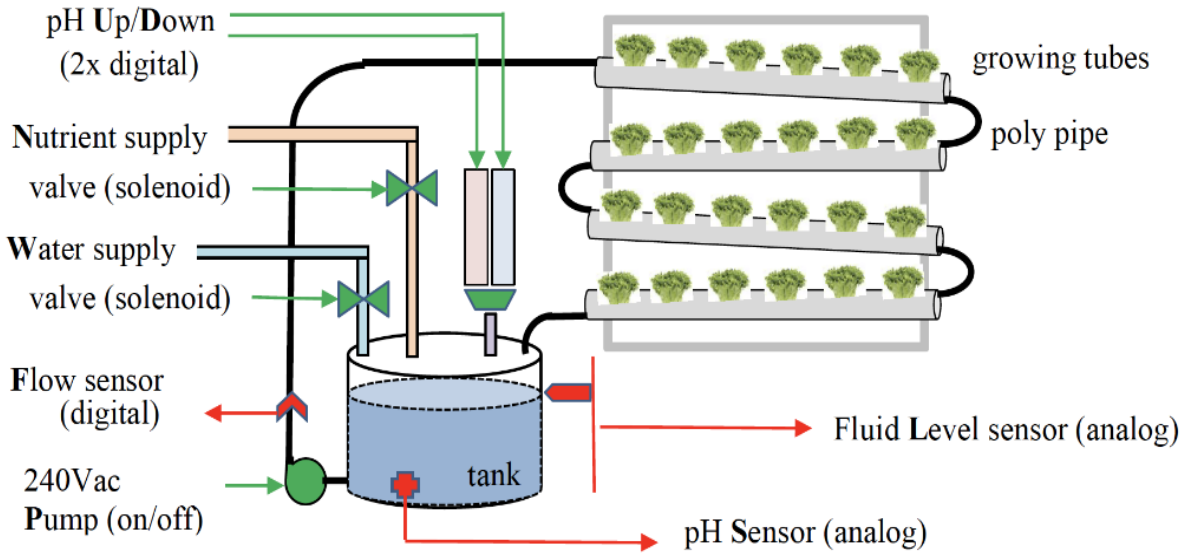

Figure 5: Basic configuration of equipment in hydroponics system

By controlling the environment of the plant, many risk factors are reduced. Plants grown in gardens and fields are introduced to a host of variables that negatively impact their health and growth. Fungus in the soil can spread diseases to plants. Wildlife like rabbits can plunder ripening vegetables from your garden. Pests like locusts can descend on crops and obliterate them in an afternoon. Hydroponic systems end the unpredictability of growing plants outdoors and in the earth. Without the mechanical resistance of the soil, seedlings can mature much faster. By eliminating pesticides, hydroponics produce much healthier and high-quality fruits and vegetables. Without obstacles, plants are free to grow vigorously and rapidly.

3.2.5 Photovoltaic Energy Generation Facility

Sishen Iron Ore Company (Pty) Ltd intends to develop a Farm Marsh Hydroponics Systems Project. The project is going to be powered using Photovoltaic plant. An overview of Photovoltaic Technology is depicted in **Figure 6**.

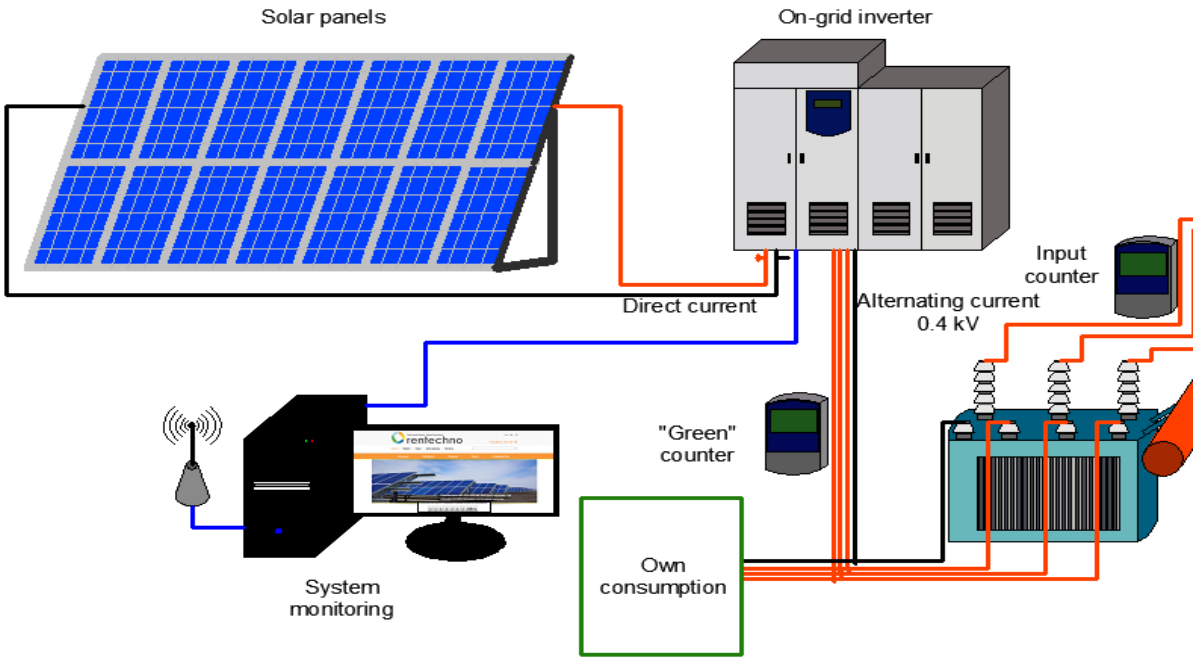

Figure 6: Overview of Photovoltaic Technology

3.2.6 Construction Phase

The construction-related activities of the proposed Farm Marsh Hydroponics Systems Project include the following:

- Vegetation clearance, removal of topsoil to a nominal depth of 150 mm and levelling;
- Construction of a Solar powered Submersible Pump system;
- Construction of Solar powered Pump station;
- Construction of game fence
- Procurement of Agricultural equipment as per Pricing sheet;
- Construction of Hydroponic Systems 25 Ha and associated resources, equipment, infrastructure and activities;
- Construction of a Solar power plant to provide power to the Hydroponic Systems and associated resources, equipment, infrastructure and activities;

- Construction of Irrigation System including Storage tanks;
- Construction of Clear view fencing; and
- Construction of bee harvesting and honey processing facility and associated beeswax product-related manufacturing facility.

3.2.7 Operational Phase

The operations of the proposed Farm Marsh Hydroponics Systems Project include the following:

- Operation and maintenance of a Solar powered Submersible Pump system;
- Operation and maintenance of Solar powered Pump station;
- Maintenance of game fence
- Maintenance of Agricultural equipment as per Pricing sheet;
- Operation and maintenance of Hydroponic Systems 25 Ha and associated resources, equipment, infrastructure and activities;
- Operation and maintenance of a Solar power plant to provide power to the Hydroponic Systems and associated resources, equipment, infrastructure and activities;
- Maintenance of Irrigation System including Storage tanks;
- Maintenance of Clear view fencing; and
- Operation and maintenance of bee harvesting and honey processing facility and associated beeswax product-related manufacturing.

3.2.8 Decommissioning Phase

The decommissioning objectives of the proposed Farm Marsh Hydroponics Systems Project include the following:

- Removal of a Solar powered Submersible Pump system;
- Demolition of Solar powered Pump station;
- Dismantling of Agricultural equipment;
- Demolition and dismantling of Hydroponic Systems 25 Ha and associated resources, equipment, infrastructure and activities;
- Demolition and dismantling of a Solar power plant to provide power to the Hydroponic Systems;

- Demolition and dismantling of Irrigation System including Storage tanks;
- Removal of Clear view fencing, if necessary;
- Restoration of pre-operations state of environment; and
- Demolition and dismantling of bee harvesting and honey processing facility and associated beeswax product-related manufacturing facility.

4 Policy and Legislative Context

In order to protect the environment and ensure that this development is undertaken in an environmentally responsible manner, there are a number of significant pieces of legislation that will be consulted for this study. After a brief scoping of applicable legislation these include but may not be limited to the following:

4.1 The Constitution of the Republic of South Africa, 1996

The Constitution of the Republic of South Africa, 1996 is the supreme law and the nucleus of all legislation in South Africa. The Constitution guarantees equality before the law, all the basic freedoms which human beings must enjoy, and must be reasonably entitled to, social and economic justice.

Section 24 of the Constitution states that:

"Everyone has the right:

- *to an environment that is not harmful to their health or well-being; and*
- *to have the environment protected, for the benefit of present and future generations through reasonable legislative and other measures that –*
    - *prevent pollution and ecological degradation;*
    - *promote conservation; and*
    - *secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."*

Section 24 of the Constitution therefore guarantees citizens of South Africa the right to an environment that is not harmful to human health or well-being, and specifically imposes a duty on the State to enact legislation and take necessary steps to ensure that the right is upheld and to ensure sustainable development through prevention, minimization of control of ecological degradation and pollution. As enshrined in the Bill of Rights, the environmental management objectives of proposed project is to ensure that present and future generations benefit from this development, to support sustainable development and the use of natural resources, whilst promoting justifiable socio-economic development in nearby communities to the project location.

4.2 NEMA and EIA Regulations published on 7 April 2017 (GN R327, GN R326, GNR325 and GN R324)

The Nation Environmental Management Act, 1998 (Act No. 107 of 1998) sets out a number of principles in the first two (2) chapters of the act to give guidance to applicant or proponents, private land owners, members of public and authorities on how to handle environmental matters. The NEMA is the national legal framework that regulates environmental issues. Various necessities such as cooperative environmental governance, compliance and non-compliance, enforcement, and regulating government and business impacts on the environment, underpin the NEMA. The NEMA, as the primary environmental legislation, is complemented by a number of sectoral laws governing mining, waste, air quality, biodiversity, marine living resources, forestry, protected areas, pollution and integrated coastal management. The triple bottom line principle proposes that development must be socially, environmentally and economically sustainable. Principle Number 4(a) states that all relevant factors must be considered, inter alia i) that the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied; ii) that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied; vi) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised; and viii) that negative impacts on the environment and on peoples' environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.

The national legal framework under which Environmental Impact assessments are undertaken is the National Environmental Management Act, 1998 (Act No. 107 of 1998) NEMA (as amended). The EIA studies under discussion are often complex as a result of many contributing factors. For purposes of remaining within the scope of work of this study, it is not necessary to discuss further these complexities. It is therefore important to highlight that the ultimate aim of EIA studies is to uphold environmental and socio-economic justice pertaining to any proposed development among other things. A definition of "environment" is given in section 1 of the NEMA. Section 2(2) of the NEMA urges sensitivity to the welfare of communities regarding their physical psychological, developmental, cultural and social interests. Development must be socially, environmentally and economically sustainable,

which requires that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimized and remedied.

The EIA Regulations (2017) under the NEMA consist of three (3) categories of activities namely: Listing Notice 1 Activities (GNR. 327 of 2017) which require a Basic Assessment study, Listing Notice 2 Activities (GNR. 325 of 2017) which require both a Scoping and an EIA study for authorisation and Listing Notice 3 Activities (GNR. 324 of 2017) which requires a Basic Assessment study for specific activities in identified sensitive geographical areas. The DEA is responsible for the authorisation of these activities.

4.3 The National Heritage Resources Act, 1999 (Act No. 25 of 1999)

The National Heritage Resources Act, 1999 (Act No. 25 of 1999) provides legal framework for the management of cultural and heritage resources in South Africa. Section 3 of the NHRA lists a wide range of phenomena under which resources may fall with the definition of heritage.

The NHRA was promulgated in order to introduce an integrated and interactive system for the management of the heritage resources, to promote good government at all levels, and empower civil society to nurture and conserve heritage resources so that they may be bequeathed to future generations and to lay down principles for governing heritage resources management throughout the Republic.

In terms of section 38 (subject to the provisions of subsections (7), (8) and (9) of the Act), any proponent who proposes to undertake a development categorised as:

- The construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
- The construction of a bridge or similar structure exceeding 50 m in length;
- Any development or other activity which will change the character of a site: - Exceeding 5 000 m² in extent;
    - Involving three or more existing erven or subdivisions thereof; or
    - Involving three or more erven or divisions thereof which have been consolidated within the past five years; or

    - The costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
- The re-zoning of a site exceeding 10 000 m^2 in extent; or
- Any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

The provincial/national offices of the South African Heritage Resource Agency (SAHRA) are going to be provided with all relevant documentation that will enable them to make an informed statutory comment as enshrined in the NHRA.

A Heritage Impact Assessment and a Palaeontological Impact Assessment (Desktop Study) are going be undertaken during the EIA Phase of the proposed Farm Mars Hydroponics Systems Project. These environmental specialist studies will be included in the EIA Reports that is going to be published for review by I&APs during the EIA Phase.

In order to comply with the South African Heritage Resources Agency (SAHRA) in terms of Section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA), a desktop Palaeontological Impact Assessment (PIA) is going to be completed for the proposed applications and findings and recommendations of specialist are going to be considered in the EIA.

4.4 The National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) makes provision for Section 21 Water Uses for which an application could be lodged and those that already exist. The NWA is the principal legal instrument relating to water resource management in South Africa and contains comprehensive provisions for the protection, use, development, conservation, management and control of the country's water resources. In addition, the management of water as a renewable resource must be carried out within the framework of environmental legislation, i.e. the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), under Regulations R324 to 327, of 07 April 2017.

A key aspect of the National Water Policy is Integrated Water Resources Management (IWRM). This recognises that water resources can only be successfully managed if the natural, social, economic and political environments in which water occurs and is used are taken into consideration. IWRM aims to strike a balance between the use of water resources for livelihoods and conservation of the resource whilst promoting social equity, environmental sustainability and economic growth and efficiency.

In addition to the National Water Act, 1998 (Act No. 36 of 1998) and the National Environmental Management Act, 1998 (Act No. 107 of 1998), the following legislation and guidelines/quality standards are applicable to hydrogeological investigations and assessments:

- National Water Act, 1998 (Act No. 36 of 1998);
- National Water Resource Strategy (NWRS, 1st Ed., September 2004);
- Department of Environmental Affairs and Development Planning's (DEA&DP) Guideline for Involving Hydrogeologists in EIA Processes (June 2005) (Snayman, 2005);
- Department of Water Affairs and Forestry's (DWAF) Integrated Water Resource Management: Guidelines for Groundwater Management in Water Management Areas in South Africa (DWAF, 2004).

The NWA defines eleven (11) consumptive and non-consumptive water uses:

- 21(a): Taking water from a water resource;
- 21(b): Storing water;
- 21(c): Impeding or diverting the flow of water in a watercourse;
- 21(d): Engaging in a stream flow reduction activity;
- 21(e): Engaging in a controlled activity;
- 21(f): Discharging waste or water containing waste into a water resource through a pipe, canal, sewer or other conduit;
- 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource;
- 21(h): Disposing in any manner of water which contains waste from, or which has been heated in any industrial or power generation process;
- 21(i): Altering the bed, banks, course or characteristics of a watercourse;

- 21(j): Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and,
- 21(k): Using water for recreational purposes.

Section 27 of the NWA specifies that the following factors regarding water use authorisation be taken into consideration:

- The efficient and beneficial use of water in the public interest;
- The socio-economic impact of the decision whether or not to issue a license;
- Alignment with the catchment management strategy;
- The impact of the water use and possible resource directed measures; and,
- Investments made by the Applicant in respect of the water use in question.

This EIA study underway is going to be used to support the Water Use Licencing Application Process.

4.4.1 Controlled Activities

The Minister of Human Settlement, Water and Sanitation is allowed to regulate activities which have a detrimental impact on water resources by declaring them to be controlled activities. The following are considered to be controlled activities:

- Irrigation of any land with waste or water containing waste generated through any industrial activity or by a water work;
- An activity aimed at the modification of atmospheric precipitation;
- A power generation activity which alters the flow regime or a water resource;
- Intentional recharging of an aquifer with any waste or water containing waste; and
- An activity which has been declared as such under Section 38.

No person may undertake a controlled activity unless such person is authorised to do so by or under this Act. The Minister may, by notice in the Gazette, in general or specifically, declare an activity to be a controlled activity. Such notice might be for a specific activity on a specific site.

4.5 The National Environmental Management: Waste Act, 2009 (Act No. 59 of 2009)

The National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) has been developed as part of the law reform process enacted through the White Paper on Integrated Pollution and Waste Management and the National Waste Management Strategy (NWMS).

The objectives of the NEM:WA relate to the provision of measures to protect health, well-being and the environment, to ensure that people are aware of the impact of waste on their health, well-being and the environment, to provide for compliance with the measures, and to give effect to section 24 of the Constitution in order to secure an environment that is not harmful to health and well-being.

Government Notice Regulations 921 (of 29 November 2013) promulgated in terms of Section 19(1) of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) determine that no person may commence, undertake or conduct a waste management activity listed in the schedule unless a license is issued in respect of that activity.

4.6 Agricultural Laws Rationalisation Act, 1998 (Act No. 72 of 1998)

The Agricultural Laws Rationalisation Act, 1998 (Act No. 72 of 1998) was enacted in order to provide for the rationalisation of certain laws relating to agricultural affairs that remained in force in various areas of the national territory of the Republic prior to the commencement of the Constitution of the Republic of South Africa; and to provide for matters connected therewith.

The agricultural laws that were promulgated after the enactment of the Agricultural Laws Rationalisation Act have to be consistent with the provisions of the Constitution.

4.7 National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)

The object of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) is to protect the environment by providing reasonable measures for the protection and enhancement of the quality of air in South Africa; the prevention of air pollution and ecological degradation; and securing ecologically sustainable development while promoting justifiable economic and social development.

Government Notice Regulation 248 (of 31 March 2010) promulgated in terms of Section 21(1)(a) of the National Environmental Management Act: Air Quality Act (Act No. 39 of 2004) determine that an Atmospheric Emission License (AEL) is required for certain listed activities, which result in atmospheric emissions which have or may have a detrimental effect on the environment. The Regulation also sets out the minimum emission standards for the listed activities. It is not envisaged that an Atmospheric Emission License will be

required for the proposed development. However, the applicant will take reasonable steps to prevent, reduce the emission of any offensive odours.

4.8 National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEM:BA) provides for "the management and conservation of South Africa's biodiversity within the framework of the NEMA, the protection of species and ecosystems that warrant national protection, and the use of indigenous biological resources in a sustainable manner, amongst other provisions". The NEM:BA specifies that the state is the custodian of South Africa's biological diversity and is committed to respect, protect, promote and fulfil the constitutional rights of its citizens.

Furthermore, the NEM:BA prohibits loss of biodiversity through habitat loss, degradation or fragmentation must be avoided, minimised or remedied. The loss of biodiversity includes inter alia the loss of threatened or protected species. Biodiversity offsets are a means of compensating for the loss of biodiversity after all measures to avoid, reduce or remedy biodiversity loss have been taken, but residual impacts still remain and these are predicted to be medium to high. Chapter 5 of NEM:BA (Sections 73 to 75) regulates activities involving invasive species, and lists duty of care as follows:

- the land owner/land user must take steps to control and eradicate the invasive species and prevent their spread, which includes targeting offspring, propagating material and regrowth, in order to prevent the production of offspring, formation of seed, regeneration or re-establishment;
- take all required steps to prevent or minimise harm to biodiversity; and
- ensure that actions taken to control/eradicate invasive species must be executed with caution and in a manner that may cause the least possible harm to biodiversity and damage to the environment.

An amendment to the NEM:BA has been promulgated, which lists 225 threatened ecosystems based on vegetation types present within these ecosystems. Should a project fall within a vegetation type or ecosystem that is listed, actions in terms of NEM:BA are triggered. Based on the preliminary sensitivity screening undertaken for the proposed site, none of the threatened ecosystems occur within the study area. This will be confirmed as part of the Ecological Impact Assessment study undertaken during the EIA Phase.

4.9 National Forests Act, 1998 (Act No. 84 of 1998)

The National Forest Act, 1998 (Act No. 84 of 1998) allows for the protection of certain tree species. The Minister has the power to declare a particular tree to be a protected tree. According to Section 12 (1) d (read with Sections (5) 1 and 62 (2) (c)) of the National Forest Act (Act 84 of 1998), a licence is required to remove, cut, disturb, damage or destroy any of the listed protected trees. The most recent list of protected tree species was published in November 2014. The Department of Agriculture, Forestry and Fisheries (DAFF) is authorised to issue licences for any removal, cutting, disturbance, damage to or destruction of any protected trees. The protected trees that commonly occur in this region are *Acacia erioloba* and *Boscia albitrunca*. The presence of these trees on site will be confirmed as part of the Ecological Impact Assessment to be conducted during the EIA Phase.

4.10 Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)

The objectives of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) are to provide for the conservation of the natural agricultural resources of South Africa by the:

- maintenance of the production potential of land;
- combating and prevention of erosion and weakening or destruction of the water sources; and
- protection of the vegetation and the combating of weeds and invader plants.

The CARA states that no land user shall utilise the vegetation of wetlands (a watercourse or pans) in a manner that will cause its deterioration or damage. This includes cultivation, overgrazing, diverting water run-off and other developments that damage the water resource. The CARA includes regulations on alien invasive plants. According to the amended regulations (GN R280 of March 2001), declared weeds and invader plants are divided into three categories:

- Category 1 may not be grown and must be eradicated and controlled;
- Category 2 may only be grown in an area demarcated for commercial cultivation purposes and for which a permit has been issued, and must be controlled; and

- Category 3 plants may no longer be planted and existing plants may remain as long as their spread is prevented, except within the flood line of watercourses and wetlands. It is the legal duty of the land user or land owner to control invasive alien plants occurring on the land under their control.

Should alien plant species occur within the study area; this will be managed in line with the EMPr. Rehabilitation after disturbance to agricultural land is also managed by CARA. The DAFF reviews and approves applications in terms of these Acts according to their Guidelines for the evaluation and review of applications pertaining to renewable energy on agricultural land, dated September 2011.

4.11 Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970)

A change of land use (re-zoning) for the development on agricultural land needs to be approved in terms of the Subdivision of Agricultural Land Act, 1970 (Act No. 70 of 1970) (SALA). This is required for long term lease, even if no subdivision is required.

4.12 Development Facilitation Act, 1995 (Act No. 67 of 1995)

The Development Facilitation Act, 1995 (Act No. 67 of 1995) (DFA) sets out a number of key planning principles which have a bearing on assessing proposed developments in light of the national planning requirements. The planning principles most applicable to the study area include:

- Promoting the integration of the social, economic, institutional and physical aspects of land development;
- Promoting integrated land development in rural and urban areas in support of each other;
- Promoting the availability of residential and employment opportunities in close proximity to or integrated with each other;
- Optimising the use of existing resources including such resources relating to agriculture, land, minerals, bulk infrastructure, roads, transportation and social facilities;
- Contributing to the correction of the historically distorted spatial patterns of settlement in the Republic and to the optimum use of existing infrastructure in excess of current needs;

- Promoting the establishment of viable communities; and
- Promoting sustained protection of the environment.

4.13 Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)

The Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013) was promulgated in order to enhance planning and land use management efficiently and effectively. The SPLUMA enable urban areas to drive spatial transformation.

4.14 Other Relevant Pieces of Legislation

- National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003);
- Agricultural Laws Rationalisation Act, 1998 (Act No. 72 of 1998);
- Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983);
- National Heritage Resources Act, 1999 (Act No. 25 of 1999);
- Fencing Act, 1963 (Act No. 31 of 1963);
- Electricity Act, 1987 (Act No. 41 of 1987);
- Electricity Regulations Amendments (August 2009);
- Biodiversity Act, 2004 (Act No. 10 of 2004);
- Hazardous Substance Act, 1973 (Act No. 15 of 1973);
- Agricultural Product Standards Act, 1993 (Act No. 129 of 1993);
- Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and Regulations;
- Road Transportation Act, 1977 (Act No. 74 of 1977)
- Civil Aviation Authority Act, 1998 (Act No. 40 of 1998); and
- Civil Aviation Act, 2009 (Act No. 13 of 2009) and Civil Aviation Regulations (CAR) of 1997;

4.14.1 Provincial Legislation

i. Northern Cape Nature Conservation Act, 2009 (Act No. 09 of 2009)

The Northern Cape Nature Conservation Act, 2009 (Act No. 09 of 2009) and in particular the Northern Cape Conservation promotes the protection of listed species. The Northern Cape Nature Conservation Act provides for sustainable development in terms of establishing and maintaining balance in the use of natural resource and protection or conservation thereof.

The Act includes six schedules, as follows:

- Schedule 1 - Specially Protected species;
- Schedule 2 - Protected species;
- Schedule 3 - Common indigenous species;
- Schedule 4 - Damage causing animal species;
- Schedule 5 - Pet species; and
- Schedule 6 - Invasive Species.

With regards to protected flora, the Northern Cape Nature Conservation Act includes a list of protected flora. The plant species potentially present within the proposed project area will be identified as part of the Biodiversity Assessment as proposed. However, it will be recommended as part of the EMPr, that a detailed plant search and rescue operation be conducted before the final design process and prior to the commencement of surface disturbances. If any of the listed species are found, the relevant permits should be obtained by the proponent prior to their relocation or removal. In addition, the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform must be consulted before the planned clearance of indigenous vegetation on site takes place.

ii. The Provincial Spatial Development Framework for the Northern Cape (Office of the Premier of the Northern Cape, 2012)

The Provincial Spatial Development Framework (PSDF) provides for developmental planning to in consistence with the provincial legislation. In the province of the Northern Cape where agriculture and mining are predominant, solar and wind renewable energy are now emerging as some of the province's major activities.

The spatial vision for the province outlines a well-structured system of sustainable land-use zones that support the Northern Cape's economy vested in the primary economic sectors, in particular, mining, agriculture, tourism, and the energy industry.

5 Need and Desirability

5.1 Agricultural Development

Sishen Iron Ore Company (Pty) Ltd proposes an Agricultural Development Project on a 35 hectare area of Farm Marsh 467 (Remaining Extent). The area of application is not zoned for the proposed development; rather, it is zoned for mining. However, the re-zoning process is going to ensue. The applicant is also the landowner who does not require funding from external sources to develop the proposed project. The applicant is in collaboration with Gamagara Local Municipality, among others, in developing Farm Marsh Hydroponics Systems Project. Sishen Iron Ore Company (Pty) Ltd is funding at least two (2) co-operatives that comprise of local community members in the proposed Farm Marsh Hydroponics Systems Project. The names of two (2) beneficiaries of the prosed project are Gamagara Agricultural and Heuningpot Honey Co-operatives at the moment. There are two boreholes (SW1263 and SW1264) within the area of application. The combined yield of the two boreholes is 81 993.6 m^3 per annum, which is sufficient quantity of water to supply the proposed project.

Sustainability in agricultural development is one of the key factors to consider as it plays a pivotal role in ensuring effective and efficient implementation of industry's best practices. The developing countries such as South Africa need now, more than ever, to ensure continued support, maintenance and monitoring of agricultural development as the world faces climate change which threatens food security among other things. The agricultural sector is one of the most important sectors of the South African economy. Not only does it contribute towards the country's GDP, the sector also contributes in environmental protection, water resource management, poverty elevation, job creation and efficient spatial and land use. These factors or aspects of the agricultural sector have to be considered in policy formulation in order to ensure sustainability for current and future generations.

Sustainability in agricultural development is an important aspect to consider in ensuring optimal utilisation of agricultural resources whilst preserving the environment. Hardtlein & Kaltschmitt (1999:220) suggests a definition for the concept of Sustainable Agriculture as following: "Sustainable Agriculture is the management and utilisation of the agricultural ecosystem in a way that maintains its biological diversity, productivity, regeneration capacity, vitality and ability to function, so that it can fulfil today and in the future significant

ecological, economic and social functions at the local, national and global levels and does not harm other ecosystems''.

Land uses in South Africa are regulated. The process of spatial and land use change through zoning are easy to understand and implement. They are influenced by many factors such as population growth, household formation and economic development.
In order to meet current and future demands, technology that is applicable in irrigation projects has been evolving. Irrigation technologies may be used by both emerging rural and established farmers for more effective and sustainable use of limited water resources. It is pertinent to know the correct quantities and frequency of water use in irrigation projects. Proper irrigation schedule needs to be devised and implemented effectively.
Agricultural land that is available for sustainable development remains an asset that is scarce. The applicability and relevance of agricultural land have been understood better over the years, especially in recent times. These now include the following:

- food safety - logistics-associated risks are limited food regulations;
- food security - that may emanate from inter-governmental tensions and political security;
- potential to reduce food carbon footprint; and
- lifestyle - in the sentimental and cultural attachment to working the land.

However, with the threats associated with urbanisation, agricultural developments have had to survive under dire situations as the number of farmers continues to decrease. Solutions to challenges that are faced by the agricultural sector lie on factors such as accurate irrigation scheduling in order to increase yield and improve quality.

5.1.1 Irrigation Systems under Climate Change

The United Nations Development Programme suggests that Farmers have lost their markets, supply chains have been disrupted, consumer demand has plummeted, and even food safety monitoring is being interrupted. Climate change and environmental degradation contribute to food insecurity. The World Food Programme estimates 135 million people face crisis levels of hunger, and another 130 million are on the edge of starvation as a result of the coronavirus (UNDP, 2020). Climate Action, as one of the 17 Sustainable Development Goals affects the planning of any developmental project currently and in the future. The

Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity by 2030. The 17 SDGs are integrated—that is, they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability (UNDP – Sustainable Development Goals, 2015).

Uncertainties as to how the climate will change and how irrigation systems will have to adapt to these changes, are challenges that planners and designers will have to cope with. In view of these uncertainties, planners and designers need guidance as to when the prospect of climate change should be embodied and factored into the planning and design process (D. De Wrachien, M. B. Goli, 2015).

5.1.2 Renewable Energy Independent Power Producers Programme (REIPPPP) and Integrated Resource Plan (2010)

The White Paper on Renewable Energy, 2003 forms part of one of the policy documents that laid foundation for embracing renewable energy sources and associated technologies such as solar, biomass, wind and hydro generation of electricity. The objectives of the White Paper on Renewable Energy, 2003 included the following:

- Ensure that an equitable level of national resources were invested in renewable technologies;
- Direct public resources to implementation of renewable energy technologies;
- Introduce suitable fiscal incentives for renewable energy; and
- Create an investment climate for the development of the renewable energy sector.

In consistence with South Africa's commitment to transition to relatively low carbon emissions, the Integrated Resource Plan (IRP 2010) was promulgated in May 2011. This Plan set an ambitious target of renewable energy generation of 17 800 MW to be achieved by 2030.

The Department of Energy (DoE) then, now the Department of Mineral Resources and Energy, together with the National Treasury and the Development Bank of Southern Africa (DBSA) introduced the concept of Renewable Energy Independent Power Producers Programme (REIPPPP) at the end of 2010. The introduction of the Renewable Energy

Independent Power Producers Programme has since evolved to include what is now known as the Independent Power Producer Procurement Programme (IPPPP), which is regarded as a key vehicle for securing electricity capacity from the private Sector for renewable and non-renewable energy sources as determined by the Minister of Mineral Resources and Energy.

The Minister of Mineral Resources and Energy, acting in consistence with the Electricity Regulation Act, 2006 (Act No. 4 of 2006), read together with the Public Finance Management Act, 1999 (Act No. 1 of 1999), and subject to the concurrence of the energy regulator NERSA, determined that the Department of Mineral Resources and Energy will procure new capacity and Eskom will be the buyer of electricity from the Independent Power Producers through a 20-year Power Purchase Agreement (PPA). The move is backed by the Government Support Framework Agreement (GSFA) whereby government shall make support available to Eskom in an Eskom event of default. This highlights the need of use of renewable energy sources.

Renewable energy generation plants and associated hybrid technologies such as storage and the associated industrial value-chain activities will help alleviate poverty and through an increase in job opportunities.

The REIPPPP is one of South African government's important initiatives aimed at increasing the country's power generation capacity. The REIPPPP objectives include securing private sector investment in order to finance or fund proposed development on new electricity generation capacity that is diverse as proposed in the 1998 White Paper on Energy Policy of South Africa. These kinds of initiatives contribute to broader national developmental objectives such as socio-economic development and transformation through broadening of economic participation.

5.1.3 National Development Plan 2030

The National Development Plan envisions a South Africa where "everyone feels free yet bounded to others"; where everyone embraces their full potential, a country where "opportunity is determined not by birth, but by ability, education and hard work". A South

Africa where “we participate fully in efforts to liberate ourselves from the conditions that hinder the flowering of our talents” as articulated in the Vision 2030.

- The NDP aims to achieve the following objectives by year 2030**:**Uniting South Africans of all races and classes around a common programme to eliminate poverty and reduce inequality;
- Encourage citizens to be active in their own development, in strengthening democracy and in holding their government accountable;
- Raising economic growth, promoting exports and making the economy more labour absorbing;
- Focusing on key capabilities of both people and the country;
- Capabilities include skills, infrastructure, social security, strong institutions and partnerships both within the country and with key international partners;
- Building a capable and developmental state; and
- Strong leadership throughout society that work together to solve our problems

At the core of the Nation Development Plan is the aim to ensure the achievement of a “decent standard of living” for all South Africans by 2030. A “decent standard of living” entails the following core elements as enshrined in the Bill of Rights:

- Housing, water, electricity and sanitation;
- Safe and reliable public transport;
- Quality education and skills development;
- Safety and security;
- Quality health care;
- Social protection;
- Employment;
- Recreation and leisure;
- Clean environment; and
- Adequate nutrition

South Africa’s National Development Plan (NDP) 2030 was adopted by Government in year 2012.

5.1.4 Strategic Infrastructure Projects (SIPs)

The South African Government adopted a National Infrastructure Plan in year 2012. The National Infrastructure Plan is at transforming the economic landscape of South Africa, create a formidable amount of new jobs, and improve the delivery of basic community services. The plan outlines the challenges and proposed solutions to these challenges to which South Africa needs to respond in order to build and develop infrastructure.

Seventeen Strategic Infrastructure Projects (SIPs) that fall within the Green Energy SIP have been, authorised, developed and approved in order to support socio-economic development in the poorest parts of South Africa.

5.1.5 Renewable Energy Development Zones (REDZ)

The Department of Environmental Affairs Fisheries and Forestry has been given a task to complete a Strategic Environmental Assessment (SEA) process. This process embraces the use solar photovoltaic power generation among others.

Government has indicated an intention to identify three additional Renewable Energy Development Zones.

Previously on 16 February 2018, Minister Edna Molewa published Gazette Number 41445 for implementation, providing in terms of section 24(5)(a) and (b) of the National Environmental Management Act, 1998 and Regulation 15 of the Environmental Impact Assessment Regulations, 2014, (Government Notice No. R. 982, in the Gazette No. 38282 of 4 December 2014), for the procedure to be followed in applying for environmental authorisation for large scale wind and solar photovoltaic energy development activities, identified in terms of section 24(2)(a) of the National Environmental Management Act, 1998.

6 Motivation For The Preferred Development Footprint On The Site Including The Process Followed To Define The Preferred Development Alternatives

An alternative in relation to a proposed activity refers to the different means of meeting the general purpose and requirements of the activity (as defined in Government Notice R326 of the EIA Regulations, 2017), which may include alternatives to:

a) The property on which or location where it is proposed to undertake the activity.
b) The type of activity to be undertaken.
c) The design or layout of the activity.
d) The technology to be used in the activity.
e) The operational aspects of the activity.

Generally, alternatives should include consideration of possible means by which the objectives, need and desirability of a proposed project or activity could be achieved or realised. Fundamental alternatives include developments that are totally different from the proposed project description. They normally include the following:

- Alternative property or location where it is proposed to undertake the activity;
- Alternative type of activity to be undertaken; and
- Alternative technology to be used in the activity.

On the other hand, incremental alternatives relate to modifications or variations to the design of a project that provide different options to reduce or minimise environmental impacts. A variety of incremental alternatives exists that could be considered with respect to a proposed project. Incremental alternatives normally include the following:

- Alternative design or layout of the activity; and
- Alternative operational aspects of the activity.

Furthermore, it is mandatory to consider the “No-Go” alternative in the Environmental Impact Assessment process. The “No-Go” alternative is the continuation of the existence of the current status quo without an option to go ahead with the proposed project or activity.

6.1 Details of the Development Footprint Alternatives Considered

Property or location alternatives

Only one property or location has been considered in this piece of work. Among many reasons for the consideration of one location only include the following:

- The proposed project location falls within a Mining Right area;
- Possible sterilisation of mineral resources of interest has to be minimised;
- Accessibility of location;
- The availability of ore body of economic value underground, climate, solar radiation and water;
- Availability of infrastructure, and
- Availability of land or lack thereof, for the proposed development, whose minerals could be sterilised that falls outside of boundaries of the Mining Right area.

Activity alternatives

Alternative activities to the proposed development are not being considered at this stage. However, possibilities for activity alternatives do exist, considering factors such as food security for the country. Currently, only Phase 1 of the proposed development is being developed and impacts the use of 1 hectare of land in size.

Layout Alternatives

No other location or properties have been applied for by the applicant, Sishen Iron Ore Company (Pty) Ltd. Alternatives (A and B) proposed for locating Hydroponics Systems are similar in ecological status except for proximity to main access gate. Alternative A presents a higher possibility for or enables the proposed limiting of floral species destruction and clustering of infrastructure as proposed in the Biodiversity Assessment Report relative to alternative B.

Land use

Specialist comparative studies are in place at the present are in place for the proposed agricultural development. Specialists were commissioned by the consultant, Thaya Trading Enterprise. The process that is going to be employed from beginning to end of implementation stage of proposed agricultural development project is going to be in phases; the applicant proposes a phased in approach to the development of the project, with each phase of the Hydroponics Systems being 1 hectare. Each hectare will have approximately 6 tunnels with cooling systems and eventually there will be approximately 150 tunnels over 25 hectares.

The dominant soil forms that are found within the application area are the Prieska and Hutton. The sub-dominant forms are Coega, Glenrosa Hutton (0 – 150) mm in depth and Prieska, Plooysburg (50 – 500) mm in depth. The Coega, Glenrosa Hutton are Shallow, grey-brown, structureless, loamy sand to sandy loam soils, usually calcareous, on cemented calcrete or rock. Calcrete and rock outcrops occur in places. The Prieska, Plooysburg are Shallow, reddish-brown, structureless, loamy sand to sandy loam soils, often calcareous, on cemented calcrete or rock. Soil depth is variable, and may be deeper in isolated instances.

Agricultural potential is very low due to shallow sandy soils and climatic constraints. Dry land production potential is estimated to be 13 Ha per large stock unit. Specific limitations applicable to the area include shallow soils, unfavourable climate, low water-holding capacity, stony soils and rock outcrops and erosion hazards.

Currently, predominant land uses are mining and agriculture in the Gamagara area. However, generation of energy from renewable power source is becoming common in recent times. The single most influential factor to the development of the Gamagara area is Sishen Iron Ore mining development. The Gamagara area became known to the general South African community as a result of enormous number of jobs that are created by Sishen Iron Ore Mine. Not only does the mine provide jobs to thousands of job-seekers, it is also the single contributing factor to the planning and development of Kathu town.

The rehabilitation process will be performed with the aim to enable normal other activities of socio-economic and environmental activities to be undertaken after the proposed

development ceases to operate or it has been deemed economically not viable, if applicable.

Consultation of I&APs

Results obtained from the consultation process followed are going to be discussed later in this report.

Biodiversity

The proposed development is going to have an impact on biodiversity because some indigenous vegetation is going to be removed. Additionally, there is going to be some destruction of habitats. However, none of this destruction would have been possible if this proposed development was not going to go on.

Heritage and Cultural Resources

The existing heritage resources, if any, are going to be protected through demarcation of the NO- GO zone(s). All encountered graves, if any, are going to be preserved. Buffer zones may be built, at least 100 m away from the preserved heritage resource. Specialists and relevant authorities will be notified and called in should any Heritage Resources of significant importance be encountered. Alternatively, a procedure/protocol that is recommended by specialists may have to be followed.

Socio-Economy

The proposed project will, if proven to be economically viable, contribute to the economy of the local communities, and to that of the country at large. During the operational phase of the proposed development alone, there are some people who are going to benefit as employees, relatives, and / or beneficiaries of the project.

The Anglo American “Social-Way” continues to benefit local community members in that, preference is being to be given to locals. Furthermore, Sishen Iron Ore Company (Pty) Ltd

is committed to Development and Sustainability of the Local Economy and Infrastructure Development. This has been demonstrated in numerous ways including the proposed development that is going to benefit Gamagara Agricultural and Heuningpot Honey Co-operatives at the moment.

Technology alternatives

In terms of the technologies proposed, these have been chosen based on the environmental friendliness, easy to operate and maintain if user is trained well, reduction of operational cost and increased production efficiency and yield quality.

The Northern Cape Province in South Africa is expected to have the highest Global Horizontal Irradiation (GHI) that is favourable for Photovoltaic installations and Direct Normal Irradiance (DNI) that are necessary for tracking Photovoltaic installations. Meaning, the Northern Cape in South Africa provides for construction and operation of solar energy facilities because of its high Global Horizontal Irradiation relative to other provinces of the country. The Northern Cape Province has a solar radiation of 2 300 kWh/m^2 per annum, which is the highest level. Solar plants are becoming popular and economical in South Africa with time as numerous solar plants are being constructed and operated in the province.

The newly constructed solar plants are either Concentrated Solar Plant or Photovoltaic Plant. Photovoltaic plants are relatives easier and cheaper to operate as opposed to Concentrated Solar Plants. The proposed project under discussion is expected to use Photovoltaic technology.

Only the Photovoltaic Plant type is going to be considered in during the EIA Phase as a result of the following factors:

- Scarcity of water in and around the application area; and
- Large volume of water required for CSP.

In addition, Photovoltaic technology required a relatively wider area on the surface for power generation than CSP.

When it comes to Hydro Energy alternative, the proposed location for agricultural development is semi-arid with minimal water resources. This factor prohibits the use of large quantities of water within the area of application for hydro generation.

The alternative of hydro power, if explored, was going create significant negative socio-economic impacts in relation to the proposed development.

Sishen Iron Ore Company (Pty) Ltd, Anglo American SED proposes to develop a Farm Marsh Hydroponics Systems Project. The proposed agricultural project is going to utilise Photovoltaic Plant as a power source together with related or associated infrastructure. The power generation capacity of the proposed Photovoltaic Plant is estimated at 50 Megawatts. Photovoltaic technology involves the use solar radiation that is converted to electrical energy, which can be used as a source of power for domestic, agricultural, industrial and mining use. This is a renewable energy source. This kind of technology is adequate for both small-scale local user and large-scale use. Solar Plants that are located in areas zoned for agricultural purposes are sometimes called solar farms or solar ranches. This is merely a casual way of calling these solar plants.

In photovoltaic technology, the power conversion sources are photovoltaic modules that convert solar radiation directly to electrical energy, contrary to other large-scale solar generation technologies, concentrated solar power, which use heat to drive a variety of conventional generator systems.

Solar technology employs the use of solar panels, which produce direct current (DC) electricity. In order for the produced DC to be suitable for domestic, agricultural, industrial and / or mining use, conversion equipment to must be utilised in order for alternating current (AC) to reach consumers. The conversion to which referred herein is performed using inverters. In order to achieve optimal efficiency, solar power plants also incorporate maximum power point trackers. Power point trackers keep individual string of solar array close to its peak power point.

There are two primary options that are utilised to configure the conversion equipment under discussion, namely: string and centralised inverters. In some instances, individual or micro-inverters are used. Single inverters enable the optimisation of output per panel. Whereas, multiple inverters enhance reliability regulating of output, thereby reducing loss of performance in an event an inverter fails.

The project is going to utilise Photovoltaic Plant (PV) power generation facilities as a power source in phases and associated (related) infrastructure on Farm Marsh 467

Hydroponics crop production is relatively more expensive to construct than the conventional field crop irrigation. Highly specialised and affordable resources are needed for the operations of hydroponics systems in order improve economic viability of a project. In an attempt to reduce Capital Cost, among other benefits, climate-controlled greenhouse structures are generally erected when a prospective farmer intends to produce high yields of crops of high value. This is applicable even to the production of vegetables (cucumbers, tomatoes) and herbs. Generally, the fresh produce of hydroponics systems is harvested continuously (weekly / bi-weekly). A balance may need to be established between the production yields, period of growth, capability to meet weekly / bi-weekly targets and value.
Honey has been used for human consumption for centuries. The health benefits associated with the consumption of honey have been known for centuries too. However, honey remains relatively of lesser demand to consumers than sugar. This may be attributed to the fact that honey is more expensive to purchase than sugar. The producer of honey may need to target specific groups for market.

Hydroponics can be described as the cultivation of plants without using soil. Hydroponic plants, vegetables, herbs, and flowers are planted in inert media that suitable for growth. As a requirement, nutrient-rich solutions, water and oxygen are supplied to the system. This system enables rapid growth, relatively higher yields, and superior quality. Contrary to conventional methods of growing plants in media where roots of plants perpetually search for nutrients that are necessary for growth and development, hydroponics systems do not utilise the soil. In conventional plant growth methods, the plant root system is exposed directly to water and nutrition, the plant does not have to exert any energy in sustaining itself. In hydroponics systems, the energy the roots would have expended acquiring food and water can be redirected into the plant’s maturation. As a result, leaf growth flourishes as does the blooming of fruits and flowers.
Plants sustain themselves through a process of photosynthesis. Plants capture sunlight with chlorophyll (a green pigment present in their leaves). They use the light’s energy to split water molecules they’ve absorbed via their root system. The hydrogen molecules combine with carbon dioxide to produce carbohydrates, which plants use to nourish themselves. Oxygen is then released into the atmosphere, a crucial factor in preserving our planet's habitability. Plants do not need soil to photosynthesize. They need the soil to supply them with water and nutrients. When nutrients are dissolved in water they can be applied directly

to the plant's root system by flooding, misting, or immersion. Hydroponic innovations have proven direct exposure to nutrient-filled water can be a more effective and versatile method of growth than traditional irrigation.

Hydroponic systems work by allowing minute control over environmental conditions like temperature and pH balance and maximized exposure to nutrients and water. Hydroponics operates under a very simple principle: provide plants exactly what they need when they need it. Hydroponics supply nutrient solutions tailored to the needs of the particular plant being grown. They allow you to control exactly how much light the plants receive and for how long. pH levels can be monitored and adjusted. In a highly customized and controlled environment, plant growth accelerates. A simplified hydroponics system is shown in **Figure 7**.

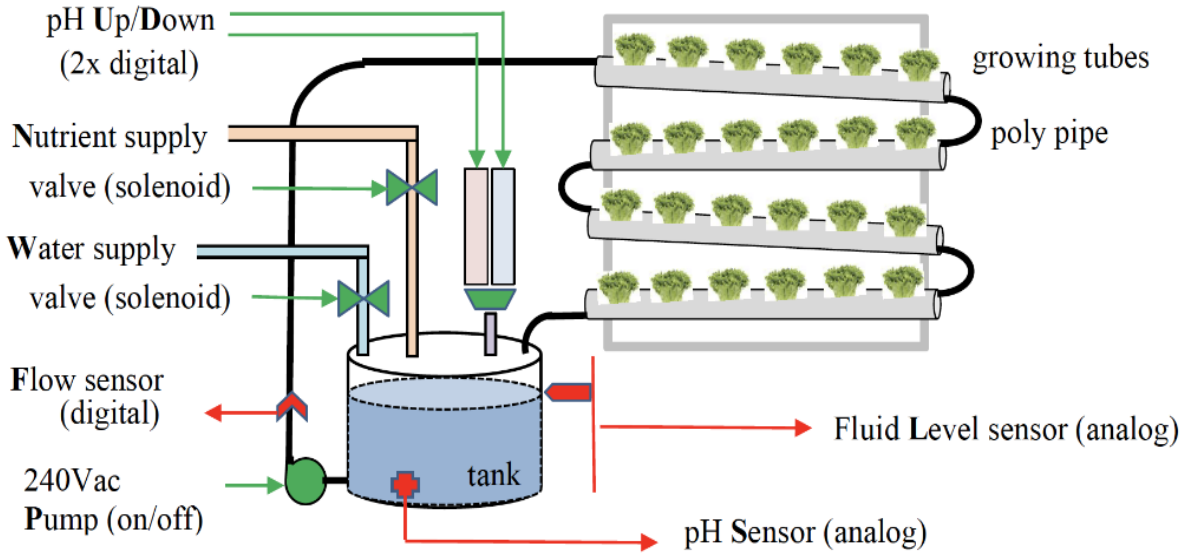

Figure 7: Basic configuration of equipment in hydroponics system

By controlling the environment of the plant, many risk factors are reduced. Plants grown in gardens and fields are introduced to a host of variables that negatively impact their health and growth. Fungus in the soil can spread diseases to plants. Wildlife like rabbits can plunder ripening vegetables from your garden. Pests like locusts can descend on crops and obliterate them in an afternoon. Hydroponic systems end the unpredictability of growing plants outdoors and in the earth. Without the mechanical resistance of the soil, seedlings can mature much faster. By eliminating pesticides, hydroponics produce much healthier and high-quality fruits and vegetables. Without obstacles, plants are free to grow vigorously and rapidly.

Operational Aspect of the Activity

Due to the nature of the proposed development, permanent services in terms of water supply, electricity, or sewerage services, good quality yields are required.
The proposed development is already under construction (1 hectare). The Environmental Impact Assessment process is underway. No unnecessary surface disturbance will be undertaken.

Based on the outcome of the Environmental Impact Assessment studies that are underway, the clearance of vegetation and removal of topsoil to the nominal depth of 150 mm will be conducted. Soil preparation will then follow.
Mentorship programme for the operation of the proposed Farm Marsh Hydroponics Systems Project has already begun. The mentor visits site at least twice a month.
A summary of alternatives that were considered in this piece of work are presented in Table 5.

Table 5: Summary of Alternatives that are considered for the proposed project

Alternatives	Status of Alternative	Advantages	Disadvantages	Reasonable & Feasible	Requires further assessment	Comment
Property or location	Preferred Site	Located on a site that is currently being developed (1 Ha) for Hydroponics crop production Close proximity to R380, a tarmac surface for accessibility Relatively low visual intrusion due to existing infrastructure and receiving environment Flat topography that is suitable for different agricultural development projects Possible sterilisation of mineral resources of interest has to applicant is minimised	The proposed project location falls within a Mining Right area Interference with existing and authorised land uses	Yes	No	
Alternatives	**Status of Alternative**	**Advantages**	**Disadvantages**	**Reasonable & Feasible**	**Requires further assessment**	**Comment**
Activity	Agricultural Development	The proposed Agricultural Development Project is a relatively environmentally friendly option. Contribute towards the country's GDP. Contributes in environmental protection. Poverty elevation. Job creation and efficient spatial and land use	Interference with existing and authorised land uses Use of scarce water resource	Yes	No	

Alternatives	Status of Alternative	Advantages	Disadvantages	Reasonable & Feasible	Requires further assessment	Comment
Technology	Preferred Technology – Hydroponics	Highly specialised and affordable resources are needed for the operations of hydroponics systems in order improve economic viability. Can sustain unpredictable weather and climate conditions. Easy to optimise conditions to improve crop yield production. Continual harvesting is possible to achieve throughout the course of the year across seasons Use of soil as ploughing medium is eliminated. By controlling the environment of the plant, many risk factors are reduced	Hydroponics crop production is relatively more expensive to construct than the conventional field crop irrigation. Highly specialised and affordable resources are needed for the operations of hydroponics systems in order improve economic viability of a project.	Yes	No	
Alternatives	**Status of Alternative**	**Advantages**	**Disadvantages**	**Reasonable & Feasible**	**Requires further assessment**	**Comment**
	Alternative – Centre Pivot	The use of Centre Pivot is by far the preferred technology of choice for on land irrigation project	Requires use of specific soil type as ploughing medium for sustainability Plants grown in gardens and fields are introduced to a host of variables that negatively impact their health and growth	Yes	Yes	
	Preferred Technology – Photovoltaic Plant	The Northern Cape Province has a solar radiation of 2 300 kWh/m2 per annum Photovoltaic plants are relatives easier and cheaper to operate as opposed to Concentrated Solar Plants Uses Smaller volumes of water than required for Concentrated Solar Plant		Yes	No	

Alternatives	Status of Alternative	Advantages	Disadvantages	Reasonable & Feasible	Requires further assessment	Comment
	Hydro Energy		Uses of large volumes of water	No	No	
Design or layout	Preferred Design and Layout A	Presents an opportunity for clustering of greenhouse tunnels and avoidance of sensitive areas.		Yes	No	
	Alternative Design and Layout B		Presents challenges for future developments	Yes	No	
No-Go	Land Use alternative remains in current condition	The environment will not be disturbed in relation to the proposed activity.	Both direct and indirect beneficiaries of the proposed development will not gain anything. Farm Marsh Hydroponics Project will not exist.	Feasible but NOT reasonable	NO	The “triple bottom-line” of environmental, economic and social aspect that are associated with the proposed development will not be assessed.

For further details on the motivation for preferred site layout, please see APPENDIX 4.

6.1.1 The "No-Go" Alternative

This process includes comparison of all site alternatives in order to determine whether or not the project may proceed. It is noteworthy that, on one hand, the proposed development has a potential to possess some economic benefits. On the other hand, the proposed development poses some negative impacts on the environment. The assessment of No-Go alternative is presented in Table 6.

No-Go Alternative

Identified Impact: Negative: Loss of opportunity to develop an Agricultural Development Project.

The proposed development has a potential to possess some economic benefits. If the proposed development does not go ahead, all the benefits associated with it will be lost.

Agricultural Development Project Operational Phase and associated infrastructure and / or associated activities

Construction	Operational	Decommissioning
Vegetation Clearance; Soil preparation; Use of infrastructure and associated activities; Waste Management; Food security; Revenue collection; Poverty Alleviation; Water use and management	Vegetation Clearance; Soil preparation; Ploughing; Use of infrastructure and associated activities; Waste Management; Food security; Revenue collection; Poverty Alleviation; Water use and management	Vegetation Clearance; Soil preparation; Ploughing; Use of infrastructure and associated activities; Waste Management; Food security; Revenue collection; Poverty Alleviation; Water use and management; Final land forms

Severity/Magnitude

An assessment of not going ahead with the proposed development and associated activities would have impact on socio-economic benefits. Severity is high before proposed mitigation measures are implemented effectively. Post effective implementation of proposed mitigation measures, severity is high.

Extent/Spatial

The spatial scale or extent is a relative term that links the identified impact to the spatial scale or extent of the project area and the world as a whole. The extent is local before proposed mitigation measures are implemented effectively. Post effective implementation of proposed mitigation measures, the extent is National.

Duration

The economic opportunities will be available during the operations of the proposed agricultural development project. This is going to happen throughout life of operation. Post effective implementation of proposed mitigation measures, duration, becomes residual.

Consequence

The consequence is low before proposed mitigation measures are implemented effectively. Post effective implementation of proposed mitigation measures, consequence is high.

Probability

Probability (synergy /summation) of impact frequency and activity frequency is definite throughout life of operation before proposed mitigation measures are implemented effectively. Post effective implementation of proposed mitigation measures, such as, among other, going ahead with the project, probability is definite throughout life of operation.

Significance

The significance is low to medium before proposed mitigation measures are implemented effectively. Post effective implementation of proposed mitigation measures, significance is high.

Cumulative Impact

The cumulative impact rating considers the predicted effects, residual effects, effects of other projects and activities in the form of potential synergistic, interactive system components, pattern, augmentative, consecutive impacts and mitigation measures, within the context of proposed project. The cumulative impact is low before proposed mitigation measures are implemented effectively. Post effective implementation of proposed mitigation measures, cumulative impact is Medium.

Table 6: No-Go Alternative

Impact Identified	**Footprint Alternative**					
Los of opportunity to develop an agricultural development project	**No-Go Alternative**					
Impact Rating						
Parameter/Attribute	Severity/Magnitude		Extent/Spatial		Duration	
	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
	High (3)	High (3)	Local (2)	National (4)	Immediate (0)	Residual (4)
Parameter/Attribute	Nature		Frequency of Impact		Frequency of Activity	
	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
	-1	+1	1	5	1	5
Significance Rating (Pre-mitigation)	Proposed Mitigation Measures					
-10	Authorise the proposed Farm Marsh Hydroponics Systems Project In the interim, it is the opinion of the EAP for the Integrated environmental Authorisation to be granted if specialist reports to be commissioned do not suggest the contrary.					
Significance Rating (Post-mitigation)						
+110						
Impact Prioritisation						
Cumulative Impact	Public Response	Reversibility	Irreplaceable loss of resources		Priority	
0		0	1			

6.2 Details of Public Participation Followed

The pre-application consultation with the Department of Agriculture, Land Reform and Rural Development that recently merged with the Department of Environment and Nature Conservation in Northern Cape Province was initiated. Another pre-application consultation meeting was conducted with the Department of Human Settlements, Water and Sanitation, Kimberley, Northern Cape. The Public Participation Process pertaining to Environmental Authorisation and Integrated Water Use License Applications will be conducted jointly.

Interested and Affected Parties (I&AP's) were notified of the proposed Farm Marsh Hydroponics Systems Project Application via registered letters, e-mails, notices in public spaces, newspaper adverts or facsimiles and / or virtual conferencing platforms. The notification letters included a questionnaire requesting comment on the proposed project. Site notices were placed in and around the application area. In addition, a newspaper advertisement (in English) was placed in a newspaper (Kathu Gazette) which is widely distributed in the area.

The Public Participation Process is being undertaken in accordance with the NWA and the NEMA process and the 2017 EIA Regulations (as amended). I&AP's were provided an initial notification and call to register period of 30 days. The draft Scoping and Environmental Impact Assessment Report will be made available for public review and comment for a total period of 30 days each. During this period, an Open Day will be scheduled to present the findings of the draft Environmental Impact Assessment Report to the public. All correspondence submitted by I&AP's will be utilised during the impact assessment and all correspondence received from I&AP's will be included in the final Environmental Impact Assessment Report.

The Environmental Impact Assessment Report and Environmental Management Programme (EMPr) for comment will be made available to all Registered Interested and Affected Parties (I&AP's). In order to take part in the process and to submit comments on these documents, I&AP's are invited to register by completing the registration form and sending it back to the consultant.

Information on the environment, the impacts of the proposed Farm Marsh Hydroponics Systems Project and recommended mitigation and management measures; as well as more information on the application itself, will be described in these documents.

The public participation process is being conducted strictly in accordance with applicable regulations. The following categories of variables will take into account when deciding the required level of public participation:

- The scale of anticipated impact; and
- The sensitivity of the affected environment.

Consultation is required in terms of Chapter 6 of the EIA Regulations, 2017. Landowners, neighbours and other Interested and Affected Parties (I&AP's) are entitled to participate in and be consulted in respect of new proposed agricultural development applications. The proposed PPP for this application includes a number of steps, as listed below:

- Newspaper advertisement in local newspaper;
- Site notices;

- Notification of surrounding land owners , land occupiers and current right owners around;
- Specialist studies will be conducted including the use of available environmental reports; and
- Public Meeting with stakeholders involve e.g. community.

6.2.1 Overview of the Public Participation Process Undertaken during the Environmental Impact Assessment Phase

The primary aims and objectives of conducting public participation process during the Environmental Impact Assessment process include the following:

- To notify Interested and Affected Parties (I&APs) of the proposed Farm Marsh Hydroponics Systems Project;
- To document and consider issues, comments and concerns as raised by I&APs;
- To promote transparency, increase participation and raise awareness on the proposed development and associated consequences;
- To provide platform for liaison and communication with I&APs; and
- To identify potential environmental, socio-economic impacts associated with the proposed development.

6.2.2 Availing of Background Information

Copies of Scoping Report and Environmental Impact Assessment are going to be accessible at www.thayatrading.co.za

A briefing paper for the project has been compiled in English. The aim of this document is to provide a brief outline of the proposed project, provide preliminary details regarding the EIA Process, and explain how I&APs could become involved in the project. The briefing paper, together with a comment sheet and relevant map, were distributed to identified stakeholders and I&APs via post or e-mail, inviting them to register for participation the proposed development and submit details of any issues and concerns that they may have.

Furthermore the briefing paper informed I&APs and Stakeholders of the prospective registration of the Farm Marsh Hydroponics Systems Project and invited to comment on the project throughout the process. An introductory letter was sent to all I&APs and Stakeholders together with the briefing paper, questionnaire and comments sheet.

6.2.3 Identification of Key Stakeholders

The first step in the Public Participation Process (PPP) is to identify key stakeholders, including:

- **National and Provincial Government Representatives:**
    - Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARDLR);
    - Department of Human Settlement, Water & Sanitation (DHSWS);
    - Department of Public Enterprises;
    - Department of Trade and Industry (DTI);
    - Department of Mineral Resources and Energy (DMRE);
    - National Environmental Standards and Regulations Enforcement Agency (NESRA);
    - South African Civil Aviation Authority (SACAA); and
    - South African Heritage Resources Agency (SAHRA).
- **Relevant Local and District Municipalities;**
    - John Taolo Gaetsewe District Municipality;
    - Gamagara Local Municipality;
    - Joe Morolong Local Municipality; and
    - Ga-segonyana Local Municipality
- **State-owned Entities:**
    - Transnet;
    - SANRAL; and
    - ESKOM
- **Landowner and neighbours**

All I&AP information, together with record of dates and details of consultations and a record of all issues raised is recorded within a comprehensive project database. This database will be updated on an on-going basis throughout the project, and will act as a record of the communication/public involvement process.

6.3 Summary of Issues Raised By I&APs

Summary of Issues Raised by Interested and Affected Parties is presented in Table 7.

Table 7: Summary of Issues Raised By I&APs (Please refer to APPENDIX 3)

Interested and Affected Parties **List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.**		**Date Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
AFFECTED PARTIES					
Joe Morolong Local Municipality	**X**				
Gamagara Local Municipality	X				
Ga-segonyane Local Municipality	X				
John Taolo Gaetsewe District Municipality	X				
Lawful occupier/s of the land					
Landowners or lawful occupiers on adjacent properties	**X**				
Municipal councillor					

Municipality	**X**				
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWA e	**X**				
Communities	X				
Dept. Land Affairs	X				
Dept. Environmental Affairs	X				
Other Competent Authorities affected					
SANRAL	X				
Transnet	X				
OTHER AFFECTED PARTIES					
SAHRA		19/11/2020	SAHRA requested for Heritage Studies to be completed.	Specialist Reports were commissioned.	Section 6.4.1.13

SAHRA				
SACAA				
Commission on Restitution of Land Rights	26/11/2020	CRLR wrote that no claim appeared on the Commission's database	The Consultant had requested for the letter from the CRLR	Section 6.4.1.15
INTERESTED PARTIES				
None				

6.4 Environmental Attributed Associated with the Project and Alternatives

6.4.1 General or Baseline Description of Environment Affected By The Proposed Activity

The purpose of this section is to provide baseline description of the area of application. The John Taolo Gaetsewe District dominated by both agricultural and mining activities. It is a semi-arid area with relatively high radiation in the Northern Cape, South Africa.

6.4.1.1 Locality

The Farm Marsh Hydroponics Systems Project is located within an area that is zoned for mining. The area of application is does not within a protected area and is therefore relatively less threatened. The findings of the proposed Biodiversity Assessment to be conducted will provide guidance of what trees are protected within the application area.

Two (2) wetland pans occur in the proximity of the proposed development. Locality of the proposed development is depicted in **Figure 8**.

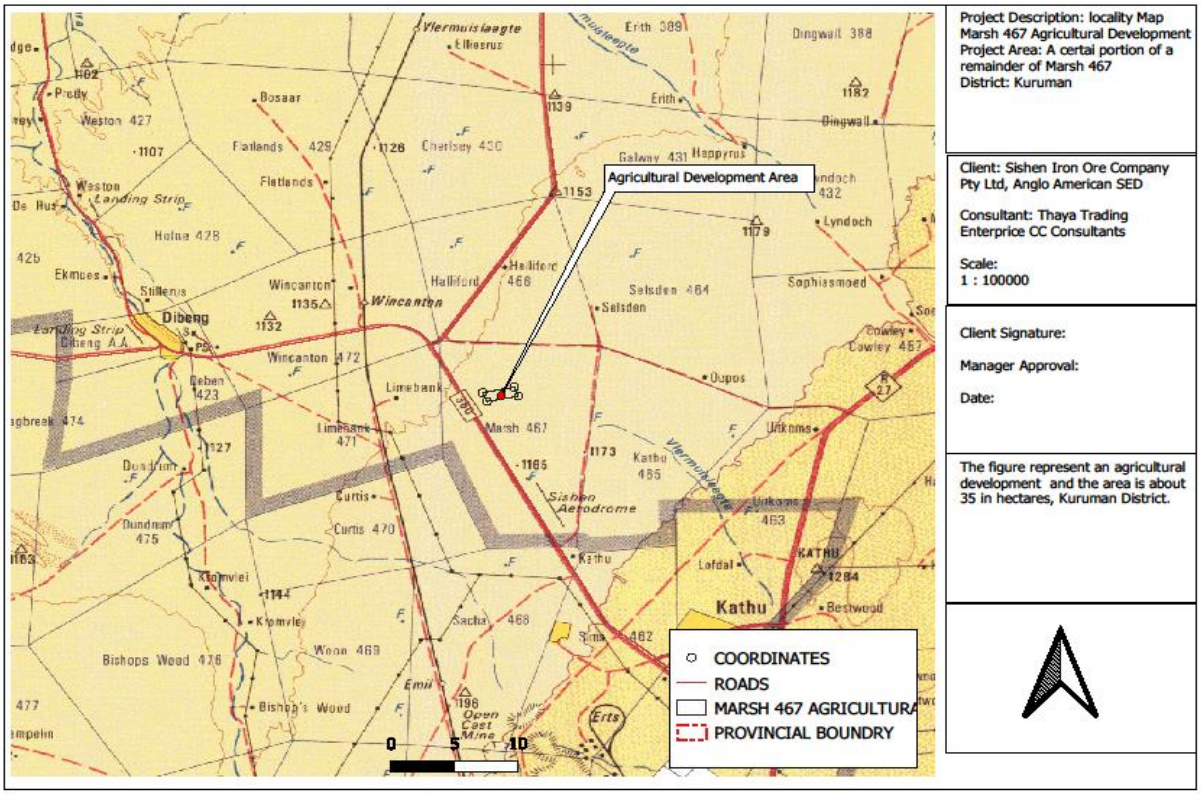

Figure 8: Locality Map of John Taolo Gaetsewe District

6.4.1.2 Geology

Rocks of the area are composed of pink white and grey fined-grained porphyritic granitic types which are the oldest rocks of the Swazian Erathem in the area.
The Schmidtsdrif Subgroup forms the lower part of the Ghaap Group and is divided into two formations (Boomplaas and Clearwater Formations) of approximately 100 m thick. In the middle of the formation shale becomes more predominant and ferruginised shale greywith siltstone and interbanded thin dolomite. Chert and chert conglomerate are present at the base. The upper formation consists of calcretic dolomite with few stromatolites and thin banded shale and siltstones (Beukes, 1987). The Ghaap Plateau Formation can be distinguished from the underlying formation only where the quartzite is present on the latter. Elsewhere the rocks consist of dark blue fine-grained dolomite. A few stromatolite-bearing zones, small lenses of black chert locally developed in thin shale and siltstone are present. Brown ferruginous jasper layers up to 12 m thick, separate the lower part of the formation from the overlying grey coursegrained dolomite. A Breccia of black chert and a few stromatolites occur in the dolomite.

A third zone can be distinguished in the upper part of the formation. It contains lenses of limestone and a prominent layer of chert forms the top of the succession. The layer of chert occurs sporadically on the Maremane anticline where it is brecciated in places to form the silica breccia (Moen et al., 1977). Asbestos Hills Subgroup is the sole representative of the Ghaap Group in this area and follows conformably on the underlying rocks. The formation is divided into the Kuruman and Danielskuil Formations (Please refer to Table 8). The uppermost chert of the Ghaap Group grades into banded iron formation of the Kuruman Formation which varies in thickness from 180 m to 240 m. It consistes of a succession of thin alternating layers of light coloured chert and jasper and dark coloured ferruginous jaspilite. The jaspilite contains mainly magnetite, haematite and limonite. A few thin layers of riebeckite-amphibolite and shale occur in places. The rock has well developed bedding plane cleavage and contains several crocidolite bearing zones. The basal layer of the banded iron formation lies on the dolomite of the Ghaap Plateau Formation in the Maremane anticline, is brecciated and ferruginised in places and constitutes the Blinkklip Breccia (Moen et al., 1977).

The “Main Marker” with a thickness of approximately 10m, lies conformably on the banded iron formation (BIF) and forms the base of the overlying jaspilite. It is characterized by an undulating structure and consists of brown jaspilite with thin magnetite layer and chert nodules. The overlying jaspilite attains a thickness of 150 m and contains several marker layers. Several “speckled markers” are present in the lower 40 m of the succession, of which only the upper one is indicated on the map. In the south a layer of eolithic chert with the appearance of quartzite is associated with the upper speckled marker. The two together are known as the quartzite marker. The intermediate quartzite maker occurs between lower speckled markers (Moen, 1977). The Gamagara Formation was deposited on the Maremane anticline and rests unconformably on dolomite and the BIF of the underlying strata Ghaap Plateau Formation. The succession consists of a basal conglomerate with pebbles of jasper and banded iron formation, shale and white to brown quartzite. The Makganyene Formation lies unconformably on the Gamagara Formation and has a maximum thickness of less than 480 m. Tillite occurs at the base of formation and contains fragments of black, white and red chert in a reddish brown sandy ground mass. Higher up in the succession, alternating layers of grit, tillite, and silicified mudstone and feldspathic quartzite occur. Dolomite or limestone occur interbanded in mudstone (Moen et al., 1977).

The Ongeluk Formation forms the lower part of the Olifantshoek Group. The formation consists of greyish-green andesitic lava with amygdales and lenses of red jasper. The Voëlwater Formation overlies the Ongeluk Formation and has a thickness of 450 m. The lower beds are banded iron stone and banded red jaspilite with chert, dolomite and lava. The upper portion of the succession consists predominantly of dolomite with chert, banded jasper and lava (Moen et al., 1977). The Lucknow Formation occurs east of the Olifantshoek Group in the Korannaberg where the strata are disturbed by a number of faults **Figure 9**. It lies unconformably on the Voëlwater Formation and is absent in places in the north. The formation has a maximum thickness of 1 500 m. The lower portion consists mainly of shale with subordinate layers of quartzite and lava and an upper portion of whitish quartzite with lenses of flagstone and dolomitic limestone. The Hartley Formation, the upper part of Olifantshoek Group, follows conformably on the Lucknow Formation with a basal conglomerate containing pebbles of quartzite, jaspilite and lava. It is overlain by andesitic lava which contains amygdales, tuff, breccia and pebbles of quartzite (Moen et al., 1977). The Matsap Subgroup lie conformably on the Hartley Formation but in places is found

unconformably on the Voëlwater Formation in the Korannaberg. Three members were recognized. They consist predominantly of sub-greywacke and purple, grey and brown quartzite with thin pebble beds and a layer of conglomerate in which quartz, banded iron formation and red jasper pebbles are abundant. The Brulsand Formation consists mainly of quartzite with subordinate shale and subgreywacke. Together with the Matsap Subgroup they form the Volop Group with a thickness of 500m (Moen et al., 1977).

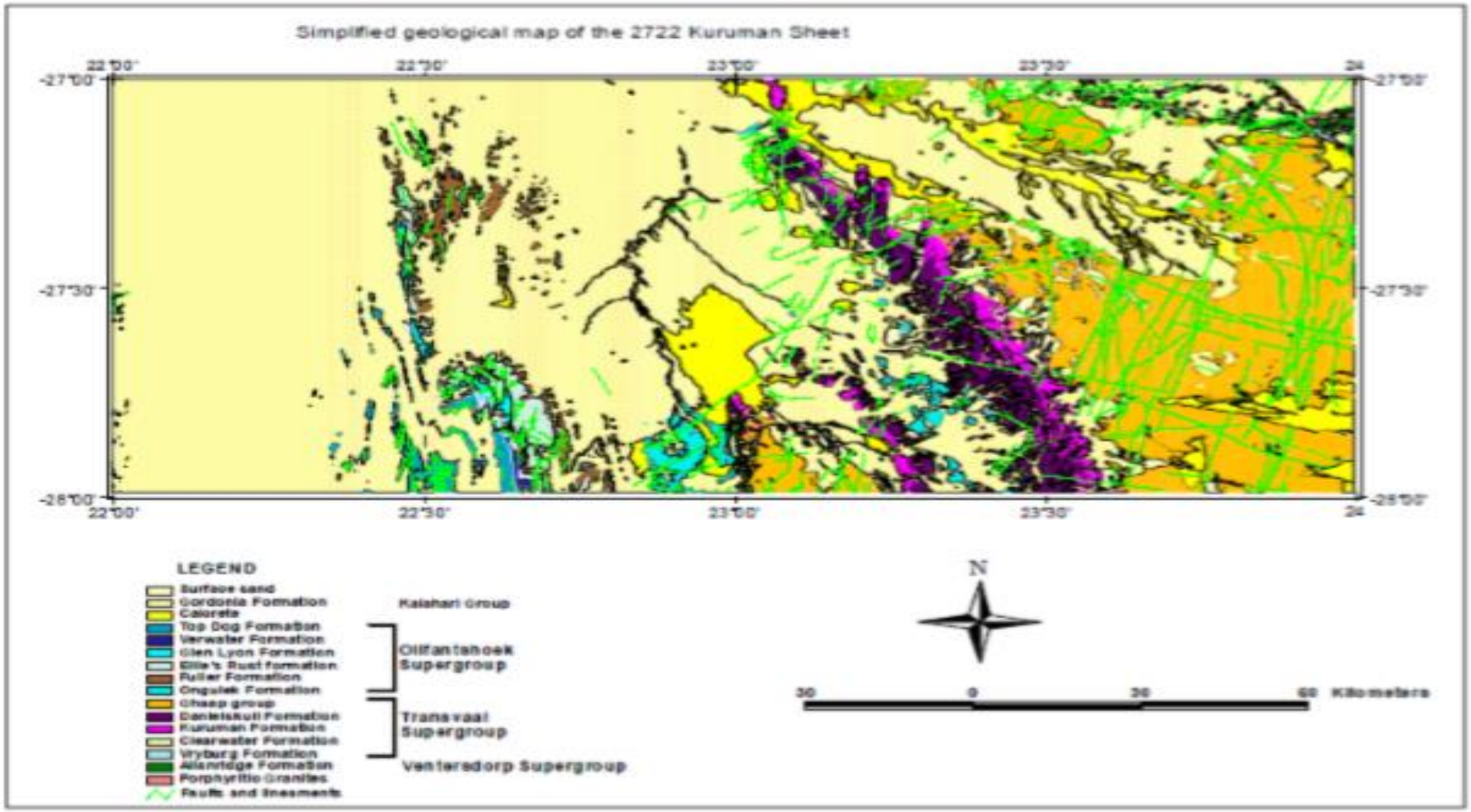

Figure 9: A simplified geological area of Kuruman (Moen, 1979)

Table 8: Lithostratigraphic column of the Kuruman Area

STRATIGRAPHY				DESCRIPTION	MAGNETIC EVENT
				Red to flesh-coloured wind-blown sand	
				Rubble	
				River-sand and gravel	
				Surface limestone	
OLIFANTSHOEK SUPERGROUP (±2 223-2 216 MA)	BRULPAN GROUP		Groblershoop Fm	Quartzite, quartz-sericite schist	Dolerite dykes
	VOLOP GROUP	Brulsand SBGRP	Top dog Fm	White, grey and pink quartzite with subordinate brown subgreywacke	
			Verwater Fm	Grey quartzite with nodule of and lenses of haematite	
		Matsap SBGRP	Glen Lyon Fm	Brown subgreywacke and conglomerate	
			Ellie's Rust Fm	Quartzite and subgreywacke	
			Fuller Fm	Quartzite, subgreywacke and conglomerate	
		Hartley Fm		Andesitic lava with interbedded tuff, agglomerate, quartzite and conglomerate	
		Lucknow Fm		Quartzite, dolomitic limestone; shale and lava	
TRANVAAL SUPERGROUP (±2 224-2 219 MA)	POSTMASBURG GROUP	Voëlwater SBGRP		Red jasper, dolomite, chert and lava	Basic lava
		Ongeluk Fm		Amygdaloidal andelisitic lava with interbedded tuff, agglomerate, chert, red jasper	
		Makganyene Fm		Diamicite, banded jasper, siltstone, mudstone, sandtone grit and dolomite	
	GHAAP GROUP	Campbell Rand SBGRP	Monteville Fm	Dolomite; quartzite	
		Asbestos Hills SBGRP	Danielskuil Fm	Yellow-brown jaspilite with crocidolite; conglomerate	
			Kuruman Fm	Banded Iron formation, subordinate amphibolite, crocidolite, jaspilite and chert	
		Schmidtsdrif SBGRP	Clearwater Fm	Conglomerate, chert ans dolomite, shale	
			Boomplaas Fm	Oolitic and stromatic dolomite and dolomite with chert and quartzite lenses	
	Vryburg Fm		Quartzite, grit, conglomerate, shale amygdaloidal lava		
VENTERSDORP SUPERGROUP (±2 714 MA)			Allanrigde Fm	Andesitic lava, amygdales and agglomerate	Andesitic lava
Porphyritic granite (basement)					

6.4.1.3 Local Geology

Local Geology of the application area can be described as comprising of red to flesh-coloured wind-blown sand of Quaternary age underlain by limestone of Tertiary age (Geological Survey, 1979). Calcrete (cemented limestone) outcrops occur in places within the proposed project area. Dolomite is among minerals that lie beneath the surface of the proposed project area.

Figures 10 and 11 depict the geology of the proposed study area.

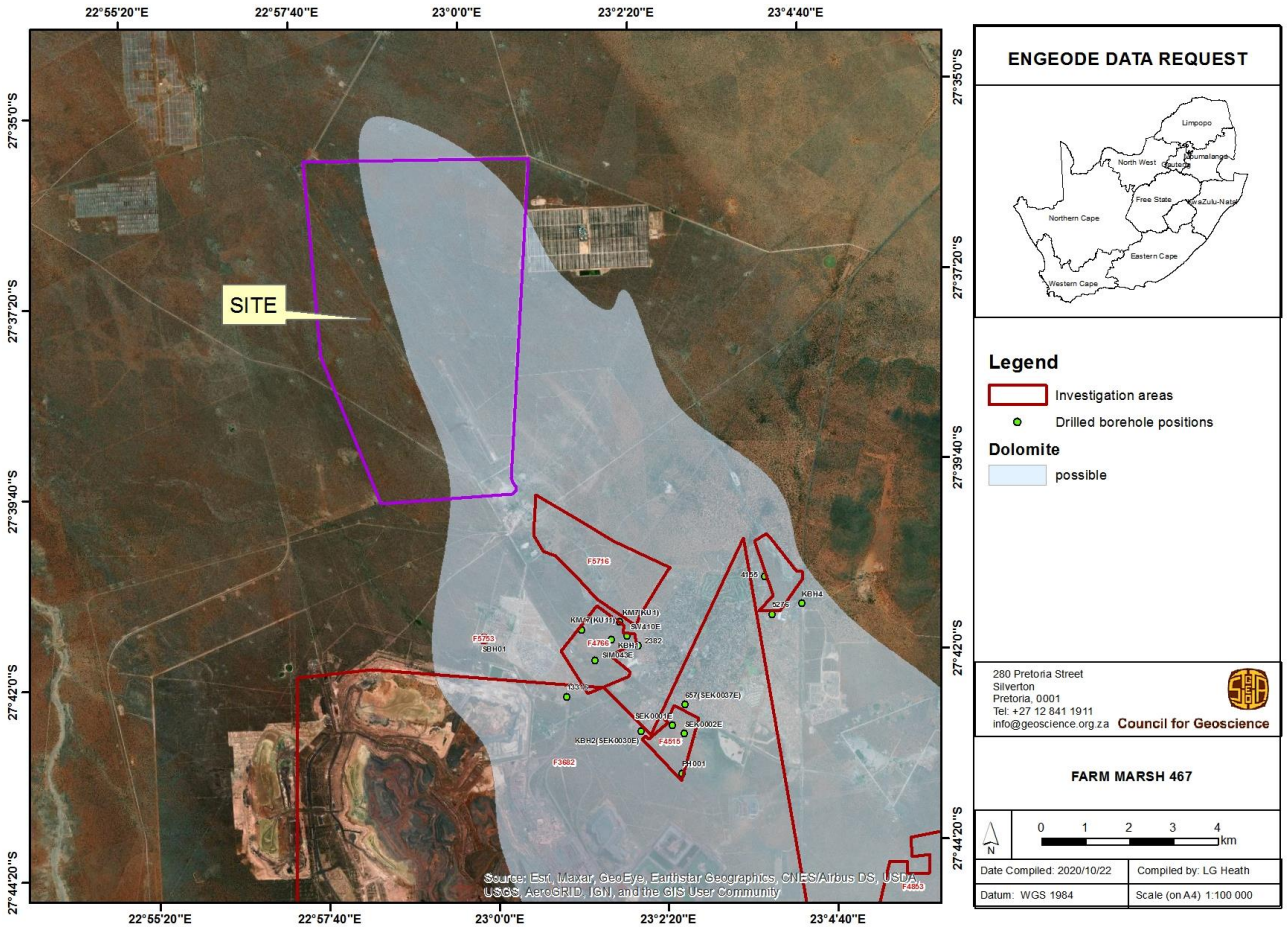

Figure 10: Local Geology (Courtesy of Council for Geoscience)

For a superimposed map of application area on the local geological map, please see **Figure 11**.

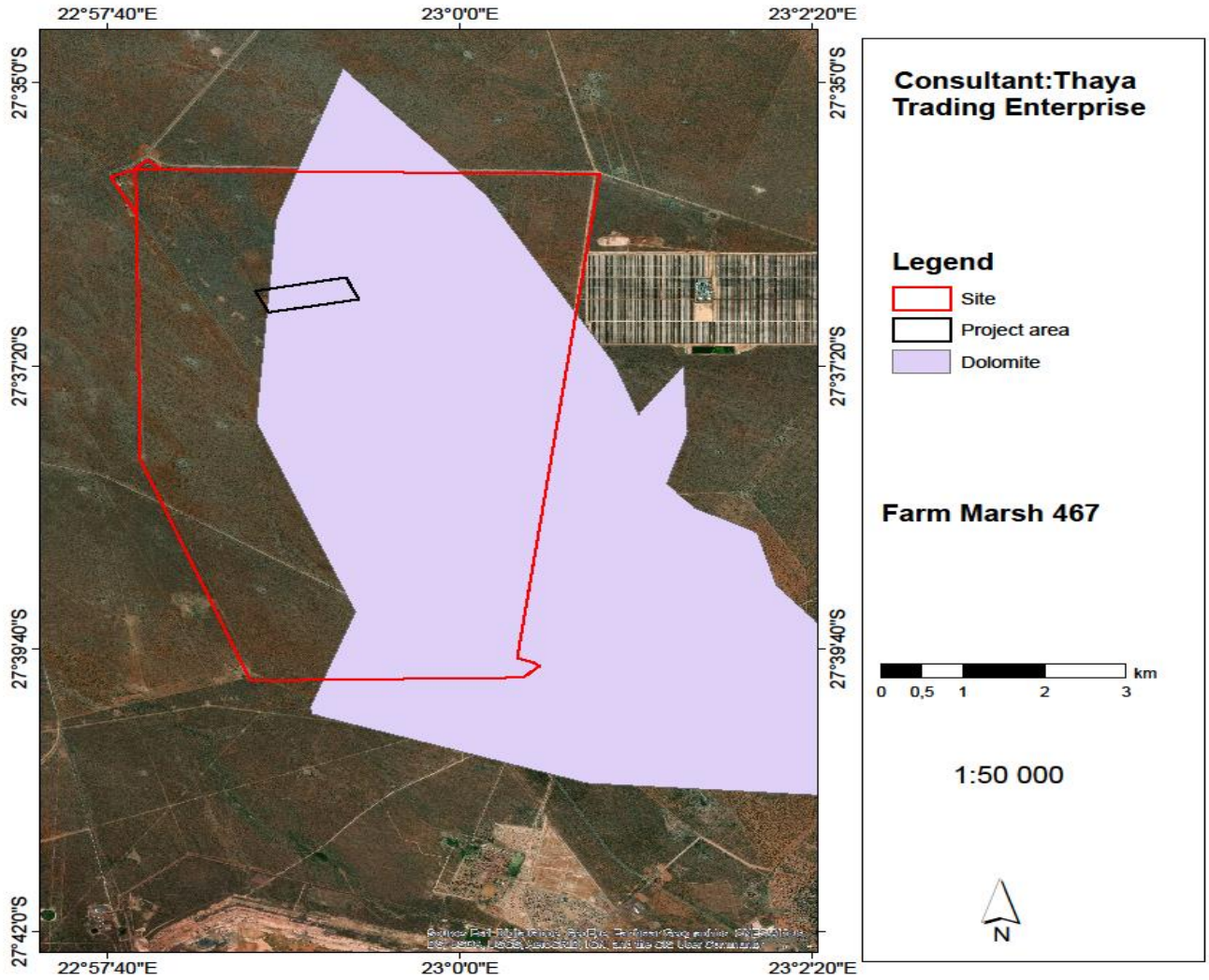

Figure 11: Superimposed project area map in respect of dolomitic material deposit.

6.4.1.4 Climate

The area of interest is located approximately 10 Km North West of Kathu town. The climate is predominantly semi-arid with low rainfall and high evaporation. The mean annual precipitation of the application area is approximately 374 mm/a. Climate plays a vital role in determining the availability of water resources, the nature of the natural landscape and vegetation types. Temperatures are high during the summer and low during the winter. The coldest months are experienced from June to August while the hottest months range from September to March. The average daily temperatures range from 19°C in June, to 26.7°C in January. The mean maximum average temperature during the summer months is approximately 33°C, while during the winter months the mean average minimum temperature of approximately 3,1°C. The area also experiences extreme events on a regular basis, including frost, hail, drought, and high speed winds. Prevailing winds are north-westerly and south easterly winds with an average speed of approximately 5 m/s, between the driest and wettest months; the difference in precipitation is 73 mm. During the year, the average temperatures vary by 15.3 °C.

The prevalent wind direction of the area of application is depicted in **Figure 12**.

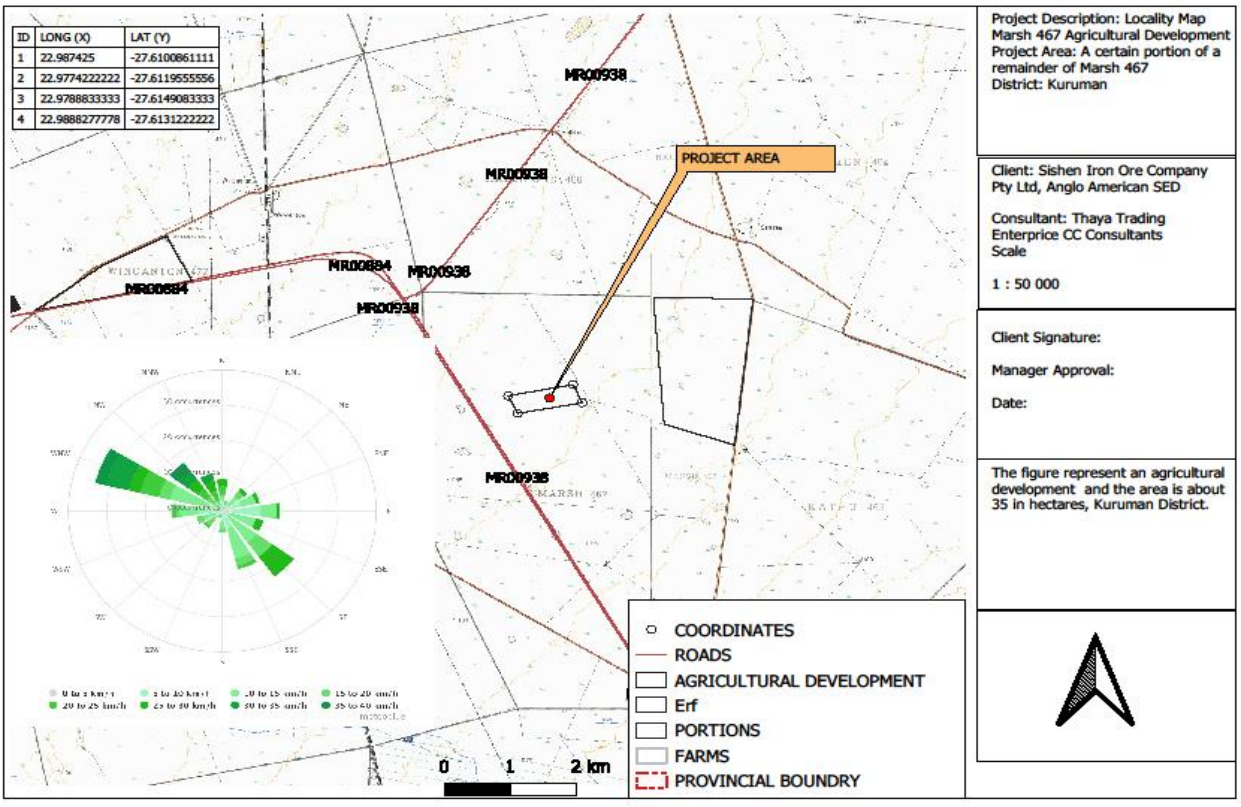

Figure 12: Prevalent wind direction

Climate can influence the potential for environmental impacts and related developmental design. Specific issues include:

- rainfall could influence erosion, evaporation, vegetation growth, rehabilitation planning, dust suppression, and surface water management planning;
- temperature could influence air dispersion through impacts on atmospheric stability and mixing layers, vegetation growth, and evaporation which could influence rehabilitation planning; and
- wind could influence erosion, the dispersion of potential atmospheric pollutants, and rehabilitation planning.

6.4.1.5 Agricultural Potential

Agricultural potential is very low due to shallow sandy soils and climatic constraints. Dry land production potential is estimated to be 13 Ha per large stock unit. Specific limitations applicable to the area include shallow soils, unfavourable climate, low water-holding capacity, stony soils and rock outcrops and erosion hazards (Please see **Figure 13**).

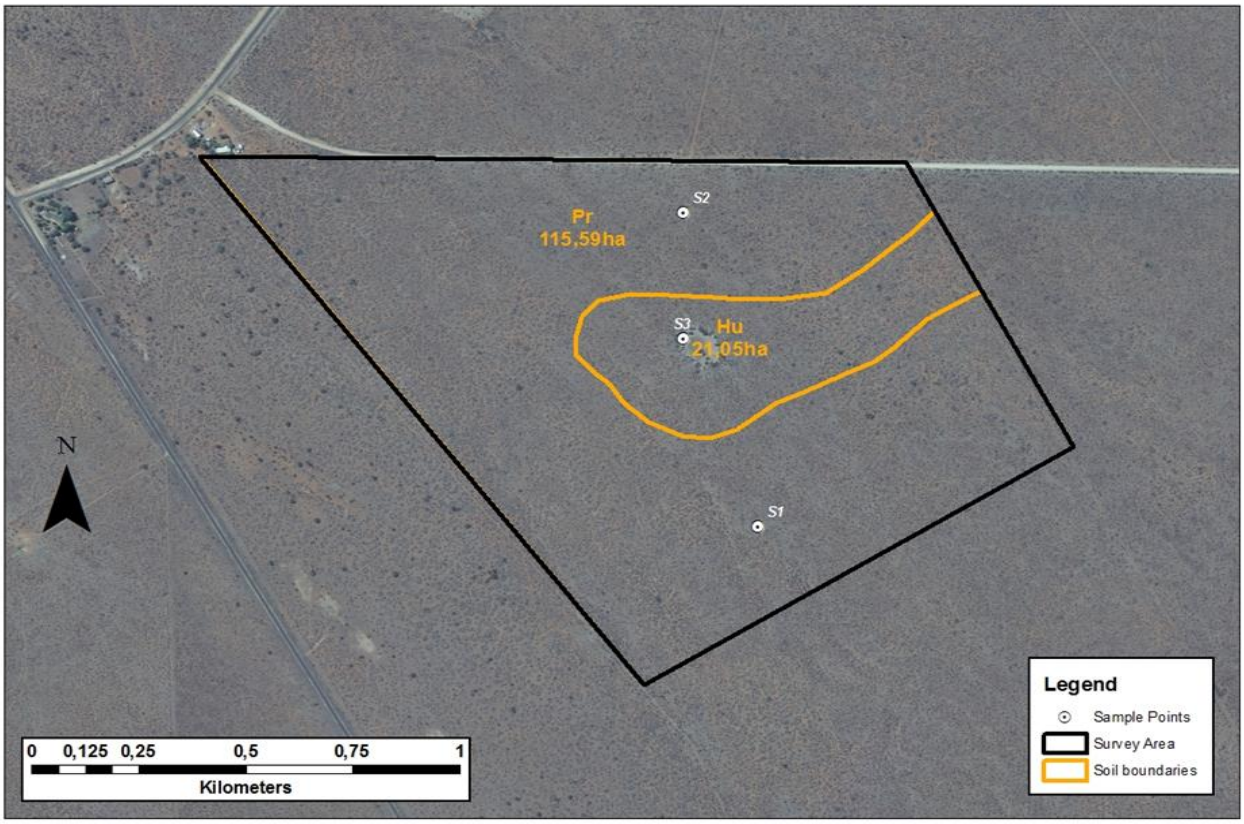

Figure 13: Soil Map (Source: ARC-Institute for Soil, Climate and Water, 2017)

Currently, predominant land uses are mining and agriculture in the Gamagara area. However, generation of energy from renewable power source is becoming common in recent times. The single most influential factor to the development of the Gamagara area is Sishen Iron Ore mining development. The Gamagara area became known to the general South African community as a result of enormous number of jobs that are created by Sishen Iron Ore Mine. Not only does the mine provide jobs to thousands of job-seekers, it is also the single contributing factor to the planning and development of Kathu town.

6.4.1.6 Surface Water

There are neither perennial nor non-perenial rivers that traverse the area of application. The Gamagara River traverses South West of the area of application. The area of application is located within the Lower Vaal Water Management Area (WMA), in the D41J Quaternary Catchment drained by the endorheic Gamagara River. The regional drainage pattern of the area is primarily to the northwest in the direction of the endorheic Gamagara River, but most of the drainage lines in the mining area have historically been impacted on by mining activities. There are two (2) wetland pans in the proximity of the proposed Farm Marsh Hydroponics Systems Project. No wetlands, drainage patterns or rivers occur within the area of application.

6.4.1.7 Groundwater

Groundwater resource is valuable. Groundwater is defined as water that is located beneath the surface in soil, rock pore spaces and in the fractures of lithological formations. Groundwater resource is impacted by a number of activities such as domestic, agricultural and mining operations. Agriculture and mining may require dewatering services in order to operate effectively and efficiently whilst promoting environmental protection and for purposes of water supply.

The Gamagara are groundwater resource is limited. The local mining operations require significant quantities of groundwater to support operations. The nearest mining operations to Farm Marsh that also use groundwater to support their operations are Tshipi Borwa and Sishen Mines. Sishen Mine’s activities have impacted on water resources in two ways, on the one hand, it is the direct dewatering zone of impact and on the other hand, it is the indirect impact of restricted surface water flow in the Gamagara River as result of swallets that formed in the river. The quality of primary and shallow groundwater at Sishen Mine has

been impacted by pollution caused by historic events and activities, with hydrocarbons being the most concerning contaminants resulting in pollution at the mine (Shangoni, 2017).

6.4.1.8 Topography

The area of application is characterised by a flat topography with gentle slope as depicted in **Figure 14**.

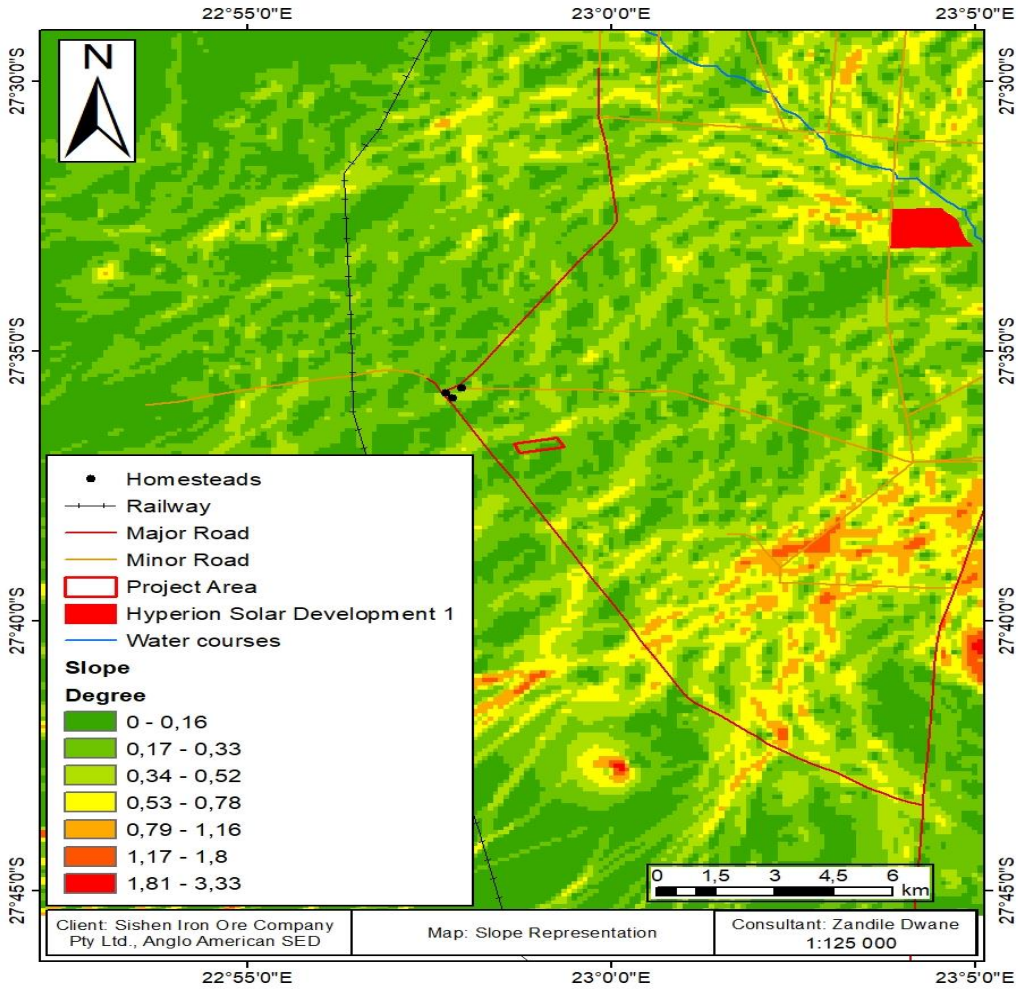

Figure 14: Slope Representation (Source: Envirod, 2020)

The elevation ranges from approximately 1 159 m and 1 164 m. The small range from 1 159 m to 1 164 m in height above sea level is another factor that is indicative of flat topography with gentle slope.

The area lies at an altitude of 1 162 meters above sea level on average, with the highest elevations occurring in the South East corner as depicted in **Figure 15**.

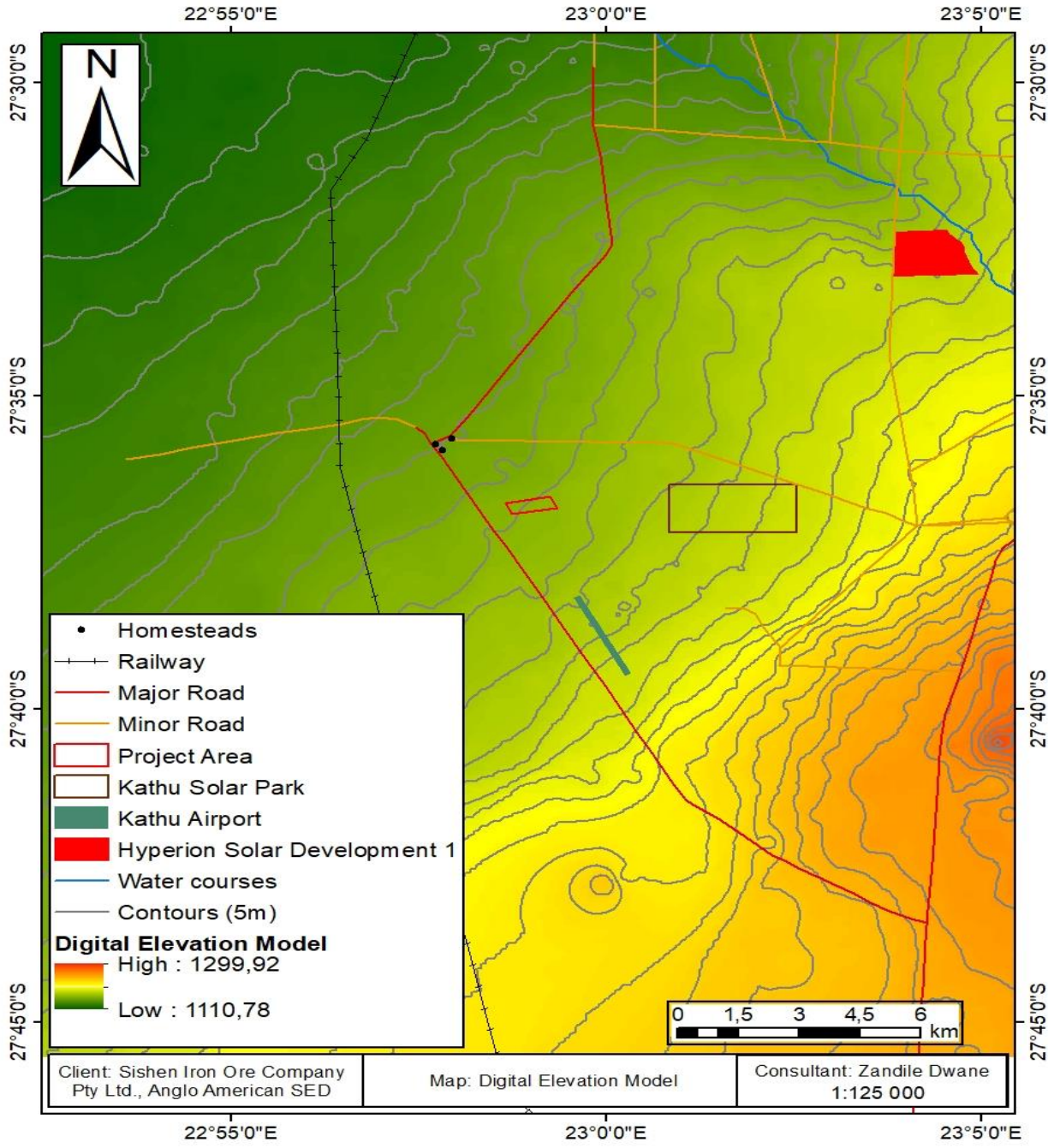

Figure 15: Digital Elevation Model (Source: Envirod, 2020)

Sishen Airport is in the South East of the project area and the Kathu Solar Park is in the Far East of the project area. The application area remains relatively undisturbed.

6.4.1.9 Biodiversity

The area of application lies within the Savanna biome that is characterised by grassy ground layer and woody plants. The Savanna biome is the largest biome in the Southern African region.

The Remaining Extent of Farm Marsh 467 is located within Kathu Bushveld/Kuruman Thornveld (Munica & Rutherford, 2006). The development footprint is 35 hectares in size and it comprises of wooded tree and shrub species. Kathu Bushveld is described as an open savannah with the Camel Thorn, *Vachellia erioloba* (formerly known as *Acacia erioloba*) and Shepards Tree, *Boscia albitrunca* as the prominent trees. The shrub layer contains the Grey Camel Thorn, *Vachellia haematoxylon* (formerly known as *Acacia haematoxylon*) Black thorn *Senegalia mellifera*, (formerly known as *Acacia mellifera*) Blue bush, *Diospyros lycioides* and *Lycium hirsutum*. The grass layer is very variable. The vegetation within the proposed development area is uniform. The area of the proposed development consisted of a dense scrub, dominated by *Senegalia mellifera* and *Tarchonanthus camphoratus*.

The sand layer overlays a limestone layer. Surface rocks are absent in certain areas but up to 5% of the soil surface may be covered by limestone. Two distinct layers were evident within the area, namely a grassy layer and a tree/shrub layer. Tall trees (>5 m) are not very abundant occurring as isolated individuals mostly on the extreme south eastern boundary where the sand layer is more conspicuous and is mostly *Vachellia erioloba.*

The shrub layer is well-developed (**Figure 16**). The species present include *Tarchonanthus camphoratus,Grewia flava, Senegalia mellifera, Lycium cinereum* and *Ziziphus mucronata*. The dwarf shrubs are represented by *Chrysocoma obtusata*, *Lasiosiphon polycephalus, Pentzia calcarea*, *Hermannia tomentosa* and *Geigeria brevifolia.* The grass layer is moderately developed although patchy. The dominant grass species are, *Tragus berteronianus, Eragrostis lehmanniana, Stipagrostis uniplumis, Aristida stipitata, Aristida congesta* subsp*. Congesta, Schmidtia pappophoroides,* and *Pogonarthria squarros. Cyperus decurvatus* was also common within the grass layer.

Figure 16: Dense shrub that covers most of the area of application.

The area immediately surrounding the existing hydroponics development has at some stage been cleared. This area now consists of secondary vegetation mostly grasses, although a *Boscia albitrunca* and one large and three smaller *Vachellia erioloba* trees (**Figure 17**) have been left *in situ*.

Figure 17: The cleared piece of land has now formed open grassland with protected trees left *in situ*.

The study area falls within the Griqualand West Centre of Endemism (GWC) (Van Wyk & Smith, 2001). A centre of plant endemism is an area with high concentrations of plant species with very restricted distributions, known as endemics. Centres of endemism are important because it is these areas, which if conserved, would safeguard the greatest

number of plant species. They are extremely vulnerable; relatively small disturbances in a centre of endemism may easily pose a serious threat to its many range-restricted species. The property does not fall within a NPAES focus area but is located 20 Km east of an area identified as a potential protected area for the eastern Kalahari bushveld. The study area does not fall within a critical biodiversity area as identified in the Northern Cape Critical Biodiversity Areas project 2016, but parts of the study site does fall within an ecological support area (ESA) (Birch, 2021).

Alien / Invasive species

The Conservation of Agricultural Resources Act (CARA) regulates and restricts the propagation, harbouring and sale of invasive alien plant and weed species listed in a set of Regulations published in terms of the Act. CARA was amended in 2001 and is administered by the National Department of Agriculture.
The National Environmental Management: Biodiversity Act (NEMBA – Act no. 10 of 2004) regulates all invasive organisms in South Africa, including a wide range of fauna and flora. All listed Invasive / Alien Plant species are divided into four categories in accordance with the Government Gazette Notice No. 40166 of July 2016. Alien invasive plant species that occur in and around the area of application are *Argemone mexicana* and *Prosopis* cf. *glandulosa.*

Invertebrates
One species of conservation concern was noted to occur within quarter degree square, based on Atlas of African Spiders (Biodiversity & Development Institute).

6.4.1.10 Wetlands

A wetland as defined by the National Water Act refers to land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water and which under normal circumstances supports or would support vegetation typically adapted to life in water saturated soil. However, there are some wetlands (ephemeral pans) in the region surrounding the project area. Kathu Pan is a series of sinkholes located on the northern outskirts of Kathu. They

have produced extremely significant archaeological and palaeocological data since its discovery in 1974. Hand axes and faunal remains were observed in the walls sinkholes.

6.4.1.11 Civil Aviation

Controls markings of structures that may influence aviation through the Civil Aviation Standards, Obstacle, Limitations and Markings outside Aerodrome or Heliports are regulated as per the standard.

All and any communications structure, building or any other structure, whether temporary or permanent, which has the potential to impact of aviation in navigable airspace, or has the potential to interfere with the operation of navigation or surveillance systems or instrument Landing Systems, including meteorological systems for aeronautical purposes, is considered an obstacle and shall be submitted to the Commissioner for Civil Aviation for evaluation (refer to SA-CATS-AH 139.01.33).

6.4.1.12 Waste

Waste is expected to be generated as a result of the proposed development and associated activities. It is proposed that waste that is generated on site should be separated at source. Waste Separation at Source pertains to setting aside post-consumer dry recyclable waste and household generated garden waste for the purpose of re-use, recycling, composting, or further processing of these materials.

Enormous value in waste separation at source emanates from, among others, procurement, recycling materials that are well sorted and uncontaminated. A basic requirement to achieve this value is that as much as possible, and efficiently as possible, waste or materials are separated early in the recycling process. This is separating waste at source essentially.

In South Africa, waste management is governed by the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) which came into effect on 1 July 2009. Following the enactment of the NEM:WA, the Minister of Environmental Affairs established the National Waste Management Strategy (NWMS) to ensure the achievement the objectives of the NEM:WA. The NWMS was approved for implementation by the Cabinet in November 2011. The Waste Act supports the waste management hierarchy in its approach to waste management, by promoting cleaner production, waste minimisation, reuse, recycling and waste treatment with disposal seen as a last resort in the management of waste. There are a number of types of waste to be transported. Before any waste is

transported, the person responsible for transporting such waste needs to assess the nature as well as the requirements for a specific load if waste to be transported. Understandably the preparations for transporting building rubble for instance, would be different to that of medical waste.

6.4.1.13 Heritage and Cultural Resources

The existing heritage resources, if any, are going to be protected through demarcation of the NO-GO zone(s). All encountered graves, if any, are going to be preserved. Buffer zones may be built, at least 100 m away from the preserved heritage resource. Specialists and relevant authorities will be notified and called in should any Heritage Resources of significant importance be encountered. Alternatively, a procedure/protocol that is recommended by specialists may have to be followed.

Kathu Pan is a series of sinkholes located on the northern outskirts of Kathu. They have produced extremely significant archaeological and palaeocological data since its discovery in1974. Hand axes and faunal remains were observed in the walls sinkholes.
Archaeological excavations at a site called KP1 began in 1980.Subsequently excavations were conducted at 11 other sites named KP2 – KP12. ESA artefacts and fauna were found in association with each other in near primary context. The stratigraphy at Kathu Pan showed an ESA to MSA sequence. A classic pear shaped hand axe made of banded ironstone was among the finds and was much publicised which has been loaned to a travelling exhibition Royal Academy of Arts exhibition *Africa, the art of a Continent* in 1995.
The Kathu Pans are protected it terms of a proclamation in 2013 as Grade 1 site in terms of Section 7 of the NHRA.
The Kathu Pan Sites have been identified as part of an established Early Stone Age Tradition which has been designated the Kathu Complex that show high intensity of lithic production as evidenced by the high density of manufacturing debris and finished artifacts. The findings from Kathu Townlands on the eastern outskirts of the town represent an extensive occupation covering several hectares and has been found to be in sharp contrast to low density Acheulean occupation at the much publicized Wonderwerk Cave in the Kuruman Hills, 56 Km to the east. In August 2013 excavations were undertaken as part of Phase Heritage Impact Assessment (data recovery as mitigation) for the development a shopping mall on a small portion of the known deposit. The excavated trenches exposed

dense artefact deposits mixed with rubble and sand reaching a maximum depth of 2.2 m. The massive quantity of artefacts recovered were consistent with an Acheulean (ESA) age exploiting the Banded Ironstone Formation (BIF) as source of the raw material. The sites are protected and are the subject of on-going research (Matenga, 2021)

The property is located 6km north of Kathu Pan Site (KP1), now proclaimed a Grade 1 site and hence protected. Kathu Airport is located between the farm Marsh 467 and KP1.

On the farm Marsh 467 there are scatters of lithics comprising a few scrapers and significantly many flakes. While the area around Kathu has a significant Early Stone Age footprint, the finds on the farm Marsh 467 appear to date to the Middle Stone Age and none of the of the ESA type tools were found.

Wooden posts, a water tank and drinking trough are remnants of livestock holding and feeding facilities. The water tank and trough may be reused in the cattle fattening project, if any.

6.4.1.14 Socio-economic

The Northern Cape Province is the largest province in South Africa in geographical extent - covering an area of 372 889 km^2. This area accounts for approximately 30% of the country's geographical extent coverage. However, the Northern Cape Province has the lowest population compared to all the other provinces. The Province is bordered by Namibia and Botswana in the Southern African Region; and the Northern Cape Province is bordered by North-West Province borders in the north-east, the Free State Province in the east, the Eastern Cape Province in the south-east, and the Western Cape Province to the south and south-west within the borders of South Africa. The Northern Cape consists of five districts, namely JohnTaolo Gaetsewe, Namakwaland, Frances Baard, ZF Mgcawu (previously known as Siyanda) and Pixley ka Seme.

The John Taolo Gaetsewe District Municipality ("JTGDM") is the second smallest of the five district municipalities in geographical extent coverage in the Province - covering a surface area 27 293 km^2 (more than 6% of the province).

Kathu is accessible via the N14, which connects to Upington, parts of North-West Province and Gauteng Province. From N14, a person can branch to join R385 to Postmasburg. Again, from N14, a person can branch to join other regional roads in the region such as the R380, which connects Kathu to Hotazel (through the Stokkiesdraai T-junction towards

Hotazel giving access to the application area, Remaining Extent of Farm Marsh 467). The road is covered by tarmac surface.

The dependency ratio of the population in the area is relatively lower than that of the Province (35.8%) and South Africa (34.5%), with 28% of people falling within the ages of 0 to 14 and over 65 years old. 43% of the employed people are employed in the formal sector while 5% are those in the informal sector. The importance of the informal sector in the local economy is recognised, as it gives those who are not skilled an opportunity to create livelihoods for themselves and their families. 5% are employed in private house, which means, they work as gardeners, as housekeepers or child minders (IDP – GLM, 2017-22).
The Gamagara Local Municipality is currently one of the major players in the economy of the Northern Cape Province. Needless to state that the GLM is an important contributor to South Africa's mining sector and Gross Domestic Product, and international mining value chain. The local municipality does benefit from infrastructure investments and Social and Labour Plan implementation schemes by various mining operations within the area. The municipality has identify the economic pull and push factors, such as education and training, research, entrepreneurship, community image and the arts. (IDP – GLM, 2017-22).

6.4.1.15 Land Uses

Potchefstroom University then, North West University now conducted soil and land use survey in year 2003. Currently, there is hydroponics systems project (less than 1 hectare) and bee harvesting going on at Farm Marsh. The zoning of Farm Marsh 467 is special zoning – mining. As such the area of application falls within the Mining Right (NC30/5/1/2/2/0259MRC) area. Sishen Iron Ore (Pty) Ltd is the holder of the mining right that was issued for Aggregate and Iron Ore by the Department of Mineral Resources then.
The Remaining Extent of Farm Marsh 467 (35 hectares), John Taolo Gaetsewe, Northern Cape is owned by the applicant, Sishen Iron Ore Company (Pty) Ltd (Title Deed No: T3280/2011). Furthermore, the CRLR confirmed no claims appeared on their database in respect of Farm Marsh 467.

To achieve sustainable irrigation of soils, the appropriate soils need to be identified, to prevent water logging and salinization. During irrigation, considerable amounts of salts are applied with the water. When water is absorbed by plant roots through transpiration, the

salts are precipitated in the soil and a long-term result is the increased concentration of salts called salinization. Salinization in the soil can hamper crop growth and in extreme cases salinization will render the soil non-vegetative. These effects can be negated with proper management on soils with specific properties. For this reason, the Department of Agriculture; Northern Cape, has provided guidelines to which soil properties must adhere before a ploughing license can be granted. A ploughing license is one of the requirements, which must be fulfilled before the Department of Water, and Sanitation will grant water rights for irrigation. An irrigation potential soil survey will investigate the morphological, physical and chemical properties of soils related to drainage, salinization and sodicity, and indicate the areas where the soils are suitable for irrigation.

6.4.1.16 Visual Amenity

Activities and associated infrastructure possess potential to impact negatively on the visual aspect of the environment (Please see **Figure 18**).

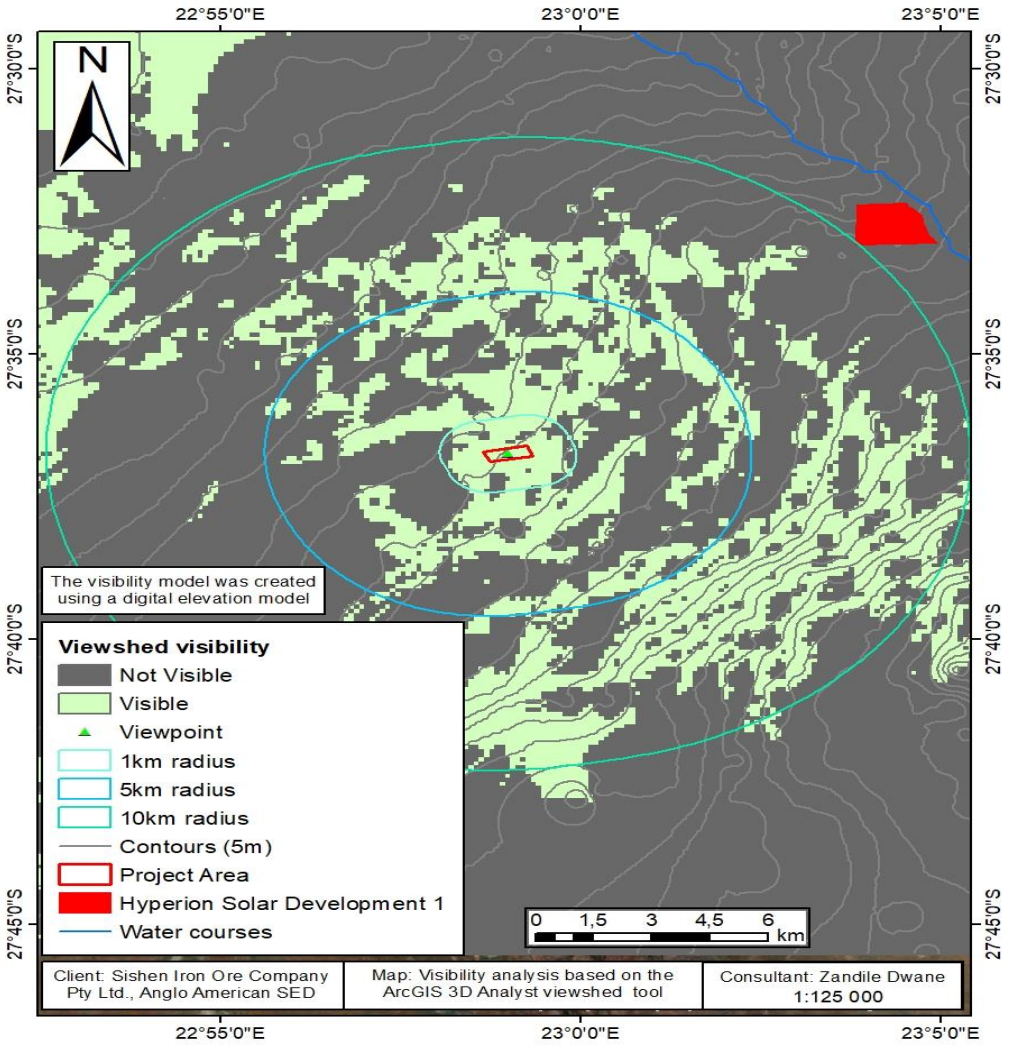

Figure 18: Visibility analysis of the Viewshed Model (Source: Envirod, 2020)

Dust that is going to be generated from the proposed development will impact on the landscape character, scenic quality among others.

There are approximately 14 Solar developments with either an approved Environmental Authorisation or applications under consideration within 30 Km radius of the proposed development. In close proximity (< 10 Km) to the proposed Farm Marsh Hydroponics Systems Project, there are three (3) Solar Energy Generation Facilities, namely; Kathu

Solar Park, Sishen Solar Facility and Reisa Solar Field. Additionally, the project area is within 8 Km of other civil aviation aerodrome.

—Visual, scenic and cultural components of the environment can be seen as a resource, much like any other resource, which has a value to individuals, to society and to the economy of the region‖ (Oberholzer, 2005). A Visual Impact Assessment (VIA) is a specialist study performed to identify the visual impacts of a proposed project on the surrounding environment. The proposed project will be investigated in terms of the visual characteristics of the receiving environment. The Zone of Theoretical Visibility was determined and is presented in **Figure 19**.

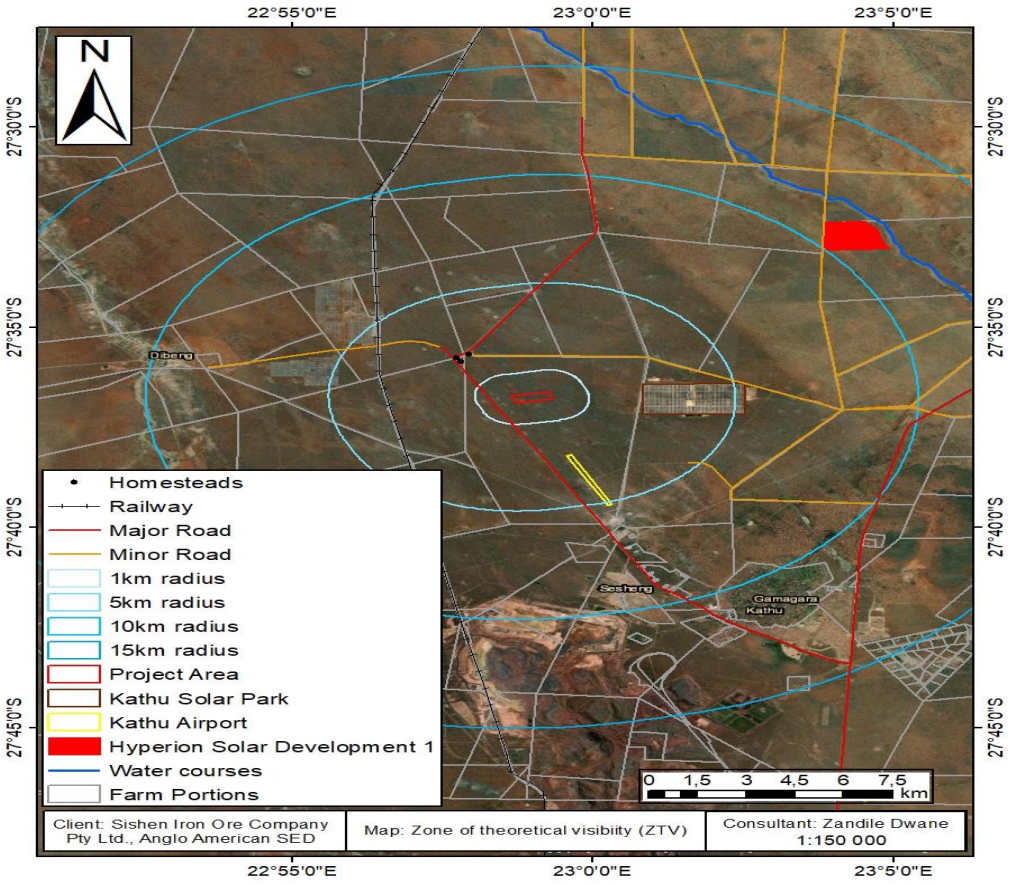

Figure 19: Zone of Theoretical Visibility (Source: Envirod, 2020)

The large size, strong regular geometry of solar facilities, and the use of mirrors or glass panels with metal supporting structures, may result in high visual contrast being created that is visible for long distances in many instances. In favourable viewing conditions, large facilities can be visible from a distance of 15 Km or greater; it should be noted however that

viewed from such long distances, the facilities may not be recognisable as solar facilities. Built structures associated with solar power facilities would introduce complex, rectilinear geometric forms and lines and artificial looking textures and colours into the landscape; these would typically contrast markedly with natural appearing landscapes.

6.4.1.17 Noise and Vibration

There are activities that are conducted in the locality which cause noise pollution. Some of them cause some vibration of the ground. They include mining activities among others. All these aspects may cause a disturbance to receptors that are in the locality.

6.4.1.18 Air Quality

The air quality of the pre-agricultural activity period is expected to have been of a better quality; however, the existing mines in the surrounding areas also contribute to the air quality degradation. The main concern in this regard would however be dust from the proposed diamond mining settling on surrounding areas. However, a dust control plan will be implemented for the proposed project in order to control any possible nuisance dust that might give rise from the surrounding. The main contaminants associated with the project includes: inhalable particulate matter less than 10 microns in size (PM_{10}), larger total suspended particulates (TSP) that relate to dust fallout, VOC, SO_2, N_2O, CH_4 and gaseous emissions mainly from vehicles, spoiled produce, bad odour and generators. A change in ambient air quality can have health and/or nuisance impacts. Related mitigation measures focus on pollution prevention and monitoring.

6.4.1.19 Site Sensitivity

The proposed project area falls mostly within an area of low sensitivity, there are however some protected trees scattered within the site and these have been classified accordingly as high sensitivity areas (**Figure 20**).

Figure 20: Site Sensitivity Map

6.5 Environmental Impacts and Risks Associated with the Alternatives

The identified potential impacts that are associated with the proposed development are presented in Table 9.

Table 9: Potential impacts identified

Environmental Factor	Nature of impact	Management
Geology and mineral resource	Sterilisation of mineral resources.	Ensure that minimal quantity of commodity of economic value is sterilised.
Topography	Changes to surface topography due to topsoil removal, construction and placement of infrastructure and development of agricultural project.	Employ effective rehabilitation strategies to restore surface topography of topsoil removal, placement of agriculture-related infrastructure.
Vegetation Clearance	Destruction of natural vegetation, including listed and / or protected species.	Ensure vegetation clearance occurs within the area of application. Ensure that permits and authorisations are obtained before removing protected species.
Soil Preparation	Disturbance of state of natural topsoil.	Remove topsoil if it is necessary to do so only. Stockpile or conserve removed topsoil for rehabilitation purposes.
Soils	Soil erosion by water and wind on disturbed and exposed soils; potential for dust production and soil microbial degradation; unmonitored use of pesticides potential contamination of soils due to spillages.	Employ appropriate management strategies to preserve soil resources; Monitor soil preparation; Spray water on the surface regularly to avoid or minimise erosion;
Land capability	Loss of land capability through topsoil removal, disturbances and loss of soil fertility.	Employ appropriate rehabilitation strategies to restore land capability; Environmentally friendly use of chemicals, pesticides and herbicides on-site; Prepare or manipulate soil to enhance agricultural potential.

Land use	Change in Land Uses; Loss of land use due to poor placement of Surface infrastructure, poor maintenance and ineffective Rehabilitation	Ensure the area of application is zoned for agricultural use too; Carefully plan the placement of infrastructure; Maintain operations effectively and efficiently; employ rehabilitation strategies to restore land capability.
Groundwater	Pollution of underground water sources; Drop in groundwater level.	Construction of measures to prevent seepage into the groundwater by biological and engineering means. Implementation of the necessary management programs to ensure the integrity of ground water resources.
Surface water	Deterioration in water quality through contamination	Frequent monitoring of surface water resources (Standing water). Prevent overspill of agriculture associated activities into drainage channels / streams, if any. Implement the necessary management programs to ensure the integrity of surface water (Standing water) resources.
Indigenous flora	The clearance of vegetation; potential loss of floral species with conservation value; potential loss of ecosystem function.	Vegetation clearance is inevitable; Apply for necessary permits and obtain necessary authorisation to remove protected species; Employ proper protection, rescue and / or rehabilitation strategies.
Alien invasive plants	Proliferation of alien invasive plants species.	Eradicate, and control the spread, of alien invasive species.
Fauna	Displacement of fauna	Prevention of overspill of activities onto the surrounding ecological environment. Employ proper protection and / or rescue strategies.
Habitat	The loss, damage and fragmentation of floral and faunal habitats; potential loss of ecosystem function.	Employ proper protection, rescue and / or rehabilitation strategies.
Air quality / Global Warming	Sources of atmospheric emission associated with the planned operations	Effective soil management; identification of the required control

	are likely to include fugitive dust from materials handling operations, lose soils, wind erosion and vehicle entrainment of road dust.	efficiencies in order to maintain dust generation within acceptable levels.
Noise and vibration	Increase in continuous noise levels; the disruption of current ambient noise levels; and the disruption of sensitive receptors by means of increased noise and vibration.	Ensure effective communication with nearby mining operation stakeholders; request them to limit generation of excessive noise and vibration, if necessary; Or at least communicate blasting period that is scheduled; Ensure all vehicles and equipment is in a good working order; proper communication.
Visual impacts	Visual impact of the infrastructure; visibility of dust.	Effective planning of the location of Infrastructure and operations to minimise visual impact; wet soils regularly.
Use of Herbicides	Pollution of soil and water resources.	Control and monitor the use of Herbicides.
Use of Pesticides	Pollution of soil and water resources.	Control and monitor the use of Pesticides.
Civil Aviation	Impact on the operations of the nearby airport.	Ensure effective communication with the relevant Government Department and airport stakeholders.
Roads	Destruction of natural state of environment.	Maintain good or acceptable condition of road surfaces. Control dust generation.
Traffic	Potential negative impacts on traffic safety; And deterioration of the existing road networks	Utilise existing access roads, where applicable; implement measures that ensure adherence to traffic rules.
Heritage resources	The deterioration of sites of cultural and Heritage importance.	Preserve, protect and / or rescue Heritage and Cultural resources identified within a no go zone; further resources uncovered during planned operations need to be reported to a suitably qualified Archaeologist and/or Palaeontologist.
Socio-economic	Positive: Poverty Alleviation; Employment Opportunities; Revenue	Application of commitments made in the Social and Labour Plan;

	Collection by the State; Indirect benefits by relatives of beneficiaries; Negative: Loss of agricultural potential; influx of workers to the area increases health risks and loitering (resulting in lack of security and safety); negative impact of employment loss during closure of project.	implementation of Community development programmes; Skilling of beneficiaries; Ensure Compliance with food production, applicable regulations;
Interested and affected parties	Loss of income. COVID-19	Ensure continuous and transparent communication with I&APs. Observe Government Regulations
Waste	Pollution of the environmental.	Ensure effective Waste Management Plan and environmentally friendly use of chemicals, pesticides and herbicides on-site.
Disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles.	Potential negative impacts on wildlife	Enter into amicable agreements that will promote wellbeing and protection of wildlife. Should there be necessity to relocate wild animals, that exercise should be undertaken in sustainable, environmentally friendly and safe manner.
Impacts on Mining Activities	Potential negative impacts on mining activities	Enter into amicable agreements that will promote wellbeing and protection of on-going mining activities.

6.6 Methodology Used In Determining The Significance of Environmental Impacts

The impact significance rating methodology presented herein is in compliance with provisions of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as amended, read in tandem with the Environmental Impact Assessment Regulations 2017 (as amended). The approach followed to determine significance rating is that of considering the consequence (*C*) of each impact (comprising Nature, Extent, Duration and Magnitude) and relate this to the probability/ likelihood (*P*) of the impact occurring as a product. This determines the significance of impact. In addition, other factors, including cumulative impacts, public concern, reversibility, and potential for irreplaceable loss of resources, are used to determine Priority. Priority is used as a guide for authorities and stakeholders to making informed decisions pertaining to the development approach. The impact assessment will be applied to all identified alternatives. Where possible, mitigation measures will be recommended for impacts identified.

Impact Assessment, Rating and Mitigation

The criteria used to assess the significance of the impacts are discussed below. The criteria used to assess the significance of the impacts are shown in the table below. The limits were defined in relation to mining characteristics. Those for probability, intensity/severity and significance are subjective, based on rule-of-thumb and experience. Natural and existing mitigation measures were considered.

These natural mitigation measures were defined as natural conditions, conditions inherent in the project design and existing management measures, which alleviate impacts. The significance rating of the impacts was calculated by using the following formula:

The Significance Rating (*SR*) of an impact is determined by applying Consequence (*C*) of the particular impact and the Probability (*P*) of the impact occurring. Consequence is determined through the consideration of the Nature (*N*), Spatial Scope/Extent (*E*), Duration (*D*), and Severity (*S)* applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = (E+D+S) \times N$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Tables 10 to 14.

The criteria used to assess the significance of the impacts are shown in Tables 10 - 14. The different project activities and associated infrastructure were identified and considered in order to identify and analyse the various possible impacts. The limits were defined in relation to project characteristics. Those for severity, extent, duration and probability are subjective, based on rule-of-thumb and experience. Natural and existing mitigation measures were considered. These natural mitigation measures were defined as natural conditions, conditions inherent in the project design and existing management measures, which alleviate impacts. The Consequence value of the impacts was calculated by using the following formula:

CONSEQUENCE	*X*	*PROBABILITY*
N x(Severity + Spatial Scope + Duration)		(Frequency of activity + Frequency of impact)

For the impact assessment, the different project activities and associated infrastructure were identified and considered in order to identify and analyse the various possible impacts. These include access roads, tunnels, centre pivot, photovoltaic energy generation facility and related infrastructure, reservoir, cooling system, polymeric water storage tanks, fence, topsoil storage, reverse-osmosis system, temporary office, workshops and ablution facilities, pump station, pipeline, other temporary buildings, etc.

Significance of impacts is described as follows:

Very Low – Impact would be negligible. Almost no mitigation and/or remedial activity would be needed, and any minor steps which might be needed would be easy, cheap and simple.

Low – Impact would have little real effect. Mitigation and/or remedial activity would be either easily achieved or little would be required or both.

Low – Medium: Impact would be real but not substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be both feasible and fairly easily possible.

Medium – High: Impact would be real and rather substantial within the bounds of those which could occur. Mitigation and/or remedial activity would be feasible, but not necessarily possible without difficulty.

High – Impacts of substantial order. Mitigation and/or remedial activity would be feasible but difficult, expensive, time consuming or some combination of these factors.

Very High – Of the highest order possible within the bounds of impacts which could occur. There would be no possible mitigation and/or remedial activity to offset the impact at the spatial or time scale for which was predicted.

Table 10: Some Consequence Parameters

Weight	Severity	Spatial Scope/Extent	Duration
0	Insignificant/non-harmful	Activity specific/No effect/Controlled	Immediate (0 – 6 months)
1	Minimal / potentially Harmful	Slight permanent deviation / on-site	Short term / construction (6 months- 1 yr)
2	Medium / slightly Harmful	Immediate surroundings / local / outside mine area	Life of operation
3	High / Critical / Serious	Regional effect	Decommissioning
4	Catastrophic / major	National/ Severe environmental damage	Residual
5	Disastrous	Trans boundary effects	Permanent

Table 11: Probability Parameters

Weight		**1**	**2**	**3**	**4**	**5**
Frequency						
Probability	Frequency of Impact	Highly unlikely	Rare	Low likelihood	Probable/ Possible	Certain
		Practically impossible	Conceivable but very unlikely	Only remotely possible	Unusual but possible	Definite
	Frequency of Activity	Annually or less	6 monthly/temporarily	Infrequent	Half-life of operation	Life of operation

Table 12: Significance Rating (It could be positive or negative, depending on the nature of impact)

CONSEQUENCE (Severity + Spatial Scope + Duration)															
PROBABILITY (Frequency of activity + frequency of impact)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90
	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table 13: Significance

Colour Code	Significance Rating	Value	Negative Impact Management Strategy	Positive Impact Management Strategy
	VERY HIGH	126 – 150	Improve current management	Maintain current management
	HIGH	101 – 125	Improve current management	Maintain current management
	MEDIUM – HIGH	76 – 100	Improve current management	Maintain current management
	LOW – MEDIUM	51 – 75	Improve current management	Maintain current management
	LOW	26 – 50	Improve current management	Maintain current management
	VERY LOW	1 – 25	Improve current management	Maintain current management

Table 14: The Rating System (Summary of Impact Rating Parameters)

NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
+1	Positive	Likely to result in a beneficial impact.
-1	Negative	Likely to result in a detrimental impact.
SPATIAL SCOPE/EXTENT		
This is defined as the area over which the impact will be experienced.		
0	Activity Specific	The impact will only affect the activity and personnel working on it.
1	On-site	The impact will only affect the site.
2	Local or immediate surroundings outside project footprint	Will affect the local area or district.
3	Regional Impact	Will affect the Province
4	National	Will affect the entire country.
5	International	Will affect the Globe/Earth
FREQUENCY OF IMPACT		
This describes the chance of occurrence of an impact.		
1	Unlikely/Annually	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Rare/Temporary	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Relatively low likelihood/Infrequent	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Probable/Possible/Life of operation	Impact will most likely occur (Greater than a 75% chance of occurrence).
5	Definite/Certain/Life of operation	Impact will certainly occur (100% chance of occurrence).
FREQUENCY OF ACTIVITY		
This describes the chance of activity taking place.		
1	Annually of Less	The chance of the activity occurring is extremely low (Less than a 25% chance of occurrence).
2	6 Monthly or Temporarily	The activity may occur (Between a 25% to 50% chance of occurrence).
3	Infrequent	The activity will likely occur (Between a 50% to 75% chance of occurrence).
4	Frequently	Activity will most likely occur (Greater than a 75% chance of occurrence).
5	Life of Operation	Activity will certainly occur (100% chance of occurrence).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
0	Immediate	The impact is avoidable through conducting and implementing risk assessment.
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter, it will be entirely negated (0 – 2 years).
2	Medium to medium term/ Life of operation	The impact will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).

3	Medium term/Decommissioning	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 30 years).
4	Medium to Long term/Residual	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
5	Long term/Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered indefinite.
INTENSITY/ SEVERITY		
Describes the severity of an impact.		
0	Insignificant/ Non-harmful	Impact affects results of an performance an individual task.
1	Minimal/ Potentially Harmful	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium/Slightly Harmful	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High/Critical/Serious	Impact alters the quality, use and integrity of the system/component but system/component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
4	Major/Catastrophic	Impact affects the continued viability of the system/ component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation
5	Disastrous	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired. Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact can be successfully reversed upon completion of the proposed activity.		
0	Completely reversible	The impact is reversible with implementation of minor mitigation measures.
1	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
2	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
3	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question. Cumulative Impact: Considering predicted effects, residual effects, effects of other projects and activities in the form of potential synergistic, interactive system components, pattern, augmentative, consecutive impacts and mitigation measures.		
0	Low cumulative impact	The impact would result in negligible/insignificant cumulative effects.
1	Medium cumulative impact	The impact would result in minor cumulative effects.
2	High cumulative impact	The impact would result in significant cumulative effects

PUBLIC RESPONSE		
1	Low public response	Issue has received relatively low public response
2	Medium Public Response	Issue has received relatively moderate public response
3	High Public Response	Issue has received relatively high public response
SIGNIFICANCE		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The calculation of the significance of an impact uses the following formula: **Nature x (Extent + severity + duration) x (frequency of impact +frequency of activity).** The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	Impact significance rating	Description
1 to 25	Negative very low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
1 to 25	Positive very low impact	The anticipated impact will have negligible positive effects.
26 to 50	Negative low impact	The anticipated impact will have minor negative effects and will require minor mitigation measures.
26 to 50	Positive low impact	The anticipated impact will have minor positive effects.
51 to 75	Negative low to medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
51 to 75	Positive low to medium impact	The anticipated impact will have moderate positive effects.
76 to 100	Negative medium to high impact	The anticipated impact will have moderate to high negative effects and will require moderate to high significant mitigation measures.
76 to 100	Positive medium to high impact	The anticipated impact will have moderate to high positive effects.
101 to 125	Negative high impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
101 to 125	Positive high impact	The anticipated impact will have significant positive effects.
126 to 150	Negative very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
126 to 150	Positive very high impact	The anticipated impact will have highly significant positive effects.
PRIORITY		
Priority is determined through consideration of other parameters that may relate to the proposed development however not necessarily forming part of the process followed to determine significance. Determination of priority is performed for purposes of assisting all stakeholders at decision-making level reach informed decisions. The calculation of Priority of an impact uses the following formula: **Priority = Public Response (*PR*) + Cumulative Impact (*CI*) + Reversibility (*R*) + Irreplaceable Loss of Resources (*LR*)**		
2	Very Low	The anticipated impact is of negligible effects and will require no attention.
3 to 4	Low	The anticipated impact is of minor effects and will require minor attention.
5 to 7	Low to Medium	The anticipated impact is of moderate effects and will require moderate attention.
8 to 10	Medium to High	The anticipated impact is of moderate to high priority and will require moderate to urgent attention.
11 to 12	High	The anticipated impact is of high priority and requires urgent attention.

6.7 Positive And Negative Impacts of The Proposed Activity and Alternatives

During construction and operation of the proposed development, there is a possibility of sterilisation of the mineral reserves and resources due to selection of location alternatives and improper placement of infrastructure. The removal of topsoil and placement of infrastructure will alter the topography by adding features to the landscape. Topsoil removal and vegetation clearance will impact on the natural topography. The construction of infrastructure and various facilities on-site can also result in loss of soil due to erosion. Vegetation will be stripped in preparation for placement of infrastructure and operations of the agricultural project, and therefore the areas will be bare and susceptible to erosion.
Protected trees should be avoided as far as possible during invasive agricultural activities. If the avoidance of protected trees is inevitable, the applicant must obtain the necessary authorisation to remove protected species. Placement of small access roads and or any other associated infrastructure such as office area and storage areas should avoid slow-growing protected trees as far as possible. Areas with high density protected trees should be regarded as “sensitive” it should be mapped and avoided as far as possible. If protected trees cannot be avoided, a licence must be applied for and obtained prior to disturbance of such species.

A search and rescue of plants of special concern (i.e. endemic species; provincially protected or specially protected species; CITES listed species and TOPS listed species) prior to disturbance of natural vegetation will be done. Succulents such as Aloe species should be rescued and transplanted after obtaining the necessary Flora Permit from the Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform (NCDAEARDLR).

The developer may also need a Flora Permit from the NCDAEARDLR for destruction of natural indigenous, protected or specially protected plant species under the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA). The same applies to TOPS or CITES listed plant species under the NEM:BA. The topsoil that is stripped and piled on surrounding areas can be eroded by wind and rain. The soil will be carried away during runoff. The declared areas will be rehabilitation, but full restoration of soil might only occur over a number of years, subsequent to the re-establishment of vegetation. Furthermore,

improper stockpiling and soil compaction can result in soil sterilisation. Leaching can also occur, resulting in the loss of nutrients.

During the construction and operation of the proposed development there is a possibility that equipment might leak oil, thus causing surface spillages. The hydrocarbon soil contamination will render the soil unusual unless they are decontaminated. Then there is the potential that contaminated soil can be carried through runoff to contaminate water resources and stripped topsoil stockpiled for rehabilitation. Soil pollution is therefore possible, but through mitigation it can be minimised.

The loss of land capability and land use can occur in two ways. Firstly, through topsoil removal, disturbances and loss of soil fertility; and secondly through the improper placement of infrastructure. The site has a relatively low agricultural potential / capability. However, with soil preparation or manipulation, this aspect could be enhanced.

If oil and fuel spillages occur, then it will seep into the underlying aquifers and contaminate groundwater. Improper handling of hazardous material will cause contamination of nearby water resources during runoff episodes. Contaminated site must be remediated immediately.

Construction and agricultural activities on site will reduce the natural habitat for ecological systems to continue their operation. It is not expected that the areas of high ecological function will rehabilitation following disturbance events. Vehicle traffic generates lots of dust which can reduce the growth success and seed dispersal of many small plant species. It is expected that some indigenous and protected species will be destroyed because of the proposed Farm Marsh Hydroponics Systems Project. .

While general clearing of the area and agricultural activities destroy natural vegetation, invasive plants can increase due to their opportunistic nature in disturbed areas. If invasive plant establish in disturbed areas, it may cause an impact beyond the boundaries of the agricultural site. These alien invasive species are thus a threat to surrounding natural vegetation and can result in the decrease of biodiversity and ecological value of the area. Therefore, if alien invasive species are not controlled, managed and / or eradicated; their

propagation into new areas could have a high impact on the surrounding natural vegetation in the long term. With proper mitigation, the impacts can be substantially reduced.

The transformation of natural habitats to agriculture and associated infrastructure will result in the loss of habitat affected individual species, and ecological processes. In turn this will result in the displacement of faunal species dependent upon such habitat. Fast moving vehicles take a heavy toll in the form of road kills of small mammals, birds, reptiles, amphibians and a large number of invertebrates. Thus, speed limit should be implemented and monitored. The construction of the Farm Marsh Hydroponics Systems Project and associated infrastructure will result in the loss of connectivity and fragmentation of natural habitat. Fragmentation of habitat will lead to the loss of migration corridors, in turn resulting in degeneration of the affected population's genetic make-up. This results in a subsequent loss of genetic variability between meta-populations occurring within the site. Pockets of fragmental natural habitats hinder the growth and development of populations.

During the operation of the proposed development, the abovementioned activities have potential for dust generation. It is anticipated that the extent of dust emissions would vary substantially from day to day depending on the level of activity and the specific operations.
The impact of site-generated trips on the traffic of the existing roads is experienced to be low. Nevertheless, if road safety is not administered it can have a high impact on the safety of fellow road users.

The operation of the proposed development will create a limited number of new employment opportunities, especially for beneficiaries of the project. The magnitude of this impact will depend on the number of people that will be employed and the number of contractors sourced. An influx of people into the rural area will possibly impact on safety and security of local residents. During the decommissioning and at closure of the project, staff will most likely be retrenched or beneficiaries lose income.

Economic slump of the local towns after surrounding mine closure is an associated potential impact although this will only be an agricultural project. Income streams from wage bills as well as goods and services contracts (at all geographical levels) will come to an end, reducing the monetary income of individuals and mine-related businesses. People who

have derived income directly or indirectly from such projects may be inclined to leave the region in search of employment or business opportunities. This could result in further decline of the economy of the region as well as the abandonment of infrastructure. The loss of the mine workforce income will also impact upon non-mine related industries within the local and regional areas, particularly the rental property market and retail and service industries who would have received income during the life of mine from the salaried workforce. The implementation of the Social and Labour Plans of various mining houses will impact negatively on the possibility of the establishment of projects such as the Proposed Farm Marsh Hydroponics Systems Project.

It is difficult to predict the actual impact of the agricultural development project in advance, but it is acceptable to assume that the agricultural development project will have a negative impact on the local and regional economy with a high probability of occurrence, a high severity and a high significance.

Positive impact includes employment and training opportunities for people in the local community and local contractors; social up-liftment and community development programmes; revenue collection and economic benefits.

6.8 Possible Management Actions That Could Be Applied and The Level of Residual Risk

Some Possible Management Actions that could be applied are presented in Table 15.

To Be Populated after Public Participation Meeting.

Table 15 : Some Possible Management Actions

Issue and concern raised	Proposed management actions or alternative to address Issue	Impact significance of the possible management actions or alternative before and after management actions	
		Pre-mitigation	Post-mitigation
Interference with existing authorised land uses (not raised)	Apply for either section 53 or section 102 in terms of the MPRDA		

6.9 Motivation Where No Alternative Sites Were Considered

The application area (a piece of the Remaining Extent of Farm Marsh 467) falls within a Mining Right area. In a set-up of that nature, available land for purposes for which an area is zoned becomes limited. Factors such limiting interference between different processes, availability of land or lack thereof had to be considered. Furthermore, the Mining Right area had been prospected in the past. Meaning, the geology for purposes of understanding possible sterilisation of mineral resources of the area is fairly known to the applicant.

6.10 Statement Motivating The Preferred Alternative

The site layout was determined by taking into consideration factors such as specialist report inputs (when available), spatial and practical operation of agricultural development project that uses photovoltaic facility as energy source and associated infrastructure aspects. Considering the nature of proposed project, security measures will be considered in order to determine the final site layout. Alternative A and B have comparative ecological setting. However, alternative A enables the clustering of infrastructure as recommended in the Biodiversity Assessment Report. That makes alternative A the preferred alternative because of potential of larger area being protected by wind breakers.

7 Full Description of the Process Undertaken to Identify, Assess and Rank the Impacts and Risks that the Activity will impose on the preferred Site through the Life of the Activity

7.1 Description of The Process Undertaken To Identify Impacts

Environmental and socio-economic impacts associated with the proposed development in order to ensure sustainable development were identified using desktop study information, through Phase 1 field surveys that were conducted by Thaya Trading Enterprise, consultation with Interested and Affected Parties and related feedback and consideration of the project description and proposed site.

7.2 Description Of The Process Undertaken To Assess and Rank The Impacts and Risks

The assessment methodology enables the assessment of environmental issues in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks including: cumulative impacts, the severity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated. This assessment method was used to assess impacts associated with all project alternatives.

The criteria used to assess the significance of the impacts are shown in Tables 10 – 14.

7.3 A Description of The Environmental Impacts and Risks Identified During The Environmental Assessment Process

This section describes potential impacts on environmental and socio-economic pertaining to each of the fundamental project actions / activities, processes that will be followed and associated infrastructure that will be used in the proposed development (Please see Table 16).

Table 16: Environmental Impacts and Risks Identified

Activity/process or part thereof	Impacts (Pre-mitigation)
Sterilisation of Mineral Resources	Sterilisation of mineral resources Infrastructure, posing safety risks to personnel and animals Vegetation Clearance Topsoil Removal Loss of soil and land capability affected through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Proliferation of Invasive and Alien Plant species Change in visual amenity Change in Land Use Civil Aviation Use of Herbicides Use of Pesticides Lowering of groundwater level Air pollution, greenhouse gas emissions, global warming Loss of heritage/cultural and palaeontological resources Influx of labour Wetlands Health and Safety, including COVID-19 Traffic Waste Socio-economic impact Interference with existing land uses (Zoned for mining)
Soil Preparation	Sterilisation of mineral resources Infrastructure, posing safety risks to personnel and animals Vegetation Clearance Topsoil Removal Loss of soil and land capability affected through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Proliferation of Invasive and Alien Plant species Change in visual amenity Civil Aviation Change in Land Use Use of Herbicides Use of Pesticides Lowering of groundwater level Pollution of soil and water resources Air pollution, greenhouse gas emissions, global warming Loss of heritage/cultural and palaeontological resources Influx of labour Wetlands

	Health and Safety, including COVID-19 Traffic Waste Socio-economic impact Interference with existing land uses (Zoned for mining)
Vegetation Clearance	Sterilisation of mineral resources Infrastructure, posing safety risks to personnel and animals Loss of soil and land capability affected through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Proliferation of Invasive and Alien Plant species Change in visual amenity Civil Aviation Change in Land Use Use of Herbicides Use of Pesticides Lowering of groundwater level Pollution of soil and water resources Air pollution, greenhouse gas emissions, global warming Loss of heritage/cultural and palaeontological resources Wetlands Health and Safety, including COVID-19 Roads Traffic Waste Socio-economic impact Influx of labour Interference with existing land uses (Zoned for mining)
Placing Infrastructure	Sterilisation of mineral resources Infrastructure, posing safety risks to personnel and animals Vegetation Clearance Topsoil Removal Loss of soil and land capability affected through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Proliferation of Invasive and Alien Plant species Change in visual amenity Civil Aviation Change in Land Use Lowering of groundwater level Pollution of soil and water resources Air pollution, greenhouse gas emissions, global warming Loss of heritage/cultural and palaeontological resources Wetlands Health and Safety, including COVID-19

	Traffic Waste Socio-economic impact Influx of labour Interference with existing land uses (Zoned for mining)
Water use and management; Waste Management	Sterilisation of mineral resources Infrastructure, posing safety risks to personnel and animals Vegetation Clearance Topsoil Removal Loss of soil and land capability affected through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Proliferation of Invasive and Alien Plant species Change in visual amenity Civil Aviation Change in Land Use Use of Herbicides Use of Pesticides Lowering of groundwater level Pollution of soil and water resources Air pollution, greenhouse gas emissions, global warming Loss of heritage/cultural and palaeontological resources Wetlands Health and Safety, including COVID-19 Roads Traffic Waste Socio-economic impact Influx of labour Interference with existing land uses (Zoned for mining) Use of veterinary medicine
Support services	Sterilisation of mineral resources Infrastructure, posing safety risks to personnel and animals Vegetation Clearance Topsoil Removal Loss of soil and land capability affected through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Proliferation of Invasive and Alien Plant species Change in visual amenity Civil Aviation Change in Land Use Use of Herbicides Use of Pesticides Lowering of groundwater level

	Pollution of soil and water resources Air pollution, greenhouse gas emissions, global warming Loss of heritage/cultural and palaeontological resources Wetlands Health and Safety, including COVID-19 Traffic Waste Socio-economic impact Influx of labour Interference with existing land uses (Zoned for mining) Use of veterinary medicine
Transport system	Sterilisation of mineral resources Infrastructure, posing safety risks to personnel and animals Vegetation Clearance Topsoil Removal Loss of soil and land capability affected through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Proliferation of Invasive and Alien Plant species Change in visual amenity Civil Aviation Change in Land Use Access Roads Lowering of groundwater level Pollution of soil and water resources Air pollution, greenhouse gas emissions, global warming Loss of heritage/cultural and palaeontological resources Wetlands Health and Safety, including COVID-19 Traffic Waste Socio-economic impact Influx of labour Interference with existing land uses (Zoned for mining)
Use of Chemicals in many forms	Sterilisation of mineral resources Infrastructure, posing safety risks to personnel and animals Loss of soil and land capability affected through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Proliferation of Invasive and Alien Plant species Change in visual amenity Change in Land Use Use of Herbicides Use of Pesticides Lowering of groundwater level

	Pollution of soil and water resources Air pollution, greenhouse gas emissions, global warming Loss of heritage/cultural and palaeontological resources Wetlands Health and Safety, including COVID-19 Traffic Waste Socio-economic impact Influx of labour Interference with existing land uses (Zoned for mining) Use of veterinary medicine
Use of equipment, infrastructure, facilities and services	Sterilisation of mineral resources Infrastructure, posing safety risks to personnel and animals Loss of soil and land capability affected through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Proliferation of Invasive and Alien Plant species Change in visual amenity Civil Aviation Change in Land Use Use of Herbicides Use of Pesticides Lowering of groundwater level Pollution of soil and water resources Air pollution, greenhouse gas emissions, global warming Loss of heritage/cultural and palaeontological resources Wetlands Health and Safety, including COVID-19 Roads Traffic Waste Socio-economic impact Influx of labour Interference with existing land uses (Zoned for mining) Use of veterinary medicine
Restoration of destructed biodiversity	Sterilisation of mineral resources Infrastructure, posing safety risks to personnel and animals Replace topsoil, if necessary Loss of soil and land capability affected through physical disturbance Physical destruction of biodiversity General disturbance of biodiversity Proliferation of Invasive and Alien Plant species Change in visual amenity Civil Aviation Change in Land Use

	Use of Herbicides Use of Pesticides Lowering of groundwater level Pollution of soil and water resources Air pollution, greenhouse gas emissions, global warming Loss of heritage/cultural and palaeontological resources Wetlands Health and Safety, including COVID-19 Traffic Waste Socio-economic impact Influx of labour Interference with existing land uses (Zoned for mining)
Closure , post-closure alternative land uses	Loss of job opportunities Economic impact Change in Land Use Replace Topsoil, if necessary Use of Herbicides Use of Pesticides Pollution of soil and water resources Health and Safety, including COVID-19 Proliferation of Invasive and Alien Plant species

7.4 Assessment of The Significance of Each Impact and Risk and An Indication of the Extent to which the Issue and Risk can be Avoided or Addressed by the adoption of Management Actions

The option of not approving the activities will result in a significant loss of valuable information regarding the benefits that could be ripped from the proposed development. In addition to this, should economical be enormous, the applicant does not have the opportunity to develop the proposed agricultural project, the opportunity to reap these benefits for planned future phases will be lost.

8 Assessment of Each Identified Potentially Significant Impact and Risk

A list of identified potential significant impacts and risks is presented in Table 17.

Table 17: Assessment of Significant Impacts and Risks

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Geology	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Sterilisation of mineral resources	Construction Operational Decommissioning	Low	• Management through best practises • Ensure that minimal quantity of commodity of economic value is sterilised.	Low	Can be managed/mitigated to acceptable levels
Topography	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Changes to surface topography due to topsoil removal, construction and placement of infrastructure and development of agricultural project.	Construction Operational Decommissioning	Medium – High	• Ensure access control; • Employ effective rehabilitation strategies to restore surface topography of topsoil removal, placement of agriculture-related infrastructure; and • remedy through emergency response procedures	Low - Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Vegetation Clearance	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Destruction of natural vegetation, including listed and / or protected species	Construction Operational Decommissioning	Low – Medium	• Ensure vegetation clearance occurs within the area of application; • Ensure that permits and authorisations are obtained before removing protected species.	Low – Medium	Can be managed/mitigated to acceptable levels
Soil Preparation	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Disturbance of natural state of topsoil.	Construction Operational Decommissioning	Medium – High	• Remove topsoil if it is necessary to do so only; • Stockpile or conserve removed topsoil for rehabilitation purposes.	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Soil and land capability	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Loss of soil resources and land capability through contamination; loss of soil fertility; Soil erosion by water and wind on disturbed; potential for dust production and soil microbial degradation.	Construction Operational Decommissioning	Low	• Employ appropriate management strategies to preserve soil resources; • Monitor soil preparation; • Spray water on the surface regularly to avoid or minimise erosion; • Control through waste management practices; • control through rehabilitation; • control through appropriate design; and • remedy through emergency response procedures Manage through limiting the project footprint; • manage through soil conservation procedures; and • manage through closure planning and rehabilitation • Restore the natural state of soil and land capability as much as reasonably practicable.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Biodiversity	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Physical destruction of biodiversity; the clearance of vegetation; potential loss of listed & protected species; potential loss of ecosystem function; Displacement of fauna; The loss, damage and fragmentation of floral and faunal habitats.	Construction Operational Decommissioning	Low – Medium	• Management though biodiversity action plan and offset; • managing through limiting the project footprint; • management through rehabilitation; and • control through permits for removal; • Employ protection, rescue and / or rehabilitation strategies; • Apply for necessary permits and obtain necessary authorisation to remove protected species	Low – Medium	Can be managed/mitigated to acceptable levels
	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity.	General disturbance of biodiversity; Displacement of fauna; The loss, damage and fragmentation of floral and faunal habitats; potential loss of ecosystem function.	Construction Operational Decommissioning	Low – Medium	• Management through alien invasive species programme; • management through training; • management through monitoring; • management through appropriate design; and • Employ proper protection, rescue and / or rehabilitation strategies.	Low – Medium	Can be managed/mitigated to acceptable levels

	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Contamination of surface water resources resulting in deterioration.	Construction Operational Decommissioning	Low – Medium	• Management through waste management practises; • management through monitoring; • Management through storm water control; • management through compensation; and • remedy through emergency response procedures	Low	Can be managed/mitigated to acceptable levels
Groundwater	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution / Contamination of groundwater resources; Lowering of groundwater levels and reducing availability if water table is reached.	Construction Operational Decommissioning	Medium – High	• Construction of measures to prevent seepage into the groundwater by biological and engineering means. Implementation of the necessary management programs to ensure the integrity of ground water resources. • management through treatment & monitoring; • management through compensation; • management through appropriate design; and • remedy through emergency response procedures	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Air quality and odour	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Air pollution and Global Warming (Climate Change); Sources of atmospheric emission associated with the proposed operations are likely to include fugitive dust from materials handling operations, lose soils, gases, wind erosion and vehicle entrainment of road dust.	Construction Operational Decommissioning	High	• Manage through air quality controls, monitoring and reporting; • Ensure facility is properly maintained; • Maintain cool temperature conditions in the greenhouse facilities; • Effective soil management; identification of the required control efficiencies in order to maintain dust generation within acceptable levels.	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Noise & Vibration	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Increase in continuous noise levels; the disruption of current ambient noise levels; and the disruption of sensitive receptors by means of increased noise and vibration, especially from neighbouring mining, industrial and civil aviation operations.	Construction Operational Decommissioning	Low – Medium	• Manage through vibration and noise controls and once-off sampling • Due to Global Warming-related uncertainties as to how the climate will affect the project, it is recommended that independent support structures for solar panels should be erected, especially for solar panels that are placed on the roof of the greenhouse tunnels; • Ensure effective communication with nearby mining operation stakeholders; request them to limit generation of excessive noise and vibration, if necessary; Or at least communicate blasting period that is scheduled; Ensure all vehicles and equipment is in a good working order.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Visual Amenity	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Visual impact of the infrastructure; visibility of dust	Construction Operational Decommissioning	Low	• Manage through limiting project footprint, rehabilitation and visual controls; • Effective planning of the location of Infrastructure and operations to minimise visual impact; wet soils regularly; Ensure effective communication with Civil Aviation Authority.	Low	Can be managed/mitigated to acceptable levels
Heritage/cultural and palaeontological resources	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Loss of heritage/cultural and palaeontological resources; Deterioration of sites of cultural and Heritage importance.	Construction Operational Decommissioning	Medium – High (Heritage) Very low (Palaeontology)	• Control through avoidance; and • remedy through emergency response procedures • Follow Chance-Find Protocol, if applicable; • Preserve, protect and / or rescue Heritage and Cultural resources identified within a no go zone; further resources uncovered during operations need to be reported to SAHRA and to a suitably qualified Heritage Specialist.	Low Very low	Can be managed/mitigated to acceptable levels Can be managed through implementation of Chance-Find Protocol

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Socio-economic	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Loss of agricultural potential; influx of workers to the area increases health risks and loitering (resulting in lack of security and safety); negative impact of employment loss during closure of project.	Construction Operational	Low – Medium	• Control through the monitoring of living conditions of employees, recruitment processes, disease management; and • remedy through emergency response procedures	Low – Medium	Can be managed/mitigated to acceptable levels
	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Poverty Alleviation; Employment Opportunities; Revenue Collection by the State; Indirect benefits by relatives of beneficiaries;	Construction Operational Decommissioning	Medium – High	• Control through good communication, recruitment and procurement processes; • Ensure Compliance with legislation, including food production and applicable regulations.	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Health and Safety	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Health and Safety impact; Loss of income. COVID-19; Bee attacks	Construction Operational Decommissioning	Low – Medium	• Implement provisions of the Mine Health and Safety Act, and Occupational Health and Safety Act; • Adhere to COVID-19 Government Regulations; • Ensure continuous and transparent communication with I&Aps • All personnel must undergo induction & training to manage bees	Low	Can be managed/mitigated to acceptable levels
Land use	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Interference with land Uses; Change in current land uses	Construction Operational Decommissioning	Medium – High	• Ensure the area is zoned for agriculture as well; • Enter into amicable agreements with landowner; • Management through effective communication; • Implement effective rehabilitation strategies.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Use of Herbicides	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution of soil and water resources.	Operational Decommissioning	Low	• Control and monitor the use of Herbicides.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Use of Pesticides	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution of soil and water resources.	Operational Decommissioning	Low	• Control and monitor the use of Pesticides.	Low	Can be managed/mitigated to acceptable levels
Civil Aviation	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Impact on the operations of the nearby airport.	Construction Operational Decommissioning	Low – Medium	• Ensure effective communication with the relevant Government Department and airport stakeholders; • Obtain necessary authorisations, if necessary.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Roads	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure.	Destruction of natural state of biodiversity.	Construction Operational Decommissioning	Low – Medium	• Maintain good or acceptable condition of road surfaces; • Control dust generation.	Low – Medium	Can be managed/mitigated to acceptable levels
Traffic	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Road disturbance and traffic safety; Potential negative impacts on traffic safety; And deterioration of the existing road networks	Construction Operational Decommissioning	Low – Medium	• Manage through road maintenance; • Apply for speed reduction signage to be displayed on R380 when approaching main entrance of Farm Marsh 467, if possible; • Adherence to speed limit; and • remedy through emergency response procedures • Implement measures to ensure adherence to traffic rules.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Waste	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution	Construction Operational Decommissioning	Medium – High	• Manage through the principle of waste separation at source; • Implement the waste National Waste Management Strategy and Waste Hierarchy; • Ensure effective Waste Management Plan and environmentally friendly use of chemicals, pesticides and herbicides on-site.	Low – Medium	Can be managed/mitigated to acceptable levels
Alien invasive plants	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Proliferation of alien invasive plant species.	Construction Operational Decommissioning	Low – Medium	• Compile weed/alien plant management programme in consultation with NCDAEARDLR; • Implement the compiled weed/alien management programme effectively; • Eradicate, and control the spread, of alien invasive species.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Disturbance of wildlife due to increased human presence and possible use of machinery and/or	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Potential negative impacts on wildlife	Construction Operational Decommissioning	Low – Medium	• Enter into amicable agreements that will promote wellbeing and protection of wildlife; • Ensure proper fence is erected to limit access; • Should there be necessity to relocate wild animals, that exercise should be undertaken in sustainable, environmentally friendly and safe manner.	Low - Medium	Can be managed/mitigated to acceptable levels
Impacts on Mining Activities	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Potential negative impacts on mining activities	Construction Operational Decommissioning	Low	• Enter into amicable agreements that will promote wellbeing and protection of on-going mining activities.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Wetlands and / or pans	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Disturbance of wetland and / or pan and riparian zone	Construction Operational Decommissioning	Low – Medium	• Design and implement a storm water management plan;	Low	Can be managed/mitigated to acceptable levels

Cumulative Impacts

Activities related and /or associated with infrastructural development may result in several complex effects (whether jointly, severally or in synergy) on the natural ecosystem and social environment. These impacts are mainly identified in relation to the immediate environment and natural processes. Cumulative impacts can be defined as changes to the environment that are caused by the combined impact of past, present and future human activities and natural processes. Multiple individual activities and associated individual direct impacts may be relatively minor at first glance or during a specific environmental impact assessment process, however, result in significant socio-economic and / or environmental effects when combined with impacts associated with other activities. These impacts may aggregate or interact with other impacts to cause additional effects, not easily quantified when assessing an individual entity. The cumulative impact rating considers the predicted effects, residual effects, effects of other projects and activities in the form of potential synergistic, interactive system components, pattern, augmentative, consecutive impacts and mitigation measures, within the context of proposed development.

The NEMA, EIA Regulations specifically require that cumulative impacts be assessed. This section provides a description and analysis of the potential cumulative effects of the agricultural and related or associated activities and past and present projects hereby considering the effects of any changes on the:

- Environment; and
- Socio – Economic conditions.

The impact assessment ratings in relation to cumulative effects could to be utilised as a useful tool for decision-makers and stakeholders in respect of the proposed development in relation to the surrounding environment. Two important aspects require consideration prior to the evaluation of cumulative effects:

- The determination of an appropriate spatial and temporal boundaries for evaluation of cumulative effects of the project; and
- The evaluation of relevant projects for consideration in the cumulative effects analysis.

Spatial and temporal boundaries for analysis of cumulative effects are dependent on several factors, including:

- The size and nature of the project and its potential effects;
- The size, nature and location of past and (known) future projects and activities in the area;
- The aspect of the environment impacted by the cumulative effect; and
- The period of occurrence of effects.

The spatial extent of the cumulative impact analysis is generally aligned with the zone of influence of the project and other projects in the vicinity. Most impact will be localised; however, others may be experienced on a regional scale. This is taken into consideration during the assessment of cumulative impacts.

It is reasonably straightforward to identify significant past and present projects and activities that may interact with the proposed Agricultural Development Project to produce cumulative impacts, and in many respects, these are considered in the descriptions of the biophysical and socio- economic baseline.

Air Quality Impacts

The potential air quality and / or Global Warming impacts associated with the proposed development relate to the potential generation of VOC's, SO_2, CH_4, N_2O, $PM_{2.5}$, PM_{10} and dust emissions as a result of site clearance, vehicular movements, and the generation / emission of pollutants from the operations in general.

Mitigation measures have been proposed to mitigate these adverse impacts. It is expected that the implementation of these mitigation measures will reduce this impact to an acceptable standard.

Mismanagement of dust generation sources at the proposed site for development may lead to poor visual amenities and an increase in air quality contamination in the atmosphere surrounding the Operations; however, the cumulative impact will be low.

Noise and Vibration Impacts

The potential vibration and noise nuisance associated with the proposed agricultural activities relate to the movement of vehicles, deep excavations, pitting and blasting (from neighbouring Mining Operations), and operation of trackless mobile machinery both on site and nearby. Mitigation measures have been proposed to avoid and/or reduce the nuisance noise impacts. It is expected that with the implementation of the mitigation measures this impact will be reduced to an acceptable level.

The majority of the land use in the vicinity of the proposed development is mostly mining, agricultural, game farming, industrial and civil aviation land uses associated with significant nuisance noise levels. It is not anticipated that the proposed development will have negative cumulative on noise impact in the area.

Other cumulative impacts have been described as part of the impact assessment discussions provided under the different phases of the proposed Farm Marsh Hydroponics Systems Project. None of the aspects were found to have negative cumulative impacts on the surroundings associated with the agricultural development.

Groundwater and Surface Water Impacts

Noteworthy, groundwater resources within the quaternary catchment area D41J are strained as all mining activities with in the area depend mostly on groundwater for operations. The potential groundwater and surface water quality impact associated with the proposed Farm Marsh Hydroponics Systems Project relates to the potential contamination as a result of mismanagement of materials stored and leakages from vehicles and machinery. Mitigation measures have been proposed for the impacts on groundwater and surface water contamination. It is expected that with the implementation of the mitigation measures this impact will be reduced to an acceptable level.
For further details on cumulative impacts, please refer to APPENDIX 4.

9 A Summary of Specialist Report Findings

A summary of specialist report findings is presented in Table 18.

Table 18: Summary of Specialist Report Findings

Conducted Study	Recommendations of Specialist	Inclusion of Specialist recommendations in the EIAR	Reference to the application section in the EIAR
Visual Impact Assessment	The following recommendations were made: • It is recommended that the South African Civil Aviation Authority (SACAA) be consulted pertaining the proposed Farm Marsh Hydroponics Systems Project; • It is recommended that the mitigation measures proposed in the VIA report are implemented to reduce the impact of the proposed hydroponic agricultural activities on the visual character of the receiving environment; • Vegetation and topsoil should only be removed when and where necessary to avoid exposing larger areas for longer periods of time which could result in soil erosion, dust generation and increase the visual disturbance; • Installation of underground pipes should be kept out of groundwater and drainage lines as far away as possible;	X	Section 24.5 of PART B *APPENDIX 5*

Conducted Study	Recommendations of Specialist	Inclusion of Specialist recommendations in the EIAR	Reference to the application section in the EIAR
Social Impact Assessment	With an expanding population and changing dynamics in global food markets, it is important to find solutions for more resilient food production methods closer to urban environments. The need for The Proposed Farm Marsh Hydroponics Systems Project is undeniable in the current economic conditions. It is therefore recommended that the Hydroponics Systems Project proceed. The mitigation measures should be adhered to ensure the proper management and mitigation of impacts. The Applicant, however, should remain cognizant of possible strained relationships with surrounding communities which may result due to the failure to meet expectations in terms of employment and socio-economic development initiatives associated with the project and increased production. The potential negative social impacts associated with the construction phase are typical of construction related projects. The construction related activities that have the potential to cause social impacts are mostly of a low magnitude and can be reduced with the implementation of the mitigation measures proposed. New business sales and employment opportunities will be created in the construction and operation phase and the impact is rated as positive even if only a relatively few individuals (approximately 25 employment opportunities will be created), Project beneficiaries from the immediate surroundings, will benefit in this regard.	X	Section 24.5 of PART B *APPENDIX 5*

Conducted Study	Recommendations of Specialist	Inclusion of Specialist recommendations in the EIAR	Reference to the application section in the EIAR
Social Impact Assessment	The proposed Project has the potential to assist the local South African economy in creating entrepreneurial development, albeit very limited, especially if local business could e involved in the provision of general material and services during the construction and operational phases.. The proposed development also represents an investment in infrastructure for a more sustainable and reliable food production technique, which, given the challenges created by climate change, represents a positive social benefit for society as a whole. The proposed development represents greater positive social potential than negative implications. The project involves no sacrifice of agricultural productive capacity and provides a significant source of additional income while introducing relatively sustainable food production methods. It is, therefore, recommended that the proposed Farm Marsh Hydroponics Systems Project is granted/ authorised, subject to the implementation of the recommended enhancement and mitigation measures contained in this Report. That is to say, in terms of the potential social impacts arising from the proposed Project, there is no apparent reason for the competent authority to reject the application on social grounds.	X	Section 24.5 of PART B *APPENDIX 5*

Conducted Study	Recommendations of Specialist	Inclusion of Specialist recommendations in the EIAR	Reference to the application section in the EIAR
Biodiversity Assessment	The area of the proposed development footprint consists of both primary and secondary vegetation. The proposed development site has already been subjected to some disturbance and fragmentation and most of the proposed development footprint falls within a low sensitivity area, i.e. an area where development will not have a significant environmental impact. With respect to the sensitivity of the region where the development is planned, portions of the project site fall an ecological support area (ESA). In terms of the Technical Guidelines for CBA Maps (June 2017), agricultural infrastructure, such as the proposed project, should not be allowed within an ESA area. To understand the sensitivity of the area it is important to investigate why and how the area has been classified. The Northern Cape CBA map has been drawn up by means of a dual analysis which included a systematic target-based assessment using the actual extent of biodiversity features and a MARXAN analysis to identify areas of the landscape for meeting targets for broader features most efficiently. The primary biodiversity features included in the MARXAN analysis were terrestrial vegetation types, however four additional criteria were applied when defining CBAs, namely ecosystem threat status (Critically Endangered and Endangered types), rarity, endemism and ecosystem process importance.	X	Section 24.5 of PART B *APPENDIX 5*

Conducted Study	Recommendations of Specialist	Inclusion of Specialist recommendations in the EIAR	Reference to the application section in the EIAR
Biodiversity Assessment	The study site does not fall within an IBA and does not fall within a river area, nor does the site have any special habitats as specified in the multi-criteria analysis used to define a minimum for ESAs. Furthermore, the site does not display a significant biological or topographic diversity or strong biophysical gradient. Thus a linking corridor in support of a conservation area is the most likely feature defining the ESA in which the study area falls. Of importance in this area is the Kathu Forest, which is classified as a CBA1. The ESA surrounding this CBA1 forms an important linking corridor for this unique conservation feature in this region. During the CBA mapping process, biodiversity features that needed to be included in the CBA map that were already precisely mapped were included as their actual extent (e.g. a wetland and its buffer) as a unit of assessment and a planning unit, however where these features were not available (i.e. had not been previously mapped or identified on the ground) a set of province-wide planning units were developed based on a hexagon grid, landcover and Protected Areas. The hexagons used were approximately 1600 ha in extent and had a 2.5km side. One of the reasons that such a large scale was used was because these larger units aimed to identify connected landscapes to secure areas for both fine-scale features such as wetlands, and broad units such as terrestrial ecosystem types. The large scale however can result in an inaccurate demarcation of an area, and thus some ground truthing operations are required to clarify the boundaries and validate these classifications of the CBA map in certain areas.	X	Section 24.5 of PART B *APPENDIX 5*

Conducted Study	Recommendations of Specialist	Inclusion of Specialist recommendations in the EIAR	Reference to the application section in the EIAR
	The CBA map represents the ESA in which the study site falls as very fragmented, so much so that parts of the study site are classified as ESA and parts as natural areas. This difference in classification does not correlate to any difference on site in terms of vegetation structure topography or biodiversity. Which provides scope for a debate about what the actual classification of the site should be - should the entire site fall within an ESA or a natural area? Given the results from the site survey the evidence suggests that perhaps the natural area classification would be more appropriate for the entire site. In addition to this the development of the study site would not significantly increase the fragmentation of the ESA as depicted on the CBA map. The impact of the proposed development on the biodiversity is considered to be low and as such the development should be able to proceed as long as the mitigations measures are adhered to and that best practice measures for the operation are implemented. The planned development will not alter the areas biodiversity and habitat connectivity significantly from the status quo.	X	Section 24.5 of PART B *APPENDIX 5*

Conducted Study	Recommendations of Specialist	Inclusion of Specialist recommendations in the EIAR	Reference to the application section in the EIAR
Heritage Impact Assessment	The agricultural project can be considered in light of the low cultural significance of the material found. As a standard precaution in the event of other heritage resources being discovered in future phases of the project, the Provincial Heritage Resources Authority or SAHRA must be alerted immediately and an archaeologist or heritage expert called to attend.	X	Section 24.5 of PART B *APPENDIX 5*
Palaeontological Impact Assessment (Desktop Study)	The palaeontologist has recommended that based on experience and the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the Tertiary Limestones. There is a very small chance that fossils may occur in pans or springs but none is evident. Nonetheless a Fossil Chance Find Protocol should be added to the EMPr: if fossils are found once excavations for foundations and amenities has commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample.	X	Section 24.5 of PART B *APPENDIX 5*

Conducted Study	Recommendations of Specialist	Inclusion of Specialist recommendations in the EIAR	Reference to the application section in the EIAR
Soil Survey	The entire study area is considered to be of low agricultural potential due to the shallow depth of the soils and the low rainfall and is thus only suited for grazing. This part of the Northern Cape is suited for grazing at best, and the grazing capacity of the region is very low, around 18-20 ha/LSU (ARC-ISCW, 2004). According to the criteria by Schoeman (2004), land in the Northern Cape is only considered to be of high potential if it is under permanent irrigation. With the prevailing climatic conditions, the only means of crop production would be by irrigation. The soils are too shallow for most types of crops, but if a source of irrigation water is available, vegetables could be considered under the following conditions: • The soil could be manually or mechanically manipulated to create ridges. In this way, the prevailing soil depth of between 150 and 200 mm could be increased to around double that depth, so that vegetables could be planted on each row. The irrigation potential would not be high, but at least production may be possible. • The underlying material is generally hard, cemented calcrete or rock, which could restrict drainage and lead to waterlogging. Efficient irrigation scheduling would be essential, coupled with a high level of management. • Temperatures in this part of South Africa, especially in summer, are extremely high. It might be necessary to erect some sort of shade net or other sun protection, especially for sensitive vegetables. At the time of the survey (October 2017), no borehole or other source of water was present on the site, so no water quality assessment could be done. If such a source becomes available in future, the water quality must be tested and compared with the soil analysis results to determine irrigation suitability.		Section 24.5 of PART B *APPENDIX 5*

10 Environmental Impact Statement

The proposed Farm Marsh Hydroponics Systems Project, intrinsically, requires the implementation of procedures and mechanisms to facilitate co-operative environmental governance. Chapter 3 of the NEMA deals with such procedures. Section 11 of NEMA makes provision for environmental implementation plans and management plans. Every national department listed in Schedule 2 must prepare an environmental management plan. The provinces and departments must further ensure that these environmental implementation or management plans are consistent. The purpose and objectives of these plans are to:

- coordinate and harmonise the environmental policies, plans, programmes and decisions of the various listed national departments and of provincial and local spheres of government, which must be done to minimise the duplication of procedures and functions and to promote consistency;
- give effect to the principle of cooperative government in Chapter 3 of the Constitution;
- secure the protection of the environment across the country as a whole;
- prevent unreasonable actions by provinces in respect of the environment, which actions are prejudicial to the economic or health interests of other provinces or the country as a whole; and
- enable the Minister to monitor the achievement, promotion and protection of a sustainable environment.

The location of the proposed project falls within the Mining Right area of Sishen Iron Ore Company (Pty) Ltd. Furthermore, the applicant proposes to utilise renewable energy as a power source. The Competent Authority in dealing with Mine-related and energy-related matters is the Department of Mineral Resources and Energy. Additionally, the proposed project requires significant quantities of water to sustain operations. Thus, the responsible authority is the Department of Human Settlements, Water and Sanitation.

The proposed project comprises multiple distinct components, which include the following:

- development of Hydroponics Systems and related or associated tools, equipment, facilities, services and infrastructure;

- development of Photovoltaic Plant and related or associated tools, equipment, facilities, services and infrastructure;
- development of Bee-harvesting and beeswax by-product processing and manufacturing Facility and related or associated tools, equipment, facilities, services and infrastructure.

A Scoping and Environmental Impact Assessment Process is necessary as per the triggered listed activities in terms of the NEMA and NEM:WA. This piece of work contains the findings of the impact assessment and specialist studies that were undertaken.

10.1 Summary of Key Findings of EIA

This section provides a summary of the findings of identified and assessed potential impacts on the receiving environment in both the unmitigated and mitigated scenarios, including cumulative impacts. Summary of potential cumulative impacts is presented in Table 19.

Table 19 : Summary of potential cumulative impacts

ASPECT	Potential Impact	Significance of the Impact (the significance ratings negative unless specified otherwise)	
		(Pre-mitigation)	(Post-mitigation)
Geology	Loss and sterilisation of mineral resources	Low	Low
Topography	Hazardous excavations and infrastructure resulting in safety risks to third parties and animals	Low	Low
Vegetation Clearance	Fragmentation of Biodiversity Patterns	Low	Low
Soil Preparation	Loss soil capability	Low	Low
Soil and land capability	Loss of soil natural resources and land capability through contamination	Low	Low
	Loss of soil resource and natural land capability through physical disturbance	Low	Low
Biodiversity	Physical destruction of biodiversity	Low	Low
	General disturbance of biodiversity	Low	Low
Surface Water	Alteration of natural drainage patterns	Low	Low
	Contamination of surface water resources	Low	Low
Groundwater	Contamination of groundwater resources	Medium	Medium

	Lowering of groundwater levels and reducing Availability	Medium	Medium
Air Quality	Air pollution and Global Warming	Low	Low
Noise and Vibration	Increase in disturbing vibration & noise levels	Low	Low
Visual Amenity	Negative visual views	Low	Low
Heritage and Palaeontology	Loss of heritage/cultural resources	Low	Low
	Loss of palaeontological resources	Low	Low
Socio-economic	Inward migration	Low	Low
	Economic impact	Low	Low
Health and Safety	Deterioration of health and decrease in safety	Low	Low
Land Use	Interference with existing land uses	Low	Low
Use of Herbicides	Pollution of soil and water resources	Low	Low
Use of Pesticides	Pollution of soil and water resources, disturbances and loss of soil fertility	Low	Low
Civil Aviation	Impact on the operations of the nearby airport	Low	Low
Roads	Potential negative impacts on traffic safety and deterioration of the existing road networks	Low	Low
Traffic	Road disturbance and traffic safety	Low	Low
Waste	Pollution	Low	Low
Alien invasive plants	Proliferation of alien invasive plants species	Low	Low

The environmental impact assessment of the proposed development, by virtue of the nature of PV solar plant and agricultural development activities, indicates that such a project poses a risk to the environment. The negative impacts PV solar plant and agricultural development activities present to the environment, pre-mitigation, include impact on water resources, socio-economic and cultural, and the general ecology on site and to the surrounding environment as a whole. These impacts can be avoided/prevented, minimised/reduced and/ or mitigated to acceptable levels. The environmental management programme is designed to take into cognisance all these factors.

10.2 Final Site Map

Please see *Appendix 2*

11 Impact Management Objectives and Outcomes for Inclusion in the EMPr

11.1 Proposed Management Objects and Outcomes for Environmental and Socio-Economic Impacts

Based on the assessment and where applicable the recommendations from specialist reports to be generated, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

Specific environmental objectives to control, remedy or avoid potential impacts emanating from the project are provided in Table 20.

Table 20: Environmental Objectives and Outcomes

Aspect	Environmental Objective	Expected Outcome
Geology	To prevent unnecessary mineral sterilisation	Avoidance, minimisation of unnecessary mineral sterilisation
Topography	To prevent physical harm to third parties and animals from potentially hazardous excavations and infrastructure	To maintain natural topography as far as reasonably practicable ensure the safety of people and animals
Vegetation Clearance	To limit clearance of vegetation to the area of application; To prepare site for construction, operation and decommissioning phases of the project.	Vegetation clearance is inevitable because of nature of proposed development; Obtain necessary Permits & Authorisations
Soil preparation	To prepare soil in order to make it suitable for the desired purpose / use.	Achieve optimal productivity possible
Soil and land capability	To prevent soil pollution and to minimise the loss of soil resources and related land capability through physical disturbance, erosion, dust control and compaction	To handle, manage and conserve soil resources to be used as part of rehabilitation and re-establishment of the pre-operation state of land capability or desired outcome by I&APs
Biodiversity	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical and general disturbance	To limit the area of disturbance as far as reasonably practicably possible; Obtain necessary Permits & Authorisations

Surface Water	To prevent pollution of surface water resources	To ensure surface water quality remains within acceptable limits for both domestic and agricultural purposes (where relevant).
Groundwater	To prevent pollution of groundwater resources and related harm to water users and to prevent losses to third party water users.	To ensure groundwater quality remains within acceptable limits for both domestic and agricultural purposes. To ensure that groundwater continues to be available to current users.
Air Quality	To prevent air pollution and reduce impact on global warming.	To ensure that any pollutants emitted as a result of the project remain within acceptable limits, if not eliminated.
Noise and Vibration	To prevent public exposure to disturbing vibration & noise	To ensure that any vibration and noise generated as a result of the project and nearby activities remain within acceptable limits.
Visual Amenity	To limit negative visual impacts	To ensure that visual views complement the surrounding environment
Heritage and Palaeontology	To manage impact on palaeontological and heritage Resources	To protect heritage resources where Possible If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements
Socio-economic	To limit immigration and related social impacts and enhance positive economic impacts	To work together with existing structures and organisations and to establish and maintain a good working relationship with surrounding communities, local authorities and land owners
Health and Safety	To prevent or reduce impact on health and safety of personnel	Maintain good health and safety of personnel
Land Use	To avoid unnecessary negative impacts on surrounding land uses	To co-exist with current and future land uses; To negatively impact on existing land uses as little as possible
Civil Aviation	To manage impact on Civil Aviation	To maintain continuous effective communication with the Civil Aviation Authority
Use of Herbicides	To control and monitor use of Herbicides	To obtain and sustain optimal productivity whilst protecting the environment
Use of Pesticides	To control and monitor use of Pesticides	To obtain and sustain optimal productivity whilst protecting the environment
Traffic	To prevent transport related accidents and/or injury to people and livestock.	To ensure the operation's use of public roads is one in a responsible manner.
Roads	To promote accessibility	To use the roads with minimal

		impact on the environment
Wetlands	To prevent destruction of wetlands	To ensure wetlands remain “alive” especially considering that South Africa, the Northern Cape Province is water scarce.
Waste	To prevent pollution of the environment	To ensure waste generation and disposal are avoided, where possible.
Alien invasive plants	Proliferation of alien invasive plants species.	Eradicate, and control the spread, of alien invasive species.

12 Final Proposed Alternatives

Although alternative A and B are comparable in ecological setting, alternative A as presented in *Appendix 4* enables the recommended clustering of infrastructure.

13 Aspects for Inclusion as Conditions of Authorisation

The applicant must comply with all pieces of legislation and accompanying regulations that apply to environmental affairs.
The recommendations, if any, on aspects for inclusion as conditions of the authorisation that are going to be made by specialists that were commissioned should be considered.

14 Assumptions, Uncertainties and Gaps in Knowledge

Uncertainties may form part of any proposed development pertaining to the accuracy of data, information, plans and designs and the actual degree of impact on the social, economic aspect and environment that the proposed development will have. This report was compiled by incorporating information provided by the applicant and the various project specific, sources, employees/directors, specialists and no warranty or guarantee, whether expressed or implied, is made by the EAP with respect to the completeness, accuracy or truth or any aspect of this document with reference to the instructions, information and data obtained from-, shared or supplied by the aforementioned parties. This piece of work may be amended to incorporate recommendations pertaining to Assumptions, Uncertainties and Gaps in Knowledge if necessary.

The impact assessment was conducted based on the EAP's knowledge and experience. The probability, intensity/severity and significance pertaining to the criteria used to assess the significance of the impacts were based on rule-of-thumb and experience.

It was assumed that, by and large in this particular landscape segment, with its relatively sparse vegetation, surface archaeological traces would be relatively visible. However it was likely that where artefacts are present, they would tend to occur in buried gravel deposits.
A proviso is routinely given, that should sites or features of significance be encountered during operations on the site (this could include an unmarked burial, fossils, or a high density of stone tools, for instance), specified steps are necessary (beginning with immediate suspension of work, and reporting to the heritage authority).
The specialist reports to be commissioned may add more to the list presented in this section.
A potential limitation associated with the sampling approach is the narrow temporal window of sampling undertaken as part of the field work. Ideally, the site should be visited several times during different seasons to ensure that the full complement of plant and animal species present are observed, recorded and reported. However, this is rarely possible due to time and cost constraints. The information presented in this piece of work represents the wet/Summer season study. The present area of application presents an advantage for identification of plant species throughout the year because it along the Gamagara River and therefore, with recent rainfalls, is not as dry as the rest of the Northern Cape Province. A full plant species list will be compiled for the site from the site visit; this will be complemented by a list of any listed species which are known from other studies to occur in the broad vicinity of the site. The lists of amphibians, reptiles and mammals for the site are based on those observed at the site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach that takes account of the study limitations.

Based on the geology of the area and the palaeontological record as we know it, it can be assumed that the formation and layout of the dolomites, sandstones, shales and sands are typical for the country and do not contain fossil plant, insect, invertebrate and vertebrate material. The loose sands of the Tertiary and Quaternary period would not preserve fossils. Only palaeo-pans or palaeo-springs could preserve fossils but no such feature is evident.

14.1 Environmental Assessment Limit

Some Environmental Assessment Limits are identified in this piece of work. Other such limits may be determined over a long period of time after collection, processing and interpretation of data. However, this is rarely possible due to time and cost constraints.

14.2 Heritage / Cultural and Palaeontological Resources

All possible care was taken to identify and document heritage resources during the survey in accordance with best practices in archaeology and heritage management. However it is always possible that some hidden or subterranean sites are overlooked during a survey. The Consultant and / or Specialists will not be held liable for such oversights and additional costs thereof.

The commissioned Palaeontological Impact Assessment (Desktop Study) that was commissioned did not cover the following:

- Where necessary, site visits by a qualified palaeontologist to locate any fossils and assess their importance (*not applicable to this assessment*);
- Where appropriate, collection of unique or rare fossils with the necessary permits for storage and curation at an appropriate facility (*not applicable to this assessment*); and
- Determination of fossils' representivity or scientific importance to decide if the fossils can be destroyed or a representative sample collected (*not applicable to this assessment*).

14.3 Biodiversity Study

The major potential limitation associated with the sampling approach is the narrow temporal window of sampling. Ideally, a site should be visited several times during different seasons to ensure a comprehensive database of plant and animal species are captured. However, this is rarely possible due to time and cost constraints and therefore these surveys usually represent a "moment in time" survey. The site survey represents the summer/wet season survey as it was conducted in February following a number of seasonal rainfall events. A plant species list was compiled for the site from the site visit, this was augmented by a list of species which are known from other studies to occur in the broad vicinity of the site. The lists of amphibians, reptiles and mammals for the site are based on those observed at the

site as well as those likely to occur in the area based on their distribution and habitat preferences. This represents a sufficiently conservative and cautious approach that takes account of the study limitations. Protected tree species which are of concern within this area are easily accounted for as they are highly visible and timing of the survey does not influence the accuracy of their records.

14.4 Soil Study

At the time of the survey (October 2017), no borehole or other source of water was present on the site, so no water quality assessment could be done. However, boreholes SW1263 and SW1264 are now available on site.

14.5 Social Impact Assessment

Social Impact Assessment Limitations and assumptions as presented by the specialist include the following:

- The SIA Report and assessment are dependent on the accuracy of the publicly available secondary information; such as Statistics South Africa (StatsSA, 2011 and community survey, 2016). Where possible, the information was verified during a site visit. The data was considered sufficient for the purpose of this study;
- The study is based on data obtained from the community survey, 2016, which may not reflect accurate information;
- Due to the COVID-19 pandemic, community meetings could not be conducted;
- It should be noted that the social environment is a dynamic, constantly changing entity. It is therefore not always possible to predict all social impacts to a very high level of accuracy. Care has been taken to identify the most likely and significant impacts in the most appropriate way for the current local context;
- Social impacts can be experienced by affected communities on an actual or a perceptual level. It is therefore not always possible to quantify social impacts properly;
- It should be noted that predictions concerning the characteristics of the receiving socio-economic environment at the time of decommissioning are subject to a large margin of error, thus significantly reducing the accuracy of impact assessment- the specialist has attempted to assess (where possible) the impact during the decommissioning phase;

- Individuals view possible social impacts differently due to their association with the anticipated impact. Impacts could therefore be perceived and rated differently than those contained in the community Health Assessment Report. Further public participation can be used to refine findings; and
- Socio-economic impacts associated with the eventual decommissioning of the mine at the end of its life are briefly discussed but are not subject to detailed assessment. This omission is motivated by the fact that predictions concerning the characteristics of the receiving socio-economic environment at the time of decommissioning (30 years in the future) are subject to a large margin of error, thus significantly reducing the accuracy of impact assessment

14.6 Visual Amenity

A Visual Impact Assessment is open to subjectivity. This subjectivity is due to the different opinions receptors may have of a proposed project. A receptor may be partial to the fact that the proposed project is occurring in an area, which becomes a source of economic upliftment for a community, whereas another receptor may view a proposed project as a negative factor which could hamper tourism or recreational activities.

Many factors can enhance or reduce the visual impact of the proposed project. Vegetation near a receptor's viewpoint can greatly reduce that receptor's view of the proposed project. Other factors such as weather / climatic conditions and seasonal change can also affect a receptor's view of the proposed project. It is, therefore, difficult to determine the visual impact of the proposed project from the viewpoint of each individual receptor. Consequently, the Visual Impact Assessment report focuses on the size of the viewshed area.

15 Reasoned Opinion as to Whether the Proposed Activity Should or Should Not be Authorised

15.1 Reasons Why the Activity Should be Authorised or Not

Agriculture is one of the most important economic activities in the Northern Cape. There are no significant reasons why the activity should not be authorized, not unless the specialist

reports yet to be commissioned suggest otherwise. However, if the proposed management and mitigation measures are not properly applied or if the agricultural development project operation intentionally disregards any of these measures, it will negatively affect the environment, socio-economic aspect and have more long-term consequences. More details on the reasons why the activity should be authorised or not will be submitted to the Competent Authority as soon as the specialist studies are available for submission. Therefore, the competent authority should take all the necessary steps to ensure that the agricultural development project operation complies with the conditions set out in the approval of the EMPr.

15.2 Conditions that must be Included in the Authorisation

Apart from ensuring that the necessary permits and authorisations are obtained for restricted activities, all recommendations and mitigation measures as set out in the EMPr should be adhered to or other reasonable mitigating measures should be implemented.

15.2.1 Specific Conditions for Inclusion in the EMPr

Please refer to Sections 24.5.1; 24.5.2; 24.5.3 and 27 of Part B of this piece of work.

16 Undertaking

The undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Environmental Impact Assessment Report and the Environmental Management Report.

17 Financial Provision

17.1 Method to Derive the Financial Provision

No Financial Provision is envisaged at this stage. The information presented herein may change as the project is expected to continue for a long period of time. Provisions will be made if and when necessary.

18 Deviations from Scoping Report and Approved Plan of Study

18.1 Deviation from the Methodology Used in Determining the Significance of Potential Environmental Impacts

There are no significant deviations, except that some specialist reports are yet to be commissioned.

18.2 Motivations for Deviation

Not applicable in this section.

19 Specific information Required by the Competent Authority

19.1 Impact on the Socio-Economic Conditions of Any Directly Affected Person

The proposed Farm Marsh Hydroponics Systems Project is going to have a positive impact as a minimum of 20 jobs are going to be created on the Beneficiaries of the project.

19.2 Impact on any National Estate referred to in Section 3(2) of The National Heritage Resources Act

Where and when level of significance of impacts before mitigation is high, the Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform, the Department of Mineral Resources and Energy, SAHRA and heritage specialist will be notified.

The proposed agricultural activity may not impact on any heritage estate if effectively mitigated referred to in section 3(2) of the National Heritage Resources Act. In terms of the National Heritage Resource Act, 1999 (Act No. 25 of 1999), Heritage resources including archaeological and paleontological sites over 100 years old, graves older than 60 years, structure older than 60 years are protected. They may not be disturbed without a permit from the relevant heritage resource Authority, which means that before such sites are disturbed by development it is incumbent on the developer to ensure that a heritage impact assessment is done and the Provincial Heritage Resources Authority and SAHRA will be contacted immediately and work will stop. Alternatively, relevant specialist may be called in

to site and in the case of fossils a representative sample may be sent for further studies or preservation.

20 Other Matters required in terms of Sections 24(4)(A) and (B) of the MPRDA

There are no alternatives, as the application area applied for is the area identified with potential for an agricultural development project.

PART B – ENVORNMENTAL MANAGEMENT PROGRAMME REPORT

21 Details of EAP

The requirement to describe the aspects of the activity that are covered by the draft environmental management programme is included in PART A, Section 1.1 herein as required.

22 Description of The Aspects of The Activity

The requirement to describe the aspects of the activity that are covered by the draft environmental management programme is included in PART A, Section 3.2.

23 Composite Map

Refer to the figure in Appendix 2 for a map that superimposes the proposed activity, its associated structures and infrastructures on the environmental sensitivities of the preferred site, also indicating any areas that should be avoided, including buffers. A more conclusive design will be presented herein after all specialist reports have been generated and considered accordingly. Final site layout will be presented after consideration of all specialist findings and recommendations when available.

24 Description of The Impact Management Objectives Including Management Statement

24.1 Determination of Closure Objectives

The key aim of decommissioning and closure is to ensure that all the significant impacts are ameliorated. All rehabilitated areas should be left in stable, self-sustainable state and in a manner that is satisfactory to both the Competent Authority and Land Owner. The closure objectives for the project were determined taking into account the existing type of environment as described in Section 6.4, in order to ensure that the closure objectives strive to achieve a condition approximating its natural state as far as reasonably practicable. Furthermore, the preliminary closure plan objectives and principles have been developed against the background of the proposed Farm Marsh Hydroponics Systems Project location in the John Taolo Gaetsewe District, Northern Cape Province, and include the following:

- that environmental damage is minimised to the extent that it is acceptable to all parties involved;
- that at closure, the land will be rehabilitated to achieve an end use of wilderness and grazing, civil aviation or even mining;
- that all surface infrastructure will be removed from site after closure;
- that contamination beyond the area of application by wind, surface run-off or groundwater movement will be prevented;
- that the proliferation of invasive and alien plant species will be controlled and / or eradicated;
- If necessary or possible, restore state of topsoil;
- Re-vegetate, if no mining operations are to take place;
- that closure of the area application is achieved efficiently, cost effectively and in compliance with the law;
- that the social and economic impacts resulting from closure of agricultural development project are managed in such a way that negative socio-economic impacts are minimised.

The closure target outcomes for the site are therefore assumed to be as follows:

- to achieve chemical, physical and biological stability for an indefinite, extended time period over all disturbed landscapes and residual agricultural development project infrastructure;
- to protect surrounding surface water, groundwater, soils and other natural resources from loss of current utility value or environmental functioning;
- to limit the rate of emissions to the atmosphere of particulate matter and salts to the extent that degradation of the surrounding areas' land capability or environmental functioning does not occur;
- to maximise visual 'harmony' with the surrounding landscape; and
- to create a final land use that has economic, environmental and social benefits for future generations that outweigh the long term aftercare costs associated with the agricultural development project.

Sishen Iron Ore Company (Pty) Ltd will be using a mobile camp site for its agricultural development project, and therefore limited infrastructure associated with the camp site will require breaking down or demolishing at closure. The waste generated from demolished infrastructure may be used to backfill open pits. The agricultural equipment may be refurbished and donated to other farmers for re-use. The areas disturbed as a result of the construction and operation of agricultural development project will be rehabilitated by maintaining the general topography of the surrounding area, ensuring that there are no remnants of the structures. The excavated area for footing water tanks may be backfilled. The closure objectives aim to return the affected area to a land use condition or desired state similar to that of the pre-Farm Marsh Hydroponics Systems Project state. The plastic water tanks will be removed at closure and re-used elsewhere and / or recycled.

The associated environmental impact caused by the proposed development is relatively of low significance. Archaeological, Biodiversity and visual sensitivity are the only activity that rate relatively higher - that is medium significance. Be that as it may, the potential environmental impacts associated with the proposed development are the following:

- Disturbance of some heritage resources if proposed mitigation measures are not implemented;
- Sterilisation of Minerals;
- Disturbance / destruction of Topography;
- Vegetation clearance;
- Visual Amenity;
- Soil preparation;
- Soils and Land Capability;
- Land Use Change;
- Biodiversity destruction;
- Noise and vibration generation or pollution;
- Air quality and Global Warming;
- Civil Aviation;
- Use of Herbicides;
- Use of Pesticides;
- Access Roads;

- Traffic;
- Heritage inclusive of Palaeontological Resources;
- Invasive alien plant species; and,
- Water resources.

An effective implementation of this environmental management plan and any other reasonable and acceptable prevention, reduction, or control and remedy of any impacts need to be ensured. This effective management of impacts will assist greatly to achieve "pain free" maintenance of operations and rehabilitation to an acceptable and self-sustainable state.

24.2 Potential Risk of Acid Mine Drainage

AMD is not a significant factor in the proposed Agricultural Activities.

24.3 Volumes And Rate of Water Use For Agriculture

The operation would require about 46 118 520 m^3/a (estimated) throughout the period of the project phases. However, this quantity may change due to future changes to the project.

24.4 Has A Water Use Licence Been Applied For?

The water use license application is in progress. The proposed Farm Marsh Hydroponics Systems Project required approximately **46 118 520 m^3/a** in order to sustain operations. The quantity of water required will be revised as and when needed.

24.5 Impacts To Be Mitigated In Their Respective Phases

The EMPr addresses the following three (3) phases:

24.5.1 Construction Phase

Table 21 contains a list of potential environmental issues and the appropriate mitigation measures that may be associated with the construction phase of this proposed development. This section serves as a framework for the construction contractor. This detailed EMPr may be included in the final contract(s) with the relevant construction contractors. The table only addresses those impacts that may occur on the site during the

Construction and associated management measures that may require additional environmental management.

Table 21: Construction Phase

Issue	Mitigation	Responsible party	Frequency of Action
Vegetation Clearance			
Objective: To limit clearance of vegetation to the area of application and to prepare site for construction, operational and decommissioning phases of the project			
Vegetation Clearance	Ensure vegetation clearance occurs within the area of application. Ensure that permits and authorisations are obtained before removing listed and protected species.	ESHRQ Department/ECO/Project Manager/Contractor	On-going
	Vegetation clearing should be restricted to areas of the development infrastructure. The development should be around the area where development has already taken place and development infrastructure should rather be clustered in one area than spread evenly across the property. Alien vegetation that has grown as a result of land clearing must be removed by approved methods.		
	A search and rescue operation should be performed prior to clearing, with special emphasis on the common baboon spider. With respect to the protected trees these need to be marked and their presence correlated with the development footprint to ensure they remain *in situ*.		
Geology			
Objective: To prevent/limit sterilisation of Minerals			
Sterilisation of mineral resources	Ensure that limited quantities of minerals of economic value are sterilised	ESHRQ Department & Project Manager	When necessary
	The agricultural development project should be well planned and delineated first and all infrastructure positions should be selected with the main aim of avoiding sterilization of future resources.		On-going
Topography			
Objective: To minimise topographic alterations			
General land disturbance	Manage through limiting all project-related activities to the proposed agricultural development project footprint area.	ESHRQ Department	Continuous

Issue	Mitigation	Responsible party	Frequency of Action
Soils and Land Capability **Objective: To minimise soil degradation**			
Soil Erosion by Water	Manage through best practices. Construct and monitor soil conservation measures at disturbed sites as well as during construction activities. Avoid bare, disturbed surfaces to be not maintained for long periods of time (e.g. wet soils; re-vegetate stockpiled soils; manage waste). Temporary and permanent erosion control methods may include silt fences, flotation silt curtains, retention basins, detention ponds, interceptor ditches, seeding and sodding, erosion mats, and mulching;	ECO/Contractor	When necessary On-going When necessary
	The soil that is excavated during construction should be stock-piled in layers and protected by berms to prevent erosion. Alternatively, the soil may be used somewhere else in an environmentally friendly manner.	ECO/Contractor	On-going On-going
	The placement of the flow retarding barriers, if necessary, must occur in consultation with the Environmental Officer and as part of an overall storm water management system during the construction phase. All stockpiles (whether soil or waste) must be kept as small as possible, maintained, protected and with gentle slopes in order to avoid excessive erosive losses. All attempts must be made to avoid exposure of dispersive soils.		
Soil Erosion by Wind	Avoid bare, disturbed surfaces to be not maintained for long periods of time (e.g. wet soils; re-vegetate stockpiled soils; manage waste).		
	Cover exposed soils with brush-packs of non-invasive species in order to minimise erosive losses. Alternatively, keep the soils wet to ensure dust control. Construct windbreaks, where necessary.		When necessary
Soil Erosion by water and wind.	At no point may plant cover be removed on windy days. Storm water channels and preferential flow paths should be delineated, filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion. The removal of plant material must be kept to a minimum. Audits must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas, and where necessary, the relocation of the cause of the erosion must be undertaken.	Agricultural Development Project community; ESHRQ Department ECO/Contractor Agricultural Development Project community; Contractor	On-going On-going When necessary and/or during windy periods; after rain
	Rehabilitation of the erosion channels and gullies must be undertaken when necessary. Restoration and re-establishment of indigenous plant cover on disturbed and / or cleared areas must take place as soon as possible once activities in that area have ceased.	ECO/Contractor ESHRQ Department; Contractor	When necessary
Dustiness.	Limit traffic congestion and traffic speed to definite, set limits and existing paths. Maintain road surfaces to keep them in good condition for use with limited impact on the environment.	ECO/Contractor ESHRQ Department	On-going When necessary
	Re-vegetate and irrigate dust sources.	ECO/Contractor	When necessary

Issue	Mitigation	Responsible party	Frequency of Action
Agro-chemical Soil pollution.	Manage through best practices. Personnel must be trained to be able to prevent or manage chemical, veterinary medicine and hydrocarbon spills.	ESHRQ Department	When necessary
	Combat chemical pollution in order to avoid toxic substances polluting water sources to impact on health and safety of human beings and that of the environment. Spill kits absorbents and spill mats must be available on-site at all times in order to ensure rapid response following spill incidents. Personnel must be suitably trained in emergency response and in the use of spill kits and bioremediation equipment.	ECO/Contractor ESHRQ Department/ ECO/ Contractor	On-going
Topsoil Degradation	Remove topsoil to a nominal depth of 150 mm Handle topsoil only in the moist state to prevent wind erosion.		
	All possible efforts must be made by the contractors to strip topsoil to a reasonable practicable level (150 mm in depth).		
	Topsoil stockpiles must be kept as small as possible in order to minimise compaction, wind erosion and the formation of anaerobic conditions.	ECO/Contractor	On-going
	Topsoil must be stockpiled for the shortest possible timeframes in order to ensure that the quality of the topsoil is not impaired. Topsoil must not be handled when the moisture content exceeds 12 %.		On-going
Topsoil Degradation	Topsoil stockpiles must be kept separate from subsoil. Excavated and stockpiled soil material are to be stored and bermed on the higher lying areas of the footprint area and not in any storm water run-off channels or any other areas where it is likely to cause erosion, or where water would naturally accumulate.		
	The topsoil should be replaced with the intended activity as soon as possible. Cover exposed soils with brush-packs of non-invasive species in order to maximise nutrient cycling and minimise erosive losses. Stockpiles susceptible to wind erosion are to be covered or moistened during windy periods.		When necessary
	Refuelling must take place in well demarcated areas and over suitable drip trays to prevent soil pollution and Trackless Mobile Machinery to be parked at a designated area. Spill kits (with 16-point Material Safety Data Sheets) to clean up accidental spills from earthmoving machinery must be well-marked and available on site. Workers must undergo induction and training to ensure that they are prepared for emergency response and rapid clean-up procedures.	ESHRQ Department	On-going
Surface Water **Objective: To mitigate negative impacts on Surface Water**			
Sedimentation of water resources	Manage through best practices. To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bermed area.	ECO/Contractor	On-going
	All topsoil must be removed, stockpiled and covered or protected on the site. Alternatively, be used somewhere else in an environmentally friendly manner. Dust suppression is necessary – using either water or a Bio-degradable chemical binding agent.		When necessary
Surface Water pollution	All construction areas should be used for the intended purpose, suitably rehabilitated or re-vegetated as soon as possible after construction.		
	Construction vehicles must be maintained in good working order, to reduce the probability of leakage of fuels and lubricants.	ECO/Contractor	On-going

Issue	Mitigation	Responsible party	Frequency of Action
Surface Water pollution	A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas. Construct overspill areas (tanks / dams / weirs) Surface water draining off contaminated areas containing oil and petrol would need to be channeled towards an oil-water separating facility, which will separate these chemicals and oils.	ESHRQ Department	On-going
	All Portable septic dual toilets must be provided and maintained for construction crews. Maintenance must include their removal without sewage spillage. Under no circumstances may ablutions occur outside of the provided facilities.	ESHRQ Department ECO/Contractor	On-going
	If servicing and washing of the vehicles are to occur on site, there must be specific areas constructed for this activity. This areas needs to have a concrete foundation, bunded as well as have oil traps to contain any spillages likely to occur.	ESHRQ Department	
	Oil residue shall be treated with oil absorbent such as OBC, Bioremediation, Enertech, GK-Spill kits or Drizzit or similar and this material removed to an approved waste site. Spill kits must be easily accessible and workers must undergo induction regarding the use thereof.		Once off
Surface water pollution: Mixing of concrete	Concrete must be mixed on mixing trays or plastic liners. If mixing of concrete is to take place on exposed soil, this has to occur in demarcated areas that must be bunded. This is so that the cement is not washed away during heavy rainfall events.	ECO/Contractor	On-going
	Concrete and tar shall be mixed in specifically demarcated areas only.		
	All concrete and tar that is spilled outside these areas shall be promptly removed by the Contractor and disposed of at a registered landfill site.		When necessary
	After all the concrete / tar mixing is complete all waste concrete / tar shall be removed from the batching area and disposed of at a registered landfill site.		
Surface water pollution: Mixing of concrete	Storm water shall not be allowed to flow through the above-mentioned areas. Ensure that there are clean water separation systems preventing clean water from entering the affected areas and measure to contain any contaminated water occurring within the actual areas.	ECO/Contractor/Project Manager/ESHRQ Department	On-going On-going
	Cement and sediment shall be removed from time to time and disposed of in a manner as instructed by the Project Manager or ESHRQ Department.		
Surface water pollution: litter	In the case of pollution of any surface or groundwater, the Regional Representative of the DHSWS must be informed immediately. Provide bins for construction workers and staff at appropriate locations, particularly where food is consumed. The construction site should be cleaned daily and litter removed.	ESHRQ Department ECO/Contractor	When necessary Once off Daily

Issue	Mitigation	Responsible party	Frequency of Action
Groundwater **Objective: To mitigate negative impacts on ground water systems**			
Groundwater level impact – dewatering	Water level monitoring should be undertaken of boreholes located adjacent to the and near the agricultural development project area. The location of boreholes within the Mining Right area, including the Agricultural Development Project area in the corridor would assist with the identification of impacts on the groundwater resource. Prevent seepage of waste water into groundwater resources through lining. Water volumes and the water balance should be compiled using actual flows, if applicable. These flows should be measured using strategically placed, calibrated flow meters.	ESHRQ Department	Quarterly
Groundwater quantity impact	All chemicals and toxicants during construction and operation must be stored in bunded area.		Monthly
	All employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping"		
Groundwater pollution of the neighbouring users water quality	Monitoring of water quality in neighbouring boreholes should be considered for background water quality identification. The frequency of sampling would be less than for the on-site monitoring boreholes. These boreholes are categorised as off-site boreholes.	ESHRQ Department	Monthly
Monitoring	A groundwater monitoring programme should be planned and implemented prior to the commencement of proposed development. Monitoring boreholes should be identified as soon as infrastructure design is completed and approved.	ESHRQ Department	
	Water level and quality monitoring should commence as soon as possible.		
Flora **Objective: To mitigate the removal and/or disturbance to flora**			
Loss of vegetation of high ecological importance	The highest quality habitat should be conserved, if available. Alternatively, ecological off-sets may be designed and implemented.	ESHRQ Department	On-going
	Where natural habitats must be transformed, consideration should be given to the quality of the habitat (based on the presence of microhabitats).		Once off
	Minimise the footprint of transformation.	Ecologist; ESHRQ Department	When necessary
Loss of vegetation of medium ecological importance	The highest quality habitat must be conserved.		Once off
	Incorporate as much of the indigenous vegetation into the design layout as possible.		
Loss of vegetation of medium ecological importance	After pegging of the site, the ecologist must return to site to provide the final consent regarding the location of the pegs. Where natural habitats must be transformed, consideration should be given to the quality of the habitat (based on the presence of microhabitats).		
Loss of conservation important plant taxa.	Footprint areas of the proposed development must be scanned for Red Listed, protected and important plant species. Recommendations of the Ecologist, if any, must be adhered to.		
Loss of trees due to water extraction.	Trees within the draw-down area must be monitored.		Annually
Fragmentation of Natural Habitat.	Retain natural corridors within the design layout as far as possible.	ESHRQ Department	On-going
	Natural corridors must be retained where possible to promote movement of fauna, especially during the construction phase when a high rate of natural disruption is expected. All road networks must be planned with care to encourage faunal dispersal and should minimise dissection or fragmentation of any important faunal habitat type.	Ecologist; ESHRQ Department	

Issue	Mitigation	Responsible party	Frequency of Action
Vegetation clearance	Use of Herbicides must be managed effectively during vegetation clearance.	Contractor ESHRQ Department	
Vegetation clearance	Stockpile all non-invasive woody vegetation removed for site establishment for brush packs to be used during compost manufacturing.		
	Cover exposed soils with brush-packs of non-invasive species in order to maximise nutrient cycling and floral re-establishment.		
	Access roads must be kept to a minimum, and where possible existing tracks should be used	Contractor	
Fauna **Objective: To mitigate disturbance of fauna**			
Faunal displacement and loss of habitat	The appointment of a full-time Environmental Control Officer must render guidance to the contractors with respect to suitable areas for all construction-related disturbances.	ESHRQ Department	On-going
	Careful consideration is required when planning the placement for stockpiling construction material, topsoil and the creation of access routes in order to avoid the destruction of pristine habitats and minimise the overall development footprint.	ESHRQ Department; Contractor	Once off
	Placement thereof should occur in areas of medium ecological importance or less, and not areas of high ecological importance provided an approved ecological offset strategy permits.		
Disturbance to fauna.	The extent of the proposed development activities should be demarcated on site layout plans (preferably on disturbed areas or those identified with low conservation importance), and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the site that are not part of the demarcated development area should be considered as “no-go” areas for employees, beneficiaries, machinery or even visitors of the proposed development.	Contractor	On-going
	All those working on site must be educated about the conservation importance of the fauna and flora occurring on site, if any.	ESHRQ Department; Contractor	On-going
	The Environmental Control Officer / ESHRQ must ensure that all contractors and workers undergo Environmental Induction prior to commencing with work on site.	ESHRQ Department	When necessary
	The environmental induction should occur in the appropriate languages for the workers who may require translation.	ESHRQ Department	
	Reptiles and amphibians that are exposed during the clearing operations should be captured for later release or translocation by a qualified expert, if practically feasible.	ECO/Contractor	
Disturbance of Raptor nests	Raptor nests located in large trees may be destroyed during the construction phase. It is therefore strongly advised, that all large trees within the development footprint be scanned for nests by suitable person. As should any nest be present, they can be relocated or chicks removed, should no other alternative be available.	ESHRQ Department	Once off
Mortality of invertebrates and other nocturnal species.	The lights used for illumination of the proposed project will attract many invertebrates and other nocturnal species. The light causes disorientation and often results in mortality. It is therefore recommended that the lights should not include any source that emits light in the white spectrum (e.g. mercury arc or halogen lamps). It is therefore recommended that all lights be fitted with sodium lights (yellow), if practicable.	ESHRQ Department	On-going

Issue	Mitigation	Responsible party	Frequency of Action
Air Quality			
Objective: To mitigate negative impacts on ambient air quality			
Dust entrainment and concomitant PM_{10} emissions	Vegetation is to only be removed when soil stripping is required. These areas should be limited to include only those areas required for development, thereby reducing the surface area exposed to wind erosion. Adequate demarcation of these areas should be undertaken.	ECO/Contractor	When necessary
	Brush packs on exposed soil will limit the amount of dust liberated from these exposed surfaces.		
	Control options pertaining to topsoil removal and handling are generally limited to wet suppression. (However, in the current setting of environment that is arid in nature, it would be impractical to base topsoil removal activity schedule on moisture considerations provided the recent rainfall does not stop.)		
Dust entrainment and concomitant PM_{10} emissions	Where it is practicable, control methods for unpaved roads should be utilised to reduce the re-suspension of particulates. Feasible methods include wet suppression (or chemical suppression to reduce water requirements), avoidance of unnecessary traffic, speed control and avoidance of track-on of material onto paved and treated roads. Erect windbreakers.	ECO/Contractor	When necessary
	The length of time where open areas are exposed should be kept at bare minimum. Construction of infrastructure should be undertaken immediately after land has been cleared and topsoil removed.		On-going
	Dust suppression methods must, where practicable, be implemented at all areas that may / are exposed for long periods of time.		When necessary
	Where practicable, seasonal meteorological conditions should be taken into consideration during construction activities (i.e. precipitation and wind field).	ESHRQ Department	
	For all construction activities management should undertake to implement health measures in terms of personal dust exposure, for all stakeholders.		On-going
Global Warming	The main contaminants associated with the project includes: inhalable particulate matter less than 10 microns in size (PM_{10}), larger total suspended particulates (TSP) that relate to dust fallout,CH_4, VOC's, SO_2, N_2O and gaseous emissions mainly from TMM's and vehicles must be kept below WHO concentration limits. Plant Trees as wind breaks around the application area.	ESHRQ Department/ Project Manager	On-going
	Use diesel with relatively low concentrations of SO_2 in TMM's.	ESHRQ Department	On-going
	Due to Global Warming-related uncertainties as to how the climate will affect the project, it is highly recommended that independent support structures for solar panels should be erected, especially for solar panels that are placed on the roof of the greenhouse tunnels.	ESHRQ Department	On-going
Noise and vibration			
Objective: To minimise the disruption of ambient noise levels and/or increase in continuous noise levels			
The impact of the operations on ambient noise climate	Maintenance of equipment and operational procedures: Proper design and maintenance of silencers on diesel-powered equipment, systematic maintenance of all forms of equipment, training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events.	ESHRQ Department; Contractor	On-going
	Ensure effective communication with nearby mining operation stakeholders; request them to limit generation of excessive noise and vibration, if necessary; Or at least communicate blasting period that is scheduled; Ensure all vehicles and equipment is in a good working order; proper communication.	ECO/Contractor/Project Manager/ESHRQ Department	When necessary
	There is unfortunately no mitigation for the vibrations caused by machinery/vehicles, except perhaps ensuring that activities are kept to a minimum. As the killing of herpetofauna is considered a result of ignorance, this can be ameliorated through education. The labour force involved should be educated regarding the conservation importance of herpetofauna.		

Issue	Mitigation	Responsible party	Frequency of Action
The impact of the operations on ambient noise climate	Equipment noise audits: Standardised noise measurements should be conducted on individual equipment at the delivery to site to construct a reference data-base and regular checks carried out to ensure that equipment is not deteriorating and to detect increases which could lead to increase in the noise impact over time and increased complaints.	ECO/Contractor	Monthly
	Environmental noise monitoring should be carried out regularly to detect deviations from predicted noise levels and enable corrective measures to be taken where warranted.	ECO/Contractor	Monthly
Sites of Heritage and Cultural Interest **Objective: To protect and preserve all cultural and heritage resources located within the study area**			
Destruction of heritage resources.	The agricultural development project may go ahead, mindful of the sites that have been flagged for protection, if any. As a standard precaution archaeological deposits are usually buried underground. Should archaeological artefacts or skeletal material be exposed in the area during operations, such activities should be halted, and the provincial heritage resources authority or SAHRA notified in order for an investigation and evaluation of the finds to take place.	ESHRQ Department;	On-going
	A 100 metre protection buffer must be kept around the graves, if any, during all phases of this proposed development and in the vicinity.	ESHRQ Department;	Once off
	If fossils are found once mining has commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. Implement Chance-Find Protocol if proposed by Palaeontologist.	ESHRQ Department;	On-going
Disruption of sites with archaeological and/or cultural interest.	If any archaeological or palaeontological sites are exposed during construction work, operations should be halted and find(s) should immediately be reported to a museum or SAHRA, preferably one at which an archaeologist or palaeontologist is available, in order for further investigations to be conducted. Or a specialist should be called in to give guidance on how to handle the heritage resource.	ECO/Contractor	On-going
Visual Aspects			
Objective: To minimise extensive scarring of the landscape			
Visual Impact	Locate construction camps and stockyards out of the visual field of highly sensitive visual receptors.	ESHRQ Department	Once off
	Retain some of the existing vegetation cover of the site through selective clearing, if possible. Where practicable, protect existing vegetation clumps during the construction phase in order to facilitate screening during construction and operational phases.		On-going
	It is imperative that topsoil from the footprint of the agricultural development project infrastructure is stripped and stockpiled. Stockpile the topsoil from the construction site on the perimeter of the facility to firstly construct a visual barrier and secondly, to protect the topsoil and the seed bank contained in it for future use in rehabilitation. The topsoil must not be stockpiled higher than two (2) m and must be vegetated directly after placement.	ECO/Contractor	
	Pave / dampen roads where relatively high traffic volumes are expected, to minimise dust generation and the potential unsightly discoloration of vegetation along these roads. Restrict speed limit.	ESHRQ Department	On-going
	Keep the construction sites and camps neat, clean and organised in order to portray a general tidy appearance. Locate the construction camps and the material stockpiles outside of the visual field of sensitive visual receptors.	ECO/Contractor	
	Remove rubble and other building rubbish off site as soon as possible or place it in a container in order to keep the construction site free from additional unsightly elements.		Monthly
	If construction is necessary during night time, light sources shall be directed away from roads.		On-going
	Dust suppression procedures should be implemented especially on windy days during earth works.	Contractor	When necessary

Issue	Mitigation	Responsible party	Frequency of Action
Socio-Economic Structure **Objective: To avoid detrimental impacts on the communities**			
Socio-economic	It is recommended that government departments (NCDAEARDLR), District and Local Municipalities, construction teams and the applicant should have continuous engagements.	ESHRQ Department	On-going
	The engagements should ensure that the needs of all the different groups are addressed and that decisions are clearly communicated to the community at large.	ESHRQ Department / Project Manager and Mentor (Consultant – Specialist)	On-going
	The engagements be open-ended. If necessary, it can be incorporated into the Future Forum as prescribed by the MPRDA as the agricultural development project is within a Mining Right area, on the condition that the relevant parties remain members of the committee.		
	Local people should, as far as possible, be utilised in the construction and operation of the project. This will maximise local economic development and the creation of employment in the area. This will also serve to minimise the risk of negative feelings and behaviour between locals and new comers, and lessen the need for developing temporary housing for construction workers. However, it is not anticipated that the operations could be staffed from local people only, and therefore it is very likely that a construction camp would be necessary. Using local labour would ensure a smaller camp.		
	The beneficiaries must be made to feel the ownership of the project. If they are employed, they should receive contracts as prescribed in the Labour Relations Act.		Once off
	Establish targets for employment and training and ensure effective implementation of training and skills development initiatives. Women must be provided with access to types of work traditionally seen as male. A specific contact person should be identified to allow community members and property owners to easily direct their queries and concerns and obtain general information regarding the construction. Establish a liaison point with the adjacent farming community to monitor the impact on their local labour force.		
	During the mentorship period, strengths and weaknesses of individual beneficiary must be identified in preparation for a proper handover that will lead to sustainability of the project.		On-going
Socio-economic	Local materials should be used for construction as far as possible and sustainable.	ESHRQ Department	On-going
	Local SMME must be prioritised when it comes to subcontracting enhance local community benefits with a focus on broad based BEE. Local suppliers should be used as far as possible.	Applicant	
	During the construction phase it is advised that contactors, working on the site, must wear visible identification cards/uniforms.	ESHRQ Department	
	Strict health and safety measures must be implemented during all phases of the project. These measures must be enforced, and if someone does not adhere to it, training and a penalty system should be in place. The rules must be enforced on contractors and beneficiaries.		
	The applicant should ensure that all beneficiaries are adequately trained and qualified to perform their duties. Visitors must be familiarised with the safety precautions of the project. This aspect will most likely be addressed by the Occupational Health and Safety officer.	ESHRQ Department	

Issue	Mitigation	Responsible party	Frequency of Action
Health and Safety			
Objective: To protect Health and Safety			
deterioration of health and safety of personnel	Training of workers in the correct use of the machinery and/or equipment so as to avoid incidents and training of personnel on compliance to Occupational Health and Safety Act. Workers to wear Personal Protective Equipment (PPE).	Project Manager / ESHRQ Department	On-going
	Control Access into the property; Fence may be erected around project area; Implement effectively and monitor EMPr presented herein. Hazardous material must be correctly labelled and handled in a safe manner. Adhere to provisions of Occupational Health and Safety Act. All personnel must undergo induction and training to manage bee attacks and snake encounters. Ensure water troughs are covered under shade at all times.	ESHRQ Department/ECO Project Manager	On-going On-going
Land Use			
Objective: To prevent unnecessary negative impacts on surrounding land uses			
Interference with existing land uses	Ensure that the land that is earmarked for Farm Marsh Hydroponics Systems Project is zoned for agriculture too. Ensure that optimal use is made of the available land through consultation with land owner and proper planning of agricultural development project activities. Enter into amicable agreements to be signed with land owners.	Project Manager	When necessary
	Employ effective rehabilitation strategies to restore land capability and land use potential of the farm, where reasonably practicable. All activities to be restricted within the demarcated areas.	ESHRQ Department & Project Manager	On-going Continuous
Traffic **Objective: To prevent traffic-related accidents and/or injury to people and livestock**			
Impacts on traffic safety and deterioration of the existing road networks	Implement measures that ensure the adherence to traffic rules. Maintain good road surface condition.	ESHRQ Department/ECO/Project Manager	When necessary

Issue	Mitigation	Responsible party	Frequency of Action
Waste			
Objective: To prevent pollution of environment			
Pollution of the environmental	All waste generated must be separated at source. If diverting zero waste to landfill is challenging, waste produced must be taken to disposal site that is permitted and designated for that purpose. Waste must be stored in designated areas for storage. Clearly demarcate and label appropriate storage for the different types of waste. Ensure regular removal of waste on site to prevent attraction of pests and disposal of waste in a permitted disposal site at a licensed landfill site, not the top part of the hierarchy could not be implemented. Identify Waste streams on site and conduct waste classification at an appropriate time. Design storm water management plan, if applicable	ESHRQ Department/ECO/Project Manager	Continuous
	Compile, Implement and Monitor and Effective Waste Management Plan. Appoint a competent contractor to handle waste on site.		
	Divert clean water around the site and collect storm water into a containment facility. Sewage Septic Tanks should be inspected and serviced regularly.		Continuous
	All untreatable waste produced to be disposed of in permitted designated waste disposal site. Waste must be stored in designated areas for storage. Clearly demarcate and label appropriate storage for the different types of waste.		
	Ensure regular removal of waste on site to prevent attraction of pests and disposal of waste in a permitted disposal site at a licensed landfill site. Waste will be collected in colour coded / clearly marked bins. Waste must be classified according to the risk that it poses. Containers will be placed at strategic points throughout the agricultural development project operation site. Waste classification is based on the concept of risk. The severity of the risk posed to the environment must be determined as well as the degree of control necessary during disposal.		
	Hazardous waste must be placed in a suitable bin in accordance with its properties and characteristics. Storage must be based on compatibility of raw materials and waste accordingly. Containers will be placed at strategic points throughout the agricultural development project operation site. Separation at source strategy must be implemented. Waste will be collected in colour coded / clearly marked refuse bags and / or bins. Industrial, hazardous and contaminated waste is transported to the to the nearest license disposal site. Used oil will be recycled as far as possible.		Continuous

Issue	Mitigation	Responsible party	Frequency of Action
Pollution of the environmental	Industrial, hazardous and contaminated waste is transported to the to the nearest license disposal site. Garden refuse is transported to the nearest composting site.	ESHRQ Department/ECO/Project Manager	Continuous
	Rubber and contaminated waste is disposed to a licensed landfill site. Scrap metal, electric cable are weighed separately and transported to site or recyclers.		
	Hazardous waste is disposed of at a suitably licensed landfill site. SAWIC must be used to register generated waste at all times. Document control and proper filing must be in place. Waste disposal certificates must be provided by the contractor for each load of waste removed from site and each load disposed to a licensed landfill site. Waste Tyres: removed from site by service provider and handles it according to Waste Tyres Regulations and Integrated Waste Tyre Management Plan.		
	There should be constant communication between the ECO and various suppliers of all consumables on site for smooth handling of their waste, information sharing and record keeping.		
	Some waste generated at the agricultural development project area may be used to backfill excavated areas of the mine.		
Wetlands **Objective: To prevent destruction of wetlands**			
Disturbance of water resource	Re-establishment of plant cover on disturbed areas must take place as soon as possible, once activities in the area have ceased.	Project Manager/ ESHRQ Department/ECO	On-going
	Waste should be regularly removed from the site by suitably equipped and qualified operators and disposed of in approved facilities. The agricultural development project must have spill procedures in place and specific awareness training. Spill kits such as from Drizzit or Enertech or Supazorb and so on, so if there is a spill it can be cleaned and treated as much as possible and report to authorities in 24 hours. Clearly define roles and responsibilities of all personnel during spillage events.		When necessary

Issue	Mitigation	Responsible party	Frequency of Action
Alien Invasive Plants			
Objective: To eradicate and control the spread of alien invasive species			
Proliferation of alien invasive plants species	Eradicate, and control the spread, of alien invasive species.	Project Manager/ ESHRQ/ECO	On-going
	Compile a working weed/alien plant management programme in collaboration with the Department of Environment, Fisheries and Forestry.		
	Implement effectively the compiled weed/alien plant management programme.		
	All landscaping must take place with indigenous species occurring in the area.		
	All exposed areas must be covered with brush-packs of indigenous species as soon as possible following exposure in order to limit the opportunity for invader species establishment. These areas must be seeded with seeds of indigenous species collected on-site.		
Soil Preparation			
Objective: To prepare soil in order to make it suitable for the desired purpose / use.			
Soil Preparation	Remove topsoil if it is necessary to do so only.	ESHRQ Department	On-going
	Stockpile or conserve removed topsoil for rehabilitation purposes.		
	Ensure quantity of soil used in manipulating topsoil is comparable to quantity of topsoil removed.		
Civil Aviation			
Objective: To manage impact on Civil Aviation			
Civil Aviation	Maintain continuous and effective communication with the Civil Aviation Authority	ESHRQ Department	On-going
Use of Chemicals, Herbicides and Pesticides			
Objective: To control and monitor use of Chemicals, Herbicides and Pesticides			
Chemicals, Herbicides and Pesticides	Establish and sustain optimal productivity whilst protecting the environment	ESHRQ Department	On-going
	Control and monitor the use of Chemical, Herbicides and Pesticides.		

24.5.2 Operational Phase

Table 22 only addresses those impacts that may occur on the site during the Operational and associated management measures that may require additional environmental management.

Table 22: Operational Phase

Issue	Mitigation	Responsible party	Frequency of Action
Vegetation Clearance			
Objective: To limit clearance of vegetation to the area of application and to prepare site for construction, operational and decommissioning phases of the project			
Vegetation Clearance	Ensure vegetation clearance occurs within the area of application	ESHRQ Department/ECO/Project Manager/Contractor	On-going
	Ensure that permits and authorisations are obtained before removing listed and protected species.		
Geology			
Objective: To prevent/limit sterilisation of Minerals			
Sterilisation of mineral resources	Ensure that limited quantities of minerals of economic value are sterilised	ESHRQ Department & Project Manager	When necessary
	The agricultural development project should be well planned and delineated first and all infrastructure positions should be selected with the main aim of avoiding sterilization of future resources.		On-going
Topography			
Objective: To minimise topographic alterations			
General land disturbance	Manage through limiting all project-related activities to the proposed agricultural development project footprint area.	ESHRQ Department	Continuous
Soils and Land Capability			
Objective: To minimise soil degradation			
Soil Erosion by Water	Manage through best practices. Construct and monitor soil conservation measures at disturbed sites as well as during construction activities.	ECO/Contractor	When necessary
	Avoid bare, disturbed surfaces to be not maintained for long periods of time (e.g. wet soils; re-vegetate stockpiled soils; manage waste).		On-going
	All canals on the development should always function efficiently and be well maintained. After heavy rain, repairs should be undertaken and the canals cleared and cleaned; The soil that is excavated during construction should be stock-piled in layers and protected by berms to prevent erosion. Alternatively, the soil may be used somewhere else in an environmentally friendly manner.	ECO/Contractor	When necessary On-going On-going

Issue	Mitigation	Responsible party	Frequency of Action
Soil Erosion by Wind	Regarding disposal of solid waste over land, vegetation cover should be maintained on the disposal area to prevent soil erosion and to enhance nutrient uptake. All stockpiles (whether soil or waste) must be kept as small as possible, maintained, protected and with gentle slopes in order to avoid excessive erosive losses.	ECO / Contractor / ERSHQ Department	On-going
	All attempts must be made to avoid exposure of dispersive soils. Avoid bare, disturbed surfaces to be not maintained for long periods of time (e.g. wet soils; re-vegetate stockpiled soils; manage waste). Cover exposed soils with brush-packs of non-invasive species in order to minimise erosive losses. Alternatively, keep the soils wet to ensure dust control.		When necessary
Soil Erosion by water and wind.	Construct windbreaks, where necessary. At no point may plant cover be removed on windy days.	Agricultural Development Project community; ESHRQ Department	On-going
	The removal of plant material must be kept to a minimum.	ECO/Contractor	On-going
	Audits must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas, and where necessary, the relocation of the cause of the erosion must be undertaken.	Agricultural Development Project community; Contractor	When necessary and/or during windy periods; after rain
	Rehabilitation of the erosion channels and gullies must be undertaken when necessary.	ECO/Contractor	When necessary
	Restoration and re-establishment of indigenous plant cover on disturbed and / or cleared areas must take place as soon as possible once activities in that area have ceased.	ESHRQ Department; Contractor	
Dustiness.	Limit traffic congestion and traffic speed to definite, set limits and existing paths. Maintain road surfaces to keep them in good condition for use with limited impact on the environment.	ECO/Contractor ESHRQ Department	On-going When necessary
Chemical Soil pollution.	Re-vegetate and irrigate dust sources. Manage through best practices. Personnel must be trained to be able to prevent or manage chemical and hydrocarbon spills.	ECO/Contractor ESHRQ Department	
	Combat chemical pollution in order to avoid toxic substances polluting water sources to impact on health and safety of human beings and that of the environment.	ECO/Contractor	On-going
Topsoil Degradation	Spill kits absorbents and spill mats must be available on-site at all times in order to ensure rapid response following spill incidents. Personnel must be suitably trained in emergency response and in the use of spill kits and bioremediation equipment. Remove topsoil to a nominal depth of 150 mm	ESHRQ Department/ ECO/ Contractor	
	Handle topsoil only in the moist state to prevent wind erosion. All possible efforts must be made by the contractors to strip topsoil to a reasonable practicable level (150 mm in depth). Topsoil stockpiles must be kept as small as possible in order to minimise compaction, wind erosion and the formation of anaerobic conditions.	ECO/Contractor	On-going
	Topsoil must be stockpiled for the shortest possible timeframes in order to ensure that the quality of the topsoil is not impaired.		On-going
	Topsoil must not be handled when the moisture content exceeds 12 %.		

Issue	Mitigation	Responsible party	Frequency of Action
Topsoil Degradation	Topsoil stockpiles must be kept separate from subsoil.		
	Excavated and stockpiled soil material are to be stored and bermed on the higher lying areas of the footprint area and not in any storm water run-off channels or any other areas where it is likely to cause erosion, or where water would naturally accumulate.		
	The topsoil should be replaced with the intended activity as soon as possible. Cover exposed soils with brush-packs of non-invasive species in order to maximise nutrient cycling and minimise erosive losses.		When necessary
	Stockpiles susceptible to wind erosion are to be covered or moistened during windy periods. Refuelling must take place in well demarcated areas and over suitable drip trays to prevent soil pollution and Trackless Mobile Machinery to be parked at a designated area.		On-going
	Spill kits (with 16-point Material Safety Data Sheets) to clean up accidental spills from earthmoving machinery must be well-marked and available on site. Workers must undergo induction and training to ensure that they are prepared for emergency response and rapid clean-up procedures.	ESHRQ Department	
Surface Water **Objective: To mitigate negative impacts on Surface Water**			
Sedimentation of water resources	Manage through best practices. To prevent erosion of material that is stockpiled for long periods, the material must be retained in a bermed area.	ECO/Contractor	On-going
	All topsoil must be removed, stockpiled and covered or protected on the site. Alternatively, be used somewhere else in an environmentally friendly manner.		
Surface Water pollution	Dust suppression is necessary – using either water or a Bio-degradable chemical binding agent. Ensure that the and overspill tank liner integrity is maintained		When necessary
Surface Water pollution	Construction vehicles must be maintained in good working order, to reduce the probability of leakage of fuels and lubricants. A walled concrete platform, dedicated store with adequate flooring or bermed area should be used to accommodate chemicals such as fuel, oil, paint, herbicide and insecticides, as appropriate, in well-ventilated areas.	ECO/Contractor ESHRQ Department	On-going
	Surface water draining off contaminated areas containing oil, petrol or diesel would need to be channeled towards an oil-water separating facility of the mine, which will separate these chemicals and oils.		
	Ensure that the discharge of water will not result in scouring and erosion of the receiving systems Under no circumstances may ablutions occur outside of the provided facilities.	ESHRQ Department ECO/Contractor	On-going
	If servicing and washing of the vehicles are to occur on site, there must be specific areas constructed for this activity. This areas needs to have a concrete foundation, bunded as well as have oil traps to contain any spillages likely to occur. Oil residue shall be treated with oil absorbent such as OBC, Bioremediation, Enertech, GK-Spill kits or Drizzit or similar and this material removed to an approved waste site. Spill kits must be easily accessible and workers must undergo induction regarding the use thereof.	ESHRQ Department	Once off

Issue	Mitigation	Responsible party	Frequency of Action
Surface water pollution: Mixing of concrete	Concrete for maintenance must be mixed on mixing trays or plastic liners. If mixing of concrete is to take place on exposed soil, this has to occur in demarcated areas that must be bunded. This is so that the cement is not washed away during heavy rainfall events.	ECO/Contractor	On-going
	All concrete and tar that is spilled outside these areas shall be promptly removed by the Contractor and disposed of at a registered landfill site.		When necessary
	Stormwater channels and preferential flow paths should be delineated, filled with aggregate and/or logs (branches included) to dissipate and slow flows limiting erosion.		
Surface water pollution: Mixing of concrete	Storm water shall not be allowed to flow through the above-mentioned areas. Ensure that there are clean water separation systems preventing clean water from entering the affected areas and measure to contain any contaminated water occurring within the actual areas.	ECO/Contractor/Project Manager/ESHRQ Department	On-going On-going
	Cement and sediment shall be removed from time to time and disposed of in a manner as instructed by the Project Manager or ESHRQ Department.		
Surface water pollution: litter	In the case of pollution of any surface or groundwater, the Regional Representative of the DHSWS must be informed immediately.	ESHRQ Department	When necessary
	All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site		
	Provide bins for construction workers and staff at appropriate locations, particularly where food is consumed.		Once off
	The operational site should be cleaned daily and litter removed.	ECO/Contractor	Daily
Groundwater			
Objective: To mitigate negative impacts on ground water systems			
Groundwater level impact – dewatering	Water level monitoring should be undertaken of boreholes located adjacent to the and near the agricultural development project area. The location of boreholes within the Mining Right area, including the Agricultural Development Project area in the corridor would assist with the identification of impacts on the groundwater resource.	ESHRQ Department	Quarterly
	Water volumes and the water balance should be compiled using actual flows, if applicable. These flows should be measured using strategically placed, calibrated flow meters.		Monthly
Groundwater quantity impact	Adequate sanitary facilities and ablutions on the servitude must be provided for all personnel throughout the project area. Use of these facilities must be enforced (these facilities must be kept clean so that they are a desired alternative to the surrounding vegetation); Groundwater must be treated before distribution.		
Groundwater pollution of the neighbouring users water quality	Monitoring of water quality in neighbouring boreholes should be considered for background water quality identification. The frequency of sampling would be less than for the on-site monitoring boreholes. These boreholes are categorised as off-site boreholes.	ESHRQ Department	Monthly
Monitoring	A groundwater monitoring programme should be planned and implemented prior to the commencement of proposed development. Monitoring measures must be implemented as detailed.	ESHRQ Department	
	Monitoring boreholes should be identified as soon as infrastructure design is completed and approved. The site characterisation boreholes with water strikes should be tested for aquifer parameters.	ESHRQ Department	Monthly
	Water level and quality monitoring should commence as soon as possible.		

Issue	Mitigation	Responsible party	Frequency of Action
Flora			
Objective: To mitigate the removal and/or disturbance to flora			
Loss of vegetation of high ecological importance	The highest quality habitat should be conserved, if available. Alternatively, ecological off-sets may be designed and implemented.	ESHRQ Department	On-going
	Where natural habitats must be transformed, consideration should be given to the quality of the habitat (based on the presence of microhabitats).		Once off
	Minimise the footprint of transformation.	Ecologist; ESHRQ Department	When necessary
Loss of vegetation of medium ecological importance	The highest quality habitat must be conserved.		Once off
	Incorporate as much of the indigenous vegetation into the design layout as possible.		
Loss of vegetation of medium ecological importance	After pegging of the site, the ecologist must return to site to provide the final consent regarding the location of the pegs.		
	Where natural habitats must be transformed, consideration should be given to the quality of the habitat (based on the presence of microhabitats).		
Loss of conservation important plant taxa.	Footprint areas of the proposed development must be scanned for Red Listed, protected and important plant species. Recommendations of the Ecologist, if any, must be adhered to.		
	Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species;		
Fragmentation of Natural Habitat.	Retain natural corridors within the design layout as far as possible.	ESHRQ Department	On-going
	Natural corridors must be retained where possible to promote movement of fauna, especially during the construction phase when a high rate of natural disruption is expected.	Ecologist; ESHRQ Department	
	All road networks must be planned with care to encourage faunal dispersal and should minimise dissection or fragmentation of any important faunal habitat type.		
Vegetation clearance	Use of Herbicides must be managed effectively during vegetation clearance.	Contractor ESHRQ Department	
Vegetation clearance	Stockpile all non-invasive woody vegetation removed for site establishment for brush packs to be used during compost manufacturing.		
	Cover exposed soils with brush-packs of non-invasive species in order to maximise nutrient cycling and floral re-establishment.		
	Access roads must be kept to a minimum, and where possible existing tracks should be used	Contractor	
Fauna			
Objective: To mitigate disturbance of fauna			
Faunal displacement and loss of habitat	The appointment of a full-time Environmental Control Officer must render guidance to the contractors with respect to suitable areas for all construction-related disturbance.	ESHRQ Department	On-going
	Careful consideration is required when planning the placement for stockpiling construction material, topsoil and the creation of access routes in order to avoid the destruction of pristine habitats and minimise the overall development footprint.	ESHRQ Department; Contractor	Once off
	Placement thereof should occur in areas of medium ecological importance or less, and not areas of high ecological importance provided an approved ecological offset strategy permits.		

Issue	Mitigation	Responsible party	Frequency of Action
Disturbance to fauna.	The extent of the proposed development activities should be demarcated on site layout plans (preferably on disturbed areas or those identified with low conservation importance), and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the site that are not part of the demarcated development area should be considered as "no-go" areas for employees, beneficiaries, machinery or even visitors of the proposed development.	Contractor	On-going
	Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited.	ESHRQ Department; Contractor	On-going
	The Environmental Control Officer / ESHRQ must ensure that all contractors and workers undergo Environmental Induction prior to commencing with work on site.	ESHRQ Department	When necessary
	The environmental induction should occur in the appropriate languages for the workers who may require translation. Reptiles and amphibians that are exposed during the clearing operations should be captured for later release or translocation by a qualified expert, if practically feasible.	ESHRQ Department ECO/Contractor	
Disturbance of Raptor nests	Raptor nests located in large trees may be destroyed during the construction phase. It is therefore strongly advised, that all large trees within the development footprint be scanned for nests by suitable person. As should any nest be present, they can be relocated or chicks removed, should no other alternative be available.	ESHRQ Department	Once off
Mortality of invertebrates and other nocturnal species.	The lights used for illumination of the proposed project will attract many invertebrates and other nocturnal species. The light causes disorientation and often results in mortality. It is therefore recommended that the lights should not include any source that emits light in the white spectrum (e.g. mercury arc or halogen lamps). It is therefore recommended that all lights be fitted with sodium lights (yellow), if practicable.		
Air Quality and Odour **Objective: To mitigate negative impacts on ambient air quality**			
Dust entrainment and concomitant PM_{10} emissions	Vegetation clearance should be undertaken when topsoil removal or development is to take place. These areas should be limited to include only those areas required for development, thereby reducing the surface area exposed to wind erosion. Adequate demarcation of these areas should be undertaken.	ECO/Contractor	When necessary
	Brush packs on exposed soil will limit the amount of dust liberated from these exposed surfaces. Control options pertaining to topsoil removal and handling are generally limited to wet suppression. (However, in the current setting of environment that is arid in nature, it would be impractical to base topsoil removal activity schedule on moisture considerations provided the recent rainfalls do not stop.)		

Issue	Mitigation	Responsible party	Frequency of Action
Dust entrainment and concomitant PM_{10} emissions	Where it is practicable, gravel road and the entire road network onsite must undergo dust suppression regularly in order to prevent re-suspension of particulates. Feasible methods include wet suppression (or chemical suppression to reduce water requirements), avoidance of unnecessary traffic, speed control and avoidance of track-on of material onto paved and treated roads. The length of time where open areas are exposed should be kept at bare minimum. Construction of infrastructure should be undertaken immediately after land has been cleared and topsoil removed.	ECO/Contractor	When necessary On-going
	Dust suppression methods must, where practicable, be implemented at all areas that may / are exposed for long periods of time.		When necessary
	Where practicable, seasonal meteorological conditions should be taken into consideration during construction activities (i.e. precipitation and wind field).	ESHRQ Department	
	For all construction activities management should undertake to implement health measures in terms of personal dust exposure, for all stakeholders.		On-going
Global Warming	The main contaminants associated with the project includes: inhalable particulate matter less than 10 microns in size (PM_{10}), larger total suspended particulates (TSP) that relate to dust fallout,CH_4, VOC's, SO_2, N_2O and gaseous emissions mainly from TMM's and vehicles must be kept below WHO concentration limits. Use deodourising agents regularly.	ESHRQ Department/ Project Manager	On-going
	Use diesel with relatively low concentrations of SO_2 in TMM's.	ESHRQ Department	On-going
	Due to Global Warming-related uncertainties as to how the climate will affect the project, it is highly recommended that independent support structures for solar panels should be erected, especially for solar panels that are placed on the roof of the greenhouse tunnels.	ESHRQ Department	On-going
Noise and vibration **Objective: To minimise the disruption of ambient noise levels and/or increase in continuous noise levels**			
The impact of the operations on ambient noise climate	Maintenance of equipment and operational procedures: Proper design and maintenance of silencers on diesel-powered equipment, systematic maintenance of all forms of equipment, training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events.	ESHRQ Department; Contractor	On-going
	Ensure effective communication with nearby mining operation stakeholders; request them to limit generation of excessive noise and vibration, if necessary; Or at least communicate blasting period that is scheduled; Ensure all vehicles and equipment is in a good working order; proper communication.	ECO/Contractor/Project Manager/ESHRQ Department	When necessary
The impact of the operations on ambient noise climate	Equipment noise audits: Standardised noise measurements should be conducted on individual equipment at the delivery to site to construct a reference data-base and regular checks carried out to ensure that equipment is not deteriorating and to detect increases which could lead to increase in the noise impact over time and increased complaints.	ECO/Contractor	Monthly
	Environmental noise monitoring should be carried out regularly to detect deviations from predicted noise levels and enable corrective measures to be taken where warranted.	ECO/Contractor	Monthly

Issue	Mitigation	Responsible party	Frequency of Action
Sites of Heritage and Cultural Interest			
Objective: To protect and preserve all cultural and heritage resources located within the study area			
Destruction of heritage resources.	The agricultural development project may go ahead, mindful of the sites that have been flagged for protection, if any. As a standard precaution archaeological deposits are usually buried underground. Should archaeological artefacts or skeletal material be exposed in the area during operations, such activities should be halted, and the provincial heritage resources authority or SAHRA notified in order for an investigation and evaluation of the finds to take place.	ESHRQ Department;	On-going
	A 100 metre protection buffer must be kept around the graves, if any, during all phases of this proposed development and in the vicinity.	ESHRQ Department;	Once off
	If fossils are found once mining has commenced then they should be rescued and a palaeontologist called to assess and collect a representative sample. Implement Chance-Find Protocol if proposed by Palaeontologist.	ESHRQ Department;	On-going
Disruption of sites with archaeological and/or cultural interest.	If any archaeological or palaeontological sites are exposed during construction work, operations should be halted and find(s) should immediately be reported to a museum or SAHRA, preferably one at which an archaeologist or palaeontologist is available, in order for further investigations to be conducted. Or a specialist should be called in to give guidance on how to handle the heritage resource.	ECO/Contractor	On-going
Visual Aspects			
Objective: To minimise extensive scarring of the landscape			
Visual Impact	Locate construction camps and stockyards out of the visual field of highly sensitive visual receptors.	ESHRQ Department	Once off
	Retain some of the existing vegetation cover of the site through selective clearing, if possible. Where practicable, protect existing vegetation clumps during the construction phase in order to facilitate screening during construction and operational phases.		On-going
	It is imperative that topsoil from the footprint of the agricultural development project infrastructure is stripped and stockpiled. Stockpile the topsoil from the construction site on the perimeter of the facility to firstly construct a visual barrier and secondly, to protect the topsoil and the seed bank contained in it for future use in rehabilitation. The topsoil must not be stockpiled higher than two (2) m and must be vegetated directly after placement.	ECO/Contractor	
	Pave / dampen roads where relatively high traffic volumes are expected, to minimise dust generation and the potential unsightly discoloration of vegetation along these roads. Restrict speed limit.	ESHRQ Department	On-going
	Keep the construction sites and camps neat, clean and organised in order to portray a general tidy appearance.	ECO/Contractor	
	Remove rubble and other building rubbish off site as soon as possible or place it in a container in order to keep the construction site free from additional unsightly elements.		Monthly
	Locate the construction camps and the material stockpiles outside of the visual field of sensitive visual receptors.	ESHRQ Department	Once off
	If construction is necessary during night time, light sources shall be directed away from residential units and roads as to prevent obtrusive lighting.		On-going
	Dust suppression procedures should be implemented especially on windy days during earth works.	Contractor	When necessary

Issue	Mitigation	Responsible party	Frequency of Action
Socio-Economic Structure **Objective: To avoid detrimental impacts on the communities**			
Socio-economic	It is recommended that government departments (NCDAEARDLR), District and Local Municipalities, construction teams and the applicant should have continuous engagements.	ESHRQ Department	On-going
	The engagements should ensure that the needs of all the different groups are addressed and that decisions are clearly communicated to the community at large.	ESHRQ Department / Project Manager and Mentor (Consultant – Specialist)	On-going
	The engagements be open-ended. If necessary, it can be incorporated into the Future Forum as prescribed by the MPRDA as the agricultural development project is within a Mining Right area, on the condition that the relevant parties remain members of the committee. Local people should, as far as possible, be utilised in the construction and operation of the project. This will maximise local economic development and the creation of employment in the area. This will also serve to minimise the risk of negative feelings and behaviour between locals and new comers, and lessen the need for developing temporary housing for construction workers. However, it is not anticipated that the operations could be staffed from local people only, and therefore it is very likely that a construction camp would be necessary. Using local labour would ensure a smaller camp. The beneficiaries must take ownership of the project and ensure project's sustainability. If they are employed, it is recommended that they receive contracts as prescribed in the Labour Relations Act to avoid lengthy unnecessary disputes.		Once off
	During the mentorship period, strengths and weaknesses of individual beneficiary must be identified in preparation for a proper handover that will lead to sustainability of the project.		On-going
Socio-economic	Local materials should be used for construction as far as possible and sustainable. Local SMME must be prioritised when it comes to subcontracting.	ESHRQ Department Applicant	On-going
	During the construction phase it is advised that contactors, working on the site, must wear visible identification cards/uniforms. Strict health and safety measures must be implemented during all phases of the project. These measures must be enforced, and if someone does not adhere to it, training and a penalty system should be in place. The rules must be enforced on contractors and beneficiaries.	ESHRQ Department	
	The applicant should ensure that all beneficiaries are adequately trained and qualified to perform their duties. Visitors must be familiarised with the safety precautions of the project. This aspect will most likely be addressed by the Occupational Health and Safety officer. If possible, a training and skills development programme for the local workers should be initiated prior to the operational phase. Effective implementation of training and skills development initiatives.	ESHRQ Department / Project Manager	
	Recruitment should be formalised and co-ordinated through the Department of Labour- avoid appointments at the gate of the proposed Project. Collaborate with Department of Labour and local business entities to develop/share skills database/registers		
	Locals should also be allowed an opportunity to be included in a list of possible local suppliers and service providers for e.g. security services. Promote employment of women and youth.		

Issue	Mitigation	Responsible party	Frequency of Action
Health and Safety			
Objective: To protect Health and Safety			
deterioration of health and safety of personnel	Training of workers in the correct use of the machinery and/or equipment so as to avoid incidents and training of personnel on compliance to Occupational Health and Safety Act. Workers to wear Personal Protective Equipment (PPE).	Project Manager / ESHRQ Department	On-going
	Control Access into the property; Fence may be erected around project area; Implement effectively and monitor EMPr presented herein. Hazardous material must be correctly labelled and handled in a safe manner. Adhere to provisions of Occupational Health and Safety Act. Conduct site and safety induction to raise awareness of the risks associated with the site. Train all relevant personnel on handling, use and storage of hazardous substances. All visitors should undergo site induction and be made aware of the risks associated with the site. Train personnel on how to deal with bee attacks and snake encounters.	ESHRQ Department/ECO Project Manager	On-going On-going
Land Use			
Objective: To prevent unnecessary negative impacts on surrounding land uses			
Interference with existing land uses	Ensure that the land that is earmarked for Farm Marsh Hydroponics Systems Project is zoned for agriculture too. Ensure that optimal use is made of the available land through consultation with land owner and proper planning of agricultural development project activities. Enter into amicable agreements to be signed with land owners.	Project Manager	When necessary
	Employ effective rehabilitation strategies to restore land capability and land use potential of the farm, where reasonably practicable. All activities to be restricted within the demarcated areas.	ESHRQ Department & Project Manager	On-going Continuous
Traffic			
Objective: To prevent traffic-related accidents and/or injury to people and livestock			
Impacts on traffic safety and deterioration of the existing road networks	Implement measures that ensure the adherence to traffic rules.	ESHRQ Department/ECO/Project Manager	When necessary
	Maintain good road surface condition.		
Waste			
Objective: To prevent pollution of environment			
Pollution of the environmental	All waste generated must be separated at source. If diverting zero waste to landfill is challenging, waste produced must be taken to disposal site that is permitted and designated for that purpose. Waste must be stored in designated areas for storage. Clearly demarcate and label appropriate storage for the different types of waste. Ensure regular removal of waste on site to prevent attraction of pests and disposal of waste in a permitted disposal site at a licensed landfill site, not the top part of the hierarchy could not be implemented.	ESHRQ Department/ECO/Project Manager	Continuous
	Identify Waste streams on site and conduct waste classification at an appropriate time. Design storm water management plan, if applicable. All materials transported to site must be transported in such a manner that they do not fly or fall off the vehicle. This may necessitate covering or wetting friable materials.		

Issue	Mitigation	Responsible party	Frequency of Action
Pollution of the environment	Compile, Implement and Monitor and Effective Waste Management Plan. Appoint a competent contractor to handle waste on site. Divert clean water around the site and collect storm water into a containment facility. Sewage Septic Tanks should be inspected and serviced regularly.	ESHRQ Department/ECO/Project Manager	Continuous
	All untreatable waste produced to be disposed of in permitted designated waste disposal site. Waste must be stored in designated areas for storage. Clearly demarcate and label appropriate storage for the different types of waste.		
	Ensure regular removal of waste on site to prevent attraction of pests and disposal of waste in a permitted disposal site at a licensed landfill site. Waste will be collected in colour coded / clearly marked bins. Waste must be classified according to the risk that it poses. Containers will be placed at strategic points throughout the agricultural development project operation site. Waste classification is based on the concept of risk. The severity of the risk posed to the environment must be determined as well as the degree of control necessary during disposal.		
	Hazardous waste must be placed in a suitable bin in accordance with its properties and characteristics. Storage must be based on compatibility of raw materials and waste accordingly. Containers will be placed at strategic points throughout the agricultural development project operation site. Separation at source strategy must be implemented. Waste will be collected in colour coded / clearly marked refuse bags and / or bins. Industrial, hazardous and contaminated waste is transported to the to the nearest license disposal site. Used oil will be recycled as far as possible. Industrial, hazardous and contaminated waste is transported to the to the nearest license disposal site. Garden refuse is transported to the nearest composting site.		
	Rubber and contaminated waste is disposed to a licensed landfill site. Scrap metal, electric cable are weighed separately and transported to site or recyclers.		
	Hazardous waste is disposed of at a suitably licensed landfill site. SAWIC must be used to register generated waste at all times. Document control and proper filing must be in place.		
	Waste disposal certificates must be provided by the contractor for each load of waste removed from site and each load disposed to a licensed landfill site.		

Issue	Mitigation	Responsible party	Frequency of Action
Pollution of the environment	Waste Tyres: removed from site by service provider and handles it according to Waste Tyres Regulations and Integrated Waste Tyre Management Plan. There should be constant communication between the ECO and various suppliers of all consumables on site for smooth handling of their waste, information sharing and record keeping. Some waste generated at the agricultural development project area may be used to backfill excavated areas of the mine.	ESHRQ Department/ECO/Project Manager	Continuous
Wetlands **Objective: To prevent destruction of wetlands**			
Disturbance of water resource	Re-establishment of plant cover on disturbed areas must take place as soon as possible, once activities in the area have ceased.	Project Manager/ ESHRQ Department/ECO	On-going
	Waste should be regularly removed from the site by suitably equipped and qualified operators and disposed of in approved facilities.		When necessary
	The agricultural development project must have spill procedures in place and specific awareness training. Spill kits such as from Drizzit or Enertech or Supazorb and so on, so if there is a spill it can be cleaned and treated as much as possible and report to authorities in 24 hours.		
	Clearly define roles and responsibilities of all personnel during spillage events.		
Alien Invasive Plants **Objective: To eradicate and control the spread of alien invasive species**			
Proliferation of alien invasive plants species	Eradicate, and control the spread, of alien invasive species.	Project Manager/ ESHRQ/ECO	On-going
	Compile a working weed/alien plant management programme/plan in collaboration with the Department of Environment, Fisheries and Forestry.		
	Implement effectively the compiled weed/alien plant management programme/plan. Compilation of and implementation of an alien vegetation management plan for the entire site, including the surrounding project area.		
	All landscaping must take place with indigenous species occurring in the area. All exposed areas must be covered with brush-packs of indigenous species as soon as possible following exposure in order to limit the opportunity for invader species establishment. These areas must be seeded with seeds of indigenous species collected on-site.		

Issue	Mitigation	Responsible party	Frequency of Action
Soil Preparation **Objective: To prepare soil in order to make it suitable for the desired purpose / use.**			
Soil Preparation	Remove topsoil if it is necessary to do so only.	ESHRQ Department	On-going
	Stockpile or conserve removed topsoil for rehabilitation purposes. Ensure quantity of soil used in manipulating topsoil is comparable to quantity of topsoil removed.		
Civil Aviation			
Objective: To manage impact on Civil Aviation			
Civil Aviation	Maintain continuous and effective communication with the Civil Aviation Authority	ESHRQ Department	On-going
Use of Chemicals, Herbicides and Pesticides **Objective: To control and monitor use of Chemicals, Herbicides and Pesticides**			
Chemicals, Herbicides and Pesticides	Establish and sustain optimal productivity whilst protecting the environment Control and monitor the use of Chemical, Herbicides and Pesticides.	ESHRQ Department	On-going

24.5.3 Decommissioning Phase

To decommission operations and rehabilitate the environment, refer to Table 25.

Table 23: **Decommissioning Phase**

Issue	Mitigation	Responsible Party	Frequency of Action
Geology	• Accessibility of minerals.	ESHRQ Department/ECO	On-going
Topography	• Restore topography reasonably practicable.	ESHRQ Department/ECO	On-going
Soils and Land Capability	• Prepare topsoil; • Restore state of land as much as reasonably practicable or as per agreement with landowner.	ESHRQ Department/ECO	On-going
Fauna and flora	• Limit vegetation clearance to only the area where activities are to take place. Restore the disturbed area to a state where, possibly, animals will become attracted post closure.	ESHRQ Department/ECO	On-going
Surface Water	• Ensure no surface water pollution is going to occur as a result of decommissioning.	ESHRQ Department/ECO	On-going
Groundwater	• Apply water-saving techniques such as re-use of the resource; • Implement pollution control measures; • Monitor quality and quantity of groundwater resource.	ESHRQ Department/ECO	On-going
Soil Erosion	• Dampen soils regularly, especially when it is windy and plant trees on bare surfaces.	ESHRQ Department/ECO	On-going
GHG Emission (Global Warming)	• Monitor GHG emissions; • Maintain GHG emissions within acceptable levels	ESHRQ Department/ECO	On-going
Dust generation	• Manage emissions of dust through dust suppression process.	ESHRQ Department/ECO	On-going
Socio-economic	• Comply with applicable pieces of legislation, including those of SARS, UIF & localisation	ESHRQ Department/ECO	On-going
Traffic	• Observe road safety traffic rules.	ESHRQ Department/ECO	On-going
Waste	• Waste must be stored in demarcated temporary storage facilities and be disposed of in accordance with applicable pieces of legislation and best practise guidelines. Some waste may be used to backfill excavated areas.	ESHRQ Department/ECO	On-going

Issue	Mitigation	Responsible Party	Frequency of Action
Wetlands Invasive Alien Plants Infrastructure	• Remove demarcations, if any. • Monitor effectiveness of invasive and alien plant management programme. • Dismantle and Demolish Infrastructure. Manage activity footprint as much as reasonable practicable. Monitoring to be conducted a reasonably practicable possible long enough period post closure, i.e. 1 - 2 years	ESHRQ Department/ECO ESHRQ Department/ECO ESHRQ Department/ECO	On-going On-going On-going
Land Uses	• Plant indigenous plant species.	ESHRQ Department/ECO	On-going

25 Impact Management Outcomes

The impact management outcomes are presented in Table 24.

Table 24: Impact Management Outcomes

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Geology	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Post-closure alternative land uses	Sterilisation of mineral resources	Construction Operational Decommissioning	Low	• Management through best practises • Ensure that minimal quantity of commodity of economic value is sterilised.	Low	Can be managed/mitigated to acceptable levels
Topography	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Changes to surface topography due to topsoil removal, construction and placement of infrastructure and development of agricultural project.	Construction Operational Decommissioning	Medium – High	• Ensure access control; • Employ effective rehabilitation strategies to restore surface topography of topsoil removal, placement of agriculture-related infrastructure; and • remedy through emergency response procedures	Low - Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Vegetation Clearance	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Destruction of natural vegetation, including listed and / or protected species	Construction Operational Decommissioning	Low – Medium	• Ensure vegetation clearance occurs within the area of application; • Ensure that permits and authorisations are obtained before removing protected species.	Low – Medium	Can be managed/mitigated to acceptable levels
Soil Preparation	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Disturbance of natural state of topsoil.	Construction Operational Decommissioning	Medium – High	• Remove topsoil if it is necessary to do so only; • Stockpile or conserve removed topsoil for rehabilitation purposes.	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Soil and land capability	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Loss of soil resources and land capability through contamination; loss of soil fertility; Soil erosion by water and wind on disturbed; potential for dust production and soil microbial degradation.	Construction Operational Decommissioning	Low	• Employ appropriate management strategies to preserve soil resources; • Monitor soil preparation; • Spray water on the surface regularly to avoid or minimise erosion; • Control through waste management practices; • control through rehabilitation; • control through appropriate design; and • remedy through emergency response procedures Manage through limiting the project footprint; • manage through soil conservation procedures; and • manage through closure planning and rehabilitation • Restore the natural state of soil and land capability as much as reasonably practicable.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Biodiversity	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Physical destruction of biodiversity; the clearance of vegetation; potential loss of listed & protected species; potential loss of ecosystem function; Displacement of fauna; The loss, damage and fragmentation of floral and faunal habitats.	Construction Operational Decommissioning	Low – Medium	• Management though biodiversity action plan and offset; • managing through limiting the project footprint; • management through rehabilitation; and • control through permits for removal; • Employ protection, rescue and / or rehabilitation strategies; • Apply for necessary permits and obtain necessary authorisation to remove protected species	Low – Medium	Can be managed/mitigated to acceptable levels
	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure, facilities and services; Restoration of destructed biodiversity.	General disturbance of biodiversity; Displacement of fauna; The loss, damage and fragmentation of floral and faunal habitats; potential loss of ecosystem function.	Construction Operational Decommissioning	Low – Medium	• Management through alien invasive species programme; • management through training; • management through monitoring; • management through appropriate design; and • Employ proper protection, rescue and / or rehabilitation strategies.	Low – Medium	Can be managed/mitigated to acceptable levels

	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Contamination of surface water resources resulting in deterioration.	Construction Operational Decommissioning	Low – Medium	• Management through waste management practises; • management through monitoring; • Management through storm water control; • management through compensation; and • remedy through emergency response procedures	Low	Can be managed/mitigated to acceptable levels
Groundwater	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution / Contamination of groundwater resources; Lowering of groundwater levels and reducing availability if water table is reached.	Construction Operational Decommissioning	Medium – High	• Construction of measures to prevent seepage into the groundwater by biological and engineering means. Implementation of the necessary management programs to ensure the integrity of ground water resources. • management through treatment & monitoring; • management through compensation; • management through appropriate design; and • remedy through emergency response procedures	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Air quality and odour	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Air pollution and Global Warming (Climate Change); Sources of atmospheric emission associated with the proposed operations are likely to include fugitive dust from materials handling operations, lose soils, gases, wind erosion and vehicle entrainment of road dust.	Construction Operational Decommissioning	High	• Manage through air quality controls, monitoring and reporting; • Ensure facility is properly maintained; • Maintain cool temperature conditions in the greenhouse facilities; • Effective soil management; identification of the required control efficiencies in order to maintain dust generation within acceptable levels.	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Noise & Vibration	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Increase in continuous noise levels; the disruption of current ambient noise levels; and the disruption of sensitive receptors by means of increased noise and vibration, especially from neighbouring mining, industrial and civil aviation operations.	Construction Operational Decommissioning	Low – Medium	• Manage through vibration and noise controls and once-off sampling • Due to Global Warming-related uncertainties as to how the climate will affect the project, it is recommended that independent support structures for solar panels should be erected, especially for solar panels that are placed on the roof of the greenhouse tunnels; • Ensure effective communication with nearby mining operation stakeholders; request them to limit generation of excessive noise and vibration, if necessary; communicate blasting period that is scheduled; Ensure all vehicles and equipment is in a good working order; effective communication.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Visual Amenity	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Visual impact of the infrastructure; visibility of dust	Construction Operational Decommissioning	Low	• Manage through limiting project footprint, rehabilitation and visual controls; • Effective planning of the location of Infrastructure and operations to minimise visual impact; wet soils regularly; Ensure effective communication with Civil Aviation Authority.	Low	Can be managed/mitigated to acceptable levels
Heritage/cultural and palaeontological resources	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Loss of heritage/cultural and palaeontological resources; Deterioration of sites of cultural and Heritage importance.	Construction Operational Decommissioning	Medium – High (Heritage) Very low (Palaeontology)	• Control through avoidance; and • remedy through emergency response procedures • Follow Chance-Find Protocol, if applicable; • Preserve, protect and / or rescue Heritage and Cultural resources identified within a no go zone; further resources uncovered during operations need to be reported to SAHRA and to a suitably qualified Heritage Specialist.	Low Very low	Can be managed/mitigated to acceptable levels Can be managed through implementation of Chance-Find Protocol

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Socio-economic	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Loss of agricultural potential; influx of workers to the area increases health risks and loitering (resulting in lack of security and safety); negative impact of employment loss during closure of project.	Construction Operational	Low – Medium	• Control through the monitoring of living conditions of employees, recruitment processes, disease management; and • remedy through emergency response procedures	Low – Medium	Can be managed/mitigated to acceptable levels
	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Poverty Alleviation; Employment Opportunities; Revenue Collection by the State; Indirect benefits by relatives of beneficiaries;	Construction Operational Decommissioning	Medium – High	• Control through good communication, recruitment and procurement processes; • Ensure Compliance with legislation, including food production and applicable regulations.	Medium – High	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Health and Safety	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Health and Safety impact; Loss of income. COVID-19; Bee attacks	Construction Operational Decommissioning	Low – Medium	• Implement provisions of the Mine Health and Safety Act, and Occupational Health and Safety Act; • Adhere to COVID-19 Government Regulations; • Ensure continuous and transparent communication with I&Aps • All personnel must undergo induction & training to manage bees	Low	Can be managed/mitigated to acceptable levels
Land use	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Interference with land Uses; Change in current land uses	Construction Operational Decommissioning	Medium – High	• Ensure the area is zoned for agriculture as well; • Enter into amicable agreements with landowner; • Management through effective communication; • Implement effective rehabilitation strategies.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Use of Herbicides	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution of soil and water resources.	Operational Decommissioning	Low	• Control and monitor the use of Herbicides.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Use of Pesticides	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution of soil and water resources.	Operational Decommissioning	Low	• Control and monitor the use of Pesticides.	Low	Can be managed/mitigated to acceptable levels
Civil Aviation	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Impact on the operations of the nearby airport.	Construction Operational Decommissioning	Low – Medium	• Ensure effective communication with the relevant Government Department and airport stakeholders; • Obtain necessary authorisations, if necessary.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Roads	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure.	Destruction of natural state of biodiversity.	Construction Operational Decommissioning	Low – Medium	• Maintain good or acceptable condition of road surfaces; • Control dust generation.	Low – Medium	Can be managed/mitigated to acceptable levels
Traffic	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Road disturbance and traffic safety; Potential negative impacts on traffic safety; And deterioration of the existing road networks	Construction Operational Decommissioning	Low – Medium	• Manage through road maintenance; • Apply for speed reduction signage to be displayed on R380 when approaching main entrance of Farm Marsh 467, if possible; • Adherence to speed limit; and • remedy through emergency response procedures • Implement measures to ensure adherence to traffic rules.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Waste	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Pollution	Construction Operational Decommissioning	Medium – High	• Manage through the principle of waste separation at source; • Implement the waste National Waste Management Strategy and Waste Hierarchy; • Ensure effective Waste Management Plan and environmentally friendly use of chemicals, pesticides and herbicides on-site.	Low – Medium	Can be managed/mitigated to acceptable levels
Alien invasive plants	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Proliferation of alien invasive plant species.	Construction Operational Decommissioning	Low – Medium	• Compile weed/alien plant management programme in consultation with NCDAEARDLR; • Implement the compiled weed/alien management programme effectively; • Eradicate, and control the spread, of alien invasive species.	Low – Medium	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Disturbance of wildlife due to increased human presence and possible use of machinery and/or	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Potential negative impacts on wildlife	Construction Operational Decommissioning	Low – Medium	• Enter into amicable agreements that will promote wellbeing and protection of wildlife; • Ensure proper fence is erected to limit access; • Should there be necessity to relocate wild animals, that exercise should be undertaken in sustainable, environmentally friendly and safe manner.	Low - Medium	Can be managed/mitigated to acceptable levels
Impacts on Mining Activities	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Potential negative impacts on mining activities	Construction Operational Decommissioning	Low	• Enter into amicable agreements that will promote wellbeing and protection of on-going mining activities.	Low	Can be managed/mitigated to acceptable levels

Aspect	Activity	Potential Impact	Phase/s	Significance (Pre-mitigation)	Management actions type	Significance (Post-mitigation)	Impact management objectives
Wetlands and / or pans	Sterilisation of Mineral Resources; Soil Preparation; Vegetation Clearance; Placing Infrastructure; Water use and management; Waste Management; Support services; Transport system Use of Chemicals in many forms; Use of equipment, infrastructure and facilities and services; Restoration of destructed biodiversity; Closure , post-closure alternative land uses	Disturbance of wetland and / or pan and riparian zone	Construction Operational Decommissioning	Low – Medium	• Design and implement a storm water management plan;	Low	Can be managed/mitigated to acceptable levels

26 Financial Provision

26.1 Determination of The Amount of The Financial Provision

The determination of amount of financial provision may not be performed accurately at this stage as the decommissioning and closure of the planned project is not foreseeable in the nearest future. It is hereby proposed that all and any part of this piece of work relating to decommissioning, closure and post-closure phases be revised in consultation with the Competent Authority when the said phases become foreseeable.

26.1.1 Description of The Closure Objectives and The Alignment With The Baseline Environment

The preliminary closure plan objectives and principles have been developed against the background of the location of planned operations in the John Taolo Gaetsewe District, Northern Cape Province, and included the following:

- that environmental damage is minimised to the extent that it is acceptable to all parties involved;
- that at closure, the land will be rehabilitated to achieve an end use of wilderness and habitat, in the case of Farm Marsh, it may include mining activities in future;
- that all surface infrastructure will be removed from site after closure;
- that contamination beyond the site (Farm Marsh 467) by wind, surface run-off or groundwater movement will be prevented;
- that closure agricultural operations is achieved efficiently, cost effectively and in compliance with the law; and,
- that the social and economic impacts resulting from closure of operations are managed in such a way that negative socio-economic impacts are minimised.

The closure target outcomes for the site are therefore assumed to be as follows:

- to achieve chemical, physical and biological stability for an indefinite, extended time period over all disturbed landscapes and residual agricultural infrastructure;
- to protect surrounding surface water, groundwater, soils and other natural resources from loss of current utility value or environmental functioning;

- to limit the rate of emissions to the atmosphere of particulate matter and gases to the extent that degradation of the surrounding areas' land capability or environmental functioning does not occur;
- to maximise visual 'harmony' with the surrounding landscape; and to create a final land use that has economic, environmental and social benefits for future generations that outweigh the long term aftercare costs associated with the agricultural project.

26.1.2 Confirmation That The Closure Objectives Have Been Consulted With Landowners and I&APs

The consultation process with interested and affected parties (neighbours) will be completed. Regular contact sessions will be held with neighbouring farmers and land owners which are currently affected by the agricultural operations. Records will be kept of the complaints and the mitigation measures will be implemented. An advert in the Kathu Gazette Newspaper will also be placed in order for other interested parties to come forward and register as interested parties in the project.

26.1.3 Rehabilitation Plan

Infrastructure Areas

When the planned agricultural operations cease, the various surfaces, including the access road, the office and cooling facility area, canals, storage areas, parking bay, disturbed environment and the pump station site should finally be rehabilitated as follows:

- All remaining material on the surface should be removed to the original topsoil level. Any compacted area should be ripped to a depth of 300 mm, where possible, the topsoil or growth medium returned and landscaped;
- All infrastructures, equipment, the office and cooling facility area, canals, storage areas, parking bay, pump station and other items used during the operational period should be removed from site; and
- On completion of operations, all buildings, structures or objects on the office site should be dealt with in accordance with the laws of the land.

Topsoil and Stockpile Deposits

It is not foreseen that any monitoring of ground or surface water should take place after closure of agricultural activities, except if so requested by the DHWS – Northern Cape.

It should be the objective of operations' management to ensure the long-term minimized dust generation from disturbed land takes place. This should be done by the monitoring of all areas until a closure certificate has been issued.

Final rehabilitation in respect of erosion and dust control: Self-sustaining vegetation will result in the control of erosion and dust and no further rehabilitation is deemed necessary, unless vegetation growth is not returned to a desirable state by the time of closure of operations.

Final Rehabilitation Roads

After rehabilitation has been completed, all constructed roads should be ripped or ploughed, fertilized and seeded, providing the landowner does not want them to remain that way and with written approval from the Director: Mineral Development of the Department of Mineral Resources and Energy and / or Director: Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform.

Submission of Information

Reports on environmental maintenance, rehabilitation and monitoring should be submitted annually to the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform and / or Department of Mineral Resources and Energy – Northern Cape, as described in Regulation 55 of the MPRDA.

Maintenance (Aftercare)

Maintenance during operations and after closure should include the regular inspection and monitoring and/or completion of the re-vegetation programme. The aim of the Environmental Management Programme is for environmental management and rehabilitation to be stable and self-sufficient, to enable the least possible aftercare to be required.

The aim with the closure of the agricultural activities should be to create and acceptable post-closure environment and land-use. Therefore all agreed commitments should be implemented by Management of the proposed project.

After-effects Following Closure

Long-Term-Impact on Ground Water: If the environmental is managed satisfactorily during operations, no after effect on the groundwater level and / or quality is expected.

Long-Term Stability of Rehabilitated Land: The stripped topsoil will have to be stabilized after closure. This stability should be obtained or maintained in such that sustainability is achieved. If a need arises for topsoil to be replaced, the replacing may be undertaken.

The steps to be followed in final rehabilitation are presented in Table 25 as preliminary step that may be reviewed.

Table 25: Final Rehabilitation

Step	Final Rehabilitation	Target	Responsible Person	Timeframe
1	**Pre-closure activities**			
1,1	The closure plan presented herein should be reviewed throughout the life of operation.	In order ensure compliance and / or meet provisions of Land surface use agreement.	ECO/ESHRQ Department/Rehabilitation Specialist	Annually
1,2	Consult with the Competent Authority before commencement of final rehabilitation.	In order ensure compliance and / or meet provisions of Land surface use agreement.	ECO/ESHRQ Department/Rehabilitation Specialist	Before final rehabilitation commences
1,3	Apply for necessary permits and licenses before disturbing protected plant and animal species.	In rescue protected species and to ensure compliance.	ECO/ESHRQ Department/Rehabilitation Specialist	Before disturbance of Protected Species
1,4	Utilise available resources, environmentally friendly waste and material during rehabilitation.	In order to ensure implementation of RRR's in waste management.	Project Manager/ECO	On-going
1,5	Separated and classified waste, if applicable, must be disposed of in accordance with applicable piece of legislation and regulations.	In order to ensure implementation of RRR's in waste management.	Project Manager/ECO/ ESHRQ Department	On-going
1,6	Call in a suitably qualified Archaeologist or Palaeontologist to attend and Notify SAHRA if any heritage and palaeontological resources are encountered during rehabilitation.	In order to preserve and rescue resources of heritage, cultural and palaeontological significance.	Project Manager/ECO/ ESHRQ Department	On-going
2	**Surface infrastructure**			
2,1	Create a database and collect data through taking of clear photographs of activity and of associated and / or related infrastructure (before, during and after rehabilitation).	In order to ensure compliance end adherence to land surface use agreement provisions	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	Before commencement of operations and on an on-going basis.
2,2	Remove mobile infrastructure from site.	In order to restore the state of land.	Contractor	After agricultural activities have been completed
2,3	Demolish, dismantle and /or remove all other infrastructure from site, if applicable.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	After agricultural activities have been completed
2,4	Rehabilitate disturbed areas.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going
2,5	Caution must be exercised in removing infrastructure for purposes of enabling re-usability and resale.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going
2,6	Storage tanks and associated infrastructure will be rehabilitated after all water grey has been used during rehabilitation.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	After agricultural activities have been completed

Step	Final Rehabilitation	Target	Responsible Person	Timeframe
3	**Soil and Land**			
3,1	Landscaping should be conducted, especially if mining activities are not going to ensue.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going
3,2	Soil erosion should be taken into account when landscaping is conducted.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going
3,3	Restore topography to acceptable levels.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going
3,4	If topsoil was removed during any phase, the topsoil may be replaced, compacted and prepared for re-vegetation.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going
3,5	Disturbed areas that were covered by concrete previously must be prepared for re-vegetation.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going
4	**Re-vegetation (before and during)**			
4,1	Measure should be put in place to ensure that topsoil is suitable for re-vegetation purposes.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	Before re-vegetation commences
4,2	Control access into the rehabilitated areas.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going
4,3	The rehabilitated areas must be protected and monitored for three (3) years post-closure, if necessary.	In order to restore the state of land.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	Post decommissioning and closure
5	**Maintenance and monitoring**			
5,1	Keep the Competent Authority updated of progress and of any developments.	In order to ensure compliance.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going
5,2	Maintenance of environment and rehabilitated areas should be performed on an on-going basis.	In order to ensure compliance.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going
5,3	Monitoring of rehabilitated areas must be performed for three (3) years post-closure, if necessary.	In order to ensure compliance.	Project Manager/ECO/ ESHRQ Department/Rehabilitation Specialist	On-going

26.1.4 Compatibility of The Rehabilitation Plan With The Closure Objectives

The ultimate rehabilitation of the agricultural site that involves the levelling, replacement of topsoil and the seeding of an grass seed mix in areas that do not recover acceptably as agreed to by the land owner will ensure that the site could be regarded as safe for vegetation growth, humans, re-establishment of habitat if possible and animals. Furthermore, ensure that the site is stable from an erosion point of view and also ensuring that the site could be used for grazing or any activities that were undertaken prior authorised operation took place again.

The removal of waste material of any description from the area operations and the, recycling, re-use or disposal thereof at an authorised Landfill facility is going to be facilitated:

- The removal of infrastructure, equipment, stations and other items from the site;
- The ripping of compacted areas to a level of 300 mm and the levelling of such areas in order to re-establish a growth medium for plants (such areas will furthermore be seeded with a vegetation seed mix adapted to reflect the local indigenous flora that was present prior to the operation were undertaken, if the re-establishment of vegetation is unacceptably slow.

26.1.5 Calculate and State The Quantum of The Financial Provision

The financial provisions presented herein are preliminary in nature.

26.1.6 Confirmation That The Financial Provision Will Be Provided

It is hereby confirmed that financial provisions will be insured with a reputable insurance company.

27 Mechanisms For Monitoring Compliance and Performance Against The EMPr

Monitoring of activities during operations will be conducted as presented in Table 26.

Table 26: Monitoring Compliance

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
All Agricultural Activities	Biodiversity; Heritage and Cultural Resources Groundwater Quality and Quantity	Ensure that the EMPr is being implemented in line with the approved scoping report Pollutants Quality Meteorological data	ESHRQ Department	Weekly Daily Monthly
	Water for consumption - treatment	Ensure output of water treatment facility is suitable for consumption.	ESHRQ Department	Monthly
Vegetation Clearance and Topsoil Removal	Cultural Heritage Resources	Monitor groundwater quality and level; Monitor protection of areas of heritage and cultural significance, including Biodiversity, especially protected species.	Appointed contractor	Weekly inspection and reporting
Soil preparation and use of facilities and activities	Noise Dust fall Visual amenity Soil & Vegetation Soil, Surface Water Groundwater Socio-economic Housekeeping & Maintenance Waste management Rehabilitation	Weekly inspections will cover the following: - Implementation of effective waste management - Establish and implement a stakeholder compliant register on site and ensure that all complaints are responded to promptly. - Ensure that an oil spill kit is readily available. - Ensure that all chemicals and hydrocarbons are stored within bundwalls - Ensure that the fire brake is maintained. - Rehabilitation of drill pads, trenches and pits; - Records of water intersections on borehole	ESHRQ Department	Weekly inspection and reporting

		logs - Control and minimise the development of new access tracks - Appropriate storage and handling of topsoil. Ensure that monitoring is implemented to cover all agricultural activity areas. Sites should be located up and downstream of the agricultural site. Analytical suites for water quality analysis recommended Site walkabouts to determine the condition of facilities and identify any leaks or overflows, blockages, overflows and system malfunctions for immediate remedial action		
Post-closure activities	Groundwater Re-vegetation Soil erosion Alien invasive species	Monitor on-site and external boreholes	ESHQR Department	Monitoring report

Monitoring Programme for Palaeontology – to commence once the excavations / drilling activities begin.

a) The following procedure is only required if fossils are seen on the surface and when drilling/excavations commence.
b) When excavations begin the rocks and must be given a cursory inspection by the environmental officer or designated person. Any fossiliferous material (plants, insects, bone) should be put aside in a suitably protected place. This way the project activities will not be interrupted.
c) Photographs of similar fossil plants must be provided to the developer to assist in recognizing the fossil plants in the shales and mudstones. This information will be built into the EMP's training and awareness plan and procedures.
d) Photographs of the putative fossils can be sent to the palaeontologist for a preliminary assessment.
e) If there is any possible fossil material found by the developer/environmental officer/miners then the qualified palaeontologist sub-contracted for this project, should visit the site to inspect the selected material and check the dumps where feasible.
f) Fossil plants or vertebrates that are considered to be of good quality or scientific interest by the palaeontologist must be removed, catalogued and housed in a suitable institution where they can be made available for further study. Before the fossils are removed from the site a SAHRA permit must be obtained. Annual reports must be submitted to SAHRA as required by the relevant permits.
g) If no good fossil material is recovered then no site inspections by the palaeontologist will be necessary. A final report by the palaeontologist must be sent to SAHRA once the project has been completed and only if there are fossils.
h) If no fossils are found and the excavations have finished then no further monitoring is required.

27.1 Frequency of Performance Assessment Report

An environmental audit should be conducted annually and submitted to the NCDAEARDLR annually. The environmental manager will conduct internal management audits against the commitments in the EMPr in accordance with an annual audit plan. In the operational phase, these audits will be conducted on a quarterly basis. The audit findings will be documented for both record-keeping purposes and for informing continual improvement.

28 Environmental Awareness Plan

28.1 Manner in which applicant intends to inform employees of The Environmental Risks which may result from their work.

Environmental and socio-economic conditions will be included in any operational contracts, thereby making contractors and beneficiaries aware of the potential socio-economic and environmental risks and impacts associated with the project and the necessity to prevent risks and impacts by implementing the proposed mitigation measures. The following principles will apply to the Environmental Awareness Plan (Safety, Health and Environment):

- Develop an induction training manual and matrix for all personnel that are going to enter the site;
- Develop a general environmental awareness training;
- Ensure all persons understand the importance of not ill-treating animals;
- All personnel will as a minimum undergo general SHE induction and awareness training; and
- The Environmental Control Officer(s) or the responsible personnel from the ESHRQ Department will identify the Safely, Health and Environment (SHE) training requirements for all personnel and contractors. The training requirements will be recorded in a training need matrix indicating particular training that must be undertaken by identified personnel and contractors. The training matrix will be administrated by the ESHRQ Department;

Development of a training programme:

- General Awareness training: It should include a general environmental awareness training module that will need to be integrated into the induction programme. The training manual shall include a review of the Environmental Policy, a review of

significant environmental aspects, a description of the EMP and the importance of compliance to its requirements, general responsibilities of personnel with regard to the EMP and a review of the emergency and corrective action procedures.

Specific environmental training:

- Specific environmental training will be in line with the requirements identified in the training matrix; and
- Personnel will be made aware of the requirements of appropriate procedures/ work instructions. The Project Manager / SHE Representative will communicate training requirements to responsible ESHRQ Department personnel in order to ensure that personnel and contractors are trained accordingly.

Training evaluation and re-training:

- Effectiveness of the environmental training will reflect on the audit of non-conformance to EMPr requirements, the results of internal audits and the general performance achieved;
- Incidents and non-conformances raised against the EMPr will be assessed by the ESHRQ Department personnel and SHE Representative (s) to determine the cause. This will be undertaken in order to determine whether or not training or refresher training is necessary.

The Environmental topics to be covered in awareness training should include the following:

- The importance of saving water;
- Ensure water is conserved;
- South Africa is a water scarce country and groundwater resources must be monitored and protected against contamination;
- Ensure personnel understand the importance of effective implementation of Emergency Response Procedure, especially when it pertains to hydrocarbon and veterinary medicine spillages;
- Ensure personnel do not throw litter into water drains;
- Ensure personnel understand the impact of air pollution and emission of Greenhouse Gases on Climate Change;
- The use of fossil fuels is increasing the amount of greenhouse gases that are discharged to the atmosphere. Share transport or use public transport;

- Ensure separation of waste at source;
- Participation in sending zero waste to landfill site;
- Don’t burn any rubble, the smoke pollutes the air;
- Plant trees, they clean the air, provide us with oxygen;
- remove the greenhouse gas carbon dioxide from the air;
- Soil conservation;
- Ensure acceptable use of chemicals, fertilizers, herbicides and pesticides;
- Prevent overgrazing of farmlands, keep vegetation on the surface of the land to prevent soil erosion; and
- Plant trees.

HAZARDOUS SUBSTANCE USE AND STORAGE

- Solvent, petrol, diesel, insecticides, chlorine, detergents, pesticides and chemicals are harmful to the environment and to a person’s health. Use them sparingly and do not let them get into the water systems. Containers must be disposed of to a licensed hazardous waste disposal facility;
- Hazardous substances must be stored and used correctly;
- Ensure that 16-point Material Substances Safety Data Sheets (MSDS) are available at points of storage and usage;
- Compatibility charts must be used when storing materials;
- Compressed gas storage requirements;
- Ensure proper labeling of hazardous substances;
- Ensure storage is undertaken as per compatibility chart; and
- Flammable substances store requirements.

INCIDENT AND EMERGENCY REPORTING

- The applicant must have an emergency/incident reporting system whereby environmental incidents can be reported and actioned to mitigate and follow up on.

OIL / DIESEL / PETROL SPILL CLEAN UP

- All employees who work with machines and vehicles must be instructed on how to prevent and clean up an oil, veterinary medicine or diesel spill appropriately. Spill kits must be available on site, drip trays must be used when servicing vehicles.

CONSERVATION OF WATER

- Campaign to save water on site;
- Clean water is expensive and potable water must be used carefully; and
- Prevent pollution of water by preventing spills and dispose of wastes properly.

CONSERVATION OF VEGETATION

- Plants, grasses and trees are very important to our existence on the earth, they provide food, fuel, shelter, raw materials and they clean the air. Indigenous plants are especially important for *muti* and the whole ecology of life. Human activities are destroying the natural forests of the earth. The natural forests are the "lungs" of the planet and unfortunately they are being cleared faster than they can be regenerated;
- EIA's are to be done before virgin bush can be cleared;
- Obtain the necessary permits and authorisations before removing any protected species;
- Vegetation cover reduces water and topsoil loss from the ground, do not clear vegetation unnecessarily;
- Indigenous trees provide shade, attract wild birds;
- Do not chop down indigenous trees without good reason and necessary authorisation;
- Devise and Implement a tree planting programme; and
- Control and / or eradicate alien and invasive plant trees on site.

WASTE MANAGEMENT

- Employees must be trained on how to manage effectively all waste streams on site;
- Examples of hazardous waste which must be recycled or sent to companies such as AVERDA, Enviroserv, InterWaste, Waste Tech, Waste Group, or any other authorised entity for disposal include the following:
    - Oil, diesel, batteries, acids, paint, thinners, electronic waste;
    - Pesticides, Jik and Handy Andy;
    - Old oil, old oil filters, old paint is hazardous and must not be disposed of to a general land fill. Oilkol of the Rose Foundation, Drizzit, GK, SpillTech or any other authorised entity will collect old oil;
    - Mercury in fluorescent light bulbs is hazardous, fluorescent lights must be handled with great care so as not to break the glass and release the mercury vapour into the air to breathe;

- Examples of general wastes which can go to the landfill site onsite, if necessary;
- old PPE;
- Waste To Recycle, Reuse, Reduce, and Recover wherever possible:
    - Recycle paper, glass, plastic, cardboard, etc.
    - Use chipped wood to manufacture compost.

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

Sishen Iron Ore Company (Pty) Ltd will develop and implement an Environmental Management System (EMS) that complies with the requirements of ISO14001:2004 Environmental Management Systems that is certified by the South African Bureau of Standards. Surveillance audits are conducted annually and recertification audits every third year. The proposed development's EMS addresses the following elements of the ISO14001 standard and these, in conjunction with the environmental commitments, ensure that potential environmental impacts arising from the agricultural development project activities are managed appropriately:

- An environmental policy that includes commitments to prevent pollution, comply with applicable legal requirements and provides a framework for setting environmental objectives and targets;
- A register of environmental aspects and impacts with a view to implementing operational control measures to limit environmental impacts;
- A register of all applicable legal requirements to ensure legal compliance;
- A register of environmental objectives and targets that is consistent with the environmental policy and takes into account significant environmental impact and the management thereof, together with a program for achieving the identified objectives and targets;
- Resources to ensure implementation of the EMS;
- An environmental training and awareness program to ensure that persons performing tasks that could cause significant socio-economic and environmental impacts are aware of such impacts and are competent to perform such tasks;
- A communication procedure for internal and external communication in respect of significant socio-economic and environmental aspects;
- All Environmental Management System Documentation, as required by the ISO14001 standard, which includes control procedures for documents and records;

- Operational control procedures for activities that could cause significant environmental impact to ensure that correct procedures are implemented to minimise potential socio-economic and environmental impacts;
- An emergency preparedness and response procedure that identifies potential emergency situations and potential accidents that can impact on the environment to ensure that such situations are dealt with in an appropriate manner;
- An environmental monitoring and measurement program to monitor and measure the key characteristics of the operation that can cause significant environmental impact and to gauge the success of implemented mitigation measures;
- A procedure for periodically evaluating compliance with applicable legal requirements;
- A procedure for dealing with non-conformities in terms of their identification, corrective action and preventative action;
- Audit programs and procedures that makes provision for internal and external audits focusing on implementation of the requirements of the EMS and legal requirements;
- Management reviews undertaken at planned intervals to ensure the system's continuing suitability, adequacy and effectiveness; and,
- Within the context of the principles listed above, the long term sustainability objectives of the agricultural development project are:

    - To avoid impacts by effective planning in order to prevent and limit possible impacts;
    - To minimize impacts by implementing decisions or activities that are designed to reduce the undesirable impact on the bio-physical and socio-economic aspects detailed in the previous sections; and
    - Rectifying impacts by rehabilitating or restoring, where applicable, the affected environment. This will include attempts at habitat re-creation, and restoring the land to the natural pre- agricultural development project's land uses or to a pre-determined and approved land use.

28.2.1 On-Going Monitoring and Management Actions

In order to monitor the performance and effective functioning of an approved EMPr, it is important to undertake the monitoring and review on an on-going basis. The proponent may

also conduct gap analysis. Subsequently, the proponent may devise proposed corrective measures. Alternatively, an internal audit process may ensue. This may be followed by an external audit.

28.2.2 Procedures In Case of Environmental Emergencies

28.2.2.1 General Emergency Procedure

29 Specific Information Required By The Competent Authority

No specific information is envisaged to be required by the Competent Authority at this stage.

30 Undertaking

31 References

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APPENDIX 1
CURRICULUM VITAE OF EAP

APPENDIX 2
ENLARGED MAPS

APPENDIX 3
PUBLIC PARTITIPATION RECORDS

APPENDIX 4
ENVIRONMENTAL IMPACT ASSESSMENT CRITERIA

APPENDIX 5
SPECIALIST REPORTS