

# Jizzakh Solar PV Project

Environmental and Social Impact Assessment

Draft Report

Masdar

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## Quality information

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## Abbreviations and Definitions

Term	Definition
<b>AOI</b>	<p>Area of influence.</p> <p>The AOI (based on the definition in IFC PS1) adopted by the Project is:</p> <ul style="list-style-type: none"> <li>• The area likely to be affected by:                             <ul style="list-style-type: none"> <li>– Project activities and facilities that are directly owned, operated, or managed (including by contractors) by the Project Proponent and that are a component of the Project;</li> <li>– Impacts from unplanned but predictable developments caused by the Project that may occur later or at a different location; or</li> <li>– Indirect Project impacts on biodiversity or on ecosystem services upon which 'Affected Communities' livelihoods are dependent.</li> </ul> </li> <li>• Associated facilities, which are facilities that are not funded as part of the Project and that would not have been expanded if the Project did not exist and without which the Project would not be viable. It is anticipated there will not be any associated facilities for the Project; and</li> <li>• Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the Project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.</li> </ul>
<b>Affected communities</b>	Local communities who are directly impacted by the Project.
<b>Developer</b>	Masdar, Abu Dhabi's (UAE) renewable energy company specialising in the development, commercialisation, and deployment of clean technologies across utility-scale plants, off-grid projects and sustainable real estate.
<b>NGO(s)</b>	Non-Governmental Organisation(s)
<b>Project</b>	A 220 MWac solar PV facility in the Gallaorol district of the Jizzakh region, Republic of Uzbekistan, complete with 180/110/10 kV substation and a 14.77 km transmission line to the Saribazar 220 kV substation.
<b>Project Area</b>	The geographic area comprising the Project Site and its immediate surroundings.
<b>Project Site</b>	The Solar PV Site and overhead line grid connection
<b>Solar PV Site</b>	The land within which the solar PV panels and associated equipment will be located. It excludes the overhead line grid connection.
<b>Study Area</b>	HOLD
<b>MWac</b>	Megawatt of AC power, a measure of power output
<b>AC</b>	Alternating current
<b>PV</b>	Photovoltaic (the conversion of sunlight into electrical energy)
<b>USD</b>	HOLD
<b>UZS</b>	HOLD
<b>GBV</b>	Gender-Based Violence
<b>IFC</b>	International Finance Corporation Performance Standard(s)

# 1. Introduction

## 1.1 Project Overview

The Government of Uzbekistan aims to develop up to 12 gigawatts (GW) of solar and wind power by 2030 through the development of privately financed and operated renewable energy projects. Scaling Solar is a World Bank Group program that assists governments to procure and develop large solar projects with private financing. The first solar photovoltaic (PV) plant, with 100 megawatt (MW) peak capacity, developed through Scaling Solar Program is being constructed in Navoi region at the time of publication of this report.

World Bank Group’s Scaling Solar Uzbekistan Round 2 program aims to add over 400 MW of clean and renewable PV energy to the country’s energy mix. As part of this round, two sites — in Samarkand and Jizzakh regions have been identified for development.

This report covers the development of a 220 MWac solar PV project in Gallaorol District, Jizzakh region of Uzbekistan, referred to as “the Project”. The Project site area is 562 ha. The Project will also comprise a 14.77 km overhead transmission line from the on-site substation to the existing Saribazar substation.

**Table 1. Key Project characteristics**

<b>Location</b>	Gallaorol District, Jizzakh region, Republic of Uzbekistan
<b>Installed capacity</b>	220 MWac
<b>Solar PV Site area</b>	562 ha
<b>Overhead grid connection line</b>	14.77 km 220 kV Steel lattice towers
<b>National grid substation</b>	Saribazar

**Table 2. Emissions Reduction**

<b>Project Annual Electricity Generation (kWh)</b>	593,938,000
<b>Number of houses powered by the Project</b>	264,093
<b>Emission reductions of carbon dioxide annually (tonnes/yr)</b>	237,684

Further details about the Project design, construction and operation are provided in Chapter 2 Project Description.



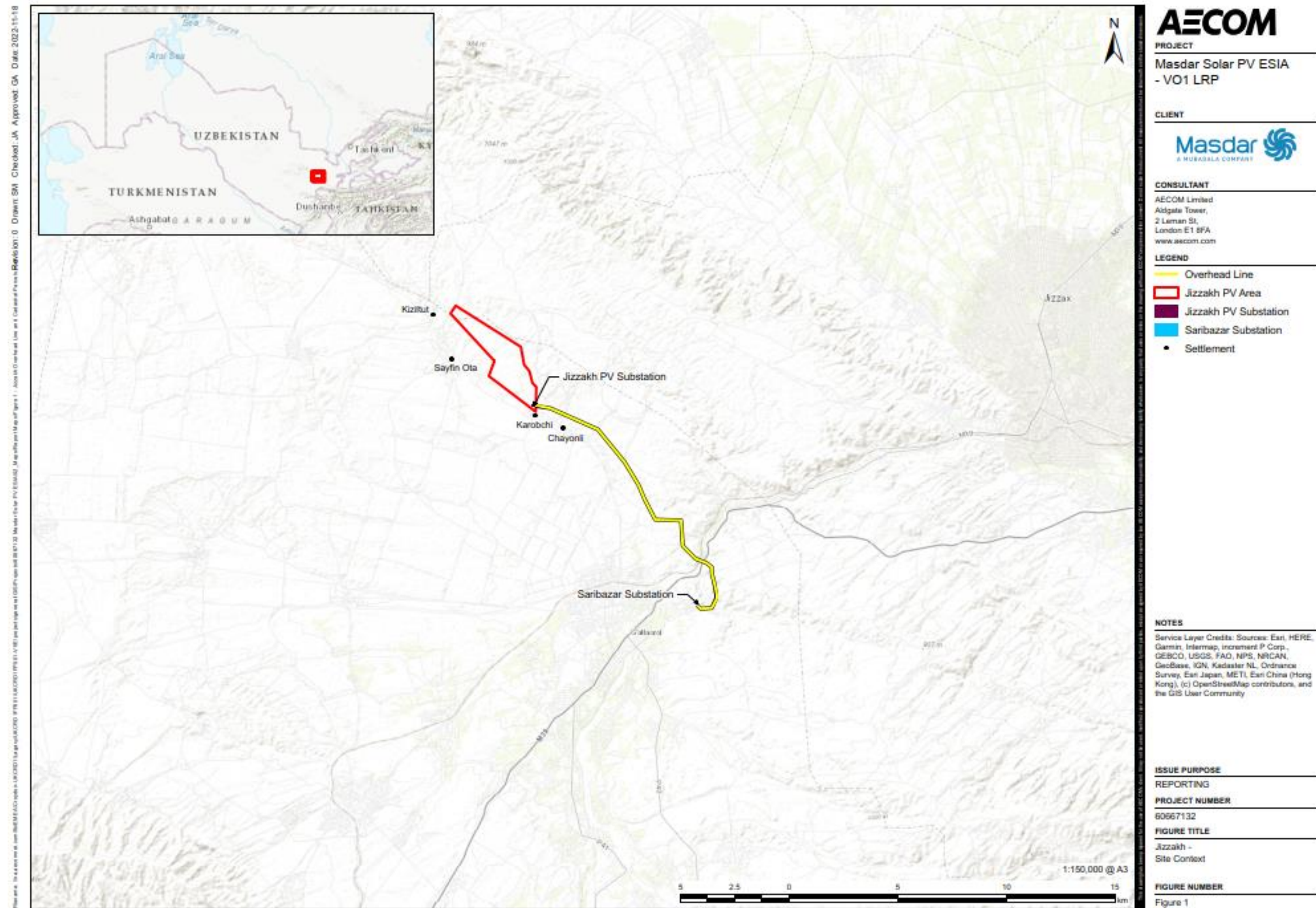


Figure 1-1. Project Location



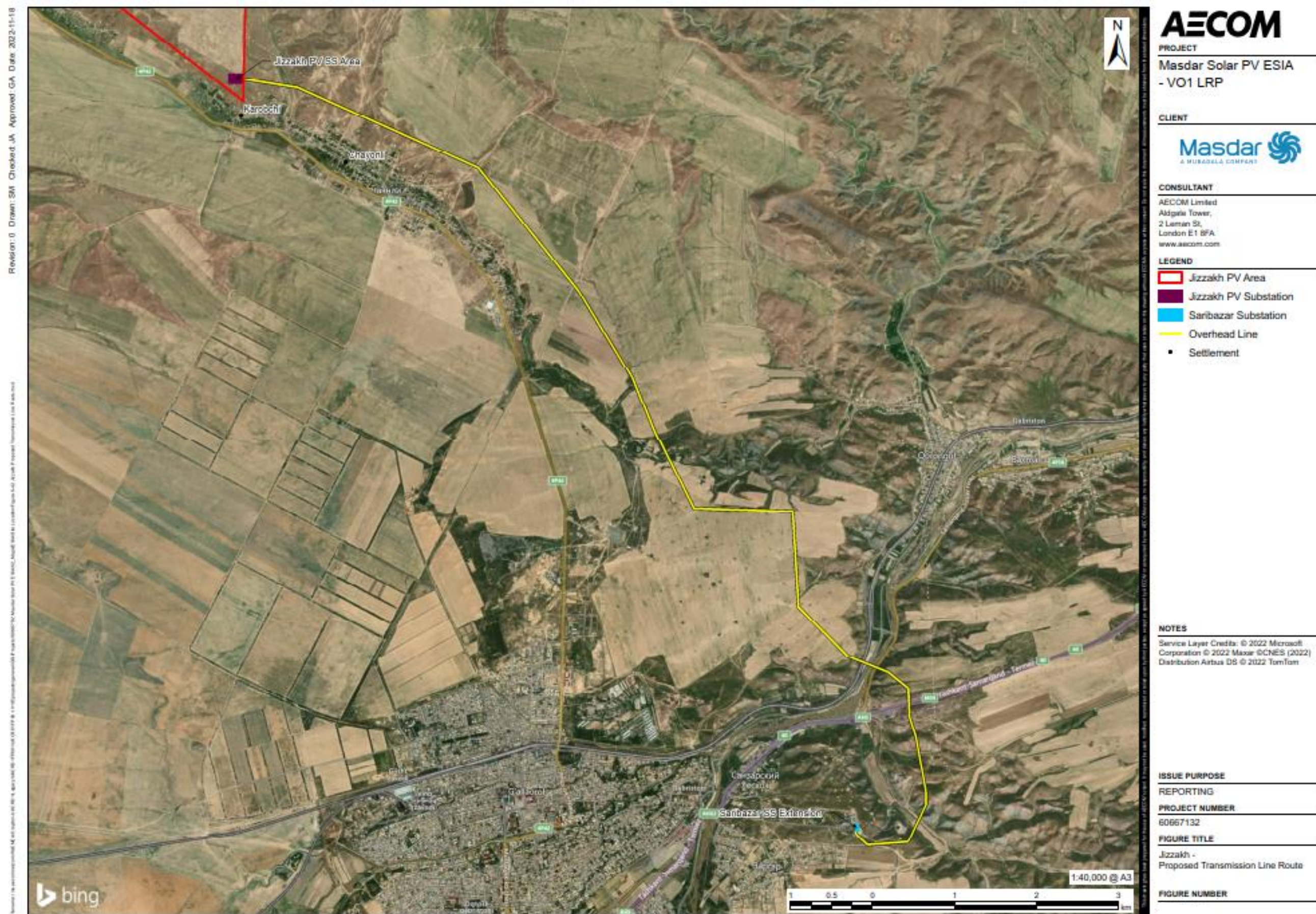


Figure 1-2. Transmission Line



## 1.2 Purpose of This Report

The purpose of this ESIA Report is to:

1. Document legislative requirements of Uzbekistan for this type of project.
2. Describe the methodology and approach to be used in assessing impacts.
3. Identify the likely key environmental and social issues associated with the construction and commissioning, operation and maintenance, and decommissioning phases of the Project.
4. Frame the scope for the baseline studies that have been undertaken in support of the ESIA.
5. Identify and assess Project impacts and develop appropriate mitigation.

This ESIA Report has been prepared in accordance with internationally accepted standards.

### 1.2.1 National OVOS

To satisfy the statutory requirements of the Republic of Uzbekistan, a separate national Environmental Impact Assessment (OVOS) report was developed concurrently with the international ESIA report. The ZVOS stage of the OVOS has been submitted and has been approved.

It is important to note that the OVOS for Jizzakh would not be possible without the completion of the tortoise translocation. The Jizzakh OVOS was returned, and additional comments requested in relation to ecology. The OVOS was only approved after the process of tortoise translocation was completed and confirmed in writing by the regional ecology department in Jizzakh.

## 1.3 Project Team

### 1.3.1 Developer

The Project is being developed by Masdar (Abu Dhabi Future Energy Company PJSC). Masdar has been selected through a competitive tender set up by the Ministry of Investment and Foreign Trade, the Ministry of Finance, and the Ministry of Energy with assistance from the International Finance Corporation (IFC).



Masdar is a global leader in renewable energy and sustainable urban development, with headquarters in Abu Dhabi. Over the past decade, Masdar have pioneered commercially viable solutions in clean energy, sustainable real estate and clean technology in the UAE and around the world.

### 1.3.2 ESIA Consultants

The Developer has commissioned AECOM to lead the Project ESIA study, ESIA consultation and ESIA reporting.



AECOM is a global leading engineering and environmental consultancy providing professional technical and management support services to a broad range of markets including power and renewables, with experience supporting more than 15 gigawatts in solar power around the world.



AECOM has partnered with Green Business Innovation, a leading environmental consultancy based in Uzbekistan, who will lead the field surveys and stakeholder engagement for the ESIA.

## 1.4 Report Structure

This ESIA Report comprises the following sections, as outlined in Table 3.

**Table 3. Report Structure**

<b>Chapter</b>	<b>Contents</b>
<b>1. Introduction (this chapter)</b>	An overview of the Project, purpose and structure of this report, and the Project team.
<b>2. Project Description</b>	Description of the proposed facilities and structures, construction methods, power plant operation, anticipated waste streams and other key aspects of the Project.
<b>3. Legal and Policy Framework</b>	Summary of legislation, regulations, policies and plans applicable to the environmental and social aspects of the Project.
<b>4. Impact Assessment Methodology</b>	Description of the approach to determining receptor sensitivity, impact magnitude and overall impact significance, as well as mitigation hierarchy.
<b>5. Stakeholder Engagement</b>	Summary of the aims, approach and process of Project stakeholder engagement.
<b>6. Environmental and Social Baseline</b>	Description of environmental and social baseline (pre-Project) conditions.
<b>7. Potential Environmental and Social Impacts</b>	Overview of the potential environmental and social impacts that could be caused by Project construction, operation and decommissioning.
<b>8. Mitigation</b>	Summary of the mitigation measures put in place to mitigate the identified impacts.
<b>9. Residual Impacts</b>	Summary of the residual impacts following mitigation.
<b>10. References</b>	



## 2. Project Description

### 2.1 Location

The proposed Project Site is located in Gallaorol District, Jizzakh region, in the south-east of the Republic of Uzbekistan. Nearest communities (makhallas) are Chayonly (also referred to as Chayli on some maps), Kiziltut, Karobchi (also referred to as Karakchi on some maps), and Sayfin Ota. The Project Site is approximately 10 km north of the city of Gallaorol and 25 km west of the city of Jizzakh, the regional capital. The Site is accessed via road R-42 off motorway M39.

The site area is 562 ha.

The Site centre point coordinates are:

	<i>Geographic (WGS 84)</i>	<i>WGS 84 UTM 42N</i>
<i>Longitude</i>	67° 31' 47" E	374733
<i>Latitude</i>	40° 7' 38" N	4442916

The overhead transmission line route is 14.77 km, connecting the Project to the existing national grid substation at Saribazar.

### 2.2 Land Ownership and Use

The land within the proposed Solar PV Site boundary belongs to the Government land reserve. The land comprises sparsely vegetated areas or bare ground and is used as for livestock grazing. No arable agriculture is evident on site, potentially due to the lack of water sources for irrigation.

The proposed Site boundaries were optimized to use the available space and avoid areas with uneven topography and to avoid sensitive areas in the communities (e.g. burial grounds). A community pathway is used by herders to access land to the north of the Solar PV Site and this access will be impacted. This loss of access is discussed in section 7.1.9.

The route of the overhead transmission line passes through agricultural land before crossing the Sangzor River valley, railway line and the M39 highway to reach the substation.

The connection to the Saribazar substation is within the existing boundaries and land owned by the existing station. No further land is required to be acquired.

### 2.3 Solar Photovoltaic (PV) Technology

In general terms, solar PV technology converts the sun's energy into electricity using a series of solar panels, inverters and transformers to connect to the electricity grid.

PV cell technologies are broadly categorised as either crystalline silicon or thin-film. Crystalline silicon (c-Si) cells provide high efficiency modules. They are sub-divided into mono-crystalline silicon (mono-c-Si) or multi-crystalline silicon (multi-c-Si). Mono-c-Si cells are generally the most efficient but are also more costly than multi-c-Si. Thin-film cells provide a cheaper alternative but are less efficient. There are three main types of thin-film cells: Cadmium Telluride (CdTe), Copper Indium (Gallium) Di-Selenide (CIGS/CIS), and Amorphous Silicon (a-Si).

The performance of a PV module will decrease over time due to degradation. Degradation rate depends on the environmental conditions in the local area and the technology of the module.

Modules are either mounted on fixed-angle frames or on sun-tracking frames. Fixed frames are simpler to install, cheaper and require less maintenance. However, tracking systems can increase yield by up to 20%. Tracking, particularly for areas with a high direct/diffuse irradiation ratio also enables a smoother power output.

The energy generated by the PV modules is then convert from direct current (DC) into alternating current (AC) electricity, conforming to the local grid requirements, by solar inverters. Inverters are

arranged either in string or central configurations. String inverters enable individual string Maximum Power Point Tracking (MPPT) and require less specialised maintenance skills. String configurations also offer more design flexibility. Central configuration inverters are considered to be more suitable for multi-MW plants.

PV modules and inverters are all subject to certification, predominantly by the International Electrotechnical Commission (IEC). New standards are currently under development for evaluating PV module components and materials.

The performance ratio (PR) of a well-designed PV power plant will typically be in the region of 77% to 86% (with an annual average PR of 82%), degrading over the lifetime of the plant. In general, good quality PV modules may be expected to have a useful life of 25 to 30 years.

The main components of the solar PV Project are:

- **Solar PV modules:** These convert solar radiation directly into electricity through the photovoltaic effect in a silent and clean process that requires no moving parts. The output from a solar PV cell is DC electricity. A PV power plant contains many cells connected together in modules which are then connected in strings to produce the required output.
- **Inverters:** These are required to convert the DC electricity to alternating current (AC) for connection to the utility grid. Many modules in series strings and parallel strings are connected to the inverters.
- **Module mounting (or tracking) systems:** These allow PV modules to be securely attached to the ground at a fixed tilt angle, or on sun-tracking frames.
- **Step-up transformers:** The output from the inverters requires a further step-up in voltage to reach the AC grid voltage level. The step-up transformer takes the output from the inverters to the required grid voltage.
- **The grid connection interface:** This is where the electricity is exported into the grid network. The substation will also have the required grid interface switchgear such as circuit breakers (CBs) and disconnects for protection and isolation of the PV power plant, as well as metering equipment.

Figure 2-1 shows the key principles and associated structures of a PV facility.

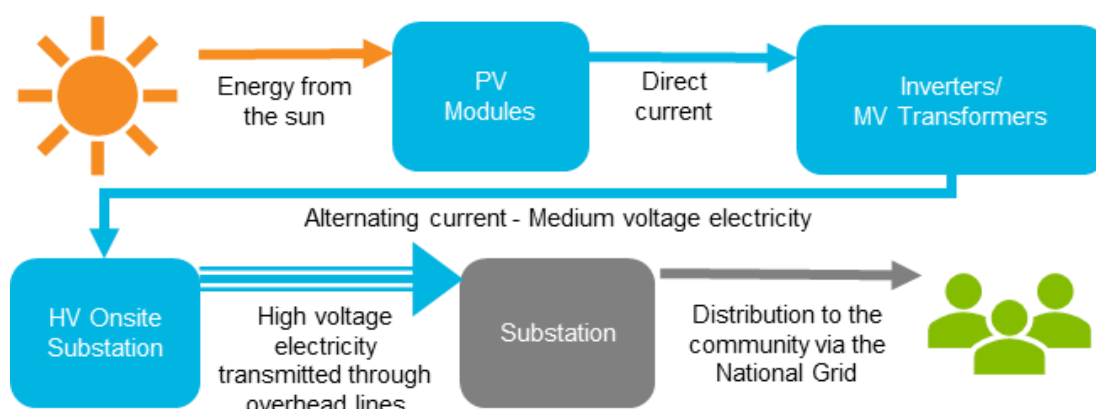


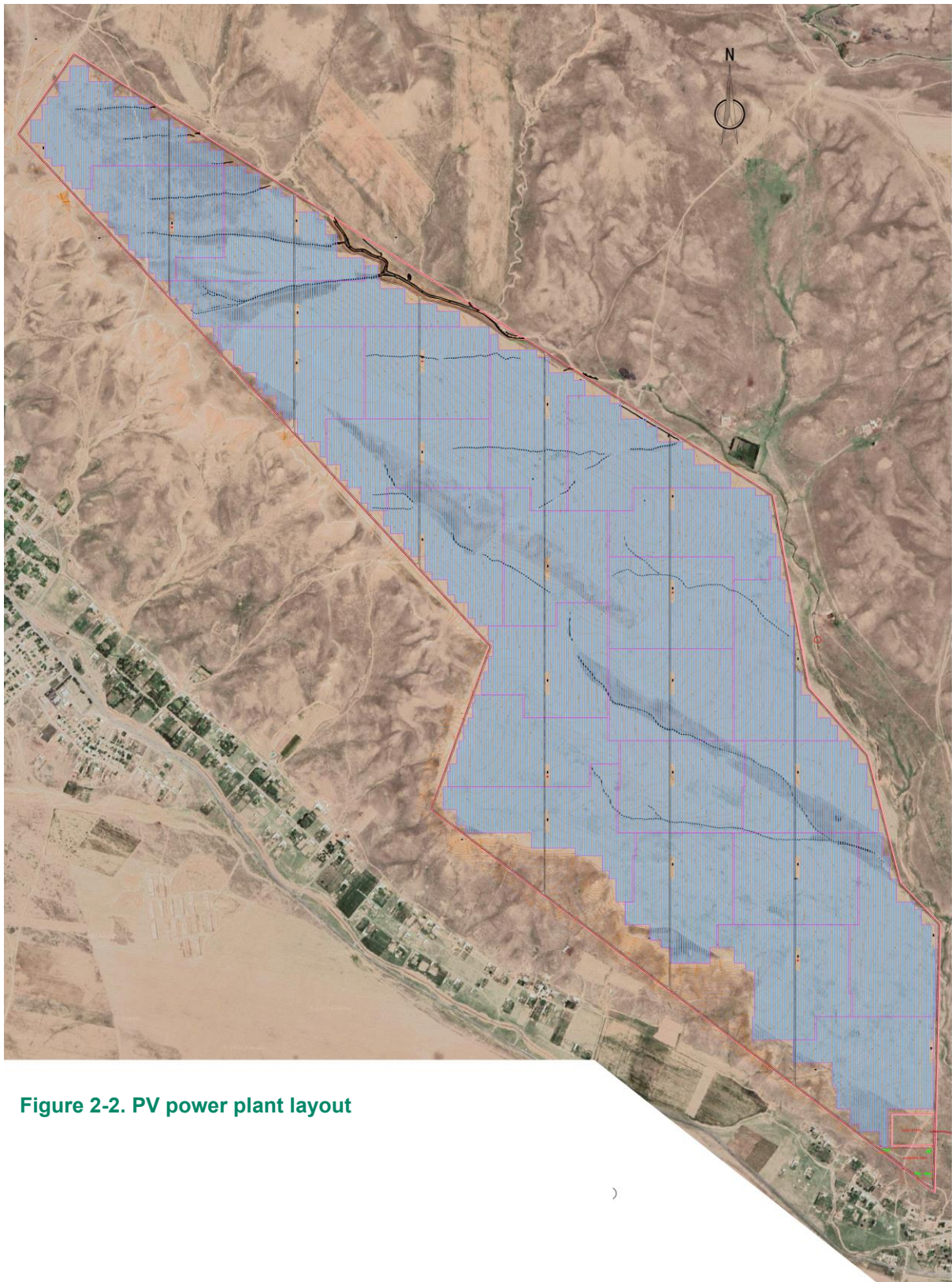
Figure 2-1. PV power plant overview

## 2.4 Project Design

### 2.4.1 Solar PV Site Layout

Gated access to the facility will be located at the south end of the facility, as well as the project substation. The proposed preliminary layout uses north-south oriented internal service roads (5 m wide) to access the different inverters and areas of the PV plant and a few east-west internal service roads. The total length of the proposed internal road network is approximately 35 km but will be confirmed by the EPC contractor. A community pathway will be blocking access for community members and their herds to cross the area.

The initial layout is provided below, and the final layout and detailed design will be provided by the EPC contractor during the detailed design phase of the Project. The design will take into account flood and erosion risk and consider future climate change.



**Figure 2-2. PV power plant layout**

The key components and parameters of the site are summarised in the table below.

**Table 4: Project components**

<b>Component</b>	<b>Value</b>
Area of Project Site (Ha)	562
Materials for all fencing	Hot dip galvanized with adequate corrosion protection.
Fence posts and foundations shall be adapted to the ground conditions and at an interval (m)	3 maximum
Struts will be installed at (m)	20 maximum
Fence height with barbed wire (m)	2.5
Alarms	Remote alarms will be installed
Number of Closed-Circuit Television CCTV Cameras to be installed during construction	at least 10 Cameras
The land for the Site will be leased by Masdar for a period of up to (years)	30
Pre-construction and Construction Phase (duration) (months)	Up to 12
Operational Phase (PV Plant lifetime) (years)	30
Number of Jobs during the Construction Phase	Up to 535
Number of Jobs during the Operational Phase	Up to 50
Installed Capacity (MWac)	220
Project Annual Electricity Generation (kWh)	593,938,000

Source: Masdar

### 2.4.2 PV Modules

The current design envisages that the Project will comprise 457,044 modules. These are likely to be 570 Wp n-type mono silicon half-cell double glass modules.

The PV modules will be installed on a tracking system. A tracking system involves attaching the PV modules to a table that can move in relation to the sun. This allows for optimal performance throughout the day. The Project would utilise a single-axis tracking system, which tilts the solar panel around a horizontal axis thus tracking the sun's movement from east to west, as illustrated in Figure 2-3. The proposed tracker system parameters are as follows:

- Tilt range: +/-60 degrees;
- Height at maximum tilt: 2.5 m;
- Clearance above ground: 0.5 m; and
- Spacing between rows: 3 m.



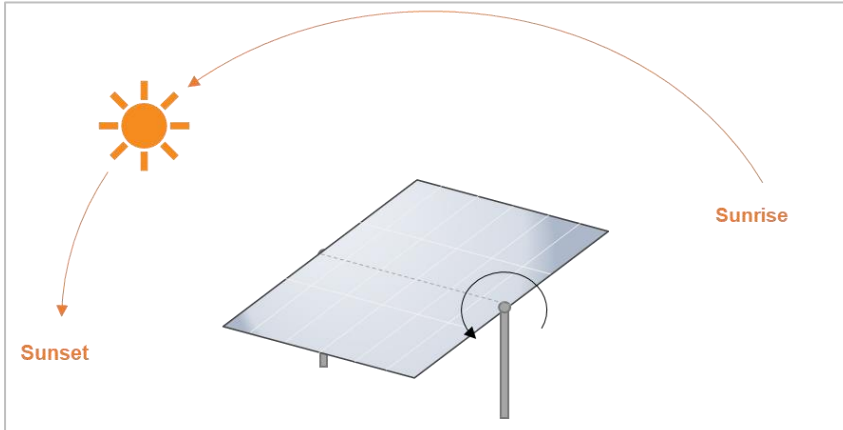


Figure 2-3. Schematic Diagram of Single-Axis Tracking System

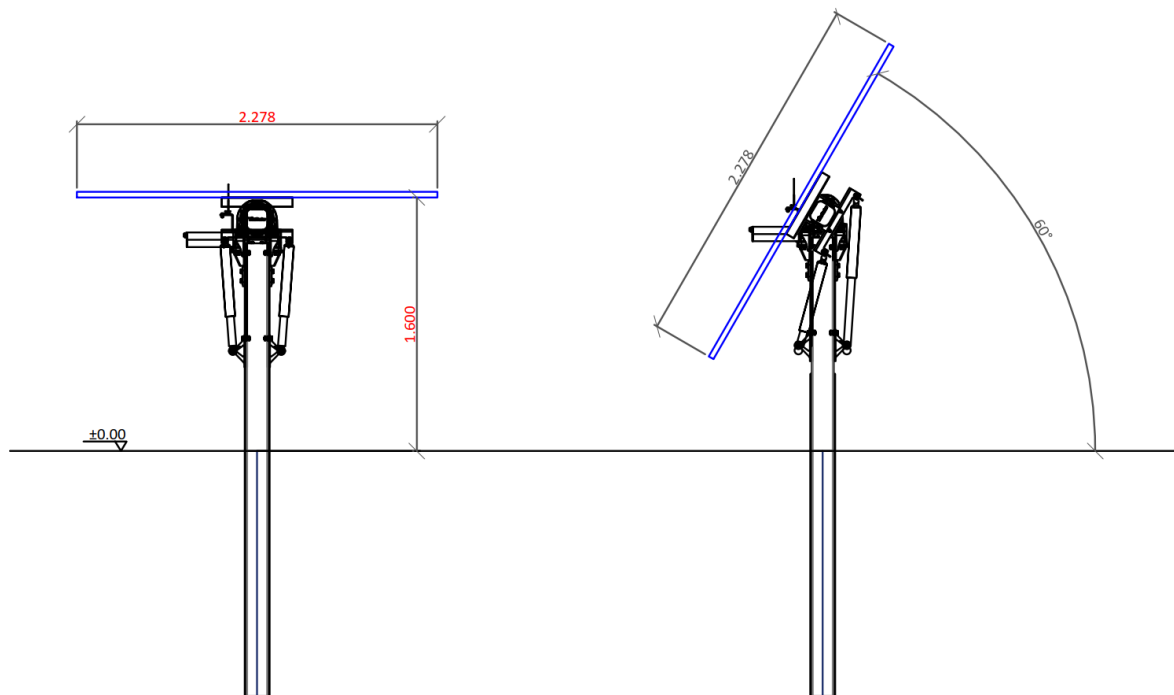


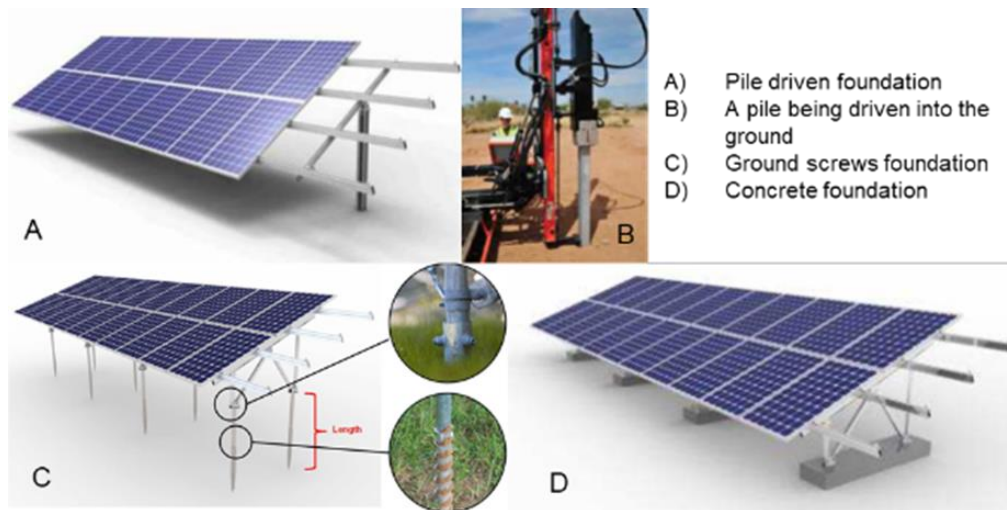
Figure 2-4. Tracker profile view

### 2.4.3 Foundations

Foundation design can be categorised into three main groups: galvanised driven piles, ground screw piles, or concrete foundations. These designs are illustrated in Figure 2-5. Piles are typically installed to the depth of 2.5 m to 3 m below ground, whereas concrete foundation slabs are placed directly onto the ground.

The choice foundation is determined based on the substrate characteristics of a site (whether the ground is too soft, too rocky, contaminated or accessible by the drilling machines) and the expected wind loads in the area. The final choice of mounting structure and foundations may depend on the outcome of further geotechnical surveys and may comprise a combination of the foundation types.

Based on the soil and surficial geological conditions of the site, driven steel piled foundations are deemed appropriate for the Project (TYP SA, 2020c). Driven steel piles are fast to install, cost effective, are suitable for a wide range of soil types and are not affected by ambient temperature fluctuations.



**Figure 2-5. Foundation options**

Source: ILF Consulting Engineers, 2019



**Figure 2-6. Example of fixed tilt solar panels on H-style steel piles**

Source: TYPSA, 2020a

The proposed facilities and auxiliary buildings can be supported by shallow foundations (typically spread footings or slabs) over compacted fill.

#### 2.4.4 Inverters

The primary function of a solar inverter is to convert the direct current (DC) produced by the PV modules into an alternating current (AC), which is suitable for use by the new substation and eventual supply to the national grid. An inverter may be located in a decentralised fashion to service small arrays of PV modules (string inverter) or in a centralised fashion to service large arrays of PV modules (central inverter); nevertheless, the functionality of the inverters is the same.

A central inverter has a footprint of approximately 1–2 m by 2–3 m and is typically up to 3 m tall, and has a noise emission rating in the order of 68 decibels (dB(A)) (SMA Solar Technology AG).

String inverters are smaller, approximately 1 m by 0.6 m and up to 1 m tall (Sungrow, 2019), and generally quieter than central inverters. The Project will likely use string inverters, such as Sungrow

String inverter SG250HX-IN-20. It is estimated that approximately 1,000 string inverters will be required for the Project but this will be confirmed by the EPC contractor.

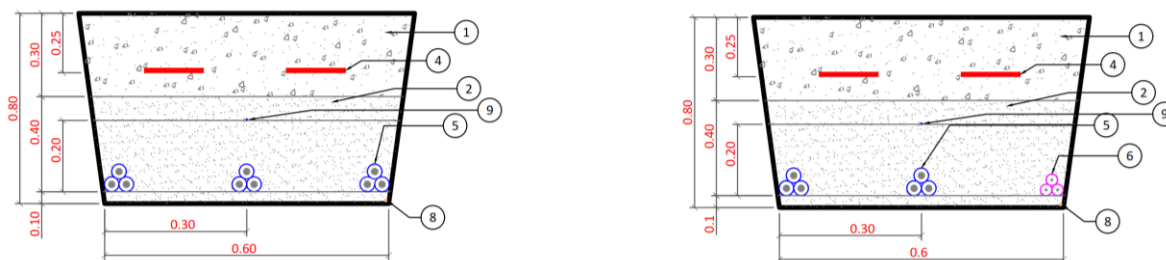


**Figure 2-7. Central inverter (left) and string inverter (right)**

Source: SMA Solar Technology AG; Sungrow, 2019

### 2.4.5 Cabling

Direct current cables, connecting several strings to a combiner box, will run along the back of the module substructure avoiding loops and will be stabilised by special clamps or ultraviolet-resistant cable conduits. DC main cables, connecting each monitor box with the inverter, will be placed underground within a pipe or a DC cable trench, buried 700 mm below ground and in a 600 mm width trench.



**Figure 2-8. Cable trenches**

### 2.4.6 On-site Substation

The on-site substation will transform the generation voltage level (35 kV) to the utility voltage (220 kV) through two 90/125 MVA power transformers and the associated electrical devices. The substation will be air insulated, due to the normal climatic conditions and ambient pollution levels, with electrical devices mounted over metallic supports and interconnected with aluminium conductors.

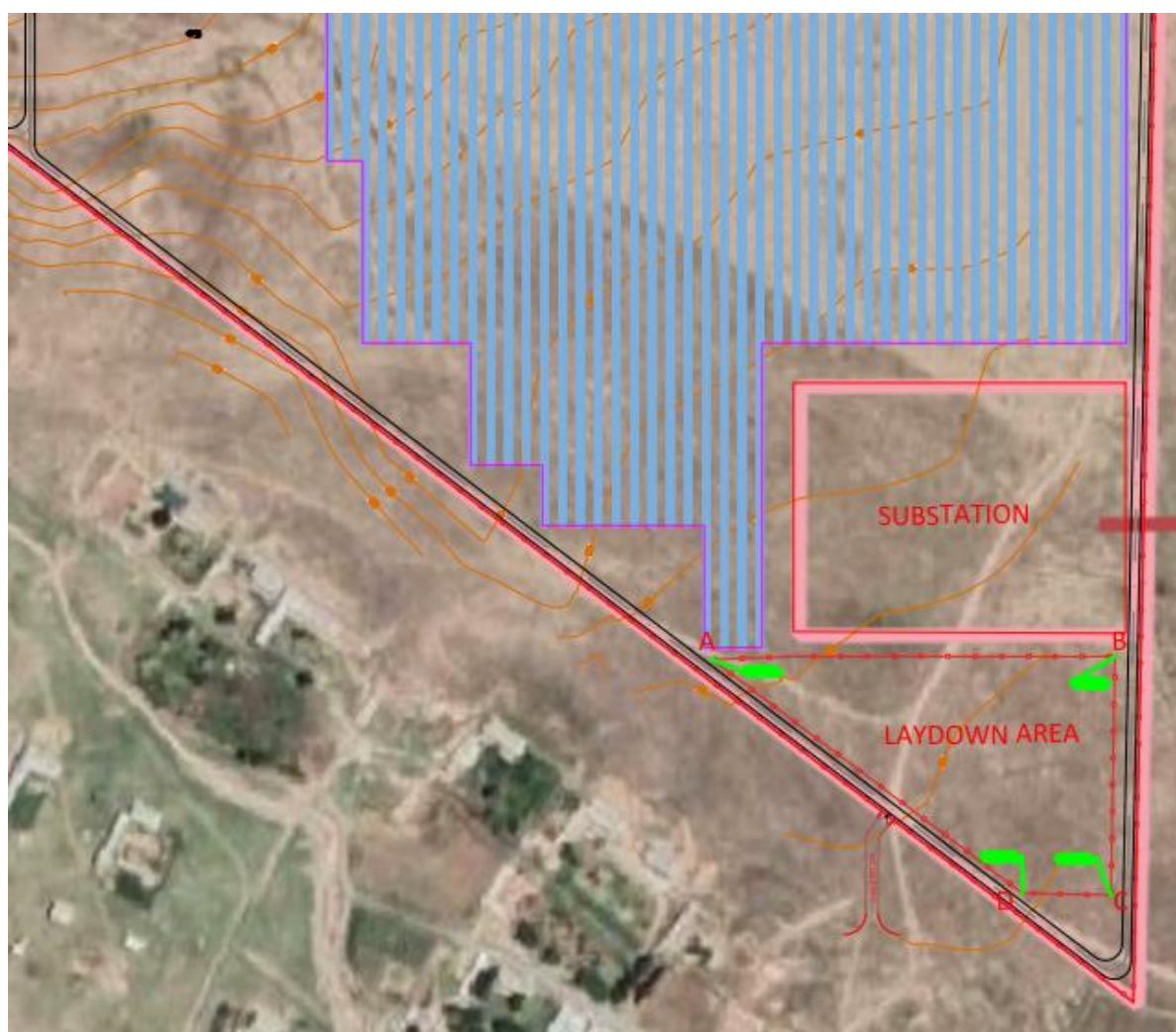
The substation shall have a control building to allocate the following systems:

- MV switchgears
- Protection and control panels and HMI
- AC/DC auxiliary power supply panels
- DC battery banks (in a separate room) and chargers
- MV/LV transformer for auxiliary services
- Telecom panels
- Other service facilities (office, storage, toilets, etc.)

In addition, the substation will include:

- A diesel generator installed close to the control building for emergency power supply.

- Chain link perimeter fencing on all sides, swing gate with two leaves and standard industrial lock at the substation access road
- Crushed yard-stone a minimum of 6" thick shall be used throughout the substation area for electrical insulation. Where clay or other poorly draining soils are present, a 12" yard-stone thickness shall be used between the substation road and ditch. This additional thickness is provided to avoid ponding under the road. Yard-stone shall extend 5 m outside the perimeter fence on all sides.
- The substation shall have lightning protection by installing lightning rods with Franklin points mounted on masts.
- The transformer shall be mounted on a concrete mat with secondary oil containment which is critical for capturing oil spills and protecting the environment. Different approaches to the design concepts of secondary containment systems include individual pits around the transformer foundation sized to hold a volume equal to 110% of the transformer oil volume (to accommodate some precipitation), or a lined area around the transformer, with piped drainage to an underground storage tank/oil-water separator.



**Figure 2-9. Location of on-site substation**

#### **2.4.7 Supervisory Control and Data Acquisition (SCADA) System**

The plant will be equipped with a SCADA system (or monitoring system) that acquires data from the PV power plant and stores it in a database. The system typically includes data logger acquiring parameters from several components of the plant such as inverters, meters and meteorological sensors measuring temperature (ambient and on the back side of the PV modules), irradiation and wind speed. A SCADA system is a key tool for the Operation and Maintenance of the plant. Its purpose is to maximize production of energy, improve the plant's availability, and consequently allows for early detection of equipment malfunction.



### 2.4.8 Drainage

Stormwater management and design will be needed to control run-off from the project catchment during operations to avoid erosion and sediment transport. Stormwater design will include water crossings with culverts where necessary. Internal plant stormwater management would consist of a series of standard trapezoidal ditches associated with the PV Plant sectors appropriately sized to carry storm run-off.

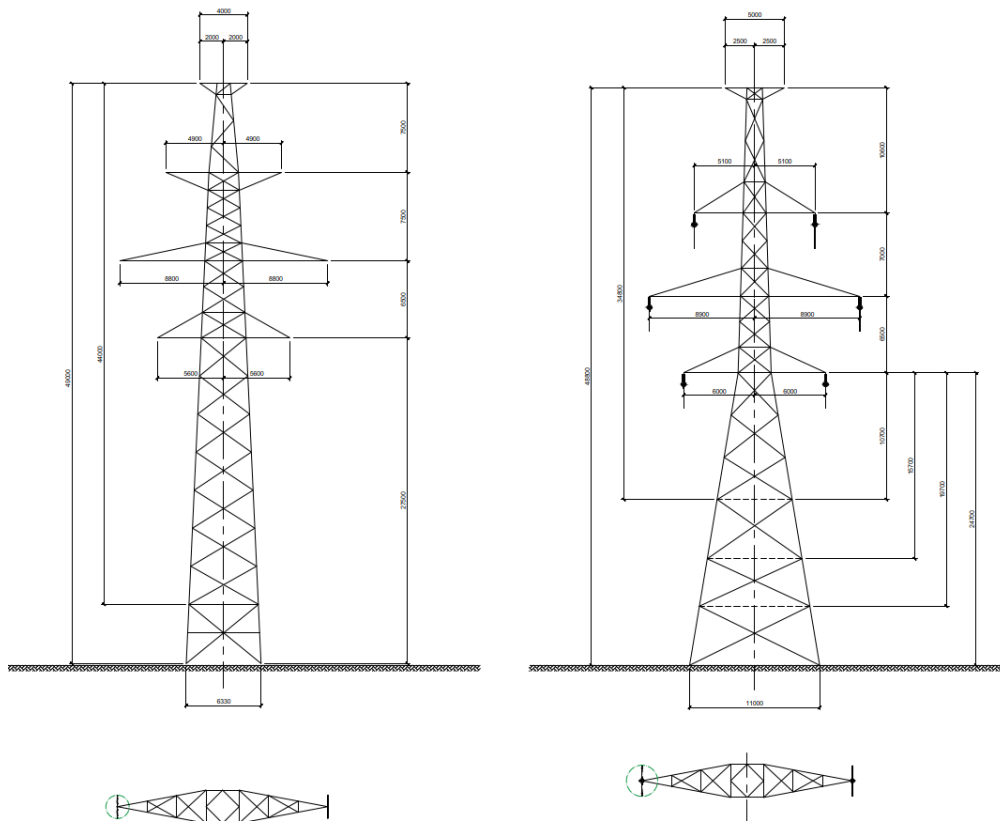
### 2.4.9 Interconnection Line

Jizzakh solar PV plant is designed for a total 220 MWac power. Evacuation of the energy produced shall be made to the existing Saribazar substation located approximately 15 km south of the generation substation.

Interconnection infrastructures shall be the following (TYPASA, 2020b):

- Generation substation located in the boundaries of the PV plant, including two power transformers 90/125 MVA, from the generation voltage level (35 kV) to the transmission voltage (220 kV) of the electrical network
- Approximately 14.77 km 220 kV interconnection line to connect the generation substation and the transmission utility switching substation
- Extension in one bay of the existing Saribazar switching substation in the 220 kV yard

The conductor to be used in interconnection line shall be aluminium conductor steel reinforced AC-300 GOST 859-59. Overhead line (OHTL) shall be installed over 60 lattice towers, double circuit, one cable per phase, and with two optical ground wires (OPGW) as ground wire and for telecommunications.



**Figure 2-10. Steel lattice towers for the overhead line**

Source: TYPASA, 2020b

Connection between tower 60 and Saribazar substation shall be confirmed by the EPC Contractor following detailed design.



**Figure 2-11. Saribazar substation**

For the overhead interconnection line, single-circuit lattice towers have been selected. Types of foundations for the towers shall be as follows:

- Isolated footing
- Pile foundations

Final selection of foundation type shall depend on the tower type to be installed, their mechanical stresses and characteristics and the geotechnical study of the terrain.

The following safety and environmental aspects have been considered in the design of the transmission line:

- Avoid tracing the transmission line through protected areas, other environmentally sensitive areas or through mature forest stands
- Avoid cultural and heritage sites
- Place transmission line towers at high points in the terrain so that conductors can be chained over valleys, thus eliminating the need to remove trees
- Locate the transmission line along the base of mountain slopes, rather than in the centre of valleys where heavy birds might contact conductors
- Locate the transmission line to avoid passing through settlements
- Minimize the need to build new access roads whenever possible
- Use existing roads and access roads whenever possible
- Ensure that minimum distances between cables and the ground, highways, roads, railway lines, buildings, communication systems, etc. are complied

Bird flight diverters will be installed on both earthing cables, on the full length of the high voltage line. The distance between elements will be 10 m. The final choice of diverter will be based on both effectiveness together with a long-term guarantee against failure.

Masdar will co-operate with National Grid of Uzbekistan on any aspects to ensure operations phase complies with Lenders requirements, particularly regarding community safety.

#### 2.4.10 Office Building

Monitoring of the solar power facility operation will be conducted from the office building.

#### 2.4.11 Fencing and Security

To prevent unauthorised access, the perimeter of the PV power plant will be fenced with an approximate 2.5 m high welded wire fabric fence with 0.5 m coil of razor wire mounted above. Pole mounted internal facing closed circuit television (CCTV) cameras will be installed around the perimeter of the site. Lighting of the fence shall be sufficient for the operation of the security CCTV system. A typical fence and CCTV system is normally relatively subtle against the landscape of the solar park and a typical set up is shown in Figure 2-12.



Figure 2-12. Typical Fence and CCTV System at a UK PV Facility

Source: AECOM, 2019

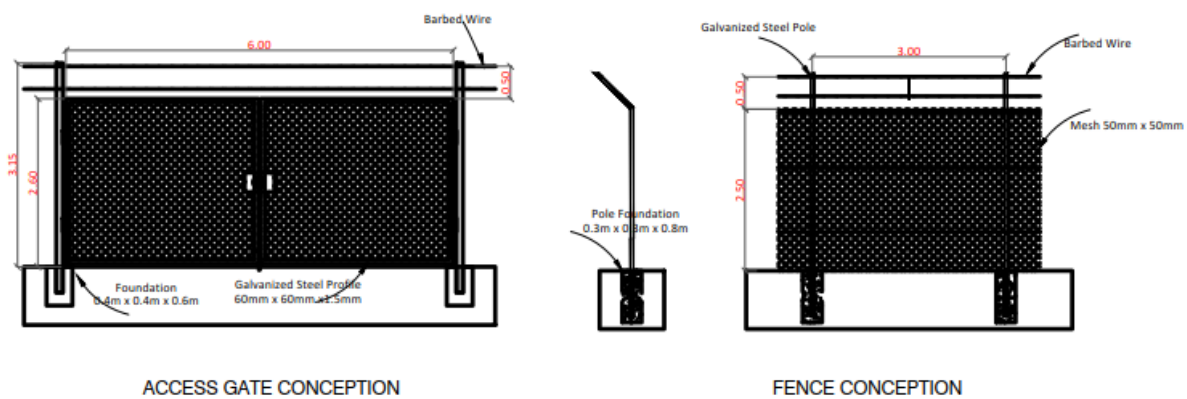


Figure 2-13. Fence and Access Gate

## 2.5 Construction

### 2.5.1 Construction Programme

The construction is planned to start in 2023 and is expected to last approximately 18 months, with first power targeted in 2024. The key stages of construction, from mobilisation of workforce to commercial operation date.

### 2.5.2 Construction Activities

Construction activities will comprise:

1. Site preparation:
  - Temporary fencing of the Site
  - Vegetation clearance
  - Earthworks, including ground levelling (cut and fill), installation of drainage ditches, trenching for cables, construction of internal site tracks. Excavated material will be re-used within the Site for backfilling as much as possible (subject to geotechnical suitability) in order to reduce the need for aggregate to be brought to Site from elsewhere
2. Project infrastructure
  - Construction of temporary storage areas, administration building, security
  - Construction of transmission line
  - Construction of accommodation camps
3. PV power plant installation:
  - Import of components to Site
  - Installation of foundations and mounting structures
  - Installation of solar panels
  - Installation of other equipment (inverters, substation)
  - Installation of lattice steel towers for the connection to the national grid substation
  - Installation of export cables
  - Connection to national grid substation
4. Commissioning of the PV plant:
  - Mechanical and visual inspection
  - Electrical and equipment testing
  - Commencement of electricity supply into the grid
5. Site clean-up and reinstatement.

#### 2.5.2.1 Earthworks

The excavations needed for the development of the plant will be generally carried out in loess and sandy loam deposits. Based on the exploration and the geologic setting of Jizzakh area, conventional grading and backhoe equipment will be able to excavate these deposits.

Where necessary, e.g. under roads and facilities, the ground will be compacted to prevent soil collapse.

The proposed facilities and auxiliary buildings can be supported by shallow foundations (typically spread footings or slabs) over compacted fill. Ground treatment techniques may be needed for improving soil bearing capacity for these foundations. Considering that the average thickness to be treated is around 2 m, rolling dynamic compaction (RDC) is proposed as a cost-effective solution. RDC consists of a non-circular module of 3, 4 or 5 sides, that rotates about its corners as it is towed, causing it to fall to the ground and compact it dynamically. The weight of the module is between 8 and 12 ton (TYPSA, 2020a).





**Figure 2-14. Rolling dynamic compaction (RDC)**

Source: TYP SA, 2020a

Fill operations will be required to create platforms for facilities and site roads. The Project will balance the cut and fill operations to maximise the use of local materials (as long as they fit the necessary geotechnical parameters).

The following areas will be cleared during the initial earthworks.

**Table 5. Earthworks**

Parameter	Area
Length of fence (m)	13,000
Area of internal roads (m <sup>2</sup> )	70,000
Area of external access roads (m <sup>2</sup> )	5,000
Area of substation (m <sup>2</sup> )	24,388
Area of inverter bases and any other infrastructure or hardstandings (m <sup>2</sup> )	566
Area of laydown area (m <sup>2</sup> )	18,000
Area shaded by PV panels (m <sup>2</sup> )	1,180,660
Area of land left free of panels (m <sup>2</sup> )	4,439,340
Land Boundary Area (m <sup>2</sup> )	5,620,000

Source: Masdar

Based on the initial site design, a total of 13.1 ha land would be cleared or 2.33% of the overall site area.

### 2.5.3 Workforce

Masdar estimate that the workforce during the peak construction period is 535 workers. During the early stages of construction, the worker numbers will be low (under 100) but will rise quickly from around month 5 when the civils work begins. After the peak level has been reached, the local workforce will gradually be reduced leading up to the start of operations. This will be confirmed by the EPC contractor.

The workforce will comprise a mix of highly qualified specialists, technicians and low-skilled personnel. Low-skilled construction workers will receive job-appropriate training before starting work on the Project. This includes basic training on health, safety and environment (HSE), labour management and, where required for specific job profiles, vocational training.

Ideally, the workforce will be sourced locally, especially for the low-skilled staff. Qualified specialists will be sourced both nationally and internationally, depending on the skills availability. The EPC Contractor suggest that up to 70% of the required workforce can be sourced locally, subject to available skill levels.

#### **2.5.4 Workers Accommodation**

It is considered by the EPC Contractor that there is sufficient accommodation available in the local area to accommodate the workforce. Nevertheless, given the large size of the peak workforce a dedicated workers camp may be required. The availability of accommodation will be confirmed by the EPC Contractor and if necessary, a dedicated construction camp would be provided in accordance with the IFC/EBRD Guidance on Workers Accommodation. Any additional land that may be required would be temporary and acquired on a willing buyer / willing seller basis to avoid triggering further requirements under IFC PS5.

If required, accommodation facilities (including potential workers accommodation camps) to comply with the principles of the IFC/EBRD Guidance on Workers Accommodation, national law and will adhere to the following key requirements:

##### **General living facilities**

Ensuring good standards in living facilities is important in order to avoid safety hazards and to protect workers from diseases and/or illness resulting from humidity, bad/stagnant water (or lack of water), cold, spread of fungus, proliferation of insects or rodents, as well as to maintain a good level of morale. The location of the facilities is important to prevent exposure to wind, fire, flood and other natural hazards. It is also important that workers' accommodation is unaffected by the environmental or operational impacts of the worksite (for example noise, emissions or dust) but is adjacent to the work site to avoid workers spending undue amounts of time travelling from their accommodation to the worksite.

##### **Water**

Special attention to water quality and quantity is absolutely essential. To prevent dehydration, water poisoning and diseases resulting from lack of hygiene, workers will have easy access to clean water from the municipal potable water pipeline. An adequate supply of potable water will be available in the buildings where bedrooms or dormitories are provided.

##### **Wastewater and solid waste**

Wastewater treatment and effluent discharge as well as solid waste treatment and disposal will comply with local and World Bank effluent discharge standards and be adequately designed to prevent contamination of any water body, to ensure hygiene and to avoid the spread of infections and diseases, the proliferation of mosquitoes, flies, rodents, and other pest vectors. Wastewater will be collected in a septic tank and collected and disposed of at a licensed facility.

##### **Room/dormitory facilities**

The standards of the rooms or dormitory facilities are important to allow workers to rest properly and to maintain good standards of hygiene. Overcrowding should be avoided particularly. This also has an impact on workers' productivity and reduces work related accidents. It is generally acknowledged that rooms/dormitories should be kept clean and in a good condition. Exposure to noise and odour should be minimised. In addition, room/dormitory design and equipment should strive to offer workers a maximum of privacy. A separate bed for each worker will be provided. There will be a minimum space between beds of 1 metre. Dormitories and rooms will be single-sex.

##### **Sanitary and toilet facilities**

Sanitary and toilet facilities will include all of the following: toilets, urinals, washbasins and showers. Sanitary and toilet facilities will be kept in a clean and fully working condition. Facilities are likely to be of portacabin type and will be easily cleanable and ensure privacy. Separate sanitary and toilet facilities will be provided for male and female residents. Additional specific additional sanitary facilities will be provided for women. Up to 70 toilets will be provided to coincide with the peak workforce of 1,000. At other times a reduced number of toilets will be provided at the ratio of 1 toilet per 15 persons.

##### **Showers/bathrooms and other sanitary facilities**

Hand wash basins and showers will be provided in each of the bedrooms. These facilities will be kept in good working condition and cleaned frequently. Adequate space will be provided for hanging, drying and airing clothes. Hand washing, shower and other sanitary facilities should be located within a reasonable distance from other facilities and from sleeping facilities in particular. Approximately 70

showers will be provided to coincide with the peak workforce of 900. At other times a reduced number of showers will be provided at the ratio of 1 shower per 15 persons.

### **Canteen, cooking and laundry facilities**

Good standards of hygiene in canteen/dining halls and cooking facilities are crucial. A centralised kitchen will prepare all food for distribution to individual dining areas. Laundry facilities will also be provided.

### **Medical facilities**

Access to adequate medical facilities is important to maintain workers' health and to provide adequate responses in case of health emergency situations. It is assessed that the local medical facilities could become overwhelmed should there be a significant number of workers requiring treatment. It is proposed that there will be one doctor on site during normal working hours, one doctor on call, and two nurses. In addition, it is proposed to have 1 first aider per 25 workers. This will require a total of 40 first aiders at the peak workforce.

### **2.5.5 Supply Chain**

Masdar conducts in-depth due diligence on every entity that it works with and ensures that suppliers and contractors adhere to Mubadala's Code of Ethics and Business Code of Conduct. In addition to including the necessary contractual protections/covenants in the EPC contract and supply agreements, Masdar also has a supply chain management system that includes the relevant policies (e.g., a sourcing policy, a supplier code of conduct), responsibilities, practices, monitoring procedures and resources for developing, implementing, achieving, reviewing and maintaining compliance with the Labor Standards on Forced Labor and identifying, assessing and managing on an ongoing basis the Project's risks in the supply chain of Solar Power Products relating to Forced Labor Matters and arising in relation to Masdar and the Supply Chain Stakeholders (the EPC Contractors, the Solar Supplier(s) and the Approved Solar PV Module Manufacturer(s)).

### **2.5.6 Water and Energy Requirement**

During construction, water will be needed in the construction camps for:

- domestic purposes by workers (drinking, washing hands, flushing toilets)
- construction activities (wash down of equipment and vehicles)
- dust suppression on community roads and on the site roads
- concrete mixing

The amount of water required during construction is estimated at up to 9,608 m<sup>3</sup>. The source of water is currently subject to consultation between the EPC Contractor/ Masdar and the Water Authority. It is assumed that water would be delivered by tanker but this will be confirmed by the EPC contractor. In addition, a further 16,729 m<sup>3</sup> of water are required for the workforce. All drinking water would be bottled water.

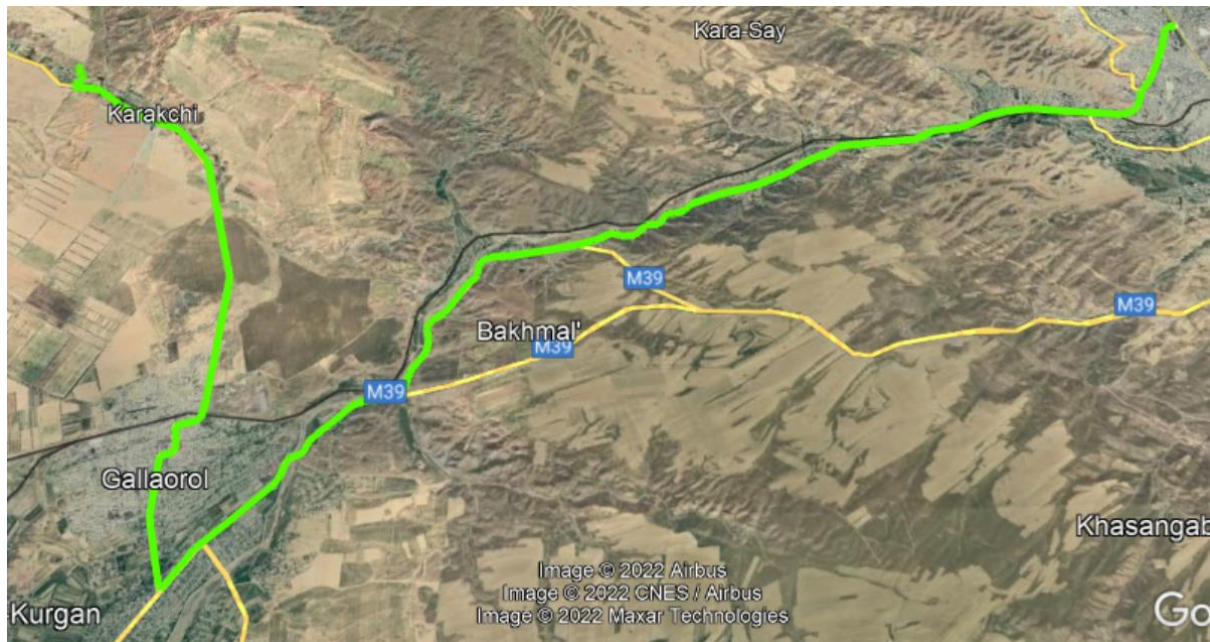
The Project site would be connected to the national grid to provide electricity for construction through a contract with the distribution company.

### **2.5.7 Site Access**

For heavy equipment and vehicles to access the site, it is possible that some existing roads and bridges will need to be widened/reinforced to accommodate wider loads. Viable alternative access routes shall be considered during detailed design with the view to select the route that reduces the potential impacts to as low as reasonably practicable. Impacts associated with the access road (including but not limited to traffic safety, land ownership, noise, dust emissions) shall be assessed and mitigated before construction commences. Strict speed limit to be applied (10kmph) in locations where it is necessary to reduce noise impacts and safety risks. It is not expected that any further land take is required but if any displacement related impacts occur as a result of the access road, the Livelihood Restoration Plan shall be updated.

Site access is proposed from the route below:





**Figure 2-15. Proposed site access**

Source: Masdar

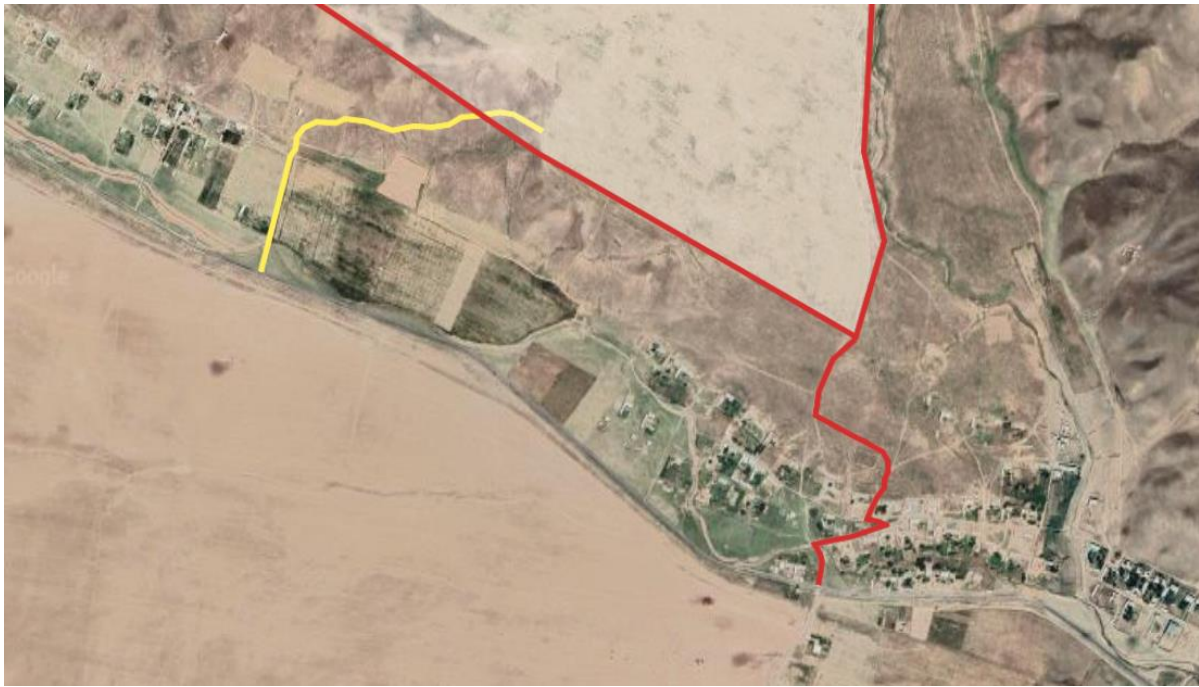


**Figure 2-16. Original site access from public road (red)**

Source: Masdar

Following review of possible access points to reduce the impact on nearby residential receptors, three access points has been considered. The second alternative was discounted due to proximity of residential properties, but a third route has been identified. This route has been approved in principle by the EPC contractor however further assessment would be required to determine any additional impact in relation to land use or other environmental sensitivity.





**Figure 2-17. New site access from public road (yellow)**

The proposed access routes are described further in Section 6.9.

### 2.5.8 Construction Vehicles and Equipment

Construction of the solar facility will require various types of machinery and equipment. Exact plant types and numbers will be determined during the detailed design stage. However, for the purposes of this impact assessment an indicative equipment list is as follows:

- Backhoe
- Pick-up
- Excavator
- Ramming machine
- Cable pulling machine
- Telehandler
- Dumper

Based on previous project experience, the construction phase is estimated to generate the traffic volumes detailed in Table 6.

This estimate is limited to the expected amount of HGV movements and construction staff transportation requirements. The HGV movements estimated peak is expected to last one month and to be 1,460 vehicles during this month. It is also likely that a larger bus would be provided for construction workers thereby reducing the number of vehicle movements. It is also considered that a large proportion of the staff will be accommodated at the workers camp, in the proximity of the project site. Traffic volumes will be confirmed by the EPC contractor.

**Table 6: Estimated Volume of Vehicle Movements during Construction**

Vehicle Type	Activity	Total Movements	Vehicle
HGV	Delivery of materials, plant, containers, concrete, aggregate material and welfare facilities	13,266	
LGV (people carrier up to 6 people)	Transportation for construction workers to site.	3,080	

There is likely to be a requirement to transport abnormal loads to the site, for example some of the substation equipment may require an abnormal sized or weight vehicle. The delivery of these abnormal loads will be infrequent and timed so as to avoid network peaks and therefore have not been considered as part of this assessment. The transport of abnormal loads will be co-ordinated with the relevant local police authorities in order to mitigate their impact on other road users.

### 2.5.9 Waste Management

The majority of waste will be generated during Project construction, originating from packaging materials (wooden pellets and cartons), which can be recycling or reused. There will also be some minor waste arisings from the kitchens and offices associated with the workforce on site. Solid waste materials generated by the Project during construction will be segregated and stored on-site prior to transport to licensed landfills and recycling facilities if they become available.

Wastewater and sewage will be temporarily stored onsite and then hauled to an appropriately licensed wastewater treatment facility. The Project will not construct or operate its own wastewater treatment, landfill, or recycling facilities. Tankers would be deployed to carry the waste generated to the nearest treatment facility.

Only licensed waste management companies will be used by the Project and will be subject to appropriate due diligence checks prior to contracting. The EPC contractor will confirm the waste collection and disposal arrangements.

Estimated waste arisings are based on previous experience in Uzbekistan and are summarised in Table 7. These volumes will be confirmed by the EPC contractor.

**Table 7. Estimated Project Waste Arisings during Construction**

Waste stream	Estimated quantity
<b>Hazardous waste</b>	
Solvent waste	1l
Used and spent oils	100l
Hydraulic fluid	20l
Resins and paints	5l
Waterproofing compounds	10 l
Adhesives	2 l
Machinery lubricants	40 l
Waste chemicals - used in the concrete forming process	20 l
Clean-up materials (such as spill kit wastes and rags) contaminated with the items listed above	1 m <sup>3</sup>
Drums, containers and tins with remains of hazardous substance	4 m <sup>3</sup>
<b>Non-hazardous solid waste</b>	
Soil	TBC
Concrete	4 m <sup>3</sup>
Asphalt paving	2 m <sup>3</sup>
Scrap steel	10 t
Glass	TBC
Plastics	10 m <sup>3</sup>
Packaging materials	20 m <sup>3</sup>
Wood	10 m <sup>3</sup>

## 2.6 Operation

Masdar will be responsible for the design, build, finance, operate, maintain and transfer (DBFOMT) of the solar PV power plant. During the operational phase, JSC National Electric Grid of Uzbekistan will purchase the generated electricity as per the Power Purchase Agreement (PPA).

After commissioning, the transmission line will be transferred to JSC National Electric Grid of Uzbekistan for operations and maintenance. JSC National Electric Grid of Uzbekistan will be responsible for the maintenance of the safety protection zone under the transmission line including vegetation management and land use close to the line.

### 2.6.1 Routine Maintenance Activities

Operation and maintenance of the facility will include:

- Replacement of faulty PV modules
- Repair of inverters and other ancillary equipment
- Periodic cleaning of PV modules depending on soiling and sand/silt accumulation
- Delivery of water and emptying the septic tank
- General upkeep of the territory within the Solar PV Site

A preventive maintenance program will be established for maintenance of the inverters; mounting structures; surge arresters, cables and PV junction boxes; meteorological station; security, fencing and gates; ditches and drainage culverts; and all sub-station components, including services and septic tank.

### 2.6.2 Workforce

The operation of a solar PV facility requires a small team of people. The number of operational workers will depend on the final operation and maintenance concept but is expected to be up to 25 people required for continuous presence onsite. Additional specialists will be required to attend the facility to conduct repairs and maintenance of the equipment.

### 2.6.3 Water Requirements

Cleaning strategy will be dry cleaning and defined in the operations and maintenance contract. It is proposed that water would be tankered to site but this will be confirmed by the EPC Contractor.

Bottled drinking water would be provided to the workforce during operation.

### 2.6.4 Waste Management

Solar PV electricity generation does produce waste in itself. Minimal waste will be generated during Project operation, associated with the main control room / amenity building activities, maintenance and repair work. There will be a toilet facility and kitchen onsite during operation; the sewage and grey waste water will be routed to a collection tank which will be emptied on a regular basis. Solid waste materials will be segregated and stored on-site prior to transport to landfills and recycling facilities.

Estimated waste arisings for the operational phase are summarised in Table 8.

**Table 8. Estimated Project Waste Arisings during Operation**

Waste stream	Estimated quantity	Management
<b>Hazardous waste</b> e.g. faulty PV panels, batteries, lights, paints, solvents and chemicals, spill response equipment	None negligible	/ Collected on site in specialised containers. Removed by an appropriately licenced third-party waste management company.

<b>Non-hazardous solid waste</b> e.g. general (domestic) waste, kitchen waste, plastic, cardboard, paper, glass, scrap metal, wood	200–300 kg per year	Segregated collection on site. Removed and transported to licenced third-party waste and recycling management facilities.
<b>Sewage and grey water</b>	0.02 m <sup>3</sup> / day	Collected on site and transported to a treatment facility.

## 2.7 Decommissioning

A typical design life of a solar PV facility is 20–30 years. The Project components will be continuously maintained throughout the lifetime of the Project. The condition of equipment will be reviewed at the end of the design life to determine whether it remains in a viable condition to continue operation after that time. The facilities may be upgraded or renewed based on the cost-benefit analysis.

The Project will be dismantled once it is no longer economical, and the land plot reinstated to its current state (albeit not reprofiled). Decommissioning of the PV power plant is expected to require 6–8 months to complete.

During decommissioning, all above ground infrastructure will be removed. It is anticipated that the redundant solar PV panels will be either recycled or sold for reuse, depending on market conditions at the time.

Below ground infrastructure such as buried cables will be removed to a depth of 0.5 m and backfilled with topsoil.

The site will be re-seeded with plants consistent with surrounding areas. The success of bio-restoration will be monitored for two dry seasons following decommissioning, and remedial actions will be taken at locations where rates of restoration are below the expected levels.

It is the responsibility of the Project company to develop and implement a decommissioning plan. The decommissioning will abide by this plan and other relevant legislation and regulations that are applicable at the time and decommissioning. This will be agreed at least six months in advance of the start of decommissioning.

## 2.8 Alternatives

### 2.8.1 No Project Alternative

The first alternative considered for any new project is a no development option, which means not adding a low carbon (solar) generation capacity into the country's energy mix. Uzbekistan has vast natural gas reserves, and over 85% of electricity here is being produced from natural gas (International Energy Agency, 2020).

Presidential Decree No. PP-4477 of 4 October 2019 approved the Strategy for the Transition of the Republic of Uzbekistan to the Green Economy for the Period 2019–2030 (The President of the Republic of Uzbekistan, 2019). Priority goals of the Strategy include reducing specific GHG emissions per unit of GDP by 10% of the 2010 level and raising the share of the renewable energy sources in total electricity generation to more than 25% by 2030.

With the projected growing electricity demand, increasing the share of low-carbon energy generation, like solar, in the national energy mix is vital for carbon emissions reduction and mitigation of global climate change. Owing to its geographical location and climate Uzbekistan has significant solar potential. In case of a no development option, the opportunity to contribute to the achievement of the Strategy goals will be missed.

### 2.8.2 Site Selection

The Government of the Republic of Uzbekistan identified several potential sites for the utility scale solar PV facilities throughout the country, including Jizzakh region. Following site screening visits by the

engineering company TYPASA and decisions by the Government of the Republic of Uzbekistan, the Solar PV Site subject to this report was carried forward and selected for further studies. Neither AECOM nor Masdar were able to obtain the site selection study that was carried out as part of IFC's Scaling Solar programme.

The Site was presented to potential bidders by the Government of Uzbekistan and as a result there was no opportunity for Masdar (the Developer) to influence site selection.

AECOM has undertaken a further review of the PV site and OHTL route to determine whether the site is considered suitable from a technical, environmental and social perspective. In identifying the suitability of the site for solar energy development, AECOM reviewed the following factors:

- Solar resource
- Environmental designations
- Residential properties
- Site access
- Grid connection

AECOM provided further updates on land use and biodiversity following site visit to determine if there are further issues that could affect the viability of the project. Finally, the review of site suitability considered EBRD PR6 requirements triggered by impacts to Critical Habitats and/or PBFs (EBRD PS6, para 13 and 16).

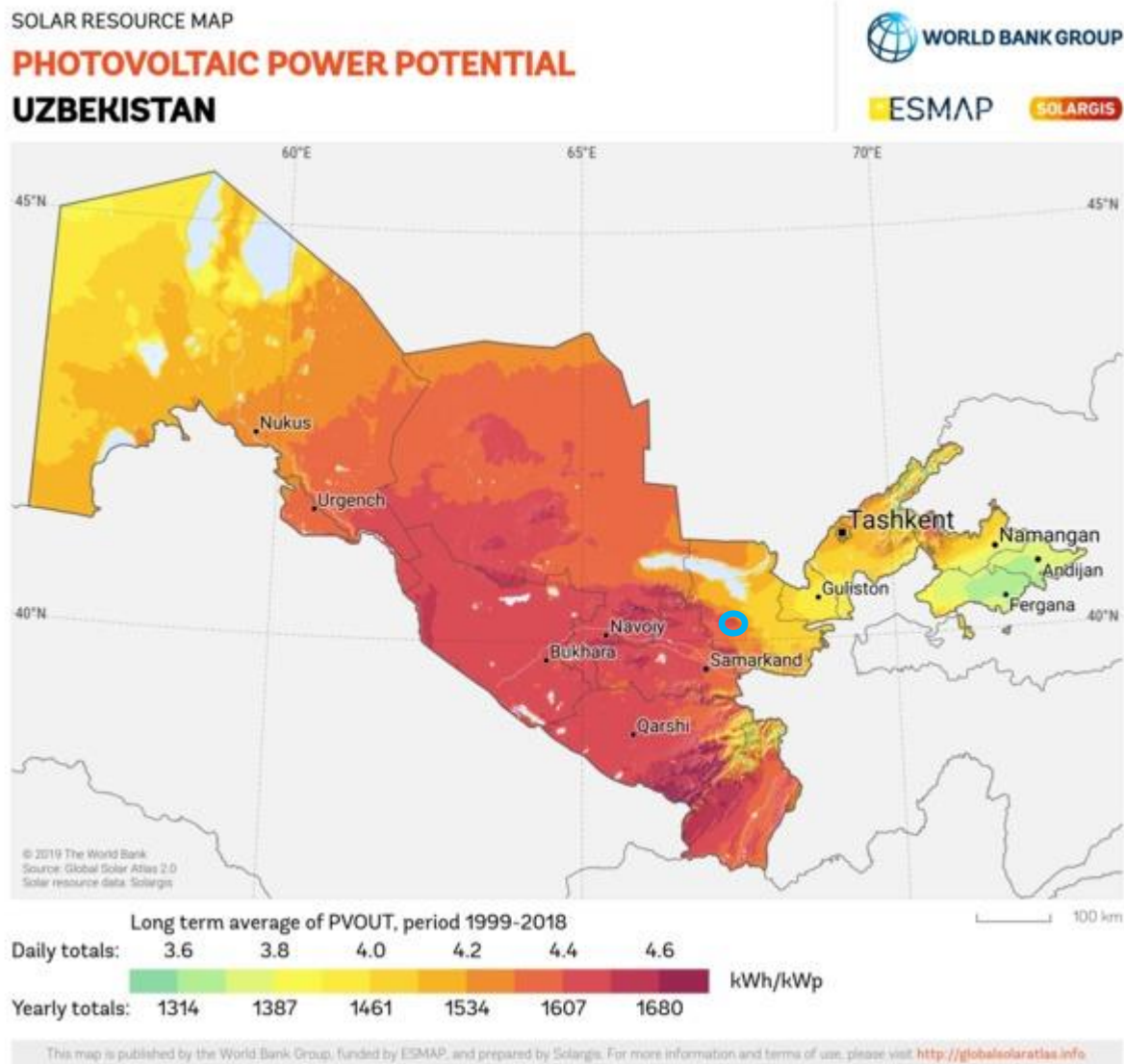


Figure 18. Solar resource map (site shown in blue)

Table 9. Summary of site selection criteria

Criteria	Overview	Likelihood of significant impact <sup>1</sup>
Solar resource	As can be seen on Figure 17 the potential project site is situated in an area of high solar resource. This would confirm that the project site is located in a suitable location in terms of likely energy yield.	No issues identified
Environmental designations	There are two Important Bird Areas (IBAs) within a 30-40 km radius from the Project site: Tuzkan Lake IBA (approx. 36km to the north) and Dzhum-Dzhum IBA; the latter is a situated in the north- western spurs of the Turkestan mountain range, approximately 25km to the south-east at its closest point to the Project site. Consultation with Birdlife International and ornithological experts (IBA Programme since 2008) was undertaken and reported in TYPSA/IFC (2020); this highlighted that none of the species for which the IBA site was designated use the Project site. The project site does	Project is not expected to impact on designated sites.

<sup>1</sup> In this case 'significant' would refer to impacts that cannot be mitigated by standard means or would materially affect the viability of the project.



	not appear to mirror any of the qualifying features of those areas and as a result the project would not expect to impact on those sites.	
Residential properties	There are no properties identified on the site. As a result, no physical resettlement would be required. The closest properties appear to be approximately 200m from the red line boundary. The project activities can be scheduled to take place during less sensitive time (travel to and from schools for example). No night work is permitted.	Nuisance impacts expected to be minimal and mitigation can be applied.
Site access	Access route selection is still being undertaken for the project. Options are screened on an initial 200m buffer to minimise noise and community H&S impacts. Where no suitable buffers exist, AECOM and Masdar identify those with least impacts that are still technically viable. To date, three access tracks have been considered with a preferred route identified that minimises the impact on the surrounding residential properties.	Access route can be optimised to minimise impacts.
Grid connection	<p>It is noted that the key transmission and distribution infrastructure is aging because the network was developed during the Soviet era as part of the regional grid in Central Asia. Some of the transmission and distribution lines, substations, and auxiliary facilities built during the Soviet era have become obsolete and past their economic life. For this reason, the electricity losses are high, estimated at 20 percent of net generation. To address this issue, a number of improvement projects have been implemented across Uzbekistan. There is a need to be close to the existing or planned HV grid to minimise electrical losses in transportation on the Project's connection and then also in the wider network. The project OHTL would meet those objectives and is close to the main demand centres of Gallaorol and Jizzakh.</p> <p>At the bidding stage, Masdar were provided with an RFP from the GoU which included technical specifications for the grid connection. As a result, the grid connection has been designed in accordance with the off-taker's requirements. This has been contractually agreed as an OHTL with specifications as per the GOST standards. To confirm, the design of the OHTL is in compliance with the requirements of the off-taker and the locally enforced GOST standards. Masdar were restricted by the off-taker design requirements which prevented the design of underground cable. A deviation from the GOST standards would not be permissible.</p> <p>It is estimated that the underground option can be 2-5 times more expensive than an overhead line due to the difficult terrains and hard ground strata, thereby resulting in a significant commercial impact that cannot be absorbed making the project economically unviable. The exact costs cannot be determined with ground investigation to determine the underlying strata and required construction techniques. It is important to note that this project has been procured at a very competitive energy tariff level that is unprecedented in Central Asia, with the main aim of providing cheap electricity to the Republic of Uzbekistan and help in further accelerating the energy transition and meeting the increasing energy requirements during this period of rapid growth and development.</p> <p>The OHTL at the southern section drops into the river valley and crosses a railway track, road and river. Following internal discussion with the Masdar technical team, it is concluded that an underground cable under the railway track is the least feasible option as it requires Ministry approval. Excavation or horizontal drilling are not permitted under normal circumstances to ensure the safety of railway track. The river crossing has significant commercial implications but are not deemed to result in a material decrease in biodiversity risks that would justify the additional costs. Finally, the crossing of the Municipality Road requires local Khokimiyat approval, acquiring either Government or Private land, and horizontal drilling which further increases the project costs. These options would significantly increase project costs contributing to the project becoming economically unviable and would require</p>	<p>Most direct grid connection route has been chosen. Land use impacts would be minimised.</p>

	<p>significant time extensions which would not be able to be accommodated within the project construction schedule.</p> <p>The relatively short ~15km connection is deemed to be positive in terms of land use. Land use impacts are discussed in more detail below. The project recognises that an OHTL introduces biodiversity impacts that have been mitigated or offset. Again, these have been discussed below. Given the fixed location of the PV site, the OHTL is assessed to have minimised potential impacts. The route is the shortest feasible route between the solar PV site and the substation. Any alternative overhead route would increase the length of the transmission line and increase the potential collision risk of CH qualifying species.</p> <p>In accordance with EBRD PR 6, Para 13. it is not considered that there are any economically feasible alternatives that would avoid or materially lessen the impact on PBFs and CH qualifying species.</p>	
Land Use	<p>A review of aerial mapping shows that the full site has been used for winter wheat. It is understood that no arable farming now takes place on the site. There are more intensively farmed areas visible surrounding the site area. There appears to be more natural habitat to the north and northeast of the site.</p> <p>The installation of towers would require a significantly lower amount of land take</p>	<p>Land does not appear to support agriculture so limited economic activity reliant on the land. No issues predicted.</p>

**Additional review of site suitability following the ESIA**

Land Use (additional)	<p>Following site visits, AECOM confirm that the land is no longer used for cultivation. There was evidence of past cultivation dating back to Soviet times but the majority of recent cultivation was winter wheat. The quality of the land is poor which was the main reason why cultivation was discontinued. The land was cultivated as a single block. Affected people adjacent to the project site is restricted to those using the land for grazing but the PV site is generally used for access to the better grazing areas to the east. The land to the west and south of the project is intensively farmed and land use is considered typical for the region. It is clear that there is a lot of higher value agricultural lands being actively farmed which the project has avoided.</p> <p>An OHTL would result in a discreet number of tower bases that would create disturbance and some loss of agricultural land that has been covered under the LRP. An estimate of 7,625m<sup>2</sup> of land take would be required for the 61 tower bases but exact land take varies per base depending on slope and terrain. Actual land take varies between 40 and 210m<sup>2</sup> per base. An underground grid connection would result in significantly higher additional impacts on livelihoods due to the greater level of disturbance and limitations on agricultural activity during operation along the whole length of transmission line. It is estimated that approximately 886,200m<sup>2</sup> of land would be required for a 60m working corridor and would have to be compensated for, albeit a significant proportion would be for temporary disturbance.</p> <p>The land allocation has been agreed for the footprint of towers only. The recently issued Presidential Decree (28 Dec 2022) provides for the allocation of land plots for the tower footprint only. It is not therefore possible to increase the land allocation at this stage without a complete renegotiation and would require significant time extensions which would not be able to be accommodated within the project construction schedule. AECOM confirm that this restriction was clearly made by the Ministry during negotiation of land allocation. All social aspects have assessed in accordance with tower footprints. OHTL design approvals are in the final stages with the off-taker so</p>	<p>Confirmed that project land is not productive and alternative land is available for grazing. OHTL route minimises impacts on farmland.</p>
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	cannot be changed without renegotiating a new contract with GoU and the offtaker. Again, this would require significant time extensions which would not be able to be accommodated within the project construction schedule	
Biodiversity	<p>Great bustard is a native non-breeding (winter visitor) to the Jizzakh and Samarkand region of Uzbekistan. During surveys completed between December 2020 and February 2021 a peak count of 845 individual great bustard were recorded from a site approximately 12 to 15km from the Project Aol. Great bustard is identified as a CH qualifying species and, as such, net gains would need to be met.</p> <p>The solar PV site and OHTL route are not considered to be suitable for this species as a staging or wintering habitat and it is therefore considered that the Project Aol is unlikely to be of significant importance for wintering Great Bustards within Uzbekistan.</p> <p>It is considered that the solar PV site does not provide suitable habitat and that other more suitable habitats are available and utilised by great bustard. Therefore, the solar PV site is not assessed to impact this species.</p> <p>However, the OHTL would increase the collision risk for this species as they travel between overwintering areas and would be mitigated on the OHTL to some extent by Firefly brand bird flight diverters. It is recognised that diverters may have limited success in reducing bustard collisions therefore offsets will be provided to further mitigate potential impact on great bustard and demonstrate a net gain.</p> <p>The OHTL travels away from the EAAA for the species and represents the most direct feasible route. As noted above, any alternative OHTL route would increase the length of the transmission line and increase the potential collision risk of CH qualifying species. Therefore, from a biodiversity perspective, having the shortest viable length of OHTL would be the preferred option to minimise collision risk.</p> <p>In accordance with ADB SR1 and EBRD PR 6, Para 16, the project's mitigation strategy will be described in a Biodiversity Action Plan.</p>	<p>No great bustards were recorded on site and it is considered that there is a low likelihood that the OHTL would cause significant impacts on this population, as the OHTL is outside the habitat directly used by bustards. Specific measures will be put in place to reduce potential collision impacts for Great Bustards, and to compensate for any that might occur, including offsets.</p>

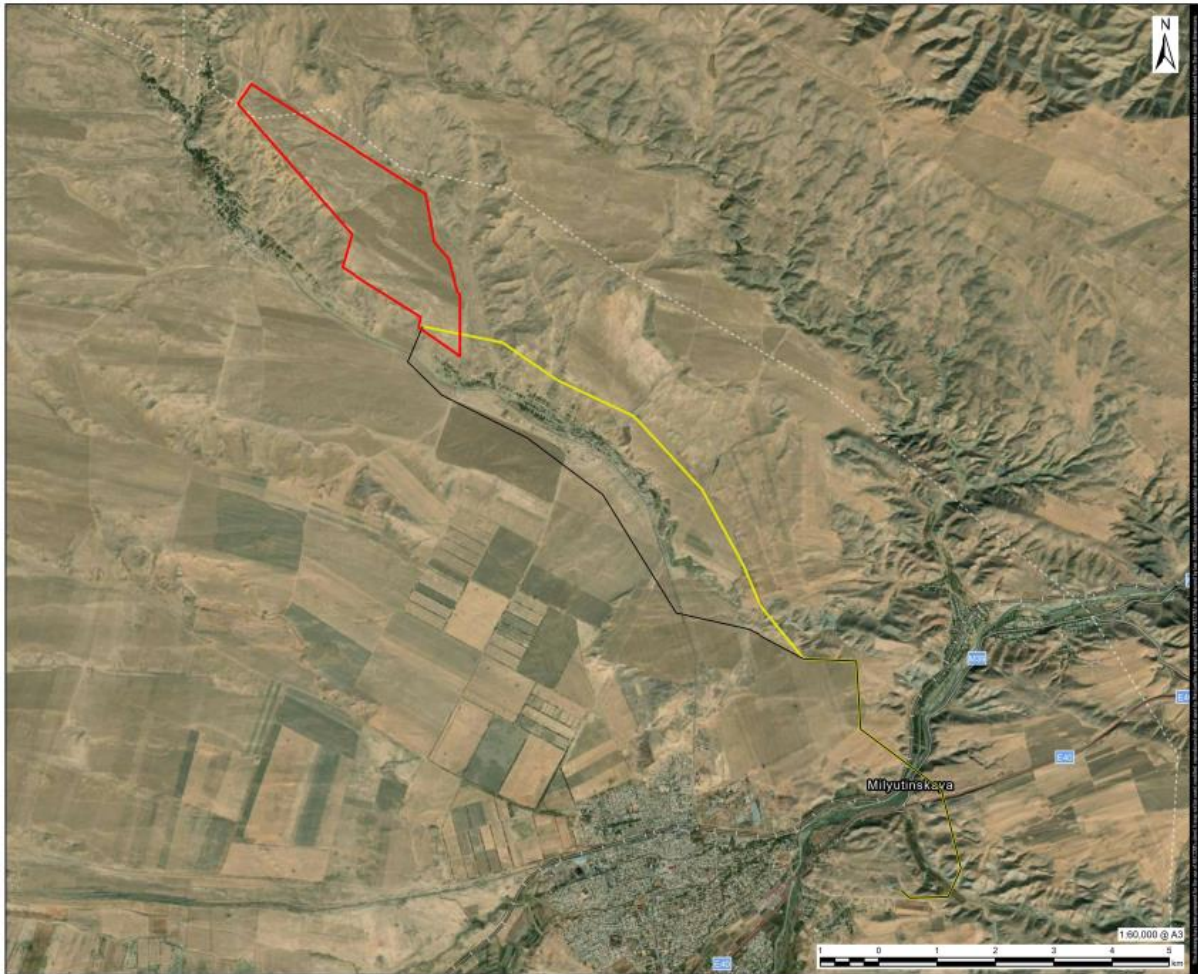
### 2.8.3 Transmission Route Selection

The land between the PV site and the substation is almost entirely actively farmed land with a road, rail and river crossing to the south. No sensitive areas were identified during site surveys therefore a route was chosen to follow field boundaries where possible. The route chosen represents to shortest viable route, minimising cost as well as the impacts of farming and livelihoods. The route also runs away from the identified great bustard overwintering areas.

Two alternative routes of the overhead transmission line from the Solar PV Site to the Saribazar Substation have been considered. The initial route, identified during feasibility studies, is passing west of Karobchi and Chauyonli villages. During site visit in September 2021, it was identified that this route passes through economically viable agricultural lands and installation of the transmission line would hinder the development and use of this land.

An alternative route going east of Karobchi and Chauyonli villages has been proposed by the local farmers. Land in this area is less valuable due to the absence of water. Therefore, construction of the transmission line here would result in lower socio-economic impact.

The figure below shows the original OHTL in black with the preferred alternative in yellow.

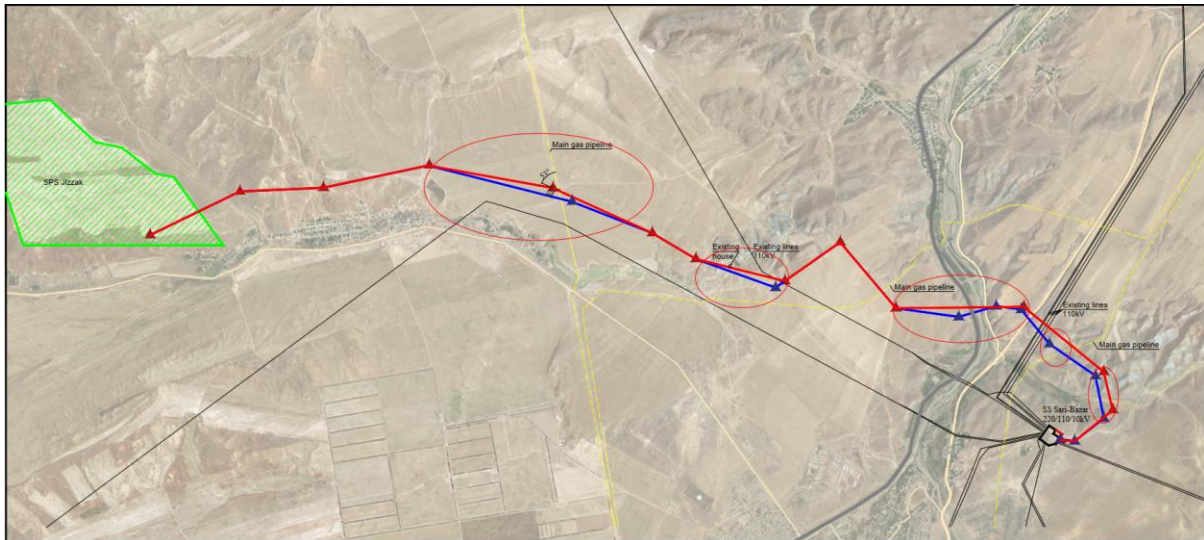


**Figure 2-19. Initial OHTL options**

There are not assessed to be any other options that would offer a better alternative in terms of environmental and social impacts therefore the route was further optimised based on the following:

- As per local regulations, main gas pipelines shall be crossed at 60-120 degree angle
- Elevated points have been chosen to cross the road and railway
- Existing OHTL shall be crossed at approximately 90 degrees as per local standards/norms

The figure below shows the preferred OHTL in red with the adjustments in blue.



**Figure 2-20. OHTL minor alterations**

### 2.8.4 Access Route Selection

Access route selection is still being undertaken for the project. Options are screened on an initial 200m buffer to minimise noise and community H&S impacts. Where no suitable buffers exist, AECOM and Masdar identify those with least impacts that are still technically viable. To date, three access tracks have been considered with a preferred route described in section 6.9.2.3.

## 3. Legal and Policy Framework

### 3.1 Uzbekistan's Green Economy Strategy

Uzbekistan's strategy for transition to a green economy in the period of 2019–2030 was approved by the Resolution of the President of the Republic of Uzbekistan dated 04.10.2019 No. PP-4477 (the "Resolution"). This Resolution was adopted to ensure fulfilment of obligations under the Paris Agreement on climate change signed by Uzbekistan on April 19, 2017, as well as the implementation of the Action Strategy for five priority areas of development of the Republic of Uzbekistan in 2017–2021.

The Resolution declares that the Strategy should bring the following results by 2030:

- Reduction of emissions of greenhouse gas per unit of GDP by 10% of the 2010 level
- Twofold increase of energy efficiency indicators and a decrease in the carbon intensity of GDP
- Further development of renewable energy sources, with coverage of more than 25% of the total volume of electricity generation
- Increase of the energy efficiency of industrial enterprises by at least 20%
- Development of electrical vehicles
- Introduction of drip irrigation technology into an area up to 1 million hectares and increasing the crops yield cultivated on them by 20–40%
- Achieving a neutral balance in the degradation of land
- Increasing the average productivity of the production of the main types of agricultural food products by 20–25%

In addition, the Resolution identifies the priority areas in Uzbekistan's strategy for transition to a green economy:

- Improvement of energy efficiency in the basic sectors of the economy
- Diversification of energy consumption and development of the use of renewable energy sources
- Adaptation and mitigation of the effects of climate change, increase in the efficiency of natural resources and preservation of natural ecosystems
- Development of financial and non-financial support mechanisms for the green economy

Priority areas envisage the implementation of measures in various sectors of economy, including electricity, heat, oil and gas, renewable energy, construction, transportation and many more.

### 3.2 Institutional Framework

The Constitution and legislative norms and rules of the Republic of Uzbekistan determine the legislative, state and executive authority's environmental and social responsibilities, and also the responsibilities of private developers. The Preamble of the Constitution recognises the "priority of the generally accepted norms of the international law".<sup>2</sup> It is therefore considered that international conventions and ratifications will prevail over national legislation whenever the former are more stringent.

The Supreme Executive body responsible for nature protection in the Uzbekistan is the State Committee for Nature Protection (SCNP), subordinated and accountable to Oliy Majlis (Parliament). It defines state policy, takes legislative acts, coordinates and manages the activity of ministries and agencies regarding environmental and social issues. The Cabinet of Ministers is the Executive body responsible for the implementation of state nature protection policy, coordinate development and realization of state programs of socio-economic development. The Cabinet controls their execution and is responsible for registration and evaluation of nature resources. Obligations of regions regarding environmental protection are put to the Soviets of National Deputies, headed by the Leader of administration (khokims). Regional and local government are responsible for registering and evaluating the condition of nature resources, ecologically harmful facilities and are responsible for control, nature protection and usage of nature resources.

<sup>2</sup> Constitution of the Republic of Uzbekistan <http://constitution.uz/en/clause/index> (20/02/2020)



Execution of nature protective measures, control function and responsibility regarding nature protection rests on a number of ministries and agencies. Responsibilities of these bodies include provision of stable system of state service, development and realization of specialized programs, strategies and plans of actions and sustainable nature management. Regional departments and agencies are generally lower executive bodies of the SCNP and other responsible ministries on regional and district levels. Organizations at the regional level have the same structure as the republican level.

Public meetings (makhalla) are an independent mechanism of self-government, which carries out general initiatives and measures, including those connected with ecology, directly in villages, regions, districts and cities. See more information on makhallas below in Section 3.3.3.

### 3.3 National Environmental and Social Legislation

#### 3.3.1 Overview

Within the limits of established state policy under the direction of the President and Cabinet of Ministers (CM) in Uzbekistan, attention is paid to the execution of accepted ecological obligations. Nature conservation policy of Uzbekistan and implemented measures related to environmental protection and nature management are based on the following principles:

- integration of economic and ecological policy for conservation and rehabilitation of the environment as a necessary condition for increasing the population's standard of living
- Transition from protection of some individual environmental elements to a more general and complex protection of ecosystems
- Placing a responsibility on all members of society for environmental protection, conservation of biodiversity and improvement of the conditions of the general population

National environmental legislation is based on the regulations of the Constitution of Uzbekistan, which was accepted on December 8, 1992, amended in accordance with the Law of Uzbekistan dated 28.12.1993, No. 989-XII, and the Law of Uzbekistan dated 24.04.2003 No. 470-II. There is a requirement that Government, departments, public officers, social associations, and citizens act in accordance with the relevant Constitution and laws (Article 15). None of the regulations of Constitution can be interpreted to the prejudice of rights and interests of Uzbekistan. None of the laws or other normative-legal acts can contradict norms and principles of the Constitution (Article 16).

In accordance with the Constitution of Uzbekistan, land, its resources, flora and fauna, and other natural resources are national wealth and are subjected to rational usage and protected by government. Article 55 of the Constitution of the Uzbekistan states, "... land, its resources, flora and fauna and also other nature resources are the national wealth and should be rationally used and protected by state".

On the basis of the Constitution, the laws are taken by Oliy Majlis (OM), signed by the President of the Uzbekistan and have the highest legal power. The President of the Uzbekistan, on the basis and in pursuance of execution of the Constitution and laws of the Uzbekistan, issues orders, statements and decrees, having compulsory power on the whole territory of the Uzbekistan (Article 94).

The Cabinet of Ministers (CM), in accordance with acting legislation, issues statements and decrees which are compulsory for the whole territory of Uzbekistan. The Khokim takes decisions which are compulsory for all ventures, establishments, associations, public officers and citizens on corresponding territory (Article 104).

The SCNP of the Uzbekistan is subordinated to OM and has responsibility for ministries, state committees, establishments and organizations for the use and protection of lands, subsoils, water, forests, flora and fauna, and air.

The fundamental legislative act regulating nature conservation is the Law "On Environment Protection" No. 754-XII dated December 9, 1992 (last revision was made by Law of Uzbekistan No.59 dated 10.10.2006). This Law states legal, economic and organizational bases for keeping conditions of environment, rational usage of nature complexes. It has the aim to provide balanced harmonic development of relations between humans and nature, protection of ecological systems, nature complexes and separate objects, and guarantee rights of citizens for favourable environment. The influence of economic activity on nature environment is limited by norms and quality standards



established for various components of the natural environment. The aim is to guarantee ecological safety of population, production and protection of nature resources.

State control of environmental protection is carried out by public authorities and regulatory bodies and departments/agencies specifically responsible for nature protection. Authorized departments responsible for nature protection are:

- State Committee for Nature Protection of Uzbekistan
- Ministry of Health of Uzbekistan
- Agency for control of safe industry works and mines inspectorate
- Ministry of Internal Affairs of Uzbekistan
- Ministry of Agriculture and water resources of Uzbekistan
- State Committee for land resources of Uzbekistan

Payments for special nature management and pollution of environment consist of taxes, compensation payments for pollution of the environment (emissions, discharge of contaminants and wastes disposal), payments for protection and restoration of nature resources.

In addition to the Law “On Environment Protection” some other laws, regulating different areas of management and environmental protection have been developed such as:

1. “On water and water usage” No. 837-XII dt May 6, 1993 (last revision was made by Law of Uzbekistan No. 240 dt 25.12.2009)
6. “On protection of atmospheric air” No. 353-I dt. December 27, 1996 (last revision was made by Law of Uzbekistan No.59 dt. 10.10.2006)
7. “On protection and usage of flora” No. 543-I dt. December 26, 1997 (last revision was made by Law of Uzbekistan No. 82-II dt. 26.05.2000)
8. “On protection and usage of fauna” No. 545-I dt. December 26, 1997 (last revision was made by Law of Uzbekistan No.59 dt. 10.10.2006)
9. “On wastes” No. 362-II dt. April 5, 2002
10. “On order of promulgation of a Land Code of Uzbekistan” No. 598-I dt. April 30, 1998. (last revision was made by Law of Uzbekistan No.714-II dt. 03.12.2004)
11. “On state land cadastre” No. 666-I dt. August 28, 1998 (last revision was made by Law of Uzbekistan No. 621-II dt. 30.04.2004)
12. “On woods” No. 770-I dt. April 15, 1999 (last revision was made by Law of Uzbekistan No.238 dt. 22.12.2009)
13. “On protected nature territories” No. 710-II dt. December 3, 2004
14. Law of Uzbekistan “On subsoils” is approved by Law of Uzbekistan No.444-II dt. 13.12.2002r. (last revision was made by Law of Uzbekistan No.133 dt. 18.12.2007)
15. Law of Uzbekistan “On EIA” No. 73-II dt. May 25, 2000

As a whole, ecological legislation of the Uzbekistan covers a wide spectrum of issues and includes regulations including:

- Protection of the environment and its main components
- Protection of ecosystems and regulation of usage of nature resources
- Evaluation of influence on environment and ecological expertise
- Regulation of compensations for damage made to environment (including economical and administrative aspects)
- Regulation of property rights for nature resources

The legislation of Uzbekistan prioritises a number of international agreements above the national legislation. For example, Article 53 of Law of Uzbekistan “On Environment Protection” requires that “in

cases, when international agreement, concluded by Uzbekistan, states rules other than that contained in the present Law or other legislative act of Uzbekistan on environment protection, the rules of international agreement are applied, excluding cases when legislation of Uzbekistan established more strict requirements”.

### 3.3.2 Requirements of the National EIA Procedure

There are specific requirements as to the content, development procedure and examination of Environment Impact Assessment (EIA) documents. These are governed by the following legislative acts of the Republic of Uzbekistan:

- Law of the Republic of Uzbekistan No 754-XII dated 09.12.1992 “On Environment Protection”
- Law of the Republic of Uzbekistan No 73-II dated 25.05.2000 “On Environmental Impact Audit”
- Regulation “On State Ecological Expertise in the Republic of Uzbekistan”, approved by the Decree of the Cabinet of Ministers of the Republic of Uzbekistan No 491 dated 31.12.2001

A series of EIA documents consisting of the following stages are required to be developed for designed facilities in accordance with the given requirements:

- DEIA — Draft Environmental Impact Assessment, which shall be developed in the conception stage of planned or anticipated economic or other activity prior to the beginning of project financing (1<sup>st</sup> stage of EIA).
- EIA — Environmental Impact Assessment, which shall be developed if, based on the results of DEIA State Environmental Expertise (SEE), it was ascertained that additional surveys, on-site investigations, special analyses, simulation experiments and development of well-founded environmental actions are required (2<sup>nd</sup> stage of EIA). Necessity of EIA development shall be defined by State Committee on Nature Protection of the Republic of Uzbekistan based on the results of DEIA state environmental expertise.
- EEA — Ecological Effect Assessment, which shall be developed prior to commissioning of the project and shall be final stage of EIA procedure for designed facilities (3<sup>rd</sup> stage of EIA).

The Project is required to take all reasonable measures in accordance with these laws and standards in order to minimize any potential violations of general balance of environment, including, but not limited to, land surface, subsoils, air, lakes, rivers, flora and fauna, crops and other natural resources. The hierarchy of protection is determined in the following order: life protection, environmental protection and property protection.

### 3.3.3 National Social Legislation

The findings regarding the key legislation in relation to social matters were based on a revision of publicly available legislation translated into English.

The key findings are summarised below:

- The Constitution of the Republic of Uzbekistan, in particular:
  - Art. 105. Recognises makhallas as self-governing bodies whose Chairmen and advisers are elected by citizens for terms of two and a half years.<sup>3</sup> This is relevant because this type of organisation is an important channel for the decision-making process of local communities. Makhallas carry out general initiatives and measures, including those connected with ecology, directly in villages, regions, districts and cities. The main principles of makhalla are democracy, publicity, social justice, humanism and mutual aid. A makhalla is responsible for taking decisions regarding problems of local importance, including issues of improving and development of infrastructure, arrangement of khashars (voluntary unpaid work on Sunday) and provision of social aid to low-income families, among others.
- **The Labour Code of the Republic of Uzbekistan** of April 1, 1996 (as amended on December 22, 2010); in particular:
  - Chapter VI. Employment contract - Articles 4 and 72 to 76 determine the content, form and term of the employment contract, the limitation of rights of the employer to enter into fixed-term

<sup>3</sup> Constitution of the Republic of Uzbekistan <http://constitution.uz/en/clause/index> (20/02/2020)

employment contract, and the ratio of legal and contractual regulation of labour relations. This is relevant because there is no specific requirement to provide workers with documented information that is clear and understandable, regarding their rights, including their rights related to hours of work, wages, overtime, compensation, and benefits upon beginning the working relationship and when any material changes occur.

- Article 77 determines the age at which employment is permitted (i.e. 16 years old).
- Article 239 establishes that all persons under the age of 18 years shall be employed only after undergoing a preliminary medical examination and further until reaching the age of 18 are subject to mandatory annual medical examination.
- Article 7 prohibits forced labour, understood as work performed under threat of punishment (including as a means of labour discipline).
- Articles 211 and 212 establish requirements on labour protection, and the duties of the employee to comply with the norms, rules and regulations on labour and protection. The employee is obliged to comply with the norms, rules and regulations on labour protection, as well as the administration of the order of safe operation, use the obtained personal protective equipment, and immediately notify their supervisor (foreman, master, chief of a site, and others) if any accidents or situations that create a direct threat to human life and health occur.
- Article 213 establishes the right of the worker to the information on occupational health and safety (OHS). At the conclusion of the employment contract and the transfer to another job worker shall be informed by the employer about working conditions, including the presence of risk occupational and other diseases due to him in connection with these benefits and compensation, as well as personal protective equipment. The employer must also inform employees or their representatives about the state of OHS in specific workplaces and production.

#### 3.3.4 Land Ownership

Management of land is governed by the rules stated within the Presidential Decree of June 8, 2021 No. UP-6243 “On measures for ensuring equality and transparency in land relations, reliable protection of land rights and their transformation into market asset”. According to the Decree, land is allocated on the basis of the right of permanent use to State bodies, institutions, enterprises and citizens' self-governing bodies. Key provisions of the Decree are as follows:

- In implementing public-private partnership projects, land is allocated to the relevant public body, which in turn provides a private partner with a lease for the duration of the agreement.
- Agricultural land is allocated only on the lease basis following online auction.
- Non-agricultural land can be allocated on the basis of ownership and leases following an online auction.
- Local authorities are prohibited from directly allocating land plots.
- Cabinet of Ministers can directly lease land plots to agricultural clusters and to large investment projects.

The Law on Procedures of Land Acquisition for Public Needs No. ZRU-781 will be used as a legal reference for this project.

#### 3.3.5 Archaeology and Cultural Heritage Legislative and Policy Context

Standards and legislation applicable to archaeology and cultural heritage are divided into two sub-sections, namely:

- National: Uzbek legislative and regulatory framework, and international protocols/agreements/treaties to which Uzbekistan is party.
- International: International policies, standards and guidelines including the International Finance Corporation (IFC) Performance Standards and Environmental Health and Safety (EHS) Guidelines, and Good International Industry Practice (GIIP).

### 3.3.5.1 Uzbek Legislative Context

The principal legislation applicable to the archaeology and cultural heritage study comprise the Constitution of the Republic of Uzbekistan<sup>4</sup>, the Criminal Code of the Republic of Uzbekistan<sup>5</sup>, Law No. ZRU-229 “On protection and use of the objects of archaeological heritage” (13 October 2009)<sup>6</sup>, Law No. 269-II “On the Protection and Use of Cultural Heritage Sites (30 August 2001, as amended)<sup>7</sup>, Presidential Decree No. R-5181 “On improving the protection and use of objects of tangible cultural and archaeological heritage” (16 January 2018)<sup>8</sup> and Presidential Decree no. PP-4068 “Regarding the strengthening of the protection, management and enhancement of tangible and intangible cultural heritage” (19 December 2018)<sup>9</sup>. A summary of the applicable legislation that will be considered during the ESIA process is presented in Table 10.

**Table 10. National legislation, standards and guidelines applicable to the archaeology and cultural heritage study**

Law/Act/Regulation	Objective
Constitution of the Republic of Uzbekistan (2017)	The Constitution of the Republic of Uzbekistan (2017) states that “It is the duty of every citizen to protect the historical, spiritual and cultural heritage of the people of Uzbekistan. Cultural monuments shall have protection by the state” (Art. 49).
Criminal Code of the Republic of Uzbekistan	Article 132 states that the intentional destruction, destruction or damage of objects of tangible cultural heritage under state protection causing significant or major damage shall be punishable by a fine, obligatory community service or by correctional labour up to three years.  Article states that violation of a grave or a corpse, as well as the seizure of objects located on a corpse, grave or burial ground, shall be punishable by a fine, by corrective labour up to three years, by restriction of liberty or imprisonment from three to five years.
Code of the Republic of Uzbekistan on Administrative Responsibility	Article 64 notes that the violation of the rules for the protection and use of objects of tangible cultural heritage shall be sanctioned by a fine on citizens and officials. Construction or destruction of protected cultural property real estate objects in protected areas in specially protected historical and cultural territories without obtaining permission shall be sanctioned by a fine or administrative arrest.
Law No. 269-II “On the Protection and Use of Cultural Heritage Sites (30 August 2001, as amended)	Regulates the protection and use of cultural heritage objects (CHO), which are the national property of the people of Uzbekistan. The law protects ensembles, sites, monuments, objects of tangible and intangible cultural heritage. The law defines objects of tangible cultural heritage as representing historical, scientific, artistic or other cultural value ensembles, sites and monuments; and objects of intangible cultural heritage as representing customs, historical, scientific, artistic or other cultural value, folklore (the art of word, dance, music, performance), as well as knowledge, skills, tools, artefacts related to them and folk arts and crafts, and cultural spaces. Tangible cultural heritage is divided into CHO of national and local historical, scientific, architectural, artistic and memorial significance. Designated cultural heritage comprises World Heritage properties, elements inscribed on the Representative List of the Intangible Cultural Heritage of Humanity, CHO on the State Register, historical and cultural reserves, museum reserves and historical settlements. These are maintained on the State Cadastre of tangible CHO and the List of intangible objects of intangible CHO.

<sup>4</sup> Constitution of the Republic of Uzbekistan (2017). Available at: <http://www.gov.uz/en/constitution/>

<sup>5</sup> Criminal Code of the Republic of Uzbekistan of September 22, 1994 No. 2012-XII (as amended on 03-12-2019) Available at: <https://www.lex.uz/acts/111457>

<sup>6</sup> Law of the Republic of Uzbekistan dated 13 October 2009 No. ZRU-229 “On protection and use of the objects of archaeological heritage”. Available at <https://lex.uz/docs/1526179>

<sup>7</sup> Law of the Republic of Uzbekistan dated August 30, 2001 No. 269-II “On the Protection and Use of Cultural Heritage Sites”. Available at: <https://www.lex.uz/acts/10375#1526009>

<sup>8</sup> Presidential Decree No. R-5181 of 16 January 2018 “On improving the protection and use of objects of tangible cultural and archaeological heritage”. Available at: <https://www.lex.uz/docs/3506339>

<sup>9</sup> Presidential Decree No. PP-4068 of 19 December 2018 “Regarding the strengthening of the protection, management and enhancement of tangible and intangible cultural heritage”. Available at: <https://lex.uz/ru/docs/4113474>

Law No. ZRU-229 “On protection and use of the objects of archaeological heritage” (13 October 2009) Regulates the protection and use of the objects of archaeological heritage. The state has exclusive right of ownership of the objects of archaeological heritage. Objects of archaeological heritage are subject to compulsory state registration. The Ministry of Culture issues field investigation permits and approves the scientific report for each permit issued. Specially authorised institutions in the field of protection and use of archaeological heritage objects (authorised agencies) approve the procedures for archaeological exploration, archaeological excavations and archaeological surveillance, issue open sheets and participate in the historical and cultural examination of archaeological heritage sites.

Presidential Decree No. PP-4068 “Concerning measures on preservation of objects of cultural and archaeological heritage” (19 December 2018) Includes a ‘Road Map’ to radically improve the protection, conservation, scientific research, propaganda and rational use of tangible cultural heritage objects for 2019-2021.

Presidential Decree No. R-5181 “On improving the protection and use of objects of tangible cultural and archaeological heritage” (16 January 2018) Required the creation of a national digital inventory, used as the basis for developing comprehensive measures to radically improve the protection, conservation, scientific study, promotion and use of objects of tangible cultural and archaeological heritage in 2018-2023.

Presidential Decree No. PF-5953 “On Measures to Strengthen the Protection of Tangible Cultural Heritage Sites and Areas Included in the UNESCO World Heritage List” (3 March 2021)<sup>10</sup> Sets out administrative and organisational measures for defining, monitoring and protecting World Heritage Sites. Indicates ongoing programmes to maintain, protect, preserve, research, popularise and use the objects of tangible cultural heritage. Notes the revision of the national list of real estate objects of tangible cultural heritage and ongoing tangible and intangible heritage inventory programmes.

The Constitution of the Republic of Uzbekistan (2017) states that “It is the duty of every citizen to protect the historical, spiritual and cultural heritage of the people of Uzbekistan. Cultural monuments shall have protection by the state” (Art. 49).

Article 132 of the Criminal Code of the Republic of Uzbekistan states that the intentional destruction, destruction or damage of objects of tangible cultural heritage under state protection causing significant or major damage shall be punishable by a fine, obligatory community service or by correctional labour up to three years.

Article 134 Criminal Code of the Republic of Uzbekistan states that violation of a grave or a corpse, as well as the seizure of objects located on a corpse, grave or burial ground, shall be punishable by a fine, by corrective labour up to three years, by restriction of liberty or imprisonment from three to five years.

Article 64 of the Code of the Republic of Uzbekistan on Administrative Responsibility<sup>11</sup> notes that the violation of the rules for the protection and use of objects of tangible cultural heritage shall be sanctioned by a fine on citizens and officials. Construction or destruction of protected cultural property real estate objects in protected areas in specially protected historical and cultural territories without obtaining permission shall be sanctioned by a fine or administrative arrest.

Law No. 269-II “On the Protection and Use of Cultural Heritage Sites (30 August 2001, as amended) regulates the protection and use of cultural heritage objects (CHO), which are the national property of the people of Uzbekistan. The law protects ensembles, sites, monuments, objects of tangible and intangible cultural heritage. The law defines objects of tangible cultural heritage as representing historical, scientific, artistic or other cultural value ensembles, sites and monuments; and objects of intangible cultural heritage as representing customs, historical, scientific, artistic or other cultural value, folklore (the art of word, dance, music, performance), as well as knowledge, skills, tools, artefacts related to them and folk arts and crafts, and cultural spaces. Tangible cultural heritage is divided into CHO of national and local historical, scientific, architectural, artistic and memorial significance.

<sup>10</sup> Presidential Decree No. PF-5953 of 3 March 2021 “On Measures to Strengthen the Protection of Tangible Cultural Heritage Sites and Areas Included in the UNESCO World Heritage List. Available at: <https://lex.uz/docs/-5320217>

<sup>11</sup> Code of the Republic of Uzbekistan on Administrative Responsibility (1994, as amended) Available at: <https://www.lex.uz/acts/97661>



Designated cultural heritage comprises World Heritage properties, elements inscribed on the Representative List of the Intangible Cultural Heritage of Humanity, CHO on the State Register, historical and cultural reserves, museum reserves and historical settlements. These are maintained on the State Cadastre of tangible CHO and the List of intangible objects of intangible CHO.

Law No. ZRU-229 “On protection and use of the objects of archaeological heritage” (13 October 2009) regulates the protection and use of the objects of archaeological heritage. The state has exclusive right of ownership of the objects of archaeological heritage. Objects of archaeological heritage are subject to compulsory state registration. The Ministry of Culture issues field investigation permits and approves the scientific report for each permit issued. Specially authorised institutions in the field of protection and use of archaeological heritage objects (authorised agencies) approve the procedures for archaeological exploration, archaeological excavations and archaeological surveillance, issue open sheets and participate in the historical and cultural examination of archaeological heritage sites.

The Presidential Decree “Concerning measures on preservation of objects of cultural and archaeological heritage” (19 December 2018) includes a ‘Road Map’ to radically improve the protection, conservation, scientific research, propaganda and rational use of tangible cultural heritage objects for 2019-2021. Presidential Decree No. R-5181 (16 January 2018) required the creation of a national digital inventory, used as the basis for developing comprehensive measures to radically improve the protection, conservation, scientific study, promotion and use of objects of tangible cultural and archaeological heritage in 2018-2023. Changes are further detailed in Presidential Decree No. PF-5953 “On Measures to Strengthen the Protection of Tangible Cultural Heritage Sites and Areas Included in the UNESCO World Heritage List” (3 March 2021).

The national list of objects of real property of a material cultural heritage is contained in Appendix 1 to the Cabinet of Ministers Resolution No. 846 "About approval of the National list of objects of real property of a material cultural heritage" (October 4, 2019)<sup>12</sup>. [<https://lex.uz/docs/-4543266>] Updates are set out in the Appendix 15 to Presidential Decree No. PF-5953, Amendments and additions to some decisions of the Government of the Republic of Uzbekistan<sup>13</sup>.

### 3.3.5.2 Uzbek International Agreements and Conventions

Environmental and social conventions and agreements of relevance to archaeology and cultural heritage are outlined in Table 11.

**Table 11. International environmental and social agreements and conventions of relevance to the archaeology and cultural heritage study**

Agreement/ Convention	Objective	Status and Date of Signature
UNESCO Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property (Convention on Cultural Property) – 1970 <sup>14</sup>	Prohibits and prevents the illicit import, export and transfer of ownership of cultural property and aims to discourage the pillage of archaeological sites and cultural heritage by controlling international trade in looted antiquities through import controls and other measures.	15 March 1996 (ratification)
UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention) – 1972 <sup>15</sup>	To ensure that effective and active measures are taken for the protection, conservation and presentation of the cultural and natural heritage on states' territories.	13 January 1993 (ratification)

<sup>12</sup> Cabinet of Ministers Resolution No. 846 "About approval of the National list of objects of real property of a material cultural heritage" (October 4, 2019). Available at: <https://lex.uz/docs/-4543266>

<sup>13</sup> Presidential Decree No. PF-5953 of 3 March 2021 “On Measures to Strengthen the Protection of Tangible Cultural Heritage Sites and Areas Included in the UNESCO World Heritage List.” Appendix 15, Amendments and additions to some decisions of the Government of the Republic of Uzbekistan. Available at: <https://lex.uz/docs/-5320217>

<sup>14</sup> UNESCO 1970 Convention on the Means of Prohibiting and Preventing the Illicit Import, Export and Transfer of Ownership of Cultural Property. Paris, 14 November 1970. United Nations Educational, Scientific and Cultural Organization <http://www.unesco.org/new/en/culture/themes/illicit-traffic-of-cultural-property/1970-convention/>

<sup>15</sup> UNESCO 1972 Convention concerning the Protection of the World Cultural and Natural Heritage. Paris, 16 November 1972. United Nations Educational, Scientific and Cultural Organization <http://whc.unesco.org/en/conventiontext/>

UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage – 2003<sup>16</sup> To safeguard and ensure respect for the world’s Intangible Cultural Heritage, including raising awareness of the importance of intangible heritage and encouraging international cooperation and assistance. 29 January 2008 (ratification)

UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions – 2005<sup>17</sup> Recognises the rights of states to protect and promote the diversity of cultural expressions, encompassing cultural and natural heritage, movable cultural property, intangible cultural heritage and contemporary creativity. 15 November 2019 (ratification)

### 3.4 International Agreements

Uzbekistan is signatory to a number of international conventions and agreements relating to industry, development and environmental management.

Table 12 below lists some of the relevant international conventions and protocols to which Uzbekistan is signatory. Many of these are incorporated into the various International Finance Corporation (IFC) Performance Standards.

**Table 12. International Environmental and Social Conventions Ratified by Uzbekistan**

Name of Convention	Date of Ratification
C029 - Forced Labour Convention, 1930 (No. 29)	13 Jul 1992
C087 - Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)	12 Dec 2016
C098 - Right to Organise and Collective Bargaining Convention, 1949 (No. 98)	13 Jul 1992
C100 - Equal Remuneration Convention, 1951 (No. 100)	13 Jul 1992
C105 - Abolition of Forced Labour Convention, 1957 (No. 105)	15 Dec 1997
C111 - Discrimination (Employment and Occupation) Convention, 1958 (No. 111)	13 Jul 1992
C138 - Minimum Age Convention, 1973 (No. 138)	6 Mar 2009
C182 - Worst Forms of Child Labour Convention, 1999 (No. 182)	13 Jul 1992
C122 - Employment Policy Convention, 1964 (No. 122)	13 Jul 1992
C187 - Promotional Framework for Occupational Safety and Health Convention, 2006 (No. 187)	14 Sep 2021
Convention on Wetlands of International Importance Especially as Waterfowl Habitat (IEA ID# 2793)	8 Feb 2002
Convention for The Protection of The World Cultural and Natural Heritage (IEA ID# 2812)	13 Jan 1993
Convention on International Trade in Endangered Species of Wild Fauna and Flora (IEA ID# 2814)	8 Oct 1997
Convention on The Conservation of Migratory Species of Wild Animals (IEA ID# 2896)	1 Sep 1998
Convention for The Protection of The Ozone Layer (IEA ID# 2982)	16 Aug 1993
Montreal Protocol on Substances That Deplete the Ozone Layer (IEA ID# 3021)	18 Aug 1993
Convention on The Control of Transboundary Movements of Hazardous Wastes and Their Disposal (IEA ID# 3042)	7 May 1996
Agreement on cooperation in the field of ecology and environmental protection (IEA ID# 2489)	8 Feb 1992

<sup>16</sup> UNESCO 2003 Convention for the Safeguarding of the Intangible Cultural Heritage. (Paris, 17 October 2003) United Nations Educational, Scientific and Cultural Organization <http://www.unesco.org/culture/ich/index.php?pg=00006>

<sup>17</sup> UNESCO 2005 Convention on the Protection and Promotion of the Diversity of Cultural Expressions. Paris, 20 October 2005. United Nations Educational, Scientific and Cultural Organization <https://en.unesco.org/creativity/convention/2005-convention/2005-convention-text>

Agreement on Cooperation in The Field of Joint Water Resources Management and Conservation of Interstate Sources (IEA ID# 3113) 18 Feb 1992

Convention on The Protection and Use of Transboundary Watercourses and International Lakes (IEA ID# 3116) 3 Dec 2007

United Nations Framework Convention on Climate Change (IEA ID# 3126) 21 Mar 1994

United Nations Convention on the Rights of Persons with Disabilities (CRPD) 28 Jun 2021

Convention on Biological Diversity (IEA ID# 3128) 17 Oct 1995

Statute of the Interstate Commission for Water Coordination of Central Asia (IEA ID# 4765) 5 Dec 1992

Agreement on Joint Activities in Addressing the Aral Sea and The Zone Around the Sea Crisis, Improving the Environment, And Ensuring the Social and Economic Development of The Aral Sea Region (IEA ID# 3155) 26 Mar 1993

Convention to Combat Desertification in Those Countries Experiencing Serious Drought And/or Desertification, Particularly in Africa (IEA ID# 3188) 26 Dec 1996

Agreement on The Conservation of African-Eurasian Migratory Water birds (IEA ID# 3216) 1 Apr 2004

Agreement between the Government of Kazakhstan, the Government of Kyrgyzstan and the Government of Uzbekistan on management of water resources in Central Asia (IEA ID# 8452) 5 Apr 1996

Agreement on The Use of Water and Energy Resources of The Syr Darya Basin (IEA ID# 3279) 7 May 1999

Convention on Wetlands of International Importance Especially as Waterfowl Habitat (IEA ID# 2793) 8 Feb 2002

Convention for The Protection of The World Cultural and Natural Heritage (IEA ID# 2812) 13 Jan 1993

Convention on International Trade in Endangered Species of Wild Fauna and Flora (IEA ID# 2814) 8 Oct 1997

Convention on The Conservation of Migratory Species of Wild Animals (IEA ID# 2896) 1 Sep 1998

Convention for The Protection of The Ozone Layer (IEA ID# 2982) 16 Aug 1993

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### 3.5 International Best Practice Guidelines

International lenders who are signatories to the Equator Principles (EPs) require projects that they finance to meet international standards. Beyond Uzbek legal requirements, the following international guidelines, regulations and policies will be followed and applied to the Project development and implementation:

- The Equator Principles (Equator Principles Association, 2020)
- IFC Performance Standards (IFC, 2012)
- IFC Environmental, Health and 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, 2007)
- IFC EHS Guidelines for Electric Power Transmission and Distribution (IFC, 2007)
- Asian Development Bank (ADB) Safeguard Policy Statement (ADB, 2009)

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.

Further detail relating to the IFC Performance Standards and Asian Development Bank Safeguard Policy are provided below.

#### 3.5.1 Equator Principles and IFC Performance Standards

The Equator Principles (EPs) is a risk management framework used by financial institutions to assess and manage environmental and social risk in projects aiming to support responsible risk decision-making. The EPs apply to all new project financings with total capital costs of USD10 million or more across all industry sectors globally. The EPs represent a framework for project financing, which is underpinned by the IFC Performance Standards (PS).

The extent to which the EPs apply to a project depends on whether the country in which the project is located is “Designated” or “Non-Designated”. Projects within Non-Designated countries such as Uzbekistan are required to follow the standards and guidelines as set out in the IFC PSs and Environmental Health and Safety Guidelines.

The IFC PS are detailed below:

1. IFC PS1 — Assessment and Management of Environmental and Social Risks and Impacts
2. IFC PS2 — Labour and working conditions
3. IFC PS3 — Resource Efficiency and Pollution Prevention
4. IFC PS4 — Community Health, Safety, and Security
5. IFC PS5 — Land acquisition and involuntary resettlement
6. IFC PS6 — Biodiversity Conservation and Sustainable Management of Living Natural Resources
7. IFC PS7 — Indigenous peoples
8. IFC PS8 — Cultural heritage

PS 1 establishes the importance of assessment to identify the environmental and social impacts associated with development, effective community engagement and project information disclosure and consultation with local Project affected communities and environmental and social management measures. This ESIA study has therefore been carried out to meet the requirements of IFC PS1 as applicable to this stage of assessment.

The remaining IFC PS set out objectives and requirements to avoid and minimize potential environmental and social adverse effects on the environment and to offset/compensate any residual effects. PS 2 to 8 have therefore been considered as part of the assessment process and discussed where relevant within the topic specific sections below. PS7 has been scoped out of the assessment due to the absence of indigenous peoples in this area.

### **3.5.2 EBRD Performance Requirements**

The environmental and social appraisal is based on provisions of the EBRD's Environmental and Social Policy (ESP) 2019 which reflects the fundamental principles of the European Union (EU) environmental legislation including EU directives that address issues of environment protection, social and environmental risk management, information disclosure and stakeholder engagement. All EBRD financed projects shall be structured to meet the requirements of the ESP.

The EBRD, as a signatory of the European Principles for the Environment (EPE), demonstrates its commitment to promoting sustainability and good international practice (GIP) in managing environmental and social risks by EBRD financed projects. For this purpose, the EBRD's ESP 2019 adopts a set of specific Performance Requirements that projects are expected to meet with regard to key areas of environmental and social sustainability. Compliance with these requirements is mandatory for the Bank's borrowers.

### **3.5.3 EIB Environmental and Social Standards**

The EIB Group Environmental and Social Sustainability Framework is an overarching policy framework that allows the Group to focus on sustainable and inclusive development, committing to a just and fair transition and supporting the transition to economies and communities that are climate and disaster resilient, low carbon, environmentally sound and more resource-efficient.

It consists of a Group-wide Environmental and Social Policy and a revised set of EIB Environmental and Social Standards, including a new Standard 11 on Intermediated finance, which describe the requirements that all EIB-financed projects must meet.

### **3.5.4 Asian Development Bank Safeguard Policy and Other Relevant Policy**

The Asian Development Bank (ADB) Safeguard Policy Statement adopted in 2009 is aligned and consistent with the IFC policies, integrating previous ADB policies and Safeguard Requirements on environment, involuntary resettlement and Indigenous Peoples under it.

ADB's Safeguard policies are generally understood to be operational policies that seek to avoid, minimize, or mitigate adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process. ADB's safeguard policy framework consists of three operational policies on the environment, Indigenous Peoples, and involuntary resettlement. These are accompanied by Operations Manual sections on Environmental Considerations in ADB Operations; Involuntary Resettlement; and Indigenous Peoples.

In addition to the three safeguard policies, several sector policies have environmental safeguard elements, for example, those pertaining to water, energy, and forestry.

All three safeguard policies involve a structured process of impact assessment, planning, and mitigation to address the adverse effects of projects throughout the project cycle. The safeguard policies require that (i) impacts are identified and assessed early in the project cycle; (ii) plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and (iii) affected people are informed and consulted during project preparation and implementation. The policies apply to all ADB-financed projects, including private sector operations, and to all project components. The internal procedural requirements involve similar implementation processes as follows: (i) screening and scoping of the main issues start as soon as potential projects for ADB financing are identified and continue throughout the project cycle; (ii) impacts are assessed, safeguard plans summarizing mitigation measures, monitoring program, and institutional arrangements are prepared, and arrangements are made to integrate safeguards into project design and implementation; (iii) affected people are consulted during project preparation and implementation and information is disclosed in a form, manner, and language accessible to them; and (iv) safeguard plans are disclosed to the general public and the information is updated at various stages in the project cycle. ADB's safeguard policies require that both ADB's and DMCs' safeguard requirements are complied with.



The safeguard policies ensure that the lost assets are to be restored and/or compensated at full replacement cost together with appropriate assistance before the displacement of affected persons and the implementation and impacts of involuntary resettlement are to be monitored

A basic principle of the three existing safeguard policies is that implementation of the provisions of the policies is the responsibility of the borrower/client. Borrowers/clients are required to undertake social and environmental assessments, carry out consultations with affected people and communities, prepare and implement safeguard plans, monitor the implementation of these plans, and prepare and submit monitoring reports. ADB's role is to explain policy requirements to borrowers/clients, help borrower's clients meet those requirements during project processing and implementation through capacity-building programs, ensure due diligence and review, and provide monitoring and supervision.

Considerable attention is devoted to the project processing and approval phase of the project cycle, although ADB's role in monitoring safeguard compliance continues during project implementation. ADB's project completion reports and project performance evaluation reports include review of the implementation of safeguards.

Other relevant ADB policy includes:

- Asian Development Bank (ADB) Social Protection Strategy (ADB, 2001)
- Asian Development Bank (ADB) Policy on Gender and Development (ADB, 2003)
- Asian Development Bank (ADB) Access to Information Policy (ADB, 2018).

## 4. Environmental and Social Assessment Methodology

The objectives of an ESIA are to identify the potential project impacts, assess their significance and develop mitigation measures to avoid, or where avoidance is not possible, minimize, mitigate, or compensate for adverse impacts on workers, affected communities, and the environment. 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 chapters of this ESIA Report. 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.

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 accounted for the impact's deviation from the established baseline conditions and the sensitivity of the environment.

### 4.1 Baseline

Obtaining accurate and reliable baseline data within the Project Area of Influence is an essential component of the ESIA process, to provide a reference point against which potential impacts can be assessed and monitored. The approach to baseline characterisation is illustrated in Figure 4-1.

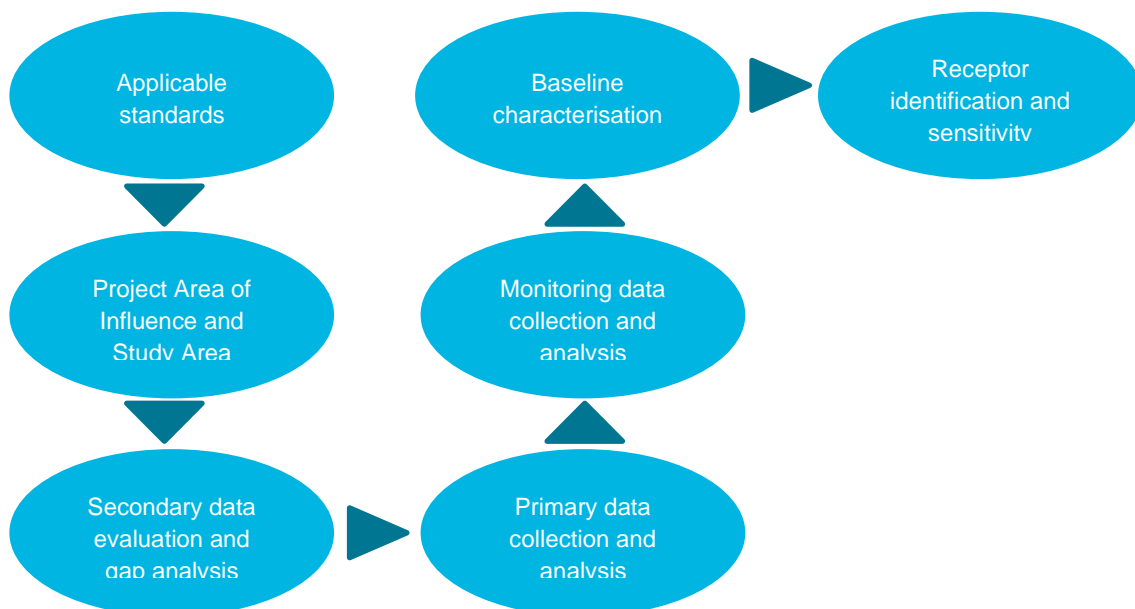


Figure 4-1. Approach to Baseline Characterisation

#### 4.1.1 Project Area of Influence and Study Area

The initial step in the baseline characterisation is the definition of the Project Area of Influence (AOI) and the Study Area.

The AOI (based on the definition in IFC PS1 (IFC, 2012) adopted by the Project is:

- The area likely to be affected by:
  - Project activities and facilities that are directly owned, operated, or managed (including by contractors) by the Project Proponent and that are a component of the Project.
  - Impacts from unplanned but predictable developments caused by the Project that may occur later or at a different location; or

- Indirect Project impacts on biodiversity or on ecosystem services upon which 'Affected Communities'<sup>18</sup> livelihoods are dependent.
- Associated facilities, which are facilities that are not funded as part of the Project and that would not have been expanded if the Project did not exist and without which the Project would not be viable. It is anticipated there will not be any associated facilities for the Project.
- Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the Project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

Using this definition of the Project components an Area of Influence was identified using the following criteria:

- Physical footprint of the Project, overhead lines and substation.
  - Area where noise effects may be experienced.
  - Area local to the Project that may be used as a resting/stopover point for migrating birds.
  - Area within the zone of theoretical visibility of the solar panels.
  - Area of 100 m either side of roads and access tracks.
  - Area of 100 m either side of overhead lines.

The AOI will be used to identify survey areas, stakeholders and project affected peoples (PAPs) who were targeted as part of the ESIA process. The AOI was then used to guide the implementation of the ESIA study.

The term PAP is broadly defined as persons affected by land acquisition, relocation, or loss of incomes associated with change in land use due to a project.

#### 4.1.2 Data Collection and Baseline Characterisation

The baseline characterisation of the physical, biological, and social environment is based on secondary (desktop research) data, supplemented by primary (field surveys) data where necessary.

As part of this scoping report, a desktop study was undertaken to collate available baseline data from published sources. The information was evaluated by the technical study teams and data gaps were identified. The desktop study was supplemented by field surveys undertaken in September 2021 at selected locations within the AOI. Further surveys were undertaken in April 2022.

Geographic information system (GIS) database has been developed to support baseline characterisation and impact assessment, incorporating remotely sensed data (satellite imagery and aerial photography), topographical maps, engineering drawings, and Geographical Positioning System (GPS) data linked to information collected in the field (e.g. photographs and field notes).

## 4.2 Impact Assessment

One of the key requirements of ESIA is to assess likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long-term permanent and temporary, positive and negative effects of the development.

Short-term effects are those considered to extend over a short period. In the context of this type of development, short-term relates typically to the construction and decommissioning periods. Effects lasting less than the life of the Project are considered to be medium-term whilst those over or exceeding the life of the Project are considered long term. Reversibility of effect; i.e. whether the effects will be reversible either wholly, or in part, in the short to medium term, are also considered where relevant.

The sensitivity of the receptor depends upon the relative importance of existing environmental features on or in the vicinity of the site or the sensitivity of receptors which have the potential to be affected by the Project. The criteria for determining sensitivity or importance are based on existing guidance, legislation, statutory designation and / or professional judgement.

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<sup>18</sup> Local communities who are directly impacted by the Project.

Following the assessment of receptor sensitivity, the potential impact on a receptor and the predicted magnitude of that change or impact was identified (i.e. the scale or degree to which the environment is affected from the existing situation). An example of the framework used to assess sensitivity and magnitude is given in Table 13 and Table 14 below. However, it should be borne in mind that the criteria depends on the specific environmental aspect being considered.

**Table 13. Assessment criteria — sensitivity of receptor**

Magnitude of Change / Impact	Criteria
High	Site or species subject to international or national protection.
Medium	Site or species subject to regional or local protection.
Low	Site or species subject to no specific protection measures.
Negligible	Site or habitat already significantly degraded.

**Table 14. Assessment criteria — magnitude of impact**

Magnitude of Change / Impact	Criteria
High	Fundamental change to the specific environmental conditions assessed resulting in temporary (long term) or permanent change.
Medium	Detectable change to the specific environmental conditions assessed resulting in non-fundamental temporary or permanent change.
Low	Detectable but minor change to the specific environmental conditions assessed.
Negligible	No perceptible change to the specific environmental conditions assessed.

The above tables will be used to determine the significance of impact. Significance is a function of the impact magnitude and sensitivity of the receptor. It is proposed to use the following matrix to determine sensitivity. It is noted that impact magnitude and receptor sensitivity will be defined qualitatively or quantitatively, depending on the methodology and nuances of the individual technical assessment topics.

**Table 15. Assessment criteria — significance of impact**

Magnitude of Change / Impact	High	Medium	Low	Negligible
High	Major	Major	Moderate	Low
Medium	Major	Moderate	Low	Low
Low	Moderate	Low	Low	Negligible
Negligible	Low	Low	Negligible	Negligible

#### 4.2.1 Assessment of Cumulative Impacts

Cumulative impacts are an important issue to be considered for the Project. Cumulative impacts are those effects that may result from the combination of past, present or future actions of existing or planned activities. While a single activity may itself result in an insignificant impact, it may, when combined with other impacts (significant or insignificant) in the same geographical area and occurring at the same time, result in a cumulative impact that is significant.

Good practice requires that, at a minimum, project sponsors assess during the ESIA process whether their development may contribute to cumulative impacts and/or may be at risk from cumulative effects on valued environmental and social components they depend on. This will be done through a rapid cumulative impact assessment during the ESIA process and will follow of Environmental Management

and Assessment (IEMA) EIA guidance, the Guidelines for the Assessment of Cumulative Impacts prepared for the European Commission and guidelines under IFC PS1 (IFC, 2013).

A rapid cumulative impact assessment was based on engagement with stakeholders as no publicly available information was identified. The identification of cumulative impacts was limited to those effects generally recognized as important on the basis of scientific concerns and/ or concerns of affected communities. AECOM have limited the projects being considered to those of \$10M USD or over aligning with projects that would potentially fall under the scope of the Equator Principles.

As a first step, AECOM and GBI attempted to source planning information online but this information is not available. To identify potential developments that may result in a cumulative impact AECOM requested any information from the Khokimiyat on the site visit in November 2021 and with the individual Makhallas during the same visit. The area of search was at the district level (Jizzakh) under control of the Khokimiyat. No relevant developments were identified during the initial consultation and the feedback from stakeholders was that there is a lack of such developments and hence a lack of employment opportunities. GBI undertook one final consultation with the Khokimiyat on 16 December 2022 who confirmed that there are no developments of a similar scale within the district.

No significant developments have been identified in proximity to the Project therefore cumulative impacts have been scoped out of the assessment.

#### 4.2.2 Mitigation Design

When developing a project, and in particular when it comes to recommending mitigation which would involve changes to the project design – either physically or operationally – it is important to ensure that both the environmental and technical teams work closely together to develop solutions that will work in practise.

When considering the level of mitigation required the objective is to reduce the impact to a level which is deemed not significant.

If there are specific project parameters that must be adhered to then these have been defined by the Client so that mitigation is developed in line with an achievable project concept. Nevertheless, if there are opportunities to implement more robust mitigation measures which would deliver a better environmental outcome without impacting the viability of the project then these have been identified.

All mitigation measures will be guided by the mitigation hierarchy (Figure 4-2); a systematic approach to addressing environmental impact and its potential compensation. The key principles are:

- Identify the impact.
- Avoid the impact.
- Minimise the impact through appropriate mitigation measures. Mitigation can be achieved through project design or through on-site operational measures.
- Compensate for the impact by offsetting residual, unavoidable impacts primarily through on- or off-site restoration and improvement works. When implementing offsetting and compensation measures, the minimum objective should be no net loss or reduction in environmental quality.



Mitigation can be carried out by:

- *Structural measures*, such as design or location changes, engineering modifications and landscape or site treatment; and
- *Non-structural measures*, such as economic incentives, legal, institutional and policy instruments, provision of community services and training and capacity building.

Structural measures are well established for large scale projects, such as energy generation, dams, roads, and oil and gas exploration and development. However, these will be applied with regard to the nature and severity of environmental impacts; for example, taking account of nearby protected areas, patterns of wildlife mitigation or constraints imposed by natural hazards. Some examples would include changes to track layout, module footprint, method of watercourse crossings or location of access point.

Non-structural measures are used increasingly. They can be applied to reinforce or supplement structural measures or to address specific impacts. For example, many types of social, community and health impacts are addressed by non-structural measures and their use is becoming broader. A good example of this would be the requirement to develop a community benefits package.

The key steps in the mitigation hierarchy as described below.

*Reduce impacts at source (Impact avoidance)*. This should be applied at an early stage of project planning. It can be achieved by:

- not undertaking certain projects or elements that could result in adverse impacts;
- avoiding areas that are environmentally sensitive; and
- putting in place preventative measures to stop adverse impacts from occurring, for example, installing a free span bridge crossing rather than a pipe culvert to cross a watercourse.

*Mitigate (Impact minimisation)*. This step is usually taken during impact identification and prediction to limit or reduce the degree, extent, magnitude, or duration of adverse impacts. It can be achieved by:

- Scaling down the proposal i.e. reducing overall installed capacity;
- Redesigning elements of the project; and
- taking supplementary measures to manage the impacts, for example, installing bird diverters on overhead transmission lines.

*Rehabilitation*. This step is applied to mitigate unavoidable residual adverse impacts. It can be achieved by:

- Rehabilitation of the affected site or environment, for example, by habitat enhancement;
- Restoration of the affected site or environment to its previous state or better.
- *Impact compensation and off-site enhancement*. Both methods involve the principle of ensuring no net-impact by providing a positive impact of the same magnitude as the negative impact from the project.
  - Provision of replacement land at an alternative location to compensate for loss of farmland (i.e. in-kind);
  - Compensation equal to the lost revenue experienced as a result of the project;

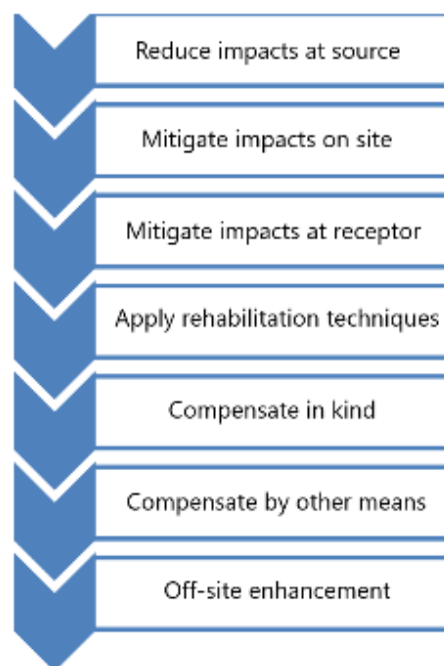


Figure 4-2. Mitigation hierarchy

- Replacement of the same resource values at another location, for example, by habitat improvement to provide an equivalent area to that lost.

Mitigation and monitoring measures identified within the ESIA will be carried forward and further developed into the Project's Environmental and Social Management Plan (ESMP) and associated sub-plans.

#### **4.2.3 Assessment of Residual Impacts**

Following the identification of mitigation measures to address significant adverse effects, an assessment of the significance of any residual effects (i.e. those remaining after mitigation) will be completed. Where significant residual impacts remain, consideration has been given to offsetting or compensating for residual impacts.

## 5. Stakeholder Engagement Programme

As part of the ESIA study, AECOM is carrying out ongoing stakeholder engagement programme. The programme comprises several stakeholder engagement activities which aim to:

- Build and maintain stakeholder relationships.
- Gather information on the local environmental and social issues.
- Continue to disclose Project information (including any access restrictions, employment and procurement opportunities, and community health and safety issues).
- Monitor and evaluate stakeholder engagement.
- Provide stakeholders the opportunity to provide feedback.
- Manage grievances from the community and workers.

This section presents a summary of the stakeholder engagement programme, namely in two parts: previous engagement activities and future engagement activities.

The details of the stakeholder engagement programme as well as the applicable regulatory framework, the stakeholder identification and analysis process, and details of the Grievance Mechanism (GM), will be document in the Stakeholder Engagement Plan (SEP), currently under development. The SEP (and the engagement programme) is a 'live' document that will be updated as the Project progresses.

Issues identified during the stakeholder engagement process have been recorded in the assessment of impacts and appropriate mitigation has been developed where appropriate.

### 5.1 Previous Engagement Activities

#### 5.1.1 Scoping Phase

TYPASA undertook an Environmental and Social Scoping Study for the current Project in September 2020 and as such have conducted some preliminary stakeholder engagement.

##### 5.1.1.1 Methods

Stakeholders were consulted either via videoconference or face-to-face during the site visits. Stakeholders consulted via videoconference were predominantly institutional stakeholders who had reliable access to a computer and the internet and therefore could easily participate in this manner. All stakeholders attended one meeting held on 9<sup>th</sup> September 2020. Stakeholders who attended included representatives from the following institutions:

- Ministry of Energy
- Ministry of Energy – Development of Renewable Resources Department
- Gallaorol District - Deputy Khokim on investments
- Gallaorol District - Head of water resources Department
- Gallaorol District - Head of cadastre Department
- Gallaorol District – Environmental Protection Committee
- Chairman of Kiziltut Makhalla
- Chairman of Sayfin Ota Makhalla
- Chairman of Karakchi Makhalla
- Chairman of Chayli Makhalla

Other stakeholders were engaged face-to-face during the scoping site visit which took place on 28th September 2020. Some of these stakeholders were community-level and therefore may not have had the resources required to participate in remote engagement methods (e.g. videoconferencing). Others were institutional stakeholders who participated in the site visit to facilitate a clear understanding of the

project site and the environmental and social opportunities and constraints it presents. Stakeholders engaged with face-to-face during the site visit include:

- Representative of environment protection committee of Gallaorol District
- Land surveyor of cadastral department of Gallaorol District
- Aksakals (village elders) of the Kiziltut, Sayfin Ota, Karakchi and Chayli makhallas
- Secretary of Rural citizens council Kuklik including Chayli and Karakchi makhallas
- Local shepherds

#### 5.1.1.2 Outcomes

The outcomes of these engagement activities yielded an understanding and appreciation of local and regional environmental and social issues. Environmental issues identified and discussed during stakeholder consultations included:

- The head of the water resources management department informed that ground water is located at a depth of 5-15 m below ground level (mbgl) in the communities around the project site.
- There is no data on air quality in the area, the District khokimiyat assumes air quality is good, as it is close to mountains.
- There is a landfill site 12-15 km from the site which can receive municipal and construction waste. Another landfill site is located 30 km from the project area. There are no licensed companies for removal of hazardous wastes, as there are no hazardous wastes generated in the project area and surroundings.
- The head of forestry department stated that there are no endangered species of birds and animals or protected areas within the project area.
- The State committee for environment and its regional and district departments are responsible for natural protected areas.
- There are no landslide risks stemming from the highlands where the project will be located. However, during the spring, there are mudflows that cross along the makhallas.

Social issues identified and discussed during stakeholder consultations included:

- According to local leaders the project area is mainly used for livestock grazing or for rainfed subsistence agriculture. These activities do not receive any legal or official permission, but district authorities are aware of them and tolerate them. The land in the project area used to be owned by a poultry farm, however, because of the land's rocky nature, the farm was not productive and therefore the company transferred this land to the Government 4 - 5 years ago.
- District authorities claimed that local communities will be provided another place for grazing cattle, as the grazing area is quite large. There are potential alternative grazing areas to the north, east and south of the project site.
- When asked about official actions taken to relocate grazing activities, participants informed that before the start of the project there was a meeting with the community and local population where they were advised to graze the cattle on alternative land. Also, the population was informed that with the project, their income would be at least doubled, according to the authorities.
- When asked about a farm identified toward the north of the project site local leaders indicated that the project poses no threat to the farm's road access or water supply. This is because there is a dedicated road which serves the farm that does not go through the project site and, water is supplied by a nearby spring, no wells have been drilled for irrigation or other purposes.
- The main source of livelihood around the project area is rainfed agriculture through the cultivation of wheat and peas, as well as livestock breeding. Wheat is sold to the Government under the order, whereas peas are sold in the local market.
- Public support programs for farmers include the development of greenhouses on 100 ha located in Chayli makhalla (more 330 ha are allocated for future development) and a program

called “Every family is an entrepreneur” through which some households in the area are provided with soft loans for livestock breeding. Land for the greenhouse projects is allocated officially to the project promoter. The primary objective of the project is to provide income generating opportunities and jobs for the local population.

- There is Farmer Union and a Population Protection Association in the area. They provide soft credits and help with machinery and other services. They provided 260 families with 7 billion 8 thousand UZS as financial support.

Other information which came out of the stakeholder engagement activities undertaken during the scoping stage include:

- The entire population in the project area is connected to power supply and only in case of extreme weather conditions there can be cut offs.
- The local population use wells for water drinking. For animals, they use watercourses and springs. Artesian wells used by the population are 7-15 meters deep.
- The majority of the population in the area are Uzbeks. There is a perception that no ethnic minorities, vulnerable groups, or migrants, etc. are located in the Project Area.
- The local population has had no previous experience with large projects in the last 15 years, except for the construction of the above mentioned 330 ha of greenhouses.

Among the questions and concerns raised by the participants, makhalla and district representatives asked about the possible adverse health impacts of the PV station. The E&S team explained that no health impact is expected. Solar panels do not produce any type of radiation. Solar power plant will be fenced to avoid current shocks. During construction there will be some dust because of heavy machines accessing the area. This will be mitigated by environmental measures.

Representatives of the population and District Khokimiyat also asked about job opportunities during the construction and operation of the PV station. The E&S team explained that the recommendation will be to hire local population based on their qualification during the construction period. As panels require maintenance, during the operation period there will be some jobs created as well, however, fewer than during the construction period.

## 5.1.2 ESIA

During the preparation of the ESIA a number of site visits were undertaken by the in-country project team which included some further stakeholder engagement activities. The site visit was conducted between 16<sup>th</sup> and 19<sup>th</sup> September 2021 and again in November 2021.

### 5.1.2.1 Methods

Stakeholder engagement is an important process at all ESIA stages however, it is particularly helpful to engage with relevant stakeholders during the early stages of the ESIA as their inputs can be considered in the assessment of impacts and the design of mitigation, management, and enhancement measures. A preliminary list of project stakeholders was identified prior to the site visit. Stakeholders identified include individuals, groups, and organizations that may be affected by or may influence project development, either positively or negatively. The list of project stakeholders will be continuously revised (expanded or reduced as necessary) throughout the ESIA study. The stakeholders identified and engaged with throughout the site visit are in Table 16.

**Table 16. Stakeholder Groups Engaged During Site Visit**

Stakeholder Group	Stakeholders
Local Government Representatives	<ul style="list-style-type: none"> <li>• Deputy Khokim of Djizzak Region on Investments</li> <li>• Deputy Khokim of Gallaorol Khokimiyat</li> <li>• Leading specialist of Mahalla and Family Department of Gallaorol Region Khokimiyat</li> </ul>
Community Representatives	<ul style="list-style-type: none"> <li>• Chair of Kukbulak mahalla</li> </ul>
Land Users	<ul style="list-style-type: none"> <li>• Herders on the site</li> <li>• Farmers using land to be impacted by the OTL:                             <ul style="list-style-type: none"> <li>– Owner of Sangzor busines parranda LTD, Oq oltin polutry LTD, Farmer 1</li> </ul> </li> </ul>



	–
Community Members	<ul style="list-style-type: none"> <li>• Local dweller of Karobchi village</li> <li>• Teachers at School №54 in Chayonli Village</li> <li>• Community women</li> <li>• Local medical point doctor</li> <li>• Kukbulok mahalla community members</li> </ul>
Individual Specialists / Academics	<ul style="list-style-type: none"> <li>• Leading specialist of Investment and Foreign Trade Department of Gallaorol Region Khokimiyat</li> <li>• Specialist on women's issues</li> </ul>

At the start of each engagement session a brief overview of the Project was provided and the rationale for engaging with the specific stakeholders was explained. The format of the engagement varied depending on the number of stakeholder's present and the environment (i.e. on the project site or in a meeting room). The selected engagement methodologies included:

- **Key Informant Interviews (KIIs):** this methodology was used to engage one-to-one with local government representatives who are used to engaging with in this manner. This methodology was also used to engage with specific land users who would be impacted by the project in different ways.
- **Focus Group Discussions (FGDs):** this methodology was used to engage with specific groups of stakeholders who were likely to have similar concerns, priorities, and perceptions of the project and its likely impacts. This included community members, women, community leaders, and teachers.

The KIIs and FGDs both followed a semi-structured format with standard list of questions for each stakeholder. Stakeholders were then given the opportunity to ask questions of the ESIA Consultants. The project site map was used as visual aid at the meeting.

### 5.1.2.2 Outcomes

Throughout the site visit a range of stakeholders were engaged with including herders (Figure 5-1), community members (Figure 5-2), Mahalla leaders (Figure 5-3), and local government representatives (Figure 5-4). Notes were taken during each stakeholder meeting and the key outcomes are presented in Section 6: Environmental and Social Baseline. Further details of these consultations are provided in the Project SEP, currently under development.



Figure 5-1. Child herders



Figure 5-2. Meeting with community members, Kukbulak mahalla



Figure 5-3. Meeting with villages leaders requesting to leave the road across the site



Figure 5-4. Meeting with Women focal point in Gallaorol Khokimiyat

### 5.1.2.3 ESIA Disclosure

The following Table shows the ESIA disclosure engagement which took place on 14<sup>th</sup> February 2023.

**Table 17. ESIA Disclosure Engagements**

Stakeholder Category	Stakeholder Engagement Methods	Location/ Timeline	Purpose	Consultation Disclosure Materials	Mean of Advance Notification	Responsibility
<b>ESIA DISCLOSURE PHASE</b>						
All stakeholder groups	Online disclosure	Documents placed on Developer and Lender Websites since 25 <sup>th</sup> December 2022	<ul style="list-style-type: none"> <li>Disclose key finding of the ESIA, identified significant impacts and mitigation measures</li> </ul>	Non-Technical Summary (NTS) of the ESIA online	<ul style="list-style-type: none"> <li>Media announcements</li> <li>Website announcements</li> </ul>	E&S Consultant (with support from the Client)
District Khokimiat	<ul style="list-style-type: none"> <li>One to one meeting</li> </ul>	14 <sup>th</sup> February 2023	<ul style="list-style-type: none"> <li>Disclose key finding of the ESIA, identified significant impacts and mitigation measures</li> </ul>	Local ESIA package NTS of the ESIA online ESIA summary presentation LRP Summary	<ul style="list-style-type: none"> <li>Telegram</li> <li>Phone call</li> </ul>	E&S Consultant
District Khokimiat – Women representative	<ul style="list-style-type: none"> <li>One to one meeting</li> </ul>	14 <sup>th</sup> February 2023	<ul style="list-style-type: none"> <li>Disclose key finding of the ESIA, identified significant impacts and mitigation measures</li> </ul>	Local ESIA package NTS of the ESIA online ESIA summary presentation LRP Summary	<ul style="list-style-type: none"> <li>Telegram</li> <li>Phone call</li> </ul>	E&S Consultant
Mahalla Offices	<ul style="list-style-type: none"> <li></li> </ul>	14 <sup>th</sup> February 2023	<ul style="list-style-type: none"> <li>Disclose and discuss the results of the ESIA study</li> </ul>	Local ESIA package ESIA summary presentation	<ul style="list-style-type: none"> <li>Personal interaction</li> </ul>	E&S Consultant
All stakeholder groups	<ul style="list-style-type: none"> <li>Public presentations to summarise the ESIA</li> <li>Placement of leaflets in public places</li> <li>Media announcements</li> </ul>	14 <sup>th</sup> February 2023 Mahalla offices	<ul style="list-style-type: none"> <li>Disclose and discuss the results of the ESIA study</li> </ul>	Local ESIA package NTS of the ESIA online ESIA summary presentation	<ul style="list-style-type: none"> <li>Media announcements</li> </ul>	E&S Consultant
Women in the community	<ul style="list-style-type: none"> <li>Public presentations to summarise the ESIA</li> <li>Placement of leaflets in public places</li> <li>Media announcements</li> </ul>	14 <sup>th</sup> February 2023 – Mahalla offices	<ul style="list-style-type: none"> <li>Comply with the ESIA regulatory requirements</li> <li>Disclose and discuss the results of the ESIA study</li> </ul>	Local ESIA package NTS of the ESIA ESIA summary presentation	<ul style="list-style-type: none"> <li>Media announcements</li> </ul>	E&S Consultant

The outcomes of these engagements were as follows:

- Community meetings were well attended, and included community members, Mahallas, the Khokimiyat, a women's representative, agricultural department, district ecology, research institutes and also mass media including bloggers and TV channel. This was partly due to the fact that the president visited the area earlier in the week and voiced his support for renewable energy. The meetings were also attended by a representative of Masdar, the EPC contractor and subcontractors of the EPC contractor.

- Introductions were made and contact details were exchanged between local authorities and the EPC contractor representatives.
- The site was visited by the delegation including the area where some early works were underway (building of an office on the project site).
- There were many questions and discussions regarding local employment:
  - The EPC contractor described the hiring process and committed to allocating an HR manager to oversee this.
  - Masdar and the EPC contractor committed to the fact they would implement a local employment plan.
  - The Mahallas explained they had already prepared a database of potential workers in the community and that they would like to be involved in the process of advertising roles.
  - The EPC contractor and GBI explained the level of employment that will be required in the construction phases and operation phases.
  - The community wanted to know when the jobs would start, as many of them travel to Russia for seasonal work and they would like to know if they can stay in the area and work on the project instead as this is their preferred choice. The schedule was explained to them, however it was highlighted that this is subject to change.
  - Community members asked if English language skills would be required. It was explained that this would only be needed for high skill level jobs, particularly in the operation phase, but most low skilled jobs in the construction phase would not need knowledge of English.
  - It was asked if women would benefit from jobs. It was explained that if they have the correct skills they could be included in construction jobs, however the local employment plan would also highlight particular opportunities for women based on their current skillset.
- The Mahallas asked questions about the technology being used at the solar site, the surveys that were undertaken and the benefits that would be experienced by the community. This was addressed by presenting a summary presentation of the ESIA.
- The Mahallas repeated their request to improve the roads and bridges in the community. The EPC contractor committed to improving some of the roads, however no commitment was made to improve the bridges because this was something that would need to be co-ordinated with district level planning.
- The printouts of the ESIA packages (including the NTS) were shared and it was explained where people could access these.
- There was also another explanation of the grievance mechanism and the existing poster was highlighted.

## 5.2 Future Engagement Activities

The future planned engagement methods are divided into the following categories:

- **Notification methods:** Used to inform stakeholders and the general population of the SEP activities and the project development process
- **Disclosure and consultation methods:** Used to provide information to stakeholders or to engage in a two-way dialogue by which information is shared with the stakeholders and these in turn can express their views and concerns about the project
- **External grievance mechanism:** System to receive and facilitate resolution of the stakeholder's concerns and grievances about project-related issues

Table 18 describes the proposed timeline for the stakeholder engagement during the ESIA phase and the tools that are proposed for each stakeholder engagement phase and for each type of stakeholder.

The draft SEP will be updated to account for ongoing engagement during construction and operational phases.

**Table 18. Stakeholder Engagement Programme**

Stakeholder Category	Stakeholder Methods	Engagement Location/ Timeline	Purpose	Consultation Disclosure Materials	Mean of Advance Notification	Responsibility
<b>CONSTRUCTION PHASE</b>						
All stakeholder groups	<ul style="list-style-type: none"> <li>• Disclosure online</li> <li>• Placement of paper versions of the ESIA in public places <b>Error! Bookmark not defined.</b></li> <li>• Leaflets in public places</li> <li>• Media announcements</li> </ul>	Location/Date: [TBC]	<ul style="list-style-type: none"> <li>• Disclose and discuss the construction status and any major events due to take place (component delivery for example)</li> </ul>	Notices	<ul style="list-style-type: none"> <li>• Media announcements</li> <li>• Website announcements.</li> <li>• Notice posted in public locations.</li> </ul>	Client
Regional Government Agencies	One-to-one meeting	Location/Date: [TBC]	<ul style="list-style-type: none"> <li>• Disclose and discuss the construction status and any major events due to take place (component delivery for example)</li> </ul>	Local ESIA package	<ul style="list-style-type: none"> <li>• Personal interaction</li> </ul>	Client
Local libraries	<ul style="list-style-type: none"> <li>• One-to-one meetings</li> <li>• Phone calls</li> <li>• Placement of paper versions of the ESIA in public places <b>Error! Bookmark not defined.</b></li> <li>• Placement of leaflets and grievance forms</li> </ul>	Location/Date: [TBC]	<ul style="list-style-type: none"> <li>• Disclose and discuss the construction status and any major events due to take place (component delivery for example).</li> <li>• Advertise potential employment opportunities</li> <li>• Collect grievance/comment forms</li> </ul>	Local ESIA package	<ul style="list-style-type: none"> <li>• Personal interaction</li> <li>• Notice posted in public locations</li> </ul>	Client
All stakeholder groups	<ul style="list-style-type: none"> <li>• Public event</li> <li>• Placement of leaflets in public places</li> <li>• Media announcements</li> </ul>	Location/Date: [TBC]	<ul style="list-style-type: none"> <li>• Disclose and discuss the construction status and any major events due to take place (component delivery for example)</li> <li>• Inform community of potential employment opportunities</li> <li>• Collect and provide feedback on potential grievances</li> </ul>	Local ESIA package NTS of the ESIA online	<ul style="list-style-type: none"> <li>• Media announcements</li> <li>• Notice posted in public locations</li> </ul>	Client



## 6. Environmental and Social Baseline

### 6.1 Data Sources

The baseline description presented in this chapter has been developed based on the data from the initial Site investigation reports by TYP SA, the primary data collected through the AECOM site visits in September 2021 and November 2021, and supplementary secondary data.

#### 6.1.1 Initial Site Investigations

The environmental and social scoping studies were carried out by TYP SA between December 2019 and November 2020 (TYP SA, 2020c); geotechnical and hydrological studies were completed by TYP SA in June 2020 (TYP SA, 2020a; TYP SA, 2020d).

#### 6.1.2 ESIA Scoping Site Visit

The ESIA scoping Site visit was undertaken in September 2021 by the team from Green Business Innovation. The survey team consisted of biodiversity and socio-economics specialists. The Site visit involved a walkover of the Project Site, the area immediately surrounding the Site, and the proposed transmission line route. Observations included land use, flora and fauna. During the Site visit, the team also conducted a series of meetings and interviews with local authorities and residents.

#### 6.1.3 ESIA Site Visit

The ESIA site visit was undertaken in November 2021 by the team from AECOM and Green Business Innovation. The survey team consisted of biodiversity and socio-economics specialists. The Site visit involved a walkover of the Project Site, the area immediately surrounding the Site, and the proposed transmission line route. Observations included land use, flora and fauna. During the Site visit, the team also conducted further meetings and interviews with local authorities and residents.

#### 6.1.4 Additional Surveys

In addition to the surveys already conducted, AECOM have, or are in the process of, conducting further surveys and assessments. The surveys are:

- Social Compliance Audit (ongoing)
- Livelihood Restoration Plan (ongoing)

## 6.2 Physical Characteristics

### 6.2.1 Climate

#### 6.2.1.1 Current Climate Conditions

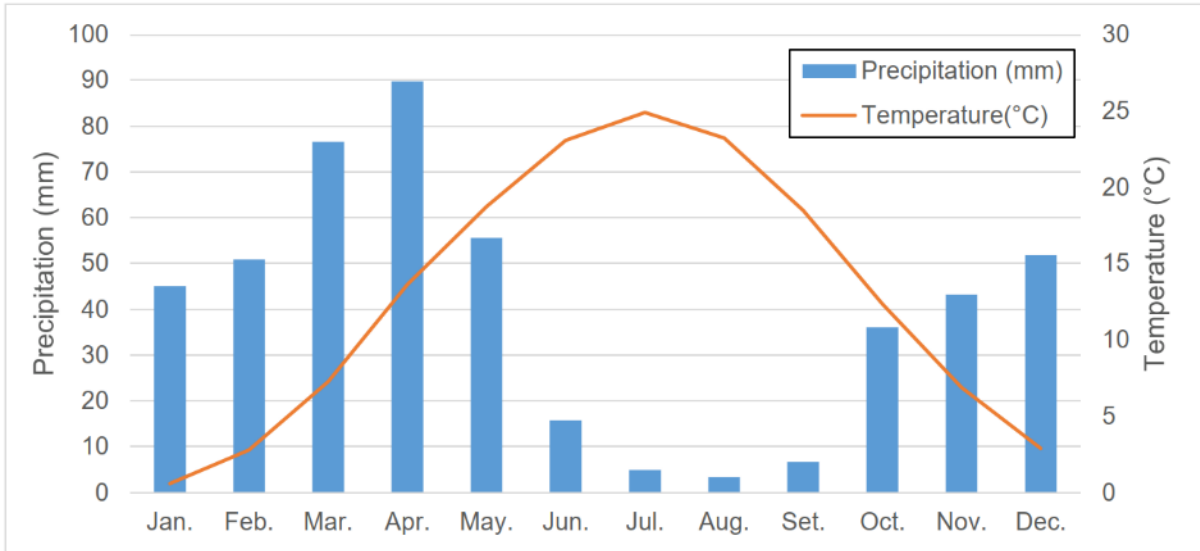
The climate of the Project Area is characterised as a warm temperate climate with hot and dry summers, according to the Köppen-Geiger climate classification (Kottek, Grieser, Beck, Rudolf, & Rubel, 2006).

The climate is continental, dry, with hot (up to +45°C) summer and moderately cold (with an extreme up to -30°C) winter.

The amount of precipitation varies greatly from year to year, from 350 to 450 mm per year. Most of the precipitation falls in autumn, winter and spring. There is almost no precipitation in summer. Heavy rains in spring often cause mudflows.

Due to the open nature of the landscape and lack of vegetation, very strong winds are common at the Site.

Figure 6-1, Figure 6-2 and Figure 6-3 summarise the key climatic parameters of the Solar PV Site based on aggregated historical data from local meteorological stations.



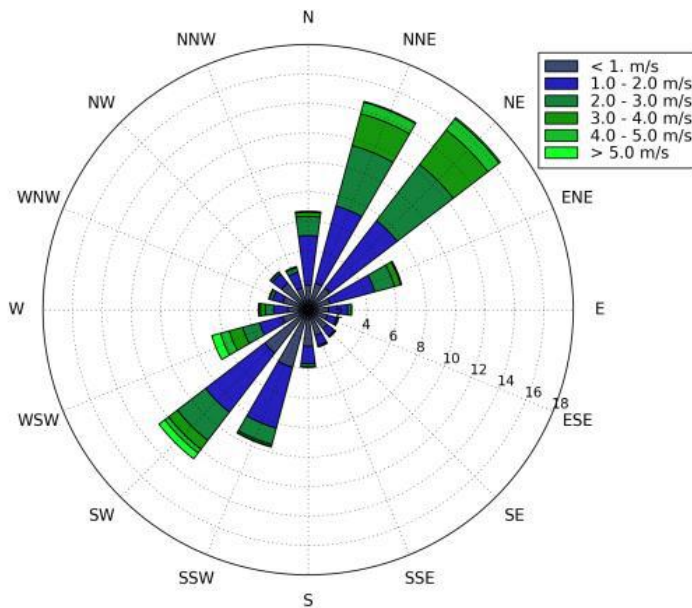
**Figure 6-1. Monthly average temperature and precipitation for the Jizzakh Solar PV Site**

Source: TYPSA, 2020d

Parameter	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Set.	Oct.	Nov.	Dec.	Year
Temperature(°C)	0.58	2.78	7.26	13.64	18.74	23.08	24.90	23.22	18.47	12.36	6.87	2.90	12.9
Precipitation (mm)	45.1	50.9	76.6	89.8	55.6	15.8	4.9	3.3	6.7	36.1	43.2	51.9	480.0
Relative humidity (%)	80	77	76	67	54	38	34	36	39	52	66	80	58.25
Evaporation (mm)	30	20	16	33	110	200	254	223	142	75	54	43	1200
Average wind velocity (m/s)	2.1	2.7	2.8	2.8	2.6	2.4	2.5	2.1	2	1.8	2	1.9	2.3

**Figure 6-2. Monthly average climate statistics for the Jizzakh Solar PV Site**

Source: TYPSA, 2020d

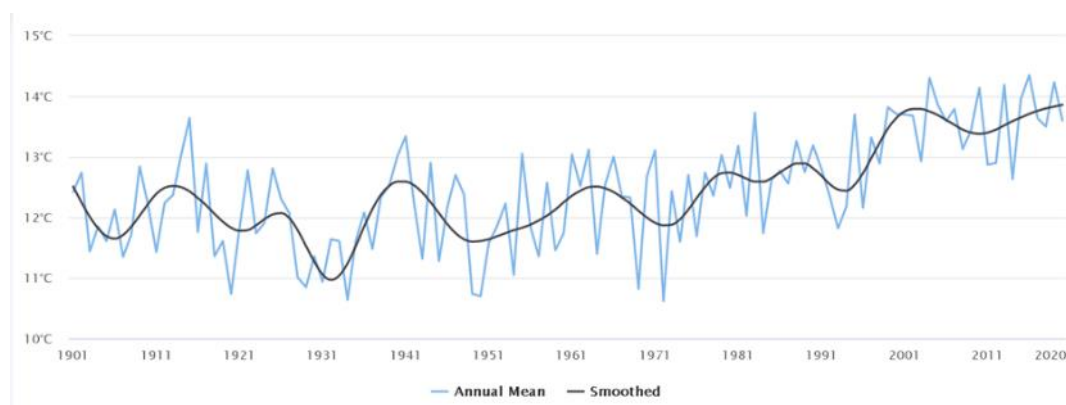


**Figure 6-3. Wind speed and direction at 10 m above ground level at the proposed site (modelled by Solargis)**

Source: TYPSA, 2020c

### 6.2.1.2 Climate Change

Over the last century, Uzbekistan's annual average temperature has increased from 10.7°C in 1920 to 13.6°C in 2020 as illustrated by Figure 6-4 (World Bank Group, 2021). This increasing trend represents a 2.9°C increase in air temperatures during the hundred-year period.



**Figure 6-4. Observed average annual temperature of Uzbekistan from 1901–2020**

Source: World Bank Group, 2021

Over the next 20–30 years, corresponding to the design life of the Project, climate change projections under the high greenhouse gas emission scenario (RCP 8.5) are as follows (World Bank Group, 2021):

- Annual average temperature to increase by 2.4°C
- Number of hot days to increase by 28.6 days
- Number of tropical nights (minimum temperature above 20°C) to increase by over 3
- Uzbekistan will experience a high variability of rainfall across different agroecological and climatic zones
- Increased heat and precipitation variability will lead to increased evapotranspiration in summer months resulting in a decrease in river flowing conditions.

### 6.2.2 Topography

The Solar PV Site area is located on a plateau. Topography is gently undulating, sloping to south and east, towards a watercourse running alongside the north and east boundaries of the Site. To the west of the project area is a rugged steep slope descending towards the valley and the neighbouring makhallas; the western site boundary is set back from this slope to avoid potentially unstable ground. The surface elevations within the site vary from 670m at the southeast corner to 780 m on the northern boundary of the site.

Stream channels and gullies, formed by the seasonal runoff, cross the site from west to east. The depth of the channels and gullies ranges from 0.5m to 3m, in some cases more.



**Figure 6-5. General ground conditions on site**



**Figure 6-6. Example of gullies found on Site**





**Figure 6-7. Example of gullies found on Site looking south**

The transmission line crosses a range of topography from the solar PV site across areas of farmland to then crossing the Sangzor River valley, M39, railway line and Sangzor River to the Saribazar substation.



**Figure 6-8. Route of transmission line**





**Figure 6-9. Sangzor River valley looking north towards the site**



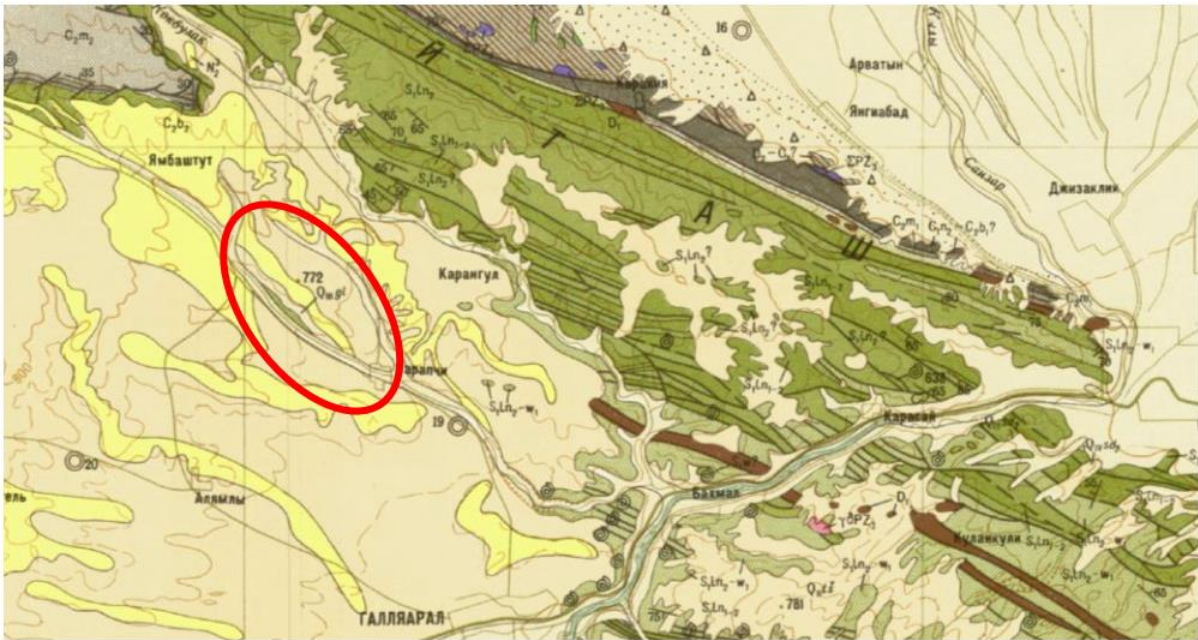
**Figure 6-10. Saribazar substation**

### **6.2.3 Geology and Soils**

A geotechnical survey was performed by TYP SA and consisted of 2 boreholes, 23 trial pits, 18 dynamic cone probing tests, 7 vertical electrical soundings, 7 thermal resistance measurement and 2 seismic refraction profiles (TYP SA, 2020a).

Geomorphologically, the study site is confined to the deluvial-proluvial slope of the Koytash foothill plain, composed of a mid-Quaternary sedimentary complex (d-pQllts) (Figure 6-11). The ground is composed mainly by piedmont deposits formed by alternating layers of gravels and sands (TYP SA, 2020a).





**Figure 6-11. Project area on geological map**

Source: TYPSA, 2020a

Layers with gravels are in the surface terrain of the upper part of the most elevated areas of the plot. Between them the slightly low areas have predominance of sands in the surface of the terrain. This could reflect the alternance of layers with gravels or sands (Figure 6-12).



**Figure 6-12. Piedmont deposits**

Source: TYPSA, 2020a

Carbonate and dark limestone rock outcrops are found to the east of the Site boundary (Figure 6-13). Within some gullies in the area it is observed that this rock substratum is overlain by 4–5 m of alternating layers of gravels and sands.



**Figure 6-13. Rock outcrops (to the east of the Site boundary)**

Three main geotechnical units have been identified at the site:

- Top soil. The first 0 to 30 cm below ground level consist of a top layer extended all over the Solar PV Site. Soils are typical grey soils.
- EGE-1. Loams, sandy loams, loess-like, highly porous. The layer thickness ranges from 2.8 m to 5.6 m, with an average value of 4.3 m. When soaking, samples of soils exhibit subsidence; 60% of the tests shows very loose to loose compacity up to 2.10 m depth.
- EGE-2. Rubble soil with loamy filler up to 20–40%, heterogenous, low degree of water saturation, saline (d-pQIIts), very dense. The thickness observed varies from 16.3 m to 22.7 m, with an average value of 19.4 m.

#### **6.2.4 Hydrology and Hydrogeology**

The predominant hydrological regime on site is a result of snow melt and rainfall. There are no permanent waterbodies within the Solar PV Site. Gullies, running through the site in west to east direction, have been formed by the surface run-off caused by the slope and past land use on site.

There are two seasonal watercourses near the Solar PV Site boundaries (see Figure 6-14):

- One running alongside the northern and eastern boundary. This watercourse receives the drainage from the gullies
- One running generally parallel to the southern and western boundary, through Kyzyltut and Karakchi settlements.
- Both watercourses converge within the Karakchi settlement south of the Solar PV Site.





**Figure 6-14. Surface water. Location of waterbodies (blue) and gullies (brown)**

Source: TYP SA, 2020c



**Figure 6-15. Seasonal watercourse on the eastern boundary**





**Figure 6-16. Seasonal watercourse delineating the eastern boundary (from the black rock)**

Downstream of Karakchi the watercourse becomes permanent and is used by the local villages for irrigation purposes.



**Figure 6-17. Watercourse downstream at Karakchi**

Heavy rainfall events in spring cause mudflows in both watercourses. During the mudflows, the water level in the watercourse near the makhallas reportedly rises by 3 to 4 meters and mudflows contain



sand, rocks, mud, and on occasion, dead cattle. Mudflows in the watercourse north of the site contain mainly sand and rocks. Community members report that during mudflows, water levels recede quickly (in approximately one day after the mudflow). The watercourses are used only for livestock.

The makhalla residents use wells for drinking water. Local residents report that groundwater depth in their communities is 5–15 m below ground level (mbgl) (TYP SA, 2020c). Groundwater depth at the boreholes installed at the Solar PV Site as part of the site investigation was found to be 35–40 mbgl (TYP SA, 2020c).

According to the map of the regional groundwater resources (Figure 6-18), the Solar PV Site is located within the Galliaral deposit. This deposit is characterised by the regional resources of approximately 47,000 m<sup>3</sup>/day, and approved reserves of 9,450 m<sup>3</sup>/day. The indicated mineralisation is 0.8 g/l, hardness 9 mg<sub>eq</sub>/l (very soft).

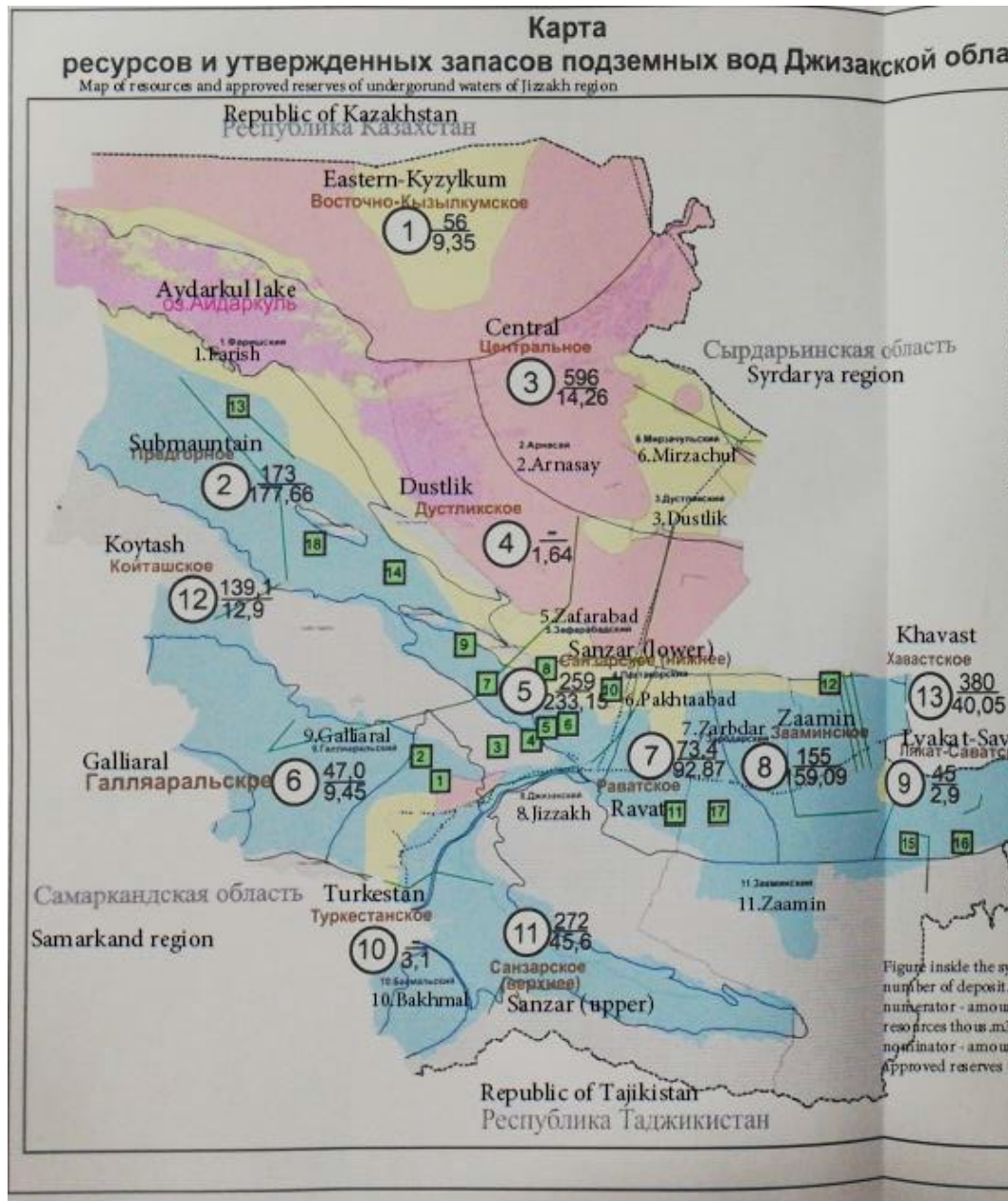
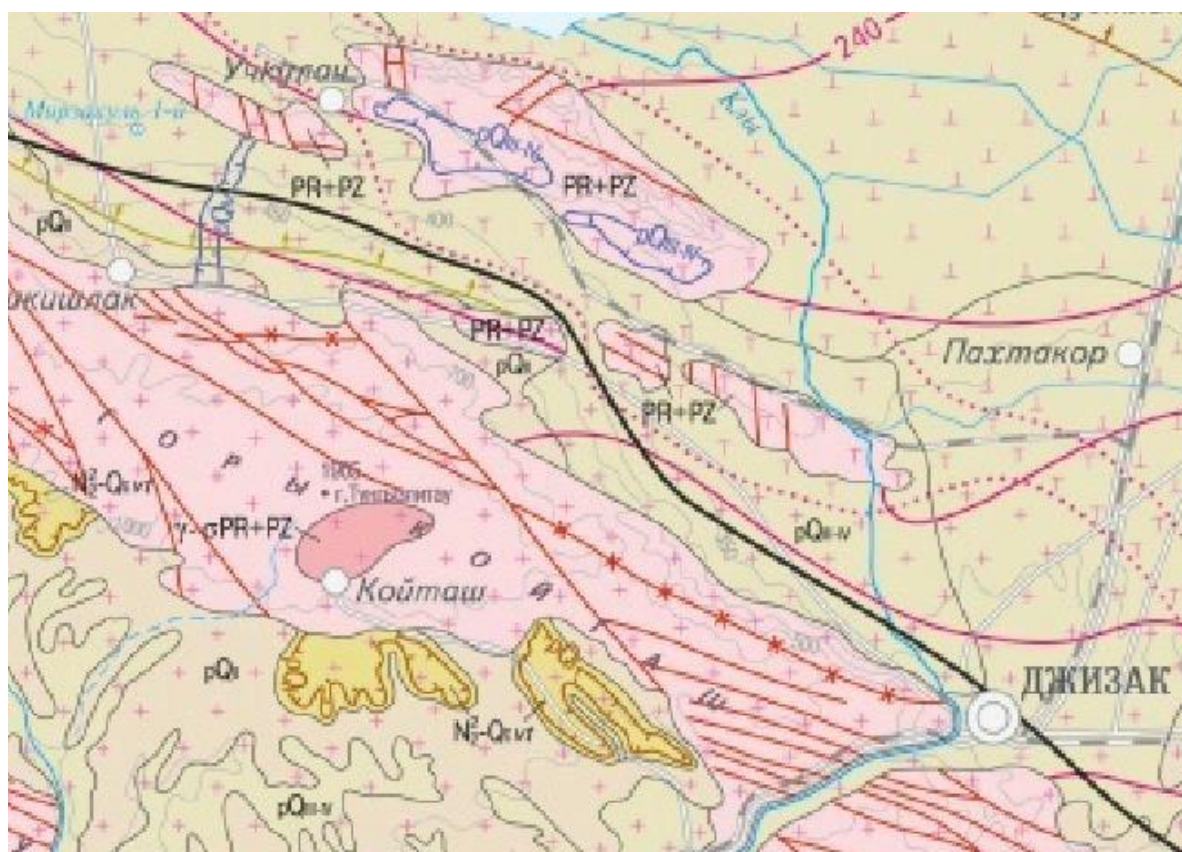


Figure 6-18. Groundwater resources in the Project area

Source: TYP SA, 2020c



**Figure 6-19. Project area in hydrogeological map**

Source: TYP SA, 2020a

### 6.2.5 Utilities

There are no known utilities passing through the Solar PV Site. The neighbouring villages are supplied by electricity and gas.

### 6.2.6 Air Quality

No routine air quality monitoring is carried out in the area. The nearest national air quality monitoring stations are located in the cities of Samarkand and Gulistan, 70 km and 100 km away respectively, and are not considered representative of the air quality in the Project Area.

The District khokimiyat assumes air quality is good, given the absence of any major sources of air pollution in the area (TYP SA, 2020c). Potential existing sources of air pollutants in the Project Area would be vehicles, the use of fuel for domestic purposes, and wind-blown dust from bare soil and unmade tracks.

### 6.2.7 Noise, Vibration and Light

The Solar PV Site is located in a rural setting in the vicinity of small villages. The soundscape is dominated by wind, sounds of wildlife, grazing animals, and human activities such as occasional cars passing by or through the Site. Nearest sources of light are associated with the nearby villages.

## 6.3 Landscape and Visual

The establishment of baseline conditions of the landscape and visual resource has involved a desk study subsequently verified through field work, GIS/computer analysis, and informed by local knowledge. This section provides a description and analysis of the existing landscape designations, landscape character areas/types, and existing visual resource. The Study Area contains a number of landscape and visual receptors, including settlements, local routes and a range of distinctive landscape elements.

Key terms used in this baseline description and subsequent impact assessment are:

- Landscape character areas (LCAs): Areas which are unique, discrete geographical areas of the landscape which demonstrate a series of recognisable features and characteristics.
- Visual amenity: The overall pleasantness of the views of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating, visiting or travelling through the area.
- Representative viewpoints: Views selected to represent the experience of diverse types of visual receptor (such as local resident, recreational visitor, passer-by), where larger numbers of viewpoints cannot be included individually and where significant effects are unlikely to differ.

### **6.3.1 Baseline data collection**

The extent of the study area is informed by the potential visibility of the Project in the surrounding landscape and is proportionate to its size and the nature of the surrounding landscape. For the purposes of this assessment the study area shown on Figure 6-20 has been defined by the zone of theoretical visibility (ZTV) analysis and professional judgement. Based upon this it is considered that it is highly unlikely that significant long-term residual effects will be possible from further than 10 km from the Site boundary.



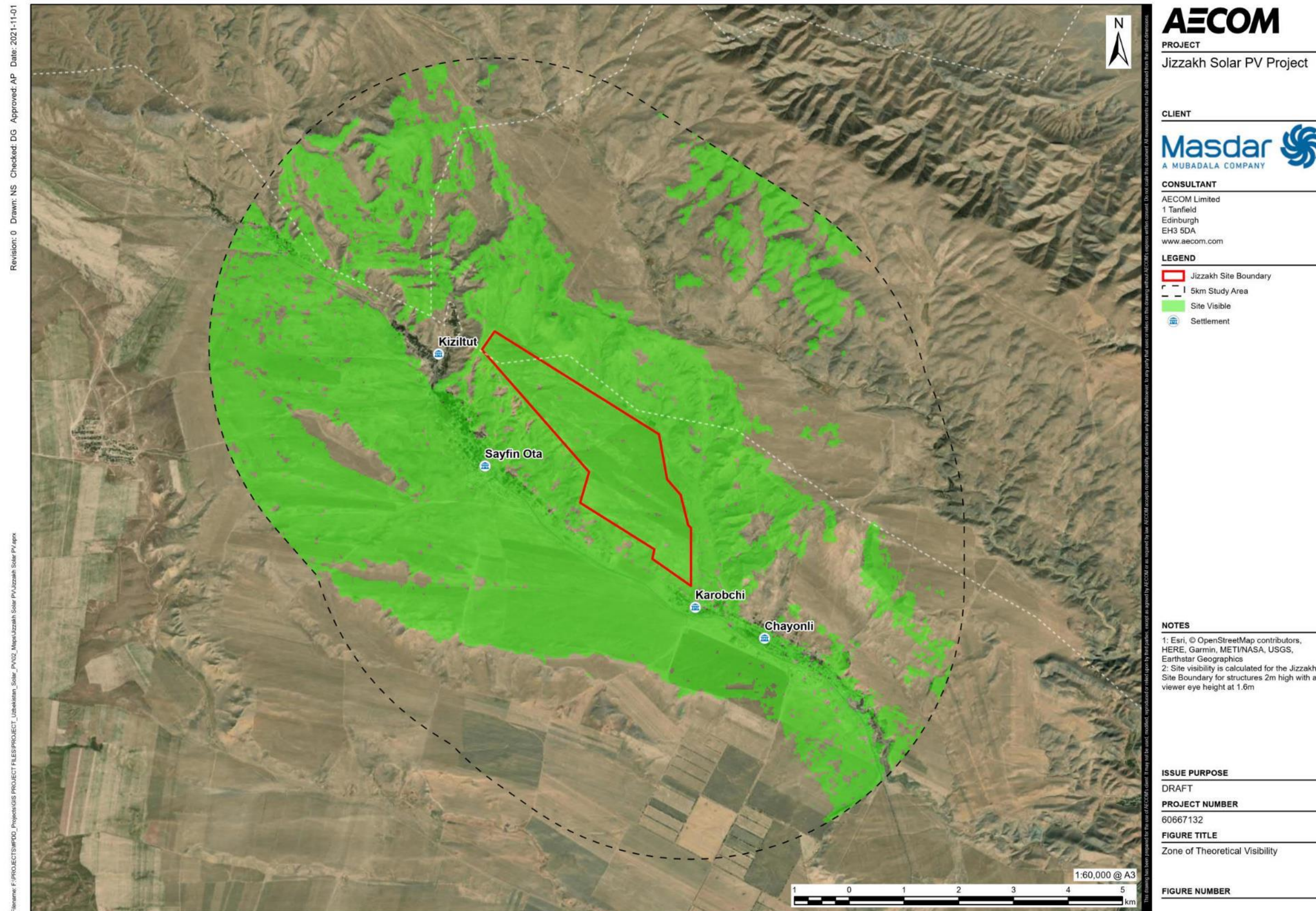


Figure 6-20. Zone of theoretical visibility



### 6.3.1.1 Data Sources

The approach to the landscape and visual assessment has been devised to address the specific effects likely to result from a development of this scale and nature. The methodology draws upon the following established good practice guidance, based predominantly on UK guidance:

- UK Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3) (Landscape Institute and Institute of Environmental Management and Assessment, 2013); and
- Visual Representations of Development Proposals, Technical Guidance Note 06/19 (Landscape Institute, 2019).

The landscape and visual assessments are primarily desk based and informed by Site photography. There are no published Landscape Character Assessments for Uzbekistan; therefore, for the purpose of this assessment, and in the absence of existing specific datasets, GIS and mapping have been used to develop landscape character areas relevant to this Project and Study Area.

It is proposed that the visual assessment be based on 6 viewpoints which will be selected to represent the experience of the different types of visual receptor where significant visual impacts are most likely to result.

### 6.3.1.2 Receptor Sensitivity

Landscape sensitivity to change has been determined by employing professional judgement to combine and analyse the identified value and susceptibility and has been defined with reference to the three-point scale outlined in Table 19.

**Table 19. Sensitivity of Landscape Receptors**

Classification	Criteria
High	Landscape of national or regional value with distinctive elements and characteristics, considered to have a limited ability to absorb the type of change proposed without fundamentally altering the key characteristics.
Medium	Landscape of regional or local value, or rarity, exhibiting some distinct elements / features, considered tolerant of some degree of the type of change proposed without fundamentally altering the key characteristics.
Low	Landscape with few distinctive elements / features or valued characteristics and considered tolerant of a large degree of the type of change proposed without fundamentally altering the key characteristics.

Visual sensitivity to change has been determined by professional judgement to combine and analyse the identified value and susceptibility and has been defined with reference to the three-point scale outlined in Table 20.

**Table 20. Sensitivity of Visual Receptors**

Classification	Criteria
High	Locations where receptors experience an impressive or well composed view containing few detracting elements, with limited ability to absorb change.
Medium	Locations where receptors experience a valued view which generally represents a pleasing composition but may include some detracting features and is tolerant of a degree of change.
Low	Locations where the view is incidental or not important to the receptors and the nature of the view is of limited value or poorly composed with numerous detracting features and is tolerant of a large degree of change.

### 6.3.2 Current landscape condition

The Solar PV Site is located at the top of a hilly plateau that stretches from northwest to southeast. The area is a dry steppe with sparse, low level vegetation, allowing for long views in all directions.

Key visual receptors are the nearby settlements.





**Figure 6-21. Site landscape, September 2021**

### 6.3.3 Landscape character areas

Desk based analysis identified three Landscape Character Areas within the 10 km study area. The description, key characteristics, likely trends and consideration of landscape value of each are detailed below. Project Landscape Character Areas are described in Table 21.

**Table 21. Landscape character areas**

LCA	Description
LCA1 Hills and plateau	This is the LCA where the site is located. The LCA is a mix of hills with flat plateaus mainly used for grazing and arable cultivation. Visibility is likely to be fairly limited within the hillier parts of the LCA. As can be seen from the ZTV, the project is generally screened to the north and east by the surrounding topography. Views would be experienced from the tops of hills overlooking the site area but such views are not deemed to be important by the local community. The LCA has no distinctive features and is generic across the region. The significant screening provided by surrounding topography and limited receptors result in the sensitivity being assessed as Low.
LCA2 River valleys with small settlements	This LCA is characterised by the ephemeral river valleys that have provided a source of water and has thus concentrated human settlement. The main vertical features of the LCA are the houses and associated transmission lines. The small watercourse is littered with rubbish from the local villages and regularly dammed with the water abstracted for irrigation purposes. The overall character of the LCA is that of small-scale agriculture. There are no distinctive features associated with this LCA. This and the combination if screening provided by topography, buildings and trees result in a Low sensitivity landscape.
LCA3 Farmlands	The LCA is characterised by medium sized agricultural fields and irrigation channels associated with the residential edge of Galloarol and surrounding villages. Transmission lines and pylons cross this LCA and roads with aboveground gas pipes running alongside provide the main linear features. A key feature of this LCA is the sense of openness particularly when viewed from slightly higher points in the LCA. The LCA has no distinctive features when considered against the generic steppe landscape across the wider region. The project would be screened from many parts of the LCA by the topography meaning only parts of the LCA to the west of the project would be viewed from the LCA. The inclusion of the project would be viewed against a backdrop of hills and below the horizon with the project becoming a less distinct part of the overall landscape. As a result the sensitivity of the LCA is assessed to be Low.



**Figure 6-22. LCA1 Hills and plateau**



**Figure 6-23. LCA2 River valleys and small settlements**





**Figure 6-24. LCA3 Farmlands**

### 6.3.4 Visual Receptors

Visual receptors within the scope of this assessment will be grouped into the following categories:

- Views from residential settlements.
- Transient views from nearby roads.
- Views from recreational/access routes and places of interest.

Given the fairly limited extend of the ZTV a total of three VPs were chosen to represent both close and distant views. There are described below.

**Table 22. Viewpoints**

VP	Description
VP1 Substation	The VP is located on the northern side of the Sarzobor substation on a higher plateau above the M39 and river valley. This VP is representative of the more distant views of the project from a southerly direction and from the higher areas around Gallaorol, the main population centre in the project AOI. The main vertical features in the near ground view are electricity pylons and the river valley that drops approximately 80m from the VP. The overall character is industrial and man made elements. The river has been heavily modified and the highway and railway run alongside it. In the distance on the northern side of the valley, an overhead line runs parallel with the valley across the field of view providing the main vertical element to the mid ground view. Visibility was not particularly good when the photographs were taken and as a result the project site was a very indistinct part of the view, below the level of the horizon with the overall view framed by the mountains in the distance. At this distance the project occupies a very small horizontal element of the field of view with the expansiveness of the view to the north and northwest becoming the dominant factor. As a result the sensitivity is deemed to be Low.
VP2 School	This VP is taken from a small school on the western side of the minor road from Gallaorol to Karakchi approximately 760m south from the edge of the Solar PV site. The VP is representative of views from the west of the site and transient views experienced by drivers travelling along the road. The dominant elements of the VP are the near-ground structures such as overhead lines,

VP	Description
	trees and single storey dwellings. The project site and hills are visible in the middle and far ground but it is the overhead lines that are the dominant vertical feature of the VP, viewed above the horizon. As noted elsewhere the small watercourse running on the opposite side of the road is littered with rubbish from the local villages and regularly dammed with the water abstracted for irrigation purposes. There are no specific features of interest associated with this VP. This and the combination of screening provided by topography, buildings and trees result in a Low sensitivity view.
VP3 Council buildings	This VP is close to the council buildings and school in the village of Karakchi, approximately 2.6 km southeast of the edge of the solar PV site. The VP is representative of views from inside the nearby villages. As noted in VP2, the dominant elements of the VP are the near-ground structures such as overhead lines, trees and single storey dwellings. The project site and hills are visible in the middle and far ground but it is the overhead lines and houses that are the dominant vertical feature of the VP, also above the horizon. The project would be visible behind the houses but would be screened by the near-ground features. There are no specific features of interest associated with this VP. This and the combination of screening provided by topography, buildings and trees result in a Low sensitivity view.

## 6.4 Biodiversity

### 6.4.1 Introduction

The Project site (the Solar PV site and the 14.77 km Overhead Line) is located within an undulating hilly area of historically cultivated pastureland and more modern agro-landscapes, adjacent to several rural settlements in the Gallaorol District in the region of Jizzakh.

The Solar PV site sits on a flat elevated plateau with small undulating topography reflecting the alternance of layers with gravels or sands (piedmont deposits). The height of the middle of the Solar PV site is 744 meters above sea level (the plot ranges from 671 m to 808 m above sea level), sloping from northwest to southeast, cut by dry streams (sai) and ravines conveying run-off flowing north/northeast towards a watercourse adjacent to the northern/eastern boundary of the site. To the south-west of the Solar PV site is a rugged steep slope descending towards the valley and the neighbouring villages of Karobchi and Sayfin Ota.

The proposed Overhead Line is routed west-east from the Solar PV through a predominantly undulating intensively cultivated and irrigated agricultural landscape, before crossing the Sanzar river valley and associated Tashkent-Samarkand highway to the existing Saribazar substation.

This section documents the ecological importance of the Project site and identifies species or habitats that may be subject to further mitigation during construction, operation and decommissioning of the Project.

#### 6.4.1.1 Ecological Assessment – TYP SA/IFC

The ecological baseline is informed by ornithological surveys undertaken by TYP SA in 2020<sup>19</sup> and 2021<sup>20</sup>.

#### 6.4.1.2 Ecological Assessment - AECOM

The ecological baseline is also informed by the ecological field surveys and consultations undertaken by AECOM in 2021 and 2022. Further details are provided in Section 6.4.7 (field survey methodologies), Section 6.4.8 (details of consultations which were undertaken) and Section 6.4.9 (Ecological Baseline).

#### 6.4.1.3 Ecological Assessment – Turnstone Ecology

A Critical Habitat Assessment (CHA) was prepared by Turnstone Ecology in 2022. The CHA was completed in line with IFC Performance Standard 6 (PS 6) and EBRD Performance Requirement 6

<sup>19</sup> TYP SA/IFC (2020). Environmental and Social Scoping Report – Jizzakh Solar PV Project. February 2020

<sup>20</sup> Tysa, 2021. Great Bustard Winter Survey – Kattakurgan and Jizzakh Solar PV Projects

(PR 6) and the corresponding Guidance Notes (GN), as well as the ADB Safeguarding Policy Statement to identify if sections of the Project area are considered as Critical Habitat.

This CHA aims to:

- Identify Critical Habitat qualifying species or habitats, Priority Biodiversity Features (PBF) and Natural Habitat associated with the Project; and
- Highlight future actions for the Project where applicable, including identification and filling of data gaps and the need for additional field surveys as well as outline details to be included in a standalone Biodiversity Action Plan (BAP).

The CHA report is included in Appendix D.

#### 6.4.1.4 Ornithological Assessment Overview

The likelihood of the Project site being used as a stopover and/or migration flyway for migrating birds has been investigated. The following sections provide further background information relevant to the assessment of ornithological baseline conditions and the assessment of potential impacts which are generally applicable for solar and power line projects:

- An overview of the potential 'lake effect' of solar panels is provided in Section 6.4.2.
- An overview of potential impacts of overhead powerlines on birds is provided in Section 6.4.3.
- The relevant key biodiversity areas for birds are detailed in Section 6.4.4.
- The details of migration flyways in Uzbekistan are provided in Section 6.4.5.
- A summary of the avifauna of Uzbekistan is provided in Section 6.4.6.
- Subsequent sections of the biodiversity baseline section are structured as follows:

#### 6.4.2 Overview of the potential 'Lake Effect' of Solar Panels

A number of unsubstantiated or unverifiable concerns have been raised in relation to the potential of solar PV arrays to mimic waterbodies resulting in bird collisions with the solar panels. The potential ornithological impacts of solar PV installations are poorly understood and there is no coherent guidance worldwide on the potential ecological effects of new and existing solar PV developments.

To date there are no experimental studies in the peer reviewed scientific literature that attempt to quantify the direct impact of PV solar farms on birds purely from an ecological perspective. The attraction of birds to solar PV installations was recognized as a concern by a focus group held to determine the potential hazards of large-scale PV development at airports (Wybo, 2013)<sup>21</sup>. The main attractant for birds recognized by Wybo (2013) was the potential for solar arrays to be used as nesting grounds; however, this claim was not supported with evidence. DeVault *et al.* (2014)<sup>22</sup> examined whether birds were more likely to use habitat at PV installations than nearby airfield grassland. The study stated that birds were rarely observed foraging on or near PV arrays. In terms of collision risk, DeVault *et al.* (2014) observed no obvious evidence for bird casualty caused by solar panels, despite conducting 515 bird surveys at solar PV sites.

Toral and Figuerola (2010)<sup>23</sup> state that the installation of solar farms on land used for rice cultivation would be detrimental to some water bird species. This claim is based on the study's findings that land used to cultivate rice in south-west Spain is used as habitat by some migratory water bird species, rather than any specific impact of solar farms. It is also suggested that the construction of solar farms will result in the loss of wetlands in southern Europe; however, no citation providing evidence of a negative impact of solar farms is presented. It is AECOM's view that the negative impacts reported are a result of changes to habitats and land use rather than the specific impact of any particular technology.

Photovoltaic panels have been shown to reflect polarised light that is attractive to polarotactic aquatic insects, which confuse solar panels with water and attempt to lay eggs on the surface, resulting in

<sup>21</sup> Wybo, J.-L. (2013) 'Large-scale photovoltaic systems in airports areas: safety concerns. Renewable and Sustainable Energy Reviews, 21, May, pp. 402–410.

<sup>22</sup> DeVault, T. L. *et al.* Bird use of solar photovoltaic installations at US airports: implications for aviation safety. *Landsc. Urban Plan.* 122, 122–128 (2014).

<sup>23</sup> Toral, G. M. and Figuerola, J. (2010) 'Unraveling the importance of rice fields for waterbird populations in Europe.' *Biodiversity and Conservation*. Department of Wetland Ecology, Doñana Biological Station, Avda. Américo Vespucio s/n 41092, P.O. Box 1056, 41080 Seville, Spain, 19(12) pp. 3459–3469.



mortality and reproductive failure (Horváth *et al.*, 2010<sup>24</sup>; Blahó *et al.*, 2012<sup>25</sup>). Insectivorous predators have been recorded feeding on polarotactic insects attracted to sources of polarised light such as vertical glass windows, horizontal black plastic sheets and dry asphalt roads (Kriska *et al.*, 1998<sup>26</sup>; Bernáth *et al.*, 2008<sup>27</sup>; Horváth *et al.*, 2009<sup>28</sup>). Bernáth *et al.* (2001)<sup>29</sup> describe birds such as Black Kite (*Milvus migrans*), Great White Egret (*Ardea alba*) and Swallow (*Hirundo rustica*) attempting to drink from plastic sheets, hypothesising that this behaviour may be due to an attraction to surfaces reflecting polarised light. The study also describes the mortality of birds at a waste oil lake in Hungary, again attributing this to the direct attraction to polarised light or to insects attracted to polarised light. As solar PV panels are solid, if this hypothesis is correct, there is unlikely to be a significant hazard to perched birds attempting to drink, however Swallows and related birds could be presented with a collision risk as hirundines are known to drink 'on the wing' (Bryant *et al.*, 1984)<sup>30</sup>.

In summary, little scientific evidence exists that demonstrates a direct impact of solar PV on birds. It is likely that different avian species are likely to be affected differently by solar developments, dependent on the habitat within and around a solar PV development, the spatial requirements of a given species (e.g. flocking species that require large areas to host the flock) and the foraging behaviour of a given species.

A review was commissioned by Natural England (Harrison *et al.* 2017<sup>31</sup>) to gather evidence from scientific literature to provide a comprehensive report on current understanding of the potential ecological impacts of solar PV developments. The conclusions reached in the Natural England study has been referred to and the Solar Park was considered in terms of:

- the habitat available prior to the development,
- the habitat that will co-occur with the development; and
- the potential for attraction to polarotactic insect species (i.e. is the development close to a water body).

In the case of the Solar PV site being considered, there are no features nearby that would suggest that the habitat is particularly sensitive or attractive to migrating birds. There are two ephemeral watercourses on the north and south boundary of the site that may attract polarotactic insect species and hence attract insectivorous bird species during certain times of the year. However, only a limited number and type of species were recorded during site surveys. It is not considered that the Solar Park would result in an increase in species diversity. As a result, no features have been identified that could potentially increase the collision risk of migrating or resident species colliding with the solar panels. As noted in DeVault *et al.* (2014) no obvious evidence was identified of bird casualty caused by solar panels after conducting 515 bird surveys at solar PV sites. Therefore, it is AECOM's opinion that the Solar PV will not result in a 'lake effect' and poses no direct risk to migrating or resident birds. This suggested effect has not been considered further.

### 6.4.3 Overview of Potential Impacts of Overhead Powerlines on Birds

Mortality due to collision is considered to represent one of the most important adverse effects of overhead power lines on birds. Birds collide with power lines because they can be difficult to see, although the degree of collision risk depends on a number of factors. These relate to the species and their behaviour, various environmental factors and the type and design of the power lines. In the 'typical'

<sup>24</sup> Horváth, G., Blahó, M., Egri, Á., Kriska, G., Seres, I. and Robertson, B. (2010) 'Reducing the maladaptive attractiveness of solar panels to polarotactic insects.' *Conservation Biology*, 24(6) pp. 1644–1653.

<sup>25</sup> Blahó, M., Egri, Á., Barta, A., Antoni, G., Kriska, G. and Horváth, G. (2012) 'How can horseflies be captured by solar panels? A new concept of tabanid traps using light polarization and electricity produced by photovoltaics.' *Veterinary parasitology*, 189(2–4) pp. 353–65.

<sup>26</sup> Kriska, G., Horváth, G. and Andrikovics, S. (1998) 'Why do mayflies lay their eggs en masse on dry asphalt roads? Water-imitating polarized light reflected from asphalt attracts Ephemeroptera.' *The Journal of experimental biology*, 201(Pt 15) pp. 2273–86.

<sup>27</sup> Bernáth, B., Kriska, G., Suhai, B. and Horváth, G. (2008) 'Wagtails (Aves: Motacillidae) as insect indicators on plastic sheets attracting polarotactic aquatic insects.' *Acta Zoologica Academiae Scientiarum Hungaricae. Hungarian Natural History Museum, Budapest*, 54(1) pp. 145–155.

<sup>28</sup> Horváth, G., Kriska, G., Malik, P. and Robertson, B. (2009). Polarized light pollution: a new kind of ecological photopollution. *Frontiers in Ecology and the Environment*. Volume 7, Issue 6. August 2009. pp 317-325

<sup>29</sup> Bernáth, B., Szedenics, G., Molnár, G., Kriska, G. and Horváth, G. (2001) 'Visual ecological impact of a peculiar waste oil lake on the avifauna: dual choice field experiments with waterseeking birds using huge shiny black and white plastic sheets.' *Arch Nature Conserv Landsc Res*, 40 pp. 1–28.

<sup>30</sup> Bryant, D. M., Hails, C. J. and Tatner, P. (1984) 'Reproductive Energetics of Two Tropical Bird Species.' *The Auk. American Ornithologists' Union*, 101(1) pp. 25–37.

<sup>31</sup> Harrison, C., Lloyd, H. and Field, C. (on behalf of Natural England (2017)). Evidence review of the impact of solar farms on birds, bats and general ecology (NEER012). 1st edition - 9th March 2017

wire arrangement for steel lattice tower supported high voltage lines it is the relatively thin earth wire (or ground wire) rather than the thicker conductors that is thought to present the greatest collision risk to birds (e.g. Alonso et al. 1994)<sup>32</sup>. Collisions are not thought to be random but are often concentrated in relatively short sections of a power line, where the various influencing factors can interact to create a collision problem or “hotspot” (e.g. Morkill & Anderson 1990<sup>33</sup>; Guyonne et al. 1998<sup>34</sup>).

Scottish Natural Heritage (SNH, 2016)<sup>35</sup> and Birdlife International (Birdlife, International, 2007<sup>36</sup>) have issued guidance regarding the effects of power lines on birds. Within this guidance, large and medium sized birds are highlighted as being the most sensitive (or potentially sensitive) to collision with overhead powerlines: storks, raptors, bustards, cranes, waterfowl and sandgrouse are included. This relatively high susceptibility of these species groups to collision is thought to be due to a number of ecological and biological factors such as: their need to regularly commute between separate roosting and foraging sites often in low light levels; their flocking and migratory behaviour; their large size and relatively poor manoeuvrability in flight; and their monocular vision (which reduces depth perception in comparison to species with binocular vision). The main potential hazards to birds from overhead power lines are (SNH 2016, Drewitt & Langston 2008<sup>37</sup>):

- Displacement of birds by the presence of new infrastructure (pylons, overhead wires), which may occur as both the deterrence of bird activity among and close to the pylons and also as a barrier effect to movement of birds across the Project area in the vicinity of new overhead wires. However, for the element of the Project that relates to replacement of existing overhead wires only, then negative impacts relating to barrier to movement are considered unlikely as birds are likely to have become habituated to the existing overhead wire and pylons.
- Habitat loss, fragmentation and / or degradation resulting from the construction of new infrastructure (including the replacement of existing overhead wires and the elements of the Project which relate to new overhead line options).
- Increased bird mortality due to collision with new operational overhead line infrastructure, especially if sited close to congregation sites such as wetlands and migration bottlenecks.

#### 6.4.4 Key Biodiversity Areas – Turkan Lake IBA and Dzhum-Dzhum IBA

Using guidance produced in the UK to determine connectivity with designated sites<sup>38</sup>, the maximum forage areas for key raptor species was up to 15km (white tailed eagle and golden eagle). Other species of wintering geese were recorded foraging up to 25km from roost sites. On the basis of these foraging areas, AECOM applied a search area of double the maximum foraging area in the guidance to account for different species and regional variations.

There are two Important Bird Areas (IBAs) within a 50 km radius from the Project site: Tuzkan Lake IBA (approx. 36km to the north) and Dzhum-Dzhum IBA; the latter is situated in the north-western spurs of the Turkestan mountain range, approximately 25km to the south-east at its closest point to the Project site.

The following figure shows the location of the IBAs relative to the Project site (shown in red).

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<sup>32</sup> Alonso, J.C., Alonso, J.A., Munoz-Pulido, R. (1994). Mitigation of bird collisions with transmission lines through groundwire marking. *Biological Conservation* 67: 129-134.

<sup>33</sup> Morkill, A.E. & Anderson, S.H. (1990). Effectiveness of marking powerlines to reduce sandhill crane collisions. Wyoming Cooperative Fish & Wildlife Research Unit Scottish Natural Heritage

<sup>34</sup> Guyonne, F., Janss, E., and Ferrer, M. (1998). Rate of bird collision with power lines: effects of conductor-marking and static wire-marking. *Journal of Field Ornithology*. 69: 8

<sup>35</sup> Scottish Natural Heritage [SNH] (2016). Assessment and mitigation of impacts of power lines and guyed meteorological masts on birds: Guidance, Version 1 (July 2016). Available at: <https://www.nature.scot/guidance-assessment-and-mitigation-impacts-power-lines-and-guyed-meteorological-masts-birds>

<sup>36</sup> Birdlife International (2007). Position Statement on Birds and Power Lines On the risks to birds from electricity transmission facilities and how to minimise any such adverse effects - adopted by the BirdLife Birds and Habitats Directive Task Force on 10 May 2007. Website:

[https://migratorysoaringbirds.birdlife.org/sites/default/files/BHDTF\\_Position\\_Power\\_Lines\\_and\\_birds\\_2007\\_05\\_10.pdf](https://migratorysoaringbirds.birdlife.org/sites/default/files/BHDTF_Position_Power_Lines_and_birds_2007_05_10.pdf)

<sup>37</sup> Drewitt, A.L. and Langston, R.H.W. (2008). Collision Effects of Wind-power generators and Other Obstacles on Birds. *Annals of the New York Academy of Sciences* 1134(1):233 – 266. DOI: 10.1196/annals.1439.015

<sup>38</sup> Scottish Natural Heritage (2016), Assessing Connectivity with Special Protection Areas (SPAs) – Guidance. Report available at: [www.webarchive.org.uk/wayback/archive/20220726144844mp\\_/https://www.nature.scot/sites/default/files/2018-08/Assessing%20connectivity%20with%20special%20protection%20areas.pdf](http://www.webarchive.org.uk/wayback/archive/20220726144844mp_/https://www.nature.scot/sites/default/files/2018-08/Assessing%20connectivity%20with%20special%20protection%20areas.pdf)



**Figure 6-25. IBAs Relative to the Project Site**

Source: BirdLife International

#### 6.4.4.1 Tuzkan Lake IBA

This 600 km<sup>2</sup> lake, with a length of 35 km, is fed by the Kly River and is partially protected nationally under the Arnasay Nature Sanctuary. According to Kasharov et al. (2009), the lake rarely freezes because its moderate salinity and has rich food supplies and the presence of open water and reeds provides safe roosting areas for waterfowl bird species.

Globally threatened and near threatened species included on the IUCN Red List are: Dalamatan pelican (*Pelecanus crispus*), Pallas's fish eagle (*Haliaeetus leucoryphus*) and cinereous vulture (*Aegypius monachus*), ferruginous duck (*Aythya nyroca*) and Asian dowitcher (*Limnodromus semipalmatus*) occurring on migration<sup>39</sup>.

Field surveys confirm that the Project site does not support any IBA qualifying species. As a result, no appropriate assessment of the impacts on the IBA was deemed necessary.

#### 6.4.4.2 Dzhum-Dzhum IBA

Dzhum-Dzhum IBA is an unprotected river gorge with narrow riverbeds with steep cliffs. The vegetation is mostly formed of xerophytes and an abundance of ephemeral plants. The southern slopes have very few trees whilst the northern slopes have juniper forests. The IBA supports Important bird species including cinereous vulture (*Aegypius monachus*) and bearded vulture (*Gypaetus barbatus*).

Field surveys confirm that the Project site does not contain any of the qualifying features of the IBA or support any IBA qualifying species although it is recognised that *Gypaetus barbatus* was observed flying over the Project site. No appropriate assessment of the impacts on the IBA was deemed necessary.

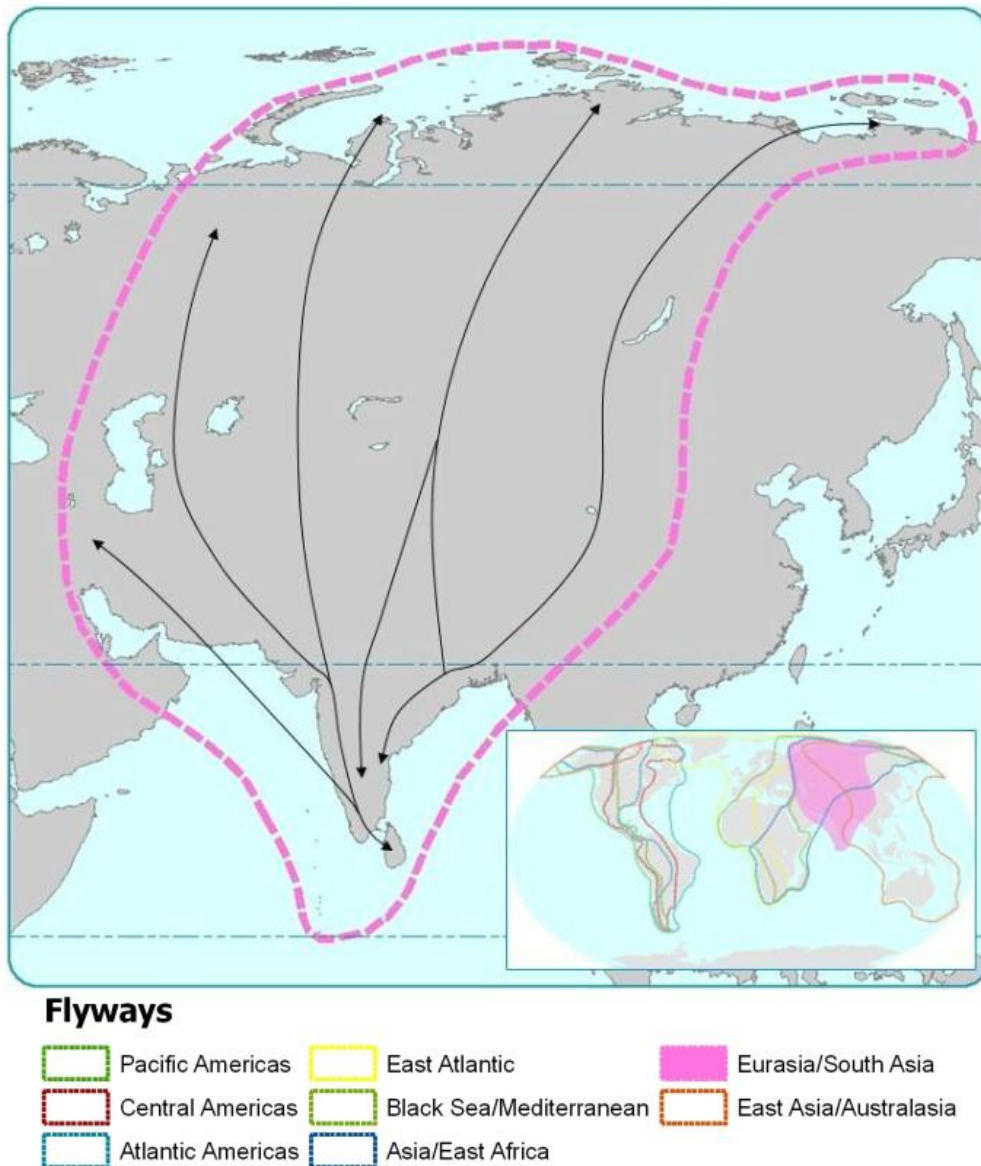
#### 6.4.5 Flyways

A number of important flyways cross Uzbekistan with the Solar PV site lying on the Central Asian Flyway (CAF). The CAF covers a large continental area of Eurasia between the Arctic and Indian Oceans and the associated island chains. The Flyway comprises several important migration routes of waterbirds, most of which extend from the northernmost breeding grounds in the Russian Federation (Siberia) to the southernmost non-breeding (wintering) grounds in West and South Asia, the Maldives and the British Indian Ocean Territory. The birds on their annual migration cross the borders of several countries. Notable migratory species potentially using the CAF and flying over the Project area include the White-

<sup>39</sup> BirdLife International (2022) Important Bird Areas factsheet: Tuzkan Lake. Downloaded from <http://www.birdlife.org> on 16/09/2022.



headed Duck and Sociable Lapwing (see further information under ‘Species of Concern’ below). Furthermore, the Asian–East African Flyway starts from the northern breeding grounds of water birds in Siberia and leads across Asia to East Africa. The larger African–Eurasian flyway covers a wider range of geographies starting from breeding grounds in Europe and Asia to wintering grounds in Africa.



**Figure 6-26. Important Flyways Relative to the Project Site**

Source: BirdLife International (2020) Central Asian Flyway

Geographically the CAF region covers 30 countries of North, Central and South Asia and Trans-Caucasus (including Uzbekistan).

There is an overlap between the CAF and the area of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA), which was concluded in 1995, at The Hague, the Netherlands. Sixteen out of the thirty countries encompassed by the CAF are located in the AEWA Agreement Area (including Uzbekistan).

Uzbekistan’s natural and artificial wetlands are important for migrating and overwintering waterfowl (Lanovenko 2006). More than 50 migratory waterbird species have been recorded on Uzbek wetlands, including at least nine which are globally threatened: dalmatian pelican (*Pelecanus crispus*), lesser white-fronted goose (*Anser erythropus*), white-headed duck (*Oxyura leucocephala*), ferruginous duck



(*Aythya nyroca*), white-tailed eagle (*Haliaeetus albicilla*), red-breasted goose (*Branta ruficollis*), marbled teal (*Marmaronetta angustirostris*), Pallas's sea eagle (*Haliaeetus leucoryphus*) and pygmy cormorant (*Phalacrocorax pygmaeus*).

Notable migratory species potentially using the flyway in the vicinity of the project area include sociable lapwing (*Vanellus gregarius*) [see further information under 'Species of Concern' below].

The CAF is a broad front area there are no specific features within 20 km of the site which could attract migrating birds. The closest feature is the aforementioned Tuzkan Lake IBA, which is attractive to migrating waterfowl, but the project site does not contain any wetland habitat that may attract such species.

Field surveys confirm that the Project site does not sit on an important migration bottleneck or stopover point. No significant numbers of migrating PBFs were recorded on site. As a result, no specific assessment on the impacts on the CAF was deemed necessary.

#### 6.4.6 Avifauna of Uzbekistan Summary

Uzbekistan has a total of approximately 352 bird species with 19 listed as globally threatened. 297 species are migratory with 55 resident species. The species that are most likely to be present, based on a review of desk-based information, are shown in Table 23 below. No species are listed as country endemics.<sup>40</sup>

Of the species below, one avian species categorised as Critically Endangered has been identified (IBAT 7 tool – using a 50 Km buffer) – sociable lapwing. The Tallymerjan area on the Uzbekistan/Turkmenistan border (approx. 140 km south of the project area) has been highlighted as a key stopover site for the eastern flyway, with all birds monitored on the eastern flyway using this site as a stopover site during their migration. It is possible that birds fly over the proposed project site, but it is considered unlikely that the birds could use habitat within the Project site as stopover sites during migration (refer to species account in Species of Concern section below).

**Table 23. Globally threatened bird species occurring in Uzbekistan**

Scientific Name	Common name	Family	IUCN Category
<i>Oxyura leucocephala</i>	White-headed Duck	Anatidae (Ducks, Geese, Swans)	EN
<i>Anser erythropus</i>	Lesser White-fronted Goose	Anatidae (Ducks, Geese, Swans)	VU
<i>Melanitta fusca</i>	Velvet Scoter	Anatidae (Ducks, Geese, Swans)	VU
<i>Marmaronetta angustirostris</i>	Marbled Teal	Anatidae (Ducks, Geese, Swans)	VU
<i>Aythya ferina</i>	Common Pochard	Anatidae (Ducks, Geese, Swans)	VU
<i>Podiceps auritus</i>	Horned Grebe	Podicipedidae (Grebes)	VU
<i>Columba eversmanni</i>	Yellow-eyed Pigeon	Columbidae (Pigeons, Doves)	VU
<i>Streptopelia turtur</i>	European Turtle-dove	Columbidae (Pigeons, Doves)	VU
<i>Leucogeranus leucogeranus</i>	Siberian Crane	Gruidae (Cranes)	CR
<i>Otis tarda</i>	Great Bustard	Otididae (Bustards)	VU
<i>Chlamydotis macqueenii</i>	Asian Houbara	Otididae (Bustards)	VU
<i>Vanellus gregarius</i>	Sociable Lapwing	Charadriidae (Plovers)	CR
<i>Numenius tenuirostris</i>	Slender-billed Curlew	Scolopacidae (Sandpipers, Snipes, Phalaropes)	CR
<i>Neophron percnopterus</i>	Egyptian Vulture	Accipitridae (Hawks, Eagles)	EN
<i>Clanga clanga</i>	Greater Spotted Eagle	Accipitridae (Hawks, Eagles)	VU

<sup>40</sup> BirdLife International (2020) Country profile: Uzbekistan. Available from <http://www.birdlife.org/datazone/country/uzbekistan>. Checked: 2020-02-03

Scientific Name	Common name	Family	IUCN Category
<i>Aquila nipalensis</i>	Steppe Eagle	Accipitridae (Hawks, Eagles)	EN
<i>Aquila heliaca</i>	Eastern Imperial Eagle	Accipitridae (Hawks, Eagles)	VU
<i>Haliaeetus leucoryphus</i>	Pallas's Fish-eagle	Accipitridae (Hawks, Eagles)	EN
<i>Falco cherrug</i>	Saker Falcon	Falconidae (Falcons, Caracaras)	EN

Further assessment was undertaken to determine the species of concern most likely to be present close to the Project site. These are listed in below.

#### 6.4.6.1 Bird Species of Concern Potentially Relevant to the Project Site

Further assessment was undertaken to determine the key species of concern which have the potential to be present within the AOI of the Project site; this is informed by the bird species which are detailed in the Critical Habitat Assessment (Turnstone Ecology, 2022), as recorded present or have a reasonable likelihood of occurrence. These species are listed below.

##### **Sociable lapwing – *Vanellus gregarius***

The sociable lapwing is a strikingly patterned plover species listed as Critically Endangered (CR) by the IUCN.

It is listed as CR due to recent dramatic declines in population size across its range, with an estimated 5,600 pairs remaining globally. It is thought that illegal hunting during migration and on wintering grounds may now be the species primary threat, although the reasons for its recent decline are poorly understood (Birdlife International, 2018).

The species breeds in Northern Kazakhstan during the summer months and a large percentage of the population flies in a south-west direction to spend the winter in Syria and Sudan between September and March. A recently discovered migratory population however migrate to the east to winter in Pakistan, crossing Afghanistan, Turkmenistan and Uzbekistan on their journey, and resting at stopover sites along their route (Birdlife International, 2018). Further information is provided in Donald *et al* (2021)<sup>41</sup> which confirms the two migration flyways from the breeding grounds in Kazakhstan; 'a longer western route (c. 5200 km) west through southern Russia, then south through the Caucasus to wintering areas in Saudi Arabia and eastern Sudan, and a shorter eastern route (c. 2800 km) south through Turkmenistan and Uzbekistan to wintering areas in Pakistan and north-western India. The migration strategy is characterised by infrequent long-distance movements followed by often lengthy stopovers in a small number of staging areas that are used consistently across years, and by high individual and low between-individual consistency in spatial and temporal patterns of movement'.

A single autumn stopover area and a single spring stopover area was identified along the migration route which is geographically relevant to the Project site ie. the aforementioned eastern route. Donald *et al* (2021) suggest that birds are highly faithful to passage and wintering sites. During migration and on the wintering grounds, the species appears to be strongly associated with areas of agriculture, particularly along rivers. In October 2015 the world's largest aggregation in recent years was discovered at a site known as Tallymarzhan (also Tallymerjen), which straddles the border between eastern Turkmenistan and south-western Uzbekistan. This site is located to the south of Qarshi within the Qashqadaryo Region; this region is located to the south of Samarkand Region and is therefore remote from the Jizzakh region where the Project site is located. Additionally, mapped distribution of sight and specimen records shown in Donald *et al* (2020), for the last 50 years (1971-2020), do not correspond to the Jizzakh region where the Project site is located. Although information in Donald *et al* (2021) does not suggest that the Project site is located on a stopover staging area for this species, the tracking data maps do suggest that tracked birds may overfly the region where the Project site is located.

Consultation undertaken by AECOM and the Jizzakh Regional Ecology Department, during a meeting on 23<sup>rd</sup> November 2021, confirmed that the Project site and surrounding locality was unlikely to be a stopover site for Sociable Lapwing during spring and autumn passage. This assessment is supported by information in the Tuzkan Lake IBA factsheet (Birdlife International website: <http://www.birdlife.org>),

<sup>41</sup> Donald P.F., Kamp J., Green R.E., Urazaliyev R., Koshkin M. and Sheldon R.D. Migration strategy, site fidelity and population size of the globally threatened Sociable Lapwing *Vanellus gregarius*. *Journal of Ornithology* (2021) 162:349–367 <https://doi.org/10.1007/s10336-020-01844-y>

which does not list this species as a biodiversity feature of the IBA, which is located in the vicinity of the Project site area.

Surveys for sociable lapwing at the Project site have been carried out by AECOM in September 2022 in accordance with advice provided by ADB. None were recorded during these surveys and therefore the species has been screened out of this assessment as a receptor which utilises the Project site for foraging or resting (ie. migratory stopover). However sociable lapwing is considered as a potential receptor in terms of overflying birds transiting the Project site on migration to and from the favoured breeding and wintering areas which are located outside Uzbekistan.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN

#### **White-headed Duck – *Oxyura leucocephala***

Listed as endangered by the IUCN, this duck species is known to occur in Uzbekistan in winter. It usually occurs within larger wetland systems where there are semi-permanent freshwater, brackish or eutrophic lakes with a fringe of emergent vegetation (BirdLife International, 2019). Major threats include the drainage of appropriate habitat and hybridisation with the north American ruddy duck. White-headed duck is listed as a qualifying feature of the Tuzkan Lake IBA.

Project Aol does not support habitat suitable for this species however transit through the Aol is possible. White-headed duck was not recorded on any surveys and considered that any transitory movements highly unlikely to be of significant numbers.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. This species was not recorded during the baseline surveys undertaken for the project.

#### **Saker Falcon - *Falco cherrug***

The saker falcon is listed as Endangered on the IUCN Red List due to electrocution from power lines, overexploitation for the falcon trade and habitat degradation. The estimated global population of the species is now between 12,200 and 29,600 individuals across its large range, with resident and breeding populations occurring in Uzbekistan. A specialist in hunting in open terrain landscapes such as semi-desert, steppe habitat and agricultural areas, it mainly hunts terrestrial rodents (BirdLife International, 2019). The species is listed as EN on the Red Data Book of Uzbekistan.

There is suitable foraging habitat within the Project site for this species and therefore there is the possibility that this species may occur within the Project site, although there is no reasonable likelihood that the proposed site regularly supports significant populations for this species considering the relatively small size of the cultivated and fallow land present within the site and immediate surrounds in terms of similar habitat which is ubiquitous throughout the region. Saker falcon has been scoped into the assessment on this basis.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. This species was not recorded during the baseline surveys undertaken for the project.

#### **Egyptian Vulture - *Neophron percnopterus***

The project location is within the native breeding range of the Egyptian vulture. Across its large range it faces a variety of threats from lead poisoning, direct or secondary poisoning, electrocution from power lines, collision with wind turbines and reduced food availability due to habitat change and is listed as Endangered on the IUCN Red List and Vulnerable (VU;D) on the Red Data Book of Uzbekistan. Egyptian vulture was recorded at the Project site during the site visit by TYPASA in 2020. Egyptian vulture has been scoped into the assessment on this basis.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF

guidelines as set out in EBRD PR6 GN. This species was recorded during the baseline surveys undertaken for the project (refer to Section 6.4.9.3 below).

#### **Cineros Vulture - *Aegypius monachus***

Cineros vulture is resident in central eastern Uzbekistan and is listed as Near Threatened (NT) by both the IUCN and the Red Data Book of Uzbekistan. According to the Birdlife International (2022) species fact sheet the main threats to this species are direct mortality caused by humans (either accidentally or deliberately [eg. poisoning due to the veterinary drug Diclofenac]) and decreasing availability of food. There is also potential for collision with wind energy turbines and electrocution with powerlines.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. This species was recorded during the baseline surveys undertaken for the project (refer to Section 6.4.9.3 below).

#### **Eurasian Griffon Vulture - *Gyps fulvus***

This species has been subject to declines over its large global range and is threatened by persecution, unintentional poisoning through poison baits, reduction in food supplies and is vulnerable to the effects of wind energy development. It is listed as Least Concern (LC) by the IUCN but it is assigned as Vulnerable (VU:D) on the Red Data Book of Uzbekistan.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. This species was recorded during the baseline surveys undertaken for the project (refer to Section 6.4.9.3 below).

#### **Bearded Vulture - *Gypaetus barbatus***

The main threats to this vulture species include non-target poisoning, direct persecution, habitat degradation, disturbance of breeding birds, inadequate food availability, changes in livestock-rearing practices and collisions with powerlines and wind turbines. It is listed as Near Threatened (NT) by the IUCN but it is assigned as Vulnerable (VU:R) on the Red Data Book of Uzbekistan.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. This species was recorded during the baseline surveys undertaken for the project (refer to Section 6.4.9.3 below).

#### **Pallas's Fish Eagle - *Haliaeetus leucoryphus***

The project area is within the native non-breeding range of this species displayed on the IUCN red list. The species is closely linked to wetland, reservoirs and lake habitats and nests in trees near these water bodies.

The eagle is listed as Endangered largely due to the continued loss and disturbance of wetland and breeding sites across its range, and there are now thought to be between 1000-2499 mature individuals globally. Pallas's fish eagle is not listed as an IBA qualifying feature of the Tuzkan Lake IBA.

There is no suitable aquatic habitat within or adjacent to the Project site and therefore this species is considered no further within this assessment; the likelihood that this species regularly transits the Project site in flight during the winter is negligible considering the unsuitability of the habitat within and surrounding the Project site for this species.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. This species was not recorded during the baseline surveys undertaken for the project.

#### **Golden Eagle - *Aquila chrysaetos***



Golden eagle is resident in Uzbekistan and is listed as Least Concern (LC) by IUCN and Vulnerable (VU:D) under the Red Data Book of Uzbekistan. According to the Birdlife International (2022) species fact sheet the main threats to this species are persecution, prey availability relating to land management changes, electrocution from powerlines, mortality from collision with wind energy turbines.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. This species was recorded during the baseline surveys undertaken for the project (refer to Section 6.4.9.3 below).

#### **Eastern Imperial Eagle - *Aquila heliaca***

This species has a small global population, and is likely to be undergoing continuing declines, primarily as a result of habitat loss and degradation, adult mortality through persecution and collision with powerlines, nest robbing and prey depletion; it is therefore listed by IUCN as Vulnerable and Vulnerable (VU;D) on the Red Data Book of Uzbekistan. Breeding has not been proved but possibly occurs in Uzbekistan (Birdlife International, 2022). Records in East/Central Uzbekistan are likely to wintering or passage birds.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. This species was recorded during the baseline surveys undertaken for the project (refer to Section 6.4.9.3 below).

#### **Steppe Eagle - *Aquila nipalensis***

This species is widespread and occurs in Uzbekistan during its migration between breeding grounds further north and wintering grounds in Africa and on the Indian subcontinent. It is found predominantly in steppe and semi-desert habitats, feeding mainly on small mammals. It has been severely affected by the conversion of steppe habitat to agricultural lands and is adversely affected by power line and wind energy infrastructure. It is listed as Endangered by the IUCN.

Steppe eagle was recorded at the Project site during the AECOM survey visits undertaken in September and November 2021 and has therefore this species has been scoped into the assessment.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. This species was not recorded during any of the baseline surveys which have been undertaken for the project.

#### **Greater Spotted Eagle - *Clanga clanga***

This species has a small population which is suspected to be declining as a result of extensive habitat loss and persistent persecution; it is therefore listed as Vulnerable. It has a fragmented breeding range across Eurasia and Asia, including Russia and Kazakhstan (Birdlife International, 2022). Records in Uzbekistan refer to passage birds.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. A peak of one bird was recorded overflying the project site during the baseline surveys and this species is only likely to occur in low numbers.

#### **Asian Houbara - *Chlamydotis macqueenii***

This species is subject to considerable over-exploitation and declines have been estimated in a large proportion of its total population, thus globally it is estimated and projected to be in rapid population decline over three generations, starting in the past and continuing into the future. This species is therefore listed as IUCN Vulnerable (VU) [Birdlife international, 2022]. It is listed as Vulnerable (VU:D) on the Red Data Book of Uzbekistan. The Project site is within the native breeding (summer visitor) range for this species

Asian houbara bustard was not recorded during the September 2021 and November 2021 surveys. A specific breeding survey for this species was undertaken in April 2022 (refer to Section 6.4.7.4) within

the Solar PV site. No Asian houbara were recorded during the AECOM surveys; therefore, the likelihood that breeding populations are present within the Project Aol is negligible.

The CHA (Turnstone, 2022: Appendix D) did not assess this species as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN. This species was not recorded during the baseline surveys undertaken for the project.

### **Great Bustard - *Otis tarda***

This species has suffered rapid global population reductions across most of its range owing to the loss, degradation and fragmentation of its habitat, hunting and also collision with powerlines. Great bustard therefore qualifies as IUCN Vulnerable (VU) [Birdlife International, 2022]. The species is also assigned Critically Endangered (CR) status under the Red Data Book of Uzbekistan.

This species is a native non-breeding (winter visitor) to the Jizzakh region of Uzbekistan. The migration movements for this species can be triggered by cold weather conditions which are more likely to occur in the Russian/Kazakhstan native breeding range between December-March.

Further details of the known ranges and wintering grounds within the Jizzakh region in relation to the project site are shown in Appendix D (Critical Habitat Assessment, Turnstone Ecology [2022]) which have been informed by the assessment for great bustard undertaken by TYPASA/IFC in the winter of 2020/21 and reported in TYPASA/IFC (2021)<sup>42</sup>.

The Solar PV site and Overhead Line route are not considered to be suitable for this species as a staging or wintering habitat and it is therefore considered that the Project Aol is unlikely to be of critical importance for wintering great bustard within Uzbekistan. This position is echoed in the aforementioned 2021 TYPASA/IFC report which clearly states '*the Project site is likely to be situated outside the area of Critical Habitat*'. That said, the airspace of the Project Aol, including route of the Overhead Line, is likely to be used by birds moving between wintering grounds as well as migrating between wintering and breeding habitats. The EAAA used in the CHA supports significant numbers of the Central Asian population and the thresholds for Critical Habitat are met for Criterion 1. Due to the unsuitability of the terrestrial habitats within the Project Aol the thresholds for Criterion 3 are however not met.

Great Bustards are known to be highly susceptible to collision with overhead lines and the project is in an area with a significant proportion of the Central Asian population of this species. Between 10 to 15 collisions would affect 1% of the Central Asian population which would be highly significant given the species' relatively low, and declining, population.

Critical Habitat has therefore been triggered for great bustard.

#### **6.4.7 Site Survey Methodology**

The ecological baseline (habitat identification, floral survey, terrestrial fauna and avifauna survey) was established by local biodiversity specialists on 17<sup>th</sup>-18<sup>th</sup> September 2021<sup>43</sup> and by AECOM ecologists/local biodiversity specialist<sup>44</sup> during site surveys on 23<sup>rd</sup>, 24<sup>th</sup> and 25<sup>th</sup> November 2021 (referred to as the 'September 2021' and 'November 2021' surveys herein). These surveys included:

- Walkover transect surveys for birds, reptiles, mammals and rare and endemic species of plants within the Solar PV site;
- Walkover transect survey for habitat assessment categorization within the Solar PV site;

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<sup>42</sup> Typsa/IFC (2021). Great Bustard Winter Survey - Kattakurgan and Jizzakh Solar PV Projects).

<sup>43</sup> Fazlullo Agzamov, Research Specialist on Biodiversity, Research Institute of Ecology and Environmental Protection, Tashkent City Department of the State Committee on Ecology and Environment Protection, Abdusalom Normatov, Senior Researcher, Forestry Scientific Research Institute, Tashkent, Zair Sharipov, Herpetologist, Retired from the Institute of Zoology and current owner of a tortoise farm and Alisher Atakhodhaev, Ornithologist, Teacher of Ornithology and Biology at the National University of Uzbekistan

<sup>44</sup> Fazlullo Agzamov, Research Specialist on Biodiversity, Research Institute of Ecology and Environmental Protection, Tashkent City Department of the State Committee on Ecology and Environment Protection

- Drive-over and point count surveys for the aforementioned ecological features along the transmission line (from the on-site substation to the existing Ishtihan substation) and also in areas adjacent to the proposed Project site.

The Solar PV site footprint (being relatively small) was surveyed on foot with a series of transects running from east to west and north to south directions. The area was traversed in a regular pattern in order to reduce the chances of missing any important biotic features.

Additional surveys for Asian houbara and sociable lapwing were also undertaken in April 2022 and September 2022 respectively.

#### 6.4.7.1 Habitat and Flora Survey

The aims of the September 2021 habitat and flora survey, which was undertaken by local botanical specialists, are as follows:

- Determine the habitat type and plant species present at and around the proposed Project site and highlight any IUCN threatened species and/or species listed in the Red Data Book of Uzbekistan. The vegetation was sampled by the local botanical specialists along a transect route using 10m x 10m quadrats, using the Drude method<sup>45</sup> for assigning vegetation cover and describing the vegetation type formations.
- Identify any exotic (non-native) or potentially invasive flora species.
- Identify the potential direct or indirect impacts, whether they are beneficial, adverse or neutral, on the current vegetation communities or protected species as a result of the construction and operation of the proposed Project.
- Identify feasible mitigation strategies as counter measures for the potential impacts.

Plant species were identified, and distributions were checked using relevant literature. The conservation status of each of the plant species documented was researched using the IUCN data bases. This was cross checked against the Uzbekistan Red List to determine the presence of species of conservation importance. The September 2021 survey was undertaken within the optimal survey season (April-September) for undertaking habitat surveys.

The site was appraised by an experienced botanist/ habitat surveyor from AECOM and a local biodiversity specialist during the November 2021 field survey visit; the habitats and species present could be identified with confidence. Sufficient information was obtained during the September 2021 visit to allow ground-truthing of habitats and flora during the November visit.

The September and November 2021 surveys did not coincide with the optimum period for surveying those spring ephemeral species which are perennials (eg. *Liliaceae* and *Iridaceae*); these have bulbs, corms or tubers which enter a period of dormancy until sprouting in early spring. Nevertheless, the above-ground parts can still be detected and identified at the end of the growing season in late summer/early autumn. Also, the dead above ground parts of spring ephemeral species which are annuals (eg. *Papaveraceae*, *Chenopodiaceae*, *Compositae*, *Fabaceae*) could be detected and identified during the September 2021 visit. Therefore, the timing of the surveys is not considered to be a limitation in terms of this botanical and habitat appraisal.

#### 6.4.7.2 Terrestrial Fauna Survey

The aims of the faunal study were to:

- Carry out field work to identify the terrestrial fauna that may reside or range within the region of the proposed Project.
- Provide detailed lists of the mammal, reptile, and amphibian fauna in the region.
- Provide the IUCN Red Data rating and protected status in Uzbekistan for each of the fauna species determined to be present or potentially occurring at the Project site.
- Identification of any direct or indirect impacts, whether they are beneficial, adverse or neutral, on the current terrestrial biodiversity and provide relevant mitigation measures.

<sup>45</sup> The Drude method is a description of vegetation in terms of its floristic composition and is generally accepted in terms of geobotany in Uzbekistan

Considering that the activity patterns of many terrestrial species are hugely variable (i.e. many are nocturnal), it is possible that certain small species (particularly small mammals, reptiles and amphibians) could have been overlooked during the surveys undertaken during the daytime. However, the September 2021 survey visit and 2022 tortoise/reptile survey included night-time surveys with the Solar PV site.

### 6.4.7.3 Avifauna Survey

The aims of the September 2021 and November 2021 avifauna surveys were to:

- Carry out field work to identify the micro-habitats within the proposed Project's footprint and identify the avifauna that may reside or frequent the area. The surveys in September 2021 were undertaken outside the main breeding bird season (resident species and autumn passage species were present); however, breeding bird species were recorded incidentally during the main part of the spring 2022 breeding season as a result of the Asian houbara survey (refer to Section 6.4.7.4 below). The November 2021 survey coincided within the period when great bustard has the potential to be present as a winter visitor, (refer to the species summary in Section 6.4.6.1).
- Provide a detailed list of avifauna that occur in the region.
- Provide the IUCN rating for each of the fauna species determined to be present and protected status in Uzbekistan for each of the avifauna species determined to be present or potentially occurring at the Project site.
- Identify direct or indirect impacts to the local avifauna that could be the result of the construction and operation of the proposed Project.
- Determine relevant mitigation measures.

There are numerous factors that could influence the presence of avian species within the region such as season, weather conditions, and food availability. In order to account for this the bird distributions were researched to formulate an index similar to that used for terrestrial fauna species. In addition, the breeding and migratory habits were researched using Bird Life International databases to derive the species lists. Birds that could potentially frequent the proposed Project site have been classified according to their migratory, breeding and resident statuses. This scale uses the following terms:

Residence status:

- **Resident:** These birds reside and breed within the local areas on a more or less permanent basis though may move within their distribution zone
- **Non-breeding migrant:** These birds do not breed in this area however may be found in the region during certain periods/ seasons as they either use this area as a temporary or seasonal home range. This includes Eurasian wintering migrants.
- **Breeding migrant:** These birds frequent the region specifically to breed and raise their young, however following the breeding season will move on to other areas.

### 6.4.7.4 Asian Houbara Breeding Survey

Following consultation with the Asian Development Bank (ADB), a species-specific survey for Asian houbara (*Chlamydotis macqueenii*) was undertaken by local biodiversity specialists<sup>46</sup> during a seasonal timeframe when breeding populations of the species would be expected to be present, ie. 10<sup>th</sup>-12<sup>th</sup> April 2022.

The aim of the Asian Houbara breeding survey was to detect communal display areas (leks) in areas of suitable breeding habitat within the project area following the methodology detailed in Sutherland et al, 1996<sup>47</sup>. The dates of the survey in early/mid-April coincide with the optimal period for lekking activity. The aim was to confirm presence/absence of breeding populations of Asian Houbara within the Solar PV site. This species 'inhabits open, arid and sparsely vegetated steppe and semi-desert; it favours scattered shrubby vegetation, typically comprising xerophytic or halophytic plants (Birdlife International,

<sup>46</sup> Team Leader Alisher Atakhodhaev, Ornithologist, Teacher of Ornithology and Biology at the National University of Uzbekistan

<sup>47</sup> Sutherland, W.J (1996). Ecological Census Techniques: A Handbook. Cambridge University Press



2022<sup>48</sup>). The intensive agricultural areas which support the proposed transmission line do not represent suitable breeding habitat for this species and therefore element of the project was scoped out of the survey.

In terms of the survey methodology, watches from vantage points were made in the early morning from elevated points using high powered optical equipment (telescopes mounted on a tripod (as well as binoculars)). The surveys coincided with the recommended timeframes as advised by ADB (ie. early mornings in April). The location of the vantage points sought to avoid any disturbance to any lekking birds that may have been present. A desk-based survey reconnaissance (using aerial photography and topographical [contour] mapping) was undertaken by the survey team, with the purpose of determining potential vantage point, access arrangements and survey logistics.

The latitude and longitude co-ordinates for any lek sites used by Asian houbara, and all other records/observations of this species, were recorded on a survey form and registered on a corresponding map.

Other bird species which were recorded incidentally during the April 2022 Asian houbara survey were also recorded as part of this survey; this included breeding and migrating (spring passage) species. The following information was recorded for these records: species, number, behaviour and flight direction (if relevant).

#### 6.4.7.5 Sociable Lapwing – Autumn Passage Survey

Following consultation with the Asian Development Bank (ADB), a species-specific survey for sociable lapwing (*Vanellus gregarious*) was undertaken by local biodiversity specialists in September 2022. The surveys overlap the autumn passage period for this species within the centre/east of Uzbekistan where the Jizzakh region is located.

#### 6.4.7.6 Central Asian Tortoise Survey

Surveys for Central Asia tortoise (*Testudo horsfieldii*) were undertaken by AECOM between 20<sup>th</sup>-23<sup>rd</sup> April 2022. The field survey was carried out by a local reptile specialist R.A. Nazarov in April 2022; the findings are reported in Nazarov, R.A. (May 2022)<sup>49</sup>. A purpose of the surveys was to confirm presence/absence and an estimation of population density within the Project site, to inform the ecological baseline, impact assessment and mitigation for this assessment and to accord with the requirements of Jizzakh Regional Ecology Department/Goscomecology with respect to permitting for translocation of tortoises. The surveys also aimed to record any other reptile species encountered during the tortoise surveys; to inform the ecological baseline, impact assessment and mitigation with respect to all reptile species present or potentially present within the Project Site.

The surveys were undertaken in April and therefore within the active season for Central Asian tortoise when they are more commonly active above ground and therefore easier to detect.

The survey involved the surveyors walking line transects within and immediately adjacent to the Solar PV site and the Overhead Line route during the daytime (three survey visits) and one nocturnal visit; observations of tortoises/other reptiles, tortoise/other reptile burrows and tortoise signs were recorded within distance bands so that population densities could be calculated.

The surveys were undertaken in suitable weather conditions, although heavy rainfall during the 20<sup>th</sup> April survey within the Solar PV site may have limited reptile detection. This is not considered a limitation of this reptile survey. The Solar PV site was appraised by a suitably experienced herpetologist (Roman Nazarov) and a second visit (21<sup>st</sup> April) was undertaken in suitable weather conditions to address any short comings in the data gathered.

### 6.4.8 Consultations

The following organisations were consulted as part of the biodiversity assessment:

<sup>48</sup> BirdLife International (2022) Species factsheet: *Chlamydotis macqueenii*. Downloaded from <http://www.birdlife.org> on 28/03/2022. Recommended citation for factsheets for more than one species: BirdLife International (2022) IUCN Red List for birds. Downloaded from <http://www.birdlife.org> on 28/03/2022.

<sup>49</sup> Nazarov, R.A. (May 2022). A Herpetological Assessment of Current State of Territory of Jizzakh Solar PV (Jizzakh Region, Uzbekistan), with the focus on the condition of the population of Asian tortoise (*Testudo horsfieldii*).

- Jizzakh Regional Ecology Department (the Head of the Regional Department of Ecology and Environmental Protection department (23rd November 2021).

#### **6.4.9 Further consultations will be undertaken following disclosure of documents with relevant stakeholders, particularly on CH and PBFs in addition to the Regional Ecology Department, on the key impacts, mitigation and enhancement measures proposed to meet PR6 requirements. The list of consultees is expected to include at least consultation with the Uzbekistan Society for the Protection of Birds, the Eurasian Bustard Alliance, BirdLife International and others if appropriate. Field Survey Results**

##### **6.4.9.1 Introduction**

The results of the ecological field surveys undertaken by AECOM are provided below. The results of consultation with statutory stakeholders and as a result of formal and informal liaisons with the local community are also included, where relevant.

A full species list for the fauna and flora recorded during the field surveys is provided in Appendix C.

##### **6.4.9.2 Habitats**

The vegetation of Uzbekistan is divided into four main ecosystems (Belolipov *et al*, 2013)<sup>50</sup>; the proposed Project site is located in the adyr zone (lowlands and foothills).

The September 2021 and November 2021 surveys confirmed that the Solar PV site is formerly cultivated land, with ridge and furrow patterns indicative of ploughing ubiquitous throughout. An interview with a local shepherd during the November 2021 visit confirmed that wheat was cultivated approximately six years previously on flatter parts of the site. Hillier parts of the Solar PV site support rows of perennial wormwood (*Artemisia lerchiana*) planted historically (1960's) as a cultivated crop for livestock grazing; this was confirmed during the public consultation with local residents. The wormwood is in a state of poor condition and die-back and has been subject to overgrazing and damage by trampling.

The fallow formerly cultivated land support an agro-ecosystem with the ruderal and weed flora typified by abundant camelthorn (*Alhagi pseudoalhagi*) and locally frequent spiny cocklebur (*Xanthium spinosum*), an introduced invasive species (refer to Sennikov *et al*, 2020<sup>51</sup>). Isirik (*Peganum harmala*), an invasive native noxious weed, is widespread and is locally abundant. Other ruderal and weed flora components which occur in this agro-ecosystem are *Tribulus terrestris*, and *Aster amellus*, with *Cynodon dactylon/Hordium leporinum* grasses and the sedge *Carex pachystylis* achieving locally abundant and locally frequent coverage respectively.

The agro-ecosystem and the associated weed flora assemblage which prevails within the Solar PV site is Modified Habitat as defined in PS6<sup>52</sup>. The Overhead Line route crosses intensively cultivated and irrigated farmland habitat between the Solar PV site and the Sanzar river valley/Tashkent-Samarkand highway; this is Modified Habitat as defined in PS6.

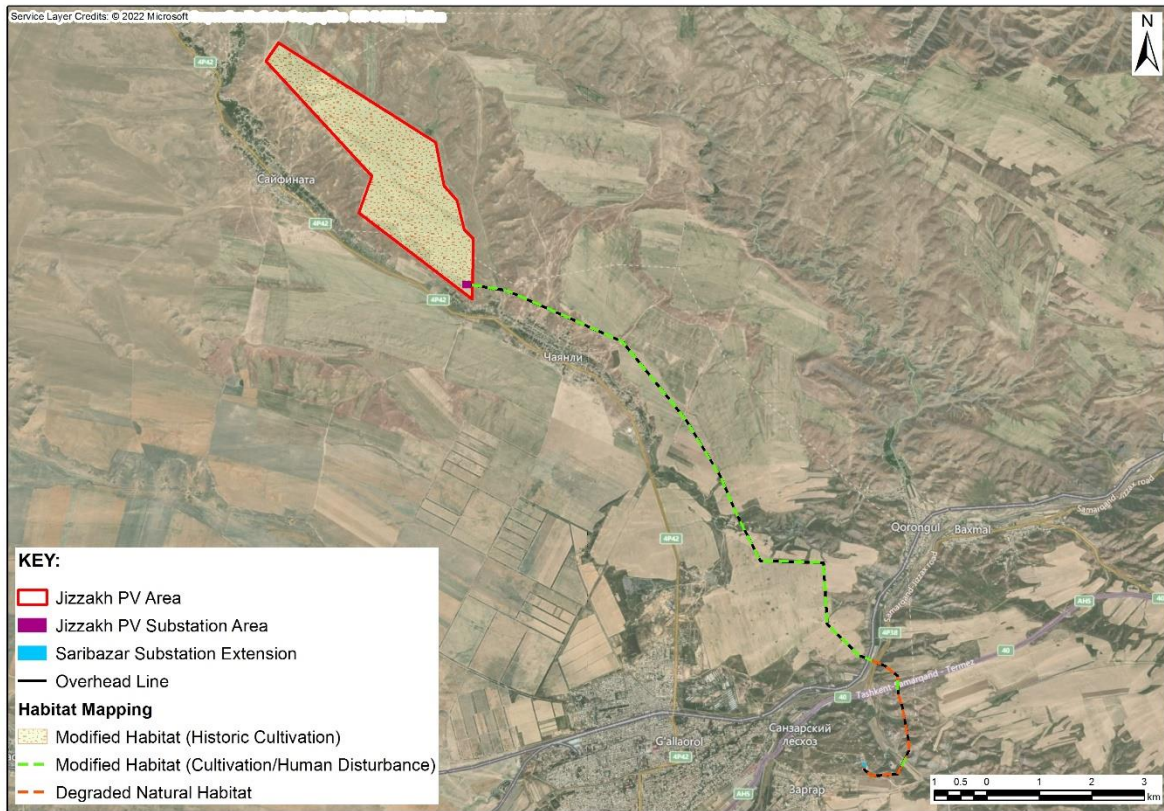
To the south-east of the Sanzar River crossing the Overhead Line traverses low lying foothills for approximately 1.5km before terminating at the existing substation at Saribazar. These foothills and plateaus support degraded pastureland typified by broad-leaved grasses (eg. *Poa bulbosa*) with locally frequent *Capparis spinosa* and Isirik (*Peganum harmala*), an invasive native noxious weed. The habitat is subject to grazing and human disturbance associated with historic construction activities associated with the existing sub-station and associated power-lines. The habitat for this section of the Overhead

<sup>50</sup> Belolipov, I.V., Zavrov, D.E. and Eisenman, S.W. (2013). The Geography, Climate and Vegetation of Uzbekistan. *Medicinal Plants of Central Asia; Uzbekistan and Kyrgystan*, pp.5-7

<sup>51</sup> Sennikov A N, Tojibaev K S, Beshko N Y, Esanov H K, Wong L J, Pagad S (2020). Global Register of Introduced and Invasive Species - Uzbekistan. Version 1.5. Invasive Species Specialist Group ISSG. Checklist dataset <https://doi.org/10.15468/m5vdkw> accessed via GBIF.org on 2022-04-07.

<sup>52</sup> PS6 paragraph 11. "Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands."

Line is classified as Natural Habitat as defined in PS6<sup>53</sup> but is degraded. The following figure shows the extent of natural and modified habitats.



**Figure 6-27. Habitat classifications**

In terms of the assessment against the PBF guidelines as set out in EBRD PR6 GN (refer to Appendix D), no habitat types or ecosystems were present or identified as being potentially present, that would be considered as priority habitats as such Criterion 1: Threatened Habitat has not been triggered. No higher or lower plant species were recorded which would be considered as Priority Biodiversity Features under PBF Criterion 2 (Vulnerable species).

None of the plant species recorded during the September 2021 and November 2021 field surveys are included on the Uzbekistan Red List.

<sup>53</sup> PS6 paragraph 13. "Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition."





**Figure 6-28. Fallow formerly cultivated land, the prevailing habitat type in the Solar PV site. Historic plough-lines are visible and prevailing feature of the landscape within the Solar PV site**

*Source: Stephen Dixon (2021) - Site visit photos November 2021*



**Figure 6-29. Lines of perennial wormwood (*Artemisia*) planted by local residents within the Solar PV site as a crop for livestock grazing (ie. introduced species). Subject to high levels of overgrazing and trampling damage**

*Source: Stephen Dixon (2021) - Site visit photos September 2021*





**Figure 6-30. View across to the foothills for the Overhead Line between the Sanzar river valley and the existing Saribazar substation – *Capparis spinosa* sub-shrub punctuating the degraded pasture in the foreground**

Source: Stephen Dixon (2021) - Site visit photos September 2021

#### **6.4.9.3 Survey Results for Breeding and Non-breeding (migratory and wintering) birds – Solar PV Site**

There are several Eurasian migrants that winter in Uzbekistan or migrate through the country as part of the African-Eurasian flyway on route to neighbouring countries. Data has shown that there have been successive declines in populations of many Afro-Palaeartic migrant birds (BirdLife International, 2018). Other species may not breed in Uzbekistan but may migrate to overwinter from breeding areas in northern Eurasia.

A summary of the bird species recorded within the Solar PV site during the AECOM surveys, which coincided with the autumn and spring migration period (ie. the September 2021 and April 2022 surveys respectively) and the wintering surveys (ie. the November 2021 survey), are shown in Table 6-3 below.

Three IUCN threatened species were recorded overflying the Solar PV site on spring passage (April 2022 survey visit):

- Greater spotted eagle (*Clanga clanga*) [IUCN VU, URDB VU] - a single bird was recorded.
- Egyptian vulture (*Neophron percnopterus*) [IUCN EN, URDB VU] – a single bird was recorded.
- Eastern imperial eagle (*Aquila heliaca*) [IUCN VU, URDB VU] – a single bird was recorded.

Four species which are listed on the Red List of Uzbekistan were recorded: cinerous vulture (*Aegypius monachus*) [IUCN NT], Eurasian griffon vulture (*Gyps fulvus*), bearded vulture (*Gypaetus barbatus*) and golden eagle (*Aquila chrysaetos*). The Solar PV site provides potential foraging/hunting habitat for these resident raptor species. A flock of five Eurasian curlew (*Numenius arquata*) [IUCN NT, URDB VU].

The Asian houbara (*Chlamydotis macqueenii*) survey undertaken in April 2022 confirmed the likely absence of this species within the Solar PV site. No wintering populations of great bustard (*Otis tarda*)

were recorded from the Solar PV site and the adjacent habitats within the Zol during the November 2021 surveys, which were undertaken in late November and therefore coinciding with a timeframe when this species may be expected to be present in the Jizzakh, although peak numbers of great bustard are likely to occur during the December-February period. As detailed in Section 6.4.6.1, great bustard is identified as a CHA trigger species and, as such, net gain would need to be met (refer to Appendix D).

Migratory and resident species recorded, which may also breed within the proposed project area include black-bellied sandgrouse (*Syrrhaptes orientalis*), crested lark (*Galerida cristata*) and pied wheatear (*Oenanthe pleschanka*). A pair of little owl (*Athene noctua*) were confirmed as breeding.

The following species recorded during the baseline surveys also meet the criteria for inclusion as priority Biodiversity Features (PBF's) when assessed against the PBF guidelines as set out in EBRD PR6 EN: steppe eagle, Egyptian vulture, eastern imperial eagle, golden eagle, greater spotted eagle, cinerous vulture, Eurasian griffon vulture and bearded vulture (refer to Appendix D). None of these species breed within, or immediately adjacent, to the Solar site. The habitat represents unsuitable nesting habitat for the aforementioned species which are resident/summer breeding (ie. bearded vulture, cinerous vulture, Egyptian vulture, Eurasian griffon vulture, golden eagle). Eastern imperial eagle, greater spotted eagle and steppe eagle occur in the Jizzakh region as migrants only (ie. non-breeders)

**Table 24. Bird Species Recorded During the AECOM Surveys**

Common Name	IUCN Threaten ed <sup>1</sup> ?	URDB Listed <sup>2</sup> ?	EBRD PR6 PBF?	Peak Count			Breeding within the Project Site	Comments
				Visit 1: Sept 2021 <sup>3</sup>	Visit 2: Nov 2021 <sup>4</sup>	Visit 3: April 2022 <sup>5</sup>		
Barn Swallow	x	x	x	12		5	No	Summer breeding and migratory species
Bearded Vulture	x	✓	✓		1		No	Resident species
Black-bellied Sandgrouse	x	x	x	6		5	Potentially breeding	Resident species
Blue-cheeked Bee- eater	x	x	x	14			Breeding	Summer breeding and migratory species
Carrion Crow	x	x	x			2	No	Resident species
Chukar Partridge	x	x	x	7			Potentially breeding	Resident species
Cinereous Vulture	x	✓(NT)	✓	2		1	No	Resident species
Common Buzzard	x	x	x			1	No	Migratory species (possibly overwintering)
Common Kestrel	x	x	x	3		1	No	Resident species
Common Myna	x	x	x	27			No	Resident species
Common Swift	x	x	x			6	No	Summer breeding and migratory species
Collared Dove	x	x	x	28			No	Resident species
Crested Lark	x	x	x	44	20+	23	Breeding	Resident species

Common Name	IUCN Threatened <sup>1</sup> ?	URDB Listed <sup>2</sup> ?	EBRD PR6 PBF?	Peak Count			Breeding within the Project Site	Comments
				Visit 1: Sept 2021 <sup>3</sup>	Visit 2: Nov 2021 <sup>4</sup>	Visit 3: April 2022 <sup>5</sup>		
Desert Wheatear	x	x	x	16			Breeding	Summer breeding and migratory species
Egyptian Vulture	✓(EN)	✓(VU)	✓			1	No	Summer breeding and migratory species
Eurasian Curlew	x	✓(VU)	x			6	No	Migratory species
Eurasian Stone Curlew	x	x	x			1	Potentially breeding	Summer breeding and migratory species
Eastern Imperial Eagle	✓(VU)	✓(VU)	✓			1	No	Wintering and migratory species
Eurasian Griffon Vulture	x	✓(VU)	✓	6		1	No	Resident species
Eurasian Magpie	x	x	x	7		2	No	Resident species
Eurasian Sparrowhawk	x	x	x			1	No	Resident species
European Bee-eater	x	x	x	2		4	Breeding	Summer breeding and migratory species
Feral Pigeon	x	x	x	220		71	Potentially breeding	Resident species
Golden Eagle	x	✓(VU)	✓	1		1	No	Resident species
Greater Short-toed Lark	x	x	x	35			Breeding	Summer breeding and migratory species



Common Name	IUCN Threaten ed <sup>1</sup> ?	URDB Listed <sup>2</sup> ?	EBRD PR6 PBF?	Peak Count			Breeding within the Project Site	Comments
				Visit 1: Sept 2021 <sup>3</sup>	Visit 2: Nov 2021 <sup>4</sup>	Visit 3: April 2022 <sup>5</sup>		
Greater Spotted Eagle	✓(VU)	✓(VU)	✓			1	No	Migratory species
Hen Harrier	x	x	x	1			No	Winter visitor
Hobby	x	x	x	2			No	Summer breeding and migratory species
Hoopoe	x	x	x	2			No	Resident species
Isabelline Wheatear	x	x	x			2	Breeding	Summer breeding and migratory species
Jackdaw	x	x	x			1	No	Resident species
Laughing Dove	x	x	x	11			No	Resident species
Little Owl	x	x	x	2		1	Breeding	Resident species
Long-legged Buzzard	x	x	x	2			No	Summer breeding and migratory species
Oriental Turtle Dove	x	x	x	18			No	Non-breeding (migratory) species
Marsh Harrier	x	x	x	3			No	Resident species
Masked Wagtail	x	x	x	4			Breeding	Summer breeding and migratory species
Northern Raven	x	x	x	6		3	No	Resident species
Northern Wheatear	x	x	x	30			Breeding	Summer breeding and migratory species
Pied Wheatear	x	x	x	9			Breeding	Summer breeding and migratory species
Rook	x	x	x	265		31	No	Resident species

Common Name	IUCN Threaten ed <sup>1</sup> ?	URDB Listed <sup>2</sup> ?	EBRD PR6 PBF?	Peak Count			Breeding within the Project Site	Comments
				Visit 1: Sept 2021 <sup>3</sup>	Visit 2: Nov 2021 <sup>4</sup>	Visit 3: April 2022 <sup>5</sup>		
Sand Martin	x	x	x	35			No	Summer breeding and migratory species
Siberian Stonechat	x	x	x			1	Potentially breeding	Summer breeding and migratory species
Spanish Sparrow	x	x	x	48			No	Resident Species
Steppe Eagle	✓(EN)	✓(VU)	✓			1	No	Migratory species (possibly overwintering)
Tawny Pipit	x	x	x	1			No	Summer breeding and migratory species
Tree Sparrow	x	x	x	68			No	Resident
White Wagtail	x	x	x	3			Potentially breeding	Summer breeding and migratory species
Yellow Wagtail	x	x	x			55	No	Summer breeding and migratory species

Footnotes

<sup>1</sup> Globally threatened species (IUCN web site): CR – critical endangered, EN – endangered, VU – vulnerable

<sup>2</sup> Uzbekistan Red Data Book (2019): CR – critically endangered, EN – endangered, VU – vulnerable, NT – near threatened species

<sup>3</sup> Species recorded during the ESIA ecology surveys undertaken in September 2021.

<sup>4</sup> Species recorded during the ESIA ecology surveys undertaken between 23<sup>rd</sup>-25<sup>th</sup> November 2021

<sup>5</sup> Species recorded incidentally during the Asian Houbara surveys undertaken between 10<sup>th</sup>-12<sup>th</sup> April 2022

<sup>6</sup> Species recorded incidentally during the Sociable Lapwing surveys undertaken in September 2022

#### 6.4.9.4 Survey Results for Breeding and Non-breeding (migratory and wintering) birds – Overhead Line

The following bird species of international and national conservation concern were recorded during the November 2021 survey visit at the Overhead Line:

- Steppe eagle (*Aquila nipalensis*) [IUCN EN] - six individuals were recorded in the Sanzar river valley, indicating late passage migrants or a potential over-wintering population.
- Cinerous vulture (*Aegypius monachus*) - single bird [URDB NT]. The habitat associated with the Overhead Line route provides potential foraging habitat for this resident species.
- White-tailed eagle (*Haliaeetus albicilla*) – a single bird [URDB VU] was recorded.

Other species recorded during the aforementioned April 2022 visit are as follows: marsh harrier (*Circus aeruginosus*) [a single female], long-legged buzzard (*Buteo rufinus*), little owl (*Athene noctua*), rook (*Corvus frugilegus*), carrion crow (*Corvus corone*), jackdaw (*Coloeus monedula*), crested lark (*Galerida cristata*) and chaffinch (*Fringilla coelebs*).

The following bird species of international and national conservation concern were recorded incidentally during the April 2022 Asian Houbara surveys at the Overhead Line in the foothills near the existing Saribazar substation:

- Cinerous vulture (*Aegypius monachus*) - single foraging bird [URDB NT] recorded.

The following species recorded during the baseline surveys also meet the criteria for inclusion as priority Biodiversity Features (PBF's) when assessed against the PBF guidelines as set out in EBRD PR6 EN: steppe eagle and cinerous vulture (refer to Appendix D).

Other species recorded during the aforementioned April 2022 visit are as follows: peregrine (*Falco peregrinus*) [possible breeding], chukar partridge (*Alectoris chukar*) [possible breeding], rook (*Corvus frugilegus*) [possible breeding], jackdaw (*Coloeus monedula*) [possible breeding], common magpie (*Pica pica*) [possible breeding], pied wheatear (*Oenanthe pleschanka*) [probably breeding].

The Asian houbara (*Chlamydotis macqueenii*) survey undertaken in April 2022 confirmed the absence of this species within the Overhead Line route.

No wintering populations of great bustard (*Otis tarda*) were recorded from Overhead Line route and the adjacent habitats within the Aol during the November 2021 surveys, which were undertaken in late November and therefore coinciding with a timeframe when this species may be expected to be present in the Jizzakh, although peak numbers of great bustard are likely to occur during the December-February period. As detailed in Section 6.4.6.1 great bustard is identified as a CH trigger species and, as such, net gain would need to be met (refer to Appendix D).



**Figure 6-31. Bearded Vulture – Solar PV**

*Source: Greg McAlister (2021) - Site visit photos November 2021*



**Figure 6-32. Little Owl in Nest Hole in Drainage Gully Cliff Face – Solar PV**

*Source: Fazlullo Agzamov (2021) - Site visit photos November 2021*





**Figure 6-33. Tawny Pipit – Solar PV**

Source: Fazlullo Agzamov (2021) - Site visit photos September 2021



**Figure 6-34. Steppe Eagle (Immature) – Overhead Line (Sanzar river valley)**

Source: Fazlullo Agzamov (2021) - Site visit photos November 2021

#### 6.4.9.5 Flora

No IUCN threatened plant species were recorded and none are listed in the Red Data Book (RDB) of Uzbekistan. The key species that were identified during the AECOM surveys are detailed in Section 6.4.4.2 (Habitats) above.

#### 6.4.9.6 Terrestrial Mammals

Several mammal species were observed during the AECOM field surveys including red fox (*Vulpes vulpes*) [IUCN Least Concern] with an individual recorded during the April 2022 visit (Overhead Line). The following mammal species were confirmed to be present within the Solar PV site from observations of indicative signs (eg. tracks, droppings, burrows, feeding signs, carcasses); none of which are IUCN threatened species or included within the Red Data Book [RDB] of Uzbekistan):

- Yellow ground squirrel (*Spermophilus fulvus*) – an active burrow and a skull were observed within the Solar PV site;
- Zaisan mole vole (*Ellobius tancrei*) – active burrows/digging/molehills by this species were observed within the Solar PV site;
- Severtzov's jerboa (*Allactaga severtzovi*) – active burrows observed within the Soar PV site were considered likely to be associated with this jerboa species;
- Long-eared hedgehog (*Hemiechinus auritus*) – a hedgehog skin was observed; and
- Red fox (*Vulpes vulpes*) – scats (droppings) observed within the Solar PV site and the Overhead Line.

There were no records of IUCN threatened mammal/Red Data Book of Uzbekistan species as a result of the AECOM site surveys, consultation with the Jizzakh Regional Ecology Department or interviews with local residents, including marbled polecat (*Vormela peregusna*), steppe polecat (*Mustela eversmannii*) and goitered gazelle (*Gazella subgutturosa*). Therefore, these species are considered absent and are considered no further in this assessment.



**Figure 6-35. Yellow Ground Squirrel Burrow Entrance and Skull (Red Fox Scat in the Foreground) - Solar PV**

Source: Fazlullo Agzamov (2021) - Site visit photos September 2021

#### 6.4.9.7 Bats

There are no trees, buildings or natural features which are suitable for roosting bats within the Solar PV site or Overhead Line route (including a 10m radius of the Solar PV or pylons).

### 6.4.9.8 Reptiles

#### AECOM 2021 Surveys

The Anguid lizard *Pseudopus apodus* and steppe-runner lizard (*Eremias arguta uzbekistanica*) were recorded within the Solar PV site during the September 2021 field survey visit. The sand racer snake (*Psammophis lineolatus*) was recorded during the November 2021 visit. None of these species are of international or national concern.

#### AECOM 2022 Reptile Surveys

The following narrative includes a summary of the reptile survey undertaken between 20<sup>th</sup>-23<sup>rd</sup> April 2022 and reported in Nazarov (2022). Nazarov (2022) reports that a total of twenty-four individual reptiles were found of three different species; Central Asian tortoise (*Testudo horsfieldii*), steppe-runner (*Eremias arguta uzbekistanica*) and Turkestan rock agama (*Paralaudakia lehmanni*); the latter species was only recorded in habitat immediately adjacent to the Solar PV site. Records of Central Asian tortoise and steppe-runner were concentrated on the periphery of the Solar PV site in gullies, clay cliffs and ravines (ie. areas unaffected by ploughing disturbance).

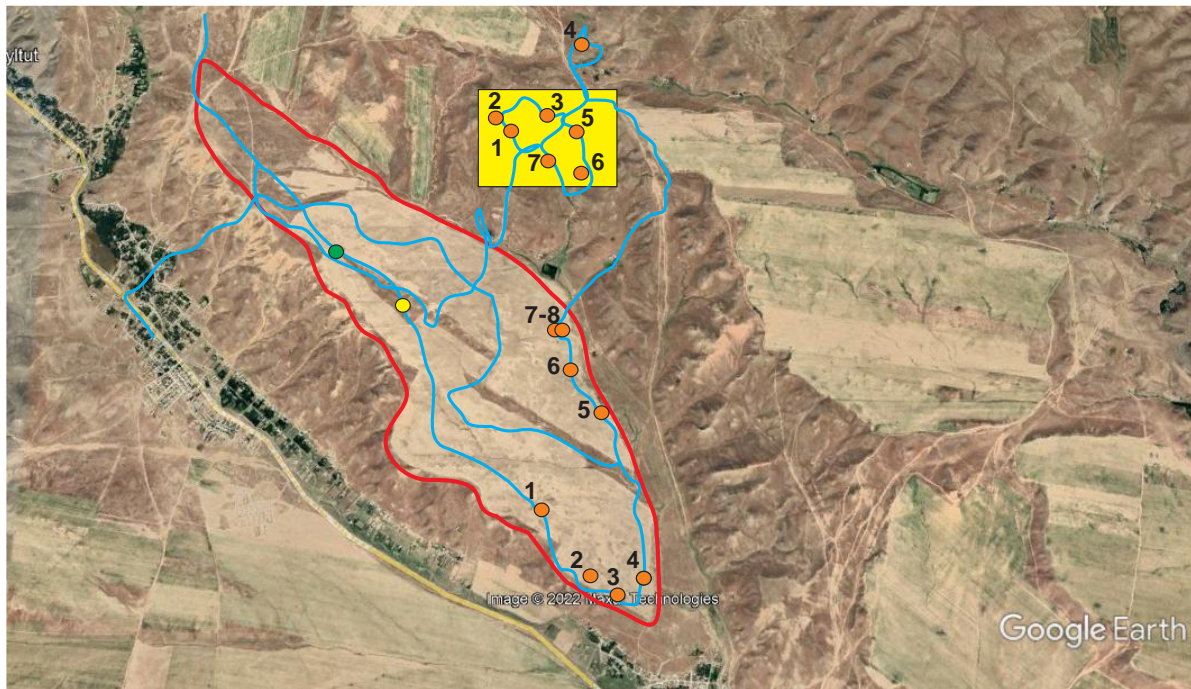
#### *Central Asian Tortoise*

Listed as Vulnerable by the IUCN and Vulnerable within the Red List of Uzbekistan, the species is threatened by habitat loss (e.g. due to agricultural development) and long-term collection for the pet trade. This species is widely distributed in Uzbekistan; it is mapped in the Zarafshan area and is widespread in the semi-desert of the central Kyzylkum (Showler, 2018). Central Asian tortoise is a Red Data Book of Uzbekistan listed species. The likely presence of this species within the Solar PV site was confirmed during the September 2021 field surveys when fragments of a carapace were found.

The results of the April 2022 baseline surveys suggest that the population size of Central Asian tortoise for the modified habitats which prevail within the Solar PV site is negligible and does not exceed 0.31 individuals/hectare. The subsequent tortoise translocation within the Solar PV that was undertaken in accordance with regional government permitting requirements for the project in June 2022 resulted in a total of 213 tortoises being found and translocated (refer to Appendix E); this is equivalent to a population density of 0.38 individuals/hectare. Nazarov (2022) considers the tortoise population within the Solar PV site to be in an unfavourable condition due to animals being caught for commercial use; this relates to the high proportion of females which were detected and the absence of juvenile tortoise observations.

A slightly higher (0.36 individuals/hectare) tortoise population was found in more natural (uncultivated) habitat to the north of the Solar PV site (seven females were found). This area (shown in yellow on Figure 6-34 below) is highlighted by Nazarov (2022) as a potential receptor area for any tortoises which have to be translocated from the Solar PV pre-construction footprint.





**Figure 6-36. Orange circles indicate the locations of individual tortoises within the red-line Solar PV boundary and the yellow square proposed reptile translocation area. Yellow circle = steppe-runner (*Eremias arguta uzbekistanica*). Green circle = European green toad (*Bufo viridis*) [an amphibian]**

Source: Nazarov (2022)

Bondarenko *et al* (2017)<sup>54</sup> suggest that the areas with the highest densities of Central Asian tortoise within the Republic of Uzbekistan support populations of >10 animals per hectare; this exceeds the estimated baseline density within the Project site (i.e. 0.31 individuals/hectare) and actual 0.38 individuals/hectare which was calculated following the tortoise translocation undertaken in June 2022 (refer to Appendix E). Therefore, the results of the April 2022 field surveys and the June 2022 translocation work suggest that the population density of tortoises within the proposed project site is relatively low. There is insufficient secondary data to determine the population within Jizzakh Region; however considering the relatively small population of tortoises within the proposed Project Site and when applying the 1% rule for national assessments in the UK (and with consideration of the relatively small size of the modified [cultivated] habitat within the Study Area compared to the ubiquity of similar and more favourable natural habitat within the wider region), there is no reasonable likelihood that the Project area is of regional value for Central Asian Tortoise (i.e. supporting more than 1% of the Jizzakh regional population). Nevertheless, this species is listed as IUCN VU and small populations are confirmed to be present within the Project area; it is also listed on the Red Data Book of Uzbekistan.

The CHA (Turnstone, 2022: Appendix D) did not assess Central Asian tortoise as a trigger for Critical Habitat but meets the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN.

#### *Tortoise Relocation*

Pre-clearance surveys and a pre-clearance translocation exercise were completed by GBI in April and June 2022 respectively. The April surveys found that the population of Central Asian Tortoise within the Project site was less than 0.31 individuals per hectare. The sex and age composition of the population also indicated that the population was in an unfavourable condition (high female:male ratio and absence of juveniles).

<sup>54</sup> Bondarenko D. A., Peregontsev E. A. (2017) *Distribution of the Central Asian Tortoise (Agrionemys horsfieldii) In Uzbekistan (Range, Regional and Landscape Distribution, Population Densities)*. Current Studies in Herpetology, 2017, vol. 17, iss. , pp. 124-?.



A translocation site was identified proximately 2 kilometres northwest of the Project area. The translocation site consists of desert habitat supporting Artemisian vegetation, within areas of ravines, suitable for Central Asian Tortoise. Population estimate or carrying capacity surveys were not completed within the translocation site prior to undertaking the translocation exercise however the receptor site was agreed with the regional Goscomecology representative and was considered to have sufficient carrying capacity to support translocated tortoises.

Searches for active tortoises was completed between the 12th and 16th of June 2022 across the whole of the project footprint (approximately 600 hectares). Any active animals were caught, health checked and marked and then moved to the receptor site. In addition to catching active tortoises a check of all identified burrows was also completed. Burrow checks were done with the use of endoscopes and any burrows identified were not destroyed due to the risk of destroying eggs.

During the translocation exercise all animals caught and moved were subject to a health check and the following details were recorded:

- Age
- Sex
- Size (length and width of carapace)
- Weight
- Location moved to (GPS)
- Photograph

A total of 213 tortoises were caught and relocated to the receptor site in June 2022. This equates to a pre works population of approximately 0.38 animals per hectare. Of the animals caught the majority were female and only 13 immature animals were captured.

#### *Steppe-runner*

This small lizard species is not of international or national conservation concern; nor is it a PBF species. A single individual was recorded within the Solar PV site (refer to Figure 6.34 above).



**Figure 6-37. Central Asian Tortoise within the Solar PV site**

Source: Nazarov (2022) - Site visit photos April 2022





**Figure 6-38. Male Steppe Runner within the Solar PV Site**

Source: Nazarov (2022) - Site visit photos April 2022



**Figure 6-39. Turkestan Rock Agama Recorded from Hilly Areas of Natural Habitat Immediately Adjacent to the Solar PV Site**

Source: Nazarov (2022) - Site visit photos April 2022

#### *Other reptiles*

No other reptile species were recorded during the April 2022 surveys; however, species which have the potential to occur within the Project site are shown in Table 25 below. Several of these species are of international and/or national conservation concern: northern barred wolf snake, Caspian desert monitor

and tatar sand boa. There are anecdotal records of the latter species within the Solar PV site as a result of interviews with local residents undertaken during the April 2022 survey visit.

**Table 25. Other Reptile Species list which potentially could occur within the Project Site (Nazarov, 2022)**

<b>FAMILY and Species names</b>	<b>English Name</b>		<b>Global Threat Status (IUCN)</b>	<b>National Threat Status (URDB)</b>	<b>PBF (EBRD PR 6)?</b>
<b>AGAMIDAE</b>					
<i>Paralaudakia lehmanni</i>	Turkestan Agama	Rock	LC	Not listed	No
<i>Trapelus sanguinolentus</i>	Steppe Agama		LC	Not listed	No
<b>ANGUIDAE</b>					
<i>Pseudopus apodus</i>	European Lizard	Glass	LC	Not listed	No
<b>BOIDAE</b>					
<i>Eryx tataricus</i>	Tartar Sand Boa		LC	NT	Yes
<b>COLUBRIDAE</b>					
<i>Hemorrhhois ravergieri</i>	Spotted Whip Snake		LC	Not listed	
<i>Lycodon bicolor striatus</i>	Northern (Barred) Wolf Snake		LC	VU:R	Yes
<b>GEKKONIDAE</b>					
<i>Tenuidactylus fedtschenkoi</i>	Turkestan Thin-toed gecko		LC	Not listed	No
<i>Mediodactylus russowii</i>	Transcaspian Bent-Toed Gecko		LC	Not listed	No
<b>VARANIDAE</b>					
<i>Varanus caspius griseus</i>	Caspian Monitor	Desert	LC	VU:D	Yes
<b>VIPERIDAE</b>					
<i>Macrovipera lebetinus turanica</i>	Levantine Viper		LC	Not listed	No

#### 6.4.9.9 Amphibians

The arid and modified (cultivated) habitats within the proposed Solar PV site are generally unsuitable for amphibians, however aquatic habitat (a watercourse) is present adjacent to the northern boundary of the Solar PV site. A single amphibian was recorded during the AECOM surveys: European green toad (*Bufo viridis* complex). This species is not of international or national conservation concern.



## 6.5 Archaeology and Cultural Heritage

### 6.5.1 Overview

The Solar PV Array element of the Project is located in the foothills of the Qo'ytosh mountain range, northwest of the village of Karakchi and east of the village of Sayfinota, in the G'allaorol District of Jizzakh Region. The Solar Array area has been subject to previous arable ploughing, and no archaeological or cultural heritage sites are currently known from within the Project area. The remains of former settlement areas and historic cemeteries are present near Sayfinota and Karakchi, southwest and southeast of the Solar Array.

The Transmission Line from the Solar Array crosses land northeast and east of an agricultural plain. At least eight large, upstanding kurgan (burial mounds) have been identified on this plain; further levelled burial mounds may be present in the vicinity of the Transmission Line and its towers.

The Transmission Line crosses over the incised course of the Sangzor River valley, a key communication corridor across central Eurasia that once irrigated many oasis settlements. Despite this there is little evidence for any ancient cultivation or settlement in the immediate vicinity of the route where it crosses the Sangzor. The line then crosses an upland pasture area, with some potential archaeological features, before joining an existing electricity substation east of G'allaorol.

This ESIA presents the cultural heritage legislation, policy context and baseline information on the Study Area based on desk-based research including the National List of Tangible Cultural Heritage Properties and a review of historic CORONA and recent Google Earth satellite imagery. An initial impact assessment and an outline of mitigation principles are presented.

### 6.5.2 Desktop Study Methodology

The aim of the desktop study is to determine, as far as is reasonably possible from existing records, the nature, extent and significance of the archaeological, historic and cultural heritage within the Study Area. The desktop study describes the historical development of the Study Area and the wider area, placing it in context in order to predict its archaeological and cultural heritage potential; anticipate the type, date, and character of remains; and broadly indicate areas with higher archaeological potential based on factors such as geology, topography, past and present land use, known archaeological remains and vegetation cover.

Sources consulted include:

- The National List of Tangible Cultural Heritage Properties (State Register of Monuments) for Jizzakh Region – G'allaorol District<sup>55</sup>.
- Historical and modern topographic mapping, including U.S. Army Map Service Series N502<sup>56</sup> and US Defense Mapping Agency Series 1501 Air mapping<sup>57</sup> and Soviet Civilian and Military Topographic Mapping<sup>58</sup>.
- CORONA satellite imagery dated from 1964 and Google Earth Pro satellite imagery dated from 1985 to 2021.
- Relevant regional and period archaeological and landscape studies, dissertations and readily available historical articles.

<sup>55</sup> Cabinet of Ministers Resolution No. 846 "On the Approval of the National List of Tangible Cultural Heritage Properties" (October 4, 2019). Available at: <https://lex.uz/docs/-4543266> Accessed 26 October 2021.

<sup>56</sup> 1954 Dzhizak, U.S.S.R. Sheet NK 42-10. Scale: 1:250,000. Western Siberia Series N502, U.S. Army Map Service. Available at: [https://maps.lib.utexas.edu/maps/ams/western\\_siberia/txu-oclc-6559336-nk42-10.jpg](https://maps.lib.utexas.edu/maps/ams/western_siberia/txu-oclc-6559336-nk42-10.jpg)

<sup>57</sup> 1969 Dzhizak, U.S.S.R. Sheet NK 42-10. Scale: 1:250,000. Russia Joint Operations Graphic U.S. National Imagery and Mapping Agency. Available at: <https://maps.lib.utexas.edu/maps/jog/russia/txu-oclc-224096193-nk42-10.jpg>

<sup>58</sup> 1984 Dzhizak, Gallyaaral. Sheet k42-136. Scale: 1:100 000. Soviet military Topographic map. Available at: <https://www.qeamap.com/en/soviet#12/40.0121/67.6238>



### 6.5.3 Cultural Heritage Baseline Context

#### 6.5.3.1 Site Location, Palaeontology and Palaeoclimate

##### Topography, geology and soils

The Project is located in Jizzakh Region, G'allaorol District. The Solar Array Site is located in piedmont, the foothills of the Qo'ytosh [Koitash] mountain range, northwest of the village of Karakchi and east of the village of Sayfinota. To the south is an agricultural plain, and the incised course of the Sangzor River valley; the Sangzor is located c. 10km southeast of the Solar Array Site and is crossed by the Transmission Line. The fertile Sangzor Valley has long been a key communication corridor across central Eurasia.

A tributary of the Sangzor rises in the mountains and runs through settlements at Sayfinota and Karakchi; as it reaches the low-lying plains, ancient meanders are visible on satellite imagery. The proposed Transmission Line runs southeast of Karakchi to an existing electricity substation east of G'allaorol, traversing the agricultural plains and upland pasture north and east of G'allaorol.

Historically, the lower piedmont areas provided summer–winter pastures. Crop agriculture was confined to narrow bands around oases and along water courses with limited irrigation. The Russian Empire and Soviets brought large-scale crop agriculture – cotton and wheat – to Central Asia. Vast tracts of marginal desert and steppe were ploughed and major irrigation projects constructed, transforming the land and the people's relationship with it.<sup>59</sup>

The Project is located in a block of land with a ridge to the southwest and a river valley to the northeast, the land rises from south to north. Satellite imagery shows that the land has previously been subject to ploughing. Historically, lead, silver, gold and iron ore have been mined in the area; sand, gravel, gypsum, granite and limestone are also quarried. The plains are formed of wind-blown loess sediments with yellow soils. There are a number of springs in the area reputed to have healing mineral water.

Although there are fossil-bearing Cretaceous outcrops in the Nurata Mountains to the west, the Project area has very limited palaeontological potential and this aspect has therefore been scoped out of the assessment.

#### 6.5.3.2 Previous Archaeological Investigations

An archaeological survey of the Zarafshan Valley was undertaken in the 1930s and 1940s, identifying ancient, early medieval and medieval sites<sup>60</sup>. These included research around the Turkestan and Nurata mountain systems and Jizzakh oasis. Excavations have also been carried out at Tuzkan, northeast of Jizzakh. Investigations were led by the Palaeontological Institute and the Institute of History of Material Culture (later the Institute of Archaeology) of the USSR Academy of Sciences (Central Asia and the Caucasus Section, Leningrad; Uzbek Branch) and the Institute of History, Archaeology & Ethnography of the Academy of Science of the Uzbek Soviet Socialist Republic (UzSSR).

In 1956 the Makhan-Darya Archaeological Detachment (Ya. G. Gulyamov) conducted surveys on some sites in the Jizzakh Region<sup>61</sup>. In 1967 the Jizzakh detachment of the Institute of History and Archaeology of the Academy of Sciences of the UzSSR carried out exploration work prior to the construction of the Jizzakh reservoir, identifying early medieval and medieval sites including several burial mounds and 5<sup>th</sup> to 6<sup>th</sup> century CE (Common Era) ossuary burials<sup>62</sup>, which was continued in 1983<sup>63</sup>.

<sup>59</sup> ADB (2010) Central Asia Atlas of Natural Resources. Central Asian Countries Initiative for Land Management, Asian Development Bank, Manila, Philippines. Available at: <https://www.adb.org/sites/default/files/publication/27508/central-asia-atlas.pdf>

<sup>60</sup> Yakubovsky, A. Yu. (1950) Results of the work of the Tajik archaeological expedition for 1948-1950. [Итоги работ Таджикской археологической экспедиции за 1948-1950 гг] Materials and Studies in the Archaeology of the USSR. No. 15, 9-20; Yakubovsky, A. Yu. (ed.) (1950) Proceedings of the Sogd-Tajik Archaeological expedition [Труды Согдийско-Таджикской археологической экспедиции]. Vol. 1. 1946–1947. Moscow; Leningrad: Academy of Sciences of the USSR.

<sup>61</sup> Gulyamov, Ya.G. (1961) Kulpi-Sar Cemetery [Кладбище Кулпи-сар]. History of Material Culture of Uzbekistan [ИМКУ], Issue 2, Tashkent

<sup>62</sup> Kasymo, M.R. (1968) Archaeological work in Uzbekistan [Археологические работы в Узбекистане]. Archaeological discoveries [Археологические открытия] 1967. M., 1968

<sup>63</sup> Pardaev, M. (1992) Archaeological Works at Rasulbaikultera [Археологические Работы На Расулбайкултепа]. History of Material Culture of Uzbekistan [ИМКУ], 26, pp. 108-113. Available at: <https://core.ac.uk/download/pdf/162464359.pdf>

Investigations around the city of Jizzakh resumed in 1997 under Mukhtor Pardaev of the Institute of Archaeological Research of the Uzbek Academy of Sciences<sup>64</sup>. This Jizzakh Archaeological Expedition is currently working on mapping the archaeological monuments in the region.

Following the recent formation of the national Agency for Cultural Heritage<sup>65</sup>, the Register of Objects of Tangible Cultural Heritage are to be revised, resurveyed and records updated.

The Project has not required archaeological investigation (State Expertise) therefore no additional surveys were undertaken as part of the national OVOS assessment process.

## 6.5.4 Archaeology and Cultural Heritage Baseline Conditions

### 6.5.4.1 Tangible Cultural Heritage

#### Archaeological Sites

The Project site has not been subject to archaeological field survey (State Expertise). The wider area has not been subject to substantial or recent archaeological field research. This Preliminary report therefore presents the results of desk-based research. Understanding of sites is likely to change following site visit and further investigation.

A review of the known archaeology and history of the wider Project area indicates that there is low potential for the presence of Palaeolithic, Mesolithic and Neolithic material. Throughout the later prehistoric, antique and medieval periods, it is likely that the foothills where the Solar Array is located and plateaux crossed by the Transmission Line were populated by mobile herders. There is little evidence for ancient cultivation or irrigation in the immediate vicinity of the route where it crosses the Sangzor Valley. There is some potential for the presence of stray finds (casual losses), travellers' campsites and for burial mounds (*kurgan*), as well as shrunken settlements and cemeteries associated with the settlements in the foothills.

A review of satellite imagery dating from 2014 to 2021 (GoogleEarth Pro) has identified a range of potential cultural heritage sites in the vicinity of the Project Area, comprising distinctive patterns and anomalies visible as cropmarks, soilmarks and earthworks, visible on imagery taken in different years and seasons. The locations of the cores of historic villages and settlements were confirmed using CORONA satellite imagery<sup>66</sup> (1011-1039Fore, 8 Oct 1964). The legibility of satellite imagery in dry and upland areas is good, and the combination of Soviet mapping, historical and recent satellite mapping is a proven tool for remote site prospection in topographically similar areas of Uzbekistan<sup>67</sup>.

Identified sites include:

- Known and possible burial mounds (*kurgan*).
- Historic cemeteries, some with known associated shrines.
- Ruined and abandoned former settlement sites.
- Upland features including livestock enclosures.
- An inventory of sites is presented in Table 26. Inventory of cultural heritage sites identified on satellite imagery. The location sites in the vicinity of the Project are illustrated on Figure 6-40..
- *Known and possible burial mounds (kurgan)*
- Eight large, upstanding **burial mounds (kurgan)** are present on the plateau north of G'allaorol [**ACH11-ACH18**]. This group of kurgans survive as large, circular earthwork mounds within an arable field. Further ploughed-out and levelled kurgans may be present on this plateau [e.g. **ACH08, ACH09,**

<sup>64</sup> Pardaev M.H. (1997) North-western Ustrushona village construction some features of early medieval architecture [Шимолий-ғарбий Уструшона қишлоқ қурилиши меъморчилигининг илк ўрта асрлардаги айрим хусусиятлари]. History of material culture of Uzbekistan [ИМКУ], Tashkent

<sup>65</sup> Presidential Decree No. PF-6199 of 6 April 2021 "On measures to further improve the system of public administration in the fields of tourism, sports and cultural heritage". Available at: <https://lex.uz/docs/5356705>

<sup>66</sup> CORONA satellite imagery. 1011-1039Fore (Oct 08, 1964). Available at: <https://corona.cast.uark.edu/>

<sup>67</sup> Rondelli, B., Stride, S. & Garcia-Granero, J.J. (2013) Soviet military maps and archaeological survey in the Samarkand region. Journal of Cultural Heritage 14, 270 – 276. DOI: <https://doi.org/10.1016/j.culher.2012.06.006>; Angas, J., Uribe, P., Bea, M., Farjas, M., Arino, E., Martinez-Ferreras, V. & Gurt, J.M. (2021) Potential of CORONA satellite imagery for 3D reconstruction of archaeological landscapes [Ancient Termez]. 3rd Congress in Geomatics Engineering, Valencia. DOI: <https://dx.doi.org/10.4995/CiGeo2021.2021.12703>

**ACH10, ACH19, ACH20, ACH24**. A further possible upstanding kurgan is located south of the Sangzor River, south of the electricity substation [**ACH22**]. It is possible that this area of kurgans also contains flat inhumations, cremations and buried evidence for associated ritual activity e.g. animal burials and votive offerings.

- *Historic cemeteries, some with known associated shrines*
- **Historic cemeteries** are present in the Study Area, on the edges of villages at Sayfinota [**ACH02**] and Karakchi/Chayanli [**ACH05**]. ESSR Reporting suggests the presence of a cemetery immediately southeast of the solar farm area at Karakchi [**ACH04**], near an area of former settlement earthworks [**ACH03**]. Further site visits are required to confirm this and assess any potential project impacts upon it. An active Muslim **shrine** is associated with the cemetery at Sayfinota [**ACH01**; Regional Inventory No. 299].
- *Ruined and abandoned former settlement sites*
- The earthworks of several ruined and abandoned former settlement sites are visible on satellite imagery in upland pasture areas [**ACH03, ACH06, ACH07**]. These include building foundations, stock enclosures and yards, small areas of ridge and furrow cultivation, hollow-ways/trackways and linear boundaries. Some abut former river meanders, demonstrating their antiquity. These represent the remains of small upland settlements and seasonal occupation connected to agricultural activities. Some settlements are isolated from modern occupation areas [**ACH07**], but others indicate that the locations of modern villages have shifted focus slightly, or shrunk compared to the earlier extent of settlement [**ACH03, ACH06, ACH24**]. Villages such as Sayfinota, Karakchi and Chayanli appear much smaller on 1964 CORONA images than they are today. Others appear to have been ruined, or at least seasonally occupied sites, by 1964.
- *Upland features including livestock enclosures*
- **Upland features** include livestock enclosures or corrals, trackways, isolated ruins of small buildings or shelters, and small-scale quarrying [e.g. **ACH21**]. Some of these may be related to recent sheep and cattle herding/grazing, ploughing, vehicle tracking or quarrying. These have not all been mapped or allocated ACH receptor numbers at this point. Any significant elements relevant to livelihoods, cultural values and ecosystems services will be noted during the site walkover, State Expertise and socio-economic surveys.

**Table 26. Inventory of cultural heritage sites identified on satellite imagery**

ESIA report ref. number	State Reg. No.	Name	Date	Location	Description	Distance from Site	Latitude (N) DMS	Longitude (E) DMS
ACH01	299	Sayfinota Main Shrine	Late 19th century to early 20th century	Sayfinota Rural Citizens' Council, Sayfin Village	Shrine. State property. On the basis of the right of operative management of the Department of Culture of Jizzakh Region. Priority Restoration List site No. 102.	1.2km southwest of northwestern boundary of proposed solar farm	40° 8'4.15"N	67°29'40.99"E
ACH02	-	Sayfinota Cemetery	Medieval, post-medieval, modern	Sayfinota Rural Citizens' Council, Sayfin Village	Large cemetery in western part of Sayfinota village	1.2km southwest of northwestern boundary of proposed solar farm	40° 8'1.81"N	67°29'42.03"E
ACH03	-	Karakchi, settlement remains, earthworks	Undated	Karakchi village	Settlement ruins visible on satellite imagery. Area to south now built up, residential.	200m southeast of southeastern boundary of proposed solar farm	40° 6'12.76"N	67°32'59.00"E
ACH04	-	Karakchi, enclosure earthworks	Undated	Karakchi village	Rectangular earthwork enclosure visible on satellite imagery Surrounding area contains settlement earthworks. Located north of settlement of Karakchi in grazing area. Accessed via dirt roads. Possibly the cemetery noted in previous reporting.	230m southeast of southeastern boundary of proposed solar farm	40° 6'14.31"N	67°32'58.81"E
ACH05	-	Karakchi/Chayanli cemetery	Medieval, post-medieval, modern	Karakchi/Chayanli villages	Cemetery in foothills NE of settlement, overlooking river to southwest. To south is extensive area of settlement earthworks visible on satellite imagery.	960m northeast of Transmission Line; 3km southeast of southeastern boundary of solar farm	40° 5'39.24"N	67°34'56.20"E
ACH06	-	Karakchi/Chayanli , settlement remains	Undated	Chayanli village	Area of settlement earthworks/ruined foundations visible on satellite imagery northeast of river/present settlement of Chayanli. Core of historic settlement is visible on CORONA satellite data dating to 1964.	770m northeast of Transmission Line; 2.7km southeast of southeastern boundary of solar farm	40° 5'24.27"N	67°34'59.63"E



ACH07	-	Settlement remains, earthworks	Undated	East of Chayanli village	Settlement remains to north of river visible as earthworks particularly on satellite imagery of Dec 2014. Much appears to have been removed during development of modern structures by April 2021. Visible on as ruined structures with no dark vegetation/active gardens on CORONA satellite imagery taken in 1964.	110m north of Transmission Line in vicinity of tower 33	40° 4'0.10"N	67°36'28.36"E
ACH08	-	Possible mound site, circular cropmark	Undated	East of Chayanli village	Possible site of mound or kurgan, partially levelled, appears as an oval in a ploughed field. Visible on satellite imagery as cropmark.	70m north of Transmission Line between tower 33 and tower 37	40° 3'47.14"N	67°36'47.26"E
ACH09	-	Possible mound site, circular cropmark	Undated	East of Chayanli village	Possible site of mound or kurgan, partially levelled, appears as an oval in a ploughed field. Visible on satellite imagery as cropmark.	70m north of Transmission Line in vicinity of tower 37	40° 3'38.63"N	67°37'9.43"E
ACH10	-	Kurgan (site of)	Prehistoric or protohistoric	North of G'allaorol	Unclear if still extant. Marked on Russian Military map of 1985 as 8m high, located immediately north of Motor and Tractor Repair Shops (MTM). Clearly visible on CORONA imagery of 1964 as a pair of kurgans; geolocation taken from CORONA imagery. Surrounding area appears to have been disturbed by groundworks/quarrying/levelling.	1.2km south of Transmission Line Tower 28	40° 3'16.71"N	67°35'37.76"E
ACH11	-	Kurgan (upstanding)	Prehistoric or protohistoric	North of G'allaorol	Burial mound marked as 5m high on 1985 1:50 000 Russian Military Map. Extant, visible on satellite imagery within ploughed field. Part of cluster of kurgans on plateau north of G'allaorol.	900m south of Transmission Line between Towers 33 and 37	40° 3'16.62"N	67°36'32.98"E
ACH12	-	Kurgan (upstanding)	Prehistoric or protohistoric	North of Gal G'allaorol	Burial mound marked as 5m high on 1985 1:50 000 Russian Military Map. Extant, visible on satellite imagery within ploughed field. Part of cluster of kurgans on plateau north of G'allaorol.	1.2km south of Transmission Line Tower 37	40° 2'59.35"N	67°36'48.04"E

ACH13	-	Kurgan (upstanding)	Prehistoric or protohistoric	North of G'allaorol	Burial mound marked as 3m high on 1985 1:50 000 Russian Military Map. Extant, visible on satellite imagery within ploughed field. Part of cluster of kurgans on plateau north of G'allaorol.	1.24km west of Transmission Line Tower 46	40° 2'50.92"N	67°36'49.22"E
ACH14	-	Kurgan (upstanding)	Prehistoric or protohistoric	North of G'allaorol	Burial mound marked as 3m high on 1985 1:50 000 Russian Military Map. Extant, visible on satellite imagery within ploughed field. Part of cluster of kurgans on plateau north of G'allaorol.	360m south of Transmission Line Tower 37	40° 3'24.52"N	67°37'1.39"E
ACH15	-	Kurgan (upstanding)	Prehistoric or protohistoric	North of G'allaorol	Burial mound marked as 8m high on 1985 1:50 000 Russian Military Map. Extant, visible on satellite imagery within ploughed field. Part of cluster of kurgans on plateau north of G'allaorol.	800m south of Transmission Line Tower 37	40° 3'9.81"N	67°37'1.23"E
ACH16	-	Kurgan (upstanding)	Prehistoric or protohistoric	North of G'allaorol	Burial mound, marked as 9m high on 1985 1:50 000 Russian Military Map, location of benchmark @ 612m. Extant, visible on satellite imagery within ploughed field. Part of cluster of kurgans on plateau north of G'allaorol.	900m south of Transmission Line Tower 37	40° 3'5.88"N	67°37'5.13"E
ACH17	-	Kurgan (upstanding)	Prehistoric or protohistoric	North of G'allaorol	Burial mound marked as 2m high on 1985 1:50 000 Russian Military Map. Extant, visible on satellite imagery within ploughed field. Part of cluster of kurgans on plateau north of G'allaorol.	1km west of Transmission Line Tower 46	40° 2'46.27"N	67°37'8.13"E
ACH18	-	Kurgan (upstanding)	Prehistoric or protohistoric	North of G'allaorol	Burial mound marked as 3m high on 1985 1:50 000 Russian Military Map. Extant, visible on satellite imagery within ploughed field. Part of cluster of kurgans on plateau north of G'allaorol.	780m west of Transmission Line Tower 46	40° 2'51.53"N	67°37'16.70"E

ACH19	-	Possible site, circular cropmark	Undated	North of G'allaorol	Possible removed structure or mound; donut-shaped berm, persistent feature in satellite imagery. wetter than surrounding areas. May be shelter, salt-lick, agricultural but located close to numerous other feature which look like ploughed-out kurgan mounds.	90m northeast of Transmission Line near Tower 46	40° 2'58.64"N	67°37'54.28"E
ACH20	-	Possible site, circular cropmark	Undated	North of G'allaorol	Persistent dark water retaining patches visible in arable field; may be natural geological; may be rotating locations of grazing salt licks or shelters. Located in an arable field southeast of a cluster of kurgans on the plateau north of G'allaorol.	20m southwest of Transmission Line near Tower 46	40° 2'54.64"N	67°37'53.00"E
ACH21	-	Possible site, circular earthworks	Undated	Possible site, circular earthworks	Double-ditched circular feature visible of satellite imagery. Possible animal pen, stock enclosure or burial mound.	Within 5m of Transmission Line between Towers 53 and 59	40° 2'6.83"N	67°38'54.27"E
ACH22	-	Possible mound site, earthworks	Undated	East of G'allaorol	Possible site of kurgan burial mound located in uncultivated square of land within an area of arable fields. Circular grassed mound appears extant in satellite imagery dated April 2021.	710m south of Transmission Line at Tower 64	40° 1'1.21"N	67°38'23.28"E
ACH23	-	Possible site, square earthworks	Undated	Hilltop northeast of Sayfinota Village	Square structure visible on CORONA and 2014-2021 satellite imagery. Overlooking river valley and plains. Approximately 37m x 39m.	c.750m southwest of southwestern corner of solar farm area	40° 8'21.47"N	67°29'47.62"E
ACH24	-	Possible site, circular cropmark	Undated	North of G'allaorol	Circular cropmark, darker than surrounding area, visible in arable field. Near confluence of stream and river. Northwest of cluster of upstanding kurgans, possible outlier.	30m north of Transmission Line between towers 28 and 33	40° 3'56.49"N	67°36'6.37"

ACH25	207	Abdulkhan Bandi Dam	10th – 13th century CE	Band Town, Forish District	World Heritage Tentative List (Cultural) Ref. 809 & 5288. The dam of Abdulkhan Bandi is important to hydrological engineering history in Central Asia. State property. On the basis of the right of operative management of the Department of Culture of Jizzakh Region	Approximately 45km northwest of Project location	40°30'33.55"N	67°16'25.28"E
ACH26		Zaamin Mountains	-		World Heritage Tentative List (Natural) Ref. 5289. The Zaamin Mountains include the Zaamin State Reserve and Zaamin National Park, various medicinal herbs and health springs and a sanatorium built in the 1970s.	Approximately 75km southeast of Project location	39°39'44.32"N	68°26'35.02"E
ACH28		Silk Roads Sites in Uzbekistan	-		World Heritage Tentative List (Natural) Ref. 5500. Silk Roads Sites in Uzbekistan. The M39 Tashkent-Samarkand-Termez road, which broadly follows the course of a historic Silk Roads route via Khujand (Tajikistan), the Fergana Valley and Samarkand. There are no surviving components of the route in the vicinity of the Project, such as caravanserais or inns, forts and garrisons, bridges, irrigation systems, religious buildings and pilgrimage sites.	The Transmission Line crosses the M39 road in two places	40° 2'38.33"N 40° 2'20.81"N	67°38'25.74"E 67°38'49.28"E



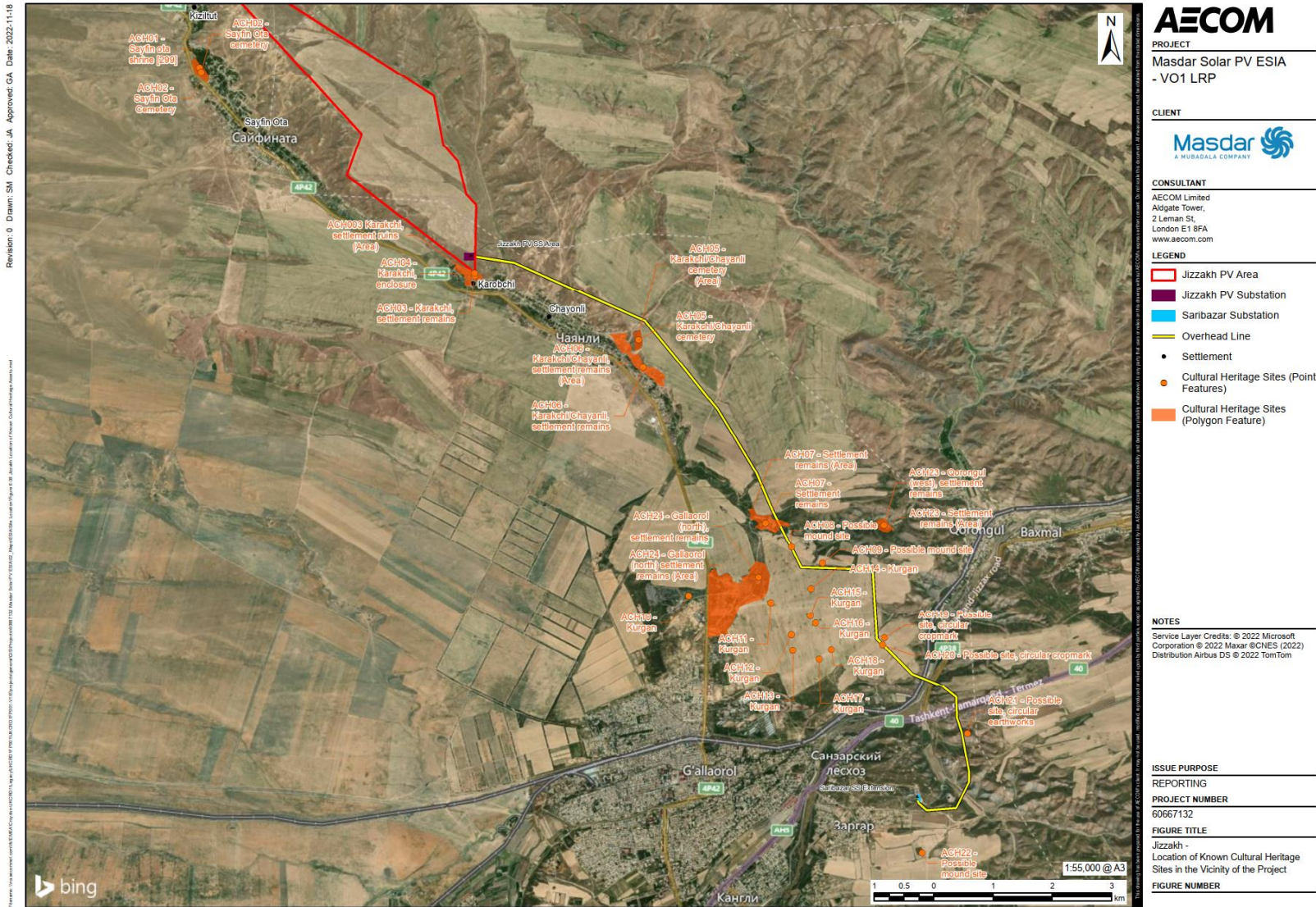


Figure 6-40. Location of known cultural heritage sites in the vicinity of the Project

#### 6.5.4.2 Natural Features and Tangible Objects with Cultural Values

Desk-based assessment has not identified any unique natural features or tangible objects that embody cultural values, such as sacred plants, rocks and watercourses that can be significant aspects of cultural landscapes. Some springs in the Jizzakh Region are considered to have healing properties.

Wild foods gathered in the area include juniper, almond, walnut, and medicinal plants<sup>68</sup>. In the Zaamin State Reserve (Zaamin District, Jizzakh Region) is the 700-year old Bobo-Yongok, an ancient nut tree.

#### 6.5.4.3 Tourism

The Jizzakh Region, including G'allaorol District, is in the process of developing tourism to attract local and foreign tourists. This includes developing cultural tourism, ecotourism, agriculture, health/curative mineral springs, sports and hunting tourism, via programmes such as the recent Accelerated Development of Tourism Potential of Jizzakh Region in 2017-2019<sup>69</sup>.

There is a focus on developing tourism to shrines, such as the Sayfinota village shrine (**ACH002**; Priority Restoration Site No. 102), defined as one of Jizzakh's heritage sites with high tourism potential and priority site for pilgrimage/tourism development<sup>70</sup>.

#### 6.5.4.4 Intangible Cultural Heritage

Intangible cultural heritage is defined as the practices, representations, expressions, as well as the knowledge and skills (including instruments, objects, artefacts, cultural spaces), that communities, groups and, in some cases, individuals recognised as part of their cultural heritage. It is sometimes called living cultural heritage and includes oral traditions and expressions, including language; performing arts; social practices, rituals and festive events; knowledge and practices concerning nature and the universe; and traditional craftsmanship (UNESCO, 2003).

#### UNESCO Representative List of Intangible Cultural Heritage and Memory of the World Register

Uzbekistan's entries on the UNESCO Representative List of the Intangible Cultural Heritage (ICH) of Humanity comprise the art of miniature, Khorazm Dance; silk and textile production; Navruz (New Year) ceremonies; Palov rice dish traditions; Askiya, the art of wit; Katta Ashula traditional song; the shamanistic beliefs, Zoroastrian, Buddhist and Islamic traditions of the Boysun District; and the classical music tradition of Shashmaqom<sup>71</sup>. Additional elements proposed for inclusion on the representative list of ICH include the art of baxshichilik epic poetry and song; pottery; embroidery; carving and carpet making.

Uzbekistan's entries in the Memory of the World Register comprise the Archives of the Chancellery of Khiva Khans, the Holy Koran Mushaf of Othman and the Collection of the Al-Biruni Institute of Oriental Studies<sup>72</sup>. Elements proposed for inclusion on the UNESCO Memory of the World Register include al-Khwarizmi's *Brief Commentary on Astronomy*; Archives of the Bukhara Emirate; state foundation documents; cinematography of Khudoibergan Devonov and documents on evacuation to Uzbekistan during the Second World War.

It is not assessed that the continuation and transmission of any entries or proposed entries on the Representative List or the Memory of the World Programme would be impacted by the Project.

#### Local intangible cultural heritage activities

Uzbek local crafts related to intangible heritage include silk production and weaving, rug and carpet-making and motifs; ceramics and varnished miniatures; wood-carving; metal chasing and embossing; silk and gold embroidery and tapestry; the Uzbek language; and culinary traditions. The G'allaorol

<sup>68</sup> Jizzakh Viloyat Website n.d. Jizzakh Khokimat: About the region [Viloyat xaqida]. Accessed 10 Oct 2021. Available at: <https://jizzax.uz/viloyat-aida.html>

<sup>69</sup> Jizzakh Viloyat Website 2020 Tourism is a promising vector for the development of the region (Turizm – perspektivnyj vektor razvitiya oblasti). Available at: <http://jizzax.uz/129-horizhiy-turistlar-oimini-kpaytirish-va-ichki-turizmni-yanada-rivozhlantirish.html>

<sup>70</sup> Resolution of the Cabinet of Ministers No. 100 on Additional Measures to Develop Domestic and Pilgrimage Tourism. Appendix 1: Cultural heritage sites with high tourism potential, which are planned to create conditions for visitors. Available at: <https://lex.uz/ru/acts/-5315060>

<sup>71</sup> UNESCO Lists of Intangible Cultural Heritage and the Register of good safeguarding practices. Available at: <https://ich.unesco.org/en/lists>

<sup>72</sup> UNESCO Memory of the World Register: Uzbekistan. Available at: <http://www.unesco.org/new/en/communication-and-information/memory-of-the-world/register/access-by-region-and-country/uz/>



District is specialised in folk handicrafts made of wood<sup>73</sup>.

Religious practices in the locality are reported to comprise Muslim 96% (mostly Sunni of the Hanafi school), Russian Orthodox 2.5%, other 1.8% includes small communities of Catholics, Protestants, Buddhists, Baha'is, Hare Krishnas, and atheists<sup>74</sup>. Uzbekistan has experienced a resurgence in religious practice since the 1980s, with increased activities of religious schools, neighbourhood mosques and religious orders which are controlled by the Muslim Board of Uzbekistan (the Muftiate). The surrounding area has a number of Islamic centres with their *maktabs* (primary schools) and *madrasahs* (seminaries) organized and supported by Muslim religious educators and their followers.

Intangible cultural heritage activities in the Project site and immediate Study Area are assessed as being of local or regional significance. There are no associations with particular innovations, technical or scientific developments.

### **Ethnic identity**

In Jizzakh Region in 2018, 89.0% of the population were recoded as Uzbeks, 1.2% Russians, 0.5% Tatars, 3.1% Kyrgyz, 2.3% Tajiks, and 3.9 % are of other nationalities<sup>75</sup>.

#### **6.5.4.5 Critical Cultural Heritage**

Critical Cultural Heritage is defined as internationally recognized or legally protected cultural heritage areas, including proposed World Heritage Sites, or the heritage of communities who use, or have used within living memory the cultural heritage (IFC, 2012).

The Project site itself does not contain any internationally recognized or legally protected cultural heritage areas. The Transmission Line crosses the M39 Tashkent-Samarkand-Termez road, which broadly follows the course of the Silk Roads, a Tentative List World Heritage Site within Uzbekistan (Ref. 5500).

### **Community Use of Cultural Heritage**

An active Muslim **shrine** is associated with the cemetery at Sayfinota [**ACH01**; Regional Inventory No. 299]. Cemeteries are located at Sayfinota [**ACH02**] and Karakchi/Chayanli [**ACH05**] and there may be a cemetery immediately southeast of the solar farm area at Karakchi [**ACH04**].

### **Potential Significance of Archaeological Remains**

No internationally recognised or legally protected cultural heritage areas have been identified within the Study Area. The Study Area has moderate potential to contain significant, stratigraphically intact archaeological remains; any remains present may have been impacted by erosion caused by physical, climatic and chemical weathering. It is anticipated that any superficial or buried archaeological sites within the Project area are likely to be classed according to IFC criteria as 'replicable cultural heritage' (IFC, 2012), and can be mitigated by appropriate archaeological investigation, recording and dissemination.

### **Internationally Recognised Cultural Heritage Areas**

#### *World Heritage properties*

Uzbekistan has four cultural properties inscribed on the World Heritage List, the Historic Centre of Bukhara, the Historic Centre of Shakhrisyabz, Itchan Kala and Samarkand – Crossroad of Cultures<sup>76</sup>. All are distant from the Project, which would not impact upon them.

<sup>73</sup> Resolution of the President of the Republic of Uzbekistan. Decision No. PQ-4539 of 28 November 2019. On Additional Measures for Further Development of Crafts and Support of Craftsmen. Available at: <https://lex.uz/ru/docs/-4622088>

<sup>74</sup> USDoS (2020) Uzbekistan 2020 International Religious Freedom Report. United States Department of State, Office of International Religious Freedom. Available at: <https://www.state.gov/wp-content/uploads/2021/05/240282-uzbekistan-2020-international-religious-freedom-report.pdf>

<sup>75</sup> Jizzakh Viloyat Website n.d. Jizzakh Khokimat: About the region. Datapoint July 1, 2018. Accessed 10 Oct 2021. Available at: <https://jizzax.uz/viloyat-aida.html>

<sup>76</sup> Uzbekistan Properties inscribed on the UNESCO World Heritage List. Available at: <https://whc.unesco.org/en/statesparties/uz>

### Tentative List World Heritage Sites

A Tentative List is an inventory of those cultural and natural properties which each State Party intends to consider for nomination to the World Heritage List.

**Silk Roads Sites in Uzbekistan** (Ref. 5500) (Jizzakh Region, G'allaorol District). The Transmission Line crosses the M39 Tashkent-Samarkand-Termez road, which broadly follows the course of a historic Silk Roads route. Uzbekistan's Silk Roads facilitated trade in silk and materials such as precious metals and stones, ceramics, perfumes, ornamental woods, and spices in return for cotton and wool textiles, glass, wine, amber, carpets and horses. This trade was sustained by a system of caravanserais, commercial settlements, trade cities and forts spreading ideas, scientific and technological developments. This is reflected in surviving monuments, sites and cultural landscapes. No individually listed component properties reflecting the urban, architectural and technological ensembles or historic and living traditions, beliefs and value systems of the Silk Roads property are located in Jizzakh Region<sup>77</sup>. There are no surviving components of the route in the vicinity of the Project, such as caravanserais or inns, forts and garrisons, bridges, irrigation systems, religious buildings and pilgrimage sites.

**Abdulkhan Bandi Dam** (Ref. 809; Ref. 5288) (Jizzakh Region, Forish District), built in the 10th to 13<sup>th</sup> century CE, is located c. 45km northwest of the Project<sup>78</sup>. [

The **Zaamin Mountains** (Ref. 5289) (Jizzakh Region, Zaamin District) are a natural site located c.75km east of the terminus of the Transmission Line. They include the Zaamin State Reserve and Zaamin National Park, and contain rare plant and animal species, various medicinal herbs and springs and a sanatorium built in the 1970s. These are located c. 75km east of the Project<sup>79</sup>.

The Project will not impact upon these Tentative List sites. The landscape in the vicinity of the Transmission Line is already characterised by modern industrial development on the fringes of G'allaorol and transport communications including the M39 road and the Tashkent-Samarkand High-speed Rail Line. The proposed solar farm will be constructed in a high valley, screened by topography and the intervening distance. The solar panels would either not be discernible or would not alter the main foci of panoramic views. Potential harmful impacts from the Project on these Tentative List properties are therefore scoped out.

**Table 27. Internationally Recognised Cultural Heritage Areas in the vicinity of the Project**

International designation	UNESCO Reference No.	State Register	State Register No.	Description	Distance from Site	Latitude (N) DMS	Longitude (E) DMS
Tentative World Heritage List	TL Ref. 5500	Var	Var	Silk Roads Sites in Uzbekistan	Area crossed by Transmission Line	40° 2'38.33"N 40° 2'20.81"N	67°38'25.74"E 67°38'49.28"E
Tentative World Heritage List	TL Ref. 809 & 5288	Forish District Architectural monument	207	Abdulkhan Bandi Dam	45km to NW	40°30'33.55"N	67°16'25.28"E
Tentative World Heritage List	TL Ref. 5289	State Reserve, National Park		Zaamin Mountains	75km to SE	39°39'44.32"N	68°26'35.02"E

### Legally Protected Cultural Heritage Areas

A full list of State Register sites located in G'allaorol District, Jizzakh Region is in Appendix A. A preliminary list of State Register sites located in the vicinity of the Study Area is presented in Table 28. There are no protected sites located within the solar farm site or Transmission Line area. The Project would not impact upon this architectural monument. Views are screened by intervening topography, vegetation and built form.

<sup>77</sup> UNESCO Tentative Lists – Silk Roads Sites in Uzbekistan. Available at: <https://whc.unesco.org/en/tentativelists/5500/>

<sup>78</sup> UNESCO Tentative Lists – Khanbandi (dam). Available at: <https://whc.unesco.org/en/tentativelists/809/> & <https://whc.unesco.org/en/tentativelists/5288/>

<sup>79</sup> UNESCO Tentative Lists – Zaamin Mountains. Available at: <https://whc.unesco.org/en/tentativelists/5289/>



**Table 28. Extract from the State Register sites on the National List of Immovable Property of the Intangible Cultural Heritage – Jizzakh Region, G’allaorol District. Distances & coordinates are estimated.**

State No.	Name of the object	Date	Address	Right to real estate	Distance from Site	Latitude (N) DMS	Longitude (E) DMS
<b>Architectural monuments</b>							
299	Sayfinota Shrine	Main Late 19th century to early 20th century	Sayfinota Rural Citizens' Council, Sayfin Village	Shrine. State property. On the basis of the right of operative management of the Department of Culture of Jizzakh Region. Priority Restoration List site No. 102.	1.2km SW of boundary proposed solar farm	40° 8'4.15"N	67° 29'40.99"E

### 6.5.5 Archaeology and Cultural Heritage Receptors and Receptor Sensitivity

The archaeological sites known from the wider area are considered to be typical of the region. Some have been designated according to local, national or international standards in terms of their outstanding aesthetic, artistic, documentary, environmental, historic, scientific, social, or spiritual value. The assessment of the scientific value of any archaeological sites may change following the site visit, State Expertise and any intrusive investigation and recording work.

Intangible cultural heritage activities are assessed as being of local significance and no particular elements are designated or registered, and consultation has not indicated any associations with particular innovations, technical or scientific developments, movements or specific individuals of regional or national significance.

### 6.5.6 Sensitivity Criteria

Table 29 presents the sensitivity criteria specific to the archaeology and cultural heritage study.

**Table 29. Archaeology and cultural heritage sensitivity criteria**

Sensitivity	Criteria
High	<p>Sites of acknowledged international importance inscribed as World Heritage Sites. Individual attributes that convey Outstanding Universal Value.</p> <p>Nationally-designated archaeological monuments, sites, buildings or historic landscapes protected by national laws. Undesignated sites, structures or historic landscapes of demonstrable national value.</p> <p>Assets that can contribute significantly to acknowledged national or international research objectives, whether designated or not.</p> <p>Well or extremely well preserved historic landscapes with considerable or exceptional coherence, time-depth, or other critical factors.</p> <p>Intangible Cultural Heritage inscribed on national registers, or associated with movements or individuals of national or global significance.</p>
Medium	<p>Designated or undesignated sites, landscapes or seascapes that can contribute significantly to regional research objectives.</p> <p>Designated or historic buildings that have exceptional qualities or historical associations, with important historic integrity and contributing significantly to historic character.</p> <p>Designated or undesignated historic landscapes or seascapes of regional value, which would warrant designation.</p> <p>Intangible cultural heritage areas in local registers, or associated with movements or individuals of local importance.</p>
Low	<p>Designated or undesignated assets of local importance. Assets compromised by poor preservation and/ or poor survival of contextual associations, or with little or no surviving archaeological interest.</p> <p>Assets with potential to contribute to local research objectives.</p> <p>Historic buildings of modest quality in their fabric or historical associations, or buildings or urban landscapes of no architectural or historical merit; buildings of an intrusive character.</p>

Undesignated historic landscapes or seascapes with importance to local interest groups, whose value is limited by poor preservation and/ or poor survival of contextual associations. Landscapes or seascapes of little or no significant historical interest.

Intangible cultural heritage activities of local significance, or associated with individuals of local importance. Poor survival of physical areas in which activities occur or are associated. Areas with few intangible cultural heritage associations or vestiges surviving.

Negligible	Assets with little or no surviving archaeological interest. Buildings or urban landscapes of no architectural or historical merit; buildings of an intrusive character. Areas with few intangible cultural heritage associations or vestiges surviving.
Unknown	The importance of the resource cannot be ascertained.

Source: ICOMOS, 2011

### 6.5.7 Receptor Sensitivity

Table 30 presents the level of sensitivity for each receptor identified.

**Table 30. Sensitivity criteria for archaeology and cultural heritage receptors**

Receptor	Sensitivity
<b>Tangible cultural heritage</b> Archaeological sites identified on satellite imagery – settlement remains, levelled burial mounds (kurgan), agricultural features	Low
<b>Tangible cultural heritage</b> Any archaeological sites identified by the State Expertise	Presently unknown, anticipated to be low
<b>Natural features/ tangible objects with cultural values</b> Rock formations, sacred trees, springs, etc.	Presently unknown, anticipated to be high
<b>Intangible cultural heritage</b> Cultural knowledge, living traditions & religious practices e.g. activities and transmission of practices related to Sayfinota Main Shrine, cemeteries, healing springs, farming practices; local crafts. These are considered to be resilient to the Project effects.	Medium
<b>Critical Cultural Heritage</b> State Register sites identified in proximity to site (Sayfinota Main Shrine architectural monument No. 299) Community Use of Cultural Heritage – Cemeteries located at Sayfinota [ACH02], Karakchi [ACH04] [and Karakchi/Chayanli [ACH05]	High

The possible remains of levelled burial mounds (kurgans) have been identified in the vicinity of the Transmission Line. Associated satellite burials and ceremonial structures may be present. A group of upstanding kurgans are present in the adjacent arable field. Neither the upstanding kurgan monuments nor the possible levelled kurgans are listed in the State Register. Kurgans are a widespread monument type in the Jizzakh Region and in Central Asia, so are not considered rare. Any remains in the vicinity of the Transmission Line will have been levelled, and ploughing may have truncated upper levels of deposits. For this reason, these receptors are assessed as being of low (local) importance.

The sensitivity of any currently unknown archaeological remains that may survive within the Project Area cannot be accurately determined at the time of writing. Their sensitivity would be derived from their potential to contribute to our scientific understanding of past human activities and environments. However, based on the likely level of preservation of remains and the condition of remains from the wider area, it is assessed that their sensitivity would be low.

Local intangible heritage practices including farming and crafts have strong administrative support and are considered to be resilient to the development. It is not assessed that the Project will impact upon the fabric, use or transmission of practices at Sayfinota Main Shrine State Register sites [ACH01], or cemeteries at Sayfinota [ACH02], Karakchi [ACH04] and Karakchi/Chayanli [ACH05].

No internationally recognized or legally protected cultural heritage areas have been identified within the Study Area. It is anticipated that any superficial or buried archaeological sites within the Project area are likely to be classed according to IFC criteria as 'replicable cultural heritage' (IFC, 2012), and can be mitigated by appropriate archaeological investigation, recording and dissemination.

## 6.6 Waste Management

AECOM identified that the nearest landfill is located approximately 12-15 km from the site in Chayanli makhalla. There are no recycling facilities at this landfill but it accepts all types of wastes, including construction wastes. Another landfill is located approximately 30 km from the project site. Stakeholder meetings suggest that there are no local licensed companies for removal of hazardous wastes, as there are no hazardous wastes generated in the project area and surroundings.

An appropriate landfill site will be identified by the EPC contractor that receive municipal and construction waste. Appropriate licensed companies will be identified by the EPC contractor for removal of hazardous wastes.

## 6.7 Socio-economic Conditions

### 6.7.1 Introduction and Methodology

Social impacts are defined as "the consequences to human populations of any public or private actions that alter the ways in which people live, work, play, relate to one another, organize to meet their needs, and generally cope as members of society" (The Interorganizational Committee on Guidelines and Principles for Social Impact Assessment, 1994). To understand the full extent of any social impacts arising from the Project, directly or indirectly, a detailed socio-economic baseline is required to appreciate current socio-economic conditions and therefore accurately assess the significance of any anticipated impacts, positive or negative. The baseline also helps to determine what mitigation measures (which aim to reduce the significance of negative impacts and enhance the significance of positive impacts) can be feasibly implemented within the Project's socio-economic context.

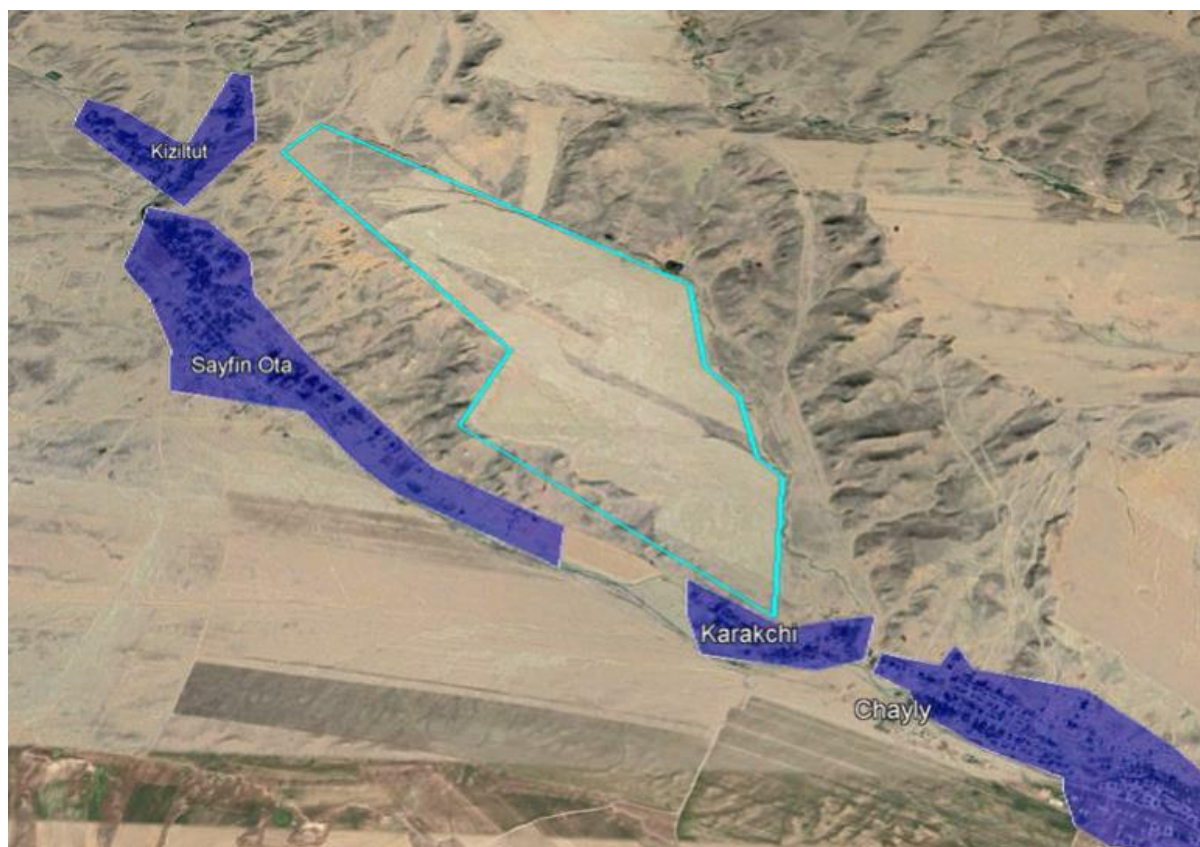
Additional baseline data was gathered during the impact assessment phase to compile a more comprehensive description of social conditions of the communities within the Projects' Area of Influence (Aoi). In order to provide socio-economic context, statistics and other summary information will also be provided for Uzbekistan as a whole.

Further work has been completed including a Social Compliance Audit and Livelihood Restoration Plan (LRP). In support of those studies, detailed socio-economic surveys have been undertaken and are included in the LRP.

### 6.7.2 Socio-economic Area of Influence

The Social Study Area, or Aoi, will focus on the Project Site, as defined in Section 2. For the purpose of characterising other potential direct and indirect socio-economic impacts to surrounding communities, in accordance with IFC guidance (see Section 3.5.1), the Study Area will also extend to 2 km from the perimeter of the Project Site to encompass nearby communities who may feasibly be impacted by the project's construction, operation and decommissioning activities. These communities have been identified in Figure 6-41.

Although the focus of the baseline study is the Project site and surrounding communities, some national and regional level baseline information may also be included to provide a wider socio-economic context.



**Figure 6-41. Makhallas within 2 km of the Project Site Boundary**

### 6.7.3 National and Regional Development Context

The Republic of Uzbekistan is a landlocked country in Central Asia and was formerly a part of the Union of Soviet Socialist Republic until it declared independence in September 1991. The country occupies a total of 448,900 square kilometres and shares borders with five other countries: Afghanistan, Kazakhstan, Kyrgyzstan, Tajikistan, and Turkmenistan.

As of 2020, the estimated total population was 34,232,050, just under 50% of whom live in rural areas (World Bank, 2021). Uzbeks account for 83.8% of the population, while other ethnic groups such as the Tajiks, Kazakhs, Russians, Karakalpak, Tartars comprise the remaining 16.2% (CIA, 2021). Uzbek is the only official and most widely spoken language in the country, spoken natively by approximately 85% of the population. Russian has widespread use as an inter-ethnic communication language and as a language of governance. Other ethnic languages spoken in the country are Tajik, Kazakh, Tatar, Kyrgyz, and others. In terms of religious faith, 88% percent of the population are Muslim (primarily Sunni), 9% are Eastern Orthodox Christians and 3% are of other faiths (CIA, 2021).

Economically, Uzbekistan is a major producer and exporter of cotton and, with a large capacity for power-generation from the Soviet era and an abundant supply of natural gas, the country has become the largest electricity producer in Central Asia. Having a large supply of liquid assets at its disposal has resulted in high economic growth and low public debt (Pajank, 2019). However, the country's GDP per capita remains relatively low, at USD 7,378 compared to other economies in the region such as Kazakhstan (USD 26,728), Turkmenistan (USD 16,195), and Azerbaijan (USD 14,452) (World Bank, 2021).

The Republic of Uzbekistan consists of the Republic of Karakalpakstan, 12 regions, 120 cities, 113 towns, 164 districts, and 11,844 rural settlements. The population is densest in the southern and eastern regions of the country near the capital, Tashkent. The population to the northern and western regions, around the Republic of Karakalpakstan is sparser (Bektemirov & Rahimov, 2001).

The system of public administration in Uzbekistan is comprised of two tiers, central and local. Local governments are subdivided into regional, district and city administrations. In addition, community self-



governments also operate locally, although they are not part of the central public administration system (Bektemirov & Rahimov, 2001).

#### 6.7.4 Local Governance and Institutional Structure

The project site is located within Jizzakh Region of Uzbekistan which has an estimated population of 127,500 people and encompasses 12 administrative districts. The project site sits within the Gallaorol District (sometimes spelt Gallyaaral), this is the largest district in the Jizzakh Region with an area of 1,959 km<sup>2</sup> and an estimated 130,000 inhabitants.

The solar Project is located near the communities listed in Table 31 below.

**Table 31: Nearest Settlements to the Project**

Settlement	Distance from the Project Site	Number of Residents*	Comments
Kiziltut	500 m	666 (M= 332, F= 334)	Rural village located the north western boundary of the site.
Sayfin Ota	450 m	2,016 (M= 1,072, F= 944)	Village running along the western boundary of the site. Residents from this village use the project area to graze sheep; approximately 8 flocks of sheep (150-300 sheep in each one) cross the project area every day.
Karakchi	200 m	371 (M= 185, F= 186)	Small rural settlement situated at the southern point of the site. Women in this village are mostly self-employed in handicraft (e.g. embroidery and carpets from sheep wool). Residents from this village met during the Site Visit confirmed that they use the land to graze livestock
Chayli	800 m	1,807 (M= 998, F= 809)	Village situated at the southern point of the site. The majority of the village's structures sits on the western side of the road connecting the project area to the district capital of Gallaorol. The OTL will sit on the eastern side of the road. Women in this village are mostly self-employed in handicraft (e.g. embroidery and carpets from sheep wool). Around 15 women in Chayonli village have home-based businesses and are also providing training for girls

Source: District Administration. Key: (M) Male Population, (F) Female Population

##### 6.7.4.1 Formal Governance Structures

At both the regional (or *oblast*) and district (or *raion*) levels local governance is divided into:

- **Local state administration**, which acts as an administrative body, the heads of which are appointed by the central government and are subject to formal approval by the corresponding local councils. The president appoints regional governors, who in turn appoint district and city/town governors that come under regional subordination. The district and city governors are accountable to the regional governor, who in turn is accountable to the president; and,
- **Elected local council**, which acts as a legislative body, the representatives of which are appointed/elected for a period of five years. These administration levels represent the executive and regulatory bodies of the state at the regional and district levels, implementing the policies of central government in the provinces.

At the sub-district level there are Makhalla Committees which act as governance institutions in towns and rural areas. Makhalla Committees are salaried state officials and as such are answerable to the local state administrators as they are fully dependent on their funding (Urinboyev, 2018). Article 105 of

the Constitution of the Republic of Uzbekistan recognises Makhallas as self-governing bodies whose role is to govern at the local level and oversee activities which include, but are not limited to:

- Development of infrastructure.
- Administering social welfare programs (e.g. provision of social aid to low-income families).
- Ensuring security and order.

Figure 6-41 shows the location of the four Makhallas situated within 2 km of the project site boundary, these are: Kiziltut, Sayfin Ota, Karakchi and Chayli.

#### 6.7.4.2 Informal Governance Structures

In addition to the formal Makhalla Committees, informal/social Makhallas often operate in parallel. The key difference between these institutions being that the leaders of the informal Makhallas are volunteers and are elected by local residents, hence they are regarded as community-led, self-governing institutions. However, no informal/social Makhallas have been identified in the project area.

#### 6.7.5 Current Land Use and Resettlement

Preliminary work has identified that land in the Project area was previously used for grazing and growing of winter wheat for a poultry farming company. Land along the transmission line is primarily used for farmland and was being ploughed during AECOM's visit in November 2021. AECOM noted that the proposed access route to site passes close to a number of residential properties in Karakchi and it may require some level of land take and physical resettlement. A Social Compliance Audit and Livelihood Restoration Plan has been undertaken which confirmed that after the official allocation of land for the project, the single leaseholder was informed to remove all structures from the project area, without any previous assessment or compensation of possible affected assets, which was not aligned with international best practices. This leaseholder was assessed during the Social Compliance Audit site visit, including in the identification of economic resettlement and compensation and it was confirmed that this leaseholder owns a large poultry farming business and did not have any assets or crops on the land at the time the land was transferred. The farmer returned 409.5 ha where he used to grow wheat for his poultry farm. The farmer was comfortable returning the 409.5 ha as the land was not economically viable, and it was bringing more costs than profit to the leaseholder. He confirmed that no further support is needed.

#### 6.7.6 Demographic Profile

The Makhallas identified correspond to the four settlements located within a radius of 2 km of the project site boundary. The populations of these individual settlements is shown in Table 31. The estimated total population of the settlements within 2 km of the site boundary is 4,860 people, 53% of which are male and 47% of which are female.

In 2020, the population of Gallaorol District was estimated to be 171,411 which is split evenly between men (50.2%) and women (49.8%). The District shows an expansive pattern, with a high birth rate in comparison to the mortality rate, as shown in Table 32. This trend is reflected at the local level in all the settlements within 2 km of the project site boundary.

Gallaorol District also shows a negative migrant balance, with more people moving out of the district than moving in. This is also true of two of the project-affected settlements, Sayfin Ota and Karatchi; but for Chayli and Kiziltut, more people moved into these areas than those who moved out.

Generally, more women are migrating in and out of identified areas. This is reflective of a general global trend of increased female migration referred to the 'feminisation of migration'. The OECD indicate that there may be any number of reasons women are becoming increasingly mobile, but most migrate for economic reasons to participate in both formal and informal, legal and illegal work (OECD, 2000).

**Table 32. Demographic data for Gallaorol District and the affected settlements (2020)**

Area	Born			Died			Immigration			Emigration		
	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women

Chayli	42	20	22	6	1	5	7	0	7	5	2	3
Kiziltut	17	6	11	1	0	1	3	0	3	1	0	1
Karatchi	12	5	7	2	1	1	2	0	2	3	0	3
Sayfin Ota	62	31	31	10	6	4	2	1	1	10	5	5
Gallaorol District	4,761	2,527	2,234	743	412	331	650	125	525	930	266	664

Source: State Committee of Statistics

The latest data available data on ethnicity in Gallaorol, which covers the Project Aol is from 2019. It showed the following major ethnic groups in Uzbekistan: Uzbeks (97,2%), Russians (0,6%), Tajiks (0,1%), other nations (2,1%) (IFC, 2020).

Ethnic groups living in the country have equal access to all social and other services, including health, education, and water and sanitation. None of the groups are socially excluded either from a legal standpoint or in terms of their actual situation. Further, none of the ethnic groups maintain cultural or social characteristics separate from the mainstream Uzbekistan society that would classify them as ethnic minorities. Therefore, based on the information obtained during the site visit and stakeholder engagement, there it is understood that there are no indigenous people living in the region that meet ADB criteria:

- i. self-identification as members of a distinct indigenous cultural group and recognition of this identity by others.
- ii. collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories.
- iii. customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
- iv. a distinct language, often different from the official language of the country or region.

## 6.7.7 Land Regulations and Use

### 6.7.7.1 Land Tenure

The legal foundation for all land tenure in Uzbekistan is contained in three key documents:

- The Constitution (1992, Article 55)
- Civil Code (1997, Head 8, Head 13, and Head 17)
- The Land Code (1998, Head 4)

Exclusive state ownership of land was first incorporated in the 1992 Constitution; hence land is the only productive asset that cannot be privately owned in Uzbekistan. The Land Code stipulates that land is a state-owned national treasure to be used in a rational manner and it is protected by the state as a base of life, activities and welfare of the population (Republic of Uzbekistan, 1998). However, lifelong inheritable land tenure is available to Uzbek citizens but only in the following cases:

- Dehkan farms (individual or family farms).
- Individual homestead construction and household operation.
- Collective orchards and vineyards.

Furthermore, land plots can be provided to legal and physical entities for a continuous, long-term, or temporary tenure and use. This is usually for agricultural or forest land, as per Head 4, Article 20 of the Land Code (1998). Land plots are usually leased to citizens and legal entities by mayors (or hokims) of districts, towns, and cities. However, if any foreign element is involved, the central Government of Uzbekistan must be the leasing entity, as per Head 4, Article 24 of the Land Code (1998).

Users pay for the use of the land in the form of land tax. Under Head 4, Article 24 (1998) of the Land Code it is not permitted to sublease the leased land plot as a whole or even part of it. This provision

further stipulates that leased land plots cannot be sold and purchased, cannot serve as collateral, and cannot be donated or exchanged. A specific form of subleasing, “intrafarm leasing”, is permitted only to worker families within a shirkat (former collective farms).

For private farms land is usually leased for approximately 30 years but can range between a minimum of 10 years and a maximum of 50 years. Farms are subject to some state interventions (e.g. quotas for the production of cotton and wheat) but for the most part they are governed by local authorities (or hokimiyat). Hokimiyat may cancel leases for various transgressions, usually if the leaseholder fails to comply with the contract terms (e.g. the cropping plan).

Most land around the project site is organized under the Dekhan modality<sup>80</sup>. Dehkan farms are rural household producers operating on small household plots received on lifetime inheritable tenure rights, they do not report the quantities of produce grown to the regional agricultural office like commercial farmers do. Dehkan farms are numerous and are considered to be very important as they satisfy basic needs of the large rural population including food, employment, income. Dehkan farms tend to specialize in vegetables, fruit, meat, milk, eggs and other animal related products. Dehkans often work for private farmers – for cash or on the basis of a sharecropping agreement (dehkans receive a percentage of the yield) (Malnikovova & Havrland, 2016).  
Current Land Use in Project Area

The project site is approximately 562 ha and is located at the top of a hilly plateau that stretches from northwest to southeast. The area is used primarily for livestock grazing. The local population use the land without any official permit.

The project area was zoned as a poultry farm but in 2018 the party leasing the land returned it back to Government land reserve as it was not productive. There are no physical structures, including any wells, on the project site.

Herders interviewed during the site visit (Figure 6-42) pointed out the importance of the community pathway to the north of the site used by local villages (mainly by people who live in the Sayfin ota community) to commute for herding activities as well as to reach the farming area located north of the project site. There are about eight flocks of sheep (150 - 300 sheep in each one) from Sayfin ota village crossing the area every day. Other community members consulted during the site visit reinforced this, saying it is very important that the community pathway is maintained.

Close to the southern site boundary there is an old burial site (Figure 6-43). It is understood that this site is not in active use but is still visited by the local communities.

Since the historic leasehold was terminated in 2019, the land in the Solar PV site has remained in the government reserve which is administrated by the local Khokimiyat – a total of 562 ha. The land in the Solar PV site has been kept vacant in anticipation of the Project at the request of the Ministry of Energy. Most of the land required for the OHTL falls into eight Sub-Lease Agreements belonging to seven farmers and the remainder of the land is also in the government reserve. Masdar is currently in the process working with the Ministry of Energy on the final land order which will then transfer the land into the jurisdiction of the Ministry of Energy. The land will then be leased by Masdar from the Ministry of Energy. It is understood that any remaining government reserved land is allocated by local authorities at their discretion.

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<sup>80</sup> Dekhan modality is where a farmer is not a formal commercial farmer and does not declare their outputs to the regional agricultural office like commercial farmers do.





**Figure 6-42. Herder using land within project site boundary to graze livestock**



**Figure 6-43. Old Burial near the local cemetery visited by the community**

#### **6.7.7.2 Current Land Use under the Overhead Transmission Line Route**

The proposed alignment of the 14.77 km-long transmission line that will connect the Project site the existing Saribazar substation is shown in Figure 6-44. The route has been designed to avoid populated areas and isolated structures however, it does pass over extensive areas of cultivation and several poles will need to be erected within the boundaries of dekhan farms. An analysis of the route has identified the current land uses which could potentially be affected by the construction and operation of the transmission line. This analysis is based on the following assumptions:

- A sterilization zone of 32 m at each side of the transmission line will be required as a wayleave.
- A clearance area of 565 m<sup>2</sup> has been defined around poles.
- A total number 61 poles have been pre-designed.



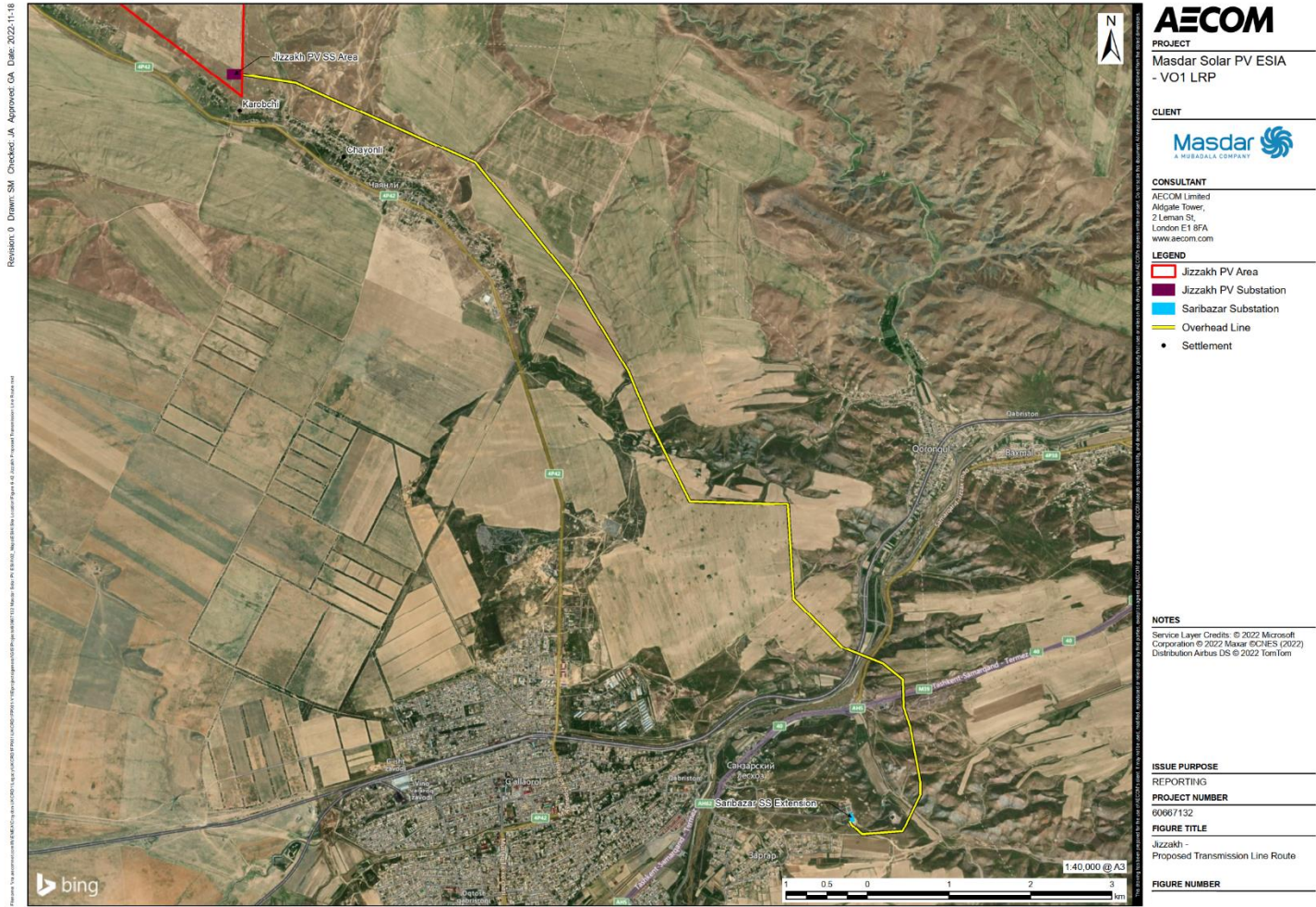


Figure 6-44: Proposed transmission line route

Estimates show that the transmission line will need approximately 2.54 ha of farmland to be acquired..

During the site visit and initial consultations with the land users which will be affected by the transmission line, some potential issues with the route were identified.

One farmer in the Gallaorol cluster requested alternative routing be considered as his house, orchard and fruit freezing equipment is near the current route. The farmer holds an official lease to the land and in 2020, renewed that lease for another 30 years. The farmer suggested moving the transmission line closer to the road to avoid any impacts to his orchard. Further engagement will take place and the final route provided during detailed design.



**Figure 6-45: Orchard on the southern section of the transmission line route**

Another farmer requested that a small part of the route be redesigned so that it avoids the part of his land where he has access to a water source as he has plans to use an air drip irrigation machine in this area and this may not be possible if there are OTL's and towers. This area has been avoided by the updated route.

## **6.7.8 Community Infrastructure and Resources**

### **6.7.8.1 Housing**

The United Nations Economic Commission for Europe (UNECE) found that rural Uzbekistani households are typically larger than urban ones, averaging between 4.9 and 6 people, compared to 3.8 in the urban Capital City of Tashkent (UNECE, 2015). However, living space per person is on average found to be lower in rural areas of Uzbekistan (14.5 m<sup>2</sup> in rural areas and 16 m<sup>2</sup> in urban areas) (Ministry of Economy of the Republic of Uzbekistan, 2014).

The communities in the Project Aol are rural, each household plot typically consists of a detached house with an attached plot of land. Households typically accommodate several family generations living together. Many of these houses are self-built using available materials and therefore often fail to meet modern construction standards and lack important amenities. In Chayonli and Karobchi households are supplied by a gas pipe, whereas households in Sayfin ota, and Kiziltut use liquified gas.



According to a representative from the Family Department of Gallaorol District, who was consulted during the site visit, the average household plot size in the area is 1,200 - 5,000 m<sup>2</sup> of land. In comparison to other areas (e.g. Kattkurgan) there is not a large demand for land in the communities surrounding the project area. Generally, the size of household plots is larger than the average size in other regions of the country due to the low population density.

The photo shown in Figure 6-46 was taken just outside Chayonli village and shows the typical housing stock in the area.



**Figure 6-46. Chayonli Village**

### 6.7.8.2 Community Services and Facilities

Social infrastructure covers a range of services and facilities that meet local needs and contribute to a good quality of life. This may include the provision of healthcare, education, recreation and sport, faith, and emergency facilities. Across Gallaorol District there are:

- 90 Schools
- 105 Kindergartens
- 107 Libraries
- 11 Health Institutions
- 19 Mosques

According to information gathered during the site visits, the Mosque closest to the project site is located in Sayfin ota makhalla and has a capacity of 400 people. As previously mentioned, there is an old burial site, no longer in active use near the southern site boundary in the village of Karakchi. There is another burial site in Sayfin Ota, approximately 1.35 km from the eastern site boundary. The cemetery in Syafin Ota is in active use by all four affected makhallas.

### 6.7.8.3 Utilities

Access to electricity is nearly universal across Uzbekistan as most people are connected to the national grid. The nearest electrical substation to the project site is Saribazar, on the outskirts of Gallaorol, approximately 12.5 km southeast of the project site. This is the substation which will be connected to the site via the OTL and feed the energy produced into the national grid. According to the consultations undertaken, no power cuts are experienced in the project area and affected communities and the power supply is reliable.

In Karakchi and Chayanli makhallas there is a centralised gas supply for cooking and heating. In Sayfin Ota and Kiziltut makhallas gas cylinders are used for cooking and coal and pressed dung is used for

heating. There is a gas fuelling station 5 km from the site. According to data provided by District Authorities the rate of equipping the population with gas supply systems stands at 63.4%.

With regards to solid waste management, the nearest landfill is located approximately 12-15 km from the site from Chayanli makhalla. There are no recycling facilities at this landfill but it accepts all types of wastes, including construction wastes. Another landfill is located approximately 30 km from the project site. Stakeholder meetings conducted at the scoping and ESIA stages revealed that there are no local licensed companies for removal of hazardous wastes, as there are no hazardous wastes generated in the project area and surroundings.

During the site visit, it was noted by multiple stakeholders that there is a weak mobile phone signal in the Chayonli, Karakchi, and Sayfin ota and that the rest of the villages do not have any coverage at all. This makes communication between settlements quite difficult and usually means that local leaders either need to physically travel to the different settlements or use telegram channels to share news.

Potable water from artesian wells (between 5 and 15 m deep) supply project-affected communities. On the project site itself water is at the depth of 35 to 40 m. According to data provided by District Authorities the rate of equipping the population with drinking water supply systems is 61.4%. Table 33 compares the infrastructure and utilities available in rural and urban areas of Uzbekistan.

**Table 33. Access to utilities in urban and rural areas in Uzbekistan (2013)**

Utility	Percentage of rural households with access (%)	Percentage of urban households with access (%)
Water Supply	50.3	82.8
Sewage	8.9	53.9
Heating	25.8	59
Hot Water	5.5	45.4
Natural Gas	72.1	87.5
Fixed Telephone Line	14	57

Source: FAO, 2019

### 6.7.9 Community Health

According to the World Bank and national statistics, life expectancy at birth has continuously been increasing in Uzbekistan, from 58 in 1960 to 71.725 in 2020 (World Bank, 2021). Table 34 shows how life expectancy varies depending on sex and location. Generally, women live longer than men and those in urban areas live longer than those who live in rural areas.

**Table 34: Life Expectancy at birth by sex and location (2016)**

Total		Urban		Rural	
Female	Male	Female	Male	Female	Male
74.9	71.1	77.1	71.8	74	68.5

Source: FAO, 2019

According to a review by the Food and Agricultural Organisation (FAO) Gender Country Assessment there have been significant improvements in the rural population's access to healthcare, maternal and child healthcare, and reproductive healthcare including access to contraception (FAO, 2019). However, there are still some key health challenges in Uzbekistan, namely the prevalence of non-communicable diseases, which is largely attributed to consumption of tobacco, alcohol, poor nutrition and lack of physical exercise. The burden of non-communicable diseases is serious in terms of socio-economic development because such diseases can "result in reduced income, early retirement, decreased productivity and employee turnover, with further implications for social protection costs" (UN and Government of the Republic of Uzbekistan, N.D.).

At the local scale, there are 11 health facilities in Gallaorol District. Within the Project Aol there is one rural medical point (feldsher obstetric point, or FAB<sup>81</sup>) in Sayfin ota village. There is one dentist, two doctors, and 15 patronage nurses which cover nine villages, including the four within the Project Aol. The nearest hospital facility is located approximately 10.15 km from the project site, in the district capital. However, according to a local doctor, it is difficult to take people to Gallaorol centre in the emergency cases, especially in winter when transportation is complicated. Twice a month a doctor from the Gallaorol facility come to examine pregnant women in the local area.

The local doctor further advised that prevalent diseases in the area are anemia, bureciliasis (seasonal), and cardiovascular. There are two HIV/AIDS cases in villages.

### 6.7.10 Education

The World Bank (World Bank, 2021) indicates that the net enrolment rate of primary school age children in primary education in Uzbekistan in 2018 was 96.845%. Of all the pupils that enrolled, 98.31% continue to the last grade of primary. However, when analysed through a gender lens, this number is slightly higher for male students (97.560%) than for female students (96.152%).

Furthermore, according to information gathered during the site visits, approximately 95% of the population in the four affected makhallas have attained secondary-level education, the majority of them having graduated from college in Gallaorol City. Under 10% of the residents in the project-affected communities have gone on to tertiary education. This is consistent with national data which indicated that 9.9% of the total population have a higher education degree. According to the Jizzakh regional government the literacy rate across the region is 100%.

With regards to educational facilities, each makhalla has one school and one kindergarten. The school in Chayonli village (School №54), which hosted some of the stakeholder consultations, has 348 students and 35 teachers. This year, seven students have left the school to attend either Jizzakh Polytechnic University or the Kazan Federal University, also located in Jizzakh.

### 6.7.11 Economy and Employment

#### 6.7.11.1 Economy

The World Bank classifies Uzbekistan as a lower middle-income country (The World Bank, 2021) because its Gross National Income (GNI) per capita is between USD 1,026 and USD 3,995<sup>82</sup>.

According to the International Monetary Fund, in 2019, the Gross Domestic Product (GDP) of Uzbekistan was at USD 60.490 billion (IMF, 2021). The national GDP composition by sector of origin is split between agriculture (28.1%), industry (36.4%) and services (35.5%). Comparing the changes in the structure of the economy between 2017 and 2019 shows a 30% increase in the share of the industrial sector and a decrease of 28.1% in the share of agricultural sector.

#### 6.7.11.2 Livelihoods

In recent years, national statistics have shown an increase in the proportion of the population who are unemployed, increasing from 4.9% to 5.2% between 2009 and 2016 and reaching 9.3% in 2018. Nationwide, the vast majority of the population (60.9%) are employed in the service sector, the agricultural sector also employs a significant proportion of the population (25.9%), and the industrial sector employs the smallest proportion of the population (13.2%).

Results from field visits and consultations undertaken during the site visits indicate that livestock keeping is the main source of employment for people in the project-affected communities. Sheep and goats are the main livestock grazed in the area. Livestock production is one of the main sources of income, food, and livelihood in Jizzakh region. Historically, the local villagers have managed these pastures by applying traditional knowledge, circulating livestock between summer (yaylak) and winter (gishlag) pastures and breeding areas. Livestock husbandry provides employment for local people and it has traditional social value for villages. Village communities apply collective grazing principles, whereby each livestock owner manages animal herds according to agreed schedules. Kinship ties and traditional collective gatherings are common in the community, where animals have a key value.

<sup>81</sup> This abbreviation comes from the Russian name: Фельдшерский акушерский пункт.

<sup>82</sup> The Uzbekistani Som (UZS) is the currency of Uzbekistan and, as of 5 October 2021, USD 1 was equal to UZS 10,638.30.

Rainfed agriculture is also practiced in the Project Aol. The main crops grown are wheat and peas. Two areas of extensive cultivation of winter wheat have also been identified approximately 1.3 km north of the project site and 1.6 km east of the project site. Wheat is sold to the Government, whereas peas are sold in the local market.

Some government support programmes for farmers have been initiated and include the development of greenhouses on 100 ha plot of land located in Chayli makhalla; a further 330 ha are allocated for the future development of this project. The primary objective of the greenhouse project is to provide income generating opportunities and jobs for the local population. In addition, a programme called “Every family is an entrepreneur” provides some households in the Aol with soft loans for livestock breeding. There is also a Farmer’s Union and a Population Protection Association in the area. These organisations provide soft credits to help with machinery and have provided 260 families with over UZS 7 billion as financial support. Other livelihoods include:

- Many women in the project-affected communities are housewives but are also involved in cattle breeding.
- According to consultations held during the site visits approximately 90% of the residents of Chayanli and Karakchi makhallas migrate for seasonal earnings.
- Approximately 100 people from the project-affected communities are engaged in construction. Further details in relation to the types of construction projects and locations will be investigated during the Full ESIA.

### 6.7.11.3 Poverty

Table 35 shows the proportion of Uzbekistanis living in poverty. According to a World Bank study conducted in 2018 titled “Listening to the Citizens of Uzbekistan” (World Bank, 2018), the Jizzakh region had the lowest proportion of the population living on less than USD 3.2 per day (less than 5% of population) when compared to Uzbekistan’s other 11 regions. The Karakalpakstan and Syrdarya regions were the poorest in country, with 30% and 38% of the population living on less than USD 3.2 per day respectively. Moreover, for the project district, Gallaorol, the USD 3.2 monetary poverty level is well below the national average (3.3% compared to 9.6%).

**Table 35. Proportion of the Uzbek Population living in poverty**

Poverty Line	Percentage of Total Uzbek Population (%)	Percentage of Gallaorol District Population (%)
Living on less than USD 3.2 per day	9.6	3.3
Living on less than USD 5.5 per day	36.6	25.7

Source: World Bank, 2018

### 6.7.12 Transportation

As shown in Table 36 automobiles are the most commonly used means of transport in Uzbekistan. Their use has experienced a 78% increase since 2000 while railroad has also experienced a slight increase in use in that time. However, the use of trolleybus, tram and metro have all decreased, by 99%, 95%, and 45% respectively.

**Table 36. Passenger transportation by transport type in Uzbekistan (per million population)**

	2000	2005	2010	2015	2019
Passengers transported, mln. persons	3,596	3,962	4,072	5,380	6,025
of which:					
railroad	14.6	15.1	14.5	20	22.9
automobile	3,285	3,796	3,962	5,293	5,915
trolleybus	77.1	16.8	1.6	0.8	0.7
tram	92.4	43.3	25.8	11	3.8



metro (subway)	125.7	89.9	65.6	52	79.2
air	1.5	0.9	1.9	2	3.2

Source: State Committee of the Republic of Uzbekistan on Statistics, N.D.

In light of the large population size and high number of road users, Uzbekistan has a relatively dense road network and an appropriate hierarchy of roads. Of the total 185,000 km of roads in the country, 42,654 km make up the core network, of which 98% are paved (ADB, 2016). This network can be grouped into the following categories:

- international (3,979 km)
- national (14,069 km)
- regional (local) roads (24,606 km)

There is an additional 140,000 km of urban and rural roads, which are managed by city municipalities and local districts (ADB, 2016). The major roads that provide access to the Jizzakh region are the M39 and the A379, illustrated in Figure 6-47. The speed limit is generally 70 km/hr in towns and 100 km/hr on highways outside towns (OSAC, 2020).

While there is a large road network, roads often suffer from poor maintenance with problems including uneven surfaces and large potholes. Traffic lights are reported to malfunction frequently and street lighting is very poor, especially on secondary/local roads (OSAC, 2020). In addition to this, local drivers often disregard rules as there is a low rate of enforcement for traffic related law breaking. As a result of these issues, minor and moderate traffic accidents are frequent (OSAC, 2020). In efforts to improve the state of travel safety in the area the government has been installing traffic radar and cameras on roads and intersections to detect speeding and traffic light violations (OSAC, 2020). These changes alongside improvements to the local road network are likely to result in a safer road network in the area in the coming years.

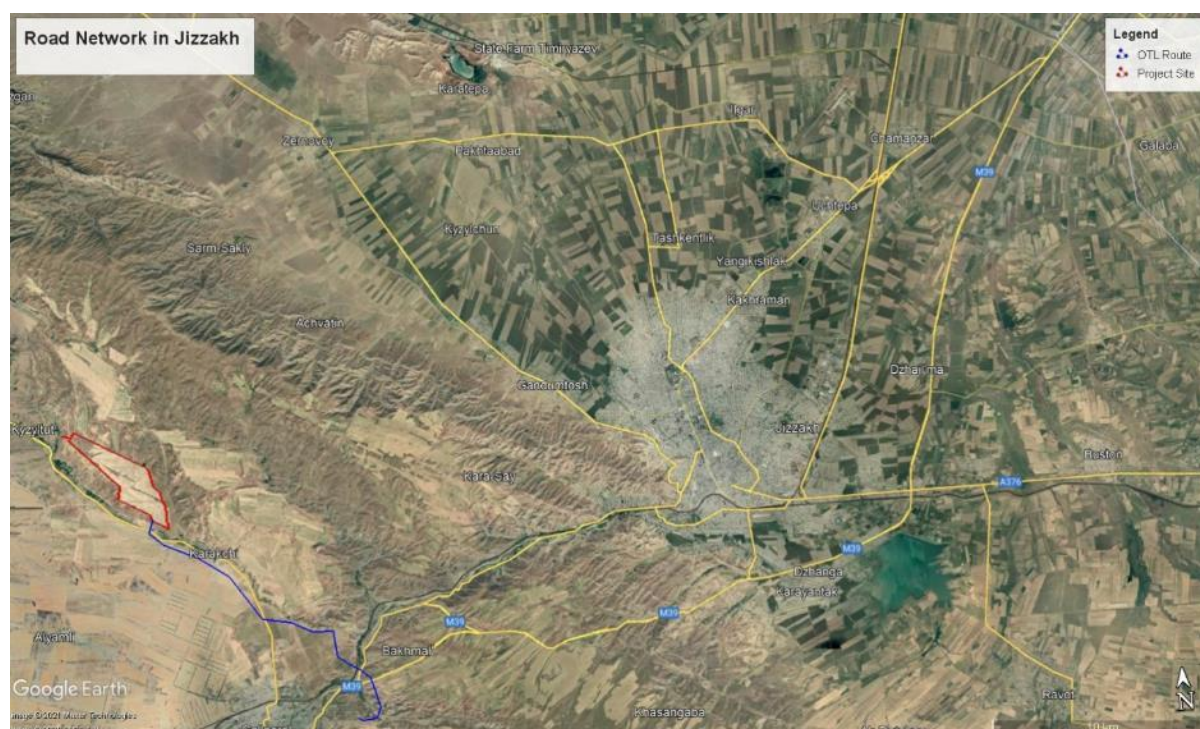


Figure 6-47. Road Network Surrounding Jizzakh

Source: Google Earth, 2021

Several stakeholders noted that the quality of the roads in the Project AoI is generally poor, as shown in Figure 6-48. Furthermore, it was also mentioned that the bridge which leads to the school in Chayonli

village, shown in Figure 6-49, is also in poor condition and needs to be replaced so that children can use it safely.



**Figure 6-48. Entry road to the project site**



**Figure 6-49. Small bridge to primary School 54 in Chayonli village**

In addition, there are several community pathways that cross through the project site. These pathways connect the local communities to the south of the project site with wheat cultivation areas and isolated farms to the north and east of the project site. Based on information gathered during the site visits it is



understood that livestock keepers also use these pathways to move livestock for grazing. Communities consulted stressed the importance of maintaining these pathways.

### 6.7.13 Vulnerable Groups

Vulnerable groups are those individuals or groups who may be directly and differentially or disproportionately affected by the Project's negative impacts and/or less able to participate in and benefit from the Project's positive impacts because of their disadvantaged or vulnerable status. This status may stem from ethnicity, property, level of income, economic situation, gender, language, religion, national or social origin, age, culture, literacy, physical or mental disability, and dependence on unique natural resources (IFC, 2012). Based on the above definition, the following groups within the Project social area of influence are considered vulnerable:

- Young families (where the parents are under 30) who have lost both parents
- Children and young people
- Families with disabled parents or children
- A widow
- A single parent family
- A single retired person
- An elderly person (over 65 years old)
- Women in the family
- Anyone farming or investing in the land without a legal title
- People in poor health
- People who are discriminated against
- Households under the poverty line
- Households in financial difficulty
- Households with a member who is addicted to drugs or alcohol

These categories should however be used as a guide and it is possible that some people may be vulnerable because of very specific circumstances which might not fit into the above list.

A local social specialist consulted during the site visit has a database of vulnerable women (*ayullar daftari*), vulnerable families (*temir daftar*) and young people (*yoshlar daftari*) in the project Aol and thus can communicate information regarding the project directly to them where necessary.

A more detailed vulnerability analysis among project affected people, is included in the LRP.

No indigenous people have been identified within the Project Aol, as part of the baseline study.

#### 6.7.13.1 Gender

Although women should not inherently be considered vulnerable in every project context, it is important to recognise and understand the challenges women face in Uzbekistan in order to accurately assess the impact the Project may have and proactively manage these risks in a pragmatic and effective way.

At the national level there are still some key challenges to gender equality, including a high prevalence of gender-based violence (GBV) and in particular, domestic violence; gender disparities in higher and technical education; and, a high female unemployment rate accompanied by a low proportion of women in leadership positions (UN, 2020). This is particularly an issue for rural women in Uzbekistan who, according to the FAO (FAO, 2019), have very limited opportunities for employment outside of agricultural work and are overrepresented in informal employment markets. For example, women's labour in the agricultural sector tends to be low-skilled manual labour, and seasonal/temporary work not covered by a written contract.

When women work informally on dehqan farms, they do not receive protection under labour law in terms of social benefits, making them more vulnerable to exploitation. As formal farm owners and managers,

women represent only around 4% of the heads of private farming enterprises across the entire country. There is no data available on the proportion of women heading dehkan farms, but since a very small number of women are heads of household, they are unlikely to be the formal heads of dehkan farms. Still, women contribute significant labour on dehkan farms, and, in migrant households, they can be the de facto farm managers.

In addition, Uzbekistan has also taken significant steps to improve women’s prosperity in the world of work, however, gender pay gaps remain significant (ILO, 2020a). Table 37 shows a clear disparity between male and female labour activity rates, with females 26% less active than their male counterparts (Lloyds Bank Trade, 2021). While the Uzbekistani Government place emphasis on the rhetoric of women’s rights and importance of women in the workplace, many women in Uzbekistan still are held to traditional roles of unpaid childcare and household work. For example, in the Jizzakh region, only a few women work in government and other governing bodies (Saferworld, 2021). While in 2019 the Uzbekistan government established the first ever gender equality law “Guarantees of Equal Rights and Opportunities for Women and Men”; these issues are likely to persist for years into the future while cultural opinions and values shift towards a new rhetoric.

**Table 37. Ratio of male to female active population in Uzbekistan**

	2017	2018	2019
Total activity rate (%)	65.26	65.25	65.19
Male activity rate (%)	78.39	78.48	78.50
Female activity rate (%)	52.31	52.19	52.05

Source: ILO, 2020b

Within the project Aol, a local specialist on women’s issues consulted during the site visit shared that the majority of women in Chayonli and Karobchi villages are self-employed in handicraft, making carpets from sheep wool or embroidery and selling these products at the local market (or *bazar*). Approximately 15 women in Chayonli village have started home-based businesses and are also providing training for girls. Women in the Project Aol are also engaged in *tomorka* gardening whereby small plots of land, usually next to houses, are used to grow food. Some women are engaged in agriculture on a larger scale, working seasonally to collect harvests (peas and fruits). 15 women in the Project Aol work in a textile factory in a village 15 km away from the project site. Salaries in the textile factory are usually around UZS 600,000 per month, which is less than minimum wage as per Uzbek legislation. Other common professions for women in the Project Aol include teaching and nursing.

#### 6.7.14 Community Security

Since President Shavkat Mirziyoyev came into power in 2016, there has been a marked shift in Uzbekistan’s approach to citizen safety and security through several government reforms in relation to forced labour (Saferworld, 2021). Despite these reforms there is still an embedded lack of trust between the police and public. For example, it was reported that in the Jizzakh region that the community is reliant on the mahalla institution to prevent crime and enforce public order, rather than the police (Saferworld, 2021).

The government of Uzbekistan does not release crime statistics; most data acquired comes from informal sources (OSAC, 2020). Uzbekistan ranked 90<sup>th</sup> in the 2021 global organized crime index for criminality and was deemed a ‘low criminality low resilience’ country (Global Initiative Against Transnational Organized Crime, 2021). It also ranked low in terms of drug trade (103<sup>rd</sup>) but slightly higher for criminal actor organisations (76<sup>th</sup>) (Global Initiative Against Transnational Organized Crime, 2021).

The local population reported no previous experience with large projects in the last 15 years, except for the construction of the above mentioned 330 ha of greenhouses. Therefore, the presence of security personnel during the project’s construction and operation may cause disruption.

#### 6.7.15 Ecosystem Services

Under IFC’s Performance Standard 6, Ecosystem services are the benefits that people, including businesses, derive from ecosystems. Based on the framework used for the Millennium Ecosystem Assessment (Alcamo, 2003), ecosystem services are organized into four types:



1. **Provisioning services**, which are the products people obtain from ecosystems (for example these may include food, freshwater, timber, fibres, medicinal plants). The provisioning services identified in the project site and Aol are:

Land used by local communities for grazing livestock.

Community pathways which connect local communities to cultivation areas and farms.

Cultivation areas used to grow rainfed winter wheat crops.

Ecosystem services provided by crops located within the transmission line corridor.

2. **Regulating services**, which are the benefits people obtain from the regulation of ecosystem processes (for example, regulating services can be surface water purification, carbon storage and sequestration, control of natural processes, such as climate regulation, disease control, erosion prevention, water flow regulation, and protection from natural hazards). The regulating services identified in the project site and Aol are:
  - a. **Water:** The project site itself does not provide significant water resources to communities. The communities have access to potable groundwater at a depth of approximately 15 mbgl. The groundwater at the project site is approximately 35-40 mbgl, as the project is located on an elevated plateau. Other sources of surface water, which the communities use for their livestock include the two main watercourses located outside the project boundaries, one to the north, and one to the south, flowing through the makhallas.
  - b. **Necrophagous bird species:** During interviews undertaken local communities explained that that livestock carcasses are removed by vultures. Carrion eating birds remove carcasses from the fields, and this prevents the spread of diseases. The elevated plateau and project site is a platform that carrion eating birds can use to feed on livestock carcasses. Given the amount of livestock in this particular area, this is significant regulating ecosystem service. This ecosystem services is not significant along the transmission line corridor in areas dominated by crop land and where the livestock densities are much lower.
  - c. **Erosion control:** Pastureland and vegetative cover on the elevated plateau and project area may provide erosion control and prevent the propagation of the deep gullies already present in the area and contributing to mudflows during the Spring rainfall events.
3. **Cultural services**, which are the nonmaterial benefits people obtain from ecosystems (for example, these could be natural areas that are sacred sites and areas of importance for recreation and aesthetic enjoyment). The cultural services identified in the project site and Aol are:
  - a. Two burial grounds are located in located in and around the cemetery approximately 1.3 km west of the project site in Sayfin Ota, and one older cemetery approximately 300 m south of the project site in Karakchi.
4. **Supporting services**, which are the natural processes that maintain the other services (such as soil formation, nutrient cycling, primary production). The supporting services identified in the project site are:
  - a. Rainfall events in the spring that can cause mud flows in both watercourses may provide supporting services such as sediment transport, nutrient cycling and primary production in the catchment.

The potential impacts on individual aspects are assessed in the specialist chapters of the ESIA and as a result the assessment of ecosystem services has been scoped out of the assessment.

#### 6.7.16 Potential Receptors

The baseline study has identified the potential socio-economic receptors that exist within the site and the project-affected communities. For the purposes of the assessment, potential receptors are defined as elements of the socio-economic environment which may interact with the Project activities or perceive an effect or change to their life conditions / quality of life as compared to their baseline characteristics, as discussed previously in this section. Receptors may be affected, directly or indirectly, positively or negatively, during the Project's construction, operations, and decommissioning phases. Table 38 lists the potential socio-economic receptors drawn from the baseline study.

**Table 38: Potential socio-economic receptors**

Receptor	Description
Project workforce	The construction workforce will either be based on site in a worker's camp or within hotel or guest house accommodation in the nearby project-affected communities. Operational workforce will likely be housed within the project-affected communities as well. Associated risks of accident and ill health due to living or working conditions are relevant for this receptor, as well as their potential interaction with nearby communities.
Local economically active population	Project related employment and training needs may interact with the local economically active population. This receptor may encompass people living within the nearby project-affected communities.
General local businesses, services providers, and equipment suppliers	Project related procurement needs during the construction and operation phases may interact with local businesses, services providers and equipment suppliers (e.g. limited use of the local shops, procurement of equipment and materials supplies).
Communities	<ul style="list-style-type: none"> <li>• Project-affected communities as shown in Kiziltut</li> <li>• Sayfin ota</li> <li>• Karakchi</li> <li>• Chayli</li> </ul>
Vulnerable groups	Groups with limited coping / adaptation capacities to external changes. Particular consideration is given to children, women and the elderly in the who reside within the project-affected communities. No indigenous peoples have been identified as part of the baseline study.
Livestock keepers	Livestock keeping is main source of income for the project-affected communities and construction and operational activities may have an adverse effect on livestock health, thus having a knock-on effect on the main source of income in the area.

## 6.8 Labour and Working Conditions

### 6.8.1 Labour Laws

The Labour Code of the Republic of Uzbekistan, 1995 (as most recently amended in September 2017) is the main law governing working conditions in the Republic. The key points which are relevant to the current project are:

Chapter VI (Articles 4 and 72 to 76) determine the content, form and term of the employment contract, the limitation of rights of the employer to enter into a fixed-term employment contract, and the ratio of legal and contractual regulation of labour relations. This is relevant because there is no specific requirement to provide workers with documented information that is clear and understandable, regarding their rights, including their rights related to hours of work, wages, overtime, compensation, and benefits upon beginning the working relationship and when any material changes occur.

- **Article 77** determines the age at which employment is permitted (i.e. 16 years old).
- **Article 239** establishes that all persons under the age of 18 years shall be employed only after undergoing a preliminary medical examination and further until reaching the age of 18 are subject to mandatory annual medical examination.
- **Article 7** prohibits forced labour, understood as work performed under threat of punishment (including as a means of labour discipline).
- **Articles 211 and 212** establish requirements on labour protection, and the duties of the employee to comply with the norms, rules and regulations on labour and protection. The employee is obliged to comply with the norms, rules and regulations on labour protection, as well as the administration of the order of safe operation, use the obtained personal protective equipment, and immediately notify their supervisor (foreman, master, chief of a site, and others) if any accidents or situations that create a direct threat to human life and health occur.
- **Article 213** establishes the right of the worker to the information on occupational health and safety (OHS). At the conclusion of the employment contract and the transfer to another job worker shall be informed by the employer about working conditions, including the presence of risk occupational

and other diseases due to him in connection with these benefits and compensation, as well as personal protective equipment. The employer must also inform employees or their representatives about the state of OHS in specific workplaces and production.

The minimum wage in Uzbekistan is UZS 62,920 a month (as of 23 September 2021, this equates to approximately USD 5.91). In addition, employers are responsible for social security contributions. Their contribution must be up to at least 25% of the worker's salary.

### 6.8.2 Working Conditions and Forced Labour

Working conditions and the eradication of child labour is an area that has been showing improvement in Uzbekistan. The government put in place proactive measures to prevent the use of child labour by introducing criminal penalties for repeat violations of hazardous work prohibitions, doubling the number of labour inspectors, and conducting extensive awareness-raising on child labour laws and penalties for violations (US Embassy in Uzbekistan, 2020). The government also established a new National Commission on Combating Trafficking in Persons and Forced Labour and adopted a new roadmap to combat these issues (US Embassy in Uzbekistan, 2020).

- Despite these advancements, secondary research has identified that forced and child labour are still an issue in Uzbekistan's agricultural sector, particularly in cotton production. ILO (ILO, 2020b) findings indicate that 102,000 people (5.9% of the cotton-picking workforce) were subjected to some level of coercion, indicating that there is still work to be done on the roll out of governmental reforms, particularly at the local level. The key issues identified by the ILO (ILO, 2020b), Human Rights Watch (Ramachandra, 2020), and the Cotton Campaign (Cotton Campaign, 2021) include the lack of a fair recruitment system which is independent of government or employer interference, and an ineffective accountability system. Having said this, the ILO also reported that in the 2019 cotton harvest there were only isolated cases of children below legal working age picking cotton and the number of people in forced labour was reportedly down 40% when compared with the 2018 statistics (ILO, 2020b).

According to a Project Appraisal Document developed by the International Development Association (IDA) to evaluate the feasibility of a proposed project which aims to improve livestock productivity and access to market in selected regions of Uzbekistan, the risk of forced labour in livestock keeping is much lower than in cotton picking. This is because livestock production and processing do not require a high level of labour and therefore the risk of large-scale mobilisation and exploitation of workers is extremely limited (IDA, 2017).

There is currently limited information available on the working conditions in the construction sector in Uzbekistan. No further information is available from the Project Developer or EPC Contractor.

## 6.9 Transportation and Access

### 6.9.1 Introduction

It is currently assumed that the Solar PV components will be transported to site by rail to Tashkent from a manufacturing plant in China, via Kazakhstan, and from Tashkent by road to the site. The transportation method will need to be confirmed by the EPC contractor. Both options are described in more detail below.

- For conventional goods, the equipment that can be carried by railway containers is transported by railway containers; all goods are sent from the Xi'an Xinzhu Railway Port to Tashkent.
- Equipment that cannot be carried by railway containers (Box-type and HV transformers) will be exported via Khorgos Port to reach its destination by truck.

#### 6.9.1.1 Baseline Data Collection

A desktop review and site visits (undertaken in September and November 2021) have been undertaken to identify any key issues with regard to accessing the site and to consider 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.

## 6.9.2 Baseline Conditions

### 6.9.2.1 Overall Transportation Route

The transportation study has considered a route from China where the parts will be delivered up to the Project site utilising the main transport network and avoiding built-up areas where possible.

The initial stage of the journey will be by train from the manufacturing sites in China to the Khorgas/Altynkol border crossing by Block Train then on to Tashkent. From Tashkent, material will be delivered to site by road.

Trans-shipment is required in Kazakhstan due to difference in track width between China & Kazakhstan. Trans-shipment will not involve the unpacking of containers / loads however it will take approximately 24 hours to trans-ship, arrange necessary documentation, arrange transit clearance, and shunting in/out of the terminal to the station.

The Chinese border crossing is located over 1,000 km east of the project site and it is key for importing and exporting goods in and out of inland central Asian countries, including Uzbekistan. The EPC Contractor will be required to confirm the suitability of the route and border crossing for delivering and handling the Project materials and, if necessary, propose an alternative route.

The Project site can be accessed directly from the road heading north from Gallaorol via a short access road thereby reducing the need for use of local, unpaved roads to any significant extent.

Given the importance of the route for trade between China and Central Asian countries, and review of satellite images, the road infrastructure between the border and the site will be of good quality and should not present any significant technical difficulties.

The proposed rail and road route comprise the following key roads (distances noted are estimates):

- Travel by rail from Xi'an Xinzhu Railway Port to Tashkent Chukursay Station.
- From Tashkent, transfer goods to truck then join the M39 towards Chinaz.
- Continue west for 5km, bearing right to continue on the M-39.
- Continue on the M-39 bearing left onto the M34 at Syrdarya then right onto to A365 at Khavast before reaching Jizzakh - 120km.
- Continue on the M39 from ~Jizzakh before reaching Gallaorol – 30km.
- On reaching Gallaorol turn right onto the road to Karakchi then take a right turn on the unmarked road to the site entrance – 6km.

#### Stopovers

A single stopover is planned between Tashkent and the site which is a distance of approximately 500km.

### 6.9.2.2 Rail Transport

The railway shipments are all containerized. Goods will be loaded at the Xi'an Xinzhu Railway Station warehouse, China and the arrival point will be Tashkent Chukursay Station. The containers are then transported to the project site by road using customs supervision vehicles. The empty containers are returned to Tashkent.

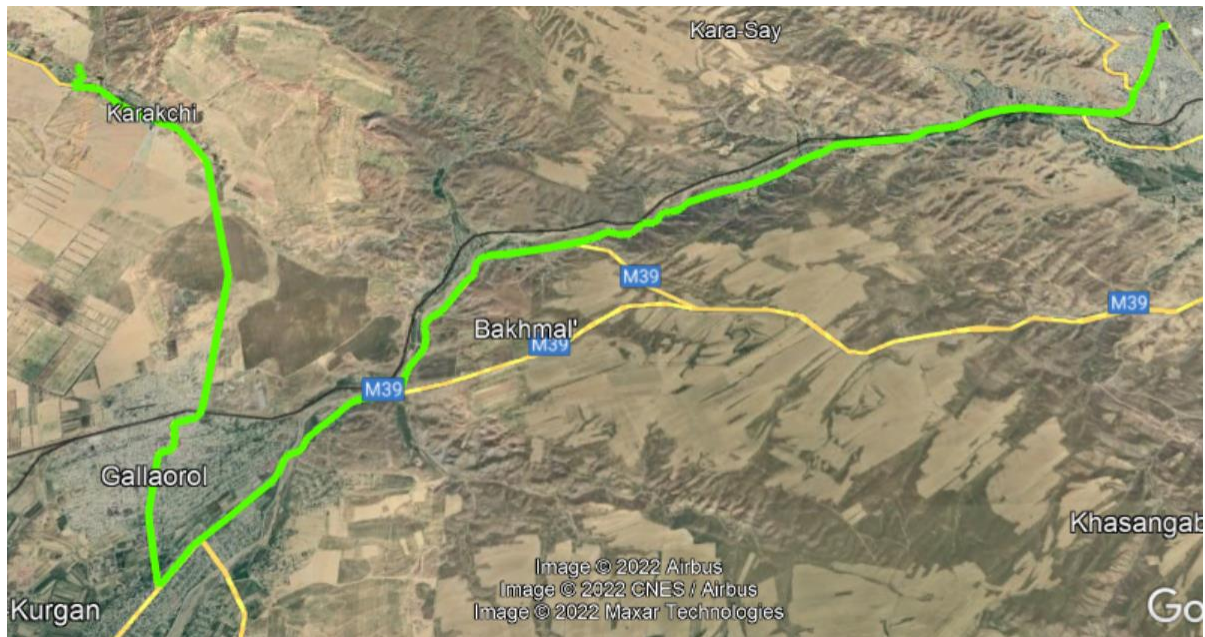
The "Chang'an" train runs from Xi'an to Horgos Port, covering a total distance of 3,200km. It passes through three railway bureaus and 10 marshalling stations and arrives at Horgos Port within three days.

On leaving China, the railway transportation route is 1,600km in total, passing through four marshalling stations, the Kazakhstan Railway and Uzbekistan Railway - Almaty, Shimkent, and Tashkent. After reloading at Altynkol Station, the train reaches Chukursay station in Tashkent, where materials are then transferred by road to the Project site.

### 6.9.2.3 Road Description

It is proposed to follow the main highways from Tashkent to Jizzakh as highlighted below.





**Figure 6-50. Transportation route from Jizzakh**

*Source: Masdar Transportation Study*

### **M39 Highway**

The road was driven as part of the ESIA visit in both September and November 2021. However, it is understood to be dual carriageway in sections and is used by HGV traffic. It is deemed suitable to use for delivery purposes and can accommodate HGV traffic.



**Figure 6-51. M39 west of Jizzakh**



Figure 6-52. M39 west of Jizzakh (2)



Figure 6-53. Junction from M39 at Gallaoral onto Minor Road (4P42) to Karakchi

#### Minor Road (4P42) to Karakchi

The Project site is accessed from the M39 via a short stretch of minor road from Gallaoral. Further grading of this road may be required for larger vehicles to access the site. It is unlikely that the road will allow for vehicular travel faster than 40 km / hr. The road is generally wide enough to allow for two



vehicles to travel in opposite directions although there are some pinch points particularly over watercourse crossings.

Some upgrades are required to the road approximately 1 km away the project site. This has been included in the scope for the EPC contractor.



**Figure 6-54. Minor road to site entrance at Karakchi**



**Figure 6-55. Pinch point on minor road to Karakchi**

#### **Site access**

The site is proposed to be accessed from the minor road at Karakchi through the village. The exact point of access will need to be confirmed by the EPC contractor and viable alternative access routes are being considered during detailed design with the view to select the route that minimises potential impacts on the local communities. Impact associated with the access road (including but not limited to traffic safety, land ownership, noise, dust emissions) shall be assessed. Surveys in support of the

assessments shall be agreed with the Lenders and carried out. Traffic Management Plan shall be prepared. Livelihood Restoration Plan shall be updated based on the results of the surveys. Once past the village, the site becomes open and expansive.



**Figure 6-56. Potential access route to site through Karakchi village**



**Figure 6-57. Potential access route to site through Karakchi village (2)**





**Figure 6-58. Entrance to the southern part of the site**

The northern section of the site was accessed by a second alternative access point to the north of Karakchi. This access point also presented challenges due to the proximity of residential properties. It is only likely to be useable for small vehicles but would result in high levels of impact for the nearby residential properties. The watercourse running along the southern edge of the site has been dammed at various points and supplies water for irrigation. As a result, this access point has been discounted.



**Figure 6-59. Access to the northern part of the site**



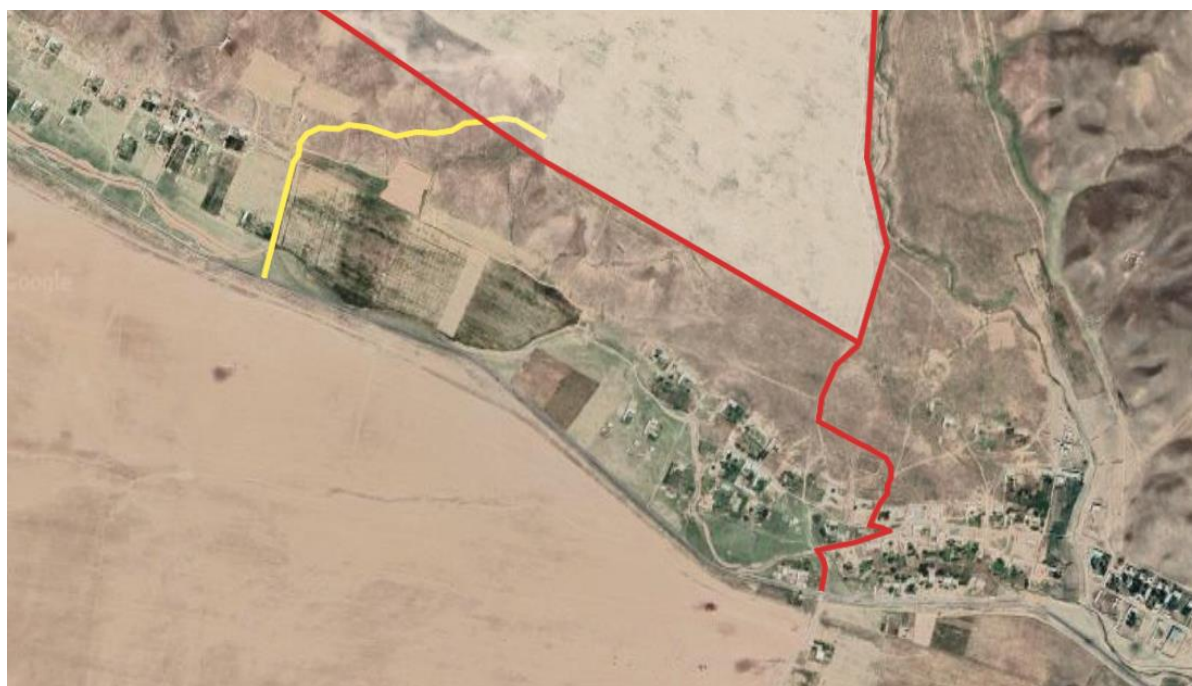


**Figure 6-60. Access through village to the northern part of the site**



**Figure 6-61. Preferred Access Point (3)**

Following review of possible access points to reduce the impact on nearby residential receptors, a third access point has been considered. This route has been approved in principle by the EPC contractor however further assessment would be required to determine any additional impact in relation to land use or other environmental sensitivity.



**Figure 6-62. Proposed site access (3) from public road (yellow) with original site access (1) in red**

### 6.9.3 Road Safety

Both Kazakhstan and Uzbekistan have relatively poor road safety records. According to the World Health Organisation (WHO) Road Safety Report, 2018<sup>83</sup>, in 2016, there were 17.6 deaths per 100,000 population in Kazakhstan with the greatest proportion of these being drivers (60%) then pedestrians (31%). However, fatalities have more than halved in the past 10 years. In Uzbekistan, there were 11.5 deaths per 100,000 population which has increased slightly since 2007.

### 6.9.4 Roads Sensitivity Analysis

Table 39 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 39: Sensitivity Analysis**

Road	Receptor Details	Sensitivity
M39 (Uzbekistan)	Paved dual carriageway road with moderate daily traffic flows. Passing residential and commercial areas. Minimal traffic management measures in place. Road suitable for and regularly used by HGVs	Low

#### 6.9.4.1 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.

<sup>83</sup> World Health Organization (2018). Global Status Report on Road Safety 2018. Geneva: World Health Organization.

### 6.9.4.2 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.

### 6.9.4.3 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.

#### 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 40. 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 40: 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.

#### 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 41 below.

**Table 41: Magnitude of Change Criteria**

Sensitivity	Value	Criteria
High	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%

#### 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, Low, Medium or High. All direct



and indirect impacts causing Medium or High effects, as identified within Table 15 are considered to be significant.

#### 6.9.4.4 Assumptions

It is assumed for the purposes of this assessment (and forecasted levels of traffic) that construction will commence in 2022/2023. 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 220 MW (AC) 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 EPC Contractor. The assessment is based on an assumed construction phase duration of around 12 to 15 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 estimated based on these “worst-case” assumptions.

#### 6.9.4.5 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. A worst-case scenario has been modelled where all materials are transported to site by road.

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 42 below. It should be noted that these traffic volumes are estimated by AECOM based on previous solar PV project experience and are to be confirmed once a construction strategy is available from the EPC Contractor.

This assessment is limited to the expected amount of HGV movements and construction staff transportation requirements. The HGV movements estimated peak is expected to last one month and to be 1,460 vehicles during this month. It is also likely that a larger bus would be provided for construction workers thereby reducing the number of vehicle movements. It is also considered that a large proportion of the staff will be accommodated at the workers camp, in the proximity of the project site.

**Table 42: Estimated Volume of Vehicle Movements during Construction**

Vehicle Type	Activity	Total Vehicle Movements
HGV	Delivery of materials, plant, containers, concrete, aggregate material and welfare facilities	13,266
LGV (people carrier up to 6 people)	Transportation for construction workers to site.	3,080

It should be noted that this does not include movements of any abnormal loads or specialist vehicles (bulldozers, cranes etc) to the Project site. The amount of construction workers being transported to site is based on a typical on-site presence of 20 project staff at any one time with approximately 115 to 900 contracted site staff needed for the installation of the modules and civil construction. A detailed assessment of vehicle movements should be provided in the TMP.

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

## 7. Potential Environmental and Social Impacts

### 7.1 Construction Impacts

The assessment has been undertaken in accordance with the methodology and assessment criteria set out in Section 4 (Assessment Methodology). The impacts, including conclusions on their potential significance, are described below. Mitigation is described in Chapter 8. Residual impacts are described in Chapter 9.

#### 7.1.1 Air Quality

Air pollution may also arise as a result of dust emanating from vehicle movements and other construction activity. However, this will be a temporary effect that can be mitigated by restricting vehicles to sealed access tracks and the use of dust suppression measures.

The Project impacts may include:

- Dust and engine emissions created by construction activities (i.e. earthworks, demolition and operation of machinery) could influence the local ambient air quality.
- The release of exhaust emissions to the atmosphere could have an effect on the local ambient air quality.

The rural nature of the site, the expansiveness of the landscape and the limited amount of traffic present mean that vehicle emissions are not predicted to be significant. As a result, the air quality assessment considers only dust emissions.

Impact Assessment: Impacts on air quality during construction					
Impact Nature	Positive			Negative	
	Impact is negative because construction activities may result in increased noise and air pollution.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is direct as construction activities would directly increase noise / air pollution.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is temporary as impacts would occur during the construction phase only.				
Impact Extent	Local		Regional	National	
	The impact is expected to occur within the site and adjacent areas.				
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	Residential receptors are located within 200 m of the Project site therefore receptor sensitivity is determined to be Medium. This will be updated following completion of detailed design and agreement of access to site.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Magnitude of change is anticipated to be Medium as there is likely to be an increase in levels and dust to air associated with construction of the Project at nearby residential receptors.				
Impact Significance	None	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Medium adverse, on the basis that residential receptors are within 200m of the site boundary but construction vehicles would pass closer to and from site. The implementation of Good International Industry Practise pollution prevention measures is considered very likely to reduce the impacts. However, additional mitigation measures are required.				

#### 7.1.2 Archaeology and Cultural Heritage

The Project is not deemed to have a direct adverse impact on any international or nationally recognised cultural heritage. No significant archaeology or cultural heritage assets are currently known from within the Solar Array area. It is not located in an area of known archaeological potential –although it has a south-facing aspect, there are no presently identified remains from this upland valley. Known remains in the surrounding region focus on river valleys, prominent strategic positions, caves and rock shelters.

The area has been subject to previous ploughing, which may have levelled any earthworks and resulted in minor damage to any underlying archaeological deposits.

In the Solar Array area, 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. Components include the solar PV system, a new substation, and access roads; temporary construction stage elements include construction and laydown areas, worker accommodation, spoil disposal, and temporary access tracks. These works and related activities such as fence installation and vehicle tracking have the potential to directly impact on unrecorded buried archaeological remains which may be present within the Project boundary and may be of archaeological importance.

Potential buried remains of kurgan burial mounds are located in the vicinity of the Transmission Line. Embedded design mitigation will be applied – Transmission Line towers will be micro-sited to avoid impacts on areas with high potential for archaeological remains where reasonably feasible [e.g. **ACH24, ACH08, ACH09, ACH19, ACH20, ACH21**]. However, it is important to note that ceremonial structures, further satellite inhumations and cremation burials may be located near/in between kurgans. For this reason, additional mitigation works will include an archaeological watching brief on any intrusive works and a chance finds procedure.

The excavation of footings for the transmission towers and the crushing and rutting of the ground surface by machinery used to string the overhead line may result in localised impacts on any earthworks or buried archaeological remains.

The Solar Array will have no impact on the setting of heritage assets due to lack of intervisibility with receptors, intervening distance and topography. The Transmission Line will be visible from a number of heritage assets, particularly the kurgan field. It will be an additional large-scale industrial element in a landscape already characterised by intensive large-scale arable agriculture and existing Transmission Lines and light industry on the periphery of G’allaorol. It is not anticipated that construction-stage views, noise, dust and vibration will affect the ability to appreciate the significance of the historic landscape or individual monuments. For this reason, the impact on the setting of heritage assets is assessed as low.

Impact Assessment: Impacts on archaeology and cultural heritage during construction				
Impact Nature	Positive		Negative	
	Impact is negative because construction activities may result in physical disturbance to cultural heritage features.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is generally direct as archaeology features could be disturbed by construction activities.			
Impact Duration	Temporary	Short-term	Medium-term	Long-term
	Permanent			
Impact Extent	Local	Regional	National	
	Any potential impact is expected to occur within the Solar Array area or Transmission Line. There are no known designated heritage assets within the Project boundary. Any impact would be on previously undiscovered remains.			
Receptor Value / Sensitivity	Low	Medium	High	
	There are no known heritage assets within the Solar Array area. Possible remains of levelled burial mounds (kurgans) have been identified in the vicinity of the Transmission Line and associated burials and ceremonial features may be present.			
Impact Magnitude	No change	Low	Medium	High
	The magnitude of change is anticipated to be medium as there is localised potential to physically disturb any surviving archaeological remains. Setting impacts are low due to lack of views, intervening distance and topography.			
Impact Significance	None	Negligible	Low	Medium
	High			
The impact is assessed as Low and not significant prior to additional mitigation measures being implemented.				

### 7.1.3 Biodiversity

#### 7.1.3.1 Avifauna

Critical Habitat has been triggered for great bustard due to its Critically Endangered national conservation status as well as the Ecologically Appropriate Area of Analysis of this species, used in the CHA, overlapping with the Project Aol (refer to Appendix D). The Project is situated within the known wintering range of great bustard and it is likely that this species will fly over the Project Aol (refer to Appendix D).

The proposed project site is not located on a major flyway or in a geographical feature that would concentrate migrating species. Survey work has confirmed that the Project site is not important for breeding or migrating species, including raptor species of international and national conservation concern, which have been assigned PBF status (refer to Appendix D). Registrations of single Egyptian vulture (IUCN EN), eastern imperial eagle (IUCN VU) and greater spotted eagle (IUCN VU) were recorded overflying during the spring passage period during the baseline surveys. Small numbers of steppe eagle (IUCN EN) were recorded potentially over-wintering within the Sanzar river valley (Overhead Line route) and small numbers of several species of large raptors of national (Uzbekistan Red List) utilise the Project site for foraging/hunting: cinerous vulture, Eurasian griffon vulture, bearded vulture and golden eagle. There is no reasonable likelihood that the populations of any these PBF species are regionally significant.

Other species which are vulnerable to construction disturbance were confirmed likely absent from the Project site, including Asian houbara and great bustard. Sociable lapwing was confirmed likely absent; the Project site is not used as a major stop-over or flyway for this IUCN CR species. The Solar PV site and Overhead Line route are not considered to be suitable for great bustard as a staging or wintering habitat and therefore the likelihood that construction related disturbance to this species is significant is negligible.

Construction impacts are likely to include habitat loss as well as disturbance impacts in the Project and adjacent areas. The existing habitat within the Solar PV and most of the Overhead Line route is Modified Habitat as defined in PS6. The degraded nature of the project site and the relatively small number of birds encountered mean that there is not likely to be a significant impact on resident bird species.

Habitat loss associated with construction is unlikely to result in a significant impact to migrating birds as no major attractant features (e.g. lakes / wetlands) will be lost. As a result, there are not anticipated to be any impacts on resting or stopover sites for migrating birds.

Large avifaunal species utilise large tree species and these are not present within the PV area of the site, thus the Project is not

Project related human activity adjacent the respective Solar PV and Overhead Line construction footprints may impact on population growth of bird species due to hunting/take and disturbance, for example great bustard.

Impact Assessment: Impacts on Great Bustard ( <i>Otis tarda</i> ) during Construction– Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species]					
Impact Nature	Positive			Negative	
	Impact is negative because construction activities may result in habitat loss, disturbance and mortality to this species.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is generally direct as disturbance caused by construction activities may directly displace birds from wintering foraging/resting/roosting areas within the ZoI due to noise and visual disturbance.  Any changes in population due to project relating hunting/take may be irreversible.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent



<b>Impact Assessment: Impacts on Great Bustard (<i>Otis tarda</i>) during Construction– Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species]</b>				
	<p>The impact is expected to be short-term and temporary as it will be restricted to the construction phase of the project. Displacement impacts (relating to disturbance and barrier effects) are temporary and short-term as construction works are expected to continue for a period of approximately 18 months.</p> <p>Population changes relating to hunting/take are temporary and short-term as construction works are expected to continue for a period of approximately 18 months.</p> <p>It should be noted that the risk to this species is likely to be only in some winters, influenced by weather patterns in Russia. This may result in more individuals which may fly through the project area.</p>			
Impact Extent	Local	Regional	National	International
	The impacts are considered unlikely at a regional level considering that no great bustards were recorded within the Project AOI or EAAA used in the CHA, based on the TYP SA 2020/21 survey results. The site is not determined to be a foraging or resting area for Great bustard.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	As stated in the Critical Habitat Assessment (Turnstone Ecology, 2022 [Appendix D]), critical habitat requirements are applicable for Great Bustard. This species is assigned a 'High' sensitivity value.			
Impact Magnitude	Negligible	Low	Medium	High
	Given the unsuitability of the Project site for foraging/resting/roosting great bustard and the relative remoteness of the nearest great bustard records identified by TYP SA/IFC (2021), the impact magnitude is assessed as Negligible.			
Impact Significance	None	Negligible	Low	Medium
	The impact is assessed as Low and not significant			
There is a requirement for the project to achieve Net Gains for this Critical Habitat qualifying species. The mitigation measures required to achieve net gains will be detailed within a Biodiversity Action Plan (BAP) for this species.				

<b>Impact Assessment: Impacts on ornithology during construction (PBF species) – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinereous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara</b>				
Impact Nature	Positive		Negative	
	Impact is negative because construction activities may result in habitat loss and disturbance.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	<p>The impact is generally direct and irreversible as potential foraging habitat may be lost through construction activities (e.g. ground clearance to accommodate infrastructure). There will be no direct destruction or damage to active nests due to the unsuitability of the habitat within the project footprint for those PDF species which have breeding ranges that have the potential to overlap the project, ie. saker falcon, golden eagle, Egyptian vulture, Eurasian griffon vulture and bearded vulture.</p> <p>Site clearance and construction of solar panel infrastructure, pylons, powerlines, access roads and other infrastructure may create barrier effects for PBF birds migrating (overflying)</p>			

<b>Impact Assessment: Impacts on ornithology during construction (PBF species) – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinereous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara</b>					
	the Project site, particularly the following species autumn and spring passage: sociable lapwing, steppe eagle, Egyptian vulture, eastern imperial eagle and greater spotted eagle. It is possible that individuals will be deterred from using preferred migration routes during periods where there is more intense activity and more people are present in the landscape. However, reversible barrier displacement effects for the Overhead Line will be limited to localised areas and focussed on pylon locations				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is permanent as there would be an irreversible change to the baseline within the Project site for the lifetime of the Project. Displacement impacts (relating to disturbance and barrier effects) are temporary and short-term as construction works are expected to continue for a period of approximately 9 months.				
Impact Extent	Local	Regional	National	International	
	The impact is expected to occur within or immediately adjacent to the Project site. Given the distance of >25km between the Project site and the Tuzkan Lake and Dzhum-Dzhum IBA's (at their closest points), and the lack of habitat connectivity or potential pathways between these IBA's and the Project site, there is no reasonable likelihood of significant direct or indirect impacts.				
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	<p>The PBF bird species which have been recorded as present or assessed as having a reasonable likelihood of occurrence are not critical habitat qualifying species and are therefore not of very high or high sensitivity according to the criteria detailed above. In terms of the PBF species which have been recorded, these have been recorded in numbers which are not significant and are assigned a Medium sensitivity value.</p> <p>No species listed as qualifying features of the Tuzkan Lake IBA were recorded during the AECOM field surveys. Very small numbers of Dzhum-Dzhum IBA qualifying species were recorded within the Project site (cinereous vulture and bearded vulture), however the numbers recorded are unlikely to be significant (defined as &gt;1% of the IBA population).</p> <p>The project does not support breeding populations for PBF birds and the habitat is not suitable for these species.</p> <p>Sociable lapwing (IUCN [CR]) has the potential to occasionally overfly the project site on spring and autumn passage (the species was assessed as likely absent as a result of the targeted surveys for this species). However, there is no reasonable likelihood that the project is located on a significant migratory corridor for this species and the sensitivity is assessed a Low.</p> <p>Houbara bustard (IUCN [VU]) has been shown to be likely absent from the Solar PV and the Overhead Line, as a result of the targeted breeding surveys for this species undertaken by AECOM. The sensitivity for this species is therefore is determined as Low.</p>				
Impact Magnitude	Negligible	Low	Medium	High	
	<p>For the Solar PV the magnitude of the effect is predicted to be Negligible for breeding PBF birds given their likely absence from the Solar PV Project site. The magnitude of the effect is predicted to be Low for non-breeding birds PBF raptor species overflying on spring and autumn migration, in terms of disturbance displacement (barrier to movement) during the construction phase.</p> <p>The magnitude of the effect for the Overhead Line is expected to be Negligible in terms of breeding by PBF birds considering the likely absence of nest sites at the areas to be cleared within the respective very localised pylon footprints. The magnitude of the barrier effect is predicted to be Low for non-breeding birds PBF raptor species overflying the AOI</p>				

<b>Impact Assessment: Impacts on ornithology during construction (PBF species) – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas’s Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinerous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara</b>					
	on spring and autumn migration, in terms of disturbance displacement (barrier to movement) during the construction phase.				
Impact Significance	None	Negligible	Low	Medium	High
	As a result, the impact is assessed as Negligible and Low for PBF bird species and not significant for the Solar PV and the Overhead Line, respectively. There is a requirement for the project to achieve No Net Loss of species defined as PBFs.				

<b>Impact Assessment: Impacts on ornithology (non PBF species) during construction</b>					
Impact Nature	Positive		Negative		
	Impact is negative because construction activities may result in habitat loss and disturbance.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is generally direct as habitat will be lost through construction activities (e.g. ground clearance to accommodate infrastructure associated with the Solar PV and transmission line [pylons]), this could include direct destruction or damage to bird nests (e.g. crested lark and wheatears). In addition, disturbance caused by construction activities may directly displace birds from breeding sites and/or foraging areas due to noise and visual disturbance.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is permanent as there would be an irreversible change to the baseline within the Project site for the lifetime of the Project. Displacement impacts are temporary and short-term as construction works are expected to continue for a period of approximately 9 months.				
Impact Extent	Local	Regional	National	International	
	The impact is expected to be restricted to the Project site.  Given the distance of >25km between the Project site and the Tuzkan Lake and Dzhum-Dzhum IBA's (at their closest points), and the lack of habitat connectivity or potential pathways between these IBA's and the Project site, there is no reasonable likelihood of significant direct or indirect impacts.				
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	The Solar PV footprint supports a limited assemblage of breeding species which are not of international or national conservation concern. Small numbers of Eurasian curlew (IUCN NT) were recorded on a single occasion during the spring passage period, however there is no reasonable likelihood that the project is sited on a key stopover or migratory corridor for this species.  This ornithological receptor has been assessed as Low value. ,				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of the effect for the Solar PV site is predicted to be Medium given the area of the site that will require to be cleared and / or disturbed and that there is potential for loss/damage to eggs and nests of common ground nesting birds if site clearance occurs during the breeding bird season. The magnitude of the effect for the Overhead Line is expected to be Low as the areas to be cleared within the respective pylon footprints will be very localised. Therefore, the magnitude of the effect for the Project site is assessed as Medium (overall).				
Impact Significance	None	Negligible	Low	Medium	High
	As a result, the impact is assessed as Low and not significant, however it is recommended standard mitigation measures are implemented to ensure impacts remain minimal.				

### 7.1.3.2 Terrestrial Ecology

Construction will cause the loss of habitat as well as disturbance in the adjacent areas. However, the natural vegetation at the Project site has been substantially altered by farming and irrigation. Due to the high level of anthropogenic disturbance to the natural vegetation and limited diversity on the Project site, there is little natural ecosystem function demonstrated by the site and it is therefore not considered a sensitive area.

The existing habitat within the Solar PV site and the majority of the extent of the Overhead Line is Modified Habitat as defined in PS6. Degraded Natural Habitat occurs near the south-eastern end of the Overhead Line between the Sanzar river valley and the existing sub-station terminus, however areas impacted by the construction of the pylons will be small. For the Solar PV it is expected that there will be limited removal of vegetation during construction as it mainly consists of low growing species. The total extent of site levelling work will be determined by the EPC Contractor. No vegetation removal is planned outside this area. For the construction of the Overhead Line the removal of the intensively cultivated habitat will be very localised at the locations of the respective pylon locations.

Direct impacts may occur in relation to Central Asian tortoise populations within the Solar PV site, mainly during site stripping activities. As stated above the total extent of site levelling work will be determined by the EPC Contractor but is expected to cover a significant percentage of the overall area of the Solar PV site area. It is within this area where direct impacts may be encountered. Based on the results of the precautionary assessment of population density it is expected that 175 tortoises may be present in this area. The number of tortoises actually found during the pre-construction reptile translocation works undertaken in 2022, in accordance with regional government permitting requirements, will be detailed when the GBI ecology summary reports are available.

#### **Potential Impacts**

##### *Loss, degradation or fragmentation of species habitat*

During site preparation, construction of project infrastructure (Solar PV and Overhead Line pylons) will result in the direct loss of disturbed (cultivation) habitat, which is a habitat for faunal species, including Central Asian tortoise. It is expected that construction activities will be restricted to areas within the immediate project footprint.

Construction of project infrastructure within the Solar PV will result in direct loss of habitat, which is used by Central Asian tortoise. Project activities during this phase may result in loss of connectivity between habitat areas for tortoises and other faunal species due to construction activities, as well as degradation of this connecting habitat. No bat roosts or potential roosts are located within the proposed working footprint or within at least 10m radius of the Solar PV or pylons; given the temporary nature of the construction works and the expected low level of noise which will be generated, a standoff zone of at least 10m from any building that may support a bat roost in settlements lying adjacent to the project site, is judged to be large enough to ensure no potential disturbance impacts on any potential bat roosts that may exist outside the project site boundary. It is expected that no general site lighting at night will be required during construction works; there are no significant adverse impacts on foraging nocturnal fauna (including bats) during the construction of the Solar PV.

##### *Temporary disturbance/ displacement/ degradation of habitat*

Faunal species, including tortoises, are likely to be disturbed by the presence of people in the landscape, vehicle movements, noise and vibration from various stages of the project. As with other faunal species, the greatest potential for disturbance will be during site clearance and construction phases, particularly during site activities such as access road creation, earth moving and other excavations.

Vibration impacts on fauna within the Zol of the project is not considered to be perceptible as a result of the project and no further assessment is required.

##### *Direct mortality/injury*

There is the potential for faunal species (including Central Asian tortoise) to be killed or harmed by machinery and/or vehicle collisions during the construction phase of the project.



### Population changes

Project related human activity within the Solar PV and Overhead Line habitat areas may impact on population growth of faunal species (including Central Asian tortoise) due to hunting/take, disturbance and loss of suitable habitat.

### Hydrological alteration of habitat

No significant adverse effects on terrestrial habitats and fauna are expected within the ZOI for habitats and fauna during the construction phase.

<b>Impact Assessment: Impacts on terrestrial ecology (PBF species) during construction – Central Asia Tortoise, Transcaspian Desert Monitor, Northern (Barred) Wolf Snake and Tatar Sand Boa</b>					
Impact Nature	Positive			Negative	
	Impact is negative because construction activities may result in habitat loss and disturbance.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is generally direct as habitat will be lost through construction activities (e.g. ground clearance to accommodate infrastructure associated with the Solar PV and transmission line [pylons]), this could include direct destruction or damage of fauna and flora. In addition, disturbance caused by construction activities may directly displace/disturb fauna. Construction vehicles and excavated areas can pose a risk of death or injury to fauna.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	Initial topsoil stripping will take place during the first 1-2 months of construction within the parts of the Project Site required for permanent compounds and hard standing. The impact is permanent as there would be an irreversible change to the baseline within the Project site for the lifetime of the Project. Displacement impacts are temporary and short-term as construction works are expected to continue for a period of approximately 12-15 months.				
Impact Extent	Local	Regional	National		
	The impact is expected to occur within the Project site.  Given the distance of >25km between the Project site and the Tuzkan Lake and Dzhum-Dzhum IBA's (at their closest points), and the lack of habitat connectivity or potential pathways between these IBA's and the Project site, there is no reasonable likelihood of significant direct or indirect impacts on faunal receptors associated with these internationally recognised sites.				
Receptor Value / Sensitivity	Low	Medium	High		
	A single species of conservation concern was recorded: Central Asian tortoise (IUCN VU, Red Data Book of Uzbekistan). However, there is no reasonable likelihood that the tortoise population occurring within the Project site is of regional importance as the modified cultivated habitats within the site support a small population of tortoises (the 0.38 ind/hectare population density which has been determined is significantly lower than for areas of Uzbekistan which support the highest population densities).				
	There are anecdotal records of tatar sand boa within the Solar PV site (Red Data Book of Uzbekistan), but there is no reasonable likelihood that regionally significant populations occur as the modified habitat does not represent optimal habitat for this species> The sensitivity of this receptor is assessed as Low.				
	Transcaspian desert monitor and northern (barred) wolf snake have the potential to occur within the project site and the sensitivity for these species is assessed as no more than Low.  The sensitivity of this receptor is assessed as Low overall.				
Impact Magnitude	No change	Negligible	Low	Medium	High

<b>Impact Assessment: Impacts on terrestrial ecology (PBF species) during construction – Central Asia Tortoise, Transcaspian Desert Monitor, Northern (Barred) Wolf Snake and Tatar Sand Boa</b>					
	<p>The magnitude of the effect is predicted to be Medium given the area of the Project site that will require to be cleared and / or disturbed and there is the potential for loss/mortality of these PBF reptile species. The magnitude of the effect for the Overhead Line is expected to be Low, as the areas to be cleared within the respective pylon footprints will be very localised.</p> <p>Therefore, the magnitude of the effect for the Project site is assessed as Medium (overall).</p>				
Impact Significance	None	Negligible	Low	Medium	High
	As a result, the impact is assessed as Low and not significant. There is a requirement for the project to achieve No Net Loss of species defined as PBFs				

<b>Impact Assessment: Impacts on other terrestrial ecology (non PBF species) during construction</b>					
Impact Nature	Positive		Negative		
	Impact is negative because construction activities may result in habitat loss and disturbance.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is generally direct as habitat will be lost through construction activities (e.g. ground clearance to accommodate infrastructure associated with the Solar PV and transmission line [pylons]), this could include direct destruction or damage of fauna and flora. In addition, disturbance caused by construction activities may directly displace/disturb fauna. Construction vehicles and excavated areas can pose a risk of death or injury to fauna.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	<p>Initial topsoil stripping will take place during the first 1-2 months of construction within the parts of the Project Site required for permanent compounds and hard standing.</p> <p>The impact is permanent as there would be an irreversible change to the baseline within the Project site for the lifetime of the Project.</p> <p>Displacement impacts are temporary and short-term as construction works are expected to continue for a period of approximately 12-15 months.</p>				
Impact Extent	Local	Regional	National		
	<p>The impact is expected to occur within the Project site.</p> <p>Given the distance of &gt;25km between the Project site and the Tuzkan Lake and Dzhum-Dzhum IBA's (at their closest points), and the lack of habitat connectivity or potential pathways between these IBA's and the Project site, there is no reasonable likelihood of significant direct or indirect impacts on faunal receptors associated with these internationally recognised sites.</p>				
Receptor Value / Sensitivity	Low	Medium	High		
	<p>The abundance and diversity of terrestrial fauna within the Solar PV site and Overhead Line route was found to be low.</p> <p>The AECOM 2021 and 2022 field surveys confirmed that the plant and animal species (other than PBF reptile species) recorded within the proposed project site during the AECOM field surveys are not of conservation concern.</p> <p>The sensitivity of the terrestrial habitat within the Solar PV has therefore been assigned as Low in terms of faunal species.</p> <p>The historic cultivated land that prevails within the Solar PV site is Modified Habitat as defined in PS6. Spiny cocklebur and Isirik are noxious weeds and are prominent components of the weed flora; the former is an introduced species. The Overhead Line route crosses mainly intensively cultivated and irrigated farmland habitat; it is Modified Habitat as defined in PS6. Degraded Natural Habitat occurs near the south-eastern end of the Overhead Line between the Sanzar river valley and the existing sub-station</p>				

Impact Assessment: Impacts on other terrestrial ecology (non PBF species) during construction					
	terminus; habitat near the sub-station has been disturbed/damaged during the historic construction of the sub-station and associated power-lines. The habitat within the Project site is therefore assessed as Low value.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of the effect is predicted to be Medium given the area of the Project site that will require to be cleared and / or disturbed.  The magnitude of the effect for the Solar PV site is predicted to be Medium given the area of the site that will require to be cleared and / or disturbed and that there is potential for loss/mortality of reptiles and small mammals. The magnitude of the effect for the Overhead Line is expected to be Low, as the areas to be cleared within the respective pylon footprints will be very localised. Therefore, the magnitude of the effect for the Project site is assessed as Medium (overall).				
Impact Significance	None	Negligible	Low	Medium	High
	As a result, the impact is assessed as Low and not significant. A suite of both standard mitigation measures <sup>84</sup> and species-specific mitigation measures will be implemented to ensure impacts are reduced to Low significance or below.				

## 7.1.4 Geology and Soils

### 7.1.4.1 General

The main impact on soils during construction will be the potential for soil contamination from spills and leaks and increase in vulnerability to erosion. Soil compaction and loss of limited vegetation present increases in the soils' vulnerability to erosion. Soils will be particularly vulnerable when wet (i.e. during snowmelt or heavy rain), when vehicle traffic is likely to cause the greatest damage.

Where roads are un-surfaced, rutting and gully erosion eventually make the roads impassable so that vehicles drive off the track and the area affected by erosion continually widens.

The following types of construction activity could lead to potential soil erosion:

- Vehicle traffic along dirt tracks used during construction of on- and off-site roads, power lines, control centre and solar panels will cause soil compaction.
- Off-road vehicle traffic will damage vegetation and cause soil compaction.
- Any vegetation and some soil will be removed for the control centre, solar panel foundations, transmission towers, and both on- and off-site roads.
- The use of heavy equipment will cause soil compaction if used outside designated roads.
- Soil erosion from increased water run-off, can cause sediment release to nearby water bodies.
- Ability of soils to support foundations.

Soil compaction and loss of limited vegetation present increases in the soils' vulnerability to erosion. Soils will be particularly vulnerable during the rainy seasons, when vehicle traffic is likely to cause the greatest damage.

Where roads are un-surfaced, rutting and gully erosion eventually makes the roads impassable so that vehicles drive off the track and the area affected by erosion continually widens.

### 7.1.4.2 Ground conditions

Electrical equipment (transformers, inverters, electrical switchgear) heavy duty equipment and ancillary buildings (office building, meteorological towers) are usually earthed by means of surface mats. The

<sup>84</sup> For example: NetRegs (2020). Guidance for Pollution Prevention (GPP). Available at: <https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>

existence of a very low strength layer of soil up to a depth of around 2.10 meters, suggests the likely existence of partial collapsible areas that could develop until reaching the surface. It is considered that collapse behaviour can take place within this superficial unit in different areas of the PV parcel. Consequently, it is not advisable to rely on the strength of this soil to support any foundation but to go through it and lay foundations on underlying sandy and gravelly layers. This will be confirmed during future studies by the EPC.

Impact Assessment: Impacts on soil quality during construction						
Impact Nature	Positive			Negative		
	Reduction in local soil quality as a result of construction activities causing erosion related to increased water run-off, soil compaction and loss of limited vegetation. Soil quality can also be negatively affected by spillage of oils during maintenance of machinery, improper storage of hazardous materials, spillage during transfers of fuel and improper disposal of waste.					
Impact Type	Direct		Indirect	Reversible		Irreversible
	The impact is generally direct as soils / geology resources will be affected through construction activities.					
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent	
	The impact is short-term as construction works are expected to continue for a period of approximately [HOLD – TBC] months.					
Impact Extent	Local		Regional	National		
	The impact is expected to occur within the site and sedimentation/oil or chemical release would be at a local level only.					
Receptor Value / Sensitivity	Negligible		Low	Medium	High	
	The sensitivity of soils in the Project area is assessed as Low. Whilst it is recognised that soils will be most vulnerable during high rainfall and snowmelt, the limited geographical extent does not require higher sensitivity.					
Impact Magnitude	No change	Negligible	Low	Medium	High	
	The magnitude of the effect is predicted to be Low, given that there is potential for construction activities to notably change the resource, particularly during rainy season. Impacts of fuel spills are deemed to be highly localised.					
Impact Significance	None	Negligible	Low	Medium	High	
	As a result, the significance of the impact is assessed as Low. The extent of reduced soil quality due to construction activities is considered local, and the duration assessed as being temporary and short-term.					

## 7.1.5 Hydrology and Hydrogeology

### 7.1.5.1 Surface Water

There are no permanent waterbodies within the Solar PV Site. Gullies, running through the site in west to east direction, have been caused by surface run-off. There are two permanent watercourses near the Solar PV Site boundary.

Surface water may be subject to reduction in quality should proper mitigation not be implemented. The watercourses adjacent to the site currently provide drinking water for livestock.

During construction, earthworks, road construction and use of heavy vehicles could alter surface drainage patterns. The removal of vegetation and compaction of soils will reduce infiltration and surface run-off will increase. The risk is greatest during severe precipitation events, which are most likely to occur in spring. The increased volume of water flowing into drainage channels is likely to cause additional soil erosion. Surface run-off will also contain higher concentrations of suspended sediments during construction than would otherwise be the case. Other potential sources of pollution during construction comprise leaks and spills of oils from machinery and discharge of sanitary waste and wastewater.

Impact Assessment: Impacts on surface water during construction	
Impact Nature	Positive Negative



Impact Assessment: Impacts on surface water during construction				
	Impact is negative because construction activities may generate pollutants that reduce the quality of surface water used as a drinking water source for livestock.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is generally direct and potential sources of pollution to surface water during construction comprise leaks and spills of oils from machinery and discharge of sanitary waste and wastewater which may subsequently run off to nearby surface water bodies. Surface water run-off may have a higher sediment load. The localised nature of spills likely to be experienced can be addressed through standard construction practises including appropriate drainage and containment. Pollution risks will continue during the construction phase.			
Impact Duration	Temporary	Short-term	Medium-term	Long-term
	The impact is short-term as construction works are expected to continue for a period of approximately 18 months.			
Impact Extent	Local	Regional	National	
	The impact is expected to occur within the site and run-off from potential spills or sediment would be at a local level only. Chemicals and fuels are not stored in sufficient quantities to result in a spill of regional importance.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity of surface water is assessed as medium, recognising the fact that only a small number of local residents use this watercourse for irrigation and drinking water for livestock.			
Impact Magnitude	No change	Negligible	Low	Medium
	The magnitude of the effect is predicted to be low given the limited area of the Project site in relation to the overall catchment area.			
Impact Significance	None	Negligible	Low	High
	As a result, the significance of the impact is assessed as low. The extent of reduced surface water quality due to construction activities is considered local, and the duration assessed as being temporary and short-term. Good International Industry Practise pollution prevention measures will be implemented, reducing the impact further.			

### 7.1.5.2 Groundwater

The amount of water required during construction is estimated at 9,608 m<sup>3</sup>. The source of water required for construction has not yet been determined but it is recommended that water is delivered by tanker and not from groundwater well.

Local communities within the vicinity of the Project use wells for drinking water.

Potential sources of pollution to groundwater during construction comprise leaks and spills of oils from machinery and discharge of sanitary waste and wastewater. During construction, sanitary waste will be collected in containers below portable toilets and transported to a registered waste disposal facility for disposal. Storage and handling procedures for oils and other chemicals will be required to minimize risk of pollution.

- Potential impacts on groundwater include:
- Accident/ unplanned event: Groundwater could be contaminated through accidental fuel spills.
- Accident/ unplanned event: Depending on the method of waste disposal, impacts could be felt on surface or groundwater, flora and fauna and/ or local communities.

Impact Assessment: Impacts on groundwater during construction	
Impact Nature	Positive
	Negative
	Impact is negative because construction activities may generate pollutants that reduce the quality of groundwater used by local residents for domestic purposes.
Impact Type	Direct
	Indirect
	The impact is generally direct and potential sources of pollution to groundwater during construction comprise leaks and spills of oils from machinery and discharge of sanitary waste and wastewater. The localised nature of spills likely to be experienced can be addressed

Impact Assessment: Impacts on groundwater during construction					
	through standard construction practises including appropriate drainage and containment. Pollution risks will continue during the construction phase.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is short-term as construction works are expected to continue for a period of approximately 18 months.				
Impact Extent	Local		Regional	National	
	The impact is expected to occur within the site and run-off from potential spills would be at a local level only. Chemicals and fuels are not stored in sufficient quantities to result in a spill of regional importance.				
Receptor Value / Sensitivity	Negligible		Low	Medium	High
	The sensitivity of groundwater is assessed as high, recognising the fact that local communities abstract groundwater for domestic use from local wells.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of the effect is predicted to be low, given that the soil and superficial deposits present in the area are expected to provide protection to the groundwater.				
Impact Significance	None	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Moderate adverse, on the basis that local communities abstract groundwater for domestic use. The implementation of Good International Industry Practise pollution prevention measures is considered to make the contamination of groundward very unlikely.				

### 7.1.6 Labour and Working Conditions

A sound worker-management relationship is a key requirement of the Project and a constructive worker-management relationship, by treating the workers fairly and providing them with safe and healthy working conditions, is required to ensure protection of the fundamental rights of workers.

The implementation of the actions necessary to meet these requirements will be managed through the Project's Environmental and Social Management System (ESMS).

The requirements apply to workers directly engaged by the client (direct workers), workers engaged through third parties to perform work related to the Project.

The aim of the Project's policies on labour and working conditions will be:

- To promote the fair treatment, non-discrimination, and equal opportunity of workers especially vulnerable workers facing particular risks due to context-specific socioeconomic characteristics.
- To establish, maintain, and improve the worker-management relationship.
- To promote compliance with national employment and labour laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers.
- Zero tolerance for the use of forced labour and child labour.
- Respecting the principles of freedom of association and collective bargaining.
- Ensuring that accessible and effective means to raise and address workplace concerns are available to workers.

During the construction phase, there may be occupational health and safety risks to workers from the various operation and maintenance activities expected to take place for the Project. Key risks could include, *inter alia*, collision with vehicles and plant and exposure to a variety of hazards such as electric shock from exposed cables and thermal burn hazards and exposure to chemicals, hazardous or flammable materials.

Labour and working conditions, including occupational health and safety impacts, are considered to be of medium-term duration throughout the construction phase and are expected to be of potential high magnitude and high sensitivity as in extreme cases they could entail permanent impacts (e.g. death or permanent disability). As such, the impacts are considered to be of High impact and appropriate mitigation will be developed.

Impact Assessment: Occupational health and safety impacts during construction					
Impact Nature	Positive			Negative	
	There will be a range occupational health and safety risks throughout construction activities. This includes risk of injury, collision with plant and equipment, electrocution, thermal burn hazards, exposure to hazardous chemicals and working in extreme temperatures. Mismanagement of wastes (such as domestic solid waste, sewage and hazardous wastes) can also represent a health and safety risk to workers, such as disease, injury or death.				
Impact Type	Direct			Indirect	
	The risks are predominantly associated with direct impacts on the operational and maintenance workers due to the operation of the Project. Health and safety risks associated with waste mismanagement are considered indirect impacts. The Project's policies on labour and working conditions will further impact worker's income and wellbeing.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impacts will persist throughout the 18 month construction timeline and are therefore considered medium-term.				
Impact Extent	Local		Regional	National	
	The impacts will be limited to the project site and local area.				
Receptor Value / Sensitivity	Low	Medium		High	
	The receptors in this case are the construction workers. There are likely to be up to 1,000 workers at the peak and all are considered high value/sensitivity.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Occupational health and safety impacts could result in disease, injury, or death to workers and so the magnitude is high.				
Impact Significance	None	Negligible	Low	Medium	High
	Pre-mitigation, the impact is assessed as High and significant. An independent Labour Assessment shall be undertaken by a qualified labour specialist, which shall include a corrective action plan with appropriate mitigation and remediation measures as well as monitoring requirements that will be implemented by the Project and its subcontractors.				

### 7.1.7 Landscape and Visual

These include areas for temporary works, construction compounds, access road and on-site roads, areas for solar PV panels, substations and transformer stations, on-site and off-site transmission lines. New machinery and equipment will be introduced into the landscape, including heavy goods vehicles excavators, bulldozers, and other heavy equipment.

Impact Assessment: Impacts on Landscape Character					
Impact Nature	Positive			Negative	
	Impact is negative because construction activities will result in additional features within the landscape. It is assumed that all Project related changes are negative in nature.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is generally direct and experienced within 5km of the Project site. The impact will continue for the duration of the Project and is therefore deemed to be irreversible.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The construction impact is short-term as construction works are expected to continue for a period of approximately 18 months.				
Impact Extent	Local		Regional	National	

Impact Assessment: Impacts on Landscape Character				
	It is assessed that only a small proportion of the local landscape will be affected by the presence of construction works, topsoil stripping and bare ground.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity this landscape is assessed to be Low as it is not important in a local context. It is noted that the landscape is not designated at the local or national level and is influenced by man-made features.			
Impact Magnitude	No change	Negligible	Low	High
	The magnitude of the effect is predicted to be low, as it is unlikely that construction works become the dominant feature in an area already impacted by human activity.			
Impact Significance	None	Negligible	Low	High
	As a result, the significance of the impact is assessed as low. Although impacts will be visible in places, the surrounding features are often of a larger scale in height and extent. Therefore, changes can be easily accommodated.			

Impact Assessment: Impacts on Visual Amenity				
Impact Nature	Positive		Negative	
	Impact is negative because construction activities will result in additional features within the landscape. It is assumed that all Project related changes are negative in nature.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is generally direct and experienced within 5km of the Project site. The impact will continue for the duration of the Project and is therefore deemed to be irreversible.			
Impact Duration	Temporary	Short-term	Medium-term	Long-term
	The construction impact is short-term as construction works are expected to continue for a period of approximately 18months.			
Impact Extent	Local	Regional	National	
	It is assessed that the views experienced will include OHTLs and pylons, roads, substation and other man-made structures which reduce the quality of the views experienced.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity of the site is assessed to be Medium because the land at which the Project is located is flat, with very few trees, hedges or fences to obscure visibility, and as such visibility can extend for several kilometres.			
Impact Magnitude	No change	Low	Medium	High
	The magnitude of the effect is predicted to be low, because the visual impact of ground-level features is likely to be low, except at close range, due to the lack of vantage points overlooking the landscape.			
Impact Significance	None	Negligible	Low	High
	As a result, the significance of the impact is assessed as low. Although impacts will be visible in places, the surrounding features are often of a larger scale in height and extent. Therefore, changes can be easily accommodated.			

### 7.1.8 Noise

Noise pollution may result from the large workforce and construction activities, particularly the movement of trucks used to carry material to the site and removal of debris. Some heavy earth moving, and compacting machinery may be required for brief periods during construction but it is expected that much of the civil work will involve manual labour. Work will not take place at night.

The Project impacts may include:

- Truck and vehicle traffic along main transport/access routes will create noise and vibration that may increase ambient noise levels.
- Construction equipment and machinery could create noise and vibrations that may increase ambient noise levels.



Typical construction for a solar development does not produce significant noise issues due to the small number of plant items, the relative size of the development and typical distance to the nearest NSRs.

A construction noise assessment has been undertaken based on British Standard BS5228-1:2014 assuming the construction of the control building / transformers and inverters as a worst-case construction noise scenario.

Construction noise will be temporary and short term. The construction noise assessment is provided in Table 43 below. When compared with the relevant noise limit set out above it can be seen that generally the project will meet construction noise limits with the exception of ground preparation works which have the potential to exceed the construction noise limits by 4 dB. Ground preparation works are considered to be short term, and further micrositing will be undertaken as part of detailed design to ensure construction noise impacts are minimised and equipment is located as far as possible from NSRs. This assessment assumes the use of heavy machinery, as detailed in Table 43.

**Table 43: Construction Noise Assessment**

Phase	Sound Power Level at Source (BS5228:2014)	Noise Level at NSR (assumed 200 m distance)
Ground preparation.	Dumper truck 118 dB SWL. Backhoe excavator 99 dB SWL.	64 dB
Concrete preparation.	Cement mixer (petrol or diesel) 92 dB SWL.	38 dB
Installation of transformer and inverter.	Delivery truck (4axle wagon) 110 dB SWL. Mobile telescopic crane (50t) 67dB spl 98 dB SWL.	56 dB

This will be updated following completion of detailed design and agreement of access to site.

Impact Assessment: Impacts on noise during construction					
Impact Nature	Positive			Negative	
	Impact is negative because construction activities may result in increased noise and air pollution.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is direct as construction activities would directly increase noise levels.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is temporary as impacts would occur during the construction phase only.				
Impact Extent	Local	Regional	National		
	The impact is expected to occur within the site and adjacent areas.				
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	Although no residential receptors are located within 200 m of the Project site, receptor sensitivity is determined to be High. This will be considered further during detailed design.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Magnitude of change is anticipated to be Medium as there is likely to be an increase in noise levels associated with construction of the Project at nearby residential receptors.				
Impact Significance	None	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Medium adverse, on the basis that no residential receptors are within 200m of the site boundary. However the access route may pass closer to NSRs. The implementation of Good International Industry Practice pollution prevention measures is considered very likely to reduce the impacts further. This will be considered further during detailed design.				

### 7.1.9 Socio-economic Impacts

There are several possible pathways which may be created between the Project and its activities and the baseline socio-economic conditions. These pathways, direct or indirect, create the opportunity for the project to have both positive and negative impacts on the receptors identified in Section 6.7.15. The potential pathways which may lead to socio-economic impacts include:

- **Interaction between employment and capacity building:** The Project will require both skilled and unskilled labour during the construction and operational phase. Labour may be sought from the local community and training provided for selected individuals, thereby creating direct and indirect employment opportunities.
- **Interaction with local communities:** The Project has been located away from individual houses and local settlements and therefore there will be no requirement to resettle any individual. As a result, physical resettlement will be avoided and a Resettlement Action Plan (RAP) for the Project is therefore not required. There will be no requirement to resettle any individual within the PV and OHTL. The impact due to the PV and OHTL access routes and accommodation camps on settlements will be determined as part of the detailed design stage.
- **Interactions with the workers' camp and migrant workforce:**
  - Local Community Demographics - Influx of workers from outside of the local Project Aol may result in a change in demographics of the local communities.
  - Social and Cultural Structure - The presence of workers in the Project Aol and the money they earn and spend may cause changes to local customs and norms causing social tensions and impacting on social institutions. Additionally, it may cause increased pressure on services due to a significant influx of workers from outside the local area.
  - Infrastructure and Services - The presence of workers in the Project area could have an impact on local social amenities and possibly saturate existing public services (water, electricity, roads, schools, health centres).
  - Increased presence of local and migrant workers looking for work opportunities near the Project Aol – The presence of workers in the Project Aol could have the potential to increase the incidence of communicable diseases, including Covid-19.
- **Interactions with Community H&S and Security:**
  - Disruption and increased traffic during construction could pose a H&S risk to members of the local communities.
  - Loss of public access to footpaths inside the Project site.
  - Dust and engine emissions created by construction activities could impact air quality and hence community and livestock health. This impact is covered in more detail in the corresponding Air Quality section.
  - Accident/ unplanned event: Degraded water quality from discharged effluent and sewerage and unplanned events could have an effect on community and livestock health. This unplanned event is covered in more detail further below.
  - Equipment and activities will create noise and vibration during construction and demolition that could impact human and livestock health. This impact is covered in more detail in the corresponding section.
  - Movement of materials and workers during construction could impact public safety.
  - Access to water and water quality impacts could negatively affect local communities and their livestock. This impact is covered in more detail in the corresponding Hydrology and Hydrogeology section.
- **Interactions with Occupational Health and Safety:** Further to impacts identified above, construction activities pose a variety of OHS risks to the workforce arising from general construction works within the Project site and during the construction and erection of the transmission line poles. These include but are not limited to:
  - Working at height during the installation of transmission line cabling

- Heavy lifting during installation of the solar panels by the workforce
- Working with live electrical components during construction and operation
- Noise, dust, and emission levels on the workforce during construction activities

### 7.1.9.1 Social Impact List

Based on the pathways described above, the following potential impacts were scoped in as the most relevant for the Aol and the socio-economic receptors.

1. Physical and economic displacement
2. Community expectations of the Project
3. Increased local employment, capacity building and supply demand
4. Capacity strain contribution to local public services and facilities
5. Loss of public access and reduced mobility through local paths
6. Reduced access to grazing and pastoral land
7. Increased presence of workers and interaction with local communities
8. Increased presence of security personnel

These will be described below. Increased road traffic will be detailed in the following section as a specific potential impact. Unplanned events are described below.

### 7.1.9.2 Economic displacement

As noted, local residents of Karakchi use the Project site<sup>85</sup> to graze livestock and gain access to other grazing lands. The land along the transmission line is used for arable farming and the land users may experience a loss of land and disturbance. The proposed access road passes through Karakchi and will require an additional assessment of impacts prior to construction. Any economic displacement will be as a result of the access road will be avoided, or if this is not possible will be included in an updated LRP.

Impact Assessment: Economic displacement				
Impact Nature	Positive		Negative	
	Impact is negative because physical or economic displacement would negatively affect a person's livelihood.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is direct because the Project may occupy land previously used for farming/grazing.			
Impact Duration	Short-term	Medium-term	Long-term	Permanent
	The impact is permanent as it would be in place for the full project lifetime.			
Impact Extent	Local	Regional	National	
	The impact may occur at a local level within the site boundary, including the OHTL, and immediate surroundings. Based on initial survey, land acquisition will affect a limited number of residents within the Project Aol.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium as there is the potential to result in limited economic resettlement.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor value is Low given that leaseholders along the OTL will have sufficient land remaining.			
	Negligible	Low	Medium	High

<sup>85</sup> It should be noted that the land within the Solar PV area was previously occupied by one historic leaseholder and the historic impact of land acquisition has been investigated and mitigated through the Land Acquisition Audit (LAA) and the Livelihood Restoration Plan (LRP), and it is not the subject of this assessment.

Impact Assessment: Economic displacement	
Impact Significance	The overall impact significance is Medium. This is an adverse and specific mitigation in the form of cash compensation and livelihood restoration has been developed as part of the LRP.

### 7.1.9.3 Community expectations of the Project

Local communities and the local economically active population may develop high expectations of the direct or indirect benefits of the Project, specifically regarding the number of work opportunities available. High expectations for jobs for the local communities will need to be continually managed from the early stages to avoid unrealistic Project expectations. It is proposed that a local hiring plan be developed to maximise employment opportunities for the local communities.

Impact Assessment: Community expectations of the Project				
Impact Nature	Positive		Negative	
	Impact is negative because unmanaged expectations may lead to heightened concerns / conflict with the local community that may ultimately negatively affect the Project's social license to operate.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is both direct and indirect as the Project will be announced and presented both as part of the regulatory process in the AoI and through the Project's own Stakeholder engagement efforts. It is also indirect because local stakeholders may disseminate expectations about the Project before it is formally disclosed. It is, however, reversible with robust stakeholder engagement.			
Impact Duration	Short-term	Medium-term	Long-term	Very Long-term
	The impact is short-term as potential expectations will likely be highest in the lead up to the start of construction works but are not likely to continue beyond that. It is highly unlikely that expectations will be high during the operational phase.			
Impact Extent	Local	Regional	National	
	Given the high-level publicity surrounding the Project, the impact is expected to occur at a regional level in Jizzakh.			
Impact Magnitude	Negligible	Low	Medium	High
	Jizzakh is a predominantly rural area and thus its population may not have a clear understanding of the employment opportunities created by industrial development. However, the levels of unemployment in the Jizzakh region are the lowest in the country and therefore expectations may be lower at the regional level. Therefore, the impact magnitude is medium at the local level (<5km) but reducing to Low at the regional level.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor value is low given that local communities and local economically active population are not depending on this Project specifically as their main source of income. However, this impact has the potential to increase unmanaged expectations among the unemployed and more vulnerable groups.			
Impact Significance	Negligible	Low	Medium	High
	The overall impact significance is Low. This is an adverse impact and the ongoing consultation and dissemination of Project information through the SCA and LRP process will be included in the Stakeholder Engagement Plan. This impact will be continuously managed throughout the construction phase (and ongoing operation phase).			

### 7.1.9.4 Loss of public access and reduced mobility through local paths

A boundary fence line shall be installed at the start of construction activities to prevent the entry of unauthorised personnel into working areas to maintain public health and safety. From the moment the fences are erected, local people from the AoI will lose access to footpaths inside the Project site. This shall result in longer time periods being required to move between locations when the footpaths are generally used. Interviews with herders and mahallas confirmed there is one herder living in east Seyfin who has been using the major path across the site since 2019 when the poultry farm company relinquished the land. There are five other herders in Seyfin but these use the western path which will not be impacted. The herder based in east Seyfin will need to travel a longer distance to access pastureland to the north. This represents approximately an additional 4 – 5 km distance (depending on the route taken) to be travelled in order to access pastureland on



the other side of the Solar PV area. This additional distance is further than the pre 2019 situation. The herder has also confirmed in interviews that he has acquired new land (leasehold) and so will not be using this path as regularly in the future. Of note, this impact does not relate to potential economic impacts (described in the next impact) or legal land lease aspects, but to the loss of informal mobility access in local paths.

<b>Impact Assessment: Impacts from a loss of public access to footpaths inside the project area</b>				
Impact Nature	Positive		Negative	
	Impact is negative as there will be a loss of access by footpaths into the Project area.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is direct because local people shall no longer be able to access the footpaths to travel. Based on the site visits and consultations undertaken, an important local path was identified across the site which is mainly used for grazing animals and taking them from the village to grazing areas. Users will no longer be travelling inside the Project area as access to this land shall be lost and users will need to travel around the project to access herding areas in the north. A single user was identified as access grazing using this path. However other local herders confirmed that they can access the preferred grazing areas using the route along the northern boundary of the site. This impact is Irreversible as there is no alternative community pathway through the site which will allow community members and their herds to cross the area.			
Impact Duration	Short-term	Medium-term	Long-term	Very Long-term
	The impact is considered to be long-term as the Project design does not have an alternative community pathway which will allow community members and their herds to cross the area during operation. Full access may be reinstated after Project decommissioning.			
Impact Extent	Local	Regional	National	
	The impact will occur at a local level only as the restrictions to land shall most likely impact people within 2 km of the site boundary.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium as the limited number of people who currently use the access tracks will not be able to access alternative tracks or roads to reach their destination.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The impact magnitude is medium as there are no alternative routes of similar distance easily available but there is an abundance of other land which is easily accessible. The path is only used regularly by one herder.			
Impact Significance	Negligible	Low	Medium	High
	The impact significance is assessed as low, primarily because the local herders and community members will need to adapt and readjust to their new timings and distances compared to baseline conditions. This will be assessed further as part of the LRP			

### 7.1.9.5 Reduced access to grazing and pastoral land

This impact will commence at the start of construction as working areas are fenced off to prevent unauthorised entry inside the site boundary. The change in land use in the Project area may result in change in local livelihoods mainly as a result of the reduction in available grazing area and reduction in income.

- Site clearing and grading will affect farming activities in the area.
- Solar PV area will be fenced, removing grazing land and cutting off access to grazing lands to the northeast of the Solar PV area.
- Transportation of waste from the site and materials and equipment by road may disrupt local livelihoods.
- No physical resettlement will be required therefore there is no need to undertake a Resettlement Action Plan.

Within areas where construction works are ongoing, spatial impacts to access to grazing and pastoral land (in contrast to distance and time-altering impacts from the mobility impact above) will occur arising from a loss of access to grazing and pastoral land.

Impact Assessment: Reduced access to grazing and pastoral land				
Impact Nature	Positive		Negative	
	Impact is negative as existing land users shall experience a reduction of access to typical livelihood areas due to the restrictions in access to the land within the site boundary. No physical displacement will occur.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is direct because the local farms will no longer be able to access land inside the Project area during the Project life cycle. Resulting impacts are reversible after the Project's decommissioning stage or after an alternative land is procured.			
Impact Duration	Short-term	Medium-term	Long-term	Very Long-term
	The impact is very long-term as land users will not be able to conduct pastoral activities inside the Project area from the moment fences are installed along the site boundary until the Project is decommissioned.			
Impact Extent	Local	Regional	National	
	Impacts associated with a loss of access to land will likely only affect those within the Project Aol.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is medium as the impact is perceptible to the local herders and will represent a relevant change to their baseline conditions in terms of local grazing areas.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The impact magnitude is Medium because no grazing will be available of the Solar PV area and there are no alternative routes of similar distance. However only one herder is known to be using the path on a regular basis and he has confirmed that he has access to other land. Other local herders may need to adapt to a new farming area and will need to travel around the Solar PV Area to access grazing areas to the north of the site. .			
Impact Significance	Negligible	Minor	Medium	High
	The impact is assessed as medium significance primarily because the local herders will need to adapt and readjust to their new timings and distances to access grazing land compared to baseline conditions. This will be assessed further as part of the LRP..			

#### 7.1.9.6 Increased presence of workers and interaction with local communities

Community H&S may be at risk from worker migration and the presence of workers in the Project area, resulting in a potential change in the disease profile of the local population. A more robust social baseline study will expand on communicable disease morbidity, crime incidence.

It is fundamentally important that the Project fully considers the COVID-19 risks as communicable respiratory diseases will most likely be the most significant concern for potential interactions between the workforce and community members. Local workers may be exposed to potential COVID-19 risks where they are employed on the workers' camp. In turn this could result in further spread of COVID-19 back to the local community. A detailed assessment will be undertaken once more information on the workforce numbers, composition, and accommodation is available. While the full details of the workforce have not been provided yet, the mitigation measures to avoid and reduce risk exposure will be implemented, as detailed in the Interim Advice for IFC Clients on Preventing and Managing Health Risks of COVID-19 in the Workplace (IFC, 2020).

Impact Assessment: Increased presence of workers and interaction with local communities				
Impact Nature	Positive		Negative	
	This is an adverse impact because of the potential for people from outside the local area to turn up seeking employment and other types of economic opportunities. The Project workers will also be exposed to H&S risks. This may result in an increased risk and exposure to spreading communicable diseases, increased tensions between residents and newcomers, and may result in an increase in the local incidence of crime, in addition to potential surges of COVID-19 risks.			
Impact Type	Direct	Indirect	Reversible	Irreversible

	The impact is direct and indirect because the Project will cause potential local employment that will attract direct and indirect opportunities and other potential worker migration. This is largely Reversible once the construction phase is concluded.			
Impact Duration	Short-term	Medium-term	Long-term	Very Long-term
	The impact is short-term as community health and safety risks will be introduced from the start of the construction phase and although there will be residual risks throughout operation of the project, no significant worker migration is expected. Depending upon the type of incident and impact to human health, the duration could be medium-term. Workers' accommodation will further restrict the movement and interaction of workers with local communities outside the site, and the workers' camp will implement COVID-19 prevention measures within its quarters.			
Impact Extent	Local	Regional	National	
	Risks will be generated at a local level within the Aol.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium because the potential for workers to travel and interact with local residents may extend past the Project Aol. Both residents and workers may be exposed to increased health and safety risks.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is Medium as the local communities may be able to adapt to this change depending on the actual location of worker accommodation. Whereas Gallaorol will have sufficient means to adapt, other localities such as may not have the same resilience to intake a large workforce or prevent their vulnerable groups from this potential increase to community H&S risks. Depending on the workforce composition, vulnerable worker population may be more sensitive to avoiding or treating communicable diseases, and this will have to be identified as a priority during the planning stage.			
Impact Significance	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Medium pre-mitigation.			

### 7.1.9.7 Increased presence of security personnel

In addition to the expected workforce, during the construction phase, private security personal shall be used to provide general security at construction working areas to ensure that there is no entry of unauthorised personnel and that construction equipment is safe and secure. There is the potential for security personnel to use excessive force that results in intimidation or even physical damage, acting as a trigger event to further potential conflicts and Human Rights risks.

Impact Assessment: Increased presence of security personnel				
Impact Nature	Positive	Negative		
	This is an adverse impact because of the potential use of excessive force or intimidating presence of security guards that may interact with local herders or community members traveling near the Project site.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is direct because the Project will employ security personnel as part of its planned activities and to avoid access from local community members to other OHS risks inside the site. It is largely reversible with the proper HR training.			
Impact Duration	Short-term	Medium-term	Long-term	Very Long-term
	The impact is short-term as community health and safety risks will be largely limited to the construction phase.			
Impact Extent	Local	Regional	National	
	Risks will be generated at a local level within Project Aol.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium because the potential for security guards to interact with local community members is a very perceptible change to the baseline conditions of ample passage and access to the site area.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is Medium as the local communities may be able to adapt to this change depending on the timing of previous disclosure of Project starting activities.			

Impact Significance	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Medium adverse, pre-mitigation. It is expected that HR training and the full implementation of the Voluntary Principles on Security and Human Rights, UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials, the UN Code of Conduct for Law Enforcement Officials and the International Code of Conduct on Private Security Providers will reduce this to Minor.			

### 7.1.9.8 Increased levels of gender-based violence, sexual exploitation and harassment

Baseline data has found that the three are generally relatively high levels of physical, sexual, economic and social violence in Uzbekistan, including sexual exploitation, domestic violence; gender disparities in higher and technical education; and a high female unemployment rate accompanied by a low proportion of women in leadership positions, particularly in for rural communities.

The construction and transportation sector are recognised as being amongst the industries most affected by HIV globally (WHO, 2018<sup>86</sup>). This is attributed to the fact that construction work employs mainly young male, low skilled workers, the workforce is highly mobile, and the working and living conditions are conducive to engagement in casual sexual relationships, including with sex workers (WHO, 2018). Therefore, Women (including vulnerable young girls) may be particularly at risk from the increased presence of local and migrant men looking for work opportunities near the Project Aol. The Project could contribute to this prevalence of GBVSEH in the following ways:

- Security personnel hired by the Project could abuse their positions of power through sexual violence and exploitation.
- Project workers could use their financial status to engage in sexual exploitation of local people, including vulnerable women and girls. This could be in the form of prostitution or other forms of transactional sex where money or gifts are used to exploit local people, including those who are vulnerable due to poverty and children.
- Project workers could exert domestic economic abuse over their family members, and particularly female spouses, because of the wages that they will earn during their Project employment.
- Domestic economic abuse associated with resettlement compensation, particularly withholding of financial payments from spouses.
- Project workers could engage in GBVSEH<sup>87</sup> of other Project workers, including those labourers in subordinate positions who come from local communities.

The receptors of this impact will be the children, women resident in communities located within the Project Aol, who have a High vulnerability.

Impact Assessment: Increased levels of gender-based violence, sexual exploitation and harassment				
Impact Nature	Positive		Negative	
	This is an adverse impact because of the potential violence, exploitation and harassment of vulnerable groups such as women and children in all aspects of the Project.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is direct and indirect because the Project will employ Project workers directly and through subcontractors. It is largely reversible through the implementation of appropriate mitigation measures.			
Impact Duration	Short-term	Medium-term	Long-term	Very Long-term
	The impact is short-term as it will be largely limited to the construction phase.			
Impact Extent	Local	Regional	National	
	The impact will be generated at a regional and local levels.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium.			
	Negligible	Low	Medium	High

<sup>86</sup> WHO, Preventing disease through a healthier and safer workplace (2018), <https://apps.who.int/iris/rest/bitstreams/1140190/retrieve>, accessed on 08/12/2020

<sup>87</sup> Gender-based Violence, Sexual Exploitation and Harassment



Receptor Value / Sensitivity	The sensitivity is High as women and children are regarded as vulnerable receptors. .			
Impact Significance	Negligible	Low	Medium	High
	The potential impact during construction is considered to be High adverse, pre-mitigation. It is expected that the introduction of specific measures to prevent and address GBVSEH (as outlined in Section 8.8.1.10), will reduce this to Low.			

## 7.1.10 Traffic and Transportation

### 7.1.10.1 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.

### 7.1.10.2 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.

### 7.1.10.3 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.

#### 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 44. 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 44. 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.

#### 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 45 below.

**Table 45. Magnitude of Change Criteria**

Sensitivity	Value	Criteria
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%

### 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 15 are considered to be significant.

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 crossroads. 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.

#### **7.1.10.4 Assumptions**

It is assumed for the purposes of this assessment (and forecasted levels of traffic) that construction will commence in 2023. 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 220 MW (AC) 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 around 18 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.

#### **7.1.10.5 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. A worst-case scenario has been modelled where all materials are transported to site by road.

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 over 10,000 vehicle movements of construction vehicles. 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. It is also likely that a larger bus would be provided for construction workers thereby reducing the number of vehicle movements.

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

#### 7.1.10.6 Effects on the Road Network

The magnitude of change in traffic numbers cannot be quantified accurately at this stage for the majority of the roads due to the lack of traffic count data for the affected roads along the route. However, the routes are major roads and it is envisaged that there is adequate capacity to accommodate the additional construction traffic. Therefore, due to the size of the Project and the length of the construction period, the construction traffic on a daily basis is unlikely to be significant.

Impact Assessment: Impacts on traffic during construction						
Impact Nature	Positive			Negative		
	Impact is negative because construction activities may result in increased traffic volumes.					
Impact Type	Direct		Indirect	Reversible	Irreversible	
	The impact is direct as construction activities would directly increase construction traffic.					
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent	
	The impact is temporary as impacts would occur during the construction phase only.					
Impact Extent	Local		Regional	National		
	The impact is expected to occur within the site and on national roads in both Uzbekistan and Kazakhstan.					
Receptor Value / Sensitivity	Low		Medium	High		
	Although the transportation route passes a number of towns, the road is likely to have existing HGV traffic and the receptor sensitivity is determined to be low.					
Impact Magnitude	No change	Negligible	Low	Medium	High	
	Magnitude of change is anticipated to be Low as the increased number of HGV movements is not expected to exceed 30% above baseline.					
Impact Significance	None	Negligible	Low	Medium	High	
	The impact is assessed as Negligible and not significant. Although no specific mitigation is required, standard good construction practice will be maintained to ensure no increase in predicted impacts during construction.					

#### 7.1.11 Waste Management

AECOM identified that the nearest landfill is located approximately 12-15 km from the site in Chayanli makhalla. There are no recycling facilities at this landfill but it accepts all types of wastes, including construction wastes. Another landfill is located approximately 30 km from the project site. Stakeholder meetings suggest that there are no local licensed companies for further treatment or recycling of hazardous wastes.

Impact Assessment: Impacts on waste during construction						
Impact Nature	Positive			Negative		
	Impact is negative because construction activities will result in increased waste volumes.					
Impact Type	Direct		Indirect	Reversible	Irreversible	
	The impact is direct as construction activities would directly increase both hazardous and non-hazardous wastes. This would include fuels, oils, inert construction waste and used, broken panels.					
	Temporary	Short-term	Medium-term	Long-term	Permanent	



Impact Assessment: Impacts on waste during construction					
Impact Duration	The impact is temporary as impacts would occur during the construction phase only.				
Impact Extent	Local	Regional	National		
	The impact is expected to occur within the site, on the road to the landfill site and in the landfill site itself, up to approximately 15km from the site.				
Receptor Value / Sensitivity	Low	Medium	High		
	Although hazardous wastes will be produced, amounts are likely to be low and the landfill site confirms it can accept construction waste. As a result the receptor sensitivity is determined to be low.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Magnitude of change is anticipated to be Low as the increased volume is not deemed to be significant.				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and not significant. Standard good construction practice will be maintained to ensure no increase in predicted impacts during construction. Wastes will be segregated and stored appropriately. Although wastes would be landfilled at present, the EPC Contractor will seek to identify appropriate recycling facilities.				

## 7.2 Operational Impacts

### 7.2.1 Air Quality

Air pollution may also arise as a result of dust emanating from vehicle movements and other maintenance activity. However, this will be a temporary effect that can be mitigated by restricting vehicles to sealed access tracks and the use of dust suppression measures.

Impact Assessment: Impacts on air quality during operation					
Impact Nature	Positive		Negative		
	Impact is negative because vehicle movements and maintenance activities may result in increased dust.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is direct as construction activities would directly increase air pollution.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is long-term as impacts would occur during the operational lifetime of the project.				
Impact Extent	Local	Regional	National		
	The impact is expected to occur within the site and adjacent areas.				
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	Although residential receptors are located close to the site, none are within 200 m of the Project site therefore receptor sensitivity is determined to be Medium. This will be updated following completion of detailed design and agreement of access to site.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Magnitude of change is anticipated to be Negligible as almost no ground disturbance will take place.				
Impact Significance	None	Negligible	Low	Medium	High
	The potential impact during operation is considered to be Negligible adverse, on the basis that almost no ground disturbance will take place.				

### 7.2.2 Archaeology and Cultural Heritage

During the operational phase there will be no new impacts on existing cultural sites. Any archaeological remains that may have been present within the footprint of the Project will either have been removed in the course of archaeological mitigation works, or will be preserved in place. The lack of setting impacts on cultural heritage sites and the absence of a construction workforce mean that no impact is predicted.

The Solar Array area will have no impact on the setting of heritage assets due to lack of intervisibility with receptors, intervening distance and topography. The Transmission Line will be visible from a number of heritage assets, particularly the kurgan field. It will be an additional large-scale industrial element in a landscape already characterised by intensive large-scale arable agriculture and existing Transmission Lines and light industry on the periphery of G'allaorol. It will not affect the ability to appreciate the significance of the historic landscape or individual monuments. For this reason, the magnitude of impact on the setting of heritage assets is assessed as low.

Impact Assessment: Impacts on archaeology and cultural heritage during operation					
Impact Nature	Positive		Negative		
Impact Type	Direct		Indirect		
	These are direct impacts associated with the operation of the Project.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
Impact Extent	Local		Regional	National	
	Impacts on archaeology are limited to Project footprint.				
Receptor Value / Sensitivity	Low	Medium	High		
	Any remains within the project footprint will have been recorded and removed during the construction phase.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	No works will be taking place other than maintenance and security. No physical impacts on archaeological remains are predicted. The new Transmission Line will impact on the setting of heritage assets.				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and not significant.				

## 7.2.3 Biodiversity

### 7.2.3.1 Avifauna

The Solar PV site and Overhead Line route are not considered to be suitable for this species as a staging or wintering habitat and it is therefore considered that the Project AoI is unlikely to be of critical importance for wintering great bustard within Uzbekistan. This position is echoed in the aforementioned 2021 TYP/SA/IFC report which clearly states '*the Project site is likely to be situated outside the area of Critical Habitat*'. That said, the airspace of the Project AoI, including route of the Overhead Line, is likely to be used by birds moving between wintering grounds as well as migrating between wintering and breeding habitats. Critical Habitat has therefore been triggered for great bustard; there is a project requirement for Net Gains for this CH qualifying species (refer to Appendix D: Critical Habitat Assessment). Great bustards are known to be highly susceptible to collision with overhead lines and the project is in an area with a significant proportion of the Central Asian population of this species. Between 10 to 15 collisions would affect 1% of the Central Asian population which would be highly significant given the species' relatively low, and declining, population.

The proposed project site is not located on a major flyway or in a geographical feature that would concentrate migrating species. Survey work has confirmed that the Project site is not important for breeding or migrating species, including raptor species of international and national conservation concern, which have been assigned PBF status (refer to Appendix D). Registrations of single Egyptian vulture (IUCN EN), eastern imperial eagle (IUCN VU) and greater spotted eagle (IUCN VU) were recorded overflying during the spring passage period during the baseline surveys. Small numbers of steppe eagle (IUCN EN) were recorded potentially over-wintering within the Sanzar river valley (Overhead Line route) and small numbers of several species of large raptors of national (Uzbekistan Red List) utilise the Project site for foraging/hunting: cinereous vulture, Eurasian griffon vulture, bearded vulture and golden eagle. There is no reasonable likelihood that the populations of any of these PBF species are regionally significant.

Other species which are vulnerable to operational impacts were confirmed likely absent from the Project site, including Asian houbara and sociable lapwing; the project site is not used as a major stop over or flyway for this IUCN CR species.

### Potential Impacts

Potential impacts to birds from the proposed operational Overhead Line are:

- Displacement of birds by the presence of new infrastructure (pylons, overhead wires), which may occur as both the deterrence of bird activity among and close to the pylons and also as a barrier effect to movement of birds across the Project area in the vicinity of new overhead wires.
- Permanent habitat loss, fragmentation and / or degradation resulting from the construction of new infrastructure.
- Increased bird mortality due to collision with new operational overhead line infrastructure.
- Loss (mortality) of birds from electrocution from perching on the powerline infrastructure and risk of electrocution by large birds whilst flying (eg. raptors)
- Disturbance of birds from people and traffic during operational maintenance.

<b>Impact Assessment: Impacts on Great Bustard (<i>Otis tarda</i>) during Operation – Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species.</b>					
Impact Nature	Positive		Negative		
	Impact is negative because construction activities may result in habitat loss, displacement (barrier to movement) and mortality to this species.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	Potential impacts during operation of the Project are as follows: <ul style="list-style-type: none"> <li>• Displacement of wintering and stop-over migratory birds due to habitat loss (Solar PV);</li> <li>• Displacement and barrier to movement (Overhead Line);</li> <li>• Disturbance of birds from people and traffic due to operational maintenance activities (Solar PV and Overhead Line) and;</li> <li>• Bird collision mortality with power lines (Overhead Line).</li> </ul> AECOM do not assess there to be an impact as a result of the so-called 'lake effect' of solar panels.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impacts will persist throughout operation and are therefore considered permanent.				
Impact Extent	Local	Regional	National	International	
	Great bustard has the potential to overfly the project site from known wintering areas within and outside the Jizzakh region, as well as migrating between wintering and breeding habitats outside of Uzbekistan. The site is not determined to be a foraging or resting area for Great bustard. It should be noted that the risk to this species is likely to be only in some winters, influenced by weather patterns in Russia. This may result in more individuals which may fly through the project area.				
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	This species, which is Critically Endangered nationally, is assigned a 'High' sensitivity value.				
Impact Magnitude	Negligible	Low	Medium	High	
	Loss and change of habitat for the Solar PV would be an effect of Negligible magnitude for great bustard considering the unsuitability for this species and absence of records during the surveys undertaken.				

<b>Impact Assessment: Impacts on Great Bustard (<i>Otis tarda</i>) during Operation – Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species.</b>					
	<p>Whilst Overhead Line route is not considered to be suitable for this species as a staging or wintering habitat, it is considered possible that this species could fly over the Overhead Line when moving between wintering grounds as well as migrating between wintering and breeding habitats. This species is known to be highly susceptible to collision with overhead lines. Therefore, the impact magnitude is assessed as High for the Overhead Line route.</p> <p>The proposed powerline is high voltage (220 kV) and therefore doesn't typically present the same risk of electrocution to raptors and other large birds as some lower-voltage powerlines (eg. where the distribution conductor cables attached via relatively short insulators to poles constructed of conducting materials) of medium voltage (e.g. 1kV to 59kV). The risk of electrocution is considered to be low due to their respective likely infrequent flight transits through the project area (in small numbers which are unlikely to be significant in terms of regional/national populations). The impact magnitude has been assessed as low for electrocution.</p>				
Impact Significance	None	Negligible	Low	Medium	High
	<p>The potential impact is assessed as High and significant for the Overhead Line.</p> <p>The potential impact is assessed as Low and not significant for the Solar PV. There is a requirement for the project to achieve Net Gains for this Critical Habitat qualifying species. The mitigation measures required to achieve net gains will be detailed within a Biodiversity Action Plan (BAP) for this species.</p>				

<b>Impact Assessment: Impacts on Ornithology (PBF species) during Operation – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinerous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara</b>					
Impact Nature	Positive		Negative		
	<p>Potential impacts during operation of the Project are as follows:</p> <ul style="list-style-type: none"> <li>• Displacement of breeding, wintering and stop-over migratory birds due to habitat loss (Solar PV);</li> <li>• Displacement and barrier to movement (Overhead Line);</li> <li>• Disturbance of birds from people and traffic due to operational maintenance activities (Solar PV and Overhead Line);</li> <li>• Loss of birds from electrocution from perching on the powerline (Overhead Line); and</li> <li>• Bird collision mortality with power lines (Overhead Line).</li> </ul> <p>AECOM do not assess there to be an impact as a result of the so-called 'lake effect' of solar panels.</p>				
Impact Type	Direct			Indirect	
	The impacts listed above are all considered to be direct effects of Project operation.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impacts will persist throughout operation and are therefore considered permanent.				
Impact Extent	Local	Regional	National	International	
	The extent of potential operational impacts includes the operational Project footprint, including the Overhead Line from the Solar PV to the grid connection point.				
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	The PBF bird species which have been recorded as present or assessed as having a reasonable likelihood of occurrence are not critical habitat qualifying species and are therefore not of very high or high sensitivity according to the criteria detailed above. In terms of the PBF species which have been recorded, these have been recorded in numbers which are not significant and are assigned a Medium sensitivity value.				



<b>Impact Assessment: Impacts on Ornithology (PBF species) during Operation – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas’s Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinereous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara</b>			
	<p>No species listed as qualifying features of the Tuzkan Lake IBA were recorded during the AECOM field surveys. Very small numbers of Dzhum-Dzhum IBA qualifying species were recorded within the Project site (cinereous vulture and bearded vulture), however the numbers recorded are unlikely to be significant (defined as &gt;1%) of the IBA population.</p> <p>The project does not support breeding populations for PBF birds and the habitat is not suitable for these species.</p> <p>Sociable lapwing (IUCN [CR]) has the potential to occasionally overfly the project site on spring and autumn passage (the species was assessed as likely absent as a result of the targeted surveys for this species). However, there is no reasonable likelihood that the project is located on a significant migratory corridor for this species and the sensitivity is assessed a Low.</p> <p>Houbara bustard (IUCN [VU]) has been shown to be likely absent from the Solar PV and the Overhead Line, as a result of the targeted breeding surveys for this species undertaken by AECOM. The sensitivity for this species is therefore is determined as Low.</p>		
Impact Magnitude	Negligible	Low	Medium
	<p>High</p> <p>Loss and change of habitat for the Solar PV would be an effect of Medium magnitude for the breeding, wintering and migratory birds which utilise habitat within the working areas for breeding, roosting or foraging within the operational footprint of the Solar PV; a high proportion of the habitat will be subject to coverage by the solar panels, but only a negligible amount of the habitat taken up by the solar panel bases. Loss of habitat for the Overhead Line would be an effect of Low magnitude for breeding, wintering and migratory birds which utilise habitat within the working areas for breeding, roosting or foraging, with only small areas are taken up by transmission line infrastructure (ie. pylon bases).</p> <p>The operational Solar PV and transmission line will result in partial reduction of bird activity through the displacement of birds; this is assessed as Medium magnitude for the breeding, wintering and migratory bird assemblage. Human influences (primarily the land management) unique to each site. Consideration has been given to the Project site is already characterised by a high level of anthropogenic disturbance (primarily due to farming activities and proximity to human habitation).</p> <p>The 14.77 km Overhead Line alignment is an extensive alignment in terms of migrating birds passing through the wider Jizzakh region on a broad front and it is orientated along an approximately eastern--western alignment, which increases the potential barrier effect of the power line/pylons with respect to birds migrating through the Project site south to north (in spring) or north to south (in autumn); an eastern-western alignment is potentially more impactful in this respect (compared to a north-south alignment). The magnitude of this potential impact is assessed as Medium.</p> <p>The Project Site is not sited on a migration bottle neck or major migration route; it is not located close to a mountain pass or wetland where large numbers of migratory birds could be concentrated or sited in an area where significant populations of species of conservation concern occur. The impact magnitude for collision of birds is therefore cautionary assessed as Medium, as the predicted mortalities for species of national and international concern are unlikely to be significant in the context of the Jizzakh, Dzhum-Dzhum IBA or Uzbekistan populations.</p> <p>The assessment does not take into account the probable reduction of bird activity resulting from displacement of birds around the proposed transmission line infrastructure, assuming instead that flight activity will continue unchanged during the operational period. Also, the assessment does not take into account that a proportion of bird flights will take avoiding</p>		

<b>Impact Assessment: Impacts on Ornithology (PBF species) during Operation – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas’s Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinerous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara</b>					
	<p>action when flying towards the power line and therefore avoiding avoid collision with the power-line; assuming instead that all flights will result in a collision.</p> <p>The proposed powerline is high voltage (220 kV) and therefore doesn’t typically present the same risk of electrocution to raptors and other large birds as some lower-voltage powerlines (eg. where the distribution conductor cables attached via relatively short insulators to poles constructed of conducting materials) of medium voltage (e.g. 1kV to 59kV). The risk of electrocution to the large raptor PBF species is considered to be low due to their respective likely infrequent flight transits through the project area (in small numbers which are unlikely to be significant in terms of regional/national populations). The impact magnitude has been assessed as low for electrocution.</p> <p>The impact magnitude is assessed as Medium (overall).</p>				
Impact Significance	None	Negligible	Low	Medium	High
	The potential impact is assessed as Medium and significant for the Overhead Line				
	The potential impact is assessed as Low and not significant for the Solar PV.				
There is a requirement for the project to achieve No Net Loss of species defined as PBFs.					

<b>Impact Assessment: Ornithology impacts (non PBF) during operation</b>					
Impact Nature	Positive		Negative		
	<p>Potential impacts during operation of the Project are as follows:</p> <ul style="list-style-type: none"> <li>• Displacement of breeding, wintering and stop-over migratory birds due to habitat loss (Solar PV);</li> <li>• Displacement and barrier to movement (Overhead Line);</li> <li>• Disturbance of birds from people and traffic due to operational maintenance activities (Solar PV and Overhead Line);</li> <li>• Loss of birds from electrocution from perching on the powerline (Overhead Line); and</li> <li>• Bird collision mortality with power lines (Overhead Line).</li> </ul> <p>AECOM do not assess there to be an impact as a result of the so-called ‘lake effect’ of solar panels.</p>				
Impact Type	Direct		Indirect		
	The impacts listed above are all considered to be direct effects of Project operation.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impacts will persist throughout operation and are therefore considered permanent.				
Impact Extent	Local		Regional	National	
	<p>The extent of potential impacts includes the Solar PV footprint and the 14.77 km length of the proposed new section of 220 kV overhead electricity line from the Project to the grid connection point.</p> <p>Given the distance of &gt;25km between the Project site and the Tuzkan Lake and Dzhum-Dzhum IBA’s (at their closest points), and the lack of habitat connectivity or potential pathways between these IBA’s and the Project site, there is no reasonable likelihood of significant direct or indirect operational impacts on faunal receptors associated with these internationally recognised sites.</p>				
Receptor Value / Sensitivity	Low		Medium	High	
	The Solar PV footprint supports a limited assemblage of breeding species which are not of international or national conservation concern. Small numbers of Eurasian curlew (IUCN NT) were recorded on a single occasion during the spring passage period, however there is no reasonable likelihood that the project is sited on a key stopover or migratory corridor for this species.				

Impact Assessment: Ornithology impacts (non PBF) during operation					
	This ornithological receptor has been assessed as Low value.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	<p>Loss and change of habitat for the Solar PV would be an effect of Medium magnitude for the breeding, wintering and migratory birds which utilise habitat within the working areas for breeding, roosting or foraging within the operational footprint of the Solar PV; a high proportion of the habitat will be subject to coverage by the solar panels, but only a negligible amount of the habitat taken up by the solar panel bases. Loss of habitat for the Overhead Line would be an effect of Low magnitude for breeding, wintering and migratory birds which utilise habitat within the working areas for breeding, roosting or foraging, with only small areas are taken up by transmission line infrastructure (ie. pylon bases).</p> <p>The operational Solar PV and transmission line will result in partial reduction of bird activity through the displacement of birds; this is assessed as Medium magnitude for the breeding, wintering and migratory bird assemblage. Human influences (primarily the land management) unique to each site. Consideration has been given to the Project site is already characterised by a high level of anthropogenic disturbance (primarily due to farming activities and proximity to human habitation).</p> <p>The 14.77 km Overhead Line alignment is an extensive alignment in terms of migrating birds passing through the wider Jizzakh region on a broad front and it is orientated along an approximately eastern--western alignment, which increases the potential barrier effect of the power line/pylons with respect to birds migrating through the Project site south to north (in spring) or north to south (in autumn); an eastern-western alignment is potentially more impactful in this respect (compared to a north-south alignment). The magnitude of this potential impact is assessed as Medium.</p> <p>The Project Site is not sited on a migration bottle neck or major migration route; it is not located close to a mountain pass or wetland where large numbers of migratory birds could be concentrated or sited in an area where significant populations of species of conservation concern occur. The impact magnitude for collision of birds is therefore cautionary assessed as Medium, as the predicted mortalities for species of national and international concern are unlikely to be significant in the context of the Jizzakh, Dzhum-Dzhum IBA or Uzbekistan populations.</p> <p>The assessment does not take into account the probable reduction of bird activity resulting from displacement of birds around the proposed transmission line infrastructure, assuming instead that flight activity will continue unchanged during the operational period. Also, the assessment does not take into account that a proportion of bird flights will take avoiding action when flying towards the power line and therefore avoiding avoid collision with the power-line; assuming instead that all flights will result in a collision.</p> <p>The proposed powerline is high voltage (220 kV) and therefore doesn't typically present the same risk of electrocution to raptors and other large birds as some lower-voltage powerlines (eg. where the distribution conductor cables attached via relatively short insulators to poles constructed of conducting materials) of medium voltage (e.g. 1kV to 59kV). The risk of electrocution to the large raptor PBF species is considered to be low due to their respective likely infrequent flight transits through the project area (in small numbers which are unlikely to be significant in terms of regional/national populations). The impact magnitude has been assessed as low for electrocution.</p> <p>The impact magnitude is assessed as Medium (overall).</p>				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and not significant.				

### 7.2.3.2 Terrestrial Ecology

Given the absence of non-avian fauna or flora of high conservation concern (IUCN CR) and IUCN EN), the sensitivity of the operational Project site is assessed to be Low. Furthermore, the high levels of anthropogenic disturbance associated with the Project site (which is primarily related to the prevailing agricultural and farming activity) will reduce the magnitude of the impact to Low. This results in a low impact (not significant), which does not require to be mitigated. There will be negligible direct impacts on Central Asian tortoise other than potential traffic impacts. The workforce will be fully briefed on the need to be aware of tortoises. Any drains or trenches will be routinely inspected and if tortoises are found they will be moved to an appropriate area within the site.

The ongoing site restoration will be actively managed to ensure the success of natural revegetation. This will include regular watering and if necessary manual seeding will be considered if suitable seeds are available commercially.

<b>Impact Assessment: Impacts on PBF species: Central Asian Tortoise, Transcaspien Desert Monitor, Northern (barred) Wolf Snake, Tartar Sand Boa</b>					
Impact Nature	Positive			Negative	
	Disturbance of fauna from presence of people, machinery, traffic, and noise, primarily within the operational Solar PV site, although less frequent maintenance will be required for the transmission line.				
Impact Type	Direct			Indirect	
	There are indirect impacts associated with the operation of the Project.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impacts will persist throughout operation and are therefore considered permanent.				
Impact Extent	Local		Regional	National	
	The impacts on terrestrial ecology are primarily limited to the footprint of the Project.				
Receptor Value / Sensitivity	Low		Medium	High	
	The abundance and diversity of terrestrial fauna was found to be low. A single species of conservation concern was recorded within the proposed project site: Central Asian tortoise (IUCN VU, RDB of Uzbekistan). However, there is no reasonable likelihood that the tortoise population occurring within the Project site is of regional importance. The sensitivity of the terrestrial habitat has been assigned as Low. Other plant and animal species recorded during the AECOM field surveys are not of conservation concern.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	It is anticipated that there will be very limited personnel and vehicle movements within the operational Solar PV site and that maintenance visits for the transmission line will be infrequent and will involve limited personnel and vehicle movements.				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and insignificant.				

<b>Impact Assessment: Impacts on non PBF species during operation</b>					
Impact Nature	Positive			Negative	
	Disturbance of fauna from presence of people, machinery, traffic, and noise, primarily within the operational Solar PV site, although less frequent maintenance will be required for the transmission line.				
Impact Type	Direct			Indirect	
	There are indirect impacts associated with the operation of the Project.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impacts will persist throughout operation and are therefore considered permanent.				
Impact Extent	Local		Regional	National	
	The impacts on terrestrial ecology are primarily limited to the footprint of the Project.				
	Low		Medium	High	



Impact Assessment: Impacts on non PBF species during operation					
Receptor Value / Sensitivity	The abundance and diversity of terrestrial fauna was found to be low. Plant and animal species (other than PBFs) recorded during the AECOM field surveys are not of conservation concern.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	<p>It is anticipated that there will be very limited personnel and vehicle movements within the operational Solar PV site and that maintenance visits for the transmission line will be infrequent and will involve limited personnel and vehicle movements.</p> <p>The bat fauna in Uzbekistan is restricted to species which belong to the microbat group. There are no megabats (fruit bats) in Uzbekistan; this bat group is vulnerable to collision and electrocution with powerlines. In terms of potential collision risk to microbats for the OHTL element of the project, the proposed powerline line is not routed through suitably favourable habitat (eg. woodland edge or linear wetland feature) that may be used regularly for commuting and / or foraging (e.g. commuting to and from a building roost to a foraging area between which the overhead line was located) there would be a theoretical collision risk to bats. Bats are extremely agile flyers and have a highly developed echolocation system which they use for navigation and prey capture; the species that could be present are able to fly through and negotiate complex environments including foraging around tree canopies and building complexes. Therefore, due to their highly developed flight skills and the relatively static nature of the powerlines, there would be a negligible collision risk posed by the proposed overhead line to bat species (ie. microbats) occurring in Uzbekistan.</p>				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and insignificant.				

#### 7.2.4 Geology and Soils

During this phase of the Project, the main impacts on soils would be from continued vehicle traffic. Vehicle movements will comprise:

- Movement of staff and materials to and from the site along the access roads.
- Movements between the control centre and across the site for operation and maintenance. Workers are expected to visit the site at least once per week for routine maintenance.

There should be no need for vehicles to travel off the improved roads, and this should be actively discouraged. As described with regard to the construction phase impacts, the main risk to soils would be where vehicles leave prepared roads and drive cross-country. If designated roads are not used, vehicle movements can cause damage over a wide area.

Impact Assessment: Impacts on soil quality during operation					
Impact Nature	Positive		Negative		
	<p>The main operational impacts on soils would be from continued vehicle traffic. Vehicle movements will comprise:</p> <p>Movement of staff and materials to and from the site along the access roads.</p> <p>Movements between the control centre and across the site for operation and maintenance. Workers are expected to visit the site at least once per week for routine maintenance.</p> <p>Risk of pollution from solid, liquid and hazardous wastes and leaks and spills from maintenance activities.</p>				
Impact Type	Direct		Indirect		
	These are indirect impacts associated with the operation of the Project.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impacts will persist throughout operation and are therefore considered permanent.				
Impact Extent	Local		Regional	National	

Impact Assessment: Impacts on soil quality during operation				
	The impacts on geology and soils are primarily limited to the footprint of the Project.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The soils are considered to have a low sensitivity.			
Impact Magnitude	No change	Negligible	Low	Medium
	The magnitude of the effect during operation is very low, since there will be much less frequent traffic than during construction, and only occasional use of heavy equipment. In addition, the use/handling of chemicals /oils/wastewater during operation will be limited.			
Impact Significance	None	Negligible	Low	Medium
	The impacts are assessed as Negligible and insignificant.			

### 7.2.5 Glare and Glint

The potential for glare and glint from the Project during operation is low. It is important to note that the PV panels work on the concept of absorbing sunlight rather than reflecting it as compared to other technologies that concentrate solar energy. The PV panels that will be used for the Project have very limited levels of either glint or glare and are substantially less reflective than most surfaces such as still water, glass or steel. Glint will be substantially reduced by the anti-reflective coating of the modules that is incorporated to maximise the light capture of the solar cells.

Previous studies have been undertaken to compare the reflectivity of solar panels with other materials. The most commonly referenced source is a Federal Aviation study focusing on solar panels located at airports. This study states that modern solar panels reflect as little as 2% of the incoming sunlight. Solar PV panels have a lower level of reflectivity than many commonly occurring features such as bare soil and vegetation.<sup>88</sup>

Impact Assessment: Glint and glare impacts during operation				
Impact Nature	Positive		Negative	
	There is a perception that solar PV panels (in a similar way to glass buildings and large metal structures) can cause significant solar reflections that can cause a distraction or nuisance. This can be an important concern for airports and highways particularly when located in the pilot's direct field of vision on approach to the runway.			
Impact Type	Direct		Indirect	
	This is a direct impact resulting from sunlight reflecting off the Project.			
Impact Duration	Temporary	Short-term	Medium-term	Long-term
	Any glint and glare issues would persist throughout operation.			
Impact Extent	Local		Regional	National
	Any impacts would be limited to areas in relatively close proximity to the site.			
Receptor Value / Sensitivity	Low	Medium	High	
	There are safety concerns with regard to any potential to distract aircraft pilots and vehicle drivers, causing accidents leading to potential injuries or deaths.			
Impact Magnitude	No change	Negligible	Low	Medium
	PV panels work on the concept of absorbing sunlight rather than reflecting it as compared to other technologies that concentrate solar energy. Previous studies have been undertaken to compare the reflectivity of solar panels with other materials. The most commonly referenced source is a Federal Aviation study focusing on solar panels located at airports. This study states that modern solar panels reflect as little as 2% of the incoming sunlight. Solar PV panels have a lower level of reflectivity than many commonly occurring features such as bare soil and vegetation. The site is not close to or located on a flight path to and from a local airport.			

<sup>88</sup> Federal Aviation Administration (FAA), July 2015. Final Report: Evaluation of Glare as a Hazard for General Aviation Pilots on Final Approach.

Impact Assessment: Glint and glare impacts during operation					
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and not significant.				

### 7.2.6 Hydrology and Hydrogeology

Potential impacts to surface waters by operating activities would include pollution, increased runoff and erosion, primarily in existing or new erosion channels that receive run-off from roads. The sensitivity of surface water is assessed as medium, recognising the fact that a small number of local residents use the two watercourses adjacent to the site for drinking water for livestock. The sensitivity of groundwater is assessed as high, recognising the fact that local communities abstract groundwater for domestic use from local wells.

The magnitude of the effect is predicted to be low given the limited area of the Project site in relation to the overall catchment area. As a result, the significance of the impact is assessed as low.

The source of water required for operation has not yet been determined.

Potential sources of pollution to groundwater during operation include sanitary waste and leaks and spills from maintenance activities.

Impact Assessment: Hydrology and hydrogeology impacts during operation					
Impact Nature	Positive		Negative		
	Impacts on surface water would include increased runoff and erosion, primarily in existing or new erosion channels that receive run-off from roads. Surface and ground water are also at risk of pollution from solid, liquid and hazardous wastes and leaks and spills from maintenance activities.				
Impact Type	Direct		Indirect		
	Pollution due to increased run-off, leaks, spillages and waste mismanagement are all considered to be indirect effects of Project operation.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact will persist throughout operation and is therefore considered permanent.				
Impact Extent	Local		Regional	National	
	Impacts anticipated to be limited to the local area and local communities.				
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	The sensitivity of surface water is assessed as medium, recognising the fact that a small number of local residents use the two watercourses adjacent to the site for drinking water for livestock. The sensitivity of groundwater is assessed as high, recognising the fact that local communities abstract groundwater for domestic use from local wells.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of the effect in relation to surface water is predicted to be low given the limited area of the Project site in relation to the overall catchment area. The magnitude of the effect in relation to groundwater is predicted to be low, given that the soil and superficial deposits present in the area are expected to provide protection to the groundwater, and that the use/handling of chemicals /oils/wastewater during operation will be limited.				
Impact Significance	None	Negligible	Low	Medium	High
	Pre-mitigation, the impact in relation to surface water is assessed as low, due to the limited extent. Pre-mitigation, the impact in relation to groundwater is assessed as low and not significant.				

### 7.2.7 Labour and Working Conditions

A sound worker-management relationship is a key requirement of the Project and a constructive worker-management relationship, by treating the workers fairly and providing them with safe and healthy working conditions, is required to ensure protection of the fundamental rights of workers.

The implementation of the actions necessary to meet these requirements will be managed through the Project's Environmental and Social Management System (ESMS).

The requirements apply to workers directly engaged by the client (direct workers), workers engaged through third parties to perform work related to the Project.

The aim of the Project's policies on labour and working conditions will be:

- To promote the fair treatment, non-discrimination, and equal opportunity of workers especially vulnerable workers facing particular risks due to context-specific socioeconomic characteristics.
- To establish, maintain, and improve the worker-management relationship.
- To promote compliance with national employment and labour laws.
- To protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- To promote safe and healthy working conditions, and the health of workers.
- Zero tolerance for the use of forced labour and child labour.
- Respecting the principles of freedom of association and collective bargaining.

Ensuring that accessible and effective means to raise and address workplace concerns are available to workers. During the operation phase, there may be occupational health and safety risks to workers from the various operation and maintenance activities expected to take place for the Project. Key risks could include, *inter alia*, collision with vehicles and plant and exposure to a variety of hazards such as electric shock from exposed cables and thermal burn hazards and exposure to chemicals, hazardous or flammable materials.

Labour and working conditions, including occupational health and safety impacts, are considered to be of long-term duration throughout the lifetime of the project and are expected to be of potential high magnitude and high sensitivity as in extreme cases they could entail permanent impacts (e.g. death or permanent disability). As such, the impacts are considered to be of High impact and appropriate mitigation will be developed.

Impact Assessment: Occupational health and safety impacts during operation					
Impact Nature	Positive			Negative	
	There will be a range occupational health and safety risks throughout operational activities. This includes electrocution, thermal burn hazards, exposure to hazardous chemicals and working in extreme temperatures. Mismanagement of wastes (such as domestic solid waste, sewage and hazardous wastes) can also represent a health and safety risk to workers, such as disease, injury or death.				
Impact Type	Direct			Indirect	
	The risks are predominantly associated with direct impacts on the operational and maintenance workers due to the operation of the Project. Health and safety risks associated with waste mismanagement are considered indirect impacts. The Project's policies on labour and working conditions will further impact worker's income and wellbeing.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impacts will persist throughout the operational phase and are therefore considered long-term.				
Impact Extent	Local		Regional	National	
	The impacts will be limited to the project site and local area.				
Receptor Value / Sensitivity	Low	Medium		High	
	The receptors in this case are the operational workers. There are likely to be approximately 25 workers and all are considered high value/sensitivity.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Occupational health and safety impacts could result in disease, injury, or death to workers and so the magnitude is high.				
	None	Negligible	Low	Medium	High



Impact Assessment: Occupational health and safety impacts during operation	
Impact Significance	Pre-mitigation, the impact is assessed as High and significant. An independent Labour Assessment shall be undertaken by a qualified labour specialist, which shall include a corrective action plan with appropriate mitigation and remediation measures as well as monitoring requirements that will be implemented by the Project and its subcontractors.

## 7.2.8 Landscape and Visual Impacts

### 7.2.8.1 Impacts on Landscape Character and Visual Amenity

The Project will be only visible to a small number of people who live locally or are travelling through the area on the minor road. The equipment used to build the Park is not large but it is expected that the construction compound and worker accommodation will be visible from nearby settlements.

The completed Project will include larger structures such as inverters, electrical substations, transformers and the Control Building. In all cases it is expected that on-site structures are no higher than the boundary fence which will be 2.5 m in height. The exception will be the substation connecting the Project to the national grid. In all cases the height of the Project will be significantly less than the height of the existing electricity pylons running in a northwest to southeast direction to the south of the Project.

The main impact to the LCTs during operation are the solar PV panels, boundary fence, and associated inverters and substation. The finished height of the Solar PV project is <2m high and it will only be visible to a limited part of the nearby settlements.

Similarly, the main source of impact to the VPs during operation is the erection of the solar PV panels, and associated foundations, inverters and substation. However, surrounding topography and housing will screen the view of the Project from many directions. At more distant views, the project becomes an indistinct part of a far more expansive view. The project, where visible, is below the level of the horizon and distant hills helping to frame the site within the context of the wider landscape and views.

Impact Assessment: Impacts on Landscape Character					
Impact Nature	Positive		Negative		
	Impact is negative because construction activities will result in additional features within the LCAs. It is assumed that all Project related changes are negative in nature.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is generally direct and experienced within 5km of the Project site. The impact will continue for the duration of the Project and is therefore deemed to be irreversible.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The construction impact is short-term as construction works are expected to continue for a period of approximately 12-15 months. However, impacts will continue for the duration of the Project lifetime.				
Impact Extent	Local		Regional	National	
	It is assessed that only a small proportion of the local landscape will be affected by the presence of construction works, topsoil stripping and bare ground.				
Receptor Value / Sensitivity	Low	Medium	High		
	The sensitivity of the LCTs is assessed to be Low as it is not important in a local context, with no sites of interest in the location of the Project. It is noted that the LCTs are not designated at the local or national level. The landscape in the wider area is expansive rural which determines the overall character of the region as a whole.				
Impact Magnitude	No change	Low	Medium	High	
	The magnitude of the effect is predicted to be Low, as it is unlikely that construction works become the dominant feature in an area already impacted by human activity.				
Impact Significance	None	Negligible	Low	Moderate	High
	As a result, the significance of the impact is assessed as low. Although impacts will be visible in places, the surrounding features such as OHTLs and pylons are of a larger scale in height and extent. Therefore, changes can be easily accommodated in all LCTs.				
	None	Negligible	Low	Medium	High

Impact Assessment: Impacts on Landscape Character	
Residual Impact Significance post mitigation	The residual impact is predicted to be Low and not significant.

Impact Assessment: Impacts on Visual Amenity	
Impact Nature	Positive Negative Impact is negative because construction activities will result in additional features within the LCAs. It is assumed that all Project related changes are negative in nature.
Impact Type	Direct Indirect Reversible Irreversible The impact is generally direct and experienced within 5km of the Project site. The impact will continue for the duration of the Project and is therefore deemed to be irreversible.
Impact Duration	Temporary Short-term Medium-term Long-term Permanent The impact will continue for the duration of the Project lifetime.
Impact Extent	Local Regional National It is assessed that the views experienced will include OHTLs and pylons, roads, substation and other man-made structures which reduce the quality of the views experienced.
Receptor Value / Sensitivity	Low Medium High The sensitivity of all VPs are assessed to be Low as they are not important in a local or regional context. There are no sites of interest from a tourism perspective. The landscape in the wider area to the south is more industrialised which determines the context of the views experienced.
Impact Magnitude	No change Low Medium High The magnitude of the effect is predicted to be low, given that the significant screening provided and the expansive nature of the landscape reduce the magnitude of impacts experienced.
Impact Significance	None Negligible Low Moderate High As a result, the significance of the impact is assessed as low. Although impacts will be visible in places, the surrounding features are often of a larger scale in height and extent. Therefore, changes can be easily accommodated at all VPs. Views from the minor road will be transient in nature and dominated by existing villages and natural features in this location.
Residual Impact Significance post mitigation	None Negligible Low Medium High The residual impact is predicted to be Low and not significant.

### 7.2.9 Noise

General EHS Guidelines sets out noise limits for industrial areas, commercial areas, residential areas and construction. The relevant limit is therefore shown as the residential limit of 45dB(A) for night-time. At levels above these criteria the noise emissions from the Project would be considered to have a significant effect.

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. While the Project will only be operational during daylight hours, as the transformers are permanently energised, they may emit some noise by way of magnetostriction hum during night-time. The distance between the substation transformers and the nearest residential properties will be confirmed following the EPC Contractor's detailed design.

For the purposes of this assessment it is assumed that the substation transformer is the dominant source of noise as the other sources (transformer and inverter stations). If the buffer of 200 m is maintained from the closest receptor, no breach of the lower 45 dB limit is considered to be likely. This will be updated following completion of detailed design and agreement of access to site.

Impact Assessment: Noise impacts during operation					
Impact Nature	Positive			Negative	
	Solar PV panels themselves do not provide a noise source, however equipment within the site (typically inverter stations and transformers) will emit noise during operation. While the Project will only be operational during daylight hours, as the transformers are permanently energised, they may emit some noise by way of magnetostriction hum during night-time.				
Impact Type	Direct			Indirect	
	Noise received at nearby receptors would be considered a direct impact of the operation of the Project.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impacts will persist throughout operation and are therefore considered permanent.				
Impact Extent	Local		Regional	National	
	Operational noise impacts will be restricted to an area immediately adjacent to the Project.				
Receptor Value / Sensitivity	Low	Medium		High	
	There are settlements in relatively close proximity to the Project, receptors are of high sensitivity.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The distance between the transformers and the nearest residential properties is considered sufficient to reduce any noise to an acceptable level, however the substation is located to the south of the site boundary in close proximity to receptors. Operational noise is predicted to be within specified limits if the buffer is maintained. A negligible magnitude of change is therefore predicted. However, if detailed design shows distances less than 200 m it is likely that limits would be exceeded and further mitigation would be required.				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and not significant.				

### 7.2.10 Socio-economic Impacts

Potential socio-economic impacts during operation of the Project are largely similar to the Construction phase, with reduced impact Magnitudes and Significance.

The following potential impacts for the operation phase were considered as the most relevant for the Aol and the socio-economic receptors:

- Impacts on land and livelihoods from land occupied by the project area.
- Impacts from local employment during operation.
- Impacts on the national and regional economy during operation.

#### 7.2.10.1 Impacts on land and livelihoods from land occupied by the project area

Impacts to land and livelihoods will be mitigated and completed prior to construction works. No other related impacts are expected to take place during the operational phase.

#### 7.2.10.2 Impacts from local employment during operation

The number of local people that are to be employed during operation are expected to comprise of a mix of Uzbek nationals working for the Proponent, in addition to personnel provided through local subcontractors to provide a range of supporting services, including security.

As the project transitions from construction into operation, there will be a shift in the skills required. Consequently, it will be necessary to develop the skills of local people during construction so that suitable individuals are able to take up the long-term (potentially 20 years) positions during operations.

The individuals employed and their household members, will benefit from increased income that is likely to increase their overall quality of life and access to healthcare, educational and other types of resources across a longer time frame. The household is also expected to experience increased resilience to external shocks from the supply of income, that could arise from a sudden change in health status or external factor such as food price inflation.

Impact Assessment: Impacts from local employment during operation				
Impact Nature	Positive		Negative	
	The impact during operations is positive.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is both direct and indirect because the individuals and their household members are expected to benefit from an increase in standard of living and reduced vulnerability to external shocks. The impact is reversible as the income generated from local employment shall cease at the end of their employment at the end of the operational phase (20 years).			
Impact Duration	Temporary	Short-term	Medium-term	Long-term
	The period of employment will continue over the lifetime of the Project which is 20 years.			
Impact Extent	Local		Regional	National
	The impact will occur at a local level amongst the communities where employees are based.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is low as the workforce required during operations is relatively small when compared to the construction stage.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is high as local employment during both construction and operations is a key expectation amongst local communities and their representatives. It is essential that Uzbeks comprise a significant component of the operational workforce.			
Impact Significance	Negligible	Minor	Medium	High
	As a result of the above, the overall impact is assessed as moderate and positive.			

### 7.2.10.3 Impacts on the national and regional economy during operation

Operation of the Project shall generate up to 220 MW of renewable energy which shall be fed into the national grid. The Proponent shall also make annual tax payments to central government in parallel with the generation of revenue.

During operations, there will also be an ongoing demand for general support from other national and regional businesses, such as consulting, legal, and accounting using small to medium enterprises.

Impact Assessment: Impacts on the national and regional economy during operation				
Impact Nature	Positive		Negative	
	Impact is positive because the operation of the Project will generate energy, which is fed into the national grid, contributing towards the ongoing development of the country which is currently severely lacking in energy generation.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is both direct and indirect because the company will provide energy to the national grid which will benefit other electricity users (households, businesses and government buildings), pay taxes, purchase materials and services which will lead to the growth of small and medium business. The impact is reversible as it will only continue during operation.			
Impact Duration	Temporary	Short-term	Medium-term	Long-term
	The impact is long-term because it would continue throughout the whole period of project operation of 20 years.			
Impact Extent	Local	Regional	National	
	The impact will occur at a regional and national level as energy shall be injected into the national grid. The local communities shall not be provided with electricity as this is the responsibility of the offtaker.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is medium as the quantity of energy generated by the project is an important contribution at 220MW.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is medium as the countries' energy demand shall continue to increase during the lifespan of the project.			



Impact Significance	Negligible	Low	Medium	High
	The overall impact significance is Medium.			

#### 7.2.10.4 Potential for of gender-based violence, sexual exploitation and harassment impacts

Although the number of project workers will reduce considerably during operation, the impact of GBVSEH on members of the community may remain. The Project could contribute to this prevalence of domestic and non-domestic violence and GBVSEH through:

- Any security personnel hired by the Project for protecting stations or other Project facilities could act violently when interacting with local community members, including physical and sexual violence as well as coercion and threats.
- Project workers could exert domestic economic abuse over their family members, and particularly female spouses, because of the wages that they will earn during their Project employment. This is anticipated to be less of a risk during operations compared to construction due to the lower numbers of workers and the long-term, stable nature of the income earned during operations.
- Project workers could use their financial status to engage in sexual exploitation of local people, including vulnerable women and girls. This could be in the form of prostitution or other forms of transactional sex where money or gifts are used to exploit local people, including those who are vulnerable due to poverty and children.
- Project workers could engage in GBVSEH of other Project workers, including those insubordinate positions.

The receptors of this impact will be the children, women resident in communities located within the Project Aol, who have a High vulnerability.

Impact Assessment: Potential for gender-based violence, sexual exploitation and harassment				
Impact Nature	Positive		Negative	
	This is an adverse impact because of the potential violence, exploitation and harassment of vulnerable groups such as women and children in all aspects of the Project.			
Impact Type	Direct	Indirect	Reversible	Irreversible
	The impact is direct and indirect because the Project will employ Project workers directly and through subcontractors. It is largely reversible through the implementation of appropriate mitigation measures.			
Impact Duration	Short-term	Medium-term	Long-term	Very Long-term
	The impact is short-term as the mitigation measures would help to identify any violence and GBVSEH-related impacts and allow the Project to put in place corrective actions, rather than allow them to continue long-term.			
Impact Extent	Local	Regional	National	
	The impact will be generated at local level.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Low.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is High as women and children are regarded as vulnerable receptors.			
Impact Significance	Negligible	Low	Medium	High
	The potential impact during operation is considered to be Medium adverse, pre-mitigation. It is expected that the continued implementation of specific measures introduced during the construction phase to prevent and address GBVSEH (as outlined in Section 8.8.1.10), will reduce this to Low.			

#### 7.2.11 Traffic and Transportation

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 not significant.

### 7.2.12 Waste Management

AECOM identified that the nearest landfill is located approximately 12-15 km from the site in Chayanli makhalla. There are no recycling facilities at this landfill but it accepts all types of wastes, including construction wastes. Another landfill is located approximately 30 km from the project site. Stakeholder meetings suggest that there are no local licensed companies for further treatment or recycling of hazardous wastes.

Impact Assessment: Impacts on waste during construction					
Impact Nature	Positive			Negative	
	Impact is negative because construction activities will result in increased waste volumes.				
Impact Type	Direct	Indirect	Reversible	Irreversible	
	The impact is direct as operational activities would directly increase both hazardous and non-hazardous wastes. This would include fuels, oils and used, broken panels.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impact is long-term as impacts would occur during the full operational phase.				
Impact Extent	Local	Regional	National		
	The impact is expected to occur within the site, on the road to the landfill site and in the landfill site itself, up to approximately 15km from the site.				
Receptor Value / Sensitivity	Low	Medium	High		
	Although hazardous wastes will be produced, amounts are likely to be low and the landfill site confirms it can accept such waste. As a result the receptor sensitivity is determined to be low.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Magnitude of change is anticipated to be Negligible as the increased volume is not deemed to be significant.				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Negligible and not significant. Wastes will be segregated and stored appropriately. Although wastes would be landfilled at present, the EPC Contractor will seek to identify appropriate recycling facilities, including for broken solar panels.				

## 7.3 Decommissioning Impacts

### 7.3.1 Air Quality

The change in ambient air quality may arise at decommissioning as a result of fugitive dust and particulate matter emissions. However, such impacts are expected to be temporary and of short-term nature as they are limited to the decommissioning phase only. The impacts will be similar to the construction phase.

### 7.3.2 Archaeology and Cultural Heritage

The activities which may impact upon archaeological and cultural heritage sites include an increased workforce presence, reinstatement activities and vehicle movements, which may result in damage to, or interference with, archaeological and cultural heritage sites. It is unlikely however to present any significant effects. Following the removal of the structures and the reinstatement of the land use there would be no further potential effects to the archaeology and cultural heritage receptors.

### 7.3.3 Biodiversity

The main impacts during decommissioning are likely to relate to Central Asian tortoise occurring within the operational Solar PV site as a result of the mitigation measures detailed in Section 8.

Following decommissioning, reinstatement will be important to re-establishing the ecosystem in areas previously occupied by solar panels, site roads and other structures. At the time of decommissioning, the sensitivity of some species, particularly those which are regionally rare, may have increased.

#### **7.3.3.1 Terrestrial Ecology**

Similar to construction, the main impacts during decommissioning are likely to comprise habitat loss, loss of small numbers of mammals, and disturbance to animals. Following decommissioning, reinstatement will be important to re-establishing the ecosystem in areas previously occupied by solar panels, site roads and other structures. At the time of decommissioning, the sensitivity of some species, particularly those animals which are regionally rare, may have increased.

#### **7.3.4 Geology and Soils**

Similar to construction, soils will be highly vulnerable to traffic and erosion during decommissioning. The movement of materials off-site may involve the construction of temporary roads and use of large vehicles. There is also potential for chemical or oil spills, or the incorrect handling/disposal of wastes during decommissioning. Similar measures to those outlined for 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.

The panels and supports will be dismantled and steel and other useful materials will be recycled. Inert materials which cannot be recycled will be taken to a suitable disposal site. However, foundations and other inert belowground materials will be buried. This is not likely to have a significant impact on soils as it will not prevent re-vegetation or restoration of land.

#### **7.3.5 Hydrology and Hydrogeology**

Effects on water resources during decommissioning are likely to be similar to those during construction, so sensitive features such as drainage channels would need to be avoided. 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.

#### **7.3.6 Labor and working conditions**

Similar to construction, the use of a workforce and decommissioning activities could potentially generate a variety of risks to the workforce, due to general site decommissioning activities (removal of site equipment and infrastructure) and the presence of project vehicles on local roads posing a risk to. As per the construction phase, an independent Labour Assessment shall be undertaken by a qualified labour specialist, which shall include a corrective action plan with appropriate mitigation and remediation measures as well as monitoring requirements that will be implemented by the Project and its subcontractors. Also, an Occupational Health and Safety Plan, Traffic Management Plan and Emergency Response Plan will be in place for the decommissioning phase of the Project. Appropriate policies will be in place to protect worker's rights.

#### **7.3.7 Landscape and visual**

Impacts of landscape will result from removal of solar PV panels, substations and transformer stations, on-site and off-site transmission lines. New machinery and equipment will be introduced into the landscape, including heavy goods vehicles excavators, bulldozers, and other heavy equipment. The impacts are expected to be the same as those experienced during construction.

#### **7.3.8 Noise**

Local noise levels will be affected temporarily by decommissioning activities such as equipment movement during building demolition and use of heavy machinery. The impacts will be similar to those experienced during the construction phase.

#### **7.3.9 Socio-economic Impacts**

Similar to construction, the use of a workforce and decommissioning activities could potentially generate a variety of health and safety risks to the local residents, due to general site decommissioning activities (removal of site equipment and infrastructure) and the presence of project vehicles on local roads posing a risk to local residents and school children. A Community Health and

Safety Plan, Traffic Management Plan and Emergency Response Plan will be in place for the decommissioning phase of the Project.

#### **7.3.10 Transportation and Access**

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. It is unlikely however to present any significant effects.

#### **7.3.11 Waste Management**



**8. AECOM identified that the nearest landfill is located approximately 12-15 km from the site in Chayanli makhalla. There are no recycling facilities at this landfill but it accepts all types of wastes, including construction wastes. Another landfill is located approximately 30 km from the project site. Stakeholder meetings suggest that there are no local licensed companies for further treatment or recycling of hazardous wastes. Decommissioning wastes are expected to be similar to that from construction and impacts will be generally similar. The Project Company shall seek to identify hazardous waste management facilities outside the Project area and these will be used as appropriate.**

Proposed mitigation measures are described below, and an outline Environmental and Social Mitigation and Monitoring Plan is provided in Appendix A. This will be incorporated into the Construction ESMP which will be the means of implementation.

## **8.1 Air Quality**

### **8.1.1 Construction Phase**

The change in ambient air quality may arise during construction as a result of fugitive dust and particulate matter emissions. However, such impacts are expected to be temporary and of short-term nature as they are limited to the construction and decommissioning phases only.

A Dust Suppression Management Plan will be prepared to identify potential sources of dust emission and provide guidance to EPC on measures to control the generation of dust, particularly during construction.

Dust emissions can be generated directly from construction activities of the project, its ancillary facilities and associated traffic, including clearing of topsoil, transport and open storage of materials, and from unpaved roads.

If visible dust dispersion to off-site locations becomes apparent additional control measures may include a maximum speed limit in dust-prone areas, cover stockpiles, temporarily suspend activities at the source of the dust emissions until wind speed is reduced, and/or apply additional water to access roads and work areas as necessary.

Internal access roads will be constructed of a base of crushed rock topped with a layer of gravel to minimise dust.

In addition, the following mitigation will be implemented:

#### **8.1.1.1 Vehicle movements, roads and parking area**

- Dusty material should be covered during transport.
- The main vehicular access roads to the project site shall be stabilized to eliminate visible fugitive dust from vehicular travel and wind erosion.
- Construction exit-wash bays shall be provided to control sediment, dust, weed (seed), etc and not to avoid scattering of any muds in the roadway when vehicle is exiting the construction site. Wash bay shall be provided in the temporary construction compound.
- Roads will be maintained to ensure dust levels are minimised.
- Implement speed limits of 20 kmph within the site to reduce dust emissions. Traffic speed signs shall be displayed prominently at all site entrances and at egress point(s).

- Spray water on roads and dusty materials stockpiles, to increase the moisture content, a few times a day along the construction traffic route. The use of oil and oil by-products are not permitted to control road dust.
- All soil and quarry materials will be covered when being transferred to site by truck.

#### 8.1.1.2 Site clearance

- Maintain the natural topography and vegetation where possible for soil stabilization.
- Establish parking / laydown areas and paved roads first in the construction programme where possible.
- Turn off equipment when it is not in use.
- When wind speeds exceed 10 m/s minimize new disturbance to the extent possible and/or mobilize additional water spraying to minimize dust emissions from exposed surfaces. This would be the equivalent of a 6 on the Beaufort Scale where large branches are in continuous motion and whistling sounds heard in overhead or nearby power and telephone lines.

#### 8.1.1.3 Disturbed and uncovered surfaces

- Stabilize surfaces upon completion of grading when subsequent development is delayed; except when such a delay is due to precipitation that dampens the disturbed surface sufficiently to eliminate visible fugitive dust emissions.
- When feasible, use a water to maintain moist disturbed surfaces and actively spread water during visible dusting episodes to minimise visible fugitive dust emissions.
- Minimise disturbance areas to the maximum extent feasible.
- Stockpiles should not exceed 2.5 m in height.
- For non-road or parking area earthen surfaces, stabilize surfaces by compaction, or other means sufficient to prohibit visible fugitive dust from wind erosion.

#### 8.1.1.4 Roads

- In order to minimise dust emissions from traffic movement within the site, all traffic will be required to keep to designated access roads. All roads within the site will include a subbase and base course consisting of well graded crushed stone. Roads will be surfaced with either concrete or asphalt.

### 8.1.2 Operational Phase

The Project company shall develop and implement specific procedures to avoid / minimise SF6 leakage as part of the Company's O&M procedures and maintain it within the acceptable leakage rates in accordance with good international industry practice (GIIP).

The Project company shall liaise with the network sub station operator to confirm that there is also a management procedure in place for SF6 periodic leakage detection and recovery. If there is no procedure in place, the Project company shall share the Project's procedure.

### 8.1.3 Decommissioning Phase

Impacts during decommissioning are expected to be similar to the construction phase. The mitigation measures proposed for construction would be implemented during decommissioning.

## 8.2 Archaeology and Cultural Heritage

### 8.2.1 Construction Phase

Appropriate mitigation will be carried out in tandem with construction works. An archaeological examination was undertaken as part of the OVOS approval process and no additional archaeological investigation was required.

The Project company will provide the EPC with the locations of the potential cultural heritage sites for micro siting the OHTL towers in the field with the supervision of an archaeological expert. Further

supervision of intrusive works, where they are taking place in close proximity to these areas to be implemented if required based on agreement with the archaeologist.

If any areas of archaeological significance (as determined by the archaeological expert) cannot be avoided, the Project company will develop a Cultural Heritage Management plan (CHMP) and undertake a programme of planned, pre-clearance excavations prior to the commencement of any construction work, in consultation with the relevant authorities.

In addition to the general requirements above, the following range of archaeology and cultural heritage mitigation measures are proposed at this preliminary stage. These have been developed with reference to national legislation, IFC PS 8 and other applicable standards.

The main method of mitigation will be the implementation of the following chance finds procedure followed by specific management measures if appropriate:

- Where required, OHTL towers will be micro-sited with the supervision of an archaeology expert during all intrusive works to prevent impact on existing archaeology/cultural heritage.
- A **Chance Find Procedure** is the key mitigation proposed and will be implemented during construction groundworks to reduce the likelihood of impacts occurring without adequate mitigation. The Developer or its contractors will not disturb any chance find further until an assessment by a competent professional is made and actions consistent with the requirements of IFC PS8 are identified.
- **Cultural Heritage Awareness Training** will be integrated into workforce site inductions and toolbox talks for all Project staff, contractors and subcontractors.
  - Should chance finds be recorded, the following management and mitigation will be implemented:
- **Design amendments – micrositing of design components (embedded mitigation)**. Should potentially significant archaeological remains be identified, elements of the Project may be micro-sited to avoid impacts upon them.
- **Excavation and recording**. For practical reasons, when archaeological sites cannot be preserved by altering the Project design or protected by signage/fencing, and relocation is not practicable, sites will be excavated and recorded in mitigation according to the principle of 'replacement by record'. This may involve a set-piece excavation undertaken prior to development, or a watching brief on groundworks alongside development.
- **Protection of vulnerable sites**: Vulnerable sites will be protected, if appropriate, by temporary flagging/ fencing and signage subject to the agreement of heritage authorities, ensuring an adequate buffer and staff awareness training.
- **Traffic management** including designated temporary access routes will be used to prevent soil erosion and vehicular and pedestrian damage to archaeological and cultural heritage sites.

### 8.2.2 Chance Finds

A review of the known archaeology and history of the wider project area indicates that there is low potential for the presence of Palaeolithic, Mesolithic and Neolithic material. Throughout the later prehistoric, antique and medieval periods, it is likely that this semi-arid desert area was populated by mobile herders. There is some potential for the presence of stray finds (casual losses), travellers' campsites and for burial mounds (kurgan).

Any terrestrial archaeological remains within the Project Area are likely to comprise:

- In situ surface scatters or features identified on bare ground.
- Surface scatters identified in areas of disturbed ground or in up-cast spoil from groundworks.
- Buried features, which may have moderate depth and complexity.

### 8.2.2.1 Procedure

Although there are not likely to be direct impacts on any features during construction, mitigation will focus on the implementation of appropriate archaeological chance finds procedure during initial construction works to identify any uncovered archaeological features.

The Contractor (including specialist archaeologist) during its activities will follow the following procedures:

- The person or group (identifier) who identified or exposed the archaeological sites, objects or artefacts must cease all activity in the immediate vicinity of the site.
- The identifier must immediately inform his/her supervisor of the discovery; The supervisor must then inform the Company representative at the construction site.
- Record every chance find and complete the documentation, keep an overall record that is reportable on a monthly basis. In the case of chance finds of high archaeological potential will implement the chance find procedure, the area affected by the finding will be defined and fenced off by the contractor.
- The supervisor must ensure that the site is secured and control access.
- Archaeological materials uncovered during excavations should be stored in finding boxes (with appropriate lists indicating the stratigraphic units of provenance and the general classification of the finds).
- The finds should be stored in the nearest museum or in the regional directories.
- Photographic documentation for the chance finds (if any).
- The EPC must inform the Department of Culture and request their presence to inspect the find.
- The Department of Culture will propose adequate mitigation measure for findings protection.

The above information will be communicated to the general workforce during toolbox talks prior to topsoil stripping or excavation works.

### 8.2.2.2 Stop Work Protocol

Construction work may uncover previously unidentified artefacts. This may occur for a variety of reasons. In the case of chance finds, the following stop protocol work will be used.

Upon the discovery of archaeology and cultural heritage elements EPC will:

- Inform the Company that will inform, discuss and agree with Department of Culture how to proceed (stop work, remove the discovery etc.).
- Where the Department of Culture requires further investigation, the EPC will:
- Report substantial archaeological finds immediately to a museum as specified by the Department of Culture, so that an investigation and evaluation of the finds can be carried out; and
- Publish the results of any investigation or excavation by an archaeologist in order to bring this information into the public domain.
- The EPC will address any additional reasonable requests by the Department of Culture that are not explicitly described herein.

### 8.2.2.3 Mitigation Strategies

In case of chance find, the Construction Manager will be promptly informed. The Construction Manager will involve the Project Manager who will be responsible to inform the Company about the chance find. The Company will advise the Department Culture which will be in charge to arrange the following actions to undertake.

The item found will not be moved or touched until the arrival and intervention of the Department of Culture.



Mitigation strategies will be implemented, if necessary, to reduce the impact on Cultural Heritage in the project area. These will involve:

- Documentation and assessment of chance finds;
- Mitigation of development impacts: it includes implementing long-term protection strategy for archaeological sites to be impacted by the project (according to the ESIA there are no archaeological sites in the project area and nearby it). If protection of the site is not possible the Contractor conducts an archaeological excavation to document the site and remove the artefact.
- If archaeological finds of major significance will be discovered on site and cannot be removed, the EPC, in accordance with the Company and relevant Department of Culture, will follow IFC PS8 requirements as follows:
  - Company shall consider protection through preservation in place.
  - If archaeological finds must be removed:
    - When no technically or financially feasible alternatives existed.
    - The benefits of the projects outweighed the anticipated CH loss of removal.
    - Removal was by the best available technique.
    - Consulted with relevant national or local regulatory agencies entrusted with the protection of archaeological find and with affected communities who use, or have used within living memory, the archaeological finds, and incorporated the views of these communities into the decision-making process.
    - Where archaeological finds have been identified and significant damage may be unavoidable, the Company shall conduct good faith negotiations with, and documented the informed participation of affected communities and the successful outcome of negotiations.
  - Appropriately mitigated other impacts on critical CH with the affected communities.

If archaeological finds are kept:

- Company identified proposed project use of cultural resources, knowledge, innovations, or practices of local communities embodying traditional lifestyles for commercial purposes.

## 8.3 Biodiversity

### 8.3.1 Reptiles

#### 8.3.1.1 Pre-Clearance Surveys (including Translocation undertaken in April 2022)

The full details of the reptile mitigation for PBF species within the Solar PV site, undertaken during the reptile active period in April 2022, is included in Appendix E: GBI Tortoise Relocation Report. The surveys and translocation were undertaken by suitably experienced herpetologists in accordance with Regional Ecology Department (Goscomecology) permitting requirements. A summary of the surveys, translocation and requirements for further pre-clearance mitigation for reptiles, as detailed in the aforementioned GBI report, is provided below; full details will be included within the BAP. The aim of the reptile mitigation is to achieve the requirement for No Net Loss (NNL) of reptile species defined as PBFs (i.e. Central Asian tortoise and tatar sand boa). The BAP will fully detail all relevant construction mitigation measures (BAP) and habitat restoration and operation mitigation and enhancement measures which will be completed during and after the construction period to achieve the objectives of No Net Loss for PBFs.

A total of 213 Central Asian tortoises were captured within the Solar PV site and translocated to a receptor area in a location which was pre-determined by the herpetological specialists in accordance with advice provided by the regional Goscomecology representative. No tatar sand boas were recorded, captured or translocated. The receptor area is located immediately adjacent to the north-western boundary of the Solar PV site within Artemisian vegetation (Natural habitat [as defined by PS6]); the location of the receptor area is shown in Appendix E.

Zoning of Ecologically Sensitive Areas for Reptiles A purpose of the aforementioned April 2022 reptile surveys was to identify the spatial location of any core areas for tortoises within the Solar PV site and to establish corresponding temporary exclusion zones within the Solar PV site (defined as 'Special Attention Areas' within the GBI report). A single Special Attention Area was identified adjacent to the north-western boundary of the Solar PV site; this area supported a high-density tortoise population compared to other parts of the site and therefore there is a higher risk that tortoises that evaded capture are present in this area (refer to Appendix E).

### 8.3.1.2 Site Clearance/Topsoil Stripping

It is important that the site clearance works programme (including temporary works e.g., site compounds) is timed to avoid the tortoise summer and winter hibernation periods, when the reptiles are more vulnerable to disturbance, injury and mortality associated with the works; i.e. no clearance works will occur during the July-February period.

Searches of potential burrows with endoscope and live capture of reptiles, including species of international and national concern (including all PBF reptile species i.e., Central Asian tortoise and tatar sand boa) will be undertaken within the footprint of the solar farm infrastructure under the supervision of suitably experienced herpetology specialists in accordance with regional government permitting requirements<sup>89</sup>. Any reptiles which are found will be translocated to a reptile receptor area, as advised by the herpetologists. Successful translocation from the construction footprint and returning them to the site once construction is complete is part of the requirement to achieve No Net Loss (NNL) of species defined as PBFs and net gain of CHs. The BAP will fully detail all relevant construction mitigation measures (BAP) and habitat restoration and operation mitigation and enhancement measures which will be completed during and after the construction period to achieve the objectives of Net Gain and/or No Net Loss for PBFs, NH and CH as appropriate.

Where reptiles are encountered on-site, these will be moved outside the fence line of the site to an area deemed appropriate by the Project ecologist. This will be either to the translocation area identified by GBI or to another appropriate area adjacent to the site. The site will be fenced during construction with no access under the fence, reducing movement in and out of the site by Central Asian tortoise. This will minimise any translocated animals moving back into the construction area.

### 8.3.2 Biodiversity Action Plan (including definition of no net loss / net gain)

The Project is required to comply with the Lenders' Environmental and Social (E&S) standards as set out in European Bank for Reconstruction and Development (EBRD) E&S Performance Requirements 6 (PR6), IFC Performance Standard 6 (PS6), European Investment Bank (EIB) – Standard 4, Asian Development Bank (ADB) Safeguard Policy Statement (SPS) Biodiversity Conservation and Sustainable Natural Resource Management – and associated Guidance Notes on 'Biodiversity Conservation and Sustainable Management of Living Natural Resources', as well as with the commitments set out in meeting national requirements.

The Lender Requirements IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources (PS6), EIB Standard 4, EBRD Performance Requirement 6 (PR6) and ABD Safeguarding Policy (SP) indicates that protecting and conserving biodiversity, and its ability to change and evolve, is fundamental to sustainable development. The requirements set out in PS6 / PR6 and SP have been guided by the Convention on Biological Diversity, which defines biodiversity as "the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part; this includes diversity within species, between species, and of ecosystems." The three broad objectives of PS6 / PR 6 / SP are:

1. To protect and conserve biodiversity,
2. To maintain the benefits from ecosystem services, and
3. To promote the sustainable management and use of natural resources through the adoption of practices that integrate conservation needs and development priorities

<sup>89</sup> The full details of the reptile mitigation which has been undertaken in 2022 will be added to the BAP. The GBI ecological summary report is provided as Appendix E.

The overall objective of the Project is to ensure:

- Ecological processes are maintained and are not disrupted.
- Impacts on fauna and flora species as a result of construction and O&M activities are minimized.
- “No net loss” for any Priority Biodiversity Features / Feature of Significant Biodiversity Value.
- Net Gains for Critical Habitat qualifying species; and
- Ensure no net negative residual impact on other ecological receptors.

Achieving these objectives requires that the mitigation hierarchy is exercised to ensure Project-related impacts are managed through taking appropriate avoidance, minimization and restoration measures before biodiversity offsets are considered to compensate for significant residual impacts. The detailed mitigation to achieve NNL/NG is provided in the Biodiversity Action Plan (BAP)<sup>90</sup> and is summarised below.

In line with GN43 of PS6, the Project will “design and implement mitigation measures to achieve at least no net loss of biodiversity, where feasible, through the application of on-site and offset mitigation measures”. The mitigation strategy will also align with EBRD PS6, para 16, and will be described in a Biodiversity Action Plan or biodiversity action plan (BAP), wherever appropriate. It is proposed to develop a BAP for this project that will incorporate measures normally part of a BMP.

The term no net loss is defined as “the point at which project-related impacts on biodiversity are balanced by measures taken to avoid and minimize the project’s impacts, to undertake on-site restoration, and finally to offset significant residual impacts, if any, on an appropriate geographic scale (for example, local, landscape-level, national, regional).” Net gains are additional conservation outcomes that can be achieved for the biodiversity values for which the critical habitat was designated. In the context of this project, Net gain would equate to an improvement of habitat quality (increased HHs) and/or an increase in population density for NH, PBFs and CHs.

No net loss and net gain includes natural habitat and its associated significant biodiversity values. Significant biodiversity values in this case include NH, PBFs and CHs.

EBRD’s PR6 requires No Net Loss (NNL) of Priority Biodiversity Features (PBFs) and the habitats that support them. This requirement is triggered by the Central Asian Tortoise. There is a requirement to demonstrate net gain for CHs designated due to overwintering populations of Great bustard.

The project will achieve NNL/NG by implementing the following general measures:

1. Ensuring the local population of PBFs remains stable (if not improves) at the site. For Central Asian tortoise, this is accomplished by temporary re-location of the tortoises to a relocation area located on similar habitat adjacent to the site during construction and subsequent re-release into the larger project area post construction.
2. Restoring the habitat in the project area that supports PBFs and improving its quality relative to the pre-project baseline.
3. Protecting the project area from human interventions, such as poaching, grazing, or other activities that could have a negative impact on the tortoises and their habitat. This will be achieved by fencing the full PV area.
4. Providing passages in fencing for tortoises to move in and out of the project site.

Performance against the NNL and NG requirement will be measured as follows.

1. The population of PBFs at the site will be measured annually using a *mark-recapture* method or as appropriate.<sup>91</sup>

<sup>90</sup> CONSTRUCTION ENVIRONMENTAL & SOCIAL MANAGEMENT SYSTEM: Biodiversity Action Plan - REF 10

<sup>91</sup> [https://en.wikipedia.org/wiki/Mark\\_and\\_recapture](https://en.wikipedia.org/wiki/Mark_and_recapture)

8. AECOM identified that the nearest landfill is located approximately 12-15 km from the site in Chayanli makhalla. There are no recycling facilities at this landfill but it accepts all types of wastes, including construction wastes. Another landfill is locat

2. The quality of the habitat at the site will be measured by comparison against a baseline habitat condition survey of the site pre-clearance.
  - a. .
3. Metrics to be determined, that demonstrate the presence of protective infrastructure (e.g., adequate fencing) and enforcement monitoring.
4. Documented presence, maintenance, and use of passages in fencing by tortoises.

Monitoring should – unless otherwise agreed with Lenders based on monitoring results and the achievement of NNL/NG, continue for the life of Project.

NNL and NG will be achieved when:

1. The population of PBFs is the same or better than pre-clearance baseline.
2. The post-construction project site has equal or better habitat scores (measured as a % of the benchmark) as the pre-clearance project site (baseline).

The BAP will be prepared and will include for the repeat surveying of the Project area to confirm the findings of the ESIA and monitor restoration.

The following metrics will be used to identify NNL and NG.

### 8.3.2.1 Habitat Metrics

A detailed description of the areas will be cleared during the initial earthworks, habitat lost and habitat retained is described in the BAP and summarised below.

**Table 46. Summary of Lost / Retained Habitat**

Habitat Type	Impact Type	Total Amount of Habitat (ha) Affected	Total Amount of Habitat Hectares Affected
Natural	Permanent	0.0112	0.0033(Lost)
Natural	Temporary	0	0
Modified	Permanent	15.816	1.58 (Lost)
Modified	Temporary	563.79	56.38 (Retained)

### 8.3.2.2 Indicator Species Metrics

The project will measure on an annual basis the population density of PBFs and compare against the pre-clearance population estimates. NNL and NG will be achieved when the population density is equal to or exceeds that recorded pre-clearance.

### 8.3.2.3 Infrastructure Metrics

NNS has included measures to avoid habitat fragmentation (GN46) and this will focus on the inclusion of tortoise passes under the site fencing to allow free movement back and forth. Furthermore, the site will be fenced to prevent grazing and hunting. The following metrics will be measured:

- Site fully fenced to exclude grazing and hunting.
- Tortoise passes on perimeter fence at a distance of 1 gate per 100m of fence

### 8.3.2.4 Measures to achieve net gain

Consultation on impacts and mitigations on Great bustard will be carried out prior to finalising the ESIA and BAP with relevant stakeholders including Birdlife, IUCN SSC Bustard Specialist Group, Eurasian Bustard Alliance and UzSPB.

From winter 2022/23, the project will set up a working group to help further research and mitigation to improve the populations of overwintering Great Bustard. The group has yet to be determined but it is



expected to include at least consultation with the Birdlife International, IUCN SSC Bustard Specialist Group, Eurasian Bustard Alliance and UzSPB and others if appropriate.

The purpose of the working group will be to further understand the key overwintering areas and occurrence schedules of the species, how they relate to the Project location and to provide a Net Gain for this species.

The working group will include a local specialist(s) to undertake further monitoring of this species during the winter periods and will provide input into the proposed action plan to conserve the species. This will include collision monitoring along the route of the OHTL. A further survey will take place in the 2022/23 winter period to gather further baseline data. Following installation of the OHTL, monitoring will be repeated annually up to the end of the first three years of operation and will include carcass searching along the OHTL. Monitoring will be reviewed and, subject to the conclusions of the monitoring and discussion with Lenders, will continue beyond the first three years of operation.

It has been identified that the highest priority for Great Bustard conservation to be protection from poaching as it migrates through and winters in Uzbekistan. The Project will work within local communities and will train local people as 'caretakers', who observe Great Bustards in their vicinity and promote conservation of the species; raising awareness of the Great Bustard among local people and hunters. The actual numbers have yet to be confirmed but will be confirmed following further investigation. At this stage approximately four caretakers are envisaged.

The caretakers will be funded for life of project (25 years) by the project and will attempt to reduce poaching in the wintering areas near the project sites, and that relevant government authorities involvement on this issue will be supported to ensure effectiveness. This action is a proposed offset for the potential impacts of collisions on project OHTLs.

As noted above, the detailed mitigation to achieve>NNL/NG is provided in the BAP. The BAP will be shared with recognised subject specialists (including Birdlife, IUCN SSC Bustard Specialist Group, Eurasian Bustard Alliance and UzSPB) who will be given the opportunity to comment and input into the BAP as it relates to monitoring and promoting conservation efforts.

### 8.3.3 Construction Phase

#### 8.3.3.1 Impacts on terrestrial ecology (PBF species) during construction

- Prior to undertaking any works on site, the EPC contractor/Ecologist shall clearly delineate the approved clearing and disturbance footprint using temporary fencing, flagging tape, parawebbing or similar.
- Pre-clearing surveys will be carried out by the ecology team prior to topsoil stripping or other works starting in the pre-clearance area. The Ecologist will identify burrows that appear suitable for hibernating Central Asian tortoise and will carry out searches with endoscope to confirm presence of hibernating tortoises. If found within the hibernation period, burrows will be marked and fenced to ensure that works will be excluded from the area until they can be moved between March and July (suitable clearance/construction buffer zones will be informed by the advice of the Ecologist).
- The Ecologist will undertake an assessment to establish a suitable receptor area adjacent to the northern boundary of the project site, in close proximity to the operational footprint of the northern boundary fence (to overlap with typical movement within a home range for this species, as advised by the Ecologist). The precise location of the receptor area will be agreed with the Ecologist and the regional Goscomecology representative. The exact release date will be determined by temperature, weather conditions and suitability of habitat. Animals will be marked and numbered to allow ongoing monitoring.
- The EPC/Ecologist should provide awareness training during site induction and toolbox talks with an emphasis on the sensitivities relating to PBF and CH species in particular and the specific Project requirements. The awareness will focus on identifying the species, preferred habitat and what to do in the event of a chance find. This will require the ecologist on-site to be informed. They will assume control of the situation and will physically move the reptile to a safe location away from construction vehicles. The ecologist will determine the most suitable location.

- Project vehicles will be restricted to designated construction roadways and designated parking areas.
- Where construction is continuing from March onwards, wooden planks or similar will be placed in excavations to allow tortoises or other animals to escape should they fall into the excavation. Excavations will be checked at the start of each shift and if an animal is identified, the EPC/Ecologist will be notified and will remove the animal to a safe location.

### 8.3.3.2 Minimise loss/damage of existing habitat during construction

- No work will take place on areas identified as Habitat Management Areas on the PV site. This area will be demarcated to ensure vehicles and workers do not enter the area. Currently the full site is assessed as MH.
- EPC and subcontractors adhere to the IFC Good Practice Note: Managing Contractors' Environmental and Social Performance.
  - Project staff and contractor(s) shall compile and implement a faunal protection policy to avoid unnecessary killing of fauna, ensures speed limits are controlled, hunting and possession of hunting equipment is prohibited, and taking pets and/or purchase/sale of wild animals or animal products is prohibited.
  - Project staff and contractors require environmental toolbox talks during construction to raise awareness, limit conflict and reduce additional disturbance to fauna and avifauna.
  - Staff will be briefed on risks of exposure to scorpions, spiders and snakes as well as the preventative measures. Workers in the field will wear protective clothing, long trousers, closed shoes and leather gloves. Information regarding nearest location of treatment for any bites and stings will be made available.
  - Any snakes encountered at the site must not be handled or harmed by Project workers. Animals must be relocated by appointed personnel.
  - Construction vehicles must remain on the access roads and not drive over vegetation which is not subject to site clearance.
- Prior to undertaking any works on site, the EPC contractor/Ecologist shall clearly delineate the approved clearing and disturbance footprint using temporary fencing, flagging tape, para-webbing or similar.
- Habitat Improvement Areas shall be clearly delineated using temporary fencing, flagging tape, para-webbing or similar. These areas will be used to offset loss of habitats on site.
- The EPC/Ecologist should provide awareness training during site induction and toolbox talks.
- The EPC shall disturb only the areas necessary for construction. This is the best way to limit the amount of erosion control that is required throughout the project.
- The EPC shall keep natural vegetation in place and leave topsoil undisturbed wherever possible during the main construction phase (e.g. piling works).
- Geotextile membranes will be used to avoid damage to natural habitat during the main construction phase (e.g. piling works).
- Project shall be developed in phases to minimise vegetation disturbance and control erosion. The EPC shall not break new ground until absolutely necessary. This will limit the amount of erosion during each construction phase and will help to conserve the natural seed bank contained within the topsoil.
- Project vehicles will be restricted to designated construction roadways and designated parking areas.
- The EPC shall manage stockpiles and exposed ground to minimise dust and erosion. Stockpiles shall be a maximum height of 2m.

- The EPC shall locate stockpiles at least 50 m away from watercourses, ditches and drains.
- The EPC shall locate stockpiles on areas of Modified Habitat.
- All waste shall be stored within the designated storage area.

#### **8.3.3.3 Habitat Restoration and Rehabilitation Measures**

- Habitat restoration to achieve No Net Loss of PBFs, based on guidance provided by the appointed specialist team of herpetologists. Habitat restoration will be applied within the PV site. Further detail will be provided in the BAP.

#### **8.3.3.4 Minimise loss/damage of topsoil (and associated seedbank)**

- Soil storage areas should be located on modified (historically cultivated land) within the project area.
- Excavated soils will be stored separately in accordance with their stratigraphic layers.
- Topsoil will be stripped to a maximum depth of 30 cm and stored separately in clearly demarcated areas. These areas will be recorded via spatial mapping.
- Subsoil will be stored separately and again will be recorded via spatial mapping.
- Stockpiles do not exceed 2 m in height.
- Areas of excavated soil and stockpiles shall be compacted to minimise erosion. There is a presumption against spraying with water as it may stimulate germination and hinder future restoration.
- Remove all alien or invasive species from the site area if encountered. Removal shall be manually in the first instance.
- Project staff require environmental toolbox talks during construction to raise awareness, limit conflict and reduce additional disturbance to fauna and avifauna.
- Searches for other reptiles (will be undertaken above ground or using an endoscope to search likely burrows during the construction phase within the footprint of the solar farm infrastructure (e.g. location of piles) under the supervision of a suitably experienced ecologist/herpetologist. If tortoises are found they will be removed to the designated tortoise mitigation area, as advised by the ecologist/herpetologist. Translocation from the construction footprint is a requirement to achieve No Net Loss (NNL) of reptile species defined as PBF's. Further detail will be provided in a Biodiversity Action Plan.
- During routine maintenance any invasive flora species will be removed.
- Ground stabilisation and revegetation shall be undertaken once work is complete in a given area.

#### **8.3.3.5 Storage of Excavated Soil**

- Soil that is excavated should not be stored in areas of ecological importance. The designated storage area may need to be checked for reptiles and breeding birds by the appointed ecological specialists.

#### **8.3.3.6 Zoning of Ecological Sensitive Areas**

- It may be necessary to establish temporary exclusion zones within the main working area, as advised by the appointed ecological specialist. These ecological sensitive areas may need to be protected due to season constraints, such as the presence of a rubble pile that could be used by hibernating reptiles; or an active bird nest. Barrier fencing mesh is considered suffice for this purpose and zone should be signed 'Ecological Sensitive Area'.
- No excavations will be left uncovered as this presents a risk of reptiles and small mammals becoming unnecessarily trapped. If trenches and pits are exposed over-night then escape routes for fauna must be made at regular intervals.

#### **8.3.3.7 Bird deflectors**

- The key operational mitigation measures for the transmission line relates to the mitigation of avian collision. Bird deflectors will be installed along the entire length of the Overhead Line between the

Solar PV and the existing sub-station at Saribazar; one diverter (Firefly brand bird flight diverters, or another brand with a long-term guarantee against failure) every 10m and staggered placement of them on the different lines to provide maximum coverage (refer to Ferrer et al, 2020)<sup>92</sup>. However, it should be clearly noted that bird deflectors shall be installed during the construction phase.

- The final mitigation design will be discussed with Birdlife International, IUCN SSC Bustard Specialist Group, Eurasian Bustard Alliance and UzSPB who will be provided the opportunity to provide input into the most suitable design. An initial introductory call with BirdLife International took place on 21 December 2022.

#### 8.3.4 Operational Phase

Operational mitigation measures for the Solar PV site are detailed below:

- No work will take place on areas identified as Habitat Management Areas on the PV site. This area will be demarcated to ensure vehicles and workers do not enter the area. The only Project access will be the ecology team who will monitor the level of improvement of the habitat to monitor the effectiveness of the BAP.
- During routine maintenance any invasive flora species will be removed.
- Natural revegetation of the cleared areas will take place. The success will be monitored and if necessary additional measures will be undertaken such as watering of those areas.
- All cleared areas will be infilled to avoid the risk of reptiles and small mammals becoming unnecessarily trapped.
- Following completion of construction works and in order to allow the free movement of reptiles and small mammals in/out of the site, a series of holes (minimum of 12cm height/breadth) will be dug under the base of the fencing . Further detail will be provided in a Biodiversity Action Plan.
- Internationally and nationally protected fauna and flora will be subject to post-construction monitoring . Further details will be provided in a Biodiversity Action Plan.

The key operational mitigation measures for the transmission line relates to the mitigation of avian collision, as follows:

- Bird deflectors will be installed during construction along the entire length of the Overhead Line between the Solar PV and the existing sub-station at Saribazar; one diverter (Firefly brand bird flight diverters, or another brand with a long-term guarantee against failure) every 10m and staggered placement of them on the different lines to provide maximum coverage (refer to Ferrer et al, 2020)<sup>93</sup>. As noted, the final design will be discussed with the Great bustard working group who will provide input into the most suitable design. During operation the project will monitor the condition of the deflectors and if necessary replace any that are broken or deficient.
- Collision monitoring will be undertaken along the OHTL. Collision monitoring will be focused on both Great bustard and other PBFs but all avian carcasses will be recorded.

All mitigation and monitoring will be included in a Biodiversity Action Plan which will also need to include a robust Adaptive Management Strategy should the results of monitoring indicate an impact on Great Bustard or other species of global conservation concern (e.g. Sociable Lapwing or raptors). The BAP will include an outline Off-setting Plan (as described above) which will need to be developed and in place should the results of the monitoring indicate an impact on bird species of global or national conservation concern

<sup>92</sup> Ferrer et al (2020), *Efficacy of different types of "bird flight diverter" in reducing bird mortality due to collision with transmission power lines*. Global Ecology and Conservation, Vo. 23, September 2020, e01130.  
Found at: <https://www.sciencedirect.com/science/article/pii/S2351989420306715>

<sup>93</sup> Ferrer et al (2020), *Efficacy of different types of "bird flight diverter" in reducing bird mortality due to collision with transmission power lines*. Global Ecology and Conservation, Vo. 23, September 2020, e01130.  
Found at: <https://www.sciencedirect.com/science/article/pii/S2351989420306715>



Further details will be provided in a Biodiversity Action Plan.

The BAP will validate the accuracy of predicted impacts and risks to biodiversity values posed by the Project, and the predicted effectiveness of biodiversity management actions and should include the following:

- Baseline: measures of the status of biodiversity values prior to the Project's impacts
- Process: monitoring of the implementation of mitigation measures and management controls
- Outcomes: monitoring of the status of biodiversity values during the life of the project, compared to the baseline.

The BAP should include a practical set of indicators (metrics) for the biodiversity values requiring mitigation and management. Specific thresholds (e.g. KPIs) should be set for monitoring results that will trigger a need to adapt the management plan(s) to address any deficiencies in performance.

Monitoring of populations of CH and PBF species known to be present on site will be undertaken to ensure that there are no long-term negative impacts as a result of the Project. On-going monitoring and reporting will be completed throughout the construction and operation phases of the Project in accordance with the relevant monitoring plans.

## 8.4 Geology and Soils

### 8.4.1 Site Preparation

To reduce the potential for erosion of drainage channels during road construction, routes will be selected to avoid ephemeral drainage channels where possible. Culverts or other drainage control features will be installed where crossings of drainage routes are unavoidable. Stormwater run-off onto roads and uncontrolled flow from roads will be minimized.

### 8.4.2 Construction Phase

The risk of contamination through temporary storage facilities will be reduced through the storage of all materials within designated areas. Supplies will also be provided for the clean-up of minor spills. A Pollution Prevention Plan will be prepared to prevent accidental spillage of fuels, chemicals or other substances.

To reduce the risk of soil and water pollution from leaks and spills through storage of oil the following will be implemented:

- A designated storage area is established with an impervious base and impermeable bund walls. Capacity must be sufficient to contain 110% of 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 will be checked regularly and accumulated oil removed.

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. Wastewater will be disposed of at a suitably licensed facility.

### 8.4.3 Operational Phase

The potential for soils and groundwater contamination associated with waste disposal will be reduced through the reduction of wastes to the extent possible whilst maximising the re-use and recycling of materials. All waste and rubbish will be collected and stored before disposal at a suitably licensed facility

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 110% of the full volume within a bund and secured area.
- Store all fuel, oil and chemical storage in the designated secure area.
- Do not leave vehicle 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.

## 8.5 Hydrology and Hydrogeology

### 8.5.1 Pre-construction

The Project company shall prepare and implement a Water Management Plan for the construction phase of the Project.

Detailed design should include assessment and mitigation to ensure that sustainability of the water supply and no E&S impacts of the project's use.

The Project company shall carry out an assessment of the Project's water sources and use during construction and operation. This shall also include water demands of worker accommodation.

The Project company shall ensure the detailed design includes drainage and erosion control measures to reduce erosion risk and ensure that the criteria used for the design is adequate (e.g. return period). The LTA will confirm that the design is appropriate, resulting in no material climate risk. The EPC Contractor will be provided with the hydrology study and Masdar will ensure studies/mitigations are integrated in the design.

To reduce the potential for erosion of drainage channels during road construction, routes will be selected to avoid ephemeral drainage channels where possible. Culverts or other drainage control features will be installed where crossings of drainage routes are unavoidable. Stormwater run-off onto roads and uncontrolled flow from roads will be minimized. All surface water drainage measures will be designed to allow free movement of reptile species.

### 8.5.2 Construction Phase

The risk of contamination through temporary storage facilities will be reduced through the storage of all materials within designated areas. Supplies will also be provided for the clean-up of minor spills. A Water Management Plan will be prepared to prevent accidental spillage of fuels, chemicals or other substances.

To reduce the risk of soil and water pollution from leaks and spills through storage of oil the following will be implemented:

- A designated storage area is established with an impervious base and impermeable bund walls. Capacity must be sufficient to contain 110% of 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 will be checked regularly and accumulated oil removed.

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 at a suitably licensed facility. If recycling facilities become available, the EPC contractor will ensure that the amount of waste being recycled is maximised.

### 8.5.2.1 Utilities

The source of water for the project has not yet been confirmed. At this stage it is recommended that the project purchase water direct from a suitably licensed utility company, which will be delivered by tanker.

The EPC Contractor will investigate the potential to segregate and reuse grey water on-site where practical.

### 8.5.2.2 Discharge of Surface Water

Discharges of process wastewater, sanitary wastewater, wastewater from utility operations or stormwater to surface water should not result in contaminant concentrations in excess of local ambient water quality criteria or, in the absence of local criteria, other sources of ambient water quality.

During construction, there will be no pre-planned direct discharges to areas potentially holding surface water, including ephemeral streams. No pathways have been identified where releases to effluent systems could be made. However, construction activities have the potential to pollute through accidents from the escape of:

- Silty and contaminated water from de-watering of excavations, exposed ground, earth stockpiles, and muddy roads.
- Leakage or accidental spillage of fuels, oils, chemicals etc., especially on the construction lay-down area.
- Washing down concrete mixing and delivery equipment.
- Sanitary wastewater from the welfare facilities.

Measures to mitigate the impacts of pollution incidents will be provided in the Wastewater Management Plan.

### 8.5.2.3 General Mitigation

To prevent impacts from runoff during land preparation and construction the EPC shall carry out the following measures:

- Construction debris will be stored in proper designated areas and at least 50m from seasonal surface water courses.
- Refuelling shall not be permitted within 50m of the seasonal water courses.
- Fuel shall be stored in suitably bunded areas, containing at least 110% of the total volume stored and at least 50m from seasonal surface water courses.
- Site office, temporary facility, worker accommodation and other similar site infrastructure shall not be permitted within 50m of the seasonal water courses.

To reduce the risk of potentially polluting materials such as oils, fuels and chemicals leaking, use dedicated storage areas with secondary containment and spillage protection and working procedures, which ensure that these materials are handled correctly. Waste oil and grease from the construction site shall be collected in suitable drums and transported out for proper disposal. Records of disposal of such material will be kept.

This is detailed in the Water Management Plan (REF 09) and Hazardous Material and Waste Management Plan (REF 08).

### 8.5.2.4 Tracks

Tracks within the site will have a 2% camber allowing surface water to run off into adjacent compacted soil ditches. If necessary, soil ditches will collect rainfall and channel it to the lowest point of the site on the southern boundary. Surface water will be discharged into surface water drainage system. Details of the drainage system will be provided by the EPC Contractor as part of detailed design.

### 8.5.2.5 Surface Water Drainage System

The EPC Contractor will develop an appropriate surface water drainage system as part of detailed design. It is proposed that surface water would discharge to the ephemeral watercourse to the southeast corner of the PV site. Where possible, clean surface water will be redirected around the site rather than risk contamination within the site.

### 8.5.2.6 Wastewater

Wastewater from toilets in the workers accommodation and office/admin buildings will be piped to a central storage tank. The wastewater would be collected and disposed of by a suitable licensed contractor.

### 8.5.2.7 Liquid Wastes

Waste oil and grease from the construction site shall be collected in suitable drums, stored on a segregated concrete area and transported for proper disposal. Records of disposal of such material will be kept.

The location of a suitable recycling/disposal facility has yet to be confirmed. The EPC Contractor will seek to identify appropriate waste management facilities (recycling and hazardous) outside the Project area.

## 8.5.3 Operational Phase

The Project company shall prepare and implement a Water Resource and Management Plan as part of the operational ESMS.

The potential for soils and groundwater contamination associated with waste disposal will be reduced through the reduction of wastes to the extent possible whilst maximising the re-use and recycling of materials. All waste and rubbish will be collected and stored before disposal in at a suitably licensed site.

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 100% of the full volume within a bund and secured area.
- Store all fuel, oil and chemical storage in the designated secure area.
- Do not leave vehicle 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.

## 8.6 Labour and Working Conditions

The implementation of the actions necessary to meet these requirements will be managed through the Project's Environmental and Social Management System (ESMS).

The requirements apply to workers directly engaged by the client (direct workers) and workers engaged through third parties to perform work related to the Project. Both the Developer and all its contractors shall commission an independent Labour Assessment undertaken by a qualified labour specialist, which shall include a corrective action plan with appropriate mitigation and remediation measures as well as monitoring requirements that will be implemented by the Project and its subcontractors.

The Project will develop appropriate policies on labour and working conditions that will:

- Promote the fair treatment, non-discrimination, and equal opportunity of workers.
- Establish, maintain, and improve the worker-management relationship.



- Promote compliance with national employment and labour laws.
- Protect workers, including vulnerable categories of workers such as children, migrant workers, workers engaged by third parties, and workers in the client's supply chain.
- Promote safe and healthy working conditions, and the health of workers.
- Avoid the use of forced labour.

## 8.7 Landscape and Visual

### 8.7.1 Design Phase

Landscape and visual mitigation for the Project was embedded in the design of the solar farm to centre around the selection of a layout which minimise the potential for significant impacts whilst achieving operational objectives.

### 8.7.2 Construction Phase

The best form of mitigation for landscape and visual impacts arising from construction is related to conservation of soils and vegetation.

Mitigation to reduce the adverse impact resulting from litter and rubbish (plastic bags, bottles etc.) include:

- Floodlights will be positioned and directed so as not to point outside of the site.
- Provision of adequate facilities for the disposal of rubbish.
- 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 rubbish.

### 8.7.3 Operational Phase

Vegetation around the Project that does not affect the performance of the Solar Park will be left in place or rehabilitated.

## 8.8 Noise

### 8.8.1 Construction Phase

In order to reduce the impact of noise during construction, best practicable means will be followed to ensure that the quietest available plant and construction techniques will be used in order to limit noise output as far as practically possible. The initial noise assessment has concentrated on the settlement at Karakchi to the south and west. It is deemed that the villages are of sufficient distance from the site to ensure that construction impacts are not likely to be significant. AECOM anticipate that the highest magnitude noise impacts will be experienced during piling operations.

Construction will generally be undertaken during normal working hours although some works may be required outside of this time. Where appropriate, micro siting will be undertaken to ensure construction noise impacts are minimised and equipment is located as far as possible from Noise Sensitive Receptors (NSRs). Mitigation measures will also include the use of a sufficient buffer between the Project and local properties to reduce noise to an acceptable level at those locations.

In addition, Project construction traffic routing through community areas will be minimised wherever possible.

A Noise Management Plan will be developed to identify the quietest available plant and construction techniques to be used to limit noise output during construction works. These include:

- Restrict all construction activities to daytime during normal working hours (0700 am – 1800 pm).
- Where appropriate, micro-siting is to be undertaken to ensure construction noise impacts are minimised and equipment is located as far as possible from noise sensitive receptors (NSRs). NSRs include onsite accommodation.
- Routing of project construction traffic shall be through the main highway and short section of unmarked road to site. Refer to the Transport MP for further details.
- Adopt and follow best practicable means to ensure that the quietest available plant and construction techniques are used. Such as:
  - Selecting equipment with lower sound power levels
  - Installing silencers for fans
  - Installing suitable mufflers on engine exhausts and compressor components
  - Installing acoustic enclosures for equipment casing radiating noise
- Provide prior information to the community of any planned noisy activity that is likely to exceed the permitted noise levels (piling work)
- Strictly ensure the use of protective personal equipment at all times while on site and noise reduction techniques such as silencers and ear mufflers to employees
- Machinery and equipment shall be maintained in good conditions in order to minimize noise.
- In the event of a valid grievance being received, carry out an investigation of noise levels to determine whether they comply with permitted maximum levels, including all vehicles and machineries on site. For this task, a handheld noise monitor will be used to measure IEC A-weighting (dB(A)<sub>eq</sub>).

### 8.8.2 Operational Phase

The initial noise assessment has concentrated on the village of Karakchi but it is deemed to be of sufficient distance from the site to ensure operational impacts are not likely to be significant.

Should additional mitigation be required during the operational phase, the following will be considered if required following detailed noise assessment:

- Installation of acoustic enclosures for equipment causing radiating noise (this would typically give 3 dB attenuation).
- Improving the acoustic performance of constructed buildings, through employing sound insulation.
- Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m<sup>2</sup> in order to minimize the transmission of sound through the barrier. Barriers will be located as close to the source or to the receptor location to be effective.
- Installing vibration isolation for mechanical equipment.

In addition, the Community Grievance Mechanism developed under IFC PS 1 will be implemented during both the construction and operational Project phases. This will be utilised to record, monitor and respond to / mitigate any noise related impacts raised by the local community and ensure compliance with noise limits is achieved at NSRs.

## 8.9 Socio-economic Impacts

The following sections provide indicative measures to mitigate the negative effects and enhance the positive effects of the Project according to the impacts listed in Section 7.1.8 and 7.2.9. The systematic approach for mitigation development will consider policy and procedure instruments, training and capacity building, and economic investment. The mitigation and monitoring measures identified within this section will be further developed within the Project's ESMP and associated sub-plans.

## 8.9.1 Construction Phase

### 8.9.1.1 Economic Displacement

The project will develop a Livelihood Restoration Plan (LRP) that considers any potential economic displacement that will be created by the Project including the OHTL and any consequent temporary land restriction. Should any additional land be required, the Project company shall undertake the assessment and mitigation planning for any additional land acquisition (including but not limited to site access roads and potentially other temporary construction facilities), in line with involuntary resettlement requirements outlined in the LRP and optimize design to minimise involuntary resettlement to the extent possible. LRP addendums to be disclosed as required. The LRP will be drafted in line with national regulations and international best practices and it will respond to the following objectives:

- Define national and international requirements for economic displacement
- Outline procedures for the land acquisition and compensation to be carried out by State parties.
- Identify PAPs and understand the socio-economic characteristics of affected households.
- Evaluate and assess the socio-economic activities that are located within the Project Site.
- Define appropriate levels and means of compensation for losses resulting from the Project in line with National Law and ADB standards.
- Identify other assistance and measures to enable affected households to restore and improve their livelihood.
- Define roles and responsibilities of key parties in the Project.
- Propose an appropriate grievance resolution mechanism.
- Evaluate and address disclosure and consultation requirements required by the project lenders.

### 8.9.1.2 Community Expectations of the Project

- Communicate employment estimates, timeframes and skills requirements clearly to the community on a continuous basis.
- Develop and disclose a Local Hiring Plan in consultation with the community and in a way that meets long term operational needs of the Project as well as the short-term construction needs, taking into account the relatively low skill base of the local population when it comes to solar power related jobs. This Plan will outline the recruitment strategy and processes, including the promotion of equal opportunities. It will be developed on the basis of a social survey and will include a clear local content target. The Plan will also describe how women and Project Affected People will be given priority, alongside with residents of Karakchi for recruitment and training before the start of construction activities (also included in the following section).
- A Stakeholder Engagement Plan will be implemented.
- A Labour Management Plan and Influx Management Plan will also be developed.

### 8.9.1.3 Increased local employment, capacity building and supply demand

To enhance the direct and indirect economic opportunities during the Project construction, the EPC Contractor will prioritize the appointment of workers from the area local to the Project site. The objective will be to develop a workforce, preferably, of a combination of nationals and expatriate workers that meets long term operational needs of the Project as well as the short-term construction needs, taking into account the relatively low skill base of the local population when it comes to solar power related jobs. This Project will consider the following activities:

- Commit to promote the hiring of local workforce where practicable and set out the process for that in the Local Recruitment and Employment Plan and require EPC contractor to implement this plan during the construction phase.

- Develop and implement Worker Influx management measures in line with IFC's handbook for addressing project-induced in-migration. The ESMS will address worker influx risks including (but not limited to) impact on local community infrastructure, housing market, potential community conflict, misconduct of workers, any potential Gender Based Violence and Harassment (GBVH) risks and incidence of communicable diseases.
- Investigation of local sourcing and procurement opportunities to promote sustainable small business and local training schools' partnerships that comply with the standards of the Project development.
- Investment in capacity building for small businesses to enable them to meet standards for procurement required by the company and to service the needs of influx populations and indirect employees (through service industries). This will be designed with a participatory and inclusive strategy between key stakeholders for economic development and the local people.
- Identification and monitoring procedures for compliance with IFC PS2 and ILO standards.
- Communication of job openings in the commonly used media identified in previous consultations through the Stakeholder Engagement Plan.
- Development of a transparent recruitment process, according to IFC PS2, which clearly communicate labour benefits (e.g. Health insurance), salary and contract length. The Plan will also describe how women and Project Affected People will be given priority, alongside with residents of Karakchi, for recruitment and training before the start of construction activities.
- Communication with local vocational training schools to develop curricula which will qualify local students to meet the project needs in further phases of the project and the solar industry locally, if possible.

#### 8.9.1.4 Capacity strain contribution to local public services and facilities

A Worker Accommodation Management Plan will be developed for the workforce. The Plan will identify the proper necessities of infrastructure, health and safety policies, and a clear strategy for the peak employee demand. Given the current assessment, the accommodation could be developed in Gallaorol and surrounding towns and villages, but further evaluation might be developed. If a local accommodation is selected, the Plan must consider a clear communication with stakeholders about on Project schedule and necessities of accommodation according to PS2 and PS4.

The Project company shall carry out the following actions in relation to the accommodation of construction labour.

- Develop a procedure as part of the Worker Accommodation Management Plan to identify the accommodation facilities required for the Project's construction phase (i.e., existing housing facilities and/or a temporary labour camp as necessary). The procedure will require the EPC and subcontractors to select existing facilities based on the results of an assessment of site-specific E&S impacts including on the host community which determines, as applicable, that the capacity of the existing infrastructure and services and of the community can host predicted workforce numbers without impacts on community health, safety or disturbance or quality of life (including GBVH, inflation of local goods and services etc) and on ability of accommodation to comply with IFC and EBRD workers' accommodation guidelines
- Select accommodation option(s) based on site-specific E&S assessment and definition of any specific mitigation measures to be included within the Worker Accommodation Management Plan
- Develop and implement related plans and procedures, with standards and provisions for basic labour services to be provided for the Project's construction labour, including (but not limited to) accommodation, sanitary, sustenance, medical, security, transportation, waste management and recreational facilities, in keeping with the IFC and EBRD workers' accommodation guidelines. The plans and procedures will highlight measures to prevent and abate impacts associated with gender-based violence and harassment, COVID-19, and the influx of the Project's construction labour into communities resident within the project area.



- Monitor and audit living conditions within pre-existing housing facilities or new labour camps designated for the accommodation of the Project's construction labour to ensure compliance with the IFC and EBRD workers' accommodation standards set out in the Project's Worker Accommodation Management Plan.
- An Occupational Health and Safety Plan and a Community Health and Safety Plan will be developed to ensure that all Contractors are provided with adequate health care (for work related injuries and off the job-related health issues) that is independent of the local health care system.
- The Plans related to capacity strain will be communicated to key stakeholders, in order to promote transparency and avoid conflict related to community concerns or investment expectations. The information provided will be appropriate to demographic and cultural characteristics of the Aol.

#### **8.9.1.5 Loss of public access and reduced mobility through local paths**

The Stakeholder Engagement Plan will provide detailed and regular information to local community members about Project activity to mitigate community concerns about mobilisation and inform updates on access routes around the Project site. Based on the site visits and consultations undertaken, an important local path was identified across the site which is mainly used for grazing animals and taking them from the village to grazing areas. A single user was identified as access grazing using this path. However other local herders confirmed that they can access the preferred grazing areas using the route along the northern boundary of the site. This impact is Irreversible as there is no alternative community pathway through the site which will allow community members and their herds to cross the area. Further detail is provided in the LRP.

#### **8.9.1.6 Reduced access to grazing and pastoral land**

As noted, the Solar PV will be fenced off at the start of construction to prevent unauthorised entry inside the site boundary. The change in land use in the Project area will result in change in local livelihoods mainly as a result of the reduction in available grazing area and reduction in income.

The level of impact and mitigation required will be further reviewed after a new site visit and socio-economic surveys are undertaken in support of the LRP.

#### **8.9.1.7 Increased presence of workers and interaction with local communities**

The Community Health and Safety Plan will be developed as a mitigation measure for unplanned worker migration and the presence of workers in the Project area. It will encompass:

- An induction for workers, that provides awareness training on communicable disease prevention (Covid-19), focusing on unplanned interaction with nearby community members.
- Ensure health screening is being conducted for employees and contractors before contracting workers and on a periodic basis throughout their employment/contract.
- Identify opportunities to support local public health campaigns that focus on prevention of communicable diseases.
- Enforce and monitor a zero-alcohol tolerance policy, including current intoxication, for workers during working hours and perform random alcohol testing through periodical screen before and / or after leaving the site. Include this policy on contractors' agreements.
- Training on the Project's goals to establish good relationships with local stakeholders, avoid unnecessary conflict with any inhabitant by respecting human rights and being acknowledgeable of culture differences.

To reduce adverse effects of influx the Project will develop an Influx Management Plan. This Plan must include, at a minimum, the following:

- Preference for hiring of people who are already established residents of local communities. Apply a mechanism to verify where job applicants come from (e.g. checking ID cards) so that jobs prioritised for members of local communities are not given to in-migrants;
- Prohibition of at-gate hiring to reduce the number of people waiting at and around the Project site.
- Working with local government in in-migration hot spots and building their capacity in dealing with impacts.
- Reviewing the range of management plans which will deal with in-migration impacts and ensuring each Project department is putting in place the required measures.
- Monitor in-migration impacts with local government and continue to provide capacity building support and report on findings.
- Suggestions on education campaigns and capacity-building training to the PACs on the dangers of alcoholism, drug abuse, domestic violence, prostitution and safe sex; and
- Ongoing engagement with the local communities to identify and respond to any grievances related to influx.

#### 8.9.1.8 Increased presence of security personnel

The Security Management Plan will make sure that security personnel or contractor personnel are trained on the Project's goals to establish good relationships with local stakeholders, according to IFC PS4. These training will seek to avoid unnecessary conflict with any local person and establish the operational area of the security personnel solely within the Project site boundary. The Plan will include actions leading to the full implementation of the Voluntary Principles on Security and Human Rights, UN Basic Principles on the Use of Force and Firearms by Law Enforcement Officials, the UN Code of Conduct for Law Enforcement Officials and the International Code of Conduct on Private Security Providers.

The Plan will consider a procedure to log all security incidents, which will be investigated, and any security grievances will be identified and actioned.

#### 8.9.1.9 Occupational health and safety impacts and impacts to Project workforce

The Project Developer and its contractors will comply with appropriate international Occupational Health & Safety regulations and standards in addition to Uzbek 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<sup>94</sup>. Furthermore, the EPC Contractor will be required to demonstrate and implement a suitable management system which conforms to the standards equivalent to ISO 9001, ISO 14001 and OSHAS 18001. This be a key contractual requirement and will be monitored by the Developer.

Both the Developer shall commission an independent Labour Assessment undertaken by a qualified labour specialist, which shall include a corrective action plan with appropriate mitigation and remediation measures as well as monitoring requirements that will be implemented by the Project and its subcontractors.

Furthermore, a single Operation Health and Safety Management Plan will be developed for both construction and operational phases and will bring together the mitigation requirements discussed in preceding sections. This will apply to all parties. The document will also outline emergency preparedness and response along with a grievance mechanism to ensure that feedback is acknowledged and addressed appropriately.

- The OHS Plan will include specific measures to prevent and mitigate Covid-19, including: Induction for workers, awareness training on communicable disease prevention, and OMS precaution recommendations on COVID -19.

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<sup>94</sup> IFC (2007a)

- Training on an ongoing basis on communicable disease and hygiene equipment, the correct use of Personal Protective Equipment, and in policies and procedures on health, safety and environment (e.g., aerial work, electrical safety, excavation safety, social distancing measures).
- Health screening on a periodic basis for employees and / or it will describe the parameters that contractors will comply on health monitoring to avoid the spread of communicable diseases and / or COVID-19.

In addition, the Developer and all its contractors will be required to establish Safety Policies and Procedures for construction phase. The following policies and procedures are listed as examples for the Project development:

- Develop an Emergency Response Plan (ERP) - this plan will be developed in conjunction with the Occupational Health and Safety Plan and Community Health and Safety Plan. The ERP will include the identification of areas where accidents and emergency situations may occur, communities and individuals that may be impacted, response procedures, provision of equipment and resources, designation of responsibilities, communication, including that with potentially affected communities and periodic training and capacity building (where applicable) to ensure effective response. The ERP activities will be periodically reviewed and revised, as necessary, to reflect changing conditions..
- Safety Reporting including incident occurrences, which will be outlined and implemented by the Project Developer and EPC.
- Stop Work Policy
- Supplementary to both Plans, and the Safety Policies and Procedures, the Developer will identify opportunities to support local public health campaigns that focus on prevention of diseases.

#### **8.9.1.10 Increased levels of gender-based violence, sexual exploitation and harassment**

The Worker Code of Conduct shall:

- Direct Project Workers on appropriate behaviours to help avoid negative interactions with local communities and promote a positive working environment;
- Prohibit violence, discrimination, sexual exploitation, harassment, bullying, and promote equal opportunity;
- Require all project staff to adhere to safety measures;
- Prohibit working under the influence of alcohol and prohibited drugs;
- Prohibit intimidation, offensive language and behaviour, prostitution, or sexual harassment when carrying out project activities (e.g. driving project vehicles), working on Project sites or in local communities;
- Detail a mechanism for safe reporting of violations of these prohibitions and ensure investigation of any reported incidents; and
- Ensure serious actions are taken up to and including dismissal of the worker and referral of cases to the local police when there is evidence of criminal acts.

The Worker Code of Conduct will be provided to all Project workers before they sign their contract of employment, and the contract of employment must state that the project Worker agrees to abide by the Worker Code of Conduct.

Training on the Worker Code of Conduct will be provided to all members of staff irrespective of their seniority or department, emphasising the prohibition on violence between Project workers, as well as provide education about how their behaviours could contribute to different types of domestic violence and harassment, including GBVSEH and economic and social violence. This programme will be designed to be culturally appropriate for the audience, and will be delivered initially through the induction programme as well as through toolbox talk topics, workplace posters and presentations.

## 8.9.2 Operation Phase

### 8.9.2.1 Community expectations of the Project

The need for local labour will vary throughout the Project duration, which could raise expectations of economic opportunities above actual Project workforce demand. As a result, the Stakeholder Engagement Plan will consider an inclusive communication program that will emphasize accurate employment estimates, timeframes and skills requirements with a clear local content target. This Plan includes a description of the responsibilities of Project staff and an organization chart related to the engagement activities. It will outline the recruitment strategy and processes to promote transparency and participation of the local population, including women.

### 8.9.2.2 Increased local employment, capacity building and supply demand

There will be approximately 25 workers employed during operation and the impact is not of a level that requires any specific mitigation or enhancement measures. However, the Project is in a leading position to develop skills through vocational training and other activities throughout the lifetime of the Project, particularly of residents within the Project AoI, leading to enhanced level of education, competency, and greater ability of the skilled workforce. Additionally, skills and vocational development will give local staff greater ability to find similar work in the future after their involvement in the Project is complete, increasing social mobility.

### 8.9.2.3 Increased presence of security personnel

Results from the Security Management Plan will be evaluated by the Developer and, if applicable, by local people. The assessment results will consider recommendations to improve relationships with local stakeholders, and best practices on human rights and cultural sensitivity training.

### 8.9.2.4 Occupational health and safety impacts and impacts to Project workforce

Further to social mitigation and enhancement measures developed in both phases, a grievance mechanism will be developed and implemented under IFC PS 1. This will provide a communication platform to identify, address, and monitor communities' concerns on the social impacts considered in this ESIA.

### 8.9.2.5 Potential for gender-based violence, sexual exploitation and harassment

Continued implementation of mitigation measures introduced during the construction phase.

## 8.10 Transportation and Access

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

- Carry out a route survey and identify the approximate numbers, sizes, and capacity of the vehicles required for the Project, identify sensitive E&S receptors, select the suitable roads and access routes and confirm the upgrades required to accommodate the Project traffic load and any associated E&S impacts and define additional mitigation measures.
- 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 will include parking for up to 40 light vehicles including 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 en-route and ensure all drivers are aware of these.
- It is recommended that the route for use by HGVs is verified through further assessment (including a route inspection undertaken prior to construction). Consultation with the relevant Roads Authority is recommended to further identify the most appropriate route and any permits or additional mitigation measures required.

The transportation of equipment and materials to site from the border with China utilises paved highways and dual carriageways which are suitable for and regularly used by HGV vehicles. Upgrade works may be required for several roads in the vicinity of the Project site due to the presence of potholes and poorly maintained bridges. This would be verified through further route inspection prior to construction.

Mitigation has been proposed to alleviate potential impacts and these measures will be incorporated into a Construction TMP for use prior to and during construction.

Overall, the assessment concludes that there will be no significant residual effects associated with transportation of materials and equipment during the construction and operation phases of the Project.

### 8.10.1 Construction Phase

#### 8.10.1.1 Vehicle and Plant Requirements

##### Operator Authorisation

A person may only operate a vehicle or item of plant on the Project if they:

- Hold the appropriate licence (or statement of attainment for plant not covered by a licence) for the class of vehicle/plant being operated.
- Have completed the Project induction.
- Have undertaken a verification of competency assessment and been approved by a content expert.
- Are fit for work.
- Are under escort of an authorised person where access to work fronts is required (Delivery Drivers & Visitors only).

##### Vehicle and Plant Specifications

All vehicles and mobile plant must be fit for purpose and maintained to a safe and legal standard at all times, including roadworthy standards for vehicles and plant intended for use on a public road.

- **Seat Belts:** Occupants of any vehicle shall use seatbelts at all times. Where it is impossible to implement the requirement for buses or coaches or car, the minimum requirements are that the seat belts are fitted for driver, front seats and seats adjacent to doorway. Passengers should not occupy such seats if seatbelts are not fitted or functional.
- **Condition of Tyres:** The tread depth of all tyres including the spare shall not be less than 1.6 mm, or below the Tread Wear Indicator (TWI) embedded in tyres at the time of manufacturing. This applies to the whole area of the tyre. Tyres (including spare tyres) need to be maintained at the correct operating pressure.
- **Pre mobilisation inspection:** Prior to mobilisation, all vehicles shall be inspected by the HSE Safety Inspector and/or other agencies designated at site to verify compliance and will include all contractors and sub-contractors. Vehicles not meeting the requirements will be rejected. Vehicles

shall be fit for purpose based on an assessment of usage, maintained in a safe working order in line with the manufacturers' specifications, servicing intervals and local legal requirements. Vehicles shall meet emission specifications as applicable in the country.

- **Light Vehicles:** All Vehicles as a minimum shall be fitted with working head lights, rear lights & brake lights, good tyres, seat belts, driver and passenger side mirrors, rear view mirror, reversing alarm, spare wheel and tyre.
- **High Visibility Colour:** High visibility colour should be preferred for light vehicles. Generally, bright light colours are better than darker colours as they reflect lighter and can be seen from up to four times the distance of vehicles painted in a darker colour.
- **Authorisation:** A sticker system is being developed showing vehicles inspected and approved for use and will be added once it is ready. There are no current plans have a requirement to use GPS/tracking. Only authorised vehicles will be permitted within the site area. Other vehicles shall require to be parked in the designated parking area.
- **Heavy Vehicles:** In addition to the above minimum requirements given for light vehicles, additional appropriate equipment shall be installed / provided in heavy vehicles.
- **Mobile plant in areas of operation within the project worksite shall be fitted with the equipment including A flashing amber warning beacon clearly visible to approaching persons and traffic; an audible reversing alarm and emergency stop buttons.**
- **Grievances:** A telephone number will be provided on Project vehicles to allow grievances to be reported.

#### 8.10.1.2 Site Rules and Regulations

##### Site Security and Access

The Project site will be secured with a fenced perimeter boundary. There will be one main entry and exit point. Security measures will be taken to ensure the safety of the site as detailed in the Site Security Management Plan.

As a minimum, to enter the Project area it is expected that all workers meet the requirements of the Code of Conduct.

Delivery drivers and visitors can enter Project construction area without the above requirements if they are escorted by a person who is authorised to operate on the Site.

All persons will wear the site-specific PPE at all times (e.g. helmets, safety boots and high visibility clothing, gloves etc.) including delivery drivers. Any delivery driver failing to adhere to this will be refused access to the Site.

##### Signage

All appropriate signage will be installed for the direction of construction-related traffic and the safety of pedestrians.

Temporary and permanent signage on site should be positioned for maximum visibility to inform operators of speed restrictions, warnings and other critical traffic information for the area. Signage outside the Project site during construction must be in accordance with required specifications.

##### Speed Restrictions

The following speed restrictions apply across the Project site:

- Site entry/exit – 20km/h.
- Laydown areas – 5 km/h.
- Satellite facilities and carpark – 5km/h.
- Main car park – 10km/h.

- Access roads – 30km/h or as Sign Posted.

Any adjustments to speed limits will be communicated via updated TMP and daily toolbox talks.

### 8.10.1.3 Right of Way

Emergency vehicles entering the Project site will have right of way at all times. Additionally:

- Mobile plant shall have right of way over heavy and light vehicles.
- Light vehicles shall give way to mobile plant and heavy vehicles.
- Pedestrians shall give way to all vehicles and mobile plant.

### 8.10.1.4 Internal Traffic Management

When assessing traffic-related risks, considerations should include (but not be limited to):

- Passing of high vehicles and loads under overhead power lines.
- Maintaining forward motion of vehicles and plant wherever possible to reduce reversing on site.
- Parking locations which do not obstruct access.
- Access for emergency vehicles.
- Unobstructed access to emergency assembly areas.
- Adequacy and visibility of signage.
- Delineation between mobile plant and pedestrians using physical barriers.
- Clearance from nearby infrastructure.

Supervisors will meet daily to plan and review construction works for the following day and where required will communicate any changes in traffic management for activities under their supervision via pre-start meetings.

### 8.10.1.5 Pedestrian Delineation

Adequate separation between vehicles and pedestrians will be established to ensure safety or, where not reasonably practicable, other means of protecting pedestrians and effective arrangements for warning, persons liable to be crushed or trapped by a vehicle, of its approach.

Pedestrian accesses which lead on to a traffic route will be sufficiently separated to enable them to see approaching plant and vehicles, from a place of safety.

Signage will be implemented to advise of unrestricted pedestrian areas and exclusion zones. Signage for exclusion zones and restricted access areas must identify the area supervisor to be contacted in the case of persons requiring entry into the area.

## 8.10.2 Operational Phase

Operational effects are likely to be minimal and limited to repair and maintenance work. No specific mitigation is required for operations although the general mitigation discussed for the construction phase would apply.

## 8.10.3 Decommissioning Phase

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. It is unlikely however to present any significant effects. Mitigation would be similar to construction phase.

## 8.11 Waste Management

AECOM identified that the nearest landfill is located approximately 12-15 km from the site in Chayanli makhalla. There are no recycling facilities at this landfill but it accepts all types of wastes, including

construction wastes. Another landfill is located approximately 30 km from the project site. Stakeholder meetings suggest that there are no local licensed companies for further treatment or recycling of hazardous wastes. The Project Company shall seek to identify hazardous waste management facilities outside the Project area and these will be used as appropriate.

The Project company shall develop a hazardous material and waste management plan for the management of non-hazardous waste, hazardous waste and wastewater during construction and operation of the Project. The plan shall define specific measures for damaged or end of life solar PV panels during both construction and operations. In addition, the Project company shall:

- Confirm that all waste contractors are licensed and that the required contracts are in place.
- Assess the availability of appropriate waste management facilities outside the Project area especially recycling and hazardous waste management facilities.
- Identify and confirm the adequacy of final disposal facilities including landfills to manage municipal and construction waste, licensed hazardous waste management facilities to handle hazardous wastes, wastewater treatment facilities and recycling facilities.

#### 8.11.1 Construction Phase

The potential for soils, water and groundwater contamination associated with waste disposal will be reduced through the reduction of wastes to the extent possible whilst maximising the re-use and recycling of materials, noting current lack of recycling facilities. All waste and rubbish will be collected and stored before disposal in at a suitably licensed site. The EPC contractor shall seek to identify hazardous waste management facilities outside the Project area and these will be used as appropriate.

The Project company (or EPC Contractor as appropriate) will:

- Develop a hazardous material and waste management plan for the management of non-hazardous waste, hazardous waste and wastewater during construction and operation of the Project. The plan shall define specific measures for damaged or end of life solar PV panels during both construction and operations.
- Confirm that all waste contractors are licensed and that the required contracts are in place.
- Assess the availability of appropriate waste management facilities outside the Project area especially recycling and hazardous waste management facilities.
- Identify and confirm the adequacy of final disposal facilities including landfills to manage municipal and construction waste, licensed hazardous waste management facilities to handle hazardous wastes, wastewater treatment facilities and recycling facilities.

#### 8.11.2 Operation Phase

Mitigation implemented during the construction phase will be applied but it is noted that waste volumes will be significantly lower during operation.

#### 8.11.3 Decommissioning Phase

Mitigation implemented during the construction phase will be applied and it is noted that waste volumes may be comparable to construction.



## 9. Residual Impacts

### 9.1 Construction Impacts

The assessment has been undertaken in accordance with the methodology and assessment criteria set out in Section 4 (Assessment Methodology). The residual impacts are assessed following the implementation of mitigation as described in Chapter 8.

#### 9.1.1 Air Quality

Impact Assessment: Impacts on air quality during construction				
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	Residential receptors are located within 250 m of the Project site therefore receptor sensitivity is determined to be Medium.			
Impact Magnitude	No change	Negligible	Low	Medium
	Magnitude of change is anticipated to be Medium as there is likely to be an increase in levels and dust to air associated with construction of the Project at nearby residential receptors.			
Impact Significance	None	Negligible	Low	Medium
	The potential impact during construction is considered to be Medium adverse, on the basis that residential receptors are within 200m of the site boundary but construction vehicles would pass closer to and from site. The implementation of Good International Industry Practise pollution prevention measures is considered very likely to reduce the impacts. However, additional mitigation measures are therefore required.			
Residual Impact Significance post mitigation	None	Negligible	Low	Medium
	The implementation of Good International Industry Practise pollution prevention measures is considered very likely to reduce the impacts to Negligible.			

#### 9.1.2 Archaeology and Cultural Heritage

Impact Assessment: Impacts on archaeology and cultural heritage during construction				
Receptor Value / Sensitivity	Low	Medium	High	
	There are no known heritage assets within the Solar Array area. Possible remains of levelled burial mounds (kurgans) have been identified in the vicinity of the Transmission Line and associated burials and ceremonial features may be present.			
Impact Magnitude	No change	Low	Medium	High
	The magnitude of change is anticipated to be medium as there is localised potential to physically disturb any surviving archaeological remains. Setting impacts are low due to lack of views, intervening distance and topography.			
Impact Significance	None	Negligible	Low	High
	The impact is assessed as Low and not significant prior to additional mitigation measures being implemented.			
Residual Impact Significance post mitigation	None	Negligible	Low	High
	The residual impact is assessed as Negligible and not significant following mitigation measures being implemented.			

#### 9.1.3 Biodiversity

##### 9.1.3.1 Avifauna

Impact Assessment: Impacts on Great Bustard ( <i>Otis tarda</i> ) during Construction –Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species.				
	Negligible	Low	Medium	High

<b>Impact Assessment: Impacts on Great Bustard (<i>Otis tarda</i>) during Construction –Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species.</b>				
Receptor Value / Sensitivity	This species, which is Critically Endangered nationally, is assigned a ‘High’ sensitivity value			
Impact Magnitude	Negligible	Low	Medium	High
	Given the unsuitability of the Project site for foraging/resting/roosting great bustard and the relative remoteness of the nearest great bustard records identified by TYPISA/IFC (2021), the impact magnitude is assessed as Negligible.			
Impact Significance	None	Negligible	Low	Medium
	The impact is assessed as Low and not significant			
Residual Impact Significance post mitigation	None	Negligible	Low	High
	The residual impact will be informed by the mitigation measures detailed in the BAP. There is a requirement for the project to achieve a Net Gain for CHs. As a result the project will result in a Low positive for CH qualifying species.			

<b>Impact Assessment: Impacts on ornithology (PBF species) – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas’s Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinerous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara</b>				
Receptor Value / Sensitivity	Negligible	Low	Medium	High
Impact Magnitude	<p>The PBF bird species which have been recorded as present or assessed as having a reasonable likelihood of occurrence are not critical habitat qualifying species and are therefore not of very high or high sensitivity according to the criteria detailed above. In terms of the PBF species which have been recorded, these have been recorded in numbers which are not significant and are assigned a Medium sensitivity value.</p> <p>No species listed as qualifying features of the Tuzkan Lake IBA were recorded during the AECOM field surveys. Very small numbers of Dzhum-Dzhum IBA qualifying species were recorded within the Project site (cinereous vulture and bearded vulture), however the numbers recorded are unlikely to be significant (defined as &gt;1%) of the IBA population.</p> <p>The project does not support breeding populations for PBF birds and the habitat is not suitable for these species.</p> <p>Sociable lapwing (IUCB [CR]) has the potential to occasionally overfly the project site on spring and autumn passage (the species was assessed as likely absent as a result of the targeted surveys for this species). However, there is no reasonable likelihood that the project is located on a significant migratory corridor for this species and the sensitivity is assessed a Low.</p> <p>Houbara bustard (IUCN [VU]) has been shown to be likely absent from the Solar PV and the Overhead Line, as a result of the targeted breeding surveys for this species undertaken by AECOM. The sensitivity for this species is therefore is determined as Low.</p>			
	<p>For the Solar PV the magnitude of the effect is predicted to be Negligible for breeding PBF birds given their likely absence from the Solar PV Project site. The magnitude of the effect is predicted to be Low for non-breeding birds PBF raptor species overflying on spring and autumn migration, in terms of disturbance displacement (barrier to movement) during the construction phase.</p> <p>The magnitude of the effect for the Overhead Line is expected to be Negligible in terms of breeding by PBF birds considering the likely absence of nest sites at the areas to be cleared within the respective very localised pylon footprints. The magnitude of the barrier</p>			

<b>Impact Assessment: Impacts on ornithology (PBF species) – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinerous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara</b>					
	effect is predicted to be Low for non-breeding birds PBF raptor species overflying the AOI on spring and autumn migration, in terms of disturbance displacement (barrier to movement) during the construction phase.				
Impact Significance	None	Negligible	Low	Medium	High
	As a result, the impact is assessed as Negligible and Low for PBF bird species and not significant for the Solar PV and the Overhead Line, respectively.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The residual impact will be informed by the mitigation measures detailed in the BAP. There is a requirement for the project to achieve No Net Loss of species defined as PBFs and a Net Gain for CHs. As a result the project will result in a residual impact of Negligible for PBFs.				

<b>Impact Assessment: Impacts on ornithology (non PBF species) during construction</b>					
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	The Solar PV footprint supports a limited assemblage of breeding species which are not of international or national conservation concern. Small numbers of Eurasian curlew (IUCN NT) were recorded on a single occasion during the spring passage period, however there is no reasonable likelihood that the project is sited on a key stopover or migratory corridor for this species.				
	This ornithological receptor has been assessed as Low value. ,				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of the effect for the Solar PV site is predicted to be Medium given the area of the site that will require to be cleared and / or disturbed and that there is potential for loss/damage to eggs and nests of common ground nesting birds if site clearance occurs during the breeding bird season. The magnitude of the effect for the Overhead Line is expected to be Low as the areas to be cleared within the respective pylon footprints will be very localised. Therefore, the magnitude of the effect for the Project site is assessed as Medium (overall).				
Impact Significance	None	Negligible	Low	Medium	High
	As a result, the impact is assessed as Low and not significant, however it is recommended standard mitigation measures are implemented to ensure impacts remain minimal.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The residual impact is predicted to be Negligible and not significant.				

### 9.1.3.2 Terrestrial Ecology

<b>Impact Assessment: Impacts on terrestrial ecology (PBF species) during construction – Central Asia Tortoise, Transcaspan Desert Monitor, Northern (Barred) Wolf Snake and Tatar Sand Boa</b>					
Receptor Value / Sensitivity	Low	Medium	High		
	A single species of conservation concern was recorded: Central Asian tortoise (IUCN VU, Red Data Book of Uzbekistan). However, there is no reasonable likelihood that the tortoise population occurring within the Project site is of regional importance as the modified cultivated habitats within the site support a small population of tortoises (the 0.31 ind/hectare population density which has been determined is significantly lower than for areas of Uzbekistan which support the highest population densities).				

<b>Impact Assessment: Impacts on terrestrial ecology (PBF species) during construction – Central Asia Tortoise, Transcaspien Desert Monitor, Northern (Barred) Wolf Snake and Tatar Sand Boa</b>						
	<p>There are anecdotal records of tatar sand boa within the Solar PV site (Red Data Book of Uzbekistan), but there is no reasonable likelihood that regionally significant populations occur as the modified habitat does not represent optimal habitat for this species&gt; The sensitivity of this receptor is assessed as Low.</p> <p>Transcaspien desert monitor and northern (barred) wolf snake have the potential to occur within the project site and the sensitivity for these species is assessed as no more than Low.</p> <p>The sensitivity of this receptor is assessed as Low overall.</p>					
Impact Magnitude	<table border="1"> <tr> <td>No change</td> <td>Negligible</td> <td>Low</td> <td><b>Medium</b></td> <td>High</td> </tr> </table> <p>The magnitude of the effect is predicted to be Medium given the area of the Project site that will require to be cleared and / or disturbed and there is the potential for loss/mortality of these PBF reptile species. The magnitude of the effect for the Overhead Line is expected to be Low, as the areas to be cleared within the respective pylon footprints will be very localised.</p> <p>Therefore, the magnitude of the effect for the Project site is assessed as Medium (overall).</p>	No change	Negligible	Low	<b>Medium</b>	High
No change	Negligible	Low	<b>Medium</b>	High		
Impact Significance	<table border="1"> <tr> <td>None</td> <td>Negligible</td> <td><b>Low</b></td> <td>Medium</td> <td>High</td> </tr> </table> <p>As a result, the impact is assessed as Low and not significant. There is a requirement for the project to achieve No Net Loss of species defined as PBFs. A suite of both standard mitigation measures will be implemented to endure impacts are reduced to Low significance or below<sup>95</sup>.</p>	None	Negligible	<b>Low</b>	Medium	High
None	Negligible	<b>Low</b>	Medium	High		
Residual Impact Significance post mitigation	<table border="1"> <tr> <td>None</td> <td><b>Negligible</b></td> <td>Low</td> <td>Medium</td> <td>High</td> </tr> </table> <p>The residual impact will be informed by the mitigation measures detailed in the BAP. There is a requirement for the project to achieve No Net Loss of species defined as PBFs and a Net Gain for CHs. As a result the project will result in a residual impact of Negligible for PBFs.</p>	None	<b>Negligible</b>	Low	Medium	High
None	<b>Negligible</b>	Low	Medium	High		

<b>Impact Assessment: Impacts on other terrestrial ecology (non PBF species) during construction</b>				
Receptor Value / Sensitivity	<table border="1"> <tr> <td><b>Low</b></td> <td>Medium</td> <td>High</td> </tr> </table> <p>The abundance and diversity of terrestrial fauna within the Solar PV site and Overhead Line route was found to be low.</p> <p>The AECOM 2021 and 2022 field surveys confirmed that the plant and animal species (other than PBF reptile species) recorded within the proposed project site during the AECOM field surveys are not of conservation concern.</p> <p>The sensitivity of the terrestrial habitat within the Solar PV has therefore been assigned as Low in terms of faunal species.</p> <p>The historic cultivated land that prevails within the Solar PV site is Modified Habitat as defined in PS6. Spiny cocklebur and Isirik are noxious weeds and are prominent</p>	<b>Low</b>	Medium	High
<b>Low</b>	Medium	High		

<sup>95</sup> For example: NetRegs (2020). Guidance for Pollution Prevention (GPP). Available at: <https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-pgps-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>



Impact Assessment: Impacts on other terrestrial ecology (non PBF species) during construction					
	<p>components of the weed flora; the former is an introduced species. The Overhead Line route crosses mainly intensively cultivated and irrigated farmland habitat; it is Modified Habitat as defined in PS6. Degraded Natural Habitat occurs near the south-eastern end of the Overhead Line between the Sanzar river valley and the existing sub-station terminus; habitat near the sub-station has been disturbed/damaged during the historic construction of the sub-station and associated power-lines. The habitat within the Project site is therefore assessed as Low value.</p>				
Impact Magnitude	No change	Negligible	Low	Medium	High
	<p>The magnitude of the effect is predicted to be Medium given the area of the Project site that will require to be cleared and / or disturbed.</p> <p>The magnitude of the effect for the Solar PV site is predicted to be Medium given the area of the site that will require to be cleared and / or disturbed and that there is potential for loss/mortality of reptiles and small mammals. The magnitude of the effect for the Overhead Line is expected to be Low, as the areas to be cleared within the respective pylon footprints will be very localised. Therefore, the magnitude of the effect for the Project site is assessed as Medium (overall).</p>				
Impact Significance	None	Negligible	Low	Medium	High
	<p>As a result, the impact is assessed as Low and not significant. A suite of both standard mitigation measures<sup>96</sup> and species-specific mitigation measures will be implemented to ensure impacts are reduced to Low significance or below.</p>				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	<p>The residual impact is predicted to be Negligible and not significant.</p>				

## 9.1.4 Hydrology and Hydrogeology

### 9.1.4.1 Surface Water

Impact Assessment: Impacts on surface water during construction					
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	<p>The sensitivity of surface water is assessed as medium, recognising the fact that only a small number of local residents use this watercourse for irrigation and drinking water for livestock.</p>				
Impact Magnitude	No change	Negligible	Low	Medium	High
	<p>The magnitude of the effect is predicted to be low given the limited area of the Project site in relation to the overall catchment area.</p>				
Impact Significance	None	Negligible	Low	Medium	High
	<p>As a result, the significance of the impact is assessed as low. The extent of reduced surface water quality due to construction activities is considered local, and the duration assessed as being temporary and short-term. Good International Industry Practise pollution prevention measures will be implemented, reducing the impact further.</p>				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	<p>Good International Industry Practise pollution prevention measures will be implemented, reducing the impact further.</p>				

### 9.1.4.2 Groundwater

Impact Assessment: Impacts on groundwater during construction					
	Negligible	Low	Medium	High	

<sup>96</sup> For example: NetRegs (2020). Guidance for Pollution Prevention (GPP). Available at: <https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-pgps-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>

Impact Assessment: Impacts on groundwater during construction					
Receptor Value / Sensitivity	The sensitivity of groundwater is assessed as high, recognising the fact that local communities abstract groundwater for domestic use from local wells.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of the effect is predicted to be low, given that the soil and superficial deposits present in the area are expected to provide protection to the groundwater.				
Impact Significance	None	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Moderate adverse, on the basis that local communities abstract groundwater for domestic use. The implementation of Good International Industry Practise pollution prevention measures is considered to make the contamination of groundward very unlikely.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	Good International Industry Practise pollution prevention measures will be implemented, reducing the impact further.				

### 9.1.5 Labour and Working Conditions

Impact Assessment: Occupational health and safety impacts during construction					
Receptor Value / Sensitivity	Low	Medium	High		
	The receptors in this case are the construction workers. Masdar estimate the peak number of workers in construction will be 535, and each individual is of high value/sensitivity.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Occupational health and safety impacts could result in disease, injury, or death to workers and so the magnitude is high.				
Impact Significance	None	Negligible	Low	Medium	High
	Pre-mitigation, the impact is assessed as High and significant.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	Through the full implementation of the ESMS. ESMP and appropriate policies, the residual impact is predicted to be Low.				

### 9.1.6 Landscape and Visual

Impact Assessment: Impacts on Landscape Character					
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	The sensitivity this landscape is assessed to be Low as it is not important in a local context. It is noted that the landscape is not designated at the local or national level and is influenced by man-made features.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of the effect is predicted to be low, as it is unlikely that construction works become the dominant feature in an area already impacted by human activity.				
Impact Significance	None	Negligible	Low	Medium	High
	As a result, the significance of the impact is assessed as low. Although impacts will be visible in places, the surrounding features are often of a larger scale in height and extent. Therefore, changes can be easily accommodated.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	As changes can be easily accommodated in the landscape, no further mitigation is proposed.				

Impact Assessment: Impacts on Visual Amenity					
	Negligible	Low	Medium	High	

Impact Assessment: Impacts on Visual Amenity				
Receptor Value / Sensitivity	The sensitivity of the site is assessed to be Medium because the land at which the Project is located is flat, with very few trees, hedges or fences to obscure visibility, and as such visibility can extend for several kilometres.			
Impact Magnitude	No change	Low	Medium	High
	The magnitude of the effect is predicted to be low, because the visual impact of ground-level features is likely to be low, except at close range, due to the lack of vantage points overlooking the landscape.			
Impact Significance	None	Negligible	Low	High
	As a result, the significance of the impact is assessed as low. Although impacts will be visible in places, the surrounding features are often of a larger scale in height and extent. Therefore, changes can be easily accommodated.			
Residual Impact Significance post mitigation	None	Negligible	Low	High
	As changes can be easily accommodated in the landscape, no further mitigation is proposed.			

### 9.1.7 Noise

Impact Assessment: Impacts on noise during construction				
Receptor Value / Sensitivity	Negligible	Low	Medium	High
No residential receptors are located within 200 m of the Project site therefore receptor sensitivity is determined to be high.				
Impact Magnitude	No change	Negligible	Low	High
	Magnitude of change is anticipated to be high as there is likely to be an increase in noise levels and dust / emissions to air associated with construction of the Project at nearby residential receptors.			
Impact Significance	None	Negligible	Low	High
	The potential impact during construction is considered to be Low adverse, on the basis that no residential receptors are within 200m of the site boundary. The implementation of Good International Industry Practice pollution prevention measures is considered very likely to reduce the impacts further.			
Residual Impact Significance post mitigation	None	Negligible	Low	High
	The potential impact during construction is considered to be Low adverse. Other than the implementation of GIIP, no further mitigation is proposed.			

### 9.1.8 Socio-economic Impacts

#### 9.1.8.1 Economic displacement

Impact Assessment: Economic displacement				
Receptor Value / Sensitivity	Negligible	Low	Medium	High
The receptor value is low given that leaseholders along the OTL will have sufficient land remaining.				
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium as there is the potential to result in limited economic resettlement for a small number of residents within the Project Aol.			
Impact Significance	Negligible	Low	Medium	High
	The overall impact significance is Medium. This is an adverse and specific mitigation in the form of cash compensation and livelihood restoration has been developed as part of the LRP.			
Residual Impact Significance post mitigation	Negligible	Low	Medium	High
	The residual impact is predicted to be Low.			

### 9.1.8.2 Community expectations of the Project

Impact Assessment: Community expectations of the Project				
Impact Magnitude	Negligible	Low	Medium	High
	Jizzakh is a predominantly rural area and thus its population may not have a clear understanding of the employment opportunities created by industrial development. However, the levels of unemployment in the Jizzakh region are the lowest in the country and therefore expectations may be lower at the regional level. Therefore, the impact magnitude is medium at the local level (<5km) but reducing to Low at the regional level.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor value is low given that local communities and local economically active population are not depending on this Project specifically as their main source of income. However, this impact has the potential to increase unmanaged expectations among the unemployed and more vulnerable groups.			
Impact Significance	Negligible	Low	Medium	High
	The overall impact significance is Low. This is an adverse impact and the ongoing consultation and dissemination of Project information through the SCA and LRP process will be included in the Stakeholder Engagement Plan. This impact will be continuously managed throughout the construction phase (and ongoing operation phase).			
Residual Impact Significance post mitigation	Negligible	Low	Medium	High
	Although the ongoing consultation and dissemination of Project information will be managed through the SCA and LRP process and the Stakeholder Engagement Plan, this impact will be continuously managed throughout the construction phase (and ongoing operation phase). As a result, residual impacts will remain Low.			

### 9.1.8.3 Loss of public access and reduced mobility through local paths

Impact Assessment: Impacts from a loss of public access to footpaths inside the project area				
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium as the limited number of people who currently use the access tracks will not be able to access alternative tracks or roads to reach their destination.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The impact magnitude is medium as there are no alternative routes of similar distance easily available but there is an abundance of other land which is easily accessible. The path is only used regularly by one herder.			
Impact Significance	Negligible	Low	Medium	High
	The impact significance is assessed as medium, primarily because the local herders and community members will need to adapt and readjust to their new timings and distances compared to baseline conditions. This will be assessed further as part of the LRP			
Residual Impact Significance post mitigation	Negligible	Low	Medium	High
	The residual impact is predicted to be Low.			

### 9.1.8.4 Reduced access to grazing and pastoral land

Impact Assessment: Reduced access to grazing and pastoral land				
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium as the impact is perceptible to the local herders and will represent a relevant change to their baseline conditions in terms of local grazing areas.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The impact magnitude is Medium because no grazing will be available of the Solar PV area and there are no alternative routes of similar distance. However only one herder is known to be using the path on a regular basis and he has confirmed that he has access to other land. Other local herders may need to adapt to a new farming area and will need to travel around the Solar PV Area to access grazing areas to the north of the site. .			
	Negligible	Minor	Medium	High



Impact Assessment: Reduced access to grazing and pastoral land				
Impact Significance	The impact is assessed as medium significance primarily because the local herders will need to adapt and readjust to their new timings and distances to access grazing land compared to baseline conditions. This will be assessed further as part of the LRP			
Residual Impact Significance post mitigation	Negligible	Low	Medium	High
	The residual impact is predicted to be Low.			

#### 9.1.8.5 Increased presence of workers and interaction with local communities

Impact Assessment: Increased presence of workers and interaction with local communities				
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium because the potential for workers to travel and interact with local residents may extend past the Project Aol. Both residents and workers may be exposed to increased health and safety risks.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is Medium as the local communities may be able to adapt to this change depending on the actual location of worker accommodation. Whereas Gallaorol will have sufficient means to adapt, other localities such as may not have the same resilience to intake a large workforce or prevent their vulnerable groups from this potential increase to community H&S risks. Depending on the workforce composition, vulnerable worker population may be more sensitive to avoiding or treating communicable diseases, and this will have to be identified as a priority during the planning stage.			
Impact Significance	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Medium pre-mitigation.			
Residual Impact Significance post mitigation	Negligible	Low	Medium	High
	The residual impact during construction is considered to be Low post-mitigation.			

#### 9.1.8.6 Increased presence of security personnel

Impact Assessment: Increased presence of security personnel				
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium because the potential for security guards to interact with local community members is a very perceptible change to the baseline conditions of ample passage and access to the site area.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is Medium as the local communities may be able to adapt to this change depending on the timing of previous disclosure of Project starting activities.			
Impact Significance	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Medium adverse, pre-mitigation.			
Residual Impact Significance post mitigation	Negligible	Low	Medium	High
	The residual impact during construction is considered to be Low post-mitigation.			

#### 9.1.8.7 Increased levels of gender-based violence, sexual exploitation and harassment

Impact Assessment: Increased levels of gender-based violence, sexual exploitation and harassment				
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is High as women and children are regarded as vulnerable receptors.			

Impact Significance	Negligible	Low	Medium	High
	The potential impact during operation is considered to be Medium adverse, pre-mitigation. It is expected that the continued implementation of specific measures introduced during the construction phase to prevent and address GBVSEH), will reduce this to Low.			
Residual Impact Significance post mitigation	Negligible	Low	Medium	High
	The residual impact during construction is considered to be Low post-mitigation.			

## 9.1.9 Traffic and Transportation

### 9.1.9.1 Effects on the Road Network

Impact Assessment: Impacts on traffic during construction					
Receptor Value / Sensitivity	Low	Medium	High		
	Although the transportation route passes a number of towns, the road is likely to have existing HGV traffic and the receptor sensitivity is determined to be low.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Magnitude of change is anticipated to be Low as the increased number of HGV movements is not expected to exceed 30% above baseline.				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Negligible and not significant. Although no specific mitigation is required, standard good construction practice will be maintained to ensure no increase in predicted impacts during construction.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	A TMP will be implemented and the residual impact will remain as Negligible.				

## 9.2 Operational Impacts

### 9.2.1 Air Quality

Impact Assessment: Impacts on air quality during operation					
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	Although residential receptors are located close to the site, none are within 250 m of the Project site therefore receptor sensitivity is determined to be Medium.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Magnitude of change is anticipated to be Negligible as almost no ground disturbance will take place.				
Impact Significance	None	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Negligible adverse, on the basis that no residential receptors are within 200m of the site boundary and almost no ground disturbance will take place.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Negligible.				

### 9.2.2 Archaeology and Cultural Heritage

Impact Assessment: Impacts on archaeology and cultural heritage during operation					
Receptor Value / Sensitivity	Low	Medium	High		
	Any remains within the project footprint will have been recorded and removed during the construction phase.				
	No change	Negligible	Low	Medium	High

Impact Assessment: Impacts on archaeology and cultural heritage during operation					
Impact Magnitude	No works will be taking place other than maintenance and security. No physical impacts on archaeological remains are predicted. The new Transmission Line will impact on the setting of heritage assets.				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and not significant.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The impact is assessed as Negligible and not significant.				

## 9.2.3 Biodiversity

### 9.2.3.1 Avifauna

Impact Assessment: Impacts on Great Bustard ( <i>Otis tarda</i> ) during Operation – Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species					
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	As stated in the Critical Habitat Assessment (Turnstone Ecology, 2022 [Appendix D]), critical habitat requirements are applicable for Great Bustard. This species is assigned a 'High' sensitivity value.				
Impact Magnitude	Negligible	Low	Medium	High	
	Loss and change of habitat for the Solar PV would be an effect of Negligible magnitude for Great Bustard considering the unsuitability for this species and absence of records during the surveys undertaken.				
	Whilst Overhead Line route is not considered to be suitable for this species as a staging or wintering habitat, it is considered possible that this species could fly over the Overhead Line when moving between wintering grounds as well as migrating between wintering and breeding habitats. This species is known to be highly susceptible to collision with overhead lines. Therefore, the impact magnitude is assessed as High for the Overhead Line.				
Impact Significance	None	Negligible	Low	Medium	High
	The potential impact is assessed as High and significant for the Overhead Line.				
	The potential impact is assessed as Low and not significant for the Solar PV.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The residual impact will be informed by the mitigation measures detailed in the BAP. There is a requirement for the project to achieve a Net Gain for CHs. As a result the project will result in a residual impact of Low positive for CH qualifying species.				

Impact Assessment: Impacts on Ornithology (PBF species) during Operation – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinerous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara				
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The PBF bird species which have been recorded as present or assessed as having a reasonable likelihood of occurrence are not critical habitat qualifying species and are therefore not of very high or high sensitivity according to the criteria detailed above. In terms of the PBF species which have been recorded, these have been recorded in numbers which are not significant and are assigned a Medium sensitivity value.			

<b>Impact Assessment: Impacts on Ornithology (PBF species) during Operation – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas’s Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinerous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara</b>			
	<p>No species listed as qualifying features of the Tuzkan Lake IBA were recorded during the AECOM field surveys. Very small numbers of Dzhum-Dzhum IBA qualifying species were recorded within the Project site (cinereous vulture and bearded vulture), however the numbers recorded are unlikely to be significant (defined as &gt;1%) of the IBA population.</p> <p>The project does not support breeding populations for PBF birds and the habitat is not suitable for these species.</p> <p>Sociable lapwing (IUCB [CR]) has the potential to occasionally overfly the project site on spring and autumn passage (the species was assessed as likely absent as a result of the targeted surveys for this species). However, there is no reasonable likelihood that the project is located on a significant migratory corridor for this species and the sensitivity is assessed a Low.</p> <p>Houbara bustard (IUCN [VU]) has been shown to be likely absent from the Solar PV and the Overhead Line, as a result of the targeted breeding surveys for this species undertaken by AECOM. The sensitivity for this species is therefore is determined as Low.</p>		
<b>Impact Magnitude</b>	Negligible	Low	Medium
	<p style="text-align: right;">High</p> <p>Loss and change of habitat for the Solar PV would be an effect of Medium magnitude for the breeding, wintering and migratory birds which utilise habitat within the working areas for breeding, roosting or foraging within the operational footprint of the Solar PV; a high proportion of the habitat will be subject to coverage by the solar panels, but only a negligible amount of the habitat taken up by the solar panel bases. Loss of habitat for the Overhead Line would be an effect of Low magnitude for breeding, wintering and migratory birds which utilise habitat within the working areas for breeding, roosting or foraging, with only small areas are taken up by transmission line infrastructure (ie. pylon bases).</p> <p>The operational Solar PV and transmission line will result in partial reduction of bird activity through the displacement of birds; this is assessed as Medium magnitude for the breeding, wintering and migratory bird assemblage. Human influences (primarily the land management) unique to each site. Consideration has been given to the Project site is already characterised by a high level of anthropogenic disturbance (primarily due to farming activities and proximity to human habitation).</p> <p>The 14.77 km Overhead Line alignment is an extensive alignment in terms of migrating birds passing through the wider Jizzakh region on a broad front and it is orientated along an approximately eastern--western alignment, which increases the potential barrier effect of the power line/pylons with respect to birds migrating through the Project site south to north (in spring) or north to south (in autumn); an eastern-western alignment is potentially more impactful in this respect (compared to a north-south alignment). The magnitude of this potential impact is assessed as Medium.</p> <p>The Project Site is not sited on a migration bottle neck or major migration route; it is not located close to a mountain pass or wetland where large numbers of migratory birds could be concentrated or sited in an area where significant populations of species of conservation concern occur. The impact magnitude for collision of birds is therefore cautionary assessed as Medium, as the predicted mortalities for species of national and international concern are unlikely to be significant in the context of the Jizzakh, Dzhum-Dzhum IBA or Uzbekistan populations.</p> <p>The assessment does not take into account the probable reduction of bird activity resulting from displacement of birds around the proposed transmission line infrastructure, assuming instead that flight activity will continue unchanged during the operational period. Also, the assessment does not take into account that a proportion of bird flights will take avoiding action</p>		



<b>Impact Assessment: Impacts on Ornithology (PBF species) during Operation – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas’s Fish Eagle, Steppe Eagle, Egyptian Vulture, Eastern Imperial Eagle, Golden Eagle, Greater Spotted Eagle, Cinerous Vulture, Eurasian Griffon Vulture, Bearded Vulture and Asian Houbara</b>					
	when flying towards the power line and therefore avoiding avoid collision with the power-line; assuming instead that all flights will result in a collision.  The impact magnitude is assessed as Medium (overall).				
Impact Significance	None	Negligible	Low	Medium	High
	The potential impact is assessed as Medium and significant for the Overhead Line  The potential impact is assessed as Low and not significant for the Solar PV.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The residual impact will be informed by the mitigation measures detailed in the BAP. There is a requirement for the project to achieve No Net Loss of species defined as PBFs. As a result the project will result in a residual impact of Negligible for PBFs.				

<b>Impact Assessment: Ornithology impacts (non PBF) during operation</b>					
Receptor Value / Sensitivity	Low	Medium	High		
	The Solar PV footprint supports a limited assemblage of breeding species which are not of international or national conservation concern. Small numbers of Eurasian curlew (IUCN NT) were recorded on a single occasion during the spring passage period, however there is no reasonable likelihood that the project is sited on a key stopover or migratory corridor for this species.  This ornithological receptor has been assessed as Low value.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Loss and change of habitat for the Solar PV would be an effect of Medium magnitude for the breeding, wintering and migratory birds which utilise habitat within the working areas for breeding, roosting or foraging within the operational footprint of the Solar PV; a high proportion of the habitat will be subject to coverage by the solar panels, but only a negligible amount of the habitat taken up by the solar panel bases. Loss of habitat for the Overhead Line would be an effect of Low magnitude for breeding, wintering and migratory birds which utilise habitat within the working areas for breeding, roosting or foraging, with only small areas are taken up by transmission line infrastructure (ie. pylon bases).  The operational Solar PV and transmission line will result in partial reduction of bird activity through the displacement of birds; this is assessed as Medium magnitude for the breeding, wintering and migratory bird assemblage. Human influences (primarily the land management) unique to each site. Consideration has been given to the Project site is already characterised by a high level of anthropogenic disturbance (primarily due to farming activities and proximity to human habitation).  The 14.77 km Overhead Line alignment is an extensive alignment in terms of migrating birds passing through the wider Jizzakh region on a broad front and it is orientated along an approximately eastern--western alignment, which increases the potential barrier effect of the power line/pylons with respect to birds migrating through the Project site south to north (in spring) or north to south (in autumn); an eastern-western alignment is potentially more impactful in this respect (compared to a north-south alignment). The magnitude of this potential impact is assessed as Medium.  The Project Site is not sited on a migration bottle neck or major migration route; it is not located close to a mountain pass or wetland where large numbers of migratory birds could be concentrated or sited in an area where significant populations of species of conservation concern occur. The impact magnitude for collision of birds is therefore cautionary assessed as Medium, as the predicted mortalities for species of national and international concern are				

Impact Assessment: Ornithology impacts (non PBF) during operation					
	<p>unlikely to be significant in the context of the Jizzakh, Dzhum-Dzhum IBA or Uzbekistan populations.</p> <p>The assessment does not take into account the probable reduction of bird activity resulting from displacement of birds around the proposed transmission line infrastructure, assuming instead that flight activity will continue unchanged during the operational period. Also, the assessment does not take into account that a proportion of bird flights will take avoiding action when flying towards the power line and therefore avoiding avoid collision with the power-line; assuming instead that all flights will result in a collision.</p> <p>The impact magnitude is assessed as Medium (overall).</p>				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and not significant.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The residual impact is predicted to be Negligible and not significant				

### 9.2.3.2 Terrestrial Ecology

Impact Assessment: Impacts on PBF species: Central Asian Tortoise, Transcaspien Desert Monitor, Northern (barred) Wolf Snake, Tartar Sand Boa					
Receptor Value / Sensitivity	Low	Medium	High		
	<p>The abundance and diversity of terrestrial fauna was found to be low. A single species of conservation concern was recorded within the proposed project site: Central Asian tortoise (IUCN VU, RDB of Uzbekistan). However, there is no reasonable likelihood that the tortoise population occurring within the Project site is of regional importance. The sensitivity of the terrestrial habitat has been assigned as Low. Other plant and animal species recorded during the AECOM field surveys are not of conservation concern.</p>				
Impact Magnitude	No change	Negligible	Low	Medium	High
	It is anticipated that there will be very limited personnel and vehicle movements within the operational Solar PV site and that maintenance visits for the transmission line will be infrequent and will involve limited personnel and vehicle movements.				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and insignificant.				
Residual Impact Significance post mitigation	The residual impact will be informed by the mitigation measures detailed in the Biodiversity Action PlanBAP. There is a requirement for the project to achieve No Net Loss of species defined as PBFs.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The residual impact will be informed by the mitigation measures detailed in the BAP. There is a requirement for the project to achieve No Net Loss of species defined as PBFs. As a result the project will result in a residual impact of Negligible for PBFs.				

Impact Assessment: Impacts on non PBF species during operation					
Impact Nature	Positive		Negative		
	Disturbance of fauna from presence of people, machinery, traffic, and noise, primarily within the operational Solar PV site, although less frequent maintenance will be required for the transmission line.				
Impact Type	Direct		Indirect		
	There are indirect impacts associated with the operation of the Project.				
Impact Duration	Temporary	Short-term	Medium-term	Long-term	Permanent
	The impacts will persist throughout operation and are therefore considered permanent.				
Impact Extent	Local		Regional	National	
	The impacts on terrestrial ecology are primarily limited to the footprint of the Project.				

Impact Assessment: Impacts on non PBF species during operation					
Receptor Value / Sensitivity	Low	Medium	High		
	The abundance and diversity of terrestrial fauna was found to be low. Plant and animal species (other than PBFs) recorded during the AECOM field surveys are not of conservation concern.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	It is anticipated that there will be very limited personnel and vehicle movements within the operational Solar PV site and that maintenance visits for the transmission line will be infrequent and will involve limited personnel and vehicle movements.				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Negligible and not significant.				

### 9.2.4 Hydrology and Hydrogeology

Impact Assessment: Hydrology and hydrogeology impacts during operation					
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	The sensitivity of surface water is assessed as medium, recognising the fact that a small number of local residents use the two watercourses adjacent to the site for drinking water for livestock. The sensitivity of groundwater is assessed as high, recognising the fact that local communities abstract groundwater for domestic use from local wells.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of the effect in relation to surface water is predicted to be low given the limited area of the Project site in relation to the overall catchment area. The magnitude of the effect in relation to groundwater is predicted to be low, given that the soil and superficial deposits present in the area are expected to provide protection to the groundwater, and that the use/handling of chemicals /oils/wastewater during operation will be limited.				
Impact Significance	None	Negligible	Low	Medium	High
	Pre-mitigation, the impact in relation to surface water is assessed as low, due to the limited extent. Pre-mitigation, the impact in relation to groundwater is assessed as moderate and significant.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The residual impact is predicted to be Low and not significant.				

### 9.2.5 Geology and Soils

Impact Assessment: Impacts on soil quality during operation					
Receptor Value / Sensitivity	Negligible	Low	Medium	High	
	The soils are considered to have a low sensitivity.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of the effect during operation is very low, since there will be much less frequent traffic than during construction, and only occasional use of heavy equipment. In addition, the use/handling of chemicals /oils/wastewater during operation will be limited.				
Impact Significance	None	Negligible	Low	Medium	High
	The impacts are assessed as Negligible and insignificant.				
	None	Negligible	Low	Medium	High

Impact Assessment: Impacts on soil quality during operation	
Residual Impact Significance post mitigation	The residual impact is predicted to be Negligible and not significant.

### 9.2.6 Glare and Glint

Impact Assessment: Glint and glare impacts during operation					
Receptor Value / Sensitivity	Low	Medium	High		
	There are safety concerns with regard to any potential to distract aircraft pilots and vehicle drivers, causing accidents leading to potential injuries or deaths.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	<p>PV panels work on the concept of absorbing sunlight rather than reflecting it as compared to other technologies that concentrate solar energy.</p> <p>Previous studies have been undertaken to compare the reflectivity of solar panels with other materials. The most commonly referenced source is a Federal Aviation study focusing on solar panels located at airports. This study states that modern solar panels reflect as little as 2% of the incoming sunlight. Solar PV panels have a lower level of reflectivity than many commonly occurring features such as bare soil and vegetation.</p> <p>The site is not close to or located on a flight path to and from a local airport.</p>				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and not significant.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The impact is assessed as Low and not significant.				

### 9.2.7 Labour and Working Conditions

Impact Assessment: Occupational health and safety impacts during operation					
Receptor Value / Sensitivity	Low	Medium	High		
	The receptors in this case are the operational workers. Although there will be few personnel involved in the operational and maintenance activities (approximately 25), each individual is of high value/sensitivity.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	Occupational health and safety impacts could result in disease, injury, or death to workers and so the magnitude is high.				
Impact Significance	None	Negligible	Low	Medium	High
	Pre-mitigation, the impact is assessed as High and significant.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	Through the full implementation of the ESMS, ESMP and appropriate policies, the residual impact is predicted to be Low.				

### 9.2.8 Landscape and Visual Impacts

#### 9.2.8.1 Impacts on Landscape Character and Visual Amenity

Impact Assessment: Impacts on Landscape Character			
Receptor Value / Sensitivity	Low	Medium	High
The sensitivity this LCT is assessed to be Low as it is not important in a local context, with no sites of interest in the location of the Project. It is noted that the LCTs are not designated at the local or national level. The landscape in the wider area is expansive rural which determines the overall character of the region as a whole.			



Impact Assessment: Impacts on Landscape Character				
Impact Magnitude	No change	Low	Medium	High
	The magnitude of the effect is predicted to be Low, as it is unlikely that construction works become the dominant feature in an area already impacted by human activity.			
Impact Significance	None	Negligible	Low	Moderate
	As a result, the significance of the impact is assessed as low. Although impacts will be visible in places, the surrounding features such as OHTLs and pylons are of a larger scale in height and extent. Therefore, changes can be easily accommodated in all LCTs.			
Residual Impact Significance post mitigation	None	Negligible	Low	Medium
	The residual impact is predicted to be Low and not significant.			

Impact Assessment: Impacts on Visual Amenity				
Receptor Value / Sensitivity	Low	Medium	High	
	The sensitivity of all VPs are assessed to be Low as they are not important in a local or regional context. There are no sites of interest from a tourism perspective. The landscape in the wider area to the south is more industrialised which determines the context of the views experienced.			
Impact Magnitude	No change	Low	Medium	High
	The magnitude of the effect is predicted to be low, given that the significant screening provided and the expansive nature of the landscape reduce the magnitude of impacts experienced.			
Impact Significance	None	Negligible	Low	Moderate
	As a result, the significance of the impact is assessed as low. Although impacts will be visible in places, the surrounding features are often of a larger scale in height and extent. Therefore, changes can be easily accommodated at all VPs. Views from the minor road will be transient in nature and dominated by existing villages and natural features in this location.			
Residual Impact Significance post mitigation	None	Negligible	Low	Medium
	The residual impact is predicted to be Low and not significant.			

### 9.2.9 Noise

Impact Assessment: Noise impacts during operation				
Receptor Value / Sensitivity	Low	Medium	High	
	There are settlements in relatively close proximity to the Project, receptors are of high sensitivity.			
Impact Magnitude	No change	Negligible	Low	Medium
	The distance between the transformers and the nearest residential properties is considered sufficient to reduce any noise to an acceptable level, however the substation is located to the south of the site boundary in close proximity to receptors. Noise calculations have deemed operational noise to be within specified limits. A Low magnitude of change is therefore predicted.			
Impact Significance	None	Negligible	Low	Medium
	The impact is assessed as Low and not significant.			
Residual Impact Significance post mitigation	None	Negligible	Low	Medium
	The impact is assessed as Low and not significant.			

## 9.2.10 Socio-economic Impacts

### 9.2.10.1 Impacts from local employment during operation

Impact Assessment: Impacts from local employment during operation				
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is low as the workforce required during operations is relatively small when compared to the construction stage.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is high as local employment during both construction and operations is a key expectation amongst local communities and their representatives. It is essential that Uzbeks comprise a significant component of the operational workforce.			
Impact Significance	Negligible	Minor	Medium	High
	As a result of the above, the overall impact is assessed as moderate and positive.			
Residual Impact Significance post mitigation	Negligible	Minor	Medium	High
	As a result of the above, the overall impact is assessed as Medium and positive.			

### 9.2.10.2 Impacts on the national and regional economy during operation

Impact Assessment: Impacts on the national and regional economy during operation				
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is medium as the quantity of energy generated by the project is an important contribution at 220MW.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is medium as the countries' energy demand shall continue to increase during the lifespan of the project.			
Impact Significance	Negligible	Low	Medium	High
	The overall impact significance is Medium.			
Residual Impact Significance post mitigation	Negligible	Minor	Medium	High
	As a result of the above, the overall impact is assessed as Medium and positive.			

### 9.2.10.3 Potential for gender-based violence, sexual exploitation and harassment

Impact Assessment: Potential for gender-based violence, sexual exploitation and harassment				
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Low.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The sensitivity is High as women and children are regarded as vulnerable receptors.			
Impact Significance	Negligible	Low	Medium	High
	The potential impact during operation is considered to be Medium adverse, pre-mitigation. It is expected that the continued implementation of specific measures introduced during the construction phase to prevent and address GBVSEH, will reduce this to Low.			
Residual Impact Significance post mitigation	Negligible	Low	Medium	High
	The residual impact during operation is considered to be negligible post-mitigation.			

## 9.2.11 Traffic and Transportation

The residual 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 residual effects of traffic movements stemming from the operational phase are therefore considered Negligible and not significant.

### 9.3 Decommissioning Impacts

The Project company shall develop and implement a Decommissioning Plan(s), setting out basic commitments for safe decommissioning of the site and site restoration to satisfactory state as required by relevant local legislation, permit conditions, ESIA commitments and international best practice. The plan includes:

- General Site Information;
- Relevant Baseline Information;
- Occupational Health and Safety and Labour and Working Conditions requirements; and
- General and Technology-Specific Procedures and Processes for Decommissioning (including the plan for the recycling or disposal of solar panels).

The Decommissioning Plan will consider the following predicted impacts.

#### 9.3.1 Air Quality

The change in ambient air quality may arise at decommissioning as a result of fugitive dust and particulate matter emissions. However, such impacts are expected to be temporary and of short-term nature as they are limited to the decommissioning phase only. The impacts will be similar to the construction phase.

#### 9.3.2 Archaeology and Cultural Heritage

The activities which may impact upon archaeological and cultural heritage sites include an increased workforce presence, reinstatement activities and vehicle movements, which may result in damage to, or interference with, archaeological and cultural heritage sites. It is unlikely however to present any significant effects. Following the removal of the structures and the reinstatement of the land use there would be no further potential effects to the archaeology and cultural heritage receptors.

#### 9.3.3 Biodiversity

Similar to construction, the main impacts during decommissioning are likely to comprise disturbance to birds. Following decommissioning, reinstatement will be important to re-establishing the ecosystem in areas previously occupied by solar panels, site roads and other structures. At the time of decommissioning, the sensitivity of some species, particularly those which are regionally rare, may have increased. The residual impact will be informed by the mitigation measures detailed in the BAP. There is a requirement for the project to achieve No Net Loss of species defined as PBFs and a net gain for CH qualifying species. As a result the project will result in a residual impact of Negligible for PBFs and a Low positive residual impact for CH qualifying species.

##### 9.3.3.1 Terrestrial Ecology

Similar to construction, the main impacts during decommissioning are likely to comprise habitat loss, loss of small numbers of mammals, and disturbance to animals. Following decommissioning, reinstatement will be important to re-establishing the ecosystem in areas previously occupied by solar panels, site roads and other structures. At the time of decommissioning, the sensitivity of some species, particularly those animals which are regionally rare, may have increased.

#### 9.3.4 Geology and Soils

Similar to construction, soils will be highly vulnerable to traffic and erosion during decommissioning. The movement of materials off-site may involve the construction of temporary roads and use of large vehicles. There is also potential for chemical or oil spills, or the incorrect handling/disposal of wastes during decommissioning. Similar measures to those outlined for 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.

The panels and supports will be dismantled and steel and other useful materials will be recycled. Inert materials which cannot be recycled will be taken to a suitable disposal site. However, foundations and

other inert belowground materials will be buried. This is not likely to have a significant impact on soils as it will not prevent re-vegetation or restoration of land.

### **9.3.5 Hydrology and Hydrogeology**

Effects on water resources during decommissioning are likely to be similar to those during construction, so sensitive features such as drainage channels would need to be avoided. 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.

### **9.3.6 Labor and working conditions**

Similar to construction, the use of a workforce and decommissioning activities could potentially generate a variety of risks to the workforce, due to general site decommissioning activities (removal of site equipment and infrastructure) and the presence of project vehicles on local roads posing a risk to. An Occupational Health and Safety Plan, Traffic Management Plan and Emergency Response Plan will be in place for the decommissioning phase of the Project. Appropriate policies will be in place to protect worker's rights.

### **9.3.7 Landscape and visual**

Impacts of landscape will result from removal of solar PV panels, substations and transformer stations, on-site and off-site transmission lines. New machinery and equipment will be introduced into the landscape, including heavy goods vehicles excavators, bulldozers, and other heavy equipment. The residual impacts are expected to be the same as those experienced during construction.

### **9.3.8 Noise**

Local noise levels will be affected temporarily by decommissioning activities such as equipment movement during building demolition and use of heavy machinery. The impacts will be similar to those experienced during the construction phase.

### **9.3.9 Socio-economic Impacts**

Similar to construction, the use of a workforce and decommissioning activities could potentially generate a variety of health and safety risks to the local residents, due to general site decommissioning activities (removal of site equipment and infrastructure) and the presence of project vehicles on local roads posing a risk to local residents and school children. A Community Health and Safety Plan, Traffic Management Plan and Emergency Response Plan will be in place for the decommissioning phase of the Project.

### **9.3.10 Transportation and Access**

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. It is unlikely however to present any significant effects.

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## Appendix A Outline ESMP

The mitigation measures for the construction and operation phases are included in this ESIA and summarised in Table A-1 and A-2 respectively and will be incorporated into the Project ESMS and CESMP/OESMP. Management measures for decommissioning will mirror that of construction and will be contained in the DESMP. The names of the individual management plans described are indicative and will be updated to maintain consistency with Masdar's ESMS.

The Project company will develop an 'Aspects and Impacts Register' as part of the ESMS if unforeseen impact not addressed in the ESIA package are identified. All identified impacts shall be listed in the relevant ESMS management plan.

The Project company shall provide resources to ensure sufficient capacity for the environmental, health, safety and social (EHSS) management of the project during the construction stage including:

- Appoint / retain an Environmental and Social (E&S) Manager common for Jizzakh and Samarkand and a dedicated deputy E&S Manager, a dedicated Community Liaison Officer (CLO) throughout the duration of construction, and an International Social Manager for the duration of Livelihood Restoration Plan (LRP) implementation up to completion audit.
- Assign a suitably qualified female team member to execute CLO and stakeholder engagement responsibilities.
- Develop the organisational chart and define roles and responsibilities, with evidence of organisational capacity and commitment.
- The level of experience and competency required for each key role shall be established as one of the main criteria based on which the employees shall be recruited.
- Clearly identified EPC team structure, roles and responsibilities including but not limited to an E&S Manager, two Senior Health Safety and Environment (HSE) Officers and a Human Resources (HR) Manager.

In addition, the Project company shall provide resources to ensure sufficient capacity for the EHSS management of the project during the operational stage including:

- Appoint / retain an Environmental and Social (E&S) Manager for the first year of operations, a designated team member in charge of E&S and a Community Liaison Officer (CLO) throughout the duration of the Project, and an international Social Manager for the duration of Livelihood Restoration Plan (LRP) implementation up to completion audit.
- Assign a suitably qualified female team member to execute CLO and stakeholder engagement responsibilities.
- Develop the organisational chart and define roles and responsibilities, with evidence of organisational capacity and commitment.
- Appoint and train a female representative to manage gender-based violence and harassment (GBVH) related grievances when required and stakeholder engagement with women; and
- Clearly identified O&M team structure, roles and responsibilities for EHSS management, including a dedicated E&S resource for implementation of ESMS responsibilities under the O&M scope.

For the avoidance of doubt, the following table and the measures listed in the ESIA should all be incorporated into the ESMS/ESMPs.

**Table A-47. Summary of the mitigation measures for the Construction Phase**

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
Loss of vegetation cover and biodiversity	Implement robust management measures <sup>97</sup> to ensure good construction practice within the proposed project site.	Biodiversity Action Plan	EPC EHS Manager	Site Inspection Reports	Prior to start of Construction.
	Employ an ecologist during construction to oversee implementation of the BAP.	Traffic Management Plan	HSE MANAGER ESHS Officer		Monitoring carried out during weekly site inspections.
	Initial site preparation and clearance to be undertaken outside of the bird breeding season, where possible.				Mitigation work to be carried out as and when identified.
	Storage of top 30cm of topsoil separately from subsoil. All of it should be stored on areas of modified habitat.				
	A pre-construction survey should be completed for works undertaken in the breeding season to check for animals (reptiles and active bird nests) and, if species of conservation importance are identified, construction activities are to be programmed to avoid such features until they have been moved or, in terms of nesting birds, there is a natural cessation of breeding effort.				
	Construction vehicles must remain on the access roads and not drive in the un-cleared bush. All workers and contractors must use the designated parking areas on site and the designated tracks. These measures to be implanted in the Traffic Management Plan (TMP).				
	Pre-construction surveys for species of conservation concern.				
Topsoil to be used for restoration purposes. Natural regeneration is proposed. There will be an active management approach to ensure revegetation is successful but will be detailed in the BAP.					

<sup>97</sup> For example: NetRegs (2020). Guidance for Pollution Prevention (GPP). Available at: <https://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	<p>Areas to be cleared, precisely demarcated with vegetation clearing only in agreed areas. Clearing to commence on sign-off from ecologist and HSE MANAGER /ESHS Officer.</p> <p>Fires will not be allowed under any circumstances.</p> <p>Cleared areas no longer required for construction activities should be restored by natural revegetation/reseeding using the existing seed bank contained in the topsoil.</p>				
<p>Disturbance, alteration &amp; destruction of faunal and avifaunal habitats</p>	<p>Environmental toolbox talks prior to, and during, construction to raise awareness, limit conflict and reduce additional disturbance to fauna and avifauna.</p> <p>Prior to undertaking any works on site, the ecologist and HSE MANAGER /ESHS Officer shall clearly delineate the approved clearing and disturbance footprint using temporary fencing, flagging tape, para-webbing or similar.</p> <p>Daily inspections will be carried out on excavations to check for animals that might be trapped in the excavation. These individuals must be carefully moved to a safe area outside construction activities.</p> <p>Procedure will be implemented for removal of animals found within the construction area.</p> <p>Drivers operating in the area must be well briefed and must be aware of the dangers that vehicles pose to the local fauna, particularly slow moving species such as tortoise. These measures to be implanted in the Traffic Management Plan (TMP).</p> <p>Vehicle speed limits must be imposed and adhered to. A limit of 20kph is proposed but will be agreed with the EPC.</p>	<p>Biodiversity Action Plan</p> <p>Traffic Management Plan</p>	<p>EPC EHS Manager</p>	<p>Site Inspection Reports</p> <p>Recorded instances of collisions with project vehicles.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>



Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	<p>Firefly bird divertors installed on new overhead lines along their entire length</p> <p>Tortoise holes cut in selected parts of the perimeter fence to enable free movement.</p>				
Conflict between construction workers and fauna	<p>The collection, harvesting or hunting of plants or animals is strictly prohibited. A 'no tolerance' policy will be adopted with respect to construction workers.</p> <p>Any person found guilty of poaching will be apprehended, immediately dismissed and referred to the appropriate authority.</p>	Biodiversity Action Plan	EPC EHS Manager	Site Inspection Reports	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>
Risk of invasive flora species	<p>Identification of potential invasive species and action taken to clear these species if they occur in or around areas designated for vegetation clearance prior to construction.</p> <p>Vehicles will be cleaned in a designated wash down area within the construction compound prior to entrance to site..</p>	Biodiversity Action Plan	EPC EHS Manager	Site Inspection Reports	Mitigation work to be carried out as and when identified.
Surface water	<p>Buffer distance of 25m applied to the seasonal watercourses.</p> <p>Routes of roads to be selected to avoid existing drainage channels or depressions where possible.</p> <p>Culverts or other drainage control features should be installed where crossings of drainage routes are unavoidable and to prevent ponding of surface water on the upstream side.</p> <p>Vehicles shall not be washed in nearby drainage canals. Washing will take place in designated wash down area within the construction compound.</p>	<p>Water and Wastewater Management Plan</p> <p>Traffic Management Plan</p>	EPC EHS Manager	<p>Site Inspection Reports</p> <p>Note: water quality samples are to be taken if there are signs of pollution.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
Soil erosion	Run-off and erosion control features included in all civil designs by contractor.	Soil Erosion Management Plan	EPC EHS Manager	Site Inspection Reports	Prior to start of Construction.
	Demarcate storage and staging areas and store all materials, equipment and vehicles in these areas to reduce soil damage.	Water and Wastewater Management Plan			Monitoring carried out during weekly site inspections.
	Vehicles confined to demarcated roadways.	Biodiversity Action Plan			Mitigation work to be carried out as and when identified.
	Where possible, establish native vegetation by natural revegetation in excavated areas immediately after final disturbance. Stockpiles of stripped topsoil will be used for revegetation as it contains native seeds.				
	Salvage and store the top 30cm of topsoil and subsoil separately from areas excavated.				
	On completion of earthworks, backfill material in same stratigraphic sequence i.e. subsoil first then topsoil.				
	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 vegetation.				
	In the first instance monitor natural regeneration of vegetation. If unsuccessful an appropriate seed mix shall be used and will be applied at the start of the active growing season.				
	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,					

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	<p>straw bales or other measures to impede storm water flow and prevent erosion.</p> <p>When damage to wet soil occurs, repair once dry conditions return. Surface levelling should be carried out in the first instance.</p>				
Wastewater	<p>Ensure temporary storage of wastewater at the site before disposal to a designated facility by a contracted waste handler.</p> <p>Where third party wastewater disposal &amp; transport companies are to be utilized, the Company / EPC will ensure all required licenses / permits are in place and that they facilities are audited to ensure that they are fit for purpose.</p> <p>Prohibit illegal disposal of wastewater into the watercourses around the project site.</p> <p>Ensure regular inspection of wastewater management practices within the solar plant to check for compliance.</p> <p>Ensure there is proper and adequate sanitation facilities at the site during construction.</p>	<p>Water and Wastewater Management Plan</p> <p>Quantity of wastewater generated.</p> <p>Quantity of wastewater disposed by a licensed waste carrier</p>	<p>EPC EHS Manager</p> <p>Licensed waste carrier</p>	<p>Monthly ESHS reports prepared by EPC.</p> <p>Monthly HSE MANAGER audits of the MPs.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>
Sewage Effluent	<p>The construction compound will have a local effluent collection and/ or treatment system. The contractor will design, build and operate these systems in accordance with Uzbek legislation and Good International Industry Practise.</p> <p>Effluent from domestic sewerage treatment shall meet the relevant standards acceptable to the Uzbek environmental authorities.</p> <p>Effluent will be stored in a septic tank or untreated storage tank and removed and disposed of periodically by a licenced contractor.</p>	<p>Water and Wastewater Management Plan</p>	<p>EPC EHS Manager</p> <p>HSE MANAGER</p>	<p>Monthly ESHS reports prepared by EPC.</p> <p>Monthly HSE MANAGER audits of the MPs.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified</p>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
Non-hazardous solid wastes	Train workers on solid waste management practices described in the Storage & Management of Waste MP and Lender Group requirements.	Storage & Management of Waste MP	EPC EHS Manager	Monthly ESHS reports prepared by EPC	Prior to start of Construction.
	Segregate all solid wastes at source.	Quantity of solid waste generated.	Licensed waste carrier.	Monthly HSE MANAGER audits of the MPs.	Monitoring carried out during weekly site inspections.
	Re-use, re-cycle or reduce solid waste generation onsite to the extent possible.	Quantity of solid waste correctly disposed to licensed disposal sites.			Mitigation work to be carried out as and when identified.
	Dispose all construction wastes that cannot be recycled or reused to a licensed solid waste disposal site using a licensed refuse handler.				
	Provide appropriately sized facilities for proper handling, segregation and storage of wastes at designated points within the construction compound.				
	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.				
	Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.				
EPC contractor shall seek to need to identify appropriate waste management facilities outside the Project area.					
In terms of broken or damaged solar PV panels, the EPC Contractor is required to identify facilities to dispose of the panels outside the Project area or return them to supplier.					

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
Hazardous materials / wastes	Provide appropriately sized facilities for proper handling, segregation and storage of wastes at designated points within the construction compound.	Storage & Management of Wastes MP	EPC EHS Manager	Monthly ESHS reports prepared by EPC	Prior to start of Construction.
	Vehicle refuelling will take place at dedicated refuelling point located in the site compound.	Storage and Management of Hazardous Materials MP.	Licensed waste carrier	Monthly HSE MANAGER audits of the MPs.	Monitoring carried out during weekly site inspections.
	For heavy equipment, a fuel tanker will be brought to site at a pre-defined time to refuel plant and equipment at site. Drip trays will be installed under mobile refuelling points.	Pollution Incident Response Plan			Mitigation work to be carried out as and when identified.
	Bunds to be located on impermeable surfaces with controlled drainage away from natural water courses. Bunds should be sufficient to contain 110% of the volume of liquids to be stored within. They should also be roofed to stop contamination of rainwater run-off.	Quantity of Hazardous Waste generated.			
	Train site workers on proper hazardous waste management.	Quantity of Hazardous Waste disposed.			
	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				



Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	<p>Containers for storing hazardous waste, including used oil, should be stored securely, labelled and disposed in line with the governing regulations</p> <p>Undertake regular inspection of hazardous waste management practices onsite.</p> <p>Strictly prohibit illegal disposal of hazardous wastes onsite</p> <p>Store hazardous materials in designated areas secured with a fence.</p> <p>Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.</p> <p>Follow Uzbek Government requirements set out in the international Convention "The Control of Transboundary Movements of Hazardous Wastes and Their Disposal (IEA ID# 3042)</p> <p>EPC contractor shall seek to need to identify appropriate waste management facilities outside the Project area.</p> <p>In terms of broken or damaged solar PV panels, the EPC Contractor is required to identify facilities to dispose of the panels outside the Project area or return them to supplier.</p>				
<p>Noise and vibration (General)</p>	<p>Adopt and follow best practicable means to ensure that the quietest available plant and construction techniques are used.</p> <p>Where appropriate, micro-siting is to be undertaken to ensure construction noise impacts are minimised and equipment is located as far as possible from noise sensitive receptors (NSRs). NSRs include on-site accommodation.</p> <p>Routing of project construction traffic shall be through the main highway and short section of unmarked road to site.</p>	<p>Noise and Vibration MP. BS 5228-1 method</p> <p>Traffic Management Plan</p> <p>Noise monitoring devices procured and installed on site</p>	<p>EPC EHS Manager</p>	<p>Monthly ESHS reports prepared by EPC</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out on a monthly basis or following a complaint.</p>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	<p>Restrict all construction activities to daytime during normal working hours</p> <p>Conduct construction activities within the maximum permitted noise levels</p> <p>Provide prior information to the community of any planned noisy activity that is likely to exceed the permitted noise levels (piling work)</p> <p>Strictly ensure the use of protective personal equipment at all times while on site and noise reduction techniques such as silencers and ear mufflers to employees</p> <p>Regularly monitor noise levels on a monthly basis (or in the event that a valid noise complaint is received) using an appropriate standard to comply with permitted maximum levels, including all vehicles and machineries on site. Construction noise limits shall be based on BS 5228-1 method, that sets noise criteria based on measured ambient noise level, with the lowest criterion for daytime construction noise being 65 dB LAeq,T.</p>	<p>Levels of noise and vibration produced at the site</p> <p>Number of Noise complaints received.</p>			Mitigation work to be carried out as and when identified.
Noise and vibration (Access road)	<p>Detailed assessment of the proposed access route will be carried out during detailed design to confirm compliance with national and international (WB) limits.</p> <p>The assessment will define mitigation measures including but not limited to:</p> <ul style="list-style-type: none"> <li>• Pre-construction building condition surveys.</li> <li>• Vibration monitoring (given the condition of the residential houses and fences in Figure 6-53 and 6-54, these may be potentially affected by construction/widening of access roads).</li> <li>• Restrictions on traffic times and speeds.</li> <li>• Consultation with local communities</li> <li>• Use of flagmen/women to manage traffic movements.</li> </ul>	<p>Noise and Vibration MP.</p> <p>Additional noise and vibration assessment</p> <p>BS 5228-1 method</p> <p>Traffic Management Plan</p> <p>Community H&amp;S Plan</p>	EPC EHS Manager	<p>Noise and vibration report</p> <p>Community H&amp;S Plan</p> <p>Monthly ESHS reports prepared by EPC</p>	<p>Assessment prior to construction.</p> <p>Monitoring throughout the construction works.</p>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	The community H&S Plan will be updated to include risks to the community from construction activities and traffic.				
Archaeology and cultural heritage	<p>Train workers on the importance of archaeological and cultural resources and how to deal with them through toolbox talks.</p> <p>In case of chance find, the work should be halted and the area protected and the matter reported immediately to the Department of Culture for appropriate action.</p> <p>Microsite OHTL towers with the supervision of an archaeology expert during any intrusive works to prevent impact on existing archaeology/cultural heritage. The coordinates of these findings should be shared with the EPC contractor.</p>	<p>Chance Find Procedure.</p> <p>Number of recorded chance finds.</p> <p>Micro-siting procedure</p>	<p>EPC EHS Manager</p> <p>Department of Culture.</p>	Monthly ESHS reports prepared by EPC	Throughout the construction works.
Visual and landscape	<p>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.</p> <p>Conduct demobilization audit prior to EPC leaving site to ensure that site conditions are acceptable for handover to the operations team.</p>	Biodiversity Action Plan	EPC EHS Manager	Monthly ESHS reports prepared by EPC	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>
Occupational Health and Safety	<p>Comply with 'governing regulations' and international best practise.</p> <p>Establish a permit to work system for all high-risk activities (i.e. hot works, confined space, working at high etc.)</p> <p>Train employees on the importance of occupational health and safety requirements and develop work instruction.</p>	<p>Occupational Health and Safety Plan.</p> <p>Covid 19 MP.</p> <p>Workers Accommodation MP</p> <p>IFC/ EBRD Guide for Workers Accommodation.</p>	<p>EPC EHS Manager</p> <p>HSE MANAGER</p>	<p>Monthly ESHS reports prepared by EPC</p> <p>Monthly HSE MANAGER audits of the MPs.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust masks, ear muffers and overalls for use during construction.	Emergency Preparedness and Response Plan.		Record of accidents and near misses	Mitigation work to be carried out as and when identified.
	Strictly enforce the use of the Personal Protective Equipment to minimise the accidents.	Confirmation of the appointment of medical professional on site.		Corrective Action Reports	
	Provide regular medical checks for the workforce.	PPE procured and being used by the workers		Grievance mechanism forms.	
	Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing, at all times.	Fire extinguishing facilities on site			
	Provision and placement of appropriate fire extinguishers and training personnel on their use	First aid kit on site			
	Put clear signage to restricted areas in Chinese, Uzbek, Russian and English languages as appropriate.	Signage installed on site.			
	Prohibit unauthorised persons from entering the site through installation of a perimeter fence.	Incident Investigation Report			
	Undertake regular inspection to ensure compliance with OHSP.	Workers/Internal Grievance Mechanism Policy and Procedure			
	Report and investigate all incidences of accidents or near misses and keep proper records of the actions taken.				
	Promote Covid-19 Awareness				
	Provide appropriate traffic safety training to all drivers (employers and contractors) as part of their induction and on an on-going basis.				
	An Incident Investigation Report outline should be developed by Developer and EPC.				
	Monitoring of its dissemination of Workers/Internal Grievance Mechanism Policy and Procedure and implementation under the				

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	<p>monitoring means. This will be continuously implemented and monitored throughout the life of the Project.</p>				
<p>Socio-economic – employment</p>	<p>Develop Local Recruitment and Employment Plan to encourage &amp; maximize local workers, vulnerable persons and women in the workforce including retention and promotion.</p> <p>Communicate employment estimates, timeframes and skills requirements clearly to the community.</p> <p>Invest in skills training to enable greater employment of local population throughout Project life, for both construction and operations phases, to start as early as possible ensuring maximum employment during construction.</p> <p>Implement a local employment plan in consultation with the community and in a way that meets long term operational needs of the Project as well as the short-term construction needs, taking into account the relatively low skill base of the local population when it comes to solar power related jobs (see separate line item below).</p> <p>Investigate local sourcing and procurement opportunities to promote sustainable small business development.</p> <p>Invest in capacity building for small businesses to enable them to meet standards for procurement required by the company and to service the needs of indirect employees (through service industries).</p> <p>Work with local vocational training schools to develop curricula which will qualify local students to better meet the needs to the developing solar industry locally.</p>	<p>Stakeholder Engagement Plan.</p> <p>Community Grievance Mechanism</p> <p>Local Recruitment &amp; Employment Plan.</p> <p>Stakeholder engagement activities.</p> <p>Number of grievances recorded.</p> <p>Number of local workers hired.</p> <p>Minutes of stakeholder meetings.</p> <p>Skills training agreement with local vocation training centre.</p> <p>Agreement to provide support to local businesses</p>	<p>CLM / CLO</p>	<p>CGM log.</p> <p>Corrective Action Reports</p> <p>Number of local people employed on the Project.</p> <p>Training places provided and completed.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>



Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
Local hiring and workforce management	<p>Develop a local employment plan including roles and responsibilities (there will be a need for HR, EPC hiring manager, CLM/CLO, EPC CLO and oversight by site management)</p> <p>Identification of job roles required and targets as appropriate. Use targets to measure the success of the local hiring plan.</p> <p>Identify level of interest in the project. This should include a list of names, skills, availability to start work. Identify training needs and verify the skills/qualifications.</p> <p>Community Liaison Officer to maintain a database of local workers expressing an interest in employment opportunities at the Project as per bullet point above,</p> <p>Pass this information on to the EPC contractor or responsible person.</p> <p>Periodically the EPC contractor will publish a list of required roles and will review the list of interested persons. The CLO should make sure this information is disclosed to the communities. The most suitable will be invited for interview and if suitable they will be offered jobs.</p> <p>The EPC hiring manager, with oversight from the E&amp;S team will set out clear fair working policies and procedures which will set out the maximum working hours, contract provision, conditions for overtime and workers' rights, non-discrimination, forced labour and safeguards to protect vulnerable workers. These policies will be developed in accordance with national employment and labor law and international best practice. This will be communicated to all workers upon induction and will be available for workers to review at office premises.</p>	<p>Local Recruitment &amp; Employment Plan.</p> <p>Monthly workforce statistics.</p> <p>IFC/EBRD Guide for Workers</p> <p>Human Resources Policy (and related Procedures)</p> <p>Human Rights Policy</p> <p>Sexual Exploitation &amp; Abuse (SEA) and Sexual Harassment (SH) Prevention &amp; Response Action Plan</p> <p>Gender Based Violence &amp; Harassment (GBVH) Policy</p> <p>Workers Grievance Mechanism</p> <p>Influx Management Plan</p> <p>Labour Management Plan</p> <p>Supply Chain Management Plan</p> <p>E&amp;S Supplier and Vendor Management Plan</p>	<p>CLM</p> <p>EPC EHS Manager</p> <p>HSE MANAGER</p>	<p>Monthly ESHS reports prepared by EPC</p> <p>Inspection reports</p> <p>CGM log.</p> <p>Number of local people employed on the Project.</p> <p>Training places provided and completed.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
		Site Inspection & Audit Plan & Procedure			
		Environmental & Social Training Plan			
		Decommissioning Plan			
Socio-economic – population and land use	<p>Implement measures to ensure access to local villages is not adversely affected by the fencing of the Project area. Such measures may include providing alternative routes to the village, which can be accessed by pedestrians as well as vehicles. Appropriate signage should be erected around the site.</p> <p>Consultation with local stakeholders and users of the mosque and graveyard following disclosure to agree on the access arrangements and mitigations during construction and operation including some the proposed adjustments to working time if necessary.</p> <p>Provide detailed and regular information to local community members about Project activity to mitigate community concerns as a result of misinformation.</p> <p>Consider scheduling construction activities to minimise the effects on local communities and farmers. For example, higher impact activities such as piling could be carried out outside of prayer times to reduce impacts on the nearby mosque.</p> <p>Prohibit non-local workers from entering the local communities.</p> <p>Operate a closed camp status for non-local residents.</p>	<p>Stakeholder Engagement Plan</p> <p>Community Grievance Mechanism</p> <p>Community Health &amp; Safety MP.</p> <p>Water Resource and Management Plan</p> <p>Confirmation of access arrangements.</p> <p>Minutes of stakeholder meetings.</p> <p>Noise and Vibration Management Plan</p>	<p>CLO</p> <p>EPC EHS Manager</p> <p>HSE MANAGER</p>	<p>Inspection reports</p> <p>CGM log</p> <p>Corrective Action Reports</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>
Social Infrastructure	<p>Provision of a dedicated medical professional to be employed by the Project.</p> <p>Investing in local social infrastructure through a community benefit program which will be developed in consultation with communities</p>	<p>Occupational Health and Safety Plan.</p>	<p>EPC EHS Manager</p> <p>HSE MANAGER</p>	<p>Confirmation of employment.</p>	<p>Prior to start of Construction.</p>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	during the construction phase. Care will be taken to manage community expectations about social infrastructure.	Contract of employment for medical professional(s)			Monitoring carried out during weekly site inspections
Air Quality	Identify strategies to manage dust on the road during the execution of the Project.	Traffic MP	EPC EHS Manager	Monthly ESHS reports prepared by EPC	Prior to start of Construction.
	Provision of designated wash down area to spray and wash wheel spokes, tires and around the wheel opening of all vehicles entering and exiting the construction compound.	Dust Suppression MP Vehicle inspection checks carried out	HSE MANAGER	Inspection reports	Monitoring carried out during weekly site inspections.
	Use of properly maintained vehicles and construction equipment with emission controls.	Minutes of stakeholder meetings.		Record of traffic accidents and near misses	Mitigation work to be carried out as and when identified.
	If necessary, use water to dampen down on-site roads and excavations to reduce dust.	CGM and WGM Grievances received.		CGM and WGM logs.	
	Maximum speed limit of 20kph in place on site.				
	Trucks carrying aggregates have covered loads when entering or leaving the site.				
	Communicate project risk to local communities and address concerns accordingly. Monitor any complaints filed (via grievance mechanism) from local stakeholders as an additional tool to monitor dust management measures.				
Spread of Food and Water-borne Disease	Food stored and prepared in accordance with good hygiene standards and required by Uzbek and IFI standards.	Water and Wastewater Management Plan	EPC EHS Manager	Monthly ESHS reports prepared by EPC	Prior to start of Construction.
	Establish food hygiene procedures including bacterial testing regimes to be established for camp kitchens and water supply.	Storage & Management of Waste MP	HSE MANAGER	Inspection reports	Monitoring carried out during weekly site inspections.
	Where appropriate, support local public health campaigns against food and water borne diseases.	Occupational H&S Plan Community H&S MP		WGM grievances log	

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
		Adherence to International food standards (for example FAO/ WHO Codex Alimentarius)		Corrective Action Reports	Mitigation work to be carried out as and when identified.
		Agreements with relevant government /NGOs to support health campaigns			
		Information disclosed as part of health campaigns			
Spread of Communicable Disease	<p>Workers accommodation designed in compliance with the IFC/ EBRD Guide for Workers Accommodation and will not be based on site but rather use existing accommodation available.</p> <p>Health screening and quarantine if necessary, carried out in accordance with Covid-19 MP.</p> <p>Establishment of designated areas to handle quarantine cases.</p> <p>Establishment of a COVID19 management plan.</p> <p>Ensure health screening is being conducted for employees and contractors before contracting workers and prior to entrance to site.</p> <p>Temperature screening will be carried out on entrance to site each day.</p> <p>Random Covid-19 testing will be carried out throughout their employment/ contract.</p> <p>As part of health and safety induction for workers, provide awareness training on communicable disease prevention. Provide this training on an ongoing basis.</p>	<p>Covid 19 MP</p> <p>Workers Accommodation Plan</p> <p>OHS MP</p> <p>Provision of employee health screening.</p> <p>Provision of health-related awareness and training to workforce</p> <p>Agreements with relevant government/ NGOs to support health campaigns</p>	<p>EPC EHS Manager</p> <p>HSE MANAGER</p>	<p>Monthly ESHS reports prepared by EPC</p> <p>Monthly HSE MANAGER audits of the MPs.</p> <p>Corrective Action Reports</p> <p>Health related advertising and communication.</p> <p>Number of reported health incidents.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	<p>Work in collaboration with an onsite medical team to ensure that such awareness and education training is appropriately provided to workers and contractors.</p> <p>Identify opportunities to support local public health campaigns that focus on prevention of communicable diseases.</p>				
Increased Pressure on Health Services	<p>Ensure that all Contractors are provided with adequate health care (for work related injuries and off the job-related health issues) that is independent of the local health care system.</p> <p>Liaise with local health professionals to identify ways that the Project can provide sustainable investments in the health care facilities used by their workers.</p> <p>Consider an agreement or contract with health care provider to provide investments in facilities used by workers</p>	<p>OHS Plan</p> <p>Provision of worker healthcare through dedicated Project professional.</p>	<p>EPC EHS Manager</p> <p>HSE MANAGER</p>	<p>Inspection reports</p> <p>Number of reported health incidents.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>
Pressure on Water Resources	<p>Ensure that workers and employees must not use water from the canals located east and west of the Project site. Ensure a system of penalties is put in place for non-compliance.</p> <p>Vehicles will not be washed in canals.</p>	<p>Water &amp; Wastewater MP</p> <p>Grievances received</p> <p>Provision of water use and resource studies.</p>	<p>EPC EHS Manager</p> <p>HSE MANAGER</p>	<p>Inspection reports</p> <p>Corrective Action Reports</p> <p>Grievance mechanism forms.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>
Sale and Use of Drugs and Alcohol	<p>Enforce and monitor the zero-alcohol and drugs tolerance policy, including current intoxication, for workers during working hours.</p> <p>Ensure random alcohol testing is conducted for workers entering and leaving the site.</p>	<p>Workers Accommodation MP</p> <p>HR MP</p> <p>Occupational H&amp;S Plan</p>	<p>EPC EHS Manager</p> <p>HSE MANAGER</p>	<p>Inspection reports</p> <p>Corrective Action Reports</p> <p>Test results.</p>	<p>Communicated prior to start of Construction.</p>



Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Design a system of penalties for anyone found with drugs or alcohol on site.			Disciplinary action taken.	Monitoring carried out during weekly site inspections.
Safety of Local Community	<p>Ensure that Project security is aware of the Project's goals to establish good relationships with local stakeholders; the grievance mechanism for communities to voice concerns; and receives human rights and cultural sensitivity training to ensure the respect and protection of the local community.</p> <p>Include policy requirements to prevent Gender Based Violence and Harassment (GBVH) of community members by the construction workforce.</p> <p>Appoint senior people in construction teams who are responsible for ensuring commitments regarding GBVH are implemented and to conduct a GBVH risk assessment and mitigate these risks appropriately inline with policy. These senior people should include women at senior decision-making levels.</p> <p>Include a safe and confidential reporting mechanism from local communities as part of the grievance process.</p> <p>Provide periodic training on GBVH to all of the workforce and ensure to vet all contractors with based on their performance of managing GBVH.</p>	<p>Community Health &amp; Safety MP</p> <p>Provision of information through the SEP and grievance mechanism</p> <p>Trainings provided on GBVH</p> <p>Senior representatives for managing GBVH appointed</p>	<p>CLO</p> <p>EPC EHS Manager</p> <p>HSE MANAGER</p>	<p>Monthly HSE MANAGER audits of the MPs.</p> <p>Inspection reports</p> <p>Corrective Action Reports</p> <p>Grievance mechanism forms.</p>	<p>Communicated prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p>
Site security	<p>Develop a Security MP / Code of Conduct for site security personnel which will be in line with the requirements of PS2, PS4 and the Voluntary Principles of Security &amp; Human Rights.</p> <p>Security provided by private security firm only, not the home guard.</p> <p>Firearms are prohibited on site.</p> <p>Fence the entire solar plant to restrict entrance to the site.</p> <p>Inspect the fence around the facility regularly and seal all loopholes, with the exception of tortoise passes.</p>	<p>Security and site access MP</p> <p>Provision of code of conduct for security personnel.</p> <p>Results of background checks for security staff.</p> <p>Minutes of stakeholder meetings.</p>	<p>EPC EHS Manager</p> <p>Security Contractor</p> <p>HSE MANAGER</p>	<p>Monthly ESHS reports prepared by EPC</p> <p>Monthly HSE MANAGER audits of the MPs.</p> <p>Inspection reports</p> <p>CGM and WGM logs.</p>	<p>Communicated prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections</p>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	<p>Ensure adequate lighting within and around the solar plant.</p> <p>Regularly check and maintain security lights at the site.</p> <p>Train the onsite guards to adequately handle trespass incidents</p> <p>Ensure that the security staff act in compliance with relevant Uzbek laws;</p> <p>Ensure that robust background checks are carried out staff to make sure they have not been implicated in past abuses;</p> <p>Implement a Code of Conduct for security personnel;</p> <p>Introduce head of security personnel to neighbouring communities and outline the necessary safety precautions that will need to be put in place to ensure both the safety of the Project and safety of local communities;</p> <p>Community safety meetings should be organised with all potentially affected groups and be conducted in advance of construction activities; and</p> <p>Ensure that all potentially affected stakeholders know how to contact the company and to file grievances or concerns about security arrangements.</p>	<p>CGM and WGM</p> <p>Grievances received.</p>			
Emergency response	<p>Work with local emergency responders to at minimum: (i) communicate ERP; (ii) depending on level of risk from emergency events build local capacity to ensure appropriate local response in case of emergency.</p> <p>Communicate potential risks and ERP to those potentially most affected by emergency events.</p> <p>Provide safety information to local community via the SEP.</p>	<p>OHS Plan</p> <p>Emergency Management and Response</p> <p>Minutes of community meetings</p> <p>Findings of Emergency Drills</p>	<p>Masdar</p> <p>EPC EHS Manager</p> <p>Security Contractor</p> <p>HSE MANAGER</p>	<p>Monthly ESHS reports prepared by EPC</p> <p>Monthly HSE MANAGER audits of the MPs.</p> <p>Emergency Drills</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p>

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Emergency drills must be completed.	CGM and WGM Grievances received.			Mitigation work to be carried out as and when identified.
Traffic management	<p>The Traffic Management Plan must aim to reduce risks to drivers, communities along the transport route, as well as components being transported. The TMP is to include (amongst others) a detailed site access route; stopovers, speed controls; measures for ensuring well-maintained vehicles and access roads; procedures for ensuring appropriate training programmes and licences are in place for all drivers; and detail on sensitive receptors along the transport route.</p> <p>Provide appropriate traffic safety training to all drivers (employees and contractors) as part of their induction and on an ongoing basis.</p> <p>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. All discussions and training sessions are to be made available in language that the workers can understand.</p> <p>Construction traffic through community areas will not be permitted with the exception of public meetings and stakeholder engagement activities.</p>	<p>Traffic MP</p> <p>Number of road safety briefings provided.</p> <p>Number of road safety complaints received.</p> <p>Number of driving incidents including speed violations.</p>	<p>EPC EHS Manager</p> <p>Security Contractor</p> <p>HSE MANAGER</p>	<p>Monthly ESHS reports prepared by EPC</p> <p>Monthly HSE MANAGER audits of the MPs.</p> <p>Inspection reports</p> <p>Record of accidents and near misses</p> <p>WGM and CGM Logs.</p>	<p>Prior to start of Construction.</p> <p>Monitoring carried out during weekly site inspections.</p> <p>Mitigation work to be carried out as and when identified.</p>

**Table A-48. Summary of the mitigation measures for the Operation Phase**

<b>Impact</b>	<b>Mitigation Measures</b>	<b>MP Reference and KPI (if appropriate)</b>	<b>Responsibility</b>	<b>Monitoring Means</b>	<b>Frequency</b>
<b>Biodiversity</b>	Confine all vehicles to roadways.	Biodiversity Action Plan	Project Developer	Audit Reports	Plan developed prior to start of Operation.
	Road condition monitored regularly, and damaged and rutted roads repaired rather than bypassing damaged sections.	Annual audits			Monitoring carried out during detailed monthly audits.
	Monitoring of erosion controls and repair as needed.	Number of bird collisions with OHTL			
	Re-stabilise existing eroded tracks with restoration of vegetation cover as required.	Tortoise population			Mitigation to be carried out as and when identified.
	Hunting prohibited on site, particularly in relation to Houbara bustard.	Success level of vegetation restoration.			
	During routine maintenance any invasive flora species should be identified and removed. Cutting and poisoning of saplings is an effective control measure.	Level of plant cover.			
	Record bird collisions with the panels and overhead lines.	Presence of indicator species.			
	Monitor and maintain bird flight diverters on OHTL throughout operational phase.				
	Implementation of mitigation measures for Central Asian Tortoise (TBC) as set out in the BAP.				
	Identify a recently excavated area on site and manage it to understand rate and success of natural revegetation. Active management approaches shall be implemented if necessary.				
Routine inspections will record any bird collisions and fatalities on site in line with IFC guidance: Bird rescue protocol and monitoring at PV solar sites					

<b>Liquid wastes</b>	Develop a Water Management Plan for operations.	Water Management Plan	Project Developer	Water Management Plan and Inventory	Plan developed prior to start of Operation.
	Train employees on the importance of proper liquid waste management and water resource management.	Pollution Incident and Response Plan	Licensed hazardous waste transporter	Inspection reports	Monitoring carried out during detailed monthly audits.
	Reduce, reuse or re-cycle all liquid waste generated onsite to the extent possible.	Quantity of liquid waste generated		Audit Reports	
	Dispose all liquid wastes that cannot be recycled or reused to liquid waste disposal facilities a licensed transporter.	Quantity of liquid waste correctly disposed to disposal sites			Mitigation to be carried out as and when identified.
	Prohibit illegal disposal of wastewater into waste resources (canals or groundwater).	Number of Waste storage facilities the plant			
	Conduct inspection of wastewater management practices to check for compliance	Number of Sanitation facilities on at the plant			
	Emphasise on proper sanitation during operation phase of the project.	Number of Audits completed			
<b>Solid Wastes</b>	Develop a Waste Management Plan for operations. This will establish the Chain of Custody system to be implemented.	Implementation of Waste Management Plan.	Project Developer	Solid waste management Plan and inventory	Plan developed prior to start of Operation.
	Train employees on the importance of proper solid waste management	Quantity of solid waste generated	Licensed hazardous waste transporter	Inspection Reports	Monitoring carried out during detailed monthly audits.
	Reduce, reuse or re-cycle all solid waste generated to the extent possible	Number of solid waste storage facilities at the plant		Audit Reports	Mitigation to be carried out as and when identified.
	Dispose all solid wastes that cannot be recycled or reused to solid waste disposal sites using a licensed refuse handler. Disposal sites shall be appropriately licensed and meet the general requirements of IFC PS.	Quantity of solid waste correctly disposed to disposal sites			
	Maintain proper records of solid wastes to know the quantity of wastes generated on site	Number of completed inspection missions			
		Annual audits			



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.

Wastes will be stored in a designated storage area within the substation area to facilitate collection of the wastes by third party waste collector.

**Water availability**

A full Water Management Plan will be developed prior to the commencement of operations.

Water Management Plan  
 Project Developer  
 Operational water availability / resource use assessment.

Inspection reports.

Plan developed prior to start of Operation.  
 Monitoring carried out during detailed monthly audits.  
 Mitigation to be carried out as and when identified.

**Soil erosion/compaction**

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.

Biodiversity Action Plan  
 Project Developer  
 Number of completed inspections,  
 Annual audits.

Inspection reports.

Plan developed prior to start of Operation.  
 Monitoring carried out during detailed monthly audits.  
 Mitigation to be carried out as and when identified.

<b>Visual Impacts</b>	Implement site rehabilitation and landscaping measures to restore the site. This should be implemented in the first available active growing season following the completion of construction.	Biodiversity Action Plan	Project Developer.	Inspection Reports	Plan developed prior to start of Operation.
	Ensure proper storage, regular collection and disposal of waste streams generated.	Waste management plan developed and implemented		Grievance Reports	Monitoring carried out during detailed monthly audits.
	Carry out the facility inspection work on regular basis.	Site inspection missions completed		Audit Reports	Mitigation to be carried out as and when identified.
		Annual audits			
<b>Hazardous Materials / Wastes</b>	Develop and implement a Waste Management Plan.	Waste Management Plan developed and implemented	Project Developer	Inspection Reports	Plan developed prior to start of Operation.
	Train employees on Hazardous waste management		Licensed hazardous waste transporter	Hazardous Waste Management Plan and Inventory	Monitoring carried out during detailed monthly audits.
	Segregate waste by separating hazardous waste from non-hazardous waste.	Number of trained Workers on Hazardous Waste Management		Audit Reports	Mitigation to be carried out as and when identified.
	Establish a designated storage area for fuels / chemicals with an impervious base and impermeable bund walls and protected from precipitation. Capacity must be 100% of the full volume to be stored within a bund and secured area.	Amount of Hazardous Waste Segregated			
	Containers for storing hazardous materials / waste (including used oil) should be stored in the designated, secured with a fence. All containers are to be labelled correctly.	Quantity of accidental hazard spillage			
	Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow.	Quantity of hazardous waste correctly disposed			
	Prohibit illegal disposal of hazardous wastes on the solar plant during solar plant maintenance exercise.	Number of completed inspection missions			
	Undertake regular inspection of hazardous waste management practices onsite.	Annual Audits			
	Vehicles will not be refuelled on site but at the nearby filling station.				

Provision for chemical, oil and hazardous spills kits to be located in strategic locations to immediate access and to control the spill and contain any hazards.

<b>Occupational Health and Safety</b>	Develop and implement an O&M ESHS MP for operations.	O&M ESHS MP developed and implemented	Project Developer	Inspection reports	Plan developed prior to start of Operation.
	Train new employees on the importance of occupational health and safety	Number of employees trained on occupational health and safety		Record of accidents and near misses	Monitoring carried out during weekly and monthly audits.
	Ensure compliance with the governing regulations	PPE procured and being used by the employees		Corrective Action Reports	Mitigation to be carried out as and when identified.
	Maintain the fence around the entire solar park to prohibit unauthorized persons from accessing the site	Fire extinguishing facilities at the plant			
	Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust masks (if required) and overalls.	First aid kit on site			
	Strictly enforce the use of the Personal Protective Equipment to minimise the accidents during decommissioning	Signage installed at the plant			
	Regular medical checks including screening for Covid-19	Number of inspection missions completed			
	Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing	Annual Audits			
	Put clear signage to restricted areas in Uzbek, Chinese and English language to reduce risk of accidents				
	Undertake regular inspection of the plant				
Promote Covid-19 Awareness in languages that the workers understand.					
<b>Noise and Vibration</b>	Carry out an operational noise survey in the event of complaints being received.	Levels of noise and vibration produced at the site	Project Developer	Inspections  Project Grievance Mechanism	In the event of a complaint being received.

Number of Noise  
 complaints received

Number of inspection  
 missions completed

<b>Socio-economic</b>	Continuing stakeholder engagement in accordance with the SEP and manage expectations in terms of the number of employment opportunities generated during operations.	Stakeholder Engagement Plan	Contractor	Inspection reports	Monitoring carried out during detailed monthly audits.
	Continued implementation of the Local Recruitment & Employment Plan in consultation with the local community.	Stakeholder engagement activities.	Project Developer	Community consultation.	
	Continued implementation of community grievance mechanism.	Number of grievances recorded.		Project Grievance Mechanism	
	Continued implementation and compliance with O&M ESHS MP.	Number of local workers hired.			
	Development of Security Management Plan and use of private security personnel.	Security Management Plan			
	National Guard will not be used to provide security.				

## Appendix B Example Key Performance Indicators

The Project's E&S targets will be assessed by the following key performance indicators which were set according to the national standards and international best practice (adhere to more stringent standards) for the project during construction and operational phases. The following table shows the elements that are proposed to be monitored during the life of the Project.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
<b>Air Quality</b>					
Ambient air quality	Fugitive dust and particles (SPM, PM10)	Construction Decommissioning	PM10: 50 µg/m3 (24-hours);	In the event of a valid complaint being received.	Independent 3rd party consultant
Ambient air quality	No visible dust outside the site boundary	Construction Decommissioning	Visual observation	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of dust suppression	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Ambient air quality	Pollution Prevention and Control Plan	Construction Decommissioning	Confirmation of compliance with measures specified in the Pollution Prevention and Control Plan as it relates to air quality. Refer to the Pollution Prevention and Control Plan for further details.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of prevention measures to reduce air quality impacts.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Vehicle emissions	Traffic management plan	Construction Decommissioning	Confirmation of compliance with measures specified in the Traffic management plan as it relates to air quality. Refer to the Traffic management plan for further details.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of prevention measures to reduce air quality impacts.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Vehicle emissions	Vehicle inspection checks	Construction Decommissioning	Confirmation that checks have been carried out and that vehicles have passed.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of prevention measures to reduce air quality impacts.	Monthly checks: EPC and ROLE TBC.



Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Ambient air quality	Complaints relating to dust and air quality	Construction Decommissioning	Minutes of community meetings Grievances received	During weekly checks and monthly detailed audit	Weekly checklist: CLO, EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
<b>Noise and vibration</b>					
Ambient noise and vibration level	Observed sound levels in $L_{Aeq}$ dBA for day and night time against nature and recipient. Limits apply at the boundary of closest residential properties.	Construction Operation Decommissioning	<u>Construction limits:</u> 65 dBA <u>Operation limits:</u> Daytime: 55 dBA Night-time: 45 dBA	Noise measurements to be taken monthly and in the event of a valid complaint being received.	Independent 3 <sup>rd</sup> party consultant
Noise and vibration	Noise monitoring devices procured and installed on site	Construction Operation Decommissioning	Number and type of noise monitoring devices	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Noise and vibration	Number of PPE procured and being used by workers	Construction Operation Decommissioning	Visual inspection of PPE use on site	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Noise and vibration	Number of Noise complaints received	Construction Operation Decommissioning	Review of grievance log	During weekly checks and monthly detailed audit	Weekly checklist: CLO, EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
<b>Hydrology and Water Quality</b>					

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Surface and groundwater quality	Level of pollutants in surface and groundwater	Prior to start of Construction Prior to Operation Decommissioning	pH (SI) Conductivity (µS/cm) TDS (mg/L) TSS (mg/L) DO (mg/L) ORP Metals (mg/L) E-coli (cfu) Hydrocarbons (mg/L)	Sampling prior to start of construction and following completion of construction. Further sampling to be taken pre and post decommissioning. Additional sampling should be carried out in the event of a valid complaint being received.	EPC and ROLE TBC. Lab analysis carried out by suitable qualified laboratory.
Loss of habitat and disturbance to waterbodies.	Water Resource and Management Plan	Construction Decommissioning	Confirmation of compliance with measures specified in the Water Resource and Management Plan. Refer to the Water Resource and Management Plan for further details.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance in terms of the protection of flora to maintain both biodiversity and to protect against erosion.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Loss of habitat and disturbance to waterbodies.	Biodiversity Action Plan	Construction Decommissioning	Confirmation of compliance with measures specified in the Biodiversity Action Plan as it relates to waterbodies. Refer to the Biodiversity Action Plan for further details.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance in terms of the protection of waterbodies.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager with support from 3 <sup>rd</sup> party ecology as required.
Alteration of surface water flow	Culverts or other drainage control measures constructed.	Construction Operation Decommissioning	Confirmation of number of culverts or other drainage control measures constructed and condition of such culverts.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance in terms of the protection of waterbodies.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Alteration of surface water flow	Water Resource and Management Plan	Construction Operation Decommissioning	Confirmation of compliance with measures specified in the Water Resource and Management Plan as it relates to waterbodies. Refer to the Water Resource and Management Plan for further details.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance in terms of the protection of waterbodies.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager with support from 3rd party ecology as required.
Alteration of surface water flow	Drainage system design	Pre-Construction. Construction Operation Decommissioning	Confirmation of suitability of drainage system design.	Prior to sign off on detailed design. Performance of drainage system verified during weekly and monthly audits.	Pre-construction: Masdar Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Alteration of surface water flow	Flood risk assessment.	Construction Operation Decommissioning	Confirmation that measures specified in the FRA have been implemented on site.	During monthly detailed audit.	Monthly detailed audit: Masdar E&S Manager with support from 3rd party ecology as required.
Untreated Sewage Effluent	Water Resource and Management Plan	Construction Operation Decommissioning	Confirmation of compliance with measures specified in the Water Resource and Management Plan as it relates to sewage effluent. Refer to the Water Resource and Management Plan for further details.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance in terms of the protection of waterbodies.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Untreated Sewage Effluent	Provision of waste management plan	Construction Operation Decommissioning	Confirmation of compliance with measures specified in the waste management plan as it relates to sewage effluent. Refer to the waste management plan for further details.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance in terms of the protection of waterbodies.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Untreated Sewage Effluent	Information disclosed as part of health campaigns	Construction Operation Decommissioning	Review of health related information disclosure and awareness programs being undertaken.	During monthly detailed audit	Monthly detailed audit: Masdar
<b>Geology and Soils</b>					
Alteration of surface water flow	Civil engineering design	Pre-Construction. Construction Operation Decommissioning	Confirmation of suitability of civil engineering design.	Prior to sign off on civil engineering design. Performance of civils design verified during weekly and monthly audits.	Pre-construction: Masdar Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Soil quality and erosion	Erosion rate observation	Construction Operation Decommissioning	Visual observation	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of managing erosion	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager
<b>Biodiversity</b>					
Flora protection	Destruction rate observation and revegetation success.	Construction Operation Decommissioning	Visual observation	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of protection of flora to maintain both biodiversity and to protect against erosion.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager with support from 3 <sup>rd</sup> party ecology as required.
Flora protection	Destruction rate observation and signs of erosion.	Construction Operation Decommissioning	Confirmation of the use of designated roads and parking areas	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance in terms of the protection of flora to maintain both biodiversity and to protect against erosion.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Flora protection	Preparation and implementation of Biodiversity Action Plan.	Construction Operation Decommissioning	Confirmation of compliance with measures specified in the Biodiversity Action Plan. Refer to the Biodiversity Action Plan for further details.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance in terms of the protection of flora to maintain both biodiversity and to protect against erosion.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager with support from 3 <sup>rd</sup> party ecology as required.
Conflict between construction workers and fauna	No evidence of workforce damaging or hunting/collecting flora and fauna	Construction Operation Decommissioning	Visual observation and monitoring of grievance mechanism	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of protection of flora and fauna and prohibition of hunting and collecting species.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager with support from 3 <sup>rd</sup> party ecology as required.
Risk of invasive flora species	No sign of spread of invasive species.	Construction Operation Decommissioning	Visual observation	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of protection of flora to maintain both biodiversity and to protect against erosion.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager with support from 3 <sup>rd</sup> party ecology as required.
Risk of invasive flora species	Preparation and implementation of Biodiversity Action Plan.	Construction Operation Decommissioning	Confirmation of compliance with measures specified in the Biodiversity Action Plan. Refer to the Biodiversity Action Plan for further details.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of protection of flora to maintain both biodiversity and to protect against erosion.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager with support from 3 <sup>rd</sup> party ecology as required.

### Occupational Health and Safety



Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Occupational Health and Safety	Occupational Health and Safety Plan developed and implemented	Construction Operation Decommissioning	Compliance with the measures specified in the OHS plan	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of OHS.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager and EPC HSE Manager.
Occupational Health and Safety	Develop and implement Emergency Preparedness and Response Plan.	Construction Operation Decommissioning	Compliance with the measures specified in the Emergency Preparedness and Response Plan	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of OHS.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager and EPC HSE Manager.
Occupational Health and Safety	Workers trained on occupational health and safety	Construction Operation Decommissioning	Workers trained on occupational health and safety and confirmation that number meets the requirement for the total workforce on site	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of OHS.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager and EPC HSE Manager.
Available of suitable PPE	PPE procured and being used by the workers	Construction Operation Decommissioning	Visual inspection and review of the number of H&S incidents, near-misses or accidents recorded.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of OHS.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager and EPC HSE Manager.
Availability of fire fighting facilities	Fire extinguishing facilities on site	Construction Operation Decommissioning	Visual inspection and review of the number, availability and condition of facilities.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of OHS.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager and EPC HSE Manager.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Availability of first aid kit and qualified first aiders	Qualified first aid professionals on site and first aid kit on site	Construction Operation Decommissioning	Visual inspection and review of the number, availability and condition of first aid kits. Confirmation of a medical professional on site.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of OHS.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Occupational Health and Safety	Signage installed on site	Construction Operation Decommissioning	Confirmation of appropriate signage on site particularly at meeting areas or where work will be undertaken. Number of H&S incidents, near-misses or accidents recorded.	During weekly checks and monthly detailed audit Daily toolbox talks should emphasise the importance of OHS.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
<b>Waste</b>					
Solid and Liquid wastes	Pollution Prevention and Control Plan	Construction Operation Decommissioning	Confirmation of implementation of the Pollution Prevention and Control Plan	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Solid and Liquid wastes	Water Resource and Management Plan	Construction Operation Decommissioning	Confirmation of implementation of the Water Resource and Management Plan	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Liquid wastes	Quantity and quality of liquid waste generated Number of Sanitation facilities on site	Construction Operation Decommissioning	Confirmation of Quantity and quality of liquid waste generated. Confirmation that waste water has been collected and disposed of at a licensed facility or appropriately treated on site in the case of sewage.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Eppert.
Liquid wastes	Number of Sanitation facilities on site	Construction Operation Decommissioning	Confirmation of number of sanitation facilities on site and confirmation that it meets the needs of the workforce.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Solid wastes	Quantity of solid waste generated and correctly disposed to licensed disposal sites.	Construction Operation Decommissioning.	Confirmation of Quantity and quality of liquid waste generated. Confirmation of disposal by licensed solid waste transporter.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Solid wastes	Solid waste storage facilities on site.	Construction Operation Decommissioning.	Confirmation of number of waste facilities on site and confirmation that there has been appropriate segregation and storage.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Hazardous materials / wastes	Hazardous Waste Management training	Construction Operation Decommissioning.	Number of Trained Workers on Hazardous Waste Management	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Hazardous materials / wastes	Amount of Hazardous Waste Segregated	Construction Operation Decommissioning.	Confirmation of amount of hazardous waste generated.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Hazardous materials / wastes	Quantity of accidental hazard spillage	Construction Operation Decommissioning.	Confirmation of number of spillages of hazardous wastes.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
<b>Security</b>					
Project site safety and security	Security Management Plan developed and implemented	Construction Operation Decommissioning.	Confirmation of implementation of the Security Management Plan	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Project site safety and security	Number of Security personnel employed	Construction Operation Decommissioning.	<ul style="list-style-type: none"> <li>Confirmation of implementation of the Water Resource and Management Plan</li> </ul>	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Project site safety and security	Site Fence Trained workers on site security	Construction Operation Decommissioning.	Visual inspection of the condition of the site perimeter fence and evidence of damage.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Project site safety and security	Trained workers on site security	Construction Operation Decommissioning.	Review of number of trained workers on site security	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Project site safety and security	Provision of code of conduct for security personnel.	Construction Operation Decommissioning.	Confirmation that a code of conduct is in place and that all security personnel have sign up to it.	Prior to the appointment of security personnel	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Project site safety and security	Results of background checks for security staff.	Construction Operation Decommissioning.	Review of Results of background checks for security staff.	Prior to the appointment of security personnel	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Project site safety and security	Positive view of the security personnel by local community meetings	Construction Operation Decommissioning.	Minutes of community meetings Confirmation of provision of information through the SEP and grievance mechanism	During weekly checks and monthly detailed audit	Weekly checklist: CLO, EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.

### Community Health and Safety

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Safety of Local Community	Community H&S Plan	Construction Operation Decommissioning.	Confirmation of implementation of the Community H&S Plan See separate CHS Plan for further details.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Safety of Local Community	Provision of information through the SEP and grievance mechanism	Construction Operation Decommissioning.	Review of information provided to communities and review of grievance log.	During weekly checks and monthly detailed audit	Weekly checklist: CLO, EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
<b>Archaeology and Cultural Heritage</b>					
Archaeology and cultural heritage	Chance Find Procedure	Construction	Confirmation of implementation of the Chance find procedure and review of reports produced	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Archaeology and cultural heritage	Number of recorded chance finds	Construction	Number and type of chance finds	During weekly checks and monthly detailed audit for the initial site preparation and topsoil stripping work.	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
<b>Visual and Landscape</b>					
Visual and landscape	Site rehabilitation and landscaping	Operation Decommissioning.	Visual inspection of success of site rehabilitation and landscaping	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Visual and landscape	General site condition	Construction Operation Decommissioning.	Visual inspection of site condition and presence of litter particularly on the perimeter fence.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.



Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
<b>Socio-economic</b>					
Socio-economic – population and economy	Stakeholder Engagement Plan and grievance mechanism	Construction Operation Decommissioning.	Confirmation of implementation of the Stakeholder Engagement Plan and grievance mechanism Review of Stakeholder engagement activities. Number of grievances recorded.	During weekly checks and monthly detailed audit	Weekly checklist: CLO Monthly detailed audit: Masdar E&S Manager.
Socio-economic – population and economy	Skills training agreement with local vocation training centre.	Construction Operation Decommissioning.	Confirmation of training places provided and completed.	During weekly checks and monthly detailed audit	Weekly checklist: CLO Monthly detailed audit: Masdar E&S Manager.
Local hiring and workforce management	Local employment plan	Construction Operation Decommissioning.	Confirmation of the implementation of a Local employment plan Monthly audit results showing workforce statistics	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Socio-economic – population and economy	Adherence to GIIP with respect to construction works.	Construction	Visual inspection of construction works	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Socio-economic – population and economy	Access arrangements for local residents.	Construction Operation Decommissioning.	Review of grievance log	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Spread of Food and Water-borne Disease	Agreements with relevant government/NGOs to support health campaigns	Construction Operation Decommissioning.	Agreements with relevant government/NGOs to support health campaigns	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Spread of Food and Water-borne Disease	Information disclosed as part of health campaigns	Construction Operation Decommissioning.	Heath related advertising and communication.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Spread of Communicable Disease	Provision of employee health screening.	Construction Operation Decommissioning.	Confirmation of health screening. Number of reported heath incidents.	During monthly detailed audit	Monthly detailed audit: Masdar E&S Manager.
Spread of Communicable Disease	Provision of H&S induction focus on heath matters.	Construction Operation Decommissioning.	Confirmation that all workers have completed the health related induction.	During monthly detailed audit	Monthly detailed audit: Masdar E&S Manager.
Spread of Communicable Disease	Provision of health related awareness and training to workforce	Construction Operation Decommissioning.	Review of heath related advertising and communication. Number of reported heath incidents.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Increased Pressure on Health Services	Provision of worker health care through dedicated Project professional	Construction Operation Decommissioning.	Agreement or contract with health care provider. Confirmation of presence of health care professional on site.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Increased Pressure on Health Services	Investments in facilities used by workers	Construction Operation Decommissioning.	Agreement or contract with health care provider to provide investment in facilities.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Pressure on Water Resources	Provision of worker code of conduct	Construction Operation Decommissioning.	Review of signed worker code of conduct. Review of grievance log. Visual inspection confirming availability of bottled water for workforce.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Sale and Use of Alcohol	Development of zero-alcohol policy	Construction Operation Decommissioning.	Review of reported incidents and results of failed alcohol tests	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
<b>Traffic and Transportation</b>					
Traffic Management	Traffic Management Plan	Construction Operation Decommissioning.	Confirmation of implementation of the Traffic Management Plan. Review of grievance log.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Traffic incidents	Advanced driver training.	Construction Operation Decommissioning.	Number of drivers that received advanced driver training.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Traffic incidents	Road safety briefings provided.	Construction Operation Decommissioning.	Number of road safety briefings provided.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.
Traffic incidents	Reported driving incidents including speed violations.	Construction Operation Decommissioning.	Number of driving incidents including speed violations.	During weekly checks and monthly detailed audit	Weekly checklist: EPC and ROLE TBC Monthly detailed audit: Masdar E&S Manager.

## Appendix C Species List

Common Name	Latin Name	IUCN Threatened ?	Uzbek Red Data Book ?	Sept 2021			April 2022 <sup>1</sup>		Comment
				Sola r PV	Sola r PV	OHT L	Sola r PV	OHT L	
<b>Birds</b>									
Barn swallow	<i>Hirundo rustica</i>	No	No	✓			✓	x	
Black-bellied sandgrouse	<i>Pterocles orientalis</i>	No	No	✓	✓	x	✓	x	Peak count 6
Blue-cheeked Bee-eater	<i>Merops persicus</i>	No	No	✓	x	x	x	x	
Carrion Crow	<i>Corvus corone</i>	No	No	x	x	x	✓	x	
Chukar partridge	<i>Alectoris chukar</i>	No	No	✓	x	x	x	-	
Cinereous vulture	<i>Aegypius monachus</i>	No	✓(NT)	✓			✓	x	
Common buzzard	<i>Buteo buteo</i>	No	No	x	x	x	✓	x	
Common kestrel	<i>Falco tinnunculus</i>	No	No	✓			✓	x	
Common myna	<i>Acridotheres tristis</i>	No	No	✓	x	x	x	x	
Common swift	<i>Apus apus</i>	No	No	x	x	x	✓	x	
Collared dove	<i>Accipiter nisus</i>	No	No	✓	x	x	x	x	
Crested lark	<i>Galerida cristata</i>	No	No	✓	✓	-	✓	-	
Desert wheatear	<i>Oenanthe deserti</i>	No	No	✓	x	-	x	-	
Egyptian vulture	<i>Neophron percnopterus</i>	✓(EN)	✓(VU)	x	x	-	✓	-	Single bird recorded
Eurasian curlew	<i>Numenius arquata</i>	No	✓(VU)	x	x	-	✓	-	6 recorded on migration
Eurasian stone curlew	<i>Burhinus oedicephalus</i>	No	No	x	x	x	✓	-	
European bee-eater	<i>Merops apiaster</i>	No	No	✓	x	x	✓	-	
Eastern imperial eagle	<i>Aquila heliaca</i>	✓(VU)	✓(VU)	x	x	x	✓	x	Single bird recorded
Eurasian griffon vulture	<i>Gyps fulvus</i>	No	✓(VU)	✓	x	x	✓	x	Peak count of 6
Eurasian magpie	<i>Pica pica</i>	No	No	✓	x	-	✓	-	
Eurasian sparrowhawk	<i>Accipiter nisus</i>	No	No	x	x	x	✓	-	
Feral pigeon	<i>Columbia livia</i>	No	No	✓	x	x	✓	-	
Golden eagle	<i>Aquila chrysaetos</i>	No	✓(VU)	✓	x	x	✓	x	Single birds recorded

Common Name	Latin Name	IUCN Threatened ?	Uzbek Red Data Book ?	Sept 2021			April 2022 <sup>1</sup>		Comment
				Sola r PV	Sola r PV	OHT L	Sola r PV	OHT L	
Greater short-toed lark	<i>Calandrella brachydactyla</i>	No	No	✓	x	x	x	x	
Greater spotted eagle	<i>Clanga clanga</i>	✓(VU)	✓(VU)	x	x	x	✓	x	Single migratory bird
Hen harrier	<i>Circus cyaneus</i>	No	No	✓	x	x	x	x	
Hobby	<i>Falco subbuteo</i>	No	No	✓	x	x	x	x	
Hoopoe	<i>Upopa epops</i>	No	No	✓	x	x	x	x	
Isabelline wheatear	<i>Oenanthe isabellina</i>	No	No	x	x	x	✓	x	
Jackdaw	<i>Coloeus monedula</i>	No	No	x	x	-	✓	-	
Bearded Vulture	<i>Gypaetus barbatus</i>	No	✓	x	✓	x	x	x	Single bird
Little owl	<i>Athene noctua</i>	No	No	✓	x	✓	x	x	
Long-legged buzzard	<i>Buteo rufinus</i>	No	No	✓	x	✓	x	x	
Oriental turtle dove	<i>Streptopelia orientalis</i>	No	No	✓	x	x	x	x	
Peregrine	<i>Falco peregrinus</i>	No	No	x	x	x	x	x	
Marsh harrier	<i>Circus aeruginosus</i>	No	No	✓	x	x	x	x	
Masked wagtail	<i>Motacilla (alba) personata</i>	No	No	✓	x	x	x	x	
Northern raven	<i>Corvus corax</i>	No	No	✓	x	x	✓	x	
Pied wheatear	<i>Oenanthe pleshanka</i>	No	No	✓	x	-	x	-	
Rook	<i>Apus apus</i>	No	No	✓	x	x	✓	x	
Sand martin	<i>Riparia riparia</i>	No	No	✓	x	-	x	x	
Siberian stonechat	<i>Saxicola maurus</i>	No	No	x	x	x	✓	-	
Spanish sparrow	<i>Passer hispaniolensis</i>	No	No	✓	x	x	x	x	
Steppe eagle	<i>Aquila nipalensis</i>	✓(EN)	✓(VU)	x	x	✓	✓	x	Peak count 6 (Sanzar Valley [OHTL])
Tawny pipit	<i>Anthus campestris</i>	No	No	✓	x	x	x	x	
Tree sparrow	<i>Passer montanus</i>	No	No	✓	x	x	x	x	
White-tailed eagle	<i>Haliaeetus albicilla</i>	No	✓(VU)		x	✓	x	x	
White wagtail	<i>Motacilla (alba) alba</i>	No	No	✓	x	x	x	x	



Common Name	Latin Name	IUCN Threatened ?	Uzbek Red Data Book ?	Sept 2021			April 2022 <sup>1</sup>		Comment	
				Sola r PV	Sola r PV	OHT L	Sola r PV	OHT L		
Yellow wagtail	<i>Motacilla flava</i>	No	No	x	x	-	✓	-		
<b>Mammals</b>										
Yellow ground squirrel	<i>Spermophilus fulvus</i>	No	No	✓	✓				N/A	
Zaisan mole vole	<i>Ellobius tancrei</i>	No	No	✓	✓				N/A	
Severtzov's jerboa	<i>Allactaga severtzovi</i>	No	No	✓	✓				N/A	
Long-eared hedgehog	<i>Hemiechinus auritus</i>	No	No	✓					N/A	
Red Fox	<i>Vulpes vulpes</i>	No	No	✓	✓	✓			N/A	
<b>Reptiles</b>										
Central Asian tortoise	<i>Testudo horsfieldii</i>	✓(VU)	✓(VU)	x	x	x	✓	x	Population size within Solar PV = 0.31 individuals/hectare	
Steppe-runner	<i>Eremias arguta uzbekistanica</i>	No	No	✓	x	x	✓	x		
An Anguid lizard	<i>Pseudopus apodus</i>	No	No	✓	x	x	x	x		
Sand racer	<i>Psammophis lineolatus</i>	No	No	x	✓	x	x	x		
<b>Amphibians</b>										
European green toad	<i>Bufo viridis</i> SL	No	No	x	x	x	✓	x		
<b>Higher plants</b>										
Hare barley	<i>Hordeum leporinum</i>	Not yet assessed	No	✓	✓				N/A	Abundant
Camelthorn/Yantak	<i>Alhagi pseudoalhagi</i>	Not yet assessed	No	✓	✓	✓			N/A	Abundant (Solar PV), Occasional (OHTL)
Viviparous bluegrass	<i>Poa bulbosa</i>	Not yet assessed	No	✓	✓	✓			N/A	Locally Abundant (Solar PV), Dominant (OHTL)
An aster	<i>Aster amellus</i>	Not yet assessed	No	✓	✓				N/A	Occasional
Ceratocarpus spp.	<i>Ceratocarpus utriculosus</i>	Not yet assessed	No	✓					N/A	Occasional
A cleome	<i>Cleome lipskyi</i>	Not yet assessed	No	✓					N/A	Rare
Cousinia	<i>Cousinia bungeana</i>	Not yet assessed	No	✓					N/A	Locally frequent
Bermuda grass	<i>Cynodon dactylon</i>	Not yet assessed	No	✓	✓				N/A	Locally abundant
Common caper	<i>Capparis spinosa</i>	Not yet assessed	No	✓	✓	✓			N/A	Rare (Solar PV), Frequent (OHTL)
Spiny cocklebur	<i>Xanthium spinosum</i>	Not yet assessed	No	✓	✓	✓			N/A	Frequent

Common Name	Latin Name	IUCN Threatened ?	Uzbek Red Data Book ?	Sept 2021			Nov 2021		April 2022 <sup>1</sup>		Comment
				Sola r PV	Sola r PV	OHT L	Sola r PV	OHT L	Sola r PV	OHT L	
A legume	<i>Psoralea drupacea</i>	Not yet assessed	No	✓	✓				N/A		Rare
Isirik	<i>Peganum harmala</i>	Not yet assessed	No	✓		✓			N/A		Abundant
A saltwort	<i>Girgenshonia oppositiflora</i>	Not yet assessed	No	✓					N/A		Rare
Halocharis sp.	<i>Halocharis hispida</i>	Not yet assessed	No	✓					N/A		Rare
A lily	<i>Ixiolirion tataricum</i>	Not yet assessed	No	✓					N/A		Occasional
A sedge	<i>Carex pachystylis</i>	Not yet assessed	No	✓					N/A		Frequent
A perennial wormwood	<i>Artemisia lerchiana</i>	Not yet assessed	No	✓					N/A		Locally abundant (planted historically as a crop for grazing)
Caltrop	<i>Tribulus terrestris</i>	Not yet assessed	No	✓					N/A		Rare

Footnote

<sup>1</sup> The April 2022 bird species list only includes incidental bird records recorded during the Asian houbara surveys and reptile species recorded during the Central Asian tortoise surveys which were undertaken in April 2022.

<sup>2</sup> The April 2022 species list for reptiles includes the species recorded and reported in Nazarov 2022.



## Appendix D Turnstone Ecology CHA Report

SEE SEPARATE ATTACHMENT





## Appendix E GBI Tortoise Relocation Report

# REPTILES RELOCATION REPORT

220 MW Solar PV Farm in Gallaorol, Uzbekistan



**Green Business  
Innovation**

DRAFT V1

Nur Jizzakh Solar FE

16.12.2022

## INTRODUCTION

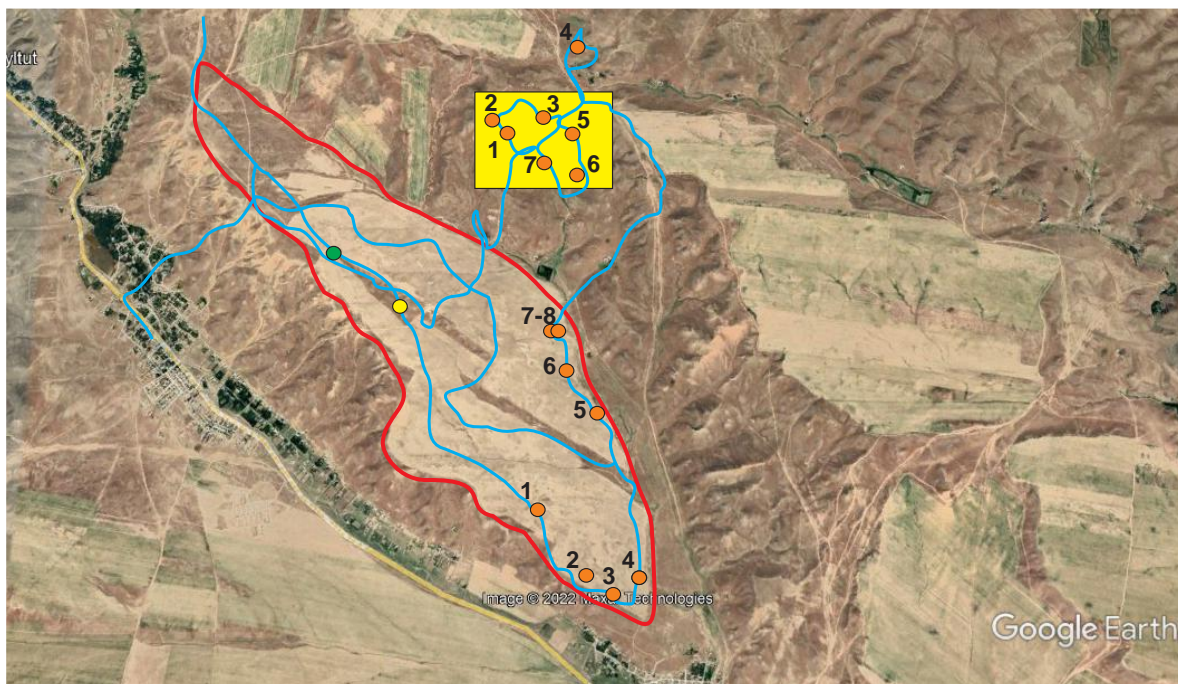
### 10.2 Overview

The purpose of this document is to provide a report on the tortoise relocation activities to date in terms of the Project specific requirements informed by herpetological assessment conducted in April 2022 and conducted consultations with the Regional Ecology Department in September, December 2021 and May 2022.

### 10.3 Background

As described in Project ESIA The herpetofauna study comprised of literature and online resource searches of species and region accounts to determine what species may be present on site, and on-site field survey which was completed in October 2022 and April 2022. During the field survey an attempt was made to assess the status of reptiles and amphibians in the study area (specification of the species and quantitative composition, territorial distribution, including places of concentration, the state of habitats).

During herpetological survey in April 2022 the total quantitative counting of species was carried out through the line transect census method at typical habitats. During the field observations, 24 individuals of species were recorded at the total transect length of 22.5 km. The species' places in the community were estimated according to indices determined by the dominance gradation scale for zoogeographic analysis: less than 0.1 individuals/ha – very rare species, 0.1 to 0.9 – uncommon one, 1.0 to 9.0 – common one, more than 10.0 – abundant one. The species with more than 10% of the total population density were considered as dominant and co-dominant ones.



**Source:** Herpetological survey, April, 2022. The routes (tracks) of day and night time observations in April; an orange circles – *Testudo horsfieldii*; yellow circle – *Eremias arguta uzbekistanica*; green circle – *Bufo viridis* complex.

The population size of the Central Asian tortoise in the project area is negligible. The census showed that the population density of the tortoise does not exceed 0.31 ind./ha. The sex and age composition of the population also indicates its extremely unfavourable condition. For the entire period of the survey, the team did not meet a single juvenile exemplar. In addition, the sex ratio is strongly biased towards females. This may indirectly indicate that the tortoise is being caught for commercial use. The state of the carapace of many individuals also manifests itself in the extremely depressed state of this population. In the adjacent area (site 2) tortoises live at approximately the same population density as in the project area – 0.36 ind/ha.



Source: Herpetological survey, April, 2022. Project site, transmission Line, tracks and three census sites of the field observations.

During this season, the tortoises are usually not bound to permanent burrows, but use temporary burrows to lodge for the night. Therefore, recording the position of temporary burrows will not help detect tortoises during hibernation. Moreover, it is highly undesirable to conduct the relocation process of tortoises at their hibernation period.

The tortoise relocation was conducted in June 2022. The relocation surveys for Central Asian tortoise were conducted within the solar farm project land footprint area total 600 ha area that required for construction of the solar PV farm.

Total 213 tortoises were caught and relocated to the receptor area suggesting 0.35 per hectare.



### 1.3 Survey Work protocol

The survey works within the areas covered the objective to record the presence and relocate any active animals:

1. *Searching for active tortoises was conducted on 12-16 June.* The footprint area was divided into 6 parts (refer to Map 1.)

Any active animals were caught, health checked and marked and then moved to the receptor areas confirmed with Jizzakh Regional ecology department.

2. *Burrows search (methodology described in Section 2.1)*

The search has been undertaken in early summer, hence there was a chance that some species could be in early stage of summer hibernation. This is why all identified burrows within working areas were checked using endoscopes. The checked burrows were not destroyed since at this season there is a risk related to eggs. The burrows within the area (Zone 1) of higher density of tortoises (the areas where majority of tortoises were caught) have higher probability of laid eggs. The Special Attention Zone (refer to Map 2) was marked to inform the pre-works ecological walkover survey to have the area re-checked by the EPC before clearing.

#### Daily working protocol:

Working hours: from 6 am to 11 am and from 4 to 7 pm with 5 hours break at hot time of the day as reptiles were not active at this hours. This was time of the day with good visibility;

- 6 am. Team briefing and setting the plan for a day;
- 7 pm. Reporting results at the end of the day, marking the animals and releasing them in the receptor area;

The Surveyors performed a transect walk 15m apart. Every person was observing 15 m on the right and 15 m on the left. The team walked in parallel and in straight lines to sweep the full section. Given the higher density in Zone 1, the team revisited the area number of times.

#### Manpower:

- The surveyors were organized into 3 teams. Each team consisted of a specialist and assistant;

Professional herpetologist oversight. Herpetologist and biodiversity specialists were working with assistants to insure professional monitoring of the works.

Details of the engaged team are provided in the Appendix 1.

### 1.4 Legislation

The main legislation of Uzbekistan applicable to biodiversity management is listed below.

- *Law №3PY- 408 of the Republic of Uzbekistan on "The Protection and use of the animal world " (new edition) as of 19.09.2016*



- *Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 290 dated 20.10.2014, on “The Regulation of the use of biological resources and on the permission procedures in the sphere of nature use”.*

The State Committee of the Republic of Uzbekistan on Ecology and Environmental Protection (Goscomecology) executes state control in the field of protection and use of the animal world.

Legal entities and individuals are obliged to take measures to prevent diseases and death of wild animals, preserve their habitat, breeding grounds and their migration routes in the implementation of any types of economic and other activities. All actions have to be coordinated with Goscomecology.

The team presented the herpetological survey results (conducted in April 2022) to the representatives of Goscomecology in Tashkent. The relocation permit (provided in the Appendix 3) was obtained from Goscomecology to execute relocation activities. The permit prescribed conditions to provide summary of BAP and Pre-construction ecology survey protocols. A copy of the permit letter from Goscomecology was sent to Jizzakh regional Department for further monitoring of the activities.

At the regional level Goscomecology is represented by its regional departments, that undertake control and coordination in the respective regions of Uzbekistan.

Jizzakh region Department for Ecology and Environmental Protection is regional department in charge of coordination and control of all environmental issues for Nur Jizzakh Solar project.

Relocation of animals was monitored by assigned representative of Gallaorol regional Department for Ecology and Environmental Protection (Sherzod Musaev). Upon completion of relocation works *Relocation protocol* with list of relocated animals and coordinates of agreed receptor area (provided in the Appendix 3) was signed by representative of Gallaorol regional Department for Ecology and Environmental Protection, Nur Jizzakh Solar representative and consultants.

## 11. TORTOISE RELOCATION METHODOLOGY

### 11.1 Rationale

Described methodology has been implemented in order to protect the ecosystem of the project area and vulnerable species from the negative effects of construction work. The main goal of the reptile's relocation is to achieve zero mortality among tortoises and other reptiles during construction phase.

#### ***Central Asia tortoises***

The relocation of tortoises to a safe place is carried out by two methods: the first is the collection of tortoises from the project area in the spring (March-early June) and relocation to another receptor area, the second method is the destructive search of tortoises in a state of hibernation. The first method is recommended to be used by herpetologist assessment report as well as approved State ecology permit methodology.

Special attention zone was marked to inform the pre-works ecological walkover survey and to have the area to be re-checked by the EPC before clearing.

While surveying areas, the team paid attention to several points that inform potential presence of tortoises in the area. First, searching for residential and non-residential old burrows with horizontally oval shapes. Second, the presence of tortoise day-beds under the bushes. These are usually shallow pits, where tortoise might hide from the heat in the daytime. Also, a characteristic feature of the habitat is the presence of tortoise excrement and dry carapace shells on the territory. Special attention zone is the areas where the majority of tortoises were caught and described by concentration of burrows and traces suggesting potential presence of tortoises.

All animals seen as well as those caught and moved are subject to a health check and the following details will be recorded:

- Age
- Sex
- Size (length and width of carapace)
- Weight
- Location moved to (GPS)
- A photograph of each animal will be taken to include pictures of the carapace

Each animal caught and moved in 2022 will have the same marking applied.

Pre-construction and pre-works surveys will be completed throughout the construction period following the methodology detailed above

The presence of burrows within working areas should be noted and checked for the presence of hibernating animals. If hibernating reptiles are found, then the area shall be avoided until the following spring when the area will be subject to secondary checks.

If during the initial pre-construction surveys the Reptile Expert identifies the presence of other species of international conservation concern they must immediately report the findings to the

EPC Contractor and Project Company, who shall communicate it to the relevant stakeholders (biodiversity authorities & lenders).

The process was conducted in communication with Goscomecology. Appointed Goscomecology specialist has visited the area and signed the act of relocation of the reptiles to the receptor area.

### 11.2 Receptor Site Selection

Potential receptor site has been suggested by the specialists (Map 3, Appendix 2) and confirmed by the Jizzakh regional ecology. One location was used for relocation of the tortoises:

*Receptor area.* Site coordinates: 40.165740, 67.513530

Selected receptor area in the north-west of the project area where it is naturally fenced with a ravines and is located approximately 2 kilometers from the project area. There is a typical grey desert with predominantly Artemisian vegetation. One of the factors in choosing this area is that it is typical natural habitat and the tortoises will feel at home here.

The receptor area was agreed with regional Goscomecology representative and included in the Relocation protocol.

### 11.3 Marking of Tortoises for Monitoring

In order to further monitor and not to confuse relocated tortoises, tortoises were marked with a waterproof paint of a white color that is easily noticeable. All tortoises were marked with it's serial number.



Source: Survey in June, 2022. Marking the tortoises

## 12. RESULTS

### 12.1 Relocation results

Total 213 tortoises were caught and relocated to the receptor area. Map 2 in the Appendix 3 shows the area where the tortoises were translocated.



Source: Tortoise relocation, June, 2022



Source: Tortoise relocation, June, 2022

### 12.2 Special attention zone

The location of tortoises, burrows and traces were used to inform Special attention zone (Zone 1) (Map 2 in the Appendix 2). The marked area is suggested for pre-works surveys to avoid the risk of juvenile and hibernating tortoises. Congestion of tortoises and burrows are observed in the polygon indicated as special attention zone. All construction works in these areas must be carried out under the close supervision and control of ecologist.

Although, there is a reasonable level of certainty that the number of collected and relocated animals represent the majority part of population in the surveyed area, the special attention are needs to be revisited for the presence of juveniles and hibernating tortoises at the pre-works surveys and, the ecologist should supervise the track construction works in these areas by working closely with the machine drivers under an Ecological Watching Brief, to ensure the ground is carefully and methodical removed by the machine operators and the ecologist removing any tortoises which might be found this way (and advising changing/adapting the

work method if higher numbers of tortoises are unexpectedly found). In case of higher numbers of tortoises are unexpectedly found it is recommended to place the animals in wild animals nurseries until next spring when the animals can be released to the receptor areas.

### *Fencing*

As suggested by the herpetologists fencing is not recommended to be installed right after the survey since tortoises are in summer hibernation/estivation and no longer active.



### 13. RELOCATED ANIMAL STATISTICS

Relocated reptiles' details are provided in the attached relocation protocol:

#### *The statistics of relocated*

- Gender distribution: 167 females, 33 males, 13 immature.
- Condition: 73 individuals with very good condition, 95- normal, 45- satisfactory;
- Age: from 1 to 23 years;



Source: Release in the receptor area, June.2022

Provided data can be used for further monitoring and inform the research of the herpetofauna of the area.

#### *Procedures undertaken:*

Communication with Jizzakh Department of Goscomecology was kept on regular basis during relocation survey. Head of the Department for Biodiversity and Protected Areas was appointed by Gallaorol Goscomecology to monitor the process of relocation of the animals to the receptor

site and sign respective documents. Photos and document including list of tortoises is provided in the Appendix 3.

## **14. FURTHER MITIGATION AND MONITORING REQUIREMENTS**

Further mitigation requirements/prescriptions described in the BAP should be observed.

## **APPENDICES**

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## APPENDIX 1. TEAM DETAILS

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### 1. Fazlullakhon Agzamov, biodiversity specialist

*Date of birth:* 18.11.1987

*Address:* Uzbekistan/Tashkent Chilanzar district, 5th-Khiva-3

*Career:*

2018- currently, research specialist on biodiversity, Research Institute of Ecology and Environmental Protection, Tashkent.

Projects engaged:

- Development of legal framework for urban trees molding;
- Research for establishment of new protected areas and national nature parks in Central Kysilkum, Babatak mountains, Tamdy Aktau mountains;
- Study of the range of seasonal migrations of ungulates in the western Tien Shan;
- Biodiversity assessment of Tamdy, Ustyurt, Surkhandarya, Karmana.

2018- 2020, Coordinator of eco-inspectors, Tashkent city department of the State committee on ecology and environment protection;

2019 - Research project in Karakalpakstan, Biodiversity conservation chapter;

2016 – 2018, Bird census project, Bird Watchers Society of Turkey;

2010 – 2015, Specialist of expedition to 11 nature reserves in Uzbekistan, joint project of Goscomecology and Zukkov Fund and Greifswald University;

2010 – 2013, National consultant on capacity assessment of nature reserve workers, UNDP/GEF project for nature reserves, Tashkent.

*Education:*

- Tashkent state Pedagogical University named after Nizami, faculty of Law, Bachelor Degree, 2009
- Tashkent State University, Biology department, 2013
- Tashkent Institute of Irrigation and Agricultural Mechanization Engineers, Department of Environmental protection and geoinformation technologies, Master Degree, 2020
- Landscape ecology & nature conservation (study course at Greifswald University/Germany) 1.5 month in 2011

Member of bird watchers society of Uzbekistan

Mentor of Central Asia cleantech startups platform



## **2. Zoir SHARIPOV, herpetologist, researcher**

*Address:* Tashkent, Mirabad district, Yangi Kuyluk street, 1/6

*Nationality:* Uzbekistan

*Work experience:*

1974 – 1978 Zoology Institute, Laboratory of Ecology and Herpetology, Researcher, Herpetologist;

1979 - 1988 Central Asia ZOO Combinat under CheifHunting Department of USSR, Head of laboratory on taking poison from arthropods, research material for Academy of Science of Uzbekistan USSR;

1989 - 1992 ZOO KOMPLEX, Herpetologist (poisonous animals);

1993- 1999 Biology Institute under the name of Shimyakin, Moscow, Researcher, project developer;

1999-2004 Kazakhstan Academy of Science of Kazakhstan (Plant Protection Institute, Locust project);

2005 – Individual consultant and researcher. Consultant of State committee on ecology and environment protection;

*Education:*

1973-1979, Biology Faculty, Taskent State University

## **3. Farhod Niyazov, ecologist**

*Address:* Navoi region, Hatirchi district

*Date of birth:* 01.10.1986

*Nationality:* Uzbekistan

*Work experience:*

2019 – Navoi region Department of Ecology and Environmental Protection, Chief specialist, Biocontrol department;

2018- 2019, Navoi region Department of Ecology and Environmental Protection Category 1, environmental specialist;

2017-2018 Navoi region Department of Ecology and Environmental Protection Inspection of waste collection, storage, transportation, disposal, processing, burial and sale, Control of waste generation, storage, collection, transportation;

2015-2017 Karmana District Consumer Protection Monitoring Specialist.

*Education:*

Tashkent Automobile and Roads Institute, Ecology Department, completed in 2012

#### **4. Bakhrom YUSUPOV, ecologist**

*Address:* Navoi region, Kiziltepa district

*Nationality:* Uzbekistan

*Work experience:*

2017 – Navoi region department of Ecology and Environmental Protection, Junior research assistant

2018 -2019 Assistant ecologist, part time, Environmental impact Assessment. A draft statement on the environmental impact (Draft EIS) on silk products "Construction of new smelting furnace at copper smelting plant»

2018- 2019 Assistant ecologist, part time, Assessment of the impact on the environment. Draft environmental impact statement for PTEO "Construction of Copper processing plant No. 3 (MOF-3) within the framework of the investment project" development of the Yeshlik-I Deposit»

*Education :*

Navoi College , Biology and chemistry class, completed in 2018

Student of Nanjing University of Science and Technology, since 2019

#### **5. Aminjon MALIKOV, veterinarian, zoologist**

*Address:* Navoi region, Kiziltepa district

*Nationality:* Uzbekistan

*Work experience:*

2018 – ecologist, Navoi region department of Ecology and Environmental Protection, Inspection Department

2013-2016 Research Assistant, Expedition specialist in the project: Census of vertebrates number on the territory of Kazakhdarya, Kungrad state forest hunting farms, Karauzyak and Takhtakupir forestry of the Republic of Karakalpakstan

2010 -2012 Specialist Veterinarian, State Vet Control, Navoi

2008- 2009 Research Lab Assistant, Samarkand Agrarian institute

*Education :*

Samarkand Agrarian institute, Department of Veterinary , Bachelor degree, 2008

**6. Abdusalom Normatov, senior researcher, Forestry scientific research institute, Tashkent**

*Address:* Tashkent, Uzbekistan

*Nationality:* Uzbekistan

*Work experience:*

2018- currently, senior researcher, Forestry Scientific Research Institute, Tashkent

2015-2018, Agronomist, Botanical Institute of the Academy of Science of the Republic of Uzbekistan;

2007 -2015, Director, private company “Jargurghon Urmon” in Surkhandarya region (sprouts harvesting);

2004- 2007, Lead Forester, Surkhandarya State Nature Protection Committee, “Tabiyat” experimental research centre;

2002-2004, Lead specialist for bio-control inspection, Surkhandarya State Nature Protection;

1996-2002, Head Forester, Sherobod Forestry, Qiziriq district, Surkhandarya region;

1988-1993, Deputy Head, Tajik Agrarian Scientific research insitute, Tajikistan;

1987-1988, Junior researcher, Ural Institute for decorative plants, Russia.

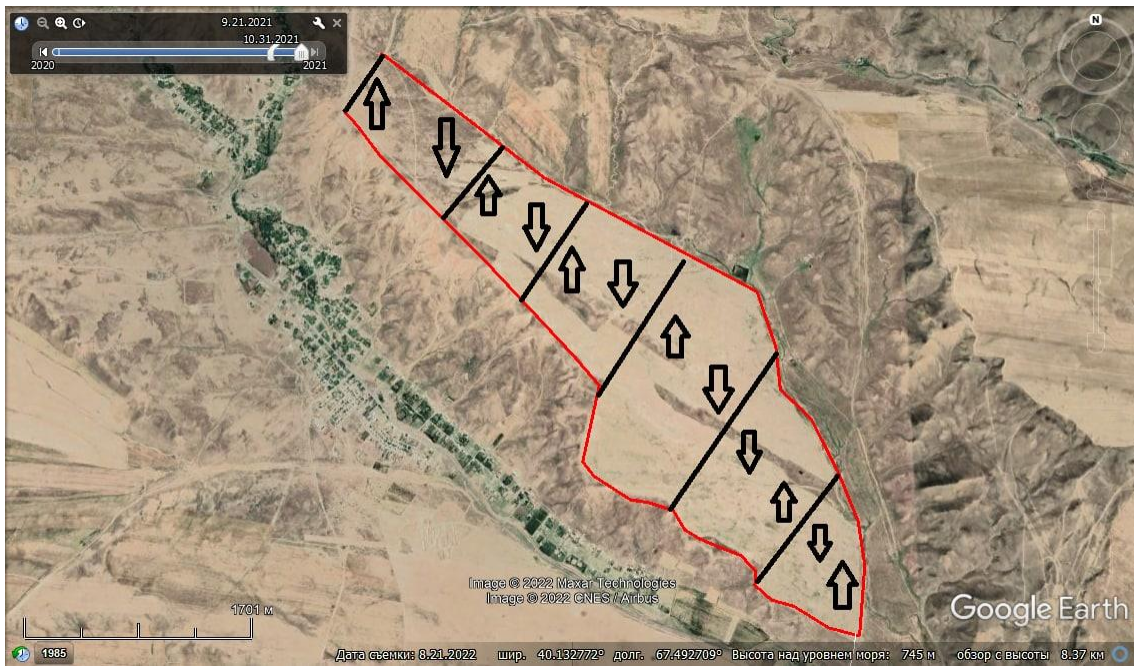
*Education:*

Ural Forestry Institute, Ural, Russian Federation 1990

PHD thesis: “The choice of promising tree and shrub species for landscaping objects located in the desert zone on the example of Uchkuduk area in Uzbekistan”

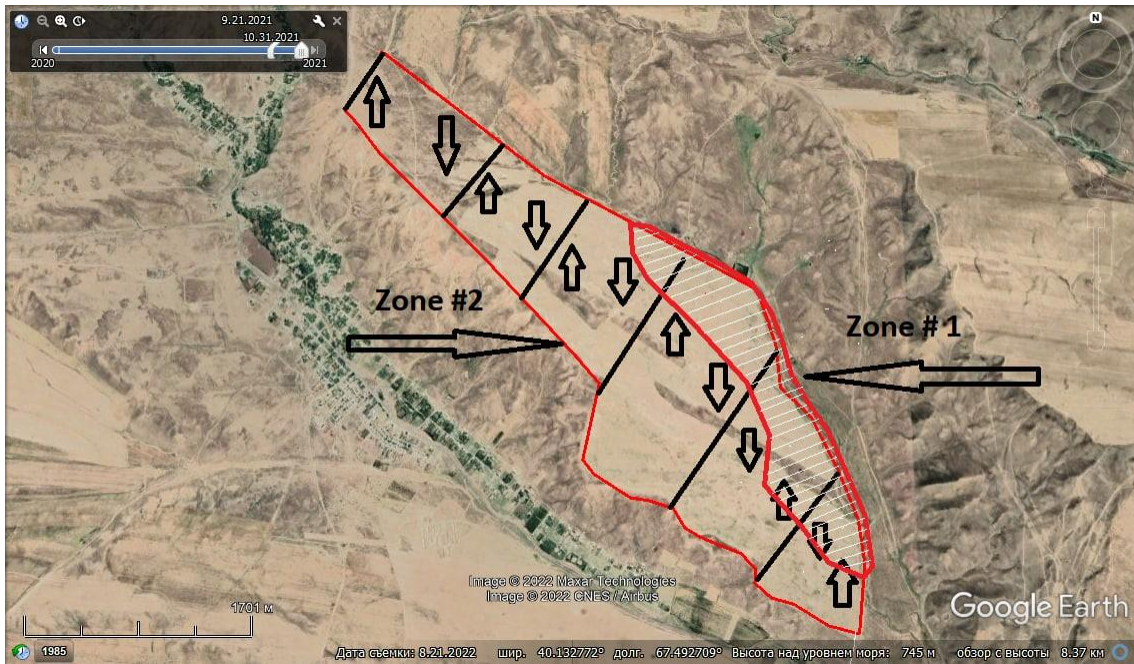
## APPENDIX 2. MAPS

Map 1. Survey protocol: division of area





## Map 2. Tortoise location map



1 Zone –tortoise high concentration zone (Special attention zone)

2 Zone – low density zone

## Map 3. Receptor area




Source: Receptor area, June, 2022.



## APPENDIX 3: PERMIT AND RELOCATION PROTOCOL

### Relocation permit of Goscomecology



**O‘ZBEKISTON RESPUBLIKASI EKOLOGIYA VA ATROF-MUHITNI  
MUHOFAZA QILISH DAVLAT QO‘MITASI RAISING BIRINCHI  
O‘RINBOSARI TOPSHIRIG‘I**

100043, Toshkent shahri, Chilonzor tumani, Bunyodkor shoh ko‘chasi, 7a-uy. tel.: 71-207-11-02,  
faks: 71-236-02-32 veb-sahifa: <http://www.eco.gov.uz>, elektron pochta: [info@eco.gov.uz](mailto:info@eco.gov.uz)

2022-yil "10" 06 02-02/P-456 - son Toshkent sh.

**Жиззах вилояти Экология ва  
атроф-мухитни муҳофаза қилиш  
бошқармаси**


**Самарқанд вилояти Экология ва  
атроф-мухитни муҳофаза қилиш  
бошқармасига**

“SHAMOL ZARAFSHAN ENERGY” масъулияти чекланган жамияти Давлат экология қўмитасига умумий қуввати 440 МВт бўлган қуёш фото-электр станциялар қурилишини бошлаш ниятидалигини билдириб ўтди. Лойиҳанинг маҳаллий биохилмаҳилликка салбий таъсирини минималлаштириш ва (2019 йилда Ўзбекистон Республикаси Қизил китобига киритилган) ўртаосиё чўл тошбақасининг биологик фаоллик вақтини инобатга олган ҳолда, ҳаётига зарар етказиш хавфинининг олдини олиш мақсадида, Давлат экология қўмитаси лойиҳа доирасида “SHAMOL ZARAFSHAN ENERGY” МЧЖ томонидан таклиф этилган бир қатор хорижий олим ва мутахассислар томонидан берилган илмий асосланган тавсиялар доирасида тошбақаларни қурилиш режалаштирилган ҳудуддан ўхшаш биотопга эга хавфсиз ҳудудга 2022 йил 20 июнга қадар кўчиришни тавсия қилди.

Шу муносабат билан, Жиззах ва Самарқанд вилоятлари Экология ва атроф-мухитни муҳофаза қилиш бошқармаларидан мазкур тадбирларда янгироқ эгил: учун малакали мутахассис ажратишингиз ва ўз навбатида назоратга олишингиз топширилади. Тошбақаларнинг кўчирилганлиги тўғрисидаги маълумотни (фото суратлар илова қилинган ҳолда) далолатнома тузишингиз ва жорий йилнинг 20 июнда Давлат экология қўмитаси биохилмаҳилликни асраш бошқармасига ҳисобот беришингиз топширилади.

Илова: \_ варақда

Раиснинг  
биринчи ўринбосари

 У.Халилов

Relocation protocols signed by Goscomecology.

Утверждаю  
Компания подрядчик



Акт  
о переселении  
диких животных

20.06.2022  
Жиззак

Мы, нижеподписавшиеся, представитель ИП ООО «NUR JIZZAKH SOLAR PV», реализующий инвестиционный проект по строительству солнечной электростанции мощностью 220 МВт составили настоящий акт в присутствии представителя Жиззакского областного управления экологии и охране окружающей среды и консультантов проекта о перемещению диких животных на соседнюю территорию со схожим биотопом, найденных на частичной территории проекта подлежащей выравниванию.

Место сбора животных – территория отведенный под строительство солнечной электростанции

Место выпуска животных -40.165843, 67.513008

Список животных и спецификация приводятся в (Приложение 1.)

Акт составлен в двух экземплярах, по экземпляру каждой из сторон.

Стороны:

ИП ООО «NUR JIZZAKH SOLAR PV»,

 Хуршид Караматов

Представитель Жиззакского областного управления экологии и охране окружающей среды:

 Ш. Мусаев Начальник экологической инспекции Галлааралского района Жиззакской области.

Консультанты:

 А. Атаходжаев, зоолог, консультант, GBI consult

 Ф. Агзамов, специалист по биоразнообразию, консультант, GBI consult

 С. Юсупова, директор GBI consult

Приложение 1:

Список и спецификация животных:

- ID номер
- пол,
- длина панциря,
- возраст,
- состояние,
- фото (Фото будут размещены в Гугл диск)

№	Животное	Детали (пол, возраст, состояние, длина панциря, вес, координаты нахождения, фото)
1	Черепаша	Самка, 14 см, 13 лет, расщарапан
2	Черепаша	Самка, 14 см, 19 лет, Слегка потертый
3	Черепаша	Самка, 13,5см, годовые кольца стерты
4	Черепаша	Самка, 16,5 см, 23 лет, Слегка потертый
5	Черепаша	Самка, 15 см, 24 лет, Слегка потертый
6	Черепаша	Самка, 16 см, 20 лет, Слегка потертый
7	Черепаша	Самец, 11,5 см, 15 лет, панцирь целый
8	Черепаша	Самка, 12 см, 14 лет, потертый
9	Черепаша	Самка, 15 см, 24 лет, Слегка потертый
10	Черепаша	Самка, 16 см, кольца стерты
11	Черепаша	Самец, 13 см, кольца стерты
12	Черепаша	Самец, 13 см, кольца стерты
13	Черепаша	Самка, 13,5 см, Панцирь разбит, кольца стерты
14	Черепаша	Самец, 13 см, 17 лет, Слегка потертый
15	Черепаша	Самец, 11 см, кольца стерты, панцирь колотый
16	Черепаша	Самка 16 см, 24 лет сщарапанный
17	Черепаша	Самка 15 см 24 лет, сщарапанный
18	Черепаша	Самка 17 см 15 лет, панцирь деформирован
19	Черепаша	Самка 15 см 19 лет, сщарапанный
20	Черепаша	Самец, 11 см, сщарапанный
21	Черепаша	Самка 16,5 см панцирь деформирован, кольца стерты
22	Черепаша	Самка 15,5 см 23 лет Слегка потертый
23	Черепаша	Самка 15 см кольца стерты
24	Черепаша	Самец 12 см кольца стерты
25	Черепаша	Самка 16,5 см кольца стерты
26	Черепаша	Самка 14,5 см 15 лет
27	Черепаша	Самка 16,5 см кольца стерты, панцирь деформирован
28	Черепаша	Самка 16 см кольца стерты
29	Черепаша	Самка 15,5 см кольца стерты, панцирь расщарапан
30	Черепаша	Самка 15 см кольца стерты
31	Черепаша	Самка 16,5 см, кольца стерты
32	Черепаша	Самка 15 см, кольца стерты
33	Черепаша	Самка 15,5 см кольца стерты
34	Черепаша	Самка 17 см кольца стерты панцирь плоский – деформирован
35	Черепаша	Самка 14,5 см кольца стерты
36	Черепаша	Самец 13 см кольца стерты
37	Черепаша	Самка 15 см кольца стерты
38	Черепаша	Самка 17 см кольца стерты
39	Черепаша	Самка 16 см кольца стерты
40	Черепаша	Самка 17 см кольца стерты рубцы на панцире
41	Черепаша	Самка 16,5 см кольца стерты
42	Черепаша	Самка 15,5 см кольца стерты
43	Черепаша	Самка 17см 21 лет
44	Черепаша	Самка 16,5 см кольца стерты

45	Черепаша	Самка 16,5 см кольца стерты
46	Черепаша	Самка 16,5 см кольца стерты
47	Черепаша	Самка 15 см кольца стерты рубцы на панцире
48	Черепаша	Самец 13 см рубцы на панцире
49	Черепаша	Самка 14,5 16 лет целый
50	Черепаша	Самец 13 см кольца стерты
51	Черепаша	Самка 15 см кольца стерты
52	Черепаша	Самец 12 см кольца стерты
53	Черепаша	Самка 16 см кольца стерты
54	Черепаша	Самка 15 см кольца стерты
55	Черепаша	Самка 15,5 см кольца стерты
56	Черепаша	Самка 16 см кольца стерты
57	Черепаша	Самка 16 см кольца стерты
58	Черепаша	Самка 15 см 21 лет
59	Черепаша	Самка 16 см кольца стерты
60	Черепаша	Самка 16,5 см 20 лет
61	Черепаша	Самка 17,5 см кольца стерты
62	Черепаша	Самка 17 см кольца стерты
63	Черепаша	Самка 16,5 см кольца стерты
64	Черепаша	Самка 16 см кольца стерты
65	Черепаша	Самка 17,5 см кольца стерты
66	Черепаша	Самка 16,5 см кольца стерты
67	Черепаша	Самец 13 см кольца стерты расщепан
68	Черепаша	Самка 10 см 5 лет
69	Черепаша	Самка 17,5 см кольца стерты
70	Черепаша	Самка 16,5 см кольца стерты
71	Черепаша	Самка 17,5 см кольца стерты
72	Черепаша	Самка 15,5 см кольца стерты
73	Черепаша	Самец 13,5 см кольца стерты
74	Черепаша	Самка 17 см кольца стерты
75	Черепаша	Самка 16,5 см кольца стерты
76	Черепаша	Самка 17 см кольца стерты
77	Черепаша	15,5 см 11 лет
78	Черепаша	14 см
79	Черепаша	5,5 см
80	Черепаша	6 см
81	Черепаша	6,5 см
82	Черепаша	5,5 см
83	Черепаша	6,5 см
84	Черепаша	6,5 см
85	Черепаша	6 см
86	Черепаша	4,5 см
87	Черепаша	14 см 14 лет
88	Черепаша	14 см 14 лет
89	Черепаша	13 см 11 лет
90	Черепаша	13,5 см 12 лет
91	Черепаша	13 см 12 лет
92	Черепаша	14,5 см 11 лет
93	Черепаша	13,5 см 14 лет
94	Черепаша	18,5 см
95	Черепаша	11 см 13 лет
96	Черепаша	10 см 12 лет
97	Черепаша	14 см 11 лет
98	Черепаша	15 см 13 лет
99	Черепаша	13,5 см 12 лет
100	Черепаша	13,5 см 12 лет
101	Черепаша	10 см 10 лет
102	Черепаша	10 см 11 лет
103	Черепаша	14,5 см 12 лет
104	Черепаша	14,5 см 14 лет

105	Черепаша	12 см 11 лет
106	Черепаша	8,5 см 11 лет
107	Черепаша	14,5 см 12 лет
108	Черепаша	11 см 10 лет
109	Черепаша	13,5 см 12 лет
110	Черепаша	4,5 см 9 лет панцирь разбитый
111	Черепаша	4,5 см 9лет
112	Черепаша	13,5 см 13 лет
113	Черепаша	13,5 см 13 лет
114	Черепаша	13,5 см 14 лет
115	Черепаша	13,5 см 15 лет
116	Черепаша	14см 13 лет панцирь разбит
117	Черепаша	14 см 14 лет
118	Черепаша	15 см 16 лет
119	Черепаша	14,5 см 14 лет
120	Черепаша	13,5 см 15 лет
121	Черепаша	14,2 см 17 лет
122	Черепаша	15 см 17 лет
123	Черепаша	10 см 11 лет
124	Черепаша	14,5 см 17 лет
125	Черепаша	14,5 см 17 лет
126	Черепаша	14,5 см 18 лет
127	Черепаша	10 см 8лет
128	Черепаша	10,5 см 7 лет
129	Черепаша	15 см 18лет
130	Черепаша	9,5 см 6 лет
131	Черепаша	10 см 6 лет
132	Черепаша	13,5 см 18 лет
133	Черепаша	13 см 11 лет
134	Черепаша	14 см 17 лет
135	Черепаша	13,5 см 18 лет
136	Черепаша	13 см 15 лет
137	Черепаша	11 см 9 лет
138	Черепаша	14,5 см 19 лет
139	Черепаша	13,5 см 16 лет
140	Черепаша	11 см 7 лет
141	Черепаша	14,5 см 19 лет
142	Черепаша	13 см 14 лет
143	Черепаша	14,5 см 17 лет
144	Черепаша	11 см 10 лет
145	Черепаша	13,5 см 17 лет
146	Черепаша	14,5 см 16 лет
147	Черепаша	13,5 см 15 лет
148	Черепаша	14 см 12 лет
149	Черепаша	12,5 см 10 лет
150	Черепаша	14,2 см 18 лет
151	Черепаша	13,5 м 19 лет
152	Черепаша	11,5 см 12 лет
153	Черепаша	13 см 13 лет
154	Черепаша	10 см 8 лет
155	Черепаша	13,5 см 17 лет
156	Черепаша	14,5 см 20 лет
157	Черепаша	13,5 см 12 лет
158	Черепаша	14,5 см 19 лет
159	Черепаша	12 см 13 лет
160	Черепаша	12 см 7 лет
161	Черепаша	12,5 см 17 лет
162	Черепаша	13 см 15 лет
163	Черепаша	13,5 см 16 лет
164	Черепаша	13,2 см 17 лет



165	Черепаша	14 см 20 лет
166	Черепаша	13 см 14 лет
167	Черепаша	14,2 см 19 лет
168	Черепаша	14,2 см 15 лет
169	Черепаша	12,2 см 11 лет
170	Черепаша	11 см 9 лет
171	Черепаша	12 см 8 лет
172	Черепаша	12 см 18 лет
173	Черепаша	15,5 см 20 лет
174	Черепаша	16 см 18 лет
175	Черепаша	15 см 9 лет
176	Черепаша	14,5 см 14 лет
177	Черепаша	11 см 8 лет
178	Черепаша	14,5 см 16 лет
179	Черепаша	12,5 см 11 лет
180	Черепаша	10 см 6 лет
181	Черепаша	14 см 18 лет
182	Черепаша	15 см 18 лет
183	Черепаша	14,5 см 16 лет
184	Черепаша	10 см 5 лет
185	Черепаша	10 см 6 лет
186	Черепаша	15,2 см 20 лет
187	Черепаша	14 см 13 лет
188	Черепаша	14,2 см 17 лет
189	Черепаша	14,2 см 17 лет
190	Черепаша	13,5 см 18 лет панцирь разбит
191	Черепаша	12,5 см 12 лет
192	Черепаша	13,5 см 18 лет
193	Черепаша	12,5 см 14 лет
194	Черепаша	13 см 14 лет
195	Черепаша	9 см 8 лет
196	Черепаша	10 см 6 лет
197	Черепаша	14,5 см 17 лет
198	Черепаша	14,5 см 16 лет
199	Черепаша	9 см 5 лет
200	Черепаша	13,5 см 10 лет
201	Черепаша	14,2 см 20 лет
202	Черепаша	9 см 6 лет
203	Черепаша	14 см 17 лет
204	Черепаша	15,2 см 18 лет самка
205	Черепаша	11,5 см 9 лет самец
206	Черепаша	15 см 21 лет
207	Черепаша	14 см 11 лет
208	Черепаша	13 см 15 лет
209	Черепаша	14 см 12 лет
210	Черепаша	9 м 8 лет
211	Черепаша	12 см 13 лет самка
212	Черепаша	14 см 18 лет самец
213	Черепаша	12 см 15 лет самка панцирь разбит

Мониторинг:



Ш. Мусаев, Начальник отдела управления по вопросам биоразнообразия и охраняемых природных территорий

Фото прилагаются

