

Environmental and Social Impact Assessment

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Uzbekistan: Samarkand 1 Solar PV and BESS Project

Appendixes – Part 7

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

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The mammal fauna of the study area is represented by typical species of the steppe biocenosis of the Turan province (Kostin, 1961). The site has been little transformed by agricultural activities, so both rare species for the region - Corsac Fox and Steppe Polecat and typical representatives of the mammalian fauna – Yellow Ground Squirrel, gerbils, jerboas - have been preserved here. It is characteristic that the presence Zaisan Mole Vole, which is an indicator of natural landscapes, in contrast to site 1 is 7 out of 8 or 87.5%, indicates the natural conditions of the territory.



Figure 13: Ground hills of Karnabchul steppe Samarkand region

Karakul BESS and access road

The location of the Karakul substation area is in the Lower Zaravshan district, which is part of the Bukhara region in the Turan province. This district covers the lower stretches of the Zarafshan River, including both the Bukhara and Karakul oases. The topography of the Karakul oasis is characterized by a mostly flat surface that gently descends towards the southwest, aligning with the flow of the Amu Darya River. The Sundukli sands delineate the south-eastern boundary of the oasis, while the southern boundary is defined by the Eshakchi sands.

The habitat of the Karakul BESS is characterized by Sandy desert with psammophilous scrub:

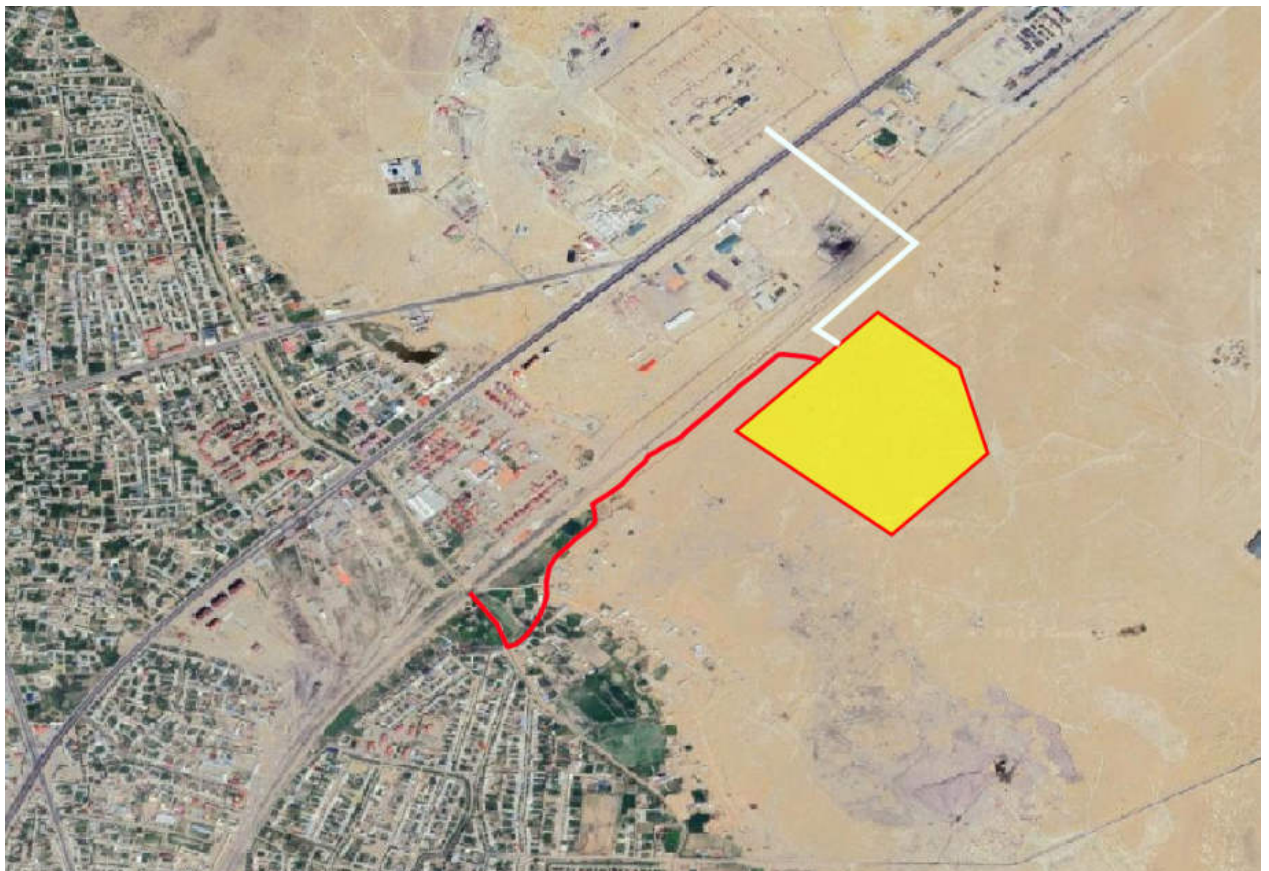


Figure 14: Habitat type of the Karakul BESS - Sandy desert with psammophilous scrub

LILO 11 km, LILO 19 km

These habitats represent heavily human-altered landscapes, with the majority of the area occupied by agricultural fields divided by fences. Proposed LILOs crosses Eski Anxor irrigation canal, two small rivers, and few temporary watercourses originating from the mountains and significantly increasing their flow during the snow melting period. Heavy machinery operates on few watercourses, and the riverbeds have been artificially altered and heavily degraded. Settlements and pasture lands also are common for the territory.



Figure 15. LILo 11 km (red) and LILo 19 km (purple)

3. Materials and methods

For the 100 MW PV solar plant, Nurabad substation, Nurabad BESS, 400MW and 500MW the research methods included walkover transect surveys and point observations. Areas for surveys were selected to ensure even coverage of the research territory, with a focus on various biotopes. Each walkover transect route ranged from 0.5 to 1.5 kilometers in length, with a 3-meter width for recording mammal activity traces and a 50-meter width for observing the mammals themselves. Binoculars were used for additional territory surveillance, and general observations were made from a moving vehicle. The data recorded during the walkover routes included traces, burrows, animal droppings, and direct observations of the animals. Coordinates of encounters were documented, and habitat areas, activity traces, and the animals themselves were photographed.

The research took place on June 15, 29; July 26-27; August 29-30, 2023, covering a total of 15,000 meters of traversed transects and surveying an area of 3,190 hectares.

Solar 100 MW PV plant and access road

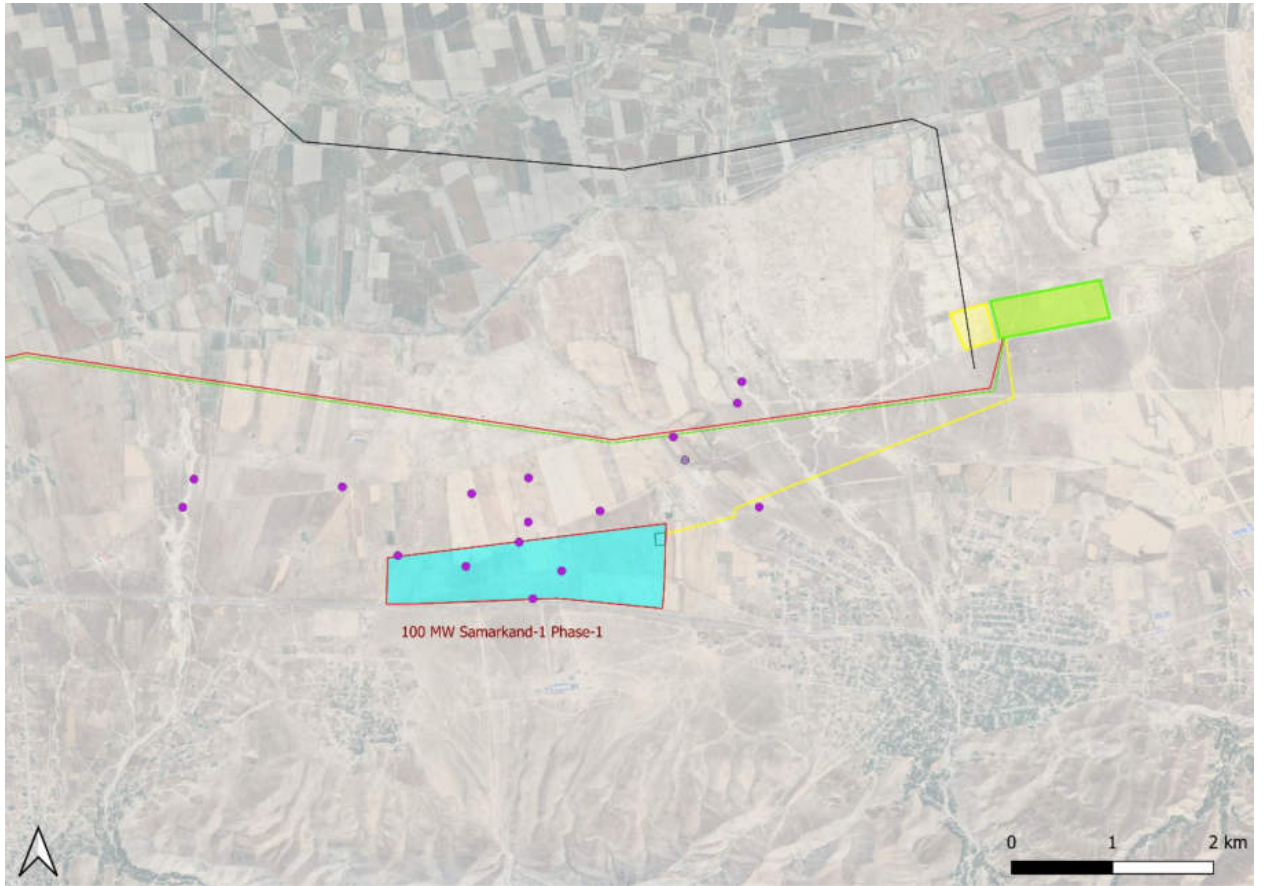


Figure 16: The survey points (violet points) on Solar 100 MW PV plant and its adjacent areas

Table 1: The survey points and coordinates on Solar 100 MW PV plant and its adjacent areas

Point	Date	N	E
Overhead line	26.07.2023	39.55709°	66.68725°
North South Electric Line North Marker	26.07.2023	39.54969°	66.68615°
Gas Pipe buffer – S	26.07.2023	39.56181°	66.70393°
Gas Pipe Western part	27.07.2023	39.55371°	66.64741°
Gas Pipe 2	27.07.2023	39.55606°	66.66579°
Gas Pipe (Central part)	27.07.2023	39.56571°	66.71132°
Overhead Line 2	27.07.2023	39.55527°	66.68068°
100MW Samarkand-1 Phase-1 (216 Ha)	27.07.2023	39.54690°	66.68003°
100MW Samarkand-1 Phase-1	27.07.2023	39.54639°	66.69105°
Heritage buffer	27.07.2023	39.55202°	66.68721°
OHTL-S (eastern part)	27.07.2023	39.55374°	66.71382°
OHTL-S (western part)	27.07.2023	39.54815°	66.67219°
Chemical Storage	27.07.2023	39.55914°	66.70525°
Gas pipe buffer-N (central part)	27.07.2023	39.56817°	66.71181°
Gas pipe buffer-N (western part)	27.07.2023	39.55694°	66.64869°
Area between Gas Pipe buffer – S and OHTL-N	27.07.2023	39.55328°	66.69548°
100MW Samarkand-1 Phase-1	27.07.2023	39.54318°	66.68775°

Nurabad substation

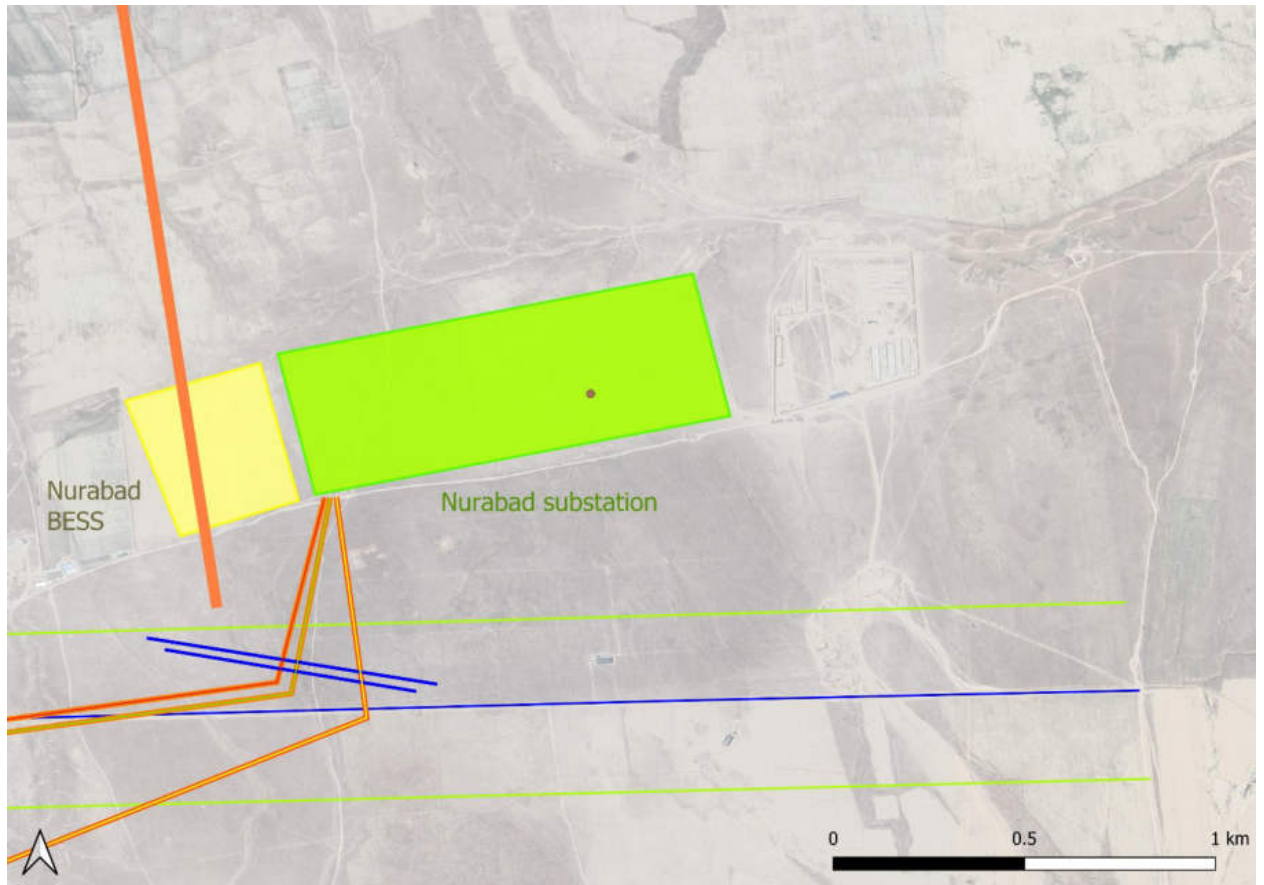


Figure 17: The survey point (brown) on Nurabad SS

Table 2: The survey points and coordinates on Nurabad SS and adjacent areas

Point/site	Date	N	E	Transect length (km)
500/220KV New Nurabad Substation (54.5 Ha)	15.06.2023	39.576222°	66.749989°	1

Nurabad BESS

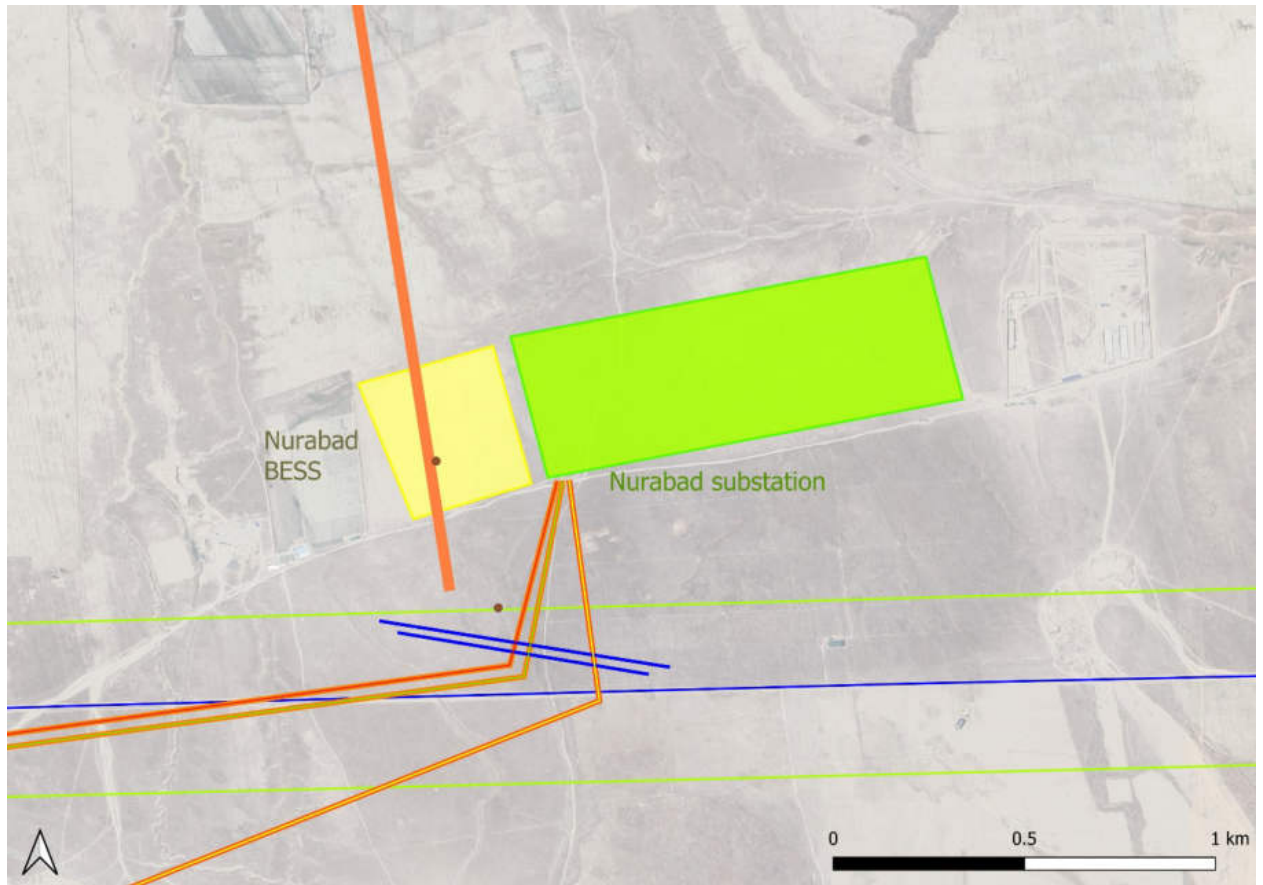


Figure 18: The survey points on Nurabad BESS and its adjacent areas

Table 3: The survey points and coordinates on Nurabad BESS and its adjacent areas

Point	Date	N	E	Transect length (km)
500 MWh New BESS Location (17 Ha)	15.06.2023	39.573656°	66.738198°	0.5
Gas pipe buffer-N (eastern part)	26.07.2023	39.569192°	66.740091°	1

Solar 400 MW PV plant and pooling station

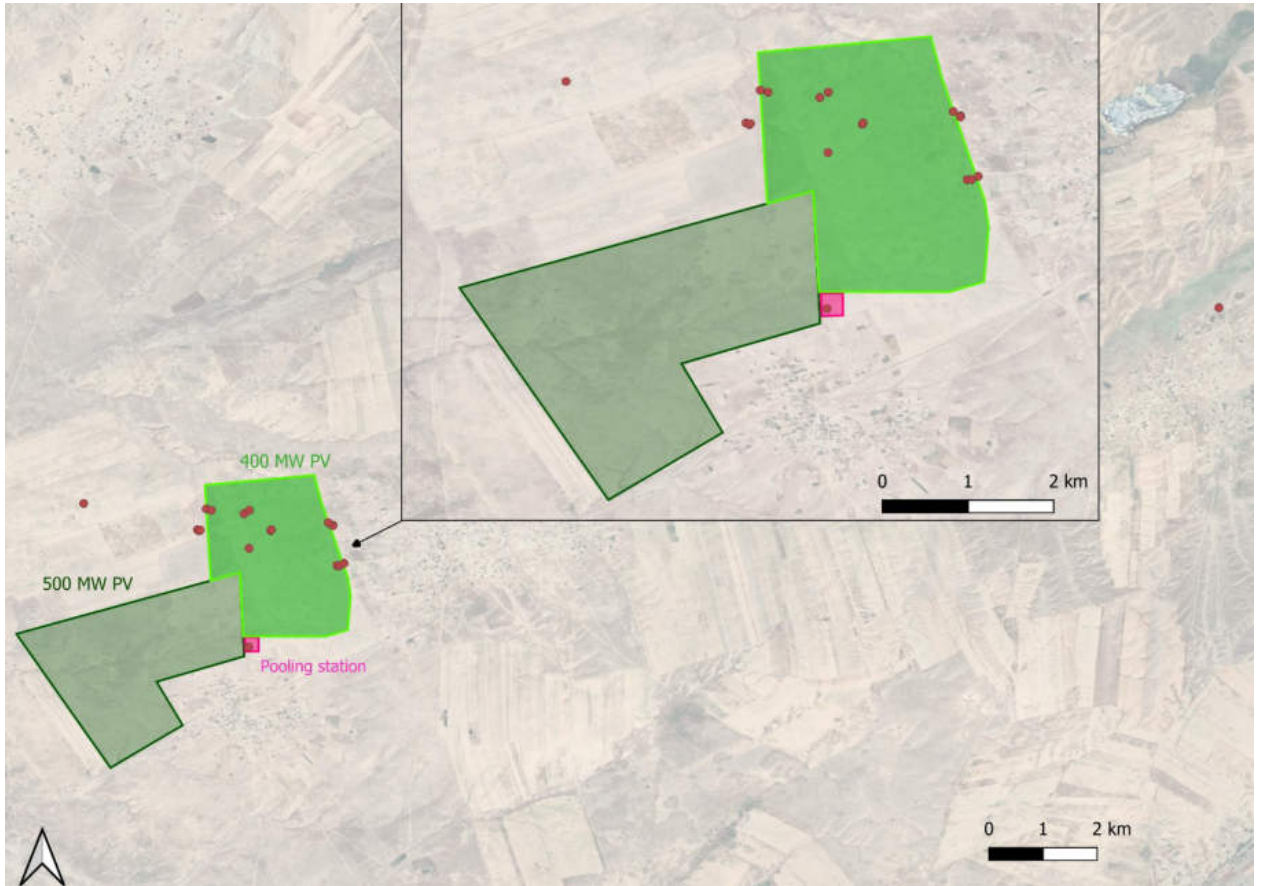


Figure 19: The survey points (red) on Solar 400 MW PV plant, pooling station, and adjacent areas

Table 4: The survey points and coordinates on Solar 400 MW PV plant, pooling station, and adjacent areas

Observation point/transect (Photo name)	Date	N	E
4004	29.08.2023	39.42827°	65.96511°
4005	29.08.2023	39.42841°	65.96503°
4009	29.08.2023	39.42916°	65.96394°
4015	29.08.2023	39.42982°	65.96483°
4030	29.08.2023	39.43549°	65.96428°
4092	29.08.2023	39.40108°	65.94357°
4007	29.08.2023	39.42877°	65.96455°
4012-4013	29.08.2023	39.42946°	65.96428°
4014	29.08.2023	39.42948°	65.96428°
4016	29.08.2023	39.42984°	65.96484°
4020	29.08.2023	39.43021°	65.96504°
4022-4023	29.08.2023	39.43046°	65.96522°
4024	29.08.2023	39.43046°	65.96526°
4025	29.08.2023	39.43019°	65.96531°
4026-4027	29.08.2023	39.43006°	65.96535°
4029	29.08.2023	39.42944°	65.96553°
4086-4087	29.08.2023	39.40074°	65.94509°
4088-4089	29.08.2023	39.40076°	65.94503°

4095	29.08.2023	39.40137°	65.94315°
Jerboa, fox, digging, hole 1 km, trace of a small fox	29.08.2023	39.42979°	65.96543°
Steppe polecat killed on the highway	29.08.2023	39.49912°	66.18065°
Degraded plain with virtually no vegetation	29.08.2023	39.43538°	65.96479°

Solar 500 MW PV plant



Figure 20: The survey points (brown) on Solar 500 MW PV plant and adjacent areas

Table 5: The survey points and coordinates on Solar 500 MW PV plant and adjacent areas

Observation point/transect	Date	N	E
Steppe polecat killed on the highway	29-30.08.2023	39.499123°	66.180649°
4081	29-30.08.2023	39.444305°	65.992894°
4073, 4074, 4076	29-30.08.2023	39.443852°	65.991980°
4071	29-30.08.2023	39.443852°	65.991377°
4073, 4074, 4076	29-30.08.2023	39.443852°	65.991377°
4066	29-30.08.2023	39.452466°	65.990516°
4068	29-30.08.2023	39.452352°	65.990447°
4069	29-30.08.2023	39.453061°	65.989508°
4078	29-30.08.2023	39.451511°	65.977297°
4065	29-30.08.2023	39.451358°	65.977161°
Tortoise carapax	29-30.08.2023	39.455699°	65.972573°

hedgehog trail	29-30.08.2023	39.447520°	65.972518°
pooling station (7 Ha) - EIF	29-30.08.2023	39.426361°	65.972400°
4059-4060	29-30.08.2023	39.454963°	65.971425°
4050	29-30.08.2023	39.455691°	65.964411°
4047-4049	29-30.08.2023	39.455969°	65.963336°
plowed degraded land litachik	29-30.08.2023	39.451436°	65.962025°
4041	29-30.08.2023	39.451302°	65.961869°
4045	29-30.08.2023	39.451511°	65.961386°
very degraded	29-30.08.2023	39.457161°	65.937009°

Khalka substation and 360 km 550 kV OHTL

For the Khalka substation and the 360 km 550 kV OHTL, chosen survey methods are corresponding to IFC recommendations. To assess the impact of linear objects on biodiversity, surveys were conducted along transects, covering at least 10% of the linear object's route and encompassing all types of landscapes. From August 29 to August 30, 2023, walking route surveys were conducted along selected transects, with a registration strip width of 50 meters on each side of the power line. The surveys focused on visual encounters of animals, their burrows, tracks, droppings, and other indicators of life activity, following the methodology outlined by Novikov (1949) and the Ministry of Ecology's methodological recommendations (2020). The total length of transects covered 34.56 km (10.1%). Coordinates, descriptions, and distribution among the administrative regions of Uzbekistan are provided in Table 6.

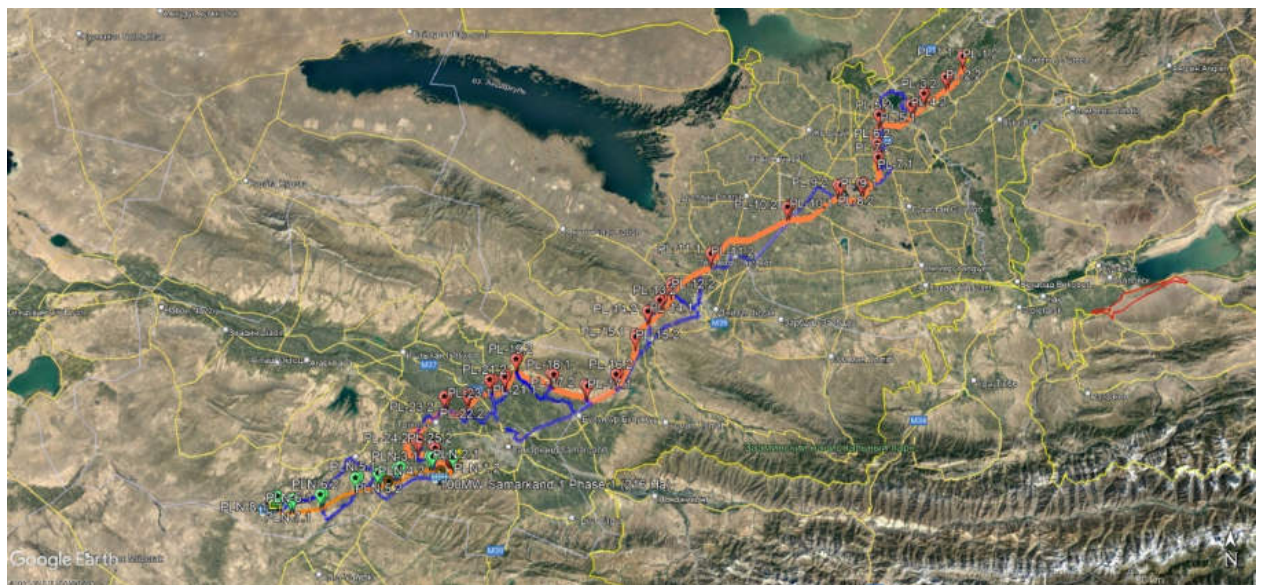


Figure 21: The survey points including survey points and transects of Khalka substation and 360 km 550 kV OHTL

Table 6: The survey points and coordinates on Khalka substation and 360 km 550 kV OHTL

No	Name of point	Date and time	Begin of transect N, E (dd format)	End of transect N, E (dd format)	Length, km	Biotope
Tashkent region						
1	PL-1	29/08/23	41.009074° 69.088070°	41.000085° 69.088619°	1.18	Agro-landscape, agricultural fields (potatoes, corn), irrigation canal
2	PL-2	29/08/23	40.927882° 69.013745°	40.921705° 68.999866°	1.36	Agro-landscape, agricultural fields (wheat, corn) poplar trees, mulberry trees along the roadside
3	PL-3	29/08/23	40.867007° 68.899121°	40.859601° 68.890741°	1.07	Arable land, irrigation canal, poplars, substation.
4	PL-4	29/08/23	40.823383° 68.838828°	40.819106° 68.825991°	1.20	Syrdarya river bank, agrolandscape
<i>In total:</i>					4.81	
Syrdarya region						
5	PL-5	29/08/23	40.817258° 68.824683°	40.810098° 68.813126°	1.28	Syrdarya river bank with outcrops of sandy loam and saline soils overgrown with tamarisk
6	PL-6	29/08/23	40.784544° 68.680706°	40.784279° 68.678717°	1.14	Intersection with highway M-39, discharge collector, agro-landscape wheat, cotton
7	PL-7	29/08/23	40.687323° 68.657145°	40.675166° 68.656544°	1.33	Agro-landscape, agricultural fields (wheat, cotton), forest belts mulberry, poplar trees
8	PL-8	29/08/23	40.604429° 68.664132°	40.594365° 68.665601°	1.19	Agro-landscape, agricultural fields (wheat, cotton), canals
9	PL-9	29/08/23	40.535790° 68.591190°	40.532299° 68.580521°	1.04	Fallow lands, rural lands, agricultural fields (corn) tamarisk, alhagi
10	PL-10	29/08/23	40.445996° 68.240662°	40.440287° 68.234253°	1.16	Agro-landscape, cotton, fallow land
<i>In total:</i>					7.14	
Jizzak region						
11	PL-11	29/08/23	40.282841° 67.877850°	40.273823° 67.873416°	1.14	Agro-landscape, wheat, mulberry, brackish soils
12	PL-12	29/08/23	40.171953° 67.695034°	40.158500° 67.692292°	1.52	Foothills of the Nurata Ridge, rock outcrops
13	PL-13	29/08/23	40.117938° 67.653120°	40.109239° 67.640821°	1.44	Dry slopes, sparse almond trees
14	PL-14	29/08/23	40.074335° 67.595727°	40.069893° 67.586395°	1.11	Agro-landscape, ravine, mulberry tree
15	PL-15	29/08/23	39.991426° 67.533282°	39.980926° 67.532629°	1.14	Agro-landscape, ravines, railway track
16	PL-16	29/08/23	39.859089° 67.457731°	39.852144° 67.447448°	1.18	Very transformed foothills, flooded from well downs, vegetable gardens and orchards
<i>In total:</i>					7.53	

Samarkand region						
17	PL-17	30/08/23	39.811038° 67.322477°	39.815622° 67.312110°	1.03	Agro-landscape, dry slopes
18	PL-18	30/08/23	39.849533° 67.171532°	39.854307° 67.160080°	1.10	Agro-landscape, dry slopes
19	PL-19	30/08/23	39.905546° 67.011410°	39.900958° 67.002427°	1.28	Agro-landscape, dry slopes
20	PL-20	30/08/23	39.847503° 66.960472°	39.839299° 66.954797°	1.01	Agro-landscape
21	PL-21	30/08/23	39.831264° 66.901851°	39.829731° 66.887918°	1.17	Akdarya river bank, floodplain forest
22	PL-22	30/08/23	39.784889° 66.800132°	39.775917° 66.790644°	1.29	Karadarya river bank, floodplain forest
23	PL-23	30/08/23	39.750304° 66.655288°	39.740929° 66.653193°	1.24	A pond covered with reeds
24	PL-24	30/08/23	39.621763° 66.576407°	39.621429° 66.588599°	1.06	Agro-landscape, flooded fields, canal
25	PL-25	30/08/23	39.604790° 66.651092°	39.596863° 66.659992°	1.18	Agro-landscape, agricultural fields (corn, cotton) irrigation systems
<i>In total:</i>					15.08	
Total:					34.54	

70 km OHTL (Pooling station – Nurabad SS)

For the 70 km OHTL from the pooling station to Nurabad SS chosen research methods are corresponding to IFC recommendations. To assess the impact of linear objects on biodiversity, surveys were conducted along transects, covering at least 10% of the linear object's route and encompassing all types of landscapes. At August 30, 2023, walking route surveys were conducted along selected transects, with a registration strip width of 50 meters on each side of the power line. The surveys focused on visual encounters of animals, their burrows, tracks, droppings, and other indicators of life activity, following the methodology outlined by Novikov (1949) and the Ministry of Ecology's methodological recommendations (2020). The total length of transects covered 34.56 km (10.1%). Coordinates, descriptions are provided in Table 7.

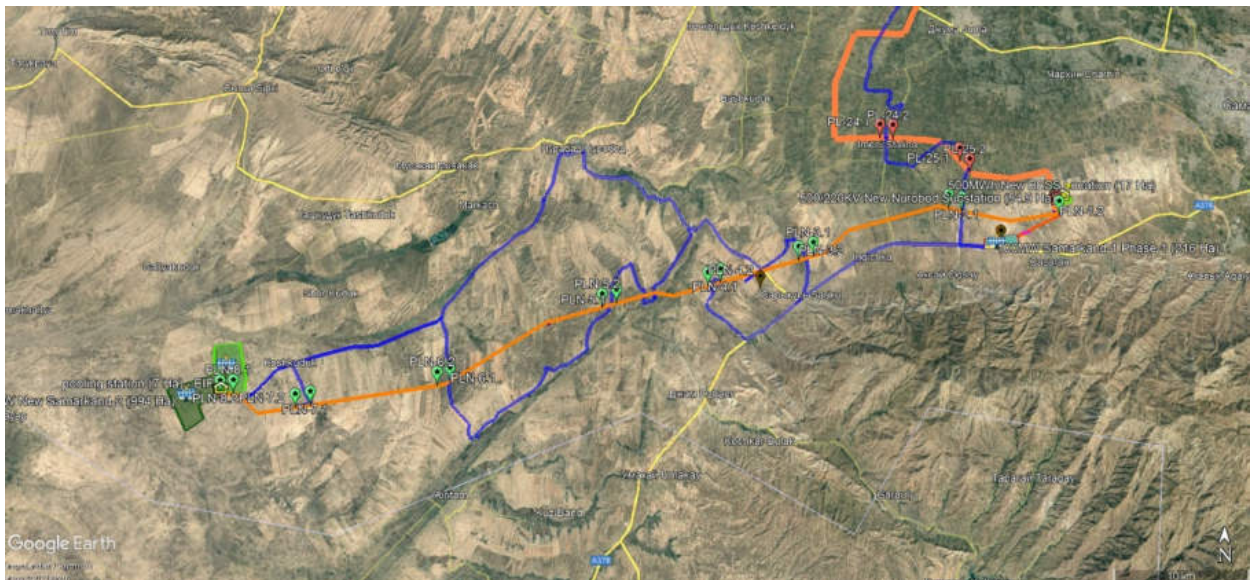


Figure 22: The survey points including survey points and transects of 70 km OHTL (pooling station - Nurabad SS)

Table 7: The survey points and coordinates on 70 km OHTL (pooling station - Nurabad SS)

No	Name of point	Date and time	Begin of transect N, E (dd format)	End of transect N, E (dd format)	Length, km	Biotope
1	PLN-1	30/08/23	39.576059° 66.737745°	39.566393° 66.742018°	1.13	Sazagan site
2	PLN-2	30/08/23	39.568289° 66.651061°	39.569996° 66.639031°	1.06	Wheat fields, fallow land, ravine
3	PLN-3	30/08/23	39.533276° 66.512261°	39.530160° 66.498623°	1.26	A ravine, a scour
4	PLN-4	30/08/23	39.512995° 66.426383°	39.510381° 66.414994°	1.04	Bagara foothills through which the gas pipeline passes
5	PLN-5	30/08/23	39.504631° 66.367995°	39.503814° 66.361326°	1.06	The natural hilly landscape
6	PLN-6	30/08/23	39.439060° 66.180656°	39.435895° 66.169032°	1.07	The hills between the bagara
7	PLN-7	30/08/23	39.420389° 66.054487°	39.418424° 66.040842°	1.2	Small-scale transformation of the territory near the village, steppe area
8	PLN-8	30/08/23	39.427239° 65.983609°	39.426674° 65.971470°	1.05	Well-preserved steppe site with salinization
Total:					8.87	

Karakul BESS

For the Karakul BESS the survey methods included walkover transect surveys and point observations. Each walkover transect route ranged from 0.5 to 1.5 kilometers in length, with a 3-meter width for recording mammal activity traces and a 50-meter width for observing the mammals themselves. Binoculars were used for additional territory surveillance, and general observations were made from a moving vehicle. The data recorded during the walkover routes included traces, burrows, animal droppings, and direct observations of the animals.

The researches took place on June 27, 2023 and on March 13, 2024.



Figure 23: Survey transects on Karakul BESS

Table 8: Survey transects and coordinates on Karakul BESS

Observation point/transect	Date and time	N	E	Length, km
PB-K-1	27.06.2023	39.516°	63.873°	1.1

LILOs 11 km and 19 km

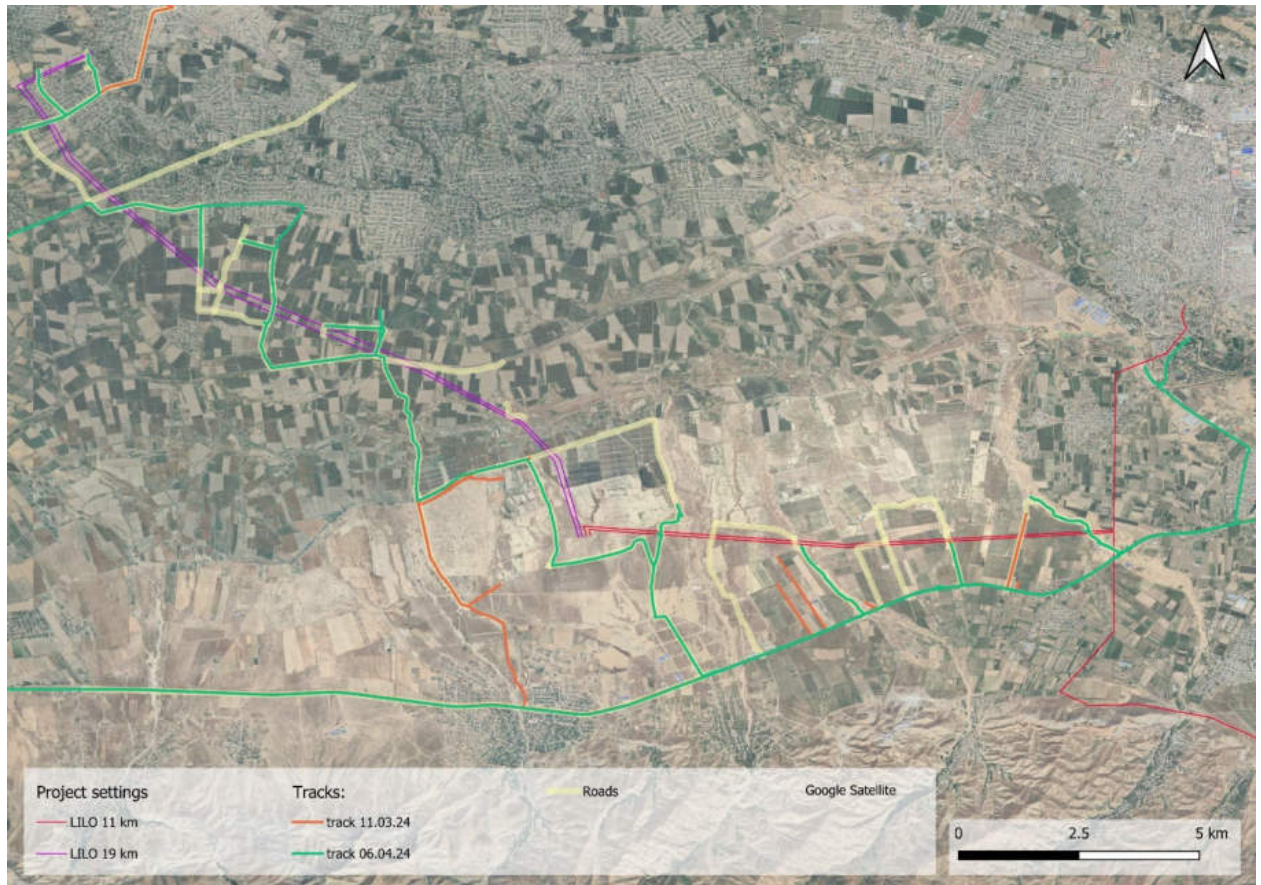


Figure 24. Site visit tracks

Mammal research for LILO 11 km and LILO 19 km were conducted on March 11 and April 6, 2024 using method of observation transects.

4. Findings and Results

Solar 100 MW PV plant and access road 70 m

During the research, 9 mammal species were discovered, including 1 insectivores, 4 rodents, and 4 predators.

Hemiechinus auritus is a fairly common species, widely distributed across the surveyed area. Its tracks and droppings were observed on dirt roads and boundaries of barley fields. *Lepus tolai*, although reported by local residents to have inhabited the area in the past, has become very rare. Its presence was not confirmed during the research and is thus not included in the list of discovered mammals. *Spermophilus fulvus* proved to be the most numerous and widespread mammal, observed in all types of biotopes, including flatlands, slopes of ravines, field outskirts, and dirt roads. Their burrows, digging, and droppings were observed. *Ellobius tancrei* is a common species, with burrow excavations observed in flatlands with sparse vegetation and on the terraces of former agricultural fields. *Meriones libycus* is also less common and sporadically distributed, observed in the archaeological excavations of Ettitepa and in the rock formations of the eastern part of the Gas pipe buffer-N area

The rodents (4 species), including the numerous *Spermophilus fulvus*, serve as prey for the predators. *Vulpes vulpes karagan*, a common predator, was found in all biotopes of the area. Its tracks, burrows, and droppings were observed. *Felis lybica*, a less numerous species, was found in only one location which is a dry riverbed.

Two species were discovered that are listed in the Red Book of the Republic of Uzbekistan (*Vulpes corsac turcmenicus*, *Mustela eversmanni*). *Mustela eversmanni* is typically associated with the settlements of the yellow ground squirrel, and its burrows were found in the surveyed area, although additional research using camera traps is necessary. *Vulpes corsac turcmenicus* burrows were found in the territory of the archaeological site Ettitepa, identified by their size and configuration, as well as small animal bones found nearby.

Table 9: Primary data of mammals recorded on Solar 100 MW PV plant

No	Scientific name	Common name	IUCN Red list	Uzbekistan Red data book	No. of recorded animals	Abundance
1	<i>Hemiechinus auritus</i>	Long-Eared Hedgehog	LC		Track	Common
2	<i>Spermophilus fulvus</i>	Yellow Ground Squirrel	LC		2 burrows	Numerous
3	<i>Ellobius tancrei</i>	Zaisan Mole Vole	LC		1 colony	Common
4	<i>Microtus ilaeus</i>	Tien Shan Vole	LC		3 burrows nearby	Sparse
5	<i>Meriones libycus</i>	Libyan Jird	LC		1 colony	Sparse
6	<i>Vulpes corsac</i>	Corsac Fox	LC	2(VU:D)	1 burrow	Rare
7	<i>Vulpes vulpes</i>	Red Fox	LC		Burrow	Common
8	<i>Mustela eversmanni</i>	Steppe Polecat	LC	2(VU:D)	Burrow	Rare
9	<i>Felis lybica</i>	Asiatic Wildcat	LC		Track, burrow	Sparse

Nurabad substation and access road 5320 m

During the research, 6 mammal species were discovered, including 1 insectivores, 4 rodents, and 4 predators.

Hemiechinus auritus is a fairly common species, widely distributed across the surveyed area. Its tracks and droppings were observed on dirt roads and boundaries of barley fields. *Lepus tolai*, although reported by local residents to have inhabited the area in the past, has become very rare. Its presence was not confirmed during the research and is thus not included in the list of discovered mammals. *Spermophilus fulvus* proved to be the most numerous and widespread mammal, observed in all types of biotopes, including flatlands, slopes of ravines, field outskirts, and dirt roads. Their burrows, digging, and droppings were observed. *Ellobius tancrei* is a common species, with burrow excavations observed in flatlands with sparse vegetation and on the terraces of former agricultural fields.

The rodents (2 species), including the numerous *Spermophilus fulvus*, serve as prey for the predators. *Vulpes vulpes karagan*, a common predator, was found in all biotopes of the area. Its tracks, burrows, and droppings were observed. *Felis lybica*, a less numerous species, was found in only one location which is a dry riverbed.

One species were discovered that are listed in the Red Book of the Republic of Uzbekistan (*Mustela eversmanni*). *Mustela eversmanni* is typically associated with the settlements of the yellow ground squirrel, and its burrows were found in the surveyed area, although additional research using camera traps is necessary.

Table 10: Primary data of mammals recorded on Nurabad BESS

No	Scientific name	Common name	IUCN Red list	Uzbekistan Red data book	No. of recorded animals	Abundance
1	<i>Hemiechinus auritus</i>	Long-Eared Hedgehog	LC		Track	Common
2	<i>Spermophilus fulvus</i>	Yellow Ground Squirrel	LC		2 burrows	Common
3	<i>Ellobius tancrei</i>	Zaisan Mole Vole	LC		1 colony	Common
4	<i>Vulpes vulpes</i>	Red Fox	LC		Burrow	Common
5	<i>Mustela eversmanni</i>	Steppe Polecat	LC	2(VU:D)	Burrow	Rare
6	<i>Felis lybica</i>	Afro-Asiatic Wildcat	LC		Track, burrow	Sparse

Nurabad BESS

During the research, 6 mammal species were discovered, including 1 insectivores, 4 rodents, and 4 predators.

Hemiechinus auritus is a fairly common species, widely distributed across the surveyed area. Its tracks and droppings were observed on dirt roads and boundaries of barley fields. *Lepus tolai*, although reported by local residents to have inhabited the area in the past, has become very rare. Its presence was not confirmed during the research and is thus not included in the list of discovered mammals. *Spermophilus fulvus* proved to be the most numerous and widespread mammal, observed in all types of biotopes, including flatlands, slopes of ravines, field outskirts, and dirt roads. Their burrows, digging, and droppings were observed. *Ellobius tancrei* is a common species, with burrow excavations observed in flatlands with sparse vegetation and on the terraces of former agricultural fields.

The rodents (2 species), including the numerous *Spermophilus fulvus*, serve as prey for the predators. *Vulpes vulpes karagan*, a common predator, was found in all biotopes of the area. Its tracks, burrows, and droppings were observed. *Felis lybica*, a less numerous species, was found in only one location which is a dry riverbed.

One species were discovered that are listed in the Red Book of the Republic of Uzbekistan (*Mustela eversmanni*). *Mustela eversmanni* is typically associated with the settlements of the yellow ground squirrel, and its burrows were found in the surveyed area, although additional research using camera traps is necessary.

The presence of *Vormela peregusna* is also possible in the area.

Table 11: Primary data of mammals recorded on Nurabad BESS

No	Scientific name	Common name	IUCN Red list	Uzbekistan Red data book	No. of recorded animals	Abundance
1	<i>Hemiechinus auritus</i>	Long-Eared Hedgehog	LC		Track	Common
2	<i>Spermophilus fulvus</i>	Yellow Ground Squirrel	LC		2 burrows	Common
3	<i>Ellobius tancrei</i>	Zaisan Mole Vole	LC		1 colony	Common
4	<i>Vulpes vulpes</i>	Red Fox	LC		Burrow	Common
5	<i>Mustela eversmanni</i>	Steppe Polecat	LC	2(VU:D)	Burrow	Rare
6	<i>Felis lybica</i>	Afro-Asiatic Wildcat	LC		Track, burrow	Sparse

Solar 400 MW PV plant, access road 696 m, and pooling station

During the research, 5 mammal species were discovered, including 1 insectivores, rodents, and 3 predators.

Three species were discovered that are listed in the Red Book of the Republic of Uzbekistan (*Hemiechinus hypomelas*, *Vulpes corsac turcmenicus*, *Mustela eversmanni*). Large tracks of *Hemiechinus hypomelas* were found on the wet bottom of a riverbed. *Mustela eversmanni* is typically associated with the settlements of the yellow ground squirrel, and its burrows were found in the surveyed area, although additional research using camera traps is necessary. *Vulpes corsac turcmenicus* was recorded on photorap installed on Solar site 500 MW in 3 km to the W from the project. The presence of *Vormela peregusna* is also possible in the area.

Lepus tolai, although reported by local residents to have inhabited the area in the past, has become very rare. Its presence was not confirmed during the research and is thus not included in the list of discovered mammals. *Spermophilus fulvus* proved to be the most numerous and widespread mammal, observed in all types of biotopes, including flatlands, slopes of ravines, field outskirts, and dirt roads. Their burrows, digging, and droppings were observed.

Vulpes vulpes karagan, a common predator, was found in all biotopes of the area. Its tracks, burrows, and droppings were observed.

Table 12: Primary data of mammals recorded on Solar 400 MW PV plant and pooling station

No	Scientific name	Common name	IUCN Red list	Uzbekistan Red data book	No. of recorded animals	Abundance
1	<i>Hemiechinus hypomelas</i>	Brandt's Hedgehog	LC	3(NT)	500MWh New BESS Location (17 Ha)	Rare
2	<i>Spermophilus fulvus</i>	Yellow Ground Squirrel	LC		Numerous burrows	Common
3	<i>Vulpes corsac</i>	Corsac Fox	LC	2(VU:D)	Recorded on Phototrap	Rare
4	<i>Vulpes vulpes</i>	Red Fox	LC		Droppings and tracks	Common
5	<i>Mustela eversmanni</i>	Steppe Polecat	LC	2(VU:D)	1 kill road animal was found in 17 km to the East	

Solar 500 MW PV plant

During the research, 5 mammal species were discovered, including 1 insectivores, rodents, and 3 predators.

Three species were discovered that are listed in the Red Book of the Republic of Uzbekistan (*Hemiechinus hypomelas*, *Vulpes corsac turcmenicus*, *Mustela eversmanni*). Large tracks of *Hemiechinus hypomelas* were found on the wet bottom of a riverbed. *Mustela eversmanni* is typically associated with the settlements of the yellow ground squirrel, and its burrows were found in the surveyed area, although additional research using camera traps is necessary. *Vulpes corsac turcmenicus* was recorded on photorap installed on Solar site 500 MW in 3 km to the W from the project. Additional research using camera traps is also needed. The presence of *Vormela peregusna* is also possible in the area.

Lepus tolai, although reported by local residents to have inhabited the area in the past, has become very rare. Its presence was not confirmed during the research and is thus not included in the list of discovered mammals. *Spermophilus fulvus* proved to be the most numerous and widespread mammal, observed in all types of biotopes, including flatlands, slopes of ravines, field outskirts, and dirt roads. Their burrows, digging, and droppings were observed.

Vulpes vulpes karagan, a common predator, was found in all biotopes of the area. Its tracks, burrows, and droppings were observed.

Table 13: Primary data of mammals recorded on Solar 500 MW PV plant

No	Scientific name	Common name	IUCN Red list	Uzbekistan Red data book	No. of recorded animals	Abundance
1	<i>Hemiechinus hypomelas</i>	Brandt's Hedgehog	LC	3(NT)	tracks	Rare
2	<i>Spermophilus fulvus</i>	Yellow Ground Squirrel	LC		1 colony	Common
3	<i>Vulpes corsac</i>	Corsac Fox	LC	2(VU:D)	Recorded on Phototrap	Rare
4	<i>Vulpes vulpes</i>	Red Fox	LC		Droppings and burrows	Common
5	<i>Mustela eversmanni</i>	Steppe Polecat	LC	2(VU:D)	1 kill road animal was found in 19 km to the East	Rare

Khalka substation and 360 km 550 kV OHTL

The survey of mammals as a whole showed their real presence in the territory. It should be noted that the Yellow Ground Squirrel had already gone into hibernation, so all surveys were in the nature of the presence of the species in the marked burrows. Other species of mammals were noted without visual surveys, but only by tracks and burrows. Faunal complexes are in satisfactory condition, as evidenced by the ratio of rodents and predatory mammals. For agricultural landscapes with an irrigation system, the Golden Jackal appears in the records.

Table 14: Primary data of mammals recorded in Tashkent and Syrdarya regions along 360 km OHTL

№	Scientific name	Common name	Transect number									
			1	2	3	4	5	6	7	8	9	10
1.	<i>Hemiechinus auritus</i>	Long-eared Hedgehog	+			+	+	+	-	+	+	-
2.	<i>Crociodura suaveolens</i>	Lesser White-toothed Shrew	+	+	+	+			-	+		-
3.	<i>Spermophilus fulvus</i>	Yellow Ground Squirrel	+	+	+	+	+	+	-	+	+	-
4.	<i>Cricetulus migratorius</i>	Grey Dwarf Hamster						+	-		+	-
5.	<i>Ellobius tancrei</i>	Zaisan Mole Vole					1-2 town/ga	1-2 town/ga	-			-
6.	<i>Microtus bucharensis</i>	Bucharian Vole					+	+	-	+	+	-
7.	<i>Microtus ilaeus</i>	Kazakhstan Vole	+	+	+	+						
8.	<i>Meriones tamariscinus</i>	Tamarisk Vole	+		+	+	+		-			-
9.	<i>Mus musculus</i>	House Mouse	+	+	+	+						
10.	<i>Canis aureus</i> (Figure 26)	Golden Jackal	+			+	+	+	-	+	+	-
11.	<i>Vulpes vulpes</i>	Red fox	+			+	+		-	+	+	-
12.	<i>Felis libyca</i>	Afro-Asiatic Wildcat				+	+		-		+	-



Figure 25: Yellow suslik hole at PL-8



Figure 26: Footprint of Golden Jackal at PL-4

Table 15: Primary data of mammals recorded in Jizzak region along 360 km OHTL

№	Scientific name	Common name	Transect number					
			11	12	13	14	15	16
1.	<i>Hemiechinus auritus</i>	Long-eared Hedgehog	+		+	-		
2.	<i>Hemiechinus hypomelas</i>	Brandt's Hedgehog		+	+	-		
3.	<i>Crocidura suaveolens</i>	Lesser White-toothed Shrew	+			-		
4.	<i>Spermophilus fulvus</i>	Yellow Ground Squirrel	+		+	-	+	+
5.	<i>Cricetulus migratorius</i>	Grey Dwarf Hamster	+	+		-	+	+
6.	<i>Ellobius tancrei</i>	Zaisan Mole Vole	1-2 town/ga		1-2 town/ga	-	1-2 town/ga	2-3 town/ga
7.	<i>Microtus bucharensis</i>	Bucharian Vole	+	+	+	-	+	+
8.	<i>Meriones tamariscinus</i>	Tamarisk Jerbil						
9.	<i>Meriones meridianus</i>	Mid-day Jerbil				-	+	
10.	<i>Mus musculus</i>	House Mouse				-		+
11.	<i>Canis aureus</i>	Golden Jackal	+			-		
12.	<i>Vulpes vulpes</i>	Red fox	+	+	+	-	+	+
13.	<i>Felis libyca</i>	Afro-Asiatic Wildcat	+		+	-	+	



Figure 27: Skill of Brandt's Hedgehog at PL-13



Figure 28: Town of Zaisan Mole vole at PL-11

Table 16: Primary data of mammals recorded in Samarkand region along 360 km OHTL

№	Scientific name	Common name	Transect number								
			17	18	19	20	21	22	23	24	25
1.	<i>Hemiechinus auritus</i>	Long-eared Hedgehog	+		+	-	+	+	+		
2.	<i>Crocidura suaveolens</i>	Lesser White-toothed Shrew		+	+	-				+	+
3.	<i>Lepus tolai</i>	Tolai Hare		+	+	-		+			
4.	<i>Spermophilus fulvus</i>	Yellow Ground Squirrel	+	+	+	-			+		+
5.	<i>Cricetulus migratorius</i>	Grey Dwarf Hamster	+	+	+	-					
6.	<i>Ellobius tancrei</i>	Zaisan Mole Vole		1-2 town/ga		-	2-3 town/ga	2-3 town/ga		1-2 town/ga	2-3 town/ga
7.	<i>Microtus bucharensis</i>	Bucharian Vole				-		+	+		
8.	<i>Meriones tamariscinus</i>	Tamarisk Gerbil				-	+	+		+	+
9.	<i>Meriones meridianus</i>	Mid-day Gerbil	+	+		-					
10.	<i>Mus musculus</i>	House mouse			+	-		+			
11.	<i>Canis aureus</i>	Golden jackal	+			-	+	+		+	+
12.	<i>Vulpes vulpes</i>	Red fox	+	+	+	-	+		+		
13.	<i>Felis libyca</i>	Afro-Asiatic Wildcat		+		-		+			



Figure 29: Hole of Tamarisk Gerbil at PL-21



Figure 30: Footprint of Golden Jacal at PL-24

70 km OHTL (Pooling station – Nurabad SS)

The survey of mammals as a whole showed their real presence on the territory in natural habitats. The minimal anthropogenic load affected the diversity of species, including the occurrence of rare species. At the same time, a number of species were noted based on indirect signs, without visual surveys. Faunal complexes are in good condition.

Table 17: Primary data of mammals recorded in Samarkand region along 70 km OHTL (Nurabad SS – Pooling station)

№	Scientific name	Common name	Transect number								
			1	2	3	4	5	6	7	8	
1.	<i>Hemiechinus auritus</i>	Long-eared Hedgehog	+	+				+		+	+
2.	<i>Hemiechinus hypomelas</i>	Brandt's Hedgehog									+
3.	<i>Spermophilus fulvus</i>	Yellow Ground Squirrel	+	+	+	+	+	+	+	+	+
4.	<i>Allactaga elater</i>	Small Five-toed Jerboa						+			+
5.	<i>Allactaga severtzovi</i>	Severtzov's Jerboa								+	+
6.	<i>Cricetulus migratorius</i>	Grey Dwarf Hamster	+	+							
7.	<i>Ellobius tancrei</i>	Zaisan Mole Vole	1-2 town/ga	1-2 town/ga		1-2 town/ga	2-3 town/ga	1-2 town/ga	2-3 town/ga	3-4 town/ga	
8.	<i>Meriones libycus</i>	Libyan Jird					1-2 colony/ga	1-2 colony/ga			
9.	<i>Meriones meridianus</i>	Mid-day Gerbil	+				+	+	+	+	
10.	<i>Mus musculus</i>	House mouse		+							
11.	<i>Mustela eversmanni</i>	Steppe polecat			+						+
12.	<i>Vulpes vulpes</i>	Red fox	+	+	1		+	+	+	+	+
13.	<i>Vulpes corsac</i>	Corsac fox			+				+	+	+

14.	<i>Felis lybica</i>	Afro-Asiatic Wildcat	+	+	+		+		+	+
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Figure 31: Severtzov's Jerboa died on the road at PL-7-8



Figure 32: Severtzov's Jerboa (one more) died on the road at PL-7-8



Figure 33: Hole of Severtzov's Jerboa at PL-7



Figure 34: Town of Zaisan Mole vole at PL-8



Figure 35: Feeding digging of Steppe Polecat at PL-3



Figure 36: Fox at PL-3

Karakul BESS

The survey was conducted 27.06.2023. Preliminary data suggests that approximately 16 species of mammals can be found in the project area and its immediate vicinity. The typical species in sandy desert are the Long-clawed ground squirrel (*Spermophilopsis leptodactylus*), Red fox (*Vulpes vulpes*), Tolai hare (*Lepus tolai*), hedgehog and various species of gerbils, jerboas.

Table 18: Primary data of mammals recorded on Karakul BESS

No	Scientific name	Common name	IUCN Red list	Uzbekistan Red data book	No. of recorded animals	Abundance
1	<i>Hemiechinus auritus</i>	Long-Eared Hedgehog	LC		tracks	Sparse
2	<i>Lepus totai</i>	Tolai Hare	LC		tracks	Common
3	<i>Phombomys opimus</i>	Great Gerbil	LC		colonies	Common
4	<i>Meriones meridianus</i>	Midday Jird	LC		Burrows	Sparse
5	<i>Spermophilopsis leptodactylus</i>	Long-Clawed Ground Squirrel	LC		1 colony	Common
6	<i>Vulpes vulpes</i>	Red Fox	LC		Droppings and burrows	Common

LILO 11 km, LILO 19 km

Since the territory is mainly occupied by agricultural fields and gardens and is actively used by humans, the probability of encountering rare mammal species is relatively low. However, during the site visit near the project area, yellow ground squirrels, karaganka foxes, and common jackals were discovered. These mammalian species are not considered rare.



Figure 37. Fruit garden



Figure 38. Vicinity of the project site, poultry farm

However, within the project's buffer zone, at the border with the fields, encounters with yellow ground squirrels are common. These squirrels are attractive as prey for many animals.



Figure 39. Yellow Ground squirrel

Thus, at a distance of 2 km to the east from the left end of the power transmission line near the settlement, a common red fox (*Vulpes vulpes karaganka*) and golden jackal were observed.



Figure 40. Red fox

Closer to the road, a domestic dog was observed with a caught ground squirrel.

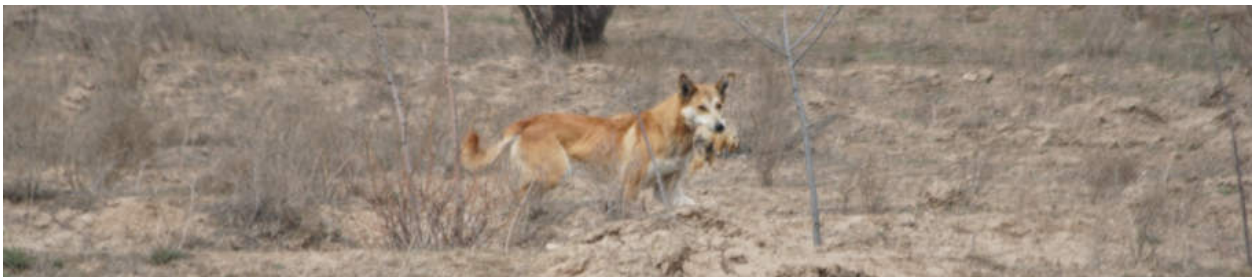


Figure 41. Dog with ground squirrel

Considering that the project area is fenced off, which presents a barrier to the movement of medium and large-sized mammals, coupled with active human activity on the site, the specifics of the project, and the characteristics of mammals, it can be concluded that the construction of the power transmission line along the proposed route will not impact the well-being of rare mammal species.

Table 19. Primary data of mammals recorded on LILO 11 km

No	Scientific name	Common name	IUCN Red list	Uzbekistan Red data book	No. of recorded animals	Abundance
1	<i>Spermophilus fulvus</i>	Yellow Ground Squirrel	LC		2	Sparse
2	<i>Canis auratus</i>	Golden Jackal	LC		1	Common
3	<i>Vulpes vulpes karaganka</i>	Red fox	LC		1	Common

5. Phototrap survey

Photo trapping survey.

On 07.13.2023, 4 traps were installed as part of the photo trapping survey.



Figure 42: Photo trap were installed at the area of Nurabad Substation.

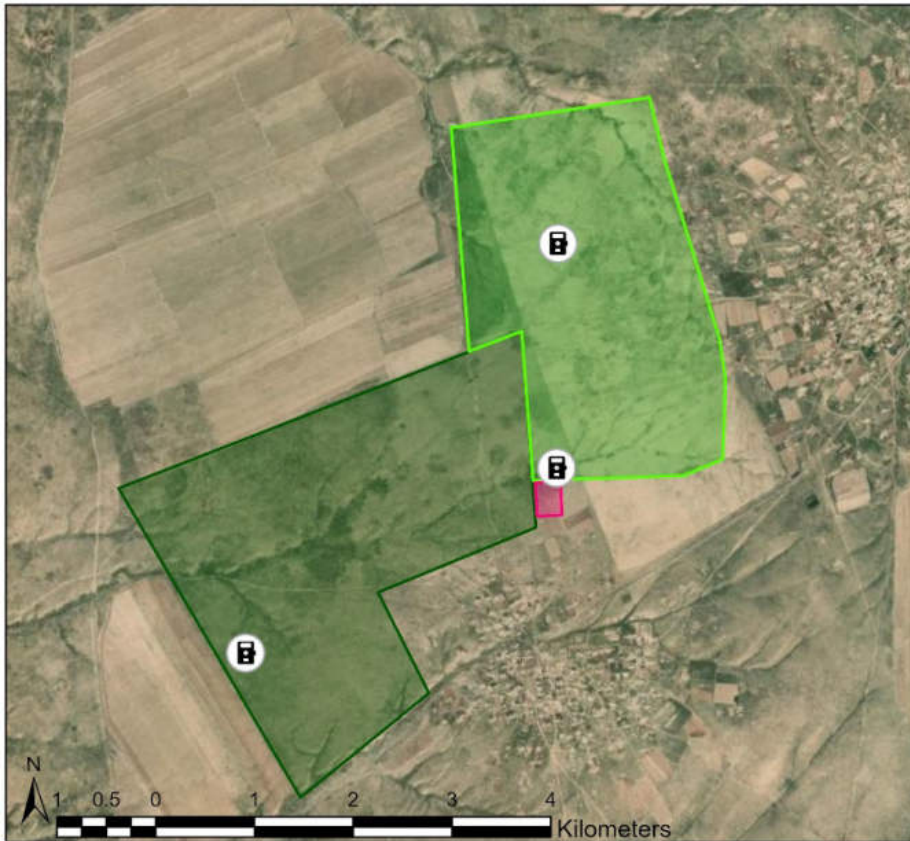


Figure 43: 3 Phototraps were installed at the area of 500 MW PV, 400 MW PV and Pooling station.

Photo traps and their location points can be found in the Table below:

Table 20: Installed photo traps and their location points.

No	Photo trap ID	Project area	Location points	Date of installation of the photo trap	Date of collecting data
1	Pht-10	Nurabad Substation	N39.580792° E66.750994°	13.07.2023	21.08.2023, was lost in October 2023.
2	Pht-02	Pooling station	N39.429751° E65.974122°	13.07.2023	Not found in August 2023
3	Pht-03	400 MW PV plant	N39.450196° E65.975129°	13.07.2023	Not found in August 2023
4	Pht-05	500 MW PVplant	N39.413850° E65.936833°	13.07.2023	21.08.2023, was lost in October 2023.

On 21.08.2023, SD cards were replaced, but unfortunately, photo traps from the planned Pooling station and the 400 MW area were stolen. During a site visit on October 15th, it was discovered that two of the remaining photo traps were also stolen.

Table 21: The results of Phototrap survey

Species	Project's area	Date	Photo num.
<i>Vulpes corsac</i>	500 MW PV plant	13.07.2023	730078
<i>Vulpes vulpes</i>	500 MW PV plant	20.07.2023	7200451
<i>Vulpes vulpes</i>	500 MW PV plant	21.07.2023	7210453

<i>Vulpes vulpes</i>	500 MW PV plant	31.07.2023	7310019
<i>Vulpes vulpes</i>	500 MW PV plant	7.08.2023	8070390
<i>Vulpes vulpes</i>	500 MW PV plant	7.08.2023	8070443
<i>Vulpes vulpes</i>	500 MW PV plant	11.08.2023	8110538
<i>Severtzov's Jerboa</i>	500 MW PV plant	07.08.2023	8070445
<i>Vulpes vulpes</i>	Nurabad Substation	13.07.2023	7130362
<i>Vulpes vulpes</i>	Nurabad Substation	20.07.2023	7200368
<i>Vulpes vulpes</i>	Nurabad Substation	25.07.2023	7250818
<i>Vulpes vulpes</i>	Nurabad Substation	11.08.2023	8110437
<i>Spermophilus fulvus</i>	Nurabad Substation	27.07.2023	7270403

Among the observations, several foxes at the project area 500 MW PV and Nurabad Substation were identified as *Vulpes vulpes karagan*, which are not classified as endangered species. Additionally, there is a photograph of a Corsac fox (*Vulpes corsac*, 500 MW PV plant, N 39°24'49.74", E 65°56'12.83"), listed as Least Concern (LC) by IUCN but considered Vulnerable, declining 2(VU:D) according to the national Red Data book.

6. Key species descriptions

Brandt's hedgehog (*Hemiechinus hypomelas*)

Uzbekistan Red Data Book: 3(NT); IUCN Red List: LC (Least Concern)

In the Samarkand Region, findings of *Hemiechinus hypomelas* are known in the vicinity of the village of Jam (Meklenburtsev, 1958) (23 km southwest of the surveyed area), as well as in the vicinity of the village of Sazagan (April 2013) on the northern and western slopes of the Zarafshan Range at altitudes of 700-1000 meters above sea level (Abduraupov et al., 2021) (the surveyed area). Their habitats include abandoned structures, rugged terrain with cliffs, accumulations of boulders, crevices, caves, and various voids (Abduraupov et al., 2021). In the areas near the surveyed location (Karshi Steppe), they inhabit loess hills and stabilized sands (Salikhbayev et al., 1967).

Yellow ground squirrel (*Spermophilus fulvus*)

Widely distributed, common, and occasionally numerous species. It inhabits the Karshi Steppe and Karnabchul. It is often sporadically distributed. The distribution of the yellow ground squirrel is significantly associated with anthropogenic factors. It colonizes pastures, areas near villages, encampments, yurts, shepherds' camps, and other permanently or temporarily inhabited places with predominantly weedy vegetation (Salikhbayev et al., 1967). In the Samarkand Region, it is found throughout the northern foothills of the Zarafshan Range, along the banks of the Dargom and Eski-Anhor canals, near reservoirs, in the Zarafshan River valley, and in the vicinity of agricultural lands (Marmazinskaya, 2005; personal communication).

Golden jackal (*Canis aureus*)

A common species in Central Asia. Live in a wide variety of habitats, due to its tolerance of dry conditions and its omnivorous diet.

Corsac fox (*Vulpes corsac turcomenicus*)

Uzbekistan Red Data Book: 2(Vulnerable: Decreasing); IUCN Red List: LC (Least Concern)

This subspecies is mosaic in its distribution. It has been found in the Karshi Steppe and Karnabchul (Salikhbayev et al., 1967). In the Samarkand Region, in areas close to the surveyed location, it has been observed west of Karnab (Chernogayev, 1992), southeast of the Kattakurgan Reservoir

(information from Sh. Khadiev, 2019), and south of Kurganchi (Marmazinskaya, Mardonova, 2016). Its primary habitats include hilly foothills, clayey plains, thickets, rugged terrain, inter-row depressions, and corsacs have been noted in the vicinity of human settlements in Karnabchul and the Karshi Steppe. They inhabit areas close to the dens of the great gerbil and yellow ground squirrel, which are food sources for corsacs (Salikhbayev et al., 1967).

Red fox (Karagan subspecies) (*Vulpes vulpes karagan*)

Widely distributed and locally common species. It has been recorded in the Karshi Steppe and Karnabchul (Salikhbayev et al., 1967). In the Samarkand Region, it inhabits areas close to the surveyed location, including the Dargom Valley, the Zarafshan River, the vicinity of the Sabirsay reservoir (Ulus Steppe), the Kattakurgan Reservoir, and the Karnabchul Steppe (Marmazinskaya, 2005).

Steppe polecat (*Mustela eversmanni*)

Uzbekistan Red Data Book: 2(Vulnerable: Decreasing); IUCN Red List: LC (Least Concern)

In the Samarkand Region, it inhabits the Zarafshan River valley and the Samarkand Oasis, preferring clayey plains and foothills (Ishunin, 1961; Chernogayev, 1992). R.N. Meklenburtsev (1958) found the steppe polecat in the vicinity of the village of Jarkum (Karnabchul). On October 5, 2005, a steppe polecat was captured in the town of Juma, located 16 km north of the surveyed area (Marmazinskaya, personal communication). In the Zarafshan Range, the habitat of the steppe polecat is known in the Amanqutan locality (Mukhamediev, Kucheryavykh, 1997; Marmazinskaya, Mardonova, 2016) and in the vicinity of the village of Urgut (Marmazinskaya, Mardonova, 2016), which are located 30-40 km southeast of the surveyed territory. These habitats are associated with the settlements of great gerbils and ground squirrels. While it is listed as Vulnerable in the Uzbekistan Red Data Book, it is considered of Least Concern by the IUCN Red List.

Vormella peregusna (Marbled polecat)

Uzbekistan Red Data Book: 2(Vulnerable: Decreasing); IUCN Red List: VU (Vulnerable)

In the past, it widely inhabited the flat, steppe, and desert areas of the Samarkand Region, and even the city of Samarkand. Its habitats are associated with the settlements of great gerbils and ground squirrels, including the red-tailed gerbil and yellow ground squirrel. In river valleys, it settles at the base of loess cliffs, and in the foothills, it inhabits hilly terrain with wormwood-ephemeral vegetation (Ishunin, 1961; Red Book of the Uzbek SSR, 1983). It is distributed in Karnabchul (Salikhbayev et al., 1967; Abduraupov et al., 2021), where its habitats include clayey and sandy deserts, loess hilly foothills, clayey plains, semi-fixed hilly sand dunes, wormwood thickets, and saxaul thickets. It has also been recorded on the northeastern shore of the Kattakurgan Reservoir, located 40 km northwest of the surveyed area (Marmazinskaya, Mardonova, 2016).

Asiatic wild cat (*Felis silvestris ornate*)

Wide-ranging and occasionally common species. It was found in the vicinity of the village of Jidalik (southwestern Karnabchul) (Salikhbayev et al., 1967). It is sporadically distributed in the Samarkand Region, including Karnabchul, the Ulus Steppe near the Sabirsay Reservoir, foothills, the valleys of the Dargom and Zarafshan rivers, and along the Eski-Anhor Canal in the area that flows through the Nurabad District (Marmazinskaya, personal communication; Marmazinskaya, 2005; 2015).

7. Conclusion

The territory itself represents various landscapes.

The threats to the local wildlife in the studied area include littering with household and construction waste, grazing of large and small cattle, free-roaming dogs, gravel quarries, trenches, vehicle traffic on unpaved roads, and fences around gardens that hinder the movement of medium-sized mammals.

Khalka substation and 360 km 550 kV OHTL area is a transformed area of the agricultural landscape with wedging of natural lands in the foothill zone and river beds. The mammal fauna is represented by typical species; there are no rare species. No conservation measures are required for the typical and most widespread species. The number of noted species is extremely small, so the project work will not have an impact on the mammal fauna.

It should only be pointed out that work at the intersections of power lines of water bodies - the Syrdarya, Akdarya and Karadarya rivers - must be carried out in strict accordance with environmental legislation regarding the water protection zones of these rivers.

In general, for the project, the creation of unnecessary access roads for vehicles is not allowed, the choice of laying dirt roads should avoid rodent burrows, all roads should be illuminated, speed limits should be observed, and watered regularly to avoid the accumulation and dispersion of dust. These measures will contribute to the conservation of mammals.

The threats to the local wildlife in the studied area include littering with household and construction waste, grazing of large and small cattle, free-roaming dogs, gravel quarries, trenches, vehicle traffic on unpaved roads, and fences around gardens that hinder the movement of medium-sized mammals.

Solar 100 MW PV plant

Area of Solar 100 MW PV plant represents typical semi-desert foothill landscape. Out of the 14 potential mammal species that could be present in this habitat, only 9 species were actually identified during the survey, two of which are listed in the Red Book of Uzbekistan. This is a relatively comprehensive list typical of the semi-desert foothill landscape, despite the proximity of residential areas, highways, livestock grazing, and agricultural cultivation.

It is crucial to adhere to the environmental legislation of the Republic of Uzbekistan during construction work. This is important to minimize any negative impact on the local ecosystem and to ensure sustainable development in the area.

Nurabad substation

Area of Nurabad substation represents typical semi-desert foothill landscape. Out of the 14 potential mammal species that could be present in this habitat, only 6 species were actually identified during the survey, one of which is listed in the Red Book of Uzbekistan. This is a relatively comprehensive list typical of the semi-desert foothill landscape, despite the proximity of residential areas, highways, livestock grazing, and agricultural cultivation.

It is crucial to adhere to the environmental legislation of the Republic of Uzbekistan during construction work. This is important to minimize any negative impact on the local ecosystem and to ensure sustainable development in the area.

Nurabad BESS

Area of Nurabad substation represents typical semi-desert foothill landscape. Out of the 14 potential mammal species that could be present in this habitat, only 6 species were actually identified during the survey, one of which is listed in the Red Book of Uzbekistan. This is a relatively comprehensive list typical of the semi-desert foothill landscape, despite the proximity of residential areas, highways, livestock grazing, and agricultural cultivation.

It is crucial to adhere to the environmental legislation of the Republic of Uzbekistan during construction work. This is important to minimize any negative impact on the local ecosystem and to ensure sustainable development in the area.

Solar 400 MW PV plant and pooling station

The Solar 400 MW PV plant is characterized by a semi modified and natural habitat (fallow lands and partially dry grassland. Out of the 18 potential mammal species that could be present in this habitat, only 5 species were actually identified during the survey, two of which is listed in the Red Book of Uzbekistan. This relatively low number of observed species could be attributed to various factors, including the specific ecological characteristics of the desert habitat and the pressures from human activities in the area. The Phototrapping survey showed the presence of Corsac fox on this area, including 500MW Solar site.

It is crucial to adhere to the environmental legislation of the Republic of Uzbekistan during construction work. This is important to minimize any negative impact on the local ecosystem and to ensure sustainable development in the area.

Solar 500 MW PV plant

The Solar 500 MW PV plant is characterized by a semi modified and natural habitat (fallow lands and partially dry grassland. Out of the 18 potential mammal species that could be present in this habitat, only 5 species were actually identified during the survey, two of which is listed in the Red Book of Uzbekistan. This relatively low number of observed species could be attributed to various factors, including the specific ecological characteristics of the desert habitat and the pressures from human activities in the area. The Phototrapping survey showed the presence of Corsac fox on this area.

It is crucial to adhere to the environmental legislation of the Republic of Uzbekistan during construction work. This is important to minimize any negative impact on the local ecosystem and to ensure sustainable development in the area.

Khalka substation and 360 km 550 kV OHTL

The study area is a transformed area of the agricultural landscape with wedging of natural lands in the foothill zone and river beds. The mammal fauna (bats were excluded) is represented by typical species; there are no rare species. No conservation measures are required for the typical and most widespread species. The number of noted species is extremely small, so the project work will not have an impact on the mammal fauna.

It should only be pointed out that work at the intersections of power lines of water bodies - the Syrdarya, Akdarya and Karadarya rivers - must be carried out in strict accordance with environmental legislation regarding the water protection zones of these rivers.

The mammal fauna of the OHTL is represented by typical species of steppe lands of Uzbekistan, which are part of the zoogeographical complex of the Turan province. A literary review showed that the territory may contain 21 species of mammals, which constitutes 32.7% of the total fauna of Uzbekistan. Among them, 2 species are included in the Red Book of Uzbekistan, 1 species is included in the CITES Annex.

During the field survey, 18 species of mammals were noted, which is 90.0% of the survey list of species (excluding 15 species of bats). Among them were 2 species from the Red Book of Uzbekistan and 1 species from the lists of the CITES Convention. The territory is highly susceptible to anthropogenic transformation from agricultural activities, the condition of the habitats and faunal complex is assessed as satisfactory. Special measures to protect species and their habitats are not required, however, within the framework of construction work, the norms of environmental legislation of the Republic of Uzbekistan must be strictly observed.

In general, for the project, the creation of unnecessary access roads for vehicles is not allowed, the choice of laying dirt roads should avoid rodent burrows, all roads should be illuminated, speed limits should be observed, and watered regularly to avoid the accumulation and dispersion of dust. These measures will contribute to the conservation of mammals.

70 km OHTL (Pooling station – Nurabad SS)

The area under study is practically natural lands of the Karnabchul steppe with areas of transformation from agriculture and the laying of linear objects - gas pipelines, roads, power lines. A natural complex of species,

including rare ones, included in the Red Book of Uzbekistan (2019) has been preserved here. Thus, any intervention should aim to mitigate potential negative impacts.

As our research has shown, the main threat here is roads. During the field survey, we twice came across animals that died under the wheels of vehicles (Severtsov's Jerboas, endemic to Central Asia). There is evidence that a Steppe Polecat was found here in August (the species is included in the Red Book of Uzbekistan). Otherwise, all recommendations for the first section must be followed for this section.

The mammal fauna along two sections of the OHTL is represented by typical species of steppe lands of Uzbekistan, which are part of the zoogeographical complex of the Turan province. A literary review showed that the territory may contain 20 species of mammals, which constitutes 18.6% of the total fauna of Uzbekistan. Among them, 2 species are included in the Red Book of Uzbekistan, 1 species is included in the CITES Annex. Species listed by the IUCN are not listed.

During the field survey, 17 species of mammals were noted, Among them were 2 species from the Red Book of Uzbekistan and 1 species from the lists of the CITES Convention. The more natural site, the state of the faunal complex is assessed as good. Special measures to protect species and their habitats are not required, however, within the framework of construction work, the norms of environmental legislation of the Republic of Uzbekistan must be strictly observed.

Karakul BESS

The Karakul BESS site is characterized by a natural habitat of "Sandy desert with psammophilous scrub". This type of ecosystem is typically found in desert regions and is adapted to sandy soil conditions.

Out of the 16 potential mammal species that could be present in this habitat, only 6 species were actually identified during the survey. This relatively low number of observed species could be attributed to various factors, including the specific ecological characteristics of the sandy desert habitat and the pressures from human activities in the area.

None of the mammal species identified in the Karakul BESS area are listed in the IUCN Red List or Uzbekistan Red list, indicating that they are not currently considered to be at significant risk of extinction at a global level.

While special measures to protect these mammal species and their habitats are not deemed necessary, it is crucial to adhere to the environmental legislation of the Republic of Uzbekistan during construction work. This is important to minimize any negative impact on the local ecosystem and to ensure sustainable development in the area.

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Annex A. Photo materials on species



Figure 44: *Hemiechinus auratus*



Figure 45: *Hemiechinus auratus*



Figure 46: *Hemiechinus hypomelas*



Figure 47: *Spermophilus fulvus*



Figure 48: *Spermophilus fulvus* colony



Figure 49: Dropping of *Spermophilus fulvus*



Figure 50: *Ellobius tancrei*



Figure 51: *Ellobius tancrei*



Figure 52: *Microtus ilaeus* burrows



Figure 53: *Microtus ilaeus* burrows



Figure 54: *Meriones libycus* burrows



Figure 55: *Meriones libycus* burrows



Figure 56: *Vulpes corsac* burrow



Figure 57: *Vulpes corsac* burrow



Figure 58: *Vulpes corsac*



Figure 59: *Vulpes corsac*



Figure 60: *Vulpes vulpes* footprint



Figure 61: *Vulpes vulpes* footprint



Figure 62: *Vulpes vulpes* burrow



Figure 63: *Vulpes vulpes* burrow



Figure 64: *Mustela eversmanni* burrow



Figure 65: *Mustela eversmanni* burrow



Figure 66: Felis silvestris ornata burrow



Figure 67: Felis silvestris ornata footprints