Environmental and Social Impact Assessment

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Uzbekistan: Samarkand I Solar PV and BESS Project

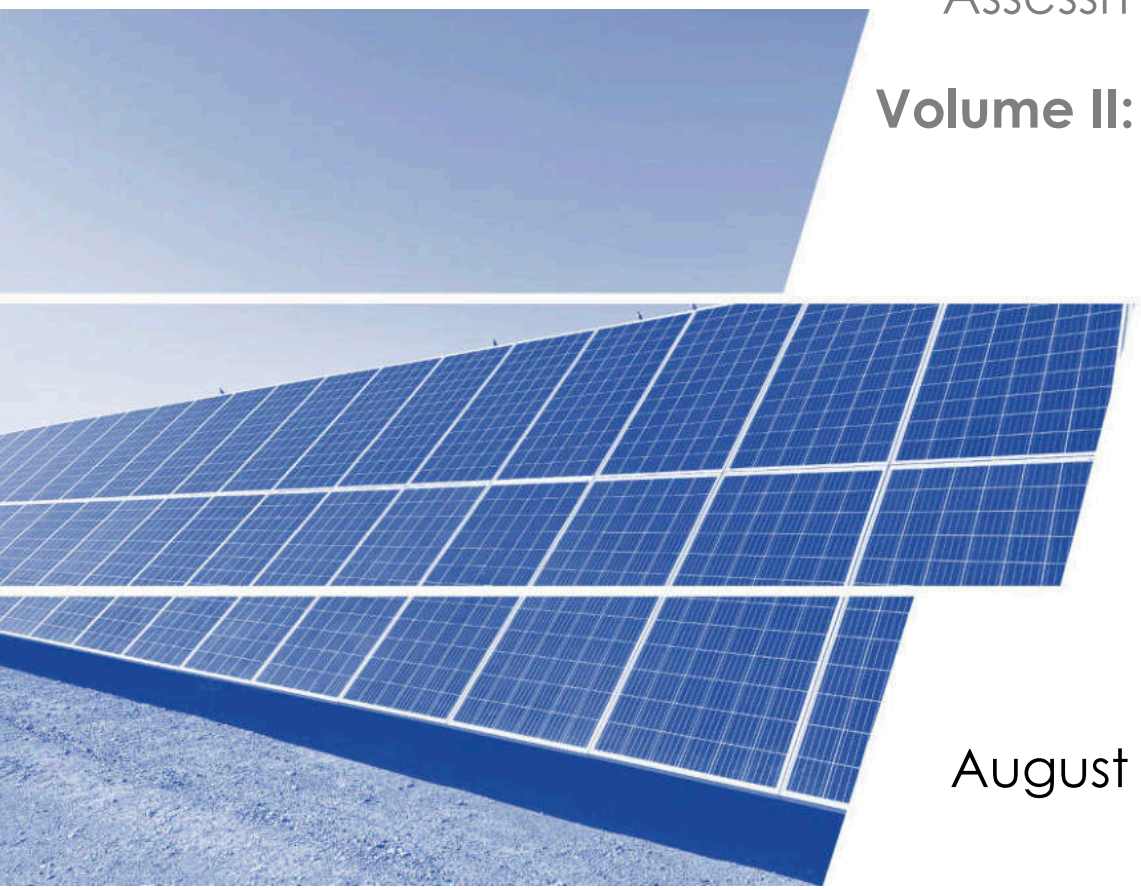
PART 1

Prepared by ACWA Power for the Asian Development Bank (ADB).

Samarkand I Solar PV and BESS Project
Republic of Uzbekistan

Environmental and Social Impact Assessment (ESIA)

Volume II: Main Text



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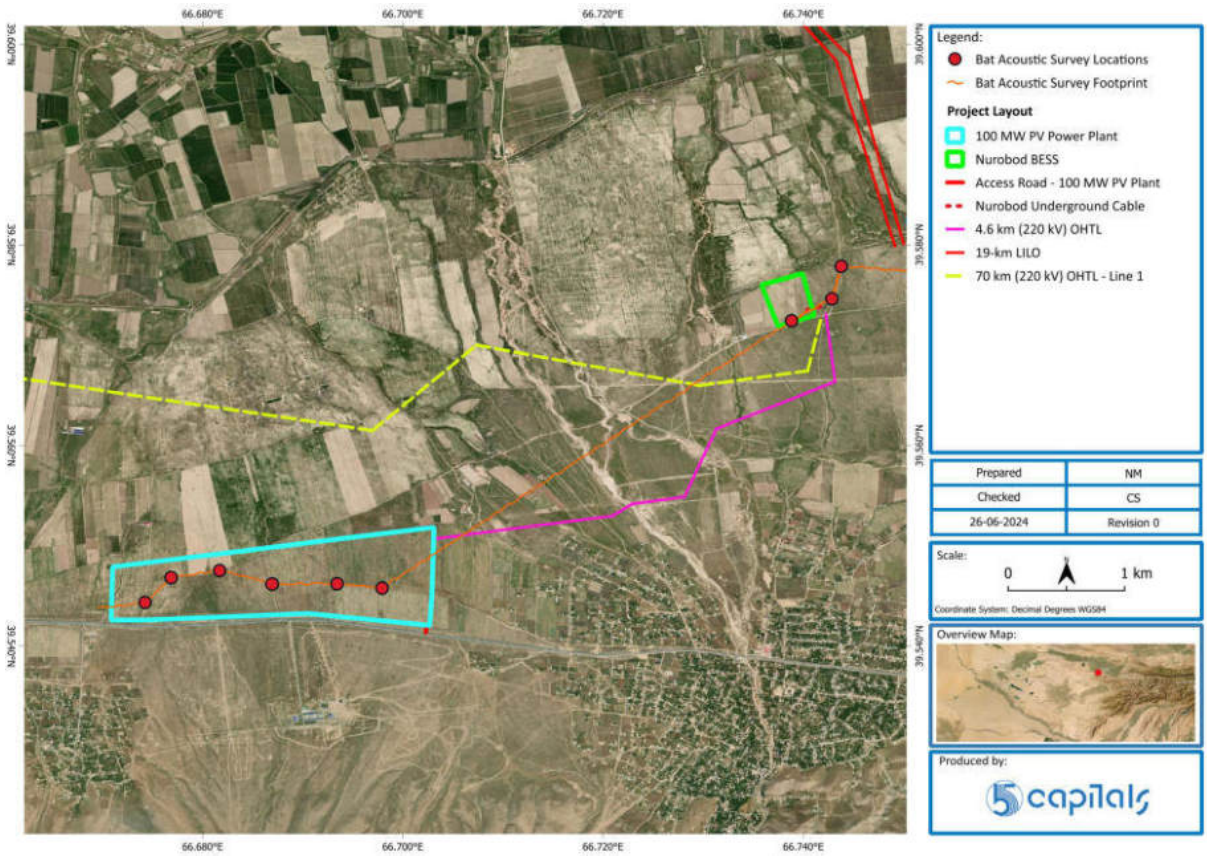

LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
AC	Alternating Current
ADB	Asian Development Bank
AEP	Annual Exceedance Probability
AIS	Air-Insulated Sub-Station
AoI	Area of Influence
AZE	Alliance for Zero Extinction Sites
BAP	Biodiversity Action Plan
BESS	Battery Energy Storage System
BMEP	Biodiversity Monitoring and Evaluation Plan
BMP	Biodiversity Management Plan
BMS	Battery Management System
BoM	Bill of Materials
CDM	Clean Development Mechanism
CESMP	Construction Environmental & Social Management Plan
CH	Critical Habitat
CHA	Critical Habitat Assessment
CLOs	Community Liaison Officers
COD	Commercial Operation Dates
CRU	Climatic Research Unit
DC	Direct Current
DEM	Digital Elevation Model
DFIs	Development Finance Institutions
DoD	Depth of Discharge
EBA	Endemic Bird Areas
EIA	Environmental Impact Assessment
EMS	Energy Management System
EPFIs	Equator Principles Financial Institutions
ESG	Environmental and Social Governance
ESIA	Environmental and Social Impact Assessment
ESMS	Environmental and Social Management System
ETC	Early Transition Countries
FGD	Focus Group Discussions
GBV	Potential Gender-Based Violence
GCM	Global Climate Models
GHG	Greenhouse gas
GHI	Global Horizontal Irradiance
GIIP	Good International Industry Practice
HGVs	Heavy Goods Vehicles

ABBREVIATION	MEANING
HSSE	Health Safety Security and Environmental
HV	High-Voltage
HVAC	Heating, Ventilation and Air Conditioning
IBA	Important Bird Areas
IFIs	International Financial Institutions
IPs	Indigenous Peoples
JBIC	Japanese Bank of International Cooperation
JSC the	Joint-Stock Company
KBA	Key Biodiversity Areas
KIIs	Key Informant Interviews
LALRP	Land Acquisition and Livelihood Restoration Plan
LCA	Landscape Character Assessment
LGA	Local Government Authorities
LILO	Loop-In-Loop-Out
LLA	Land Lease Agreement
MDAs	National Ministries, Departments, and Agencies
MEEPCC	Ministry of Ecology, Environmental Protection and Climate Change
MME	Multi-Model Ensemble
MPC	Maximum Permissible Concentrations
MV	Medium-Voltage
NCC	National Climate Contributions
NDC	Nationally Determined Contribution
NEGU	National Electric Grid of Uzbekistan
NFPA	National Fire Protection Association
NG	Net Gain
NGOs	Non-Governmental Organizations
NNL	Not Net Loss
NTS	Non-Technical Summary
O&M	Operation and Maintenance
OESMP	Operational Environmental & Social Management Plan
OTL	Overhead Transmission Line
PAC	Project-Affected Communities
PAs	Protected Areas
PCS	Power Conversion System
PGA	Peak Ground Acceleration
PICs	Project Information Centres
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PSs	IFC Performance Standards

ABBREVIATION	MEANING
PV	Photo-Voltaic
RCP	Representative Concentration Pathway
SACs	Special Areas of Conservation
SBV	Significant Biodiversity Value
SCADA	Supervisory Control and Data Acquisition
SCMP	Supply Chain Management Plan
SEA	Sexual Exploitation and Abuse
SEE	State Environmental Expertise
SEP	Stakeholder Engagement Plan
SoC	State of Charge
SPAs	Special Protection Areas
SSP	Shared Socioeconomic Pathway
STCs	Standard Testing Conditions
UNFCCC	United Nations Framework for the Convention on Climate Change
UPS	Uninterruptable Power System
VECs	Valued Environmental Components
VES	Vertical Electrical Sounding
VOCs	Volatile Organic Compounds
VP	Vantage Point
ZTV	Zone of Theoretical Visibility

1 INTRODUCTION

1.1 National Energy Context

Uzbekistan is amongst the fastest growing economies in the Central Asian region, with a steady demand for energy. In 2018, the country's power consumption reached 50 million TWh, and the domestic demand for power is projected to rise at an annual rate of 4%, due to continued population growth and industrial expansion. In 2019, the installed capacity of electricity generation in Uzbekistan totalled 63 TWh, with natural gas fired thermal power plants accounting for 85% of this production.

The steady uptrend in power consumption, declining yield of aged power plants and emergent climatic pressures have led to unprecedented power supply shortages, particularly within the regions of Tashkent, Andijan, Namangan, Ferghana, Samarkand, and Surkhandarya. In December 2022, severe grid overload ensued from widespread spikes in electrical demand for domestic heating under extreme winter temperatures, culminating in a series of power blackouts across Tashkent Region. The emerging power crisis in Uzbekistan has prompted a priority agenda for the development of the country's renewable energy base. This plan aligns with the country's policy shift towards decarbonization and a greener economy.

In 2018, Uzbekistan ratified the Paris agreement, and in 2021 the country submitted its latest Nationally Determined Contribution (NDC) to global carbon footprint cutbacks. The NDC includes a commitment to reduce domestic greenhouse gas (GHG) emissions by 35% relative to its 2010 GHG output by 2030. In step with the power security emergency and efforts towards green transition, the Government of Uzbekistan introduced several sectoral strategies and laws to scale up the country's renewable power infrastructure. These instruments include the Strategy for the Transition of the Republic of Uzbekistan to the Green Economy for the Period (2019-2030), Law on the Use of Renewable Energy (2019), and the Transmission Network Development Plan to 2030. Amongst other objectives, the reforms mandate a larger renewable contribution (25%) to Uzbekistan's energy mix, and upgrade of interconnection facilities for the integration of additional power sources, efficient and stable transmission, and international electricity trade.

To promote private sector inclusion and international collaboration in the country's pursuit of a carbon-neutral economy, the Government of Uzbekistan has also enhanced the policy landscape on these fronts, with the execution of the Law on Public-Private Partnership (PPP, 2019) and the Presidential Decree on Measures to Further Improve the Mechanisms of Attracting Foreign Direct Investment to the Economy of the Republic.

1.2 Project Rationale and Roadmap

The emergence of a dire energy crisis at the height of recent peak-demand periods in Uzbekistan has been met with urgent measures to augment the country's installed power capacity. This agenda will largely involve the establishment of additional renewable energy sources, with a view to attaining a solar power capacity of 10,000 MW by 2030, amongst other targets.

With regard to renewable energy production, Uzbekistan offers remarkable technical solar energy potential totalling 7,411 PJ, which is fourfold higher than the country's current electricity consumption level. In terms of local Photo-Voltaic (PV) power potential, recent solar resource assessments across the country have indicated a Global Horizontal Irradiance (GHI) value of 4.52 kWh per square metre, which equates to 2,000 hours of sunshine per year. This potential is attributable to the country's central geographic location, distance from large waterbodies, and predominantly anticyclonic conditions.

To leverage the country's solar resources in response to the current power crisis and climate agenda, the Government of Uzbekistan has passed a Presidential Decree on Measures to Increase the Effectiveness of Reforms Aimed at the Transition of the Republic of Uzbekistan to A "Green" Economy by 2030 (2022). In its commitment to include private sector machinery in the fast-paced development of the country's energy infrastructure, the Ministry of Energy of Uzbekistan has signed a USD 7.5 billion investment agreement with ACWA Power (hereinafter the Project Developer).

In furtherance of the master agreement, on 19 March 2023, the Joint-Stock Company (JSC) National Electric Grid of Uzbekistan (NEGU) entered into a Power Purchase Agreement (PPA) with ACWA Power (hereinafter Project Developer), for the fast-track development and operation of two PV power plants (100 MW and 400 MW) and a 500-megawatt hour (MWh) Battery Energy Storage System (BESS) in Samarkand Region, hereinafter referred to as the Project. The agreement also includes the construction of related interconnection facilities (i.e., and powerlines). The agreement will be executed over a period of 25 years and 20 years from the Commercial Operation Dates (COD) for the PV power plant and BESS components respectively. Upon the completion of the agreement term, the project facilities will be handed over to the off-taker (NEGU) for subsequent operation and maintenance (O&M).

To this end, the project company, ACWA Power Sazagan Solar 1 LLC, was incorporated on 2 March 2023. In preparation for the Project, the Project Developer is seeking international financing from Development Finance Institutions (DFIs) including the Asian Development Bank (ADB), International Finance Corporation (IFC), and Japan Bank for International Cooperation (JBIC) (hereinafter Project Lenders).

To ensure comprehensive planning and permitting, in keeping with applicable E&S appraisal criteria, the Project Developer has commissioned 5 Capitals (hereinafter the Consultant) to undertake a bankable Environmental and Social Impact Assessment (ESIA) for the Project. The Consultant has engaged Juru as a local sub-consultant, for support in the completion of the national EIA, ESIA and LALRP surveys, and related stakeholder engagement.

1.3 E&S Assessment Background

The Project will involve the greenfield development of power generation, storage and interconnection facilities in Samarkand Region. The Project Developer is seeking to finance the Project in cooperation with several International Financial Institutions (IFIs), including ADB, IFC and JBIC). The operations and activities of these FIs are guided by E&S policies that serve to mainstream the identification, assessment and management of the E&S risks associated with investment projects, in furtherance of the global initiative on sustainable development.

The commitment towards ensuring environmental and socioeconomic sustainability of development projects is enshrined in numerous international conventions and IFI performance benchmarks addressing topical developmental issues, such as biodiversity conservation, pollution control, climate change, preservation of cultural heritage, protection of human rights, public participation in decision-making, and access to information. This commitment is also founded on the principles of transparency, accountability, and good governance, which underpin the mandates of the IFIs in relation to their partners, clients, and stakeholders (including project-affected communities).

As set out in the broad-based international accords and industry guidelines, beyond the management of E&S risks, project-specific E&S risk appraisal processes are aimed at creating sustainable and equitable project benefits for potential beneficiaries, and pre-empting legal, financial, and reputational risks associated with failure to meet relevant host country regulatory requirements, project development objectives and IFI operational policies. An expansive discussion of the legal and administrative context for the Project's E&S appraisal is provided in Section 3 of this Report, with an elaboration on the Project's E&S risk categorization.

The Project is subject to a dual E&S impact assessment framework prior to the start of operations, as outlined below:

- Dedicated (facility-specific), phased national EIA studies aimed at assessing potential E&S impacts and developing appropriate management measures in line with national laws and regulations. The requisite outcomes of this appraisal are positive conclusions at each stage of the study, whereby interim E&S clearance is issued (i) in advance of the Project's construction phase, and (ii) final E&S clearance is issued prior to the Project's operational phase.

- A bankable ESIA study aimed at ensuring (i) statutory E&S compliance, (ii) delivery on ratified E&S convention commitments, and (iii) alignment with the mandates, policy objectives, national and sectoral strategies, and E&S requirements of the Project Lenders. Further to the ESIA, an ESDD will be undertaken by the lenders E&S advisor, which will entail the development of an E&S Action Plan (ESAP) that will contain the E&S loan covenants for due compliance in the Project's construction and operational phases.

The E&S impact assessment framework applicable to the Project requires the Project developer to commission national and bankable ESIA studies and an LALRP, and to furnish pertinent information, for an informed appraisal process which aligns with statutory and lender policy requirements.

1.4 Objectives of the ESIA

The objectives of this ESIA in relation to this project include the following:

- Provide an overview of the Project design, identification of sensitive receptors in the Project's area of influence and assessment of Project alternatives.
- Assessment of baseline conditions prior to the development of the Project through review of available data and conducting surveys;
- Assessment of the project's environmental and social impacts for the construction and operational phases;
- Review of compliance obligations, including applicable Uzbekistan regulations and international regulations and standards as well as international lender requirements;
- To engage with key stakeholders and project affected people to disclose Project information, study outcomes, gain lay knowledge about the local environmental and social context, seek feedback on proposal and to understand and map any resettlement requirements.
- Determination of applicable mitigation and management measures including monitoring requirements to be implemented in order to avoid or minimise potential impacts and maximise potential environmental and social gains;
- Consideration of alternatives that can be used for the project leading to reduced impacts and/or greater social and environmental gains.
- Prepare a framework from which the construction phase and operational phase respective environmental and social management systems and plans can be developed and implemented.

1.5 Structure of the ESIA

This ESIA is presented in the following format:

- **Volume 1**: Non-Technical Summary

- A Non-Technical Summary of the ESIA, including the main outcomes, and conclusions.

- **Volume 2**: Main Text, Tables and Figures
  - The assessment of impacts associated with the Project.
- **Volume 3**: Framework for Environmental and Social Management
  - A framework for the development of the Construction and Commissioning and Operational Environmental and Social Management Systems (including associated system structures, documents and management plans) based on the findings from this ESIA. The intention is that this volume (alongside the full ESIA package and other E&S documents) will be issued to the EPC Contractor and O&M Company to develop and implement their project specific ESMS respectively; under the Project Company's E&S Policy.
- **Volume 4**: Appendices

2 PROJECT DESCRIPTION

The following sections elaborate on the facilities, activities and resources planned for the Project's construction and operational phases. This description is based on the information available at the time of this assessment and serves to aid the identification of the Project's E&S aspects and potential impacts.

2.1 Key Project Information

Table 2-1 Key Project Information

PROJECT TITLE	Samarkand I Solar PV and BESS Project
PROJECT DEVELOPER	ACWA Power
PROJECT COMPANY	ACWA Power Sazagan Solar 1 LLC
OFF TAKER	JSC National Electric Grid of Uzbekistan
EPC CONTRACTOR	Larsen and Tourbo (L&T)
O&M COMPANY	NOMAC
ENVIRONMENTAL CONSULTANT	5 Capitals Environmental and Management Consulting (5 Capitals) PO Box 119899, Dubai, UAE Tel: +971 (0) 4 343 5955, Fax: +971 (0) 4 343 9366 www.5capitals.com
POINT OF CONTACT	Ken Wade (Director), Ken.wade@5capitals.com

2.2 Project Location

The project consists of three main components which include (i) the 400 MW PV power plant, (ii) 500 MWh BESS and its interconnection cable, (iii) 70-km 220kv Overhead Transmission Line (OTL), as well as two Loop-In-Loop-Out Connections (LILOs).

The 100 MW and 400 MW PV power plants are located in Nurobod District, about 17 and 78 km from Samarkand City respectively. The BESS and the 150-metre underground cable connecting the facility to an adjacent sub-station are located in Pastdargom District, approximately 12 km from Samarkand City. The planned power plants are linked to the sub-station by a 4.9-kilometre OTL and 70-kilometre OTL respectively, each with a rating of 220 kilovolts (kV). This sub-station will be developed as part of the ongoing Samarkand II solar PV and BESS project.

In addition, the Project will involve the development of two Loop-In-Loop-Out (LILO) connections, which will connect the new sub-station to the grid. Two northward 11-kilometre, 220 kV OTLs and two westward 19-kilometre, 220 kV LILO OTLs will extend from the sub-station towards two existing OTLs.

The relative locations of the planned project facilities are illustrated in Figure 2-1 and Figure 2-2 below.

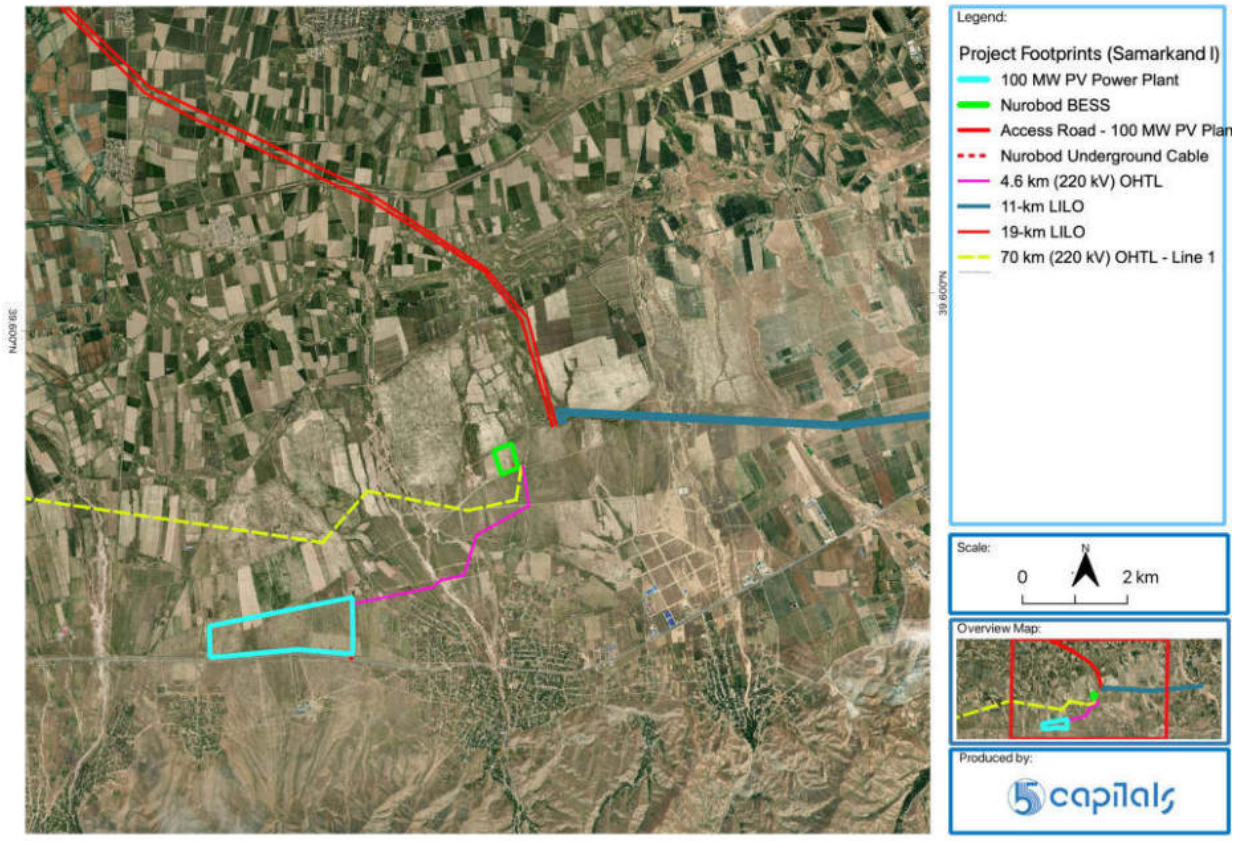

Figure 2-1 Location of the planned 100 MW PV power plant, Nurobod BESS, OTL corridors and new access roads

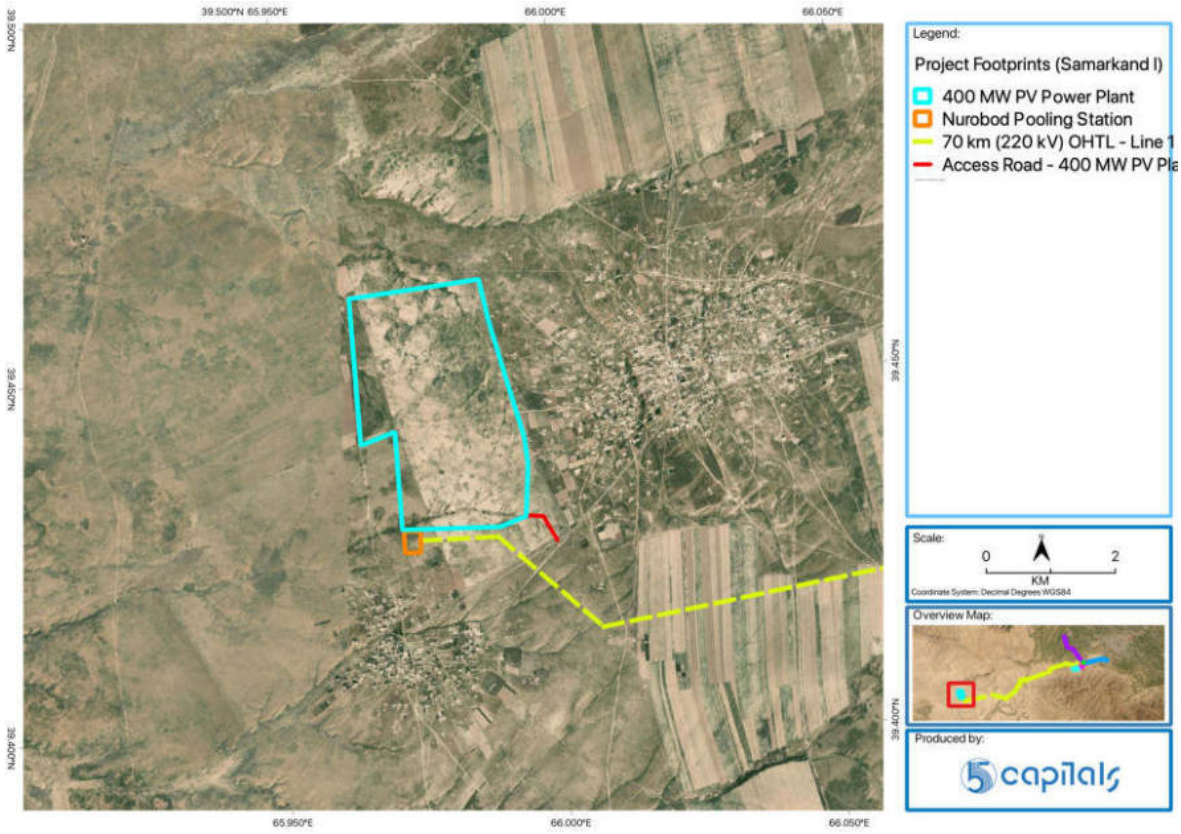

Figure 2-2 Location of the planned 400 MW PV power plant and new access road

Indicative GPS coordinates for the non-linear project facilities are provided in the table below.

Table 2-2 GPS coordinates for the project site boundaries

LATITUDE	LONGITUDE
100 MW PV power plant site	
66.67100788	39.5478947
66.70309628	39.551831
66.70265133	39.54206311
66.69050389	39.54323008
66.67086644	39.54257615
400 MW PV power plant site	
65.96305235	39.4610762
65.98647932	39.46322421
65.99377415	39.44100089
65.99430429	39.43733709
65.99368476	39.43003983
65.98897432	39.42864873
65.97129917	39.42866702
65.97054867	39.44231101

LATITUDE	LONGITUDE
65.96431009	39.44062496
65.94276584	39.40046985
Nurobod BESS site	
65.97156865	39.42845134
65.97454371	39.42844425
65.97455479	39.42544241
65.97167309	39.42538893
Pooling station site	
65.97156865	39.42845134
65.97454371	39.42844425
65.97455479	39.42544241
65.97167309	39.42538893

2.3 Land Acquisition

The Project Developer entered into a PPA with the Ministry of Energy (represented by NEGU JSC) of Uzbekistan in March 2023. On 4th July 2023, a presidential decree was issued to mandate the project plan and its implementation.

Amongst other provisions, the presidential decree sets the legal basis for the expropriation of land within specific sites earmarked for the development of the planned project facilities. The land expropriation process in Uzbekistan mainly begins with the withdrawal of earmarked land into state reserves, on the basis of Land Allotment Orders (LAOs) from district- and regional khokimiyats with existing ownership of the land. Subsequently, land returned to state reserves is reclassified and reallocated to new landholders, on the basis of Land Lease Agreements (LLAs). The LAO for the Project was issued on 20 July 2023, however, no access restrictions and eviction have been enforced to date, and LLAs have not been established for the PV power plants and BESS sites. Further, the detailed design of the planned OTLs is underway, and the footprint of the OTL towers has not been established (i.e., both area and location for pylon types along each OTL).

At present, the majority of the project sites fall within land tracts zoned for agricultural land-use. The Project's land acquisition process will involve the reallocation of the land for industrial use.

The best available estimates for the Project's land-take by facility is summarized in the table below.

Table 2-3 Land take for planned project facilities

SN	PROJECT SITE	OVERALL AREA (HA)
1.	100 MW PV power plant	216
2.	400 MW PV power plant	800
3.	Nurobod BESS and underground cable	16.8
4.	Pooling station	8.5
5.	4.9-km (220 KV) OTL	9.7
6.	70-km (220 kV) OTL	143
7.	11-km (220 kV) OTL	[TBC]
8.	11-km (220 kV) OTL	[TBC]
9.	19-km (220 kV) OTL	[TBC]
10.	19-km (220 kV) OTL	[TBC]
11.	100 MW PV power plant access road	0.016
12.	400 MW PV power plant access road	0.273

2.4 Existing Land-Use

The following sections describe the general land-use within the project sites, with a further outline of current land ownership subject to expropriation. Further information on existing land use and tenure within the project footprint is provided in Section 14 of this Report and the project LALRP.

2.4.1 100 MW PV power plant

The 100 MW PV power plant site is located within a rural area in Nurobod District, which lies about 30 kilometres south-east of the Nurobod district centre, and 18 kilometres south-west of Samarkand City.

Land-use within the site is largely agricultural. Activities identified over the course of the ESIA include small-scale crop farming and livestock rearing. No residential buildings were identified within the site, however several agricultural structures, including a livestock pen were enumerated within the plot. Land-use in the vicinity of the site is largely similar, with the presence of crop farms and livestock pens.

Figure 2-3 Land use within the 100 MW PV plant site

2.4.2 400 MW PV power plant

The 400 MW PV power plant site lies within a rural area in Nurobod District, which lies about 31 kilometres south-west of the Nurobod district centre, and 79 kilometres south-west of Samarkand City.

Land use within the site is predominantly pastoral. Residential property is not present within the site. Land-use in the surrounding vicinity includes small-scale crop farming, and two residential communities.

Figure 2-4 Dry steppe and scrubland within the 400 MW PV plant site

2.4.3 Pooling station

The pooling station site is located next to the 400 MW PV power plant site, in Nurobod District. Land use within the pooling station is largely similar to that within the PV power plant site, with the absence of any residential property.

2.4.4 Nurobod BESS and underground cable

The BESS site is located within a rural area in Pastdargom district, which lies about 8 kilometres south of the town of Juma (district centre), 37 kilometres east of the Nurobod district centre, and 13 kilometres south-west of Samarkand City.

Land within the BESS and underground cable perimeter consists of idle fallowland, with limited seasonal grazing activity. No built assets are present within the site. Land-use in the vicinity of the site relatively varied, with herding, livestock farms, crop farms and quarry sites located within a one-kilometre radius.

Figure 2-5 Denuded, arid landscape within the Nurabad BESS site

2.4.5 70-km and 4.9-km OTLs

The 70-km and 4.9-km OTL routes cut across a rural, agricultural landscape in Nurobod District. Land-use in and around the OTL corridor largely includes crop farming. No residential property was identified within the OTL corridors.


Figure 2-6 Pastural land-use and crop cultivation around the 70-km OTL corridor

2.4.6 11-km and 19-km LILO OTLs

The 11-km and 19-km LILO (OTL) routes cut across an agricultural landscape in Pastdargom District, and a small portion of the 11-km (easterly) LILO extends into Samarkand District. Land-use in and around the OTL corridor is dominated by crop farming. Several residential clusters are located along the northern end of the 19-km LILO corridor, which cuts across a peri-urban expanse adjoining the township of Juma.

Figure 2-7 Pastural land-use and crop cultivation within the 19-km and 11-km LILO corridors

2.5 Initial Identification of E&S Impact Receptors

A preliminary identification of potential E&S receptors (i.e., Valued Environmental Components) located within 1 kilometre of the project site boundaries was carried out based on the examination of satellite imagery, field reconnaissance and ongoing consultations with key stakeholders. As shown in Figure 2-8 below, these receptors include active and abandoned/ decommissioned residential, economic, industrial and utility establishments, as well as surface water bodies. The general Area of Influence (AoI) was set based on the maximum Area of Influence (AoI) expected for potential direct impacts associated with the project facilities.

The following maps and tables provide an overview of the E&S impact receptors pre-identified within the AoI, for the Project's non-linear facilities (with the exception of access roads).

A receptor map is not provided for the planned OTLs, considering the multitude of receptors linked to the extensive footprint of these facilities. A non-visual analysis for this set of receptors is nonetheless provided in Sections 6 through 16 of this report.

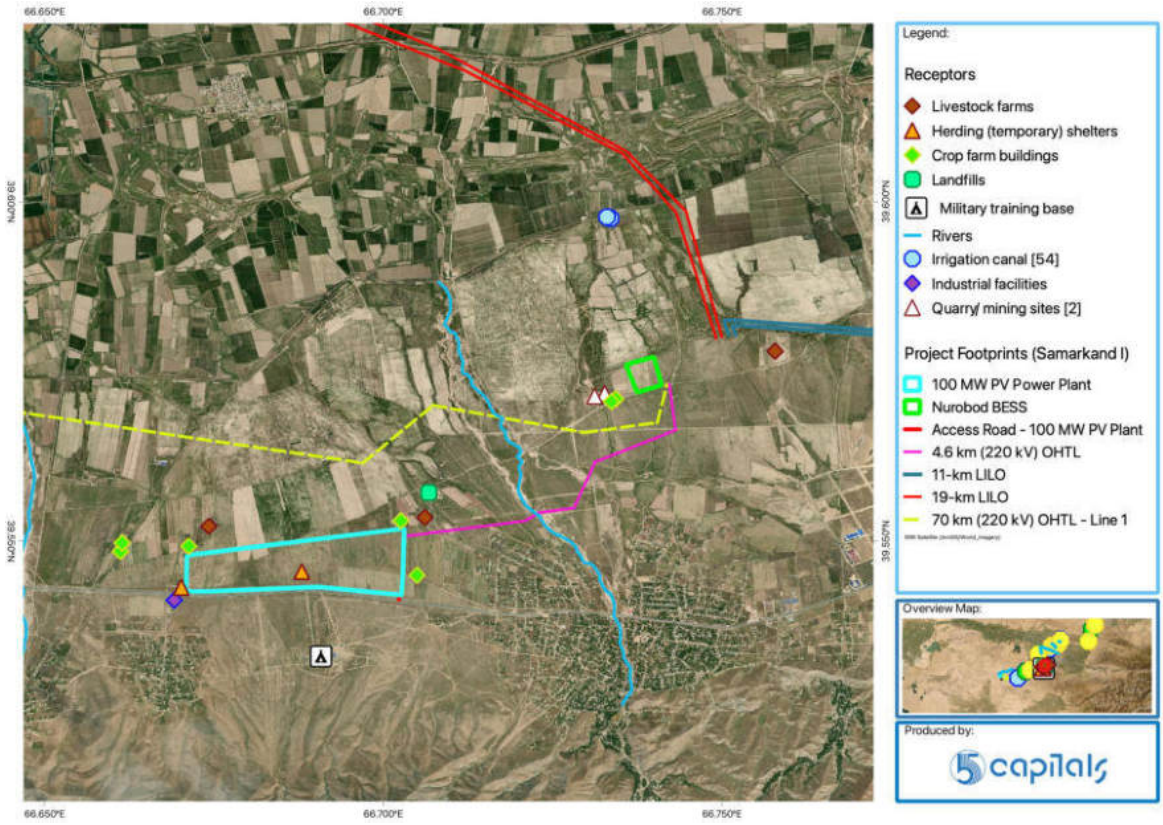

Figure 2-8 Overview of potential E&S impact receptors within the AoI of the Project's main facilities

Table 2-4 below provides a list of the E&S receptors provisionally identified within the general preliminary AoI of the 100 MW PV power plant and Nurobod BESS, with respective summary descriptions.

Table 2-4 Overview of potential E&S impact receptors within one kilometre of the 100 MW PV power plant and Nurobod BESS

Receptor Type	Proximity to Project Sites	Description
Residential building	140 m	Residential building located North of the 100 MW PV power plant site.
Crop farm buildings/ herding structures	60 – 860 m	Agricultural structures located nearby the 100 MW PV power plant include seasonal herding shelters located West and North-East of the site. A livestock pen is also located within the site.
Livestock farms	165 – 425 m	Chicken farm located East of the Nurobod BESS.
Industrial facility	200 m	Aggregate processing facility located south-west of the power plant site, across the A-378 highway.
Quarry	396 – 530 m	Sand mining sites located west of the Nurobod BESS.
Military base	1.06 km	Military training base located south of the 100 MW power plant site, across the A-378 highway.

Receptor Type	Proximity to Project Sites	Description
Landfill	532 m	Engineered, decommissioned landfill located north-east of the site.
Rivers	2.1 – 2.5 km	Aksai and Sazagansai Rivers located west and east of the 100 MW power plant and Nurobod BESS respectively.

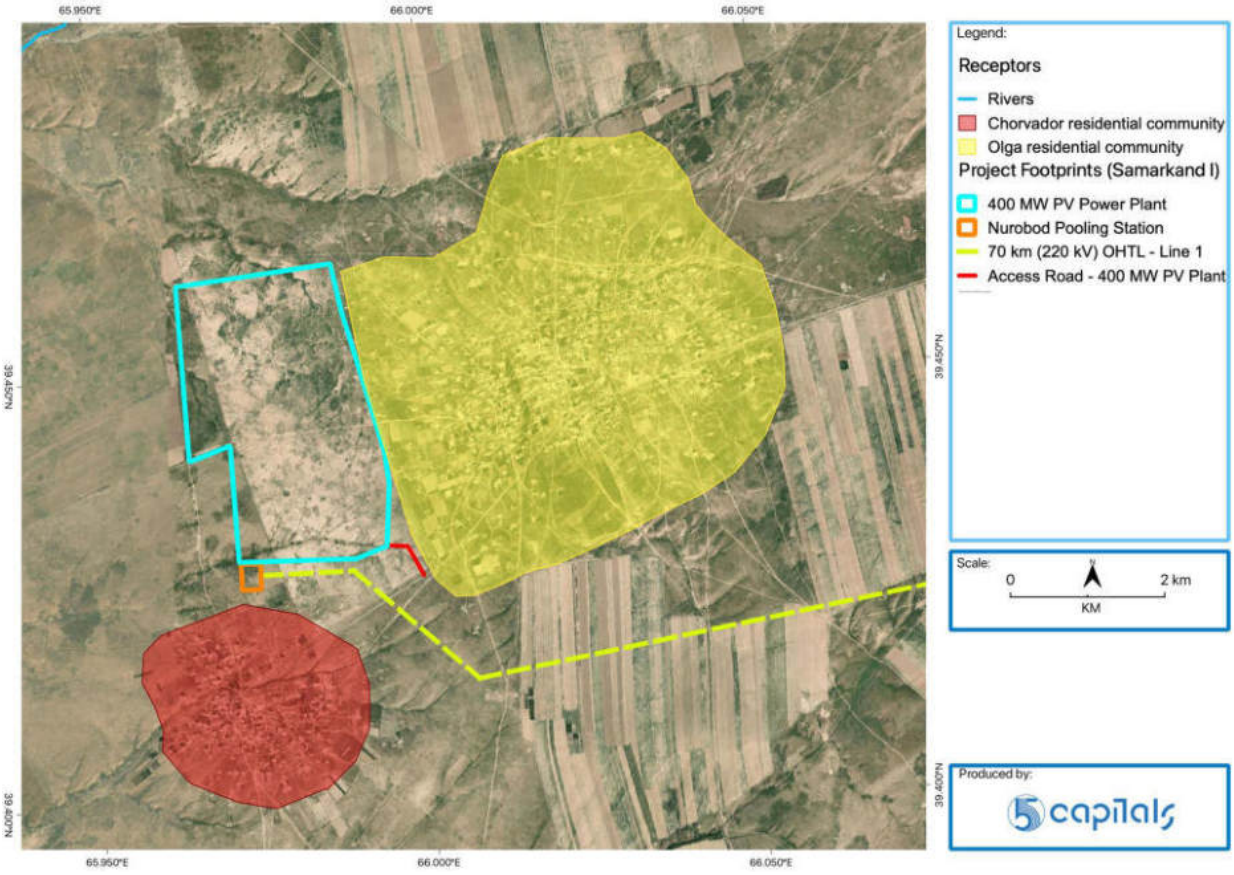

Figure 2-9 Overview of potential E&S impact receptors within the AoI of the Project's main facilities

Table 2-5 below provides a list of the E&S receptors provisionally identified within the general preliminary AoI of the 400 MW PV power plant, with respective summary descriptions.

Table 2-5 Overview of potential E&S impact receptors within one kilometre of the 400 MW PV power plant and pooling station

Receptor Type	Proximity to Project Sites	Description
Chorvador residential community	600 m	Residential community located east of the 400 MW power plant and pooling station, with the closest dwelling situated about 600 metres from the power plant site boundary.

Receptor Type	Proximity to Project Sites	Description
Olga residential community	50 m	Residential community located east of the 400 MW power plant and pooling station, with the closest dwelling situated about 50 metres east of the PV power plant.

2.6 Project Facilities

Project facilities planned for the Project's construction and operational phases can be split into several categories, based on their relation to the project and the financing agencies involved in the development of these facilities.

2.6.1 Main facilities

The main facilities refer to facilities planned as part of the project, which are of primary importance to the Project's operational objectives and funded by the Project Lenders.

These facilities comprise the solar (PV) power plants and the BESS. The planned PV power plant will serve the following main functions:

- Generation of solar power.
- Conditioning of the raw electrical output, for conformity with the operational standards of the recipient utility grid.
- Evacuation of power harnessed by the PV power plant to the recipient utility grid.

The main functions of the BESS include:

- Storage of surplus power in the utility grid during periods of off-peak demand.
- Controlled discharge of stored power to the utility grid during periods of limited production and/or peak-demand.

2.6.1.1 Solar power (PV) plant

The solar (PV) plants sited at different locations within Nurobod District will operate at a capacity of 100 MW and 400 MW, with a total estimated lifetime yield of 6,324,686 MWh and 25,298,744 MWh respectively. The PV power plant components involved in the generation of electricity are described in the following sub-sections.

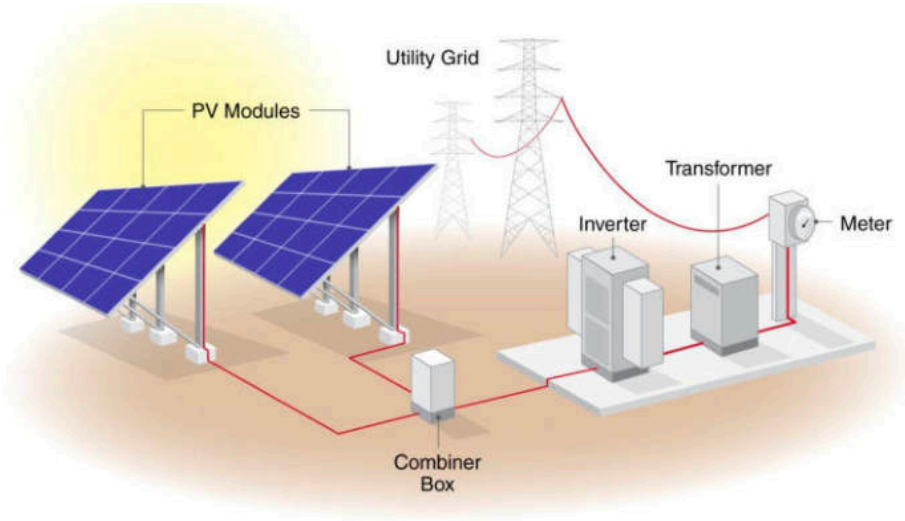

Figure 2-10 Illustration of the configuration of utility-scale PV power plants

SOLAR MODULES, PANELS, AND STRINGS

Solar cells represent the smallest unit of PV power generation equipment and are fabricated as part of solar modules. The cells consist of monocrystalline silicon, which generates electricity from solar radiation by means of the photoelectric effect. The electrical yield of the cells is conducted in form of a Direct Current (DC).

Under Standard Testing Conditions (STCs), preferable modules offer a maximum power output of 570 Watts, with a corresponding voltage of 43 Volts. The modules utilize leading-edge PV technology to guarantee cost efficiency, relatively high yield and durability. Specifically, the model presents the following technological and economic advantages:

- Bifacal energy yield with power production on both sides (front and rear ends) of the solar panels (with a bifaciality factor of 80±10%). Single-axis sunlight trackers will be installed to continually adjust the positioning (angle) of the solar modules (and wider panels) relative to the direction of sunlight, for maximum irradiation throughout the daytime.
- Passivated Emitter and Rear Cell architecture with an in-cell passivation layer that boosts the electrical yield of solar modules by reducing charge recombination and enhancing light absorption (to achieve a module efficiency of 22.8%);
- N-type monocrystalline, 10M-sized wafers (182mm x 247mm) built into dual, heat-resistant glass, to achieve operational temperatures ranging between -40°C and 85°C, as well as a front-side and rear-side maximum static load capacities of 5400 Pa and 2400 Pa respectively.
- A low annual performance degradation rate of 0.4% over the first 30 operational years.

The solar modules will be assembled into solar panels, and the solar panels will be linked to form multiple strings, such that the designed output current is discharged from each string of solar modules. The table below provides an overview of the number of solar modules, panels and strings constituting the solar array of the power plant.

Table 2-6 Total number of PV power generation components

PV Components	Total number
100 MW PV power plant	
Solar modules	206,898
	827,590
Solar strings	
Solar strings	7,958
	31,830

Solar trackers and mounting system

The solar panels will be mounted on active, single-axis solar trackers which will rest on piles driven about four metres below ground level. The trackers will move the solar panels from East to West to maximize exposure of the modules to the changing direction of sunlight. Solar tracking is intended to raise the yield of the solar array by an estimated 27% to 30%.

Central combiner boxes

For each PV power plant, direct current generated in solar cells and the broader modules will be collected by module cables, which will feed into the larger string cables (dedicated to each solar string of modules). The power produced in each solar string will be delivered to central combiner boxes for consolidation by the string DC cables. Each combiner box will combine a number of string DC cables into a single connection (main DC cable) leading to a dedicated central inverter. The solar array and hierarchy of power connections altogether constitute the DC circuit of the PV power plant.

In addition to combining the current discharged by numerous solar strings, the combiner boxes will house power regulation and circuit isolation devices. Specifically, string fuses built into the combiner boxes will provide protection of electrical equipment constituting the DC circuit in the event of faults and resultant overloads. In addition, disconnectors placed in the boxes will allow for the isolation of faulty components of the overall DC circuit for maintenance purposes.

Inverters

The first form of power conditioning is the transformation of the electric current generated by the solar module strings, for integration with the utility grid. Because the grid operates with Alternating Current (AC), the power consolidated from the solar strings requires conversion

from Direct Current (DC) to AC. A total of 488 central inverters will be installed for this purpose. The AC output of each inverter will be delivered to a dedicated series of step-up transformers.

MEDIUM-VOLTAGE STEP-UP TRANSFORMERS

The recipient utility grid consists of transmission and distribution power lines. To avoid power losses due to the heating effect of high-current (low-voltage) electricity, the transmission components of utility grids are designed to carry low-current (high-voltage) power loads. Therefore, the low-voltage output yielded by the solar array requires a staged voltage amplification (with a proportional reduction of the output current) before it is fed into the utility grid.

The AC power from the central inverters will be conducted towards dedicated Medium-Voltage (MV) step-up transformers, to generate a 33kV output. These transformers will operate at a capacity of 8.8 mVA each.

The following table provides an overview of the total number of central combiner boxes, inverters and MV step-up transformers for the consolidation and transformation of the DC power output from the solar array.

Table 2-7 Total number of PV power consolidation and conditioning components

PV COMPONENTS	TOTAL NUMBER
100 MW PV power plant	
DC combiner boxes	[TBC]
Inverters	98
Medium-voltage step-up transformers (0.6/33 kV)	[TBC]
400 MW PV power plant	
DC combiner boxes	[TBC]
Inverters	390
Medium-voltage step-up transformers (0.6/33 kV)	[TBC]

COLLECTOR SUB-STATION

For each PV power plant, the consolidated and optimized power output from the solar array will be evacuated to the utility grid via the collector sub-station. Two underground 35 kV cables stemming from the MV step-up transformers will connect to the collector sub-station dedicated to the PV power plant.

The Air-Insulated Sub-Station (AIS) will primarily include two High-Voltage (HV) step-up transformers, which will further raise the voltage of the solar power output to a level that is consistent with that of the recipient utility grid. This set of transformers will operate at a capacity of 120 mVA each.

Besides final voltage adjustment for integration with the grid and subsequent transmission, the sub-station will include a host of facilities to enable the monitoring, regulation, isolation and protection of the power generation equipment and circuits. These facilities include but are not limited to:

- Circuit breakers – Serve to interrupt faulty circuits and isolate defective elements, in the event of overload and maintenance work.
- Circuit switchers – A set of circuit breakers with the capacity to provide three-phase interruption, and protection of transformers, lines, cables and capacity banks against overloads including transient overloads.
- Relays – Automatic power monitoring devices capable of activating circuit breakers in the event of a circuit overload.
- Surge arrestors – Used to protect high-voltage equipment and conducting superstructures from power surges caused by lightning strikes, switching surges and other abnormal loads from faulty circuits.
- Meters – Tariff metering will be installed between the HV step-up transformers and the grid connection point, to measure and record the quantity of exported power on a continual basis.

Another key component of the collector sub-station is the Supervisory Control and Data Acquisition (SCADA) system. The main functions of the SCADA system include the following:

- Identifying and signalling issues within the solar power generation, conditioning and evacuation systems, to enable timely maintenance and minimum interruptions to the power yield and supply.
- Providing an electronic interface for remote control of the solar power generation, conditioning, and evacuation system components, to enable (i) the optimization of power generation by adjusting the operational parameters of electrical equipment and circuits, and (ii) isolation of faulty circuits for maintenance.
- Collection and storage of real-time information regarding system performance and various key metrics to inform the power plant maintenance program and financial modelling for regular commercial assessments.
- Reducing Operation and Maintenance (O&M) costs and safety hazards by automating basic maintenance operations.

The SCADA system will generally comprise of (i) weather and circuit sensors, (ii) a satellite/Wi-Fi/optical fibre line communication network, (iii) the central processing hub (console), and (iv) the remote communication server. The various sensors will gauge operating conditions and generate signals for remote analysis, which will be transmitted to the master console via the dedicated network. A continual and centralized analysis and display of the system performance will be carried out on the master console. The communication server will host the

software for operating signal transmission and remote feedback, as well as the database for logs related to various system performance metrics.

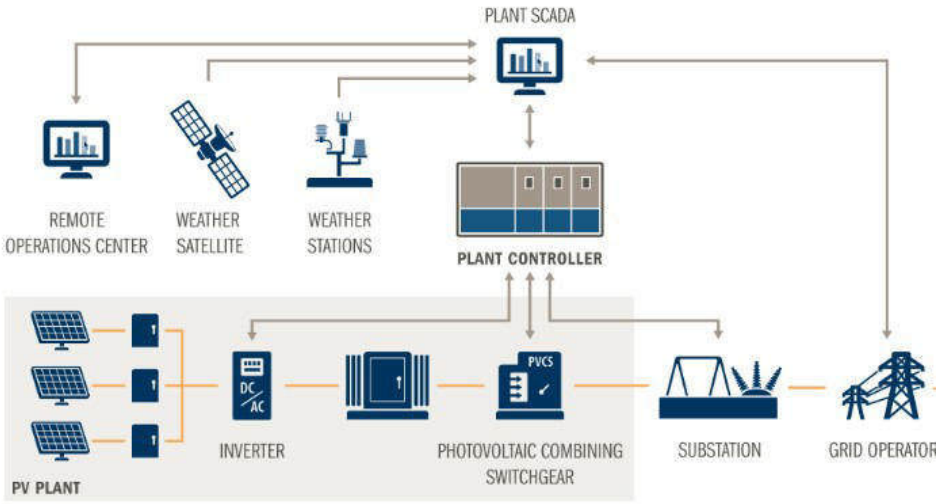

Figure 2-11 General schematic of a SCADA system for the PV power plant

The following table provides a quantitative overview of the Project's evacuation facilities.

Table 2-8 Total number of PV power transmission components

PV COMPONENTS	TOTAL NUMBER
High-voltage step-up transformers	[TBC]
Metal-clad switch gear	[TBC]

2.6.1.2 Pooling Station

Certain facilities planned under the Samarkand I PV and BESS project are located alongside (adjacent) to the same set of facilities planned under the Samarkand II PV and BESS project (planned concurrently by the Project Developer). Specifically, the 400 MW PV power plant and its respective 70-km OTL are located alongside the 500 MW PV power plant and 70-km OTL planned under the Samarkand II project.

During operation, the power from the Samarkand I 400 MW PV power plant will be exported to Nurobod sub-station, via the 70-km OTL, and power from the adjacent Samarkand II 500 MW PV power plant will be exported to the same sub-station through a separate, dedicated 70-km OTL planned under the Samarkand II project.

A pooling station planned under the Samarkand I project will be situated between the two PV power plants.

- The station will comprise switchyard facilities, which will link the internal collector sub-stations located within each PV power plant with their respective (dedicated) 70-km OTLs.
- The pooling station will also allow power from the two adjacent power plants to be integrated and exported along one of the two OTLs, in the event that one OTL is shut down for maintenance.

2.6.1.3 4.9-km OTL

The 220-kV 4.9-km OTL will convey power from the 100 MW PV plant to the recipient 220kv/ 500 kV sub-station in Nurobod District.

2.6.1.4 70-km OTL

The 220-kV 70-km OTL will convey power from the 400 MW PV plant to the recipient 220kv/ 500 kV sub-station in Nurobod District.

2.6.1.5 Battery Energy Storage System

The Project will also involve the establishment of a 500 MWh AC-coupled Battery Energy Storage System (BESS). The BESS will operate on an independent basis (separately from the PV power plant) and be developed close to the planned sub-station. The BESS facility will serve the following main functions:

- Storage of electrical energy from power sources feeding into the project-associated utility grid during off-peak grid time, and the dispatch of the operating reserves in the event of grid congestion (i.e., instances of power demand exceeding power supply).
- Stabilization of the frequency of the project-associated utility grid by provisioning power reserves to equalize power demand and power supply within the grid.

The BESS facility is designed to address power shortages within the grid connecting to the PV power plant planned under the Project, to prevent and alleviate the occurrence of power outages in Uzbekistan. Power shortages can arise in the event of peak power demands, downtime events of power generation facilities feeding into the grid and declines in the electrical yield of the project-associated PV power plant as a result of limited solar irradiance.

While the PV power plant is set to augment the capacity of the existing grid, its yield is intermittent, as it is a function of solar irradiation, which is subject to both cyclic variations on a daily and seasonal scale, as well as irregular fluctuations due to transient changes in weather. A number of other climatic and weather-related factors can affect the productivity of the PV power plant, such as extreme temperatures and wind conditions, which can affect the yield of the power plant, to a significant degree.

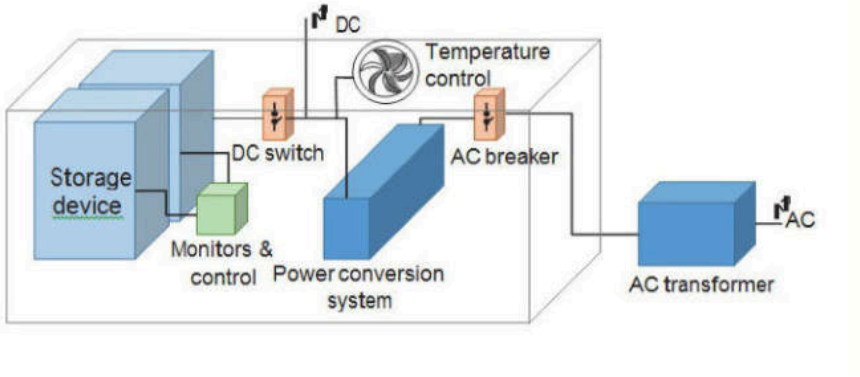

Figure 2-12 General schematic of a BESS facility

The main components of the BESS facility are outlined below.

BATTERY ASSEMBLY

The BESS will operate with Lithium-Ion batteries. On utility-scale BESS facilities, Li-ion batteries are superior to lead acid, nickel-cadmium, sodium-sulphur and redox flow batteries, due to their high performance on energy density, fast response time, longevity, coulombic efficiency, charging time and maintenance costs. A few disadvantages related to this battery technology include low charging rates in sub-zero temperatures and susceptibility to thermal runaway (uncontrolled heating and degradation), which necessitate over-current protection.

The smallest power storage unit of the battery planned assembly is the lithium cell. These cells will be wired into both serial and parallel configurations within separate lithium modules, to achieve the required output voltage per module. In turn, rows of lithium modules will be stacked into multiple lithium racks. The array of lithium racks will be housed by a modular arrangement of 9,340 mm (length) x 1,730 mm (width) x 2,600 mm (height) steel containers, with a total weight of 28,400 kilograms (kg). The entire battery assembly will be supplied by the Chinese-based manufacturer, JA Solar.

The table below provides the counts of the battery assembly units constituting the BESS facility.

Table 2-9 Total number BESS battery assembly components

BATTERY UNITS	TOTAL NUMBER
Lithium battery cells	[TBC]
Battery modules	[TBC]
Battery racks	121
Battery containers	280

BATTERY MANAGEMENT SYSTEM

The Battery Management System (BMS) is an automated system that will perform continual monitoring of the battery assembly to ensure operation under optimal operating conditions (e.g., voltage, current, temperature, State of Charge), and the regulation of charging and discharging power. The design temperature of the Li-ion batteries is 20°C to 25°C.

POWER CONVERSION SYSTEM

The Power Conversion System (PCS) is an automated system that will charge and discharge the battery assembly. Charging will involve the import of AC power from the utility grid during off-peak (surplus power) periods, whereas discharging will involve the the dispatch of reserved DC power to the utility grid.

Because the grid operates with AC power while the battery base operates with DC power, a PCS is required to enable a bi-directional conversion of electrical power between in between these facilities. This conversion will be carried out by hybrid inverters installed as part of the PCS.

In addition to current transformation, another form of power regulation between the battery base and utility grid is voltage adjustment. Power discharged to the grid must have a high voltage applicable to the grid, to minimize power losses over long-range transmission. Conversely, power imported into the BESS (for charging depleted reserves) must have a low voltage that is suitable for the batteries. The adjustment to the imported and exported power will be performed using Medium-Voltage (MV) step-up and step-down transformers, which will operate at a capacity of [TBC] mVA each.

Table 2-10 Total number BESS battery assembly components

BATTERY UNITS	TOTAL NUMBER
Hybrid inverters	280
Step-up and step-down MV transformers	70
HV transformers	2
Battery containers	280

GRID CONNECTION

The connections between the battery assembly and the adjacent planned sub-station will comprise underground AC cabling and terminal (sub-station) buses. The table below outlines the planned grid connection components and their respective counts.

Table 2-11 Total number of grid connection components

BATTERY UNITS	TOTAL NUMBER
Incoming HV lines	2
Outgoing HV lines	2
Underground interconnection cable (incoming)	2

BATTERY UNITS	TOTAL NUMBER
Underground interconnection cable (outgoing)	2

ENERGY MANAGEMENT SYSTEM

The Energy Management System (EMS) is a system will perform two vital functions in relation to BESS operation and maintenance via Supervisory Control and Data Acquisition (SCADA). The system will enable high-level monitoring of the operating conditions and performance of the battery assembly and PCS, to allow for timely corrective action that will be initiated at the master unit (control centre with manned console). Further, the system will coordinate the charging and discharging of battery units, based on critical parameters, such as State of Charge (SoC) and Depth of Discharge (DoD).

HEATING VENTILATION AND AIR CONDITIONING SYSTEM

The Heating, Ventilation and Air Conditioning (HVAC) system is a crucial element of the BESS facility, which regulates the ambient temperature of containerized battery assembly enclosures. Operation of the battery base within the optimal temperature is integral to ensuring optimal performance, maximizing the life span of the battery cells by reducing thermal degradation, and preventing thermal runaway which can lead to severe damage to affected battery assemblies/ clusters.

The designated supplier will use the R410A refrigerant, which does not cause ozone depletion and has a relatively low global warming potential.

2.6.2 Associated facilities

Associated facilities refer to facilities which are necessary for the viability of the Project but not covered by lender financing.

2.6.2.1 11-km Loop-In-Loop-Out Connection OTLs

The project will involve the development of two, parallel 11-kilometre LILO powerlines, as outlined in Section 2.4.6 above. The 220-kV LILO will serve to connect the planned Nurobad sub-station to an existing operational OTL. This will allow the export of power from the Phase I (100 MW) and Phase II (400 MW) power plants to the local grid in Samarkand.

2.6.2.2 19-km Loop-In-Loop-Out Connection OTLs

The project will involve the development of two, parallel 19-kilometre LILO powerlines, as outlined in Section 2.4.6 above. The 220-kV LILO will serve to connect the planned Nurobad

sub-station to another existing operational OTL. This will allow the export of power from the Phase I (100 MW) and Phase II (400 MW) power plants to the local grid in Samarkand.

2.6.3 Ancillary facilities

Ancillary facilities refer to facilities which are planned as part of the project, which are (i) of secondary importance to the Project's operational objectives and (ii) directly owned, operated, or managed by the Project Developer, EPC Contractor, and O&M Company. This set of project facilities will be established for auxiliary purposes during the Project's construction and operational phases, such as general maintenance and connection to enabling utility infrastructure.

2.6.3.1 Construction enabling and maintenance

The following facilities will be established to enable construction activities planned for the Project.

UTILITY SERVICES

At the time of the assessment, the establishment of temporary overhead power lines for power supply to the PV power plant and BESS site was not envisaged, as on-site generators will be used. Connection to centralized (piped) water supply schemes is also not planned, as water will be tankered to construction sites by contracted suppliers.

ACCESS ROADS

A short access road measuring about 70 metres in length will be constructed for access to the 100 MW PV power plant site. The access road will branch out of the existing A-378 highway (trunk road). A 700-metre-long access road will be developed to connect an existing district road to the 400 MW PV power plant site.

Part of an existing asphalt (public) road extends alongside the Nurobod BESS site. The road branches out the A-378 highway, measuring a total length of 5.2 kilometres between this junction and the project site location. While dedicated service roads will be established within the site, no major roadworks are envisaged outside of the site perimeter, as the existing adjacent road is in good condition.

LAYDOWN AREAS

Temporary laydown areas will be established within the PV power plant, and BESS sites, to allow for the storage of construction materials. The areas will be sited relatively close to the site entry points and EPC Contractor temporary offices.

CONCRETE SUPPLY

Construction works will entail the construction of concrete structures, including foundations and hard-standings for the planned PV power plant and BESS facilities. At the time of this assessment, the establishment of concrete-batching plants within the project sites was not envisaged. Readymade concrete-mix feedstock will be delivered by suitable concrete mix suppliers based within the project-affected districts.

CONSTRUCTION SITE OFFICES AND WELFARE FACILITIES

The Project's construction phase will employ a peak workforce totalling 700 workers. At the time of this assessment, the development of construction labour camps was not envisaged. Suitable, existing accommodation facilities within the host districts and the suburbs of the nearby Samarkand City will be identified.

SANITATION FACILITIES

Sanitation facilities planned for the Project's construction phase include mobile toilets. A licensed wastewater collection contractor will be engaged to carry out sewage transfer to designated wastewater treatment plants within the project-affected districts and nearby cities.

SOLID WASTE FACILITIES

Waste storage areas will be developed for the segregation and storage of construction waste. A licensed solid waste collection contractor will be engaged to carry out solid waste collection and transfer to designated waste management facilities for recycling, and disposal as appropriate.

SECURITY SYSTEM

During construction, the following security measures will be put in place to safeguard on-site personnel and assets from potential security incidents, such as theft, vandalism, and personal violence against construction workers:

- Permanent fencing for the PV power plant and BESS sites.
- Entry gates and guard posts.
- Access controls in form of guard-post registration, door locks and access control devices.
- Provision of ID documents for all construction personnel.
- Surveillance systems (remote and on-site inspections).
- Lighting system.
- Ad-hoc engagement with local authorities (i.e., makhalla security units/ guilds, khokimiyats and local police stations).

As power generation and storage facilities in the Republic of Uzbekistan are strategic assets of national importance, National Guard is mandated to provide on-site security services for both the PV power plant and BESS sites throughout the Project's construction phase.

2.6.3.2 Operation and maintenance

DRAINAGE SYSTEM

Detailed feasibility studies to identify any engineered drainage requirements within the project sites at the Project's construction and operation stages (i.e., PV power plant and BESS footprints) were ongoing at the time of the ESIA.

FIRE SAFETY SYSTEM

Fire safety measures planned for the PV power plant and BESS operation include a range of fire detection, warning, and suppression facilities. The O&M contractor will ensure that the Plant has a high level of fire detection and protection in accordance with National Fire Protection Association (NFPA) Codes, International Fire Code and with all applicable national and local codes and regulations. The recommendations of NFPA 971, NFPA 850, NFPA 855, NFPA 68, NFPA 69, NFPA 13, NFPA 15 and related standards will be followed. Where recommendations are interpreted as requirements of the NFPA and the applicable national and local codes and regulations, the more stringent requirements will override others. The MV station fire detection and protection measures will follow the NFPA 850 guideline.

No firefighting stations are located nearby the BESS site, with the capacity to suppress fires in battery installations. The O&M Contractor will demonstrate provisions for the management of fire hazards and incidents. Further, the contractor will identify the areas of fire risk and subsequently propose the types of fire protection/detection systems as may be required. These provisions potentially include fire detection and alarm systems, portable fire extinguishers for buildings and MV transformers, and clean gas fire suppression for electrical rooms. Water hydrant system for the HV power transformer at pooling substations will employ plant fire-fighting systems. The contractor will consider utilizing dry hoses with sprinkler arrangements in battery containers/rooms with water connection points outside the battery rooms/containers and consider requisite safety buffers to operate the hydrant valves during fire incidents due to thermal runaway.

A pre-commissioning fire design report will be completed by the contractor to demonstrate robust protection systems in the event of an external fire risk and an internal fire risk (including thermal runaway condition of a battery, if applicable) within the BESS enclosure. The following minimum requirements will apply to the planned BESS facilities:

- Automatic fire detection system with smoke detectors in all buildings onsite.

- Heat, gas, and smoke detection in all enclosures.
- Fire suppression as per NFPA 855.
- In the case of a water-based FPS system for battery containers, the provided design must work at the site's minimum temperature limits. During these temperatures, FPS water shouldn't freeze.
- Fire extinguishers will be provided in or near the control buildings, BESS enclosures and switchgears as required.
- Circuit breaker operation will occur for stage two alarms (detection of both smoke and heat).
- Shutdown of HVAC upon fire detection.
- Both active and passive system (passive vent will operate in case of failure in Active ventilation system) to vent the gas inside the enclosure post any thermal run-away event.
- Gas detection system designed for enclosure will be linked to active (mechanical) deflagration ventilation systems such that the level of flammable gas inside the enclosure does not exceed 25% of the LFL. In any case, gas detection systems will be provided with a minimum of two hours of standby power.

Alarms will be signalled locally (audible and visible) and in the main control room and should also permit remote connection. The fire detection and alarm will be fed by DC or safe AC from the Uninterruptable Power System (UPS).

LIGHTNING PROTECTION SYSTEM

A complete lighting protection system will be installed within on-site buildings and commissioned in accordance with relevant standards. Lighting points will be installed on the BESS site, to allow operators to perform maintenance activities during the night-time. The rated voltage for these systems will be 400/230 V, three-phase/single phase, 60 Hz. The lighting system will include all necessary main and sub-distribution boards for normal and emergency lighting, lighting fixtures with lamps for indoor and outdoor lighting, lighting poles, power socket outlets, cabling, wiring, switches, and sockets, and as well as fixing and fastening devices.

O&M OFFICE

An administrative office will be established on the 400 MW PV power plant site, to house the O&M contractor's staff and components of the SCADA monitoring and control systems dedicated to the PV power plant, collector sub-station and BESS infrastructure.

WAREHOUSE

A warehouse will be established on the PV power plant and BESS sites, for operation-phase storage of spare materials and equipment. The warehouse will be situated next to the main office building.

SANITATION FACILITIES

Permanent sanitation facilities will be established within on-site O&M offices. Concrete underground septic tanks will be constructed for the collection and partial treatment of sewage, and regular water level monitoring will be carried out to prevent and detect overflow and spills.

A licensed wastewater collection contractor will be engaged to carry out sewage transfer to designated wastewater treatment plants within the project-affected districts and nearby towns/ cities where necessary.

SOLID WASTE FACILITIES

A waste storage area will be developed for the storage and segregation of operational waste within the PV power plant and BESS sites, including electronic refuse and domestic waste. Solid waste will be segregated, and special provisions and facilities will be used for the management of hazardous waste.

A licensed solid waste collection contractor will be engaged to carry out solid waste collection and transfer to designated waste management facilities for solid waste recycling and disposal as appropriate.

SECURITY SYSTEM

At the Project's operational stage, the following security measures will be put in place to safeguard on-site personnel and assets from potential security threats, such as theft and vandalism:

- Permanent fencing for the PV power plant and BESS sites.
- Entry gates and guard posts.
- Access controls in form of guard-post registration, door locks and access control devices.
- Provision of ID documents for all construction personnel.
- Surveillance systems (remote and on-site inspections).
- Lighting system.
- Ad-hoc engagement with local authorities (i.e., makhalla security units/ guilds, khokimiyats and local police stations).

As power generation and storage facilities in the Republic of Uzbekistan are strategic assets of national importance, National Guard is mandated to provide on-site security services for both the PV power plant and BESS sites throughout the Project's operational phase.

2.7 Construction Activities, Resources and Waste

2.7.1 Construction activities

The Project's construction phase will entail the following main activities.

2.7.1.1 Mobilization and early construction works

This will entail site clearance to remove any obstructive vegetation from construction zones and the solar array where shading should be eliminated. This will be followed by site levelling and grading to allow for construction and installation of temporary and permanent facilities.

Subsequently, interior (on-site) access roads will be constructed to enable transit within all sections of the project sites, and temporary fencing and demarcation will be established to ensure site security and public safety. Laydown areas, waste management areas, contractor offices, welfare and sanitary facilities will also be established within the sites. Temporary grid connections will be developed for power supply for construction activities.

Mobilization will also involve a phased dispatch of construction equipment, materials, and labour to construction sites. The onboarding of the EPC contractor staff will include various technical and health and Health Safety Security and Environmental (HSSE) induction and trainings. Sensitization of local communities within the project areas to potential employment opportunities during the Project's construction and operational phases has commenced as part of the ESIA and ongoing LALRP public hearings and Focus Group Discussions (FGDs).

2.7.1.2 Civil works

Civil works will begin with excavation (with a maximum depth of 4-5 metres below ground level) for the construction of foundations and hard standings within the project sites (as appropriate). Further earthworks will include pile-driving for the installation of solar trackers, excavation of trenches for underground cabling, as well as the development of drainage ditches where necessary.

2.7.1.3 Electrical and mechanical works

This scope of construction activities will involve the assembly and installation of the solar array, collector sub-station, BESS and OTL equipment. Mechanical works will mostly involve the installation of mounting structures/ trackers. It will also entail the installation of electrical connections suitable for various PV power plant, sub-station, OTL and BESS components.

2.7.1.4 Demobilization

Upon the completion of the above construction activities, the EPC Contractor will carry out demobilization, as well as site restoration beyond the footprint of the Project's operational (permanent) facilities. This will entail the phased disengagement of construction labour, site clean-up, and transfer of all residual waste for controlled off-site disposal, as well as mechanical completion.

2.7.2 Construction equipment

The main equipment to be employed for construction activities includes excavators, bulldozers, mobile cranes, forklifts, trucks, trenchers, compactors, welding machines, and power generators, among others. Summary counts for the main construction equipment are provided in Table 2-12 below.

Table 2-12 Provisional inventory of construction equipment

BATTERY UNITS	TOTAL NUMBER
Bulldozer	2
Excavator	2
Mobile crane	2
Truck	2
Truck-mounted drill rig	6

2.7.3 Construction materials and waste

The planned construction activities will require a host of raw materials and generate various streams of liquid and solid refuse, which will require temporary and controlled on-site storage, prior to handover to licensed contractors for disposal, off-site treatment and/or recycling at designated sites.

Table 2-13 provides a list of the main construction materials, which will be used during the Project's construction phase.

Table 2-13 Estimated quantities of raw construction materials

MATERIAL	QUANTITY
Water	84,503 m^3 per year
Concrete	20,000 tonnes
Steel	5,000 tonnes
Fuel (for generator and motorized machinery)	1.2 million litres

Water supplies for construction activities will be tankered to construction sites, from suppliers within nearby urban centres, such as Nurobod District Centre, Juma Town and Samarkand City.

An overview of construction-phase waste streams and their respective estimated quantities is provided in Table 2-14 below.

Table 2-14 Estimated quantities of construction waste

MATERIAL	QUANTITY
Sewage	1,693 m^3 per year
Solid waste	600 tonnes

2.7.4 Power demand

Construction work for the development of the PV power plant, BESS, and powerlines will require a monthly average of 132,666 KWh. Electricity may be sourced from the grid, however, the use of on-site diesel generators is envisaged at this stage.

2.7.5 Construction workforce

The Project Company will employ a total of 16 employees, [TBC] of whom are anticipated to be Uzbekistan nationals.

The Project Developer has appointed Larsen and Tourbo (L&T) as EPC Contractor for the Project. The construction workforce will comprise skilled and semi-skilled labour, with a peak total of 700 workers. A sizeable fraction of the contracted workforce (i.e., 40-60%) will be foreign, however recruitment for readily available specialists and blue-collar jobs will be reserved for Uzbekistan nationals and residents of the Project's affected communities, to the extent feasible.

The establishment of construction camps for worker accommodation is not envisaged. Construction workers will utilize rental housing in the nearby district centres (e.g., Nurobod, Juma etc.) and urban suburbs. Transportation service will be provided by staff vehicles, including buses. Any centralized accommodation facilities (i.e., new or existing) will be audited to ensure accommodation and sanitary conditions meet the requirements of the IFC/ EBRD guidelines for labour accommodation.

Beyond contracted labour, the Project will engage a supply chain including labour employed in the upstream production of materials and components used for the manufacture of essential power equipment. The primary supplier of electrical equipment (including PV modules) for the Project is JA Solar.

2.8 Operation and Maintenance Activities, Resources and Waste

2.8.1 Operational activities

The following Operation and Maintenance (O&M) activities will be carried out over the course of the Project's operational lifetime.

2.8.1.1 Commissioning and plant handover

This work stream includes post-construction facility inspection, provisional and final acceptance testing, as well as handover to the Project Company. The main purpose of commissioning is to ensure the following:

- The facilities are structurally and electrically safe, in conformity with national and international (including, International Electrotechnical Commission) standards.
- The facilities are robust to a degree that guarantees operation over the duration of their operational lifespan.
- The construction and operation of the facilities matches the detailed designs, and that the performance of the facilities meets pre-set parameters.

2.8.1.2 Scheduled/ preventative maintenance

This includes routine maintenance activities aimed at preventing the occurrence of system faults and ensuring optimal performance, maximal yield, and longevity of constituent equipment. This includes yield and efficiency monitoring to identify causes of sub-optimal performance, dry-cleaning of solar modules (to remediate module soiling and debris), inspection of connection integrity (including insulation checks) for above-ground and underground wires, cables and bus bars, inverter and tracker servicing, repair of tracking motors, transformer oil replacement and vegetation control. Automated (i.e., robotic) dry cleaning of solar panels will be carried out regularly (using a robotic cleaning system), as needed.

Preventative maintenance specific to the BESS facility includes battery health monitoring, thermal management, and the maintenance of the HVAC system.

2.8.1.3 Unscheduled/ corrective maintenance

This type of maintenance is conducted in response to system faults and mainly involves the replacement or correction of defective system components. Common remedial maintenance activities that will be performed as part of O&M include inverter repair, replacement of blown fuses, rectification of tracking system faults, connection and insulation repairs/corrections for above-ground and below-ground wires, cables and bus bars, short circuit repairs and

contingent response to any fire outbreak (i.e., in the event of inverter faults, thermal runaway and overcurrent).

Preventative maintenance specific to the BESS facility includes battery replacement, HVAC maintenance and container servicing.

2.8.1.4 Performance monitoring, production forecasting and reporting

Based on the SCADA system, the Project's O&M staff will monitor the performance of various PV power plant and BESS equipment (as well as exogenous factors such as weather) and undertake regular power supply forecasting for the off taker. Monitoring results and system maintenance will be reported upon, for financial modelling and any strategies to rectify performance shortfalls.

2.8.2 Operational equipment

Key equipment that will be used at the Project's O&M phase mainly includes miscellaneous spare equipment parts/ devices (i.e., batteries, fuses etc.).

2.8.3 Operational materials and waste

Materials required for O&M activities will be delivered to PV power plant and BESS sites upon demand and stored within on-site warehouses. These materials will include water for sanitary and other maintenance activities. Operation and maintenance will also generate various streams of liquid and solid refuse, which will require temporary and controlled on-site storage, prior to handover to licensed contractors for disposal, treatment and/or recycling at designated sites.

Operation-phase waste materials potentially include:

- Electronic waste
- Spent oils
- Domestic solid refuse from site offices
- Domestic wastewater/ sewage

2.8.4 Power demand

Auxiliary power supply is required to operate inverter control circuitry, transformer magnetizing circuitry, cooling fan, air conditioner, lights, computers, server, and lighting. During the daytime, generated yield will provide auxiliary power, whereas during the night-time or downtime, power will be sourced from the grid.

2.8.5 Operational workforce

The Project's operational workforce will include a full-time workforce of 16 personnel. In addition, a total of 20-25 specialist staff may be deployed for major maintenance activities.

NOMAC Maintenance Energy Services is the main O&M Contractor appointed for O&M support under the Project Company.

2.9 Project Milestones

The following pre-feasibility and feasibility studies, have been completed for the Project:

- Remote and on-site solar resource assessment.
- Topographic survey.
- Geotechnical survey.
- Hydrological survey.
- Commercial modelling.

The Government of Uzbekistan commissioned the solar resource assessment in March 2023. Following the execution of the PPA, the Project Developer assigned Juru Limited and Uza(ssystem to undertake the engineering related feasibility surveys, in preparation for detailed design and construction.

The Project is currently in its development and detailed design phase, which includes the completion of engineering designs, selection of the Project's EPC Contractor and supplier, acquisition of various permits from competent authorities, and access to project financing.

Table 2-15 below provides and overview of the tentative schedule for subsequent stages of project implementation.

Table 2-15 Milestones for project implementation

Project Facility	Start Date		
	Mobilization	Construction	Commercial Operation
100 MW PV power plant	August 2024	January, 2025	October, 2025
400 MW PV power plant and access road	August 2024	January, 2025	October, 2026
Pooling station	August 2024	January, 2025	May, 2026
Nurobod BESS	August 2024	January, 2025	October, 2026
4.9-km OTL	August 2024	January, 2025	August, 2025
11-km OTLs (LILO)	[TBC]	[TBC]	August, 2025
19-km OTL (LILO)	[TBC]	[TBC]	August, 2025
70-km OTL	August 2024	January, 2025	May, 2026

2.10 Sazagan Power Purchase Scheme

The Project will be undertaken in parallel with a similar project, namely the Samarkand II Solar PV and BESS Project. Both Projects will be delivered by the Developer, under comparable agreements with the Ministry of Energy of Uzbekistan.

The Samarkand II Project includes a relatively large-scale interconnection scope which extends between Samarkand Region and Tashkent Region. The two projects also differ in their financing arrangements and associated E&S performance standards. On this basis, a standalone ESIA has been commissioned for the Samarkand II solar PV and BESS project.

The composite maps below provide an overview of the concurrent and co-located developments constituting these projects, for reference in regard to the subsequent assessment of cumulative E&S impacts.

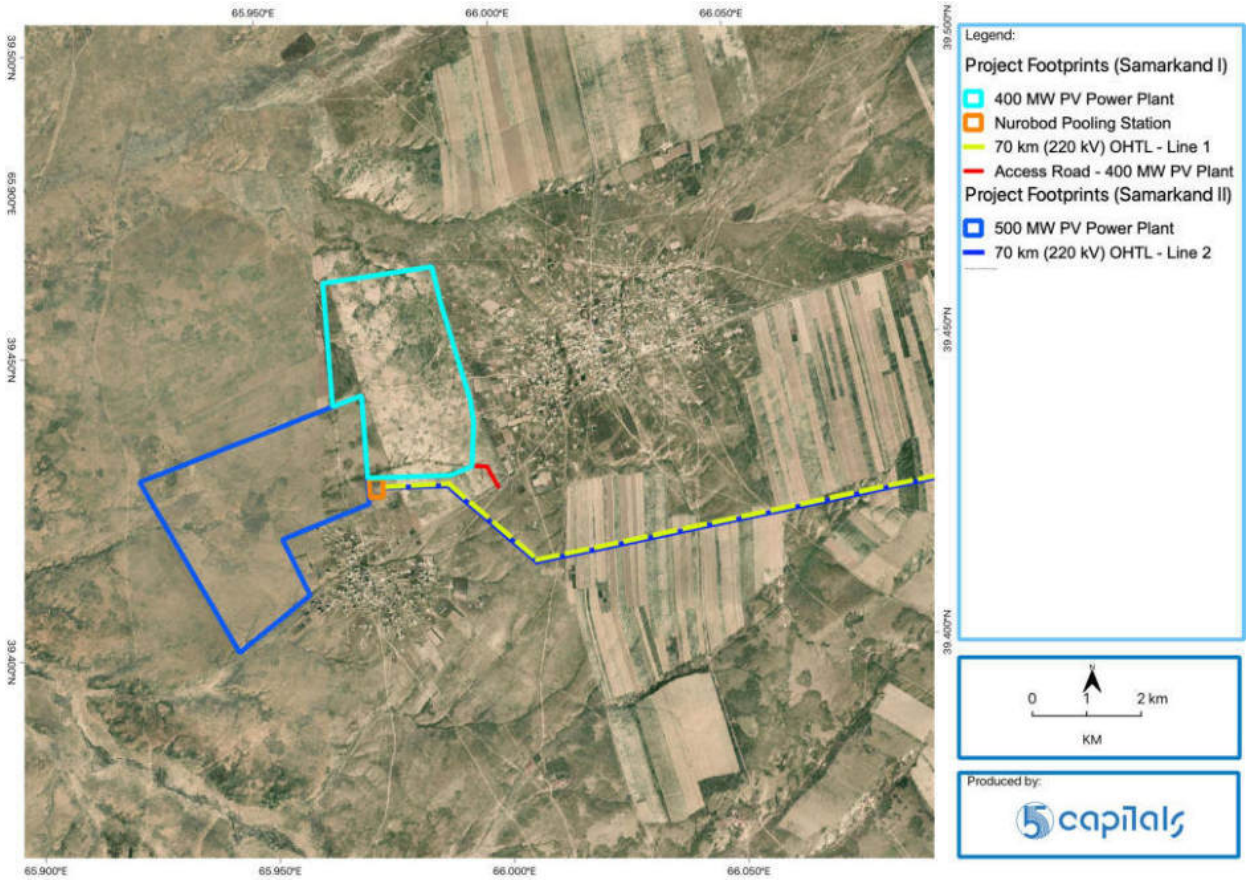

Figure 2-13 Adjacent, planned power generation and transmission facilities constituting the Project and the associated Samarkand II Solar PV and BESS Project.

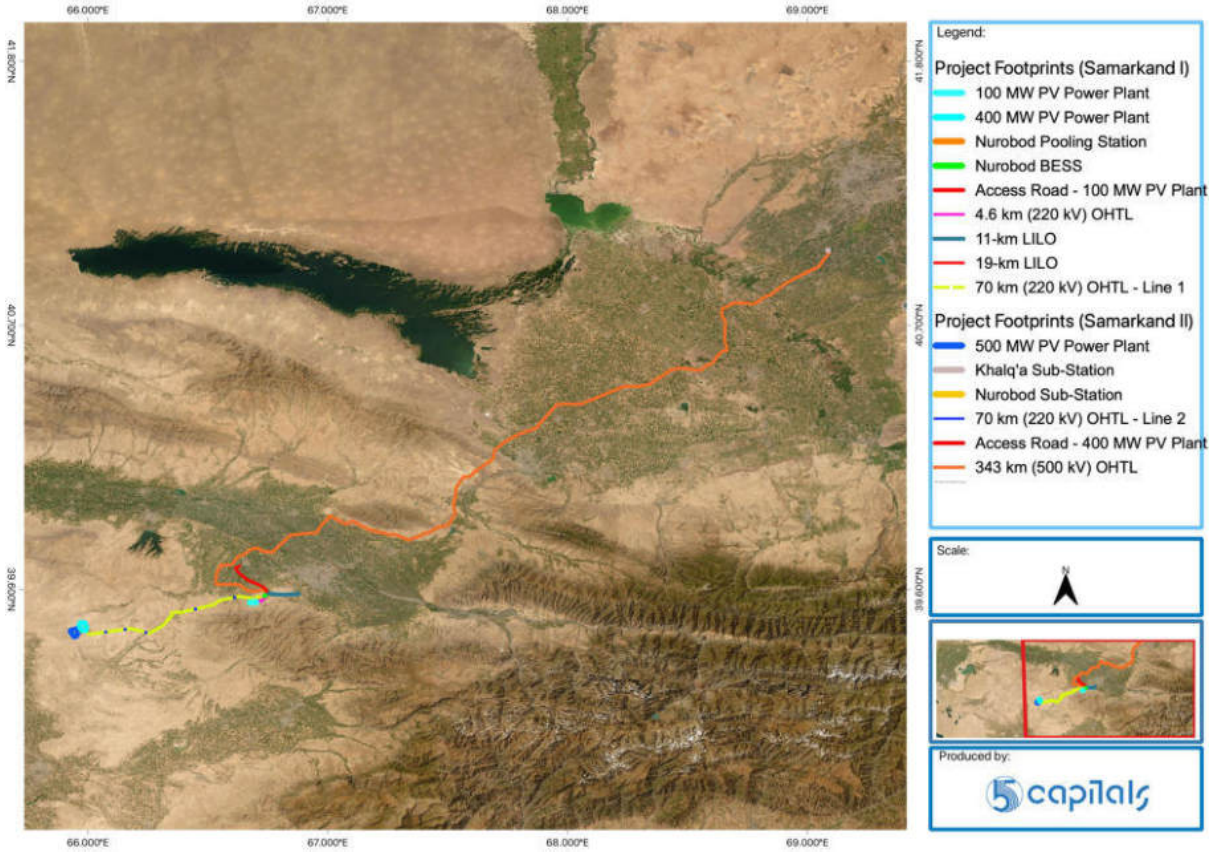

Figure 2-14 Adjacent, planned power generation, storage and transmission facilities constituting the Project and the associated Samarkand II Solar PV and BESS

3 REGULATORY AND ADMINISTRATIVE FRAMEWORK

3.1 National Laws and Regulations

3.1.1 Constitution of Uzbekistan

The Constitution of Uzbekistan has been amended following a referendum that took place on 30th of April 2023. Key constitutional reforms in the context of the ESIA are as follows:

- Uzbekistan is a legal, social, and secular state.
- Human rights may be restricted in order to maintain social morality and public order (for instance, homosexualism, considering cultural and religious perceptions of majority of population).
- Land can be private property (it is expected that more cases of owning land will be allowed, compared to the previous years when ownership status was granted in very few case).
- Prohibition of death penalty
- Moreover, the following articles of the Constitution may be applicable for provisions relating to environmental and social aspects:
- Article 30. No one will be convicted, punished, deprived of property, or any other right on the basis of a law that is not publicly promulgated.
- Article 40. Everyone shall have the right, both individually and collectively, to submit applications, proposals, and to lodge complaints with competent state bodies and organizations, citizens' self-governing bodies, officials and public representatives. Such applications, proposals and complaints shall be considered in accordance with the procedure and within the time-limit specified by law.
- Article 41. Everyone shall have the right to own property. The privacy of bank operations, deposits, and accounts, as well as the right to inheritance shall be guaranteed by law.
- Article 42: Everyone shall have the right to decent work, to free choice of profession and occupation, favourable working conditions that meet the requirements of safety and hygiene, to fair remuneration for work without any discrimination and not below the established minimum wage, as well as the right to unemployment protection in the manner prescribed by law. The minimum wage shall be determined taking into account the need to ensure a decent standard of living for a person. It shall be prohibited to refuse to hire women, dismiss them from work and reduce their wages on the basis of pregnancy or having a child.
- Article 44: Any forced labour shall be prohibited, except as punishment under the court decision, or in some other Instances specified by law. Any form of child labor that poses a threat to the health, safety, morality, mental and physical development of the child, including those that prevent him or her from getting an education, shall be prohibited.

- Article 49: Everyone shall have the right to a favorable environment, reliable information about its condition.The State shall create conditions for the implementation of public control in the field of urban planning activities in order to ensure the environmental rights of citizens and prevention of harmful environmental impact. Draft urban planning documents shall be subject to public discussion in the manner prescribed by law. The State, under the principle of sustainable development, shall implement measures to improve, restore and protect the environment, maintain ecological balance.
- Article 58. Women and men shall have equal rights. The State shall ensure equal rights and opportunities for women and men in the administration of public and state affairs and in other spheres of social and state life.
- Article 61. It is the duty of citizens to protect the historical, spiritual and cultural scientific and natural heritage of the people of Uzbekistan. The historical, spiritual, cultural, scientific, and natural heritage shall be protected by the state.
- Article 62. Citizens shall be obliged to protect the environment.
- Article 65. The basis of the economy of Uzbekistan, evolving to enhance the well-being of citizens, shall be a property in its various forms. The State shall create the conditions for the development of market relations and fair competition, and guarantee the freedom of economic activity, enterprise and labour, taking into account the priority of consumer rights. Equality and legal protection of all forms of property shall be ensured in Uzbekistan. Private property shall be inviolable. An owner may not be deprived of his or her property except in the cases and according to the procedure prescribed by law and on the basis of a court decision.
- Article 66. An owner, at his/her discretion, shall possess, use and dispose of his/her property. The use of any property must not be harmful to the environment or violate the rights and legitimate interests of other persons, society and the state.
- Article 68. The land, its minerals, waters, flora and fauna, other natural resources shall constitute the national wealth and shall be rationally used and protected by the state. Land may be privately owned on the terms and in the manner prescribed by law, which ensure its rational use and protection as national wealth.

3.1.2 Law on Nature Protection, 1992 (as Amended in 2021)

This law is the key national environmental law for the protection of the environment and the sustainable use of resources and the right for the population to a clean healthy environment. This law states legal, economic, and organisational basis for the conservation of the environment and the rational use of natural resources.

Article 25 of this law states that the State Environmental Expertise (SEE) is a mandatory measure for environmental protection, preceded to decision making process. In addition, the law prohibits the implementation of any Project without approval from SEE.

It should be noted that Article 53 of this law confirms that if an international treaty concluded by the Republic of Uzbekistan establishes rules other than those provided for by the legislation of the Republic of Uzbekistan on nature protection, the rules of the international treaty shall be applied, except in cases where the legislation of the Republic of Uzbekistan establishes stricter requirements.

3.1.3 Law on Environmental Control, 2013 (as Amended in 2022)

The law generally provides for the protection of the environment and natural (ecosystem) resources in Uzbekistan. The main objectives of this law include:

- Prevention, detection, and suppression of violation of legislative requirements relating to environmental protection and rational use of natural resources.
- Monitoring the state of the environment, identifying situations that can lead to environmental pollution, irrational use of natural resources, pose a threat to the life and health of citizens.
- Determination of compliance with environmental requirements of any ongoing economic development activities.
- Ensuring compliance with the rights and legitimate interests of legal entities and individuals performing their duties in relation to environmental protection and sustainable use of natural resources.

The Article 7 of this law states that, the objects of environmental control are:

- Land, its subsoil, waters, flora and fauna, and atmospheric air;
- Natural and man-made sources of impact on the environment; and
- Activities, action, or inaction that may lead to pollution of the environment and irrational use of natural resources, create a threat to the life and health of citizens.

3.1.4 Other relevant legislation

3.1.4.1 Mandate for the Project

The Resolution of The President of The Republic of Uzbekistan No. PD-207 "Construction of 500 MW Solar Photovoltaic Power Plant, 334 MW Electricity Storage System and a Substation Serving to Ensure its operation (Sazagan Solar 1) in Nurobod District of Samarkand Region" was enacted on 4 July 2023.

3.1.4.2 National/local requirements for environmental impact assessment

The national Environmental Impact Assessment (EIA) procedure for various development projects is mandated by the following legislation:

- Law "On Environmental Expertise" No.73-II of 25.05.2000 (as amended on 29.04.2021).

- Regulation on State Environmental Expertise (SEE), approved by Decree No.949 of the Cabinet of Ministers on 22 November 2018 which is replaced by "On the further improvement of the environmental impact assessment mechanism No.541, approved by Resolution of the cabinet of ministers of the Republic of Uzbekistan on 9 July 2020."

3.1.4.3 Public participation in national EIA

Based on changes in the national legislation regarding the national EIA process, public consultation is now a mandatory part of the first EIA stage.

According to the Resolution of the Cabinet of Ministries of the Republic of Uzbekistan on "Further Improvement of the Environmental Impact Assessment Process" No. 541 dated 7th September 2020, the procedure of conducting public consultations is as follows:

- Annex 3 of the Resolution No 541 – Rules and regulations for conducting public consultations states that public consultations should include discussions and decision making regarding planned activities (for construction of any facility) that may have negative impacts on the environment.
- A non-technical summary regarding any planned project activity that is categorized as I & II group (in accordance with national requirements for categorization) shall be prepared. The NTS should include information about the following:
  - Brief description of the project.
  - Technology solutions and alternative options for the project.
  - Current state of the environment at the selected project site.
  - A brief assessment of socio-economic conditions.
  - Brief description of the causes and type of negative impacts on the environment as a result of the project.
  - Forecast and assessment of possible changes in the state of the environment, socio-economic conditions.
  - Forecast and assessment of project and non-project risks.
  - Measures to prevent, minimise and/or compensate for adverse impacts; and
  - Assessment of possible significant adverse cross-border impacts.
- A public consultation shall be based on the review of non-technical summary by providing equal rights to all participants to express their concerns, opinions, and suggestions.
- The following entities shall be considered as part of public consultations:
  - Representatives of local departments of State Committee on Ecology and Environmental Protection who will be considered as observers of public consultations.
  - Local municipalities (considered as the responsible organisation for organising and inviting participants to the meetings).
  - NGOs'.
  - All organisations interested in the project.

- Local communities.
- Mass media.

- Expenses, if any, related to the public consultations are to be financed by the Project Developer.

In addition to the above national requirements on conducting public consultations, the Law of the Republic of Uzbekistan 'Regarding Appeals of Individuals and Legal Entities' No 378 dated 3.12.2014 (with amendments on 17th August 2017), regulates the appeals of individuals and legal entities to state bodies as well as to their officials. Appeals can be oral, written, or electronic and regardless of their form and type are of equal importance. A people's 'Reception Office' is tasked with organising a direct dialogue with the population, ensuring the functioning of an effective system of appeals aimed at the full protection of their rights, freedoms and legitimate interests. Any applications are considered within 15 days from date of receipt and any additional consideration is completed within 1 month.

3.1.4.4 Environment

The following laws focused on the protection of specific environmental/ natural resource elements are in effect and applicable to the Project. An elaboration on the requirements of these laws in relation to the project is provided in Sections 5.1 to 5.5 of this Report.

- The Law of the Republic of Uzbekistan "On Water and Water Use" (1993) as amended in 2022.
- The Law of the Republic of Uzbekistan "On Ecological Expertise" (2000) as amended in 2021.
- The Law of the Republic of Uzbekistan "On Atmospheric Air Protection" (1996, amended on 21.04.2021).
- The Law of the Republic of Uzbekistan "On Protection and Use of Vegetation" (1997) as amended in 2016.
- The Law of the Republic of Uzbekistan "On Protection and Use of the Wildlife" (1997) as amended in 2016.
- The Law of the Republic of Uzbekistan "On Protected Natural Reserves" (2004) as amended in 2022.
- The Law of the Republic of Uzbekistan "On Wastes" (2002) as amended in 2021;
- The Law "On the sanitary and epidemiological well-being of the population" (2015) as amended in 2021.
- The Resolution of the Cabinet of Ministries of the Republic of Uzbekistan №.541 "On further improvement of the environmental impact assessment mechanism' (2020) as amended in 2022.

- The Resolution of Cabinet of Ministries of the republic of Uzbekistan №820 "On measures to further improve the economic mechanisms for ensuring nature" (2018) as amended in 2021.
- The Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No 14. "On approval of the regulation on the procedure for the development and agreement of projects with environmental standards" (2014) as amended in 2022.
- Resolution of Cabinet of Ministers of Republic of Uzbekistan No.95 "On approval of general technical regulations of environmental safety" (2020) as amended in 2022.

3.1.4.5 Land rights, acquisition and resettlement

The following laws govern the process of land tenure, expropriation, and reallocation in Uzbekistan. The specific requirements of these laws in relation to the project are elaborated in Section 14 of this Report.

- Civil Code of the Republic of Uzbekistan (1997) as amended on 8.11.2022.
- Land Code of the Republic of Uzbekistan (1998) as amended on 1.10.2022.
- Law of the Republic of Uzbekistan on State Land Cadastre No.666-I of 28.08.1998.
- Presidential Decree №. UP-5495. Decree "On measures on cardinal improvement of investment climate in the republic of Uzbekistan".
- Appendix No. 2 to the Resolution of the Cabinet of Ministers №. 146 (2011), regulation "On the Procedure for Compensation for Losses of Land Owners, Users, Tenants and Owners, as well as Losses of Agricultural and Forestry Production".
- Resolution №. 911 of the Cabinet of Ministers (2019) "On the Procedure for withdrawal of land plots and compensation to owners of immovable property located on the land plot.
- Law No 781 "On procedures for the withdrawal of land plots for public needs with compensation" October 1st, 2022. The Law specifies cases when the land plots can be acquired for public need among which construction (reconstruction) of roads and railways of national and local significance is also specified. Law No. 781 also prescribes procedures of land acquisition, communication with project affected people (PAPs), compensation calculation, and demolition of affected assets. As of October 1st, 2022, all projects that require the acquisition of land for public needs should be managed in accordance with this Law.

With regard to wayleaves and exclusion zones that are mandated for the establishment of certain infrastructure, specific legal provisions for land acquisition are as follows:

- With regards to the acquisition of land for Right of Way, procedures to establish a right of way (ROW) in Uzbekistan are the same for legal entities and individuals. ROW or limited use of a land plot is determined in the Land Code of Uzbekistan, Civil Code (under the term servitude), and the Resolution of Cabinet of Ministries

No.911 dated 16.11.2019. All grid interconnection works are expected to be undertaken within the existing ROW; however, for completeness, the requirements for establishing a ROW are presented below, and their applicability will be confirmed during the ESIA process.

- Article 30 of the Land Code (LC) determines engineering, electrical power and other lines and constructions as a reason for receiving the right to servitude. Following Article 30 of the Land Code, Article 173 of the Civil Code (CC), and Article 30 of Annex 1 of the Resolution of Cabinet of Ministers No. 1060 dated December 29, 2018, servitude is established by agreement between persons demanding the establishment of servitude and the owner, user, lessee, proprietor of the land plot. If they do not achieve consent, the servitude shall be established by a court decision at the user's claim. The agreement on servitude shall be subject to state registration and preserved when the land plot is transferred to another person. Servitude agreements can be terminated in cases of the cessation of the reason according to which it was established.
- Article 173 of CC also states that the burdening of a land parcel by servitude does not deprive the owner of the parcel of the rights of possession, use, and disposition of this parcel.
- Calculation and compensation of losses due to servitude agreement are performed following Law No 781 "On procedures for the withdrawal of land plots for public needs with compensation" (if it is a project for public needs) the Resolutions of Cabinet of Ministers No.146 from 25 May 2011 "On measures to improve the procedure for granting land plots for urban development activities and other non-agricultural purposes" and No. 911 from 16 November 2019 "On additional measures for enhancing modalities of providing compensation on withdrawal and allocation of land plots and safeguard the property rights legal and physical entities".
- Article 86 of the LC states that losses caused to the owners of land parcels, landowners, land users and lessees are liable to be fully refunded (including the lost profit) in the case of limitation of their rights in connection with land acquisition. Refunding of losses is carried out at the expense of the resources of the corresponding centralized funds for compensation of losses to individuals and legal entities in connection with the seizure of land plots from them for public needs and by enterprises, establishments and organizations the activity of which causes limitation of rights of land parcel owners, landowners, land users and lessees or worsening the quality of the neighbouring lands in the order established by legislation.
- Article 173 of the CC states that the parcel owner burdened with the servitude has the right unless otherwise provided by a Law, to demand from the person in whose interests the servitude is established proportional payment for the use of the parcel.

3.1.4.6 Labour and employment

The following laws pertain to the recruitment and management of labour in Uzbekistan, and the protection of labour rights within the workplace. An elaboration of key relevant provisions is provided in Section 16 of this Report.

- Labour Code of the Republic of Uzbekistan 1996 as amended on 18.05.2022.
- Law "On the employment of the population" No. 642 of 20.10.2020.
- Resolution of the Ministry of Labour and Social Protection of the Population, Ministry of Health of the Republic of Uzbekistan, registered on 29.07.2009, reg. number 1990 "About the approval of the list of occupations with unfavourable conditions, in which the use of the labour of persons under 18 years of age is prohibited".
- Decree No. 133 of 11 March 1997 to approve normative acts necessary for the realization of the Labour Code of the Republic of Uzbekistan.
- Decree of the Cabinet of the Ministers No. 1011 of 22 December 2017 "On Perfection of the Methodology of Definition of Number of People in Need of Job Placement, including the Methodology for Observing Households with Regard to Employment Issues, also for the Development of Balance of Labour Resources, Employment and Job Placement of Population".
- Decree of the Cabinet of the Ministers No. 965 of 5 December 2017 "On the Measures of Further Perfection of the Procedure of Establishment and Reservation of Minimum Number of Job Places for the Job Placement of Persons who are in need of Social Protection and Face Difficulties in Searching Employment and Incapable of Competing in Labour Market with Equal Conditions".
- Decree No. 964 of 5 December 2017 "On the Measures for Perfection of the Activity of Self-Government Bodies Aimed at Ensuring Employment, Firstly for the Youth and Women".

3.1.4.7 Archaeology and cultural heritage

The laws pertaining to the exploration, protection and preservation of archaeological resources and cultural heritage sites in Uzbekistan are listed below. Detailed mandatory requirements for different aspects of cultural heritage in relation to the Project will be provided in the detailed ESIA report.

- Constitution of the Republic of Uzbekistan, the Criminal Code of the Republic of Uzbekistan.
- Law No. ZRU-229 "On protection and use of the objects of archaeological heritage" (13 October 2009).
- Law No. 269-II "On the Protection and Use of Cultural Heritage Sites (30 August 2001, as amended).
- Presidential Decree No. R-5181 "On improving the protection and use of objects of tangible cultural and archaeological heritage" (16 January 2018).
- Presidential Decree no. PP-4068 "Regarding the strengthening of the protection, management and enhancement of tangible and intangible cultural heritage" (19 December 2018). The relevance of these requirements will be determined during the ESIA process.

3.1.4.8 Safety along overhead transmission lines

An essential standard for establishing OTLis SanPiN No.0236-07 on "Ensuring Safety for the Population Living Near High Voltage Power Lines". This standard specifies Health Protection Zones (HPZs), also known as setbacks, for the overhead power lines with different voltage ratings. The purpose of the HPZs is to protect any human receptors (and occupied buildings in particular) from any substantial electromagnetic fields (EMFs) that pose adverse impacts on human health. For newly designed OTL, buildings and structures must be set back the following distances either side of the OTL[1]:

- 15 m for OTL with a voltage of 220kV.
- 20 m for OTL with a voltage of 330 kV.
- 30 m for OTL with a voltage of 500 kV.
- 40 m for OTL with a voltage of 750 kV.
- 55 m for OTL with a voltage of 1150 kV.

All of the OTLs planned under the Project have a voltage rating of 220 kV. Accordingly, the HPZ for the OTLs is 15 metres from the outer most conductors on each side of the OTLs.

Other relevant national laws and regulations pertaining to the installation and operation of transmission and distribution powerlines, in the context of E&S assessment, include the following:

- Resolution of Cabinet of Ministers of Republic of Uzbekistan No.95 "On approval of general technical regulations of environmental safety" (2020).
- Decree of the Cabinet of Ministers of the Republic of Uzbekistan No.1050 "On approval of Rules for Protection of Power Grid Facilities, 2018".
- SanPiN & Norms No. 0236-07 "Sanitary norms and rules to ensure safety for people living near high voltage power transmission lines, 2007".

Electrical safety regulations pertaining to ecological receptors include the following:

- Resolution of Cabinet of Ministers of Republic of Uzbekistan No.95 "On approval of general technical regulations of environmental safety" (2020). This law requires the implementation of environmental safety measures for the protection of flora and fauna. This includes the prevention of faunal mortalities due to electrocution through provisions such as equipment housing and plant site barriers.
- Decree of the Cabinet of Ministers of the Republic of Uzbekistan No.1050 "On approval of Rules for Protection of Power Grid Facilities, 2018". This law established the procedure for establishing protected zones for power grid facilities, as well as

1 The HPZ (set back) is defined as the distance from the outermost wires in a direction perpendicular to the OTL.

special conditions for using land located within the protected zones and ensure the functioning and operation of the said facilities. Construction of power grid facilities with 110, 220 or 500kV in protected areas of state nature reserves, protected areas of nature parks and state biosphere reserves requires prior permission from the Cabinet of Ministers of the Republic of Uzbekistan.

MANAGEMENT OF PUBLIC GRIEVANCES

The Resolution No. 728 provides for the resolution of communal and private grievances in relation to various development projects and programs within Uzbekistan.

The law establishes a centralized public Grievance Redress Mechanism (GRM) which employs a publicly accessible online platform for the collection of grievances from residents across the country. The Portal allows any member of the public to submit a grievance, for the attention of various authorities within the various domains of local and central Government. The application for grievance resolution can target any authority within the hierarchy of executive Government.

Upon initial review of the grievance statement by the target authority, the grievance is allocated to the most relevant LGA for further review and remedial action. In the event that resolution cannot be delivered by the most relevant LGA level, the grievance is cascaded higher along the administrative hierarchy, until an appropriate executive decision is provided by a competent authority.

3.2 International Conventions and Protocols

Uzbekistan is signatory to a number of effective international conventions pertaining to environmental management, social sustainability, climate change and human rights. The nationally binding E&S commitments enshrined in these accords will apply to the Project, as outlined in the following table.

Table 3-1 International Protocols and Conventions

NAME OF INTERNATIONAL PROTOCOL/CONVENTION	SIGNED/ RATIFIED	RELEVANCE TO THE PROJECT
UN Framework Convention on Climate Change	Accession: 20 June 1993	The Project will comply with all national standards for GHG emissions in order to contribute to Uzbekistan's targets.
Kyoto Protocol to UNFCCC	Ratified: 12th October 1999	
Paris Agreement to UNFCCC	Signed: 19th April 2017	
Montreal Protocol on Substances that Deplete the Ozone Layer (with London, Copenhagen, Montreal amendments)	Accession: 10th June 1998	The Project will support Uzbekistan's contribution towards the protection of the ozone layer by refraining from use of ozone depleting substances.

Name of International Protocol/Convention	Signed/ Ratified	Relevance to the Project
Vienna Convention on the Protection of Ozone Layer	Accession: 18 May 1993	
UN (Rio) Convention on Biological Diversity	Accession: 19th July 1995	The Project will implement mitigation and management measures to ensure the conservation and protection of terrestrial and canal ecology during the Project lifecycle.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Accession: 10th July 1997	The Project staff and workers will be strictly forbidden from trading in any wild flora and fauna found in the Project site or outside the Project boundaries.
Convention on Migratory Species of Wild Animals	1 May 1998	The project will implement mitigation and management measures to ensure conservation of terrestrial and avian migratory species where identified.
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	Accession: 7th February 1996	The Project will be required to adhere to all national and international standards for hazardous waste generation and management.
United Nations Convention to Combat Desertification	Ratified: 31 August 1995	The Project will not result in accelerated desertification through sourcing of its materials and will contribute to sustainable development.
UNECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes	Accession: 4th September 2007	The canal south of the project site is found between the border of Uzbekistan and Tajikistan. Therefore, the Project will ensure that any impacts to the canal I.e. discharge are mitigated and managed in accordance with the national and lenders requirements.
Paris Convention on Protection of the World Cultural and Natural Heritage	Succession: 13th January 1993	The Project will implement mitigation and management measures where items/sites/monuments of cultural or natural heritage are identified within or near the Project boundaries and notify the relevant authorities immediately.
Stockholm Convention on Persistent Organic Pollutants	Accession: 28th June 2019	The Project will implement control measures to eliminate any use of chemicals under Annex A and B and reduce the unintentional release of those under Annex C.

3.3 Institutional Framework

Key organisations with responsibility for environmental management in Uzbekistan are:

- Cabinet of Ministers of the Republic of Uzbekistan (COM).

- Ministry of Ecology, Environmental Protection and Climate Change (MEEPCC).
- The Centre for State Ecological Expertise, which is under the MEEPCC.
- The Cabinet of Ministers of the Republic of Uzbekistan governs the executive body in the Republic of Uzbekistan following the Constitution of the Republic of Uzbekistan (Article 98), and the Law of the Republic of Uzbekistan "On the Cabinet of Ministers of the Republic of Uzbekistan" (new edition of 2019). The COM exercises the following main functions.

The Ministry of Ecology, Environmental Protection and Climate Change (MEEPCC) is the main regulating body of state administration on environmental protection issues. The primary responsibilities of the MEEPCC include ensuring the implementation of a unified state policy on environmental safety, environmental protection, and the use and reproduction of natural resources; and enforcing state control over the compliance of ministries, state committees, departments, enterprises, institutions, and organisations, as well as individuals, with respect to the use and protection of land, mineral resources, water, forests, flora and fauna, and atmospheric resources. Structurally, the MEEPCC consists of the central unit (located in Tashkent), regional units (oblast) and local (district) units.

The Centre for State Ecological Expertise: The Centre for State Ecological Expertise's activities are directly related to the evaluation of materials for EIA and the issuance of documents determining compliance with environmental requirements for planned or executed business and other activities, as well as determining the admissibility of the implementation of the object of environmental expertise.

Due to the cross-cutting nature of sustainable development and the environment, virtually all other state bodies have some responsibility towards them. Other Ministries, Departments and Agencies (MDAs) related to E&S impact management in the context of the Project include (but are not limited to):

- Ministry of Energy of the Republic of Uzbekistan
- Ministry of Health
- Ministry of Poverty Reduction and Employment
- Ministry of Water Resources
- Ministry of Agriculture
- Inspection of Mining, Geology and Industrial Safety Control (Kontekhnazorat) under the Ministry of Mining Industry and Geology of the Republic of Uzbekistan
- Ministry of Tourism and Cultural Heritage
- Ministry of Emergency Situations
- Cadastre Agency under the Ministry of Economy and Finance of the Republic of Uzbekistan

3.4 Lender E&S Requirements

The Project developer is pursuing an amount of project finance from a number of Financial Institutions (FIs), which seek to mainstream environmentally and socioeconomically sustainable development planning through the evaluation and management of E&S risks associated with investment projects, in step with:

- Internal E&S policies, standards, and guidelines
- Industry-wide, voluntary E&S risk assessment and management frameworks drawing on well-developed and internationally accredited E&S performance standards

The Project's prospective lenders include the Asian Development Bank (ADB), International Finance Corporation (IFC) and Japan Bank for International Cooperation (JBIC). The E&S policies, frameworks, and performance standards applicable the Project based on its prospective lenders are outlined in the following sub-sections.

3.4.1 Asian Development Bank (ADB)

The E&S policies, principles and objectives adopted by the ADB are enshrined in the Safeguard Policy Statement (SPS 2009). The main focal areas of the Policy are (i) environmental safeguards, (ii) involuntary resettlement, and (iii) Indigenous Peoples (IP) safeguards. The key objectives of the SPS include:

- To avoid adverse impacts of projects on the environment and affected people, where possible.
- To minimise, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is impossible.
- To help borrowers/clients to strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

ADB's Indigenous People's Safeguard is not applicable to this Project. This is because as per the ADB's requirement on Indigenous Peoples, there are no indigenous peoples within the project area of influence.

3.4.2 IFC Performance Standards

The IFC Performance Standards are a key component of the IFC's Sustainability Framework and directed towards clients (i.e. party responsible for implementing and operating the project that is being financed), providing guidance on how to identify risks and impacts. The IFC Performance Standards are designed to help avoid, mitigate, and manage risks and impacts throughout the life of a project as a way of doing business in a sustainable way, including

stakeholder engagement and disclosure obligations of the client in relation to project-level activities.

The IFC Performance Standards (2012) are listed below:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
- Performance Standard 2: Labour and Working Conditions
- Performance Standard 3: Resource Efficiency and Pollution Prevention
- Performance Standard 4: Community Health, Safety, and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage

3.4.3 WBG EHS Guidelines (2007)

The World Bank Group International Finance Corporation (IFC), Environmental, Health and Safety (EHS) General Guidelines of April 2007 superseded the World Bank Handbook issue of 1998. In terms of specific guidelines to control environmental externalities (e.g. wastewater quality etc.), EHS guidelines have been set out by IFC and the World Bank Group to provide general guidelines for its members when involved in a project or when providing financial support to a project. These guidelines contain general and industry-specific examples of Good International Industry Practice (GIIP). In summary, it should be noted that the following IFC EHS Guidelines are relevant to this project:

- General EHS Guidelines (2007).
- Electric Power Transmission and Distribution (2007).
- Guidelines for Water and Sanitation (2007).

3.4.4 Equator Principles

The Equator Principles (EP) is a risk assessment framework used by financial institutions to determine, assess and manage the environmental and social risk in Project's financing. At present, a total of 139 financial institutions from 39 countries have adopted the Eps. The Equator Principles were updated in 2006 (EPII), 2013 (EPIII) and a further update (EPIV) came into effect in October 2020. The EPs currently include the following guiding principles for E&S due diligence:

- Principle 1: Review and Categorisation.

- Principle 2: Environmental and Social Assessment.
- Principle 3: Applicable Environmental and Social Standards.
- Principle 4: Environmental and Social Management System and Equator Principles Action Plan.
- Principle 5: Stakeholder Engagement.
- Principle 6: Grievance Mechanism.
- Principle 7: Independent Review.
- Principle 8: Covenants.
- Principle 9: Independent Monitoring and Reporting.
- Principle 10: Reporting and Transparency.

The EPIV issue establishes the minimum E&S standards to be adopted by EP Financial Institution (EPFIs) as those from IFC Performance Standards on Environmental and Social Sustainability (Performance Standards), the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) and/or the relevant host country laws, regulations and permits that pertain to environmental and social issues.

3.5 Project E&S Risk and Assessment Categorization

3.5.1 Categorization by national legislation

3.5.1.1 Project categorisation

In the regulatory context of Uzbekistan, the Project's categorization in terms of E&S risk level is carried out on using sector-specific criteria set out in the Resolution No. 541 on "Measures for the Further Improvement of Environmental Impact Assessment Procedures". The Resolution provides the following E&S risk categories for power-generating facilities:

- Thermal, photovoltaic, wind power and other power-generating facilities with a capacity of 300 MW or higher – Category I (high risk).
- Thermal power plants and other power-generating facilities with a capacity of 100 MW to 300 MW – Category II (medium risk).
- Thermal, photovoltaic, wind power, and other power-generating facilities with less than 100 MW capacity – Category III (low risk).

Based on regulatory requirements and criteria for the national EIA process in Uzbekistan, a total of five (5) specific national EIA studies were commissioned for the project facilities planned under the Project.

3.5.1.2 EIA process

Pursuant with Resolution No. 541, the Project is subject to a national EIA process (OVOS), which consists of three stages. Separate national EIA studies are required for the PV power plant and BESS developments. The stages constituting the OVOS process are outlined below.

- **Stage I – Preliminary Statement of Environmental Impacts (PZVOS)**

  The PZVOS study is commissioned at the Project's planning stage and performed by qualified E&S consultants. The objective of the study is the generic assessment of potential E&S impacts associated with a given project, and the development of mitigation measures, the implementation of which is guided in an Environmental Management Plan (EMP) constituting the PZVOS report. Upon completion, the PZVOS report is submitted to the Ministry of Ecology, Environmental Protection and Climate Change (MEEPCC) for review.

  Provided the assessment is considered sufficient, a positive conclusion is issued, which provides permission for the implementation of the Project's construction phase. In the event that the assessment is considered insufficient, a directive is issued to either (i) upgrade the PZVOS report based on specific comments or (ii) undertake a follow-up (Stage II) ZVOS study. A positive PZVOS conclusion for any given project is valid for a period not exceeding three years from the date of issue.

- **Stage II – Statement of Environmental Impacts (ZVOS)**

  The requirement for a ZVOS (Stage II) study is contingent on the review of the PZVOS (Stage I) study. Where the PZVOS report review establishes the need for an expanded assessment, the ZVOS study is commissioned. The objective of the ZVOS study is to provide a more detailed assessment of potential E&S impacts, in addition to the formulation of commensurate mitigation plans. Upon completion, the ZVOS report is submitted to the Ministry of Ecology, Environmental Protection and Climate Change (MEEPCC) for review.

  Provided the assessment is considered sufficient, a positive conclusion is issued, which provides permission for the implementation of the Project's construction phase. In the event that the assessment is considered insufficient, a directive is issued to upgrade the PZVOS report based on specific comments. A positive ZVOS conclusion for any given project is valid for a period not exceeding three years from the date of issue.

- **Stage III – Statement on Environmental Consequences (ZEP)**

  The ZEP study is commissioned at the Project's implementation stage and performed by qualified E&S consultants, prior to the start of commissioning activities. At the final stage of the national EIA process, additional and thematic modelling assessments are commissioned to quantify the Project's emissions and discharges into receiving environments. Based on this round of assessment, the ZEP study is intended to provide elaborate mitigation and monitoring plans. Upon completion, the ZEP report is submitted to the Ministry of Ecology, Environmental Protection and Climate Change (MEEPCC) for review.

  Provided the assessment is considered sufficient, a positive conclusion is issued, which provides permission for the implementation of the Project's commissioning

and operational phases. In the event that the assessment is considered insufficient, a directive is issued to upgrade the ZEP report based on specific comments. A positive ZEP conclusion for any given project is valid for a period not exceeding two years from the date of issue.

The completion of the national EIA process (OVOS) and the issue of a positive conclusion, as a permit for project construction (or commission and operations, as appropriate) is amongst the focus areas of the Project Lenders' ESDD. Positive national EIA conclusions (approvals) have been issued for both the PV power plant and BESS (including interconnection) sites.

3.5.2 Categorization by E&S performance standards of Project Lenders

3.5.2.1 ADB

Within ADB's E&S assessment framework, the risk category of a project is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:

- **Category A** – A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.
- **Category B** – A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.
- **Category C** – A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.
- **Category FI** – A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI.

3.5.2.2 IFC

In 2012, the IFC instituted its Policy on Environmental and Social Sustainability. The Policy expresses the Corporation's commitment to enabling sustainable development, in the context of its overall mission and mandate. It further establishes the framework for E&S compliance monitoring, and good governance for IFC's direct and indirect investments, with a view to identifying and managing E&S risks within the Corporation's existing portfolio and prospective business activities.

The IFC categorizes prospective investments into the following E&S risk categories, at the time of ESDD reviews:

- **Category A** – Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented.
- **Category B** – Business activities with potential limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures.
- **Category C** – Business activities with minimal or no adverse environmental or social risks and/or impacts.
- **Category FI** – Business activities involving investments in FIs or through delivery mechanisms involving financial intermediation.

This categorization determines the extent of ESDD reviews and public disclosure applicable to different projects under financing consideration, to ensure potential impacts are managed proportionally.

3.5.2.3 JBIC

In 2015, Japan Bank for International Cooperation established its corporate guidelines for the confirmation of environmental and social considerations. The guidelines define the procedures and criteria for ESDD, which is necessary for all projects subject to funding by JBIC.

To ensure that development funding does not result in adverse impacts on the environment and human rights, the Bank strives to ensure accountability and transparency in the identification and management of project-related E&S risk before and after the establishment of JBIC funding agreements, through a series of E&S reviews.

According to the guidelines, all projects with potential eligibility for JBIC financing should undergo an ESDD screening, which serves to enable the categorization of each project in terms of level of E&S risks, and potentially associated reputational and financial risks.

The risk categories for direct investments are as follows:

- **Category A** – A proposed project is classified as Category A if it is likely to have a significant adverse impact on the environment. A project with complicated impact or impact which is difficult to assess due to lack of precedence is also classified as Category A. The impact of Category A projects may affect an area broader than the sites or facilities subject to physical construction. These projects may also occur sensitive sectors or with sensitive characteristics, and projects located in or near sensitive areas.
- **Category B** – A proposed project is classified as Category B if its potential adverse environmental impact is less adverse than that of Category A projects. Typically, its impacts are site-specific, few if any are irreversible, and mitigation measures are more readily available.

- **Category C** – A proposed project is classified as Category C if it is likely to have minimal or no adverse environmental impact.
- **Category FI** – A proposed project is classified as Category FI if it satisfies all of the following: JBIC's funding of the project is provided to a financial intermediary etc.

The extent of risk assessment, management plans, implementation monitoring and relevant stakeholder engagement is commensurate with the general risk rating determined through categorization.

4 APPROACH TO ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

4.1 Scope of Work and Key Deliverables

4.1.1 National EIA

The key deliverables pertaining to the national EIA process (OVOS), in line with pertinent legislation, are as follows:

- Stage I - Preliminary EIA Report (PZVOS).
- Stage II - Statement of the Environmental Impact (ZVOS).
- Stage III - Statement on Environmental Consequences (ZEP).

As detailed in Section 3.5.1 of this Report, MEEPCC can issue a 'positive conclusion' based on the first stage of the national EIA (PVOS), thereby permitting the completion of all construction works planned under the Project and obviating the requirement for the second (conditional) stage of the national EIA (ZVOS) in advance of construction.

A total of five (5) PZVOS studies for the development of the project facilities were assigned to the designated local E&S Consultant (i.e., Juru), and approvals for all of the EIA studies undertaken were issued at the time of this assessment.

Table 4-1 List of national EIA studies commissioned and state of regulatory approvals

SN	NATIONAL EIA	DATE OF POSITIVE CONCLUSION ISSUE
1.	100 MW PV power plant	31 August, 2023
2.	400 MW PV power plant	16 October, 2023
3.	Pooling station and 70-km OTL	26 February, 2024
4.	Nurobod BESS	29 November, 2023
5.	4.9-km OTL	25 December, 2023

Following the issue of a the first positive (PZVOS) conclusion on the first (and second as relevant) stages of the national EIA reports and management plans for the Project's construction phase exclusively, the completion of the third stage of the national EIA and issue of a second positive (ZEP) conclusion will be required prior to the start of the project's commissioning and commercial operation.

4.1.2 Lenders ESIA

The key deliverables of the ESIA process for the lenders are:

- ESIA Scoping Report.
- Detailed ESIA Report.

The E&S package of documents (delivered alongside the ESIA) for the Project will also include:

- Stakeholder Engagement Plan (SEP).

  A plan set to identify the full range of project stakeholders and provide a differential engagement strategy for each stakeholder grouping over the course of the Project's construction and operational phases, including an external Grievance Redress Mechanism (GRM) for resolving complaints and concerns from third party stakeholders.

- Land Acquisition and Livelihood Restoration Plan (LALRP)

  A plan set to identify and assess physical and economic displacement impacts associated with the establishment of the Project's physical footprint and any requisite safety buffers (as applicable), in conjunction with appropriate compensation and livelihood restoration measures for tenure-differentiated categories of PAPs subjected to involuntary resettlement.

- Construction Environmental & Social Management Plan (CESMP)

  The overarching management plan (prepared following the issue of the project ESIA and E&S policy) set to guide the management of project-related E&S impacts in line with regulatory requirements and lender E&S performance standards, at the Project's construction phase. The Plan will further underpin the development of the construction-phase Environmental and Social Management System (ESMS), by linking relevant E&S aspects and impacts to respective mitigation commitments and the monitoring arrangements for impact and mitigation monitoring by the E&S organization deployed for construction.

- Operational Environmental & Social Management Plan (OESMP)

  A plan that is analogous to the C-ESMP and set to underpin the operations-phase ESMS, at the Project's operational stage.

4.2 ESIA Methodology

4.2.1 Scope of the ESIA

The scope of potential E&S impacts for the purposes of the bankable ESIA includes the following:

- E&S impacts associated with the main facilities constituting the Project (i.e., PV power plant and BESS). The Project's main facilities are described in Section 2.6 of this document, whereas pertinent impacts and impact-specific areas of influence

for potentially affected VECs are presented in in Section 6 to Section 18 of this Report.

- E&S impacts associated with the ancillary facilities constituting the Project (i.e., laydown areas, contractor offices, temporary and permanent sanitation facilities etc.). The Project's ancillary facilities are described in Section 2.6 of this document, whereas pertinent impacts and impact-specific areas of influence for potentially affected VECs are presented in in Section 6 to Section 18 of this Report.
- E&S impacts associated with the associated facilities constituting the Project (i.e., LILO OTLs). The Project's associated facilities are described in Section 2.6 of this document, whereas pertinent impacts and impact-specific areas of influence for potentially affected VECs are presented in in Section 6 to Section 18 of this Report.
- Cumulative impacts resulting from the Project's incremental contribution to collective impacts co-generated by other developments in and around the Project's areas of influence, as discussed in Section 18 of this Report.

4.3 Project Alternatives

Several technological and locational alternatives have been taken into consideration in the course of the project's conceptual planning, feasibility studies and detailed design. The following sub-sections provide an overview of the alternatives considered, with a focus on economic viability, and environmental and socioeconomic criteria factored into the project ESIA.

4.3.1 Technological considerations

The project design is based on the selection of the best technological options determining various parameters of solar power yield, transmission efficiency and the longevity of various electronic components.

The optimization strategies used in the design of the power PV power plant include the following:

- Selection of a site with minimal shading from topographic features and structures (e.g., nearby buildings, trees, mountains and OTLs).
- Selection of a site with sufficient space to minimize inter-row shading between solar strings throughout the daytime.
- Selection of high-quality modules with bifacial capability, enhanced efficiency, robust architecture, low temperature sensitivity, and a low degradation rate.
- Single-axis solar tracking to maximize the capture of solar radiation along the east-west (azimuth) motion of the sun and adjusting the tilt angle to maximize capture of solar radiation along the north-south (zenith) motion of the sun.

- Robust and galvanized tracker models have been selected for resistance to strong winds and corrosion.
- Minimization of cable runs, optimization of cable dimensions, as well as selection of efficient transformers and inverters to minimize power losses.
- Use of inverter model with a high Maximum Power Point Tracking (MPPT) capability to ensure that the PV modules are operating at maximum efficiency despite fluctuations in solar irradiance.
- Integration of a complete SCADA system to enable the timely identification and remediation of system faults, and thereby reduce the incidence of operational downtime and yield deficits.
- Use of Li-ion batteries with a high energy density and coulombic efficiency to enable a high-power output and round trip efficiency for stable power supply.

4.3.2 Locational considerations

A number of factors determine the suitability of a given site for solar power generation. As such, the identification of candidate sites and final site selection are based on a number of technical feasibility studies. Site investigation undertaken as part of the feasibility studies took stock of several viability factors described below.

4.3.2.1 Solar resources

Solar irradiance is amongst the principal factors governing the location of solar power plants, as the intensity of incident solar radiation varies both spatially and temporally, depending on variables such as time of day, season of the year, amount of humidity and cloud cover, dust conditions, and shading from surrounding features. Global Horizontal Irradiation (GHI) is the best indicator of the amount of solar radiation received per unit area, which covers both direct radiation from the sun, and scattered radiation reflected by the atmosphere and surrounding surfaces. The GHI is initially estimated using satellite-based data, to determine broad regions with potentially high irradiation. Subsequently the GHI is measured using site-based sensors and adjusted using climatic variation data from nearby meteorological stations, to determine smaller candidate sites with the highest solar power potential.

The figure below illustrates the spatial variation in GHI across Uzbekistan, based on data collected by Solargis and for solar resource mapping by the World Bank. Measurements from a network of meteorological stations across the country indicate that solar irradiance is highest between the months of May and September, with highest insolation recorded in July.

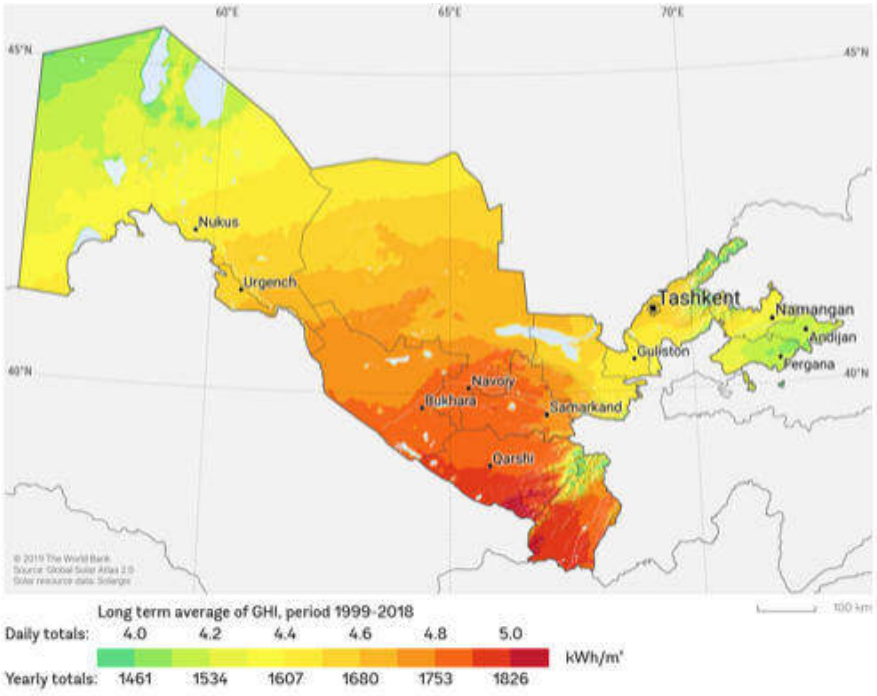

Figure 4-1 GHI variation across the regions of Uzbekistan

The solar assessment carried out by China Energy Engineering Group Anhui Electric Power Design Institute in 2003 did not identify any undeveloped areas of land within Samarkand Region, of equivalent or greater solar resource potential. The final selected sites in Nurobod District are conducive for sufficient solar irradiation, with a peak GHI level of 238 kW/m^2. With the opted PV power plant technology, the energy yield analysis taking into account the annual variability of solar irradiance and insolation indicates a mean annual power generation potential totalling 1,264,937 MWh.

An important factor affecting local irradiance and potential yield is the degree of on-site shading from high-rise structures and topographic features (e.g., trees, OTLs, buildings etc.).

4.3.2.2 Area and land-use

The development of solar power generating facilities demands a sizeable area of land. The spatial extent of a potential site is an integral parameter in terms of potential yield, taking into account the number of solar modules required to meet the target generation capacity and yield, and the significance of inter-row shading on the power productivity.

In addition to space, potential sites should ideally not be occupied, to minimize adverse impacts on potentially affected land users and livelihoods and the duration of land reallocation and acquisition processes. Industrially developed sites that are compatible with the establishment of solar power facilities, should otherwise accommodate the solar arrays and other PV power plant components. It is important that any co-located infrastructure and

surrounding land use do not impinge on PV generation by light interception (shading) and module soiling. Natural elements of the environment within potential sites, such as vegetation canopy and avifauna, can also contribute to soiling.

Considering the scarcity of suitable unoccupied land in the region, best efforts were made to site the PV power plants in areas with relatively low-priority land-use (i.e., areas without residential, intensive crop cultivation and/or industrial property).

4.3.2.3 Climatic extremes and hazards

Besides the availability of sufficient mean irradiance, climate related pressures are an additional criterion for the selection of the Project site. Strong winds (in excess of 16-20 m/s) pose the risk of damage to mobile solar trackers and costly plant downtime. Likewise, flooding from major rivers or extensive stormwater runoff can cause severe erosion which can undermine the foundation of PV module mounting structures and result in washout and associated downtime. Further, heavy, and sustained snowfall can constrain solar insolation, overload the solar panels, and impede tracker movement by ground-based build-up, whereas dust storms can cause a significant drop in insolation and yield.

Historical climate and weather records indicate that the selected sites are not prone to the regular occurrence of the above extreme climate events.

4.3.2.4 Geotechnical and hydrological conditions

The viability of a project site further depends on its geotechnical and hydrological conditions, considering the implications of the sub-surface environment on the integrity, stability, and performance of designed sub-structures and superstructures. Dedicated geotechnical and hydrological surveys have been conducted within the final designated sites in Nurobod, and Pastdargom Districts.

The studies investigated the resident geology, soil-bearing capacity of the soils, resistivity of the soils, groundwater level, drainage patterns, flood risk and as well as the chemical properties of the soils and groundwater. The results of these studies were evaluated to ensure that due provisions are designed to ensure the stability and integrity of planned structures (e.g., erosion and corrosion protection) and effective depths for grounding systems.

4.3.2.5 Grid connection

The grid connection requirements are an important consideration in the location of PV projects. The projects should be established with respect to grids that offer an adequate capacity, (ii) availability and (iii) proximity. The transmission conductors and switchyards constituting the recipient transmission line must have a rating that corresponds to the power

yield, require minimal down-time for maintenance, and be located close to the proposed generation sites to minimize the cost of connection facilities.

4.3.2.6 Access

Convenient sites access is important with regard to transportation during the Project's construction and operational phases. The designated sites are located nearby existing trunk and district roads that are in relatively good condition. The roads also connect to district centres and cities with commercial centres and residential facilities.

4.3.3 Consideration of project alternatives

4.3.3.1 Technological alternatives

Considering the scarcity of suitable, unoccupied land in Samarkand Region, PPA performance requirements, and the best technological features already adopted in the Project's detailed design, no feasible technological alternatives for the development of the project facilities were identified over the course of the ESIA.

4.3.3.2 Locational alternatives

PV PLANT AND BESS FACILITIES

A number of locational alternatives were evaluated on the basis of E&S sensitivities, among other criteria, at the outset of the Sazagan Power Purchase (SPP) Scheme. In the early stages of feasibility studies, the Government of Uzbekistan, through the Ministry of Energy, engaged GOPA Consulting to provide technical support in identifying sites suitable for the projects planned under the scheme.

Due to the scarcity of land with sufficient insolation, the study targeted one three plots of land for the development of a (i) single PV power plant, (ii) nearby sub-station (under separate Sazagan 2 project), (iii) BESS with a short-range, underground connection to the sub-station, and (iv) a single OTL to link the power plant with the sub-station. This plan was subsequently transferred to the Project Developer via the SPP scheme, for advanced feasibility studies.

With the commencement of detailed feasibility investigations and the ESIA, a number of E&S constraints were identified within the interior and vicinity of the sites originally selected for the development of the PV power plant and BESS in Nurobod District, specifically:

- A housing project planned near the site
- A hazardous waste management facility within the site
- A gas pipeline transecting the site
- An OTL running along the site

Through progressive feasibility reviews and cross-cutting stakeholder consultation, the design was modified such that the power plant was split into two plants (100 MW, 400 MW), with the bigger section relocated 70-km West of the original site, and the sub-station and BESS pairing was shifted further out North. The translocation of the 400 MW PV plant necessitated the establishment of a 70-km OTL, to interconnect the 400 MW PV plant with the distant sub-station. This set-up was the determined to be the best and final locational alternative, considering the absence of strategically located, low-value (unoccupied) land with suitable technical advantages elsewhere in the region.

The original project design is shown in the map below, in relation to the final constellation, based on a screening against E&S, technical and economic feasibility criteria.

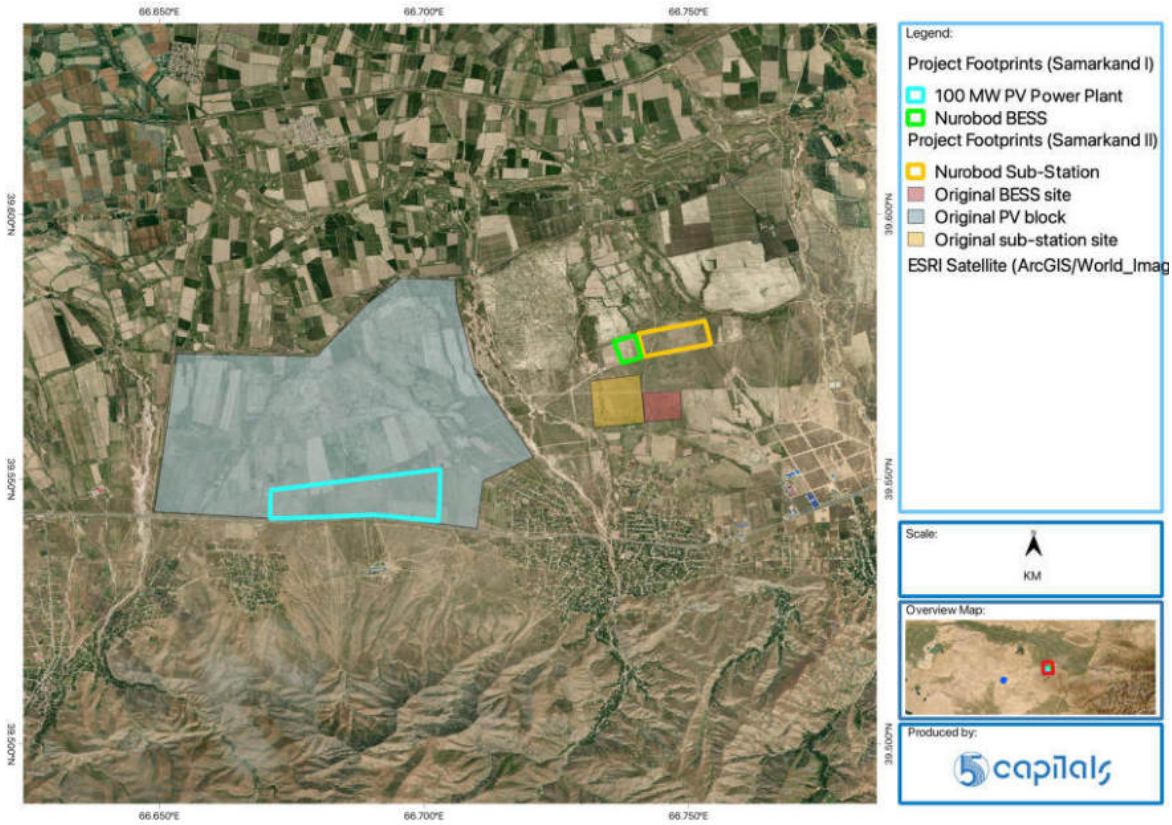

Figure 4-2 Alternative project sites considered at the feasibility stage

POWERLINES

Beyond the design modifications above, a series of adjustments were made to the OTL routes associated with the separate SPP scheme components. A total of 6 purposive iterations were made for the 70-km OTL routes, a total of 2 iterations for the 4.9-km OTL and a total of 10 revisions for the 350-km OTL planned under the Samarkand 2 PV and BESS Project (under the SPP scheme.

The OTL design adjustments were made in efforts to avoid the following E&S sensitivities:

- Provisionally identified residential property (i.e., households subject to physical displacement)
- High-value orchards
- Mining and prospecting zones

The main alternative routes which were originally planned for the 70-km OTL are shown in the figure below. The final (selected) route was set to avoid key receptors and constraints, including commercial fruit orchards, agricultural buildings and structures, as well as a mining area, where Uranium prospecting is underway. The line was therefore designed to avoid any establishments within mandatory OTL setbacks, including the 15-meter Health Protection Zone (HPZ), and 25-metre Grid Security Zone (GSZ).

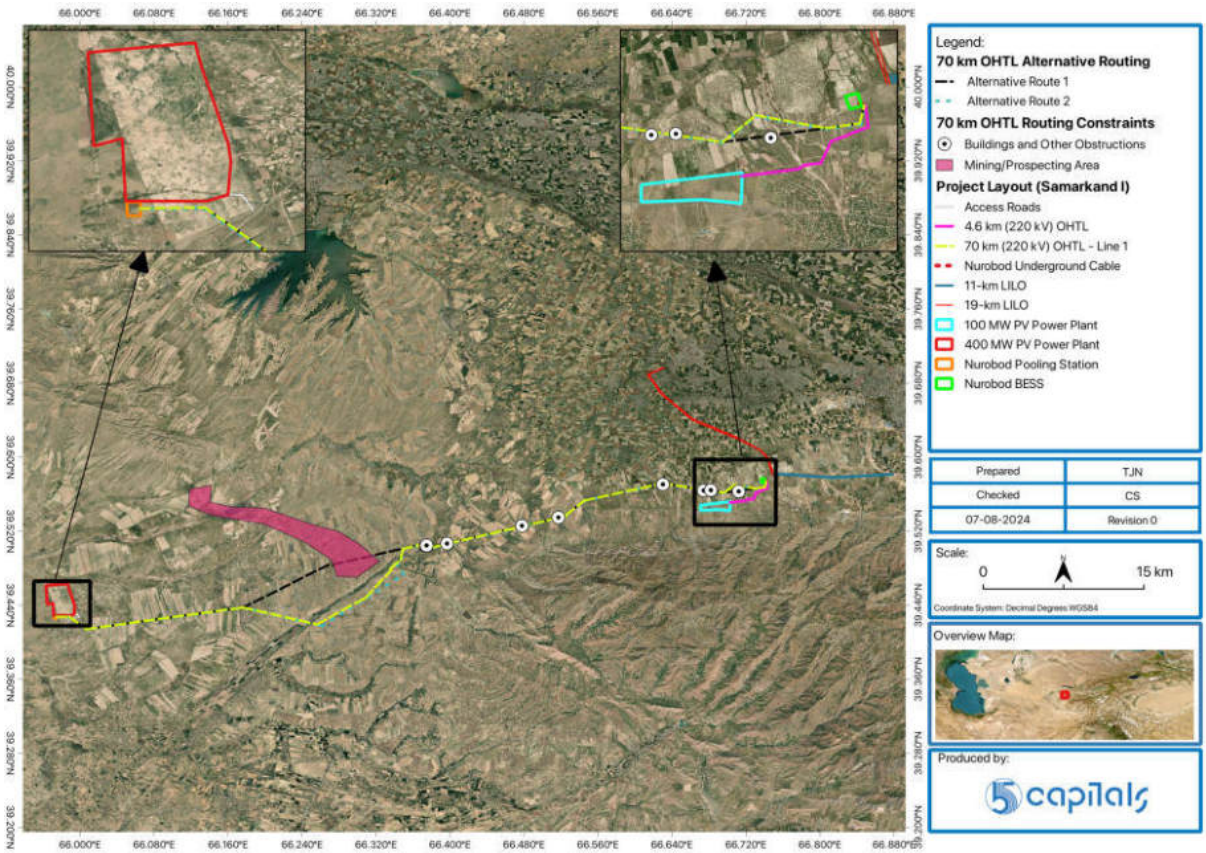

Figure 4-3 Route adjustments for the 220kV 70-km OTL

In addition, the 70-km OTL was aligned in parallel with another 220kV OTL planned under the Samarkand II PV and BESS project, with a view to minimizing potential E&S impacts, particularly those relating to local livelihoods and biodiversity. The planned OTLs are separated by a minimum intervening distance of 40 metres, in line with mandatory grid security requirements.

4.3.3.3 No project alternative

The zero alternative is not regarded as favourable, as the project is set to deliver on nationally important energy security objectives, in face of the ongoing power shortages across the country. In addition, the Project aligns with the national movement towards a cleaner and more efficient power sector, to meet the rising domestic demand for energy.

4.3.4 Baseline studies

E&S baseline studies are an integral aspect of the Project's ESIA process. These studies serve to define the baseline (pre-project) condition of potentially affected E&S receptors (i.e., Valued Environmental Components (VECs)) and thereby provide a frame of reference for monitoring E&S impacts at the Project's implementational stage. Technical descriptions for specialized baseline surveys designed for specific E&S receptor groupings are provided in Section 6 to Section 17 of this Report.

4.4 Impact Assessment and Significance Criteria

In order to obtain a credible assessment of environmental and social impacts, the assignment of "effect significance" to each identified impact needs to be a robust, consistent and transparent process. The methodology to assess 'effect significance' is outlined below and follows an International Best Practice based on the assumption that the significance of an impact on resources or receptors is considered to result from an interaction between three factors:

- The nature and magnitude of the impact (i.e. a change in the environment, social and/or health baseline conditions);
- The number of resources or receptors affected (i.e. humans and the environment); and
- The environmental value or sensitivity of those resources or receptors to the change.

A three-step approach has been used to determine the significance of environmental effects, as follows:

- Step 1 – Evaluation of value/sensitivity of resource or receptor;
- Step 2 – Assessing the magnitude of the impact on the resource or receptor; a
- Step 3 – Determining the significance of effects.

4.4.1 Identification and Evaluation of Sensitive Receptors

Sensitive receptors are defined as:

- Elements of the ***environment*** that are of value to the functioning of natural systems (i.e. areas or elements of ecological, landscape or heritage value, species, habitats and ecosystems, soil, air and water bodies or land-use patterns);
- ***Human*** receptors, such as stakeholders (i.e. users of dwellings, places of recreation, places of employment, community facilities or household relocation) and human systems (e.g. employment market, population disease susceptibility and disease communicability, exposure to toxicity of chemicals).

Table 4-2 Environmental value of receptor or resources

VALUE (SENSITIVITY)	DESCRIPTION OF VALUE
Very High	High importance and rarity on an international scale and limited or no potential for substitution. The receptor has already reached its carrying capacity, so any further impact is likely to lead to an excessive damage to the system that it supports. Locations or communities that are highly vulnerable to the environmental impact under consideration or critical for society (e.g. indigenous peoples, hospitals, schools).
High	High importance and rarity on a national scale, and limited potential for substitution. The receptor is close to reaching its carrying capacity, so a further impact may lead to a significant damage to the system that it supports. Locations or communities that are particularly vulnerable to the environmental impact under consideration (e.g. residential areas, vulnerable/marginalized groups).
Medium	High or medium importance and rarity on a regional scale, limited potential for substitution. The receptor is already significantly impacted, but it is not close to reaching its carrying capacity. Further impacts will get increase the stress of the underlying system, but evidence does not suggest that it is about to reach a critical point. Locations or groups that are relatively vulnerable to the environmental impact under consideration (e.g. commercial areas).
Low (or Lower)	Low or medium importance and rarity on a local scale. The receptor is not significantly impacted and shows a large spare carrying capacity. Impacts are not likely to generate any noticeable stress in the underlying system. Locations or groups that show a low vulnerability to the environmental impact under consideration (e.g. industrial areas).
Very Low	Very low importance and rarity on a local scale. The receptor is not impacted and shows a very large spare carrying capacity. Impacts are very unlikely to generate any noticeable stress in the underlying system. Locations or groups that show a very low vulnerability to the environmental impact under consideration (e.g. industrial areas).

4.4.2 Identification and evaluation of potential impacts

During the evaluation undertaken, the following types of impacts will be considered:

- Direct Impacts - Potential impacts that may result from the construction, commissioning, and operations of the Project acting directly on an environmental or social receptor;

- Indirect Impacts – Potential impacts which are not a direct result of a Project activity, that may be realised later in time or at distances further removed from the project footprint, but are normally a result of a complex pathway;
- Cumulative Impacts – Changes to the environment that are caused by an action in combination with other past present and future actions.
- Beneficial Impacts – Those impacts that have a positive, desirable or favourable effect on the sensitive resources or receptors (e.g. landscape providing artificial habitat for a variety of species, jobs opportunities during the construction and/or occupation phases of a project);
- Adverse Impacts – Those impacts that are detrimental and have a negative influence on the environment, social structures, resources or other receptors;
- Secondary Impacts - Potential impacts that may result from the implementation of protection measures applied to mitigate potential direct impacts;
- Event Related Impacts - Potential unplanned or accidental impacts stemming from an unintentional event such as fire, explosion, oil spill, etc.; and

4.4.3 Defining impact magnitude

The magnitude of the impact will be defined wherever possible in quantitative terms. The magnitude of an impact has a number of different components, for example:

- The extent of physical change;
- The level of change in an environmental condition;
- The permanence of impact and the reversibility of the impacted condition;
- Its spatial footprint;
- Its duration, its frequency; and
- Its likelihood of occurrence where the impact is not certain to occur.

Where necessary, the determination of impact magnitude may be assisted through the use of computer modelling (as outlined in the Terms of Reference sections herein). The criteria used for identifying the magnitude of impacts is provided within the table below.

Table 4-3 Criteria for magnitude of Impacts

MAGNITUDE	DESCRIPTION OF MAGNITUDE
Major	Adverse: Loss of resource and/or quality and integrity; severe damage to key characteristics, features or elements. A major impact is usually large scale, permanent and irreversible. Beneficial: Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Moderate	Adverse: Significant impact on the resource, but not adversely affecting the integrity; Partial loss of/damage to key characteristics, features or elements. Moderate impacts usually extend above the site boundary, and are usually permanent, irreversible or cumulative. Beneficial: Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.

MAGNITUDE	DESCRIPTION OF MAGNITUDE
Minor	Adverse: Some measurable change in attributes quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. Minor impacts usually are only noticeable within the site and are temporary and reversible. Beneficial: Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse: Very minor loss or detrimental alteration to one or more characteristics, features or elements. Beneficial: Very minor benefit to or positive addition of one or more characteristics, features or elements.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

4.4.4 Determining Significance of Effects

The significance of effects is a combination of the environmental value (or sensitivity) of a receptor or resource and the magnitude of the project impact value (change). In other words, it is this product of the impact acting on the receptor that produces an environmental effect. The table below provides criterion used for determining the significance of environmental effects through consideration of the potential magnitude of impact and sensitivity of the associated receptor. Definitions of each significance categories are provided.

Table 4-4 Criteria for Determining Significance of Effects

		Magnitude of Impact (Degree of Change)				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Sensitivity of Receptor	**Very High**	Neutral	Minor	Moderate or Major	Major	Major
	High	Neutral	Minor	Minor or moderate	Moderate or Major	Major
	Medium	Neutral	Negligible or minor	Minor	Moderate	Moderate or Major
	Low	Neutral	Negligible or minor	Negligible or minor	Minor	Minor or moderate
	Very Low	Neutral	Negligible	Negligible or minor	Minor	Minor

Table 4-5 Definition of Significance of Effects

Significance Category	Criteria
Very Large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	Important considerations at a local scale but, if adverse, are potential concerns to the project and may become key factors in the decision-making process.
Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
Slight	Local issue unlikely to be of importance in the decision-making process. Effects do not exceed statutory limits. Nevertheless, they are of relevance in enhancing the subsequent design of the project and consideration of mitigation or compensation measures.
Neutral	No effect or effect that is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error. No mitigation is required.

4.4.5 Mitigation and management measures

It is noted that the Project will incorporate certain mitigation as a function of its design (e.g. air emissions control, wastewater treatment plants). Where applicable, these measures will be included to the Project description.

In addition to the mitigation incorporated in the Project design, the ESIA will consider the assessed impacts to develop further measures (where necessary) for applicable construction and the operational phase impacts.

4.4.6 Residual impacts

The residual impacts section will consider the overall significance of impacts following the implementation of the mitigation and management measures not already included to the design and project activities. The significance of such impacts will be re-evaluated based upon the same criteria used to determine the impact significance stated above.

4.5 Framework for E&S Management

The ESIA will include a standalone framework to guide the Project parties in establishing structures for the management of E&S risks, impacts, opportunities and compliance associated with both the construction and operational phases of the Project.

The Framework will outline systematic structures and management programmes that will be further detailed in the project specific Environmental and Social Management Plans:

- Construction Environmental & Social Management Plan (CESMP)
- Operational Environmental & Social Management Plan (OESMP)

A preliminary C-ESMP will be prepared for the EPC Contractor and issued prior to the start of construction work. The C-ESMP will be updated following the completion and external review of the detailed ESIA for final issue. The O-ESMP will also be developed based on the detailed ESIA, subsequently and prior to the start of commissioning and operations.

4.6 ESIA Reporting Structure

In order to align ESIA documentation with review and disclosure requirements indicated in the E&S performance standards and policies of the Project Lenders, the ESIA report is structured as follows:

- Volume 1 will include a Non-Technical Summary (NTS) of the ESIA, including the main outcomes, and conclusions.

- Volume 2 will comprise the main text of the ESIA and full impact assessment, with mitigation, management and monitoring measures identified.
- Volume 3 will provide the Framework for Environmental and Social Management as outlined above.
- Volume 4 will comprise all technical appendices relevant to the studies and ESIA.

5 STAKEHOLDER ENGAGEMENT

The following sections outline the objectives of stakeholder engagement and preliminary identification of various project stakeholders, in terms of their roles and broader relation to the project. A description of stakeholder engagement activities completed at the time of the ESIA is also provided below. A more elaborate description of the stakeholder engagement process and the way forward for future stakeholder engagement is provided in the Stakeholder Engagement Plan (SEP) submitted in tandem with this Report.

5.1 Stakeholder Engagement Objectives

Stakeholder engagement is a crucial element of the Project's ESIA, as prescribed in relevant national legislation and the Project Lenders' E&S performance standards. The legal framework requires a meaningful and adaptive stakeholder engagement process which begins at reasonably early stages of project planning and continues throughout subsequent stages of project implementation. Continual stakeholder engagement serves to fulfil the following E&S performance objectives:

- To establish a participatory, informative, and transparent dialogue with parties with the potential to influence the project and/or become affected by the project, as well as constituencies with an interest in the outcome of the project.
- To leverage and integrate local and expert knowledge in the identification and assessment of E&S impacts, subsequent optimization of the project design and effective mitigation planning.
- To establish community, buy-in and ensure the delivery of sustainable and equitable project benefits to targeted beneficiaries.

Stakeholder engagement is a 'live' process that must be organized by means of a dedicated and documented Stakeholder Engagement Plan (SEP). The SEP developed at the bankable ESIA stage was built upon the rounds of stakeholder engagement discharged as part of the national EIA process. The basis for the preparation of the project SEP and an overview of the SEP commitments are detailed below.

5.2 Stakeholder Mapping

The preparation of the Stakeholder Engagement Plan (SEP) commenced with a stakeholder mapping exercise. The wide range of stakeholders associated with the Project were identified and categorized based on a review of the Project's legal framework and preliminary identification of E&S impact receptors. In terms of project parties, the project stakeholders were categorized as follows:

1. Project-affected landowners and land users.
2. Project-Affected Communities (PACs).
3. Local Government Authorities ((LGAs) i.e., regional and district administration).
4. National Ministries, Departments, and Agencies (MDAs).
5. Non-Governmental Organizations (NGOs).
6. Project Lenders.

The stakeholders were screened further, in terms of their relevance to the project, to enable a differential engagement plan such that the scope, modes and frequency of planned consultation and disclosure are commensurate with the parties' roles, risks, and interests in relation to the Project. This analysis enabled a subsequent round of stakeholder grouping, based on their influence on the Project:

- Decision-making stakeholders (Category 'D') – entities charged with the implementation, appraisal and/or regulation of the various project aspects, which can critically affect the course of the Project (i.e., national regulators and Project Lenders).
- Impacted stakeholders (Category 'A') – entities that are potentially impacted by the Project directly or indirectly.
- Key interest groups (Category 'I') – entities that are neither affected by the project nor bear any executive influence on the project but hold certain interests in the project.

The IFC PS1 and PS5 and the ADB Safeguards Policy Statement, define vulnerable groups as sections of project-affected communities that are subject to disproportionate adverse socioeconomic impacts from projects, by virtue of attributes such as gender, gender identity, sexual orientation, religion, ethnicity, indigenous status, age (including children, youth, and the elderly), physical or mental disability, literacy, political views or social status. On this basis, the list of criteria for the identification of vulnerable community members or sections in the context of the Project includes the following:

- Any households within project-affected communities, which are (i) subject to economic and/or physical displacement, and (ii) do not have legally demonstrable (formal) rights to project-affected landholdings and pastural areas.
- Households in which more than two members or the household head are disabled.
- Households in which more than two members or the household head are chronically sick.
- Female-headed households.
- Child-headed households.

- Households with an elderly head (over 60 years).
- Households living in extreme poverty (i.e., under the national basic poverty line.
- Households belonging to Indigenous Peoples (IPs)

5.3 Stakeholder Engagement Program

For the purposes of this ESIA, a number of stakeholder engagement modes are planned for subsequent consultation and disclosure vis-à-vis the various stakeholder groups identified. The table below outlines the applicability of these engagement modes, taking into account the stakeholder categories, the size and geographical distribution of the stakeholder groups, sensitivity of stakeholder information, and sociocultural factors affecting the participation and expression of certain community groupings.

Table 5-1 Applicability of different stakeholder engagement modes

STAKEHOLDER ENGAGEMENT MODE	APPLICABILITY
Formal consultative letters/ correspondence	• Inviting stakeholders to public meetings. • Disclosing information to a large and/or extensive target audience. • Formal project introduction and preliminary rounds of consultations with MDAs, LGAs and other authorities.
Community meetings	• Initial disclosure for project introduction, description of potential E&S impacts impact management strategies, for the information of the general public within project-affected communities. • Initial consultation with community members with regard to the general E&S context, potential E&S receptors and impacts, appropriate management measures and related recommendations. • Responses to general project-related queries from affected communities. • Presentation of the plan for subsequent rounds of engagement and grievance management.
Leaflets and infographics	• Presentation of lucid summary information regarding the project objectives, plan, associated E&S impacts and corresponding management measures. • Illustration of project design, and various E&S management processes (i.e., ESIA, grievance redress mechanism etc.). • Providing reference where attendance of meetings is not possible or oral presentations delivered during prior meetings is not well understood.
Household surveys	• Collection of detailed household-level socioeconomic information, from a representative sample of households resident within project-affected communities and districts. • Collection of voluntary and sensitive information that may otherwise be reserved on public consultation platforms.
Focus Group Discussions (FGDs)	• Collective consultations with affected communities, which target a specific groups or guilds for discussions based around certain E&S topics. • Exclusive and safe platforms for engaging with marginalized or minority groups who may otherwise be underrepresented or intimidated with regard to self-expression, during general community meetings.

Key Informant Interviews (KIIs)	• Consultation on key resource persons and subject matter experts from local communities, district and regional administration, MDAs and NGOs. • May be conducted for follow-up consultations with various authorities, following an initial round of consultative correspondence. • Useful for collecting expert information related to key E&S topics applicable to specific locations.
Participatory site visits	• Site visits for ground truthing and observation, attended by project-affected affected entities, including community members and/or relevant officials from competent authorities. • Useful for the demarcation of plot boundaries (for affected landholdings) and utility asset surveys.
Official announcements and media coverage	• Written notices posted in community centres and project information centres. • Notices disseminated to communities by phone calls, phone messages, emails, door-to-door visits or local media. • Useful for official announcements and notices related to project milestones of account to affected stakeholders.
Local and online disclosure of E&S safeguard documents	• Suitable for engagement aimed at consultation and disclosure within the public domain, which can result in material changes to the Project's E&S safeguard documents and the Project Company's Environmental and Social Management System (ESMS). • Local disclosure of E&S safeguard documents (i.e., ESIA Non-Technical Summary (NTS), LALRP, and SEP) at strategic Project Information Centres (PICs) within local communities (i.e., makhalla offices, school libraries and country offices of Project Lenders, as appropriate). • Online disclosure of E&S safeguard documents (i.e., ESIA, LALRP, and SEP) on the websites of Project Lenders.

Following the stakeholder analysis and the selection of suitable engagement modes, a forward Stakeholder Engagement Plan (SEP) was drawn up to ensure that an appropriate scope, frequency, and means of communication are allocated to each stakeholder group.

The above-described modes of stakeholder engagement will be conducted in a manner that is culturally appropriate, understandable to target audiences, and free of manipulation, coercion, and intimidation. The timing and location of community meetings and FGDs will be organized with efforts to ensure sufficient and equitable representation of groupings or constituencies whose attendance may be constrained by a lack of mobile communication, transportation means and overriding workplace or domestic commitments. Oral and written communication will be made in local languages, namely Uzbek and Russian, as appropriate. Where engagement is focused on international stakeholders, the default language will be English. All modes of engagement will be documented by minutes of meetings and attendance and/or document dispatch logs, as relevant.

It is noted that the SEP is a live document that will be updated over the course of project implementation. Potential and actual E&S risks, impacts and receptors may change with the (i) progression of project activities, (ii) variation in project plans and (iii) changes in the Project's

legal framework. Accordingly, the range of relevant stakeholders and corresponding engagement requirements will evolve in turn. The timing and frequency of engagements is set to ensure timely communication and liaison, which will play an instrumental part in minimizing the Project's adverse E&S impacts while enhancing development benefits to relevant constituencies.

The table below provides an overview of the project stakeholders (grouped by administrative capacity and relation to the project), their respective consultation and disclosure agenda, and engagement modes.

Figure 5-1 FGD with male residents of Chortut makhalla (top left) and female residents of Olga makhalla (top right); KII with Nurobod District Khokimiyat (bottom left) and with Pastdargom Khokimiyat (bottom right)

Table 5-2 Overview of project stakeholders, and their respective engagement modes, consultation agenda and inputs

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
Project-affected and land users (PAPs)	Displaced land users (landowners and workers) Total of 268 PAPs identified to date	**A:** Landowners subject to economic displacement as a result of land acquisition for the Project.	• Disclosure of project plans, potential E&S impacts, and mitigation strategies. • Request for information on potentially impacted property, resources, and land tenure. • Establishment of the Project's external Grievance Redress Mechanism (GRM).	• Official announcements. • Community meetings. • Focus Group Discussions (FGDs). • Key Informant Interviews (KIIs) (LALRP-stage). • Household surveys (LALRP-stage).	• Information on usage and tenure of land parcels affected by the project. • Information on household structure, existing livelihood assets, income status and access to social services.
Project-Affected Communities (PACs/ Makhallas)	Community residents Total of 20 affected communities as enumerated in Section 14.	**A:** Communities subject to E&S impacts from various project aspects.	• Disclosure of project plans, potential E&S impacts, and mitigation strategies. • Request for information on potentially impacted public infrastructure and resources. • Request for specific information on local demography, household economy and social services. • Establishment of the Project's external Grievance Redress Mechanism (GRM).	• Official announcements. • Project leaflets. • Community meetings. • FGDs. • Household surveys (ESIA-stage).	• Information on existing livelihoods and access to social services. • Concerns about the electromagnetic radiation and safety of the power plants and OTL corridors. • Unemployment rates are generally high in the rural reaches of the project-affected regions, particularly within Nurobod District. Temporary, semi-skilled labour mostly includes agricultural jobs available in the Spring and Autumn seasons.

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
					• Requests for project employment for men and women alike. Women can accept semi-skilled project work (i.e., cookery, cleaning, landscaping). • Communities requested for project assistance in revamping local infrastructure such as roads, existing OTLs, particularly within Nurobod District, and for entrepreneurial support such as fruit drying facilities for resident women. • Residents within Nurobod District anticipate access to stable and affordable power supply following the development of the Project, due to long-standing challenges with access to gas (manure from subsistence agriculture is being used for domestic heating etc.) and power outages from dilapidated, overwhelmed power distribution systems. • Communities along the 19-km LILO route (i.e., Parchakora, Parcha Chandir) recommended that the OTLs be re-routed to avoid residential area nearby Juma Town.

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
	Local women Local youth Other vulnerable groups within affected communities	**A:** Community members subject to disproportionate E&S impacts from various project aspects.	• Disclosure of project plans, potential E&S impacts, and mitigation strategies. • Request for information on potentially impacted public infrastructure and resources. • Request for specific information on local demography, household economy and social services. • Request for information special needs and current resilience to potential socioeconomic impacts. • Establishment of the Project's external Grievance Redress Mechanism (GRM).	• Official announcements. • Project leaflets. • FGDs. • Household surveys (ESIA-stage). • Household surveys (LALRP-stage).	• Information on existing livelihoods, access to social services, and social security. • In the rural reaches of project-affected regions, particularly within the Nurobod and Pastdargom Districts, most formal and semi-formal jobs outside of private (household) agriculture are temporary/ seasonal. • In general, women resident in the project-affected communities are employed in full-time and seasonal jobs such as farming, cotton harvesting, small-scale harvest processing facilities, vending, food catering, textile workshops, small-scale harvest sewing, home maintenance, and a few are employed in public institutions (i.e., schools, medical centres etc). • Women in the communities of Olga and Chorvador engage in herding, as many residents (especially men) are employed and stationed outside of the communities.

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
					• There are limited civil service and commercial jobs for local youth. • Assistance such as priority credit facilities for women, youth and vulnerable households, as well as social investments to support the establishment of local SMEs (e.g., textile workshops, confectionary factories, agro-processing facilities) would alleviate unemployment and poverty within affected communities.
	Residential and commercial land owners nearby the PV power plant and BESS sites	**A:** Entities that are subject to construction-phase impacts such as noise, vibration, dust, and traffic congestion.	• Disclosure of project plans (objectives, design, and activities). • Disclosure of the Project's GRM. • Request for any immediate queries and/or concerns.	• Official announcements. • Project leaflets.	• Information requests regarding the Project (i.e., developer, planned facilities, construction sites, and duration of construction). • No specific concerns raised to date.
Local Government Authorities (LGAs / Khokimiyats)	Makhalla leadership (i.e., chairpersons and committee for 20 affected communities)	**D:** -Grass-roots administration and monitoring of development projects, and coordination with district administration.	• Disclosure of project plans (objectives, design, and activities). • Request for information on potentially impacted public infrastructure and resources.	• Formal consultative letters/ correspondence. • KIIs.	• Information on existing livelihoods and vulnerable/ marginalized community groups.

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
		- Registration of community grievances.	• Request for general information on local demography, household economy and social services. • Request for general information on socioeconomically vulnerable community groupings. • Request for cadastral maps and local land-use. • Request for information on the progress of land expropriation and relevant procedures. • Establishment of the Project's external Grievance Redress Mechanism (GRM).		
	District khokimiyats (i.e., for 3 affected districts of Nurobod, Pastdargom and Samarkand)	**D:** - District-level planning and administration of development projects. - Preparation of land-use proposals, approval of subsequent land-use plans, commissioning of cadastral registration of landholdings, and administration of Land Lease Agreements (LLAs). - Implementation of land expropriation for the Project.			• Information on existing livelihoods, access to social services, and public infrastructure. • Cadastral maps and information on the usage and tenure of affected land. • Recommendation for change in the LILO design, to avoid the residential cluster nearby Juma Town and Juma Market.
	Samarkand Region Khokimiyat	**D:** - Regional planning and administration of development projects. - Implementation of land expropriation for the Project.			• Information regarding site selection and land acquisition for the Project. • Information regarding public infrastructure and natural resources/ ecology.

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
National Ministries, Departments, and Agencies (MDAs) – Energy	Ministry of Energy	**D:** Review and approval of project design, execution of a LLA for the Project, operational power off-take, and O&M post PPA term completion.	• Disclosure of project design. • Updates on project implementation progress (i.e., design, construction planning).	• Ad-hoc formal consultative letters/ correspondence.	Approval of project design.
	Ministry of Mining Industry and Geology	**D:** Management of groundwater resources and hazardous land as well as the development of mining and extraction areas.	• Disclosure of project plans (objectives, design, and activities). • Request for information on any geotechnically hazardous land within project sites. • Request for information on existing and planned mining and prospecting sites in and around the project sites, and relevant regulatory buffers/ exclusion zones.	• Formal consultative letters/ correspondence. • Key Informant Interviews (KIIs)	Uranium mining and prospecting zone nearby the 70-km OTL and exclusion/ buffer requirements for the OTL route adjustment.
	National Electricity Grids of Uzbekistan (NEGU)	**D:** Review and approval of project design, land acquisition, operational off-take and O&M of planned interconnection facilities post PPA term completion.	• Design of the Project's associated facilities (i.e., LILO transmission lines).	• Ad-hoc formal consultative letters/ correspondence.	• Approval of project design. • Provision of information relating to the design, construction and operation of the Project's associated facilities (i.e., LILO transmission lines).

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
	Asia Trans Gas	**D:** Provision of general information on transboundary/ international gas pipelines within the project-affected areas, and execution of laws and regulations pertaining to the operation and maintenance of gas supply infrastructure (e.g., appropriate buffer zones).	• Disclosure of project plans (objectives, design, and activities). • Request for information on existing gas pipelines located in and around the project area. • Request for regulatory buffers for gas pipelines located in and around the project area.	• Formal consultative letters/ correspondence.	• Information on operational gas pipelines nearby the project footprints and their respective capacities. • Regulatory setback/ buffer distances for gas pipelines located nearby project facilities. • The project sites are not located within the security buffers of any transboundary gas pipelines.
	Uztransgaz.	**D:** Provision of general information on regional gas pipelines within the project-affected areas, and execution of laws and regulations pertaining to the operation and maintenance of gas supply infrastructure (e.g., appropriate buffer zones).	• Disclosure of project plans (objectives, design, and activities). • Request for information on existing gas pipelines located in and around the project area. • Request for regulatory buffers for gas pipelines located in and around the project area.	• Formal consultative letters/ correspondence. • Participatory site visits.	• Information on operational gas pipelines nearby the project footprints and their respective capacities. • Regulatory setback/ buffer distances for gas pipelines located nearby project facilities. • The sites for main project facilities (i.e., PV power plants and BESS) are not located within the security buffers of any region gas pipelines. • A number of gas pipelines intersect the routes of the 70-km OTL. The position of these pipelines should be taken into consideration during detailed design, to ensure OTL towers

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
					are not constructed within relevant security buffers.
	Hududgaz	**D:** Provision of district-level information on existing gas pipelines within the project-affected areas, and execution of laws and regulations pertaining to the operation and maintenance of gas supply infrastructure.	• Disclosure of project plans (objectives, design and activities). • Request for information on gas pipelines located in and around the project area. • Request for regulatory buffers for gas pipelines located in and around the project area.	• Ad-hoc formal consultative letters/ correspondence.	• Information on operational gas pipelines nearby the project footprints and their respective capacities. • The sites for main project facilities (i.e., PV power plants, BESS and sub-station) are not located within the security buffers of any region gas pipelines.
MDAs – Environment and Climate Change	Ministry of Ecology, Environmental Protection and Climate Change (MEEPCC)	**D:** - Provision of information on biodiversity and ecologically important water resources within the project-affected areas. -Execution of laws and regulations pertaining to environmental management.	• Disclosure of project plans (objectives, design, and activities). • Request for information on any species and habitats of conservation concern within the project-affected areas, and recommendation for the relocation/ replanting of any threatened species. • Request for information on any ongoing conservation programs and protected areas in and around project-affected areas.	• Formal consultative letters/ correspondence.	• Instruction to carry out comprehensive baseline biodiversity surveys within the project sites. • Review of mandatory Environmental Impact Assessment (EIA) reports and issue of approvals (Stage I permit) for relevant management and monitoring plans prior to construction. • Review of the report for the Central Asian tortoise population assessment survey (April/May 2024).

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
		-Review of national EIA reports for planned project facilities. -Issue of environmental permits for construction and operation. -Follow-up monitoring of E&S compliance.			• Review of the Central Asian tortoise translocation plan and issue of advance translocation approval (Stage I).
	MEEPCC - Regional Offices (for Samarkand, Region)	**D:** -Provision of information on biodiversity and ecologically important water resources within the project-affected areas, and related conservation programs. -Implementation of contingent pre-construction biodiversity surveys. -General monitoring of E&S compliance during the Project's construction and operational phases.	• Disclosure of project plans (objectives, design, and activities). • Ad-hoc request for information on any species and habitats of conservation concern within the project-affected areas. • Ad-hoc request for information on any ongoing conservation programs and protected areas in and around project-affected areas.	• Formal consultative letters/ correspondence.	• Information on local biodiversity. • Review of mandatory Environmental Impact Assessment (EIA) reports and issue of approvals (Stage I permit) for relevant management and monitoring plans prior to construction. • Review of the report for the Central Asian tortoise population assessment survey (April/May 2024). • Review of the Central Asian tortoise translocation plan and issue of advance translocation approval (Stage I). • Tortoise translocation monitoring on the 400 MW PV power plant site and issue of

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
					translocation completion approval (Stage II).
	Uzbekistan Academy of Sciences – Institute of Zoology	**I:** Provision of information on biodiversity and technical support on ad-hoc baseline surveys for specific faunal species and habitats.	• Information on the extent of occurrence and are of occupancy (or population statistics), for any potentially affected faunal species or habitats of conservation concern.	• Ad-hoc formal consultative letters/ correspondence.	• No specific comments provided to date. • The institute is available for ad-hoc technical support with baseline surveys.
	Uzbekistan Academy of Sciences – Institute of Botany	**I:** Provision of information on biodiversity and technical support on ad-hoc baseline surveys for specific floral species and habitats.	• Information on the extent of occurrence and are of occupancy (or population statistics), for any potentially affected faunal species or habitats of conservation concern.	• Ad-hoc formal consultative letters/ correspondence.	• Appropriate baseline surveys should be conducted within the project sites, to ensure impacts on any species of conservation concern are identified and managed.
MDAs – Water resources	Ministry of Water – Regional and District Offices	**D:** -Provision of information on planned and existing irrigational water supply facilities within the project-affected areas, and execution of laws and regulations pertaining to the operation and maintenance of related infrastructure (e.g., appropriate buffer zones).	• Request for information on existing irrigational canals in and around the project sites. • Request for regulatory buffers for potentially affected irrigation channels and rivers. • Request for any additional considerations and recommendation with regard to potential E&S impacts.	• Formal consultative letters/ correspondence. • Ad-hoc KIIs.	• Information on setback/ protective buffers for irrigation channels and rivers. • No water supply/ distribution pipes are situated within the project sites (confirmed for main facilities i.e., PV power plants and BESS).

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
		-Issue of permits for use of water supply system during construction (i.e., water abstraction).			
	Uzsuvtaminot	Development and operation of water supply and sanitation facilities.	• Request for information on suitable wastewater treatment facilities nearest to the project sites.	• Formal consultative letters/ correspondence.	• Capacity and location of waste water treatment plants in the project-affected districts and communities.
MDAs – Health, Sanitation, Safety and Security	Sanitary and Epidemiological Welfare and Public Health Service of The Republic of Uzbekistan	**D:** -Execution of laws and regulations pertaining to public health and safety. -Establishment of health and safety buffer zones. - Regular monitoring of E&S compliance in relation to impacts on environment and public health and safety.	• Disclosure of project plans (objectives, design and activities). • Request for information on recommendable Health Protection Zones/ Buffers (HPZs) for planned project facilities.	• Formal consultative letters/ correspondence.	• Feedback on recommendable Health Protection Zones (HPZs) for the PV power plant, BESS and OTL connections. • Physical and economic displacement not warranted in relation to HPZs for the PV power plants and BESS facilities.
	Toza Hudud	**A:** State waste management agency that is responsible for the provision of waste	• Request for information on the availability, location and capacity of waste treatment and disposal	• Formal consultative letters/ correspondence.	• Information on waste collection service providers in the project affected districts.

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
		collection and management services within project-affected makhallas (communities).	facilities in the project affected districts and the broader Samarkand Region.		• Information on solid waste management facilities nearest to the project sites.
MDAs – Industry, Commerce and Livelihoods	State Committee for Sericulture and Wool Industry Development (SWID)	**A:** - Overarching custodian of designated pastural land in Uzbekistan. Responsible for developing the wood and sericulture sector.	• Request for information on the utility and ownership of affected pastural land in Nurobod District, and the availability of alternative pastures within 2 kilometres of local livestock farmers and herders.	• Formal consultative letters/ correspondence. • KIIs.	• Information on designated pastures held by the Committee in and around the project sites, particularly within Nurobod District. • Information on the availability of alternative pastures nearby affected communities (where informal herders are impacted). • Information regarding leaseholds for pastural land, for project-affected, formal livestock farmers. • Relocation of all affected pastoral entities is challenged by constraints such as a limited number of livestock watering wells (requisite minimum of 1 well every 3-5km), limited pastural yield (carrying capacity) and distance from farmer or herder bases.

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
	State Committee of the Republic of Uzbekistan on Geology and Mineral Resources	**D:** Provision of information on planned and existing mineral exploration surveys (and related exclusion zones within the project-affected areas, and any geotechnically hazardous land.	• Request for information on any mining and prospecting areas in and around the project sites. • Request for information on any geotechnically hazardous land in and around the project sites.	• Formal consultative letters/ correspondence. • KIIs.	• Information on sand quarries near the Nurobod BESS was provided, without any specific concerns. • Information on a Uranium prospecting site near the 70-km OTL in Nurobod District was provided, with feedback on OTL re-routing (i.e., mine boundaries and buffer), and final approval.
MDAs – Transportation and Communication	Ministry of Transportation – Regional and District Offices	**I:** Provision of information on the transport infrastructure within the project-affected areas, and execution of laws and regulations pertaining to the operation and maintenance of related infrastructure (e.g., construction of crossings, upgrade or extension of existing roads, and traffic regulation).	• Request for technical guidance for road and railway crossings. • Request for feedback on proposed access roads.	• Formal consultative letters/ correspondence. • KIIs.	• Information on regulatory Rights of Way for different road categories (and feedback on Project's access roads). • Information on permitting requirements for haulage vehicles. • The Project Developer (and EPC Contractor) should apply to the Regional General Administration of Roads, for permits in relation to the construction of underground and above-ground transmission lines across roads and railways.

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
	Uzbektelecom	**I:** Provision of information on the telecommunication cables within the project-affected areas, and execution of laws and regulations pertaining to the security and relocation of underground cables.	• Request for information on any existing telecommunication cables in and nearby the project sites.	• Formal consultative letters/ correspondence.	• No underground telecommunication cables are situated within the PV power plant and BESS.
MDAs – Cultural Heritage	Cultural Heritage Agency – Regional Offices	**I:** Provision of information on tangible and intangible cultural heritage within the project-affected areas, and execution of laws and regulations pertaining to cultural heritage in Uzbekistan.	• Request for information regarding any designated archaeological sites and cultural sites in and around the project sites. • Request for information on any prevalent forms of intangible cultural heritage within the project-affected districts and wider regions.	• Formal consultative letters/ correspondence.	• The project sites have not been surveyed for tangible cultural heritage resources previously. • Accordingly, a pre-construction archaeological survey should be completed by the Institute of Archaeology to ascertain the absence of archaeological resources.
	Academy of Sciences – Institute of Archaeology	**I:** Provision of information on tangible and intangible cultural heritage within the project-affected areas, and completion of archaeological surveys for the national inventory of cultural heritage sites.	• Request for information regarding any designated archaeological sites and cultural sites in and around the project sites. • Request for technical support for pre-construction archaeological survey within the project sites.	• Formal consultative letters/ correspondence.	• No designated (pre-existing) tangible cultural heritage sites exist within the project sites. • A pre-construction survey was commissioned for all project sites and corridors. • No archaeological findings have been recorded within the PV power plant and BESS.

Stakeholder Category	Stakeholder	Relevance	Consultation Agenda	Mode of Engagement	Inputs to Date
					• A Chance Find Procedure was recommended the regional Cultural heritage offices.
Non-Governmental Organizations (NGOs)	• Uzbekistan Society for the Protection of Birds • BirdLife International • Eurasian Bustard Alliance • International Union for Conservation of Nature (Bustard Specialist Group) • Bankwatch	Feedback on the management of project impacts/ risks for biodiversity	• Provision of information regarding current population of avifaunal species of conservation concern, ongoing conservation programs in the country and wider region, and any recommendations regarding OTL routing and safeguards for mitigating and/or offsetting impacts on sensitive avifauna.	• Formal consultative letters/ correspondence.	• Pending
Project Lenders (FIs)	ADB, IFC and JBIC	D: Providing project finance and undertaking related due diligence over the period of the financing agreement.	Technical reviews and feedback to be provided through ongoing E&S due diligence.		

5.4 External Grievance Redress Mechanism (GRM)

5.4.1 Objectives of the GRM

The Project's external Grievance Redress Mechanism (GRM) was established at the outset of the ESIA study, with the following key objectives:

- To enable the receipt of concerns and complaints regarding the Project's performance on the management of potential or ongoing E&S impacts, from to Project's third-party stakeholders (e.g., affected communities, PAPs, and authorities).
- To provide timely and responsive resolution for third-party E&S grievances, through corrective measures and/or remedial clarification through the provision of key project information.

5.4.2 Guiding principles

The GRM process involves the collection, investigation, and follow-up engagement with aggrieved parties for subsequent resolution. The system was structured based on the following key principles:

- **Community-oriented** – The system serves to address the needs and interests of the project-affected communities, and the familiarization of local communities with the GRM is an essential aspect of stakeholder engagement.
- **Risk-proportionate** – The capacity of the system is commensurate to the scale and severity of the Project's potential impacts.
- **Prompt** – The system is designed to resolve concerns and complaints as quickly as possible.
- **Understandable and transparent** – Grievance redressal is set to follow clear, standard, and documented procedures, which involve relevant parties and guarantee a remedial response that entails the disclosure of correct and meaningful information.
- **Consultative** – The platforms for grievance collection are designed to capture essential information for an effective resolution, which must be demonstrated through follow-up engagements and feedback requests.
- **Culturally appropriate** – The system involves multiple platforms for the delivery of grievances, and at least one female CLO is involved in the GRM. Grievances can be submitted in both Uzbek and Russian.
- **Readily accessible** – The system includes information channels, which are conveniently available to all sections of the project-affected communities. Grievances can be conveyed in both oral and written form.
- **Free of charge** – Using the system does not carry any service charges or expenses.

- **No retribution** – The system prohibits any acts of reprisal against third parties who issue grievances, and aggrieved parties are allowed the option to submit grievances anonymously.
- **No barriers to alternative remedies** – Where all tiers of remedial actions in the scheme of the project GRM fail to deliver a resolution that is satisfactory to the aggrieved party, recourse to external arbitration and/or the judicial system will not be impeded by any means.

5.4.3 Platforms for grievance issue

The GRM includes a range of channels for the receipt of grievances, which are meant to provide convenient GRM access to all sections of communities and stakeholders. These platforms include:

- Phone calls.
- Email correspondence.
- General consultation forums (i.e., KIIs, FGDs, wider community meetings).
- During construction and operations, grievance boxes at project site entry points.
- During construction and operations, submission of grievance forms through in-person meetings with project CLOs or security personnel[2].

5.4.4 Grievance management process

The grievance redressal process includes three tiers of management. If the grievance is not resolved upon the first resolution attempt, the grievance is escalated for a high-level review involving the Project Company's E&S Manager (as well as other top management representatives as relevant). In the event that resolution is not attained at this level, the grievance is issued to the designated LALRP Committee, for another round of joint review and deliberation. The final concerted course of remedial action or investigation report is then conveyed to the grievant.

In the unlikely event that the final redressal attempt fails to establish a resolution that is acceptable to the grievant, the grievant will be allowed to seek administrative or judicial recourse (i.e., outside of the project organization).

[2] Security personnel will receive the necessary induction for handling community grievances and assisting the completion of grievance forms (upon grievants' request).

Table 5-3 Overview of the GRM process

ACTION	TIMELINE
Grievance is received/submitted.	-
• Grievance is logged. • The grievant is contacted for acknowledgement of receipt and the response timeline is confirmed.	Within 7 working days of grievance being submitted
• Grievance is investigated by the Consultant and Project Company's CLOs. • A decision on remedial action is made.	Within 14 working days of grievance being submitted*
• Proposed remedial action or due clarification is conveyed to grievant. • Grievant is requested to provide feedback regarding the remedial action or clarification. **Note:** The course of action below will be taken in the event that the grievant is not satisfied with the first response.	Within 14 working days of grievance being submitted
The following procedures will be followed in the event of negative feedback on first remedial response	
• The grievant's feedback is recorded on the grievance register (i.e., reason for dissatisfaction). • If the grievant has a request for an alternative solution, this request is noted as part of the feedback.	Within 14 working days of grievance being submitted
• The grievance is revisited by the Consultant and Project Company's E&S Manager. • New proposed remedial action or final decision with additional clarification/ substantiation is internally prepared.	Within 28 working days of grievance being submitted
• A new proposed solution or final decision with additional	

ACTION	TIMELINE
clarification/ substantiation conveyed to the grievant. **Note:** The course of action below will be taken in the event that the grievant is not satisfied with the second response.	Within 28 working days of grievance being submitted
The following procedures will be followed in the event of negative feedback on second remedial response	
The grievance and relevant investigation reports are submitted to the LALRP Committee for review.	Within 30 working days of grievance being submitted
A consensus on the proposed solution.	Within 40 working days of grievance being submitted
Final decision is conveyed to grievant on concerted remedial measures. **Note:** The course of action below will be taken in the event that the grievant is not satisfied with the third response.	Within 40 working days of grievance being submitted
The following procedures will be followed in the event of negative feedback on third remedial response	
The grievant is informed about their liberty to pursue alternative recourse for the resolution of the outstanding grievance or claim, outside of the project organization. External resolution includes access to ADB's Accountability Mechanism. Complainants may submit written[3] grievances to designated Complaint Receiving Officers (CROs) in ADB's country office.	-
*In the event that certain complexities result in protracted investigation and remedies, the Grievant will be informed of this delay and advised on the updated timeline to response.	

[3] Official correspondence by email or posted letters.

5.4.5 GRM points of contact

At the ESIA and LALRP development stage, the Consultant's designated Community Liaison Officers (CLOs) will support the Project Company in publicizing and implementing the GRM.

The Project Company will be notified about each grievance and involved in subsequent investigation to determine an appropriate remedial response. All grievances lodged by project stakeholders (including PAPs) and related redressal procedures and outcomes will be documented in the Project's external (community) grievance register, which will be monitored by the Project Company.

Upon the completion of the ESIA and LALRP studies, the Project Company will take full charge of the external GRM. This handover will be publicized within the project-affected communities (through official announcements by local leadership and FGDs), and the communities will be familiarized with the Project Company's succeeding CLOs. New GRM contact information will be circulated via project leaflets and appropriate social media broadcasts.

Table 5-4 Contact details for GRM points of contact

COMMUNITY LIAISON OFFICER (CLO)	COMPANY	CONTACT DETAILS
Iroda Malikova	Juru	Email: i.malikova@juru.org Mob: +998-71-202-0440
Dinara Rustami	Juru	Email: d.rustami @juru.org Mob: +998-71-202-0440

5.5 Forward Plan

Further information of the stakeholder engagements completed to date, and the plan for future consultation and disclosure will be provided in the final (ESIA) version of the Stakeholder Engagement Plan (SEP).

6 GEOLOGY AND HYDROLOGY

6.1 Legal Requirements and Standards

6.1.1 National laws and regulations

The protection of geological formations, soil and water resources in Uzbekistan is governed by the following laws and regulations.

6.1.1.1 Soil quality

- SanPiN No.0272-09 Sanitary rules and norms for compiling hygienic justifications for soil protection schemes from pollution in Uzbekistan": The Sanitary Rules and Norms include the basic requirements for development of hygienic justification for the soil protection schemes against pollution, duties and functions of state sanitary supervision bodies in this area.
- SanPiN No.0191-05 Maximum permissible concentrations (MPC) and Approximate allowable concentrations (AAC) of exogenous harmful substances in soil: This defines MPC values of chemicals and pesticides polluting the soil. MPCs and AACs are designed to ensure that there is no negative direct or indirect impact on human health, its future generations and public health through soil contact.
- SanPiN No.0212-06 Sanitary rules and norms for the hygienic assessment of soil contamination of different types of land use: This document provides a unified methodology for hygienic assessment of soil pollution using a nomenclature of indicators of soil hygienic condition, which should be used both in the development of regulatory and technical documentation on the hygiene of soils, and in assessing the degree of its pollution.

Further research will be undertaken into the applicability of any domestic soil and groundwater quality standards.

6.1.1.2 Water resources

The Ministry of Water Resources of Uzbekistan is primarily responsible for the allocation, development, and protection of water resources. The implementation of projects and regulatory oversight at the provincial and district levels is delegated to the Ministry's local offices, which represent some of the key line departments operating under the regional and district khokimiyats in Uzbekistan.

- Constitution of the Republic of Uzbekistan.
  - Article 55 states "Land, depths, water, flora and fauna and other natural resources are national wealth, should be rationally used and are under state protection."
- The Law of the Republic of Uzbekistan "On water and water use" (1993 as amended on 01.12.2021).

- Article 1 requires "Regulation of water relations; effective use of water; protection of water from pollution, littering and exhaustion; prevention and liquidation of harmful impact on water resources; improvement of state water objects; and protection of the rights of enterprises, organisations, farms and citizens in the field of water relations."
- Article 3 stipulates that "Water resources are the state property and wealth of the Republic of Uzbekistan, should be rationally used and is protected by the state."
- The law authorises the State to carry out management and control of water use and protection through authorized agencies.

6.1.1.3 Other relevant legislation

- SanPiN No 0255-08 which provides the criteria for hygienic assessment of the level water bodies contamination for health risks to the population in Uzbekistan.
- Decree of the Cabinet of Ministers No.255 of 31.03.2018 On the approval of some administrative regulations of the provision of public services in the field of nature use (scheme for issuing permits for special water use or water consumption) as amended on 15.01.2020.
- SanPiN RUz No. 0318-15. Hygienic and anti-epidemic requirements for the protection of water in reservoirs on the territory of the Republic of Uzbekistan.
- The Decree № 981 of December 11 2019 "Regulation on procedure of establishing water protection zones and sanitary protection zones for water bodies on the territory of the Republic of Uzbekistan".
- The law mandates protection zones for various water sources, including natural water bodies, artificial wetlands, as well as infrastructure constituting water supply systems (i.e., waterworks). For rivers, the width of mandated water source protection buffers is a function of the riverine discharge, as detailed below:
  - For rivers with a capacity of more than 100 cubic meters of water per second – 300 – 500 meters.
  - For rivers with a capacity from 5 to 100 cubic meters of water per second – 100 – 300 meters.
  - For rivers with a capacity from 2 to 5 cubic meters of water per second – 50 – 100 meters.
  - For rivers with a capacity of less than 2 cubic meters of water per second – under 35 – 50 meters.

The riverine buffer is measured from each bank of the river (i.e., the mean annual bank position is taken into account).

The width of the water protection zones is set differentially for the entire length of rivers, based on the variation in the flow rate at each given segment. While the above protection are mandated in the law, assessments to determine the river banks (from the which the protection zones are measured) and the appropriate protection zone is undertaken on a case by case basis for various development projects. This assessment is a participatory process involving

expert inputs from the Ministry of Ecology, Environmental Protection and Climate Change (MEEPCC), the Ministry of Agriculture and Water Resources, and project developers.

6.1.2 Lender requirements

6.1.2.1 ADB

The ADBS SPS requirements in relation to environmental performance include specific requirements to prevent pollution and to minimise or control the intensity or loads of pollutant emissions and discharge. This includes effective management of hazardous materials and wastes, which can degrade soil and/or groundwater quality.

6.1.2.2 IFC and EPFIs

IFC Performance Standard 3 on 'Resource Efficiency and Pollution Prevention' requires the client and/or the Project to:

- Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; and
- Prevent the release of pollutants to water and land due to routine, non-routine, and accidental circumstances, or when not feasible, minimize and/or control the intensity and mass flow of their release.

6.2 Baseline Conditions – Geology and Soils

A series of geotechnical feasibility surveys were carried out by Juru and Uzassystem within the 100 MW PV power plant, 400 MW PV power plant, Nurobod pooling station and Nurobod BESS sites. These surveys were completed between April and August 2023.

A subsequent ESIA-oriented study was conducted to gather broad-based baseline information on the following environmental components in the context of geology:

- Seismic potential of the project sites
- Stability, corrosivity and erodibility of resident soils
- Local land use
- Quality of resident soils

The study involved dedicated literature reviews, site walkovers, water, and soil sampling, as well as consultation with affected communities and relevant authorities. The following sub-sections elaborate on findings related to the geotechnical and geological context of the project sites.

6.2.1 Seismicity of the project locations

Uzbekistan at large is located within a seismically active zone, which features deep fault lines influenced by tectonic activity within the Western Tian Shan Mountain range. Historical records on seismic events within Uzbekistan indicate a total of five major earthquake events between 1900 and 2024. All five earthquakes occurred in the country's western reaches, specifically within the regions of Tashkent, Ferghana, Namangan and Andijan. With regard to recent seismic events, one major earthquake struck Tashkent Region in 1992, with a surface wave magnitude of 7.5. In 2011. Another severe earthquake took place in Ferghana region, with a reported moment magnitude of 6.1.

No major shocks have been recorded within Samarkand Region. According to a recent seismic zoning study, seismic activity in the region is relatively low, with a seismic potential of 6.6 M_{max}.

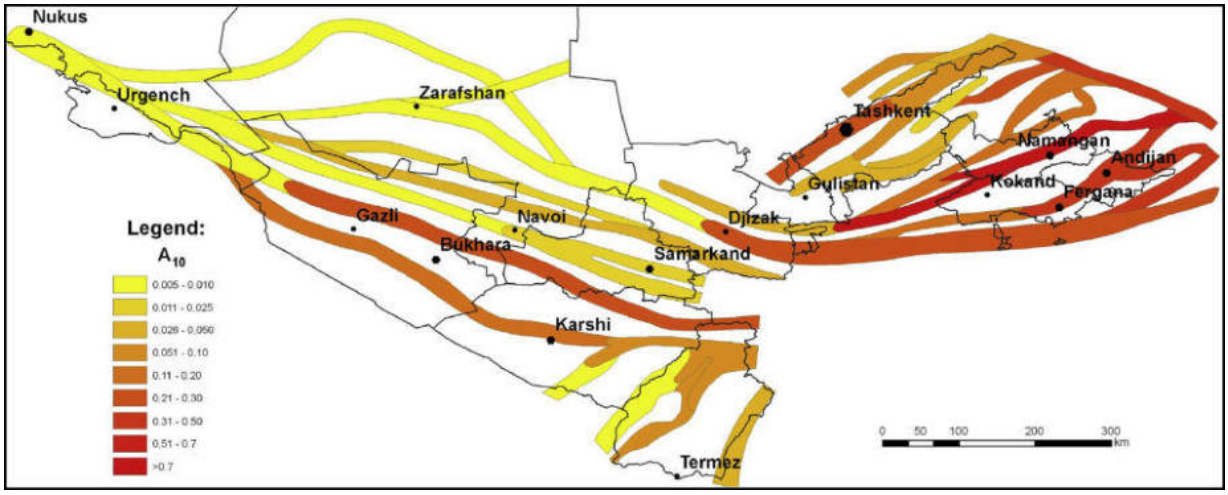

Figure 6-1 Spatial variation in seismic activity (frequency of seismic events) in Uzbekistan

According to national hazard maps (OSR-2011), the earthquake magnitudes for the general location of the 100MW PV power plant, 400 MW PV power plant, and Nurobod BESS ranges from 7-8, while Peak Ground Accelerations range from 0.15 g to 0.25 g.

Table 6-1outlines the classification of the general project locations by seismic site class, in accordance with criteria set out in the International Building Code and National Earthquake Hazard Reduction Program Uniform Building Code.

Table 6-1 Seismic class of the general project locations

General Project Location	Seismic Site Class	Definition

100MW PV power plant and Nurobod BESS	B, C, D	Rock, Too Tight / Hard Ground or Soft Rock, Hard / Firm Ground
400 MW PV power plant and Pooling Station	D	Stiff Soil Profile

6.2.2 Geology and geotechnical classification

The following sub-sections outline the geotechnical properties of the project sites, with further focus on erosion potential and soil quality.

6.2.2.1 100 MW PV power plant and Nurobod BESS sites

Drilling and soil logging carried out as part of the geotechnical survey revealed that the local geology largely comprises of Cenozoic eratemic formations represented by quaternary sediments. The quaternary deposits include deluvial-proluvial clay and coarse-clastic deposits. The clay fraction consists of clay loams with inclusions of clastic material, with lenses and interlayers of loams with silt and silt loam, while the coarse clastic fraction consists of peaty soil. Additionally, in-situ seismic refraction testing, and subsequent sieve analyses indicate that the unconsolidated formation consists of (i) silty, sandy loam soils in layers with a thickness of 0.2-17.1 metres, (ii) gravelly sand with layer thickness of 0.3-2.6 metres, and (iii) grass-crushed gravel with a layer thickness of 0.5-4.8 metres.

In-situ standard penetration tests and standard laboratory tests were performed to further characterize the mechanical properties of resident soil, with the primary aim of assessing its shear strength and consolidation (and subsidence) potential. The analysis revealed that the site includes settlement-prone upper loam layers of soil, which require shallow foundations and stabilization measures for excavation.

As part of the geotechnical survey, electrical resistivity testing was conducted using Vertical Electrical Sounding (VES) equipment at numerous locations. The resistivity values recorded indicated a generally low level of soil aggressiveness.

Thermal conductivity and thermal diffusion testing for resident soil indicates that the maximum frost depth, for a return period of 50 years, is about 33 cm. Further, the relatively high thermal conductivity of the soil is conducive for optimal operation of underground cables, particularly those with a high current loading.

The thermal conductivity and thermal diffusion of resident soil was measured in a total of 30 pits. Based on the results of this testing, the maximum depth of soil frost is estimated to be 70 cm with a return period of 50 years.

6.2.2.2 400 MW PV power plant and pooling station sites

Literature reviews, drilling and soil logging carried out as part of the geotechnical survey indicate that the local geology largely comprises of quaternary deposits, which are dominated by middle section quaternary deposits, with a small pocket of holocene quaternary deposits. In-situ seismic refraction testing and subsequent sieve analyses indicate that the unconsolidated formation consists of fine-grained clayey silts with low plasticity.

In-situ standard penetration tests and standard laboratory tests were performed to characterize the mechanical properties of resident soil, with the primary aim of assessing its shear strength and subsidence potential. The analysis revealed that the site includes soils that are prone to collapse and settlement upon inundation/ groundwater saturation, which require shallow foundations and sufficient drainage and stabilization measures for excavation.

As part of the geotechnical survey, electrical resistivity testing was conducted using Vertical Electrical Sounding (VES) equipment at numerous locations. The resistivity values recorded indicated a large variance in soil aggressiveness within the general location.

Thermal conductivity and thermal diffusion testing for resident soil indicates that the maximum depth, for a return period of 50 years, is about 32 cm. Further, the relatively high thermal conductivity of the soil is conducive for optimal operation of underground cables, particularly those with a high current loading.

6.2.2.3 4.9-km, 11-km LILO OTLs, 19-km LILO OTLs and 70-km OTLs

Feasibility studies for the overhead transmission lines planned as part of the project included geotechnical surveys. The OTLs routes were set to avoid sites characterized by landslides, steep slopes, subsidence and aggressive soils.

6.2.3 Soil erosion

6.2.3.1 100 MW PV power plant and Nurobod BESS sites

Over the course of field reconnaissance and subsequent soil sampling, sheet, rill, and gully erosion were not evident within the 100 MW PV power plant and Nurobod BESS sites. The absence of major forms of soil erosion is attributable to the even topography of the sites, and lack of riverine water bodies in and around the site.

Based on the results of stream network analysis and flood modelling performed for these sites (see sub-sections below), highest runoff discharge during extreme precipitation events may occur on the mid-western part of the 100 MW PV power plant site, and its eastern fringe. Precipitation-driven soil erosion is less likely to occur on the Nurobod BESS site, where run-off is less concentrated on little to no relief.

Nevertheless, the bare, arid and loam topsoil denuded of steppe grass and scrub vegetation by herding activities are potentially prone to wind-driven soil erosion, particularly in the event of soil disturbance/ destabilization and strong wind conditions.

6.2.3.2 400 MW PV power plant and pooling station sites

Sheet, rill, and gully erosion were not noted within the 400 MW PV power plant site during field reconnaissance and subsequent soil sampling. The absence of major forms of soil erosion on this site is likewise attributable to the even topography of the site, and lack of riverine water bodies in and around the site.

Stream network analysis and flood modelling performed for the 400 MW PV power plant site (see sub-sections below), suggests that the north-eastern part of the site is potentially prone to concentrated runoff discharge and resultant soil erosion, during extreme precipitation events.

Stream network analysis and flood modelling performed for the 400 MW PV power plant site (see sub-sections below), suggests that the central portion of the site is potentially prone to concentrated runoff discharge and resultant soil erosion, during extreme precipitation events.

Further, the arid and unvegetated landscape is potentially prone to wind-driven soil erosion, particularly in the event of soil disturbance/ destabilization and strong wind conditions, due to extensive grazing activity within the site.

6.2.3.3 Overhead transmission line (i.e., 4.9-km, 11-km, 19-km, and 70-km OTLs) sites

Much of the landscape within the 4.9-km, 11-km, 19-km, and 70-km OTL corridors is exploited for extensive agriculture. No major indicators of severe erosion (e.g., gullies) were noted during driven transects along the OTL corridors.

Nevertheless, minor to moderate levels of soil erosion can be expected to occur within tilled crop land adjoining seasonal streams and riverbanks.

6.2.4 Soil quality

6.2.4.1 100 MW PV power plant site

EXISTING LAND-USE AND INFLUENCES

Land-use in and around the 100 MW PV power plant includes is mostly agricultural. The site is utilized for herding, and several livestock shelter facilities have been established within the site. Operational and developing livestock rearing facilities are located within 500 metres of the site perimeter, and crop farm clusters are located further away East, North and West of the site.

Non-agricultural establishments in the eastern vicinity of the site include an abandoned (decommissioned) airstrip and a non-operational hazardous waste management facility

which lies 612 metres East of the site. In addition, the site is adjacent to the M378 highway, and a military training base is also located some 1.1 kilometres South of the site. Residential communities are also situated south-west of the site.

Based on this preliminary observation, diffuse sources of soil pollution within the sites potentially include (but are not limited to):

- Organic waste from livestock grazed within the sites.
- Any legacy contamination (impact plume) from former land-use in and around the sites (potentially including the hazardous waste management facility).

SOIL SAMPLING

No visual and olfactory indicators of point source pollution were noted during the ESIA baseline surveys. Nevertheless, precautionary soil sampling and quantitative soil quality analyses were carried out, considering the potential for multiple source-receptor pollution pathways in the Project's construction and operational phases due to the (i) disturbance of resident soils with any confined legacy contamination, and/or (ii) an accidental release of chemical contaminants into the soil (i.e., by spills, leakages and spray of hazardous materials and waste products), with an impact on human receptors.

Baseline soil quality testing was scoped into the ESIA study on a precautionary basis and carried out between July and October 2023. The results of the geotechnical survey did not identify substantial variation in the geological, drainage and land-use characteristics of the study area. The site can therefore be considered homogenous, and sampling strata were not delineated on this account. A total of three representative sampling locations were targeted within the 100 MW PV power plant site, for establishing a baseline frame of reference for future monitoring. The sampling locations were distributed to provide an even coverage of the entire site.

Table 6-2 GPS coordinates for soil samples taken from the 100 MW PV power plant site

SAMPLE ID	LATITUDE	LONGITUDE
SQ03	39.55054137	66.70210103
SQ04	39.54740439	66.6908333
SQ05	39.54524227	66.67596321

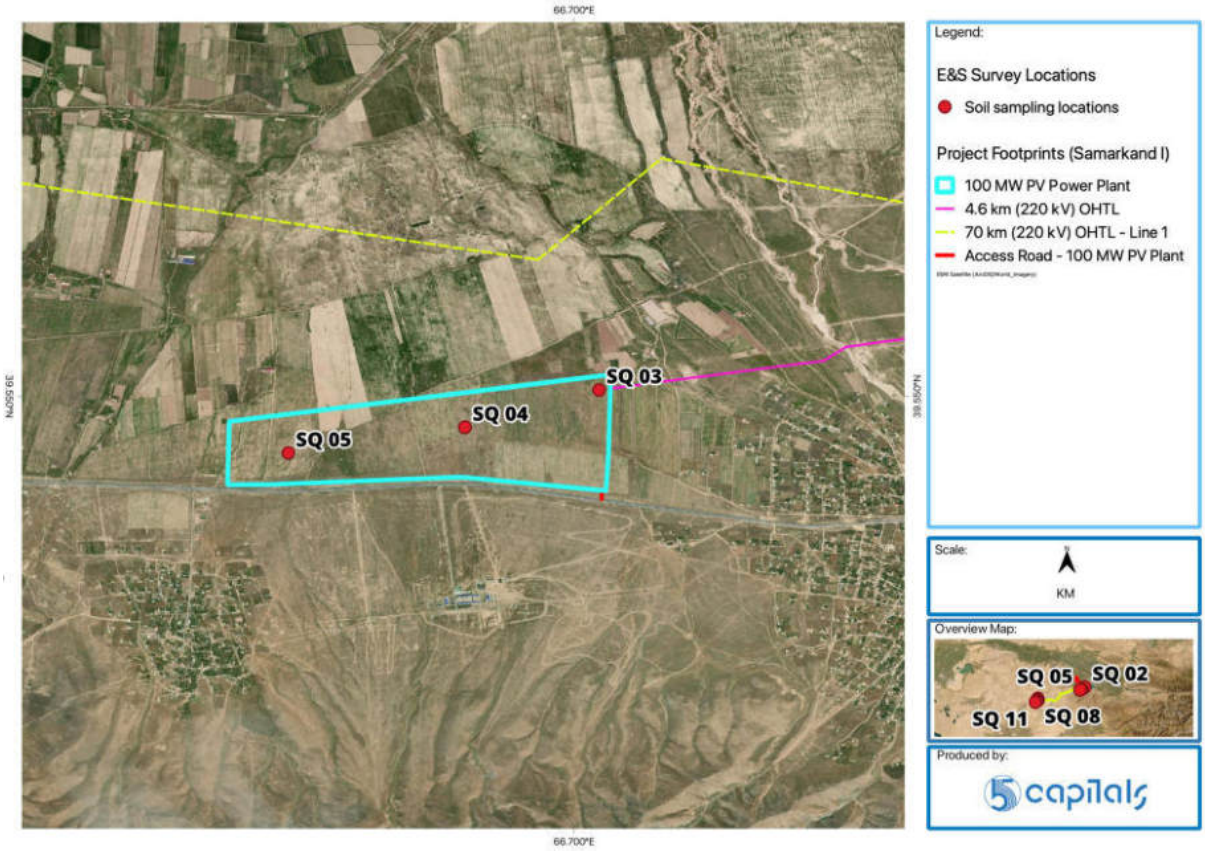

Figure 6-2 Soil sampling locations within the 100 MW PV power plant site

In terms of the sampling methodology, the top layer with litter and natural (organic) residue was scrapped off, and soil samples were extracted from a depth of 20 cm below ground level, using a stainless-steel shovel. Samples were collected in airtight nylon bags, labelled accordingly, and placed in cooler boxes. A chain of custody was observed in the transfer of the samples to a nationally accredited laboratory, with a holding time not exceeding 48 hours.

The suite of parameters selected for soil quality testing includes heavy metals (cadmium, mercury, arsenic etc.), hydrocarbons, microbial agents (coliforms etc.) as well as saline/ alkaline mineral constituents (e.g., sulphates, nitrates, and chlorides).

ANALYTICAL RESULTS

The full listing of soil quality test parameters and results for collected samples are presented in Table 6-3 below.

Table 6-3 Results of quantitative analyses for soil samples taken from the 100 MW PV power plant site

Parameter	Unit	Lower Detection Limit	Sample ID			Maximum Permissible Concentration (SanPin No 0191-05)	Dutch Threshold Concentration for Remediation
			SQ3	SQ4	SQ5		
pH	-	1-14	6.6	7.3	7.9	-	-
Nitrate (NO3)	mg/kg	0.00	0.7	1.4	2.3	130.0	-
Zinc (Zn)	mg/kg	1.00	71.0	63.0	67.0	23.0	720.0
Chromium (Cr)	mg/kg	1.00	57.0	52.0	60.0	6.0	78.0
Cadmium (Cd)	mg/kg	0.01	0.3	0.4	0.2	-	13.0
Copper (Cu)	mg/kg	3.00	39.0	1,000.0	39.0	3.0	190.0
Manganese (Mn)	mg/kg	20.00	600.0	510.0	840.0	60.0	-
Mercury (Hg)	mg/kg	0.03	<0.03	0.3	0.1	2.1	4.0
Nickel (Ni)	mg/kg	1.00	38.0	33.0	42.0	4.0	100.0
Lead (Pb)	mg/kg	0.10	17.0	16.0	23.0	32.0	530.0
Arsenic (As)	mg/kg	0.10	23.0	26.0	25.0	-	76.0
Cobalt	mg/kg	0.10	9.1	8.0	11.0	5.0	190.0

As shown in Table 6-3 above, soils within the PV plant site exhibit good to moderate quality, with no exceedances of internationally recognized thresholds which would signal ongoing impact from nearby soil and/or groundwater pollution sources. Baseline soil concentrations of Zinc, Manganese, Nickel, Cobalt, and Chromium at all sampling locations are in excess of national guideline values for soil quality but are significantly lower than the Dutch thresholds for remediation. However, the Copper concentration recorded for the sample SQ4 is substantially higher than the Dutch guideline value. No soil and water pollution sources were observed within the site, and Copper concentrations recorded for the remaining soil samples and nearby groundwater sample were significantly lower than their respective threshold values. The likelihood of legacy pollution at the SQ4 location is therefore low, and an advanced environmental site assessment (for potential remediation requirements) would therefore be warranted in the event that a water well is drilled within this location.

Taking into account the consistency of this data with that of the other project sites in Nurobod District, elevated concentrations of the above-mentioned heavy metals across the site can be attributed to the local geology.

6.2.4.2 Nurobod BESS site

EXISTING LAND-USE AND INFLUENCES

Agricultural land-use is predominant in and around the Nurobod BESS site. Land within the site boundaries is used mainly for agriculture (i.e., small-scale crop farming and seasonal grazing). A chicken farm is located to the East, and a crop farm and adjacent cold storage facilities are located to the West. An expanse of cropland is situated 1.5 kilometres north of the site. Non-agricultural land-use nearby the BESS site include sand quarries located about 400 metres West of the site.

Based on this preliminary observation, diffuse sources of soil pollution within the sites potentially include (but are not limited to) organic waste from livestock grazed within the sites.

SOIL SAMPLING

No visual and olfactory indicators of point source pollution were noted during the ESIA baseline surveys. Nevertheless, precautionary soil sampling and quantitative soil quality analyses were carried out, using the methodology described in Section 6.2.4.1.

The site can be considered homogenous, and sampling strata were not delineated on this account. A total of two representative sampling locations were targeted within the Nurobod BESS site, for establishing a baseline frame of reference for future monitoring.

Table 6-4 GPS coordinates for soil samples taken from the Nurobod BESS site

SAMPLE ID	LATITUDE	LONGITUDE
SQ01	39.57297502	66.737459
SQ02	39.57715648	66.7528726

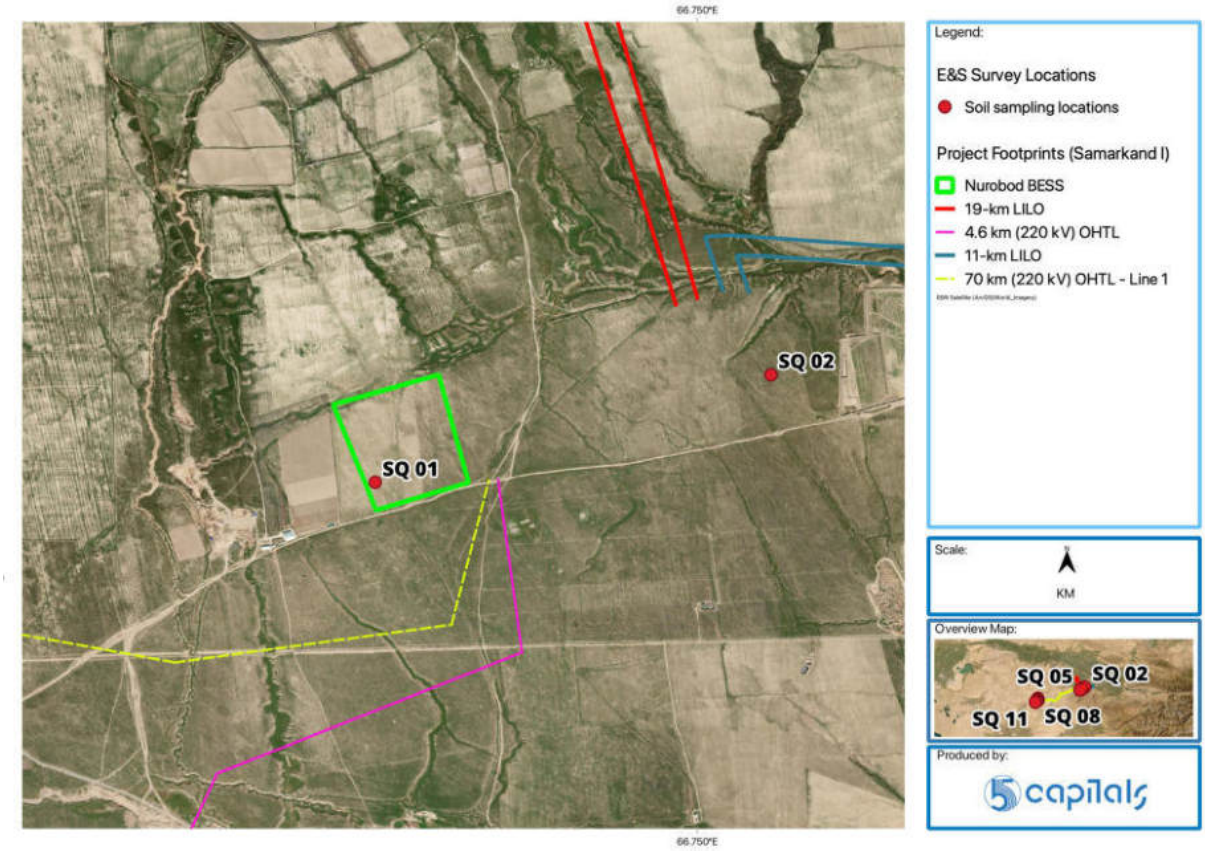

Figure 6-3 Soil sampling locations within the Nurobod BESS site

ANALYTICAL RESULTS

The full listing of soil quality test parameters and results for collected samples are presented in Table 6-5 below.

Table 6-5 Results of quantitative analyses for soil samples taken from the Nurobod BESS site

PARAMETER	UNIT	LOWER DETECTION LIMIT	SAMPLE ID		MAXIMUM PERMISSIBLE CONCENTRATION (SANPIN NO 0191-05)	DUTCH THRESHOLD CONCENTRATION FOR REMEDIATION
			SQ3	SQ4		
pH	-	1-14	7.4	7.7	-	-
Nitrate (NO3)	mg/kg	0.00	0.8	1.6	130.0	-

Parameter	Unit	Lower Detection Limit	Sample ID		Maximum Permissible Concentration (SanPin No 0191-05)	Dutch Threshold Concentration for Remediation
			SQ3	SQ4		
Zinc (Zn)	mg/kg	1.00	56.0	72.0	23.0	720.0
Chromium (Cr)	mg/kg	1.00	51.0	53.0	6.0	78.0
Cadmium (Cd)	mg/kg	0.01	0.2	0.4	-	13.0
Copper (Cu)	mg/kg	3.00	41.0	34.0	3.0	190.0
Manganese (Mn)	mg/kg	20.00	710.0	1,400.0	60.0	-
Mercury (Hg)	mg/kg	0.03	0.4	<0.03	2.1	4.0
Nickel (Ni)	mg/kg	1.00	52.0	51.0	4.0	100.0
Lead (Pb)	mg/kg	0.10	21.0	27.0	32.0	530.0
Arsenic (As)	mg/kg	0.10	26.0	26.0	-	76.0
Cobalt	mg/kg	0.10	6.9	11.0	5.0	190.0

As shown in Table 6-5 above, resident soils exhibit good to moderate quality, with no exceedances of internationally recognized thresholds which would signal ongoing impact from nearby soil and/or groundwater pollution sources. Baseline soil concentrations of Zinc, Copper, Manganese, Nickel, Cobalt, and Chromium at all sampling locations exceed national guideline values for soil quality but are substantially lower than the Dutch thresholds for remediation.

Considering the consistency of this data with that of the nearby 100 MW PV plant site, elevated concentrations of the above-mentioned heavy metals across the site can be attributed to the local geology.

6.2.4.3 400 MW PV power plant and pooling station sites

Land-use within the 400 MW PV power plant and pooling station sites is largely limited to livestock grazing. The eastern vicinity of the site is utilized for small-scale crop farming. Two residential communities are also located east and south of the sites.

Based on preliminary findings, diffuse sources of soil pollution within the sites potentially include (but are not limited to):

- Organic waste from livestock grazed within the sites.
- Domestic refuse from nearby residential and commercial establishments.

Soil sampling

No visual and olfactory indicators of point source pollution were noted during the ESIA baseline surveys. Nevertheless, precautionary soil sampling and quantitative soil quality analyses were carried out, using the methodology described in Section 6.2.4.1.

The site can be considered homogenous, and sampling strata were not delineated on this account. A total of six representative sampling locations were targeted within the 400 MW PV power plant site, for establishing a baseline frame of reference for future monitoring.

Table 6-6 GPS coordinates for soil samples taken from the 400 MW PV power plant and pooling station sites

SAMPLE ID	LATITUDE	LONGITUDE
SQ06	39.45713646	65.98284357
SQ07	39.43525861	65.98608164
SQ08	39.44534503	65.97332166
SQ09	39.4333785	65.96338414
SQ10	39.42260102	65.95290533
SQ11	39.41164123	65.94132695

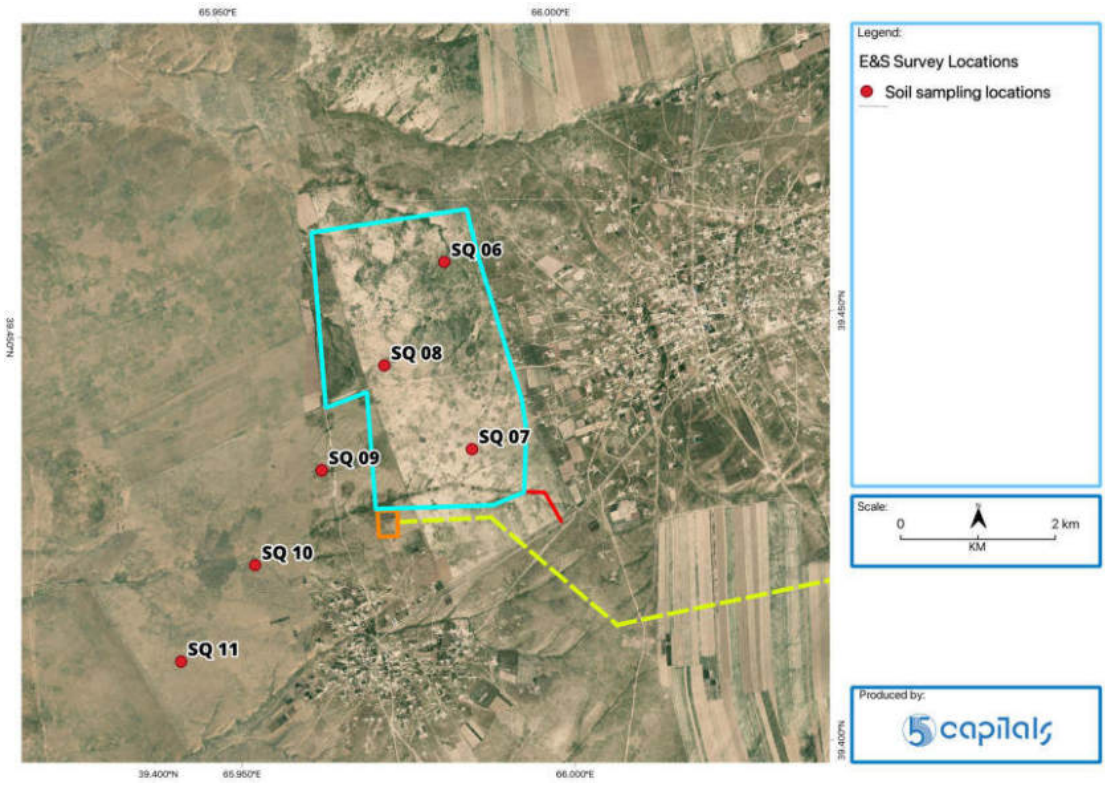

Figure 6-4 Soil sampling locations within the 400 MW PV power plant and pooling station sites

ANALYTICAL RESULTS

The full listing of soil quality test parameters and results for collected samples are presented in Table 6-7 below.

Table 6-7 Results of quantitative analyses for soil samples taken from the 400 MW PV power plant and pooling station site

Parameter	Unit	Lower Detection Limit	Sample ID						Maximum Permissible Concentration (SanPin No 0191-05)	Dutch Threshold Concentration for Remediation
			SQ6	SQ7	SQ8	SQ9	SQ10	SQ11		
pH	-	1-14	7.4	7.5	8.0	7.9	7.9	7.9	-	-
Nitrate (NO3)	mg/kg	0.00	1.4	1.4	2.6	2.6	2.6	2.6	130.0	-
Zinc (Zn)	mg/kg	1.00	58.0	64.0	60.0	63.0	60.0	59.0	23.0	720.0
Chromium (Cr)	mg/kg	1.00	54.0	59.0	57.0	56.0	60.0	61.0	6.0	78.0
Cadmium (Cd)	mg/kg	0.01	0.4	0.3	0.2	0.2	0.4	0.1	-	13.0
Copper (Cu)	mg/kg	3.00	35.0	35.0	310.0	64.0	36.0	160.0	3.0	190.0
Manganese (Mn)	mg/kg	20.00	630.0	630.0	630.0	640.0	600.0	580.0	60.0	-
Mercury (Hg)	mg/kg	0.03	0.2	0.4	<0.03	0.7	0.2	0.5	2.1	4.0
Nickel (Ni)	mg/kg	1.00	40.0	39.0	39.0	39.0	37.0	38.0	4.0	100.0
Lead (Pb)	mg/kg	0.10	22.0	18.0	16.0	15.0	16.0	17.0	32.0	530.0
Arsenic (As)	mg/kg	0.10	25.0	25.0	24.0	26.0	24.0	27.0	-	76.0
Cobalt	mg/kg	0.10	10.0	10.0	10.0	10.0	10.0	10.0	5.0	190.0

As shown in Table 6-7 above, soils within the PV plant site exhibit good to moderate quality, with no exceedances of internationally recognized thresholds, which would signal ongoing impact from nearby soil and/or groundwater pollution sources. Baseline soil concentrations of Zinc, Copper, Manganese, Nickel, Cobalt, and Chromium at all sampling locations exceed national guideline values for soil quality but are well under the Dutch thresholds for remediation.

Considering the consistency of this soil quality data with that of the nearby project sites in Nurobod District, elevated concentrations of the above-mentioned heavy metals across the site can be attributed to the local geology.

6.2.4.4 Overhead transmission line (i.e., 4.9-km, 11-km, 19-km, and 70-km OTLs) sites

The 4.9-km, 11-km, 19-km, and 70-km OTL corridors cover agricultural tracts of land, which are largely used for irrigated crop farming. Agricultural fields in and around the OTL impact corridors are interspersed with residential clusters. No major point sources of soil contamination were evident in the review of satellite imagery and subsequent site visits along the OTL corridors.

6.3 Baseline Conditions – Hydrology

A series of hydrological feasibility surveys were carried out by Juru and Uzassystem within the 100 MW PV power plant, 400 MW PV power plant, Nurobod pooling station and Nurobod BESS sites. The surveys were completed between March and August 2023.

A subsequent ESIA-oriented study was conducted to gather broad-based baseline information on the following environmental components in the context of hydrology:

- Local aquifer characteristics
- Drainage and wetlands
- Flood risk
- Quality of groundwater and surface water
- Local use of land and water resources

The study involved dedicated literature reviews, site walkovers, groundwater sampling, as well as consultation with affected communities and relevant authorities. The following sub-sections elaborate on findings related to the hydrological context of the project sites.

6.3.1 Drainage and flood risk

6.3.1.1 100 MW PV power plant and Nurobod BESS sites

GROUND WATER

The geotechnical surveys conducted within the 100 MW PV power plant site and Nurobod BESS sites indicated the absence of groundwater to a depth of the 20 metres below ground level. The hydrogeology of the wider aquifer is poorly studied, however relevant literature suggests that groundwater is likely present in the deeper Mesozoic, Cenozoic, and Quaternary formations.

SURFACE WATER

The 100 MW PV power plant site is located on relatively flat, arid terrain defined by a minor descent from South to North and small drainage channels. No permanent wetland or streams were observed within the site, at the time of the ESIA baseline surveys. In relation to larger water courses, the site lies 2.1 kilometres east of Aksai River and 1.6 km west of Zasagansai River, which feed into Zarafshan River.

The Nurobod BESS site is located on an arid plain with a slight downward inclination from South to North. The drainage pattern of the site is characterized by unpronounced, ephemeral stream beds. No permanent wetland or streams were observed within the site at the time of the ESIA baseline surveys. In relation to larger water courses, two larger ephemeral streams are situated 226 metres east and 554 metres west of the site. These streams flow into tributaries associated with Zarafshan River.

FLOOD RISK

A hydrological survey was carried out for the 100 MW PV power plant and BESS site in Nurobod District, based on primary and the best available secondary information.

The analysis began with the construction of a Digital Elevation Model (DEM) for hydrodynamic modelling. A 1-metre resolution DEM was developed for the 100 MW PV power plant site and a global, open-access, 30 metre resolution Forest and Building removed Copernicus Digital Elevation Model (FABDEM) was utilized for elevation modelling for the Nurobod BESS site and surrounding catchment area. The elevation models altogether indicate that the elevation of the overall project site ranges from 740 on the northern side to 765 metres on the southern side, with generally low to medium slope in between, as shown in the figure below.

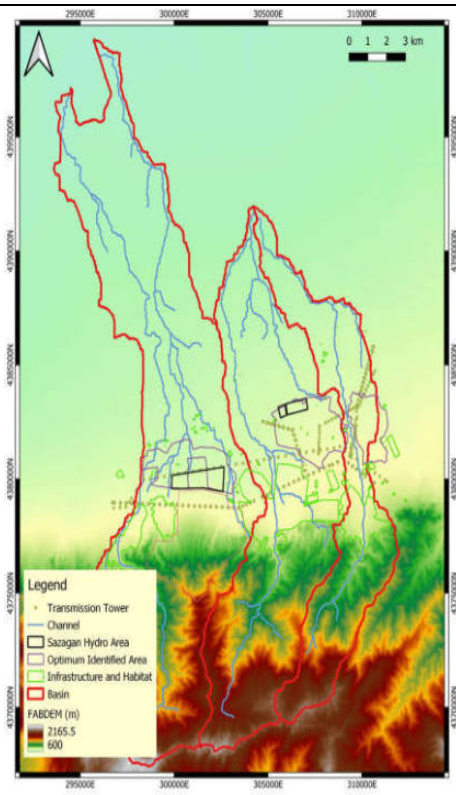

Figure 6-5 Elevation model and stream network for the 100 MW PV plant and Nurobod BESS site

The watershed analysis performed on the localized DEM and wider FABDEM further indicates that the site lies within an upstream section of the sub-basin contributing to the wider drainage basin associated with the site. Natural stream beds (small runoff channels) traverse the site, as shown in the figure above.

Subsequently, meteorological data was sourced from the M-II Samarkand meteorological station for a hydrograph analysis to establish the frequency of peak precipitation events in terms of return periods. Specifically, historical precipitation, snow depth and temperature data were acquired for the period 1993-2022. An examination of the data pegged the maximum recorded daily precipitation at 54.9 mm (observed in March 2004), and the maximum snow depth at 32 cm below ground level (observed in December 2022).

The annual daily precipitation maxima were extracted from historical data, and the values were fitted to the Generalized Extreme Value (GEV) theoretical distribution function, and derived for 2-, 5-, 10-, 20-, 50- and 100-year return periods. The GEV distribution was determined to be more appropriate that the Gumbel, log-normal and exponential distributions, based on the Cramer von Misses p-test. Afterwards, Intensity-Duration-Frequency (IDF) curves were constructed based on the GEV distribution annual precipitation maxima.

Based on the IDF curves, precipitation intensity values for a number of short-term (flash flood) durations and longer (catchment-contribution) durations were determined, across the return

periods. A Mann-Kendal trend analysis and Sen's slope analysis were carried out to investigate trends in temperature and precipitation based on historical meteorological data for the period 1993-2022. These analyses indicated that climate change effects on precipitation are not significant within the sub-catchment (and study area).

The contribution of snowmelt to precipitation was also studied. Based on the meteorological data, snow occurs in the months of December, January and February. While rainfall is mostly absent during these months, coincidental snowmelt and rainfall do occur. The occurrence of heavy snow cover in the project site and the wider catchment area was investigated using the global, 500-metre resolution Moderate Resolution Imaging Spectroradiometer (MODIS) Terra Snow Cover database and mapping tool (MOD10A1.006). The snow cover analysis showed that snowmelt is not an important contributor to discharge (stream flow).

The Direct Rainfall Method (DRM) was used for 2D flood modelling using HEC-RAS software, for a 100-year extreme precipitation event. This flood modelling method involves the simulation of precipitation on the hydrodynamic surface-flow model constructed from the local DEM.

The Manning's roughness coefficient for drainage channels and infiltration capacity of resident soils constitute the main parameters for the modelled discharge/ surface flow. The roughness coefficient for the base DEM was set based on a review of primary information and literature constants. The infiltration capacity of the project site was determined using global databases for land cover and soil types. For land cover, 10-metre resolution maps were sourced from the European Space Agency database, whereas for soil classification, 250-metre resolution maps were sourced from the Global Hydrologic Soil Groups database. Precautionary settings were selected for simulating runoff and infiltration.

Flood modelling for a 100-year return period indicates that the overall site does not present a high risk of pluvial floods, as shown in figures below.

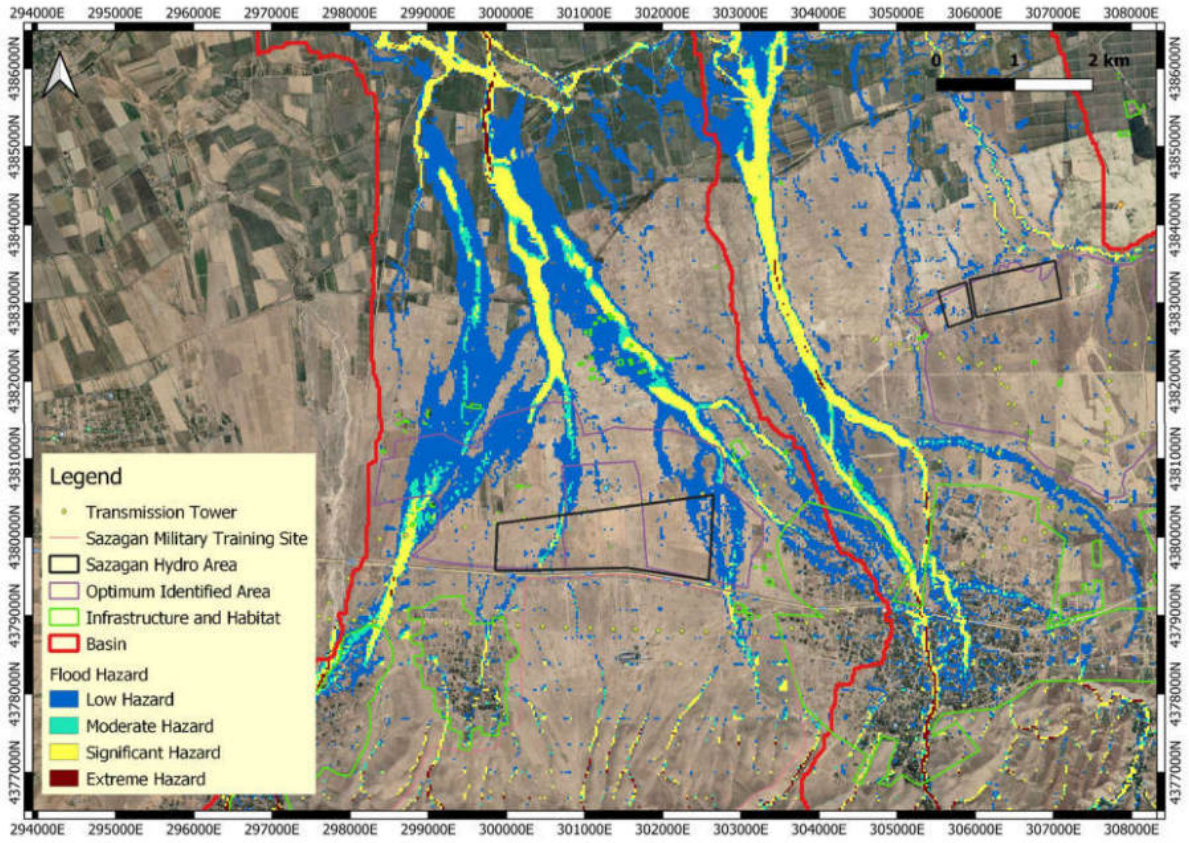

Figure 6-6 Alluvial flood hazard map for the 100 MW PV plant and Nurobod site (with basin contribution)

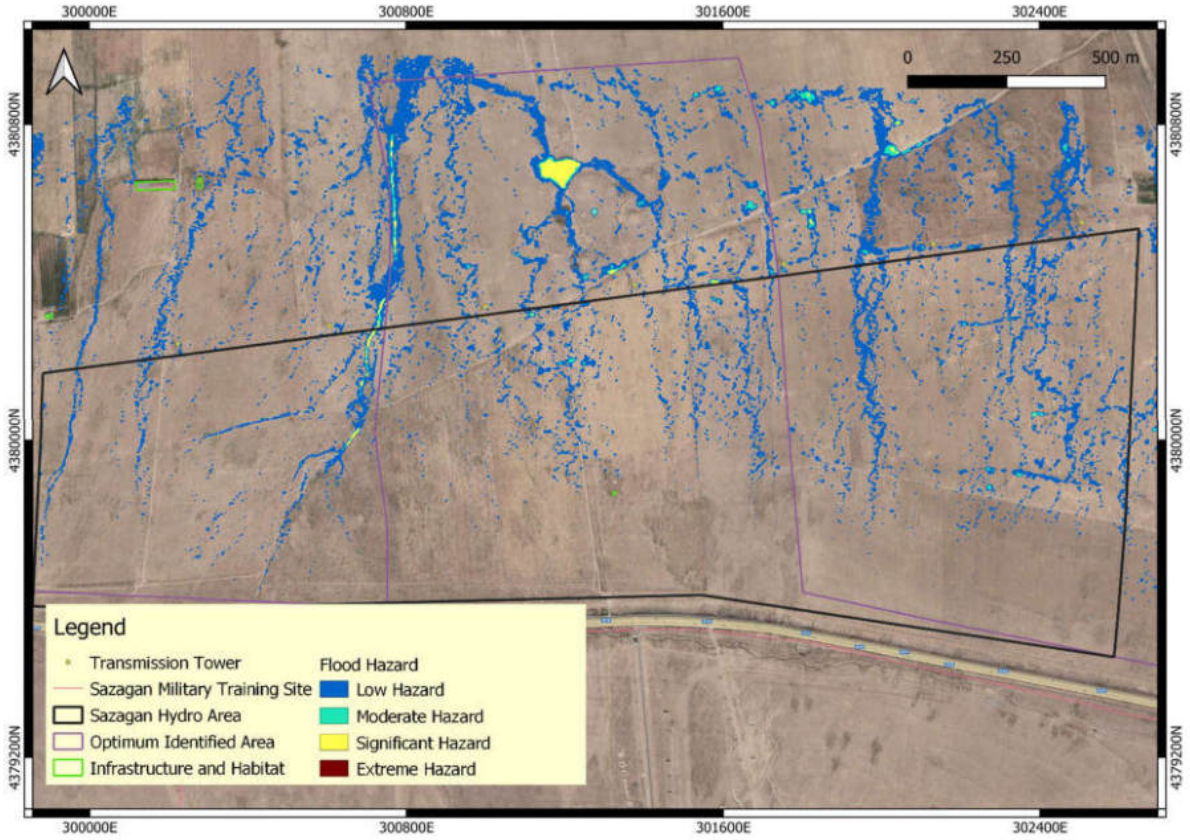

Figure 6-7 Flash flood hazard map for the 100 MW PV plant and Nurobod site

6.3.1.2 400 MW PV power plant and pooling station sites

GROUND WATER

Groundwater was not encountered up to the bedrock depth at 135 metres below ground level, over the course of geotechnical surveys within the 400 MW PV power plant and pooling station sites.

SURFACE WATER

The 400 MW PV power plant and pooling station sites include relatively flat, arid terrain, with a slight downward slope from north-east to south-west. The drainage pattern of the site includes a number of small drainage channels. No permanent wetland or streams were observed within the site, at the time of the ESIA baseline surveys. In relation to larger water courses, the site lies 3.9 kilometres South of Sabirsay River, which contributes to the Zarafshan River catchment.

FLOOD RISK

A hydrological survey was carried out for the 400 MW PV power plant and pooling station sites in Nurobod District, based on primary and the best available secondary information.

The analysis began with the construction of a Digital Elevation Model (DEM) for hydrodynamic modelling. A 0.3 metre resolution DEM was developed for the project site, and a global, open-access, 30 metre resolution Forest and Building removed Copernicus Digital Elevation Model (FABDEM) was utilized for elevation modelling for the surrounding catchment area. The DEM indicates that the elevation of the overall project site ranges from 406 metres on the eastern side and 369 metres on the western side, with generally low to medium slope in between, as shown in Figure 6-8 below.

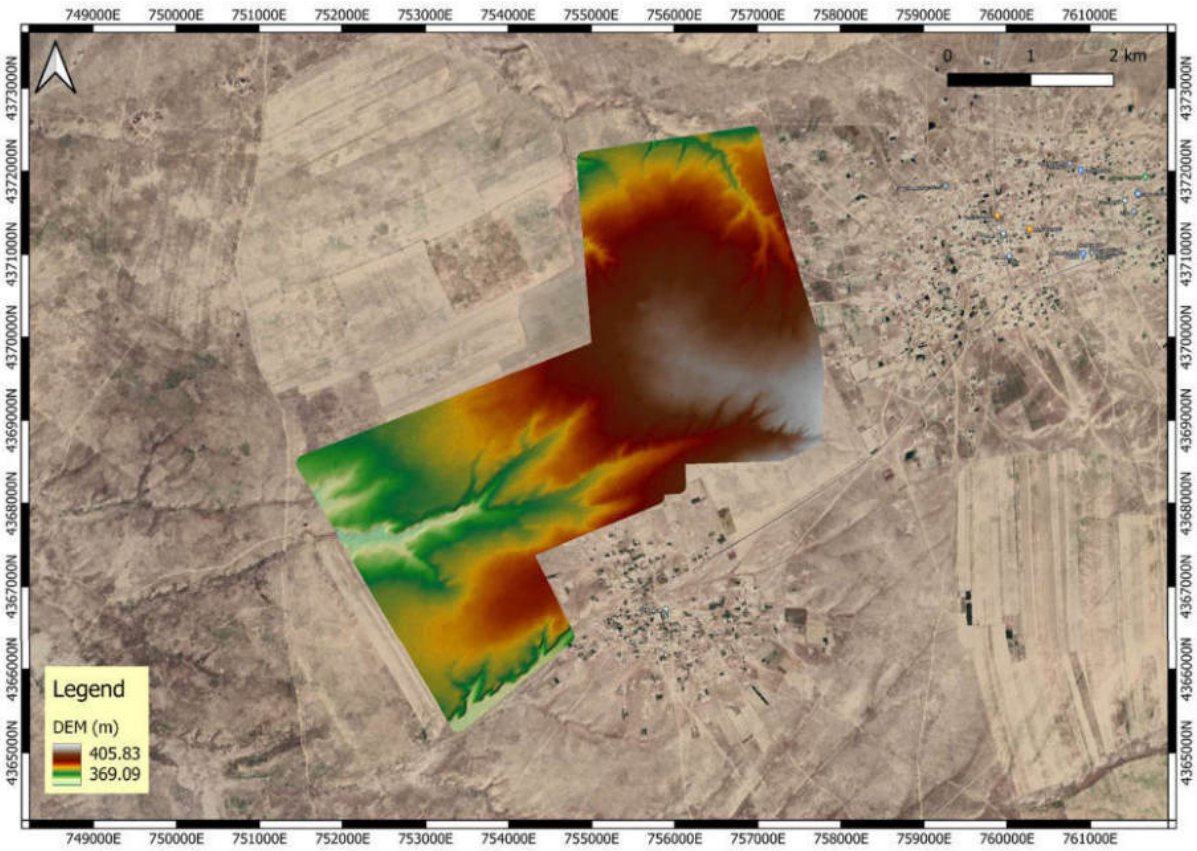

Figure 6-8 Elevation model and stream bed analysis for the 400 MW PV plant and pooling station sites

The watershed analysis performed on the localized DEM and wider FABDEM further indicates that the site lies within an upstream section of the sub-basin contributing to the wider drainage basin associated with the site. Natural stream beds (small runoff channels) traverse the site, as shown in the figure above.

Subsequently, meteorological data was sourced from the M-II Nurobod meteorological station for a hydrograph analysis to establish the frequency of peak precipitation events in terms of return periods. Specifically, historical precipitation, snow depth and temperature data were acquired for the period 2002-2021. An examination of the data pegged the maximum recorded daily precipitation at 51.4 mm (observed in April 2019), and the maximum snow depth at 22 cm below ground level (observed in March 2013).

The annual daily precipitation maxima were extracted from historical data, and the values were fitted to the Gumbel theoretical distribution function, and derived for 2-, 5-, 10-, 20-, 50- and 100-year return periods. The Gumbel distribution was determined to be more appropriate that the Generalized Extreme Value (GEV), log-normal and exponential distribution, based on the Cramer von Misses p-test. Afterwards, Intensity-Duration-Frequency (IDF) curves were methodically constructed based on the Gumbel distribution annual precipitation maxima.

Based on the IDF curves, precipitation intensity values for a number of short-term durations were determined, across the return periods. A Mann-Kendal trend analysis and Sen's slope analysis were carried out to investigate trends in temperature and precipitation based on historical meteorological data for the period 2002-2021. These analyses indicated that climate change effects on precipitation are not significant within the sub-catchment (and study area).

The contribution of snowmelt to precipitation was also studied. Based on the meteorological data, snow occurs in the months of December, January, February, and March, with snow depth peaking in March. While rainfall is mostly absent during these months, coincidental snowmelt and rainfall do occur. The occurrence of heavy snow cover in the project site and the wider catchment area was investigated using the global, 500-metre resolution Moderate Resolution Imaging Spectroradiometer (MODIS) Terra Snow Cover database and mapping tool (MOD10A1.006). The snow cover map review indicates that snowmelt is not an important contributor to discharge (stream flow), as illustrated in the map below.

The Direct Rainfall Method (DRM) was used for 2D flood modelling using HEC-RAS software, for a 100-year extreme precipitation event. This flood modelling method involves the simulation of precipitation on the hydrodynamic surface-flow model constructed from the local DEM.

The Manning's roughness coefficient for drainage channels and infiltration capacity of resident soils constitute the main parameters for the modelled discharge/ surface flow. The roughness coefficient for the base DEM was set based on a review of primary information and literature constants. The infiltration capacity of the project site was determined using global databases for land cover and soil types. For land cover, 10-metre resolution maps were sourced from the European Space Agency database, whereas for soil classification, 250-metre resolution maps were sourced from the Global Hydrologic Soil Groups database. Precautionary settings were selected for simulating runoff and infiltration.

Flood modelling for a 100-year return period indicates that the site does not present a high risk of flash floods.

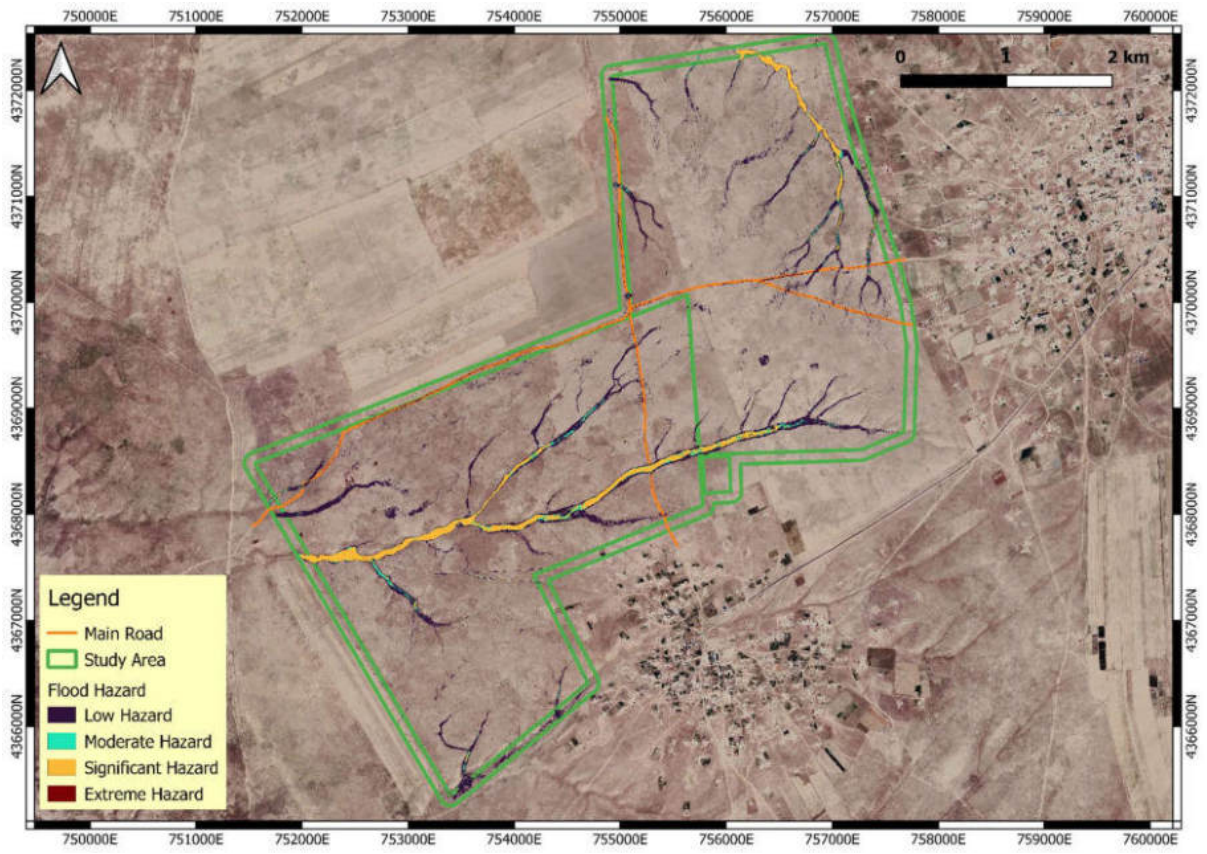

Figure 6-9 Flash flood hazard map for the 400 MW PV plant and pooling station sites

6.3.1.3 4.9-km OTL, 11-km, 19-km and 70-km OTLs

Hydrological surveys carried out as part of feasibility studies for the Project's overhead transmission lines ensured that the OTL routes avoid extensively waterlogged and flood-prone areas. Environmental baseline surveys undertaken during the ESIA studies indicate the following potential wetlands within the OTL corridors:

- The 4.9-km OTL crosses Sazagansai River and a total of three smaller streams.
- The 70-km OTL route crosses two rivers (including Sazagansai River), and a total of four, smaller streams. The OTL also crosses one major irrigational canal known as the Moskva Canal.
- The 11-km and 19-km OTLs cross several irrigation channels.

6.3.2 Surface water quality

6.3.2.1 100 MW PV power plant and Nurobod BESS sites

As no permanent wetlands were observed within the 100 MW PV power plant and Nurobod BESS sites, and their 500-metre buffers, surface water sampling for quantitative water quality

analyses were excluded from the scope of the ESIA baseline surveys. The 500-metre buffer is based on the maximum protection zone for large rivers (as prescribed in Resolution 981).

6.3.2.2 400 MW PV power plant and pooling station sites

As no permanent wetlands were observed within the 400 MW PV power plant site, and its 500-metre buffer, surface water sampling for a quantitative water quality analysis was excluded from the scope of the ESIA baseline surveys.

6.3.2.3 Overhead transmission lines (i.e., 4.9-km, 11-km, 19-km, and 70-km OTL) sites

The construction of the 200 kV overhead transmission lines will not involve construction work requiring bulk storage of construction materials (including waste), extensive earthworks and large-scale on-site labour welfare facilities (i.e., labour camps etc.), which carry the potential for contamination of resident soils and ambient surface water bodies. On this basis, surface water sampling for quantitative water quality analyses was excluded from the scope of the ESIA baseline surveys.

6.3.3 Groundwater quality

6.3.3.1 100 MW PV power plant and Nurobod BESS sites

Groundwater was not encountered up to the depth of the resident bedrock, within the 100 MW PV power plant and Nurobod BESS sites.

GROUNDWATER SAMPLING

Considering the possibility of groundwater abstraction nearby the project sites, baseline groundwater quality testing was scoped into the ESIA study on a precautionary basis and carried out between July and October 2023. Due to the large depth of resident aquifers and consistent land-use in and around these sites, an opportunistic sampling strategy for groundwater was set taking the following into consideration:

- One representative sampling location was targeted at a groundwater well located 300 metres north-east of the 100 MW PV power plant site and 230 metres south-west of the nearby waste disposal facility.
- No monitoring wells were installed on the sites. Therefore, the general direction of groundwater flow could not be verified, and groundwater samples were extracted from existing community boreholes (without purging etc.).
- Usable groundwater boreholes were not identified in the vicinity of the Nurobod BESS, and groundwater sampling was therefore excluded for this site.

The groundwater sampling location nearby the 100 MW PV plant site is shown in the following table and figure.

Table 6-8 GPS coordinates for the groundwater sample taken nearby the 100 MW PV power plant site

SAMPLE ID	LATITUDE	LONGITUDE
GW01	39.42503814	65.97478893

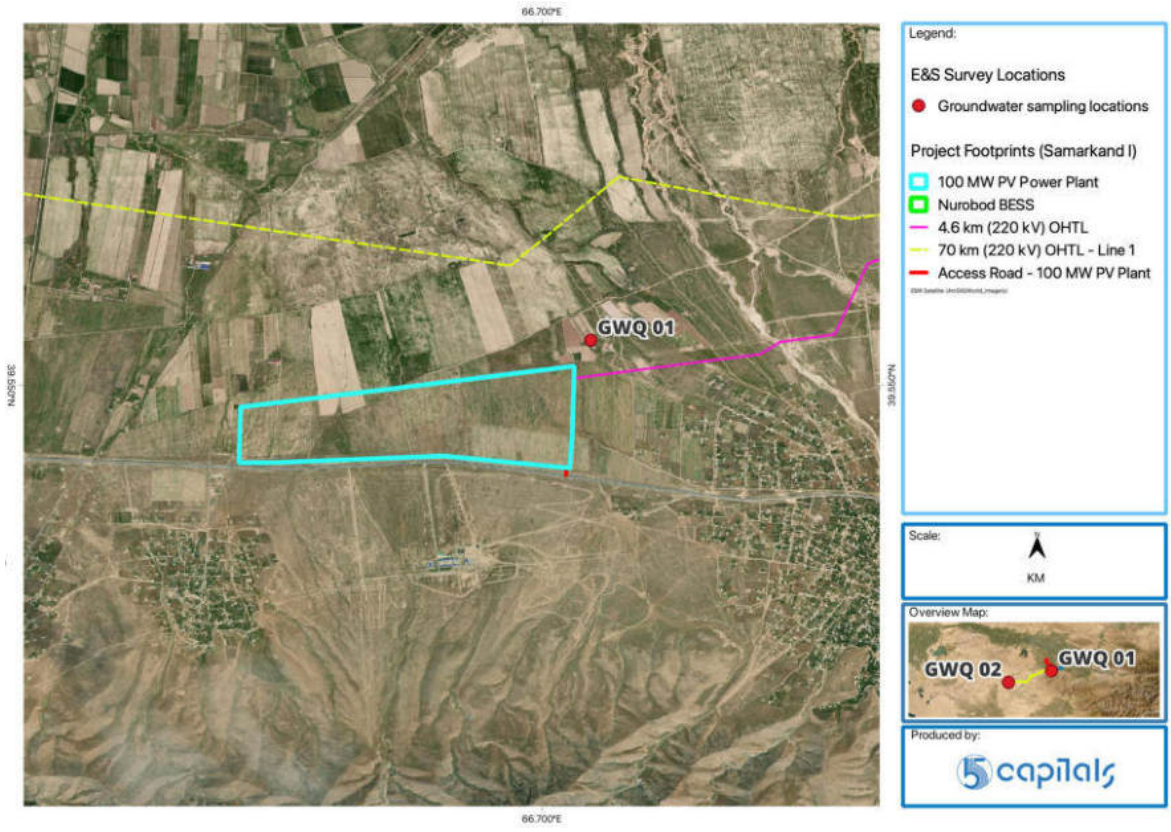

Figure 6-10 Groundwater sampling location nearby the 100 MW PV power plant site

The groundwater sample was collected in one litre HDPE container, labelled accordingly, and placed in a cooler box. A chain of custody was observed in the transfer of the samples to a nationally accredited laboratory, with a holding time not exceeding 48 hours.

The suite of parameters selected for water quality testing included (but is not limited to) heavy metals (cadmium, mercury, arsenic etc.), hydrocarbons, microbial agents (coliforms etc.) as well as saline/ alkaline mineral constituents (e.g., sulphates, nitrates, and chlorides).

ANALYTICAL RESULTS

The full listing of the groundwater quality test parameters and results for the analysed sample are presented in Table 6-9 below.

Table 6-9 Results of quantitative analyses for groundwater sample taken nearby the 100 MW PV plant site

Parameter	Unit	Lower Detection Limit	Sample ID GW02	Maximum Permissible Concentration (SanPin No 0191-05)	WHO Potable Water Quality Guidelines	Dutch Threshold Concentration for Remediation
pH	-	1-14	7.5200	6.5-8.5	N/A	N/A
Nitrate (NO3)	mg/L	0.0010	2.00	45.00	50.00	N/A
Sulphates (SO4)	mg/L	25-500	947.00	400.00	N/A	N/A
Chloride (Cl)	mg/L	0.5000	674.00	250.00	N/A	N/A
Zinc (Zn)	mg/L	0.0002	0.0006	0.05	N/A	0.0240
Chromium (Cr)	mg/L	0.0020	0.0680	0.05	0.05	N/A
Cadmium (Cd)	mg/L	0.0001	0.0001	0.01	0.00	0.0004
Copper (Cu)	mg/L	0.0020	0.0023	1.00	2.00	0.0013
Manganese (Mn)	mg/L	0.0002	0.0002	N/A	N/A	N/A
Mercury (Hg)	mg/L	0.0001	<0.0001	0.005	0.0060	N/A
Nickel (Ni)	mg/L	0.0020	0.0053	0.10	0.07	0.0021
Lead (Pb)	mg/L	0.0002	0.0002	0.03	0.01	0.0017
Arsenic (As)	mg/L	0.0001	0.0057	0.05	0.01	0.0072
Cobalt	mg/L	0.0001	0.0006	0.10	N/A	0.0007

As shown in Table 6-9 above, groundwater in the vicinity of the 100 MW PV plant site exhibits generally good water quality, with most parameters meeting national and international guideline values. One exception is the exceedances recorded for total Chromium, against SanPin and WHO standards. The salinity of local groundwater, in terms of sulphates and chlorides, is also higher than SanPin thresholds.

Taking into account the analytical results for soil samples from the project site, elevated concentrations of Chromium, sulphates and chlorides can be attributed to the local geology and the arid context of the project area.

6.3.3.2 400 MW PV power plant and pooling station sites

Groundwater was not encountered up to the depth of the resident bedrock, within the 400 MW PV power plant site.

Groundwater sampling

Considering the possibility of groundwater abstraction nearby the project sites, precautionary groundwater sampling and quantitative groundwater quality analyses were carried out, using the methodology described in Section 6.3.3.1 above. One groundwater sample was extracted from a borehole located 300 metres south of the 400 MW PV power plant site.

The groundwater sampling location nearby the 400 MW PV plant site is shown in the following table and figure.

Table 6-10 GPS coordinates for groundwater sample taken nearby the 400 MW PV power plant site

SAMPLE ID	LATITUDE	LONGITUDE
GW02	39.55432639	66.70469243

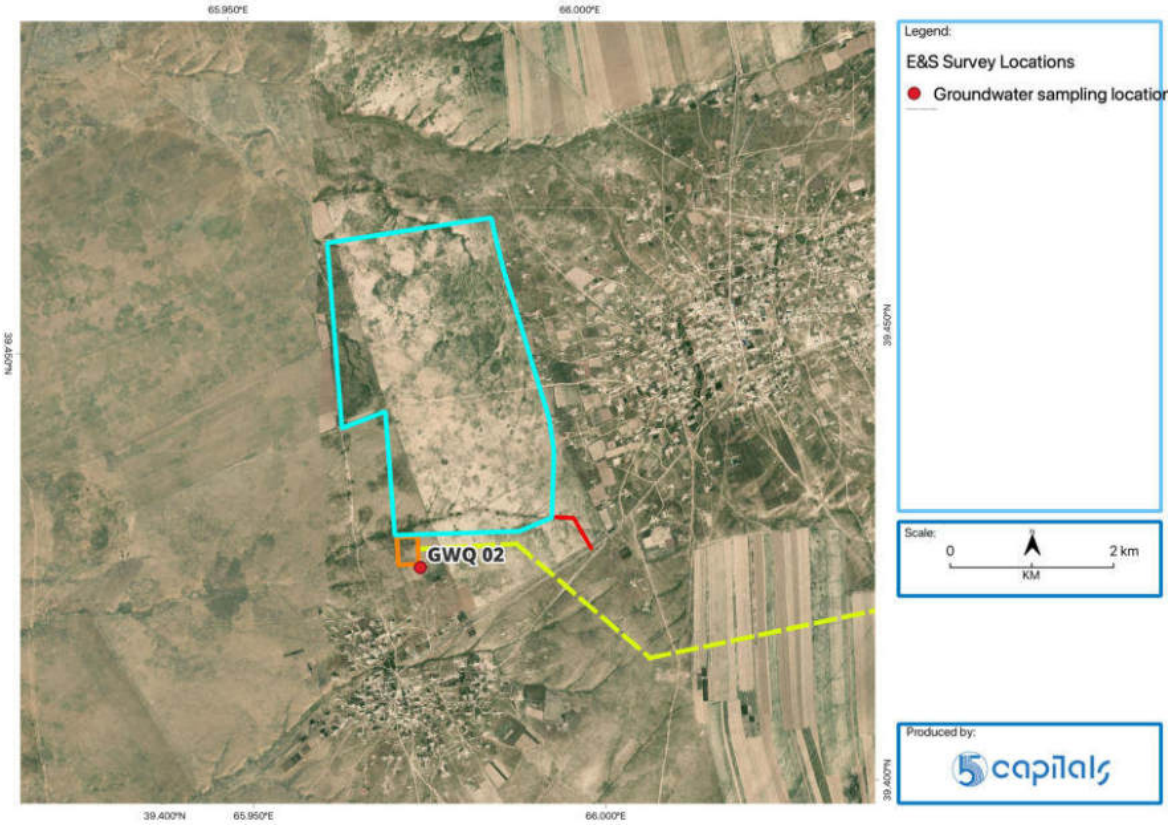

Figure 6-11 Groundwater sampling location nearby the 400 MW PV power plant site

ANALYTICAL RESULTS

The full listing of the groundwater quality test parameters and results for the analysed sample are presented in Table 6-11below.

Table 6-11 Results of quantitative analyses for groundwater sample taken nearby the 400 MW PV plant site

PARAMETER	UNIT	LOWER DETECTION LIMIT	SAMPLE ID	MAXIMUM PERMISSIBLE CONCENTRATION (SANPIN NO 0191-05)	WHO POTABLE WATER QUALITY GUIDELINES	DUTCH THRESHOLD CONCENTRATION FOR REMEDIATION
			GW01			

pH	-	1-14	7.4500	6.5-8.5	N/A	N/A
Nitrate (NO3)	mg/L	0.0010	2.0000	45.00	50.00	N/A
Sulphates (SO4)	mg/L	25-500	67.0000	400.00	N/A	N/A
Chloride (Cl)	mg/L	0.5000	9.0000	250.00	N/A	N/A
Zinc (Zn)	mg/L	0.0002	0.0002	0.05	N/A	0.0240
Chromium (Cr)	mg/L	0.0020	0.0110	0.05	0.05	N/A
Cadmium (Cd)	mg/L	0.0001	0.0001	0.01	0.00	0.0004
Copper (Cu)	mg/L	0.0020	0.0018	1.00	2.00	0.0013
Manganese (Mn)	mg/L	0.0002	0.0002	N/A	N/A	N/A
Mercury (Hg)	mg/L	0.0001	<0.000013	0.005	0.0060	N/A
Nickel (Ni)	mg/L	0.0020	0.0022	0.10	0.07	0.0021
Lead (Pb)	mg/L	0.0002	0.0002	0.03	0.01	0.0017
Arsenic (As)	mg/L	0.0001	0.0120	0.05	0.01	0.0072
Cobalt	mg/L	0.0001	0.0003	0.10	N/A	0.0007

As shown in Table 6-11 above, groundwater in the vicinity of the 400 MW PV plant site exhibits generally good water quality, with most parameters meeting national and international guideline values. One exception is the minor exceedance recorded for Arsenic, relative to the WHO guideline value. The concentration of Arsenic is nonetheless significantly lower than the SanPIn threshold.

In consideration of the analytical results for soil samples from the project site, elevated groundwater concentrations of Arsenic can be attributed to the local geology.

6.3.3.3 Overhead transmission line (i.e., 4.9-km, 11-km, 19-km, and 70-km OTL) sites

The construction of the 200 kV overhead transmission lines will not involve construction work requiring bulk storage of construction materials (including waste), extensive earthworks and large-scale on-site labour welfare facilities (i.e., labour camps etc.), which carry the potential for contamination of resident soils and groundwater. The establishment of on-site boreholes for potable water supply during the Project's construction and operational phases is also not planned. On this basis, groundwater sampling for quantitative water quality analyses was excluded from the scope of the ESIA baseline surveys.

6.4 Receptors

The following table provides a descriptive overview of E&S impact receptors in the context of geology, soils, and hydrology in the project AoI, and their respective sensitivity ratings.

Table 6-12 E&S impact receptors – Geology, soils, and hydrology

RECEPTOR	SENSITIVITY	JUSTIFICATION
Soil	Medium	Predominantly medium to fined grained loam and clay soils with considerable permeability and low to medium erosivity. Soils are arid but provide ecosystem services for local livelihoods, including crop farming, grazing, wood harvesting and vegetative erosion control.
Groundwater	Medium	Deep groundwater aquifers with moderately saline water. Groundwater sources are used by the majority of residents in affected communities within the districts of Nurobod and Pastdargom.
Surface water	Medium	Surface water bodies nearby the PV plant and BESS sites include small (ephemeral) drainage channels and seasonal ponds, which are utilized for crop and livestock farming. Unprotected surface water bodies along the OTL corridors include seasonal irrigation channels, canals, streams and larger rivers, which are utilized for local irrigation, livestock upkeep, other commercial purposes, and domestic use.

6.5 Potential Impacts and Management Measures

The following section elaborates on potential impacts on soils, groundwater, and surface water within the relevant AoI, during the Project's construction, operation, and decommissioning phases. This includes avoidance and mitigation measures for the management of the impacts, with further evaluation to determine any residual impacts/ risks and their significance.

6.5.1 Construction Phase

6.5.1.1 Soil erosion and associated sedimentation

The Project's construction phase will involve earthworks such as land clearance, topsoil stripping, site grading, excavation, back-filling, as well as the movement of heavy machinery. Excavated and imported stocks of soil and other construction aggregates will also be stockpiled during excavation and back-filling. Earthworks and earth-moving activities will take place during the following main activities:

- Site preparation and mobilization.
- Construction of foundations.
- Establishment of service roads.
- Cable trenching.
- Construction of site drainage channels.

The disturbance, displacement and exposure of soils potentiates the risk of wind- and water-driven soil erosion within the construction footprint. The risk of erosion is particularly high for

construction sites characterized by sandy soils and steep slopes. Any earthworks nearby streams, rivers, and unlined irrigation channels (for the construction of OTL towers) can also result in erosion and sediment mobilization. Sediment loading within impacted irrigation channels can limit water distribution to nearby farms. In extreme cases, increased siltation can also temporarily degrade aquatic habitats along large rivers and canals.

For the PV plant and BESS sites, the impact significance is potentially moderate, in the absence of mitigation, considering the scale of earthworks, moderate to low erodibility of soils within these sites, and the absence of major rivers within construction zones requiring extensive earthworks.

For the OTL sites, the impact significance is potentially moderate, in the absence of mitigation, considering the potential proximity of tower foundation sites to streams, rivers, and canals.

6.5.1.2 Pluvial flooding

Construction activities such as vegetation removal (land clearance), purposive compaction, trenching, establishment of new structures, and site drainage works, can alter drainage patterns, reduce infiltration within construction zones, and thereby lead to increased stormwater runoff. Similarly, haphazard stockpiling of excavated or imported aggregates can block drainage channels and agricultural canals nearby the project sites, and thereby lead to drainage bottlenecks. This poses the risk of overflows, which cause ponding, gulley erosion and associated impacts on off-site (third party) property (i.e., crop farms, livestock pond).

For the PV plant and BESS sites, the impact significance is potentially minor/moderate in the absence of mitigation, considering the scale of earthworks, generally even topography and the absence of streams within the PV plant and BESS sites.

6.5.1.3 Contamination of ambient soil, groundwater, and surface water

The Project's construction phase will involve the transportation, handling, storage, and use of various materials, including solid refuse, sewage, contaminated runoff, and hazardous construction materials such as fuel, paints, solvents, hydraulic fluids, and lubricants. The accidental release of these materials through spills and leaks can result in the contamination of resident soils, groundwater, and surface water resources. Depending on the scale of such discharges and various pollutant migration factors (i.e., soil permeability, groundwater levels, hydraulic gradient, surface water flows etc.), soil and water contamination can expose human end-receptors to a host of risks, including acute and chronic health impacts. A mass release of toxic substances into soils and water bodies can also have a deleterious effect on ecological receptors within receiving environments (i.e., flora and fauna within areas of impact).

Further, construction activities typically entail the generation of hazardous waste such as used oils, concrete washout water, untreated sewage, hazardous chemical containers, and soiled absorbents. Improper waste handling, storage and transfer facilities and procedures, as well as accidental spills and leakages of liquid waste can likewise result in the uncontrolled contamination of resident soil, groundwater, and surface water resources, with harmful effects on human and ecological end-receptors due to exposure pathways including (but not limited to) direct contaminated water consumption and exterior contact with contaminated water. The release of organic waste into wetlands and nutrient loading within aquatic habitats can also result in eutrophication and deleterious anoxic conditions.

Construction zones with an elevated risk of soil and water contamination typically include material and waste storage, materials pick-up and drop-off areas, concrete batching plants, refuelling areas, and areas around sewage storage and treatment facilities.

For the PV plant and BESS sites, the impact significance is potentially moderate in the absence of mitigation, considering the depth of local groundwater tables and absence of permanent streams within the PV plant and BESS sites. For OTL sites, the impact significance is potentially moderate in the absence of mitigation, considering relatively limited on-site waste storage, and the presence of streams, rivers, and canals along the OTL corridors.

Table 6-13 Overview of potential impacts relating to geology, soils, groundwater and surface water during construction

E&S Impact	Area of Influence	Impact Magnitude	Potential Receptors (direct and indirect receptors)	Receptor Sensitivity	Pre-management Impact Significance	Residual Impact Significance
PV Plant and BESS Sites						
Soil erosion and associated sedimentation	Construction zones within the PV plant and BESS sites, and nearby streams/ drainage channels	Minor	Soil	Medium	**Minor/ Moderate**	**Negligible/ Minor**
			Surface water	Medium	**Minor/ Moderate**	**Negligible/ Minor**
Pluvial flooding	Construction zones within the PV plant and BESS sites	Minor	Soil	Medium	**Minor/ Moderate**	**Negligible/ Minor**
Contamination of ambient soil, groundwater, and surface water	Construction zones within the PV plant and BESS sites, and nearby streams/ drainage channels	Moderate	Soil	Medium	**Moderate**	**Negligible/ Minor**
		Major	Groundwater	Medium	**Moderate/ Major**	**Minor**
		Major	Surface water	Medium	**Moderate/ Major**	**Minor**
OTL Sites						
Soil erosion and associated sedimentation	Construction zones for OTL foundations and access roads, and nearby streams, canals, and rivers	Minor	Soil	Medium	**Minor/ Moderate**	**Negligible/ Minor**
			Surface water	Medium	**Minor/ Moderate**	**Negligible/ Minor**
Contamination of ambient soil, groundwater, and surface water	Construction zones for OTL foundations and access roads, and nearby streams, canals, and rivers	Moderate	Soil	Medium	**Moderate**	**Negligible/ Minor**
		Major	Groundwater	Medium	**Moderate/ Major**	**Minor**

E&S Impact	Area of Influence	Impact Magnitude	Potential Receptors (direct and indirect receptors)	Receptor Sensitivity	Pre-management Impact Significance	Residual Impact Significance
		Moderate	Surface water	Medium	**Moderate/ Major**	**Minor**

Impact avoidance and mitigation measures

Soil erosion and associated sedimentation

- Land clearance and other forms of soil disturbance will be restricted to demarcated construction zones within the project sites and designated transit corridors.
- Erosion-prone locations within the project sites will be identified prior to the commencement of land clearance and earthworks and avoided to the extent feasible. Where avoidance is not feasible, erosion control listed further below will be carried out.
- Land clearance, excavation and intensive earth-moving activities will be avoided, suspended, or otherwise curtailed to the extent feasible during periods of heavy rainfall and/or rapid snowmelt, to the extent feasible.
- Excavation and stockpiling will be sited as far as possible from unprotected drainage and irrigation channels, canals, natural streams and rivers.
- Silt traps fences or curtains will be installed where earthworks must be carried out in close proximity to unprotected drainage and irrigation channels, canals, natural streams and rivers.
- The length and slope of excavations and stockpiles will be minimized to the extent feasible.
- Shoring and shielding for any deep excavations within unstable soils will be retained up to the time of backfilling, to minimize soil erosion and subsequent sedimentation with nearby water courses.
- Excavated soil that is fit for backfilling purposes will be segregated during excavation and stockpiling, such that the original soil profile is maintained during backfilling.
- Excavations including trenches will be backfilled as quickly as practicable, with efforts to re-establish the original soil profile (i.e., layering sub-soil beneath topsoil).
- Wetting-down and construction of berms will be carried out for stockpiles to minimize soil erosion and subsequent sedimentation within nearby water courses during periods of heavy rainfall and/or strong winds.
- The development of on-site service roads for the Project will involve design and grading efforts to minimize roadway gradients, surface compaction and appropriate drainage for constructed or upgraded roads.
- Site rehabilitation will be implemented following the completion of construction activities, with complete backfilling of on-site excavations, removal of remnant soil stockpiles and re-establishment of vegetative cover in residual areas within the project sites (i.e., those located outside of permanent footprint of O&M facilities).

E&S Impact	Area of Influence	Impact Magnitude	Potential Receptors (direct and indirect receptors)	Receptor Sensitivity	Pre-management Impact Significance	Residual Impact Significance
• Site rehabilitation will include ad-hoc erosion and sedimentation control measures for any disturbed erosion-prone locations located within 60 metres of sensitive water courses. These measures will include grading, as well as vegetative contouring for steeply sloping terrain. • Resident communities and establishments based around the project sites will be familiarized with the Project's community GRM, to enable the collection of relevant grievances on platforms that are accessible to all local constituencies and free of manipulation, interference, intimidation, service charges and restrictions on arbitration, judicial recourse, and choice of confidentiality. • An Erosion Control Plan and Reinstatement and Landscape Management Plan including (but not limited to) provisions for the avoidance and mitigation measures listed above will be developed and implemented. **Pluvial flooding** • Land clearance and other forms of soil disturbance will be restricted to demarcated construction zones within the project sites and designated transit corridors. • The movement of heavy vehicles and mass storage of construction materials will be restricted to on-site service roads and laydown areas respectively, to minimize the compaction of undisturbed soils. • Excavation and stockpiling will be sited as far as possible from unprotected drainage and irrigation channels, canals, natural streams, and rivers. • Existing drainage channels will not be blocked or constricted without ensuring the diversion of affected watercourses through the establishment or use of alternative drainage channels with sufficient drainage capacity. • Haphazard dumping of solid and liquid waste into water bodies in and around the project sites will be strictly prohibited. The discharge of liquid construction waste (e.g., sewage, concrete washout, used/waste oils) into water bodies will be proscribed. • Site rehabilitation will be implemented following the completion of construction activities, with complete backfilling of on-site excavations, removal of remnant soil stockpiles and re-establishment of vegetative cover in residual areas within the project sites (i.e., those located outside of permanent footprints of O&M facilities). • Site rehabilitation will include ad-hoc erosion and sedimentation control measures for any disturbed erosion-prone locations located within 60 metres of sensitive water courses. These measures will include grading, as well as vegetative contouring for steeply sloping terrain. • Local communities and establishments based around the project sites will be familiarized with the Project's community GRM, to enable the collection of relevant grievances on platforms that are accessible to all local constituencies and free of manipulation, interference, intimidation, service charges and restrictions on arbitration, judicial recourse, and choice of confidentiality. • An Erosion Control Plan, Water Management Plan and Reinstatement and Landscape Management Plan including (but not limited to) provisions for the avoidance and mitigation measures listed above will be developed and implemented.						

E&S Impact	Area of Influence	Impact Magnitude	Potential Receptors (direct and indirect receptors)	Receptor Sensitivity	Pre-management Impact Significance	Residual Impact Significance
Contamination of resident soil, groundwater, and surface water • The sanitary and erosion control buffers will be observed for all construction activities and facilities nearby canals, large rivers and aquacultural ponds (buffers for rivers range from 35 to 300 metres, while those for canals vary between 5 and 15 metres). • Haphazard dumping of solid and liquid waste into water bodies in and around the project sites will be strictly prohibited. The discharge of liquid construction waste (e.g., sewage, concrete washout, used/waste oils) into water bodies will be proscribed. • Regular and specialized hazard assessments will be carried out for any construction activities and contingencies involving the use, generation and/or potential release of hazardous materials and waste. • Robust, non-defective, fully sealed/ closed and inert (or product-compatible) containers and/or vessels will be used for the transfer of any hazardous materials and waste in and out of the project sites, using safe transportation means. • Regular maintenance will be carried out for vehicles, equipment and devices used for the transportation, loading and discharge of hazardous materials and waste during construction. • Fuel transport vehicles and equipment to be maintained and routinely inspected to ensure the tank, pumps, pipe work and other vehicle components are fit for purpose, with no signs of leakage. Vehicles with any identified defects (e.g., compromised fluid vessels) will be withdrawn from service for immediate maintenance. • All defunct heavy machinery will be serviced within service centres outside of the project site, or within designated workshops with adequate roofing and an impermeable base. • Washing of equipment and machinery (including vehicles) will only be permitted in designated areas, with impermeable surfaces and isolated drainage systems that lead to dedicated sumps, treatment facilities including oil/water separators and/or lined evaporation ponds. • Refuelling of equipment and machinery (including vehicles) will be permitted only in designated areas with impermeable surfaces and isolated drainage systems that lead to dedicated sumps, treatment facilities including oil/water separators and/or lined evaporation ponds. • Connection points for the discharge of hazardous materials and waste from one containment structure to another will be positioned above drip trays and/or impervious bases that are isolated from stormwater drainage systems. • Oil-containing containers and vessels (with the exception of vehicles) will be placed on bunded impermeable hard-standings or drip trays. • Designated facilities with an impermeable base (flooring), roofing, and facilities for temperature control, lighting protection, and fire detection and suppression will be established for the storage of hazardous materials and waste. These facilities will be sheltered to prevent exposure of chemical/waste stock to direct sunlight, precipitation, humid external conditions, and wind. • On-site storage of hazardous materials and waste will be physically segregated to avoid the commingling of incompatible materials and potentially hazardous chemical reactions and/or products. Incompatible pairings with potential for violent and flammable reactions include acids and bases, oxidizing and flammable/explosive substances, etc.).					

E&S Impact	Area of Influence	Impact Magnitude	Potential Receptors (direct and indirect receptors)	Receptor Sensitivity	Pre-management Impact Significance	Residual Impact Significance
• Designated facilities for the storage of hazardous materials and waste will be sited as far as possible from main working areas, water sources, stormwater drainage systems, and sources of ignition. A protective buffer of at least 100 metres will be maintained from water sources. • Storage of liquid hazardous materials and waste will include impervious and chemically resistant structures for secondary containment, which will feature berms, dikes or retaining walls. The capacity of secondary containment structures will amount to 110% of the capacity of the largest primary containment structure (e.g., tank or vessel) or 25% of the combined capacity of co-located primary containment structures, whichever is larger. • All containers and vessels for temporary on-site storage of hazardous construction materials and waste will be labelled accordingly, with signage and descriptions in Uzbek, Russian, Chinese, and English. Prominent precautionary signage and multilingual descriptions will be included on labels and placards. • On-site storage of hazardous materials will be carried out in accordance with instructions on Material Safety Data Sheets (MSDSs) and/or other guides from the product manufacturers. • A Hazardous Materials Register will be maintained to record and track the import and on-site inventory of hazardous materials, with details on relevant suppliers, chain of custody, transportation routes for delivery to the project sites. • Any hazardous waste generated on site (e.g., electronic refuse, waste oils, sewage) will be collected and transferred to designated waste management facilities by licensed waste collection contractors as soon as possible (i.e., on site storage to not exceed one week). • A Waste transfer log will be maintained to record and track the generation, storage and segregation of various construction waste streams, as well as the dispatch of waste consignments for off-site treatment and/or disposal, with details on waste management contractors, chain of custody, transportation route to the designated waste management facilities. • Regular coordination will be made with relevant authorities on permitting requirements and H&S measures for any instances of on-site storage and project-related transportation of hazardous materials and waste in quantities that exceed regulatory thresholds. • Where connection to an existing sewerage system is not feasible for the disposal of sewage, mobile toilets will be used prior to the completion of construction of an on-site sewage treatment system for the Project's operational phase (e.g., septic tank). • Bunded septic tanks will be established for the collection of sewage throughout construction. • Frequent servicing will be carried out for mobile toilets stationed within the project sites by licensed waste collection contractors, with safeguards for spills and leakages. • Oil/grease traps will be installed within any kitchen facilities established within the project sites. • In the event that a concrete batching plant is installed on construction sites, any on-site structures for containment of concrete washout water will be designed with sufficient capacity and located at a sufficient distance from stormwater drainage systems. • Washout of concrete trucks will be performed in designated areas only at the batching plant or any other approved concrete washout areas at the site.					

E&S Impact	Area of Influence	Impact Magnitude	Potential Receptors (direct and indirect receptors)	Receptor Sensitivity	Pre-management Impact Significance	Residual Impact Significance
• Any containers and implements used for the storage and handling of hazardous materials and waste, will be managed as hazardous waste and not used for any other applications. • Soils and aggregates for on-site construction works will be procured from accredited suppliers with licensed operational quarries and certificate of quality. • Dedicated equipment and resources for emergency response to hazardous materials spills and leakages will be stationed at suitable locations (e.g., materials/waste storage facilities and pick-up/unloading sites), with regular maintenance checks and re-stocking. • Sufficient and readily accessible spill kits will be provided for on-site hazardous material/ waste storage facilities. • Emergency response measures for spills on land will include the deployment of spill kits, berming, excavation and dewatering. • Soil, sediment, water, and materials contaminated by spills of hazardous materials and spill response measures will be handled and stored as hazardous waste and handed over to licensed hazardous waste management contractors for appropriate off-site treatment and/or disposal. • Emergency response measures for spills within water bodies will include the deployment of floating booms, absorbent pads and oil skimmers. • Emergency response will be implemented for spills and leakages of hazardous materials immediately after the identification of any such incidents. Remedial measures will involve best efforts to stop or otherwise minimize the spread of soil, groundwater, and surface water contamination (and off-site pollutant migration) and recover accidentally released product and contaminated soil and water for specialized treatment and/or disposal. • Response to all incidents of spills and leakages of hazardous materials, subsequent root-cause investigation and corrective actions will be recorded on environmental incident logs. • Induction and refresher trainings for all direct and contracted construction workers will cover hygiene, housekeeping and sanitation, the waste management hierarchy, construction-related waste streams, relevant categories of hazardous materials and waste, the impacts of hazardous materials and waste on human health and ecosystems, as well as requirements and safeguards for the handling, storage and transposition of various hazardous and non-hazardous construction materials and waste streams. • Periodic refresher trainings and daily tool-box talks will be provided updated or reiterated information on emergency response for spills and leakages of hazardous materials, and periodic drills will be carried out for spill emergency preparedness. • Regular environmental monitoring will be carried out by the Project Company's and EPC Contractor's relevant HSSE staff. This line of monitoring will include (i) inspections to ensure the implementation of relevant safeguards in work procedures/ activities, and (ii) maintenance inspections and testing to ensure the structural integrity, mechanical integrity and overall operability of construction equipment and engineering controls for the prevention of accidental release of hazardous materials, and (iii) monitoring of ambient soil, water, and air quality. • A Waste Management Plan, Hazardous Materials and Waste Management Plan, Occupational Health and Safety Plan, Spill Preparedness and Response Procedure integrating into a broader Emergency Preparedness and Response Plan including (but not limited to) provisions for the avoidance and mitigation measures listed above will be developed and implemented.					

6.5.2 Operational Phase

6.5.2.1 Contamination of ambient soil, groundwater and surface water

The Project's operational phase will entail operation and maintenance (O&M) activities with lower waste generation rates. These activities include the replacement of defective electronic equipment, transformer servicing and oil draining, as well as the generation of black and grey wastewater (sewage). In addition, spills and leakages can also occur during the servicing of mechanical and electrical equipment constituting the PV plant and BESS facilities, on-site operation of vehicles, and overflow or failure of facilities for sewage collection and treatment (e.g., septic tanks, sewage tankers).

Specific operational zones with an elevated risk of soil and water contamination potentially include on-site warehouses, waste storage facilities, materials pick-up and drop-off bays, and areas around sewage storage and treatment facilities.

For the PV plant and BESS sites, the impact significance is potentially moderate to major in the absence of mitigation, considering the depth of local groundwater tables and absence of major watercourses within these sites.

Table 6-14 Overview of potential impacts relating to geology, soils, groundwater and surface water during operation

E&S Impact	Area of Influence	Impact Magnitude	Potential Receptors (direct and indirect receptors)	Receptor Sensitivity	Pre-management Impact Significance	Residual Impact Significance
Contamination of ambient soil, groundwater, and surface water	PV plant and BESS sites, and nearby streams/ drainage channels	Major	Soil	Medium	**Moderate/ Major**	**Minor**
		Major	Groundwater	Medium	**Moderate/ Major**	**Minor**
		Major	Surface water	Medium	**Moderate/ Major**	**Minor**
Impact avoidance and mitigation measures • Oil-containing containers and vessels (with the exception of vehicles) will be placed on bunded impermeable hard-standings or drip trays. • Designated facilities with an impermeable base (flooring), roofing, and facilities for temperature control, lighting protection, and fire detection and suppression will be established for the storage of hazardous materials and waste. These facilities will be sheltered to prevent exposure of chemical/waste stock to direct sunlight, precipitation, humid external conditions, and wind. • On-site storage of hazardous materials and waste will be physically segregated to avoid the commingling of incompatible materials and potentially hazardous chemical reactions and/or products. Incompatible pairings with potential for violent and flammable reactions include acids and bases, oxidizing and flammable/explosive substances, etc.). • Designated facilities for the storage of hazardous materials and waste will be sited as far as possible from main working areas, water sources, stormwater drainage systems, and sources of ignition. A protective buffer of at least 100 metres will be maintained from water sources. • Storage of liquid hazardous materials and waste will include impervious and chemically resistant structures for secondary containment, which will feature berms, dikes or retaining walls. The capacity of secondary containment structures will amount to 110% of the capacity of the largest primary containment structure (e.g., tank or vessel) or 25% of the combined capacity of co-located primary containment structures, whichever is larger. • All containers and vessels for temporary on-site storage of hazardous construction materials and waste will be labelled accordingly, with signage and descriptions in Uzbek, Russian, Chinese, and English. Prominent precautionary signage and multilingual descriptions will be included on labels and placards.						

E&S Impact	Area of Influence	Impact Magnitude	Potential Receptors (direct and indirect receptors)	Receptor Sensitivity	Pre-Management Impact Significance	Residual Impact Significance
• On-site storage of hazardous materials will be carried out in accordance with instructions on Material Safety Data Sheets (MSDSs) and/or other guides from the product manufacturers. • A Hazardous Materials Register will be maintained to record and track the import and on-site inventory of hazardous materials, with details on relevant suppliers, chain of custody, transportation routes for delivery to the project sites. • Dedicated equipment and resources for emergency response to hazardous materials spills and leakages will be stationed at suitable locations (e.g., materials/waste storage facilities and pick-up/unloading sites), with regular maintenance checks and re-stocking. • Sufficient and readily accessible spill kits will be provided for on-site hazardous material/ waste storage facilities. • Emergency response measures for spills on land will include the deployment of spill kits, berming, and excavation. • Soil, sediment, water, and materials contaminated by spills of hazardous materials and spill response measures will be handled and stored as hazardous waste and handed over to licensed hazardous waste management contractors for appropriate off-site treatment and/or disposal. • Any hazardous waste generated on site (e.g., electronic refuse, waste oils, sewage) will be collected and transferred to designated waste management facilities by licensed waste collection contractors as soon as possible (i.e., on site storage to not exceed one week). • O&M will obtain relevant permits to transport and dispose any hazardous waste from operational processes. • Operator to develop and implement an Emergency Preparedness and Response Plan (ERP) to include or link to a Spill Response and Contingency Plan. • Conformance with ERP procedures (preventative and response) will be monitored through routine inspections. • Appropriate training of staff in regard to the handling and response to spill/leak events. • O&M Company to ensure that sanitation facilities have effective leak tight plumbing systems and the manholes will be inspected regularly for any blockage. • If used in landscaped areas, the application of fertilisers and pesticides must be limited and monitored. • Use of any toxic/non-biodegradable pesticides will be prohibited in accordance with the Stockholm Convention on banned chemicals. • Only organic, chloride free and environmentally friendly fertilizers will be applied. • Regular environmental monitoring will be carried out by the Project Company's and O&M Contractor's relevant HSSE staff. This line of monitoring will include (i) inspections to ensure the implementation of relevant safeguards in work procedures/ activities, and (ii) maintenance inspections and testing to ensure the structural integrity, mechanical integrity and overall operability of construction equipment and engineering controls for the prevention of accidental release of hazardous materials, and (iii) monitoring of ambient soil, water and air quality. • A Waste Management Plan, Hazardous Materials and Waste Management Plan, Occupational Health and Safety Plan, Spill Preparedness and Response Procedure integrating into a broader Emergency Preparedness and Response Plan including (but not limited to) provisions for the avoidance and mitigation measures listed above will be developed and implemented.					

E&S Impact	Area of Influence	Impact Magnitude	Potential Receptors (direct and indirect receptors)	Receptor Sensitivity	Pre-Management Impact Significance	Residual Impact Significance

6.5.3 Decommissioning Phase

Project decommissioning will entail the deconstruction of project facilities, demobilization of related equipment and materials, as well as potential repurposing and/or rehabilitation works. At this stage, potential impacts on resident soils, groundwater and surface water will be similar to the above-described construction-phase impacts. Specifically, this set of impacts potentially includes:

- Soil erosion and associated sedimentation
- Pluvial flooding
- Contamination of resident soil, groundwater, and surface water

For the avoidance and mitigation of these impacts, relevant impact management measures specified in Section 6.5.1 will be implemented. Accordingly, the same residual significance ratings are provisionally assigned to mutually relevant impacts on soils and water resources.

6.6 Monitoring Requirements

Table 6-15 provides an overview of the key monitoring arrangements for evaluating performance against applicable standards relating to geology, soils, groundwater and surface water, in the Project's construction and operational phases. A more elaborate coverage of these requirements will be provided in the Construction- and Operations-phase Environmental and Social Management Plans (C-ESMP, O-ESMP) and Environmental and Social Monitoring Plans (ESMoPs)[4].

[4] The Project Company is responsible for the oversight of management and monitoring measures in relation to all potential E&S impacts at each implementation stage.

Table 6-15 Monitoring arrangements for impacts and preventative and mitigation measures relating to geology, soils, groundwater and surface water

E&S Impact	Key Performance Indicator/ Parameter	targets and standards	Monitoring Location / Means of Verification	Monitoring Frequency	Responsible Entity
Soil erosion and associated sedimentation	Gully erosion	- No evidence of gully erosion (i.e., observations or community grievances)	- All construction zones on steep slopes	Ongoing	- EPC Contractor Environmental Officer
	Grievances concerning siltation within third party drainage/irrigation channels	- All related grievances are closed out within the shortest practicable duration	- Community Grievance Log	Ongoing	- EPC Contractor CLOs
Pluvial flooding	Grievances concerning flooding	- All related grievances are closed out within the shortest practicable duration	- Community Grievance Log	Ongoing	- EPC Contractor CLOs
Contamination of ambient soil, groundwater, and surface water	Percentage of chemical spills investigated and addressed through remedial and preventative actions within the shortest practicable duration	- 100% of chemical spills investigated and addressed through remedial and preventative actions within the shortest practicable duration	- Chemical and waste storage areas	Daily	- EPC Contractor Environmental Officer
	Soil and groundwater quality	- Uzbekistan Ecological Guidelines – Maximum Allowable Concentrations of Pollutants in Surface Water Bodies - SanPiN No.0191-05	- Soil and groundwater sampling locations targeted for ESIA baseline survey	Upon the occurrence of a spill exceeding 25 Litres	- EPC Contractor Environmental Officer

E&S Impact	Key Performance Indicator/ Parameter	targets and standards	Monitoring Location / Means of Verification	Monitoring Frequency	Responsible Entity
		- ESIA-stage groundwater quality baseline results			
Operational Phase					
Contamination of ambient soil, groundwater and surface water	Frequency of drills for spill response preparedness	- One annual drill for spill response preparedness has been delivered to relevant O&M workers	- HSSE Training report	Annually	- O&M Contractor HSSE Trainer - O&M Contractor Environmental/HSSE Officer
	Percentage of significant environmental incidents (i.e., a spill exceeding 25 Litres) investigated and addressed through remedial and preventative actions within the shortest practicable duration	- 100% of significant environmental incidents have been investigated and addressed through corrective (remedial and preventative) actions within the shortest practicable duration	- Environmental Incidents Log	Daily	- O&M Contractor Environmental/ HSSE Officer
	Soil and groundwater quality	- Uzbekistan Ecological Guidelines – Maximum Allowable Concentrations of Pollutants in Surface Water Bodies - SanPiN No.0191-05 - ESIA-stage groundwater quality baseline results	- Soil and groundwater sampling locations targeted for ESIA baseline survey - Environmental Monitoring Log	Upon the occurrence of a spill exceeding 25 Litres	- O&M Contractor Environmental/ HSSE Officer