Samarkand Solar PV Project

Environmental and Social Impact Assessment

16 January 2023

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Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
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Table of Contents

Figures

Tables

Abbreviations and Definitions

Term	**Definition**
AOI	Area of influence. The AOI (based on the definition in IFC PS1) 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' 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; and • 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.
Affected communities	Local communities who are directly impacted by the Project.
Developer	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.
Project	A 200 MWac solar PV facility in the Kattakurgan district, Samarkand region of the Republic of Uzbekistan, complete with 220/110/10 kV substation and a 4.5 km transmission line to the Ishtihan 220 kV substation.
Project Area	The geographic area comprising the Project Site and its immediate surroundings.
Project Site	The Solar PV Site and overhead line grid connection
Solar PV Site	The land within which the solar PV panels and associated equipment will be located. It excludes the overhead line grid connection.
Study Area	
MWac	Megawatt of AC power, measurement of installed capacity of the solar PV facility.
AC	Alternating current
PV	Photovoltaic (the conversion of sunlight into electrical energy)

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) 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 Kattakurgan District, Samarkand region of Uzbekistan, referred to as "the Project", location of which is shown in Figure 1-1. The project site is approximately 20 km from Kattakurgan and approximately 50 km from Samarkand. The Project site area is 438 ha.

The Project will also comprise a 4.5 km overhead transmission line (OHL) from the on-site substation to the existing Ishtihan substation.

Table 1-1. Key Project characteristics

LOCATION	Kattakurgan District, Samarkand region, Republic of Uzbekistan
INSTALLED CAPACITY	220 MWac
SOLAR PV SITE AREA	438 ha
OVERHEAD GRID CONNECTION LINE	4.5 km 220 kV Steel lattice towers
NATIONAL GRID SUBSTATION	Ishtihan

Table 1-2. Emissions Reduction

PROJECT ANNUAL ELECTRICITY GENERATION (KWH)	594,209,000
NUMBER OF HOUSES POWERED BY THE PROJECT	264,093
EMISSION REDUCTIONS OF CARBON DIOXIDE ANNUALLY (TONNES/YR)	237,684

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

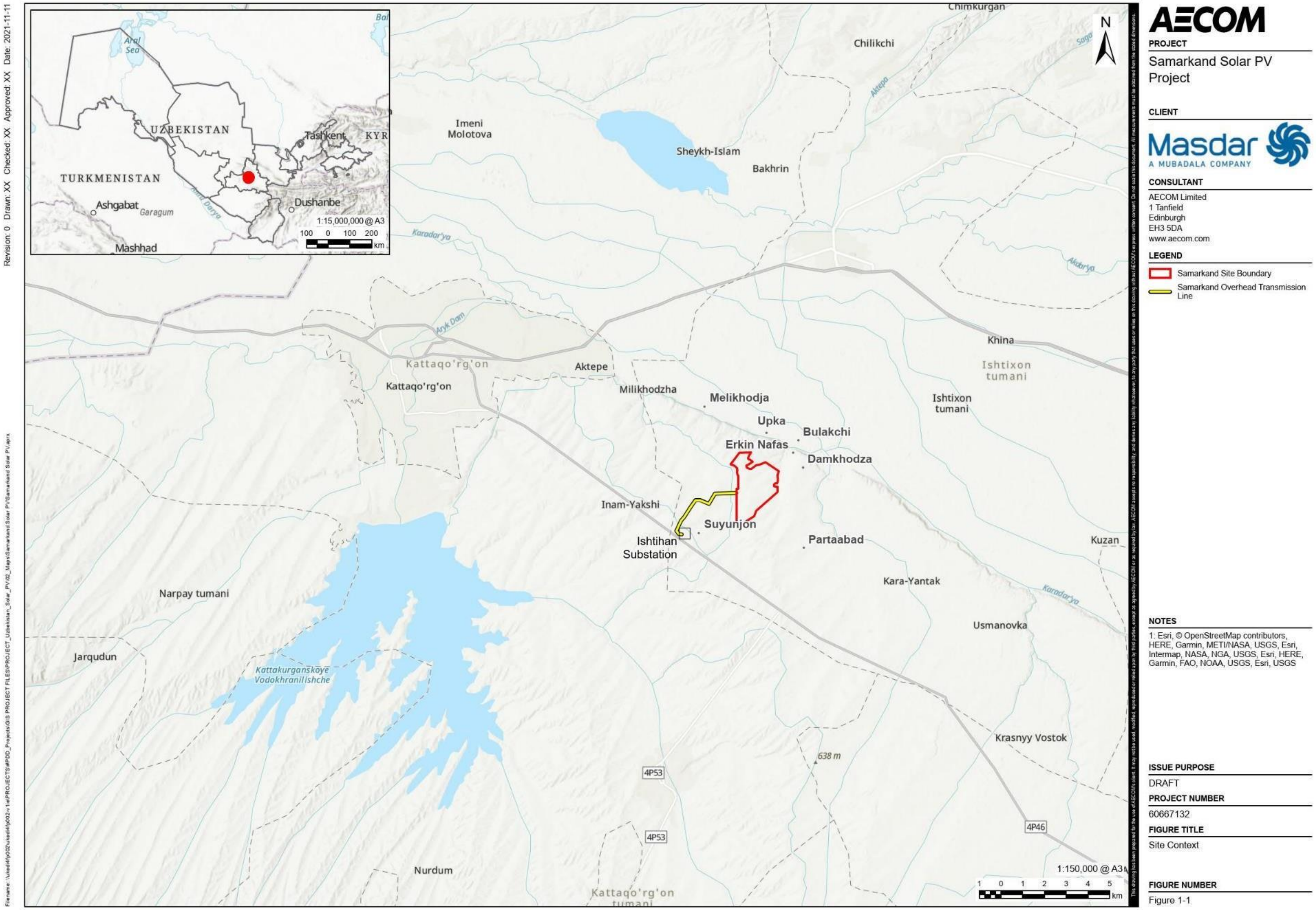

Figure 1-1. Site context

1.2 Purpose of This Report

The purpose of this ESIA Report is to:

- Document legislative requirements of Uzbekistan for this type of project
- Describe the methodology and approach to be used in assessing impacts
- Identify the likely key environmental and social issues associated with the construction and commissioning, operation and maintenance, and decommissioning phases of the Project
- Frame the scope for the baseline studies that support the ESIA
- Identify potential Project impacts that will be assessed further in the ESIA
- 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 Samarkand (and Jizzakh) would not be possible without the completion of the translocation of tortoises. The Samarkand OVOS was returned and additional comments requested in relation to ecology. The OVOS was only approved after the process of translocation was completed and confirmed in writing by the regional ecology department in Samarkand.

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
A MUBADALA COMPANY

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

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.

Green Business Innovation

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 Report comprises the following sections, as outlined in Table 1-3.

Table 1-3. Report Structure

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

2. Project Description

2.1 Location

The proposed site is in the Kattakurgan District, Samarkand region, in the Republic of Uzbekistan. The nearest communities are Bulakchi and Damkhodzha. The Project Site is approximately 20km from the city of Kattakurgan and approximately 50km from Samarkand. The site can be accessed via a road at the south end of the facility.

The Project Site area is approximately 438 ha.

The overhead transmission line route is 4.5km, connecting the Project to the existing national grid substation Ishtihan.

2.2 Land Ownership and Use

The land in the Project area is classified as rainfed agricultural land and consists of open areas with mild slopes. The Zeravshan river is located approximately 2km from the northern boundary of the proposed site. Most land around the project site is organised under Sub Lease Agreements used for private farms or under Dehkan modality. Dehkan farms are rural household producers operating on small household plots received on lifetime inheritable tenure rights. In Uzbekistan, “household plots” were reclassified as "dehkan farms" in 1998, when the Law of Dehkan Farms was passed[1]. Household plot is a legally defined farm type in all former socialist countries in CIS and CEE. This is a small plot of land (typically less than 0.5 ha) attached to a rural residence. The household plot is primarily cultivated for subsistence and its traditional purpose since the Soviet times has been to provide families with food.

Historically the Solar PV Site Area itself was sub-leased to five private leaseholders discussed in section 6.7.6.

The Project Site boundaries were optimised to use the available space excluding legally farmed land at the north end of the Project Site, the northern portions of the site with uneven topography and deep gullies, and the cemetery. The entire site was previously used for the cultivation of wheat but more recently the land was given over to a larger number of small farms. Past cultivation was evident across the entire site area.

AECOM understands that the cultivation of smaller parcels was not profitable, and the five historic leaseholders have subsequently had their leases revoked and the land acquired by the local authority for the Project. All the households who were subject to the land acquisition process continue to commercially farm the new provided land except for two historic leaseholders who have gained considerable debts accrued due to the land acquisition process and/or were allocated unsuitable land.

The route of the overhead transmission line passes through agricultural land before connecting to the substation at Ishtihan. Land required for connection to the substation is within the substation boundary.

A Land Acquisition Audit (LAA) and Livelihood Restoration Plan (LRP) have been undertaken in parallel with the ESIA for the five historic leaseholders that were previously farming on the site area prior to acquisition for the Project.

[1] Law on Dehkans, Head 1, article 1, 1998

Figure 2-1. View to the centre of the site

Figure 2-2. Zarafshan river to the north of the site

The overhead transmission line has been designed with the purpose of avoiding any populated areas or isolated structures. In some sections, however, the corridor will need to cross along extensive areas of cultivation, whist several poles will need to be pegged within the boundaries of dekhan farms.

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 converted 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 2-3 shows the key principles and associated structures of a PV facility.

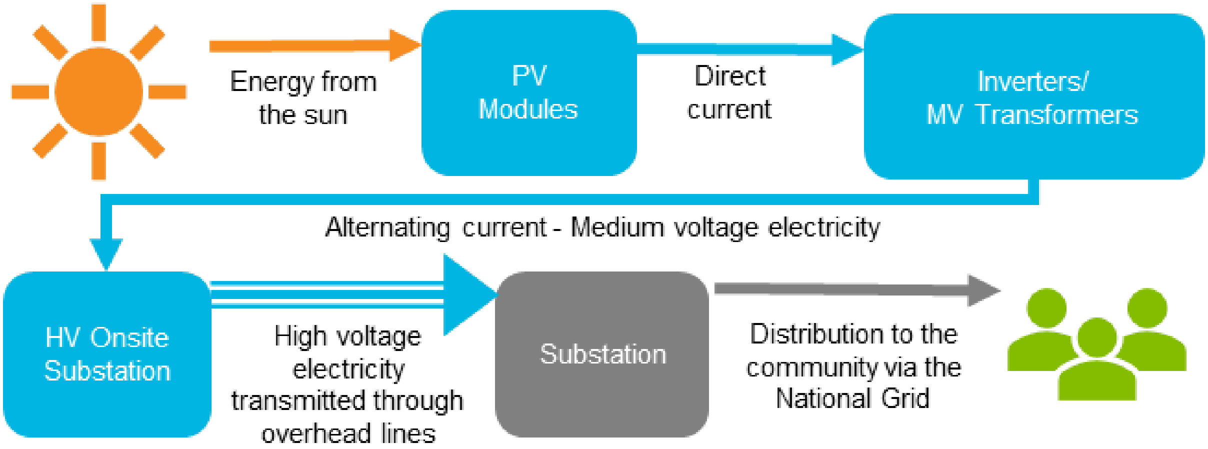

Figure 2-3. PV power plant overview

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 temporary workers camp for the construction phase of the project. The project substation will be located towards the southwest boundary of the site. The proposed preliminary layout uses north-south orientated internal service roads, 5m in width, to access different inverters and areas of the PV plant and a few east-west internal service roads.

The fence surrounding the PV plant is approximately 10km long. The total length of the proposed internal road network is approximately 28km.

The final layout and detailed design will be provided by the EPC contractor during the detailed design phase of the Project.

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.

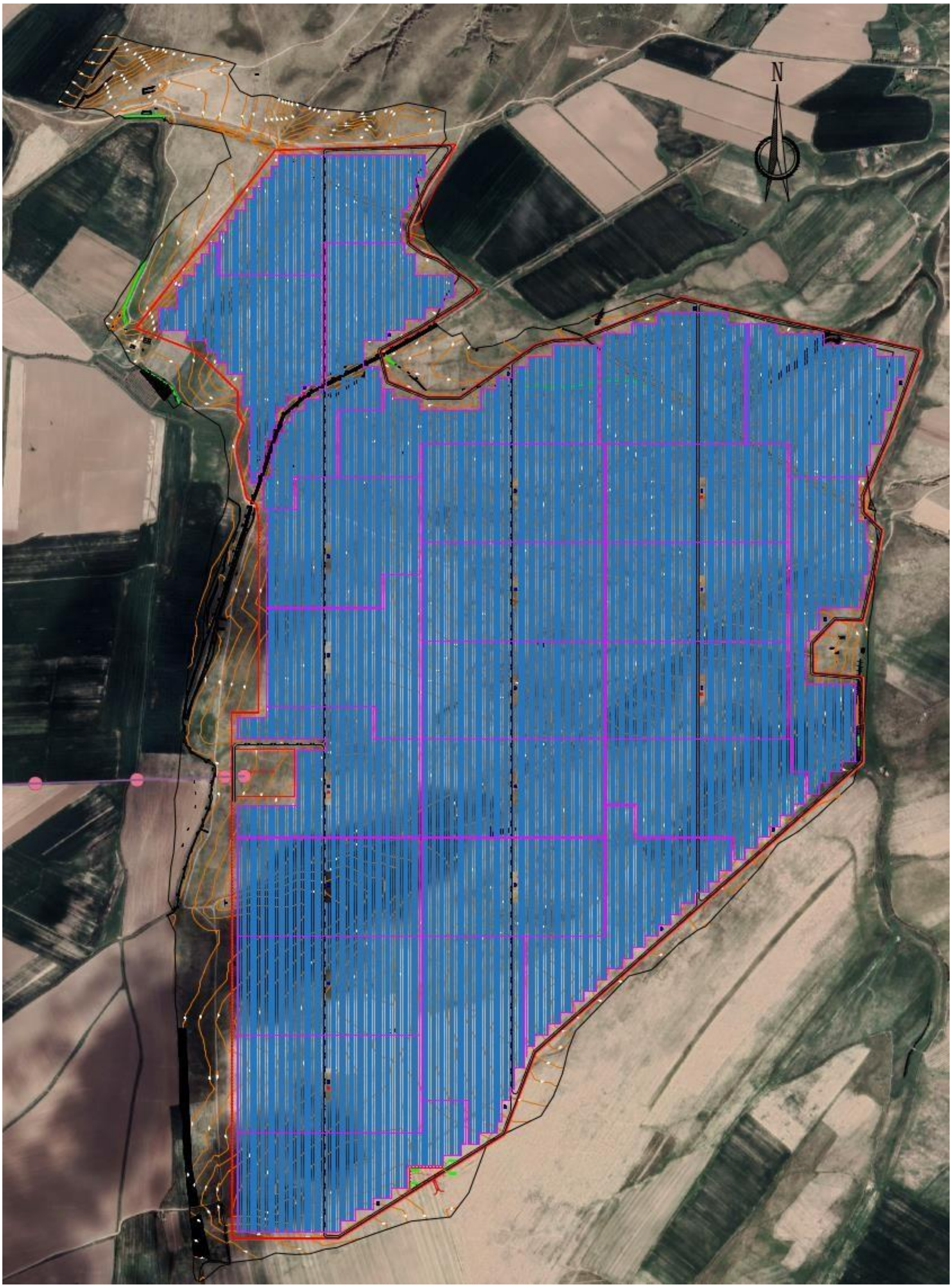

Figure 2-4. PV power plant layout

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

Table 2-1. Project components

Component	Value
Area of Project Site (Ha)	438
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 maximum
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 25
Installed Capacity (MWac)	220
Project Annual Electricity Generation (kWh)	594,209,000

Source: Masdar

2.4.2 Solar PV Modules

The current design envisages that the Project will comprise 449,064 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 2-5. 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.

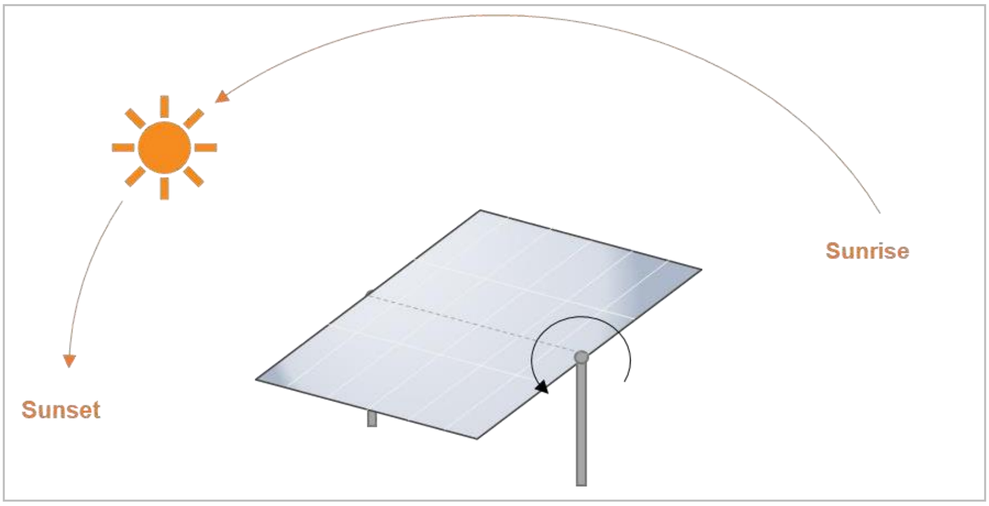

Figure 2-5. Schematic Diagram of Single-Axis Tracking System

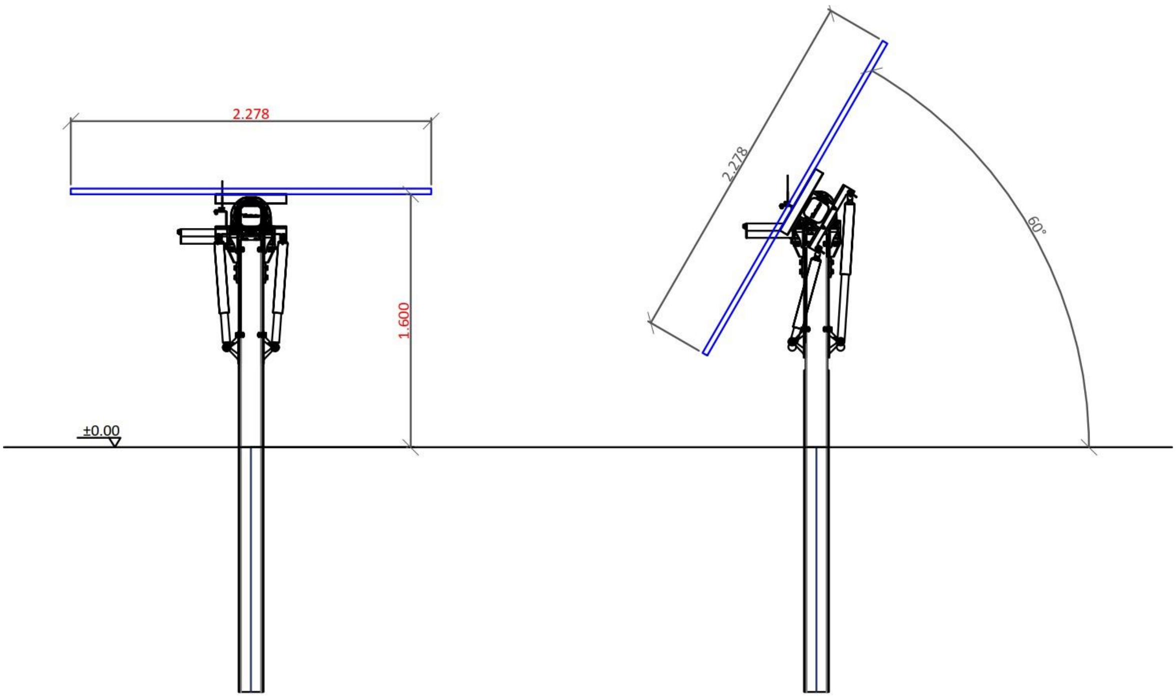

Figure 2-6. Tracker profile view

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 2-7. 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 (TYPSA, 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.

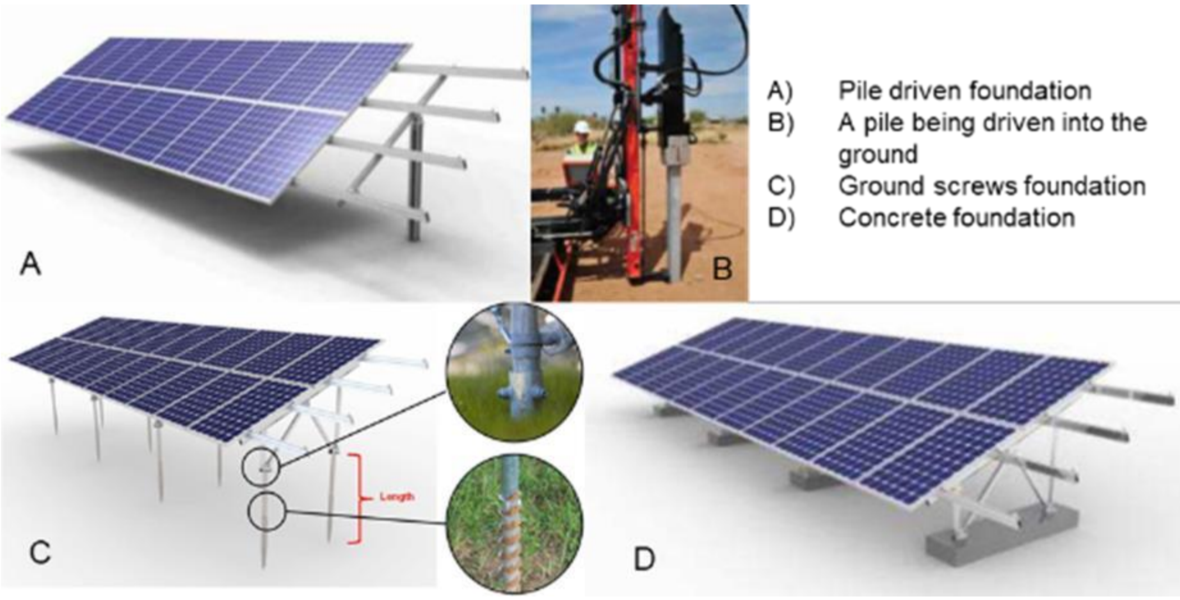

Figure 2-7. Foundation options

Source: ILF Consulting Engineers, 2019

Figure 2-8. 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 following final project design.

Figure 2-9. 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.

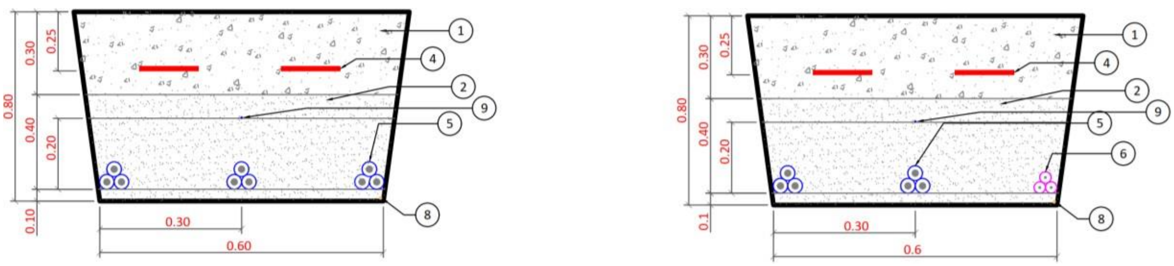

Figure 2-10. Cable trenches

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.

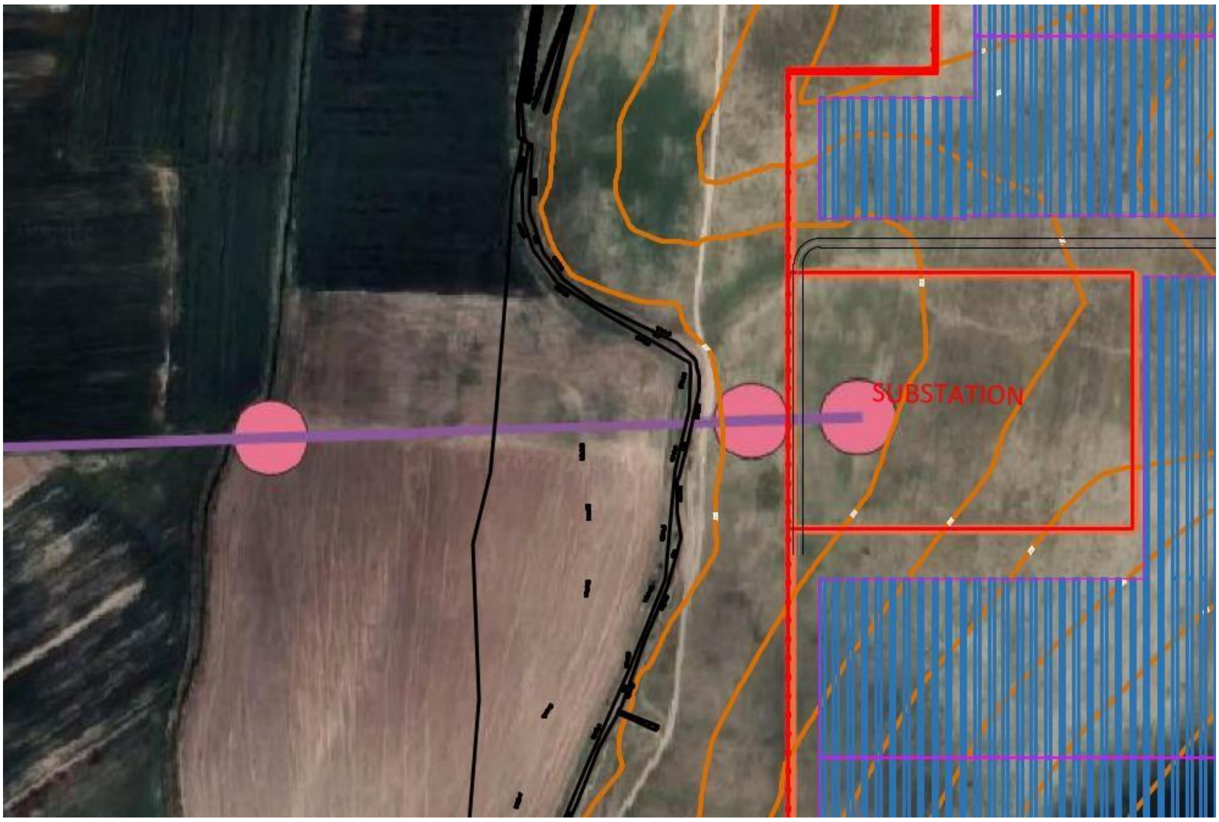

Figure 2-11. Location of on-site substation

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

Samarkand solar PV plant is designed for a total 220 MWac installed power capacity. Evacuation of the energy produced shall be made to the existing Ishithan substation located 4.5km from the Project generation substation.

Interconnection infrastructures shall be the following:

- Generation substation located in the boundaries of the PV plant, including two power transformers 60/76/100 MVA, from the generation voltage level (35 kV) to the transmission voltage (220 kV) of the electrical network.
- Approximately 4.5 km 220 kV interconnection line to connect the generation substation and the transmission utility switching substation.

- Extension in two bays of the existing Samarkand 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 (OHL) shall be installed over 22 lattice type steel towers, double circuit, one cable per phase, and with two optical ground wires (OPGW) as ground wire and for telecommunications.

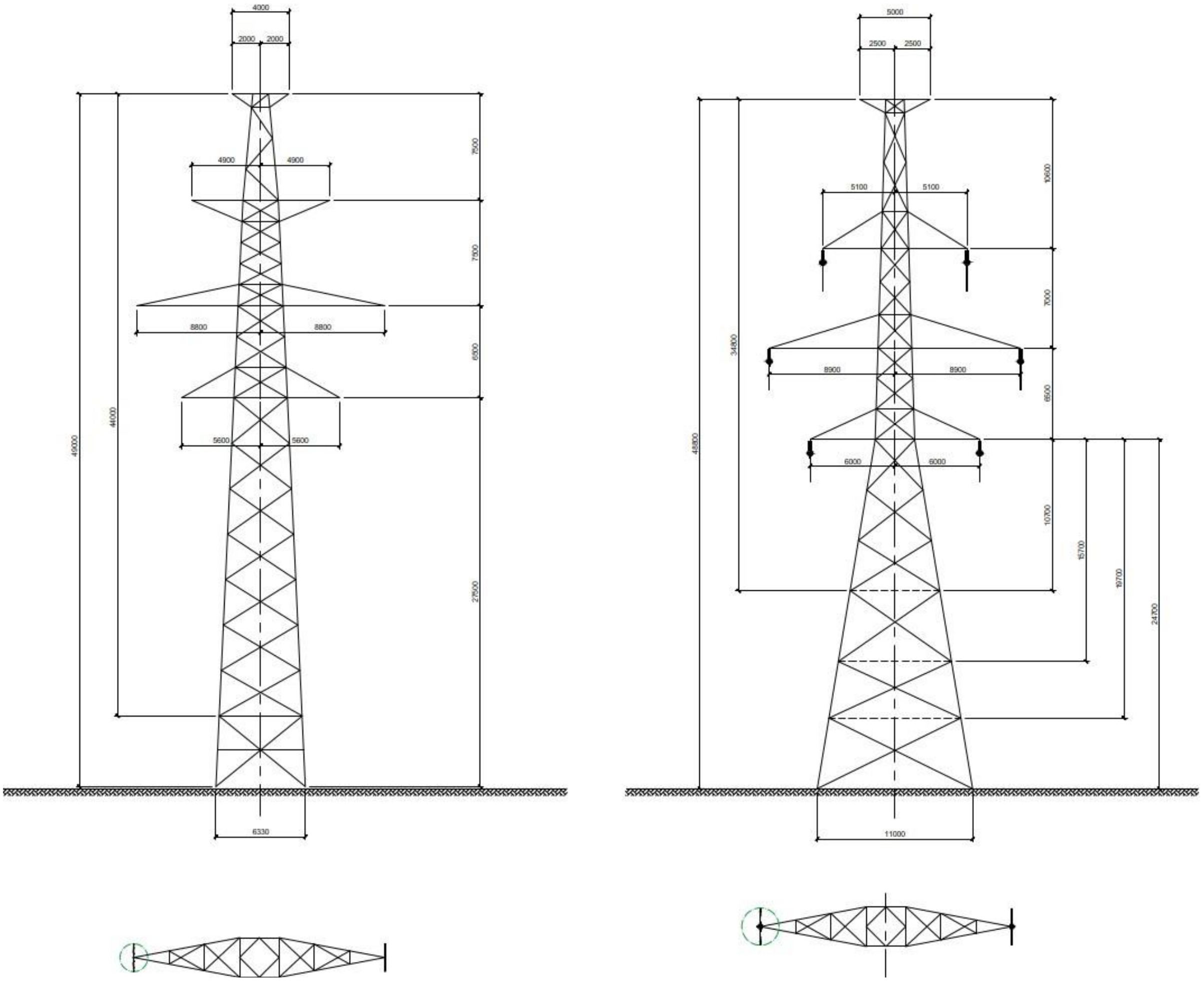

Figure 2-12. Steel lattice towers for the overhead line

Source: TYPSA, 2020b

Connection between tower and substation shall be underground with cross linked polyethylene insulated aluminium conductor armoured (XLPE) cables and dielectric cables for fibre optic (FO) communications. Depth of cable burial is 1m below ground level.

For the overhead interconnection line, double-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.
- Locate the transmission line to avoid passing through settlements and populated areas.
- Minimize the need to build new access roads and 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 compliant with GIIP (Good International Industry Practice).
- Ensure adequate right of way to each side of the transmission line for community safety and in line with GIIP.
- Ensure the appropriate design of the towers and associated components (cross arms, position of insulators etc) and installation of conductors according to best international practices for protecting birds against collision and /or electrocution.

Bird flight diverters (Firefly brand) will be installed on both earthing cables, on the full length of the high voltage line. The distance between elements will be 10 m.

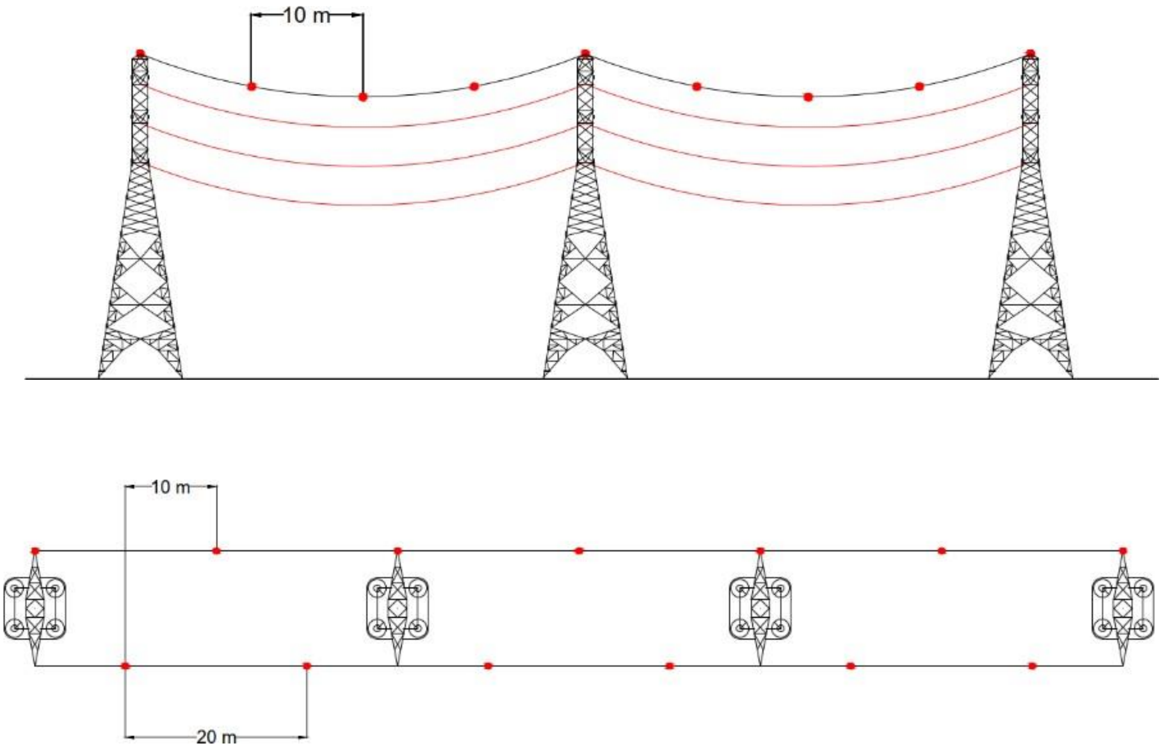

Figure 2-13. Location of the bird protection devices on the overhead lines

Source: TYPSA, 2020b

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 2.5m 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 2-10.

Figure 2-14. Typical Fence and CCTV System at a UK PV Facility

Source: AECOM, 2019

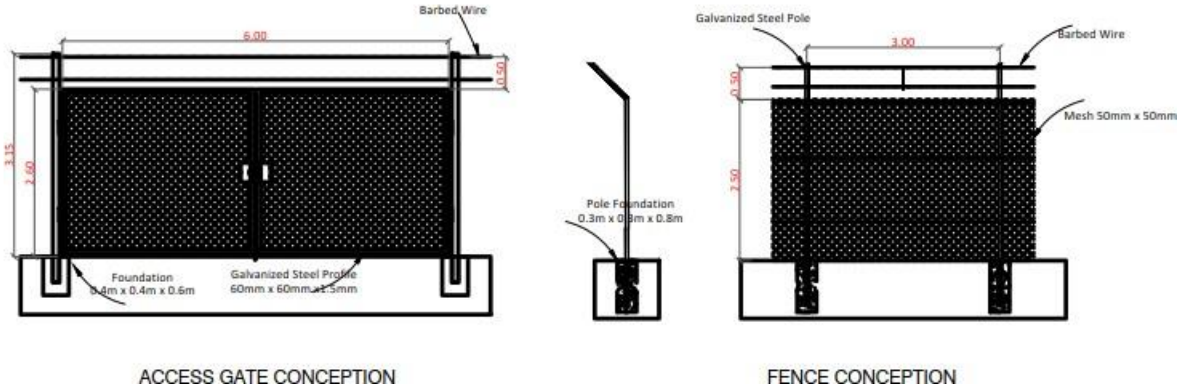

Figure 2-15. Fence and Access Gate

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

It is assumed that construction will be carried out by an EPC (Engineering, Procurement and Construction) contractor and that the main site preparation and construction activities will be the following (but not limited to):

- Site Preparation and PV Power Plant Installation:
- Required road upgrades and widening of turning radii, where needed.
- Import of components to Site
- Construction of temporary construction camp, construction lay-down area and other infrastructure.

- Site preparation: removal of vegetation and any remaining structures followed by grading of the solar PV and sub-station area and fencing of construction area for community safety.
- Construction of the internal road network.
- Construction of foundations, mounting structures, assembly, and erection of structures to support PV panels.
- Construction of substation and electrical control room, site offices, storage, and services.
- Installation of solar panels
- Construction of array enclosures and power block foundations and housing, and
- Installation of cables.
- Erection of permanent facility fencing.
- Construction of transmission line and interconnection works at the existing Ishithan substation located at about 4.5km from the Project site.
- Commissioning of the PV plant:
- Mechanical and visual inspection
- Electrical and equipment testing
- Commencement of electricity supply into the grid
- Site clean-up and reinstatement.

2.5.2.1 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.

2.5.2.2 Stores and Power Control Centre, and Storage Facilities

The power control centre and storage facilities will be constructed on site where all equipment will be stored. This will help to limit the potential ecological impacts associated with this phase of the project to within one designated area.

No permanent fuel storage at site is anticipated. For vehicle refuelling, a petrol station has been identified within 5 km from the site and will be used. For heavy equipment, a fuel truck will be used as required and will be during a pre-specified refuelling time, most likely on a weekly basis.

No concrete batching plant is currently proposed. Ready Mix concrete will be used from a supplier based local to Kattakurgan.

2.5.2.3 Earthworks

Soil will be stripped on areas required for roads and hardstandings, including temporary construction compounds, offices and other buildings. Outside of these areas, soils will not be stripped with the aim of reducing impacts of habitats within the site.

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 the Kattakurgan 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 2-16. Rolling dynamic compaction (RDC)

Source: TYPSA, 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 2-2. Earthworks

Parameter	Area
Length of fence (m)	11,000
Area of internal roads (m2)	90,000
Area of external access road (m2)	2,500
Area of substation (m2)	24,388
Area of inverter bases and any other infrastructure or hardstandings (m^2)	566
Area of laydown area (m^2)	18,000
Area shaded by PV panel (m^2)	1,160,045
Area of land left free of panels (m^2)	3,099,955
Land Boundary Area (m2)	4,260,000

Source: Masdar

Based on the initial site design as set out in the table above, a total of 14.6 ha land would be cleared or just over 3% of the overall site area.

2.5.2.4 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 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.

2.5.2.5 Worker 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 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.

2.5.2.6 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)).

2.5.2.7 Emergency and Safety Support Systems

Management of the Solar Park will ensure periodic monitoring and upgrading of the safety support systems. These include; the firefighting equipment and well-marked emergency exit routes and assembling points, the necessary signage posts erected in all areas susceptible to dangers, general information and prohibitions. Portable fire extinguishers consisting of dry chemical carbon dioxide and foam type are to be provided at strategic locations in the plant. Adequate numbers of sand buckets are to be provided at various locations and there will also be a water hydrant system at the site.

First Aid units fully equipped with the necessary materials shall be provided and proper protection gear shall be availed to employees and visitors at the plant. All the above will be supported with comprehensive continuous employee training and awareness on environmental, health and safety matters. An emergency action plan that includes the procedures for handling leaks and spillage will be developed.

A written health and safety plan will be developed by the EPC Contractor for the facility prior to construction using established safety procedures for power generation plants as guideline. This will be available in both Chinese and Russian/Uzbek. Employees will be intimately involved with the development of the process hazard analysis and on the development of other elements of process safety management required. Access to this data and all other pertinent information will be made readily available to all employees and onsite contractors.

Clear written operating procedures for safely conducting activities within the plant will be developed. This includes steps for each operating phase, operating limits, safety and health considerations and safety systems and their functions. This document will be readily accessible to employees who work on or maintain a covered process and will be reviewed as often as necessary to assure they reflect current operating practice. Safe work practice will be implemented and will provide for special circumstances such as lockout/tag out and confined space entry and training limits.

2.5.2.8 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 preparation, etc

The amount of water required during construction is estimated at up to 100,000 m^3. 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 13,133 m^3 of water is 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.

2.5.2.9 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

The construction phase is expected to generate the traffic volumes detailed in Table 2-1.

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. However detailed traffic types and volumes have not yet been provided. This will be provided by the EPC contractor as part of detailed design.

Table 2-3. Estimated Construction Traffic

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

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. This will be included in the Traffic Management Plan.

2.5.2.10 Waste Management

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. No recycling facilities have been identified however waste will continue to be segregated for recycling should the EPC Contractor identify suitable sites in future.

The Project will not construct or operate its own wastewater treatment, landfill, or recycling facilities. The volumes per day of domestic and sewage waste expected to be generated has yet to be confirmed by the EPC Contractor. Nevertheless, wastewater and sewage would be stored in a central tank on site. Tankers would be deployed to remove 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.

Estimated waste arisings are based on previous experience in Uzbekistan and are summarised in Table 2-4.
These volumes will be confirmed by the EPC contractor.

Table 2-4. Estimated Project Waste Arisings during Construction

Waste stream	Estimated quantity
Hazardous waste	
Solvent waste	2 l
Used and spent oils	200 l
Hydraulic fluid	40 l
Resins and paints	10 l
Waterproofing compounds	20 l
Adhesives	4 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^3
Drums, containers and tins with remains of hazardous substance	4 m^3
Non-hazardous solid waste	
Soil	HOLD
Concrete	4 m^3
Asphalt paving	2 m^3
Scrap steel	10 t
Glass	HOLD

Plastics	10 m^3
Packaging materials	20 m^3
Wood	10 m^3

2.5.2.11 Infrastructure Requirements during Construction of Power Plant

The construction of the Solar Park will require a number of temporary infrastructure and services will be required:

- Construction compound that will include offices, parking, as well as equipment and material storage,
- Purpose-built storage for hazardous materials.
- Purpose-built facilities for the segregation and temporary storage of wastes.
- Effluent and storm-water drainage.
- Sanitation and sewerage disposal.
- Water supply system including reservoir and a 1,050 m pipe connecting to a public water pipeline. This system will be used during construction and remain in place during operation.
- On-site electricity supply (by means of diesel generator).
- Road access.
- Medical facilities on-site.

2.5.3 Operation

Masdar will be responsible for the design, build, finance, operation, maintenance, and transfer (DBFOMT) of a solar PV power plant of 220 MWac in the Kattakurgan District, Samarkand Region of Uzbekistan. 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.

2.5.3.1 Routine Maintenance Activities

Operation and maintenance of the facility will include:

- Periodic cleaning of PV modules depending on soiling and sand/silt accumulation
- Replacement of faulty PV modules
- Preventative maintenance and repair of inverters, mounting structures, surge arresters, cables and PV junction boxes, and meteorological station
- Maintenance of site security, fencing and gates
- Cleaning of ditches and drainage culverts
- Delivery of water and emptying the septic tank
- General upkeep of the territory within the Solar PV Site

2.5.3.2 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.

2.5.3.3 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.

2.5.3.4 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 septic 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 2-3.

Table 2-5. Estimated Project Waste Arisings during Operation

Waste stream	Estimated quantity	Management
Hazardous waste 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.
Non-hazardous solid waste 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.
Sewage and grey water	0.02 m^3 / day	Collected on site and transported to a treatment facility.

2.5.4 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 6–8months 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.

The decommissioning will abide by the relevant legislation and regulations that are applicable at the time and decommissioning will be planned at least six months in advance.

2.6 Alternatives

2.6.1 No Project Alterative

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.

2.6.2 Site Selection

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

Furthermore, 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.

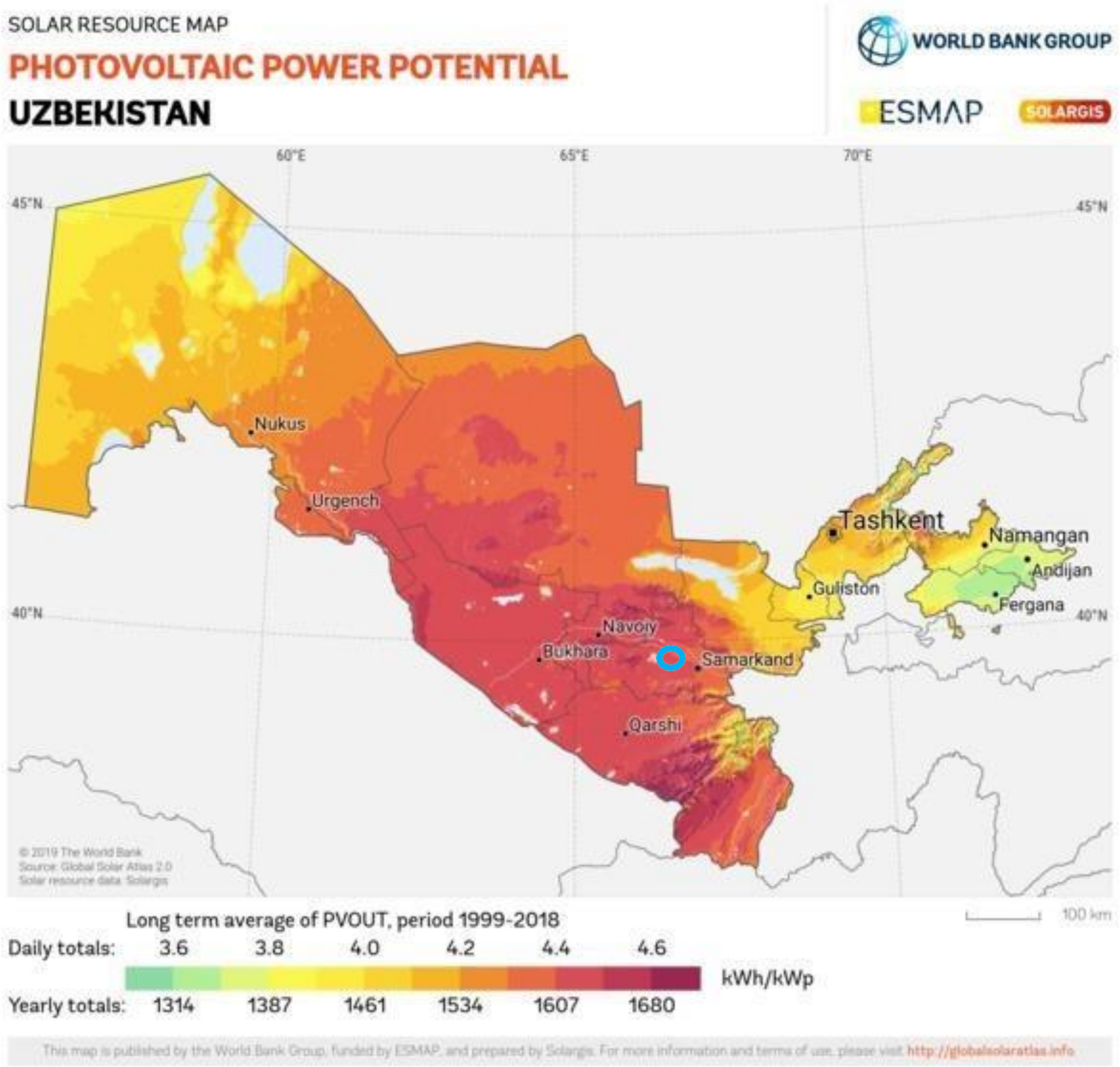

Figure 2-17. Solar resource map (site shown in blue)

Table 2-6. Summary of site selection criteria

Criteria	Overview	Likelihood of significant impact[2]
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	The Kattakurgan Water Reservoir is an Important Bird Area (IBA situated in a natural depression approximately 15km to the south-west of the Project site at its closest point; it is a non-protected area. 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, with the exception of the potential for Asian houbara bustard. The project site does 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.	Project is not expected to impact on designated sites.

[2] In this case 'significant' would refer to impacts that cannot be mitigated by standard means or would materially affect the viability of the project.

Residential properties	There was one potential property identified on or close to the site but AECOM understand that this is no longer being used. As a result, no physical resettlement would be required. The closest properties appear to be approximately 150m 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. The access tracks are still being finalised and a preferred route will be identified that minimises the impact on the surrounding residential properties.	Access route will be optimised to minimise impacts.
Grid connection	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 centre of Kattakurgan. 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 and would make the project unviable from a legal and permitting perspective. 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 meetings the increasing energy requirements during this period of rapid growth and development. The relatively short ~4.5km 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 avoiding the nearby village. Any alternative overhead route would increase the length of the transmission line and increase the potential collision risk of CH qualifying species.	Most direct grid connection route has been chosen. Land use impacts would be minimised.

	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.	
Land Use	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 northwest of the site. The installation of towers would require a significantly lower amount of land take	Land does not appear to support agriculture so limited economic activity reliant on the land. No issues predicted.
Additional review of site suitability following the ESIA		
Land Use (additional)	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. Five parcels of land had been cultivated within the site however all had vacated the site by the time of AECOM's site visit. The house observed from aerial maps was confirmed to be partially demolished and uninhabited. Affected people adjacent to the project site is restricted to those using the land for grazing. The land surrounding 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. 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. 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 2,750m2 of land take would be required for the 22 tower bases but exact land take varies per base depending on slope and terrain. Actual land take varies between 40 and 210m^2 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 270,000m^2 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. The land allocation has been agreed for the footprint of towers only. The recently issued Presidential Decree 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 cannot be	Confirmed that project land is not productive and alternative land is available for grazing. OHTL route minimises impacts on farmland.

	changed without renegotiating a new contract with GoU and the off-taker. Again, this would require significant time extensions which would not be able to be accommodated within the project construction schedule	
Biodiversity	Great bustard is a native non-breeding (winter visitor) to the Jizzakh and Samarkand region of Uzbekistan. In total an overwintering population of 924 Great Bustard were recorded in 2020./21 and this represents 61.6 to 92.4% of the Central Asian population. Great bustard is identified as a CH qualifying species and, as such, net gains would need to be met. 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 AoI is unlikely to be of significant importance for wintering Great Bustards within Uzbekistan. 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. 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. 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. In accordance with ADB SR1 and EBRD PR 6, Para 16, the project's mitigation strategy will be described in a Biodiversity Action Plan...	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.

2.6.3 Transmission Route Selection

The land between the PV site and the substation is almost entirely actively farmed land with a small settlement to the southwest. No sensitive areas were identified during site surveys therefore a route was chosen to follow field boundaries where possible and to avoid crossing through the settlement. The route chosen represents to shortest viable route, minimising cost as well as the impacts of farming and livelihoods.

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

- The route has been altered in order to avoid the water channel
- The route was modified in order to cross the existing OHTL at approximately 90 degrees . This is a technical requirement as per local standards/norms.

The following figure was provided by Masdar showing the route optimisation as agreed with the Regional Government of Samarkand region. Note the green line shows the water channel (irrigation canal), blue line is the optimised OHTL and the red line shows the original OHTL route.

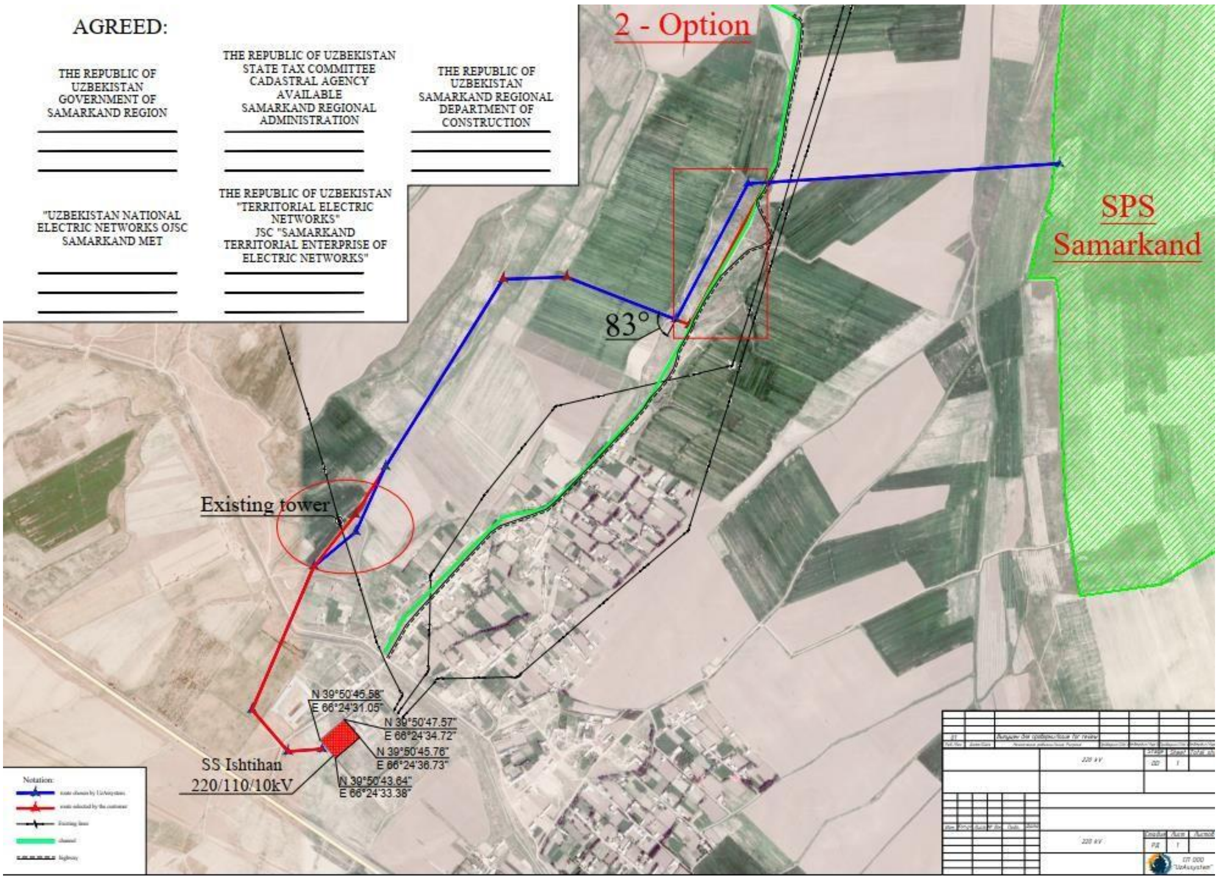

Figure 2-18. OHTL options

2.6.4 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 health and safety impacts. Where no suitable options exist, AECOM and Masdar will identify those with least impacts that are still technically viable.

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".[3] 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

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

condition of nature resources, ecologically harmful facilities and are responsible for control, nature protection and usage of nature resources.

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 3.4.

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:

- “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)
- “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)
- “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)
- “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)
- “On wastes” No. 362-II dt. April 5, 2002
- “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)
- “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)
- “On woods” No. 770-I dt. April 15, 1999 (last revision was made by Law of Uzbekistan No.238 dt. 22.12.2009)
- “On protected nature territories” No. 710-II dt. December 3, 2004
- Law of Uzbekistan “On subsoils” is approved by Law of Uzbekistan No.444-II dt. 13.12.2002. (last revision was made by Law of Uzbekistan No.133 dt. 18.12.2007)
- 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 (1st 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 (2nd 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 (3rd 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.[4] 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 employment contract, and the ratio of legal and contractual regulation of labour relations. This is relevant because there is no specific

[4] Constitution of the Republic of Uzbekistan http://constitution.uz/en/clause/index (20/02/2020)

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.

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 Uzbekistan5, the Criminal Code of the Republic of Uzbekistan6, Law No. ZRU-229 "On protection and use of the objects of archaeological heritage" (13 October 2009)[7], Law No. 269-II "On the Protection and Use of Cultural Heritage Sites (30 August 2001, as amended)[8], Presidential Decree No. R-5181 "On improving the protection and use of objects of tangible cultural and archaeological heritage" (16 January 2018)[9] and Presidential Decree no. PP-4068 "Regarding the strengthening of the protection, management and enhancement of tangible and intangible cultural heritage" (19 December 2018)[10]. A summary of the applicable legislation that will be considered during the ESIA process is presented in Table 3-1.

Table 3-1. 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 High 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.
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

[5] Constitution of the Republic of Uzbekistan (2017). Available at: http://www.gov.uz/en/constitution/
[6] 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
[7] 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
[8] 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
[9] 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
[10] 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

	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)[11]	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 High 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[12] 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.

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

[11] 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

[12] Code of the Republic of Uzbekistan on Administrative Responsibility (1994, as amended) Available at: https://www.lex.uz/acts/97661

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)[13]. [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[14].

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 3-2.

Table 3-2. 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[15]	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[16]	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)
UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage – 2003[17]	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[18]	Recognises the rights of states to protect and promote the diversity of cultural expressions, encompassing cultural and natural heritage, movable	15 November 2019 (ratification)

[13] 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
[14] 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
[15] 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/
[16] 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/
[17] 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
[18] 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

	cultural property, intangible cultural heritage and contemporary creativity.

3.4 International Agreements

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

Table 3-3 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 3-3. 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
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
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
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
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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)
- EBRD's Environmental and Social Policy (ESP) 2019
- EIB Environmental and Social Standards

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 African Development Bank Integrated Safeguards System 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:

- IFC PS1 — Assessment and Management of Environmental and Social Risks and Impacts
- IFC PS2 — Labour and working conditions
- IFC PS3 — Resource Efficiency and Pollution Prevention
- IFC PS4 — Community Health, Safety, and Security
- IFC PS5 — Land acquisition and involuntary resettlement

- IFC PS6 — Biodiversity Conservation and Sustainable Management of Living Natural Resources
- IFC PS7 — Indigenous peoples
- 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

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. In particular:

- 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)

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 borrowers 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.

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.

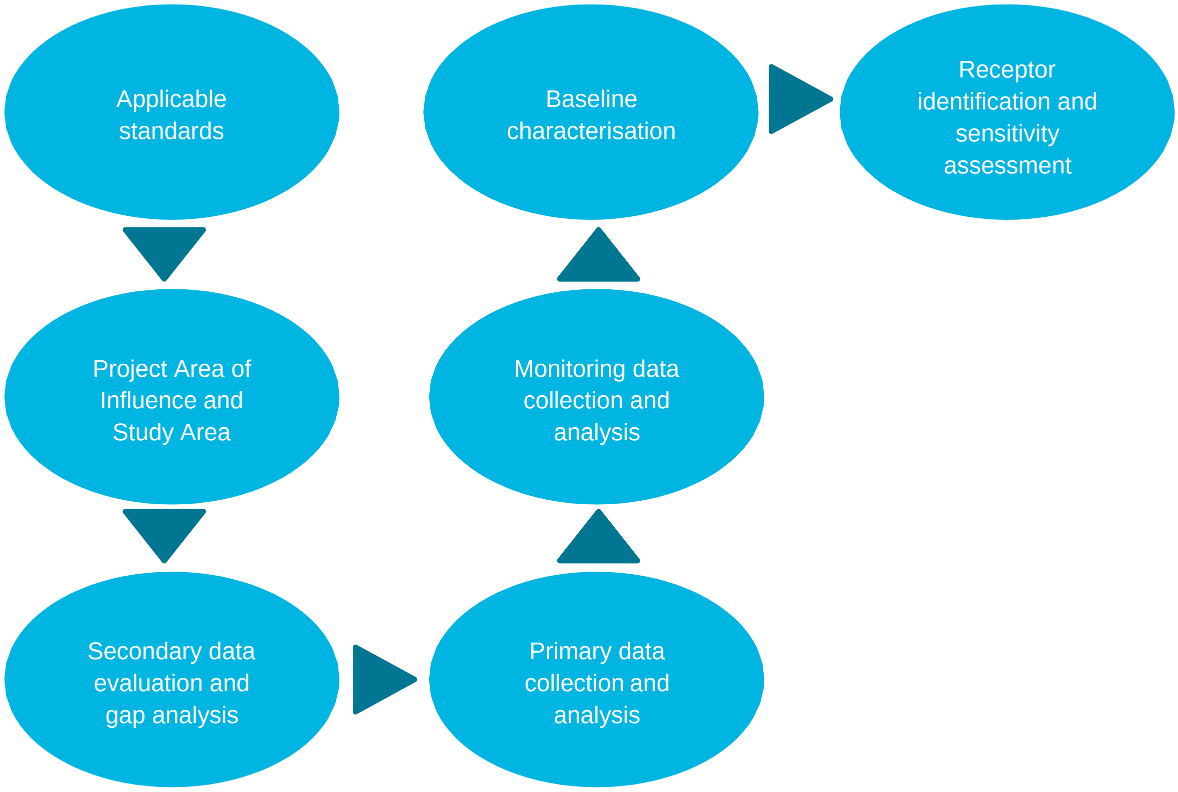

Figure 4-1. Approach to Baseline Characterisation

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'[19] 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.

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

[19] Local communities who are directly impacted by the Project.

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.

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 4-1 and Table 4-2 below. However, it should be borne in mind that the criteria depend on the specific environmental aspect being considered.

Table 4-1. 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 4-2. 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 4-3. Assessment criteria — significance of impact

Magnitude of Change / Impact	High	Medium	Low	Negligible
High	High	High	Medium	Low
Medium	High	Medium	Low	Low
Low	Medium	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 Khokimyiat 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 (Kattakurgan) under control of the Khokimyiat. 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 Khokimyiat on 16 December 2022 who confirmed that there is one development of a similar scale – the Kattakurgan cement plant.

The Khokimyiat confirmed a 2.4Mt/yr cement plant in the Kattakurgan district of Samarkand. The project has an investment of US$420m, according to the Uzbekistan National News Agency. The first stage of construction created a 1.2Mt/yr plant in 2020. The plant is now expanding its production capacity with a planned completion date of 2023. A further 100 construction jobs are expected to be created. Given that the first phase of the project has been completed this is considered to form part of the baseline conditions. The extension of the plant is not therefore expected to result in any significant cumulative impacts in combination with the Solar PV project.

No other 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.

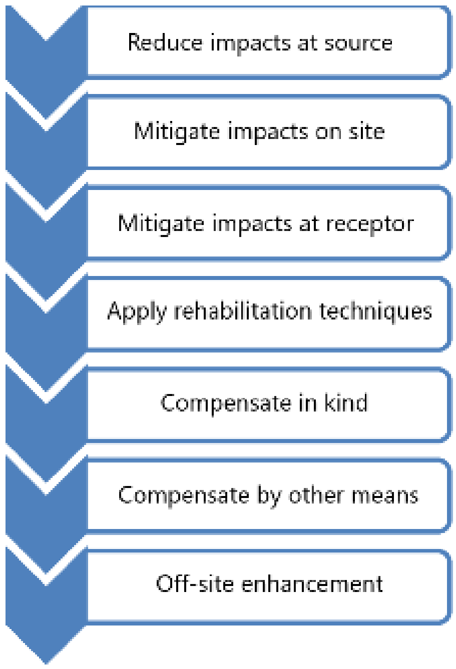

Figure 4-2. Mitigation hierarchy

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;
- 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) was 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

Spanish consulting firm TYPSA undertook the Scoping Study for the current Project in September - October 2020 and as such have already conducted some preliminary stakeholder engagement. It is important to understand the depth and breadth of these consultations prior to conducting any further engagement to build up a picture of which stakeholders have been consulted, what has been discussed, and crucially which stakeholders have thus far not been consulted. This will enable AECOM to tailor the stakeholder engagement programme for the ESIA to the project context.

5.1.1.1 Methods

Stakeholders were consulted either via videoconference or face-to-face during the site visit. 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 8th September 2020. Stakeholders who attended included representatives from the following institutions:

- Ministry of Energy – Head of Renewable Resources Department
- Ministry of Energy – Social Specialist
- Samarkand Region – Deputy Head of Cadastre Department
- Kattakurgan District - Deputy Khokim
- Kattakurgan District – Deputy Head of Cadastre Department
- Kattakurgan District - Head of Construction Department
- Kattakurgan District – Head of Forestry Department
- Kattakurgan District – Head of Water Resources Management Department

- Kattakurgan District – Head of Employment Department
- Kattakurgan District – Deputy Head of Department for Communications with Makhallas
- Chairman of Melikhudj Makhalla
- Chairman of Upka Makhalla
- Chairman of Bulakchi Makhalla
- Chairman of Damkhodza Makhalla
- Chairman of Partaabad 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:

- Deputy Khokim of Kattakurgan District on Investments
- Head of Environmental Department of Kattakurgan District
- Land Surveyor of Kattakurgan District
- Head of Land Cadastre Department of Kattakurgan District
- Deputy Head of Samarkand Region Cadastre Department
- Mulitple residents of Damhodja Makhalla
- Head of leasehold farm identified in Area 2 (see Section 6.7.5)

Additional phone conversations with affected farmers in Area 2 (Kosimov Abdullo Olmazori Farm) and Area 4 (Shomurod Nur Sakhovat Farm) (see Section 6.7.5) were also conducted during project scoping on 29th October 2020. The farmers confirmed that the Government has already taken action to acquire their land and to resettle them and provided details about their land and agricultural activities. The contents and findings of the consultation are presented in the land use section of the socio-economic baseline conditions description (see Section 6.7.5).

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:

- Groundwater on the project site is between 180 to 200 m below ground level (mbgl). There is a substation located near Ishtikhan, approximately 3 - 4 km from the site which has a well that is 150 m deep.
- The head of the water resources management department for Kattakurgan District advised that the best option to obtain water from construction and operations is to drill a well. The alternative option is to pump water from the canal located to the north, but it was advised that this would not be cost effective.
- The head of the water resources management department further advised that there are artesian wells located approximately 4 km from the project area and water data analysis for these wells, as well as other water resources in the district, is available and can be provided.
- There is a landfill site 30 km from the project area and sorting of wastes is performed in the landfill site. There are no licensed companies for removal of hazardous wastes, as there are no hazardous wastes generated in the project area and surroundings but there are companies engaged in removal of construction materials.
- The head of forestry department for Kattakugan District advised that there are no endangered species of birds and animals or protected areas within the project area.
- It was further clarified that the State committee for environment and its regional and district departments are responsible for natural protected areas.

Social issues identified and discussed during stakeholder consultations included:

- Some contradictory information on current land uses within and surrounding the project site came to light during the consultations:
- According to District authorities, there is no legal use of land, although some informal use for cattle grazing occurs in springtime.
- Some participants indicated that no structures had ever been present on the project site (as grazing would mostly take place 1.5-2km away).
- Whereas, representatives from the Cadastre Department of Kattakurgan District indicated that while there were structures made of light construction materials on the site these had been demolished after the official allocation of land for the project, when the local population was instructed to remove all structures from the project area, in accordance with the Decree of the Cabinet of Ministers No.416.
- However, during the scoping site visit there were still structures on the site, as described in Section 6.7.5.

The process for land acquisition and compensation was explained by the Kattakurgan District Cadastre Department:

- The tenure of agricultural land is based on long-term contracts between Khokimiyat and individual farmers. A specific clause in the contract regulates land acquisition for state needs.
- Based on the contract, compensation is paid unless it is proved that the land has not been used for agricultural purposes. If structures are present and legally registered, compensation is also paid. If there are crops on the land, compensation is paid for yield.
- Compensation is agreed only after the last crop cycle has been harvested. Agronomists of the District´s agricultural departments determine the amount of compensation based on crops productivity, market price, future yield, etc.
- Participants were shown a recent satellite image in which a well-developed farm and some structures were clearly present inside the project site. Kattakurgan District representatives stated that where there was a formal contract between the farmer and Khokimiyat, then compensation will be paid based on the contract.
- Where there is no formal contract IFC PS5 entitles informal settlers to assistance and compensation of assets. However, representatives from Kattakurgan District stated that usually, where structures are not residential and not official, compensation is not paid. There can be assistance, but through volunteers, aksakals (makhalla elderly leaders), and other unofficial assistance.
- The consulted authorities insisted that the land is not being used in any form.
- The presence of a drainage channel crossing through the northern end of the site was also discussed:
- Participants were shown images of the irrigation/drainage canal and authorities insisted that it was a naturally formed current and man-made irrigation infrastructure.
- According to local farmers consulted during the site visit, the channel currently serves as a drainage canal for polluted waters from irrigation of fields upstream. Local farmers also stated that their cattle drink this water without any consequence.
- Lastly, a burial site is visible in the north-east corner of the project site, but authorities claimed that the territory of the cemetery does not fall to the project area. The Chairman of nearby Makhalla also confirmed that this is correct.

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 20th and 22nd September 2021. A further site visit was carried out late November 2021 by AECOM and the in-country team.

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 5-1.

Table 5-1. Stakeholder Groups Engaged During Site Visit

Stakeholder Group	Stakeholders
Local Government Representatives	• Deputy Khokim of Samarkand Region on Investments • Head of Industry development, Samarkand region Khokimiyat • Deputy Khokim on Investments of Kattakurgan District • Kadastr of Kattakurgan • Head of department on Investments, Kattakurgan Khokimiyat • Deputy Khokim on women and families, Kattakurgan Khokimiyat • Ecology department of Kattakurgan District
Community Organizations	• Women's Shelter, Kattakrgan District
Community Representatives	• Mahalla Chairs • Community leaders from Pasdargom District
Land Users	• Farmer affected by OTL • Area 1 Farmer • Area 2 Farmer • Area 3 Farmer • Area 4 Farmer • Farmer affected by OTL • Area 5 Farmer • Herder
Community Members	• Shurak and Melikhodja mahalla community members • Teachers from School №57
Individual Specialists / Academics	• Specialist on women's issues of Pasdargon District

•

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 where necessary.

5.1.2.2 Outcomes

Throughout the site visit a range of stakeholders were engaged with including farmers (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 key issues discussed. Further details of these consultations are provided in the Project SEP.

Figure 5-1. Meeting with Farmer 5 at his home

Figure 5-2. Shurak and Melikhodja mahalla community members

Figure 5-3. Meeting with Bogishamol mahalla leaders

Figure 5-4. Kattakurgan women deputy governor

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 5-2 describes the proposed timeline for the stakeholder engagement during further phases 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 5-2: Stakeholder Engagement Programme

Stakeholder Category	Stakeholder Engagement Methods	Location/ Timeline	Purpose	Consultation Disclosure Materials	Mean of Advance Notification	Respo
ESIA DISCLOSURE PHASE						
All stakeholder groups	Public meeting	Location/Date: Prior to construction (with exception of early works agreed with lenders)	• Disclose key finding of the ESIA, identified significant impacts and mitigation measures	Non-Technical Summary (NTS) of the ESIA online	• Media announcements • Website announcements	E&S Co from the
Mahalla Offices	• One-to-one meetings • Phone calls • Placement of paper versions of the ESIA in public places[20] • Placement of leaflets	Location/Date: Prior to construction (with exception of early works agreed with lenders)	• Arrange disclosure of the local ESIA package	Local ESIA package	• Personal interaction	E&S Co from the
All stakeholder groups	• Public presentations to summarise the ESIA • Placement of leaflets in public places • Media announcements	Location/Date: Prior to construction (with exception of early works agreed with lenders)	• Comply with the ESIA regulatory requirements • Disclose and discuss the results of the ESIA study	Local ESIA package NTS of the ESIA online	• Media announcements	Local au (with su Consult
CONSTRUCTION PHASE						
All stakeholder groups	• Disclosure online • Placement of paper versions of the ESIA in public places • Leaflets in public places • Media announcements	Location/Date: [TBC]	• Disclose and discuss the construction status and any High events due to take place (component delivery for example).	Notices	• Media announcements • Website announcements. • Notice posted in public locations	Client
Regional Government Agencies	• One-to-one meeting	Location/Date: [TBC]	• Disclose and discuss the construction status and any High events due to take place (component delivery for example).	Local ESIA package	• Personal interaction	Client
Local libraries	• One-to-one meetings • Phone calls	Location/Date: [TBC]	• Disclose and discuss the construction status and any High events due to take	Local ESIA package	• Personal interaction • Notice posted in public locations	Client

[20] Paper versions of the ESIA document will be placed in accessible public places in the local language for stakeholders to read. A register and comment box will be left with the ESIA document to record the members of the public who have consulted the ESIA and to attain any feedback/concerns the community have. This information will be shared with the Client so they can managed these issues as the project moves into the construction phase.

	• Placement of paper versions of the ESIA in public places**Error! B ookmark not defined.** • Placement of leaflets and grievance foms		place (component delivery for example). • Advertise potential job opportunities • Collect grievance/comment forms			
All stakeholder groups	• Public event • Placement of leaflets in public places • Media announcements	Location/Date: [TBC]	• Disclose and discuss the construction status and any High events due to take place (component delivery for example). • Inform community of potential employment opportunities • Collect and provide feedback on potential grievances	Local ESIA package NTS of the ESIA online	• Media announcements • Notice posted in public locations	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 TYPSA, 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 TYPSA between December 2019 and November 2020 (TYPSA, 2020c); geotechnical and hydrological studies were completed by TYPSA in June 2020 (TYPSA, 2020a; TYPSA, 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)

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6.2 Physical Characteristics

6.2.1 Climate and Meteorology

The project site is located in the Zarafshan River Valley which has a semi-arid climate with warm dry summers and cold winters. Table 6-1 provides monthly climate data averages between 1915-2003. The average annual precipitation in Samarkand between 1891–2000 was 339.3 mm. Most of the precipitation (70–90%) occurs in the winter and spring. In summer rainfall is rarely observed. Average air temperature in Samarkand (between 1991–2021) is 14.7°C, with the coldest month being January (average air temperature 0°C) and the warmest being July (average air temperature 27.63°C) (NOAA, 2021). Absolute minimal air temperatures reach -20°C and maximal air temperatures reaching upwards of 41°C (NOAA, 2021).

Table 6-1. Average monthly statistics of air temperature, precipitation, relative humidity, evaporation and average wind speed

Parameter	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Set.	Oct.	Nov.	Dec.	Year
Temperature(°C)	0.00	2.41	7.46	14.30	20.07	25.29	27.63	25.62	19.87	12.78	6.39	1.97	13.7
Precipitation (mm)	46.8	44.4	67.6	56.1	26.8	4.4	1.3	0.3	2.0	13.6	25.2	41.4	330.0
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

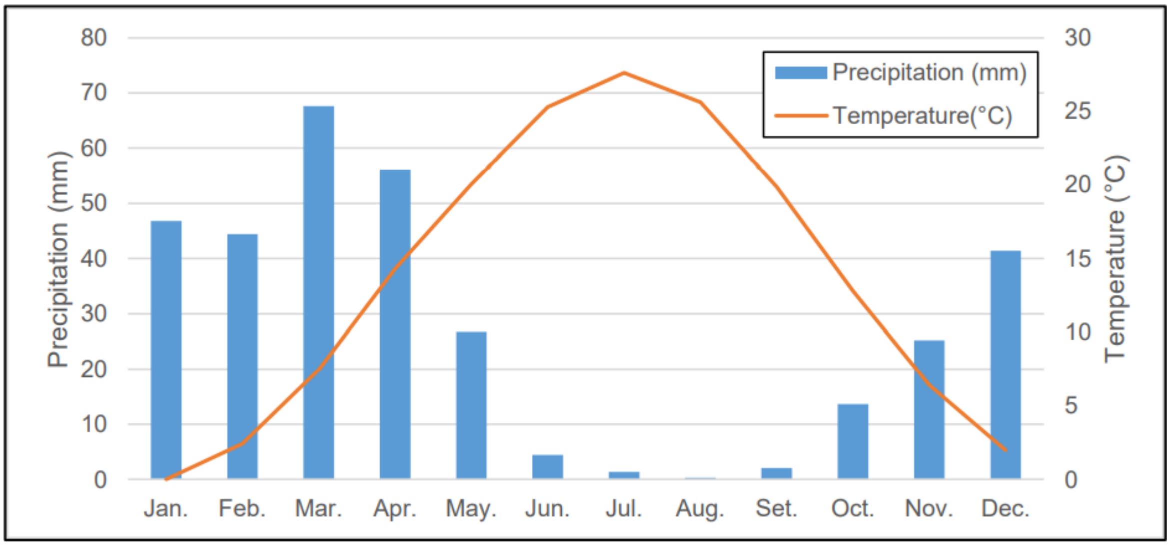

Figure 6-1: Average monthly precipitation and temperature variability at the Project Site

Source: TYPSA, 2020a

6.2.1.1 Climate change

Over the last century Uzbekistan's climate has warmed from 10.7°C in 1920 to 13.6°C in 2020 as illustrated by Figure 6-2 (World Bank Group, 2021). This increasing trend represents a 2.9°C increase in air temperatures during the hundred-year period. This trend is consistent with the observations in other middle eastern countries which have historically been some of the worst affected by the impacts of climate change over the last 50 years (World Bank Group, 2016).

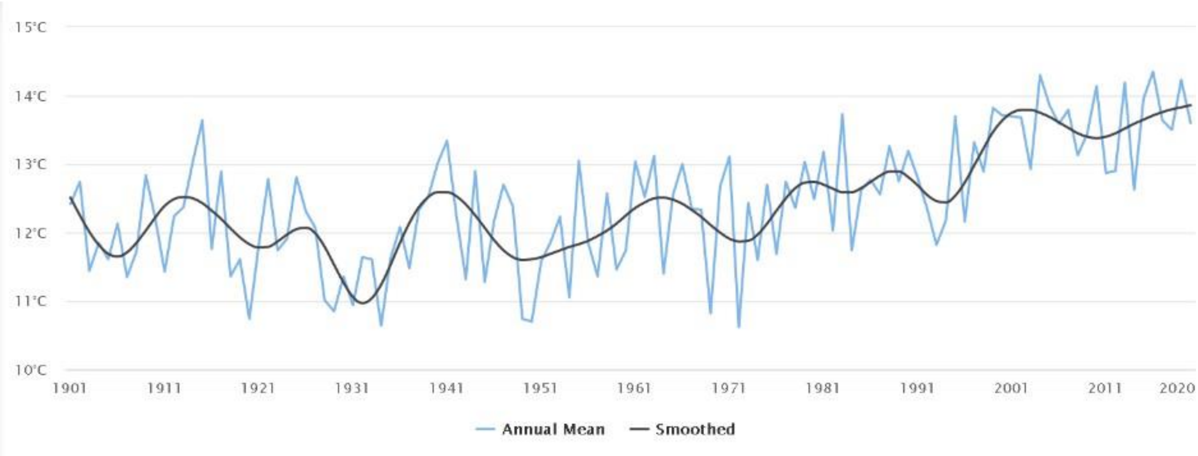

Figure 6-2. Observed Average Annual Temperature of Uzbekistan from 1901-2020

Source: World Bank Group, 2021

Climate change is expected to produce increases in monthly maximum temperatures across Uzbekistan. Figure 6-3 illustrates a projected warming under the highest emission pathway (RCP 8.5) of 2.4ºC by mid-century and nearly 5ºC by end of the century (World Bank Group, 2021). The number of hot days in Uzbekistan is projected to increase by 28.6 days by 2040-2059 days, under a RCP 8.5 scenario (World Bank Group, 2021). Furthermore, the number of tropical nights, where temperatures remain above 20°C, is projected to increase by over 31 days between 2040-59 under the same scenario.

With regard to precipitation, Uzbekistan will experience a high variability of rainfall across different agroecological and climatic zones. In general, it is expected that precipitation will decline between 50-100mm in central and eastern districts while Mediumly increasing in regions near the Aral Sea (World Bank Group, 2021). As a result of these projections, it is expected that Samarkand will experience reduced levels of precipitation due to its position ~820km South East of the Aral Sea region. Increased heat and precipitation variability will lead to increased evapotranspiration in summer months resulting in a decrease in river flowing conditions. Moreover, future projections suggest that increased glacier melting is expected to impact water availability and river flow in the short to long term in Uzbekistan (World Bank Group, 2021).

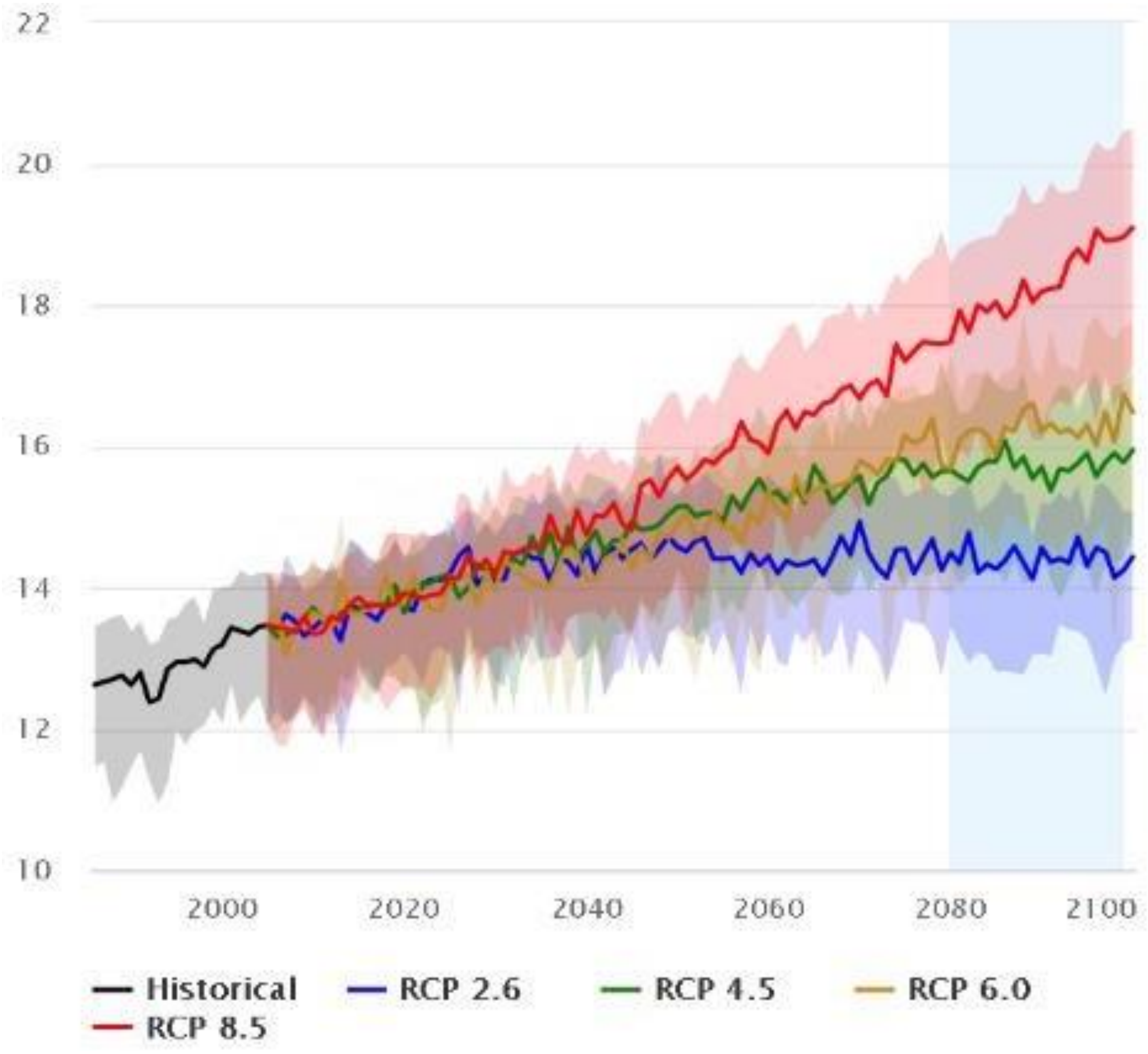

Figure 6-3. Projected mean-temperature in Uzbekistan from 1986-2100 under different emissions scenarios

6.2.2 Topography

The topography in the project area is slightly hilly and inclines gently towards the Zarafshan river valley. The surface is densely indented by canyon-like deep gullies, irrigation canals and ravines. The surface elevation of the project site varies from 535.5 to 582.5 m (unknown datum). The main water course in the area is the Zarafshan River, located approximately 3 km to the north. The project site is also crossed by numerous ditches and temporary watercourses.

6.2.3 Geology and Soils

6.2.3.1 Overview

Geomorphologically, the project is confined to the diluvial-proluvial clay deposits of the Tashkent complex (d-pQ_{II}^{ts}), undulating loess plain and is located within the IV left-bank above-floodplain erosional terrace of the Zarafshan River, formed during the Tashkent cycle of sedimentation.

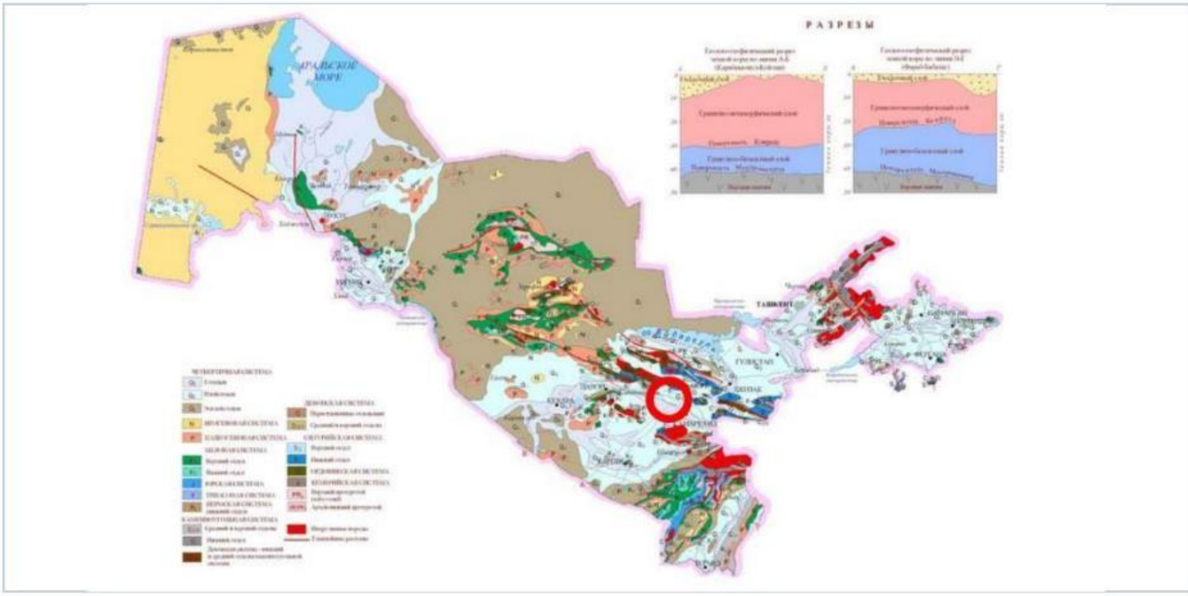

Figure 6-4. Kattakurgan solar plant in geological context of Uzbekistan

6.2.3.2 Local Geology

The ground at the project site is mainly composed by tertiary sands, with variable proportions of clay. According to the borehole data from geotechnical investigations, cenozoic formations are present in the geological structure of the site to an explored depth of 15.0 m. These formations are represented by mid-Quaternary diluvial-proluvial clay deposits of the Tashkent complex (d-pQ_{II}^{ts}). Clay soils are represented by loams, less often sandy loams, loess-like, light brown and macroporous, without inclusions of clastic material. A ground vegetation layer is developed overlying the clay deposits.

Of the modern physical and geological phenomena at the site, gully formation processes are observed; in the spring, mudflows may pass along the channels of dry riverbeds. Satellite imagery such as that of Figure 6-5 shows that there have been deep gullies towards the north of the site since 1980; although subsequent images such as Figure 6-6 indicate that these gullies are not growing towards the study area (TYPSA, 2020a).

The geotechnical investigations describe the topsoil at the site as follows: the first surficial 0 to 20 cm of the soil consists of a top vegetative soil layer that extends throughout the site. Its composition is very similar to that of the underlying sandy loams with inclusion of land waste and rubble, roots of plants, which results from weathering and organic activity. The next 15 meters are characterized by loams, sandy loams, loess-like, light brown, solid, highly porous, from weakly subsiding to highly subsiding, without inclusions of clastic material, non-saline (boreholes were drilled to a depth of 15m from surface).

Figure 6-5 Aerial picture of the gullies on the North side of Samarkand.

Source: TYPSA, 2020a

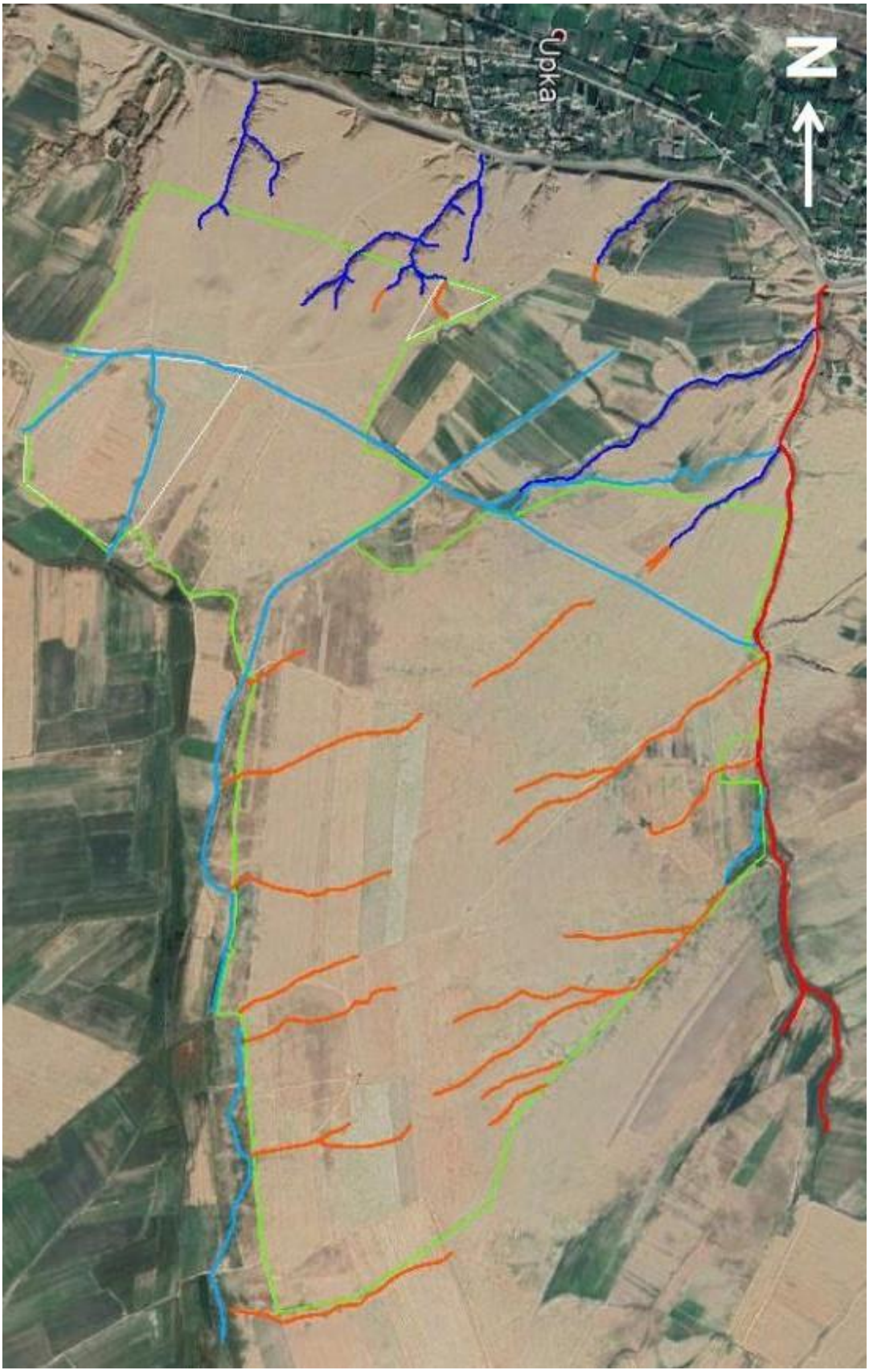

Figure 6-6 Deep gullies (blue lines), drainage ditches (light blues lines), gullies with depths less than 1.50 meters (orange lines) and a watercourse (red line).

Source: TYPSA, 2020a

6.2.3.3 Seismicity

Central Asia is a region of large crustal compression due to the collision of the Eurasian and Indian plates. The significant convergence and crustal shortening causes deformation resulting in many high magnitude earthquakes throughout the region, including eastern Uzbekistan, illustrated by Figure 6-7.

In parts of Uzbekistan, there are several seismically active zones; their directions coincide with large tectonic deformation strike lines, capable of generating earthquakes with a magnitude of M ≥ 5, called internal zones. With that said, the project site is not considered the most seismically active region of the country.

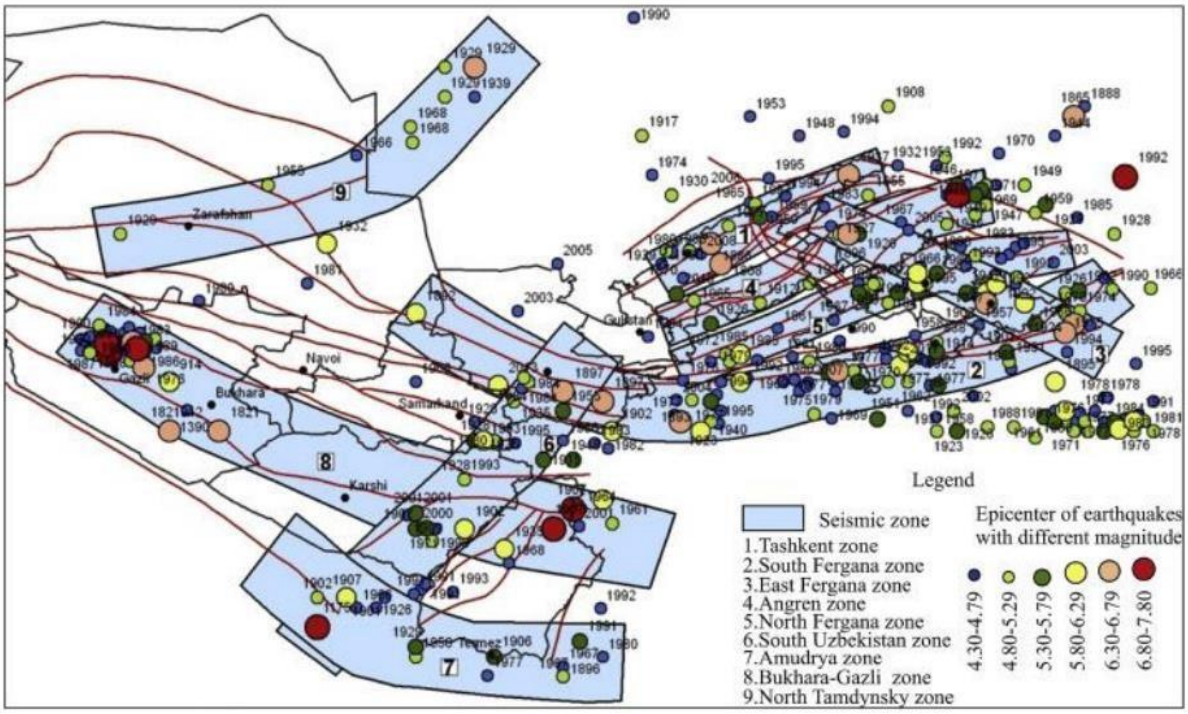

Figure 6-7. Map of earthquake epicentres in Uzbekistan and neighbouring countries

Source: Artikov, 2015.

6.2.4 Hydrology and hydrogeology

6.2.4.1 Regional

The water bodies in close proximity to the proposed site are:

- Zarafshan River – ~3 km North of the proposed site
- Zarafshan lead canal – ~2.5 km North of the proposed site
- Kattakugan Reservoir – ~15 km West of the proposed site
- Akdaryinskoe Reservoir – ~15 km North of the proposed site

The main source of surface water in the Samarkand area is the Zarafshan River, the third largest river of Uzbekistan. The Zarafshan River is a transboundary river that flows westward from the Zarafshan glacier in Tajikistan, through Uzbekistan, past Samarkand and through the Katta-Kurgan valley. The river then ceases in the desert near to the Amu Darya. The total river basin covers an area of 4,000 km^2 and the river length is 781 km. The Zarafshan River has no High contributing tributaries. The Zarafshan Valley is home to more than 7 million people and their only source of water is the Zarafshan river. The population faces water scarcity throughout the year. Along the northern border of the Project site, there is a lead canal originating at the Zarafshan River and feeding the Kattakurgan water reservoir. The Katta-Kurgan reservoir is a source of irrigation water for the valley. Spring rainfall events cause short term flooding of the canals and temporary watercourses located on the Project site.

On entering Uzbekistan from Tajikistan, the annual river discharge is 5.3 km^3. Further downstream the discharge increases only to 5.5. km^3. Tajikistan at present utilizes only 0.3 km^3, i.e. 8% of the discharge. The rest of the water is used in Uzbekistan.

The river has a number of dams and barrages: Pervomai, Akdarin, Damkhodzhin, Narpai, Karmarin, Shafrikan, Kharkhur, Babkent, and many large and medium canals for irrigation and water supply. In the middle Zarafshan are situated the reservoirs Tudakul (22,000 ha), Kuyumazar (1,600 ha), and Shurkul (1,600 ha). There are also several reservoirs which contain highly saline water. Four lakes receive drainage water through collector canals: Dengizkul (25 000 ha), Karakyr (12 000 ha), Tuzgan (5,700 ha), and Shurgak (1,600 ha).

Figure 6-8. Zarafshan River North of the site

Source: AECOM, 2021.

6.2.4.2 Local

Surface water hydrology on site is dominated by historical and current irrigation practises. There is a small stream/wetland area on the eastern boundary of the site (Figure 6-9). There are a number of irrigation ditches and collectors on site which were used to irrigate the wheat crops and allow run-off to be collected and used for irrigation downstream (Figure 6-10).

Figure 6-9. Stream/wetland on eastern boundary

Figure 6-10. Collector (now unused) on north eastern part of site

It was identified that water was being pumped from the Zarafshan River or canal to the area surrounding the site for irrigation purposes. The water was transferred by pipeline before being discharged into the irrigation system. Irrigation channels that cross the site and are still in use will be culverted to allow continued use by nearby farmers whilst protecting from construction impacts.

Figure 6-11. Irrigation pipe likely from Zarafshan River or canal

Figure 6-12. Irrigation water discharging into the irrigation system

The area of land on the route of the transmission line is actively farmed and irrigated. The farmlands on the transmission line route are likely to experience some temporary disturbance during construction and some loss of land where pylon bases are located on their land. The LRP process is being finalised and those PAPs will be compensated through that process.

Figure 6-13. Farmland on transmission line route being irrigated

Figure 6-14. Farmland on transmission line route being irrigated (2)

Figure 6-15. Farmland on transmission line route being irrigated (3)

6.2.4.3 Water Quality

The water quality in the river has deteriorated in recent years due to the impact of the return water from irrigation and waste waters from Samarkand and Kattakurgan. Water salinity in the river increases from 0.27 g/l at its source to 2.4 g/l at its mouth (AECOM, 2021). The highest pollution level is downstream of the towns Kattakurgan and Navoi, and the maximum allowable levels of oil, phenols, copper, and pesticides are usually considerably exceeded (AECOM, 2021). It was reported during the site visits that surface water or agricultural run-off tends to be contaminated with fertilizer and pesticides. The river water is classified as having a medium level of pollution.

6.2.4.4 Groundwater

In the valley of the Zarafshan River, the groundwater is confined to alluvial-proluvial gravel formation with an aquifer thickness of up to 50 m. During the geotechnical investigations (15 m borehole), groundwater was not found (TYPSA, 2020a). Stakeholder meetings revealed that water supply is mainly from wells that are about 200 meters deep. The Ishtikhan substation, to which the project's transmission line will be connected to will be located 4.5 km from the project area, has artesian wells 150 m deep (TYPSA, 2020b).

6.2.4.5 Flood Risk

A full hydrologic and hydraulic study was carried out by TYPSA[21] and according to the available data there is low flooding risk in the site of the project related to extreme flows of the Zarafshan River (TYPSA, 2020a). This conclusion is consistent with the geographical information (distance and elevation difference between the project site and the river). Spring rainfall events cause short term flooding of the canals and temporary watercourses located on the Project site. This flow conveyance is often facilitated by the gullies near to the site which transfer rainfall to the temporary watercourses.

[21] Typsa, 2020. Hydrology and Hydraulic Report. Report SP6349-RP-HE-HyStd-D03 (14 Oct 2020)

6.2.4.6 Water Resources

In the Samarkand region the river water is used for irrigating 530,000 ha of land, mainly for agricultural products serving the immediate needs of the fast-growing country population (AECOM, 2021). On the north western edge of the site, a water pipe was recorded from the Zarafshan river (or potentially the canal) to irrigate the fields outside the permitter of the project site.

Figure 6-16. Water pipe from Zarafshan River (west of site)

Figure 6-17. Outflow of water pipe from Zarafshan River to irrigation system

There are two reservoirs in the area surrounding the project site: the Kattakurgan and the Akdaryinskoe Reservoir which are utilised heavily by the local population around the site. There is also a lead canal originating at the Zarafshan river which feeds the Kattakugan reservoir. A municipal water works is located in Samarkand but no assessment of the quality of the water has been carried out for this ESIA. No water pipes have been identified crossing over or adjacent to the site. To date the EPC Contractor has not confirmed the source of water they wish to use for the Project but will provide as part of detailed design.

6.2.5 Utilities

There are no known utilities passing through the Solar PV Site. The neighbouring villages are supplied by electricity and gas (see Section 6.7.7.3).

6.2.6 Air Quality

No routine air quality monitoring is carried out in the area although the site is located on an open rural area. Nearest national air quality monitoring stations are located in Samarkand, 60 km away, and are not considered representative of the air quality in the Project Area.

There are limited sources of air pollutants in the Project Area and this would be related to vehicles, the use of fuel for domestic purposes, and wind-blown dust from bare soil and unmade tracks.

The closest residential properties are 225m and 470m from the project boundary. AECOM are of the opinion that the limited sources of air emissions mean that dust is the issue to be managed and would be managed through appropriate construction practises. As a result AECOM do not propose to collect ambient air quality data.

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 livestock and human activities such as occasional cars passing by or through the Site. Nearest sources of light are associated with the nearby villages.

As noted above, the closest residential properties are 225m and 470m from the project boundary. AECOM are of the opinion that the limited sources of noise can be modelled and mitigated without the need for ambient noise measurements. As a result, AECOM do not propose to collect ambient noise data.

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 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.

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.

6.3.2 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 sparce, low level vegetation, allowing for expansive views in all directions.

Key visual receptors are the nearby settlements to the north, west and east of the site boundary.

Figure 6-18. Site landscape, November 2021

6.3.3 Landscape character areas

Desk based analysis identified two Landscape Character Areas within the 10 km study area. These were verified as part of the site surveys. The description, key characteristics, likely trends and consideration of landscape value of each are detailed below. Project Landscape Character Areas are described in Table 6-2.

Table 6-2. Landscape character areas

LCA	Description
LCA1 Historic and current farmland	This is the LCA where the site is located. The LCA is a mix of small undulating landform with flat plateaus mainly used for grazing and historic arable cultivation. Irrigation channels and collectors are still present across the LCA. Visibility is limited within the more undulating parts of the LCA. In more open areas the view become more extensive particularly towards the south. The character of the landscape has been significantly altered by human activity during the Soviet era. The sensitivity is classed as Low.
LCA2 Zarafshan River and settlements	Like much of this region the LCA has been disturbed by human influences. The main features of this LCT are the main river valley, irrigation canals, built development, roads and bridges however much of this infrastructure has been in a state of decay for some years. There is little in the way of vertical features within this LCA other that overhead lines and pylons. Residential properties tend to be single storey with a small amount extending the two stories. As above, the character of the landscape has been significantly altered by human activity during the Soviet era. Overall the landscape value of LCA 02 is considered to be low.

Figure 6-19. View towards LCA1 from western side of the site

Figure 6-20. View from within LCA1 from centre of the site looking east

Figure 6-21. View from within the site looking northeast towards settlements of LCA2

Figure 6-22. View from within LCA2 Zarafshan River and settlements

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.

6.3.4.1 Representative Viewpoints

A total of three representative viewpoints were selected based on the visual receptor criteria above and where the Project is likely to affect views.

Table 6-3. Viewpoint Descriptions

Viewpoint ID	Location	Representative Receptors	Description
Viewpoint 1	1 km west of the nearest part of the Project Site boundary	Farm access road and residential receptors	This viewpoint is representative of residents travelling from the villages to the west of the project site on the dirt road towards small farms close to the site. The VP edge of the settlement is at an elevation of approximately 980 m ASL and is approximately 20 m above the southern edge of the site. The northern part of the site is at an elevation of 950 m ASL. As a result, the views from VP1 are expansive. The only vertical features are trees and transmission towers associated with the settlements. As the viewer approaches the site, elevation decreases, and the views become screened by the undulated land form. In this area the farms and small buildings become the dominant feature of the view. Views become screened by small trees and shrubs. Overall, residents are expected to experience extensive views of the project which will become the dominant feature of the view from this location therefore the visual value is considered to be medium.
Viewpoint 2	750 m east of the nearest part of the Project Site boundary	Residential receptors	This viewpoint is representative of residents travelling from Damkhodzha to the east of the project site on the dirt road towards small farms close to the site and the cemetery. The VP edge of the settlement is at an elevation of approximately 555 m ASL and is approximately 10 m above the northern edge of the site. The central part of the site rises to an elevation of 580 m ASL. As a result, the

			views from VP2 are generally limited to the eastern half of the project area. The only vertical features are trees and transmission towers associated with the settlements. As the viewer approaches the site, elevation decreases, and the views become screened by the undulated land form. In this area the farms and small buildings become the dominant feature of the view. Views become screened by small trees and shrubs. As noted, views of residents will be partially restricted by the topography, therefore the visual value is considered to be low.
Viewpoint 3	400 m north of the closest part of the Project Site boundary	Residential receptor	The view, looking south towards the project, is representative of the small scattered properties to the immediate north of the project. The foreground is comprised of areas of cultivated ground, bounded by trees and shrubs. The dirt road is predominantly used by local residents for access purposes. A high degree of screening is provided by the earth wall on the edge of the road and the vegetation. Views are generally limited from this location. There is considerable screening provided by the existing vegetation and topography therefore the visual value is considered to be low.

6.3.4.2 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 6-4.

Table 6-4. 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 6-5.

Table 6-5. 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.

Based on the above criteria, sensitivity of the receptors is summarised in Table 6-6.

Table 6-6. Project Landscape and Visual Receptor Sensitivity

Receptor	Sensitivity
Landscape Character Areas	
LCA01	Low
LCA 02	Low
Human Receptors	
Residential receptor VP1	Medium
Residential receptor VP2	Low
Residential receptor VP3	Low

6.4 Biodiversity

6.4.1 Introduction

The Project site (the Solar PV site and the 4.5km OHL) is located within an agricultural landscape adjacent to several rural settlements in the Zarafshan river basin.

The Solar PV site sits on flat and gently sloping cultivated land that mostly has been abandoned, but the area is densely indented by deep gullies, irrigation canals, ditches and temporary watercourses which have the potential to attract a wide range of species. The soils are light textured sierozems and are non-saline. Notably, the Zarafshan river is located approximately 2km from the northern boundary of the proposed Solar PV site.

The proposed OHL is routed through a generally flat, intensively cultivated and irrigated agricultural landscape, with field crops including cotton.

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 – TYPSA/IFC

The ecological baseline is informed by ornithological surveys undertaken by TYPSA in 2020[22] and 2021[23].

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 6.4.3 (field survey methodologies), Section 6.4.4 (details of consultations which were undertaken) and Section 6.4.5 (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 (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.

[22] TYPSA/IFC (2020). Environmental and Social Scoping Report – Kattakurgan Solar PV Project . March 2020

[23] Typsa, 2021. Great Bustard Winter Survey – Kattakurgan Solar PV Project

6.4.2 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 6.4.2.1.
- An overview of potential impacts of overhead powerlines on birds is provided in Section 6.4.2.2.
- The relevant key biodiversity areas for birds are detailed in Section 6.4.1.3.
- The details of migration flyways in Uzbekistan are provided in Section 6.4.1.4.
- A summary of the avifauna of Uzbekistan is provided in Section 6.4.1.5.
- A summary of the status of birds of conservation concern which are relevant to the
- Project site is provided in Section 6.4.1.6.

- Subsequent sections of the biodiversity baseline section are structured as follows:
  - The methodologies for the AECOM ecological surveys undertaken.
  - Details of the consultations undertaken.
  - The results of the ecological surveys undertaken by AECOM.

6.4.2.1 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)[24]. 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)[25] 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)[26] 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 southwest 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 mortality and reproductive

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

[25] 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).

[26] 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.

failure (Horváth *et al*., 2010[27]; Blahó et al., 2012[28]). 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[29]; Bernáth *et al*., 2008[30]; Horváth *et al*., 2009[31]). Bernáth *et al*. (2001)[32] 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)[33].

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[34]) 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 Park site being considered, there are no features nearby that would suggest that the habitat is particularly sensitive or attractive to migrating birds. There are a number of small irrigation ditches close to the site and small stream/wetland areas on the eastern edge that may attract polarotactic insect species and hence attract insectivorous bird species. 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 Park 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.

6.4.2.2 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' 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

[27] 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.
[28] 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.
[29] 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.
[30] 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.
[31] 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
[32] 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 birdsusing huge shiny black and white plastic sheets.' Arch Nature Conserv Landsc Res, 40 pp. 1–28.
[33] 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.
[34] 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

present the greatest collision risk to birds (e.g. Alonso et al. 1994)[35]. 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[36]; Guyonne et al. 1998[37]).

Scottish Natural Heritage (SNH, 2016)[38] and Birdlife International (Birdlife, International, 2007[39]) 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[40]):

- 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); and
- 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.

6.4.2.3 Key Biodiversity Areas - The Kattakurgan Water Reservoir Important Bird Area

The Kattakurgan Water Reservoir is an Important Bird Area (IBA situated in a natural depression approximately 15km to the south-west of the Project site at its closest point; it is a non-protected area. Tree and shrub plantations (pistachio, oleaster, acacia, maple and others) cover 2,600 ha along the southern, south-eastern and western banks. The reservoir gets its water from the Kara-darya river, which is a right branch of the Zaravshan. river. The reservoir fills in autumn, winter and spring. Water is used for irrigation from May to June. The reservoir freezes for a short time in winter. Emergent vegetation is not developed because of water level fluctuations. The phytoplankton of the reservoir is poor in species composition and numbers. A total of 115 species of birds have been recorded at the site, 61 of them breeding. There are 10 species of birds included in the National Red Book. Of these, 4 species breed: pygmy cormorant (*Phalocrocrax pygmaeus*), common pheasant (*Phasianus colchicus*), Asian houbara (*Chlamydotis macqueeni*), and pin-tailed sandgrouse (*Pterocles alchata*). This site plays an important role in the protection of the Asian houbara and pin-tailed sandgrouse. The site meets several criteria for breeding and migratory species, including globally threatened and biome-restricted species, 1% or more biogeographical population, and congregations of 20,000 of more waterbirds[41]. The following waterfowl species are listed as IBA trigger species: greylag goose (*Anser anser*), common goldeneye (*Bucephala clangula*), smew (*Mergellus albellus*), ruddy shelduck (*Tadorna ferruginea*), great crested grebe (*Podiceps cristatus*), demoiselle crane (*Anthropoides virgo*) and great cormorant (*Phalacrocorax carbo*).

[35] 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.
[36] 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
[37] 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
[38] 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
[39] 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
[40] 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
[41] BirdLife International (2021) Important Bird Areas factsheet: Kattakurgan Reservoir. Downloaded from http://www.birdlife.org on 15/12/2021.

Consultation with Birdlife International and ornithological experts (IBA Programme since 2008) was undertaken and reported in TYPSA/IFC (2020)[42]; this highlighted that none of the species for which the IBA site was designated use the Project site, with the exception of the potential for Asian houbara bustard.

In terms of non-bird biodiversity features of the IBA, the following fish species are listed in the National Red Book*:* *Barbus capito conocephalus*, *Capaetobrama kuschakewitschi* and *Sabanejewia aurata*. There are 11 species of reptiles, including *Varanus griseus* and *Testudo horsfieldi*. A total of 26 mammalian species have been recorded.

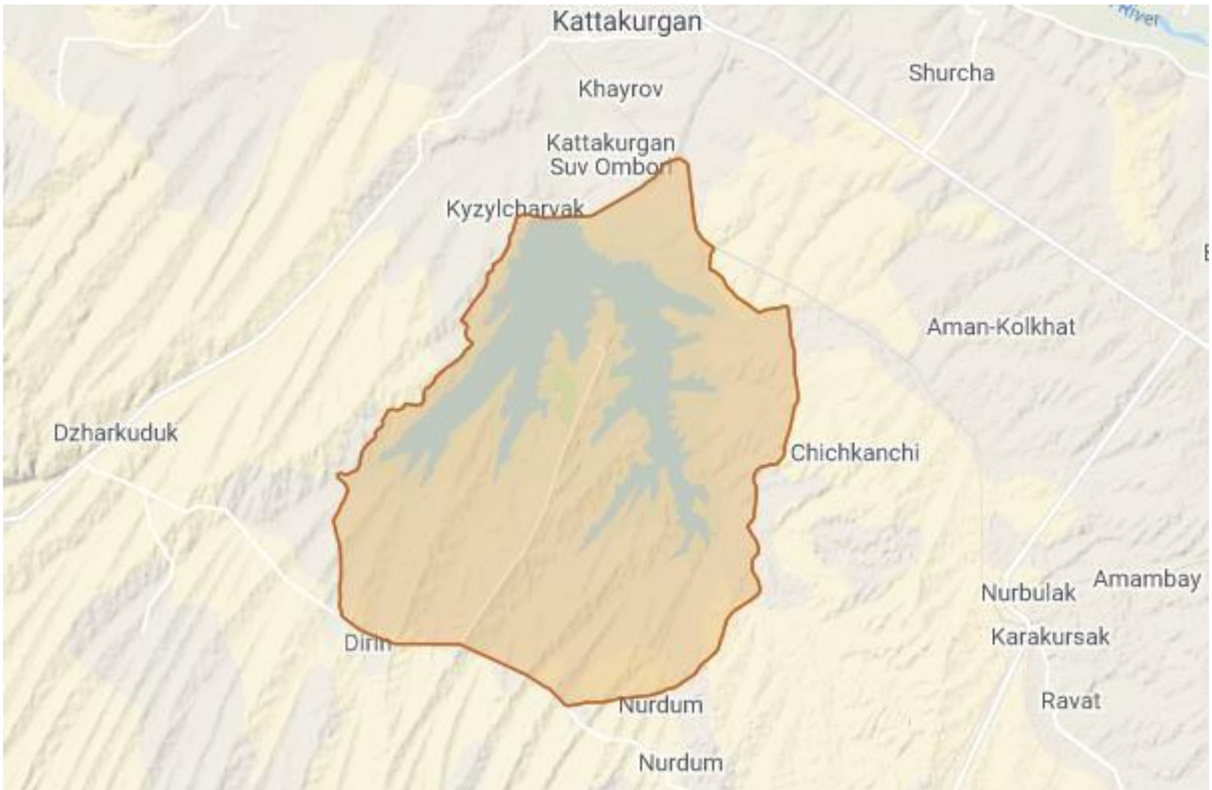

Figure 6-23. Location of the Kattakurgan Reservoir IBA

Source: Birdlife International, 2021

6.4.2.4 Flyways

A number of important flyways cross Uzbekistan with the Solar Farm 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-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.

[42] Environmental and Social Scoping Report – Kattakurgan Solar PV Project. Prepared by TYPSA for IFC. March 2020

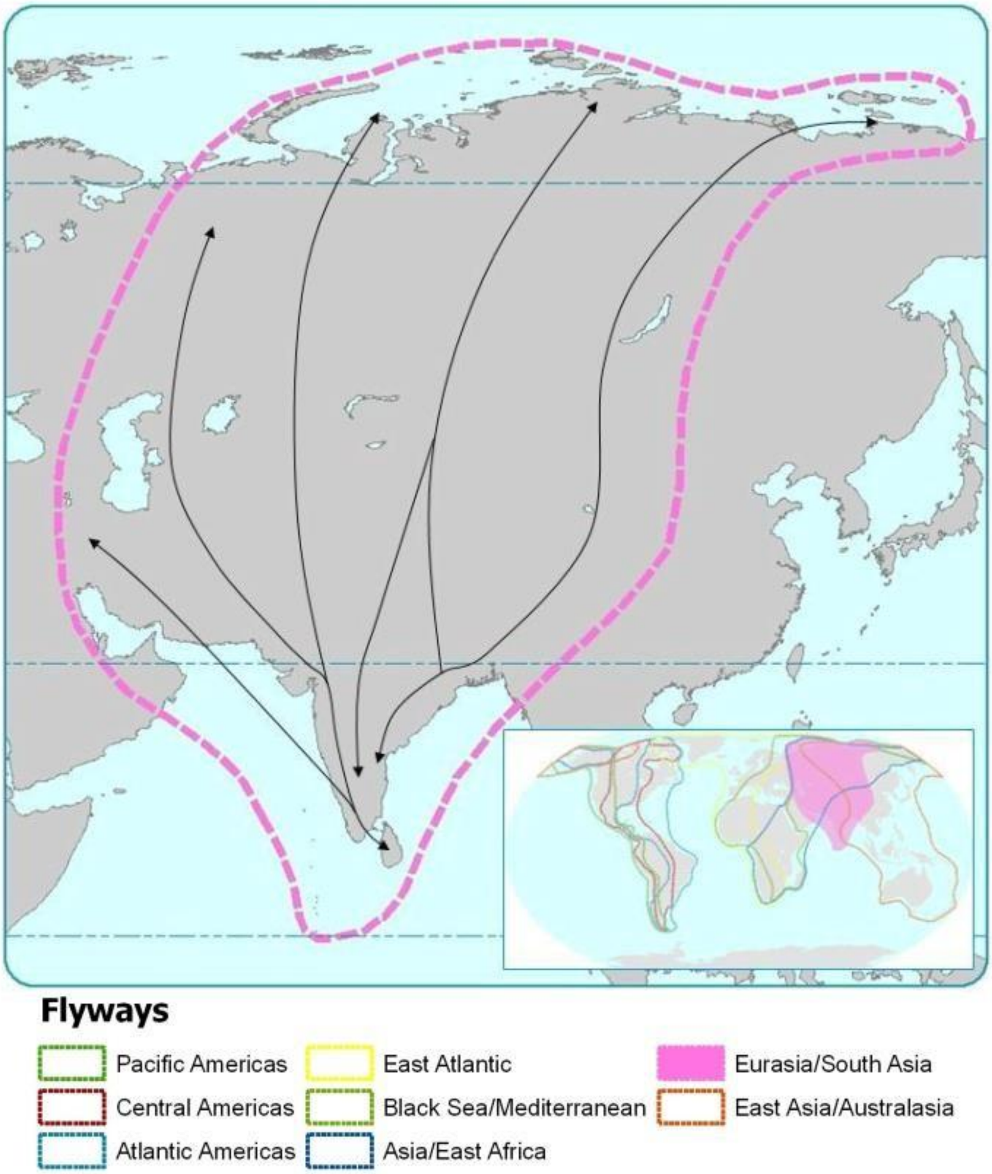

Figure 6-24. Important Flyways Relative to the Project Site

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 gregarious*) [see further information under 'Species of Concern' below].

The CAF is a broad front are there are no specific features within 20 km of the site which could attract migrating birds. The closest feature is Kattakurgan Reservoir IBA, which is attractive to migrating waterfowl, but the project site does not contain any wetland habitat that may attract such species and no waterfowl were recorded as a result of the baseline surveys (refer to Section 6.4.4: Field Survey Results)

6.4.2.5 Avifauna of Uzbekistan Summary

Uzbekistan has a total of 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 6-7 below. No species are listed as country endemics.[43]

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 6-7. Globally threatened bird species occurring in Uzbekistan

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

6.4.2.6 Bird Species of Concern Relevant to the Project Site

The following bird species were identified by the IBAT screening undertaken by TYPSA.[44].

[43] BirdLife International (2020) Country profile: Uzbekistan. Available from http://www.birdlife.org/datazone/country/uzbekistan. Checked: 2020-02-03
[44] See footnote 21

Sociable lapwing – *Vanellus gregarious*

The sociable lapwing is a strikingly patterned plover species listed as Critically Endangered (CR) by the IUCN and Vulnerable (VU: R) on the Red Data Book of Uzbekistan.

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)[45] 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 Samarqand Region and is therefore remote from the Project site. 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 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 Samarkand Regional Ecology Department, during a meeting on 26th 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 Kattakurgan IBA factsheet [46], which does not list this species as a biodiversity feature of the IBA which is located in the vicinity of the Project site area. It is possible that sociable lapwing may fly over the proposed Project site during spring and autumn passage and therefore surveys for this species of high conservation concern were undertaken during the autumn 2022 passage period; this is consistent with advice provided during consultation with ADB.

The CHA (Turnstone Ecology, 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.

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). High threats include the drainage of appropriate

[45] 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 gregarious. Journal of Ornithology (2021) 162:349–367 https://doi.org/10.1007/s10336-020-01844-y

[46] BirdLife International (2022) Important Bird Areas factsheet: Kattakurgan Reservoir. Downloaded from http://www.birdlife.org on 11/04/2022.

habitat and hybridisation with the north American ruddy duck. White-headed duck is not listed as an IBA trigger species for the Kattakurgan Water Reservoir KBA.

The CHA (Turnstone Ecology, 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. The project AoI does not support habitat suitable for this species however transit through AoI is possible. White-headed duck was not recorded on any of the baseline surveys and it is considered that any transitory movements are highly unlikely to be of numbers which are significant.

Saker Falcon - *Falco cherrug*

The saker falcon is listed as Endangered (EN) 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 also listed as Near-threatened (NT) 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.

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.

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 (EN) by the IUCN and 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. A single migrating steppe eagle was recorded at the Project site during the AECOM survey visit undertaken in September 2021.

Pallas's Fish Eagle - *Halieetus 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 trigger species for the Kattakurgan Water Reservoir KBA.

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.

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 (EN) on the IUCN Red List and Vulnerable (VU) on the Red Data Book of Uzbekistan. An Egyptian vulture was recorded at the Project site during the site visit by TYPSA in autumn 2020.

The CHA (Turnstone Ecology, 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.

Asian Houbara - *Chlamydotis macqueenii*

Consultation undertaken by AECOM with the Samarkand Regional Ecology Department during a meeting on 26th November 2021 confirmed that the project site is unlikely to support populations of Asian Houbara.

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 6.4.2.4) 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 AoI 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 any of the baseline surveys which have been undertaken for the project.

Little Bustard - *Tetrax tetrax*

The main threats are habitat loss, degradation and fragmentation, lack of food availability and nest failure due to modern agricultural practices.

The CHA (Turnstone Ecology, 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 surveys undertaken by TYPSA in 2021 (a single bird).

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 pressure 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 Samarkand 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 Samarkand region (and 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 TYPSA/IFC in the winter of 2020/21 and reported in TYPSA/IFC (2021). The Project AoI is to the south-west of a known core wintering area in the Jizzakh region (Nuratau Range) and is located to the north-east of the a known core wintering area in Samarkand region (Steppe of Karnabchul). The Project AoI therefore does not overlap with the core wintering areas of great bustard detailed in the aforementioned CHA. As detailed in the CHA, the Project AoI does not support suitable terrestrial habitat for over-wintering or staging Great Bustard and no birds were recorded within the AoI during the winter surveys undertaken in the winter 2020-21 (Typsa/IFC 2021). The species was not recorded during winter baseline surveys undertaken by AECOM. It is therefore considered that the Project AoI in unlikely to be of critical importance for wintering Great Bustard within Uzbekistan. This position is echoed in the 2021 Typsa/IFC (2021) report which clearly states ‘the Project site is likely to be situated outside the area of Critical Habitat’. However, the airspace of the Project AoI, including route of the OHL is likely to be used by birds moving between wintering grounds as well as migrating between wintering and breeding habitats. The CHA has determined that the EAAA used for the assessment is likely to support significant numbers of the Central Asian population and the thresholds for Critical Habitat are met for Criterion 1.

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

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.

In summary, Critical Habitat has therefore been triggered for great bustard.

6.4.3 Site Survey Methodology

The ecological baseline (habitat identification, floral survey, terrestrial fauna and avifauna survey) was established by local biodiversity specialists on September 2021[47] and by AECOM ecologists/local biodiversity specialist[48] during site surveys on 26th, 27th and 28th 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;
- Drive-over and point count surveys for the aforementioned ecological features along the OHL (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 baseline surveys were undertaken in April and September 2022 (for Asian houbara and sociable lapwing respectively); refer to sections 6.4.2.4 & 6.2.4.5 below.

6.4.3.1 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 10mx10m quadrats, using the Drude method[49] 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.

[47] 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 and Abdusalom Normatov, Senior Researcher, Forestry Scientific Research Institute, Tashkent

[48] 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

[49] The Drude method is a description of vegetation in terms of its floristic composition and is generally accepted in terms of geobotany in Uzbekistan

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 Data Book to determine the presence of species of national 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 aboveground 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.

6.4.3.2 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.

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 daily site surveys.

6.4.3.3 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.
- 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.

6.4.3.4 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[50] on 11th-13th 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[51]. 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, 2022[52]). The intensive agricultural areas which support the proposed OHL 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).

6.4.3.5 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. **Further detailed method will be added on receipt of the GBI ecology summary report.**

6.4.3.6 Central Asian Tortoise Survey

Following consultation with the Samarkand Regional Ecology Department/Goscomecology surveys for Central Asia Tortoise (*Testudo horsfieldii*) were undertaken by AECOM between 27th-29th 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)[53]. 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 Samarkand 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.

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[50] Team leader - 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

[51] Sutherland, W.J (1996). Ecological Census Techniques: A Handbook. Cambridge University Press

[52] 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.

[53] Nazarov, R.A. (May 2022). A Herpetological Assessment of Current State of Territory of Samarkand Solar PV (Samarkand Region, Uzbekistan), with the focus on the condition of the population of Asian tortoise (*Testudo horsfiledii*).

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 surveyor walking a 12.4km line transect within the Solar PV site and the OHL route during the daytime and also on a single occasion during the night-time; observations of tortoises, tortoise burrows and tortoise signs were recorded within distance bands so that population densities could be calculated.

6.4.4 Consultations

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

- Samarkand Regional Ecology Department (included the respective Heads from the Regional Department of Ecology, Biodiversity Division, Expertise Division and Air Protection Division) [26th November 2021].

6.4.5 Field Survey Results

6.4.5.1 Introduction

The results of the ecological field surveys undertaken by AECOM, as detailed in Section 4.1.3, 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 A.

6.4.5.2 Habitats

The vegetation of Uzbekistan is divided into four main ecosystems (Belolipov *et a*l, 2013)[54]; 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 a mosaic of historic (within the last 20 years) and more recent (within last 5 years) cultivated land, with ridge and furrow patterns indicative of ploughing ubiquitous throughout. Camelthorn (*Alhagi pseudoalhagi*) is a ubiquitous feature of the vegetation (abundant) and spiny cocklebur (*Xanthium spinosum*), a noxious weed, is locally abundant; the latter species is an introduced invasive species (refer to Sennikov *et al*, 2020[55]). Isirik (*Peganum harmala*), a native noxious weed, is widespread and is locally abundant. Other ruderal and weed flora components which typify this agro-ecosystem are *Papaver pavonium*, *Tribulus terrestris*, and *Sphaerophysa salsula*, with *Cynodon dactylon* and *Hordium leporinum* grasses achieving local abundance*.* A full species list is shown in Appendix A.

The agro-ecosystem (a mosaic of historic and more recent [within last 5 years] cultivated land) and the associated weed flora assemblage which prevails within the Solar PV site is Modified Habitat as defined in PS6. The OHTL route crosses intensively cultivated and irrigated farmland habitat, with cropped fields including cotton cultivation: it is Modified Habitat as defined in PS6 (refer to Figure 6-25).

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).

[54] 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*
[55] 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/m5vdwk accessed via GBIF.org on 2022-04-07.

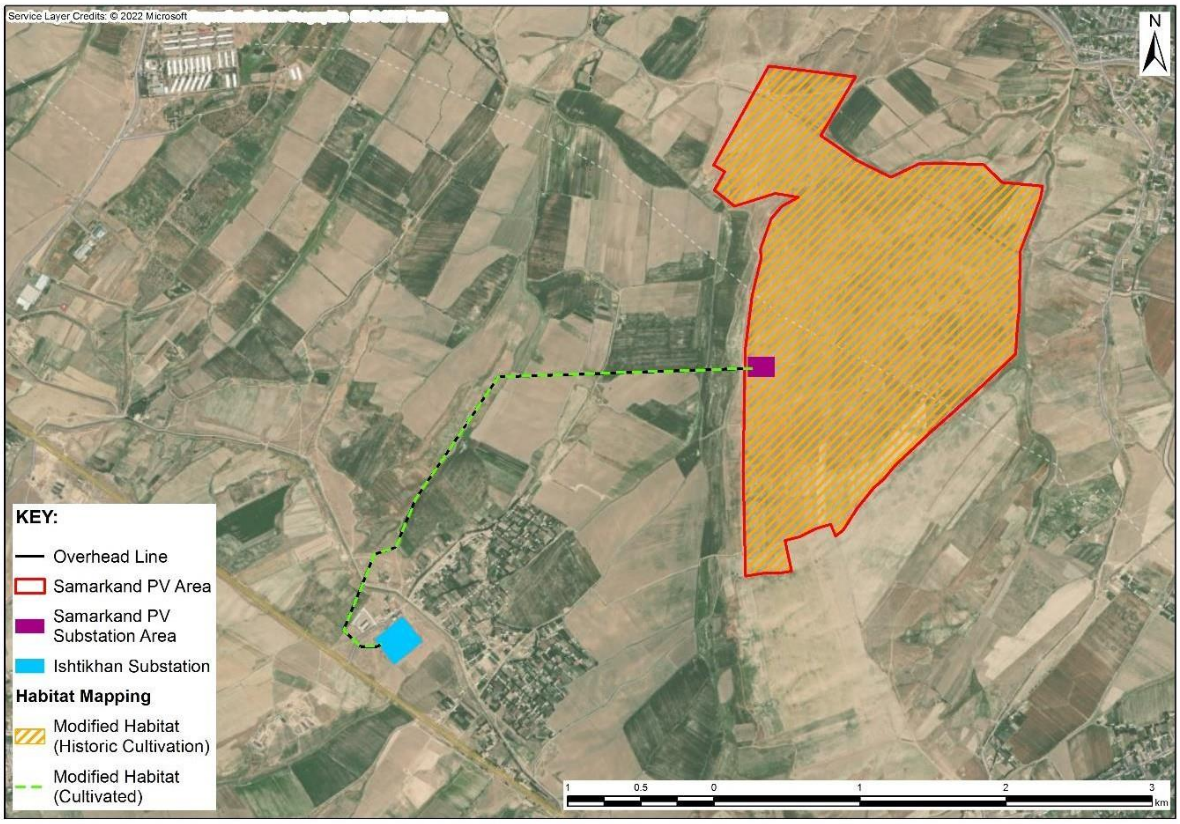

Figure 6-25. Habitats Relevant to Project Site

Figure 6-26. Fallow cultivated land in southern part of Solar PV site with remnant cereal crop and frequent Camelthorn

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

Figure 6-27. The prevailing agro-landscape (ridge and furrow) with associated ruderal weed flora assemblage within the Solar PV site

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

Figure 6-28. Northern part of the Solar PV site, historic ridge and furrow and crop planting holes

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

Figure 6-29. Spiny cocklebur, an introduced invasive species, is locally abundant within the historic cultivated land.

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

6.4.5.3 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-Palaearctic 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 6.8 below.

A single species of conservation concern and PBF species was observed during the September 2021 field survey visit: steppe eagle (*Aquila nipalensis*) [IUCN Endangered]. A single overflying bird on autumn passage was recorded. A single species, white-tailed eagle (*Haliaeetus albicilla*), is included within the Red Data Book of Uzbekistan (VU); an individual was recorded overflying the Solar PV site during the November 2021 visit.

The Asian houbara survey undertaken in April 2022 confirmed the likely absence of breeding populations for this species within the Project site. The sociable lapwing survey undertaken in September 2022 confirmed the likely absence of this species within the project site, however there is potential for possible movements over site during spring and autumn migration.

Migratory and resident species recorded during the April 2022 field survey, which may also breed within the proposed project area include: black-bellied sandgrouse (*Syrrhaptes orientalis*), crested lark (*Galerida cristata*) and isabelline wheatear (*Oenanthe isabelline*). None of the breeding bird species recorded are of global conservation concern (refer to Table 6-8) and non are included in the Red Data Book of Uzbekistan.

Table 6-8. Summary of the Bird Species Recorded During the AECOM Surveys within the Solar PV site (refer to footnotes)

Common Name	Latin Name	IUCN threatened[1]?	URDB Listed[2]?	PBF (EBRD PR6 GN)	Peak Count			
					Visit 1: Sept 2021	Visit 2: Nov 2021	Visit 3: April 2022[3]	Comments
Black-bellied Sandgrouse	*Syrrhaptes orientalis*	x	x	x	4	-	6	Resident species
Feral Pigeon	*Columba livia forma domestica*	x	x	x	165	-	14	Resident species
Oriental Turtle Dove	*Streptopelia orientalis* SL	x	x	x	68	-	-	Non-breeding (migratory) species
Eurasian Collared Dove	*Streptopelia decaocto*	x	x	x	14	-	-	Resident species
Laughing Dove	*Spilopelia senegalensis*	x	x	x	2	-	-	Resident species
Steppe Eagle	*Aquila nipalensis*	✓ EN	✓VU:D	✓	1	-	-	Non-breeding (migratory) species which is included in the Red Book of Red Data Book of Uzbekistan (VU)
White-tailed Eagle	Haliaeetus albicilla	x	✓VU	x	-	1	-	Winter visitor
Western Marsh Harrier	*Circus aeruginosus*	x	x	x	5	1	2	Resident species
Hen Harrier	*Circus cyaneus*	x	x	x	1	3	1	Winter visitor
Montagu's Harrier	*Circus pygargus*	x	x	x	-	-	2	Summer breeding and migratory species
Eurasian Sparrowhawk	*Accipiter nisus*	x	x	x	-	-	2	Resident species

Shikra	*Accipiter badius*				-	-	1	Summer breeding and migratory species
Long-legged Buzzard	*Buteo rufinus*	x	x	x	2	-	-	Summer breeding and migratory species
Peregrine Falcon	*Falco peregrinus*	x	x	x	-	1	-	Winter visitor
Common Kestrel	*Falco tinnunculus*	x	x	x	3	3+	-	Resident species
Hobby		x	x	x	2	-		Summer breeding and migratory species
Little Owl	*Athene noctua*	x	x	x	1	1	-	Resident species
Common Swift	*Apus apus*	x	x	x	-	-	4	Summer breeding and migratory species
Blue-cheeked Bee-eater	*Merops persicus*	x	x	x	33	-	-	Summer breeding and migratory species
European Bee-eater	*Merops apiaster*	x	x	x	18	-	-	Summer breeding and migratory species
Hoopoe	*Upopa epops*	x	x	x	1	-	1	Resident species
Northern Raven	*Corvus corax*	x	x	x	5	-	-	Resident species
Rook	*Corvus frugilegus*	x	x	x	52	100+	25	Resident species
Magpie	*Pica pica*	x	x	x	11	-	-	Resident species
Eurasian Skylark	*Alauda arvensis*	x	x	x	47	30+	-	Non-breeding (wintering) species.
Crested Lark	*Galerida cristata*	x	x	x	36	40+	42	Resident species
Asian Short-toed Lark	*Alaudala cheleensis*	x	x	x	16	-	-	Summer breeding and migratory species

White-winged Lark	*Alauda leucoptera*	x	x	x	-	90	-	Winter visitor
Calandra Lark	*Melanocorypha calandra*	x	x	x	-	100+	-	Resident species
Sand Martin	*Riparia riparia*	x	x	x	47	-	-	Summer breeding and migratory species
Eurasian Barn Swallow	*Hirundo rustica*	x	x	x	80	-	8	Summer breeding and migratory species
Common Myna	*Acridotheres tristis*	x	x	x	35	-	-	Resident species. Recorded at the farm to the south of the site boundary.
Starling	*Sturnus vulgaris*	x	x	x	34	-	-	Resident species
Common Rock Thrush	*Monticola saxatilis*	x	x	x	-	-	1	Summer breeding and migratory species
Northern Wheatear	*Oenanthe oenanthe*	x	x	x	18	-	-	Summer breeding and migratory species
Isabelline Wheatear	*Oenanthe isabellina*	x	x	x	-	-	9	Summer breeding and migratory species
Desert Wheatear	*Oenanthe deserti*	x	x	x	6	-	-	Summer breeding and migratory species
Pied Wheatear	*Oenanthe pleschanka*	x	x	x	4	-	3	Summer breeding and migratory species
Siberian stonechat	*Saxicola maurus*	x	x	x	-	-	17	Summer breeding and migratory species
Tree Pipit	*Anthus trivalis*	x	x	x	-	-	30	Migratory species

White Wagtail	*Motacilla (alba) alba*	x	x	x	3	-	-	Summer breeding and migratory species
Masked Wagtail	*Motacilla (alba) personata*	x	x	x	5	-	-	Summer breeding and migratory species
Tree Sparrow	*Passer montanus*	x	x	x	12	-	-	Resident species
Spanish Sparrow	*Passer hispaniolensis*	x	x	x	49	-	-	Resident species
Brambling	*Fringilla montifringilla*	x	x	x	-	-	-	Winter visitor
Linnet	*Linaria cannabina*	x	x	x	-	5+	-	Resident species
Corn Bunting	*Emberiza calandra*	x	x	x	-	5+	5	Resident species

Footnotes

[1] Globally threatened species (IUCN web site): CR – critical endangered, EN – endangered, VU – vulnerable

[2] Uzbekistan Red Data Book (2019): CR – critically endangered, EN – endangered, VU – vulnerable, NT – near threatened species

[3]Species recorded incidentally during the Asian Houbara surveys undertaken in April 2022

6.4.5.4 Survey Results for Non-breeding birds – OHL

The following bird species were recorded during a reconnaissance of the OHL on 27th November 2021: northern lapwing (*Vanellus vanellus*), white stork (*Ciconia ciconia*), grey heron (*Ardea cinerea*), white-tailed eagle (*Haliaeetus albicilla*), hen harrier (*Circus cyaneus*), common buzzard (*Buteo buteo*), common kestrel (*Falco tinnunculus*), merlin (*Falco columbarius*), little owl (*Athene noctua*), feral pigeon (*Columba livia* forma *domestica*), great grey shrike (*Lanius excubitor*), hooded crow (*Corvus cornix*), rook (*Corvus frugilegus*), magpie (*Pica pica*), skylark (*Alauda arvensis*), crested lark (*Galerida cristata*), calandra lark (*Melanocorypha calandra*), meadow pipit (*Anthus pratensis*), common myna (*Acridotheres tristis*), starling (*Sturnus vulgaris*), white wagtail (*Motacilla [alba] alba*), tree sparrow (*Passer montanus*), common chaffinch *(Fringilla coelebs*), brambling (*Fringilla montifringilla*), desert finch (*Rhodospiza obsoleta*), reed bunting (*Emberiza schoeniclus*) and corn bunting (*Emberiza calandra*). None of these species are IUCN 'threatened' species. A single species, white-tailed eagle, is included within the Red Data Book of Uzbekistan (VU).

The sociable lapwing survey undertaken in September 2022 confirmed the likely absence of this species within the project site, however there is potential for possible movements over site during spring and autumn migration.

Figure 6-30. White-tailed Eagle (Immature)

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

Figure 6-31. Little Owl

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

Figure 6-32. Crested Lark

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

Figure 6-33. Hen Harrier

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

6.4.5.5 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 6.4.2.1 (Habitats) above. A full species list is provided in Appendix A.

6.4.5.6 Terrestrial Mammals

A single mammal species was observed during the AECOM field surveys: Tolai Hare (*Lepus tolai*) [IUCN Least Concern]; an individual was recorded during the November 2021 visit (within the Solar PV site). 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):

- Zaisan mole vole (Ellobius tancrei) [IUCN Least Concern] – active burrows/digging by this species were observed;
- Long-eared hedgehog (Hemiechinus auritus) [IUCN Least Concern] –a hedgehog skin was observed; and
- Eurasian pygmy shrew (Soricidae minutus) [IUCN Least Concern] – bones found in a found in a kestrel pellet;
- Red fox (Vulpes vulpes) [IUCN Least Concern] – scats (droppings) observed.

During the September 2021 field visit anecdotal reports provided during an interview with the local residents confirmed the presence of Red Fox.

- 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 Samarkand Regional Ecology Department or interviews with local residents, including Marbled Polecat (*Vormela peregusna*), Steppe Polecat (*Mustela eversmanii*) and Goitered Gazelle (*Gazella subgutturosa*). Therefore, these species are considered absent and are considered no further in this assessment.

6.4.5.7 Bats

Common pipistrelle (*Pipistrellus pipistrellus*) [IUCN Least Concern] was recorded foraging/commuting within the proposed Solar Site during the September 2021 visit. There is no habitat suitable for roosting within the Solar PV site and it is considered likely that bats are utilizing the farm buildings adjacent to the Solar PV site for roosting.

6.4.5.8 Reptiles

AECOM 2021 Surveys and Consultation

The Samarkand Regional Ecology Department advised that the following IUCN threatened species has the potential to occur within the Project Area: Central Asian tortoise (*Testudo horsfieldii*). Tatar sand boa (*Eryx tataricus*) [Uzbekistan Red Data Book species] was also highlighted as being potentially present.

No reptile species were recorded during the September 2021 field survey, which coincided with the end of the reptile active season, prior to winter hibernation. The November 2021 survey visit was undertaken outside the main active season for reptiles, hence no reptiles were recorded during this visit.

Burrows which have the potential to support reptiles (for example lizards, snakes, tortoises) were observed in localised areas during both 2021 AECOM field survey visits.

During the consultation meetings with the local community, it was established that tortoises had been intensively harvested within the Solar PV site within the past 20 years and that it is likely that the current density of the tortoise population within the site is low, with only a small population remaining. However, at the time of the 2021 AECOM surveys, it was not possible to confirm the status of the population in the absence of any baseline data gathered for the spring period, which is the optimal time for tortoise survey.

AECOM 2022 Reptile Surveys

The following narrative includes a summary of the surveys undertaken between 27th-29th April 2022 for Central Asian Tortoise and reported in Nazarov (2022).

Central Asian Tortoise

Listed as Vulnerable by the IUCN, 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 potential presence of this species within the Solar PV site was confirmed by consultation with the Samarkand Regional Ecology Department and also by Nazarov (2022).

A total of five Central Asian Tortoises were recorded during the April 2022 surveys (three adult females and two adult males), in the northern part of the Soar PV site. Tortoise burrows were recorded in the north-eastern part of the Solar PV site. The locations of the tortoises and tortoise burrows are shown in Figure 6.33 below. All records of tortoises refer to the Solar PV site; localised areas where the ground is sloped were favoured as these areas provide suitable areas for burrowing (ie. gullies and local depressions).

Nazarov (2022) concludes that the population size in the Project site is very low and does not exceed 0.1 individuals/hectare. Tortoises recorded during the survey showed evidence of damaged carapaces due to agricultural activity (eg. ploughing).

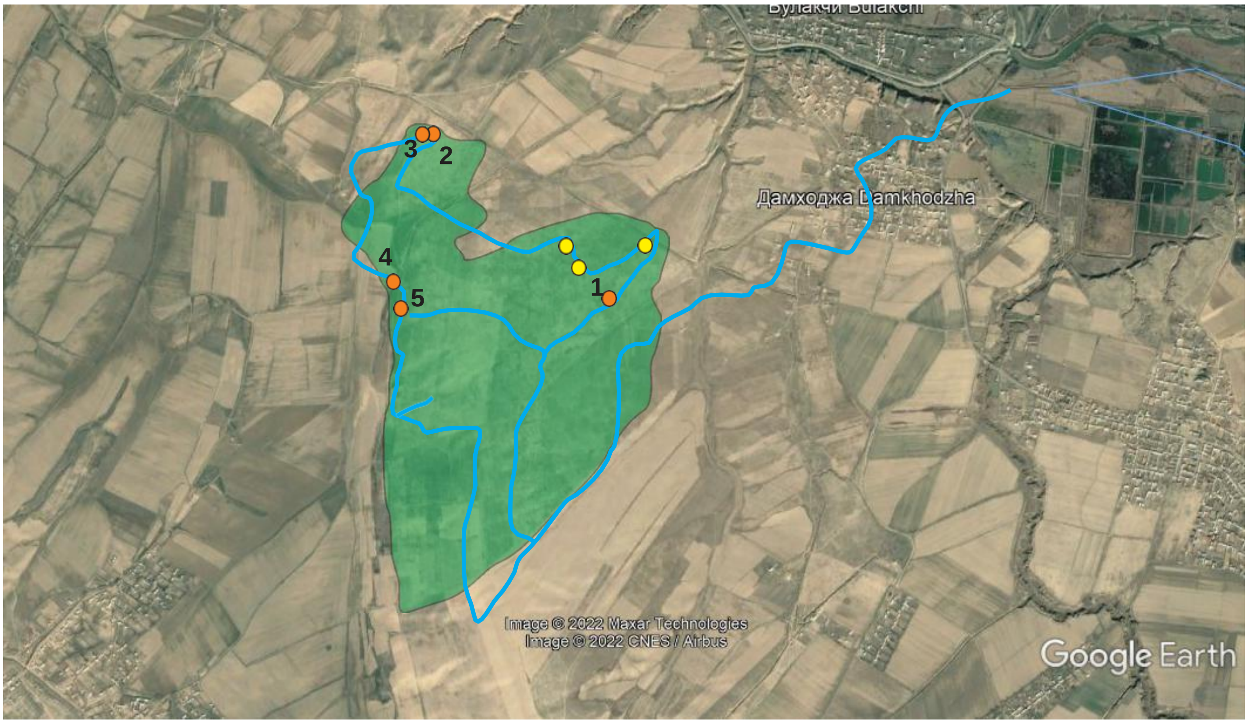

Figure 6-34. Central Asian Tortoise Survey Results (April 2022) - orange circles indicate the location of the tortoises recorded; yellow circles indicate the location of tortoise burrows. The transect route is shown by the blue line.

Bondarenko *et al* (2017)[56] 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 density within the Project site (i.e. 0.1 individuals/hectare). Therefore, the results of the April 2022 field surveys suggest that the population density of tortoises within the proposed project site is low. There is insufficient secondary data to determine the population within Samarkand 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 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 Samarkand 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.

Central Asian Tortoise was the only IUCN Vulnerable reptile species recorded within the Project AoI.

The occurrence of Central Asian tortoise does not trigger critical habitat in terms of IFC Performance Standard 6 (PS6); refer to Turnstone Ecology CHA: Appendix D. However, Central Asian tortoise is included as a Priority Biodiversity Feature when assessed against the PDF guidelines as set out in EBRD PR6 GN.

[56] 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-?.

Figure 6-35. Central Asian Tortoise foraging within a gully within the Solar PV site

Source: R.A. Nazarov (2022) - Site visit photos April 2022.

Figure 6-36. Damaged carapace, probably due to ploughing activities

Source: R.A. Nazarov (2022) - Site visit photos April 2022.

Tatar Sand Boa (Eryx tataricus)

This Uzbekistan Red Data Book species was not recorded during the April 2022 surveys, however, there are anecdotal records of this species within the Project site derived from informal discussions with local residents during the survey work. Therefore, this species is scoped into the impact assessment due to its potential presence with the Project site. The potential occurrence of tatar sand boa does not trigger critical habitat in terms of IFC Performance Standard 6 (PS6); refer to Turnstone Ecology CHA: Appendix D. However, the species is included as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN.

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 6.9 below. None of these species are of international or national conservation concern or are included as PBF species when assessed against the EBRD PR6 GN (refer to Appendix D). .

Table 6-9. Summary of Reptile Species Within the Project Area (Nazarov 2022) [refer to footnotes]

FAMILY and Species names	English Name	Global Threat Status (IUCN)	National Threat Status (URDB)	Confirmed to be Present Within the Project Site	Potentially Present Within the Project Site[2]
ANGUIDAE					
Pseudopus apodus	European Glass Lizard	LC	Not listed	No	Yes
BOIDAE					
Eryx tataricus[1]	Tartar Sand Boa	LC	3 (NT)	No (anecdotal records only)	Yes
COLUBRIDAE					
Hemorrhois ravergieri	Spotted Whip Snake	LC	Not listed	No	Yes
LACERTIDAE					
Eremias arguta uzbekistanica	Steppe-Runner	LC	Not listed	No	Yes
Gekkonidae					
Tenuidactylus fedtschenkoi	Turkestan Thin-toed gecko	LC	Not listed	No	Yes
Mediodactylus russowii	Transcaspian Bent-Toed Gecko	LC	Not listed	No	Yes
TESTUDINIDAE					
Testudo horsfieldii[1]	Central Asian Tortoise	VU	2 (VU)	Yes (April 2022 field survey confirmed presence)	N/A

Footnote

[1] Species meeting the criteria for inclusion as a Priority Biodiversity Feature when assessed against the PBF guidelines as set out in EBRD PR6 GN

[2] Based on known geographical ranges for each species and the respective habitat requirements, in relation to the habitat types/extent within the Project site

6.4.5.9 Amphibians

The arid and modified (cultivated) habitats within the proposed Solar PV site are unsuitable for amphibians. Amphibians are therefore considered absent and are not considered further within this assessment.

6.4.6 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 (2003) ecosystem services are organized into four types:

- Provisioning services, which are the products people obtain from ecosystems (for example these may include food, freshwater, timber, fibres, medicinal plants);
- 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, climate regulation, protection from natural hazards);
- 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)
- Supporting services, which are the natural processes that maintain the other services (such as soil formation, nutrient cycling, primary production).

The following is preliminary baseline ecosystem services review for the project area:

- Provisioning Services provided by the project site include grazing by pastoral farmers and their livestock herds. Carrion eating birds remove carcasses from the field. During interviews with locals, they told that livestock corpses are removed by vultures, and this prevents the spread of diseases if they decompose in the landscape. The area also provides pathways that are used by communities and farmers to cross the area.

More information about grazing and herding is discussed in section 6.7.6 and in the LRP. Impacts on herding and pasture land are assessed in section 7.1.9 and 7.2.9 and therefore a separate assessment on ecosystem services is not required.

- Regulating Services include access to ground water (well water for irrigation) and the natural streambed channels and gullies that convey runoff and floods during the spring rainfall events.
- Cultural Services include the burial ground located to the northeast of the project boundaries.
- Supporting Services provided by the project area are few. The project site has been previously used for agriculture and this has affected natural run-off and streamflow patterns by concentrating and redirecting flows into channels and irrigation canals. Rainfall events in the spring may provide supporting services such as sediment transport, nutrient cycling and primary production in the catchment that contributes run-off to the Zarafshan River located 2–3 km to the north.

6.5 Archaeology and Cultural Heritage

6.5.1 Overview

The project site is located on a terrace south of the Podvodyaschiy Canal, on the left bank of the Zarafshan Valley in Samarkand Region, Kattakurgan District. The Solar Array site has been subject to previous ploughing, and no archaeological or cultural heritage sites are currently known from within the Project footprint. The Transmission Line crosses a low-lying landscape characterised by extensive irrigation channels, canals and agriculture.

Although the Zarafshan Valley was a key communication corridor across central Eurasia and irrigated many ancient and historic oasis settlements, there is little evidence for any ancient cultivation or settlement within or in the immediate vicinity of the Project.

This Preliminary ESIA presents the cultural heritage legislation and policy context and baseline information regarding the Site and study area based on desk-based research including the State Register of Tangible Cultural Heritage Properties and a review of historic CORONA and recent Google Earth satellite imagery.

6.5.2 Approach to Assessment

6.5.2.1 Scope

The scope of the archaeology and cultural heritage baseline studies follows the definition set out in EBRD and IFC cultural heritage policy and guidance.

EBRD PR8 defines cultural heritage “as a group of resources inherited from the past which people identify, independently of ownership, as a reflection and expression of their evolving values, beliefs, knowledge and traditions. It encompasses tangible (physical) and intangible cultural heritage, which is recognised at the local, regional or national level, or within the international community. Its scope includes:

- Physical cultural heritage refers to movable or immovable objects, sites, groups of structures as well as cultural or sacred spaces associated therewith, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic or other cultural significance.
- Intangible cultural heritage refers to practices, representations, expressions, knowledge and skills that communities, groups and, in some cases, individuals recognise as part of their cultural heritage and which are transmitted from generation to generation.” (EBRD 2019).
- IFC Performance Standard 8: Cultural Heritage (IFC 2012) aims to protect cultural heritage from the adverse impacts of project activities and support its preservation. Its scope includes:
- Tangible cultural heritage with archaeological, paleontological, historical, cultural, artistic, and religious values.
- Unique natural features or tangible objects that embody cultural values, such as sacred groves, sacred trees and rocks.
- Intangible forms of culture proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.
- Critical Cultural Heritage, internationally recognised or legally protected cultural heritage areas, including proposed World Heritage Sites. Heritage of communities who use, or have used within living memory the cultural heritage for long-standing cultural purposes.

The baseline study considers palaeontological sites and archaeological and cultural heritage sites ranging in date from the prehistoric to the modern period, and considers both tangible and intangible heritage.

6.5.2.2 Study Area

The methodology for the archaeology and cultural heritage baseline assessment was based on identifying the Project Area of Influence (PAI), conducting a desk-top literature review and assessing the sensitivities of potential archaeological and cultural heritage sites.

The PAI is defined as a 50m buffer around the Solar Project including the solar PV plant, new substation, common facilities and a 200m buffer around the Transmission Line ROW centre line.

The Study Area for cultural heritage considers known heritage assets in the wider area in order to provide context and to understand the archaeological potential of the Project location. It includes:

- The Project location plus a 500m buffer area around it, in order to identify assets in the immediate vicinity of the Project that may be vulnerable to the physical impact of project activities.
- Designated heritage assets (World Heritage properties, elements inscribed on the Representative List of the Intangible Cultural Heritage of Humanity, cultural heritage listed on the State Register, historical and cultural reserves, museum reserves) within 5km of the Project location, to provide context and assess Project impacts on their setting and visual amenity.
- Visually prominent, designated heritage assets between 5km and 15km from the Project location, depending on backdrop, visual contrast and viewing geometry in relation to the solar PV plant, Transmission Line and cleared ROW, to provide context and assess Project impacts on their setting and visual amenity.

6.5.3 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 archaeology 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 Samarkand Region – Kattakurgan District and for the adjoining Pastdargom District to the east and Ishtikhon District to the north57;
- Historical and modern topographic mapping, including U.S. Army Map Service Series N50258 and US Defense Mapping Agency Series 1501 Air mapping59 and Soviet Civilian and Military Topographic Mapping60;
- CORONA satellite imagery dated from 196461 and Google Earth Pro satellite imagery dated from 1985 to 2021; and
- Relevant regional and period archaeological and landscape studies, dissertations and readily available historical articles.

6.5.4 Archaeological Field Evaluation (State Expertise)

If required during the OVOS approval process, the Site would be subject to formal State Historical-Cultural Expertise of the Site by the Scientific Methodology Council under the Main Scientific Production Administration for Protection and Use of the Cultural Heritage Items of the Ministry of Culture of the Republic of Uzbekistan. No request for archaeological information was received therefore no further investigation was required.

6.5.5 Archaeology and Cultural Heritage Baseline Conditions

6.5.5.1 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 systematic or recent archaeological field research.

This Preliminary report therefore presents the results of desk-based research together with a site visit by the AECOM team in September 2021. Understanding of baseline conditions could change as a result of State Expertise.

A review of satellite imagery dating from 2014 to 2021 (GoogleEarth Pro) has identified a range of erosional ravines and paleochannel courses in the Solar Array area, visible on imagery taken in different years and seasons. In the vicinity of the Transmission Line, an overlapping sequence of irrigation canals and field systems is visible.

CORONA satellite imagery[62] was also reviewed (1109-1024Aft, 1964–1970). The combination of Soviet mapping, historical and recent satellite mapping is a proven tool for remote site prospection in topographically similar areas of Uzbekistan [63].

[57] 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.
[58] 1952 Samarkand, Sheet NJ 42-1. 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-nj42-1.jpg
[59] 1977 Samarkand, Uzbekistan, Sheet NJ 42-1. Scale 1:250,000. US Defense Mapping Agency Hydrographic/Topographic Centre, Washington. Series 1501 Air. Edition 2. Available at: https://maps.lib.utexas.edu/maps/jog/russia/txu-oclc-224096234-nj42-01.jpg
[60] 1984 Samarkand, Kattakurgan. Sheet J42-001. Scale: 1:100 000. Soviet military topographic map. Available at: MapStor.com
[61] Corona imagery: 1011-1039F126-127 (08 Oct 1964); 1043-1103Fore089 (17 Aug 1967); 1109-1024Aft (06 Mar 1970). Available at: https://corona.cast.uark.edu/
[62] CORONA satellite imagery. 1109-1024Aft, 1964-1970. Available at: https://corona.cast.uark.edu/
[63] 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

- The Doab (two waters) area between the Karadarya and Akdarya, in the Middle Zarafshan Valley has formed the largest oasis in the whole of Central Asia at least since the middle of the first millennium BCE. However, the Middle Zarafshan Valley has been subject to extensive development projects during the Soviet period, particularly between the 1960s and 1980s. The levelling of the plain, the creation of artificial terraces and the construction of new canals have destroyed or seriously affected many archaeological remains, permanently modifying the entire landscape. Extensive cotton and tobacco cultivation continue to cause the loss of archaeological data[64]. Many surviving monuments have been diminished by ploughing, resulting in a spread of findspots around them. This extensive agricultural development means that proportionally fewer remains are known from the Zarafshan Valley than other areas. This is important given the extensive medieval historical accounts of the sophisticated Sogdian oasis settlements once present along the valley[65].

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 Solar Array area was an upland area on the south bank of the Karadarya River. To the north of the Karadarya river was an extensive zone of low-lying irrigated oasis agriculture, centred on the historic city of Ishtikhon; to the west were the ancient settlements of Košāniya and the Sogdian city of Rabinzhan, now Kattakurgan.

Any terrestrial archaeological remains within the Project Area are likely to comprise:

- In situ surface finds scatters or features identified on bare ground.
- Surface scatters identified in areas of disturbed ground or in up-cast spoil from groundworks. If there are extensive erosion channels then these may also reveal surface scatters weathering-out/eroding from buried deposits.
- Landscapes of historic irrigation and cultivation, e.g. west of Tower 1 [39°51'47.50"N 66°26'11.11"E]; between Towers 5 and 7 [39°51'33.45"N 66°25'27.80"E]; near Tower 15 [39°51'2.65"N 66°24'30.50"E] and mound north of Tower 18 [39°50'46.41"N 66°24'26.75"E].
- Buried or partially buried remains associated with historical upland grazing and more recent irrigated large-scale arable agriculture.
- Buried features, which may have Medium depth and complexity.

The visibility of archaeological sites may be hampered by burial under accumulated material dredged from irrigation canals and spread out over the adjacent ground surface, particularly in the vicinity of the Transmission Line. This may be between 5m and 10m deep in places[66].

6.5.5.2 Natural Features and Tangible Objects with Cultural Values

Desk-based assessment and socio-economic field survey and interviews have not identified any unique natural features or tangible objects that embody cultural values, such as sacred plants, rocks and watercourses, within the site or in its area of impact.

6.5.5.3 Tourism

The Samarkand Region is in the process of developing tourism to attract local and foreign tourists. This includes developing cultural tourism, ecotourism, agriculture, health/curative mineral springs and pilgrimage tourism.

[64] Rondelli, B & Mantellini, S (2004) Methods and Perspectives for Ancient Settlement Studies in the Middle Zeravshan Valley. The Silk Road Foundation Newsletter Vol 2 No. 3, December 2004

- [65] Askarov, K.K (1995) Rural settlements in the southern regions of Samarkand Sogd in the early Middle Ages (typology of settlement systems). Thesis, Academy of Sciences of the Republic of Uzbekistan Institute of History, Tashkent http://cheloveknauka.com/selskie-poseleniya-yuzhnyh-rayonov-samarkandskogo-sogda-v-rannem-srednevekovie-tipologiya-sistem-rasseleniya#ixzz7BqJ56U4X
- [66] Rakhmonovna, F.O. (2012) Natural and archaeological monuments of the Zarafshan valley and the problem of their protection. Dissertation. Available at: https://otherreferats.allbest.ru/geography/00948324_0.html

No specific cultural heritage sites with high tourism potential or priority restoration sites are noted in Kattakurgan District[67]. The Kattakurgan Reservoir is visited and used for recreation. There are plans to further develop visitor facilities at the Khoja Hasan Andoqi shrine and spring[68] in the north of the district.

6.5.5.4 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[69]. 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[70]. 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 Kattakurgan District specialise in the making of gold jewellery [71].

- Religious practices in Uzbekistan 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[72]. 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) organised and supported by Muslim religious educators and their followers.

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[67] 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

[68] Tokhliyev, I (2018) The role of tourism in the economy or ways to take advantage of opportunities to develop pilgrimage tourism in the regions. [Turizmning iqtisodiyotdagi o'rni yoxud hududlarda ziyorat turizmini rivojlantirish imkoniyatlaridan foydalanish yo'llari]. Zarnews. Available at: https://zarnews.uz/uz/post/turizmning-iqtisodiyotdagi-o-rni-yoxud-hududlarda-ziyorat-turizmini-rivojlantirish-imkoniyatlaridan-foydalanish-yo-llari

[69] UNESCO Lists of Intangible Cultural Heritage and the Register of good safeguarding practices. Available at: https://ich.unesco.org/en/lists

[70] 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/

[71] 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

[72] 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

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.

6.5.5.5 Critical Cultural Heritage

Critical Cultural Heritage is defined as internationally recognised 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 recognised or legally protected cultural heritage areas.

The Silk Roads, a Tentative List World Heritage Site within Uzbekistan (Ref. 5500), broadly follows the course of the Zarafshan Valley.

Community Use of Cultural Heritage

Approximately 600m north of the northern boundary of the Solar Array area are a cemetery and prayer room, south of the village of Upka [39°53'4.20"N 66°27'0.88"E]. According to the scoping report, it has been used for over 100 years, and residents of Damhodja, Bulokcha, Upka and Erkin Nafas makhallas are buried there. A further cemetery is located about 1.5km from the southern boundary of the project site between Suyunjon and Partaabad Makhallas[73].

According to information gathered during a field visit for the scoping report, the nearest mosque is 10km from Damhodja makhalla towards Melihuja makhalla, another mosque is 7km from Damhodja makhalla towards Ishtikhan substation.

Interviews with land users and local communities indicated one sacred site in the vicinity of the Project, the 19th-20th century Khoji Abdurahmon Mausoleum (State Register Architectural Monument No. 691) which is located along the M37 highway, c.10km west of the Project. This mausoleum is visited by local communities during religious holidays.

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 low potential to contain significant, stratigraphically intact archaeological remains. There is potential for surface remains in the form of findspot scatters and for remains to be well preserved below levels of intensive farming / land re-modelling within alluvial and colluvial deposits. Any remains present may have been impacted by agricultural ploughing, irrigation works and 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[74]. The nearest World Heritage Property is:

- Samarkand – Crossroad of Cultures (Ref: 603rev), described as a crossroad and melting pot of the world's cultures. Founded in the 7th century BCE as ancient Afrasiab, Samarkand had its most significant development in the Timurid period from the 14th to the 15th centuries. The High monuments include the Registan Mosque and madrasas, Bibi-Khanum Mosque, the Shakhi-Zinda compound and the Gur-Emir ensemble, as well as Ulugh-Beg's Observatory[75].

[73] TYPSA (2020). Uzbekistan Scaling Solar Round 2. Environmental and Social Scoping Report – Kattakurgan Solar PV Project. Report for International Finance Corporation (IFC/WB). Document No. SP6349-RP-EN-KK-ESScop-D02, p.
[74] Uzbekistan Properties inscribed on the UNESCO World Heritage List. Available at: https://whc.unesco.org/en/statesparties/uz
[75] Samarkand – Crossroad of Cultures. Available at: https://whc.unesco.org/en/list/603

The historic city of Samarkand, located in a large oasis in the valley of the Zarafshan River, is located approximately 50km east of the Project, which would not impact upon it due to the intervening distance.

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. Those in proximity to the Project comprise:

- Arab-Ata Mausoleum, Samarkand Region (Ref. 5290). Built on top of a tepa, this brick mausoleum in the village of Tim dates to the 10th century CE. It is located c.55km southwest of the Project[76].
- Silk Roads Sites in Uzbekistan (Ref. 5500)[77]. 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. Although the route broadly followed the Zarafshan Valley, no properties forming part of the Silk Roads Sites in Uzbekistan within Samarkand Region are included in this tentative listing.
- Silk Roads: Zarafshan-Karakum Corridor (Uzbekistan) (Ref. 6497)[78]. The "Silk Roads: Zarafshan-Karakum Corridor" is located along the Zarafshan river, its wider hydrological basin and the Karakum desert. The corridor consists of 31 component parts, but none are located in Kattakurgan District or in the vicinity of the Project.
- The Project will not impact upon these Tentative List sites. The landscape in the vicinity of the Project is already characterised by modern intensive farming and other power infrastructure near Ishtikhon substation. Potential harmful impacts from the Project on these Tentative List properties are therefore scoped out.

Legally Protected Cultural Heritage Areas

No State Register sites have been identified within, or in the vicinity of the Project.

6.5.6 Archaeology and Cultural Heritage Receptors and Receptor Sensitivity

Ground in low-lying areas is likely to have been disturbed by the excavation of ditches and canals, ground levelling and ploughing. Any surviving archaeological deposits may be buried under thick anthropogenic deposits. Surface findspots may be present where disturbed by ploughing or erosion, unknown buried remains may be present within natural deposits (alluvium, colluvium) and beneath made ground

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.

6.5.7 Sensitivity Criteria

Receptor sensitivity is the degree to which a particular receptor is more or less susceptible to a given impact. Receptor sensitivity takes into consideration the receptor's resilience and value.

[76] UNESCO World Heritage Centre – Tentative Lists. Arab-Ata Mausoleum. Available at: https://whc.unesco.org/en/tentativelists/5290/
[77] UNESCO World Heritage Centre – Tentative Lists. Silk Roads Sites in Uzbekistan. Available at: https://whc.unesco.org/en/tentativelists/5500/
[78] UNESCO World Heritage Centre – Tentative Lists. Silk Roads: Zarafshan-Karakum Corridor (Uzbekistan). Available at: https://whc.unesco.org/en/tentativelists/6497/

Receptor resilience or vulnerability describes the ability of the receptor to withstand adverse impacts. It takes into consideration activity-impact-receptor pathways, as well as environmental characteristics that might make it more or less resilient to change. As such, a receptor can be considered as existing within a spectrum of 'vulnerable' to 'resilient', with the former more likely to experience significant impacts as a result of a given change.

Receptor value takes into consideration its quality and its importance as represented, for example, by its conservation status, its cultural importance and/ or its economic value. The evaluation of receptor sensitivity employs a qualitative scale of negligible, low, medium, and high for each of the sensitivity characteristics, resilience and value.

In the absence of any national or international consensus on archaeological impact assessment methods for non-designated resources, the criteria used to determine receptor sensitivity, magnitude, nature and significance of impacts on cultural heritage are based on the International Commission on Monuments and Sites (ICOMOS) 2011 Guidance on Heritage Impact Assessments for Cultural World Heritage Properties (appendices 3A and 3B)[79]. It is acknowledged that it contains much reference to World Heritage, but the assessment tools contained in its appendices are applicable to all cultural heritage assets.

None of the sites or objects have been previously recorded or designated, so there are no assigned national designation rankings to apply. The sensitivity of an archaeological or cultural heritage receptor also reflects how vulnerable or robust a site, monument, artefact, assemblage or complex is to damage or destruction by a number of factors, including:

- Natural conditions, such as erosion, flooding, wave movement and chemical deterioration.
- Environmental conditions, such as faunal and floral impacts.
- Human conditions, such as vandalism or interference, recreational use, vehicular damage.
- Project-related conditions, including construction and operational impacts.

The assessment of heritage value with regard to research agendas is important in establishing the significance and value of archaeological remains. The value of archaeological remains and sensitivity of archaeological sites, monuments and artefact find-spots is judged upon the extent of survival, their current condition, rarity, representativeness, the importance of the period to which the remains date, fragility, connection to other monuments (group value), potential to contribute to knowledge, understanding and appreciation, potential for future research, the values assigned by local experts and the extent of documentation enhancing the monuments' value.

Table 6-10 presents the sensitivity criteria specific to the archaeology and cultural heritage study.

Table 6-10 Archaeology and cultural heritage sensitivity criteria

Sensitivity	Criteria
High	Sites of acknowledged international importance inscribed as World Heritage Sites. Individual attributes that convey Outstanding Universal Value. Nationally-designated archaeological monuments, sites, buildings or historic landscapes protected by national laws. Undesignated sites, structures or historic landscapes of demonstrable national value. Assets that can contribute significantly to acknowledged national or international research objectives, whether designated or not. Well or extremely well preserved historic landscapes with considerable or exceptional coherence, time-depth, or other critical factors. Intangible Cultural Heritage inscribed on national registers, or associated with movements or individuals of national or global significance.
Medium	Designated or undesignated sites, landscapes or seascapes that can contribute significantly to regional research objectives.

[79] ICOMOS 2011 [under review] Guidance on heritage impact assessments for Cultural World Heritage Properties. International Council on Monuments and Sites. Paris. Available at: http://openarchive.icomos.org/266 /

	Designated or historic buildings that have exceptional qualities or historical associations, with important historic integrity and contributing significantly to historic character. Designated or undesignated historic landscapes or seascapes of regional value, which would warrant designation. Intangible cultural heritage areas in local registers, or associated with movements or individuals of local importance.
Low	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. Assets with potential to contribute to local research objectives. 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. 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

6.5.8 Receptor Sensitivity

Table 6-11 presents the level of sensitivity for each receptor identified.

Table 6-11 Assessed sensitivity of archaeology and cultural heritage receptors

Receptor	Sensitivity
Tangible cultural heritage Any archaeological sites identified by the State Expertise	Presently unknown, anticipated to be low
Natural features/ tangible objects with cultural values None identified	High
Intangible cultural heritage Cultural knowledge, living traditions & religious practices e.g. activities and transmission of practices related to shrines, cemeteries, healing springs, farming practices; local crafts. These are considered to be resilient to the Project effects.	Medium
Critical Cultural Heritage None identified	High

No archaeological remains have been identified within the project site or Transmission Line. It is anticipated that past ploughing and irrigation works may have truncated the 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, herding and crafts. These 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 associated with shrines or cemetery sites.

No internationally recognised or legally protected cultural heritage areas have been identified. 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

An appropriate landfill site will be identified by the EPC contractor that receive municipal, construction and hazardous waste. AECOM have not identified an appropriate licensed company for recycling of wastes. The EPC Contractor will provide this information as part of detailed design.

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*" (ICGPSA, 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 Land Acquisition Audit (LAA) and Livelihood Restoration Plan (LRP). In support of those studies, detailed socio-economic surveys have been undertaken and are included in the LRP Socio-economic Area of Influence.

The Social Study Area, or AoI, focused on the Project Site and surrounding areas, as defined in Section 2.7. 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 6-37.

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.

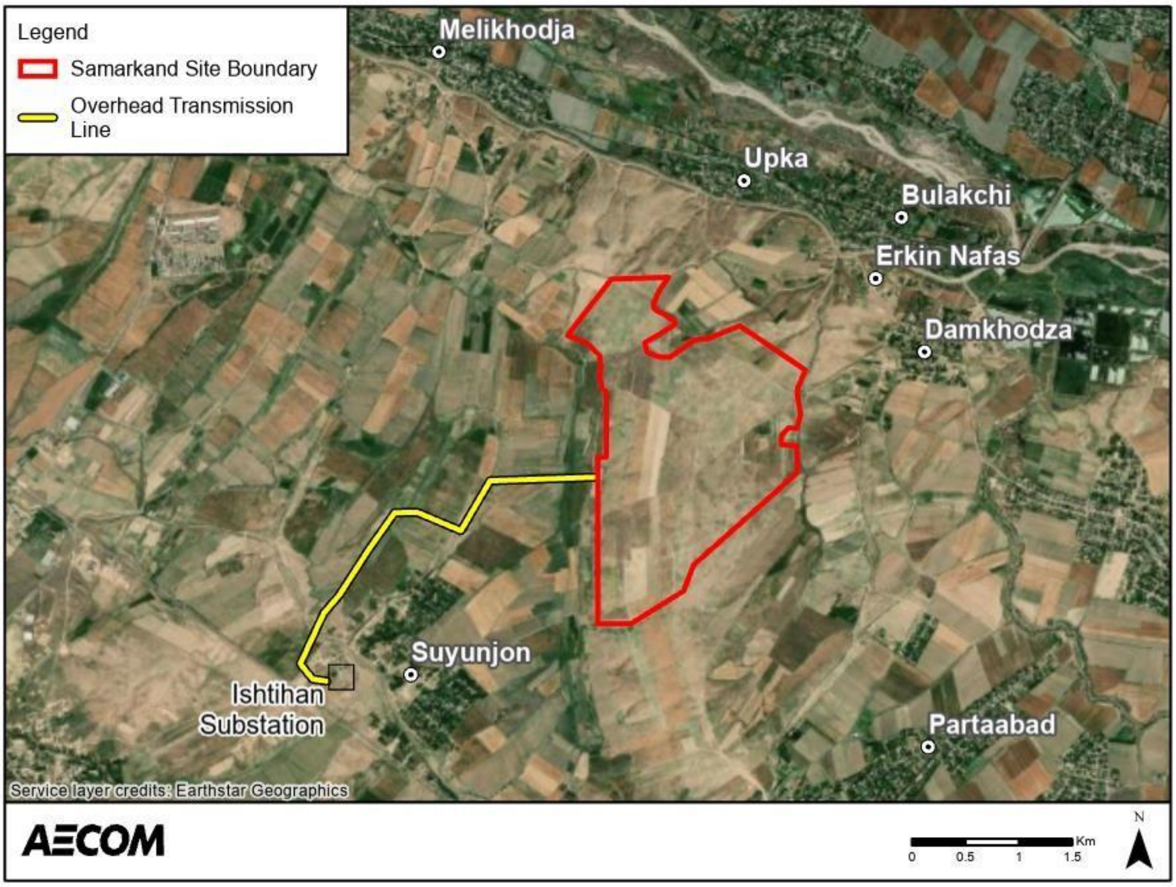

Figure 6-37. Makhallas within 2 km of the Project Site Boundary

6.7.2 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 (WBD, 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 High 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 (Brookings Institute, 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).

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. Whereas, 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).

6.7.3 Local Governance and Institutional Structure

The project site is located within the Samarkand Region of Uzbekistan which has an estimated population of 3.6 million people and encompasses 14 administrative districts. The regional capital is the City of Samarqand, this is the second-largest centre for economic activity after the country's capital, Tashkent. The project site sits within the Kattakurgan District, with an estimated population of 272,320 people and a total area of 139,000 km^2 (SRG, 2021).

The solar Project is located near the communities listed in Table 6-12 below.

Table 6-12. Nearest Settlements to the Project

Settlement	Distance from the Project Site (km)	Number of Residents	Comments
Melikhodja	1.6	1,701 *(M= 858, F= 843)*	Small village located northwest of the project site. Falls under the Melikhodja mahalla Approximately 100 sheep from the Melikhodja village are thought to be grazed on the project site
Erkin Nafas*	0.87	719 *(M=353, F= 361)*	Erkin Nafas, Upka and Damhoda, grouped together by the district administration for the purpose of population estimates, are located to the northeast of the project site. These settlements are three relatively small rural villages. All three of these villages fall under the Shurak mahalla
Bulakchi	1.2	718 (M=349, F= 369)	Also located to the north east of the project site, Bulakchi is a rural village. 29 households from Bulokchi collectively own approximately 300 sheep which graze on the project land. Each household takes it in turn to herd the sheep. There is also a herd of cows (approximately 100 animals) and two smaller herds of sheep (approximately 20 animals) from Bulokchi village which use the project area as grazing land.
Suyunjon	1.35	1,177 (M= 597, F= 580)	Southwest of the project site Suyunjon is a small village which contains an electrical substation where the OTL from the project site will send the energy to be fed into the national grid. Falls under the Melikhodja mahalla Suyunjon community members get their water from a well on a farmer's land that will be affected by the OTL route Suyunjon community members are also allowed to graze their livestock on this farmers land (for an agreed price) after the harvest is collected.

Settlement	Distance from the Project Site (km)	Number of Residents	Comments
			It is estimated that there are between 2,000-3,000 sheep belonging to community households in the Suyunjon village.
Partaabad	1.8	-	The village of Partaabad in located southeast of the project site and falls within the Pastdargom District (other settlements in the AoI are in the Kattakurgan District). Falls under the Bagishamol mahalla of Pasdargom District.

Source: District Administration. Key: (*) including Upka and Damkhodza, (M) Male Population, (F) Female Population.

6.7.3.1 Formal Governance Structures

At both the regional (or *oblast*) and district (or *raion*) levels local governance is divided into:

A. 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,

B. 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.

There are the seven Makhallas situated within 2 km of the project site boundary, these are: Melikhodja, Erkin Nafas, Upka, Bulakchi, Damkhodzha, Partaabad[80], and Suyunjon.

6.7.3.2 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 AoI.

6.7.4 Demographic Profile

The Makhallas identified in Section 6.7.3 correspond to the seven settlements located within a radius of 2 km of the project site boundary. The populations of these settlements (except for Partaabad) is shown in Table 6-12. Based on satellite images and extrapolating population figures to the seemingly populated land, it has been estimated that the overall population of all seven settlements could be within the range of 5,000-6,000 inhabitants.

[80] This village crosses into the Pastdargom District

In 2020, the population of Kattakurgan District as a whole was estimated to be 272, 320 which is split quite evenly between men (51%) and women (49%). The District shows an expansive pattern, with a high birth rate in comparison to the mortality rate, as shown in Table 6-13. This trend is reflected at the local level in all the settlements within 2 km of the project site boundary.

Kattakurgan 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, Meylihuja and Erkin Nafas, for Bulakchi the number of people moving into and out of the area was the same, and for Suyunjon, more people moved into this area 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 6-13. Demographic data for Kattakurgan District and the affected settlements (2020)

Area	Born			Died			Immigration			Emigration		
	T	M	F	T	M	F	T	M	F	T	M	F
Meylihuja	46	26	20	4	3	1	0	0	0	17	6	11
Erkin Nafas*	12	8	4	3	1	2	2	0	2	4	2	2
Bulakchi	19	9	10	2	1	1	3	1	2	3	2	1
Suyunjon	25	13	12	4	3	1	6	1	5	4	2	2
Partaabad	-	-	-	-	-	-	-	-	-	-	-	-
Kattakurgan District	7182	3773	3409	1001	568	433	312	87	225	1166	435	731

Source: State Committee of Statistics. Key: (T) Total Population, (M) Male Population, (F) Female Population, (*) including Upka and Damkhodza.

Although detailed ethnicity information for Kattakurgan, which covers the Project AoI is not available, Generally, ethnic groups living in Uzbekistan 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.

6.7.5 Land Regulations and Use

6.7.5.1 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 (Land Code of the 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. quotes 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 Dehkan modality. Dehkan farms are rural household producers operating on small household plots received on lifetime inheritable tenure rights. 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) (Melnikovová & Havrland, 2016).

6.7.5.2 Residential Properties

The closest residential properties to the site are the residence associated with Area 1 on the west of the site. This property is approximately 225m from the site boundary. On the east side the closest property is associated with the scattered properties south of Damkhodzha and is 470m from the eastern edge of the site.

6.7.5.3 Current Land Use in Project Area

There are 5 distinct areas within and adjacent to the project site that are being used for both sanctioned and unsanctioned farming activities, see Figure 6-41. The status of key affected areas, as of the site visit conducted in September 2021, is as follows:

- <u>*Area 1*</u>*:* a registered farm in a long-term lease contract with the district government, which sits adjacent to the project site’s north-western boundary. As part of the government optimisation process, the farmer was given 10 hectares (ha) of land. In 2020 he returned 7 ha of the land for the Project voluntarily, as he was not using it and did not make any improvement on the land. He believed that the 3 ha of land were enough for him and his household. The farmer has a house outside of the project area on the remaining 3 ha and one in the village. The farmer has been growing peas and fruits, herding 50 sheep and has a well next his property. The leaseholder is currently an employee of Masdar.

- *Area 2:* is a registered farm of 12ha in a lease contract with the Khokimiyat of Kattakurgan for the last 4 years. This farmland is adjacent to the project's north-eastern boundary. The farm is leased and used by five siblings (three brothers and two sisters) and their children – two siblings have relocated to Russia, while the remaining siblings are still using the land near the project to keep livestock (four cows) and grow crops such as watermelons and melons, tomatoes, potatoes, sesame on 1 ha and winter wheat. The siblings were originally offered a replacement plot of land but this land was not appropriately serviced (i.e. no power line for pump, no well for water) and the siblings refused the replacement land. They reached an informal agreement with the Khokimiyat to obtain monetary compensation instead, which never materialised. As a result, the siblings made considerable investment in their land, including building a well and an overnight shelter, before it was acquired for the project – incurring into considerable debt.
- *Area 3:* a registered farm of 60 ha used to grow crops (grain, barley, wheat) and for livestock grazing. The historic leaseholders are an elderly couple with married children and grandchildren. The couple base their income from the remittance from two of their children currently abroad and from state pension. The whole 60ha was acquired by the project and the historic leaseholder was allocated replacement land of 20 ha by the Khokimiyat. The historic leaseholders practice rain-fed agriculture, including peas and wheat – the yield depends on the weather conditions. During the site visit, the leaseholder stated that only half of his current land (10 ha) is adequate, and the other 10 ha are unsatisfactory. Although he had livestock grazing in the land acquired by the project as well as agricultural equipment and a container, the replacement land is small and not suitable for grazing sheep and the farmer never received support with the removal and transfer of the agricultural equipment and a container.
- *Area 4:* is a registered farm of 67 ha which was used for agriculture (15ha) and herding livestock (52 ha). The farmer made substantial improvement on the land including a water well, electricity supply and a shelter. They planted a lot of crops from 2016 until 2020, such as wheat, different vegetables, grapes and fruit trees. The historical leaseholder was allocated 10.5 ha – 8.5 ha are used for cultivation of watermelon, melon, and wheat, and the remaining 2 ha are allocated for livestock herding as they recently bought 10 sheep. The new allocated land does not have regular access to water with the farmer relaying on collecting water from a nearby-channel using electric pumps but the electricity gets cut off on a regular basis and struggling to achieve the level of yields she had prior to the project acquiring land. The farmers receive state pension as additional income.
- *Area 5:* a registered farm of approximately 57 ha and the project acquired 35 ha. The leaseholder current farm is 15 ha, which are used for agriculture (10 ha) and for pasture (5 ha) – the farmer grown rainfed wheat and have 25 sheep. The farmer has disabilities, both him and his wife obtain state pension.

Figure 6-38. Recent farmed areas associated with Farm 5

Figure 6-39. Ruined Farm 5 house

Figure 6-40. Inside of ruined Farm 5 house

Figure 6-41. Areas to be affected by the Project

To the northeast of the project site there is a cemetery and a small prayer room (shaded red in Figure 6-42) which has been used by the residents of Damhodja, Bulokcha, Upka, and Erkin Nafas makhallas for over 100 years.

Figure 6-42. Location of the cemetery and small prayer room (shaded red), initial site boundary (red line), and revised site boundary (green line)

There is also an irrigation/drainage channel which passes through the northern end of the project site, as shown in Figure 6-43. According to the TYPSA Scoping Report (TYPSA, 2020b), the irrigation channel is in a state of decay and is currently used as a drainage canal for dirty water from irrigation of fields located upstream. Local farmers indicated that their cattle sometimes drink from the drainage channel without any consequences.

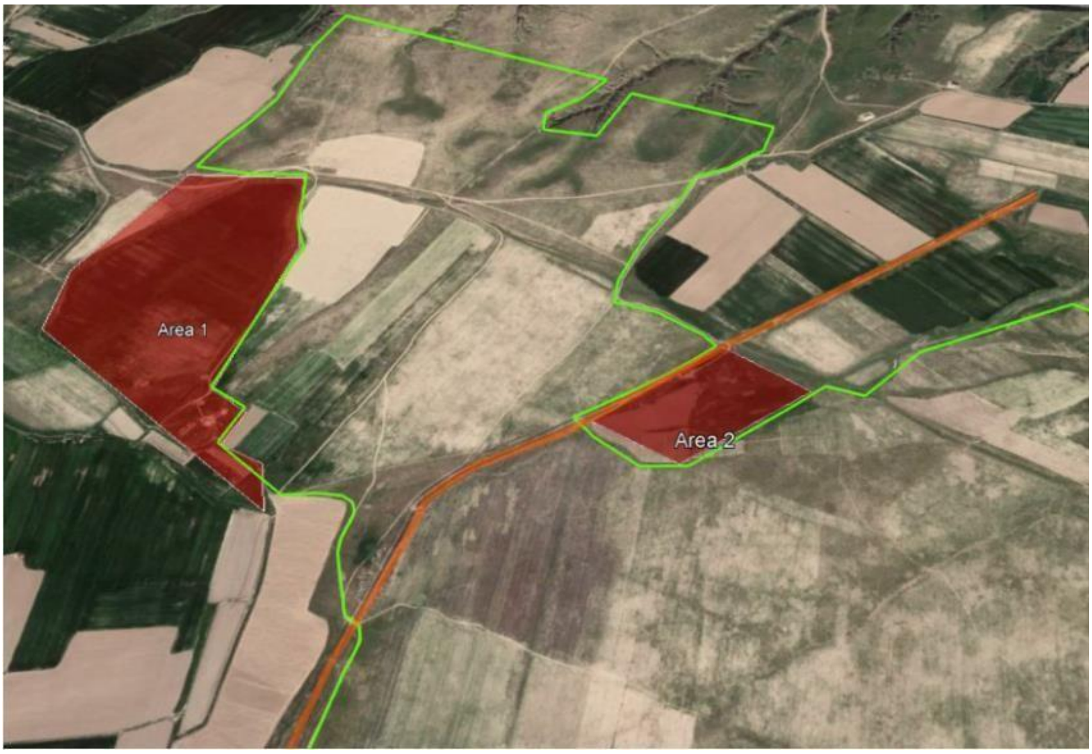

Figure 6-43. Drainage channel which passes through project site

6.7.5.4 Current Land Use under the Overhead Transmission Line

The proposed OHTL route, shown in Figure 6-44 has been designed to avoid populated areas and isolated structures however, it does pass over extensive areas of cultivation whilst several poles will need to be pegged within the boundaries of farms. A preliminary analysis of the route has identified the current land uses which could potentially be affected by the construction and operation of the OHTL. This analysis is based on the following assumptions:

- A clearance corridor of 32m at each side of the OTL will be required as a wayleave
- A clearance area of 5 m^2 has been defined around towers
- A total number 19 towers have been pre-designed

Figure 6-44. Proposed OTL Route (to be updated)

In summary, the OHTL will affect four farms and will need approximately 0.678 ha[81] of land to be acquired. No structures were identified along the route and all the fields which will be affected grow seasonal crops.

Out of the four farmers with leaseholds under the OHTL, the largest permanent land take is 0.03% of their land for the towers. The largest temporary land take is 0.8% of the land for assembly areas and construction route. The commercial farmers typically employ farmworkers who help to manage the farm and seasonal formwork during harvest is a significant source of livelihood for women in the nearby communities who help with the harvest of Wheat and Cotton. The impact on these workers is however expected to be negligible.

During the site visit and initial consultations with land users who will be affected by the OTL a few key points were noted.

For example, the leaseholder of Kattkurgan Cluster LLC land stated that they had no objection to the Project, so long as compensation for the loss of productive land is provided. Their land is mainly used for planting cotton and grazing cattle. They requested that their land specialist be informed when technical specialists visit the area as they want to be informed/consulted on each location of the towers along the route and avoid crossing the centre of the field if possible.

[81] All quoted land take figures are subject to change before the final draft of the LRP is issued

Another farmer, whose 400-ha farm is close to the village of Suyunjon, also noted that he had no objection to the Project, so long as compensation for the loss of productive land is provided. The land is used to grow cotton and wheat and to graze 100 cows and 200 sheep. The farmer also employees 40 seasonal workers. The farmer has three wells on his land and allows the community members of Suyunjon to use these wells. It was also noted that the farmer has no objection to the reconstruction of the road that passes through the area of his farm. He felt that it will be convenient road for the Project and can be jointly used by him and the project personnel. The farmer also requested to be consulted by the project technical specialist on the exact locations of the electrical towers along the route on his area, so that he can inform if there are any specific features that should be considered.

- Since the five historic leaseholds were altered or terminated to make way for the Solar PV site in 2019, the land in the Solar PV site has remained in the government reserve which is administrated by the local Khokimiyat. The land in the Solar PV site has been kept vacant in anticipation of the Project at the request of the Ministry of Energy but is still used for community herding and gathering of animal feed. Most of the land required for the OHTL falls into four Sub-Lease Agreements belonging to four households. 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.

6.7.6 Community Infrastructure and Resources

6.7.6.1 Housing

The United Nations Economic Commission for Europe (UNECE) found that rural 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 found to be lower in rural areas of Uzbekistan (14.5 m^2 in rural areas and 16 m^2 in urban areas) (Ministry of Economy of the Republic of Uzbekistan, 2014).

Rural housing in the project area typically consists of a detached house with an attached plot of land which accommodates 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. Figure 6-45 is the residence of the farmer of Area 5 and exemplifies the detached nature of most households in the Project AoI.

Figure 6-45. Area 5 farmer’s house in the village of Bulokchi

6.7.6.2 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 Kattakurgan District there are:

- 8 medical departments
- 9 rural medical posts
- 1 hospital
- 3 rural family polyclinics
- 8 emergency health institutions
- 1 central multidisciplinary polyclinic

According to information gathered during the scoping phase, the nearest mosque is 10 km from Damhodja makhalla towards Melikhodja makhalla, another mosque is 7 km from Damhodja makhalla towards Ishtikhan substation. The Scoping Report also identified two cemeteries in the vicinity of the project site. One of them is located in north-east corner of the project site (partly on the territory of the site according to some sources but this needs to be confirmed in future site visits). This cemetery has been used by the residents of Damhodja, Bulokcha, Upka, and Erkin Nafas makhallas for over 100 years. Another cemetery is found about 1.5 km from the southern boundary of the project site between Suyunjon and Partaabad Makhallas.

There is also a women's shelter in the Kattakurgan District, established by Tanzilya Narbaeva, Chair of Senate and Gender Commission of Uzbekistan. The building maintenance and utilities for the shelter are covered by district administration. A local NGO, *Mehr Sahova*, which operates under the local mosque provides financial support. The local population also provide support in the form of clothing and food for women and kids in the shelter. Currently there are two women with children in the centre, they are victims of domestic violence. Women receive psychological and medical support as well as opportunities to develop skills and gain employment. At the time of the site visit, the women were engaged in seasonal cotton picking to earn for children's school supply needs. Children at the shelter attend the village school. Most women who come to the centre are not educated and struggle to get a regular job.

6.7.6.3 Utilities

Access to electricity is nearly universal across Uzbekistan as most people are connected to the national grid. However, according to consultations undertaken during the site visits power cuts are common in the Project AoI, especially in winter and therefore community stakeholders hope to directly benefit from the power generated at the project site. Gas for heating and cooking is supplied by gas cylinders only. There is no centralized gas supply in the Makhallas around the site.

The nearest established landfill is located 35 km northwest of the Project Site in Yarbashi. The landfill has recycling facilities for plastic, paper, metal, and glass. The landfill site has been operating for 10 years and accepts all types of wastes which are sorted on site. However, stakeholder meetings undertaken during the scoping phase revealed there are no local licensed companies for removal of hazardous wastes, as there are no hazardous wastes generated in the project area and surroundings.

A new landfill is planned to be constructed following the decision of the Cabinet of Ministers of the Republic of Uzbekistan to change the boundaries of Kattakurgan District. The new landfill is expected to be 20 km from the site.

During the site visit, it was noted by multiple stakeholders that there is a weak mobile phone signal in the Project AoI. 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.

Water supply is mainly supplied by artesian wells approximately 200 meters deep. Two wells in Damhodja makhalla are gravity-fed, as the water is close to the surface. This type of water supply is typical in rural areas of Samarkand because, as shown in Table 6-14, only 41.2% of the rural households in the region have access to a centralised water supply. Furthermore, under 10% of the rural households of Samarkand have access to sewage utilities.

Stakeholders consulted during the site visit indicated that the lack of readily available and easily accessible drinking water and water for irrigation is a key concern for local communities.

Table 6-14. Households with access to centralised water supply and sewage facilities in Samarkand Region (2019)

Region	Access to a centralised water supply (percentage of households)		Access to sewage utilities (percentage of households)	
	Total	Rural Areas	Total	Rural Areas
Samarkand	57.3	41.2	25.6	9.9

Source: State Committee of Statistics

To put this in context of national utilities infrastructure, Table 6-15 compares the infrastructure and utilities available in rural and urban areas of Uzbekistan.

Table 6-15. Access to utilities in urban and rural areas in Uzbekistan (2013)

Utilities	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: Gender Country Assessment (Food and Agricultural Organisation, 2019)

6.7.7 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 6-16 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 6-16. 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: Gender Country Assessment (Food and Agricultural Organisation, 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 (Food and Agricultural Organisation, 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, the medical facilities available within the Samarkand Region are listed in Section 6.7.6.2. According to information provided in consultations undertaken during the scoping phase with a Damhodja Makhalla member, there is a medical post in all Makhallas around the site. The nearest hospital facility is located in Paishanba, the capital of Kattakurgan District, approximately 10 km from the project site.

During consultations the Deputy Khokim on Women and Families in Kattakurgan Khokimiyat shared that there are three cases of HIV/AIDs in the local mahallas, they are male labour migrants and they receive regular medication from district centre clinic. It was further understood that the most common health issues in the area are related to blood pressure, heart and kidney problems.

6.7.8 Education

The World Bank indicates that the net enrolment rate of primary school age children in primary education in Uzbekistan in 2018 was 96.845% (World Bank, 2021). Of all the pupils that enrolled 98.31% continued to the last grade of primary (ibid.). However, when analysed through a gender lens, this number is slightly higher for male students (97.560%) than for female students (96.152%) (ibid.).

At the secondary level over 4 million pupils are enrolled nationally, 48% of which are female (World Bank, 2021). Regionally, approximately 87% of the Samarkand population aged 16 and over have a secondary-level education, either from mainstream secondary education institutions (40.9%), or from vocational training centres (46.2%).

At the tertiary level under 10% of the national Uzbekistani population has a higher education degree. However, in the Samarkand region this percentage is slightly higher than the national average at 12.3% (World Bank, 2021). The literacy rate, according to data provided by the regional government, stands at 100%.

Consultations undertaken during the scoping phase identified two schools within the AOI, one in Damkhodzha Makhalla (Kattakurgan District) and one in Damhodja Makhalla (Pastdargom District). School №57, which hosted some of the stakeholder consultations, has 650 students and 55 teachers. Availability of other data education levels and facilities from other Makhallas was limited.

6.7.9 Economy and Employment

6.7.9.1 Economy

The World Bank classifies Uzbekistan as a lower middle-income country (World Bank, 2019)because its Gross National Income (GNI) per capita is between USD 1,026 and USD 3,995[82].

According to the International Monetary Fund, in 2019, the Gross Domestic Product (GDP) of Uzbekistan was at $60.490 billion USD (IMF, 2019). 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.

6.7.9.2 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 Highity 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%).

Table 6-17 shows the distribution of the workforce by different sectors of the economy in Samarkand region. The proportion of people in Samarkand employed in primary sector work such as agriculture and forestry has gradually been decreasing since the early 1990s to approximately one-third of total employment (Hasanov & Sanaev, 2018). Whereas the secondary and tertiary sector provide a significant proportion of the regional population with employment. Employment in education and health care has slightly grown in the last decade, although jobs in these two sectors are scarce in the project area.

[82] The Uzbekistani Som (UZS) is the currency of Uzbekistan and, as of 5 October 2021, USD 1 was equal to UZS 10,638.30.

Consultations undertaken during the scoping phase in Damkhodzha Makhalla indicated that approximately 50% of the residents are engaged in dehkan and livestock farming under the agricultural cluster. The dehkan farms mostly cultivate wheat, various types of vegetables (potatoes, paprika pepper, eggplants etc.) and sell it in Chimbay bazaar, a market organized in the same town twice a week (on Mondays and Thursdays).

Most of the remaining 50% of the labour force is employed in the construction sector, according to consulted sources. Every year about 200-300 people leave for seasonal jobs abroad, mostly to Kazakhstan. There is also a perception among the local communities consulted that there are many migrant workers in the area. The local community was also very interested in the potential job opportunities to be created by the project and asked to be kept abreast of any vacancies.

Table 6-17. Percentage of the Samarkand Population employed by sector (2017-2019)

Employment Sector	2017 (%)	2018 (%)	2019 (%)
Agriculture, Forestry, Fishing	28.2	27.6	27.6
Industry	12.1	12.4	12.5
Construction	7.2	6.8	6.8
Trade	12.0	11.8	11.9
Transportation and Storage	5.6	5.6	5.7
Catering and Hotels	3.0	3.0	3.1
Education	8.7	9.0	9.0
Health Sector and Social Services	4.3	4.5	4.5
Other	19.0	19.1	19.0

Source: State Committee of Statistics

6.7.9.3 Poverty

Table 6-18 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 Samarkand region had one of the lowest proportions of the population living on less than USD 3.2 per day (less than 12% of the 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. However, in the project district, Kattakurgan, the proportion of people living on less than USD 3.2 per day is much higher than the national average at 23%.

Table 6-18. Proportion of the Uzbek Population living in poverty

Poverty Line	Percentage of Total Uzbek Population (%)	Percentage of Kattakurgan District Population (%)

Living on less than USD 3.2 per day	9.6	23
Living on less than USD 5.5 per day	36.6	48.3

Source: World Bank, 2021

6.7.10 Transportation

As can be seen in Table 6-19, automobiles are the most commonly used means of transport in Uzbekistan. Their use has experienced a 78% increase since 2000. Railroad and air travel have also both increased during the 20-year time-frame – yet only slightly. However, the use of trolleybus, tram and metro have all decreased (-99%, -95% and -45% respectively).

Table 6-19. 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:

i. international (3,979 km)

ii. national (14,069 km)

iii. 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 High road which surrounds the project boundary is the M37 as shown in Figure 6-46. The speed limit is generally 70km/hr in towns and 100 km/hr on highways outside towns (OSAC, 2020).

While there is a large road network in Uzbekistan, 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 given a low rate of enforcement for traffic related rule breaking. As a result of these issues, minor and Medium 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 6-46. Road network surrounding the site

Source: Google Earth, 2021

Locally, several stakeholders pointed out that roads around the project site are in a poor condition making it difficult to reach remote areas, especially during winter months. One of the farmers whose land will be affected by the OTL route noted that the construction of site access roads would be convenient and used by local communities. Examples of roads around the project site and along the OTL route are shown in Figure 6-19 and Figure 6-20.

Community members consulted further shared that there are no regular buses from the villages in the Project AoI. Most people use taxis to get to the district centre and from there catch the buses to the city and other destinations. One taxi journey is approximately UZS 5,000.

Figure 6-47. Road in Project AoI- 1

Figure 6-48. Road in Project AoI - 2

In addition, as shown in Figure 6-48, there are several community pathways that cross through the project site. These pathways appear to connect the local communities to the onsite farms. Based on information gathered during the scoping phase it is understood that livestock keepers also use these pathways to move livestock for grazing.

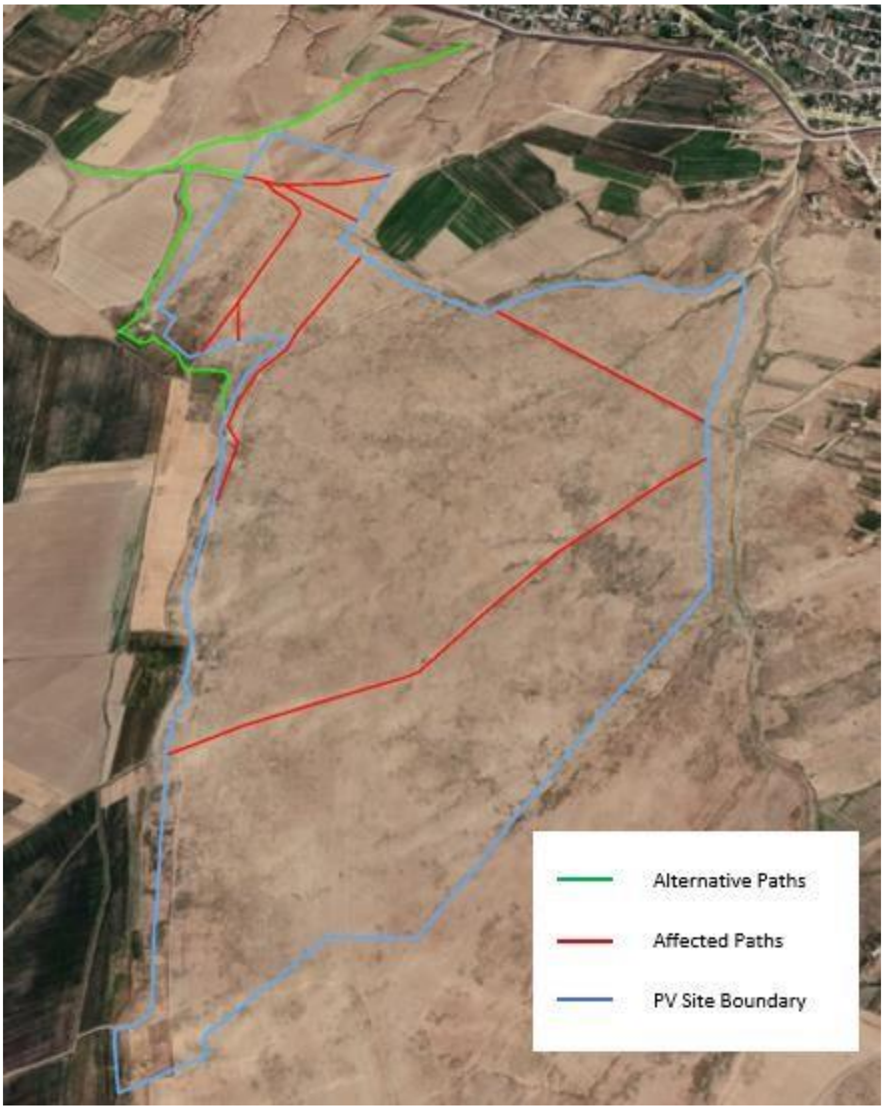

Figure 6-49. Local walking pathways in the project area

6.7.11 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
- 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 more detailed vulnerability analysis among project affected people, is included in the LRP.

During consultations the Deputy Khokim on Women and Families for the Kattakurgan Khokimiyat shared that there is a registry of vulnerable families and individuals in the Project AoI and thus can communicate information regarding the project directly to them where necessary.

6.7.11.1 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 dehkan frams, 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 6-19 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. Often 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 6-20. 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).

6.7.12 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 some regions 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 90th in the 2021 global organized crime index for criminality and was deemed a 'low criminality low resilience' country (Global Initiative Against Transational Organized Crime, 2021). It also ranked low in terms of drug trade (103rd) but slightly higher for criminal actor organisations (76th) (Global Initiative Against Transational Organized Crime, 2021).

6.7.13 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 (2006), 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 AoI are:
   a. food from the crops located within the project boundaries from both small subsistence and larger scale agricultural crops, which seem to have been abandoned.
   b. Areas that are no longer used as cropland are used for grazing by pastoral farmers and their livestock herds.
   c. Carrion eating birds remove carcasses from the field. During interviews with locals they stated that livestock corpses are removed by vultures, which prevents the spread of diseases if they decompose in the landscape.
   d. The area also provides pathways that are used by communities and farmers to cross the area.
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, climate regulation, protection from natural hazards). The regulating services identified in the project site and AoI are:
   a. access to ground water (well water for irrigation).
   b. the natural streambed channels and gullies that convey runoff and floods 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 area of importance for recreation and aesthetic enjoyment). The only cultural service identified was the burial ground located northeast of the project site boundary.

4. Supporting services, which are the natural processes that maintain the other services (such as soil formation, nutrient cycling, primary production). The project site was previously used for agriculture and this has affected the natural run-off and streamflow patterns by concentrating and redirecting flows in channels and irrigation canals. Rainfall events in the spring may provide supporting services such as sediment transport, nutrient cycling and primary production in the catchment that contributes run-off to the Zarafshan River located 2 to 3 km to the north.

Within the Solar PV Site, the only ecosystem service identified that is obtained by the communities is the feed/fodder which is either grazed by livestock herds owned by the community or is collected manually and stored for the winter months. More information about grazing and herding is discussed in section 6.7.6 and in the LRP. Some drainage channels also exist on the site and this is discussed in further detail in section 6.2.4.

6.7.14 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 6-21 lists the potential socio-economic receptors drawn from the baseline study.

Table 6-21: Potential socio-economic receptors

Receptor	Description
Project workforce	The construction workforce will either be based on site in a workers 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	Project-affected communities as shown in Table 6-12: • Melikhodja • Erkin Nafas • Upka • Bulakchi • Damkhodzha • Partaabad • Suyunjon
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 one of the main sources 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 income in the area.
Current Land Users	The acquisition of land in the project site will, if it hasn't already, physically and/or economically displace current land users. As per IFC guidance, regardless of their land tenure status these people are entitled to compensation and/or resettlement assistance.

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.

As of 1 September 2021, the minimum wage in Uzbekistan is UZS 822,000 a month (at the time of writing, this equates to approximately USD 77). In addition, employers are responsible for social security contributions. Their contribution must be up to at least 25 percent of the worker's salary.

6.8.2 Working Conditions and Forced Labour

In Uzbekistan, employment relations are overseen by statutory legislation or by collective agreements. The law in Uzbekistan considers the concerns and interests of workers, employers, and the state to maximise market functioning, working conditions are just and the rights of workers are protected. 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 which, according to the site visit undertaken by TYPSA in 2020, is the main land use just beyond the northwest boundary of the site. This was corroborated during the scoping site visit, when project team members observed cotton being transported around the Project AoI, see Figure 6-50. .

Figure 6-50. Cotton Collection and Transportation in the Project AoI

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. Details of transportation (vehicles, numbers and loads) has been requested by AECOM. This should be provided by the EPC Contractor as part of detailed design. The report would be updated end of December 2022 if this information is provided.

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 minor road heading west from Shurcha via a short access road however a large part of the access from Shurcha is through local, unpaved roads.

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 Samarkand via Jizzakh - 150km.
- Take the M-37 to Ishtihan – 50km and a further 10km to Kattakurgan before bearing left then left again past the village of Gish zavod.
- After 5km turn left to the village of Shurcha then take the minor rural roads to access the western side of the site.

Stopovers

A single stopover is planned between Tashkent and the site which is a distance of approximately 650km.

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 Kattakurgan as highlighted below.

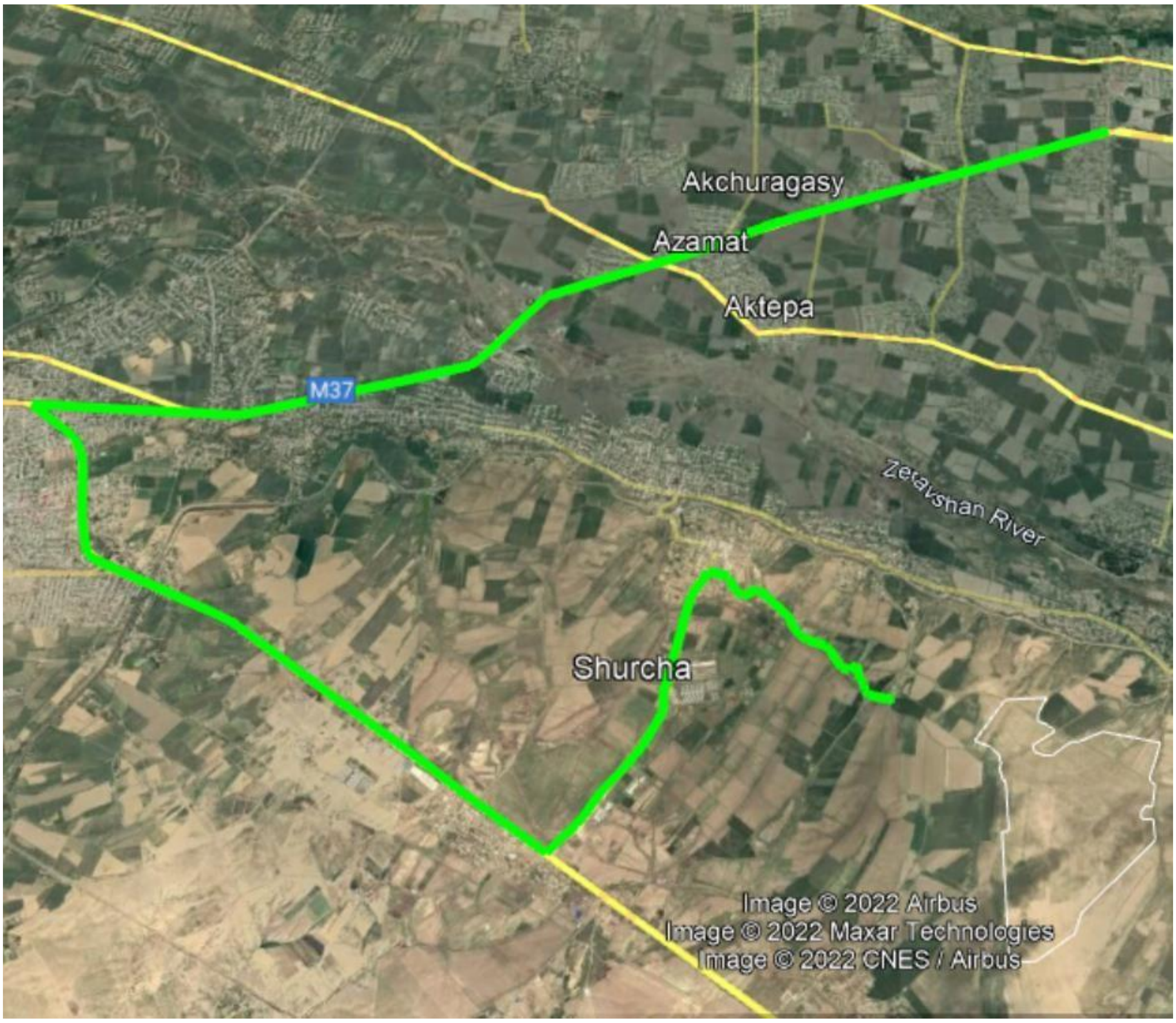

Figure 6-51. Transportation route from the M-37

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 6-52. M39 west of Jizzakh

Figure 6-53. M39 west of Jizzakh (2)

Minor Road Shurcha

The Project site is accessed from the M37 via a short stretch of minor road from Kattakurgan. 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 closer to villages.

The last 1 km approach is earthen road which would developed further by the EPC considering the loads being transported.

Site access

The site is proposed to be accessed from the unpaved road at Shurcha through the village to the western side of the site. AECOM note that significant work may be required given the proximity of houses and services. Once past the village, the site becomes open and expansive. The exact point of access has not yet been confirmed by the EPC contractor.

Once available, final access road to the site will be shown on the map also allowing social receptors along the access road to be defined.

As of 10 November 2022, alternative access roads were still in the process of being evaluated for the Project.

Figure 6-54. Access route over collector close to Shurcha village

Figure 6-55. Access route close to Shurcha village

Figure 6-56. Entrance to the southwestern part of the site

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[83], 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 6-22 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 6-22: Sensitivity Analysis

Road	Receptor Details	Sensitivity
Road A353 (Kazakhstan)	Paved highway with medium daily traffic flows. Passing residential and commercial areas. Minimal traffic management measures in place. Highway suitable for all types of vehicles and volumes.	Low
Road A3 (Kazakhstan)	Paved dual carriageway road with moderate daily traffic flows. Passing residential and commercial areas.	Low

[83] World Health Organization (2018). Global Status Report on Road Safety 2018. Geneva: World Health Organization.

Road	Receptor Details	Sensitivity
	Minimal traffic management measures in place. Highway suitable for all types of vehicles and volumes.	
Route A2 (Kazakhstan)	Paved highway with moderate daily traffic flows. Passing residential and commercial areas. Minimal traffic management measures in place. Highway suitable for all types of vehicles and volumes.	Low
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
M37 (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

6.9.5 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.

6.9.5.1 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.

6.9.5.2 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.

6.9.5.3 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 6-23. 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 6-23: 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 6-24 below.

Table 6-24: Magnitude of Change Criteria

Sensitivity		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 of High. All direct and indirect impacts causing Medium or High effects are considered to be significant.

6.9.5.4 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 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 estimated based on these “worst-case” assumptions.

6.9.5.5 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 6-25 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 6-25: 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

6.9.5.6 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.

6.9.5.7 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.

6.9.5.8 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 6-26. 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 6-26: 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 6-27 below.

Table 6-27: Magnitude of Change Criteria

Sensitivity		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, Medium or High. All direct and indirect impacts causing Medium or High effects 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 High traffic artery. The term is used to describe a complex series of factors that separate people from places and other people. Severance can also result from difficulty in crossing a heavily trafficked road. The guidance indicates that severance effects are considered ‘slight’ in cases that include:

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

Pedestrian delay

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

6.9.5.9 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. 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 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 air pollution.				
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 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	
	A single residential receptors are located 225m from 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 low as there is unlikely to be an increase in levels and dust to air associated with construction of the Project at nearby settlements located <1km from the project. Individual properties are located at 225m and 470m from the site boundary. The imp[act magnitude is predicted as Medium at the closest property reducing to Low for the other nearest properties.				
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 250m of the site boundary but construction vehicles may 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.				

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 Site. 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 terrace. Known remains in the surrounding region focus on river valleys, prominent strategic positions, terraces, 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 and surface findspots 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 any unrecorded buried archaeological remains which may be present within the site boundary and may be of archaeological importance.

Irrigation works in the vicinity of the Transmission Line may have resulted in widespread levelling and burial beneath dredged deposits. There is therefore potential for localised preservation beneath alluvial and colluvial deposits and made ground, and for finds being brought to the surface by ploughing, irrigation and construction activities. 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 or surface findspots.

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. It will be an additional large-scale industrial element in a landscape already characterised by intensive large-scale agriculture and existing transmission lines and light industry on the periphery of Kattakurgan. 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
	The impact is permanent as impacts occur there would be an irreversible change to the baseline within the Project site.				
Impact Extent	Local	Regional	National		
	Any potential impact is expected to occur within the Solar Array site or Transmission Line. There are no known designated heritage assets within the site. Any impact would be on previously undiscovered remains.				
Receptor Value / Sensitivity	Low	Medium	High		
	There are no known heritage assets within the Solar Array site or Transmission Line.				
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 overlapping with the Project AoI (refer to Appendix D). The Project is situated within the known wintering range of this species and it is likely that this species will fly over the Project AoI.

The proposed project site is not located on a major (high importance) 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 a single steppe eagle (IUCN EN) and a single Egyptian vulture (IUCN EN) overflying the project site on migration during the baseline surveys A single little bustard (a PBF species) was recorded during the surveys undertaken by TYPSA/IFC in 2021. However, there is no reasonable likelihood that populations of any of the aforementioned PBF species are regionally significant.

Other PBF species which are vulnerable to construction disturbance were confirmed likely absent from the Project site, including Asian houbara and great bustard. Non-breeding little bustard was confirmed present during the winter but in small numbers which aren't significant. 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 for this CH qualifying species.

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 supports a low diversity of resident and breeding species which are not of international or national conservation concern. Therefore, significant impacts on resident and breeding bird species are not expected.

If site clearance and construction activities should occur during the breeding bird season (typically March-August for most species) this could result in the destruction of and/or damage to nests of ground nesting birds, including black-bellied sandgrouse, crested lark and isabelline wheatear.

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.

<table>
<tr><th colspan="5">Impact Assessment: Impacts on Great Bustard (Otis tarda) during Construction – Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species]</th></tr>
<tr><td rowspan="2">Impact Nature</td><td colspan="2">Positive</td><td colspan="2">Negative</td></tr>
<tr><td colspan="4">Impact is negative because construction activities may result in habitat loss, disturbance and mortality to this species.</td></tr>
<tr><td>Impact Type</td><td>Direct</td><td>Indirect</td><td>Reversible</td><td>Irreversible</td></tr>
</table>

Impact Assessment: Impacts on Great Bustard (*Otis tarda*) during Construction – Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species]						
	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	
	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 12-15 months. 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					
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 TYPSA/IFC2020/21 survey results					
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 that there were no records of great bustard in Samarkand during the surveys by TYPSA/IFC in 2020-21, the impact magnitude is assessed as Negligible.					
Impact Significance	None	Negligible	Low	Medium	High	
	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.					

Impact Assessment: Impacts on ornithology during construction (PBF species) – White-headed Duck Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Little Bustard and Asian Houbara				
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 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 and Asian Houbara.			

<table>
<tr><th colspan="6">Impact Assessment: Impacts on ornithology during construction (PBF species) – White-headed Duck Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Little Bustard and Asian Houbara</th></tr>
<tr><td></td><td colspan="5">Site clearance and construction of solar panel infrastructure, pylons, powerlines, access roads and other infrastructure may create barrier effects for PBF birds migrating (overflying) the Project site, particularly the following species autumn and spring passage: sociable lapwing, steppe eagle and Egyptian vulture. 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</td></tr>
<tr><td rowspan="2">Impact Duration</td><td>Temporary</td><td>Short-term</td><td>Medium-term</td><td>Long-term</td><td>Permanent</td></tr>
<tr><td colspan="5">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 12-15 months.</td></tr>
<tr><td rowspan="2">Impact Extent</td><td>Local</td><td>Regional</td><td>National</td><td colspan="2">International</td></tr>
<tr><td colspan="5">The impact is expected to occur within or immediately adjacent to the Project site.

Given the distance of 15km between the Project site and Kattakurgan Water Reservoir IBA (at its closest point), and the lack of habitat connectivity or potential pathways between the IBA and the Project site, there is no reasonable likelihood of significant direct or indirect impacts. This assessment is consistent with the TYPSA/IFC Scoping Report (2020), which states: 'Many species of birds stop to rest and feed during spring and autumn migration, but, after consultation with Birdlife International and ornithological experts (IBA Programme since 2008) none of the species for which the IBA site was designated use the proposed Project area, except the Asian houbara'. The results of the baseline surveys undertaken by AECOM confirm that breeding populations of Asian houbara and stopover sociable lapwing are likely absent.</td></tr>
<tr><td rowspan="2">Receptor Value / Sensitivity</td><td>Negligible</td><td>Low</td><td>Medium</td><td colspan="2">High</td></tr>
<tr><td colspan="5">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.
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.

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.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>Negligible</td><td>Low</td><td>Medium</td><td colspan="2">High</td></tr>
<tr><td colspan="5">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 Negligible 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.</td></tr>
</table>

Impact Assessment: Impacts on ornithology during construction (PBF species) – White-headed Duck Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Little Bustard and Asian Houbara					
	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 Negligible 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 Low (overall) 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.				

Impact Assessment: Impacts on ornithology (non PBF species) during construction					
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 OHL [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 12-15 months.				
Impact Extent	Local	Regional	National	International	
	The impact is expected to be restricted to the Project site. Given the distance of 15km between the Project site and Kattakurgan Water Reservoir IBA (at its closest point), and the lack of habitat connectivity or potential pathways between the IBA and the Project site, there is no reasonable likelihood of significant direct or indirect impacts. This assessment is consistent with the TYPSA/IFC Scoping Report (2020), which states: 'Many species of birds stop to rest and feed during spring and autumn migration, but, after consultation with Birdlife International and ornithological experts (IBA Programme since 2008) none of the species for which the IBA site was designated use the proposed Project area .				
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. 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				

Impact Assessment: Impacts on ornithology (non PBF species) during construction					
	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[84].				

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 OHL is considered to be Modified Habitat as defined in PS6. 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. Based on the initial site design, a total of 5.4 ha land would be cleared or just under 1.3% of the overall site area. This area currently does not include land required for internal access roads.. No vegetation removal is planned outside this area. For the construction of the OHL the removal of the intensively cultivated habitat will be very localised at the locations of the respective pylon locations.

Potential Impacts

Loss, degradation or fragmentation of species habitat

During site preparation, construction of project infrastructure (Solar PV and OHL 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 ZoI 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.

[84] 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/

Population changes
Project related human activity within the Solar PV and OHL 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.

Impact Assessment: Impacts on terrestrial ecology (PBF species) during construction – Central Asia Tortoise and Tatar Sand Boa					
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 15km between the Project site and Kattakurgan Water Reservoir IBA (at its closest point), and the lack of habitat connectivity or potential pathways between the IBA and the Project site, there is no reasonable likelihood of significant direct or indirect impacts.				
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 supports a population size which is very low and does not exceed 0.1 individuals/hectare, which 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, but there is no reasonable likelihood that regionally significant populations occur as the modified habitat does not represent optimal for this species. The sensitivity of this receptor is assessed as Low overall.				
Impact Magnitude	No change	Negligible	**Low**	**Medium**	High
	The magnitude of the effect is predicted to be Medium given the area of the Solar PV site that will require to be cleared and / or disturbed and there is the potential for loss/mortality of these PBF reptile species.				

Impact Assessment: Impacts on terrestrial ecology (PBF species) during construction – Central Asia Tortoise and Tatar Sand Boa					
	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 (overall) and not significant. There is a requirement for the project to achieve No Net Loss of species defined as PBFs				

Impact Assessment: Impacts on other terrestrial ecology (non PBF species) during construction					
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 15km between the Project site and Kattakurgan Water Reservoir IBA (at its closest point), and the lack of habitat connectivity or potential pathways between the IBA and the Project site, there is no reasonable likelihood of significant direct or indirect impacts.				
Receptor Value / Sensitivity	Low	Medium	High		
	The abundance and diversity of terrestrial fauna within the Solar PV site and Overhead Line route was found to be low. 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. The sensitivity of the terrestrial habitat within the Solar PV has therefore been assigned as Low in terms of faunal species. The historic (within the last 20 years) and the more recent (within the last 5 years) 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 OHL route crosses intensively cultivated				

<table>
<tr><th colspan="6">Impact Assessment: Impacts on other terrestrial ecology (non PBF species) during construction</th></tr>
<tr><td></td><td colspan="5">and irrigated farmland habitat, with cropped fields (eg, cotton); it is Modified Habitat as defined in PS6. The habitat within the Project site is therefore assessed as Low sensitivity.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>No change</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">The magnitude of the effect is predicted to be Medium given the area of the Solar PV site that will require to be cleared and / or disturbed and the 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).</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>None</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">As a result, the impact is assessed as Low (overall) and not significant. A suite of both standard mitigation measures[85] and species-specific mitigation measures will be implemented to ensure impacts are reduced to Low significance or below.</td></tr>
</table>

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.

[85] 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/

The existence of weak soils up to a depth of around 15 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 undertake ground improvement treatment.

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 18 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. The poor quality of the soils to support agriculture has resulted in the cessation of wheat production on the site. No evidence of erosion or mudflows were identified during site surveys. Whilst it is recognised that soils will be most vulnerable during high rainfall and snowmelt, the limited geographical extent and poor quality does not justify 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. Permanent watercourses nearest to the Solar PV Site boundary are the Zarafshan lead canal and Zarafshan River, approximately 850m and 1.8km north of the site, respectively.

Surface water may be subject to reduction in quality should proper mitigation not be implemented. The waterbodies adjacent to the site are currently used as a source of irrigation water.

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.

There is a historic collector (drainage gully) that runs across the northern part of the site. AECOM understand that the man-made gullies across the site would be filled in for the project however this would be confirmed by Masdar and the EPC Contractor as part of detailed design. The detailed design would also include details of the proposed surface water drainage system.

Impact Assessment: Impacts on surface water during construction						
Impact Nature	Positive		Negative			
	Impact is negative because construction activities may generate pollutants that reduce the quality of surface water used for irrigation.					
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	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 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, recognising that the Zarafshan lead canal feeds the Kattakurgan reservoir, which is a source of irrigation water.					
Impact Magnitude	No change	Negligible	Low	Medium	High	
	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	Medium	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. Nevertheless, Good International Industry Practise pollution prevention measures will be implemented.					

7.1.5.2 Groundwater

The amount of water required during construction is estimated at 45,840 m3. The source of water required for construction has not yet been determined.

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	**Reversible**	Irreversible	
	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 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 low, recognising that groundwater is abstracted by only two farmers who have been offered alternative land.				
Impact Magnitude	No change	Negligible	**Low**	Medium	High
	The magnitude of the effect is predicted to be low, given that the depth of the groundwater is greater than 15 m and is likely to be considerably deeper.				
Impact Significance	None	Negligible	**Low**	Medium	High
	The potential impact during construction is considered to be Low adverse, on the basis that only two farmers abstract groundwater for their 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 labor 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.				
IImpact 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 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

7.1.7.1 Impacts on Landscape Character and Visual Amenity

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 [HOLD – TBC] months. However impact 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	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 such already include man-made features. 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	Permanent
	The construction impact is short-term as construction works are expected to continue for a period of approximately 18 months. However, impact will continue for the duration of the Project lifetime.				
Impact Extent	Local	Regional	National		
	It is assessed that the views experienced will include OHLs 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 at VP1 and assessed as the worst case. The land at which the Project is located is flat, with very few trees, hedges or fences				

Impact Assessment: Impacts on Visual Amenity					
	to obscure visibility, and as such visibility can extend for several kilometres. This applies to VP1 on the western site. Sensitivity is low at Vp2 and VP3 to the east and north.				
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	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.				

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 7-1 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 7-1.

Table 7-1: 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 invertor.	Delivery truck (4axle wagon) 110 dB SWL. Mobile telescopic crane (50t) 67dB spl 98 dB SWL.	56 dB

This may 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	
	No residential receptors are located within 200 m of the Project site therefore now exceedances of noise levels are predicted. The closest property is 225m to the west of the site boundary and receptor sensitivity is determined to be Medium.				
Impact Magnitude	No change	Negligible	**Low**	Medium	High
	Magnitude of change is anticipated to be Low as the increase in noise levels associated with construction of the Project is predicted to be within IFC limits for construction noise at nearby residential receptors.				
Impact Significance	None	Negligible	**Low**	Medium	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.				

7.1.9 Socio-economic Impacts

Based on the pathways described above, the following potential impacts were scoped in as the most relevant for the AoI and the socio-economic receptors.

- Community expectations of the Project
- Economic displacement
- Capacity strain contribution to local public services and facilities
- Loss of public access and reduced mobility through local paths
- Reduced access to grazing and pastoral land
- Increased presence of workers and interaction with local communities
- Increased presence of security personnel
- Increased levels of gender-based violence, sexual exploitation and harassment

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.

7.1.9.1 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 Recruitment and Employment 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 Kattakurgan.				
Impact Magnitude	Negligible	Low	Medium	High	
	Kattakurgan 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 Kattakurgan region are low and therefore expectations may be higher than at the regional level. Therefore, the impact magnitude is medium at the local level (<10km) 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 will be included in the Stakeholder Engagement Plan currently under development. This impact will be continuously managed throughout the construction phase (and ongoing operation phase).				

7.1.9.2 Economic displacement

The Solar PV Area[86] is used by four communities to herd livestock and collect animal feed. There are nine known herds from the four communities which are regularly taken to the Solar PV Area by community herders or professional herders. While the project will not eliminate community grazing areas, the majority of the area will no longer be accessible, and the remaining areas to the north and east will not be sufficient to sustain the current level of grazing.

Most of the land required for the OHTL falls into four Sub-Lease Agreements belonging to four households: the Project will require both permanent and temporary land take from these Sub-Lease Agreements.

Impact Assessment: Economic displacement		
Impact Nature	Positive	Negative
	Impact is negative because economic displacement would negatively affect a person's livelihood.	

[86] It should be noted that the land within the Solar PV area was previously occupied by five historic leaseholders 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 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.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium as there is the potential to result in economic resettlement, particularly of herders.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor value is Low for leaseholders along the OTL given they will have sufficient land remaining. However herders will have limited alternative land and so the receptor value is high.			
Impact Significance	Negligible	Low	Medium	High
	The overall impact significance is High and specific mitigation in the form of cash compensation and livelihood restoration has been developed as part of the LRP.			

7.1.9.3 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. Of note, this impact does not relate to potential economic impacts (described above) or legal land lease aspects, but to the loss of informal mobility access in local paths.

Impact Assessment: Impacts from a loss of public access to footpaths inside the project area				
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 roads/footpaths to travel. Users will no longer be travelling inside the Project area as access to this land shall be lost. This impact is Irreversible as users will no longer have access though the site during the project lifetime.			
Impact Duration	Short-term	Medium-term	Long-term	Very Long-term
	The impact is considered to be long term as the as the Project design does not have an alternative community pathway which will allow community members and their herds to cross the area during the lifetime of the project.			
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 Low as the limited number of people who currently use the dirt tracks will be able to access alternative tracks or roads to reach their destination.			
	Negligible	Low	Medium	High

Impact Assessment: Impacts from a loss of public access to footpaths inside the project area				
Receptor Value / Sensitivity	The receptor value is Medium given that local communities and local herders rely on these pathways for access to livelihoods.			
Impact Significance	Negligible	Low	Medium	High
	The impact is assessed as Low adverse, primarily because the local farm users may need to adapt and readjust to their new timings and distances compared to baseline conditions.			

7.1.9.4 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.
- Transportation of waste from the site and materials and equipment by road may disrupt local livelihoods.

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 during the Project's lifetime			
Impact Extent	Local	Regional	National	
	Impacts associated with a loss of access to land will likely only affect those within the Project AoI.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium because no grazing will be available of the Solar PV area and grazing area will be significantly reduced as there is limited alternative grazing land. Local herders may need to adapt to a new farming area and will need to travel around the Solar PV Area to access alternative grazing areas.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor's sensitivities is High as herders will require alternative land.			
Impact Significance	Negligible	Low	Medium	High
	The impact is assessed as High 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..			

7.1.9.5 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).

<table>
<tr><th colspan="5">Impact Assessment: Increased presence of workers and interaction with local communities</th></tr>
<tr><td rowspan="2">Impact Nature</td><td colspan="2">Positive</td><td colspan="2">Negative</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td rowspan="2">Impact Type</td><td>Direct</td><td>Indirect</td><td>Reversible</td><td>Irreversible</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td rowspan="2">Impact Duration</td><td>Short-term</td><td>Medium-term</td><td>Long-term</td><td>Very Long-term</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td rowspan="2">Impact Extent</td><td>Local</td><td>Regional</td><td colspan="2">National</td></tr>
<tr><td colspan="4">Risks will be generated at a local level within the AoI.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="4">The impact magnitude is Medium because the potential for workers to travel and interact with local residents may extend past the Project AoI. Both residents and workers may be exposed to increased health and safety risks.</td></tr>
<tr><td rowspan="2">Receptor Value / Sensitivity</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="4">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 Kattakurgan 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.</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="4">The potential impact during construction is considered to be Medium adverse, pre-mitigation.</td></tr>
</table>

7.1.9.6 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.

<table>
<tr><th colspan="5">Impact Assessment: Increased presence of security personnel</th></tr>
<tr><td rowspan="2">Impact Nature</td><td colspan="2">Positive</td><td colspan="2">Negative</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td rowspan="2">Impact Type</td><td>Direct</td><td>Indirect</td><td>Reversible</td><td>Irreversible</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td rowspan="2">Impact Duration</td><td>Short-term</td><td>Medium-term</td><td>Long-term</td><td>Very Long-term</td></tr>
<tr><td colspan="4">The impact is short-term as community health and safety risks will be largely limited to the construction phase.</td></tr>
<tr><td rowspan="2">Impact Extent</td><td>Local</td><td>Regional</td><td colspan="2">National</td></tr>
<tr><td colspan="4">Risks will be generated at a local level within Project AoI.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td rowspan="2">Receptor Value / Sensitivity</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="4">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.</td></tr>
</table>

7.1.9.7 Increased levels of gender-based violence, sexual exploitation and harassment

Baseline data has found that there 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 rural communities.

The construction and transportation sector are recognised as being amongst the industries most affected by HIV globally (WHO, 2018). 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 AoI. 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[87] 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 AoI, who have a High vulnerability.

<table>
<tr><th colspan="5">Impact Assessment: Increased levels of gender-based violence, sexual exploitation and harassment</th></tr>
<tr><td rowspan="2">Impact Nature</td><td colspan="2">Positive</td><td colspan="2">Negative</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td rowspan="2">Impact Type</td><td>Direct</td><td>Indirect</td><td>Reversible</td><td>Irreversible</td></tr>
<tr><td colspan="4">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.</td></tr>
<tr><td rowspan="2">Impact Duration</td><td>Short-term</td><td>Medium-term</td><td>Long-term</td><td>Very Long-term</td></tr>
<tr><td colspan="4">The impact is short-term as it will be largely limited to the construction phase.</td></tr>
<tr><td rowspan="2">Impact Extent</td><td>Local</td><td>Regional</td><td colspan="2">National</td></tr>
<tr><td colspan="4">The impact will be generated at a regional and local levels.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="4">The impact magnitude is Medium.</td></tr>
<tr><td rowspan="2">Receptor Value / Sensitivity</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="4">The sensitivity is High as women and children are regarded as vulnerable receptors. .</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="4">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.</td></tr>
</table>

7.1.10 Transportation and Access

7.1.10.1 Effects on the Road Network and Local Community

As stated in Section 2.5,2.9 it is estimated that up to 15,000 total vehicle movements will be expected to be carried out to/from the Project site. These numbers reflect what is anticipated to be required during the construction phase and may slightly decrease in number.

It is anticipated that the Project traffic will use a combination of national roads and motorways which are of low sensitivity, However, local roads near the Project AoI experience limited vehicle traffic and are used by pedestrians, bicycles, animals, vehicles for personal use (e.g. cars, small trucks) and livestock. Furthermore, it has been noted by international agencies that Uzbekistan has relatively poor road safety records with the majority of fatalities being drivers and pedestrians

The increase in traffic flow of larger vehicles, resulting from Project construction activities, will impact local road users and those receptors living and working alongside local roads in a number of ways:

- Increase in noise, vibration and dust creation;
- Increase in traffic and journey times;

[87] Gender-based Violence, Sexual Exploitation and Harassment

- Disruption to businesses and day to day activities (e.g. livestock rearing);
- Accidental damage to community assets, crops and livestock which may lead to temporary loss of income; and
- Potential injuries to existing road users.

Those receptors living or working directly alongside local roads near the Project site will be more adversely impacted.

Impact Assessment: Impacts on traffic during construction (National and Regional)					
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. The volume of traffic expect makes the impact likely to be irreversible.				
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 at the national and regional levels as the increased number of HGV movements is not expected to exceed 30% above baseline for High roads..				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Negligible at the national and regional levels and not significant pre mitigation. Although no specific mitigation is required, standard good construction practice will be maintained to ensure no increase in predicted impacts during construction.				

Impact Assessment: Impacts on traffic during construction (Local)					
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. The volume of traffic expect makes the impact likely to be irreversible.				
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 local roads in minor road from Kattakurgan to Shurcha .				
Receptor Value / Sensitivity	Low	Medium	High		
	At the local level, settlements are small with few amenities. There is likely to be large volumes of construction traffic in close proximity to local roads, residential properties and amenities.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	At the local level, impacts are likely to be significantly above baseline and High given that very limited HGV traffic is likely to use the local dirt roads on a regular basis.				
	None	Negligible	Low	Medium	High

Impact Assessment: Impacts on traffic during construction (Local)	
Impact Significance	At the local level impacts are assessed to be Medium-High and will require the project to prepare a traffic management plan to mitigate the impact. The plan will include safety measures such as a signals network and driving rules, measures to reduce the creation of dust, and community-related measures such as the use of the Grievance Mechanism for managing and rectifying cases where road users or local residents are injured as a result of Project traffic.

7.1.11 Waste Management

Based on recent experience, AECOM expect that wastes will be disposed of at landfill. The EPC Contractor will provide details of the most suitable disposal site as part of detailed design but it is not expected that there are any recycling facilities at this landfill.

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.					
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, on the road to the landfill site and in the landfill site itself.					
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 water. 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 should they become available.					

7.2 Operational Impacts

7.2.1 Air Quality

Air pollution is unlikely to arise from the operation of the project. Air emissions would be limited to vehicles carrying our maintenance work and potential dust.

Impact Assessment: Impacts on air quality during operation						
Impact Nature	Positive			Negative		
	Impact is negative because construction 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 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		
	A single residential receptor is located 225m from the site, therefore receptor sensitivity is determined to be Medium. The next closet receptors are located 470m and above from the boundary.					
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 a single residential receptor is 225m from the site boundary and 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 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 agriculture and existing transmission lines and light industry east of Kattakurgan. 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 that maintenance and security. No physical impacts on archaeological remains are predicted. The new Transmission Line will impact on the setting of heritage assets.				
	None	Negligible	Low	Medium	High

Impact Significance	The impact is assessed as Low and not significant.

7.2.3 Biodiversity

7.2.3.1 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 (EAAA) of this species overlapping with the Project AoI (refer to Appendix D). The Project is situated within the known wintering range of this species and it is likely that the airspace of the Project AoI, including route of the OHL is likely to be used by birds moving between core wintering areas within Uzbekistan, as well as migrating between wintering and breeding habitats. The EAAA is therefore likely to support 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 AoI 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 (refer to Appendix D).The proposed project site is not located on a major (high importance) 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 a single steppe eagle (IUCN EN) and a single Egyptian vulture (IUCN EN) overflying the project site on migration during the baseline surveys A single little bustard (a PBF species) was recorded during the surveys undertaken by TYPSA/IFC in 2021. However, there is no reasonable likelihood that populations of any of the aforementioned PBF species are regionally significant.

Potential Impacts

Potential impacts to birds from the proposed operational phase of the project 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 associated with the Solar PV and OHL (pylons);
- 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); and
- Disturbance of birds from people and traffic during operational maintenance of Solar PV and OHL.

<table>
<tr><th colspan="6">Impact Assessment: Impacts on Great Bustard (Otis tarda) during Operation – Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species.</th></tr>
<tr><td rowspan="2">Impact Nature</td><td colspan="3">Positive</td><td colspan="2">Negative</td></tr>
<tr><td colspan="5">Impact is negative because construction activities may result in habitat loss, displacement (barrier to movement) and mortality to this species.</td></tr>
<tr><td rowspan="2">Impact Type</td><td colspan="2">Direct</td><td>Indirect</td><td>Reversible</td><td>Irreversible</td></tr>
<tr><td colspan="5">Potential impacts during operation of the Project are as follows:
• Displacement of wintering and stop-over migratory birds due to habitat loss (Solar PV);
• Displacement and barrier to movement (Overhead Line);
• Disturbance of birds from people and traffic due to operational maintenance activities (Solar PV and Overhead Line); and
• Bird collision mortality with power lines (Overhead Line).

AECOM do not assess there to be an impact as a result of the so-called ‘lake effect’ of solar panels.</td></tr>
<tr><td rowspan="2">Impact Duration</td><td>Temporary</td><td>Short-term</td><td>Medium-term</td><td>Long-term</td><td>Permanent</td></tr>
<tr><td colspan="5">The impacts will persist throughout operation and are therefore considered permanent.</td></tr>
<tr><td rowspan="2">Impact Extent</td><td colspan="2">Local</td><td>Regional</td><td>National</td><td>International</td></tr>
<tr><td colspan="5">Great bustard has the potential to overfly the project site from known wintering areas within and outside the Samarkand region, as well as migrating between wintering and breeding habitats outside of Uzbekistan.</td></tr>
<tr><td rowspan="2">Receptor Value / Sensitivity</td><td colspan="2">Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">This species, which is Critically Endangered nationally, is assigned a ‘High’ sensitivity value.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td colspan="2">Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>None</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">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.
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.</td></tr>
</table>

<table>
<tr><th colspan="6">Impact Assessment: Impacts on Ornithology (PBF species) during Operation – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Little Bustard and Asian Houbara</th></tr>
<tr><td rowspan="2">Impact Nature</td><td colspan="2">Positive</td><td colspan="3">Negative</td></tr>
<tr><td colspan="5">Potential impacts during operation of the Project are as follows:
• Displacement of breeding, wintering and stop-over migratory birds due to habitat loss (Solar PV);
• Displacement and barrier to movement (Overhead Line);
• Disturbance of birds from people and traffic due to operational maintenance activities (Solar PV and Overhead Line);
• Loss of birds from electrocution from perching on the powerline (Overhead Line); and
• Bird collision mortality with power lines (Overhead Line).
AECOM do not assess there to be an impact as a result of the so-called 'lake effect' of solar panels.</td></tr>
<tr><td rowspan="2">Impact Type</td><td colspan="2">Direct</td><td colspan="3">Indirect</td></tr>
<tr><td colspan="5">The impacts listed above are all considered to be direct effects of Project operation.</td></tr>
<tr><td rowspan="2">Impact Duration</td><td>Temporary</td><td>Short-term</td><td>Medium-term</td><td>Long-term</td><td>Permanent</td></tr>
<tr><td colspan="5">The impacts will persist throughout operation and are therefore considered permanent.</td></tr>
<tr><td rowspan="2">Impact Extent</td><td>Local</td><td>Regional</td><td colspan="2">National</td><td>International</td></tr>
<tr><td colspan="5">The extent of potential operational impacts includes the operational Project footprint, including the Overhead Line from the Solar PV to the grid connection point.

Given the distance of 15km between the Project site and Kattakurgan Water Reservoir IBA (at its closest point), and the lack of habitat connectivity or potential pathways between the IBA and the Project site, there is no reasonable likelihood of significant direct or indirect impacts. This assessment is consistent with the TYPSA/IFC Scoping Report (2020), which states: 'Many species of birds stop to rest and feed during spring and autumn migration, but, after consultation with Birdlife International and ornithological experts (IBA Programme since 2008) none of the species for which the IBA site was designated use the proposed Project area, except the Asian houbara'. The results of the baseline surveys undertaken by AECOM confirm that breeding populations of Asian houbara are likely absent.</td></tr>
<tr><td rowspan="2">Receptor Value / Sensitivity</td><td>Negligible</td><td>Low</td><td colspan="2">Medium</td><td>High</td></tr>
<tr><td colspan="5">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.

The project does not support breeding populations for PBF birds and the habitat is not suitable for these species.

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.

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.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>Negligible</td><td>Low</td><td colspan="2">Medium</td><td>High</td></tr>
<tr><td colspan="5">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</td></tr>
</table>

<table>
<tr><td></td><td colspan="5">breeding, roosting or foraging within the operational footprint of the Solar PV; a high proportion of the habitat will be covered by the solar panels. Loss of habitat for the transmission 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 4.5km transmission line alignment is not extensive in terms of migrating birds passing through the wider Samarkand region on a broad front and it is orientated along an approximately north-east-south-west alignment, which reduces 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); a perfect east-west alignment would potentially be more impactful in this respect. Therefore, the magnitude of this potential impact is assessed as Low.

The Project Site is not sited on a migration bottle neck or High 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 Samarkand or Uzbekistan populations. 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.

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). However, the precise configuration and dimensions of the electrical design is not yet available for this project. Species recorded during the baseline surveys which are potentially most vulnerable to electrocution, both in flight and from perching, due to their likely frequent presence within the project site (and also behavioural trait for perching whilst feeding, resting and hunting), are: long-legged buzzard (not of national or international conservation concern). The risk of electrocution to steppe eagle and Egyptian vulture (both IUCN Endangered) is considered to be low due to their respective likely infrequent flight transits through the project area (in small numbers which are highly unlikely to be significant in terms of regional/national populations). The impact magnitude has been cautionary assessed as medium (overall) for electrocution. The impact magnitude is assessed as Medium (overall).</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>None</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">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.</td></tr>
</table>

<table>
<tr><th colspan="6">Impact Assessment: Ornithology impacts (non PBF) during operation</th></tr>
<tr><td rowspan="2">Impact Nature</td><td colspan="2">Positive</td><td colspan="3">Negative</td></tr>
<tr><td colspan="5">Potential impacts during operation of the Project are as follows:
• Displacement of breeding, wintering and stop-over migratory birds due to habitat loss (Solar PV);
• Displacement and barrier to movement (Overhead Line);
• Disturbance of birds from people and traffic due to operational maintenance activities (Solar PV and transmission line);
• Loss of birds from electrocution from perching on the powerline (Overhead Line); and
• Bird collision mortality with power lines (Overhead Line).

AECOM do not assess there to be an impact as a result of the so-called ‘lake effect’ of solar panels.</td></tr>
<tr><td rowspan="2">Impact Type</td><td colspan="2">Direct</td><td colspan="3">Indirect</td></tr>
<tr><td colspan="5">The impacts listed above are all considered to be direct effects of Project operation.</td></tr>
<tr><td rowspan="2">Impact Duration</td><td>Temporary</td><td>Short-term</td><td>Medium-term</td><td>Long-term</td><td>Permanent</td></tr>
<tr><td colspan="5">The impacts will persist throughout operation and are therefore considered permanent.</td></tr>
<tr><td rowspan="2">Impact Extent</td><td colspan="2">Local</td><td>Regional</td><td colspan="2">National</td></tr>
<tr><td colspan="5">The extent of potential operational impacts includes the operational Project footprint, including the Overhead Line from the Solar PV to the grid connection point.

Given the distance of 15km between the Project site and Kattakurgan Water Reservoir IBA (at its closest point), and the lack of habitat connectivity or potential pathways between the IBA and the Project site, there is no reasonable likelihood of significant direct or indirect impacts. This assessment is consistent with the TYPSA/IFC Scoping Report (2020), which states: ‘Many species of birds stop to rest and feed during spring and autumn migration, but, after consultation with Birdlife International and ornithological experts (IBA Programme since 2008) none of the species for which the IBA site was designated use the proposed Project area, except the Asian houbara’. The results of the baseline surveys undertaken by AECOM confirm that breeding populations of Asian houbara are likely absent.</td></tr>
<tr><td rowspan="2">Receptor Value / Sensitivity</td><td>Low</td><td colspan="2">Medium</td><td colspan="2">High</td></tr>
<tr><td colspan="5">The Solar PV footprint supports a limited assemblage of breeding species which are not of international or national conservation concern.

This ornithological receptor has been assessed as Low value.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>No change</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">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 covered by the solar panels. Loss of habitat for the transmission 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</td></tr>
</table>

<table>
<tr><th colspan="6">Impact Assessment: Ornithology impacts (non PBF) during operation</th></tr>
<tr><td></td><td colspan="5">already characterised by a high level of anthropogenic disturbance (primarily due to farming activities and proximity to human habitation).

The 4.5km transmission line alignment is not extensive in terms of migrating birds passing through the wider Samarkand region on a broad front and it is orientated along an approximately north-east-south-west alignment, which reduces 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); a perfect east-west alignment would potentially be more impactful in this respect. Therefore, the magnitude of this potential impact is assessed as Low.

The Project Site is not sited on a migration bottle neck or High 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 Samarkand or Uzbekistan populations. 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.

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). However, the precise configuration and dimensions of the electrical design is not yet available for this project. Species recorded during the baseline surveys which are potentially most vulnerable to electrocution, both in flight and from perching, due to their likely frequent presence within the project site (and also behavioural trait for perching whilst feeding, resting and hunting), are: long-legged buzzard (not of national or international conservation concern). The risk of electrocution to steppe eagle and Egyptian vulture (both IUCN Endangered) is considered to be low due to their respective likely infrequent flight transits through the project area (in small numbers which are highly unlikely to be significant in terms of regional/national populations). The impact magnitude has been cautionary assessed as low (overall) for electrocution.
The impact magnitude is assessed as Medium (overall).</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>None</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">The impact is assessed as Low and not significant.</td></tr>
</table>

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 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.

Impact Assessment: Impacts on PBF species: Central Asian Tortoise and Tartar Sand Boa					
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.				

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.				
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.				
	No change	Negligible	Low	Medium	High

Impact Assessment: Impacts on non PBF species during operation					
Impact Magnitude	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.				

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			
	The main operational 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. Risk of pollution from solid, liquid and hazardous wastes and leaks and spills from maintenance activities.				
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		
	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	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.				

7.2.5 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 is assumed to be approximately 500 m, although this will be confirmed as part of the ESIA.

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 invertor stations) are over 200 m from the closest receptor.

No breach of the lower 45 dB limit is considered to be likely.. Detailed design information will be provided by the EPC Contractor. As a result, no further clarification is possible. The report will be updated by end of Dec 2022 assuming that such information is provided.

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 in close proximity to receptors. Noise calculations have deemed operational noise to be within specified limits. A negligible magnitude of change is therefore predicted.				
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 construction has not yet been determined. This will be provided by the EPC Contractor as part of detailed design.

Potential sources of pollution to groundwater during operation include sanitary waste and leaks and spills from maintenance activities.

<table>
<tr><th colspan="6">Impact Assessment: Hydrology and hydrogeology impacts during operation</th></tr>
<tr><td rowspan="2">Impact Nature</td><td colspan="2">Positive</td><td colspan="3">Negative</td></tr>
<tr><td colspan="5">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. The canals and ephemeral water courses within the site will be filled in if not being used. Much of the irrigation and drainage across the region is artificial. The EPC Contractor will prepare a surface water drainage system as part of detailed design.</td></tr>
<tr><td rowspan="2">Impact Type</td><td colspan="2">Direct</td><td colspan="3">Indirect</td></tr>
<tr><td colspan="5">Pollution due to increased run-off, leaks, spillages and waste mismanagement are all considered to be indirect effects of Project operation.</td></tr>
<tr><td rowspan="2">Impact Duration</td><td>Temporary</td><td>Short-term</td><td>Medium-term</td><td>Long-term</td><td>Permanent</td></tr>
<tr><td colspan="5">The impact will persist throughout operation and is therefore considered permanent.</td></tr>
<tr><td rowspan="2">Impact Extent</td><td colspan="2">Local</td><td>Regional</td><td colspan="2">National</td></tr>
<tr><td colspan="5">Impacts anticipated to be limited to the local area, primarily adjacent wetland areas and local communities.</td></tr>
<tr><td rowspan="2">Receptor Value / Sensitivity</td><td>Negligible</td><td>Low</td><td colspan="2">Medium</td><td>High</td></tr>
<tr><td colspan="5">The sensitivity of surface water is assessed, recognising that the Zarafshan lead canal feeds the Kattakurgan reservoir, which is a source of irrigation water.
The sensitivity of groundwater is assessed as low, recognising the fact that no local communities will abstract groundwater for domestic use during operation.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>No change</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>None</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">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.</td></tr>
</table>

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) and 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 labor 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 operational 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.

Occupational health and safety impacts are considered to be of long-term duration throughout the operational phase and are expected to be of high magnitude and high sensitivity as in extreme cases they could entail permanent impacts (e.g. permanent disability). As such, the impacts are considered to be of High impact and appropriate mitigation will be developed.

<table>
<tr><th colspan="6">Impact Assessment: Occupational health and safety impacts during operation</th></tr>
<tr><td rowspan="2">Impact Nature</td><td colspan="3">Positive</td><td colspan="2">Negative</td></tr>
<tr><td colspan="5">There will be some occupational health and safety risks through carrying out operational and maintenance activities. This includes risk of electrocution, thermal burn hazards, exposure to hazardous chemicals and working in extreme temperatures. 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.</td></tr>
<tr><td rowspan="2">Impact Type</td><td colspan="3">Direct</td><td colspan="2">Indirect</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td rowspan="2">Impact Duration</td><td>Temporary</td><td>Short-term</td><td>Medium-term</td><td>Long-term</td><td>Permanent</td></tr>
<tr><td colspan="5">The impacts will persist throughout operation and are therefore considered long-term.</td></tr>
<tr><td rowspan="2">Impact Extent</td><td colspan="2">Local</td><td>Regional</td><td colspan="2">National</td></tr>
<tr><td colspan="5">The impacts will be limited to the project site and local area.</td></tr>
<tr><td rowspan="2">Receptor Value / Sensitivity</td><td>Low</td><td colspan="2">Medium</td><td colspan="2">High</td></tr>
<tr><td colspan="5">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.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>No change</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">Occupational health and safety impacts could result in disease, injury, or death to workers and so the magnitude is high.</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>None</td><td>Negligible</td><td>Low</td><td>Medium</td><td>High</td></tr>
<tr><td colspan="5">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.</td></tr>
</table>

7.2.8 Landscape and Visual Impacts

The Project will cover approximately 600 hectares of land but the Highity of the Solar Park is less than 3m in height and there is limited potential for the project to have a High impact on the people living in the local residential properties to the north and east of the project site. Residents to the west and south west are likely to experience more expansive views of the project for the lifetime of operation.

Impact Assessment: Landscape and visual impacts during operation					
Impact Nature	Positive			Negative	
	The introduction of large-scale infrastructure has potential for impacts that would be perceived by some as being detrimental.				
Impact Type	Direct		Indirect		
	Impacts can be direct (the introduction of the Project changes the landscape itself) or indirect (when the Project affects views from other adjacent or more distant landscapes).				
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	
	Given the low height of solar arrays (approximately 2.4 m) and the screening offered by surrounding topography (particularly to the east) and vegetation, potentially significant effects will generally be restricted to the local area.				
Receptor Value / Sensitivity	Low	Medium		High	
	The local landscape is already altered due to the presence of man-made structures such as overhead power lines, main highway, existing electricity substation and other commercial structures. Sensitivity is also reduced by anthropogenically altered watercourses. The whole area was extensively farmed in Soviet times and it is only in the past decade that the level of farming has been reduced, most likely due to poor soil quality. However, receptors in proximity to the site are predominately related to residential settlement. Sensitivity is considered Low.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of change is assessed to be Low as the Project will introduce a notable change to the landscape, particular to receptors in closest proximity to the Project site but this will be on a very localised level.				
Impact Significance	None	Negligible	Low	Medium	High
	As a result, the effect is assessment as Low and not significant.				

7.2.8.1 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.[88]

[88] 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 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	Permanent
	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 obvious 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
	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.				
Impact Significance	None	Negligible	Low	Medium	High
	The impact is assessed as Low and not significant.				

7.2.9 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 AoI and the socio-economic receptors:

1. Impacts on land and livelihoods from land occupied by the project area
2. Impacts from local employment during operation
3. Impacts on the national and regional economy during operation
4. Potential for gender-based violence, sexual exploitation and harassment

7.2.9.1 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.

7.2.9.2 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**	Permanent
	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	Low	**Medium**	High	
	As a result of the above, the overall impact is assessed as Medium and positive.				

7.2.9.3 Impacts on the national and regional economy during operation

Operation of the Project shall generate up to 100 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**	Permanent

	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 100MW.			
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.			

7.2.9.4 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 earnt 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 AoI, 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.			

7.2.10 Transportation and Access

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

7.2.11 Waste Management

Based on recent experience, AECOM expect that wastes will be disposed of at landfill. The EPC Contractor will provide details of the most suitable disposal site as part of detailed design but it is not expected that there are any recycling facilities at this landfill.

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.				
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

7.3.3.1 Avifauna

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.

7.3.3.2 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 risks 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.

7.4 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.

7.4.1 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 risks 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.

7.4.2 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.

8. Mitigation

Proposed mitigation measures are described below, and an outline Environmental and Social Mitigation and Monitoring Plan is provided in Appendix B with suggested KPIs provided in Appendix C. 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

No specific mitigation is proposed during the operational phase.

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 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 specifical management measures if appropriate:

- 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 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.

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;
- Publish the results of any investigation or excavation by an archaeologist in order to bring this information into the public domain; and
- 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, this should be done where:

- 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 Pre-Construction Surveys

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[89]. 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.

8.3.2 Site condition assessment and definition of no net loss / net gain

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 BAP.

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. [90]

2. The quality of the habitat at the site will be measured by comparison with a benchmark site considered to be high-quality tortoise habitat in the same ecosystem. This is accomplished by:

[89] 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.
[90] https://en.wikipedia.org/wiki/Mark_and_recapture

a. Finding an area of high-quality tortoise habitat in the same ecosystem, install sampling plots (enough to allow for statistical comparison with project site), and measure the following variables: % vegetative cover; % native species; richness of native species; Pielou's evenness index of native species (J'); % herbaceous plants; % shrubs. This is the *benchmark* against which the project site will be compared. The project site does not need to attain these benchmark values – the benchmark is simply a reference point.

b. Install sampling plots in the project area (enough to allow for statistical comparison with benchmark and post-construction samples at this same site) *prior* to construction, and measure the variables enumerated above. Compare the values for each variable relative to the benchmark site. Express the comparison as a percentage of the benchmark values.

c. Return to the project site sampling plots every year *post* construction, and measure the variables enumerated above. Compare the values for each variable relative to the benchmark site. Express the comparison as a percentage of the benchmark values.

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 will be undertaken for the first three years of operation, at which point the success of the BAP will be reviewed and a decision taken to either extend monitoring or to confirm that NNL/NG has been achieved and that monitoring can be discontinued.

NNL and NG will be achieved when:

1. The population of PBFs is the same or better than pre-construction baseline.

2. The post-construction project site has equal or better habitat scores (measured as a % of the benchmark) as the pre-construction 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

As noted in the construction earthworks activities, the following areas will be cleared during the initial earthworks.

Table 8-1. Earthworks

Parameter	Area
Length of fence (m)	11,000
Area of internal roads (m2)	90,000
Area of external access road (m2)	2,500
Area of substation (m2)	24,388
Area of inverter bases and any other infrastructure or hardstandings (m^2)	566
Area of laydown area (m^2)	18,000
Area shaded by PV panel (m^2)	1,160,045
Area of land left free of panels (m^2)	3,099,955
Land Boundary Area (m2)	4,260,000

Source: Masdar

Based on the initial site design as set out in the table above, a total of 14.6 ha land would be cleared or just over 3% of the overall site area. It is deemed that there are significant areas on the PV site to allow habitat restoration to take place.

8.3.2.2 Infrastructure Metrics

NNS has included measures to avoid habitat fragmentation (GN46) and this will focus on the inclusion of tortoise gates in 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 gates on perimeter fence at a distance of 1 gate per 100m of fence

8.3.2.3 Great bustard offsets

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. Monitoring will commence with the 2022/23 winter period and will be repeated annually up to the end of the first three years of operation. Monitoring will be reviewed

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.

Further details will be provided in a Biodiversity Action Plan. The proposals will be shared with recognised subject specialists (tbc) who will be given the opportunity to comment and input into the final 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, para-webbing or similar.
- Pre-clearing surveys will be carried out by the ecology team prior to topsoil stripping or other works starting in the pre-construction 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.

- 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 Ishithan; one diverter (Firefly or equivalent type to be agreed with Lenders) every 10m and staggered placement of them on the different lines to provide maximum coverage (refer to Ferrer et al, 2020)[91].
- 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 along the entire length of the Overhead Line between the Solar PV and the existing sub-station at Ishithan; one diverter (Firefly or equivalent type to be agreed with Lenders) every 10m and staggered placement of them on the different lines to provide maximum coverage (refer to Ferrer et al, 2020)[92]. As noted, the final design will be discussed with the Great bustard working group who will provide

[91] Ferrer *et a*l (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

[92] Ferrer *et a*l (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.

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.

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

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. Soil will be stripped on areas required for roads and hardstandings, including temporary construction compounds, offices and other buildings. Outside of these areas, soils will not be stripped with the aim of reducing erosion and preserving habitats within the site.

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.

Found at: https://www.sciencedirect.com/science/article/pii/S2351989420306715

- 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 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.

8.5.2 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 location to be agreed with Local Government respective officer or environmental officer.

8.5.2.1 Utilities

The source of water for the project has not yet been confirmed but is subject to ongoing consultation with the Water Authority, EPC and Masdar. At this stage it is proposed 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 boundaries. 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. 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 east side of the PV site. Where possible, clean surface water will be redirected around the site rather than risk contamination within the site.

8.5.2.5 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.

8.5.2.6 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 waste recycling/disposal facility has yet to be confirmed. Currently all waste would be landfilled.

8.5.3 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 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 labor 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 labor and child labor.

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 Shurcha and Rassvet to the west and Damkhodzha to the east. 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 developer 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 ($dB(A)_{eq}$).

8.8.2 Operational Phase

The initial noise assessment has concentrated on the villages of Shurcha and Rassvet to the west and Damkhodzha to the east 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/m2 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 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 Recruitment and 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. 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, advertising of local job position will be made available in a central location and information will be available in the local language. The Plan will also describe how women and Project Affected People will be given priority, alongside with residents of Kattakurgan for recruitment and training before the start of construction activities (also included in the following section).
- A Stakeholder Engagement Plan will be implemented.

8.9.1.2 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. 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.

8.9.1.3 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:

- 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 compliment 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 Kattakurgan, 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 Kattakurgan 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.

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 AoI.

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 potential alternative access routes outside the Project site. The current Project design does not have an alternative community pathway which will allow community members and their herds to cross the area during the lifetime of the project. However, the local farm users may need to adapt and readjust to their new timings and distances compared to baseline conditions. 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.

A livelihood Restoration Plan has been undertaken to quantify and mitigate potential impacts on livelihoods.

8.9.1.6 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;
- Mitigations will be included to manage potential risks on the issues of community relations; community health and safety and gender based violence and harassment (GBVH)[93];
- 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.

8.9.1.7 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.

8.9.1.8 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[94]. 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.

[93] Guidance provided in: https://www.ebrd.com/gbvh-construction.pdf
[94] IFC (2007a)

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.
- 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 stablish 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. This might state the procedures for engaging 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.
- Safety Reporting including incident occurrences.
- 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.

8.9.1.9 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 emphasizes 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):

- 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 stickering 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.

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	High
	Magnitude of change is anticipated to be high 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 250m 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	High
	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**	Medium	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	Medium	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 (*Otis tarda*) during Construction – 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	
	Given the unsuitability of the Project site for foraging/resting/roosting great bustard, and that there were no records of great bustard in Samarkand during the surveys by TYPSA/IFC in 2020-21, the impact magnitude is assessed as Negligible.				
Impact Significance	None	Negligible	Low	Medium	High
	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.				
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 Low positive for CH qualifying species.				

Impact Assessment: Impacts on ornithology during construction (PBF species) – White-headed Duck Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Little Bustard 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. 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. 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.			
Impact Magnitude	Negligible	Low	Medium	High
	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			

Impact Assessment: Impacts on ornithology during construction (PBF species) – White-headed Duck Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Little Bustard and Asian Houbara					
	is predicted to be Negligible 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. 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 Negligible 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 Low (overall) 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.				
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 NNL for PBFs. As a result the project will result in a Negligible impact for PBFs.				

Impact Assessment: Impacts on ornithology (non PBF species) during construction					
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. 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[95].				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The residual impact will be Negligible and not significant.				

[95] 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/

9.1.3.2 Terrestrial Ecology

Impact Assessment: Impacts on terrestrial ecology (PBF species) during construction – Central Asia Tortoise and Tatar Sand Boa					
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 Significance	None	Negligible	Low	Medium	High
	As a result, the impact is assessed as Low (overall) and not significant. 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 NNL of PBFs. As a result the project will result in a Negligible impact for PBFs.				

Impact Assessment: Impacts on other terrestrial ecology (non PBF species) during construction					
Receptor Value / Sensitivity	Low	Medium		High	
	The abundance and diversity of terrestrial fauna within the Solar PV site and Overhead Line route was found to be low. 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. The sensitivity of the terrestrial habitat within the Solar PV has therefore been assigned as Low in terms of faunal species. The historic (within the last 20 years) and the more recent (within the last 5 years) 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 OHL route crosses intensively cultivated and irrigated farmland habitat, with cropped fields (eg, cotton); it is Modified Habitat as defined in PS6. The habitat within the Project site is therefore assessed as Low sensitivity.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	The magnitude of the effect is predicted to be Medium given the area of the Solar PV site that will require to be cleared and / or disturbed and the potential for loss/mortality of reptiles and small mammals.				

Impact Assessment: Impacts on other terrestrial ecology (non PBF species) during construction					
	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 (overall) and not significant. A suite of both standard mitigation measures[96] and species-specific mitigation measures will be implemented to ensure impacts are reduced to Low significance or below.				
Residual Impact Significance post mitigation	None	**Negligible**	Low	Medium	High
	The residual impact will be Negligible and not significant.				

9.1.4 Geology and Soils

Impact Assessment: Impacts on soil quality during construction					
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.				
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 Hydrology and Hydrogeology

9.1.5.1 Surface Water

Impact Assessment: Impacts on surface water during construction					
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	High
	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.				
	None	Negligible	**Low**	Medium	High

[96] 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 Assessment: Impacts on surface water during construction					
Impact Significance	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.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	Good International Industry Practise pollution prevention measures will be implemented, reducing the impact further.				

9.1.5.2 Groundwater

Impact Assessment: Impacts on groundwater during construction					
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 Medium 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.				

9.1.6 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 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.				

9.1.7 Landscape and Visual

Impact Assessment: Impacts on Landscape Character				
	Negligible	Low	Medium	High

Impact Assessment: Impacts on Landscape Character					
Receptor Value / Sensitivity	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					
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	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.				

9.1.8 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	Medium	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	Medium	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.				

Impact Assessment: Impacts on noise during construction					
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The potential impact during construction is considered to be Low adverse. Other than the implementation of GIIP, no further mitigation is proposed.				

9.1.9 Socio-economic Impacts

9.1.9.1 Economic displacement

Impact Assessment: economic displacement				
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor value is Low for leaseholders along the OTL given they will have sufficient land remaining. However herders will have limited alternative land and so the receptor value is high.			
Impact Magnitude	Negligible	Low	Medium	High
	The impact magnitude is Medium as there is the potential to result in economic resettlement, particularly of herders.			
Impact Significance	Negligible	Low	Medium	High
	The overall impact significance is High 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.			

9.1.9.2 Community expectations of the Project

Impact Assessment: Community expectations of the Project				
Impact Magnitude	Negligible	Low	Medium	High
	Kattakurgan 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 Kattakurgan 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.			

9.1.9.3 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 Low as the limited number of people who currently use the dirt tracks will be able to access alternative tracks or roads to reach their destination.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor value is low given that local communities and local herders rely on these pathways for access to livelihoods.			
Impact Significance	Negligible	Low	Medium	High
	The impact is assessed as Low adverse, primarily because the local farm users may need to adapt and readjust to their new timings and distances compared to baseline conditions.			
Residual Impact Significance post mitigation	Negligible	Low	Medium	High
	The residual impact is predicted to be Low.			

9.1.9.4 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 because no grazing will be available of the Solar PV area and grazing area will be significantly reduced as there is limited alternative grazing land. Local herders may need to adapt to a new farming area and will need to travel around the Solar PV Area to access alternative grazing areas.			
Receptor Value / Sensitivity	Negligible	Low	Medium	High
	The receptor's sensitivities is High as herders will require alternative land.			
Impact Significance	Negligible	Minor	Medium	High
	The impact is assessed as High 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 Medium. As part of the LRP, additional support will be provided to vulnerable households, where applicable.			

9.1.9.5 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 AoI. 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 Kattakurgan 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.			
	Negligible	Low	Medium	High

Impact Significance	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.			

9.1.9.6 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.			

9.1.9.7 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 construction 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.			

9.1.10 Traffic and Transportation

9.1.10.1 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 Assessment: Impacts on traffic during construction					
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.				
Impact Magnitude	No change	Negligible	Low	Medium	High
	No works will be taking place other that 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	None	Negligible	Low	Medium	High
	The impact is assessed as Negligible and not significant.				

Impact Assessment: Impacts on archaeology and cultural heritage during operation	
Significance post mitigation	

9.2.3 Biodiversity

9.2.3.1 Avifauna

Impact Assessment: Impacts on Great Bustard (*Otis tarda*) during Operation – Critical Habitat is triggered for this species under Criteria 1: significant populations of nationally or regionally EN or CR species.					
	Great bustard has the potential to overfly the project site from known wintering areas within and outside the Samarkand region, as well as migrating between wintering and breeding habitats outside of Uzbekistan.				
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. 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 NG of CH qualifying species. As a result the project will result in a Low positive impact for CH.				

Impact Assessment: Impacts on Ornithology (PBF species) during Operation – White-headed Duck, Sociable Lapwing, Saker Falcon, Pallas's Fish Eagle, Steppe Eagle, Egyptian Vulture, Little Bustard 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. The project does not support breeding populations for PBF birds and the habitat is not suitable for these species.			

	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. 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.			
Impact Magnitude	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 covered by the solar panels. Loss of habitat for the transmission 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 4.5km transmission line alignment is not extensive in terms of migrating birds passing through the wider Samarkand region on a broad front and it is orientated along an approximately north-east-south-west alignment, which reduces 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); a perfect east-west alignment would potentially be more impactful in this respect. Therefore, the magnitude of this potential impact is assessed as Low. The Project Site is not sited on a migration bottle neck or High 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 Samarkand or Uzbekistan populations. 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. 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). However, the precise configuration and dimensions of the electrical design is not yet available for this project. Species recorded during the baseline surveys which are potentially most vulnerable to electrocution, both in flight and from perching, due to their likely frequent presence within the project site (and also behavioural trait for perching whilst feeding, resting and hunting), are: long-legged buzzard (not of national or international conservation concern). The risk of			

	electrocution to steppe eagle and Egyptian vulture (both IUCN Endangered) is considered to be low due to their respective likely infrequent flight transits through the project area (in small numbers which are highly unlikely to be significant in terms of regional/national populations). The impact magnitude has been cautionary assessed as medium (overall) for electrocution. 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. 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 NNL of PBFs. As a result the project will result in a Negligible impact for PBFs.				

Impact Assessment: Ornithology impacts (non PBF) during operation					
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. 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 covered by the solar panels. Loss of habitat for the transmission 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 4.5km transmission line alignment is not extensive in terms of migrating birds passing through the wider Samarkand region on a broad front and it is orientated along an approximately north-east-south-west alignment, which reduces 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); a perfect east-west alignment would potentially be more impactful in this respect. Therefore, the magnitude of this potential impact is assessed as Low. The Project Site is not sited on a migration bottle neck or High migration route; it is not located close to a mountain pass or wetland where large numbers of migratory birds could				

Impact Assessment: Ornithology impacts (non PBF) during operation					
	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 Samarkand or Uzbekistan populations. 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. 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). However, the precise configuration and dimensions of the electrical design is not yet available for this project. Species recorded during the baseline surveys which are potentially most vulnerable to electrocution, both in flight and from perching, due to their likely frequent presence within the project site (and also behavioural trait for perching whilst feeding, resting and hunting), are: long-legged buzzard (not of national or international conservation concern). The risk of electrocution to steppe eagle and Egyptian vulture (both IUCN Endangered) is considered to be low due to their respective likely infrequent flight transits through the project area (in small numbers which are highly unlikely to be significant in terms of regional/national populations). The impact magnitude has been assessed as low (overall) for electrocution. The impact magnitude is assessed as Medium (overall).				
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 and Tartar Sand Boa					
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.				

Impact Assessment: Impacts on PBF species: Central Asian Tortoise and Tartar Sand Boa					
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 NNL of PBFs. As a result the project will result in a Negligible impact for PBFs.				

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 Low and insignificant.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	The residual impact is predicted to be 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 Medium 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.				
Residual Impact Significance post mitigation	None	Negligible	Low	Medium	High
	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
	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.				
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 Assessment: Occupational health and safety impacts during operation					
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 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	Medium	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 OHLs 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	High
	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	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 at all VPs. Views from the minor road will be transient in nature and dominated by exiting 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.				

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	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. 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	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.				

9.2.10 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 Medium 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.			
	Negligible	Low	Medium	High

Impact Significance	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

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

9.3.3.1 Avifauna

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.

9.3.3.2 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 risks 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 risks 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 Species List

Common Name	Latin Name	IUCN Category	Uzbek Red Data Book	Sept 2021	Nov 2021		April 20221	Comment
				Solar PV	Solar PV	T-line	Solar PV	
Birds								
Black-bellied sandgrouse	*Pterocles orientalis*	Least Concern	No	P			P	6 (peak count)
Feral pigeon	*Columbia livia*	N/A	No	P		P	P	
Laughing Dove	*Spilopelia senegalensis*	Least Concern	No	P				
Oriental turtle dove	*Streptopelia orientalis* SL	Least Concern	No	P				
Eurasian Collared dove	*Streptopelia decaocto*	Least Concern	No	P				
Northern lapwing	*Vanellus vanellus*	Least Concern	No			P		Flock of 4 birds
Western white stork	*Ciconia ciconia ciconia*	Least Concern	No			P		Flock of 4 birds
Grey heron	*Ardea cinerea*	Least Concern	No			P		
Egyptian vulture	*Neophron percnopterus*	Endangered	VU					Recorded on migration (Solar PV) during the Typsa 2020 surveys
Steppe eagle	*Aquila nipalensis*	Endangered	VU	P				
Western marsh harrier	*Circus aeruginosus*	Least Concern	No	P	P	P	P	
Hen harrier	*Circus cyaneus*	Least Concern	No	P	P	P		
Montagu's harrier	*Circus pygargus*	Least Concern	No				P	
White-tailed eagle	*Haliaeetus albicilla*	Least Concern	VU		P			1 overflying
Long-legged buzzard	*Buteo rufinus*	Least Concern	No	P				
Peregrine	*Falco peregrinus*	Least Concern	No		P			
Common kestrel	*Falco tinnunculus*	Least Concern	No	P	P	P		
Merlin	*Falco columbarius*	Least Concern	No			P		
Hobby	*Falco subbuteo*	Least Concern	No	P				

Sparrowhawk	*Accipiter nisus*	Least Concern	No				P	
Shikra	*Accipiter badius*	Least Concern	No				P	
Little owl	*Athene noctua*	Least Concern	No	P	P	P		
Great grey shrike	*Lanius excubitor*	Least Concern	No			P		
European bee-eater	*Merops apiaster*	Least Concern	No	P				
Blue-cheeked bee-eater	*Merops persicus*	Least Concern	No	P				
Rook	*Corvus frugilegus*	Least Concern	No	P	P	P	P	
Carrion crow	*Corvus corone*	Least Concern	No		P	P		
Hooded crow	*Corvus cornix*	Least Concern	No			P		
Raven	*Corvus corax*	Least Concern	No	P				
Magpie	*Pica pica*	Least Concern	No	P				
Swift	*Apus apus*	Least Concern	No				P	
Crested lark	*Galerida cristata iwanowi*	Least Concern	No	P	P	P	P	
Asian Short-toed lark	*Alaudala (rufescens) cheleensis*	Least Concern	No	P				
Skylark	*Alauda arvensis*	Least Concern	No	P	P	P		
White-winged lark	*Alauda leucoptera*	Least Concern	No		P			c90 overflying birds
Calandra lark	*Melanocorypha calandra*	Least Concern	No		P	P		
Tree Pipit	*Anthus trivialis*	Least Concern	No				P	
Common myna	*Acridotheres tristis*	Least Concern	No	P		P		
Common starling	*Sturnus vulgaris*	Least Concern	No	P		P		
Siberian stonechat	*Saxicola maurus*	Least Concern	No				P	
Wheatear	*Oenanthe oenanthe*	Least Concern	No	P				
Isabelline wheatear	*Oenanthe isabellina*	Least Concern	No				P	

Desert wheatear	*Oenanthe deserti*	Least Concern	No	P				
Pied wheatear	*Oenanthe pleshanka*	Least Concern	No	P			P	
Common rockthrush	*Monticola saxatilis*	Least Concern	No				P	
Meadow pipit	*Anthus pratensis*	Least Concern	No			P		
White wagtail	*Motacilla (alba) alba*	Least Concern	No	P		P		
Masked wagtail	*Motacilla (alba) personata*	Least Concern	No	P				
Hoopoe	*Upopa epops*	Least Concern`	No	P			P	
Barn swallow	*Hirundo rustica*	Least Concern	No	P			P	
Sand martin	*Riparia riparia*	Least Concern	No	P				
Tree sparrow	*Passer montanus*	Least Concern	No	P		P		
Spanish sparrow	*Passer hispaniolensis*	Least Concern	No	P		P		
Desert finch	*Rhodospiza obsoleta*	Least Concern	No			P		
Chaffinch	*Fringilla coelebs*	Least Concern	No			P		
Brambling	*Fringilla montifringilla*	Least Concern	No			P		
Linnet	*Linaria cannabina*	Least Concern	No			P		
Reed bunting	*Emberiza schoeniclus*	Least Concern	No			P		
Corn bunting	*Emberiza calandra*	Least Concern	No		P	P	P	
Mammals								
Tolai hare	*Lepus tolai*	Least Concern	No		P		N/A	
Zaisan mole vole	Ellobius tancrei	Least Concern	No	P	P		N/A	Burrows observed
Shrew spp.	*Soricidae* spp.	Least Concern	No		P		N/A	Bones founds in kestrel pellet
Long-eared hedgehog	*Hemiechinus auritus*	Least Concern	No	P			N/A	Skin found
Common pipistrelle	*Pipistrellus pipistrellus*	Least Concern	No	P			N/A	
Red Fox	*Vulpes vulpes*	Least Concern	No	P			N/A	Scats found
Reptiles								

Central Asian tortoise	*Testudo horsfieldii*	Vulnerable	Yes		P	5 tortoises
Higher plants						
Hare barley	*Hordeum leporinum*	Not yet assessed	No	P	N/A	Abundant
Camelthorn/Yantak	*Alhagi pseudoalhagi*	Not yet assessed	No	P	N/A	Frequent (locally abundant)
Viviparous bluegrass	*Poa bulbosa*	Not yet assessed	No	P	N/A	Rare
Desert daisy	*Microcephala lamellata*	Not yet assessed	No	P	N/A	Frequent
Ceratocarpous spp.	*Ceratocarpus utriculosus*	Not yet assessed	No	P	N/A	Rare
Poppy spp.	*Papaver pavoninum*	Not yet assessed	No	P	N/A	Frequent
Cousinia	*Cousinia bungeana*	Not yet assessed	No	P	N/A	Rare
Goose onion	*Gagea sp.*	Not yet assessed	No	P	N/A	Frequent
Eremopyrum sp.	*Eremopyrum bonaopartis*	Not yet assessed	No	P	N/A	Rare
Roemeria sp.	*Roemeria refracta*	Not yet assessed	No	P	N/A	Rare
Bermuda grass	*Cynodon dactylon*	Not yet assessed	No	P	N/A	Locally abundant
Common caper	*Capparis spinosa*	Not yet assessed	No	P	N/A	Rare
Spiny Cocklebur	*Xanthium spinosum*	Not yet assessed	No	P	N/A	Locally abundant
Cocklepur sp.	*Xanthium strumarium*	Not yet assessed	No	P	N/A	Rare
A legume	*Sphaerophysa salsula*	Not yet assessed	No	P	N/A	Frequent
A legume	*Psorolea drupacea*	Not yet assessed	No	P	N/A	Frequent
Isirik	*Peganum harmala*	Not yet assessed	No	P	N/A	Locally abundant
Common saltwort	*Salsola tragus*	Not yet assessed	No	P	N/A	Rare
A saltwort	*Girgenshonia oppositiflora*	Not yet assessed	No	P	N/A	Rare
Halocharis sp.	*Halocharis hispida*	Not yet assessed	No	P	N/A	Rare
A lily	*Ixiolirion tataricum*	Not yet assessed	No	P	N/A	Rare
A sedge	*Carex pachystylis*	Not yet assessed	No	P	N/A	Rare

A grass	*Aegilops squarrosa*	Not yet assessed	No	P	N/A	Locally abundant
A grass	*Bromus oxyodon*	Not yet assessed	No	P	N/A	Rare
A brassica	*Malcolmia trichocarpa*	Not yet assessed	No	P	N/A	Rare
A brassica	*Cryptospora omissa*	Not yet assessed	No	P	N/A	Rare
Bearded fescue	*Vulpia cilicata*	Not yet assessed	No	P	N/A	Locally abundant
A trefoil	*Trigonella geminiflora*	Not yet assessed	No	P	N/A	Rare
A compositae	*Amberboa bucharica*	Not yet assessed	No	P	N/A	Rare
Caltrop	*Tribulus terrestris*	Not yet assessed	No	P	N/A	Frequent

Footnote

[1] The April 2022 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.

Appendix B Outline ESMMP

The mitigation measures for the construction and operation phases are summarised in Table 44 and Table 45, 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.

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-10-1. 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[97] to ensure good construction practice within the proposed project site. Employ an ecologist during construction to oversee implementation of the BAP. Initial site preparation and clearance to be undertaken outside of the bird breeding season, where possible. 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. 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. Areas to be cleared, precisely demarcated with vegetation clearing only in agreed areas.	Biodiversity Action Plan	EPC EHS Manager HSE MANAGER ESHS Officer	Site Inspection Reports	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

[97] 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
	Clearing to commence on sign-off from ecologist and HSE MANAGER /ESHS Officer. Any areas outside of the footprint of the Project, that are cleared as a result of construction activities (compound, storage areas etc.) should be restored following the completion of construction phase. Fires will not be allowed under any circumstances. Cleared areas no longer required for construction activities should be restored by natural revegetation/reseeding using the existing seed bank contained in the topsoil.				
Disturbance, alteration & destruction of faunal and avifaunal habitats	Environmental toolbox talks prior to, and during, construction to raise awareness, limit conflict and reduce additional disturbance to fauna and avifauna. 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. 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. Procedure will be implemented for removal of animals found within the construction area. 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. Vehicle speed limits must be imposed and adhered to. A limit of 20kph is proposed but will be agreed with the EPC. Record all instances of collisions with project vehicles.	Biodiversity Action Plan	EPC EHS Manager	Site Inspection Reports	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Bird divertors installed along entire extent of overhead lines. Tortoise holes cut in selected parts of the perimeter fence to enable free movement.				
Conflict between construction workers and fauna	The collection, harvesting or hunting of plants or animals is strictly prohibited. A 'no tolerance' policy will be adopted with respect to construction workers. Any person found guilty of poaching will be apprehended, immediately dismissed and referred to the appropriate authority.	Biodiversity Action Plan	EPC EHS Manager	Site Inspection Reports	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
Risk of invasive flora species	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. Vehicles will be cleaned in a designated wash down area within the construction compound prior to entrance to site. Wash water will be part of the surface water drainage system.	Biodiversity Action Plan	EPC EHS Manager	Site Inspection Reports	Mitigation work to be carried out as and when identified.
Surface water	Buffer distance of 25m applied to the seasonal watercourses and irrigation channels. Routes of roads to be selected to avoid existing drainage channels or depressions where possible. 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. Vehicles shall not be washed in nearby drainage canals. Washing will take place in designated wash down area within the construction compound.	Water and Wastewater Management Plan	EPC EHS Manager	Site Inspection Reports Note: water quality samples are to be taken if there are signs of pollution.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
Soil erosion	Run-off and erosion control features included in all civil designs by contractor.	Soil Erosion Management Plan Water and Wastewater Management Plan	EPC EHS Manager	Site Inspection Reports	Prior to start of Construction.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Demarcate storage and staging areas and store all materials, equipment and vehicles in these areas to reduce soil damage. Vehicles confined to demarcated roadways. Where possible, establish native vegetation by natural revegetation in excavated areas immediately after final disturbance. Stockpiles of stripped topsoil with 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, straw bales or other measures to impede storm water flow and prevent erosion. When damage to wet soil occurs, repair once dry conditions return. Surface levelling should be carried out in the first instance.	Biodiversity Action Plan			Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
Wastewater	Ensure temporary storage of wastewater at the site before disposal to a designated facility by a contracted waste handler. Where third party wastewater disposal & 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. Prohibit illegal disposal of wastewater into the canals around the project site. Ensure regular inspection of wastewater management practices within the solar plant to check for compliance. Ensure there is proper and adequate sanitation facilities at the site during construction.	Water and Wastewater Management Plan Quantity of wastewater generated. Quantity of wastewater disposed by a licensed waste carrier	EPC EHS Manager Licensed waste carrier	Monthly ESHS reports prepared by EPC. Monthly HSE MANAGER audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
Sewage Effluent	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. Effluent from domestic sewerage treatment shall meet the relevant standards acceptable to the Uzbek environmental authorities. Effluent will be stored in a septic tank or untreated storage tank and removed and disposed of periodically by a licenced contractor.	Water and Wastewater Management Plan	EPC EHS Manager HSE MANAGER	Monthly ESHS reports prepared by EPC. Monthly HSE MANAGER audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified
Non-hazardous solid wastes	Train workers on solid waste management practices described in the Storage & Management of Waste MP and Lender Group requirements. Segregate all solid wastes at source. Re-use, re-cycle or reduce solid waste generation onsite to the extent possible. Dispose all construction wastes that cannot be recycled or reused to a licensed solid waste disposal site using a licensed refuse handler. Provide suitably sized facilities for proper handling, segregation and storage of wastes at	Storage & Management of Waste MP Quantity of solid waste generated. Quantity of solid waste correctly disposed to licensed disposal sites.	EPC EHS Manager Licensed waste carrier.	Monthly ESHS reports prepared by EPC Monthly HSE MANAGER audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	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.				
Hazardous materials / wastes	Provide facilities for proper handling, segregation and storage of wastes at designated points within the construction compound. Hydrocarbons will not be stored on site. Refuelling will take place at fuel station located at the junction with the highway. For heavy equipment, a fuel tanker will be brought to site at a pre-defined time to refuel this equipment at site. Drip trays will be installed under refuelling points. 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. Train site workers on proper hazardous waste management. Segregate site wastes by separating hazardous waste from non-hazardous waste. Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow.	Storage & Management of Wastes MP Storage and Management of Hazardous Materials MP. Pollution Incident Response Plan Quantity of Hazardous Waste generated. Quantity of Hazardous Waste disposed.	EPC EHS Manager Licensed waste carrier	Monthly ESHS reports prepared by EPC Monthly HSE MANAGER audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Ensure that hazardous materials are stored in proper areas, where they cannot reach land in case of any spillage. Incorporate dripping pans at machinery, equipment and area prone to contamination by leakage of hazardous materials such as oil and fuel Regular maintenance of all equipment and machines used onsite so as to minimise leakage of hazardous materials Containers for storing hazardous waste, including used oil, should be stored securely, labelled and disposed in line with the governing regulations Undertake regular inspection of hazardous waste management practices onsite. Strictly prohibit illegal disposal of hazardous wastes onsite Store hazardous materials in designated areas secured with a fence. Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of. Follow Uzbek Government requirements set out in the international Convention "The Control of Transboundary Movements of Hazardous Wastes and Their Disposal (IEA ID# 3042)				
Noise and vibration	Adopt and follow best practicable means to ensure that the quietest available plant and construction techniques are used. 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. Routing of project construction traffic shall be through the main highway and short section of unmarked road to site.	Noise and Vibration MP. Traffic MP Noise monitoring devices procured and installed on site Levels of noise and vibration produced at the site Number of Noise complaints received.	EPC EHS Manager	Monthly ESHS reports prepared by EPC	Prior to start of Construction. Monitoring carried out on a monthly basis or following a complaint. Mitigation work to be carried out as and when identified.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Restrict all construction activities to daytime during normal working hours Conduct construction activities within the maximum permitted noise levels Provide prior information to the community of any planned noisy activity that is likely to exceed the permitted noise levels (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 Monthly monitoring of LAeq in the daytime and night-time (if night-time work is required) should be carried out at the Solar PV, OHL, and access roads nearest receptors during construction only. .				
Archaeology and cultural heritage	Train workers on the importance of archaeological and cultural resources and how to deal with them through toolbox talks. 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.	Chance Find Procedure. Stop Work Protocol Number of recorded chance finds.	EPC EHS Manager Department of Culture.	Monthly ESHS reports prepared by EPC	Throughout the construction works.
Visual and landscape	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. Conduct demobilization audit prior to EPC leaving site to ensure that site conditions are acceptable for handover to the operations team.	Site Restoration Plan Biodiversity Action Plan	EPC EHS Manager	Monthly ESHS reports prepared by EPC	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
Occupational Health and Safety	Comply with 'governing regulations' and international best practise. Establish a permit to work system for all high-risk activities (i.e. hot works, confident space, working at high etc.)	Occupational Health and Safety Plan. Incident Investigation Report Covid 19 MP.	EPC EHS Manager HSE MANAGER	Monthly ESHS reports prepared by EPC Monthly HSE MANAGER audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Train employees on the importance of occupational health and safety requirements and develop work instruction. Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust masks, ear mufflers and overalls for use during construction. Strictly enforce the use of the Personal Protective Equipment to minimise the accidents. Provide regular medical checks for the workforce. Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing, at all times. Provision and placement of appropriate fire extinguishers and training personnel on their use Put clear signage to restricted areas in Chinese, Uzbek, Russian and English languages. Prohibit unauthorised persons from entering the site through installation of a perimeter fence. Undertake regular inspection to ensure compliance with OHSP. Report and investigate all incidences of accidents or near misses and keep proper records of the actions taken. An Incident Investigation Report should be developed. 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.	Workers Accommodation MP IFC/ EBRD Guide for Workers Accommodation. Emergency Preparedness and Response Plan. Confirmation of the appointment of medical professional on site. PPE procured and being used by the workers Fire extinguishing facilities on site First aid kit on site Signage installed on site.		Record of accidents and near misses Corrective Action Reports Grievance mechanism forms.	Mitigation work to be carried out as and when identified.
Socio-economic – employment	Develop Local Recruitment and Employment Plan to encourage & maximize local workers, vulnerable persons and women in the workforce including retention and promotion.	Stakeholder Engagement Plan. Community Grievance Mechanism Local Recruitment & Employment Plan.	CLM / CLO	CGM log. Corrective Action Reports Number of local people employed on the Project.	Prior to start of Construction. Monitoring carried out during weekly site inspections.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Communicate employment estimates, timeframes and skills requirements clearly to the community. 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. 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). Investigate local sourcing and procurement opportunities to promote sustainable small business development. 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). 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.	Stakeholder engagement activities. Number of grievances recorded. Number of local workers hired. Minutes of stakeholder meetings. Skills training agreement with local vocation training centre. Agreement to provide support to local businesses		Training places provided and completed.	Mitigation work to be carried out as and when identified.
Local hiring and workforce management	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) Identification of job roles required and targets as appropriate. Use targets to measure the success of the Local Recruitment and Employment Plan. 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.	Local Recruitment & Employment Plan. Monthly workforce statistics.	CLM EPC EHS Manager HSE MANAGER	Monthly ESHS reports prepared by EPC Inspection reports CGM log. Number of local people employed on the Project.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Community Liaison Officer to maintain a database of local workers expressing an interest in employment opportunities at the Project as per bullet point above, Pass this information on to the EPC contractor or responsible person. 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.			Training places provided and completed.	
Socio-economic – population and land use	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. Provide detailed and regular information to local community members about Project activity to mitigate community concerns as a result of misinformation. 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. Prohibit non-local workers from entering the local communities. Operate a closed camp status for non-local residents.	Community Health & Safety MP. Water Management Plan SEP Confirmation of access arrangements. Minutes of stakeholder meetings. Noise and Vibration Management Plan	CLO EPC EHS Manager HSE MANAGER	Inspection reports CGM log Corrective Action Reports	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
Social Infrastructure	Provision of a dedicated medical professional to be employed by the Project. Investing in local social infrastructure through a community benefit program which will be developed in consolation with communities	Occupational Health and Safety Plan. Contract of employment for medical professional(s)	EPC EHS Manager HSE MANAGER	Confirmation of employment.	Prior to start of Construction. Monitoring carried out during weekly site inspections

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..				
Air Quality	Identify strategies to manage dust on the road during the execution of the Project. 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. Use of properly maintained vehicles and construction equipment with emission controls. If necessary, use water to dampen down on-site roads and excavations to reduce dust. 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.	Traffic MP Dust Suppression MP Vehicle inspection checks carried out Minutes of stakeholder meetings. SEP CGM and WGM Grievances received.	EPC EHS Manager HSE MANAGER	Monthly ESHS reports prepared by EPC Inspection reports Record of traffic accidents and near misses CGM and WGM logs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
Spread of Food and Water-borne Disease	Food stored and prepared in accordance with good hygiene standards and required by Uzbek and IFI standards. Establish food hygiene procedures including bacterial testing regimes to be established for camp kitchens and water supply. Where appropriate, support local public health campaigns against food and water borne diseases.	Water and Wastewater Management Plan Storage & Management of Waste MP OHS and CHS MP Adherence to International food standards (for example FAO/ WHO Codex Alimentarius) Agreements with relevant government	EPC EHS Manager HSE MANAGER	Monthly ESHS reports prepared by EPC Inspection reports WGM grievances log Corrective Action Reports	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
		/NGOs to support health campaigns Information disclosed as part of health campaigns			
Spread of Communicable Disease	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 Health screening and quarantine if necessary, carried out in accordance with Covid-19 MP. Establishment of designated areas to handle quarantine cases. Establishment of a COVID19 management plan. Ensure health screening is being conducted for employees and contractors before contracting workers and prior to entrance to site. Temperature screening will be carried out on entrance to site each day. Random Covid-19 testing will be carried out throughout their employment/ contract. As part of health and safety induction for workers, provide awareness training on communicable disease prevention. Provide this training on an ongoing basis. Work in collaboration with an onsite medical team to ensure that such awareness and education training is appropriately provided to workers and contractors. Identify opportunities to support local public health campaigns that focus on prevention of communicable diseases.	Covid 19 MP Workers Accommodation Plan OHS MP Provision of employee health screening. Provision of health-related awareness and training to workforce Agreements with relevant government/ NGOs to support health campaigns	EPC EHS Manager HSE MANAGER	Monthly ESHS reports prepared by EPC Monthly HSE MANAGER audits of the MPs. Corrective Action Reports Heath related advertising and communication. Number of reported heath incidents.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
Increased Pressure on Health Services	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. Liaise with local health professionals to identify ways that the Project can provide sustainable investments in the health care facilities used by their workers. Consider an agreement or contract with health care provider to provide investments in facilities used by workers	OHS Plan Provision of worker healthcare through dedicated Project professional.	EPC EHS Manager HSE MANAGER	Inspection reports Number of reported heath incidents.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
Pressure on Water Resources	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. Vehicles will not be washed in canals.	Water & Wastewater MP Grievances received Provision of water use and resource studies.	EPC EHS Manager HSE MANAGER	Inspection reports Corrective Action Reports Grievance mechanism forms.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
Sale and Use of Drugs and Alcohol	Enforce and monitor the zero-alcohol and drugs tolerance policy, including current intoxication, for workers during working hours. Ensure random alcohol testing is conducted for workers entering and leaving the site. Design a system of penalties for anyone found with drugs or alcohol on site.	Workers Accommodation MP HR MP OHS MP	EPC EHS Manager HSE MANAGER	Inspection reports Corrective Action Reports Test results. Disciplinary action taken.	Communicated prior to start of Construction. Monitoring carried out during weekly site inspections.
Safety of Local Community	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. Include policy requirements to prevent Gender Based Violence and Harassment (GBVH) of community members by the construction workforce.	Community Health & Safety MP Provision of information through the SEP and grievance mechanism. Trainings provided on GBVH Senior representatives for managing GBVH appointed	CLO EPC EHS Manager HSE MANAGER	Monthly HSE MANAGER audits of the MPs. Inspection reports Corrective Action Reports Grievance mechanism forms.	Communicated prior to start of Construction. Monitoring carried out during weekly site inspections.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	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. Include a safe and confidential reporting mechanism from local communities as part of the grievance process. Provide periodic training on GBVH to all of the workforce and ensure to vet all contractors with based on their performance of managing GBVH.				
Site security	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 & Human Rights. Security provided by private security firm only, not the home guard. Firearms are prohibited on site. Fence the entire solar plant to restrict entrance to the site. Inspect the fence around the facility regularly and seal all loopholes. Ensure adequate lighting within and around the solar plant. Regularly check and maintain security lights at the site. Train the onsite guards to adequately handle trespass incidents Ensure that the security staff act in compliance with relevant Uzbek laws; Ensure that robust background checks are carried out staff to make sure they have not been implicated in past abuses;	Security and site access MP Provision of code of conduct for security personnel. Results of background checks for security staff. Minutes of stakeholder meetings. CGM and WGM Grievances received.	EPC EHS Manager Security Contractor HSE MANAGER	Monthly ESHS reports prepared by EPC Monthly HSE MANAGER audits of the MPs. Inspection reports CGM and WGM logs.	Communicated prior to start of Construction. Monitoring carried out during weekly site inspections

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Implement a Code of Conduct for security personnel; 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; Community safety meetings should be organised with all potentially affected groups and be conducted in advance of construction activities; and Ensure that all potentially affected stakeholders know how to contact the company and to file grievances or concerns about security arrangements.				
Emergency response	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. Communicate potential risks and ERP to those potentially most affected by emergency events. Provide safety information to local community via the SEP. Emergency drills must be completed.	OHS Plan Emergency Management and Response Minutes of community meetings Findings of Emergency Drills CGM and WGM Grievances received.	Masdar EPC EHS Manager Security Contractor HSE MANAGER	Monthly ESHS reports prepared by EPC Monthly HSE MANAGER audits of the MPs. Emergency Drills	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
Traffic management	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.	Traffic MP Number of road safety briefings provided. Number of road safety complaints received. Number of driving incidents including speed violations.	EPC EHS Manager Security Contractor HSE MANAGER	Monthly ESHS reports prepared by EPC Monthly HSE MANAGER audits of the MPs. Inspection reports Record of accidents and near misses WGM and CGM Logs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Provide appropriate traffic safety training to all drivers (employees and contractors) as part of their induction and on an ongoing basis. As part of pre-construction engagement activities, ensure that traffic safety and “rules of the road” are discussed with local communities. Discuss and address community concerns. Special sessions may be required for particularly vulnerable groups such as children. At minimum communicate type, frequency and traffic risks before heavy traffic begins for the construction phase. All discussions and training sessions are to be made available in language that the workers can understand. Construction traffic through community areas will not be permitted with the exception of public meetings and stakeholder engagement activities.				

Table A-10-2. of the mitigation measures for the Operation Phase

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
Biodiversity	Confine all vehicles to roadways. Road condition monitored regularly, and damaged and rutted roads repaired rather than bypassing damaged sections. Monitoring of erosion controls and repair as needed. Re-stabilise existing eroded tracks with restoration of vegetation cover as required. Hunting prohibited on site, particularly in relation to Houbara bustard. During routine maintenance any invasive flora species should be identified and removed. Cutting and poisoning of saplings is an effective control measure. Record bird collisions with the panels and overhead lines. Monitor and maintain bird flight diverters on OHL throughout operational phase. Implementation of mitigation measures for Central Asian Tortoise (TBC) as set out in the BAP. Record sightings of Sociable lapwing and Houbara bustard in the vicinity of the Solar Park, 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	Biodiversity Action Plan Annual audits Number of bird collisions with OHL Tortoise population Success level of vegetation restoration. Level of plant cover. Presence of indicator species.	Project Developer	Audit Reports	Plan developed prior to start of Operation. Monitoring carried out during detailed monthly audits. Mitigation to be carried out as and when identified.
Liquid wastes	Develop a Water Management Plan for operations. Train employees on the importance of proper liquid waste management and water resource management. Reduce, reuse or re-cycle all liquid waste generated onsite to the extent possible. Dispose all liquid wastes that cannot be recycled or reused to liquid waste disposal facilities a licensed transporter.	Water Management Plan Pollution Incident and Response Plan Quantity of liquid waste generated Quantity of liquid waste correctly disposed to disposal sites	Project Developer Licensed hazardous waste transporter	Water Management Plan and Inventory Inspection reports Audit Reports	Plan developed prior to start of Operation. Monitoring carried out during detailed monthly audits. Mitigation to be carried out as

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Prohibit illegal disposal of wastewater into waste resources (canals or groundwater). Conduct inspection of wastewater management practices to check for compliance Emphasise on proper sanitation during operation phase of the project.	Number of Waste storage facilities the plant Number of Sanitation facilities on at the plant Number of Audits completed			and when identified.
Solid Wastes	Develop a Waste Management Plan for operations. This will establish the Chain of Custody system to be implemented. Train employees on the importance of proper solid waste management Reduce, reuse or re-cycle all solid waste generated to the extent possible Dispose all solid wastes that cannot be recycled or reused to solid waste disposal sites using a licensed refuse handler. Disposal sites shall be appropriately licensed and meet the general requirements of IFC PS. Maintain proper records of solid wastes to know the quantity of wastes generated on site Provide adequate waste bins and containers at specific places and ensure they are properly marked with type of wastes Perform regular inspection of waste management practices onsite. Wastes will be stored in a designated storage area within the substation area to facilitate collection of the wastes by third party waste collector.	Implementation of Waste Management Plan. Quantity of solid waste generated Number of solid waste storage facilities at the plant Quantity of solid waste correctly disposed to disposal sites Number of completed inspection missions Annual audits	Project Developer Licensed hazardous waste transporter	Solid waste management Plan and inventory Inspection Reports Audit Reports	Plan developed prior to start of Operation. Monitoring carried out during detailed monthly audits. Mitigation to be carried out as and when identified.
Water availability	A full Water Management Plan will be developed prior to the commencement of operations.	Water Management Plan Operational water availability / resource use assessment.	Project Developer	Inspection reports.	Plan developed prior to start of Operation. Monitoring carried out during detailed monthly audits. Mitigation to be carried out as

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
					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 Number of completed inspections, Annual audits.	Project Developer	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.
Visual Impacts	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. Ensure proper storage, regular collection and disposal of waste streams generated. Carry out the facility inspection work on regular basis.	Biodiversity Action Plan Waste management plan developed and implemented Site inspection missions completed Annual audits	Project Developer.	Inspection Reports Grievance Reports Audit Reports	Plan developed prior to start of Operation. Monitoring carried out during detailed monthly audits. Mitigation to be carried out as and when identified.
Hazardous Materials / Wastes	Develop and implement a Waste Management Plan. Train employees on Hazardous waste management Segregate waste by separating hazardous waste from non-hazardous waste. 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. 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.	Waste Management Plan developed and implemented Number of trained Workers on Hazardous Waste Management Amount of Hazardous Waste Segregated Quantity of accidental hazard spillage Quantity of hazardous waste correctly disposed	Project Developer Licensed hazardous waste transporter	Inspection Reports Hazardous Waste Management Plan and Inventory Audit Reports	Plan developed prior to start of Operation. Monitoring carried out during detailed monthly audits. Mitigation to be carried out as and when identified.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
	Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow. Prohibit illegal disposal of hazardous wastes on the solar plant during solar plant maintenance exercise. Undertake regular inspection of hazardous waste management practices onsite. 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.	Number of completed inspection missions Annual Audits			
Occupational Health and Safety	Develop and implement an O&M ESHS MP for operations. Train new employees on the importance of occupational health and safety Ensure compliance with the governing regulations Maintain the fence around the entire solar park to prohibit unauthorized persons from accessing the site Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust masks (if required) and overalls. Strictly enforce the use of the Personal Protective Equipment to minimise the accidents during decommissioning Regular medical checks including screening for Covid-19 Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing 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.	O&M ESHS MP developed and implemented Number of employees trained on occupational health and safety PPE procured and being used by the employees Fire extinguishing facilities at the plant First aid kit on site Signage installed at the plant Number of inspection missions competed Annual Audits	Project Developer	Inspection reports Record of accidents and near misses Corrective Action Reports	Plan developed prior to start of Operation. Monitoring carried out during weekly and monthly audits. Mitigation to be carried out as and when identified.
Noise and Vibration	Carry out an operational noise survey in the event of complaints being received.	Levels of noise and vibration produced at the site Number of Noise complaints received	Project Developer	Inspections Project Grievance Mechanism	In the event of a complaint being received.

Impact	Mitigation Measures	MP Reference and KPI (if appropriate)	Responsibility	Monitoring Means	Frequency
		Number of inspection missions completed			
Socio-economic	Continuing stakeholder engagement in accordance with the SEP and manage expectations in terms of the number of employment opportunities generated during operations. Continued implementation of the Local Recruitment & Employment Plan in consultation with the local community. Continued implementation of community grievance mechanism. Continued implementation and compliance with O&M ESHS MP. Development of Security Management Plan and use of private security personnel. National Guard will not be used to provide security.	Stakeholder Engagement Plan Stakeholder engagement activities. Number of grievances recorded. Number of local workers hired. Security Management Plan	Contractor Project Developer	Inspection reports Community consultation. Project Grievance Mechanism	Monitoring carried out during detailed monthly audits. .

Appendix C 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
Air Quality					
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.
Noise and vibration					
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	Construction limits: 70 dBA Operation limits: Daytime: 55 dBA Night-time: 45 dBA	Noise measurements to be taken in the event of a valid complaint being received.	Independent 3rd 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.
Hydrology and Water Quality					
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.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Loss of habitat and disturbance to waterbodies.	Water Management Plan	Construction Decommissioning	Confirmation of compliance with measures specified in the Water Management Plan. Refer to the Water 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 3rd 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 Management Plan	Construction Operation Decommissioning	Confirmation of compliance with measures specified in the Water Management Plan as it relates to waterbodies. Refer to the Water 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 Management Plan	Construction Operation Decommissioning	Confirmation of compliance with measures specified in the Water Management Plan as it relates to sewage effluent. Refer to the Water 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.
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
Geology and Soils					

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
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
Biodiversity					
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 3rd 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 3rd 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 3rd 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 3rd party ecology as required.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
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 3rd party ecology as required.
Occupational Health and Safety					
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.
Waste					
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 Management Plan	Construction Operation Decommissioning	Confirmation of implementation of the Water 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.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
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.
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.
Security					
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.	• Confirmation of implementation of the Water Management Plan	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					
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.
Archaeology and Cultural Heritage					

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
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.
Visual and Landscape					
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.
Socio-economic					
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.

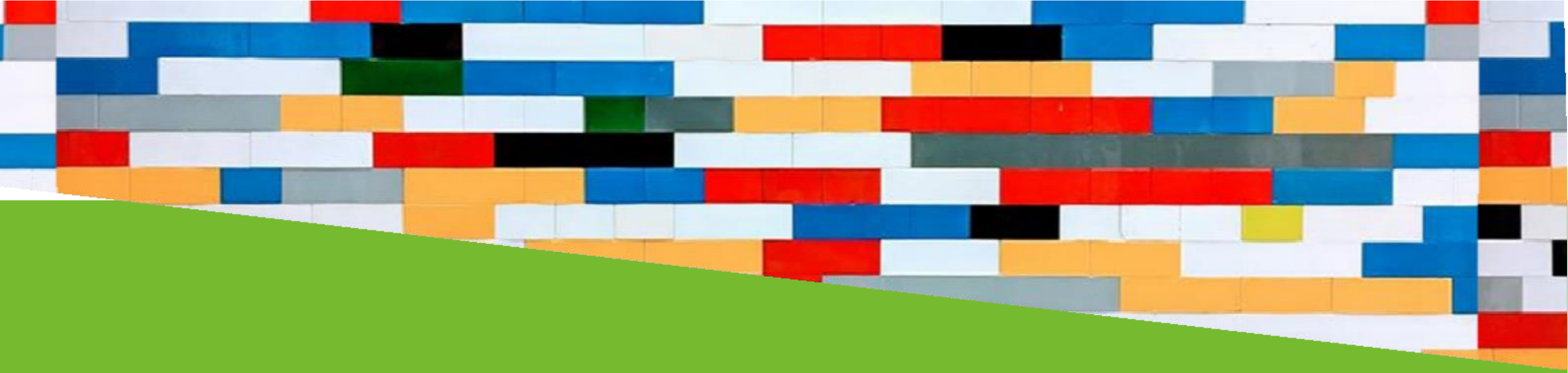
Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
Socio-economic – population and economy	Adherence to GIIP with respect to construction works.	Construction	Visual inspection of construction works	During weekly checks and monthly 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.
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.

Environmental component	Key performance indicators	Project phase	Parameter to be measured	Sampling frequency	Responsibility
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.
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.
Traffic and Transportation					
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 D Turnstone Ecology CHA Report

SEE SEPARATE ATTACHMENT

Appendix E DRAFT Central Asian Tortoise Relocation Report



CENTRAL ASIAN TORTOISE RELOCATION REPORT

220 MW Solar Farm in Kattakurgan, Samarkand, Uzbekistan

Green Business Innovation

DRAFT V1

Nur Samarkand Solar FE

16.12.2022

TABLE OF CONTENTS

1 INTRODUCTION

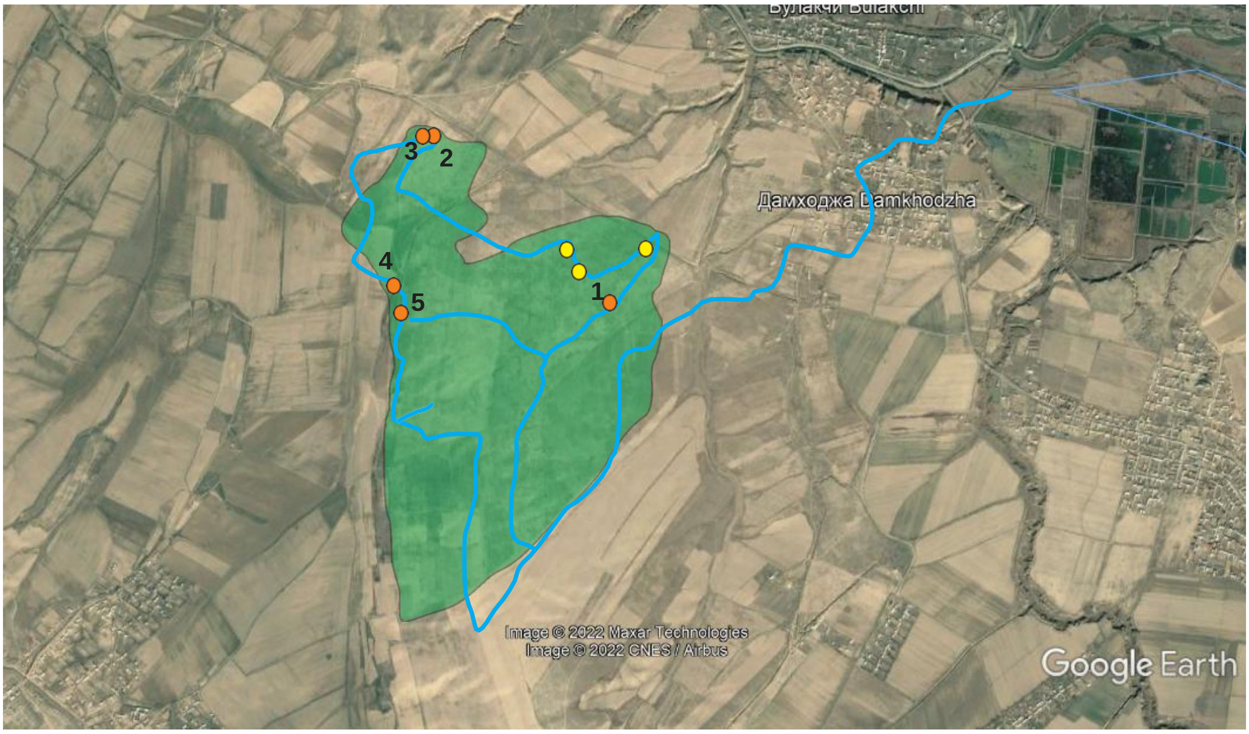
1.1 Overview

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 State Ecology in May 2022.

1.2 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, only 5 individuals of species were recorded at the total transect length of 12.4 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: Figure1**.** Herpetological survey, April, 2022. The tracks of April observation; an orange circles – *Testudo horsfieldii*; yellow circle marked the burrows of *Testudo horsfieldii*.

The census showed that the population density of the tortoise does not exceed 0.1 ind./ha. The state of the carapace of many individuals also manifests itself in the extremely depressed state of this population. Almost all tortoises show injuries, probably traces of ploughing the territory.

The project site is surrounded by ploughed fields for many kilometres around. In this regard, it turned out to be problematic to find a suitable site for the relocation of tortoises from the project area.

Recommended actions:

- Creation of the "Closed Zones", which will be located on the territory of the object (behind the fence). This area should represent biotopes and serve as an indicator of the presence of protected species. It will serve as a kind of buffer zone for the facility, and at the same time, a kind of nature reserve where wild animals can live peacefully. Depending on the construction project, I can give recommendations on where it is most appropriate to allocate a buffer zone at the facility.

The population density of *Testudo horsfieldii* in the project area extremely low. According to our estimates, only a few dozen tortoises inhabit the project area (no more than 20-30).

- In order to protect tortoises in the project area, it is recommended to fence off a plot of about 50x50 meters, in a suitable biotope with developed vegetation and a large number of bushes.
- Prior to the start the construction work, necessary to scan the entire territory and relocate all tortoises to this enclosure for the entire period of active construction. Captured tortoises should be tagged and photographed before being placed in the enclosure. This will enable monitoring and control of the moved tortoises. If necessary, organize the feeding of tortoises before they hibernate.
- In the next year it will be possible to remove the fence of the enclosure and the tortoises will be able to disperse around the project area and live in their original areas. At the same time, tortoises can quite successfully live within inside the project area, because they natural habitats (beams, ravines, gullies and depressions) will not been deeply affected of the construction process. However, it is necessary to take into account the design specifics of the location of solar panels on the site, how close they will be located to each other, in which area the top layer of soil will be removed to level the surface, whether it is expected to use herbicides or other chemicals during the operation of this area. The answers of these questions will determine the choice of strategy.

Source: April survey, 2022. Central Asian Tortoise feeding in the ravine.

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 438 ha area that required for construction of the solar PV farm.

Total 52 tortoises were caught and relocated to the receptor area - Nursery Site in the project area, suggesting 0.1 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:

5. Searching for active tortoises was conducted on 9-14 June (+ 2 days nursery arrangement time) in Kattakurgan. 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 Samarkand Regional ecology department.

6. 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 (Zone 1, Map 1) was marked to inform the pre-works ecological walkover survey to have the area re-checked by the EPC before clearing.

Each day 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 these 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 №ЗРУ- 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 Goscoecology was sent to Samarkand 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.

Samarkand region Department for Ecology and Environmental Protection is regional department in charge of coordination and control of all environmental issues for Nur Samarkand Solar project.

Relocation of animals was monitored by assigned representative of Samarkand regional Department for Ecology and Environmental Protection (Rusiboev Dilmurod). 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 gional Department for Ecology and Environmental Protection, Nur Samarkand Solar representative and consultants.

2 TORTOISE RELOCATION METHODOLOGY

2.1 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.

2.2 Receptor Site Selection- Nursery site

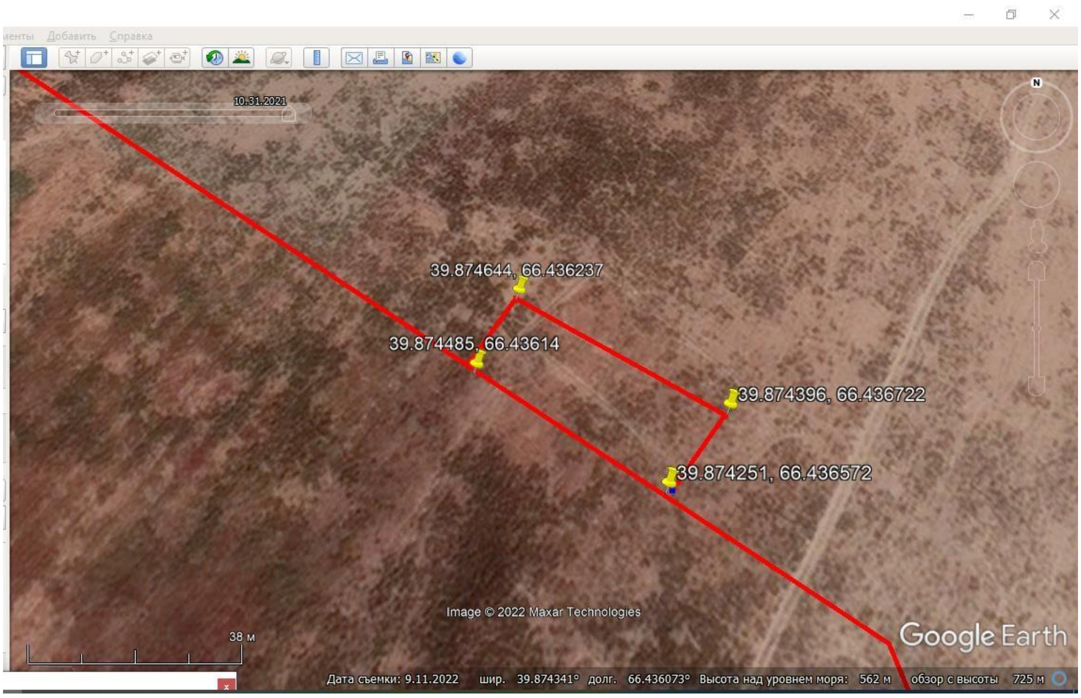
The results of the assessment conducted in April 22 showed the relatively small number of tortoises population in the area, and most importantly, there is no suitable area for relocation within a 20 km zone around the project site.

It was recommended to fence off a plot of about 50x50 meters, in a suitable biotope with developed vegetation and a large number of bushes and relocate tortoises for the period of construction to the created nursery in the project site.

The nursery site selection was undertaken in consultation with Herpetologist (methodology advisor) and head of bio control department of Samarkand regional ecology (Map 3, Appendix 2) and confirmed by the Samarkand regional ecology.

Nursery site coordinates are as follows:

- 39.874644,66.436237
- 39.874485,66.436141
- 39.874396,66.436722
- 39.874251,66.436572



It is a square plot of 50x70 meters. Selected area in the north-west edge of the project area. Selected area is characterized as typical habitat for tortoises with ravines, gullies where vegetation lasts longer and there are enough shelters.

Following specialist's recommendations, the fence was installed 40 cm underground and 60 cm above the ground. The height enough to protect the nursery from grazing.

Source:Tortoise relocation, fencing the nursery, June 2022

2.3 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 yellow color that is easily noticeable.

Source: Survey in June, 2022. Marking the tortoises

3 RESULTS

3.1 Relocation results

Total 52 tortoises were caught and relocated to the nursery site. Map 2 and3 in the Appendix 2 shows the area where the tortoises were collected and relocated.

Source: Tortoise relocation, June, 2022

Source: Tortoise relocation, June, 2022

Before placing the tortoises in the Nursery site, preparatory measures were undertaken.
To make the digging process for tortoises in the nursery site easier, the team has prepared burrows that made the upper soil softer and allowed the tortoises to go underground easier.

Source: Tortoise relocation, Nursery site arrangement, June, 2022

Also the 3 tons of water was delivered to the nursery site to additionally soften the soil and cool down the surface that helped tortoises to start the estivation season. The team continued to monitor the process for two consecutive days and after that visited the area regularly next two weeks.

Source: Source: Tortoise relocation, June, 2022

3.2 Special attention zone

The location of tortoises, burrows and traces were used to inform Special attention zone (Zone 1) (Map 1 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.

4 RELOCATED ANIMALS STATISTICS

Relocated reptiles details are provided in the attached relocation protocol:

The statistics of relocated

- Gender distribution: 38 females, 8 males, 6 immature.
- Condition: 4 individuals with very good condition, 20 - normal, 28- satisfactory;
- Age: from 1 to 15 years;

Provided data can be used for further monitoring and inform the research of the herpetofauna of the area.

Procedures undertaken:

Communication with Samarkand Department of Goscomecology was kept on regular basis during relocation survey. Head of the Department for Biodiversity and Protected Areas was appointed by Samarkand 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.

5 FURTHER MITIGATION AND MONITORING REQUIREMENTS

Further mitigation requirements/prescriptions described in the BAP should be observed.

APPENDCES

APPENDIX 1. TEAM DETAILS

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;
- Reseach for establishment of new protected areas and national nature parks in Central Kysilkum, Babatak moutines, Tamdy Aktau mountines;
- 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

Wor*k 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 Automile 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 Colleage , 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 Reseach 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 SpecialistVeterinarian, State Vet Control, Navoi

   2008- 2009 Research Lab Assistant, Samarkand Agrarian institute

   Education :

   Samarkand Agrarian institute, Department of Veterenary , 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”

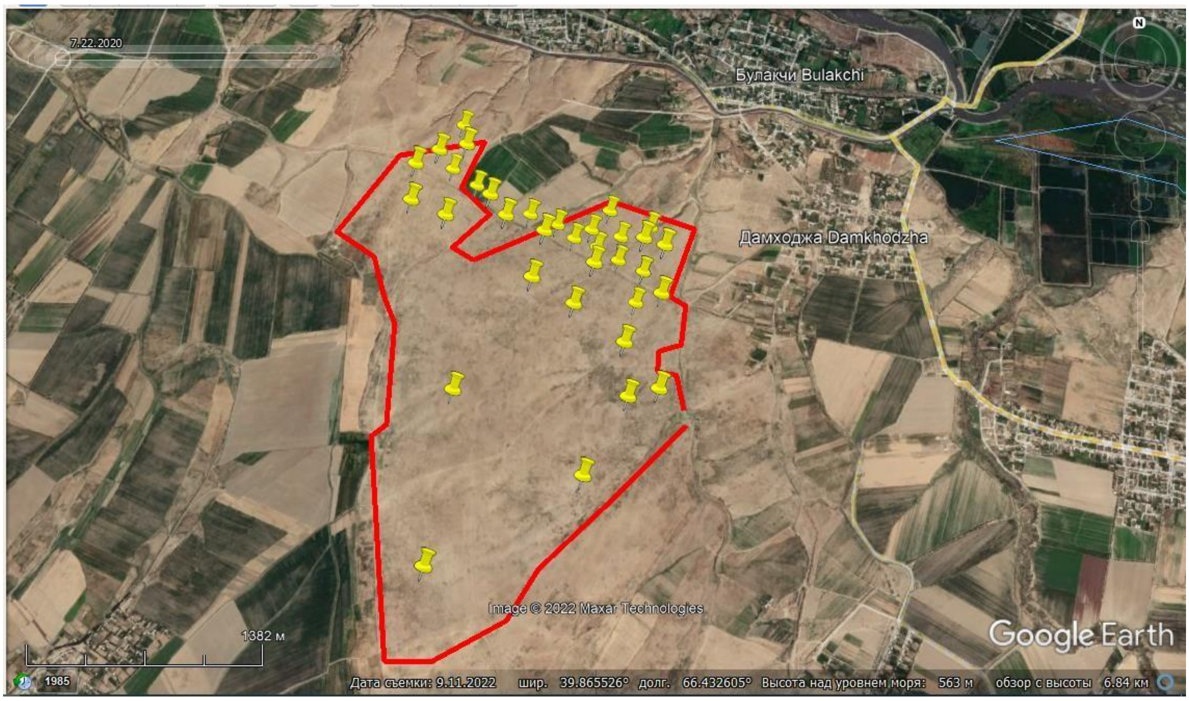
APPENDIX 2. MAPS

Map 1. *Survey protocol: division of area*

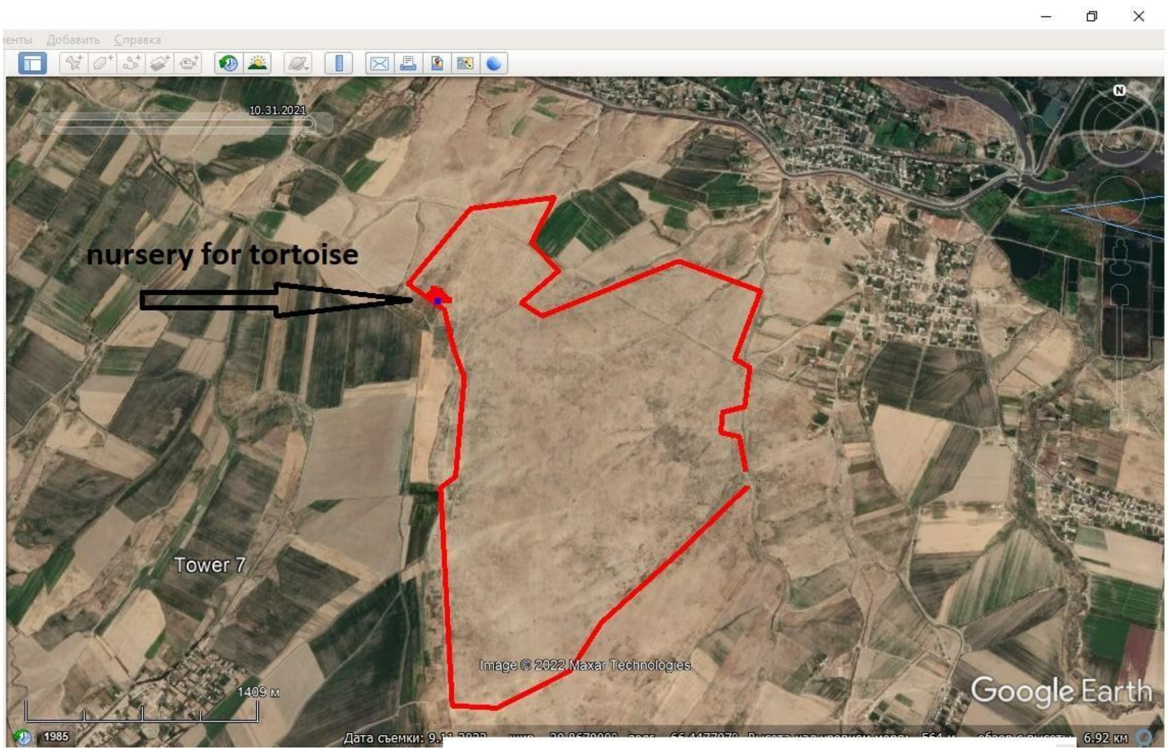
1 Zone –tortoise high concentration zone (Special attention zone)

2 Zone – low density zone

Map 2. Tortoise location map



Map 3. Tortoise nursery site



APPENDIX 3: PERMIT AND RELOCATION PROTOCOL

Relocation permit of Goscomecology

O'ZBEKISTON RESPUBLIKASI EKOLOGIYA VA ATROF-MUHITNI MUHOFAZA QILISH DAVLAT QO'MITASI RAISINING 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

2022-yil "10" 06 02-02/1-756 -son Toshkent sh.

Жиззах вилояти Экология ва атроф-муҳитни муҳофаза қилиш бошқармаси

Самарқанд вилояти Экология ва атроф-муҳитни 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 биохилмахилликка салбий таъсирини минималлаштириш ва (2019 йилда Ўзбекистон Республикаси Қизил китобига киритилган) ўртаосиё чўл тошбақасининг биологик фаоллик вактини инобатга олган холда, ҳаётига зарар етказиш хавфининиг 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-муҳитни муҳофаза қилиш бошқармаларидан мазкур тадбирларда иштирок этиш 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 биохилмахилликни асраш бошқармасига ҳисобот беришингиз топширилади.

Илова: _ варақда

Раиснинг биринчи ўринбосари У.Халилов

Relocation protocols signed by Goscomecology.

Утверждаю
Компания подрядчик
_______________GBI consult

GREEN
BUSINESS
INNOVATION

20.06.2022
Самарканд

Акт
о переселении
диких животных

Мы, нижеподписавшиеся, представитель ИП ООО «NUR SAMARKAND SOLAR PV», реализующий инвестиционный проект по строительству солнечной электростанции мощностью 220 МВт составили настоящий акт в присутствии представителя Самаркандская 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 39.874458, 66.436436
Животные были помещены в временный загон размером в на территории объекта и 20*50 метром. По завершению строительства будут обратно выпущены на территорию.

Список животных и спецификация приводятся в (Приложение 1.)

Акт составлен в двух экземплярах, по экземпляру каждой из сторон.

Стороны:

ИП ООО «NUR SAMARKAND SOLAR PV»,

__________ Хуршид Караматов

Представитель Самаркандская областного управления экологии и охране окружающей среды:

__________ Д.Рўзибоев, Начальник отдела управления по сохранения биоразнообразия, оцифровки и ведения кадастра

Консультанты:

__________Ф. Агзамов, специалист по биоразнообразию, консультант, GBI consult

__________С. Юсупова, директор GBI consult

Приложение 1:

Список и спецификация животных:

- ID номер, пол, длина панциря, фото (Фото будут размещены в Гугл диск)

№	Животное	Детали (пол, возраст, состояние, длина панциря, вес, координаты нахождения, фото)
1	Черепаха	Самка 16 см
2	Черепаха	Самка 16,5 см
3	Черепаха	Самка 15 см
4	Черепаха	Самка 15 см
5	Черепаха	Самка 13 см
6	Черепаха	Самец 11 см
7	Черепаха	Самец 13 см
8	Черепаха	Самка 17 см
9	Черепаха	Самка 17 см
10	Черепаха	Самка 15,5 см
11	Черепаха	Самец 13,5 см
12	Черепаха	Самец 13 см
13	Черепаха	Самка 14 см
14	Черепаха	Самец 12 см
15	Черепаха	Самец 11 см
16	Черепаха	Самка 14 см
17	Черепаха	Самка 14 см
18	Черепаха	Самка 16 см
19	Черепаха	Самка 17 см
20	Черепаха	Самец 12 см
21	Черепаха	Самка 16 см
22	Черепаха	Самка 16 см
23	Черепаха	Самка 14,5 см
24	Черепаха	Самец 17 см
25	Черепаха	Самка 17 см
26	Черепаха	Самка 10 см
27	Черепаха	Самка 14 см
28	Черепаха	Самка 16 см
29	Черепаха	Самка 16 см
30	Черепаха	Самка 15 см
31	Черепаха	Самка 15,5 см
32	Черепаха	Самка 17 см
33	Черепаха	Самка см 12
34	Черепаха	Самка 16 см
35	Черепаха	Самка 15 см
36	Черепаха	Самец 12 см
37	Черепаха	Самка 13 см
38	Черепаха	Самка 15 см
39	Черепаха	Самка 13,5
40	Черепаха	Самка 14 см
41	Черепаха	Самец 12 см
42	Черепаха	Самка 16 см
43	Черепаха	Самка 16 см
44	Черепаха	Самка 14,5 см
45	Черепаха	Самец 10 см
46	Черепаха	Самка 17 см
47	Черепаха	Самка 13,5 см
48	Черепаха	Самец 12 см
49	Черепаха	Самка 16 см
50	Черепаха	Самец 10 см
51	Черепаха	Самка 15 см
52	Черепаха	Самец 13 см

Мониторил:

_________________ Д.Рўзибоев, Начальник отдела управления по сохранения биоразнообразия, оцифровки и ведения кадастра

Фото прилагаются

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