Environmental and Social Impact Assessment

PUBLIC

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Uzbekistan: Kungrad 1 Wind Power BESS Project

PART 5

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

23. OVERHEAD TRANSMISSION LINE (OHTL)

23.1 Background

The electricity produced from the Wind Project will supply key regions in Uzbekistan by connecting to the national grid through an ~ 800 kilometer (km) high voltage Overhead Transmission Line (OHTL).

This section presents the following:

- Detailed description of the OHTL component of the Project to include route, components, activities, phases and other;
- Key risks and impacts expected from the development of the OHTL along with required mitigation and monitoring measures to be implemented; and
- Present outcomes of E&S baseline studies undertaken to date as applicable.

23.2 Project Description

23.2.1 Administrative Setup and Project Location

It is important to understand the administrative setup of Uzbekistan as several terminologies will be referenced throughout this section. Administratively, Uzbekistan is divided into 12 Regions (also known as *viloyatlar*), 1 sovereign republic (known as the Sovereign Republic of Karakalpakstan), and 1 independent city (which includes Tashkent as the capital of Uzbekistan).

The Project runs within the following Regions as also presented in the table and figure that follows:

- Sovereign Republic of Karakalpakstan. The Republic occupies the whole northwestern part of Uzbekistan. The capital of the Republic is Nukus. Under Soviet rule, it was an autonomous area within the Russian Soviet Federative Socialist Republic before becoming part of Uzbekistan in 1936 as the Karakalpak ASSR. Since the independence of Uzbekistan in 1990, it is still considered a sovereign republic. Total length of OHTL within this region is around 500 km.
- Khorazm Region. The Region is located in the northwest of the country and borders with Turkmenistan, Karakalpakstan, and Bukhara Region. The capital is Urgench. Total length of OHTL within this region is around 50 km.
- Bukhara Region. The Region is located in the southwest of the country. It borders Turkmenistan, Navoiy Region, Qashqadaryo Region, a small part of Khorazm Region and the Karakalpakstan Republic. The capital is Bukhara city. Total length of OHTL within this region is around 240 km.

Table 90: Region Divisions of Uzbekistan

Division	Legend	Division	Legend	Division	Legend
Andijan Region	2	Qashqadaryo Region	8	**Khorazm Region**	**13**
Bukhara Region	**3**	Samarqand Region	9	Namangan Region	6
Fergana Region	4	Sirdaryo Region	10	Navoiy Region	7
Jizzakh Region	5	Surxondaryo Region	11	Tashkent Region	12
Karakalpakstan	**14**	Tashkent	1		

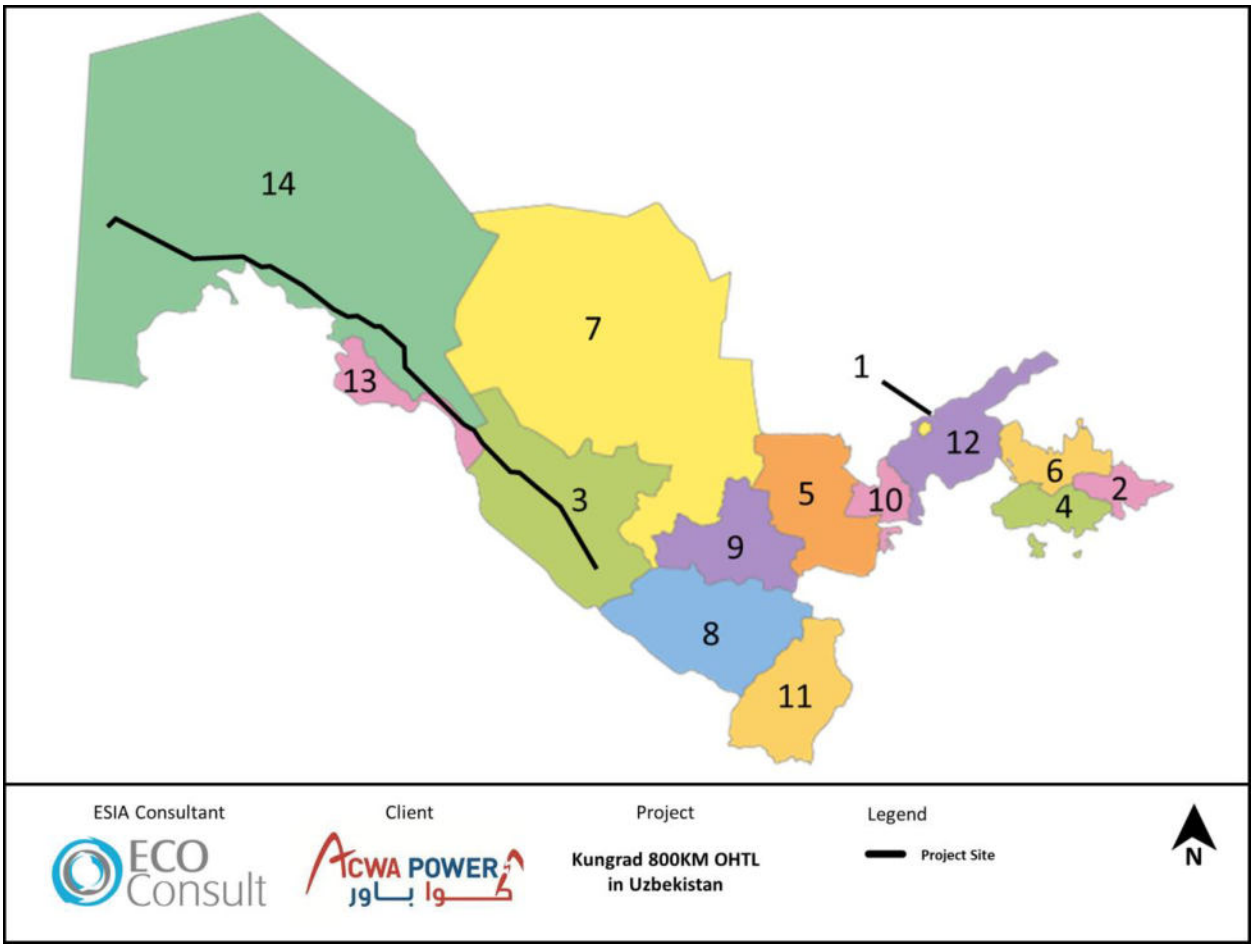


Figure 108: Region Division of Uzbekistan

Sovereign Republic of Karakalpakstan

The administrative setup of Karakalpakstan includes multiple levels of governance to ensure effective management and service provision within the region. At the highest level, Karakalpakstan is led by the **Supreme Council** (known as *Jokori Kenes*), which acts as the legislative body representing the interests of the population. The republic has its own constitution but follows all legislations as that of Government of Uzbekistan. However, it shares veto power with Uzbekistan over decisions concerning its affairs.

The Supreme Council Chairman is the head of the Government including the Council of Ministers. All ministries within Uzbekistan are also present in Karakalpakstan. For example, there is a Ministry of Ecology, Environmental Protection, and Climate Change in Tashkent, and a Ministry of Ecology, Environmental Protection, and Climate Change for the Republic of Karakalpakstan.

Administratively, Karakalpakstan is divided into 14 Districts, known as "*Rayons*." Each District has its own local administration (known as ***Khokimiyat***) led by the ***Hokim*** (equivalent to a Governor). The *Khokimiyat* is responsible for the local governance, development, and implementation of government programs and initiatives at the district level. They are also responsible for municipal services such as water supply, waste management and other.

The OHTL runs within a total of **eight (8) Districts** which are highlighted in grey and bold below and that include: Kungrad District, Shumanay District, Kanlikul District, Nukus District, Karauzyak District, Beruniy District, Ellikkala District, and Turtkul District.

Table 91: District Divisions of Karakalpakstan

Division	Capital	Legend	Division	Capital	Legend
Amudaryo District	Mang‘it	2	**Kanlikul District**	**Qanliko‘l**	**5**
Beruniy District	**Beruniy**	**3**	**Kungrad District**	**Kungrad**	**8**
Chimboy District	Chimboy	15	**Karauzyak District**	**Qorao‘zak**	**6**
Ellikkala District	**Bo‘ston**	**17**	**Shumanay District**	**Shumanay**	**16**
Kegeyli District	Kegeyli	7	Taxtako‘pir District	Taxtako‘pir	12
Mo‘ynoq District	Mo‘ynoq	9	**Turtkul District**	**To‘rtko‘l**	**13**
Nukus District	**Oqmang‘it**	**10**	Xo‘jayli District	Xo‘jayli	14
Taxiatosh District	Taxiatosh	11	Bo‘zatov District	Bo‘zatov	4

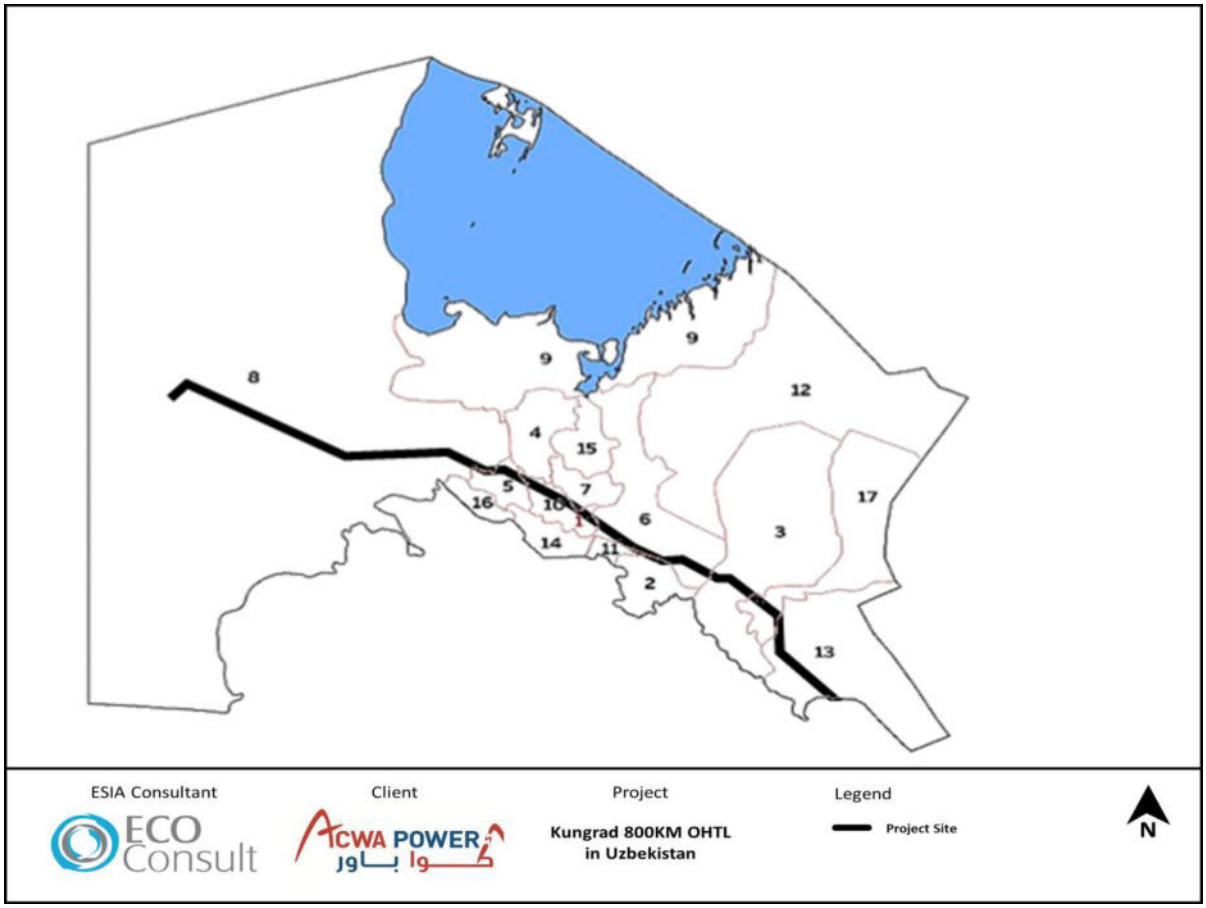


Figure 109: District Divisions in Karakalpakstan

The smallest administrative division in Uzbekistan as well as Karakalpakstan is known as the ***Mahalla***. It could include one (1) or more cities, towns, neighborhoods, and villages. The Mahallas have the following roles and responsibilities: (i) act as the community unit and governance institutions within these cities, towns, neighborhoods and villages; (ii) help facilitate local governance and service delivery to the residents; (iii) act as a coordination point with community; (iv) focal point for information sharing; (v) implement government programs and other.

The Mahalla is headed by a Chair who is elected by local communities. In addition, each Mahalla includes a Mahalla Committee composed of 3-4 people that are appointed formally by the government (this always includes at least one (1) woman that would be responsible for women and youth affairs). In addition, informally, the Committee also includes the participation of elderly and community leaders.

Khorazm and Bukhara Region

The administrative setup of both Khorazm and Bukhara Regions includes multiple levels of governance to ensure effective management and service provision within the regions. At the highest level, each region is led by its own regional administration (known as ***Hokimligi***) which are led by Governors (known as ***Hokim – Governor*** – equivalent to a governor). The Hokim – Governor is appointed by the President of the Republic of Uzbekistan and serves for 5 consecutive years.

Generally, the Hokim - Governor is responsible for regional administrative governance, economic growth, and infrastructure development. They supervise social services such as healthcare and education, ensure public safety, and contribute to regional planning. They coordinate with local authorities, implement policies, and contribute to the region's welfare and growth. In addition, the Hokim - Governor contributes to the provision of essential services to the region's residents.

Regional departments that are divisions of Ministries in Uzbekistan are present in Khorazm and Bukhara Regions. For example, there is a Ministry of Ecology, Environmental Protection, and Climate Change in Tashkent, and an Administration of Ecology and Environmental Protection of Bukhara, under the Ministry.

Administratively, Khorazm and Bukhara are each divided into 11 Districts (known as ***Tumani***), with each district having its own local administrations (known as ***Khokimiyat***) which are led by Mayors (known as ***Hokim – Mayor*** – equivalent to a mayor). The Khokimiyat supervises the administration as a whole, which includes the provision of social services such as education and healthcare. In addition, they play an important role in municipal services such as water distribution, waste management, and other essential public services.

The OHTL runs within a total of four (4) Districts in Bukhara Region and one (1) District in Khorazm Region which are highlighted in grey and bold below. This includes Jondor, Karakul, Peshkun, Romitan in Bukhara and Tuproqqala in Khorazm.

Table 92: District Divisions of Bukhara and Khorazm Regions

Bukhara Region			Khorazm Region		
Division	**Capital**	**Legend**	**Division**	**Capital**	**Legend**
Olot District	Olot	1	Bog‘ot District	Bog‘ot	1
Bukhara District	Galaosiyo	2	Gurlan District	Gurlan	2
G‘ijduvon District	G‘ijduvon	3	Xonqa District	Xonqa	3
Jondor District	**Jondor**	**4**	Khazoarasp District	Khazoarasp	4
Kogon District	Kogon	5	Khiva District	Khiva	5
Karakul District	**Qorako‘l**	**6**	Qo‘shko‘pir District	Qo‘shko‘pir	6
Qorovulbozor District	Qorovulbozor	7	Shovot District	Shovot	7
Peshkun District	**Yangibozor**	**8**	Urganch District	Qorovul	8
Romitan District	**Romitan**	**9**	Yangiariq District	Yangiariq	9
Shofirkon District	Shofirkon	10	Yangibozor District	Yangibozor	10

Vobkent District	Vobkent	11	**Tuproqqala District**	**Pitnak**	**11**

Similar to Karakalpakstan, the smallest administrative division in Uzbekistan is known as the ***Mahalla***. It could include one (1) or more cities, towns, neighborhoods, and villages. The Mahallas have the same roles and responsibilities and composition identified earlier under Karakalpakstan.

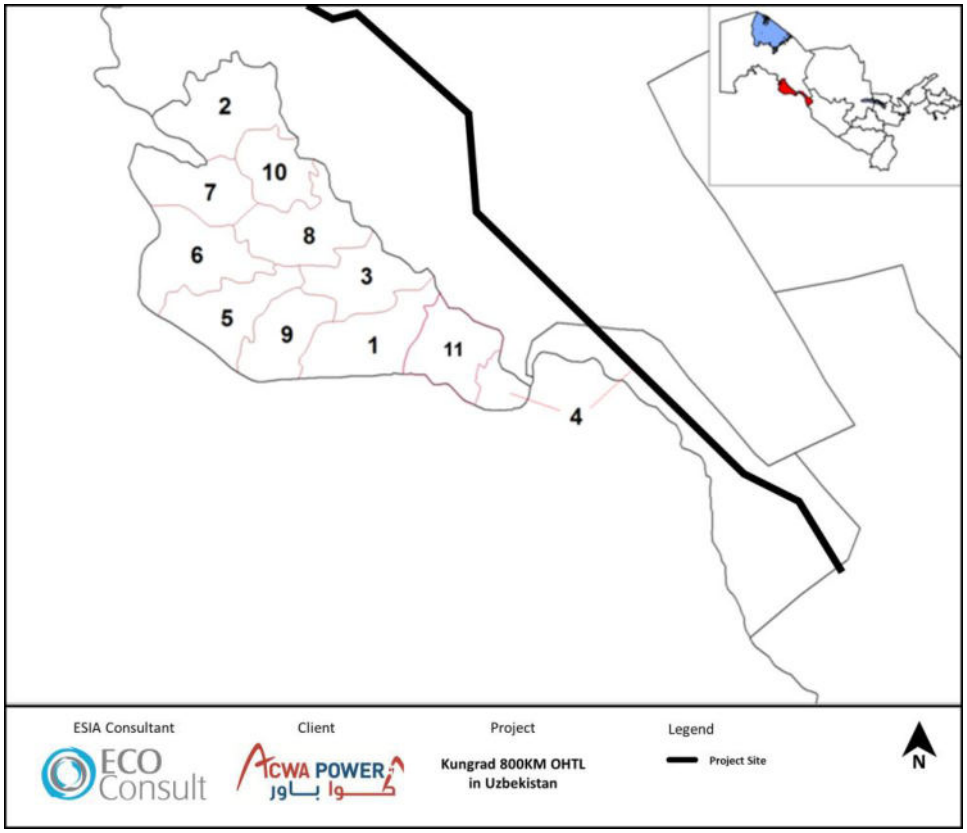


Figure 110: District Divisions in Khorazm Region

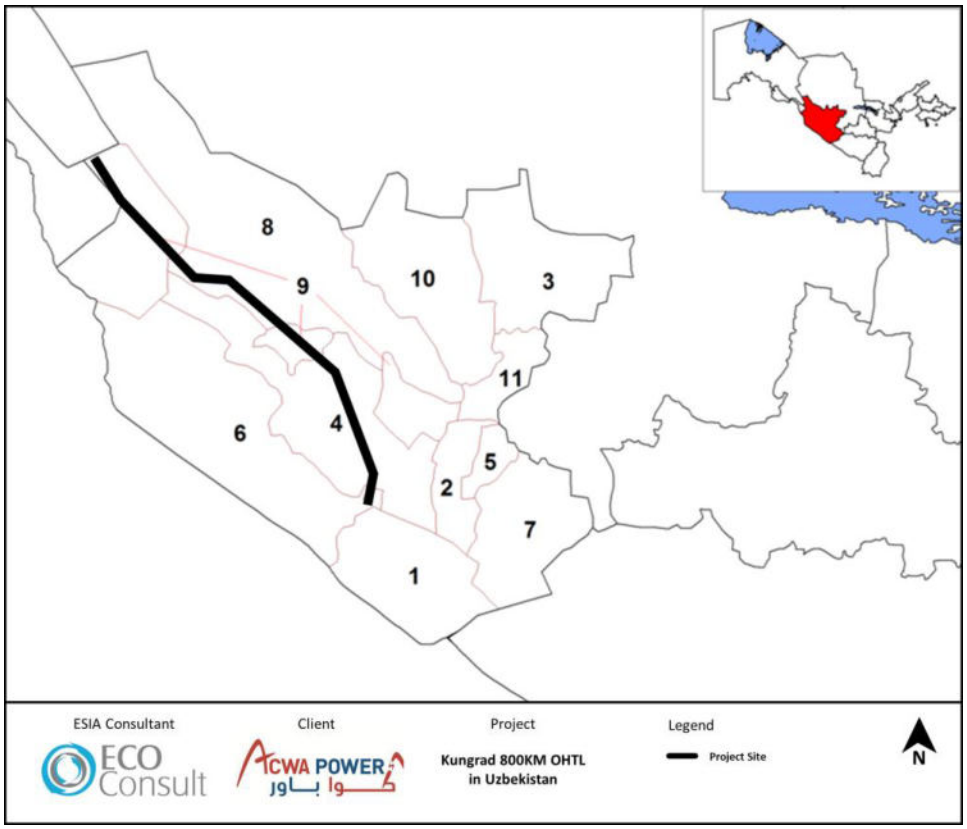


Figure 111: District Divisions in Bukhara Region

23.2.2 Local Communities

Throughout this section, the term local communities will be used. This will refer to the following settlements in particular all of which are located within a distance of less than 5km from the OHTL[111].

It is important to note that the OHTL and its Right of Way (ROW) does not pass through any community settlements.

Table 93: Local Communities within a 5km Buffer Area from the Project

Region	District	Town/Village	Distance from OHTL (Km)
Bukhara	Karakul	Karakul	3.2
Bukhara	Romitan	Gazli	3.55
Karakalpakstan	Ellikkala	Qiriqqizabad	4.32
Karakalpakstan	Ellikkala	Qirqjoy	4.75
Karakalpakstan	Ellikkala	Qiriqqiz	1.25
Karakalpakstan	Amudaryo	Beshtom	4.7
Karakalpakstan	Xo'jayli	Berdaq	4.14
Karakalpakstan	Kegeyli	Darbent	2.8
Karakalpakstan	Nukus	Toqimbet	3.96

[111] The 5km distance has been selected as it is the greatest distance within which impacts are likely to occur as demonstrated throughout this section. These are related mainly to visual impacts from the tower footprint (as discussed in further details in throughout this section well as potential for worker influx (if applicable)

Karakalpakstan	Nukus	Qumayqus awili	3.19
Karakalpakstan	Nukus	Mamiqshi	1.39
Karakalpakstan	Nukus	Jiydeli (Zheydeyli)	1.04
Karakalpakstan	Nukus	Shuyit	4.22
Karakalpakstan	Nukus	Telman	3.8
Karakalpakstan	Nukus	Madeniyat	3.53
Karakalpakstan	Nukus	Aqman‘g‘it	2.86
Karakalpakstan	Nukus	Baymaklyaul	4.65
Karakalpakstan	Nukus	Madeniyat	3.06
Karakalpakstan	Nukus	Qizilu'y	1.33
Karakalpakstan	Nukus	Tulegenau)	2.22
Karakalpakstan	Nukus	Jiydeli	1.07
Karakalpakstan	Shumanay	Taqirko'l	4.23
Karakalpakstan	Shumanay	Birqazanko'l	2.93
Karakalpakstan	Shumanay	Jon'ishqaliko'l	2.43
Karakalpakstan	Kungrad	Sag'ir awil	1.41
Karakalpakstan	Kungrad	Abilla	0.97
Karakalpakstan	Kungrad	Gu'njiliko'l	4.91
Karakalpakstan	Shumanay	Qipshaq	2.28
Karakalpakstan	Kanlikul	Nurimbet	4.62
Karakalpakstan	Nukus	Qran taw (Krantau)	1.66

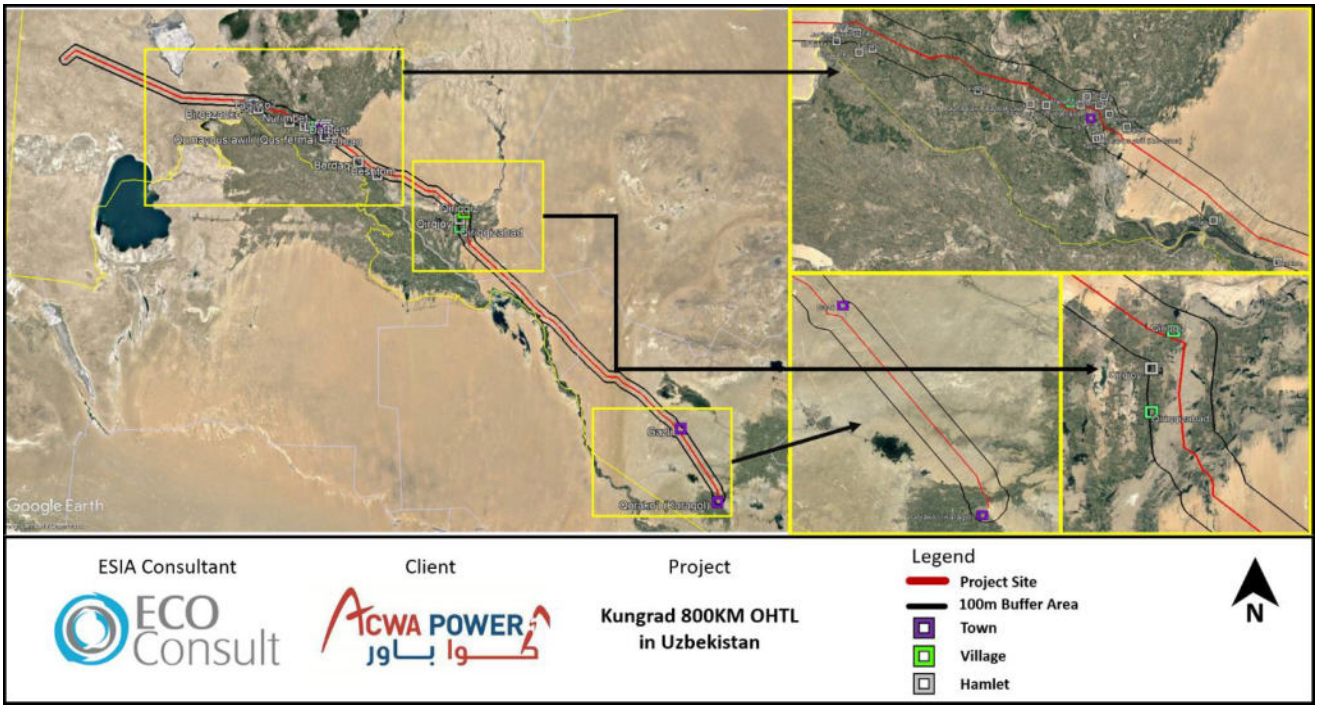


Figure 112: Project Site and Closest Communities

23.2.3 OHTL Project Components

The following describes the main Project components. This has been based on current available information provided by the Developer at this stage.

The Project can be divided into three (3) areas that will include the following with a total distance of 794 km:

- Wind Farm switching station (also known as **Ustyurt station) to Nukus switching station** with a total distance of around 276 km. This will include two (2) OHTL lines running parallel to each other;
- **Nukus switching station to Sarymay switching station** with a total distance of around 265 km. This will include two (2) OHTL lines running parallel to each other; and
- **Sarymay switching station to Karakul switching station** with a total distance of around 245 km that will include one (1) OHTL.

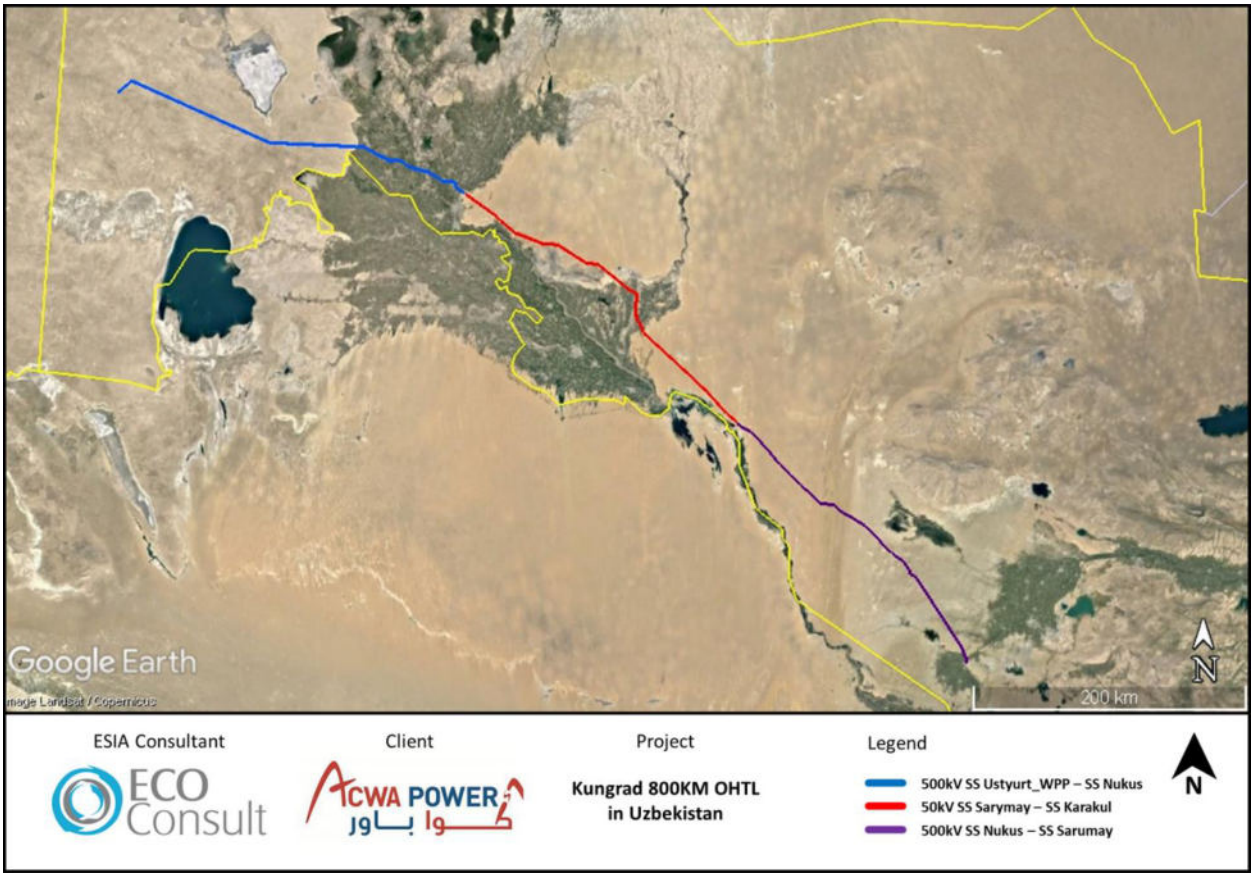


Figure 113: Project OHTL

The figure to the left below presents an illustration of the two (2) OHTL running parallel to each other (i.e. the line from Ustyurt to Nukus switching station and that from Nukus to Sarymay switching station), while the figure to the right presents an illustration of the 1 OHTL running from Sarymay to Karakul switching station.

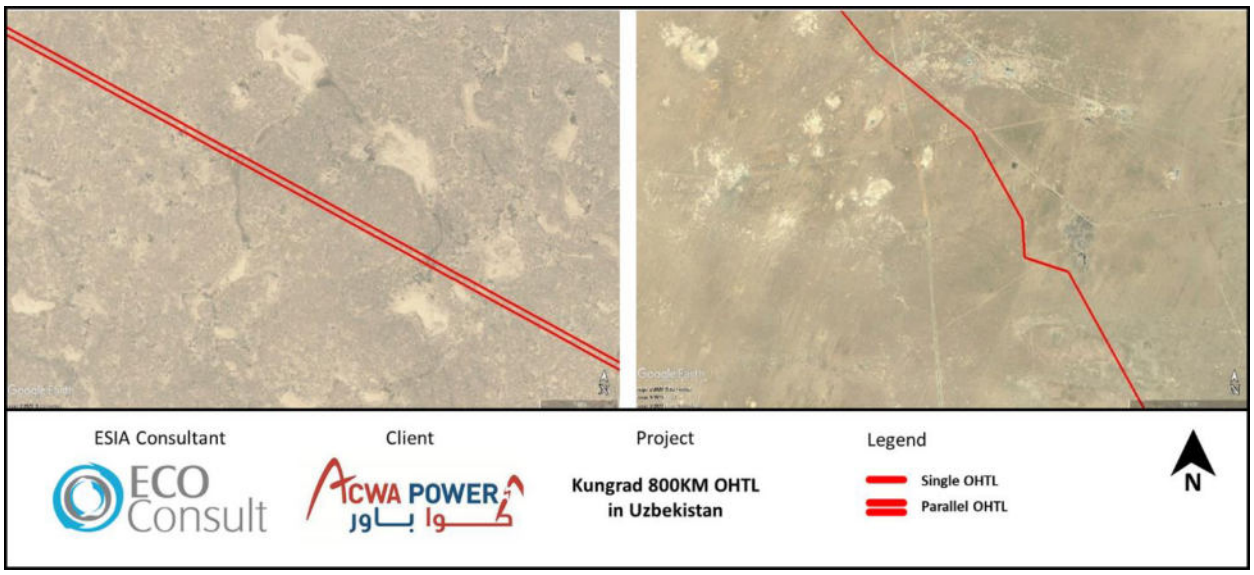


Figure 114: Parallel and Single OHTLs

A. *Transmission Towers*

The main component of the OHTL is the transmission tower. Each transmission tower will be a three (3) phase steel beam tower, which will transport the electricity from to the High Voltage National Grid. The typical structure of the tower is presented in the figure below.

Each transmission tower will consist of the following:

- **Foundations:** each tower will be fixed and bolted to the ground through reinforced concrete foundations. There will be four (4) foundations for each tower (check Figure 117 below later);
- **Steel structure:** the foundations will support the steel structure that will carry the conductors, cross-arms, insulators and shield wire;
- **Conductors:** the conductor is the line used to transmit electrical energy from one tower to the next until its connection with the High Voltage National Grid. There will be three (3) conductors that will connect through the cross-arms. The conductor will be a 500kV line;
- **Cross-Arms:** each tower will have two (2) steel beam cross arms which connect the conductors (discussed below) with the towers. Each crossarm has a sideway length of 6.3m;
- **Shield Wire (also known as earth wire):** positioned above the phase conductors, the shield wire is grounded at each tower to facilitate the safe and rapid dissipation of voltage surges caused by technical issues or external factors (e.g. lightning); and
- **Insulators:** provide electrical isolation and support for the conductors, which are typically made of aluminum or aluminum alloy. Insulators isolate the towers from the live wires that carry the electricity.

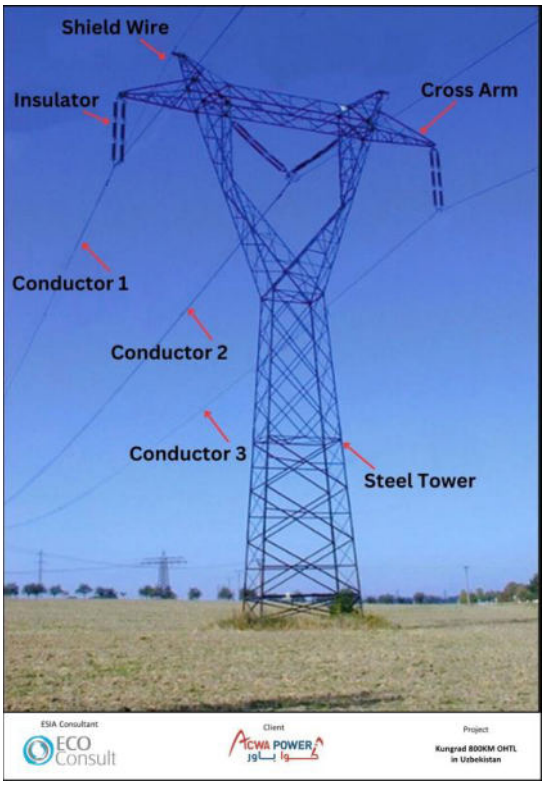


Figure 115: Key Components of a Transmission Tower

Based on information available at this stage, there will be one (1) tower installed every 300 – 350m. The table below presents the total number of transmission towers based on information available at this stage.

Table 94: Number of Towers for the OHTL

Route	Distance	Number of Towers
Wind Farm substation to Nukus Substation	276 km with two (2) OHTL lines running parallel to each other	2,039
Nukus Substation to Sarymay Substation	265 km with two (2) OHTL lines running parallel to each other	1,801
Sarymay Substation to Karakul Substation	245 km with one (1) OHTL	792
Total		**4,632**

The type of tower that will be used is known as PB4 which has a total height of 32.2m. The figure below presents a schematic of the PB4 tower showing the length of crossarms (6.3m) and height (32.2m).

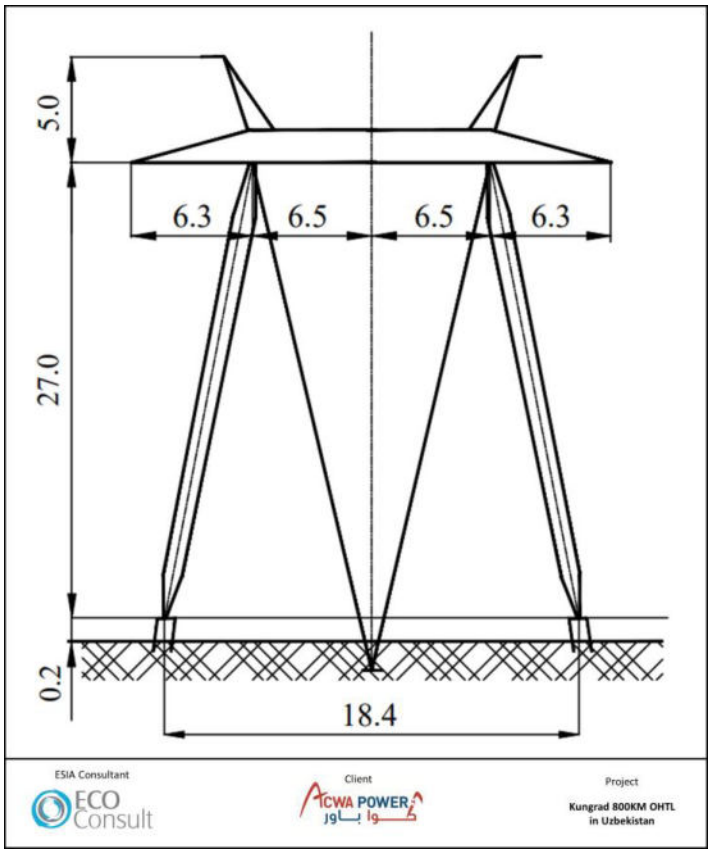


Figure 116: Heights and Distance for Transmission Towers

The tower has a total footprint of 305m^2 as noted in the figure below. The footprint includes the 4 foundation locations, the area in between, as well as a 1.5m strip to be taken from center of each foundation as required within the ““Electrical Installation Rules”.

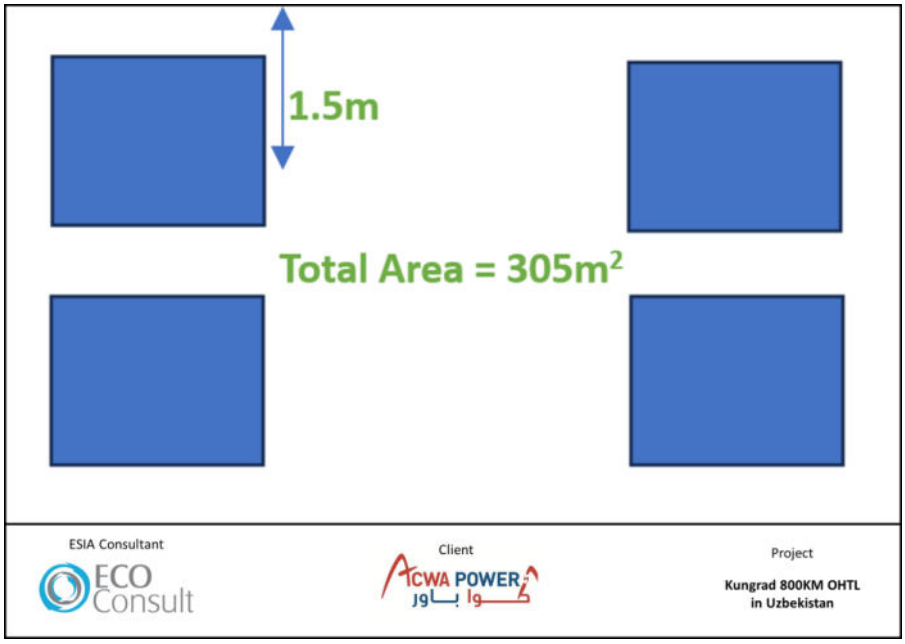


Figure 117: Footprint for the PB4 Tower

Route	Number of Towers	Footprint per Tower (m^2)	Total Footprint (km^2)
Wind Farm substation to Nukus Substation	2,039	305	0.62
Nukus Substation to Sarymay Substation	1,801	305	0.55
Sarymay Substation to Karakul Substation	792	305	0.24
Total			**1.41**

B. Angle Towers

Angle towers will be used: (i) first towers leaving any switching station (after which they connect with transmission towers) and last tower before entry into a switching station (switching stations are discussed below); and (ii) whenever the OHTL has a change in direction (as per figure below). The main component of the angle towers is similar to that of the transmission tower and which include:

- Foundations
- Conductors
- Cross-Arms
- Shield Wire (also known as earth wire)
- Insulators

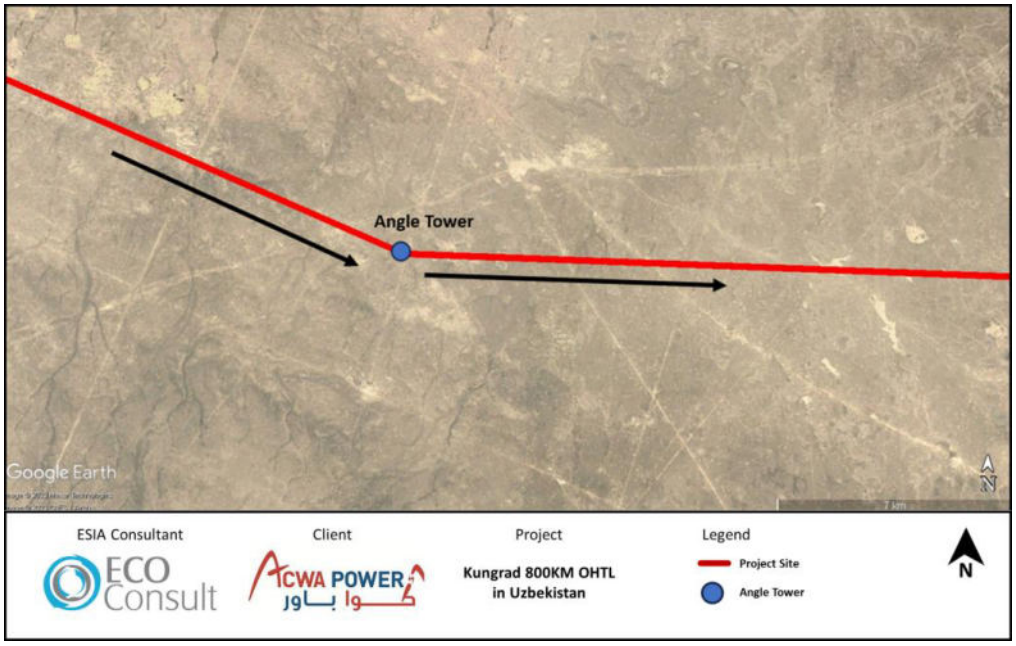


Figure 118: Angle Towers and Change of Direction

At each angle tower location there will be three (3) parallel towers separated by a distance of 14m from the center (one for each conductor line). Refer to figure below. The table below presents the total number of angle towers based on preliminary information available at this stage.

Table 95: Number of Angle Towers for the OHTL

Route	Distance	Number of Towers
Wind Farm substation to Nukus Substation	276 km with two (2) OHTL lines running parallel to each other	88
Nukus Substation to Sarymay Substation	265 km with two (2) OHTL lines running parallel to each other	88
Sarymay Substation to Karakul Substation	253 km with one (1) OHTL.	45
	Total	**221**

There are currently three (3) types of towers that will be used as angle towers, however the exact tower type to be used at each location is not known or available at this stage and will be prepared as part of the detailed design by the EPC Contractor. The table below presents characteristics for each type of tower.

Table 96: Type of Towers, Height and Footprint

Tower Type	Total Height (m)	Total Footprint (m^2)
U2K	24.5	205
U2K +5	29.5	275
U2K + 12	36.5	360

The figure below presents the length of crossarms (6.5m), height of the U2K+5 tower (29.5m) and the distance between the three (3) towers from center to center (14m).

Finally, the table that follows also presents the total footprint required for the angle towers. As previously discussed, the footprint area includes the 4 foundation locations, the area in between, as well as a 1.5m strip to be taken from center of each foundation as required within the ““Electrical Installation Rules”.

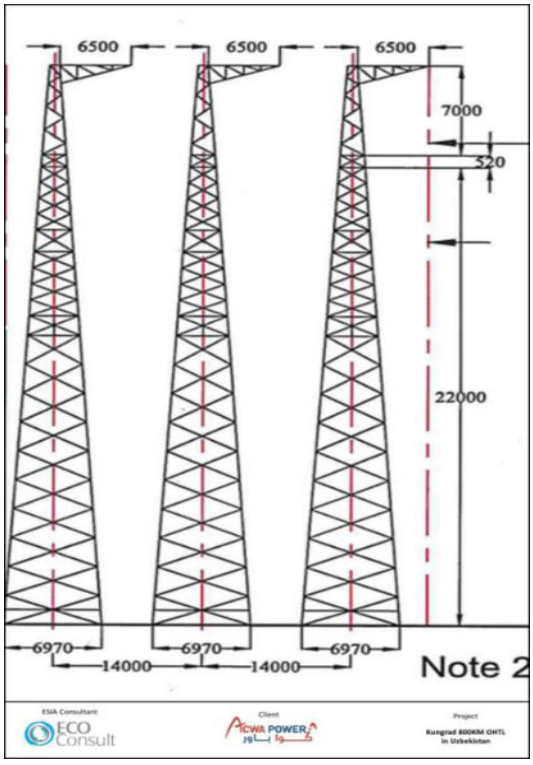


Figure 119: Heights and Distance for Transmission Towers

Route	Number of Towers	Footprint per Tower (m^2)	Total Footprint (km^2)
Wind Farm substation to Nukus Substation			***0.028***
U2k+12M	*32*	*360*	*0.012*
U2k+5	*54*	*275*	*0.015*
U2k	*2*	*205*	*0.001*
Nukus Substation to Sarymay Substation			***0.025***
U2k+12M	*22*	*360*	*0.008*
U2k+5	*52*	*275*	*0.014*
U2k	14	*205*	*0.003*
Sarymay Substation to Karakul Substation			***0.012***
U2k+12M	10	*360*	*0.004*
U2k+5	*18*	*275*	*0.005*
U2k	17	*205*	*0.003*
Total			**0.065**

C. Switching Station

The switching station (or substation) is a high voltage transformer unit that converts the output from the OHTL to a lower voltage (from 500kV to 33kV) that is appropriate for connection with the distribution network. Through the distribution network, electricity will then be supplied to end users within the areas identified below.

As explained earlier, the Project will connect with four (4) switching stations – two (2) that will be newly constructed and two (2) existing. This will include the following:

- Switching Station #1: Wind Farm station (located within the Wind Farm and also known as Ustyurt)
- Switching Station #2: Nukus station
- Sarymay Substation (existing station)
- Karakul Substation (existing station)

Each substation will have a footprint of around $0.3km^2$.

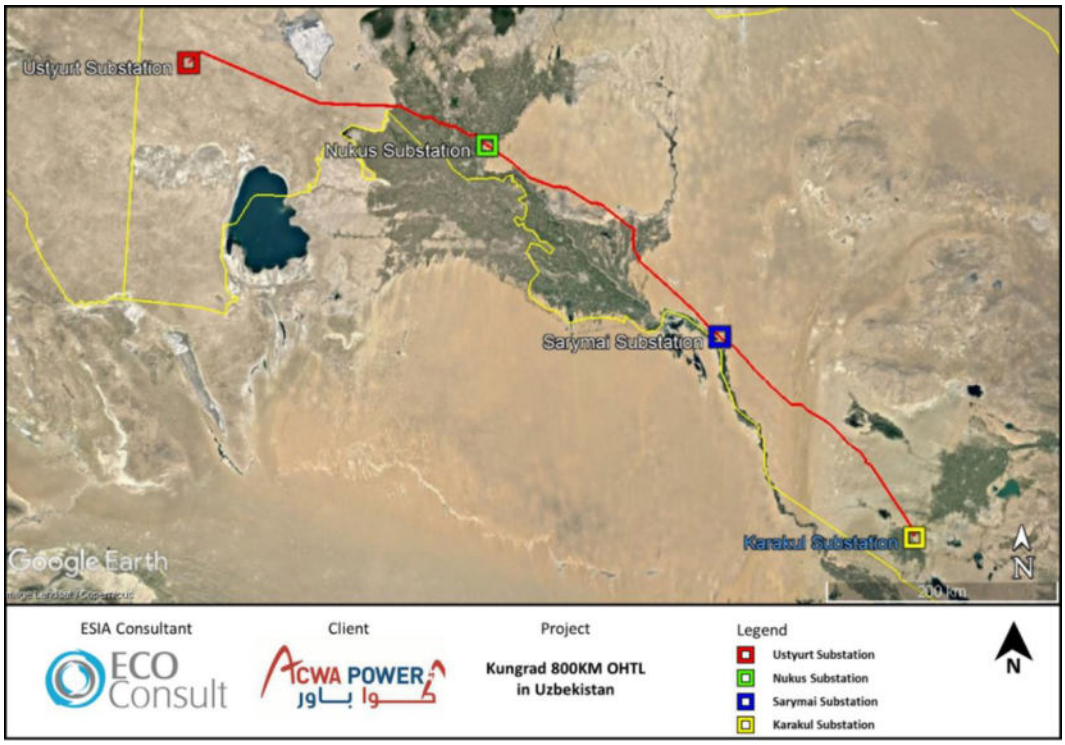


Figure 120: Project Switching Stations

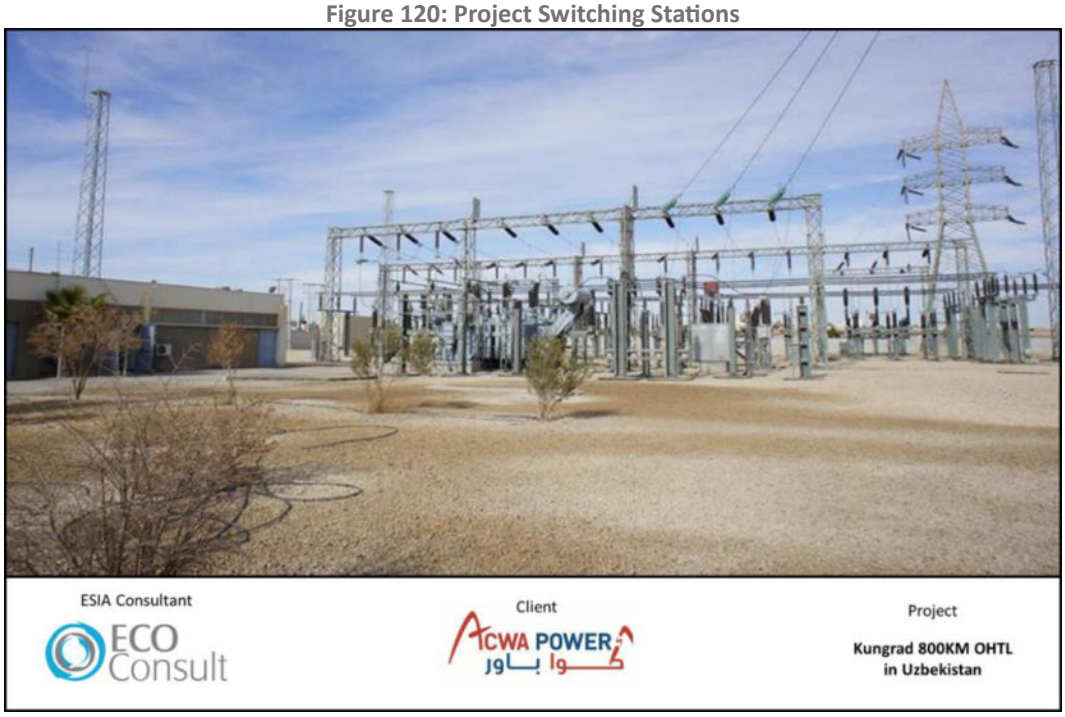


Figure 121: Typical Substation

D. Access Road

There will be no permanent access roads established for the Project for construction or O&M activities. Access of vehicles and machinery during construction and for maintenance activities during operation will be only to tower locations. Access will be through existing tracks or dirt roads as applicable that lead directly to each exact footprint location.

E. Other Temporary Components

There are additional Project components that will be required on a temporary basis throughout the construction phase of the Project in particular. Those are identified below. The location of such components in particular will not be available at this point, nor is it expected to be available during the ESIA preparation phase. Those will be identified once the EPC Contractor is appointed and a detailed design is completed.

- Laydown areas: this is a temporary storage area where tools, materials, equipment and vehicles are stored when not in use. Due to the length of the OHTL, it is likely that several laydown areas will be established along the route.
- Batching Plant: it is not yet clear whether a mobile concrete batching plant will be established or whether it will be procured from permanent existing batching plants available within each working area along the OHTL route (most likely scenario). Batching plant will be required for preparation of the concrete to be used for foundation installation. A typical batching plant is provided in the figure below.
- Worker Camp Area: it is not yet clear whether workers will be accommodated within designated worker camp areas or within some of the closest local communities along the working areas within the OHTL route.

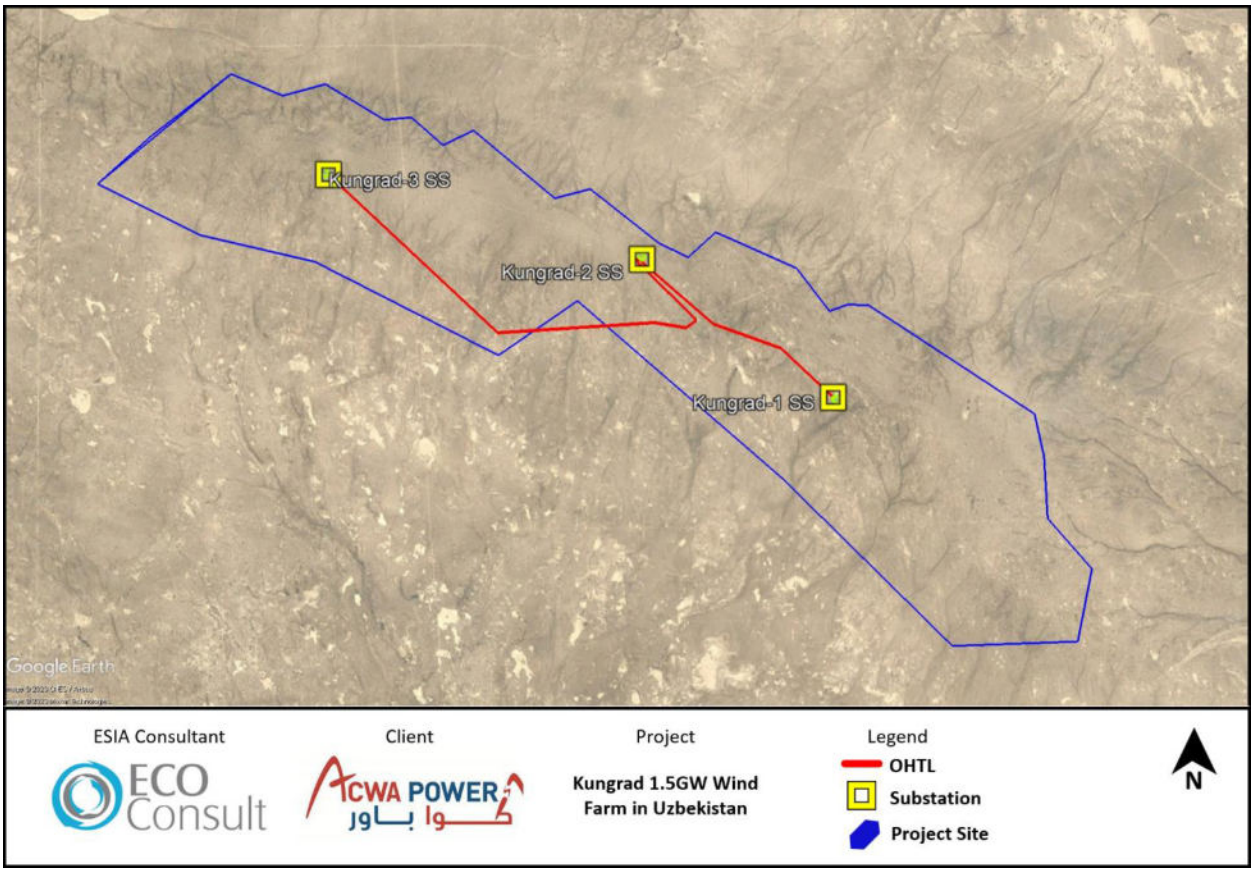
As discussed in further details in “Section 22.2”, requirements for temporary components will be included within the Environmental and Social Management Plan (ESMP) and Environmental and Social Management System (ESMS) to be considered by the EPC Contractor when planning for such components.

Figure 122: Typical Mobile Batching Plant

F. Internal OHTL Network

There will be internal OHTL lines that will connect from the three (3) Wind Farm substations (please refer to "Section 2.3" for details on the 3 wind farm substations) to the Wind Farm Switching Station #1 – Ustyurt Switching Station (discussed under earlier).

The figure below presents the layout of the internal OHTL lines.



23.2.4 Right of Way (ROW) and Land Acquisition

A. ROW Requirements

Electricity transmission and distribution projects require Rights-of-Way (ROW) to protect the system from windfall, contact with trees, branches, utilities, buildings, and other potential hazards that may result in damage to the system, or power failures, as well as public health and safety concerns. ROW are also utilized to access, service, and inspect transmission and distribution systems.

The IFC EHS Guidelines for Electric Power Transmission and Distribution (2007), states that the ROW width for transmission lines ranges from 15 to 100m depending on voltage and proximity to other ROW, but typical range is between 15 and 30m.

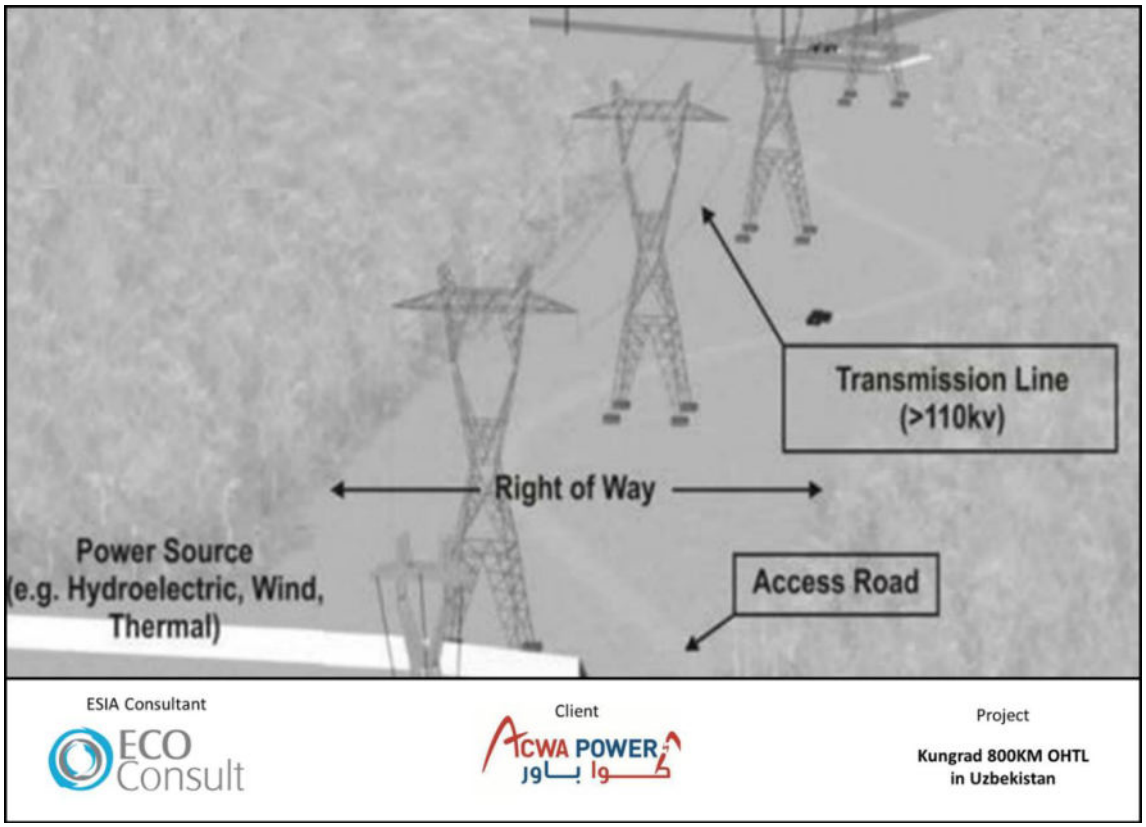


Figure 123: Right of Way and Access Road for OHTL (IFC, 2007)

Within the local requirements and context, there are two (2) key issues that define the ROW which include the following:

- Sanitary Protection Zone: Those are determined in accordance with "Sanitary Norms No. 0236-07: Sanitary Standards and Regulations to Ensure Safety for Populations Living near High Voltage Power Lines". The sanitary protection zone for 500kV OHTL is 30m. No houses are allowed within; and
- Security Zone: Those are determined in accordance with "Electrical Installation Rules" where the calculated security zone for 500kV line is 30m from the crossarms. Within the established security zone, no permanent structures are allowed on land plots or air space (e.g. trees).

The figure below presents the sanitary protection zone and security zone in areas where there will be one (1) OHTL only (i.e. Sarymay Substation to Karakul Substation) for the following: (i) transmission towers; and (ii) angle towers.

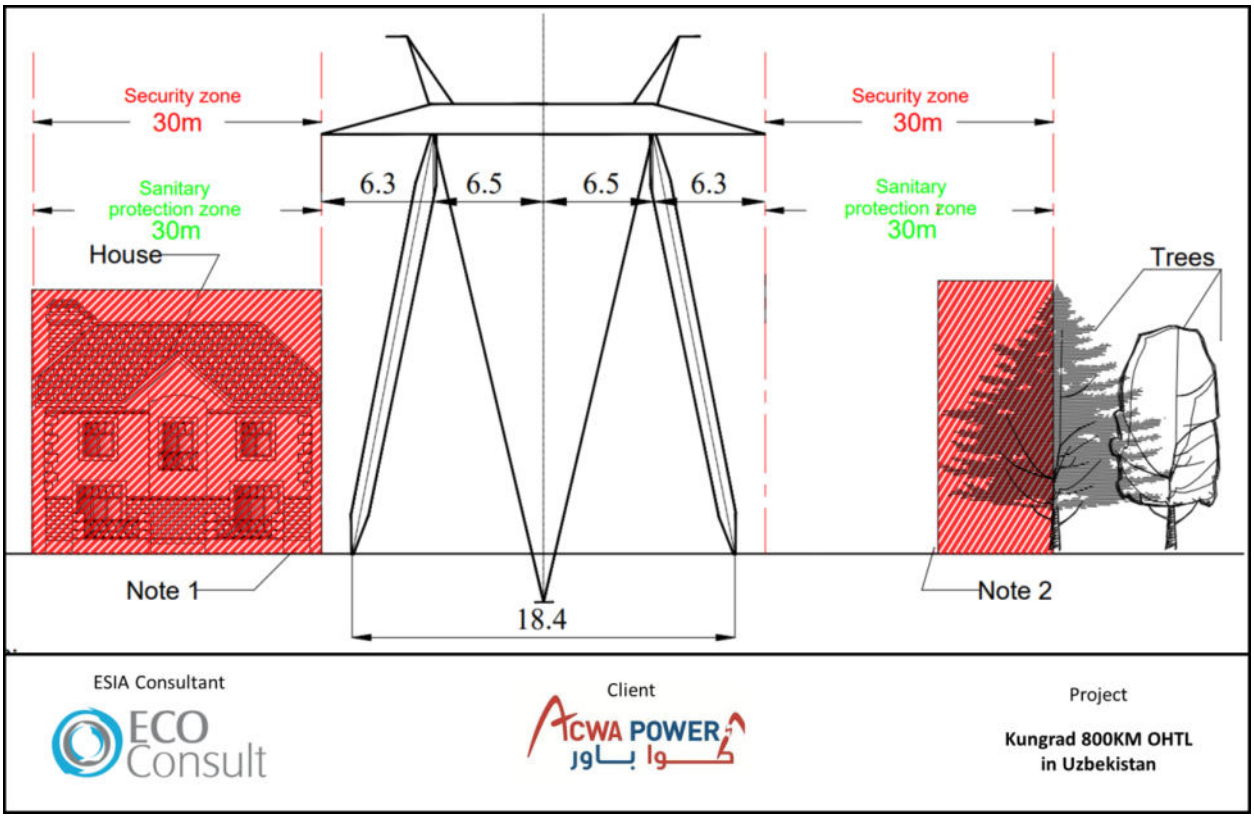


Figure 124: Sanitary Protection and Security Zones for Transmission Towers for 1 OHTL

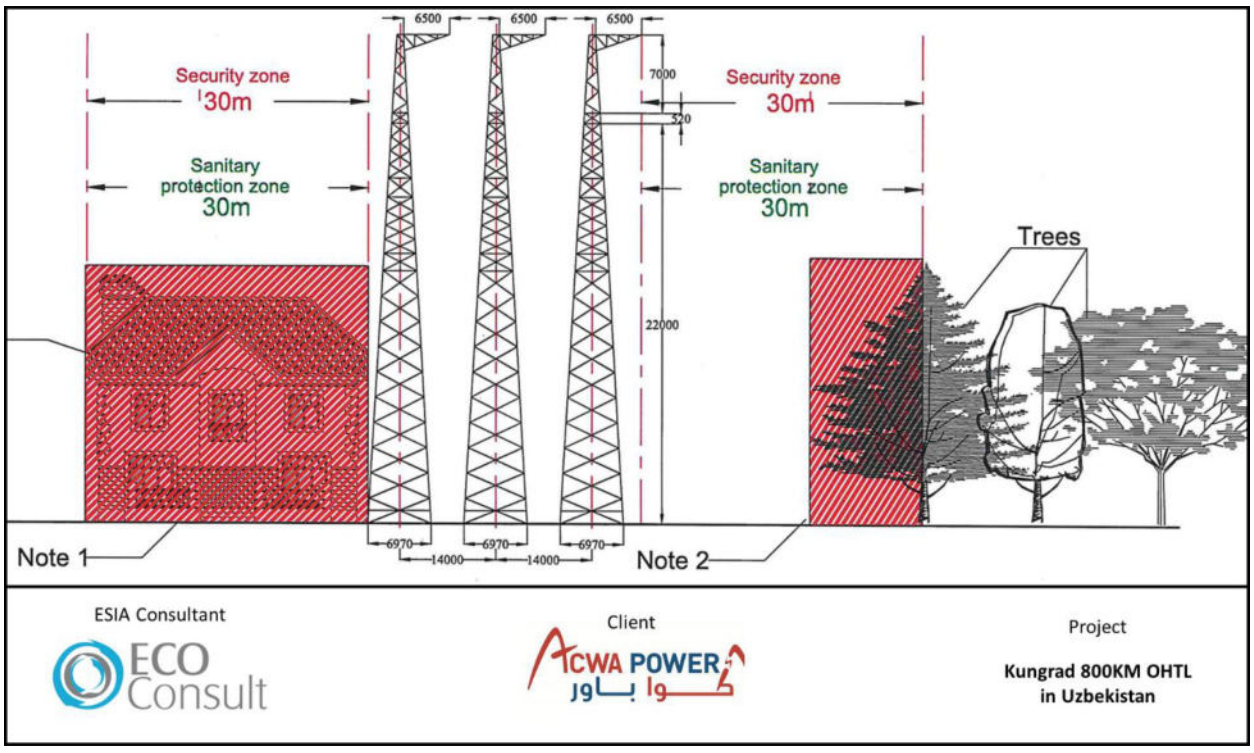


Figure 125: Sanitary Protection and Security Zones for Angle Towers for 1 OHTL

The figure below presents the sanitary protection zone and security zone applicable for areas where there will be two (2) OHTL line running parallel to each other (i.e. Ustyurt substation to Nukus substation and Nukus substation to Sarymay substation).

As noted in the figure below this includes the same distances as that of the single OHTL route in addition to 50m buffer distance which is required between two (2) 500KV high voltage OHTLs in accordance with the "Electrical Installation Code". The same applies for the transmission towers as well.

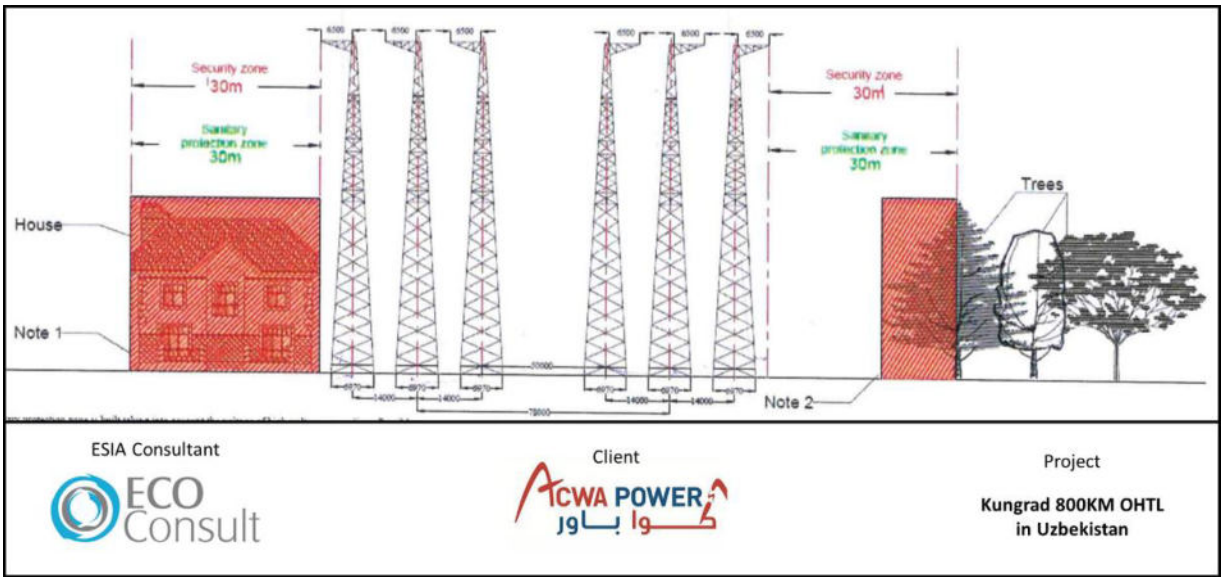


Figure 126: Sanitary Protection and Security Zones for 2 OHTLs

B. Permanent Land Acquisition

The table below presents the permanent land acquisition required for the Project. This will only include the footprint of the tower locations only. The conductor lines, security zone, sanitary protection zone, etc. are not subject to a permanent land acquisition process.

The table below does not include the full right of way (i.e. sanitary protection zone and security zone), which is defined as 30m from the outer extent of the tower arm in each direction. This is because the right of way does not constitute permanent acquisition but remains under the ownership of existing owner but with permanent restrictions in place. The right of way will have the following rules in place:

- No structures and no large trees will be permitted in the right of way. Any such assets will be surveyed and compensated for permanent loss incurred;
- Land ownership will remain with current owners in the areas outside the tower base. Land within tower base areas will be surveyed and compensated for permanent loss incurred; and
- Agriculture will be permitted in areas outside the tower bases after the construction phase. Crops will be surveyed and compensated for the construction phase only.

This issue is discussed in further detail in "Section 23.5".

Table 97: Permanent Land Acquisition Requirements

Item	Footprint (km^2)
Transmission Towers	1.41
Angel Towers	0.067
Total (km^2)	**1.477**

C. *Temporary Land Requirements*

There will be temporary land required during the construction phase for the temporary facilities as described earlier" (e.g. laydown areas or access roads in case there are no existing tracks). The temporary land will not be subject to an acquisition process given that it is temporary short-term use for the period of construction. Those will be subject to an evaluation and compensation process (refer to "Section 23.5". for additional details).

In accordance with the "Electrical Installation Rules", temporary land requirements are equivalent to the following:

- 7.5m from the centerline of the conductor (15m in total); and
- 2500m^2 for PB4 towers (transmission towers) and 2000m^2 for angle towers. This area is additional to the 15m temporary use area discussed above.

The table below presents the temporary land requirements. Note: in addition to this 7.5m and 15m buffer, should there be any additional areas disturbed during construction (e.g. laydown areas beyond the 15m buffer) then this will be subject to an evaluation and compensation process.

Table 98: Temporary Land Acquisition

No.	District	Land Acquisition km^2
		Temporary use
Route from Ustyurt Substation to Nukus Substation – Line 1		
Republic of Karakalpakstan		
1	Kungrad District	4.4134775
2	Shumanay District	0.509194
3	Kanlikul District	0.9262845
4	Nukus District	0.931055
Total for the Region:		**6.780011**
Route from Ustyurt Substation to Nukus Substation – Line 2		
Republic of Karakalpakstan		
1	Kungrad District	4.4134775
2	Shumanay District	0.509194
3	Kanlikul region	0.9262845
4	Nukus District	0.931055
Total for the Region:		**6.780011**
Route from Nukus Substation to Sarymay – Line 1		
Republic of Karakalpakstan		
1	Nukus District	0.336334
2	Karauzyak District	1.8289465
3	Beruniy District	0.9628895
4	Ellikkala District	0.3004755
5	Turtkul District	2.0280265

Total for the Region:		**5.456672**
Khorazm Region		
1	Tuproqqala District	0.860119
Total for the Region:		**0.860119**
Route from Nukus Substation to Sarymay – Line 2		
Republic of Karakalpakstan		
1	Nukus District	0.336334
2	Karauzyak District	1.8289465
3	Beruniy District	0.9628895
4	Ellikkala District	0.3004755
5	Turtkul District	2.0280265
Total for the Region:		**5.456672**
Khorazm Region		
1	Tuproqqala District	0.8191
Total for the Region:		**0.81**
Route from Nukus Substation to Sarymay – Karakul		
Republic of Karakalpakstan		
1	Turtkul District	0.222972
Total for the Region:		**0.222972**
Khorazm Region		
1	Tuproqqala District	1.022604
Total for the Region:		**1.022604**
Bukhara Region		
1	Romitan District	0.9452095
2	Peshkun District	0.2500345
3	Jondor District	3.1200455
4	Karakul District	0.1780475
Total for the Region:		**4.493337**
Grand Total		**31.659426**

D. Permits

The Developer has already obtained permits for the development of the OHTL from various governmental entities. The table below presents an overall list of permits obtained to date.

Table 99: List of Permits Obtained to Date for OHTL Development

A	**Ustyurt WPP-Nukus SS**
Khokimiyat of Kungrad district	Construction Authority of Kanlikul district
State Cadaster of Kungrad district	Khokimiyat of Nukus district
Construction Authority of Kungrad district	State Cadastre of Nukus district
Khokimiyat of Shumanay district	Construction Authority of Nukus district
State Cadastre of Shumanay district	Agency of Culture of the Republic of Karakalpakstan
Construction Authority of Shumanay district	Ministry of Water Resources of Karakalpakstan
Khokimiyat of Kanlikul district	Karakalpakstan BEN (Backbone Electric Networks)
State Cadastre of Kanlikul district	Territorial Electricity Network Company of Karakalpakstan
National Electric Grid of Uzbekistan	
B	**Nukus SS - Sarymay SS**
Khokimiyat of Nukus district	Construction Authority of Ellikkala district

Chamber of State Cadastres of Nukus district	Khokimiyat of Turtkul district
Construction Authority of Nukus district	Chamber of State Cadastres of Turtkul district
Khokimiyat of Karauzyak district	Construction Authority of Turtkul district
Chamber of State Cadastres of Karauzyak district	Khokimiyat of Khazarasp district
Construction Authority of Karauzyak district	Chamber of State Cadastres of Khazarasp district
Khokimiyat of Beruniy district	Construction Authority of Khazarasp district
Chamber of State Cadastres of Beruniy district	Agency of Culture of the Republic of Karakalpakstan
Construction Authority of Beruniy district	Karakalpakstan BEN (Backbone Electric Networks)
Khokimiyat of Ellikkala district	Territorial Electricity Network Company of Karakalpakstan
Chamber of State Cadastres of Ellikkala district	Khorazm BEN (Backbone Electric Networks)
Ministry of Defense of the Republic of Uzbekistan North-Western Military District	Territorial Electricity Network Company of Khorazm
National Electric Grid of Uzbekistan	

C	**Sarymay SS - Karakul SS**
Khokimiyat of Khazarasp district	Chamber of State Cadastres of Zhondar district
Chamber of State Cadastres of Khazarasp district	Construction Authority of Zhondar district
Construction Authority of Khazarasp district	Khokimiyat of Karakul district
Khokimiyat of Turtkul district	Chamber of State Cadastres of Karakul district
Chamber of State Cadastres of Turtkul district	Construction Authority of Karakul district
Construction Authority of Turtkul district	Agency of Culture of the Republic of Uzbekistan
Khokimiyat of Romitan district	Karakalpakstan BEN (Backbone Electric Networks)
Chamber of State Cadastres of Romitan district	Territorial Electricity Network Company of Karakalpakstan
Construction Authority of Romitan district	Territorial Electricity Network Company of Khorazm
Khokimiyat of Peshkun district	Territorial Electricity Network Company of Khorazm
Chamber of State Cadastres of Peshkun district	Bukhara BEN (Backbone Electric Networks)
Construction Authority of Peshkun district	Territorial Electricity Network Company of Bukhara
Khokimiyat of Zhondar district	National Electric Grid of Uzbekistan

23.2.5 Overview of Project Activities

This section presents the likely activities to take place during the Project development and which will include three distinct phases: (i) planning and construction, (ii) operation, and (iii) decommissioning. Each of which is summarized below.

A. Planning and Design Phase

This phase will involve the following;

- Completion of all required studies for the Project development. This will include but not limited to ESIA, LRP, topography study, geotechnical study, etc.;
- Obtaining and finalizing required financing from IFIs;
- Finalizing all required permits;
- Appointment of EPC Contractor;
- Preparation of detailed design and layout requirements; and

- Finalize evaluations and compensations.

B. Construction Phase

The typical activities that will take place during the construction phase for OHTL by the EPC Contractor includes the following:

- Mobilization of Project team and equipment to the site and recruitment of workers;
- Undertake mobilization works for temporary facilities which will involve deployment of site offices, worker camp, worker facilities, laydown areas, etc.;
- Transportation of various Project components to the Project site to include the towers, conductors, etc. The components are expected to be transported by road to the Project area;
- Site preparation activities for the tower foundations. Such activities are limited to the individual footprint of the towers and therefore the actual area of disturbance is small. Nevertheless, such activities could include land clearing activities, excavations, and levelling;
- Installation of components such as the towers, cross-arms, insulators, etc.;
- Stringing to install the conductor wires and the ground wire which is typically undertaken through using sufficient pulling force on one end and tension capabilities on the other.
- Decommissioning of temporary facilities
- Handover to Project Operator (i.e. JSC National Electric Grid of Uzbekistan).

Note: It is expected to have 5 to 7 teams, each working in stretches of 8-10 kms. They will start with foundation first, followed by tower erection and stringing in the end.

C. Operation Phase

OHTL projects generally require extremely limited operational activities as this mainly includes the following:

- Routine maintenance and repair which would be based on a set schedule. This would include towers, conductors and accessories and would include activities such as insulators cleaning, joints tightening, checkup on foundations and its earthing, power conductor and earth wire conductor, etc.
- Non-routine maintenance which is undertaken in case of failure of any of the Project components and could include replacement of equipment such as broken insulators, worn-out cables, damaged cross-arms, etc.

As discussed earlier, all O&M activities will be undertaken by JSC National Electric Grid of Uzbekistan.

D. Decommissioning Phase

Decommissioning activities will depend on the Wind Project. The Wind Project is expected to remain operational for 25 years after which the Project could be decommissioned. Decommissioning activities

will include disassembly of the towers for final disposal. However, most of these materials are salvageable (i.e. recyclable).

23.2.6 Project Schedule

Discussed below is the preliminary and tentative schedule for the overall Project development that is available at this point, as provided by the Developer.

- Planning and Design phase: This phase is ongoing and is expected to be completed by Q4 2023 / Q1 2024;
- Construction phase: this will involve undertaking of all construction activities as identified earlier for the Project development. This is expected to require 24 months starting from Q2 2024; and
- Operation phase: is expected to start in Q4 2027 for the duration of the PPA which is as discussed earlier set for 25 years.

23.2.7 Workforce Requirements

According to information provided by the Developer, the Project will require the following workforce throughout the construction and operation phase:

- Around 400 job opportunities at peak during the construction phase for a duration of approximately 24 months. This will mainly include skilled job opportunities (to include engineers, technicians, consultants, surveyors, etc.) and semi-skilled and unskilled job opportunities (such as laborers, security personnel, housekeeping, etc.).
- As explained earlier, there is minimum O&M activities that are corrective in nature only and that will be undertaken by the internal staff within the National Electric Grid of Uzbekistan.

Taking the above into account, the Developer is aiming to hire local community members to the greatest extent possible throughout the construction phase for skilled and unskilled jobs. The Developer is committed to adhering to transparent recruitment procedures which include local community members.

23.3 Analysis of Alternatives

This section presents the alternatives that were considered for the Project development to date. This includes site alternatives as well as design alternatives, both of which are discussed in further details below.

23.3.1 General Alternatives

As a first step, the Developer first investigated whether it would be possible to connect the electricity generated from the Wind Project through existing OHTLs instead of developing a new OHTL. However, due to the factors below it was decided that a new OHTL will be required.

- The scale of the Wind Project (1.5GW) is too big for existing OHTLs capacity to handle; and
- Currently, there aren't 500kV OHTLs that run within or near the same routes for the connection points required for this Project (i.e. Nukus substation, Sarymay substation and Karakul substation).

23.3.2 Route Alternatives

The route selection process was undertaken by the Developer, throughout a third-party technical consultant. This section presents the route selection process based on the outcomes of the technical report provided by technical consultant.

Several routes and options were considered and developed until a final route was selected (as presented under "Section 23.2 " earlier) which was considered the most feasible. The several routes and options were based on the following:

- Desktop review;
- Stakeholder consultation and engagement activities;
- Collection of secondary data available from various governmental and non-governmental entities;
- Site verifications and surveys;
- Current state and department standards and regulatory requirements; and
- Clearances and permits from authorities (identified later in detail below) .

This selection process has taken into account technical factors as well as E&S factors as discussed in further details below.

Biodiversity and Avifauna

From the start and as part of the preliminary route mapping, information was collected on all Key Biodiversity Areas (KBAs) within Uzbekistan so that they are avoided. This includes nature reserves, national parks, protected areas, Important Bird Areas (IBAs), and other.

All routes and options considered have taken the above into account, including the final route as presented in the figure below.

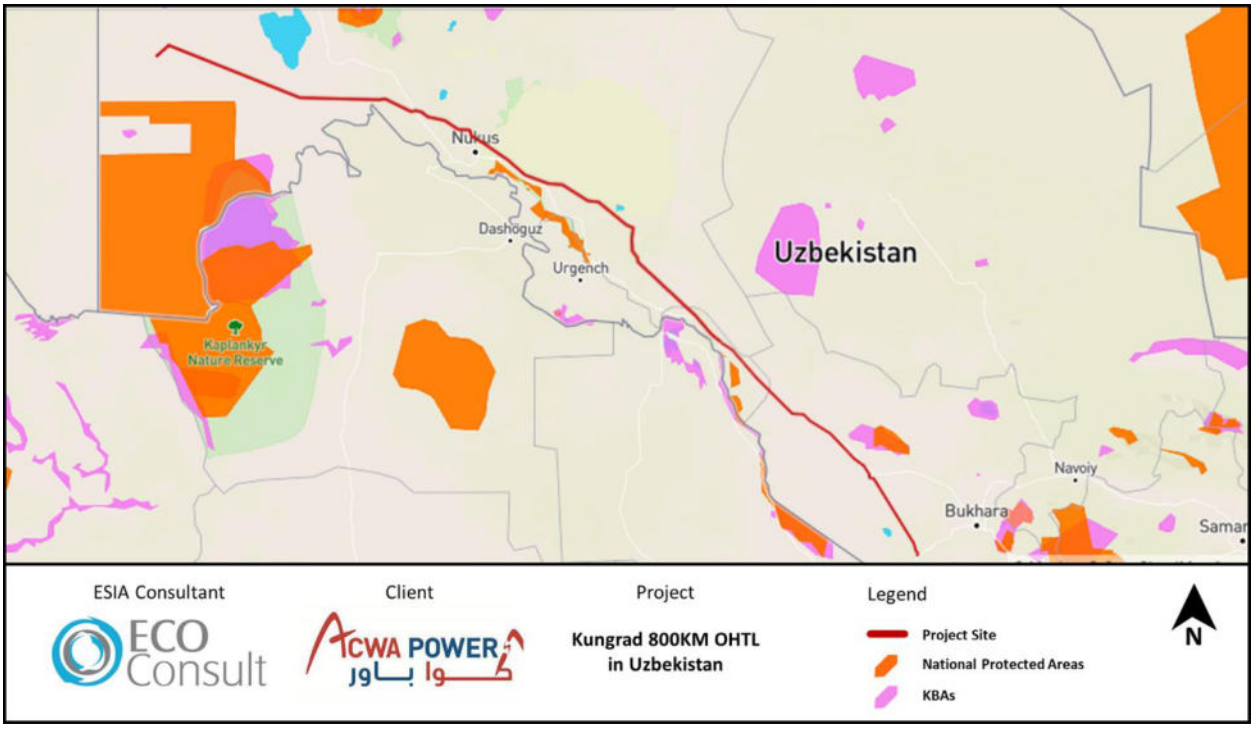


Figure 127: KBAs and National Protected Areas Around the Project

Archeology and Cultural Heritage

Consultations were undertaken with the following entities who provided location of known sites of importance within the OHTL area in general based on available databases.

- Ministry of Cultural Heritage of the Republic of Karakalpakstan;
- Agency of Cultural for Khorazm Region; and
- Agency of Cultural Heritage of Bukhara Region.

The initial routes developed avoided all areas provided except for one (1) site known as “Kyrantau Cultural Heritage Site”. Therefore, the Ministry provided detailed coordinates for this site and required that the OHTL avoid the entire site (80 hectares) – refer to Figure 130 in particular.

Based on the above, the final route has taken this into consideration as noted in the figure below.

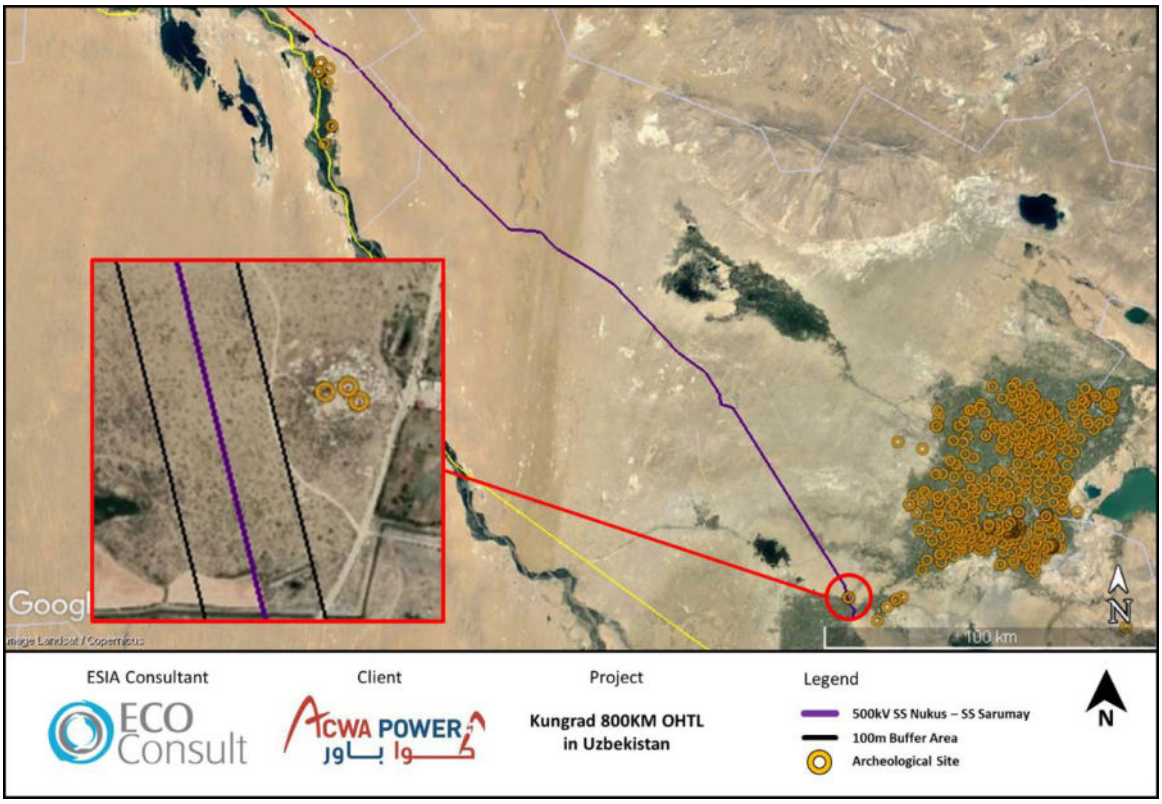


Figure 128: Archeological Site Surrounding the 500kV SS Nukus - SS Sarymay Part of the Project

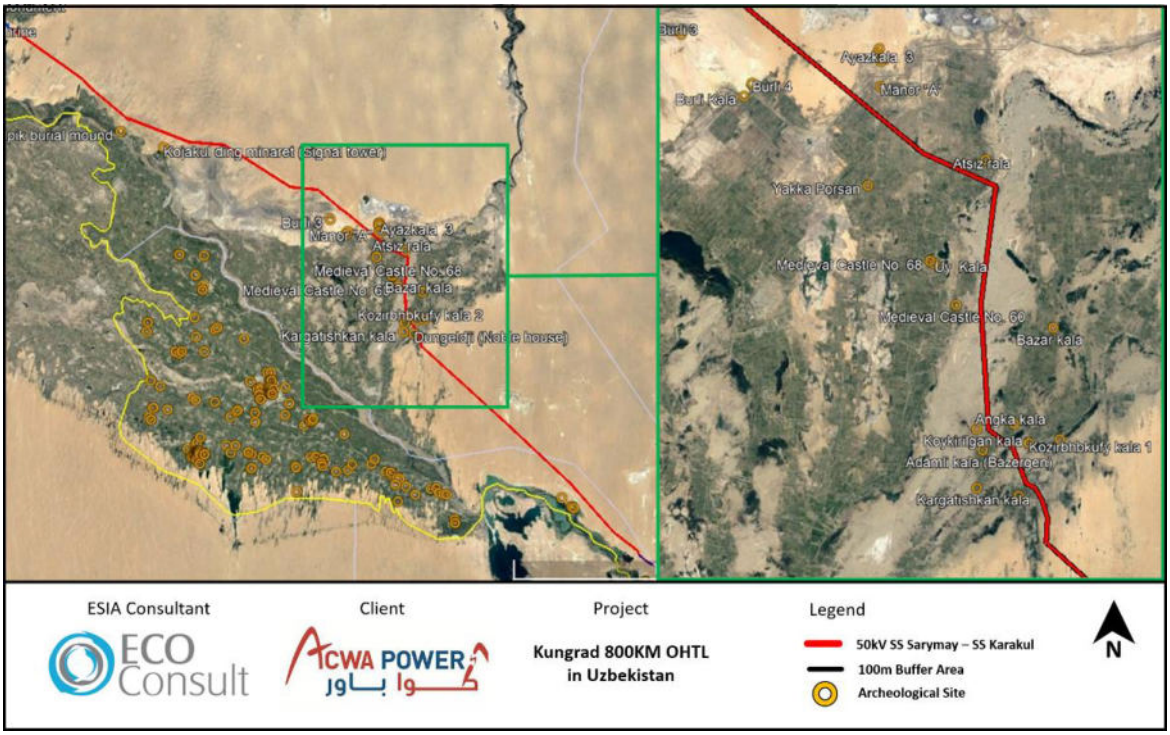


Figure 129: Archeological Site Surrounding the 500kV SS Sarymay - SS Karakul Part of the Project

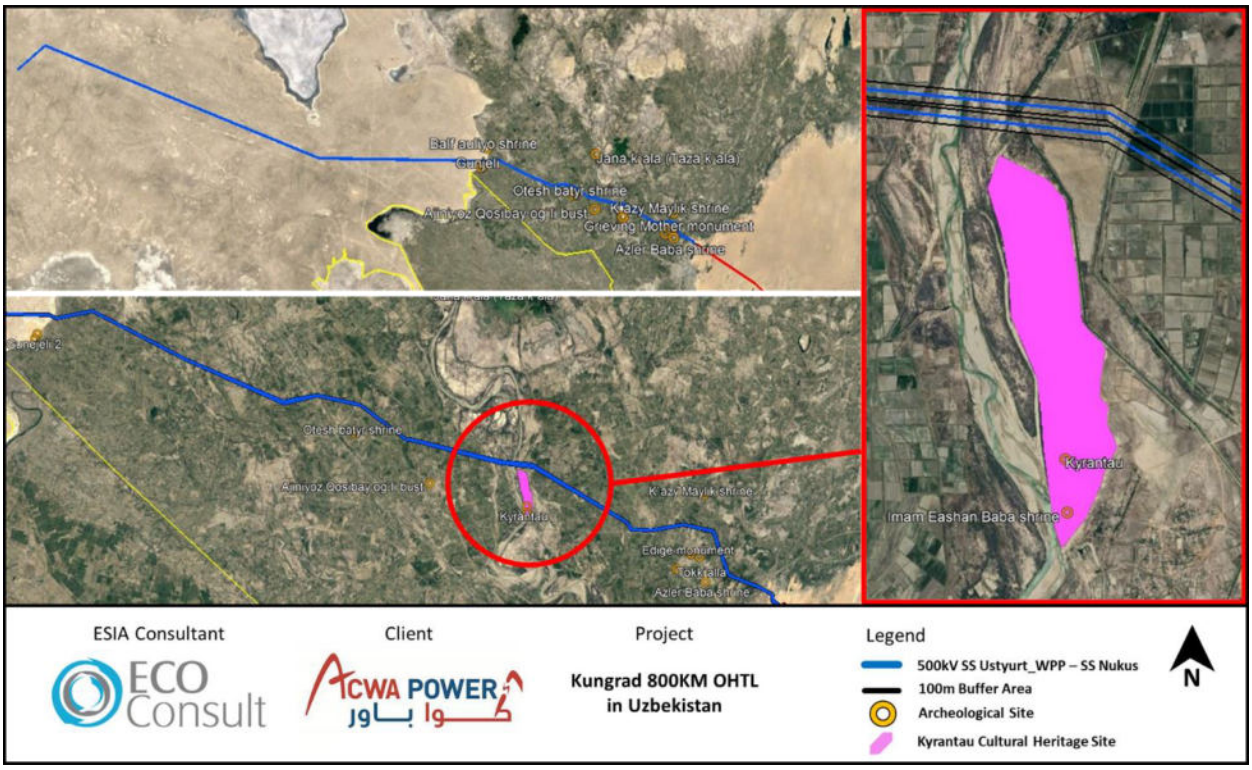


Figure 130: Archeological Site Surrounding the 500kV SS Ustyurt_WPP - SS Nukus Part of the Project

Agricultural Lands

Based on secondary data available, all OHTL routes aimed to the greatest extent possible to avoid agricultural lands. A key objective in the design of the OHTL was to select a route that is as short as possible considering the conditions for land acquisition, disturbance to agricultural lands and plantations.

However, given the requirement for the OHTL to connect with Nukus substation to supply Karakalpakstan Region with electricity, completely avoiding the agricultural lands within Kungrad, Kanlikul, and Nukus Districts as depicted in the green box in the figure below is not practically possible. The only design alternative that can be considered is to bypass the agricultural lands by running the OHTL to the north, but this would result in an increased length of the OHTL of more than 250km – which is not realistic nor feasible. Therefore, the final OHTL route must run within a total length of around 85km within agricultural lands. Refer to figure below.

Similarly, given the requirement for the OHTL to connect with Sarymay substation to supply Khorazm Region with electricity, completely avoiding the agricultural lands within the Ellikkala and Turtkul Districts as depicted in the yellow box in the figure below is not practically possible. The only design alternatives that can be considered is to bypass the agricultural lands by running the OHTL to north, but this would result in an increased length of the OHTL of around 100km which is not realistic nor feasible. Therefore, the final OHTL route must intersect with a total of around 20km of agricultural lands. Refer to figure below.

In line with the stated above, given the requirement for the OHTL to connect to Karakul substation in Bukhara Region, completely avoiding the agricultural lands within Karakul District as depicted in the orange box in the figure that follows is not practically possible. The only design alternative that can be considered is to bypass the agricultural lands by running the OHTL to the east, but this would result in an increased

length of the OHTL of more than 45km which is not realistic nor feasible. Therefore, the final OHTL route must run within a total length of around 10km within agricultural lands. Refer to figure below.

Additional details on the final route and its impacts on physical and economical displacement is presented in “Section 23.5”.

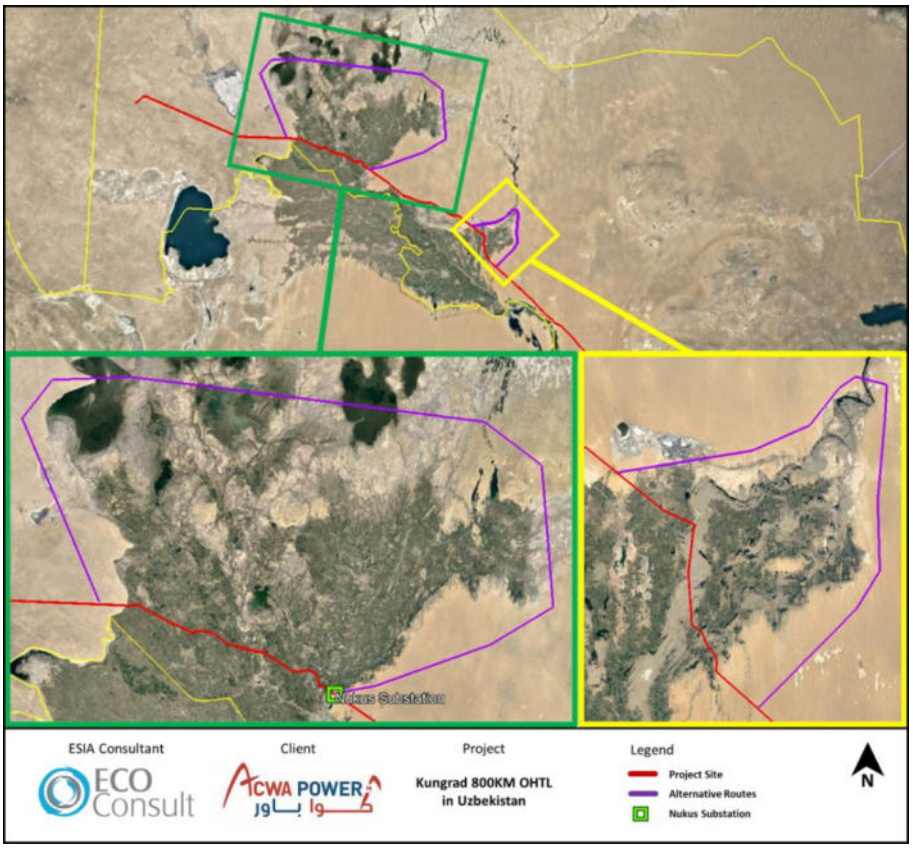


Figure 131: Alternative Routes to Avoid Agricultural Lands with Bypasses In Karakalpakstan

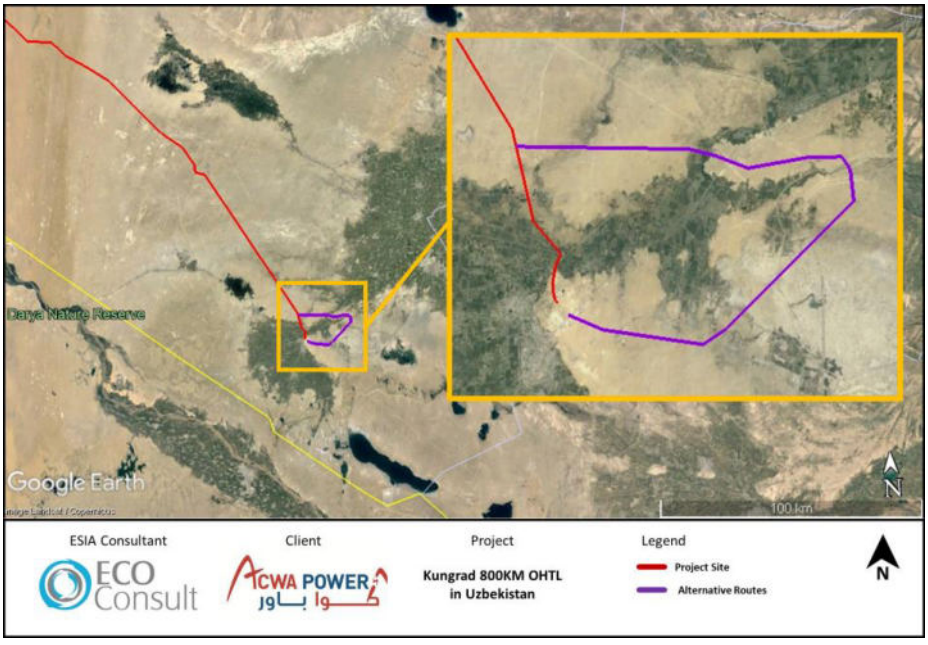


Figure 132: Alternative Routes to Avoid Agricultural Lands with Bypasses in Bukhara

Other Infrastructure and Utilities

From the start and as part of the preliminary route mapping, secondary information was collected on existing highways/roads and OHTLs. The objective of all routes proposed was to follow to the greatest extent possible exiting highways and other OHTLs. In addition, the final route has taken into account all design requirements that should be considered for intersection with highways and roads as well as other OHTLs in accordance with the "Electrical Installation Rules".

However, as part of the detailed design, the EPC Contractor will consult with relevant entities related to highways and roads to obtain technical conditions for the OHTL parts that intersect/cross existing highways and roads.

Similarly, secondary information was collected on other infrastructure elements such as civil and military airports. The OHTL is not located within or near airports (the closest airport being Nukus Airport located around 7KM from the OHTL). In accordance with local requirements, no permit or formal clearance is required from the Civil Aviation Agency (CAA) for structures that are lower than 50m in height (as discussed earlier maximum towers height is around 37m) and in addition there are no restrictions on setback distances of OHTLs from airports. However, as part of the detailed design, the EPC Contractor will consult with CAA to obtain technical conditions for the OHTL parts that run near Nukus airport (e.g. aviation lighting requirements).

Finally, secondary information was collected on other infrastructure elements such as railways. As noted in the figure below, the OHTL crosses the railway in three (3) different sections. The final OHTL has taken into account all design considerations required for railway crossings in accordance with the "Electrical Installation Rules". However, as part of the detailed design, the EPC Contractor will be required to consult with relevant entity managing the railway to obtain technical conditions for the OHTL intersections / crossings.

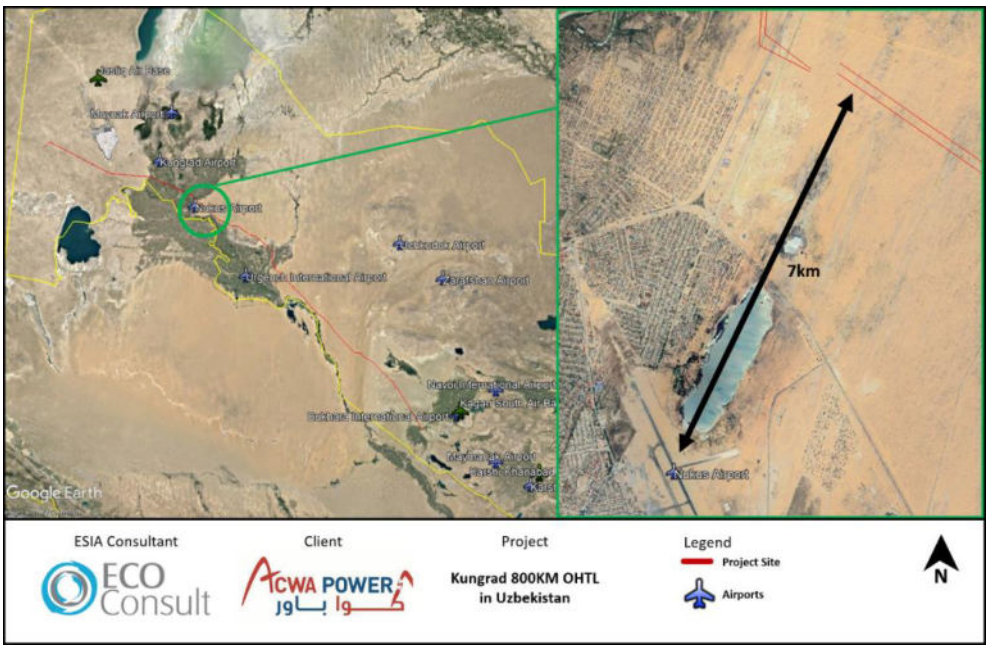


Figure 133: Project Site and Surrounding Airports

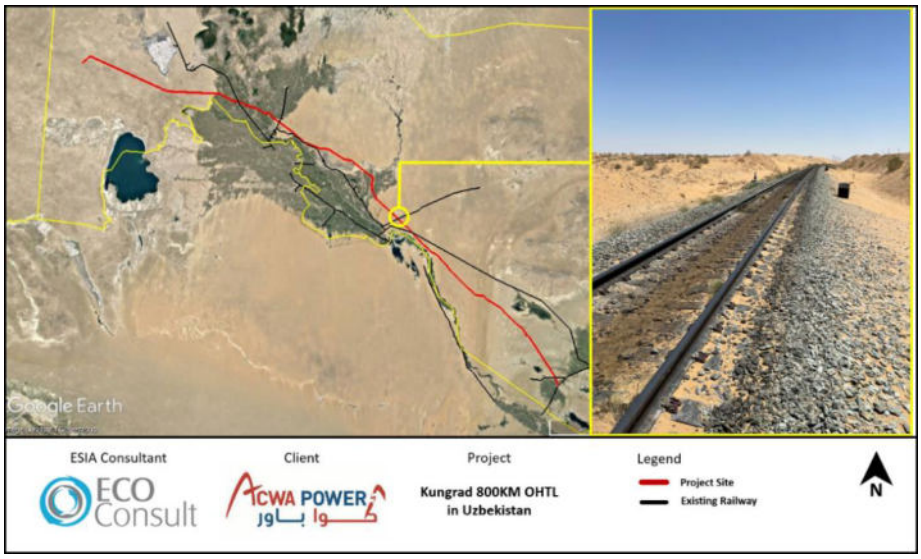


Figure 134: Project Site and Existing Railways

Oil and Gas Infrastructure

From the start and as part of the preliminary route mapping, secondary information was collected on all oil and gas pipelines. It was noted that the OHTL crosses over petroleum and gas pipelines at several points. The final OHTL has taken into account all design considerations required for oil and gas pipeline crossings in accordance with the "Electrical Installation Rules", which identifies specific requirements related to the angle of crossing. However, as part of the detailed design the EPC Contractor will be required to consult with relevant oil and gas authorities to obtain other potential technical conditions that may be required for crossings/intersections.

Community Settlements

From the start and as part of the preliminary route mapping, secondary information was collected on community settlements to include cities, towns, villages, etc. so that they are avoided. As noted in the figure below, the final route avoids all community settlements.

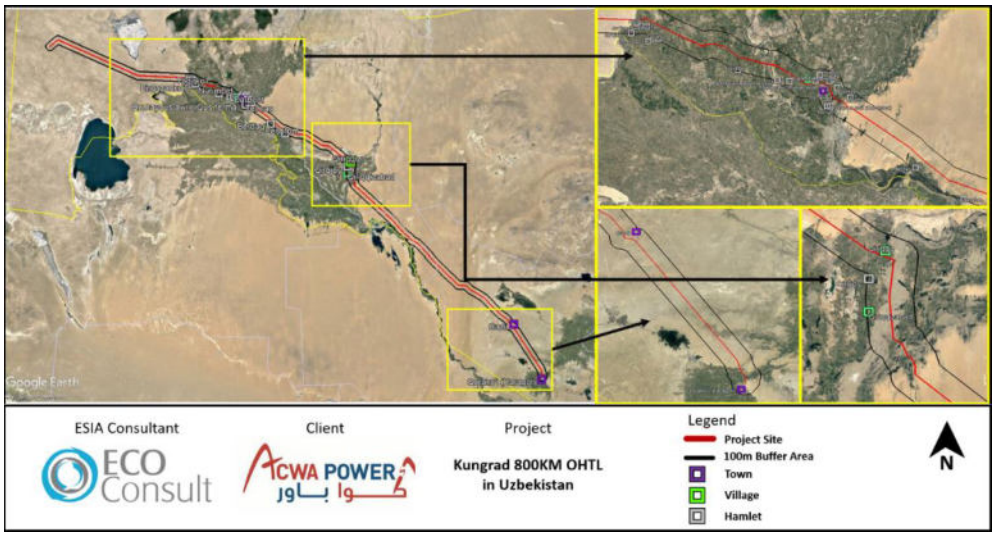


Figure 135: Closest Community Settlements

Water Resources and Water Bodies

From the start and as part of the preliminary route mapping, secondary information was collected on water bodies to include lakes, reservoirs, marshlands, water canals, rivers, etc. in order to avoid all these features.

The only exception is the Amu Darya River and Zarafshan stream as noted in the figure below. However, completely avoiding the river/stream is not practical as noted in the figure below. The only design alternative that can be considered is to bypass the Amu Darya River by running the OHTL to the north, but this would result in an increased length of the OHTL of more than 150km which is not realistic nor feasible. Similarly, bypassing the Zarafshan stream would result in an increased length of 50km. Currently, the expected crossing area of Amu Darya River is around 350m and for the Zarafshan stream is about around 20m. However, as discussed later in "Section 23.7" the Developer will avoid installing any towers within the Amu Darya River or the Zarafshan stream.

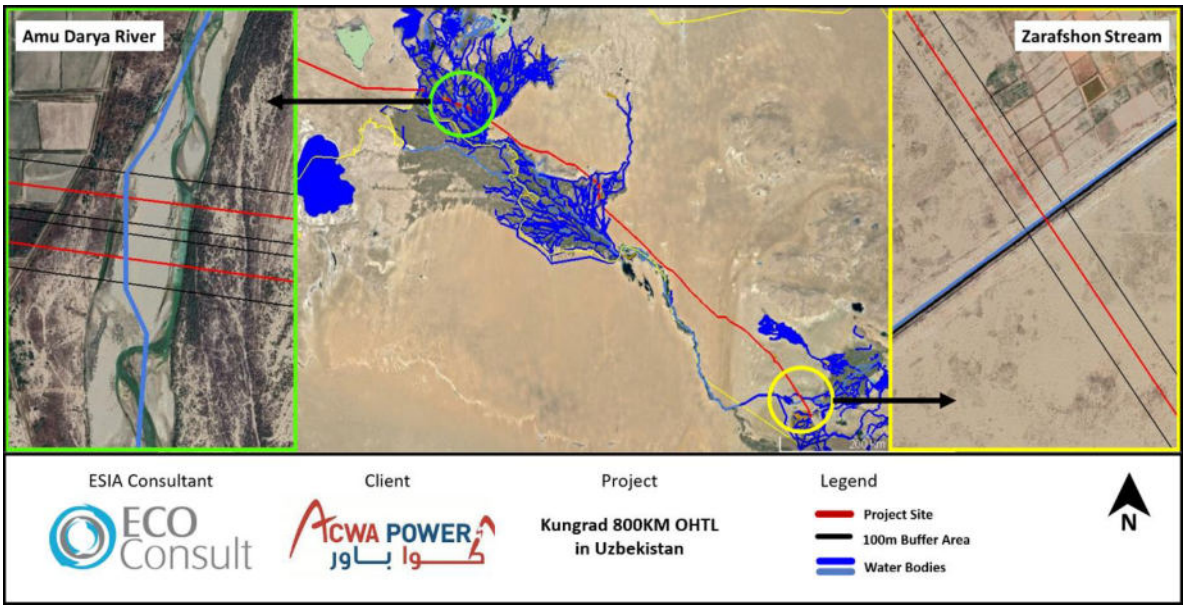


Figure 136: Project Site with Surrounding Water Bodies

Other

Based on a site survey it was noted that the initial and preliminary OHTL routes passed through a military area and compound. Further discussion and site visits were undertaken with the Ministry of Defense and Northern Military District whom provided final boundary for the military area and required a setback distance of 165m. Based on that, the final route design avoided this area and a permit was obtained on this from the Ministry of Defense.

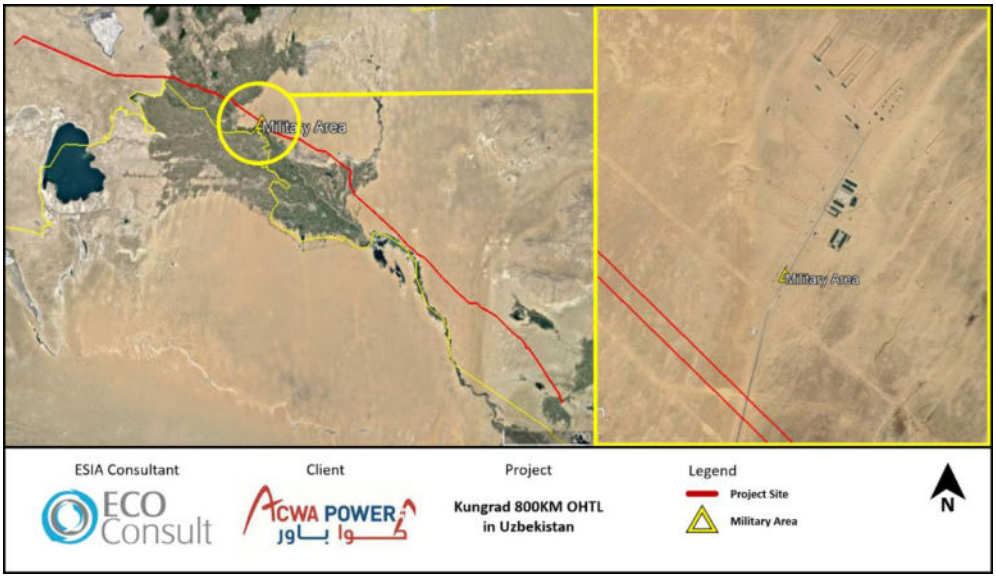


Figure 137: Military Area Adjacent to the Project

23.3.3 Design Alternatives

The Developer is committed to ensuring that all identified E&S constraints throughout the ESIA process are considered fully throughout the Project design, specifications and layout.

At the current scoping stage, no further design E&S constraints have been identified as presented throughout this section. During the updated ESIA process, there is the possibility of identifying further site-specific E&S constraints in relation to the Project site.

23.4 Landscape and Visual

23.4.1 Baseline Conditions

Landscape

Based on a site visit undertaken by the 'E&S Team', it is noted that the route runs through diverse and various landscape features that can be generally categorized as follows: (i) desert areas; (ii) agricultural areas; and (iii) areas with some shrub vegetation.

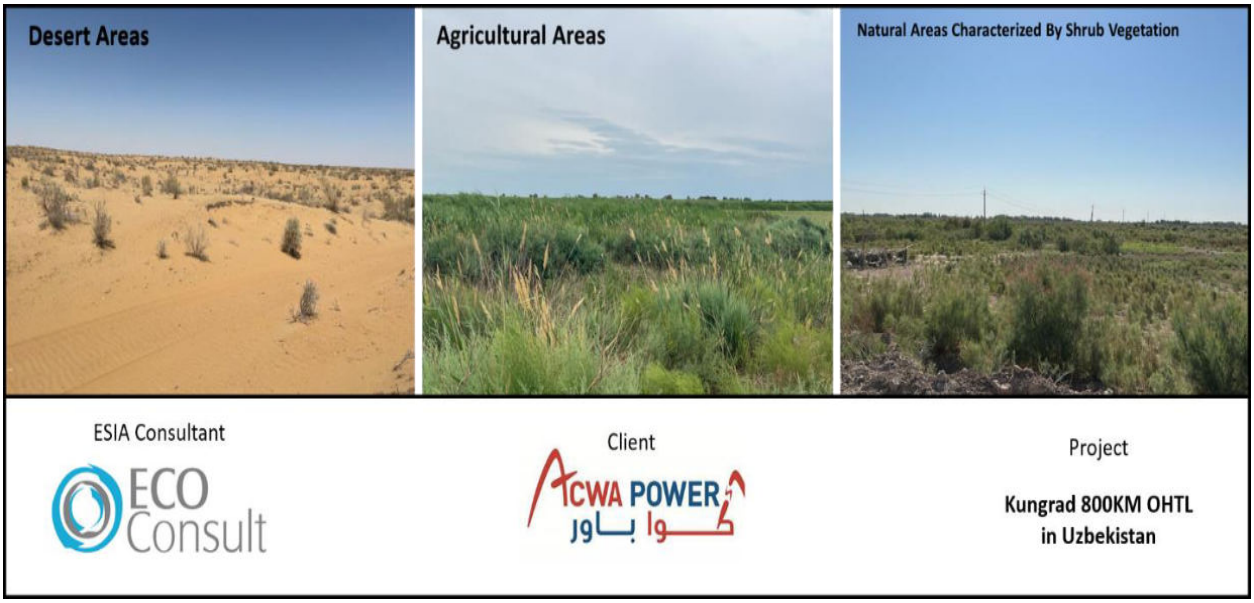
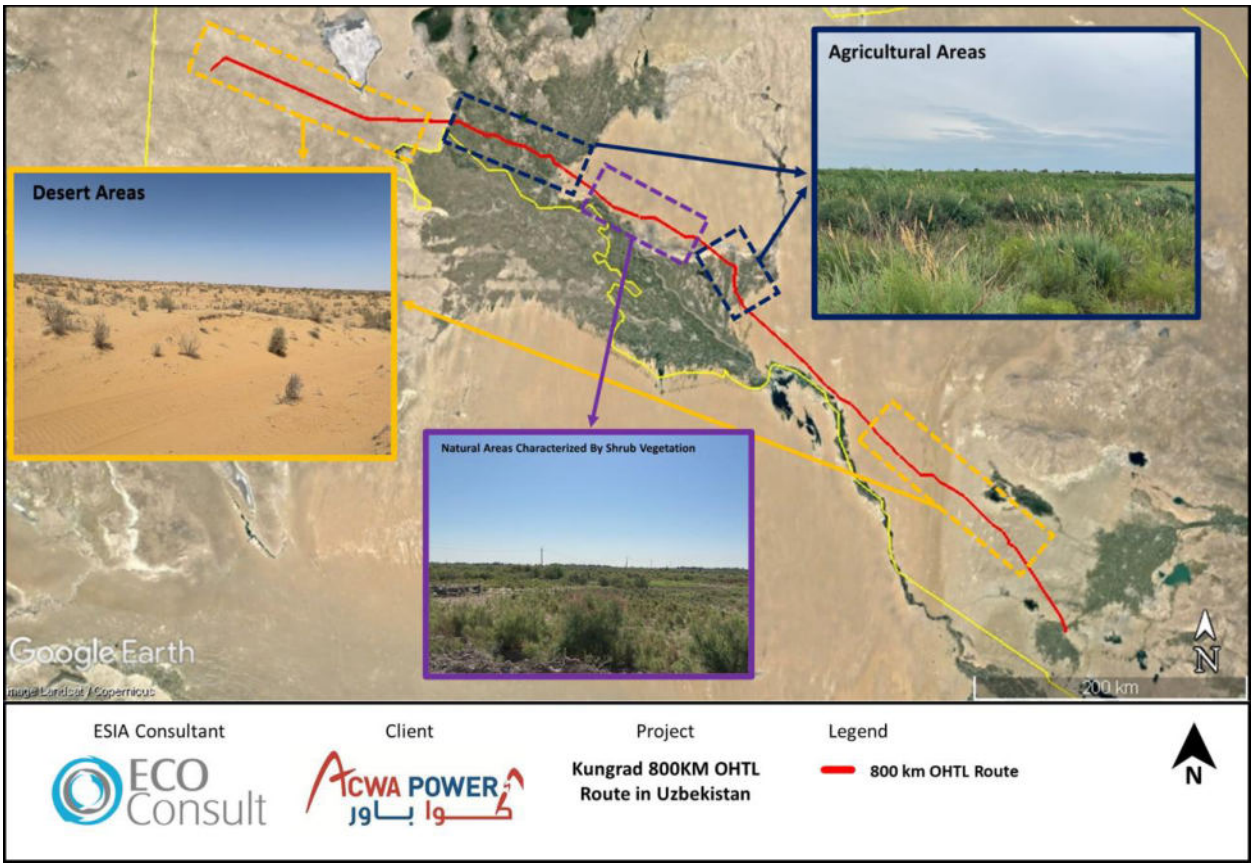


Figure 138: General Landscape and Visual within the Project

The figure below presents the general landscape features (desert, agriculture, and natural) across the OHTL.



In general, the OHTL generally runs through a uniform topographical profile with minor and gradual variations/changes in elevation, with the exception of two (2) areas as illustrated in the figure below. The first significant change features a 70m drop in elevation, while the second is around 40m.

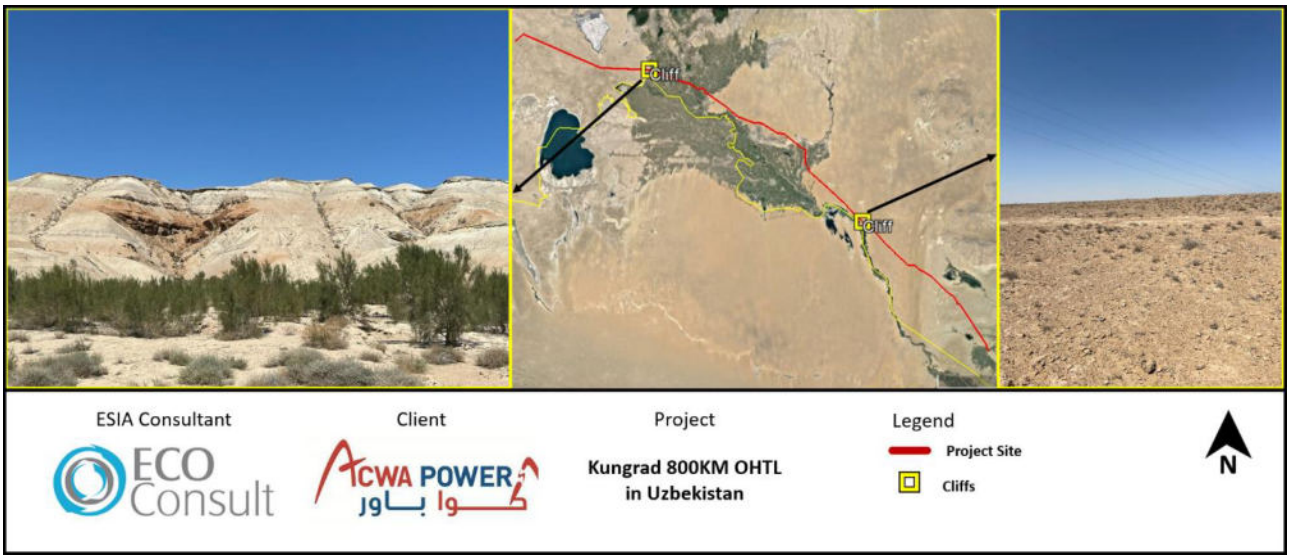


Figure 139: Key Points with Drastic Changes in Topography Along the Route

Visual

For the purpose of the assessment below, critical visual receptors is based on the "Guidelines for Landscape and Visual Impact Assessment (GLVIA)" as per the table below.

Table 100: Critical Visual Receptors

Critical Receptors definition per GLVIA
Residents at home.
People engaged in outdoor recreation, whose attention/interest is likely to be focused on the landscape or particular views, including from public rights of way.
Communities where views contribute to landscape setting enjoyed by residents.
Visitors to heritage assets or other attractions, where views of the surroundings are an important contributor to the experience.
Travelers on scenic routes

Based on a site visit undertaken by the 'E&S Team', no critical visual receptors were recorded within the OHTL route or a 100m buffer on either side.

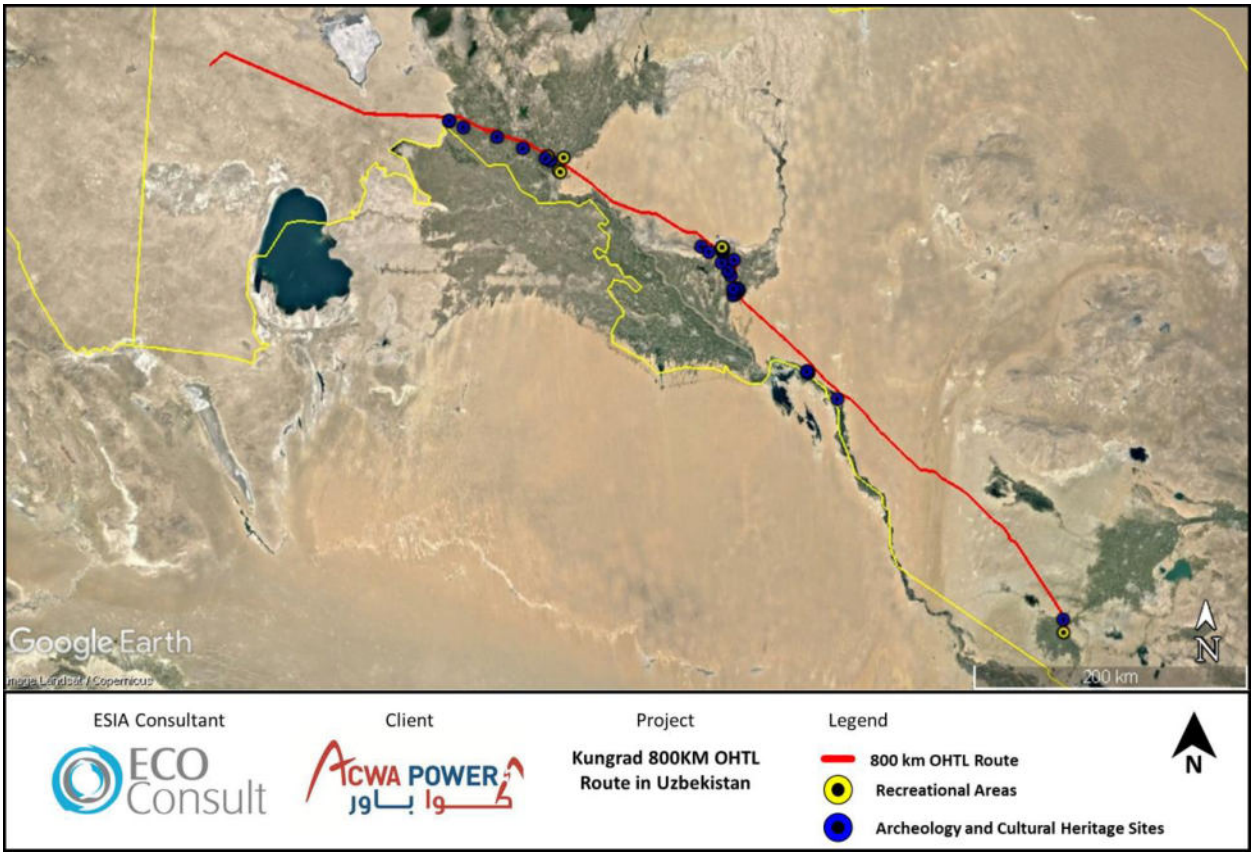
A detailed desktop review was undertaken to document all critical visual receptors in accordance with the criteria identified above. A buffer distance of 5km was selected from each end of the OHTL. A 5km radius has been selected given that the maximum height expected of the transmission towers (37m as identified earlier), no visibility is expected beyond this distance.

Table 101: Critical Visual Receptors Across the OHTL

Town/Village	Distance from OHTL (Km)
Community Settlements	
Karakul	3.2
Gazli	3.55
Qiriqqizabad	4.32
Qirqjoy	4.75
Qiriqqiz	1.25
Beshtom	4.7
Berdaq	4.14
Darbent	2.8
Toqimbet	3.96
Qumayqus awili	3.19
Mamiqshi	1.39
Jiydeli (Zheydeyli)	1.04
Shuyit	4.22
Telman	3.8
Madeniyat	3.53
Aqman'g'it	2.86
Baymaklyaul	4.65
Madeniyat	3.06
Qizilu'y	1.33
Tulegenau)	2.22

Jiydeli	1.07
Taqirko'l	4.23
Birqazanko'l	2.93
Jon'ishqaliko'l	2.43
Sag'ir awil	1.41
Abilla	0.97
Gu'njiliko'l	4.91
Qipshaq	2.28
Nurimbet	4.62
Qran taw (Krantau)	1.66
Recreational Areas	
Ashykul. A public place for to relaxation.	4.75
Yurta Yurt camp	4.22
Ayaz qala yurt camp	4.18
Central park	2.98
Hippodrome	4.96
Amphitheater	2.65
Archeology and Cultural Heritage Sites	
Azer baba shrine	2.15
Mechet shrine	4.33
Ayaz qala1 remains of fortifications of the Kushan culture	3.94
Ayaz qala2 remains of fortifications of the Kushan culture	3.57
Ruins Ayaz qala remains of fortifications of the Kushan culture	3.45
Ruins 1 of the Aqaz qala fortification	3.23
Ruins 2 of the Aqaz qala fortification	3.19
Ayaz qala 3 remains of fortifications of the Kushan culture	3.39
Oy qala fortress	3.86
Qoy qirilgan qala fortress	0.85
Angha qala fortress	1.47
Meshekli Fortress	4.17
ruins of a Meshsekli historical fortress	4.77
Historical Cemetry Uch uchoq	3.48
Shrine	3.33
Cemetry and historical monuments of Chibirdon ota	0.26
Shrine	4.30
Otesh batir shrine	2.93
Tok taw monument	4.57
Ruins of "Yakke parsan" settlement	4.51
Ruins of "Bezirgen" settlement	1.96
Gunjeli archeological site1	2.53
Gunjeli archeological site 2	2.04

Krantaw medevil settlements	3.95
Burli3 ancient object	4.53
Burli4 ancient object	4.13
Usadba A early medieval castle	1.80
Castle N60 early medieval castle	1.83
Castle N68 early medieval castle	4.20
Noname castle early medieval castle	1.45
Adamli kala early medieval antique monument	1.48
Kuzi kirilgan kala early medieval antique monument	1.21
Kargatishkan kala early medieval antique monument	3.58
Ruins of Meshekli historical fortress	4.63



23.4.2 Key Risks and Impacts during Operation

Key impacts are mainly limited to the operation phase. Visual impacts associated typically concern the OHTL towers themselves (e.g. color, height, and number) and impacts relating to their interaction with the character of the surrounding landscape and the visual receptor which might be present.

However, the towers are not considered mega or huge structures that would impose a key change on the landscape and visual character of the area. Under a worst-case scenario, views from the critical receptors identified earlier could mainly include the OHTL towers. This assumes that there will be a direct line of

sight from the receptor to the tower – i.e. that there is no blockage of view due to onsite receptors or difference of in elevation that would prevent the OHTL tower from being visible.

Although the receptor's identified above are considered sensitive, the magnitude of change is considered in general to be very small given that it is likely to include just a number of towers that would have direct views and in such a case it would result in a perceptible change in the existing view, and/or without affecting the overall quality and/or character of the view and where the OHTL would form an apparent small element in the wider landscape that may be missed by the observer or receptor.

Taking the above into account, such impacts are likely to be minor.

Operation Phase		
Type	Negative	N/A
Duration	Long-term	Throughout entire operational period
Magnitude	Low	Views will not affect overall quality and/or character of the view may be missed by the observer or receptor
Reversibility	Reversible	Given that
Sensitivity	High	Given that there are no sensitive receptors
Likelihood	High	Given nature of activities expected
Significance	**Minor**	

23.4.3 Mitigation and Monitoring Measures

A Stakeholder Engagement Plan (SEP) along with a grievance mechanism will be implemented by the Developer. Please refer to the standalone SEP for additional details. In the case grievances are received from any of the sensitive receptors in relation to tower visibility, the Developer should consider planting native vegetation or trees around the receptor location to screen the view through creating buffer zones of natural or landscaped features to help blend the OHTL into the landscape.

Following the implementation of these mitigation measures, the significance of the residual impact can be reduced to not significant.

23.5 Land Use

23.5.1 Baseline Conditions

The proposed OHTL will traverse 786.6km of land, made up of approximately 110km of small-scale commercial arable land under long-term leases from the government, and 677km of desert land which is largely owned by state institutions as reserve land or grazing land. The arable land is irrigated by an extensive network of canals. The most common crops are cotton and rice. Water shortages exist, soil is saline in many areas and some farms have been abandoned. The desert land is largely unutilized, with some sections used for livestock grazing. The OHTL will pass over gravel and asphalt roads, irrigation canals, existing small powerlines, train tracks, gas pipelines, bridges, cemeteries, and grazing areas. Micro-siting of the towers will avoid displacement impacts on this infrastructure.