Sudair Solar Photovoltaic Independent Power Plant

Kingdom of Saudi Arabia

ESIA Addendum

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CONTENTS

LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
ARCS	Automatic Robotic Cleaning system
CCTV	Closed-circuit television
CIA	Cumulative Impact Assessment
EBRD	European Bank for Reconstruction and Development
EPC	Engineering, procurement, and construction
EPFIs	Equator Principles Financial Institutions
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
GBVH	Guidance on Gender Based Violence and Harassment
GHG	Greenhouse Gases
GW	Giga-Watt
HR	Human Resources
HRGPs	United Nations Human Rights Guiding Principles
HSE	Health Safety and Environment
IFC	International Finance Corporation
ILO	International Labour Organization
IPP	Independent Power Plant
KSA	Kingdom of Saudi Arabia
LTA	Lender's Technical Advisor
MEWA	Ministry of Environment, Water & Agriculture
MOL	Ministry of Labour
NCEC	National Centre for Environmental Compliance
ODS	Ozone Depleting Substances
OHS	Occupational Health and Safety
PC	Project Company
PPA	Power Purchase Agreement
PPE	Personal Protective equipment
PS	Performance Standard
PV	Photovoltaic
REPDO	Renewable Energy Project Development Office
RFP	Request for Proposal
SCB	Standard Chartered Bank
SCTNH	Saudi Commission for Tourism and National Heritage
SEA	Sexual Exploitation & Abuse
SEEC	Saudi Energy Efficiency Centre
SEP	Stakeholder Engagement Plan
SH	Sexual Harassment
TBD	To Be Determined

ABBREVIATION	MEANING
TDD	Technical Due Diligence
UNTC	United Nations Treaty Collection
VECs	Valued Environmental and Social Components
VOC	Volatile Organic Compound
WHO	World Health Organization

1 INTRODUCTION

ACWA Power is developing the Sudair Solar Photovoltaic (PV) Independent Power Project (IPP), a 1.5 Giga Watt (GW) capacity project located approximately 150 km outside of Riyadh, KSA. A preliminary Environmental and Social Impact Assessment (ESIA) and Stakeholder Engagement Plan (SEP) have been prepared by Wood in 2019 on behalf of the Renewable Energy Project Development Office (REPDO). These documents have been reviewed as part of a Technical Due Diligence (TDD) report prepared in April 2021 by Mercados-Aries International, the Lenders Technical Advisor (LTA) acting on behalf of the lender group.

The purpose of the TDD report prepared by the LTA is to review, from a technical, environmental, and social standpoint, the Sudair PV IPP against the applicable requirements and standards of the lenders. As part of this process, gaps in the ESIA are highlighted with identification of additional required studies/assessments. Such gaps have been included to an Environmental and Social Action Plan (ESAP) alongside other obligations that are necessary during project implementation.

5 Capitals has been engaged by ACWA Power to address specific ESAP items required for completion prior to the first drawdown (linked to the ESIA gaps). These gaps are primarily related to inconsistencies with the updated Equator Principles IV requirements that are necessary to secure project financing from Equator Principles Financial Institutions (EPFIs); such as Standard Chartered Bank (SCB) who is understood to be a target lender.

1.1 Gaps Identified in the TDD

The relevant ESIA gaps included to the ESAP prepared as part of the TDD report of the LTA are extracted in the following table.

Accordingly, this report is prepared as an Addendum to the existing ESIA, to close out the identified gaps, which include:

- Climate Change Impacts Assessment;
- Human Rights Impacts Assessment;
- Ecosystem Services Review & Assessment;
- Cumulative Impacts Assessment; and
- Stakeholder Engagement Plan Update.
    - Note: an editable version of the SEP has not been made available and as such an addendum to it has been provided herein (rather than an update)

Table 1-1 Environmental and Social Action Plan extracted from the TDD

Item No.	Issue, Measure or Corrective Actions	Responsibility	Deliverable/Report or Measurement	Schedule/ Deadline	Status	Reference in this Addendum
PS1	**Assessment and Management of Environmental and Social Risks and Impacts**					
1.3	Stakeholder Engagement and ongoing community engagement. Section 2.8.2 of the Instructions to bidders of the RFP states that "in order to satisfy IFC Equator Principles, evidence may be required of completion of a consultation process with public stakeholders on the proposed projects. Successful Bidder will be responsible for consultation with public stakeholders."	ACWA POWER	Update the Stakeholder Engagement Acton Plan to include community stakeholder engagement and consultation: • Stakeholder mapping of communities, community groups, nomadic groups within the project site (tents and camps) • Ecosystem services • Community grievance mechanism (included in the SEP: needs to be socialised during Stakeholder engagement and consultation) • Community engagement and consultation, • Provisions for ongoing communications with communities and governmental stakeholders, • Provision for communication of information related to employment opportunities, including women, offered by the project. • Information on disclosure of project information	Prior to Financial Close (1st drawdown) provided covid-19 restrictions are lifted.	Pending	Addressed in Chapter 6 of this Addendum

Item No.	Issue, Measure or Corrective Actions	Responsibility	Deliverable/Report or Measurement	Schedule/ Deadline	Status	Reference in this Addendum
1.8	Climate Change Risk and Adaptation	ACWA POWER	Prepare a Water Management Plan which includes the following: • Adaptation opportunities related to the potential effects of Climate change on water availability, increased droughts and sandstorms and potential for more extreme rainfall events • Construction water supply plan • Operations water supply plan	Prior to Financial Close (1st drawdown)	Pending	Addressed in Chapter 2 of this Addendum
1.9	Cumulative Impact Assessment	ACWA POWER	ACWA will retain a consultant to carry out a CIA to supplement the Project's ESIA	Prior to Financial Close (1st drawdown)	Pending	Addressed in Chapter 5 of this Addendum
PS5	**Land Acquisition and Involuntary Resettlement**					
5.1	Verify whether there are any temporary camps and herders without land rights occupying the land (or camps, property, animals) that use Project land and surrounding areas.	ACWA POWER	Determine applicability of PS5 (Engage and consult with owners of temporary tents and camps if any are present on project land).	Prior to Financial Close (1st drawdown)	Applicability TBD	Addressed in Chapter 7 of this Addendum
PS6	**Biodiversity Conservation and Sustainable Management of Living Natural Resources**					
6.1	Lack of ecosystem services review and lack of mitigation measures to prevent the propagation of invasive species.	ACWA POWER	Retain a consultant to: • Conduct an ecosystem services review • Include mitigation measures to prevent the propagation of invasive species.	Prior to Financial Close (1st drawdown)	Pending	Ecosystem review is addressed in Chapter 3 and the invasive species mitigation measures are addressed in chapters 3.4 and 3.5 of this Addendum

Item No.	Issue, Measure or Corrective Actions	Responsibility	Deliverable/Report or Measurement	Schedule/ Deadline	Status	Reference in this Addendum
PS8	**Cultural Heritage**					
6.1	Stakeholder Engagement	ACWA POWER	The SEP includes the Saudi Commission for Tourism and National Heritage (SCTNH) as one of the project Stakeholders. Engage and consult with this entity or an archaeologist to ascertain if the site has any cultural heritage potential.	Prior to Financial Close (1st drawdown)	Pending	Addressed in Chapter 6.2.1 of this Addendum
EP10	**Reporting and Transparency – Public Disclosure ESIA Summary**					
EP10.3	Human Rights Assessment	ACWA POWER	ACWA will retain a consultant to complete a Human Rights Assessment in line with EP4 as supplemental information to the ESIA, that considers actual or potential adverse Human Rights impacts and if none are identified, provide an explanation of how the determination of the absence of Human Rights risks was reached, including which stakeholder groups and vulnerable populations (if present) were considered in their analysis.	Prior to Financial Close (1st drawdown)	Pending	Addressed in Chapter 4 of this Addendum

2 CLIMATE CHANGE AND VULNERABILITY ASSESSMENT

Addendum Rationale: The recent update of the Equator Principles (to EP IV) necessitates the inclusion of a 'Climate Impact and Vulnerability' assessment as part of the ESIA for projects financed by Equator Principles Financial Institutions (EPFIs). This was not included to the original project ESIA prepared for REPDO.

2.1 Overview

Significant amounts of scientific research have identified a link between the rising concentration of greenhouse gases in the atmosphere and trends in current global warming. A key factor in the increases of GHGs would result from the combustion of fossil fuels and the associated release of GHGs into the atmosphere. Potential impacts of global warming have been modelled by various agencies and organisations and are now well documented. Besides a global average rise in temperature, there is expected to be more frequent extreme weather events, as well as associated impacts to biodiversity, amongst many other primarily negative impacts.

Such impacts of current climate change are being reported to be realised worldwide and will potentially include impacts to KSA. The impacts on climate due to the proposed project activities and associated facilities are discussed in this chapter, as is a high-level vulnerability overview of potential climate impacts on the Project.

2.2 Standards and Regulations

2.2.1 National Context and Regulations

The Paris Agreement came into force on 4th November 2016. The KSA signed and ratified the Agreement on 3rd November 2016 (UNTC, 2020). To date, the Kingdom of Saudi Arabia has not released a national climate action plan, however, the country has established a number of initiatives to address climate change issues, including (Al-Sarihi, 2019):

- Establishing a Renewable Energy Project Development Office (REPDO) by the Ministry of Energy in 2017 to raise the renewable energy capacity in the total energy mix within the Kingdom to 9.5 GW by 2023, in line with Saudi's Vision 2030;
- Establishing a National Committee for the Clean Development Mechanism and Designated National Authority in 2009, which oversees the development process of Clean Development Mechanism projects;

- Establishing a Saudi Energy Efficiency Program launched by Saudi Energy Efficiency Centre (SEEC), which aims at designing and implanting energy efficiency initiatives for the country; and
- Oil and Gas Climate Initiative lead by Saudi Aramco to help member companies support the Paris Agreement and its aims (https://oilandgasclimateinitiative.com/about-us/#guidingprinciples).

2.2.2 Lenders Requirements

Equator Principles IV establishes that impacts to climate should be avoided where possible, and in support of the 2015 Paris Agreement recognises that EPFIs have a role to play in improving the availability of climate-related information.

Factors including climate change are required to be incorporated into the Project Review and Categorisation (EP1), while a key element of EP IV (under EP2 for Environmental and Social Assessment) is that an assessment of climate change risks is expected in an ESIA and should link to the 'Climate Physical Risk' and 'Climate Transition Risk' categories developed by the Task Force on Climate-related Financial Disclosures (TCFD).

For projects that have Scope 1 & 2 GHG emissions of over 100,000 tonnes of CO2 equivalent per annum, there are also other requirements linked to alternative analysis and client annual reporting on GHG emissions.

2.3 Potential Project Impacts upon Climate Change

2.3.1 Construction

STATIONARY SOURCE - FUEL COMBUSTION

The stationary combustion sources used during the construction phase of the Project will primarily relate to temporary Diesel Generators, which will be located around the site in the Engineering, Procurement, and Construction (EPC) Contractor and sub-contractors administration & office areas.

Currently, electricity is provided by an on-site generator consuming approximately 10,500 L of diesel per month. A temporary electricity connection from Saudi Electricity Company is expected to be installed by end of August 2021, which would enable grid drawn electricity.

Using the GHG Protocol calculation tool for GHG Emissions from Stationary Combustion (World Resources Institute, 2015), the GHG emissions during construction are calculated and are summarised in the table below.

Table 2-1 Generators-GHG Emissions During Construction of the Project

Fuel Type	Volume of Fuel (L/ Month)	GHG Emissions (tonnes/month)			Total GHG (tonnes CO_2E/month) *
		CO_2	CH_4	N_2O	
Liquid Fossil (Diesel)	10,500	28.103	1.138E-03	2.276E-04	28.195
Total GHG emissions from fossil fuels (tonnes CO_2e)					**28.195**
*If/when the generators are operational					

Mobile Source - Fuel Combustion

The construction phase of the Project will necessitate an amount of mobile equipment/plant and vehicles to facilitate works. Equipment such as excavators, rollers, cranes, pneumatic compressors, and other vehicles will be ample on the site, and are expected to be used in most construction processes. Such equipment will be fuelled by either diesel or unleaded petrol. Given the early stages of the Project's development, the expected quantity of fuel to be consumed during construction by the appointed EPC has not yet been confirmed. The expected fuel quantity will depend on the number of mobile equipment, hours of operation and efficiency of machinery. Therefore, the potential GHGs have not been calculated for the mobile equipment/plant and vehicles.

Loss of Carbon Sinks

The Project is located in an open area with limited vegetative ground cover and a lack of voluminous biomass that would present stores for carbon.

No trees were identified on site, therefore, the stores of carbon on-site relate to some *Rhazya stricta* along the central wadi and an amount of low lying and sporadic shrubs (ref. ecology section of Wood ESIA, 2019). These stores are very limited, and the construction phase will result in the removal of ground cover vegetation. This is not expected to result in significant loses of carbon storage, due to the limited biomass.

2.3.2 Operations

Primary Operations – GHG Emissions Abatement

As a renewable energy project, there is essentially a neutral operational impact on GHGs, as the Project will not combust fossil fuels, or otherwise operationally reduce (or affect) carbon sinks. A key benefit of the Project is the resulting lowering of the carbon intensity of the grid produced electricity in KSA.

It is possible to make a comparison of GHGs mitigated against a grid factor for GHG emissions in KSA. The GHG emissions avoided over the operational phase have been calculated below using the 'IFI (Interim) Dataset of Grid Factors'. Version 1.0 was originally released in July 2016 on the basis of the methodological approaches to GHG Accounting for Emissions from grid-connected renewable energy and energy efficiency projects, that were announced by the

IFIs at the 21st Conference of the Parties in Paris in December 2015. The IFI Data set (Version 2.0, July 2019) is currently used by IFIs as the default basis of their GHG emissions accounting.

The table below shows estimated CO_2e that will be avoided per year, compared with typical grid generation emissions. This is based on the KSA default grid factor of 650 gCO_2/kWh from the IFI Dataset for Intermittent renewable energy sources (i.e. solar and wind).

Table 2-2 Estimated CO_2 Emissions Mitigated in Tonnes per Year

Year	Project Electrical Generation (kWh)	Relative Net Emissions Saving (tCO_2eq/year)
1	4,451,723,000	2,893,619.95
2	4,442,608,000	2,887,695.20
3	4,433,376,000	2,881,694.40
4	4,424,025,000	2,875,616.25
5	4,414,557,000	2,869,462.05
6	4,404,969,000	2,863,229.85
7	4,395,234,000	2,856,902.10
8	4,385,343,000	2,850,472.95
9	4,375,210,000	2,843,886.50
10	4,365,004,000	2,837,252.60
11	4,354,693,000	2,830,550.45
12	4,344,262,000	2,823,770.30
13	4,333,674,000	2,816,888.10
14	4,322,937,000	2,809,909.05
15	4,312,066,000	2,802,842.90
16	4,301,051,000	2,795,683.15
17	4,289,896,000	2,788,432.40
18	4,278,586,000	2,781,080.90
19	4,266,807,000	2,773,424.55
20	4,255,115,000	2,765,824.75
21	4,243,339,000	2,758,170.35
22	4,231,466,000	2,750,452.90
23	4,219,492,000	2,742,669.80
24	4,207,377,000	2,734,795.05
25	4,195,136,000	2,726,838.40
Total (25-years)	**108,247,946,000**	**70,361,164.90**

GHG Emission - Grid Electricity Usage

Although being a renewable energy project, the generation of solar power is intermittent and restricted to daylight hours only. As such the project will draw power from the grid during the night to provide electricity for lighting, security purposes (e.g. security systems, CCTV etc.) and any site office, workshop or other requirements being undertaken at night.

Given that it is only expected that security staff will be present at night, and there are no operational processes that will require large quantities of power to be drawn from the KSA grid, the amount of power usage is expected to be 18,000 KWh/month.

According to Climate Transparency, 2020, the energy sector in KSA generates 703 gCO2/kWh. Based on an estimated 18,000 KWh monthly electricity consumption, a total of 151.85 tons of CO_2e are expected to be generated annually.

Emergency Diesel Generator - Fuel Combustion

The Project has an emergency diesel generator that will be located on-site. This generator is not expected to be used except during grid blackout conditions, where the generator would provide an amount of power load to enable the safe operation of the plant in such circumstances. While the exact quantity of fuel required for the operation of the generator cannot be determined, it is estimated that 1,080 L of fuel will be required annually (which includes regular functionality testing). Using the Greenhouse Gas Protocol calculation tool for GHG Emissions from Stationary Combustion (World Resources Institute, 2015), the GHG emissions during operation were calculated and are summarised in the table below.

Table 2-3 Generator-GHG Emissions During Operation of the Project

Fuel Type	Volume of Fuel (L/year)	GHG Emissions (tonnes/year)			Total GHG (tonnes CO_2E/year)
		CO_2	CH_4	N_2O	
Liquid Fossil (Diesel)	1,080	2.891	1.170E-04	2.341E-05	2.9
Total GHG emissions from fossil fuels (tonnes CO_2e)					**2.9**

Mobile Source - Fuel Combustion

Mobile source GHG emissions during operations will only relate to the few vehicles being used on-site for O&M purposes and for the commuting of the small number of staff who will be required to operate the Project. The Project does not require key supply chains (i.e. regular deliveries or removals) and is not expected to require significant maintenance. An estimated 1,050 L/year is required for the operation of seven vehicles. Using the Greenhouse Gas Protocol calculation tool for GHG Emissions from Mobile Combustion (World Resources Institute, 2015), the GHG emissions from vehicles during operation were estimated at 2.385 tonnes CO_2eq/year.

Use of Ozone Depleting Substances (ODS)

It is expected that sulphur hexafluoride (SF6) is to be used in high voltage electrical equipment as the insulating gas, as part of the Gas Insulated Switchgear (GIS), and associated facility of the main PV project. There may be some leakage from the GIS, or where mishandled. Under normal operational conditions leakage should not occur.

REFRIGERANTS

Trace amounts of refrigerants will be used in chiller packages were needed on-site for air conditioning, refrigerators etc. Where applicable, the requirements of the Montreal Protocol are applicable concerning applicable ODS. Any leakage of refrigerants would be negligible.

2.4 Vulnerability of the Project to Climate Change

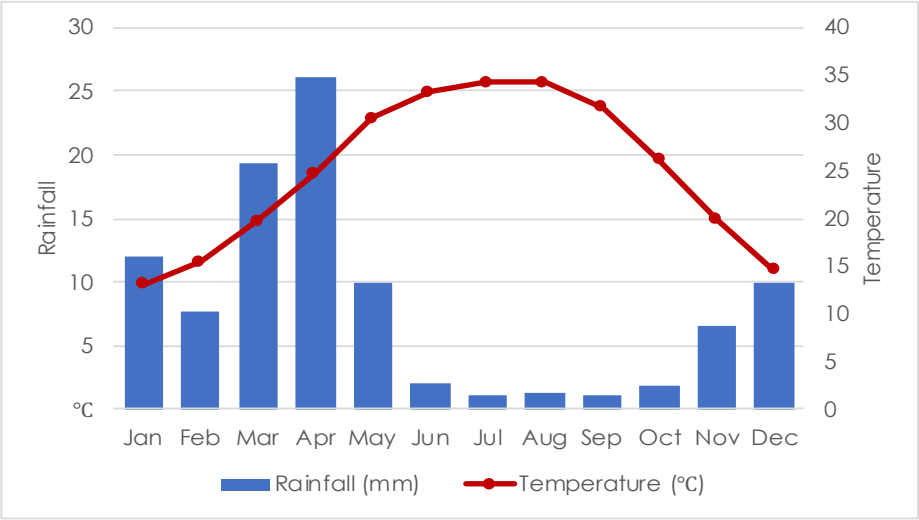
HISTORIC CONDITIONS AND PROJECTIONS

Saudi Arabia is characterised by a desert climate, with the exception of the southwestern part of the country, which exhibits a semi-arid climate. Key historical key trends are provided below (World Bank Climate Change Knowledge Portal, 2021):

- General warming varied from a minimum of about 0.15°C since 1950 in Tabuk, Makkah and Al Ahssa, to a maximum of about 0.75°C since 1950 in Khamis Mushait, Wadi Al Dawasser and Yanbu;
- Great variability in precipitation changes with high decreases to the north and southwestern parts of the country by up to 50 mm; and
- The mean annual temperature and precipitation for Saudi is 25.48°C and 75.20mm for the period 1991-2020, respectively.

The figure below presents the long-term mean monthly temperature and rainfall for the Project area for the years 1901 until 2020.

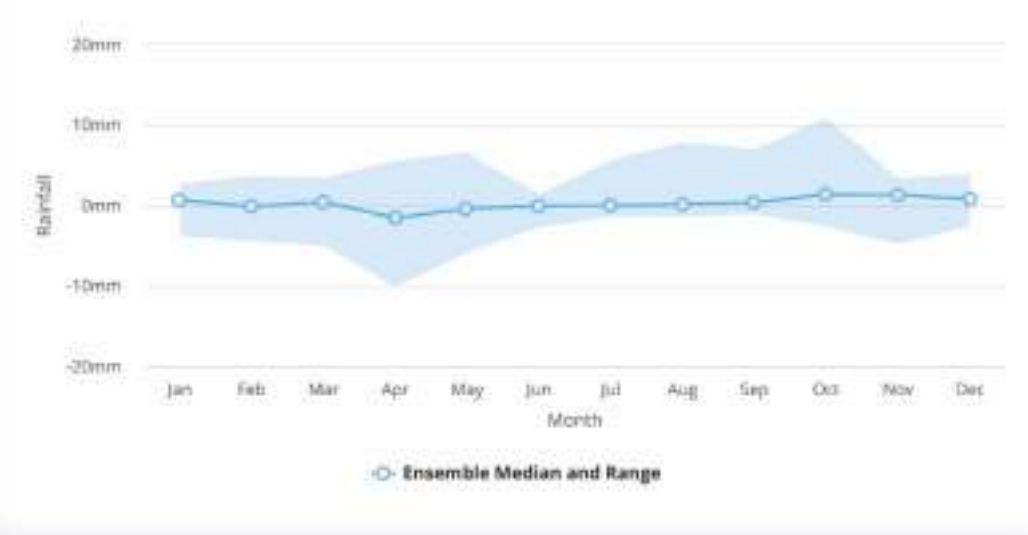
Figure 2-1 Average Monthly Temperature and Rainfall in the Project Area for 1901-2020 (World Bank Climate Change Knowledge Portal, 2021)



According to the World Bank Climate Change Knowledge Portal (2021), the projected change in average monthly temperature for the Project area between 2040-2059 (the period when the 25-year Power Purchase Agreement (PPA) will expire) will be between 1.14 and 4.3°C higher compared with the averaging period of 1986-2005. This considers various projected emission and climate scenarios that the World Bank data has in its database.

The average projected change in precipitation for the Project area for 2040-2059 is relatively minimal as shown in the figure below. Potential decrease in average precipitation during the months of February, April, May, June and an increase during the remaining months is anticipated over the project's PPA term (World Bank Climate Change Knowledge Portal, 2021). It is possible however that increased intensity of rainfall may occur at times.

Figure 2-2 Projected Change in Monthly Precipitation in the Project Area for 2040-2059 Compared to 1986-2005 (World Bank Climate Change Knowledge Portal, 2021)



According to the Global Facility for Disaster Reduction and Recovery (GFDRR), Saudi Arabia is most vulnerable to coastal and river floods, earthquakes, volcanoes and water scarcity. Out of these natural disasters, flooding is considered the most common in the country. Floods in Saudi Arabia occur as flash floods with little warning, damaging property and causing loss of lives. It is considered that the Project site is subject to water flows and as such may be prone to flooding.

As indicated in the Figure below, the most significant floods that occurred from 1985 to 2018 were recorded in the years 1985, 2003, 2004, 2005, 2009, 2010, 2013, 2016 and 2017. The table below presents the key natural disasters in Saudi along with the number of people affected. According to the GFDRR, unplanned urban development including lack of risk-informed territorial planning and weak enforcement of building codes are the main causes of damage and loss (Saudi Arabia - GFDRR, 2020). In addition to the below, the COVID-19 Pandemic is a major disaster that affected Saudi Arabia with 483,221 cases and 7,775 deaths reported between January 2020 and June 2021 as per the World Health Organization (WHO).

Figure 2-3 Key Natural Disasters in Saudi for the Period of 1985-2018 (World Bank Climate Change Knowledge Portal, 2021)

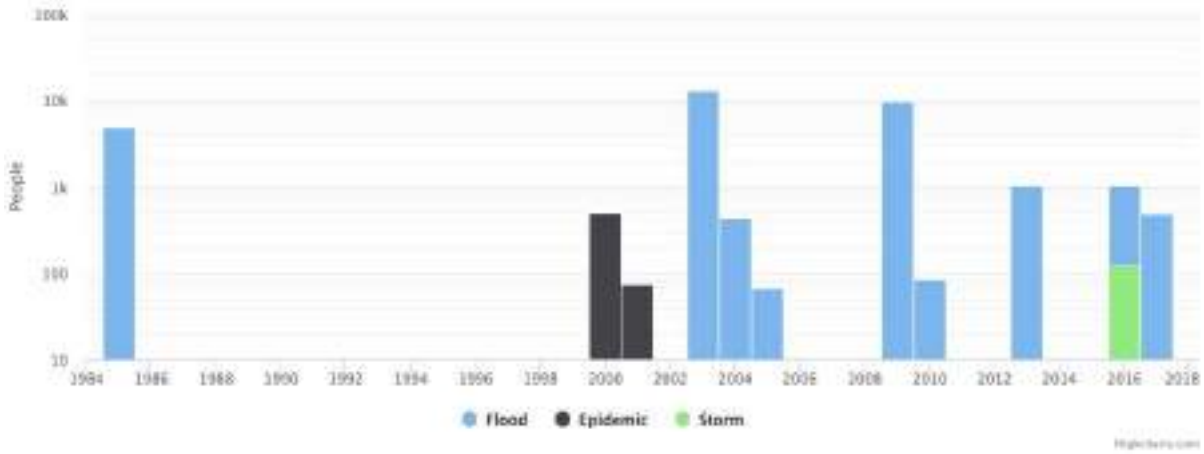


Table 2-4 Key Natural Disasters in Saudi for the Period of 1985-2018 (World Bank Climate Change Knowledge Portal, 2021)

Natural Hazard/ Disaster	Year	People Affected
Flood	1985	5,000
Epidemic	2000	497
Epidemic	2001	74
Flood	2003	13,050
Flood	2004	430
Flood	2005	67
Flood	2009	10,000
Flood	2010	85
Flood	2013	1,021
Strom	2016	915
Flood	2016	112
Flood	2017	481

2.4.1 Climate Physical Risks

Temperature Risks

The Project will require around 21 O&M staff some of which will have to work outdoors during operations. Primary project staff will be security, control room operators, administration teams and some maintenance engineers, most of which will be based indoors, although sufficient air conditioning capacity will be required. The number of these staff working outdoors will be limited and as such impacts to the workforce from possible rising temperatures due to climate change are expected to be limited and can be managed by resting periods indoors

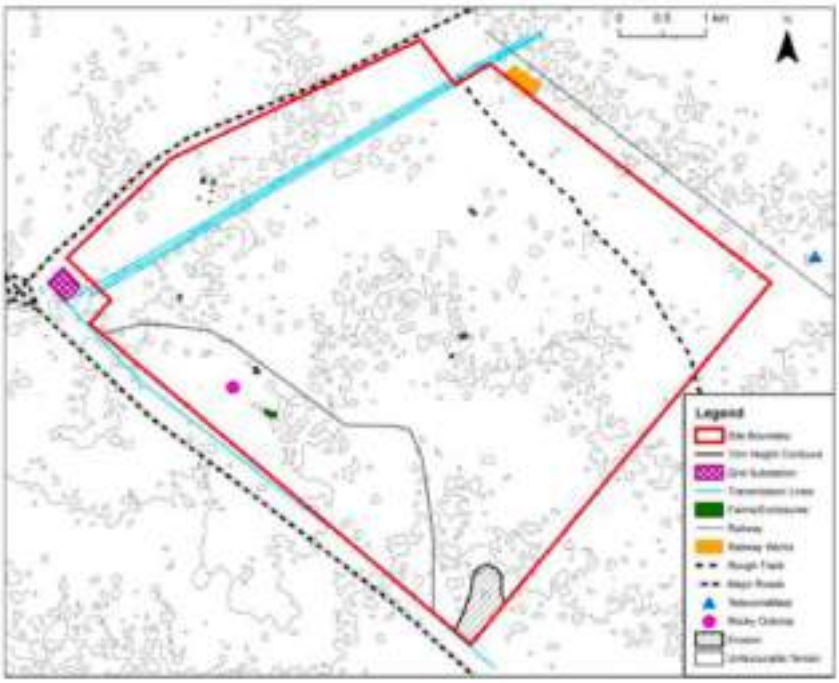
Rainfall and Flash Flooding

The Project is located inland in an area of the country that experiences relatively stable weather patterns, with relatively low rainfall levels. While there are no permanent surface water

bodies within the area, the Project site has evidence of water flows from the western part of the site draining towards the culvert of the adjacent highway 65.

The ESIA of 2019 identified two areas potentially unsuitable for development due to unfavourable undulating topography and soil erosion as shown in the Figure below.

Figure 2-4 Project Constraints (Wood, 2019)



An example of soil erosion is shown in the figure below.

Figure 2-5 Evidence of Surface Drainage (Wood, 2019)

A hydrology and hydraulics assessment was conducted for the Sudair Solar PV IPP by Larson & Tourbo in July 2021. The study identified seven culverts surrounding the study area, one located on the North-West road which drains flood water towards the study area while the remaining six located on the South-West road collecting the drained flood water from the study area towards the area underneath the South-West road as shown in the figures below.

Figure 2-6 Culvert Draining Flood Water into Study Area (LNT, 2021)

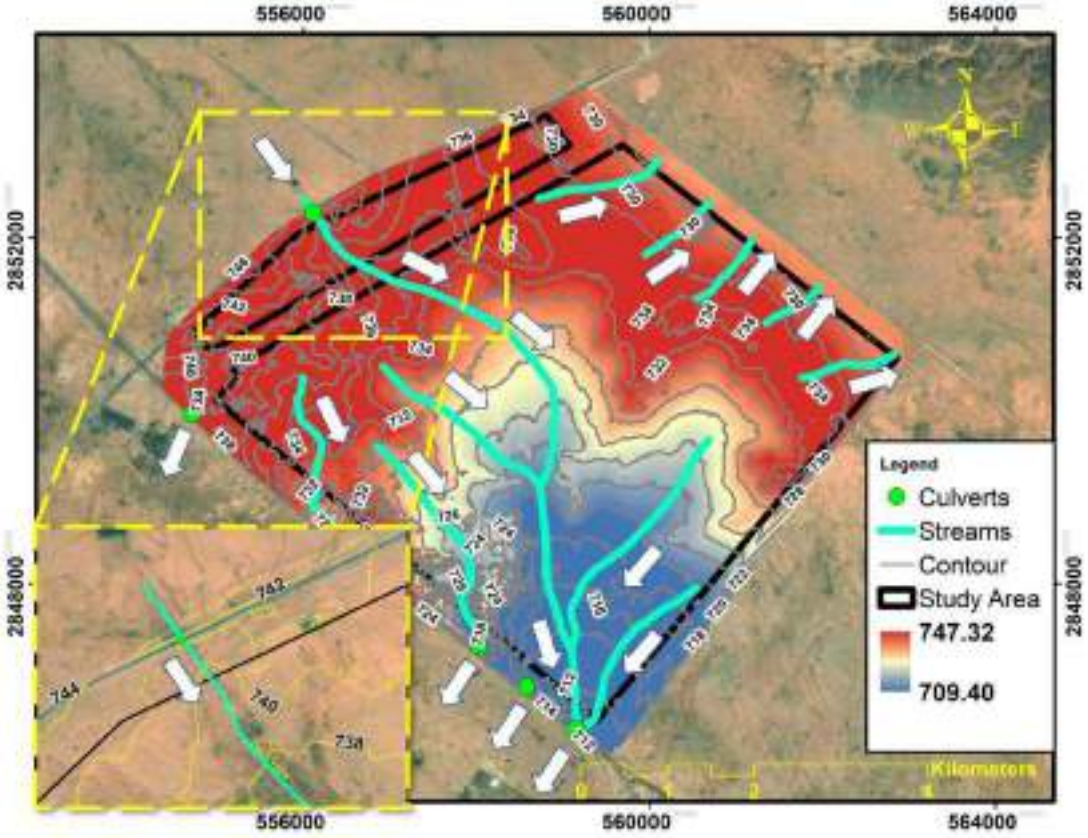
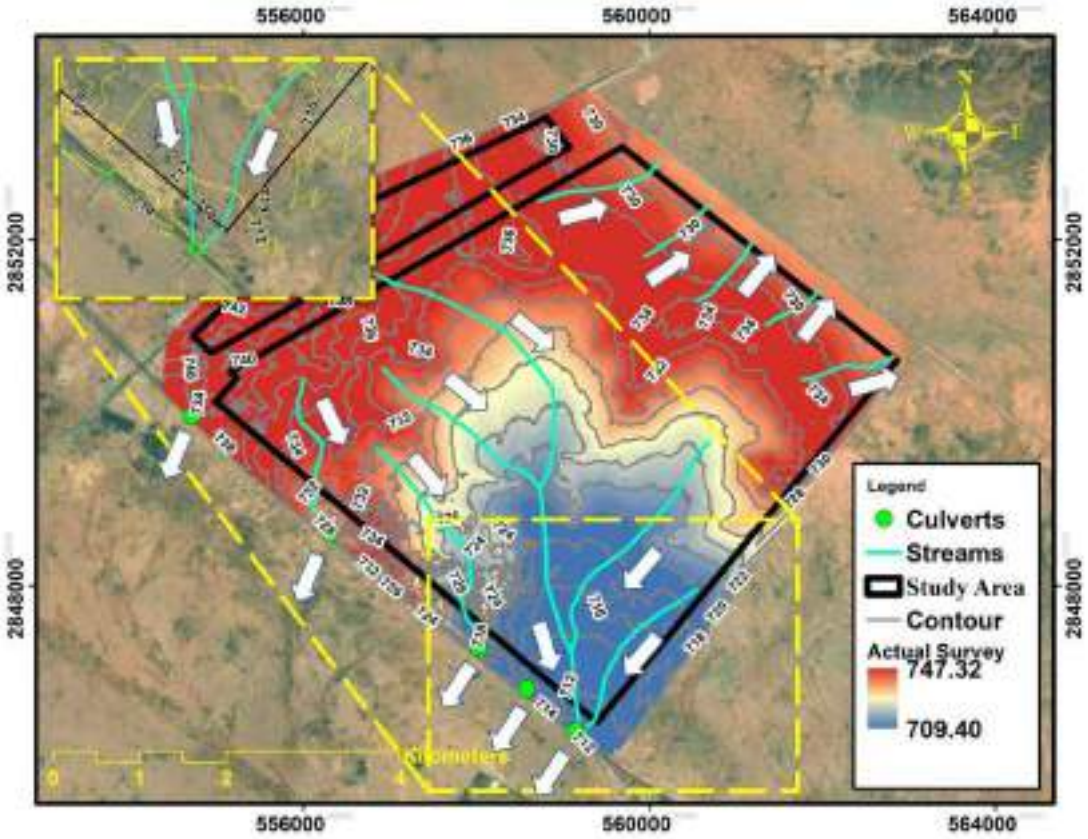


Figure 2-7 Culvert Draining Flood Water from Study Area (LNT, 2021)



The assessment considered rainfall events of 1, 2, 5, 10, 25, 50, and 100 year return periods and included flood flow paths, depths and magnitudes. The figures below present the water flow, depth and velocity based on a 100-year storm event.

The assessment indicates that water depths on the project site range between 0.05 m and 1 m having maximum depths in the area of the central surface flow pathway, at the southern boundary of the Project site. The maximum flow velocity reaches 0.7 m/s (LNT, 2021).

Figure 2-8 Water Flow Path Corresponding to100 Year Return Period (LNT, 2021)

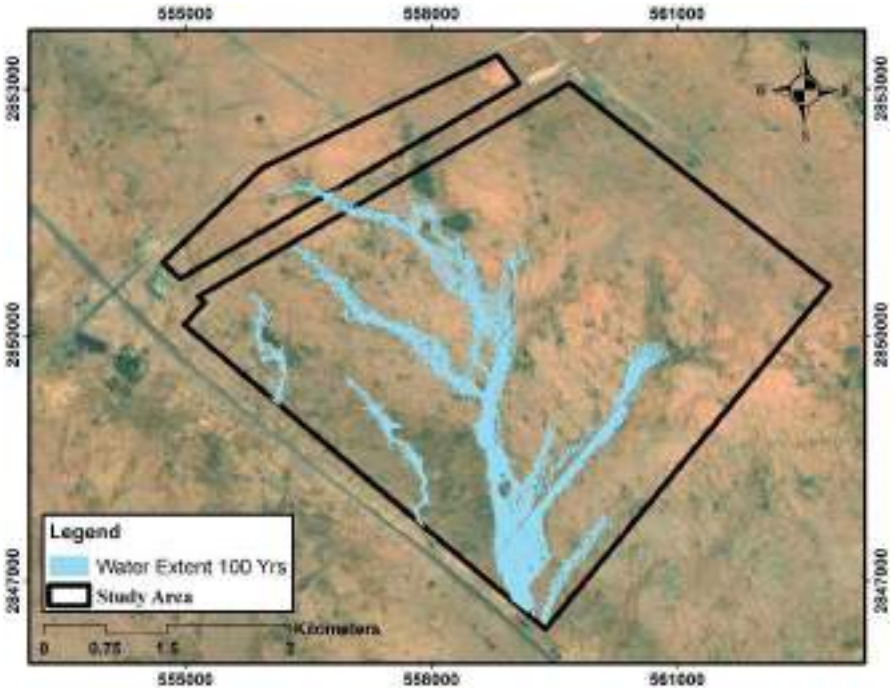


Figure 2-9 Water Depth Corresponding to100 Year Return Period (LNT, 2021)

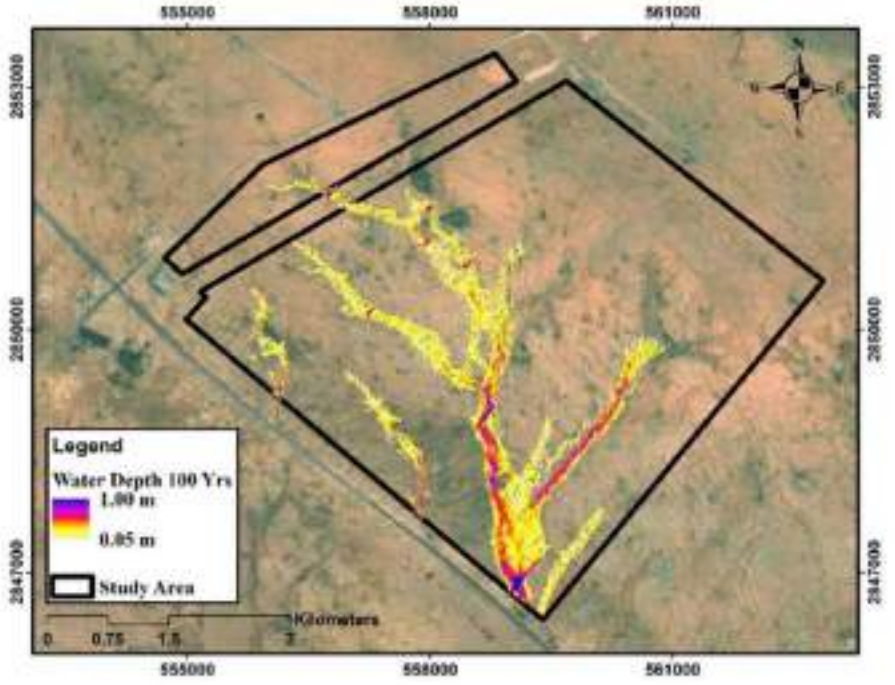
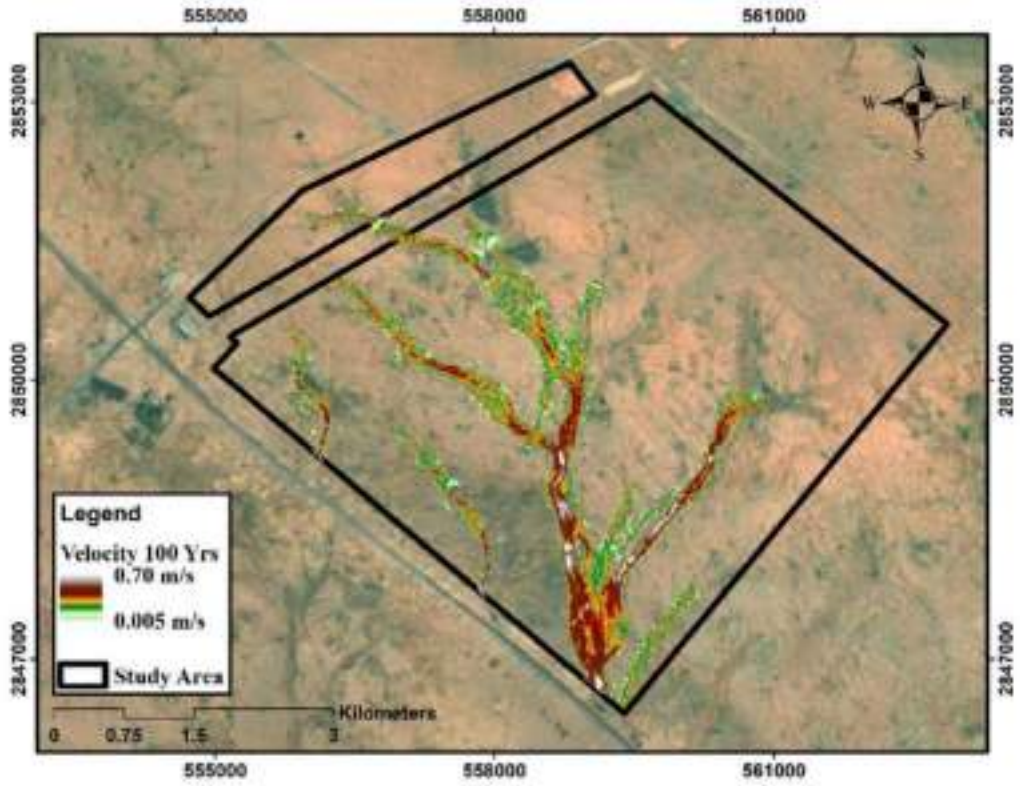


Figure 2-10 Water Velocity Corresponding to100 Year Return Period (LNT, 2021)



Climate projections predict a slight decrease in rainfall in the Project area for few months and an increase during other months reaching a maximum of 10.88 mm during October (World Bank Climate Change Knowledge Portal 2021). It is therefore possible that storms may become more intense, which may result in increased runoff on occasions. There is potential that this may result in possible flooding at the site if drainage channels become inundated with water.

Climate change impacts were not directly considered and a factor of safety for the developed rainfall intensity was not used for the assessment. However, according to the Hydrological Assessment for Sudair prepared by Wood in 2018, "For the annual rainfall different emission scenarios show depending on the period an increase as well a decrease of the annual rainfall. Overall change of rainfall is likely to be insignificant (-10.2 – 20.3 mm/year)."[1] According to Larsen & Toubro Saudi Arabia (EPC contractor), the current Hydrology analysis report (LNT, 2021) considers a maximum rainfall of 83.1 mm/year which is higher than the value for future climate change rainfall. According to Larsen & Toubro, the rainfall due to climate change is not anticipated to be higher than the scenario considered in the hydrological assessment.

[1] "Climate: Observations, projections and impacts - Saudi 95 Arabia; UK Met Office in collaboration with experts from the University of Nottingham, Walker Institute at the University of Reading, Centre for Ecology and Hydrology, University of Leeds, Tyndall Centre — University of East Anglia, and Tyndall Centre — University of Southampton" as cited in Wood, 2018.

Drought and Water Availability

The PV panels will be equipped with an automated dry cleaning system and therefore will not require water. The Project operation will procure drinking and domestic water from local suppliers. The estimated annual amount of water required during operation (considering 21 O&M employees) is provided in the table below.

Table 2-5 Annual Water consumption Based on Type of Use

Use	Quantity (m^3/year)
Domestic	280
Drinking Water	42
Firefighting (emergency situations only)	66

Water scarcity is a key challenge in KSA which depends heavily on desalinated water. According to the U.S.-Saudi Business Council, KSA is the largest country in the world without running surface water and has one of the highest rates of water consumption in the world having total water consumption over 8 million m^3/day (considering 263 L/capita/day in 2019) and was forecast to reach 12.3 million m^3/day by 2040.

As per the World Future Energy Summit, the Ministry of Environment, Water and Agriculture (MEWA) announced the launch of the Qatrah program in 2019 to rationalize water consumption and address the overuse and waste of water resources. The mission of the program is to reduce 24% of the country's daily per capita consumption rate by 2022 and 43% by 2030. The main elements of the Qatrah program include:

- Promoting sustainable agriculture.
- Implementing smart water management systems.
- Technological innovation in water desalination.
- Raising awareness on the importance of water conservation.

Taking into consideration the water quantity required over the PPA for the Project, climate change impacts on water resources are not anticipated to pose a significant risk to the availability of water for the Project.

Dust and Dust storms

In the event of warmer temperatures and any prolonged dry periods (i.e. during the summer), this could potentially result in the increase in the severity or frequency of dusty days and dust storms. This may include increased wind velocity over current storm speeds.

The Project will be equipped with Automatic Robotic Cleaning system (ARCS), a dry cleaning technology to ensure the PV panels remain clean.

2.4.2 Climate Transitions Risks

Given the Project as a Solar PV plant and is aligned with wider strategies for transition to a lower carbon economy (such as those being pursued by REPDO in line with Saudi Vision 2030), there are not expected to be specific risks related to future low carbon economies (policy, regulations etc.) or future public perceptions of the Project that are considered to be risks at this stage.

2.5 Recommended Mitigation Measures

Besides increased temperature, which will have minimal effect on workers, who will largely be able to avoid the heat (i.e. in air conditioned rooms), a key material climate risk to the Project during the PPA term is the risk of flash flooding in certain areas of the site as identified by the flood risk assessment.

SCOPE 2 GHG EMISSIONS

As the Project will draw a small amount of electricity from the KSA grid for night time uses, it is recommended that where possible the Project endeavours to install energy efficient appliances and utilities, lights etc., throughout the plant.

PHYSICAL RISK-INCREASED FLASH FLOODING RISKS

Hydrological Study Recommended Mitigation Actions

According to the hydrological assessment, the project area can be used for the installation of a solar park and where most of the PV modules and the main station are planned outside the water flow path with maximum water depth area, no protection is required. If equipment foundation is located fully or partially inside the water flow path with maximum water depth area, the foundation should be protected using one of the following options:

- 'Sand cement mortar with grooves at equal interval (fine gravel may be added to morter to increase its strength),
- Gabions, or
- Grouted riprap or similar.'

ESIA Addendum Recommendations

The ESIA report under sections 7.5.2 and 7.5.3 provide the list of mitigation measures relevant to flood risk management and the Project team has confirmed that the recommendations of the ESIA and the hydrological study will be considered for developing the detailed design of the Project.

It is noted however that the hydrological model only included input data for historical rainfall patterns and intensity and has not included projections that may account for increased intensity and/or volume of precipitation from storms due to climate change related factors.

It is therefore recommended that the detailed design of the Project takes account and makes applicable allowances for any additional rainfall (of higher intensity runoff peaks) based upon climate change factors. Such projections for future climate scenarios should cover the full PPA duration and be based on reputable climate model scenario resources for the region and where possible, the local area.

PHYSICAL RISK-WATER AVAILABILITY

Although not identified as a significant risk, to reduce impacts on water resources, a water management plan/programme could be implemented to include the following:

- Installing smart water management systems (faucets with sensors, water meters, leakage detection systems etc.).
- Monitoring water consumption.
- Conducting regular maintenance of faucets, plumbing, water tanks etc.
- Raising awareness on water conservation among workers.

3 ECOSYSTEM SERVICES ASSESSMENT

Addendum Rationale: Further to the ecology chapter in the ESIA prepared by Wood in 2019, this 'Ecosystem Services Assessment' addendum has been included to address the gaps identified by the LTA to provide an overview of the local ecosystem services people (and businesses) interact with and benefit from. This addendum assesses the potential Project impacts on identified ecosystem services and proposes applicable mitigation measures.

This section also addresses the mitigation measures that should be implemented by the Project to prevent the propagation of invasive species.

3.1 Overview

Ecosystems provide services that provide beneficial human impacts. A decline or loss of any of these services and their benefits can result in socio-economic impacts that extend beyond environmental damages (World Resources Institute, 2013).

Ecosystems services are divided into four categories (World Resources Institute, 2013 and also consistent with the four types outlined in IFC PS6):

- "Provisioning services are the goods or products obtained from ecosystems, such as food, timber, fiber, and freshwater.
- Regulating services are the contributions to human well-being arising from an ecosystem's control of natural processes, such as climate regulation, disease control, erosion prevention, water flow regulation, and protection from natural hazards.
- Cultural services are the nonmaterial contributions of ecosystems to human well-being, such as recreation, spiritual values, and aesthetic enjoyment.
- Supporting services are the natural processes, such as nutrient cycling and primary production, that maintain the other services."

IFC PS6 outlines that ecosystem services valued by humans are often underpinned by biodiversity, and hence impacts to biodiversity can adversely affect the delivery of ecosystem services.

3.2 Standards and Regulations

3.2.1 National Context and Regulations

There is no specific Saudi Arabian regulation specific to ecology or ecosystems services. However, the Environmental Law published in 2020 makes various reference to the general

and wider protection of the environment, defining it as, *'Everything that surrounds a person, animal, plant or any living organism; including water, air, land, soil, organisms, biological diversity, atmospheric gases, water bodies, and what these media contain in terms of inanimate objects and various forms of energy, environmental habitats, and natural processes and interaction between each other.'* Hence, this includes ecosystems services.

3.2.2 Lender Requirements

The assessment of impacts upon ecosystem services is made with due consideration to the following:

- IFC Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources which establishes requirements for protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources.
    - Management of Ecosystem Services: through identifying priority ecosystem services, avoiding adverse impacts where possible or implementing the required mitigation measures to maintain the value and functionality of the priority services. The Ecosystem Services are divided into two priority types:
        - Type I: Services that the project operations are most likely to impact and, therefore, would result in adverse impacts to affected communities.
        - Type II: Services on which the project is directly dependent for its operations (e.g., water).
    - Invasive Alien Species: The project should not intentionally introduce alien species with high risk of invasive behavior. Implement measures to prevent the potential introduction of invasive species including the transportation of substrates and vectors that may contain alien species.
- Performance Standard 4 Community Health, Safety, and Security to address the project's potential impacts on provisioning and regulating ecosystem services which will result in adverse health and safety risks and impacts to affected communities.

3.3 Baseline

3.3.1 ESIA

Note: The below provides an overview of relevant ESIA elements related to ecosystem services. For the full baseline ecology report, please refer to the Wood ESIA.

The ESIA prepared by Wood in 2019 undertook a combination of desk based and site ecological survey work (between March and May 2018, with a site visit in April 2018). The site

survey element primarily consisted of a habitat identification process with incidental siting's of flora and fauna recorded. Other ground truthing was also undertaken, based on desk-based research and certain target species.

The ESIA reports that the site consists mainly of sand/gravel desert habitat, intersected by wadis with some areas disturbed by human activity including excavations (including a small 'quarry' area), tracks and grazing. Small areas of standing water were identified in depressions and excavated/disturbed areas.

The ESIA reports limited vegetation on-site, which was primarily restricted to wadi areas, where it was dense in places. Photographs provided by Wood show the presence of some herder camps in proximity to the more densely vegetated wadi areas. The ESIA states that, '*extensive evidence of grazing by camels, sheep and goats was evident across site.*'

In terms of fauna, there were limited sitings or evidence of bird species, mammals, bats, reptiles or invertebrates. The ESIA does however indicate the potential for certain bird species (e.g., MacQueen's Bustard) based on the expected wintering range, as well as the potential for migrating birds to cross the site; although unlikely to come to ground. '*Evidence of Arabian Red Fox (Vulpes vulpes arabica) was found in a number of locations around the northern and eastern edges of site with active holes and fresh scat present.*' Small mammals are also likely but were not observed.

Two lizard species were observed on-site including one Spiny-Tailed Lizard, which has subspecies of IUCN conservation value (although not specified in the Wood ESIA). It is known that Spiny-Tailed Lizards are subject to hunting in KSA (for food), although this is illegal.

In addition to the above, Invasive Species were not specifically identified on the Project site by the ESIA.

3.3.2 Stakeholder Consultation

As part of the 2021 stakeholder consultations related to this ESIA Addendum and SEP Addendum (discussed in section 6 of this report), certain targeted discussions were had regarding land users at and around the project site, to understand potential interactions of humans with the ecosystem and to identify potential ecosystem services.

The outcomes of the consultation meetings conducted on the 16th and 20th of June 2021 indicated that the Project area was previously used informally by seasonal herders for grazing and camping, however, it is not currently being used and has not been used for the past few months. The consulted herders who work on farms in the vicinity of the Project area confirmed that not having access to the Project site for grazing will not impact their livelihood considering they have several alternative plots available around the Project area for use. The herders also indicated that it is normal for them to be travelling looking for available grass around the region without staying or committing to a specific location.

3.3.3 Identified Ecosystem Services

Based on the above and taking into consideration the ecological conditions of the Project area and the local herders in the Project area the ecosystem services provided by the Project site are limited to the following:

Table 3-1 Ecosystem Services Provided by the Project Site

Ecosystem Service	Type of Service	Beneficiary	Category	Description
Provisioning service	Type I	Local herders	Food-Livestock	The Project area was reported in the ESIA to be utilized by herders with livestock, although it has been advised that there are no herders on the site at this time. The consulted herders who work on farms in the Project area confirmed that the Project plot is not currently used and has not been used for the past few months. Therefore, currently the land does not have significant provisional services to the local herders.
Regulating services	Type I	Local communities and the global population	Regulating air quality and climate change	Existing vegetation and shrubs trap air pollutants and GHGs and accordingly help reduce the impacts on air quality and climate change. No trees exist on site and vegetation is limited to sparse shrubs that provide limited stocks for this regulating service. The chances for this to change into the future is very limited considering the type of environment and habitat in the Project area.
	Type I	Local communities and surrounding landowners	Regulating water flows	As per the ESIA prepared by Wood in 2019, the surface soils in the Project area indicate a high degree of permeability. Soil permeability facilitates aquifer recharge during rain events. In addition, there are a number of Wadis that spread across site and meet and disperse mainly to the southern corner of site, conveying water to the surrounding plots.

3.4 Potential Impacts

3.4.1 Construction

Provisioning Service-Livestock

Considering the Project site is not currently occupied and has not been used for the past few months for grazing, the provisional services are limited. In addition to that, and taking into consideration the limited amount of vegetation on site and the availability of alternative lands

in the vicinity of the site, the Project is not expected to adversely impact this ecosystem service to the local herders.

The grievance mechanism and the contact details for raising concerns or complaints has been disseminated to the stakeholders during the consultation meetings as discussed in Section 6.4 of this report. Should there be specific grievances in regard to this ecosystem service, this can be raised via this process for logging and investigation.

REGULATING SERVICES-REGULATING AIR QUALITY AND CLIMATE CHANGE

Considering the limited vegetative ground cover and a lack of voluminous biomass that would present stores for carbon, the implementation of the Project is not expected to result in the loss of significant carbon sinks.

REGULATING SERVICES- REGULATING WATER FLOWS

The construction phase will result in changes in the direction or the natural flow of surface water from the site. This can potentially divert water flows away from vegetated areas, carry contamination from the construction site, or result in flooding resulting in impacts upon nearby communities and lands.

INVASIVE SPECIES

While the ecological assessment did not identify any existing types of invasive species within the Project area, those can be introduced purposely or unintentionally resulting in adverse impacts on native species and ecosystems. Sources of invasive non-native species include soil procured for use on site, vehicles accessing the site, as well as the selected vegetation for landscape (if any).

3.4.2 Operation

REGULATING SERVICES- REGULATING WATER FLOWS

Considering the low precipitation levels in the Project area and the limited concrete or impermeable surfaces within the Project Plot and the plan to implement a stormwater management system on the Project site to convey rainwater to the surrounding plots, the Project implementation is not expected to have major impacts on groundwater recharge.

The implementation of the Project and the installation of a stormwater network will result in changes in the direction or the natural flow of surface water from the site. This can potentially divert water flows away from vegetated areas or result in flooding which will result in direct impact upon nearby communicates and lands.

INVASIVE SPECIES

During operation, invasive species can be introduced through vehicles accessing the site, as well as the selected types of vegetation for landscape (if any).

3.5 Recommended Mitigation Measures

3.5.1 Construction & Operation

PROVISIONING SERVICE-LIVESTOCK

Implement the required construction mitigation measures and environmental management plans proposed in the ESIA, 2019 for air quality, noise, soil and groundwater, ecology etc. to ensure the project construction does not impact the surrounding plots that are used by herders and thus indirectly impacting their livelihoods.

To ensure the concerns of the local herders are taken into consideration, a robust grievance redress mechanism should be implemented. The contact details of the grievance redress team should be distributed around the site in areas accessible by third parties.

Any complaints or concerns raised should be acknowledged, addressed and closed out in a timely manner.

REGULATING SERVICES- REGULATING WATER FLOWS

The stormwater management measures for the construction phase should take into consideration the existing wadis onsite and the natural flow of surface water while maintaining the existing discharge areas of the wadis to the surrounding plots to the extent possible. The aim should be not to increase water flows (or the speed of water flow) off the site, that could result in additional flooding/water flows downstream.

Maintain good housekeeping practices onsite and ensure proper materials, chemicals and waste management procedures are implemented. Wastes, chemicals, and stockpiles should be stored in contained areas away from water flow pathways.

In addition, a robust grievance redress mechanism should be implemented to ensure the concerns of the local community and surrounding land owners are considered and addressed.

INVASIVE SPECIES

To ensure invasive species are not carried to the site, the following is recommended:

- Ensure soil supplied for construction (if any) is not contaminated with invasive species or carrying seeds from external species.
- Clean vehicle tyres before allowing access to the site.
- Select potential vegetation for landscape from native local species.

4 HUMAN RIGHTS ASSESSMENT

Addendum Rationale: This addendum has been provided in compliance with the LTA requirement to develop a specific Human Rights risks and impacts assessment for the project. This section covers the potential adverse impacts and mitigation measures relevant to human rights including impacts on community, health, safety, security, labour and working conditions as well as gender based violence and harassment.

4.1 Overview

With new requirements under EP IV an increased attention is being given to the accountability of businesses for their impact on human rights and now necessitates the inclusion of a 'Human Rights Impact Assessment' as part of the ESIA for projects financed by Equator Principles Financial Institutions (EPFIs). Accordingly, a Human Rights Impact Assessment has been conducted to evaluate:

- The rights of the local community and herder's who live and work in the surrounding area to a healthy, safe, secure environment; and
- The rights of the labourers to adequate healthy and safe living conditions.
- The rights of the labourers healthy, safe and fair working environment and conditions.

4.2 Standards and Regulations

4.2.1 National Context and Regulations

Saudi Labour law is governed by Royal Decree No. M/51 (23 Sha'ban 1426 / 27th September 2005). The labour law includes terms and conditions of employment in Saudi Arabia required by employers and includes details of worker rights.

The Ministry of Labour (MOL) approved amendments to the Labour Law on 5th April 2015 (Resolution No. 258), which was first published in the official gazette on 24th April 2015.

The Ministry of Labour and Social Development was later merged with Ministry of Civil Service to establish the Ministry of Human Resources and Social Development in 2019, which is the governing Ministry in Saudi Arabia responsible for providing development, support, and protection for the community.

Section 26 of the Basic Law of Governance states the Government is responsible for protecting human rights in accordance with the Shari'a Law that governs the country. Human Rights treaties ratified by the Kingdom include (Treaty Body Database, 2020):

- Convention against Torture and Other Cruel Inhuman or Degrading Treatment or Punishment (23 September 1997);
- Convention on the Elimination of All Forms of Discrimination against Women (7 September 2000);
- International Convention on the Elimination of All Forms of Racial Discrimination (23 September 1997);
- Convention on the Rights of the Child (26 January 1996);
- Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict (10 June 2011):
- Optional Protocol to the Convention on the Rights of the Child on the sale of children child prostitution and child pornography (18 August 2010);
- Convention on the Rights of Persons with Disabilities (24 June 2008);
- The Arab Charter of Human Rights; and
- Geneva Convention (18 May 1963).

In addition, Saudi Arabia is an International Labour Organisation (ILO) member state and has ratified 16 ILO Conventions out of which 6 are part of the IFC Performance Standard 2.

4.2.2 Lender Requirements

IFC PERFORMANCE STANDARD 4-COMMUNITY HEALTH, SAFETY AND SECURITY

This standard establishes requirements for the safeguard of the local community from potential risks associated with the project including impacts associated with the introduction of communicable disease, loss of ecosystem function, site access and operation, material use etc. It requires the Client (and Project) to avoid or minimize the risks and impacts to community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.

IFC PERFORMANCE STANDARD 2-LABOUR AND WORKING CONDITION

- IFC PS2 recognises that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers. This includes rights for direct, contracted and supply chain workers (as applicable for key primary supply chains).

PS 2 is in part guided by several ILO conventions, as follows:

- ILO Convention 87 on Freedom of Association and Protection of the Right to Organize;
- ILO Convention 98 on the Right to Organize and Collective Bargaining;
- ILO Convention 29 on Forced Labour (ratified by KSA);
- ILO Convention 100 on Equal Remuneration (ratified by KSA);
- ILO Convention 105 on the Abolition of Forced Labour (ratified by KSA);

- ILO Convention 111 on Discrimination (Employment and Occupation) (ratified by KSA);
- ILO Convention 138 on Minimum Age (of Employment) (ratified by KSA);
- ILO Convention 182 on the Worst Forms of Child Labour (ratified by KSA);
- UN Convention on the Rights of the Child, Article 32.1; and
- UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families.

In addition to this, PS 2 outlines certain requirements for projects linked to Human Resource (HR) policies, management, working conditions and terms of employment (other elements not linked to the ILO conventions above) as well as key processes for occupational health and safety (OHS) management and grievance redress.

UNITED NATIONS HUMAN RIGHTS GUIDING PRINCIPLES (HRGPS)

HRGP II on "The corporate responsibility to respect human rights" recognises that it is the responsibility of businesses and corporations to respect human rights. It is a global standard of expected conduct for all business enterprises wherever they operate. It exists independently of a States' ability and/or willingness to fulfil their human rights obligations and does not diminish those obligations. The Foundational principles to take into consideration are:

- Principle 11: Business enterprises should avoid infringing on the human rights of others and should address adverse human rights impacts with which they are involved.
- Principle 12: The responsibility of business enterprises to respect human rights refers to internationally recognized human rights – understood, at a minimum, as those expressed in the International Bill of Human Rights and the principles concerning fundamental rights set out in the International Labour Organization's Declaration on Fundamental Principles and Rights at Work.
- Principle-13: The responsibility to respect human rights requires that business enterprises avoid causing or contributing to adverse human rights impacts through their activities and address such impacts when they occur.
- Principle-14: The responsibility of business enterprises to respect human rights applies to all enterprises regardless of their size, sector, operational context, ownership and structure. Nevertheless, the scale and complexity of the means through which enterprises meet that responsibility may vary according to these factors and with the severity of the enterprise's adverse human rights impacts.
- Principle-15: Business enterprises should have policies and processes appropriate to their size and circumstances in place, including:
    - Principle 16: Policy commitment
    - Principle 17 to 21: Human rights due diligence
    - Principle 22: Remediation

The assessment, prevention, monitoring and response measures with regards to GBVH should be underpinned by the following principles:

- Survivor Centred: The rights of GBVH survivors need to be consistently prioritised and used as the starting point for all decisions on efforts to assess, prevent, monitor and respond to GBVH.
- Safe: Survivors, witnesses and those who report and seek to address GBVH can be at risk of retaliation, including threatening and violent behaviour, often from those who do not like their position of power being challenged. Companies should prioritise the safety of those who have experienced, witnessed and reported GBVH.
- Context specific: All measures need to be rooted in a thorough understanding of the local context. Investors and companies should understand the legal and social context and identify the support mechanisms that are in place.
- Collaborative: Companies should seek inputs from a range of internal and external stakeholders to increase the likelihood of broader buy-in and make GBVH prevention more effective.
- Inclusive: Companies should recognise the heightened risks of GBVH faced by certain groups who are subject to discrimination and marginalisation. High risk groups often include people with disabilities, single parents, migrants and ethnic minorities and sexual and gender minorities. The system should also account for illiterate or non-literate people who may not be able to access written information on GBVH reporting mechanisms.
- Integrated: Processes, efforts to assess, prevent, monitor and respond to GBVH needs to be integrated as much as possible into existing processes and management systems, such as occupational health safety, security management systems, environmental and social management systems (ESMS) and human resources (HR) policies and procedures.
- Non-discriminatory: All survivors need to be listened to and treated equally and promote diversity in the work place.
- Well-informed: Companies should draw on relevant expertise when developing prevention and response measures. The grievance mechanism and investigation procedures should be set up to ensure they are appropriate, relevant and safe in the local context.

According to the guidance, the benefits of addressing GBVH include:

- Improves workers' physical and emotional wellbeing and strengthens occupational health and safety.
- Avoids reputational damage, financial risks and legal liabilities for companies, investors and construction contractors.
- Builds relationships and social license to operate in communities. This can result from regular dialogue to understand and track project GBVH risks as well as the effective use of measures to prevent and respond to GBVH.

- Broadens the pool of potential workers that companies can draw upon, including women workers from nearby communities because of lower perceived risk of GBVH.

EQUATOR PRINCIPLES GUIDANCE ON IMPLEMENTATION OF THE EQUATOR PRINCIPLES DURING THE COVID-19 PANDEMIC

The guidance recommends considering the following in the engagement of workforce and management of risks:

Engagement of Workforce

- Communicate its approach to COVID-19 management to its workforce (including contractors) and provide information and advice about the virus.
- Engagement methods should ensure the ability to provide frequent updates with a central information communication network that allows workers to access all the latest information and guidance.
- Consider the need for a 24-hr hotline.
- Design communication in a way that avoids risks of stigma associated with infection in line within available good practice.

Managing Health Risks

Developing a range of actions/procedures to manage workers risks. These procedures must align with the latest guidance/requirements at national/regional/international levels and WHO guidelines. It should also ensure that up to date information is maintained at the Project level and liaise with national/local authorities as applicable.

Welfare and Livelihoods

Where travel restrictions lead to workers remaining on site for longer rotations, fatigue management procedures are recommended. The following measures are also recommended in instances where workforce reduction maybe required:

- Consultation with workers/representatives during the entire process of evaluating viable options.
- Options for avoiding redundancy should be considered in the first instance (e.g. paid/unpaid leave, reduced hours/pay) with retrenchment taken as the last option.
- Reduction in workforce should be undertaken incrementally where possible and regularly reviewed.

Consideration should also be given to risks posed to vulnerable workers i.e. casual workers, woman, workers with childcare issues, supply-chain workers and their needs and support provided as required.

4.3 Project Affected People

4.3.1 Local Communities and Herders

The ESIA prepared by Wood in 2019 did not identify any Indigenous People within the Project Site and the LTA considers the semi-nomadic or nomadic herders occupying the land on a temporary basis Project Affected People (PAPs). Accordingly, the performance standard on Indigenous People does not apply to the project and only the local herders are discussed under this section.

The Project site is located within Sudair Industrial City in Al Majma'ah governorate of the Riyadh administrative region of KSA around 20km south Al Majma'ah city. No private landowners or permanent settlements were identified within the Project site (Wood, 2019). The project activities can potentially result in direct or indirect impacts to employees and visitors of nearby facilities, users of the adjacent roads, as well as nearby communities.

Temporary camps and herders with livestock were evident within the Project area (Wood, 2019). As per the LTA, a recent site visit conducted by the Project Company (PC) in February 2021 indicated the absence of camps and tents from the Project area. While the camps and tents are no longer existing within the Project site, and the consultations with the local herders confirmed that the Plot has not been used by herders for a while, herders are still using the surrounding plots and can be impacted by the Project activities.

Accordingly, Project related activities can increase the risks to local herders, employees and visitors of nearby facilities, users of the adjacent roads, as well as nearby communities.

4.3.2 Project Workers

At this stage, the EPC Contractor has estimated that the peak Project workforce, including subcontractors, will likely be 1,693 workers, although this may vary and is largely dependent on the numbers of workers engaged by sub-contractors (agreements with whom are to be arranged). In addition to the workers, the Project parties employing staff are expected to include:

- Project Company: a total of 20 staff on-site during construction.
- EPC Contractor; a total of 105 management and support staff.
- Sub-Contractors: a total of 120 staff members.

Certain parties may also engage contract staff (e.g. from agencies), where additional manpower is required. There will also be suppliers/service providers for deliveries, waste management etc. who will have access to the site and will be exposed to certain risks.

Accordingly, Project related activities, management processes, living conditions, and work environment can result in potential adverse impacts to employees and workers.

4.4 Potential Project Impacts on Human Rights

4.4.1 Construction

COMMUNITY SAFETY AND SECURITY

All construction projects have potential risks to public safety associated with the use of high-powered equipment, heavy construction equipment, excavation activities, transportation, fire incidents and pollution releases as well as non-authorised parties (including the public) accessing the construction site.

Public risks during construction have the potential to result in isolated incidents, which could be of a devastating magnitude to a person or group of people in the wrong place at the wrong time; however, this rarely occurs. Such impacts are possible due to the location of the Project close to herders and other local receptors.

It is noted that a Grievance Mechanism has been established for the Project, to allow third parties to raise concerns or complaints against the Project without cost, retribution or fear of negative consequences.

The Project will ensure that the right of local communities to a clean and safe environment is safeguarded through the implementation of mitigation and management measures detailed in the ESIA prepared by Wood in 2019 as well as this addendum including adherence to all monitoring requirements.

OCCUPATIONAL HEALTH AND SAFETY

Common activities undertaken during construction such as the movement of heavy machinery, excavation, handling of chemicals works undertaken at height, in confined space, with electrical hazards etc. can introduce risk to the health and safety for the workforce. In particular, risks are more likely to be apparent for those who are not familiar, applicably qualified or otherwise well trained with the type of works undertaken and/or the associated hazards.

The type of hazards attributable to a construction site will vary significantly depending on the construction methods employed and the degree of control implemented by the contractor. The ratio that will be implemented in the Project for the HSE personnel compared to workers is 1:40 for day activities and 1:25 for night activities. These personnel will be dedicated Health, Safety and environment professionals to ensure the EPC workers and affiliated sub-contractors demonstrate consideration of health and safety risks as part of their chosen construction methods and that these risks are appropriately mitigated during the construction phase.

COVID-19 AND OTHER COMMUNICABLE DISEASES

The peak construction phase of the Project will require approximately 1,938 employees and workers including PC, EPC Contactor and Subcontractors as well as suitable accommodation

areas located off-site. Accommodation for management employees will be rented within Al Majmaah City. It is expected that the majority of site staff will be sub-contractor workers who will be based in the existing Himmah Logistics camp located in Sudair Industrial City, however, this is subject to final agreement with the Himmah Logistics Company, otherwise, sub-contractor workers will be accommodated in Al Majmaah City.

Impacts on Workforce

The risk associated with the spread of communicable diseases within workforces is prominent in construction working environments that require close contact and the sharing of equipment, accommodation, canteens and transportation buses between workers.

The current COVID-19 pandemic poses potential risks to the health and safety of the workers and the development of the Project. Workers will be sourced locally but will also include migrant workers from other countries thus increasing the risk of infection (i.e. some workers may come from regions/countries with higher COVID-19 infection cases). Such a high number of workers working in close proximity or confined spaces increases the risk of infection.

Impacts on Surrounding Community

The location of management employees accommodation within Al Majmaah city may also have a possible impact on community health, where integration with local communities takes place, should either parties become infected with a communicable disease (such as COVID-19).

Project site and the EPC workers will be located in Himmah Logistics camp with in Sudair Industrial City or Majmaah city (accommodation is not finalized yet), therefore, it is quite possible that interactions with local populations may take place. Hence, there is some potential for the spread of diseases within the local community (and vice-versa to the workforce).

WORKING CONDITIONS, WELFARE & ACCOMMODATION

Inequality in income, education and opportunities among the workforce is resulting in opportunistic immoral practices with labourers and site staff who consequently suffer.

The quality of living accommodation, living areas, the number of workers per room, facilities and amenities available to workers, maintenance accommodation areas and provisions of associated services (e.g. catering, waste management etc.) can significantly impact the lives of Project workers. This can include a lack of welfare provisions on-site such as clean drinking water, hygienic and ample toilet facilities, hand basins (with soaps/hand wash), temperate rest areas, food and other amenities necessary to the works and the environment.

In addition, due to the ongoing COVID-19 pandemic, movement of workers to their families or home region/countries may be restricted which could leave some feeling isolated, fatigued

and could lead to mental health issues if not properly addressed. Some workers may be required to work from home in cases where schools are closed in order to take care of their children. In such instances, women may be more disproportionately affected than the men.

WORKER / WORKFORCE EXPLOITATION

The Project will have several parties contributing as part of the construction phase, of which there will likely be varying internal processes and protocols for each concerning HR, labour/workforce employment and other related elements.

However, labour exploitation on construction sites, unfortunately, has become a reality in some parts of the world. Examples from other projects within the region have shown that there can be instances of forced labour (including bonded labour), labour with poor contracting conditions, or lacking processes in place to manage such elements. Therefore, potential risks exist regarding the above and are expected to be more prevalent at lower ends of the project hierarchy, particularly for sub-contractors and agency/contract manpower that may need to be engaged.

Gender Inequality & Discrimination

Saudi Arabia eliminated restrictions on women's employment in industrial sectors including construction, however, the construction industry remains lacking in gender equality and is dominated by men. Women are generally more likely to face discrimination in terms of employment or wages, even when they engage in the same tasks as men.

In addition, income earning opportunities for women through direct employment during the construction phase or through indirect employment has the potential to increase household tensions and expose women to cultural pressure or harassment and violence in their homes or communities considering them 'home makers' who should not be engaged in construction work.

The Project will hire four female office-based employees during the construction Phase and allocates designated facilities such as female toilets and resting areas. However, to manage the potential risks, the Project will be required to implement robust HR policies and procedures. In addition, the Project should guarantee the right of all Project workers including women to just and favourable work conditions free of discrimination.

GENDER BASED VIOLENCE AND HARASSMENT, SEXUAL EXPLOITATION & ABUSE AND SEXUAL HARASSMENT

Members of the workforce or the neighbouring communities can potentially face harassment in the workplace or at home in form of Gender Based Violence and Harassment (GBVH), Sexual Exploitation & Abuse (SEA) and Sexual Harassment (SH). Influx in workers from outside the Project region will increase the likelihood of GBV. The constructions workers are likely to be predominantly young male coming from other regions and outside the country. These workers will be away from their families and removed from their normal social spheres. This could

potentially result in peer pressure and involvement in unlawful behaviour. Such behaviour can lead to unwanted aggressive advances and harassment.

During the construction phase, workers will also be vulnerable to various forms of harassment, exploitation and abuse, aggravated by traditionally male working environment.

4.4.2 Operations

COMMUNITY SAFETY AND SECURITY

Although expected to be minimal for a Solar PV project, the Project will carry certain risks that could result in impacts to public/external party safety where such impacts are transferred or received outside of the Project boundaries. Such impacts are unlikely to occur but may relate to fire, Volatile Organic Compound (VOC) fumes, explosions, spills of back-up generator fuels and un-warranted/accidental releases of sanitary wastewater.

The extent of such impacts may range outside of the boundaries of the project and require the involvement of outside agencies to help manage and abate such impacts (e.g. Civil Defence, Police and Army).

Potential risks can arise from non-authorised parties (including the public) accessing the Project. Several measures are considered to reduce those risks including fencing the site and installing monitored gates and hiring security guards either through a 3rd party or direct employees of the Company to prevent the public from trespassing to the site and any malicious intrusion during operation.

A grievance mechanism has been established for the Project, and it includes:

- Verbal complaints/concerns received in person or through phone calls.
- Written complaints/concerns received through emails or grievance boxes located:
  - At the main gate
  - At the gate of the temporary site facilities
  - Around the site

The grievance mechanism should allow third parties to raise concerns or complaints against the Project without cost, retribution or fear of negative consequences.

The Project will ensure that the right of local communities to a clean and safe environment is safeguarded through the implementation of mitigation and management measures detailed in ESIA prepared by Wood in 2019 as well as this addendum including adherence to all monitoring requirements.

OCCUPATIONAL HEALTH AND SAFETY

The risks associated with the operational phase of the project are anticipated to be less than during the construction phase due to reduced site activity and requirements for heavy plant and machinery.

However, there will remain occupational health and safety risks attributable to the operational phase associated with maintenance and inspection requirements and with particular emphasis on electrical hazards (given the nature of the Project). Maintenance and inspection will also still require the use of site vehicles and activities that pose risks to human health and safety.

The severity and likelihood of risks during the operational phase will also be dependent on the frequency and requirements for planned and unplanned maintenance. The O&M team should develop and implement a robust plan to appropriately manage these risks.

A grievance mechanism has been established for the Project and will be implemented to allow employees to express their concerns or complaints without cost, retribution or fear of negative consequences.

COVID-19 AND OTHER COMMUNICABLE DISEASES

The current COVID-19 pandemic poses potential risks to the health and safety of the workers and nearby community. It is expected that Project operation will require around 30 employees from PC, O&M Contractor and subcontractors for security, maintenance, waste management etc. Even though the required number of workers is limited during operation, there is some potential for the spread of diseases among workers, or within the local community and vice-versa to the workforce.

WORKERS CONDITIONS

The number of staff required during operation is limited, however, the lack of welfare provisions on-site such as clean drinking water, hygienic and ample toilet facilities, hand basins (with soaps/hand wash), temperate rest areas, food and other amenities necessary to the works and the environment can impact the lives of Project workers.

No accommodation requirements are planned for the Project's operations.

WORKER / WORKFORCE EXPLOITATION

The operational phase workforce is greatly reduced compared to the construction phase. Furthermore, mainly Project Company staff are expected on-site (as the owner operator). However, it is possible that a certain number of sub-contracted staff may provide security and other services.

As majority of the staff will be direct employees of the Project Company, the potential risks associated with worker exploitation are anticipated to be limited due to consistent processes in place as part of the respective HR management systems, given they are appropriately designed and resources.

However, where there is an agency/contract staff the risks of exploitation (particularly forced and child labour) may be more prevalent.

GENDER BASED VIOLENCE AND HARASSMENT

As majority of the staff will be direct employees of the Project Company, the potential risks associated with violence and harassment are anticipated to be limited due to consistent processes in place as part of the respective HR management systems, assuming they are appropriately designed and resources.

4.5 Recommended Mitigation Measures

4.5.1 Construction

To reduce the impacts on health and safety of the community and site personnel and to ensure the provision of the required human rights during the construction phase, appropriate measures should be implemented. The table below presents the relevant mitigation measures.

Table 4-1 Mitigation & Management Measures – Construction

POTENTIAL IMPACT	MITIGATION AND MANAGEMENT MEASURES
Public/Community Safety	• Risks to public safety will be appropriately addressed and prepared for in an 'Emergency Preparedness and Response Plan'. • Site personnel should be trained in emergency procedures and plans, and the potentially affected receptors should be notified of procedures to follow via relevant communication channels. • Employees shall undergo a Code of Conduct training to ensure smooth coordination with the neighbouring community. • Project induction training will include a section on code of conduct when engaging with local community members. This will include an overview of culturally appropriate measures and etiquette to bear in mind. • The plan will include the appropriate procedure to respond to any such incidents, as well as site-specific contact details and details of external agencies who may be required. • All high-risk areas including fuel storage areas will be secured with internal fencing and will be patrolled by security throughout the day. • Appropriate mechanisms for emergency control (e.g. firefighting equipment) will be placed at suitable positions around the site. • Ensure the implementation of a robust Grievance Mechanism.
Public/Community Security	• The EPC Contractor shall prepare a Security Plan consistent with its Security Risk Assessment. • The project will employ its security staff to provide 24/7 security control across the Project site and dedicated security staff at gatehouses.

Potential Impact	Mitigation and Management Measures
	• All vehicles entering the site will require pre-approved clearance and will need to be registered. • The project site will be guarded during the enabling work's stage and security will manage visitors as per the Security Management Plan • Project security will record all instances of incoming vehicles. • CCTV will be installed at key locations around the site and gatehouses. • Appropriate lighting will be provided at gatehouses for security personnel to prevent unauthorised access. • Project personnel will only be provided access to the construction site with valid ID cards and permits to work in line with Health Safety and Environment (HSE) requirements. • People trying to gain unauthorized access to the site without appropriate permits and PPE will not be permitted, or will be removed from site if identified and an investigation carried out on how they were able to access the site and corrective action taken. • The security personnel will be regularly trained on GBVH code of conduct including how to handle grievances related to GBVH from the community.
Occupational Health and Safety	• The EPC Contractor will provide all workers with a safe and healthy work environment, considering inherent risks and specific classes of hazards associated with the project. • The EPC Contractor shall implement and maintain an OHS management system considering specific risks associated with the project, legal requirements and duty of care. • The EPC Contractor shall be responsible for ensuring that all affiliated sub-contractors comply with the OHS management system. The OHS management system shall be in-line with recognised international best practice and as a minimum, this plan shall include: o Means of identifying and minimising, so far as reasonably practicable, the causes of potential H&S hazards to workers. o Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances. o Provision of appropriate protective equipment to minimise risks, and requiring and enforcing its use. o Training of workers, and the provision of appropriate incentives for them to use and comply with OHS procedures and protective equipment. o Documentation and reporting of occupational accidents, diseases and incidents. o Emergency prevention, preparedness and response arrangements.
Staff/Community exposure to communicable diseases and risks associated with COVID 19 specifically	• Staff and workers shall have access to medical insurance, health professionals and suitable medical facilities, which will aim to prevent the spread of diseases internally and externally. • Any reportable disease shall be diagnosed by the authorized medical centre doctors. Diagnosis includes identifying any new symptoms or any significant worsening of existing symptoms. • The potential for exposure to water-borne, water-based, vector-borne diseases and communicable diseases as a result of project activities will be avoided or minimized. • Any external and internal spreading diseases shall be diagnosed and the precautions as per the instructions from the national/local medical authority shall be implemented.

Potential Impact	Mitigation and Management Measures
	• The Health and Safety Team on site should provide advice during training/inductions on exposure to diseases, including national and project requirements for COVID-19 (or any other infectious disease that may be present). • Develop a COVID-19 specific communication procedure for the workforce. • Provide a 24hr emergency hotline. • Isolate/care for sick and potentially infected staff and workers. • Identify any vulnerable groups (i.e. those with pre-existing conditions) working in the Project site (for the EPC and sub-contractors) and take precautionary measures in accordance with the national and WHO guidelines. • Provide testing for staff as required at no cost to them. • Ensure that social distancing measures are put in place i.e. allow some of the office staff to work from home, working in shifts etc. • Promote personal hygiene among the workers and provide training and posters to remind workers to wash their hands regularly, clean their work areas and equipment, sanitize properly etc. • Provide COVID-19 PPE to all workers. • Ensure social distancing, proper ventilation, hygiene within workers accommodation. • Coordinate and regulate transportation of workers and access to the site i.e. through reduced bus occupancy, temperature and PPE checks etc. • Provide a flexible working regime for employees who may prefer to work from home due to health issues, childcare, home schooling etc. without fear of victimisation. • Address mental health issues where workers are not able to travel back to their families due to travel restrictions, through induction and provide information on how to seek help from local experts. • Reporting of illness and self-isolation will be encouraged and there will be zero tolerance for discrimination against sick workers. • Regularly review and update information/requirements in the ever-evolving situation including daily review of COVID-19 updates from WHO, national/regional public health authorities etc.
Worker Welfare (site)	• Ensure that welfare provisions are available on-site, including but not limited to: o Hygienic and regularly cleaned toilets (commensurate to applicable requirements or good practices for the quantity required on-site, or in areas of the site), o Basins and running clean water, with hand-wash/soap for hand cleaning, o Rest areas (with air conditioning, chairs and tables), o Clean drinking water available in working areas (at a suitable temperature) • If applicable suitable and hygienic areas for eating and storing food (including refrigerators, heating devices [ovens/microwaves] etc.)
Worker Accommodation	• Provide accommodation that complies with the IFC & EBRD Workers Accommodation: Processes and Standards (2009)
Workers Conditions - Terms of Employment, Non-discrimination and	• Project parties will establish HR Policies and processes to ensure working conditions and terms of employment are compliant with the requirements of National Labour Law, IFC PS 2 and associated ILO conventions.

Potential Impact	Mitigation and Management Measures
equal opportunities, Working Relationships	• Project employment relationships shall be on the principle of equal opportunity and fair treatment, and will not discriminate concerning any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. • Project parties will not make employment decisions based on personal characteristics, such as gender, race, nationality, ethnic origin, religion or belief, disability, age or sexual orientation, unrelated to inherent job requirements. • Project parties will document and communicate to all workers their working conditions and terms of employment including their entitlement to wages, hours of work, overtime arrangements and overtime compensation, and any benefits (such as leave for illness, maternity/paternity, or holiday). *Special measures of protection or assistance to promote local employment opportunities or selection for a particular job based on the inherent requirements of the job, which are per national law, will not be deemed discrimination.*
Workers Conditions- Forced Labour	• Project parties will not employ forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements. • Such requirements are also applicable in the hiring of agency/other contracted manpower, for which processes should be in place by the Project party to undertake due diligence on the agency providing the manpower. Where potential risks of forced labour are identified other suppliers with reputable processes and controls should be sought. • HR policies and procedures will be adapted appropriately to the size of the workforce required for the Project. Policies and procedures must be prepared to demonstrate consistency with the requirements of national legislation and IFC PS 2.
Workers Conditions- Child Labour	• Project parties will comply with all relevant national laws provisions related to the employment of minors. • In any event, project parties will not employ children in a manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. • Young people below the age of 18 years will not be employed in hazardous work and all work of persons under the age of 18 shall be subject to an appropriate risk assessment • Such requirements are also applicable in the hiring of agency/other contracted manpower, for which processes should be in place by the Project party to undertake due diligence on the agency providing the manpower. Where potential risks of child labour are identified other suppliers with reputable processes and controls should be sought.
Workers Conditions- Wages, benefits, conditions of work and retrenchment	• HR policies and procedures will be adapted appropriately to the size of the workforce required for the Project. Policies and procedures must be prepared to demonstrate consistency with the requirements of national legislation and IFC PS 2 and include a code of conduct on GBVH. • Wages, benefits and conditions of work offered should, overall, be comparable to those offered by equivalent employers in the relevant region of that country/region and sector concerned.

Potential Impact	Mitigation and Management Measures
	• If Project parties anticipate collective dismissals associated with the proposed project, the parties shall develop a plan to mitigate the adverse impacts of retrenchment, in line with national law and good industry practice and based on the principles of non-discrimination and consultation. Without prejudice to more stringent provisions in national law, such consultation will involve reasonable notice of employment changes to the workers' representatives and, where appropriate, relevant public authorities so that the retrenchment plan may be examined jointly to mitigate adverse effects of job losses on the workers concerned. The outcome of the consultations will be reflected in the final retrenchment plan.
Workers Conditions- Key Supply Chain (i.e. PV module suppliers)	• Project parties shall devise and implement applicable controls to ensure the measures herein are implemented by any sub-contractors and the requirements for workers conditions are included in the pre-qualifications criteria for selection of key contractors and suppliers. • Project parties will take reasonable steps to inquire about the use of child labour and forced labour in their supply chains and try to exert influence where possible or identify other suppliers.
Grievance Mechanism	• A grievance mechanism for workers will be provided to raise reasonable workplace concerns. • Workers will be informed of the grievance mechanism at the time of hiring and make it easily accessible to them. • The mechanism will involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides feedback to those concerned, without any retribution. • The mechanism will not impede access to other judicial or administrative remedies that might be available under law or through existing arbitration procedures, or a substitute for grievance mechanisms provided through collective agreements. • Grievance mechanism should be used to monitor worker morale, understand how workers are affected and what their concerns are in relation to COVID-19 and address pressing matters promptly. • The grievance mechanism shall provide for confidential reporting and a support system for any workers reporting issues relating to GBVH. The grievance mechanism will also allow for reporting through word of mouth for those who cannot write. • A grievance mechanism for community members will be provided to raise concerns or complaints. • Community members will be informed of the grievance mechanism through stakeholders' engagement and make it easily accessible to them. • Complaints will be acknowledged, addressed, and closed out in a timely manner.
Violence and Harassment	• The Project parties will conduct a GBVH risk assessment in consultation with relevant stakeholders including women leaders and those working with young adolescent girls and boys. This will also include the identification of potential interventions and risk mitigation measures. • Awareness training will be mandatory for all Project workers regarding the GBVH risks and the workers responsibilities and the legal consequences of being a perpetrator. • Information will be provided on how to report any cases of violence or harassment and the services that will be made available to offer support to any of the survivors.

Potential Impact	Mitigation and Management Measures
	• Approach towards GBVH prevention, mitigation and response will be survivor centred and ensure confidentiality, dignity and respect to them. • The Project staff will be trained on how to preserve the safety of the women, girls, boys when interviewing them and collecting information about their experiences on GBVH. • The project will provide essential services for survivors such as access to counselling services, support groups, legal support etc. at no cost to them. • All determined cases of GBVH will be referred to relevant legal entities in the Project area for further investigation and prosecution. • The Project grievance mechanism will be made available to project workers and community members and will ensure that survivors' information is confidential and kept anonymous. • All cases relating to GBVH shall be documented and closed.

4.5.2 Operation

To reduce the impacts on health and safety of the community and site personnel and to ensure the provision of the required human rights during the operation phase, appropriate measures should be implemented. The table below presents the relevant mitigation measures.

Table 4-2 Mitigation & Management Measures – Operation

Potential Impact	Mitigation and Management Measures
Public/Community Safety	• Risks to public safety will be appropriately addressed and prepared for in the operational phase 'Emergency Preparedness and Response Plan' and training. • The plan will include the appropriate procedure to respond to any such incidents, as well as site-specific contact details and details of external agencies who may be required. • All high-risk areas including fuel storage areas (such as at the Emergency Generator) will be secured. • Appropriate mechanisms for emergency control (e.g. firefighting equipment) will be placed at suitable positions around the site. • The employees during the operational phase shall undergo a Code of Conduct training to ensure smooth coordination with the neighboring community. • Grievance Redressal Mechanism shall be made accessible to the community to ensure that community members raise grievances to the Project leadership.
Public/Community Security	• The project will employ its security staff who will provide 24/7 security control across the Project site and dedicated security staff at gatehouses. • The security personnel will be regularly trained on GBVH code of conduct including how to handle grievances related to GBVH from the community. • All vehicles entering the site will require pre-approved clearance and will need to be registered. Project security will record all instances of incoming vehicles. • CCTV will be installed at key locations around the site and gatehouses.

Potential Impact	Mitigation and Management Measures
	• Appropriate lighting will be provided at gatehouses for security personnel to prevent unauthorised access. • Project personnel will only be provided access to the construction site with valid ID cards and permits to work in line with HSE requirements. • Security arrangements will be in line with the KSA National Standards. In addition to this, security personnel will receive internal training aligned to the UN requirements on the control of force by law enforcement officials. Additional training will be provided to access gate staff regarding grievances, reporting such grievances and dialogue with any members of the local community.
Occupational Health and Safety	• The Project Company will provide the workers with a safe and healthy work environment, considering inherent risks and specific classes of hazards associated with the project. • The Project Company shall implement and maintain an ohs management system considering specific risks associated with the project, legal requirements and duty of care. • The Project Company shall be responsible for ensuring that all affiliated sub-contractors comply with the OHS management system. The OHS management system shall be in-line with recognised international best practice and as a minimum, this plan shall include: o Means of identifying and minimising, so far as reasonably practicable, the causes of potential H&S hazards to workers. o Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances. o Provision of appropriate equipment to minimise risks, and requiring and enforcing its use. o Training of workers, and the provision of appropriate incentives for them to use and comply with H&S procedures and protective equipment. o Documentation and reporting of occupational accidents, diseases and incidents. o Emergency prevention, preparedness and response arrangements
Staff/Community exposure to communicable diseases and risks associated with COVID 19 specifically	• Staff and workers shall have access to medical insurance, health professionals and suitable medical facilities, which will aim to prevent the spread of diseases internally and externally. • Any reportable disease shall be diagnosed by the authorized medical centre doctors. Diagnosis includes identifying any new symptoms or any significant worsening of existing symptoms. • The potential for exposure to water-borne, water-based, vector-borne diseases and communicable diseases as a result of project activities will be avoided or minimized. • Any external and internal spreading diseases shall be diagnosed and the precautions as per the instructions from the national/local medical authority shall be implemented. • Develop a COVID-19 specific communication procedure for the workforce. • Provide a 24hr emergency hotline. • Isolate/care for sick and potentially infected staff and workers. • Identify any vulnerable groups (i.e. those with pre-existing conditions) working in the Project site and take precautionary measures in accordance with the national and WHO guidelines.

Potential Impact	Mitigation and Management Measures
	• Provide testing for staff at no extra cost to them. • Ensure that social distancing measures are put in place i.e. allowing some of the office staff to work from home, working in shifts etc. • Promote personal hygiene among the workers and provide training, posters to remind workers to wash their hands regularly, clean their work areas and equipment, and sanitize properly etc. • Provide COVID-19 PPE to all workers. • The transportation of workers and access to the site shall be coordinated and regulated i.e. through reduced bus occupancy, temperature and PPE checks etc. • Provide a flexible working regime for those workers who may prefer and are able to work from home due to health issues, child care, home schooling etc. without fear of victimisation. • Address mental health issues during induction and provide information on how to seek help from local experts. • Regularly review and update of information/requirements in the ever-evolving situation including daily review of COVID-19 updates national/regional/international public health authorities etc.
Worker Welfare (site)	• Project parties will ensure that welfare provisions are available on-site, including but not limited to: o Hygienic and regularly cleaned toilets (commensurate to applicable requirements or good practices for the quantity required on-site, or in areas of the site), o Basins and running clean water, with hand, wash for hand cleaning, o Rest areas (with air conditioning, chairs and tables), o Clean drinking water available in working areas (at a suitable temperature) o If applicable suitable and hygienic areas for eating and storing food (including refrigerators, heating devices [ovens/microwaves] etc).
Workers Conditions-Terms of Employment, Non-discrimination and equal opportunities, Working Relationships	• Project parties will establish HR Policies and processes consistent with the requirements of National Labour Law, IFC PS 2 and associated ILO conventions. • Project parties will provide a plan detailing how working conditions and terms of employment are compliant with national labour, social security and occupational health and safety laws. • Employment relationships shall be on the principle of equal opportunity and fair treatment, and will not discriminate concerning any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. • Project parties will not make employment decisions based on personal characteristics, such as gender, race, nationality, ethnic origin, religion or belief, disability, age or sexual orientation, unrelated to inherent job requirements. • Project parties will document and communicate to all workers their working conditions and terms of employment including their entitlement to wages, hours of work, overtime arrangements and overtime compensation, and any benefits (such as leave for illness, maternity/paternity, or holiday). *Special measures of protection or assistance to promote local employment opportunities or selection for a particular job based on the*

Potential Impact	Mitigation and Management Measures
	inherent requirements of the job, which are following national law, will not be deemed discrimination.
Workers Conditions-Forced Labour	• Project parties will not employ forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements. ◦ HR policies and procedures will be adapted appropriately to the size of the workforce required for the Project. Policies and procedures must be prepared to demonstrate consistency with the requirements of national legislation and IFC PS 2 and include a code of conduct on GBVH. • Such requirements are also applicable in the hiring of agency/other contracted manpower, for which processes should be in place by the Project party to undertake due diligence on the agency providing the manpower. Where potential risks of forced labour are identified other suppliers with reputable processes and controls should be sought.
Workers Conditions-Child Labour	• Project parties will comply with all relevant national laws provisions related to the employment of minors. • In any event, project parties will not employ children in a manner that is economically exploitative, or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development. • Young people below the age of 18 years will not be employed in hazardous work and all work of persons under the age of 18 shall be subject to an appropriate risk assessment • Such requirements are also applicable in the hiring of agency/other contracted manpower, for which processes should be in place by the Project party to undertake due diligence on the agency providing the manpower. Where potential risks of child labour are identified other suppliers with reputable processes and controls should be sought.
Workers Conditions-Wages, benefits, conditions of work and retrenchment	• Wages, benefits and conditions of work offered should, overall, be comparable to those offered by equivalent employers in the relevant region of that country/region and sector concerned. • If Project parties anticipate collective dismissals associated with the proposed project, the parties shall develop a plan to mitigate the adverse impacts of retrenchment, in line with national law and good industry practice and based on the principles of non-discrimination and consultation. Without prejudice to more stringent provisions in national law, such consultation will involve reasonable notice of employment changes to the workers' representatives and, where appropriate, relevant public authorities so that the retrenchment plan may be examined jointly to mitigate adverse effects of job losses on the workers concerned. The outcome of the consultations will be reflected in the final retrenchment plan. • Where workers have to be retrenched due to the economic impacts of COVID-19, this shall be carried our incrementally and consider options avoiding redundancy with retrenchment as the last option. • The workers/representatives shall be involved on any labour reduction measures including those relating to COVID-19.

Potential Impact	Mitigation and Management Measures
Workers Conditions- Key Supply Chain (if any)	• Project Company shall devise and implement applicable controls to ensure the measures herein are implemented by any sub-contractors and are internally checked/audited. • Project Company shall take reasonable steps to inquire about the use of child labour and forced labour in their supply chains and try to exert influence where possible or identify other suppliers.
Grievance Mechanism	• A grievance mechanism for workers will be provided to raise reasonable workplace concerns. • Workers will be informed of the grievance mechanism at the time of hiring and make it easily accessible to them. • The mechanism will involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides feedback to those concerned, without any retribution. • The mechanism will not impede access to other judicial or administrative remedies that might be available under law or through existing arbitration procedures, or a substitute for grievance mechanisms provided through collective agreements. • A grievance mechanism for community members will be provided to raise concerns or complaints. • Community members will be informed of the grievance mechanism through stakeholders' engagement and make it easily accessible to them. • Complaints will be acknowledged, addressed, and closed out in a timely manner.
Violence and Harassment	• The Project parties will conduct a GBVH risk assessment in consultation with relevant stakeholders including women leaders and those working with young adolescent girls and boys. This will also include the identification of potential interventions and risk mitigation measures. • Awareness training will be mandatory for all Project workers regarding the GBVH risks and the workers responsibilities and the legal consequences of being a perpetrator. • Information will be provided on how to report any cases of violence or harassment and the services that will be made available to offer support to any of the survivors. • Approach towards GBVH prevention, mitigation and response will be survivor centred and ensure confidentiality, dignity and respect to them. • The Project staff will be trained on how to preserve the safety of the women, girls, boys when interviewing them and collecting information about their experiences on GBVH. • The project will provide essential services for survivors such as access to counselling services, support groups, legal support etc. at no cost to them. • All determined cases of GBVH will be referred to relevant legal entities in the Project area for further investigation and prosecution. • The Project grievance mechanism will be made available to project workers and community members and will ensure that survivors' information is confidential and kept anonymous. • All cases relating to GBVH shall be documented and closed.

4.6 Monitoring

The protection of human rights is an on-going process, and this should be reflected in the Projects internal management policies.

It will be expected from the EPC Contractor (for construction) and the O&M Company (for operations) to be the primary parties for ensuring that mitigation measures are internally audited, and processes are in place to protect labourers, subcontractors, suppliers, as well as the surrounding community. Monitoring required is provided in the Table below.

Table 4-3 Key Monitoring Indicators during Construction and Operation

MONITORING	PARAMETER	FREQUENCY & DURATION	MONITORING LOCATIONS
Worker Contracts & HR	Records of contracts, payments, receipt of benefits, leave entitlements, retrenchment etc.	On-going	For all Project workers (direct staff) and oversight of sub-contractor staff dedicated to the project
Women employed in the Project	Number of women employed in the project including their rank and renumeration compared to men occupying the same positions.	On-going	For all female Project personnel including those employed by the sub-contractors.
Worker Welfare	Quality, appropriate numbers and suitable locations of Sanitation Facilities, Office Spaces, Welfare and Rest Areas	On-going	At all such facilities on-site
Quality of Accommodation	Inspection/internal audit of worker accommodation facilities vs. IFC & EBRD standards	Monthly	All accommodation facilities provided to direct and full time sub-contracted labour.
OH&S Near Misses (involving external parties)	Any classified near miss	On-going	n/a
OH&S Emergency Situations and Incidents	Any classified emergency situation or incident	On-going	n/a
Grievances and disputes including those relating to gender-based violence and harassment, sexual exploitation & abuse and sexual harassment	Grievances received	On-going	Project site and any other grievances received from communities in reference to Project workforce including suppliers.
Health of the workers	Records of the illnesses the workers are suffering from and an analysis of top diseases.	On-going	Project site clinic or first aid facility
	COVID-19	Daily	All Project site workers including those under different sub-contractors, suppliers etc.

Monitoring	Parameter	Frequency & Duration	Monitoring Locations
Human rights complaints/violations as reported by Project workers including workers hired through third-parties or in the supply chain	Grievances received	On-going	As defined in the Stakeholder Engagement Plan (SEP)
Emergency Situations and Incidents	Any classified emergency situation or incident	On-going	n/a
Environmental emissions	As per the recommendations of WOOD ESIA, 2019		

5 CUMULATIVE IMPACTS ASSESSMENT

Addendum Rationale: This addendum has been prepared to provide an assessment of the cumulative impacts of the Project and the potential future development plans within the Project's area.

5.1 Overview

Cumulative impacts are those that 'result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones.' Cumulative Impact Assessment (CIA) is therefore the process of:

- Analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and environmental and social external drivers on the chosen Valued Environmental and Social Components (VECs) over time; and
- Proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk to the extent possible.

The purpose of a cumulative impact assessment is to determine how the potential impacts of a proposed development might combine cumulatively, with the potential impacts of other projects or human activities as well as natural stressors such as droughts or extreme climatic events.

The objectives and expected outcomes of a CIA process are as follows:

- Identification of Valued Environmental and Social Components (VECs) such as air, water, soil etc. that may be affected by the Project and the selected VECs the assessment will focus on;
- Identification of existing and reasonably anticipated and/or planned developments, as well as natural environmental and external social drivers, that could affect the selected VECs;
- Assessment and/or estimation of the future condition of selected VECs, as the result of the cumulative impacts that the development is expected to have, when combined with those of other reasonably predictable developments;
- Evaluation of the future condition of the VECs relative to established or estimated thresholds of VEC condition or to comparable benchmarks;
- Avoidance and minimization of cumulative impacts of the Project on the VECs and
- Monitoring and management measures to ensure the VEC viability over the life span of the development or its impacts.

5.2 Identification of Valued Environmental and Social Components

For the purpose of this ESIA Addendum, the CIA is undertaken to establish whether there are barriers to both on-going and future development within the Projects Area of Influence (AoI). At the time of writing, only those developments outlined in section 5.3 below are known.

The following table presents the different environmental and social components or aspects that have the potential to be impacted by the construction & operation of on-going activities and planned developments within the Project's AoI.

Table 5-1 Valued Environmental and Social Components

Environmental and Social Components	Considered VEC to be included in CIA?	Justification for Inclusion or Exclusion
Air Quality	**No**	Project related impacts on ambient air quality would be those associated with construction: temporary emissions from vehicles, dust from earthworks and vehicle movements within the Project. Given the location of the other Projects outside the Sudair PV Project AoI (15 to 50 km away), cumulative impact on air quality with respect to dust generation and gaseous emissions is therefore not anticipated.
Noise and Vibration	**No**	Project related impacts with regards to nuisance to sensitive receptors from noise and vibration would be those associated with construction. Given the location of the other Projects outside the Sudair PV Project AoI (15 to 50 km away), cumulative impact on noise quality is therefore not anticipated.
Soils, Geology and Groundwater	**No**	Project related impacts on soil and groundwater quality would be those related to the potential contamination of soil and groundwater resources during construction. Groundwater abstractions are not expected for project construciton or operaiton. Such impacts will be localized and limited within the Project boundaries, with no potential for cumulative effects with other developments.
Hydrology, Surface Water Drainage and Flood Risk	**No**	Project related impacts on hydrology or surface water would be those related to surface water, alteration of surface water flow, and flood risk during construction as well as during operation. Such risks would be limited to the sub-catchment at the Project area, which are different to the sub-catchments at other more distant projects. Further, there are no surface water features at the project or in the nearby area that may be subject to cumulative impacts.
Terrestrial Ecology	**Yes**	Project related impacts with regards to terrestrial ecology would be those associated with the land clearance and loss of typical habitat for fauna and flora. Any planned development will also require land clearance of habitat. This could result in cumulative impacts on terrestrial ecology (i.e. habitat loss or adaptation). This is particularly

Environmental and Social Components	Considered VEC to be included in CIA?	Justification for Inclusion or Exclusion
		pertinent due to the potential large land areas for development of the other known projects.
Landscape and Visual	**No**	Given that potentially sensitive receptors are restricted to users of the nearby roads and the presence of existing anthropogenic and industrial features in the landscape, minimal impact on Landscape and visual is anticipated. The known future development Projects are located outside the Project's AoI and therefore cumulative impact on landscape and visual is not anticipated.
Archaeology and Cultural Heritage	**No**	Project related impacts in relation to archaeology and cultural heritage would mainly be those related to the excavation, earthworks and clearance of the Project site and the potential for encountering unknown buried archaeological remains. The impact will be limited to the Project area and therefore cumulative impacts on Archaeology and Cultural Heritage are not anticipated.
Socio-economics	**Yes**	Project socio-economics impacts are those related to creation of employment (beneficial impact) and dissemination of skills; which will likely be beneficial regionally. Therefore, positive cumulative socio-economic impacts are anticipated.
Traffic and Transportation	**Yes**	Project impacts on Traffic and Transportation are related to the increased road traffic during both construction and operational phases for the transportation of workers and employees, material, and waste. The construction phase will most likely have the most noticeable impact on traffic flows, due to the amount of vehicles, plant and equipment required. During operations there will be relatively few daily movements. Where the constrution phase coincides with other projects, there is potential for cumulative impacts on traffic.
Community Health, Safety and Security	**Yes**	Project related impacts with regards to community health, safety and security would mainly be those associated with construction: influx of workers, public trespassing, security concerns as well as incidents (accidents) from the presence of vehicles, heavy plant and machinery. Cumulative impacts are anticipated as a result of influx of workers and if worker accommodation are shared or established in nearby areas.
Worker Conditions & Occupational Health and Safety	**No**	Project related impacts with regards to worker conditions and occupational health and safety would mainly be those associated with construction and will depend on conditions within the Project site as well as depending on Project-specific construction activities. Cumulative impacts with other projects are therefore not envisaged.

5.3 Identification of other Activities and Environmental Drivers

Consultation meetings were conducted with the Chamber of Commerce and Industry of Al Majmaah on the 16th of June 2021 and MODON on the 20th of June 2021 to identify the future planned projects located in the project vicinity.

According to the representative of MODON Mr. Ahmed Al Mudhi, future projects will potentially be developed in the Project vicinity within Sudair Industrial area, however those Projects have not been determined yet and therefore details regarding their type and locations are not available at this stage. The planned projects can potentially result in cumulative impacts if their timeline overlaps. However, given that the future development plan within the Project's area of influence is not known yet, it is not possible to speculate the potential cumulative impacts relating to future projects planned for Sudair Industrial area.

In addition, the Chamber of Commerce and Industry of Al Majmaah was consulted to confirm other future Projects in the projects area. According to its representative Mr. Tariq Mohammed Al Haidary, the following developments were identified in the Project area.

Table 5-2 Known and Future Projects in the Project's Area

Project Name	Distance to Project	Start-Up Date
The Dry Port expected to cover an area of around 30,000,000 m² area.	15 km	Construction is expected to start mid 2022
Sudair Industrial City	25 km	Construction is ongoing Operating date is unknown
King Faisal Air Academy	50 km	Construction is ongoing Operating date is within 2 years

The Projects identified by the Chamber of Commerce and Industry are located outside the Project's area of influence for environmental impacts and are therefore not anticipated to result in cumulative impacts.

Although unlikely due to distance separation, there are potential cumulative impacts on some VECs including socio-economics, terrestrial Ecology, Traffic & Transportation and community health and safety are discussed and assessed in this addendum.

5.4 Assessment of Cumulative Impacts on VECs

The impacts on the main VECs that have been considered for the purpose of this cumulative impacts assessment during construction and operation are provided in the Table below.

Table 5-3 Summary of Cumulative Impacts (Qualitative Assessment)

RECEPTORS	CONSTRUCTION	OPERATION
Socio-Economics		
Impacts from Sudair PV IPP	• Increased employment opportunities and the diversification of existing skills of the labour force will result in positive impacts on the local and national economy. • Increased traffic, waste, and water consumption will increase the pressure on existing infrastructure. The influx of workers will increase pressure on local healthcare infrastructure. • Impact on the livelihood of the local herders using the Project plot for grazing. The ESIA indicated the presence of tents and herders in the Project site, however, no consultations were conducted at that time to determine the need for resettlement or compensation. ***Note:*** *The consultations conducted in June 2021 indicated that the Plot was previously informally used by seasonal herders and has not been used for a while now, and the herders did not raise any concerns regarding their livelihood considering alternative Plot are available for use. Therefore, the need for resettlement was not identified.*	• Positive economic impacts as a result of increased job opportunities. • Positive impacts through contributing to the national renewable energy targets and maintaining security of electricity supply.
Impacts from other Projects	• The development of the future Projects will result in similar impacts to those resulting from the construction of the Sudair PV IPP Project.	• Positive economic impacts as a result of increased job opportunities.
Cumulative Impacts	**Development of the Projects at the same time will lead to:** • **Increase in local employment.**	• **Positive impact in terms of increase in employment opportunities.**

Receptors	Construction	Operation
	• **Loss of livelihood of herders due to reduced available lands for grazing.**	
Terrestrial Ecology		
Impacts from Sudair PV IPP	• As per the Wood ESIA, the habitats identified at the project area are typical of wider desert regions. Habitats of the Project Site and the Study Area are limited in diversity and coverage. The Project Site and the surrounding desert land is mostly barren and supports a very little permanent animal and plant life. Despite this, the project will result in a large area of habitat loss and vegetation removal, which would impact upon species that inhabit these areas. • The ESIA indicates the potential for certain bird species (e.g., MacQueen's Bustard) based on the expected wintering range, as well as the potential for migrating birds to cross the site; although unlikely to come to ground. • 'Evidence of Arabian Red Fox (Vulpes vulpes arabica) was found in a number of locations around the northern and eastern edges of site with active holes and fresh scat present.' Small mammals are also likely but were not observed. • Two lizard species were observed on-site including one Spiny-Tailed Lizard, which has subspecies of IUCN conservation value (although not specified in the Wood ESIA).	• Certain studies, including Horvath et al. (2009) have theorised a possible phenomenon known as 'lake effect', where water-obligate birds (typically waterbirds that require water for foraging, reproduction and/or roosting and those that cannot take-off from land) may be attracted to and collide with Solar PV modules, mistaking these for lakes. There is little further research on this and papers by Hathcock (2019) and Kosciuch et al. (2020) (a study specifically about bird mortality at solar PV projects) indicate that there is no firm data to evidence this in practice. Observations by 5 Capitals from a number of Solar PV sites in the Middle East and North Africa have not included bird carcasses, and operators have not reported bird mortality occurring on a frequent basis. • In the event that 'lake effect' is a potential factor, the lack of waterbodies is not likely to result in impacts to resident birds. Although KSA is close to certain regional migratory fly-ways (e.g. the Red Sea, and along the eastern coast of KSA), migrating birds are known to primarily follow coastlines or historic flight paths that have included numerous waterbodies and /or water courses. As these features are not present in central KSA, it is unlikely that migrating birds would be frequent in this area and could be affected. • At this stage, lake effect is not considered to be a significant factor on bird mortality at this location in central KSA.
Impacts from other Projects	• Impacts will depend on the exact location of the projects and the existing ecology. However, considering the similarities of the sites in the area in general, the impacts during the construction phase of the future Projects are expected to be similar to those resulting from Sudair PV IPP (as above).	• Further to construction related habitat loss and potential regional habitat fragmentation, details on the future operations of the identified development Projects are not specifically known (as would be outlined in an ESIA). • However, considering the King Faisal Air Academy impacts to birds may occur at low altitudes where birds coincide with the flight paths of aircraft during take-off, climb, descent and

Receptors	Construction	Operation
		approach. The KSA Aviation Investigation Bureau reported bird strike statistics occurring on 5 KSA airlines between January to October 2017, with 24 reported events occurring in the busy Riyadh area. Given that the King Faisal Air Academy will likely have far fewer flights and will operate smaller aircraft, the likelihood of bird strikes is expected to be far fewer than this and is not likely to result in a cumulative impacts alongside impacts from the Sudair PV IPP.
Cumulative Impacts	• **Based on the limited flora and fauna diversity of the Project area, cumulative impacts are expected to be minimal.**	• **Based on the limited flora diversity of the Project area, cumulative impacts are expected to be minimal. However, reducing the availability of lands for herders can increase the pressure on surrounding plots.**
Traffic and Transportation		
Impacts from Sudair PV IPP	• Increased traffic on local roads for the transportation of workers, construction equipment/machinery, and materials which can also pose safety risks to the local community and farmers.	• Transportation impacts during operations are not expected to be significant and will be mainly related to transportation of workers. These impacts are not expected to result in noticeable increases of traffic along local roads and certainly not on major roads.
Impacts from other Projects	• Impacts on traffic and transportation are expected to be similar to the impacts identified for the Sudair PV IPP.	• Considering the nature of the known projects, especially the Dry Port and Sudair Industrial Area, pressure to the local roads in these areas is expected, as well as increase in vehicles along key highways leading to these areas. • 5 Capitals has not had access to traffic impact studies for these projects.
Cumulative Impacts	• **If the construction phases of the projects overlap, there is expected to be the potential for noticeable cumulative impacts on traffic on main roads and highways, which may be common for these projects. Cumulative impacts on local roads are not expected due to the separation in distance between these projects.** • **As cumulative impacts would only be limited to main roads, and as highways in KSA tend to be relatively free-flowing, the ultimate impact on road network availability will not likely be of significance.**	• **The pressure on the roads infrastructure due to additional traffic will increase once all projects are operational.** **The ESIAs prepared for the planned developments are not available, however, considering the nature of those projects as key logistical services (particularly the dry port), it is assumed that project specific traffic and transportations studies will be conducted to identify the impacts on road infrastructure and any required upgrades for additional traffic.**

Receptors	Construction	Operation
		Therefore, the resulting cumulative impacts on roads infrastructure is not anticipated to be significant, but may be noticeable.
Community Health and Safety		
Impacts from Sudair PV IPP	• Impacts to community health, safety and security will be low in relation to conduct of workforce in the community, spread of diseases and illnesses, incidents and accidents from operation of vehicles and machinery etc with the implementation of mitigation and management measures. • The risk of COVID-19 infections could be high if the safety precautions and procedures are not adhered to.	• Impacts related to operations will mainly be: new workers, public trespassing, as well as incidents (accidents) from equipment operation and the Project vehicles. • The Project is expected to be fenced and with security guards to ensure that there is no unauthorised access into the site.
Impacts from other Projects	• The impacts to community health and safety are expected to be similar to the impacts identified for the Sudair PV IPP. However, the magnitude and significance of the impacts will differ depending on the location of those projects, their proximity to sensitive receptors, the construction methods used, and management plans implemented.	• Considering the nature of the project, nuisance and health impacts on the surrounding communities are expected as a result of air and noise emissions, in the absence of waste, wastewater and chemicals management, in the absence of proper traffic management are anticipated. • The risk of COVID-19 infections could be high if the safety precautions and procedures are not adhered to. • The Project is expected to be fenced and with security guards to ensure that there is no unauthorised access into the site.
Cumulative Impacts	• **Increased incidents and accidents resulting from increased traffic.** • **The risk of COVID-19 infections could be high if the safety precautions and procedures are not adhered to.**	• **Increased incidents and accidents resulting from increased traffic.** • **The risk of COVID-19 infections could be high if the safety precautions and procedures are not adhered to.**

5.5 Conclusion

The confirmed Projects identified by the Chamber of Commerce and Industry are relatively far from the Project site and are primarily located outside the Project's area of influence for most Valued Environmental (and Social) Components (VECs).

The table above outlines the potential cumulative impacts of these known projects in combination with the Project on the identified VECs. In summary, there are expected to be cumulative impacts on:

- Socio-Economics
  - Positive impacts on employment opportunities and spending on local/regional goods & services.
  - Negative impacts on loss of grazing land for herders.
- Community, Health Safety & Security
  - Potential for disease spread and cultural conflicts with expatriate workers.
- Traffic & Transportation
  - Potential cumulative vehicle increases on highways and main roads, particularly if the construction phases overlap.
- Terrestrial Ecology
  - Regional habitat losses due to large project footprints.

6 STAKEHOLDER ENGAGEMENT PLAN

Addendum Rationale: Further to the Stakeholder Engagement Plan that was prepared by Wood in 2019, this addendum has been prepared to address the gaps identified by the LTA to provide an overview of the stakeholder engagement carried out and the dissemination of the Project information, impacts, and the grievance mechanism.

The addendum presents the outcomes of the consultations carried out with the relevant stakeholders including the local community, farmers and herders who use the land for temporary camps and livestock, as applicable.

6.1 Overview

A Stakeholder Engagement Plan (SEP) was developed by Wood in 2019. The SEP includes a stakeholders mapping, the consultations carried out with government entities and the outcomes of the stakeholder engagement. The components of the SEP prepared in 2019 and the identified gaps that are addressed as part of this addendum are provided in the table below.

Table 6-1 Summary of the Components and Gaps of the Stakeholder Engagement Plan Developed by Wood in 2019

CHAPTER	DESCRIPTION	GAPS
Chapter 1- Introduction	An introduction to the Project and a summary of the SEP content and chapters.	No gaps were identified.
Chapter 2- Project Description	A brief summary of the Project and its location	No gaps were identified.
Chapter 3- Roles and Responsibilities	A brief on the responsibilities of the developer and the EPC contractor. This section did not provide the name of the EPC contractor of the contact details.	The EPC Contractor is Larsen & Tourbo Subcontracting Team. Contact details: • Danish Ahmed- Deputy Project Director Mobile: +971543035607 Email: danish-ahmed@Lntecc.com • Vikas Shetty- Project Control Manager Mobile: +971505139523 Email: vikasshetty@Lntecc.com

Chapter	Description	Gaps
Chapter 4- Regulations and Requirements	A summary of the public consultations and stakeholders engagement requirements as per the national laws and international standards. • Public consultation for environmental permitting purposes is not a requirement in Saudi Arabia • International Standards Requirements include: o Equator Principle 5 on Consultation and Disclosure and Equator Principles 6 on Grievance Mechanism o IFC Performance Standard 1 on Assessment and Management of Environmental and Social Risks and Impacts. It stipulates that affected communities should be appropriately engaged and a grievance mechanism should be developed and implemented.	The LTA required identifying the applicability of Performance Standard 5 on Land Acquisition or Involuntary Resettlement. This is addressed in Chapter 7 of this addendum.
Chapter 5- Identification of Stakeholders	A stakeholders mapping exercise was conducted to identify organisations and individuals who are directly or indirectly affected (positively and negatively) by, or have an interest in the project. • Authorities and government agencies. • Educational, research and design organizations. • Non-governmental organizations (NGO's) including Professional associations and Public organizations. • Local citizens. • Local communities. • Land users. For the full list of stakeholders and their contact details refer to Table 5-1 of the SEP, 2019.	No gaps were identified in the list of stakeholders. Additional consultations were conducted in June 2021 with the Chamber of Commerce and Industry, King Khalid Hospital, MODON, Tameer Municipality, and two herders near the Project area. The outcomes of those consultations are provided as part of this addendum.

Chapter	Description	Gaps
Chapter 6- Public Consultation and Disclosure Undertaken to Date	Information leaflets were shared with the identified stakeholders on October 2018 and multiple meetings were held with the Stakeholders to provide an overview of the proposed Project and ESIA process, discuss and identify potential Project construction and operation impacts, identify and agree on effective information dissemination processes and identify the main affected stakeholders' groups and local people. • For the summary of key stakeholder observations of meeting conducted in October 2018 and May 2019, refer to Table 6-1 of the SEP. • For the summary of the ongoing consultation since 2019 refer to Table 6-2 of the SEP. No Objection were received from Ministry of Interior, ARAMCO, NDU, Mawani, Saudi Arabia Investment Authority, Ministry of Housing, Ministry of Transportation, Saudi Commission for Tourism and National Heritage, Ministry of Municipal and Rural Affairs, and MODON.	Several other stakeholders who were consulted as part of the stakeholder engagement process have not provided their feedback to date. Those are listed in Table 6-2 of the SEP and include: Ministry of Defence, Ministry of Interior, Communications and Information Technology Commission, Ministry of Communications and Information Technology, Ministry of Environment, Water and Agriculture, Saudi Electricity Company, Public Transport Authority, General Authority of Civil Aviation, General Authority for Meteorology and Environment, Saudi Wildlife Authority, Ministry of Economy and Planning, Public Investment Found, Saudi Arabia Riyal, and Ministry of Commerce and Investments. Additional consultations were conducted in June 2021 with the Chamber of Commerce and Industry, Heath care sector represented by King Khalid Hospital, MODON, Tameer Municipality, and two herders near the Project area. The outcomes of those consultations are provided as part of this addendum.
Chapter 7- Future Stakeholder Engagement	Outlines the proposed future stakeholder engagement and consultation programme and project disclosure requirements. It also provides the requirements for community health and safety management.	The outcomes of the consultations conducted in June 2021 are provided as part of this addendum.
Chapter 8- Monitoring and Reporting	Monitoring the effectiveness of the identified and implemented mitigation measures. Continuous engagement with stakeholders during construction and being responsive to grievances. This is an ongoing process that should be implemented though out the Project construction and Operation.	No gaps were identified.

CHAPTER	DESCRIPTION	GAPS
Chapter 9- Grievance Mechanism	Details of the grievance mechanism required to be implemented though out the Project construction and Operation.	The contact details of the persons responsible for receiving and handling the grievances are provided in this addendum.

6.2 Consultation Timeline

Stakeholder identification for the Sudair PV was conducted as part of the SEP prepared by Wood in 2019. The methods used for the on-going stakeholder engagement process include bi-lateral meetings, emails, telephone calls and letters with national, regional and local authorities. Previous consultations were conducted in October 2018 and May 2019, for details refer to the SEP, 2019.

This addendum provides the additional targeted stakeholder engagement conducted in the month of June 2021 to address the requirements of the report and the ESAP. Those include:

- Meetings with representatives of MODON, Tameer Municipality and the Chamber of Commerce and Industry-Al Majmaah on the 16th of June 2021.
- A meeting with the representative of King Khalid Hospital-Al Majmaah on the 20th of June 2021.
- Two meetings with indirectly impacted herders who use the surrounding lands (off-site) for livestock grazing conducted on the 16th of June 2021.

CHALLENGES IN ORGANISING THE CONSULTATION MEETINGS

The outbreak of a global pandemic (COVID-19) and the implementation of travel restrictions to Saudi Arabia greatly hindered 5 Capitals team from travelling to Saudi Arabia to conduct the meetings in person. Alternatively, and in order to complete the consultations within the Project's timeframe, the Sudair PV IPP Project Company HSSE team carried out the stakeholders engagement. To assist the Project Company HSSE team and ensure the requirements of the TDD, ESAP, Equator Principles IV (Principle 5 & 6) and IFC Performance Standard (PS 1) are met, 5 Capitals prepared Stakeholder Engagement Guideline. The guideline is provided in Appendix A and it includes the following:

- Guideline on how the consultation process should be undertaken.
- The recommended type of consultations.
- The stakeholders that should be targeted during the consultation process.
- Targeted consultation questions for each relevant stakeholder.

The table below provides a summary of the consultation conducted to date. Full details of the consultation process, minutes of meetings, numbers of individuals consulted, comments and pictures are provided in the Public Consultation section and respective appendices of this ESIA.

6.2.1 Consultation with Saudi Commission for Tourism and National Heritage

The TDD and ESAP required consultations with the Saudi Commission for Tourism and National Heritage (SCTNH) to ascertain if the site has any cultural heritage potential.

As per the SEP prepared by Wood in 2019, SCTNH was one of the stakeholders identified in the stakeholders mapping and were engaged with as part of the project consultation and disclosure process. As part of the previous consultations, Project information leaflets were prepared by the Developer and distributed to the identified stakeholders one of whom was SCTNH. According to the ongoing consultation summary provided in Table 6-2 of the SEP of 2019, SCTNH provided a No objection email.

While the correspondences with SCTNH as part of the previous consultations is not available to confirm the information shared with them and validate the absence of any cultural heritage potential in the project site and its surroundings, the no objection letter from SCTNH indicates there are no concerns of the Project construction or operation impacting cultural heritage. Therefore, no additional consultations were carried out with SCTNH.

6.3 Summary of the Consultations and Minutes of Meetings

The agenda of the consultations and meetings included:

- A presentation of the Sudair PV IPP Project including:
    - Project Information
    - General overview of the Project construction and operation
    - Project Timeline
    - Impacts of the Project:
        - Positive (e.g., job opportunities, greenhouse gas reduction, etc.)
        - Negative (noise, air pollution, etc.)
    - Grievance Redress Mechanism: contact details for sending feedbacks, suggestions, inquires and complaints etc.
- Targeted questionnaires and discussions.

The stakeholders also highlighted the positive socio-economic impacts of the project and no major concerns were raised during these consultations. Based on the discussions carried out during the meetings, the influx of laborers is not expected to put major pressure on the labors accommodation or the health sector, given the required mitigation measures are implemented and regular coordination with relevant authorities and stakeholders is conducted.

6.4 Grievance Mechanism

The grievance mechanism was provided in the presentation prepared for the consultations and it includes:

- Verbal grievances or concerns can be raised face to face during group or individual meetings and field visits or through phone calls or WhatsApp voice messages.
- Written grievances or concerns can be raised face to face during group or individual meetings and field visits or via mailing, grievance collection boxes installed at multiple locations around the site, emails, or messages.

The following details were provided to the stakeholders in order to be able to submit their grievances or comments regarding the proposed Project.

Table 6-8 Stakeholder Engagement - Grievance Mechanism Contact Details

COMPANY	CONTACT DETAILS
Larsen & Tourbo Subcontracting Team	Email: Sudair-Solar@Intecc.com Mob: +966504966402

6.4.1 Grievances Received

Up to date no grievances have been received and any arising issues were addressed during the consultation meetings.

6.5 Media Coverage of the Project

The development of the 1,500 MW Sudair PV IPP Project has received both national and international coverage in various media outlets. The most notable press coverage is as provided below.

LOCAL NEWS COVERAGE

- Sudair Gulf Projects
  - https://www.saudigulfprojects.com/2021/04/lt-awarded-epc-contract-of-sudair-solar-pv-project/
- Arab news
  - https://www.arabnews.com/node/1888016/business-economy

INTERNATIONAL MEDIA COVERAGE

- ACWA Power's website
  - https://acwapower.com/en/projects/sudair-pv-ipp/
- GCC Business News
  - https://www.gccbusinessnews.com/indias-lt-bags-saudis-1-5gw-sudair-solar-epc-project-contract/

- Construction Week
    - https://www.constructionweekonline.com/projects-and-tenders/271737-lt-bags-epc-contract-for-saudi-arabias-sudair-solar-pv-project
- METenders
    - https://metenders.com/project_cms/project/sudair-solar-pv-substation-project

7 LAND ACQUISITION AND INVOLUNTARY RESETTLEMENT

Addendum Rationale: This addendum has been prepared to address the gaps identified by the LTA to confirm if any herders, tents, or farms are using the Project area and accordingly validate the applicability of IFC Performance Standard 5 on Land Acquisition or Involuntary Resettlement to the Project.

7.1 Standards and Regulations

7.1.1 National Context and Regulations

There are no statutory requirements in Saudi Arabia's legal system for land acquisition and resettlement related to informal land users.

7.1.2 Lenders Requirements

IFC PERFORMANCE STANDARD 5-LAND ACQUISITION AND INVOLUNTARY RESETTLEMENT

Recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement (loss of assets or access to assets that leads to loss of income sources or other means of livelihood) as a result of project-related land acquisition and/or restrictions on land use. Where involuntary resettlement is unavoidable, it should be minimized and appropriate measures to mitigate adverse impacts on displaced persons and host communities should be carefully planned and implemented.

7.2 Applicability of IFC Performance Standard 5

Temporary camps and herders with livestock were previously reported within the Project area (Wood, 2019). As mentioned by the LTA, a recent site visit conducted by the Project Company (PC) in February 2021 indicated the absence of camps and tents from the Project area. Consultation meetings were conducted with the relevant stakeholders including herders working in the vicinity of the Project area to confirm if anyone occupies the project plot or uses it for grazing.

The consultations outcomes discussed in chapter 6.3 of this addendum confirmed that the land was previously used informally by seasonal herders for grazing and camping, and that it is currently not occupied or being used and has not been used for the past few months. The herders did not raise any concerns regarding their livelihood or daily work activities being

affected by the Project despite the restrictions for accessing to the site. This is attributed to the availability of alternative plots to be used by the herders for grazing and carrying their daily activities.

Accordingly, IFC Performance Standard 5 on Land Acquisition or Involuntary Resettlement is not currently applicable to the Project based on this context. However, a robust grievance mechanism should be implemented to ensure that any complaints or concerns raised by the stakeholders (including those in regard to any claims of displacement), particularly herders or farmers are acknowledged, addressed and closed out in a timely manner.

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Renewable Energy Project Development Office (REPDO)

Sudair Solar Park

Environmental and Social Impact Assessment

08 June 2018

Report Summary

This Environmental and Social Impact Assessment (ESIA) has been prepared for the Renewable Energy Project Development Office (REPDO) for the proposed Sudair Solar Park (the Project) located within the Sudair Industrial City. An area of approximately 30.8 km^2 has been proposed for a solar photovoltaic (PV) technology development. The purpose of this report is to establish the potential environmental and social impacts of the Project drawing on desk-based studies and site survey work. The ESIA is intended to be supplemented following the findings of on-going studies such as Noise monitoring, air quality monitoring, flood risk assessment and stakeholder engagement.

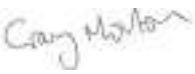
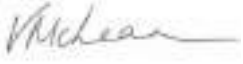
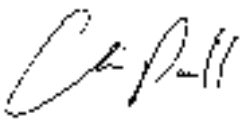
This ESIA is to be submitted to the General Authority of Meteorology and Environmental Protection (GAME), who are responsible for issuing consent for the Project under the Public Environment Law. Under the General Environmental Regulations and Rules for Implementation (GERRI) requires an ESIA to be prepared for a project that may have a negative environmental impact. The GERRI cite solar power plants as a Category 3 development, meaning a comprehensive ESIA is required in order to gain a development license.

The construction of this Project will be undertaken by a Project Developer who is still to be confirmed through a tender process carried out by REPDO. Any changes to the indicative layouts and/or construction plans detailed in the ESIA by the Project Developer may require a further addendum of information to the ESIA.

Report Details

Client:	Renewable Energy Project Development Office (REPDO)
Client Contact:	Tariq Sanqorah
Report Distribution:	
Renewable Energy Project Development Office (REPDO):	Tariq Sanqorah, Steven Follows, Ahmad Alamoudi
Wood:	File
Report Classification:	Confidential

Approval Record

	Name	Job Title	Signature
Prepared by:	Graeme Crawford	Senior Renewable Energy Consultant	
	Craig Morton	Senior Renewable Energy Consultant	
	Vicky Mclean	Senior Environmental Consultant	
Reviewed by:	Greg McAlister	Environment Team Leader	
Authorised by:	Chris Parcell	Director of Feasibility & Development	
Date of issue:	08 June 2018		

Amendment Record

Revision Number	Date	Summary of Amendments	Purpose of Revision
A1	04 June 2018	First draft	Internal review
A2	08 June 2018	Changes following review	Internal approval
B1	08 June 2018		Client issue

Contents

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Glossary

Abbreviation or Term	Definition
AC	Alternating Current
ASL	Above Sea Level
CCTV	Closed-Circuit Television
CITES	Convention on International Trade in Endangered Species
DC	Direct Current
DTG	Dakkak Trading Group
EHS	Environmental Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GAME	General Authority of Meteorology and Environmental Protection
GERRI	General Environmental Regulations and Rules for Implementation
GFDRR	Global Facility for Disaster Reduction and Recovery
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GTI	Global Tilted Irradiation
GW	GigaWatt
HV	High Voltage
IBA	Important Bird and Biodiversity Areas
IEMA	Institute of Environmental Management and Assessment
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature and Natural Resources
KAUST	King Abdullah University of Science and Technology
KSA	Kingdom of Saudi Arabia
kV	Kilo-Volt
LCT	Landscape Character Type
LV	Low Voltage
MAQMS	Mobile Air Quality Monitoring System
MEIM	Ministry of Energy, Industry, and Mineral Resources
MEIMR	Ministry of Energy, Industry and Mineral Resources
MLSD	Ministry of Labour and Social Development
MODON	Saudi Industrial Property Authority
MRWA	Ministry of Energy, Industry and Mineral Resources

Abbreviation or Term	Definition
MV	Medium Voltage
MW	MegaWatt
NCWCD	National Commission for Wildlife Conservation and Development
NREP	National Renewable Energy Program
NSR	Noise sensitive receptors
NTP	National Transformation Program
PGA	Peak Ground Acceleration
PS	Performance Standard
PV	Solar photovoltaic
RAP	Resettlement Action Plan
REPDO	Renewable Energy Project Development Office
RMU	Ring main unit
SEP	Stakeholder Engagement Plan
SRTM	Shuttle Radar Topography Mission
TDS	Total Dissolved Solids
TMP	Transport Management Plan
ZTV	Zone of Theoretical Visibility

1 Introduction

1.1 This Document

This Environmental and Social Impact Assessment (ESIA) has been prepared for Renewable Energy Project Development Office (REPDO) for the Sudair Solar Park (the Project).

The ESIA presents information on the identification and assessment of the likely significant environmental and social effects of the Project and its ancillary infrastructure. The document has been prepared by Wood with specialist input from Turnstone Ecology Ltd, Fugro Suhaimi and Dakkak Trading Group.

1.2 Background to the Project

Wood have carried out pre-development feasibility studies to determine a suitable solar photovoltaic (PV) development on land controlled by the Saudi Industrial Property Authority (MODON) in the Sudair Industrial City, south of the city of Al Majmahh in the Riyadh Province. An area of approximately 30.8 km^2 has been proposed for a solar photovoltaic (PV) technology development.

1.3 Need for the Project

The Kingdom of Saudi Arabia's Ministry of Energy, Industry, and Mineral Resources (MEIM) has launched the National Renewable Energy Program (NREP) for the implementation of 9.5 GW of renewable power by 2023, with an initial target of 3.45 GW by 2020. In support of this, Wood has been commissioned by the REPDO to carry out pre-development studies for the proposed South Jeddah Solar Energy Park located in KSA.

1.4 Scope and Content of the Environmental Statement

In order to successfully develop this Project, the following requirements must be met:

- The Project would meet the KSA's national environmental requirements
- The Project would include all necessary mitigation measures to minimize any significant adverse change in environmental, health and safety, and socioeconomic conditions.

When assessing potential environmental and social impacts, the overall scope of the ESIA includes:

- Definition of baseline conditions of key environmental and social resources.
- Assessment of positive and negative impacts of the Project.
- Consultation with people who may be affected by the Project and other stakeholders.
- Development of design and operating practices that are sufficient to avoid, reduce, or compensate for significant adverse environmental and social impacts.
- Development of such monitoring programs as are necessary to verify mitigation is effective in accomplishing its goals, and to develop and refine the effectiveness of mitigation measures.

1.5 Best Practice

The overall approach for the ESIA and reporting were based on the following sources of guidance together with additional sources as referenced throughout the text:

- IFC Guidelines, including *General EHS Guidelines* (IFC, 2007a), *Draft EHS Guidance for Roads* (IFC, 2006), *EHS Guidelines for Electric Power Transmission and Distribution (IFC, 2007b)* and *Operational Policy 4.01*.
- European Union Council Directive 85/337/EEC *on the assessment of the effects of certain public and private projects on the environment*, as amended by Council Directive 97/11/EC (Council of the European Union, 1985; 1997).

1.6 Structure of the Environmental Statement

The remainder of this report is organized as follows:

- Chapter 2 describes the Project and proposed layout.
- Chapter 3 describes the legal and institutional framework and context in which the Project is being proposed and developed.
- Chapter 4 demonstrates the general assessment methodology applied for this ESIA.
- Chapters 5 to 13 describe the baseline environmental and socio-economic conditions of the area, potential impacts that may result from construction, operation and decommissioning, proposed mitigation measures and residual impacts.

- Chapter 14 provides a general summary of impacts that can be expected during construction, operation and decommissioning of the Project. This includes measures that are needed to prevent, mitigate, or otherwise address potentially significant impacts.
- Chapter 15 provides the Environmental and Social Management Plan.
- Chapter 16 sets out the Monitoring, Evaluation and Reporting criteria.

2 Project Description

The following provides a description of the Project location, Project components and Project activities.

2.1 Geographical Location

The proposed site is located on land controlled by MODON, 25 km to the south east of Al Majmahh in the Riyadh Province. The location of the site is shown in Figure 2-1 below.

Figure 2-1: Project Geographical Location

2.2 Project Layout

It is anticipated that the Project capacity will be up to 1.9 GWp (DC) in total capacity. It is proposed that the Project will be split into six separate schemes and Project Developers will be invited to tender for each of these schemes by REPDO. Wood have developed an indicative Project layout as shown in Figure 2-2 below. A detailed indicative project layout is provided in drawing SU002 in Figure 2-2.

Figure 2-2: Project Separation at Sudair

Further details of the project components and constraints to development are provided in this Chapter.

2.3 Summary of Solar Power Plant Design

The Project will have a total installed capacity of up to 1.9 GWp (DC) covering an area of approximately 30.8 km^2. The operational lifetime of the Project will be 20 years.

A representation of a typical solar PV energy park arrangement is shown in Figure 2-3. The key components required are:

- Solar PV modules, to convert solar irradiation into direct current (DC) electricity.
- Mounting structure or racks, for installing the PV modules at the desired angle. The PV modules installed on the mounting structure are referred to as arrays.
- Inverters for converting DC to alternating current (AC) electricity.
- Transformers for increasing the AC voltage to enable connection to the grid.
- Electrical substations, to enable isolation and protection of the energy park.

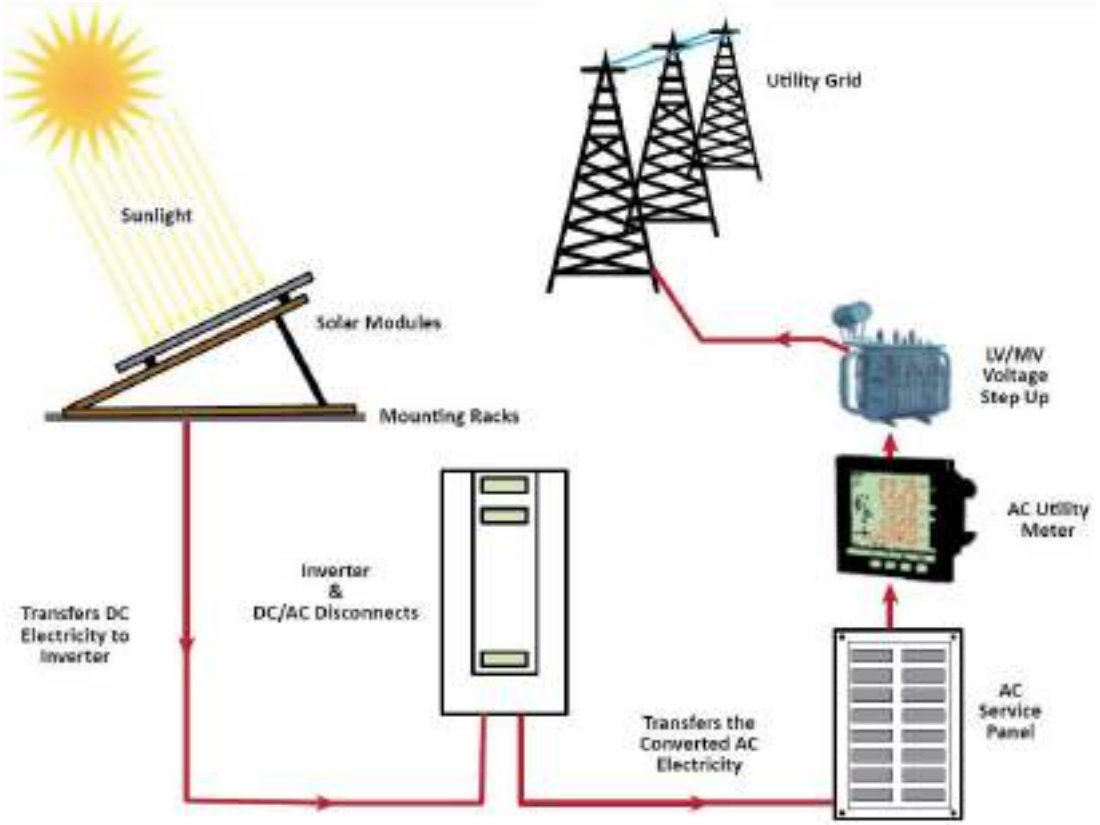

Figure 2-3: Typical solar PV energy park arrangement

2.4 Main Alternatives Considered

ESIA best practice and IFC Performance Standard 1 require an assessment of alternatives as part of an environmental assessment. The section below sets out the main alternatives considered, during the site selection process and demonstrates the reasoning for the decision to take forward the Project site.

2.4.1 Without the Project

This alternative is to maintain the status of the land as it currently stands. The land has been degraded because of human activity and existing vegetation is relatively species poor and dominated by a limited number of common species. From an environmental standpoint, the 'Without Project' option would mean that the country continues to have an over-reliance on thermal power plants thereby increasing the carbon footprint, contribution to global warming and climate change. This would also deny the local population potential employment opportunities associated with the Project. A 'With Project Alternative' is therefore recommended.

2.4.2 Technology Alternatives

It has already been defined that there is a need for the development of renewable energy projects in KSA. Wood has evaluated various renewable technology alternatives in line with the aims of REPDO and the need for renewable energy development in KSA.

Different technology alternatives were screened based on availability of suitable land, access to the grid network and available renewable resource (solar irradiation, wind resource etc).

The conditions of the site are optimal for solar PV and unfavourable for other renewable technologies. The site does not possess sufficient wind resource and is not characterised by hydro or geothermal potential. Thermal power could potentially be a technically suitable alternative but its carbon footprint and the geographical location would make it both environmentally and economically disadvantageous. A 'Solar PV' technology option is therefore the most suitable for the site.

2.5 Site Selection

In identifying a suitable site for solar energy developments, various elements need to be considered such as the available resource, site constraints, suitability of access and suitability of grid connection.

The site area shown in Figure 2-4 below was provided by MODON for potential solar development.

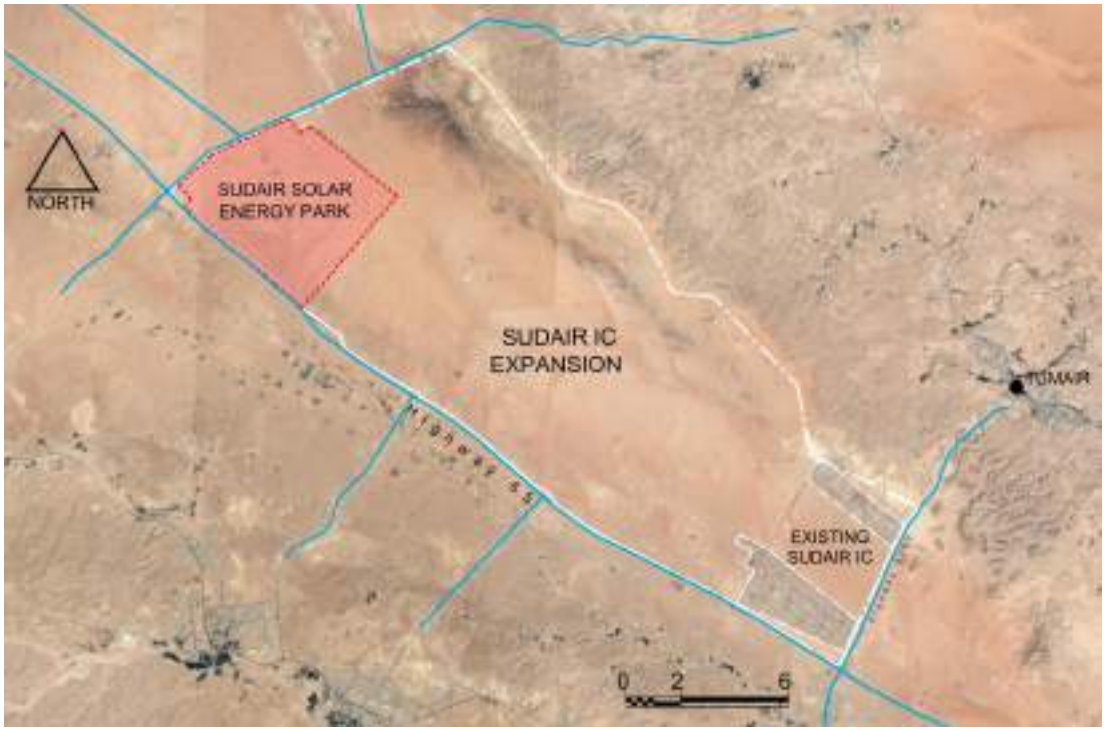

Figure 2-4: Project Location (shown red) in MODON's Sudair Industrial City

The following details the initial site assessment undertaken for the Project area.

2.5.1.1 Solar Resource

Wood has undertaken an assessment of the available solar resource at the site considering the available irradiation resource, impact of horizon shading, monthly distribution, temperature and precipitation. From this assessment it is considered that an average annual Global Tilted Irradiation (GTI) of 2,814 (kWh/m^2) would be available at the Project location which is considered to be highly favourable for a solar development.

2.5.2 Constraints mapping

A constraints mapping exercise was carried out based on an inspection of the site, satellite imagery and topographical data.

Based on information obtained during a site inspection the site is found to be generally flat with large homogeneous areas. This is especially the case for the northern and eastern areas of the site. This is considered ideal for PV plant installation at a relatively low cost as little to no ground preparation is expected to be required.

Two land areas were identified as being potentially unsuitable for a solar development due to unfavourable undulating topography and soil erosion. These areas have been identified within the constraints map. To maximise the capacity of the site, these areas remain available for development.

Transmission lines traverse the northern and eastern peripheries of the site, originating from the substation located in the north-west corner. Graded access roads run along the length of these lines. The areas below and immediately adjacent to the overhead lines traversing the have been excluded from consideration for development.

Indicative site topography was evaluated using publicly available topographical data. This was used to identify any unfavourable steep slopes at the site. It is noted that unfavourable undulating terrain observed during the site visit is not visible from the elevation data.

The final constraints map produced for the Project site is shown in Figure 2-5 below.

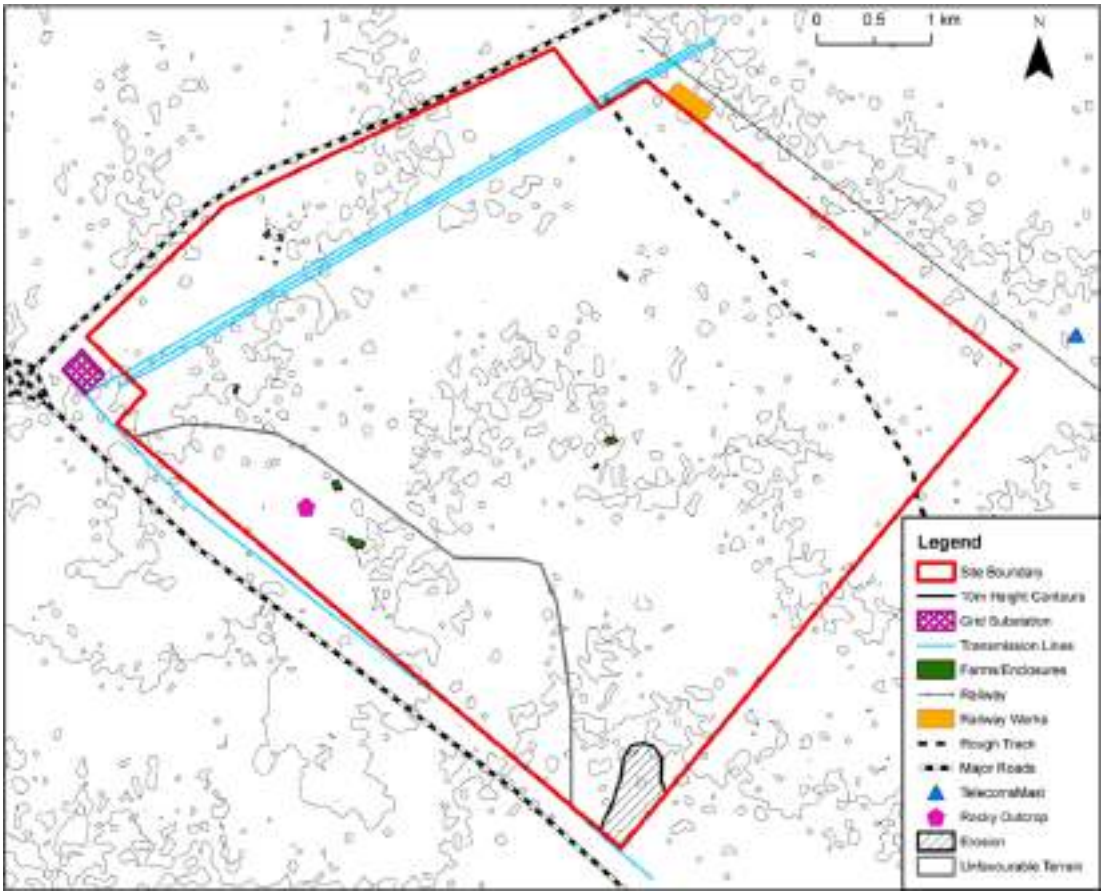

Figure 2-5: Project Constraints Map

2.6 Project Components

The following provides a description of the components required for the Project.

2.6.1 PV Modules

Solar PV cells convert solar irradiation directly into electricity through the photoelectric effect in a silent and clean process that requires no moving parts. The output from a solar PV cell is DC electricity. Cells are interconnected in series and parallel and incorporated into a protective casing to form a PV module.

There are different types of PV modules available, classified according to the PV cell technology. The most common of these include (mono and poly) crystalline silicon and cadmium telluride (CdTe) thin film technology.

An example of the appearance of a PV module is given in Figure 2-6. For reference these modules have dimensions of approximately 2.0 m by 1.0 m.

Figure 2-6: Typical PV module

In solar energy parks a number of modules are connected in series via combiner boxes to form a string; increasing the DC system voltage and decreasing losses. Strings of modules are then mounted in structures and arranged in large rows, or arrays, to optimise the space available on site. An example of the appearance of a string of PV modules mounted on their frames is given in Figure 2-7.

Figure 2-7: Example of solar PV modules mounted into strings on frames

2.6.2 Mounting System

In its simplest form, the mounting structure is a metal framework onto which the PV modules are installed. The mounting structures are securely fixed to the ground using foundations appropriate for the local ground conditions and must be capable of withstanding the environmental stresses, most notably those from wind loads. Mounting structure foundations are designed to withstand the appropriate environmental stresses for the site location. The foundations are designed to avoid the use of concrete foundations such that they can be easily extracted during decommissioning. With this type of solution, the labour involved and the construction time and environmental impact is limited.

Mounting structures are typically divided into two categories, fixed tilt and tracking systems. Fixed tilt systems maintain a fixed module position, whilst tracking systems move the modules' position relative to the sun's position in the sky. The latter significantly increases the solar irradiation captured by the PV modules, but have higher installation and maintenance costs. A typical mounting structure is shown in Figure 2-8.

Figure 2-8: Typical Mounting Structure

For this Project, it is proposed to use a single axis tracking mounting system using piled mounting structures. The proposed mounting system is shown in Drawing number SU007 in Appendix A**.**

2.6.3 Inverters

Inverters are solid state electronic devices. They convert DC electricity generated by the PV modules into AC electricity conforming to the local grid requirements. Inverters can also perform a variety of functions to maximise the output of the energy park. These range from optimising the voltage across the strings and monitoring string performance to logging data and providing protection and isolation in case of irregularities in the grid or with the PV modules.

There are two broad classes of inverters, central inverters and string inverters. The central inverter configuration is the most common choice for large-scale ground mounted solar PV energy parks and will be used for this Project. Central inverters are typically located adjacent to a step-up transformer to minimise cable losses, this configuration is referred to as an inverter station. A typical representation of an inverter station is shown in Figure 2-9 below. Details of the inverter station used for the Project are shown in Drawing number SU009 in Appendix A**.**

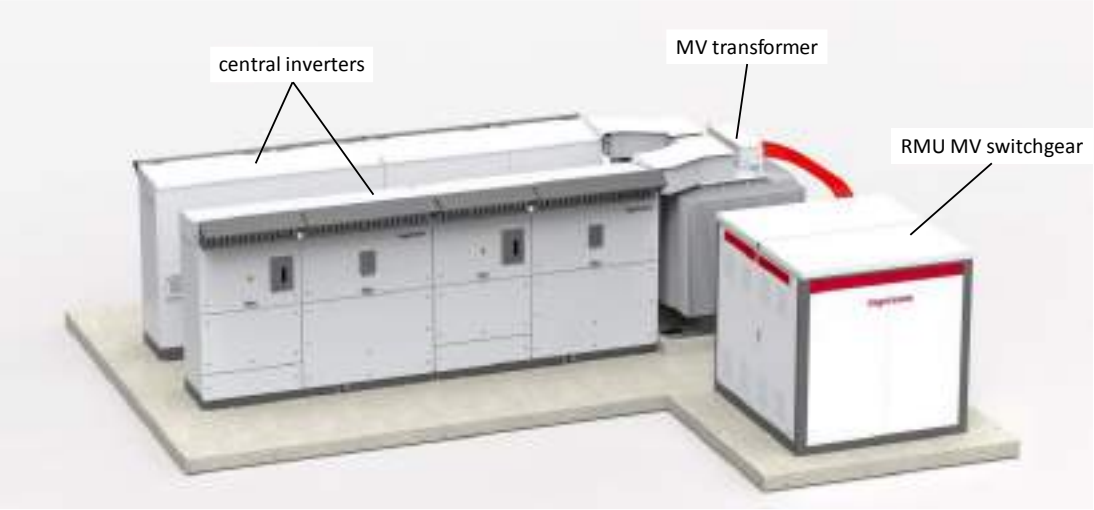

Figure 2-9: Typical Inverter Station

2.6.4 Transformers

Power transformers are electrical devices which convert voltage to different levels. As PV modules and inverters typically operate at low voltages, power transformers are required to step the voltage up to a level suitable for distribution. The increase in voltage, and subsequent reduction in current, gives the benefit of lower electrical losses and makes it more feasible to distribute generated energy greater distances to centres of demand through cables of practical dimensions.

Transformers are required to be located at the output side of the inverters to step the voltage from low voltage (LV, e.g. 400 V) up to medium voltage (MV, typically 33kV), and up to high voltage (HV) at 380 kV as is the case for the Project. Details of the transformer used for the Project are shown in Drawing number SU009 in Appendix A**.**

Figure 2-10: Typical Transformer Unit

2.7 Electrical Infrastructure

2.7.1 Grid Connection

The Park is located in close proximity to existing 380 kV transmission lines which exist in large numbers on the northern and eastern periphery. The point of grid connection is formed by a switching station located in close proximity to the existing transmission substation. Access to the switching station, situated within the site boundary, will be provided by the shared access route to the Project sites located to the south of the overhead lines.

At this stage it is envisaged that each Project will have dedicated MV electrical infrastructure up to the switching station, where the combined output from the six Projects is stepped up to the transmission network voltage of 380 kV (HV). The central corridor provides ample space for the MV cabling between each Project substation and the switching station. The location of the transmission line and the main substations and switching station are shown in Figure 2-11 and Figure 2-12 below.

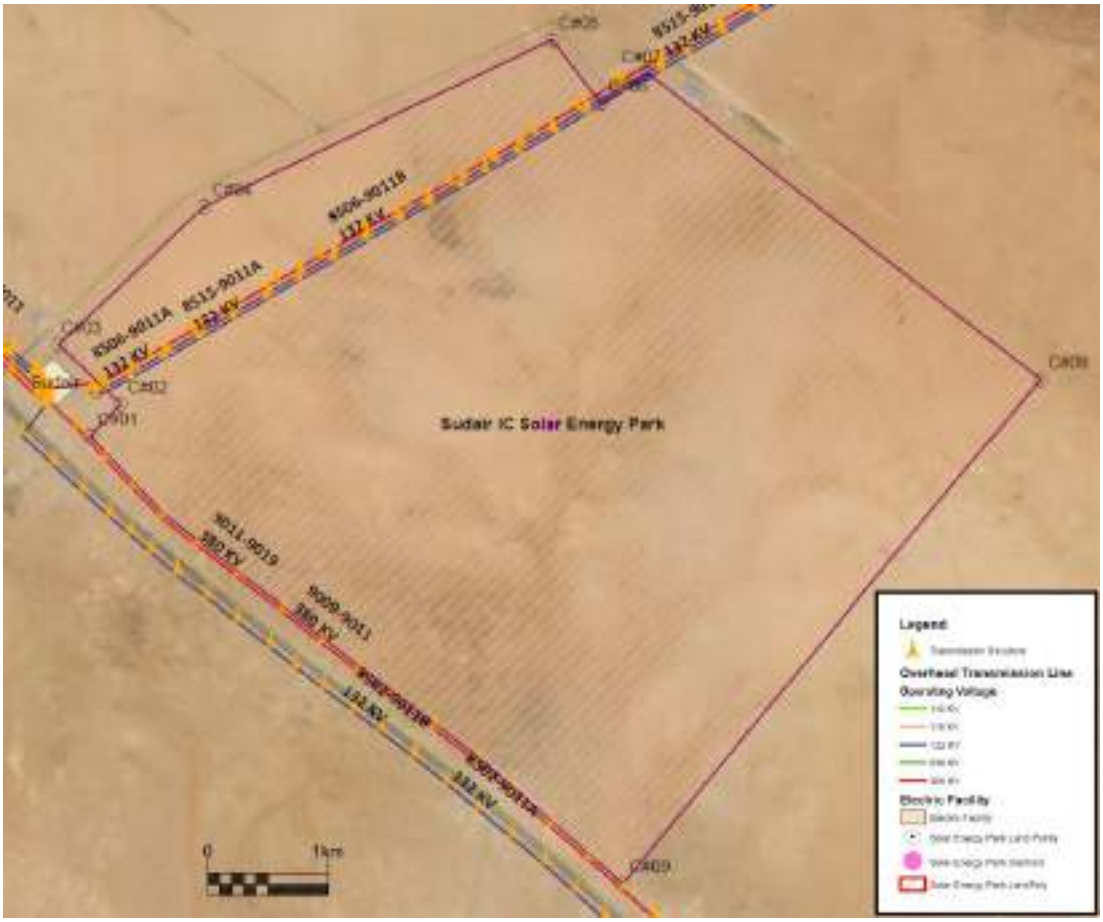

Figure 2-11: Project layout with transmission line

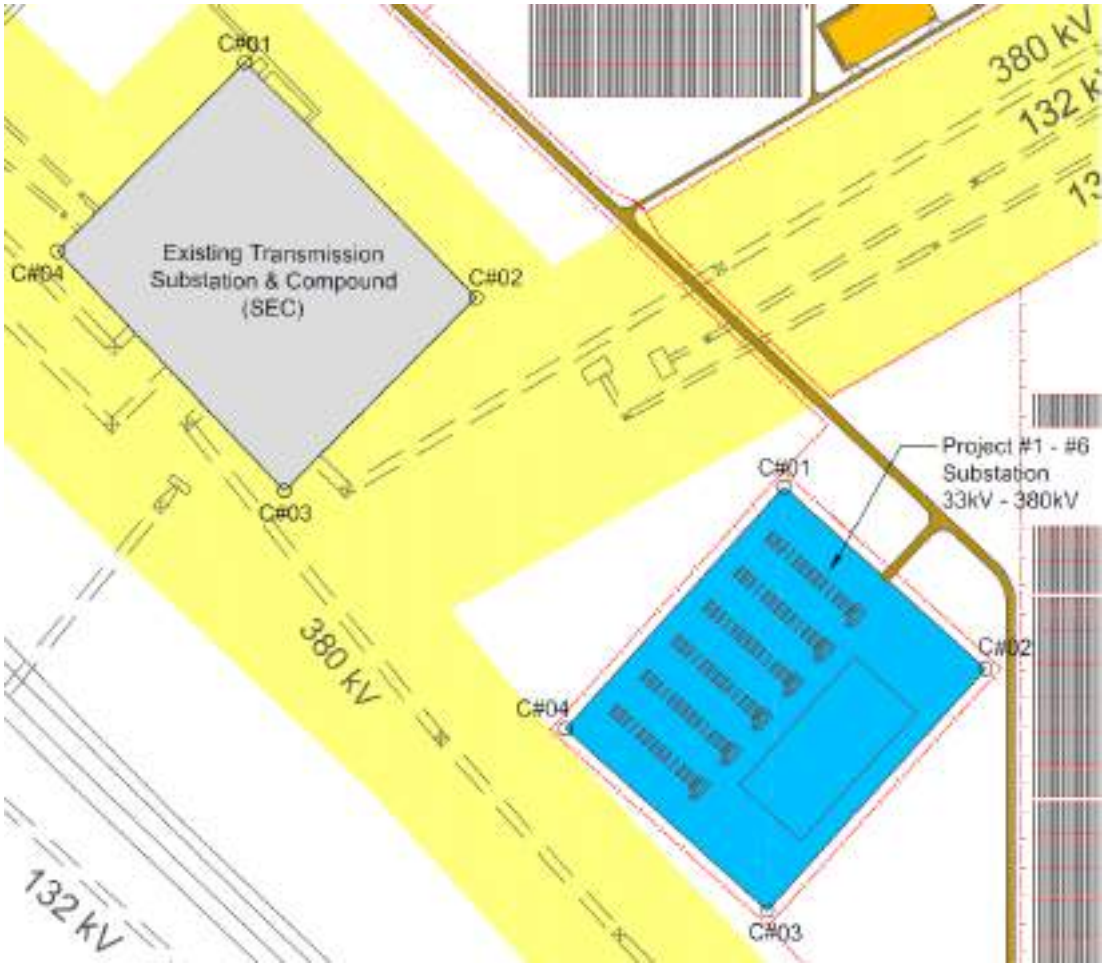

Figure 2-12: Arrangement of main substations (blue enclosure) and Switching Station

2.7.2 Electrical Substations

It is typical for large-scale solar PV energy parks to have both large and small electrical substations. Small electrical substations containing Medium Voltage (MV) ring main unit (RMU) switchgear are located at the inverter stations adjacent to the MV transformers. The large electrical substations, referred to as the main PV energy park substation, houses the MV switchgear that connects to the smaller substation's RMUs. The large electrical substations also contain switchgear such as circuit breakers and disconnectors for protection and isolation of the PV energy park, as well as metering equipment in the main substation.

2.7.3 Cabling and Communications

Various types of cabling are required to connect the park to the grid network, including:

- LV DC string cables connecting the PV modules to a string combiner box.
- LV DC main cables connecting string combiner boxes to an inverter.

- LV AC cables connecting inverters to a transformer.
- MV AC cables connecting the MV transformers to ring main units and the main PV energy park substation.
- HV AC cables connecting the HV transformers to the grid.

Communications systems are installed to monitor and control energy park performance, meteorological conditions and video feeds from security cameras. These systems are connected to the energy park control room using a network of communications cabling. Figure 2-13 shows a typical cable trench detail.

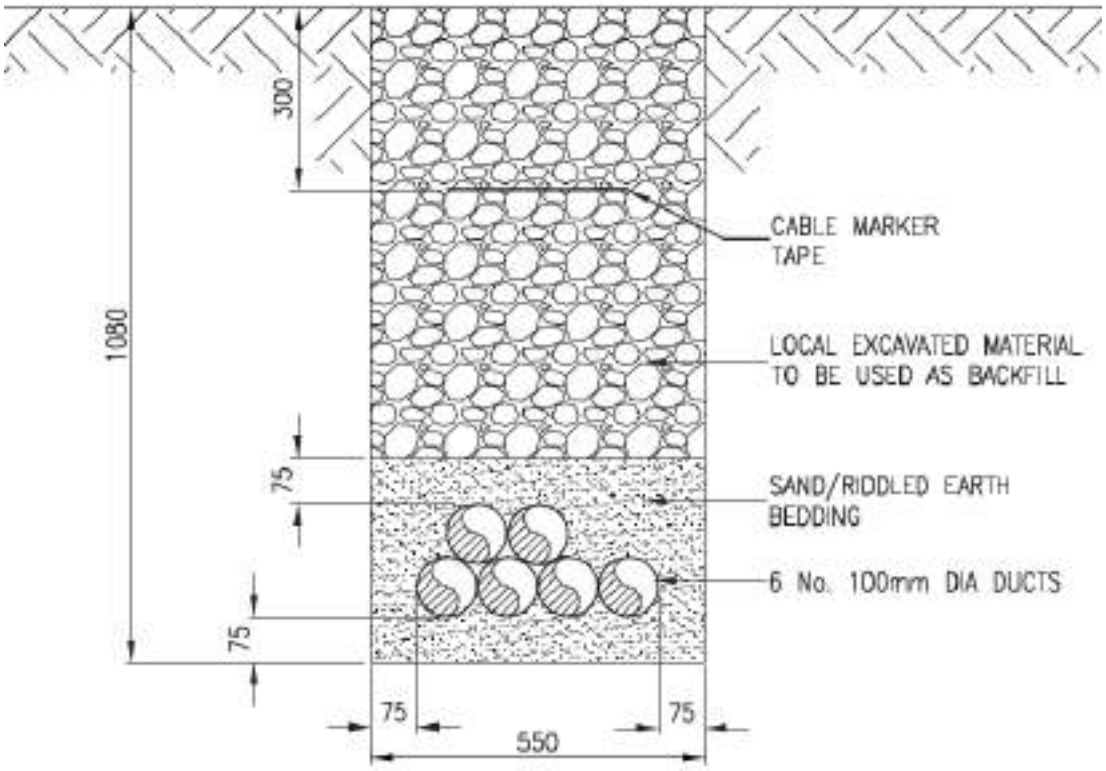

Figure 2-13: Typical cable trench detail (dimensions in mm)

2.8 Civil Infrastructure

The following details the civil infrastructure required for the Project.

2.8.1 Construction Compound

A construction compound will be required during the construction phase of development which will consist of site offices, mess facilities, parking and storage facilities. The details of the construction compound are shown in Drawing number SU012 in Appendix A.

2.8.1 Main Substation and Control Room

Roads internal to the site are constructed to enable access throughout the site, to the solar PV arrays and substation buildings. These are designed based on the ground conditions at the site and are constructed to be suitable for the delivery of the energy park's components, and to last the lifetime of the energy park for operations and maintenance activities. A typical access road is shown in Figure 2-14. Typical details drawing of road construction details can be found in Drawing number SU006 in Appendix A.

Figure 2-14: Typical access road

The site is immediately adjacent to Highway 65 with direct access possible from the junction at the western corner of the site near a transmission substation.

2.8.2 Drainage

Culverts and drainage channels may be constructed divert storm water away from assets and infrastructure and into predetermined areas evaluated as part of the hydrological assessment provided in Chapter 7. A typical example of a box culvert can be seen in Figure 2-15. The actual size and location of culverts will be dependent on the specifics of the hydrology at the park.

Figure 2-15: Typical culvert under a road

2.8.3 Security

PV energy park site security measures will comprise of a perimeter fence to prevent intrusion, and intrusion detection and surveillance equipment will be installed including lighting and closed-circuit television (CCTV) systems. Details of the proposed security system is provided in Drawing number SU005 in Appendix A.

2.9 Project Implementation Activities

The project will entail a series of activities including:

a) The pre-construction phase will include carrying out land survey, power plant design review with reference to ESIA recommendations; planning for storm water drainage and containment, undertaking site preparation, manufacturing-procurement of items and transporting the required components and construction equipment to site.
b) The construction phase will include establishment of internal and external access roads; establishment of construction areas; construction of the solar array, construction of the power substation and other onsite structures) and other ancillary infrastructure (i.e. underground cable for evacuation of electricity); and inter-connection of the solar plant substation to the national electricity utility grid.
c) The post-construction phase will include plant operation and maintenance, site remediation, clearance and deposition of debris off the site, restoration of areas where construction activities temporarily disturbed the environment, repairs and replacements of failed parts; and finally decommissioning the entire plant when the useful life of the facilities is over.
d) The decommissioning phase will require the Project site to be returned to its original state. Activities will include site preparation and temporary storage; transportation and deposition of waste material. The decommissioning or upgrading of the infrastructure has not been discussed in this ESIA report, but will be addressed before decommissioning is required. A separate ESIA will be conducted prior to the time of decommissioning.

3 Legal and Institutional Framework

The ESIA study for the Project has been carried out within the framework of local, national and international environmental regulations and guidelines. This chapter therefore outlines different policy and legislation requirements pertinent to the project including the KSA regulations/Institutions as well as international conventions that may be triggered by the Project.

3.1 Policy Framework

3.1.1 Saudi Vision 2030

"Saudi Arabia's Vision 2030" was adopted in 2016 as a methodology and roadmap for economic and developmental action in the Kingdom of Saudi Arabia. Its aim is to reduce Saudi Arabia's dependence on oil, diversify its economy, and develop public service sectors such as health, education, infrastructure, recreation and tourism.

The Vision is translated into 10 implementation programs to accomplish its goals and directions. The National Transformation Program includes an aim to develop relevant legislation for the country's renewable energy sector.

3.1.2 The Kingdom of Saudi Arabia 10th Development Plan 2015 - 2019

The policy objective of the tenth development plan is economic development. Key aspects of the plan include:

- Diversification
- Knowledge society
- Capital productivity
- Labour
- Resource efficiency
- Private sector

Of most relevance to this Project is resource efficiency. For both economic and environmental reasons, the plan makes conservation of oil resources and rationalisation of their use a stated goal. This will be achieved through the promotion of energy efficiency measures and by fast-tracking regulations to spur the use of renewable energy sources for electricity generation and water desalination.

3.2 Legislative Framework

3.2.1 General Environmental Regulations and Rules for Implementation (October 2011)

This law provides a general regulatory framework for the development and enforcement of environmental rules and regulations and assigns general responsibility to GAME, formally known as the Presidency of Meteorology and Environment (PME).

Article 5 of the GERRI details the importance of carrying out environmental assessment studies early in the design stages. GAME has overall authority for all environmental protection and management activities in KSA. The purpose of these is to:

- Provide appropriate basis for the evaluation and regulation of industrial and urban activities that currently exist in the Kingdom;
- Assist in the planning, design, execution and operation of facilities that will be established in a manner which will not adversely affect the health, safety and welfare of the people;
- Promote the overall economic and social well-being of the people;
- Protect the Kingdom's environment in general.

The most important articles of the GERRI relevant to the project are detailed below.

Article 2: 2-1, the General Environmental Regulations and its Rules aim at preserving, protecting and developing the environment and preventing its pollution.

Article 2: 2-2, General Environmental Regulations and its Rules aim at protecting the public health from activities and acts that harm the environment.

Article 3: 3-3-3 states that the Competent Agency will prepare general guidelines for EIA studies.

Article 5: 5-1-5-6 classifies different projects into three categories depending on project kind and descriptions.

Article 6: states that new projects must utilize the best and most suitable technologies available for the local environment and use materials that cause least contamination to the environment.

Article 9: 9-2, states that all concerned agencies must commit to prepare and develop contingency plans as required for the protection of the environment from pollution hazards which may result from emergencies in their projects during normal activity.

Article 9: 9-3 states that projects or facilities whose operations might have potential negative impact on the environment must develop contingency plans to prevent or mitigate risks of these impacts and must acquire the means capable of implementing such plans.

Article 10 clarifies the importance of different environmental aspects in planning for projects and programs.

Article 11 states that an EIA should be taken into consideration by the owners, designers, operators, and environmental government officials in all project stages including design, construction, and operation.

Article 13: 13.1 emphasizes the need to avoid any contamination of surface, ground, and coastal waters.

Articles 17-21 explain the procedures that have to be followed in the case of violations of standards and regulations.

3.2.2 Environmental Standards

Nine Environmental Standards were issued by Saudi Arabia in 2012 to measure and monitor activities that cause environmental degradation. Those of relevance to the Project are set out below.

3.2.2.1 Ambient Air Standard 2012

The Standard sets the limit values for ambient air quality parameters and establishes the responsibilities of the GAME regarding management of ambient air quality in the kingdom.

The Standard aims to provide a basis for the maintenance and restoration of ambient air quality to prevent or reduce harmful effects on human health and the environment. It introduces new limits for companies that are required to manage their emissions.

3.2.2.2 Standard on Emissions from Mobile Sources 2012

The Standard requires companies to reduce their emissions to the levels required and to properly maintain their equipment to ensure emissions reduction. It presents a framework for a sustainable management of mobile sources and sets out emission limit values depending upon the engine type and capacity. Mobile sources include, for example, mobile generators, agricultural machinery, and large earthmoving equipment.

3.2.2.3 General Environmental Standard for Noise 2012

The Standard regulates community noise, noise from industrial units in areas set aside primarily for industrial facilities, noise from construction activities, noise from vehicles (including motorized vessels and recreational craft), and noise from equipment used outdoors. The Standard issued by the GAME provides a basis for statutory control to restrict and reduce the nuisance caused by environmental noise.

3.2.2.4 National Ambient Water Quality Standard 2012

The Standard sets forth a framework for the sustainable management of ambient water quality by protecting the water supply and the natural aquatic environment. It also provides a basis for the restoration of water used for recreational, agricultural, industrial, potable, and ecological purposes. This Standard applies to all coastal and underground water and includes any surface freshwater that may be present permanently or temporarily. The ambient water covered by the Standard includes coastal and underground water and any surface freshwater that may be present permanently or temporarily.

3.2.2.5 Wastewater Discharge Standard 2012

The Standard sets out use-related criteria and specific limits on individual discharges designed to protect water quality. Liquid waste generators are required to comply with the emissions limits, permit requirements, as well as any reuse or conservation requirements. Notably, if a facility cannot restrict its emissions to the limits stated in the Standard, it is required to obtain a permit by June 24, 2012. The Wastewater Discharge Standard applies to liquid emissions generated by persons or facilities. It is intended to improve wastewater management in Saudi Arabia without increasing the financial burden on companies.

3.2.3 Labour Law

The new amendments to the Saudi Arabian labour laws (initially announced in a Royal Decree No. M/46 of 05/05/1436H) came into force on 18 October 2015. The reforms follow the Saudi Ministry of Labour's ongoing efforts to strike a balance between the creation of a dynamic marketplace for foreign businesses and protection and development of the local workforce.

3.2.3.1 New Implementing Regulations 2016

The New Implementing Regulations became enforceable on 22 April 2016 and introduces clarifications to the Labour Law as well as new regulations and an extended framework governing labour relations.

The update to the regulations of relevance to this Project include details relating to:

- Provisions for incidental and temporary workers.
- Internal work policy.
- On-site registers (registering all workers, job titles, age, nationalities, id card numbers, salaries, arrivals to and from work, medical examination results etc.).
- Passport custody.
- Disabled workers.
- "Saudization" and "saudized" positions (enhancing the in-country workforce skills to reduce reliance on foreign workers).
- Expatriate workers.
- Employment contracts.
- Overtime work.
- Holidays and vacations.
- Part-time work.
- Work safety.
- Remote locations.
- Employment of youth.

3.3 Institutional Framework

3.3.1 The General Authority for Meteorology and Environmental Protection (GAME)

GAME is the primary agency in KSA with responsibility for environmental issues. The agency's responsibilities include, but are not limited to, the following:

- Environmental surveys and pollution assessment and control.
- Establishment of environmental standards and regulations.
- Recommendations on practical measures for emergency situations.
- Keeping up to date with environmental developments internationally.
- Preparing and issuing climatological, environmental, and meteorological analyses, forecasts and bulletins

3.3.2 Ministry of Labour and Social Development (MLSD)

The MLSD deals with the development and use of the Kingdom's human resources. It is responsible for manpower planning, labour relations and the general monitoring of all matters relating to employment affairs. The Ministry also deals with labour disputes, employment in the private sector and labour visas.

3.3.3 Ministry of Energy, Industry and Mineral Resources (MEIMR)

The ministry is responsible for developing the National Renewable Energy Program (NREP). The NREP targets 9.5 GW of Renewable Energy by 2023 in support of Vision 2030, with an interim target of 3.45 GW of Renewable power capacity by 2020 under the National Transformation Program (NTP).

3.3.4 Ministry of Environment, Water and Agriculture (MRWA)

The MRWA has a vision to achieve sustainability of the environment and natural resources in such a manner that it would ensure water security, contribute to achieving food security and improve quality of life in the Kingdom.

3.4 International Best Practise Guidelines

KSA is a signatory of a number of international conventions, including several that are relevant to the Project. These include:

- Convention on Biological Diversity (United Nations, 1992a).
- Convention on Climate Change (United Nations, 1992b).
- Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987 (As Amended)
- Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora, 1979 (As Amended)
- International Union for Conservation of Nature and Natural Resources (IUCN) Guidelines

Relevant requirements of these conventions have been embodied into national law.

International lenders who are signatories to the Equator Principles (EPs) require projects that they finance to meet international standards. Beyond the Kingdom's legal requirements, the following international guidelines, regulations and policies will be followed where gaps in the national environmental standards are noted.

- Equator Principles and IFC Performance Standards (IFC, 2012).

- Environmental, Health & Safety (EHS) General Guidelines, including wastewater and ambient water quality, waste management and hazardous materials management, noise management, occupational health and safety, and construction and decommissioning guidelines (IFC, 2007a).
- EHS Guidelines for Electric Power Transmission and Distribution (IFC, 2007b).
- European Union Environmental Impact Assessment Directive 85/337/EEC (as amended).

These are all specific policies, procedures, strategies and regulations designed for promoting sustainable development. These procedures include a detailed environmental review process prior to final approval of financing for the Project, detailed environmental guidelines, detailed health and safety requirements, procedures for social impact assessment and public consultation and information disclosure and many other issues, associated with project construction, operation and decommissioning. Many of the mitigation measures described in later sections of this ESIA are based on these requirements.

4 Assessment Methodology

4.1 Assessment of Impacts

A number of criteria were used to determine whether or not a potential impact of the Project could be considered 'significant'. These are outlined with reference to specific environmental and social issues in the subsequent topic chapters of this ESIA. Wherever possible, a quantitative assessment of the impacts was undertaken. Where this was not possible, a qualitative assessment of impacts was carried out, based on existing information available for the site and the surrounding study area, and experience with other solar PV developments.

The ESIA covers the direct impacts and any indirect, secondary, short, medium and long-term, permanent and temporary, reversible and irreversible, beneficial and adverse impacts of the Project.

Where relevant, the anticipated impact was compared against appropriate legal requirements and standards. Where no such standards exist, assessment methods involving interpretation and the application of professional judgement were employed. The assessment of significance in all cases took into account the impact's deviation from the established baseline conditions and the sensitivity of the environment.

4.2 Methodology for Assessing Environmental Impacts

A general method for grading of the significance of environmental impacts was adopted to ensure consistency in the terminology of significance, whether for a beneficial or an adverse impact. The two principal criteria determining significance are the sensitivity of the receptor and the magnitude of the change arising from the Project, as shown in Table 4-1 below. A number of best practise sources of guidance were used to inform the assessment process.

Table 4-1: Determination of Environmental Impact Significance

		Sensitivity of Receptor		
		High (e.g. international or national protection)	***Medium*** (e.g. regional or local protection**)**	***Low*** (e.g. no protection)
Magnitude of Change	**High** (e.g. >75% of area or receptor affected)	Major (H, H)	Major (H, M)	Moderate (H, L)
	Medium (e.g. 25-75% of area or receptor affected)	Major (M,H)	Moderate (M, M)	Minor (M, M)
	Low (e.g. 5 to 25% of area or receptor affected)	Moderate (L, H)	Minor (L, M)	Negligible (L, L)
	Very Low (e.g. >0, but <5% of area or receptor affected)	Minor (VL, H)	Negligible (VL, M)	Negligible (VL, L)
	No Change	None (NC, H)	None (NC, M)	None (NC, L)

Table 4-1 shows that the significance of impacts was classed as major, moderate, minor, or none; and either positive (beneficial) or negative (adverse). This categorization is widely recognised and accepted in the field of ESIA. Where appropriate, topic-specific assessment methods and criteria for determining significance are utilised. Potentially significant effects can then be identified for further analysis. Effects are considered to be 'significant' where the assessment indicates a moderate effect or higher. Any alternative approaches are described where applicable in Chapters 5 to 13.

Another consideration is the duration of the impact, whether the impact would be temporary or permanent, and if they were temporary whether they would be short-, medium-, or-long term. Defining the duration of the impact can be subjective, depending on the receptor. For instance, following temporary use of land during construction, it may then take many years for the area of grassland to re-establish, particularly in arid environments. Similarly, although in ecological terms this period may not be a long time, for the people who use the land for pasture, this period could be significant in relation to their lifetime, and could therefore be considered permanent. Table 4-2 defines the criteria for assessing the duration of impact.

Table 4-2: Duration of Impacts

Nature of Change	Duration	Definition / Description
Temporary	Short-term	Impact continues during construction (1-2 yrs) and up to 1 year following construction.
	Medium-term	Impact continues 1-5 years following construction.
	Long-term	Impact continues 5-10 years after construction.
Permanent		Due to the length of time period for human beings, impacts over 10 years can subjectively be defined as permanent.

4.3 Environmental Mitigation and Enhancement

Where significant impacts are identified, mitigation measures are then developed. These measures are intended to avoid, reduce, compensate, and/or remediate adverse impacts, or to enhance potentially beneficial impacts. Wherever possible, this is undertaken as part of the Project design, so the measures will feed back into impact assessment.

The mitigation and enhancement which should be undertaken as part of the Project are set out within relevant sections of Chapters 5 to 13 and within Chapter 15 (Environmental Management). These measures can then be applied in order to manage different phases of the Project.

4.4 Assessment of Residual Impacts

Following the identification of mitigation measures to address significant adverse effects, an assessment of the significance of any residual impacts (i.e. those remaining after mitigation) was completed.

4.5 Environmental Monitoring

Where there is uncertainty over the potential significance of an impact, mitigation may include monitoring of that impact to determine whether additional measures are required. It is recommended that Project monitoring be described in a corresponding Environmental and Social Management Plan (ESMP), a framework ESMP accompanies this ESIA. The Project Developer(s) will ultimately be responsible for developing an ESMP for the Project.

5 Landscape and Visual Impact Assessment

5.1 Introduction

This chapter of the ES evaluates the impacts of the Project on the landscape character and visual amenity.

The key elements and characteristics of the Project which may give rise to landscape impacts are as follows:

- Solar panels.
- Access tracks and hardstanding areas.
- Temporary construction compound.
- Sub-station control building.

All disturbed areas would be restricted as far as practicable to the specified areas and the laydown areas, temporary construction compound, excavations and underground cables would be reinstated once construction is complete.

5.2 Assessment Methodology

The key components, features and characteristics that contribute to the quality and perception of the landscape within the study area have been identified. An evaluation of the implications of the Project in terms of direct impacts on key landscape components and features has been carried out. This considers the extent to which loss of features and the introduction of the Project would influence perception of the local character within the study area and its implications for the wider regional landscape character.

5.2.1 Assessment Guidance

The assessment has been prepared with reference to industry standard Guidelines for Landscape and Visual Impact Assessment (Third Edition) (GLVIA) published by the Landscape Institute and the Institute of Environmental Management and Assessment (2013).

Renewable energy development, including solar PV, inevitably attracts a spectrum of opinion from members of the public, ranging from very adverse to very beneficial reactions. However, using the precautionary principle, the LVIA has been carried out based on the assumption that all landscape and visual impacts reported are adverse. The significance of environmental impact has been defined as described in Chapter 4.

5.2.2 Zone of Theoretical Visibility

To identify and assess potential impacts on the landscape and visual resource, a Zone of Theoretical Visibility (ZTV) have been prepared. The ZTV defines the effective boundaries within which views of the Project could potentially be obtained. ZTVs have been prepared using specialist computer software which produces an analysis of a computer-based model that uses landform as the key determinant of availability or construction of view. The contour data utilised in the LVIA are based on data from the Shuttle Radar Topography Mission (SRTM) digital elevation dataset with 30 m horizontal resolution, for the wider region. The ZTV is shown in Drawing SU018 in Appendix A.

It should be noted that the computer model does not consider features such as trees or woodland, buildings and other structures or local landform, which can vary the ZTV locally and therefore the ZTV is not representative of visual impact in itself. Nevertheless, the ZTV is a valuable tool in assisting with the identification of areas of potential impact.

5.2.3 Impact Significance Criteria

Anticipated impacts are reported in terms of a descriptive scale. The criteria adopted for the assessment of landscape impacts are as follows:

- Substantial adverse (or beneficial) – very noticeable deterioration / improvement in the existing landscape.
- Moderate adverse (or beneficial) – noticeable deterioration / improvement in the existing landscape.
- Slight adverse (or beneficial) – perceptible deterioration / improvement in the existing landscape.
- Negligible – virtually imperceptible deterioration / improvement in the existing landscape.
- No Change – no deterioration / improvement in the existing landscape.

For the purposes of this assessment, impacts of moderate and above are considered to be significant in terms of EIA.

5.3 Baseline Landscape Conditions

5.3.1 Overview

Much of the site is flat with large homogeneous areas. This is especially the case for the northern and eastern areas of the site. This is considered ideal for PV plant installation at a relatively low cost as little to no ground preparation is expected to be required (Figure 5-1).

Figure 5-1: Flat terrain across the northern part of the site

The terrain along a large portion of the south-western boundary (adjacent along highway) is significantly undulating. The area ranges from more gradual slopes through to steeper ridges and hills (Figure 5-2).

Figure 5-2: An example of larger ridges and hills towards the south-western boundary

5.3.2 Landscape Character Types

Three main landscape character types (LCTs) were identified within the study area. These are:

- Industrial/Commercial areas – characterised by industrial buildings/warehouses and areas of planted vegetation, laid out in uniform patterns.
- Rocky Ridge – a ridge of exposed rock to the north-east of the Project site.
- Open Desert – Areas of open, relatively flat desert, transected by roads, a railway line and overhead transmission lines supported on large pylons.

These LCTs are shown in SU019 in Appendix A. The Project is located wholly within the Open Desert LCT.

5.3.3 Potentially Sensitive Receptors

The nearest National Park, Al-Ghat National Park, is located approximately 47.5 km north-west of the site.

The nearest permanent residential settlement is At Tuwaim, located approximately 10 km to the south of the Project, from the edge of the site boundary.

The site has roads running along the north-western and south-western boundaries and a railway line running along the north-eastern boundary. Users of this infrastructure would be considered potential receptors to landscape and visual impacts of the Project.

5.4 Assessment of Potential Landscape Effects

5.4.1 Construction Phase

Landscape and visual impacts are not considered to be a significant adverse impact during construction due to industry standard "good house-keeping" measures routinely adopted during the construction phase.

5.4.2 Operational Phase

None of the identified landscape character types are considered to be particularly sensitive to the development of the Project. The Open Desert LCT, within which the Project would be located, is already transected by existing anthropogenic features such as roads and overhead lines. The Industrial/Commercial LCT areas, which are scattered within the Open Desert LCT, also add anthropogenic elements to the landscape. The Rocky Ridge LCT is a more natural landscape, however, there is no obvious visual receptors in this area to experience views to the Project.

The ZTV indicates the Project would not be visible across large areas of the surrounding areas, particularly to the north-west and east. Visibility is also shown to be limited in the lee of the rocky ridge to the north-east of the Project site.

The Al-Ghat National Park, located approximately 47.5 km distant, is not anticipated to experience any significant landscape and visual impacts from the Project. The nearest residential settlement, At Tuwaim, is located approximately 10 km from the edge of the Project site and is beyond the coverage of the ZTV. Therefore this settlement is not anticipated to receive any significant landscape and visual impacts.

The most significant landscape and visual impacts are likely to be experienced within close proximity to the site. Key receptors are considered to be the roads forming the south-western and north-western boundaries of the site and the railway line forming the north-eastern boundary. The views from these receptors will be transient and the Project would be viewed in the context of an existing anthropogenic and industrial landscape. The undulating terrain along the south-western border of the site is also expected to provide partial screening of views from the highway running along this part of the Project site.

Given that potentially sensitive receptors are restricted to transient users of the nearby roads and railway line and the presence of existing anthropogenic and industrial features in the landscape, the sensitivity of receptors is considered to be Low and the magnitude of change is considered to be Very Low. The overall significance of the impact is therefore considered Negligible.

5.4.3 Decommissioning Phase

As with the construction stage, no significant landscape and visual impacts will occur due to the temporary nature of decommissioning activities. Where possible following decommissioning, the Project site will be re-instated to its original condition.

5.5 Mitigation

Landscape and visual mitigation for the Project has been embedded in the design of the solar farm and has largely centred on the selection of a layout which minimises the potential for significant impacts whilst achieving operational objectives. Further mitigation is outlined in the following sections.

5.5.1 Construction Phase

Standard "good house-keeping" measures that will be implemented to mitigate potential impacts during construction include:

- Provision of adequate facilities for the disposal of garbage.
- Training of the workforce in waste management.
- Reduce the amount of waste to the maximum extent possible.
- Collect all solid waste and store until transported to an appropriate waste disposal facility and disposed.
- Organization of clean-ups for existing garbage.

5.5.2 Operational Phase

Mitigation options are fairly limited during operation. The negligible significance of the landscape and visual impact during operation does not present a requirement for mitigation measures to be implemented.

5.5.3 Decommissioning Phase

Mitigation during decommissioning will be as per described in Section 0 in relation to the construction phase. A reinstatement methodology shall also be prepared by the Project developer in order to return the Project site to its original condition.

5.6 Residual Effects and Conclusions

As all mitigation for landscape and visual impacts was centred on site layout and design, the impacts outlined in the main assessment are considered to represent residual impacts.

Given that potentially sensitive receptors are restricted to transient users of the nearby roads and railway line and the presence of existing anthropogenic and industrial features in the landscape, the overall level of landscape and visual impact is assessed to be Negligible and not significant.

6 Ecology

TO BE COMPLETED

7 Hydrology and Hydrogeology

7.1 Introduction

The hydrology and hydrogeology assessment examines any potential impacts resulting from the construction, operation and decommissioning of the Project on the water environment including surface water and groundwater conditions.

7.2 Assessment Methodology

Baseline data has been collected to inform the assessment process. The assessment has been undertaken in accordance with the criteria set out in Chapter 4 (Assessment Methodology).

The sensitivity of water resources is based on the size and function of the feature and water quality. The function includes use by humans as well as providing habitat for aquatic organisms. Examples of sensitivity of the water environment are listed in Table 7-1.

Table 7-1: Examples of Sensitivity of the Water Environment

Sensitivity	Examples
High	River which supports fish with conservation status or provides major fisheries resources. River with good water quality (no pollution sources). Surface or groundwater which is used for drinking water. Large floodplain.
Medium	River which supports common fish or provides resource for small-scale fishing. River with fair water quality (occasional pollution sources) Surface or groundwater used for industry or agriculture. Small floodplain.
Low	River which does not support fish resources. River with poor water quality (pollution discharge sources). Intermittent or no use of surface or groundwater by humans. No floodplain.

7.3 Baseline Conditions

7.3.1 Surface Water

Due to the local climatic conditions, there are no significant permanent surface water bodies within the Project site. Some areas of soil erosion at the site have been noted, believed to be caused by periods of rain where surface water from part of the western portion of the site drains towards a culvert under the adjacent highway. An example of an eroded area is shown in Figure 7-1 below.

Figure 7-1: Soil Erosion at Site

7.3.2 Water Consumption

No groundwater wells or springs within the site boundary or the wider area have been identified. This is to be further investigated as part of the stakeholder engagement process which is currently ongoing. It was noted during initial site investigations that the land is currently being used temporarily for livestock. It should be confirmed through stakeholder engagement where the water for livestock is sourced.

7.3.3 Precipitation

There is relatively low precipitation throughout most of the year, with the majority of rainfall occurring in April with a monthly average of 17 mm. The monthly precipitation levels[1] at the Project site are shown in Figure 7-2 below.

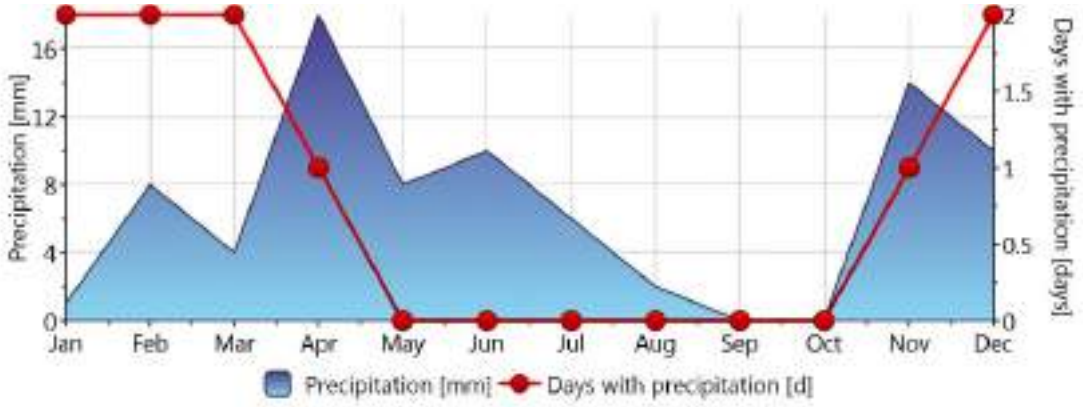

Figure 7-2: Monthly Precipitation Levels

7.3.4 Hydrogeology

The occurrence of groundwater (and its quality) in the aquifers and its movement depends not only on type of formation but also on the recharge mechanisms. All groundwater must have had a source of recharge. This is normally rainfall but can also be seepage from seas, rivers, canals, or lakes. Given the low levels of precipitation, much of the aquifers in KSA do not recharge at the current rates of groundwater extraction.

Infiltrating water percolates to the water table and flows from the points of recharge to the points of discharge. The aquifer flow regime depends on the hydraulic characteristics of the rocks (media) and the hydraulic gradient and may vary widely with the geology and the recharge conditions.

[1] Obtained from Meteonorm database

The geotechnical assessment[2] carried out by Fugro Suhaimi Ltd shows that the subsurface composition of the site can generally be characterised as sand or sand with limestone. Details of the subsurface composition from the geotechnical assessment is provided in Table 7-2 below. The borehole locations are shown in Drawing SU001 provided in Appendix A.

Table 7-2: Subsurface Composition

Location	Borehole no	Subsurface Condition	Description
Profile 1	01, 08, 09, 11, 12, 13, 14, 15, 16 and 19	Stratigraphy	Generally consists of sand from the existing grade to the varying explored depth of 30 m. However, in borehole 08 sandstone was found between soil layers at a depth of 21.0 m to 27.0 m
		Soil Density	Generally medium dense to dense in condition from the existing site grade to the varying depth of 5 m followed by dense to very dense in condition.
Profile 2	02, 03, 04, 05, 06, 07, 10, 17, 18 and 20	Stratigraphy	Generally consists of sand with or without gravel from the existing grade to the varying explored depth of 30 m. However in some boreholes limestone was encountered from varying depth of 1.3 m to 4.0 to the maximum explored depth of 10 m.
		Soil Density	Generally dense to very dense in condition from the existing site grade to the varying explored depth of 30 m.

The results of the geotechnical assessment suggest a high degree of permeability of the surface soils. Groundwater conditions at the Project site were investigated within the boreholes and no groundwater was observed above the maximum explored depth of 30 m.

[2] Preliminary Geotechnical Assessment Sudair Solar Energy Park, Saudi Arabia – 02 May 2018

7.3.5 Flood Risk

Fugro Suhaimi Ltd have carried out a flood risk assessment[3] at the site based on a 100-year flood event[4]. The model has been produced based on a rainfall duration of three hours. From the flood risk model, it is shown that flood water depths can range up to 0.5 m, as shown in Figure 7-3 below. The full hydrological report is provided in Appendix D.

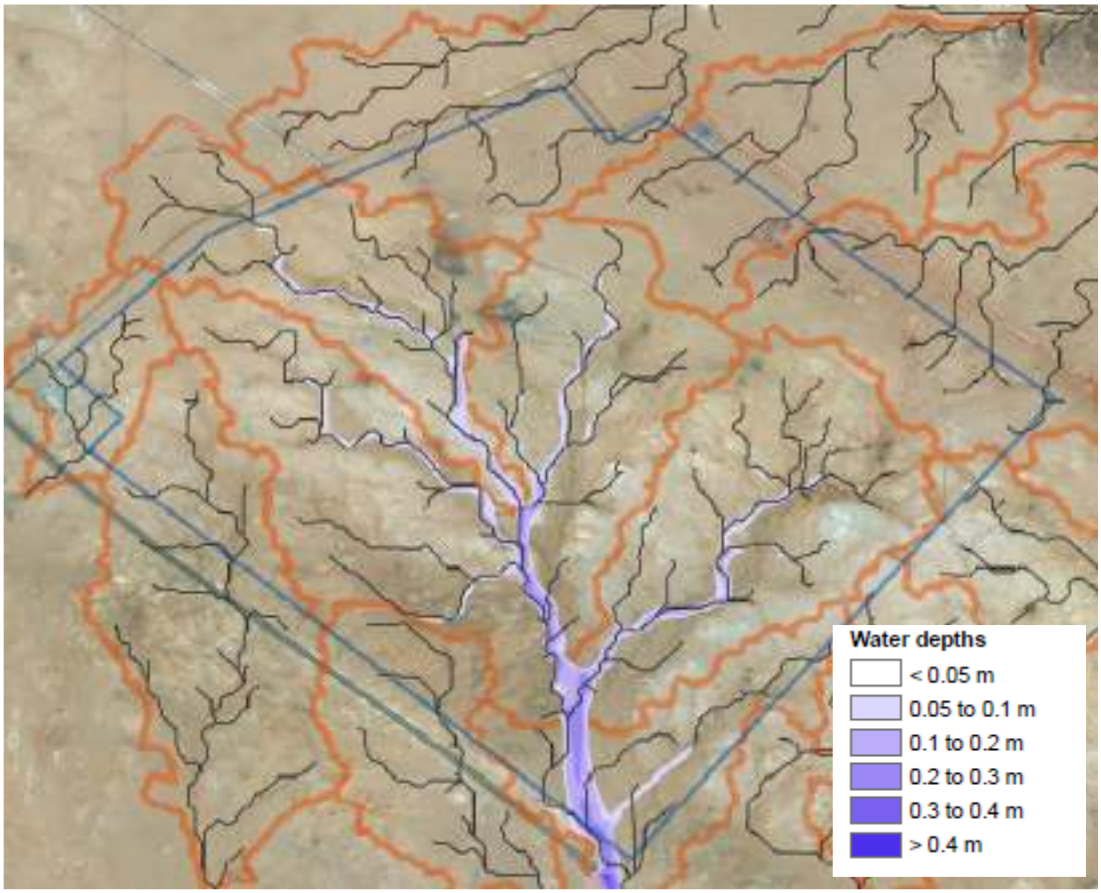

Figure 7-3: Sudair 100 Year Flood Risk (catchment areas shown in orange)

7.4 Assessment of Impacts

This section describes the potential impacts of the Project on the water environment, including both surface and groundwater.

[3] Hydrological Assessment Sudair Solar Energy Park – May 2018

[4] Storm event with 1% chance of occurrence

7.4.1 Construction Impacts

7.4.1.1 Storm water flooding

The flood risk assessment carried out by Fugro Suhaimi Ltd has indicated that some areas within the Project site will be susceptible to flooding during intense rainfall. There is a risk that the introduction of impermeable surface areas used for access roads, construction compounds and building foundations can further increase the water level at these areas. Increased water levels will also increase the risk of erosion through an increased flow rate of surface water downstream from the site. Sensitive receptors downstream of the Project site include plantations/farmland approximately 2 km to the south and Highway 65 to the south. It has been noted during site investigations that significant drainage infrastructure is in place to protect the highway.

From the model produced by in the hydrological report, it is noted that flood water will be dispersed along existing drainage channels to the south of the site via a large culvert that passes under Highway 65. The small area of impermeable surfaces introduced during construction is negligible in comparison to the permeable surface area of the wider catchment area. The magnitude of impact from flood water impacting sensitive receptors downstream of the Project site is considered to be very low, while the sensitivity of these receptors could be considered to be Medium. The overall significance of the impact is therefore considered to be Negligible and temporary in nature.

7.4.1.2 Alteration of Surface Water Flow

During construction earthworks, road construction, trenching and the use of heavy vehicles could alter surface drainage patterns which could impact on surface water features and existing drainage at the Project site. There is a lack of surface water features within the area, however blockages or alterations to the existing drainage pathways could impact on receptors downstream from the site. Without mitigation, the magnitude of impact is considered to be Medium while the sensitivity of receptors is also considered Medium. The overall significance of the impact is therefore considered to be Moderate and temporary in nature.

7.4.1.3 Alteration of Groundwater flow

The introduction of new impermeable surfaces following ground compaction has the potential to impact on the recharge rate of groundwater levels. This has the potential to impact on users within the wider area surrounding the Project site. Given the limited area of impermeable surfaces created compared to the regional extent of the groundwater aquifer the magnitude of change is considered to be Very Low.

Groundwater has not been recorded at the site during the geotechnical assessment and it is considered to be unlikely to be readily available for use within the wider area. However the use of groundwater at the site and the surrounding area should be confirmed as part of ongoing stakeholder consultation (described in Chapter 13). As previously described, the sensitivity of receptors is considered to be Medium. The overall impact significance is therefore considered Negligible.

7.4.1.4 Water Quality

Activities during construction may result in leaks and/or spills from oils, chemicals, concrete wash water and sanitary waste. This has the potential to contaminate surface water and groundwater at the Project site and downstream of the site. Spills, leakages and silt laden run-off during construction is a common occurrence and therefore the magnitude of impact is considered to be High. As has already been defined, the sensitivity to change for receptors regarding to surface water and groundwater are also considered to be Medium. The overall impact significance, prior to mitigation, is therefore considered to be Major and of a temporary short term nature.

7.4.1.5 Water Consumption

Water consumption will be at its highest during the construction phase. It is estimated that a volume of 50 gallons per day (227 litres per day) per construction worker will be required, based on guidance provided by the American Water Works Association. Anticipated construction worker totals are still to be determined, however assuming a peak total work force of 5,700, the Project would require 285,000 gallons per day to cover the needs of the workforce during this peak period.

The number of workers on site is still to be defined as a Project Developer has not been confirmed and therefore a construction strategy is not available. Details of the water consumption on site should be provided by the Project Developer once a construction strategy has been developed.

Some water will be required for the construction of foundations for inverter stations, control room, main substation and switching station. The water requirement will be calculated and assessment updated on confirmation of the foundation requirements. It is not proposed that a local groundwater well is used to provide water for construction activities. It is anticipated that all water will be sourced locally with being transported to the site by lorry, subject to a supply agreement.

Until a detailed project plan is completed by the Project Developer, it is not possible to accurately assess the potential impact of water consumption during the construction phase. This should be determined by the Project Developer. If it is decided by the Project Developer that groundwater is to be used, they will be required to assess the capacity within the aquifer and the water quality prior to construction.

7.4.2 Operational Impacts

7.4.2.1 Storm Water Flooding

There is a risk that the introduction of impermeable surface areas can further increase the water level at areas prone to flooding. The operational stage of the Project will not introduce a significant amount of impermeable surfaces in comparison with the wider catchment area. The magnitude of impact is therefore considered to be Very Low and the impact significance is Negligible.

7.4.2.2 Alteration of Surface Water Flow

Potential impacts to surface water by operating activities would be confined to increased runoff and erosion, primarily in existing or new drainage channels that receive run-off from access roads. Fewer new drainage pathways will be present during the operational phase as all trenching and excavations will have been backfilled and resurfaced following construction. The magnitude of impact on these areas are therefore considered to be Very Low. As previously described, the sensitivity to change is considered to be Medium. The overall impact significance is therefore considered to be Negligible.

7.4.2.3 Alteration of Groundwater Flow

As the mounting structures for the solar panels will be pile driven, the overall impermeable surface area introduced will be limited to access roads, building foundations and inverter station foundations. Given the limited area of impermeable surfaces compared to the regional extent of the groundwater aquifer the magnitude of change is considered to be Very Low and the overall significance of the impact is considered Negligible.

7.4.2.4 Water Quality

The requirement for the use of chemicals and oils will be limited in comparison to the construction phase of development. The requirement for welfare facilities will also be significantly reduced, meaning the potential risk of sanitary waste spills is greatly reduced. The overall magnitude of impact is therefore considered Low. The overall impact significance, prior to mitigation, is therefore considered to be Minor and permanent.

7.4.2.5 Water Consumption

The requirement for water during operation will be limited for use by welfare facilities and drinking water at the control room. Panels will be dry cleaned and no water will be consumed for this purpose. The magnitude of impact is therefore Very Low and the impact significance is considered to be Negligible.

7.4.3 Decommissioning

Effects on water resources during decommissioning are likely to be similar to those during construction through the introduction of new drainage channels from earthworks. Contaminated materials such as oil storage tanks would need to be removed from the site and taken to a suitable disposal site to prevent future contamination of surface and groundwater. Due to the proposed future development of the Sudair Industrial City, the baseline conditions should be reassessed and the impact assessment of the decommissioning phase assessed as part of a separate ESIA.

7.5 Mitigation

7.5.1 Mitigation by Design

The details of the hydrology assessment (Appendix D) should be considered by the Project Developer in order to design an appropriate drainage system. A suitable mounting system for the solar panels should be utilised within flood zones in order to prevent the blockage of existing surface water drainage channels.

7.5.2 Construction

To reduce the potential for erosion of drainage channels during construction, transport routes should be selected to avoid ephemeral drainage channels where possible. Culverts or other drainage control features should be installed where crossings of drainage routes are unavoidable.

The risk of contamination through temporary storage facilities should be reduced through the storage of all materials within designated areas. Supplies should also be provided for the clean-up of minor spills.

To reduce the risk of soil and water pollution from leaks and spills through storage of oil it is recommended that:

- A designated storage area is established with an impervious base and impermeable bund walls. Capacity must be sufficient to contain the full volume within a bund and secured area.
- All fuel, oil and chemical storage is stored in a designated secure area.
- Hoses and valves are checked regularly for signs of wear and ensure that they are turned off and securely locked when not in use.
- Diesel pumps and similar items are placed on drip trays to collect minor spillages. Trays should be checked regularly and accumulated oil removed.

A suitable drainage system should be designed by the Project Developer to ensure that any silt laden run off during construction does not impact on surface water features downstream from the project site. The drainage system may consist of swale features running parallel to site contours within the downslope areas of the site. The system should intercept and distribute flow, create storage, attenuate runoff and promote infiltration across the site

With regards to potential impacts associated with the construction workforce, it is proposed that sanitary waste is collected in containers below portable toilets and transported for disposal. The waste will be disposed of by a licenced contractor.

A water resource use assessment and management plan will be developed to confirm construction water use and the potential impact on other receptors.

7.5.3 Operation

The potential for soils and groundwater contamination associated with waste and chemical spills should be reduced through the reduction of wastes to the extent possible whilst maximising the re-use and recycling of materials. All waste and garbage should be collected and stored before disposal at a designated storage location.

Mitigation measures associated with maintenance and use of oils and other chemicals include:

- Establish a designated storage area with an impervious base and impermeable bund walls, and protected from precipitation. Capacity must be sufficient to contain the full volume within a bund and secured area.
- Store all fuel, oil and chemical storage in the designated secure area.
- Do not leave vehicles unattended during refuelling, never leave open a delivery valve.
- Check hoses and valves regularly for signs of wear and ensure that they are turned off and securely locked when not in use.
- Place diesel pumps and similar on drip trays to collect minor spillages. Check trays regularly and remove any accumulated oil.

An operational water availability / resource use assessment and management plan will be developed to confirm operational water use.

7.6 Residual Effects and Conclusions

The assessment has identified areas of activity, particularly during construction and decommissioning operations that have the potential to impact on the hydrology and hydrogeology of the site. Prior to mitigation, the most significant impact has been classed as Major and temporary in nature. This is with regard to the potential for water contamination during the construction phase of the Project. Suitable construction mitigation measures have been proposed and the construction ESMP should be implemented in order to reduce any hydrological and hydrogeological impacts. Following implementation of the mitigation measures, the residual impact significance can be considered to be Minor during construction and Negligible during operation.

8 Geology and Soils

8.1 Introduction

This assessment considers the potential impacts of the Project on geology and soils at the Project site.

8.2 Assessment Methodology

Baseline data has been collected from specialist survey and desk-based sources to inform the assessment process. The assessment of potential impacts has been undertaken in accordance with the criteria outlined in Chapter 4.

8.3 Baseline Conditions

A geotechnical assessment of the Project site has been carried out by Fugro Suhaimi Ltd (Appendix B). The results of the geotechnical assessment define the baseline conditions of the Project site.

8.3.1 Soils

The topsoil layer at the site is classified as silty sand and vulnerable to erosion. The laboratory tests for the topsoil layer at the site are detailed in Table 8-1 below.

Table 8-1: Topsoil Characteristics

Borehole	Sample depth	Gravel (%)	Sand (%)	Fines Content (%)	Unified Soil Classification
01	0 – 1.0 m	1.7	70.8	275	Silty Sand
02		14.0	68.4	17.6	
03		6.8	79.3	13.9	
04		0	80.2	19.8	
05		2.8	79.1	18.1	

Chemical tests of the soils at the sites have also been undertaken, these are detailed in Table 8-2 below.

Table 8-2: Soil Chemical Test Results

Borehole	Depth (m)	Chloride Content Cl (%)	Sulphate Content SO_4^2(%)	pH	Calcium Carbonate, $CaCO_3$ (%)
04	1.50	0.123	0.912	8.78	5.2
07	2.25	0.006	0.011	9.40	16.0
12	1.50	0.04	0.002	9.23	4.8
16	2.25	0.004	0.011	9.44	8.4

8.3.2 Seismic Conditions

The ThinkHazard[5] tool developed by the Global Facility for Disaster Reduction and Recovery (GFDRR) defines the Riyadh region of KSA as a Very Low hazard to earthquakes. GFDRR define this risk as meaning there is a 2% chance of potentially damaging earthquakes within the next 50 years. Seismic risk is therefore not assessed further in the ESIA.

8.4 Assessment of Effects

8.4.1 Construction

The construction phase has the potential to impact on soils at the site from activities such as levelling, earthworks, facility construction, trenching and excavation.

8.4.1.1 Loss of Soil Resource

From the test results described above, there is little or no agricultural value at the site and the sensitivity of the receptor is therefore considered to be Low. As the Project location is located within the Sudair Industrial City under the ownership of MODON, the proposed use of the land as a Solar PV Plant means magnitude of change is considered to be Very Low. The overall impact significance is therefore Negligible.

[5] www.thinkhazard.org

8.4.1.2 Erosion

Earthworks carried out at the site may alter existing site drainage pathways and increase the risk of erosion at other areas of the Project site. Vehicle traffic along dirt tracks will also cause compaction, potentially introducing new drainage pathways which could contribute to soil erosion.

The characteristics of the topsoil at the site means that the soil will be susceptible to erosion, however the relatively level topography of the Project site means the soil has an overall Low sensitivity to erosion impacts from surface water.

Piling will be used for the construction of the mounting structures, the level of soil compaction across the site area will therefore be limited to the construction compound, access roads and building foundations. The dry climate in the region also means that the introduction of new drainage channels is considered to be limited. The main risk regarding the formation of new drainage channels is from the movement of vehicles on site during clearance activities, as dedicated roads will not yet be established. The magnitude of change is considered to be Medium during the construction phase. The overall significance of the impact is therefore considered to be Minor and of a temporary short term nature.

8.4.2 Operation

8.4.2.1 Erosion

During the operational phase of the Project, the main impacts on surface soils will be from continued vehicle traffic. There should be no requirement for vehicles to travel outside of the constructed access roads and this should be discouraged. If designated roads are not used, vehicle movements will cause damage over the wider area and potentially introduce new drainage channels which could increase the risk of erosion across the site. As previously described, the receptor sensitivity is considered to be Low. However the magnitude of change is considered to be Very Low due to the decreased level of traffic using the site during operation. The overall impact significance is therefore considered Negligible.

8.4.1 Decommissioning

Similar to construction, soils will be highly vulnerable to traffic and erosion during decommissioning. The potential adverse impacts as described during the construction phase are of relevance to the decommissioning phase of the Project.

The movement of materials off-site may involve the construction of temporary roads and use of large vehicles. Similar mitigation measures to those during under the construction phase will need to be taken to minimize impacts on soils. Reinstatement of land and after-care will be critical to mitigating the damage to soils. As with the construction stage, the overall impact significance is considered to be Minor and temporary in nature.

8.5 Mitigation

8.5.1 Design and Planning

To reduce damage to soils and risks of soil erosion, the length and width of the on-site and off-site roads should be optimized to reduce the need for cut-and-fill material. Run-off and erosion control features should be included in all civil designs by the Project Developer.

Design parameters for foundations, access roads and drainage constructed at the site have been provided by Fugro Suhaimi Ltd to account for soil liquefaction potential, wind erosion, water erosion chemical attack and carbonate leaching. These design parameters are required to be adhered to by the contractor to reduce the potential impacts detailed above. The design parameters are detailed in the geotechnical report detailed in Appendix B.

8.5.2 Construction

General mitigation measures to be applied during construction include the following:

- Clearly demarcate storage and staging areas and store all materials, equipment and vehicles in demarcated area to reduce soil damage. Furthermore, vehicles should be confined to demarcated roadways.
- Establish native grasses in erosion control channels and in other areas immediately after final disturbance.
- Salvage and store topsoil and subsoil before areas are excavated, with topsoil stripped and stockpiled separately.
- Segregate excavated soils into stockpiles dependant on material type and provide erosion control while stockpiled.
- On completion of earthworks, backfill material in the same stratigraphic sequence.
- If narrowing access roads following construction, scarify compacted areas and establish native grasses.

- Once construction and road-building are complete, scarify all areas compacted by off-road vehicle / equipment movements and establish native grasses.
- Store all materials within designated areas of temporary storage facilities and provide supplies to clean-up of minor spills.
- Confine all vehicles and equipment to the roadway and, to extent possible, minimize activities during wet conditions. When activities must occur in wet conditions, control storm water by using fabric, straw bales or other measures to impede storm water flow and prevent erosion.
- When damage to wet soil occurs, repair once dry conditions return.
- For storage of oil, establish a designated storage area, with impervious base and impermeable bund walls. Capacity must be sufficient to contain full volume within a bund and secured area.
- Store all fuel, oil and chemical storage in the designated storage area.
- Check hoses and valves regularly for signs of wear and ensure they are turned off and securely locked when not in use.
- Place diesel pumps and similar items on drip trays to collect minor spillages. Check trays regularly and remove any accumulated oil.
- Reduce the amount of waste to the maximum extent possible.
- Collect all solid waste and store until transported to the designated disposal site.

The above mitigation measures will be incorporated within the proposed ESMP provided in Chapter 15.

8.5.3 Operation

Several measures are recommended during operation of the Project to reduce damage to soils. These include:

- Confine all vehicles to roadways.
- Monitor road condition regularly; then repair damaged and rutted roads rather than bypassing damaged sections.
- Monitor erosion controls and repair as needed.
- Where possible, maintain grass cover on berms and ditches.
- Prohibit use of vehicles and equipment off prepared roads.
- Re-stabilize existing eroded tracks and restore grass cover as needed.
- Do not collect firewood from the site.

- Reduce wastes to the extent possible and maximise re-use and recycling of materials. Collect and store all waste and garbage before disposal at the designated site.
- Clean up and store oily and chemical waste and contaminated material before transport to the designated disposal site to reduce risk of soil and groundwater contamination.
- Establish a designated storage area with an impervious base and impermeable bund walls, and protected from precipitation. Capacity must be sufficient to contain full volume within a bund and secured area.
- Store all fuel, oil and chemical storage in the designated secure area.

The above mitigation measures will be incorporated within the proposed ESMP provided in Chapter 15.

8.6 Residual Effects and Conclusions

The most significant impacts on soils have been assessed as Minor during construction as a result of potential erosion from vehicle traffic, topsoil stripping, soil compaction and the use of heavy equipment. Impacts should be relatively short in duration, lasting only through construction. Following implementation of the proposed mitigation measures, the residual impact is considered to be Negligible.

During operation, impacts on soils are less significant and mainly confined to continued vehicle traffic. The main risks are associated with vehicles leaving the prepared roads and driving cross-country. With mitigation implemented, these risks should be removed, resulting in no residual impacts.

9 Archaeology and Cultural Heritage

9.1 Introduction

Cultural heritage is important as a source of valuable historical and scientific information, as an asset for economic and social development and as an integral part of a people's cultural identity, practices and continuity.

This chapter assesses the potential impacts of the Project and associated works on cultural heritage assets in the surrounding area. Mitigation is proposed where appropriate to reduce adverse impacts and enhance benefits where possible.

9.2 Assessment Methodology

Baseline data was collected through desk-based studies and a site visit conducted in January 2018. This information has been utilised to guide the assessment of potential impacts. The method of assessment has been based upon that which is outlined in Chapter 4.

9.3 Baseline Conditions

In terms of the Project site and its immediate environs, it does not appear that the site has been set aside for any cultural purposes or declared a protected site. It does not have forests or trees of cultural significance. It was further noted that no archaeological, cultural and/or heritage sites are located within the Project site. However, the potential for chance finds remains, especially during construction, which would require considerable care and proper management.

There are four UNESCO World Heritage Sites in Saudi Arabia[6]:

- Al-Hijr Archaeological Site (Madâin Sâlih)
- At-Turaif District in ad-Dir'iyah
- Historic Jeddah, the Gate to Makkah
- Rock Art in the Hail Region of Saudi Arabia

The closest of these (At-Turaif District in ad-Dir'iyah) is located approximately 150km to the south-east of the Project site.

[6] whc.unesco.org/en/statesparties/sa

A list of identified important archaeological sites in Saudi Arabia was composed, as shown in Table 9-1, based on desk-top research of publically available information. The Saudi Commission for Tourism and National Heritage will be consulted prior to construction in order to ensure that all relevant heritage and antiquity sites are considered in the assessment.

Table 9-1: Important Archaeological Sites in Saudi Arabia

ID	Name	Location (Lat/Long)	ID	Name	Location (Lat/Long)
1	Abu Loza's Bath	26.561°N 49.993°E	12	Dhat al-Hajj	29.047°N 36.169°E
2	Al-`Ula	26.617°N 37.917°E	13	Dosariyah	26.877°N 49.818°E
3	Al-Rabadha	24.632°N 41.291°E	14	Dumat al-Jandal	29.811°N 39.868°E
4	Al-Ukhaydir, Tabuk Province	28.092°N 37.126°E	15	Land of Tema	27.63°N 38.544°E
5	Al-Ukhdūd Archeological Area	17.545°N 44.230°E	16	Leuke Kome	28.097°N 35.203°E
6	Jubbah	28.010°N 40.939°E	17	Marid Castle	29.811°N 39.867°E
7	Tārūt	26.574°N 50.067°E	18	Pharaonic Tayma inscription	27.612°N 38.529°E
8	Al-Shuwayḥaṭiyah	30.308°N 40.204°E	19	Qal'at al-Qatif	26.559°N 50.005°E
9	Thāj	26.887°N 48.704°E	20	Shanqal Fort	21.205°N 41.626°E
10	Dūmat Al-Jandal	29.811°N 39.889°E	21	Tomb of Eve	21.492°N 39.19°E
11	Bir Hima Rock Petroglyphs and Inscriptions	18.249°N 44.452°E			

All of the above-listed sites are located outside a 100 km radius of the site.

9.4 Assessment of Effects

As no international or nationally recognised cultural heritage feature have been identified within the Project site or in the surrounding area, the Project is deemed not to have any direct or in-direct adverse impacts on such features during construction, operation or decommissioning.

There is the potential for the discovery of unrecorded buried archaeological remains during the construction phase as the Project will involve ground clearance activities such as levelling, grading and excavation works. These works have the potential to directly impact on unrecorded buried archaeological remains which may be present within the site boundary and may be of archaeological importance.

9.5 Mitigation

As there are no direct or indirect impacts predicted in relation to known cultural heritage features during any stage of the Project, mitigation will focus on the implementation an appropriate archaeological chance finds procedure during initial construction works to identify any uncovered archaeological features.

An archaeological chance finds procedure will in all cases be intended:

- To allow, within the resources available, the preservation by record of archaeological deposits. The presence and nature of which could not be established (or established with sufficient accuracy) in advance of development or other potentially disruptive works.
- To provide an opportunity, if needed, for the watching archaeologist to signal to all interested parties, before the destruction of the material in question, that an archaeological find has been made for which the resources allocated to the chance find procedure itself are not sufficient to support a treatment to a satisfactory and proper standard.

The archaeological chance finds procedure will be intended to establish and make available information about the archaeological resource existing on the site.

During construction, toolbox talks will be provided to ensure that workers will be alert to any signs of past cultural activity in the area. Should any artefacts or evidence of past activity be discovered, REPDO will notify the appropriate authorities and await direction before taking action that would disturb the resources.

9.6 Residual Effects and Conclusions

The assessment of potential impacts on known cultural heritage assets in and around the Project site has determined that there are no likely significant effects. There is the potential for residual impacts on any previously undiscovered sites and features that may be discovered during construction works. Mitigation measures will be put in place to alert the appropriate authorities to artefacts or evidence of past activity discovered.

With mitigation, it can be concluded that there would be no significant impacts associated with cultural heritage as a result of the Project.

10 Noise and Vibration

10.1 Introduction

Although solar power projects have limited noise sources, there can be noise generated from the inverter units and substation building. Additionally, the construction phase will result in some short-term noise impacts from construction activities and vehicles.

This assessment details the potential noise impact on nearby sensitive receptors.

10.2 Assessment Methodology

Sensitive noise receptors have been identified through site investigation and desk based assessment.

The noise impact assessment considered the relevant national standards with regards to noise[7]. Baseline background noise assessments are required in order to inform the ESMP and ongoing monitoring of environmental performance. These baseline assessments are being carried out using IEC compliant[8] sound level meters. Noise measurements are taken over a one hour period at identified sensitive receptor locations.

The assessment of potential impacts has been undertaken in accordance with the criteria outlined in Chapter 4.

10.3 Baseline Conditions

The fieldwork necessary for completing the baseline noise measurements is currently ongoing and being carried out by Dakkak Trading Group. The results of the baseline monitoring will be provided as an addendum to the ESIA. The remainder of this section focuses on any identified sensitive receptors and the regulatory requirements set by GAME.

10.3.1 Regulatory Requirements

The noise standards set by GAME set a basis for statutory control to restrict and reduce nuisance caused by environmental noise. This standard does not address the issue of occupational noise which falls under the jurisdiction of KSA Health and Safety Law.

[7] PME Environmental Standards, Environmental Noise 2012

[8] IEC 61672 – A Standard for Sound Level Meters

Those noise activities covered by the standards, and those relevant to the Project, include:

- Noise from industrial units in areas set aside primarily for industrial facilities
- Noise from construction activities.
- Noise from vehicles.
- Noise from equipment used outdoors.

Permitted noise limits at specific receptors are detailed in the noise standards and summarised in Table 10-1 below.

Table 10-1: Noise Limit Categories

Category	Receptor Description	Day L_{Aeq} (dB)	Evening L_{Aeq} (dB)	Night L_{Aeq} (dB)
A	**Sensitive** – These areas are designated quiet areas as they hold value in terms of them being places of worship, important tourist attractions, recreational park land and those areas surrounding hospitals, schools and noise sensitive natural habitats.	50	45	40
B	**Mixed** – Areas designated in this category will typically be dominated by residential properties (including hostels and hotels) and may range from sparse population densities to suburban districts of cities.	55	50	45
C	**Non-sensitive** – This designation applies to mixed areas, often within cities where there is a mix of residential and commercial activities. This designation will also apply to retail and financial districts.	60	55	50

Noise limits at sensitive receptors during construction activities are also defined in the noise standard. These are detailed in Table 10-2 below.

Table 10-2: Construction Noise Limits

Category	Receptor Description	Day L_{Aeq} (dB)	Evening L_{Aeq} (dB)	Night L_{Aeq} (dB)
A	**Quiet Areas** - These areas are designated quiet areas as they hold value in terms of them being places of worship, important tourist attractions, recreational park land and those areas surrounding hospitals, schools and noise sensitive natural habitats.	75	65	45
B	**Sensitive** – Areas designated in this category will typically be dominated by residential properties (including hostels and hotels) and may range from sparse population densities to suburban districts of cities.	75	65	45
C	**Mixed** – This designation applies to mixed areas, often within cities where there is a mix of residential and commercial activities. This designation will also apply to retail and financial districts.	75	65	45
D	**Non-sensitive** – The final classification of district is a predominantly industrial area where there are few residential properties and commercial premises. This classification also applies to industrial cities and land that is generally unpopulated.	80	80	80

10.3.2 Noise Sensitive Receptors

Identification of noise sensitive receptors (NSR) has been undertaken based on site investigations and desk based assessment. A potential area of influence of 2 km from the site boundary has been utilised in order to identify potential receptors. This is illustrated in Figure 10-1 below.

Figure 10-1: Noise Receptor Search Buffer (shown blue)

Some potential NSRs have been noted approximately 2 km to the south of the site (as shown above). Prior to carrying out baseline monitoring, it should be confirmed whether these are residential areas. It is noted that some temporary camps are located within the site boundary, however these camps are to be relocated prior to construction (see Chapter 13). Areas outside the Project's area of influence are considered to be non-sensitive in accordance with KSA's environmental noise standard.

Consideration should be made for any new camps or residential properties that may be located within the area of influence following Project construction and operation. As the site is classified as an industrial city, any future receptors in the area could be considered as non-sensitive with criteria described in Table 10-1 and Table 10-2.

10.4 Assessment of Effects

10.4.1 Construction

There will be short term noise impacts on any future NSRs during construction. This will mainly be from construction traffic, excavation works, construction of hardstandings, piling and the erection of security fencing.

Typical construction noise levels are detailed in Table 10-3 below based on British Standard BS5228-1:2014. The noise impact assessment has been undertaken on the assumption that future NSRs would not be located closer than 200 m from the Project site.

Table 10-3: Typical Construction Noise Levels

Phase	Sound Power Level at Source (BS5228:2014)	Noise Level at NSR (assumed 200 m distance)
Ground preparation.	Dumper truck 118 dB. Backhoe excavator 99 dB.	64 dB
Concrete preparation.	Cement mixer (petrol or diesel) 92 dB.	38 dB
Installation of transformers and invertors.	Delivery truck (4axle wagon) 110 dB. Mobile telescopic crane (50t) 98 dB.	56 dB

The noise impact on construction workers is considered further as part of the social impact assessment in Chapter 13.

The nearest potential NSRs are located approximately 2 km from the Project site. Based on the existing and future use of the site and the surrounding area, it is considered that these NSRs can be categorised as Category C receptors in accordance with KSA noise standards. At a distance of 2 km from the edge of the Project boundary, there is not considered to be any adverse impacts from noise during construction and statutory noise limits are unlikely to be breached.

Based on the categorisation of the NSRs, the sensitivity of the receptor is considered to be Medium while the magnitude of impact would be Very Low. The overall significance of the impact will therefore be Negligible and of a temporary nature.

10.4.2 Operation

Solar PV panels themselves do not provide a noise source during operation, however equipment within the site (typically inverter stations and transformers) will emit noise during operation. At this stage, the specifications of the equipment have not been finalised, however it is expected that inverter units and transformers will emit a low level of noise in the region of 65 – 70 dB.

The larger main substations connected to the switching station will also emit noise during operation. These will be located adjacent to the existing transmission line which runs adjacent to the site boundary. It is considered unlikely that future NSRs will be located within the vicinity of the substations due to the presence of the transmission line infrastructure.

The lack of sensitive receptors in the vicinity of the Project site and the low level of operational noise means there are no anticipated adverse impacts from operational noise from the Project.

10.4.3 Decommissioning

Similar noise impacts during decommissioning as shown during construction are anticipated. The change in baseline conditions prior to decommissioning should be assessed in a separate ESIA prior to any decommissioning activities.

10.4.4 Mitigation

No specific mitigation through design is proposed to reduce noise related impacts at NSRs as no adverse impacts have been identified.

10.4.5 Residual Effects and Conclusions

No significant adverse impacts from noise have been identified. Baseline monitoring is currently being carried out at the request of GAME. The baseline noise levels will be used to assess the noise from the Project at any existing and future NSRs that may be present in the future during the operational phase of the Project. The requirement for these measures is detailed in the ESMP provided in Section 15.

11 Air Quality

11.1 Introduction

Solar power projects will have no emission sources during their operation. However, air quality during the construction phase should be considered through short-time impacts from construction activities and vehicles.

This assessment details the potential impact on air quality at nearby sensitive receptors.

11.2 Assessment Methodology

The air quality impact assessment considered the relevant national standards with regards to air quality[9,10]. Baseline air quality measurements are required in order to inform the ESMP and ongoing monitoring of environmental performance. These baseline assessments are being carried out by Dakkak Trading Group (DTG) using their Mobile Air Quality Monitoring System (MAQMS). The MAQMS is housed in a trailer mounted environmentally controlled shelter containing the air quality monitoring equipment. Ambient air is brought into the MAQMS through an intake system designed to minimise the effects of excess moisture and sand. The system operates automatically and data is stored within internal data loggers for a 24 hour period.

The analysis equipment includes a sulphur dioxide analyser, ozone analyser, carbon monoxide analyser, nitrogen analyser and particulate matter analyser. The parameters to be measured during baseline assessments are detailed in Table 11-1 below.

Table 11-1: Ambient Air Quality Parameters

Parameter	Formula
Sulphur Dioxide	SO_2
Nitrogen Dioxide	NO_2
Ozone	O_3
Hydrogen Sulphide	H_2S
Carbon Monoxide	CO

[9] PME Environmental Standards, Ambient Air Quality

[10] PME Environmental Standards, Mobile Source Emissions

Parameter	Formula
Particulate Matter (10 µm)	PM_{10}
Particulate Matter (2.5 µm)	$PM_{2.5}$

The assessment of potential impacts has been undertaken in accordance with the criteria outlined in Chapter 4.

11.3 Baseline Conditions

The fieldwork necessary for completing the baseline ambient air quality measurements is currently ongoing. The results of the baseline monitoring will be provided as an addendum to the ESIA.

The remainder of this section focuses on any identified sensitive receptors and the regulatory requirements set by GAME.

11.3.1 Regulatory Requirements

The ambient air quality standards and mobile source emission standards set by GAME set a baseline standard for air quality within KSA. The ambient air quality standards set by these standards are detailed in Table 11-2.

Table 11-2: Ambient Air Quality Limits

Parameter	Time-weighted average µg/Nm₃ (ppm)	Averaging Time	Number of allowable Exceedances
Carbon Monoxide	10,000 (8.1)	8 Hours	None
	40,000 (32)	1 Hour	
Lead	0.5 (0.00005)	Annual	N/A
Nitrogen Dioxide	660 (0.35)	1 Hour	2 times per 30 days
	100 (0.05)	Annual	N/A
Sulphur Dioxide	730 (0.28)	1 Hour	2 times per annum
	365 (0.14)	24 Hours	1 time per annum

Parameter	Time-weighted average µg/Nm_3 (ppm)	Averaging Time	Number of allowable Exceedances
	80 (0.03)	Annual	N/A
Benzene	5 (0.0015)	Annual	N/A
Particulate Matter (PM_{10})	340 (variable)	24 hours	24 times per annum
	80 (variable)	Annual	N/A
Particulate Matter (PM2.5)	35	24 hours	24 times per annum
	15	Annual	N/A
Ozone	235 (0.12)	1 hour	2 times per 30 days
	157 (0.08)	8 hour	2 times per 7 days
Hydrogen Sulphide	150 (0.1)	24 hour	10 times per annum
	40 (0.03)	Annual	N/A

In addition to ambient air quality standards, emission limits for mobile sources (e.g. vehicles, generators etc) are detailed within the mobile source standards. These limits are detailed in Table 11-3 to Table 11-5 below. The aim of these limits is to protect human health, occupational health and natural ecosystems such as croplands, forests and deserts.

Table 11-3: Non Road Diesel Engine Limits

Rated Power	Carbon Monoxide (g/kWh)	Hydrocarbons (g/kWh)	Nitrous Oxides (g/kWh)	Particulate Matter (g/kWh)	Smoke Opacity (acc/lug/peak)
50 ≤ hp < 100	N/A	N/A	9.25	N/A	20/15/50 %
100 ≤ hp < 175					
175 ≤ hp < 750	11.4	1.34		0.54	
Hp > 750					

Table 11-4: Non Road Petrol Engine Limits

Rated Power	Carbon Monoxide (g/kWh)	Hydrocarbons (g/kWh)	Nitrous Oxides (g/kWh)	Hydrocarbons and Nitrous Oxides Ratio
<225cc (non handheld)	518.97	N/A	N/A	N/A
≥ 225cc (non handheld)				
<20cc (handheld)	804.6	295.02	5.36	.0.54
≥20cc >50cc (handheld)		241.38		N/A
≥50cc (handheld)	603.45	160.92		

Table 11-5: Non Road Vehicles

Vehicle Type	Engine Capacity (cc)	Carbon Monoxide (g/kWh)	Hydrocarbons (g/kWh)	Hydrocarbon/ Nitrous Oxides Ratio	Particulate Matter (g/kWh)
Specialty vehicle engines (<25hp)	<225	469.35	N/A	16.1	1.21
	≥225			13.41	
Specialty vehicles engines	All	134.1	N/A	4.29	0.34
Off-road Motorcycles and all terrain vehicles	All	20.12	1.61	N/A	N/A

11.3.2 Sensitive Receptors

Identification of sensitive receptors has been undertaken as part of the noise assessment detailed in Chapter 10. Potential sensitive receptors have been noted within a 2km search area from the site boundary to the south of the Project site. In the future, residential receptors and/or camps may also be present within the area. Compliance air quality monitoring can be undertaken at these receptors in comparison to the baseline values monitored as part of this assessment.

11.4 Assessment of Effects

11.4.1 Construction

Temporary sources of potentially harmful emissions will occur during the construction phase from various sources of construction plant machinery and stationary generators. Additionally, due to the surface conditions of the Project site, airborne dust is likely to be an issue. Prolonged exposure to dust can have present respiratory health issues through the inhalation of particulate matter. The existing baseline conditions of particulate matter from airborne dust is not currently known as baseline monitoring is currently ongoing. Construction activities such as earthworks and excavations are likely to increase the baseline levels of particulate matter. The sensitivity of any receptors to air quality impacts is High, however given the distance these receptors are from the Project site the magnitude of impact is considered to be Low. The overall significance of the impact is therefore considered to be Moderate and of a temporary nature.

The impact on construction workers should be taken into consideration. Given the susceptibility of the soil with regards to erosion, it is considered that the magnitude of change to air quality during construction would be Medium. The overall impact, prior to mitigation, would be Major and of a temporary short term nature. Mitigation measures relating to occupational health and safety are discussed further in Chapter 13.

11.4.2 Operation

The operation of a solar plant will not contribute potentially harmful emissions. Some emissions will occur through vehicle movements and machinery from operation and maintenance activities, however these are considered to be negligible. The operation of the Project is considered to have a net positive impact on air quality through the generation of clean energy.

11.4.3 Decommissioning

The impacts of decommissioning will have a similar impact to those during the construction phase. Further assessment of the air quality impact should be assessed prior to decommissioning activities as part of a separate ESIA. This will require an assessment of any sensitive receptors within the area that were not present during the construction phase.

Mitigation measures are required to ensure construction workers and nearby sensitive receptors are protected from potentially harmful emissions, particularly from dust particulate matter. The following mitigation will be in place during the construction phase:

- Control the speed limit for all motor vehicles coming to or leaving the construction site
- Train all workers on the management of air pollution from vehicles and machinery
- Prohibit engine idling and over revving of construction vehicles and machinery to minimise emissions
- Ensure all vehicles and machinery comply with the KSA mobile source emission standards.
- Sprinkle water at the construction site and on access roads to minimize fugitive dust during dry weather conditions
- Ensure regular inspection and scheduled maintenance for all construction vehicles and machinery
- Provide workers with dust masks at all times when working in dusty conditions
- Continuously monitor dust emission levels at construction site
- Ensure the vehicles transporting loose materials like soil and cement are properly covered

These measures will be included within an Occupational and a Community Health and Safety Plan, as discussed further in Chapter 13.

11.4.4 Residual Effects and Conclusions

Baseline monitoring of the air quality at the Project site is currently ongoing. This information will be used to inform the construction ESMP and the ongoing monitoring of the environmental performance of the Project.

It is noted that the impact of airborne dust during the construction phase could have a significant impact on construction workers at the site and receptors to the south of the site. Mitigation measures have been proposed and the implementation of these mitigation measures will mean the residual impact will be Minor. The implementation of these mitigation measures will be monitored in accordance with the ESMP provided in Chapter 15.

12 Transportation and Access

12.1 Introduction

This Chapter describes the likely effects of the Project including a description of the access routes and the likely extent of highway works along those routes, and presents the assessment of the significance of these effects. Where required, appropriate mitigation measures are outlined and any resultant residual effects assessed. As with the other chapters, a realistic worst-case scenario has been assessed.

At this stage it is assumed that the Solar PV components will be transported over land from the Riyadh to the Project site. The proposed transport route is shown in SU020 Appendix A.

12.2 Assessment Methodology

The assessment is based on the use of a number of different types of vehicles used during the construction and operation of the Project. These include:

- Light Goods Vehicles (LGVs) – contractors' vans, minibuses, private cars etc.
- Heavy Goods Vehicles (HGVs) – vehicles with a maximum rigid length of 12 m and a maximum articulated length of 16.5 m.
- Abnormal loads – vehicles over 25 m in length or 3.6 m wide.

12.2.1 Guidance

The assessment has been carried out using the IEMA (2003) "Guidelines for the Environmental Assessment of Road Traffic". The guidelines suggest the following thresholds are adopted to assess whether particular links of the network are to be subject to assessment:

- Rule 1 – Include highway links where traffic flows will increase by more than 30 % (or number of HGVs increasing by more than 30 %).
- Rule 2 – Include any other specifically sensitive areas where traffic flows will increase by 10 % or more.

12.2.2 Baseline Data Collection

A desktop review and site visit (undertaken in January 2018) have been undertaken to identify any key issues with regard to accessing the site and to consider the availability of potentially suitable access routes from an appropriate port or main road. This high-

level route assessment was based on existing maps, satellite imagery and information gathered during the site visit.

There has been no data available to estimate the current national traffic volumes on the proposed roads to be used for transportation of materials on the site.

12.2.3 Assessment of Effects

The following sections set out the methodology which has been used to determine if the increased traffic flows during the construction phase of the Project are likely to be significant.

12.2.3.1 Sensitivity Criteria

The sensitivity of roads, their users and settlements along the proposed route has been assessed in accordance with the criteria set out in Table 12-1. The IEMA guidance details that sensitive locations are defined as receptors that are sensitive to traffic including amenities such as hospitals, places of worship, schools and historic buildings.

Table 12-1: Sensitivity Criteria

Sensitivity	Criteria
High	Large rural settlement containing numerous amenities. Traffic management measures in place such as controlled crossings, signalled junctions etc. Minor / unclassified unpaved roads with low traffic flow volumes. These may not be suitable for large HGV vehicles.
Medium	Rural settlement with a number of amenities. Minor traffic management measures in place. Local road (paved / unpaved) suitable for HGV traffic.
Low	Small rural settlement with few local amenities. Minimal traffic management measures in place. Paved road capable of large volumes of HGV traffic.
Negligible	Scattered dwellings with no local amenities. No / little traffic management in place. Highway suitable for all types of vehicles and volumes.

12.2.3.2 Magnitude of Change Criteria

The magnitude of impact on traffic flow is determined based on criteria set out in the IEMA guidelines. This is set out within Table 12-2 below.

Table 12-2: Magnitude of Change Criteria

Magnitude of Change	Increase in Traffic Flow	Increase in HGVs
Large	Above 90%	Above 90%
Medium	Between 60% and 90%	Between 60% and 90%
Small	Between 30% and 60%	Between 30% and 60%
Negligible	Under 30%	Under 30%

12.2.3.3 Assessing Level of Effect

Using these definitions, a combined assessment of sensitivity and magnitude has been made to determine the level of the predicted effect on a receptor i.e. Negligible, Minor, Moderate or Major. All direct and indirect impacts causing Moderate or Major effects, as identified within Table 12-3 are considered to be significant.

Table 12-3: Matrix for Assessing Level of Effect

Magnitude of Change	Sensitivity			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible	Negligible	Negligible
Small	Negligible	Negligible	Minor	Minor
Medium	Negligible	Minor	Moderate	Moderate
Large	Negligible	Minor	Moderate	Major

Where the identified thresholds above are exceeded, the IEMA guidance sets out a list of effects which should be assessed. This includes:

- Accidents and safety.
- Driver delay.
- Pedestrian amenity.
- Severance.

- Air pollution.
- Dust and dirt.
- Ecological effects.
- Hazardous loads.
- Heritage and conservation.
- Noise.
- Pedestrian delay.
- Vibrations.
- Visual effects.

A number of these effects are covered elsewhere in the ESIA and so those considered within this chapter include:

- Accidents and safety.
- Severance.
- Driver delay.
- Pedestrian amenity.
- Pedestrian delay.

Accidents and safety

IEMA guidelines do not recommend the use of thresholds for identifying significance of impacts due to numerous local causation factors involved in personal injury accidents. However, it is recognised that a significant increase in overall traffic volumes and abnormal loads may raise concerns over road safety. Therefore, measures to address road safety concerns will form a key part of the assessment methodology and development of mitigation options.

Driver delay

Driver delay occurs due to additional traffic present on the road network. IEMA guidelines note that additional delays are only likely to be significant if the traffic on the network is already at, or close to, capacity. Key areas where delays may occur include:

- At the site entrance due to turning of vehicles.
- On the highway passing the site.
- At key intersections along the highway.

- At junctions where the ability to find gaps in the traffic may be reduced, thereby lengthening delays.

Pedestrian amenity

This is broadly defined as the relative pleasantness of a journey and is considered to be affected by traffic flow, traffic composition and pavement width / separation from traffic. IEMA guidelines state that this may be significant where traffic is either halved or doubled.

Severance

IEMA guidelines state that severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery. The term is used to describe a complex series of factors that separate people from places and other people. Severance can also result from difficulty in crossing a heavily trafficked road. The guidance indicates that severance effects are considered 'slight' in cases that include:

- Pedestrian at-grade crossings on new roads carrying below 8,000 vehicles per day (AADT) (DoT, June 1993); or
- Changes of traffic flow of less than 30% (IEMA, March 1993).

Pedestrian delay

Changes in the volume and composition or speed of traffic on the road network may affect the ability of people to cross roads. In general, increasing traffic volumes will lead to an increase in pedestrian delay. Thresholds are not recommended for use to identify significance of potential effects due to the range of local factors and conditions which can affect delay.

12.2.4 Assumptions

It is assumed for the purposes of this assessment (and forecasted levels of traffic) that construction will commence in 2018. Should this not be the case, it is unlikely that the change in forecasted levels of traffic will be of such a level as to change the assessment outcomes. The calculations are also based on a 1.9 GW solar plant.

As the details of how road stone and other materials will be supplied are not known at this stage, it is assumed that the routing of all materials will follow the route identified in the section below, thus presuming a "worst-case" scenario.

The construction schedule will be defined by the Project Developer. The assessment is based on an assumed construction phase duration of six months, taking consideration of potential delays in transportation of materials and weather conditions. It is also assumed that the Project will be constructed as one development rather than in a phased approach. The vehicle numbers and personnel requirements have been calculated based on these "worst-case" assumptions.

12.3 Baseline Conditions

12.3.1 Transportation by Road

The transportation study assumed that route to the Project site from Riyadh. The route follows Route number 65 (primary route) for approximately 177 km directly from Riyadh to the Project site.

The site is immediately adjacent to Highway 65 with direct access possible from the junction at the western corner of the site near a large transmission substation. There is good access to the site from a tarmac road running along the north-western boundary.

Due to the site's close proximity to the country's network of public highways delivery of components and equipment to this site is not anticipated to present significant challenges. The highways are generally well maintained across the country, particularly in and around Riyadh.

Table 12-4 sets out the level of sensitivity of the different sections of roads along the proposed route considering the type of road, current traffic volumes and the presence of any sensitive receptors.

Table 12-4: Sensitivity Analysis

Road	Receptor Details	Sensitivity
Route 65	Paved multi-lane highway with high daily traffic flows. Primarily passing industrial/commercial areas or undeveloped desert, with few residential areas. Minimal traffic management measures in place. Highway suitable for all types of vehicles and volumes.	Negligible-Low

12.3.2 Roads on Site

For solar PV plant development, works to construct an access point to the main road are expected to be minimal.

12.4 Assessment of Effects

12.4.1 Construction

12.4.1.1 Traffic Generation

The Project will result in additional vehicles travelling to and from the site during construction. These will include heavy goods vehicles (HGVs) and light vehicles. Overall, the total number of vehicles required to travel to and from site is not expected to be significant.

The first period of construction will be associated with the delivery of equipment to site and the construction activities that will be carried out on site. The second phase will involve set up and commissioning of all infrastructure and as such, this stage will have reduced vehicle requirements. The construction phase is expected to generate the traffic volumes detailed in Table 12-5 below. It should be noted that these traffic volumes are based on previous solar PV project experience and are to be confirmed once a construction strategy is available from the Project Developer. This assessment is limited to the expected amount of HGV movements and construction staff transportation requirements.

Table 12-5: Potential volume of vehicle movements during construction

Vehicle Type	Activity	Total Vehicle Movements
HGV	Delivery of materials, plant, containers, concrete, aggregate material and welfare facilities	156,100
Vans (people carrier up to 6 people)	Transportation for construction workers to site.	50,650

No abnormal load deliveries would be expected for the supply of materials and components to construct this site. The requirement for construction staff transportation should also be confirmed as the Project Developer may consider a construction camp to be located at the Project site. This is discussed further in Section 13.

Construction times can be arranged to avoid local peak times and routing arrangements, particularly for HGVs to minimise potential impacts.

12.4.1.2 Effects on the road network

The magnitude of change in traffic numbers cannot be quantified accurately at this stage due to the lack of traffic count data for the affected roads along the route. However, consultation will be undertaken with the relevant roads authorities to obtain this information and update this assessment prior to construction. It is envisaged that the magnitude of change could be up to Large due to the high numbers of predicted traffic movements associated with the Project.

Although the magnitude of change in traffic numbers along Route 65 could be considered as High, the sensitivity of this major road is assessed to be Low. Consequently, the overall level of effect is predicted to be Moderate and of a temporary nature.

The impact on the local road network is not anticipated to be significant during construction. Mitigation measures have been proposed to ensure that any impacts are limited.

12.4.1.3 Road works

Damage to road edges and general 'wear and tear' of the road may occur through increased HGV movements. It is difficult to identify the extent to which this may occur however, it is likely that, at worst, there would be an impact of Moderate significance, pre-mitigation.

12.4.1.4 Road safety

Current road safety levels across Saudi Arabia are largely poor with a high number of accidents occurring each year, many of them fatal. Prior to mitigation, the addition of vehicles to the roads could result in a Minor increase in the risk of traffic accidents. Mitigation is set out in Section which will reduce these levels to Negligible.

12.4.2 Operation

The main transport impacts will occur during the construction phase. The number of vehicles during operation is likely to be very low, with access required only for maintenance and servicing. The majority of these will be light vehicles and, at the worst case, a HGV trip may be required to transport a replacement transformer to site. The effects of traffic movements stemming from the operational phase are therefore considered negligible and so insignificant.

12.4.3 Decommissioning

Decommissioning effects are likely to be similar to that during construction although reduced in magnitude. At this stage, it is not possible to quantify the traffic effect during decommissioning of the Project as it is considered to be too far in the future to estimate any baseline traffic flows. Further ESIA will be required prior to decommissioning.

12.5 Further Work

It is recommended that the route for use by HGVs is verified through further assessment (including a route inspection undertaken prior to construction). Ongoing consultation with the Ministry of Transport will also be required, this is detailed in the stakeholder engagement plan in Appendix C.

12.6 Mitigation

It is recommended that the efficiency of deliveries of construction materials to the site is closely monitored and, if necessary, sufficient storage provision is made available on site to prevent any delays to the construction process.

A Transport Management Plan (TMP) will be developed which will reduce risks to drivers and components being transported. This will include (amongst others):

- Detailed site access route.
- Speed controls (such as speed limits, signs, speed bumps etc.).
- Measures for ensuring use of well-maintained vehicles which are serviced regularly.
- Measures to maintain / make good the access roads.
- Details of the temporary site compound which should include parking for up to 40 light vehicles including a HGV manoeuvring, holding and unloading areas.
- Information regarding road safety briefings which will be given to all staff and contractors.
- Procedures for ensuring appropriate licenses / permits are in place for all drivers and provision of suitable training to reduce potential accidents on route to, and within, the site.
- Measures to control the delivery / departure of all HGVs to avoid conflict with other road users.
- Detail sensitive receptors enroute and ensure all drivers are aware of these.

The TMP should be provided to the Ministry of Transportation for further comments. The Project Developer will be required to work closely with the ministry to ensure the TMP is implemented effectively.

The requirement for a construction camp for workers should also be confirmed by the Project Developer. This will ensure that impacts on the local transportation network, in terms of traffic generation and road safety, will be minimised.

12.7 Residual Effects and Conclusions

The transportation of equipment and materials to site from Riyadh would involve the use of a single large paved highway which is suitable for and regularly used by HGV vehicles.

Mitigation has been proposed to alleviate potential impacts and these measures should be incorporated into a Transport Management Plan (TMP) for use prior to and during construction. The implementation of a TMP will ensure that the residual impacts can be reduced to Minor significance. The requirement for a TMP is outlined within the ESMP provided in Chapter 15.

13 Social Impact Assessment

13.1 Introduction

This chapter sets out details of information disclosure, consultation and participation that have been undertaken as part of the ESIA process and assesses the potential socio-economic impacts of the Project and associated works. The assessment considers the changes which may occur during the construction, operation and decommissioning of the Project in demographics and economics, social infrastructure, land use, community aspects and occupational and community health and safety.

13.2 Assessment Methodology

The objective of the social impact assessment was to identify major risks to social and economic conditions in the area of the proposed action and to assess impacts of the construction and operation on socio-economics following recognised good practice guidance[11,12,13].

Generally, the social impact assessment process involves the following major tasks:

- Identifying types of adverse and beneficial impacts of the proposed action.
- Assessing the level of socioeconomic risks in terms of frequency (how likely is it to happen) and consequences.
- Assessing the acceptability of the risks.
- Introducing mitigation measures to reduce risks to acceptable level.

The social impact assessment typically addresses the following issues:

- **Demographics:** Changes in local population size, emigration/immigration in the area, migration of people in search of work, and other issues.
- **Economic issues:** Supply chain impacts, local sourcing opportunities, potential impacts on local markets for goods and services, employment opportunities for construction, operation and decommissioning phases of the Project.
- **Health issues:** Risks of new diseases to indigenous communities, impacts on health of operations personnel and local communities, impact of local diseases on workers.

[11] Centre for Good Governance (2006)

[12] World Bank (2003)

[13] Mackenzie Valley Environmental Impact Review Board (2007)

- **Social infrastructure**: Adequacy of health care and education facilities, transport and roads, power supply, fresh water supply to support project activities and personnel as well as the local communities.
- **Resources**: Land use changes, increased access to rural or remote areas, use of natural resources.
- **Psychological and community aspects**: Changes from traditional lifestyles, community cohesion, attitudes and behaviour, perception of risk.
- **Cultural**: Issues associated with sites that have archaeological, historical, religious, cultural, or aesthetic values.
- **Social equity**: Local social groups who will gain or lose as a result of the Project or operation.

A key element of the social impact assessment is the stakeholder engagement process. Stakeholder consultation is currently ongoing and information will be distributed to identify stakeholders such as local communities and government organisations. Further details of information disclosure and outcomes of the consultation process will be detailed within an addendum to this ESIA.

A draft Stakeholder Engagement Plan (SEP) is provided in Appendix C detailing the principles of stakeholder engagement, stakeholders identified and the responsibilities of the Project developer. The SEP will be updated throughout the stakeholder engagement process and kept as a live document for the duration of the development construction. In accordance with the SEP, the Project Developer will be required to implement a grievance mechanism to establish a procedure for receiving, recording and addressing any complaints received form stakeholders during construction and operation.

13.3 Baseline Conditions

A desktop study and site investigations were undertaken to gather baseline data. Data was collected from published sources to include websites, reports, government and non-government organisations and Project documentation for other development projects being implemented in the region. Project specific data is currently being collected as part of the ongoing stakeholder engagement process and the baseline will be updated as necessary as an addendum to this ESIA.

13.3.1 Population and Demographic

The Project site is located within the Almajmaah governorate area of the Riyadh administrative region of KSA. The population demographics for the Almajmaah governorate are detailed in Table 13-1 below.

Table 13-1: Demographic Status of Almajmaah Governorate[14]

Demographic	Population
Saudi Male Nationals	50,068
Saudi Female Nationals	48,354
Non – Nationals	34,891
Total	133,313

The total population of the Almajmaah Governorate accounts for 2% of the total population of the Riyadh region. No publicly available population statistics are available for the smaller communities that make up the region in the vicinity of the Project site.

The surrounding land is owned by the government and there are no private landowners or permanent settlements within the Sudair Industrial City. It has been observed during site investigations that some temporary camps use the Project area for keeping livestock. An example of a camp at the Project site is shown in Figure 13-1 below.

Figure 13-1: Camp at Sudair

[14] 2010 KSA National Census

The potential impact of the development on these communities will be considered further through stakeholder engagement. The outcome of stakeholder engagement will be included within an addendum to the ESIA.

13.3.2 Economic Conditions

The area surrounding the Project site comprises a number of industrial facilities. The future development plans for the Sudair Industrial City will introduce further industry to the region. MODON are encouraging a diverse range of industries and supply chain services as part of the expansion of the industrial city.

Employment statistics for the Almajmaah governorate are available and detailed in Table 13-2 below.

Table 13-2: Almajmaah Governorate Employment Statistics[15]

Demographic	Total Labour Force (>15 years)	% Employed	% Higher Education	% Retired	% Out of Work Force
Saudi Nationals (male)	34,350	63%	24%	11%	2%
Saudi Nationals (female)	33,785	19%	30%	<1%	51%
Saudi Non-Nationals	31,151	92%	3%	<1%	5%

KSA currently has a high reliance on non-nationals within the labour force and approximately 31% of the current labour force within the Almajmaah governorate comprises of non-nationals. The KSA government aims to reduce the level of unemployment of Saudi Nationals through encouraging more women to join the labour force[16] and through the implementation of the Nitaqat Programme[17], which requires private sector companies within KSA to employ a specific quota of Saudi nationals.

[15] 2010 National Census

[16] Vision 2030 Kingdom of Saudi Arabia

[17] Ministry of Labour KSA, Ministerial Resolution no 4040

The KSA government has also prioritised the diversification of the industrial sector to reduce dependence on oil extraction and refinement. The petroleum export sector currently accounts for 42% of GDP and 90% of KSA's export revenues[18]. With regards to the renewable energy sector, the government have set a target of installing an additional 9.5 GW of renewable energy generation by 2030. This Project will contribute approximately 4 % of this target.

13.3.3 Social Infrastructure

13.3.3.1 Electricity

Nearly all of the electricity produced in KSA is sourced from fossil fuels where 51% is sourced from natural gas and 49% from oil. Electricity consumption in KSA has increased 59% over the past 10 years. The KSA government has introduced targets to improve the energy mix and security of supply by developing 9.5 GW of renewable electrical energy by 2023.

13.3.3.2 Roads

The Sudair Industrial city is served from the 65 highway to the south of the Project site boundary providing a direct link to the city of Riyadh.

13.3.3.3 Airports

The area of is served by a small airport approximately 25 km to the North West. Riyadh International Airport is located approximately 140 km to the south east.

13.3.3.4 Water and Municipal Services

No serviced water supply or sewerage systems exist at the Project site. It is envisaged that, once the site is operational, the responsibility for the supply of these services will be consistent with the rest of the industrial city.

[18] CIA World Fact Book

13.3.3.5 Health Services

Statistics for health centres within the Almajmaah Governorate are not publicly available. For the wider Riyadh region, there are 47 hospitals and 424 health care centres that serve the province[19]. The nearest hospital to the Project site is approximately 25 km to the North West in Almajmaah.

13.4 Assessment of Impacts

13.4.1 Construction

The following details the potential socioeconomic impact of the Project during the construction phase of development.

13.4.1.1 Economic Impact

The Project is expected to have a positive impact on the local and national economy through the increased employment opportunities and a diversification of the existing skill base of the current labour force. This will range from both skilled and non-skilled construction jobs. Additionally, indirect impacts from construction activities will benefit through the supply of services (accommodation, catering etc) during the construction phase. It is estimated that approximately 5,700 workers will be required for the construction period at its peak. However this will be dependent on the construction programme and strategy developed by the Project contractor(s). The requirement for a hiring plan is detailed within the ESMP in Chapter 15. The overall impact is considered to be net positive although temporary in nature.

13.4.1.2 Worker Influx

The renewable energy industry, particularly solar PV development, is within its infancy in KSA. It is therefore expected that a high proportion of experienced migrant workers would be required for the construction phase of the Project. The influx of migrant workers has the potential to present a negative impact with regards to cultural sensitivities of the area. However this is not considered to raise significant issue as migrant workers, of those that are new to KSA, will be informed of religious and cultural sensitivities on arrival to the country.

[19] 2015 KSA Government statistics

Depending on the construction strategy of the Project contractor(s), it is considered unlikely that members of the construction team will reside in nearby communities. It is expected that accommodation via temporary camps located at the site will be in place. There is therefore not considered to be a negative impact on nearby smaller communities from the influx of construction workers to the area.

The sensitivity to change of nearby local communities and the surrounding area to worker influx is considered to be High and the magnitude of change is considered to be Low in the instance that a temporary construction camp is provided by the Project Developer. The overall significance is therefore considered to be Moderate and temporary in nature.

13.4.1.3 Social Infrastructure

The number of construction workers on site has the potential to impact on the existing infrastructure through increased traffic, increased waste, water consumption and the increased use of public infrastructure.

As this part of Sudair Industrial City is at the pre-developed phase, there are no utilities such as water and wastewater currently servicing the site. Due to the temporary nature of the construction impacts for the Project, the requirement for significant new utility infrastructure at the site is not necessary. Waste streams will be dealt with by a suitably licensed contractor and water is expected to be delivered to site via tanker during the construction phase. Details of waste and water management is provided in the ESMP in Chapter 15.

The future land use of the industrial city means that the Project site is serviced by a suitable road infrastructure and immediately adjacent to a major highway. No adverse impacts on road infrastructure used by the local community are anticipated.

It is noted that some concerns may be raised by nearby airfields with regards to potential glare from the solar panels. However, adverse impacts on air traffic are not anticipated as the solar modules are designed on the concept of absorbing light rather than reflecting it. It is expected that the modules will reflect as little as 2% of the incoming sunlight[20]. The ministry of transportation have been identified as a key stakeholder for the project and they will be consulted as part of the stakeholder engagement process, which is currently ongoing.

Some negative impacts on the local healthcare infrastructure may be experienced due to the influx of workers in the locality. The overall number of workers could be of a considerable value, this will be dependent on the construction strategy implemented by the Project Developer. The large scale of the development and the requirement for a large number of workers means the magnitude of impact is considered to be High.

Overall, the social infrastructure of the region is considered to be well established and the sensitivity to change is considered Medium. Given the large scale of the proposed development, there will be a requirement for a significant number of construction workers. The overall significance of the impact on social infrastructure is therefore considered Major and of a temporary nature.

13.4.1.4 Resettlement

It is noted that a proportion of the site is currently being used for livestock and temporary camps. The construction of the Project will require the displacement and resettlement of the occupants at the site.

It is not known how long the site has been used for this purpose and this is to be defined as part of stakeholder engagement, which is currently ongoing. Based on site investigations to date, it is considered that there is sufficient land available in the adjacent areas to support the relocation of the camps. Adjacent land is of a similar nature and is considered to be suitable for keeping livestock.

[20] USA Federal Aviation Administration, Technical Guidance for Evaluating Selected Solar Technologies on Airports – November 2010

MODON currently own the area of land that is currently being occupied by the camp and it is not known whether this is known to the settlers here. Given that land access and land use rights are under the ownership of MODON, it is not anticipated that resettlement is considered to trigger any special provisions with regards to IFC Performance Standard 5[21]. Nonetheless, the impact of economic displacement and potential community unrest should be taken into consideration. As such it is considered that a resettlement plan should be developed by the Project Developer in conjunction with MODON. This will be developed further following consultation with local communities.

At this stage it is not possible to accurately define the magnitude of impact prior to stakeholder consultation. Depending on the number of people and the length of time they have occupied the site the sensitivity to change is considered to be High. Given the availability of adjacent land the magnitude of change is considered to be Medium. Prior to mitigation, this presents potential Major impact significance on a permanent basis.

13.4.1.5 Community and Occupational Health and Safety

This section introduces the potential impacts of the Project on occupational and community health and safety. The major potential hazards are discussed below.

Safety Risks from Traffic

Vehicle traffic, particularly HGVs, will increase as a direct result of the construction phase of the Project.

The increase in HGV traffic due to the Project construction presents a risk of accidents that could result in anything from minor injury to serious injury or death. In addition, emergency response capacity is limited (lack of responders, transportation and equipment). Hence, response time to potential accidents is unlikely to be rapid.

[21] Land Acquisition and Involuntary Resettlement

Respiratory Effects from Poor Air Quality

As discussed in Chapter 11 construction activities will result in fugitive dust. It will be generated by vehicle traffic on unpaved roads, naturally occurring windblown dust from disturbed lands and dust generated during construction activities. Impacts will vary depending on the construction activity and the severity of most air related impacts reduce with distance from the source.

Fugitive dust will have the greatest potential impact on construction workers at the site. This could result in respiratory impacts ranging from minor irritation of the throat, eyes, nose to chronic irritation, asthma and other respiratory effects.

Introduction and Spread of Communicable Diseases

The rapid increase in population from the presence of large, male workforces, coupled with in-migration of income seekers to the area of influence, increases the risk of introducing and spreading communicable diseases. Close living conditions, poor water and sanitation, and deprivation (whether inside or outside of the construction camp), can increase the risk of respiratory disease, as well as food and water-borne diseases.

Construction Accidents

As with all construction projects there is an inherent risk to community and occupational health and safety. The major potential hazards for this project include, but are not limited to:

- Using hand tools or larger equipment could result in accidents that harm or kill workers or trespassers.
- Falling overhead objects causing injury or death to workers or trespassers.
- Falls into or collapse of open excavations could cause injury or death to workers or trespassers.
- Falls from could cause injury or death to workers or trespassers
- Contact with electrical lines or transformers could cause injury or death to workers or trespassers.

In general, it is considered that the sensitivity to change and magnitude of impact is High with regards to community and occupational health and safety. Prior to the implementation of mitigation measures, the impact significance is considered Major and of a temporary nature.

Construction Noise

Noise from construction activities has the potential to impact on construction workers at the Project site. The IFC EHS Guidelines[22] for occupational health and safety states that no employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day. Based on the expected noise generated from construction it is considered that the magnitude of impact can be considered to be High while the sensitivity of the receptor (construction workers) is also considered High. The overall significance of impact is therefore considered to be Major prior to any mitigation.

Overall, the significance of impact to occupational and community health and safety is considered Major during the construction phase. Suitable mitigation should be implemented through an occupational and community health and safety plan.

13.4.2 Operation

13.4.2.1 Economic Impact

The Project will present local employment opportunities during the operational phase for operational and maintenance activities. This could present a net positive, if minor, impact on the local economy on a permanent basis. The number of employees required during the operational phase will be defined by the Project contractor.

The operation of the Project will also contribute to national renewable energy targets and help to maintain security of supply and diversify electricity generation. At an installed capacity of approximately 1.9 MW, the Project presents a 20% contribution to the national target of 9.5 GW of renewable energy by 2023. This presents a net positive impact on a permanent basis.

13.4.2.2 Community and Occupational Health and Safety

Similarly to the construction phase there will be some occupational health and safety risks through carrying out operational and maintenance activities. This includes risk of electrocution, thermal burn hazards, exposure to hazardous chemicals and working in extreme temperatures.

[22] EHS Guidelines: Occupational Health and Safety – April 2007

As with the construction phase, the sensitivity to change and magnitude are considered to be High. The overall impact significance, prior to mitigation, is considered to be Major and of a permanent nature.

13.4.3 Decommissioning

The socioeconomic impact during the decommissioning phase will be similar to what is experienced during the construction phase. The socioeconomic impact during the decommissioning phase will be detailed in a separate EISA as socioeconomic baseline conditions are likely to change significantly after the end of the Project's operational life.

13.5 Mitigation

13.5.1 Resettlement

At this stage there is considered to be a potential Major significant impact regarding the displacement of communities at the site.

Further stakeholder engagement is being undertaken to assess whether a RAP will be necessary. The outcome of these stakeholder engagement activities will be detailed as part of an addendum to this ESIA.

If required, it is proposed that a Resettlement Action Plan (RAP) is developed by the Project Developer with support from MODON. The RAP should contain details of all affected communities, an inventory of affected assets, economic impact studies and details of consultation with affected communities. Provisions should be made for any identified vulnerable groups requiring special assistance. Any new land proposed for resettlement should be located in a reasonable proximity to the previously used land and fee of any transaction costs for the affected communities.

13.5.2 Community and Occupational Health and Safety

The ESIA has identified potential Major adverse impacts on community and occupational health and safety. The following mitigation measures are required to be implemented. These measures should be detailed within a community and occupational health and safety plan, as outlined in the ESMP in Chapter 15.

13.5.2.1 Construction traffic

To mitigate the potential traffic related impacts from the Project, a Traffic Management Plan, comprising strategies to manage vehicles and equipment during the execution of the Project will be implemented, including the following measures:

- Provide appropriate traffic safety training to all drivers (employees and contractors) as part of their induction and on an ongoing basis.
- As part of pre-construction engagement activities, ensure that traffic safety and "rules of the road" are discussed with local communities. Discuss and address community concerns. Special sessions may be required for particularly vulnerable groups such as children. At minimum communicate type, frequency and traffic risks before heavy traffic begins for the construction phase.
- Use a grievance mechanism and other means to monitor driver conduct.
- Implementation and compliance with the Community, Health and Safety Management Plan.

13.5.2.2 Respiratory Effects from Poor Air Quality

To mitigate potential air quality related impacts from Project activities, particularly during construction, the following mitigation measures should be implemented:

- Implementation and compliance with a Traffic Management Plan which should identify the strategies used to manage dust on the road during the execution of the Project.
- Implementation and compliance with a Dust Management Plan (as referred to in the overall ESMP).
- Use of properly maintained vehicles and construction equipment with emission controls.
- Communicate project risk to local communities (if any) and address concerns accordingly. Monitor any complaints filed (via grievance mechanism) from local stakeholders as an additional tool to monitor dust management measures.

13.5.2.3 Introduction and Spread of Communicable Diseases

To mitigate the potential spread of food and water-borne disease related impacts from the Project, the following mitigation measures will be implemented:

- Implementation of the Waste Management Plan, to ensure that household and project waste is disposed of in line with KSA standards;

- Where appropriate, support local public health campaigns against food and water borne diseases.
- Implementation of a Camp Management and Security Management Plan to ensure the provision of a safe and healthy environment for workers.
- Implement Influx Management Plan as referred to under "Population and Economy" mitigation.

13.5.2.4 Construction Accidents

The Project Contractor and its contractors will comply with international Occupational Health & Safety regulations and standards (for example, Directive 89/391[23] and OSHA[24] standards) in addition to KSA safety standards regarding construction works, electrical works, structural climbing and other hazards. In general, construction operations will be planned and implemented in accordance with these standards and with IFC safety guidelines[25]. Furthermore, the EPC Contractor will be required to demonstrate and implement a suitable management system which confirms to ISO 9001, ISO 14001 and OSHAS 18001. This will be a key contractual requirement and will be monitored by the Developer.

There will be a workforce manager in charge of all activities, and in charge of compliance with health and safety requirements. This individual will report directly to the Project Contractor's project manager and will have independent lines of reporting to the Project Contractor's upper management. Prior to beginning work on the site, the workforce manager will develop a safety program to cover construction and then operation of the site. The program will describe in detail the potential hazards and the ways in which they will be prevented or avoided. All construction workers (including contractors) will be required to complete a training program that covers the safety program, and training will cover hazard awareness, job- and site-specific hazards, and emergency procedures for fire and for illness or injury, and natural disaster.

[23] European Union Council Directive 89/391/EEC

[24] Code of Federal Regulations (1974) 39 FR 23502

[25] IFC (2007a)

Besides training, the safety program will include detailed requirements for inspecting, testing, and calibrating safety equipment, for monitoring the working environment for hazards, and for monitoring worker health. In addition, all incidents and accidents will be recorded if they resulted, or nearly resulted, in damage to equipment or injury or to humans or animals, will be recorded. On an annual basis, the Project Contractor will report to the lender on the status of the overall safety program, including information on training and on incidents. Both the Project Contractor and all its contractors will be required to produce a Health and Safety Plan for both construction and operational phases and will bring together the mitigation requirements discussed in preceding sections.

With regards to the construction workforce, a local labour force will be employed to the maximum extent possible and wages will be paid which are at least average for the area.

A Project Community Health and Safety Plan will also be developed. This will describe the potential hazards of the Project during construction, commissioning and operation to local communities and how these will be controlled. The document will set out community health and safety mitigation measures associated with the use of the site for agricultural / grazing purposes. The document will also outline emergency preparedness and response along with a grievance mechanism to ensure that feedback is acknowledged and addressed appropriately.

13.5.3 Construction Camps

It is proposed that, in order to mitigate the potential impact on local infrastructure, a camp for workers is maintained at the site during the construction phase. A construction camp management plan should be developed by the Project Developer. It is recommended that this plan complies with IFC standards[26] to include details of the following:

- Compliance with national standards
- General living facilities
- Room/dormitory facilities
- Sanitary and toilet facilities
- Canteen, cooking and laundry facilities

[26] IFC Worker' Accommodation : Processes and Standards August 2009

- Nutrition and food safety
- Medical facilities

The camp management plan should provide details of the management of camp facilities including monitoring procedures, grievance procedures, security and health and safety. The requirement for a camp management plan is outlined in the ESMP provided in Chapter 15.

13.6 Residual Effects and Conclusions

It is considered that the development of the Project will result in a net positive socio-economic impact during the construction and operational phase of the development following the implementation of the mitigation measures.

There are some potential adverse impacts regarding the displacement of communities currently using the land, worker influx and community and occupational health and safety. Further study on the impact on these communities will be determined through the stakeholder engagement process. A working Stakeholder Engagement Plan, detailed in Appendix C will be updated as part of an addendum to the ESIA. Should resettlement of these communities be necessary, it is proposed a RAP will be developed to reduce the significance of impact on any affected communities.

The development of a construction camp and proper implementation of an occupational and community health and safety plan will ensure significant adverse impacts are reduced. The requirement for these mitigation measures are detailed within the ESMP in Chapter 15.

14 Summary of Impacts

Table 14-1 below details adverse impacts identified in Chapters 5 to 13, the impact significance and the residual impact following mitigation.

Table 14-1: Summary of Impacts

Topic	Description	Project Phase	Impact Significance	Length	Residual Impact
Landscape and Visual	Landscape and visual impact	Construction	Negligible	Temporary – Short Term	Negligible
		Operation		Permanent	
Ecology	Habitat	Construction	Negligible	Temporary – Short Term	Negligible
	Protected Species				
	Habitat	Operation	Negligible	Permanent	
	Protected Species				
Hydrology	Flood Risk	Construction	Negligible	Temporary – Short Term	Negligible
	Alteration of surface water flow		Minor		Minor
	Alteration of ground water flow		Negligible		Negligible
	Water Quality		Major		Minor
	Water Consumption		TBC		TBC

Topic	Description	Project Phase	Impact Significance	Length	Residual Impact
	Flood Risk	Operation	Negligible	Permanent	Negligible
	Alteration of surface water flow				
	Alteration of ground water flow				
	Water quality		Minor		Minor
	Water Consumption		Negligible		Negligible
Geology	Loss of Soil Resource	Construction	Negligible	Temporary – Short Term	Negligible
	Soil erosion		Minor		Minor
	Soil erosion	Operation	Negligible	Permanent	Negligible
Cultural Heritage	Adverse on Archaeology and/or cultural heritage	Construction	None	None	None
		Operation			
Noise	Construction Noise	Construction	Negligible	Temporary – Short Term	Negligible
	Operational Noise	Operation	Negligible	Permanent	Negligible
Air Quality	Construction Air Quality	Construction	Negligible	Temporary – Short Term	Negligible
	Operation Air Quality	Operation	Minor Positive	Permanent	Minor Positive
Transport	Impact on road network	Construction	Negligible	Temporary – Short Term	Negligible

Topic	Description	Project Phase	Impact Significance	Length	Residual Impact
	Road condition		Moderate		Moderate
	Road Safety		Minor		Minor
	Impact on road network	Operation	Negligible	Permanent	Negligible
	Road condition				
	Road Safety				
Social	Economic impact	Construction	Minor Positive	Temporary – Short Term	Minor Positive
	Worker Influx		Minor		Minor
	Social infrastructure		Negligible		Negligible
	Resettlement		Major	Permanent	Minor
	Community and Occupational Health and Safety		Major	Temporary – Short Term	Minor
	Economic Impact	Operation	Minor Positive	Permanent	Minor Positive
	Community and Occupational Health and Safety		Major		Negligible

15 Environmental and Social Management Plan

15.1 Introduction

This ESIA Report has summarised the process undertaken to identify the impacts that will arise from the Project construction and operation and the mitigation measures required to prevent or reduce these. During the detailed design stage, further consultations and surveys will be undertaken to refine the design and construction techniques. One of the key mechanisms for environmental management during the design and construction stages is the Environmental and Social Management Plan (ESMP) and associated subject plans which should be developed by the Project Developer. The ESMP provides a framework for the management of the identified impacts to improve the efficacy of the mitigation and enhancement measures.

15.2 Roles and Responsibilities

The overall responsibility for the implementation of the project's ESMP rests with the Project Developer. They will be responsible for reviewing the reporting and auditing requirements to ensure that the implementation of mitigation measures meet the requirements stipulated within project's ESMP.

The Project Developer will be required to prepare work plans for environmental management in line with this Project's ESMP and any other condition that may be imposed by GAME for the development of the proposed Project. The Project Developer will also develop action plans and standard procedures for use at the site. The Project Developer will maintain a monitoring and oversight role to ensure that the obligations as set out in the ESMP are followed.

15.3 Environmental and Social Management Plan (ESMP)

The ESMP has been developed for each of the proposed project phases. Table 15-1 and Table 15-2 present the ESMP for the Project during construction and operation phases respectively. The ESMP details the identified project impact, mitigation measures, monitoring indicator, responsible party, monitoring means and monitoring frequency.

These standards form the basis against which the site will be measured during environmental audits. The primary purpose of this document is to act as the mechanism by which the project developer and sub-contractors will incorporate the requirements of the ESIA together with Equator Principles and IFC Performance Standards into the construction and operation of the Project.

This ESMP for the Project enables factors that affect solar farm construction, operation and decommissioning to be addressed.

The document sets a number of objectives to ensure that the site is operated in an environmentally acceptable manner through managing the site's significant environmental aspects. The scope of this ESMP for the Project includes all activities, whether conducted by the Project Developer and sub-contractors that are part of the construction, operation and decommissioning of the Project. It will be detailed in all contractor's contracts that they will have to demonstrate compliance with the sections of this ESMP relevant to their activities.

Each significant aspect has one or more objectives, which are followed by mitigation measures to ensure that the objectives are met through operational controls. The ESMP will be set out key action items to ensure appropriate mitigation is implemented.

An Environmental Manager will be established to communicate progress of site operations and report the internal environmental performance audit results during the construction phase.

15.3.1 Implementation of the ESMP

In order to successfully implement the ESMP, the following key tasks will be undertaken:

- Preparation of audit checklist based on the targets and objectives.
- Undertake inspection/audit of site and project operations, including records of training and waste management practices.
- Prepare a report detailing areas of compliance/non-compliance.
- Prepare a list of actions (action plan) to address non-compliances with associated timescales for completion.
- Audit the actions to ensure issues have been addressed.

It will be the responsibility of the Project Developer to monitor the effectiveness of the Project ESMP and identify improvement actions as necessary.

Table 15-1: ESMP for the Construction Phase

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
Loss of vegetation cover and biodiversity	• Implement proper management measures to prevent damage to biodiversity within the proposed project site • Site preparation during the non-breeding season to make areas of road and hardstanding unsuitable for species. • Pre-construction survey for works within the wet season to check for animals (reptiles and active bird nests). • Ensure proper demarcation and delineation of the project construction site • Ban on all hunting activities. • Speed limits strictly adhered to within the construction zone. • Designate access routes and a parking area within the site to reduce vegetation disturbance • Ensure regular inspection of construction works. • Limit night-time driving. • Regular maintenance of machinery to reduce noise disturbance and air pollution. • Pollution control measures in place and appropriate storage of potential pollutants.	• Pre-construction survey. • Designated parking areas on site • Number of inspection reports	Project Developer	• Survey Report • Site Inspection Reports	Once, at Construction

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
Alteration of surface water flow	• Development of a flood risk assessment. • Avoidance of ephemeral drainage channels along transport routes. • Installation of culverts or other drainage control features where crossings or drainage channels unavoidable. • Design of suitable drainage system which may include swale features.	• Flood risk assessment. • Number of culverts or other drainage control measures constructed. • Design of drainage system.	• Contractor. • Project Developer. • GAME.	• Inspection • Water quality monitoring.	Continuous.
Soil erosion	• Run-off and erosion control features included in all civil designs by contractor. • Demarcate storage and staging areas and store all materials, equipment and vehicles in these areas to reduce soil damage. • Vehicles confined to demarcated roadways. • Where possible, establish native grasses in erosion control areas immediately after final disturbance. • Salvage and store topsoil and subsoil before areas excavated with topsoil stripped and stockpiled separately. • On completion of earthworks, backfill material in same stratigraphic sequence. • If narrowing access roads following construction, scarify compacted areas and establish native grasses.	• Civil designs. • Number of completed inspections.	• Contractor • Project Developer	• Inspection	Continuous.

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	• Once construction and road-building are complete, scarify all areas compacted by off-road vehicle / equipment movements and establish native grasses. • Store all materials within designated areas of temporary storage facilities and provide supplies to clean-up of minor spills. • Confine all vehicles and equipment to the roadway and, to extent possible, minimize activities during wet conditions. When activities must occur in wet conditions, control storm water by using fabric, straw bales or other measures to impede storm water flow and prevent erosion. • When damage to wet soil occurs, repair once dry conditions return.				
Liquid Wastes	• Develop a wastewater management plan for use at the site in line with wastewater management regulations and water quality regulations • Ensure proper storage of wastewater at the site before disposal to a designated facility by a contracted waste handler registered by GAME. • Prohibit illegal disposal of wastewater into water resources around the project site	• Wastewater Management Plan • Quantity of liquid waste generated • Quantity of liquid waste correctly disposed to GAME Approved disposal sites	• Contractor • Project Developer • GAME • Licensed liquid waste transporter	• Waste Management Plan and Inventory • Inspection	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	• Ensure regular inspection of wastewater management practices within the solar farm to check for compliance • Ensure there is proper and adequate sanitation facilities at the site during construction	• Number of Waste storage facilities at the site • Number of Sanitation facilities on site • Number of completed inspection missions			
Change in Air Quality	• Control the speed limit for all motor vehicles coming to or leaving the construction site • Train all workers on the management of air pollution from vehicles and machinery • Prohibit engine idling and over revving of construction vehicles and machinery to minimise emissions • Sprinkle water at the construction site and on access roads to minimize fugitive dust during dry weather conditions • Ensure regular inspection and scheduled maintenance for all construction vehicles and machinery • Provide workers dust masks at all times when working in dusty conditions • Continuously monitor dust emission levels at construction site	• Number of Vehicles on site • Quantity of dust emitted • Quantity of emissions emitted • Workers trained on air quality management • Number of completed inspection missions	• Contractor • Project Developer • GAME	• Air Quality Monitoring Reports developed in line with the Ambient Air Quality Standards 2012. • Vehicle speed limit reports • Inspection	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	• Ensure the vehicles transporting loose materials like soil and cement are properly covered				
Solid Wastes	• Develop and implement a Solid Waste Management Plan before commencement of construction activities in line with the governing regulations • Train workers on proper solid waste management practices • Segregate all solid wastes at source • Re-use, re-cycle or reduce solid waste generation onsite to the extent possible • Dispose all construction wastes that cannot be recycled or reused to a GAME approved licensed solid waste disposal site using a licensed refuse handler • Provide facilities for proper handling and storage of wastes at designated points • Do not leave wastes on site at the end of the work • Provide adequate number of properly contained litter bins and containers properly marked with type of wastes • Strictly prohibit burning or dumping of any wastes at the site • Perform regular inspection of solid waste management practices onsite.	• Solid Waste Management Plan • Quantity of solid waste generated • Number of solid waste storage facilities on site • Quantity of solid waste correctly disposed to GAME Approved disposal sites • Number of completed inspection missions	• Contractor • Project Developer • Licensed solid waste transporter	• Solid Waste Management Plan • Regular inspection • Solid Waste Manifest	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
Hazardous Wastes	• Develop and implement Hazardous Waste Manage Plan in line with the governing regulations • Train site workers on proper hazardous waste management • Segregate site wastes by separating hazardous waste from non-hazardous waste • Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow • Ensure that hazardous materials are stored in proper areas, where they cannot reach land in case of any spillage. • Incorporate dripping pans at machinery, equipment and area prone to contamination by leakage of hazardous materials such as oil and fuel • Regular maintenance of all equipment and machines used onsite so as to minimise leakage of hazardous materials • Containers for storing hazardous waste including used oil should be securely bundled, labelled and disposed in line with the governing regulations • Undertake regular inspection of hazardous waste management practices onsite. • Strictly prohibit illegal disposal of hazardous wastes onsite	• Hazardous Waste Management Plan developed and implemented • Number of Trained Workers on Hazardous Waste Management • Amount of Hazardous Waste Segregated • Quantity of accidental hazard spillage • Quantity of hazardous correctly disposed • Number of completed inspection missions	• Contractor • Project Developer • Licensed hazardous waste transporter	• Inspection Reports • Hazardous Waste Management Plan and Inventory	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	• Store hazardous materials in designated areas secured with a fence				
Security concerns	• Develop and implement Site Security Plan • Train workers on the importance of site security • Employ a day and a night time security guards for the solar farm. • Fence the entire solar farm to restrict entrance to the site • Train the onsite guards to adequately handle trespass incidents • Inspect the fence around the facility regularly and seal all loopholes • Ensure adequate lighting within and around the solar farm • Regularly check and maintain security lights at the site	• Site Security Plan developed and implemented • Number of Security personnel employed • Site Fence • Trained workers on site security • Number of inspection missions	• Contractor • Project Developer • Security Personnel	• Inspection • Security reports and intelligence	Construction Phase
Noise and Vibration	• Restrict all construction activities to day time during normal working hours • Conduct construction activities within the maximum permitted noise levels • Provide prior information to the community of any planned noisy activity that is likely to exceed the permitted noise levels • Strictly ensure the use of protective personal equipment at all times while on site and noise	• Noise monitoring devices procured and installed on site • Levels of noise and vibration produced at the site • Number of PPE procured and being used by workers	• Contractor • Project Developer • GAME	• Noise Monitoring Reports in line with KSA Noise Standard 2012. • Inspections	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	reduction techniques such as silencers and ear mufflers to employees • Regularly monitor noise levels to comply with permitted maximum levels • Inspection of activities during decommissioning by carrying out regular Noise level test. • Emphasize on the use of noise reduction techniques such as silencers and ear mufflers to employees while onsite. • Undertake regular inspection and scheduled maintenance program for all vehicles and machineries on site • Adopt and follow best practicable means to ensure that the quietest available plant and construction techniques are used	• Number of Noise complaints received • Maintenance procedure for vehicles and machinery • Number of inspection missions completed			
Archaeology and National Heritage	• Develop and implement a Chance Find Plan and Procedure • Train workers on the importance of archaeological and cultural resources and how to deal with them. • Employ an archaeologist during top soil tripping (trenching) to monitor for chance find archaeological remains. • In case of chance find, the work should be halted and the area protected and the matter reported immediately to the Saudi Commission for Tourism and National Heritage for appropriate action.	• Chance Find Plan and Procedure • Number of recorded chance finds • Number of inspections mission on site	• Contractor • Project Developer • Saudi Commission for Tourism and National Heritage	• Chance find procedure and reports • Inspections	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
Visual and Landscape	• Develop and implement a site rehabilitation plan to restore the site to a better visual state after construction • Ensure proper storage, regular collection and disposal of waste streams generated. • Carry out the facility inspection work on regular basis • Minimize the use project construction signage. Necessary signage should be made of non-glare materials and unobtrusive colours. • Remove in a timely manner all the construction machinery, equipment and vehicles that are not in use and keep them in specific locations within the Project site. • Ensure proper storage, collection and disposal of waste streams generated. • Undertake regular inspection of site construction activities	• Site rehabilitation and landscaping plan developed and implemented • Availability of waste management plan developed and implemented • Site inspection missions completed	• Contractor • Project Developer	• Inspection reports • Waste Management Plan	Continuous
Occupational Health and Safety	• Develop and implement an Occupational Health and Safety Plan for use during construction in line with governing regulations • Develop and implement emergency preparedness and response plan. • Develop water resource use assessment and management plan.	• Occupational Health and Safety Plan developed and implemented • Develop and implement Emergency	• Contractor • Project Developer • GAME	• Inspection reports • Record of accidents and near misses • Corrective Action Reports	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	• Train employees on the importance of occupational health and safety requirements and develop work instruction • Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust masks, ear mufflers and overalls for use during construction • Strictly enforce the use of the Personal Protective Equipment to minimise the accidents during decommissioning • Regular medical checks • Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing, at all times • Provision and placement of appropriate fire extinguishers and training personnel on their use • Put clear signage to restricted areas in Arabic and English language. • Prohibit unauthorised persons from entering the site through installation of a perimeter fence. • Undertake regular inspection to ensure compliance with OHSP. • Report all incidences of accidents or near misses and keep proper records of the actions taken. • Promote HIV/AIDs Awareness	Preparedness and Response Plan. • Number of workers trained on occupational health and safety • PPE procured and being used by the workers • Fire extinguishing facilities on site • First aid kit on site • Signage installed on site • Number of inspection missions competed. • Number of water quality testing activities at water monitoring boreholes.		• Grievance mechanism forms.	

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	• Provide appropriate traffic safety training to all drivers (employers and contractors) as part of their induction and on an on-going basis.				
Socio-economic	• Continuing stakeholder engagement in accordance with a stakeholder engagement plan to cover groups who temporarily reside on site. • Assist in the reallocation of groups prior to construction should this be required. • Provision of support for the local community prior to and during construction. • Implement a local hiring plan in consultation with the local community. • Invest in skills training to enable a greater employment of local population. • Develop and implement community grievance mechanism. • Implementation and compliance with Community Health and Safety Plan (CHSP). • Develop a Resettlement Action Plan (RAP) for displacement of communities at the Project site • Provide suitable accommodation for construction workers and develop a construction camp management plan.	• Stakeholder engagement activities. • Number of grievances recorded. • Number of local workers hired. • Development and implementation of CHSP.	• Contractor • Project Developer	• Inspection reports • Community consultation.	Continuous.

Table 15-2: ESMP for the Operation Phase

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
Biodiversity	• Confine all vehicles to roadways. • Road condition monitored regularly and damaged and rutted roads repaired rather than bypassing damaged sections. • Monitoring of erosion controls and repair as needed. • Re-stabilise existing eroded tracks with restoration of vegetation cover as required. • No firewood collection on site or wider area. • Hunting prohibited on site.	• Annual audits	• Project Developer	• Audit Reports	Continuous
Liquid wastes	• Develop and implement Liquid Waste Management Plan in line with the governing regulations • Train employees on the importance of proper liquid waste management and water resource management • Reduce, reuse or re-cycle all liquid waste generated onsite to the extent possible • Dispose all liquid wastes that cannot be recycled or reused to GAME approved liquid waste disposal facilities a licensed transporter • Prohibit illegal disposal of wastewater into waste resources.	• Liquid Waste Management Plan Developed and Implemented • Quantity of liquid waste generated • Quantity of liquid waste correctly disposed to GAME Approved disposal sites	• Project Developer • GAME • Licensed hazardous waste transporter	• Waste Management Plan and Inventory • Inspection reports • Audit Reports	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	• Conduct inspection of wastewater management practices to check for compliance • Emphasise on proper sanitation during operation phase of the project.	• Number of Waste storage facilities the plant • Number of Sanitation facilities on at the plant • Number of Audits completed			
Solid Wastes	• Develop and implement Solid Waste Management Plan for the operation phase in line with the governing regulations • Train employees on the importance of proper solid waste management • Reduce, reuse or re-cycle all solid waste generated to the extent possible • Dispose all solid wastes that cannot be recycled or reused to GAME approved solid waste disposal sites using a licensed refuse handler • Maintain proper records of solid wastes to know the quantity of wastes generated on site • Provide adequate waste bins and containers at specific places and ensure they are properly marked with type of wastes • Perform regular inspection of waste management practices onsite	• Solid Waste Management Plan developed and implemented • Quantity of solid waste generated • Number of solid waste storage facilities at the plant • Quantity of solid waste correctly disposed to GAME Approved disposal sites • Number of completed inspection missions	• Project Developer • GAME • Licensed hazardous waste transporter	• Solid waste management Plan and inventory • Inspection Reports • Audit Reports	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
		• Annual audits			
Water availability	• Operational water availability / resource use assessment and management plan developed.	• Operational water availability / resource use assessment.	• Project Developer • GAME •	• Inspection reports.	Continuous
Soil erosion	• Confine all vehicles to roadways. • Monitor road condition regularly; then repair damaged and rutted roads rather than bypassing damaged sections. • Monitor erosion controls and repair as needed. • Where possible, maintain any existing grass cover on berms and ditches. • Prohibit use of vehicles and equipment off prepared roads. • Re-stabilize existing eroded tracks and restore grass cover as needed. • Do not collect firewood from the site. • Reduce wastes to the extent possible and maximise re-use and recycling of materials. Collect and store all waste and garbage before disposal at the designated site.	• Number of completed inspections, • Annual audits.	• Project Developer • GAME	• Inspection reports.	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	• Clean up and store oily and chemical waste and contaminated material before transport to the designated disposal site to reduce risk of soil and groundwater contamination. • Store all fuel, oil and chemical storage in the designated secure area.				
Visual Impacts	• Develop and implement a site rehabilitation and landscaping plan to restore the site to a better visual state • Ensure proper storage, regular collection and disposal of waste streams generated. • Carry out the facility inspection work on regular basis	• Availability of waste management plan developed and implemented • Site inspection missions completed • Annual audits	• Project Developer.	• Inspection Reports • Grievance Reports • Audit Reports	Continuous
Hazardous Wastes	• Develop and implement Hazardous Waste Management Plan in line with the governing regulations • Train employees on Hazardous waste management • Segregate waste by separating hazardous waste from non-hazardous waste • Containers for storing hazardous waste including used oil should be securely bundled, labelled and disposed in line with the governing regulations • Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow	• Hazardous Waste Management Plan developed and implemented • Number of Trained Workers on Hazardous Waste Management • Amount of Hazardous Waste Segregated	• Project Developer • GAME • Licensed hazardous waste transporter	• Inspection Reports • Hazardous Waste Management Plan and Inventory • Audit Reports	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	• Prohibit illegal disposal of hazardous wastes on the solar farm during solar farm maintenance exercise. • Store hazardous materials in designated areas secured with a fence • Undertake regular inspection of hazardous waste management practices onsite.	• Quantity of accidental hazard spillage • Quantity of hazardous waste correctly disposed • Number of completed inspection missions • Annual Audits			
Occupational Health and Safety	• Develop and implement an Occupational Health and Safety Plan • Train employees on the importance of occupational health and safety • Ensure compliance with the governing regulations • Install a fence regularly by netting breakages in order to prevent accidents involving local inhabitants or wildlife • Fence the entire solar farm to prohibit unauthorized persons from accessing the site • Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust masks, ear mufflers and overalls. • Strictly enforce the use of the Personal Protective Equipment to minimise the accidents during decommissioning	• Occupational Health and Safety Plan developed and implemented • Number of employees trained on occupational health and safety • PPE procured and being used by the employees • Fire extinguishing facilities at the plant • First aid kit on site • Signage installed at the plant	• Project Developer • GAME	• Inspection reports • Record of accidents and near misses • Corrective Action Reports	Continuous

Impact	Mitigation Measures	Monitoring Indicator	Responsibility	Monitoring Means	Frequency
	• Regular medical checks • Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing • Put clear signage to restricted areas in Arabic and English language to reduce risk of accidents • Undertake regular inspection of the plant • Promote HIV/AIDs Awareness	• Number of inspection missions competed • Annual Audits			

15.3.2 Other Plans

Several additional plans will require to be produced by the Project Developer in support of the ESMP. These plans will provide a system against which to monitor and audit environmental performance. The plans will detail the practical methods required to ensure work is completed in accordance with current best practice, the mitigation measures in this ESIA and legislative and regulatory requirements.

15.3.3 Method Statements

In addition to the above, Project-specific Method Statements and a variety of detailed site-specific plans will be produced to cover the detailed construction methodologies to be employed for all main construction activities.

15.3.4 Health and Safety

The Project Developer will require its contractors to comply with international Occupational Health & Safety regulations and standards (for example, EU Directive 89/3918 and OSHA standards) in addition to Saudi Arabian safety standards regarding construction works, electrical works, structural climbing and other hazards. In general, construction operations will be planned and implemented in accordance with these standards and with IFC safety guidelines.

There will be a workforce manager in charge of all activities, and in charge of compliance with health and safety requirements. This individual will report directly to the Project Developer project manager and will have independent lines of reporting to upper management. Prior to beginning work on the site, the workforce manager will develop a safety program to cover construction and then operation of the site. The program will describe in detail the potential hazards and the ways in which they will be prevented or avoided. All construction workers (including contractors) will be required to complete a training program that covers the safety program, and training will cover hazard awareness, job- and site-specific hazards, emergency procedures for fire, illness or injury, and natural disaster.

Besides training, the safety program will include detailed requirements for inspecting, testing, and calibrating safety equipment, for monitoring the working environment for hazards, and for monitoring worker health. In addition, all incidents and accidents will be recorded if they resulted, or nearly resulted, in damage to equipment or injury or to humans or animals, will be recorded.

Workplace inspections will be undertaken on a regular basis to monitor H&S aspects on site.

15.3.5 Environmental Notices

Posters and notices shall be used as appropriate to communicate nuisance abatement, environmental protection and waste management issues, such as the Contractor's environmental policy, environmental objectives, site-layout plans, and good and bad environmental practices to the workforce and interested parties.

Notice boards shall be established at strategic locations within the site and at the boundary where it interfaces with the general public.

The project environmental coordinator or nominee will be responsible for maintaining the information on the notice boards up-to-date.

15.3.6 Environmental Audit

Environmental audits are fundamental to ensuring that the actions for each objective contained within the ESMP are established and maintained on the Project. Audits will take place provisionally every month from the start of the construction works.

Before an audit the following documents will be consulted to check conformance where applicable:

- Consents and licences.
- Planning Permission and conditions.
- Records of any previous environmental audits, non-conformance notices, complaints and environmental incidents.

The measures to control significant aspects outlined in the ESMP and their effective implementation will be checked during regular environmental audits of the site, during the site construction phase.

The local government environmental official, representatives from the local community and liaison committee members will be invited to attend the audits.

The results of the audit will be recorded on the environmental audit report and any non-conformances found will be formally recorded along with the action required.

Each non-conformance will be issued to the relevant person/s to take the corrective / preventative action detailed within an agreed timescale.

The Environment Manager will monitor the progress of actions and once action has been taken it will be checked and if satisfactory the non-conformance will then be closed out. If there are any outstanding actions at the next audit, these will be priority items to check.

The audit results will be reported at the site liaison committee.

15.3.7 Environmental Monitoring

A programme of Environmental and Social Monitoring will be undertaken to verify the effectiveness of the proposed mitigation measures in reducing impacts and also to allow mitigation measures to be refined or developed as needed to further address potential impacts or to develop plans for future development. More specifically, the objectives of the monitoring program are to:

- Record project impacts during construction and operation.
- Meet legal and community obligations.
- Evaluate the effectiveness of the mitigation measures and identify any shortcomings.
- Allow refinement and enhancement of mitigation measures to further reduce impacts.
- Allow identification unforeseen issues or changes in operations and provide information for development of mitigation measures to deal with those issues or changes.

The environmental and social monitoring program was developed in accordance with the best international practices for the solar energy sector.

Details of monitoring together with results will be summarised in a monitoring report which will be submitted to the Lenders for approval. Each monitoring report will cover a period of three months and will be submitted one month after the end of that monitoring period.

15.3.8 Review of ESMP

The ESMP will be reviewed periodically during construction. This is likely to occur on a two-monthly basis. During the first year of operation, the ESMP will be reviewed every six months. Following this period, the ESMP will be reviewed annually.

The results of the review will be used to update the ESMP if deemed necessary to either ensure targets are met or to ensure continual improvements in environmental performance.

15.4 Summary

The most effective form of mitigation is to design the Project to avoid environmental impacts at source. Many environmental impacts have been avoided by sensitive layout and/or by commitment to the use of particular construction techniques and mitigation measures. In addition, construction and reinstatement techniques, that minimise environmental impacts, are well established.

The ESMP will ensure that the requirements detailed within this ESIA together with the Equator Principles and IFC Performance Standards are incorporated into the construction and operation of the Project.

16 Monitoring, Evaluation and Reporting

16.1 Introduction

Monitoring, evaluation and reporting is vital for any plan. Consequently, the success of the ESMP will depend on effective monitoring, evaluation and reporting system. The system will ensure that mitigation measures or strategies are implemented effectively, allow response to new and developing issues of concern in a timely manner and provide feedback on significant environmental changes for remedial actions. This chapter presents the monitoring, evaluation and reporting arrangements for the ESMP developed in Chapter 15 of this Report.

16.2 Monitoring

The overall objective of environmental and social monitoring is to ensure that all construction, operation and decommissioning activities comply with the legal and regulatory requirements so that all mitigation measures are implemented effectively. The items to be monitored for this ESIA will include but not limited to: Air quality, Noise Quality, Surface Water and Groundwater Quality, Wastes, Occupational Health and Safety, Visual and Landscape. The key measurement indicators for these aspects are contained in the ESMP. The Project Developer will employ various monitoring techniques including supervision and regular site inspections. Monitoring activities will be undertaken at two levels as discussed below.

16.2.1 Internal Monitoring

The objectives of internal monitoring will be to ensure that the ESMP is implemented correctly to meet the legal requirements. It will be the responsibility of the Project Developer to conduct regular internal monitoring and audits on the implementation of the ESMP. To do this, the Project Developer will have to develop the capacity of its staff to carry out internal monitoring activities. Capacity building would ensure that the project staff has adequate manpower in all aspects of ESMP for effective monitoring.

Monitoring should be participatory. This may be achieved through establishment of an Environmental Monitoring Committee (EMC) that would foresee an effective mechanism for monitoring the implementation of ESMP and improving communications amongst the stakeholders. The EMC would also work with the external monitoring expert as required.

16.2.2 External Monitoring

The Project Developer will hire an external expert to carry out external monitoring. The GAME has the overall responsibility for issuing approval for the project and ensuring that their environmental guidelines are followed during project implementation. Their role therefore will be to review environmental monitoring and environmental compliance documentation submitted by the Project Developer.

16.2.3 Monitoring Indicators

These are the measurements, statistics or values that provide a proximate gauge or evidence of the effects of environmental management programs or of the state or condition of the environment that could result from the implementation of the proposed project. The key environmental indicators that need to be monitored have been factored into the project's ESMP in Chapter 15. Performance indicators are summarised in Table 16-1 and a monitoring checklist is provided in Table 16-2.

16.3 Evaluation / Audits

Evaluation (Audits) will enable the Project Developer to take stock of what has been achieved in terms of ESMP implementation and providing information for corrective action. In this regard, the Project Developer will undertake an Annual Audit of the ESMP and submit the report to the GAME. The main objectives of the Annual Audit will be to:

- Find out any significant environmental hazards and their existing control systems in place.
- Determine environmental and safety problems which are not adequately controlled and suggesting how the control system in place can be improved.
- Provide information that would be used to improve an environmental health and safety management system.
- Comply with the legal requirements.

16.4 Reporting

Regular reporting on the progress of implementation of the ESMP will be critical in adjusting strategic directions and measuring performance. Progress reports will be made on quarterly basis. The reports will outline, in summary, the performance on key measurement indicators. The results of internal and external monitoring will be clearly documented for all the phases of the Project.

Table 16-1: Performance Indicators

Environmental component	Project activities	Key performance indicators	Project phase	Best Practice Guidelines
Ambient air quality	Earthwork and removal of vegetation cover; Transportation of materials, equipment, and employee commuting; Storage of chemicals, materials, and waste on site; On-site energy and heat consumption; and Other indirect supply chain activities.	Fugitive dust and particles (SPM, PM10)	Pre-construction Construction Decommissioning	International best practice (IFC EHS General Guidelines) on management of emissions to air.
Ambient noise and vibration level	Earthwork and site preparation; and transportation of materials, equipment, and employee commuting.	Sound levels in Leq dB(A) for day-time and night-time.	Construction Operation Decommissioning	International best practice (IFC EHS General Guidelines) on noise prevention and control.

Environmental component	Project activities	Key performance indicators	Project phase	Best Practice Guidelines
Surface and Groundwater quality	Storage of oil, lubricating materials, chemicals, domestic and industrial waste on site; Transportation of oil, lubricating materials, chemicals, and other computations; and Earthworks.	National Ambient Water Quality Standards.	Prior to start of Construction Operation Decommissioning	International best practice (IFC EHS General Guidelines) on protecting surface and groundwater, management of hazardous materials and management of waste.
Soil quality and erosion	Storage of oil, lubricating materials, chemicals, domestic and industrial waste on site Transportation of oil, lubricating materials, chemicals, and other computations Earthwork	Erosion rate observation; Soil contaminants identified in the international standards.	Construction Operation Decommissioning	International best practice (IFC EHS General Guidelines) on restoring degraded land and re-establishing vegetation relevant to construction, operation, and decommission.

Environmental component	Project activities	Key performance indicators	Project phase	Best Practice Guidelines
Flora protection	Earthwork Transportation	Destruction rate observation	Construction Operation Decommissioning	International best practice (IFC EHS General Guidelines) on restoring degraded land and re-establishing grassland vegetation relevant to construction, operation, and decommission.
Occupational H&S	Earthwork and site preparation Site construction activities, use of construction equipment	Sound levels in Leq dB(A).	Construction Decommissioning	International best practice (IFC EHS General Guidelines) on minimising occupational hazards and the use of appropriate PPE.
Waste management	Generation of general waste on site; use of oil, lubricating materials and other chemicals on site.	Inspection reports; Waste inventory.	Construction Operation Decommissioning	International best practice (IFC EHS General Guidelines) on waste management.

Table 16-2 provides a description of the common environmental and social monitoring activities. The Project Developer will carry out required monitoring and audits aimed at improving the solar farm's environmental and social performance. The monitoring will be comprised of weekly checklists, follow-up checklists, and quarterly audits during construction and monthly, semi-annual, and annual audits during operation (frequencies will be determined). Where international best practice standards (IFC) are more stringent than local regulations, the former have been referenced.

Table 16-2: Monitoring Checklist

Component	Project phase	Parameters	Deliverables	Frequency	Location	Standard
Ambient air quality	Pre-construction Construction Decommissioning	SPM, PM10	1 sample per location	Once per construction season Once per decommissioning season	Along the roadways Construction areas	IFC Ambient Air Quality Guidelines: PM10: 50 µg/m3 (24-hours);
Ambient noise quality	Construction Operation Decommissioning	dB(A) level	Records of each location	Once per construction season Annual or 6 monthly independent audit Following any complaint Once per decommissioning season	Along the roadway The identified recipient location Substation	IFC noise level guidelines for industrial / commercial receptors: Daytime: 70 dB(A) Night-time: 70 dB(A)

Component	Project phase	Parameters	Deliverables	Frequency	Location	Standard
Surface and groundwater quality	Pre-construction	Analyses stipulated in the National Ambient Water Standards, including (but not limited to): pH (SI) Temperature (°C) Conductivity (µS/cm) TDS (mg/L) TSS (mg/L) DO (mg/L) BOD (mg/L) ORP (mV) E-coli (cfu) Major Cations and Anions (mg/L) Hydrocarbons (mg/L) Ecoli (cfu) Water levels (mbgl) (Groundwater supply and monitoring wells)	1 sample per location	Once	At any groundwater supply wells constructed prior to construction / operation. At any groundwater wells / springs within the site. At any groundwater monitoring wells installed for the Project Any other natural waters used as potable water (none at this time)	National Ambient Water Quality Standard for KSA, 2012.
	Construction		1 sample per location	Once per construction season		
	Operation		1 sample per location	Annual After any spill within 1km of the well		

Component	Project phase	Parameters	Deliverables	Frequency	Location	Standard
Soil quality and erosion	Pre-construction	Erosion rate observation Soil contaminants identified in international standards since soil contaminants vary in properties from organic to water soluble contaminants, radioactive contaminant properties.	Photographic records	Once	General	International best practices
	Construction		Records at each location Checklist observation reports Annual photographic record	Continuous during construction After any accidental spill	All areas destructed by earthwork, construction equipment, and workers All roadways All areas of accidental spills	
	Operation		Annual photographic record Checklist observation record	Quarterly observation for evidence of soil erosion After major spills, precipitation/run-off event		

Component	Project phase	Parameters	Deliverables	Frequency	Location	Standard
Flora protection	Pre-construction	Disturbance levels	Photographic record Inspection reports	Once	Soil monitoring locations	Best international standards
	Construction			Before construction and after construction season (reclamation)	Soil monitoring locations	
	Operation			Annually	Soil monitoring locations	
	Construction	Noise, fire safety, hazardous materials registrar, solid and sanitary waste	Inspection Reports	To be determined	At construction camp	Best international practices.

Component	Project phase	Parameters	Deliverables	Frequency	Location	Standard
Occupational and public health and safety	Operation	PPE use Health and safety trainings Traffic safety, signs, road inspection Accident, incident registration Speed limit enforcement Health checks Workers grievances Other workplace inspections	Inspection Reports	To be determined	All roadways	International best practice (IFC EHS General Guidelines) on OH&S. The Guidelines include measures for minimising occupational hazards (related to noise, electrical hazards etc.).
Socio – economic conditions	Pre-construction	Baseline social economic condition	Baseline socio-economic conditions report (completed as part of ESIA)	Once	To be determined	Best international practices.
	Construction	Population size Grievances Social and employment records (wage rate, unemployment rate, local government annual budget, contracts with local service)	Inspection reports Annual summary report	To be determined		
	Operation		Annual summary report	To be determined		

Component	Project phase	Parameters	Deliverables	Frequency	Location	Standard
Safety and Security	Construction	Number of security personnel employed; Number of inspection missions	Inspection and security reports	TBC	Construction areas	Best international practices.
Drinking Water (delivered to site)	Construction Operation Decommissioning	Analyses stipulated in the National Drinking Water Standards, including (but not limited to): pH (SI) Temperature (°C) Conductivity (µS/cm) TDS (mg/L) TSS (mg/L) DO (mg/L) BOD (mg/L) ORP (mV) E-coli (cfu) Major Cations and Anions (mg/L) Organics (µg/L)	Water chemical analysis reports (certificates of analysis)	Per batch / delivery	At supplier	National Drinking Water Quality Standard for KSA, 2012.