REPORT

Central Térmica de Temane Project - Visual Impact Assessment

Moz Power Invest, S.A. and Sasol New Energy Holdings (Pty) Ltd

Submitted to:

Ministry of Land, Environment and Rural Development (MITADER)

Submitted by:

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Executive Summary

Moz Power Invest, S.A. (MPI), a company to be incorporated under the laws of Mozambique and Sasol New Energy Holdings (Pty) Ltd (SNE) in a joint development agreement is proposing the construction and operation of a gas to power facility, known as the Central Térmica de Temane (CTT) project. The site of the CTT project is located in the Temane/Mangugumete area, Inhassoro District, Inhambane Province, Mozambique; and approximately 40 km northwest of the town of Vilanculos. This document represents the Visual Impact Assessment (VIA) undertaken to support the Environmental and Social Impact Assessment (ESIA).

The visual resource value of the power plant and transmission lines study area was determined to be moderate, mainly attributable to the relatively low levels of existing development. The area that is expected to be visually impacted by the CTT power plant and transmission line is similar in appearance to other surrounding areas in the region and is not characterised by distinguishing or unique visual attributes.

The visual impacts associated with the power plant will be of a comparable nature and extent, regardless of the technology that is selected. This is due to the fact that the two technology options will essentially consist of elements that are similar in appearance from a visual perspective, with neither option being notably less intrusive in terms of the existing landscape visual context.

A number of relatively short-lived visual impacts are expected to occur during the construction and decommissioning phases of the power plant and transmission line construction, which can be partially mitigated through appropriate planning and site management measures. By contrast, the scope to mitigate or reduce the visual impacts caused by the power plant and transmission lines during the operational phase is limited, given the scale and visual nature of these project components and associated operational requirements.

From a purely visual perspective, the significance of the visual impacts during the operational phase have been indicated to be moderate after reasonable and practical mitigation measures have been implemented. However, this rating is partially a consequence of the project impact scoring methodology that was applied, and the results may therefore be conservative and represent a “worst-case” scenario. Other, potentially more important positive impacts such as the power supply security and socio-economic benefits of the project must also be taken into consideration.

The visual resource value of all three beach landing sites have been determined to also be moderate, although specific aspects or elements may be perceived as having a greater level of visual appeal. Furthermore, the visual resource value of the off-shore anchoring site was estimated to be high, given the lack of human impact and pristine visual quality.

From a visual perspective, the beach landing sites as well as the support infrastructure construction sites located in Inhassoro are considered a temporary, secondary impact associated with the main project components, namely the power plant and transmission line. The scope of visual mitigation of the beach landing site itself is very limited, however the majority of the other construction-related visual impacts can be managed or mitigated to some extent. The duration of this phase will also be limited in terms of the overall lifespan of the project.

Based on the above considerations it is expected that the project visual impacts can be appropriately managed, provided that the visual mitigation measures stipulated in this VIA are implemented and monitored as indicated.

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ACRONYMS

Acronym	Description
CCGT	Steam turbines for Combined Cycle Gas Turbine
CPF	Central processing facility
CTT	Central Térmica de Temane project
ESIA	Environmental and Social Impact Assessment
OCGE	Open Cycle Gas Engines
SEPI	Sasol Exploration Production International
VAC	Visual absorption capacity
VIA	Visual impact assessment

1.0 INTRODUCTION

The Mozambican economy is one of the fastest growing economies on the African continent with electricity demand increasing by approximately 6-8% annually. In order to address the growing electricity demand faced by Mozambique and to improve power quality, grid stability and flexibility in the system, Moz Power Invest, S.A. (MPI), a company to be incorporated under the laws of Mozambique and Sasol New Energy Holdings (Pty) Ltd (SNE) in a joint development agreement is proposing the construction and operation of a gas to power facility, known as the Central Térmica de Temane (CTT) project. MPI's shareholding will be comprised of EDM and Temane Energy Consortium (Pty) Ltd (TEC). The joint development partners of MPI and SNE will hereafter be referred to as the Proponent. The Proponent propose to develop the CTT, a 450MW natural gas fired power plant.

The proposed CTT project will draw gas from either the Sasol Exploration and Production International (SEPI) gas well field via the phase 1 development of the PSA License area, covering gas deposits in the Temane and Pande well fields in the Inhassoro District and the existing Central Processing Facility (CPF) or from an alternative gas source. Consequently, the CTT site is in close proximity to the CPF. The preferred location for the CTT is approximately 500 m south of the CPF. The CPF, and the proposed site of the CTT project, is located in the Temane/Mangugumete area, Inhassoro District, Inhambane Province, Mozambique; and approximately 40 km northwest of the town of Vilanculos. The Govuro River lies 8 km east of the proposed CTT site. The estimated footprint of the CTT power plant is approximately 20 ha (see Figure 1).

Associated infrastructure and facilities for the CTT project will include:

1) Electricity transmission line (400 kV) and servitude; from the proposed power plant to the proposed Vilanculos substation over a total length of 25 km running generally south to a future Vilanculos substation. [Note: the development of the substation falls outside the battery limits of the project scope as it is part of independent infrastructure authorised separately (although separately authorised, the transmission line will be covered by the Project ESMP, and the Vilanculos substation is covered under the Temane Transmission Project (TTP) Environmental and Social Management Plans). Environmental authorisation for this substation was obtained under the STE/CESUL project. (MICOA Ref: 75/MICOA/12 of 22nd May)];

2) Piped water from one or more borehole(s) located either on site at the power plant or from a borehole located on the eastern bank of the Govuro River (this option will require a water pipeline approximately 11 km in length);

3) Access road; over a total length of 3 km, which will follow the proposed water pipeline to the northeast of the CTT to connect to the existing Temane CPF access road;

4) Gas pipeline and servitude; over a total length of 2 km, which will start from the CPF high pressure compressor and run south on the western side of the CPF to connect to the power plant or from an alternative gas source;

5) Additional nominal widening of the servitude for vehicle turning points at points to be identified along these linear servitudes;

6) A construction camp and contractor laydown areas will be established adjacent to the CTT power plant footprint; and

7) Transhipment and barging of equipment to a temporary beach landing site and associated logistics camp and laydown area for the purposes of safe handling and delivery of large oversized and heavy equipment and infrastructure to build the CTT. The transhipment consists of a vessel anchoring for only approximately 1-2 days with periods of up to 3-4 months between shipments over a maximum 15 month period early in the construction phase, in order to offload heavy materials to a barge for beach landing. There are 3 beach

landing site options, namely SETA, Maritima and Briza Mar (Figure 7). The SETA site is considered to be the preferred beach landing site for environmental and other reasons; it therefore shall be selected unless it is found to be not feasible for any reason; and

8) Temporary bridges and access roads or upgrading and reinforcement of existing bridges and roads across sections of the Govuro River where existing bridges are not able to bear the weight of the equipment loads that need to be transported from the beach landing site to the CTT site. Some new sections of road may need to be developed where existing roads are inaccessible or inadequate to allow for the safe transport of equipment to the CTT site. The northern transport route via R241 and EN1 is considered as the preferred transport route (Figure 8) on terrestrial impacts; however, until the final anchor point is selected, and the barge route confirmed, the marine factors may still have an impact on which is deemed the overall preferable route.

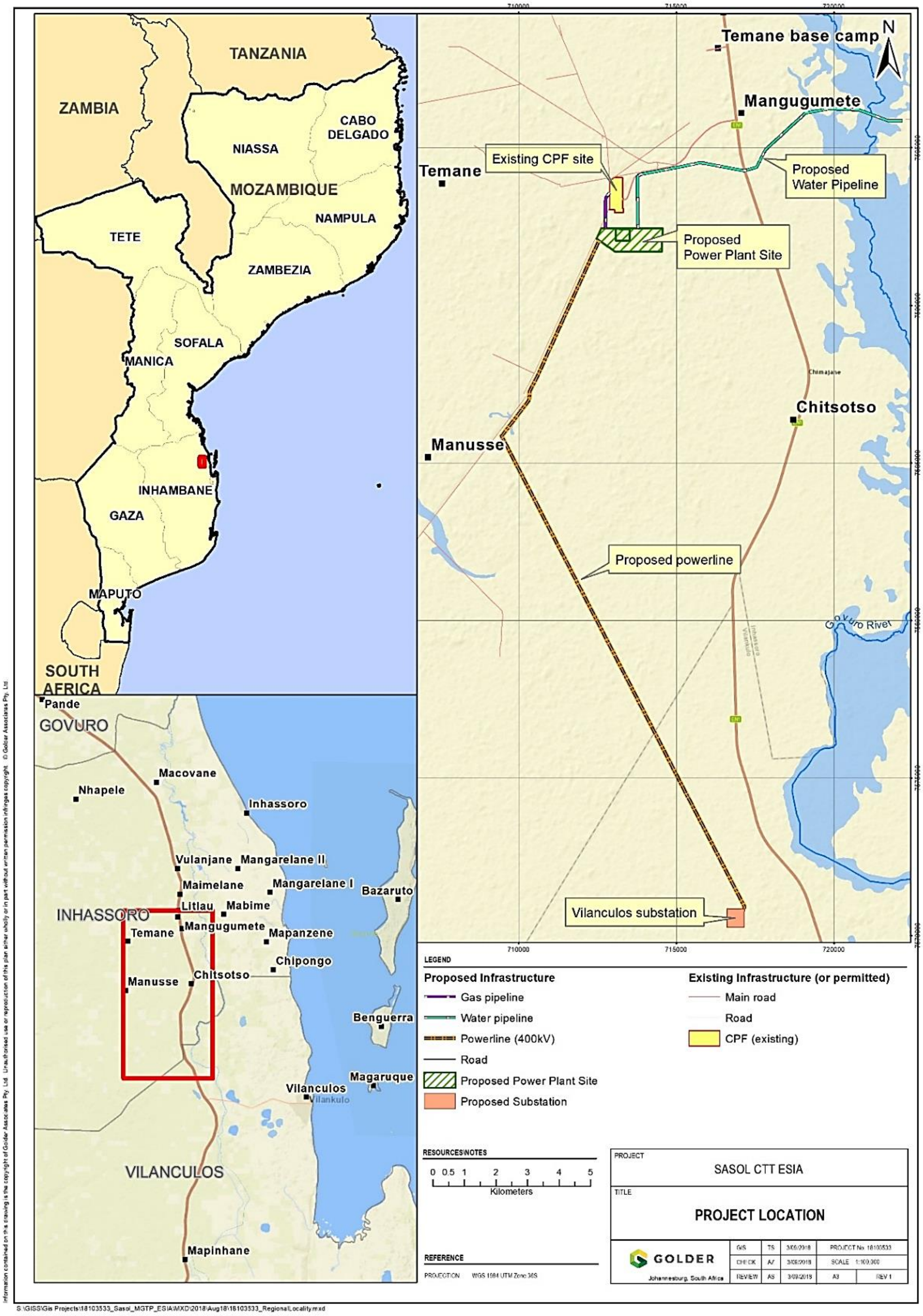

Figure 1: Project Location

2.0 DESCRIPTION OF THE KEY PROJECT COMPONENTS

The CTT project will produce electricity from natural gas in a power plant located 500 m south of the CPF. The project will consist of the construction and operation of the following main components:

- Gas to Power Plant with generation capacity of 450 MW;
- Gas pipeline (±2 km) that will feed the Power Plant with natural gas from the CPF or from an alternative gas source;
- 400 kV Electrical transmission line (± 25 km) with a servitude that will include a fire break (vegetation control) and a maintenance road to the Vilanculos substation. The transmission line will have a partial protection zone (PPZ) of 100 m width. The transmission line servitude will fall inside the PPZ;
- Water supply pipeline to a borehole located either on site or at borehole located east of the Govuro River;
- Surfaced access road to the CTT site and gravel maintenance roads within the transmission line and pipeline servitudes;
- Temporary beach landing structures at Inhassoro for the purposes of delivery of equipment and infrastructure to build the power plant. This will include transhipment and barging activities to bring equipment to the beach landing site for approximately 1-2 days with up to 3-4 months between shipments over a period of approximately 8-15 months;
- Construction camp and contractor laydown areas adjacent to the CTT power plant site; and
- Temporary bridge structures across Govuro River and tributaries, as well possible new roads and/or road upgrades to allow equipment to be safely transported to site during construction.

Figure 2: Examples of gas to power plant sites (source: www.industcards.com and www.wartsila.com)

The final selection of technology that will form part of the power generation component of the CTT project has not been determined at this stage. The two power generation technology options that are currently being evaluated are:

- Steam turbines for Combined Cycle Gas Turbine (CCGT); and
- Open Cycle Gas Engines (OCGE).

Please refer to Chapter 4 of the main ESIA document for further details on the technology option.

At this early stage in the project a provisional layout of infrastructure footprints, including the proposed linear alignments is indicated in Figure 1. A conceptual layout of the CTT plant site is shown below in Figure 3.

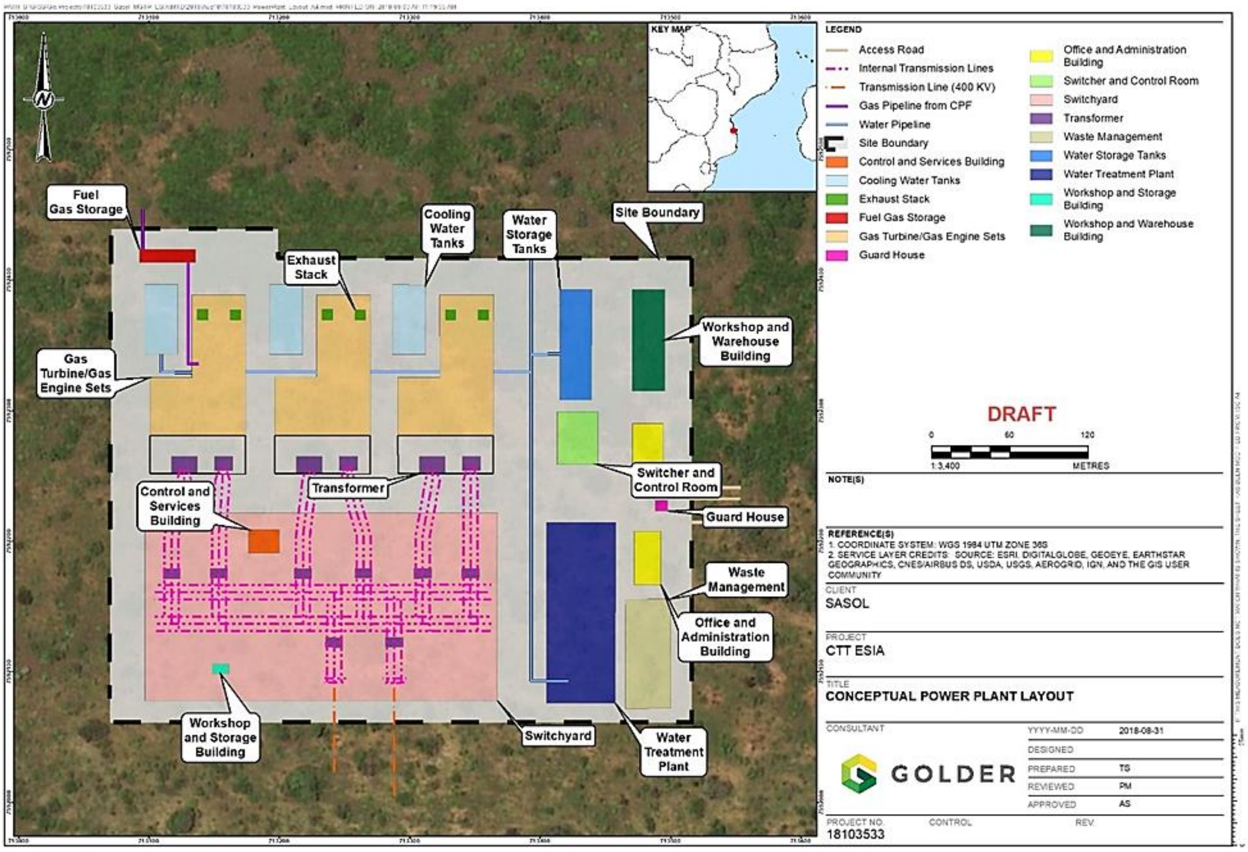

Figure 3: Conceptual layout of CTT plant site

2.1 Ancillary infrastructure

The CTT project will also include the following infrastructure:

- Maintenance facilities, admin building and other buildings;
- Telecommunications and security;
- Waste (solid and effluent) treatment and/or handling and disposal by third party;
- Site preparation, civil works and infrastructure development for the complete plant;
- Construction camp (including housing/accommodation for construction workers); and
- Beach landing laydown area and logistics camp.

The heavy equipment and pre-fabricated components of the power plant will be brought in by ship and transferred by barge and landed on the beach near Inhassoro. The equipment and components will be brought to site by special heavy vehicles capable of handling abnormally heavy and large dimension loads. Figure 4, Figure 5 and Figure 6 show examples of the activities involved with a temporary beach landing site, offloading and transporting of large heavy equipment by road to site.

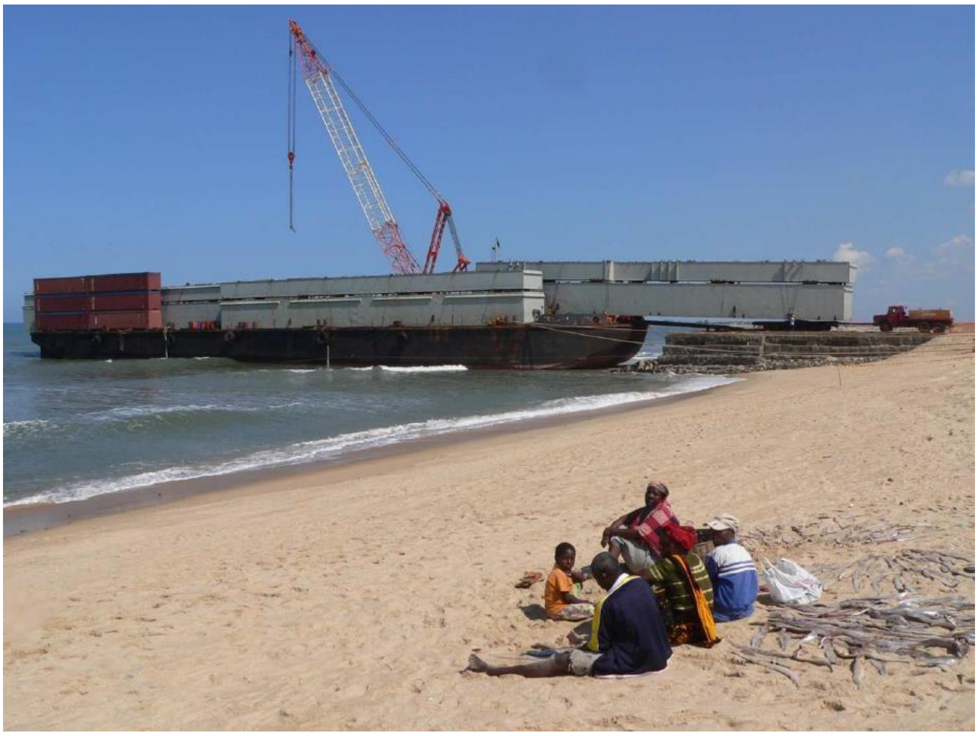

Figure 4: Typical beach landing site with barge offloading heavy equipment (source: Comarco)

Figure 5: Example of large equipment being offloaded from a barge. Note the levels of the ramp, the barge and the jetty (source: SUBTECH)

Figure 6: Heavy haulage truck with 16-axle hydraulic trailer transporting a 360 ton generator (source: ALE)

2.2 Water and electricity consumption

The type, origin and quantity of water and energy consumption are still to be determined based on the selected technology to construct and operate the CTT plant. At this stage it is known that water will be sourced from existing boreholes located on site or east of the Govuro River for either of the technology options below:

- Gas Engine: ± 12 m^3/day; or
- Gas Turbine (Dry-Cooling): ± 120 – 240 m^3/day.

2.3 Temporary beach landing site and transportation route alternative

As part of the CTT construction phase it was considered that large heavy equipment and materials would need to be brought in by a ship which would remain anchored at sea off the coast of Inhassoro. Equipment and materials would be transferred to a barge capable of moving on the high tide into very shallow water adjacent to the beach to discharge its cargo onto a temporary off-loading jetty (typically containers filled with sand) near the town of Inhassoro. As the tide changes, the barge rests on the beach and off-loading of the equipment commences.

Currently, the SETA beach landing site is the preferred beach landing site together with the road route option to be used in transporting equipment and materials along the R241 then the EN1 then via the existing CPF access road to the CTT site near the CPF. Figure 7 and Figure 8 indicate the beach landing site and route transportation option. The alternative beach landing sites of Maritima and Briza Mar are still being evaluated as potential options, as well as the southern transport route, which would also require road upgrades and a temporary bridge construction across the Govuro at the position of the existing pipe bridge. As part of the transportation route, the Govuro River bridge may need to be upgraded / strengthened to accommodate the abnormal vehicle loads. Alternatively, a temporary bypass bridge will be constructed adjacent to the existing bridge.

Figure 7: The three beach landing site options and route options at Inhassoro

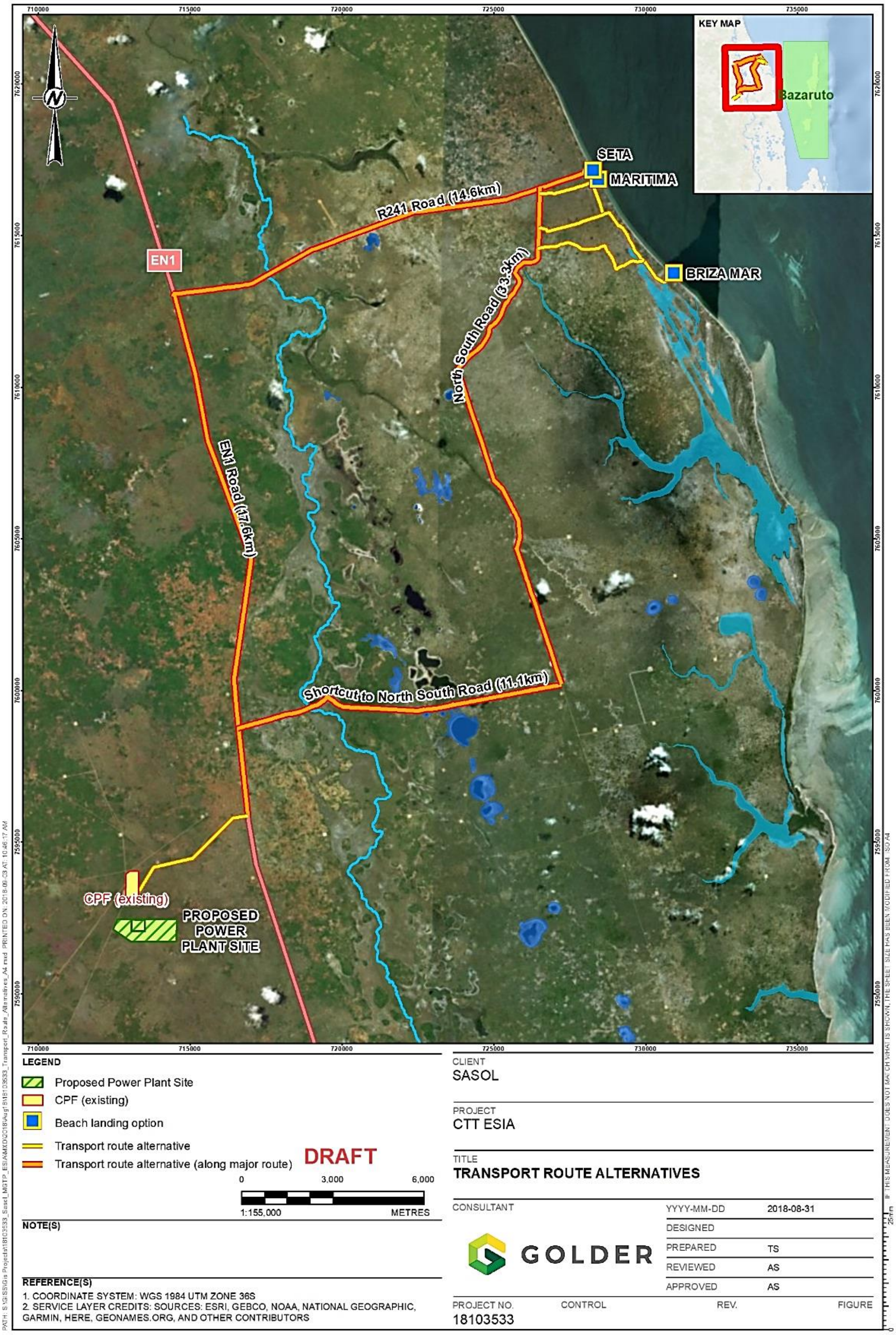

Figure 8: The two main transportation route alternatives from the beach landing sites to the CTT site

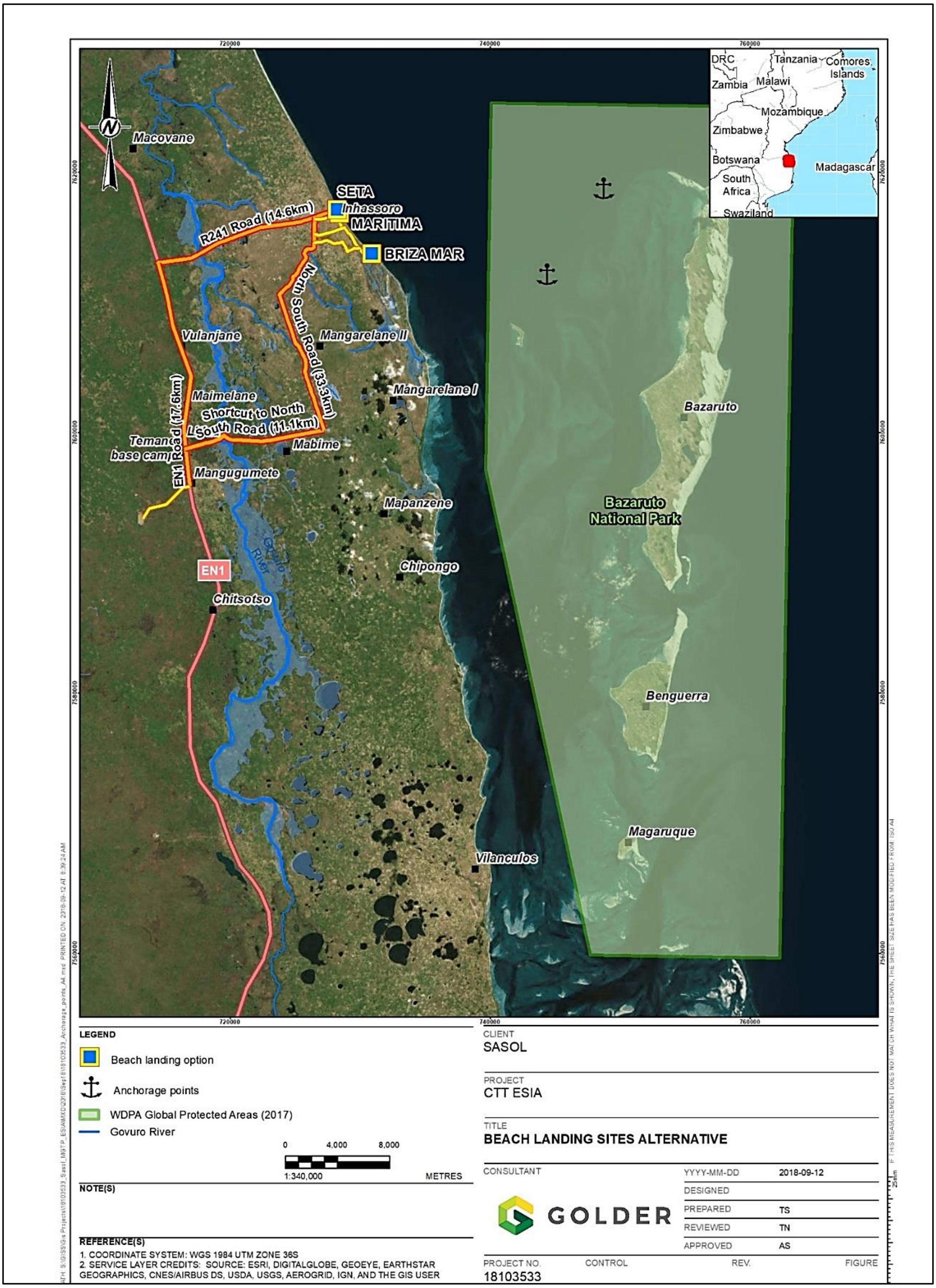

Figure 9: Proposed anchorage point alternatives for transhipment vessel

3.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The proposed project has been determined as ‘Category A’ in terms of Mozambique’s environmental law (Decree 54/2015 of 31 December, which has been in force since April 2016). For ‘Category A’ projects, an Environmental and Social Impact Assessment (ESIA) must be prepared by independent consultants as a basis for whether or not environmental authorisation of the project is to be granted, and if so, under what conditions. The final approval must be provided by the Ministry of Land, Environment and Rural Development (Ministério da Terra, Ambiente e Desenvolvimento Rural (MITADER) through the National Directorate of Environmental Impact Assessment (DNAIA). MITADER consults with other relevant government departments prior to making a decision.

This document represents the Visual Impact Assessment (VIA) undertaken to support the ESIA. This study is undertaken in terms of the requirements of the process for Environmental Impact Assessment as approved by Decree 54/2015 as well as the World Bank Group operational policies and general environmental health and safety guidelines. In particular the World Bank Performance Standard (OP 4.03), has been considered and incorporated throughout this assessment. In addition, a number of concepts and criteria that are universally applied in visual and aesthetic assessments have also been applied in identifying and assessing the magnitude (or intensity) of the visual impacts that are expected to be caused by the project.

4.0 ASSUMPTIONS AND QUALIFICATIONS

The following assumptions and qualifications are relevant to the process followed, as well as the findings of this VIA:

- The value, quality and significance of a visual resource, or the significance of the impact that an activity may have on it is often a subjective process. The value of a visual resource is partly determined by the receptor or viewer, and therefore influenced by a person’s personal preferences as well as fluctuating factors such as emotional mood. Changes in conditions such as weather patterns, time of day and the season during which the landscape is viewed can also dramatically alter its appearance, and perceived resultant appeal;
- It is furthermore acknowledged that different cultures attach diverse values to the landscape, and that different aesthetic considerations may therefore also apply to different people groups. Individual or constituent elements of the landscape may be of specific importance to certain people groups, which may not be obvious to others;
- For these reasons, visual impact cannot be measured by empirical standards only, as is for instance the case with water, noise or air pollution. A visual assessment is also executed by a qualified consultant, who is by nature biased and therefore to some extent subjective. However, a large body of scientific knowledge exists on the field of visual assessment, which were applied in conducting this study. The opinion of the visual consultant is unlikely to materially influence the findings and recommendations of the study, and is therefore not expected to marginalise specific socio-cultural or religious value systems;
- This VIA assessed the visual resource value of the project study area as a single entity, even though discreet attributes of the landscape character were considered. This was done because of the specific “sense of place” that this particular landscape possesses, which is as much a function of the relationship between the various landscape character elements, as it is of the individual constituent attributes themselves. This is an important point, as the implication is that changes to any one landscape character attribute will have an impact on the entire visual study area. Visual impacts in such a context can therefore not easily be “isolated”, in order to mitigate them;
- The potential visual impacts of the proposed project have been assessed from an anthropocentric point of view only, as evaluating the potential impact on other biota was not part of the scope of work for this VIA.

However, it is expected that the ecological impact of specifically light pollution at night could be notable, as amongst others marine aquatic animals and insects that use moonlight for navigation may be negatively impacted by the night-time lighting associated with the development;

- The visual impact assessment specialist did not conduct a site visit to the project study area, as the area was sufficiently photographed and documented by various other specialists during recently conducted fieldwork;
- The viewshed analysis was conducted using the latest available project development layout plans, as well as heights for the various project components as provided by the client. However, three-dimensional models for the various infrastructure components were not available, and were therefore conceptually generated by Golder for graphic representations purposes;
- At present a final decision in terms of the gas to power plant technology has not been made yet, as this will partly be informed by the outcomes of the various other specialist studies being conducted, but mainly from the CTT Feasibility Study once concluded. However, from a visual perspective it is expected that the visual impact associated with the CCGT and OCGE options respectively will be largely similar in nature and magnitude / intensity. Consequently, only the CCGT power plant alternative was assessed in terms of the viewshed analysis/visibility modelling and graphic representation, as this option represents the "worst-case" scenario in terms of the number of stacks and their heights;
- The following power plant and other infrastructure heights were used when generating the various viewshed analyses and graphic representations:
  - Gas turbines and six associated stacks - 3.2 m diameter, 50 m height (which was used for the viewshed analysis/visibility modelling and graphic representation purposes as the "worst-case" scenario due to the higher and larger stacks);
  - Gas engines and four associated stacks - 1.6 m diameter, 30 m height (which was not modelled as the visual impact associated with this technology choice would be largely similar to that of the gas turbines and stacks);
  - Other buildings and structures within the power plant complex where modelled at heights ranging from approximately 7 m to 30 m, based on similar existing power plant examples. A radius of 20 km was applied for the powerplant infrastructure viewshed analysis;
  - The height of the power lines was modelled at 25 m, which represents the average height of the individual power lines pylons. A radius of 5 km was applied for the power lines viewshed analysis. Individual pylons were not modelled due to the fact their individual locations have not been established yet and as this will not materially affect the outcome of the viewshed analysis; and
  - The visual screening effect of the existing vegetation was incorporated into the viewshed analysis results, based on the existing LIDAR-generated land cover. Average vegetation heights for the different vegetation communities was applied in consultation with the Golder project terrestrial ecologist, ranging from of 0 m to 8 m for various vegetation units.
- Certain photographs have been digitally "stitched" together or alternatively cropped to illustrate certain concepts, and may not represent a "natural" view or perspective as viewed by the human eye;
- The findings of this report are considered to be indicative of the nature and magnitude / intensity of the potential project visual impacts only, due to the preliminary nature of the available layout and design drawings. Certain findings of this VIA including proposed mitigation measures may therefore need to be

reviewed and updated, once a technology option has been chosen and when final site layout drawings have been produced and/or actual project implementation commences; and

- The quality of especially the night-time photos and graphic simulations are significantly reduced when printed, or during low-resolution conversion of the original MS Office Word file to .pdf or other formats. It is therefore recommended that the report be viewed in its original Word format, or that the photos and graphic simulations be printed at a high resolution on photo quality paper.

4.1 Scope of study

The terms of reference for this VIA were as follows:

- Assess the baseline conditions and perceived aesthetic resource value of the visual context within which the CTT and associated/ancillary project infrastructure will be located, these being:
  - Beach landing site with laydown area and potential bridge upgrade;
  - Proposed water and gas pipelines and their respective servitudes and access roads;
  - Construction camp;
  - Power plant complex with access road from CPF; and
  - Powerline connecting to the Vilanculos substation.
- Establish what visual impacts may potentially arise as a result of the above project infrastructure and components, should it proceed;
- Determine what visual receptor groups may potentially be affected by the project, and the likely perceived significance of the visual impacts caused; and;
- Investigate possible methods by which the potential impacts may be mitigated or reversed, where feasible.

4.2 Study methodology

This VIA specialist study was conducted following a series consecutive steps listed below and illustrated by Figure 10:

- **Step one:** determining the intensity of the impact, which is a function of the visual resource value of the study area and a number of industry-standard visual assessment criteria, i.e. visibility, visual exposure, visual intrusion and receptor sensitivity and perceived landscape value. This was done as follows:
  - Describing the baseline landscape visual character of the project study area based on a desktop review available aerial photography and topographical maps, photographs taken by various other specialists, in terms of:
    - Overall topographical character and specific landform features;
    - Water bodies and features as well as drainage lines and patterns;
    - Overall vegetation cover and specific vegetation communities;
    - Visual absorption capacity of the landscape; and
    - Sense of place of the landscape, as a function of the relationship between the afore-mentioned aspects and human activity in the study area.
  - Determining the visual resource value of the landscape, based on the above visual characteristics;

- Assessing the likely visual impacts of the project, using recognised visual assessment criteria namely:
  - Theoretical visibility;
  - Visual exposure.
  - Visual intrusion; and
  - Receptor sensitivity.
- Determining the impact intensity, by considering the results of the above visual impact assessment in terms of the landscape visual resource value;

- **Step two:** evaluating the impact significance, in terms of the following standard impact assessment criteria:
  - Direction of the impact (whether the impact is positive or negative);
  - Geographic extent of the impact (over how large an area will the impact likely be experienced by receptors, which in the context of visual assessment comprises different people groups);
  - Duration of the impact (how long will it last for); and
  - Probability (likelihood that the impact will occur should the project proceed); and
- **Step three:** Identifying potential mitigation measures to reduce or the intensity of the visual impacts, where feasible.

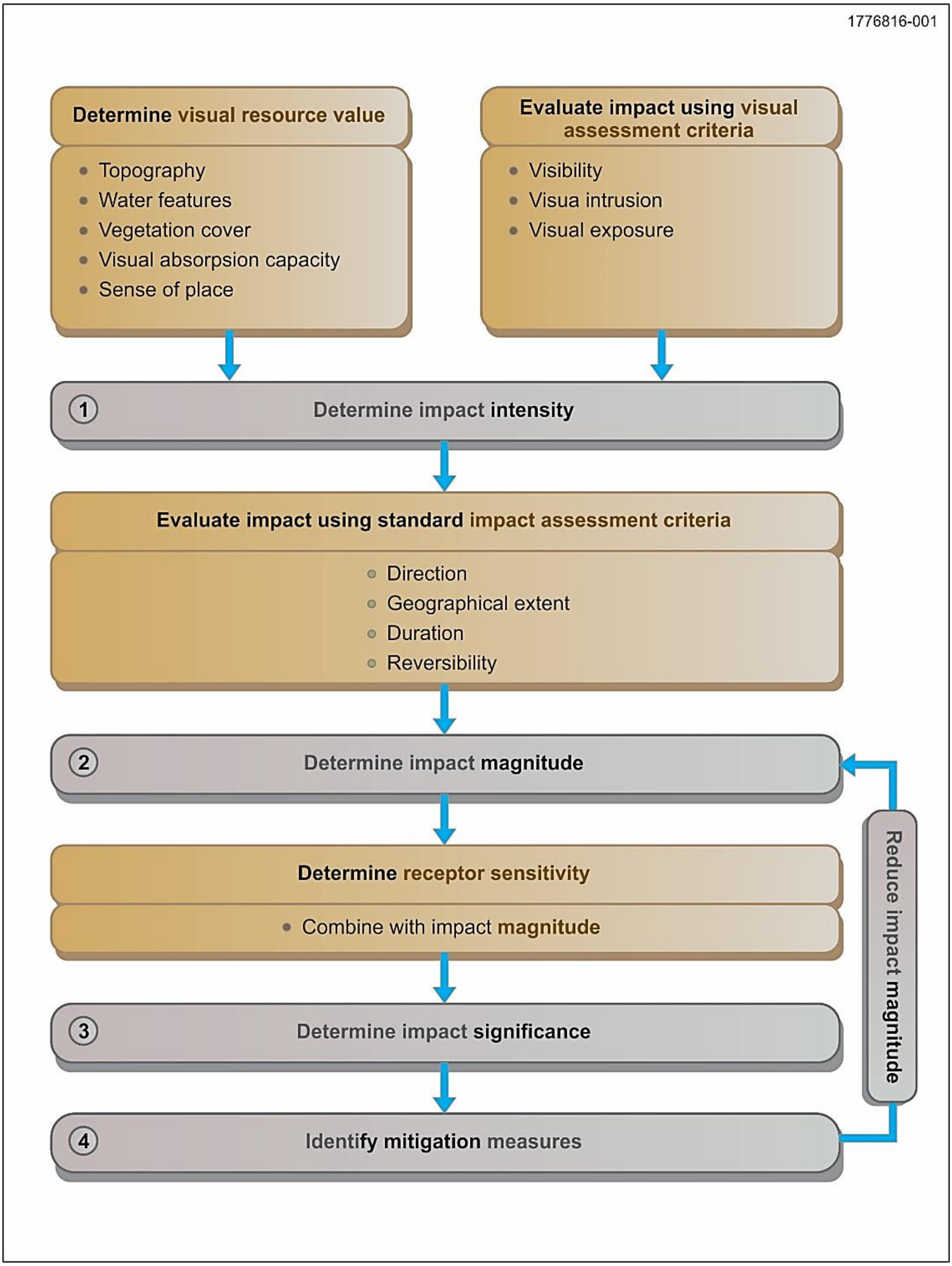

Figure 10: Process for conducting a visual impact assessment

5.0 BASELINE CONDITIONS

5.1 Desktop review of available information

The following documents and information specifically relevant to the project was reviewed at a desktop level to inform the compilation of this VIA. Note that additional information of a general nature listed in Section 13.0 was also consulted as appropriate:

- AECOM (2014). *Sasol Beach Landing Assessment for the Mozambique Gas to Power Project* (report nr. 60332554/03);
- Golder (2018). *Central Térmica de Temane Project - Environmental and Social Impact Assessment Report - Moz Power Invest, S.A. and Sasol New Energy Holdings (Pty) Ltd* (report nr. 18103533-320908-2) [Draft];
- Google Earth aerial imagery of the respective project sites and surrounding study areas as described in Section 5.2; and
- Photographs of the various sites and surrounding areas, taken during September 2014 and June 2018 respectively.

5.2 Study area

The proposed project will cause a visual impact due to the presence of the new infrastructure that will be constructed and areas where the existing landscape will be altered, as well as activities associated with the various project phases. For the purposes of this VIA, the project study area is therefore defined as the spatial footprint of the infrastructure and related landscape alterations, as well as an associated zone of influence from which these elements and changes may be visible. Three project study areas were identified, as follows:

- The SETA, Maritima and Briza Mar landing sites and off-shore transhipment vessel anchoring location, as well as respective pipeline construction sites (which would constitute temporary construction phase study areas only);
- The power plant site complex and an associated 20 km radius zone of visual influence. The distance of 20 km was selected based on the assumption that most daytime visual impacts regardless of their nature or extent, will be relatively inconspicuous beyond this range as the human eye can no longer distinguish significant detail over this distance. Additionally, vegetation cover and other existing structures act as visual barriers or screens and tend to restrict visibility to well within this range; and
- The power lines corridor from the power plant to the Vilanculos substation, as well as an associated 5 km radius zone of influence. The reduced distance of 5 km was chosen based on the lower structure height of the pylons, as well as the visually less substantial or "opaque" nature of the pylons, compared to the power plant infrastructure.

5.3 Baseline visual resource assessment

5.3.1 Visual resource value criteria

It is necessary to first determine the visual resource value of a landscape, in order to assess what the actual perceived visual impact of a proposed project on that landscape may be. Visual resource value refers to the perceived aesthetic quality of individual aspects of an environment, as well as the relationships between these elements and how they appeal to our senses. The visual resource value of the landscape is therefore assessed by considering both the natural (physical and biological) and human-made (land use) attributes within a given study area.

Studies in perceptual psychology have shown that in a broad sense, humans have an affinity for landscapes with a higher visual complexity, than for homogeneous ones (NLA, 2004). Furthermore, based on research in human visual preference (Crawford, 1994), landscape visual quality is a function of the following landscape attributes, which were assigned score values for the purposes of this VIA:

- The general topographical character of the study area including prominent landforms, and the spatial orientation of these in terms of the project site. Landscapes with prominent and varied topography and/or interesting geological landmarks and features are considered to have high visual resource value (rated 3), whereas landscapes with rolling and relatively featureless topography have lower visual resource values (rated 1 to 2, depending on the context);
- The nature, physical extent and appearance of water bodies such as coastal areas, lakes, dams, rivers, pans or wetlands within the study area. Large expanses of open water, prominent watercourses or interesting features such as waterfalls typically have a high visual resource value (rated 3), whereas less prominent hydrological features such as wetlands, ephemeral pans or smaller streams have a moderate visual resource value (rated 2). In landscapes where few to no hydrological features are present, this aspect is rated as low (1);
- The nature of the vegetation cover within the study area in terms of its density, height, visual diversity and level of disturbance. Landscapes characterised by prominent natural vegetation with relatively high levels of visual diversity such as forests, woodlands and expansive blooming fields are rated as having high visual resource value (3). Vegetation cover that is not particularly prominent or visually diverse such as grasslands, artificial woodlots or croplands are rated as moderate (2). In landscapes where the natural vegetation cover has been largely displaced by invaders or removed, this aspect is rated as being of low visual resource value (1). It is however important to realise that context also plays a significant and somewhat subjective role in this regard, as a lack of vegetation cover can in some instances still result in visually appealing conditions, such as desert landscapes;
- The level of visual absorption capacity (VAC) of the existing landscape, which is the ability of the landscape to accommodate alterations without a significant negative impact or reduction in the visual resource value of the landscape. Landscapes that are characterised by very low VAC are rated as sensitive or high (3) in this regard, as they will be most severely impacted by any new development. Landscapes that will likely be only moderately impacted due to some pre-existing development and/or visual complexity, are rated as moderate (2). Conversely, landscapes that are unlikely to be materially impacted by new or further development are rated as low (1); and
- The perceived sense of place of the landscape, or the degree of visual uniqueness or distinctiveness of the landscape and the cultural and spiritual significance that different people groups attach to it. Landscapes that have a very strongly defined visual character, or with high levels of cultural or spiritual significance attached to them by certain population groups, are rated as high (3). Similarly, national or international landmarks are also considered as having a strongly defined sense of place, as they are usually unique and highly recognisable, and therefore irreplaceable. Conversely, landscapes in which the pre-existing natural attributes have been largely displaced by visually incoherent and intrusive elements and that are not associated with any specific group of people would be considered to have little, or alternatively a negative sense of place, and would be rated low (1). This aspect is obviously subject to a significant degree of personal interpretation and may be highly context-specific, as significantly transformed or built-up landscapes may still have a strongly defined positive sense of place, as would for instance be the case with cultural-historic monuments, or highly scenic towns and cities.

The visual resource value ratings assigned to each of the landscape attributes determined according to the above criteria was then scored according to the categories summarised in Table 1 below.

Table 1: Visual resource value scores

Visual resource value score	Criteria
13 – 15 = High visual resource value	Pristine or near-pristine condition / natural areas with little to no visible human intervention visible / characterised by highly scenic or attractive natural features, or cultural heritage sites with high historical or social value and visual appeal / Areas that exhibit a strong positive character with valued features that combine to give the experience of unity, richness and harmony. These are landscapes that may be considered to be of particular importance to conserve and are expected to be sensitive to change.
9 – 12 = Moderate visual resource value	Partially transformed or disturbed landscape / human intervention visible but does not dominate view / scenic appeal of landscape partially compromised / noticeable presence of incongruous elements / Areas that exhibit positive character, but which may have evidence of degradation / erosion of some features resulting in areas of more mixed character. These landscapes are less important to conserve but may include certain areas or features worthy of conservation.
5 – 8 = Low visual resource value	Extensively transformed or disturbed landscape / human intervention dominates available views / scenic appeal of landscape greatly compromised / visual prominence of widely disparate or incongruous land uses and activities / Areas generally negative in character with few, if any, valued features. Scope for positive enhancement frequently occurs.

When assessing the value of a landscape as a visual resource, it is also necessary to consider the landscape in terms of the broader context in which it is located. Although a specific landscape may objectively be considered to be less scenically appealing than other similar but far-off landscapes, it may still be considered significant in terms of the local visual context within which it is located. In this way, what may be commonplace when placed in another visual context, may be special or exceptional when viewed within its present setting.

5.3.2 Beach landing sites visual resource value

The visual resource value of the potential beach landing sites is considered to be more or less equal for all three sites, due to their largely similar visual character, as illustrated by Figure 11 to Figure 13 and discussed below.

- Topography: The topography of all three beach landing sites is typical to the Mozambique coastline, characterised mostly by low rises and rolling sand dunes. In this respect, the landscape is therefore dominated by the strongly linear horizon line formed by ocean, which in itself has a particular and unique appeal. However, as there are very few prominent landforms at any of the landing sites the resource value of this aspect is rated as low (1);
- Water bodies: The visual character of all three beach landing sites is largely defined by the ocean and associated strip of beach. This specific attribute is considered one of the major attractions of the country as a whole and responsible for much of its tourism, and is therefore rated as having a high visual resource value (3);
- Vegetation cover: The vegetation along the populated sections of Mozambique's coast is usually a mixture of native indigenous and exotic garden species, as is evident at all three beach landing sites. In some

instances, the exotic species are visually incongruous, and could therefore be argued to detract from the overall resource value of the study area. However, some of the larger trees are appealing in their own right, and strips of vegetation representative of the indigenous coastal plant communities are still in evidence along sections of beach. For this reason, the visual resource value of the vegetation cover at all three landing sites is rated as moderate (2);

- Visual absorption capacity: The VAC of a landscape is determined by the relationship between a number of factors, including the levels and nature of existing development and landscape transformation, overall vegetation density and to a lesser extent the topographical character of the area. The landing sites are generally characterised by low density to sparse development, vegetation cover of varying height, and landscape topography that is not highly varied. The VAC of all three beach landing sites is therefore considered to be moderate (2); and

- Sense of place: Sense of place is arguably the most subjective and intangible aspect of the landscape visual resource value, as it is a function of the relationship between all the other attributes, as well as how people perceive these. Furthermore, sense of place also considers how “unique” a visual landscape is within its greater contextual setting, i.e. to what extent it can be distinguished from other sites or areas in the greater vicinity. Essentially, the three beach landing sites are characterised by the same “types” of visual components, although each site differs somewhat in appearance due to the types of development present. The SETA site is located at the terminus of an existing road, which passes through the built-up area of Inhassoro. Similarly, the Maritima site is located just south of the SETA site, and both are therefore characterised by a fair degree of development and landscape transformation. The Briza Mar site by contrast is located some distance to the south on the outskirts of the development area, with noticeably lower levels of transformation and a more identifiable rustic character. For this reason, the sense of place of the SETA and Maritima sites is rated as being moderate (2), whereas that of the Briza Mar site is considered high (3).

Figure 11: Landscape visual character of SETA beach landing site

Figure 12: Landscape visual character of Maritima beach landing site

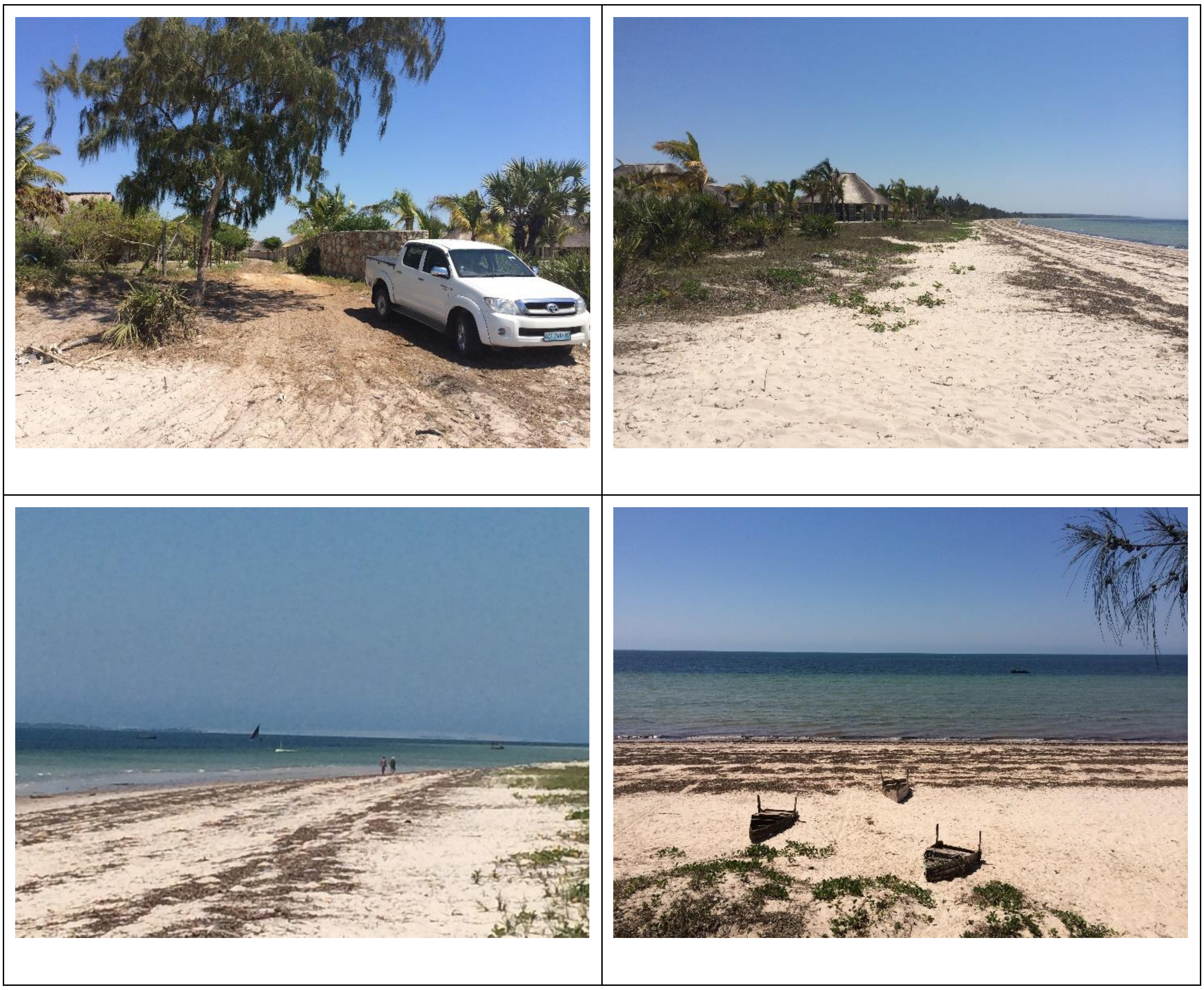

Figure 13: Landscape visual character of Briza Mar beach landing site

The visual resource value of the three beach landing sites was then determined using the score ranges provided in Table 1, based on their individual visual baseline characteristic scores. In addition, the visual resource value of the offshore visual environment within which the transhipment vessel will be anchored and through which barges will ferry equipment and material was also assessed, as summarised in Table 2:

Table 2: Visual resource value assessment – beach landing sites and off-shore environment

Beach landing site	Visual baseline attribute				
	Topography	Water bodies	Vegetation	VAC	Sense of place
SETA and Maritima sites	1	3	2	2	2
Total visual resource value score for SETA and Maritima sites					**10 (moderate)**
Briza Mar site	1	3	2	2	3

Beach landing site	Visual baseline attribute				
	Topography	Water bodies	Vegetation	VAC	Sense of place
Total visual resource value score for off-shore areas					**11 (moderate)**
Off-shore / transhipment vessel anchorage areas	1	3	N/A (3)	3	3
Total visual resource value score for off-shore / transhipment vessel anchorage areas					**13 (high)**

5.3.3 CTT power plant and power line corridor visual resource value

The visual character and resource value of the power plant and transmission lines study area is considered representative of that of the larger region, as illustrated by Figure 15 and discussed below.

- Topography: The topography of the inland study area is mostly flattish to gently rolling or undulating, with no prominent landforms occurring in the vicinity of the power plant and transmission line site. A low ridge is located several kilometres east of the site, between and roughly paralleling the EN1 national road and coastline. Although this feature is expected to screen the proposed power plant from view to some extent, it is not visually prominent. The visual resource value of the study area topography is therefore rates as being low (1);
- Water bodies: The majority of the eastern half of the study area located between the coastline and the EN1 national road contains numerous pans of varying sizes and extensive wetland areas, while the Govuro River roughly parallels the road from north to south. Conversely, the more inland western half of the study area is noticeably dryer with almost no pans present, although a number of less obvious and possibly ephemeral wetlands are still in evidence. The degree to which water bodies contribute to the visual resource value of the overall study area therefore varies from east to west, however the majority of the more visible water features are located more than five kilometres from the site itself. For this reason, their visual resource value in terms of the study area as a whole is estimated to be moderate (2);
- Vegetation cover: The vegetation cover varies somewhat throughout the study area, ranging from cleared grazing and open grassland sparsely dotted by shrubs and small trees, to relatively dense bushveld. In addition, the settlement areas also contain a variety of exotic ornamental garden and fruiting plant species, which noticeably contrast with the more indigenous vegetation. However, from a *visual perspective* the visual character of the majority of the study area vegetation cover appears to represent the native vegetation communities. Coupled with the mostly low levels of development, the visual resource value of the vegetation within the study area is therefore considered moderate (2);
- Visual absorption capacity: The VAC of the power plant and transmission lines study area varies somewhat in accordance with the changes in vegetation cover and levels of development. However, as a whole the study area VAC is considered to be moderate (2), due to the mostly low vegetation height and varied density, as well as low levels of development; and
- Sense of place: The power plant and transmission line study area are visually similar to much of the area immediately inland of Mozambique's coastline, and possesses few to no discernible distinguishing

features. However, the rural and largely undeveloped nature of the entire area could be perceived as evoking a sense of peaceful solitude with at least some visual appeal and is therefore rated as moderate (2).

Figure 14: Visual character of the power plant and transmission lines study area

Figure 15: Landscape visual character of the proposed power plant site

The visual resource value of the power plant and transmission lines study area was subsequently determined using the score ranges provided in Table 1, based on their individual visual baseline characteristic scores, as summarised in Table 2:

Table 3: Visual resource value - CTT plant and power line study area

Visual baseline attribute	Topography	Water bodies	Vegetation	VAC	Sense of place
Visual resource value score	1	2	2	2	2
Total visual resource value score					**9 (moderate)**

From the assessment performed in Section 5.3, it was concluded that the visual resource value of all three beach landing sites as well as the power plant and transmission line study areas is moderate, although certain elements or specific areas thereof may be of a higher visual resource value. By contrast, the visual resource value score for off-shore / transhipment vessel anchorage areas is considered to be high.

An assessment of the expected visual impacts that would arise as a consequence of the proposed project was subsequently conducted, as described in Section 6.0.

6.0 IMPACT ASSESSMENT METHODOLOGY AND RATING CRITERIA

The significance of the visual impacts that are expected to occur as a consequence of the project during the construction, operation and closure phases were determined in two stages, as follows:

- Determining the intensity (or magnitude) of the expected impact, using industry-accepted criteria in the field of visual impact identification and assessment within the context of the visual resource value of the landscape; and
- Evaluating or determining the expected significance of these impacts, based on standard impact assessment criteria.

6.1 Visual impact intensity assessment

The intensity of the individual visual impacts expected to occur during the various project phases was evaluated using four criteria, these being:

- Extent of visibility;
- Level of visual exposure;
- Degree of visual intrusion; and
- Predicted receptor sensitivity.

The above visual impact criteria were considered together with the visual resource value of the beach landing sites and the power plant and transmission line study areas respectively, as established in Section 5.3.1, to determine the intensity of the visual impact.

6.1.1 Level of visibility

The expected level visibility is defined as the sections of the study area from which the proposed project or its constituent elements may be visible. This area was determined by conducting a viewshed analysis and using Geographic Information System (GIS) software with three-dimensional topographical modelling capabilities, including viewshed and line-of-sight analyses (cross-sections).

The basis for the viewshed analysis was a digital elevation model (DEM) and the viewsheds were modelled on the above-mentioned DEM using Global Mapper 15® software. In this fashion, the level of visibility based on the results of the viewshed analysis was then rated as shown in Table 4, as a function of how much of the study area is indicated as being visually exposed to the project infrastructure:

Table 4: Level of visibility rating

Level of theoretical visibility of project element	Visibility rating
Less than a quarter of the total project study area	Low
Between a quarter and half of the study area	Moderate
More than half of the study area	High

6.1.2 Visual exposure

The visual impact of a development diminishes at an exponential rate as the distance between the observer and the object increases – refer to Figure 16. Relative humidity and fog in the area directly influence the effect. Increased humidity causes the air to appear greyer, diminishing detail. Thus, the impact at 1 000 m would be 25% of the impact as viewed from 500 m. At 2 000 m it would be 10% of the impact at 500 m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (Hull, R.B and Bishop, I.E, 1998) (Hull, R.B and Bishop, I.E, 1998) and was used as important criteria for this study.

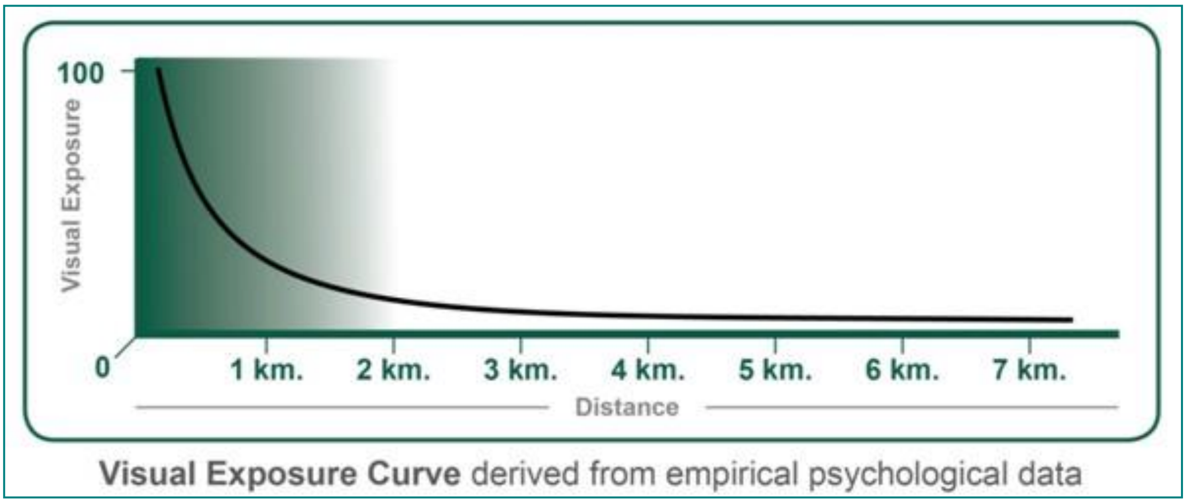

Figure 16: Visual impact vs. visual exposure distance

Thus, visual exposure is an expression of how close receptors are expected to get to the proposed interventions on a regular basis. For the purposes of this assessment, visual exposure is defined as summarised in Table 5:

Table 5: Level of visual exposure

View range/receptor distance from visual impact source	Visual exposure rating
Close-range views / views over a distance of 500 m or less	High (3)
Medium-range views / views of 500 m to 2 km	Moderate (2)
Long-range views / views over distances greater than 2 km	Low (1)

6.1.3 Visual intrusion

Visual intrusion deals with how well the project components fit into the ecological and cultural aesthetic of the landscape as a whole. An object will have a greater negative impact on scenes considered to have a high visual quality than on scenes of low quality, because the most scenic areas have the "most to lose".

The visual impact of a proposed landscape alteration also decreases as the complexity of the context within which it takes place, increases. If the existing visual context of the site is relatively simple and uniform any alterations or the addition of human-made elements tend to be very noticeable, whereas the same alterations in a visually complex and varied context do not attract as much attention. Especially as distance increases, the object becomes less of a focal point because there is more visual distraction, and the observer's attention is diverted by the complexity of the scene (Hull, R.B and Bishop, I.E, 1998). The expected level of visual intrusion of the main project infrastructure elements is assessed below.

6.1.4 Visual receptor sensitivity and incidence

Receptors for visual impacts are people that might see the proposed development, as visual impact is primarily an impact concerned with human interest. Receptor sensitivity refers to the degree to which an activity will actually impact on receptors; and depends on how many persons are expected to view or see (thus be impacted by) the proposed project or elements thereof, how frequently they are exposed to it and their perceptions regarding aesthetics. The receptors around the project can be classified for high, moderate, or low visual sensitivity as indicated in Table 6.

Table 6: Visual receptor sensitivity

Perceived landscape value factor (receptor perception regarding project and visual landscape)	Exposure factor (amount of people that will see the project)		
	High (thousands of individuals, mixture of resident and transient receptors)	**Moderate** (Hundreds of individuals, predominantly resident receptors)	**Low** (small number / several dozen individuals only, or almost exclusively transient receptors only)
High	High (3)	High (3)	Moderate (2)
Moderate	High (3)	Moderate (2)	Low (1)
Low	Moderate (2)	Low (1)	Low (1)

6.1.5 Visual impact intensity

The intensity of the individual visual impacts was then established, by considering the impacts in terms of the preceding impact assessment criteria within the context of the established landscape visual resource value. This was done on the premise that landscapes with a higher visual resource value have “more to lose” than landscapes with a lower resource value, should a specific visual impact occur in each landscape. This rating was done as illustrated by Table 7.

Table 7: Visual impact intensity scores

Visual resource value	Visual impact criteria rating *		
	High (10-12)	Moderate (7-9)	Low (4-6)
High	10 (Very high/don't know)	8 (High)	6 (Moderate)
Moderate	8 (High)	6 (Moderate)	4 (Low)
Low	6 (Moderate)	4 (Low)	2 (Minor/negligible)

(Where for the total rating score: 4-6 = low; 7-9 = moderate; and 10-12 = high)*

6.2 Visual impact significance

Potential impacts are assessed according to the direction, intensity (or magnitude), duration, extent and probability of occurrence of the impact. These criteria are discussed in more detail below:

Direction of an impact may be positive, neutral or negative with respect to the particular impact. A positive impact is one which is considered to represent an improvement on the baseline or introduces a positive change. A negative impact is an impact that is considered to represent an adverse change from the baseline or introduces a new undesirable factor.

Intensity / magnitude is a measure of the degree of change in a measurement or analysis (e.g. the concentration of a metal in water compared to the water quality guideline value for the metal), and is classified as none, negligible, low, moderate or high. The categorisation of the impact intensity may be based on a set of criteria (e.g. health risk levels, ecological concepts and/or professional judgment). The specialist study must attempt to quantify the intensity and outline the rationale used. Appropriate, widely-recognised standards are used as a measure of the level of impact.

Duration refers to the length of time over which an environmental impact may occur: i.e. transient (less than 1 year), short-term (1 to 5 years), medium term (6 to 15 years), long-term (greater than 15 years with impact ceasing after closure of the project) or permanent.

Scale/Geographic extent refers to the area that could be affected by the impact and is classified as site, local, regional, national, or international. The reference is not only to physical extent but may include extent in a more abstract sense, such as an impact with regional policy implications which occurs at local level.

Probability of occurrence is a description of the probability of the impact actually occurring as improbable (less than 5% chance), low probability (5% to 40% chance), medium probability (40 % to 60 % chance), highly probable (most likely, 60% to 90% chance) or definite (impact will definitely occur).

Impact significance will be rated using the scoring system shown in Table 8 below. The significance of impacts is assessed for the two main phases of the project: i) construction ii) operations. While a somewhat subjective term, it is generally accepted that significance is a function of the intensity of the impact and the likelihood (probability) of the impact occurring. Impact intensity is a function of the extent, duration and intensity of the impact, as shown in Table 8.

Table 8: Scoring system for evaluating impacts

Intensity	Duration	Extent	Probability
10 (Very high/don't know)	5 (Permanent)	5 (International)	5 (Definite/don't know)
8 (High)	4 (Long-term – longer than 15 years and impact ceases after closure of activity)	4 (National)	4 (Highly probable)
6 (Moderate)	3 (Medium-term- 6 to 15 years)	3 (Regional)	3 (Medium probability)
4 (Low)	2 (Short-term - 1 to 5 years)	2 (Local)	2 (Low probability)
2 (Minor)	1 (Transient – less than 1 year)	1 (Site)	1 (Improbable)
			0 (None)

After ranking these criteria for each impact, a significance rating was calculated using the following formula:

SP (significance points) = (magnitude + duration + extent) x probability.

The maximum value is 100 significance points (SP). The potential environmental impacts were then rated as of High (SP >75), Moderate (SP 46 – 75), Low (SP ≤15 - 45) or Negligible (SP < 15) significance, both with and without mitigation measures in accordance with Table 9.

Table 9: Impact significance rating

Value	Significance	Comment
SP >75	Indicates **high** environmental significance	Where an accepted limit or standard may be exceeded, or large intensity impacts occur to highly valued/sensitive resource/receptors. Impacts of high significance would typically influence the decision to proceed with the project.
SP 46 - 75	Indicates **moderate** environmental significance	Where an effect will be experienced, but the impact intensity is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value. Such an impact is unlikely to have an influence on the decision. Impacts may justify significant modification of the project design or alternative mitigation.
SP 15 - 45	Indicates **low** environmental significance	Where an effect will be experienced, but the impact intensity is small and is within accepted standards, and/or the receptor is of low sensitivity/value or the probability of impact is extremely low. Such an impact is unlikely to have an influence on the decision although impact should still be reduced as low as possible, particularly when approaching moderate significance.
SP < 15	Indicates **negligible** environmental significance	Where a resource or receptor will not be affected in any material way by a particular activity or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background levels. No mitigation is required.
+	**Positive impact**	Where positive consequences / effects are likely.

In addition to the above rating criteria, the terminology used in this assessment to describe impacts arising from the current project are outlined in Table 10 below. In order to fully examine the potential changes that the project might produce, the project area can be divided into Areas of Direct Influence (ADI) and Areas of Indirect Influence (AII).

- Direct impacts are defined as changes that are caused by activities related to the project and they occur at the same time and place where the activities are carried out i.e. within the ADI.
- Indirect impacts are those changes that are caused by project-related activities but are felt later in time and outside the ADI. The secondary indirect impacts are those which are as a result of activities outside of the ADI.

Table 10: Types of impact

Term for impact nature	Definition
Direct impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (i.e. between an effluent discharge and receiving water quality).
Indirect impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (i.e., pollution of water placing a demand on additional water resources).
Cumulative impact	Impacts that act together with other impacts (including those from concurrent or planned activities) to affect the same resources and/or receptors as the Project.

6.3 Project phases

The project visual impacts were assessed for the following three phases:

- Construction Phase - the construction period is deemed to be a secondary impact period that is comparatively short in relation to the operational phase. A number of temporary or intermittent impacts such as dust propagation, materials stockpiling, and vehicular movement will occur due to construction-related activities. However, during this phase the degree of visual impact caused by the project is also expected to steadily increase, as construction of the project infrastructure progresses;
- Operational Phase - this phase is deemed to represent the primary visual impact, as the operational project infrastructure will result in the most significant impacts and this phase will also continue for the longest period of time, lasting several decades; and
- Decommissioning Phase – this is deemed as part of mitigation for this project, as these activities will progressively assist in lessening the visual impact. Activities associated with the demolition and subsequent rehabilitation of disturbed areas will have a temporary negative impact but will assist in returning the site to a condition that more closely resembles the pre-development visual baseline. Permanent changes in the landscape expected to persist after decommissioning of the site are also considered as part of this phase.

6.4 Identified impacts – CTT power plant

The power plant and transmission line are expected to cause the following visual impacts, during the respective project phases described above (Table 11):

Table 11: Identified impacts – CTT power plant

Anticipated visual impact	Project phase		
	Construction	Operation	Decommissioning
1) Airborne dust clouds and dust pollution	✓	✗	✓
2) Alteration of site topography and loss of vegetation cover	✓	✗	✗
3) Construction-related activity on site (presence of construction equipment/plant, vehicles, materials handling) and increasing visual prominence of infrastructure under construction	✓	✗	✗
4) Visually intrusive operational power plant infrastructure	✗	✓	✗
5) Visually intrusive linear transmission lines and associated vegetation clearance	✗	✓	✗
6) Light pollution at night at the CTT plant	✓	✓	✗
7) Loss of sense of place during construction and operation phases (resultant impact)	✓	✓	✗
8) Decommissioning, demolition and rehabilitation-related activities (presence of construction equipment/plant, vehicles, materials handling) on site	✗	✗	✓
9) Reinstatement of landscape visual character and sense of place after decommissioning phase (resultant positive impact)	✗	✗	✓

6.4.1 Construction phase impacts

6.4.1.1 Impact intensity

The construction phase impacts associated with the power plant and transmission lines identified in Table 11 are discussed in terms of the previously described visual assessment criteria (i.e. a) Level of visibility; b) Visual exposure; c) Visual intrusion and d) Visual receptor sensitivity, as described in Section 6.1) and subsequently scored accordingly in Table 12:

(Note: also refer to Figure 19 which indicates the modelled visibility of the power plant and transmission line during the operational phase).

6.4.1.1.1 Airborne dust clouds and dust pollution

- Airborne dust clouds caused by construction activities are usually far more visible than the activities that cause them and can in windy conditions be propagated over great distances. However, the project construction site will not be vast, and this impact is also somewhat sporadic or intermittent in nature, and this impact is therefore rated as having a moderate level of visibility (2) within the study area.
- In terms of visual exposure, the majority of resident as well as transient receptors are located more than two kilometres away from the power plant and transmission line sites and so this aspect is scored as being low (1).
- Regarding visual intrusion, airborne dust clouds are usually perceived as visually unappealing and negatively impact surrounding areas due to dust fallout. In addition, construction-related dust is often a highly irritating source of nuisance to those affected by it and is therefore rated as high (3).
- Furthermore, the number of potential resident visual receptors (mostly low-income local inhabitants) number in the several thousands, even though they may not attach particularly high levels of value to the visual appearance of the project site and its surroundings, and the receptor sensitivity is therefore scored as moderate (2). This aspect has the same rating score for all other visual impacts identified for the construction, operational and decommissioning phases, respectively.

6.4.1.1.2 Alteration of site topography and loss of vegetation cover

- During construction, the power plant complex footprint area will be cleared of vegetation and levelled to create one or more artificial terraces, in order to accommodate the power plant infrastructure. In addition, the transmission line servitude will for safety reasons also be cleared of trees and shrubs, and a number of temporary clearings will also be created for materials laydown purposes. The level of visibility of this impact will however be less than that of the other construction-related activities or of the operational infrastructure and is therefore rated as low (1).
- The majority of resident as well as transient receptors are located more than two kilometres away from the power plant and transmission line sites, therefore the level of visual exposure of this impact is scored as being low (1).
- The removal of existing vegetation and earthworks that will occur prior to construction will essentially remove all existing land cover, and to some extent introduce geometric / artificial terraces in the landscape. Given the relatively large scale and extent of these landscape alterations the level of visual intrusion is therefore rated as being moderate (2).

6.4.1.1.3 Construction-related activity on site and infrastructure under construction

- Construction-related impacts will occur within the construction site itself, the level of visibility of which is expected to systematically increase to that of the operational phase, as the infrastructure under construction nears completion. In addition, the presence of increased construction-related traffic and other associated activities will also have a visual impact, the level of visibility of which will fluctuate throughout the course of the construction phase. This aspect is therefore rated as moderate (2).

- The majority of construction-related impacts will occur on the construction sites themselves, which is located two or more kilometres from most potential receptors. However, the level of visual exposure of receptors to other construction-related impacts is also expected to fluctuate and increase to some extent, based on changing traffic volumes and other aspects dictated by the construction schedule. A conservative approach was adopted, and this criterion was accordingly scored as moderate (2).
- The level of visual intrusion of the power plant infrastructure under construction is expected to be comparatively high, as large construction sites are usually characterised by high levels of visual “clutter’ and incongruous elements, regardless of how well they are managed. The additional scaffolding, construction machinery and vehicles, materials laydown and waste storage areas are all likely to be perceived as being visually intrusive and is therefore rated as high (3).

6.4.1.1.4 Light pollution at night at the CTT power plant

- The extent to which the illuminated plant under construction is visible at night should theoretically be the same as during the day-time. However, light pollution at night is particularly visible, as most of the visual detail that may camouflage a visual impact by day is not visible at night. A cursory overview of various online sources dealing with astronomy and star gazing indicate that relatively small towns may cause light pollution beyond a range of 20 miles / 30 km. The visual impact is caused both as a result of direct glare, and indirect sky glow caused by the lights. The power plant and to a lesser extent transmission line construction sites also will be highly illuminated for security and safety reasons. However, the power plant construction site will be situated close to the existing facility, which already contributes a measure of light pollution, and the construction-related light pollution will therefore occur in a visual context that is already partially compromised. For this reason, the combined level of visibility of the direct glare and indirect sky glow is rated as moderate (2), as the additional light contribution from the CTT power plant will likely be visible to some extent within a significant percentage of the study area.
- The level of visual exposure for this impact is expected to be the same as that of the previous two construction-related impacts and is therefore rated as low (1).
- Light pollution is specifically considered visually intrusive in areas that don’t have high levels of existing night-time illumination, as is common in rural or remote locations. Given that the existing power plant is the only large infrastructure element in the study area and the rural, low-income nature of the area, the existing levels of night-time illumination in the study area is expected to be low. For this reason, the visual intrusion of construction-related light pollution is expected to be high (3).

6.4.1.1.5 Loss of sense of place (indirect impact)

- The overall sense of place of the study area is expected to be negatively impacted upon, as a consequence of the other impacts assessed above. As this is a resultant or cumulative and indirect impact of the other direct impacts listed above, it was scored using the highest score rating for each criterion for each of the other impacts.

Table 12: CTT power plant - construction phase impacts criteria rating

Visual impact	Visual impact criteria				Total rating score *
	Visibility	Visual exposure	Visual intrusion	Receptor sensitivity	
Airborne dust clouds and dust pollution	2	1	3	2	**8 (moderate)**
Alteration of site topography and loss of vegetation cover	1	1	2	2	**6 (low)**
Construction-related activity on site and increasing visual prominence of infrastructure under construction	2	2	3	2	**9 (moderate)**
Light pollution at night at the CTT plant	2	1	3	2	**8 (moderate)**
Loss of sense of place (indirect impact)	2	2	3	2	**9 (moderate)**

(Where for the total rating score: 4-6 = low; 7-9 = moderate; and 10-12 = high)*

The visual resource value of the power plant and transmission line study areas was determined as being moderate (refer to Section 5.3.3). Accordingly, using the scoring system indicated in Table 7, the intensity of each of the visual impacts was established as follows:

- Airborne dust clouds and dust pollution – moderate (6);
- Alteration of site topography and loss of vegetation cover – low (4);
- Construction-related activity on site and infrastructure under construction - moderate (6);
- Light pollution at night at the CTT plant - moderate (6); and
- Loss of sense of place - moderate (6).

6.4.1.2 Impact significance

The significance of the expected visual impacts before and after mitigation was subsequently determined using the impact intensity and the standard impact assessment criteria, described in Section 6.2. The following ratings were applied as per Table 8, and the impacts ranked as being either of high, moderate, low or negligible significance, or as being positive in nature where relevant, as per Table 9:

- Duration – construction-related visual impacts will only last for the duration of the construction phase, which is expected to be short-term or two to five years, and was therefore given a score of 2;
- Geographic extent – visual impacts are always at either a site or local scale. Given the scale and height of the project infrastructure (notably the power line stacks), and the fact that the extent to which this will become visible will continuously increase during the construction phase, the geographic extent was rated as occurring on a local level, and scored 2; and

- The expected visual impacts will occur should the project proceed, and probability was therefore given a score of 5.

Table 13: CTT power plant – construction phase impacts significance

Indicator of potential impact	Pre-mitigation					Post-mitigation				
	Intensity	Duration	Geographic Extent	Probability	Significance *	Intensity	Duration	Geographic Extent	Probability	Significance *
Airborne dust clouds and dust pollution	6	2	2	5	**50**	4	2	2	5	**40**
Alteration of site topography and loss of vegetation cover	4	2	2	5	**40**	4	2	2	5	**40**
Construction-related activity on site and infrastructure under construction	6	2	2	5	**50**	4	2	2	5	**40**
Light pollution at night at the CTT plant	6	2	2	5	**50**	4	2	2	5	**40**
Loss of sense of place	6	2	2	5	**50**	4	2	2	5	**40**

(Where significance >75 = High/don't know; 46 – 75 = Moderate; 15 – 45 = Low and < 15 = Negligible)

6.4.2 Operational phase impacts

6.4.2.1 Impact intensity

The operational phase impacts associated with the power plant and transmission lines identified in Table 11 are discussed in terms of the previously described visual assessment criteria (i.e. a) Level of visibility; b) Visual exposure; c) Visual intrusion and d) Visual receptor sensitivity, as described in Section 6.1) and subsequently scored accordingly in Table 13.

The level of visibility of the operational power plant infrastructure and transmission lines was modelled by conducting a viewshed analysis, using the maximum expected infrastructure height for the CCGT stacks of 50 m and transmission lines of 25 m, as well as considering the screening effect of existing vegetation, using averaged vegetation heights derived from LIDAR imagery ranging from 0 to 8 m. The mapped vegetation heights for the power plant and transmission lines study areas are indicated by Figure 17 and Figure 18 respectively, and the combined viewshed analysis for both project components on Figure 19. The two study areas also coincide to a large extent, indicating an area to the south in which both the transmission lines and power plant infrastructure is expected to be visible.

6.4.2.1.1 Visually intrusive operational CTT power plant infrastructure

- The level of visibility of the power plant within the overall study area can be described as “mottled” or spotty, with many individual locations from which potential views of the power plant are expected to be partially obscured by the existing vegetation. The screening effect of the vegetation can clearly be seen, with the level of visibility decreasing significantly as the viewer moves away from the respective sites. The influence of the topography on the level of visibility of the infrastructure is also evident, with the two roughly north-south orientated low-lying areas being largely screened from view. The power plant is therefore expected to be mostly screened throughout the largest part of the study area, although the stacks which represent its tallest component will be substantially more visible. The overall level to which the power plant will be visible within the study area is consequently estimated as being less a quarter within the study area and is therefore rated as low (1).
- As previously indicated, the majority of resident as well as transient receptors will be located more than two kilometres away from the power plant, and therefore the level of visual exposure of this impact is scored as being low (1).
- The power plant once constructed and operational will essentially be a continuation of the visual impact created by the existing power plant (Figure 15) albeit to a greater extent. The existing visual baseline is therefore already partially compromised by the presence of this infrastructure and to a lesser extent the sprawling low density settlements. Nevertheless, the expansive and highly geometric shapes of the power plant infrastructure will likely be perceived as visually intrusive by most viewers and will dominate short-range views (Figure 20) and is therefore rated as moderately intrusive (2).

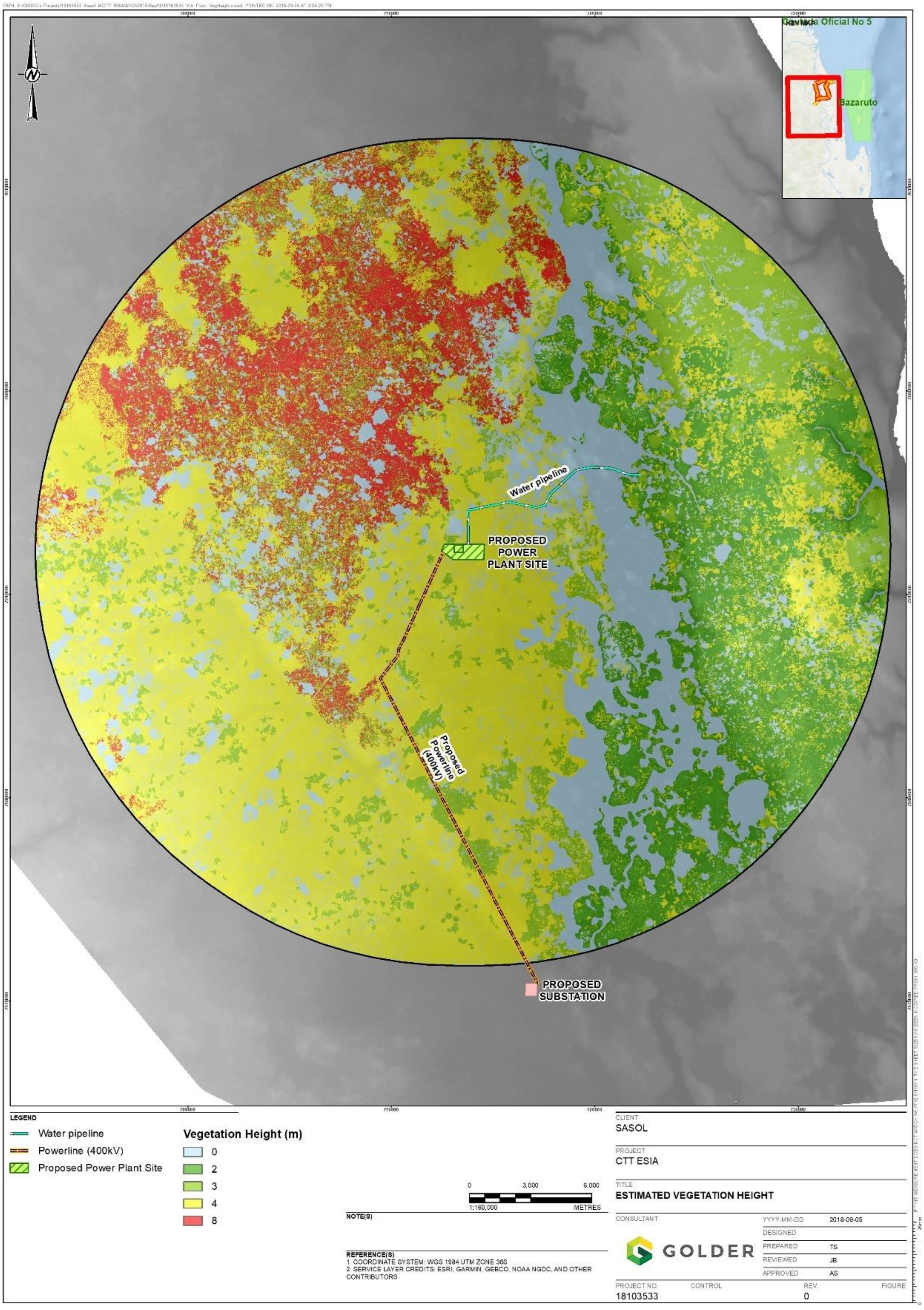

Figure 17: Modelled vegetation height for the power plant study area

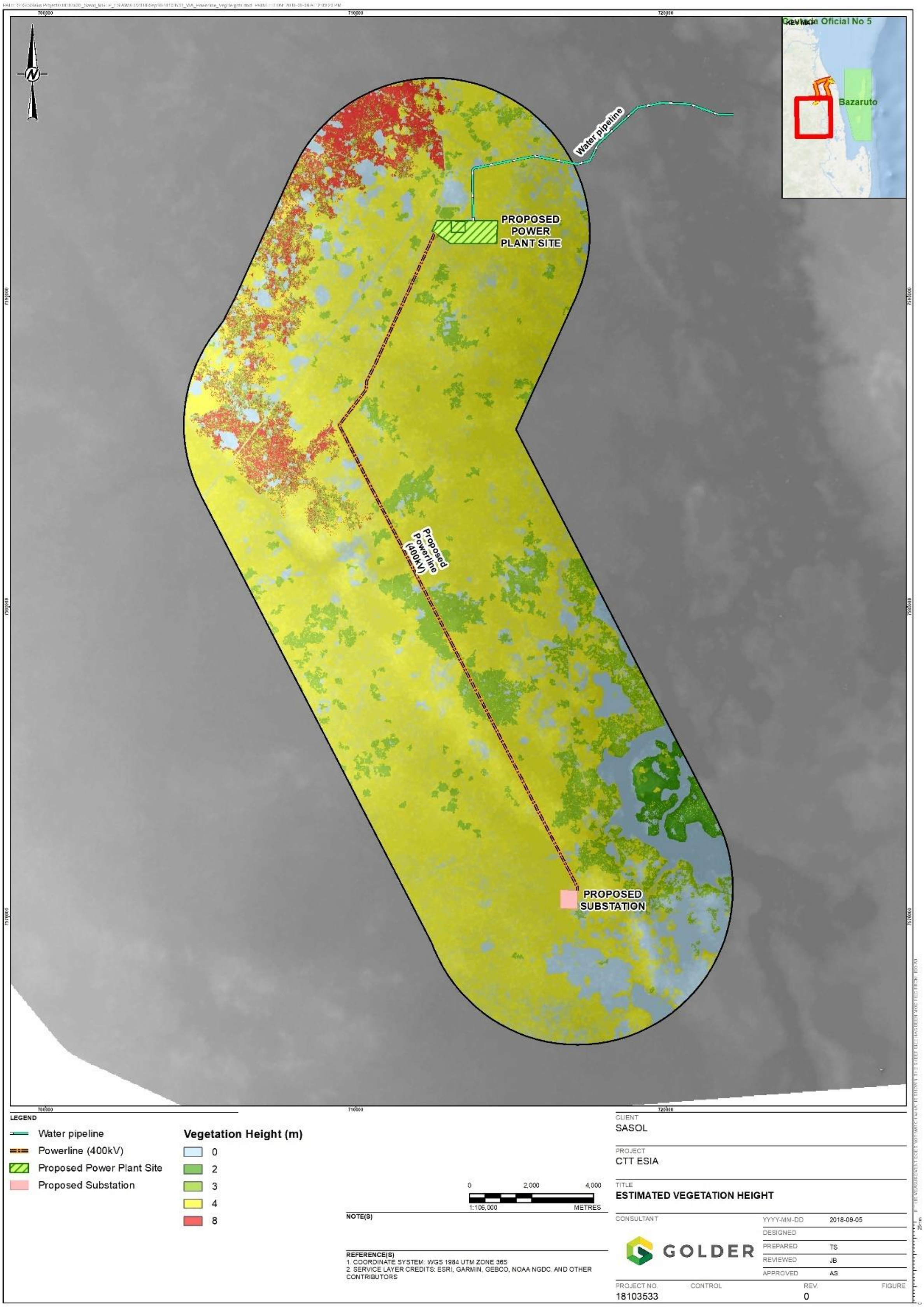

Figure 18: Modelled vegetation height for the transmission line study area

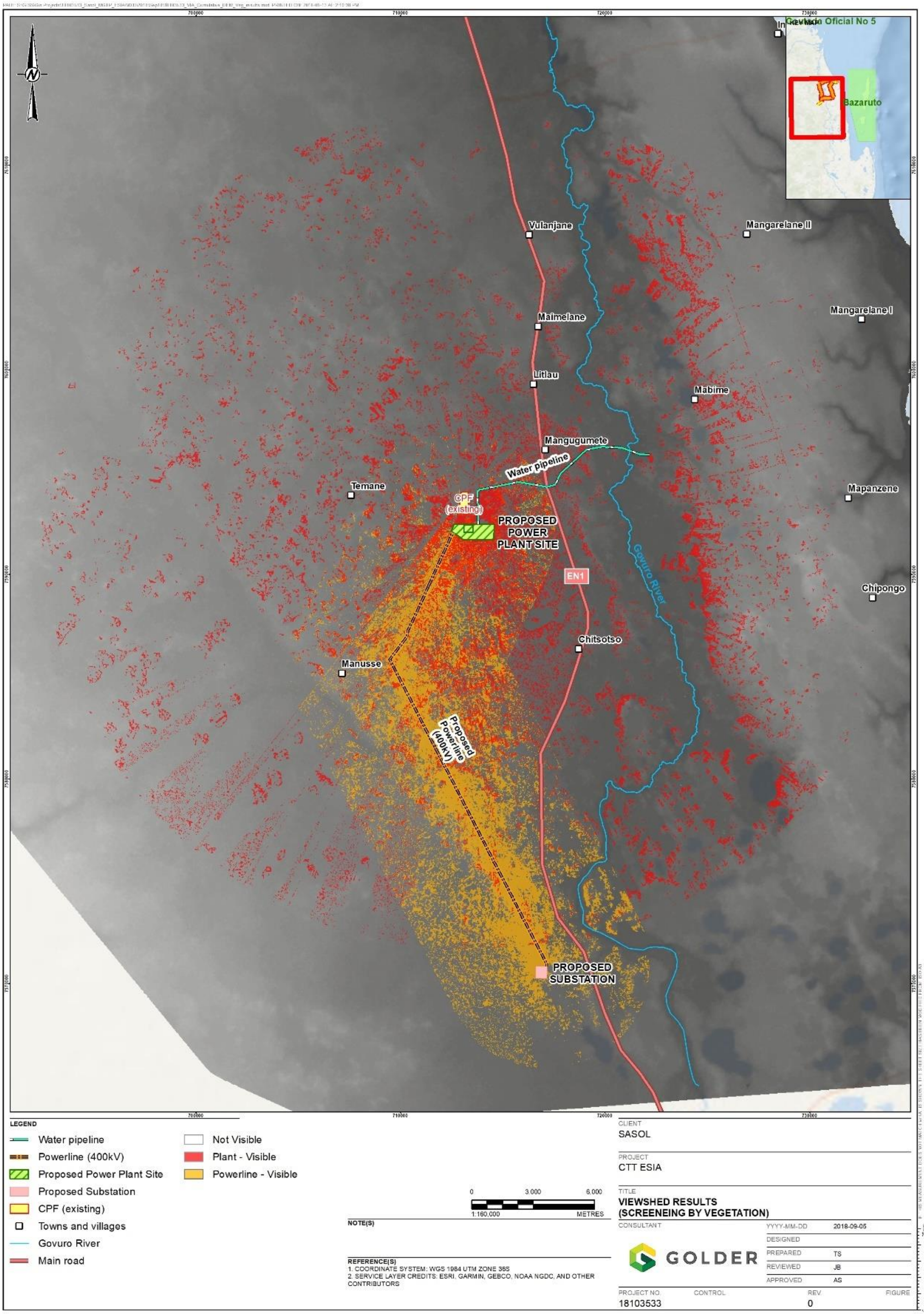

Figure 19: Combined viewshed / visibility analysis of power plant and transmission line

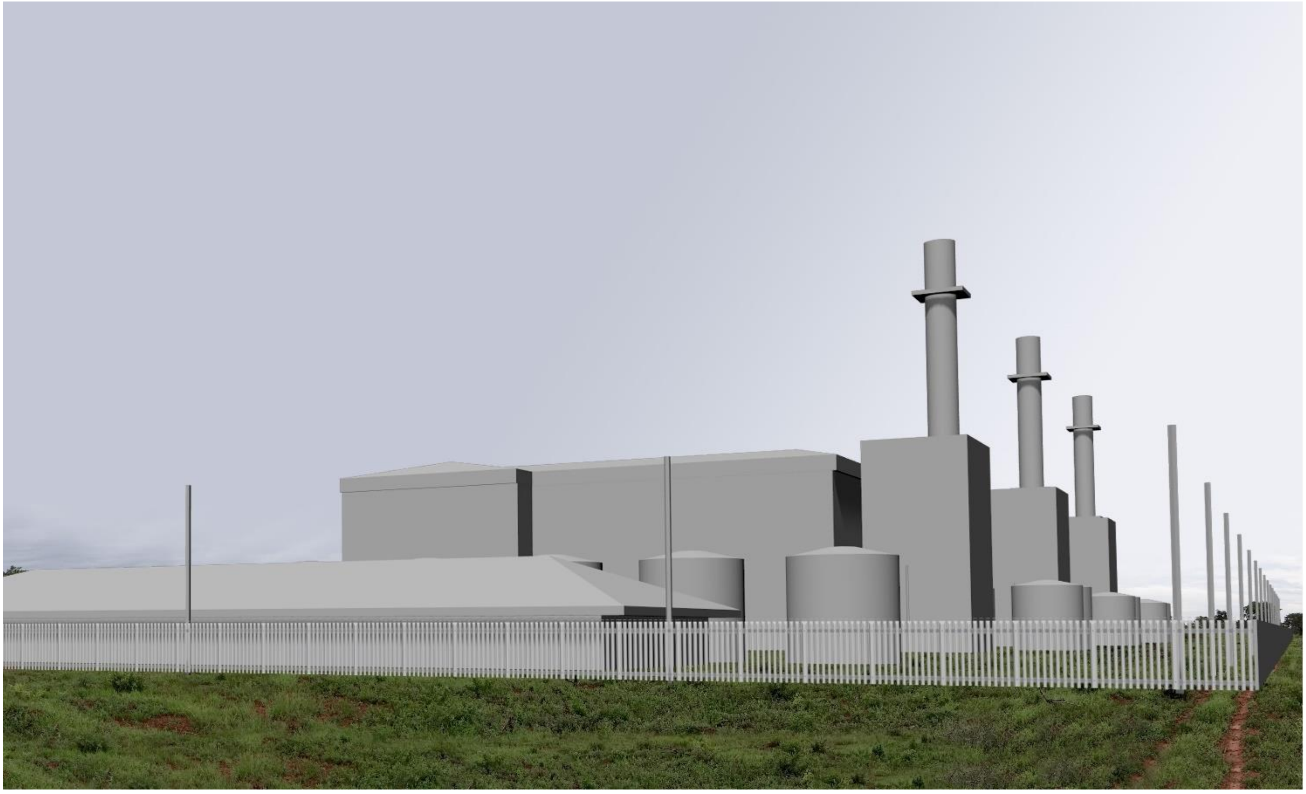

Figure 20: Visual scale of power plant within the existing landscape (short-range view)

6.4.2.1.2 Visually intrusive linear transmission lines and associated vegetation clearance

- The effective level of visibility of the transmission lines is somewhat higher within the 5 km radius study area than that of the power plant in the same radius, as the pylons will only be spaced a few hundred meters apart and it is therefore likely that several pylons may be visible from any given location. The compounding screening effect of the vegetation over distance can however still be seen, even if to a lesser degree than is the case with the power plant. As previously mentioned, the study area for the transmission lines was limited to a 5 km radius around the infrastructure, as the pylon structures are visually more opaque than the solid shapes of the plant infrastructure. The visual prominence of the pylons will therefore diminish over distance more rapidly than the power plant over the same distance. However, the level of visibility of the transmission line pylons is far greater within their defined study area than the power plant and is therefore rated as moderate (2).
- As majority of resident as well as transient receptors will also be located more than two kilometres away from the transmission lines, and therefore the level of visual exposure of this impact is scored as being low (1).
- The transmission line pylons will be similar in appearance to other existing pylons within the region, and as mentioned the frame construction is visually opaque and their visual impact therefore diminishes over time and therefore rated as only slightly intrusive (1).

6.4.2.1.3 Light pollution at night from CTT power plant

- The operational power plant will be situated close to the existing facility, which already contributes a measure of light pollution. The relatively sparsely settled residential areas to the north and east of the plant site likely also contribute some light pollution, and hence the power plant will be located in a visual setting that already has a measure of “background” light pollution. However, the extent to which the new power plant will be illuminated for security and safety reasons is expected to be more extensive than any of the existing structures within the study area (Figure 21). For this reason, the combined level of visibility of the direct glare and indirect sky glow is rated as moderate (2), as this will likely be visible to some extent within a significant percentage of the study area.

- The level of visual exposure of the operational plant will be similar to that of the plant during construction and is therefore rated as low (1).
- As is the case for the construction phase, the visual intrusion of the illuminated plant is expected to be high (3).

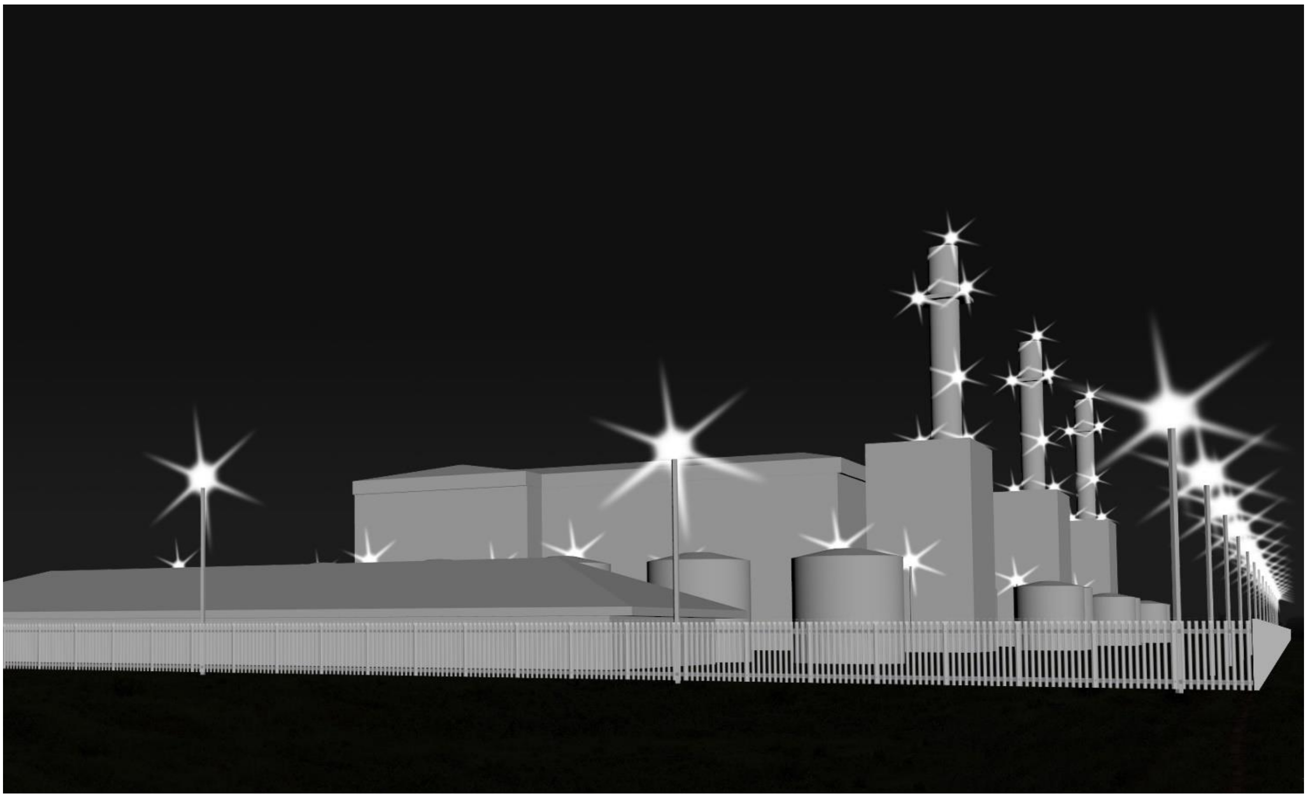

Figure 21: Light pollution at night from power plant (short-range view)

Figure 22: Light pollution at night from power plant (screened medium-range view)

6.4.2.1.4 Loss of sense of place (resultant impact)

- As was done for the construction phase impacts, this is considered a cumulative impact and was therefore scored using the highest score rating for each criterion for each of the other impacts.

Table 14: CTT plant - operational phase impacts criteria rating

Visual impact	Visual impact criteria				Total rating score *
	Visibility	Visual exposure	Visual intrusion	Receptor sensitivity	
Visually intrusive operational power plant infrastructure	1	1	2	2	**6 (low)**
Visually intrusive linear transmission lines and associated vegetation clearance	2	1	1	2	**6 (low)**
Light pollution at night at the CTT plant	2	1	3	2	**8 (moderate)**
Loss of sense of place (resultant impact)	3	1	3	2	**9 (moderate)**

*(***** Where for the total rating score: 4-6 = low; 7-9 = moderate; and 10-12 = high)*

The visual resource value of the power plant and transmission line study areas was determined as being moderate (refer to Section 5.3.3). Accordingly, using the scoring system indicated in Table 7, the intensity of each of the visual impacts was established as follows:

- Visually intrusive operational power plant infrastructure – low (4);
- Visually intrusive linear transmission lines and associated vegetation clearance - low (4);
- Light pollution at night at the CTT plant - moderate (6); and
- Loss of sense of place (resultant impact) - moderate (6).

6.4.2.2 Impact significance

The significance of the expected operational visual impacts before and after mitigation was subsequently determined using the impact intensity and the standard impact assessment criteria, described in Section 6.2. The following ratings were applied as per Table 8, and the impacts ranked as being either of high, moderate, low or negligible significance, or as being positive in nature where relevant, as per Table 9:

- Duration – operational-related visual impacts will last for the duration of the operational lifespan of the project, which is expected to last for a number of decades and was therefore given a score of 4;
- Geographic extent – The visual impacts associated with the operational power plant and transmission line will occur on a local level and was scored as 2; and
- The expected visual impacts will occur should the project proceed, and probability was therefore given a score of 5.

Table 15: Impact assessment table - operational phase

Indicator of potential impact	Pre-mitigation					Post-mitigation				
	Intensity	Duration	Geographic Extent	Probability	Significance *	Intensity	Duration	Geographic Extent	Probability	Significance *
Visually intrusive operational power plant infrastructure	4	4	2	5	**50**	4	4	2	5	**50**
Visually intrusive linear transmission lines and associated vegetation clearance	4	4	2	5	**50**	4	4	2	5	**50**
Light pollution at night at the CTT plant	6	4	2	5	**60**	4	4	2	5	**50**
Loss of sense of place (resultant impact)	6	4	2	5	**60**	4	4	2	5	**50**

(Where significance >75 = High/don't know; 46 – 75 = Moderate; 15 – 45 = Low and < 15 = Negligible)

6.4.3 Decommissioning phase impacts

6.4.3.1 Impact intensity

The decommissioning phase impacts associated with the power plant and transmission lines identified in Table 11 are discussed in terms of the previously described visual assessment criteria (i.e. a) Level of visibility; b) Visual exposure; c) Visual intrusion and d) Visual receptor sensitivity, as described in Section 6.1) and subsequently scored accordingly in Table 14.

6.4.3.1.1 Airborne dust clouds and dust pollution during decommissioning activities

- Airborne dust clouds similar to those during construction can be expected to be caused by demolition and rehabilitation-related earthworks activities and is expected to have a moderate level of visibility (2) within the study area.
- In terms of visual exposure, the majority of resident as well as transient receptors will be located more than two kilometres away from the demolition and rehabilitation activities on site and so this aspect is scored as being low (1).
- Although the airborne dust clouds will be associated with a positive visual impact (i.e. progressive reinstatement of the pre-existing landscape aesthetic and character) the dust clouds themselves will still be as unsightly as during construction, and their visual intrusion is therefore rated as high (3).

6.4.3.1.2 Decommissioning, demolition and rehabilitation-related activity on site

- The decommissioning, demolition and rehabilitation activities will be somewhat similar in visual appearance as those that will have taken place during construction, however will largely take place I the reverse order. Accordingly, the level of visibility of the plant infrastructure will systematically decrease as it is progressively removed from site, and rehabilitation activities will commence thereafter. Nevertheless, this phase will be characterised by a large number of demolition machinery and vehicles as well as stockpiling of material and waste and the site is expected to be somewhat unsightly during this phase. This aspect was therefore rated as moderate (2).
- Similar to the construction sites themselves, the level of visual exposure of receptors to other demolition-related impacts is expected to increase to some extent during the decommissioning phase, due to increased traffic volumes and the increased activity footprint and was scored as moderate (2).
- The level of visual intrusion of the power plant site during demolition works is again expected to be comparatively high, for similar reasons to those during construction. A conservative approach was therefore again adopted, and this criterion therefore rated as high (3).

6.4.3.1.3 Reinstatement of landscape visual character and sense of place after decommissioning (resultant impact)

- During the decommissioning phase the primary sources of visual impact will essentially be removed when the power plant and transmission lines are demolished, and the resultant footprint areas rehabilitated. It is therefore anticipated that the pre-existing visual character and sense of place can be largely reinstated, provided that effective rehabilitation is conducted.

Table 16: CTT power plant - decommissioning phase impacts criteria rating

Visual impact	Visual impact criteria				Total rating score *
	Visibility	Visual exposure	Visual intrusion	Receptor sensitivity	
Airborne dust clouds and dust pollution	2	1	3	2	**8 (moderate)**
Decommissioning, demolition and rehabilitation-related activity on site	2	2	3	2	**9 (moderate)**

*(***** Where for the total rating score: 4-6 = low; 7-9 = moderate; and 10-12 = high)*

The visual resource value of the power plant and transmission line study areas was determined as being moderate (refer to Section 5.3.3). Accordingly, using the scoring system indicated in Table 7, the intensity of each of the visual impacts was established as follows:

- Airborne dust clouds and dust pollution – moderate (6);
- Decommissioning, demolition and rehabilitation-related activity on site - moderate (6); and
- Reinstatement of landscape visual character and sense of place after decommissioning (resultant positive impact).

6.4.3.2 Impact significance

The significance of the expected decommissioning-related visual impacts before and after mitigation was again determined using the impact intensity and the standard impact assessment criteria, described in Section 6.2. The following ratings were applied, and the impacts ranked as being either of high, moderate, low or negligible significance, or as being positive in nature where relevant, as per Table 9:

- Duration – the demolition and rehabilitation-related visual impacts that are expected to occur during the decommissioning phase will be relatively short-lived and likely even shorter in duration than the construction phase. However, the visual character of the site will remain compromised for a number of years after initial rehabilitation and this factor was therefore given a score of 2;
- Geographic extent – Visual impacts associated with the decommissioning phase will occur on a local level and was therefore scored as 2; and
- The expected visual impacts will occur during decommissioning and probability was therefore given a score of 5.

Table 17: Impact assessment table - decommissioning phase

Indicator of potential impact	Pre-mitigation					Post-mitigation				
	Intensity	Duration	Geographic Extent	Probability	Significance *	Intensity	Duration	Geographic Extent	Probability	Significance *
Airborne dust clouds and dust pollution during decommissioning activities	6	2	2	5	**50**	4	2	2	5	**40**
Decommissioning, demolition and rehabilitation-related activity on site	6	2	2	5	**50**	4	2	2	5	**40**

(Where significance >75 = High/don't know; 46 – 75 = Moderate; 15 – 45 = Low and < 15 = Negligible)

6.5 Identified impacts – beach landing site and support infrastructure

This section considers the following project components, which will mainly result in visual impacts during the construction and decommissioning phases;

- Beach landing site and associated materials and equipment laydown area. The SETA site is currently the preferred alternative and was therefore used for this assessment;
- Equipment and materials ferrying activities, that will take place between the transhipment vessel that will be anchored off-shore and the beach landing site;
- Water pipeline (which it is assumed will be buried), and associated access road that will connect to the existing road leading to the Temane CPF; and
- Gas pipeline (which it is assumed will be buried) and servitude, leading from the CPF high pressure compressor to the western side of the CTT and connecting to the power station (or from an alternative gas source).

The project will also entail a number of other nominal components, such as potential bridge upgrades and/or implementation of temporary bridge crossings, and other improvements or alterations to existing transportation routes. However, the visual impacts associated with these project components and activities are not considered notable, as they will be highly localised and short-term in duration. Also, these elements will only result in very minor alterations to the urban residential visual environment in which they will occur, which is already characterised by existing similar elements.

The beach landing site and support infrastructure construction sites are expected to give rise to the following visual impacts:

Table 18: Identified impacts – beach landing site and support infrastructure

Anticipated visual impact	Project phase		
	Construction	Operation	Decommissioning
1) Airborne dust clouds and dust pollution	✓	✗	✗
2) Construction-related activity at beach landing site, and along water and gas pipeline corridors (excavation activities, presence of construction equipment/plant, vehicles, materials handling)	✓	✗	✗
3) Visually intrusive beach landing site infrastructure	✓	✗	✗
4) Light pollution at night from transhipment vessel anchored off-shore	✓	✗	✗
5) Loss of sense of place during construction phase (resultant impact)	✓	✗	✗
6) Reinstatement of landscape visual character and sense of place after construction phase ends (resultant positive impact)	✗	✗	✓

6.5.1 Construction phase impacts

6.5.1.1 Impact intensity

The construction phase impacts associated with the power plant and transmission lines identified in Table 11 are discussed in terms of the previously described visual assessment criteria (i.e. a) Level of visibility; b) Visual exposure; c) Visual intrusion and d) Visual receptor sensitivity, as described in Section 6.1) and subsequently scored accordingly in Table 12.

The majority of the infrastructure listed above will be constructed within Inhassoro and in close proximity of a large number of local residents, and the level of visual exposure for all of these impacts were therefore rated as high (3), as many of the affected receptors reside directly adjacent to these sites/areas. In addition, several thousand residents may be affected by the project and are expected to attach at least a moderate level of value to their visual environment, and receptor sensitivity was also rated as high (3).

The only exception to the above is the light pollution from the transhipment vessel anchored off-shore, which will be located several kilometres from the shoreline and Bazaruto Islands. For this impact, visual exposure was therefore rated as low (1). However, the potentially affected receptors would include residents and tourism destinations located along the mainland and island beaches, as well as tourists passing through the study area via ship or aircraft. The majority of these receptors are also expected to attach a high level of value to the visual environment and is therefore rated as high (3).

6.5.1.1.1 Airborne dust clouds and dust pollution

- The formation of dust clouds during construction is expected to occur sporadically / intermittently and is rated as having a moderate level of visibility (2) within the study area; and
- The level of visual intrusion of airborne dust clouds and associated dust fallout was rated as high (3).

6.5.1.1.2 Construction-related activity at beach landing site, and along water and gas pipeline corridors

- Construction-related impacts will occur within the urban area of Inhassoro, and the level of visibility will therefore be high to residents living near the construction sites. However, the level of visibility is expected to rapidly decrease as one moves away from the construction sites, due to the screening effect of existing buildings and structures. The construction-related activities will also result in an increase of traffic within the study area. The overall level of visibility of this aspect was therefore rated as moderate (2).
- The physical infrastructure itself as well as the associated construction site footprints of the beach landing site and pipelines will be notably smaller than that of the power plant. For this reason, the level of visual intrusion of the beach landing site and pipeline construction phase is rated as moderate (2).

6.5.1.1.3 Visually intrusive beach landing site infrastructure

- The degree to which the beach landing site will be visible will vary significantly (see Figure 23), depending on the location of the receptor. The level of visibility inland is expected to be limited, as the majority of the beach landing site components will be completely screened off from view by the first few rows of houses. However, from the ocean the visibility will be 100% over a distance of many kilometres, even though the number of receptors within this area will be limited. Theoretically, the beach landing site would therefore be visible from slightly more than half of any circular study area delineated around it. However, given that half of the study area is essentially devoid of receptors for most of the time, a pragmatic approach was adopted, and this aspect was therefore rated as moderate (2).
- The beach landing site infrastructure is expected to be visually intrusive, as the visually “solid” and strongly geometric shapes of the constructed jetty platform, barge and offloading machinery will contrast strongly with the flat horizon line. Furthermore, most of the machinery and vehicles are expected to be brightly coloured and will therefore contrast strongly with the light beach sand and deep blue ocean as backdrop. The level of visual intrusion of the breach landing site during the construction phase of the project is therefore expected to be high (3).

Figure 23: SETA beach landing site during various phases of equipment and material offloading

6.5.1.1.4 Light pollution at night from transhipment vessel anchored off-shore

- The transhipment vessel anchored at sea will basically be fully visible from any location within the entire area surrounding it, up to the Mozambique mainland and Bazaruto island shorelines. This translates into an area with a radius of at least 10 km or more, depending on the final position of the anchor site. However, the number of visual receptors within this area will be small and limited to fishermen and tourists at sea, as well as a small number of tourist destinations along the Bazaruto Island coastline, depending on the final location of the anchorage point. The greatest percentage of affected receptors will however therefore be residents and tourists along the shoreline, located 10 km or more away from the source of the visual impact. The overall level of visibility of light pollution from the transhipment vessel anchored offshore was therefore rated as moderate (2).

- As previously mentioned, light pollution at night is usually considered particularly intrusive in settings with no or very limited levels of existing / background artificial illumination. However, fishing boats, larger transhipment vessels and tourist cruise liners do travel along the Mozambique coast from time to time and are therefore not an uncommon site. Even though the project transhipment vessel will be anchored in one location for a period of approximately a week or two at a time during the 6 to 9 months construction period, and therefore constitute a frequent source of light pollution, the distance from the mainland and island coastlines is significant. The result is that the lights from the ship will not be bright or visually dominant (Figure 25), and their level of visual intrusion will at worst be moderate (2).

Figure 24: Transhipment vessel anchored at sea as seen from the Inhassoro coastline during the day (note location on left of horizon)

Figure 25: Transhipment vessel anchored at sea as seen from the Inhassoro coastline during the night (note location on left of horizon)

6.5.1.1.5 Loss of sense of place during construction phase (resultant impact)

- The overall sense of place of the study area is expected to be negatively impacted upon, as a consequence of the other impacts assessed above. As this is a resultant or cumulative and indirect impact of the other direct impacts listed above, it was scored using the highest score rating for each criterion for each of the other impacts.

6.5.1.1.6 Reinstatement of landscape visual character and sense of place after construction phase ends (resultant impact)

- During the decommissioning phase the primary sources of visual impact will essentially be removed when the temporary beach landing site and associated infrastructure is demolished, and pipeline trenches and other construction-related disturbances rehabilitated. It is therefore anticipated that the pre-existing visual character and sense of place can be largely reinstated, provided that effective rehabilitation is conducted.

Table 19: Beach landing site and support infrastructure - Construction phase impacts criteria rating

Visual impact	Visual impact criteria				Total rating score *
	Visibility	Visual exposure	Visual intrusion	Receptor sensitivity	
Airborne dust clouds and dust pollution	2	3	3	3	**11 (high)**
Construction-related activity at beach landing site, and along water and gas pipeline corridors	2	3	2	3	**10 (high)**
Visually intrusive beach landing site infrastructure	2	3	3	3	**11 (high)**
Light pollution at night from transhipment vessel anchored off-shore	2	1	2	3	**8 (moderate)**
Loss of sense of place during construction phase (resultant impact)	2	3	3	3	**11 (high)**

*(***** Where for the total rating score: 4-6 = low; 7-9 = moderate; and 10-12 = high)*

The visual resource value of the SETA beach landing site was determined as being moderate, whereas that of the off-shore area associated with the transhipment vessel was rated as high (refer to Section 5.3.3). Accordingly, using the scoring system indicated in Table 7, the intensity of each of the visual impacts associated with the beach landing site and support infrastructure during construction was established as follows:

- Airborne dust clouds and dust pollution – high (8);
- Construction-related activity at beach landing site, and along water and gas pipeline corridors – high (8);
- Visually intrusive beach landing site infrastructure – high (8);
- Light pollution at night from transhipment vessel anchored off-shore – high (8);
- Loss of sense of place during construction phase (resultant impact) – high (8); and

- Reinstatement of landscape visual character and sense of place after construction phase ends (resultant positive impact).

6.5.1.2 Impact significance

The significance of the expected visual impacts before and after mitigation was subsequently determined using the impact intensity and the standard impact assessment criteria, described in Section 6.2. The following ratings were applied as per Table 8, and the impacts ranked as being either of high, moderate, low or negligible significance, or as being positive in nature where relevant, as per Table 9:

- Duration – construction-related visual impacts will only last for the duration of the construction phase, which is expected to be short-term or two to five years, and was therefore given a score of 2;
- Geographic extent – visual impacts are always at either a site or local scale. Given the scale and height of the project infrastructure (notably the power line stacks), and the fact that the extent to which this will become visible will continuously increase during the construction phase, the geographic extent was rated as occurring on a local level, and scored 2; and
- The expected visual impacts will occur should the project proceed, and probability was therefore given a score of 5.

Table 20: Impact assessment table - decommissioning phase

Indicator of potential impact	Pre-mitigation					Post-mitigation				
	Intensity	Duration	Geographic Extent	Probability	Significance *	Intensity	Duration	Geographic Extent	Probability	Significance *
Airborne dust clouds and dust pollution	8	2	2	5	**60**	4	2	2	5	**40**
Construction-related activity at beach landing site, and along water and gas pipeline corridors	8	2	2	5	**60**	4	2	2	5	**40**
Visually intrusive beach landing site infrastructure	8	2	2	5	**60**	8	2	2	5	**60**
Light pollution at night from transhipment vessel anchored off-shore	8	2	2	5	**60**	8	2	2	5	**60**
Loss of sense of place during	8	2	2	5	**60**	8	2	2	5	**60**

Indicator of potential impact	Pre-mitigation					Post-mitigation				
	Intensity	Duration	Geographic Extent	Probability	Significance *	Intensity	Duration	Geographic Extent	Probability	Significance *
construction phase (resultant impact)										

(Where significance >75 = High/don't know; 46 – 75 = Moderate; 15 – 45 = Low and < 15 = Negligible)

7.0 ENVIRONMENTAL ACTION PLAN – CTT PLANT

Table 21 summarizes the proposed mitigation to address the visual impacts that are expected to be caused by the power plant and transmission lines during the construction, operational and decommissioning phases respectively, as relevant.

Table 21: Environmental action plan - CTT plant

Aspect	Potential impact and source	Detailed actions	Responsibility
Construction Phase			
Visual aesthetics	Airborne dust clouds and dust pollution	■ Water down any large bare areas associated with the construction and rehabilitation phases as frequently as is required to minimise airborne dust ■ Rehabilitate temporary bare areas as soon as feasible using appropriate vegetation species ■ Place a sufficiently deep layer of crushed rock or gravel over parking surfaces for vehicles and machinery ■ Apply chemical dust suppressants if wet dust suppression is insufficient ■ Implement a dust bucket fallout monitoring system	Contractor site supervisor
	Alteration of site topography and loss of vegetation cover	■ Visual mitigation will not be possible as this is an inevitable consequence of the construction process	N/A
	Construction-related activity on site and infrastructure	■ Maintain the construction and rehabilitation phase sites in a neat and orderly condition at all times	Contractor site supervisor

Aspect	Potential impact and source	Detailed actions	Responsibility
	under construction	■ Create designated areas for: material storage, waste sorting and temporary storage, batching, and other potentially intrusive activities ■ Limit the physical extents of areas cleared for material laydown, vehicle parking and the like as much as possible and rehabilitate these areas as soon as is feasible ■ Repair project related erosion damage to steep or bare slopes as soon as possible and re-vegetate these areas using a suitable mix of indigenous grass species	
	Light pollution at night at the CTT plant	■ Identify zones of high and low lighting requirements, focusing on only illuminating areas to the minimum extent possible to allow safe operations at night and for security surveillance ■ Plan the lighting requirements of the facilities to ensure that lighting meets the need to keep the site secure and safe, without resulting in excessive illumination ■ Reduce the heights of light post where possible and develop a lighting plan that focusses on illuminating the required areas through strategically placed individual lights rather than mass light flooding ■ Utilise security lights that are movement activated rather than permanently switched on where feasible, to prevent unnecessary constant illumination ■ Fit all security lighting with ‘blinkers’ or specifically designed fixtures, to ensure light is directed downwards while preventing side spill. Light fixtures of this description are commonly available for a variety of uses and should be used to the greatest extent possible ■ Eliminate any ground-level spotlights as these invariable result in both direct glare and increased sky glow, and cannot be effectively mitigated	CTT Project design engineer, contractor site supervisor

Aspect	Potential impact and source	Detailed actions	Responsibility
	Loss of sense of place (resultant impact)	■ This impact will be mitigated through the measures indicated for the other impacts listed above, if implemented	N/A
Operational Phase			
Visual aesthetics	Visually intrusive operational power plant infrastructure	■ To reduce the visual intrusion of the buildings, where feasible roofing and cladding material should not be white, shiny (e.g. bare galvanized steel that causes glare) or brightly coloured ■ Buildings and workshops exteriors should also be painted in colours that are complementary to the surrounding landscape, such as olive green, light grey, blue-grey, or variations of tan and ochre ■ Retain existing trees wherever possible, as they already provide valuable screening ■ Appropriate landscaping using indigenous vegetation should be introduced within the permanent camp facility as well as entrance areas to other facilities, in order to create a more welcoming overall appearance	CTT Project design engineer, contractor site supervisor
	Visually intrusive linear transmission lines and associated vegetation clearance	■ Visual mitigation of the transmission lines is not considered feasible/practical	N/A
	Light pollution at night at the CTT plant	■ Same as for the construction phase, where relevant	CTT Project design engineer, contractor site supervisor
	Loss of sense of place (resultant impact)	■ This impact will be mitigated through the measures indicated for the other impacts listed above, if implemented	N/A
Decommissioning Phase			
Visual aesthetics	Airborne dust clouds and dust pollution	■ Same as for the construction phase	Rehabilitation contractor site supervisor

Aspect	Potential impact and source	Detailed actions	Responsibility
	Decommissioning, demolition and rehabilitation-related activity on site	■ Same as for the construction phase, where relevant	Rehabilitation contractor site supervisor

8.0 ENVIRONMENTAL ACTION PLAN – BEACH LANDING SITE AND SUPPORT INFRASTRUCTURE

Table 22 summarizes the proposed mitigation to address the visual impacts that are expected to be caused during the beach landing site and support infrastructure construction phase, as relevant.

Table 22: Environmental action plan – beach landing site and support infrastructure

Aspect	Potential impact and source	Detailed actions	Responsibility
Construction Phase			
Visual aesthetics	Airborne dust clouds and dust pollution	■ Same as for power plant construction phase	Contractor site supervisor
	Construction-related activity at beach landing site, and along water and gas pipeline corridors	■ Same as for power plant construction phase, as relevant	Contractor site supervisor
	Visually intrusive beach landing site infrastructure	■ Visual mitigation of the beach landing site is not considered feasible/practical	N/A
	Light pollution at night from transhipment vessel anchored off-shore	■ Visual mitigation / reduction of light pollution by the transhipment vessel is not considered feasible/practical	N/A
	Loss of sense of place during construction phase (resultant impact)	■ This impact will be mitigated through the measures indicated for the other impacts listed above, if implemented	N/A

9.0 MONITORING PROGRAMME – CTT POWER PLANT

Table 23 indicates the proposed monitoring programme in terms of the relevant visual impact mitigation measures for the CTT plant and transmission lines, during the construction, operational and decommissioning phases, respectively:

Table 23: Monitoring programme - CTT plant

Objective	Detailed Actions	Frequency	Responsibility
Construction Phase			
To minimise airborne dust clouds and dust fallout, caused by construction activities	■ Conduct dust bucket monitoring for all construction sites as per air quality impact assessment (AQIA) recommendations ■ Conduct visual inspections of the construction site areas and immediate surroundings to determine whether construction activities are causing undue dust propagation	As per AQIA Depending on weather / wind conditions, in the event of stakeholder complaints	Contractor site supervisor
To minimise visual nuisance caused by the construction site and activities	■ Conduct visual inspections of all construction site areas to ensure that acceptable visual conditions are being maintained	Weekly	Contractor site supervisor
To reduce the degree of night-time light pollution caused by the construction site	■ Conduct periodic night-time visual inspection of the power plant construction site from immediate surroundings and nearest settlements / residences, to determine whether undue light pollution is occurring	Monthly, in the event of stakeholder complaints	Project engineer, site environmental manager
Operational Phase			
To improve the appearance or otherwise reduce the visual intrusion caused by the power plant complex	■ Conduct periodic inspections of the power plant and associated infrastructure under construction, to ensure that visual improvement measures are implemented where practical	Periodically during construction as required, and prior to final site sign-off and handover	CTT site environmental / operations manager
Light pollution at night at the CTT plant	■ Conduct periodic night-time visual inspection of the operating power plant from immediate surroundings and nearest settlements / residences, to determine whether undue light pollution is occurring	Annually, in the event of stakeholder complaints	CTT site environmental / operations manager
Decommissioning Phase			
To minimise airborne dust clouds and dust fallout, caused by demolition and	■ Conduct dust bucket monitoring for all rehabilitation areas as per air quality impact assessment (AQIA) recommendations	As per AQIA Depending on weather / wind	Rehabilitation contractor site supervisor

Objective	Detailed Actions	Frequency	Responsibility
rehabilitation earthworks activities	■ Conduct visual inspections of rehabilitation earthworks areas and immediate surroundings to determine whether construction activities are causing undue dust propagation	conditions, in the event of stakeholder complaints	
To minimise visual nuisance caused by demolition and rehabilitation and activities	■ Conduct visual inspections of all rehabilitation areas to ensure that acceptable visual conditions are being maintained	Weekly	Rehabilitation contractor site supervisor

10.0 MONITORING PROGRAMME – BEACH LANDING SITE AND SUPPORT INFRASTRUCTURE

Table 24 indicates the proposed monitoring programme in terms of the beach landing site and support infrastructure visual impact mitigation during the construction:

Table 24: Monitoring programme - beach landing site and support infrastructure

Objective	Detailed Actions	Frequency	Responsibility
Construction Phase			
To minimise airborne dust clouds and dust fallout, caused by construction activities	■ Same as for power plant construction site		Contractor site supervisor
To minimise visual nuisance caused by the construction site and activities	■ Same as for power plant construction site		Contractor site supervisor

11.0 CONCLUSIONS – CTT PLANT

The visual resource value of the power plant and transmission lines study area was determined to be moderate, mainly attributable to the relatively low levels of existing development. The area that is expected to be visually impacted by the project is similar in appearance to other surrounding areas in the region and is not characterised by distinguishing or unique visual attributes.

The visual impacts associated with the power plant will be of a comparable nature and extent, regardless of whether the CCGT or OCGE technology is selected. This is due to the fact that the two technology options will essentially consist of elements that are similar in appearance from a visual perspective, with neither option being notably less intrusive in terms of the existing landscape visual context.

A number of relatively short-lived visual impacts are expected to occur during the construction and decommissioning phases of the project, which can be partially mitigated through appropriate planning and site management measures. By contrast, the scope to mitigate or reduce the visual impacts caused by the power plant and transmission lines during the operational phase is limited, given the scale and visual nature of these project components and associated operational requirements.

From a purely visual perspective, the significance of the visual impacts during the operational phase have been indicated to be moderate after reasonable and practical mitigation measures have been implemented. However, this rating is partially a consequence of the project impact scoring methodology that was applied, and the results may therefore be conservative and represent a “worst-case” scenario. Other, potentially more important factors such as the power supply security and socio-economic benefits of the project must also be taken into consideration.

Based on the above considerations it is expected that the project visual impacts can be appropriately managed, provided that the visual mitigation measures stipulated in this VIA are implemented and monitored as indicated.

12.0 CONCLUSIONS – BEACH LANDING SITE AND SUPPORT INFRASTRUCTURE

The visual resource value of all three beach landing sites have been determined to also be moderate, although specific aspects or elements may be perceived as having a greater level of visual appeal. Furthermore, the visual resource value of the off-shore anchoring site was estimated to be high, given the lack of human impact and pristine visual quality.

From a visual perspective, the beach landing sites as well as the support infrastructure construction sites located in Inhassoro are considered a temporary, secondary impact associated with the main project components, namely the power plant and transmission line. The scope of visual mitigation of the beach landing site itself is very limited, however the majority of the other construction-related visual impacts can be managed or mitigated to some extent. Given the short duration and limited geographic scale of these visual impacts in relation to the rest of the project, the proposed SETA beach landing site can therefore be viewed as the preferred option.

13.0 REFERENCES

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Google Earth aerial imagery of the project sites and surrounding study areas (respective imagery dates 14 July 2016, and 31 December 2016)

Photographs of the various sites and surrounding areas, taken during September 2014 and June 2018 respectively

Signature Page

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APPENDIX A

Document Limitations

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