APPENDIX F

Draft Basic Environmental Impact Assessment Report

in terms of the

Environmental Impact Assessment Regulations, 2014

for the

Carpe Diem Raisins Wastewater Evaporation Ponds & Associated Infrastructure

Dawid Kruiper Local Municipality

Northern Cape Province

Carpe Diem

GRAPES & RAISINS

VAN ZYL

ENVIRONMENTAL CONSULTANTS

2009/073037/23

EAP Report Number:	**2019/19**
Environmental Report Date:	**January 2023**
Revision No.:	**00**

TABLE OF CONTENTS

Table of Figures

Index of Tables

GLOSSARY OF TERMS

Aeration	infusion with air
Aerobic	the breakdown of organic matter in the presence of free oxygen
Algae	simple living aquatic organisms that capture light energy through photosynthesis, using it to convert inorganic substances into organic matter
Alien species	Plants and animals which do not arrive naturally in an area - they are brought in by humans. Alien plants often force indigenous species out of the area. Mesquite is a good example of an alien species in the Northern Cape.
Alternative	A possible course of action, in place of another, that would meet the same purpose and need defined by the development proposal. Alternatives considered in the EIA process can include location and/or routing alternatives, layout alternatives, process and/or design alternatives, scheduling alternatives or input alternatives.
Alternatives	different options with regard to site or location, type of activity, design or layout, technology, and operational aspects of the activity that could be considered in order to meet the general purpose and requirements of the activity
Anaerobic	the breakdown of organic matter in the absence of oxygen that typically produces methane, carbon dioxide and hydrogen sulphide
Aspect	Element of an organisation's activities, products or services that can interact with the environment.
Auditing	A systematic, documented, periodic and objective evaluation of how well the Environmental Management Program is performing. Auditing aims to help safeguard the environment by facilitating management control, including compliance with regulatory requirements. Results of the audit help the organisation to improve its environmental policies and management systems.
Aquifer	a geological formation of porous rock, such as sandstone, that has the ability to store water and may yield water to wells and springs
Bacteria	living micro-organisms of very small size which are largely responsible for the decomposition of wastewater sludge
Biochemical	the chemical processes and transformations in living organisms
Biodiversity	The rich variety of plants and animals that live in their own environment. The Succulent Karoo is a good example of rich biodiversity in the Northern Cape.
Bioreactor/Biological Reactor	a tank in which organic waste and effluent are reduced by means of bacteriological action, under controlled conditions
Built environment	Physical surroundings created by human activity, e.g. buildings, houses, roads, bridges and harbours.
Catchment	The area from which any rainfall will drain into the watercourse or watercourses or part of the watercourse, through surface flow to a common point or common points.
Conservation	Protecting, saving and using resources wisely, especially the biodiversity found in an area.
Contamination	Polluting something or making it impure.
Corrective (or remedial) action	Response required to address an environmental problem that is in conflict with the requirements of the EMP. The need for corrective action may be determined through monitoring, audits or management review.
Cumulative Impact	an impact that is not necessarily significant in itself, but which may become significant when considered in addition to the existing and potential impacts of other similar or diverse activities in the area
Degradation	The lowering of the quality of the environment through human activities, e.g. river degradation and soil degradation.
Denitrification	the process of reducing nitrate and nitrite into gaseous nitrogen
Direct Impact	A generally obvious and quantifiable impact, usually associated with the construction, operation or maintenance of an activity, which is caused directly by the activity and generally occurs at the time and place of the activity.

'Do-Nothing' Alternative	The option of not undertaking the proposed activity or any of its alternatives, which provides the baseline against which the impacts of other alternatives should be compared.
Ecology	The scientific study of the relationship between living things (animals, plants and humans) and their environment.
Ecosystem	The relationship and interaction between plants, animals and the non-living environment.
Endangered Species	Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating, including taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.
Endemic	Having a distribution restricted to a particular area or region.
Environment	Our surroundings, including living and non-living elements, e.g. land, soil, plants, animals, air, water and humans. The environment also refers to our social and economic surroundings, and our effect on our surroundings. all external conditions and factors, living and non-living (chemicals and energy), that affect an organism or other specified system during its lifetime (Miller, 2005: G6)
Environmental Impact	An environmental change caused by a human activity.
Environmental Impact Assessment (EIA)	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 a proposed development. The EIA includes an evaluation of alternatives, recommendations for appropriate management actions for minimising or avoiding negative impacts and for enhancing positive impacts, and proposed monitoring measures. a study of the environmental consequences of a proposed course of action, usually conducted in order to provide information for the consideration of an application for environmental authorisation as defined in NEMA
Environmental Management	Addressing environmental concerns in all stages of development, in order to ensure that the development is sustainable and does not exceed the carrying capacity of the environment.
Environmental Management System (EMS)	Environmental Management Systems (EMS) provide guidance on how to manage the environmental impacts of activities, products and services. They detail the organisational structure, responsibilities, practices, procedures, processes and resources for environmental management. The ISO14001 EMS standard has been developed by the International Standards Organisation.
Environmental Management Program	An operational program that organises and coordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.
Environmental policy	Statement of intent and principles in relation to overall environmental performance, providing a framework for the setting of objectives and targets.
Eutrophication	over-enrichment of a water body with nutrients resulting in excessive growth of organisms and depletion of oxygen concentration
Evaporation	the process whereby atoms or molecules in a liquid state gain sufficient energy to enter the gaseous state; evaporation is exclusively a surface phenomenon and should not be confused with boiling
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.
Facultative	capable of functioning under varying environmental conditions; used by certain organisms, such as bacteria that can live with or without oxygen
Force Majeure	An Event of Force Majeure means any circumstance which is beyond the control of the aggrieved party and is not reasonably foreseeable by the same, such as but not limited to: acts of God, orders of the authority, change of laws, etc. 1. An Event of Force Majeure can be: (a) drought, hail, heavy or torrential rain meaning precipitation of more than 40 mm per hour, floods, tornados, fires, landslides or other adverse natural phenomena except lightning strikes, which prevent the Contractor to perform the Works, get access to the Site or otherwise perform any of its obligations under this Agreement (b) epidemics, quarantine restrictions, war or civil conflicts, (c) national, territorial or sector strikes (other than strikes limited to the Contractor's or its subcontractors'

business)
(d) sabotage, terrorism, acts of vandalism, embargoes
(e) explosions, archaeological finds
(f) changes in applicable legislation, the revocation or suspension of any authorisation, permit or license or any other decision or act of any authority which cannot be ascribed to the party affected by the force majeure event
(g) climate conditions that exceed those for which the plant was designed and that are detailed in the respective technical specifications of the plant
(h) climate or meteorological conditions that, according to health and safety laws and regulations, make the access to the site and/or the execution of the works unsafe or, otherwise, unviable.

2. For the sake of clarity, lightning strikes do not constitute an Event of Force Majeure.

Habitat	The physical environment that is home to plants and animals in an area, where they live, feed and reproduce.
Hazardous waste	Waste, even in small amounts, that can cause damage to plants, animals, their habitat and the well-being of human beings, e.g. waste from factories, detergents, pesticides, hydrocarbons, etc.
Homogeneous	of the same nature
Hydrogeological	The study of distribution and movement of groundwater.
Hydrological	The study of movement, distribution, and quality of surface water and groundwater.
Hydrology	The science encompassing the behaviour of atmospheric, surface and ground water.
Impact	A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.
Indigenous	Having occurred naturally in the area in question before the year 1800.
Indigenous species	Plants and animals that are naturally found in an area.
Indirect Impact	An impact that occurs at a different time or place to the activity that causes it.
Infrastructure	The network of facilities and services that are needed for economic activities, e.g. roads, electricity, water, sewerage.
Integrated	Mixing or combining all useful information and factors into a joint or unified whole. See Integrated Environmental Management.
Integrated Environmental Management (IEM)	A way of managing the environment by including environmental factors in all stages of development. This includes thinking about physical, social, cultural and economic factors and consulting with all the people affected by the proposed developments.
Interested and Affected Party (I&AP)	a person, group or organisation interested in or affected by a proposed activity, and any organ of state that may have jurisdiction over any aspect of the activity.
Irrigation	to water lands by means of canals, furrows or pipes
Land use	The use of land for human activities, e.g. residential, commercial, industrial use.
Laydown area	An area that has been cleared for the temporary storage of equipment and supplies. Laydown areas are usually covered with rock and/or gravel to ensure accessibility and safe manoeuvrability for transport and off-loading of vehicles.
Maturation pond	a manmade pond through which final effluent from a works passes in order to improve the effluent quality through exposure to ultraviolet light and natural bacteriological degradation before being released to the receiving water body
Mitigation	Measures designed to avoid, reduce or remedy adverse impacts.
Monitoring program	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.
Natural environment	Our physical surroundings, including plants and animals, when they are unspoiled by human activities.
Organic	material of animal or vegetable origin which can be consumed by bacteria
Over-utilisation	Over-using resources - this affects their future use as well as the environment.

Oxidation	the chemical reaction taking place when elements combine with oxygen to form oxides; not all oxidation reactions produce oxides
Parameter	a set of measurable factors such as temperature, pressure and pH that define a system and determine its behaviour.
Photosynthesis	the process in green plants and certain other organisms by which carbohydrates are synthesized from carbon dioxide and water using light as an energy source; most forms of photosynthesis release oxygen as a by-product
Photovoltaic Cell	A cell that converts solar energy into electrical energy.
Photovoltaic Effect	the effect attained when the electrons within a photovoltaic cell are excited by solar radiation.
Photovoltaic Module	a packaged unit consisting of interconnected photovoltaic cells or development.
Policy	A set of aims, guidelines and procedures to assist in the decision-making and management of an organisation or structure. Policies are based on people's values and goals.
Pollution	means the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it - less fit for any beneficial purpose for which it may reasonably be expected to be used; or harmful or potentially harmful - to the welfare, health or safety of human beings; to any aquatic or non-aquatic organisms; to the resource quality; or to property;
Process	Development usually happens through a process – a number of planned steps or stages.
Proponent	Developer or entity applying for environmental approval and ultimately accountable for compliance with conditions stipulated in the Environmental Authorisation (EA) and requirements of the EMP.
Protection	in relation to a water resource, means - maintenance of the quality of the water resource to the extent that the water resource may be used in an ecologically sustainable way; prevention of the degradation of the water resource; and the rehabilitation of the water resource;
Public Participation Process	a process of involving the public in order to identify needs, address concerns, choose options, plan and monitor in terms of a proposed project, programme a process of involving the public in order to identify needs and issues, obtain feedback on options and impacts associated with a proposed project, address concerns, choose options, plan and monitor in terms of a proposed project, program or development.
Recycling	Collecting, cleaning and reusing materials.
Red Data Species	a species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or the South African Red Data List
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 - • relying upon; • taking water from; or • 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.
Resources	Parts of our natural environment that we use and protect, e.g. land, forests, water, wildlife, and minerals.
Scoping	a procedure for determining the extent of and approach to an EIA, used to focus the EIA to ensure that only the significant issues and reasonable alternatives are examined

Scoping Report	A report presenting the findings of the scoping phase of the EIA. This report is primarily aimed at reaching closure on the issues and alternatives to be addressed in the EIA (in the case of a full EIA process).
Significant Impact	an impact that by its magnitude, duration, intensity or probability of occurrence may have a notable effect on one or more aspects of the environment
Siltation	is the movement of silt - tiny particles of clay and sand - into streams during erosion.
Sky glow	Illumination of the night sky when light reflects off particles in the atmosphere such as moisture, dust, or smog.
Sludge	the general term applied to the accumulated solids separated from wastewater; a large portion of the sludge material in a digester consists of bacteria, which are responsible for decomposition of the sludge
Stakeholders	A subgroup of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term includes the proponent, authorities and all interested and affected parties.
Storm water management	Strategies implemented to control the surface flow of storm water in such a way as to mitigate erosion, sedimentation and pollution of surface and groundwater resources in the immediate and surrounding environments. This is specifically important during the construction and decommissioning phases of a project.
Sustainable development	Development that is planned to meet the needs of present and future generations, e.g. the need for basic environmental, social and economic services. Sustainable development includes using and maintaining resources responsibly.
Sustainability	Being able to meet the needs of present and future generations.
Topography	graphic representation of the surface features of a place or region on a map, indicating their relative positions and elevations
Tributaries	A stream or river which flows directly into a larger river or stream.
Waste Management	Classifying, recycling, treatment and disposal of waste generated during construction and decommissioning activities.
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.
Wetlands	An area of land with water mostly at or near the surface, resulting in a waterlogged habitat containing characteristic vegetation species and soil types e.g. vleis, swamps.
Zoning	The control of land use by only allowing a specific type of development in fixed areas or zones

ABBREVIATIONS

AIA	Archaeological Impact Assessment
BA	Basic Assessment
BATNEEC	Best Available Technologies Not Exceeding Excessive Cost
BEE	Black Economic Empowerment
BID	Background Information Document
BOD	Biological Oxygen Demand
BPG	Best Practice Guideline
CARA	Conservation of Agricultural Resources Act (Act 43 of 1983)
CBA	Critical Biodiversity Area
CDR	Carpe Diem Raisins (Pty) Ltd
CE	Consulting Engineer
CLO	Community Liaison Officer
CO_2	Carbon dioxide
COD	Chemical Oxygen Demand
CSP	Concentrating Solar Power
DAFF	Department of Agriculture, Fisheries and Forestry
DENC	Northern Cape Department of Environment and Nature Conservation
DEA	Department of Environmental Affairs
DM	District Municipality
DNI	Direct Normal Irradiation
DoE	Department of Energy
DR&PW	Northern Cape Provincial Department of Roads and Public Works,
DWA	Department of Water Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECA	Environmental Conservation Act (Act 73 of 1989)
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMC	Electromagnetic Conformance
EMF	Environmental Management Framework
EMP	Environmental Management Program
EMPr	Environmental Management Program
EO	Environmental Officer

ABBREVIATIONS

EPWP	Expanded Public Works Programme
ESA	Ecological Support Area
ESO	Environmental Site Officer
ESS	Environmental Scoping Study
F	Fluorides
FIT	Feed-in Tariff
GA	General Authorisation
GDP	Gross Domestic Product
GG	Government Gazette
GHG	Greenhouse Gas
GIS	Geographical Information Systems
GN	Government Notice
GPS	Global Positioning System
GWh	Gigawatt Hour
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IPP	Independent Power Producer
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
kV	Kilovolt
LED	Local Economic Development
LM	Local Municipality
MAP	Mean Annual Precipitation
MAR	Mean Annual Rainfall
Mbgl	Meter Below Ground Level
MW	Megawatt
NCNCA	Northern Cape Nature Conservation Act
NCPSBP	Northern Cape Provincial Spatial Biodiversity Plan 2016
NEMA	National Environmental Management Act (Act 107 of 1998)
NEM:BA	National Environmental Management: Biodiversity Act (Act 10 of 2004)
NEM:WA	National Environmental Management: Waste Act (Act 59 of 2008) as amended
NERSA	National Energy Regulator of South Africa
NFA	National Forests Act (Act 84 of 1998)
NO_3 as N	Nitrates
NWA	National Water Act (Act 36 of 1998)

ABBREVIATIONS

NWRS	National Water Resource Strategy
OD	Oxidation Dams
ONA	Other Natural Area
O&M	Operations and Maintenance
PES	Present Ecological State
PIA	Palaeontological Impact Assessment
POL	Petrochemicals, Oils and Lubricants
PPE	Personal Protective Equipment
PV	Photovoltaic
RE	Residential Engineer
REFIT	Renewable Energy Feed-In Tariff
RFQ	Request for Qualification
RFP	Request for Proposal
RoD	Record of Decision
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SMMEs	Small, Medium and Micro Enterprises
SWMP	Storm Water Management Plan
TDS	Total Dissolved Solids
ToR	Terms of Reference
UV	Ultraviolet
VAC	Visual Absorption Capacity
WMA	Water Management Area
WSA	Water Services Authority
WUL	Water Use Licence
WULA	Water Use License Application
WWEP	Wastewater Evaporation Ponds

TERMS OF REFERENCE

Carpe Diem Raisins (Pty) Ltd (also the applicant or CDR) has appointed Van Zyl Environmental Consultants as the independent environmental assessment practitioner (EAP) to conduct the Basic EIA Process, Environmental Management Program (EMP) and public participation process related to the application process.

STATEMENT OF INDEPENDENCE

Neither Van Zyl Environmental Consultants nor any of its specialist sub-consultants on this project are subsidiaries of or are affiliated to the applicant and does not have any material present or contingent interest in the outcome of this application, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of Van Zyl Environmental Consultants.

Van Zyl Environmental Consultants has no beneficial interest in the outcome of the assessment, which is capable of affecting its independence.

DISCLAIMER

The opinions expressed in this report have been based on the information and project description supplied to Van Zyl Environmental Consultants by the applicant, information obtained from the water use licence application (WULA) process, WULA technical report, integrated water & waste water management plan, public participation related to that application process, specialist studies, water use licence issued by DWS and various sources referenced in this report. Should the development deviate from the description as stipulated within this report, the legislative requirements may change. Van Zyl Environmental Consultants has exercised all due care in reviewing the supplied information, but conclusions from the review are reliant on the accuracy and completeness of the supplied data. Van Zyl Environmental Consultants does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features, as they existed at the time of Van Zyl Environmental Consultants' investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which Van Zyl Environmental Consultants had no prior knowledge nor had the opportunity to evaluate.

Irmé B. van Zyl (Van Zyl Environmental Consultants cc)
NAME OF EAP

_____ Friday 13 January 2023
SIGNATURE OF EAP DATE

DETAILS AND EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Van Zyl Environmental Consultants is an environmental consulting firm providing environmental management services, including environmental impact assessments and planning to evaluate the environmental risk and ensure environmental compliance of proposed developments, water use licence application processes, rehabilitation processes as well as the implementation of environmental management tools.

Irmé van Zyl is managing this basic EIA application process. She is the sole member of Van Zyl Environmental Consultants and is fulfilling the duties as EAP.

Irmé van Zyl has been working in the environmental management field since 1996. She has conducted processes for environmental impact assessments, water use licence applications, waste license applications, rectification applications (S24G), compilation of EMPs, prospecting applications, mining permit applications, public participation processes, acting as environmental control officer, screenings as well as advice to developers on a wide range of projects in the Northern Cape.

She holds a National Diploma in Nature Conservation, a Further Diploma in Environmental Education and a Master's Degree in Environmental Management. (Appendix H)

Should this report be used as a reference, it should be cited as follows:

Van Zyl, I.B., 2022. **Draft Basic Environmental Impact Assessment Report & Environmental Management Program in terms of the EIA Regulations, 2014 for the Carpe Diem Raisins Wastewater Evaporation Ponds & Associated Infrastructure, Dawid Kruiper Municipality, Northern Cape Province.** Van Zyl Environmental Consultants cc, Upington

SECTION 1: SUMMARY AND OVERVIEW OF THE PROJECT (RAISIN PROCESSING)

Carpe Diem Raisins (Pty) Ltd (also the applicant or CDR) is located approximately 15 km from Upington on the N10 route to Groblershoop south of the Orange River.

CDR is operating a raisin export packaging plant with associated infrastructure on parcel 81 and parcel 64 of the farm Vaal Koppies No. 40. It is located within the Dawid Kruiper Local Municipality and ZF Mgcawu District Municipality, Northern Cape Province. Access to the assessment area is obtained via the N10 national highway and subsequent dirt access road from the north.

The surrounding area near the fertile Orange River is largely of agricultural nature that produce grapes, cotton, pecan nuts, fruits, vegetables etcetera. Livestock and game farming are practised in the areas outside the fertile high productive soils. Processing of these agricultural produce also takes place in the surrounding area that further add value to the socio-economic environment of the region.

Raisins are received in bulk bins from January to May. These bins are stored and packed according to orders. During processing the bins are tipped onto a production line where the product is pre-cleaned, and stalks and foreign material removed. The product is put through a wash process and different laser sorters, X-ray, metal detection and hand sorting to ensure that the product is clean and comply to product specification. Different quality control measures are in place to ensure a safe product, including cleaning and sanitation, pest control, maintenance, etc. The company is BRC, Halaal and Kosher certified.

During the process, water is used to wash raisins, to clean and sanitise the process facility, for hygiene and sanitation purposes and drinking water for staff. The effluent, containing high organic matter, is channelled with a separate pipeline to the evaporation ponds where the solids are separated and removed from the waste water. The solids are used to prepare compost to be used in the gardens. Excessive solid waste will be disposed of at the registered municipality waste disposal area. The waste water is then channelled to the evaporation ponds consisting of 4 pans.

The plant process ~ 22 000 ton raisins per annum. CDR supply approximately 22% of South Africa's total production of which 95% is exported globally. As an organic processor, CDR encourage and promote the use of organic plant protection products to contribute to a healthier environment and welfare. (Van Wyk, 2020)

CDR process products produced by Carpe Diem Estate, Deo Gloria Estate and more than 80 other farms in the area that provides work to persons from local communities. CDR is the only certified organic packer in South Africa which differentiate them from all the other packers in South Africa.

1.1 PROPERTY DESCRIPTION

Parcel 81 of 1.3 ha is situated within parcel 64 (Figure 1: Planned Wastewater Evaporation Ponds at Carpe Diem Raisins) of Farm Vaalkoppies No. 40. This area has been cleared of natural vegetation and the CDR raisin processing and packaging plant are situated on this property.

Parcel 64 of 364.8 ha surround parcel 81. The CDR office building, storage areas, WWEP and related infrastructure of the CDR processing plant are situated near the main processing plant. The WWEP are also situated on parcel 64 near parcel 81. The rest of the property is characterised by vineyards, infrastructure related to the grape industry, and natural vegetation.

1.2 LEGISLATIVE BACKGROUND OF THE RAISIN PROCESSING FACILITY

During 2004 the need for a raisin processing facility was identified and subsequently the EIA process done and authorised. An environmental authorisation, permit 79/2005 dated 28 May 2005, was issued in terms of Section 21 of the Environmental Conservation Act (hereafter ECA), 1989 (Act 73 of 1989) as published in the GG R1182 of September 1997 to Mr J. van der Colff for the development of a raisin processing facility (attached to the Land Use Change Application in Appendix D4 as Annexure H and K).

Subsequently, the site was developed with a footprint of ~12 ha (Includes offices, parking bay, garden, and open areas where vegetation was removed.)

The listed activity 2(c) authorised in terms of Schedule 1 of GG R1182:

"The change of land use from agricultural or zoned undetermined use or an equivalent zoning, to any other land use"

Permit 79/2005 authorised:

- the extension to the existing shed in order to make provision for the washing, classification and packing of the raisins; and
- the wash water from the raisins processing plant will be stored in oxidation ponds.

Similar listed activities of the NEMA EIA Regulations, 2014 is GNR 983 LN 1 Activity 8, Activity 27, and Activity 28. The similar listed activity 8 contains an operational component and therefore this EA is still relevant and in place.

R. 983: LN 1 Activity 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.

New HDPE lined wastewater evaporation ponds (WWEP) with a total size of approximately 1.8 ha and access road are required that will replace the current WWEP to comply with the stipulations of the National Water Act. An EIA application has been identified for the new WWEP. (Figure 1: Planned Wastewater Evaporation Ponds at Carpe Diem Raisins)

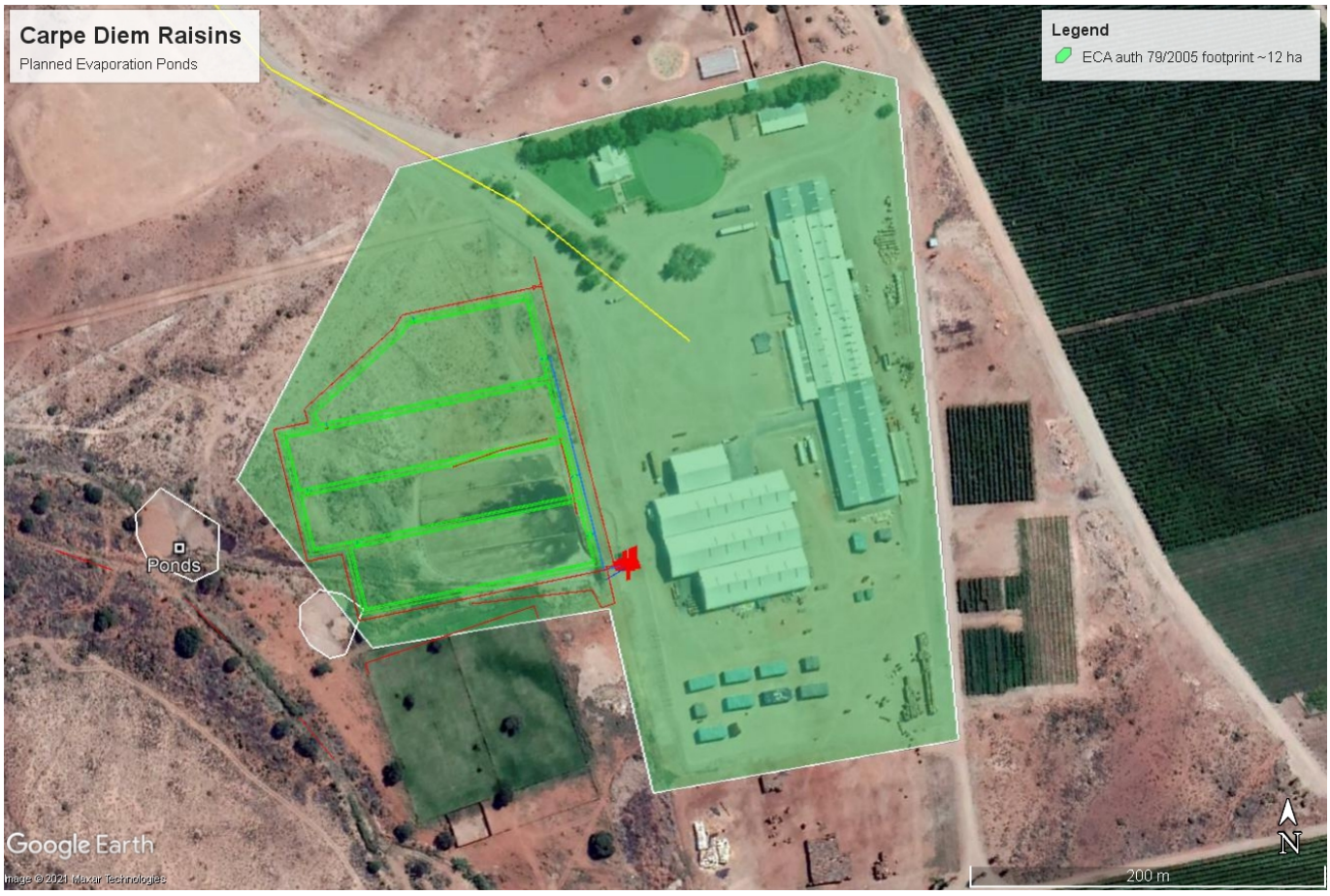

Figure 1: Planned Wastewater Evaporation Ponds at Carpe Diem Raisins

During the period 2015-2020 two small informal ponds were constructed that is currently not in use. The rehabilitation of these ponds is included in this EIA application.

Infrastructure, such as the pipeline, pumping stations etc., is in place and operational. It will still be utilised to abstract the water, pump it via the pipeline and store in six 10kl JoJo containers on site and used as required.

An industrial water use licence (WUL) has been issued to Carpe Diem Raisins by the DWS (Appendix J1).

The following water uses has been authorised:

- Section 21(a): Taking water from a water resource of approximately 170 KL/day for cleaning of the raisins (product), cleaning of the production facility and equipment, potable use and sanitation. The abstraction of water from the Orange River using existing infrastructure by CDR that is in place and in use by Carpe Diem Landgoed (Pty) Ltd.
- Section 21(c): Impeding or diverting the flow of water in a watercourse.
  The evaporation ponds will be located nearer than 100m from dry water rivulets. It was identified that the evaporation ponds would need to be replaced to comply with the National Water Act as well as compendium environmental legislation. The applicant subsequently appointed BVi that redesigned the ponds and provided a technical report (Appendix D3) and engineering drawings for the ponds (Appendix C1) that was accepted and authorised by the DWS (Appendix J1).
  A wetland delineation study (PES & EIS risk assessment included) as well as related rehabilitation plan was commissioned as part of the WULA (Appendices D2 and D5).
- Section 21(i): Altering the beds, banks, and characteristics of a watercourse. The presence of high sugar content and phosphates of the wastewater used in the packing plant to wash the raisins might impact the water quality in the rivulet and thus its characteristics.
- Section 21(g): Disposing of waste in a manner that may detrimentally impact on a water resource. The wastewater evaporation ponds (WWEP) are currently not lined. However, the engineer proposed new WWEP with lining that will be implemented when and should the environmental authorisation be granted (Appendix D3). Therefore an integrated water and wastewater management plan formed part of the technical report that was reviewed and authorised by DWS. This drawing took the recommendations of the ecological assessment done for this development into consideration.

SECTION 2: ACTIVITY DESCRIPTION (STATUS QUO AND PLANNED)

2.1 STATUS QUO

2.1.1 Description of activity

Receiving, Storage, Processing, Packing and Dispatch of raisins. The process generates process water which has a high organic content due to the natural sugars occurring in the fruit that is processed that is pumped to wastewater evaporation ponds. (Van Wyk, 2020)

Activity infrastructure description of the CDR processing facility to enable it to process and export raisins:

- Offices;
- Parking area;
- Abstraction pumps and pipeline;
- Six 10 kl water storage tanks where water are purified and treated to international drinking water standards;
- Water purification system;
- Back up electricity generation system;
- Bunded diesel storage tanks;
- Raisin processing plant:
    - Receiving area;
    - Storage; area
    - Processing area;
        - Pre-cleaning process – removal of stalks and foreign material;
        - Wash process;
        - Laser sorters;
        - X-ray;
        - Metal detection; and
        - Hand sorting.
    - Packing; and
    - Dispatch.
- Sanitation & ablution facilities;
- Closed cell sewage holding tanks and the local municipality removes sewage to the municipal sewage works when contacted when the tanks are nearly full; and
- Effluent or wash water
    - Solids removed – composting to gardens;
    - Excessive solid waste will be disposed of the municipal waste disposal site; and
    - Evaporation ponds.

2.1.2 Extent of activity

The developed area related to the CDR processing plant and related infrastructure is ~12.5 ha. The area of the WWEP (that is required to replace the current WWEP in the same location) will be ~ 1.8 ha.

2.1.3. Water

2.1.3.1 Water Supply

The water is sourced from the Orange River. The Johan van der Colff Trust is in possession of an agricultural water use licence for 15,000m^3/ha/annum for a scheduled area of 92,5 ha from the Orange River.

An industrial water use licence has been issued to CDR by the DWS (Appendix J1) for the abstraction of 45,000m^3 per annum from the Orange River for the cleaning of raisins in the raisin processing plant, and the evaporation of the process water. The existing pumping and pipeline infrastructure is used.

Water is stored on-site (6x10m^3 JoJo tanks) to ensure that sufficient water is always available even if the supply is interrupted. Water is purified and treated to international drinking water standards.

Water is used at the packaging plant to wash raisins, cleaning and sanitation of the process facility, for hygiene and sanitation purposes and drinking water for staff.

Water is used to suppress dust on roads when dust is prevalent especially during harvesting when tractors, vehicles and machinery cause dust that eventually settles on grapes.

This water will also be used for the construction of the WWEP.

2.1.3.2 Stormwater Management

The stormwater management plan is attached as Appendix D7 and within the engineering report (Appendix D3).

Although rainfall is low with an average of only 189mm per annum, flash floods, due to thunder storms, do sometimes occur in the area. This means short duration – high intensity rainfall can take place. Due to the topography and relatively hard soils, runoff accumulates rapidly and drainage lines can quickly become fast flowing rivers. (Meiring, 2020)

There is one major drainage line which originates to the south of the project site, which has a catchment area of approximately 2.68km^2, which could generate reasonable runoff. This drainage line passes approximately 75m west of the proposed project site in a well-defined channel. (Meiring, 2020)

The second drainage line is to the north of the project site, and is considered a minor drainage line which will basically drain the flat area just north of the existing factory offices (Meiring, 2020).

Neither of these drainage lines pose any risk to the proposed evaporation ponds which will be constructed on land located at an elevation which is at least 3m higher than the drainage lines' outlet (Meiring, 2020).

To be safe and to ensure that any rainfall occurring on either the level developed area on which the factory is located, or on the area where the evaporation ponds are to be constructed, it is proposed that the top of the evaporation ponds be constructed at least 500mm higher than the natural ground level (Meiring, 2020).

This means that a cut to fill earthworks operation could be utilized, where the ponds are excavated to 500mm below natural ground level, and the excavated material is then utilized to construct the surrounding embankments (Meiring, 2020).

By utilizing this method of construction, and maintaining a top level of 500mm above Normal Ground Level, any risk of stormwater damage is negated (Meiring, 2020).

This addresses the best practice guideline (DWAF 2006) of "keeping clean water clean".

2.1.3.3 Groundwater

The process water is not suitable for direct disposal to soil either by irrigation or any other means without some form of treatment to reduce the level or organic pollutants (Meiring, 2020).

Subsequently, it is recommended that the ponds be lined with an impermeable membrane such as a 1mm thick welded HDPE liner. The alternative is that the process water be pre-treated to an acceptable level of organic content and then irrigated or discharged (Meiring, 2020).

The impact on groundwater resources is discussed from page 29 of this report.

2.1.4 Effluent

2.1.4.1 Sewage

A waterborne sewage system is operational. It consists of underground storage tanks that are pumped when full and taken to the nearest local municipal sewage works. (Appendix J4)

2.1.4.2 Process water

The process water from the raisin processing is generated from the washing of the fruit as well as cleaning of equipment and facilities. Raisin processing water is characterized by high concentrations of particulate and soluble organic waste, very low pH levels, high phosphates and high levels of Potassium. (Meiring, 2020)

Both the organic waste, the low pH and the phosphates are common polluting constituents for both water and soil. As such, water containing these constituents cannot be disposed directly onto natural soil. Firstly, the soils will become depleted in oxygen due to the organic pollutants, and secondly, there is a risk that these elements could end up either in the groundwater, or in the surface water after rains due to run-off. (Meiring, 2020)

The process water from CDR has been analysed and the following parameters are of concern (Meiring, 2020):

- pH: 3.90
- COD: 26 150mg/l measured as O
- Phosphates: 73.26mg/l measured as P
- Potassium: 500mg/l measured as K

The heavy metal concentrations in the process water are at low levels with only Iron showing significant concentration levels at 4.32mg/l (Meiring, 2020).

The process water is therefore not suitable for direct disposal to soil either by irrigation or any other means without some form of treatment to reduce the level or organic pollutants (Meiring, 2020).

Subsequently, it is recommended that the ponds be lined with an impermeable membrane such as a 1mm thick welded HDPE liner. The alternative is that the process water be pre-treated to an acceptable level of organic content and then irrigated or discharged (Meiring, 2020).

The complete analysis of the Carpe Diem raisin processing facility's process water is attached to the Engineering Technical Report (Appendix D3) as Annexure 4 (Meiring, 2020).

The Engineer has calculated a daily discharge of 133 m^3/day and used this to calculate the size of the evaporation ponds. The engineer calculated that an area of 18,000m^2 or 1.80 ha is required to accommodate the expected maximum discharge from the raisin processing facility. Four ponds were designed, each having approximate dimensions of 30m x 150m in length with a depth of 500mm. This provides exactly 1.80ha of evaporation area. This calculated area is approximately 3.3 times larger than what is currently provided for the worst-case scenario given the information is currently available. (Meiring, 2020)

2.1.5 Waste

There are no waste management activities as listed in GN R634 under the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM: WA) undertaken by CDR. CDR and associated infrastructure do not currently trigger any activities listed in terms of the NEM: WA and will therefore not require a waste management licence.

EIA application for the replacement of the old WWEP with new WWEP.

This application pertains to the storage, evaporation and/or treatment of the effluent from the water used to process the raisins, cleaning and sanitation. It is piped to evaporation ponds. Prior to the evaporation ponds, solids are removed that is in turn processed for use as compost in gardens.

During the process, water is used to wash raisins, cleaning and sanitation of the process facility, for hygiene and sanitation purposes and drinking water for staff. The process water, containing high organic matter due to the natural sugars occurring in the fruit that is processed, is channelled with a separate pipeline to the evaporation ponds where the solids are separated and removed from the waste water. The solids are used to prepare compost to be used in the gardens. Excessive solid waste will be disposed of at the registered municipality waste disposal area. The process water is then channelled to the evaporation ponds consisting of 4 pans.

2.1.5.1 General Waste

CDR is responsible for the weekly or more frequent removal of general waste to the municipal waste site. Waste generated on the site is kept in closed bins, located within enclosed areas from where it is removed to the municipal waste site.

2.1.5.2 Hazardous waste

Hazardous waste is kept in impervious, closed bins in a secure area until safely removed by a suitably certified company. Proof of safe disposal must be kept on file.

2.2 OPERATIONAL MANAGEMENT

CDR process products produced by Carpe Diem Estate, Deo Gloria Estate and more than 80 other farms in the area that provides work to persons from local communities. CDR is the only certified organic packer in South Africa which differentiate them from all the other packers in South Africa.

The processing plant process 22 000 tons of raisins per annum. The factory operates 24 hours, 5 days a week with day and night shifts. (Van Wyk, 2020)

Water, approximately 170 m^3/day, is abstracted from the Orange River to clean the raisins (product), to clean the production facility and equipment, for potable use and sanitation in the raisin processing plant.

Raisins are received in bulk bins from January to May. These bins are stored and packed according to orders. During processing the bins are tipped onto a production line where the product is pre-cleaned, and stalks and foreign material removed. The product is put through a wash process and different laser sorters, X-ray, metal detection and hand sorting to ensure that the product is clean and comply to product specification. Different quality control measures are in place to ensure a safe product, including cleaning and sanitation, pest control, maintenance, etc. (Van Wyk, 2020)

During the process, water is used to wash raisins, cleaning and sanitation of the process facility, for hygiene and sanitation purposes and drinking water for staff. The process water, containing high organic matter due to the natural sugars occurring in the fruit that is processed, is channelled with a separate pipeline to the evaporation ponds where the solids are separated and removed from the waste water. The solids are used to prepare compost to be used in the gardens. Excessive solid waste will be disposed of at the registered municipality waste disposal area. The process water is then channelled to the evaporation ponds consisting of 4 pans.

2.3 PLANNED ACTIVITIES

The proposed WWEP will have a daily throughput of less than 2000 cubic metres per day. The estimated maximum throughput is ~ 170 KL/day.

An industrial WUL has been issued to CDR by the DWS (Appendix J1).

A service road will be constructed from the provincial road that will be ~10m wide.

2.3.1 Construction Phase Activities

Construction phase activities would include the following activities:

- Preparation of construction lay down area for storage and assembly.
- Delivery of material and equipment.
- Site clearing and site preparation - Clear plant material (including clear, remove, sort, separate, chop, dispose & transport)
- Earthworks - Excavate, blast, cut, fill, slope, source, backfill, level, compact, remove & transport (incl. bedding & backfill material).
- Concrete works - Supply, deliver, pre-mix, mix, cast, construct, finish-off & cure of concrete.
- General building works - Supply, deliver, mix, build, construct, install & finish-off building works should there be any.
- Construction of a small inlet works with stainless steel manual rake bar screen and a grit removal channel. The bar screen and grit removal channel will be located at the inlet of the WWEP.

- Structural steel works - Supply, deliver, cut, weld, drill, assemble, install & construct steel sections, frameworks & platforms for securing, installation & removal (maintenance) purposes.
- Pumps, motors etc. Supply, deliver, handle, couple & install
- Mechanical equipment & accessories - Supply, deliver, handle, couple, weld, steel pipes, rubber suction hoses, valves, reducers, flow meters should it be needed, etc.
- Electrical equipment, control & accessories (reticulation): - Supply, deliver, handle, connect, assemble & install.
- Wastewater Evaporation Ponds:
  - Welded HDPE liner of 1mm thick:
    - Supply, deliver, handle, cut, place, install, weld, and overlap liner on top of bedding layer according to specifications.
  - Stone rip rap on outside (wind erosion)
    - Supply, source, load, transport, dump, level rip rap erosion cover layer according to specifications.
- Fencing (1.8m high diamond mesh perimeter security fence): - Supply, deliver, cut, dig holes, mix concrete, cast, construct, finish-off & cure of concrete, assemble, install & construct fence.
- Testing and commissioning of WWEP and service road.
- Start of operational phase.

2.3.1.1 Surveys

Before construction can commence, a survey will be required to confirm the micro footprint of the WWEP.

An application would be submitted to the competent authority for the removal of the plants protected in terms of the Northern Cape Nature Conservation Act (Act No. 9 of 2009). Should it be issued, protected plants will be removed within the delineated areas as mentioned above prior to the commencement of any construction activities. This aspect has been addressed in the Pre-Construction Phase section of the EMP (Appendix G). No go areas as well as plants and trees to be conserved, should there be any, will also then be marked and delineated as stipulated in the EMP attached in Appendix G.

2.3.1.2 Access and Internal Roads

The involved farm portions is bordered by the N10 National Road to the north and the DR3035 Provincial Road to the west. Currently the involved Raisin Processing plant receives access from the N10 across Portion 64 of the Farm Vaalkoppies, No.40.

However, SANRAL restricted this access for vehicles with a maximum height of 2.4m and accordingly heavy motor vehicles that exceed this height limit will have to gain access to the plant via the DR3035. The DRPW in turn issued a no-objection in terms of the proposed land use changes. The approval of the proposed access position from the DR3035 is however, subject to the submission of detailed bellmouth designs which is currently being drawn up by an appointed engineer and will be submitted upon completion thereof to the DRPW and Dawid Kruiper Local Municipality. (Welthagen, 2022)

In light of the comments from DRPW regarding the access form the DR3035 Provincial Road, the right of way servitude to be registered in respect thereto might deviate from the position indicated in the figures included as part of this application if it is deemed necessary by the relevant department that the proposed access be moved. No problems are expected in this regard. (Welthagen, 2022)

2.3.1.3 Site Preparation and Construction Laydown Areas

Activities would include the removal of vegetation and levelling of the laydown and storage areas for the construction equipment. The topsoil would be stripped and stockpiled, backfilled and/or spread on the site. Areas where construction would take place would be levelled. A small construction area for the storage and use of petrochemicals, oils and lubricants (POL), and a storage area for construction equipment and infrastructure, machinery and vehicles would be established. The WWEP will be fenced with ~1,8m fencing according to health and

safety regulations. Temporary ablution facilities for workers on site will be implemented and a waste storage area will be implemented with bins for recyclable and non-recyclable materials to be removed weekly.

2.3.1.4 Transportation of Equipment, Infrastructure and Materials to Site

Equipment and materials required for the construction of the WWEP will be transported to the site by means of national and/or provincial road and access road. CDR has access to civil construction equipment and machinery from the neighbouring farm that will be delivered to the site via internal roads. These could include, among other types of equipment, excavators, trucks, graders, and compaction equipment.

2.3.1.5 Construction of the WWEP and Ancillary Infrastructure

Vegetation would be required to be cleared and areas of the site would need to be levelled. Excavation and lying of foundations of some structures would be required.

The perimeter fence will be implemented. Holes would be dug up to 600mm and ~ 1.8 m fence poles would be concreted into place. The fence would then be erected according to specifications.

Concrete batching plant could be done on site or pre-mixed concrete obtained from an external supplier. The distance to the site from Upington is not a limiting factor.

Potable water would be supplied via a small trailer where personnel will be working. Water is readily available near the WWEP and will be required for the construction phase.

During the construction period chemical toilets would be available on site. A waterborne sewage system is in place at the CDR processing facility as well as associated facilities. Grey & sewage water are contained in closed cell tanks. When the tanks are nearly full, sewage is removed by the local municipality to the nearest municipal sewage works.

During the construction phase generators would most likely be used for power supply.

General and emergency maintenance of infrastructure, vehicles and machinery would be done on site. Vehicles and machinery would be moved to the workshop at neighbouring Deo Gloria to be repaired.

The WWEP will be built according to the design plans of a storage depth of 500mm with a freeboard of 150mm to accommodate sudden down pours. This equates to an effective storage depth of 350mm. The WWEP will require an evaporation area of ~ 1.80 ha to accommodate the expected maximum discharge from the raisin processing facility. The WWEP will consist of 4 ponds, each having approximate dimensions of 30m x 150m in length with a depth of 500mm. This calculated area is approximately 3.3 times larger than what is currently provided. This calculation was conducted using the flow figures available at the time. As time passes and more data becomes available, this calculation could be optimized. The current calculation is for the worst-case scenario given the information we have available at the moment. (Meiring, 2020)

The drainage lines do not pose any risk to the proposed evaporation ponds which will be constructed on land located at an elevation which is at least 3m higher than the drainage lines'outlet. (Meiring, 2020)

2.3.2 Decommissioning of Construction Areas after Completion of Construction Work

All the clean and solid construction waste would be used in backfill or onsite landscaping where possible. This is a use/reuse matter and is usually the most cost-effective as well. Construction waste that is not appropriate for backfill or for landscaping would be disposed of at the closest municipal waste site.

Other waste would be removed to nearest general waste site. The construction camp, infrastructure, equipment, machinery and vehicles that would not be used during the operation and maintenance phase would be removed. Compacted areas would be ripped where necessary. Topsoil would be replaced in areas where the operational phase would not continue and rehabilitated where practical and reasonable.

2.3.3 Operational & Maintenance Phase Activities

The effluent from raisin processing is generated from the washing of the fruit as well as cleaning of equipment and facilities. Raisin processing effluent is characterized by high concentrations of particulate and soluble organic waste, very low pH levels, high phosphates and high levels of Potassium. (Meiring, 2020)

The effluent, containing high organic matter, is channelled with a separate pipeline to the evaporation ponds where the solids are separated and removed from the waste water. The solids, containing sugars, phosphates and organic matter are used to prepare compost to be used in the gardens. Excessive solid waste will be disposed of at the registered municipality waste disposal area. The waste water is then channelled to the evaporation ponds consisting of 4 pans.

The evaporation ponds are shallow (500mm) with large surface areas to enhance the effect of evaporation.

The WWEP will be inspected from time to time for possible erosion and construction problems. The NDPE layer will be maintained to prevent leakage of process water, erosion prevention and repair, and the prevention of spills and or leaks.

The waste generated by the maintenance activities will be removed to a municipal waste disposal facility.

The WWEP facility itself use very little water during operations. Water is

2.3.4 Decommissioning Phase Activities

The developer intends to operate this WWEP system and associated infrastructure for an indefinite period and should it become too old for maintenance it would be upgraded or replaced. The then EIA regulations and stipulations will then be followed.

In case the WWEP would be decommissioned the site would be returned to a state similar to its original state and conditions. The components that could be feasibly removed will then either be re-used and other obsolete material & spoil will be removed to the local municipal waste disposal facility. Furthermore, the soil will be inspected for any industrial waste or other remaining contamination. Such parts will be decontaminated and cleaned or removed to a suitable graded waste disposal facility. Compacted areas would be contoured and ripped. If plant growth should not establish naturally within one season, active seeding and planting of vegetation would be conducted.

SECTION 3. FEASIBLE AND REASONABLE ALTERNATIVES

"alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, 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; and
(f) the option of **not implementing** the activity.

In this section the alternatives are discussed that are considered in this application. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity could be accomplished in the specific instance taking account of the interest of the applicant in the activity. The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. The determination of whether site or activity (including different processes etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the competent authority may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

3.1 PLANNING PHASE

3.1.1 The Site

The current location of the WWEP was chosen for the following reasons:

1. The existing WWEP has been located here fore approximately 15 years.
2. All associated infrastructure is in place and in operation such as electricity, effluent transport pipeline, screening and grit removal etc.
3. Existing disturbed area.
4. The new WWEP has been authorised at this location by the DWS (Appendix J1).

No alternatives were provided for the location of the WWEP other than the "no-go alternative". The area required should preferably be as flat and open as possible. It should also be situated as close as possible to the raisin processing facility to curb costs.

The existing access and internal roads are sufficient to facilitate the movement of construction vehicles during the construction as well as the maintenance and operational phases.

Despite the presence of the two ephemeral drainage lines, this area is environmentally acceptable should the stipulations of the EMP, the ecology study, the hydrogeology study, and the civil engineering plans be complied with.

This recommended area falls outside the recommended watercourse and drainage line buffer zone and is mainly confined to the transformed and degraded areas of the assessment area while only a small portion is located within the undeveloped northern shrubland portion. (Lamprecht, 2020)

By application of the NEMA Mitigation Hierarchy, these potentially significant cumulative ecological impacts associated with the proposed development can be suitably reduced and mitigated to within acceptable residual levels by implementation of the recommended mitigation measures. It is therefore not anticipated that the proposed development will necessarily add any significant residual cumulative ecological impacts to the surrounding environment. (Lamprecht, 2020)

3.1.2 Technology

3.1.2.1 Wastewater Treatment/Evaporation System

The following alternatives were considered:

- wastewater evaporation ponds (WWEP)
- reed bed treatment system
- conventional treatment plant
- Reverse Osmosis Plant (RO plant)

A. Wastewater Evaporation Ponds (WWEP)

Evaporation ponds are essentially shallow ponds (500mm deep) with large surface areas to enhance the effect of evaporation. Typically, when water is discharged to an evaporation pond, provision is made in terms of storage, as evaporation is very weather dependent and the expected evaporation rates may not occur due to climate variability.

A lined evaporation pond's (Figure 2: Example of wastewater evaporation pond) expected design life is determined by the material and quality of the lining. If a high-quality High-Density Polyethylene (HDPE) is used, the design life could be as long as 25 years.

Figure 2: Example of wastewater evaporation pond

Figure 3: Example of wastewater evaporation pond

With the received hydrological data, and an effective storage depth of 350mm, a required area of 18 000m^2 was calculated for the evaporation of the expected effluent volume. It is proposed that four evaporation ponds with dimensions of 30m x 150m x 500mm depth be constructed. This means that each pond will have a dry freeboard of at least 750mm. Each pond be equipped with an inlet valve from the discharge pipe and also that each pond be equipped with a small brick masonry overflow structure to avoid overtopping of the embankment and subsequent damage by erosion. The floors of each pond must be perfectly level or have a maximum slope of 0.1% over the length of the pond. All evaporation ponds are to be lined with a 1mm thick HDPE lining for its full area.

This calculation was conducted using the flow figures available at the time. As time passes and more data becomes available, this calculation could be optimized. The current calculation is for the worst-case scenario given the information we have available at the moment.

There is one major drainage line which originates to the south of the project site, which has a catchment area of approximately 2.68km^2, which could generate reasonable runoff. This drainage line passes approximately 75m west of the proposed project site in a well-defined channel.

The second drainage line is to the north of the project site, and is considered a minor drainage line which will basically drain the flat area just north of the existing factory offices.

Neither of these drainage lines pose any risk to the proposed evaporation ponds which will be constructed on land located at an elevation which is at least three meters higher than the drainage lines'outlet.

To be safe and to ensure that any rainfall occuring on either the level developed area on which the factory is located, or on the area where the evaporation ponds are to be constructed, it is proposed that the top of the evaporation ponds be constructed at least 500mm higher than the natural ground level.

This means that a cut to fill earthworks operation could be utilized, where the ponds are excavated to 500mm below natural ground level, and the excavated material is then utilized to construct the surrounding embankments.

By utilizing this method of construction, and maintaining a top level of 500mm above Normal Ground Level, anay risk of stormwater damage is negated.

Advantages:

- Low operational and maintenance cost
- Effective evaporation with minimal threat to the environment
- Simple to construct
- Do not need advanced technical skills to operate and maintain
- Several pond configurations possible

Disadvantages:

- Long processing time
- Need larger area for treatment
- Not suitable for large amounts of wastewater
- Lining to be implemented
- Operations subject to environmental factors such as high rainfall or overcast days
- Aesthetically unacceptable to some people
- Quality of water not improved sufficiently to return to rivers or streams
- Open body of water is potentially dangerous (although required to be fenced, access by people or animals is not necessarily prevented)

B. Reed bed treatment system

The Reed Bed technology or constructed wetland is a high functional efficiency eco-friendly wastewater treatment plant that has a lower cost and lower carbon footprint compared to conventional wastewater treatment methods. (Reed Bed, 2021)

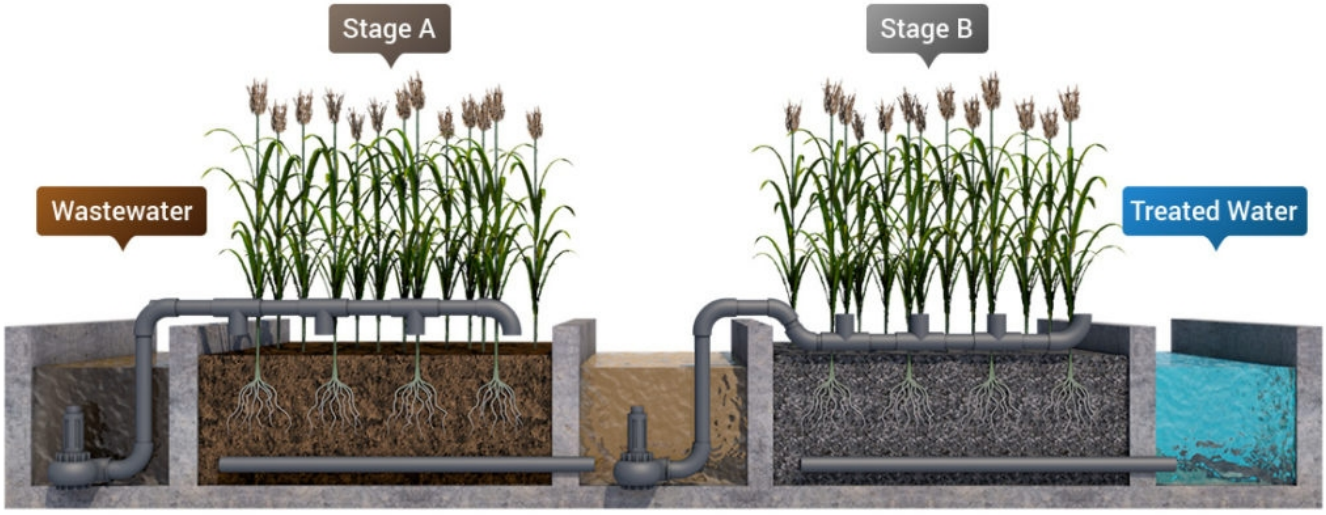

Figure 4: Example of Reed Bed (Reed Bed, 2021)

The main principle consists of filtering and aerating waste water in different stages of sand filter basins planted with green wetland plants, in order to produce treated water. This system can be incorporated and combined with a wide range design of wastewater treatment plants and/or WWEP. (Reed Bed, 2021) They work by allowing bacteria, fungi and micro-organisms to break down, digest and clean the wastewater to the point where it can be safely discharged (Pullen, 2021), pumped to the storage dam on the farm from where it is mixed with the raw water pumped from the Orange River and used for irrigation and/or at the raisin processing facility.

Figure 5: Example of a reed bed wastewater treatment system
(https://images.esi.info/Images/80023_1478101179113_PF.jpg?tr=w-700.0,h-487.0,c-at_max)

Figure 6: Example of a reed bed wastewater treatment system (https://www.enviropro.co.uk/entry/139245/ARM-Ltd/Surface-water-runoff-solution-for-distribution-centre/)

The degradation of pollutants undertaken by the microbial populations attached to wetland substrate (gravel) and the roots, rhizomes and submerged stems of the macrophytes. Planted macrophytes not only provide the physical structure for these microbes to grow, they transfer oxygen to their root zone, providing microscopic aerobic sites for micro-organisms. These oxygenated micro environments enhance pollutant removal processes within reed bed systems. (Pullen, 2021)

In selecting macrophyte species for reed bed systems, the nutrient uptake capacity of the plants is not the primary selection criteria. Species should be selected based on their capacity to grow well in local conditions (which may mean survive frost) and maintain abundant surface biomass. Stem density may also be a consideration for the reed bed designer. (Pullen, 2021)

Figure 7: Example of a reed bed wastewater treatment system (https://www.enviropro.co.uk/entry/134571/ARM-Ltd/Horizontal-flow-reedbed-refurbished-for-water-company/)

Reed beds will need weeding to remove any nettles, thistles, docks, chickweed, etc. which has to be done by hand as weed-killer or strimmer is likely to damage the plants you want. (Pullen, 2021)

They need watering during low flow if they look dry. Plants need time and care to become established. (Pullen, 2021)

After a few years the reeds will need "harvesting" but initially it is important to allow the green tops to grow fully.

The top 70 to 80mm of soil will need to be forked over periodically in the first 2 or 3 years (or after hard frost of heavy rain) to maintain porosity, essential for incoming water to be filtered and cleaned by the soil. (Pullen, 2021)

Bio Solids

The appropriate exploitation and clearance of bio solids is one of the most significant problems presently confronting wastewater treatment plants. Practically all wastewater treatment plant operators confront the issue of storing and casting away bio solids. Reed bed construction technology renders lasting storage and quantity decreases of biological solids. (Bright Hub PM, not dated)

Reed beds are classified as horizontal beds or vertical beds. In horizontal beds the water enters at one end and runs horizontally to the exit accumulator, whereas in vertical beds the water runs down perpendicularly through the bed. Vertical beds fill up and drain, oxygenating the bed as they work, but horizontal beds remain full most of the time and depend on the reeds to extract oxygen downward into their roots to nourish the aerobic microbes that keep the water smelling clean. This is where wastewater sludge treatment in reed beds plays a significant role. (Bright Hub PM, not dated)

Inlet and outlet pipe works are placed beneath the gravel surface so that the water perpetually stays under the gravel surface, thus barring human vulnerability to the effluent, the mosquitos engendered, and bitter odors. (Bright Hub PM, not dated)

Prior to entering a reed bed, all solids must be automatically separated from the water, which then runs through one or more beds filled up with beds of gravel, sand, and appropriate plants. Wastewater is scavenged by straining it through these layers, then by biological and chemical simplification of wastes. This decline is triggered by bacteria and micro-organisms located on the roots. (Bright Hub PM, not dated)

Conclusion

Reed beds have comparatively low operating costs when compared with established biological treatment systems. As flow by the system is regulated by gravitation, there are no prerequisites for pumping as soon as the wastewater is in the reed bed. (Bright Hub PM, not dated)

In addition, a reed bed can become an aesthetically pleasing, functional part of a garden. (Bright Hub PM, not dated)

Advantages:

- Low operational and maintenance cost
- Do not require energy
- Effective treatment with minimal threat to the environment
- Simple to construct
- Do not need advanced technical skills to operate and maintain
- Several pond configurations possible
- Aesthetically pleasing when established and working correctly
- Provide habitat to invertebrates and wildlife
- No bad odours
- Topography is important and needs to slope gently to allow for gravity flow of wastewater as is the case at the preferred site.

Disadvantages:

- Require removal of organic solid material that would clog the growth medium and render it impervious to the wastewater. This, however is already being done on site. Should the vertical and horizonal reed bed system be combined, it would alleviate this problem significantly.
- Need large area for treatment
- Processing time longer than with conventional treatment works
- Not suitable for large amounts of wastewater
- Lining to be implemented

C. Conventional Treatment Plants

Advantages

- Treat large amounts of wastewater in a short period of time
- Small footprint
- Used in areas with sensitive environmental features

Disadvantages

- Expensive
- Construction to be executed by skilled technicians
- Need personnel with good technical expertise to operate and maintain
- Environmentally harmful chemicals are used to treat water

D. Reverse Osmosis Plant and Associated Infrastructure

The RO plant consists of various specialized equipment and materials and purifies contaminated wastewater. The RO plant, with all the specialized equipment and instruments, needs to be located within a waterproof housing. Prepackaged RO plants are available on the market. This ensures that the chemicals used are kept away from human contact; entrance to the plant is restricted with regards to vandalism and general public safety; and that ablution facilities are available for plant operators and personnel. (BVi Consulting Engineers, 2012)

WWEP will still be required to store the concentrated contaminated wastewater from the RO plant filters. Much smaller WWEP will be needed as the stand alone WWEP. The life expectancy of the WWEP would be much longer than currently the case.

The RO plant would generate organic waste such as sugars en phosphates and chemicals would be used to maintain the plant. This can be managed and mitigated by ensuring that lining of the WWEP are appropriate and ensure the proper disposal of the used chemicals etc. to prevent environmental contamination and damage. (BVi Consulting Engineers, 2012)

RO Treatment

The desalination plant consists out of various specialized equipment and materials. The flow diagram in **Figure 1** below indicates the different stages in the RO treatment process (BVi Consulting Engineers, 2012).

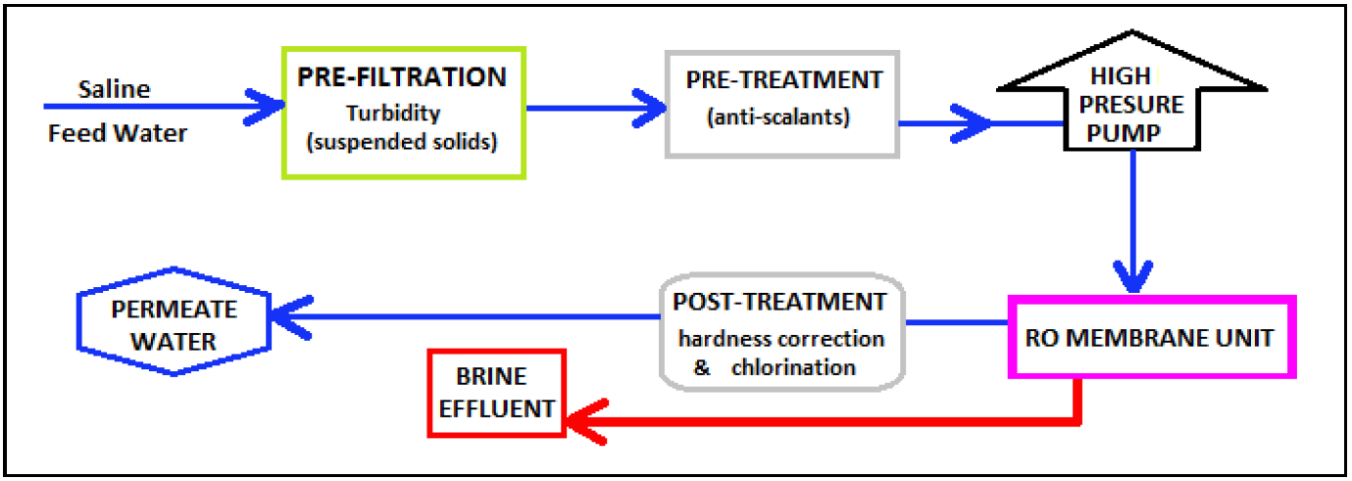

Figure 8: Process Flow Diagram of RO Treatment Plant (BVi Consulting Engineers, 2012)

The reverse osmosis (RO) process as indicated in the above flow diagram consists out of the following major process phases:

a) Wastewater **Feed** with a pre-determined flow rate and water quality determines the size and specific design of the plant to produce permeate water suitable for human consumption.

b) **Pre-Filtration** is required for the removal of suspended solids and other particles from the feed water, to protect the membranes from being damaged and from blockage. This can be achieved by using standard sand filters.

c) **Pre-Treatment** through the introduction of anti-scalants to promote the breaking down high sugar concentration which tends to precipitate onto filter membranes, causing blockage and ultimately prevents to membranes from functioning.

d) **High Pressure Pump** is required to force the pre-treated feed water through the membranes by producing in the order of 60 bar of pressure in front of the membranes.

e) **Post-treatment** by means of hardness correction and chlorination is necessary to bring the permeate water up to standard for human consumption and use in the raisin processing facility.

f) Organic **Effluent** is produced and discharged into the evaporation ponds for safe storage.

The highly sophisticated and specialized nature of the processes and operation of the plant calls for the following:

- The design and installation of the plant must be performed by a RO Treatment Plant Specialist Service Provider who has a good knowledge of RO treatment plants.
- The above mentioned specialist service provider must be a well-established institution with a good track record in the field of RO treatment works.
- All the various aspects such as Mechanical, Electrical, Chemical, Project Management, Operation and Maintenance, etc. must be incorporated within a single entity RO Specialist Service Provider to ensure that all the above mentioned aspects of the plant will be operated and maintained by them for a period not less than a year.
- The plant must be operated by a trained technician and this person must undergo onsite training from the specialist RO service provider after which period the plant operator will be solely responsible for the running of the plant in terms of operation and maintenance.

Figure 9: Example of reverse osmosis plant

Figure 10: Example of reverse osmosis plant

The cleaning of the RO membranes is essential for optimal functioning. If the following parameters **increase** by more than 10-15%, the membranes should be cleaned:

- feed pressure
- drop in pressure across the plant
- wastewater passage or water conductivity (Reverse Osmosis Chemicals, 2013)

With the cleaning of the RO membranes certain chemicals will be used. Chemicals used for this purpose could typically include the following:

- Citric Acid
- Ethylenediaminetetraacetic acid (EDTA)
- Sodium tripolyphosphate (STPP)

- Trisodium phosphate (TSP)
- Sodium lauryl sulphate (SLS)
- Calcium hydroxide/Sodium Hydroxide (PD Naidoo and Associates et. al., 2008)
- NaOH (Burger et.al., 2010)

3.1.2.2 Preferred Alternative

The wastewater evaporation pond system (WWEP) was chosen as the preferred alternative due to the following reasons:

- the site is situated in favourable climatic conditions such as
    - low rainfall per annum (arid area)
    - high temperatures and therefore high evaporation rate
    - a long summer period
- There is a vast open area for air circulation.
- Scrubland does not hamper air circulation.
- Enough land is available.
- Funding for construction is limited. Lower Life-Cycle costs than conventional treatment plants:
    - relatively low construction cost
    - very low maintenance cost
    - have a long life cycle
- Low technology. Neither technical skill to operate and maintain conventional treatment works nor funding for obtaining and retaining personnel with the relevant skills is available.
- It is a rural area.
- This type of system is widely accepted as the norm by Northern Cape communities.

Should the new preferred WWEP become insufficient, the reed bed system can be added to prolong the life of the WWEP. The water from a reed bed system can be piped to the storage dam where water from the Orange River is pumped and stored. This would ensure sufficient dilution of the wastewater for use as irrigation as well as water treatment for potable use.

3.1.3 Layout Alternatives

The significant fourth order ephemeral watercourse will be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer will be placed around the watercourse and no development is allowed to take place within the buffered zone. (Appendix C1).

The small ephemeral water drainage line will be adequately buffered out of the proposed development footprint area. A minimum approximately 32 m buffer will be placed around the drainage line and no development is allowed to take place within the buffered zone. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the watercourse and drainage line. (Lamprecht, 2020) The engineering drawings of the evaporation ponds was amended and complies with the stipulation (Appendix C1).

The ecologist proposed different layouts within the above constraints.

The design of evaporation ponds was amended to fit into the alternative areas that are regarded as potentially suitable for the development by the ecologist. A section of the preferred alternative area selected by the ecologist was not selected by the engineer as it is not practicable for the design of the evaporation ponds.

3.1.4 Power Technology

The following power technologies were investigated:

- Photovoltaic Technologies
- Electricity supplied by Eskom with backup generators in place to provide electricity during load shedding periods.

3.1.4.1 Photovoltaic Technologies

As an alternative or supplementary to Eskom electricity provision, solar technology could be utilised for solar electricity generation, namely Photovoltaic (PV) technology, more commonly known as solar modules. Solar energy power plants use the energy from the sun to generate electricity through a process known as the Photovoltaic Effect. This is achieved through the use of a PV cell that is made of silicone, which acts as a semiconductor. The cell absorbs solar irradiation, which energises the electrons inside the cells and produces electricity. PV cells are linked and placed behind a protective glass sheet to form a PV module (Figure 11). As a single cell produces a small amount of electricity, the proposed activity would require numerous cells arranged in arrays that would be fixed to a support structure (Figures 11-12).

Figure 11: PV power technologies

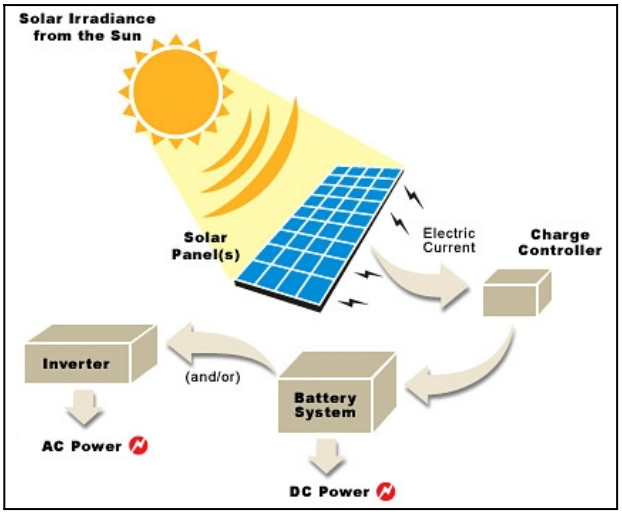

Figure 12: PV power technologies

Insolation is a term for incident solar radiation from sunrays. It is the amount of solar radiation energy received on a given surface during a given time, usually measured in kWh/m^2/day or kWh/m^2/year. Vapour or dust particles in the air can scatter the sunrays before reaching the earth's surface (diffuse irradiation).

Advantages:

- Low operational and maintenance cost
- No water requirements during operation
- Variability in size (from 10 kW to 100 MW) and installation possible on rooftops
- Simple and fast construction
- Topography is not important (can be built on gentle slopes as well as flat areas)
- Does not need advanced technical skills to operate and maintain
- Low visual impact
- No CO_2 emissions
- Established technology installed in numerous areas worldwide
- No noise
- Does not interfere with aircraft operations
- Feasible from as small as 0.5 MW
- Safe technology
- Combination of energy production and agriculture possible
- Location is suitable for PV with high "peak sun hours" (intensity of sunlight)

Disadvantages:

- Cost of technology
- No production at night time

- Battery storage expensive. May however choose to alternate between Eskom at night and PV technologies during the daytime.
- Land disturbance/land use impacts should rooftop installation not be possible.

3.1.4.2 Preferred Alternative

The pre-screening and removal of solids from the effluent prior to entering the WWEP requires power. Currently it is powered by ESKOM. Back up generators are in place to provide electricity to core business areas during power failures and loadshedding. The developer might choose to install PV power technologies should it become financially viable.

3.1.5 Timing

CDR would want to have all the planning and permitting completed as soon as possible to be able to build the WWEP as stipulated in and authorised in the WUL and start with operations.

The following processes also influence the timeframe of the proposed project:

- the EIA Phases and outcomes from these phases, which are to inform the planning, construction, operation and maintenance phases of the project;
- protected plant removal permits from the NC provincial conservation authorities;

The new HDPE lined WWEP is to be constructed soonest to ensure compliance with the National Water Act and prevent any possible impacts to the surface and ground water resources due to the fact that the current WWEP is insufficient and also not lined. The planned WWEP has been accepted and authorised with the inclusion of S21(g) of the National Water Act in the water use licence. This EIA application process is the last legislative action that has to be completed to ensure that the construction and operation of the new WWEP is legal.

3.1.6 Resources

The following types of resources are to be obtained:

- financial resources to drive the process; and
- high quality, financially viable suppliers of the infrastructure.

3.1.7 Technical Competence

Technical competence is needed from the planning, construction, to the operational and maintenance phases of the project. In some cases it might be viable to import competent technicians in the short term especially during the construction phase. The WWEP and associated infrastructure would, especially during the operational phase, add future financial value to the business itself and socio-economic value to the workers and extended families as well as companies providing dervices due to continued job availability. Local or regional construction companies could be involved in the construction process.

3.1.8 Demand

Demand forms an integral part of development and progress and, as communities in South Africa is uplifted, the demand for better quality and quantity products are growing.

3.1.9 Activity/Land Use

The land is zoned as agriculture but will be changed to agri-industrial use. The land has been used for the current WWEP and will be continued to be used for this purpose. The carrying capacity of this land is very low and the additional area that would be developed is very small compared to the carrying capacity and would have a negligent impact on the loss of grazing capacity.

The development would be legally bound to the EMP. It is stipulated that vegetation shall be disturbed as little as possible.

3.1.10 'Do Nothing' Alternative

The 'do nothing' alternative is the option of not undertaking the replacement of the WWEP. Should this alternative be selected, it would have local and broader impacts. It would entail maintaining the *status quo.* The "no-go" alternative will have a definite impact on the environment due to the fact that the current WWEP is overloaded, degraded and not lined to prevent seepage.

The use of the new WWEP technology is the least expensive of the options investigated.

In the long term the new WWEP will add socio-economic value to the local and broader communities due to the continued direct and indirect provision of jobs. This would not be the case if the WWEP are not replaced as DWS will issue a directive and stop operations.

The 'do nothing' alternative is not a preferred alternative in this application.

SECTION 4. COST BETENFIT ANALYSIS OF WWEP

There are various cost benefits to WWEP.

The main cost of a WWEP is the construction thereof. The operational cost of a WWEP system is the electricity consumption of the screening grid, and operation costs are therefore quite low.

The system does not require regular downtime for routine maintenance. This system also requires minimal operator interaction.

Socio-Economic Factors

- Simple technology
- be easy operate and has very low maintenance requirements;
- requires a minimal amount of power; and
- promote water security (promote reliable, safe and clean water.)
- Uses local resources
- Safe technology
- Stable technology
- Produces no dangerous waste

Environmental Factors

- Clean water
- Minimal environment impact
- Quiet operation
- Low Water Consumption

Sustainable development can be described as a “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. The concept of sustainability is based on three pillars: social, environmental and economic sustainability. (Greenpeace, 2011)

SECTION 5: THE AFFECTED ENVIRONMENT

This section provides a general description of the environment that may be affected by the WWEP. This information facilitates understanding of the receiving environment where the proposed development would be situated. The biophysical, social and economic environment that could be directly, indirectly or cumulatively affected by, or could affect the proposed development is described. The information was obtained from existing information available with regard to the area and collected field data that is attached to this report.

The following aspects were addressed in the ecology study (Appendix D2):

- Description Biophysical environment
    - Climate
    - Geology & Soils
    - Vegetation and Conservation Status

A site assessment for the development footprint area was conducted on 25 March 2020. This date forms part of the growing season and most plant species present could therefore be successfully identified. (Lamprecht, 2020)

5.1 REGIONAL CLIMATE

The climate of the area is typical of a semi-desert with very hot summers and cold winters.

The maximum average monthly temperature is approximately 26.2°C in the summer months while the minimum average monthly temperature is approximately 11.5°C during the winter (www.climate-data.org as cited in Lamprecht, 2020). Maximum daily temperatures can reach up to 48°C in the summer months and dip to as low as -8°C during the winter.

The climate of the area is typical of a semi-desert with very hot summers and cold winters.

The mean annual rainfall figures and evaporation figures where acquired from the South African Weather Service in Pretoria. Their long-term data was averaged out and condensed in Figure 6 of the Technical Design Report that is attached within Appendix D3 (Meiring, 2020).

5.1.1 Rainfall

Rainfall is predominantly in the summer months with a mean annual precipitation (MAP) of 183 mm/a reported for quaternary drainage region D73E (Visser, 2021).

5.1.2 Evaporation

The mean annual evaporation potential for D73E is c.2 650 mm (DWAF GRA-2, 2005). Average monthly evaporation values, recorded at Gauging Station G7E003 for the period October 1957 to September 2005, are shown in Figure 2-4 of the Geohydrology study (Appendix D1). The average evaporation rate recorded at Gauging Station G7E003 was 3 413 mm/a. As expected, highest evaporation rate (57%) is during the hot summer months from October to March. (Visser, 2021)

When the evaporation rates exceed the mean annual precipitation, the area is classified as being an arid region. (Meiring, 2020)

5.2 VEGETATION

The assessment area form part of the Kalahari Karroid Shrubland vegetation type (NKb5) due to the lack of a well-established grass layer and the dominance of dwarf karroid shrub species (Lamprecht, 2020).

This vegetation type is classified as least concerned (SANBI, 2006-2019) (Lamprecht, 2020).

The entire assessment area is classified as an Ecological Support Area (ESA) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province (Lamprecht, 2020).

ESA's are areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a Critical Biodiversity Area (CBA) or protected area or that play an important role in delivering ecosystem services (Collins, 2017).

The remaining majority northern and central portions of the assessment area constitute a slightly sloping undeveloped karroid shrubland which is in a slightly disturbed state and therefore scored a moderate PES value. The presence of surrounding infrastructure and agricultural developments to the east and south and the associated continued anthropogenic activities tend to cause an ecological 'edge effect' which negatively impacts on the urban/rural interface area and has subsequently slightly decreased the ecological integrity of these portions. (Lamprecht, 2020)

The south-eastern portion of the assessment area is in a highly disturbed and degraded state and is mainly dominated by weeds and legally declared invasive species. Significant dumping of vegetation debris and building rubble is also present within the most south-easterly corner of the assessment area. This portion is therefore not reminiscent of the natural climactic state of the relevant vegetation type and scored a very low Present Ecological State (PES) value. (Lamprecht, 2020)

The natural surface vegetation is transformed within the footprint area. The assessment area is also completely isolated to the east and south by existing infrastructure- and agricultural developments. The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the existing evaporation ponds' footprint areas is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within these footprint areas, will therefore not be practicably feasible. (Lamprecht, 2020)

A significant number of clusters of the provincially protected species *Aloe claviflora* as well as a sporadic individuals of the provincially protected species *Psilocaulon subnodosum* are present within the surrounding undeveloped areas (Lamprecht, 2020).

The individuals/clusters of provincially protected species, that fall within the final design layout footprint of the proposed WWEP, will be removed and adequately relocated to a suitable and similar area as to where they were removed from. This removal and relocation process must be completed prior to the commencement of any vegetation clearance- or construction activities. A Provincial Flora Permit has to be obtained prior to the commencement of any such removal and relocation activities and for the destruction of any other provincially protected species such as *Psilocaulon subnodosum*. (Lamprecht, 2020)

Eight individuals of the nationally protected tree species *Vachellia erioloba* have been left intact within- and directly adjacent to the two cultivated lands within the assessment area. A further eight individuals of this species are also present within the riparian zone along the length of the significant fourth order ephemeral watercourse. (Lamprecht, 2020)

Four small individuals of the nationally protected tree species *Boscia albitrunca* grow within the undeveloped northern and central shrubland portions of the assessment area. (Lamprecht, 2020)

One *Vachellia erioloba* and 3 *Boscia albitrunca* (Figure 13) individuals fall within the final design layout footprint of the proposed WWEP. A Protected Tree License will firstly have to be obtained from the Department of Agriculture Forestry and Fisheries (DAFF) for their removal, prior to the commencement of any such removal activities.

With the exception of the identified nationally and provincially protected species individuals/clusters as discussed above, no Red Data Listed-, provincially- or nationally protected species or any other species of conservation significance were found to be present within the northern and central shrubland portions of the assessment area. (Lamprecht, 2020)

The south-eastern portion of the assessment area is in a highly disturbed and degraded state and is mainly dominated by weeds and legally declared invasive species. (Lamprecht, 2020)

A significant fourth order ephemeral watercourse traverses the western portion of the assessment area and flows in a north-westerly direction. The watercourse possesses a distinct riparian zone which is mainly dominated by hydrophytic grass species but also houses a distinct woody component. (Lamprecht, 2020) Infrastructure cut the surface flow of the watercourse off from the Orange River, which is located approximately 1.7 km north of the assessment area. It now discharges into an agricultural field and canal system.

Figure 13: Occurance of *Boxcia albitrunca* and *Vachellia erioloba*

A very small ephemeral water drainage line also traverses the northern portion of the assessment area and flows in a westerly direction. It also discharges into the significant fourth order watercourse as discussed above. This small drainage line is not playing an important role in the local and regional water catchment. (Lamprecht, 2020)

The assessment area does not fall within any Important Bird Areas (IBA) as per the latest IBA map obtained from the Birdlife SA website (https://www.birdlife.org.za/what-we-do/important-bird-and-biodiversity-areas/media-and-resources/#1553597171790-6f83422a-a731). Sporadic nests of common resident bird species were observed within some of the very sparsely represented shrub and small tree individuals, but no important bird species, unique or specialised bird habitats were observed or are expected to utilise the northern and central shrubland portions of the assessment area for breeding and/or persistence purposes. The watercourse and its associated riparian zone however provide locally unique and distinct aquatic habitat attributes within the broader terrestrial landscape. It is therefore reasonably expected that this area is utilised by a variety of common and specialised bird species for breeding, foraging and persistence purposes. (Lamprecht, 2020)

Due to the surrounding operations of the raisin processing facility, the northern and central shrubland portions of the assessment area are subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise these portions for breeding and/or persistence purposes. (Lamprecht, 2020)

5.3 SURFACE WATER

The major surface water hydrological features within the study area consist of the perennial Orange River in the northern section (travelling past Upington), numerous non-perennial ponds and drainage lines scattered all over the area (Meiring, 2020).

The significant fourth order ephemeral watercourse that traverses the western portion of the assessment area and flows in a north-westerly direction is playing an important role in the local and regional water catchment and drainage towards the River. (Lamprecht, 2020)

The very small ephemeral water drainage line that discharges into the significant fourth order watercourse, as discussed earlier above, possesses no distinct riparian zone and merely a slight increase in the woody karroid shrub component is evident directly within the drainage line. (Lamprecht, 2020)

5.3.1 Water Management Area

The site is located within the quaternary drainage region D73E, which is c.386 670 ha in extent of the Lower Orange Water Management Area. (Visser, 2021)

5.3.2 Surface Water Hydrology – Catchments, surface flow and sediment regime

The size of the direct catchment area of the ephemeral watercourse where the CDR processing plant, evaporation ponds and associated infrastructure are located, is ~592 Ha (Figure 3).

The surface flow of this watercourse, downstream from the CDR evaporation ponds and outside of the Carpe Diem Group area of responsibility, have been impeded or cut off by several structures such as a secondary gravel road, an earth dam structure, canalised by the N10 national road and the canal system along the Orange River and effectively cut off from the Orange River by the agricultural developments along the Orange River (Figure 2).

The existing infrastructure and agricultural developments to the east and south of the assessment area, have continuously impeded the upstream catchment and drainage areas and the subsequent flow regimes of these smaller watercourses, over time. This has led to a gradual decrease in ecological functionality and -integrity of these smaller watercourses, over time. Therefore, although small intermittent portions of these watercourses still remain and possess certain watercourse attributes, they are not necessarily viewed as playing an important role in the local and regional water catchment anymore. (Lamprecht, 2020)

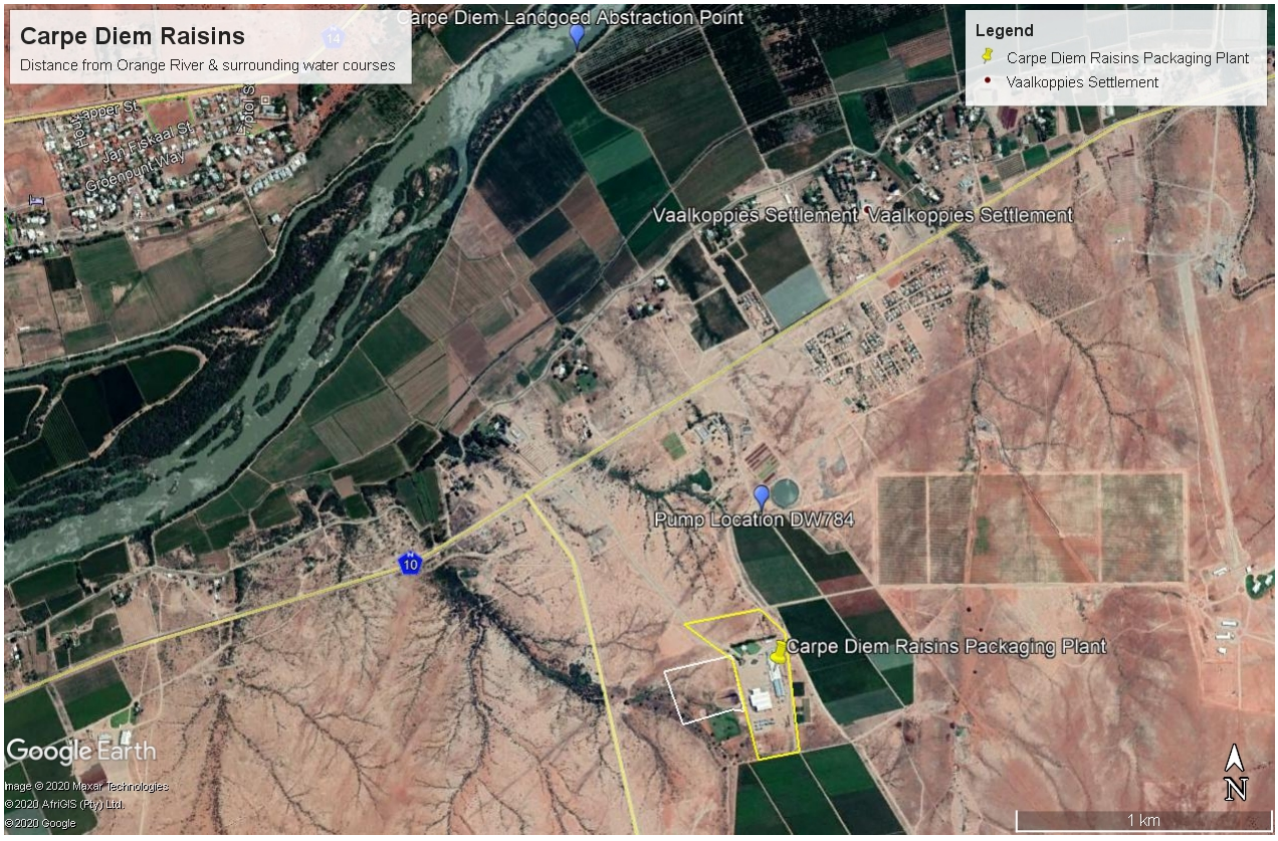

Figure 14: Distance from the Orange River to Carpe Diem Raisins (Google Earth, 2020)

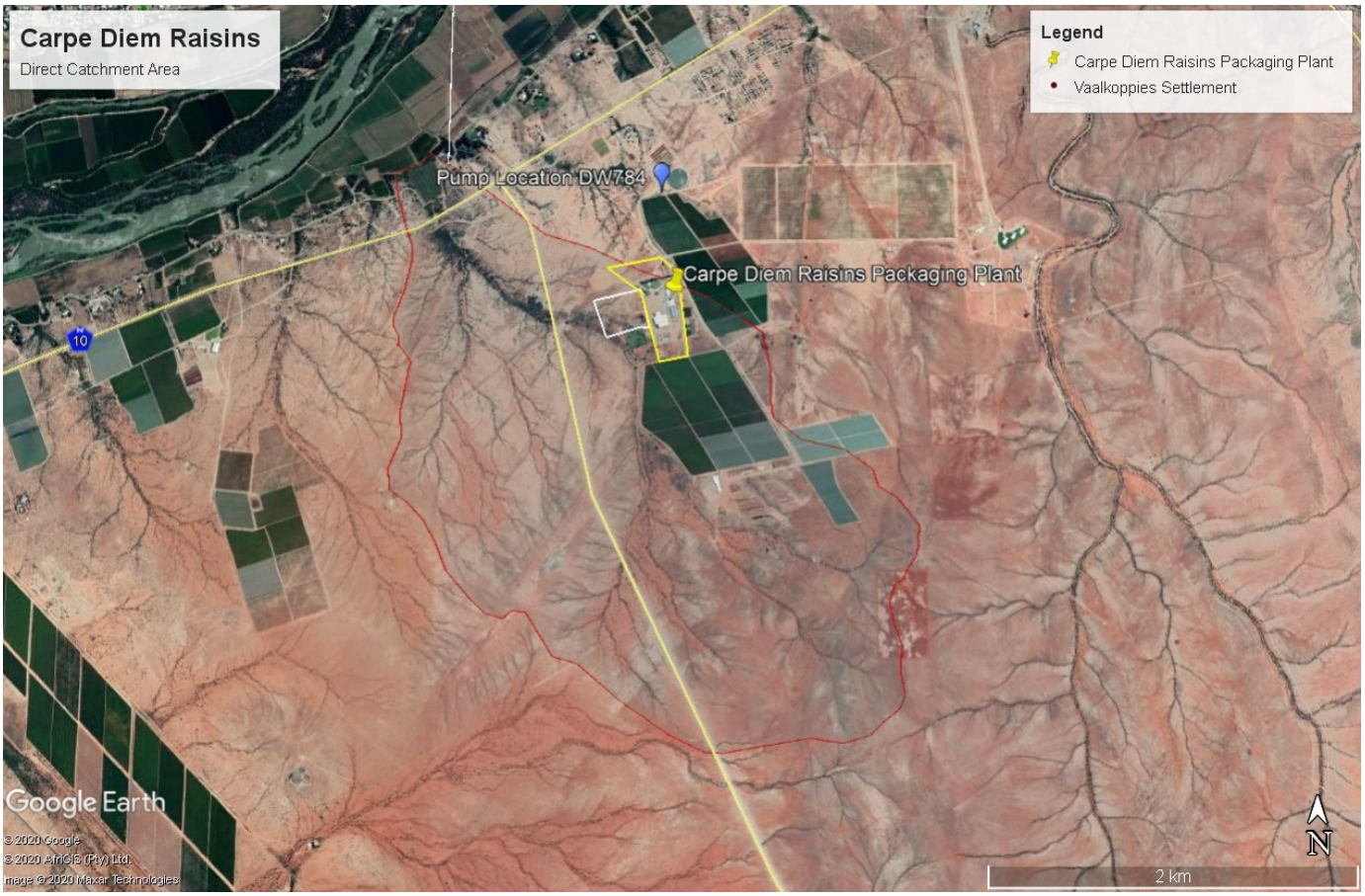

Figure 15: Direct catchment area where Carpe Diem Raisins are Located (Google Earth, 2020)

The very small ephemeral water drainage line also traverses the northern portion of the assessment area that flows in a westerly direction and discharge into the significant fourth order watercourse as discussed above is not playing an important role in the local and regional water catchment. (Lamprecht, 2020)

These streams still do have ecosystem functions such as flood attenuation, sediment trapping, provision of livestock grazing, water retention and water purification.

No significant soil erosion is currently evident within or around the assessment area. The entire assessment area possesses a slightly sloping topography. The area could therefore be prone to slight soil erosion due to the loosening of materials and vegetation clearance caused by construction activities. (Lamprecht, 2020)

The sediment transport is probably intermittent, and probably occurs during high rainfall events (i.e. rarely) only – hence and would manifest where localised slopes are steeper.

5.3.3 Resource Class and River Health, Receiving Water Quality Objectives and Reserve

5.3.3.1 Watercourses and Drainage Line

The Present Ecological State (PES) of the significant fourth order ephemeral watercourse is classified as Class B as it is largely natural. A small change in natural habitats and biota may have taken place mainly due to continued anthropogenic activities, but the ecosystem functionality has remained essentially unchanged. (Lamprecht, 2020)

The Ecological Importance and Sensitivity (EIS) of the significant fourth order ephemeral watercourse is classified as Class C (moderate) as it is viewed as being ecologically important and sensitive on local and provincial scale mainly due to it forming part of an Ecological Support Area (ESA), the significant presence of nationally protected tree species individuals as well as playing an important role in the local and regional water catchment and drainage towards the Orange River. Biodiversity is however still ubiquitous. (Lamprecht, 2020)

The significant fourth order ephemeral watercourse is therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem,

broader vegetation type, ESA, nationally protected species as well as the local and regional water catchment and drainage. (Lamprecht, 2020)

5.3.3.2 Undeveloped Northern and Central Portions of the Assessment Area

No significant change in soil structure or landscape topography or features is evident within the assessment area. These undeveloped northern and central portions of the assessment area will be discussed as reference areas. (Lamprecht, 2020)

Due to the surrounding operations of the raisin processing facility, the northern and central shrubland portions of the assessment area are subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise these portions for breeding and/or persistence purposes, or would necessarily have historically utilised the existing evaporation ponds' footprint areas. (Lamprecht, 2020)

Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the northern and central portions of the assessment area is classified as Class C as they are moderately modified. Moderate loss and transformation of natural habitat and biota have occurred, mainly due to continued anthropogenic activities, but the basic ecosystem functionality has still remained predominantly unchanged. (Lamprecht, 2020)

The Ecological Importance and Sensitivity (EIS) of the northern and central portions of the assessment area is classified as Class C (moderate) as they are viewed as being ecologically important and sensitive on local scale mainly due to them forming part of an Ecological Support Area (ESA) as well as the significant presence of provincially protected species individuals/clusters and the sparse presence of nationally protected tree species individuals. Biodiversity is however still ubiquitous. (Lamprecht, 2020)

The northern and central portions of the assessment area are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA as well as provincially and nationally protected species. (Lamprecht, 2020)

The broader areas surrounding the assessment area, which are associated with the relevant vegetation types, are however extremely vast and also largely natural and undeveloped. The size of the proposed development is therefore minute relative to the surrounding natural region. (Lamprecht, 2020)

5.3.3.3 Transformed and Degraded Portions within the Assessment Area

The historic construction of the existing evaporation ponds has completely transformed all previously existing natural surface vegetation within their footprint areas. The assessment area is also completely isolated to the east and south by existing infrastructure- and agricultural developments. The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the existing evaporation ponds' footprint areas is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within these footprint areas, will therefore not be practicably feasible. (Lamprecht, 2020)

Two cultivated lands which are used for livestock grazing purposes, are present within the southern portion of the assessment area. The cultivation of these lands has also virtually completely transformed all previously existing natural surface vegetation within their footprint areas. (Lamprecht, 2020)

The south-eastern portion of the assessment area is in a highly disturbed and degraded state and is mainly dominated by weeds and legally declared invasive species. The presence of surrounding infrastructure and agricultural developments to the east and south and the associated continued anthropogenic activities tend to cause an ecological 'edge effect' which negatively impacts on the urban/rural interface area and has subsequently significantly decreased the ecological integrity of this portion. Significant dumping of vegetation debris and building rubble is also present within the most south-easterly corner of the assessment area. This portion is therefore not reminiscent of the natural climactic state of the relevant vegetation type. (Lamprecht, 2020)

Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS)

The Present Ecological State (PES) of the transformed and degraded portions of the assessment area is classified as Class E as they are seriously modified. The loss of natural habitat, biota and basic ecosystem functionality is extensive due to continued anthropogenic activities. The basic ecosystem functionality has virtually been destroyed and sufficient ecological restoration will prove to be very difficult. (Lamprecht, 2020)

5.3.4 Ecological Site Sensitivity

The site sensitivity map on page 37 of the ecology study (Appendix D1) illustrates the locations of the significant watercourse, the small water drainage line and their associated buffer zone as well as the identified sixteen individuals of the nationally protected tree species *Vachellia erioloba* and the four individuals of the nationally protected tree species *Boscia albitrunca*. (Lamprecht, 2020)

The new WWEP will affect three individuals of the tree species *Vachellia erioloba.* Licence applications will be submitted to the Department of Forestry for these protected trees. Should the Forestry Department consider the application favourably, any stipulations in such a licence by the Forestry Department to replace these trees, will be adhered to by the developer.

5.4 GROUNDWATER

5.4.1 Topography and Drainage

The site is located within the quaternary drainage region D73E (Visser, 2021).

Regionally, the topography of the site and surrounds slopes in a northwesterly direction towards the Orange River, which is c.2 km northwest of the site. Drainage is therefore towards the Orange River at elevation c.795 mamsl. (Visser, 2021)

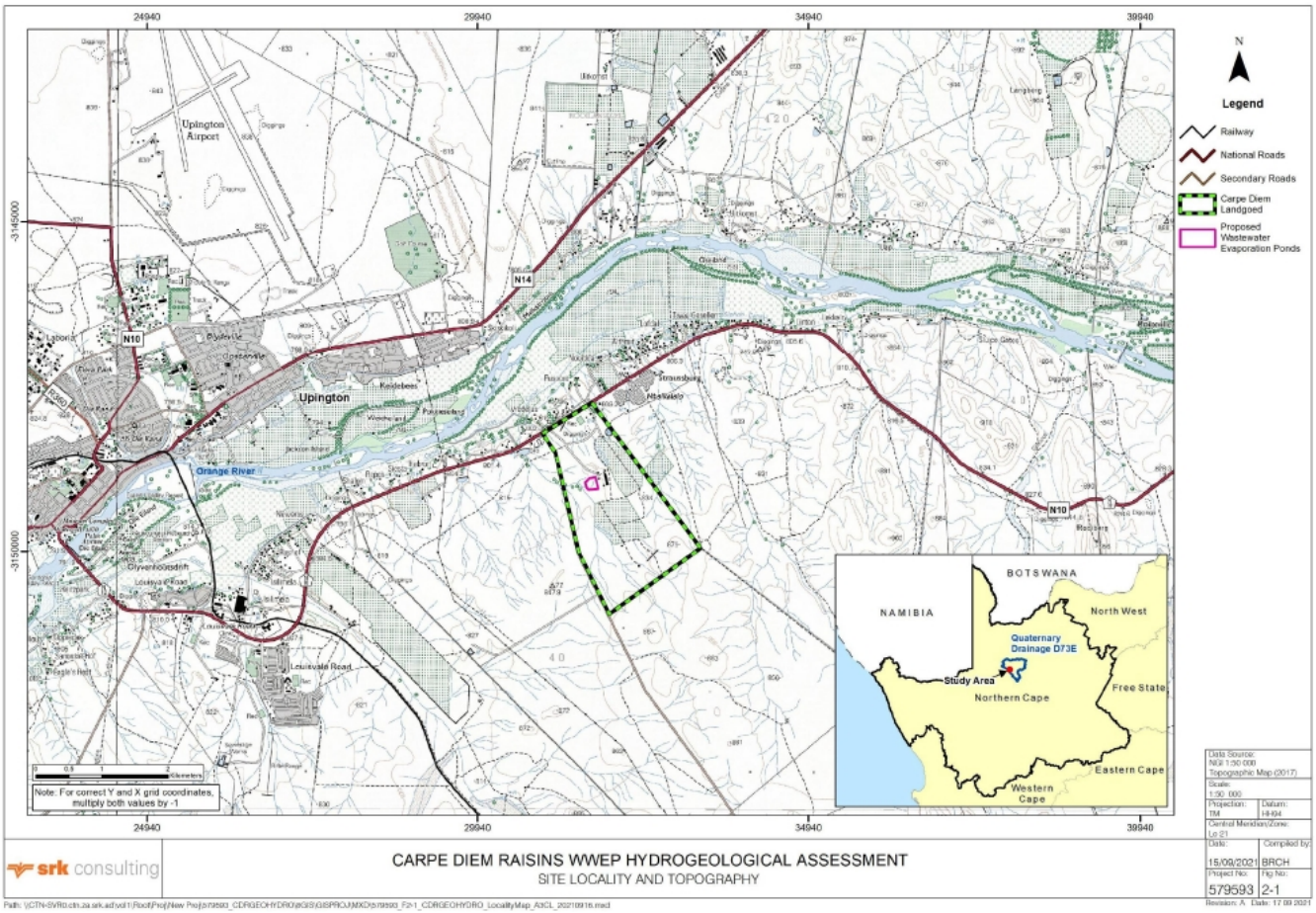

Figure 16: CDR WWEP Hydrogeological Assessment Site Locality and Topography (Visser, 2021)

Locally the site is flat, with elevations varying from c.820 mamsl at its southeastern corner to c.811 mamsl at its northwestern border near a local non-perennial drainage course. Regionally, the average regional slope from the site's southeastern boundary towards the perennial Orange River in the northwest is c.1.6%. (Visser, 2021)

5.4.2 Groundwater Recharge

Effective mean annual groundwater recharge of 0.23 mm/a and <1 mm/a from the Lower Orange WMA groundwater EWR report (Visser, 2021).

5.4.3 Groundwater Availability Assessment

The site has extremely low groundwater resource potential of the granite underlying site and surrounds. (Visser, 2021)

5.4.4 Groundwater quality

Groundwater in this area typically is of poor quality with a noticeable salty taste (Visser, 2021). The groundwater quality, measured as EC (salinity), at the site and surrounds ranges between 70 and 300 mS/m. (Visser, 2021)

5.4.5 Unsaturated Zone

The unsaturated zone at the site is inferred to extend to a depth of c.15 to 20 mbgl consisting of an upper c.1 m overburden of sandy soil and calcrete followed by weathered to fresh granite of the Straussburg Granite. The average water level depth reported for D73E is 41.9 mbgl (GRA-2, DWAF, 2005). There are no boreholes on, or near (5 km radius) the site. The DWS 2017 report indicated average depth to rest water level for D73E as 40 – 60 mbgl. (Visser, 2021)

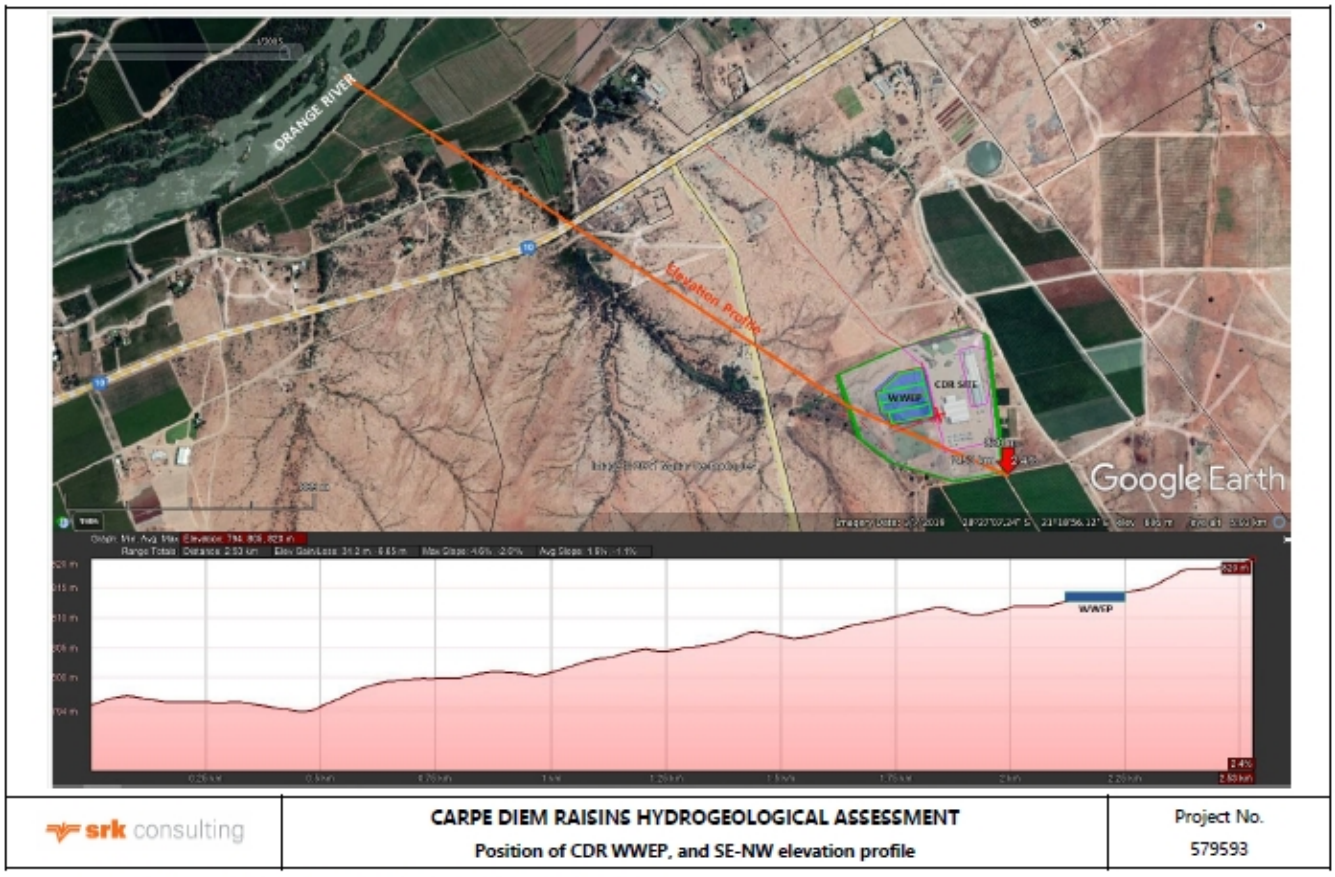

Figure 2-2: Position of the CDR WWEP and SE-NW elevation profile

Figure 17: Position of the CDR WWEP and SE-NW Profile (Visser, 2021)

5.4.6 Saturated Zone

The saturated zone consists of weathered to fresh granite bedrock. At the site, the saturated zone is inferred to extend from c.15 to 20 mbgl to a depth of c.238 mbgl. (Visser, 2021)

5.4.7 Hydraulic Conductivity and Storativity

The very low recharge rate reported for the GRU in which the site is located, is related to a very low vertical hydraulic conductivity and a deep water table. The storativity is low. (Visser, 2021)

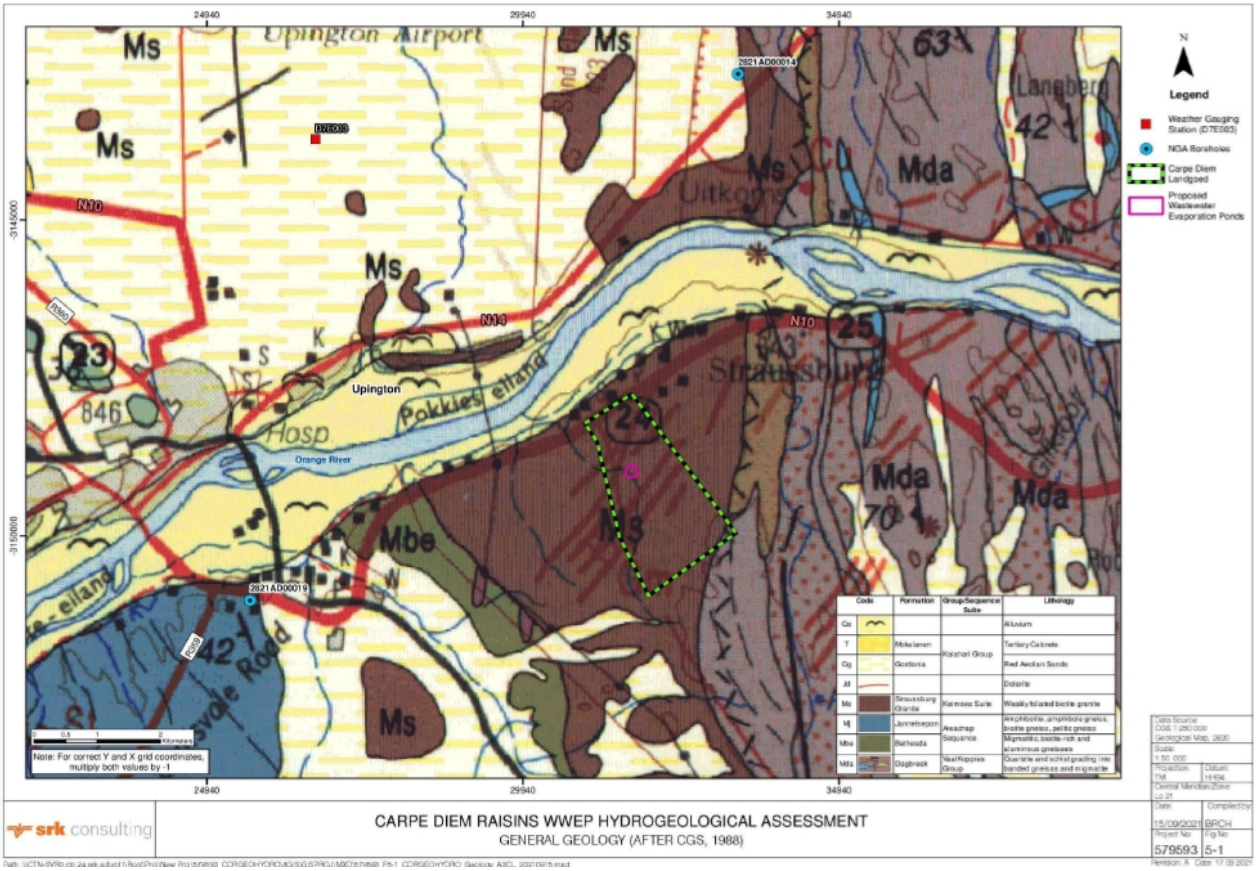

Figure 18: CDR WWEP General Geology (Visser, 2021)

5.4.8 Groundwater Levels

Groundwater levels for this area are 15 – 20 mbgl. Groundwater contours are expected to mimic the topography to a certain extent, with deeper water levels in the higher lying areas and shallower levels closer to the lower lying Orange River. Groundwater flow at the site and its surrounds is inferred to be from the higher lying area in the southeast towards the Orange River in the northwest. Note: The groundwater component of baseflow is zero. Therefore, the Orange River is inferred to be a "losing river" here, i.e., the groundwater table is below the base of the river channel and river water is slowly percolating down to the deeper groundwater table. (Visser, 2021)

The average seasonal piezometric water level variation is 10 m . (Visser, 2021)

5.4.9 Groundwater Potential Contaminants

Naturally occurring salinity concentrations in the groundwater is elevated in certain areas and exceeds drinking water limits, especially boreholes drilled near pans, where evaporation concentrates the salts washed with storm water runoff into the pans. (Visser, 2021)

The wastewater derived from washing the raisins, as well as cleaning purposes, has a high organic content due to natural sugars occurring in the fruit (BVi Consulting Engineers, 2012). Analysis of the wastewater at Bemlab indicated the following parameters of concern (BVi Consulting Engineers, 2012):

- pH: 3.90
- Chemical Oxygen Demand (COD): 26 150 mg/L measured as O
- Phosphates: 73.26 mg/L measured as P
- Potassium: 500 mg/L measured as K

Trace metals concentrations of the wastewater are low, with only Iron (Fe) showing an elevated concentration of 4.32 mg/L. Wastewater of this poor quality cannot be discharged directly to the soil or natural environment, therefore BVi recommended disposal to lined evaporation ponds (BVi Consulting Engineers, 2012).

5.5 AQUIFER CHARACTERISATION

The site zoning for this area is b2, i.e., fractured-rock aquifers, as intergranular aquifers are known to be confined to small areas underlain by thin alluvial deposits along some of the dry water courses. These perched intergranular aquifers are also mostly seasonal with no groundwater present during dry periods. (Visser, 2021)

Its present status category is B with low protection priority. The aquifer type is 'Poor' with 'Low' vulnerability. (Visser, 2021)

5.5.1 Groundwater Vulnerability

Aquifer vulnerability is defined as the likelihood for contamination to reach a specified position in the groundwater system after being introduced at some point above the uppermost aquifer. (Visser, 2021)

The site's vulnerability rating is 'Low'. (Visser, 2021)

5.5.2 Aquifer Classification

The aquifer in the site area is classified as a 'Poor' aquifer system. (Visser, 2021)

Aquifer Protection Classification

The fractured-rock aquifer at the site has 'low sensitivity' due to being classified as a Poor aquifer with Low vulnerability. Limited protection is therefore required, which will primarily include inhibiting discharge of large amounts of poor-quality wastewater in a manner to limit potential contamination of this local aquifer. (Visser, 2021)

Groundwater Flow Directions

The groundwater elevation generally mimics the surface elevation contours and generally flows from higher lying to lower lying areas. The inferred flows are from the higher lying areas to the south northwards towards the Orange River. The general direction of groundwater flow may locally be diverted by zones of higher permeability such as faults.

Table 1: Stratigraphy and lithology of the site area (after 1:250 000 Geological Series Sheet Upington 2820)

Code	Formation	Group/Sequence/Suite	Lithology
Qs			Alluvium
T	Mokalanen	Kalahari Group	Tertiary Calcrete
Qg	Gordonia		Red Aeolian Sands
Jd			Dolerite
Ms	Straussburg Granite	Keimoes Suite	Weakly foliated biotite granite
Mj	Jannelsepan	Areachap Sequence	Amphibolite, amphibole gneiss, biotite gneiss, pelitic gneiss
Mbe	Bethesda		Migmatitic, biotite-rich and aluminous gneisses
Mda	Dagbreek	Vaalkoppies Group	Quartzite and schist grading into banded gneiss and migmatite

5.6 GEOLOGY

The site and surrounds are underlain by c.1 m of shallow sandy soil and calcrete (Photo 5-1) of the Kalahari Group, while the dry water courses are underlain by thin deposits of poorly sorted alluvial sand, pebbles, and clay. Bedrock beneath this thin overburden comprises weakly foliated biotite granite of the Straussburg Granite, Keimoes Suite, Namaqua Metamorphic Complex . The Straussburg granites are characterised by exfoliation-type weathering forming granitic domes. (Visser, 2021)

A brief description of the geology underlying the site is presented in Table 1: Stratigraphy and lithology of the site area and the geology is depicted in Figure 18: CDR WWEP General Geology . (Visser, 2021)

5.7 HERITAGE RESOURCES

A Phase 1 Heritage Impact Assessment was carried out over an approximately 5.5 ha area designated for industrial development on the farm Vaalkoppies 40 near Upington in the Northern Cape Province. (Rossouw, 2021)

The site is underlain by palaeontologically insignificant metamorphic rocks. (Rossouw, 2021)

The proposed development footprint within a degraded area because of the previously established ponds and associated agricultural activities. The site is capped by gritty to gravelly top soils, that varies between an admixture of weathered bedrock gravel and calcretes exposed towards the north and Quaternary-aged wind-blown sands with associated alluvium-accumulated drainage lines in the south. (Rossouw, 2021)

Impact on potential palaeontological heritage resources within more developed superficial sediments (overlying Quaternary sediments) along gullies and drainage lines is considered unlikely. (Rossouw, 2021)

The field assessment provided no aboveground evidence of prehistoric structures, buildings older than 60 years, graves or material of cultural significance or in situ archaeological sites within the study area. (Rossouw, 2021)

The proposed development footprint is not considered palaeontologically or archaeologically vulnerable and is assigned a site rating of Generally Protected C (GP.C). (Rossouw, 2021)

5.8 CONCLUSION

In accordance with the recent re-evaluation of the evaporation ponds' parameters by the appointed engineer, it was concluded that a minimum 1.8 ha surface area is required for the proposed new evaporation ponds in order to ensure sufficient capacity for adequate storage and containment of the process waste water volumes received from the raisin processing facility. (Lamprecht, 2020)

The alternative development area of approximately 1.8 ha, have been selected by the engineer which fall outside the watercourse and drainage line buffer zone with a portion located within the undeveloped northern and central shrubland of the assessment area (Appendix C3). This location was selected due to the fact that a section has already been disturbed rather than select an entire new area that would degrade that area too. It is also near to the raisin processing plant that would assist in good management and control. The proximity would also reduce pumping costs to the evaporation ponds. The area is very suitable to develop a proper evaporation pond system due to the topography related to the raisin processing facility.

The proposed WWEP will in all probability completely transform the majority of the existing natural surface vegetation on the portion of the assessment area used for the development (Lamprecht, 2020).

The broader areas surrounding the assessment area, which are associated with the relevant vegetation types, are however extremely vast and also largely natural and undeveloped. The size of the proposed development is therefore minute relative to the surrounding natural region. (Lamprecht, 2020)

SECTION 6: SOCIO-ECONOMIC ENVIRONMENT

The Northern Cape is geographically the largest province in South Africa having a land mass increased from 361,830 km² to 373,239 km² with the introduction of the new provincial boundaries and covers approximately one third of the country's surface area.

The midyear population estimates for 2001 was 822,829, which was 1.9% of the total population of South Africa (Stats SA, 2001). The population has increased by 33% from 2001 (822,829) to 2006 (1,094,500) resulting in an increase in the population density, of a still sparsely populated province, from 2.27 to 2.93 persons per km². (Stats SA, 2019)

The development is situated in the Dawid Kruiper Local Municipal and The ZF Mgcawu District Municipal areas (DC 8) and its main office is located at Upington. It has a size of more than 65 000km² and a population of 200 000. The ZF Mgcawu district lies in the mid northern section of the Northern Cape.

The main social challenges experienced within the district include:

- Low or no economic growth rate that limits the material needs of communities;
- negative population growth rate due to urbanisation;
- lack of job creation and training institutions in the province resulting in high unemployment rates;
- poor primary education;
- a desperate need for social activities, services, and youth development; and
- lack of basic services including sanitation.

Due to the lockdown imposed during the Covid 19 pandemic of 2020, the socio-economic challenges worsened drastically.

6.1 ORGANISATIONAL STRUCTURE

The key responsible positions related to the water and environmental management is the managing director, financial manager also responsible for compliance to environmental legislation, marketer and logistics that is responsible for environmental awareness and communication with customers, factory and production manager responsible for efficient processes, maintenance manager also responsible for water monitoring, group technical and environmental manager, and the technical advisor that is also responsible for environmental awareness of producers and suppliers.

6.2 RESOURCES AND COMPETENCE

The Environmental Management System (EMS) that is implemented and operated at CDR address the actions that should be implemented to ensure the competent management of the resources used and impacted upon by this development including the responses during environmental incidents and accidents (Appendix J3.3).

6.2.1 Economic Factors

The raisin processing plant:

- promote the local economy development;
- create new job opportunities;
- is part of a highly standardized sector;
- contribute to the import of expertise;
- benefit from proven safety and reliability; and
- promote food security.

Employment opportunities created have long-term positive impacts that improve the lives of individuals and families locally. The majority of employment opportunities are offered to local workers that is trained in the different skillsets that such a plant requires.

Most of the goods, materials and services are procured locally that result in positive indirect socio-economic impacts.

6.3 EDUCATION AND TRAINING

The majority of employment opportunities are offered to local workers that is trained in the different skillsets that such a plant requires.

Environmental education and awareness training is addressed in the EMS (Appendix J3.3).

6.4 ENVIRONMENTAL AWARENESS PLAN

Environmental education and awareness training are addressed by the EMS (Appendix J3.3).

The objective of the environmental awareness plan is to ensure that:

- Training needs are identified and all personnel whose work may create a significant impact upon the environment are to receive the appropriate training.
- All employees to be made aware of the impact of their activities.
- Procedures are established and maintained to make employees aware of:
- The significant environmental impacts (actual or potential) of their work activities and environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving conformance with environmental policies, procedures, and any implementation measures.
- The potential consequences of departure from specified operation procedures.
- Personnel performing tasks that can cause significant environmental impacts, are competent in terms of appropriate education, training and / or experience.

Environmental awareness will be part of the existing training and development plan. Key personnel with environmental responsibilities will be identified and the following principles will apply:

- Procedures will be developed to facilitate training of employees, on-site service providers and contractors.
- Environmental awareness will focus on means to enhance the ability of personnel and ensure compliance with the environmental requirements.
- Top management will build awareness and motivate and reward employees for achieving environmental objectives.
- Environmental policies will be availed to contractors.
- Environmental inductions will be conducted for employees, contractors and visitors.
- There will be an ongoing system of identifying training needs.

General environmental awareness training as part of the induction should focus on the following:

- General environmental awareness.
- The policies and vision concerning environmental management.
- Legal requirements.
- Construction activities and their potential impacts.
- Different management measures to manage identified impacts.
- Personnel's role in implementing environmental management objectives and targets.

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

It is the responsibility of management to ensure that all employees, contractors and visitors are trained to understand the impacts of their tasks on the environment and to reduce them wherever possible. Environmental awareness should be part of the existing training and development plan.

Key personnel with environmental responsibilities should be identified and the following principles should be applied:

- Procedures should be developed to facilitate training of employees, on-site service providers and contractors.
- Environmental awareness should focus on means to enhance the ability of personnel and ensure compliance with the environmental requirements.
- Top management should build awareness and motivate and reward employees for achieving environmental objectives.

- There should be an ongoing system of identifying training needs.
- An environmental, health and safety induction programme should be provided to all employees, contractors and visitors prior to commencing work or entering the site, and they should sign acknowledgement of the induction. An attendance register and agenda/programme should be filed for each induction.
- "Toolbox talks" should be held regularly, which will include discussions on health, safety and environmental considerations. The toolbox talks should be led by the site manager or the appointed supervisor/s.
- Refresher training should also be given to permanent employees and long-term contractors on a regular basis, to ensure that all are competent to perform their duties, thereby eliminating negative impacts on their safety, health and environment.

General environmental awareness training as part of the induction should focus on the following:

- General environmental awareness, which incorporates environmental, ecological and heritage elements.
- The developer's and/or EPC's policies and vision concerning environmental management.
- Legal requirements.
- Construction and O&M activities and their potential impacts.
- Different management measures to manage identified impacts.
- Personnel's role in implementing environmental management objectives and targets.

Environmental awareness topics to be covered in training should include:

- Natural resource management and conservation;
- Biodiversity awareness and conservation principles;
- Heritage resource awareness and preservation principles;
- Hazardous substance use and storage;
- Waste management; and
- Incident and emergency actions and reporting.

SECTION 7: APPROACH TO THE ENVIRONMENTAL STUDY

Environmental Impact Assessments, when conducted with the purpose of obtaining Environmental Authorisation for a development activity, are regulated. South African Environmental Law is grounded in the Constitution of South Africa (Act No. 108 of 1996). The Bill of Rights states that everyone has a right to a non-threatening environment and requires that reasonable measures are applied to protect the environment. This protection encompasses preventing pollution and promoting conservation and environmentally sustainable development.

The National Environmental Management Act (NEMA, Act 107 of 1998) expands on and specifies these principles. The act states that the principles of Integrated Environmental Management (IEM) should be adhered to in order to ensure sustainable development. Accountability to the various parties that may be interested in and/or affected by the proposed development forms an integral part of the IEM procedure. This procedure requires public participation, starting during the application phase, when the application for authorisation is submitted to the competent authority and continued through the environmental impact assessment decision making phases. The purpose of the IEM procedure is to ensure that the environmental consequences of a development proposal are understood and adequately considered and that negative aspects are resolved or mitigated and positive aspects enhanced.

An investigation with regard to the environmental impacts associated with the proposed development is being conducted in compliance with the Environmental Impact Assessment Regulations published in Government Notices R 982 to R 985, promulgated on 4 December 2014 in terms of the National Environmental Management Act (Act No. 107 of 1998) (as amended).

The Environmental Impact Assessment Process is being conducted by identifying the scope and conducting an Environmental Impact Assessment (EIA), including an Environmental Management Program (EMP).

The potential direct, indirect and cumulative property/activity/design/technology/operational alternative related impacts (as appropriate) are listed that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed.

The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed.

In addition to its function as a decision-making aid in terms of environmental authorisation, an EIA is an effective planning and decision-making tool for the project developer as it allows for the identification and management of potential environmental impacts, as well as the identification of other applicable legislation that must be considered and adhered to.

7.1 METHODOLOGY OF THE ENVIRONMENTAL IMPACT ASSESSMENT

The study describes the preliminary decision-making processes with regard to the project, including the investigation of development alternatives and the selection of preferred alternatives. The specific activities expected to form part of the proposed development are also described.

The study provides a description of the receiving environment and investigates how this environment may be directly, indirectly and cumulatively affected by the proposed development. Potentially significant impacts (both social and biophysical) that may result from the construction, operation and maintenance phases of the proposed development are identified.

An Impact Matrix (Appendix F1) is used to determine any positive and/or negative impacts, whether direct, indirect or cumulative, that the proposed activities and development in this area may pose to the environment and people in the vicinity. Proposed mitigation through design and/or operational changes, as well as the significance of the impact thereafter is being investigated.

The nature of the activity, extent, duration, intensity, and probability of the direct, indirect and cumulative identified impacts are assessed. These parameters are used to establish the significance of the impact of an activity that will

take place or is already taking place. The parameters are then compared to the level of significance in the Significance Rating Scale.

The EIA phase provides an overall social, economic and biophysical assessment of the environment surrounding the proposed development, as well as a detailed assessment of the site for development, in terms of environmental criteria. It also provides a discussion of alternatives to the proposal, which would meet the stated need for the activity, and ways to reduce the impact of the project by imposing mitigating measures. Significant impacts identified are rated and appropriate mitigation measures for potentially high environmental impacts are recommended in the EMP.

The objective of the EIA is to provide environmental authorities with sufficient relevant and objective environmental information to make an informed decision regarding the proposed project.

7.2 SPECIALIST STUDIES

Specialist studies were conducted on the study areas comprised of:

Table 2: Specialist Studies - CDR WWEP

Study	Specialist	Appendix #
Engineering Survey Report	LJCC Engineering Surveys	C2
Hydrogeological Assessment Report	SRK Consulting	D1
Ecology Report	EcoFocus Consulting	D2
PES & EIS Risk Assessment (WULA)	EcoFocus Consulting	D2.2
Engineering Design Technical Report	Bvi Consulting Engineers	D3
Land Use Change Application	Makroplan Town & Regional Planners	D4
Rehabilitation Plan	Van Zyl Environmental Consultants	D5
Heritage Impact Assessment	Paleo Field Services	D6

SECTION 8: IMPACT ASSESSMENT

An environmental impact matrix (Appendix F1) was used to identify possible positive and negative environmental issues for the planning, construction, operation and maintenance, and decommissioning phases. The following possible environmental elements were identified to be addressed in this study:

- water resources;
- soil and agricultural potential (risk of erosion linked to topography of area, land use potential and restriction of land use);
- ecology and biodiversity (impacts on ecology, flora and fauna and avifauna);
- social aspects on the macro-, meso-, and microlevel;
- visual quality and aesthetics;
- economic impacts (mostly positive);
- noise (construction, upgrading and decommissioning phases);
- air quality;and
- heritage resources.

The ecologist, hydrogeologist and heritage specialist investigated the impacts on the water resources; soil, ecology and biodiversity as well as the heritage resources.

The identified possible impacts and possible cumulative effects are being discussed in detail in the Report.

Regulatory and mitigatory measures with regard to these impacts have also been stipulated in a comprehensive EMP (Appendix G), which forms part of the Report.

8.1 PLANNING AND DESIGN PHASE ALTERNATIVES (PREFERRED ALTERNATIVE)

The development area of approximately 1.8 ha, have been selected by the engineer which fall outside the watercourse and drainage line buffer zone with a portion located within the undeveloped northern and central shrubland of the assessment area (Appendix C3). This location was selected due to the fact that a section has already been disturbed rather than select an entire new area that would degrade that area too. It is also near to the raisin processing plant that would assist in good management and control. The proximity would also reduce pumping costs to the evaporation ponds. The area is very suitable to develop a proper evaporation pond system due to the topography and climate related to the raisin processing facility.

It is recommended that the ponds be lined with an impermeable membrane such as a 1mm thick welded HDPE liner. The alternative is that the process water be pre-treated to an acceptable level of organic content and then irrigated or discharged (Meiring, 2020).

Direct impacts:

Poorly planned and designed wastewater treatment works can cause construction and possibly later operation and maintenance difficulties that can delay construction, cause management problems during operations, be expensive to rectify and cause environmental damage such as soil and possibly groundwater contamination (cost to the environment). This may lead to legal and later financial impacts to the client, the consulting engineer as well as the contractor/s.

Indirect impacts:

The above aspects may lead to a delay in the replacement of the old WWEP and construction of the new WWEP and associated infrastructure that would delay the compliance to the WUL.

Cumulative impacts:

Should poor planning cause delays to the construction of the new WWEP, the risk will increase that DWS will issue a directive which will have a legal and financial impact.

Mitigation:

Alternatives need to be considered with regards to the BATNEEC principle (Best Available Technology Not Exceeding Excessive Cost).

Proper planning to be done by relevant skilled people to identify the infrastructure, technology & processes, available resources and resources needed, identify and acquire persons with the required technical competence, and plan the timing of the implementation and operation of the WWEP system.

Land surveying and delineation of infrastructure as well as construction area should be done considering to minimise the removal of the protected trees and vegetation on site and search, rescue and transplanting of protected species, where possible, should be done prior to any construction activities.

The fourth order ephemeral watercourse should be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer must be placed around the watercourse and no development is allowed to take place within the buffered zone. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the watercourse. (Lamprecht, 2020)

The small ephemeral water drainage line, which traverses the northern portion of the assessment area, should be adequately buffered out of the proposed development footprint area. A minimum approximately 32 m buffer must be placed around the drainage line and no development is allowed to take place within the buffered zone. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the watercourse and drainage line. (Lamprecht, 2020)

A recommended development area of approximately 1.8 ha in size has been selected which should result in the least negative ecological impact on the surrounding undeveloped environment. This recommended area falls outside the recommended watercourse and drainage line buffer zone and is mainly confined to the transformed and degraded areas of the assessment area while only a small portion is located within the undeveloped northern shrubland portion. (Lamprecht, 2020)

The broader areas surrounding the assessment area, which are associated with the relevant vegetation types, are however extremely vast and also largely natural and undeveloped. The size of the proposed development is therefore minute relative to the surrounding natural region. (Lamprecht, 2020)

The new WWEP will affect protected tree and vegetation species. Licence applications will be submitted to the Department of Forestry for these protected trees. Should the Forestry Department consider the application favourably, any stipulations in such a licence by the Forestry Department to replace these trees, will be adhered to by the developer.

8.2 "NO-GO" ALTERNATIVE

The 'do nothing' alternative is the option of not undertaking the replacement of the WWEP. Should this alternative be selected, it would have local and broader impacts. It would entail maintaining the *status quo.*

The use of the new WWEP technology is the least expensive of the options investigated.

In the long term the new WWEP will add socio-economic value to the local and broader communities due to the continued direct and indirect provision of jobs. This would not be the case if the WWEP are not replaced as DWS will issue a directive and stop operations.

The 'do nothing' alternative is not a preferred alternative in this application.

Direct impacts:

The "no-go" alternative will have a definite impact on the environment due to the fact that the current WWEP is overloaded, degraded and not lined to prevent seepage. There is therefore a possibility that water resources, soil and groundwater may be impacted currently and will be continuing should the system not be implemented. The remedial action may have legal and financial implications to the developer and CA.

Indirect impacts:

Deciding not to proceed with the development would have a negative impact on the biodiversity, water resources and socio-economic development of the area.

Cumulative impacts:

The construction of the new WWEP is required to comply with the stipulations of the WUL and NWA. This will have a further legal and financial risk to the developer and CA assessing this application as DWS is awaiting the urgent replacement of the old WWEP and will issue a directive and proceed with legal action should this not be done.

8.3 CONSTRUCTION PHASE ALTERNATIVES (PREFERRED ALTERNATIVES)

Activities that may have an impact on the environment during the construction phase:

Some impacts associated with the project would only be effected during the construction phase and the action would thus be temporary in duration. However, actions performed during the construction phase may cause pollution that would have longer lasting effects on the environment.

Construction phase impacts are therefore investigated further during this phase, especially with a view to limit and mitigate lasting effects. The activities associated with the construction phase is listed in Section 2 point 2.2.1.

8.3.1 Water Resources:

Impacts (Direct, Indirect and Cumulative):

Potential impacts associated with the Construction phase include:

- Surface Water Pollution and Quality Degradation;
- Ground Water Pollution;
- Hydrology
- impact on infiltration;
- change in storm water drainage;
- catchment areas;
- ponding; and
- change in amount and velocity of runoff.

8.3.1.1 Surface Water/Hydrology

The water usage during the construction phase is mainly for construction of concrete foundations and potable water. A concrete batching plant could possibly be erected on site should a large amount of concrete be required for the construction of the works.

Potable water would be supplied via a small trailer or 20 litre containers where personnel are working depending on the size of the workforce.

Open water do not occur within the study area and rainfall is very low but heavy thunderstorms occur in summer that could mobilise spilled contaminants to other areas and also cause ingress. Water enlarges the area of contamination significantly and after ingress or dissipation of the water soil pollution emanates in another area.

The construction of the WWEP system, new access road and associated infrastructure would create some impervious areas. This would cause local changes to infiltration, but storm water drainage would disperse this on site.

The runoff generated by rainfall on a soil surface is dependent on the intensity and duration of the rainfall, combined with the infiltration capacity of the soil. It is not likely that the proposed new infrastructure would have any significant impact on runoff, as the area surrounding would retain its soil and topographical characteristics. When runoff occurs in this arid environment, it occurs as storm flow, subsiding quickly, with the stream channel reverting to its normal dry condition. Thus it is also likely that there would be no effect on stream flow.

The earthworks on site would not present long term impacts should the soil erosion mitigation measures be implemented. Impacts on plant growth will be short termed should the stipulated prevention and mitigation measures be implemented.

The proposed development could potentially add to the cumulative impeding and contamination of the local and regional water catchment and drainage along with the existing infrastructure and agricultural developments. The

impeding and contamination of the flow regimes of the significant fourth order ephemeral watercourse and the northern drainage line is therefore viewed as a potentially significant cumulative impact which can be caused by the proposed development. (Lamprecht, 2020)

8.3.1.2 Ground Water

The following potential direct construction phase impacts on groundwater were identified:

G1: Reduction in Groundwater Quality.

1. Contamination of the groundwater resources by fuel and oil spills from construction vehicles.

There is a slight risk of contamination of the aquifer by accidental spillages of hydrocarbons from construction machinery. This potential impact is rated as very low and can be mitigated to insignificant by good housekeeping and regular maintenance of the vehicles. The fractured-rock aquifer is naturally protected against these potential contaminants by a deep water table of 15 to 20 mbgl and a shallow, very low permeable granitic bedrock. (Visser, 2021)

These impacts are assessed to be of very low significance that can be mitigated to Insignificant

Best practice groundwater mitigation measures during construction are as follows (Visser, 2021):

- Minimise storage of hazardous substances onsite during construction;
- Service construction vehicles at a commercial service station;
- Maintain vehicles to limit the potential for accidental hydrocarbon spillages;
- Encourage contractors to report, react and manage all spills and leaks so that any subsequent spills can be cleaned up immediately to prevent contamination of the groundwater.

8.3.1.3 Mitigation Measures

Mitigation measures pertaining to water resources are contained in the following sections of the EMP (Appendix G)

- Preconstruction phase
    - Planning of layout
    - Provision for Groundwater Monitoring
- Construction phase
    - handling stockpiles
    - oil and chemicals
    - cement and concrete batching
    - provision of storage facilities for dangerous and toxic materials
    - bulk storage of fuels and oils
    - use of dangerous and toxic materials
    - toilets and ablution facilities
    - waste management
    - workshop equipment, maintenance and storage
    - erosion and sedimentation
    - no-go/sensitive areas
    - access road
    - hydrology
    - soil
    - WWEP and Reed Beds
    - Groundwater Monitoring
    - Sludge Treatment

To ensure that any rainfall occurring on either the level developed area on which the factory is located, or on the area where the evaporation ponds are to be constructed, it is proposed that the top of the evaporation ponds be constructed at least 500mm higher than the natural ground level. (Meiring, 2020)

This means that a cut to fill earthworks operation could be utilized, where the ponds are excavated to 500mm below natural ground level, and the excavated material is then utilized to construct the surrounding embankments. (Meiring, 2020)

By utilizing this method of construction, and maintaining a top level of 500mm above Normal Ground Level, any risk of stormwater damage is negated. (Meiring, 2020)

The inner pond excavations and embankments will be lined.

Storage of POL on a concrete floor fitted with an oil trap as well as a berm to contain contaminated water or accidental rupturing of tanks.

The oil trap or separator has to be cleaned and maintained regularly.

Vehicles to be maintained and repaired at the designated area within the construction camp where possible. For major repairs vehicles and machinery shall be removed from site to a suitable dealership complying with acceptable standards regarding responsible handling, storing and disposing of hazardous material and liquids such as petrochemicals, oils and lubricants.

Drip trays to be used for possible oil and diesel (POL) leaks that might occur for each machine and vehicle and when they are stored at the site when not in use.

Correct placement of the construction camp in consultation with the ECO.

Construct structures to trap fuel spills at fuelling station, immediately clean oil and fuel spills and dispose contaminated material (soil, etc.) at licensed sites only.

Draw-up and strictly enforce procedures for the storage, handling and transport of different hazardous materials.

Ensure vehicles and equipment are in good working order and drivers and operators are properly trained; and

Good and effective day to day management, control and housekeeping through the implementation and enforcement of the EMP by the project manager.

Impeding and contamination of the flow regimes of the significant fourth order ephemeral watercourse and the northern drainage line and the associated local and regional water catchment and drainage towards the Orange River

Implement an adequate Erosion and Stormwater Management Plan during the construction and operational phases. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation towards the watercourse in order to prevent any significant contamination and to ensure its continued flow and subsequent ecological functionality and –integrity. (Lamprecht, 2020)

Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction in order to prevent significant contamination from occurring (Lamprecht, 2020).

If hydrocarbons or other chemicals are to be stored on site during the construction phase, the storage areas must be situated as far away as practicably possible from the watercourse (Lamprecht, 2020).

Hydrocarbon and other chemical storage areas must be adequately bunded in order to be able to contain a minimum of 150 % of the capacity of storage tanks/units (Lamprecht, 2020).

Adequate hydrocarbon and other chemical storage, handling, usage and emergency spill procedures must be developed and all relevant construction personnel must be sufficient trained on- and apply these procedures during the entire construction phase (Lamprecht, 2020).

Continued impeding of the flow regimes of the significant fourth order ephemeral watercourse and the northern drainage line and the associated local and regional water catchment and drainage towards the Orange River

The proposed buffer zone around the watercourse and drainage line must be adequately maintained and no future development is allowed to take place within the buffered zone (Lamprecht, 2020).

If all the recommended mitigation measures for the construction phase are adequately implemented and managed, it should prove sufficient in preventing any continued impeding of- or significant impact on the watercourse and drainage line and the associated local and regional water catchment and drainage towards the Orange River (Lamprecht, 2020).

Contamination of the significant fourth order ephemeral watercourse and the northern drainage line by overflows from the evaporation ponds

In accordance with the recent re-evaluation of the evaporation ponds' parameters by the appointed engineer, it was however concluded that the recommended minimum 1.8 ha surface area of the expansion should ensure sufficient capacity for adequate storage and containment of the process waste water volumes received from the raisin processing facility (Lamprecht, 2020).

The evaporation ponds should therefore be constructed strictly as per the required specifications of the appointed engineer (Lamprecht, 2020).

It is recommended that a cut-off berm/trench be constructed directly downstream of the evaporation ponds in order to prevent any potential overflow from reaching the watercourse and drainage line (Lamprecht, 2020).

It is recommended that an emergency procedure be developed for the management of any potential overflows during significant rainfall events (Lamprecht, 2020).

It is recommended that the structural integrity of the evaporation ponds should be inspected by an engineer on a minimum biannual basis (every two years). If any compromises to the integrity of the evaporation ponds are detected, these issues must immediately be resolved and repaired. (Lamprecht, 2020)

It is recommended that the amount of solid waste build-up on the bottom of the evaporation ponds also be inspected on a minimum biannual basis (every two years). If significant build-ups are detected which could compromise the capacity of the evaporation ponds, such build-ups must be mechanically or manually removed and adequately disposed of in accordance with the National Environmental Management: Waste Act (Act 59 of 2008) as amended. (Lamprecht, 2020)

According to the stipulations of the WUL, the licence holder must investigate the re-use of the wastewater. The applicant should investigate the Reed Bed treatment system for the wastewater and bio-digester/bio-reactor for the organic waste removed from the screening prior to entering the WWEP. These systems can be implemented as an integrated system with the WWEP in the long term.

8.3.2 Soil & Agriculture

Construction-related activities that could have an impact on the soil and agricultural potential of the study area include:

- vegetation clearing;
- construction of WWEP and access road;
- excavation activities;
- operation and maintenance of construction camps, construction vehicles and machinery;
- stockpiling;
- batching plant; and
- dust suppression.

Potential impacts associated with the construction phase include:

- soil pollution;
- soil degradation;

- soil erosion;
- compaction of soils;
- impacts on topography or slope;
- impacts on land use potential or capability;
- impacts on agricultural potential or capability; and
- restriction of land use.

No significant soil erosion is currently evident within or around the assessment area. The entire assessment area possesses a slightly sloping topography. The area could therefore be prone to slight soil erosion due to the loosening of materials and vegetation clearance caused by construction activities. (Lamprecht, 2020)

The sediment transport is probably intermittent, and probably occurs during high rainfall events (i.e. rarely) only – hence and would manifest where localised slopes are steeper.

No significant change in soil structure or landscape topography or features is evident within the assessment area. (Lamprecht, 2020)

Due to the surrounding operations of the raisin processing facility, the northern and central shrubland portions of the assessment area are subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated that any large or conservationally significant faunal species would utilise these portions for breeding and/or persistence purposes, or would necessarily have historically utilised the existing evaporation ponds' footprint areas. (Lamprecht, 2020)

The impact on land use potential, agricultural potential and restriction of land use would be very low due to the small scale of development as well as the degradation of the surrounding area.

8.3.2.1 Mitigation Measures

Surface material erosion

Implement an adequate Erosion and Stormwater Management Plan during the construction and operational phases. This must be done in order to sufficiently manage storm water runoff and clean/dirty water separation towards the watercourse in order to prevent any significant soil erosion in and around the assessment area (Lamprecht, 2020).

Dust generation and emissions

Implement suitable dust management and prevention measures during the construction phase of the proposed development (Lamprecht, 2020).

Construction areas and –roads to be sufficiently wetted down during the construction phase in order to prevent significant fugitive dust emissions (Lamprecht, 2020).

Adequate operational procedures for machinery and equipment must be developed in order to strictly govern and restrict movement of machinery in order to avoid unnecessary fugitive dust emissions and ensure environmentally responsible construction practices and activities. (Lamprecht, 2020)

Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction in order to prevent significant dust emissions (Lamprecht, 2020).

The construction phase would, in general, have no severe impact on the agricultural potential or activities at the identified site, while agricultural activities would continue in the surrounding area.

To ensure effective mitigation regarding impacts on the soil integrity and texture it is imperative:

- to limit the various construction and activity footprints within the demarcated site to as small an area as possible;
- to delineate these areas clearly ;
- to limit vegetation removal and land clearing within these delineated areas;
- to ensure effective dust suppression and rehabilitation measures be implemented.

Table 1: List of impact descriptions and mitigation measures recommended

Impact description	Mitigation measures recommended
Land loss for grazing	Although low in potential, some of the areas are currently used for grazing. It is recommended that any vegetation removed during construction is re-established once the development is commissioned
Storm water	Should runoff directions be disturbed by construction activities or by the footprint of the development, the necessary control measures should be implemented to prevent erosion.
Water erosion and wind erosion	Should soil and gradient be disturbed and vegetation removed during construction, soil should be compacted and vegetation re-established. Windblown dust should be prevented by watering down the working areas.
Construction rubble and other waste may spill into rivers or be carried onto neighbouring agricultural land by runoff water.	Rubble and waste should be removed from the construction site regularly.
Degradation of roads (used by farmers) due to heavy construction vehicles.	Maintenance of roads should be undertaken throughout the construction and operational phases.
Increased heavy vehicle traffic due to construction.	Truck drivers and other heavy machinery operators should be made aware of pedestrians, stray animals and stock herders on the roads.
Loss of farm labour to construction	The proponent should refrain from employing farm labourers for construction purposes. It should be explained to such applicants that they would exchange permanent jobs for temporary jobs.
Security risks	All possible measures should be implemented to prevent construction workers from entering neighbouring farms.
Risk of injury to people and animals	The construction site should be fenced in to prevent children and animals entering the site and getting injured.
Potential third party tampering	Permanent security fencing should be erected to prevent ignorant and innocent tampering by third parties.

Mitigation measures pertaining to soil and agricultural resources are contained in the following sections of the EMP (Appendix G):

- Preconstruction phase
    - Site demarcation and development
    - Planning of layout
- Construction phase
    - handling stockpiles
    - oil and chemicals
    - provision of storage facilities for dangerous and toxic materials
    - bulk storage of fuels and oils
    - use of dangerous and toxic materials
    - dust
    - erosion and sedimentation

- no-go/sensitive areas
- access roads
- internal service roads
- hydrology
- soil

8.3.3 Ecology and Biodiversity

Ecology and Biodiversity impacts were assessed by the ecologist (Appendix D2).

Construction-related activities that could have an impact on the ecology and biodiversity of study area include:

- land clearing;
- construction of WWEP and access road;
- concrete batching;
- implementation of main and associated infrastructure; and
- the use and storage of petrochemicals and possibly other chemicals.

Potential impacts associated with the construction phase include:

- habitat transformation and/or degradation;
- loss of sensitive/pristine local and regional habitat types;
- ecological and corridor function due to fencing;
- increase in local and regional fragmentation;
- isolation of habitat (long-term impact);
- invasion of alien flora and fauna on disturbed land;
- vegetation destruction (loss of economic use of vegetation);
- depletion of natural resources (e.g. grazing capacity and quality loss);
- destruction of red data/threatened flora spp. (high ecological value);
- floristic species changes;
- destruction of protected tree spp.;
- impacts on threatened faunal spp.;
- impacts on common faunal spp.;
- faunal interactions with structures, servitudes and personnel;
- impacts on surrounding habitats and spp.;
- impacts on South Africa's conservation obligations and targets;
- impacts on avifauna:
- disturbance;
- roosting/nesting;
- perching;
- nuisance (faeces);
- collisions;
- electrocutions; and
- issues with regard to associated infrastructure.

Areas that are considered to be sensitive are (Van Rooyen, 2015):

- untransformed natural vegetation;
- high diversity or habitat complexity;
- areas containing Red Data species; and
- systems that is vital to sustain ecological functions.

The northern and central portions of the assessment area are viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA as well as provincially and nationally protected species. (Lamprecht, 2020)

The broader areas surrounding the assessment area, which are associated with the relevant vegetation types, are however extremely vast and also largely natural and undeveloped. The size of the proposed development is therefore minute relative to the surrounding natural region. (Lamprecht, 2020)

The historic construction of the existing evaporation ponds has completely transformed all previously existing natural surface vegetation within their footprint areas. The assessment area is also completely isolated to the east and south by existing infrastructure- and agricultural developments. The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the existing evaporation ponds' footprint areas is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within these footprint areas, will therefore not be practicably feasible. (Lamprecht, 2020)

The south-eastern portion of the assessment area is in a highly disturbed and degraded state and is mainly dominated by weeds and legally declared invasive species. The presence of surrounding infrastructure and agricultural developments to the east and south and the associated continued anthropogenic activities tend to cause an ecological 'edge effect' which negatively impacts on the urban/rural interface area and has subsequently significantly decreased the ecological integrity of this portion. Significant dumping of vegetation debris and building rubble is also present within the most south-easterly corner of the assessment area. This portion is therefore not reminiscent of the natural climactic state of the relevant vegetation type. (Lamprecht, 2020)

The entire assessment area is classified as an Ecological Support Area (ESA) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province (Lamprecht, 2020).

ESA's are areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a Critical Biodiversity Area (CBA) or protected area or that play an important role in delivering ecosystem services (Collins, 2017).

8.3.3.1 Mitigation Measures

Mitigation measures pertaining to ecology and biodiversity aspects are contained in the following sections of the EMP (Appendix G):

- Preconstruction phase
    - Site demarcation and development
    - Planning of layout
- Construction phase
    - Fires
    - Erosion and sedimentation
    - Fauna
    - Flora
    - No-go/sensitive areas
    - Access routes/haul roads
    - Ecological specialist findings

Transformation of an Ecological Support Area (ESA) associated with the assessment area

The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the existing evaporation ponds' footprint areas is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within these footprint areas, will therefore not be practicably feasible. (Lamprecht, 2020)

The development construction footprint must be kept as small as practicably possible to reduce the surface impact on surrounding vegetation and no unnecessary/unauthorised footprint expansion into the surrounding areas may take place. (Lamprecht, 2020)

No site construction basecamps may be established within the surrounding undeveloped areas outside the proposed development footprint. (Lamprecht, 2020)

Adequately cordon off the proposed development construction footprint area and ensure that no construction activities, -machinery or -equipment operate or impact within the surrounding undeveloped areas outside the cordoned off area. (Lamprecht, 2020)

Adequate operational procedures for construction machinery and equipment must be developed in order to strictly govern movement of machinery only within the proposed development construction footprint area and to ensure environmentally responsible construction practices and activities. (Lamprecht, 2020)

Existing roads and farm tracks in close proximity to the proposed development construction footprint area must be used during the construction phase. No new temporary roads or tracks may be constructed or implemented within the surrounding undeveloped areas outside the proposed development footprint area. (Lamprecht, 2020)

Disturbed areas within and immediately surrounding the proposed development footprint must be adequately rehabilitated as soon as practicably possible after construction. (Lamprecht, 2020)

It is recommended that the significant fourth order ephemeral watercourse should be adequately buffered out of the proposed development footprint area. A minimum approximately 50 m buffer must be placed around the watercourse and no development is allowed to take place within the buffered zone. (Lamprecht, 2020) The engineering drawings of the evaporation ponds was amended and complies with the stipulation (Appendix C3).

It is also recommended that the small ephemeral water drainage line should be adequately buffered out of the proposed development footprint area. A minimum approximately 32 m buffer must be placed around the drainage line and no development is allowed to take place within the buffered zone. This must be done in order to ensure the continued flow and subsequent ecological functionality and -integrity of the watercourse and drainage line. (Lamprecht, 2020) The engineering drawings of the evaporation ponds was amended and complies with the stipulation (Appendix C3).

The design of evaporation ponds was amended to fit into the alternative areas that are regarded as potentially suitable for the development by the ecologist. A section of the preferred alternative area selected by the ecologist was not selected by the engineer as it is not practicable for the design of the evaporation ponds.

Destruction of-/damage to Red Data Listed, nationally or provincially protected species individuals/habitats associated with the assessment area

One *Vachellia erioloba* and three *Boscia albitrunca* (Figure 13) individuals fall within the final design layout footprint of the proposed WWEP. A Protected Tree License will firstly have to be obtained from the Department of Agriculture Forestry and Fisheries (DAFF) for their removal, prior to the commencement of any such removal activities. The other tree individuals shall be left intact as it is not located within the evaporation ponds' footprint area.

If any individuals/clusters of the provincially protected species *Aloe claviflora* fall within the final design layout footprint of the proposed expansion (which is highly likely), it is recommended that they be removed and adequately relocated to a suitable and similar area as to where they were removed from. This removal and relocation process must be completed prior to the commencement of any vegetation clearance- or construction activities. (Lamprecht, 2020)

A Provincial Flora Permit has to be obtained from the NC Department of Agriculture, Land Reform and Rural Development -Directorate: Sustainable Resource Management prior to the commencement of any such removal and relocation activities and for the destruction of any other provincially protected species such as *Psilocaulon subnodosum* (Lamprecht, 2020).

Terrestrial and aquatic alien invasive species establishment

An "invasive species" is any species whose establishment and spread outside of its natural distribution range (i) threatens ecosystems, habitats or other species or has a demonstrable potential to threaten ecosystems, habitats or other species; and (ii) may result in economic or environmental harm or harm to human health. Invasive alien plant species are globally considered as one of the greatest threats to biodiversity and ecosystem integrity. (Van Rooyen, 2015)

Alien invaders should be controlled by mechanical and/or chemical means. Mechanical means include ringbarking (girdling), uprooting, chopping, slashing and felling. An axe or chain saw or brush cutter can be used. Stumps or ringbarked stems should be treated immediately with a chemical weedkiller (Van Rooyen, 2015).

All the identified alien invasive species individuals must be actively eradicated from the assessment area and adequately disposed of in accordance with the National Environmental Management: Biodiversity Act (Act 10 of 2004); Alien and Invasive Species Regulations, 2014 (Lamprecht, 2020).

Implement an adequate Alien Invasive Species Establishment Management and Prevention Plan during the construction and operational phases. Such a management plan must be compiled by a suitably qualified and experienced ecologist (Lamprecht, 2020).

8.3.4 Social Environment

The main social challenges experienced within the district include:

- low economic growth rate that limits the material needs of communities;
- lack of job creation, cost effective and affordable training institutions in the province resulting in high unemployment rates;
- primary education;
- a desperate need for social activities, services, and youth development; and
- lack of basic services including sanitation.

Potential impacts associated with the construction phase might include:

- Mesosystem
    - safety and security
    - daily movement patterns
    - socio-economic impacts (social investment, job creation, job seekers, population increase, increased services demand, social problems)
    - impact on urban expansion
    - impact on and from tourism and recreation
    - economic impact
    - distance to residential areas
- Microsystem (physical presence of infrastructure)
    - health and safety of workers and public
    - sense of place (tourism and recreation)
    - land use impacts (cultivation and grazing)
    - traditional/cultural conflicts
    - I&AP interest

The sphere of influence of the proposed upgrade has been assessed within the mesosystem and the microsystem.

Social impacts at the macrosystem level would not be relevant as the WWEP and road development would be small and would not have an impact on the national level.

Social impacts at the mesosystem level include all or part of the district or local municipality's area of responsibility.

Impacts at the microsystem level are caused by the physical presence of the WWEP, road and ancillary infrastructure, and are confined to the occupants of the study area or directly adjacent to it.

8.3.4.1 Mesolevel Impacts

The construction of the WWEP would ensure the continued long term provision of work to local communities contribute significantly to the socio-economic wellbeing of these communities and their extended families. This would have long term indirect positive socio-economic impacts.

8.3.4.2 Microlevel Impacts

Due to the rural setting of the development, any negative socio-economic impacts directly on the persons working on the site would be negligible. The construction of the WWEP and access road will have a positive impact on these personnel as it will ensure compliance to the environmental compendium laws, and the aesthetic view of the new WWEP would be much improved to the current ponds.

8.3.4.3 Mitigation Measures

Mitigation measures pertaining to the social environment are contained in the following sections of the EMP (Appendix G)

- Preconstruction phase
    - Communication with stakeholders and I&APS
- Construction phase
    - Cognisance of other developments
    - Employment opportunities for local communities
    - Capacity building in local communities
    - Crime, safety and security

8.3.5 Visual and Aesthetical Impacts

Potential impacts associated with the construction phase include:

- visual impacts;
- reduction in aesthetic properties; and
- littering and housekeeping on the construction site.

The construction infrastructure, machinery and activities will be visual from a short distance. The vertical dimension of the machinery will be the highest and might reach ~3 meters in height depending on the type and size of machinery that would be used. Trees and surrounding landscape will conceal the activity. The activity will have a short term and very low aesthetic impact.

8.3.5.1 Mitigation Measures

In most cases, the landscape and visual impacts occurring during the construction phase can be mitigated relatively effectively. Rehabilitation of the disturbed areas would prevent the exposure of soil, which may cause a reduction in the visual quality of the study area.

Mitigation measures pertaining to the visual impacts are contained in the following sections of the EMP (Appendix G):

- Pre-construction phase
    - Site demarcation and development;
    - Planning of layout; and
    - Visual impacts (lighting).
- Construction and operational phase
    - Crew camps;
    - Traffic impacts;
    - Visual impact; and
    - Ecological specialist recommendations.

8.3.6 Economic Impacts

Potential impacts associated with the construction phase include:

- financial and economic impacts;
- stakeholder interest;
- business risk/benefit;
- improvement of property value; and
- damage to property (landowner and developer).

The economic and financial impacts have been sufficiently addressed in the social environment section.

Should property such as equipment, infrastructure, machines and vehicles be damaged or lost, it will have a negative financial impact on the developer and contractor for replacing infrastructure. While a high level of both stakeholder and business risk is involved, there are also great potential benefits. There is a high level of financial input.

The stakeholders are the developer, contractor and community who will benefit from the construction of the WWEP. The developer and, to a lesser extent, the contractor carries all the risk associated with this project.

The activity will have some positive economic impact should Northern Cape based suppliers be utilised.

Business, financial and economic benefit to community is a net benefit as all expenditures, technology inputs, will be carried by the developer.

8.3.6.1 Mitigation Measures

This impact could only be mitigated by internalising the externalities and clearly identifying and defining aspects related to this development. It would include proper planning, good management control and housekeeping, as well as safety and security of infrastructure and personnel.

The purpose of the EIA as a whole is to assist in addressing these aspects very early in the planning phase. The EIA will continue to do so as the project planning (critical project timeline) of the proposed development progresses.

Business risk to the developer can be mitigated partly through research, business plans drawn up, and strict control of expenditures and implementation of effective but affordable technology.

Mitigation measures have been addressed in the following sections of the EMP (Appendix G):

- Pre-construction phase
    - Project contract and programme; and
    - Appointments and duties of project team.
- Construction phase
    - Crime, safety and security.

8.3.7 Noise

Potential impacts associated with the construction phase include:

- nuisance;
- health and safety of workers and public;
- traffic volumes; and
- noise sensitive areas.

Noise associated with the proposed development would be generated during the construction phase and, to a lesser extent, during the decommissioning phase, and would be limited to noise levels generally associated with construction machinery.

Noise nuisances will be low and short termed.

The WWEP is situated on the farm away from offices and workplaces. The noise impact of the construction phase would be negligible.

Should any areas be declared as noise areas, the noise will have a direct impact on the hearing of workers. It will be declared as such and the correct PPE issued. Public will not be allowed near these areas.

8.3.7.1 Mitigation Measures

Workers should be issued with and wear proper PPE in areas declared as noise areas. Mitigation measures pertaining to the noise impacts are contained in the construction phase noise section of the EMP (Appendix G).

8.3.8 Air Quality

Potential impacts associated with the construction phase include dust nuisance and emissions by vehicles and construction equipment related to the construction phase.

The prevailing near-surface winds measured in the region mainly comprise north-northwesterly flows throughout the year. Mean wind speed is highest during the early afternoon. (Van Rooyen, 2015)

Dust nuisance emanating from the construction site could therefore be a high nuisance factor. The vineyards are located to the south-south-west of the location of the WWEP might be impacted upon should the construction phase take place during the period of harvesting.

Dust nuisances duration period would be short. The dust may have a direct impact on the respiratory health of the construction workers. The extent, duration and intensity would be low.

8.3.8.1 Mitigation Measures

Mitigation measures are included in the dust section of the construction phase section of the EMP.

Air pollution

Vehicles are to be maintained and fitted with exhausts and mufflers to ensure that air pollution is kept to minimum.

The vehicles and machinery that is to be used shall be maintained and kept in good order according to standard rules and regulations as to keep the air pollution generated from these vehicles and machinery to within the limits as prescribed within legislation.

Regulatory control of vehicles and machinery as well as regular and good maintenance should be ensured.

Dust nuisance

Dust suppression to be conducted when needed such as windy periods to prevent dust pollution and nuisances.

Health & safety of workers & public

Workers to wear proper PPE and public should not be allowed to come near the construction area. Due to the remoteness of the area it is possible to keep the public out of this area.

8.3.9 Heritage Resources

The field assessment provided no aboveground evidence of prehistoric structures, buildings older than 60 years, graves or material of cultural significance or in situ archaeological sites within the study area. (Rossouw, 2021)

The proposed development footprint is not considered palaeontologically or archaeologically vulnerable and is assigned a site rating of Generally Protected C (GP.C). (Rossouw, 2021)

Recommended mitigation measures

If during construction any possible finds such as stone tool scatters, artefacts or bone and fossil remains are made, the operations must be stopped and a qualified archaeologist must be contacted for an assessment of the find.

Should any substantial fossil remains (*e.g.* well-preserved plant fossils, mammalian bones and teeth) be encountered during excavation, these should be safeguarded, preferably *in situ*, and reported by the ECO to SAHRA, *i.e.* The South African Heritage Resources Authority, as soon as possible so that appropriate action can be taken by a professional palaeontologist, at the developer's expense.

Mitigation measures pertaining to the heritage impacts are contained in the construction as well as operational phase heritage sections of the EMP (Appendix G). Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (*e.g.* stratigraphy, sedimentology, taphonomy) by a professional palaeontologist.

8.4 DECOMMISSIONING AND REHABILITATION OF CONSTRUCTION AREAS AFTER COMPLETION OF CONSTRUCTION WORK ALTERNATIVE (PREFERRED ALTERNATIVE)

Activities that may have an impact on the Environment after the completion of construction work:

Removal and disposal of spoil and construction rubble. It is an option to re-use clean spoil or rubble as cover material at the municipal general waste disposal site.

Removal and dismantling of the construction camp and associated infrastructure.

Rehabilitation of contaminated areas should it be needed.

Transporting of equipment, machinery and vehicles to the next construction site.

Contouring of topsoil back onto construction areas.

Mulching and seeding with indigenous vegetation where needed.

Impacts (direct, indirect, cumulative):

The impacts (direct, indirect and cumulative) will be approximately the same as the construction phase although some would have a lower impact than during the construction phase. The scale of these impacts can be viewed in the Environmental Impact Matrix in Appendix F.

8.4.1 Mitigation:

The mitigation measures for the decommissioning and rehabilitation of construction areas after completion of construction work has been addressed in the EMP within the following sections:

- crew camps;
- erosion and sedimentation;
- flora; and
- soil.

8.5 O&M PHASE OF INFRASTRUCTURE AND SERVICES ALTERNATIVES (PREFERRED ALTERNATIVE)

Activities that may have an impact on the Environment during the O&M phase:

- Commissioning of the WWEP and access road
- Conduct installation tests
- Maintenance and repair of WWEP system and associated infrastructure
- Maintenance and repair of the access road

8.5.1 Water Resources:

Impacts (Direct, Indirect, Cumulative):

Potential impacts associated with the O&M phase include:

- Surface Water Pollution and Quality Degradation;
- Ground Water Pollution
- Hydrology
    - impact on infiltration;
    - change in storm water drainage;
    - catchment areas;
    - ponding; and
    - change in amount and velocity of runoff.
- Impact on the sustainability of aquifer/groundwater of area.

8.5.1.1 Surface Water

Open water do not occur within the study area and rainfall is very low but heavy thunderstorms occur in summer that could mobilise spilled contaminants or leaked effluent. Direct and indirect impacts may be experienced due to the above mentioned activities. The same aspects are applicable as in the construction phase.

The proposed development could potentially further add to the cumulative impeding and contamination of the local and regional water catchment and drainage along with the existing infrastructure and agricultural developments. The impeding and contamination of the flow regimes of the significant fourth order ephemeral watercourse and the northern drainage line is therefore viewed as a potentially significant cumulative impact which can be caused by the proposed development. (Lamprecht, 2020)

If all the recommended mitigation measures for the construction phase are adequately implemented and managed, it should prove sufficient in preventing any continued impeding of- or significant impact on the watercourse and drainage line and the associated local and regional water catchment and drainage towards the Orange River (Lamprecht, 2020).

8.5.1.2 Groundwater

The following impact has been identified that could potentially impact on the groundwater quality during operation (Visser, 2021):

1. Contamination of the groundwater resource by wastewater leaks and spillages.

There is a slight risk of contamination of the aquifer by spillage/leakage of wastewater from the site and the WWEP. This potential impact significance is rated as very low and can be mitigated to insignificant by appropriate engineering design, good housekeeping, and regular maintenance of infrastructure. The fractured-rock aquifer is also naturally protected against these potential contaminants by a deep water table of c.15 to c.20 mbgl and a low permeable hard granitic bedrock with low aquifer vulnerability. This impact is assessed to be of very low significance. (Visser, 2021)

Essential mitigation measures (Visser, 2021):

- Take care that WWEP and other wastewater facilities are well maintained and serviced regularly.
- Ensure that good housekeeping rules are applied.
- Draw-up and strictly enforce procedures for the storage, handling and transport of different waste materials.

8.5.1.3 Mitigation Measures

Essential groundwater mitigation measures during operations are as follows (Visser, 2021):

- Implement and follow water saving procedures and methodologies to limit generation of wastewater.
- Take care that wastewater facilities are well maintained and serviced regularly
- Draw-up and strictly enforce procedures for the storage, handling and transport of different hazardous materials
- Ensure that good housekeeping rules are applied.

Best practice groundwater mitigation measures during operation are as follows (Visser, 2021):

- Install a shallow, narrow diameter (c.25 m deep) monitoring borehole downstream of the WWEP, i.e., between the dry drainage course and the WWEP, and about 10 m from the edge of the WWEP;
- Measure and record the water level in the monitoring borehole on a biannual basis. A dipmeter with 1 cm calibration and 30 m cable will have to be purchased by the facility manager for this purpose;
- Collect water samples from the borehole and from the WWEP on a biannual basis and submit it to a SANAS accredited laboratory (e.g., Bemlab) for analysis of pH, EC, macro-chemistry (Na, Mg, K, Ca, NH4, Cl, SO4, Total Alkalinity, PO4, F, NO3), VOC, TOC and Fe; and
- Appoint a SACNASP registered hydrogeologist to evaluate the monitoring data on an annual basis and compile a monitoring report.

Mitigation measures pertaining to water resources are contained in the following sections of the EMP(Appendix G)

- Operational phase
    - Waste management
    - erosion and sedimentation
    - no-go/sensitive areas
    - access road
    - hydrology

- soil
- WWEP
- Groundwater Monitoring
- Sludge Treatment

8.5.2 Soil and Agriculture

Operation-related activities that could have an impact on the soil and agricultural potential of the study area include:

- Operation and maintenance of
  - access roads;
  - WWEP system infrastructure including ancillary infrastructure; and
  - vehicles.

Possible Impacts:

- Soil Pollution
- Soil Erosion

Operation and maintenance activities could possibly cause soil pollution should breakdowns, causing spillage of effluent, and/or leakage of the liner be experienced. Repairs need to be conducted.

Soil erosion could proceed during this phase should rehabilitation during the decommissioning phase not be conducted correctly or rehabilitated areas not maintained afterwards where vegetation did not establish properly due to various reasons such as grazing and movement of animals on the areas that could cause deterioration or excessive draughts be experienced after the rehabilitation phase.

8.5.2.1 Mitigation Measures

The continued implementation of the rehabilitation and control measures as set out within the EMP should ensure that soil pollution and erosion be prevented and should it re-surface the mitigation and rehabilitation measures as set out within the EMP should be re-implemented.

Soil pollution should also be prevented by implementing the stipulations regarding the management of the WWEP system and the integrity of the lining as well as sludge treatment.

8.5.3 Ecology & Biodiversity

Operation- and maintenance-related activities that could have an impact on the ecology and biodiversity of the study area include:

- Use and maintenance of access roads;
- operation and maintenance of WWEP and associated infrastructure;
- management and eventual disposal of waste emanating from the operation of the WWEP system;
- presence of impermeable surfaces; and
- maintenance of vegetation in the area (veld management).

Impacts that relate to the operational phase and the surrounding environment include potential floristic species changes in the development area, faunal interactions with all components of the development, and impacts on surrounding habitats and species.

Indirect impacts would be:

- Overflow of effluent from the facility will enter the underlying soils.
- As a result of the loss of indigenous vegetation and resulting disturbance, alien species might invade the area.
- Some disturbance will inevitably occur in the direct surroundings of the development footprint.
- Conversely removal of alien species and the rehabilitation of the habitat may favour indigenous plant species.

No significant change in soil structure or landscape topography or features is evident within the assessment area. (Lamprecht, 2020)

Due to the surrounding operations of the raisin processing facility, the northern and central shrubland portions of the assessment area are subjected to continued anthropogenic activity and disturbance. It is therefore not anticipated

that any large or conservationally significant faunal species would utilise these portions for breeding and/or persistence purposes, or would necessarily have historically utilised the existing evaporation ponds' footprint areas. (Lamprecht, 2020)

The northern and central portions of the assessment area are therefore viewed as being of moderate conservational significance for habitat preservation and ecological functionality persistence in support of the surrounding ecosystem, broader vegetation type, ESA as well as provincially and nationally protected species. (Lamprecht, 2020)

The broader areas surrounding the assessment area, which are associated with the relevant vegetation types, are however extremely vast and also largely natural and undeveloped. The size of the proposed development is therefore minute relative to the surrounding natural region. (Lamprecht, 2020)

The historic construction of the existing evaporation ponds has completely transformed all previously existing natural surface vegetation within their footprint areas. The assessment area is also completely isolated to the east and south by existing infrastructure- and agricultural developments. The virtually complete loss and transformation of natural habitat, biota and basic ecosystem functionality within the existing evaporation ponds' footprint areas is deemed irreversible. Sufficient ecological restoration of the relevant vegetation type and its functionality within these footprint areas, will therefore not be practicably feasible. (Lamprecht, 2020)

The south-eastern portion of the assessment area is in a highly disturbed and degraded state and is mainly dominated by weeds and legally declared invasive species. The presence of surrounding infrastructure and agricultural developments to the east and south and the associated continued anthropogenic activities tend to cause an ecological 'edge effect' which negatively impacts on the urban/rural interface area and has subsequently significantly decreased the ecological integrity of this portion. Significant dumping of vegetation debris and building rubble is also present within the most south-easterly corner of the assessment area. This portion is therefore not reminiscent of the natural climactic state of the relevant vegetation type. (Lamprecht, 2020)

The entire assessment area is classified as an Ecological Support Area (ESA) in accordance with the Northern Cape Provincial Spatial Biodiversity Plan 2016 (NCPSBP), which sets out biodiversity priority areas in the province (Lamprecht, 2020).

ESA's are areas that must be maintained in at least fair ecological condition (semi-natural/moderately modified state) in order to support the ecological functioning of a Critical Biodiversity Area (CBA) or protected area or that play an important role in delivering ecosystem services (Collins, 2017).

8.5.3.1 Mitigation Measures

Residual impacts should be low if the mitigation measures are applied and alien invasive species are controlled. (Van Rooyen, 2015)

Mitigation measures pertaining to ecology and biodiversity aspects are contained in the following sections of the EMP (Appendix G):

- Operational phase
    - Fires
    - Erosion and sedimentation
    - Fauna
    - Flora
    - No-go/sensitive areas
    - Access routes/haul roads
    - Ecological specialist findings

Implement a monitoring program for the early detection of alien invasive plant species and a control program to combat declared alien invasive plant species should be continued during the operational phase.

Transplanted/relocated juvenile individuals of the protected species should be monitored and cared for.

8.5.4 Socio Economic Environment

Social Aspects relevant in the O&M phase would be:

- Mesosystem
    - Socio economic benefits
    - Economic Impact
    - I&AP interest
- Economy
    - Economic impacts
    - Financial impacts
    - Damage to property
    - Stakeholder interest
    - Business risk/benefit

The continued employment opportunities to the community will continue to benefit the socio-economic development of the local area (positive impact).

This also depends on its correct operation and maintenance. It will ensure that the WWEP system will be serviceable in the long term.

8.5.5 Air Quality

Nuisances such as odours might be experienced during the operational phase. The impact would be negligible due to the location of the WWEP.

Mitigation: Dust suppression to be done on site and on the access road when needed.

8.6 DECOMMISSIONING AND CLOSURE PHASE ALTERNATIVES (PREFERRED ALTERNATIVE)

Activities that may have an impact on the Environment during the decommissioning and closure phase:

The removal of the sludge, lining system, pump and associated infrastructure as well as removal of the spoil to a general landfill site and selling or re-use of infrastructure.

Impacts(Direct, Indirect, Cumulative):

The removal of the infrastructure would have indirect environmental impacts of which the most important would be soil and water pollution. A socio-economic impact would be experienced within the local communities due to the loss of employment opportunities.

The removal of the infrastructure would therefore not be feasible prior to the implementation of another systems.

Mitigation:

The same principles for prevention, control and rehabilitation as set out within the EMP for the construction and operation and maintenance phases would be applicable should it become necessary to decommission the WWEP system and associated infrastructure as well as the proposed road in future.

SECTION 9: CONCLUSION

Impacts investigated that might potentially be associated with the WWEP include impacts on water resources; soil and agricultural potential; ecology and biodiversity; social aspects on the meso- and microlevel; visual quality and aesthetics; economic impacts (mostly positive); noise (construction, upgrading and decommissioning phases); air quality; visual and aesthetical impacts; and heritage resources.

Most of the potential impacts identified are anticipated to be site-specific. No environmental fatal flaws were identified.

All recommendations and mitigation measures that should be included in the authorisation is addressed in the EMP. Should the amended EIA report and EMP be accepted and authorised, all aspects that have been discussed within the report and program would be addressed.

It is imperative that the EMP be implemented during pre-construction, construction and operational phase and continued compliance to it be ensured. This would be possible by stipulating that the EMP should form part of all contracts with businesses, contractors and sub-contractors, as well as the work force.

9.1 "NO-GO" ALTERNATIVE

The 'do nothing' alternative is the option of not undertaking the replacement of the WWEP. Should this alternative be selected, it would have local and broader impacts. It would entail maintaining the *status quo.*

In the long term the new WWEP will add socio-economic value to the local and broader communities due to the continued direct and indirect provision of work. This would not be the case if the WWEP are not replaced as DWS will issue a directive and stop operations.

The 'do nothing' alternative is not a preferred alternative in this application.

9.2 ASSESSMENT OF LEVEL AND CONFIDENCE OF INFORMATION

Refer to the disclaimer on page xiii of this report.

Information contained in this study was sourced from the specialist studies conducted for the project area. The specialists appointed to undertake the various investigations are considered to be competent in their particular fields. In light of the above, the level of confidence with regards to the information and reports used to compile this document is high.

The assumptions and limitations identified by the ecologist, is addressed on page 17 of the ecology study that is attached to Appendix D of this study.

Bibliography

Bright Hub PM, not dated: Bright Hub Engineering, Reed Bed Construction for Sludge Management, not dated,

Burger et.al., 2010: Burger, A.J., Du Plessis, J.A., Port Nolloth Desalination Study - Concept Design and Costing of Reverse Osmosis Plant, 2010,

BVi Consulting Engineers, 2012: BVi Consulting Engineers, Preliminary Design & Technical Investigation Report: Brandvlei Bulk Water Supply & RO Treatment Plant, 2012

Collins, N.B., 2017. Free State Province Biodiversity Plant: Technical Report v1.0. <> . .

Lamprecht, A.J.H., 2020. Ecological Assessment Report. Carpe Diem Raisins Evaporation Pond Development, Upington, Northern Cape Province. <> EcoFocus Consulting (Pty) Ltd. Bloemfontein.

Lloyd Rossouw, 2021. Phase 1 Heritage Impact Assessment of a proposed 5.5 ha development on the farm Vaalkoppies 40, Upington, NC Province.. <> Paleo Field Services. Langenhovenpark.

Meiring, G.H., 2020. Carpe Diem Group: Raisin Processing Facility. Technical Report and Design of Wastewater Evaporation Ponds.. <> BVi Consulting Engineers. Upington.

Reed Bed, 2021: NA, Reed Bed Principle, 2012,

PD Naidoo and Associates et. al., 2008: PD Naidoo and Associates & SRK Consulting, 2008, Final Basic Environmental Assessment Volume 1, Reverse Osmosis Desalination Plant at the Transnet Iron Ore Handling Facility, Saldanha Bay, Western Cape, 2008,

Pullen, 2021: Pullen, T., Reed Beds: How do They Work for Waste Water Management?, 2021,

Reverse Osmosis Chemicals, 2013: Reverse Osmosis Chemicals, 2013, RO chemicals – Advanced Reverce Osmosis Technologies, 2013,

Van Wyk, M., 2020. Carpe Diem Raisins Description of Works. <> Carpe Diem Group. Upington.

Visser, D., 2021. Carpe Diem Raisins Processing Facility - Proposed New Wastewater Evaporation Ponds. Hydrogeological Assessment Report. <> SRK Consulting (South Africa) (Pty) Ltd. Rondebosch, Cape Town.

Welthagen, J.A., 2022. Raisin Processing Plant. Application for land use change according to the Spatial Planning and Land Use Management Act (Act 16 of 2013) pertaining to Ptn 64 & 81 of the Farm Vaalkoppies No 40, Dawid Kruiper Municipality, Northern Cape Province. <> Macroplan Town & Regional Planners. 4A Murray Avenue, Upington, 8801.

Greenpeace & European Photovoltaic Industry Association (EPIA), 2011. **Solar Generation 6. Solar Photovoltaic Electricity Empowering the World.** <http://www.greenpeace.org/international/Global/international/publications/climate/2011/Final%20SolarGeneration%20VI%20full%20report%20lr.pdf>

Van Rooyen, N. 2015. **Biophysical Evaluation of Three Alternative Sites for the Askham Oxidation Pond, Northern Cape (Farm Kameelduin 139). January 2015.** Ekotrust cc, Lynnwood

www.climate-data.org