REPORT N^O 47579-R01

LAND CAPABILITY AND FRESHWATER HABITAT IDENTIFICATION: LETSOAI CSP SITE 1

BIOTHERM ENERGY (PTY) LTD

PUBLIC

JANUARY 2017

LAND CAPABILITY AND FRESHWATER HABITAT IDENTIFICATION: LETSOAI CSP SITE 1

BIOTHERM ENERGY

(PTY) LTD

Draft
Public

Project no: 47579
Date: January 2017

WSP | Parsons Brinckerhoff
WSP House, Bryanston Place,
199 Bryanston Drive,
Bryanston, 2191

Tel: +27 (0) 11 300 6085
Fax: +27 (0) 11 361 1381
www.wspgroup.com
www.pbworld.com

QUALITY MANAGEMENT

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks				
Date	29/11/2016			
Prepared by	Bruce Wickham			
Signature				
Checked by	Colin Holmes			
Signature				
Authorised by	Greg Matthews			
Signature				
Project number	47579			
Report number	R01			
File reference	47579_R01-Letsoai CSP Site 1-Freshwater Habitat Assessment Final Report-20161129.docx			

PRODUCTION TEAM

CLIENT

Senior Associate	Michael Barnes
Environmental Manager	Irene Bezuidenhout
Analyst	Siphelele Dunga

WSP | PARSONS BRINCKERHOFF

Author	Bruce Wickham
Reviewer	Colin Holmes
Authorisation	Greg Matthews

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

BioTherm Energy (Pty) Ltd (BioTherm) have proposed the development for a renewable energy complex Letsoai CSP Site 1 in the Northern Cape province. As part of the application process for Environmental Authorisation, WSP Environmental (Pty) Ltd (WSP | Parsons Brinckerhoff) was appointed by BioTherm to undertake a Social and Environmental Impact Assessment (SEIA).

The SEIA is divided into two phases, the Scoping Phase and the Environmental Impact Assessment (EIA) Phase. This report will follow from the scoping phase, addressing the land capability and freshwater habitat systems (i.e. wetlands and watercourses) located within the project footprint, and providing a high level assessment of the potential environmental impacts associated with the proposed development.

1.1 OBJECTIVES OF THE REPORT

The objective associated with the assessments include the following:

- Describe the background of the project and contextualise it in the natural environment. This will include defining the land capability and appraisal and identification of freshwater habitat systems located within the project footprint;
- List and assess the potential environmental impacts associated with the proposed project to the environs identified; and
- Conclude the finding of the report, highlighting any significant impacts and their corresponding mitigation and management measures which should be considered as conditions in the authorisation.

1.2 STUDY APPROACH AND METHODOLOGY

The scope of work covered within this report, which entails a land capability assessment and freshwater habitat identification, forms part of the process required for BioTherm to apply for an environmental authorisation from the Department of Environmental Affairs (DEA). The study therefore focuses on the identification and assessment of sensitive environments that may be impacted on by the proposed project.

The purpose of this report was to conduct a high level study that defined the land capability and identified freshwater habitat systems in the area of the proposed Letsoai CSP Site 1 and associated pipelines. The potential impacts to the land and freshwater habitat systems were defined at a generic and high level. This entailed a desktop review and site visit from which an initial scoping report was developed. The desktop review utilised available information at the time, including the following spatial information resources:

- Google Earth Pro;
- Agricultural Geo-Referenced Information System (AGIS);
- National Freshwater Ecosystem Priority Areas (NFEPA);
- The U.S. Geological Survey (USGS);
- The Soil Maps of Africa: European Digital Archive of Soil Maps (EuDASM);
- Hydrological features including rivers and, catchments and water management areas, and

- Existing maps and detailed project information provided by BioTherm which were available at the onset of the project.

Preliminary maps and figures were developed to use during the site visit to verify the information collected during the desktop review, through a ground-truthing exercise.

The site investigation comprised of a three-day site visit conducted between the 9th and 11th of February 2016. The site assessments entailed a drive through of the property on which the proposed Letsoai CSP Site 1 is located. The area covered during the site visit was the operational footprint of the proposed project as well as a 500m boundary buffer. The following tasks were undertaken as part of the site investigation:

- Verification of desktop review information;
- Wetland and riparian zone identification and delineation;
- Soil profile characterisation and sample collection, including:
  - Soil depth and profile description (i.e. subjective moisture estimation, effective rooting depth, presence of mottling, gleying, pedocretes and soil structure);
  - Classification of soil form and family based on the Taxonomic Soil Classification System for South Africa (Macvicar, 1991);
  - Permeability based on in-situ estimation and texture properties;
- Underlying lithology; and
- Soil sample collection for laboratory analyses of pH, electrical conductivity, exchangeable sodium and soil texture.

A handheld Global Positioning System (GPS) and camera were used in conjunction with the maps produced in the desktop review, to conduct the ground-truthing exercise. The GPS was used to delineate areas as well as verify and mark all relevant points with exact co-ordinates. Representative soil samples were collected using a hand-operated auger, where holes were drilled until the parent material/refusal was reached. The representative soil samples were sent for analyses to the SGS Soil Laboratory situated in Somerset West in the Western Cape, to determine the pH, electrical conductivity, exchangeable sodium and texture.

LAND CAPABILITY

The land capability for the proposed Letsoai CSP Site 1 project footprint was assessed according to the Land Capability Classification described in the Chamber of Mines Guidelines (Chamber of Mines of South Africa/Coaltech, 2007). The physical and chemical data from the soils laboratory analyses, in conjunction with the climatic, topographical, vegetation and land use information, was used to classify the Land Capability of the farm property into 4 broad categories:

- Class 1 Wetland - It is made up of vleis, swamps, marshes, peat-bogs and the like. There is usually a water table present at shallow depth in the soil with the result that it is difficult or impossible to recover soil material for later use because heavy machinery becomes bogged down, unless the soils are drained;
  - Wetland, has one of the following characteristics:
  - a diagnostic organic (O) horizon at the surface;
  - horizon that is gleyed throughout more than 50 percent of its volume and is significantly thick, occurring within 75 cm of the surface;
- Class 2 Arable land - Land which conforms to all of the following requirements: Does not qualify as a wetland;

- has soil that is readily permeable to the roots of common cultivated plants throughout a depth of 0.75 m from the surface;
- has a soil pH value between 4,0 and 8,4. Has electrical conductivity of the saturation extract less than 400mS/m at 25°C, and an exchangeable sodium percentage less than 15 through the upper 0,75 m of soil;
- has a permeability of at least 1,5 mm per hour in the upper 0.5 m of soil;
- has less than 10 percent by volume of rocks or pedocrete fragments larger than 100 mm in diameter in the upper 0,75 m of soil;
- the product of the slope (in percent) and erodibility factor (K) is less than 2.0;
- occurs under a climate regime which permits, from soils of similar texture and adequate effective depth (0,75 m), the economic attainment of yields of adapted agronomic or horticultural crops that are at least equal to the current national average for those crops. Or is either currently being irrigated successfully or has been scheduled for irrigation by the Department of Water Affairs;

- Class 3 Grazing Land - Grazing land conforms to all of the following requirements;
  - does not qualify as wetland or as arable land;
  - has soil or soil-like material, permeable to the roots of native plants, that is more than 0.25 m thick and contains less than 50 % by volume of rocks or pedocrete fragments larger than 100 mm diameter;
  - supports or is capable of supporting a stand of native or introduced grass species or other forage plants utilisable by domesticated livestock or game animals on a commercial basis;
- Class 4 Wilderness land - This is land which has little or no agricultural capability by virtue of being too arid, too saline, too steep or too stony to support plants of economic value. Its uses lie in the fields of recreation and wildlife conservation. It does, however, also include watercourses, submerged land, built-up land and excavations. Wilderness land is defined by exclusion, namely land which does not qualify as wetland, arable land or grazing land.

In addition to the above four classes, the land capability was also defined by the eight land capability classes based on the original USDA work and adapted for SA conditions by ARC. This was done at a desktop level, based on the GIS information provided on the Department of Agriculture, Forestry, and Fisheries (DAFF) Agricultural Geo-Referenced Information System website (AGIS, 2007).

FRESHWATER HABITAT IDENTIFICATION

The freshwater habitat identification for the proposed Letsoai CSP Site 1 project entailed the following tasks described below:

- Desktop review to establish the baseline environmental conditions and location of wetlands marked in the National Land Cover GIS database for South Africa (SANBI – BGIS) and the National Freshwater Ecosystem Priority Areas (NFEPA);
- Identification of wetlands, based on the Department of Water Affairs and Forestry (DWAF) publication *Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas* (DWAF, 2008); and
- High level description of the potential impacts on the identified freshwater habitats located within a 500m radius of the proposed Letsoai CSP Site 1 project footprint.

IMPACT METHODOLOGICAL FRAMEWORK

The impact valuation uses a methodological framework used by WSP | Parsons Brinckerhoff to meet the combined requirements of international best practice and NEMA, Environmental Impact

Assessment Regulations, 2014 (GN No. 982) (the "EIA Regulations"). As required by the EIA Regulations (2014), the determination and assessment of impacts will be based on the following criteria:

- Nature of the Impact;
- Significance of the Impact;
- Consequence of the Impact;
- Extent of the impact;
- Duration of the Impact;
- Probability if the impact;
- Degree to which the impact:
  - can be reversed;
  - may cause irreplaceable loss of resources; and
  - can be avoided, managed or mitigated.

Following international best practice, additional criteria have been included to determine the significant effects. These include the consideration of the following:

- **Magnitude** to what extent environmental resources are going to be affected;
- **Sensitivity** of the resource or receptor (rated as high, medium and low) by considering the importance of the receiving environment (international, national, regional, district and local), rarity of the receiving environment, benefits or services provided by the environmental resources and perception of the resource or receptor); and
- **Severity** of the impact, measured by the importance of the consequences of change (high, medium, low, negligible) by considering inter alia magnitude, duration, intensity, likelihood, frequency and reversibility of the change.

It should be noted that the definitions given are for guidance only, and not all the definitions will apply to all of the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

Impacts are assessed in terms of the following criteria:

- The nature, a description of what causes the effect, what will be affected and how it will be affected (**Table 1**);
- The physical extent, wherein it is indicated whether (**Table 2**);
- The duration, wherein it is indicated whether the lifetime of the impact will be (**Table 3**);
- The magnitude of impact on ecological processes, quantified on a scale from 0-10, where a score is assigned (**Table 4)**; and
- The probability of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where (**Table 5**):

Table 1: Nature or Type of Impact

NATURE OR TYPE OF IMPACT	DEFINITION
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.

Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).
Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

Table 2: Physical Extent of Impact

SCORE	DESCRIPTION
1	The impact will be limited to the site.
2	The impact will be limited to the local area.
3	The impact will be limited to the region.
4	The impact will be national.
5	The impact will be international.

Table 3: Duration of Impact

SCORE	DESCRIPTION
1	A very short duration (0 to 1 years).
2	A short duration (2 to 5 years).
3	A medium term (5–15 years).
4	A long term (> 15 years).
5	Permanent.

Table 4: Magnitude of Impact on Ecological Processes

SCORE	DESCRIPTION
0	Small and will have no effect on the environment.
2	Minor and will not result in an impact on processes.
4	Low and will cause a slight impact on processes.
6	Moderate and will result in processes continuing but in a modified way.
8	High (processes are altered to the extent that they temporarily cease).
10	Very high and results in complete destruction of patterns and permanent cessation of processes.

Table 5: Impact Probability of Occurrence

SCORE	DESCRIPTION
1	very improbable (probably will not happen.
2	improbable (some possibility, but low likelihood).
3	probable (distinct possibility).
4	highly probable (most likely).
5	definite (impact will occur regardless of any prevention measures).

- The significance, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- The status, which is described as either positive, negative or neutral;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources; and

- The degree to which the impact can be mitigated.

  The significance is determined by combining the criteria in the following formula:

$$S = (E + D + M) \times P$$

S = Significance weighting;

E = Extent;

D = Duration;

M = Magnitude, and

P = Probability.

The significance weightings for each potential impact are as follows (**Table 6**):

Table 6: Significance Weightings for Each Impact

OVERALL SCORE	SIGNIFICANCE RATING	DESCRIPTION
< 30 points	Low	where this impact would not have a direct influence on the decision to develop in the area
31-60 points	Medium	where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	High	where the impact must have an influence on the decision process to develop in the area

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the Project's actual extent of impact, and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures, and is thus the final level of impact associated with the development of the Project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this EIA Report.

1.3 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations were identified as part of the assessment:

- The various published data sources (i.e. aerial imagery, mapping and previous reports) have been assumed to be accurate at the time of use.
- At the time of the site investigation, the final layout routes of the pipelines, powerlines and substations was not made available, and as such could not be investigated as part of the infield site assessment.
- Identification of freshwater habitats in the region of the proposed Letsoai CSP Site 1 project, was limited to a high level desktop exercise.
- Owing to the extent of the site and accessibility constraints, groundtruthing was only possible in certain areas of the site. Conditions of freshwater habitat in inaccessible areas were therefore inferred based on site observations of accessible habitats.
- The site visit was limited to a 500m radius around the farm property Hartebeestvlei RE86 within which the proposed Letsoai CSP Site 1 project sites are located. As such, only the freshwater habitats identified within the 500m buffer of the farm property that were accessible by vehicle at the time of the site visit, were investigated.
- The site visit was conducted during the dry season for the region (and during a drought period), making it difficult to identify and distinguish any freshwater habitats in the area due to arid nature of the region.

1.4 DECLARATION OF INDEPENDENCE

Bruce Wickham is a Hydrologist with a MSc from the University of KwaZulu-Natal in 2015. He joined WSP | Parsons Brinckerhoff in 2015 and has worked on various soil and wetland related projects. He is registered as a Candidate Natural Scientist – Water Resources Science with the South African Council for Natural Scientific Professions (SACNASP).

Colin Holmes is a Senior Environmental Consultant at WSP | Parsons Brinckerhoff with a MSc in Applied Environmental Science. He has also completed wetland management courses with the University of Free State. He has completed and managed numerous projects relating to wetland and riparian delineations, Present Ecological State and Ecological Importance and Sensitivity assessments, and the compilation of IWWMPs. He is registered with the South African Council for Scientific Professions – Professional Natural Scientist (Environmental Scientist) and is a SETA accredited Carbon Footprint Analyst.

Greg Matthews has 17 years of professional experience and is registered with the South African Council for Scientific Professions – Professional Natural Scientist (Environmental Scientist and Hydrological Scientist). He has been involved in numerous projects associated with the assessment of activities on both soil and water resources.

WSP | Parsons Brinckerhoff has no financial or other interest in the proposed development and will derive no benefits other than fair remuneration for consulting services provided.

I, Greg Matthews, declare that –

à I act as the independent specialist in this application;

à I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;

à I declare that there are no circumstances that may compromise my objectivity in performing such work;

à I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;

à I will comply with the Act, regulations and all other applicable legislation;

à I have no, and will not engage in, conflicting interests in undertaking of the activity;

à I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have potential of influencing – any decision to be taken with respect to the application by the competent authority; and – the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;

à All the particulars furnished by me in this form are true and correct; and

à I realise that a false declaration is an offense in terms of regulation 71 and is punishable in terms of section 24F of the Act.

Name: Greg Matthews Sign:  **Date:** 29/11/2016

2 DESCRIPTION OF THE PROJECT

The proposed Solar BioTherm development, is located on the remaining extent farm portion Hartebeestvlei RE86 in the Northern Cape province (**Figure 1**). The project entails two renewable solar power technologies viz. Concentrated Solar Power (CSP) and Photovoltaics (PV), differentiated by Letsoai (CSP) and Enamandla (PV) site names (**Figure 2**). Furthermore, there are two alternative site layouts for the Enamandla PV sites 2 – 5, of which the second layout (i.e. 'Alternatives 2") is the preferred option (**Figure 2**).

This report is primarily focused towards potential activities and impacts associated with the Letsoai CSP Site 1 and associated pipelines, however there are also proposed infrastructure options associated with the development (i.e. substations, power transmission lines and pipelines). The associated infrastructure has been assessed in separate report.

The Letsoai CSP Site 1 will produce 150 MW of electrical power which will be fed into the national grid. There will be an onsite substation connected to the facility power island which is comprised of a steam turbine generator transformer. The power-island will be linked to the onsite substation using suitable underground cables (except where a technical assessment suggest that overhead lines are applicable), before being evacuated by 132kV powerlines to the common substation.

The CSP method is a type of technology used to create energy through the use of sunlight, using mirrors/lenses to focus a large area of sunlight onto one space creating a small, concentrated beam of light. This method utilises solar energy to heat up the Heat Transfer Fluid (HTF). This HTF is then utilised to create steam which in turn drives the turbines, to generate electricity. The CSP can either make use of a tower or a trough, with the former proposed for the BioTherm project. The CSP tower technology comprise of an array of large sun tracking mirrors (i.e. heliostats) that reflects and concentrates the sun's rays to a central receiver located atop a large tower position in the middle of the heliostat field. The receiver consists of series of tubes that is filled with HTF. The HTF comprises of an oil or salt which is liquid at temperatures between 257°C - 400°C and has the ability to retain its heat under the correct insulting conditions.

The Letsoai CSP Site 1 occupies an area of 13.00 km^2, in the northern portion of the farm property, which has a total area of 132 km^2. The closest town is a small mining village, Aggeneys, which is 15km north of the sites (**Figure 1**). The Orange River is located 55km north of the site (**Figure 1)**.

Water will be supplied to the CSP sites via proposed pipeline. Three pipeline routing options are proposed, transferring water from either the Kokerboom Reservoir or the Orange River (**Figure 3**). The pipeline routing options are as follows:

- Option 1 is 28.8km in length, and supplied by Kokerboom Reservoir located at Aggeneys settlement, north of the site;
- Option 2 is 34.1km in length, and supplied by Kokerboom Reservoir; and
- Option 3 is 65.6km in length, and abstracts water from the Orange River at the Pella Pump station, located north-east of the site.

The site is located within the Namakwa District Municipality (DM) and the Khâi-Ma Local Municipality (LM). The cities and towns located within the Khâi-Ma LM are Aggeneys, Pofadder and Pella. The main economic sectors are agriculture, tourism, community, social and personal services (The Local Government Handbook, accessed 2016). The village of Aggeneys was established to accommodate the employees of the Black Mountain Mine. Most municipal services within the town are provided and funded by the Black Mountain Mining Company. The main road of the N14 runs from Upington to Springbok and serves as the primary access route to Aggeneys and neighbouring towns (**Figure 1**).

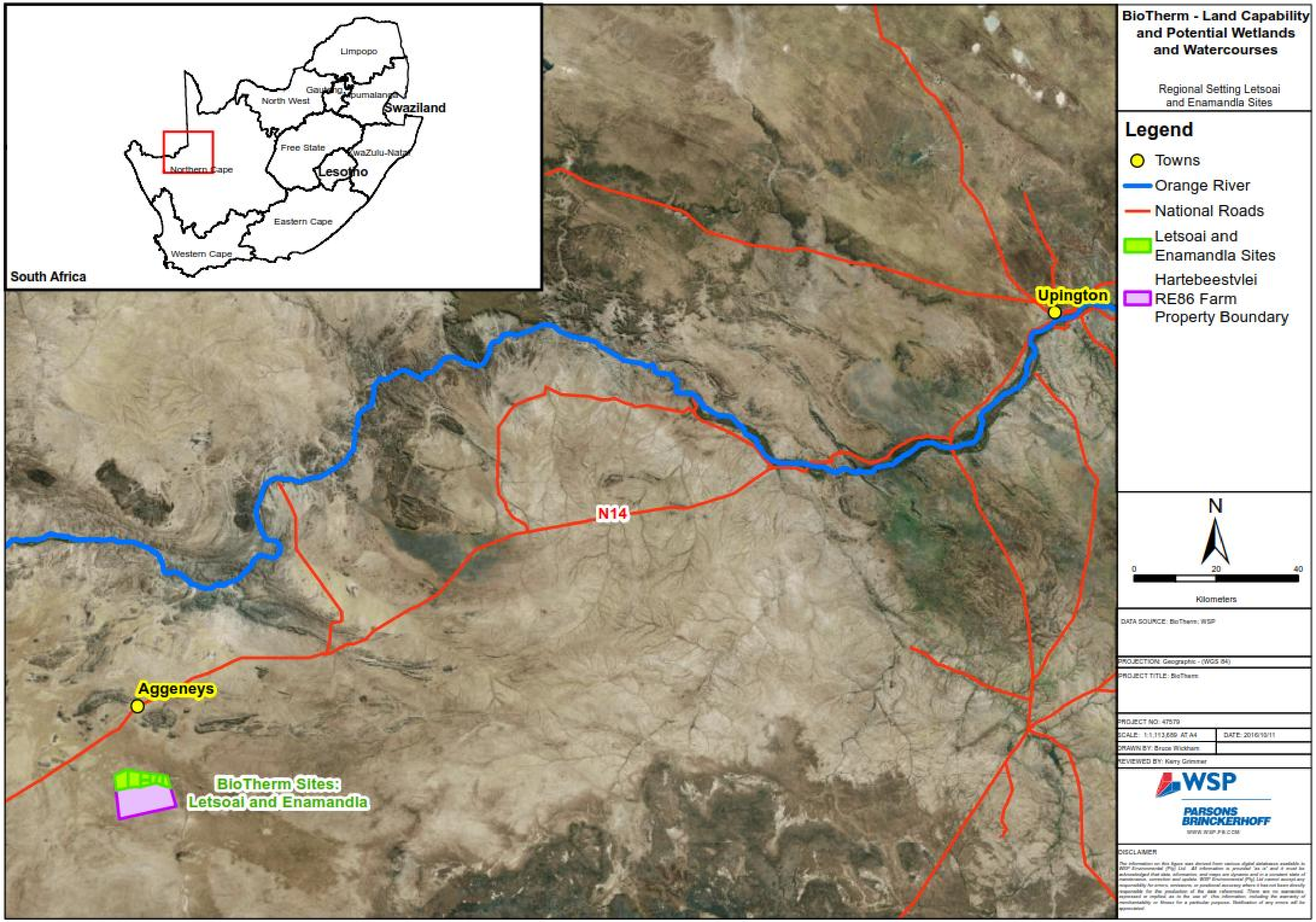

Figure 1: Regional Setting of Letsoai CSP Site 1 in relation to the entire BioTherm Project

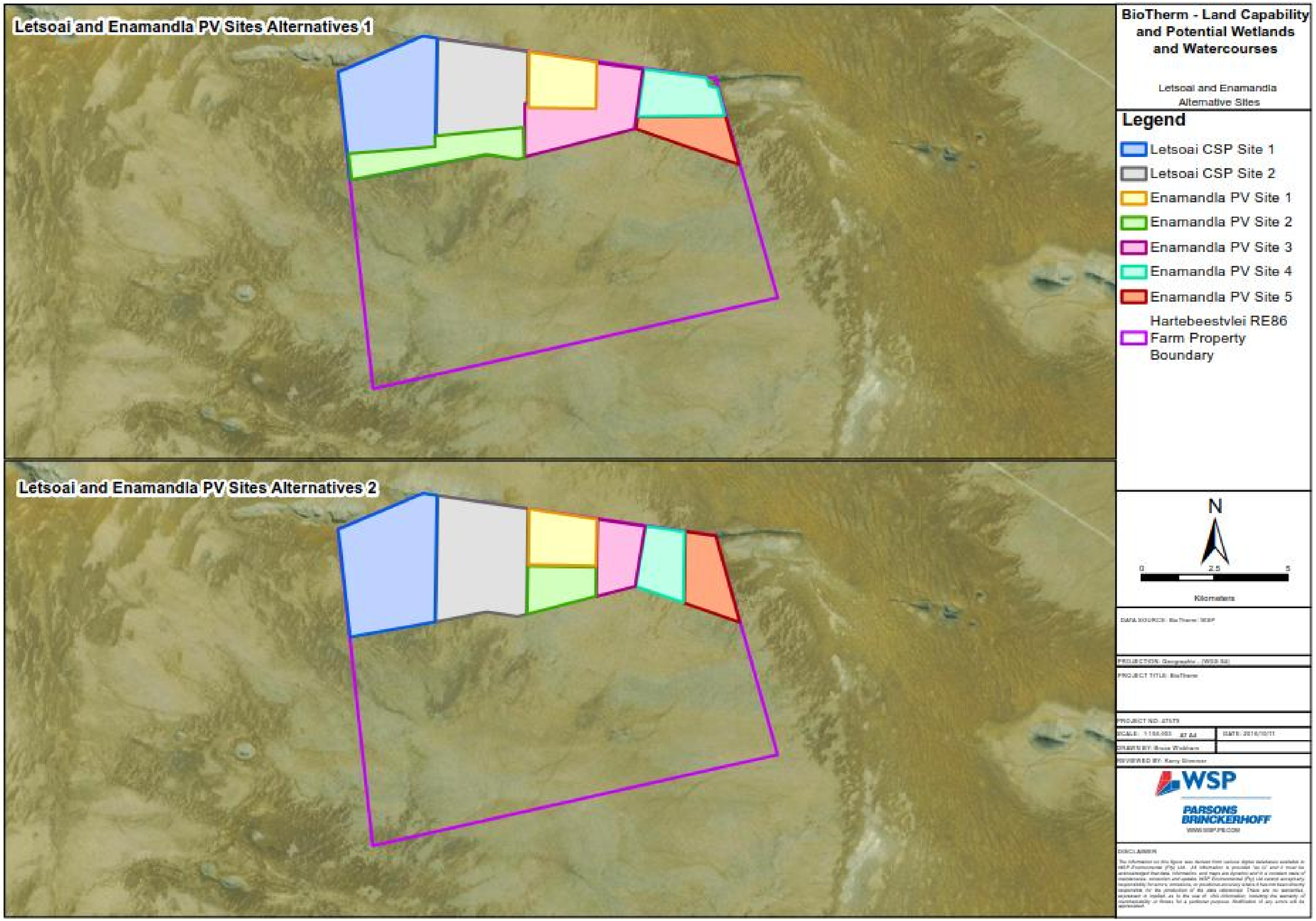

Figure 2: Letsoai CSP and Enamandla PV Alternative Sites

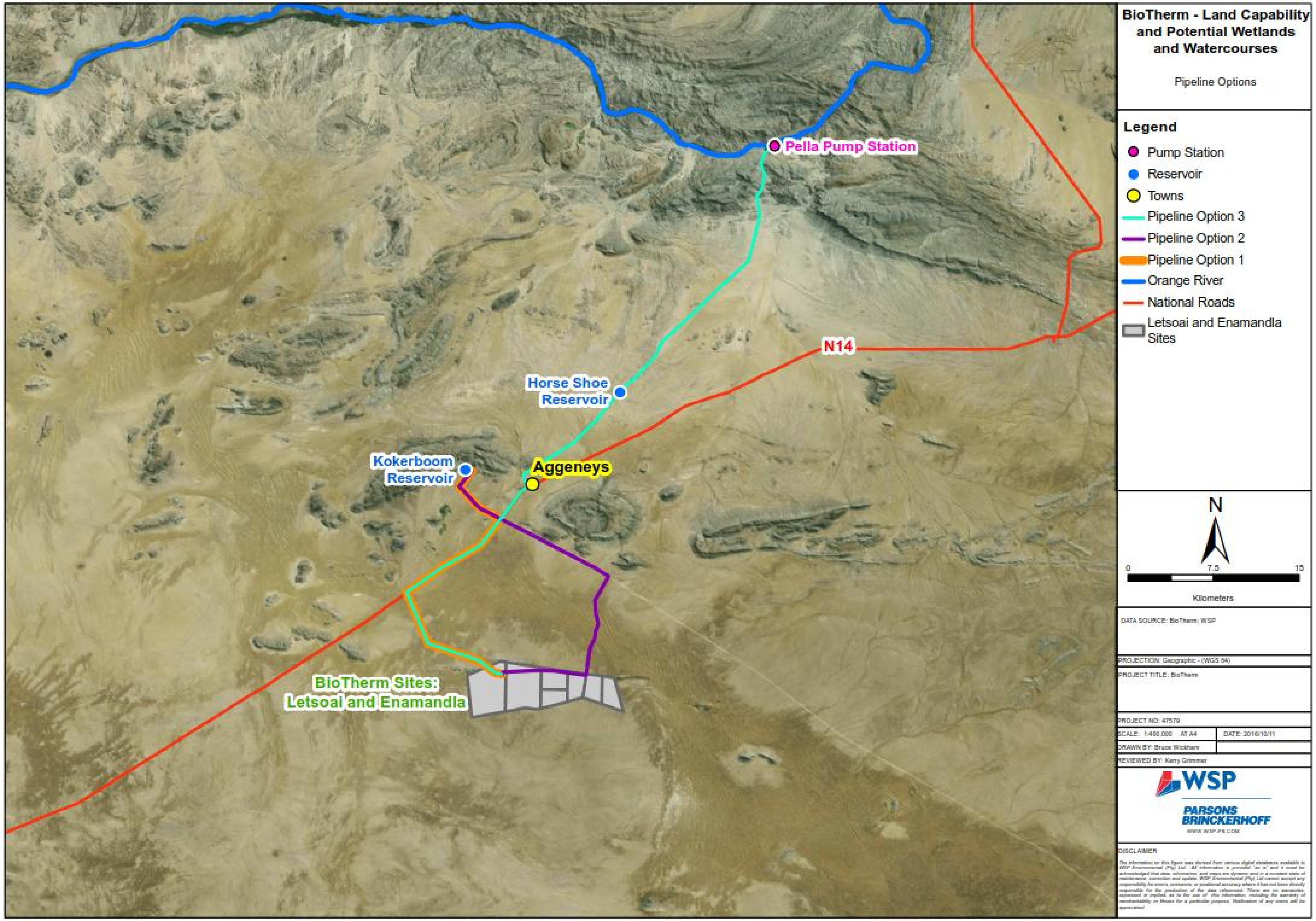

Figure 3: Proposed Pipeline Route Options

In addition to the proposed Letsoai CSP Site 1 project, there are additional potential solar/wind power developments planned in the area around the proposed BioTherm solar sites (**Figure 4**). This area falls within the Springbok Wind Renewable Energy Development Zone (REDZ). These zones were identified throughout South Africa in a Strategic Environmental Assessment (SEA), as part of the Department of Environmental Affairs Strategic Integrated Project National Infrastructure Plan.

In a separate SEA - Electrical Grid Infrastructure (EGI), national power corridors were delineated for the efficient and effective expansion of the transmission infrastructure throughout South Africa. The location of the BioTherm sites, as well as the proposed neighbouring renewable energy developments, are strategically placed to overlap with the REDZs and EGI demarcated zones (**Figure 4**). The neighbouring potential solar/wind power developments will be factored into the EIA as part of the cumulative impact assessment. These renewable energy developer entities include:

- Orlight SA (Pty) Ltd – Photovoltaic Power Plant
- Sato Energy Holdings – Photovoltaics (1 site);
- Solar Capital (Pty) Ltd – Concentrate Solar Power (1 site);
- Mainstream Renewable Power SA – Solar (2 sites); and
- JUWI Renewable Energies (Pty) Ltd – Wind Turbines (2 sites).

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

The local natural environment within which the proposed Letsoai CSP Site 1 project is located is summarised in the following section. This will include the local hydrology, natural vegetation and land use, soil type and characterisation, and a simple geological description with a basic groundwater assessment. This will serve as basic description of the present natural conditions in the area of the proposed Letsoai CSP Site 1 project.

3.1 HYDROLOGY

South Africa is divided into nine Water Management Areas (WMAs), where the proposed BioTherm solar power sites and pipelines are situated in the Orange WMA 6 (**Figure 5**). The site and pipelines are located in the downstream portion of the Orange River Basin, which starts in the Lesotho Highlands headwaters of the Senqu River. The Upper region of the Orange WMA, as well as the Upper, Middle and Lower Vaal WMA's all contribute to the Orange River Basin as a whole.

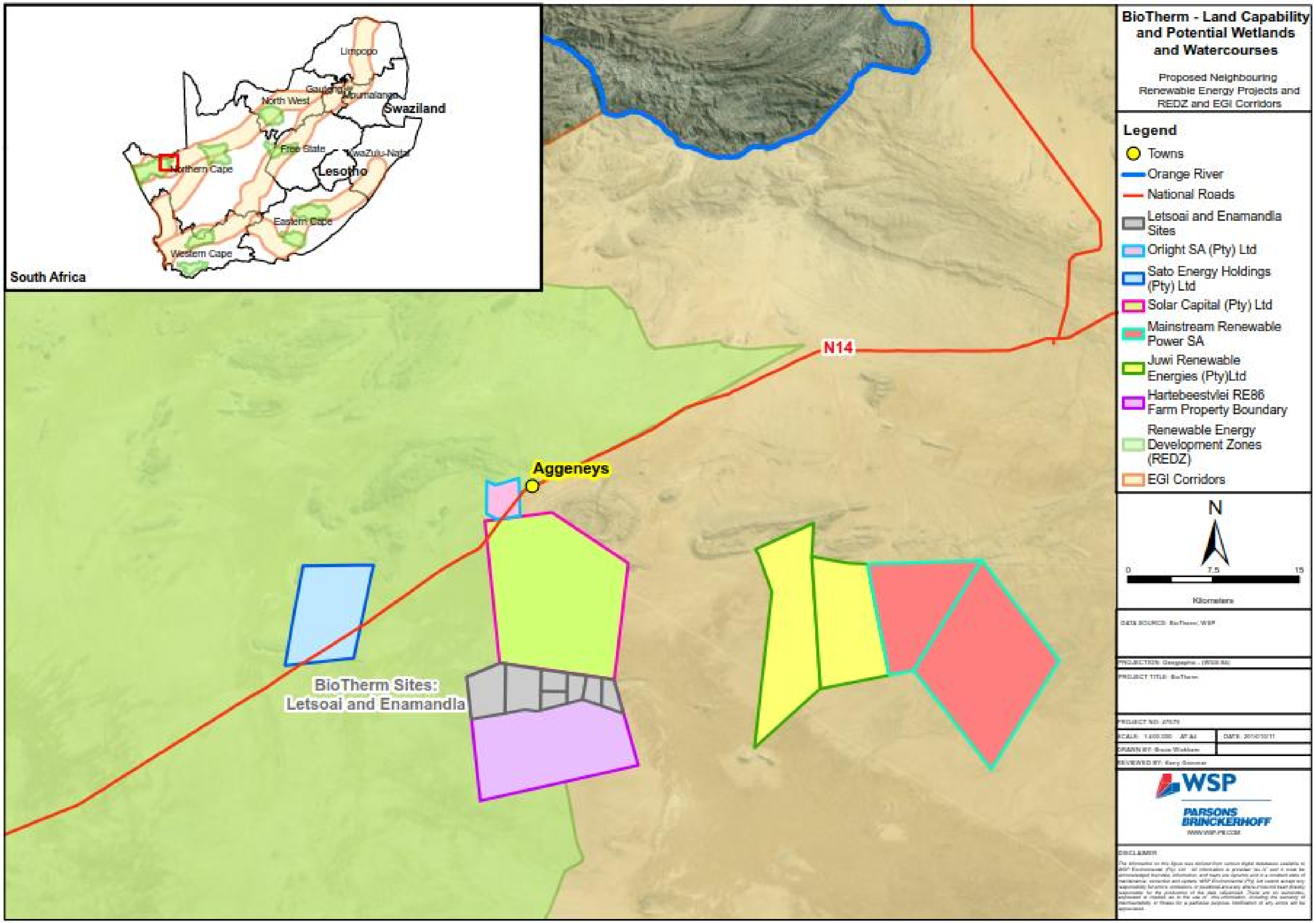

Figure 4: Proposed Neighbouring Renewable Energy Projects, REDZ and EGI

Figure 5: **Location of BioTherm Sites and pipelines in Relation to the New Water Management Areas**

The Letsoai CSP Site 1 and pipelines lie within tertiary catchment D82 and various quaternary catchments with D82 (**Figure 6**). The hydrological characteristics for D82 and D81G are summarised in **Table 7**, including catchment area, Mean Annual Precipitation (MAP), Mean Annual Evaporation (MAE) and Mean Annual Runoff (MAR). The MAE largely exceeds the MAP, resulting in very low runoff and reinforcing the arid conditions of the region. Quaternary catchment D82C, is 100% endoreic (WRC/DWA, 2012). An endoreic area does not contribute to runoff, and thus rainfall on this area is lost through either evaporation or percolation to the underlying groundwater environment, and as such does not contribute to surface water runoff. For a complete assessment of the water component of the Study, the reader is referred to the *Water Assessment report for the Solar Power Generation in the Northern Cape Province* Report (WSP, 2016).

Table 7: Characteristics of Quaternary Catchments where the Letsoai CSP Site 1 and pipelines are located

QUATERNARY	CATCHMENT AREA (km^2)	MAP (mm)	MAE (mm)	MAR (million m^3/a)
D81G	2007	102	2 650	0.87
D82A	1 917	77	2 650	0.28
D82B	4 877	80	2 650	0
D82C	3 996	83	2 650	0

Upon the site visit, there were no watercourses identified within the proposed Letsoai CSP Site 1. The nearest evidence of a watercourse was the Kao River (and associated tributaries) which is located north of the project site (**Figure 6**). During the site visit there was no water present in the Kao River. At a high level desktop review, all three pipeline options traverse the Kao River drainage area with the option 3 intersecting the Goob se Laagte River near the Orange River (**Figure 6**). The topography or the area is predominantly flat with average slope of 3.5% from the Letsoai CSP Site 1 towards the Orange River. The low rainfall and endoreic characteristic for the region means that rivers in the region are mostly ephemeral (excluding the Orange), and are likely to only convey water during infrequent high rainfall events.

3.2 VEGETATION AND LAND USE

Based on the Mucina and Rutherford (2006) natural vegetation classification map, the area of proposed BioTherm solar power project is mostly Bushmanland Arid Grassland (**Figure 6**). There are minor portions of Bushmanland Inselberg Shrubland situated on the small hills along the northern edge of the Hartebeestvlei RE8 farm property boundary (**Figure 7**). The Department of Agriculture, Forestry and Fisheries (DAFF) define the land use within the Hartebeestvlei RE86 farm property, as predominantly Shrubland and Low Fynbos, with smaller pockets of unimproved (natural) Grassland, and minor areas of Woodlands (DAFF, 2012) (**Figure 8**). There are three potential wetlands located approximately 3.4km ,5.2km and 1.7km south of the proposed Letsoai CSP Site 1. At a desktop level, there are two wetlands within 500m of pipeline option 2 and 3 (**Figure 8**).

Upon the site visit, the vegetation was identified as mostly shrub-like arid grassland, which is primarily used for sheep grazing (**Plates 1 – 3**). Cattle grazing activities and herd of indigenous antelope (Springbok) were also present within Hartebeestvlei RE86 farm property. Windmill driven boreholes located throughout the farm property supply water to small reservoirs for the sheep and cattle (**Plate 4**).

Beyond the Hartebeestvlei RE86 farm property boundary, additional land use activities identified during the site walkover included, sheep farming, the Eskom Aggeneis Sub-station, Aggeneys mining village, the Black Mountain Mine and the Gamsberg Mine.

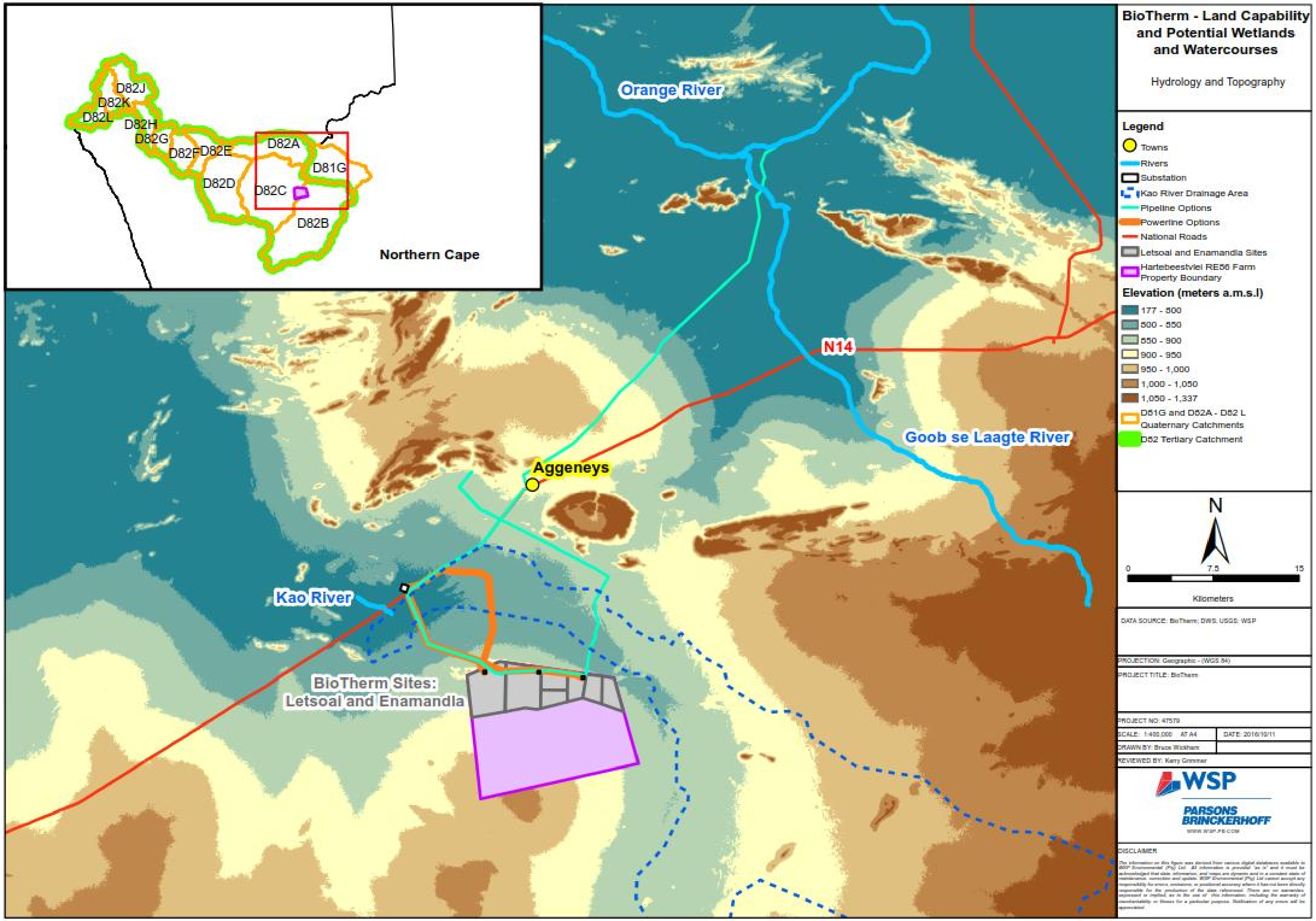

Figure 6: Local Hydrology and Topography

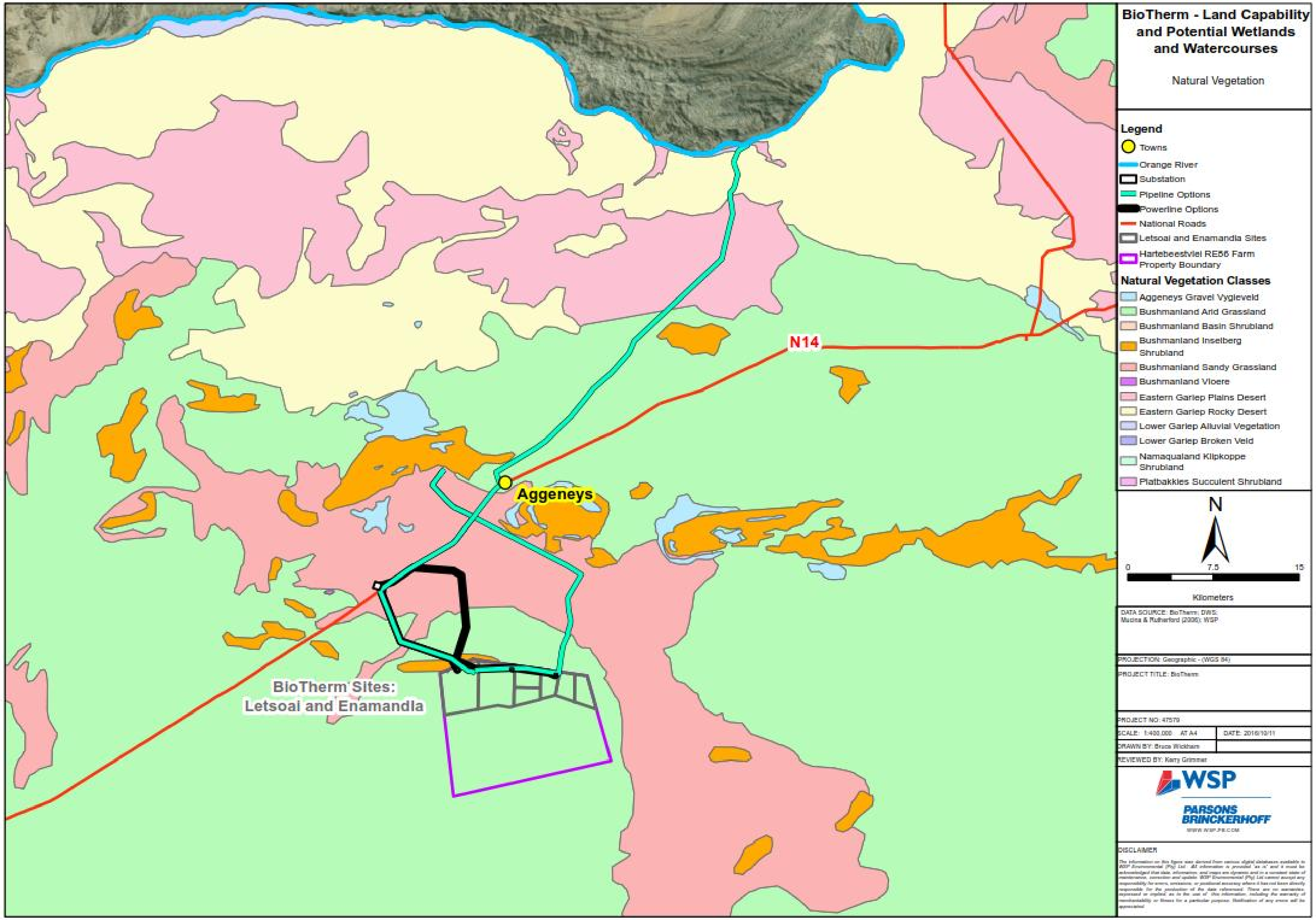

Figure 7: Local Natural Vegetation

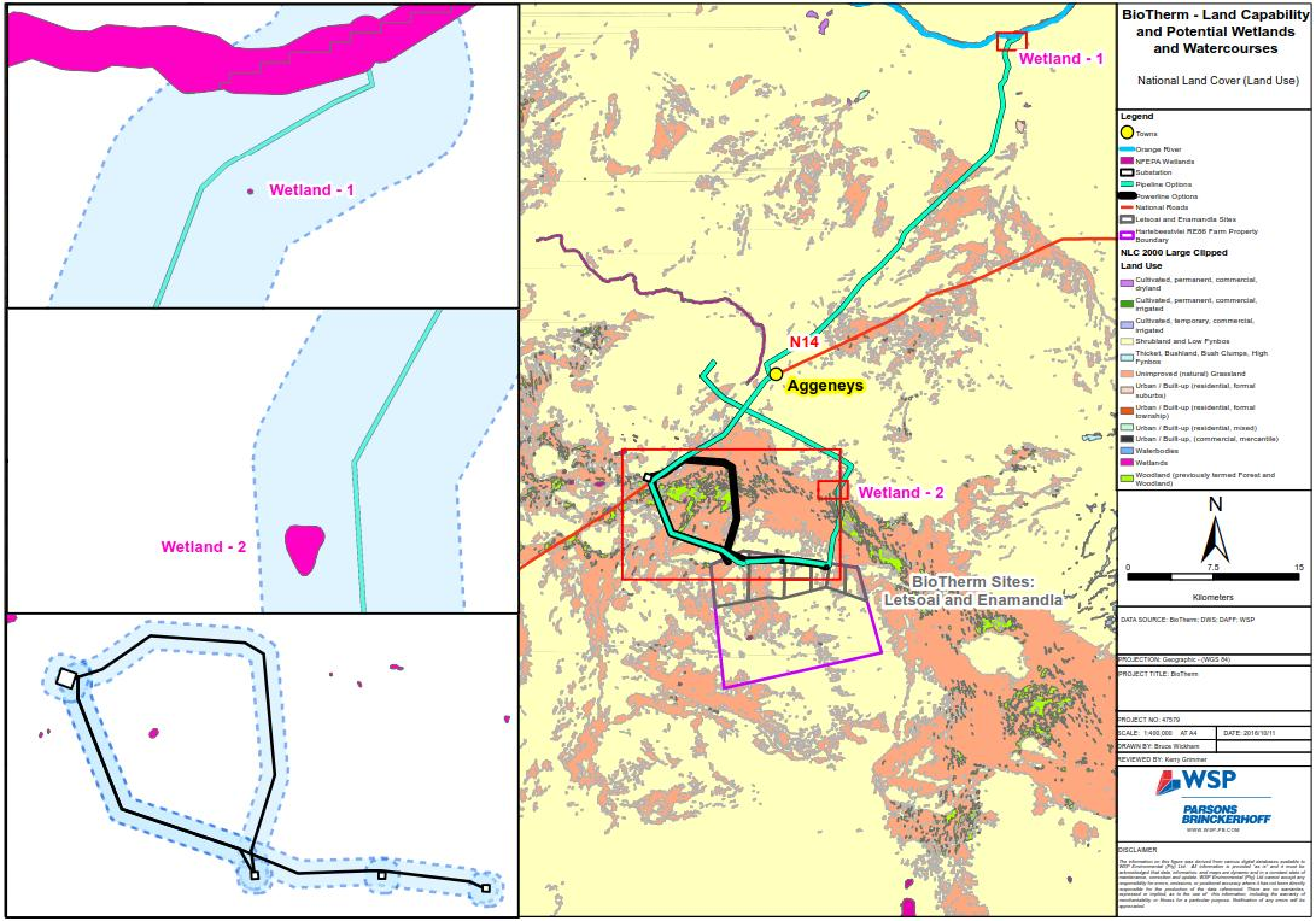

Figure 8: Local Land Cover (Land Use), indicating the desktop identified wetland systems

3.3 SOILS AND GEOLOGY

Based on the information included in the land type maps of South Africa (AGIS, 2007) the soils in the area of the Hartebeestvlei RE86 farm are identified mostly as "*Red-yellow apedal, freely drained soils, red, high base status, < 300 mm deep*". There are smaller areas comprised of "*Miscellaneous land classes, very rocky with little or no soils*" on the inselbergs (small hills) located on the northern boundary of the farm property (**Figure 9**). The landscape is mostly shaped by wind erosion, and there is a low to moderate water erosion hazard (AGIS, 2007).

The general geology description of the area is based on the 1:1 000 000 geological map for Northern Cape Province, published by the Trigonometrical Survey Office in 1970 (Schifano *et.al*., 1970). The farm property is located on the Namaqualand and Natal belt of metamorphism and granitization where the rock type comprises of *Migmatite, gneiss and ultrametamorphic rocks* (**Figure 10**). Upon the site walkover, gneiss rock types were present below the soil profile (**Plate 5**)

The ranges of hills, mountains and inselbergs in the area display some of the most diverse and complex geology in Southern Africa including some of the richest known concentrations of copper, lead and zinc (Mining Technology, accessed 2016). The Aggeneys deposits occur in the Precambrian metavolcanic metasedimentary Bushmanland Group which forms part of the Namaqualand Metamorphic Complex. The Bushmanland Group is located within the Namaqualand-Natal Mobile Belt, with an area of approximately 18 000km^2.

Due to the high minerals in the area, mining activities have been active for many years, and projected to continue for decades to come (i.e. the Black Mountain Mine and Gamsberg Mine). The Black Mountain Mine is an underground base-metal operation mining zinc, lead, copper and silver, and is located 14 km north of Hartebeestvlei farm RE86.

The large flat plains dominated by the fine red sand sediment, is underlain by granitic gneisses, while the protruding inselbergs and ranges of hills are characterised by metavolcanic-metasedimentary units of the Bushmanland Group (Bailie *et al*., 2007). The orebody at the proposed Gamsberg mine nearby is hosted by iron sulphide-rich pelitic rocks and iron formation, and the economic mineralisation comprises sphalerite (zinc) and minor galena (lead). As of November 2014, the Gamsberg mine was estimated to contain mineral resources of 194Mt.

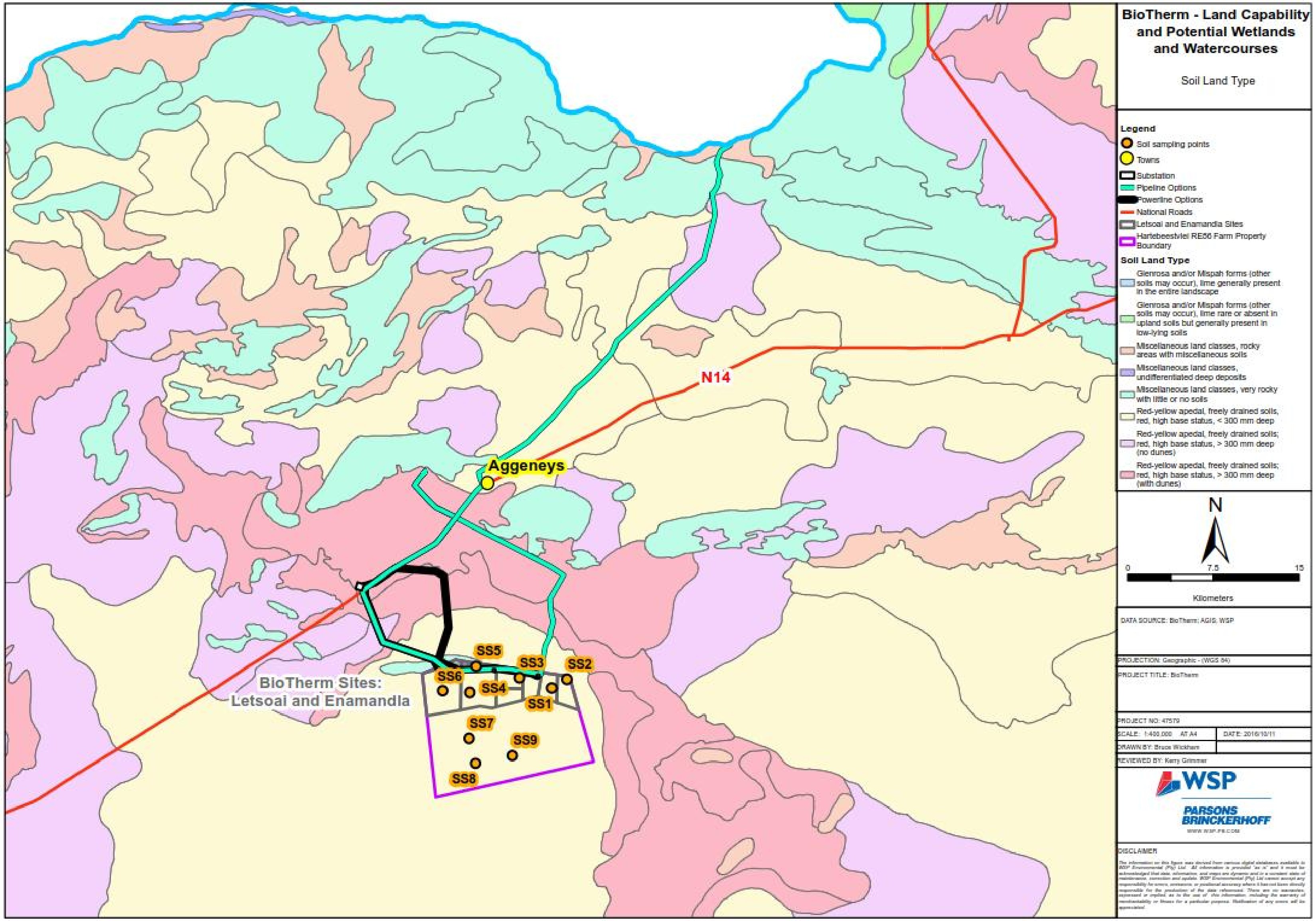

Figure 9: Local Soil land Type and Soil Sampling Locations

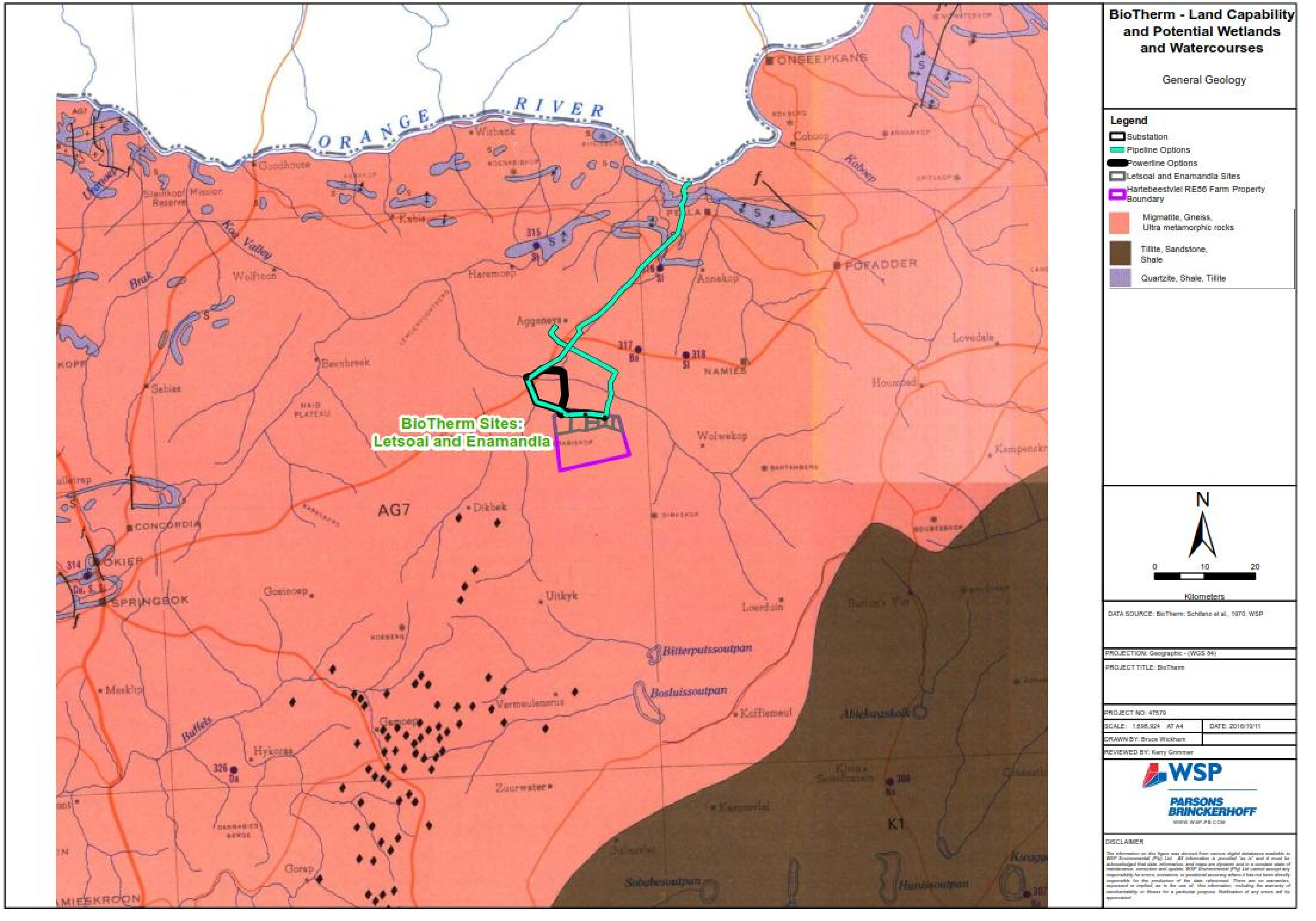

Figure 10: Local General Geology

3.4 GROUNDWATER

The groundwater of the area was assessed through a site walkover conducted by WSP | Parsons Brinckerhoff and VSA Leboa Consulting. Several boreholes over the area were identified with three representative boreholes chosen to be analysed for both yield and chemical constituents.

The groundwater investigation identified the underlying natural geology as a poor aquifer, with a low low-yielding system of poor water quality with a least vulnerability to contamination and the low susceptible to anthropogenic activities. The regional depth to groundwater is 30 to 50m below ground level (bgl). Water level measured from the boreholes ranged between 27.74 m and 79.59m bgl. Owing to mining within the area groundwater level may be induced to drop.

Aquifer testing of two of the boreholes indicated that the average sustainable yield ranged between 0.72 l/s and 1.105 l/s. The groundwater quality analysis revealed a dominance in sodium, potassium, chloride and sulphate ions, with Totals Dissolved Solids ranging from 1000 to 1500 mg/l.

The *Water Assessment report for the Solar Power Generation in the Northern Cape Province* Report (WSP, 2016) summaries the finding of the assessment of hydrogeological conditions associated with the broader site

4 FINDINGS – LETSOAI CSP SITE 1 AND ASSOCIATED PIPELINES

The assessment of the Land Capability and Freshwater Habitat for the Letsoai CSP Site 1 and associated pipelines are outlined below. Note this only applies to the section of pipelines options located within the Letsoai CSP Site 1.

4.1 LAND CAPABILITY

To ascertain the characteristics of the soils across the site, soil samples were obtained from nine locations (i.e. SS1 – SS9) (**Figure 8**). The location of the soil sampling points was determined from interpreting the soil land type map for the area as well as on-site observation for changes in the topography and land feature which might induce a change in the soil type.

At each location, the soil depth and diagnostics horizons were identified, and a sample was collected for chemical and physical analyses in a suitable soil laboratory (**Appendix A**). For practical reasons, soil samples that were collected (within 0.3m depth) in a similar setting and had the same soil family, were composited to provide representative samples for the area (**Table 8**). The characteristics of the soil samples and profiles are described in **Table 9**. Based on the *Taxonomic Soil Classification System for South Africa* (Macvicar, 1991) all the soil samples were classified as Namib soil form (**Plate 6**).

Table 8: Representative Soil Samples

REPRESENTATIVE SOIL SAMPLE	MIX SOIL SAMPLES
1	SS1 + SS2 + SS3
2	SS4 + SS5 + SS6
3	SS7 + SS8 + SS9

Table 9: Soil Sample Characteristics

CHARACTERISTIC	SS1	SS2	SS3	SS4	SS5	SS6	SS7	SS8	SS9
Soil Form	Namib	Namib	Namib	Namib	Namib	Namib	Namib	Namib	Namib
Profile Depth	0.16	0.95	0.23	1.58	1.13	0.33	0.31	0.34	0.22
Dry Colour*, mottling and gleying	Pale orange	Pale orange	Orange	Orange	Orange	Pale orange	Orange	Orange	Orange
	Hue 5 YR	Hue 5 YR	Hue 2.5 YR	Hue 2.5 YR	Hue 2.5 YR	Hue 5 YR	Hue 5 YR	Hue 7.5 YR	Hue 7.5 YR
	Value 8	Value 8	Value 8	Value 8	Value 8	Value 8	Value 7	Value 7	Value 7
	Chroma 4	Chroma 4	Chroma 8	Chroma 8	Chroma 8	Chroma 4	Chroma 8	Chroma 6	Chroma 6
Subjective moisture	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Effective rooting depth- Grasses (m)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Effective rooting depth - Shrubs (m)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Soil structure	Single grained	Single grained	Single grained	Single grained	Single grained	Single grained	Single grained	Single grained	Single grained
Presence of rocks, pedocretes, calcareousness	No	No	No	No	No	No	No	No	No
pH	6.7	6.7	6.7	7.1	7.1	7.1	7.4	7.4	7.4
Electrical conductivity (mS/m)	18.4	18.4	18.4	20.1	20.1	20.1	19.9	19.9	19.9
Exchangeable sodium (%)	1.4	1.4	1.4	2.2	2.2	2.2	1.1	1.1	1.1
Sand (S) Silt (Si) & Clay (C) (%)	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2	96, 2, 2
Texture**	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand	Fine Sand
Estimate permeability (m/d)***	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0	1.6 – 6.0
Erodibility K factor #	52	52	52	52	52	52	52	52	52

Sources: ** Colour based on the revised Standard Soil Colour Chart (Fujihara Industry Co.,2001) ;*

*** Texture based upon the United States Department of Agriculture (USDA) Soil texture triangle and grain size*

**** Estimate Permeability based upon soil structure and texture (van der Molen, Beltran, & Ochs, 2007)*

 # Estimated from the soil erodibility nomograph of Wischmeier, Johnson and Cross (1971)

According to DAFF Agricultural Geo-Referenced Information System (AGIS, 2007), the land capability within the Hartebeestvlei RE86 farm property is largely classified as non-arable with a low potential for grazing, while the inselbergs on the northern boundary of the farm property constitute as Wilderness (**Figure 11**). These two groups correlate to Classes VII and VIII from the Eight-Class Land Capability System described in Klingebiel and Montgomery (1961), as follows:

- VII: Severe limitations that make the land unsuited to cultivation and restrict its use largely to grazing, woodland or wildlife. Restrictions are more severe than those for Class VI due to one or more limitations which cannot be corrected, such as very steep slopes, erosion, shallow soil, stones, wet soil, salts or sodicity (amount of sodium held in a soil) and unfavourable climate.
- VIII: Limitation that preclude its use for commercial plant production and restrict its use to recreation, wildlife, water supply, or aesthetic purposes; limitations that cannot be corrected may result from the effects of one or more of erosion or erosion hazard, sever climate, wet soil, stones, low water-holding capacity, salinity or sodicity.

Based on the Land Capability Classification described in the Chamber of Mines Guidelines the land capability within the Letsoai CSP Site 1 is classified as *Class 3: Grazing Land*, for the following reasons:

- There were no wetlands confirmed within the site during the desktop and site walkover exercises. Thus by definition of the Chamber of Mines classification, it is not a wetland;
- The soils are predominately shallow (average 0.58m). Thus by definition of the Chamber of Mines classification, it is not an arable land;
- The product of the slope (in percent) and erodibility factor (K) in the site is not less than 2 (the lowest value is 161.2). Thus by definition of the Chamber of Mines Guidelines, it is not arable land;
- The land on the site is not irrigated. Thus by definition of the Chamber of Mines Guidelines, it is not an arable land; and
- It meets all the requirements for class 3: grazing land.

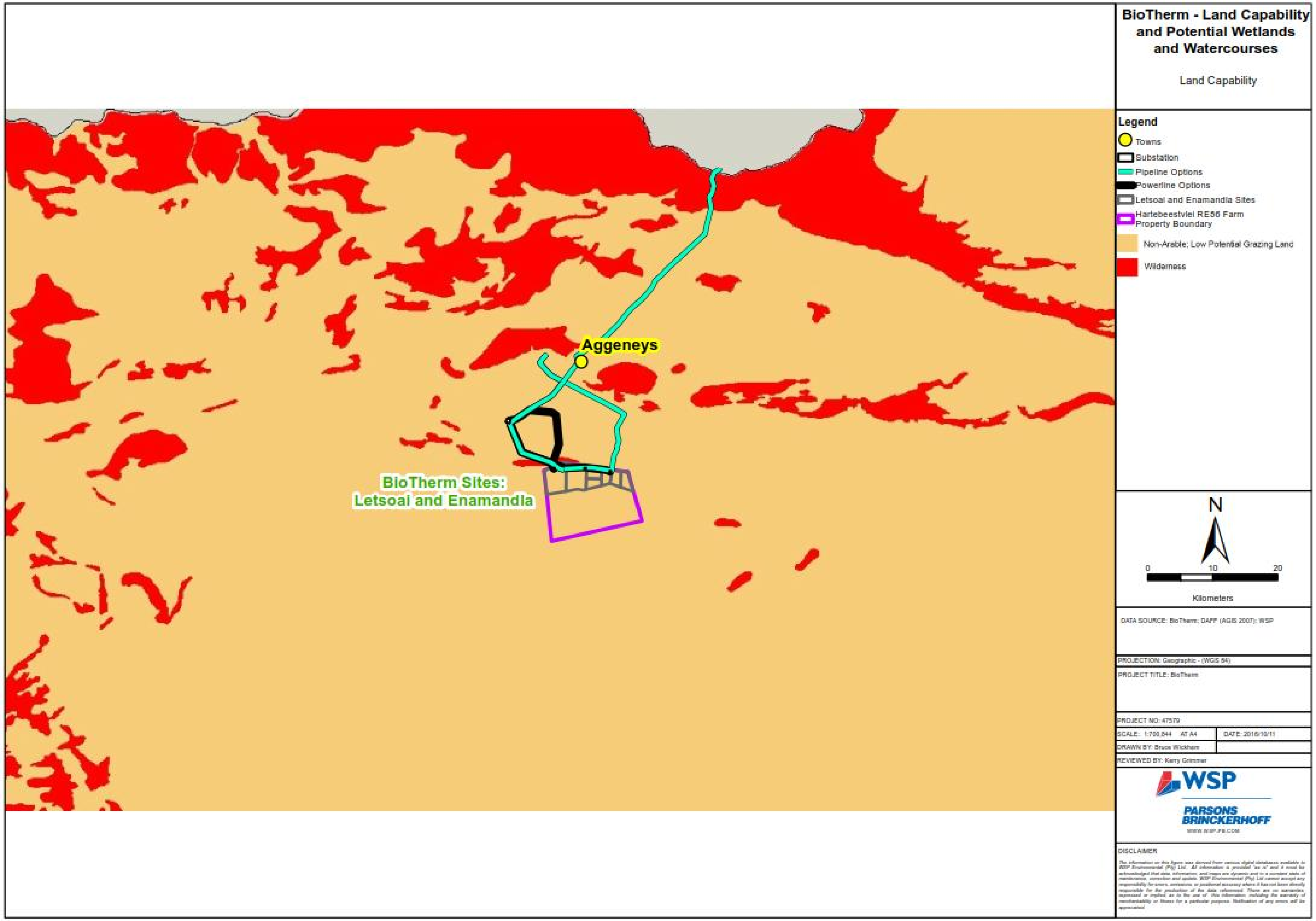

Figure 11: Local Land Capability

4.2 FRESHWATER HABITAT

A wetland is defined as land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil (National Water Act, Act 36 of 1998). During the desktop investigation, two riparian (Good se Laagte and Kao) and two wetland systems were located within a 500m radius of the pipelines (**Figure 12**). While the confirmation of these wetlands was not included during the site visit, it was not possible to delineate and assess. Similarly, the location of where pipeline option 3 intersects the Good se Laagte River, was not inspected during the infield site visit.

5 ASSESSMENT OF IMPACTS

The impacts identified for the Letsoai CSP Site 1 and pipelines are assessed in the section that follows. The methodology for defining the significance of the respective impacts is described in section 1.2 of this report. The impacts will be assessed for the construction, operational and decommissioning phases of the project. A cumulative impact assessment will also be performed for the neighbouring BioTherm sites and adjacent renewable energy projects. This section will provide a summary of the findings from the significance rating tables used for each impact. The process for determining the relevant significances of each impact for the various phases of the project is provided in **Appendix B**.

5.1 CONSTRUCTION PHASE

The anticipated impacts for the Letsoai CSP Site 1 and pipelines during the construction phase of the project are summarised in **Table 10**.

Table 10: Construction Phase Impacts

ACTIVITY	POTENTIAL IMPACT
Site preparation and construction of solar power facility and associated infrastructure.	Loss of grazing land current utilised for grazing mostly sheep farming, cattle farming and indigenous antelope.
	Loss of aesthetical value of the natural landscape.
	Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.
	Increased potential of soil erosion due to vegetation clearance, soil disturbance and a high traffic movement on site, especially wind driven. Subsequent potential sedimentation of watercourses.
	Potential land contamination from hazardous substances. This includes spillage of concrete onto soil surface, as well as oils, fuel, grease (from construction vehicles) and sewage from temporary on-site ablution facilities.
	Temporary degradation of wetland/riparian habitat due to the proposed traversing pipelines

There are no fatal flaws identified for the construction phase associated with the proposed Letsoai CSP Site 1 project, other than the potential wetlands located with 500m of pipeline option 2 and 3. The loss of gazing land is a negative impact and was assigned a medium environmental significance rating score, after mitigation measures. This impact is unavoidable given the fact that during the construction phase the project will physically occupy portions of the land located within the project footprint. Potential impacts of soil erosion and spillage of hazardous substances were both classified with a low environmental significance, before and after mitigation measures, due to the lower probability of significant erosion or spills occurring.

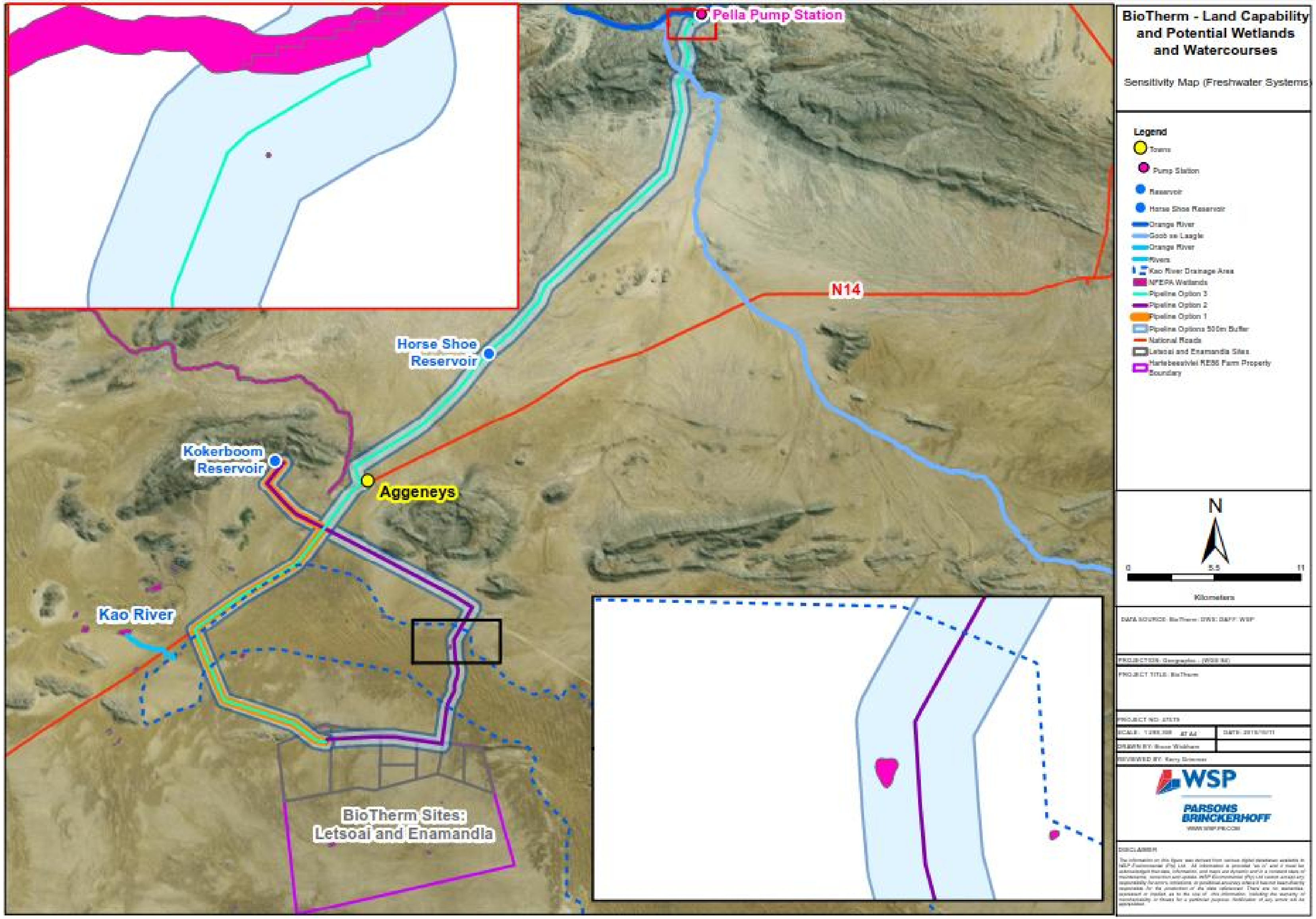

Figure 12: Sensitive Areas for Proposed Site and Pipelines

5.2 OPERATIONAL PHASE

The anticipated impacts for the Letsoai CSP Site 1 and associated pipelines during the operational phase of the project are summarised in **Table 11**.

Table 11: Operational Phase Impacts

ACTIVITY	POTENTIAL IMPACT
Day-to-day operational activities during the normal functioning of the solar power facility and pipelines, including maintenance .	Loss of grazing land current utilised for mostly sheep farming, cattle farming and indigenous antelope.
	Loss of aesthetical value of the natural landscape.
	Alterations of flow regimes of watercourses, in close proximity to the site, or where the pipeline traverses the watercourse.
	Increased potential of soil erosion due to vegetation clearance (wind driven), and more run-off from harden surfaces (i.e. roads and array of heliostats).
	Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland.
	Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from site operational and maintenance vehicles) and permanent onsite sewage systems.
	Permanent degradation of wetland habitat due to the proposed traversing pipelines

Similar to the construction phase, there were no fatal flaws identified during this phase of the project, other than the potential wetlands located with 500m of pipeline option 2 and 3. The loss of grazing land was assigned a high environmental significance rating, however this negative impact is unavoidable given the fact that associated solar power infrastructure will permanently occupy a portion of the land within the proposed project footprint. With mitigation measures in place, this impact was brought down to a medium environmental significance. The medium rating is under the assumption that farming practices may continue in and around the infrastructure during the operational phase. The other negative impacts of potential pipe leaks, soil erosion and spillage of hazardous substances were assigned a low environmental significance before and after mitigation measures.

5.3 DECOMMISSIONING PHASE

The anticipated impacts for the Letsoai CSP Site 1 and associated pipelines during the de-commissioning phase of the project are summarised in **Table 12**.

Table 12: De-commissioning Phase Impacts

ACTIVITY	POTENTIAL IMPACT
De-commissioning of the solar power facility.	Increased potential of soil erosion due to removal of solar power infrastructure (i.e. Heliostats) and pipelines, soil disturbance and a high traffic movement on site.
	Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from construction vehicles) and sewage from on-site systems.
	Temporary and permanent degradation of wetland habitat due to the removal of the traversing pipelines

The decommissioning phase exhibited the lowest environmental significance rating scores for the associated impacts of the proposed Letsoai CSP Site 1 project. There were no fatal flaws identified during this phase of the project.

5.4 CUMULATIVE IMPACTS

There are a number of Environmental Authorisations (EA) (either issued or in process) in the area surrounding the Proposed Project site. It must be stressed that the fact that there are several approved EA surrounding the site does not equate to actual 'development'. The surrounding projects, except for the Preferred Bidders, are still subject to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) bidding process like the Letsoai project.

In addition to the Letsoai CSP Site 1, the proposed BioTherm project includes one additional CSP site and five PV sites (**Figure 2**). Furthermore, there are five proposed renewable energy projects located within a 100 km radius from the centroid of the BioTherm sites (**Figure 3**). A summarised desktop review of the proposed neighbouring projects, (Including the BioTherm sites) is summarised in **Table 13**. At the time of this report, the number and layout of the potential pipelines for these renewable projects is unknown, and thus cannot be evaluated presently, and is beyond the scope of this report.

The renewable energy projects that have received Environmental Authorisation were investigated to determine any identified potential impacts on land capability and freshwater habitats. These individual impacts were tabulated and assigned a significance rating (Low to High) which allowed for the cumulative assessment of these impacts on the landscape. Overall the cumulative impact of the proposed Letsoai CSP Site 1 and pipelines is deemed to be of 'Low' significance (**Appendix C**).

The proposed Letsoai CSP Site 1 pipeline alternatives as well as the neighbouring renewable energy developments potentially intersect freshwater habitat systems however the CSP's Site are not located within watercourses. Each of these pipeline crossings should not have a regional impact on water resources therefore limiting the cumulative impact on the greater landscape. There was no fatal flaw identified for the cumulative impacts for the proposed Letsoai CSP Site 1. The assessment of these potentially affected ecological features within the four neighbouring renewable energy developments is beyond the scope of this study, and will require an individual assessment for the respective projects in their own scoping and EIA studies. It is assumed that the impacts during the construction, operational and de-commissioning phases are expected to be the same as those summarised above for the Letsoai CSP Site 1.

There was no fatal flaw identified in the cumulative impacts for the proposed BioTherm sites and the five proposed renewable energy projects. As in the case of the above mentioned phases, the loss of grazing land is unavoidable. This impact was initially assigned a high environmental significance, which can be reduced to low with the implementation of mitigation measures (i.e. keep the affected area to a minimal during the construction, operational and decommissioning phases). Potential impacts of soil erosion and spillage of hazardous substances were both classified with a low environmental significance, before and after mitigation measures.

6 MITIGATION AND MANAGEMENT MEASURES

The potential impacts identified in Section 5 of this report, have been assessed with and without mitigation and management measures. These mitigation and management measures are summarised in **Table 14**, for the construction, operation and decommissioning phases of the project.

The same mitigation and management measures are proposed for the cumulative impacts identified in the previous section, however the responsible person may differ according to the renewable energy project developer.

In addition, an aquatic specialist should be present onsite before the site preparation phase of construction to conduct an in-depth site walkover prior to any site work to assess the area for any freshwater habitats which may be affected by the actions conducted during the construction phase.

Table 13: Neighbouring Renewable Energy Projects Comparison

ENERGY ENTITY	RENEWABLE ENERGY TECHNOLOGY	FOOTPRINT (KM^2)	NO. OF WATER COURSES INTERSECTIONS	NFEPA WETLANDS INTERSECTIONS	PARENT FARM PROPERTIES	TOWNS INTERSECTED
Letsoai CSP Site 2	Concentrated Solar Power	11.77	None	None	Hartebeestvlei RE86	None
Enamandla PV Site 1	Photovoltaics	4.0	None	None	Hartebeestvlei RE86	None
Enamandla PV Site 2 (Alternative)	Photovoltaics	4.9 (3.1)	None	None	Hartebeestvlei RE86	None
Enamandla PV Site 3 (Alternative)	Photovoltaics	7.3 (3.4)	None	None	Hartebeestvlei RE86	None
Enamandla PV Site 4 (Alternative)	Photovoltaics	3.8 (3.4)	None	None	Hartebeestvlei RE86	None
Enamandla PV Site 5 (Alternative)	Photovoltaics	3.2 (3.8)	None	None	Hartebeestvlei RE86	None
Orlight SA (Pty) Ltd	Photovoltaics	1.16	1 x ephemeral watercourse	None	Aroams 57 RD	None
Sato Energy Holdings (Pty) Ltd	Photovoltaics	51.7	1 x ephemeral watercourse	6	Zuurwater62	None
Solar Capital (Pty) Ltd	Concentrated Solar Power	141.5	1 x ephemeral watercourse	5	Bloemhoek 61	None
Mainstream Renewable Energies (Pty) Ltd Site 1	Solar Power	57.8	1 x ephemeral watercourse	None	Namies Suid 212	None
Mainstream Renewable Energies (Pty) Ltd Site 2	Solar Power	116.3	1 x ephemeral watercourse	None	Poortje 209	None
Juwi Renewable Energies (Pty) Ltd WEF 1	Wind Turbines	72.7	1 x ephemeral watercourse	None	Vogelstruis Hoek 88	None
Juwi Renewable Energies (Pty) Ltd WEF 2	Wind Turbines	57.11	1 x ephemeral watercourse	None	Namies Suid 212	None

Table 14: Mitigation and Management Measures for Potential Impacts

Activity	Mitigation and Management Measure	Responsible Person	Applicable Development Phase	Include as Condition of Authorisation	Monitoring requirements
Loss of land previously used for sheep, cattle and antelope grazing will be occupied by the solar power facility and associated infrastructure.	Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum.	Site construction managers (BioTherm contractors)	Construction and Operational	Yes – activity has been assigned a high environmental significance during the operational phase	A site compliance audit should be conducted (1) prior to construction to determine the base line conditions, (2) during construction on a monthly basis and (3) after rehabilitation measures have been implemented.
Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Construction of the pipeline should occur during the dry season, as far as practically possible, and the site rehabilitated before major rainfall events occur. Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised. It is understood that the proposed pipelines would be located aboveground therefore they should be positioned above the 1:100 floodline of any watercourse. Regular pipeline inspections during operation are required to ensure there are no leaks which would alter the local hydrological regime. These crossings have a potential of needing a Water Use Licence in terms of the National Water Act.	Site construction managers (BioTherm contractors); SHEQ representative.	Design, Construction and Decommissioning	Yes – all requirements of Section 21 of the NWA must be compiled with, resulting in the potential need for a water use licence application where a more in-depth freshwater habitat assessment will be required.	A freshwater habitat specialist must conduct an in-depth site walkover prior to the construction phase commencing to assess the area for any freshwater habitats which may be affected by the actions conducted during the construction phase (e.g. road construction, trenching, etc.). Any identified systems must be visibly demarcated.
Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland	The entire pipeline route should be inspected regularly (no more than 3 months for the entire length of pipeline), by a competent individual. Similarly, the management of the pipeline and pump house should be overseen by competent individuals.	Site management and relevant contractors for maintenance	Operational	Yes – while the impact has been assigned a low environmental significance, it is an important potential risk.	During operational phase, the entire pipeline route should be inspected regularly (no more than 3 months for the entire length of pipeline), by a competent individual.
Increased potential for soil erosion (especially wind driven) due to vegetation clearance, soil disturbance and high traffic movement on site.	Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum. Traffic of construction vehicles should be kept to a minimum to reduce soil compaction, and limited to existing or proposed roadways where practical. Soils excavated during construction of the facility should be appropriately stored in stockpiles which are protected from erosion (wind and water) (i.e. through use of vegetation cover in the case of long-term stockpiles- this should form part of the rehabilitation process after the construction phase). Wind erosion is dominant for the region, however the array of heliostats will act as an artificial wind break and reduce the effect in the site footprint. Water erosion action is considered limited, however backfilling with soil and use of gabions or Reno Mattresses should be used where evidence of erosion is present.	Site construction managers (BioTherm contractors)	Construction, Operational and Decommissioning	Yes – activity has been assigned a medium environmental significance during the construction phase	A site compliance audit should be conducted (1) prior to construction to determine the base line conditions, (2) during construction on a monthly basis and (3) after rehabilitation measures have been implemented.
Potential spillage of hazardous substances such as oils, fuel, grease from construction and operational vehicles, and sewage from on-site sanitation systems	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper upkeep of machinery and vehicles. A complete spill kit must be onsite at all times.	Site construction managers (BioTherm contractors)	Construction, Operational and Decommissioning	No – activity has been assigned a low environmental significance during the construction, operational and decommissioning phases	A site compliance audit should be conducted (1) prior to construction to determine the base line conditions, (2) during construction on a monthly basis and (3) after rehabilitation measures have been implemented.
Degradation of wetland habitat due to the proposed positioning of the pipelines	Should BioTherm be recognised as a Preferred Bidder, the required application for a Water Use Licence (WUL) in terms of Section 21 of the National Water Act (NWA) (Act 36 of 1998) may commence. This application (WULA) will require detailed functional assessments (i.e. PES, EIS and EcoServices) of freshwater habitats potentially affected by the site and pipelines. At this stage design details should be available allowing the freshwater specialist to assess specific areas within the site. Therefore, a more in-depth and thorough freshwater functional assessment should be conducted should BioTherm be recognised as a Preferred Bidder. The detailed freshwater habitat assessment must provide recommendations in terms of road access in relation to freshwater habitats.	Site construction managers (BioTherm contractors) and onsite specialist	Design, Construction and Decommissioning	Yes – all requirements of Section 21 of the NWA must be compiled with, resulting in the potential need for a water use licence application where a more in-depth freshwater habitat assessment will be required.	A freshwater habitat specialist must conduct an in-depth site walkover prior to the construction phase commencing to assess the area for any freshwater habitats which may be affected by the actions conducted during the construction phase (e.g. road construction, trenching, etc.). Any identified systems must be visibly demarcated. After the decommissioning, rehabilitation of the site must occur immediately to ensure no residual impacts remain. A rehabilitation specialist must compile the rehabilitation plan and monitoring its implementation.

7 STAKEHOLDER CONSULTATION

7.1 STAKEHOLDER CONSULTATION PROCESS

Public participation is a requirement of the S&EIR process; it consists of a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIR decision-making process. Effective public participation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the Proposed Project.

A comprehensive stakeholder consultation process was undertaken during the scoping phase. Stakeholders were identified through existing databases, site notices, newspaper adverts and meetings. All stakeholders identified to date have been registered on the project database. All concerns, comments, viewpoints and questions (collectively referred to as 'issues') received to date have been documented and responded to in a Comment and Response Report.

There will be ongoing communication between WSP | Parsons Brinckerhoff and stakeholders throughout the S&EIR process.

7.2 STAKEHOLDER COMMENTS AND RESPONSE

The stakeholder's queries and comments to the Draft Environmental Scoping Report, relating to land Capability and Freshwater Habitats, have been responded to in **Table 15** below.

Table 15: Stakeholder Comments and Queries and the associated Responses

STAKEHOLDER DETAILS	COMMENT	SPECIALIST RESPONSE
C Schwartz **Department of Water and Sanitation** Northern Cape Region (Lower Orange Water Management Area) 25 October 2016	à The Department takes note of the proposed activity and therefore provides the following comments: à Indicated on page 48 of the above-mentioned report, water will be sourced from Sedibeng Water. Please note that an agreement between the applicant and Sedibeng Water should be submitted to the Department. à Any spillage of any hazardous materials including diesel that may occur during construction and operation must be reported immediately to this Department. à All sewage and grey water, as well as any waste generated during the construction phase of the facilities will be collected, contained and disposed of at the permitted and/or licenced facilities of the Local Authority and this must please be confirmed in writing by the local authority.	à Noted. à Noted. à Noted. Spill response has been addressed within the site-specific EMPr. It is specified that all major spills are reported to the DWS immediately. A representative onsite must be trained in the use of the spill kit stop, contain and remove contamination, to prevent further pollution of the environment. à Waste and water management has been addressed within the site specific EMPr. All waste generated onsite must be disposed of in a safe manner at permitted and/or licenced facility. Safe disposal certificates are required to be onsite for inspection by the ECO and officials. The DWS must be informed of any use of private contractors. The details of this contractor and safe disposal certificates must be made available to the DWS when requested.

STAKEHOLDER DETAILS	COMMENT	SPECIALIST RESPONSE
Mr Sabelo Malaza **Department of Environmental Affairs** 12th December 2016	Section 19 and Section 21 of the National Water Act No. 36 of 1998 may be triggered as GN R. 983 Activities 12 and 19 were applied for. A hydrological impact assessment must be conducted and must also assess the impacts on the surface hydrology of the proposed development rea and must be included in the EIAr. The terms of reference of the study must include, inter alia, the following: à Identification and sensitivity rating of all surface water courses for the impact phase of the proposed development; à Identification, assessment of all potential impacts to the water courses and suggestion of mitigation measures; and, à Recommendations on the preferred placement of the parabolic troughs and all associated infrastructure and preference must be provided to the avoidance of the watercourses on the property.	à This report provides an initial high-level identification of freshwater habitat systems within the site boundary. This is due to the extent of the site, accessibility constraints and lack of information relating to the positioning of operational and road infrastructure. Should BioTherm be recognised as a Preferred Bidder, the required WULA in terms of NWA may commence. This application (WULA) will require detailed functional assessments (i.e. PES, EIS and EcoServices) of freshwater habitats potentially affected. Therefore, a recommendation within this land capability and freshwater identification report (Section 8) is a more in-depth and thorough freshwater functional assessment be conducted should BioTherm be recognised as a Preferred Bidder. Appropriate buffers for the identified systems must then form part of the in-depth assessment report. At this stage design details should be available allowing the freshwater specialist to assess specific areas within the site and determine proximity of the structures to freshwater systems. Another recommendation is that the freshwater specialist be present onsite during the construction phase of the project, and conduct an in-depth site walkover prior to any site work to assess the area for any wetlands and watercourses which may be affected by the actions conducted during the construction phase (e.g. road construction). à Noted, the abovementioned detailed freshwater habitat assessment must provide recommendations in terms of placement of the associated infrastructure in relation to freshwater habitats.

8 CONCLUSION

The land capability of the proposed Letsoai CSP Site 1 is defined as non-arable with a low potential for grazing. Grazing activities (mainly sheep) are the dominant land use for the region and has the largest potential to be impacted by the activities of the proposed Letsoai CSP Site 1 project. Indirect impacts of increased soil erosion are expected at the site given the dry, fragile environment of the region. Furthermore, spillage of hazardous substances onto the land as a result of the activities of the Letsoai CSP Site 1 project, is a possibility. However, all these potential impacts on the current land capability for the area were classified with a low environmental significance risk, should the appropriate mitigation measure be followed during the construction, operational and decommissioning phases of the project.

There were no freshwater habitat systems identified within the proposed Letsoai CSP Site 1. There is however, the concern for the Kao River and the potential wetlands that may lie within 500m of the site and pipeline options 2 and 3, however this need to be investigated further and confirmed onsite by an aquatic specialist. Consequently, there are no fatal flaws anticipated for the proposed Letsoai CSP Site 1 project, from a land capability and freshwater habitat perspective. It is recommended that the mitigation and management measures outlined in this report be followed throughout all phases of the project.

A portion of the pipeline Option 3 would follow the same servitude as an existing pipeline while Option 1 and 2 would be new infrastructure within the landscape. However, Option 3 is significantly longer than the other two. As stated above, all three cross the Kao River drainage region and the area as whole is considered homogenous. Therefore, all options have a potential to negatively impact the surrounding environment and no one option is significantly preferred over the other.

This report provides an initial high-level identification and description of the land capability and freshwater habitat systems within the site boundary. This is due to the extent of the site, accessibility constraints and lack of information relating to the positioning of operational and road infrastructure. Should BioTherm be recognised as a Preferred Bidder, the required application for a Water Use Licence (WUL) in terms of Section 21 of the National Water Act (NWA) (Act 36 of 1998) may commence. This application (WULA) will require detailed functional assessments (i.e. PES, EIS and EcoServices) of freshwater habitats potentially affected. Therefore, it is recommended that a more in-depth and thorough study be conducted by a land capability and aquatic specialist should BioTherm be recognised as a Preferred Bidder.

It is also recommended that an aquatic specialist must conduct an in-depth site walkover prior to the construction phase commencing, after the proposed construction footprint has been confirm and demarcated. This is to assess the footprint for any freshwater habitats, allowing for slight alterations in the footprint, to prevent any impacts on the freshwater habitats due to the actions conducted during the construction phase.

9 PLATES

Plate 1 – Vegetation

Plate 2 – Sheep pen

Plate 3 – Cattle pen

Plate 4 – Windmill-driven boreholes and reservoir

Plate 5 – Namib soil form

Plate 6 – Gneiss rock type below soil profile

10 REFERENCES

- AGIS. (2007). AGIS Agricultural Geo-Referenced Information System. Retrieved March 10, 2016, from AGIS Agricultural Geo-Referenced Information System Web site: http://www.agis.agric.za/agisweb/agis.html.
- Bailie, R., Armstrong, R., & Reid, D. (2007). *The Bushmanland Group supracrustal succession,Aggeneys, Bushmanland, South Africa: Provenance, age of deposition and metamorphism*. SOUTH AFRICAN JOURNAL OF GEOLOGY Volume 110, 59 -86.
- Chamber of Mines of South Afica/Coaltech. 2007, November. *Guidelines for the Rehabilitation of Mined Land. Guidelines for the Rehabilitation of Mined Land*. Johannesburg, Gauteng, South Africa: Chamber of Mines of South Afica/Coaltech.
- DWAF (2008). *Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas*, prepared by M. Rountree, A. L. Batchelor, J. MacKenzie and D. Hoare. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa.
- Fujihara Industry Co. (2001). *Revised standard soil color charts*. Fujihara Industry Company, Tokyo, Japan.
- Klingebeil, A. A., & Montgomery, P. H. (1961). *Land capability classification. Agriculture handbook no 210.* Soil conservation service. Washington DC: US Department of Agriculture.
- Macvicar, C. N. (1991). *Soil Classification: A Taxonomic System for South Africa*. Pretoria: Department of Agricultural Development.
- Mining Technology. 2016. Gamsberg-Skorpion Integrated Project. Retrieved May 2016, from Mining Technology website, http://www.mining-technology.com/projects/gamsbergskorpion-integrated-project/.
- Mucina, L., & Rutherford, M. C. (2006). The vegetation of South Africa, Lesotho, and Swaziland. Strelitzia 19. Pretoria: South African National Biodiversity Institute.
- Schifano, G., Eeden van, O. R., & Coertze, F. J. (1970). The Soil Maps of Africa: European Digital Archive of Soil Maps - EuDASM. Retrieved March 7, 2016, from The Soil Maps of Africa: European digital archive of soil maps - EuDASM Web site: http://eusoils.jrc.ec.europa.eu/esdb_archive/EuDASM/Africa/maps/afr_za2003_4toge.htm
- The Local Government Handbook. Retrieved May 2016, from The Local Government Handbook website: http://www.municipalities.co.za/provinces/view/7/northern-cape.
- USGS U.S Geological Survey. (2009). USGS. Retrieved March 10, 2016, from USGS Website: http://www.usgs.gov/.
- Van der Molen, W. H., Beltran, J. M., & Ochs, W. J. (2007). Annex 1: Estimating soil hydrological characteristics from soil texture and structure. In W. H. van der Molen, J. M. Beltran, & W. J. Ochs, *Guidelines and computer programs for the planning and design of land drainage systems* (pp. 115 - 116). Rome: Food and Agriculture Organisation of the United Nations.
- WSP. 2016. *Water Assessment Report for The Letsoai Solar Facilities Letsoai CSP Site 1*. Project: BioTherm, Project No. 47579, Report Number: R03.
- Wischmeier, W H; Johnson, C H and Cross, V A. (September-October 1971). *A soil erodibility nomograph for farmland and construction sites*. Journal of Soil and Water Conservation, Vol. 26, No 5, pp 189-193, September-October 1971
- WRC - Water Research Commission. 2008. *Wetland Management Series: Wet-EcoServices, a technique for rapidly assessing ecosystem services supplied by wetlands*. Report No. TT339/08. Water Research Commission, Pretoria, South Africa

Appendix A

SGS LABORATORY SOIL ANALYSIS REPORT

SGS

LABORATORY REPORT FOR SOIL ANALYSIS

REG No. 1949/032643/07 VAT REG No. 4560117428

COMPANY: WSP
ADDRESS:
ADDRESS:
TEL/FAX:
REF: 229161

NAME: P BRINKERHOFF
FARM:
DISTRICT:
DATE: 3/3/2016
REP:

Building H1
AECI-site
De Beers Avenue
Somerset West
Tel: (021) 852 7899

Lab Nr.	Ref.	Camp	Depth	pH	P	K	Ca	Mg	Na	K	Ca	Mg	Na	K	Ca	Mg	Na	KCl (H^+)	Ca:Mg	(Ca+Mg)/K	Mg:K	Acid Sat
				KCl	Bray 1 mg/kg	Amm Acetate mg/kg				%				meq = cmol(+)/kg					Norms			%
																			1.5 - 4.5	10 - 20	3 - 4	
B16-203-43	1	SS 1,2,3		6.7	9	95	350	100	9	8.5	61.4	28.7	1.4	0.24	1.75	0.82	0.04	0.00	2.1	10.6	3.4	0.00
B16-203-44	2	SS 4,5,6		7.1	3	96	377	100	15	8.1	62.5	27.2	2.2	0.25	1.89	0.82	0.07	0.00	2.3	11.0	3.3	0.00
B16-203-45	3	SS 7,8,9		7.4	10	111	571	108	10	7.0	70.2	21.8	1.1	0.28	2.86	0.89	0.04	0.00	3.2	13.2	3.1	0.00

SGS

LABORATORY REPORT FOR SOIL ANALYSIS

REG No. 1949/032643/07 VAT REG No. 4560117428

SGS s

COMPANY: WSP
ADDRESS:
ADDRESS:
TEL/FAX:
REF: 229161

Lab Nr.	Ref.	Camp	S-Value	T-Value	Base Sat	Cu	Zn	Mn	Fe	B	S	Clay	Silt	Sand	Density	EC
			cmol(+)/kg	cmol(+)/kg	%	0.1M HCl mg/kg				H_2O mg/kg	Am Ac mg/kg	Hydrometer %			g/cm^3	mS/m
B16-203-43	1	SS 1,2,3	2.9	2.9	100.00	0.55	0.74	12.20	4.00	0.17	4.0	2	2	96	1.730	18.4
B16-203-44	2	SS 4,5,6	3.0	3.0	100.00	0.59	0.49	8.30	0.00	0.15	4.1	2	2	96	1.689	20.1
B16-203-45	3	SS 7,8,9	4.1	4.1	100.00	0.65	0.94	12.70	0.00	0.19	6.8	2	2	96	1.629	19.9

Appendix B

ENVIRONMENTAL SIGNIFICANCE FOR EACH IMPACT

BioTherm Energy - Letsoai CSP Site 1

{insert specialist filed here}

Significance Rating Table

Construction Phase									
Letsoai CSP Site 1									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Loss of land previously used for sheep, cattle and antelope grazing will be occupied by the solar power facility and associated infrastructure	Nature of impact:	Direct							
	Without Mitigation	2	2	8	5	60	Medium	-	medium
	degree to which impact can be reversed:	low							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum.							
	With Mitigation	1	2	6	5	45	Medium	-	medium
Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	6	4	40	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Construction of the pipeline should occur during the dry season and the site rehabilitated before major rainfall events occur. Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the							
	With Mitigation	2	2	4	3	24	Low	-	Medium
Construction activities will entail vegetation clearance, soil disturbance and high	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	6	4	40	Medium	-	medium
	degree to which impact can be reversed:	high							

soil disturbance and high traffic movement on site, resulting in a higher potential for soil erosion	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum. Traffic of construction vehicles should be kept to a minimum to reduce soil							
	With Mitigation	1	2	4	3	21	Low	-	medium
Potential spillage of hazardous substances such as oils, fuel, grease from construction vehicles, and sewage from on-site sanitation systems	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	medium
	degree to which impact can be reversed:	high							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper							
	With Mitigation	1	2	0	1	3	Low	-	medium
Temporary degradation of wetland/riparian habitat due to the proposed traversing pipelines	Nature of impact:	Direct							
	Without Mitigation	2	2	6	4	40	Medium		
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The WULA application will require detailed functional assessments (i.e. PES, EIS and EcoServices) of freshwater habitats potentially affected by the site and powerlines. At this stage design details should be available allowing the							
	With Mitigation	1	2	4	3	21	Low		
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

Letsoai CSP Site 1 - No-Go

Potential Impact	Mitigation	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								

	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

BioTherm Energy - Letsoai CSP Site 1

{insert specialist filed here}

Significance Rating Table

Operational Phase									
Letsoai CSP Site 1									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Loss of land previously used for sheep, cattle and antelope grazing will be occupied by the solar power facility and associated infrastructure	Nature of impact:	Direct							
	Without Mitigation	2	4	8	5	70	High	-	medium
	degree to which impact can be reversed:	low							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	Infrastructure of the solar power facility should be limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum.							
	With Mitigation	1	4	6	5	55	Medium	-	medium
Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	5	6	4	52	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised. The proposed pipelines should be positioned above the 1:100 floodline of any watercourse. Regular pipeline inspections during operation are required to ensure there are no leaks which							

	With Mitigation	2	1	2	2	10	Low	-	Medium
Vegetation clearance for heliostats, soil disturbance and stockpiles, and increased traffic movement on site, resulting in a higher potential for soil erosion	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	4	4	3	30	Low	-	medium
	degree to which impact can be reversed:	high							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	Areas of disturbance should be (where practical) limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum. Traffic of maintenance vehicles should be kept to a minimum to							
	With Mitigation	1	4	2	2	14	Low	-	medium
Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems	Nature of impact:	Indirect							
	Without Mitigation	2	4	2	2	16	Low	-	medium
	degree to which impact can be reversed:	high							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and							
	With Mitigation	1	4	2	1	7	Low	-	medium
Unattended pipeline leakages due to lack of maintenance, negligent operation or management, or unforeseen activity, resulting in soil erosion and establishment of local artificial wetlands.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	4	6	3	36	Medium	-	medium
	degree to which impact can be reversed:	high							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	Regular maintenance and inspection of pipeline by competent individuals. Competent management of the pipeline and pump station system.							
	With Mitigation	1	1	0	1	2	Low	-	medium
	Nature of impact:	Direct							

Permanent degradation of wetland/riparian habitat due to the proposed traversing pipelines	Without Mitigation	2	5	6	4	52	Medium		
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	An aquatic specialist be present onsite during the construction phase of the project, and conduct an in-depth site walkover prior to any site work to assess the area for any wetlands and watercourses which may be affected by the actions conducted during the construction phase. This will potentially prevent any long term degradation							
	With Mitigation	1	5	2	3	24	Low		
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

Letsoai CSP Site 1 - No-Go

Potential Impact	Mitigation	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								

	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

BioTherm Energy - Letsoai CSP Site 1

{insert specialist filed here}

Significance Rating Table

Decommissioning Phase									
Letsoai CSP Site 1									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Increased potential of soil erosion due to removal of solar power infrastructure (i.e. Heliostats), soil disturbance and a high traffic movement on site.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	4	3	24	Low	-	medium
	degree to which impact can be reversed:	high							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	Areas of disturbance should be (where practical) limited to the extent of the project footprint, and activities outside of the site should be kept to a minimum. Traffic of de-construction vehicles should be kept to a minimum							
	With Mitigation	1	2	2	2	10	Low	-	medium
Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low		
	degree to which impact can be reversed:	high							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and							
	With Mitigation	1	2	0	1	3	Low	-	medium

Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	3	6	5	55	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	After the decommissioning, rehabilitation of the site must occur immediately to ensure no residual impacts remain. A rehabilitation specialist must compile the rehabilitation plan and monitoring its implementation.							
	With Mitigation	2	1	2	2	10	Low	-	Medium
Temporary & Permanent degradation of wetland/riparian habitat due to the proposed traversing pipelines	Nature of impact:	Direct							
	Without Mitigation	2	3	6	5	55	Medium	-	
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	After the decommissioning, rehabilitation of the site must occur immediately to ensure no residual impacts remain. A rehabilitation specialist must compile the rehabilitation plan and monitoring its implementation.							
	With Mitigation	2	1	2	2	10	Low	-	
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							
	Nature of impact:							
	Without Mitigation							
	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							
	Nature of impact:							
	Without Mitigation							
	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							

Letsoai CSP Site 1 - No-Go

Potential Impact	Mitigation	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)	Status (+ve or -ve)	Confidence
	Nature of impact:							

	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

BioTherm Energy - Letsoai CSP Site 1

{insert specialist filed here}

Significance Rating Table

Cumulative Impacts									
Letsoai CSP Site 1									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Loss of land (including wetlands) previously used for sheep, cattle and antelope grazing will be occupied by the solar power facility and associated infrastructure	Nature of impact:	Direct							
	Without Mitigation	2	4	8	5	70	High	-	Low
	degree to which impact can be reversed:	medium							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	Infrastructure of the different renewable power facility should be limited to the extent of the respective project footprints, and activities outside of the sites should be kept to a minimum. Special consideration should be given							
	With Mitigation	1	4	6	5	55	Medium	-	Low
Vegetation clearance for project infrastructure (i.e. heliostats and tower or PV cells/modules or wind turbines), soil disturbance and stockpiles, and increased traffic movement on site, resulting in a higher potential for soil erosion	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	4	4	3	30	Low	-	Low
	degree to which impact can be reversed:	high							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	Areas of disturbance should be (where practical) limited to the extent of the respective project footprint, and activities outside of the site should be kept to a minimum. Traffic of maintenance vehicles should be kept to a							
	With Mitigation	1	4	2	2	14	Low	-	Low

Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems	Nature of impact:	Indirect							
	Without Mitigation	2	4	2	2	16	Low	-	Low
	degree to which impact can be reversed:	high							
	degree of impact on irreplaceable resources:	low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and							
	With Mitigation	1	4	2	1	7	Low	-	Low
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
Letsoai CSP Site 1 - No-Go									
Potential Impact	Mitigation	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
	Nature of impact:								

	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

BioTherm Energy - Solar Water Pipeline

{insert specialist filed here}

Significance Rating Table

Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Construction Phase									
Pipeline Alternative 1									
Loss of land previously used for sheep, cattle and antelope grazing will be occupied by the construction material for the pipeline infrastructure and soil stock piles	Nature of impact:	Direct							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Infrastructure of the pipelie should be limited to the extent of the respective project footprint and pipeline routing options.							
	With Mitigation	1	2	0	1	3	Low	-	Medium
Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	6	4	40	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Construction of the pipeline should occur during the dry season and the site rehabilitated before major rainfall events occur. Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised. It is understood that the proposed pipelines would be located aboveground therefore they should							
	With Mitigation	2	2	4	3	24	Low	-	Medium
Construction activities will entail vegetation clearance, soil disturbance and high traffic movement on site, resulting in a higher potential for soil erosion	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the							
	With Mitigation	1	2	0	1	3	Low	-	Medium
	Nature of impact:	Indirect							

Potential spillage of hazardous substances such as oils, fuel, grease from construction vehicles, and sewage from on-site sanitation systems	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper upkeep of machinery and							
	With Mitigation	1	1	0	1	2	Low	-	Medium
Temporary degradation of wetland/riparian habitat due to the proposed traversing pipelines	Nature of impact:	Direct							
	Without Mitigation	2	2	6	4	40	Medium		
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The WULA application will require detailed functional assessments (i.e. PES, EIS and EcoServices) of freshwater habitats potentially affected by the site and pipelines. At this stage design details should be available allowing the freshwater specialist to assess specific areas within the site. Therefore, a more in-depth and thorough freshwater functional assessment should be							
	With Mitigation	1	2	4	3	21	Low		

Pipeline Alternative 2

Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Loss of land previously used for sheep, cattle and antelope grazing will be occupied by the construction material for the pipeline infrastructure and soil stock piles	Nature of impact:	Direct							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Infrastructure of the pipeline should be limited to the extent of the respective project footprint and pipeline routing options.							
	With Mitigation	1	2	0	1	3	Low	-	Medium
Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	6	4	40	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							

that is proposed to be traversed.	Mitigation Measures	Construction of the pipeline should occur during the dry season and the site rehabilitated before major rainfall events occur. Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised. It is understood that the proposed pipelines would be located aboveground therefore they should							
	With Mitigation	2	2	4	3	24	Low	-	Medium
Construction activities will entail vegetation clearance, soil disturbance and high traffic movement on site, resulting in a higher potential for soil erosion	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the							
	With Mitigation	1	2	0	1	3	Low	-	Medium
Potential spillage of hazardous substances such as oils, fuel, grease from construction vehicles, and sewage from on-site sanitation systems	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and							
	With Mitigation	1	1	0	1	2	Low	-	Medium
Temporary degradation of wetland/riparian habitat due to the proposed traversing pipelines	Nature of impact:	Direct							
	Without Mitigation	2	2	6	4	40	Medium		
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The WULA application will require detailed functional assessments (i.e. PES, EIS and EcoServices) of freshwater habitats potentially affected by the site and powerlines. At this stage design details should be available allowing the freshwater specialist to assess specific areas within the site. Therefore, a more in-depth and thorough freshwater functional assessment							
	With Mitigation	1	2	4	3	21	Low		
Pipeline Alternative 3									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Loss of land previously used for sheep, cattle and antelope grazing will be occupied by the construction material for the pipeline infrastructure	Nature of impact:	Direct							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							

the pipeline infrastructure and soil stock piles	Mitigation Measures	Infrastructure of the pipelie should be limited to the extent of the respective project footprint and pipeline routing options.							
	With Mitigation	1	2	0	1	3	Low	-	Medium
Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	6	4	40	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Construction of the pipeline should occur during the dry season and the site rehabilitated before major rainfall events occur. Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised. It is understood that the proposed pipelines would be located aboveground therefore they should							
	With Mitigation	2	2	4	3	24	Low	-	Medium
Construction activities will entail vegetation clearance, soil disturbance and high traffic movement on site, resulting in a higher potential for soil erosion	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Areas of construction should be (where practical) limited to the extent of the project footprint, and activities outside of the							
	With Mitigation	1	2	0	1	3	Low	-	Medium
Potential spillage of hazardous substances such as oils, fuel, grease from construction vehicles, and sewage from on-site sanitation systems	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and							
	With Mitigation	1	1	0	1	2	Low	-	Medium
Temporary degradation of wetland/riparian habitat due to the proposed traversing pipelines	Nature of impact:	Direct							
	Without Mitigation	2	2	6	4	40	Medium		
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The WULA application will require detailed functional assessments (i.e. PES, EIS and EcoServices) of freshwater habitats potentially affected by the site and powerlines. At this stage design details should be available allowing the freshwater specialist to assess specific areas within the site. Therefore, a more in-depth and thorough freshwater functional assessment							
	With Mitigation	1	2	4	3	21	Low		
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

Pipeline - No-Go

Potential Impact	Mitigation	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

BioTherm Energy - Solar Water Pipeline

{insert specialist filed here}

Significance Rating Table

Operational Phase

Pipeline Alternative 1

Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	4	4	2	20	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Regular maintenance and inspection of pipeline by competent individuals. Competent management of the pipeline and pump station system.							
	With Mitigation	1	1	0	1	2	Low	-	Medium
Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper							Medium
	With Mitigation	1	1	0	1	2	Low	-	Medium
	Nature of impact:	Direct and Indirect							

Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Without Mitigation	2	5	6	4	52	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised. The proposed pipelines should be positioned above the 1:100 floodline of any watercourse. Regular pipeline inspections during operation are required to ensure there are no leaks which							
	With Mitigation	2	1	2	2	10	Low	-	Medium
Permanent degradation of wetland/riparian habitat due to the proposed traversing pipelines	Nature of impact:	Direct							
	Without Mitigation	2	5	6	4	52	Medium		
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	An aquatic specialist be present onsite during the construction phase of the project, and conduct an in-depth site walkover prior to any site work to assess the area for any wetlands and watercourses which may be affected by the actions conducted during the construction phase. This will potentially prevent any long term degradation during							
	With Mitigation	1	5	2	3	24	Low		
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
Pipeline Alternative 2									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	4	4	2	20	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Regular maintenance and inspection of pipeline by competent individuals. Competent management of the pipeline and pump station system.							
	With Mitigation	1	1	0	1	2	Low	-	Medium
Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper							
	With Mitigation	1	1	0	1	2	Low	-	Medium
	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	5	6	4	52	Medium	-	Medium

Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised. The proposed pipelines should be positioned above the 1:100 floodline of any watercourse. Regular pipeline inspections during operation are required to ensure there are no leaks which							
	With Mitigation	2	1	2	2	10	Low	-	Medium
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

Pipeline Alternative 3

Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	4	4	2	20	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Regular maintenance and inspection of pipeline by competent individuals. Competent management of the pipeline and pump station system.							
	With Mitigation	1	1	0	1	2	Low	-	Medium
	Nature of impact:	Indirect							

Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and proper							
	With Mitigation	1	1	0	1	2	Low	-	Medium
Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	5	6	4	52	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Pipelines must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised. The proposed pipelines should be positioned above the 1:100 floodline of any watercourse. Regular pipeline inspections during operation are required to ensure there are no leaks which							
	With Mitigation	2	1	2	2	10	Low	-	Medium
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

Pipeline - No-Go

Potential Impact	Mitigation	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							
	Nature of impact:							
	Without Mitigation							
	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							
	Nature of impact:							
	Without Mitigation							
	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							
	Nature of impact:							
	Without Mitigation							
	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							

	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

BioTherm Energy - Solar Water Pipeline

{insert specialist filed here}

Significance Rating Table

Decommissioning Phase									
Pipeline Alternative 1									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Increased potential of soil erosion due to vegetation removal and removal pipeline infrastructure, soil disturbance and a high traffic movement on site.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Areas of disturbance should be (where practical) limited to the extent of the project footprint, and activities outside of the footprint should be kept to a minimum.							
	With Mitigation	1	2	0	1	3	Low	-	Medium
Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from construction vehicles) and sewage from on-site systems.	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and							
	With Mitigation	1	1	0	1	2	Low	-	Medium

Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	3	6	5	55	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	After the decommissioning, rehabilitation of the site must occur immediately to ensure no residual impacts remain. A rehabilitation specialist must compile the rehabilitation plan and monitoring its implementation.							
	With Mitigation	2	1	2	2	10	Low	-	Medium
Temporary/ Permanent degradation of wetland/riparian habitat due to the proposed traversing pipelines	Nature of impact:	Direct							
	Without Mitigation	2	3	6	5	55	Medium	-	
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	After the decommissioning, rehabilitation of the site must occur immediately to ensure no residual impacts remain. A rehabilitation specialist must compile the rehabilitation plan and monitoring its implementation.							
	With Mitigation	2	1	2	2	10	Low	-	
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							
	Nature of impact:							
	Without Mitigation							
	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							
	Nature of impact:							
	Without Mitigation							
	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							

Pipeline Alternative 2

Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)	Status (+ve or -ve)	Confidence
	Nature of impact:	Direct and Indirect						

Increased potential of soil erosion due to vegetation removal and removal pipeline infrastructure, soil disturbance and a high traffic movement on site.	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Areas of disturbance should be (where practical) limited to the extent of the project footprint, and activities outside of the footprint should be kept to a minimum.							
	With Mitigation	1	2	0	1	3	Low	-	Medium
Potential land contamination from hazardous substances. This includes spillage of oils, fuel, grease (from construction vehicles) and sewage from on-site systems.	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and							
	With Mitigation	1	1	0	1	2	Low	-	Medium
Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	3	6	5	55	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	After the decommissioning, rehabilitation of the site must occur immediately to ensure no residual impacts remain. A rehabilitation specialist must compile the rehabilitation plan and monitoring its implementation.							
	With Mitigation	2	1	2	2	10	Low	-	Medium
	Nature of impact:	Direct							
	Without Mitigation	2	3	6	5	55	Medium	-	

Permanent degradation of wetland/riparian habitat due to the proposed traversing pipelines	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	After the decommissioning, rehabilitation of the site must occur immediately to ensure no residual impacts remain. A rehabilitation specialist must compile the rehabilitation plan and monitoring its implementation.							
	With Mitigation	2	1	2	2	10	Low	-	
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
Pipeline Alternative 3									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Increased potential of soil erosion due to vegetation removal and removal pipeline infrastructure, soil disturbance and a high traffic movement on site.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Areas of disturbance should be (where practical) limited to the extent of the project footprint, and activities outside of the footprint should be kept to a minimum.							
	With Mitigation	1	2	0	1	3	Low	-	Medium
Potential land	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Medium

contamination from hazardous substances. This includes spillage of oils, fuel, grease (from construction vehicles) and sewage from on-site systems.	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and							
	With Mitigation	1	1	0	1	2	Low	-	Medium
Alterations of flow regimes of watercourses, in close proximity to the site, or that is proposed to be traversed.	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	3	6	5	55	Medium	-	Medium
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	After the decommissioning, rehabilitation of the site must occur immediately to ensure no residual impacts remain. A rehabilitation specialist must compile the rehabilitation plan and monitoring its implementation.							
	With Mitigation	2	1	2	2	10	Low	-	Medium
Permanent degradation of wetland/riparian habitat due to the proposed traversing pipelines	Nature of impact:	Direct							
	Without Mitigation	2	3	6	5	55	Medium	-	
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	After the decommissioning, rehabilitation of the site must occur immediately to ensure no residual impacts remain. A rehabilitation specialist must compile the rehabilitation plan and monitoring its implementation.							
	With Mitigation	2	1	2	2	10	Low	-	
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								

	Mitigation Measures							
	With Mitigation							

Pipeline - No-Go

Potential Impact	Mitigation	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)	Status (+ve or -ve)	Confidence
	Nature of impact:							
	Without Mitigation							
	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							
	Nature of impact:							
	Without Mitigation							
	degree to which impact can be reversed:							
	degree of impact on irreplaceable resources:							
	Mitigation Measures							
	With Mitigation							
	Nature of impact:							
	Without Mitigation							
	degree to which impact can be reversed:							

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								

	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								

BioTherm Energy - Solar Water Pipeline

{insert specialist filed here}

Significance Rating Table

Cumulative Impacts									
Pipeline Alternative 1									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	4	4	2	20	Low	-	Low
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Regular maintenance and inspection of pipeline by competent individuals. Competent management of the pipeline and pump station system.							
	With Mitigation	1	4	0	1	5	Low	-	Low
Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Low
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and							
	With Mitigation	1	1	0	1	2	Low	-	Low

	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
Pipeline Alternative 2									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
	Nature of impact:	Direct and Indirect							

Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland	Without Mitigation	2	4	4	2	20	Low	-	Low
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Regular maintenance and inspection of pipeline by competent individuals. Competent management of the pipeline and pump station system.							
	With Mitigation	1	1	0	1	2	Low	-	Low
Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Low
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and							
	With Mitigation	1	1	0	1	2	Low	-	Low
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								

	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
Pipeline Alternative 3									
Potential Impact		Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
Pipeline water leaks, leading to soil erosion at leakage and establishment of an artificial wetland	Nature of impact:	Direct and Indirect							
	Without Mitigation	2	4	4	2	20	Low	-	Low
	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	Regular maintenance and inspection of pipeline by competent individuals. Competent management of the pipeline and pump station system.							
	With Mitigation	1	1	0	1	2	Low	-	Low
	Nature of impact:	Indirect							
	Without Mitigation	2	2	2	2	12	Low	-	Low

Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems	degree to which impact can be reversed:	High							
	degree of impact on irreplaceable resources:	Low							
	Mitigation Measures	The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of bunding around storage of hazardous materials and							
	With Mitigation	1	1	0	1	2	Low	-	Low
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								

	Mitigation Measures								
	With Mitigation								

Pipeline - No-Go

Potential Impact	Mitigation	Extent (E)	Duration (D)	Magnitude (M)	Probability (P)	Significance (S=(E+D+M)*P)		Status (+ve or -ve)	Confidence
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								

	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								
	Mitigation Measures								
	With Mitigation								
	Nature of impact:								
	Without Mitigation								
	degree to which impact can be reversed:								
	degree of impact on irreplaceable resources:								

Appendix C

CUMULATIVE IMPACT ASSESSMENT

BIOTHERM – CUMULATIVE ASSESSMENT

APPROACH

The Department of Environmental Affairs (DEA) has requested that a detailed cumulative assessment is undertaken for each of the proposed BioTherm projects. The cumulative assessment must take the specialist studies from the surrounding Environmental Authorisations into account.

In order to ensure that a consolidated cumulative assessment can be developed for each project, a template has been produced to ensure that the specialist studies across the disciplines utilise the same approach.

Each specialist discipline will be required to compile the table below and provide a qualitative discussion on the overall cumulative impact of the projects in the study area.

MASTER ASSUMPTIONS

The following assumptions and limitations have been identified in relation to the above approach:

- Due to the number of different significance rating methodologies utilised across the various projects, significance ratings have been simplified to include only Low, Medium and High ratings.
- In the event that specialist studies were unable to be obtained, this has been noted.
- All approved and ongoing environmental authorisations within a 70km radius above been considered

Table 1: Cumulative Impacts – Solar Soil & Land Capability

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Farms	Impacts																	Proposed Mitigation Measures
							Construction								Operation					Decommissioning				
							Agriculture land	Soil erosion	Agricultural impact	Contamination	Dust	Agric potential	Topsoil loss	Veld degrade	Agriculture land	Soil erosion	Dust	Contamination	Agric potential	Soil erosion	Contamination	Dust	Agric potential	
Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections, near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	14/12/16/3/3/2/346/AM1	In Process		46 535	75		L	L	L						L									
Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections, Near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	14/12/16/3/3/2/447	In Process		46 535	1000		L	L	L						L									
The Proposed Boesmanland Solar Farm Portion 6 (A Portion Of Portion 2), Farm 62 Zuurwater, Aggeneys, Northern Cape Province.	12/12/20/2602	Approved		200	75			L								L								
75MW PV plant on the Farm Zuurwater No 62 in the Namakwa District, Northern	14/12/16/3/3/2/473	In Process		222	75			L		L	M	L				M	L	L	L	L	L	M	L	

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Farms	Impacts																	Proposed Mitigation Measures
							Construction								Operation					Decommissioning				
							Agriculture land	Soil erosion	Agricultural impact	Contamination	Dust	Agric potential	Topsoil loss	Veld degrade	Agriculture land	Soil erosion	Dust	Contamination	Agric potential	Soil erosion	Contamination	Dust	Agric potential	
Cape Province, Phase 4.																								
Proposed Boesmanland Solar Farm Portion 6 (A portion of portion 2) Farm 62 Zuurwater, Aggeneys, Northern Cape.	14/12/16/3/3/2/222	Approved		200	75																			
Proposed Wind Energy Facility and Associated Infrastructure on Namies Wind Farm Pty Ltd, near Aggeneys, Northern Cape Province.	14/12/16/3/3/2/550	In Process		15	220		L		L						L				L					
The Proposed Construction of a Photovoltaic Power Generation Facility within the Black Mountain Mining Area near Aggeneys in the Northern Cape Province.	12/12/20/2151	Approved		19.5	19																			
Proposed 75MW Korana Wind Energy Facility, near Poffader in the Northern Cape.	14/12/16/3/3/2/683	Unknown		3257 (all facilities)	Unknown		M	L					L	L										
Proposed 140MW Khâi-Mai Wind Energy Facility near Pofadder.	14/12/16/3/3/2/680	Unknown		3257 (all facilities)	Unknown		M	L					L	L										
				Total	Total																			
				50248.5	1538 MW																			
Significance Totals per impact	Significance Rating						**Total Hectares per impact**																	

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Farms	Impacts																	Proposed Mitigation Measures
							Construction								Operation					Decommissioning				
							Agriculture land	Soil erosion	Agricultural impact	Contamination	Dust	Agric potential	Topsoil loss	Veld degrade	Agriculture land	Soil erosion	Dust	Contamination	Agric potential	Soil erosion	Contamination	Dust	Agric potential	
	High Significance																							
	Medium Significance						3257				222					222						222		
	Low Significance						46 550	50 214	46 550	222		222	3257	3257	46 550	200	222	222	237	222	222		222	
	Positive Impacts																							

The following EAs surrounding the solar developments have been either withdrawn or have lapsed and are therefore not been considered as part of the cumulative impact assessment:

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Farms
Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local Municipality, Northern Cape.	12/12/20/2334/7	Withdrawn / Lapsed			75	
Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local Municipality, Northern Cape.	12/12/20/2334/6	Withdrawn / Lapsed			75	
Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local municipality, Northern Cape.	12/12/20/2334/7	Withdrawn / Lapsed			75	
Proposed Gamsberg Solar Energy Project on Portion 1 of Farm 57 Aroams near Upington, Khâi-Ma Municipality, Northern Cape.	12/12/20/2605	Withdrawn / Lapsed			Unknown	

BIOTHERM – CUMULATIVE ASSESSMENT

APPROACH

The Department of Environmental Affairs (DEA) has requested that a detailed cumulative assessment is undertaken for each of the proposed BioTherm projects. The cumulative assessment must take the specialist studies from the surrounding Environmental Authorisations into account.

In order to ensure that a consolidated cumulative assessment can be developed for each project, a template has been produced to ensure that the specialist studies across the disciplines utilise the same approach.

Each specialist discipline will be required to compile the table below and provide a qualitative discussion on the overall cumulative impact of the projects in the study area.

MASTER ASSUMPTIONS

The following assumptions and limitations have been identified in relation to the above approach:

- Due to the number of different significance rating methodologies utilised across the various projects, significance ratings have been simplified to include only Low, Medium and High ratings.
- In the event that specialist studies were unable to be obtained, this has been noted.
- All approved and ongoing environmental authorisations within a 70km radius above been considered

Table 1: Cumulative Impacts – Solar Surface Water

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Farms	Impacts															Proposed Mitigation Measures
							Construction					Operation						Decommissioning				
							Watercourse sedimentation	Fresh water and habitat loss	Turbines	Power lines	Access route	Fresh water	Watercourse sedimentation	Recharge patterns of pans	Turbines	Power lines	Access route	Watercourse sedimentation	Turbines	Power lines	Access route	
Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections, near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	14/12/16/3/3/2/346/AM1	In Process		46 535	75		L					L										
Construction of the Wind and Photovoltaic (PV) Energy Facilities, including the Construction of the Wind and PV Substations and Gridline Connections, Near Springbok, within the Nama-Khoi Local Municipality, Northern Cape Province.	14/12/16/3/3/2/447	In Process		46 535	1000		L					L										
The Proposed Boesmanland Solar Farm Portion 6 (A Portion Of Portion 2), Farm 62 Zuurwater, Aggeneys, Northern Cape Province.	12/12/20/2602	Approved		200	75		L						L									
75MW PV plant on the Farm Zuurwater No 62 in the Namakwa District, Northern Cape Province, Phase 4.	14/12/16/3/3/2/473	In Process		222	75		L						M	L				L				
Proposed Boesmanland Solar	14/12/16/3/3/2/222	Approved		200	75																	

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Farms	Impacts															Proposed Mitigation Measures
							Construction					Operation						Decommissioning				
							Watercourse sedimentation	Fresh water and habitat loss	Turbines	Power lines	Access route	Fresh water	Watercourse sedimentation	Recharge patterns of pans	Turbines	Power lines	Access route	Watercourse sedimentation	Turbines	Power lines	Access route	
Farm Portion 6 (A portion of portion 2) Farm 62 Zuurwater, Aggeneys, Northern Cape.																						
Proposed Wind Energy Facility and Associated Infrastructure on Namies Wind Farm Pty Ltd, near Aggeneys, Northern Cape Province.	14/12/16/3/3/2/550	In Process		15	220				L	L	L				L	L	L		L	L	L	
The Proposed Construction of a Photovoltaic Power Generation Facility within the Black Mountain Mining Area near Aggeneys in the Northern Cape Province.	12/12/20/2151	Approved		19.5	19																	
Proposed 75MW Korana Wind Energy Facility, near Poffader in the Northern Cape.	14/12/16/3/3/2/683	Unknown		3257 (all facilities)	Unknown		L	L				L										
Proposed 140MW Khâi-Mai Wind Energy Facility near Pofadder.	14/12/16/3/3/2/680	Unknown		3257 (all facilities)	Unknown		L	L				L										
				Total	**Total**																	
				50248.5	1538 MW																	
Significance Totals per impact	Significance Rating						**Total Hectares per impact**															
	High Significance																					
	Medium Significance												222									
	Low Significance						50 214	3 257	15	15	15	49 792	200	222	15	15	15	222	15	15	15	
	Positive Impacts																					

The following EAs surrounding the solar developments have been either withdrawn or have lapsed and are therefore not been considered as part of the cumulative impact assessment:

PROPOSED DEVELOPMENT NAME	DEA REFERENCE	CURRENT EA STATUS	PROPONENT	EXTENT	PROPOSED CAPACITY	FARMS
Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local Municipality, Northern Cape.	12/12/20/2334/7	Withdrawn / Lapsed			75	
Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local Municipality, Northern Cape.	12/12/20/2334/6	Withdrawn / Lapsed			75	
Proposed Sato Energy Holdings Photovoltaic Project, Khai Ma Local municipality, Northern Cape.	12/12/20/2334/7	Withdrawn / Lapsed			75	
Proposed Gamsberg Solar Energy Project on Portion 1 of Farm 57 Aroams near Upington, Khâi-Ma Municipality, Northern Cape.	12/12/20/2605	Withdrawn / Lapsed			Unknown	