REKO DIQ
MINING COMPANY

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	2024-02-23		 Sadia Asghar	 Vaqar Zakaria	 Barbara Wessels

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Executive Summary

1. Introduction

Reko Diq Mining Company (RDMC), a subsidiary of Barrick Gold Corporation (Barrick), intends to commence the Early Works (the 'Project') for the proposed Reko Diq Mining Project (the 'Mining Project'), located near Nok Kundi in the Chagai district in the Balochistan province of Pakistan. Figure 1 shows the location of the Project and associated facilities. The Early Works for the Mining Project will consist of construction of an accommodation facility at the proposed Reko Diq Mine Site, a water supply pipeline from the Fan Sediments area to the accommodation facility, and minor earthworks. The Fan Sediments will be used as a water source for the Early Works and the Mining Project. There are no doorstep communities to the proposed Reko Diq Mine Site, with the nearest being Humai approximately 20 kilometers (km) away. The early construction works are required to maintain the Mining Project delivery schedule. A separate Environmental and Social Impact Assessment (ESIA) will be submitted later to seek approval for full construction works and operations of the Reko Diq Mining Project.

2. Legal and Institutional Framework

The Early Works Project will comply with the Balochistan regulations and the ESIA process for the Early Works Project will follow the guidelines and requirements of the Balochistan Environmental Protection Act, 2012 (BEPA, 2012).

3. Project Description

The expected duration of the Early Works phase will be nine months. Activities in the Early Works will consist of:

- Fencing: Approximately 100 km of fencing will be installed, comprising a 1.8 meters (m) high chain wire fence that will demarcate the proposed Reko Diq Mine Site.
- Water Supply Source: Water for the accommodation facility will be sourced from the Fan Sediments area (Figure 1). The Fan Sediments aquifer is located northwest of the proposed Reko Diq Mine Site, extending for 70 km along the Pakistan-Afghanistan border. The water in the aquifer is saline and not suitable for drinking or irrigation, and there are no communities living in the Fan Sediments area or using water from it.
- Water Supply Pipeline: A water supply pipeline will be constructed to supply water from the Fan Sediments area to the accommodation facility as part of the Early Works for the Mining Project. The length of the pipeline will be ~78 km from the Fan Sediments area to the accommodation facility. It will utilize four to five of the existing Fan Sediments boreholes drilled by Barrick back in 2010. Boreholes will be fitted with submersible pumps, headworks, and a portable generator. The boreholes will be connected to the site via an epoxy lined and Three-Layer Polyethylene (3LPE) wrapped steel 250-millimeter (mm) diameter, buried pipeline.

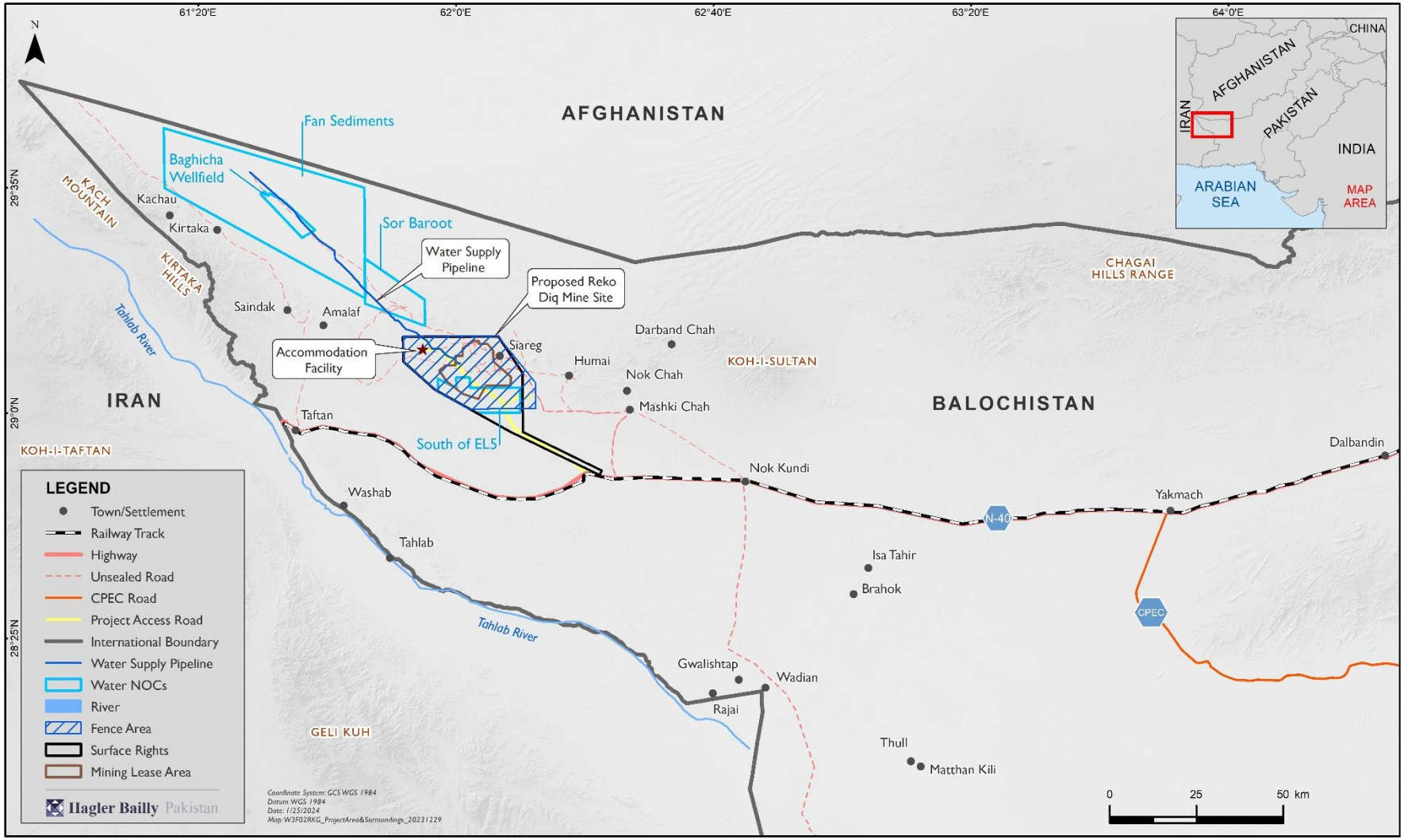


Figure 1: Early Works Activities – Accommodation Facility, Water Supply Pipeline, and Access Road

- Accommodation Facility: An accommodation facility will be constructed for workers' accommodation as part of the Early Works for the Mining Project. The accommodation facility will be constructed to accommodate about 6,400 workers during the peak construction time of the Mining Project.
- Minor Earthworks: The Early Works will comprise some minor earthworks within the mining and surface rights leases. These will likely include the preparation of an unsealed access road from the accommodation facility to the Fan Sediments area for the construction of water supply pipeline and possible upgrade of the existing site access road. This access road will be used for Project access only. Geotechnical and other field investigations are ongoing to enable finalization of infrastructure layouts. Use of multiple tracks will be avoided to minimize dust emissions and only a single site access road will be developed for the Project.
- Power Supply: Diesel generators will be employed to fulfill the energy needs during the construction of the water supply pipeline and the accommodation facility. Water sourced from the Fan Sediments will be treated at a Water Treatment Plant. The Water Treatment Plant will be located at the accommodation facility and will be a self-contained treatment unit including filtration, reverse osmosis (RO) and chlorination processes.
- Land Requirement and Acquisition: The construction of the accommodation facility will require about 0.6 km^2 (~60 hectares) of land. However, no land acquisition will be required for the accommodation facility as it will be located on the Surface Rights lease granted by the Government of Balochistan to RDMC. The construction of the water supply pipeline will require about 0.0038 km^2 (~0.38 hectares) of land. The land for the construction of the pipeline will be purchased or leased from the Government of Balochistan.

4. Analysis of Alternatives

The following alternatives were considered for assessment:

- No Project Option
  - Scenario 1: No Reko Diq Mining Project.
  - Scenario 2: No Early Works Project for the Reko Diq Mining Project.
- Water Supply Alternatives
- Pipeline Material Alternatives
- Project Routes/Site Alternatives
- Pipeline Layout Alternatives (surface vs. buried)

The selection of the alternatives for the Project design was based on technical, economic. and environmental considerations.

5. Description of Environment

5.1 Physical Environment

Physical Environment Study Area accounts for an area in which the physical environment may be impacted by the Project related activities. It includes an area of 5 km around the proposed Reko Diq Mine Site consisting of an accommodation facility and 1 km along the water pipeline route from Fan Sediments to the accommodation facility for workers' accommodation.

5.1.1 Topography

Gravel plains, sandy plains and shifting sand dunes are the dominant topographic features of the Project Area. The topographic relief in the Physical Environment Study Area is generally relatively gentle. The elevations at the proposed Reko Diq Mine Site located south of the Physical Environment Study Area are lower compared to the elevations at the north at the Fan Sediments area. The elevation gradually rises at approximately 2 meters per kilometer when moving from south to north within the Physical Environment Study Area. The topography altitude range in the Physical Environment Study Area lies between 525 m and 1,445 m above mean sea level (AMSL).

5.1.2 Geology

The Reko Diq porphyry complex is situated within the western Chagai magmatic belt in Pakistan. This magmatic belt extends over 400 km from east to west and 140 km from north to south along the border with Afghanistan and Iran. The development of the Chagai magmatic arc is attributed to the northward subduction of the Arabian oceanic plate beneath the southern edge of Eurasia.[1] Geologically, the province is divided into four main geological regions. Central Mountains Range, Chagai Hills and Ras Koh Range, Makran Mountains Range and Chagai – Kharan Basin.

5.1.3 Seismicity

The entire province of Balochistan lies in a seismically active region. The Building Code of Pakistan with Seismic Provisions – 2007[2] divides Pakistan into five seismic zones. According to these provisions, the Chagai District falls in Zone 2A with the PGA values from 0.08 to 0.16 g (where g is the acceleration due to gravity, which is equal to 9.80 meters per second square (m/s^2)).

5.1.4 Climate

The climate of the Project Area is hyper-arid. The mean annual rainfall is <100 mm/year and it receives most of its rainfall from January to March (30-50%).[3] The following are the general characteristics of the seasons:

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1 https://www.segweb.org/SEG/Events/Conference-Archive/2010/Conference-Proceedings/data/papers/posters/2337.pdf accessed on December 12, 2023

2 Government of Pakistan. 2007. *Building Code of Pakistan–Seismic Provisions Islamabad*: Ministry of Housing and Works.

3 The IUNC-Balochistan Program, water requirement of major crops in different agro-climatic zones of Balochistan.

- Summer (mid-April to mid-July): Characterized by high temperatures, very low rainfalls with moderate atmospheric humidity and high speed-winds that blow from northwest towards southeast.
- Summer Monsoon (mid-June to mid-September): Characterized by high temperatures, moderate atmospheric humidity and high speed-winds that blow from northwest towards southeast.
- Post-Monsoon summer (mid-September to mid-November): Characterized by moderate temperatures, low rainfalls and high speed-winds that normally blow from southwest towards northeast with the direction of wind changing at the end of post-monsoon summer from northwest to southeast.
- Winter (mid-November to mid-April): Characterized by low temperatures and high speed-winds that blow from northwest to southeast.

5.1.5 Water Resources and Quality

There are no surface water resources available at Fan Sediments and the proposed Reko Diq Mine Site. The proposed Project will rely on groundwater from boreholes in the Fan Sediments area, drilled by Barrick in 2010.

- A hydrocensus survey was carried out in the settlements located east and west of the proposed Reko Diq Mine Site to map the community water resources. It was observed that the settlements use water from different sourcesincluding dug wells, boreholes, and springs.
    - Dug Wells: These are the wells that are manually constructed, and the least costly way to extract water from shallow sources (10–20 meters). These wells were generally observed in the settlements east of the proposed Reko Diq Mine Site. A total of 34 dug wells were observed in the 12 settlements surveyed in the hydrocensus study.
    - Boreholes: These are the holes that are drilled by machines. These boreholes were generally observed in the settlements west of the proposed Reko Diq Mine Site. These boreholes were mostly constructed by the government and notable persons in the settlements. A total of four boreholes were observed in the 12 settlements surveyed in the hydrocensus study.
    - Springs: This is an underground water resource without any human or machine effort and is called Karez by locals. This water source was particularly observed in the Kachau, Beeduk, Bore Chah, Maskin and Kirtaka settlements located west of the proposed Reko Diq Mine Site and are at higher elevation. A total of eight springs were observed in the 12 settlements surveyed in the hydrocensus study.
- A water quality survey was carried out between April 18, 2023, and May 14, 2023. A total of five water samples were collected during 2023 survey including one sample from the boreholes at Fan Sediments (FS13-PB) and four from the community water resources. The water sample collected from Fan Sediments showed twice the hardness of the community water resources, with Total Dissolved Solids (TDS) levels approximately four times higher than those of the community water resources.

5.1.6 Air Quality

The baseline ambient air quality was assessed using the primary data collected in 2023 and secondary data obtained from the 2020 ESIA.

- The measured concentrations of PM_{10} and $PM_{2.5}$ at Siareg settlement and FC Camp at Nok Kundi were within the 24-hours limits prescribed in the BEQS.
- The measured concentrations of NO_2 and SO_2 were within the limits prescribed in the BEQS at both proposed Project site and Humai settlement in the 2023 survey.

5.1.7 Noise

Noise monitoring was conducted at Nok Kundi along the Road Route from September 24 to 25, 2022. The monitoring was carried out for a 24-hour duration. The noise measurements carried out in August 2020 and reported in 2020 ESIA were also used for preparation of the noise baseline.

- Daytime noise levels observed at Nok Kundi in 2022 comply with the prescribed limits in the BEQS for commercial areas. However, nighttime noise levels recorded at this location exceed the specified limits. The high noise levels observed at nighttime are associated with the traffic movement along the N–40 highway and high-speed winds.
- Noise levels observed at Siareg settlement in 2020 exceed the day and nighttime noise limits prescribed in the BEQS for residential area, even though there was no one living in the village and there was no anthropogenic source of noise in the area. The exceeding noise levels observed were linked with high-speed winds that are in the range of 6-8 meters per second (m/s) blowing in the area and called ‘Gorek’ in the local language.
- Noise levels observed at the access road to proposed Reko Diq Mine Site in 2020 were within the daytime noise limits prescribed in the BEQS for commercial area, however, they exceed the nighttime noise limits. The high noise levels observed at nighttime are associated with the high traffic and high-speed winds (Gorek).

5.1.8 Traffic

A traffic count was conducted along the Road Route N-40 at Nok Kundi town in 2022 from September 24 to September 25, 2022. The traffic data obtained from 2020 ESIA was also used for the access road to the proposed Reko Diq Mine Site.

- Traffic count in 2022 at Nok Kundi: The traffic starts from 6:00 to 7:00 when people go to work and tends to end around 22:00 to 23:00. Two distinct peaks are formed centered at 09:00 to 10:00 and 18:00 to 19:00 after which the traffic volume decreases continually with each passing hour. This is due to the traffic generated mainly by pickups (locally known as Zamyad and used for border trade purposes) and trucks. The traffic at peak hours represents about 16% of total traffic at this point.
- Traffic count at Access Road to the proposed Reko Diq Mine Site: The traffic starts from 6:00 to 7:00 when people go to their work and tends to end around 21:00 to 22:00. At T1-20, two distinct peaks are formed centered at 07:00 to 08:00 and 17:00 to 18:00 after which the traffic volume decreases continually with each passing hour.

This is due to the traffic generated mainly by trucks and buses which have fixed timings of morning and evening. The traffic at peak hours represents about 25% of total traffic at this point. The traffic from Reko Diq to Taftan or vice versa is negligible, as this route is not used by the locals.

5.1.9 Soil

Most soil in Balochistan has a homogenous porous structure invariably calcareous in nature. The lime content of soil varies from 5 to 30 percent. Lime is uniformly distributed in most soil textures. Where having a high lime content (> 15 percent), the soil is hard when dry and friable when moist. The organic matter content is generally low, in order of 0.3 to 0.5 percent. Most of the surface of mountains and hills slopes are bare rock without soil cover (about 70 percent). Small patches contain shallow, strongly calcareous, gravelly, and stony loams. Soil in the piedmont plains is very deep, well drained, homogeneous, silty, and strongly calcareous with an 18-20 percent lime content uniformly distributed.[4] The soils at the Project site are thin (less than 1 m in most places) and consist largely of sands and gravels with fines (silt and clay material) comprising an average of 10-30% of the total weight. A large proportion of the soil fraction has undergone aeolian (wind) transport and is still variably mobile depending on the soil fraction.

5.2 Ecology Baseline

The Ecological Study Area was demarcated by applying a buffer of 10 km around the Project's facilities and infrastructure such as proposed Reko Diq Mine Site, the Fan Sediment Water Supply Pipeline Area, and the Access Road. A summary of the ecological baseline is presented below.

5.2.1 Habitat Classification

- The Ecological Study Area was differentiated into different habitat types which include the Agricultural Area/Date Palm, Built-up Areas, Clayey Plains, Dry Streambeds, Gravel Plains, Mountains/Hills, Sandy Plains/Sand Dunes, and Wetlands.
- The most abundant habitat type in the Ecological Study Area was Gravel Plains (53.8%), followed by Mountains/Hills (24.7%), Sandy Plains/Sand Dunes (13.2%), Clayey Plains (4.5%), Dry Streambed (3.8%), Agricultural Areas/Date Palms (0.001%) and Built-up Areas (0.013%).

5.2.2 Vegetation

- A total of 41 plant species were observed during both Post-Monsoon 2022 and Spring 2023 surveys.
- All the species observed in these surveys were Least Concern except one plant species *Eucalyptus camaldulensis* which is listed as Near Threatened according to the IUCN Red List of Threatened Species.

[4] Environmental Profile, Balochistan (LARUS-IT, Enschede: Netherland, 1992)

- One Alien Plant Species (*Eucalyptus camaldulensis*) and one Alien-Invasive Plant species (*Cynodont dactylon*) were observed from the Ecological Study Area.

5.2.3 Birds

- A total of 39 birds' species were observed during both Post-Monsoon 2022 and Spring 2023 surveys.
- The conservation concern birds 'species observed include one Endangered (*Neophron percnopterus*) and one Vulnerable (*Chlamydotis macqueenii*) species while the rest of the species are Least Concern according to IUCN Red List of Threatened Species.

5.2.4 Herpetofauna

- A total of 19 herpetofauna species were observed during both Post-Monsoon 2022 and Spring 2023 surveys.
- No conservation concern herpetofauna species was observed during both Post-Monsoon 2022 and Spring 2023 surveys.
- Only one restricted range herpetofauna species i.e., Alcock's toad-headed Agama *Phrynocephalus euptilopus* was observed during the Post-Monsoon 2022 Survey.

5.2.5 Mammals

- A total of six mammalian species were observed during both Post-Monsoon 2022 and Spring 2023 surveys.
- All the species observed are Least Concern except *Gazella subgutturosa* which is listed as Vulnerable according to the IUCN Red List of Threatened Species.
- Sand Cat *Felis margarita* and Goitred Gazelle *Gazella subgutturosa* are listed as Critically Endangered while, two species i.e., Cape Hare *Lepus capensis* and Ruppell's Fox *Vulpes ruppellii* are listed as Vulnerable and one species i.e., Red Fox *Vulpes vulpes* is listed as Near Threatened according to Pakistan National List of Mammals.
- Only one species of small mammal i.e., Great Gerbil *Rhombomys opimus* was captured during both Post-Monsoon 2022 and Spring 2023 surveys. This species is listed as Least Concern according to IUCN Red List of Threatened Species.

5.2.6 Invertebrates

A total of 10 invertebrates' species were observed during both Post-Monsoon 2022 and Spring 2023 surveys. All the invertebrate species observed in these surveys were Least Concern according to IUCN Red List of Threatened Species.

5.2.7 Protected Areas in Project Vicinity

- There is no Protected Area near the Project area. However, two national parks, four wildlife sanctuaries and Ramsar sites, and three key biodiversity areas are within 500 km radius of the Project site.

5.2.8 Land Cover and Sensitivity Mapping

- Change in land use was also compared for 2021 and 2010. In 2021, a slight increase in the Built-up Area and a decline in Agricultural Areas was observed for most of the Project facilities.
- The Project facilities are located in areas that have low to moderate sensitivity. Threats due to existing anthropogenic factors and extreme dry conditions are observed for biodiversity in the area.

5.2.9 Critical Habitat Assessment

- Most of the Project facilities are in areas where the habitat is intact with no disturbance. Habitat in built-up areas and agricultural areas is modified which are only a fraction of total area while in the rest of the areas, it is a natural habitat. Overall, the habitat is declared as a Natural Habitat.
- Some conservation concerns and restricted-range species are reported/observed in the area. However, most of these species have a wide distribution range, and very rare occurrences in the area, and Project activities will not directly affect any of these species. Considering this, Critical Habitat is not triggered for any of the criteria of IFC PS6.

5.3 Socioeconomic Environment

The Socioeconomic Study Area includes an area of 40 km around the proposed Reko Diq Mine Site and 30 km along the water supply pipeline route from Fan Sediment boreholes to the permanent accommodation facility. The Socioeconomic Study Area was selected to assess the Project impacts on the communities residing near the mine site and its facilities that may be positively or negatively impacted by its activities. The socioeconomic survey included the settlements east of the Reko Diq Mine Site (Humai, Nok Chah, Mashki Chah, and Darband Chah), settlements west of the Reko Diq Mine Site (Kachau, Amalaf, and Saindak), and the nearest major towns (Nok Kundi and Dalbandin).

- The surveyed settlements located east of the Reko Diq Mine Site are in a rural setting, with adobe (Katcha) housing construction. These settlements rely mainly on dug wells to meet their water needs. Educational facilities are absent in these settlements as of the survey in 2022. However, in 2023, RDMC established primary schools, one each in Humai, Darband Chah, and Mashki Chah settlements, all of which are currently in operation. Primary sources of income include cross-border trading and livestock rearing. Some households from Nok Chah and Mashki Chah migrate to Nok Kundi and Dalbandin, in search of better employment and educational prospects for their children. Women face health-related challenges due to the absence of health facilities near the settlements; the closest one being approximately 85 km away in Nok Kundi. RDMC was observed building a Community Health Center in the Humai settlement during the survey in 2022. In September 2023, RDMC established the first Community Health Center (CHC) in Humai settlement, which is currently in operation. Similar facilities are planned for establishment in the other settlements. Furthermore, RDMC, in collaboration with the Indus Hospital &

Healthcare Network (IHHN), is in the process of constructing a larger health facility in Nok Kundi. Additionally, a Mobile Medical Unit, equipped with a laboratory and pharmacy stocked with essential medical supplies, has been set up at Nok Kundi by RDMC. The locals rely on range land as fuel, while agricultural activities are limited due to water scarcity. However, some households cultivate date palms near the settlement, utilizing water from dug wells. RDMC has established new water wells in Darband Chah and Nok Chah settlements to meet the water requirements of the communities. Additionally, a water treatment plant has been installed in the Humai settlement, and similar water treatment plants are planned for establishment in the other settlements located east of the Reko Diq Mine Site.

- The settlements located west of the Reko Diq Mine Site near Fan Sediments water supply area are connected by sealed roads to Taftan, and onwards to Nok Kundi, and Dalbandin. The residents of the Saindak settlement are predominantly employed at the Saindak Copper-Gold Project. In the settlements of Amalaf, Kachau, and Saindak, inhabitants access the health facility located within the Saindak Copper-Gold Project, and rely on electricity supplied by the project. Wood sourced from range lands serves as the primary fuel in the Kachau settlement. Additionally, both Amalaf and Saindak settlements utilize Liquefied Petroleum Gas (LPG) as a fuel source. These settlements receive their drinking water supply from the Saindak Copper-Gold Project, which pumps water from an aquifer source in Upper Tahlab near the Iran border. In the Kachau settlement, the locals used spring (local name Karez) water for both irrigation and domestic purposes.
- Nok Kundi and Dalbandin towns are situated along the Road Route that will be used for Project-related transportation. Nok Kundi is the town nearest to the Reko Diq Mine Site, while Dalbandin is the tehsil headquarters of the Chagai District. These settlements are interconnected via the national highway N-40 and show a mix of rural and urban characteristics. The areas adjacent to the N-40 highway display more urbanized development.

6. Information Disclosure and Public Consultation

The consultations were carried out for a larger extent as part of the ESIA of the proposed Reko Diq Mining Project and will be comprehensively discussed in that ESIA that will be submitted to the Balochistan-EPA at a later stage. The consultations included the details of the Reko Diq Mining Project, its facilities and activities during construction and operational phases. The discussion on the construction activities also included the Early Works activities. Further awareness and engagement specific to the early works is currently being undertaken. This section presents information limited to the scope of ESIA of the Early Works.

6.1 Consultation Process and Project Stakeholders

A transparent, unbiased, and effective consultation mechanism was adopted for the proposed Project. The main document for distribution to stakeholders during the consultation was the Background Information Document (BID). The BID informed the stakeholders about the ESIA process and how they can participate in it. In addition, it

included the details of the complete Reko Diq Mining Project and the activities involved in the Early Works.

The consultations in the Socioeconomic Study Area were carried out between September and October 2022. Keeping local norms in view, male and female consultations were held separately by male and female experts. Separate meetings with institutional stakeholders were arranged in Dalbandin and Quetta (Table 1). The consultation team consisted of two male consultation experts, two female consultation experts, and a gender specialist. The consultation team held meetings with groups of men and women in nine settlements. A total number of 174 persons (83 men and 91 women) were consulted.

Table 1: Project Stakeholders

Stakeholder Group	Stakeholder
Environmental Regulatory Department	Balochistan Environmental Protection Agency, Quetta
Government Departments	Education Department, Dalbandin
	Health Department, Dalbandin
	District Administration, Dalbandin
	Public Health Engineering (PHE) and Water and Sanitation Agency (WASA)
	District Vice Chairman Local Government and Rural Development Chagai
	Irrigation Department
NGOs	Islamic Relief (NGO), Quetta
	Balochistan Rural Support Program (BRSP)
Settlements east of the Reko Diq Mine Site	Humai, Mashki Chah, Nok Chah, and Darband Chah
Settlements west of the Reko Diq Mine Site	Kachau, Amalaf, and Saindak
Settlements along the Road Route	Nok Kundi (nearest main town) and Dalbandin (headquarters of Chagai District)

6.2 Feedback from Consultations

Following is a summary of concerns expressed by the communities:

- There will be an increase in traffic volume due to Project-related transportation resulting in subsequent increase in the number of accidents in the area.
- The community was concerned that while there will be an increase in employment opportunities for the local population, transparency in the recruiting process for local community members may not be ensured, and there may not be sufficient job opportunities for women in the Project.
- There should be an upgrade of local infrastructure and there should also be provisions for health facilities such as dispensaries, educational facilities such as private schools, and safe drinking water facilities such as RO plants.

- The proposed Project will create job opportunities however, work-related trainings should be provided to the locals to be eligible and hired during the Project activities.
- The community was concerned about the limited active participation of residents in decision-making processes and suggested empowering women through education, entrepreneurship, and small-scale industries, as well as encouraging community involvement in overseeing CSR initiatives and projects.

Following is a summary of concerns expressed by the institutions:

- The proposed Project will generate wastewater so there will be appropriate methods to manage it.
- There will be impacts on the environment, wildlife and forest due to the construction activities during Early Works.
- There should be transparency of the recruitment process and preference should be given to local community members during hiring and employment.
- There should be a grievance redress mechanism to resolve grievances of local community members.
- There should be a CSR plan by Project developers/proponents for the benefit of local communities.

7. Environmental Impacts and Mitigation Measures

7.1 Design Related Impacts

The Project will be in an open desert area with no protected areas in the vicinity and no nearby settlements. No significant impacts on physical, ecology, and social aspects are anticipated from the design of the Project.

- The Project will not involve private land acquisition as it will be constructed on land leased or purchased from the Government of Balochistan.
- No impacts are anticipated from the pipeline leakages because the design of the pipeline incorporates protective measures.
- No impacts are anticipated from the extraction of water to meet the water requirements of the Early Works activities. The proposed Project will not utilize the community's water resources; rather, the water will be sourced from the Fan Sediments.

7.2 Early Works Phase Impacts

The Early Works Phase impacts were assessed for the physical, ecological, and socioeconomic environments. For impacts relating to air quality, noise levels, traffic volume and GHG emissions, the initial and residual ratings will remain same considering the negligible impact and low significance. Moreover, Good Practice Measures will be adopted during the Early Works for such impacts.

A summary of the impacts with their initial and residual ratings are presented below (Table 2).

8. Environmental and Social Management Plan

An ESMP is the fundamental tool that ensures that all mitigation measures are consolidated, their implementation responsibilities are identified, and the resources required to implement the measures are provided. Further, the ESMP includes monitoring measures as a feedback mechanism on the implementation and effectiveness of the mitigation measures considering applicable local regulations. The ESMP will be included in all bid documents of the Project and will become a part of the Contractors' work contract. The strict implementation of the ESMP and project management's strict enforcement of adequate construction practices and standards will greatly reduce the negative impacts of the Project.

The ESMP contains the following elements:

- An institutional framework for effective implementation of the plan.
- The mitigation plan summarizes the mitigation measures to be implemented.
- A monitoring plan with guidelines on reporting and feedback.
- Suggested training programs to build capacity for the implementation of the ESMP.
- A framework for the establishment of a GRM.
- Guidelines for the development of supplementary, content specific plans including:
    - Waste Management Plan
    - Occupational Health and Safety Plan
    - Emergency Preparedness and Response Plan
    - Stakeholder Engagement Plan
    - Gender Action Plan
    - Influx Management Plan
    - Habitat Restoration Plan
- Guidelines on how changes to the ESMP and Project will be handled.

Table 2: Early Works Phase Impacts

ID	Aspect	Impact	Impact Rating	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance	+/-	Confidence
Physical Environment											
1	Air Quality	Generation of particulate matter and gaseous emissions from construction activities, vehicular movement, and diesel generators.	Ini.	Minor	Short Term	Small	Low	Unlikely	Low	-	High
			Res.	Minor	Short Term	Small	Low	Unlikely	Low	-	High
2	Noise Levels	Increase in noise levels due to operation of construction equipment and movement of construction traffic.	Ini.	Minor	Short Term	Small	Low	Unlikely	Low	-	High
			Res.	Minor	Short Term	Small	Low	Unlikely	Low	-	High
3	Traffic Volume	A slight Increase in traffic volume during the Early Works for the transportation of construction materials.	Ini.	Minor	Short Term	Small	Low	Unlikely	Low	-	High
			Res.	Minor	Short Term	Small	Low	Unlikely	Low	-	High
4	GHG Emissions	Generation of GHG emissions due to the combustion of fuel in diesel generators to meet energy requirements during Early Works.	Ini.	Minor	Short Term	Small	Low	Unlikely	Low	-	High
			Res.	Minor	Short Term	Small	Low	Unlikely	Low	-	High
5	Soil and Water Contamination	Contamination of soil and water resources due to accidental spills and releases of fuels, solvents, oils, and chemicals, and disposal of waste.	Ini.	Moderate	Short Term	Extensive	Medium	Possible	Medium	-	High
			Res.	Minor	Short Term	Small	Low	Unlikely	Low	-	High
6	Occupational Health and Safety	Risk of exposing workers to occupational health, safety, and fire hazards during the Early Works.	Ini.	Major	Short Term	Small	Medium	Possible	Medium	-	High
			Res.	Minor	Short Term	Small	Low	Unlikely	Low	-	High
Ecological Environment											
1	Disturbance of Terrestrial Habitat	Disturbance of terrestrial habitat caused by construction-related activities such as land clearance for the mine's accommodation facility, water supply pipeline, and access road.	Ini.	Major	Short Term	Small	Medium	Definite	Medium	-	High
			Res.	Minor	Short Term	Small	Low	Possible	Low	-	High
2	Impact on Abundance and Diversity	Impacts on abundance and diversity of terrestrial flora and fauna caused by construction-related activities.	Ini.	Major	Short Term	Small	Medium	Definite	Medium	-	High
			Res.	Minor	Short Term	Small	Low	Possible	Low	-	High

ID	Aspect	Impact	Impact Rating	Magnitude	Timeframe	Spatial Scale	Consequence	Probability	Significance	+/-	Confidence
Socioeconomic Environment											
1	Pressure on Social Infrastructure and Services	Increase in population due to the in-migration of job seekers (in-migrants) leading to pressure on existing social infrastructure and services in the Socioeconomic Study Area.	Ini.	Moderate	Short Term	Intermediate	Medium	Possible	Medium	-	Medium
			Res.	Minor	Short Term	Intermediate	Low	Possible	Low	-	High
2	Conflicts due to Provision of Employment to Outsiders	Disputes over the distribution of Project employment within and between the Socioeconomic Study Area inhabitants and the in-migrants resulting in social unrest.	Ini.	Moderate	Short Term	Intermediate	Medium	Possible	Medium	-	Medium
			Res.	Minor	Short Term	Intermediate	Low	Possible	Low	-	High
3	Employment Opportunities & Development Initiatives for Women	Employment opportunities inadvertently favoring men as women face barriers in participating in project jobs, thereby exacerbating their socioeconomic vulnerability.	Ini.	Minor	Short Term	Extensive	Medium	Possible	Medium	-	Medium
			Res.	Major	Short Term	Extensive	High	Definite	High	+	High
4	Employment Opportunities	Direct, indirect and induced employment at the local level for men and women, resulting in increased prosperity and wellbeing due to higher and more stable incomes of people.	Ini.	Minor	Short Term	Extensive	Medium	Possible	Medium	+	High
			Res.	Moderate	Short Term	Extensive	High	Definite	High	+	High
5	Skill Development	Increase in the stock of skilled human capital due to the transfer of knowledge and skills under the Project resulting in enhanced productivity of local labor.	Ini.	Minor	Short Term	Intermediate	Low	Unlikely	Low	+	High
			Res.	Major	Short Term	Extensive	High	Definite	High	+	High
6	Social Development	Social development projects resulting in improved infrastructure, health and education outcomes.	Ini.	Minor	Short Term	Extensive	Medium	Possible	Medium	+	High
			Res.	Major	Short Term	Extensive	High	Definite	High	+	High

Init: Initial; Res: Residual

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1. Introduction

Reko Diq Mining Company (RDMC or the 'Client'), a subsidiary of Barrick Gold Corporation (Barrick), intends to commence the early construction works for the proposed Reko Diq Mining Project, located near Nok Kundi in the Chagai district in the Balochistan province of Pakistan (Figure 1-1). The early construction works are referred to as the 'Early Works' or the 'Project' and the proposed Reko Diq Mining Project as the 'Mining Project'.

The Early Works for the Mining Project will consist of construction of an accommodation facility at the proposed Reko Diq Mine Site, and a water supply pipeline from the Fan Sediments area to the accommodation facility, and minor earthworks. The Fan Sediments will be used as a water source for the Early Works Project and the Mining Project. There are no doorstep communities to the proposed Reko Diq Mine Site, with the nearest being Humai approximately 20 kilometers (km) away. Activities in the Early Works will consist of:

- Fencing: Approximately 100 km of fencing will be installed, comprising a 1.8 meters (m) high chain wire fence that will demarcate the proposed Reko Diq Mine Site.
- Water Supply Source: Water for the accommodation facility will be sourced from the Fan Sediments area (Figure 1-1). The Fan Sediments aquifer is located northwest of the proposed Reko Diq Mine Site, extending for 70 km along the Pakistan-Afghanistan border. The water in the aquifer is saline and not suitable for drinking or irrigation, and there are no communities living in the Fan Sediments area or using water from it. Four to five of the existing Fan Sediments boreholes which were drilled by Barrick in 2010 will be utilized to meet the water needs. Water will be abstracted from the Fan Sediments at a rate of between 10 and 50 liters per second (L/s).
- Water Supply Pipeline: A 78 km long water supply pipeline will be constructed to supply water from the Fan Sediments area to the accommodation facility. The boreholes will be connected to the mine site via a buried epoxy lined steel 250-millimeter (mm) diameter pipeline.
- Accommodation Facility: An accommodation facility will be constructed for workers' accommodation as part of the Early Works for the Mining Project. The accommodation facility will be constructed to accommodate about 6,400 workers during the peak construction time of the Mining Project.
- Minor Earthworks: The Early Works will comprise some minor earthworks within the mining and surface rights leases. These will likely include the preparation of an unsealed access road from the accommodation facility to the Fan Sediments area for the construction of water supply pipeline and possible upgrade of the existing site access road.

To comply with Balochistan regulations, RDMC has engaged Digby Wells Environmental (Digby Wells) and Hagler Bailly Pakistan Pvt. Ltd (HBP or the 'in-country ESIA

Consultant') to conduct an Environmental and Social Impact Assessment (ESIA)[5] of the Early Works Project. This ESIA, referred to as the 'Early Works ESIA' or the 'Study' will meet the regulatory requirements of the Balochistan Environmental Protection Agency (Balochistan-EPA). These early construction works are required to maintain the Mining Project delivery schedule. A separate ESIA will be submitted at a later date to seek approval for full construction works and operations of the Reko Diq Mining Project (the 'Mining Project ESIA').

The focus of conducting the Early Works ESIA is to secure the necessary NOC from the Balochistan-EPA. This clearance is required to commence early construction activities for the Mining Project, encompassing activities such as installation of a water supply pipeline and the establishment of an accommodation facility. Construction cannot proceed without the EPA's approval, hence the imperative for conducting the Early Works ESIA, aligning with regulatory obligations, and satisfying EPAs.

Barrick, in a Joint Venture partnership with the Government of Pakistan and the Government of Balochistan, is undertaking a feasibility study for the Mining Project in Balochistan (Figure 1-2). As part of the feasibility study, an ESIA for the Mining Project is being conducted, including specialist studies. The ESIA will be a part of the environmental permitting process and will provide a basis for the integration of environmental and social considerations into the project design. Barrick has established RDMC as its subsidiary to manage the Mining Project and appointed Digby Wells and HBP to carry out the proposed environmental and social studies and permitting process for the Mining Project.

The ESIA of the Mining Project is being prepared according to the requirements of Balochistan-EPA and International Finance Corporation Environmental, Health, and Safety Guidelines (IFC-EHS) and IFC Performance Standards (IFC PS).

The Mining Project, for which a separate ESIA will be completed, will result in the production of copper and gold and is expected to have a life of 40 years as a truck-and-shovel open pit operation with processing facilities producing a high-quality copper-gold concentrate. As per the Reko Diq 2022 Conceptual Design, the construction is expected in two phases. Phase 1 is expected to have a capacity of 40 million tonnes per annum (MTPA) and Phase 2 with a combined process capacity of 80 MTPA.

5 The terms Environmental and Social Impact Assessment (ESIA) and Environmental Impact Assessment (EIA) refer to the assessment or processes which considers the environmental and social impacts of a proposed project or development. ESIA considers and evaluates the potential social consequences in more detail, including impacts on communities, cultural heritage, socioeconomic conditions, and human health. The Balochistan-EPA also considers the term ESIA and understands its purpose of emphasizing and covering social aspects. However, the term EIA is used in this report where the discussion was referred to the Balochistan regulations to ensure consistency with the terms used in the regulatory documents. The term ESIA is used in the rest of the report.

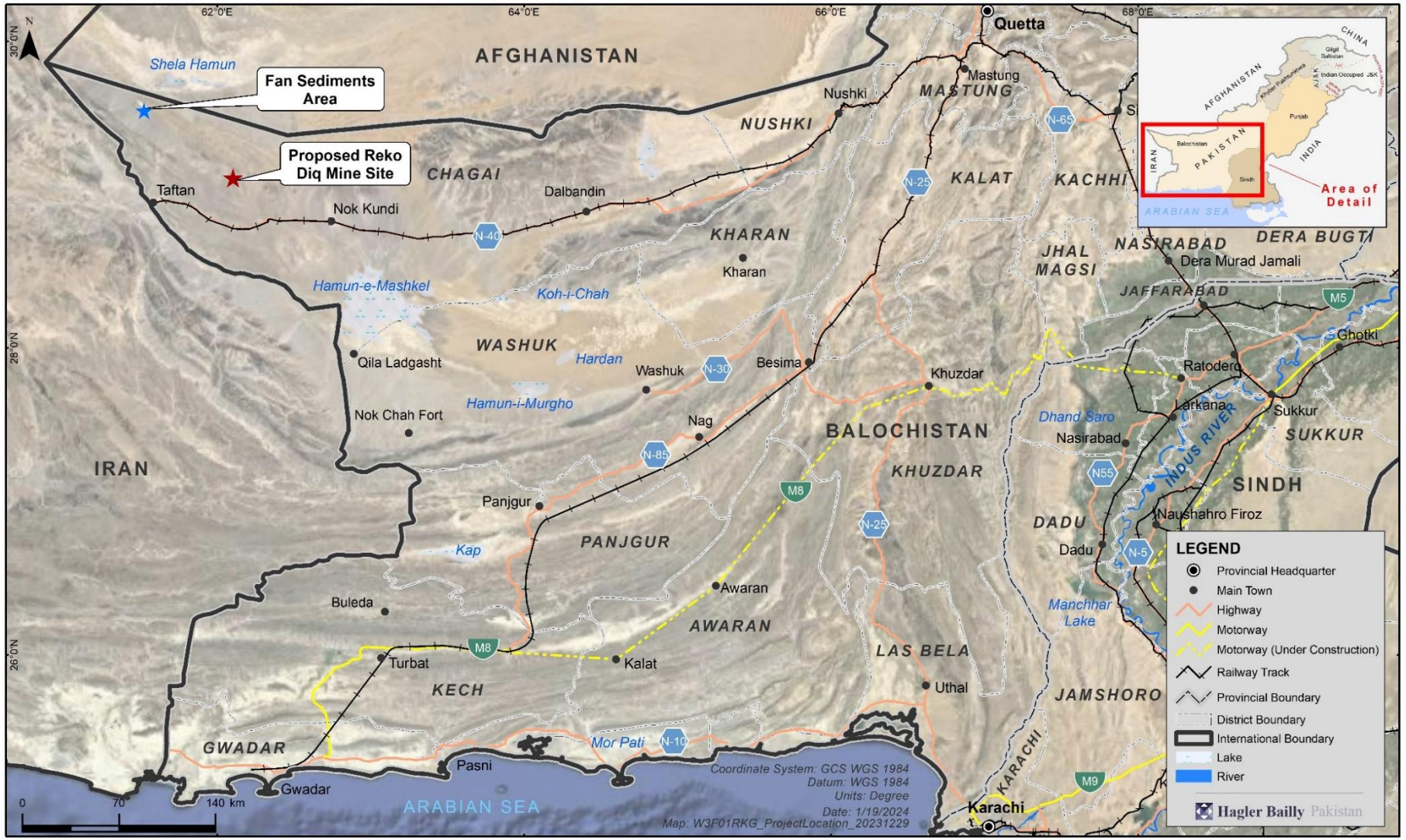
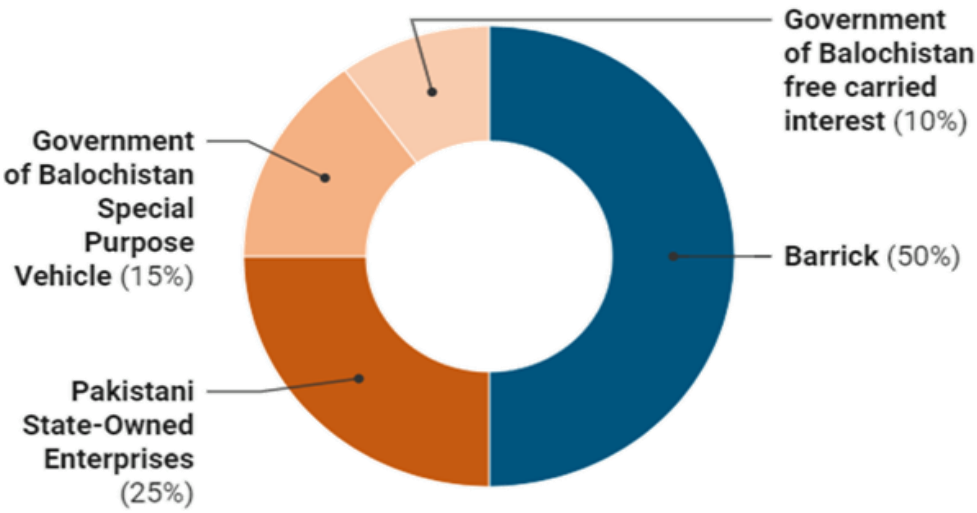


Figure 1-1: Project Location



Source: Barrick Gold Corporation website accessed on December 09, 2023.
https://www.barrick.com/English/operations/reko-diq/default.aspx

Figure 1-2: Ownership of the Reko Diq Mining Project

1.1 Proponent

RDMC, a subsidiary of Barrick, is the proponent of the Project and will undertake the Early Works for the Project. RDMC office is in Quetta, Balochistan. The office address is 121 - 127, Serena Hotel Zarghoon Road Quetta.

1.2 Project Location

The proposed Reko Diq Mine Site will be in the Nok Kundi tehsil, which is in the Chagai district of the Balochistan province. It is in the western part of the Chagai district between the Iran (approximately 128 km away) and Afghanistan (approximately 65 km away) borders. Nok Kundi is the nearest town to the Project at about 80 kilometers (km) away (Figure 1-1). There are no doorstep communities to the proposed Reko Diq Mine Site, with the nearest being Humai approximately 20 km away.

Water for the accommodation facility will be sourced from the Fan Sediments via a 78 km long buried pipeline (Figure 1-1). The Fan Sediments represent a saline aquifer located to the northwest of the proposed Reko Diq Mine Site, extending for 70 km along the Pakistan-Afghanistan border. There are no communities living in the Fan Sediments area, and the boreholes there are not in use by the local community.

1.3 Project Categorization

The Early Works consists of construction of an accommodation facility, water supply pipeline and minor earthworks. These activities are relatively minor compared to the main construction of the Mining Project and may fall in Schedule I (projects requiring an Initial Environmental Examination (IEE)) of the *Balochistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2020 (IEE/EIA Regulations 2020)*. However, an ESIA of the Early Works was conducted to obtain an environmental approval from the EPA considering the following reasons:

1. Water Supply and Treatment: Schedule I of the IEE/EIA Regulations 2020 state that the water supply schemes and treatment plants with total cost less than Pakistani Rs.

25 million will require an IEE. Given the expected total cost of the proposed water supply scheme, which involves constructing a pipeline from Fan Sediments boreholes to the accommodation facility at the proposed Reko Diq Mine Site, it is likely to exceed the IEE cost limit.

2. Urban Development and Tourism: According to the Schedule I of the IEE/EIA Regulations 2020, hotels/guest houses/buildings with less than 50 living rooms would fall under the category requiring an IEE. Based on the preliminary specifications provided by RDMC, the accommodation facility is expected to have more living rooms than the IEE threshold, requiring an ESIA.
3. Waste Disposal: Schedule I of the IEE/EIA Regulations 2020 states that the waste disposal processing facility unit for domestic or industrial wastes, with annual capacity of less than 10,000 cubic meters, would require an IEE. Considering the anticipated volume of waste generated by the accommodation facility and site, it is likely to surpass the annual capacity limit specified for an IEE.
4. Legal Requirements: While the Early Works are expected to have a minor environmental impact, obtaining approval from the EPA is essential to ensure that no activity is undertaken without the knowledge and approval of the EPA.

1.4 Project Area

The Project Area refers to the geographical area in which the activities related to the Early Works of the Mining Project are proposed to take place and in which the environmental impact of the activities is likely to happen and where the future developments will occur. The term Project Area does not imply specific spatial boundaries. For assessment of impacts on the physical environment, on ecology and on the socioeconomic environment, different Study Areas have been selected due to differences in receptors. These Study Areas are shown in their respective sections of this report. Unless otherwise specified or implied by context, the term ‘Project Area’ refers to the area within and outside of the Study Area and more specifically the area in the vicinity of the Project. The magnitude, duration, and extent of the Early Works will be minimal as compared to the main construction and operation of the Mining Project. No nearest receptor is present in the immediate vicinity of the accommodation facility and Fan Sediments water supply area.

Figure 1-3 show the Project Area and its surroundings.

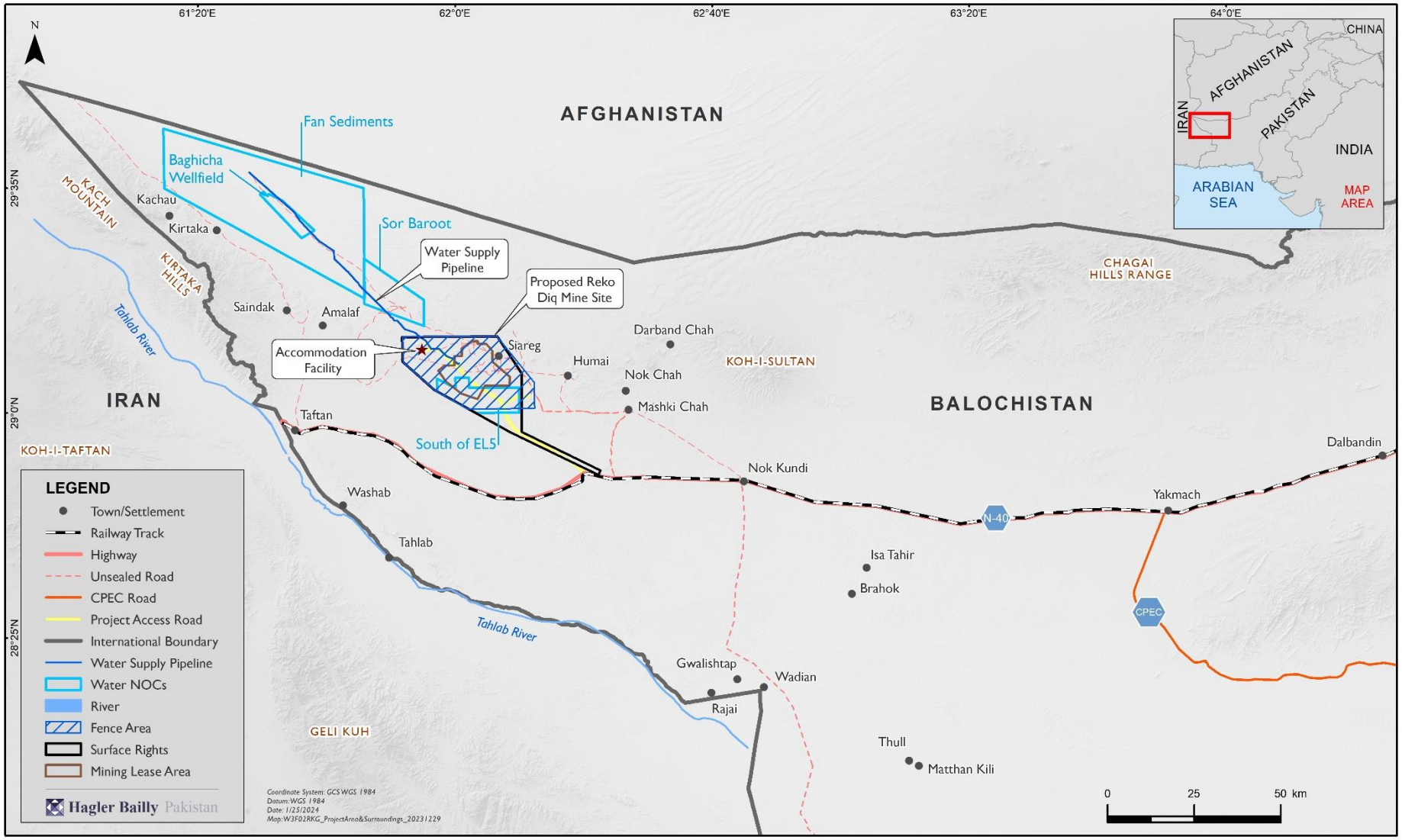


Figure 1-3: Project Area and Surroundings

1.5 Introduction of the ESIA

1.5.1 Objectives

The objectives are to:

- Ensure environmental factors are considered in the decision-making process.
- Ensure that possible adverse environmental impacts are identified and mitigated to ensure that their magnitude is within acceptable limits.
- Inform the stakeholders about the Project and its potential impacts.
- Ensure the proposed activities comply with the relevant environmental regulations in Pakistan.
- Prepare an ESIA report for consideration of decision makers, i.e., the Balochistan Environmental Protection Agency (BEPA) and other financing agencies.

1.5.2 Scope of Work

The scope of work of the ESIA will include assessment of the environmental and social impacts of the Early Works that will include:

- Construction of the accommodation facility and its associated facilities for workers' accommodation. Figure 1-4 shows the accommodation facility location within the proposed Reko Diq Mine Site.
- Construction of the water supply pipeline to supply water from the Fan Sediments area to the accommodation facility.
- Minor Earthworks: The Early Works will comprise some minor earthworks within the mining and surface rights leases and possible upgrade of the existing site access track.

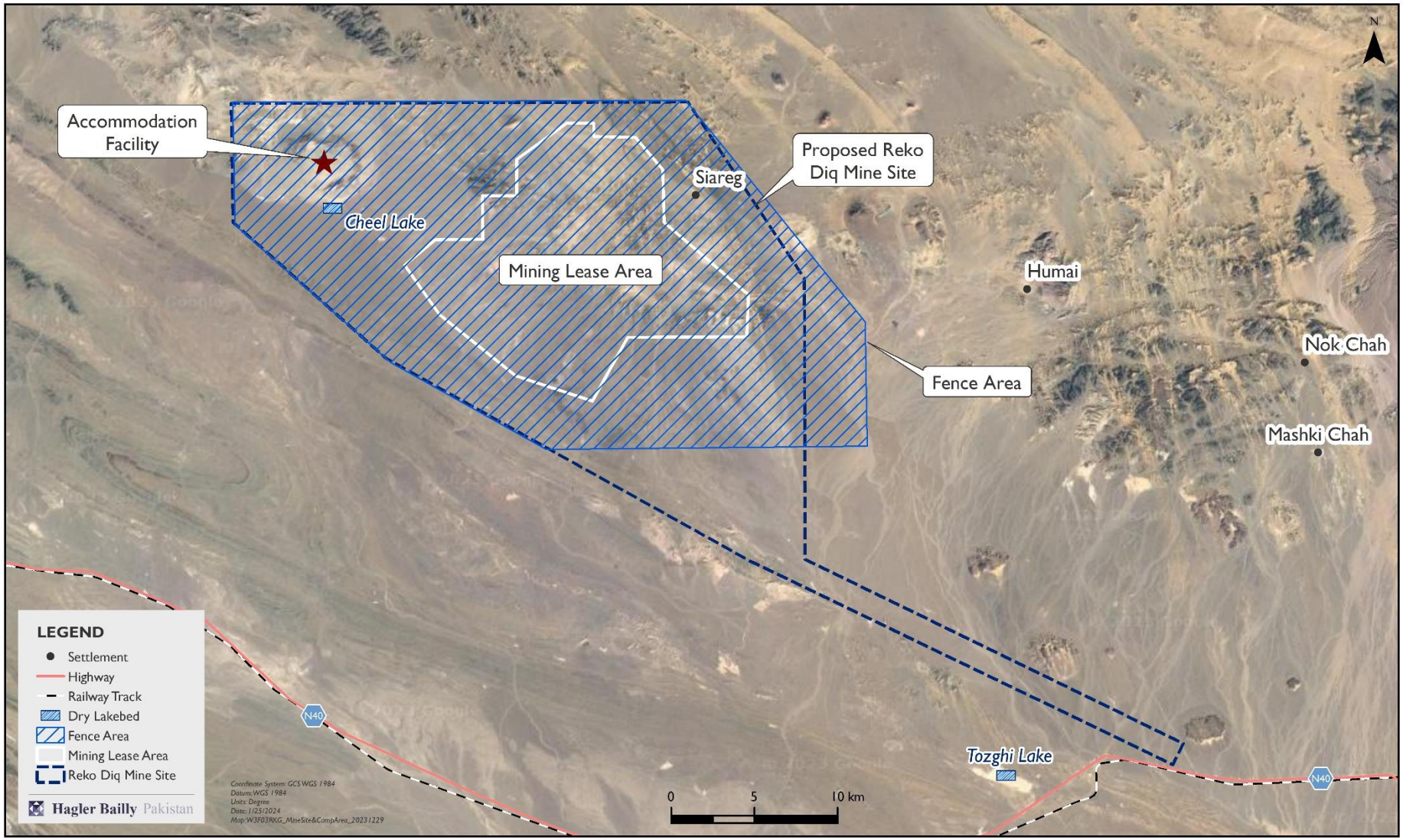


Figure 1-4: Proposed Accommodation Facility Location

1.5.3 Approach and Methodology

The ESIA was performed in four main phases, which are described below.

1.5.3.1 Scoping

The key activities of this phase included:

- *Project Data Compilation*: A generic description of the proposed activities relevant to environmental assessment was compiled with the help of the proponent.
- *Legislative Review*: Information on relevant legislation, regulations, guidelines, and standards was reviewed and compiled.
- *Identification of Potential Impacts*: The information collected in the previous steps was reviewed and potential environmental issues identified.

1.5.3.2 Baseline Data Collection

Primary and secondary baseline data collection was carried out to describe the physical, ecological, and social setting of the Project Area.

1.5.3.3 Impact Assessment

The environmental, socioeconomic, and project information collected was used to assess the potential impacts of the proposed activities. The issues studied included potential Project impacts on:

- Groundwater and surface water quality
- Ambient air quality
- Ambient noise levels and traffic
- Soil quality
- Ecology of the area, including flora and fauna
- Local communities

Wherever possible and applicable, the discussion covers the following aspects:

- Present baseline conditions
- Potential change in environmental parameters likely to be affected by Project related activities
- Identification of potential impacts
- Evaluation of the likelihood and significance of potential impacts
- Definition of mitigation measures to reduce impacts to as low as practicable
- Prediction of any residual impacts, including all long-term and short-term, direct and indirect, and beneficial and adverse impacts
- Monitoring of mitigation measures and residual impacts.

1.5.3.4 Documentation

This report documenting the ESIA process and results is prepared according to the relevant guidelines set by the Balochistan-EPA.

1.6 Organization of this Report

Section 2 (*Legal and Institutional Framework*) briefly discusses existing and applicable national legislations for sustainable development and environmental protection, and then presents the legislative requirements that need to be followed while conducting an ESIA.

Section 3 (*Project Description*) provides an overview of the activities included in the Early Works of the proposed Reko Diq Mining Project.

Section 4 (*Analyses of Alternatives*) presents the alternatives that were considered for the works or activities in the initial works, and the reasons for their selection or rejection.

Section 5 (*Description of the Environment*) provides information about the existing physical, ecological, and socioeconomic conditions within the Study Area and its vicinity.

Section 6 (*Information Disclosure and Public Consultation)* describes the outcome of public disclosure and stakeholder engagement.

Section 7 (*Environmental Impacts and Mitigation Measures*) presents an assessment of the Early Works activities on the physical, ecological, and socioeconomic environment and recommend appropriate mitigation measures.

Section 8 (*Environmental and Social Management Plan*) facilitates the implementation and monitoring of the mitigation measures identified in the environmental and social impact assessment section.

Section 9 (*Conclusions*) summarizes the ESIA findings.

2. Legal and Institutional Framework

The history of legislation drafted specifically to protect the environment in Pakistan dates to the 1980s. This section provides a brief historical and constitutional context followed by a discussion of relevant laws.

The abbreviation ESIA is one of several commonly used terms for impact assessments. Another frequently used abbreviation, "EIA" (Environmental Impact Assessment), has been adopted by the Pakistan and Balochistan legislation and guidelines. The term ESIA is used herein to emphasize the inclusion of social aspects in the impact assessment (environmental and social impact assessment) and refers to both the process undertaken and the resulting report. This ESIA is equivalent to the EIA referred to in the Pakistan and Balochistan legislation and guidelines summarized below.

2.1 Primer on Legal Instruments

Constitution: The present Constitution of Pakistan was adopted by the National Assembly of Pakistan on April 10, 1973. It has been amended twenty-five times since 1973, the last time in 2019 through the Twenty-Fifth Amendment Bill.[6] The Constitution gives the legislative powers to legislate on *environmental pollution and ecology* to the provincial assemblies.[7] Article 9 of the Constitution declares that "No person shall be deprived of life…" whereas Article 14 states the "dignity of man and, subject to law, the privacy of home, shall be inviolable." In the *Shehla Zia and Others versus Water and Power Development Authority* case (1994), the Supreme Court of Pakistan held that the right to a healthy environment was part of the fundamental right to life and right to dignity, guaranteed by Articles 9 and 14 of the Constitution, respectively.[8]

Statutes: Acts are passed by the legislative assemblies whilst ordinances are generally created when there is an urgent need for legislation and the respective assembly is not in session. Ordinances can be promulgated by the president at the national level and by governors at the provincial level. Ordinances have the same force and effect as acts but, unlike acts, they remain in force for only a limited period. During this period, the president or governors may withdraw the ordinance, or it may be disapproved or modified by the relevant legislative body. If neither happens, an ordinance will lapse after the expiry of a specified period. This difference is prescribed in the present constitution, but for a diversity of reasons, mainly linked to historical events, some ordinances have a permanent lifetime.

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6 The 9th, 11th, and 15th Amendment Bills were not passed by the parliament.

7 Prior to 18th Amendment to the Constitution (2010), this power was held by both Federal and Provincial legislatures

8 The case is considered a landmark in the constitutional history of Pakistan as it pioneered the use of judiciary to tackle complex environmental issues by interpreting the common words considering concepts of sustainable development. For example, it stated "The word life has not been defined in the Constitution, but it does not mean, nor can it be restricted only to the vegetative or animal life or mere existence from conception to death. Life includes all such amenities or facilities which a person in a free country is entitled to enjoy with dignity, legally and constitutionally." *The Role of Judiciary and Judicial Commissions on Sustainable Development Issues in Pakistan*. Dr Pervez Hassan. Paper presented at the International Judicial Conference organized by the Supreme Court of Pakistan during its Golden Jubilee Celebrations from 11-14 August, 2006. https://www.yumpu.com/en/document/view/38685782/dr-parvez-hassan-supreme-court-of-pakistan accessed on December 19, 2023.

Rules and Regulations: Rules and regulations are framed by the executive branch of the government —federal or provincial ministry or any other government agency—under powers granted to them by a specific statute. Rules are the principles to which an action or procedure is intended to conform. Rules may or may not be required to be published in the official gazette to become law. Regulations provide for specific measures that are required to put an act or ordinance into effect.

Standards: In terms of regulatory hierarchy, standards are at par with rules and regulations and are promulgated in the same manner.

Regulatory Guidelines: Compliance with guidelines is not mandatory but voluntary. The Government may, however, frame guidelines on certain issues and require through a rule or regulation adherence to these guidelines. The respective rule or regulation allows a departure from the guideline if satisfactory justification is provided to the regulatory agency.

2.2 Historical and Constitutional Context

The development of statutory and other instruments for environmental management has steadily gained priority in Pakistan since the late 1970s. The Pakistan Environmental Protection Ordinance, of 1983 was the first piece of legislation designed specifically for the protection of the environment. The promulgation of this ordinance was followed, in 1984, by the establishment of the Pakistan Environmental Protection Agency (Pak–EPA), the primary government institution at that time dealing with environmental issues. Significant work on developing the environmental policy was carried out in the late 1980s, which culminated in the drafting of the Pakistan National Conservation Strategy. Provincial environmental protection agencies were also established at about the same time. The National Environmental Quality Standards (NEQS) were established in 1993. In 1997, the Pakistan Environmental Protection Act (PEPA), 1997, was enacted to replace the 1930 Ordinance. PEPA conferred broad-based enforcement powers to the environmental protection agencies. This was followed by the publication of the *Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000* which provided the necessary details on the preparation, submission, and review of Initial Environmental Examinations (IEE) and EIAs.

Prior to the 18th Amendment to the Constitution of Pakistan in 2010, the legislative powers were distributed between the federal and provincial governments through two ‘lists’ attached to the Constitution as Schedules. The Federal List covered the subjects over which the federal government had exclusive legislative power, while the ‘Concurrent List’ contained subjects regarding which both the federal and provincial governments could enact laws. The subject of ‘environmental pollution and ecology’ was included in the Concurrent List and hence allowed both the national and provincial governments to enact laws on the subject. However, as a result of the 18th Amendment this subject is now in the exclusive domain of the provincial government other than International Treaties and Agreements. The main consequences of this change were as follows:

- The Ministry of Environment at the federal level was abolished. Its functions related to national environmental management were transferred to the provinces. To manage international obligations in the context of the environment, a new ministry—the Ministry of

Climate Change—was created at the federal level. The Ministry of Climate Change retains some of the roles of the Ministry of Environment.

- The PEPA, 1997 is technically no longer applicable to the provinces. The provinces were required to enact their legislation for environmental protection. The provinces were required to enact their own legislation for environmental protection. However, to ensure legal continuity PEPA, 1997 continued to be the legal instrument for environmental protection in the provinces till the enactment of the provincial law.

  The PEPA, 1997 specifically includes international agreements which are a federal subject. After the devolution of powers through the Constitution (18th Amendment) Act 2010, some of the Provincial Acts, such as that of Punjab, recognize that it is necessary to fulfill the obligations envisaged under the biodiversity-related Multilateral Environmental Agreements ratified by the Government of Pakistan. Nonetheless, these are within the jurisdiction of the Federal authorities.

  The Concurrent List containing subjects, on which both the Parliament and Provincial Assembly could legislate, was omitted after the 18th Constitutional amendment. The subjects on the Federal List were substantially increased by the transfer of some subjects from the omitted Concurrent List, and some subjects from Part I of the Federal Legislative List to Part II of the Federal Legislative List. While certain subjects are still governed exclusively by federal laws which take precedence over principal provincial environmental law (e.g. shipping, oil and gas, nuclear energy and nuclear waste), after deletion of the Concurrent List the additional responsibilities of the provinces related to the environment included:

- Environmental pollution and ecology
- Boilers
- Social welfare
- Evacuee property
- Ancient and historical monuments
- Safety of labor in mines, factories, and oilfields

  All four provinces have enacted their own environmental protection laws. These provincial laws are largely based on PEPA, 1997 and, hence, provide the same level of environmental protection as the parent law. However, where the laws or standards are not formulated, the federal laws shall remain applicable.

2.3 Balochistan Environmental Protection Act, 2012

The Early Works for the Reko Diq Mining Project will follow the guidelines and requirements of the Balochistan Environmental Protection Act, 2012 (BEPA, 2012). BEPA, 2012 is the basic legislative tool empowering the provincial government to frame regulations for the protection of the environment. Some of the specific requirements of the BEPA, 2012 that have direct bearing on the proposed activities are discussed below.

Appendix A includes the complete BEPA, 2012.

2.3.1 Institutional Framework

The success of environmental assessment as a means of ensuring that development projects are environmentally sound and sustainable depends in large measure on the capability of regulatory institutions for environmental management. The institutional framework for decision-making and policy formulation in environmental and conservation issues in Balochistan is briefly described below.

The Balochistan-EPA was created on February 22, 1992, and under the administrative control of the Urban Planning and Development Department. Subsequently, it was relocated under the administrative control of the Department of Environment, which was abolished and put under the administrative control of Environment, Wildlife Livestock and tourism Department. At present, due to the long consultations and endeavor, the Government of Balochistan has notified it as a separate department headed by Secretary Environment and Sports.

The Balochistan-EPA's role is to serve as the main environment regulatory body for Balochistan Province, responsible for implementing National and Provincial Laws, and improving the protection of the Environmental and Natural Resources of Balochistan, developing policies for improvement and sustainable use of natural resources.

2.3.2 Environmental Examinations and Assessments

The Balochistan-EPA established the Balochistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2020 (or the 'IEE/EIA Regulations 2020'). These establish essential policy and procedural guidelines, include a concise statement defining the purpose of environmental assessments emphasizing the overarching objective of sustainable development, and provide the necessary details on the preparation, submission, and review of the IEE, EIA, and IEE Proforma.

The Balochistan IEE/EIA Regulations 2020 repealed the provisions of the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Assessment Impact Regulations 2000, to the extent of the Province of Balochistan.

The Early Works consists of construction of an accommodation facility, water supply pipeline installation and minor earthworks. These activities are relatively minor compared to the main construction of the Mining Project and may fall in Schedule I (projects requiring an Initial Environmental Examination (IEE)) of the *Balochistan Environmental Protection Agency (Review of IEE and EIA) Regulations, 2020 (IEE/EIA Regulations 2020)*. However, an ESIA of the Early Works was conducted to obtain an environmental approval from the EPA considering the scope of the activities involved in the Early Works (**Section 1.4**, *Project Categorization*).

Guidelines in the IEE/EIA Regulations 2020 for the Preparation and Review of Environmental Reports cover the following:

- Scoping, alternatives, site selection, and format of environmental reports;
- Identification, analysis, and prediction, baseline data, and significance of impacts;

- Mitigation and impact management and preparing an environmental management plan;
- Preparation of IEE, EIA, and IEE Proforma;
- Filing of IEE, EIA, and IEE Proforma;
- Preliminary scrutiny;
- Review and decision-making;
- Conditions and validity period of approval;
- Monitoring and auditing; and
- Environmentally sensitive areas.

Guidelines for Public Consultation, which covers the following:

- Consultation, involvement, and participation;
- Identifying stakeholders;
- Techniques for public consultation (principles, levels of involvement, tools, building trust);
- Effective public consultation (planning, stages of EIA where consultation is appropriate);
- Consensus-building and dispute resolution; and
- Facilitating involvement (including the poor, women, building community, and NGO capacity).

The following articles of BEPA, 2012 provide requirements for environmental assessments:

- Article 15(1): 'No proponent of a project of public or private sector shall commence construction or operation unless he has filed an Initial Environmental Examination with the Government Agency designated by the Balochistan Environmental Protection Agency, as the case may be, or, where the project is likely to cause adverse environmental effects, an Environmental Impact Assessment and has obtained from the Government Agency approval in respect thereof.'
- Article 15(2): The agency shall:
    - a) review the initial environmental examination and accord its approval, subject to such terms and conditions as it may prescribe, or require submission of an environmental impact assessment by the proponent; or
    - (b) review the environmental impact assessment and accord its approval subject to such terms and conditions as it may deem fit to impose or require that the environmental impact assessment be re-submitted after such modifications as may be stipulated or decline approval of the environmental impact assessment as being contrary to environmental objectives.
- Article 15(3): 'No proponent of a project of public or private sector shall commence construction or operation unless he has filed an Initial Environmental Examination or Environmental Impact Assessment with the Government Agency designated by the Balochistan Environmental Protection Agency, as the case may be, or, where the project

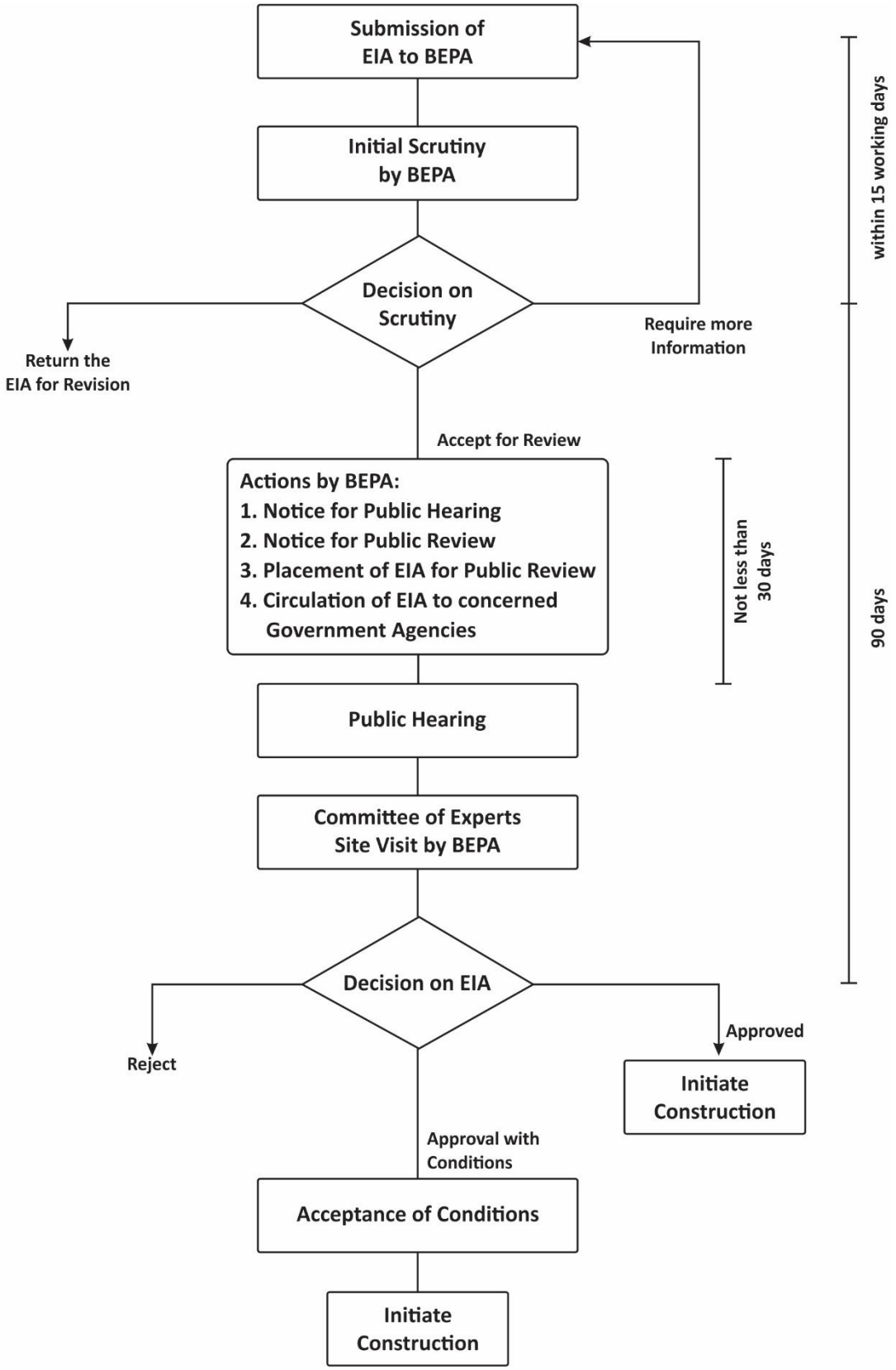
is likely to cause adverse environmental effects, an Environmental Impact Assessment and has obtained from the Government Agency approval in respect thereof.'

- Article 15(5): 'Subject to sub-section (4) the appropriate Government may in a particular case extend the aforementioned period of four months if the nature of the project so warrants.'
- Article 15(9): 'The prospect licenses for mining, quarrying, crushing, etc. shall only be awarded/ granted in compliance with the sub-section (1), (2), (3), (4) and (5)' of Article 15 as discussed above.
- Article 15(16): 'The proponent of the project shall remit fifty thousand rupees as review fee of an Initial Environmental Examination (IEE) and one hundred thousand as review fee for Environmental Impact Assessment (EIA).'

2.3.3 Environmental Approvals and Requirements for Construction, Operation and Monitoring

The following articles of BEPA, 2012 discuss environmental approvals and requirements for construction and operations:

- Article 15(4): 'The Agency shall communicate its approval or otherwise within a period of four months from the date the initial environmental examination or environmental impact assessment is filed complete in all respects in accordance with the regulations, failing which the initial environmental examination or, as the case may be, the environmental impact assessment shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations' (Figure 2-1).
- Article 15(12): 'No person or company related to public and private sector shall commence construction or operation unless the concerned building authority accord approval under the provisions of the in-vogue Building Code.'
- Article 15(13): 'After fulfilling the sub-section (12) of Article 15, an Action plan shall be submitted to the concerned municipal/town/union council to carry out the Activities for a specific period as to provide the general public or road users an alternative corridor.'
- Article 6(h): 'Establish systems and procedures for surveys, monitoring, measurement, examination, investigation, research, inspection and audit to prevent and control pollution, and to estimate the costs of cleaning up pollution and rehabilitating the environment in various sectors.'



Source: Balochistan IEE/EIA Regulations 2020

Figure 2-1: Balochistan-EPA EIA Approval Timeline

2.3.4 Environmental Quality Standards and Pollution Management

The Act applies to a broad range of issues and extends to air, water, industrial liquid effluent, marine, and noise pollution, as well as to the handling of solid and hazardous wastes.

The following articles of BEPA, 2012 provide requirements for environmental standards:

- Article 6(1)e: 'BEPA shall establish standards for the quality of ambient air, water and land, by notification in the Official Gazette in consultation with other relevant Government Departments/Agencies.'
- Article 14(1): 'Subject to the provisions of this Act and the rules and regulations made thereunder no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the Environmental Quality Standards…'
- Article 15(14): 'The waste generated during the construction or maintenance, or repair of any building shall be appropriately disposed of or transported or collected to a designated place allocated for the purpose like any landfill site to avoid public nuisance.'
- Article 17(1): 'Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle or import any hazardous substance…'
- Article 19(1): 'No person may collect, transport, sort, recover, store, dispose of or otherwise manage waste in a manner that results in a significant adverse effect.'
- Article 20(1): 'All persons, for the purpose of protection, conservation, development, use, control, and management of water resources, would take into account the following measures:
    - protecting aquatic and associated ecosystems and their biological diversity;
    - reducing and preventing pollution and degradation of water resources.'
- Article 21 (1): 'Subject to the provisions of this Act, and the rules and regulations, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the Environmental Quality Standards.'
- Article 21(5): 'The inspection or monitoring shall be carried out at least once in a month wherein a mechanism be chalked out for issuance of warning tickets (red: Highly polluted, Blue: less polluted) on a prominent on the vehicle, as the case may be for a specific period not exceeding 30 days to maintain the vehicle in order.'

Initially, Balochistan-EPA had exercised the implementation of the National Environmental Quality Standards (NEQS) 2010. However, in 2020 the agency established the Balochistan Environmental Quality Standards (BEQS). These include standards for Noise, Ambient Air, Drinking Water, and Industrial Gaseous Emission. A few standards including municipal and liquid effluents and motor vehicle exhaust/noise have not been established by BEQS. The Project will comply with the BEQS and where gaps exist, NEQS will be applicable, in line with clause 42 (v) of the BEPA, 2012.

The below exhibits outline the applicable standards. Table 2-1 outlines the NEQS for municipal and liquid effluents while Table 2-2 specifies BEQS for industrial gaseous emissions. For power plants operating on oil and coal, Table 2-3 and Table 2-4 delineate BEQS for sulfur dioxide and nitrogen dioxide. Table 2-5 provides the NEQS for vehicle exhaust and noise standards. Table 2-6**,** Table 2-7, and Table 2-8 provides the BEQS for ambient air quality, noise, and drinking water, respectively.

Table 2-1: National Environmental Quality Standards for Municipal and Liquid Industrial Effluents (mg/l, unless otherwise defined)

No.	Parameter	Standards		
		Into Inland Waters	Into Sewage Treatment[1]	Into Sea[2]
1.	Temperature increase[3]	=<3°C	=<3°C	=<3°C
2.	pH value	6 to 9	6 to 9	6 to 9
3.	Five-day bio-chemical oxygen demand $(BOD)_5$ at 20°C[4]	80	250	80[5]
4.	Chemical oxygen demand (COD)[1]	150	400	400
5.	Total suspended solids (TSS)	200	400	200
6.	Total dissolved solids (TDS)	3,500	3,500	3,500
7.	Grease and oil	10	10	10
8.	Phenolic compounds (as phenol)	0.1	0.3	0.3
9.	Chlorides (as 'Cl')	1,000	1,000	SC[6]
10.	Fluorides (a' F')	10	10	10
11.	Cyanide total (as 'CN')	1.0	1.0	1.0
12.	Anionic detergents (as MBAS)[7]	20	20	20
13.	Sulfates (SO_4)	600	1,000	SC[6]
14.	Sulfides'(s')	1.0	1.0	1.0
15.	Ammonia (NH_3)	40	40	40
16.	Pesticides[8]	0.15	0.15	0.15
17.	Cadmium[9]	0.1	0.1	0.1
18.	Chromium (trivalent and hexavalent)[9]	1.0	1.0	1.0
19.	Copper[9]	1.0	1.0	1.0
20.	Lead[9]	0.5	0.5	0.5
21.	Mercury[9]	0.01	0.01	0.01
22.	Selenium[9]	0.5	0.5	0.5
23.	Nickel[9]	1.0	1.0	1.0
24.	Silver[9]	1.0	1.0	1.0
25.	Total toxic metals	2.0	2.0	2.0
26.	Zinc	5.0	5.0	5.0
27.	Arsenic[9]	1.0	1.0	1.0
28.	Barium[9]	1.5	1.5	1.5
29.	Iron	8.0	8.0	8.0

No.	Parameter	Standards		
		Into Inland Waters	Into Sewage Treatment[1]	Into Sea[2]
30.	Manganese	1.5	1.5	1.5
31.	Boron[9]	6.0	6.0	6.0
32.	Chlorine	1.0	1.0	1.0

Explanations:

1. Applicable only when and where sewage treatment is operational and BOD = 80 mg/l is achieved by the sewage treatment system.
2. Provided discharge is not at the shore and not within 10 miles of mangrove or other important estuaries.
3. The effluent should not result in a temperature increase of more than 3°C at the edge of the zone where initial mixing and dilution take place in the receiving body. In case zone is not defined, use 100 m from the point of discharge.
4. Assuming minimum dilution 1:10 discharge, a lower ratio would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency. By 1:10 dilution means, for example, that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meters of water for dilution of this effluent.
5. The value for industry is 200 mg/l.
6. Discharge concentration at or below sea concentration (SC).
7. Methylene Blue Active substances assuming surfactant as biodegradable.
8. Pesticides include herbicides, fungicides, and insecticides.
9. Subject to total toxic metals discharge should not exceed the level given at S. No. 25.

Notes:

1. Dilution of liquid effluents to bring them to the NEQS limiting values is not permissible through freshwater mixing with the effluent before discharging into the environment.
2. The concentration of pollutants in water being used will be subtracted from the effluent for calculating the NEQS limits.

Table 2-2: Balochistan Environmental Quality Standards for Industrial Gaseous Emissions (mg/Nm^3, unless otherwise defined)

No.	Parameter	Source of Emission	Standards
1.	Smoke	Smoke opacity not to exceed	40% or 2 on Ringlemann Scale or equivalent smoke number
2.	Particulate matter[1]	(a) Boilers and furnaces:	
		i) Oil-fired	300
		ii) Coal-fired	500
		iii) Cement kilns	300
		(b) Grinding, crushing, clinker coolers and related processes, metallurgical processes, converters, blast furnaces and cupolas	500
3.	Hydrogen chloride	Any	400
4.	Chlorine	Any	150
5.	Hydrogen fluoride	Any	150
6.	Hydrogen sulfide	Any	10
7.	Sulfur oxides[2, 3]	Sulfuric acid/sulfonic acid plants	5,000

No.	Parameter	Source of Emission	Standards
		Other plants except power plants operating on oil and coal	1,700
8.	Carbon monoxide	Any	800
9.	Lead	Any	50
10.	Mercury	Any	10
11.	Cadmium	Any	20
12.	Arsenic	Any	20
13.	Copper	Any	50
14.	Antimony	Any	20
15.	Zinc	Any	200
16.	Oxides of nitrogen3	Nitric acid manufacturing unit	3,000
		Gas-fired	400
		Oil-fired	600
		Coal-fired	1,200

1. Based on the assumption that the size of the particulate is 10 microns or more.
2. Based on 1 percent sulfur content in fuel oil. Higher content of sulfur will cause standards to be pro-rated.
3. In respect of emissions of sulfur dioxide and nitrogen oxides, the power plants operating on oil and coal as fuel shall in addition to BEQS above, comply with the standards stated in Table 2-3 and Table 2-4.

Table 2-3: Balochistan Environmental Quality Standards for Sulfur Dioxide emitted by Power Plants Operating on Oil and Coal

Sulfur Dioxide Background Levels (µg/m^3)			Standards	
			Criterion I	Criterion II
Background Air Quality (SO_2 basis)	Annual Average	Maximum 24-Hour Interval	Max. SO_2 Emissions (TPD)	Max. Allowable 1-Year Average Ground Level Increment to Ambient (µg/m^3)
Unpolluted	< 50	< 200	500	50
Moderately Polluted[1]				
Low	50	200	500	50
High	100	400	100	10
Very polluted[2]	> 100	> 400	100	10

1. For intermediate values between 50 and 100 µg/m^3 linear interpretation should be used.
2. No project with sulfur dioxide emissions will be recommended.

Table 2-4: Balochistan Environmental Quality Standards for Nitrogen Oxides Emitted by Power Plants Operating on Oil and Coal

Annual arithmetic means of ambient air concentrations of nitrogen oxides (expressed as NO_2) should not exceed		100 µg/m³ (0.05 ppm)
Maximum emission levels for stationary source discharges, before mixing with the atmosphere: For fuel-fired steam generators		
	Liquid fossil fuel	130 ng/J of heat input
	Solid fossil fuel	300 ng/J of heat input
	Lignite fossil fuel	260 ng/J of heat input

Table 2-5: National Environmental Quality Standards for Motor Vehicle Exhaust and Noise

No.	Parameter	Standards (Maximum Permissible Limit)		Measuring Method
1.	Smoke	40% or 2 on the Ringelmann Scale during engine acceleration mode.		Compared with the Ringlemann chart at a distance of 6 meters or more.
2.	Carbon Monoxide	Emission Standards:		
		New Vehicles	Used Vehicles	
		4.5%	6%	Under idling conditions: Nondispersive infrared detection through the gas analyzer.
3.	Noise	85 db (A)		Sound-meter at 7.5 meters from the source.

Table 2-6: Balochistan Environmental Quality Standards for Ambient Air Quality

Pollutants	Time-weighted Average	Concentration
Sulfur Dioxide (SO_2)	Annual Average*	80 µg/m³
	24 hours**	120 µg/m³
Oxide of Nitrogen as (NO)	Annual Average*	40 µg/m³
	24 hours**	40 µg/m³
Oxide of Nitrogen as (NO_2)	Annual Average*	40 µg/m³
	24 hours**	80 µg/m³
O_3	1 hour	130 µg/m³
Suspended Particulate Matter (SPM)	Annual Average*	360 µg/m³
	24 hours**	500 µg/m³
Respirable particulate Matter. PM_{10}	Annual Average*	120 µg/m³
	24 hours**	150 µg/m³
Respirable Particulate Matter. $PM_{2.5}$	Annual Average*	15 µg/m³
	24 hours**	35 µg/m³
	1 hour	15 µg/m³
Lead (Pb)	Annual Average*	1 µg/m³
	24 hours**	1.5 µg/m³

Pollutants	Time-weighted Average	Concentration
Carbon Monoxide (CO)	8 hours**	5 mg/m^3
	1 hour	10 mg/m^3

* Annual arithmetic means a minimum 104 instruments in a year taken twice a week 24 hourly at uniform interval.

** 24 hourly /8 hourly values should be met 98% of the in a year. 2% of the time, it may exceed but not on two consecutive days.

Table 2-7: Balochistan Quality Standards for Noise 2020 (dBA)

No.	Category of Area/Zone	Time	
		Daytime	Nighttime
1.	Residential are (A)	55	45
2.	Commercial are (B)	65	55
3.	Industrial area (C)	75	65
4.	Silence zone (D)	50	45

Note:

1. Limit in dB(A) Leq (time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.)
2. Day time hours: 6:00 am to 10:00 pm
3. Nighttime hours: 10:00 pm to 6:00 am
4. Silence zone: Zones that are declared as such by the competent authority. An area comprising not less than meters around hospitals, educational institutions and courts and courts.
5. Mixed categories of areas may be declared as one of the four above-mentioned categories by the competent authority.

Table 2-8: Balochistan Environmental Quality Standards for Drinking Water

Properties/ Parameters	Standard Values	WHO Standards	Remarks
Bacterial			
All water intended for drinking (E.Coli or Thermo tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Note 1
Treated water entering the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Note 1
Treated water in the distribution system (E. coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample in case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.	Must not be detectable in any 100 ml sample in case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.	Note 1
Physical			
Color	≤15 TCU	≤15 TCU	
Taste	Non objectionable/Accept able	Non objectionable/Accept able	
Odor	Non objectionable/Accept able	Non objectionable/Accept able	
Turbidity	< 15 NTU	< 15 NTU	
Total hardness as CaCO3	< 500 mg/l	–	

Properties/ Parameters	Standard Values	WHO Standards	Remarks
TDS	< 1000	< 1000	
pH	6.5 – 8.5	6.5 – 8.5	
Chemical			
Essential Inorganic	mg/Liter	mg/Liter	
Aluminum (Al) mg/1	<0.2	0.2	
Antimony (Sb)	<0.005	0.02	
Arsenic (As)	< 0.05	0.01	Note 2
Barium (Ba)	0.7	0.7	
Boron (B)	0.3	0.3	
Cadmium (Cd)	0.01	0.003	Note 2
Chloride (Cl)	<250	250	
Chromium (Cr)	<0.05	0.05	
Copper (Cu)	2	2	
Toxic Inorganic	mg/Liter	mg/Liter	
Cyanide (CN)	<0.05	0.07	Note 2
Fluoride (F)*	<1.5	1.5	
Lead (Pb)	<0.05	0.01	Note 2
Manganese (Mn)	< 0.5	0.5	
Mercury (Hg)	<0.001	0.001	
Nickel (Ni)	<0.02	0.02	
Nitrate (NO_3)	<50	50	
Nitrite (NO_2)	<3	3	
Selenium (Se)	0.01	0.01	
Residual chlorine	0.2-0.5 at the consumer end 0.5-1.5 at the source	–	
Zinc (Zn)	5.0	3	Note 2
Alpha Emitters bq/L or pCi	0.1	0.1	
Beta emitters	1	1	
* Indicates priority health-related inorganic constituents that need regular monitoring.			

Notes:

1. Most Asian countries also follow WHO standards.
2. The standard for Pakistan is similar to most Asian developing countries.

2.4 Other Environmental Laws

The regulations pertaining to the below aspects shall not apply to the Early Works ESIA. These will be comprehensively discussed in the ESIA of the complete Reko Diq Mining Project, which will be submitted at a later stage to the Balochistan-EPA for approval.

- Regulations related to mining and its processes including blasting or the use of explosives as the scope of Early Works does not include mining.

- Regulations related to protected areas, heritage sites, and surface waters. The Early Works for the Reko Diq Mining Project will include the proposed Reko Diq Mine Site and the Fan Sediments water supply area as the possible work locations. These locations do not include any reserve forest or protected area, cultural or archeological sites and running river or surface water body, therefore, the regulations related to these aspects will not apply to the Early Works assessment.
- Regulations related to generation, transmission, and distribution of electricity. There will be no power plants to meet energy requirements, therefore, the regulations related to the generation, transmission, and distribution of electric power to consumers, will also not be applicable. Diesel generators will be employed to fulfill the energy needs during the construction of the water supply pipeline and the accommodation facility. Furthermore, these gensets will serve the overall energy requirements of the accommodation facility once it is operational.
- Regulations related to land acquisition. No land acquisition will be required for the accommodation facility as it is located on the Surface Rights lease granted by the Government of Balochistan to RDMC. Moreover, the pipeline installation and bore field is on government-owned land and will be acquired by Government following applicable policies.
- Regulations related to hazardous wastes as the proposed activities will only generate oily waste, domestic waste, and sewage, none of which are classified as hazardous.

Table 2-9 provides a list of environmental laws that may have relevance to the Early Works of the Mining Project including provincial and national legislations.

Table 2-9: Environmental Laws and Relevancy to the Project

Law	Description	Applicability to the Project
The Balochistan Occupational Safety & Health Act 2022, Act No. XXXIII of 2022.	This legislation is enacted to establish provisions for occupational safety and health conditions at all workplaces, safeguarding individuals from injury risks arising from workplace activities. The aim is to cultivate a safe, healthy, and conducive working environment that caters to the physical, physiological, and psychological needs of all individuals at work.	Applicable to construction and operation phases to ensure safety and health standards are met create a secure and supportive environment for workers.
The Balochistan Workers Compensation Act, 2022, Act No. XXXII of 2022.	This legislation aims to enhance compensation provisions for workers in certain classes of employment, providing coverage for injuries or fatalities resulting from accidents. The objective is to adapt to the evolving needs of workers and industry by extending the dimensions of compensation and increasing its quantum.	Applicable on both construction and operation phases of the Project.

Law	Description	Applicability to the Project
The Provincial Motor Vehicles Ordinance of 1965 and The Balochistan Motor Vehicles (Amendment) Act No. 01 of 2017. The Balochistan Motor Vehicle (Amendment) Act 2022, Act No. XXIV of 2022.	The ordinance deals with vehicle registration, penalty in default of registration and prohibiting driving without the provision of an appropriate license, etc. According to this ordinance no one is allowed to drive a vehicle without proper registration and an authorized license that too per the guidelines of this ordinance. The ordinance clearly states the power of the court to order the disqualification of a person convicted of an offense. It also outlines the speed limit of vehicles followed by the penalties for violating the same action. It also warns the drivers about using vehicles in unsafe conditions as it may make the other seated travelers vulnerable to serious accidents.	Applicable to all Project vehicles and drivers, including those of contractors.
The Balochistan Minimum Wages Act, 2021, Act No. X of 2021.	The Balochistan Minimum Wages Act, 2021 (Act No. X of 2021), enacted to regulate minimum rates of wages and allowances for various categories of workers in industrial and commercial undertakings, aims to ensure decent living conditions. In alignment with the 18th Constitutional Amendment, this law necessitates periodic reviews of minimum wages, emphasizing the regulation of wage rates in all industries and occupations in line with the economic conditions specific to the Province of Balochistan.	Applicable on both construction and operation phases of the Project.
Balochistan Drinking Water Policy/ Strategy 2017	Balochistan Drinking Water Policy /Strategy provides strategic direction and a development framework to the stakeholders and addresses the issues and challenges faced by both its urban and rural populations. It is envisaged that the efforts of all tiers of government and the local authorities shall be planned, executed, and coordinated accordingly. The new policy/strategy proposes the establishment of new drinking water supply systems, and rehabilitation and upgradation of existing systems in urban as well as rural areas to ensure sustainable access to drinking water for the entire population of Balochistan.	Applicable on both construction and operation phases of the Project.
Balochistan (Wildlife Protection, Preservation, Conservation and Management) Act, 2014, Act No. XV of 2014.	An Act to provide protection, preservation, conservation, sustainability and management of the Wildlife, and establishment and management of protected areas in the Province of Balochistan. The Act caters to the protection of wildlife resources in the province. Besides ensuring an environment conducive to their rearing and livelihood, the Act also regulates hunting, poaching, possession, and trade in birds and animals. The Act also prescribes penalties for its contraventions. Government can notify and amend lists of protected ecosystems, national parks, wildlife sanctuaries, safari parks, and game reserves.	The proposed activities might have minor impacts on the wildlife of the area as the Project Area has sparse wildlife habitat and vegetation. The law insists on carrying out environmental assessment of the project before development and to identify impacts on wildlife with mitigations.

Law	Description	Applicability to the Project
The Balochistan Factories Act, 2021, Act No. XIX of 2021. The Balochistan Factories (Amendment) Act, 2022, Act No. XIV of 2022.	This legislative initiative seeks to re-enact the current labor regulation law for factories, tailoring it to the specific needs of Balochistan following the constitutional changes from the Eighteenth Amendment. The objective is to enhance the relevance and effectiveness of labor regulations in the province's industrial landscape. Amendment of the Balochistan Factories Act, 2021 (Act No. XIX of 2021) is deemed necessary to remove obsolete provisions, enhance enforcement mechanisms, and ensure the effective implementation of regulations governing working conditions in the province's factories. This amendment aims to streamline and optimize the existing legal framework for improved and contemporary governance.	Applicable to workers' accommodation and rights during construction and operations.
The Building Code of Pakistan (2007)	Requirements for safety to be included in the design of buildings in Pakistan. The Building Code of Pakistan – Fire Safety Provisions (2016) provides the requirements for fire prevention, and life safety in relation to fire and fire protection of buildings and building-like structures.	Applicable on both construction and operation phases of the Project.
Balochistan Buildings Control Ordinance, 1979 (Ord: VI of 1979)	The ordinance sets the requirements for the approval of buildings.	Applicable on both construction and operation phases of the Project.
Balochistan Groundwater Rights Administration Ordinance, 1978 (No. IX of 1978).	The ordinance ensures efficient and site-specific management of scarce water resources in Balochistan. It regulates the pumping/ extraction of groundwater in the Balochistan.	Applicable on both construction and operation phases of the Project.
Balochistan Development Authority Act, 1974, Act No. X of 1974.	The act related to the preparation and execution of comprehensive development programs including projects and schemes related to land and water development, power, industry, mineral exploitation, and development for the economic uplift of relatively under-developed areas.	Applicable on both construction and operation phases of the Project.
The Workers' Welfare Fund Ordinance, 1971, Act No. XXXVI of 1971.	The ordinance establishes a Workers' Welfare Fund aimed at providing residential accommodation and other facilities for workers. Under this ordinance, employers are obligated to contribute 2% of their net profit to the fund.	Applicable on both construction and operation phases of the Project.
Road Transport Workers Ordinance, 1961, Act No. XXVIII of 1961.	The law sets conditions for the driver of a vehicle and imposes driving time and limits.	Applicable to all Project vehicles and drivers, including those of contractors.

2.5 International Treaties

Table 2-10 presents the important international environmental treaties that have been signed by Pakistan and may have relevance to the proposed activities. They concern climate change and depletion of the ozone layer; biological diversity; and waste and pollution.

Table 2-10: Relevant International Environmental Treaties and Conventions endorsed by Pakistan

Topic	Convention	Date of Treaty	Entry into force in Pakistan
Climate change and the ozone layer	United Nations Framework Convention on Climate Change - the primary objective is the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.	1992	1994
	Kyoto Protocol to the United Nations Framework Convention on Climate Change - enabled by the above Convention on Climate Change. It has more powerful and legally binding measures. It sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas emissions.	1997	2005
	Vienna Convention for the Protection of the Ozone Layer - acts as a framework for international efforts to protect the ozone layer with a primary objective to protect human health and the environment against adverse effects resulting from human activities that modify or are likely to modify the ozone layer.	1985	1993
	The Montreal Protocol on Substances that Deplete Ozone Layer and associated amendments - enabled by the Vienna Convention, is designed to protect the ozone layer by phasing out the production and consumption of several substances believed to be responsible for ozone depletion.	1987	1993
Waste and pollution	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal - regulates the transboundary movement of hazardous waste and other waste with the stated purpose of protecting human health and the environment against the adverse effects from generation and management of hazardous waste and other waste. The Convention provides for three sets of measures with binding obligations. These are: Strict control of the transboundary movement of hazardous waste; Environmentally sound management of hazardous waste; and Enforcement and implementation of the provisions of the convention at international and national levels.	1989	1994
Desertification	International Convention to Combat Desertification –to combat desertification and mitigate the effects of drought. It is supported by international cooperation and partnership arrangements, to achieve sustainable use of land and water resources and sustainable development in affected areas.	1994	1997
Biodiversity and the protection of plants and animals	Convention on Biological Diversity – covering ecosystems, species, and genetic resources and the field of biotechnology. The objectives are: to conserve biological diversity; sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources.	1992	1994
	Cartagena Protocol on Biosafety to the Convention on Biological Diversity - addresses potential risks posed by living modified organisms resulting from modern biotechnology.	2000	2009
	Bonn Convention on the Conservation of Migratory Species of Wild Animals - aims to conserve terrestrial, marine, and avian migratory species throughout their range. It is concerned with the conservation of wildlife and habitats on a global scale.	1979	1987

Topic	Convention	Date of Treaty	Entry into force in Pakistan
	Memorandum of Understanding concerning Conservation Measures for the Siberian Crane - parties undertake to provide strict protection to Siberian Cranes and identify and conserve wetland habitats essential for their survival.	1998	1999
	Convention on International Trade in Endangered Species of Wild Fauna and Flora - to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	1973	1976
	International Plant Protection Convention (1997 Revised Text) - to prevent the international spread of pests and plant diseases. It requires the maintenance of lists of plant pests, tracking of pest outbreaks, and coordination of technical assistance between member nations.	1951/52	1954
	Agreement for the Establishment of the Near East Plant Protection Organization - to establish the Near East Plant Protection Organization (NEPPO), which promotes international cooperation to implement the International Plant Protection Convention.	1993	2009
	Plant Protection Agreement for the Asia and Pacific Region and amendments – establishes the Asia and Pacific Plant Protection Commission to review and promote the region's progress in the implementation of the Agreement. Trade in plants and plant products are regulated by certification, prohibition, inspection, disinfection, quarantine, destruction, etc., as necessary.	1955 (amendment 1967)	1958 (amendment 1969)
	Convention on Wetlands of International Importance especially as Waterfowl Habitat and associated protocols and amendments - to promote conservation and sustainable use of wetlands. The Ramsar List of Wetlands of International Importance now includes almost 1,800 sites (known as Ramsar Sites). There are currently 19 Ramsar sites in Pakistan.	1971 (amended 1987)	1976 (amended 1994)

3. Project Description

This section provides an overview of the Early Works for the Mining Project. The Early Works for the Mining Project will consist of the construction of an accommodation facility at the proposed Reko Diq Mine Site and a water supply pipeline from the Fan Sediments area to the accommodation facility and minor earthworks for the access road and to support other future activities of the Mining Project. The information in this section is provided by RDMC.

The Reko Diq Mining Project will result in the production of copper and gold and is expected to have a life of 40 years as a truck-and-shovel open pit operation with processing facilities producing a high-quality copper-gold concentrate. As per the Reko Diq 2022 Conceptual Design, the construction is expected in two phases. Phase 1 is expected to have a capacity of 40 Million tonnes per annum (Mtpa) and Phase 2 with a combined process capacity of 80 Mtpa.

3.1 Activities in Early Works

Figure 3-1 shows the activities included in the Early Works.

3.1.1 Fencing

Approximately 100 km of fencing will be installed, comprising a 1.8 m high chain wire fence that will demarcate the proposed Reko Diq Mine Site.

3.1.2 Water Supply Source

The Fan Sediments will be used as a water source for the Project. The Fan Sediments represent a saline aquifer located to the northwest of the proposed Reko Diq Mine Site, extending for 70 km along the Pakistan-Afghanistan border. There are no communities living in the Fan Sediments area, and there are no boreholes in use by the local community. Water supply investigations continue in the Fan Sediments and other RDMC leases and Water Supply Investigation NOCs.

Water, for the Early Works, will be abstracted from the Fan Sediments at a rate of between 10 and 50 liters per second (L/s) from existing RDMC water supply bores (see Table 3-1). Table 3-1 presents the boreholes that will be used to supply water to the accommodation facility with their estimated pumping capacity.

Table 3-1: Boreholes with Estimated Pumping Capacity during Early Works Phase

Borehole ID	Easting (m)	Northing (m)	Estimated Pumping Capacity (L/s)
FS04-PB	362883	3266366	50
FS08-PB	368644	3258222	5
FS9-PB	372474	3255066	5
FS13-PB	364074	3264150	40
FS20-PB	351471	3278086	40

Note: FS04-PB stands for FS – Fan Sediments, 04 – Borehole ID, and PB – Production Bore

3.1.3 Water Supply Pipeline

A water supply pipeline will be constructed to supply water from the Fan Sediments area to the accommodation facility as part of the Early Works for the Mining Project. The length of the pipeline will be ~78 km from the Fan Sediments area to the accommodation facility at the proposed Reko Diq Mine Site. It will utilize four to five of the existing Fan Sediments boreholes drilled by Barrick back in 2010. Boreholes will be fitted with submersible pumps, headworks, and a portable generator. The boreholes will be connected to the site via a buried epoxy lined and Three-Layer Polyethylene (3LPE) wrapped steel 250-millimeter (mm) diameter, buried pipeline. The construction of the water pipeline will likely include the preparation of an unsealed access road from the accommodation facility to the Fan Sediments area for the construction of water supply pipeline.

The design code and dimensional specification of the pipeline will follow the American Society of Mechanical Engineers (ASME) standard i.e., ASME B36.10M. This standard provides guidelines for the nominal pipe sizes, wall thicknesses, and dimensions of pipes.

3.1.4 Accommodation Facility

An accommodation facility will be constructed for workers' accommodation as part of the Early Works for the Mining Project. Figure 3-1 shows the preliminary layout of the proposed Reko Diq Mine Site with the accommodation facility location indicated within the proposed mine site.

The accommodation facility will be constructed to accommodate about 6,400 workers during the peak construction period of the Mining Project. Table 3-2 presents the basic specifications of the accommodation facility at the proposed Reko Diq Mine Site.

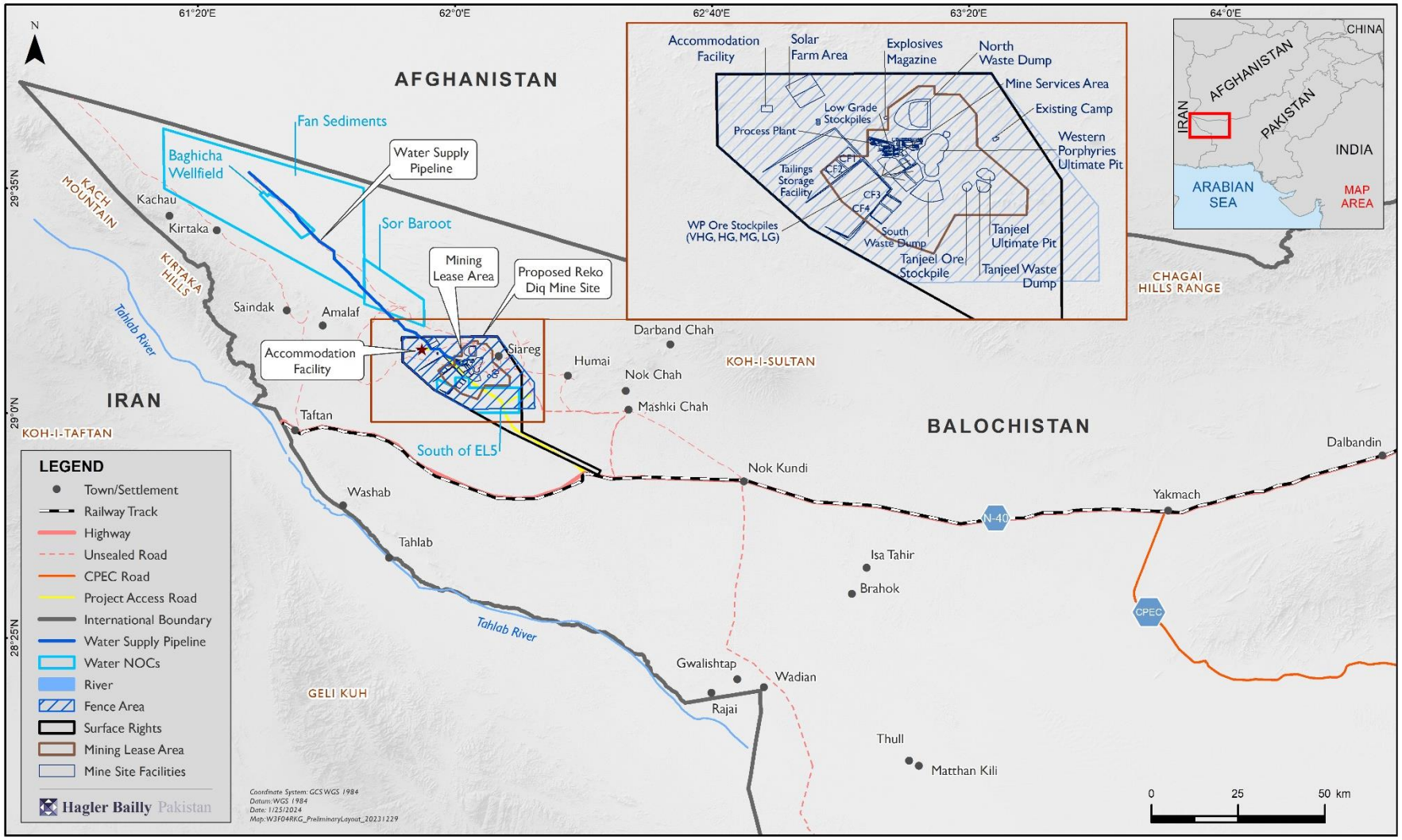


Figure 3-1: Early Works Activities and Preliminary Layout of proposed Reko Diq Mine Site

Table 3-2: Basic Specifications

Item	Description	Total Units (No.)	Estimated Area (m^2)
1	Accommodation Rooms - Single	1,875	15 (per room)
2	Accommodation Rooms - 4 persons	1,125	25 (per room)
3	Dry Mess and Kitchen	3	0.45 per person
4	Toilet Block(s)	6	500
5	Main Laundry/ Bulk Linen / Chemical Store	2	400
6	Clinic	1	700
7	Administration Office / Reception / Shop	1	1,000
8	Gymnasium	2	0.75 per person
9	Security Induction Facility and Gatehouse	1	900
10	Covered Bus Stop/ Pick-up Area	4	200 (concrete area)
11	Prayer Room (including wash facilities)	1	3,500
12	Multipurpose Court	1	800
13	Recreation and TV Room	3	500
14	Ice Machine Room	2	100
15	Universal Access Rooms	2 for each 100	22 (per room)
16	Fire Station	0	500
17	Commercial Center	0	3,500
18	Cricket Field	1	10,000
19	Housekeeping Storage	2	300
20	Central Food Storage	1	1,000
21	Maintenance and Warehouse	1	500

3.1.5 *Minor Earthworks*

The Early Works will comprise some minor earthworks within the mining and surface rights leases. These will likely include the preparation of an unsealed access road from the accommodation facility to the Fan Sediments area for the construction of water supply pipeline and possible upgrade of the existing site access road. This access road will be used for Project access only. Geotechnical and other field investigations are ongoing to enable finalization of infrastructure layouts. Use of multiple tracks will be avoided to minimize dust emissions and only a single site access road will be developed for the Project.

3.2 Utilities

The utilities required for the Early Works phase encompass electricity and water.

3.2.1 *Electricity Consumption*

Diesel generators will be employed to fulfill the energy needs during the construction of the water supply pipeline and the accommodation facility. Furthermore, these gensets will serve the overall energy requirements of the accommodation facility once it is operational until the permanent power station for the Mining Project has been constructed. Neither

captive power plants nor renewable energy sources will be utilized during this preliminary phase.

The electricity consumption will be about 2 – 4 megawatts (MW) during the Early Works phase which will be met by diesel generators. Between 3,200 – 6,400 liters of diesel will be required daily to meet the energy requirements of accommodation facility considering that the typical diesel consumption for a 1.25 MW diesel generator at 75% load consumes ± 250 liters per hour (l/hour) with the assumption that engines will run for 8 hours a day.

3.2.2 Water Consumption

The per capita water consumption varies significantly from 30 liter per capita per day (l/c/day) to 350 liters per capita per day in Pakistan.[9] Given this, the average per capita per day requirement will be ~200 liters (~0.2 cubic meters). It is estimated that the per capita water requirement with 427 personnel at the accommodation facility during the Early Works will be ~85,400 l/d (~85 m^3/d).

The water from the Fan Sediments area will be treated at a Water Treatment Plant. The Water Treatment Plant will be located at the accommodation facility and will be a self-contained treatment unit including filtration, reverse osmosis (RO) and chlorination processes.

In addition to the drinking water needs, the accommodation facility will have adequate arrangements for onsite water storage for firefighting which will include:

- Outdoor hydrants
- Fixed fire water monitor
- Indoor hydrants and firefighting vertical pipe
- Fire extinguishers

3.3 Construction Materials

The construction material for the Early Works activities will mainly include coarse and fine aggregates, cement, concrete, steel, and electrical materials. The coarse and fine aggregates and limestone to produce cement and concrete will come from the identified quarry and borrow areas located within the Mining and Surface Rights lease granted by the Government to RDMC. These include four quarries (three andesite and one limestone quarry) and one sand borrow area. Figure 3-2 shows the location of the different quarry and borrow areas that will be used to extract material for construction purposes.

Steel, and other materials (electrical, fixtures, plastics, and glass) will be transported to the proposed mine site via National Highway 40 (N-40) through trucks having a carrying capacity of about 25 tonnes.

3.4 Required Land

No receptor is present in the immediate vicinity of the accommodation facility. Humai is the nearest settlement located about 20 km east of the proposed location of accommodation facility. The construction of the accommodation facility will require about 0.6 km^2 (~60 hectares) of land. However, no land acquisition will be required for the

[9] https://ssms.jp/img/files/2019/04/sms10_183.pdf accessed on December 28, 2023.

accommodation facility as it is located on the Surface Rights lease granted by the Government of Balochistan to RDMC.

It is estimated that the total area required by the pipeline of length ~78 km and a diameter of 250 mm will be ~0.0038 km^2 (~0.38 hectares). The land for the construction of the pipeline will be purchased or leased from the Government of Balochistan.

3.5 Onsite Storage Facilities

Figure 3-1 shows the proposed Reko Diq Mine Site layout with its proposed facilities. The mine services area will be used to store the chemicals, lubricants, fuel, and water required during the Early Works phase with appropriate bunding and lining of the facilities and as per the relevant material safety data sheets and legal requirements.

3.6 Construction Equipment

The following equipment will be used for the construction purposes:

- Earth Moving: Crawler Tractors, Dozers, Front-end Loaders, Graders, Earth Haulers, and Dump Trucks.
- Material Handling: Mobile Cranes, Concrete Pumps, and Concrete Mixers (Trucks).
- Impact Equipment: Jackhammers and Pneumatic Tools.
- Auxiliary Equipment: Pumps, Generators, Compressors, Paging Systems, and Warning Horns.
- Other Equipment: Saws and Vibrators.

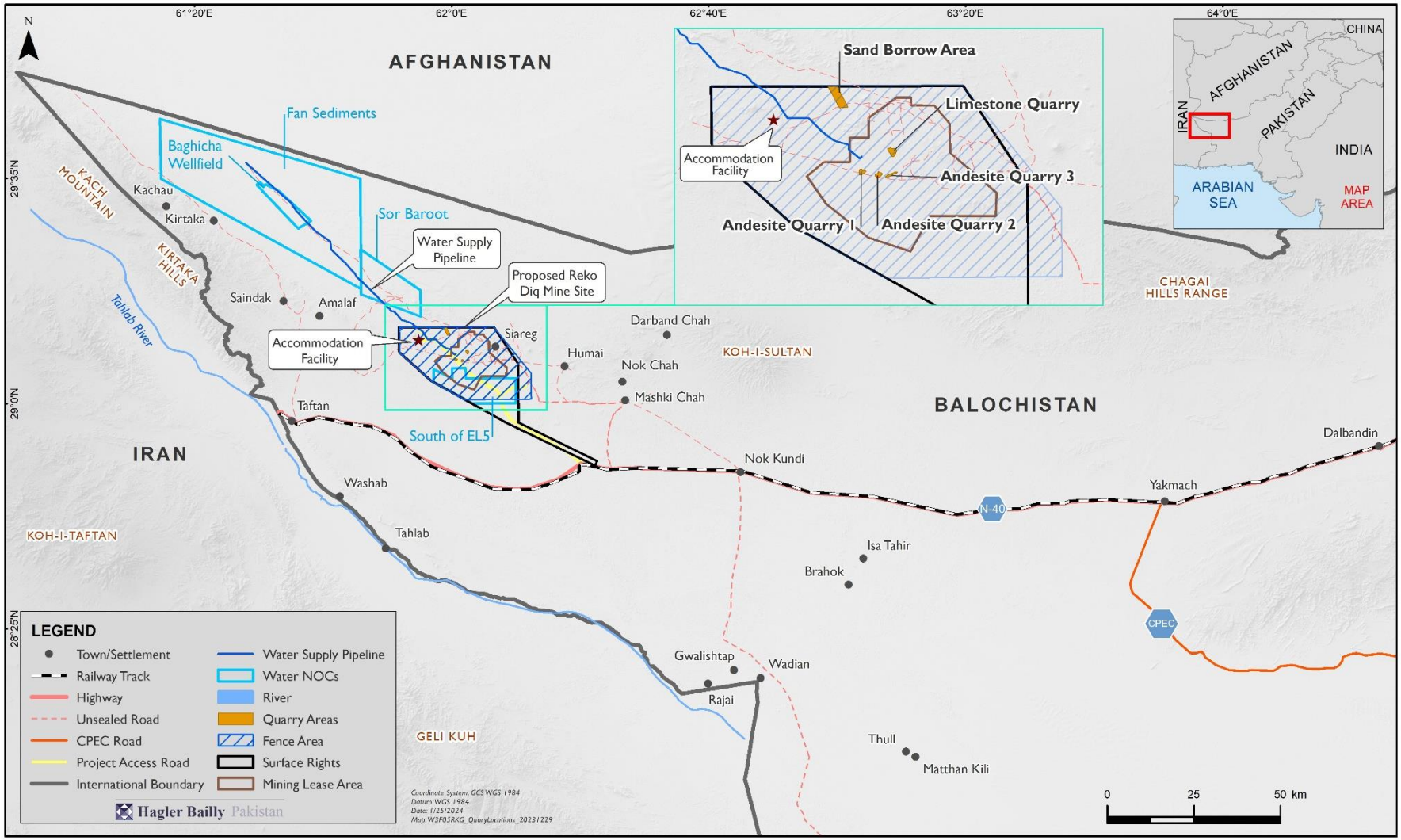


Figure 3-2: Quarry Location

3.7 Staffing and Employment

Table 3-3 provides details of RDMC staff that will be hired during the Early Works. There will be additional contractor employees also engaged during the Early Works. Preference will be given to locals and appropriately qualified individuals from the communities in the surroundings of the proposed Reko Diq Mine Site will be selected for employment. The staff hired during the Early Works will be staying in the existing camp.

Table 3-3: Project Staffing during Early Works Phase – 2024

Labor Type	Expatriates	National	Locals*
Skilled and Management (diploma and degree holders)	41	61	169
Semi-skilled (drivers, fitters, carpenters)		8	98
Unskilled (labors, guards)			**50**

* Hired from the local community

3.8 Waste Generation

The construction of the accommodation facility and the water supply pipeline will mainly generate oily waste, domestic waste, construction waste, and sewerage. The waste generated on site will be stored until an incinerator is installed at site, expected in 2025. The details and impacts of an incinerator will be discussed comprehensively in the Mining Project ESIA.

Sewage from accommodation facility will be the main source of wastewater during the Early Works. An onsite Wastewater Treatment Plant will be installed to treat the generated wastewater.

Solid waste generated during the Early Works will include paint tins, used batteries, rubber tires, used oil filters, chemical containers (crushed), cable drums, wood, packaging, buildings materials, plastic sheeting, cement bags, scrap metal, recyclable plastic sheeting, cotton wastes, food waste, and papers.

Solid non-hazardous wastes will be collected and stockpiled separately at the site before disposal. Recycling or reuse of waste material will be the preferred option. However, where that is not possible, waste will be treated and appropriately disposed of as per standard practices such as to approved landfill site/vendor. The hazardous waste will be managed as per the local guidelines.

Medical waste will be packaged up in specialized containers and transported offsite for incineration which will be managed by our approved medical service provider.

3.9 Schedule

The expected duration of the Early Works phase will be 09 months. Table 3-4 presents the list of activities and its sequence as part of Early Works which spans over a 09-month period.

Table 3-4: Early Works Schedule and Sequence of Activities

Item	Apr-24	May-24	Jun-24	Jul-24	Aug-24	Sep-24	Oct-24	Nov-24	Dec-24
Installation of EPCM site offices, medical facilities, and amenities									
Fit out of water supply bores and water supply pipe installation									
Establishment of crushing and screening plant for construction materials									
Bulk earthworks and drainage:									
• EPCM site offices, medical facilities, and amenities pads									
• Crushing and screening plant pad									
• Fuel and lubricant storage site pad									
• Concrete batch plant pad									
• Vehicle maintenance and warehouse pad									
Installation of initial pioneering camp									
Full accommodation facility construction									
Wastewater treatment plant									
Potable water treatment plant									
Temporary fuel storage installation									
Vehicle maintenance and warehouse construction									

4. Analysis of Alternatives

Analysis of alternatives is a critical consideration in the assessment of the feasibility of projects. This section describes the various alternatives that were examined during the preparation of the Early Works ESIA report.

The following alternatives were considered for assessment:

- No Project Option
- Water Supply Alternatives
- Pipeline Material Alternatives
- Project Routes/Site Alternatives
- Pipeline Layout Alternatives (surface vs. buried)

The alternative for each option is selected based on technical and economic grounds and minimal environmental impact.

4.1 No Project Option

The following scenarios can be considered under the 'No Project Option':

Scenario 1: No Reko Diq Mining Project.

Scenario 2: No Early Works Project for the Reko Diq Mining Project.

4.1.1 Scenario 1: No Reko Diq Mining Project

Scenario 1 considers no development of the Reko Diq Mining Project. The construction and operation of the proposed Reko Diq Mine and its associated facilities may affect the physical and ecological environments surrounding the proposed mine which are manageable but will result in significant socioeconomic benefits.

No impacts on ecological environment are expected to occur on any species of conservation concern or sensitive environments. There are no protected forests or game reserves within a 100 km radius from the proposed Reko Diq Mine Site. The impact on physical aspects including air quality and noise will be localized. No private land acquisition will be carried out for the Reko Diq Mining Project and its facilities. However, if Scenario 1 happens the following will be the likely consequences:

- Reko Diq represents one of the largest copper and gold reserves in the world. The estimated reserves are 5.9 billion tons of ore, grading 0.41% copper, and 41.5 million ounces of gold.[10] No Reko Diq Mining Project Option will prevent the extraction of these minerals.
- The proposed Reko Diq Mining Project will provide many local contractual jobs, many permanent jobs, business opportunities, and many other direct or indirect local economic activities that implementation of Scenario 1 will fail to provide.

[10] USGS, 2011, The Mineral Industry of Pakistan

- If the Reko Diq Mining Project is not developed, the government will be deprived of revenues and royalties that can be utilized for local and regional development projects, and opportunities for employment and growth of local businesses associated with the Project will also be lost. The local communities will also not be able to benefit from the health and educational facilities that Barrick has constructed in the past and will be building in the future as part of its Community Development Programme..

  Considering the issues described above, the No Project Option will avoid the environmental impacts, which are largely manageable and can be mitigated, at the cost of significant economic and social benefits.

4.1.2 Scenario 2: No Early Works Project for the Reko Diq Mining Project

The focus of conducting the Early Works ESIA is to secure the necessary NOC from the Balochistan-EPA. This clearance is required to commence early construction activities for the Mining Project, encompassing activities such as installation of a water supply pipeline and the establishment of an accommodation facility. Construction cannot proceed without the EPA's approval, hence the imperative for conducting the Early Works ESIA, aligning with regulatory obligations, and satisfying EPAs. The Mining Project will be subject to its own permitting process and a separate ESIA will be submitted to the Balochistan-EPA at a later stage.

Initially, RDMC planned to acquire the NOC for the main Reko Diq Project ESIA, which would include the main construction phase with the Early Works activities in it. However, in view of the extensive time required for assessments and specialized studies, RDMC decided to initiate a separate Early Works ESIA. This strategy enables RDMC to undertake initial construction concurrently with the preparation of the main ESIA, thus avoiding delays.

4.2 Water Supply Alternatives

The water source for the Early Works will be the Fan Sediments located northwest of the proposed Reko Diq Mine Site. The decision to extract water from the Fan Sediments was made to eliminate the Project's reliance on community water resources, thus protecting their water supply. The Fan Sediments area is uninhabited and is not utilized by the local communities, and the groundwater is unsuitable for community use due to its high salinity and non-potable nature, making it unfit for drinking, irrigation, and domestic purposes.

4.3 Project Routes/Site Alternatives

A water supply pipeline of length ~78 km will be constructed to supply water from the Fan Sediments area to the accommodation facility as part of the Early Works for the Project. It will utilize four to five of the existing Fan Sediments boreholes drilled by Barrick Gold back in 2010. The selected pipeline route aligns with existing boreholes in Fan Sediments, provides a direct and shortest route avoiding rocky hills and settlements, and ensures easy access for maintenance, monitoring, and future expansion of the water supply system.

The accommodation facility will be constructed for workers' accommodation as part of the Early Works for the Project. The accommodation facility will be situated on an open land, enveloped by mountains on three sides with one side providing access to the facility

(Figure 4-1). This location naturally offers security making it a suitable space to accommodate people (employees and contractors). Moreover, the selected site will not be a part of any settlement and thus will not put pressure on the existing infrastructure of the settlements. The selected site will be located within the Surface Rights lease granted by the Government of Balochistan to RDMC. This eliminates the need for land acquisition procedures that would have been necessary if the site were outside the designated lease area.



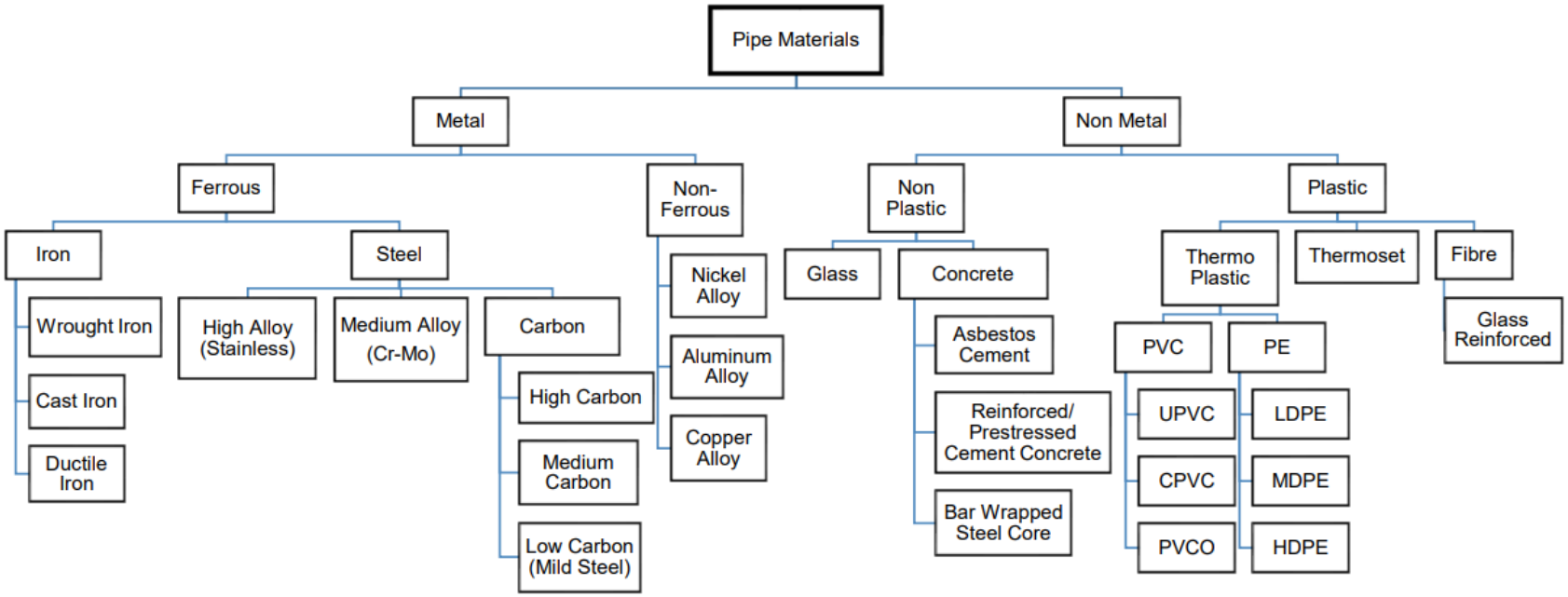
Figure 4-1: Accommodation Facility Location – Google Earth View

4.4 Pipeline Material Alternatives

Pipeline materials play a crucial role in the construction of water supply systems, and their selection requires a comprehensive evaluation of environmental, social, and economic factors.

Materials commonly used to construct water pipes include polyvinyl chloride, copper, steel and in older systems concrete or fired clay. Joining individual water pipe lengths to make up extended runs is possible with flange, nipple, compression, or soldered joints.

A comprehensive analysis was conducted to identify the most suitable material for the construction of a 250 mm diameter buried pipeline. Figure 4-2 shows different types of materials with their nature classification i.e., metallic, or non-metallic pipes. Table 4-1 presents the advantages and disadvantages of alternative materials.



Source: Advisory on Pipeline Materials for Transmission of Water (July 2022) by Central Public Health and Environmental Engineering Organization for Government of India. https://mohua.gov.in/pdf/624eb2fc45713Advisory-on-Pipe-Materials-for-Transmission-of-Water.pdf

Figure 4-2: Pipeline Materials

Table 4-1: Suitability of Various Pipeline Materials for the Project

	Advantages	Disadvantages
Cast Iron Pipes	▪ Good lasting qualities. ▪ Strong and durable. ▪ Corrosion resistance with coating. ▪ Good Strength, strong and durable. ▪ Good corrosion resistance if coated can be used in soils and for water of slightly aggressive character. ▪ Well suited for pressure mains and laterals where tapping is made for house connections.	▪ Heavyweight, and consequently high transport costs. ▪ Short length, leading to higher laying and jointing costs. ▪ Low tensile strength, prone to defects or breaks during transportation and jointing.
Ductile Iron Pipes	▪ Resistant to breakage, offering heightened durability. ▪ Enhanced tensile strength, comparable to mild steel, enables the pipes to withstand higher working pressures effectively and effectively mitigate the impact of water hammer. ▪ Traditional corrosion resistance is comparable to that of cast iron. ▪ Lighter in mass as compared to cast iron pipes. ▪ Strong material properties and flexibility of joints contribute to preventing leakages. ▪ A comprehensive range of fittings makes easy incorporation of branches, service connections, etc., with well-developed mains and leakage detection systems.	▪ Centrifugally cast pipe coatings are required for protection against aggressive external operating environments. ▪ Ductile iron pipes are susceptible to corrosion over time, especially in aggressive or acidic soil conditions. This corrosion can reduce the pipe's lifespan and compromise its structural integrity. ▪ Relatively heavy, making transportation, handling, and installation more labor-intensive and potentially increasing associated costs. ▪ Installing ductile iron pipes can be more complex and time-consuming compared to some alternative materials, requiring skilled labor and specialized equipment.
Galvanized Iron Pipes	▪ Exhibits high durability and extended longevity. ▪ Ensures consistent weld integrity for enhanced structural strength. ▪ Amenable to rigorous fabrication processes. ▪ Boasts a superior finish and anti-rust coating. ▪ Displays greater corrosion resistance. ▪ Offers superior bendability and ease of cutting and threading, enhancing versatility.	▪ Should not be used underground unless properly covered, posing potential inconveniences. ▪ May conceal significant defects beneath the zinc coating on the steel. ▪ May contain lead, accelerating corrosion and reducing overall lifespan. ▪ Use may result in internal rough patches, leading to expensive repairs.
Steel Pipes including Carbon Steel	▪ High elasticity, adaptable to ground-level changes, suited for subsidence-prone areas.	▪ Coating Requirements: Steel pipes necessitate epoxy inside, 3LPE outside, and cathodic protection for the entire pipeline, adding to production and maintenance costs.

	Advantages	Disadvantages
	▪ Steel pipes are lightweight and excel in diverse conditions, including nonuniform bedding, settling soils, and external loads, owing to their superior longitudinal strength. ▪ Simplified installation process, particularly beneficial for micro-tunneling projects. ▪ Low frictional resistance allows for efficient water flow. ▪ Mitigates leakage risk, especially with welded joints. ▪ Long Service Life which depends on the rate of corrosion and internal abrasion. Impurities in water cause pipe abrasion to occur more rapidly. ▪ Exhibits toughness, ensuring reliability during unprecedented events. ▪ Easily adapts to modifications and changes in bedding. ▪ Cost-effective transportation and installation due to lightweight and longer sections.	▪ Complicated welding joints require skilled labor, potentially increasing installation expenses. ▪ Prone to internal tuberculation, external corrosion, and electrolysis if not adequately protected, impacting long-term durability. ▪ The use of anti-corrosion products increases production and maintenance costs. ▪ Air vacuum valves are necessary in large-diameter pipes to prevent collapse, contributing to added installation expenses.
Asbestos Cement Pipes	▪ Asbestos cement pipes feature a smooth inside surface, facilitating efficient water flow. ▪ The joining of pipes is effective and flexible, allowing for installation versatility. ▪ These pipes exhibit anti-corrosive characteristics, enhancing their durability over time. ▪ Asbestos cement pipes are relatively inexpensive, providing a cost-effective option for water supply projects. ▪ The pipes are light in weight, making them easy to handle and transport to the installation site. ▪ Minimal storage costs as they can be stored in open spaces at the work site. ▪ Reduced theft risk due to the lack of resale value for asbestos cement pipes.	▪ Asbestos cement pipes may pose health risks due to the presence of asbestos fibers, potentially causing respiratory issues if inhaled. ▪ These pipes can be relatively brittle, making them susceptible to cracking or breaking under certain conditions or external pressures. ▪ Compared to some alternative materials, asbestos cement pipes may have limitations in terms of strength, affecting their suitability for high-pressure applications. ▪ Asbestos is a known environmental hazard, and the production and disposal of asbestos-containing materials can have negative environmental implications.
Reinforced Cement Concrete (RCC) Pipes	▪ RCC pipes resist corrosion, ensuring longevity in various environments. ▪ With high compressive strength, RCC pipes withstand external loads and pressures effectively.	▪ Heavy, making transportation, handling, and installation labor-intensive. ▪ Despite high compressive strength, RCC pipes may be vulnerable to cracking under certain conditions or loads.

	Advantages	Disadvantages
	▪ The smooth inside surface promotes efficient water flow, reducing the risk of blockages. ▪ Properly manufactured and installed RCC pipes offer a durable, long-lasting solution. ▪ RCC pipes have widespread availability often a cost-effective choice for water conveyance projects.	▪ Less flexible than some alternative materials, potentially limiting their adaptability to ground movements. ▪ Susceptible to corrosion, impacting the overall structural integrity.
Prestressed Concrete Pipes	▪ High compressive strength, providing durability and resistance to external loads. ▪ The corrosion resistance of the concrete contributes to a longer service life. ▪ Widespread availability makes them easily accessible for various construction projects. ▪ Good load-supporting capacity and smooth inside surface, promoting efficient water flow and reducing the risk of blockages. ▪ Fire resistance properties. ▪ Cost-effective, providing a balance between strength and economy.	▪ Requires careful installation to avoid cracking. ▪ Heavy requires careful handling and transportation. ▪ Limited flexibility, potentially posing challenges in adapting to ground movements. ▪ Susceptible to damage from severe impacts or aggressive soils ▪ If the prestressing strands are not adequately protected, they may be susceptible to corrosion, affecting the overall structural integrity. ▪ Poor adaptability in installation.
Plastic Pipes	▪ Resistance to corrosion. ▪ Lightweight, facilitating easy transportation, handling, and installation, leading to cost savings. ▪ Flexible, making them adaptable to ground movements and reducing the risk of breakage or cracking. ▪ Often resistant to chemical corrosion, making them suitable for conveying various types of fluids. ▪ Require minimal maintenance. ▪ Electrically safe non-conductive material.	▪ Plastic pipes may have temperature limitations, restricting their use in high-temperature applications. ▪ In certain cases, chemicals from the plastic material may leach into the conveyed fluid, impacting water quality. ▪ Exposure to ultraviolet (UV) light may degrade the structural integrity of some plastic pipes over time. ▪ Water hammer in plastic pipes can cause stretching.
Unplasticized Polyvinyl Chloride (uPVC)	▪ uPVC is a rigid form of PVC that is not plasticized, making it stiffer and more durable. ▪ Commonly used for water supply, drainage, and irrigation systems. ▪ Corrosion resistance, lightweight nature, and non-conductive properties. ▪ Easy transportation, handling, and installation, leading to cost savings.	▪ Susceptible to chemical attacks, especially solvents. ▪ Strength affected by sunlight. ▪ Not suitable for above-ground installations. ▪ Require great care during laying, relatively brittle, making them more susceptible to breakage under certain conditions.

	Advantages	Disadvantages
	▪ A smooth surface reduces friction losses. ▪ Long pipe sections reduce leakage/ infiltration potential. ▪ Flexible.	▪ Susceptible to damages due to external pressure and blows in above-ground level application. ▪ Production and disposal of uPVC pipes can have environmental implications.
Chlorinated PVC (CPVC)	▪ CPVC pipes can withstand higher temperatures compared to uPVC, making them suitable for hot water and cold-water applications. ▪ Lightweight and easy for transportation. ▪ Requires fewer tools for installation and maintenance. ▪ Lack of plasticizers which discourages microbial growth. ▪ Corrosion and abrasion Resistance. ▪ Reduces heat loss due to lower thermal conductivity.	▪ More expensive than PVC piping materials. ▪ Sensitive to prolonged exposure to UV light. ▪ High thermal expansion coefficient. ▪ Proper installation of CPVC pipes requires specific skills and techniques, and improper installation can lead to issues such as leaks.
Polyethylene Pipes	▪ Cost-effective. ▪ Corrosion resistance, ensuring long-term durability and minimal maintenance. ▪ Lightweight and flexible, allowing for easy installation around obstacles and in challenging terrains. ▪ Long-term and permanent. ▪ Flexible, fatigue, surge and crush resistant. ▪ Resistant to various chemicals, PE pipes maintain water quality and resist degradation from chemical exposure. ▪ Supply in long coil or 12 m length to reduce jointing and leaks.	▪ Reduction in strength due to exposure to sunlight. ▪ Limitations in high-temperature applications and exposure to extreme temperatures can affect their performance. ▪ UV light may degrade the outer surface of PE pipes, necessitating protection if use in outdoor applications. ▪ Joining PE pipes can be more complex, requiring specific fusion techniques, and may be less forgiving to installation errors.
High-Density Polyethylene (HDPE) Pipes	▪ Highly durable and resistant to abrasion, providing long-term reliability. ▪ Lightweight, easy to install, economical. ▪ Good corrosion resistance. ▪ A smooth surface reduces friction losses. ▪ Flexible allowing for easy installation around obstacles and in challenging terrains.	▪ Susceptible to chemical attacks, especially solvents. ▪ Strength affected by sunlight. ▪ Environmental impact considerations for manufacturing processes and recycling challenges.

Source: Advisory on Pipeline Materials for Transmission of Water (July 2022) by Central Public Health and Environmental Engineering Organization for Government of India. https://mohua.gov.in/pdf/624eb2fc45713Advisory-on-Pipe-Materials-for-Transmission-of-Water.pdf

The use of asbestos concrete pipes was rejected owing to the environmental and social risks and so is the use of concrete pipes or copper pipes due to cost implication and conformity with the best practice in the industry which has scaled down on their usage.

The steel pipes present advantages including fewer joints, cost-effectiveness, durability, flexibility, and easy transportation over the other discussed materials making them a suitable material for the construction of the pipeline. In the current case, the pipeline will be epoxy lined, 3LPE wrapped, Carbon Steel (CS) piping system. The choice of CS pipes, being the most commonly used, meets the specific needs for the pipeline material due to its combination of strength, corrosion resistance, and durability. The decision factors include considerations of durability, corrosion resistance, suitability for buried applications, and overall cost-effectiveness. Metallic materials like CS offer the ability to withstand heat in higher-temperature environments, providing resistance to fire hazards. In contrast, the use of plastic pipelines may expose operators to increased fire hazards due to static charge accumulation.[11] The Stainless Steel (SS) was dropped as it is more expensive than CS, attributed to the presence of additional elements such as chromium.

4.5 Surface and Buried Water Pipeline Alternatives

The buried pipeline layout was selected considering the advantages given below. Table 4-2 compares the characteristics of surface and buried water pipelines.

Table 4-2: Surface and Buried Water Pipeline Alternatives

Process	Surface Pipeline	Buried Pipeline
Advantages	▪ Low construction cost ▪ Low capital cost ▪ Easier installation ▪ Reduced environmental impacts. ▪ Flexibility in routings of pipeline ▪ Diversification of water sources ▪ Accessibility for repairs and maintenance	▪ Prevention of water contamination by avoiding ultraviolet radiation exposure. ▪ Reduction of water loss due to evaporation and leakage. ▪ Protection of water systems against extreme weather events. ▪ Enhanced system durability to withstand external pressures. ▪ Low aesthetics or visual impacts. ▪ Improved resistance to extreme weather conditions. ▪ Reduced vulnerability to vandalism and accidental damage. ▪ Lower maintenance cost and reduced repair needs. ▪ Savings from reduced water loss through improved leak detection. ▪ Low risk of soil erosion.
Disadvantages	▪ High maintenance cost ▪ High risk of pipeline rusting ▪ Habitat loss and disruption of local ecosystems ▪ Weather and climate vulnerability ▪ Evaporation losses in high-temperature and low-humid regions	▪ Difficulties in inspection and maintenance ▪ Higher installation costs ▪ Limited visibility of issues ▪ Potential for groundwater contamination ▪ Limited flexibility in routing of pipeline ▪ Limited accessibility for repairs

11 https://egyptoil-gas.com/features/the-wise-choice-for-infrastructure-metal-and-non-metal-pipelines/

5. Description of Environment

This section describes the physical, ecological, and socioeconomic environment at the Project site and its vicinity.

5.1 Physical Environment

The baseline for the physical environment provides an overview of the physical conditions including topography, geology, seismicity, climate, air quality, water resources and quality, noise and traffic levels, soil and visual baseline at the Project site and its vicinity. This baseline also outlines the area of study, the methodology for the preparation of the baseline, and the findings of the survey carried out in 2022 and 2023 for the physical sampling. The scope and methodology and the survey period of each physical aspect is discussed in the respective sections.

5.1.1 Scope and Methodology

The specific tasks performed to carry out this physical baseline study included:

- Review of available literature on the physical baseline within the Physical Environment Study Area.
- Analysis of secondary information to prepare baselines for topography, geology, seismicity, and climate.
- Collection of primary data through field surveys to determine conditions of ambient air quality, noise levels and traffic, soil quality, water resources and quality, and visual character.

5.1.1.1 Physical Environment Study Area

Figure 5-1 shows the Physical Environment Study Area which includes an area of 5 km around the proposed Reko Diq Mine Site consisting of an accommodation facility and 1 km along the water pipeline route from Fan Sediments to the accommodation facility for workers' accommodation. This accounts for an area in which the physical environment may be impacted by the Project related activities. The discussion on regional topography, geology, seismicity, and climate extends further than this Physical Environment Study Area as described in the respective sections. The spatial extent of the hydrocensus survey also extends beyond the defined Physical Environment Study Area described in the respective sections. This area includes the communities located both east and west of the proposed Reko Diq Mine Site and involves mapping their respective water resources. This is also in line with the area selected for the social surveys.

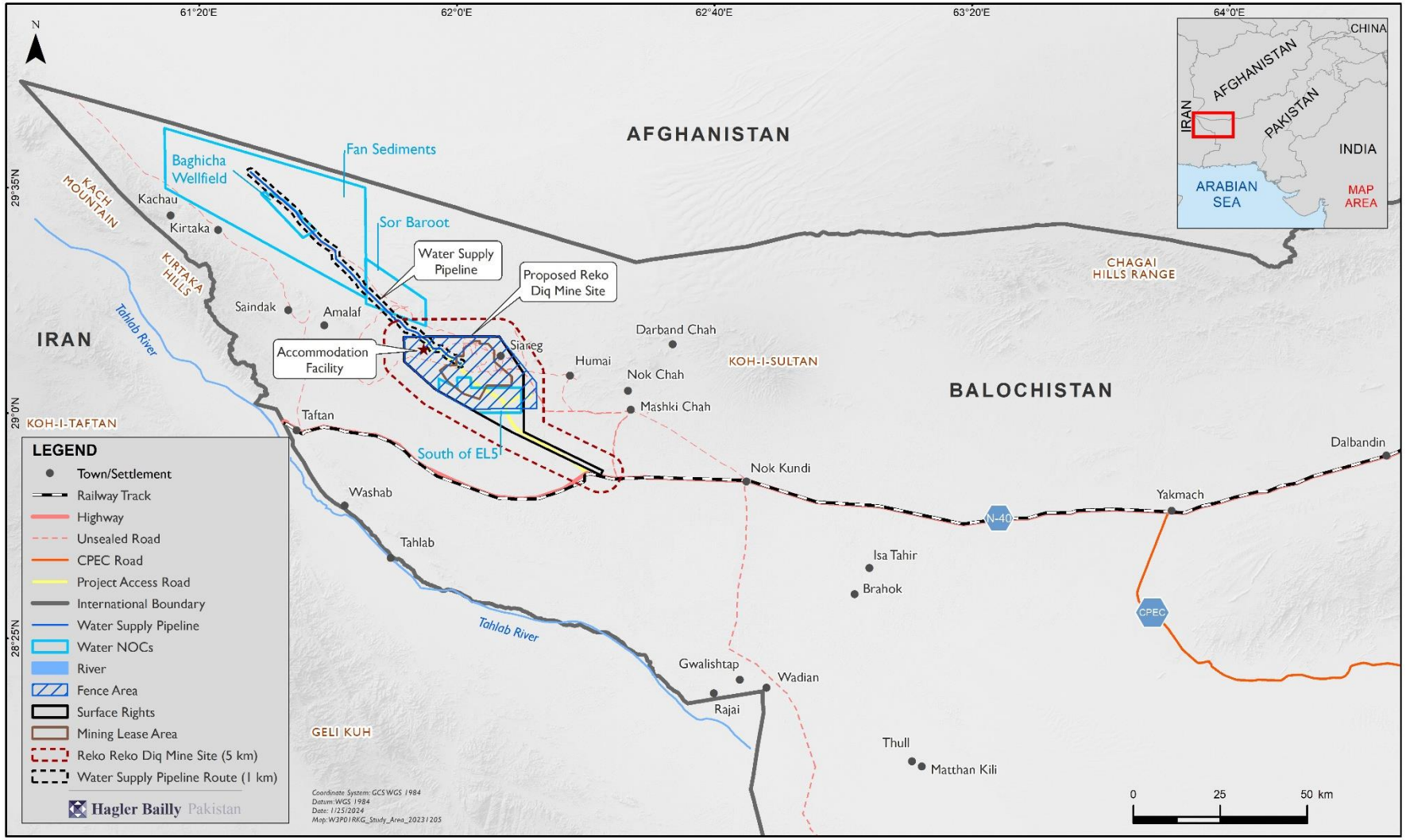


Figure 5-1: Physical Environment Study Area

5.1.1.2 Data Sources

5.1.1.2.1 Primary Data

The data on the physical environment aspects was collected through field surveys conducted in 2022 and 2023 to assess the baseline conditions within the Physical Environment Study Area. These field surveys were conducted as part of the main Project ESIA, however, the data in this section is limited to the scope of the Early Works phase. The primary data was collected using pre-designed forms and sampling equipment. To ensure accuracy, quality control samples were also collected where required.

5.1.1.2.2 Secondary Data

The information from secondary sources used in developing this section is referenced, where required. The data from the ESIA Report of the Tanjeel Copper Deposits developed in 2020 (referred to here as 2020 ESIA) was also used in establishing the baselines for air quality, water quality, noise and traffic levels, and soil quality.

Appendix B includes the Physical Environment Survey Plan for the primary and secondary data collection.

5.1.2 Topography

The Balochistan plateau is in the southwestern part of Pakistan with altitudes mainly ranging from 600 to 3,010 meters. Covering a vast expanse of 347,190 square kilometers (km^2), this region boasts diverse and distinct natural topographical characteristics. To the north, the Chagai Hills delineate an area characterized by a true desert, marked by inland drainage and *hamuns* (playa). The easternmost part comprises the Kirthar Range.[12]

About 80 percent of the area of the Balochistan province is inter-mountainous. The remaining 20 percent consists of flood plains and coastal plains. Due to dominated mountainous terrain, only 15 percent of the landscape is available for landforms on which most human settlements, farms, and roads are developed. [13]

The Reko Diq region stands as one of the several worn remnants of volcanic centers within the Chagai volcanic chain of mountains. This chain extends in an east-west direction across the Balochistan province, situated between the Quetta to Taftan railway and the border with Afghanistan.[14]

Figure 5-2 shows the regional topography. Gravel plains, sandy plains and the shifted sand dunes are the dominant topographic features of the Project Area. The communities located west of the proposed Reko Diq Mine Site, namely Kachau and Kirtaka, along the Pakistan-Iran border, are at a higher elevation (>1,000 m above mean sea level, amsl) than the communities located east of the Reko Diq Mine Site. The Kachau settlement is at an elevation of 1,142 m amsl. These communities are located on the foothills of the Kach Mountains and Kirtaka Hills. These communities primarily rely on springs that are present in the area due to their higher elevations. The elevation gently descends while moving from the northwest (Pakistan-Iran border) to the southeast direction towards the Pakistan-

12 https://www.britannica.com/place/Pakistan/The-Balochistan-plateau accessed on December 12, 2023.

13 https://www.adb.org/sites/default/files/linked-documents/48098-002-eiaab.pdf accessed on December 12, 2023.

14 https://lifesmilestones.wixsite.com/benway/copy-of-home accessed on December 12, 2023.

Afghanistan border. The Fan Sediments along the Pakistan-Afghanistan border lie at an elevation ranging from ~450 to 1,000 m amsl, lower than the communities in the Kach Mountains and Kirtaka Hills. The proposed Project will utilize water from the Fan Sediments area, where boreholes were drilled by Barrick in 2010 and are currently not in use by the community.

The topographic relief in the Physical Environment Study Area is relatively gentle. The elevations at the proposed Reko Diq Mine Site located south of the Physical Environment Study Area are lower compared to the elevations at the north at the Fan Sediments area. The elevation gradually rises at approximately 2 meters per kilometer when moving from south to north within the Physical Environment Study Area. The topography altitude range in the Physical Environment Study Area lies between 525 m and 1,445 m above mean sea level (AMSL).

5.1.3 Geology

The Reko Diq porphyry complex is situated within the western Chagai magmatic belt in Pakistan. This magmatic belt extends over 400 km from east to west and 140 km from north to south along the border with Afghanistan and Iran. The development of the Chagai magmatic arc is attributed to the northward subduction of the Arabian oceanic plate beneath the southern edge of Eurasia. [15]

Geologically, the province is divided into four main geological regions. Central Mountains Range, Chagai Hills and Ras Koh Range, Makran Mountains Range and Chagai – Kharan Basin. The hills and mountain ranges consist predominantly of folded and faulted Mesozoic to middle Tertiary limestone. Mesozoic and tertiary sedimentary rocks mostly inter bedded limestone, sandstone, shale, and marls make up the bulk of the Central Mountains Range. Similar sedimentary rocks, in addition to the Cal alkaline and ultramafic intrusions, are found together with young quaternary volcanic rocks in the Ras Koh Range. This range is favorable for copper, iron, and sulfur deposits (Saindak). The Makran Mountain Range includes central and coastal ranges and is mainly made up of uniform sequence of tertiary and quaternary sedimentary rocks. The Chagai – Kharan Basin is mostly desert basin partly filled with younger sedimentary rocks derived from surrounding mountain ranges.[16]

Figure 5-3 shows the lithological units within the Physical Environment Study Area, and in the region. According to the geological map of Pakistan, [17] the Physical Environment Study Area lies mostly in:

- Q (Quaternary; Alluvium and extrusive mud, unconsolidated surficial deposits),
- Qes (Quaternary; Alluvium and extrusive mud, Eolian sand),
- Qp (Quaternary; Poorly consolidate shale, sandstone, and conglomerate, thickness up to 1,524 m),

15 https://www.segweb.org/SEG/Events/Conference-Archive/2010/Conference-Proceedings/data/papers/posters/2337.pdf accessed on December 12, 2023

16 ibid

17 Geological Survey of Pakistan (GSoP) and United States Geological Survey (USGS). “Geological Map of Pakistan [Scale: 1:2,000,000]” (1964)

- Te (Tertiary; Eocene sedimentary rocks, Washap formation, mostly limestone, and Robat limestone in western Chagai belt. Kullan formation, Erikalag limestone, and Kharan limestone in Ras Koh belt; thickness over ~305 m (1,000 feet)),
- TKf (Cretaceous and Tertiary; Early Tertiary and Late Cretaceous intrusive rocks, Felvic intrusive rocks, mostly monzonite and small amounts of ultramafic rocks in the Ras Koh belt, granodiorite and small amounts of diorite, granite, and mafic dykes in the central Chagai belt),
- TKm (Cretaceous and Tertiary; Early Tertiary and Late Cretaceous intrusive rocks, Mafic intrusive rocks, mostly sills, dykes, and small boss-like intrusives in the western Chagai belt),
- Tp (Tertiary: Paleocene sedimentary rocks, Juzzak formation in the western Chagai belt; thickness up to 2,438 meters), and
- some part lies in Kv (Cretaceous: Cretaceous sedimentary and volcanic rocks, Humai formation: limestone shale, sandstone, conglomerate, and agglomerate. Thickness up to 1,219 m and includes inseparable Chagai intrusions).

5.1.4 Seismicity

The entire province of Balochistan lies in a seismically active region. Over the past century, the surrounding region has witnessed 21 earthquakes of magnitude M6 or higher.[18] Some events are as follows:

- An earthquake of magnitude 5.9 occurred early morning on October 7, 2021, near Quetta, Balochistan, Pakistan. According to the National Seismic Monitoring Centre (NSMC), the earthquake was centered near the Harnai District (~100 km east of Quetta) and had a depth of ~14.97 km (9.3 miles). Such shallow earthquakes are felt more strongly than deeper ones. According to the Provincial Disaster Management Authority (PDMA) Balochistan, 20 people were killed, including eight children; and more than 300 were injured (42% children).[19]
- A M7.1 (earthquake magnitude of 7.1) thrust earthquake with similar faulting characteristics to the October 2021 earthquake, occurred on February 27, 1997, ~40 km to the southeast of the October 2021 earthquake. This 1997 earthquake led to ~100 casualties and strong shaking in Quetta. West of the Sulaiman Mountains, an M7.2 earthquake occurred on August 27, 1931, ~75 km to the southwest of the October 2021 earthquake. An M7.5 earthquake on May 30, 1935, located 205 km southwest of the October 2021 earthquake caused widespread destruction in Quetta and approximately 20,000 fatalities. [20]
- An earthquake of magnitude 8.6 on the Richter scale hit Balochistan on November 28, 1945, resulting in the loss of nearly 4,000 lives. [21]

[18] https://earthquake.usgs.gov/earthquakes/eventpage/us6000fsg9/executive accessed on December 12, 2023.

[19] ibid.

[20] ibid.

[21] https://www.adb.org/sites/default/files/linked-documents/48098-002-eiaab.pdf accessed on December 12, 2023.

The Building Code of Pakistan with Seismic Provisions – 2007[22] divides Pakistan into five seismic zones. These zones are divided based on the Peak Ground Acceleration (PGA) ranges (Table 5-1). According to these provisions, the Chagai District falls in Zone 2A with the PGA values from 0.08 to 0.16 g (where g is the acceleration due to gravity, which is equal to 9.80 meters per second square (m/s^2) (Figure 5-4).

Table 5-1: Seismic Zones and Peak Horizontal Ground Acceleration by Building Code of Pakistan – Seismic Provisions 2007

Seismic Zone	Peak Horizontal Ground Acceleration
1	0.05 to 0.08 g
2A	0.08 to 0.16 g
2B	0.16 to 0.24 g
3	0.24 to 0.32 g
4	> 0.32 g

Note: "g" is the acceleration due to gravity.

According to the Global Seismic Hazard Map of Pakistan, the Western part of the Balochistan, where the Project Area falls, has PGA values ranging from 0.8 to 1.6 m/s^2 with a 10% probability of exceedance in 50 years (Figure 5-4).[23]

22 Government of Pakistan. 2007. *Building Code of Pakistan–Seismic Provisions Islamabad*: Ministry of Housing and Works.

23 Giardini, D., Grünthal, G., Shedlock, K. M. and Zhang, P.: The GSHAP Global Seismic Hazard Map. Annali di Geofisica 42 (6), 1225-1228, 1999.

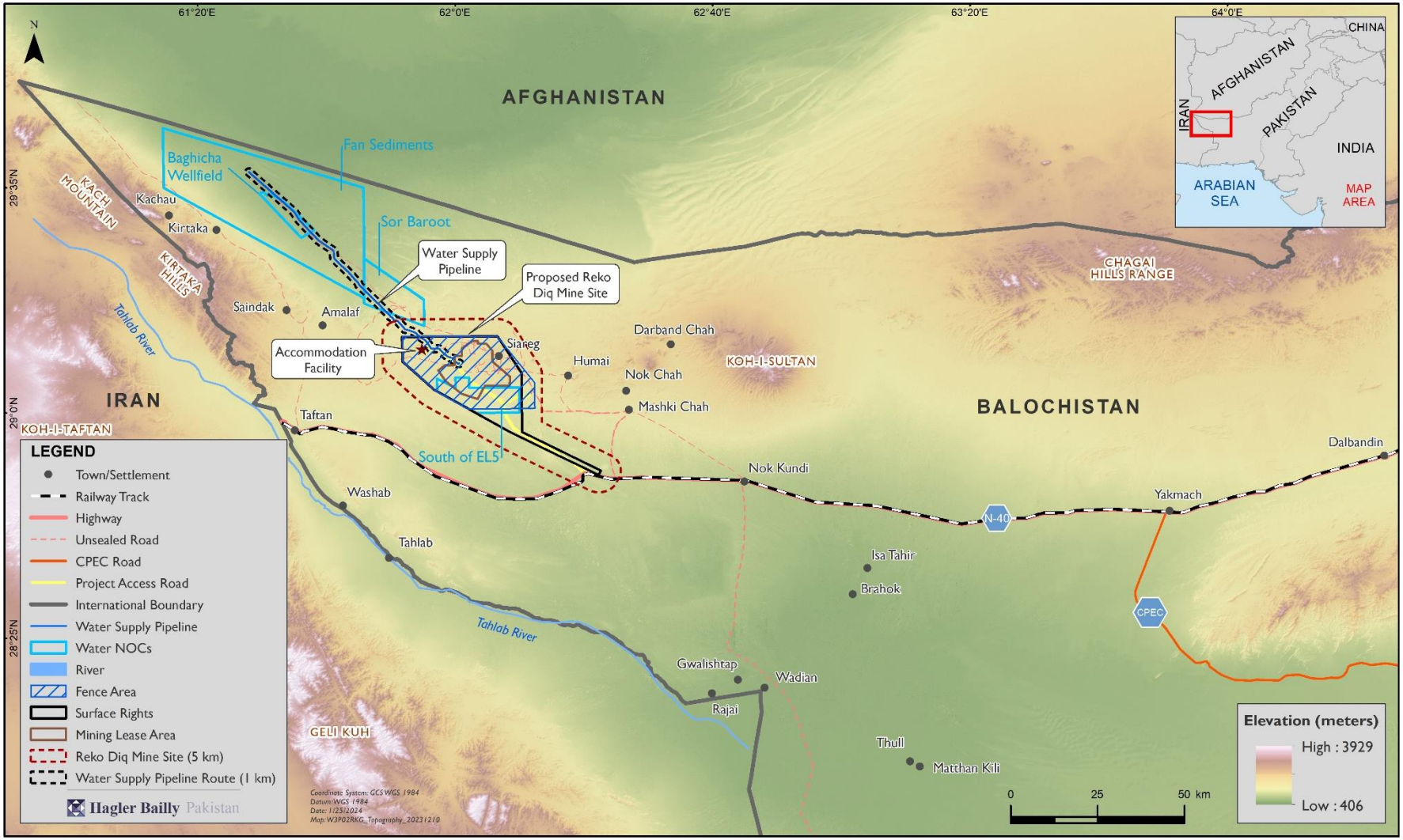
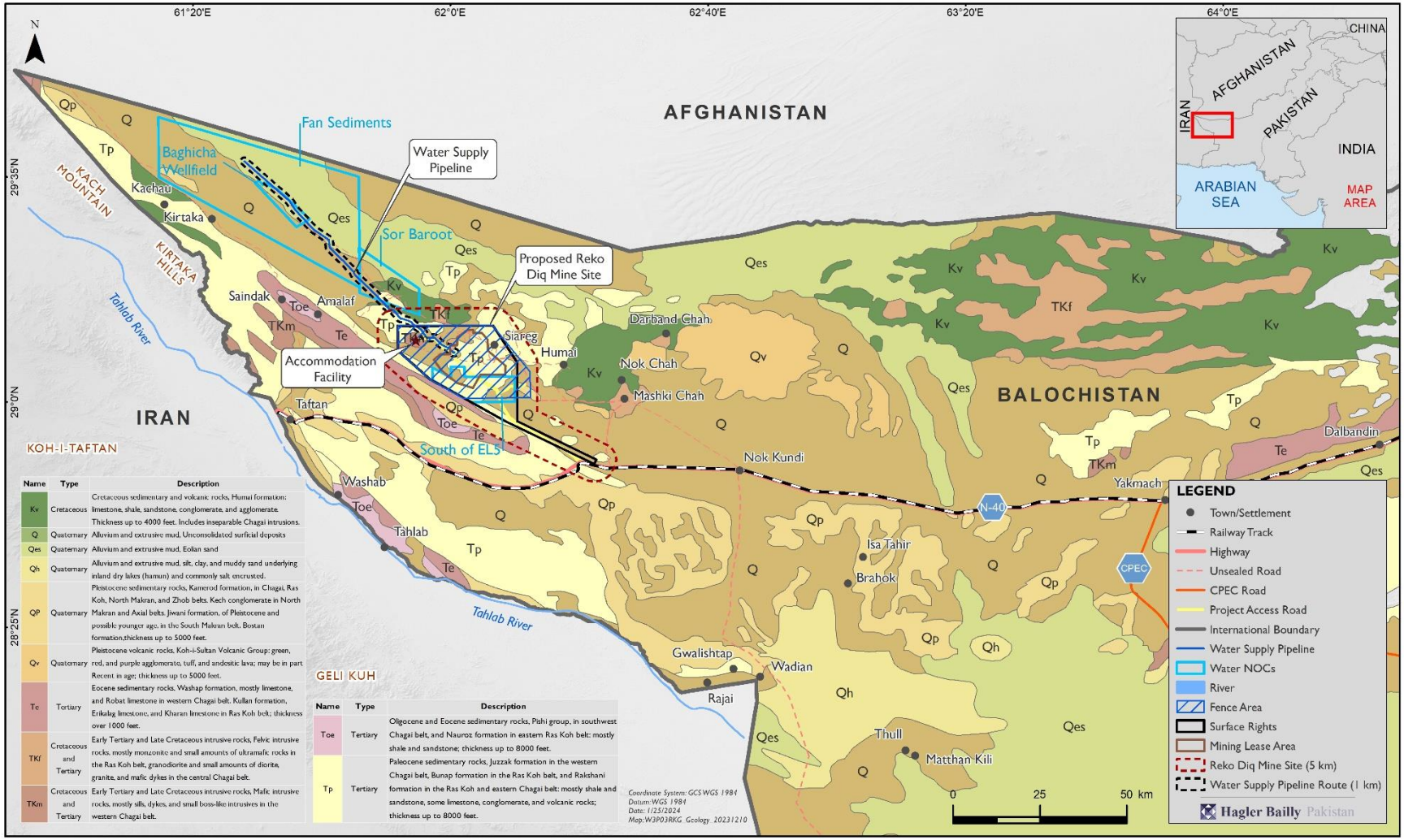
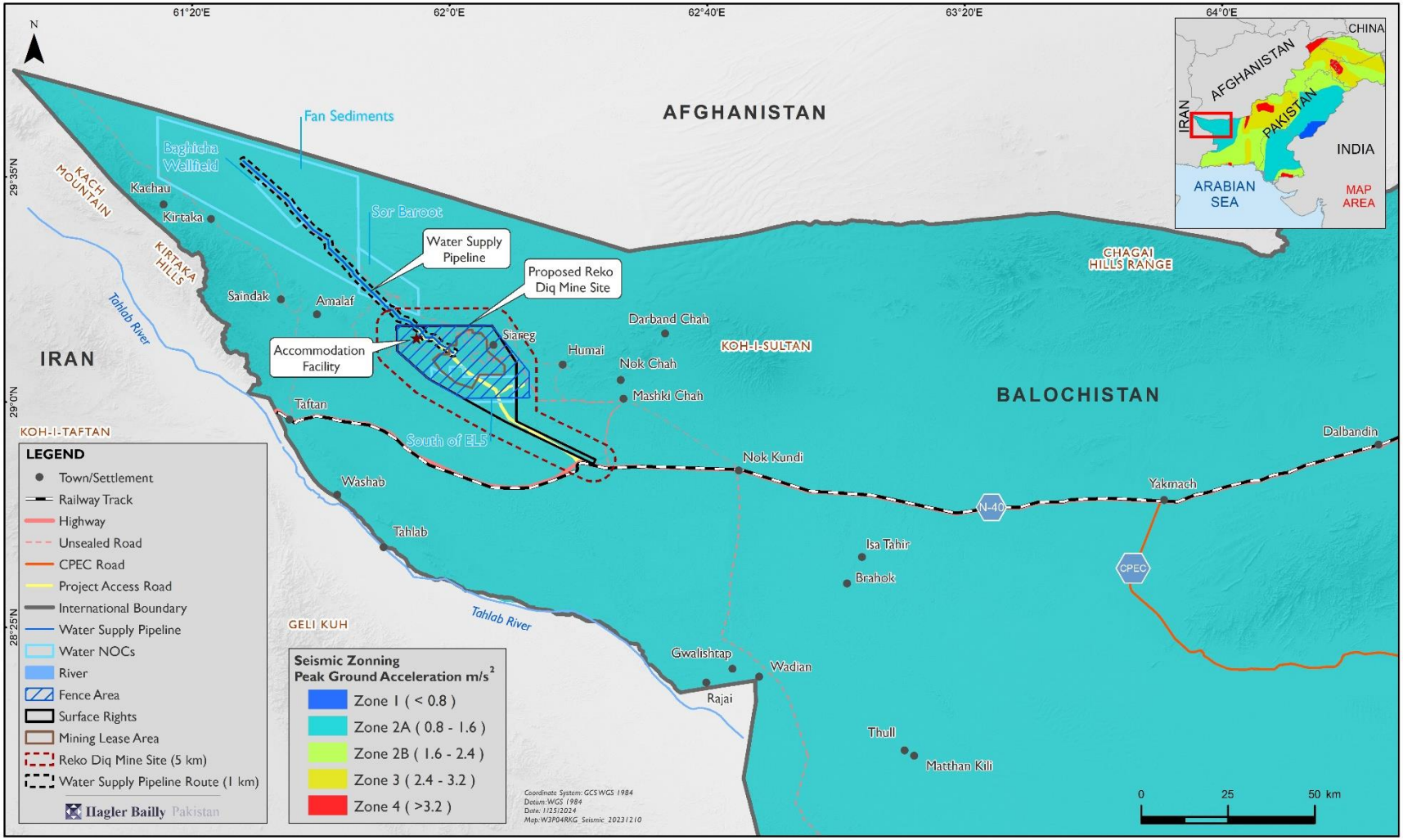


Figure 5-2: Regional Topography



Source: Geological Survey of Pakistan (GSoP) and United States Geological Survey (USGS). "Geological Map of Pakistan [Scale: 1:2,000,000]" (1964)

Figure 5-3: Regional Geology



Source: Giardini, D., Grünthal, G., Shedlock, K. M. and Zhang, P.: The GSHAP Global Seismic Hazard Map. Annali di Geofisica 42 (6), 1225-1228, 1999

Figure 5-4: Peak Ground Acceleration Values of the Project Area – Global Seismic Hazard Map of Pakistan

5.1.5 Climate

The climate of Balochistan is generally arid. The province can be divided into three broad climatic zones[24]:

- Hyper-arid (<100 millimeter per year (mm/year)) - Chagai, Makran coastal areas and south-east of Lasbela.
- Arid (100-250 mm/year) - Northeast of Zhob, Loralai, Sibi, Kachhi, Lasbela plains, and Pab-Mor ranges.
- Semi-arid (250 – 400 mm/year) - Sulaiman ranges covering Toba Kakari area, Marri Bugti areas, and Pab Kirthar mountain ranges and Brahui ranges.

The climate of the Project Area is hyper-arid. The mean annual rainfall is <100 mm/year and it receives most of its rainfall from January to March (30-50%).[25]

5.1.5.1 Historic Data

The historic meteorological data for the proposed Project site was obtained from Lakes Environmental ™.[26] The data covers a six years' period from 2017 to 2022. The mean averages of the climatic parameters were calculated from the database developed from the data provided by Lakes Environmental ™.

Table 5-2 provides a summary of the mean monthly weather parameters and Figure 5-5 to Figure 5-9 present the graphical representation of these parameters. Figure 5-10 shows the monthly and annual wind rose prepared from the six years' data obtained from Lakes Environmental ™. The general characteristics of the seasons based on this data are described as follows:

- Summer (mid-April to mid-July)

Characterized by high temperatures, very low rainfalls with moderate atmospheric humidity and high speed-winds that blow from northwest towards southeast.

- Summer Monsoon (mid-June to mid-September)

Characterized by high temperatures, moderate atmospheric humidity and high speed-winds that blow from northwest towards southeast.

- Post-Monsoon summer (mid-September to mid-November)

Characterized by moderate temperatures, low rainfalls and high speed-winds that normally blow from southwest towards northeast with the direction of wind changing at the end of post-monsoon summer from northwest to southeast.

- Winter (mid-November to mid-April)

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24 Burke F, Huda SN, Hamza S, Azam M (2005) Disparities in agricultural productivity in Balochistan - A GIS perspective. Pakistan Geographical Review

25 The IUNC-Balochistan Program, water requirement of major crops in different agro-climatic zones of Balochistan.

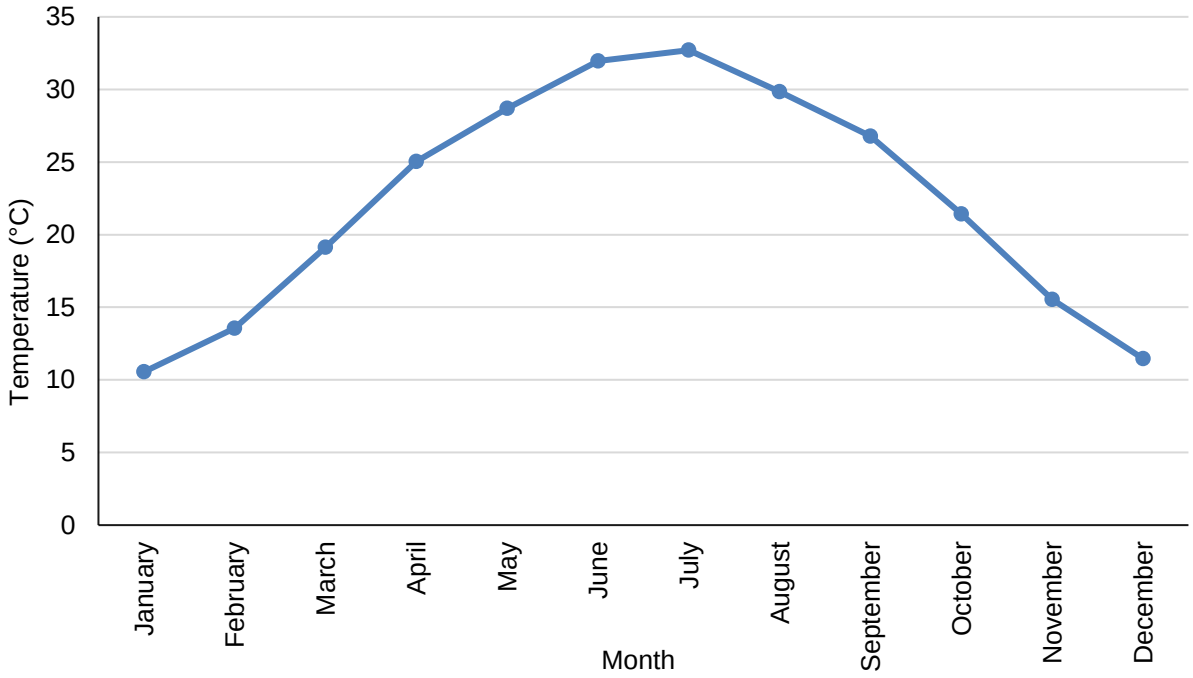
26 https://www.weblakes.com/services/met_data.html

Characterized by low temperatures and high speed-winds that blow from northwest to southeast.

Table 5-2: Summary of Mean Monthly Weather Parameters at Project Site

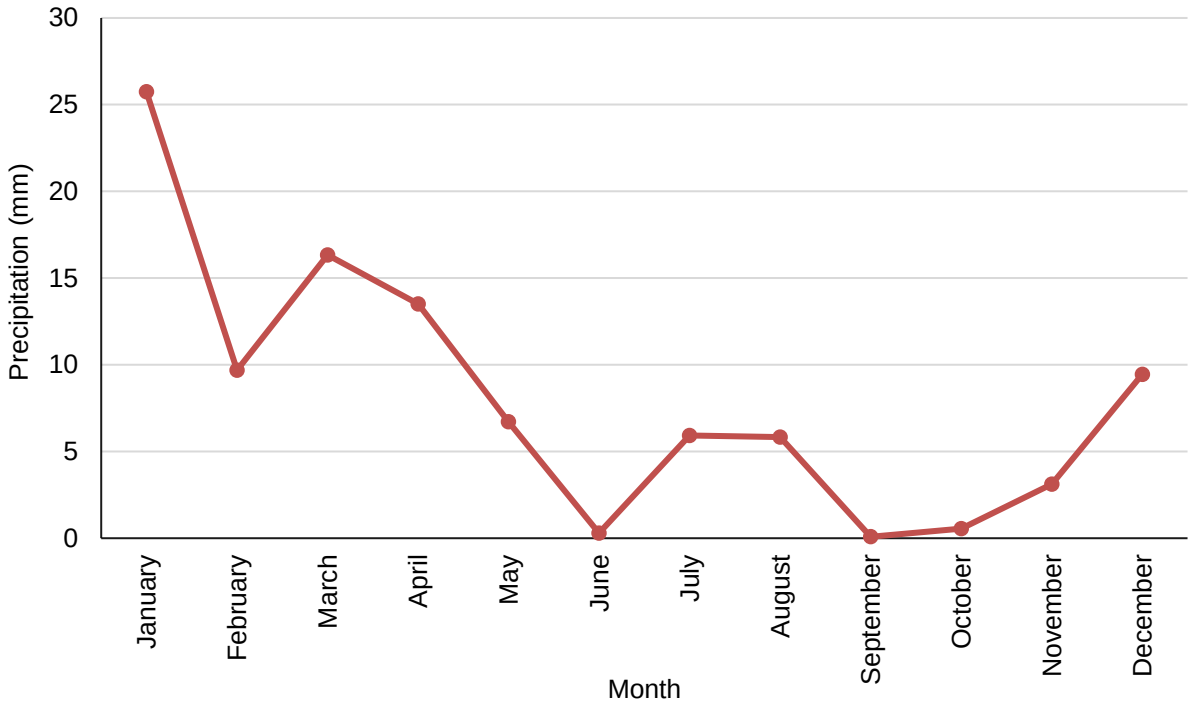
Month	Temperature (°C)	Relative Humidity (%)	Pressure (millibar)	Wind Speed (m/s)
Jan.	10.6	39.8	906.5	5.2
Feb.	13.6	32.6	906.5	5.1
Mar.	19.1	28.0	903.6	5.1
Apr.	25.0	21.5	902.0	4.9
May	28.7	17.0	899.4	5.7
Jun.	32.0	13.7	895.1	6.6
Jul.	32.7	19.3	892.7	5.9
Aug.	29.8	17.4	894.7	7.0
Sep.	26.8	15.5	899.6	6.2
Oct.	21.4	21.2	904.8	6.1
Nov.	15.5	33.1	907.8	4.8
Dec.	11.5	37.2	908.7	4.8

Source: Lakes Environmental (2017-2022) https://www.weblakes.com/services/met_data.html



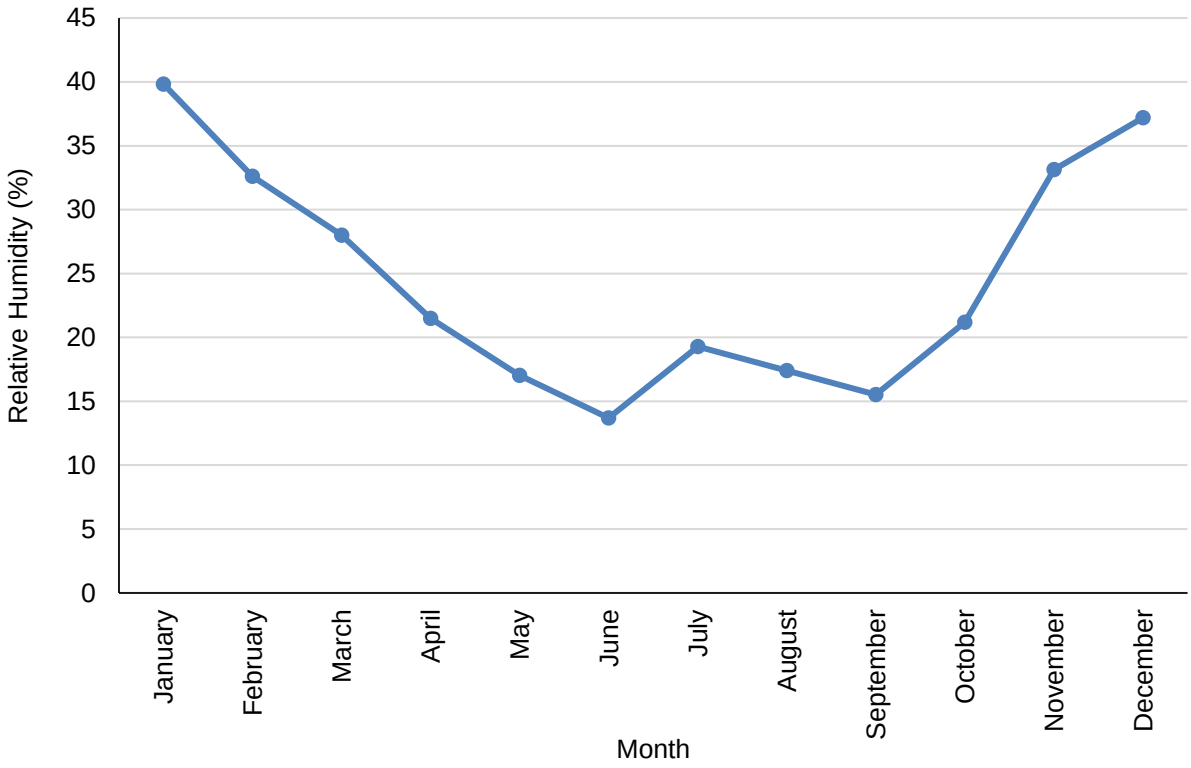
Source: Lakes Environmental (2017-2022) https://www.weblakes.com/services/met_data.html

Figure 5-5: Mean Monthly Temperature (°C)



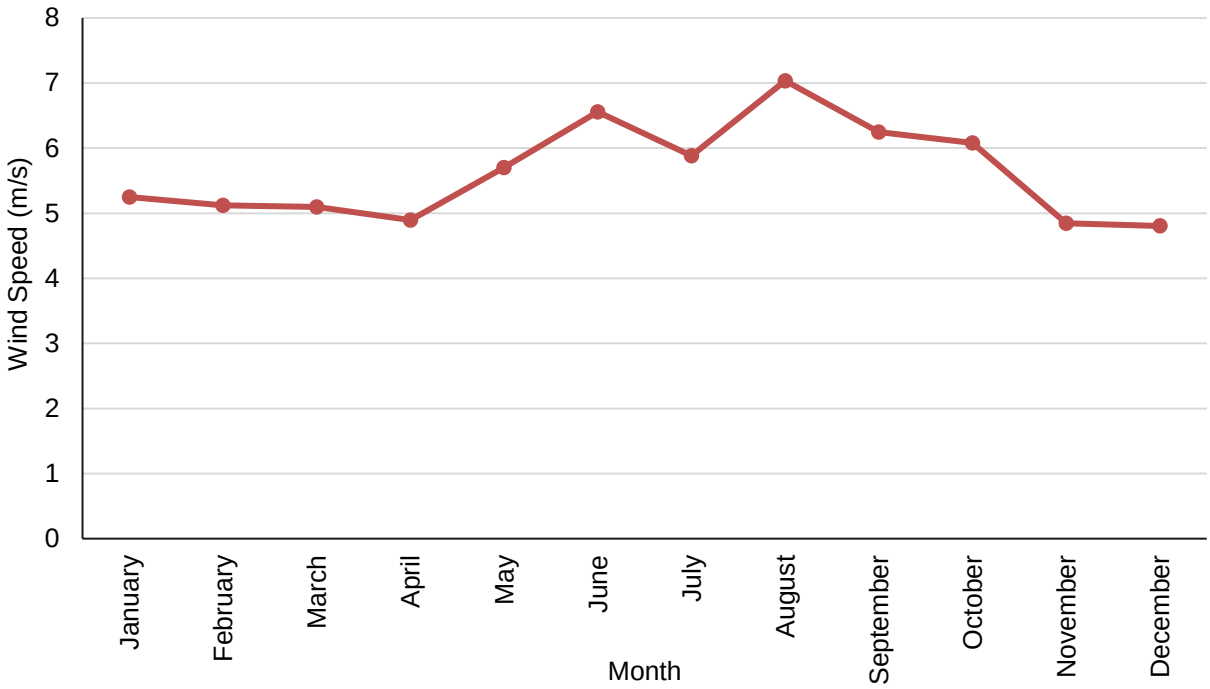
Source: Lakes Environmental (2017-2022) https://www.weblakes.com/services/met_data.html

Figure 5-6: Mean Monthly Rainfall (mm)



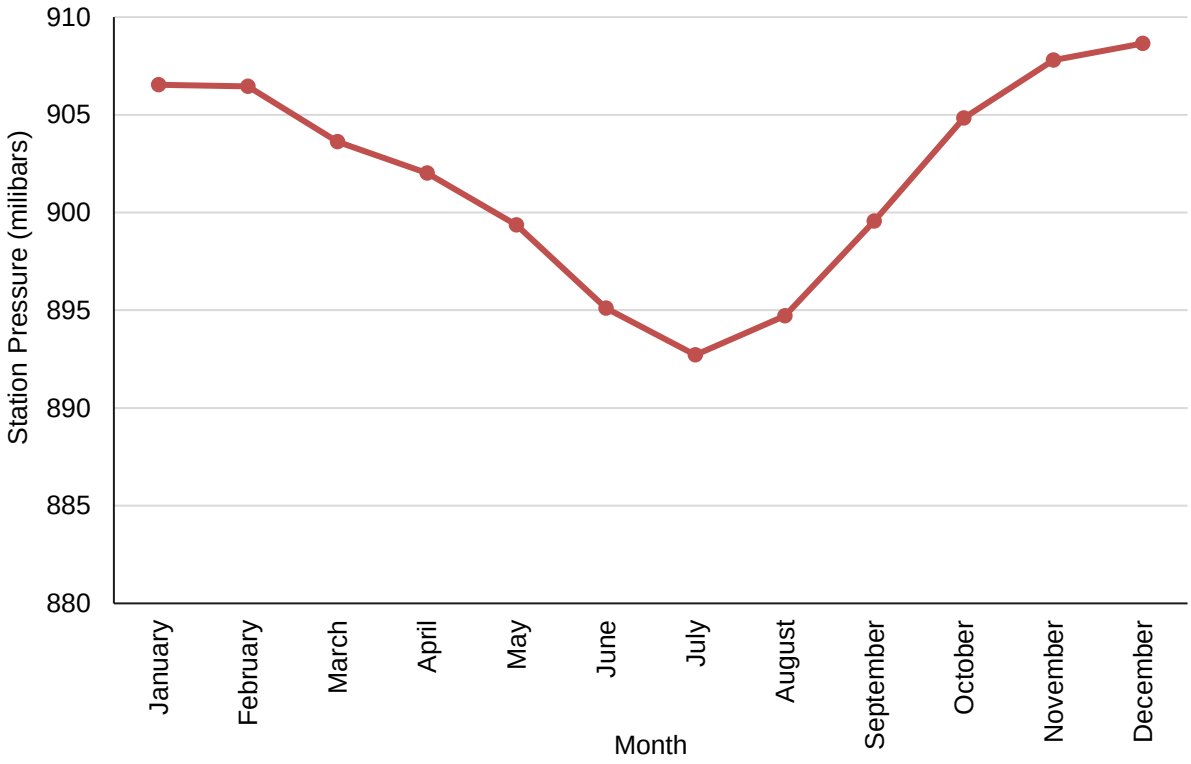
Source: Lakes Environmental (2017-2022) https://www.weblakes.com/services/met_data.html

Figure 5-7: Mean Monthly Relative Humidity (%)



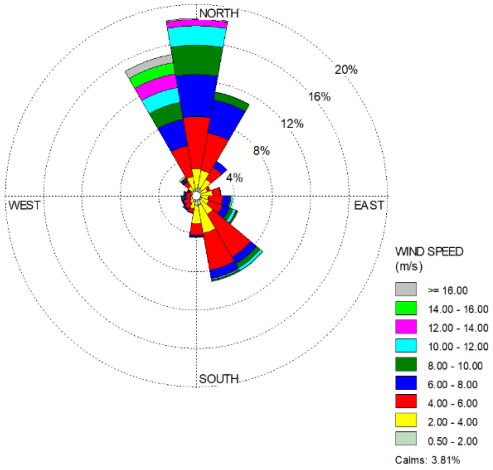
Source: Lakes Environmental (2017-2022) https://www.weblakes.com/services/met_data.html

Figure 5-8: Mean Monthly Wind Speed (m/s)

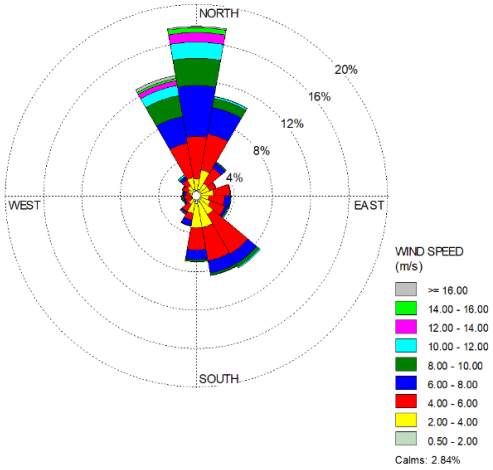


Source: Lakes Environmental (2017-2022) https://www.weblakes.com/services/met_data.html

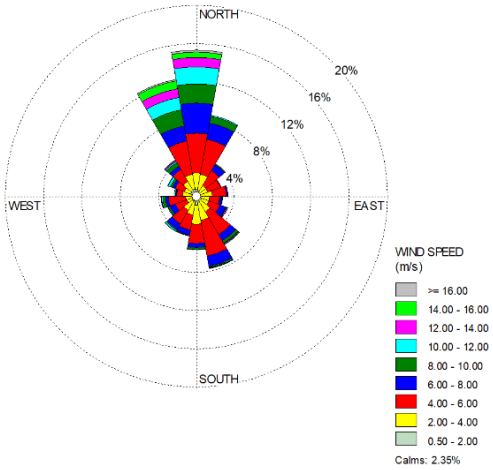
Figure 5-9: Mean Monthly Pressure (millibars)



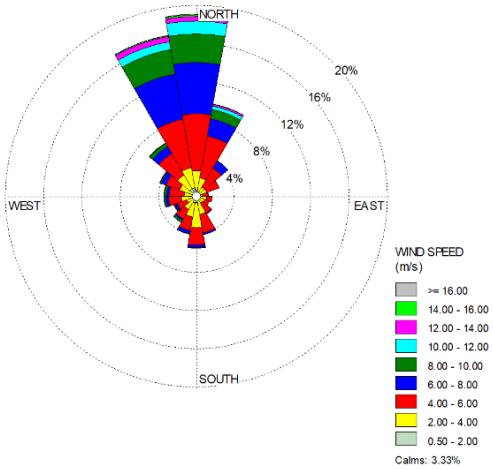
January



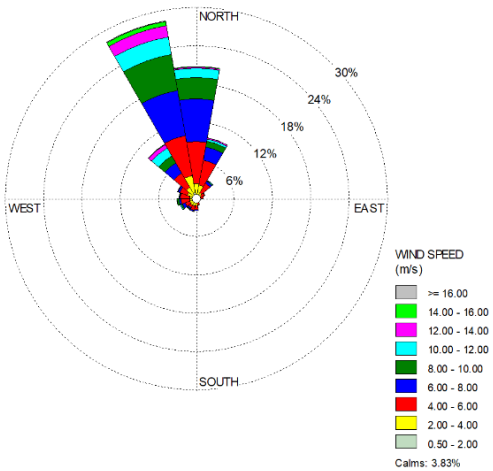
February



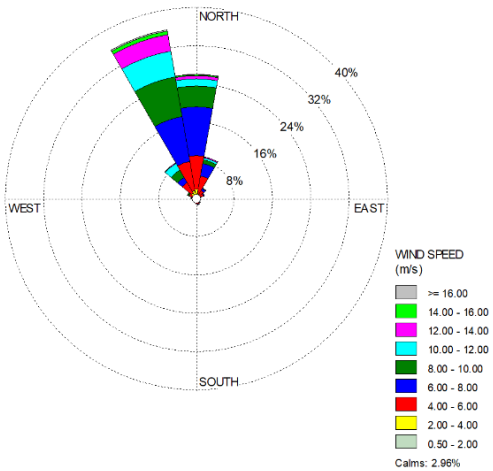
March



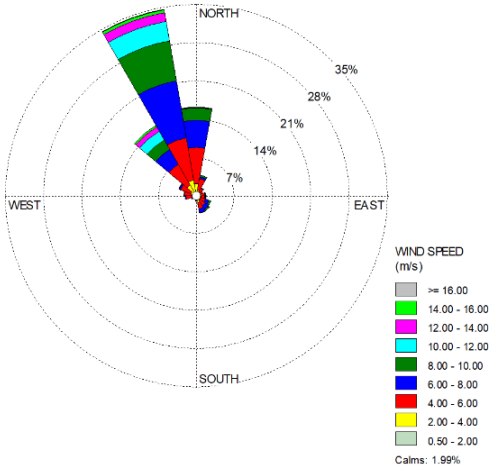
April



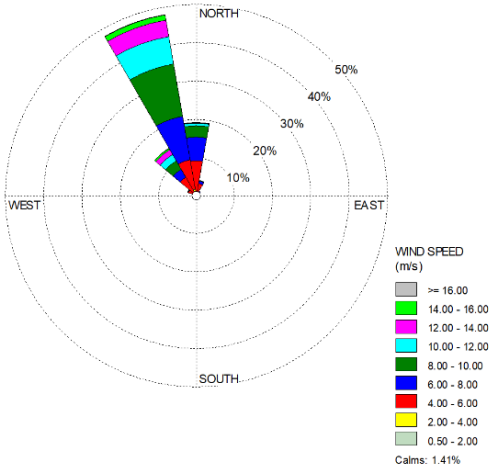
May



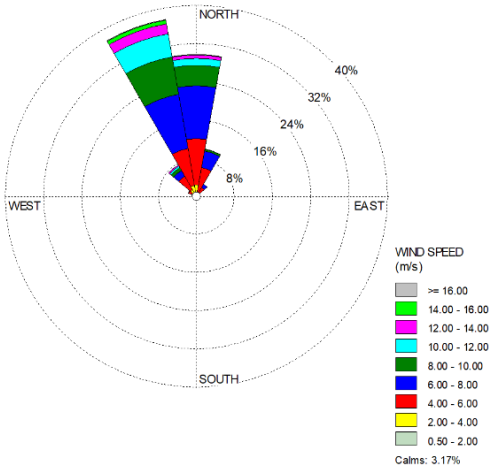
June



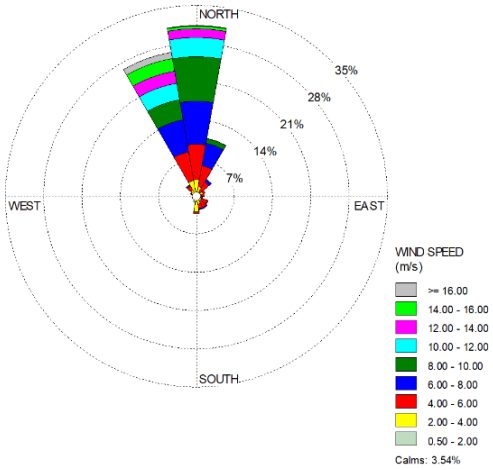
July



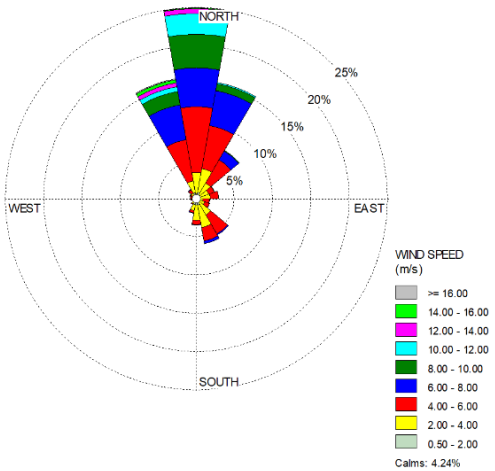
August



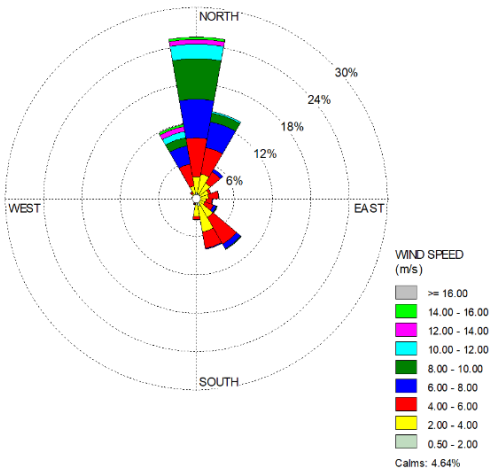
September



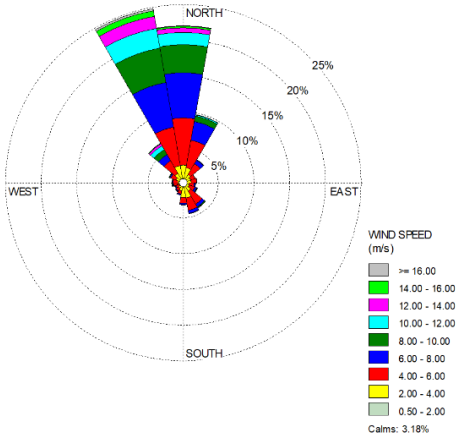
October



November



December



Annual

Source: Lakes Environmental (2017-2022) https://www.weblakes.com/services/met_data.html

Figure 5-10: Monthly and Annual Windrose

5.1.5.2 On-site Climate Data

Table 5-3 presents the average on-site climate data collected between September 25, 2023, and November 17, 2023, from the on-site weather station installed at the Reko Diq Mine Site in September 2023. Figure 5-11 shows the location of on-site weather station.

Table 5-3: Average On-site Climate Data collected between September and November 2023

Parameter	Units	Value
Temperature	°C	23.8
Wind Speed	m/s	4.8
Relative Humidity	%	21.3
Atmospheric Pressure	hPa	901.2
Rainfall Total (from September 15 to November 17, 2023)	mm	1.42

Note:
m/s is meters per second
hPa is hectopascal, which is a unit of pressure used in meteorology and measuring atmospheric pressure.
mm is millimeters

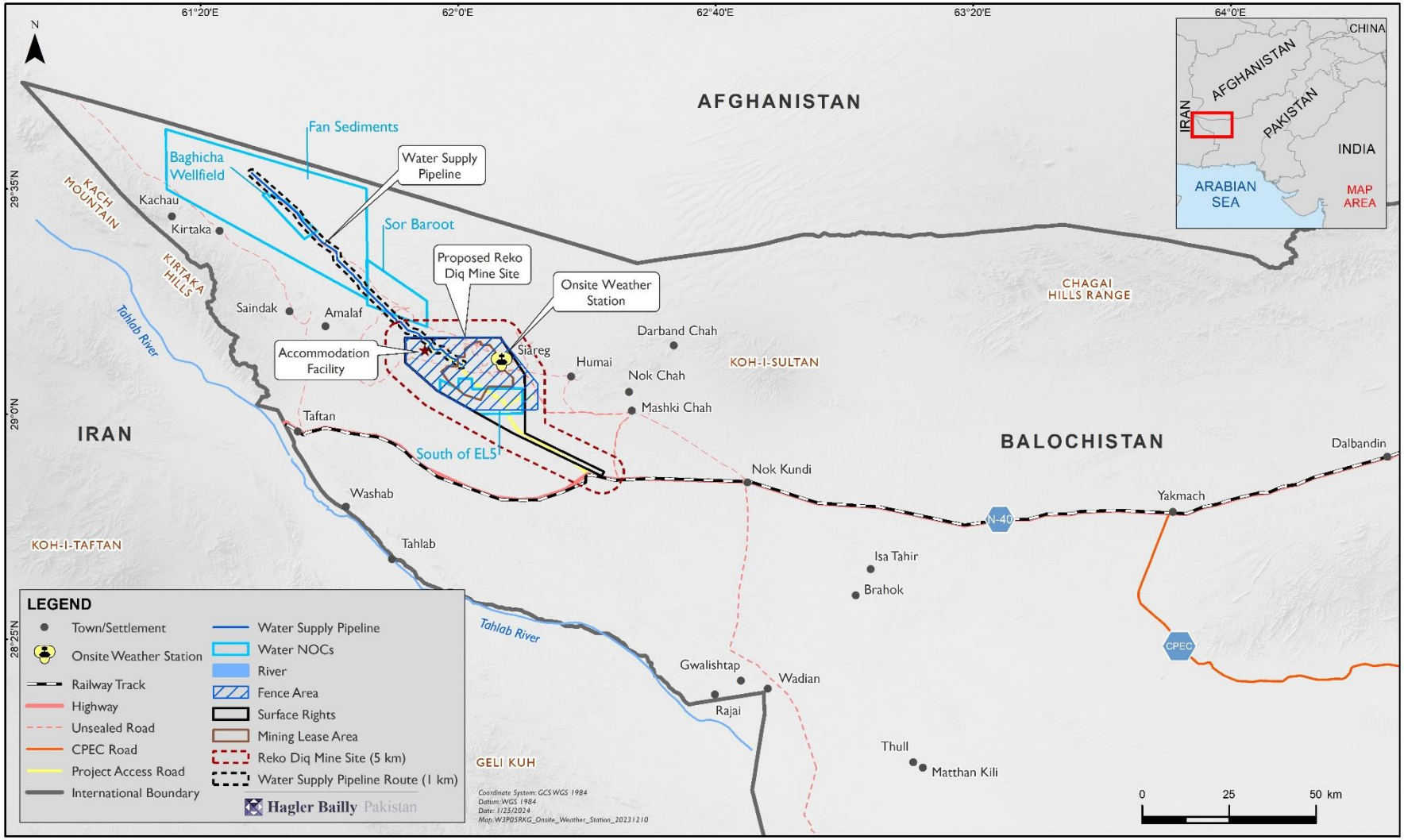


Figure 5-11: On-site Weather Station

5.1.6 Water Resources and Quality

There are no surface water resources available at Fan Sediments and the proposed Reko Diq Mine Site. The proposed Project will rely on groundwater from boreholes in the Fan Sediments area, drilled by Barrick in 2010. A hydrocensus survey was carried out to understand the community water resources; their locations and usages, and to ensure that the proposed Project will protect the community water resources and will not utilize them for its water requirements.

The hydrocensus survey findings were supported by water quality sampling carried out at the boreholes in Fan Sediments and the community water resources. This was done to understand why people are not using water from Fan Sediments, which the proposed Project plans to use after treating the water.

5.1.6.1 Hydrocensus – Community Water Resources

The proposed Project will not affect the water resources of the communities located east and west of the proposed Reko Diq Mine Site. However, the survey was conducted in these communities as a good practice and a comprehensive database for the community water resources located east and west of the proposed Reko Diq Mine Site was developed through two rounds of surveying. Round 1 of the survey was carried out from September 12, 2022, to October 14, 2022, and Round 2 from April 28, 2023, to May 14, 2023. The purpose of the Round 2 survey was to validate the data collected in Round 1 and make a consolidated database of the community water resources.

5.1.6.1.1 Hydrocensus Study Area

Figure 5-12 shows the Hydrocensus Study Area, covering a 40 km radius around the proposed Reko Diq Mine Site, encompassing the accommodation facility. Additionally, it extends 30 km along the water supply pipeline route from Fan Sediment boreholes to the accommodation facility, designated for workers' accommodation. The Hydrocensus Study Area aligns with the Socioeconomic Study Area facilitating the evaluation of the water resources utilized by the communities that are residing near the Fan Sediments area, proposed Reko Diq Mine Site and its facilities.

5.1.6.1.2 Methodology and Settlements for Hydrocensus Survey

The hydrocensus was conducted in the settlements located east and west of the proposed Reko Diq Mine Site in parallel with the socioeconomic survey. These include:

- Settlements east of the proposed Reko Diq Mine Site: Humai, Mashki Chah, Nok Chah, and Darband Chah.
- Settlements west of the proposed Reko Diq Mine Site: Kachau, Bore Chah, Kirtaka, Maki, Beeduk, Maskin, Amalaf, and Saindak.

Table 5-4 provide geographical coordinates of the surveyed water resources in the settlements in the Hydrocensus Study Area. Figure 5-12 show the location of the surveyed water resources in the Hydrocensus Study Area.

Figure 5-13 and Figure 5-14 shows the photographs of the surveyed water resources in the settlements located east and west of the proposed Reko Diq Mine Site, respectively.

The location and onsite water quality at the origin of the water resource were recorded. The following key information was collected at each water source:

- Well location (village name, neighborhood (if applicable), and geographical coordinates,
- Well usage:
  - Approximate water extraction rate,
  - Approximate number of users,
  - Water extraction method.
- Onsite water quality – basic chemical parameters (measured on site): pH, DO, Electrical Conductivity (EC), Total Dissolved Solids (TDS), turbidity and temperature,
- Time and date of measurement,
- Pictures.

Table 5-4: Details of Surveyed Water Resources

Hydrocensus Location ID	Coordinates	Settlement	Type of Water Resource
Settlements east of the proposed Reko Diq Mine Site			
W1	29°05’59.50” N 62°17’25.50” E	Humai	Borehole
W2	29º05’44.60’’ N 62º17’34.70’’ E		Dug Well
W3	29º05’45.10’’ N 62º17’37.10’’ E		Dug Well
W4	29º05’50.40’’ N 62º17’29.80’’ E		Dug Well
W5	29°05’47.10” N 62°17’30.50” E		Reverse Osmosis (RO) Plant
W6	29º06’02.30’’ N 62º16’47.20’’ E		Dug Well
W7	29°06’25.20” N 62°16’52.00” E		Dug Well
W8	29°05’59.60” N 62°16’49.70” E		Dug Well
W9	29º06’34.70’’ N 62º16’51.40’’ E		Dug Well
W10	29º06’29.21’’ N 62º16’52.50’’ E		Dug Well
W11	29º06’08.60’’ N 62º17’20.40’’ E		Dug Well
NW1	29°05’49.00” N 62°17’39.70” E		Borehole

Hydrocensus Location ID	Coordinates	Settlement	Type of Water Resource
NW2	29º06’01.10’’ N 62º17’26.30’’ E		Dug Well
NW3	29º06’04.40’’ N 62º16’47.80’’ E		Dug Well
NW4	29º06’03.10’’ N 62º16’47.50’’ E		Dug Well
W12	29º00’32.50’’ N 62º27’32.00’’ E	Mashki Chah	Dug Well
W13	29º00’37.80’’ N 62º27’08.60’’ E		Dug Well
W14	29º00’27.70’’ N 62º27’30.30’’ E		Dug Well
W15	29º00’30.90’’ N 62º26’57.80’’ E		Dug Well
W16	29º03’29.40’’ N 62º26’29.60’’ E	Nok Chah	Dug Well
W17	29º10’44.70’’ N 62º33’37.70’’ E	Darband Chah	Dug Well
W18	29º10’46.80’’ N 62º33’32.90’’ E		Dug Well
W19	29º10’42.60’’ N 62º33’28.20’’ E		Dug Well
W20	29º10’39.40’’ N 62º33’26.60’’ E		Dug Well
W21	29º10’24.60’’ N 62º33’31.80’’ E		Dug Well
W22	29º10’19.50’’ N 62º33’27.50’’ E		Dug Well
W23	29º10’18.10’’ N 62º33’32.10’’ E		Dug Well
W24	29º10’13.80’’ N 62º33’34.40’’ E		Dug Well
W25	29º10’18.50’’ N 62º33’34.50’’ E		Dug Well
W26	29º10’31.20’’ N 62º33’37.20’’ E		Dug Well
W27	29º10’32.90’’ N 62º33’37.20’’ E		Dug Well
W28	29º10’33.60’’ N 62º33’37.70’’ E		Dug Well

Hydrocensus Location ID	Coordinates	Settlement	Type of Water Resource
NDW1	29º10’36.60’’ N 62º33’21.20’’ E		Dug Well
NDW2	29º10’29.20’’ N 62º33’19.30’’ E		Dug Well
NDW3	29º10’32.70’’ N 62º33’34.10’’ E		Dug Well
Settlements west of the proposed Reko Diq Mine Site			
W32	29°29’58.17” N 61°15’29.99” E	Kachau	Spring/Karez
W33	29°30’38.84” N 61°15’35.21” E		Spring/Karez
Bore Chah	29°31’46.50” N 61°19’25.80” E	Bore Chah	Spring/Karez
Multiple Springs	29°30’18.80” N 61°20’50.50” E		Spring/Karez
Kirtaka	29°28’11.50” N 61°23’25.20” E	Kirtaka	Spring/Karez
Maki	29°28’00.60” N 61°19’30.50” E	Maki	Spring/Karez
Beeduk	29°24’29.80” N 61°25’08.40” E	Beeduk	Spring/Karez
Maskin	29°21’54.10” N 61°26’26.00” E	Maskin	Spring/Karez
W29	61º39’30.90’’ E 29º13’46.30’’ N	Amalaf	Dug Well
W30	61º39’07.10’’ E 29º13’29.00’’ N		Dug Well
W31	61º36’07.30’’ E 29º12’13.50’’ N	Saindak	Borehole

Note:
W is for water resource surveyed in 2022 (Round 1) and 2023 (Round 2)
NW is for new water resource found and surveyed in 2023 (Round 2) in Humai settlement.
NDW is for new water resource found and surveyed in 2023 (Round 2) in Darband Chah settlement.

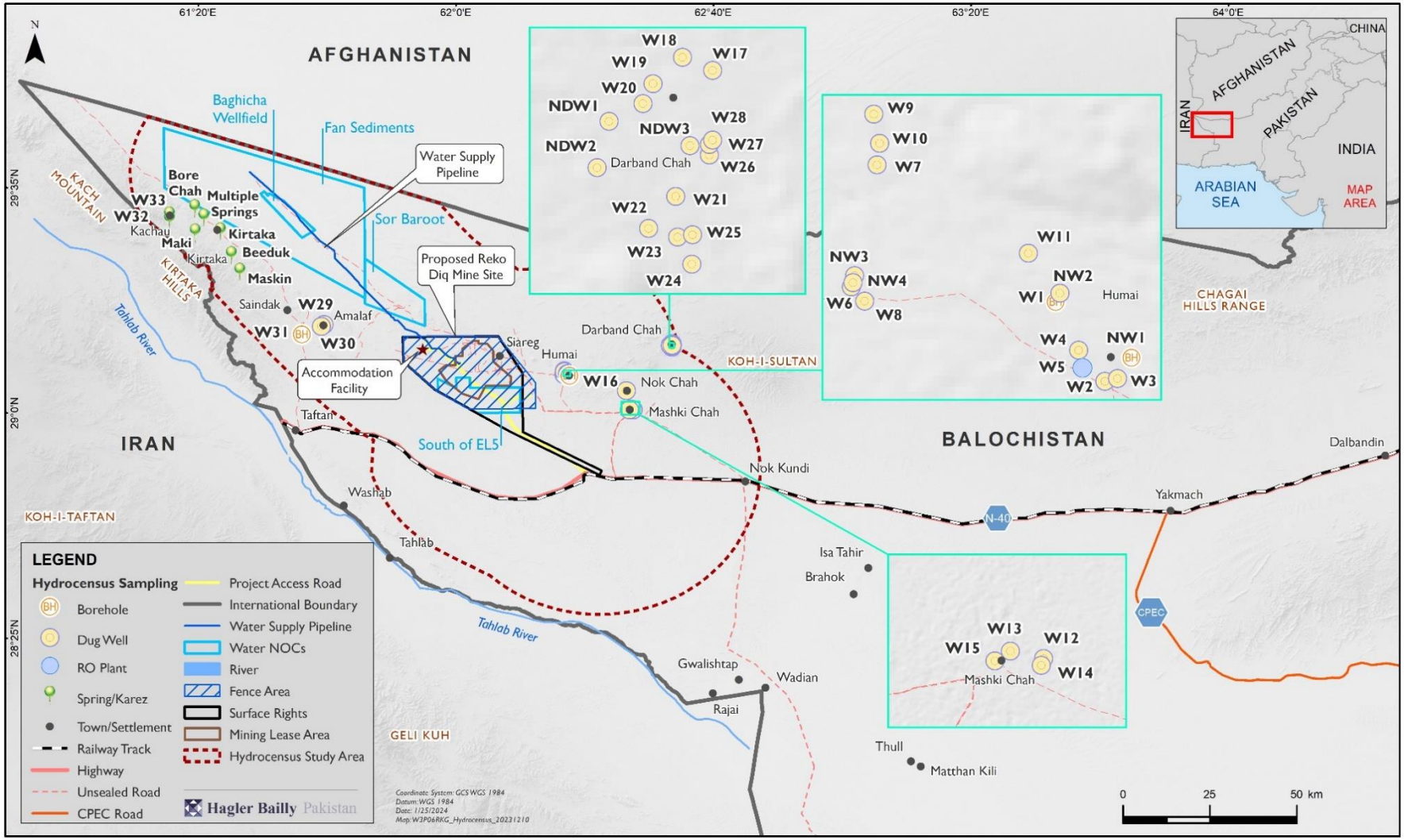


Figure 5-12: Location of Surveyed Community Water Resources within the Hydrocensus Study Area



Borehole at Humai – W1



Dug well at Humai – W2



Dug well at Humai – W3



Dug well at Humai – W4



RO Plant in Humai – W5



Dug well at Humai – W6



Dug well at Humai – W7



Dug well at Humai – W8



Dug well at Humai – W9



Dug well at Humai – W10



Dug well at Humai – W11



Dug well at Humai – W4



Dug well at Mashki Chah – W12



Dug well at Mashki Chah – W13



Dug well at Mashki Chah – W14



Dug well at Nok Chah – W16



Dug well at Darband Chah – W17



Dug well at Darband Chah – W18



Dug well at Darband Chah – W19



Dug well at Darband Chah – W20



Dug well at Darband Chah – W21



Dug well at Darband Chah – W22



Dug well at Darband Chah – W23



Dug well at Darband Chah – W24



Dug well at Darband Chah – W25



Dug well at Darband Chah – W26

Figure 5-13: Photographs of Surveyed Community Water Resources East of the proposed Reko Diq Mine Site



Spring water at Beeduk



Borehole at Saindak – W31



Dug well at Amalaf – W29



Dug well at Amalaf – W30



Spring outlet and collection structure at Kachau – W33



Spring water at Kachau – W32

Figure 5-14: Photographs of Surveyed Community Water Resources West of the proposed Reko Diq Mine Site

5.1.6.1.3 Results and Analysis

During the hydrocensus survey, the locals of the communities located east of the proposed Reko Diq Mine Site reported that there are no communities living in the Fan Sediments, and no one is using water from this source. The reasons reported by the locals are the availability of springs/Karezes in their settlements and the inaccessibility of the water at Fan Sediments due to its distance from the settlements and poor water quality. Table 5-5 provides a summary of the surveyed water resources in the settlements located east and west of the proposed Reko Diq Mine Site, respectively. A comparison of the onsite field–testing parameters: pH, turbidity, and total dissolved solids is also made with the Balochistan Drinking Water Quality Standards and WHO Guidelines. Figure 5-15 to Figure 5-20 shows a graphical presentation of the onsite testing parameters including pH, TDS, DO, EC, temperature, and turbidity.

It was observed that the settlements use water from different sources. These include dug wells, boreholes, and springs.

5.1.6.1.3.1 Dug Wells

These are the wells that are manually constructed, and the least costly way to extract water from shallow sources (10–20 meters). These wells were generally observed in the settlements east of the proposed Reko Diq Mine Site where locals used rope and bucket systems or submersible pumps operating on solar panels to obtain water for drinking and domestic purposes as well as for livestock. A total of 34 dug wells were observed in the 12 settlements surveyed in the Hydrocensus Study Area. One RO plant was observed in the Humai settlement (east of the proposed Reko Diq Mine Site) operated with a solar power system. The treated water from the RO plant is stored in a tank and then distributed to the residents via a pipeline system. It was observed from the field–testing results that the pH and turbidity levels were below the limits prescribed in the BEQS, whereas the TDS exceeds at most of the places and requires filtration before use.

- Settlements east of the Reko Diq Mine Site: Total – 32, Functional – 27, Non–functional – 5

- Settlements west of the Reko Diq Mine Site: Total – 2, Functional – 2, Non–functional – 0

5.1.6.1.3.2 Boreholes

These are the holes that are drilled by machines. These boreholes were generally observed in the settlements west of the proposed Reko Diq Mine Site where the economic conditions of the people were observed better than the ones living east of the proposed Reko Diq Mine Site. These boreholes were mostly constructed by the Government and notable persons in the settlements. The water is first stored in a collection system i.e., tanks, made around these boreholes, and then the water is distributed among the settlements via pipeline. Small tanks are typically built around boreholes to store water, and act as constant heads for water supply pipelines, or such that the settlements can manually draw water from the tank. A total of four boreholes were observed in the 12 settlements surveyed in the Hydrocensus Study Area. It was observed from the field–testing results that the pH and turbidity levels were below the limits prescribed in the BEQS in the samples taken from boreholes, whereas the TDS generally exceeded the BEQS.

- Settlements east of the proposed Reko Diq Mine Site: Total – 3, Functional – 3, Non–functional– 0
- Settlements west of the proposed Reko Diq Mine Site: Total – 1, Functional – 1, Non–functional– 0

5.1.6.1.3.3 Springs

This is an underground water resource without any human or machine effort and is called *Karez* by locals. This water source was particularly observed in the Kachau, Beeduk, Bore Chah, Maskin and Kirtaka settlements located west of the proposed Reko Diq Mine Site. Locals have constructed a storage structure around this source from where they extract stored water via pipelines. This water source was observed to be used mainly for drinking followed by domestic and livestock and agricultural purposes. Small tanks are typically built around springs to store water, and act as constant heads for water supply pipelines, or such that the settlements can manually draw water from the tank. A total of eight springs were observed in the 12 settlements surveyed in the Hydrocensus Study Area. It was observed from the field–testing results that the pH and turbidity levels were below the limits prescribed in the BEQS, whereas the TDS exceeded at most of the places and required filtration before use.

- Settlements east of the proposed Reko Diq Mine Site: No spring was observed.
- Settlements west of the proposed Reko Diq Mine Site: Total – 8, Functional – 7, Non–functional– 1

Appendix C includes the hydrocensus survey findings for the surveyed water resources.

Table 5-5: Summary of Surveyed Water Resources in the Hydrocensus Study Area

Parameter Group	Units	Parameter	Settlements East of proposed Reko Diq Mine Site	Settlements West of proposed Reko Diq Mine Site	BEQS for Drinking Water	WHO Drinking Water
EC	mS/m	Min.	17.8	83.8	–	–
		Max.	637.0	728.0		
		Mean	412.6	355.9		
pH	–	Min.	6.5	7.5	**6.5–8.5**	**6.5–8.5**
		Max.	8.5	8.2		
		Mean	7.2	7.8		
TDS	ppm	Min.	89	419	**<1,000**	–
		Max.	3,185	5,180		
		Mean	2,063	2,099		
Temperature	˚C	Min.	21.7	25.3	–	–
		Max.	33.3	32.2		
		Mean	26.8	27.7		
DO	ppm	Min.	3.9	3.2	–	–
		Max.	9.2	3.6		
		Mean	5.9	3.5		
Turbidity	NTU	Min.	0.6	1.3	**<15**	**<15**
		Max.	225.0	54.3		
		Mean	18.0	9.9		

Notes: Values exceeding the standards are shaded.
'-'means standard is not defined for that parameter.

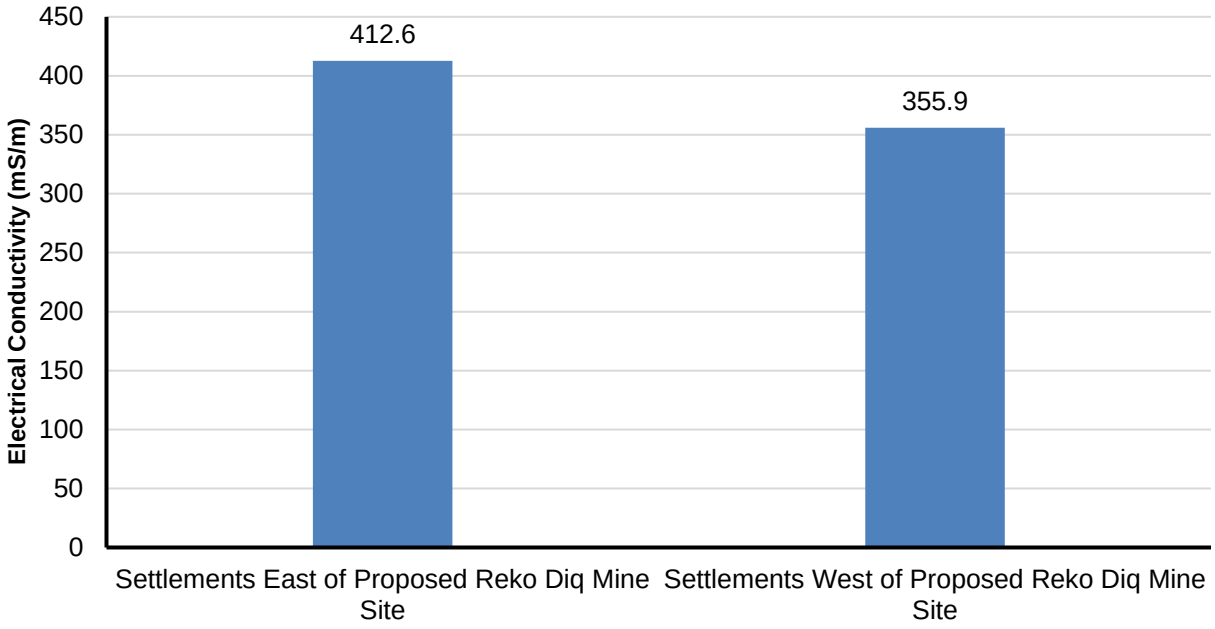


Figure 5-15: Mean Electrical Conductivity of the Surveyed Community Water Resources in the Hydrocensus Study Area

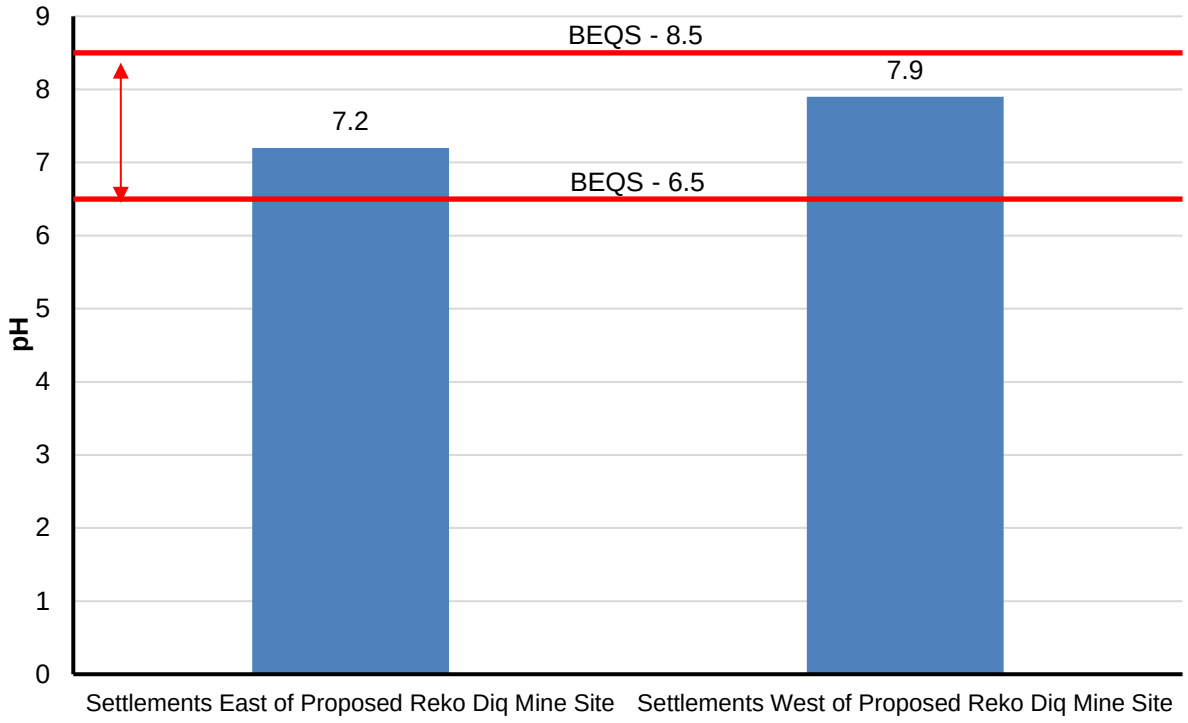


Figure 5-16: Mean pH of the Surveyed Community Water Resources in the Hydrocensus Study Area

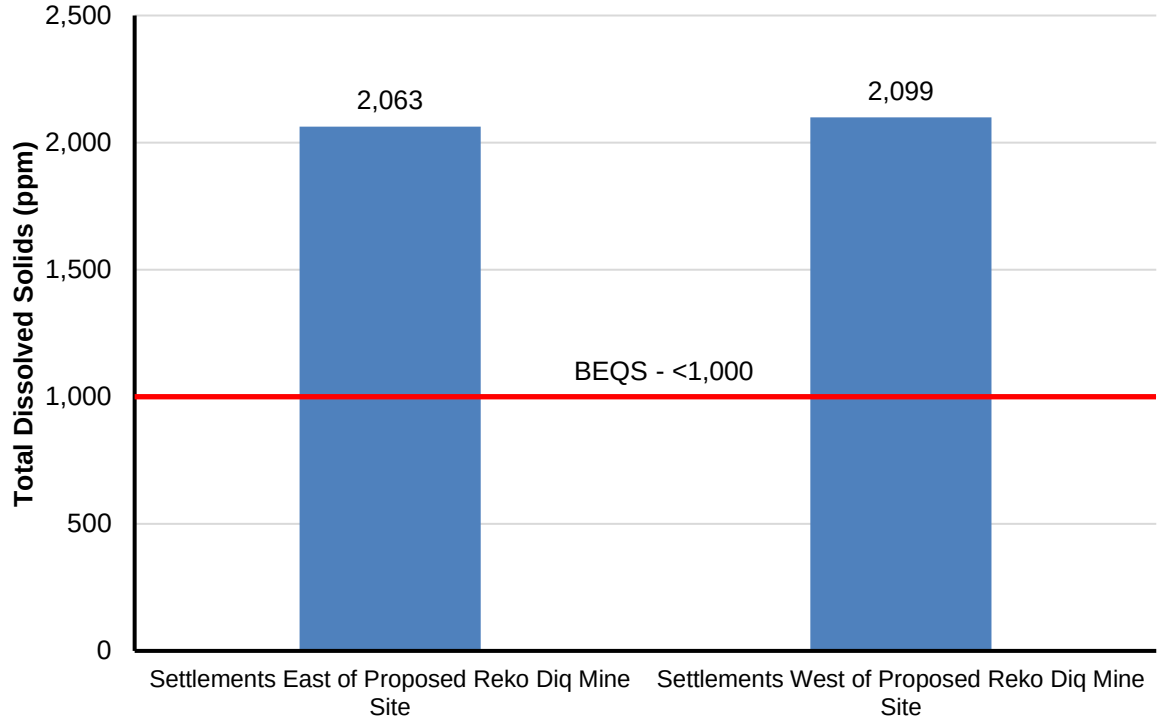


Figure 5-17: Mean Total Dissolved Solids of the Surveyed Community Water Resources in the Hydrocensus Study Area

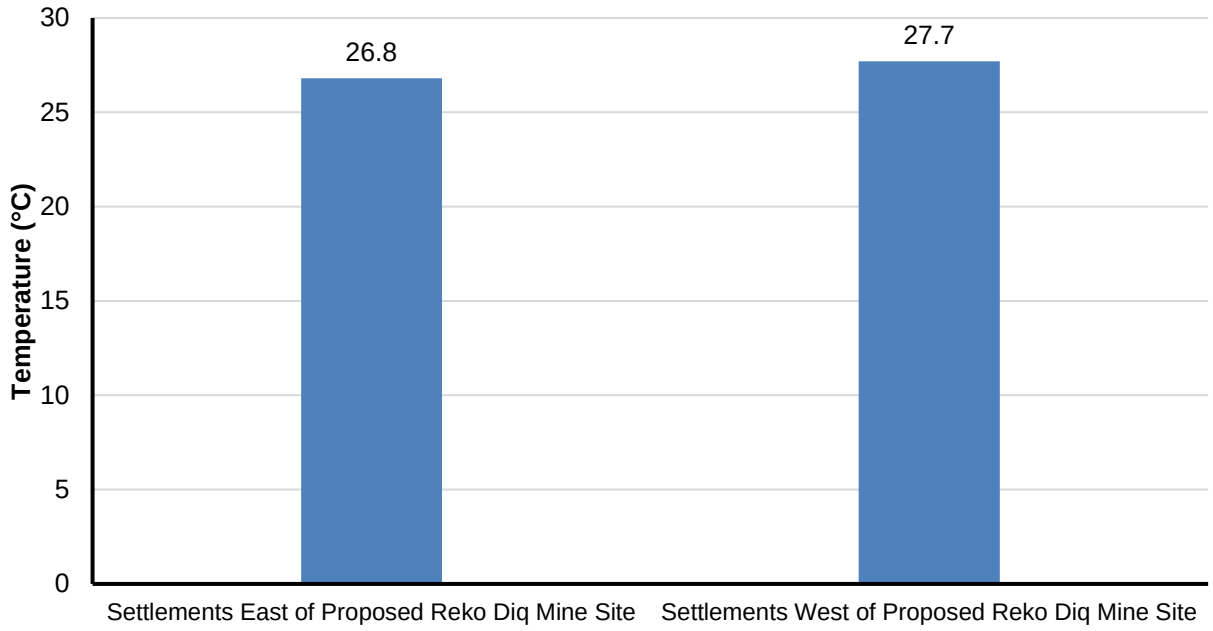


Figure 5-18: Mean Temperature of the Surveyed Community Water Resources in the Hydrocensus Study Area

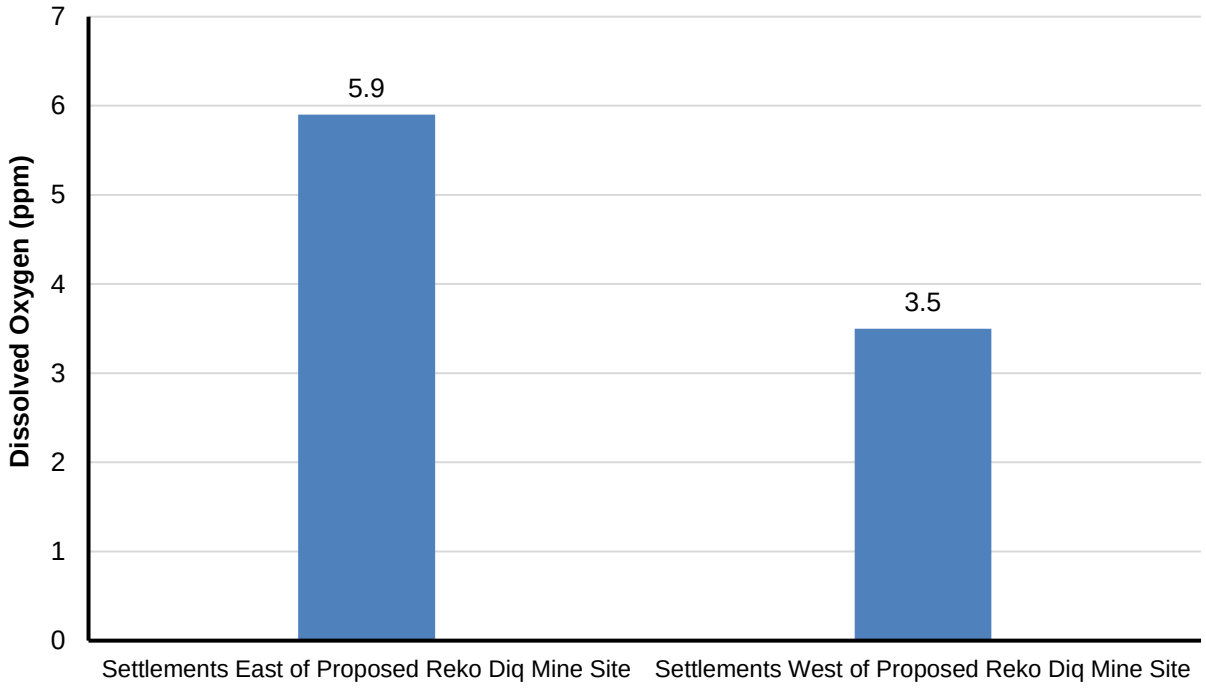


Figure 5-19: Mean Dissolve Oxygen of the Surveyed Community Water Resources in the Hydrocensus Study Area

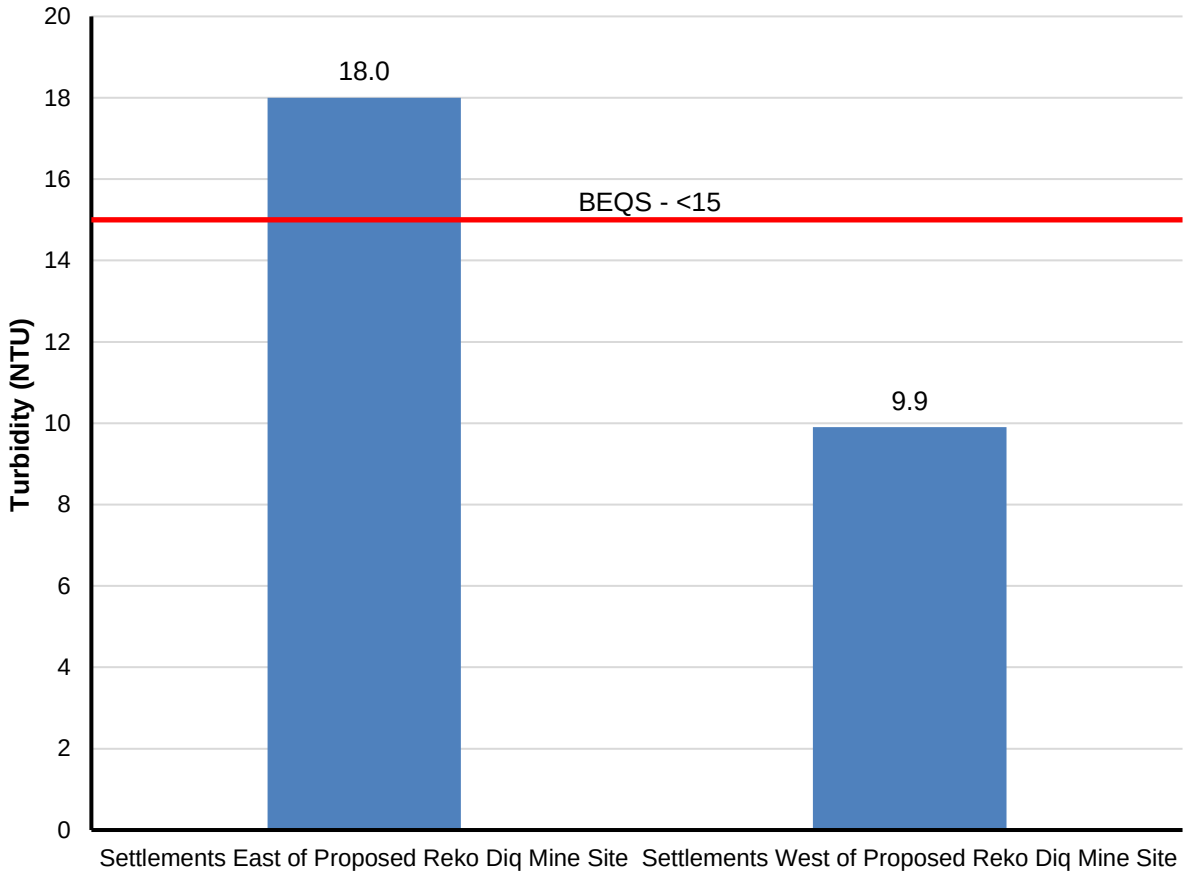


Figure 5-20: Mean Turbidity of the Surveyed Community Water Resources in the Hydrocensus Study Area

5.1.6.2 Water Quality

A water quality survey was carried out between April 18, 2023, and May 14, 2023, to carry out chemical analysis assess the water quality of the community water resources and the boreholes at Fan Sediments area that will be used to supply water to the accommodation facility during the Early Works.

5.1.6.2.1 Methodology and Sampling Locations

Grab sampling technique was carried out in which an individual sample is collected from a single location at a specific time or period. Water from deep wells was collected using bailer and rope. The bailer was properly washed with distilled water, cleaned, and dried before the field mobilization. Moreover, before taking samples, water was initially extracted four to five times with a bailer, to minimize any cross contamination and then the desired sample was collected.

A total of five water samples were collected during 2023 survey including one sample from the boreholes at Fan Sediments (FS13-PB) and four from the community water resources. The water samples collected were sent to i2 Analytical Lab in the United Kingdom for water quality analysis.

Table 5-6 provides details of the sampling locations in 2023 survey and Figure 5-21 shows the sampling locations. Figure 5-22 presents photographs of water quality sampling conducted in 2023.

Table 5-6: Water Quality Sampling Locations and Rationale for Selection

Sample ID	Coordinates	Location	Rationale for Selection
Sampling in 2023			
Community Water Resources			
W13-23	29º00'37.80" N 62º27'08.60" E	Mashki Chah	At Mashki Chah (settlement), to assess the water quality of the dug well in use by the settlement.
Bore Chah-23	29°31'46.50"N 61°19'25.80"E	Bore Chah	At Bore Chah (settlement), to assess the water quality of the spring water used by the locals.
Kirtaka-23	29°28'11.50"N 61°23'25.20"E	Kirtaka	At Kirtaka (settlement), to assess the water quality of the spring water used by the locals.
Maskin-23	29°21'54.10"N 61°26'26.00"E	Maskin	At Maskin (settlement), to assess the water quality of the spring water used by the locals.
Fan Sediments Area Borehole			
FS13-PB-23	29°29'58.29" N 61°35'51.84” E	Fan Sediment	To assess the water quality of the borehole to be used to supply water during Early Works.

Note: W13-23: water sample collected from W13 sampling location during 2023 survey.

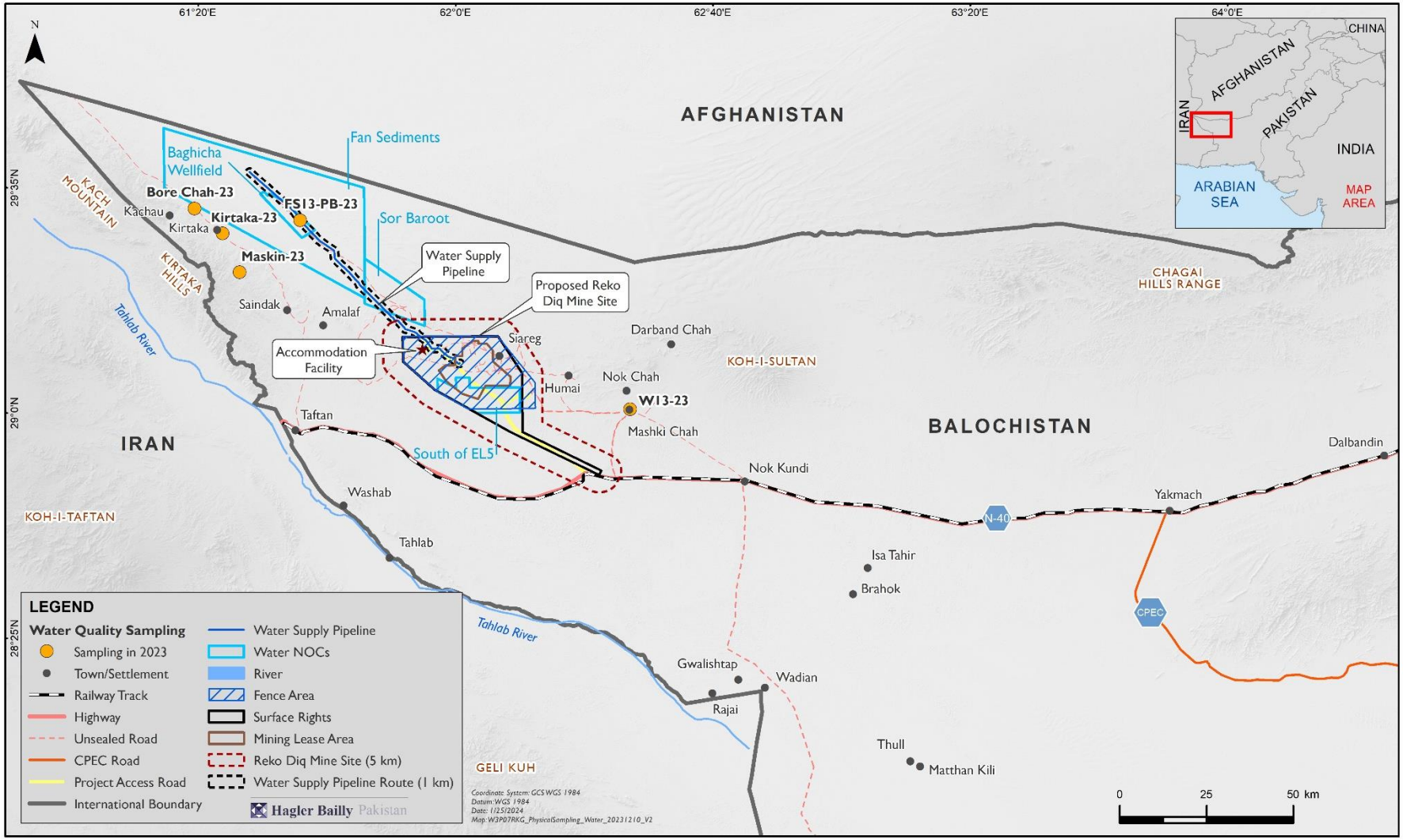


Figure 5-21: Water Quality Sampling Locations – 2023 Survey



Water sample collection at W13-23



Borehole FS13-PB-23



Spring/Karez at Bore Chah-23



Spring/Karez at Kirtaka-23



Spring/Karez at Maskin-23

Figure 5-22: Water Quality Sampling Photographs

5.1.6.2.2 Results and Analysis

Table 5-7 presents the results for water quality sampling in 2023 and the comparison with BEQS and WHO Guidelines for drinking water. The results of community water resources and Fan Sediments area borehole are discussed below and are highlighted where the values exceed the BEQS or WHO Guidelines. Appendix D includes the lab analysis reports.

The proposed Project will not affect the water resources of the communities located east and west of the proposed Reko Diq Mine Site and will use groundwater from the boreholes in the Fan Sediments area. The groundwater in the Fan Sediments area is not used by any of the communities or locals due to its poor quality. The water sample collected from FS13-MB – 23 showed twice the hardness of the community water resources, with TDS levels approximately four times higher than those of the community water resources. The measured hardness and TDS concentrations at FS13-MB – 23 were 2,680 mg/l and 8,000 mg/l, respectively. Additionally, the water sample collected from FS13-MB – 23 exhibited twice the chloride and nitrate concentrations compared to the community water resources. The proposed Project will use water from the boreholes and treat it in a Water Treatment Plant before using it at the accommodation facility.

5.1.6.2.2.1 Community Water Resources

- General Parameters
  - Turbidity levels at all community water sampling locations were found within the levels prescribed in the BEQS and WHO Guidelines.
  - Hardness levels exceed the BEQS at all community water sampling locations except at Maskin-23. The maximum levels observed at Kirtaka-23. It is mainly caused due to the presence of dissolved calcium and magnesium ions in water (naturally present in groundwater) and is most expressed as Calcium Carbonate ($CaCO_3$). Hardness itself is not a health concern, but it can be a nuisance as hard

water[27] can cause mineral buildup in plumbing, fixtures, and water heaters, and can corrode water pipelines/ processing facilities. No health-based guidelines are proposed for hardness in drinking water.

- TDS at all community water sampling locations exceed the levels prescribed in the BEQS. The maximum levels of 3,600 mg/l were observed at Kirtaka-23. The higher levels are due to the presence of calcium, magnesium, sodium, and potassium cations and carbonate, chloride, sulfate, and nitrate anions.[28]
- The pH value of the collected community water samples was within the 6.5 to 8.5 pH range prescribed in the BEQS and WHO Guidelines.

- Essential Inorganics:
  - Aluminum, antimony, barium, cadmium, and copper were detected at all community water sampling locations with levels within the prescribed limits of the BEQS and WHO Guidelines.
  - Chlorides at all community water sampling locations exceed the levels prescribed in the BEQS and WHO Guidelines. Higher levels of chlorides (>250 mg/l) give a salty taste to water however, no health-based guidelines are proposed for chlorides in drinking water.
  - Arsenic and chromium were detected at all community water sampling locations with the levels within the prescribed limits of the BEQS and WHO Guidelines, except at Kirtaka-23, where the levels of arsenic and chromium detected, respectively, exceeded the prescribed limits.
  - Boron was detected at all community water sampling locations with levels found to exceed the limits prescribed in the BEQS and WHO Guidelines.
- Toxic Inorganics:
  - Lead and mercury were below detection limits at all community water sampling locations.
  - Manganese, nickel, and zinc were detected at all community water sampling locations with levels within the prescribed limits in the BEQS and WHO Guidelines.
  - Selenium was detected at all community water sampling locations with levels within the prescribed limits of the BEQS and WHO Guidelines.
  - Fluorides concentration was within the levels prescribed in the BEQS and WHO Guidelines at all community water sampling locations, except at Maskin-23.
  - Nitrates were within the limits prescribed in the BEQS and WHO Guidelines at all community water sampling locations. Nitrates are generally higher in groundwater than in surface water.

27 Water containing calcium carbonate at concentrations below 60 mg/l is generally considered as soft; 60–120 mg/l, moderately hard; 120–180 mg/l, hard; and more than 180 mg/l, very hard. https://www.who.int/water_sanitation_health/dwq/chemicals/hardness.pdf

28 https://www.who.int/water_sanitation_health/dwq/chemicals/tds.pdf

- Nitrites observed at all community water sampling locations were within the levels prescribed in the BEQS and WHO Guidelines.

5.1.6.2.2.2 Fan Sediments Area Borehole

- Turbidity levels at borehole sampling location of Fan Sediments area were found within the levels prescribed in the BEQS and WHO Guidelines.
- Hardness levels exceed the BEQS at borehole sampling location of Fan Sediments area.
- TDS at borehole sampling location of Fan Sediments area exceed the levels prescribed in the BEQS. The higher levels are due to the presence of calcium, magnesium, sodium, and potassium cations and carbonate, chloride, sulfate, and nitrate anions.[29]
- The pH value of the collected sample from borehole of Fan Sediments area was within the 6.5 to 8.5 pH range prescribed in the BEQS and WHO Guidelines.

- Essential Inorganics:
  - Aluminum, antimony, barium, cadmium, and copper were detected at borehole sampling location of Fan Sediments area with levels within the prescribed limits of the BEQS and WHO Guidelines.
  - Chlorides at borehole sampling location of Fan Sediments area exceed the levels prescribed in the BEQS and WHO Guidelines. Higher levels of chlorides (>250 mg/l) give a salty taste to water however, no health-based guidelines are proposed for chlorides in drinking water.
  - Arsenic and chromium were detected at borehole sampling location of Fan Sediments area with the levels within the prescribed limits of the BEQS and WHO Guidelines.
  - Boron was detected at borehole sampling location of Fan Sediments area with levels found to exceed the limits prescribed in the BEQS and WHO Guidelines.
- Toxic Inorganics:
  - Lead and mercury were not detected (in quantities lower than the level of reporting) at borehole sampling location of Fan Sediments area.
  - Manganese, nickel, and zinc were detected at borehole sampling location of Fan Sediments area with levels within the prescribed limits in the BEQS and WHO Guidelines.
  - Selenium was detected at borehole sampling location of Fan Sediment area with levels found to exceed the limits prescribed in the BEQS and WHO Guidelines.
  - Fluorides concentration was within the levels prescribed in the BEQS and WHO Guidelines at borehole sampling location of Fan Sediments area.

[29] https://www.who.int/water_sanitation_health/dwq/chemicals/tds.pdf

- Nitrates were within the limits prescribed in the BEQS and WHO Guidelines at borehole sampling location of Fan Sediments area. Nitrates are generally higher in groundwater than in surface water.
- Nitrites observed at borehole sampling location of Fan Sediments area were within the levels prescribed in the BEQS and WHO Guidelines.

Table 5-7: Water Quality Sampling Results – 2023 Survey

Parameter	Unit	LOD	Analysis Method	BEQS for Drinking Water	WHO Drinking Water	Community Water Resources				Fan Sediment Area
						W13 –23	Kirtaka – 23	Bore Chah – 23	Maskin – 23	FS13-PB – 23
Turbidity	NTU	1	–	<15	<15	<1.0	13	2.6	2.6	13
Hardness as $CaCO_3$	mg/l	1	ISO 17025	<500	–	514	1,080	818	485	2,680
TDS	mg/l	4	ISO 17025	<1,000	–	2,700	3,600	2,400	2,100	8,000
pH	–	–	ISO 17025	6.5-8.5	6.5-8.5	7.8	7.7	8.1	8.4	7.7
Essential Inorganics										
Aluminum (Al)	mg/l	0.001	ISO 17025 (ICP-MS)	≤0.2	0.2	0.0012	0.0027	0.0037	0.0023	0.002
Antimony (Sb)	mg/l	0.0004	ISO 17025 (ICP-MS)	≤0.005	0.02	0.0006	0.0006	0.0007	0.0007	0.0007
Arsenic (As)	mg/l	0.00015	ISO 17025 (ICP-MS)	≤0.05	0.01	0.00743	0.347	0.00163	0.00786	0.00062
Barium (Ba)	mg/l	0.00006	ISO 17025 (ICP-MS)	0.70	0.7	0.016	0.02	0.016	0.014	0.015
Boron (B)	mg/l	0.010	ISO 17025 (ICP-OES)	0.3	0.3	1.7	12	13	1.8	2.5
Cadmium (Cd)	mg/l	0.00002	ISO 17025 (ICP-MS)	0.01	0.003	0.00009	0. 00008	0. 00005	<0.00002	0.00011
Chloride (Cl^-)	mg/l	0.15	ISO 17025	≤250	250	930	1,200	430	580	2,400
Chromium (Cr)	mg/l	0.0002	ISO 17025 (ICP-MS)	≤0.05	0.05	0.0014	0.0003	0.0004	0.0014	0.028
Copper (Cu)	mg/l	0.0005	ISO 17025 (ICP-MS)	2.00	2.00	0.0035	0.0041	0.0032	0.0022	0.0016
Toxic Inorganics										
Fluoride (F^-)	mg/l	0.05	ISO 17025	≤1.5	1.5	1.5	0.52	0.56	1.8	0.31
Lead (Pb)	mg/l	0.0002	ISO 17025 (ICP-MS)	≤0.05	0.01	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Manganese (Mn)	mg/l	0.00005	ISO 17025 (ICP-MS)	≤0.5	0.5	0.00033	0.016	0.0079	0.00053	0.0025
Mercury (Hg)	mg/l	0.00005	ISO 17025 (ICP-MS)	≤0.001	0.001	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005
Nickel (Ni)	mg/l	0.0005	ISO 17025 (ICP-MS)	≤0.05	0.02	0.0008	<0.0005	<0.0005	<0.0005	0.0028
Nitrate (NO_3^-)	mg/l	0.01	ISO 17025	≤50	50	4.31	0.09	1.03	5.62	13.4

Parameter	Unit	LOD	Analysis Method	BEQS for Drinking Water	WHO Drinking Water	Community Water Resources				Fan Sediment Area
						W13 –23	Kirtaka – 23	Bore Chah – 23	Maskin – 23	FS13-PB – 23
Nitrite (NO_2^-)	mg/l	0.001	ISO 17025	≤3	3	0.0032	0.37	<0.001	0.005	<0.001
Selenium (Se)	mg/l	0.0006	ISO 17025 (ICP-MS)	0.01	0.01	0.0039	0.004	0.0082	0.0071	0.03
Zinc (Zn)	mg/l	0.0005	ISO 17025 (ICP-MS)	5	3	0.012	0.0083	0.0096	0.0047	0.0082

Note:

Organics and Microbiology were not measured during the 2023 survey due to very short holding times for these parameters.

LOD = Limit of Detection

ICP-OES = Inductively Coupled Plasma – Optical Emission Spectrometry

ICP-MS = Inductively Coupled Plasma – Mass Spectrometry

mg/l = milligram per liter

NTU = Nephelometric Turbidity Unit

5.1.7 Air Quality

The baseline ambient air quality was assessed using the primary data collected in 2023 and secondary data obtained from the 2020 ESIA.

5.1.7.1 Methodology and Sampling Locations

Table 5-8 presents the sampling locations for air quality and rationale for selection, and Figure 5-23 shows the sampling locations. Figure 5-24 presents the photographs of particulate matter and diffusion tubes sampling.

The pollutants selected to assess the baseline air quality before the Project are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter 10 (PM_{10}) and particulate matter 2.5 ($PM_{2.5}$). The selection of parameters for evaluation was based on the expected emissions from the planned construction activities and operations, and the level of risk to human health and the local environment posed by these pollutants.

Particulate matter (PM_{10} and $PM_{2.5}$) was sampled using Airmetrics MiniVol Portable Air Samplers. This equipment draws an air sample through an inlet by a vacuum pump at a fixed flow rate (~5.0 L/min). The sampling is normally carried out for a 24-hours duration. The particulates are filtered using an impactor and collected on filter paper, which is dried and weighed after the sampling to obtain the weight of particulates in the sampled volume of air. The analysis of PM_{10} and $PM_{2.5}$ was conducted at HBP Lab, Islamabad by gravimetric method.

Passive diffusion tubes were used for the measurement of gaseous pollutants NO_2, and SO_2. The diffusion tubes passively uptake pollutants via diffusion and are typically installed for two to four weeks. The diffusion tubes were provided and analyzed by Gradko International, an internationally recognized and United Kingdom Accreditation Service (UKAS) accredited laboratory (referred to here as Gradko Lab). NO_2 was analyzed using ultraviolet/visible spectroscopy (UKAS Number: GLM7), whereas SO_2 was analyzed using ion chromatography (UKAS: Number GLM1).

One field duplicate and one blank were collected as quality control samples during sampling in 2020 and 2023 to ensure the absence of any contaminants in diffusion tubes that can affect the results and that consistent and unbiased procedures are used for analysis.

Table 5-8: Air Quality Sampling Locations and Rational for Selection

Sample ID	Coordinates	Dates and Duration of Sampling	Location	Rationale for Site Selection
Sampling in 2023				
A1-23	29°08'21.60" N 62°06'47.20" E	**SO_2 and NO_2 sampling:** October 24 to November 19, 2023 (~4 weeks)	Reko Diq Mine Site	To assess the baseline ambient air quality at the proposed Reko Diq Mine Site.
A2-23	29°05'44.00" N 62°17'37.80" E	**SO_2 and NO_2 sampling:** October 24 to November 19, 2023 (~4 weeks)	Humai settlement	To assess the baseline ambient air quality of the settlement east of the proposed Reko Diq Mine Site before Project activities

Sample ID	Coordinates	Dates and Duration of Sampling	Location	Rationale for Site Selection
				(downwind of Project facilities).
Sampling in 2020 (from 2020 ESIA)				
A1-20	29°08'52.40" N 62°06'49.00" E	**PM_{10}** and **$PM_{2.5}$ sampling:** August 24, 2020, to August 25, 2020 (24 hours) **SO_2/NO_2 sampling:** October 06 to October 22, 2020 (~2 weeks)	Siareg Settlement	To assess the baseline ambient air quality of the settlement north of the proposed Reko Diq Mine Site before Project activities. This settlement is now moved to Humai and only abandoned structures are left there (upwind of Project facilities).
A2-20	28°49'23.00" N 62°44'25.30" E	**PM_{10}** and **$PM_{2.5}$ sampling:** August 26, 2020, to August 27, 2020 (24 hours) **SO_2** and **NO_2 sampling:** October 06 to October 22, 2020 (~2 weeks)	FC Camp in Nok Kundi	To assess the baseline of the nearest major town. Moreover, all the construction machinery and transportation will be done through this road.
A3-20	29°04'58.80" N 62°18'35.90" E	**SO_2** and **NO_2 sampling:** October 06 to October 22, 2020 (~2 weeks)	Humai settlement	To assess the baseline ambient air quality of the settlement before Project (downwind of Project facilities)

Note:

A1-23 means sampling location A1 monitored in 2023

A1-20 means Sampling Location A1 monitored in 2020 as part of 2020 ESIA

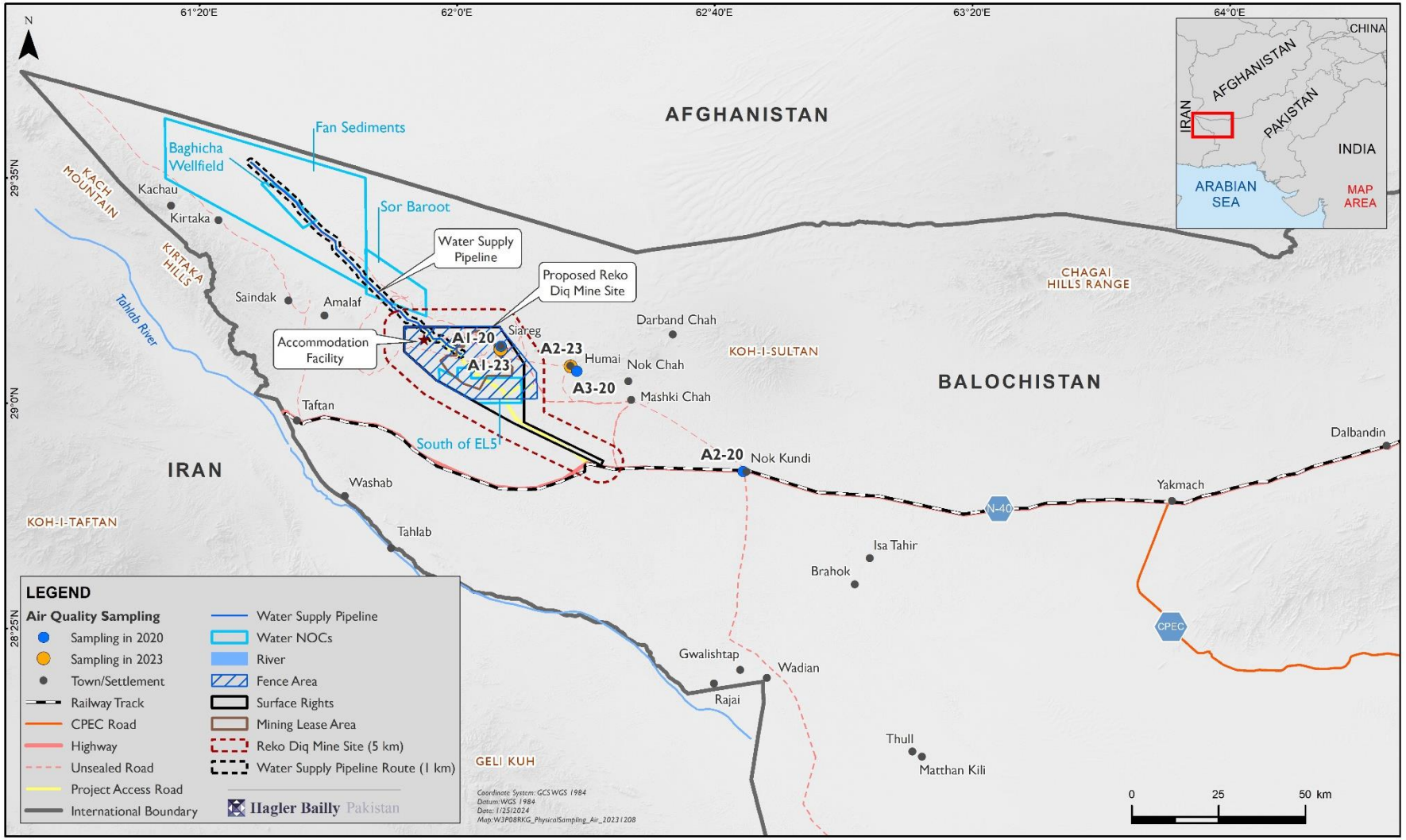


Figure 5-23: Air Quality Sampling Locations



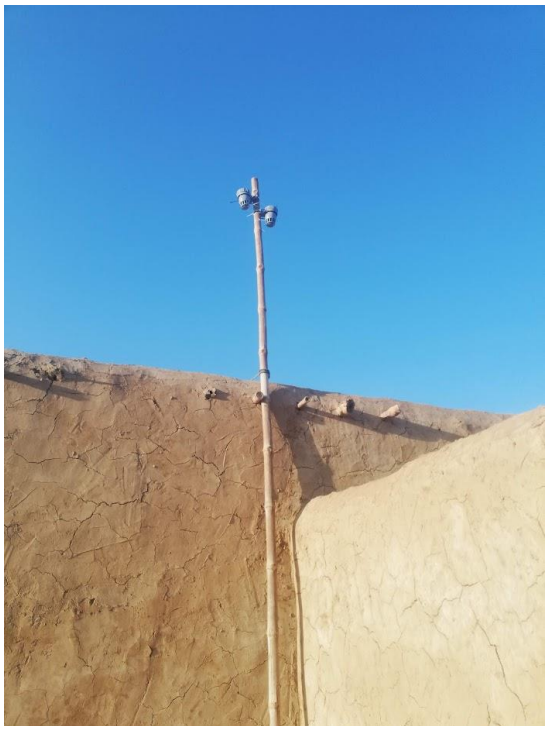
Diffusion tubes installed at A1-23



Diffusion tubes installed at A1-23



Diffusion tubes installed at A2-23



Diffusion tubes installed at A2-23



PM samplers installed at A1-20



PM samplers installed at A1-20



Weather meter installed at A2-20



PM samplers installed at A2-20



Diffusion tubes at A1-20



Diffusion tubes at A3-20

Figure 5-24: Ambient Air Quality Sampling Site Photographs

5.1.7.2 Results and Discussion

Table 5-9 provides the air quality sampling results and comparison with BEQS.

Appendix E provides the lab analysis reports and the results and discussion of the QA/QC samples collected and analyzed during air quality sampling.

Table 5-9: Results of Ambient Air Quality Sampling (µg/m^3)

Sample ID	NO_2	SO_2	$PM_{2.5}$	PM_{10}
A1-23 (Proposed Reko Diq Mine Site in 2023)	0.7	<1.71	–	–
A2-23 (Humai settlement in 2023)	5.0	<1.70	–	–
A1-20 (Siareg near Reko Diq Mine Site in 2020)	<0.6	<2.32	22	136
A2-20 (Nok Kundi in 2020)	1.7	2.78	33	143
A3-20 (Humai settlement in 2020)	4.4	3.62	–	–
BEQS (24-hour)	**80**	**120**	**35**	**150**
BEQS (Annual average)	**40** [a]	**80** [a]	**15** [b]	**120** [b]

Note:

a Annual limits for NO_2 and SO_2 were considered for comparison purposes due to a sampling period of 2 weeks during 2020 and 4 weeks during 2023 survey.

b Annual limits do not apply to PM_{10} and $PM_{2.5}$ as these were 24-hours reading. Therefore, 24-hour limits were considered for comparison purposes.

5.1.7.2.1 Particulate Matter (PM_{10} and $PM_{2.5}$)

Figure 5-25 and Figure 5-26 shows the PM_{10} and $PM_{2.5}$ concentrations at each sampling location, respectively, and comparison with the 24-hour limits prescribed in the BEQS.

The following conclusions are drawn from particulate matter sampling results:

- Regulatory Compliance:
  - The measured concentrations of PM10 at sampling locations A1-20 and A2-20 were within the 24-hours limits prescribed in the BEQS.
  - The measured concentrations of $PM_{2.5}$ at sampling locations A1-20 and A2-20 were within the 24-hours limits prescribed in the BEQS.
- General Trend in PM concentrations:
  - Minimum concentrations of PM_{10} as 136.0 µg/m^3 and $PM_{2.5}$ as 22.0 µg/m^3, respectively, were observed at sampling location A1-20 (proposed Project site).
  - Maximum concentrations of PM_{10} as 143.0 µg/m^3 and $PM_{2.5}$ as 33.0 µg/m^3 were observed at sampling location A2-20 (Nok Kundi). This sampling site was in a populated village of the area and experienced domestic pollution from wood burning, and small construction related activities observed at the time of sampling.
  - Several anthropogenic sources of PM (particulate matter) emissions were observed during field visits in the Project Area. These included smoke plumes from wood-burning stove chimneys for heating and cooking needs in many households, construction related activities, and vehicular movement on the

unpaved or dirt roads, and desert conditions of the Project area. High speed of winds, generally greater than 30 kilometer per hour (km/h), that blows at the end of August called 'Gorek' in the local language.

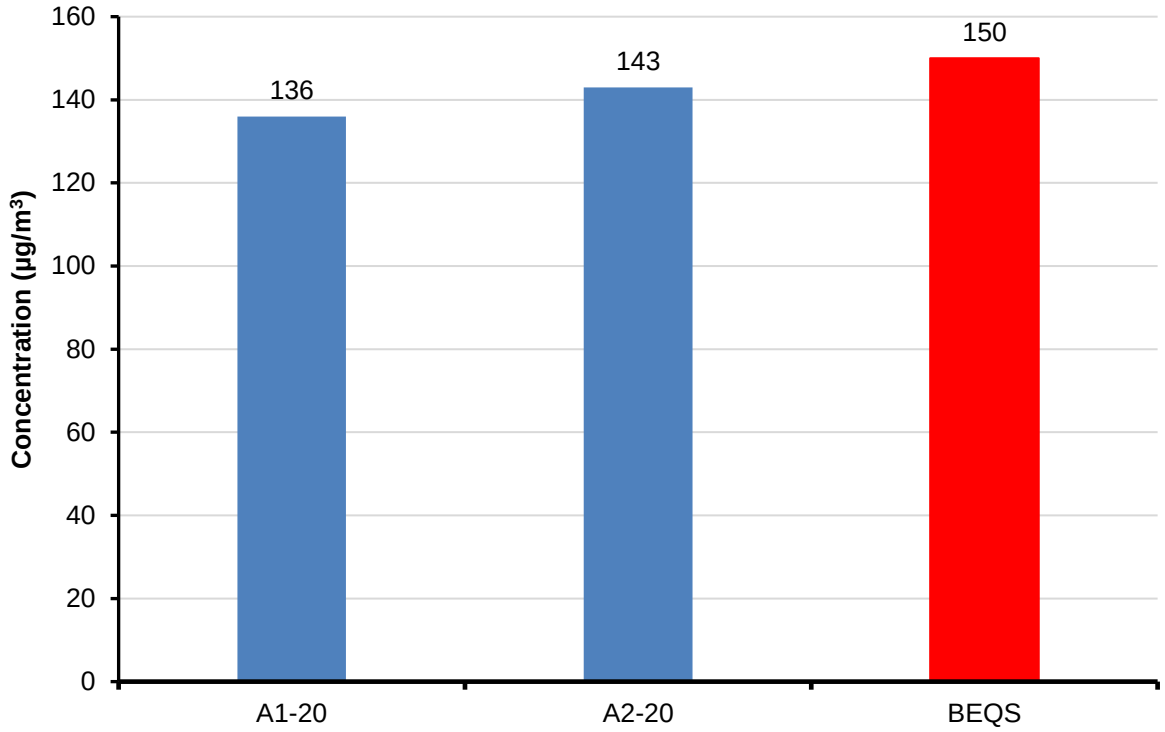
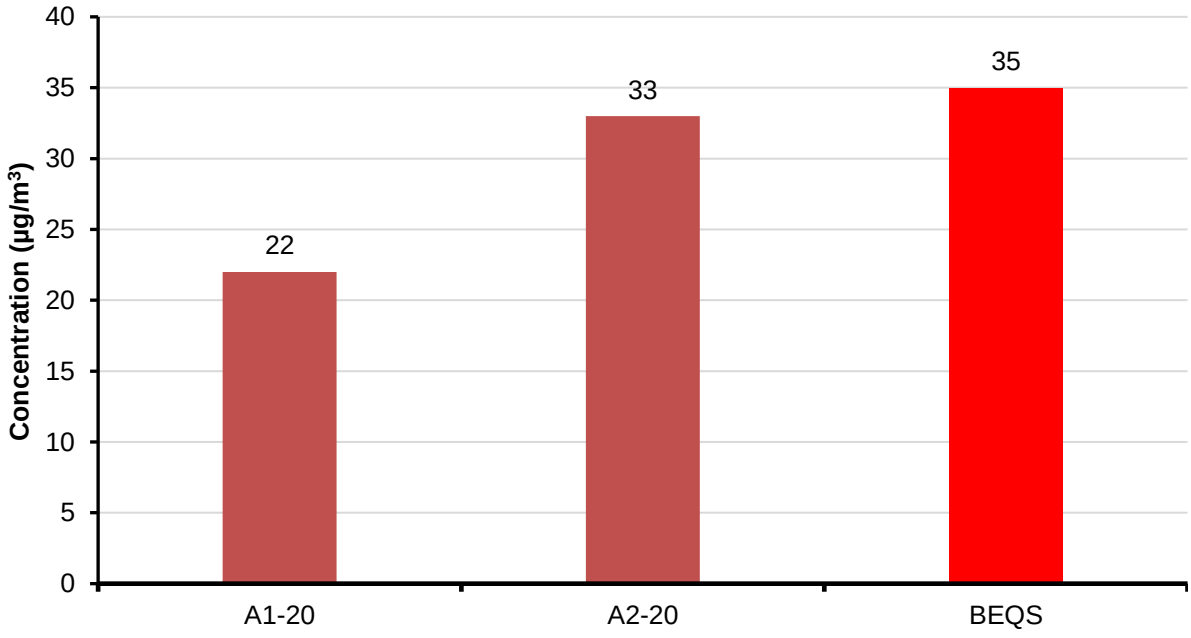


Figure 5-25: PM_{10} Sampling Results and Comparison with BEQS

Note: BEQS for annual averaging periods are not presented here as the sampling was carried out for 24-hours duration only.



Note: BEQS for annual averaging periods are not presented here as the sampling was carried out for 24-hours duration only.

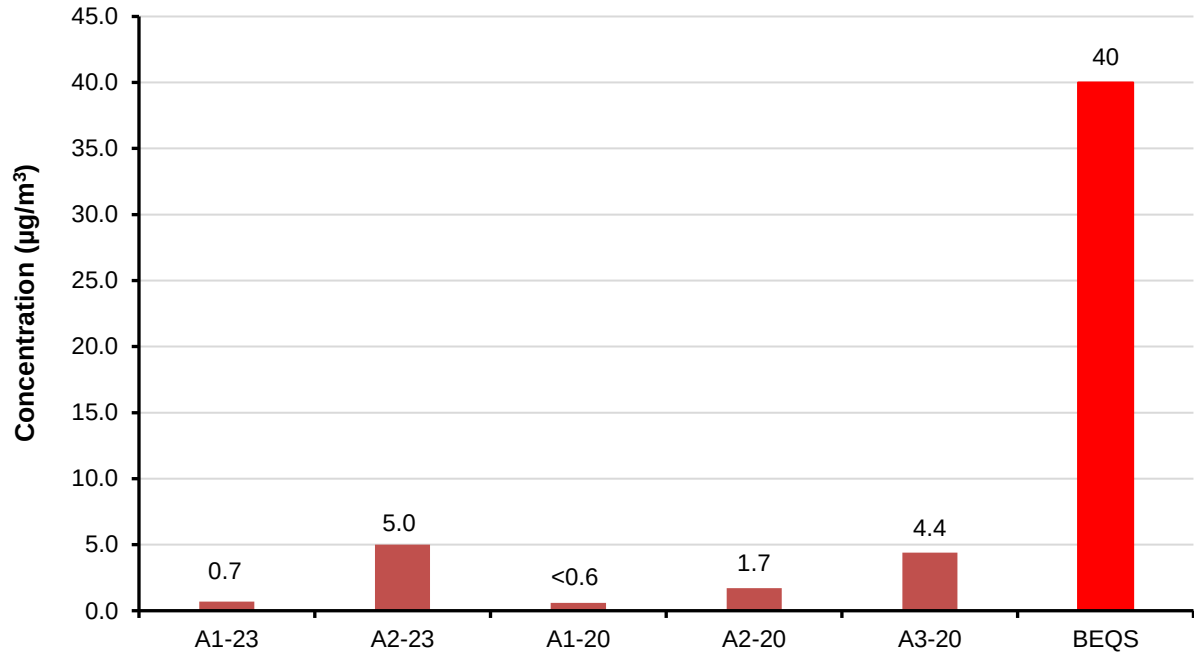
Figure 5-26: $PM_{2.5}$ Sampling Results and Comparison with BEQS

5.1.7.2.2 Gaseous Pollutants (NO_2, SO_2)

Figure 5-27 and Figure 5-28 presents the results of NO_2 and SO_2 sampling, respectively, and comparison with the annual limits prescribed in the BEQS.

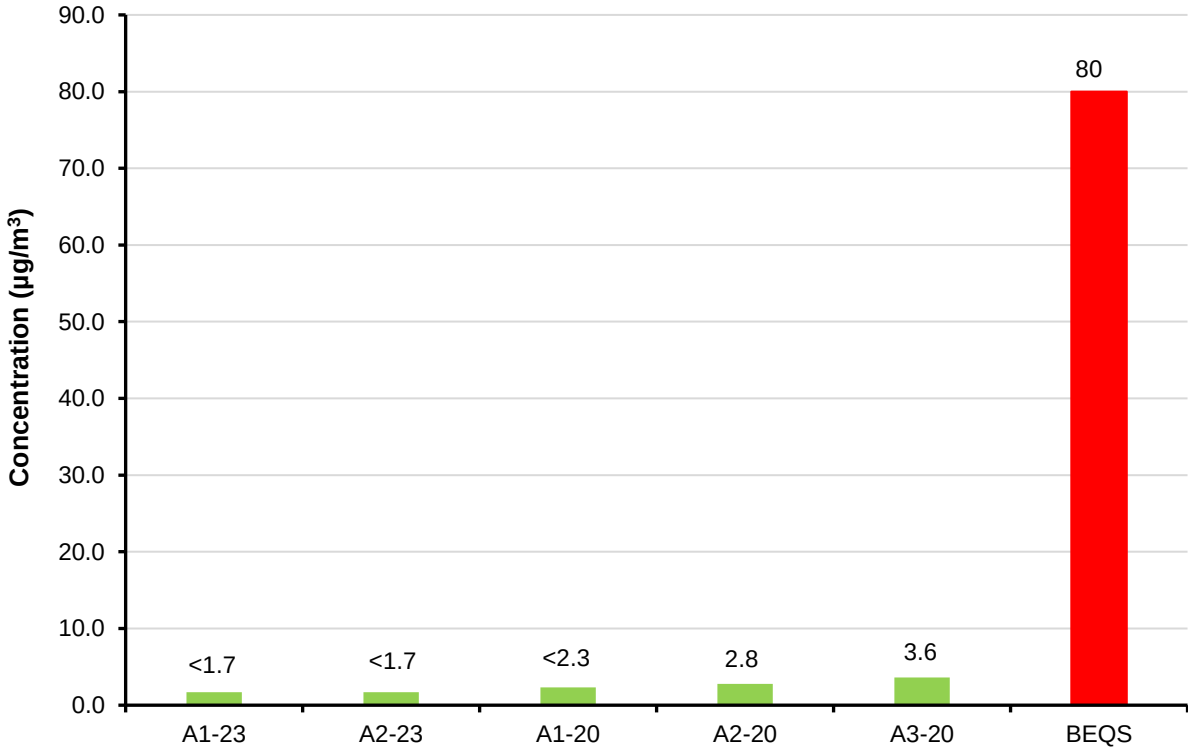
The following conclusions are drawn from the air quality sampling results in the 2023 and 2020 survey:

- Regulatory Compliance:
  - The measured concentrations of NO_2 were within the limits prescribed in the BEQS at both sampling locations A1-23 (proposed Project site) and A2-23 (Humai settlement) in the 2023 survey.
  - The measured concentrations of NO_2 were within the limits prescribed in the BEQS at all sampling locations in the 2020 survey.
  - The concentration values SO_2 remain very low and were within the limits prescribed in the BEQS at both sampling locations A1-23 (proposed Project site) and A2-23 (Humai settlement) in the 2023 survey.
  - The measured concentrations of SO_2 were within the limits prescribed in the BEQS at all sampling locations in the 2020 survey.
- General Trend in Concentrations of Air Pollutants:
  - The maximum and minimum concentrations of NO_2 in the 2023 survey were observed at A2-23 (Humai settlement) as 5.0 µg/m^3 and at A1-23 (proposed Reko Diq Mine Site) as 1.3 µg/m^3. NO_2 is primarily formed through chemical reactions involving nitrogen oxides (NO_x), particularly nitrogen oxide (NO), with various air components. Human activities, such as the combustion of fossil fuels in vehicles, are the main contributors to nitrogen dioxide emissions.
  - SO_2 concentrations were consistently low (less than 1.70 µg/m^3) at both sampling locations in the 2023 survey. Sulfur dioxide primarily originates from the burning of fossil fuels containing sulfur, like coal and oil (e.g., residential coal combustion for heating and diesel vehicles). Industrial activities, including fertilizer manufacturing, aluminum smelting, and steel production, also contribute to sulfur dioxide emissions. However, no industrial activity was found during the survey likely accounts for the observed low concentration values.
  - SO_2 and NO_2 concentrations were within the limits prescribed in the BEQS at each sampling location in the 2020 survey. The maximum concentrations of NO_2 and SO_2 were detected at A3-20 (Humai settlement). No industrial activities, known for emitting SO_2 and NO_2, were observed during the 2020 survey.



Note: BEQS for annual averaging periods are presented here as the sampling was carried out for about 4-weeks in 2023 and 2-weeks in 2020.

Figure 5-27: NO_2 Sampling Results and Comparison with BEQS



Note: BEQS for annual averaging periods are presented here as the sampling was carried out for about 4-weeks in 2023 and 2-weeks in 2020.

Figure 5-28: SO_2 Sampling Results and Comparison with BEQS

5.1.8 Noise

This section defines the baseline ambient noise levels within the Physical Environment Study Area and at Nok Kundi – the nearest town.

The following is a brief description of the terminology used in this assessment:

- Sound: A vibratory disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone.
    - Noise: Sound that is loud, unpleasant, unexpected, or otherwise undesirable.
    - *Decibel (dB)*: A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals.
    - *A-Weighted Decibel (dB(A))*: An overall frequency-weighted sound level in decibels, which approximates the frequency response of the human ear. The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. Therefore, when assessing potential noise impacts on people, an electronic filter is used that de-emphasizes certain frequencies in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies. All the noise levels reported in this Section are A-weighted.
    - Equivalent *Sound Level* (L_{eq}): The equivalent steady-state sound or vibration level, which is a stated period, typically one hour, would contain the same acoustical or vibration energy.

5.1.8.1 Methodology and Sampling Locations

A noise survey was carried out in August 2020 within the Physical Environment Study Area and at Nok Kundi town along the Road Route. The monitoring was carried out for a 24-hour duration. The noise data monitored at this location was obtained from 2020 ESIA.

Another 24-hour noise monitoring was conducted at Nok Kundi along the Road Route from September 24 to 25, 2022.

Cirrus Research® plc.'s sound level meter (model: CR 1720) was used for the measurement of noise levels in 2020 and 2022 surveys. The equipment has a time history data rate of 10 milliseconds (ms), 62.5 ms, 100 ms, 125 ms, 250 ms, ½ sec, 1 sec, and 2 secs respectively, with a resolution of 0.1 dB. The equipment is in compliance with the international standards IEC 61672-1:2013, IEC 61672-1:2002, IEC 60651:2001, IEC 60804:2000, IEC 61252:1993, ANSI S1.4 -1983 (R2006), ANSI S1.43 - 1997 (R2007) and ANSI S1.25:1991 where applicable.

The equipment was calibrated using Cirrus Research plc.'s acoustic calibrator (model: CR:514) at the beginning of each measurement. The equipment was mounted on a tripod to avoid any surface reflecting fluxes in the surrounding and a windshield was used in all the measurements. The monitoring activity at each location was carried out continuously for a 24-hours duration for averaging noise levels based on day and nighttime with a temporal resolution of 1 sec.

Table 5-10 provides noise sampling locations in 2022 and 2020 surveys and rationale for selection and Figure 5-29 shows the sampling locations. Figure 5-30 presents the photographs of the noise sampling conducted in 2022 and 2020 surveys.

Table 5-10: Noise Sampling Locations and Rationale for Selection

ID	Coordinate	Date of Survey	Location	Rationale for Site Selection
Sampling in 2022				
N1-22	28°49'06.32" N 62°46'21.54" E	September 24, 2022, to September 25, 2022 (24 hours)	Nok Kundi	At N-40 near Nok Kundi to assess the baseline noise levels from the traffic movement along the road that will be used for the Project–related transportation. The point was monitored simultaneously with a traffic count.
Sampling in 2020 (from 2020 ESIA)				
N1-20	29°08'52.4" N 62°06'49.0" E	August 24, 2020, to August 25, 2020, (24 hours)	Siareg	To assess the baseline noise conditions of the nearest settlement (Siareg) before Project (upwind of proposed Project facilities)
N2-20	28°49'23.0" N 62°44'25.3" E	August 26, 2020, to August 27, 2020, (24 hours)	Nok Kundi	To assess the baseline of the nearest town (Nok Kundi). Moreover, all the construction machinery and transportation will be done through this road.
N3-20	28°50'35.2" N 62°24'57.9" E	August 25, 2020, to August 26, 2020, (24 hours)	Access road to the Reko Diq Mine Site	At the access road to Reko Diq from N-40 to assess the baseline noise.

Notes:

N1-22 means sampling location N1 monitored in 2022.

N1-20 means sampling location N1 monitored in 2020.

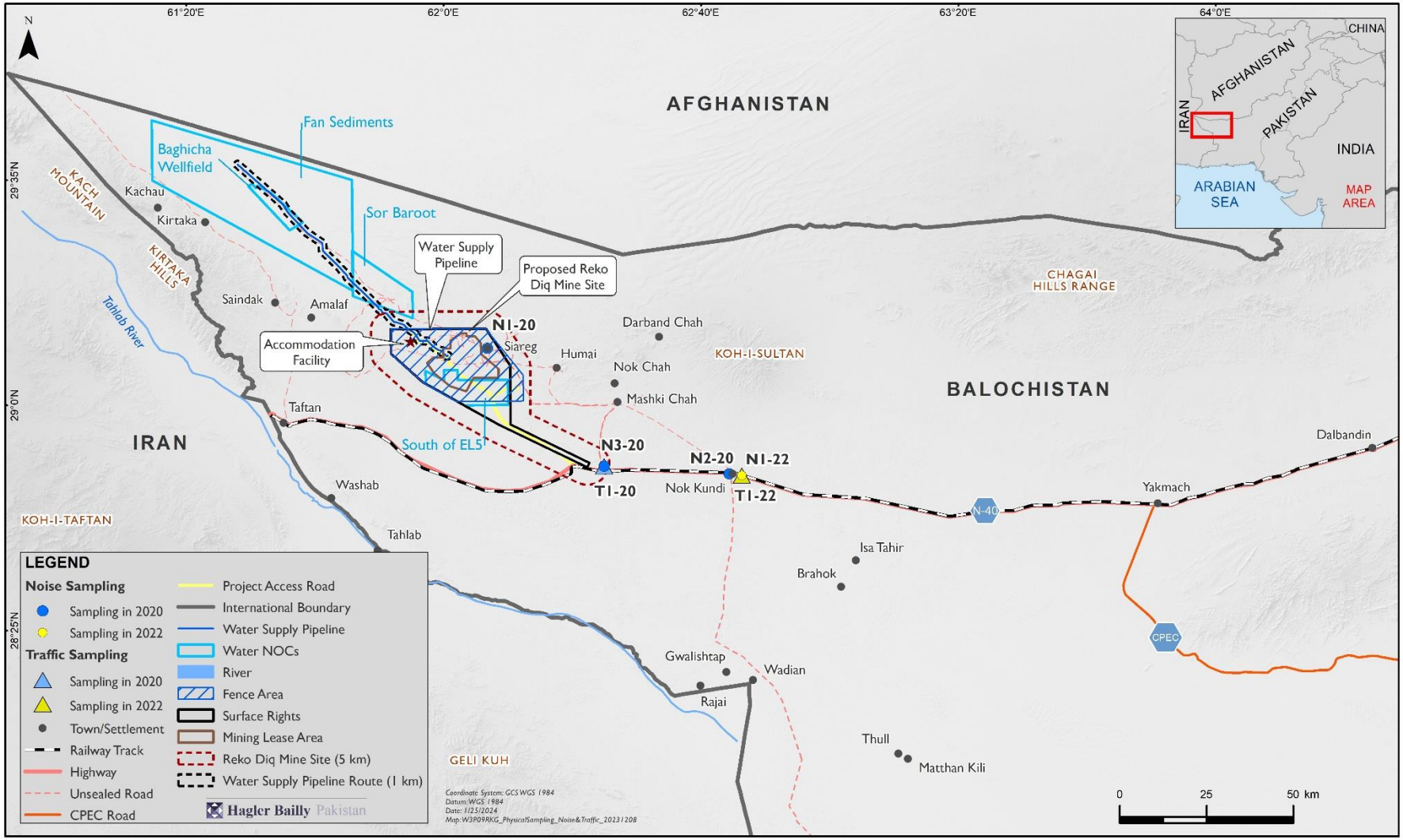


Figure 5-29: Noise and Traffic Sampling Locations



Sound meter installed at N1-22



Another view of Sound meter installed at N1-22



Calibration and installation at N1-20



Sound meter installed at N2-20



Calibration and installation at N3-20



Sound meter installed at N3-20

Figure 5-30: Noise Sampling Site Photographs

5.1.8.2 Results and Analysis

Table 5-11 provides a summary of the sampling results in 2022 and 2020, and comparison with BEQS. Appendix F provides the complete set of noise data. The day and nighttime limits prescribed in the BEQS for commercial areas are used to compare the noise levels observed at sampling locations along N-40 highway. The day and nighttime

limits prescribed in the BEQS for residential areas are used to compare the noise levels observed at the proposed Reko Diq Mine Site and the nearby settlements.

5.1.8.2.1 Findings of the survey in 2022

N1-22 was monitored at Nok Kundi town situated along the Road Route (N-40 highway). This town is the key area of the Chagai District with commercial activity, therefore, the BEQS for commercial areas will be applicable to this location. Daytime noise levels observed at N1-22 comply with the prescribed limits in the BEQS for commercial areas. However, nighttime noise levels recorded at this location exceed the specified limits. The high noise levels observed at nighttime are associated with the traffic movement along the N–40 highway and high-speed winds.

5.1.8.2.2 Findings of the survey in 2020

N1-20 was monitored at the nearest settlement (Siareg) therefore, the BEQS for residential area will be applicable at this location. On the other hand, N3-20 and N2-20 were monitored at the access road to proposed Reko Diq Mine Site from the N-40 highway and the nearest town (Nok Kundi) respectively, therefore, the BEQS for commercial areas will be applicable to these locations. Analysis of the summary statistics is as follows:

- Noise levels at N1-20 exceed the day and nighttime noise limits prescribed in the BEQS for residential area, even though there was no one living in the village and there was no anthropogenic source of noise in the area. The exceeding noise levels observed were linked with high-speed winds that are in the range of 6-8 meters per second (m/s) blowing in the area and called '*Gorek*' in the local language.
- Noise levels at N2-20 exceed the day and nighttime noise limits prescribed in the BEQS for commercial area. The sampling location was at an army mess which was at 50 meters from army check post on N-40 highway. The exceeding noise levels are associated with the traffic at check post and the army mess.
- Noise levels at N3-20 are within the daytime noise limits prescribed in the BEQS for commercial area, however, they exceed the nighttime noise limits. The high noise levels observed at nighttime are associated with the high traffic and high-speed winds (*Gorek*).

Table 5-11: Noise Sampling Results (dBA) and Comparison with BEQS

Sample ID	Day	Night
Survey in 2022		
N1-22 (Nok Kundi town)	63	58
Survey in 2020		
N1-20 (Siareg north of the proposed Reko Diq Mine Site)	82	81
N2-20 (Nok Kundi town)	70	67
N3-20 (access road to the proposed Reko Diq Mine Site)	64	58
BEQS for Commercial Area	**65**	**55**
BEQS for Residential Area	**55**	**45**

Note: Daytime hours are marked as to be from 6:00 am to 10:00 pm.

Nighttime hours are marked as to be from 10:00 pm to 6:00 am.
Values exceeding the BEQS are shaded.

5.1.9 Traffic

A traffic baseline was prepared to assess the current traffic conditions along the Road Route that will be used for the Project related transportation.

5.1.9.1 Methodology and Sampling Locations

A traffic count was conducted along the Road Route (N-40) at Nok Kundi town in 2022 from September 24 to September 25, 2022. The traffic data obtained from 2020 ESIA was also used for the access road to the proposed Reko Diq Mine Site. Figure 5-29 shows the traffic count locations in 2020 and 2022 surveys.

At the counting site, two surveyors were stationed for daytime and nighttime to separately count the daily traffic in both directions.

Traffic flow was monitored at one location during survey in 2022 and is as follows:

- T1-22: 1) Mashkel to Nok Kundi and vice versa, 2) Mashkel to Dalbandin and vice versa, and 3) Nok Kundi to Dalbandin and vice versa.

Traffic flow was monitored at one location during survey in 2020 and is as follows:

- T1-20: 1) Nok Kundi to Taftan and vice versa, 2) Proposed Reko Diq Mine Site to Nok Kundi and vice versa, and 3) Proposed Reko Diq Mine Site to Taftan and vice versa.

Table 5-12 provide details of the traffic count locations in 2022 and 2020 surveys and rationale for selection and Figure 5-29 shows the traffic count location. Figure 5-31 provides pictures of monitoring.

Table 5-12: Traffic Monitoring Location and Rationale for Selection

Sample ID	Coordinates	Date of Sampling	Monitoring Directions	Rationale for Selection
Sampling in 2022				
T1-22	28°49'06.32" N 62°46'21.54" E	September 24 to 25, 2022 (24 hours)	1. traffic flow from Mashkel to Nok Kundi, or vice versa 2. traffic flow from Mashkel to Dalbandin, or vice versa 3. traffic flow from Nok Kundi to Dalbandin, or vice versa	At the access road to Reko Diq from the National Highway (N–40) near Nok Kundi to assess the current load of the road. The location can be used to assess the increase in existing traffic volume due to Project related activities.
Sampling in 2020 (from 2020 ESIA)				
T1-20	28°50'35.2" N 62°24'57.9" E	August 25 to 26, 2020 (24 hours)	1. traffic flow from Nok Kundi to Taftan, or vice versa 2. traffic flow from Reko Diq to Nok Kundi, or vice versa 3. traffic flow from Reko Diq to Taftan, or vice versa	At the access road to Reko Diq from the N-40 to assess the current load of the road. The location will be used to assess the increase in traffic due to Project activities.



Team monitoring traffic flow at N–40 highway



Team monitoring traffic flow at N–40 highway



Team monitoring traffic flow at N-40 highway



Team monitoring traffic flow at N-40 highway



View of Reko Diq access road



View of N-40 Highway towards Taftan



View of Reko Diq access road from N-40 Highway



View of N–40 Highway towards Nok Kundi

Figure 5-31: Traffic Monitoring Photographs

Passenger Car Equivalent (PCE) or Passenger Car Unit (PCU) is a metric unit used to assess traffic–flow rate.[30] PCU, is a measure of the relative space requirement of a vehicle compared to that of a passenger car under a specified set of roadway, traffic, and other conditions. The value assigned to each of the classification of the vehicles may depend on several factors such as:

- dimensions, power, speed, acceleration, and braking characteristics of the vehicle.
- road characteristics such as geometrics including gradients, curves, access controls, type of road: rural or urban, presence and the type of intersections.
- transverse and longitudinal clearances between vehicles moving on road, which in turn depends upon the speeds, driver characteristics and the classes of other moving vehicles.
- environmental and climatic conditions.
- traffic control methods, speed limits, and barriers.

The PCU for different classes of vehicles are not defined universally, however, the values used here are typical for Pakistani road conditions. The PCUs are calculated based on traffic counts. Table 5-13 shows PCU factor for each vehicle**.**

Table 5-13: PCU Factor for Vehicle

Vehicle	PCU Factor
Motorcycles	0.50
Auto rickshaws	0.75
Cars (sedans)	1.00
Jeeps/Pickups	1.25
Minibus	1.50
Bus	2.00

30 Adnan, Muhammad; Passenger Car Equivalent Factors in Heterogenous Traffic Environment – are We Using the Right Number? Procedia Engineering, Vol. 77, Pg. 106–113, 2014.

Vehicle	PCU Factor
Truck – 2 axles	2.50
Truck – 3 axles	3.00
Truck – 4 axles	3.50
Truck – 5 axles	4.00
Truck – 6 axles	4.50

5.1.9.2 Results and Discussion

Table 5-14 provides the results at each traffic count location in 2020 and 2022. Appendix F includes the traffic count data at the monitoring locations.

Table 5-14: Daily Traffic in each Direction

	T1-22 at Nok Kundi						T1-20 at Access Road to the Reko Diq Site		
	Mashkel–Nok Kundi	Nok Kundi–Mashkel	Mashkel–Dalbandin	Dalbandin–Mashkel	Nok Kundi–Dalbandin	Dalbandin–Nok Kundi	Nok Kundi – Taftan	Reko Diq – Nok Kundi	Reko Diq – Taftan
Cars	2	8	1	0	199	153	71	1	0
Pickup	118	44	34	16	320	431	73	68	1
Bikes	9	1	0	0	41	58	8	0	0
Buses	1	0	0	0	61	40	38	0	0
Trucks – 2 axles	4	6	1	3	35	52	6	0	0
Trucks – 3 axles	7	9	1	5	37	28	40	0	0
Trucks – 4 axles	0	0	0	0	2	3	18	0	0
Trucks – 5 axles	0	0	0	0	14	40	0	0	0
Trucks – 6 axles	0	0	0	0	38	82	0	0	0
Trailer	0	0	0	0	3	22	0	0	0
Tractor	0	0	0	0	2	1	0	0	0
Other*	0	0	0	0	0	0	1	0	0
Total	**141**	**68**	**37**	**24**	**752**	**910**	**435**	**69**	**1**
LTV (cars/pickups/bikes/others)	129	53	35	16	560	642	153	69	1
HTV (buses/trucks/trailer/tractor)	12	15	2	8	192	268	282	0	0
LTV (%)	91%	78%	95%	67%	74%	71%	35%	100%	100%
HTV (%)	9%	22%	5%	33%	26%	29%	65%	0%	0%

*others include rickshaws

HTV = Heavy Traffic Vehicle, LTV = Light Traffic Vehicle

5.1.9.2.1 Daily Traffic Volume at T1-22 (Nok Kundi)

The daily traffic volume at the traffic location at T1-22 (Nok Kundi) is plotted in Figure 5-32. Figure 5-32 shows that the traffic starts from 6:00 to 7:00 when people go to work and tends to end around 22:00 to 23:00.

At T1-22, two distinct peaks are formed centered at 09:00 to 10:00 and 18:00 to 19:00 after which the traffic volume decreases continually with each passing hour. This is due to the traffic generated mainly by pickups (locally known as *Zamyad* and used for border trade purposes) and trucks. The traffic at peak hours represents about 16% of total traffic at this point.

The traffic from Mashkel to Dalbandin or vice versa is the least contributor of traffic in the daily traffic volume at T1-22 by adding only 3% traffic while traffic from Nok Kundi to Dalbandin or vice versa is the highest contributor of traffic in the daily traffic volume at T1-22 by adding 86% traffic in the total daily traffic volume at T1-22.

5.1.9.2.2 Daily Traffic Volume at T1-20 (Access Road to the Reko Diq Mine Site)

The daily traffic volume at traffic location is plotted in Figure 5-33. Figure 5-33 shows that the traffic starts from 6:00 to 7:00 when people go to work and tends to end around 21:00 to 22:00.

At T1-20, two distinct peaks are formed centered at 07:00 to 08:00 and 17:00 to 18:00 after which the traffic volume decreases continually with each passing hour. This is due to the traffic generated mainly by trucks and buses which have fixed timings of morning and evening. The traffic at peak hours represents about 25% of total traffic at this point.

The traffic from Reko Diq to Taftan or vice versa is almost nil, as this route is not used by the locals.

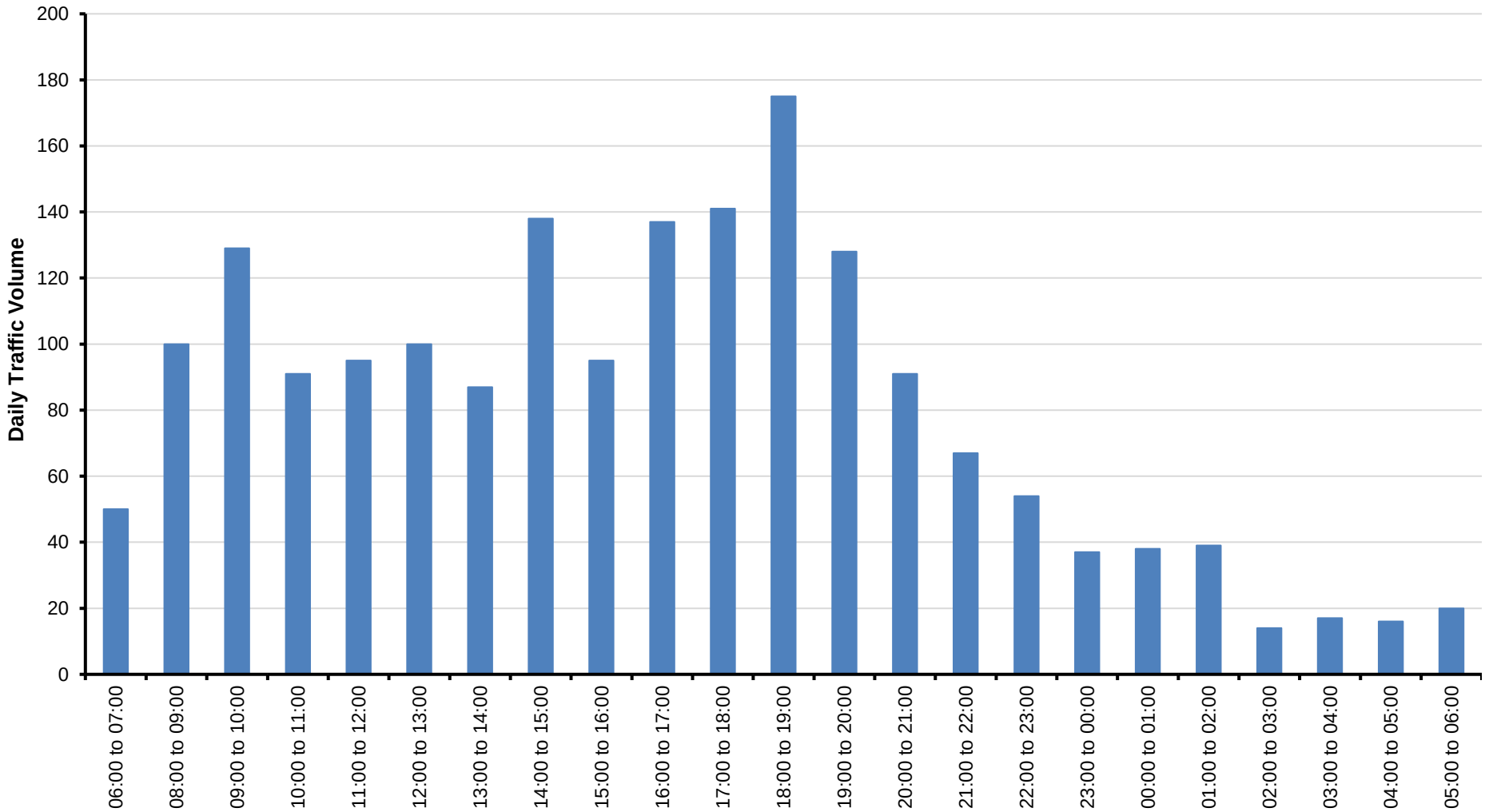


Figure 5-32: Daily Traffic Volume at T1-22 (Nok Kundi)

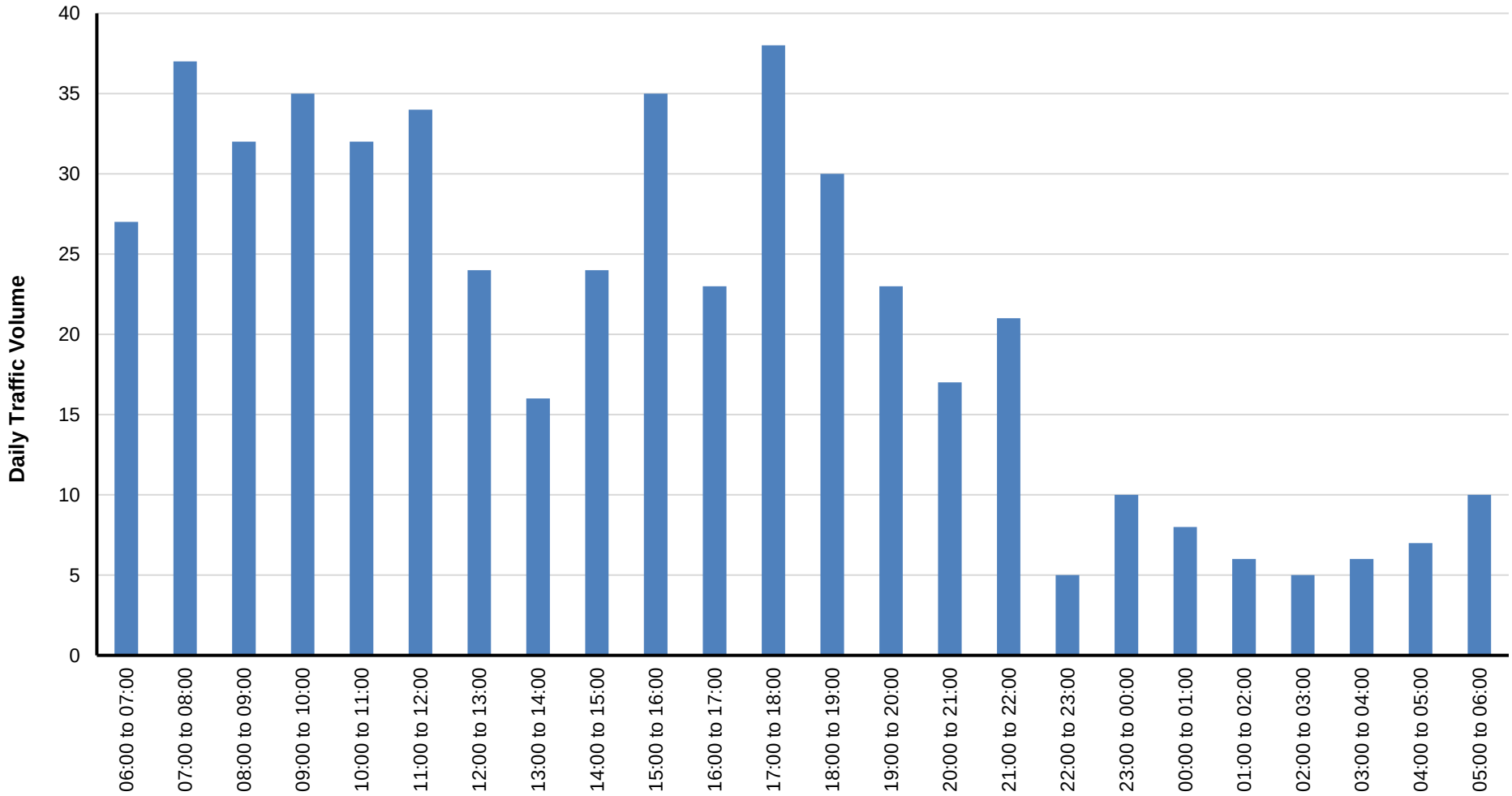


Figure 5-33: Daily Traffic Volume at T1-20 (Access Road to the Reko Diq Mine Site)

5.1.9.2.3 Daytime and Nighttime – LTV and HTV Distribution of T1-22 (Nok Kundi)

- At T1-22, hourly traffic was recorded for a period of 24–hours. The daytime hours are from 6:00 am to 10:00 pm whereas the nighttime hours are from 10:00 pm to 6:00 am.[31] The daytime and nighttime traffic volume in terms of LTV and HTV is presented in Figure 5-34. The daytime traffic volume is higher compared to nighttime as the mostly passenger and local traffic goes and comes back in the daytime hours.
- LTV forms about 75% of the daily daytime traffic volume and 69% of nighttime traffic volume in comparison with HTV which forms 25% daily daytime traffic volume and 31% of nighttime traffic volume. LTV is dominant during daytime and nighttime due to the movement of greater number of pickups (locally known as *Zamyad*) mainly for transportation of goods from border area.
- LTV is dominant in the area as N–40 highway is mainly used for transportation of goods and fuel from Taftan border. The main occupation of the residents of the area is transportation of goods and fuel. In LTV vehicles, 67% of the vehicles were pickups which are either used for transportation of good/fuel or as public transport.

5.1.9.2.4 Daytime and Nighttime - LTV and HTV Distribution of T1-20 (Access Road to the proposed Reko Diq Mine Site)

- At T1-20, hourly traffic was recorded for a period of 24 hours. The daytime hours are from 6:00 am to 10:00 pm whereas the nighttime hours are from 10:00 pm to 6:00 am.[32] The daytime and nighttime traffic volume in terms of LTV and HTV is presented in Figure 5-35. The daytime traffic volume is higher compared to nighttime as the mostly passenger and local traffic goes and comes back in the daytime hours.
- LTV forms about 45% of the daily daytime traffic volume and 40% of nighttime traffic volume in comparison with the HTV which forms 55% daily daytime traffic volume and 60% of nighttime traffic volume. HTV is dominant during daytime and nighttime due to the movement of greater number of trucks and passenger buses mainly for transportation of goods from border area. The two separate peaks for HTV can be seen centered at 07:00 to 8:00 and 16:00 to 17:00 which are generated mainly by trucks and buses which have fixed timing of morning and evening. On average, the traffic in these hours represents about 25% of the total daily HTV traffic.
- HTV is dominant in the area as N-40 highway is mainly used for transportation of goods and fuel from Taftan border with Iran. The main occupation of the residents of the area is transportation of goods and fuel. In LTV vehicles, 64% of the vehicles were pickups which are either used for transportation of good/fuel or as public transport. Moreover, there are few residential areas between Nok Kundi and Taftan which also contributes to low LTV traffic count at T1-20.

31 The daytime hours in BEQS are from 6:00 am to 10:00 pm.

32 Ibid.

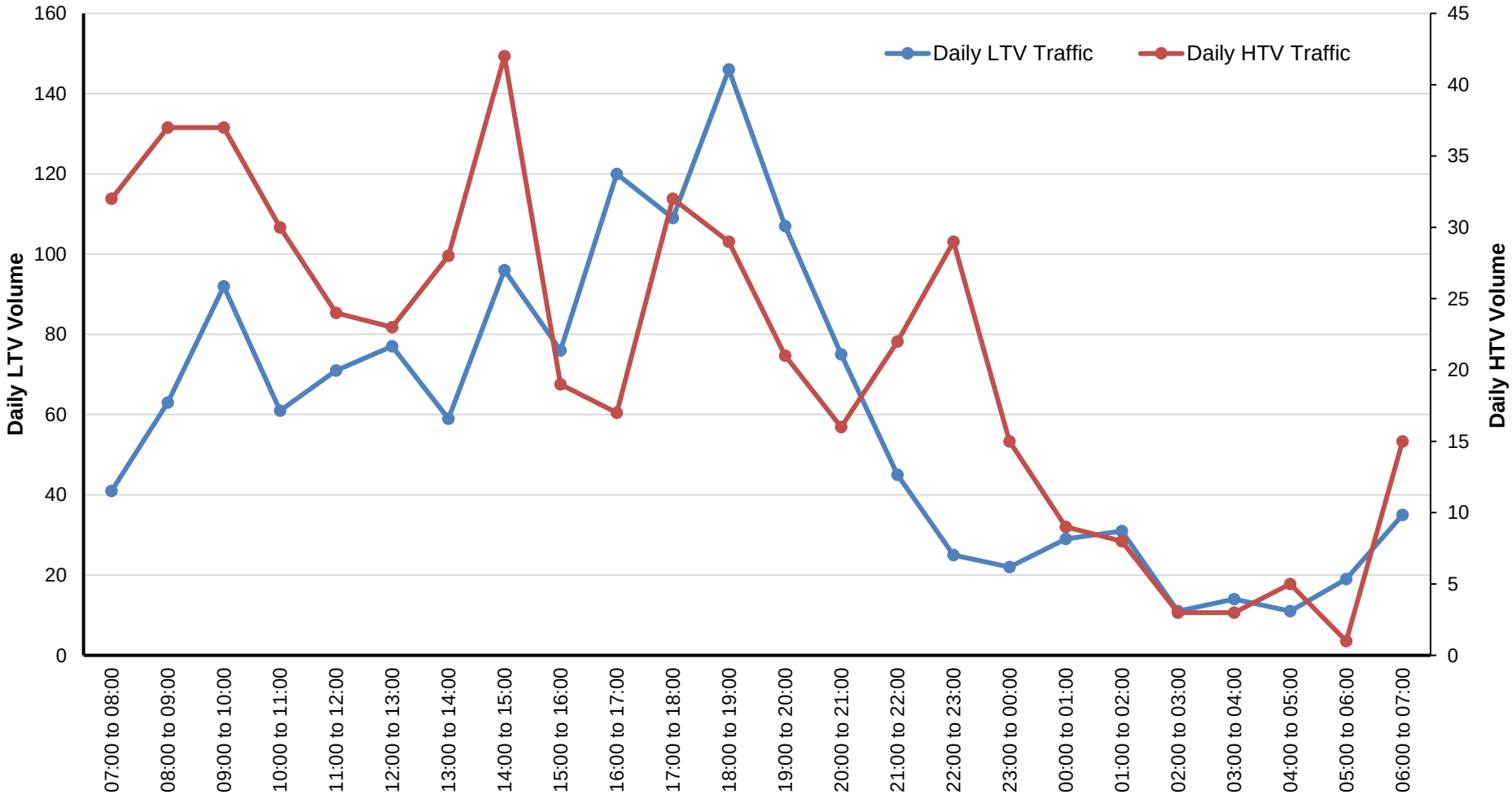


Figure 5-34: Daily Traffic Distribution between LTV and HTV at T1-22 (Nok Kundi)

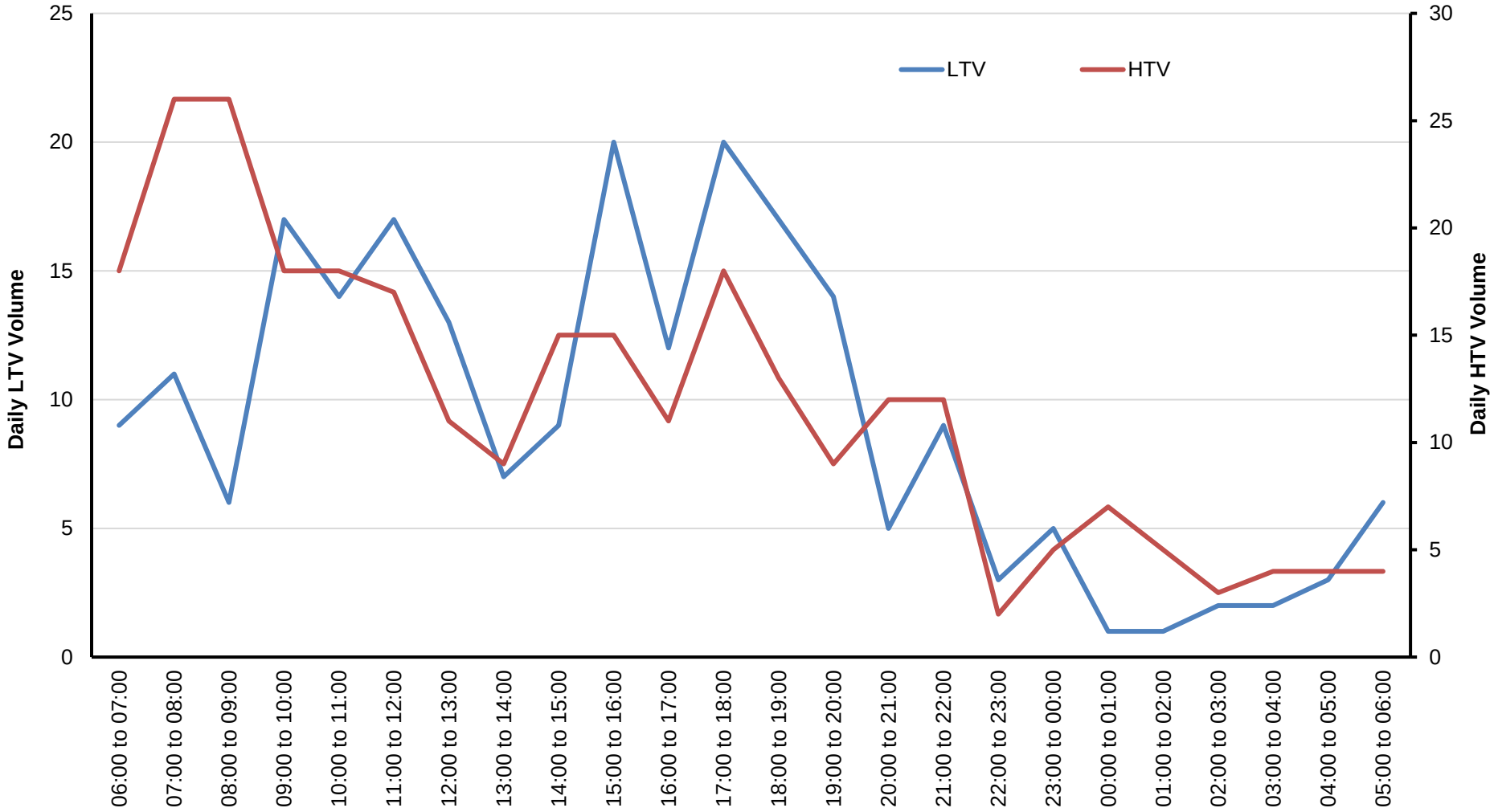


Figure 5-35: LTV and HTV Distribution both at Daytime and Nighttime at T1-20 (Access Road to the proposed Reko Diq Mine Site)

5.1.9.2.5 Relation of Noise Levels with Traffic Levels at T1-22 (Nok Kundi)

Traffic count and noise measurements were undertaken simultaneously at T1-22 (Nok Kundi) to assess the relationship of noise with traffic volume.

Figure 5-36 illustrate the distribution of day and nighttime noise levels in relation to variations in the traffic volume. The observed noise levels were not only due to the vehicular movement but also due to other factors, including movement of animals, passing of high voltage electric wires, fluctuations in weather (high winds etc.), and movement of birds from their nests during sunrise and sunset.

The noise levels tend to increase with an increase in traffic starting from 06:00 am at all the monitoring locations. The minimum noise levels of 54.6 dBA at T1-22 was observed during the nighttime hour from 02:00 am to 03:00 am. During these hours, the observed traffic levels were also minimum.

5.1.9.2.6 Relation of Noise Levels with Traffic Levels at T1-20 (Proposed Reko Diq Mine Site)

Traffic count and noise measurements were undertaken simultaneously at T1-20 (Figure 5-29), simultaneously to assess the relationship of noise with traffic volume. Figure 5-37 illustrate the distribution of day and nighttime noise levels in relation to variations in the traffic volume. It is to be noted that the noise levels measured depend on other factors than traffic including noise from movement of animals, passing of high voltage electric wires, and high winds.

The noise levels tend to increase with an increase in traffic starting from 06:00 am and had a peak between 07:00 to 08:00 am. The minimum traffic volume (5) was observed at 2:00 to 3:00 and 22:00 to 23:00 with corresponding noise levels as 52.05 dBA and 55.8 dBA, respectively.

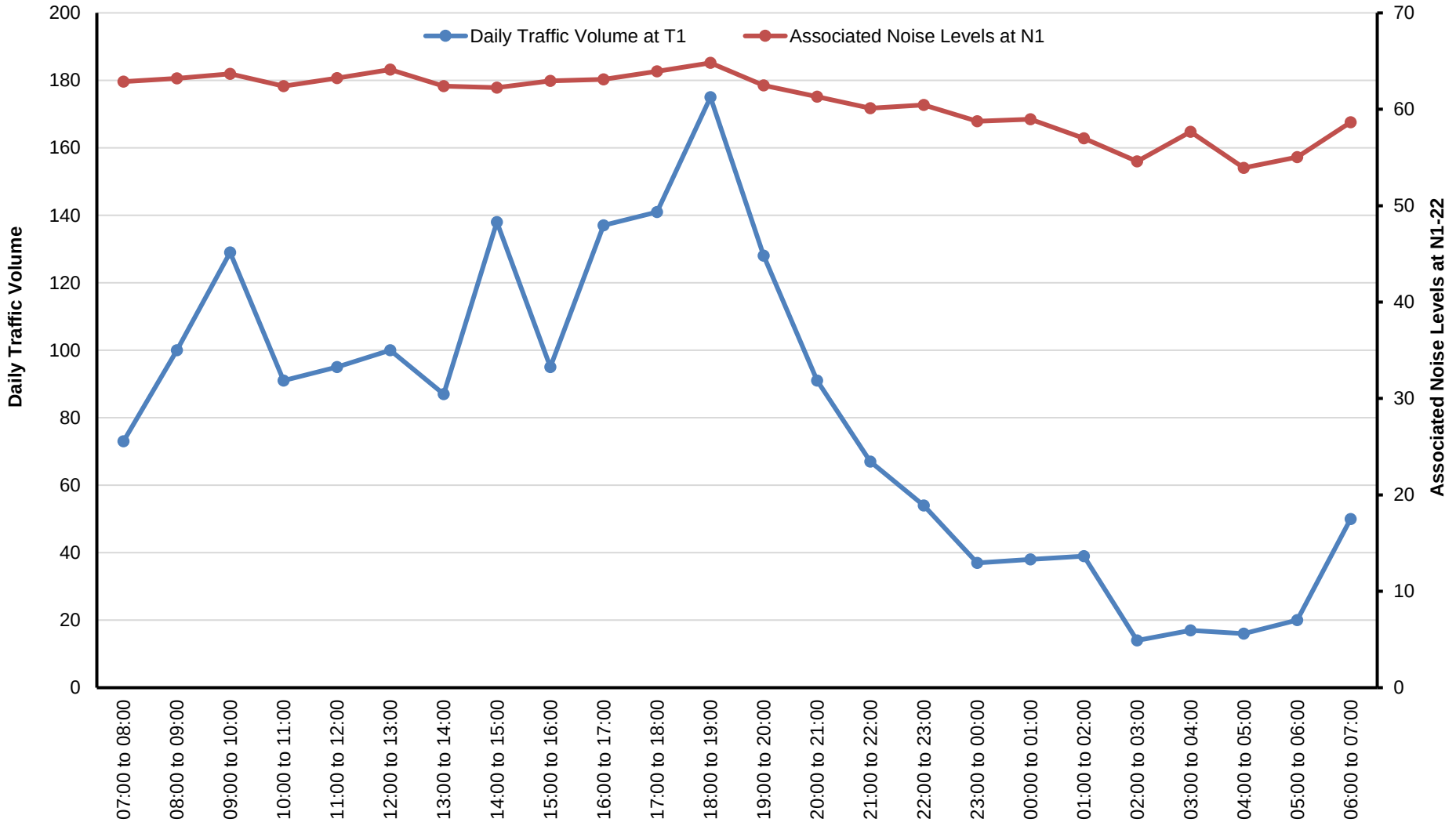


Figure 5-36: Relation of Noise Levels with Traffic at T1-22 (Nok Kundi)

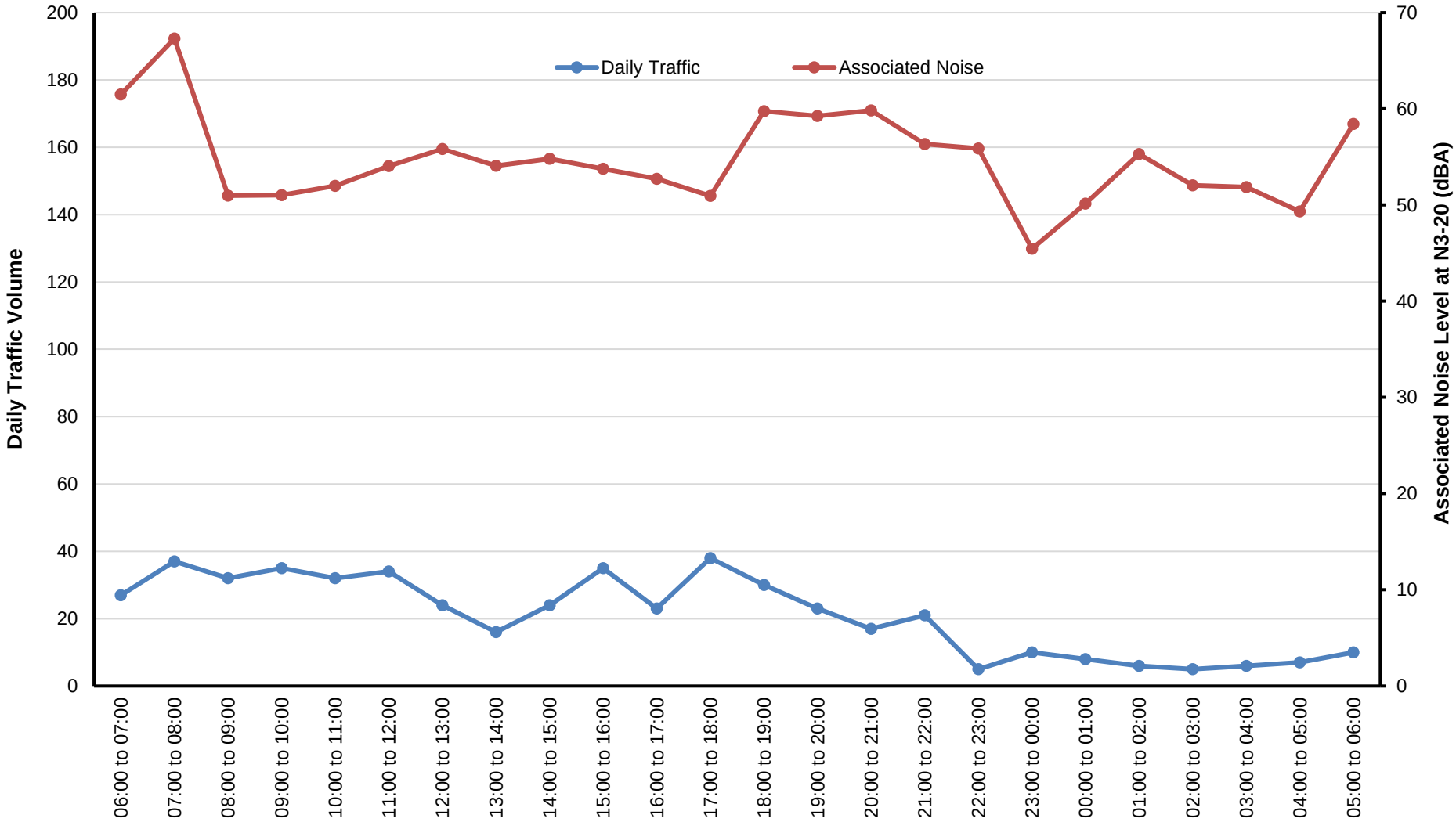


Figure 5-37: Relation of Noise Levels with Traffic at T1-20 (Access Road to the proposed Reko Diq Mine Site)

5.1.10 Soil

Most soil in Balochistan has a homogenous porous structure invariably calcareous in nature. The lime content of soil varies from five to 30 percent. Lime is uniformly distributed in most soil textures. Where having a high lime content (> 15 percent), the soil is hard when dry and friable when moist. The organic matter content is generally low, in order of 0.3 to 0.5 percent. Most of the surface of mountains and hills slopes are bare rock without soil cover (about 70 percent). Small patches contain shallow, strongly calcareous, gravelly, and stony loams. Soil in the piedmont plains is very deep, well drained, homogeneous, silty, and strongly calcareous with an 18-20 percent lime content uniformly distributed.[33]

Soil of the saline basin (playas) is characterized by being strongly hygroscopic, gypsiferous and saline with local sodicity and pH value of 8.6 – 10.0. The loess plains have brown silt loams or very fine sandy loams and are strongly calcareous containing about 22 percent calcium carbonate. While sandy plains are extremely homogeneous in soil. The lime content ranges between 5 and 10 percent.[34]

The soils at the proposed mine site are thin (less than 1 m in most places) and consist largely of sands and gravels with fines (silt and clay material) comprising an average of 10-30% of the total weight. A large proportion of the soil fraction has undergone aeolian (wind) transport and is still variably mobile depending on the soil fraction.

A soil survey was carried out in August 2020 as part of the 2020 ESIA to assess the soil quality at the proposed Reko Diq Mine Site including accommodation facility and along the water supply pipeline route from the Fan Sediments area to the accommodation facility.

5.1.10.1 *Methodology and Sampling Locations*

Soil samples from the proposed Reko Diq Mine Site and the Fan Sediments area were collected in 2020 and sent to PINSTECH, Islamabad for soil quality analysis which is a well-renowned and reputed laboratory in Pakistan. It is an ISO 9001:2015 certified laboratory registered with Pakistan National Accreditation Council (PNAC).

The soil was collected using an SS bailer. The top layer of about 0.025 m (6 inches) of soil was removed and then a sample of 1 to 1.5 kg was collected in zip-locked bags. Another 250 g of sample was collected in glass jars for analysis of heavy metals.

- 1 – 1.5 kg in plastic zip-locked bags for general analysis
- 250 g glass bottle for heavy metal analysis

One field duplicate sample was collected as quality control samples to assess the precision of sampling and laboratory analysis that can affect the results and that consistent and unbiased procedures are used for analysis.

33 Environmental Profile, Balochistan (LARUS-IT, Enschede: Netherland, 1992)
34 Ibid

Table 5-15 provides details of the sampling locations in 2022 and 2020 along with their rationale for selection. Figure 5-38 provides pictures of sampling locations. Figure 5-39 presents the photographs of sampling location.

Table 5-15: Soil Sampling Locations and Rationale for Selection

Sample ID	Coordinates	Location	Rationale for Selection
Sampling in 2020 (from 2020 ESIA)			
S1-20	29°31'13.40" N 61°34'33.60" E	Project Site	At the source of water pipeline to evaluate the soil quality at the water extraction point.
S6-20	29°08'47.70" N 62°06'52.90" E	Project Site	At Siareg (settlement) with indirect impact of the Project.
S7-20	29°08'47.70" N 62°06'52.90" E	Project Site	Duplicate of S6, as a QC sample.

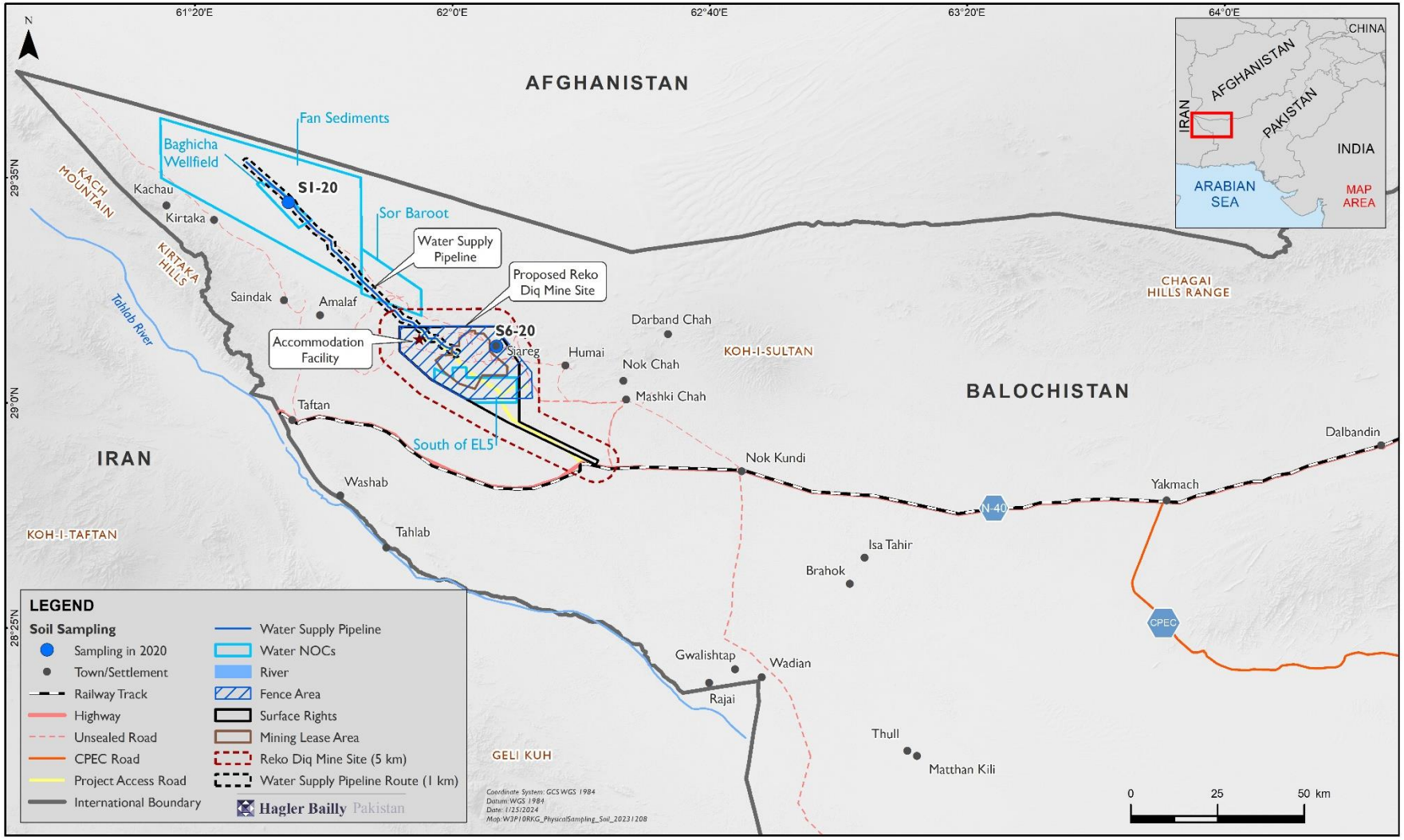


Figure 5-38: Soil Sampling Locations



Soil sampling using SS Bailer at S1-20



Soil sampling at S6-20



Soil sampling Jar and Bag at S6-20



Soil sampling at S7-20

Figure 5-39: Soil Sampling Photographs

5.1.10.2 Results and Analysis

Table 5-16 provides results of the soil sampling. No comparison was made due to non-availability of local standards.

Appendix G provides detailed lab analysis reports.

From the measured values the following conclusions can be drawn for the survey conducted in 2020:

General Parameters:

- Maximum pH of 7.49 was observed at S6-20 (Siareg settlement) and the minimum of value 7.07 was observed at S1-20 (Fan Sediments Area).
- Carbonates were not detected at any sampling location.
- The other general parameters including calcium, potassium, sodium, magnesium, chloride, sulphate, phosphorous, nitrate-nitrogen, and ammonia were detected at all locations.

- Metals:

- The metals: Arsenic, Barium, Copper, Zinc, Nickel, Chromium, Aluminum, and Mercury were detected at all monitoring locations.
- Antimony, Cadmium and Lead were not detected at any of the sampling locations.
- Boron was not detected at S6-20 (Siareg settlement), but was detected at S1-20 (Fan Sediments Area).
- Selenium was detected only at S1-20 (Fan Sediments Area).
- The maximum concentration of Manganese was observed 451 mg/kg at S1-20 (Fan Sediments Area) and minimum 438 mg/kg at S6-20 (Siareg settlement). The maximum concentration of Iron was observed 28,604 mg/kg at S1-20 (Fan Sediments Area) and minimum 21,272 mg/kg at S6-20 (Siareg settlement). The maximum Strontium was observed 195 mg/kg at S6-20 and minimum 116 mg/kg at S1-20 (Fan Sediments Area).

Table 5-16: Soil Sampling Results

Parameter	Unit	Analysis Method	LOD	S1-20	S6-20
General					
pH	–	pH Meter	1-4	7.46	7.49
Conductivity	mS/cm	HPLC & Instrumental	0.001	3.71	3.31
Calcium (Ca)	mg/kg	ICP-OES	5	46,649	33,108
Magnesium (Mg)	mg/kg	ICP-OES	0.15	13,441	14,359
Potassium (K)	mg/kg	ICP-OES	32	2,262	2,139
Sodium (Na)	mg/kg	ICP-OES	12	2,081	1,143
Carbonates	mg/L	ICP-OES	5	ND	ND
Chloride (Cl-)	mg/L	HPLC	0.50	1,020	260
Sulfate (SO_4)	mg/kg	ICP-OES	2.50	520	33,93
Nitrate Nitrogen (NO_3-N)	mg/L	HPLC & Instrumental	4	27	5.64
Ammonia (NH_3)	mg/L	HPLC & Instrumental	0.02	0.54	0.25
Phosphorus (P)	mg/kg	ICP-OES	2.50	259	252
Metals					
Aluminum (Al)	mg/kg	ICP-OES	3.50	16,193	14,249
Antimony (Sb)	mg/kg	HGAAS	0.03089	ND	ND
Arsenic (As)	mg/kg	HGAAS	0.02960	1.321	2.041
Barium (Ba)	mg/kg	ICP-OES	0.50	49.05	45.08
Boron (B)	mg/kg	ICP-OES	2.50	5.78	ND
Cadmium (Cd)	mg/kg	ICP-OES	0.50	ND	ND
Chromium (Cr)	mg/kg	ICP-OES	1.00	50.5	47.1

Parameter	Unit	Analysis Method	LOD	S1-20	S6-20
Copper (Cu)	mg/kg	ICP-OES	1.50	17.55	20.28
Iron (Fe)	mg/kg	ICP-OES	1.00	28,604	21,272
Lead (Pb)	mg/kg	ICP-OES	2.00	ND	ND
Manganese (Mn)	mg/kg	ICP-OES	0.50	451	438
Nickel (Ni)	mg/kg	ICP-OES	0.50	28.49	30.79
Selenium (Se)	mg/kg	HGAAS	0.03347	0.135	ND
Strontium (Sr)	mg/kg	ICP-OES	0.10	116	195
Zinc (Zn)	mg/kg	ICP-OES	0.15	42.49	43.62
Mercury (Hg)	mg/kg	HGAAS	0.02867	0.345	0.501

Note:
LOD = limit of detection
HGAAS = Hydride Generation Atomic Absorption Spectroscopy
ICP-OES = Inductively Coupled Plasma Optical Emission Spectroscopy
HPLC = High-Performance Liquid Chromatography

5.2 Ecology Baseline

The ecology baseline outlines the Ecological Study Area, sampling locations, methodology for ecology data collection, overview of the Ecological Resources in the study area, findings of the field visits, comparison with previous surveys, land use changes, site assessment, sensitivity mapping, protected areas near the Project vicinity and a Critical Habitat Assessment. The baseline is based on a detailed literature review of relevant journal articles, books, and online reports, as well as field visits to the Project site conducted from September 13, 2022, to October 13, 2022 (referred hereafter as Post-Monsoon 2022 Survey) and April 28, 2023, to May 13, 2023 (referred hereafter as Spring 2023 Survey).

5.2.1 Objectives and Scope

The scope of this section includes the establishment of baseline conditions for ecology. This baseline was prepared with the following objectives:

- Carrying out desktop assessments based on information obtained from published sources including books, research articles, and information from different databases and websites such as Global Biodiversity Information Facility (GBIF),[35] Global Invasive Species Database (GISD),[36] International Union for Conservation of Nature (IUCN),[37] Key Biodiversity Areas (KBAs),[38] Integrated Biodiversity Assessment Tool (IBAT),[39] Reptile Database,[40] Avibase,[41] Animal Diversity Web,[42] Centre for Agriculture and Biosciences International (CABI),[43] eFlora of Pakistan and Previous ESIA studies[44],[45] within and around the Ecological Study Area.
- Delineation of the Ecological Study Area and selection of sampling locations using information from previous studies[46],[47] and ***Google Earth™*** Satellite Imagery.
- Identification of microhabitats and sensitive ecosystems, if any.
- Qualitative and quantitative assessment of the ecological resources such as vegetation, avifauna, herpetofauna, mammals, small mammals, and invertebrates.

35 Global Biodiversity Information Facility, Available at: https://www.gbif.org
36 Global Invasive Species Database (GISD), Available at: https://portals.iucn.org/library/node/8912.
37 International Union for Conservation of Nature (IUCN) Red List of Threatened Species, Available at: https://www.iucnredlist.org/
38 Key Biodiversity Area, Available at: https://www.keybiodiversityareas.org/
39 Integrated Biodiversity Assessment Tool, Available at: https://www.ibat–alliance.org/
40 Reptile Database, Available at: http://www.reptile–database.org/
41 Avibase, World's Bird Database, Available at: https://avibase.bsc-eoc.org/avibase.jsp?lang=EN
42 Animal Diversity Web, Available at: https://animaldiversity.org/
43 Centre for Agriculture and Biosciences International, Available at: https://www.cabi.org/
44 Hagler Bailly Pakistan April 2010, Environmental Impact Assessment of Reko Diq Copper Mining Operations, Tethyan Copper Company Pty Limited (TCC)
45 Hagler Bailly Pakistan, November 2020, Environmental and Social Impact Assessment of Tanjeel Copper Project, National Resource Limited Pakistan
46 Hagler Bailly Pakistan April 2010, Environmental Impact Assessment of Reko Diq Copper Mining Operations, Tethyan Copper Company Pty Limited (TCC)
47 Hagler Bailly Pakistan, November 2020, Environmental and Social Impact Assessment of Tanjeel Copper Project, National Resource Limited Pakistan

- Verification of the information collected from the desktop-based assessment in the field surveys.
- Comparison of ecological resources of the Ecological Study Area observed in field surveys with the Previous Surveys.[48],[49]
- Habitat sensitivity mapping of the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and Access Road to the Reko Diq Mine Site.

5.2.2 Ecological Study Area

The Project Area falls within the desert ecoregion which contains the dry Sistan Basin of southern Afghanistan and portions of eastern Iran and southwest Pakistan.[50] The region is dominated by dry sandy desert conditions, with some irrigated cropland along the rivers. There are some seasonal wetlands at the western terminus of the Helmand River into Hamun Lake.

The area is characterized by a desert biome, revealing distinct features typical of arid environment due to scant rainfall leading to limited vegetations. The drought conditions are prevalent as this region experiences low annual precipitation and high temperatures, fostering a landscape with limited vegetation adapted to survive in dry conditions. The terrain consists of sandy or gravelly surfaces, often with dunes or rocky landscapes, and the soil is well-drained but nutrient levels may be low. Temperature extremes are common, with hot daytime temperatures and cooler nights.

The Ecological Study Area was demarcated by applying a buffer of 10 km around the Project's facilities and infrastructure such as proposed Reko Diq Mine Site, the Fan Sediment Water Supply Pipeline Area, and the Access Road.

Figure 5-40 shows the Ecological Study Area.

Based on ***Google Earth™*** satellite imagery[51] the Ecological Study Area further delineated into various habitat types. These habitat types include the Agricultural Areas/Date Palms, Built-up Areas, Clayey Plains, Dry Streambed, Gravel Plains, Mountain/Hills, Sandy Plains/Sand Dunes, and Wetlands.

The Gravel Plains and Mountains/Hills are the major habitat types comprising 53.8% and 24.7% of the Ecological Study Area, respectively. The other habitat types in the Ecological Study Area include the Sandy Plains/Sand Dunes (13.6%), Clayey Plains (4.5%), Dry Streambed (3.9%), Agricultural Areas/Date Palms (0.003%) and Built-up Areas (0.01%). Date Palm habitat at Kirtaka is a microhabitat with only a fraction of the total habitat area; however, this habitat is comparatively diverse in terms of the flora and fauna it supports.

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48 Hagler Bailly Pakistan April 2010, Environmental Impact Assessment of Reko Diq Copper Mining Operations, Tethyan Copper Company Pty Limited (TCC)

49 Hagler Bailly Pakistan, November 2020, Environmental and Social Impact Assessment of Tanjeel Copper Project, National Resource Limited Pakistan

50 European Commission Website https://dopa-explorer.jrc.ec.europa.eu/ecoregion/81326 <European Commission > EU Science Hub > DOPA > DOPA Explorer > Registan-North Pakistan sandy desert>, accessed on January 22, 2024

51 Google Earth Pro. Free geospatial desktop application Available at: https://google–earth–pro.en.softonic.com/

Table 5-17 provides the details of habitat types along with the area and percentage of each habitat type.

Figure 5-41 and Figure 5-42 provide photographs of different habitats in the Ecological Study Area during the sampling of Post-Monsoon 2022 and Spring 2023 surveys, respectively.

There are no protected areas within 100 km radius and the nearest ecological important areas in the proximity to the Project facilities include Ras Koh, designated as a Wildlife Sanctuary and an Important Bird Area (IBA), which is situated 255 km away. Additionally, Raghai Rakshan (Wildlife Sanctuary), and Zangi Nawar, recognized as an Important Bird Area and Game Reserve, are located at a distance of 338 km from the Access Road to the proposed Reko Diq Mine. However, other areas such as Chorani, Koh-i-Surkho, Maslakh, Shashan, Zawakhan (all wildlife sanctuaries), and Hazar Ganji – Chiltan (a National Park) are situated farther away, with distances ranging from 405 km to 470 km from the Access Road to the proposed Reko Diq Mine. The details of the nearest protected areas are provided in **Section 5.2.11**.

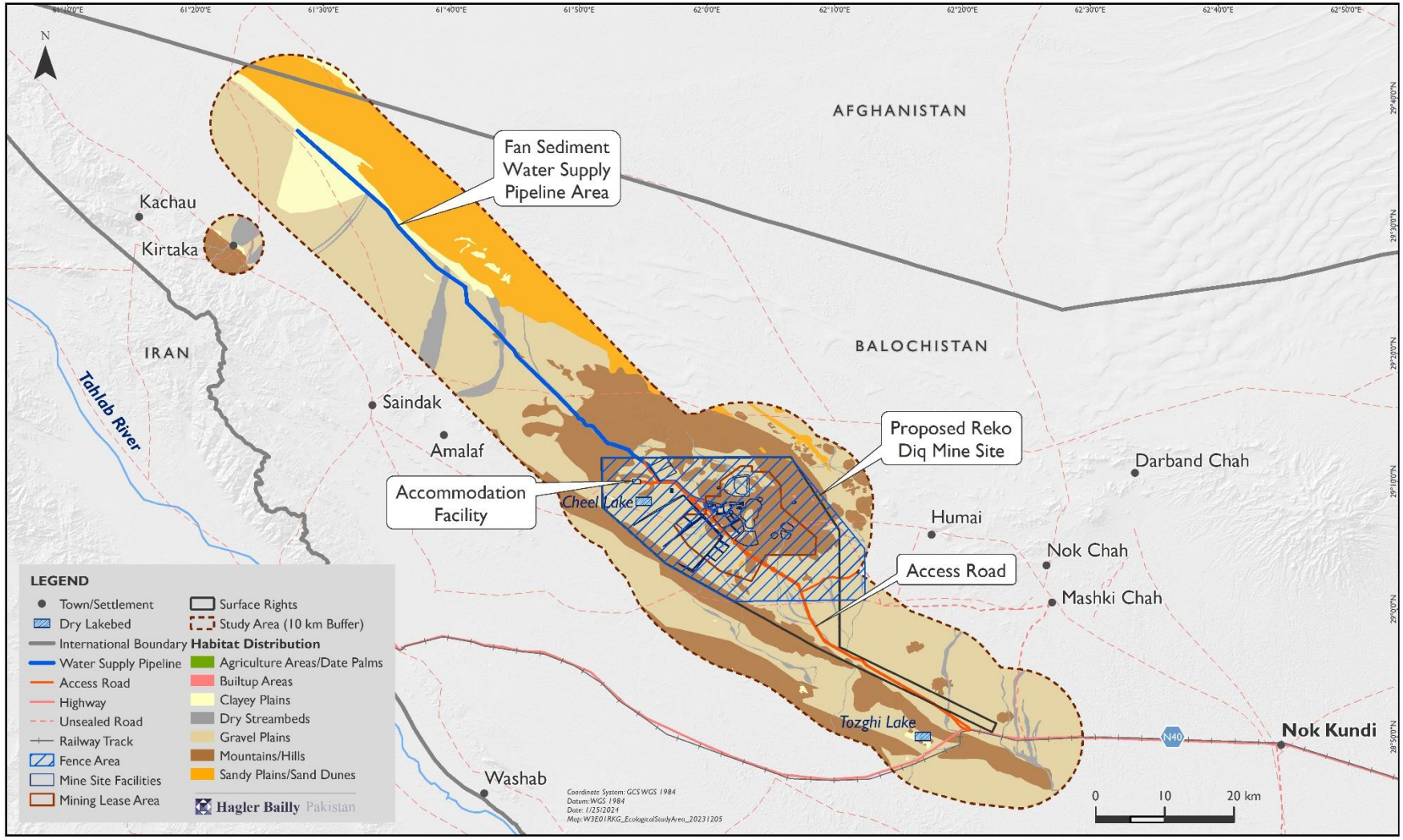


Figure 5-40: Ecological Study Area

Table 5-17: Habitat Types along with Area and Percentage of each Habitat Type

No.	Habitat Types	Area (km^2)	Percentage (%)
1.	Gravel Plains	1,757.4	53.8
2.	Mountains/Hills	808.8	24.7
3.	Sandy Plains/Sand Dunes	430.8	13.2
4.	Clayey Plains	148.1	4.5
5.	Dry Streambeds	129.4	3.8
6.	Agriculture Areas/Date Palms	0.1	0.01
7.	Built-up Areas	0.1	0.01
Total		**3,274.6**	**100.0**



a) *Date Palm along Fan Sediment Water Supply Area*



b) *Vegetation Cluster along Fan Sediment Water Supply Pipeline Area*



c) *Mountain/ Hills at proposed Reko Diq Mine Site*



d) *Sandy Plains/ Sand Dunes near proposed Reko Diq Mine Site*



e) *Sandy Plains/ Sand Dunes near dry Tozghi Lake along the Access Road to the proposed Reko Diq Mine Site*



f) *Dry Streambed along Access Road to the proposed Reko Diq Mine Site*



g) *Dry Streambed near dry Cheel Lake (proposed Reko Diq Mite Site)*



h) *Gravel Plains along Access Road*

Figure 5-41: Photographs of Different Habitats, Post-Monsoon 2022 Survey



a) *Mountain/ Hills at the proposed Reko Diq Mine Site*



b) *Sandy Plains and Sand Dunes at the proposed Reko Diq Mine Site*



c) *Gravel Plains along Access Road*



d) *Vegetation along Fan Sediment Water Supply Pipeline Area*



e) *Dry Streambed along Access Road*



f) *Clayey Plains along Fan Sediment Water Supply Pipeline Area*

Figure 5-42: Photographs of Different Habitat Types, Spring 2023 Survey

5.2.3 Sampling Locations

The ecological sampling was carried out in the Ecological Study Area in different habitat types including Agricultural Areas/Date Palms, Built-up Areas, Clayey Plains, Dry Streambed, Gravel Plains, Mountain/Hills, and Sandy Plains/Sand Dunes.

Sampling was conducted at a total of 41 sampling locations for Ecological Resources (terrestrial vegetation, birds, herpetofauna, and mammals) using the line transect method. A total of 15 sampling locations were selected in Gravel Plains, 12 in Dry Streambeds, six in Mountains/Hills, four in Clayey Plains, three in Sandy Plains/Sand Dunes, and one in Agricultural Areas/Date Palms. In addition, sampling for small mammals and invertebrates was also conducted at four sampling locations.

The Ecological Resources that were sampled in the Ecological Study Area include:

- Terrestrial Vegetation: diversity, abundance, and distribution
- Avifauna: diversity, abundance, and distribution
- Herpetofauna: diversity, abundance, and distribution
- Mammals: diversity, abundance, and distribution
- Invertebrates: diversity, abundance, and distribution

Sampling was conducted at all of these sampling locations during both Post-Monsoon 2022 and Spring 2023 surveys. Out of 41 sampling locations, 20 sampling locations are located at the proposed Reko Diq Mine Site, 13 along the Fan Sediment Water Supply Pipeline Area, and eight along the Access Road to the proposed Reko Diq Mine Site. In addition, sampling for small mammals and invertebrates was also conducted at four sampling locations (BM1 along Fan Sediment Water Supply Pipeline Area, BM2, BM3, BM4 at proposed Reko Diq Mine Site) using Sherman traps and pitfall traps in both the Post-Monsoon 2022 Survey and Spring 2023 Survey.

Figure 5-43 shows the sampling locations that were sampled in the Ecological Study Area during the Post-Monsoon 2022 Survey.

Figure 5-44 shows the sampling locations that were sampled in the Ecological Study Area during the Spring 2023 Survey.

Table 5-18 provides details of sampling locations, habitat types, coordinates, and Ecological Resources sampled at each sampling location during both Post-Monsoon 2022 and Spring 2023 surveys.

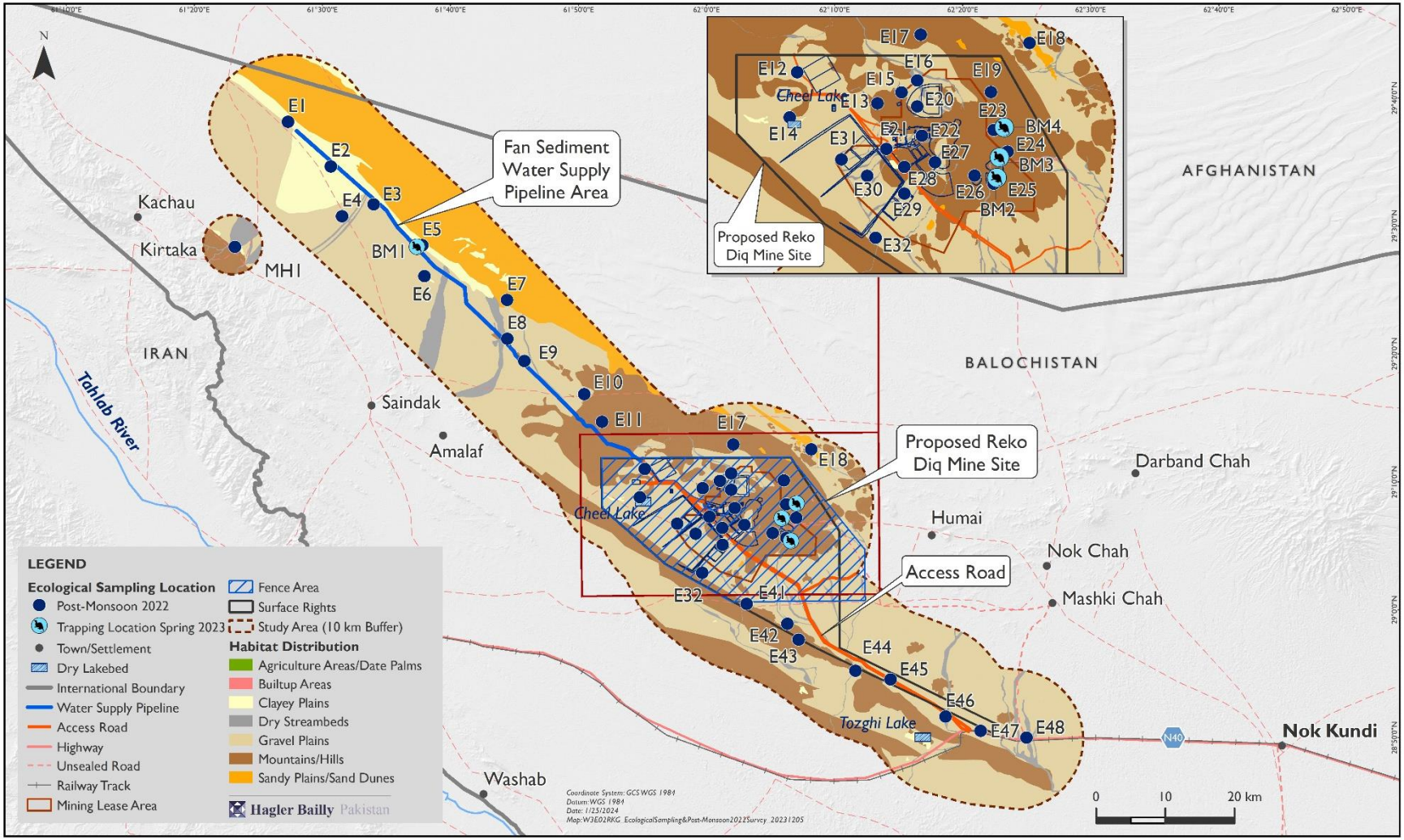


Figure 5-43: Ecological Sampling Locations, Post-Monsoon 2022 Survey

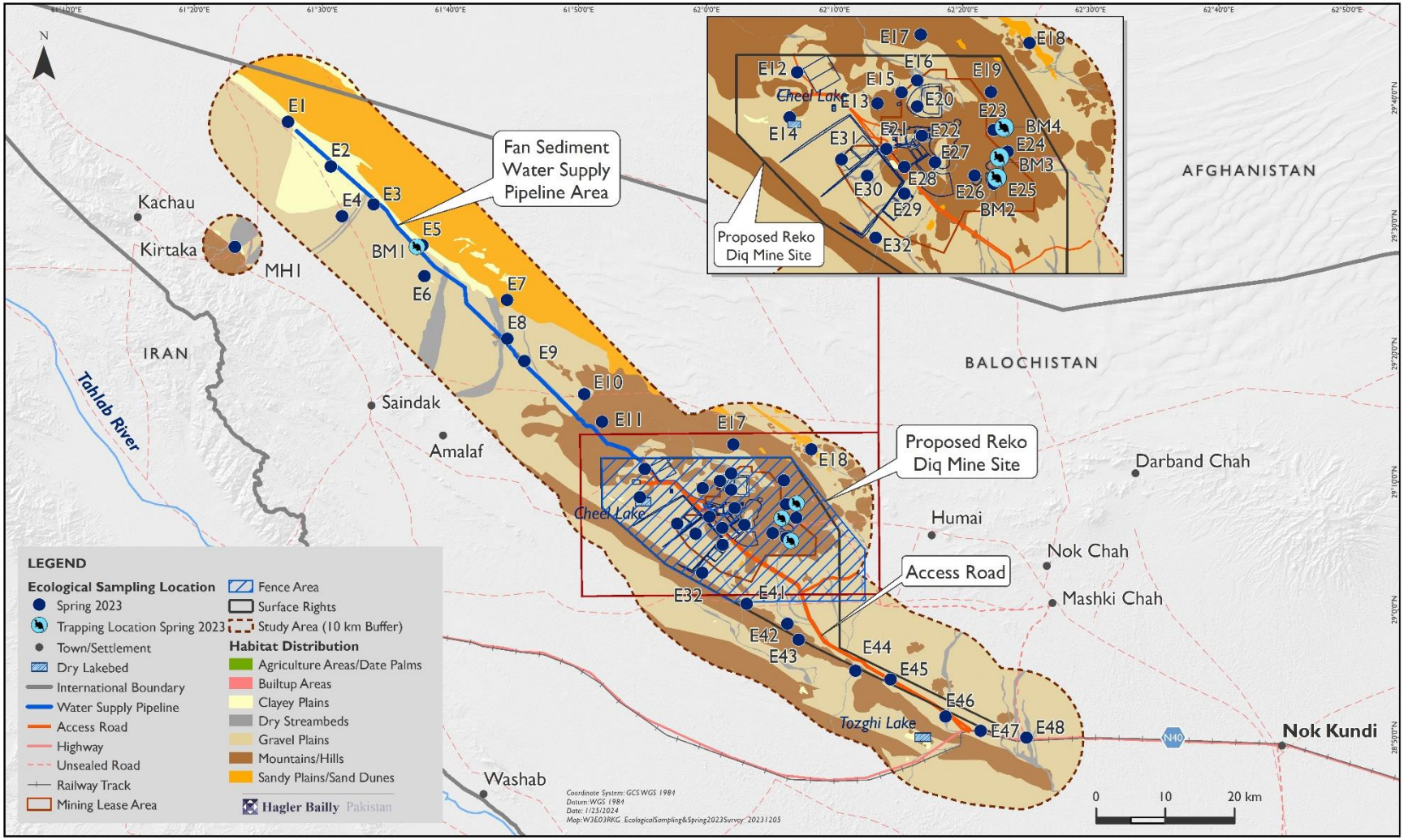


Figure 5-44: Ecological Sampling Locations, Spring 2023 Survey

Table 5-18: Sampling Locations, Habitat Types, Coordinates, and Ecological Resources Sampled in Ecological Study Area in Post-Monsoon 2022 and Spring 2023 Surveys

Sampling Location Detail			Post-Monsoon 2022 Survey	Spring 2023 Survey	Ecological Resources Sampled
Sampling ID	Habitat	Coordinates			
Fan Sediment Water Supply Pipeline Area					
E1	Clayey Plains	29°38' 09.1" N 61°27' 28.0" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E2	Clayey Plains	29°33' 59.7" N 61°31' 30.7" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E3	Gravel Plains	29°31' 43.1" N 61°33' 46.2" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E4	Dry Streambeds	29°30' 37.8" N 61°31' 26.1" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E5	Sandy Plains/ Sand Dunes	29°28' 22.7" N 61°37' 52.2" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E6	Gravel Plains	29°25' 53.7" N 61°37' 53.8" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E7	Sandy Plains/ Sand Dunes	29°24' 10.4" N 61°44' 31.2" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E8	Dry Streambeds	29°21' 03.4" N 61°44' 30.3" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E9	Dry Streambeds	29°19' 20.6" N 61°45' 49.6" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E10	Gravel Plains	29°16' 55.3" N 61°50' 19.5" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E11	Mountains/ Hills	29°28' 22.6" N 61°23' 15.5" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E12	Gravel Plains	29°11' 9.3" N 61°55' 7.7" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
MH1	Agricultural Areas/ Date Palms	29°28' 22.6" N 61°23' 15.5" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
BM1	Sandy Plains/ Sand Dunes	29°28' 22.7" N 61°37' 52.2" E	✓	✓	Small mammals and invertebrates trapping
Proposed Reko Diq Mine Site					
E13	Mountains/ Hills	29°09' 30.3" N 61°59' 31.2" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E14	Clayey Plains	29°08' 54.0" N 61°54' 42.5" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E15	Dry Streambeds	29°10' 12.3" N 62°01' 06.7" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E16	Gravel Plains	29°10' 32.7" N 62°02' 8.5" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E17	Mountains/ Hills	29°12' 47.9" N 62°02' 14.1" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates

Sampling Location Detail			Post-Monsoon 2022 Survey	Spring 2023 Survey	Ecological Resources Sampled
Sampling ID	Habitat	Coordinates			
E18	Sandy Plains/ Sand Dunes	29°12' 41.8" N 62°08' 01.9" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E19	Mountains/ Hills	29°10'07.2" N 62°06'16.1" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E20	Gravel Plains	29°09'16.3" N 62°02'04.6" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E21	Dry Streambeds	29°07'19.9" N 62°00'28.7" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E22	Gravel Plains	29°08' 04.4" N 62°02' 49.9" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E23	Gravel Plains	29°08' 19.0" N 62°06' 03.0" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E24	Gravel Plains	29°07' 20.6" N 62°07' 05.6" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E25	Dry Streambeds	29°05' 44.3" N 62°06' 19.3" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E26	Gravel Plains	29°06' 09.2" N 62°05' 04.3" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E27	Dry Streambeds	29°06' 46.8" N 62°03' 01.3" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E28	Mountains/ Hills	29°06' 36.6" N 62°01' 54.9" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E29	Dry Streambeds	29°05' 15.8" N 62°01' 57.1" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E30	Dry Streambeds	29°06' 07.0" N 61°59' 17.1" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E31	Gravel Plains	29°06' 49.6" N 61°57' 50.7" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E32	Gravel Plains	29°03' 01.0" N 61°57' 50.7" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
BM2	Dry Streambeds	29°05' 44.3" N 62°06' 19.3" E	✓	✓	Small mammals and invertebrates trapping
BM3	Built-up Area	29° 06'55.04" N 62° 06'34.87" E	✓	✓	Small mammals and invertebrates trapping
BM4	Built-up Area	29° 08'23.29" N 62° 06'49.29" E	✓	✓	Small mammals and invertebrates trapping
Access Road to the proposed Reko Diq Mine Site					
E41	Gravel Plains	29°00' 22.5" N 62°03' 03.8" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E42	Clayey Plains	28°58' 53.4" N 62°06' 19.9" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E43	Mountains/ Hills	28°57' 43.3" N 62°07' 38.4" E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates

Sampling Location Detail			Post-Monsoon 2022 Survey	Spring 2023 Survey	Ecological Resources Sampled
Sampling ID	Habitat	Coordinates			
E44	Dry Streambeds	28°55’ 27.3” N 62°11’ 32.1” E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E45	Gravel Plains	28°54’ 28.5” N 62°14’ 30.0” E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E46	Dry Streambeds	28°51’ 34.0” N 62°18’ 38.4” E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E47	Gravel Plains	28°50’ 27.5” N 62°21’ 32.7” E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates
E48	Dry Streambeds	28°49’ 53.0” N 62°25’ 01.7” E	✓	✓	Vegetation, Avifauna, Herpetofauna, Mammals, and Invertebrates

5.2.3.1 Description of Important Areas or Sites in or near the Project Facilities

The Ecological Study Area is divided into three areas or sites considering the Project facilities. These include:

- Proposed Reko Diq Mine Site including the accommodation facility
- Fan Sediment Water Supply Pipeline Area
- Access Road to the proposed Reko Diq Mine Site

A brief description of each of these Project areas is given below.

5.2.3.1.1 Proposed Reko Diq Mine Site

The proposed Reko Diq Mine Site is largely comprised of Rocky Mountains, scattered sand dunes, dry streambeds, and dry lakebeds (Cheel Lake). A total of 20 sampling locations (E13-E32) were selected at the proposed Reko Diq Mine Site for sampling of birds, herpetofauna, invertebrates, mammals, and vegetation (*see* Figure 5-43**)**. The major habitats at the proposed Reko Diq Mine Site include Gravel Plains, Dry Streambeds, Mountains/Hills, and Sandy Plains/Sand Dunes. In addition, Sherman traps and pitfall traps were set at three sampling locations for small mammals and invertebrates during both surveys (Post-Monsoon 2022 Survey and Spring 2023 Survey). **Section 5.2.4**. provides the details on sampling methodologies.

5.2.3.1.2 Fan Sediment Water Supply Pipeline Area

The Fan Sediment Water Supply Pipeline Area extends to approximately 64 km northwest of the proposed Reko Diq Mine Site. A total of 13 sampling locations (E1-E12 and MH1) were sampled along the Fan Sediment Water Supply Pipeline Area in both surveys. The major habitats of this site were Gravel Plains, Dry Streambeds, Sandy Plains/Sand Dunes, Clayey Plains, and Mountains/Hills. A patch of Agricultural Areas/Date Palms (MH1) which is considered a microhabitat, was identified in the field and sampling was also conducted in this location (*see* Figure 5-43). In addition, Sherman traps and pitfall traps were set at one sampling location each along the Fan Sediment Water Supply Pipeline Area for small mammals and invertebrates respectively in both surveys. **Section 5.2.4**. provides the details on sampling methodologies.

5.2.3.1.3 Access Road to the proposed Reko Diq Mine Site

Access Road to the proposed Reko Diq Mine Site is about 37 km from the main Nok Kundi -Taftan National Highway 40 (N-40) to proposed Reko Diq Mine Site. It includes the dry Tozghi Lake which is typically dry. A total of eight sampling locations (E41-E48) were sampled along the Access Road to the proposed Reko Diq Mine during both Post-Monsoon 2022 Survey and Spring 2023 Survey. The sampling was conducted in Gravel Plains, Dry Streambeds, and Mountain/Hills.

5.2.4 Field Survey Methodology

This section provides a brief methodology of field sampling while the detailed are Ecology Survey Plan is provided in **Appendix H**.

5.2.4.1 Ecological Resources

The sampling for Ecological Resources during both Post-Monsoon 2022 Survey and Spring 2023 Survey involved the use of specific methodologies. The line transect method was employed for sampling avifauna, herpetofauna, mammals, and invertebrates, while the quadrate method was utilized for vegetation sampling. Sherman traps were set to capture small mammals and pitfall traps were also used to capture and study invertebrate species.

The details of each of these methods are discussed below.

5.2.4.2 Vegetation

5.2.4.2.1 Methods for Data Collection

The vegetation in the Ecological Study Area was sampled by the quadrat method, taking three quadrats of 5 m by 5 m at each sampling location. Depending upon the site condition, the transect was started where vegetation was available. The first quadrat was taken at the beginning of the transect, the second at 250 m distance and the third at 500 m distance. Plants within each quadrat were noted and collected for the identification of the plant species if required. Plants collected were identified following the nomenclature from Flora of Pakistan (Nasir and Ali 1972-1994,[52] Ali and Qaiser, 1995-to date)[53].

Visual observation of the habitat condition was recorded for each site. Additional plant species in the area adjacent to the quadrat were noted down and their locations were recorded. Photographs were taken of all the species encountered within the Ecological Study Area, including nationally protected species, and ecologically sensitive areas. The Alien-Invasive Plant Species (AIPS)[54] occurring within the Ecological Study Area were specifically recorded. In addition, local people were consulted to gather information about local plant names, uses, and social value and cultural values of the plants of the area. All

[52] S. I. and Nasir. 1972–1994. Flora of Pakistan Fascicles. Islamabad

[53] Ali, S. I. and Qaiser, M. 1995 to date. Flora of Pakistan Fascicles. Karachi

[54] An alien or non-native plant species is introduced beyond its original range of distribution. AIPS are non-native species that may become invasive or spread rapidly by outcompeting native plants and animals when they are introduced into a habitat that lacks their controlling factors as determined by natural evolution.

the data and auxiliary information were recorded in the field on specifically designed survey forms.

5.2.4.2.2 Analysis of Field Data

The data collected from the field was analyzed for species richness and other parameters such as cover, relative cover, density, relative density, frequency, relative frequency percentages, and Importance Value Index (IVI).

5.2.4.3 Avifauna

5.2.4.3.1 Methods for Data Collection

A line transect of 500 m long and 50 m wide was placed systematically at each sampling location in the Ecological Study Area to record all birds observed in the surveys. Transects were started as early as possible in the morning and the late afternoon and covered all possible habitats. The start time, end time, and coordinates of the starting and end points were recorded. The bird species were identified using the most recent keys available in the literature. The diversity and abundance of birds were calculated at each sampling location.

5.2.4.3.2 Analysis of Field Data

The species richness (number of species observed) and abundance (number of individuals of each species observed) at the specified sampling sites were calculated.

5.2.4.4 Herpetofauna

5.2.4.4.1 Methods for Data Collection

An effective way to survey reptiles is by active searching using the line transect method which is equally applicable to both nocturnal and diurnal species. A line transect of 500 m long and 20 m wide was placed systematically at each sampling location in the Ecological Study Area. The presence of signs such as an impression of body, tail or footprints, fecal pellets, tracks, dens, or egg-laying excavations were recorded. The specimens were identified with the help of the most recent keys available in the literature. The samples were collected and preserved for identification purposes where the species were not identified in the field for any reason. The species collected or observed in the survey were photographed with a digital camera and necessary field data was recorded. The coordinates and elevations were recorded using GPS, and other features of interest like habitat type and climate conditions were also documented.

5.2.4.4.2 Analysis of Field Data

The diversity and abundance of herpetofauna were calculated at each sampling location.

5.2.4.5 Mammals

5.2.4.5.1 Methods for Data Collection

5.2.4.5.1.1 Line Transect Method

Line transects of 500 m by 20 m were placed at each sampling location to record sightings and signs of mammals. The GPS coordinates of the location and habitat type were documented. Animal signs such as scats, pugmarks, and tracks were identified and photographed. In addition, incidental sightings of all mammals were recorded; the number of individuals, location, and habitat type were recorded for each sighting. Anecdotal

information regarding specific mammals was collected from the local people and relevant literature was also consulted.

5.2.4.5.1.2 Live Trapping of Small Mammals

Sherman traps were used for small mammals. A mixture of different food grains mixed with fragrant seeds was used as bait. Wheat and rice were used as food grains while peanuts, butter, coriander, and oats were used for fragrance. Freshly prepared bait was used on every trapping day. The traps were set at selected potential sites in the evening and checked the next day as early as possible. The species and number of specimens for each species trapped were noted. The trapped specimens were later released back to their habitat. Photographs of the trapped animals were taken.

5.2.4.5.2 Analysis of Field Data

The species richness (number of species observed) and abundance (number of individuals of each species observed) at the specified sampling location were calculated using data obtained from the line transect and Sherman traps.

5.2.4.6 Invertebrates

5.2.4.6.1 Methods for Data Collection

Invertebrates were collected by applying two types of sampling techniques i.e., active sampling and passive sampling. Active sampling involves the direct collection of specimens by the collector (observer) i.e., line transect method, hand collecting, beat and sweep sampling. The passive sampling method was conducted without the collector (observer) present, which includes pitfall trapping.

5.2.4.6.1.1 Line Transect Method

Line transects of 100 m by 5 m were used to capture above and below-ground invertebrates. Random quadrats were taken out along the transect. The invertebrate samples were collected using digging techniques at each quadrat along the transect line.

5.2.4.6.1.2 Pitfall Traps

Pitfall traps were used for surface active invertebrates and deployed along one flank of the transect at about 5 m to 10 m distance from the quadrat. The pitfall traps were set at roughly 5 m intervals along one flank of the transect. The traps were placed in the afternoon or early evening and emptied 12 hours later, the next morning.

5.2.4.6.2 Analysis of Field Data

The diversity and abundance of invertebrates were calculated at each sampling location.

5.2.5 Survey Teams

The survey team for sampling Ecological Resources includes a herpetofauna expert, invertebrate expert, vegetation expert, vegetation specialist, mammal expert, avifauna expert, and avifauna specialist.

Table 5-19 provides details of the survey team for Ecological Resources.

Table 5-19: Ecology Survey Team

Name of Expert	Area of Expertise	Post-Monsoon 2022 Survey	Spring 2023 Survey	Position Assigned
Ahmad Shoaib	Ecology and Biodiversity	-	-	Quality Control, Backend Supervision and Reporting
Dr. Rafaqat Masroor	Herpetofauna	✓	✓	Herpetofauna Expert
Dr. Mishkatullah	Invertebrates	✓	-	Invertebrates Expert
Dr. Aziz Khan	Vegetation	✓	-	Vegetation Expert
Muhammad Shakil	Mammals	✓	✓	Mammals Expert
Muhammad Akram	Avifauna	✓	✓	Avifauna Expert
Muhammad Danish	Avifauna	✓	✓	Avifauna Specialist
Adnan Arif	Vegetation	-	✓	Vegetation Specialist

5.2.6 Overview of Ecological Resources

This section provides an overview of the ecology in the Ecological Study Area and surroundings based on information from articles in published journals, previous ESIAs, surveys conducted for different projects in the area, information from IBAT, IUCN, KBA, Reptile database, Avi Base, Animal Diversity Web, Fish Base, CABI, GISD, Flora of Pakistan (Flora of Pakistan), Plants of the World Online, as well as information collected from the Balochistan Forests and Wildlife Department in Quetta.

5.2.6.1 Ecological Resources

5.2.6.1.1 Vegetation

A total of 28 species of plants belonging to 12 different families are reported from Chagai District including *Poaceae, Palmae, Areceae, Chenopodiaceae, Fabaceae, Cucarbitaceae*, *Moraceae, Polygonaceae, Tamaricaceae, Zygohyllacaea, Convolvulaceae* and *Boraginaceae.*[55] The study carried out by HBP in 2010 and 2020 surveys observed a total of 27 species of plants from part of the Ecological Study Area including two Alien-Invasive Plant Species *Prosopis glandulosa* and *Prosopis juliflora*.[56],[57] According to the CABI and GISD, the Ecological Study Area also supports AIPS including the *Calotropis procera* and *Prosopis juliflora*.[58],[59]

Ethnobotanical flora is also reported from the Ecological Study Area where a total of 23 different species are used in traditional health care such as stomach-related disorders, malarial, typhoid, common fevers, liver and kidney disorders, cough-related ailments, aphrodisiac, gonorrhea, diuretic, diabetes, eye diseases, skin allergies, rashes, diarrhea,

55 Nawaz, M. A., Rafique, M., & Khan, N. K. (2011). Pattern of mammalian distribution in the Chagai Desert, Balochistan, Pakistan. Pakistan J. Zool, 43(5), 841–847.

56 Hagler Baily Pakistan (HBP), April 2010, Environmental and Social Impact Assessment for the Reko Diq Project, Tethyan Copper Company Pakistan (Private) Ltd.

57 Hagler Baily Pakistan (HBP), November 2020, Environmental and Social Impact Assessment for the Tanjeel Copper Project, National Resources Limited Pakistan Ltd.

58 Centre for Agriculture and Biosciences International https://www.cabi.org/ Accessed on 20–Oct–22

59 Global Biodiversity Information Facility https://www.gbif.org/ Accessed on 20–Oct–22

and dysentery.[60] According to the IUCN Red List of Threatened Species, the *Commiphora wightii* is listed as a Critically Endangered species whereas the rest of the species are listed as either Least Concern or Not Evaluated.

Appendix I provides a list of literature-based plant species and the species reported in the previous EIAs from the Ecological Study Area.

5.2.6.1.2 Avifauna

The avifauna of Pakistan is diverse and intriguing, influenced by its location in a transitional zone between the Palearctic and Indo-Malayan (Oriental) realms, as well as its rich variety of habitats.[61] With approximately 660 bird species reported, [62] [63] some studies suggest an even higher count of 670 described species. [64],[65] Among these, 30% are long-distance migratory, 43% are Palearctic species that visit Pakistan solely for breeding, and 28% are regular winter visitors, primarily breeding in the northern trans-Himalayan regions.[66]

The avifauna of Balochistan consists of 380 species reported from the varied habitats of the province such as coastal and marine environment, mangrove forests, swamps and marshes, rivers and inland wetlands, scrub forests, montane region, hill ranges, and sand dune deserts[67],[68],[69] out of which 128 species are waterbirds.[70] Another study reported 373 bird species to date, out of which, 256 species are migratory, and 117 species are resident.[71] According to Avi Base, the total number of species reported in Balochistan is 471 including 25 globally threatened species and two introduced species.[72]

Studies of avifauna have been carried out for only a few districts of Balochistan. Zangi Nawar, situated 338 km from the Access Road to the proposed Reko Mine Site, stands

60 Durrani, M. I., Taj, A. M., & Hussain, F. (2003). Folk medicinal plants of Nushki, district Chagai, Pakistan. *Journal of Science and Technology (Peshawar)*, *27*(1–2), 45–51.

61 Mahboob, S. (2009). Diversity of avifauna of Trimmu Barrage, District Jhang, Punjab, Pakistan. Pakistan Journal of Zoology, 41(1).

62 Mahmood, T., Khan, L. U., & Naeem, M. (2021). Diversity and abundance of Avifauna of Manglot Wildlife Park, Nowshera District, Khyber Pakhtunkhwa, Pakistan. Pakistan Journal of Zoology, 53(5).

63 Roberts, T.J., 1991. The birds of Pakistan, Vol I: Regional studies and non–Passeriformes. Oxford University Press, U.K.

64 Grimmett, Richard, Tom J. Roberts, Tim Inskipp, and Clive Byers. Birds of Pakistan. A&C Black, 2008

65 Khan, M. Z., Ghalib, S. A., Zehra, A., & Hussain, B. (2010). Bioecology and conservation of the birds of Hingol National Park, Balochistan. Journal of Basic & Applied Sciences, 6(2).

66 Grimmett, Richard, Tom J. Roberts, Tim Inskipp, and Clive Byers. Birds of Pakistan. A&C Black, 2008

67 Khan, M. Z., Ghalib, S. A., Zehra, A., & Hussain, B. (2010). Bioecology and conservation of the birds of Hingol National Park, Balochistan. Journal of Basic & Applied Sciences, 6(2).

68 Ghalib, S. A., Khan, M. Z., Zehra, A., & Khan, A. R. (2004). Current population status of the birds of Balochistan. Pakistan. J. Nat. Hist. Wildlife, 3(2), 51–62.

69 Pandrani, A. T. T. A. U. L. L. A. H., Hasnain, S. A., Ghalib, S. A., & Ahmad, E. J. A. Z. (2005). Observations on the Waterbirds of Jiwani Wetland Complex, Makran Coast (Balochistan). Pakistan Journal of Zoology, 37(4), 301.

70 Ibid.

71 Ghalib et al. (2019). Recent Observations on the Distribution and Status of Wildlife of Balochistan. Canadian Journal of Pure $ Applied Sciences, 13(2), 4813–4846

72 Avibase– The World Database, https://avibase.bsc–eoc.org/checklist.jsp?lang=EN&p2=1&list=clements&synlang=&region=PKba&version=text&lifelist=&highlight=0, Accessed on: 14/04/2022

out as an Important Bird Area and Game Reserve (see Figure 5-88).[73] This location serves as a crucial habitat for migratory and resting birds, attracting species such as Whooper Swan, Marbled Teal, White-tailed Lapwing, Grebe, Coot, Moorhen, Peregrine Falcon, Marsh Harrier,[74] White Headed Duck, Ferruginous Duck, Purple Heron and Black-winged Stilt.[75]

Based on the literature, four birds of conservation importance are reported which includes two Vulnerable bird species, the Eastern Imperial Eagle *Aquila heliaca* and Asian Houbara Bustard *Chlamydotis macqueenii,* and two Endangered including the Saker Falcon *Falco cherrug* and Egyptian Vulture *Neophron percnopterus* according to IUCN Red List of Threatened Species. Houbara Bustard and Egyptian Vulture were observed in the Post-Monsoon and Spring 2023 surveys while Eastern Imperial Eagle and Saker Falcon were not observed in any of these surveys.

Table 5-20 provides a literature-based list of conservation concern species.

Appendix I provides a list of avifauna based on the literature review and previous EIAs.

Table 5-20: Literature Based List of Conservation Concern Bird Species Reported from Ecological Study Area

No.	Scientific Name	Common Name	IUCN Status	Observed in Post-Monsoon and Spring Surveys
1.	*Aquila heliaca*	Eastern Imperial Eagle	Vulnerable	-
2.	*Chlamydotis macqueenii*	Asian Houbara Bustard	Vulnerable	✓
3.	*Falco cherrug*	Saker Falcon	Endangered	-
4.	*Neophron percnopterus*	Egyptian Vulture	Endangered	✓

5.2.6.1.3 Herpetofauna

Reptiles are known for their habitat specificity, often occupying small niches with typically restricted home ranges, unlike birds and mammals with more extensive foraging areas. In general, species, except for Monitor Lizards and large snakes, tend to stay within an area of less than square kilometer for feeding and breeding, with some geckos or skinks occupying even smaller microhabitats.[76] The breeding grounds of reptiles are scattered across suitable habitats, dependent on favorable climatic conditions. The country boasts

73 Ghalib et al. (2019). Recent Observations on the Distribution and Status of Wildlife of Balochistan. Canadian Journal of Pure $ Applied Sciences, 13(2), 4813–4846

74 IUCN (1990). IUCN Directory of South Asian Protected Areas. IUCN, Gland, Switzerland and Cambridge, U.K. xxiv + 294

75 KHAN, A. A. (1998). LULUKDAN: ANOTHER IMPORTANT WETLAND AS MARBLED TEAL MARMARONETTA ANGUSTIROSTRIS BREEDING SITE, BALOCHISTAN, IRAN AND PAKISTAN. Pak. J. Ornith, 2, 1–2.

76 Mertens, R. 1969. “Die Amphibians und Reptilians West Pakistan”. Stutt. Beit. Naturkunde, 197, pp. 1–96.

a rich reptilian diversity, with a reported total of 219 species, including 24 amphibians and 195 reptiles, with nine amphibians and 13 reptiles being endemic to Pakistan.[77]

The herpetofauna of Balochistan is comprised of 120 species of reptiles and seven species of amphibians.[78] The Chagai District alone represents 47 species of herpetofauna, among them two are amphibian[79] i.e., Zugmayer's Green Toad *Bufotes zugmayeri* and Skittering Frog *Euphlyctis cyanophlyctis,* and the remaining are reptilian species including 11 species of geckos, nine species of agama, skinks, tortoise, and some snake's species. The snakes reported from the area include 11 species that have habitat affinities in different habitat types.[80],[81] Other studies reported, the herpetofauna diversity in Balochistan varies across districts. The common species of the herpetofauna mainly distributed nortwestern and eastern region of Balochistan.[82],[83],[84] While, some southern parts of Chagai share habitat characteristics with the adjacent Kharan region, hosting 39 taxa, including several endemic species.[85]

The surveys conducted by HBP in November 2008 and September 2009 at the proposed Reko Diq Mine Site and Fan Sediment Water Supply Pipeline Area observed a total of 19 and 25 reptile species, respectively.[86] In the August 2020 Survey, a total of six species of herpetofauna were observed from the proposed Reko Diq Mine Site and Fan Sediment Water Supply Pipeline Area including Asian Rock Agamas *Laudakia nupta*, Brilliant Ground Agama *Trapelus agilis*, Persian long-tailed Desert Lizard *Mesalina watsonana*, Blacktail Toad Head Agama *Phrynocephalus maculatus*, Schokari Sand Racer *Psammophis schokari* and Pakistani Thin-toed Gecko *Cyrtopodion watsoni.*[87]

Appendix I provides a list of herpetofauna based on literature and previous EIAs.

77 Ali, W., Javid, A., Hussain, A., & Bukhari, S. M. (2018). Diversity and habitat preferences of amphibians and reptiles in Pakistan: a review. Journal of Asia–Pacific Biodiversity, 11(2), 173–187.

78 Ghalib, S. A. "Recent observation on the distribution and status of wildlife of Balochistan"

79 Baig, K. J., Awan, M. R., & Ashraf, N. A. E. E. M. (2006). Ecological studies and zoogeographic affinities of the amphibians and reptiles found in Chagai Desert, Balochistan, Pakistan. Pakistan Journal of Zoology, 38(2), 145.

80 Sarwar, M. K., Malik, M. F., Hussain, M., Azam, I., Iqbal, W., & Ashiq, U. (2016). Distribution and current status of amphibian fauna of Pakistan: A review. Electronic Journal of Biology, 12(3), 243–246.

81 Baig, K. J., Awan, M. R., & Ashraf, N. A. E. E. M. (2006). Ecological studies and zoogeographic affinities of the amphibians and reptiles found in Chagai Desert, Balochistan, Pakistan. Pakistan Journal of Zoology, 38(2), 145.

82 Sarwar, M. K., Malik, M. F., Hussain, M., Azam, I., Iqbal, W., & Ashiq, U. (2016). Distribution and current status of amphibian fauna of Pakistan: A review. Electronic Journal of Biology, 12(3), 243–246.

83 Khan, M. S. (2014). Amphibians of Pakistan and their conservation status. *Natural History Publications, Kota Kinabalu, Malaysia*, 1–35.

84 Khan, M. S. (2006). *Amphibians and reptiles of Pakistan* (p. 311). Malabar, Florida, USA: Krieger Publishing Company.

85 Khan, M. S. (1987). Checklist, distribution and zoogeographical affinities of herpetofauna of Balochistan. In *Proceedings of Pakistan Zoological Congress* (Vol. 7, pp. 105–112).

86 Ibid

87 Hagler Baily Pakistan (HBP), November 2020, Environmental and Social Impact Assessment for the Tanjeel Copper Project, National Resources Limited Company Pakistan Ltd.

No conservation concern herpetofauna species are reported from the Ecological Study Area in the IUCN Red List of Threatened Species.[88]

5.2.6.1.4 Mammals

Pakistan is home to ten of 18 known mammalian orders.[89] The varied and interesting mammalian fauna found in Pakistan is largely due to the country being in the transitional zone between two of the world's six major zoogeographical regions, the Palearctic and Oriental.[90] The ecology of Balochistan is typical of an arid coastal area which comprised of a total of 90 mammalian species.[91]

The mammalian fauna reported from Balochistan includes a variety of species such as Asiatic Jackal *Canis aureus*, Blandford's Fox *Vulpes cana*, Caracal *Caracal caracal*, Cape Hare *Lepus capensis*, Chinkara *Gazella bennettii*, Indian Crested Porcupine *Hystrix indic*a, Honey Badger *Mellivora capensis*, Red Fox *Vulpes vulpes*, Sand Cat *Felis margarita*, Sand Fox *Vulpes rueppellii*, Wild Boar *Sus scrofa* and Wild Goat/Sind Ibex *Capra aegagrus*.[92],[93] Small mammals reported from the western part of Balochistan include more than 10 species.[94]

The Chagai District is home to significant large mammalian species, including the Vulnerable Goitered Gazelle *Gazella subgutturosa* and the regionally endemic Pygmy Jerboa *Salpingotulus michaelis*.[95] Within Chagai District, the Zawakhan,[96] and Kambran[97] are designated as protected areas, safeguarding the habitats for Afghan Urial, Sindh Ibex, and Gazelle.[98] The surveys conducted by HBP in 2008 and 2009,[99] observed 12 species of mammals while, in the August 2020 Survey,[100] a total of eight mammalian species were observed from the proposed Reko Diq Mine Site and Fan Sediment Water Supply Pipeline Area.[101]

88 The IUCN Red List of Threatened Species. Version 2020–1. <www.iucnredlist.org>. Accessed on 18 April 2022.

89 Sheikh, K. M., and S. Molur. 2006. "Status and Red List of Pakistan's Mammals: Based on the Conservation Assessment and Management Plan", pp. 20–312. IUCN Pakistan, Karachi.

90 Roberts TJ. 1997. Mammals of Pakistan. Oxford University Press, Karachi.

91 Ghalib, S. A., Jabbar, A. B. D. U. L., Khan, A. R., & Zehra, A. (2007). Current status of the mammals of Balochistan. Pakistan journal of Zoology, 39(2), 117.

92 Molur, S. (2003). Status and Red List of Pakistan's Mammals.

93 Ghalib, S. A., Jabbar, A. B. D. U. L., Khan, A. R., & Zehra, A. (2007). Current status of the mammals of Balochistan. Pakistan journal of Zoology, 39(2), 117.

94 Molur, S. (2003). Status and Red List of Pakistan's Mammals.

95 Ghalib, S. A., Jabbar, A. B. D. U. L., Khan, A. R., & Zehra, A. (2007). Current status of the mammals of Balochistan. *Pakistan journal of Zoology*, *39*(2), 117.

96 Wildlife Sanctuary, located approximately 470 km away in Chagi from the project area.

97 Wildlife Sanctuary and Game Reserves

98 Chagai District Development Profile 2011, by Planning $ Development Department GoB with UNICEF

99 Hagler Baily Pakistan (HBP), 2010, Environmental and Social Impact Assessment for the Reko Diq Project, Tethyan copper company Limited Pakistan Ltd.

100 Hagler Baily Pakistan (HBP), November 2020, Environmental and Social Impact Assessment for the Tanjeel Copper Project, National Resources Limited Pakistan Ltd.

101 Hagler Baily Pakistan (HBP), 2010, Environmental and Social Impact Assessment for the Reko Diq Project, Tethyan copper company Limited Pakistan Ltd.

The conservation concern species include the Wild Goat or Sind Ibex *Capra aegagrus*, Striped Hyena *Hyaena hyaena* which are listed as Near Threatened as well as Goitered Gazelle *Gazella subgutturos*a and Afghan Urial *Ovis vignei* which are listed as Vulnerable in IUCN Red List of Threatened Species.[102] In addition to these, Pygmy Jerboa *Salpingotulus Michaelis* is an endemic species of Nushki and Chagai districts of Balochistan.

Appendix I provides a list of mammals based on literature and previous EIAs.

5.2.6.1.5 Invertebrates

A variety of invertebrates are present in Pakistan due to the seasonal variation of the country, however, research on invertebrates is limited. More than 5,000 species of invertebrates are reported from Pakistan including insects (1,000 species of true bugs, 400 species of butterflies and moths, 110 species of flies, and 49 species of termites). The total number of butterfly species probably exceeds 400, with high rates of endemism in the Satyrids, Lycaenids, and Pierids families.

Limited studies on invertebrates have been conducted in Balochistan so far, however the richest occurrence of Nummulites with Assilina and Alveolina in Pakistan are reported in the shelly limestone and shale of the Early Eocene Chamalang Group and Early-Middle Eocene Kahan Group (previously called Kirthar Formation) southern limb of Gochina syncline of Harnai area (Western Sulaiman fold belt), Ziarat and Sibbi districts of Balochistan.[103]

5.2.7 Results and Comparisons

This section outlines the results of the Post-Monsoon 2022 Survey, and Spring 2023 Survey as well as a summary of their comparison with surveys conducted in May 2008, November 2008, June 2009, September 2009, and August 2020 referred to as Previous Surveys.

Results of the Post-Monsoon 2022 Survey and Spring 2023 Survey are presented separately for different Project facilities which include the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and Access Road to the proposed Reko Diq Mine Site. The total number of species observed, species abundance and richness by sampling locations and habitat type, conservation concern species, restricted range species, and endemic species are discussed for the Post-Monsoon 2022 Survey and Spring 2023 Survey.

Appendix J provides field data for all the Ecological Resources.

5.2.7.1 Vegetation

A total of 41 plant species were observed from the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and Access Road to the proposed Reko Diq Mine Site. Of these plant species, 29 species were observed during the Post-Monsoon 2022

102 The IUCN Red List of Threatened Species. Version 2019–1. <www.iucnredlist.org>. Downloaded on 21 April 2022.

103 Malkani, M. S. (2019). Recently Discovered Basilosaurid, Baluchithere Rhinoceros, Horses, Sea Cow, Proboscidean, Eucrocodile, Pterosaurs, Plesiosaur, Fishes, Invertebrates and Wood Fossils, Tracks and Trackways of Dinosaurs from Pakistan; Comparison of Recognized Four Titanosaur Taxa of Indo–Pakistan with Madagascar. *Open Journal of Geology*, *9*(12), 919–955.

Survey, and 31 species were observed during the Spring 2023 Survey. All the plant species observed are Least Concern or Not Evaluated except for *Eucalyptus camaldulensis* which is listed as Near Threatened according to the IUCN Red List of Threatened Species.[104] However, *Eucalyptus camaldulensis* is an alien species so it is not considered a conservation concern as it poses a risk to the native flora. In addition to *Eucalyptus camaldulensis*, a second Alien-Invasive Plant species (*Cynodon dactylon*) were observed from the Ecological Study Area.

Table 5-21 provides the plant species observed during both Post-Monsoon 2022 and Spring 2023 surveys.

104 Fensham, R., Laffineur, B. & Collingwood, T. 2019. Eucalyptus camaldulensis. The IUCN Red List of Threatened Species 2019: e.T61909812A61909824. https://dx.doi.org/10.2305/IUCN.UK.2019–3.RLTS.T61909812A61909824.en. Accessed on 11 July 2023.

Table 5-21: Plant Species Observed, Post-Monsoon 2022 Survey and Spring 2023 Surveys

No.	Scientific Name	Common Name or Local Name	IUCN Status	Post-Monsoon 2022 Survey	Spring 2023 Survey	Fodder or Grazing Value	Native/Alien Status	Plant Form
1.	*Acanthophyllum sp.*	Spiny Head	Not Evaluated	-	✓	None	Native	Herb
2.	*Aeluropus lagopoides*	Russian knapweed	Not Evaluated	✓	-	High	Native	Herb
3.	*Aerva tomentosa*	Kapok Bush	Not Evaluated	-	✓	Medium	Native	Herb
4.	*Alhagi maurorum*	Camel thorn	Not Evaluated	✓	✓	Medium	Native	Shrub
5.	*Anabasis setifera*	Anabasis	Not Evaluated	✓	✓	Low	Native	Shrub
6.	*Aristida adscensionis*	Six weeks Threeawn	Not Evaluated	✓	✓	Medium	Native	Herb
7.	*Aristida sp*	Purple Threeawn	Not Evaluated	✓	✓	Medium	Native	Herb
8.	*Azadirachta indica*	Neem	Least Concern	✓	-	High	Native	Tree
9.	*Bromus sp*	Cheat Grasses	Not Evaluated	✓	-	High	Native	Herb
10.	*Calligonum comosum*	Fire Bush	Not Evaluated	✓	✓	High	Native	Shrub
11.	*Calligonum polygonoides*	Phog	Not Evaluated	✓	✓	Medium	Native	Shrub
12.	*Cenchrus biflorus*	Sandbur	Not Evaluated	✓	-	High	Native	Herb
13.	*Cistanche tubulosa*	Desert hyacinth	Not Evaluated	✓	-	High	Native	Herb
14.	*Cithareloma lehmannii*	-	Not Evaluated	-	✓	None	Native	Herb
15.	*Citrullus colocynthis*	Bitter apple	Not Evaluated	✓	✓	None	Native	Herb
16.	*Cornulaca monacantha*	Djouri	Not Evaluated	✓	✓	Low	Native	Shrub
17.	*Crotalaria burhia*	Kharshan	Not Evaluated	-	✓	Medium	Native	Shrub
18.	*Cynodon dactylon*	Bermuda Grass	Not Evaluated	✓	-	High	Alien	Herb
19.	*Cynomorium coccineum*	Maltese Fungus	Not Evaluated	-	✓	None	Native	Herb
20.	*Eleusine compressa*	Sandbur	Not Evaluated	✓	-	High	Native	Herb
21.	*Eucalyptus camaldulensis*	Red-river Gum	Near Threatened	-	✓	Low	Alien Invasive	Tree

No.	Scientific Name	Common Name or Local Name	IUCN Status	Post-Monsoon 2022 Survey	Spring 2023 Survey	Fodder or Grazing Value	Native/Alien Status	Plant Form
22.	*Fagonia ovalifolia*	Dereima or Shaki	Not Evaluated	✓	✓	None	Native	Herb
23.	*Fortuynia bungei*	-	Not Evaluated	-	✓	None	Native	Shrub
24.	*Haloxylon persicum*	-	Not Evaluated	✓	✓	High	Native	Shrub
25.	*Haloxylon salicornicum*	Hammada Elegance	Not Evaluated	✓	✓	High	Native	Shrub
26.	*Haloxylon stocksii*	Salt Tree	Least Concern	✓	-	High	Native	Shrub
27.	*Heliotropium crispum*	Salt Heliotrope	Least Concern	✓	✓	Low	Native	Herb
28.	*Heliotropium zeylanicum*	Salt Heliotrope	Not Evaluated	✓	-	Low	Native	Herb
29.	*Malcolmia scorpioides*	Virginia Stock	Not Evaluated	-	✓	None	Native	Herb
30.	*Panicum turgidum*	Desert Grass	Not Evaluated	✓	✓	High	Native	Herb
31.	*Peganum harmala*	African-rue	Not Evaluated	✓	✓	Low	Native	Herb
32.	*Phoenix dactylifera*	Date Palm	Least Concern	✓	✓	None	Native	Tree
33.	*Physorrhynchus chamaerapistrum*	Bladder-seed	Not Evaluated	-	✓	None	Native	Herb
34.	*Rumex vasicarius*	Bladder Dock	Not Evaluated	-	✓	None	Native	Herb
35.	*Salix tetrasperma*	Indian Willow	Least Concern	-	✓	Medium	Native	Tree
36.	*Salsola stocksii*	Saltwort	Least Concern	✓	✓	Medium	Native	Shrub
37.	*Tamarix aphylla*	Athel Tamarisk	Not Evaluated	✓	✓	Medium	Native	Tree
38.	*Tamarix stricta*	Salt Cedar	Not Evaluated	-	✓	Medium	Native	Tree
39.	*Tribulus terrestris*	Puncture Vine	Least Concern	✓	✓	Medium	Native	Herb
40.	*Vachellia jacquemontii*	-	Least Concern	✓	-	Low	Native	Tree
41.	*Zygophyllum simplex*	Simple-leaved Bean Caper	Not Evaluated	✓	-	High	Native	Shrub
Total				**29**	**31**			

5.2.7.1.1 Post-Monsoon 2022 Survey

During the Post-Monsoon 2022 Survey, sampling for vegetation was conducted at the proposed Reko Diq Mine Site, Fan Sediment, and Access Road to the proposed Reko Diq Mine Site using the quadrat sampling method. Plant cover, count, and diversity in each habitat type were calculated to describe the conditions of flora within each type of habitat. During the Post-Monsoon 2022 Survey, a total of 29 species of plants were observed from the Ecological Study Area.

Table 5-21 provides a list of plant species observed during the Post-Monsoon 2022 Survey along with their IUCN status, feeding value, native status, and plant form.

5.2.7.1.1.1 Proposed Reko Diq Mine Site

The proposed Reko Diq Mine Site included Mountain/Hills, Gravel Plains, Dry Streambed, Clayey Plains, and Sandy Plains/Sand Dunes. A total of 18 species of plants were observed during the Post-Monsoon 2022 Survey from the 20 selected sampling locations from the proposed Reko Diq Mine Site.

The highest average species diversity was observed in Clayey Plains (5.0) followed by Sandy Plains/Sand Dunes (3.0), Dry Streambeds (2.3), Mountain/Hills (1.7), and Gravel Plains (1.4). The highest density was observed in Clayey Plains (14.0) followed by Dry Streambeds (13.3), Mountain/Hills (9.2), Gravel Plains (9.1), and Sandy Plains/Sand Dunes (3.0). The most abundant plant species observed at the proposed Reko Diq Mine Site was *Salsola stocksii* followed by *Panicum turgidum* and *Haloxylon persicum* whereas the least abundant plant species were *Citrullus colocynthis* and *Calligonum polygonide.*

Table 5-22 provides the vegetation cover, plant count, and diversity by habitat type at the proposed Reko Diq Mine Site.

Table 5-23 provides the phytosociological attributes for the species in the different habitat types at the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey.

Figure 5-45 provides photographs of plant species observed at the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey.

Table 5-22: Vegetation Cover, Plant Count, and Diversity by Habitat Type at proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

No.	Habitat Types	Plant Cover (m^2)			Total Cover (m^2)	Plant Count			Total Count	Diversity (Average no. of species per Sampling Location)
		Average	Maximum	Minimum		Average	Maximum	Minimum		
1.	Mountain/Hills	7.4	13.4	1.9	**29.2**	9.3	14	6	**37**	1.8
2.	Gravel Plains	2.8	7.5	0.3	**22.6**	9.1	20	4	**73**	1.4
3.	Dry Streambeds	124.8	719.3	0.5	**748.2**	13.3	28	4	**80**	2.3
4.	Clayey Plains	6.4	6.4	6.4	**6.4**	14	14	14	**14**	5.0
5.	Sandy Plains/Sand Dunes	10.6	10.6	10.6	**10.6**	3	3	3	**3**	3.0

Table 5-23: Phyto-sociological Attributes of Plant Species Observed in each Habitat Type at proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

Habitat	Species	D1	D3	C1	C3	F1	F3	IVI
Clayey Plains	*Anabasis setifera*	0.1	1	21.7	12.7	0.1	2.7	5.5
	Citrullus colocynthis	0.4	3.9	0.2	0.4	0.2	5.4	3.2
	Haloxylon stocksii	0.1	1	0.3	0.2	0.1	2.7	1.3
	Panicum turgidum	0.1	1	0	0	0.1	2.7	1.2
	Tamarix aphylla	3.3	29.1	0	0.4	0.3	8.1	12.5
Gravel Plains	*Anabasis setifera*	0.5	4.5	7.7	28.4	0.3	8.7	13.9
	Bromus sp.	1.2	10.6	0.1	1.3	0.5	13	8.3
	Cenchrus biflorus	0.2	1.5	4	5	0.2	4.3	3.6
	Calligonum comosum	0.3	3	0.1	0.2	0.2	4.3	2.5
	Cenchrus biflorus	0.2	1.5	1.9	2.3	0.2	4.3	2.7
	Eleusine compressa	5.3	48.5	0	1.2	0.8	21.7	23.8
	Fagonia ovalifolia	1.5	13.6	4.3	47.8	0.8	21.7	27.7
	Haloxylon persicum	0.7	6.1	2.1	10.5	0.3	8.7	8.4
	Haloxylon salcornicom	0.2	1.5	0.1	0.1	0.2	4.3	2
	Haloxylon stocksii	0.4	12.8	0.4	19.5	0.3	14.6	15.7
	Helitropium zeyloncum	0.0	1.3	0.1	0.3	0.0	2.4	1.3
	Panicum turgidum	0.5	16.7	0.0	0.2	0.1	4.9	7.2
Mountain/Hills	*Aeluropus lagopoides*	1.3	7.7	0.2	1.5	0.3	7.1	5.4
	Calligonum comosum	0.3	1.9	1.2	2	0.2	3.6	2.5
	Cornulaca monacantha	0.2	1	3.5	3	0.2	3.6	2.5
	Fagonia ovalifolia	4.7	26.9	0	0.4	0.5	10.7	12.7
	Haloxylon persicum	1	5.8	0	0.1	0.2	3.6	3.1
	Haloxylon salcornicom	0.8	4.8	4.5	19.2	0.3	7.1	10.4
	Haloxylon stocksii	0.2	1	0	0	0.2	3.6	1.5
Sandy Plains/Sand Dunes	*Calligonum comosum*	0.3	3	2.2	27.4	0.2	7.1	12.5
	Fagonia ovalifolia	1.3	12.1	0.1	3.5	0.1	3.6	6.4
	Haloxylon salcornicom	0.1	1	0.6	2.6	0.1	3.6	2.4
Dry Streambeds	*Aeluropus lagopoides*	0.1	1.9	0.1	0	0.1	4	2
	Calligonum comosum	0.3	9.4	1.3	0.9	0.3	20	10.1
	Cornulaca monacantha	0.1	1.9	0	0	0.1	4	2
	Fagonia ovalifolia	0.1	3.8	0	0	0.1	8	3.9
	Haloxylon persicum	0.1	3.8	0.2	0	0.1	8	3.9
	Haloxylon salcornicom	0.6	18.9	0.7	0.9	0.2	16	11.9
	Haloxylon stocksii	1.8	60.4	22.9	98.1	0.6	40	66.2



a) *Fagonia ovalifolia*



b) *Cornulaca monacantha*



c) *Haloxylon persicum*



d) *Calligonum comosum*



e) *Tamarix aphylla*



f) *Cenchrus biflorus*

Figure 5-45: Plant Species Observed at proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

5.2.7.1.1.2 Fan Sediment Water Supply Pipeline Area

The Fan Sediment Water Supply Pipeline Area has a diverse range of habitats including Clayey Plains, Dry Streambeds, Gravel Plains, Mountain/Hills, and Sandy Plains/Sand Dunes with an addition of a micro-habitat (Date Palms) which was identified in the field. A total of 20 plant species were observed from the 13 sampling locations selected along the Fan Sediment Water Supply Pipeline Area during the Post-Monsoon 2022 Survey. Out of the aforementioned habitats, Date Palm microhabitat was the most productive with the

highest average diversity of 6.0 followed by Dry Streambeds and Mountain/Hills (3.0 each), Sandy Plains (2.5), Gravel Plains (2.5) and Clayey Plains (2.5). The highest density i.e., 26.0 was observed in two habitats i.e., Date Palms and Clayey Plains, followed by Mountain/Hills (16.0), Dry Streambeds (15.3), Gravel Plains (11.8) and Sandy Plains/Sand Dunes (9.5).

The most abundant plant species observed along Fan Sediment Water Supply Pipeline Area was *Salsola stocksii* followed by *Tribulus terrestis* whereas the least abundant plant species were *Citrullus colocynthis* and *Azadirachta indica.* Species like *Salsola stocksii* and *Tribulus terrestis* are specialized xerophytic plants well adapted to dry and arid conditions.

Table 5-24 provides the vegetation cover, plant count, and diversity by habitat type along the Fan Sediment Water Supply Pipeline Area.

Table 5-25 provides the phyto-sociological attributes for the species in the different habitat types along the Fan Sediment Water Supply Pipeline Area.

Figure 5-46 provides photographs of plant species observed along the Fan Sediment Water Supply Pipeline Area.

Table 5-24: Vegetation Cover, Plant Count and Diversity by Habitat Type at Fan Sediment Water Supply Pipeline Area, Post-Monsoon 2022 Survey

No.	Habitat Types	Plant Cover (m^2)			Total Cover (m^2)	Plant Count			Total Count	Diversity (Average No. of species per Sampling Location)
		Average	Maximum	Minimum		Average	Maximum	Minimum		
1.	Mountain/Hills	2.25	2.25	2.25	**2.0**	16.0	16	16	**16**	3.0
2.	Gravel Plains	3.20	8.31	0.02	**13.0**	11.7	21	4	**47**	2.5
3.	Dry Streambeds	2.00	4.20	0.09	**3.0**	15.3	22	6	**46**	3.0
4.	Clayey Plains	2.68	5.11	0.24	**5**	26.0	33	19	**52**	2.5
5.	Date Palms	35.29	35.29	35.29	**26.0**	26.0	26	26	**26**	6.0
6.	Sandy Plains/Sand Dunes	5.64	5.69	5.59	**11.0**	9.50	10	9	**19**	1.54

Table 5-25: Phyto-sociological Attributes of Plant Species Observed in each Habitat Type along Fan Sediment Water Supply Pipeline Area, Post-Monsoon 2022 Survey

Habitat	Species	D1	D3	C1	C3	F1	F3	IVI
Clayey Plains	*Alhagi maurorum*	0.8	9.6	0.0	0.3	0.3	16.7	8.9
	Calligonum polygonide	0.7	7.7	0.1	3.4	0.3	16.7	9.3
	Citrullus colocynthis	0.8	9.6	1.0	93.1	0.3	16.7	39.8
	Helitropium crispum	0.3	3.9	0.0	0.3	0.2	8.3	4.2
	Tribulus terrestris	6.0	69.2	0.0	2.8	0.8	41.7	37.9

Habitat	Species	D1	D3	C1	C3	F1	F3	IVI
Gravel Plains	*Aeluropus lapopoides*	0.1	2.1	0.0	0.1	0.1	4.6	2.2
	Aristida sp	0.2	4.3	0.0	0.4	0.1	4.6	3.1
	Fagonia ovalifolia	0.3	6.4	0.1	1.7	0.3	13.6	7.2
	Haloxylon persicum	0.2	4.3	3.9	61.6	0.2	9.1	25.0
	Haloxylon salcornicum	0.6	14.9	0.1	7.6	0.3	13.6	12.0
	Haloxylon stocksii	1.4	36.2	0.2	26.6	0.5	27.3	30.0
	Helitropium crispum	0.1	2.1	0.0	0.1	0.1	4.6	2.3
	Panicum turgidum	0.7	17.0	0.0	0.6	0.2	9.1	8.9
	Tribulus terrestris	0.3	6.4	0.0	0.1	0.1	4.6	3.7
	Zygophylon sp.	0.3	6.4	0.1	1.2	0.2	9.1	5.6
Mountain/Hills	*Anabasis setifera*	2.3	43.8	0.1	43.3	1.0	42.9	43.3
	Haloxylon salcornicum	2.3	43.8	0.2	55.3	1.0	42.9	47.3
	Panicum turgidum	0.7	12.5	0.0	1.4	0.3	14.3	9.4
Sandy Plains/Sand Dunes	*Calligonum comosum*	0.3	3.0	2.2	27.4	0.2	7.1	12.5
	Haloxylon persicum	0.3	10.5	2.4	42.3	0.3	18.2	23.7
	Haloxylon salcornicum	0.8	26.3	1.0	43.1	0.5	27.3	32.2
	Haloxylon stocksii	0.2	5.3	0.1	1.1	0.2	9.1	5.2
	Tribulus terrestris	1.5	47.4	0.2	12.2	0.7	36.4	32.0
Dry Streambeds	*Haloxylon stocksii*	2.6	57.5	0.1	94.8	0.7	54.6	69.0
	Aeluropus lapopoides	0.8	17.5	0.0	0.9	0.2	18.2	12.2
	Alhagi maurorum	0.1	2.5	0.0	0.7	0.1	9.1	4.1
	Fagonia ovalifolia	0.3	7.5	0.0	2.7	0.1	9.1	6.4
	Panicum turgidum	0.7	15.0	0.0	1.0	0.1	9.1	8.4
Date Palms	*Tamarix aphylla*	1.3	15.4	1.1	12.5	0.7	20.0	16.0
	Aristida sp	0.7	7.7	0.0	0.2	0.3	10.0	6.0
	Phoenix dactylifera	0.7	7.7	14.8	83.7	0.7	20.0	37.1
	Peganum harmala	2.0	23.1	0.1	2.4	0.7	20.0	15.2
	Alhagi maurorum	2.0	23.1	0.1	0.8	0.7	20.0	14.6
	Vachellia jacquemontii	2.0	23.1	0.0	0.5	0.3	10.0	11.2



a) *Tribulus terrestis*



b) *Anabesis setifera*



c) Haloxylon salicornicum



d) Salsola stocksii



e) Alhaji mauroram



f) Heliotropium crispum



g) *Peganum harmala*



h) *Phoenix dactylifera*



i) Panicum turgidum



j) Citrullus colocynthis

Figure 5-46: Plant Species Observed along Fan Sediment Water Supply Pipeline Area, Post-Monsoon 2022 Survey

5.2.7.1.1.3 Access Road to the proposed Reko Diq Mine Site

The Access Road to the proposed Reko Diq Mine Site passes through different habitats including Mountains/Hills, Gravel Plains, and Dry Streambeds. A total of 13 species were observed from eight sampling locations (E41-E48). Among these habitats, Mountains/Hills were observed as the most diverse habitat regarding floral species with the highest average diversity (5.0) followed by Gravel Plains (2.3) and Dry Streambeds (2.0). The highest average density was observed in Gravel Plains (16.0) followed by Dry Streambeds (13.7) and Mountain/Hills (11.0).

The most abundant plant species observed include *Salsola stocksii* followed by *Calligonum polygonoides* whereas the least abundant plant species was *Cistanche tubulosa.* Species like *Salsola stocksii* are specialized xerophytic plants well adapted to dry conditions and provide food refugia to other wildlife species.

Table 5-26 provides the vegetation cover, plant count, and diversity by habitat type at the Access Road to the proposed Reko Diq Mine Site.

Table 5-27 provides the phyto-sociological attributes for the species in the different habitat types at the Access Road to the proposed Reko Diq Mine Site.

Figure 5-47 provides photographs of plant species observed at the Access Road to the proposed Reko Diq Mine Site.

Table 5-26: Vegetation Cover, Plant Count, and Diversity by Habitat Type Observed at Access Road to the proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

No.	Habitat Types	Plant Cover (m^2)			Total Cover (m^2)	Plant Count			Total Count	Diversity (Average No. of species per Sampling Location)
		Average	Maximum	Minimum		Average	Maximum	Minimum		
1.	Mountain/Hills	2	2	2	**2**	11.0	11	11	**13**	5.0
2.	Gravel Plains	3	4	1	**6**	11.5	16	7	**23**	2.3
3.	Dry Streambeds	5	7	3	**19**	13.7	15	12	**47**	2.0

Table 5-27: Phyto-sociological Attributes of Plant Species Observed at Access Road to proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

Habitat	Species	D1	D3	C1	C3	F1	F3	IVI
Dry Streambeds	*Calligonium comosum*	0.2	4.3	1.2	12.5	0.2	11.1	9.3
	Calligonum polygonides	0.3	6.4	0.2	3.2	0.1	5.6	5.1
	Fagonia ovalifolia	0.3	6.4	0.1	0.9	0.3	16.7	8.0
	Haloxylon persicum	0.1	2.1	0.3	1.5	0.1	5.6	3.0
	Salsola stocksii	3.2	80.9	0.4	82.0	0.9	61.1	74.6
Gravel Plains	*Aristida adsecensionis*	0.3	13.0	0.0	0.5	0.1	10.0	7.8
	Fagonia ovalifolia	0.8	30.4	0.4	48.0	0.3	30.0	36.2
	Salsola stocksii	0.1	4.4	0.0	0.6	0.1	10.0	5.0
	Tribulus terrestris	0.1	4.4	0.1	1.4	0.1	10.0	5.2
Mountain/Hills	*Anabasis setifera*	0.7	15.4	0.1	8.1	0.3	16.7	13.4
	Aristida adsecensions	0.7	15.4	0.0	0.7	0.3	16.7	10.9
	Calligonum polygonides	0.3	7.7	0.2	8.6	0.3	16.7	11.0
	Cornulaca monacanta	1.0	23.1	0.2	26.4	0.3	16.7	22.1
	Haloxylon salicornicum	0.7	15.4	0.3	31.6	0.3	16.7	21.2
	Salsola stocksii	1.0	23.1	0.2	24.6	0.3	16.7	21.4



a) Cistanche tubulosa



b) Aristida adscensionis

Figure 5-47: Plant Species Observed along Access Road to the proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

5.2.7.1.2 Comparison of Post-Monsoon 2022 Survey and Previous Surveys in Similar Conditions

The details on comparisons of the results of vegetation sampling conducted during the Post-Monsoon 2022 Survey and Previous Surveys (November 2008, September 2009, and August 2020) are provided in **Appendix K** while a summary is discussed below.

5.2.7.1.2.1 Proposed Reko Diq Mine Site

The average diversity (1.2) and density (9.7) of vegetation observed during the Post-Monsoon 2022 Survey was higher compared to the average diversity (1.0) and density (7.0) in Previous Surveys. The Sandy Plains were the most promising habitat in terms of floral diversity (3.0) whereas in Previous Surveys no floral species was observed in this

habitat type. Previously, Sandy Plains were the most disturbed habitat due to frequent vehicle movement for cross-border trade. In the case of average density, Dry Streambed (16.5) is the most promising habitat type during the Post-Monsoon 2022 Survey due to the availability of subsurface moisture.

5.2.7.1.2.2 Fan Sediment Water Supply Pipeline Area

The average diversity (1.9) observed during the Post-Monsoon 2022 Survey was higher compared to the average diversity (1.3) in Previous Surveys. However, the average density (13.5) observed during the Post-Monsoon 2022 Survey was slightly lower compared to the average density (16.0) in Previous Surveys which can be attributed to the extreme dry season due to no rainfall since 2010. According to locals, there are only localized light rains which are not sufficient to support the biodiversity in the area. The Agricultural Areas/Date Palm habitat was the most promising habitat for floral species in terms of species richness (6.0) and abundance (26.0) during the Post-Monsoon 2022 Survey due to the availability of water and lower anthropogenic disturbances. However, in Previous Surveys highest species diversity (four species) was observed in Agricultural Areas/Date Palm whereas the highest density (26.0) was observed in Clayey Plains habitat.

5.2.7.1.2.3 Access Road to the proposed Reko Diq Mine Site

The average diversity (1.1) and density (5.3) observed during the Post-Monsoon 2022 Survey was higher compared to the average diversity (0.5) and density (3.3) in Previous Surveys. During the Post-Monsoon 2022 Survey, the highest average diversity was observed in Gravel Plains (16.0) whereas in Previous Surveys it was observed in Dry Streambeds (15.0). The highest average diversity (5.0) was observed in Mountains/Hills during the Post-Monsoon 2022 Survey while the highest diversity (1.3) was observed from Dry Streambeds in Previous Surveys. This area was highly disturbed due to frequent movement of vehicles for cross-border trade and livestock grazing.

5.2.7.1.3 Spring 2023 Survey

During the Spring 2023 Survey, the sampling for vegetation was conducted at the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline, and Access Road to the proposed Reko Diq Mine Site using the quadrat sampling method. Plant cover, count, and diversity in each habitat type were calculated to describe the conditions of flora within each type of habitat. During the Spring 2023 Survey, a total of 31 plant species were observed from the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline, and Access Road to the proposed Reko Diq Mine Site.

5.2.7.1.3.1 Proposed Reko Diq Mine Site

The proposed Reko Diq Mine Site includes Mountain/Hills, Gravel Plains, Dry Streambeds, Clayey Plains, and Sandy Plains/Sand Dunes. A total of 10 species of plants were observed from 20 sampling locations (E13-E32).

The highest average species diversity was observed in Clayey Plains (2.0) followed by Mountain/Hills (1.4), Sandy Plains/Sand Dunes (1.0), Dry Streambeds (0.8), and Gravel Plains (0.6). The highest density was observed in Clayey Plains (14.0) followed by Dry Streambeds (7.7), Mountain/Hills (7.4), Gravel Plains (6.6), and Sandy Plains/Sand Dunes (5.0). The most abundant plant species observed at the proposed Reko Diq Mine Site was *Salsola stocksii* followed by *Aristida adscensionis* and *Haloxylon persicum*

whereas the least abundant plant species were *Anabasis setifera*, *Tribulus terrestris*, and *Calligonum polygonide.*

Table 5-28 provides the vegetation cover, plant count, and diversity by habitat type at the proposed Reko Diq Mine Site.

Table 5-29 provides the phyto-sociological attributes for the species in the different habitat types at the proposed Reko Diq Mine Site during the Spring 2023 Survey.

Figure 5-48 provides photographs of plant species observed at the proposed Reko Diq Mine Site during the Spring 2023 Survey.

Table 5-28: Vegetation Cover, Plant Count, and Diversity by Habitat Type at the proposed Reko Diq Mine Site, Spring 2023 Survey

No.	Habitat Types	Plant Cover (m^2)			Total Cover (m^2)	Plant Count			Total Count	Diversity (Average No. of species per Sampling Location)
		Average	Maximum	Minimum		Average	Maximum	Minimum		
1	Mountain/Hills	4.7	7.1	0.04	**24.0**	7.4	11	4	**37**	1.4
2	Gravel Plains	3.0	12.1	0.01	**21.2**	6.5	13	1	**46**	0.6
3	Dry Streambeds	5.8	11.5	1.57	**34.6**	7.6	11	4	**46**	0.8
4	Clayey Plains	7.7	7.68	7.68	**7.68**	14	14	14	**14**	2.0
5	Sandy Plains/Sand Dunes	2.2	2.2	2.17	**2.17**	5	5	5	**5**	1.0

Table 5-29: Phyto-sociological Attributes of Plant Species Observed in each Habitat Type at the proposed Reko Diq Mine Site, Spring 2023 Survey

Habitat	Species Name	D1	D3	C1	C3	F1	F3	IVI
Clayey Plains	*Haloxylon salicornicum*	0.7	14.3	1.6	40.8	0.3	25.0	26.7
	Salsola stocksii	4.0	85.7	0.4	59.2	1.0	75.0	73.3
Gravel Plains	*Aristida adscensionis*	1.8	47.7	0.0	0.2	0.3	23.5	23.8
	Haloxylon persicum	0.1	2.3	4.3	20.4	0.1	5.9	9.5
	Salsola stocksii	1.8	50.0	0.8	79.4	0.9	64.7	64.7
	Eleusine compressa	0.2	4.5	0.0	0.0	0.1	5.9	3.5
Mountain/Hills	*Anabasis setifera*	0.1	2.7	0.0	0.0	0.1	5.3	2.7
	Calligonum polygonoides	0.1	2.7	0.1	0.3	0.1	5.3	2.7
	Cornulaca monacantha	0.3	8.1	0.0	0.1	0.2	10.5	6.2
	Haloxylon persicum	1.4	45.9	1.4	97.3	0.8	47.4	63.5
	Haloxylon salicornicum	0.5	16.2	0.0	0.9	0.2	10.5	9.2
	Salsola stocksii	0.7	21.6	0.0	1.4	0.3	15.8	12.9
	Tribulus terrestris	0.1	2.7	0.0	0.0	0.1	5.3	2.7
Sandy Plains	*Calligonum comosum*	1.7	100	0.4	100	0.3	100	100
Dry Streambeds	*Aristida adscensionis*	1.1	21.7	0.0	0.1	0.3	15.0	12.3

Habitat	Species Name	D1	D3	C1	C3	F1	F3	IVI
	Calligonum polygonoides	0.1	2.2	6.7	19.3	0.1	5.0	8.8
	Haloxylon persicum	0.1	2.2	0.6	1.8	0.1	5.0	3.0
	Salsola stocksii	3.7	71.7	0.8	73.6	1.6	70.0	71.8
	Calligonum comosum	0.1	2.2	1.8	5.3	0.1	5.0	4.2

A brief description of vegetation in each habitat type is given below.

5.2.7.1.3.1.1 Mountain/Hills

Seven species with an average cover of 4.7 m^2, an average density of 7.4, and an average diversity of 1.4 were observed from the five sampling locations located in Mountains/Hills of the proposed Reko Diq Mine Site. The species observed in this habitat include *Cornulaca monacantha, Calligonum polygonoides, Haloxylon persicum, Salsola stocksii,* and *Haloxylon salicornicum,* which are largely native to the area.

5.2.7.1.3.1.2 Gravel Plains

Four species with an average cover of 3.0 m^2, an average density of 6.6, and an average diversity of 0.6 were observed from the seven sampling locations located in the Gravel Plains of the proposed Reko Diq Mine Site. The species observed in this habitat include *Aristida adscensionis, Eleusine compressa, Haloxylon persicum*, and *Salsola stocksii*.

5.2.7.1.3.1.3 Dry Streambeds

Five species with an average cover of 5.7 m^2, an average density of 7.7, and an average diversity of 0.8 were observed from the six sampling locations located in Dry Streambed at the proposed Reko Diq Mine Site. The species observed in this habitat include *Aristida adscensionis, Calligonum polygonoides, Calligonum comosum, Haloxylon persicum,* and *Salsola stocksii.*

5.2.7.1.3.1.4 Clayey Plains

Two species with an average cover of 7.6 m^2, an average density of 14.0, and an average diversity of 2.0 were observed from only one sampling location located in Clayey Plains habitat at the proposed Reko Diq Mine Site. The species observed in this habitat include *Haloxylon salicarnicum* and *Salsola stocksii.*

5.2.7.1.3.1.5 Sandy Plains/Sand Dunes

Only one species with a cover of 2.2 m^2, density of 5.0, and diversity of 1.0 was observed from one sampling location located in Sandy Plains/Sand Dunes habitat in the proposed Reko Diq Mine Site. The species observed in this habitat was *Calligonum comosum.*



a) Salsola stocksii



b) Haloxylon salicarnicum



c) Haloxylon persicum



d) Calligonum comosum



e) Tribulus terrestris



f) Calligonum polygonoides

Figure 5-48: Plant Species Observed at the proposed Reko Diq Mine Site, Spring 2023 Survey

5.2.7.1.3.2 Fan Sediment Water Supply Pipeline Area

A total of 28 species were observed from the 13 sampling locations sampled along the Fan Sediment Water Supply Pipeline Area during the Spring 2023 Survey. Out of these habitats, Mountain/Hills was most productive with the highest average diversity of 13.0 followed by Date Palms microhabitat (8.0), Clayey Plains (3.5), Gravel Plains (1.5), Dry Streambeds (1.5) and Sandy Plains (1.0). The highest density i.e., 30.0 was observed in Date Palms followed by Mountain/Hills (24.0), Clayey Plains (20.5), Sandy Plains (9.0), Dry Streambeds (8.2), and Gravel Plains (5.0).

The most abundant plant species observed along Fan Sediment Water Supply Pipeline Area was *Salsola stocksii* followed by *Alhaji maurorum* whereas the least abundant plant species were *Crotalaria burhia* and *Salix tetrasperma.* Species like *Salsola stocksii* and *Tribulus terrestis* are specialized xerophytic plants and well adapted to dry and arid conditions.

Table 5-30 provides the vegetation cover, plant count, and diversity by habitat type.

Table 5-31 provides the phyto-sociological attributes for the species in the different habitat types.

Figure 5-49 provides photographs of plant species observed along the Fan Sediment Water Supply Pipeline Area.

Table 5-30: Vegetation Cover, Plant Count, and Diversity by Habitat Type along Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

No.	Habitat Types	Plant Cover (m^2)			Total Cover (m^2)	Plant Count			Total Count	Diversity (Average No. of species per Sampling Location)
		Average	Maximum	Minimum		Average	Maximum	Minimum		
1.	Mountain/Hills	11.8	11.8	11.8	**11.8**	24.0	24	24	**24**	13.0
2.	Gravel Plains	6.6	16.2	0.0	**26.5**	5.0	10	1	**20**	1.5
3.	Dry Streambeds	10.6	20.3	0.2	**42.5**	8.2	13	5	**33**	1.5
4.	Clayey Plains	2.0	3.8	0.2	**4.0**	20.5	26	15	**41**	3.5
5.	Date Palms	58.8	58.8	58.8	**58.8**	30.0	30	30	**30**	8.0
6.	Sandy Plains/Sand Dunes	9.5	9.5	9.5	**9.5**	9.0	9	9	**9**	1.0

Table 5-31: Phyto-sociological Attributes of Plant Species Observed in each Habitat Type along Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

Habitat	Species Name	D1	D3	C1	C3	F1	F3	IVI
Clayey Plains	*Alhaji maurorum*	2.0	29.3	0.0	5.4	0.3	14.3	16.3
	Calligonum polygonoides	0.2	2.4	0.0	0.2	0.2	7.1	3.2
	Citrullus colocynthis	1.3	19.5	0.4	79.4	0.5	21.4	40.1
	Fagonia ovalifolia	0.2	2.4	0.0	0.2	0.2	7.1	3.2
	Heliotropium crispum	0.7	9.8	0.0	0.3	0.3	14.3	8.1
	Peganum harmala	1.0	14.6	0.1	13.2	0.5	21.4	16.4
	Tribulus terrestris	1.5	22.0	0.0	1.4	0.3	14.3	12.5
Gravel Plains	*Aristida sp*	0.2	10.0	0.0	0.0	0.2	14.3	8.1
	Calligonum comosum	0.2	10.0	7.7	58.1	0.2	14.3	27.5
	Aerva tomentosa	0.5	30.0	0.1	1.9	0.3	21.4	17.8

Habitat	Species Name	D1	D3	C1	C3	F1	F3	IVI
	Haloxylon salicornicum	0.3	20.0	0.1	0.8	0.2	14.3	11.7
	Heliotropium crispum	0.1	5.0	0.0	0.0	0.1	7.1	4.0
	Salsola stocksii	0.4	25.0	2.1	39.1	0.3	28.6	30.9
Mountain/ Hills	*Haloxylon salicornicum*	2.3	29.2	0.6	34.1	1.0	18.8	27.3
	Fagonia ovalifolia	0.7	8.3	0.0	0.4	0.3	6.3	5.0
	Calligonum polygonoides	0.3	4.2	0.1	1.3	0.3	6.3	3.9
	Aristida adscensionis	0.3	4.2	0.0	0.0	0.3	6.3	3.5
	Acanthophyllum	0.3	4.2	0.0	0.1	0.3	6.3	3.5
	Malcolmia scorpioides	0.3	4.2	0.0	0.1	0.3	6.3	3.5
	Calligonum comosum	1.3	16.7	1.9	62.7	0.7	12.5	30.6
	Cornulaca monacantha	0.7	8.3	0.0	0.2	0.3	6.3	4.9
	Rumex vasicarius	0.3	4.2	0.0	0.2	0.3	6.3	3.5
	Citharelloma lehmannii	0.3	4.2	0.0	0.1	0.3	6.3	3.5
	Cynomorium coccineum	0.3	4.2	0.0	0.3	0.3	6.3	3.6
	Fortuynia bungei	0.3	4.2	0.0	0.4	0.3	6.3	3.6
	Physorrhynchus chamaerapistrum	0.3	4.2	0.0	0.1	0.3	6.3	3.5
Dry Streambeds	*Aristida adscensionis*	0.1	3.0	0.0	0.0	0.1	6.7	3.2
	Calligonum comosum	0.3	12.1	2.4	22.7	0.2	13.3	16.1
	Haloxylon persicum	0.2	6.1	2.1	9.8	0.1	6.7	7.5
	Heliotropium crispum	0.3	9.1	0.0	0.1	0.2	13.3	7.5
	Crotalaria burhia	0.1	3.0	0.1	0.1	0.1	6.7	3.3
	Salsola stocksii	1.8	66.7	1.3	67.2	0.7	53.3	62.4
Sandy Plains	*Salsola stocksii*	3.0	100.	1.1	100.	1.0	100.	100.
Agricultural Areas/Date Palms	*Tamarix aphylla*	1.7	16.7	0.5	4.1	0.3	10.0	10.3
	Eucalyptus camaldulensis	0.7	6.7	3.1	10.7	0.3	10.0	9.1
	Salix tetrasperma	0.3	3.3	0.6	1.1	0.3	10.0	4.8
	Phoenix dactylifera	1.0	10.0	15.7	80.3	0.7	20.0	36.8
	Alhaji maurorum	4.0	40.0	0.1	1.2	0.7	20.0	20.4
	Peganum harmala	0.7	6.7	0.1	0.2	0.3	10.0	5.6
	Calligonum polygonoides	0.3	3.3	0.4	0.7	0.3	10.0	4.7
	Penicum turgidum	1.3	13.3	0.3	1.7	0.3	10.0	8.4

A brief description of vegetation in each habitat type along the Fan Sediment Water Supply Pipeline Area is given below.

5.2.7.1.3.2.1 Mountain/ Hills

A total of 13 species with a cover of 11.83 m^2, density of 24.0, and diversity of 13.0 were observed from only one Sampling Location E1, located in Mountain/ Hills. Some of the species observed in this habitat include *Aristida adscensionis, Calligonum comosum, Acanthophyllum, Rumex vasicarius, Cithareloma lehmannii, Cynomorium coccineum, Fortuynia bungei, Physorrhynchus chamaerapistrum*, and *Malcolmia scorpioides.*

5.2.7.1.3.2.2 Gravel Plains

Six species with an average cover of 6.6 m^2, an average density of 5.0, and an average diversity of 1.5 were observed from the four sampling locations located in the Gravel Plains habitat in the Fan Sediment Water Supply Pipeline Area. The species observed in this habitat include *Aerva tomentosa, Aristida sp, Calligonum comosum, Haloxylon salicornicum, Heliotropium crispum*, and *Salsola stocksii*.

5.2.7.1.3.2.3 Dry Streambeds

Six species with an average cover of 10.6 m^2, an average density of 8.2, and an average diversity of 1.5 were observed from four sampling locations located in Dry Streambed habitat in Fan Sediment Water Supply Pipeline Area. The species observed in this habitat include *Aristida adscensionis, Calligonum comosum, Crotalaria burhia, Haloxylon persicum, Heliotropium crispum*, and *Salsola stocksii*.

5.2.7.1.3.2.4 Clayey Plains

Seven species with an average cover of 2.0 m^2, an average density of 20.5, and an average diversity of 3.5 were observed from the two sampling locations located in Clayey Plains of Fan Sediment Water Supply Pipeline Area. The species observed in this habitat include *Alhaji maurorum, Calligonum polygonoides, Citrullus colocynthis, Fagonia ovalifolia, Heliotropium crispum, Peganum harmala*, and *Tribulus terrestris.*

5.2.7.1.3.2.5 Sandy Plains/Sand Dunes

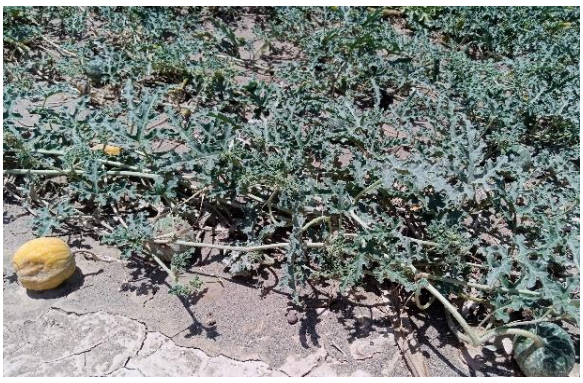
One species with a cover of 9.5 m^2, density of 9.0, and diversity of 1.0 was observed from only one sampling location located in Sandy Plains/ Sand Dunes along Fan Sediment Water Supply Pipeline Area. The species observed in this habitat was *Salsola stocksii.*

5.2.7.1.3.2.6 Date Palm

Eight species with a cover of 58.8 m^2, density of 30.0, and diversity of 8.0 were observed from only one sampling location located in Date Palm habitat in the Fan Sediment Water Supply Pipeline Area. This was a micro-habitat identified and sampled in a field that has diverse fauna and flora. The species observed in this habitat include *Alhagi maurorum*, *Peganum harmala, Phoenix dactylifera, Tamarix aphylla* and *Vachellia jacquemontii.*



a) *Alhaji maurorum*



b) *Citrullus colocynthis*



c) Fagonia ovalifolia



d) Heliotropium crispum



e) Peganum harmala



f) Rumex vasicarius

Figure 5-49: Plant Species Observed along Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

5.2.7.1.3.3 Access Road to the proposed Reko Diq Mine Site

A total of seven species were observed from eight sampling locations located at Access Road to the proposed Reko Diq Mine Site during the Spring 2023 Survey. Among these habitats, Mountain/Hills was observed as the most diverse habitat due to the presence of abundant floral species with the highest average diversity (5.0) followed by Dry Streambeds (1.5), and Gravel Plains (1.0). The highest average density was observed in Mountain/Hills (13.0) followed by Dry Streambeds (9.4) and Gravel Plains (3.5). The most abundant plant species observed were *Salsola stocksii* followed by *Calligonum polygonoides* whereas the least abundant plant species was *Tamarix aphylla*

Table 5-32 provides the vegetation cover, plant count, and diversity by habitat type.

Table 5-33 provides the phyto-sociological attributes for the species in the different habitat types.

Table 5-32: Vegetation Cover, Plant Count, and Diversity by Habitat Type Observed at Access Road to the proposed Reko Diq Mine Site Spring 2023 Survey

No.	Habitat Types	Plant Cover (m^2)			Total Cover (m^2)	Plant Count			Total Count	Diversity (Average No. of species per Sampling Location)
		Average	Maximum	Minimum		Average	Maximum	Minimum		
1	Mountain/Hills	19.8	19.8	19.8	**20**	13	13	13	**13**	5.00
2	Gravel Plains	0.4	0.8	0.1	**11**	4	5	2	**12**	1.00
3	Dry Streambeds	20.5	30.1	19.8	**92**	11	12	8	**42**	1.50

Table 5-33: Phyto-sociological Attributes of Plant Species Observed in each Habitat Type at Access Road to the proposed Reko Diq Mine Site, Spring 2023 Survey

Habitat	Species Name	D1	D3	C1	C3	F1	F3	IVI
Dry Streambeds	*Aristida adsecensionis*	0.1	2.1	0.0	0.0	0.1	5.0	2.4
	Calligonum polygonoides	0.3	8.5	1.0	3.9	0.3	20.0	10.8
	Haloxylon salicornicum	0.3	8.5	0.7	2.8	0.1	5.0	5.4
	Salsola stocksii	1.9	61.7	2.0	57.7	0.7	50.0	56.5
	Tamarix aphylla	0.1	2.1	3.9	3.9	0.1	5.0	3.6
	Tamarix stricta	0.5	17.0	4.1	31.8	0.2	15.0	21.3
Gravel Plains	*Calligonum polygonoides*	0.3	28.6	0.2	50.3	0.3	33.3	37.4
	Salsola stocksii	0.8	71.4	0.1	49.7	0.7	66.7	62.6
Mountain/Hills	*Haloxylon persicum*	0.7	15.4	3.1	30.9	0.3	11.1	19.1
	Calligonum polygonoides	1.3	30.8	2.6	51.7	1.0	33.3	38.6
	Salsola stocksii	1.0	23.1	0.7	10.9	1.0	33.3	22.4
	Aristida adsecensionis	1.0	23.1	0.0	0.0	0.3	11.1	11.4
	Haloxylon salicornicum	0.3	7.7	1.3	6.5	0.3	11.1	8.4

A brief description of vegetation in each habitat is given below.

5.2.7.1.3.3.1 Mountain/Hills

Five species with an average cover of 19.8 m^2, average density of 13.0, and average diversity of 5.0 were observed from only one sampling location located in the Mountains/Hills. The species observed in this habitat include *Aristida adsecensionis, Calligonum polygonides, Haloxylon persicum, Haloxylon salicornicum,* and *Salsola stocksii.*

5.2.7.1.3.3.2 Gravel Plains

Three species with an average cover of 3.6 m^2, an average density of 4.0, and an average diversity of 1.0 were observed from the three sampling locations located in the Gravel Plains habitat. The species observed in this habitat include *Calligonum polygonoides, Salsola stocksii,* and *Tamarix stricta*.

5.2.7.1.3.3.3 Dry Streambeds

Six species with an average cover of 23.1 m^2, an average density of 10.5, and an average diversity of 1.5 were observed from the four sampling locations located in Dry Streambeds. The species observed in this habitat include *Aristida adsecensionis, Calligonum polygonoides, Haloxylon salicornicum, Salsola stocksii, Tamarix aphylla,* and *Tamarix stricta*.

5.2.7.1.4 Comparison of Spring 2023 Survey and Previous Survey in Similar Conditions

The comparison is only provided for the proposed Reko Diq Mine Site for the common sampling locations where sampling was conducted during both Previous Survey (May 2008 Survey) and Spring 2023 Survey. **Appendix K** provides the details on comparisons of the results of vegetation sampling conducted during both Spring 2023 Survey and Previous Survey (May 2008 Survey) while a summary is discussed below.

5.2.7.1.4.1 Proposed Reko Diq Mine Site

The average diversity (2.3) and density (8.5) of vegetation observed during the Spring 2023 Survey was lower compared to the average diversity (3.5) and density (31.5) during the Previous Surveys. Mountains/Hills were the most promising habitat in terms of floral density during both Spring 2023 Survey and the Previous Survey, however, in terms of floral diversity; the Gravel Plain was the most promising habitat. This significant change in diversity and density during the Spring 2023 Survey can be attributed to insufficient rainfall since 2010 results in arid conditions, impacting water and vegetation availability, thereby influencing habitats crucial for various animal species.

5.2.7.1.5 Alien-Invasive Plant Species

Two AIPS were observed during both Post-Monsoon 2022 and Spring 2023 surveys which include *Eucalyptus camaldulensis* and *Cynodon dactylon*. A brief description of AIPS is given below:

- Eucalyptus camaldulensis

  Eucalyptus camaldulensis, commonly known as the River Red Gum, is a tree that was endemic to Australia. It is now introduced into different countries around the globe including Pakistan, due to its high adaptation property in any environmental conditions. In Pakistan, it is spreading quickly replacing native vegetation, and is marked as a threat to biodiversity by ecologists.

- Cynodon dactylon

  It was observed at different Project facilities. It is not native to all parts of the world but has been widely introduced and can exhibit invasive characteristics in some environments.

5.2.7.1.6 Ethnobotany

The majority of plant species observed in the Study Area have important roles as fuelwood, fodder, timber wood, and/or the treatment of ailments. The ethnobotanical importance of a few species occurring in the Study Area is given below.
Appendix L provides the ethnobotanical uses of all the vegetation species.

- Azadirachta indica

The fruit is used for hemorrhoids, intestinal worms, urinary tract disorders, bloody nose, phlegm, eye disorders, diabetes, wounds, and leprosy.

- Citrullus colocynthis

  Citrullus colocynthis is used to treat colds, diarrhea, parasitic worms, the expulsion of wind, tumors, ascites, leukoplakia, ulcers, asthma, bronchitis, and diabetes.

- Cornulaca monacantha

  Cornulaca monacantha is a remedy used as a laxative, hepatoprotective, and antiparasitic medicine.

- Crotalaria burhia

  The leaves, branches, and roots can be used as a cooling medicine. Plant juice is useful for treatments of gout, eczema, hydrophobia, pain, and swelling.

- Tribulus terrestris

  Tribulus terrestris is used as a diuretic, pain reliever, and appetite stimulant, as well as a treatment for kidney stones.

5.2.7.1.7 Discussion

The Ecological Study Area falls within the arid or semi-arid zone, influenced by climate, soil, and topography. The challenging environmental conditions in this area make it unfavorable for supporting a wide range of biodiversity. The area receives only a little rain, and these rains are localized and mostly restricted to the Mountains/Hills. These rains support vegetation growth in the Mountains/Hills and to some extent in Dry Streambeds where higher floral diversity was observed. Specialized organisms with specific physiological and behavioral adaptations thrive in such harsh conditions. The topographical features of the habitats within the Ecological Study Area including Mountain/Hills, Dry Streambeds, Gravel Plains, Clayey Plains, Sandy Plains/Sand Dunes, and Agricultural Areas/Date Palms contribute to habitat diversity. Most of the vegetation species observed in the area were well adapted to dry environments, displaying xerophytic or halophytic characteristics. These species include *Calligonum comosum, Cornulaca monacantha, Fagonia ovalifolia, Haloxylon persicum, Salsola stocksii, Heliotropium crispum, Tribulus terrestris*, and *Haloxylon salcornicum*. They have evolved to thrive in regions with limited water availability. These plant species play a crucial role in supporting a range of fauna by providing them with shelter, food, and water sources. Small mammals such as the Indian Jerboa and Long-eared Hedgehog benefit from these plants' presence in the ecosystem. The vegetation acts as a protective cover, shielding them from predators and harsh environmental conditions. Additionally, certain species may serve as a source of food for these mammals, either through direct consumption or as part of the food chain.

The Fan Sediment Water Supply Pipeline Area is characterized by different types of habitats such as Clayey Plains, Sand Dunes, and Dry Streambeds which provide relatively favorable conditions for vegetation compared to proposed Reko Diq Mine Site and Access Road to proposed Reko Diq Mine Site. This can be attributed to less disturbance of cross border trade after the fencing along the border (Pak-Iran and Pak-Afghan). As a result, the movement of vehicles is now limited to a few designated routes

for cross-border trade. Additionally, the presence of microhabitats with enough water supply contributes relatively distinct and diverse biodiversity.

The habitat at the proposed Reko Diq Mine Site was relatively intact, although there was a medium level of disturbance observed. Despite the disturbance, a specialized type of flora and fauna was observed in the area. These species are well adapted to the arid environment present at the proposed Reko Diq Mine Site. The rugged terrain of Mountains/Hills, Sandy Plains, and Clayey Plains offer different microclimates and soil characteristics for the growth and survival of various plant species. On the other hand, the Gravel Plains and Dry Streambeds were observed to have limited floral diversity. These habitats may offer harsher conditions, such as poor soil quality, which restricts the growth of many plant species. As a result, the diversity of vegetation in these areas is low.

The Access Road to the proposed Reko Diq Mine Site experienced a high level of disturbance, leading to a significant loss of natural vegetation and a subsequent decline in biodiversity. The dominant habitats in this area were Gravel Plains and Mountains/Hills, which exhibited very low productivity and had the minimal potential to support biodiversity. The geographic location of the area has made it a major route for cross-border trade. This continuous flow of human activity further contributes to the disturbance and degradation of the natural vegetation. Some plant species in this habitat displayed stunted growth, primarily due to grazing by camels and other livestock. This grazing has resulted in the depletion of plant resources and hindered the natural regeneration of vegetation. Additionally, the construction activities associated with the road infrastructure have further impacted the biodiversity in the area.

5.2.7.1.8 Conservation Concern Plant Species

All the plant species within the Study Area were either Least Concern or Not Evaluated, no conservation concern plant species were observed during both Post-Monsoon 2022 and Spring 2023 surveys. Only one plant species *Eucalyptus camaldulensis* is listed as Near Threatened according to the IUCN Red List of Threatened Species.[105] As this species is an alien species it is not considered a conservation concern as it poses a risk to the native flora.

5.2.7.2 Avifauna

The line transect sampling method was used for bird sampling during both Post-Monsoon 2022 and Spring 2023 surveys. A total of 39 bird species were observed during both Post-Monsoon 2022 and Spring 2023 surveys from the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and Access Road to the proposed Reko Diq Mine Site Area. Higher species richness was observed during the Post-Monsoon 2022 Survey when 30 bird species were observed compared to Spring 2023 Survey when only 21 bird species were observed. A notable decline in the abundance of birds was also observed during the Spring 2023 Survey (79 specimens) compared to the Post-Monsoon 2022 Survey (165 specimens). Moreover, harsh weather conditions in terms of higher temperatures and strong winds during the Spring 2023 Survey further affected the bird diversity.

[105] Fensham, R., Laffineur, B. & Collingwood, T. 2019. Eucalyptus camaldulensis. The IUCN Red List of Threatened Species 2019: e.T61909812A61909824. https://dx.doi.org/10.2305/IUCN.UK.2019–3.RLTS.T61909812A61909824.en. Accessed on 11 July 2023.

Table 5-34 provides a list of species observed during both Post-Monsoon 2022 and Spring 2023 surveys along with IUCN status, CITES status, regional status, migratory status, food items, and occurrence in the area.

Table 5-34: Bird Species Observed in Post-Monsoon 2022 and Spring 2023 Surveys

No.	Scientific Name	Common Name	IUCN Status	Post-Monsoon 2022 Survey	Spring 2023 Survey	Regional Status	Migratory Status	CITES Status	Global Population Trend	Feeding Guild/ food items	Occurrence in the Area
1.	*Acrocephalus melanopogon*	Moustached Warbler	Least Concern	-	✓	-	Winter Visitor	-	Stable	Insectivore	Rare
2.	*Acrocephalus stentoreus*	Clamorous Reed-warbler	Least Concern	-	✓	-	Winter Visitor	-	Stable	Insectivore	Uncommon
3.	*Alaemon alaudipes*	Hoopoe Lark	Least Concern	✓	✓	-	Resident	-	Decreasing	Insectivore/ Frugivore	Uncommon
4.	*Ammomanes cinctura*	Bar-tailed Lark	Least Concern	✓	✓	-	Resident	-	Decreasing	Insectivore/ Frugivore	Uncommon
5.	*Ammomanes deserti*	Desert Lark	Least Concern	✓	✓	-	Resident	-	Increasing	Insectivore/ Frugivore	Common
6.	*Ammopardix griseogularis*	See-see Partridge	Least Concern	✓	-	-	Resident	-	Stable	Insectivore-Granivore	Common
7.	*Anthus trivialis*	Tree Pipit	Least Concern	✓	-	-	Passage Migrant	-	Decreasing	Insectivore	Uncommon
8.	*Athene noctua*	Little Owl	Least Concern	✓	-	First record	Resident	-	Stable	Carnivore	Rare
9.	*Buteo buteo vulpinus*	Common Buzzard	Least Concern	✓	-	-	Passage Migrant	-	Increasing	Carnivore	Rare
10.	*Calandrella brachydactyla*	Greater Short-Toed Lark	Least Concern	✓	✓	-	Passage Migrant	-	Unknown	Insectivore/ Granivore	Uncommon
11.	*Caprimulgus europaeus*	Eurasian Nightjar	Least Concern	✓	-	-	Summer Breeder	-	Decreasing	Insectivore	Uncommon
12.	*Cercotrichas galactotes*	Rufous-tailed Scrub Robin	Least Concern	✓	✓	-	Passage Migrant	-	Stable	Insectivore/ Frugivore	Rare
13.	*Chlamydotis macqueenii*	Asian Houbara Bustard	Vulnerable	✓	-	-	Winter Visitor	Appendix I	Decreasing	Omnivore	Rare

No.	Scientific Name	Common Name	IUCN Status	Post-Monsoon 2022 Survey	Spring 2023 Survey	Regional Status	Migratory Status	CITES Status	Global Population Trend	Feeding Guild/ food items	Occurrence in the Area
14.	*Coracias garrulus*	Eurasian Roller	Least Concern	✓	✓	-	Passage Migrant	-	Decreasing	Insectivore/ Carnivore	Uncommon
15.	*Corvus corax*	Common Raven	Least Concern	-	✓	-	Resident	-	Increasing	Carnivore	Uncommon
16.	*Corvus ruficollis*	Brown-necked Raven	Least Concern	✓	✓	-	Resident	-	Increasing	Omnivore	Common
17.	*Curruca mystacea*	Menetries`s Warbler	Least Concern	✓	-	First record	Unknown	-	Stable	Insectivore	Rare
18.	*Curruca nana*	Asian Desert Warbler	Least Concern	✓	✓	-	Resident	-	Stable	Insectivore-Frugivore	Common
19.	*Ficedula parva*	Red-throated Flycatcher	Least Concern	✓	-	-	Passage Migrant	-	Stable	Insectivore	Uncommon
20.	*Galerida cristata*	Crested Lark	Least Concern	✓	✓	-	Resident	-	Decreasing	Insectivore/ Frugivore	Common
21.	*Hirundo rustica*	Barn Swallow	Least Concern	-	✓	-	Summer Breeder	-	Decreasing	Insectivore	Common
22.	*Iduna caligate*	Booted Warbler	Least Concern	✓	✓	-	Passage Migrant	-	Increasing	Insectivore	Uncommon
23.	*Monticola saxatilis*	Rufous-tailed Rock Thrush	Least Concern	-	✓	-	Resident	-	Decreasing	Insectivore/ Frugivore	Rare
24.	*Motacilla alba*	White Wagtail	Least Concern	✓	-	-	Resident	-	Unknown	Insectivore/ Frugivore	Rare
25.	*Muscicapa striata*	Spotted Flycatcher	Least Concern	✓	-	-	Passage Migrant	-	Decreasing	Insectivore	Uncommon
26.	*Neophron percnopterus*	Egyptian Vulture	Endangered	✓	-	-	Resident	Appendix II	Decreasing	Carnivore	Rare
27.	*Oenanthe monacha*	Hooded Wheatear	Least Concern	-	✓	-	Resident	-	Stable	Insectivore	Uncommon

No.	Scientific Name	Common Name	IUCN Status	Post-Monsoon 2022 Survey	Spring 2023 Survey	Regional Status	Migratory Status	CITES Status	Global Population Trend	Feeding Guild/ food items	Occurrence in the Area
28.	*Oriolus kundoo*	Indian Golden Oriole	Least Concern	✓	✓	First record for Western Balochistan	Common	-	Unknown	Insectivore/ Frugivore	Common
29.	*Pastor roseus*	Rosy Starling	Least Concern	✓	✓	Observed away from its known route	Passage Migrant	-	Unknown	Insectivore/ Frugivore	Uncommon
30.	*Porzana porzana*	Spotted Crake	Least Concern	✓	-	-	Passage Migrant	-	Decreasing	Insectivore	Uncommon
31.	*Progne chalybea*	Grey-breasted Martin	Least Concern	-	✓	-	Passage Migrant	-	Stable	Insectivore	Uncommon
32.	*Ptyonoprogne rupestris*	Crag Martin	Least Concern	✓	-	-	Summer Breeder	-	Stable	Insectivore	Uncommon
33.	*Pycnonotus cafer*	Red-vented Bulbul	Least Concern	-	✓	-	Resident	-	Increasing	Insectivore/ Frugivore	Uncommon
34.	*Pycnonotus leucotis*	White-eared Bulbul	Least Concern	✓	✓	-	Resident	-	Decreasing	Insectivore/ Frugivore	Common
35.	*Saxicola caprata*	Pied Bushchat	Least Concern	✓	-	-	Resident	-	Stable	Insectivore	Uncommon
36.	*Saxicola maura*	Siberian Stonechat	Least Concern	✓	-	-	Passage Migrant	-	Stable	Insectivore-Frugivore	Uncommon
37.	*Streptopelia decaocto*	Eurasian Collared Dove	Least Concern	-	✓	-	Resident	-	Stable	Insectivore/ Frugivore	Common
38.	*Spilopelia senegalensis*	Laughing Dove	Least Concern	✓	-	-	Resident	-	Stable	Insectivore/ Frugivore	Common
39.	*Sylvia curruca*	Asian Desert Warbler	Least Concern	✓	-	-	Resident	-	Stable	Insectivore/ Frugivore	Common
Total				**30**	**21**						

5.2.7.2.1 Post-Monsoon 2022 Survey

A total of 165 birds belonging to 30 species were observed from the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and Access Road to proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey. Of these, 62 specimens belonging to 12 species were observed from the proposed Reko Diq Mine Site, 69 specimens belonging to 23 species from the Fan Sediment Water Supply Pipeline Area, and 34 specimens belonging to eight species from the Access Road to proposed Reko Diq Mine Site. Overall, abundance was lower at the proposed Reko Diq Mine Site compared to the Fan Sediment Water Supply Pipeline Area. This can be attributed to the scarcity of food, shelter, and harsh climatic conditions. Higher diversity at Fan Sediment Water Supply Pipeline Area can be attributed to the diverse habitat types, food, and refugia for bird species.

Figure 5-50 provides photographic evidence of some bird species observed during the Post-Monsoon 2022 Survey.



a) Spotted Flycatcher *Muscicapa striata*



b) Eurasian Collard Dove *Streptopelia decaocto*



c) Isabelline Shrike *Lanius isabellinus*



d) Eurasian Nightjar *Caprimulgus europaeus*



e) Brown-necked Raven *Corvus ruficollis*



f) Crested Lark *Galerida cristata*

Figure 5-50: Bird Species Observed, Post-Monsoon 2022 Survey

5.2.7.2.1.1 Proposed Reko Diq Mine Site

A total of 62 bird specimens belonging to 12 species were observed from the proposed Reko Diq Mine Site from 20 sampling locations. The most abundant bird species observed at the proposed Reko Diq Mine Site was the Brown-necked Raven with a total of 40 specimens observed followed by the See-see Partridge (four specimens) and Bar-tailed Lark, Hoopoe Lark, Lesser Whitethroat (three specimens each). Species like the Booted Warbler, Menetries's Warbler, Little Owl, Siberian Stonechat, and Tree Pipit were rare species with only one specimen of each species observed.

The highest diversity of birds was observed in Dry Streambeds (1.3) habitat followed by Mountain/hills (1.0) and Gravel Plains (0.4), while the highest density of birds was observed in Gravel Plains (3.6) habitat followed by Dry Streambeds (3.3) and Mountain/Hills (2.6). The availability of food and shelter in Dry Streambeds is the main reason for higher diversity in this habitat.

Table 5-35 provides the abundance of bird species by habitat type observed at the proposed Reko Diq Mine Site. Figure 5-51 provides the graph of bird abundance and richness observed at each sampling location of the proposed Reko Diq Mine Site.

Table 5-35: Abundance of Bird Species Observed at Reko Mine Site, Post-Monsoon 2022 Survey

No.	Scientific Names	Common Names	Habitat				
			Dry Streambeds	Sandy Plains/Sand Dunes	Gravel Plains	Mountains/ Hills	Total
1.	*Ammomanes cinctura*	Bar-tailed Lark	2	0	1	0	**3**
2.	*Alaemon alaudipes*	Hoopoe Lark	2	0	0	1	**3**
3.	*Ammopardix griseogularis*	See-see Partridge	0	0	0	4	**4**
4.	*Anthus trivialis*	Tree Pipit	1	0	0	0	**1**

No.	Scientific Names	Common Names	Habitat				
			Dry Streambeds	Sandy Plains/Sand Dunes	Gravel Plains	Mountains/ Hills	Total
5.	*Athene noctua*	Little Owl	0	0	0	1	**1**
6.	*Calandrella brachydactyla*	Greater Short-Toed Lark	2	0	0	0	**2**
7.	*Corvus ruficollis*	Brown-necked Raven	8	0	27	5	**40**
8.	*Curruca mystacea*	Menetries's warbler	1	0	0	0	**1**
9.	*Iduna caligate*	Booted Warbler	1	0	0	0	**1**
10.	*Ptyonoprogne rupestris*	Crag Martin	0	0	0	2	**2**
11.	*Saxicola maura*	Siberian Stonechat	0	0	1	0	**1**
12.	*Sylvia curruca*	Lesser Whitethroat	3	0	0	0	**3**
Total Abundance			**20**	**-**	**29**	**13**	**62**
Total Richness			**8**	**-**	**3**	**5**	**12**

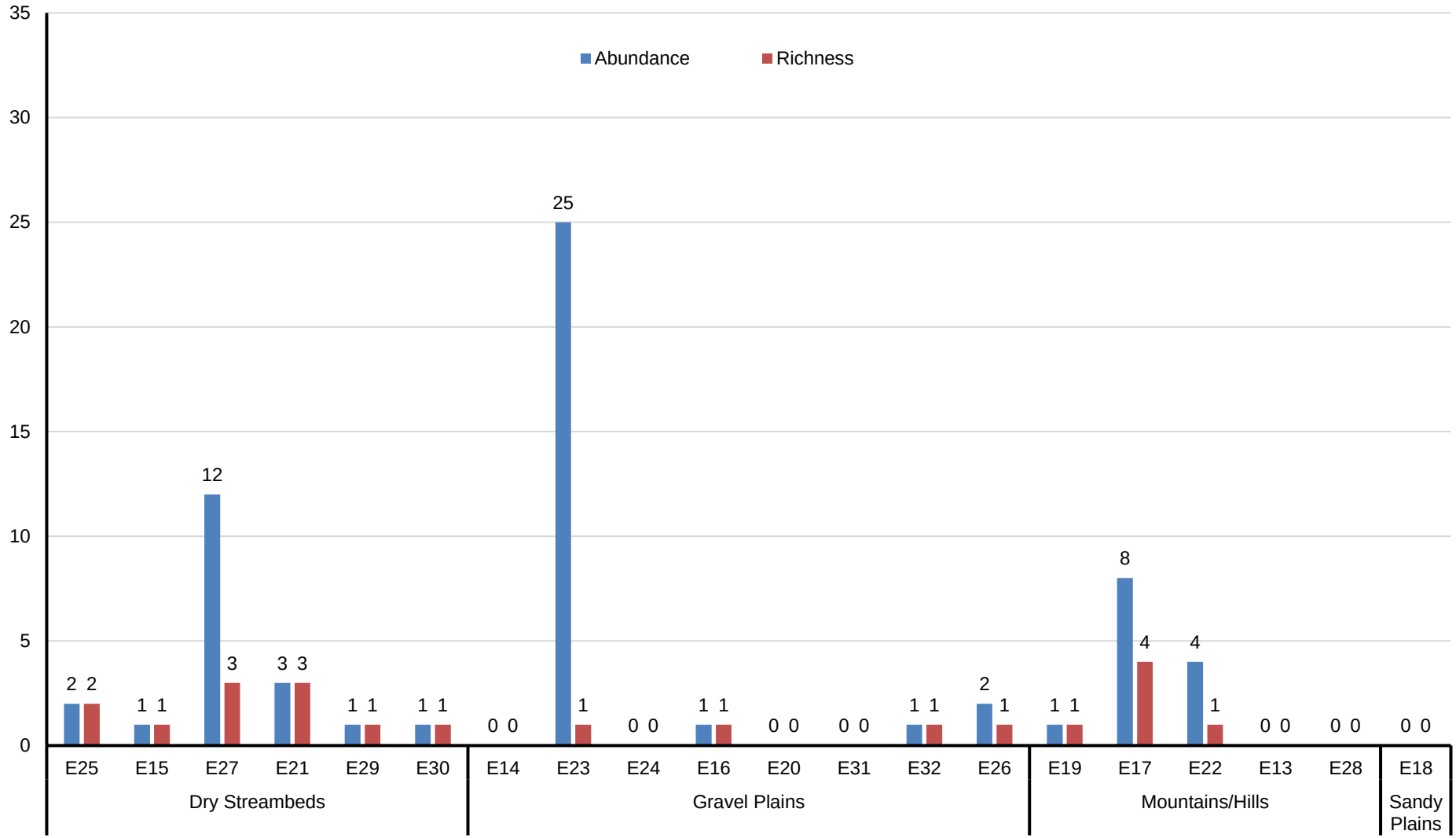


Figure 5-51: Bird Abundance and Richness Observed at proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

5.2.7.2.1.2 Fan Sediment Water Supply Pipeline Area

A total of 69 bird specimens belonging to 23 species were observed from the Fan Sediment Water Supply Pipeline Area from 13 sampling locations. The most abundant bird species observed was the Indian Golden Oriole with a total of 11 specimens followed by the European Bee-eater (10 specimens) and White-eared Bulbul (eight specimens). The Asian Desert Warbler, Asian Houbara Bustard, Bar-tailed Lark, Common Buzzard, Eurasian Nightjar, Eurasian Roller, Hoopoe Lark, Pied Bush Chat, Red-throated Flycatcher, and Rosy Starling were rare species with one specimen each of these species observed. The highest abundance and richness of birds was observed in Agricultural Areas/Date Palms habitat with a total of 40 specimens belonging to 10 species.

The highest diversity of birds was observed in Agricultural Areas/Date Palms (10.0) habitat followed by Sandy Plains/Sand Dunes (2.5), Mountains/Hills (2.0), Gravel Plains (1.7), Dry Streambeds (1.3), and Clayey Plains (1.0). Similarly, the highest density of birds was also observed in Agricultural Areas/Date Palms habitat (42.0) followed by Sandy Plains/Sand Dunes (4.0), Mountains/Hills (3.0), Gravel Plains (2.5), Dry Streambeds (1.3) and Clayey Plains (1.0) habitat.

Table 5-36 provides the abundance of bird species observed along the Fan Sediment Water Supply Pipeline Area.

Figure 5-53 provides the graph of bird's abundance and richness by sampling location and habitat types along Fan Sediment Water Supply Pipeline Area.

Table 5-36: Birds Species Observed in Different Habitats along Fan Sediment Water Supply Pipeline Area, Post-Monsoon 2022 Survey

No.	Common Names	Common Names	Habitat						
			Dry Streambeds	Sandy Plains/Sand Dunes	Gravel Plains	Mountains/Hills	Clayey Plains	Agricultural Areas/Date Palms	Total
1	*Alaemon alaudipes*	Hoopoe Lark	0	1	0	0	0	0	**1**
2	*Ammomanes cinctura*	Bar-tailed Lark	0	0	0	0	1	0	**1**
3	*Ammomanes deserti*	Desert Lark co	0	0	0	2	0	0	**2**
4	*Buteo buteo vulpinus*	Common Buzzard	0	0	1	0	0	0	**1**
5	*Calandrella brachydactyla*	Greater Short-Toed Lark	1	2	1	0	0	0	**4**
6	*Caprimuleus europaeus*	Eurasian Nightjar	0	0	0	1	0	0	**1**
7	*Chlamydotis macqueenii*	Asian Houbara	0	0	0	0	1	0	**1**

No.	Common Names	Common Names	Habitat						
			Dry Streambeds	Sandy Plains/Sand Dunes	Gravel Plains	Mountains/Hills	Clayey Plains	Agricultural Areas/Date Palms	Total
8	*Coracias garrulus*	Eurasian Roller	0	1	0	0	0	0	**1**
9	*Corvus ruficollis*	Brown-necked Raven	0	0	2	0	0	0	**2**
10	*Curruca nana*	Asian Desert Warbler	1	0	0	0	0	0	**1**
11	*Ficedula parva*	Red-throated Flycatcher	0	0	0	0	0	1	**1**
12	*Galerida cristata*	Crested Lark	1	0	2	0	0	1	**4**
13	*Motacilla alba*	White Wagtail	0	0	1	0	0	1	**2**
14	*Muscicapa striata*	Spotted Flycatcher	1	2	0	0	0	0	**3**
15	*Neophron percnopterus*	Egyptian Vulture	0	0	2	0	0	0	**2**
16	*Oriolus kundoo*	Indian Golden Oriole	0	0	0	0	0	11	**11**
17	*Pastor roseus*	Rosy Starling	0	0	0	0	0	1	**1**
18	*Ptyonoprogne rupestris*	Crag Martin	0	0	0	0	0	6	**6**
19	*Pycnonotus leucotis*	White-eared Bulbul	0	0	0	0	0	8	**8**
20	*Saxicola caprata*	Pied Bushchat	0	0	1	0	0	0	**1**
21	*Spilopelia senegalensis*	European Bee-eater	0	0	0	0	0	10	**10**
22	*Spilopelia senegalensis*	Laughing Dove	0	0	0	0	0	2	**2**
23	*Sylvia curruca*	Lesser Whitethroat	0	2	0	0	0	1	**3**
Total Abundance			**4**	**8**	**10**	**3**	**2**	**42**	**69**
Total Richness			**4**	**5**	**7**	**2**	**2**	**10**	**23**

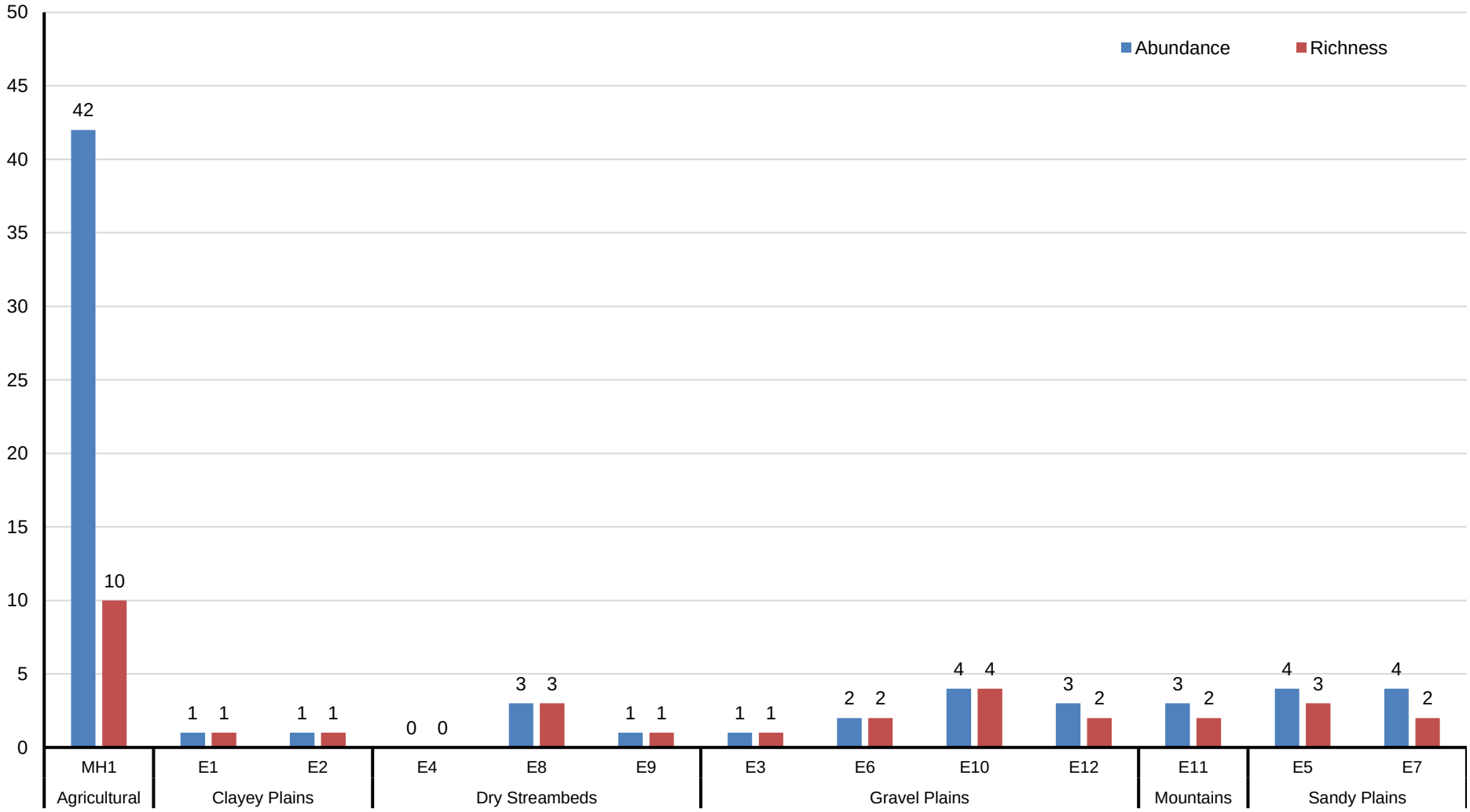


Figure 5-52: Bird Abundance and Richness Observed along Fan Sediment Water Supply Pipeline Area, Post-Monsoon 2022 Survey

5.2.7.2.1.3 Access Road to the proposed Reko Diq Mine Site

A total of 34 bird specimens belonging to eight species were observed along the Access Road to proposed Reko Diq Mine Site from eight sampling locations. The most abundant bird species that was observed was the Greater Short-toed Lark with a total of 26 specimens followed by the Brown-necked Raven (two specimens). The Eurasian Nightjar, Bar-tailed Lark, Crested Lark, Hoopoe Lark, Rufous-tailed Scrub Robin, and Spotted Crake were rare species with one specimen each observed during the Post-Monsoon 2022 Survey. The highest abundance of birds was observed in Mountain/Hills with a total of 25 specimens belonging to one species, while the highest bird's richness was observed in Gravel Plains with a total of four species.

The highest diversity of birds was observed in Mountains/Hills (2.0) followed by Dry Streambeds and Gravel Plains (0.1 in each habitat), while the highest density of birds was observed in Mountains/Hills (25.0) followed by Gravel Plains (1.5) and Dry Streambeds (1.0) habitats.

Table 5-37 provides the abundance of bird species observed while Figure 5-53 provides a graph for bird abundance and richness observed by sampling locations along the Access Road to proposed Reko Diq Mine Site.

Table 5-37: Birds Species Observed at Access Road to proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

No.	Scientific Names	Common Names	Habitat			
			Mountain/Hills	Dry Streambeds	Gravel Plains	Total
1.	*Ammomanes cinctura*	Bar-tailed Lark	0	0	1	**1**
2.	*Corvus ruficollis*	Brown-necked Raven	2	0	0	**2**
3.	*Galerida cristata*	Crested Lark	0	1	0	**1**
4.	*Caprimulgus europaeus*	Eurasian Nightjar	0	1	0	**1**
5.	*Calandrella brachydactyla*	Greater Short-Toed Lark	23	0	3	**26**
6.	*Alaemon alaudipes*	Hoopoe Lark	0	1	0	**1**
7.	*Cercotrichas galactotes*	Rufous-tailed Scrub Robin	0	0	1	**1**
8.	*Porzana porzana*	Spotted Crake	0	0	1	**1**
Total Abundance			**25**	**3**	**6**	**34**
Total Richness			**2**	**3**	**4**	**8**

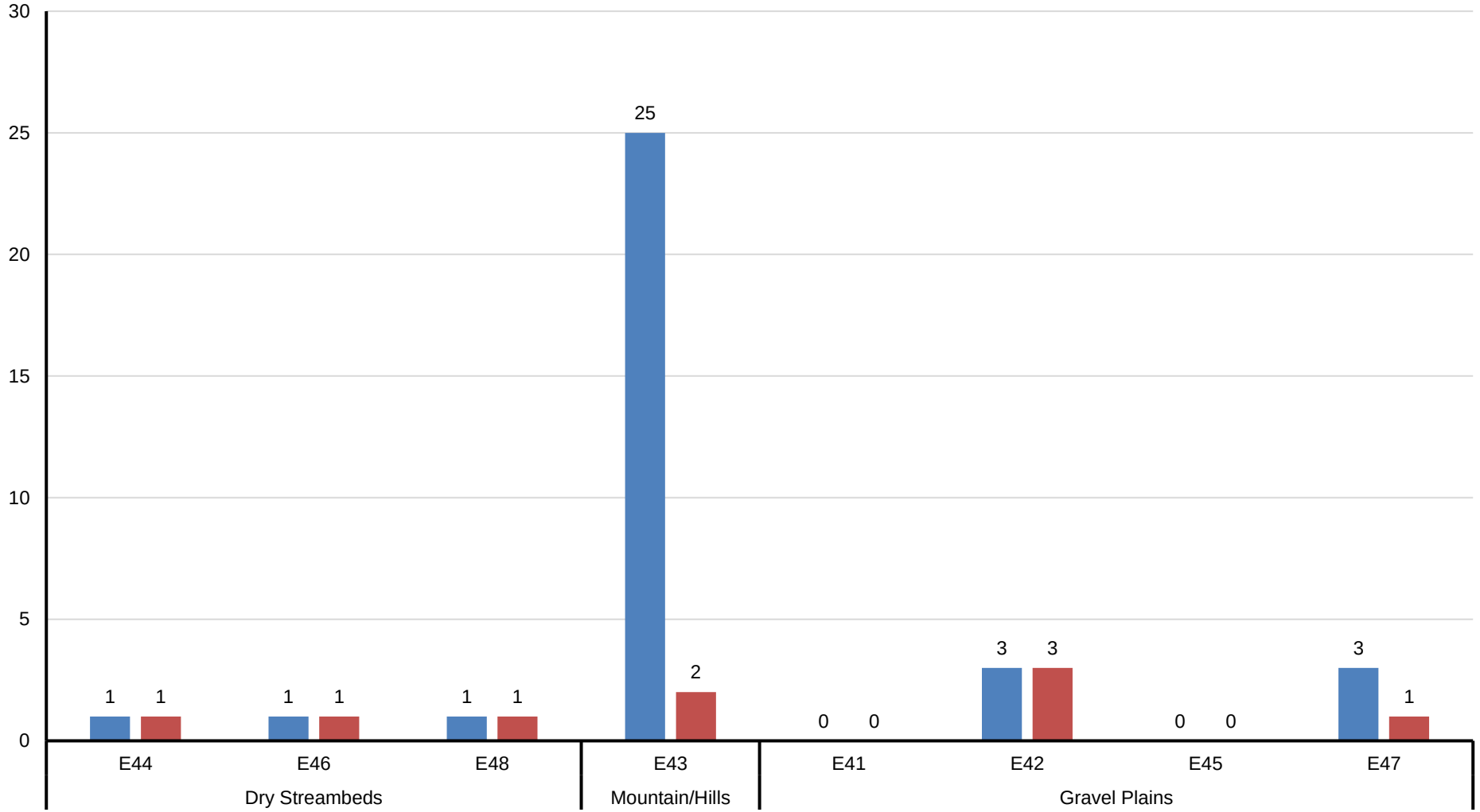


Figure 5-53: Bird Abundance and Richness Observed at Access Road to proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

5.2.7.2.2 Comparison of Post-Monsoon 2022 Surveys and Previous Surveys in Similar Conditions

Appendix K provides the details on comparisons of the result of avifauna sampling during the Post-Monsoon 2022 Survey and Previous Surveys while a summary is discussed below.

A comparison of bird abundance and richness observed during the Post-Monsoon 2022 Survey was made with Previous Surveys conducted in November 2008, September 2009, and August 2020 (collectively referred to as Previous Surveys). The comparison is only given for common sampling locations that were sampled during the Post-Monsoon 2022 and Previous Surveys. The species richness (39 species) observed during the Post-Monsoon 2022 Survey was higher compared to species richness (34 species) in Previous Surveys from common sampling locations. A comparison of each of the Project facilities is discussed below.

5.2.7.2.2.1 Proposed Reko Diq Mine Site

Avifauna abundance and richness (62 specimens of 12 species) at the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey was higher in comparison with Previous Surveys (15 bird specimens of four species). This can be attributed to the establishment of Project's accommodation facility in the area. The facility will serve as a source of food for the species surveyed. During the Previous Surveys, the highest bird diversity was observed in Mountain/Hills (1.0) and Sandy Plains (1.0) habitats while during the Post-Monsoon 2022 Survey, the highest bird diversity was observed in Dry Streambeds (1.3). In Previous Surveys, the highest bird density was observed in Sandy Plains (3.0) while in Post Monsoon 2022 Survey the highest density of birds was observed in the Gravel Plains (3.6) habitat.

5.2.7.2.2.2 Fan Sediment Water Supply Pipeline Area

Birds' abundance and richness (69 specimens of 23 species) observed along the Fan Sediment Water Supply Pipeline Area during the Post-Monsoon 2022 Survey was higher in comparison with Previous Surveys (33 birds' specimens of 13 species) which can be attributed to the lower level of disturbance. In addition, low vegetation may also provide food refugia for desert birds. As these birds extract nutrients from seeds, insects and other scarce food sources in low vegetated environment. Date Palms is the most promising habitat for bird species as the highest abundance and richness were observed in this habitat in both surveys i.e., Post-Monsoon 2022 and Previous Surveys.

5.2.7.2.2.3 Access Road to proposed Reko Diq Mine Site

Birds' abundance and richness (47 specimens of seven species) along the Access Road observed during the Post-Monsoon 2022 Survey were higher compared to Previous Surveys (five bird specimens of one species). The highest bird diversity was observed in Mountain/Hills (2.0) during the Post-Monsoon 2022 Survey while in Previous Surveys, the highest diversity of birds was observed from Dry Streambeds (0.3). During the Previous Surveys, the highest bird density was observed in Dry Streambeds (1.7) while during the Post-Monsoon 2022 Survey, the highest density of birds was observed in Mountains/Hills (25.0).

5.2.7.2.3 Spring 2023 Survey

A total of 79 bird specimens belonging to 21 species were observed at the proposed Reko Diq Mine Site, along the Fan Sediment Water Supply Pipeline Area, and Access

Road of proposed Reko Diq Mine Site. The highest average diversity of bird species was observed at the Fan Sediment Water Supply Pipeline Area (1.3) followed by the Access Road to proposed Reko Diq Mine Site (1.0), and proposed Reko Diq Mine Site (0.5). The highest average density was observed along the Fan Sediment Water Supply Pipeline Area (3.9) followed by the proposed Reko Diq Mine Site (1.2), and Access Road to proposed Reko Diq Mine Site (1.0).

Table 5-37 provides the list of bird species observed during the Spring 2023 Survey along with IUCN status, CITES status, regional status, migratory status, food items, and occurrence in the area.

Figure 5-54 provides photographs of some bird species observed during the Spring 2023 Survey.



a) Indian Golden Oriole



b) Eurasian Collard Dove



c) Rufous-tailed Rock Thrush



d) A gulp of Barn Swallows



e) European Roller



f) Crested Lark

Figure 5-54: Bird Species Observed, Spring 2023 Survey

5.2.7.2.3.1 Proposed Reko Diq Mine Site

A total of 25 bird specimens belonging to 10 species were observed from the proposed Reko Diq Mine Site from 20 sampling locations. The most abundant bird species observed at the proposed Reko Diq Mine Site was the Brown-necked Raven with a total of 11 specimens followed by the Common Raven (three specimens) and Asian Desert Warbler, Moustached Warbler, Rufous-tailed Scrub Robin with two specimens each. The Bar-tailed Lark, Booted Warbler, Desert Lark, and Greater Short-toed Lark were rare species with only one specimen of each species observed.

The highest average diversity of birds was observed in Clayey Plains (2.0), followed by Mountains/Hills (1.2), Sandy Plains/Sand Dunes (1.0), and Dey Streambeds (0.3). Similarly, the highest average density was observed in Mountains/Hills (3.4), followed by Clayey Plains (3.0), Sandy Plains/Sand Dunes (3.0), and Dry Streambeds (0.3). No specimen of any species was observed in Gravel Plains at the proposed Reko Diq Mine Site during the Spring 2023 Survey. This can be attributed to unfavorable weather conditions for birds with harsh and heavy winds prevalent. Consequently, birds tend to avoid these weather conditions. Therefore, the absence of food and the challenges posed by the strong winds make it an unsuitable habitat for birds.

Table 5-38 provides the list of the bird species observed in different habitats at the proposed Reko Diq Mine Site. Figure 5-55 provides the graph of bird abundance and richness observed at each sampling location at the proposed Reko Diq Mine Site.

Table 5-38: Bird Species Observed in Different Habitats at the proposed Reko Diq Mine Site, Spring 2023 Survey

No.	Scientific Names	Common Names	Habitat					Total
			Clayey Plains	Gravel Plains	Mountain/Hills	Dry Streambeds	Sandy Plains	
1.	*Acrocephalus melanopogon*	Mustached Warbler	-	-	2	-	-	**2**
2.	*Alaemon alaudipes*	Hoopoe Lark	-	-	-	1	-	**1**
3.	*Ammomanes cinctura*	Bar-tailed Lark	-	-	-	1	-	**1**
4.	*Ammomanes deserti*	Desert Lark	-	-	1	-	-	**1**
5.	*Calandrella brachydactyla*	Greater Short-toed Lark	-	-	1	-	-	**1**
6.	*Cercotrchas galactotes*	Rufous-tailed Scrub Robin	2	-	-	-	-	**2**
7.	*Corvus corax*	Common Raven	-	-	-	-	3	**3**
8.	*Corvus ruficollis*	Brown-necked Raven	-	-	11	-	-	**11**
9.	*Iduna caligate*	Booted Warbler	-	-	1	-	-	**1**
10.	*Sylvia nana*	Asian Desert Warbler	1	-	1	-	-	**2**
Total Abundance			**3**	**-**	**17**	2	3	**25**
Total Richness			**2**	**0**	**6**	2	1	**10**

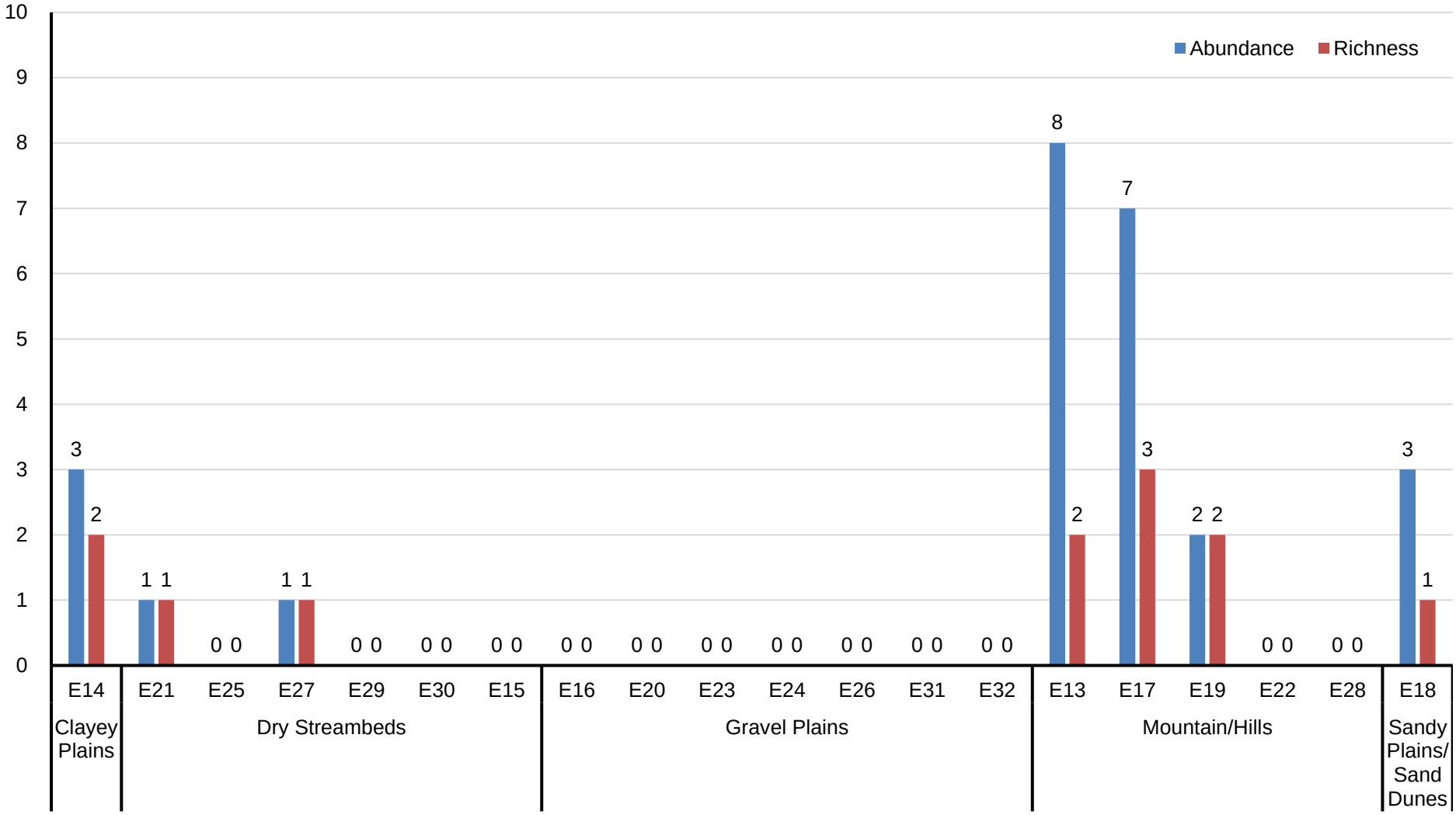


Figure 5-55: Bird Abundance and Richness Observed at the proposed Reko Diq Mine Site, Spring 2023 Survey

5.2.7.2.3.2 Fan Sediment Water Supply Pipeline Area

A total of 50 birds belonging to 17 species were observed along the Fan Sediment Water Supply Pipeline Area from 13 sampling locations. The most abundant bird species observed along the Fan Sediment Water Supply Pipeline Area was the Greater Hoopoe Lark with a total of 11 specimens followed by the Desert Lark and Brown-necked Raven (five specimens each), four specimens of the Eurasian Collared Dove, European Roller and Red Vented Bulbul, three specimens of the Asian Desert Warbler, Barn Swallow and White-eared Bulbul.

The Clamorous Reed Warbler, Greater Short-toed Lark, Hooded Wheatear, Indian Golden Oriole, Moustached Warbler, Rosy Starling, and Rufous-tailed Rock Thrush were the rare species with only one specimen of these species observed along Fan Sediment Water Supply Pipeline Area during the Spring 2023 Survey. The highest abundance and richness of birds were observed in Agricultural Areas/Date Palms with a total of 23 specimens belonging to nine species.

During the Spring 2023 Survey, the highest average diversity of birds was observed in Agricultural Areas/Date Palms (9.0) followed by Mountains/Hills (5.0), Sandy Plains/Sand Dunes (2.0), Clayey Plains (1.0), Gravel Plains (0.7) and Dry Streambeds (0.5). Similarly, the highest average density of the bird species was observed in Agricultural Areas/Date Palms (23.0), Mountains/Hills (7.0), Clayey Plains (3.0), Sandy Plains/Sand Dunes (2.0), Gravel Plains (1.7), and Dry Streambed (1.2).

Table 5-39 provides the abundance of bird species observed along the Fan Sediment Water Supply Pipeline Area during the Spring 2023 Survey.

Figure 5-56 provides the graph of bird abundance and richness by sampling location and habitat types along the Fan Sediment Water Supply Pipeline Area.

Table 5-39: Birds Species Observed in Different Habitats along Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

No.	Scientific Names	Common Names	Habitat						Total
			Agricultural Areas/ Date Palms	Dry Streambeds	Mountain/Hills	Sandy Plains	Clayey Plains	Gravel Plains	
1.	*Acrocephalus melanopogon*	Moustached Warbler	1	-	-	-	-	-	**1**
2.	*Acrocephalus stentoreus*	Clamorous Reed Warbler	-	-	-	-	1	-	**1**
3.	*Alaemon alaudipes*	Hoopoe Lark	5	-	-	1	5	-	**11**
4.	*Ammomanes deserti*	Desert Lark	-	4	1	-	-	-	**5**

No.	Scientific Names	Common Names	Habitat						
			Agricultural Areas/ Date Palms	Dry Streambeds	Mountain/Hills	Sandy Plains	Clayey Plains	Gravel Plains	Total
5.	*Calandrella brachydactyla*	Greater Short-toed Lark	-	-	-	-	-	1	**1**
6.	*Coracias garrulus*	European Roller	-	-	-	-	-	4	**4**
7.	*Corvus ruficollis*	Brown-necked Raven	-	1	2	-	-	2	**5**
8.	*Hirundo rustica*	Barn Swallow	3	-	-	-	-	-	**3**
9.	*Monticola saxatilis*	Rufous-tailed Rock Thrush	-	-	1	-	-	-	**1**
10.	*Oenanthe monacha*	Hooded Wheatear	-	-	1	-	-	-	**1**
11.	*Oriolus kundoo*	Indian Golden Oriole	1	-	-	-	-	-	**1**
12.	*Pastor roseus*	Rosy Starling	1	-	-	-	-	-	**1**
13.	*Riparia chinensis*	Asian Plain Martin	-	-	-	1	-	-	**1**
14.	*Pycnonotus cafer*	Red Vented Bulbul	4	-	-	-	-	-	**4**
15.	*Pycnonotus leucotis*	White-eared Bulbul	3	-	-	-	-	-	**3**
16.	*Streptopelia decaocto*	Collared Dove	4	-	-	-	-	-	**4**
17.	*Sylvia nana*	Asian Desert Warbler	1	-	2	-	-	-	**3**
Total Abundance			**23**	**5**	**7**	**2**	**6**	**7**	**50**
Total Richness			**9**	**2**	**5**	**2**	**2**	**3**	**17**

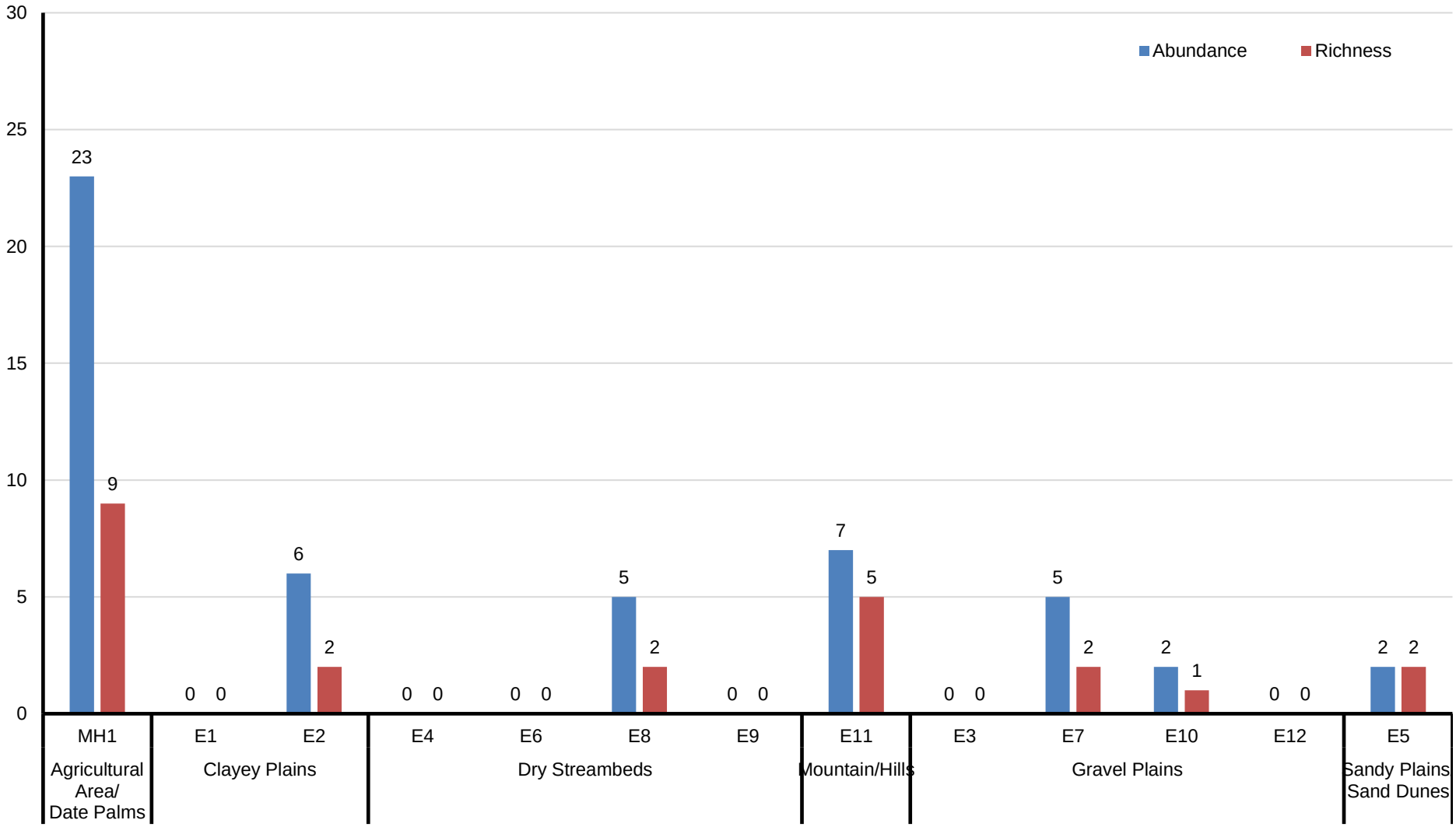


Figure 5-56: Bird Abundance and Richness Observed along Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

5.2.7.2.3.3 Access Road to the proposed Reko Diq Mine Site

A total of four birds belonging to four species were observed along the Access Road to the proposed Reko Diq Mine Site from eight sampling locations. The major habitat types were Dry Streambeds, Gravel Plains, and Mountains/Hills. The bird species observed during the Spring 2023 Survey include the Barn Sallow, Greater Short-toed Lark, Indian Golden Oriole, and Rufous-tailed Scrub Robin.

During the Spring 2023 Survey, the highest average diversity and density was observed in Dry Streambeds (1.0) while no bird species was observed from Gravel Plains and Mountains/Hills during the Spring 2023 Survey.

Table 5-40 provides the abundance of bird species observed along the Access Road to the proposed Reko Diq Mine Site during the Spring 2023 Survey.

Figure 5-57 provides the graph of bird abundance and species richness observed by sampling location at Access Road to the proposed Reko Diq Mine Site.

Table 5-40: Bird Species Observed in Different Habitats along Access Road to the proposed Reko Diq Mine Site, Spring 2023 Survey

No.	Scientific Names	Common Names	Habitat			Total
			Dry Streambeds	Mountain/Hills	Gravel Plains	
1.	*Calandrella brachydactyla*	Greater Short-toed Lark	1	-	-	**1**
2.	*Cercotrchas galactotes*	Rufous-tailed Scrub Robin	1	-	-	**1**
3.	*Hirundo rustica*	Barn Swallow	1	-	-	**1**
4.	*Oriolus kundoo*	Indian Golden Oriole	1	-	-	**1**
Total Abundance			**4**	**-**	**-**	**4**
Total Richness			**4**	**-**	**-**	**4**

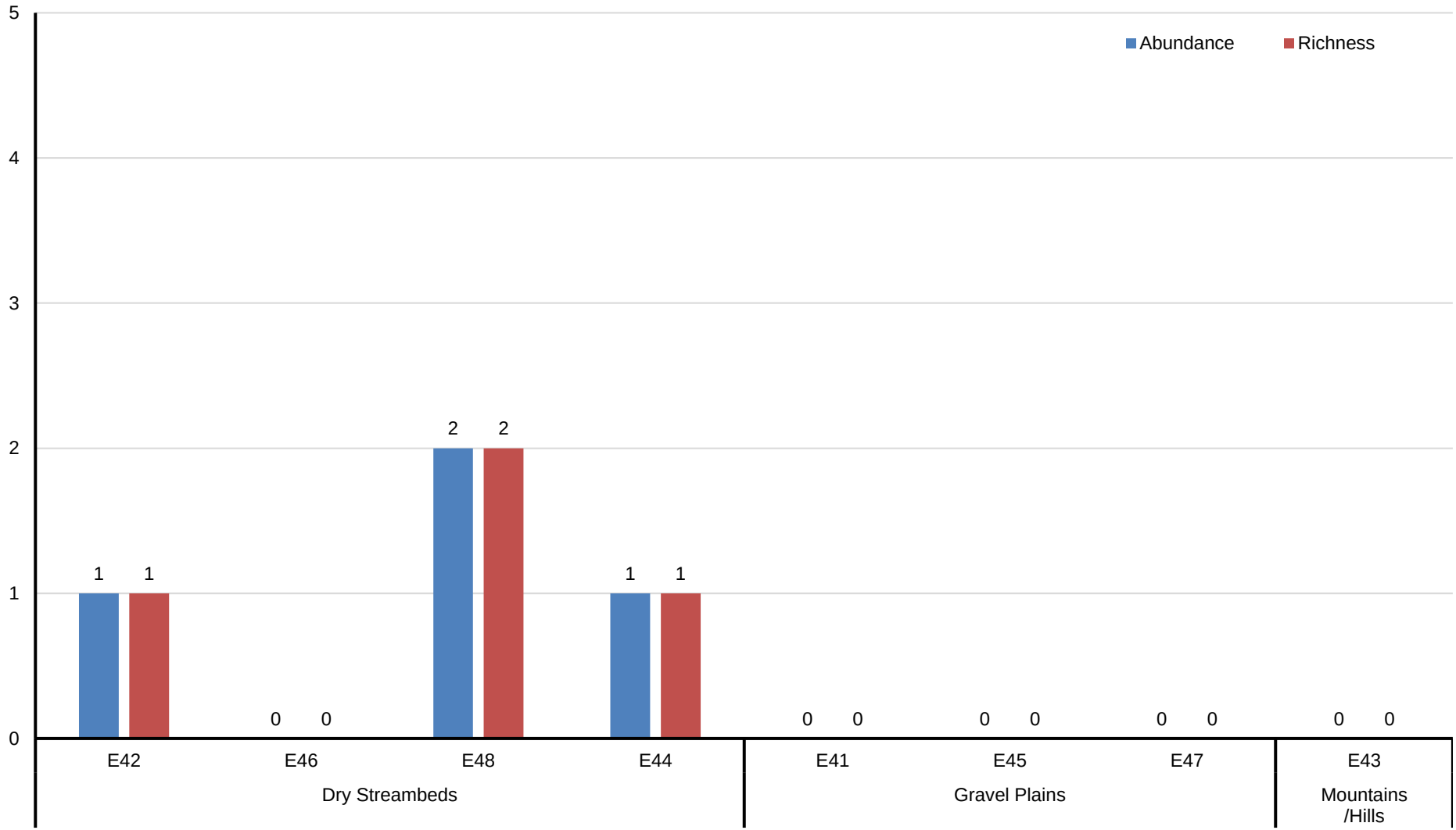


Figure 5-57: Bird Abundance and Richness Observed along Access Road to the proposed Reko Diq Mine Site, Spring 2023 Survey

5.2.7.2.4 Comparison of Spring 2023 Survey and Previous Survey in Similar Condition

The comparison is only provided for the proposed Reko Diq Mine Site for the common sampling locations where sampling was conducted during both Previous Survey (May 2008 Survey) and Spring 2023 Survey. The details on comparisons of the result of avifauna sampling during both Spring 2023 Survey and Previous Survey are provided in **Appendix D**. The comparison is only made for four common sampling locations at the proposed Reko Diq Mine Site. A short summary is discussed below.

5.2.7.2.4.1 Proposed Reko Diq Mine Site

Avifauna abundance and richness (10 bird specimens of four species) at the proposed Reko Diq Mine Site during the Previous Survey was higher as compared to the Spring 2023 Survey (no specimen of any species was observed from common sampling locations). This can be attributed to the extremely dry and hard weather conditions at the proposed Reko Diq Mine Site during the Spring 2023 Survey. In addition, the regular movement of vehicles for cross border trade, small scale mining and camps for security forces at this site may also be the reason for lower birds' abundance during the Spring 2023 Survey in comparison with Pervious Survey. During the Previous Survey, the highest bird density and diversity of bird species at the was observed in Gravel Plains, however, in the Spring 2023 Survey no specimen of any bird species was observed from common sampling locations.

5.2.7.2.5 Discussion

Birds are often considered important indicators of environmental changes and the overall health of ecosystems. Their abundance and richness can provide valuable insights into the ecological conditions and dynamics of the Ecological Study Area. The findings of Post-Monsoon 2022 and Spring 2023 surveys suggest that the Fan Sediment Water Supply Pipeline Area is particularly favorable for birds due to its natural habitat, availability of food and water resources, and adaptation to climatic conditions. Certainly, the lower level of disturbance along the Fan Sediment Water Supply Pipeline Area, particularly due to lower vehicle movement for cross-border trade contributes towards creating a favorable environment for birds compared to other sites. Decline in these anthropogenic factors reduced noise pollution, and habitat fragmentation and enhanced the habitat for nesting and foraging opportunities.

The scarcity of water and limited vegetation in comparison to other areas makes it a less preferred site for birds at the proposed Reko Diq Mine Site. These factors directly affect the availability of food and shelter for bird populations, reducing their overall abundance and diversity. Additionally, anthropogenic activities, such as the frequent movement of vehicles for cross-border trade contribute to the disturbance of bird species at the proposed Reko Diq Mine Site. Birds are sensitive to disturbances in their environment, and constant vehicle movement can disrupt their feeding and nesting sites, causing them to avoid or leave the area altogether. The results of the Post-Monsoon 2022 and Spring 2023 surveys likely reflected these challenges, showing a decline in bird species compared to the Previous Survey (May 2008 Survey) when conditions were more favorable.

The conditions are harsh and dry along Access to the proposed Reko Diq Mine Site. The habitat is characterized by gravel plains and dry streambeds with sparse vegetation. The

presence of frequent vehicle movement for cross-border trade and human trafficking using multiple routes creates disturbances and disrupts the natural environment. As a result, there is little food and only a few suitable breeding grounds available for birds in the area. Dry streambeds along the Access Road are the most promising habitat for birds. The presence of vegetation in these areas likely supports a higher diversity of bird species compared to the gravel plains and mountains/hills.

5.2.7.2.6 Conservation Concern Birds Species

Two conservation concern bird species were observed from the Fan Sediment Water Supply Pipeline Area during the Post- Monsoon 2023 Survey, the Egyptian Vulture *Neophron percnopterus* listed as Endangered and the Asian Houbara Bustard *Chlamydotis macqueenii* listed as Vulnerable.[106] No conservation concern bird species was observed during the Spring 2023 Survey.

The Egyptian Vulture is distributed from the Iberian Peninsula across North Africa and India. In Pakistan, it breeds in the summer season in Balochistan Province, however, it is a year-round resident found extensively in various areas of Pakistan. They more often feed on carrion, rotting flesh of dead animals, and sometimes prey on small birds and reptiles. These vultures were once common in Pakistan, but their number has decreased drastically due to the loss of habitat because of infrastructure development. Consequently, the Egyptian Vulture has become very rare.

The Asian Houbara Bustard arrives every year in Pakistan in November and December from Mongolia, Siberia, and Central Asian republics for wintering. In Pakistan, this precious bird species is called ‘the Provincial Bird’ of Balochistan. The major threats to this species are hunting, habitat destruction, and overgrazing.

5.2.7.3 Herpetofauna

The line transect sampling method was used for herpetofauna sampling during both Post-Monsoon 2022 and Spring 2023 surveys. A total of 19 herpetofauna species were observed during both Post-Monsoon and Spring 2023 surveys from the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and along the Access Road to the proposed Reko Diq Mine Site. Of the observed herpetofauna species, 14 species were observed during the Post-Monsoon 2022 Survey, and 10 species were observed during the Spring 2023 Survey.

Table 5-41 provides a list of herpetofauna species observed during both Post-Monsoon 2022 and Spring 2023 surveys from the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and along the Access Road to the proposed Reko Diq Mine Site.

5.2.7.3.1 Post-Monsoon 2022 Survey

A total of 45 specimens belonging to 14 species were observed from the Ecological Study Area. Of these, 17 specimens of seven species were observed at the proposed Reko Diq Mine Site, 23 specimens of nine species along the Fan Sediment Water Supply Pipeline

106 International Union for Conservation of Nature (IUCN), Available at https://www.iucnredlist.org/species/22695180/205187871, Accessed on 09 July 2023

Area, and five specimens of three species along the Access Road to the proposed Reko Diq Mine Site.

Table 5-41 provides a list of herpetofauna species, observed during the Post-Monsoon 2022 Survey along with IUCN status, feeding behavior, and other features while Figure 5-58 provides photographs of herpetofauna species observed during the Post-Monsoon 2022 Survey.

Table 5-41: Herpetofauna Species Observed in Post-Monsoon 2022 and Spring 2023 Surveys

No.	Scientific Name	Common Name	Post Monsoon 2022	Spring 2023	IUCN Status	Feeding Behavior	Occurrence in the Area	Activity Pattern	Breeding Season
1.	*Acanthodactylus blanfordii*	Blanford's Fringe-fingered Lizard	✓	✓	Least Concern	Insectivore	Common	Diurnal	June
2.	*Agamura cruralis*	Spider Gecko	✓	-	Not Evaluated	Insectivore	Rare	Non-specific	April
3.	*Acanthodactylus micropholis*	Ornated Toad-headed Agama	✓	-	Least Concern	Insectivore	Common	Diurnal	April
4.	*Cyrtopodion scabrum*	Rough-tailed Bentoed Gecko	✓	-	Least Concern	Insectivore	Common	Nocturnal	May
5.	*Echis carinatus multisquamatus*	Multiscale Saw-scaled Viper	-	✓	Least Concern	Carnivore	Common	Nocturnal	-
6.	*Eremias cf. scripta*	Sand Racerunner	-	✓	Least Concern	Insectivore	Common	Diurnal	May
7.	*Eremias fasciata*	Seistan Racerunner	-	✓	Least Concern	Insectivore	Common	Diurnal	May
8.	*Eumeces zarudnyi*	Schokari Sand Racer	✓	-	Least Concern	Insectivore	Rare	Nocturnal	June
9.	*Laudakia fusca*	Yellow-headed Rock Agama	✓	-	Least Concern	Omnivore (mostly insectivorous)	Common	Diurnal	July
10.	*Mesalina watsonana*	Persian Long-tailed Desert Lizard	✓	-	Least Concern	Insectivore	Common	Diurnal	August
11.	*Ophiomorus tridactylus*	Indian Sand Swimmer	✓	✓	Least Concern	Insectivore	Common	Nocturnal	July
12.	*Phrynocephalus maculatus*	Black Tailed Toad-headed Agama	✓	✓	Least Concern	Insectivore	Common	Diurnal	June
13.	*Phrynocephalus ornatus*	Ornated Toad-headed Agama	✓	✓	Least Concern	Insectivore	Rare	Diurnal	May

No.	Scientific Name	Common Name	Post Monsoon 2022	Spring 2023	IUCN Status	Feeding Behavior	Occurrence in the Area	Activity Pattern	Breeding Season
14.	*Platyceps karelini*	Gold Skink	✓	-	Least Concern	Insectivore	Common	Diurnal	July
15.	*Psammophis schokari*	Spotted Desert Racer	✓	✓	Least Concern	Carnivore	Common	Diurnal	June
16.	*Phrynocephalus euptilopus*	Alcock's Toad-headed Agama	✓	-	Least Concern	Insectivore	Rare	Diurnal	May
17.	*Phrynocephalus clarkorum*	Clark's Toad-headed Agama	-	✓	Least Concern	Insectivore	Rare	Diurnal	May
18.	*Trapelus agilis*	Brilliant Ground Agama	✓	-	Least Concern	Insectivore	Common	Diurnal	April
19.	*Phrynocephalus luteoguttatus*	Yellow-speckled Toad-headed Agama	-	✓	Least Concern	Insectivore	Rare	Diurnal	May
Total			**14**	**10**					



a) Laudakia fusca



b) Phrynocephalus maculatus



c) Trapelus agilis



d) Acanthodactylus blanfordii



e) Psammophis schokari



f) Eumeces zarudnyi

Figure 5-58: Herpetofauna Species Observed, Post-Monsoon 2022 Survey

The following are key observations of Post-Monsoon 2022 Survey for each Project facility.

5.2.7.3.1.1 Proposed Reko Diq Mine Site

A total of 17 herpetofauna specimens belonging to seven species were observed from 20 sampling locations at the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey. The species observed from the proposed Reko Diq Mine Site include the Black-tail Toad-headed Agama *Phrynocephalus maculatus*, Blanford's Fringe-fingered Lizard *Acanthodactylus blanfordii*, Indian Sand-Swimmer *Ophiomorus tridactylus*, Ornated Toad-headed Agama, *Phrynocephalus ornatus*, Persian Long-tailed Desert Lizard *Mesalina watsonana*, Rough-tailed Bentoed Gecko, *Cyrtopodion scabrum* Spider Gecko *Agamura cruralis*, and Yellow-headed Rock Agama *Laudakia fusca*. These species were well

adapted to the climatic conditions which offer a range of suitable habitats such as food, refugia, and breeding grounds.

At the proposed Reko Diq Mine Site, the highest density of herpetofauna was observed in the Sandy Plains/Sand Dunes (3.0) followed by Mountain/Hills (1.0), Dry Streambeds (0.8), and Gravel Plains (0.5). Similarly, the highest diversity of herpetofauna was also observed in the Sandy Plains/Sand Dunes (2.0) followed by Mountain/Hills (0.6), Dry Streambeds (0.3), and Gravel Plains (0.3). The highest abundance and richness were observed at Sampling Location E18 in Sandy Plains/Sand Dunes with three specimens belonging to two species: Spider Gecko *Agamura cruralis* and Ornated Toad-headed Agama *Phrynocephalus ornatus.*

Overall, herpetofauna abundance and richness were lower due to extreme arid conditions, and scarcity of food and shelter. However, different habitats offer varying resources for herpetofauna species. The aforementioned results indicate that the Sandy Plains/Sand Dunes habitat was most promising for the herpetofauna. Sandy Plains/Sand Dunes have scattered vegetation which provides food and shelter to herpetofauna species. Additionally, most desert reptiles prefer to lay in sun-exposed sandy sites where they easily get food in terms of invertebrates and avoid predators by hiding in sand. No conservation concern species were observed from the proposed Reko Diq Mine Site.

Table 5-42 provides the abundance of herpetofauna species by habitat type observed at the proposed Reko Diq Mine Site.

Figure 5-59 provides the abundance and richness of herpetofauna species by sampling locations observed at each sampling location along with their habitat types.

Table 5-42: Abundance of Herpetofauna by Habitat Type Observed at the proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

No.	Scientific Names	Common Names	Habitat Type				
			Dry Streambeds	Sandy Plains/Sand Dunes	Gravel Plains	Mountains/Hills	Total
1.	*Phrynocephalus maculatus*	Blacktailed Toad-headed Agama	3	-	3	-	**6**
2.	*Acanthodactylus blanfordii*	Blanford's Fringe-fingered Lizard	2	-	-	-	**2**
3.	*Phrynocephalus ornatus*	Ornated Toad-headed Agama	-	2	-	-	**2**
4.	*Mesalina watsonana*	Persian Long-tailed Desert Lizard	-	-	1	-	**1**
5.	*Cyrtopodion scabrum*	Rough-tailed Bentoed Gecko	-	-	-	1	**1**
6.	*Agamura cruralis*	Spider Gecko	-	1	-	1	**2**
7.	*Laudakia fusca*	Yellow-headed Rock Agama	-	-	-	3	**3**
Abundance			**5**	**3**	**4**	**5**	**17**
Richness			**1**	**2**	**1**	**6**	**7**

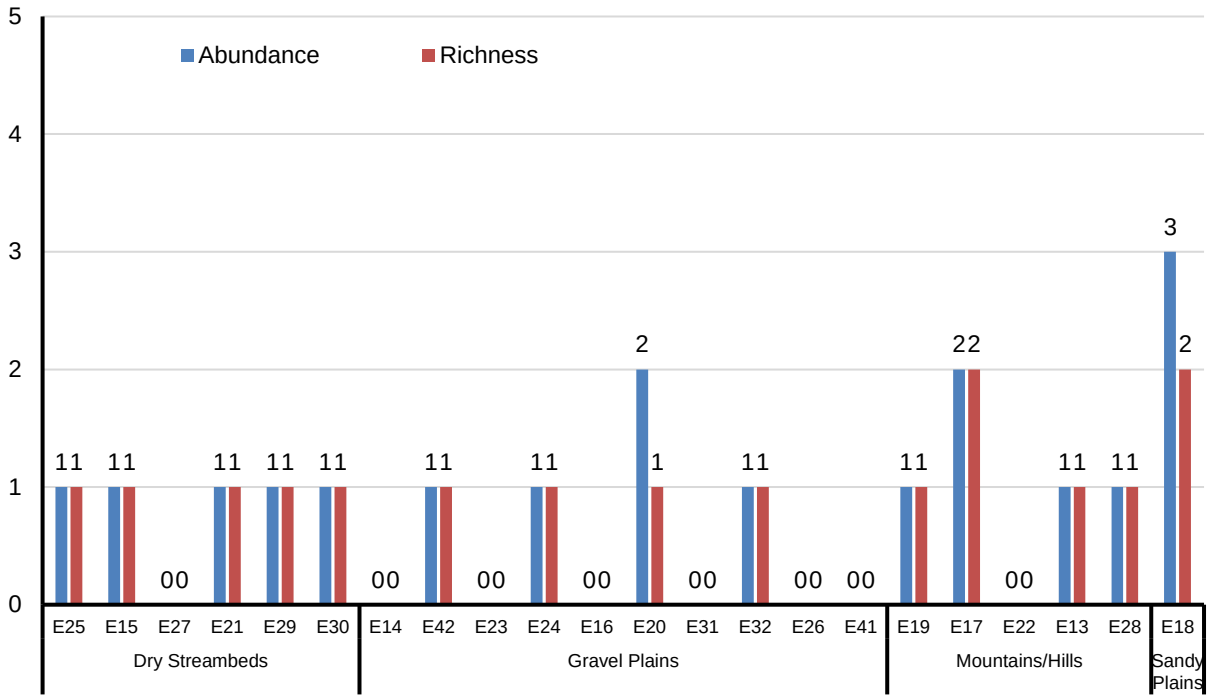


Figure 5-59: Abundance and Richness of Herpetofauna Species by Sampling Location at the proposed Reko Diq Mine Site Observed, Post-Monsoon 2022 Survey

5.2.7.3.1.2 Fan Sediment Water Supply Pipeline Area

A total of 23 specimens belonging to nine species were observed from 13 sampling locations, including one microhabitat identified in the field. The species observed along Fan Sediment Water Supply Pipeline Area include Alcoks's/Chagai Toad-headed Agama *Phrynocephalus maculatus*, Brilliant Ground Agama *Trapelus agilis*, Alcock's toad-headed Agama *Phrynocephalus euptilopus*, Gold Skink *Platyceps karelini*, Indian Sand Swimmer *Ophiomorus tridactylus*, Ornated Toad-headed Agama *Acanthodactylus micropholis*, Spotted Desert Racer *Eumeces zarudnyi*, Schokari Sand Racer *Psammophis schokari* and Yellow-tailed Fringe-fingered Lizard *Phrynocephalus ornatus*.

The highest density of herpetofauna was observed in the Sandy Plains/Sand Dunes (6.0) followed by Gravel Plains (1.8) Agricultural Areas/Date Palms (1.0), Clayey Plains (1.0), Dry Streambeds (0.3). Similarly, the highest diversity of herpetofauna was observed in the Sandy Plains/Sand Dunes (3.0) followed by Agricultural Areas/Date Palms (1.0), Gravel Plains (0.5), Clayey Plains (0.5) and Dry Streambeds (0.3). However, no herpetofauna species was observed in Mountain/Hills. Sandy Plains/Sand Dunes with little vegetation provide perfect refugia and food, especially for herpetofauna species. On the other hand, Mountains/Hills along the Fan Sediment Water Supply Pipeline Area were dry without any shelter which is the reason for the absence of herpetofauna in this habitat.

The highest abundance and richness were observed at Sampling Location E5 located in Sandy Plains/Sand Dunes. A total of 11 specimens of six species were observed along Fan Sediment Water Supply Pipeline Area which include Black-tailed Toad-headed Agama *Phrynocephalus maculatus,* Brilliant Ground Agama *Trapelus agilis*, Spotted Desert Racer *Platyceps karelini*, Indian Sand-swimmer *Ophiomorus tridactylus*, Schokari Sand Racer *Psammophis schokari*, and Ornated Toad-headed Agama *Phrynocephalus*

ornatus. Table 5-43 provides the abundance of herpetofauna species observed along Fan Sediment Water Supply Pipeline Area.

Figure 5-60 provides the abundance and richness of herpetofauna species observed along Fan Sediment Water Supply Pipeline Area.

Table 5-43: Herpetofauna Species by Habitat Type Observed along Fan Sediment Water Supply Pipeline Area, Post-Monsoon 2022 Survey

No.	Scientific Names	Common Names	Habitat						
			Clayey Plains	Gravel Plains	Dry Streambeds	Sandy Plains/Sand Dunes	Mountains/Hills	Agricultural Areas/ Date Palms	Total
1	*Phrynocephalus maculatus*	Blacktailed Toad-headed Agama	2	6	-	4	-	-	**12**
2	*Trapelus agilis*	Brilliant Ground Agama	-	-	-	-	-	1	**1**
3	*Phrynocephalus euptilopus*	Alcock's toad-headed Agama	-	-	-	1	-	-	**1**
4	*Platyceps karelini*	Spotted Desert Racer	-	-	-	1	-	-	**1**
5	*Ophiomorus tridactylus*	Indian Sand Swimmer	-	-	-	4	-	-	**4**
6	*Acanthodactylus micropholis*	Yellowtail Fringe-fingered Lizard	-	-	-	1	-	-	**1**
7	*Eumeces zarudnyi*	Gold Skink	-	-	-	1	-	-	**1**
8	*Psammophis schokari*	Schokari Sand Racer	-	-	1	-	-	-	**1**
9	*Phrynocephalus ornatus*	Ornated Toad-headed Agama	-	1	-	-	-	-	**1**
Abundance			**2**	**7**	**1**	**12**	**-**	**1**	**23**
Richness			**1**	**2**	**1**	**6**	**0**	**1**	**9**

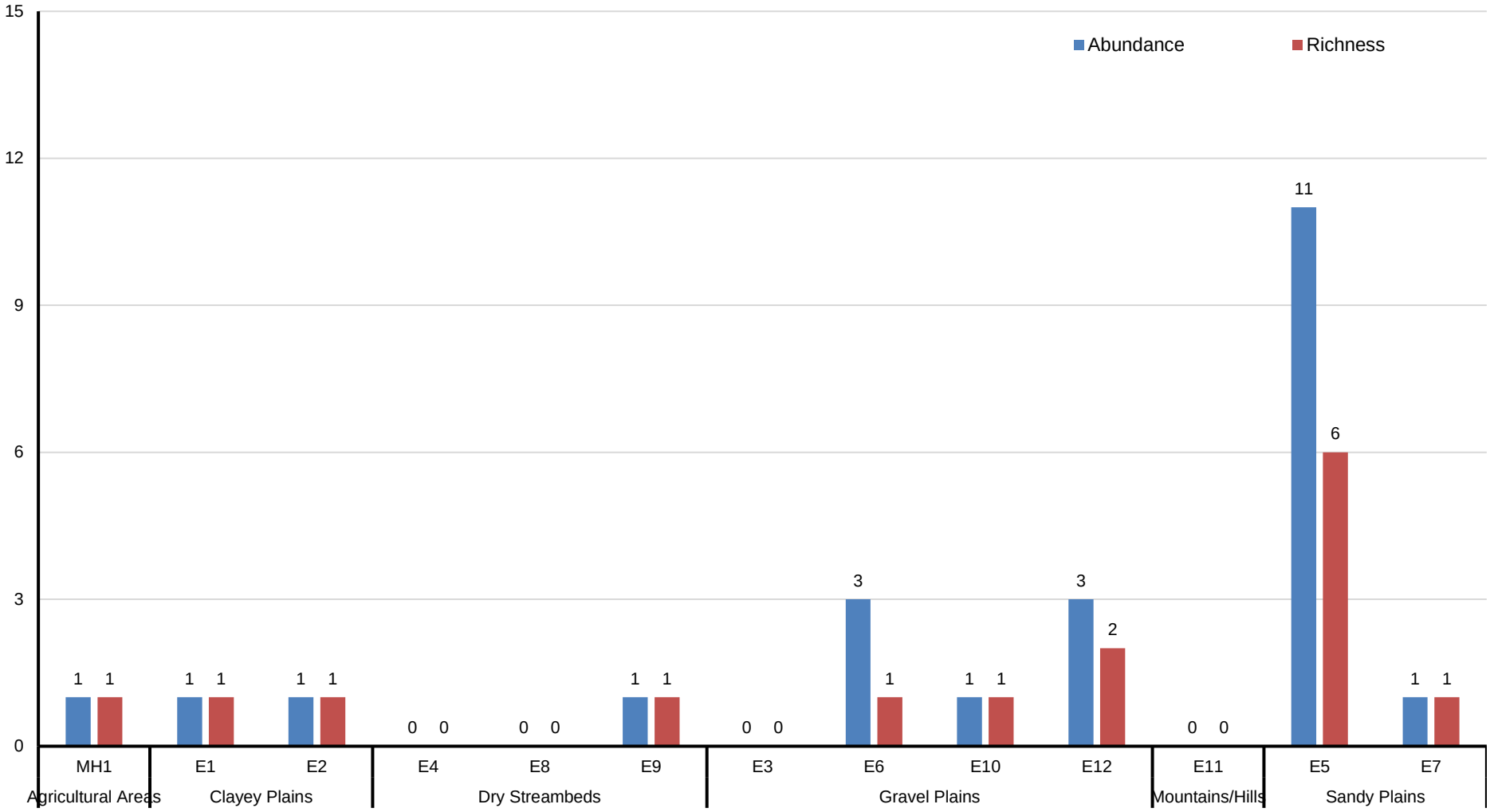


Figure 5-60: Abundance and Richness of Herpetofauna Species by Sampling Locations Observed along Fan Sediment Water Supply Pipeline Area, Post-Monsoon 2022 Survey

5.2.7.3.1.3 Access Road to the proposed Reko Diq Mine Site

A total of five specimens belonging to three species were observed from eight sampling locations. The species observed along Access Road include the Black-tailed Toad-headed Agama *Phrynocephalus maculatus*, Indian Sand Swimmer *Ophiomorus tridactylus*, and Blanford's Fringe-fingered Lizard *Acanthodactylus blanfordii*.

The highest density of herpetofauna was observed in the Dry Streambeds (1.0) followed by Gravel Plains (1.8) Agricultural Areas/Date Palms (1.0), Clayey Plains (1.0), and Dry Streambeds (0.5). Similarly, the highest diversity of herpetofauna was also observed in the Dry Streambeds (0.7) followed by Gravel Plains (0.50). However, no herpetofauna species was observed in Mountain/Hills. Mountains/Hills along the Access Road were dry without any shelter which is the reason for the absence of herpetofauna.

Table 5-44 provides the abundance of herpetofauna species observed along the Access Road to the proposed Reko Diq Mine Site.

Figure 5-62 provides the abundance and richness of herpetofauna species observed along the Access Road to the proposed Reko Diq MIne Site.

Table 5-44: Herpetofauna Species by Habitat Type Observed along Access Road to the proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

No.	Scientific Names	Common Names	Habitat			
			Gravel Plains	Dry Streambeds	Mountains/Hills	Total
1.	*Phrynocephalus maculatus*	Black-tailed Toad-headed Agama	1	2	-	**3**
2.	*Ophiomorus tridactylus*	Indian Sand Swimmer	1	-	-	**1**
3.	*Acanthodactylus blanfordii*	Blanford's Fringe-fingered Lizard	-	1	-	**1**
Abundance			**2**	**3**	**-**	**5**
Richness			**2**	**2**	**0**	**3**

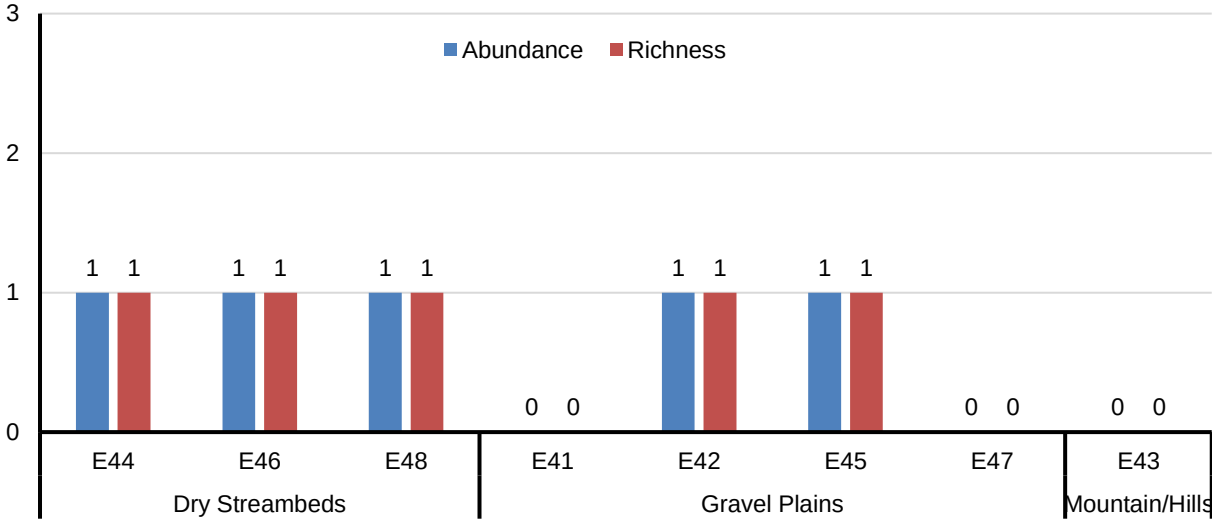


Figure 5-61: Abundance and Richness of Herpetofauna Species by Sampling Locations Observed along Access Road to proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

5.2.7.3.2 Comparison of Post-Monsoon 2022 Survey with Previous Surveys

Appendix K provides the details on comparisons of the result of herpetofauna sampling conducted during the Post-Monsoon 2022 Survey and Previous Surveys while a summary is discussed below.

The lower species richness (17 species) was observed during the Post-Monsoon 2022 Survey compared to Previous Surveys (29 species). This can be attributed to survey limitation, as previously nocturnal survey was also conducted which was not feasible during the Post-Monsoon 2022 Survey due to security considerations. There was higher disturbance during the Post-Monsoon 2022 Survey due to increased vehicle movement for cross-border trade and less rains in last decade or so, which avoid the movement of herpetofauna.

5.2.7.3.2.1 Proposed Reko Diq Mine Site

No change in average diversity (0.5) of herpetofauna species was observed at the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey and Previous Surveys. However, a slight decline in the density of herpetofauna was observed during the Post-Monsoon 2022 Survey (0.9) compared to Previous Surveys (1.1). This slight decrease in density can be attributed to the less rains in last decade or so which affected the overall fauna and flora at the proposed Reko Diq Mine Site.

In Previous Surveys, the highest average diversity (0.7) and density (2.3) were observed in Dry Streambeds and Mountains/Hills respectively, while during the Post-Monsoon 2022 Survey, the highest diversity (2.0) and density (3.0) were observed in Sandy Plains. In Sandy Plains, no species was observed during the Previous Surveys, but higher diversity was observed during the Post-Monsoon 2022 Survey. Shifting sand dunes with scattered vegetation provide potential habitat for herpetofauna species.

5.2.7.3.2.2 Fan Sediment Water Supply Pipeline Area

The average diversity (0.7) and density (1.8) of herpetofauna species observed during the Post-Monsoon 2022 Survey was lower compared to the average diversity (0.9) and density (3.4) during the Previous Surveys. It can be attributed to the extreme dry season which affected the flora and fauna along Fan Sediment Water Supply Pipeline Area. In Previous Surveys, the highest average diversity was observed in Clayey Plains (3.0) however during the Post-Monsoon 2022 Survey, the highest average diversity was observed in Sandy Plains (3.0). No specimen was observed in Mountain/Hills in any survey. The highest average density for herpetofauna during the Previous Surveys was observed in Dry Streambeds (6.8), however during the Post-Monsoon 2022 Survey, the highest average density was observed in Sandy Plains (6.0).

5.2.7.3.2.3 Access Road to the proposed Reko Diq Mine Site

The average diversity (0.2) of herpetofauna species observed during the Post-Monsoon 2022 Survey was lower compared to the average diversity (0.6) in Previous Surveys. It can be attributed to the extreme dry conditions due to the lack of rain which affected the flora and fauna along Access Road. During the Previous Surveys, the highest average diversity was observed in Mountain/Hills (3.0) however during the Post-Monsoon 2022 Survey, the highest average diversity was observed in Dry Streambeds (0.7). The highest average density for herpetofauna in Previous Surveys was observed in Mountain/Hills

(4.0), however during the Post-Monsoon 2022 Survey, the highest average density was observed in Dry Streambeds (1.0).

5.2.7.3.3 Spring 2023 Survey

A total of 38 specimens belonging to 10 species were observed from the Ecological Study Area. Of these, eight specimens of four species were observed at the proposed Reko Diq Mine Site, 20 specimens of six species along Fan Sediment Water Supply Pipeline Area, and 10 specimens of five species along Access Road to the proposed Reko Diq Mine Site.

Table 5-44 provides a list of herpetofauna species, observed during the Spring 2023 Survey along with IUCN status, CITES status, feeding behavior, and other features while Figure 5-62 provides photographs of herpetofauna species observed during the Spring 2023 Survey.



a) *Phrynocephalus luteoguttatus*



b) *Eremias cf. scripta*



c) *Echis carinatus multisquamatus (dead specimen)*



d) *Psammophis schokari*



e) *Agamura cruralis*



f) *Phrynocephalus clarkorum*



g) Phrynocephalus scutellatus



h) Phrynocephalus maculatus

Figure 5-62: Herpetofauna Species Observed, Spring 2023 Survey

A brief description of herpetofauna species observed at the proposed Reko Diq Mine Site, along the Fan Sediment Water Supply Pipeline Area, and the Access Road to the proposed Reko Diq Mine Site is provided below.

5.2.7.3.3.1 Proposed Reko Diq Mine Site

A total of eight herpetofauna specimens belonging to four species were observed from 20 sampling locations at the proposed Reko Diq Mine Site during the Spring 2023 Survey. The species observed from the proposed Reko Diq Mine Site include the Racerunner *Eremias sp*., Clark's Toad-headed Agama *Phynocephalus clarkorum*, Yellow-speckled Toad-headed Agama *Phrynocephalus luteoguttatus*, and Black-tailed Toad-headed Agama *Phrynocephalus maculatus.* These species are well adapted to the climatic conditions which offer a range of suitable habitats such as food, refugia, and breeding grounds.

At the proposed Reko Diq Mine Site, the highest density of herpetofauna was observed in the Mountain/Hills and Clayey Plains (1.0 each) followed by Dry Streambeds (0.3). Similarly, the highest diversity of herpetofauna was observed in the Clayey Plains (1.0) followed by Mountain/Hills (0.4), and Dry Streambeds (0.3). The absence of herpetofauna specimens in Gravel Plains and Sandy Plains habitats is due to the unfavorable conditions in these habitats. The highest abundance and richness were observed at Sampling Location E17 located in Mountain/Hills with four specimens of two species i.e., Clark's Toad-headed Agama *Phrynocephalus clarkorum* and Yellow-speckled Toad-headed Agama *Phrynocephalus luteoguttatus.*

Mountains/Hills emerged as the most promising habitat for herpetofauna species compared to other habitats. This can be attributed to the topographical features of hills, which provided ample refugia in the form of boulders. These boulders served as effective hiding places, offering protection against predators, and enhancing the survival chances of herpetofauna species. The absence of herpetofauna species in Gravel Plains and Sandy Plains/Sand Dunes can be attributed to dry conditions and the absence of food and refugia in these habitat types.

Table 5-45 provides the abundance of herpetofauna species by habitat type observed at proposed Reko Diq Mine Site. Figure 5-63 provides the abundance and richness of herpetofauna species by sampling locations observed at each sampling location along with their habitat types.

Table 5-45: Abundance of Herpetofauna by Habitat Type Observed at the proposed Reko Diq Mine Site, Spring 2023 Survey

No.	Scientific Name	Common Name	Habitat					Total
			Dry Streambeds	Sandy Plains	Gravel Plains	Mountain/Hills	Clayey Plains	
1.	*Eremias sp.*	Racerunner	1	-	-	-	1	**2**
2.	*Phrynocephalus clarkorum*	Clark's Toad-headed Agama	-	-	-	4	-	**4**
3.	*Phrynocephalus luteoguttatus*	Yellow-speckled Toad-headed Agama	-	-	-	1	-	**1**
4.	*Phrynocephalus maculatus*	Black-tailed Toad-headed Agama	1	-	-	-	-	**1**
Abundance			**2**	**-**	**-**	**5**	**1**	**8**
Richness			**2**	**-**	**-**	**2**	**1**	**4**

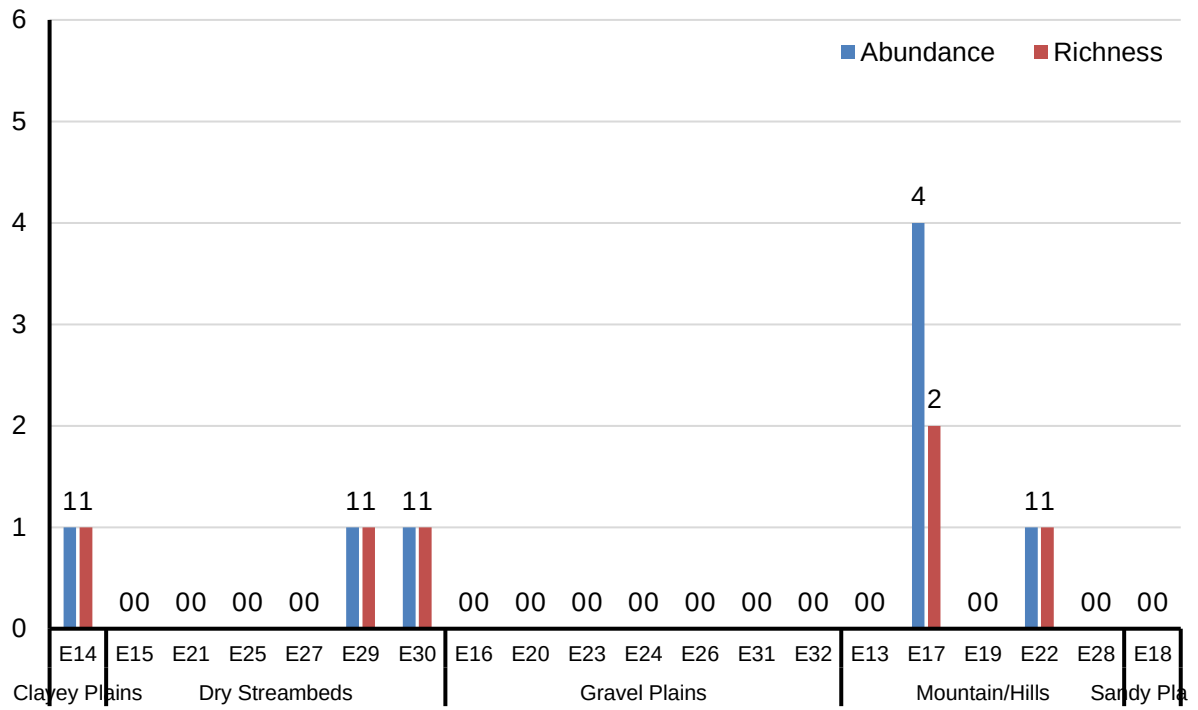


Figure 5-63: Abundance and Richness of Herpetofauna Species by Sampling Location at the proposed Reko Diq Mine Site Observed, Spring 2023 Survey

5.2.7.3.3.2 Fan Sediment Water Supply Pipeline Area

A total of 20 specimens belonging to six species were observed from 13 sampling locations, including one microhabitat. The species observed along Fan Sediment Water Supply Pipeline Area include the Black-tailed Toad-headed Agama *Phrynocephalus maculatus*, Schokari Sand Racer *Psammophis schokari*, Sand Racerunner *Eremias scripta*, Indian Sand Swimmer *Ophiomorus tridactylus*, Saw-scaled Viper *Echis carinatus multisquamatus* and Ornated Toad-headed Agama *Phrynocephalus ornatus*.

The highest density of herpetofauna was observed in the Sandy Plains/Sand Dunes (5.0) followed by Clayey Plains (1.5), Dry Streambeds (1.5), Gravel Plains (1.3), and Agricultural Areas/Date Palms (1.0). Similarly, the highest diversity of herpetofauna was also observed in the Sandy Plains/Sand Dunes (2.0) followed by Agricultural Areas/Date Palms (1.0), Gravel Plains (0.8), Clayey Plains and Dry Streambeds (0.5 each). However, no herpetofauna species was observed in Mountain/Hills. The highest abundance (five specimens) and richness (two species) were observed at Sampling Location E5 located in Sandy Plains/Sand Dunes.

The Sandy Plains/Sand Dunes offer unique advantages in terms of predator protection for reptiles. The loose and shifting nature of the sand can create challenging terrain for predators to navigate prey, making it more difficult for them to access reptiles. In addition, the sandy substrate also provides excellent opportunities for reptiles to hide and burrow in extreme temperatures. This habitat experiences minimal disturbances, with only occasional grazing by camels. This low level of disruption allows reptiles to inhabit and navigate the sandy terrain for feeding, shelter, and reproduction.

Table 5-46 provides the abundance of herpetofauna species observed along the Fan Sediment Water Supply Pipeline Area. Figure 5-66 provides the abundance and richness of herpetofauna species observed along the Fan Sediment Water Supply Pipeline Area.

Table 5-46: Herpetofauna Species by Habitat Type Observed along Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

No.	Scientific Name	Common Name	Habitat						
			Dry Streambeds	Sandy Plains	Gravel Plains	Mountain/Hills	Clayey Plains	Agricultural Areas/Date Palms	Total
1.	*Phrynocephalus maculatus*	Black-tailed Toad-headed Agama	5	3	3	-	3	-	**14**
2.	*Psammophis schokari*	Schokari Sand Racer	-	-	1	-	-	-	**1**
3.	*Eremias scripta*	Sand Racerunner	1	-	-	-	-	-	**1**
4.	*Ophiomorus tridactylus*	Indian Sand-swimmer	-	2	-	-	-	-	**2**
5.	*Echis carinatus multisquamatus*	Saw-scaled Viper	-	-	-	-	-	1	**1**
6.	*Phrynocephalus ornatus*	Ornated Toad-headed Agama	-	-	1	-	-	-	**1**
Abundance			**6**	**5**	**5**	**-**	**3**	**1**	**20**
Richness			**2**	**2**	**3**	**-**	**1**	**1**	**6**

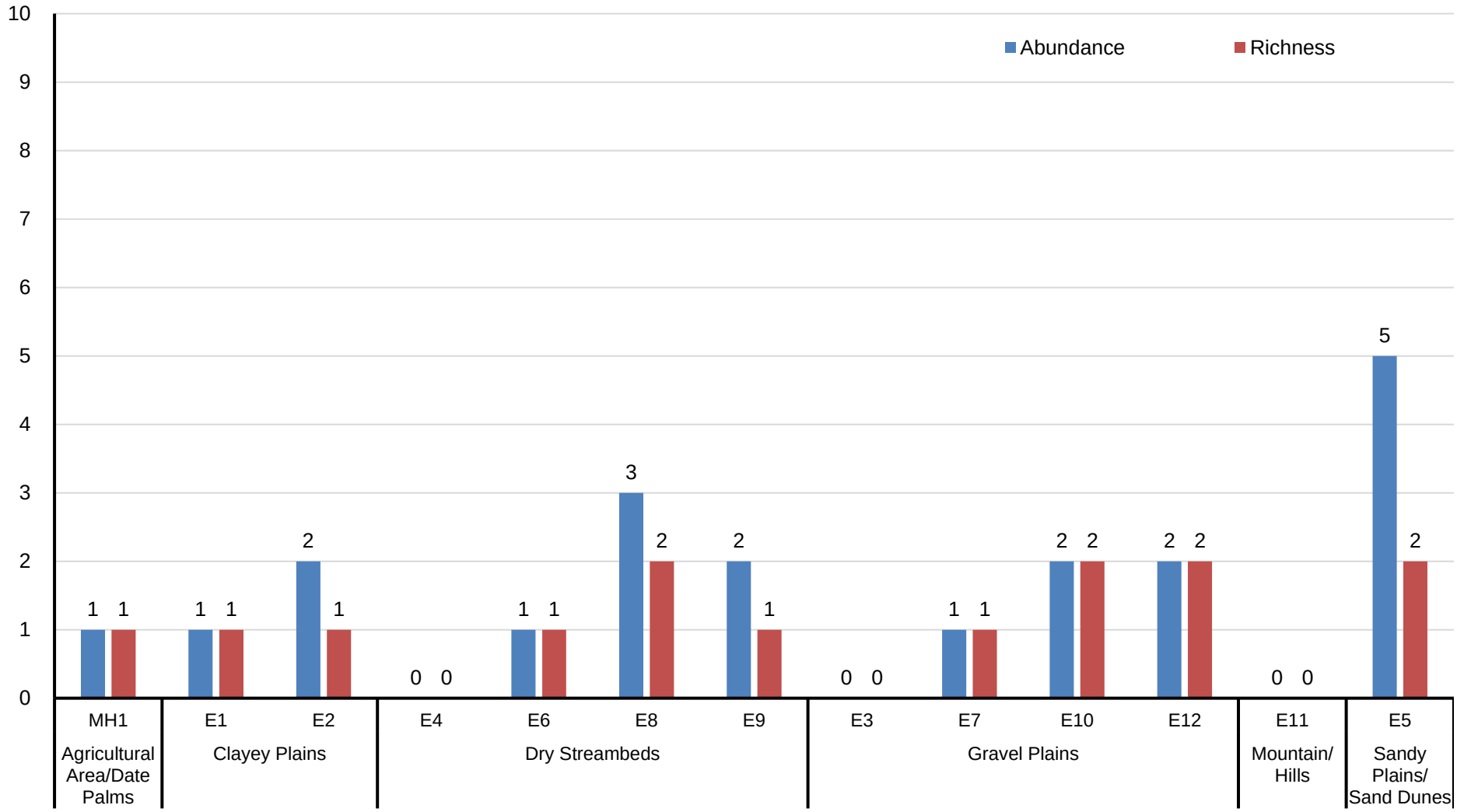


Figure 5-64: Abundance and Richness of Herpetofauna Species by Sampling Locations Observed along Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

5.2.7.3.3.3 *Access Road to the proposed Reko Diq Mine Site*

A total of 10 specimens belonging to five species were observed from eight sampling locations along the Access Road to the proposed Reko Diq Mine Site. The species observed along Access Road to the proposed Reko Diq Mine Site include the Black-tailed Toad-headed Agama *Phrynocephalus maculatus*, Blanford's Fringe-fingered Lizard *Acanthodactylus blanfordii*, Clark's Toad-headed Agama *Phrynocephalus clarkorum*, Seistan Racerunner *Eremias fasciata*, and Indian Sand Swimmer *Ophiomorus tridactylus*.

The highest density of herpetofauna was observed in the Mountain/Hills (2.0) followed by Dry Streambeds (1.6). Similarly, the highest diversity of herpetofauna was also observed in the Mountain/Hills (2.0) followed by Dry Streambeds (0.6). However, no herpetofauna species was observed in Gravel Plains. The highest abundance (three specimens) and richness (two species) were observed at Sampling Location E48 located in Dry Streambeds.

Table 5-47 provides the abundance of herpetofauna species observed along Access Road to proposed Reko Diq Mine Site. Figure 5-65 provides the abundance and richness of herpetofauna species observed along Access Road to proposed Reko Diq Mine Site.

Table 5-47: Herpetofauna Species by Habitat Type Observed along Access Road to the proposed Reko Diq Mine Site, Spring 2023 Survey

No.	Scientific Name	Common Name	Dry Streambeds	Gravel Plains	Mountain/Hills	Total
1.	*Phrynocephalus maculatus*	Black-tailed Toad-headed Agama	2	-	-	**2**
2.	*Acanthodactylus blanfordii*	Blanford's Fringe-fingered Lizard	2	-	-	**2**
3.	*Phrynocephalus clarkorum*	Clark's Toad-headed Agama	-	-	1	**1**
4.	*Ophiomorus tridactylus*	Indian Sandswimmer	-	-	1	**1**
5.	*Eremias cf. scripta*	Sand Racerunner	4	-	-	**4**
Abundance			**8**	**-**	**2**	**10**
Richness			**3**	**-**	**2**	**5**

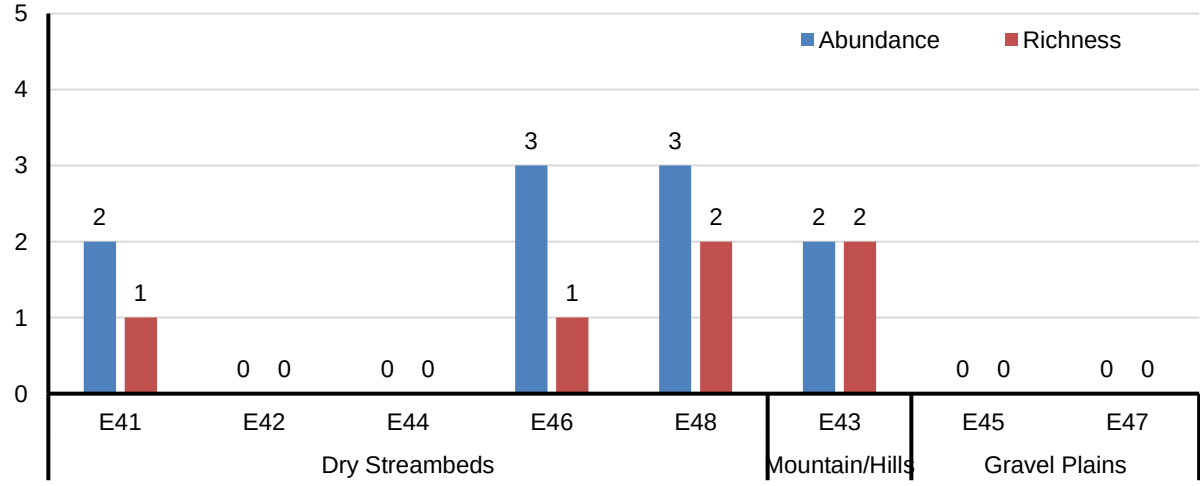


Figure 5-65: Abundance and Richness of Herpetofauna Species by Sampling Locations Observed along Access Road to proposed Reko Diq Mine Site, Spring 2023 Survey

5.2.7.3.4 Comparison of Spring 2023 Survey with Previous Survey

The comparison is only provided for the proposed Reko Diq Mine Site for the common sampling locations where sampling was conducted during both Previous Survey (May 2008 Survey) and Spring 2023 Survey. **Appendix K** provides the details on comparisons of the result of herpetofauna sampling during the Spring 2023 Survey and the Previous Survey. The comparison is only made for four common sampling locations at the proposed Reko Diq Mine Site. A short summary is discussed below.

5.2.7.3.4.1 Proposed Reko Diq Mine Site

The abundance of herpetofauna was higher (six specimens of two species) during the Previous Survey compared to the Spring 2023 Survey (only one specimen of one species). During the Previous Survey, the highest average diversity (0.7) and density (2.0) of herpetofauna were observed in the Gravel Plains while it was much lower during the Spring 2023 Survey as only one species of herpetofauna was observed. No specimen of herpetofauna was observed in Gravel Plains and Mountain/Hills during the Spring 2023 Survey or the Previous Survey. This decline in herpetofauna abundance and richness can be attributed to a decline in plant cover over a long period, as evident from the comparison of vegetation data between the Spring 2023 and the Previous Survey.

5.2.7.3.5 Discussion

The Ecological Study Area provides unique habitats and ecological niches that support a diverse array of herpetofauna species. The desert ecosystem often has extreme temperature fluctuations, limited water availability, and arid conditions. Despite these challenges, many reptiles and amphibians have adapted to thrive in desert environments. They have developed various physiological and behavioral adaptations to conserve water and withstand high temperatures. The Ecological Study Area possesses different habitat types like Agricultural Areas/Date Palm, Dry Streambeds, Mountains/Hills, Clayey Plains, and Sandy Plains/Sand Dunes that cater to different herpetofauna species. For example, Sand Plains/Sand Dunes provide ideal burrowing sites for snakes and lizards, while rock crevices in Mountain/Hills offer shelter for small reptiles. Vegetation Cluster and Dry Streambeds attract amphibians and reptiles that rely on water sources for breeding and survival.

During both Post-Monsoon 2022 and Spring 2023 surveys, some restricted range herpetofauna species were observed demonstrating that these species are naturally adapted to specific habitats and may not be found in other regions. However, the movement associated with cross-border trade at both the proposed Reko Diq Mine Site and along the Access Road to the proposed Reko Diq Mine Site poses a serious threat to the herpetofauna in this area. The diminishing availability of suitable shelter and food resources in Gravel Plains, Sandy Plains, and Clayey Plains significantly impacts these herpetofauna species. The Ecological Study Area showed great potential as a habitat for several herpetofauna species, but only a few species were observed in the area. Nocturnal surveys are recommended to further explore the rich herpetofauna species of the area.

5.2.7.3.6 Conservation Concern Herpetofauna Species

All the herpetofauna species observed were listed as Least Concern or Not Evaluated in the IUCN Red List of Threatened Species. However, Alcock's Toad-headed Agama

Phrynocephalus (restricted range) was observed during both Post-Monsoon 2022 and Spring 2023 surveys.

5.2.7.4 *Mammals*

A total of six mammalian species were observed from the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and along the Access Road to proposed Reko Diq Mine Site. Of the observed mammalian species, four species were observed during the Post-Monsoon 2022 Survey and six during the Spring 2023 Survey.

Table 5-48 provides the list of mammalian species observed during both Post-Monsoon 2022 and Spring 2023 surveys.

Table 5-48: Mammals Species Observed, Post-Monsoon 2022 Survey and Spring 2023 Survey

No.	Scientific Name	Common Name	IUCN Status	Regional Status	Post-Monsoon 2022 Survey	Spring 2023 Survey
1.	*Felis margarita*	Sand Cat	Least Concern	Critically Endangered	✓	✓
2.	*Gazella subgutturosa*	Goitered Gazelle	Vulnerable	Critically Endangered	-	✓
3.	*Hemiechinus auritus*	Long Eared Hedgehog	Least Concern	Least Concern	-	✓
4.	*Lepus capensis*	Cape Hare	Least Concern	Vulnerable	✓	✓
5.	*Vulpes rueppellii*	Ruppell's Fox	Least Concern	Vulnerable	✓	✓
6.	*Vulpes vulpes*	Red Fox	Least Concern	Near Threatened	✓	✓
Total					**4**	**6**

5.2.7.4.1 Post-Monsoon 2022 Survey

During the Post-Monsoon 2022 Survey, a total of four mammalian species were observed from the 41 sampling locations located at the proposed Reko Diq Mine Site, along Fan Sediment Water Supply Pipeline Area, and Access Road to the proposed Reko Diq Mine Site. The observed mammalian species include the Cape Hare *Lepus capensis,* Red Fox *Vulpes vulpes,* Ruppell's Fox *Vulpes rueppellii,* and Sand Cat *Felis margarita.*

Table 5-48 provides a list of mammal species observed during the Post-Monsoon 2022 Survey while, Figure 5-66 provides photographs of mammal signs and sightings for Post-Monsoon 2022 Survey.



a. Ruppell's Fox *Vulpes rueppellii*



b. Pugmarks of Red Fox *Vulpes vulpes*



c. Den of Mammalian Species



d. Scats of Sand Cat *Felis margarita*

Figure 5-66: Signs and Sighting of Mammalian Species Observed, Post-Monsoon 2022 Survey

A brief description of mammalian species observed at the proposed Reko Diq Mine Site, along the Fan Sediment Water Supply Pipeline and Access Road to the proposed Reko Diq Mine Site is provided below.

5.2.7.4.1.1 Proposed Reko Diq Mine Site

During the Post-Monsoon 2022 Survey, a total of four mammalian species were observed from 20 sampling locations located at the Reko Mine Site. The species observed from the proposed Reko Diq Mine Site include the Cape Hare, Red Fox, Ruppell's Fox, and Sand Cat. Signs were observed for species including the Cape Hare, Red Fox, Ruppell's Fox, and Sand Cat while Ruppell's Fox was also sighted during the Post-Monsoon 2022 Survey.

The highest number of signs and sightings were observed in Gravel Plains (five signs) followed by Dry Streambeds (four signs/sightings), and Mountain/Hills (three signs). However, no sightings or signs were observed in Sandy Plains/Sand Dunes. The highest average diversity was observed in Mountains/Hills (0.6) followed by Gravel Plains (0.3) and Dry Streambeds (0.2), while the highest average density was observed in Dry Streambeds (0.7) followed by Gravel Plains (0.6) and Mountain/Hills (0.6). Dry Streambeds and Mountains/Hills are considered preferred habitats for mammals as they provide food and refugia due to the presence of vegetation and rocks in these habitats.

Table 5-49 provides signs and sightings of mammal species by habitat type observed at the proposed Reko Diq Mine Site.

Figure 5-67 provides the graph of mammal abundance and richness by sampling locations.

5.2.7.4.1.2 Fan Sediment Water Supply Pipeline Area

During the Post-Monsoon 2022 Survey, signs of three mammalian species were observed from 13 sampling locations located along the Fan Sediment Water Supply Pipeline Area. Sampling was conducted in Date Palms, Clayey Plains, Gravel Plains, Dry Streambeds, Mountain/hills, and Sandy Plains/Sand Dunes. Signs of mammalian species were only observed in Gravel Plains, Dry Streambeds, and Sandy Plains. The observed species include the Cape Hare, Red Fox, and Ruppell's Fox.

The highest diversity of mammal was observed in Gravel Plains (0.5) followed by Sandy Plains/Sand Dunes (0.5) and Dry Streambeds (0.3) while the highest density was observed in Sandy Plains/Sand Dunes (1.0) followed by Dry Streambeds (0.7) and Gravel Plains (0.5). However, no signs or sightings of mammalian species were observed in the Mountains/Hills, Date Palms, and Clayey Plains habitat. This can be attributed to dry conditions, absence of food and shelter, and disturbance due to livestock grazing especially in the Clayey Plains and Date Palms habitat.

Table 5-50 provides lists of mammal species by habitat type observed along the Fan Sediment Water Supply Pipeline Area during the Post-Monsoon 2022 Survey. Figure 5-68 provides the graph of mammal abundance and richness by sampling locations.

5.2.7.4.1.3 Access Road to the proposed Reko Diq Mine Site

During the Post-Monsoon 2022 Survey, signs of two mammalian species were observed from eight sampling locations located along the Access Road to the proposed Reko Diq Mine Site. The species observed were the Cape Hare and Red Fox. Sampling was conducted in Gravel Plains, Dry Streambeds, and Mountain/Hills. Signs of mammalian species were only observed in Gravel Plains and Mountain/Hills.

The highest diversity of mammal was observed in Mountains/Hills (1.0) followed by Gravel Plains (0.3). Similarly, the highest density was also observed in Mountain/Hills (2.0) followed by Gravel Plains (0.3). However, no signs or sightings of mammalian species were observed in the Dry Streambed habitat. This can be attributed to dry conditions, absence of food and shelter, and disturbance due to frequent vehicle movement.

Table 5-51 provides lists of mammal species by habitat type observed along the Access Road route during the Post-Monsoon 2022 Survey. Figure 5-69 provides the graph of mammal abundance and richness by sampling locations.

Table 5-49: Mammal Signs and Sightings at the proposed Reko Diq Mine Site by Habitat Type Observed, Post-Monsoon 2022 Survey

No.	Scientific Name	Common Name	Habitat								Total
			Dry Streambeds		Gravel Plains		Mountains/Hills		Sandy Plains/Sand Dunes		
			Sightings	Signs	Sightings	Signs	Sightings	Signs	Sightings	Signs	
1.	*Felis margarita*	Sand Cat	0	0	0	0	0	1	0	0	**1**
2.	*Lepus capensis*	Cape Hare	0	0	0	0	0	1	0	0	**1**
3.	*Vulpes rueppellii*	Ruppell's Fox	1	3	0	1	0	0	0	0	**5**
4.	*Vulpes vulpes*	Red Fox	0	0	0	4	0	1	0	0	**5**
Total			**1**	**3**	**0**	**5**	**0**	**3**	**0**	**0**	**12**

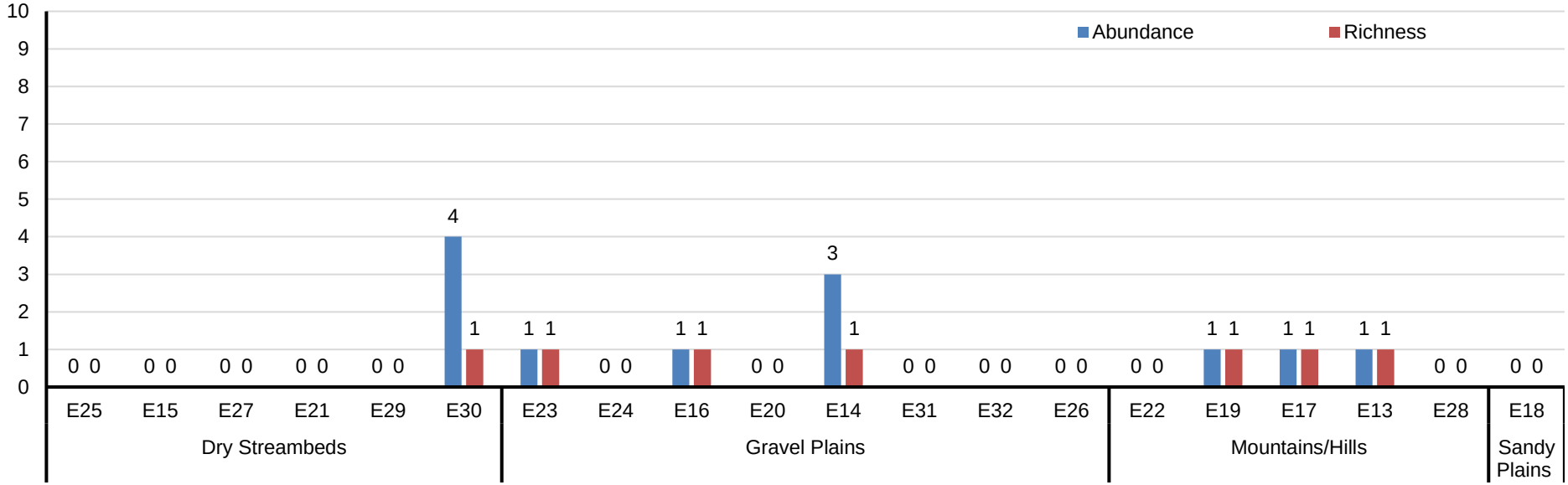


Figure 5-67: Mammal Abundance and Richness by Sampling Location at the proposed Reko Diq Mine Site Observed, Post-Monsoon 2022 Survey

Table 5-50: Mammal Signs and Sightings along Fan Sediment Water Supply Pipeline Area by Habitat Type Observed, Post-Monsoon 2022 Survey

No.	Common Name	Scientific Name	Habitat										Total
			Clayey Plains		Dry Streambeds		Gravel Plains		Mountains/Hills		Sandy Plains/Sand Dunes		
			Sightings	Signs	Sightings	Signs	Sightings	Signs	Sightings	Signs	Sightings	Signs	
1.	*Lepus capensis*	Cape Hare	-	-	-	-	-	1	-	-	-	-	**1**
2.	*Vulpes rueppellii*	Ruppell's Fox	-	-	-	2	-	-	-	-	-	-	**2**
3.	*Vulpus vulpus*	Red Fox	-	-	-	-	-	1	-	-	-	2	**3**
Total			**-**	**-**	**-**	**2**	**-**	**1**	**-**	**-**	**-**	**2**	**5**

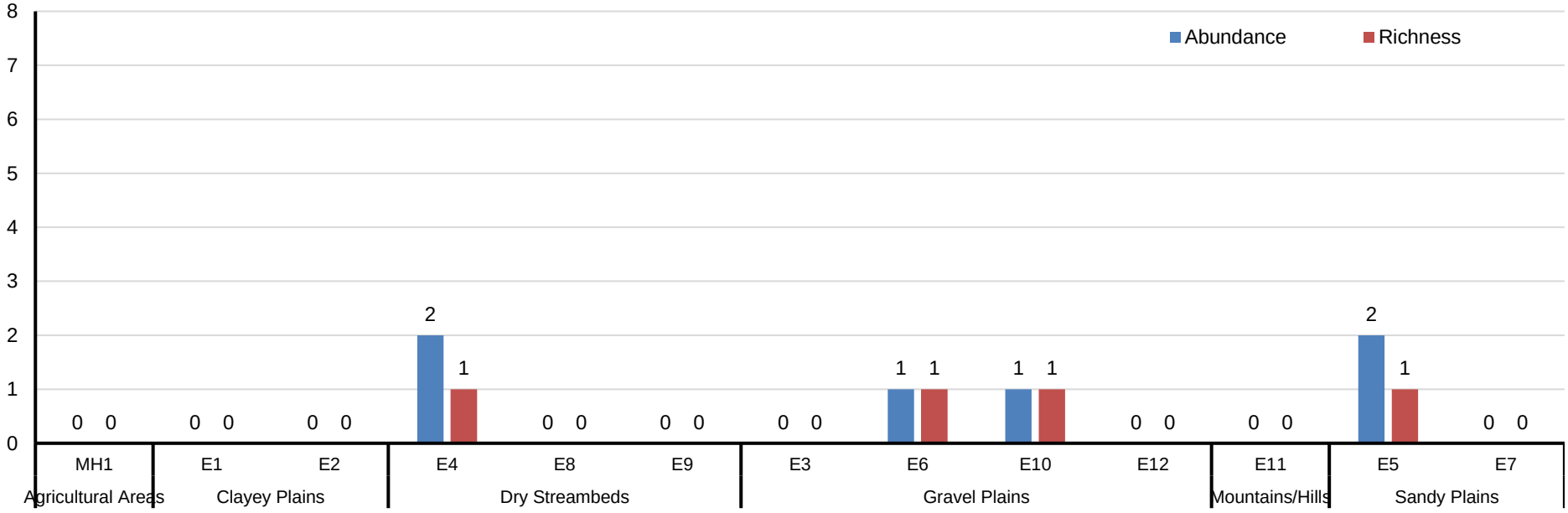


Figure 5-68: Mammal Abundance and Richness by Sampling Location Observed along Fan Sediment Water Supply Pipeline Area in Post Monsoon 2022 Survey

Table 5-51: Mammal Species Observed along Access Road to the proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

No.	Scientific Name	Common Name	Gravel Plain		Hill/Mountain		Dry Streambed		Total
			Sightings	Signs	Sightings	Signs	Sightings	Signs	
1.	*Lepus capensis*	Cape Hare	-	-	-	*2*	-	-	**2**
2.	*Vulpes vulpes*	Red Fox	-	*1*	-	-	-	-	**1**
Total			**-**	**1**	**-**	**2**	**-**	**-**	**3**

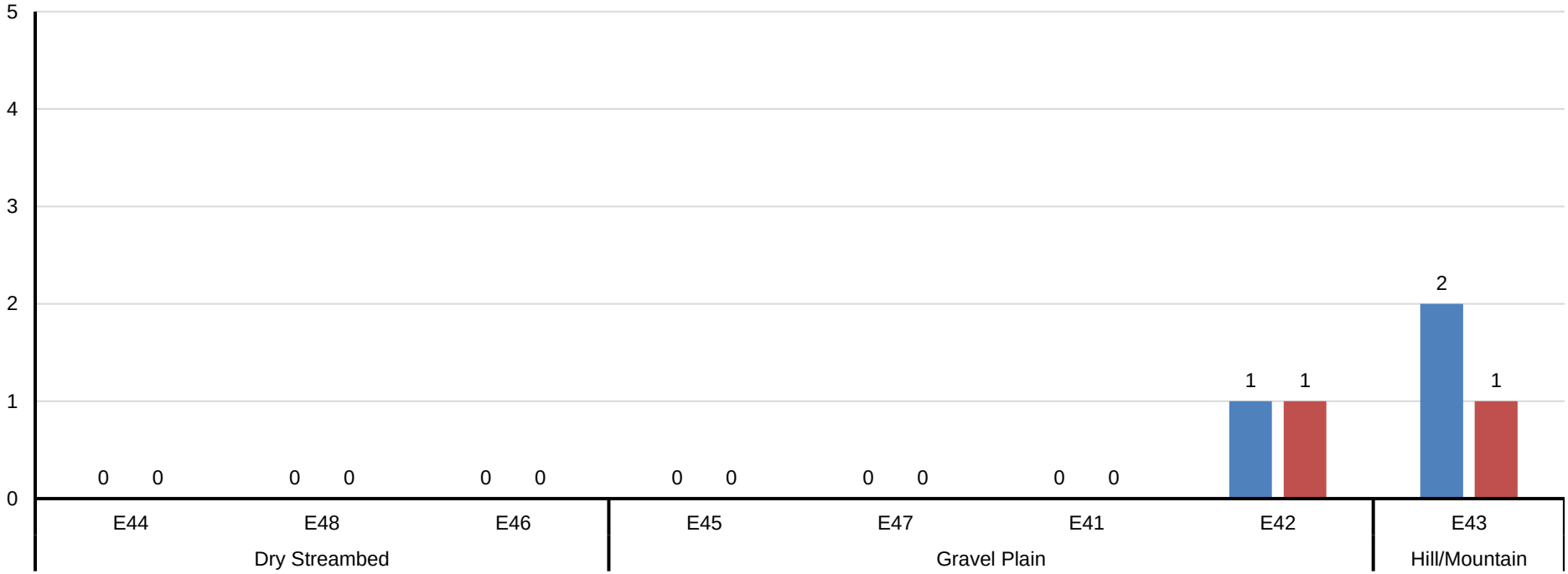


Figure 5-69: Mammal Abundance and Richness by Sampling Location Observed along Access Road to the proposed Reko Diq Mine Site, Post-Monsoon 2022 Survey

5.2.7.4.2 Comparison of Post-Monsoon 2022 Survey with Previous Surveys in Similar Conditions

Appendix K provides the details on comparisons of the result of mammal sampling conducted during the Post-Monsoon 2022 Survey and Previous Survey while a summary is discussed below.

A comparison of mammal abundance and species richness observed in Previous Surveys (November 2008, September 2009, and August 2020) and Post-Monsoon 2022 Survey is given for common sampling locations that were sampled in both surveys. The species richness observed during the Post-Monsoon 2022 Survey (four species) was lower compared to species richness in Previous Surveys (five species) from the common sampling locations. The Goitered Gazelle which was observed in Previous Surveys was not observed during the Post-Monsoon 2022 Survey. Similarly, the Sand Cat observed during the Post-Monsoon 2022 Survey was not observed in Previous Surveys. Hunting and fencing along the border are the major reasons for the decline in the abundance of the Goitered Gazelle although the other natural phenomenon is arid conditions which affected the feeding of this species.

5.2.7.4.2.1 Proposed Reko Diq Mine Site

The average density (0.6) and diversity (0.3) of mammalian species observed from the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey was higher compared to the average density (0.6) and diversity (0.2) in Previous Surveys. The sighting of Red Fox was observed during the Previous Survey while, both signs and sighting of Red Fox and Ruppell's Fox were observed during the Post-Monsoon 2022 Survey.

During the Previous Surveys, the highest mammal diversity was observed in Dry Streambeds (0.7) while during the Post-Monsoon 2022 Survey the highest diversity of mammals was observed in Mountains/Hills (0.8). In Previous Surveys, the highest mammal density was observed in Gravel Plains (0.8) while during the Post-Monsoon 2022 Survey, the highest density was observed in Dry Streambeds (0.7). Dry Streambeds are the only habitat having sparse vegetation which provides food and shelter to different mammalian species.

5.2.7.4.2.2 Fan Sediment Water Supply Pipeline Area

The average density (0.5) and diversity (0.2) of mammalian species observed along the Fan Sediment Water Supply Pipeline Area during the Post-Monsoon 2022 Survey was lower compared to the average density (8.3) and diversity (0.7) in Previous Surveys. In Previous Surveys, the highest mammal density (29.0) and diversity (6.0) were observed in Date Palm whereas during the Post-Monsoon 2022 Survey, the highest density (1.0) and diversity (0.5) were observed in Sandy Plains.

5.2.7.4.2.3 Access Road to the proposed Reko Diq Mine Site

The average density (0.4) of mammalian species observed along the Access Road to the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey was lower compared to the average density (2.5) during the Previous Surveys. During the Previous Surveys, the highest mammal density (3.3) was observed in Gravel Plains whereas during the Post-Monsoon 2022 Survey, the highest density (2.0) was observed in Mountain/Hills.

5.2.7.4.3 Spring 2023 Survey

During the Spring 2023 Survey, a total of six mammalian species were observed from the Reko Diq Mine, Fan Sediment Water Supply Pipeline Area, and along Access Road to the proposed Reko Diq Mine Site. Mammalian species which were observed during the Spring 2023 Survey include the Cape Hare *Lepus capensis,* Long Eared Hedgehog *Hemiechinus auriatus,* Red Fox *Vulpes vulpes,* Ruppell's Fox *Vulpes rueppellii,* Sand Cat *Felis margarita* and Goitered Gazelle *Gazella subgutturosa.*

Table 5-51 provides lists of mammal species observed during the Spring 2023 Survey. Figure 5-70 provides photographs of mammal signs and sightings for Spring 2023 Survey.



a) Scats of Sand Cat



b) Scats of Red Fox



c) Pellets of Goiterred Gazelle



d) Pellets of Cape Hare



e) Pugmark of Red Fox



f) Den of Cape Hare

Figure 5-70: Signs and Sighting of Mammalian Species, Spring 2023 Survey

A brief description of mammalian species observed at the proposed Reko Diq Mine Site, along the Fan Sediment Water Supply Pipeline Area, and the Access Road to the proposed Reko Diq Mine Site is provided below.

5.2.7.4.3.1 Proposed Reko Diq Mine Site

During the Spring 2023 Survey, a total of three mammalian species were observed from 20 sampling locations located at the Reko Mine Site. No mammalian species were sighted however, the signs of mammalian species were observed from the proposed Reko Diq Mine Site for species including the Cape Hare *Lepus capensis*, Red Fox *Vulpes vulpes*, and Sand Cat *Felis margarita*. The highest number of signs were observed in Mountain/Hills (five signs at Sampling Location E19 and three signs at Sampling Location E13). The highest average diversity was observed in Clayey Plains (1.0) followed by Mountains/Hills (0.6), Dry Streambeds (0.3), and Gravel Plains (0.1) while the highest average density was observed in Mountains/Hills (1.8), followed by Clayey Plains (1.0), Dry Streambeds (0.3) and Gravel Plains (0.1).

During the Spring 2023 Survey, two habitats such as Clayey Plains and Mountains/Hills appeared as preferred habitats for mammals because these habitats offer moderate food and potential shelter for mammals. The mountains provide refuge from predators, extreme temperatures, and harsh desert conditions due to the availability of rocks and scattered vegetation, allowing mammals to find suitable habitats for breeding, resting, and raising their young.

Table 5-54 provides lists of mammals' species by habitat type observed along the Fan Sediment Water Supply Pipeline Area.

Figure 5-71 provides the graph of mammals' abundance and richness by sampling locations.

5.2.7.4.3.2 Fan Sediment Water Supply Pipeline Area

During the Spring 2023 Survey, signs of six mammalian species were observed from 13 sampling locations located along the Fan Sediment Water Supply Pipeline Area. The species that were observed include the Cape Hare *Lepus capensis*, Red Fox *Vulpes vulpes*, Goitered Gazelle *Gazella subgutturosa*, Long-eared Hedgehog *Hemiechinus auritus*, Sand Cat *Felis margarita* and Ruppell's Fox *Vulpes rueppellii*. Sampling was conducted in Date Palms, Clayey Plains, Gravel Plains, Dry Streambeds, Mountain/hills, and Sandy Plains/Sand Dunes. Signs of mammalian species were observed in all habitat types except the Clayey Plains habitat. This can be attributed to dry conditions, the absence of food and shelter, and higher grazing pressure in Clayey Plains.

The highest diversity of mammals was observed in Mountain/Hills (3.0) followed by Agricultural Areas/Date Palms (2.0), Sandy Plains (1.0), Dry Streambeds (0.8), and Gravel Plains (0.3). Similarly, the highest density was also observed in Mountain/Hills (4.0) followed by Agricultural/Date Palms (2.0), Dry Streambeds (1.3), Sandy Plains/Sand Dunes (1.0), and Gravel Plains (0.8).

Table 5-54 provides lists of mammal species by habitat type observed along the Fan Sediment Water Supply Pipeline Area.

Figure 5-73 provides the graph of mammals' abundance and richness by sampling locations observed along the Fan Sediment Water Supply Pipeline Area.

5.2.7.4.3.3 Access Road to the proposed Reko Diq Mine Site

During the Spring 2023 Survey, signs of three mammalian species were observed from eight sampling locations located along Access Road to the proposed Reko Diq Mine Site. The species that were observed during the Spring 2023 Survey include the Cape Hare *Lepus capensis*, Red Fox *Vulpes vulpes*, and Sand Cat *Felis margarita*. Sampling was conducted in Gravel Plains, Dry Streambeds, and Mountain/Hills. Signs of mammalian species were observed in all habitat types except the Gravel Plains habitat. This can be attributed to dry conditions and the absence of food and shelter.

The highest diversity of mammals was observed in Mountain/Hills (1.0) followed by Dry Streambeds (0.6). Similarly, the highest density was also observed in Mountain/Hills (1.0) followed by Dry Streambeds (0.8).

Table 5-54 provides lists of mammals' species by habitat type observed along Access Road to the proposed Reko Diq Mine Site.

Figure 5-73 provides the graph of mammals' abundance and richness by sampling locations observed along Access Road to the proposed Reko Diq Mine Site.

Table 5-52: Mammals Species Observed at the proposed Reko Diq Mine Site, Spring 2023 Survey

No.	Scientific Name	Common Name	Clayey Plains		Dry Streambeds		Gravel Plains		Mountain/Hills		Sandy Plains		Total
			Sightings	Signs	Sightings	Signs	Sightings	Signs	Sightings	Signs	Sightings	Signs	
1.	*Lepus capensis*	Cape Hare	-	-	-	1	-	-	-	6	-	-	**7**
2.	*Vulpes vulpes*	Red Fox	-	-	-	1	-	1	-	2	-	-	**4**
3.	*Felis margarita*	Sand Cat	-	1	-	-	-	-	-	1	-	-	**2**
Total			**-**	**1**	**-**	**2**	**-**	**1**	**-**	**9**	**-**	**-**	**13**

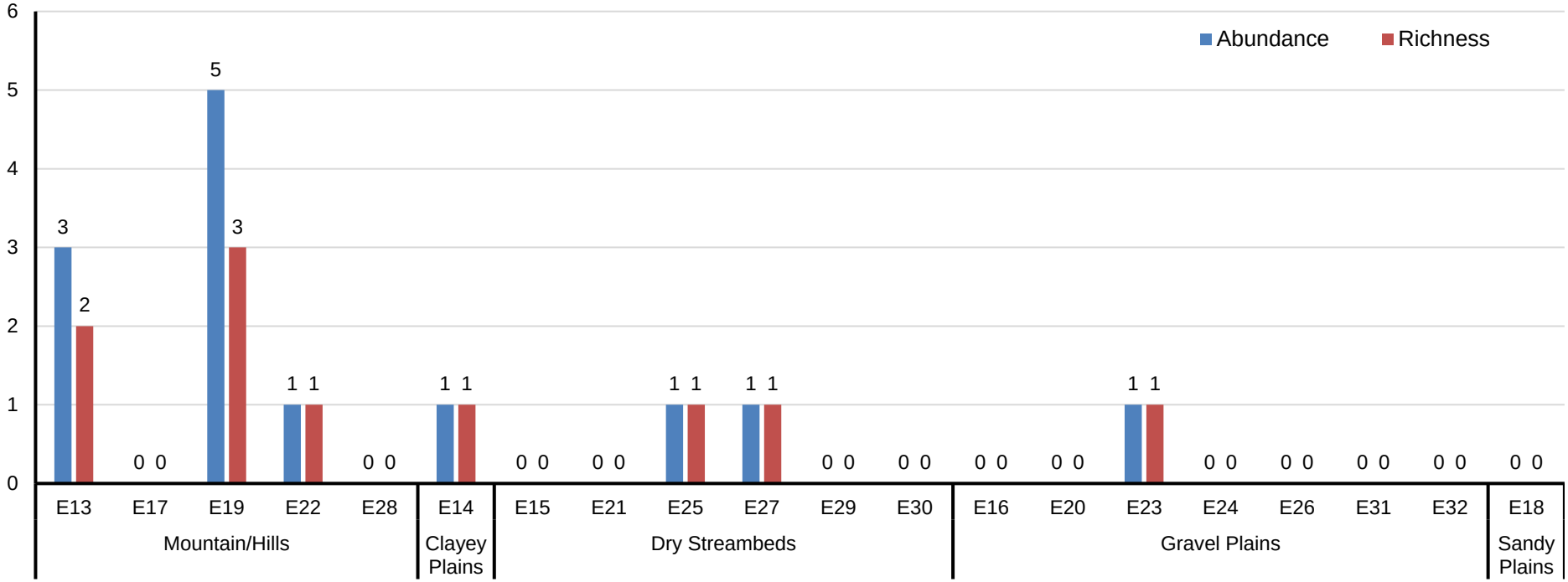


Figure 5-71: Abundance and Richness of Mammals by Sampling Location at the proposed Reko Diq Mine Site, Spring 2023 Survey

Table 5-53: Mammals Species Observed along Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

No.	Scientific Name	Common Name	Habitat												Total
			Clayey Plains		Dry Streambeds		Gravel Plains		Mountain/Hills		Sandy Plains		Agricultural Areas/Date Palms		
			Sightings	Signs	Sightings	Signs	Sightings	Signs	Sightings	Signs	Sightings	Signs	Sightings	Signs	
1.	*Lepus capensis*	Cape Hare	-	-	-	-	-	-	-	2	-	-	-	-	**2**
2.	*Gazella subgutturosa*	Goitered Gazelle	-	-	-	2	-	-	-	-	-	-	-	-	**2**
3.	*Hemiechinus auritus*	Long Eared Hedgehog	-	-	-	-	-	-	-	-	-	-	-	1	**1**
4.	*Vulpes vulpes*	Red Fox	-	-	-	-	-	3	-	-	-	1	-	1	**5**
5.	*Vulpes rueppellii*	Ruppel Fox	-	-	-	1	-	-	-	1	-	-	-	-	**2**
6.	*Felis margarita*	Sand Cat	-	-	-	2	-	-	-	1	-	-	-	-	**3**
Total			**-**	**-**	**-**	**5**	**-**	**3**	**-**	**4**	**-**	**1**	**-**	**2**	**15**

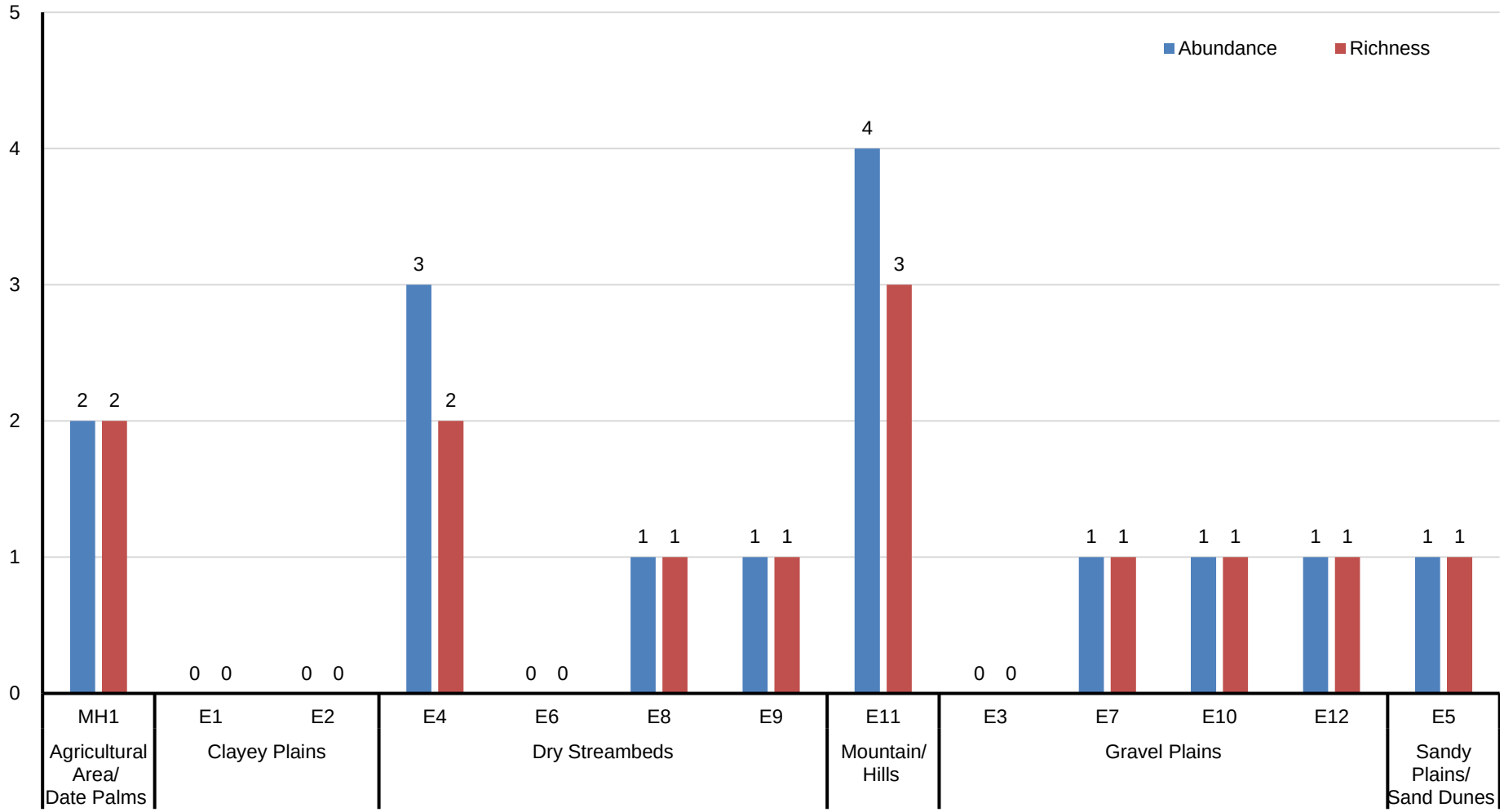


Figure 5-72: Mammals' Abundance and Richness by Sampling Location Observed along Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

Table 5-54: Mammals Species Observed along Access Road to the proposed Reko Diq Mine Site, Spring 2023 Survey

No.	Scientific Name	Common Name	Habitat						Total
			Dry Streambeds		Gravel Plains		Mountain/Hills		
			Sightings	Signs	Sightings	Signs	Sightings	Signs	
1.	*Lepus capensis*	Cape Hare	-	1	-	-	-	1	**2**
2.	*Vulpes vulpes*	Red Fox	-	2	-	-	-	-	**2**
3.	*Felis margarita*	Sand Cat	-	1	-	-	-	-	**1**
Total			**-**	**4**	**-**	**-**	**-**	**1**	**5**

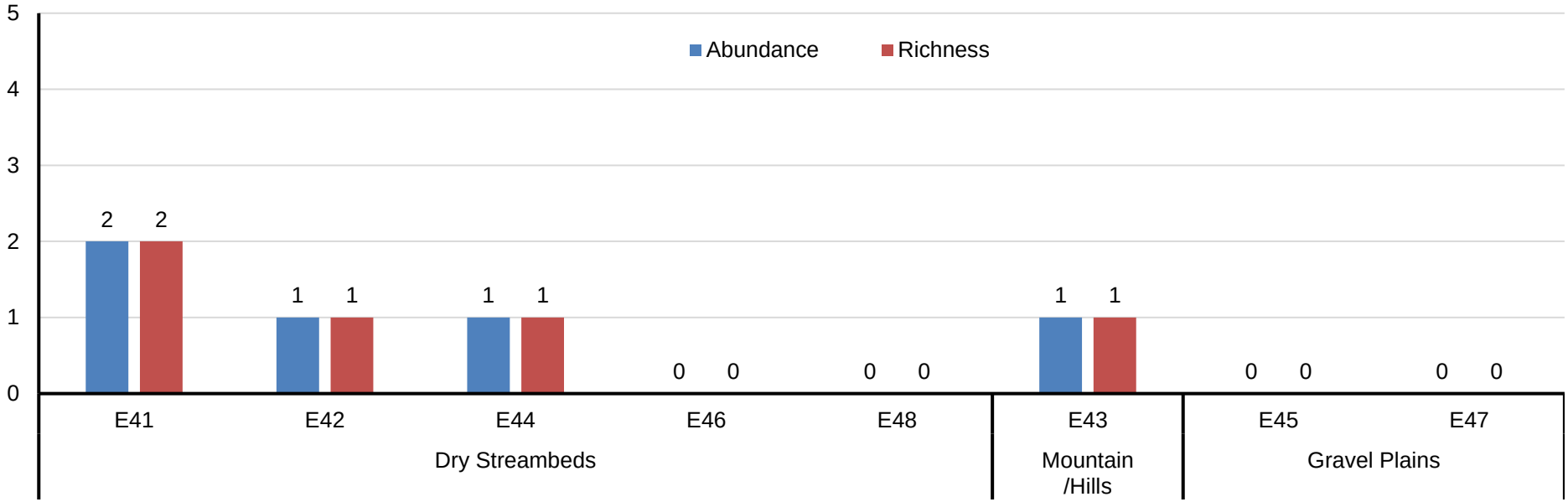


Figure 5-73: Mammals' Abundance and Richness by Sampling Location Observed along Access Road to the proposed Reko Diq Mine Site, Spring 2023 Survey

5.2.7.4.4 Comparison of Spring 2023 Survey with Previous Survey in Similar Conditions

The comparison is only provided for the proposed Reko Diq Mine Site for the common sampling locations where sampling was conducted during both Previous Survey (May 2008 Survey) and Spring 2023 Survey. **Appendix K** provides the details on comparisons of the result of mammals sampling during both Spring 2023 Survey and Previous Survey. The comparison is only made for four common sampling locations at the proposed Reko Diq Mine Site. A short summary is discussed below.

5.2.7.4.4.1 Proposed Reko Diq Mine Site

During the Previous Survey, the average diversity (0.7) and average density (1.2) were higher when compared with average density and diversity (0.5 each) of Spring 2023 Survey. The decrease in mammal diversity and density during the Spring 2023 Survey can be attributed to a decline in plant cover, as discussed above.

5.2.7.4.5 Mammal's Sighting and Illegal Hunting by Locals

During both Post-Monsoon 2022 and Spring 2023 surveys, locals reported the presence of species such as Red Fox, Ruppel Fox, Cape Hare, Sand Cat, and Asiatic Jackal. A few locals also reported occasional sightings of Goitered Gazelle in the area as well. Locals reported frequent sightings of Red Fox and Ruppel Fox at the proposed Reko Diq Mine Site and along the Fan Sediment Water Supply Pipeline Area.

During both Post-Monsoon 2022 and Spring 2023 surveys, the locals reported illegal hunting of large mammals including the Afghan Urial, Sindh Ibex, and Goitered Gazelle. Although, the Afghan Urial and Sindh Ibex do not have confirmed distribution in the area. Locals reported occasional sightings of these species in previous years. The illegal hunting of these species are reported from the Kirtika area along the Fan Sediment Water Supply Pipeline Area. Only a few specimens of these species used to visit the area in the past which were killed by locals. However, after the fencing of the border (along Iran and Afghanistan), these species are restricted only to the other side of the border (Iran and Afghanistan). Locals did not report any recent sightings of these species in the area and also stated that the fence along the border restricted the migration of these species. Frequent hunting of Cape Hare was reported by locals in the area, especially at the proposed Reko Diq Mine Site and along the Fan Sediment Water Supply Pipeline Area.

Figure 5-74 provides photographs of illegal hunting by locals along the Fan Sediment Water Supply Pipeline Area during the Post-Monsoon 2022 Survey.

Figure 5-75 provides photographs of illegal hunting by locals along the Fan Sediment Water Supply Pipeline Area during the Spring 2023 Survey.





a) Hunted specimen of Goitered Gazelle and Wild Goat/Sindh Ibex



b) Trophy of Afghan Urial



c) Illegally killed Afghan Urial

Source: These photographs were collected from a local at accommodation facility of the proposed Reko Diq Mine Site

Figure 5-74: Illegal Hunting by Locals along Fan Sediment Water Supply Pipeline Area, Post-Monsoon 2022 Survey





a) Hunted Specimens of Goitered Gazelle and Afghan Urial from Fan Sediment Area





b) Trophies of Goitered Gazelle and Afghan Urial

Source: These photographs were collected from a local at accommodation facility at proposed Reko Diq Mine Site.

Figure 5-75: Illegal Hunting by Locals along Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

5.2.7.4.6 Discussion

The harsh climatic conditions and topographical features of the Ecological Study Area do not favor the thriving population of mammalian species in the region. Extreme temperatures, minimal precipitation, and high rates of water loss through transpiration make deserts challenging environments for sustaining biodiversity. However, certain species that possess physiological and morphological adaptations suitable for desert conditions can survive and persist in such environments.

During the Post-Monsoon 2022 Survey, generalist species like Red Fox, Ruppel Fox, Asiatic Jackal, and Cape Hare were commonly observed across the Ecological Study Area. During the Spring 2023 Survey, the most abundant mammalian species observed from the Ecological Study Area were the Red Fox, Rupple's Fox, and Cape Hare. These species have specific physiological adaptations to cope with the challenges of desert ecosystems. They can survive with limited water intake, obtaining much of their moisture from the food they consume. These species are primarily nocturnal, which helps them avoid the extreme heat of the day.

During the Spring 2023 Survey, signs of Goitered Gazelle were detected along the Fan Sediment Water Supply Pipeline Area. Overall, the population of Goitered Gazelle has greatly decreased in the area due to illegal hunting and fencing along the Iran-Pakistan border which prevent the movement of Goitered Gazelle. Locals in the area reported hunting of this species if any specimens visit the area. These reports provided additional insight into the threats faced by the Goitered Gazelle population within the Ecological Study Area. In addition, frequent hunting of Cape Hare was also reported by locals.

The habitat at the proposed Reko Diq Mine Site was characterized by aridity and limited vegetation, primarily comprising Gravel Plains. Consequently, mammalian species in the vicinity faced significant challenges due to the scarcity of food and the absence of suitable refugia. Moreover, human activity in the area has further contributed to the decline in mammal populations. Therefore, the combination of environmental factors and human disturbances possibly impacted the mammalian populations at the proposed Reko Diq Mine Site.

Despite the suitability of the habitat for mammalian species near the border area along the Fan Sediment Water Supply Pipeline Area, limited observations were made. This can be attributed to the presence of a fence along the Pakistan-Iran and Pakistan-Afghanistan borders, which has disrupted the natural movement patterns of many large mammalian species in the region.

5.2.7.4.7 Conservation Concern Mammal Species

All the species observed are Least Concern except Goitred Gazelle *Gazella subgutturosa* which is listed as Vulnerable according to the IUCN Red List of Threatened Species. This species was only observed along the Fan Sediment Water Supply Pipeline Area during the Spring 2023 Survey. In addition, two species of mammals i.e., Sand Cat *Felis margarita* and Goitered Gazelle *Gazella subgutturosa* are listed as Critically Endangered while, two species i.e., Cape Hare *Lepus capensis* and Ruppell's Fox *Vulpes ruppellii* are

listed as Vulnerable and one species i.e., Red Fox *Vulpes vulpes* is listed as Near Threatened according to Pakistan National List of Mammals.

5.2.7.5 *Small Mammals*

Only one species of small mammal was captured from the Reko Diq Mine Site and Fan Sediment Water Supply Pipeline Area during both Post-Monsoon 2022 and Spring 2023 surveys. Sampling was not conducted along the Access Road to the proposed Reko Diq Mine Site for small mammals. Only one small mammal species i.e., Great Gerbil was observed which is Least Concern according to the IUCN Red List of Threatened Species.

Table 5-55 provides a list of small mammal species captured through Sherman traps during both Post-Monsoon 2022 Survey and Spring 2023 Survey.

Table 5-55: Small Mammals Species Captured, Post-Monsoon 2022 Survey and Spring 2023 Survey

No	Scientific Name	Common Name	IUCN Status	Post-Monsoon 2022 Survey	Spring 2023 Survey
1.	*Rhombomys opimus*	Great Gerbil	Least Concern	✓	✓
Total				**1**	**1**

5.2.7.5.1 Post-Monsoon 2022 Survey

During the Post-Monsoon 2022 Survey, only one small mammalian species the Great Gerbil *Rhombomys opimus* was captured from the five sampling locations located at the Reko Diq Mine Site and along the Fan Sediment Water Supply Pipeline Area. Sampling was not conducted at the Access Road of the proposed Reko Diq Mine Site. Of these areas, a total of five specimens of Great Gerbil were captured from Sampling Location BM3 while only two specimens of this species were captured from Sampling Location BM4. Both of these sampling locations are located at the proposed Reko Diq Mine Site.

During the Post-Monsoon 2022 Survey, small mammals were only captured from the Built-up Area. This can be attributed to the availability of food. As a secondary consumer, small mammals have a significant role in ecological niches and are a primary food source for a broad range of predators. Therefore, the occurrence of large mammals in the area that feed on these species may influence the population of these species. The lower diversity of small mammals in the area is likely a result of dry weather conditions and food availability.

Figure 5-76 provides the abundance and richness of small mammals captured during the Post-Monsoon 2022 Survey.

Figure 5-77 provides photographs of Great Gerbil captured during the Post-Monsoon 2022 Survey.

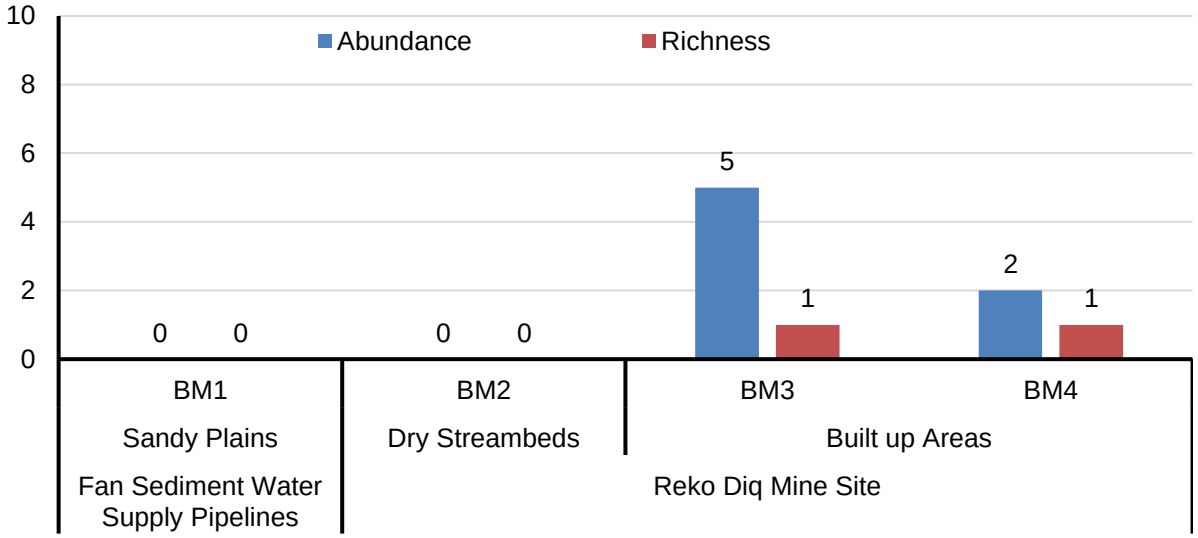


Figure 5-76: Abundance and Richness of Small Mammals, Using Sherman Traps, Post-Monsoon 2022 Survey



Great Gerbil *Rhombomys opimus*

Figure 5-77: Great Gerbil *Rhombomys opimus* Captured, Post-Monsoon 2022 Survey

5.2.7.5.2 Comparison of Post-Monsoon 2022 Survey with Previous Surveys in Similar Conditions

Appendix K provides the details on comparisons of the result of small mammal sampling During the Post-Monsoon 2022 Survey and Previous Survey while a summary is discussed below.

The live trapping for small mammals was conducted in Previous Surveys (November 2008, and September 2009) at the proposed Reko Diq Mine Site. In the November 2008 Survey, higher abundance, and richness (12 specimens of five species) of small mammals were observed compared to the September 2009 (three specimens of three species) and Post-Monsoon 2022 Survey (six specimens of only one species). In Previous Surveys, small mammals were captured from Gravel Plains and Clayey Plains however, they were captured only from Built-up Area during the Post-Monsoon 2022 Survey.

The habitats surveyed during November 2008 and September 2009 offered favorable conditions for small mammals, providing food, shelter, and relatively less dry environments. However, the lesser rains have led to the complete dryness of the Gravel Plains and Clayey Plains, with minimal to no vegetation. In Built-up Areas, though limited, there is still an available food source for these species, supporting their survival under the current conditions.

5.2.7.5.3 Spring 2023 Survey

During the Spring 2023 Survey, a total of nine specimens of the Great Gerbil *Rhombomys opimus* were captured from the four sampling locations located at the proposed Reko Diq Mine Site and Fan Sediment Water Supply Pipeline Area.

During the Spring 2023 Survey, Sherman trapping was conducted at four sampling locations, and the only species captured at all sampling locations was the Great Gerbil *Rhombomys opimus*. These results indicate that the Great Gerbil is well adapted as it was able to utilize the available food resources near the Built-up Area. Great Gerbils are known to primarily feed on plant material, such as seeds and vegetation. However, when plant material is not readily available, they can adapt their food preferences and habitat. In this case, the abundance of the Great Gerbil was high near the Built-up Area, where they were able to feed on different waste food discarded by humans. This alternate food source likely contributed to their increased abundance in that area.

Additionally, very dry conditions at the proposed Reko Diq Mine Site may have resulted in the scarcity of food for small mammals. The lack of sufficient food resources could be a contributing factor to the lower diversity and abundance of small mammals in natural habitats. Overall, the availability of food near the Built-up Area influences large mammalian predators, which combined with the challenging environmental conditions at the proposed Reko Diq Mine Site, likely contribute to the observed patterns of abundance and diversity of small mammals in the Ecological Study Area.

Figure 5-78 provides the abundance and richness of small mammals captured during the Spring 2023 Survey. Figure 5-79 provides photographs of Great Gerbil captured during the Spring 2023 Survey.

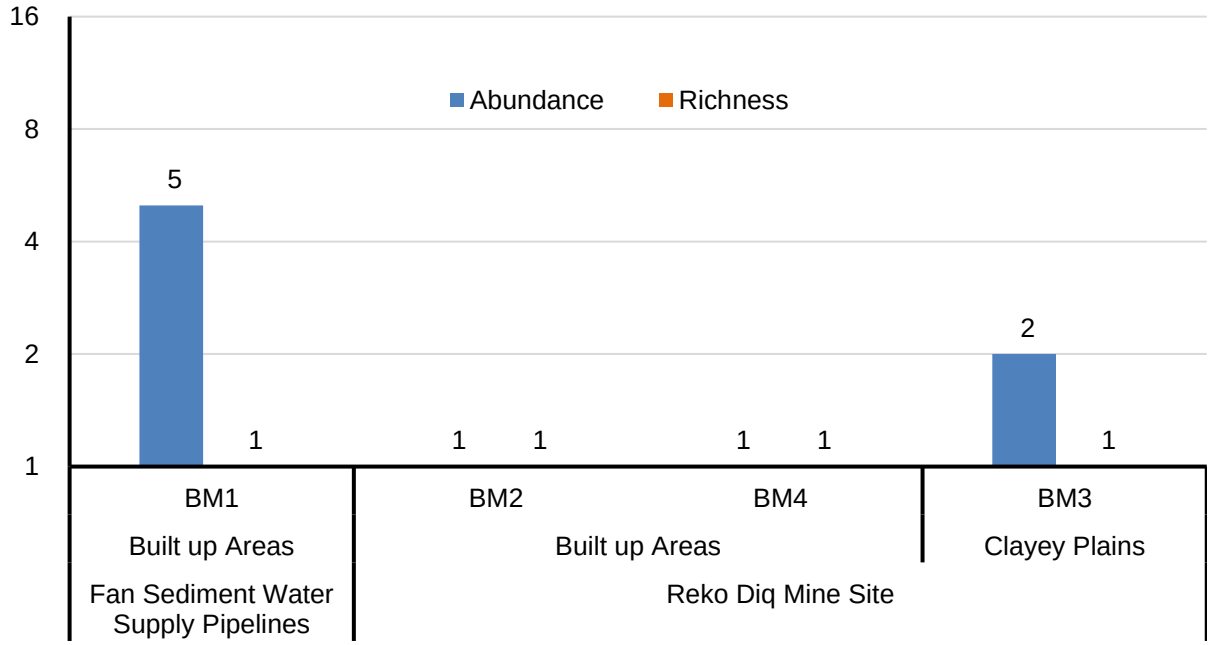


Figure 5-78: Abundance and Richness of Small Mammals, Using Sherman Traps, 2023 Survey



Great Gerbil *Rhombomys opimus*

Figure 5-79: Great Gerbil *Rhombomys opimus* Captured, Spring 2023 Survey

5.2.7.5.4 Conservation Concern Small Mammals Species

No conservation concern small mammal species was captured during both Post-Monsoon 2022 and Spring 2023 surveys. The only captured species, Great Gerbil is listed as Least Concern according to the IUCN Red List of Threatened Species.

5.2.7.6 Invertebrates

A total of 10 invertebrate species were observed from the proposed Reko Diq Mine Site, along the Fan Sediment Water Supply Pipeline Area, and Access Road to proposed Reko Diq Mine Site. During the Post-Monsoon 2022 Survey, nine invertebrate species were observed. However, only five species were observed during the Spring 2023 Survey.

Table 5-56 provides a list of invertebrate species observed during both Post-Monsoon 2022 Survey and Spring 2023 Survey.

Table 5-56: Invertebrates Species Observed, Post-Monsoon 2022 Survey and Spring 2023 Survey

No.	Scientific Name	Common Name	IUCN Status	Post-Monsoon 2022 Survey	Spring 2022 Survey
1.	*Belenois aurota*	Caper White Butterfly	Least Concern	✓	✓
2.	*Blaps sp.*	-	Not Evaluated	✓	✓
3.	*Buprestidae*	Jewel Beetle	Not Evaluated	✓	-
4.	*Danaus chrysippus*	Plain Tiger	Least Concern	✓	✓
5.	*Freyeria trochylus*	African Grass Jewel		✓	-
6.	*Julodis sp.*	-	Not Evaluated	-	✓
7.	*Lampides boeticus*	Pea Blue	Least Concern	✓	-
8.	*Pieris rapae*	Small Cabbage White		✓	-
9.	*Polyommatus icarus*	Meadow Blue		✓	-
10.	*Tenebrionidae*	-	Not Evaluated	✓	✓
Total				**9**	**5**

5.2.7.6.1 Post-Monsoon 2022 Survey

The sampling for invertebrates was conducted using the transects and pitfall traps. None of the invertebrate specimens were captured in pitfall traps and those observed along the transects revealed the lower abundance during the Post-Monsoon 2022 Survey. A total of

nine invertebrate species were observed including some butterflies such as Plain Tiger *Danaus chrysippus*, Caper White Butterfly *Belenois aurota*, Small Cabbage White *Pieris rapae,* and Small Cupid *Chilades parrhasius*.

Key observations of the Post-Monsoon 2022 Survey are described below.

- A total of 23 specimens belonging to nine species were observed at the proposed Reko Diq Mine Site, along the Fan Sediment Water Supply Pipeline Area, and the Access Road to the proposed Reko Diq Mine Site.
- Higher abundance was observed from the proposed Reko Diq Mine Site and along the Fan Sediment Water Supply Pipeline Area (10 specimens each) followed by the Access Road where a total of three specimens were observed.
- The most abundant taxon observed was *Blaps sp.* followed by *Tenebrionidae* and *Danaus chrysippus*.
- These taxa were observed from those habitats having potential vegetation dominated by *Tamarix aphylla, Pseudo fruticose, Anabasis sp.,* and *Haloxylon stocksii* providing food, refugia, and water.
- Overall, invertebrates' abundance and species richness were lower in Ecological Study Area, this is because the habitat was completely dry, and lacking in vegetation at most of the sampling locations. In addition, strong wind impeded their migration to other locations and resulted in mortality within their current environment.
- The biology of desert invertebrates is different compared to other habitats. To survive in that ecosystem, they manifested adaptation to seasons or times of day. Many invertebrates avoid heat by spending the day in shady places and procuring food at night.

Table 5-56 provides a list of invertebrates observed during the Post-Monsoon 2022 Survey. Figure 5-80 provides abundance and richness of invertebrates at Fan Sediment Water Supply Pipeline Area, proposed Reko Diq Mine Site and Access Road to the proposed Reko Diq Mine Site. Figure 5-81 provides photographs of invertebrate observed during the Post-Monsoon 2022 Survey.

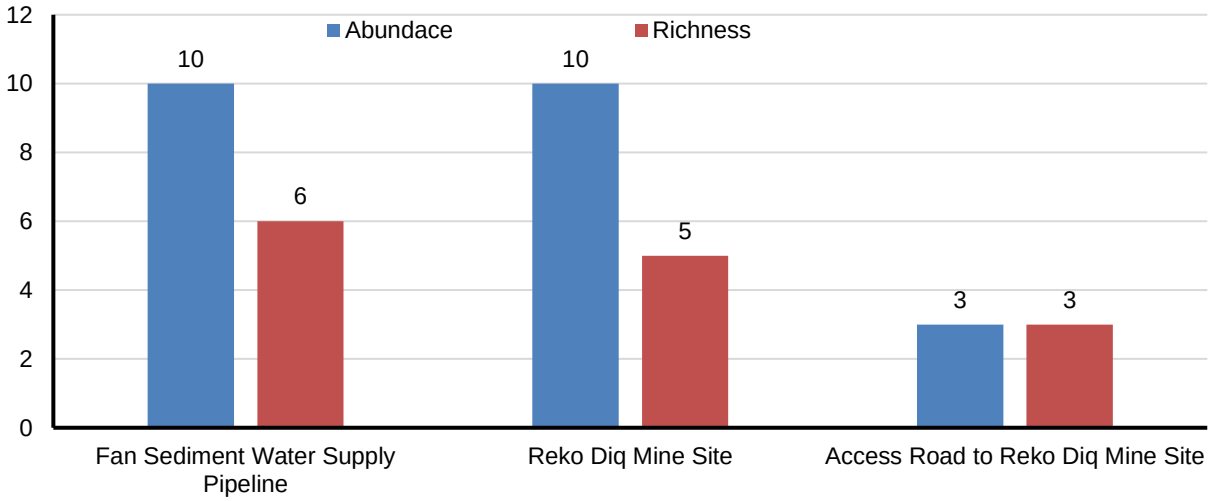


Figure 5-80: Abundance and Richness of Invertebrates Observed, Post-Monsoon 2022 Survey



a) *Blaps sp. (Tenebrionidae)*



b) Jewel Beetle, *Buprestidae*, fore-wing



a) Plain Tiger *Danaus chrysippus*



b) Meadow Blue *Polyommatus icarus*

Figure 5-81: Invertebrates Species Observed at the proposed Reko Diq Mine Site, along Fan Sediment Water Supply Pipeline Areas and Access Road, Post-Monsoon 2022 Survey

5.2.7.6.2 Spring 2023 Survey

During the Spring 2023 Survey, five invertebrate species were observed from the proposed Reko Diq Mine Site, along the Fan Sediment Water Supply Pipeline Area, and the Access Road to the proposed Reko Diq Mine Site. The invertebrate species observed during the Spring 2023 Survey include some butterflies which include Plain Tiger *Danaus chrysippus*, and Caper White *Belenois aurota*.

Key observations of the Spring 2023 Survey are described below.

- A total of nine specimens belonging to five taxa were observed from the proposed Reko Diq Mine Site, along the Fan Sediment Water Supply Pipeline Area, and Access Road to the proposed Reko Diq Mine Site.
- A higher abundance of invertebrate species was observed along the Fan Sediment Water Supply Pipeline Area (five specimens of three species), followed by proposed Reko Diq Mine Site (two specimens of two species), and along Access Road to the proposed Reko Diq Mine Site (two specimens of one species).
- The most abundant taxon was *Danaus chrysippus* and *Balps sp*. followed by *Lampides boeticus.*
- These taxa were observed from those habitats having potential vegetation dominated by *Tamarix aphylla, Pseudo fruticose, Anabasis sp.,* and *Haloxylon stocksii* providing food, refugia, and water.

- The overall lower abundance and species richness of invertebrates in the desert habitat can be attributed to several factors.
  - Firstly, the habitat being completely dry and lacking vegetation at most sampling locations creates a challenging environment for many invertebrate species.
  - Invertebrates often rely on vegetation for food, shelter, and reproduction, so the scarcity of vegetation limits their ability to thrive and populate the area.
  - Another factor contributing to the lower abundance of invertebrates in the described habitat is the disturbance caused by strong winds.
  - Extreme temperature and strong winds are other reasons for the lower abundance of invertebrates during the Spring 2023 Survey.

  Table 5-56 provides a list of invertebrates observed during the Spring 2023 Survey. Figure 5-82 provides abundance and richness of invertebrates at the Fan Sediment Water Supply Pipeline Area, proposed Reko Diq Mine Site, and Access Road to the proposed Reko Diq Mine Site.

  Figure 5-83 provides photographs of invertebrate observed during the Spring 2023 Survey.

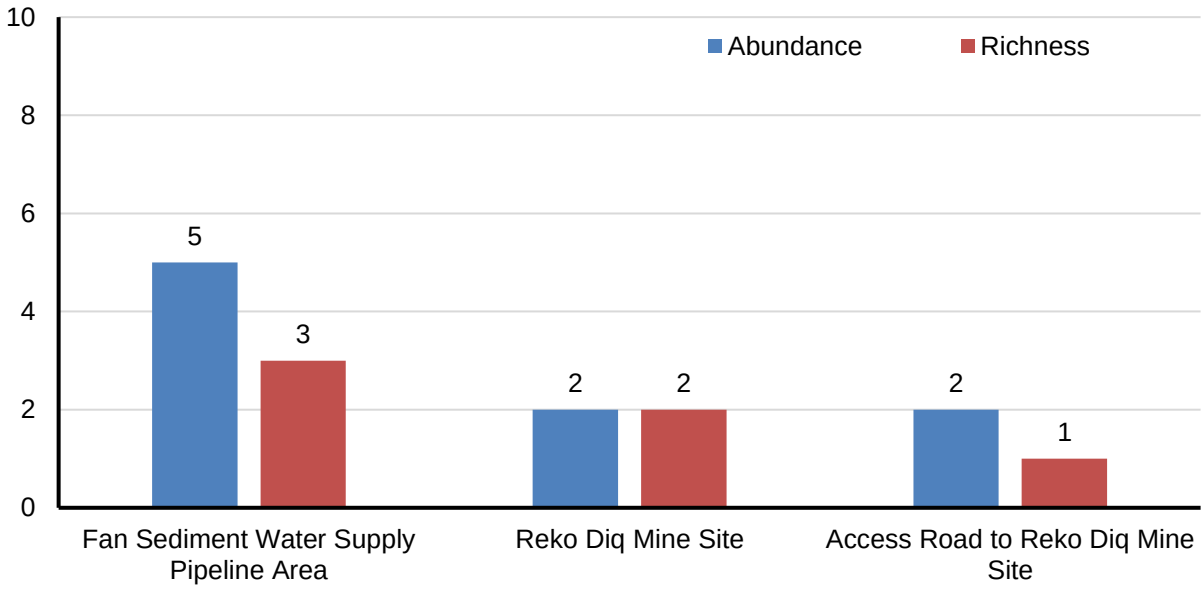


Figure 5-82: Abundance and Richness of Invertebrates Observed, Spring 2023 Survey



a) Plain Tiger *Danaus chrysippus*



b) Pioneer White *Belenois aurota*



c) Darkling Beetle (Tenebrionidae)



d) *Blaps* sp.



e) *Julodis* sp.

Figure 5-83: Invertebrates Taxa Observed at the proposed Reko Diq Mine Site, along Fan Sediment Water Supply Pipeline Areas and Access Road to the proposed Reko Diq Mine Site, Spring 2023 Survey

5.2.8 Land Use

Land use is an indicator of habitat conversion and a proxy indicator for water and air pollution associated with anthropogenic activities. Through the analysis of ***Google Earth™*** Satellite Imagery, the percent of land under different uses relevant to biodiversity such as Agricultural Areas/Date Palms, Built-up Areas, Clayey Plains, Clayey Mountains/Hills, Sandstone Hills, Dry Streambeds, Gravel Plains, Mountains Hills, Sandy Plains/Sand Dunes and Wetlands was calculated for proposed Reko Diq Mine Site, Fan

Sediment Water Supply Pipeline Areas, and Access Road with a buffer of 10 km for the year 2021.[107]

The land use was calculated for 2021 and then compared with 2010 to observe the change. A small difference in the land use percentage for Agricultural Areas/Date Palms, Built-up Areas, and Dry Streambeds was observed which can be attributed to climatic condition, higher salinity, limited freshwater availability and an increase in infrastructure like roads, human settlements, and the expansion of cities.

Table 5-57 provides land use categories and comparison of area and percentage of each habitat type for 2021 and 2010 while Figure 5-84 provides the changes in land use for the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area and Access Road to the proposed Reko Diq Mine Site for 2021 and 2010.

Table 5-57: Land Use Categories and Comparison of Area and Percentage of Habitat for proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area and Access Road to proposed Reko Diq Mine Site in 2010 and 2021

No.	Habitat Type	Total Area (km^2)		Percentage of Land Use (%)		Change in Land Use (%)
		2010	2021	2010	2021	
1.	Agriculture Areas/Date Palms	0.10	0.02	0.003	0.001	-0.002
2.	Built-up Areas	0.12	0.41	0.004	0.01	0.01
3.	Clayey Plains	148.07	148.30	4.52	4.53	0.01
4.	Dry Streambeds	129.37	125.20	3.95	3.82	-0.13
5.	Gravel Plains	1,757.44	1,761.38	53.67	53.79	0.12
6.	Mountains/Hills	808.75	808.49	24.70	24.69	-0.01
7.	Sandy Plains/Sand Dunes	430.80	430.84	13.16	13.16	0.00
Total		**3,274.64**	**3,274.64**	**100.0**	**100.0**	

Note: Agriculture Areas/Date Palms habitat is only a fraction of the total habitat types. This habitat is only present along the Fan Sediment Water Supply Pipeline Area around the security forces camps which was identified as a microhabitat in the field.

107 Google Earth Satellite Image is available for 2021 accessed on November 05, 2022, so land use is given for 2021 and compared with 2010 land use. Although land use was available for few sites for 2022 and 2023 but that was not for all the Project facilities. Therefor comparison is given for 2021 which is available for all the Project facilities.

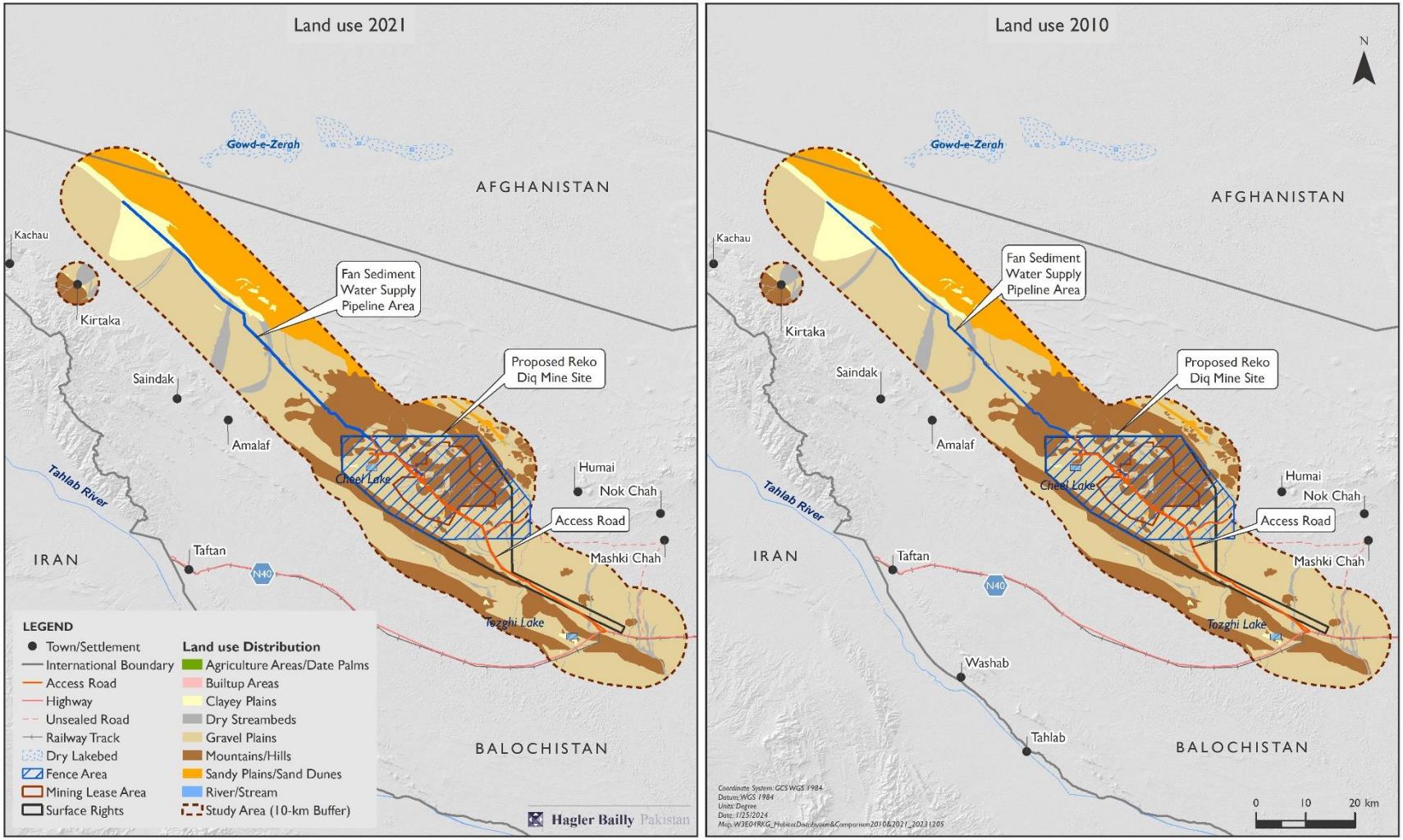


Figure 5-84: Comparison of Land Use for proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline and Access Road to the proposed Reko Diq Mine Site for 2021 and 2010

5.2.9 Site Assessment

The site assessment process forms the basis of mitigation measures that may be required to manage the valued ecological resource at a specific site. Overall, arid climatic conditions were prevailing in the area due to lower rainfall in last decade therefore, the Ecological Study Area does not specifically fall in the monsoon region. Some conservation concerns, rare, and restricted range species were observed from most of the Project areas in the Ecological Study Area.

Table 5-58 provides conservation and restricted range species of the Ecological Study Area.

Appendix M provides the description of sites along with abundance and richness and threats to Ecological Resources.

Table 5-58: Conservation Concern and Restricted Range Species Observed in Ecological Study Area

Project Facility	Conservation Concern Species	Restricted Range Species
Proposed Reko Diq Mine Site	*Neophron percnopterus* (EN)	-
Fan Sediment Water Supply Pipeline Area	*Chlamydotis macqueenii* (VU)	-
	Neophron percnopterus (EN)	*Phrynocephalus euptilopus*
Access Road to the proposed Reko Diq MIne Site	-	-

A description of the overall biodiversity status and challenges/threats to biodiversity at each Project site/area is given below.

5.2.9.1 *Proposed Reko Diq Mine Site*

The habitat at the proposed Reko Diq Mine Site is characterized by barren flat land having sparse vegetation dominated by xerophytic plants. A low to moderate level of disturbance was observed at the proposed Reko Diq Mine Site due to vehicle movement for cross-border trade and security forces camps. Continuous vehicle movement and associated noise can disturb the natural behaviors of wildlife which can limit their access to essential resources such as food, water, and shelter. The area has sparse vegetation which supports lower faunal diversity in the area. The scarcity of vegetation can be attributed to a lack of precipitation and different anthropogenic activities which include camel grazing and vehicle movement. The Dry Streambed and Mountains/Hills were the habitats that have the potential for harboring the greatest diversity of flora and fauna. This is evident from the range of faunal and floral species observed in these habitats. This can be attributed to the uniform distribution of vegetation in these habitat types providing promising habitats for small mammals, reptiles, and large mammals. The dominant floral species at the Reko Diq Mine Site were *Salsola stocksii* followed by Aristida *adscensionis, Haloxylon persicum, Haloxylon salicornicum,* and *Calligonum comosum.* These floral species at the proposed Reko Diq Mine Site provide important food resources for the local wildlife community. These plant species contribute to the ecological functioning and food web dynamics of the site, supporting the survival and population dynamics of these animals in this ecosystem. Gravel Plains and Sand Dunes/Sandy Plains have lower potential with only fewer species observed. This is

because these habitats have little or no vegetation so there is no food and refugia for species in this habitat.

5.2.9.2 *Fan Sediment Water Supply Pipeline Area*

The habitat along the Fan Sediment Water Supply Pipeline Area was categorized with different habitat types including Agricultural Areas/Date Palms, Clayey Plains, Dry Streambeds, Gravel Plains, Mountains/Hills, and Sandy Plains/Sand Dunes. Some of these habitats have very high potential for specific flora and fauna, especially the Date Palm/Agricultural Area which is a microhabitat. Similarly, Mountain/Hills and Sand Dunes/Sandy Plains also have high potential due to the unique topography of these habitat types along the Fan Sediment Water Supply Pipeline Area. A moderate level of disturbance was observed along the Fan Sediment Water Supply Pipeline Area due to livestock grazing and security forces camps. However, specialized species of flora and fauna were observed. Major plant species observed along the Fan Sediment Water Supply Pipeline Area include the *Haloxylon stocksii, Haloxylon salsola, Haloxylon persicum, Tribulus terestris, Phoenix dactylifera, Citrullus colocynthis, Tamarax aphyllya*, *Peganum harmala*, *Alhagi maurorum*, and *Vachellia jacquemontii.* Some unique bird species were observed in this habitat including the Laughing Dove, White-eared Bulbul, Indian Golden Oriole, Crested Lark, Eurasian Crag Martin, Lesser White Throat, Egyptian Vulture, European Bee-eater, and Red-throated Flycatcher. The herpetofauna species observed in this habitat was the Black-tailed Toad-headed Agama *Trapelus agilis*. Signs of small mammals were also observed. A recently established Frontier Corps (FC) check post in this habitat has modified the natural integrity of this site. Overall, Fan Sediment Water Supply Pipeline Area was the preferred habitat for herpetofauna with slight potential for mammals and birds.

5.2.9.3 *Access Road to the proposed Reko Diq Mine Site*

Habitat along the Access Road to the proposed Reko Diq Mine Site was largely disturbed being a main route for cross-border trade, and camps for security agencies. In addition, most of the habitat was dry due to lack of rain for a long period. The major area along the Access Road to the proposed Reko Diq Mine Site is comprised of Gravel Plain without any vegetation. Only specialized, or xeric plant species were observed which were dominated by *Aristida sp. Haloxylon stocksii Alhagi marorum,* and *Aloropus sp.* The Gravels Plains and Clayey Plains in this area were the most promising habitats for birds, mammals, and rodents mainly in the areas around the dry Tozghi Lake. The potential habitat for many Ecological Resources was present in areas around the dry Tozghi Lake with the availability of food and shelter.

5.2.10 Sensitivity Mapping

Sensitivity mapping is a source of ecological and habitat information for resource development and planning. Maps portray ecological units, which are unique combinations of hierarchically ordered environmental factors that are rated as habitats for regionally important wildlife species. To get a better picture of the Ecological Study Area, sensitivity analysis was done before the field survey based on high-resolution ***Google Earth™*** Satellite Imagery and other accessible resources like IUCN, KBA, IBAT, data from the desktop assessment and spatial databases and then verified in the field survey.

The purpose of sensitivity mapping is to identify the sensitive areas within the Ecological Study Area which includes conservation concern species, restricted range or endemic species, higher species richness areas, microhabitats, and areas supporting higher ecosystem services to locals in terms of livestock grazing and fuelwood. These areas were identified in the field and given a score based on the available sensitive receptors and mapped using advanced statistical analysis in GIS. The habitat was categorized into three categories based on the level of sensitivity and Project facilities. The sensitivity of the area is correlated with the Project facilities which can anticipate the impacts of the Project activities on the sensitive areas. This sensitivity determination is only a comparison of the different habitats surveyed within the Project area rather than the sensitivity of all habitats elsewhere in the country (i.e. rainforest, temperate regions etc.).

5.2.10.1 Approach and Methodology

The detail of the approach and methodology[108] used for sensitivity mapping is based on a series of events which are given below:

- Identification of sensitive species, habitats, and ecosystem services;
- Compilation of datasets;
- Development of a scoring system; and
- Mapping.

5.2.10.1.1 Identification of Sensitive Species, Habitats, and Ecosystem Services

Identification of sensitive species and habitats is a critical step in Sensitivity Mapping. Sensitive species and habitats were identified using the field data and the species or habitat that are likely to be impacted by the Project, considering all the life events of the species and the role of the habitat for the survival of the species. Species sensitivity was decided based on their conservation status and restricted range or endemic status. In addition, the ecosystem services like the role of these species for fuelwood, fodder, livestock grazing, and hunting were also considered for Sensitivity Mapping. Protected areas were also considered although no protected area is present in the close vicinity of the Ecological Study Area.

5.2.10.1.2 Compilation of datasets

After the identification of sensitive species, habitats, and other resources that are likely to be impacted, the datasheets for diversity, density, economic importance, endemic or restricted range, and conservation concern species were compiled using the field data collected during both Post-Monsoon 2022 and Spring 2023 surveys.

5.2.10.2 Development and Use of Scoring System for Sensitivity Mapping

A sensitive scoring system was developed based on the identification of sensitive species, habitats, and other resources in the Ecological Study Area. This scoring system includes species characteristics like species abundance, diversity, economic importance, conservation status, occurrence in the area, and restricted or endemic species in the Ecological Study Area. For habitat scoring certain characteristics like microhabitat or

[108] Allinson, T., Jobson, B., Crowe, O., Lammerant, J., Van Den Bossche, W., & Badoz, L. (2020). The Wildlife Sensitivity Mapping Manual: Practical guidance for renewable energy planning in the European Union. Final report for the European Commission (DG ENV)(Project 07.027733/2017/768654/SER/ENV. D. 3).

unique habitat, level of disturbance in habitats, and presence of protected areas were considered. The scoring system was based on the sampling conducted during both Post-Monsoon 2022 and Spring 2023 surveys. For each sampling location, a score was assigned based on the presence of the aforementioned Ecological Resources.

5.2.10.2.1 Scoring Criteria 1: Species Abundance and Richness

Based on the overall species abundance and richness for all the Ecological Resources (birds, herpetofauna, mammals, and vegetation) a criterion was set from low to high and a score was assigned to each sampling location. Cumulative value of abundance and richness was used for Sensitivity Mapping.

Table 5-59 provides the scoring criteria for species abundance and richness for Sensitivity Mapping.

Table 5-59: Scoring Criterion based on Species Abundance and Richness for Sensitivity Mapping

Criteria	Category	Score
Species Abundance		
Number of specimens ≥ 30	High	3
Number of specimens < 30 and ≥ 20	Medium	2
Number of specimens < 20	Low	1
Species Richness		
Number of species ≥ 10	High	3
Number of species < 10 and ≥ 5	Medium	2
Number of species < 5	Low	1

5.2.10.2.2 Scoring Criteria 2: Economic Importance of Species

The economic importance of vegetation, birds, and mammals was considered at each sampling location. The economic importance of vegetation species was assigned in terms of fodder/grazing and fuelwood value. Mammals and birds were given scores based on their importance in terms of hunting. The economic roles of these species are based on the information from literature and consultations with locals. Cumulative score of economic value for all these Ecological Resources was used for Sensitivity Mapping.

Table 5-60 provides the scoring criteria for the economic importance of vegetation, mammals, and bird species.

Table 5-60: Scoring Criterion for Economic Importance of Species for Sensitivity Mapping

Species Group	Description	Category	Score
Vegetation	High fodder/grazing, fuelwood value	High	3
	Medium fodder/grazing, fuelwood value	Medium	2
	Low fodder/grazing, fuelwood value	Low	1
	None	None	0
Mammals and Birds	Higher importance in terms of hunting	High	3
	Medium importance in terms of hunting	Medium	2
	Lower importance in terms of hunting	Low	1
	None	None	0

5.2.10.2.3 Scoring Criteria 3: Restricted Range Species or Endemic Species

The number of restricted-range or endemic vegetation, mammals, birds, and herpetofauna species present at each sampling location is considered one of the scoring criteria for Sensitivity Mapping. This score was given based on field data collected during both Post-Monsoon 2022 and Spring 2023 surveys.

Table 5-61 provides the criterion for the scoring of restricted-range species or endemic species.

Table 5-61: Scoring Criterion for Restricted-range Species or Endemic Species for Sensitivity Mapping

Criteria	Category	Score
Number of restricted-range or endemic species = ≥ 5	High	3
Number of restricted-range or endemic species = 3 or 4	Medium	2
Number of restricted-range or endemic species = 1 or 2	Low	1
No species = 0	None	0

5.2.10.2.4 Scoring Criteria 4: Rare or Unique Species

Rare or unique species from each ecological resource like vegetation, birds, mammals, and herpetofauna were selected. These species were selected based on their economic importance, conservation importance, role in the ecosystem, species behavior and vulnerability to disturbance, and restricted distribution range in the Ecological Study Area.

Table 5-62 provides the scoring criteria used for rare or unique species for sensitivity mapping.

Table 5-63 provides a list of rare or unique species from each ecological resource and enlists the criteria for the selection of these species.

Table 5-62: Scoring Criterion for Rare or Unique Species for Sensitivity Mapping

Criteria	Category	Score
Number of rare or unique species = ≥ 5	High	3
Number of rare or unique species = 3 or 4	Medium	2
Number of rare or unique species = 1 or 2	Low	1
No species = 0	None	0

Table 5-63: Criteria for Selection of Rare/Unique Species

Biodiversity Group	Selected Species for Sensitivity Mapping	Criteria for Selection
Vegetation	*Haloxylon persicum*	These are the native and dominant floral species and survive in extremely dry conditions where the survival of other species is difficult. These species have high value for livestock grazing and these also offer refugia and food to the resident faunal species including the small mammals, herpetofauna, and mammals.
	Haloxylon salcornicum	
	Haloxylon stocksii	
Mammal	*Vulpes rueppellii*	This species is widespread in desert and semi-desert regions of North Africa and across the Arabian Peninsula eastwards to Pakistan. As this species is a rare/unique species of the Ecological Study Area, it is considered for sensitivity mapping.

Biodiversity Group	Selected Species for Sensitivity Mapping	Criteria for Selection
Birds	*Chlamydotis macqueenii*	This species is listed as Vulnerable according to the IUCN Red List with a decreasing global population. In Pakistan, this species visits arid areas including the Thal, Thar, Cholistan, Kharan Desert, and other areas including the Chagai District. Due to its higher conservation importance and rapidly declining global population, it is selected as a rare/unique species for sensitivity mapping.
	Neophron percnopterus	This species is listed as Endangered according to the IUCN Red List with a decreasing global population. In Pakistan, this species has a wide distribution but due to the development and use of certain chemicals like diclofenac, these species are declining at a rapid rate. Therefore, this species is selected as a rare/unique species for sensitivity mapping.
Herpetofauna	*Phrynocephalus euptilopus*	This species is selected due to its restricted range in the Ecological Study Area.

5.2.10.2.5 Scoring Criteria 5: Conservation Concern Species

For this category, all the sampling locations were given scores based on the conservation status in the IUCN Red List of Threatened Species. According to this criterion, a species was given a score of three if it is Critically Endangered or Endangered, for Vulnerable species the score was two, for Near Threatened the score was one while no score (zero) was given to species with IUCN status of Least Concern, Not Evaluated and Data Deficient.

Table 5-64 provides a scoring criterion for conservation concern species of vegetation, birds, mammals, and herpetofauna.

5.2.10.2.6 Scoring Criteria 6: Protected Area in Ecological Study Area

Protected Areas in and around the Project facilities were mapped based on the data from the KBAs, and other resources. Based on the location of Protected Areas, scores were assigned to each sampling location. If the entire Ecological Study Area is in a protected area, then a score of “three” was assigned. If a part of the Ecological Study Area is in the protected area, then a score of “two” was assigned. If the Ecological Study Area falls in the proposed protected area, then a score of “one” was assigned. If no part of the Ecological Study Area is in any protected area, then a score of “zero” was assigned.

Table 5-64 provides the scoring criteria for protected areas.

5.2.10.2.7 Scoring Criteria 7: Micro-Habitat or Unique Habitat

Scoring for microhabitat or unique habitat was done based on topographic conditions, habitat productivity, and species diversity observed during both Post-Monsoon 2022 and Spring 2023 surveys.

Table 5-64 provides the scoring criteria for micro-habitat or unique habitat for Sensitivity Mapping.

5.2.10.2.8 Scoring Criteria 8: Level of Disturbance

Scoring for habitat disturbance at each sampling location was done based on the physical characteristics of the habitat as well as the productivity of the habitat. This score was based on the information and observation from different experts who were involved during

both Post-Monsoon 2022 and Spring 2023 surveys. A low score was given to highly disturbed habitats and vice versa.

Table 5-64 provides criteria for scoring the level of habitat disturbance for Sensitivity Mapping.

5.2.10.3 *Overall Sensitivity Score*

The cumulative score of all the aforementioned scoring criteria is used for an overall Sensitivity Mapping for the specific area or site. If the cumulative score of all the criteria set for species, habitat, and other parameters for any of the sampling locations ranged from zero to 10, it was marked as Least Sensitivity Area. If the cumulative score ranged from 11 to 15, it was marked as Moderate Sensitivity Area and if the cumulative score was greater than 16 then it was marked as High Sensitivity Area.

Table 5-64 provides the overall score and categories for Sensitivity Mapping.

Table 5-64: Criteria based on Overall Sensitivity Score

Criteria	Score
Criterion for Conservation Important Species	
Critically Endangered and Endangered	3
Vulnerable	2
Near Threatened	1
Least Concern, Not Evaluated or Data Deficient	0
Criterion for Protected Area Scoring	
If the entire study area is in Protected Area	3
If a part of the study area is in Protected Area	2
If the study area falls in a proposed Protected Area	1
No Protected Area	0
Criteria for Micro-Habitat and Unique Habitat	
Micro habitat or unique habitat which is considered as keystone habitat like a small patch of vegetation or water source.	3
Habitat with sufficient resources like food and shelter for species, like streambeds having enough vegetation and mountains/hills having rocky substrates providing habitat for a variety of species.	2
Habitat with moderate resources like food and shelter.	1
Very dry habitat with rare vegetation and shelter.	0
Criteria for Level of Disturbance	
No disturbance at all and the habitat is a natural	3
Habitat is slightly disturbed due to lower grazing, deforestation, and off-road vehicle movement activities	2
Habitat is disturbed due to grazing, deforestation, and ongoing construction activities	1
Habitat is completely modified due to construction activities and frequent vehicle movement	0
Overall Sensitivity Score	
Least Sensitivity Area	0 to 10
Moderate Sensitivity Area	11 to 15
High Sensitivity Area	≥16

5.2.10.3.1 Preparation of Sensitivity Maps

The overall sensitivity score is mapped using the Inverse Distance Weighting (IDW)[109] Geostatistical Tool in GIS. IDW interpolation explicitly assumes that things that are close to one another are more alike than those that are farther apart. To predict a value for any unmeasured location, IDW uses the measured values surrounding the predicted location. Based on the overall sensitivity score. Sensitivity maps were prepared for the proposed Reko Diq Mine Site and all the Water Supply Pipeline areas for both Post-Monsoon 2022 and Spring 2023 surveys. **Appendix N** provides the sensitivity maps for the Post-Monsoon 2022 and Spring 2023 surveys.

5.2.10.3.2 Composite Sensitivity Map

Sensitivity maps for both Post-Monsoon 2022 and Spring 2023 Survey were processed in GIS to produce the Composite Sensitivity Maps. The overlay sum tool in GIS was used to produce the Composite Sensitivity Maps for all the Project facilities where sampling was conducted during both the Post-Monsoon 2022 and Spring 2023 surveys. The overlay sum tool adds multiple layers of spatial datasets. It generated Composite Maps that reflect the actual sensitivity of the area based on two seasons.

5.2.10.4 Sensitive Area and Project Facilities

The sensitivity maps prepared for each Project facility and the overall sensitivity of the area and its vulnerability due to Project activities are discussed below.

5.2.10.4.1 Proposed Reko Diq Mine Site

The composite sensitivity map based on results of the Post-Monsoon 2022 Survey and Spring 2023 Survey prepared for the proposed Reko Diq Mine Site indicates that most of the area at and around the proposed Reko Diq Mine Site is least to moderately sensitive while only a fraction of the area is moderate to highly sensitive.

High Sensitivity Area: This is only a fraction of the area around the proposed Reko Diq Mine Site. The area of proposed Reko Diq Mine Site which is located around the Mountains/Hills and along the scattered Sand Dunes and Clayey Plains of dry Cheel Lake provide a diverse range of floral species that provide food and refugia to many wildlife species as well as provide economic services in the form of fodder, livestock grazing, and hunting of Desert Hare.

Moderate Sensitivity Area: Moderate sensitivity area around the proposed Reko Diq Mine Site falls in Gravel Plains and Mountains/Hills habitat types. The overall productivity of these areas in terms of biodiversity and economic value was lower than the high-sensitivity area. The level of disturbance was higher compared to the high sensitivity area as frequent movement of vehicles for cross-border trade was observed.

Least Sensitive Area: Most of the Project facilities are in least sensitivity areas. The least sensitive area at proposed Reko Diq Mine Site is either Gravel Plains, Sandy Plains/Sand Dunes, Dry Streambeds, or Mountains/Hills with very little or no vegetation, providing less refugia and food for wildlife species. Additionally, there was an unpaved road route in this area which is used for local transport.

[109] Inverse Distance Weighting (IDW), https://gisgeography.com/inverse–distance–weighting–idw–interpolation/

Although the proposed Reko Diq Mine Site is the most vulnerable area due to Project activities as most of the area will be converted to permanent Project facilities as well as use of heavy machinery which will also degrade the habitat. Thus, the fragile desert ecosystem which is already suffering from extreme arid conditions will become more vulnerable to Project activities. This is because the Balochistan Province and Chagai District where the Project is located has large area while the Project Area is only a fraction of the total area. The combined habitat loss area, considering a 100 m buffer around each facility (Mine Site, Fan Sediment, and Access Road to Mine Site) is projected to be less than 0.05%, which is considered minor when compared to total area of desert ecosystem in Balochistan.

Table 5-65 provides the score for Sensitivity Mapping for the proposed Reko Diq Mine Site for both Post-Monsoon 2022 and Spring 2023 surveys.

Figure 5-85 provides a composite sensitivity map for proposed Reko Diq Mine Site.

Table 5-65: Score for Sensitivity Mapping for proposed Reko Diq Mine Site for Post-Monsoon 2022 and Spring 2023

ID's	Habitat	Coordinates		Sensitivity Score	
		Latitude	Longitude	Post-Monsoon 2022 Survey	Spring 2023 Survey
E13	Mountain/Hills	29°09'31.21" N	61°59'43.08"E	19	16
E14	Clayey Plains	29°08'48.03" N	61°54'48.61"E	17	13
E15	Dry Streambeds	29°10'04.65" N	62°01'3.64" E	15	12
E16	Gravel Plains	29°10'40.22" N	62°01'55.97" E	16	7
E17	Mountain/Hills	29°12'55.75" N	62°02'06.3" E	15	15
E18	Sandy Plains	29°12'32.92" N	62°08'12.04" E	13	7
E19	Mountain/Hills	29°10'07.17" N	62°06'3.52" E	18	15
E20	Gravel Plains	29°09'23.55" N	62°01'56.15" E	16	7
E21	Dry Streambeds	29°07'17.05" N	62°00'14.09" E	17	7
E22	Mountain/Hills	29°07'57.42" N	62°02'12.66" E	18	18
E23	Gravel Plains	29°08'15.44" N	62°06'13.9" E	23	8
E24	Gravel Plains	29°07'11.89" N	62°07'1.04" E	19	7
E25	Dry Streambeds	29°05'37.13" N	62°06'15.31" E	17	10
E26	Gravel Plains	29°06'0.83" N	62°05'10.65" E	11	10
E27	Dry Streambeds	29°06'38.75" N	62°02'57.56" E	21	8
E28	Mountain/Hills	29°06'24.33" N	62°01'14.9" E	17	8
E29	Dry Streambeds	29°05'05.42" N	62°01'15.42" E	14	9
E30	Dry Streambeds	29°05'57.53" N	61°59'09.88" E	17	13
E31	Gravel Plains	29°06'44.67" N	61°57'43.29" E	18	9
E32	Gravel Plains	29°02'54.29" N	61°59'40.47" E	15	9

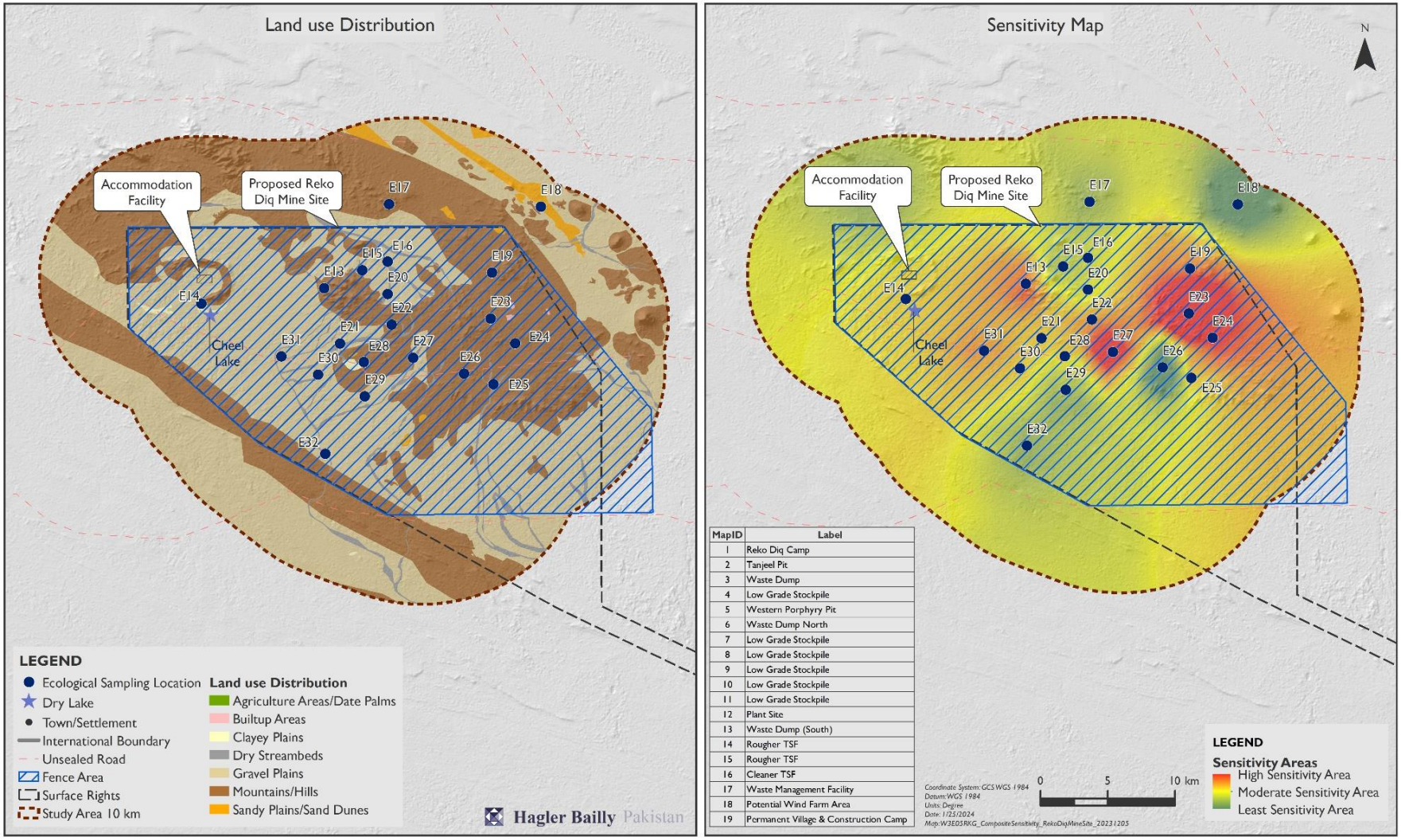


Figure 5-85: Composite Sensitivity Map for the proposed Reko Diq Mine Site

5.2.10.4.2 Fan Sediment Water Supply Pipeline Area

The composite sensitivity map based on the results of Post-Monsoon 2022 Survey and Spring 2023 Survey prepared for Fan Sediment Water Supply Pipeline Area indicates that the area around Fan Sediment Water Supply Area (dry Baghicha Lake) is least sensitive and sensitivity increases while heading toward the proposed Reko Diq Mine Site.

High Sensitivity Area: The high sensitivity area along the Fan Sediment Water Supply Pipeline Area is only located closer to the proposed Reko Diq Mine Site mostly in the Mountains/Hills habitat with a few patches located closer to Dry Streambeds, Clayey Plains, and Gravel Plains. This can mainly be attributed to the lower disturbance in this area as due to mountains there is little or no movement of cross-border trade vehicles. In addition, scattered vegetation along with rocky substrate to provide food and refugia for faunal species. Dry Streambeds and Gravel Plains also provide diverse habitats with some food for species rendering this area moderately to highly sensitive.

Moderate Sensitivity Area: The moderate sensitivity area was a fraction of the total area along the Fan Sediment Water Supply Pipeline Area located mostly in Clayey Plains, Gravel Plains, and around Dry Streambeds. These habitats were mostly dry with little vegetation, however, being closer to the Dry Streambeds they offer moderate levels of resources for biodiversity in the area.

Least Sensitivity Area: The least sensitive area along the Fan Sediment Water Supply Area is located around the dry Baghicha playa having Clayey Plains and Gravel Plains as dominant habitat with Sand Dunes as well. The dry Baghicha Lake was dry with an almost barren lakebed with sparse vegetation. The camel grazing was also observed despite very low vegetation which further reduced the area's sensitivity.

In addition, a microhabitat (Agricultural Areas/Date Palm) closer to Fan Sediment Water Supply Pipeline Area is also a highly sensitive area. Despite high disturbance in the form of security forces check posts and camps, this habitat supports a diverse range of unique fauna and flora.

The area along the Fan Sediment Water Supply Pipeline Area is located between the Iran-Afghanistan border which is fenced so animal migration is disturbed. A slight disturbance due to the camp of security forces was also observed. Given the arid climatic conditions, level of disturbance, and sensitivity of the area, further disturbance due to Project activities will increase the vulnerability of limited fauna resulting in habitat degradation.

Table 5-66 provides the score for Sensitivity Mapping for Fan Sediment Water Supply Pipeline Area for Post-Monsoon 2022 and Spring 2023 surveys.

Figure 5-86 provides a composite sensitivity map for Fan Sediment Water Supply Pipeline Area.

Table 5-66: Score for Sensitivity Mapping for Fan Sediment Water Supply Pipeline Area

ID's	Habitat	Coordinates		Sensitivity Score	
		Latitude	Longitude	Post-Monsoon 2022 Survey	Spring 2023 Survey
E1	Clayey Plains	29°38'09.2" N	61°27'19.4" E	10	11
E2	Clayey Plains	29°34'40.6" N	61°30'39.8" E	21	17
E3	Gravel Plains	29°31'42.4" N	61°34'01.1" E	8	7
E4	Dry Streambeds	29°30'46.4" N	61°31'32.5" E	14	22
E5	Sandy Plains	29°28'30.2" N	61°37'49.2" E	16	11
E6	Dry Streambeds	29°26'05.3" N	61°37'59.0" E	16	9
E7	Gravel Plains	29°24'13.5" N	61°44'26.0" E	17	16
E8	Dry Streambeds	29°21'11.3" N	61°44'26.5" E	20	21
E9	Dry Streambeds	29°19'28.1" N	61°45'47.1" E	17	14
E10	Gravel Plains	29°16'51.4" N	61°50'27.9" E	21	21
E11	Mountain/Hills	29°14'42.0" N	61°51'50.7" E	19	30
E12	Gravel Plains	29°11'01.2" N	61°55'11.9" E	19	14
MH1	Agricultural Area/Date Palms	29°28'22.8" N	61°23'10.3" E	20	25

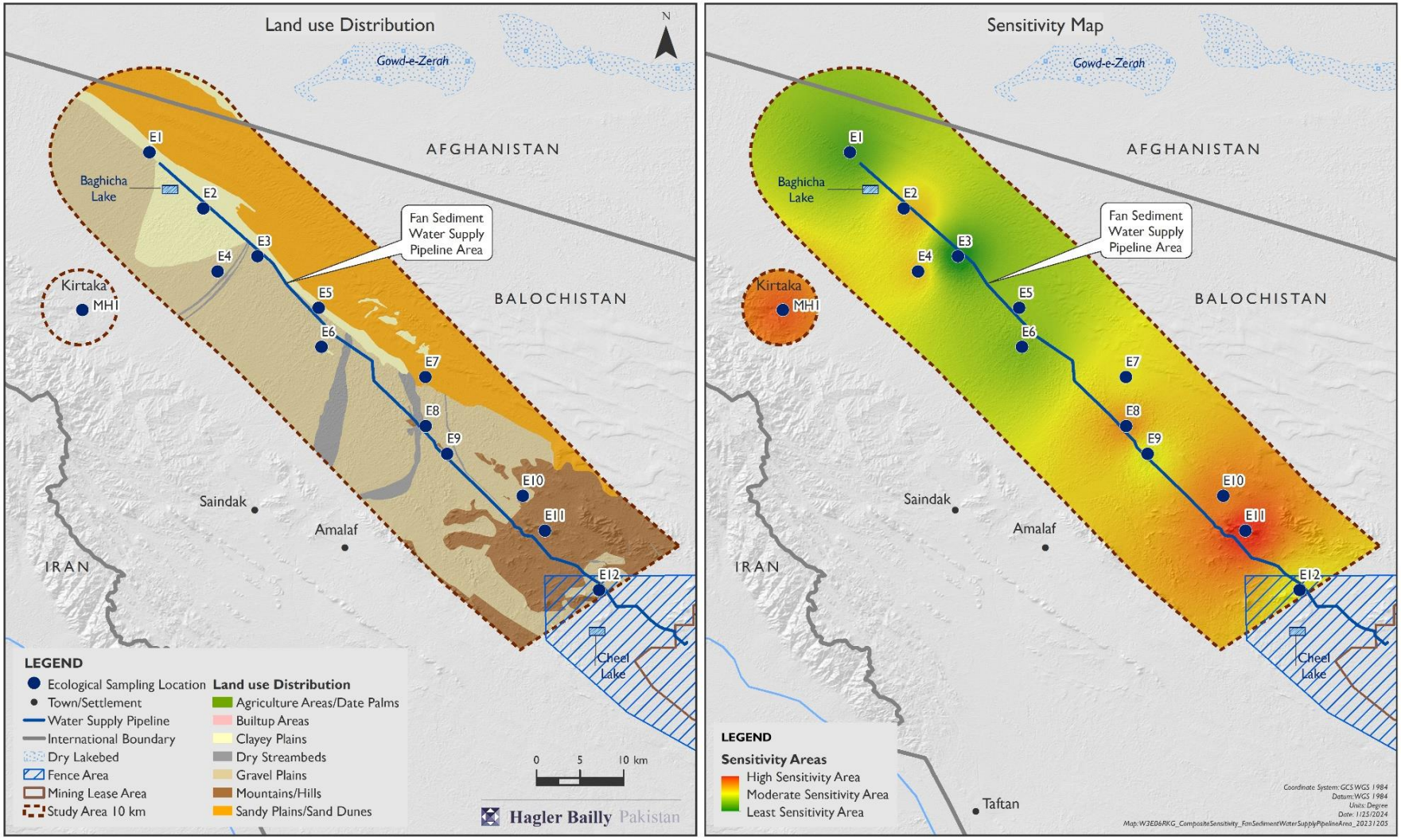


Figure 5-86: Composite Sensitivity Map, Fan Sediment Water Supply Pipeline Area

5.2.10.4.3 Access Road to the proposed Reko Diq Mine Site

The sensitivity map prepared for Access Road indicates that the area closer to the proposed Reko Diq Mine Site in the Mountains/Hills habitat is a high-sensitivity area. However, a major part of the area is least to moderately sensitive.

The area closer to the proposed Reko Diq Mine Site is comprised of mountains/hills with scattered vegetation and dry streambeds. These habitat types offer potential habitat in terms of food and shelter for animals. Moreover, due to the difficult terrain, there is limited vehicle movement in this area. However, when moving to the main N-40 Highway (Nok Kundi-Taftan) from the proposed Reko Diq Mine Site, the major habitat comprises mountains/hills and gravel plains. Dry streambed habitat is also greatly modified due to frequent vehicle movement. These vehicles used for cross-border trade follow multiple routes resulting in habitat modification and disturbance to the biodiversity in the area. The dry Tozghi Lake along the Access Road offers a unique habitat. Overall, the level of disturbance is very high along the Access Road and construction of the Access Road will restrict the traffic to one route thereby avoiding off-road vehicle movement.

Table 5-67 provides the score for Sensitivity Mapping for the Access Road to the proposed Reko Diq Mine Site.

Figure 5-87 provides a sensitivity map for the Access Road to the proposed Reko Diq Mine Site.

Table 5-67: Score for Sensitivity Map for Access Road to the proposed Reko Diq Mine Site

ID's	Habitat	Coordinates		Sensitivity Score	
		Latitude	Longitude	Post-Monsoon 2022 Survey	Spring 2023 Survey
E41	Dry Streambeds	29°00'28.8" N	62°03'08.6" E	9	13
E42	Dry Streambeds	28°58'54.7" N	62°06'19.8" E	10	16
E43	Mountain/Hills	28°57'40.2" N	62°07'12.1" E	22	22
E44	Dry Streambeds	28°55'15.1" N	62°11'39.2" E	12	10
E45	Gravel Plains	28°54'34.4" N	62°14'23.9" E	9	7
E46	Dry Streambeds	28°51'39.9" N	62°18'41.5" E	9	10
E47	Gravel Plains	28°50'32.3" N	62°21'25.3" E	14	9
E48	Dry Streambeds	28°50'1.13" N	62°25'0.9" E	11	12

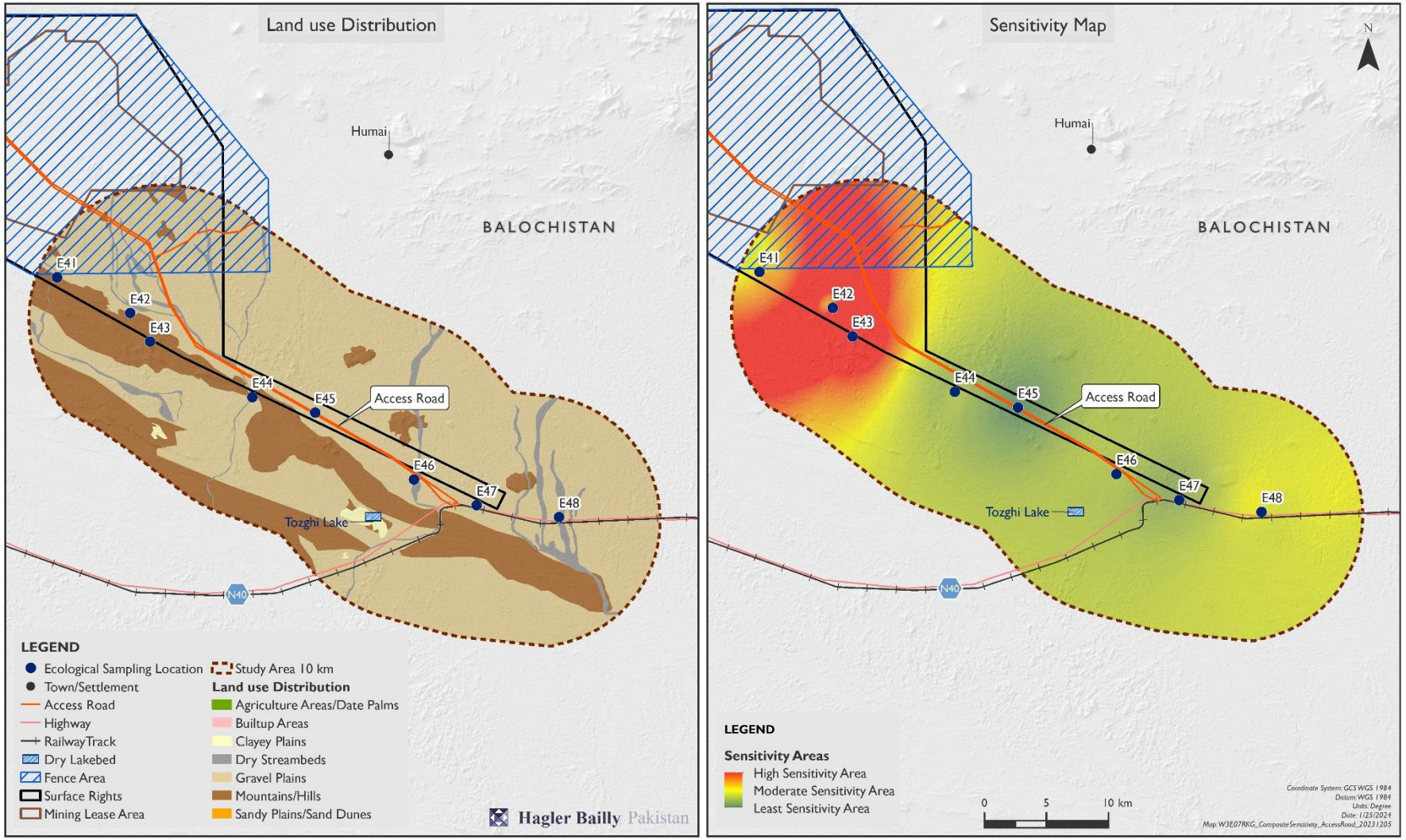


Figure 5-87: Composite Sensitivity Map for Access Road to the proposed Reko Diq Mine Site

5.2.11 Protected Areas

According to the IUCN, a Protected Area is defined as “an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and natural and associated cultural resources, and managed through legal or other effective means.”[110] Based on management objectives, the IUCN has identified seven different protected areas categories which are described below.

- **Category Ia:** Strict nature reserve/wilderness protection area managed mainly for science or wilderness protection.
- **Category Ib**: Wilderness Area: protected area managed mainly for wilderness protection.
- **Category II**: National Park: protected area managed mainly for ecosystem protection and recreation.
- **Category III**: Natural Monument: protected area managed mainly for conservation of specific natural features.
- **Category IV**: Habitat/Species Management Area: protected area managed mainly for conservation through management intervention.
- **Category V**: Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation or recreation.
- **Category VI**: Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural resources.

According to the information collected from Key Biodiversity Areas,[111]and IBAT,[112] 10 key biodiversity areas, located within 500 km radius of the Project site. The key biodiversity areas include Hazar Ganji-Chiltan (National Park), Chorani (Wildlife Sanctuary), Koh-i-Surkho (Wildlife Sanctuary), Maslakh (Wildlife Sanctuary), Ras Koh (Wildlife Sanctuary), Ras Koh (Important Bird Area), Raghai Rakshan (Wildlife Sanctuary), Shashan (Wildlife Sanctuary), Zangai Nawar (Important Birds Area) and Zangi Nawar (Game Reserve).[113]

Table 5-68 provides a list of protected areas identified within 500 km radius of the Project site.

Figure 5-88 shows protected areas in the Balochistan province located within 500 km radius of the Project site.

110 Dudley, N., & Stolton, S. (2008). Defining protected areas: an international conference in Almeria, Spain. *IUCN, Gland*.

111 Key Biodiversity Areas. Available at https://www.keybiodiversityareas.org/sites/search Accessed on 20–Oct–22

112 Integrated Biodiversity Assessment Tool https://www.ibat–alliance.org/ Accessed on 20–Oct–22

113 Ibid

Table 5-68: Detail of Protected Areas

No.	Protected Areas	Distance from the nearest Project Facility	Category			
			National Park	Wildlife Sanctuary	Important Birds Area	Game Reserve
1.	Chorani	450 km away from Access Road to proposed Reko Diq Mine Site	-	✓	-	-
2.	Koh-i- Surkho	422 km away from Access Road to proposed Reko Diq Mine Site	-	✓	-	-
3.	Maslakh	418 km away from proposed Reko Diq Mine Site	-	✓	-	-
4.	Ras Koh	255 km away from Access Road to proposed Reko Diq Mine Site	-	✓	-	-
5.	Ras Koh	255 km away Access Road to proposed Reko Diq Mine Site	-	-	✓	-
6.	Raghai Rakshan	338 km away Access Road to proposed Reko Diq Mine Site	-	✓	-	-
7.	Shashan	424 km away from Access Road to proposed Reko Diq Mine Site	-	✓	-	-
8.	Zangi Nawar	338 km away from Access Road to proposed Reko Diq Mine Site	-	-	✓	-
9.	Zangi Nawar	338 km away from Access Road to proposed Reko Diq Mine Site	-	-	-	✓
10.	Hazar Ganji-Chiltan	405 km away from Access Road to proposed Reko Diq Mine Site	✓	-	-	

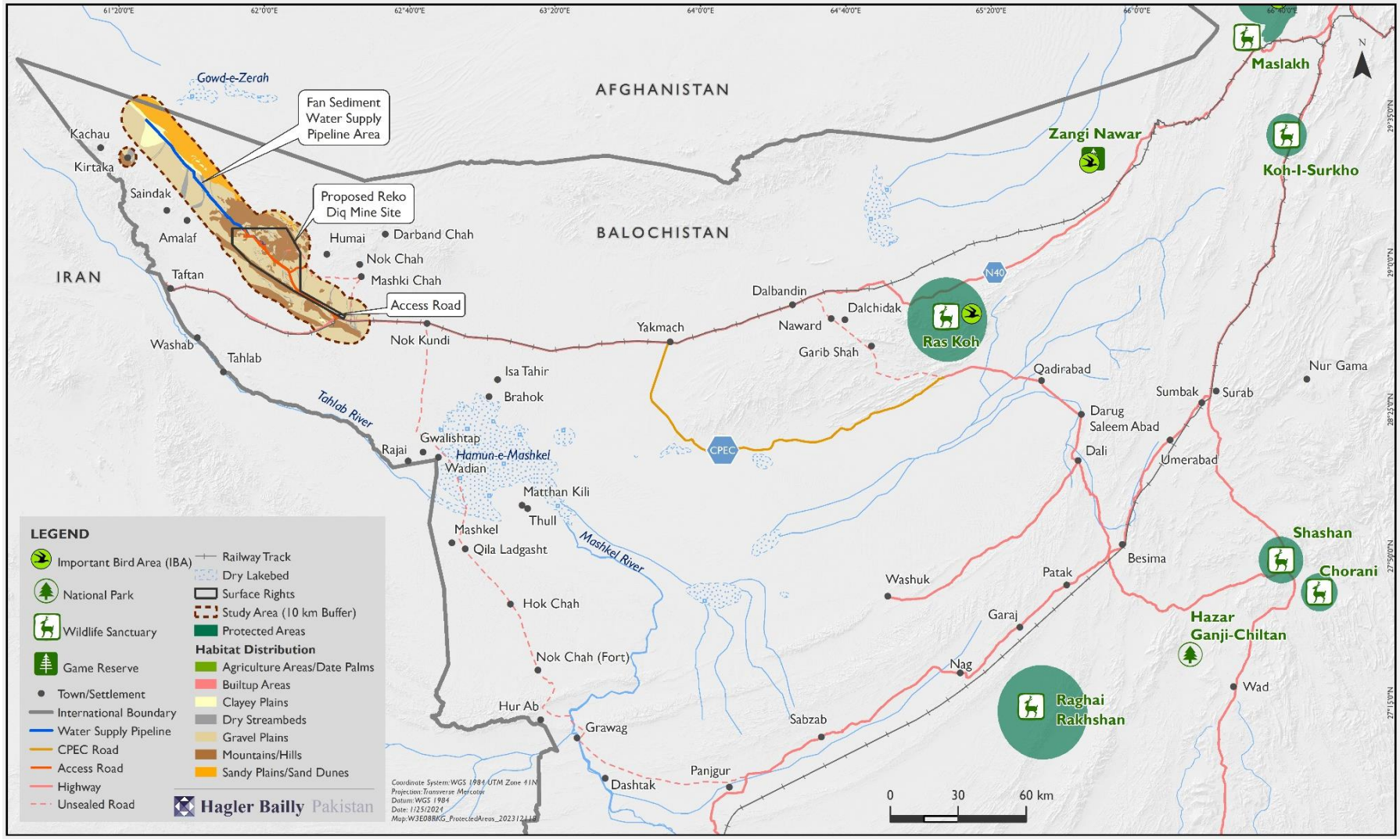


Figure 5-88: Location of Protected Areas

5.2.12 Critical Habitat Assessment

This section provides the Critical Habitat Assessment (CHA) for the Reko Diq Mining Project, which has been completed in line with IFC Performance Standard 6 (PS 6) and the corresponding Guidance Notes (GN) to identify if the Project area is considered as Natural/Modified Habitat and Critical Habitat. The assessment also evaluates whether the Project is situated within these habitats and considers conservation concerning species in the Project vicinity. This evaluation draws from existing literature, previous Environmental Impact Assessments (EIAs), and recent survey findings including the Post-Monsoon 2022 Survey and Spring 2023 Survey.

5.2.12.1 Ecological Study Area

The Ecological Study Area designated for the Critical Habitat Assessment includes the proposed Reko Diq Mine Site, Fan Sediment Water Supply Area and Access Road to proposed Reko Diq Mine Site. A buffer of 10 km has been applied around these Project facilities for delineation of the Ecological Study Area.

Figure 5-89 provides the Ecological Study Area for Critical Habitat Assessment.

5.2.12.2 Objective

This CHA aims to:

- Identify Critical Habitat qualifying species or habitats, priority biodiversity features, including mapping for species of Critical Habitat where possible; and Natural Habitat associated with the Project.
- Highlight future actions for the Project where applicable, including habitat protection for those species whose endangerment is established.

5.2.12.3 Ecologically Appropriate Areas of Analysis (EAAAs)

Ecologically Appropriate Area of Analysis (EAAAs) refer to a Project's indirect impacts which can greatly exceed its direct impacts. EAAAs typically extend well beyond a Project's anticipated physical footprint and may also extend beyond the Project area of influence. For some wide-ranging species, the EAAAs should incorporate any important areas of aggregation, recruitment, and other habitat features, connectivity, or ecosystem processes that are needed to maintain viable populations of the species.

As per GN65 of IFC's Guidance Note 6 states that for Criteria 1-3, the determination of critical habitat should be based on a EAAAs which is an area that has a definable boundary within which the biological communities have more in common with each other than they do with those outside the boundary.

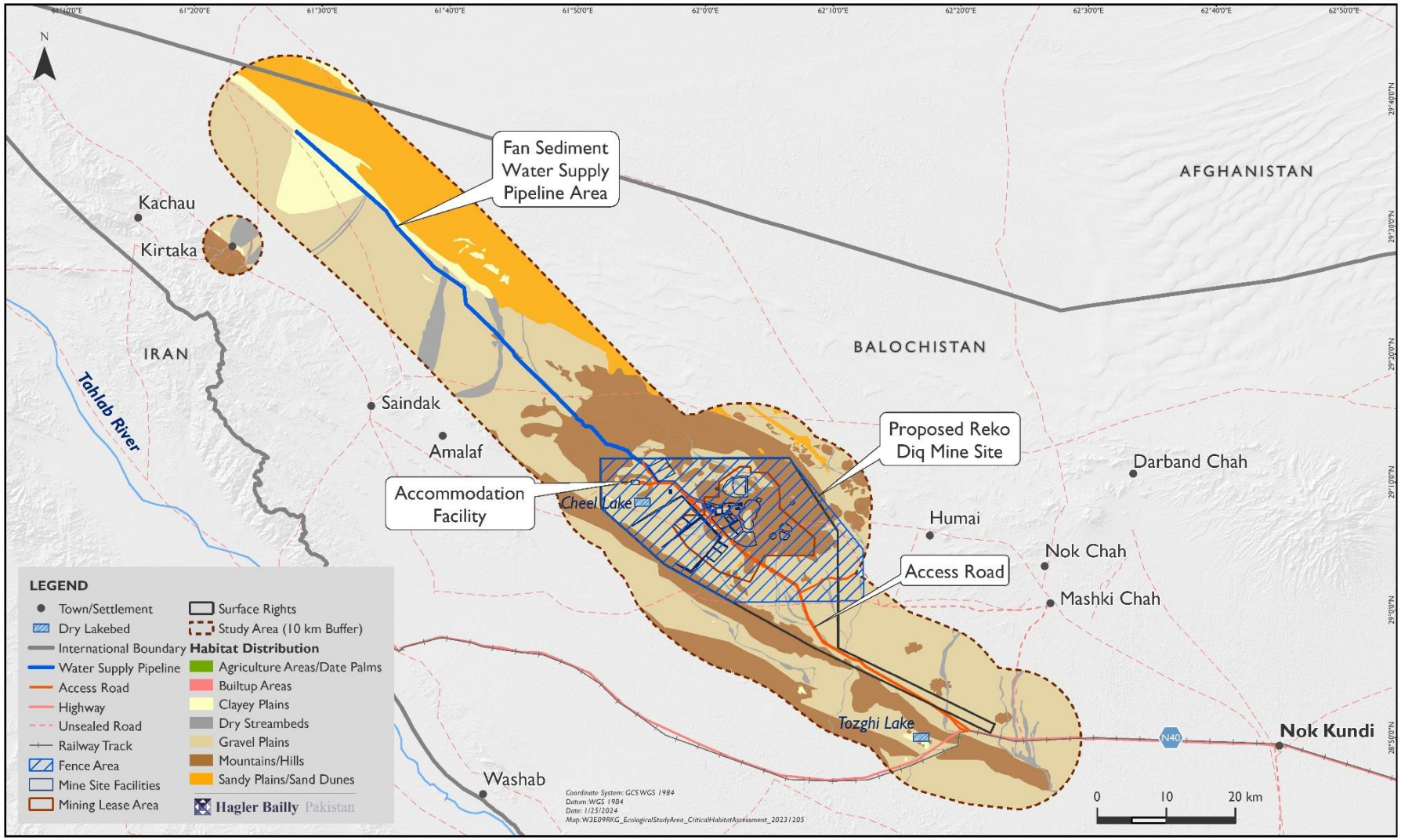


Figure 5-89: Ecological Study Area for Critical Habitat Assessment

International Finance Corporation's Performance Standard 6 (PS6) "Biodiversity Conservation and Sustainable Management of Living Natural Resources" requires the categorization of habitats into modified, natural, and critical. Critical Habitats are a subset of modified or natural habitats and are habitats of high biodiversity value.

5.2.12.4 Natural and Modified Habitat Assessment

Natural and Modified Habitats are defined and described in International Finance Corporation's PS6.[114] Their definitions are as follows.:

5.2.12.4.1 Natural Habitat

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

5.2.12.4.2 Modified Habitat

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

5.2.12.4.3 Determination of Natural or Modified Habitat

The proposed Project facilities (proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area and Access Road to the proposed Reko Diq Mine Site) are located in an intact habitat with scattered vegetation patches, attributed to natural desert conditions. There are low to moderate disturbances in terms of main routes for cross-border trade, security force check posts and camps. The Agricultural Area/Date Palms covers only 0.40 km^2 within the Project area which is a mix of planted and natural vegetation while, only 0.02 km^2 area is classed as Built-up Area. These two habitat types can be referred to as Modified Habitats in the definition of IFC and these constitute only 0.013% of the total Ecological Study Area. However, the rest of all habitats including Clayey Plains, Dry Streambeds, Gravel Plains, Mountains Hills, and Sandy Plains/Sand Dunes are natural land and cover 3,274.2 km^2 of the land areas (see Table 5-17 *Habitat Types along with Area and Percentage*).

Considering these, Ecological Study Area habitat types within the Project area meets the IFC definition of Natural Habitat. In addition, the Project area also supports a diverse range of species having distinctive behaviors in the desert area, therefore, it is considered as a Natural Habitat.

5.2.12.5 Criteria for Critical Habitat Assessment

As defined by IFC's Performance Standard 6, Critical Habitats are areas with high biodiversity value, including:

- habitat of significant importance to Critically Endangered and/or Endangered species.

[114] International Finance Corporation. January 2012. Policy on Social and Environmental Sustainability, Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, The World Bank Group

- habitat of significant importance to endemic and/or restricted-range species.
- habitat supporting globally significant concentrations of migratory species and/or congregatory species.
- highly threatened and/or unique ecosystems; and/or
- areas associated with key evolutionary processes.
- Moreover, projects that are located within internationally and/or nationally recognized areas of high biodiversity value may require a critical habitat assessment. Examples include areas that meet the criteria of the IUCN's Protected Area Categories Ia, Ib, and II. Key Biodiversity Areas (KBAs)[115] or those that encompass Important Bird and Biodiversity Areas (IBAs)[116] may also be evaluated for the presence of Critical Habitat.
- An assessment of whether the Study Area fulfills these criteria is given below.:

5.2.12.5.1 Criterion 1: Habitat of significant importance to Critically Endangered and/or Endangered species

Thresholds for Criterion 1 are the following:

a) Areas that support globally important concentrations of an IUCN Red-listed Endangered (EN) or Critically Endangered (CR) species (≥ 0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species)

b) Areas that support globally important concentrations of an IUCN Red-listed Vulnerable (VU) species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds in GN72(a)

c) As appropriate, areas containing important concentrations of a nationally or regionally listed EN or CR species.

5.2.12.6 Conservation Concern Species

The only one bird species i.e., Egyptian Vulture *Neophron percnopterus* observed as an Endangered species according to the IUCN Red List. Other species reported/observed from Ecological Study Area that are listed as Vulnerable include Asian Houbara Bustard *Chlamydotis macqueenii*, Goitred Gazelle *Gazella subgutturosa* and Afghan Urial *Ovis vignei* during both Post-Monsoon 2022 Survey and Spring 2023 Survey.

Although the species have been reported/observed at proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area and Access Road to the proposed Reko Diq Mine Site, not all of them are at equal risk due to project impact. This is evident through greater population trends, distribution, or the availability of suitable habitat within the Ecological Study Area and in other countries. Moreover, all of these species have very rare

115 Key Biodiversity Areas (KBA) are 'sites contributing significantly to the global persistence of biodiversity', in terrestrial, freshwater and marine ecosystems. More information available at official website of KBA http://www.keybiodiversityareas.org/what-are-kbas

116 An Important Bird and Biodiversity Area is an area identified using an internationally agreed set of criteria as being globally important for the conservation of bird populations. More information available at official website of Bird Life International. https://www.bing.com/search?q=important+bird+areas&form=EDGEAR&qs=PF&cvid=a8a263c9d7544100a15c5f1f718d280a&cc=US&setlang=en-US&plvar=0

occurrences in the area. Therefore, these species do not trigger Criteria 1(a) and (b) of the Critical Habitat.

Two species of mammals are listed as Critically Endangered in the Pakistan National List. The species include Goitered Gazelle *Gazella subgutturosa* and Sand Cat *Felis margarita.*

Goitered Gazelle is widely distributed in central Asian countries, possibly parts of Iraq, Pakistan, Afghanistan, India, northwest China, and Mongolia. During the Spring 2023 Survey, signs of this species were observed along the Fan Sediment Water Supply Pipeline Area. While this species visits from nearby regions in Iran after 2 or 3 years, they are often hunted before they can establish a population in the area. The fencing along the Iran-Pakistan border has also impeded the migration of this species into the Balochistan region. Based on this information, this species is rarely found and restricted to the Fan Sediment Water Supply Pipeline Area. As a result, the Project under consideration does not have a direct impact on this species therefore, this sub-criterion does not trigger Critical Habitat for this species.

Sand Cat is the only felid found primarily in the true desert and has a wide (EOO 15,414,561 km²) but disjunct distribution in the deserts of northern Africa and southwest and central Asia. This species was observed from the proposed Reko Diq Mine Site and along the Fan Sediment Water Supply Pipeline Area during both Post-Monsoon 2022 and Spring 2023 surveys. The population of this species is affected due to political strife, and war-like conditions that have accelerated habitat destruction in Balochistan.[117] This species is found in the deserts of Nushki and Chagai districts of Balochistan where it is widely distributed.[118] Only indirect signs of this species was observed during both Post-Monsoon 2022 and Spring 2023 surveys. Considering the wide distribution range and more Extent of Occurrence (EOO), the Project activities will not change its status to Critically Endangered therefore, Critical Habitat is not triggered for this species.

5.2.12.6.1 Criterion 2: Habitat of significant importance to endemic and/or restricted-range species

The threshold for criterion 2 is the following:

117 Sliwa, A., Ghadirian, T., Appel, A., Banfield, L., Sher Shah, M. & Wacher, T. 2016. Felis margarita. The IUCN Red List of Threatened Species 2016: e.T8541A50651884. https://dx.doi.org/10.2305/IUCN.UK.2016-2.RLTS.T8541A50651884.en. Accessed on 29 August 2023.

118 http://thebalochistanpoint.com/sand-cat-of-balochistan-is-under-threat-of-extinction/

a) Areas that regularly hold ≥10% of the global population size AND ≥10 reproductive units of a restricted range species.[119] [120]

Only one plant species *Gagea quettica* and one small mammal Pygmy Jerboa *Salpingotulus michaelis* listed as endemic species are reported within the Ecological Study Area. *Gagea quettica* (plant) and *Salpingotulus michaelis* (small mammal) were not observed/captured in any study (2008, 2009, 2010, 20200, 2022, and 20223 surveys). These species are reported from areas far away from the Project area, so the Project's direct impacts are not considered to affect them. During the Post-Monsoon 2022 Survey, only one herpetofauna species, Alcock's Toad-headed Agama *Phrynocephalus euptilopus* was observed as a restricted-range species along the Fan Sediment Water Supply Pipeline at Sampling Location E5. This species also has a very rare occurrence in the area and is mostly restricted to the sand dunes/sandy plains habitat along the Afghanistan border. Considering the absence of these species in the area, these species also do not trigger Critical Habitat according to Criterion 2 although these species have an EOO of less than 50,000 km^2.

5.2.12.6.2 Criterion 3: Habitat supporting globally significant concentrations of migratory species and/or congregatory species.

(a) Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle.

(b) Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.

Two bird species were observed listed as long-distance migratory or congregatory species from the Study Area including the Asian Houbara Bustard, and Egyptian Vulture (*see* Table 5-34).

These species have a wider distribution range and population worldwide as well as in Pakistan. Moreover, the Ecological Study Area does not support ≥ 1 percent of the global population of these species and, therefore, does not qualify Criterion 3 (a) and (b).

5.2.12.6.3 Criterion 4: Highly threatened and/or unique ecosystems

There is no highly threatened and/or unique ecosystem in and around the Ecological Study Area therefore, Critical Habitat according to Criterion 4 is not triggered. Several ecosystems such as Balochistan Juniper and Pistachio Scrub Forest, Chagai Desert, Gut

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[119] Restricted range refers to a species extent of occurrences (EOO) and is defined according to its habitat.

- For terrestrial vertebrates and plants, restricted-range species are defined as those species that have an EOO less than 50,000 km^2.
- For marine systems, restricted-range species are provisionally being considered those with an EOO of less than 100,000 km^2.
- For coastal, riverine, and other aquatic species in habitats that do not exceed 200 km width at any point (for example, rivers), restricted range is defined as having a global range of less than or equal to 500 km linear geographic span (i.e., the distance between occupied locations furthest apart).
- For freshwater species in particular, this approach may underestimate the number of restricted-range species, since they may not occupy entire catchments within which they occur. To address this, careful consideration was also given to freshwater species where linear geographic span was less than 600 km^2.

[120] Ng, C., Walsh, G., Katariya, V., Tatum-Hume, E., & Livingstone, S. R. (2020). Critical Habitat Assessment, Morava Corridor Motorway Project, Serbia Final report.

Forest Wildlife Sanctuary, Zawakhan, and Kambran Wildlife Sanctuaries/Game Reserves have been recognized as a high priority for conservation at the national level. The distribution of these ecosystems is either outside the Project area or these habitat types are relatively widespread throughout Balochistan and mountain ranges across Iran and Afghanistan. Therefore, none of the ecosystems within the Project Area qualify under Criterion 4.

5.2.12.6.4 Criterion 5: Areas with unique assemblages of species or which are associated with key evolutionary processes.

According to IFC Performance Standard 6, the structural attributes of a region, such as its topography, geology, soil, temperature, and vegetation, and combinations of these variables, can influence the evolutionary processes that give rise to regional configurations of species and ecological properties.

The available information does not indicate that the Ecological Study Area, or any part of it, is associated with key evolutionary processes. Therefore, Critical Habitat is also not triggered according to Criterion 5.

5.2.12.6.5 Criterion 6: Areas that meet the criteria of the IUCN's Protected Area Categories Ia, Ib, and II

No Project infrastructure lies within any legally protected areas of high biodiversity value and therefore Criterion 6 of Critical Habitat does not apply. While several national parks, wildlife sanctuaries, and Ramsar sites are located around the Project area and its vicinity, but do not have species that qualify for Critical Habitat.

5.2.12.6.6 Key Biodiversity Areas (KBAs), which encompass Important Bird and Biodiversity Areas (IBAs)

There are no Key Biodiversity Areas or Important Wildlife Areas in the Ecological Study Area near the proposed Reko Diq Mine Site therefore, Critical Habitat is not triggered (*see* Figure 5-88).

5.2.12.7 Critical Habitat Determination

Some conservation concern species according to the IUCN Red List of Threatened Species are reported and observed from the Project area which include Egyptian Vulture *Neophron percnopterus* listed as Endangered, Asian Houbara Bustard *Chlamydotis macqueenii*, Goitred Gazelle *Gazella subgutturosa* and Afghan Urial *Ovis vignei* listed as Vulnerable. Similarly, Sand Cat *Felis margarita* and Goitered Gazelle *Gazella subgutturosa* are listed as Critically Endangered according to the Pakistan National Red List. Some restricted-range species reported from the area include *Gagea quettica* (a plant species), Alcock's toad-headed Agama *Phrynocephalus euptilopus* (a reptile species), and Pygmy Jerboa *Salpingotulus Michaelis* (a small mammal species). Most of these species have a wide distribution range, and very rare occurrences in the area, and Project activities will not directly affect any of these species. Considering this, Critical Habitat is not triggered for any of the criteria of IFC PS6.

5.2.13 Summary

This section provides a summary of ecological baseline.

5.2.13.1 Project Areas

- An ecological survey was conducted for the Project facilities which include the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area and Access Road to proposed Reko Diq Mine Site.
- Sampling was conducted at the proposed Reko Diq Mine Site, along Fan Sediment Water Supply Pipeline Area and Access Road to proposed Reko Diq Mine Site during both Post-Monsoon 2022 Survey and Spring 2023 Survey.

5.2.13.2 Habitat Classification

- The Ecological Study Area was differentiated into different habitat types which include the Agricultural Area/Date Palm, Built-up Areas, Clayey Plains, Dry Streambeds, Gravel Plains, Mountains/Hills, Sandy Plains/Sand Dunes, and Wetlands.
- The most abundant habitat type in the Ecological Study Area was Gravel Plains (53.8%), followed by Mountains/Hills (24.7%), Sandy Plains/Sand Dunes (13.2%), Clayey Plains (4.5%), Dry Streambed (3.8%), Agricultural Areas/Date Palms (0.001%) and Built-up Areas (0.013%).

5.2.13.3 Study Areas and Sampling Locations

- Sampling for Ecological Resources was conducted during both Post-Monsoon 2022 and Spring 2023 surveys.
- A total of 41 sampling locations were selected for both Post-Monson 2022 Survey and Spring 2023 Survey.

5.2.13.4 Ecological Resources

- The Ecological Resources including vegetation, birds, herpetofauna, invertebrates, and mammals were sampled using the line transect method. However, Sherman traps were used for sampling small mammals and pitfall traps for invertebrates.

5.2.13.4.1 Vegetation

- A total of 41 plant species were observed during both Post-Monsoon 2022 and Spring 2023 surveys.
- Of these plant species, 29 species were observed during the Post-Monsoon 2022 Survey, and 31 species were observed during the Spring 2023 Survey.
- All the species observed in these surveys were Least Concern except one plant species *Eucalyptus camaldulensis* which is listed as Near Threatened according to the IUCN Red List of Threatened Species.
- One Alien Plant Species (*Eucalyptus camaldulensis*) and one Alien-Invasive Plant species (*Cynodont dactylon*) were observed from the Ecological Study Area.

5.2.13.4.2 Birds

- A total of 39 birds' species were observed during both Post-Monsoon 2022 and Spring 2023 surveys.

- Higher species richness was observed during the Post-Monsoon 2022 Survey when 30 bird's species were observed compared to Spring 2023 Survey when only 21 birds' species were observed.
- The conservation concern birds 'species observed include one Endangered (*Neophron percnopterus*) and one Vulnerable (*Chlamydotis macqueenii*) species while the rest of the species are Least Concern according to IUCN Red List of Threatened Species.

5.2.13.4.3 Herpetofauna

- A total of 19 herpetofauna species were observed during both Post-Monsoon 2022 and Spring 2023 surveys.
- Of the observed herpetofauna species, 14 species were observed during the Post-Monsoon 2022 Survey, and 10 species were observed during the Spring 2023 Survey.
- No conservation concern herpetofauna species was observed during both Post-Monsoon 2022 and Spring 2023 surveys.
- Only one restricted range herpetofauna species i.e., Alcock's toad-headed Agama *Phrynocephalus euptilopus* was observed during the Post-Monsoon 2022 Survey.

5.2.13.4.4 Mammals

- A total of six mammalian species were observed during both Post-Monsoon 2022 and Spring 2023 surveys.
- Of the observed mammalian species, four species were observed during the Post-Monsoon 2022 Survey and six species during the Spring 2023 Survey.
- All the species observed are Least Concern except *Gazella subgutturosa* which is listed as Vulnerable according to the IUCN Red List of Threatened Species.
- Sand Cat *Felis margarita* and Goitred Gazelle *Gazella subgutturosa* are listed as Critically Endangered while, two species i.e., Cape Hare *Lepus capensis* and Ruppell's Fox *Vulpes ruppellii* are listed as Vulnerable and one species i.e., Red Fox *Vulpes vulpes* is listed as Near Threatened according to Pakistan National List of Mammals.
- Only one species of small mammal i.e., Great Gerbil *Rhombomys opimus* was captured during both Post-Monsoon 2022 and Spring 2023 surveys. This species is listed as Least Concern according to IUCN Red List of Threatened Species.

5.2.13.4.5 Invertebrates

- A total of 10 invertebrates' species were observed during both Post-Monsoon 2022 and Spring 2023 surveys.
- During the Post-Monsoon 2022 Survey, nine species were observed, and five species were observed during the Spring 2023 Survey.
- All the invertebrate species observed in these surveys were Least Concern according to IUCN Red List of Threatened Species.

5.2.13.5 Protected Areas in Project Vicinity

- There is no Protected Area near the Project area. However, two national parks, four wildlife sanctuaries and Ramsar sites, and three key biodiversity areas are within 500 km radius of the Project site.

5.2.13.6 Land Cover and Sensitivity Mapping

- Change in land use wascompared for 2021 and 2010. In 2021, a slight increase in the Built-up Area and a decline in Agricultural Areas was observed for most of the Project facilities.
- Most of the Project facilities are located in low to moderate sensitivity areas. Threats due to existing anthropogenic factors and extreme dry conditions are observed for biodiversity in the area.

5.2.13.7 Critical Habitat Assessment

- Most of the Project facilities are in areas where the habitat is intact with no disturbance. While the habitat in built-up areas and agricultural areas is modified which are only a fraction of total area while in the rest of the areas, it is a natural habitat. Overall, the habitat is declared as a Natural Habitat.
- Some conservation concerns and restricted-range species are reported/observed in the area. However, most of these species have a wide distribution range, and very rare occurrences in the area, and Project activities will not directly affect any of these species. Considering this, Critical Habitat is not triggered for any of the criteria of IFC PS6.

5.3 Socioeconomic Environment

This section provides an overview of the socioeconomic setting at both the provincial and district levels in the Balochistan province, and a socioeconomic profile of the Project Area based on a survey carried out between September and October 2022 in the settlements that could potentially be impacted by or benefit from the Project's activities.

5.3.1 Overview of Balochistan and Chagai District

The administrative structure of Pakistan presently comprises four provinces, Punjab, Khyber Pakhtunkhwa, Balochistan, and Sindh. Balochistan is the largest province (area-wise) of the country constituting 43% of the total national landmass with substantial mineral wealth. Balochistan has six divisions, 31 districts, and 137 tehsils. Tehsil is the administrative sub-division of a district.

- **Population**: According to the 2023 Census, the population of Balochistan is 14,894,402[121] as compared to 12,344,408 in 2017 Census.
- **Health Facilities**: Balochistan has 27 District Headquarter Hospitals (DHQs), 10 Tehsil Headquarter Hospitals (THQs), 4 teaching hospitals, 82 Rural Health Centers (RHCs), and 549 Basic Health Units (BHUs)

121 https://www.pbs.gov.pk/sites/default/files/population/2023/Balochistan.pdf accessed on December 14, 2023. The Population Census 2023 currently provides information on the population and household size only on the website and is updated in this section accordingly. However, the Population Census 2017 was used for the rest of the information.

- **Literacy**: According to the 2017 Census, the literacy rate of Balochistan is 43.58%.[122]

The Early Works for the Project will be carried out in the Chagai District of Balochistan province (Figure 5-90).

5.3.1.1 *Chagai District*

Chagai is the largest district in Balochistan covering an area of 44,748 square kilometers (km^2).[123] The district is rich with mineral resources which are largely unexploited. According to the 2017[124] census, the male population is 118,973 and the female population is 107,537. The literacy rate is 36.91% and the average household size in the district is 7.04.[125] Gold, copper, and silver deposits at Saindak were discovered in Chagai district in the 1970s in collaboration with Saindak Metals Ltd. Currently, Metallurgical Corporation of China is operating two mechanized hard rock mines with current production of 7.25 tons per annum of copper-gold from the smelting process (Saindak Copper-Gold Project). There are numerous small-scale mining activities in the vicinity of the Reko Diq Mine Site, mainly for marble (for example at Mashki Chah and Darband Chah) and pumice (locally known as Pufak mining).

Table 5-69 provides the estimated population of the Chagai District in three censuses: 1998, 2017, and 2023.

122 ibid

123 https://www.pbs.gov.pk/content/final-results-census-2017-0 accessed on December 12, 2023.

124 https://www.pbs.gov.pk/content/final-results-census-2017-0 accessed on October 30, 2023.

125 https://www.pbs.gov.pk/sites/default/files/population/2023/Balochistan.pdf accessed on December 14, 2023.

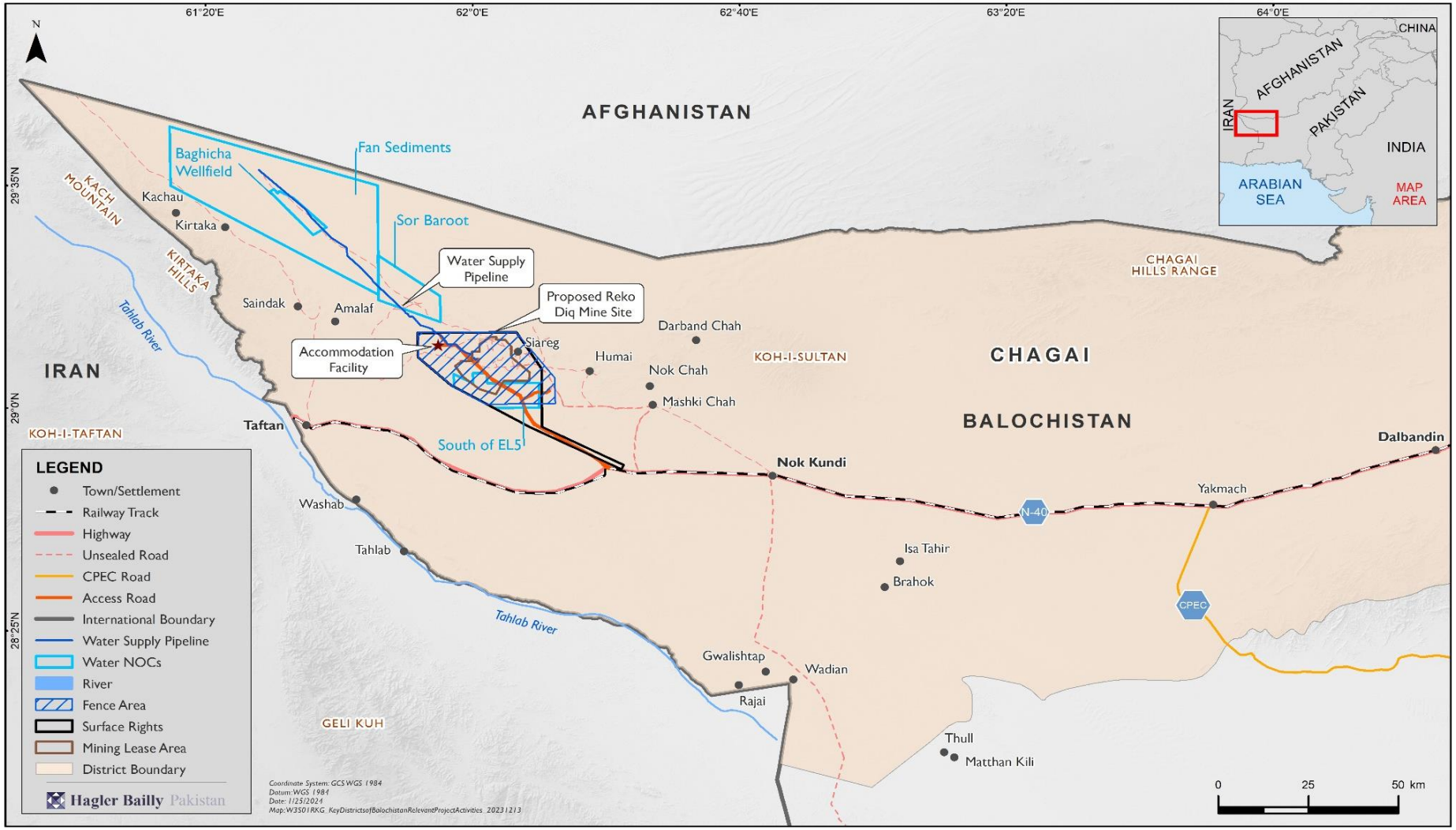


Figure 5-90: Location of Project in Chagai District

Table 5-69: Estimated Population of Chagai District

District	1998 Census		2017 Census		Proportion in Balochistan's Population (2017) 000' Population	2023 Census		Proportion in Balochistan's Population (2023)
	000' Population	Population Density (per km^2)	000' Population	Population Density (per km^2)		000' Population	Population Density (per km^2)	
Chagai	203	4.0	226	5.06	1.83%	269	5.32	1.81%
Balochistan Province	6,566	18.9	12,335	35.53	5.9% of Pakistan's population	14,894	42.87	6.17% of Pakistan's population

Source: Pakistan Bureau of Statistics- Population Census 1998, 2017, and 2023

5.3.2 *Overview of the Socioeconomic Conditions of the Surveyed Settlements*

The socioeconomic survey included the settlements east of the Reko Diq Mine Site (Humai, Nok Chah, Mashki Chah, and Darband Chah), settlements west of the Reko Diq Mine Site (Kachau, Amalaf, and Saindak), and the nearest major towns (Nok Kundi and Dalbandin).

The surveyed settlements located east of the Reko Diq Mine Site are in a rural setting, with adobe (*Katcha*) housing construction. These settlements rely mainly on dug wells to meet their water needs. Educational facilities are absent in these settlements as of the survey in 2022. However, in 2023, RDMC established primary schools, one each in Humai, Darband Chah, and Mashki Chah settlements, all of which are currently in operation. Primary sources of income include cross-border trading and livestock rearing. Some households from Nok Chah and Mashki Chah migrate to Nok Kundi and Dalbandin, in search of better employment and educational prospects for their children. Women face health-related challenges due to the absence of health facilities near the settlements; the closest one being approximately 85 km away in Nok Kundi. RDMC was observed building a Community Health Center in the Humai settlement during the survey in 2022. In September 2023, RDMC established the first Community Health Center (CHC) in Humai settlement, which is currently in operation. Similar facilities are planned for establishment in the other settlements. Furthermore, RDMC, in collaboration with the Indus Hospital & Healthcare Network (IHHN), is in the process of constructing a larger health facility in Nok Kundi. Additionally, a Mobile Medical Unit, equipped with a laboratory and pharmacy stocked with essential medical supplies, has been set up at Nok Kundi by RDMC. This unit serves as a temporary healthcare solution for the communities in and around Nok Kundi until the completion of the IHHN-RDMC hospital in Nok Kundi. Non-governmental Organizations (NGOs) like Muslim Hands and Islamic Relief were involved in implementing safe drinking water projects in Humai and Nok Chah settlements. The locals rely on range land as fuel, while agricultural activities are limited due to water scarcity. However, some households cultivate date palms near the settlement, utilizing water from dug wells. RDMC has established new water wells in Darband Chah and Nok Chah settlements to meet the water requirements of the communities. Additionally, a water treatment plant has been installed in the Humai settlement, and similar water treatment plants are planned for establishment in the other settlements located east of the Reko Diq Mine Site.

The settlements situated west of the Reko Diq Mine Site near Fan Sediments water supply area are connected by sealed roads to Taftan, and onwards to Nok Kundi, and Dalbandin. The residents of the Saindak settlement are predominantly employed at the Saindak Copper-Gold Project. In the settlements of Amalaf, Kachau, and Saindak, inhabitants access the health facility located within the Saindak Copper-Gold Project, and rely on electricity supplied by the project. Wood sourced from range lands serves as the primary fuel in the Kachau settlement. Additionally, both Amalaf and Saindak settlements utilize Liquefied Petroleum Gas (LPG) as a fuel source. These settlements receive their drinking water supply from the Saindak Copper-Gold Project, which pumps water from an

aquifer source in Upper Tahlab near the Iran border. In the Kachau settlement, the locals used spring (local name *Karez*[126]*)* water for both irrigation and domestic purposes.

Nok Kundi and Dalbandin towns are situated along the Road Route that will be used for Project-related transportation. Nok Kundi is the nearest main town to the Reko Diq Mine Site, while Dalbandin is the tehsil headquarters of the Chagai District. These settlements are interconnected via the national highway N-40 and show a mix of rural and urban characteristics. The areas adjacent to the N-40 highway display more urbanized development.

5.3.3 Scope and Methodology

A socioeconomic survey was conducted from September 12 to October 10, 2022, in the settlements located east and west of the Reko Diq Mine Site and along the Road Route. The transport route N-40 that will be used for the Project-related transportation is referred to as 'Road Route'.

Appendix O includes the Socioeconomic Survey Plan.

5.3.3.1 Socioeconomic Study Area

The Socioeconomic Study Area includes an area of 40 km around the proposed Reko Diq Mine Site and 30 km along the water supply pipeline route from Fan Sediment boreholes to the accommodation facility. The Socioeconomic Study Area was selected to assess the Project impacts on the communities residing near the mine site and its facilities that may be positively or negatively impacted by its activities.

5.3.3.2 Pilot Survey

A one-day pilot survey was conducted prior to the main socioeconomic survey to ensure that the designed survey forms are appropriate for collecting the required data and that the survey team is trained to collect data effectively and efficiently.

5.3.3.3 Selection of Settlements for the Survey

Figure 5-91 shows the Socioeconomic Study Area and location of the settlements that were surveyed and consulted. The settlements, shown in Figure 5-91, are categorized as follows:

- Settlements east of the Reko Diq Mine Site – Humai, Mashki Chah, Nok Chah, and Darband Chah
- Settlements west of the Reko Diq Mine Site – Kachau, Amalaf, and Saindak
- Settlements along the Road Route – Nok Kundi and Dalbandin

The Siareg settlement, situated approximately 5 km from the Reko Diq Mine Site, was the closest community to the site. Initially, only one or two families lived in this settlement. The settlement expanded during the exploration phase when the Project started supplying water and food to the community. However, when the Project ceased operations and discontinued the provision of water and food, the inhabitants had relocated to Humai,

126 An underground channel being used for drinking and for irrigation purposes by locals.

merging with the existing Humai settlement. During the survey, only abandoned structures were observed at the location of the Siareg settlement.

Although the Kirtaka settlement was initially identified during the planning phase, the surveys conducted in 2022 revealed that its residents had relocated to Kachau settlement approximately 12 km away. This reason for relocation was the presence of a Frontier Corps (FC) Camp in Kirtaka, which restricted the mobility of the community, particularly for women.

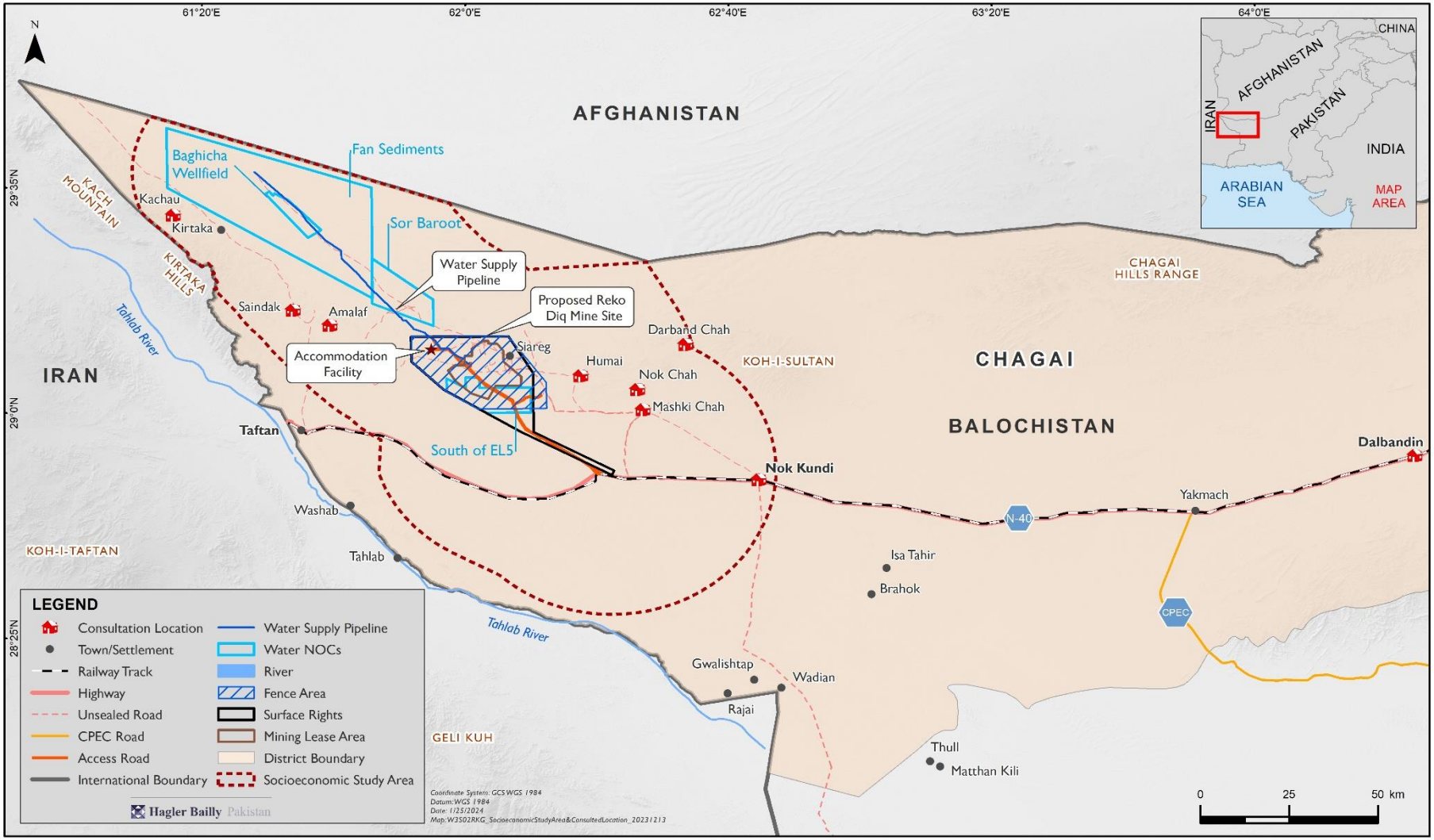


Figure 5-91: Socioeconomic Study Area & Location of the Settlements Surveyed and Consulted

5.3.3.4 Data Sources

5.3.3.4.1 Primary Sources

The data on the socioeconomic conditions was collected through field surveys to develop a profile of the communities residing within the Socioeconomic Study Area. The primary data was collected by conducting a socioeconomic survey at the settlement level using Participatory Rapid Appraisal methods, including Focus Group Discussions (FGDs), Key Informant Interviews (KIIs), and a pre-designed socioeconomic survey form.

To ensure accuracy and efficiency, the survey forms were programmed on the ONA.io application[127] in Urdu and English and the survey was conducted on Android phones and tablets using the Open Data Kit (ODK). This application permits online data entry and enables a supervisor to review the database daily and guide the survey team as needed.

A household-level survey was also conducted followed by a settlement-level survey. The household (HH) level survey utilized a separate form and included information from the individual households. **Appendix P** provides the socioeconomic survey questionnaire.

Male and female enumerators were hired for data collection considering their proficiency in the local (Balochi) language and their ability to communicate in the local language.

5.3.3.4.2 Secondary Sources

Data from secondary sources was also utilized, where required, to strengthen the assessment and evaluate the change in socioeconomic conditions over time. The information from secondary sources used in developing this section is referenced, however, the key secondary sources of information include:

- ESIA Report of the Reko Diq Mining Project developed in 2010 (referred to here as 2010 ESIA);
- Pakistan Economic Survey 2021-2022; and
- District at Glance Balochistan, Pakistan Bureau of Statistics Population Census 1998, 2017, and 2023.

5.3.3.5 Sample Size

A total of 9 settlements were surveyed and consulted. Four settlements located east of the Reko Diq Mine Site and three located west of the Reko Diq Mine Site were selected and consulted for the survey. Additionally, Nok Kundi – as the nearest main town, and Dalbandin – headquarter of Chagai District, were also surveyed. These two settlements are along the Road Route that will be used for Project-related transportation.

The percentage of HHs included in the surveys generally ranged from 10% to 30% with a minimum of five HHs and a maximum of 50 HHs per settlement:

- 30% in the settlements with estimated HHs ≤200.
- 10% in the settlements with estimated HHs >200.

127 https://ona.io/home/ accessed on December 10, 2023.

The HHs for the surveys were selected using a random sampling technique i.e., selecting every fourth household for the survey.

Interviews were conducted with key informants to gather information on each settlement's social and economic setup, with a focus on social and physical infrastructure and livelihoods. Information was obtained in discussion with a group of four to five community members preferably including but not limited to, the following:

- Union Council (local government) heads;
- Notable of the local community;
- Educated Persons (men and women);
- School Teachers;
- Businessmen; and
- Shopkeepers.

5.3.4 Socioeconomic Aspects

5.3.4.1 Governance and Administration

The Early Works, including the construction of an accommodation facility and a water supply pipeline with some minor earthworks, will be situated within the jurisdiction of the Chagai District of Balochistan. The administrative structure in this district is centralized under a single local government known as the District Government, led by an elected District (*Zila*) Council Chairman. The district administration comprises district offices including sub-offices at the Union Council (UC) and town levels (including municipal and town committees).

5.3.4.2 Demography

The demography is described in terms of the following indicators:

- Population and Household Size
- Sex Ratio
- Age Groups
- Birth Rate and Death Rate
- Housing Structure

5.3.4.2.1 Population and Household Size

The estimated HHs in 09 settlements were 40,000 with an estimated population of 300,000. The surveyed HHs were 277 and the total population of the surveyed settlements is estimated to be around 1,920. The smallest settlement is Nok Chah with 14 HHs and the largest settlement is Dalbandin with approximately 15,000 HHs. Dalbandin is the headquarters of the Chagai District. According to the 2107[128] census, Dalbandin has an area of 15,363 square kilometers (km^2) with a population of 127,468 (male 65,949 and

[128] https://www.pbs.gov.pk/sites/default/files/population/2017/results/11901.pdf accessed on December 10, 2023

female 61,514), while Nok Kundi has an area of 16,092 square kilometers (km^2) with a population of 22,283 (male 11,851 and female 10,432).

A household may either be a single-person or a multi-person household. Household members may be related or unrelated and essentially include people who make common provisions for food and other essentials of living and have no usual place of residence elsewhere. The average household size of the surveyed settlements was 6.9 persons. The maximum and minimum household sizes, recorded in the surveyed population were 7.3 and 6.6, respectively. The population residing in the area is largely rural and semi-urban.

Table 5-70 and Table 5-71 show the number of surveyed settlements and household size in the surveyed settlements respectively.

The settlements located east of the Reko Diq Mine Site have scattered houses with clusters of 5 to 8 houses at a single location. Settlements located west of the Reko Diq Mine Site and along the Road Route are generally large as compared to the settlements located east of the Reko Diq Mine Site.

Figure 5-92 shows photographs of the surveyed settlements.

Table 5-70: Number of Surveyed Settlements

Location	Total Surveyed Settlements	
	Number	Name
East of the Reko Diq Mine Site	4	Humai, Nok Chah, Mashki Chah, Darband Chah
West of the Reko Diq Mine Site	3	Kachau, Saindak, Amalaf
Road Route	2	Nok Kundi, Dalbandin
Total	**9**	

Table 5-71: Household Size within the Surveyed Settlements

Location	No. of Surveyed HHs	Surveyed Population	Average Surveyed HH Size
East of the Reko Diq Mine Site (4 settlements)	103	757	7.3
West of the Reko Diq Mine Site (3 settlements)	74	505	6.8
Road Route (2 towns)	100	658	6.6
Total	**277**	**1,920**	**6.9**



Nok Chah settlement (East of the Reko Diq Mine Site)



Kachau settlement (West of the Reko Diq Mine Site)



Humai settlement (East of the Reko Diq Mine Site)

Figure 5-92: Photographs of the Surveyed Settlements

5.3.4.2.1.1 Comparison with the 2010 ESIA

In the 2010 ESIA, the average household size in the vicinity of the Reko Diq Mine Site and along the Road Route was reported as 8.3 and 6.5 persons respectively. Data from the socioeconomic survey in 2022 indicates a reduction in average household size in the settlements located east of the Reko Diq Mine Site, from 8.3 to 7.3.

5.3.4.2.2 Sex Ratio

About 52% of the total estimated population of the surveyed settlements was male 48% was female (Table 5-72).

Table 5-72: Sex Ratio within the Surveyed Settlements

Location	Surveyed Population	Sex Ratio in Surveyed Population			
		Male	Percentage	Female	Percentage
East of the Reko Diq Mine Site	757	401	53%	356	47%
West of the Reko Diq Mine Site	505	244	48%	261	52%
Road Route	658	354	54%	304	46%
Total	**1,920**	**999**	**52%**	**921**	**48%**

5.3.4.2.3 Age Groups

Figure 5-93 provides the details of the age groups in the surveyed population.

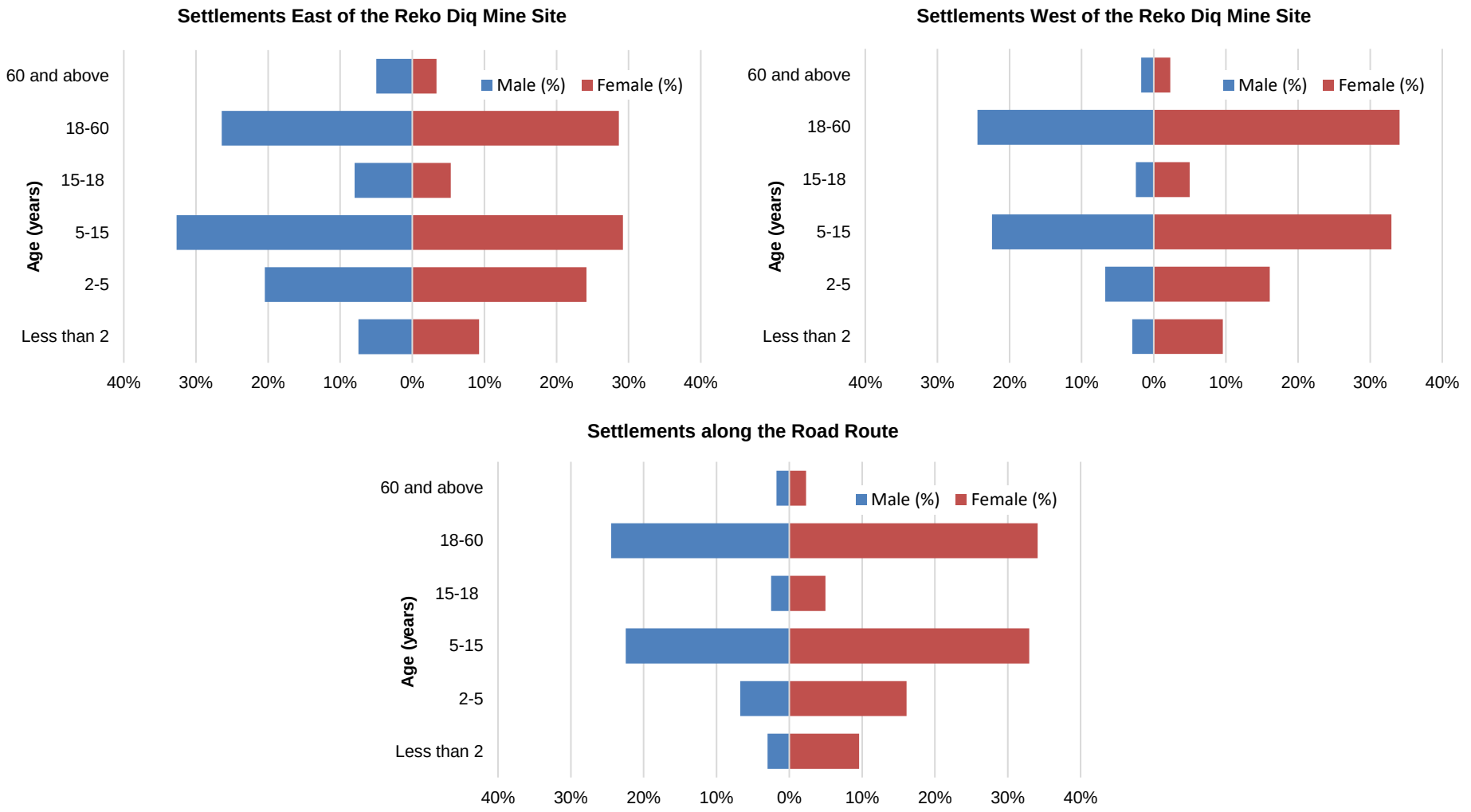


Figure 5-93: Age Distribution between Male and Female within the Surveyed Settlements

5.3.4.2.4 Birth Rate and Death Rate

Table 5-73 presents the statistics of the live births, stillbirths, and deaths in the families of the surveyed settlements in the past 2 years. The general cause of stillbirths was the lack of health facilities for the treatment of complicated cases.

Table 5-73: Birth and Death Rates within the Surveyed Settlements

Location	Number of live births in the family in last 2 years (Surveyed HHs)	Number of stillbirths in the family in last 2 years (Surveyed HHs)	Number of deaths in the family in the last 2 years (Surveyed HHs)
East of the Reko Diq Mine Site	41	0	18
West of the Reko Diq Mine Site	25	0	3
Road Route	56	3	8

5.3.4.2.5 Housing Structure

88.3% of the occupied structures in the surveyed settlements were of adobe (*Katcha*) construction, 3.4% were of Semi-Pucca, while the remaining 8.3% were of masonry (*Pucca*) construction (Figure 5-94). The construction was mainly adobe (*Katcha*) in the settlements located East of the Reko Diq Mine Site, while the main towns like Dalbandin, and Nok Kundi had some masonry (*Pucca*) construction. These main towns also had general stores, grocery shops, food stores, medical stores, mechanics, and other service shops. Smaller shops for basic supplies exist in other surveyed settlements.

Figure 5-94 shows the photographs of the structures (houses, shops, mosques) observed during the survey.

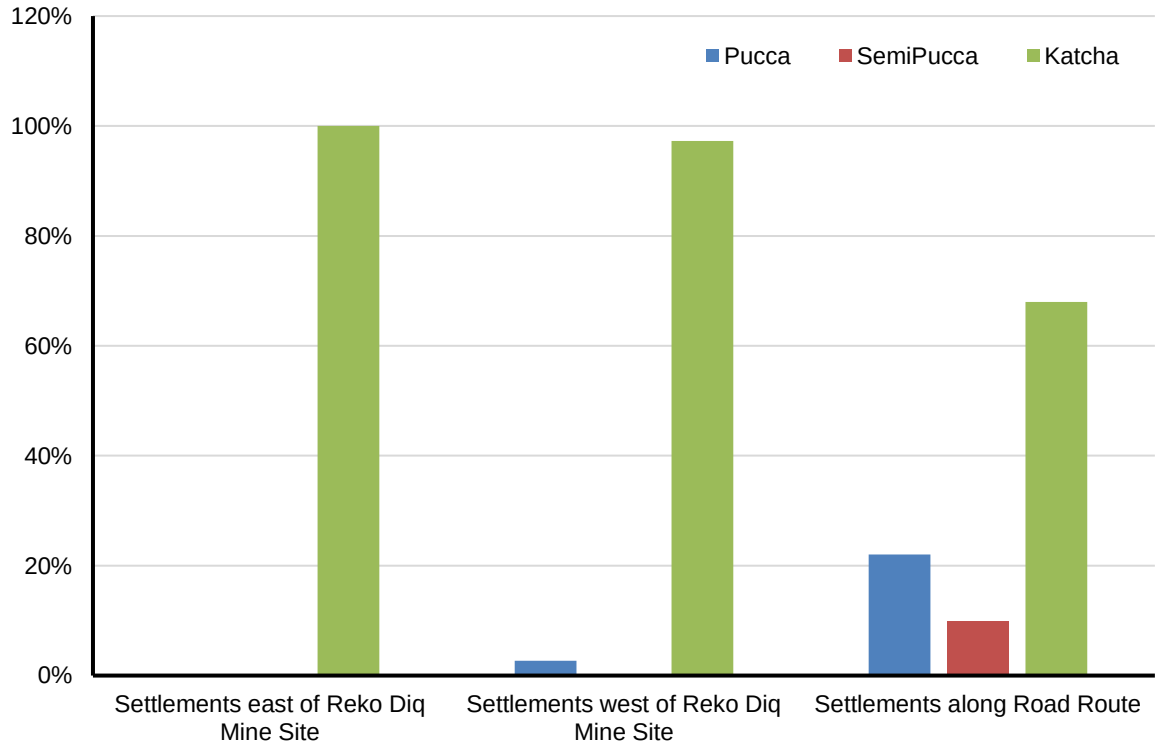


Figure 5-94: Housing Structure in the Surveyed Settlements



Adobe (*Katcha*) constructed house at Humai settlement (East of the Reko Diq Mine Site)



Adobe (Katcha) constructed shop at Nok Kundi settlement (Road Route)



Masonry (Pucca) constructed NGO worked at Nok Kundi settlement (Road Route)



Masonry (Pucca) constructed Reverse Osmosis plant at Humai settlement (East of the Reko Diq Mine Site)



Semi-Pucca constructed Mosque at Amalaf settlement (West of the Reko Diq Mine Site)

Figure 5-95: Photographs of the Structures in the Surveyed Settlements

5.3.4.3 Comparison with the 2010 ESIA

There was no major change in the structure of the settlements located near the Reko Diq Mine Site since 2010. However, the trend of masonry (*Pucca*) houses slightly increased in the settlements along the Road Route.

5.3.4.4 Caste

A caste is a social group identity in which individuals get through their status as a close class separated from other classes by distinctions of hereditary status or profession. It is

different from the open class system because in the open class system one may change identity through wealth but in a caste, it is forever and hereditary.

Table 5-74 presents caste distribution data in the Socioeconomic Study Area. A total of 16 caste classes were reported in the surveyed settlements.

The ethnic makeup of the population within the surveyed settlements comprises mainly the Muhammad Zai (23%) followed by other 15 castes that make up 77% of the population.

Table 5-74: Castes in the Surveyed Settlements (%)

	Settlements East of the Reko Diq Mine Site				Settlements West of the Reko Diq Mine Site			Settlements along Road Route	
	Humai	Mashki Chah	Nok Chah	Darband Chah	Amalaf	Saindak	Kachau	Nok Kundi	Dalbandin
Muhammad Zai	100	100	100	25	25	-	-	30	-
Sher Zai	-	-	-	30	-	-	-	10	10
Burhan Zai	-	-	-	15	-	-	-	-	5
Mushwani	-	-	-	5	-	-	-	3	5
Dagar Zai	-	-	-	10	-	-	-	10	2
Mussa Zai	-	-	-	-	60	100	-	5	3
Sanjarni	-	-	-	-	-	-	-	2	20
Ajbani	-	-	-	-	-	-	-	5	-
M Hassani	-	-	-	-	15	-	-	5	15
Jamal Zai	-	-	-	-	-	-	-	20	-
Hassan Zai	-	-	-	-	-	-	-	10	10
Syed	-	-	-	7	-	-	-	-	5
Kubdani	-	-	-	3	-	-	-	-	-
Yar Muhammad Zai	-	-	-	-	-	-	20	-	-
Notai Zai	-	-	-	5	-	-	80	-	25

5.3.4.5 Ethnicity

According to the 2017[129] census, the people of Balochistan are divided into three main ethnic groups, i.e. Baloch, Brahvi and Pashtuns, and 27 major tribes. A majority speaks Balochi language, whereas Pushto speaking people are 35.34 percent and Brahvi language is spoken by nearly 17.12 percent. Urdu and Siraiki are also the languages spoken by these ethnic groups. The Baloch are mainly concentrated in the West, East, South and Southeastern sparsely populated areas of the province. The center of the province is dominated by Brahvi speaking people. The Pashtuns have majority in the

129 https://www.pbs.gov.pk/sites/default/files/population/census_reports/pcr_balochistan.pdf accessed on December 10, 2023.

north having both categories of tribal system - nomadic and the settled ones. During the last 25 years, a drift towards modernity has slightly changed the nomadic lifestyle of the people. The tribal people prefer now to reside in settled areas. The tribal bases are rooted in Sardari and Khan System. Sardari System is the major feature of Baloch and Brahvi tribes while Khan System exists in Pashtoon tribes. The Balochi speaking tribes include Rind, Lashar, Marri, Jamot, Ahmedzai, Bugti Domki, Magsi, Kenazai, Khosa, Rakhashani, Dashti, Umrani, Nosherwani, Gichki, Buledi, Notazai, Sanjarani, Meerwani, Zahrozai, Langove, Kenazai and Khidai. Each tribe is further sub-divided into various branches. The tribal chief is called Sardar while head of sub-tribe is known as Malik, Takari or Mir. Sardars and Maliks are members of district and other local Jirgas according to their status.

5.3.4.6 Religion and Language

The population in the surveyed settlements is entirely Muslim belonging to the Sunni sect. No minorities were observed living within the surveyed population. Furthermore, according to the 2017[130] census the population of the Balochistan province is predominantly Muslim with a Sunni majority.

The primary language spoken in the surveyed settlements is Balochi followed by the Barohi language, which is generally spoken in the Nok Kundi and Dalbandin towns. However, Urdu, the national language is understood everywhere.

5.3.4.7 Decision Making

It was observed during the community consultations that most HHs in the surveyed settlements did not involve women in decision-making. The locals communicated that men are the head of households and most of the decisions are taken by the men themselves (Figure 5-96). In 84% households in the surveyed settlements men take unilateral decisions on household budget management while only 16% take decisions in consultation with women. In 47% of the households' men take matrimonial decisions, while in 62% of the households' men also take decisions related to inheritance and property management.

[130] ibid

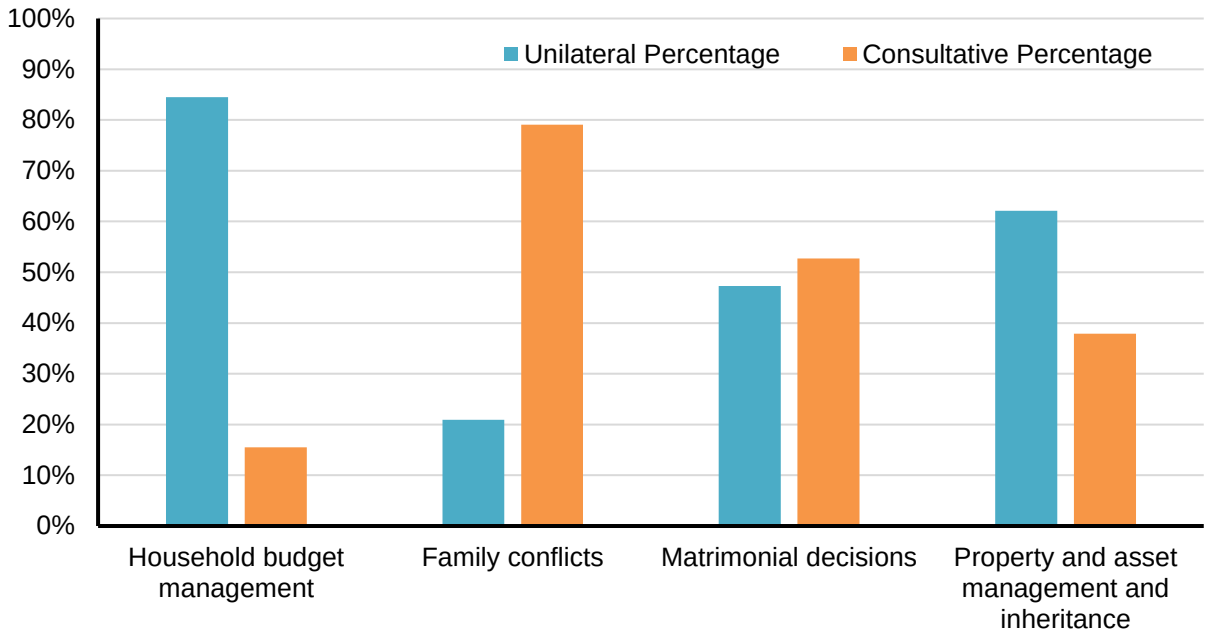


Figure 5-96: Decision Making by Men

In the past, the matrimonial trend was to marry children within the clan, mostly to cousins. Out of 288 married couples, 54% were married to their first cousins. Figure 5-97 shows that 26% HHs from the settlements located east of the Reko Diq Mine Site, 3% HHs from the settlements west of the Reko Diq Mine Site and 36% HHs from the settlements along the Road Route had no hesitation to marry their children out of their clan.

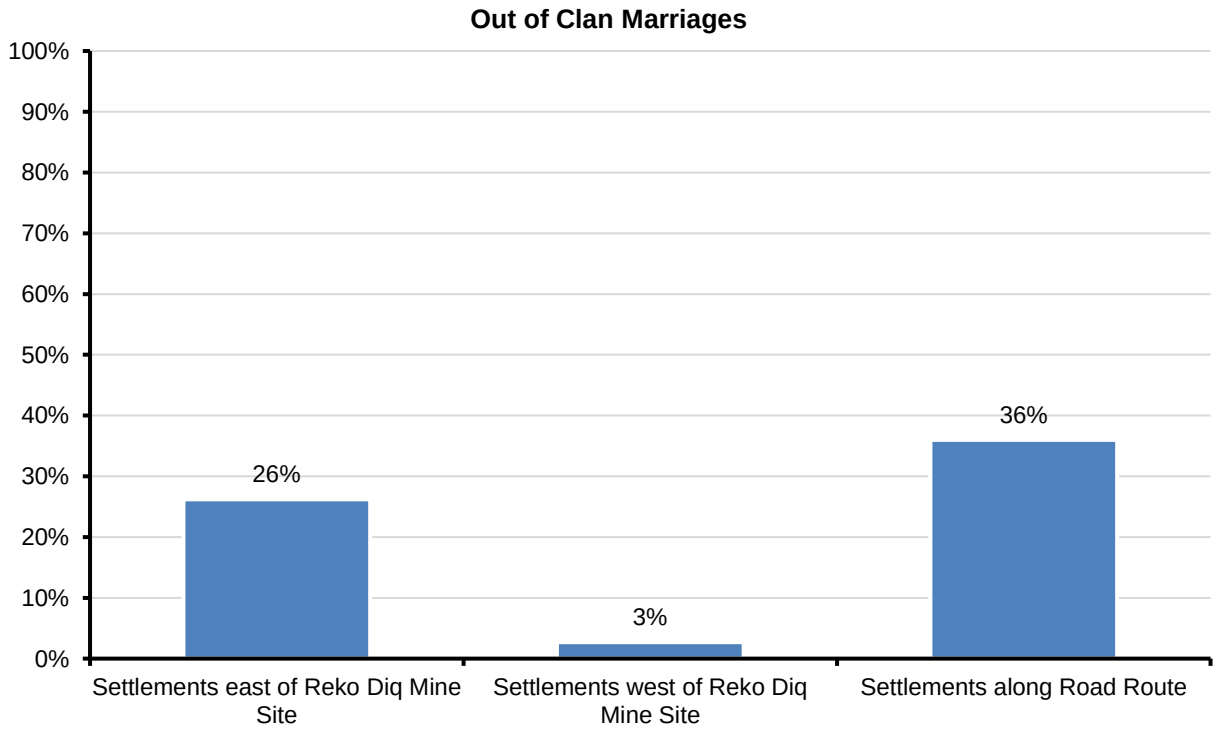


Figure 5-97: Out-of-Clan Marriages

5.3.4.8 *Occupation Profile*

Most of the working age population is without any gainful employment. As shown in Table 5-75, primary occupations of 35%[131] of the working age population was livestock rearing, of 16% was different types of labor, of 4% was farming, of 12% was self-owned business (mostly cross-border trade), and only 1% were working as artisans. Only 6% of the working–age population was employed in the government and 12% was employed in the private sector.

Out of the total income-earning population, about 19% are female and 81% are male.

Table 5-76 provides the area wise distribution of occupational profiles among the surveyed HHs.

Table 5-75: Primary Occupation Profile of the Surveyed Population

Livelihood Sector	Male	Female	Total	Percentage
Employed in government sector	28	8	36	6%
Employed in private sector	66	8	74	12%
Income generating farming	17	10	27	4%
Livestock rearing	137	72	209	35%
Self–owned trade and business	70	4	74	12%
Self–employed, working as artisans	8	0	8	1%
Working as construction labor sites	41	0	41	7%
Working as labor (Mining) sites	44	11	55	9%
Working as labor (Quarrying) sites	0	0	0	0%
Working as skill and un-skill labor	78	0	78	13%
Total	**489**	**113**	**602**	100%
Gender% of Total Population	**81%**	**19%**	**100%**	

Table 5-76: Area wise Distribution of Occupational Profile of the Surveyed Population

Livelihood Sector	East of the Reko Diq Mine Site		West of the Reko Diq Mine Site		Road Route	
	Male	Female	Male	Female	Male	Female
Employed in government sector	3	0	4	0	21	8
Employed in private sector	9	0	43	0	14	8
Income generating farming and Date Palms	2	1	14	9	1	0
Livestock rearing	58	33	53	23	26	16
Self–owned trade and business	21	2	9	2	40	0
Self–employed, working as Artisans	8	0	0	0	0	0
Construction Labor	8	0	18	0	15	0
Mining Labor	43	11	1	0	0	0
Quarrying Labor	0	0	0	0	0	0
Skilled and Un-skilled Labor	37	0	10	0	31	0

[131] Please note these % indicates the income from primary occupation which is not exclusive.

5.3.4.9 *Income and Expenditure*

Figure 5-98 presents the average monthly income of the surveyed households and the percentage of monthly income from each occupation with respect to the total income generated from all the occupations observed in the surveyed households.

As shown in Figure 5-98, almost 29% of HHs from the surveyed settlements were involved in cross-border trade, and 34% were involved in labor including mining, construction, and quarrying. Locals from the settlements located east and west of the Reko Diq Mine Site work in nearby projects, including the Saindak Copper-Gold Project and other local mining projects. 30% of the total household income is derived from salaried jobs (private and public), 4% from pensions, 2% from livestock and 1% from farming.

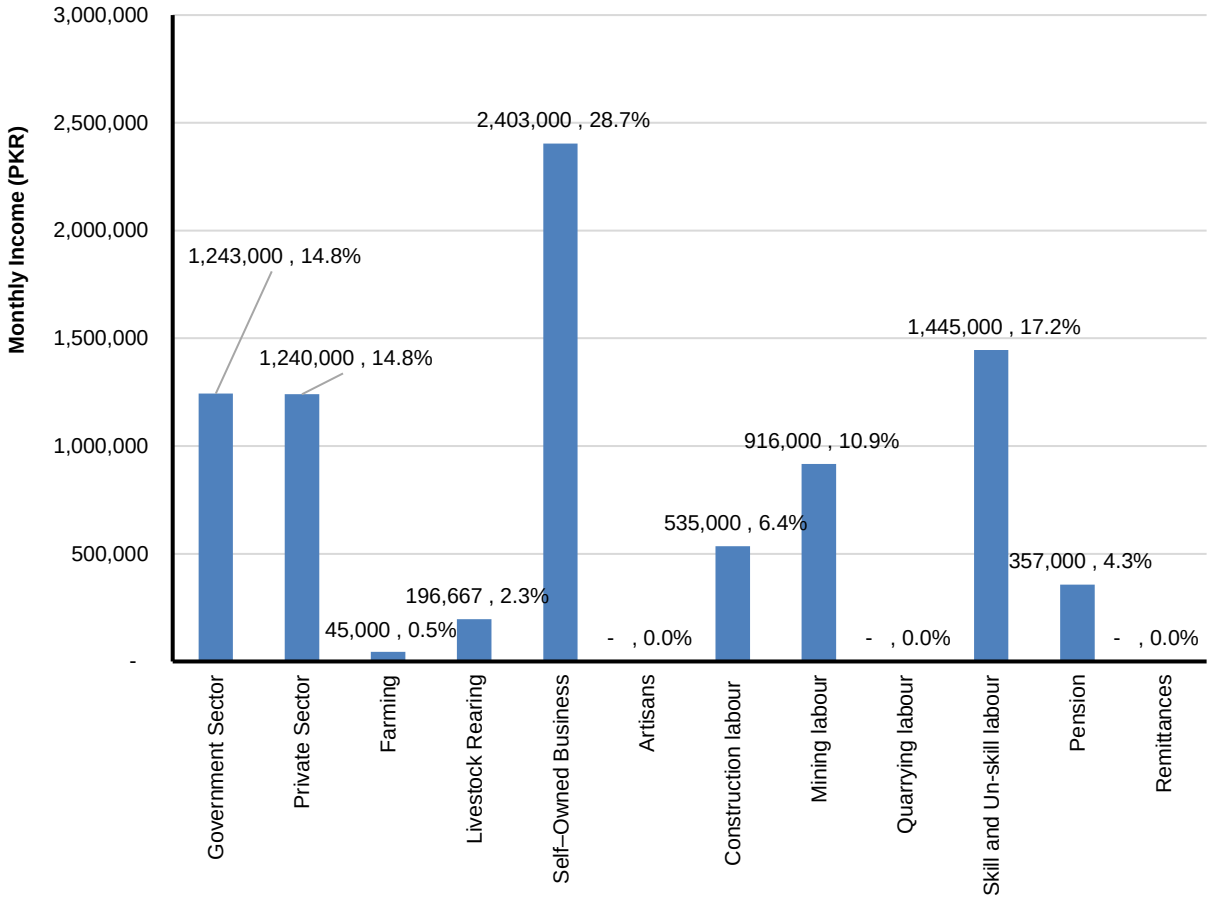


Figure 5-98: Average Monthly Income of the Surveyed Households

The average estimated income of a HH is PKR 30,255 per month and the average estimated expenditure of a HH is PKR 25,166 per month. On average one HH is saving PKR 5,090 per month. Table 5-77 provides the income and expenditures of the surveyed HHs.

Table 5-78 shows the area wise distribution of the income, expenditure, and savings of the surveyed households.

Table 5-77: Income and Expenditure of the Surveyed Households

Income and Expenditures	Income and Expenditure in PKR/ Month		
	Minimum	Maximum	Average
Income	8,000	200,000	30,255
Expenditure	7,100	104,500	25,166
Savings	100	95,500	5,090

Table 5-78: Area-Wise Distribution of the Income and Expenditure of the Surveyed HHs (PKR/month)

East of the Reko Diq Mine Site			West of the Reko Diq Mine Site			Road Route		
Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
12,000	50,000	24,990	8,000	150,000	24,081	12,000	200,000	40,247
9,800	40,000	21,243	7,100	60,200	19,824	10,800	104,500	33,158
100	14,000	3,747	100	89,800	4,257	100	95,500	7,089

5.3.4.9.1 Employment and Livelihood

Sources of income, access to sustainable income sources, diversity of sources, and dependence on these sources have a direct impact on poverty, income distribution, and economic development. There are certain issues inherent to employment like literacy, skill level, and lack of opportunities observed within the Socioeconomic Study Area.

Labor work is the main occupation of the men observed in the Socioeconomic Study Area which accounts for 68% of the surveyed population. This is mainly due to low literacy levels and a lack of skilled labor. Labor work is followed by self-owned businesses, in which 12% of the locals are involved. Businesses mainly include cross-border trade followed by shops/stores. A smaller percentage of the male population in the surveyed settlements is employed in private jobs (8%) and government services (7%). Private jobs include administration and security jobs in Saindak Copper-Gold Project and bank jobs particularly at Taftan, Nok Kundi and Dalbandin, whereas government services include jobs in the Levies Security Force, and health, and education departments. Other sources of income observed during the survey include agriculture (4%) and livestock rearing (1%).

Approximately 1.2% of women, mainly in Dalbandin and Nok Kundi were involved in income-generating activities. Of the women employed, 79% were in government services as teachers and health workers, 11% in private jobs, 4% in traditional embroidery work and 6% in laboring roles (domestic workers in Taftan and Dalbandin). Women in the settlements along the Road Route are employed in government and private businesses, whereas the women in the settlements located east of the Reko Diq Mine Site are less educated and work as laborers.

Table 5-79 shows the sources of livelihood as a percentage of the surveyed settlements in the Socioeconomic Study Area.

Table 5-79: Sources of Livelihood of People Surveyed

Livelihood Sources	Govt. Service	Private Service	Agriculture	Livestock	Business	Labor	Cottage Industry	Other Occupations	Total
Men									
East of the Reko Diq Mine Site	13	20	0	4	63	301	0	0	401
West of the Reko Diq Mine Site	15	63	3	13	14	260	0	0	368
Road Route	315	315	210	42	525	2,793	0	0	4,200
Total	**343**	**398**	**213**	**59**	**602**	**3,354**	**0**	**0**	**4,969**
Percentage	**7%**	**8%**	**4%**	**1%**	**12%**	**68%**	**0%**	**0%**	**100%**
Women									
East of the Reko Diq Mine Site	0	0	0	0	3	15	0	0	18
West of the Reko Diq Mine Site	1	1	0	0	4	2	0	0	9
Road Route	219	29	0	0	3	0	0	0	250
Total	**220**	**30**	**0**	**0**	**10**	**17**	**0**	**0**	**277**
Percentage	**79%**	**11%**	**0%**	**0%**	**4%**	**6%**	**0%**	**0%**	**100%**

Note: Other occupations include Designer, Entrepreneur, Freelancer, and Athlete.

Figure 5-99 shows the distribution of households in the surveyed settlements by income level. A significant portion (38%) of households in the surveyed population earn between PKR 20,001 to PKR 35,000. A small percentage (3%) of households earn more than PKR 75,000. There is some variation in income across the settlements, however, variation appears to be random, with no settlement being significantly better or worse off. Figure 5-100 shows the area wise breakdown of the HH income. Average income of males was PKR 20,991 and average income of females was PKR 6,375.

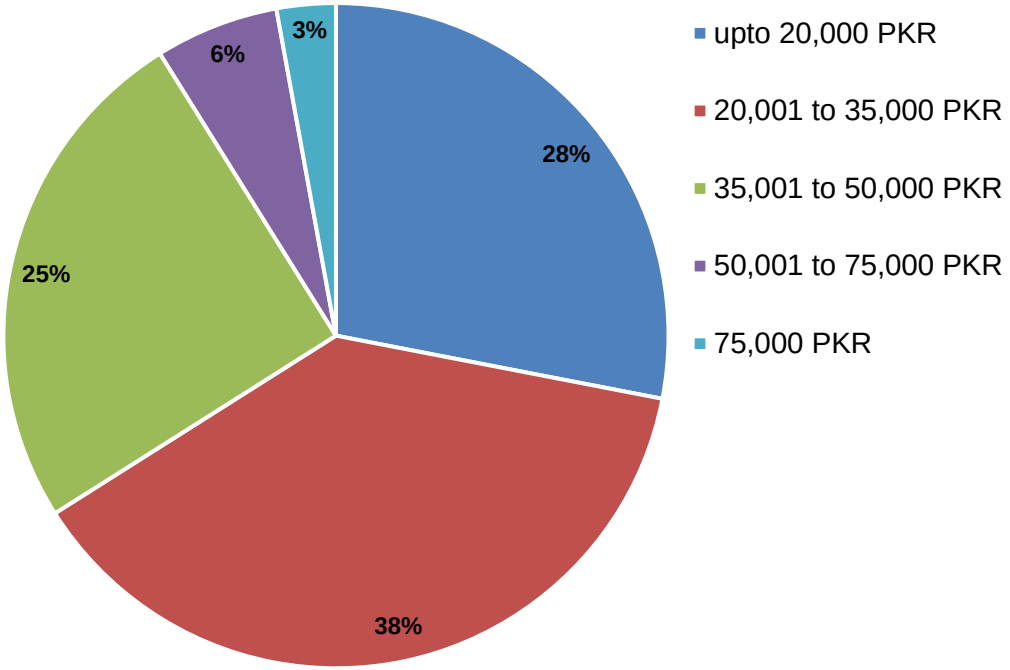


Figure 5-99: Average Distribution of Estimated Monthly Household Income

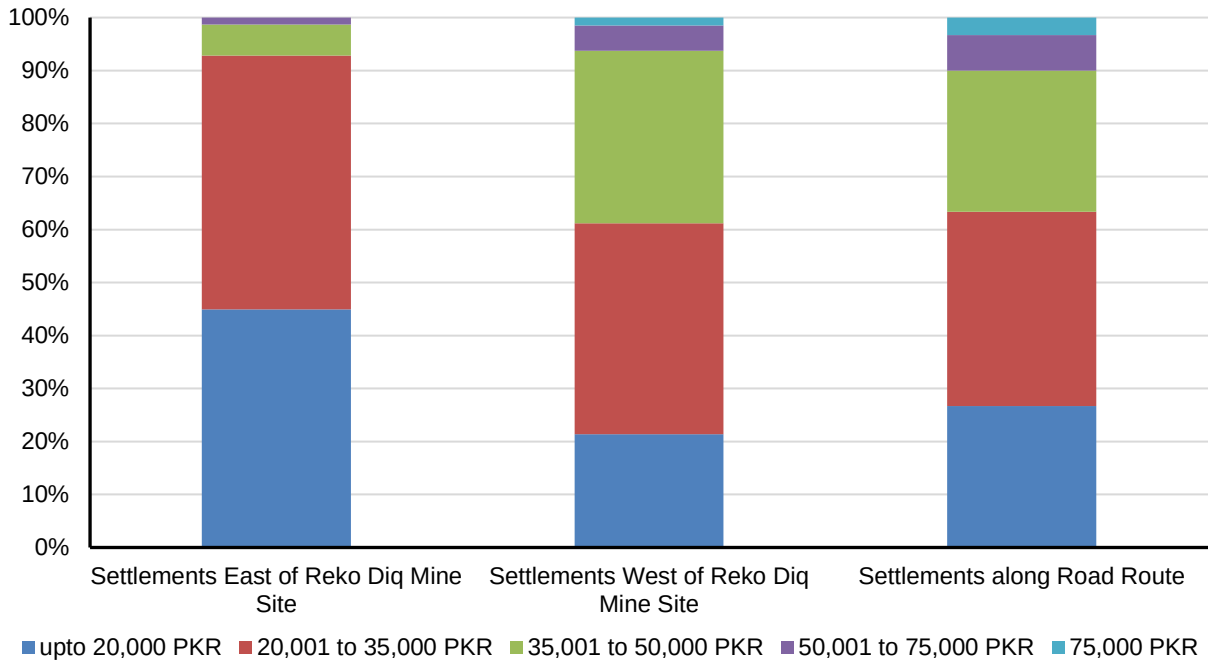


Figure 5-100: Area wise Breakdown of the HH Income (%)

5.3.4.9.2 Comparison with the 2010 ESIA

According to the 2010 ESIA, the main source of income was agriculture and wood collection, which accounted for about 45% of the total income from this source. This percentage has reduced to about 3% as observed during the survey in 2022. The operation of the Saindak Copper-Gold Project has provided employment opportunities to many locals and the trend of cross-border trading has also increased. Employment in other industries, including marble, iron, and pumice mining projects, has risen, especially

from the settlements located East of the Reko Diq Mine Site. Human traffic from across the border has also increased. People travelling from Afghanistan pass through from near the Reko Diq Mine Site and enter Iran from Mashkel.

Due to the general scarcity of water, agricultural activities have decreased. However, communities located near Upper Tahlab engage in agricultural activities as water is available in that area. Meanwhile, communities located to the east of the mine site are involved in cross-border trade, and this activity has experienced a significant increase following the previous surveys conducted in 2010.

Figure 5-101 provides the pictures of the cross-border activities.



Cross-border trade of Sugar and Fertilizer



Local traffic





Cross-border trade of Fuel

Figure 5-101: Cross-border Activities

5.3.4.10 Vulnerability

Vulnerable groups refer to people who by virtue of gender identity, sexual orientation, religion, ethnicity, indigenous status, age, disability, economic disadvantage, or social status may be more adversely affected by project impacts than others and who may be limited in their ability to claim or take advantage of project benefits. Vulnerable individuals and/or groups may also include, but not be limited to, people living below the poverty line, the landless, the elderly, women and children-headed households, refugees, internally displaced people, ethnic minorities, natural resource-dependent communities, or other

displaced persons who may not be protected through national legislation and /or international law.[132]

The vulnerability is discussed in this section in terms of:

- Poverty
- Women
- Disabled (mentally/ physically)
- Widows
- Elderly or women-headed families

5.3.4.10.1.1 Poverty

Poverty is usually measured as an index of income inequality. In Pakistan, the poverty line is PKR 3,030[133] per person per month. Of the surveyed HHs, 94 HHs consisting of 44% from the settlements east of the Reko Diq Mine Site, 47% from the settlements west of the Reko Diq Mine Site, and 10% from the settlements along the Road Route are under the national poverty line and are considered vulnerable. While HHs earning more than PKR 10,000 per person per month make up 16 HHs from the settlements west of the Reko Diq Mine Site and along the Road Route, which are 13% and 88%, respectively. None of the HH earned more than 10,000 per person per month from the settlements east of the Reko Diq Mine Site (Table 5-80). Most households in the surveyed settlements spend more than two-thirds of their income on food and cooking fuel.

Table 5-80: Income Level and Percentage of Surveyed Households Above and Below the Poverty Line

Income Level PKR/Person/Month	Number of HH	East of the Reko Diq Mine Site	West of the Reko Diq Mine Site	Road Route
Up to 3,030	94	44%	47%	10%
3,030 to 5,000	109	49%	17%	34%
5,001 to 10,000	58	16%	16%	69%
10,001 and above	16	0%	13%	88%

5.3.4.10.1.2 Women

Women in the surveyed settlements, particularly in the settlements located east and west of the Reko Diq Mine Site, have limited opportunities to work and are confined to their homes and nearby areas and their share in income is not significant. Examples of these activities are the maintenance of houses and livestock rearing. Their social contacts are mostly limited to the settlement level. Women in the area are vulnerable, not only economically but also due to their poor educational level and lack of contacts outside their homes. Only a few women from Humai, and Saindak settlements are involved in traditional embroidery work.

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132 http://www.ebrd.com/downloads/research/policies/esp-final.pdf accessed on December 14, 2023. (Article 11, footnote 8)

133 https://tribune.com.pk/story/2322313/22-pakistanis-living-below-poverty-line-na-told accessed on December 13, 2023

5.3.4.10.1.3 Disabled (mentally/ physically)

A total of 34 (0.13% of the total surveyed population) people were reported mentally and physically disabled within the surveyed settlements.

5.3.4.10.1.4 Widows

There were 111 widows, mostly above 45 years old, reported within the surveyed settlements. Either their brothers or sons are feeding them.

5.3.4.10.1.5 Elderly or Women-Headed Family

There were no women-headed families in the surveyed settlements where a woman is serving as head of household. Moreover, elderly men and women, 60 years and above, accounted for less than 2% and 1% respectively of the surveyed population.

5.3.4.10.1.6 Comparison with the 2010 ESIA

The 2010 ESIA reported that the poverty incidence for rural areas in Pakistan in 2005/06 was 27%. The percentage of poverty incidences in rural areas of Pakistan in 2018-19 was reported at 21.6%. In the Project Area, about one-third of the households are below the poverty line.

5.3.4.11 Household Assets

5.3.4.11.1 Appliances

Table 5-81 provides details of appliances owned by the surveyed HHs. The presence of appliances in a household is an indicator of the living standard. Recording appliances in socioeconomic surveys provides valuable information for Project developers to understand the living conditions, resource allocation, and technology adoption within a community or population.

Table 5-81: Appliance Owned by the Surveyed HHs

Appliances	% of Appliances in Settlements east of Reko Diq Mine Site	% of Appliances in Settlements west of Reko Diq Mine Site	% of Appliances in Settlements along Road Route
Television	0.97%	66.22%	71.00%
Radio	2.91%	0.00%	1.00%
Electric Room Heater	0.00%	51.35%	24.00%
Electric Water Heater/Geyser	0.00%	35.14%	22.00%
Refrigerator	0.00%	68.92%	71.00%
Freezer	0.00%	0.00%	0.00%
Washing Machine	4.85%	62.16%	63.00%
Iron	0.97%	67.57%	87.00%
Electric Fan	27.18%	82.43%	94.00%
Sewing Machine	12.62%	25.68%	29.00%
Generator	0.00%	0.00%	0.00%
Computer	0.00%	5.41%	7.00%

5.3.4.11.2 Vehicles

Out of the 277 surveyed households, 55 (20%) own more than one vehicle. Specifically, 9 (3%) households were from the settlements located near the east of the Reko Diq Mine Site, 30 (11%) were from the settlements near the west of the Reko Diq Mine Site, and 16 (6%) were from the settlements along the Road Route.

Figure 5-102 provides the type and number of vehicles owned by the people within the surveyed settlements. The locals mostly have motorcycles and pickups which they can use for transportation.

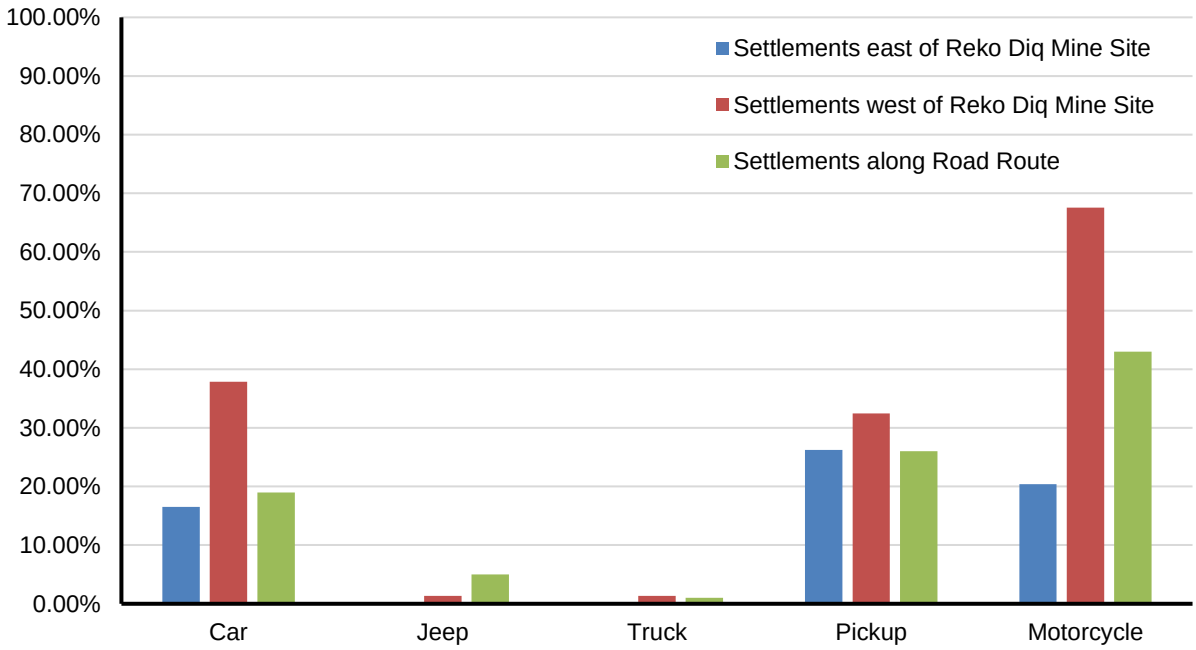


Figure 5-102: Number with Types of Vehicles Owned by the Surveyed Population

5.3.4.11.3 Livestock

Figure 5-103 presents the number and type of livestock reported within the surveyed settlements. These include buffaloes, cows, oxen, goats, sheep, camels, and chickens. It was reported that most of the HHs in the surveyed settlements keep goats, camels, and chickens. The livestock grazes in the proximity of settlements.

Figure 5-103 shows the photographs of the livestock.

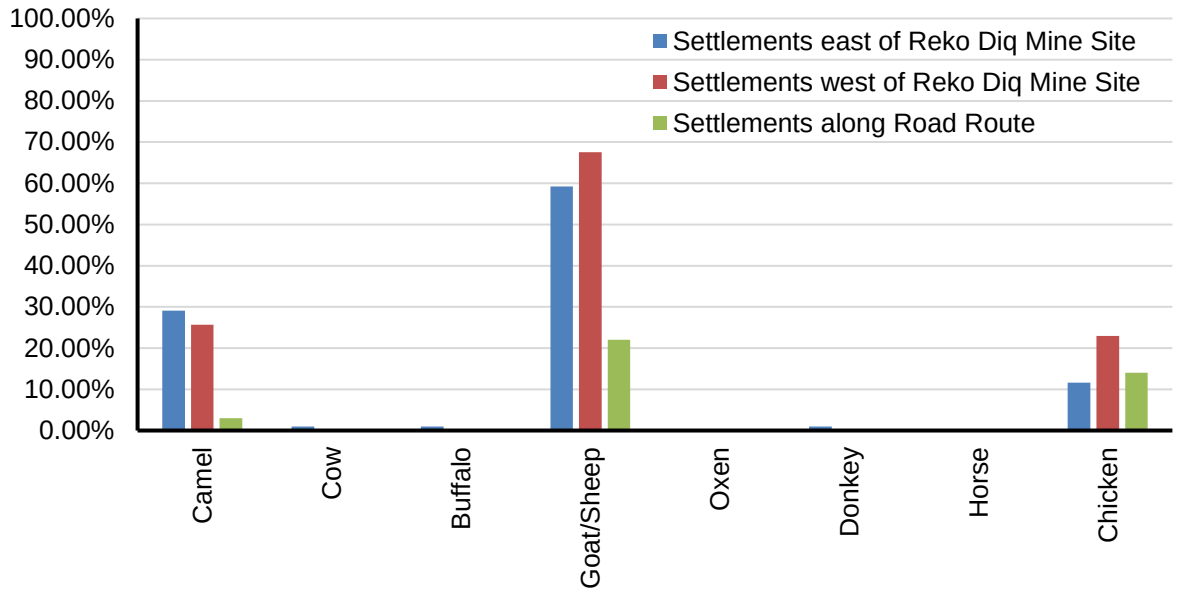


Figure 5-103: Number of Livestock Owned by the Surveyed Population



Livestock near the Humai settlement (East of the Reko Diq Mine Site)

Figure 5-104: Photographs of the Livestock

5.3.4.11.4 Cultivated Area and Agriculture

Water is a critical input for agricultural production and plays an important role in food security. The surveyed settlements lack access to fresh water and face a shortage of water not only for agriculture but also for domestic purposes.

Only about two out of the nine settlements in the Socioeconomic Study Area were found involved in agriculture. No settlement east of the Reko Diq Mine Site was involved in agricultural activities. However, date palms were observed near the Humai settlement. Agriculture is practiced in the settlements located west of the Reko Diq Mine Site (Kachau) and along the Road Route (Dalbandin). The common crops grown in the surveyed settlements were wheat, maize, rice, and fodder for animals. Some HHs also grow vegetables for self-consumption. Groundwater was used for irrigation of the crops in

most of the surveyed settlements. The HHs of the Kachau settlement used spring water for irrigation of the crops.

Some HHs in the settlements east of the Reko Diq Mine Site (Humai, and Nok Chah) and west of the Reko Diq Mine Site (Kachau) have grown date palms near the settlements for self-consumption. Water from nearby wells was used for the irrigation of the date palms.

Table 5-82 provides information on the cultivated land and crops. Table 5-83 shows water sources for irrigation and Figure 5-105 shows photographs of the agricultural land and water sources.

Table 5-82: Cultivated Land and Crops

Location	Settlements	Cultivated Land (Kanal)	Crops Grown	Wheat	Maize	Rice	Vegetable	Fodder	Date Palms
East of the Reko Diq Mine Site	Humai	0	No	No	No	No	No	No	Yes
	Mashki Chah	0	No	No	No	No	No	No	Yes
	Nok Chah	0	No	No	No	No	No	No	No
	Darband Chah	0	No	No	No	No	No	No	No
West of the Reko Diq Mine Site	Amalaf	0	No	No	No	No	No	No	No
	Saindak	0	No	No	No	No	No	No	No
	Kachau	20	Yes	Yes	No	No	Yes	Yes	No
Road Route	Nok Kundi	0	No	No	No	No	No	Yes	No
	Dalbandin	100	Yes	No	No	Yes	Yes	No	No

Table 5-83: Source of Water for Irrigation

Location	Public Water Supply	Dug Well	Spring	Groundwater
East of the Reko Diq Mine Site	No	No	No	No
West of the Reko Diq Mine Site	No	No	Yes	No
Road Route	No	No	No	Yes



Cultivated land near Kachau settlement (West of the Reko Diq Mine Site)



Date Palms near Humai settlement (East of the Reko Diq Mine Site)



Well water for irrigation of date palms at Humai settlement (East of the Reko Diq Mine Site)

Figure 5-105: Photographs of the Agricultural Land and Water Sources

5.3.4.12 Physical Infrastructure

The presence of roads, communication networks and other infrastructure are indicators of development in a region. The survey determined that there is considerable scope for development in the infrastructure, as access to various facilities and infrastructure is low in most parts of the Socioeconomic Study Area.

5.3.4.12.1 Roads and Transportation

The settlements located east and west of the Reko Diq Mine Site are connected to main towns and cities through the N-40 road. Local communities and the Project site access road were unsealed and in poor condition. A new road is under construction under the China-Pakistan Economic Corridor (CPEC) Project called the Yakmach-Kharan Road. The road will be constructed from the Yakmach settlement located along the Road Route down to the Kharan District. It will connect the settlements in the Kharan District to the main towns and cities of Chagai District including Nok Kundi and Dalbandin.

Figure 5-106 shows the conditions of the road and transport infrastructure in the Socioeconomic Study Area.



Un-sealed road near Humai settlement (East of the Reko Diq Mine Site)



Blacktop N-40 road near Nok Kundi settlement (Road Route)



Un-sealed road near Kachau settlement (West of the Reko Diq Mine Site)



Un-sealed road near Saindak settlement (West of the Reko Diq Mine Site)

Figure 5-106: Photographs of the Road Network

5.3.4.12.2 Electricity and Fuel Sources

Five out of the nine settlements did not have access to electricity and most of the households were dependent on fuelwood and shrubs from the forest for cooking and space heating during winter. Most of the surveyed settlements from the East and West of the Reko Diq Mine Site used solar panels for lighting. Electricity was available to households in Amalaf, Saindak, Nok Kundi and Dalbandin settlements (Table 5-84). Liquified petroleum gas (LPG) was mostly used for cooking in the main towns and cities including Dalbandin and Nok Kundi.

Figure 5-107 provides photographs of the solar panels and fuel sources.

Table 5-84: Electricity and Fuel Sources

Location	Settlements	Percentage HHs using Electricity	Percentage HHs using Solar panels	Percentage HHs using Fuel wood from range land and shrub	Percentage HHs using Fuel wood from Market	Percentage HHs using LPG	Percentage HHs using Kerosene	Percentage HHs using Gas Pipeline
East of the Reko Diq Mine Site	Humai	0	100	80	12	8	0	0
	Mashki Chah	0	100	65	15	20	0	0
	Nok Chah	0	100	75	10	15	0	0
	Darband Chah	0	100	90	0	10	0	0
West of the Reko Diq Mine Site	Amalaf	100	0	40	0	60	0	0
	Saindak	100	0	40	0	60	0	0
	Kachau	0	100	100	0	0	0	0
Road Route	Nok Kundi	100	0	10	0	90	0	0
	Dalbandin	100	0	0	0	100	0	0



Solar panels at Humai settlement (East of the Reko Diq Mine Site)



LPG cylinder at Nok Kundi settlement (Road Route)



Shrubs near Amalaf settlement (West of the Reko Diq Mine Site)



Fuelwood used at Kachau settlement (West of the Reko Diq Mine Site)

Figure 5-107: Photographs of the Solar Panel and Fuel Sources

5.3.4.12.3 Potable Water Supply

Most of the surveyed settlements in the Socioeconomic Study Area suffer from a severe water shortage. Piped water supply was not common in the surveyed settlements except at Dalbandin and Nok Kundi. The settlements west of the Reko Diq Mine Site and along the Road Route reported good water quality. However, the settlements east of the Reko Diq Mine Site complained of poor water quality with high salinity levels. The traditional wells are also vulnerable to contamination from human and other animal waste. Settlements have access to groundwater through a well at some points near the settlements. Water is carried by the family from the well to the house. Only Kachau settlement used the spring water system. It was reported in almost all the surveyed settlements that groundwater did not meet the provincial drinking water quality standards, however, due to a lack of alternatives it is consumed. Table 5-85 shows available water supply sources in the Socioeconomic Study Area and Figure 5-108 shows photographs of water sources.

Table 5-85: Potable Water Supply Sources

Location	Public Water Supply	Dug Well/s	Spring	Groundwater
East of the Reko Diq Mine Site	No	Yes	No	No
West of the Reko Diq Mine Site	No	Yes	Yes	Yes
Road Route	Yes	Yes	No	Yes



Water source at Humai settlement (East of the Reko Diq Mine Site)



Water source at Mashki Chah settlement (East of the Reko Diq Mine Site)



Water source at Nok Chah settlement (East of the Reko Diq Mine Site)

Figure 5-108: Photographs of the Potable Water Sources

5.3.4.12.4 Sanitation

Most of the settlements in the Socioeconomic Study Area were using a mixture of pit latrines and pit latrines with slabs, but open defecation is also common. Only main towns and cities like Dalbandin and Nok Kundi have a municipal sewage system (Table 5-86).

Table 5-86: Commonly used Sanitation Facilities

Location	Pit Latrine	Pit Latrine with Slabs	Septic Tanks	Open Latrine	Municipal Sewage System	Open Drains
East of the Reko Diq Mine Site	Yes	Yes	Yes	Yes	No	Yes
West of the Reko Diq Mine Site	Yes	Yes	Yes	Yes	No	Yes
Road Route	Yes	Yes	Yes	Yes	Yes	Yes

5.3.4.13 Social Infrastructure

5.3.4.13.1 Health

Most of the rural settlements did not have dispensaries and basic health facilities within the settlements during the survey in 2022 and the nearest health facility was the Rural Health Center (RHC) in Nok Kundi, which is located at an average of 50 km from the

settlements east of the Reko Diq Mine Site. However, RDMC's is constructing health facilities in the settlements located east of the Reko Diq Mine Site.

In September 2023, RDMC Country Head inaugurated the first Community Health Center (CHC)[134] in Humai settlement located east of the Reko Diq Mine Site. The health center is staffed by two doctors, one male and one female, support staff of paramedics and pharmacy staff. RDMC has partnered with the renowned Indus Hospital & Healthcare Network (IHHN) to establish this first healthcare project in Chagai District. At the same time, RDMC Country Head also inaugurated the first Mobile Medical Unit, equipped with a laboratory and pharmacy stocked with essential medical supplies, which serves as a temporary healthcare solution for the communities in and around Nok Kundi until the IHHN-RDMC hospital at Nok Kundi is ready. The mobile unit provides primary healthcare services through a team of doctors and community workers.

A Basic Health Unit (BHU) is located at Taftan at an average of 35 km from the settlements located west of the Reko Diq Mine Site. A District Headquarter Hospital (DHQ) is available at Dalbandin. Lady health visitors/workers (LHVs and LHWs) visit the surveyed settlements and provide basic health services. LHVs and LHWs also provide polio vaccination services in the settlements in the Socioeconomic Study Area.

Figure 5-109 shows photographs of the health facilities accessible to the settlements in the Socioeconomic Study Area. Table 5-87 presents available health facilities and distance (km) from the settlements. Table 5-88 presents health facilities developed by RDMC.

It was observed during the survey that not only is there a lack of health facilities but also of medical staff. General information collected on the medical staff in the health facilities is presented below.

- CHC Humai settlement: 2 doctors – 1 male and 1 female
- RHC Nok Kundi: 1 medical technician, LHV 2, Trained Midwife (dai) 2
- Health Center Saindak: 1 doctor
- DHQ Dalbandin: 3 doctors, LHV 4, Trained Midwife (dai) 4.

134 Rural Health Center (RHC) and Community Health Center (CHC) both aim to provide healthcare services, however, Community Health Centers can serve a broader demographic, encompassing various communities, whereas Rural Health Centers specifically target and tailor their services to meet the healthcare needs of populations living in rural, often more isolated, areas.



Health center in construction at Humai settlement in 2022 (East of the Reko Diq Mine Site)



Health facility at Dalbandin settlement (Road Route)



First Community Health Center at Humai (East of the Reko Diq Mine Site and nearest settlement) in 2023



First Mobile Medical Unit by RDMC-IHHN at Nok Kundi settlement (Road Route) in 2023



RHC at Nok Kundi settlement (Road Route)

Figure 5-109: Photographs of the Available Health Facilities

Table 5-87: Available Health Facilities

	Settlement	Facility	Type	Distance (km)	Location	Facility	Type	Distance (km)	Location	Facility	Type	Distance (km)	Location
East of the Reko Diq Mine Site	Humai	Dispensary	Private	85	Nok Kundi	RHC	Government	85	Nok Kundi	DHQ	Government	270	Dalbandin
	Mashki Chah	Dispensary	Private	50	Nok Kundi	RHC	Government	50	Nok Kundi	DHQ	Government	220	Dalbandin
	Nok Chah	Dispensary	Private	60	Nok Kundi	RHC	Government	60	Nok Kundi	DHQ	Government	60	Dalbandin
	Darband Chah	Dispensary	Private	75	Nok Kundi	RHC	Government	75	Nok Kundi	DHQ	Government	240	Dalbandin
West of the Reko Diq Mine Site	Amalaf	Dispensary	Private	5	Saindak Copper-Gold Project	Health center	Private	5	Saindak Copper-Gold Project	BHU	Government	35	Taftan
	Saindak	Dispensary	Private	7	Saindak Copper-Gold Project	Health center	Private	7	Saindak Copper-Gold Project	BHU	Government	36	Taftan
	Kachau	Dispensary	Private	100	Taftan	BHU	Government	100	Taftan	DHQ	Government	385	Dalbandin
Road Route	Nok Kundi	Dispensary	Government	0	Nok Kundi	RHC	Government	0	Nok Kundi	DHQ	Government	170	Dalbandin
	Dalbandin	Dispensary	Private	0	Dalbandin	Private Hospitals	Private	0	Dalbandin	DHQ	Government	0	Dalbandin

Table 5-88: Health Facilities by RDMC

	Settlement	Facility	Type	Distance (km)	Location
East of the Reko Diq Mine Site	Humai	CHC	Private	-	Humai
	Mashki Chah	CHC	Private	18	Humai
	Nok Chah	CHC	Private	15	Humai
	Darband Chah	CHC	Private	27	Humai

Table 5-89 shows the reported incidence of common diseases in the surveyed settlements in the Socioeconomic Study Area. No disease was reported as an epidemic. The most common illness reported for all ages of the population was flu/fever. Other illnesses reported included dysentery, malaria, chickenpox, TB, diarrhea, goiter, jaundice, stomach and kidney problems, and high blood pressure. All the surveyed settlements reported that groundwater is not drinkable and is the main cause of diseases.

Table 5-89: Reported Incidences of Diseases in the Surveyed Settlements

Location	Flu/ Fever	Malaria	Chicken pox	Typhoid	Diarrhea/ Dysentery	TB	Goiter	Jaundice	Stomach problems	Kidney problems	Blood pressure
East of the Reko Diq Mine Site	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
West of the Reko Diq Mine Site	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Road Route	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

5.3.4.13.1.1 Comparison with the 2010 ESIA

According to the 2010 ESIA, the closest hospital to the Reko Diq Mine Site was the District Headquarters Hospital in Dalbandin (approximately 270 km from the Reko Diq Mine Site by road). A RHC was in Nok Kundi.

During the survey in 2022, it was observed that there were no additional health facilities available for the settlements located east of the Reko Diq Mine Site. However, in 2023 RDMC inaugurated the first Community Health Center at Humai settlement and one Mobile Medical Unit at Nok Kundi. RDMC also inaugurated three primary schools with one in each Humai, Mashki Chah, and Darband Chah settlements earlier in 2023.

5.3.4.13.2 Education

It was observed during the survey in 2022, most of the surveyed settlements have school buildings, in which most of the schools are without teachers. The children enrolled at the primary level from these settlements mostly resided with their relatives in the main towns and cities. Secondary schools (up to level 10) and higher secondary schools (up to level 12) are in Nok Kundi and Taftan for the settlements located East and West of the Reko Diq Mine Site. Educational facilities (up to level 10 and above) are available in Nok Kundi and Dalbandin.

In 2023, RDMC have opened primary schools in all the settlements located east of the Reko Diq Mine Site and are employing teacher in these schools.

Table 5-90 provides the number of students at different educational levels with a gender breakdown within the Socioeconomic Study Area. The information pertains to the time of the 2022 survey, and it is likely to have changed since the opening of RDMC-funded schools in the settlements located near the east of the Reko Diq Mine Site.

Table 5-90: Distribution of Enrolled Population by Gender

Location	East of the Reko Diq Mine Site		West of the Reko Diq Mine Site		Road Route	
Gender	Male	Female	Male	Female	Male	Female
Primary (Nursery to Class V)	3.3%	2.7%	5.6%	4.7%	25.8%	25.1%
Secondary (Class IX to X)	1.4%	0.3%	4.6%	3.1%	11.9%	7.1%
Degree College/ University	0.2%	0.0%	0.6%	0.0%	2.3%	1.5%

Figure 5-110 shows photographs of educational facilities available in the area. There was a non-functional primary school observed in the Humai settlement that RDMC made functional. RDMC has also established two more primary schools; one at Mashki Chah and the other at Darband Chah that were inaugurated earlier this year.



Primary school by RDMC at Humai settlement (East of the Reko Diq Mine Site)



Primary school at Kachau settlement (West of the Reko Diq Mine Site)



FC public school and college at Nok Kundi settlement (Road Route)



FC public school at Dalbandin settlement (Road Route)



Primary school by RDMC at Darband Chah settlement (East of the Reko Diq Mine Site)



Primary school by RDMC at Mashki Chah settlement (East of the Reko Diq Mine Site)

Figure 5-110: Photographs of the Educational Facilities

Table 5-91 provides the education level of the surveyed population by gender.

Table 5-91: Education Level of the Surveyed Population

Education Level	Gender	Total	East of the Reko Diq Mine Site	West of the Reko Diq Mine Site	Road Route
Illiterate	Male	234	48%	21%	31%
	Female	324	39%	27%	35%
0-5	Male	103	31%	37%	32%
	Female	46	17%	39%	43%
6-10	Male	57	12%	37%	51%
	Female	4	0%	25%	75%
11-12	Male	25	12%	24%	64%
	Female	0	0%	0%	0%
>12	Male	28	7%	7%	86%
	Female	1	0%	0%	100%

Balochistan has the lowest literacy rate among the provinces in Pakistan. The gender disparity in literacy is also significant, with a much lower literacy rate in the female population. The socioeconomic survey at the household level revealed that the literacy rate among the surveyed population above the age of fifteen is 32%.

Table 5-92 further shows that the literacy rate for males is 48%, which is higher than that for females (14%).

Table 5-92: Literacy Rate of the Surveyed Population

Literacy level	Total Number of Persons		
	Male	Female	Total
Illiterate	234	324	**558**
Literate	213	51	**264**
Total	**447**	**375**	**822**
Literacy Ratio%	48%	14%	32%

5.3.4.13.2.1 Comparison with the 2010 ESIA and Population Census

In the 1998 census, the overall literacy rate in Balochistan was 25%, with literacy rates of 14% for females and 34% for males. Moreover, at the district level, literacy levels were Chagai 27%, Kharan and Washuk 15%, Panjgur 31%, Kech 27%, and Gwadar 25%.

According to the 2017[135] census, the overall literacy rate in Balochistan was 44%, with Kech district 62.66%, Panjgur 59.22%, Washuk 23.86%, Chagai 36.91%, Quetta, 58.76%, Pishin 52.97%, Gwadar 51.97% and Noshki 51.67%. Furthermore, the literacy rate among the surveyed population above the age of fifteen years is 32%, and the literacy rate for males is 48%, which is higher than that for females 14%.

5.3.4.14 Cultural Heritage Sites

It was reported by the locals during the field survey and community consultation, that there was no culturally important site in the socioeconomic Study Area. However, Koh-i-Sultan, approximately 30 km away from Nok Kundi, is visited by the locals for recreation.

135 mekran-tops-balochistan-in-literacy-rate-ranked-8th-on-national-level/

6. Information Disclosure and Public Consultation

The consultations were carried out to a larger extent as part of the ESIA of the proposed Reko Diq Mining Project and will be comprehensively discussed in that ESIA that will be submitted to the Balochistan-EPA at a later stage. The consultations included the details of the Reko Diq Mining Project, its facilities and activities during construction and operational phases. The discussion on the construction activities also included the Early Works activities. Further awareness and engagement specific to the Early Works is currently being undertaken. This section presents information limited to the scope of ESIA of the Early Works.

This section documents the consultation process adopted, identifies stakeholders who may be affected or benefit from the proposed Early Works activities, and summarizes concerns raised and suggestions provided by stakeholders during these consultations. In addition, this section presents further engagement for Early Works and outlines the stakeholder engagement process for the future.

6.1 Objectives of Stakeholder Consultations

The principal objective of the stakeholder engagement and information disclosure is to ensure involvement of the affected and interested parties in the project planning, ESIA decision making, and construction and operation phases of the project through:

- Identifying stakeholders that have an interest in the project and may be affected by it;
- Informing the stakeholders on the proposed activities and its consequences;
- Gathering data and information from the local adjacent communities about their human and biophysical environment, as well as about the relations they have with their environment;
- Seeking input from the public on the planned activities to increase its positive outcomes and avoid or mitigate negative impacts; and
- Ensuring continued engagement of the stakeholders through the operating life of the project.

Stakeholder consultations starts in the planning stage of the project and continue throughout the lifecycle of the project including the construction and operation phases. Stakeholders will be consulted and informed about any planning and development related to the Project which may affect them.

RDMC has developed a Stakeholder Engagement Plan which will include the mechanisms through which stakeholders will be involved in the different phases of the Project.

6.2 Outcomes of Stakeholder Consultations

The views, interests, and concerns of Project stakeholders will be considered in the following decisions:

- Planning, design, and implementation of the Project;

- During the assessment of the potential impacts of the Project and the identification of appropriate mitigation measures; and
- Decisions by the regulatory authorities on whether to approve the Project and corresponding conditions of approval.

6.3 Good Practice Principles

The consultations were undertaken in good faith while remaining impartial. The good practice principles that were observed during the consultations are listed below.

- *Cultural sensitivity* – This required understanding and appreciation of the social institutions, values, norms, and culture of the communities in the Project Area and respect for the historical, cultural, environmental, political, and social backgrounds of the communities which are affected by the Project.
- *Interactive approach* – Consultation was not limited to one–way dissemination of information. Stakeholder comments were fed into the ESIA process and proposed Project design.
- *Open, transparent, and informative* – People who may be affected by the Project and were interested in participating were given access to relevant information, in a simple and understandable format.
- *Inclusive and equitable* – It was ensured that all stakeholder groups are represented, including less represented groups such as women, children, elderly, and poor people.
- *Appropriateness and flexibility* – Consultation methodologies were appropriate to the specific phase of the ESIA process, and the stakeholder groups identified. The consultation process was flexible and was adjusted according to the resources available.
- *Capacity building* – Capacity building measures were adopted during consultation interactions to increase confidence of affected persons to communicate their concerns.

6.4 Framework for Consultations

Public consultation is mandated under Balochistan's environmental law. Regulation 7 of the IEE/EIA Regulations 2020 provides the general requirements whereas the sectoral guidelines indicating specific assessment requirements are provided in the Guidelines for Public Consultation 1997 (the 'Guidelines'). These are summarized below.

- **Objectives of Public Involvement:** To inform stakeholders about the proposed project, to provide an opportunity for those otherwise unrepresented to present their views and values, providing better transparency and accountability in decision making, creating a sense of ownership with the stakeholders.
- **Stakeholders:** People who may be directly or indirectly affected by a project will clearly be the focus of public involvement. Those who are directly affected may be project beneficiaries, those likely to be adversely affected, or other stakeholders. The identification of those indirectly affected is more difficult, and to some extent, it will be a subjective judgment. For this reason, it is good practice to have a very wide definition of who should be involved and to include any person or group who thinks that they have an interest. Sometimes it may be necessary to consult with a representative from a particular

interest group. In such cases, the choice of representative should be left to the group itself. Consultation should include not only those likely to be affected, positively or negatively, by the outcome of a project, but should also include those who can affect the outcome of a project.

- **Mechanism of Consultations:** Provide sufficient relevant information in a form that is easily understood by non-experts (without being simplistic or insulting), allow sufficient time for stakeholders to read, discuss, consider the information and its implications and to present their views, responses should be provided to issues and problems raised or comments made by stakeholders, selection of venues and timings of events should encourage maximum attendance.
- **Timing and Frequency:** Planning for the public consultation program needs to begin at a very early stage; ideally, it should commence at the screening stage of the project and continue throughout the EIA process.
- **Consultation Tools:** Some specific consultation tools that can be used for conducting consultations include focus group meetings, needs assessment, semi-structured interviews; village meetings and workshops.
- **Other Important Considerations:** The development of a public involvement program would typically involve consideration of the following issues: objectives of the project and the study; identification of stakeholders; identification of appropriate techniques to consult with the stakeholders; identification of approaches to ensure feedback to involved stakeholders; and mechanisms to ensure stakeholders' consideration are taken into account.

6.5 Project Stakeholders

Stakeholders include individuals and groups that can affect or take effect from a project's outcome. In the case of the Project, these include:

- Directly or indirectly affected communities by the Project.
- Government and regulatory authorities directly or indirectly connected to or overseeing, the activities of the Project.
- Non–governmental organizations working in areas that can be affected by the Project.
- Academia that can be interested in the Project from the transfer of skill and knowledge point–of–view.

6.6 Consultation Process

A transparent, unbiased, and effective consultation mechanism was adopted for the proposed Project, which ensured that the consultation objectives were met.

6.6.1 Consultation Material

The main document for distribution to stakeholders during the consultation was the Background Information Document (BID). The BID informed the stakeholders about the ESIA process and how they can participate in it. In addition, it included the details of the complete Reko Diq Mining Project and the activities involved in the Early Works.

Appendix Q includes the BID for the larger extent for the Reko Diq Mining Project covering the Early Works activities.

6.6.2 Consultation Methodology

The consultations in the Socioeconomic Study Area were carried out between September and October 2022. The feedback from the communities was recorded and detailed logs of consultations with the attendees were prepared. Community consultation and key informant interviews were conducted within the settlements located in the Socioeconomic Study Area. Special attention was paid to identifying the needs of vulnerable groups (such as the poor, women, and elderly), to ensure that their views are considered in the formulation of the ESIA. Keeping local norms in view, male and female consultations were held separately by male and female experts.

Separate meetings with institutional stakeholders were arranged in Dalbandin and Quetta.

Representatives of RDMC and the HBP team were present during the consultation meeting with the stakeholders. The contact details of the RDMC and HBP representatives were shared with the stakeholders to reach out at a later stage, if required, to share any concerns pertaining to the Project.

6.6.3 Documentation and Reporting

6.6.3.1 *Community Consultations*

A consultation process was carried out in 2022 as part of the Mining Project ESIA that included presentation of all project aspect (including activities to be completed during the Early Works). Figure 6-1 shows locations of communities consulted during the 2022 Socioeconomic Study. The consultations were carried out with the residents of the communities. The consultations were conducted in nine settlements. Four settlements located east of the Reko Diq Mine Site and three located on the west. The residents in Nok Kundi – as the nearest town, and Dalbandin (headquarters of Chagai District) were also consulted. These two towns are situated along the Road Route (N-40) that will be used for the Project related transportation.

- Settlements east of the Reko Diq Mine Site – Humai, Mashki Chah, Nok Chah, and Darband Chah.
- Settlements west of the Reko Diq Mine Site – Kachau, Amalaf, and Saindak.
- Settlements along the Road Route – Nok Kundi (nearest main town) and Dalbandin (headquarters of Chagai District).

The consultation team consisted of two male consultation experts, two female consultation experts, and a gender specialist. The consultation team held meetings with groups of men and women in nine settlements. A total number of 174 persons (83 men and 91 women) were consulted.

Further, more recent consultation has and is being completed which is specific to the project Early Works. RDMC has undertaken a second round of engagement and further awareness sessions specifically for the Early Works ESIA as a Good Practice Measure to inform stakeholders. The feedback of this engagement will be recorded into the consultation logs and incorporated in the Early Works ESIA. This engagement will ensure

that the communities concerns and suggestions are recorded and appropriately addressed in the Early Works ESIA. Moreover, it will help RDMC to understand the needs of communities and to incorporate them into its Community Development Program and strengthen its Stakeholder Engagement Plan and Grievance Redress Mechanism.

Engagement will be ongoing prior to and following the public forum.

Table 6-1 shows the number of participants in the consultations in different settlements. Figure 6-3 shows the photographs of the community consultations. Photographs of consultations with women were not taken in some communities because the community members did not provide consent for taking photographs of women in the community.

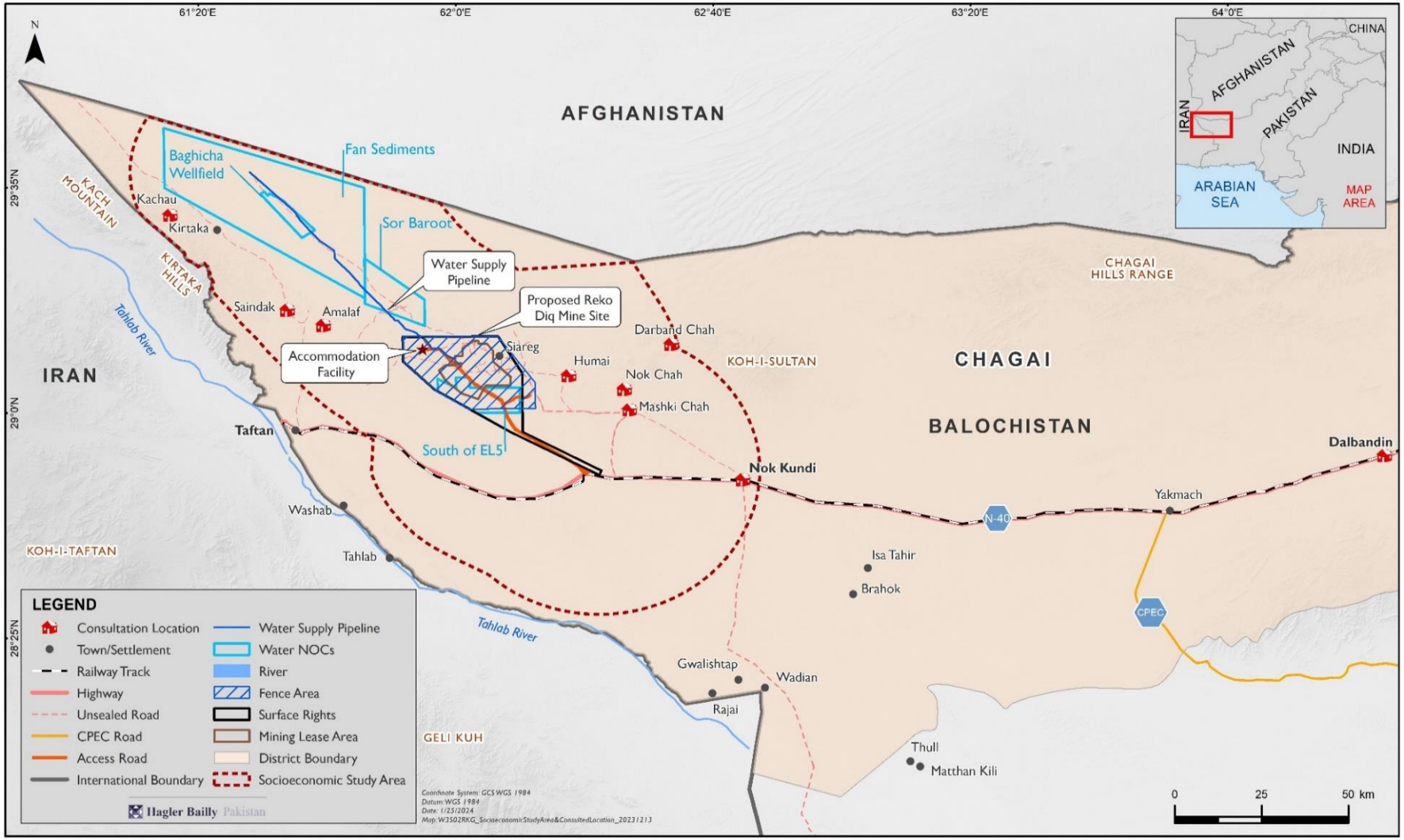


Figure 6-1: Locations of Communities Consulted in the Socioeconomic Study Area

Table 6-1: Participants in the Community Consultations

Location	Settlement	Number of Participants			Date Consulted
		Men	Women	Total	
East of the Reko Diq Mine Site	Humai	12	11	23	September 13, 2022
	Mashki Chah	7	11	18	September 14, 2022
	Nok Chah	4	10	14	September 14, 2022
	Darband Chah	10	9	19	September 15, 2022
West of the Reko Diq Mine Site	Amalaf	13	9	22	September 17, 2022
	Saindak	10	11	21	September 16, 2022
	Kachau	10	10	20	September 18, 2022
Road Route	Nok Kundi	9	12	21	September 26, 2022
	Dalbandin	8	8	16	September 26, 2022
West of the Reko Diq Mine Site	Kachau	25	24	49	February 10, 2024
East of the Reko Diq Mine Site	Humai	16	23	39	February 11, 2024
East of the Reko Diq Mine Site	Humai	10	11	21	February 15, 2024
	Mashki Cha	4	9	13	February 16, 2024
	Nok chah	2	9	11	February 16, 2024
	Durban Chah	12	22	34	February 16, 2024
West of the Reko Diq Mine Site	Amalaf	6	9	15	February 17, 2024
	Saindak	10	7	17	February 17, 2024
	Kachau	14	30	44	February 18, 2024
Road Route	Nok Kundi	18	11	29	February 19, 2024
	Dalbandin	15	12	27	February 20, 2024



Consultation with men at Humai settlement (East of the Reko Diq Mine Site)



Consultation with men at Nok Chah settlement (East of the Reko Diq Mine Site)



Consultation with men at Mashki Chah settlement (East of the Reko Diq Mine Site)



Consultation with men at Darband Chah settlement (East of the Reko Diq Mine Site)



Consultation with men at Saindak settlement (West of the Reko Diq Mine Site)



Consultation with men at Kachau settlement (West of the Reko Diq Mine Site)



Consultation with men at Amalaf settlement (West of the Reko Diq Mine Site)



Consultation with men at Dalbandin town (Transport Corridor)



Consultation with men at Nok Kundi town (Transport Corridor)



Consultation with men at Kachau settlement (West of the Reko Diq Mine Site)


Consultation with men at Humai settlement (East of the Reko Diq Mine Site)


Consultation with men at Darband Chah settlement (East of the Reko Diq Mine Site)


Consultation with men at Amalaf settlement (West of the Reko Diq Mine Site)


Consultation with men at Nok Kundi town (Transport Corridor)


Consultation with men at Humai settlement (East of the Reko Diq Mine Site)


Consultation with men at Mashki Chah settlement (East of the Reko Diq Mine Site)


Consultation with men at Saindak settlement (West of the Reko Diq Mine Site)


Consultation with men at Nok Chah settlement (East of the Reko Diq Mine Site)


Consultation with men at Dalbandin town (Transport Corridor)


Consultation with men at Kachau settlement (West of the Reko Diq Mine Site)



Consultation with women at Kachau settlement (West of the Reko Diq Mine Site)



Consultation with women at Dalbandin town (Transport Corridor)



Consultation with women at Humai settlement (East of the Reko Diq Mine Site)



Consultation with women at Saindak settlement (West of the Reko Diq Mine Site)



Consultation with women at Darband Chah settlement (East of the Reko Diq Mine Site)



Consultation with women at Nok Chah settlement (East of the Reko Diq Mine Site)



Consultation with women at Mashki Chah settlement (East of the Reko Diq Mine Site)



Consultation with women at Kachau settlement (West of the Reko Diq Mine Site)



Consultation with women at Nok Chah settlement (East of the Reko Diq Mine Site)



Consultation with women at Dalbandin town (Transport Corridor)



Consultation with women at Humai settlement (East of the Reko Diq Mine Site)



Consultation with women at Kachau settlement (West of the Reko Diq Mine Site)

Figure 6-2: Photographs of the Community Consultations

Table 6-2: Summary of Concerns raised during Consultation with Communities

Aspect	Concerns	Responses
Traffic	Increase in traffic volume and the number of accidents in the area	The activities in the Early Works phase will not result in a significant increase in traffic. The construction traffic will increase slightly; however, this increase will only be of a few trucks. The national highways are designed with the capacity to deal with slight increases. Moreover, the mitigation measures for the management of traffic, presented in **Section 7** (*Environmental Impacts and Mitigation Measures),* will be followed.
Livelihood/ Employment	Increase in employment opportunities for the local population	The Project will provide employment opportunities to the local community during the construction and operation phases. Preference will be given to local community during hiring and the recruitment process will be made transparent. Training will also be imparted as an enhancement measure by the Client. The aspect is covered as enhancement and good practice measures in **Section 7**, *Environmental Impacts and Mitigation Measures*.
	Transparency in the recruiting process for local community members	
	There will not be sufficient job opportunities for women in the Project	
Infrastructure	Upgrade of local infrastructure	The Project will give special attention to upgrading and developing the local infrastructure as part of Community Development Program (CDP). In 2023, RDMC has established primary schools in Humai, Mashki Chah, and Darband Chah settlements and a Community Clinic Center in Humai settlement and a Mobile Healthcare Unit in Nok Kundi. Moreover, the Project is developing a health facility in Nok Kundi in collaboration with the Indus Hospital and Healthcare Network. The aspect is covered as enhancement and good practice measures in **Section 7**, *Environmental Impacts and Mitigation Measures*.
	Provision of health facilities such as dispensaries, educational facilities such as private schools, and safe drinking water facilities	
Capacity Building	Provision of work-related training	With commencement of the Project, technical and work-related training will be given to the local community to develop their skills. This aspect is included as enhancement and good practice measures in **Section 7**, *Environmental Impacts and Mitigation Measures*.
Community Engagement, Empowerment and Entrepreneurship	Active participation of residents in decision-making processes.	CDP will ensure active participation of residents and allocation of CDP funds for community development and empowerment through education and entrepreneurship. Moreover, the Women's Empowerment Plan will also be developed under CDP which will ensure the allocation of CDP funds for women's education, entrepreneurship, and small-scale industries initiatives. A Community Oversight Committee will also be proposed in the CDP, which will be directly involved in CDP initiatives, ensuring transparency and accountability during Project implementation. The aspect is covered in **Section 7**, *Environmental Impacts and Mitigation Measures.*
	Empowerment of women through education, entrepreneurship, and small-scale industries.	
	Community involvement in overseeing CSR initiatives and projects.	

Table 6-3: Concerns and Suggestions by the Key Informants

Settlement	Concerns and Suggestions
Humai Settlement	▪ Mr. Malik Liaqat said that previously the TCC started work in the area and provided employment to the local community. The company also provided health and educational facilities to the local communities, especially the Humai community. The people of the area were happy with this development but after the closure of the Project, they became unemployed and as a result became involved in cross-border trade again. He added that the involvement of Barrick in this project is welcomed, as it will generate employment opportunities and contribute to the development of infrastructure for the local community members. ▪ Muhammad Khan said that the local communities lack access to safe drinking water, which contributes to most of the diseases in the area. The Project developers should provide safe drinking water to the nearby communities. He also added that the area is rich in mineral resources, which can contribute to the economy of the country. Project developer should start this Project as soon as possible and once it starts, the local communities will cooperate with the Project team. He said that the NGOs Islamic Relief and Muslim Hands were previously working in this settlement but now their functions have been suspended. According to him, women in the settlement are not involved in decision making, however, family conflicts are discussed with them. He also expressed a keen interest in the project as it is expected to create jobs and livelihood opportunities for the local communities.
Mashki Chah Settlement	▪ Mr. Muhammad Tahir said that although the Project did not have any direct impact on the Mashki Chah settlement, they have concerns about the routes of cross-border trade as the local community uses routes near the Mashki Chah for cross-border trade. He added that they hoped that this Project would uplift the lifestyle of the local communities through the development of the area. He also said that employment opportunities should be provided to the local communities on a priority basis. ▪ Mr. Jamal informed that there is no health facility in the settlement and the water for domestic use is being taken from nearby wells. This water is not fit for drinking and causes stomach and kidney diseases. He said that positive impacts can be expected from the Project as it will bring employment opportunities and boost their income. Infrastructure development should be carried out by the Project for this settlement.
Nok Chah Settlement	▪ Haji Muhammad Hassan, who had retired from a government job, informed the team that his community has been settled in the area since generations. The community has suffered from water scarcity and quality issues, which has badly affected their livelihood and health. Due to the shortage of water, there are no agricultural activities near the settlement. The community uses water from dug wells for drinking and domestic purposes. The communities hope that a water filtration plant will be provided by the Project. He added that some households have moved to Nok Kundi and Dalbandin to access education facilities for their children and employment opportunities for themselves as there are no educational facilities available in the settlement. Local community residents travel to Nok Kundi for major purchases and to access health facilities. Women faces many problems in travelling to Nok Kundi, especially for health-related visits. Most of the males in the settlement are involved in cross-border trade and livestock rearing business. Females are limited to household work and are not involved in decision-making. ▪ Mr. Salah-Ud-Din said that unemployment is an issue for the communities, roads and other infrastructure is not available, and travelling to Nok Kundi or Dalbandin for health visits is cumbersome.
Darband Chah Settlement	▪ Syed Bashir said that the Project is being delayed by the government. As a result, local community members are involved in labor at the nearest mine site, where the wages are low as compared to those at the Saindak Project. There are no health and education facilities in the settlement and no road infrastructure and cellular network has been provided by the government.

Settlement	Concerns and Suggestions
	▪ Mr. Ghulam Ahmad informed that a few women are working as labor at mine site at very low wages. Since this village is situated at the farthest end of the district and is near the Afghan border, it is overlooked by the government. Border trading is the key profession of the local community members. ▪ Mr. Feroz Shah informed that a new mining project is being initiated by the government in coordination with a Chinese firm. The notables proposed that till the commencement of Reko Diq Mining Project the government or the firm can hire people from the local community for their project.
Amalaf Settlement	▪ Mr. Malik Shah Mureed said that most of the local community members are working at Saindak Project, and earn handsome salaries, as the Saindak Project pays in United States (US) Dollars. The Saindak Project is providing them with health and education facilities within their premises. ▪ Mr. Ahmad Buksh added that the Saindak project is also providing them with electricity and water tankers for domestic use. The local community members of the settlement are happy that the Reko Diq Mining Project will start soon and generate significant employment opportunities due to the scale of the Project. ▪ Mr. Nawab Khan suggested that the Barrick administration should start apprenticeship for youth and literate individuals in the nearby settlements and provide vocational trainings to unskilled or semi-skilled persons.
Kachau Settlement	▪ Mr. Sher Ali said that the Reko Diq Project was previously executed by the Tethyan Copper Company (TCC) in 2010 and some people from the local community were employed by the project, but when the TCC terminated its operations, they became unemployed. A few of them who were skilled have now been employed by the Saindak Project. ▪ Haji Abdullah added that now a days most of the local community members are involved in livestock rearing as the border trade is becoming difficult. A few of them are also involved in agricultural activities e.g., date trade at Taftan. The Saindak Project has significantly contributed to air pollution in the area and has impacted the health of local community members, some of whom are asthma patients. ▪ Mr. Allah Dad and Mr. Qalamdar suggested that the upcoming Reko Diq Project should give them priority for employment and provide the communities with basic infrastructure such as primary schools for boys and girls, roads, health center, RO plant as the water is brackish, and a veterinary doctor/dispenser.
Nok Kundi Town	▪ Mr. Jalal informed the team that previously many persons from local community had worked on the TCC project, but after its closure they had been unemployed for many months. He said that a few had been employed by Saindak Project as they were skilled. He added that the water is brackish due to sulfur in the mountains in the region due to which a 70 km long water pipeline had been laid for supply of water to the communities. ▪ Mr. Ali Dost suggested that the Reko Diq Mining Project should rehabilitate the local BHU/RHC and high school. ▪ Mr. Shahbaz Khan, a notable, added that a vocational training institute should be established by Barrick. This will allow local community members to acquire skills which will also be beneficial for the Project Company.
Dalbandin Town	▪ Mr. Hameed Ullah informed that the number of people employed in the private sector is low in comparison to those employed by the government. Employment in the private sector was previously higher due to the TCC. Locals who had previously been employed by the TCC were now involved in cross border trading, which has several associated risks.

Settlement	Concerns and Suggestions
	▪ Mr. Hafeez Ullah added that the water is brackish causing locals to suffer from kidney and stomach ailments. Agricultural activity in the area is increasing, however, more attention from the agricultural department is required to realize its full potential. The livestock and dairy development departments should promote livestock rearing. A few women are working in the government as LHVs and schoolteachers but most of the women are engaged in domestic work at their homes. ▪ Meer Jamshed said the company should develop a vocational training institute for the local community. The company should also provide services which are currently being provided by the Saindak Project e.g., better schools, bus service for school going children, and health services.
Saindak Settlement	▪ Haji Qadar Shah highlighted the increasing air pollution due the Saindak Project, causing health issues among local community members. He also pointed out the community's heavy reliance on Saindak Project for employment, limited road infrastructure, a partially operational cellular network affecting communication, and the exclusion of women from decision-making processes. ▪ Bibpak Shah, Haji Gul Muhammad, Hamid Shah, and Ameen Ullah echoed these concerns, emphasizing the effect of air pollution on health, the community's dependence on employment at Saindak Project, and the need for improved infrastructure. Gender-specific concerns include limited roles for women confined to housework and their exclusion from decision-making processes. The CSR initiatives could include control of air pollution, investments in environmentally friendly practices, road infrastructure development, better communication networks, and programs to train and employ women.

6.6.3.2 *Institutional Consultations*

The institutional stakeholders consulted for the Project included relevant government agencies and Non-Governmental Organizations (NGOs). Table 6-4 shows the list of institutional stakeholders consulted for the Project. Figure 6-3 shows the photographs of the institutional consultations.

Table 6-4: List of Institutional Stakeholders

Stakeholder		Date Consulted
Education Department, Dalbandin	Government Department	September 26, 2022
Health Department, Dalbandin	Government Department	September 26, 2022
District Administration, Dalbandin	Government Department	September 27, 2022
Balochistan Environmental Protection Agency, Quetta	Environmental Regulatory Department	October 5, 2022
Islamic Relief (NGO), Quetta	NGO	October 5, 2022
Public Health Engineering (PHE) and Water and Sanitation Agency (WASA)	Government Department	September 04, 2023
District Vice Chairman Local Government and Rural Development Chagai	Government Department	September 01, 2023
Irrigation Department	Government Department	September 04, 2023
Balochistan Rural Support Program (BRSP)	NGO	September 05, 2023



Consultation with Deputy Commissioner, Dalbandin



Consultation with District Officer Education, Education Department, Dalbandin



Consultation with Deputy Director Environment (EPA), Quetta



Consultation with Balochistan Rural Support Program (BRSP)



Consultation with District Health Officer, Health Department, Dalbandin



Consultation with Area Program Manager, Islamic Relief (NGO), Quetta



Consultation with Public Health Engineering (PHE) and Water and Sanitation Agency (WASA)



Consultation with District Vice Chairman Local Government and Rural Development, Chagai



Consultation with Irrigation Department

Figure 6-3: Photographs of Consultation with Institutions

Table 6-5: Summary of Concerns raised during Consultation with Institutions

Aspect	Concerns	Responses
Wastewater Generation	Generation and management of wastewater	The Project will generate wastewater from camps; however, it will be treated onsite in a Wastewater Treatment Plant. Mitigation measures to handle and manage the wastewater generated by the Project are presented in **Section 7**, *Environmental Impacts and Mitigation Measures*.
Wildlife and Forest	Impact of the construction activities during Early Works	The Project does not involve any protected area or forest. However, there was sparse wildlife habitat and vegetation observed in the area. Mitigation measures to protect against the killing of wildlife and to carry out Project activities in a manner that does not disturb wildlife habitat and vegetation clearing are presented in **Section 7**, *Environmental Impacts and Mitigation Measures*.
Livelihood Opportunities	Transparency of the recruitment process and preference to local community members during hiring and giving employment	The Project will provide employment opportunities to the local community members during the construction and operation phases. Preference will be given to local community members during the hiring and the recruitment process will be made transparent. Training will also be imparted as an enhancement measure by the Client. The aspect is covered as enhancement good practice measures in **Section 7**, *Environmental Impacts and Mitigation Measures*.
Grievance Mechanism	Grievance mechanism to resolve grievances of local community members	RDMC has developed a grievance mechanism to redress the grievances of local communities. There will be grievance redress committees that will hear and resolve the grievances. The details of the Grievance Redress Mechanism are provided in **Section 8**, *Environmental and Social Management Plan*.
Corporate Social Responsibility (CSR)	Development of a CSR plan by Project developers/proponents for local communities	The Project will develop and implement a CDP with the involvement of the local community. CDP will incorporate the following activities to the extent feasible: ▪ Development of new or improvement of existing educational facilities such as schools. ▪ Development of new or improvement of existing health facilities such as hospitals. ▪ Provision of safe drinking water plants/wells. ▪ Provision of clean energy i.e., small-scale solar projects. ▪ Provision of technical and/or work-related courses/training. ▪ Provision of training for unskilled people. ▪ Scholarships for educated youth. ▪ Provision of Technical Education and Vocational Training Authority (TEVTA) Centre for females. ▪ Conducting annual sports events for the local community members. ▪ Events to encourage and uplift local talent

6.7 Stakeholder Engagement for Early Works ESIA

A consultation process was carried out in 2022 as part of Mining Project ESIA that included Early Works activities to meet the regulatory requirement. However, RDMC has undertaken a second round of engagement and further awareness sessions specifically for the Early Works ESIA as a Good Practice Measure to inform stakeholders. The feedback of this engagement will be recorded into the consultation logs and incorporated in the Early Works ESIA. This engagement will ensure that the communities concerns and suggestions are recorded and appropriately addressed in the Early Works ESIA. Moreover, it will help RDMC to understand the needs of communities and to incorporate them into its Community Development Program and strengthen its Stakeholder Engagement Plan and Grievance Redress Mechanism.

A third round of engagement will also be carried out at the time of submission of the Early Works ESIA leading up to the public forum.

6.8 Future Consultations

The Project will continue to engage with local communities and concerned institutions throughout the life of the Project. The staff of the Project will visit the communities at least twice a year, depending on the number of concerns raised in consultations. Ongoing community engagement activities relevant to the ESIA include:

- Reporting on progress on the implementation of environmental and social management measures identified in the ESIA process and recording comments on the effectiveness of these measures;
- Updating communities about new project developments and recording comments on them; and
- Operation of the GRM.

Table 6-6 provides an overview of the stakeholder engagement process for the future.

Table 6-6: Overview of the Stakeholder Engagement Process for the Future

Stakeholder Group	Stakeholders	Engagement Method	Frequency
Government Institutions	▪ Balochistan Environmental Protection Agency, Quetta ▪ District Administration, Dalbandin ▪ Public Health Engineering (PHE) and Water and Sanitation Agency (WASA) ▪ District Vice Chairman Local Government and Rural Development Chagai ▪ Irrigation Department ▪ Balochistan Revenue Authority (BRA)	▪ Face-to-face meetings. ▪ Periodic reports	Annually or earlier, if required
Non-Government Organizations	▪ Islamic Relief ▪ Balochistan Rural Support Program (BRSP)	▪ Face-to-face meetings. ▪ Periodic reports	Annually or earlier, if required

Stakeholder Group	Stakeholders	Engagement Method	Frequency
Local Communities within the Socioeconomic Study Area	▪ Directly or indirectly affected communities within the Socioeconomic Study Area	▪ Meetings with the communities ▪ Visits to homes ▪ Group meetings ▪ Sharing of documents in Urdu and Balochi	Twice a year

7. Environmental Impacts and Mitigations

7.1 Impact Assessment Methodology

7.1.1 Impact Identification and Definition

There are several guidelines and tools available to define a comprehensive and consistent method to capture the potential impacts of a proposed project or development. However, it is now widely recognized by environmental and social practitioners that impact evaluation is not a purely objective and quantitative exercise. It has a subjective element; often based on expert experience as much as scientific criteria. Recognizing this, a uniform system of impact description is used to enable the reviewers to understand how impacts have been interpreted. The description of each impact will have the following features:

- a definition of the impact using an **impact statement** identifying the Project activity or activities that causes the impact, the pathway or the environmental parameter that is changed by the activity, and the potential receptors of the impact (aspect-pathway-receptor)
- **description of the sensitivity and importance value** of the receiving environment or receptors (based on the stakeholder consultations undertaken)
- **extent of change** associated with the impact
- rating of the significance of the impact
- description of appropriate mitigation and management measures and potential effectiveness of the proposed measures
- characterization of the level of uncertainty in the impact assessment

The significance of an impact is determined based on the product of the consequence of the impact and the probability of its occurrence. The consequence of an impact, in turn, is a function primarily of three impact characteristics:

- magnitude
- spatial scale
- timeframe

Magnitude is determined from quantitative or qualitative evaluation of several criteria including:

- sensitivity of existing or reasonably foreseeable future receptors
- importance value of existing or reasonably foreseeable future receptors, described using the following:
  - inclusion in government policy
  - level of public concern
  - number of receptors affected
  - intrinsic or perceived value placed on the receiving environment by stakeholders

  - economic value to stakeholders

- severity or degree of change to the receptor due to impact, measured qualitatively or quantitatively, and through comparison with relevant thresholds:
  - legal thresholds—established by law or regulation
  - functional thresholds—if exceeded, the impacts will disrupt the functioning of an ecosystem sufficiently to destroy resources important to the nation or biosphere irreversibly and/or irretrievably
  - normative thresholds—established by social norms, usually at the local or regional level and often tied to social or economic concerns
  - preference thresholds—preferences for individuals, groups or organizations only, as distinct from society at large
  - reputational thresholds—the level of risk a company is willing to take when approaching or exceeding the above thresholds

  Spatial scale is another impact characteristic affecting impact consequence. The spatial scale of impacts can range from localized (confined to the proposed Project site) to extensive (national or international extent). They also may vary depending on the component being considered.

  The impact **timeframe** is the third principal impact characteristic defining impact consequence and relates to either its duration or its frequency (when the impact is intermittent). Impact duration can range from relatively short (less than five years or active construction period) to long (beyond the life of the Project). Frequency ranges from high (e.g. more than 10 times a year) to low (e.g. less than once a year). These timeframes will need to be established for each Project based on its specific characteristics and those of the surrounding environment.

  Once the impact consequence is described based on the above impact characteristics, the **probability of impact** occurrence is factored in to derive the overall impact significance. The probability relates to the likelihood of the impact occurring, not the probability that the source of the impact occurs. For example, a continuous Project activity may have an unlikely probability of impact if there are no receptors within the area influenced by that activity.

  The **reversibility of each impact** at the end of construction and operation are important, as these impacts may need on-going management after operation. The reversibility of each impact at the end of construction and operation will be noted and described alongside the three primary characteristics of magnitude, spatial scale and duration. Table 7-1 provides the characteristics used to describe the impact.

Table 7-1: Characteristics Used to Describe Impact

Characteristics	Sub-components	Terms used to describe the impact
Type		Positive (a benefit), negative (a cost) or neutral
Nature		▪ Biophysical, social, cultural, health or economic ▪ Direct, indirect or cumulative
Phase of Project		Construction, operation, decommissioning or post closure
Magnitude	Sensitivity of receptor	▪ High, medium or low capacity to accommodate change ▪ High, medium or low conservation importance ▪ Vulnerable or threatened ▪ Rare, common, unique, endemic
	Importance or value of receptor	▪ High, medium or low concern to some or all stakeholders ▪ High, medium or low value to some or all stakeholders (for example, for cultural beliefs) ▪ Locally, nationally or internationally important ▪ Protected by legislation or policy
	Severity or degree of change to the receptor	▪ Gravity or seriousness of the change to the environment ▪ Intensity, influence, power or strength of the change ▪ Never, occasionally or always exceeds relevant thresholds
Spatial scale	Area affected by impact - boundaries at local and regional extents will be different for biophysical and social impacts.	▪ Area or Volume covered ▪ Distribution ▪ Local, regional, transboundary or global
Timeframe	Length of time over which an environmental impact occurs or frequency of impact when intermittent	▪ Short term or long term ▪ Intermittent (what frequency) or continuous ▪ Temporary or permanent ▪ Immediate effect (impact experienced immediately after causative project aspect) or delayed effect (effect of the impact is delayed for a period following the causative project aspect)
Probability - likelihood or chance an impact will occur		▪ Definite (impact will occur with high likelihood of probability) ▪ Possible (impact may occur but could be influenced by either natural or project related factors) ▪ Unlikely (impact unlikely unless specific natural or Project related circumstances occur)
Reversibility/Sustainability		▪ Potential for recovery of the endpoint from a negative impact ▪ Reversible or irreversible ▪ Sustainability for positive impacts
Effectiveness of management measures (will management measures reduce impact to an acceptable level)		▪ Indication of what could occur in the absence of management measures ▪ Effectiveness of proposed measures
Confidence in impact evaluation (degree of certainty in the significance ascribed to the impact)		▪ Scientific uncertainty – limited understanding of ecosystem (or community) and processes governing change ▪ Data uncertainty – restrictions introduced by incomplete or incomparable information, or by insufficient measurement techniques

Characteristics	Sub-components	Terms used to describe the impact
		▪ Policy uncertainty – unclear or disputed objectives, standards or guidelines

7.1.2 *Impact Significance Rating*

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the approval process; secondly, it shows the primary impact characteristics, as defined above, used to evaluate impact significance. Table 7-2 presents the impact significance rating system and describes as follows:

- **Part A**: Define impact consequence using the three primary impact characteristics of magnitude, spatial scale and duration.
- **Part B**: Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and
- **Part C**: Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from Part B) and the probability of occurrence.

Using the matrix, the significance of each described impact is rated.

Table 7-2: Method for Rating the Significance of Impacts

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE *Use these definitions to define the consequence in Part B*			
Definition		Criteria	
MAGNITUDE	Major	Negative	Positive
		▪ Large number of receptors affected (more than 20%) ▪ Receptors highly sensitive and/or are of conservation importance ▪ Substantial deterioration, nuisance or harm to receptors expected ▪ Relevant thresholds often exceeded ▪ Significant public concern expressed during stakeholder consultation ▪ Receiving environment has an inherent value to stakeholders	▪ Large number of receptors affected (more than 20%) ▪ Receptors highly amenable to positive change ▪ Receptors likely to experience a big improvement in their situation ▪ Relevant positive thresholds often exceeded
	Moderate	▪ Some receptors affected (more than 5% but less than 20%) ▪ Receptors slightly sensitive and/or of moderate conservation importance ▪ Measurable deterioration, nuisance or harm to receptors ▪ Relevant thresholds occasionally exceeded ▪ Limited public concern expressed during stakeholder consultation ▪ Limited value attached to the environment	▪ Some receptors affected (more than 5% but less than 20%) ▪ Receptors likely to experience some improvement in their situation ▪ Relevant positive thresholds occasionally exceeded
	Minor	▪ No or limited receptors within the zone of impact (less than 5%) ▪ Receptors not sensitive to change ▪ Minor deterioration, nuisance or harm to receptors ▪ Change not measurable or relevant thresholds never exceeded ▪ Stakeholders have not expressed concerns regarding the receiving environment	▪ No or limited receptors affected (less than 5%) ▪ Receptors not sensitive to change ▪ Minor or no improvement in current situation Change not measurable ▪ Relevant positive thresholds never exceeded ▪ No stakeholder comment expected
TIMEFRAME (determine specific to each Project)		Duration of continuous aspects	Frequency of intermittent aspects
	Short term/ low frequency	Less than 1 year from onset of impact coinciding with the active construction period	Occurs less than once a year

	Medium term/ frequency	More than 1 year from onset of impact up to 15 years	Occurs less than 10 times a year but more than once a year
	Long term/ high frequency	Impact is experienced during and beyond 15 years	Occurs more than 10 times a year
SPATIAL SCALE (determine specific to each project)		Biophysical	Socio-economic
	Small	Within the project fence line or within 200 m of unfenced facilities	Within the 200 m of the Project footprint in which the activity occurs
	Intermediate	Within 3 km of the area in which the facilities are located	Within 15 km of the Project activities
	Extensive	Beyond 3 km of the area in which the facilities are located	Beyond 15 km of the Project activity

PART B: DETERMINING CONSEQUENCE RATING
Rate consequence based on definition of magnitude, spatial extent and duration

MAGNITUDE	TIMEFRAME	SPATIAL SCALE		
		Small	Inter-mediate	Extensive
Minor	Short term / low frequency	Low	Low	Medium
	Medium term / frequency	Low	Low	Medium
	Long term / high frequency	Medium	Medium	Medium
Moderate	Short term / low frequency	Low	Medium	Medium
	Medium term / frequency	Medium	Medium	High
	Long term / high frequency	Medium	High	High
Major	Short term / low frequency	Medium	Medium	High
	Medium term / frequency	Medium	Medium	High
	Long term / high frequency	High	High	High

PART C: DETERMINING SIGNIFICANCE RATING
Rate significance based on consequence and probability

		CONSEQUENCE		
		Low	Medium	High
PROBABILITY (of exposure to impacts)	Definite	Low	Medium	High
	Possible	Low	Medium	High
	Unlikely	Low	Low	Medium

7.1.3 Mitigation, Management and Good Practice Measures

Using the matrix (Table 7-2), the significance of each described impact is rated initially. This initial rating assumes that the management measures inherent in the Project design are in place.

Wherever the Project is likely to result in unacceptable impact on the environment, additional mitigation measures are proposed (over and above the inherent design measures included in the Project description). In the case of positive impacts, management measures are suggested to optimize the benefits to be gained. Where mitigation measures are required, the impact will be rated again to show the residual impact after implementation of management controls.

The following mitigation hierarchy will be utilized in selecting practical mitigation measures for unacceptable impacts as follows (in order of preference):

- avoid the impact wherever possible by removing the cause(s)
- reduce the impact as far as possible by limiting the cause(s)
- ameliorate the impact by protecting the receptor from the cause(s) of the impact
- providing compensatory measures to offset the impact, particularly where an impact is of high significance and none of the above are appropriate.

A rating of impact considering mitigations will be carried out to highlight the effectiveness of proposed management measures designed to mitigate or enhance the impact, and by characterizing the level of confidence or uncertainty in the assessment.

For each of the impacts identified, a table will be filled in Table.7-3.

Table.7-3: Impact Assessment Template

Impact #:								
Applicable Project Phase								
Initial Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Major	Long Term	Extensive	High	Definite	High	+	High
Mitigation Measures, Offsets and Recommendations								
Residual Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Minor	Medium	Extensive	Low	Medium	High	-	High

7.2 Design Related Impacts

The Project will be in an open desert area with no protected areas in the vicinity and no nearby settlements. No significant impacts on physical, ecology, and social are anticipated from the design of the Project.

- The Project will not involve private land acquisition as it will be constructed on land leased or purchased from the Government of Balochistan.
- The impacts of pipeline leakage are not discussed below because the design of the pipeline incorporates protective measures, which would otherwise have been mentioned

as mitigation measures. These protective measures include epoxy lining and 3LPE protection for corrosion prevention and structural integrity. The epoxy lining and 3LPE protection work together to safeguard the underground water pipeline from corrosion, maintain its structural integrity, and ensures a longer operational life for the pipeline, while also preserving the quality of the transported water. Moreover, flow transmitters will be installed at each end of the pipeline, and regular inspections and maintenance will be carried out to detect any leaks before they cause an impact.

- No impacts are anticipated from the extraction of water to meet the water requirements of the Early Works activities. The proposed Project will not utilize the community's water resources; rather, the water will be sourced from the Fan Sediments. The boreholes at Fan Sediments area are not being used by the locals for any purpose and will be solely used for the Project activities. As observed during the hydrocensus survey in 2023, the water of these boreholes is of poor quality, being turbid, odorous, and having a salty taste. In addition, there are no identified environmental receptors (i.e. groundwater dependent ecosystems) in the abstraction area. To make this water usable, the water from the boreholes will be treated in an onsite Water Treatment Plant that will be a self-contained treatment unit including filtration, RO, and chlorination processes. The capacity of the Water Treatment Plant will be designed to ensure it can handle and process enough water to meet the accommodation facility's water needs during the peak construction time of the Mining Project. Additionally, the RDMC has initiated a groundwater modeling exercise to develop various scenarios and to evaluate the potential impact on the water table due to water extraction for the Mining Project. The impacts of extraction of water for the Mining Project will be addressed and discussed in the Main Project ESIA.

7.3 Early Works Phase Impacts

The environmental impacts associated with the Early Works phase of the Project are discussed in this section. The impacts that are discussed in the below sections are as follows:

- Physical Environment
- Ecology
- Socioeconomic Environment

7.3.1 Physical Environment

A list of the impacts on the physical environment due to Early Works activities is as follows:

- Impact 1: Generation of particulate matter and gaseous emissions from construction activities, vehicular movement, and diesel generators.
- Impact 2: Increase in noise levels due to operation of construction equipment and movement of construction traffic.
- Impact 3: Increase in traffic volume during the Early Works for the transportation of construction materials.
- Impact 4: Generation of GHG emissions due to the combustion of fuel in diesel generators to meet energy requirements during Early Works.

- Impact 5: Contamination of soil and water resources due to accidental spills and releases of fuels, solvents, oils, and chemicals, and disposal of waste.
- Impact 6: Risk of exposing workers to occupational health, safety, and fire hazards during the Early Works.

7.3.1.1 Air Quality

Potential sources of the air emissions during Early Works will be earthworks (excavation and preparation of site including dirt or debris pushing and grading, leveling, and trenching for pipeline construction), exposed surfaces, vehicle movement on dirt tracks and the combustion of fuel in diesel generators and vehicles. Diesel generators will be the primary source of gaseous emissions during accommodation facility operations.

Table 7-4 presents the anticipated air emissions from the diesel generators that will be used during Early Works phase to meet energy requirements and its comparison with BEQS for Industrial Gaseous Emissions. These pollutants are expected to be emitted in very low quantities, resulting in negligible impacts on air quality. The expected PM and CO emission levels are well within the limits prescribed in the BEQS for Industrial Gaseous Emissions at source. There are no limits prescribed in the BEQS for the HC and NOx emissions, therefore, no comparison was made with these pollutants.

However, the BEQS do provide a limit for the ambient air concentration of NOx for an annual averaging period, which should not exceed 100 µg/m^3 at the receptor. Generally, the impact of such small capacity power plants, such as 2 – 4 MW as is the case here occurs within 1 km of the source. There are no sensitive receptors present within the Project Area and the nearest settlement to the Reko Diq Mine Site is Humai, located approximately 25 km southeast of the proposed Reko Diq Mine Site. Considering this distance, the emissions from construction activities and diesel generators will have a negligible impact on the settlement. Moreover, the Reko Diq Mine Site is in a desert area prone to sandstorms and high-speed winds (>30 km/h) resulting in high dust levels in the area. Therefore, the emissions from 2 MW diesel generators will be negligible and will meet the air quality limits at receptors.

The IFC-EHS Guidelines do not specify limits for HC emissions from power generating units. However, the Guidelines do provide limits for NOx emission levels, which are applicable to power generating units with capacities exceeding 50 MW.

Considering the above, the proposed Project will meet air quality limits at receptors located in the Project Area. Additionally, the Project will use latest and modern diesel generators designed to significantly reduce the air emissions. The impact on the air quality from the Early Works will be localized, and dust emissions will be limited to construction activities, thus temporary in nature. The initial and residual ratings will remain the same, given the negligible generation of particulate matter and gaseous emissions which will be hardly noticeable beyond the battery limits. Moreover, Good Practice Measures will be adopted during the Early Works activities.

Table 7-4: Expected Air Emissions from Diesel Generators and Comparison with BEQS for Industrial Gaseous Emissions

Parameter	Expected Air Emissions (mg/Nm^3)	BEQS (mg/Nm^3)
CO	320.6	800
HC	42.0	-
PM	44.1	300
NOx	2,382.8	-

Notes:
Expected air emissions are provided by RDMC.
'-' means standard is not available for that pollutant.
PM = Particulate Matter, CO = Carbon monoxide, HC = Hydrocarbons, NOx = Oxides of Nitrogen

Impact 01: Generation of particulate matter and gaseous emissions from construction activities, vehicular movement, and diesel generators.

	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
Initial Impact Rating	Minor	Short Term	Small	Low	Unlikely	Low	-	High

Good Practice Measures:

1. Dust emissions from the Project activities will be prevented through water sprinkling as appropriate.
2. Trucks hauling soil, sand, and other loose materials and onsite dirt piles and other stockpiled areas will be covered with tarpaulin sheets.
3. Use of properly maintained equipment and machinery will be ensured to avoid dust and gaseous emissions.
4. Emission control measures including adjusting the air-to-fuel ratio, using low-sulfur diesel fuel and additives, and regular maintenance and tuning to control emissions from diesel generators will be investigated and implemented, to the extent feasible.

	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
Residual Impact Rating	Minor	Short Term	Small	Low	Unlikely	Low	-	High

7.3.1.2 Noise Levels

The construction activities included in the Early Works will result in an increase in noise levels due to the operation of construction equipment and movement of construction traffic.

The proposed early works at the proposed Reko Diq Mine Site will be in an area where there are no existing operational industries. Humai, the nearest settlement to the mine site, is considered for assessment purposes, and is referred to as a *'sensitive receptor'*.

Depending on the construction equipment used and its distance from receptors, the receptors may typically be exposed to intermittent and variable noise levels. During the day such noise results in general annoyance and can interfere with sleep during the night. In general, human sound perception is such that a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as a doubling or halving of sound level.

Comprehensive inventory of construction equipment developed by the United States' Federal Highway Authority (FHWA)[136] was used as reference for equipment noise levels. Table 7-5 provides the selected list of equipment and associated noise specifications.

The information provided in Table 7-6 includes:

- The *acoustical usage factor* is the estimate of the fraction of time during each work cycle that a piece of construction equipment is operating at full power i.e., at its loudest condition.
- The maximum noise limit for each piece of equipment provided in manufacturers' specifications, expressed as a L_{max} level in dBA at a reference distance of 50 feet (15 m) from the loudest side of the equipment; and
- The emission level as measured by FHWA at 50 feet (15 m) for each piece of equipment. It is the average of hundreds of emission measurements performed at work sites.

FHWA found that the measured noise levels were lower than those in the specification in most cases. FHWA, therefore, recommends using the measured noise levels, unless more reliable information specific to the equipment to be used is available.

The noise levels received by the receptor during Early Works will fluctuate depending on the type, number, and duration of use of various pieces of construction equipment and distance from the receptor.

The noise analysis was conducted as follows:

- number and type of equipment is selected, which is likely to be used in Early Works (Table 7-7).
- the approximate distance of nearby surrounding settlement is measured from the Project site.
- incremental noise levels from the operation of construction equipment in Early Works are predicted.
- noise levels received by receptor (Humai) are predicted (Table 7-7) using FHWA methodology when all equipment is operating simultaneously and individually at the Project site.

The following conclusions can be drawn from predicted noise levels:

- The predicted incremental noise levels, during Early Works, are within the day and nighttime noise limits prescribed in the BEQS for residential areas.
- The baseline day (82 dBA) and nighttime (81 dBA) noise levels measured at Siareg (north of the Reko Diq Mine Site) (Section 5.1.8, Noise Levels), exceeded the day (55 dBA) and nighttime (45 dBA) noise limits prescribed in the BEQS for residential areas. The baseline day and nighttime noise levels at Humai are assumed to be the same as the noise levels measured at Siareg during physical field surveys conducted in August 2020

136 Federal Highway Authority, Construction Noise Handbook, August 2006, https://www.fhwa.dot.gov/ENVIRONMENT/noise/construction_noise/handbook/handbook09.cfm.

and reported in the 2020 ESIA. The natural sources, predominantly the prevailing winds, are the dominant source of noise in the area.

- During the Early Works, any noise propagation is not expected to increase ambient noise levels at the Humai settlement. The anticipated incremental noise levels from the collective operation of all equipment at the accommodation facility during construction activities will be minimal compared to day and nighttime baseline noise levels, resulting in negligible impact on the residents' noise experience.
- The initial and residual ratings will be the same given the negligible impact on the ambient noise levels which will be hardly noticeable. Moreover, Good Practice Measures will be adopted during the construction activities.

Table 7-5: Construction Equipment Noise Levels (dBA)

Equipment	Acoustic Usage Factor	Sound Pressure Level Specified by Manufacturers, Lmax at 50 ft (15m)	Sound Pressure Level Measured by FHWA, Lmax at 50 ft (15m)	Early Works
	%	dBA	dBA	
Batch Plant	15%	83	NA	Y
Concrete Mixers	40%	85	78.8	Y
Water Bowser	40%	80	75	Y
Loader	40%	84	79.1	Y
Trailer	16%	80	74	Y
Crane	16%	85	80.6	Y
Excavator	40%	85	80.7	Y
Tractor/Trolley	40%	80	NA	Y
Bulldozers	40%	85	80	Y
Paver	50%	85	77	Y
Compactor	20%	80	83.0	Y
Pumps	50%	77	80.9	Y
Generators	50%	82	80.6	Y
Vibrators	20%	NA	76	Y
Drilling Machines	10%	NA	90	Y
Compressors	40%	80	77.8	Y
Dump Truck	40%	84	76.5	Y
Roller	20%	85	80	Y
Welding Machines	40%	73	74.0	Y
Fork Lifter	40%	85	80	Y

Source: Federal Highway Authority, Construction Noise Handbook, August 2006

Table 7-6: Expected Quantity of Equipment during Early Works

Equipment	Early Works
Batch Plant	1
Concrete Mixers	1
Water Bowser	2
Loader	1
Trailer	2
Crane	2
Excavator	2
Tractor/Trolley	2
Bulldozers	1
Paver	1
Compactor	2
Pumps	1
Generators	2
Vibrators	1
Drilling Machines	1
Compressors	1
Dump Truck	5
Roller	1
Welding Machines	2
Fork Lifter	1

Note: The quantities of construction equipment are assumed due to the non-availability of available Project information.

Table 7-7: Predicted Noise Levels at Humai during Early Works

Receptor		**Humai**
Distance (m)		35,000
Baseline Noise Levels (dBA)	Day	82
	Night	81
Baseline Noise Levels (dBA)	Day	82
	Night	81
Predicted Incremental Noise Level during Early Works (dBA)		22.6
Predicted Ambient Noise Levels (dBA)	Day	82
	Night	81
BEQS for residential area (dBA)	Day	55
	Night	45

Note: Baseline noise levels measured in Humai are assumed to be the same as the noise levels measured at Siareg as reported in the 2020 ESIA.

The predicted incremental noise levels during Early Works are in dBA L_{eq}. L_{eq} for all equipment operating simultaneously and is sum of individual equipment L_{eq} values where L_{eq} are energy averages.

Ambient noise levels are calculated as sum of baseline and predicted incremental noise levels. This is according to the addition rule of noise levels that if a difference between two noise levels is more than 10 dBA, the higher noise level will be the resultant noise level.

Impact 2: Increase in noise levels due to operation of construction equipment and movement of construction traffic.

	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
Initial Impact Rating	Minor	Short Term	Small	Low	Unlikely	Low	-	High

Good Practice Measures:

1. Noise producing units will be monitored, maintained, and improved to reduce noise where appropriate. If improvement is not possible, then the equipment will be replaced with less noisy equipment as soon as practicable.
2. Visual alarms will be used in preference to audible alarms where appropriate.
3. Noise abatement devices such as mufflers and silencers will be investigated and installed on the equipment to reduce noise at the source wherever feasible.
4. The use of equipment in a poor state of maintenance will be avoided, particularly without effective noise control.
5. Noisy operations will be combined to occur at the same time where possible. The total noise level produced would not be significantly greater than the level produced if the operations were performed separately.
6. Periodic noise monitoring will be carried out at the mine site boundary to ensure compliance with applicable standards.

	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
Residual Impact Rating	Minor	Short Term	Small	Low	Unlikely	Low	-	High

7.3.1.3 *Traffic Volume*

Traffic volumes on N-40 at Nok Kundi (T1-22) are calculated using the basic construction materials to be used during Early Works. Basic construction materials which will be used include pre-fabricated buildings, cement, coarse and fine aggregates, steel, paint/finishes, pipe and tiles. The coarse and fine aggregates and limestone to produce cement and concrete will come from the identified quarry and borrow areas located within the Mining and Surface Rights lease granted by the Government to RDMC. These include four quarries (three andesite and one limestone quarry) and one sand borrow area (Figure 3-3, Quarry Locations). Transport of construction materials from these quarries and borrow areas to the mine site will be facilitated by trucks with a carrying capacity of up to 25 tonnes. Simultaneously, the remaining construction materials will be locally sourced and transported to the mine site via the N-40 using trucks with a capacity of 25 tonnes.

The total area designated for the accommodation facility within the Reko Diq Mine Site will span 0.59 km^2 (equivalent to approximately 588,269 m^2). Within this accommodation facility area, roughly 0.096 km^2 (around 96,046 m^2) will be allocated as the covered area. This covered section will encompass the buildings, offices, medical and recreational facilities, accommodations, as well as mess and toilet facilities.

The length of the pipeline will be ~78 km from the Fan Sediments area to the accommodation facility at the Reko Diq Mine Site. The boreholes will be connected to the site via an epoxy lined and 3LPE wrapped CS 250 mm diameter, buried pipeline.

Table 7-8 presents the estimates for the basic construction material required for the accommodation facility. These estimates have been calculated based on the materials required for 92.903 m^2 (equivalent to 1,000 square feet (ft^2)) of construction.[137]

Table 7-8: Estimates of Construction Material for the Accommodation Facility

Construction Material	Quantity Required for the Covered Area		Density		Total Amount Required (million tonnes)
	Value	Units	Value	Units	
Cement	20,676,620	kg	-		0.0207
Sand	1,860,896	ft^3	1,602	kg/m^3	0.0835
Aggregate	1,395,672	ft^3	2,650	kg/m^3	0.1036
Steel	4,135,324	kg	-		0.0041
Paint	186,090	liter	1.5	kg/l	0.0003
Tiles	1,343,980	ft^2	2,000	kg/m^3	0.0030
				Total	**0.2152**

Notes: Covered area = 96,046 m^2

ft^2 = square foot, ft^3 = cubic foot, kg/m^3 = kilogram per cubic meter, kg/l = kilogram per liter.

"-" means the density is not required for the particular construction material.

Standard tile thickness of ½ inch (~0.04 ft) is considered for the calculations.

Densities of various construction materials are obtained from the following online sources:

Sand: https://dreamcivil.com/density-of-sand/ accessed on January 8, 2024.

Aggregate: https://dreamcivil.com/density-of-aggregate/ accessed on January 8, 2024.

Paint: https://www.ncbi.nlm.nih.gov/books/NBK563048/#:~:text=Composition,-General%20composition%20of&text=The%20density%20of%20waterborne%20wall,6%2D10%2D2006 accessed on January 8, 2024.

Tiles: https://link.springer.com/article/10.1007/s11340-006-9032-6#:~:text=The%20apparent%20density%20of%20pressed,between%2020%20and%2040%25 accessed on January 8, 2024.

Steel constitutes the primary material needed for the construction of the water supply pipeline. The estimated steel weight for each meter of the pipeline is calculated to be 60.301 kg/m, featuring an outside diameter of 250 mm and a standard wall thickness.[138]

Table 7-9: Estimates of Steel Required for the Water Supply Pipeline

Parameter	Value	Units
Length of the pipeline	78	km
	78,000	m
Steel unit weight per meter	60.301	kg/m
Total estimated steel required	4,703	tonnes
	0.0047	million tonnes

Notes: (1 km = 1,000 m)

[137] https://happho.com/choose-building-materials-estimate-cost-quantities-house-construction/ accessed on January 8, 2024.

[138] How to Calculate Steel Pipe Weight per Foot/Meter by Size and Chart (octalsteel.com) accessed on January 8, 2024.

The estimated total requirement for construction materials necessary for the accommodation facility and water supply pipeline is 0.2197 million tonnes. Out of this, approximately 0.2078 million tonnes will be sourced from the four quarries, and one borrow area. These sources will provide materials such as sand, limestone, and aggregates. The remaining 0.0119 million tonnes of construction materials, comprising steel, paints, bricks, and tiles, will be locally sourced and transported to the site using trucks with a carrying capacity of 25 tonnes.

The estimated daily increase in heavy traffic during the Early Works will be less than 1% (equivalent to 2 trucks per day)[139] of the total daily heavy traffic (497) on N-40 at Nok Kundi (T1-22) as described in **Section 5.1.9**, *Traffic*. This marginal increase will keep the significance of the impacts low. In addition, drivers will be trained to reduce the risk of accidents, and route planning will be carried out to avoid/minimize congestion and longer commute times on highways due to traffic generated by the Project. The initial and residual ratings will be the same given the slight increase in the traffic volume which will be hardly noticeable. Moreover, Good Practice Measures will be adopted during the construction activities.

The anticipated increase in traffic during accommodation facility operations is expected to be minimal due to the accommodation of personnel within the accommodation facility premises. The movement of personnel outside the facility will primarily occur on occasional trips to their homes or for essential purchases.

Impact 03: A slight increase in traffic volume during the Early Works for the transportation of construction materials.

Initial Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Minor	Short Term	Small	Low	Unlikely	Low	-	High

Good Practice Measures:

1. Suitable times to transport material and equipment will be identified.
2. Route planning will be carried out to avoid sensitive areas (mosques, hospitals, schools) during peak public activity hours on N-40.
3. Speed limits and defensive driving policies will be strictly implemented.
4. Drivers will be trained to reduce the risk of accidents by keeping their vehicle speed within limits and considering traffic signs and boards.
5. Vehicles, especially brakes, will be maintained.
6. Use of daily vehicle safety and maintenance checklists completed by the driver/operator before use, to include checks of horn, brakes, lights, etc. will be kept mandatory.

Residual Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Minor	Short Term	Small	Low	Unlikely	Low	-	High

7.3.1.4 Greenhouse Gas Emissions (GHGs)

GHG emissions are estimated as tons of Carbon dioxide (CO_2) per day, as CO_2 is considered as the major greenhouse gas under the United Nations Framework Convention on Climate Change. Also, for power generation processes, CO_2 is the key emission of concern, as methane and CFCs are not emitted by power generating units

[139] Calculated as: construction materials locally sourced (0.0119 million tonnes) ÷ 25 tonnes (carrying capacity) ÷ 274 days (days in 09 months from Apr 2024 to December 2024) = 2 trucks per day

and none of the other greenhouse gases are emitted in sufficient quantities from power generation to be considered important in terms of the greenhouse effect.[140]

The energy requirements of the Early Works activities will be met through diesel generators. The CO_2 emissions, from the combustion of fuel in diesel generators, are calculated using emission factors and guidelines provided by Intergovernmental Panel on Climate Change 2006.[141] The IPCC 2006 presents emission factor as 2.69 kg CO_2 equivalent per liter of diesel fuel (kg CO_2 eq/l).Table 7-10 presents the estimated GHG emissions from diesel generators during Early Works. No comparison was made due to non-availability of the limits for GHG emissions in the BEQS.

Table 7-10: Estimation of GHG Emissions from Diesel Generators

Emission Factor - IPCC 2006	2.69	kg CO_2 eq/liter of diesel fuel		
Diesel Required (3,200-6,400 l/d)	3,200	l/d	6,400	l/d
CO_2 Emissions	8,608	kg CO_2 eq/day	17,216	kg CO_2 eq/day
	8.608	tCO_2 eq/day	17.216	tCO_2 eq/day

Impact 4: Generation of GHG emissions due to the combustion of fuel in diesel generators to meet energy requirements during Early Works.

	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
Initial Impact Rating	Minor	Short Term	Small	Low	Unlikely	Low	-	High

Good Practice Measures:

1. Low-sulfur diesel fuel or alternative cleaner fuels such as biodiesel or synthetic diesel to reduce carbon emissions will be explored and used to the extent feasible.
2. Energy efficient practices including optimizing generator loading will be considered to enhance fuel efficiency and reduce overall GHG emissions per unit of energy produced.
3. The best available high efficiency generators will be used.
4. A regular maintenance schedule will be established to ensure engines operate at peak efficiency, reducing fuel consumption, and GHG emissions.

	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
Residual Impact Rating	Minor	Short Term	Small	Low	Unlikely	Low	-	High

7.3.1.5 Soil and Water Contamination

The impacts associated with the contamination of soil and water resources during the Early Works are discussed in this section.

7.3.1.5.1 Leakages and Accidental Discharges

Possible sources of soil and water contamination include:

- Spills during refueling, discharges during vehicle and equipment maintenance, traffic accidents and leakages from equipment and vehicles and accidental releases of solvents,

140 https://www.adb.org/sites/default/files/institutional-document/296466/guidelines-estimating-ghg.pdf,

141 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, "Chapter 2: Stationary Combustion," Intergovernmental Panel on Climate Change (IPCC), 2006. https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol2.html.

oils, and lubricants. Leakages from pipelines or tanks responsible for the transport and storage of chemicals, solvents, or fuel are the key sources of contamination.

- Various types of wastes such as packing waste, metal scrap, excess materials, uprooted vegetation, and excess soil will be generated during the early works phase.
- Improper/unsafe storage and disposal of waste.

7.3.1.5.1.1 Onsite Storages

Accidental discharge and leakages of oil or any chemical from the site storage facilities and construction activities can potentially affect the soil and water resources.

Leakages and accidental spills from tanks responsible for the transport and storage of chemicals and fuel can cause contamination of groundwater or surrounding water bodies.

Fuel, oil, lubricants, and chemicals will be stored at a designated area with appropriate bunding and lining of the facilities with impervious base and as per the relevant material safety data sheets and legal requirements. Moreover, the site management will ensure that appropriate training to staff on control and management of chemical and oil spills and accidental discharges is provided alongside spill cleaning kits. As soon as a leak in an unpaved area is detected, it will be addressed as per the site spill response procedures. Information on such leaks will be recorded including the location of the spill or leak; the estimated quantity of leaked material; the name of the material; mitigation measures utilized; photographs and assessment of any possible environmental contamination to avoid future accidents.

7.3.1.5.2 Waste Generation, Treatment, and Disposal

The estimated waste generation, and the proposed treatment and disposal methods are discussed below.

7.3.1.5.2.1 Waste Generation

An estimated 427 personnel will be required during Early Works. Solid waste and wastewater will be generated during the construction and operation of the accommodation facility. There will be other solid waste generated from construction activities such as tyres, metals, plastic, waste wood etc., but will not be generated in significant quantities during Early Works phase. Recycling and reuse will be the preferred options. In cases where recycling and reuse are not feasible, the waste will either be stored onsite until an incinerator is installed at the site or treated and appropriately disposed of according to standard practices, such as to an approved landfill site or vendor.

Wastewater generation typically ranges from 57 to 76 liters per day (l/d) (15 to 20 gallons per day), averaging around 67 liters per capita per day.[142] Table 7-11 outlines the estimated wastewater generation in accommodation facility.

142 https://ecoseptic.com.au/how-much-wastewater-does-a-person-produce/#:~:text=For%20example%2C%20in%20developed%20countries,%2D76%20liters)%20per%20day. Accessed on January 8, 2024.

Solid waste generation in Pakistan ranges between 0.283 to 0.612 kg/capita/day, averaging around 0.4475 kg per capita per day. [143] Table 7-12 presents the estimated solid waste generation in accommodation facility.

Table 7-11: Estimates of Wastewater Generated in Accommodation Facility

Parameter	Value	Units
Wastewater generation rate	67	l/capita/d
Personnel during Early Works	427	persons
Wastewater generation in Accommodation Facility during Early Works	**28,609**	**l/d**

Table 7-12: Estimates of Solid Waste Generated in Accommodation Facility

Parameter	Value	Units
Solid domestic waste generation rate	0.4475	kg/capita/d
Personnel during Early Works	427	persons
Solid Waste generation in Accommodation Facility during Early Works	**191**	**kg/d**

7.3.1.5.2.2 Waste Treatment and Disposal

The construction of the accommodation facility and the water supply pipeline will mainly generate oily waste, domestic waste, construction waste, and sewerage. The waste generated on site will be stored until an incinerator is installed at site, expected in 2025. The details and impacts of an incinerator will be discussed comprehensively in the main Mining Project ESIA.

Sewage from accommodation facility will be the main source of wastewater in the Early Works. An onsite Wastewater Treatment Plant will be installed. It will be a packaged aerated wastewater treatment system which will treat the sewage to a high level of water quality. The treated sewage will be disinfected using ultraviolet light avoiding the use of chlorine, which is a hazardous chemical, before discharge for reuse. The treated sewage will be made BEQS compliant before discharge for reuse.

Solid waste generated during the Early Works will include paint tins, used batteries, rubber tires, used oil filters, chemical containers (crushed), cable drums, wood, packaging, buildings materials, plastic sheeting, cement bags, scrap metal, recyclable plastic sheeting, cotton wastes, food waste, and papers.

The proposed Project will have an onsite landfill for putrescible waste. Solid non-hazardous waste will be recycled and reused wherever possible. In cases where recycling and reuse are not feasible, the waste will either be stored onsite until an incinerator is installed at the site or treated and appropriately disposed of according to standard practices, such as to an approved landfill site or vendor. Hazardous waste like tires, paint tins, and used batteries will be handled with care and will be disposed of through a certified and approved waste contractor/vendor and as per the local guidelines.

143 https://epd.punjab.gov.pk/solid_waste#:~:text=Problems,rate%20is%202.4%25%20per%20year. Accessed on January 8, 2024.

Medical waste will be packaged in specialized containers and transported offsite for incineration, which will be managed by our approved medical service provider.

Impact 5: Contamination of soil and water resources due to accidental spills and releases of fuels, solvents, oils, and chemicals, and disposal of waste.

Initial Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Moderate	Short Term	Extensive	Medium	Possible	Medium	-	High

Mitigation Measures:

Leakages and Accidental Discharges:

1. An Emergency Preparedness and Response Plan (EPRP) will be developed and implemented.
2. Appropriate training will be provided to staff to manage onsite generated waste and any incident of spill.
3. Onsite maintenance of construction vehicles and equipment will be avoided as far as possible, to avoid contamination of soil and groundwater.
4. Detailed spill response procedures will be developed.
5. Appropriate spill control arrangements, including shovels, spill prevention trays, plastic bags, and absorbent materials, near oil and chemical storage areas will be provided.
6. An inventory of incident records of all moderate and major spills will be maintained. The record will include the location of spill; estimated quantity; spill material; restoration measures; photographs; description of any damage to vegetation, water resource, or community asset; and corrective measures taken.
7. Appropriate bunding and lining of the storage facilities will be provided.
8. Secondary containment around storage tanks of fuels and oils and other chemicals will be constructed.

Disposal of Waste:

9. A Waste Management Plan will be implemented that will include identification, categorization, storage/handling, and disposal of generated waste.
10. An onsite Wastewater Treatment Plant will be constructed to treat the generated wastewater.
11. Cleanup of any littering will be monitored to avoid solid waste scattering.
12. The amount of generated waste will be reduced by considering reuse and recycle options, to the extent feasible.
13. Hazmat (hazardous materials) will be stored and used only over impermeable surfaces.
14. Records of all waste generated during the construction and operation periods will be maintained to the extent possible. Track and log the quantities of waste disposed of, recycled, or reused on a Waste Tracking Register.
15. Recycling and sale to commercial users will be considered where feasible to reduce the amount of waste generated.
16. The waste disposal methods including incineration and disposal to approved facilities will be investigated and implemented to the extent feasible. The waste will be treated and appropriately disposed of according to standard practices, such as to an approved landfill site or vendor.
17. Training will be provided to personnel for identification, segregation, and management of waste.

Residual Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Minor	Short Term	Small	Low	Unlikely	Low	-	High

7.3.1.6 Occupational Health and Safety

The impacts associated with occupational health and safety during the Early Works are discussed in this section. The proposed Project can expose the workers to several occupational health, safety, and fire hazards.

Appropriate firefighting equipment and training will be provided to the operators and workers and safe storage of any combustible material will be undertaken. A hazard and risk assessment of the processes and onsite storages will be carried out prior to operations, as good industry practice, to identify the safe distance of working, the zone

(area) that can be affected during any occupational emergency and the time required to affect the identified risk zone.

Noise exposure limits will be set and implemented for the workers' working in noisy environments and where they are exposed to high noise levels for longer durations. The BEQS does not explicitly provide noise exposure limits for workers and only provide noise levels respective to areas such as residential, industrial, commercial, and silent. Therefore, due to non-availability of local standards for exposure of workers to occupational noise, the proposed Project will consider the exposure limits set for workers/operators by Occupational Safety and Health Administration (OSHA).[144] Table 7-13 provides Permissible Exposure Limits (PEL) given by OSHA. According to OSHA, the workers should not be exposed to noise levels higher than 90 dBA for more than 8 hours.

Table 7-13: Permissible Noise Exposure Limits

Duration per Day (Hours)	Sound Level (dBA)
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25	115

Source: OSHA Permissible Noise Levels

Moreover, emergency preparedness and response plans including fire emergency response plans will be implemented on site to deal with emergencies related to fire.

Impact 6: Risk of exposing workers to occupational health, safety, and fire hazards during the early works phase.

Initial Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Major	Short Term	Small	Medium	Possible	Medium	-	Medium

Mitigation Measures:

1. An Occupational Health and Safety Plan will be developed and implemented during Early Works. The Plan will include the measures mentioned below.
2. Workers' exposure to high noise levels will be reduced by keeping moving workers away from the noise source; restricting access to areas; rotating workers performing noisy tasks and shutting down noisy equipment when not needed.
3. Earplugs/earmuffs will be used to reduce workers' exposure to high noise levels.
4. Pressure vessels and piping will be regularly inspected and maintained.

144 https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.95

5. Fire and smoke detectors and early warning systems will be provided.
6. Workers will be trained in the identification and management of operational hazards.
7. Hazard analysis of processes will be conducted to prevent and avoid any emergency.
8. Fire drills will be conducted to make workers aware of the sirens, fire exits, and the assembly point in case of any fire emergency.
9. Safe containment of any combustible sources such as dry wood and fuels will be ensured.
10. Surfaces where workers come in close contact with hot equipment, including generating equipment, pipes etc. will be shielded.
11. Warning signs near high-temperature surfaces and Personal Protective Equipment (PPE) as appropriate, including insulated gloves and shoes, will be used.
12. Permissible exposure noise limits will be set and implemented for workers working in noisy environments (Table 7-13).
13. The Project will utilize the procedures/system for process safety and occupational hygiene and industrial hygiene, as an enhancement measure, to protect workers from occupational hazards.
14. Protective respiratory equipment will be used by employees when the exposure levels to welding fumes, solvents and other materials present in the working area are likely to exceed acceptable limits.
15. Personnel will use eye protection equipment when undertaking welding work.

Residual Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Minor	Short Term	Small	Low	Unlikely	Low	-	Medium

7.3.2 *Ecological Environment*

A description of the ecology of the Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and the Access Road to the Reko Diq Mine Site is provided in Section 5, *Description of Environment (Ecological Baseline)*. The terrestrial flora and fauna observed from the Ecological Study Area include some conservation concern species while most of the species are Least Common or Not Evaluated, however, keeping in mind the desert environment, the fauna and flora observed were highly adapted and have unique characteristics. The threatened species include Endangered bird species i.e., the Egyptian Vulture *Neophron percnopterus*. While one bird species Asian Houbara Bastard *Chlamydotis macqueenii* and one mammal species Goitered Gazelle *Gazella subgutturosa* are listed as Vulnerable. In addition, one restricted range species of herpetofauna Alcock's Toad-headed Agama *Phrynocphalus euptilopus* was observed along Fan Sediment Water Supply Pipeline Area. The Project area does not lie in any Protected Areas.

The anticipated aspects affecting ecology and biodiversity at the proposed Reko Diq Mine Site, along the Fan Sediment Water Supply Pipeline Area, and the Access Road to the proposed Reko Diq Mine Site are discussed below.

- Impact 1: Disturbance of terrestrial habitat caused by construction-related activities such as land clearance for the mine’s Accommodation Facility, Fan Sediment Water Supply Pipeline, and Access Road.
- Impact 2: Impacts on abundance and diversity of terrestrial flora and fauna caused by construction-related activities.

7.3.2.1 Impact 1: Disturbance of terrestrial habitat caused by construction-related activities for land clearance and construction for Accommodation Facility, Fan Sediment Water Supply Pipeline, and Access Road

Figure 5-40 provides a map of the area of disturbance or modification of terrestrial habitat.

The site clearance and construction of Project infrastructure will result in disturbance or modification of 0.59 km^2 area due to the construction of Accommodation Facility at the proposed Reko Diq Mine Site, 7.9 km^2 area along the Fan Sediment Water Supply Pipeline Area, and 13.7 km^2 area along the Access Road to the proposed Reko Diq Mine Site leading to the loss of plants and displacement of animals in this area.[145]

Table 5-17 provides the major habitat types that will be disturbed/ modified.

Table 7-14: Percentage of Habitat Types Disturbed/ Modified along with Proposed Project Facilities

Habitat Type	Accommodation Facility (%)	Fan Sediment Water Supply Pipeline (%)	Access Road (%)
Gravel Plains	100.0	64.1	81.8
Mountains/Hills	0.0	11.6	11.2
Sandy Plains/Sand Dunes	0.0	0.0	0.6
Clayey Plains	0.0	19.5	0.6
Dry Streambeds	0.0	4.8	5.8
Built-up Areas	0.0	-	-
Total	**100.0**	**100.0**	**100.0**

- The only habitat type that will be disturbed at the proposed Reko Diq Mine Site is Gravel Plain.
- The major habitat type that will be disturbed at the proposed Fan Sediment Water Supply Pipeline is Gravel Plain (64.1%).
- The Gravel Plains (81.8%) is the major habitat that will be disturbed along the Access Road.

As discussed above, the Project facilities are located mainly in Gravel Plains, Mountains/Hills, and Dry Streambeds. The Gravel Plains habitat type at the proposed Reko Diq Mine Site, along the Fan Sediment Water Supply Pipeline Area and Access Road to the proposed Reko Diq Mine Site are least sensitive (**Section 5.9**, Sensitivity Mapping of Ecological Baseline) as it has very low potential to support different biodiversity groups.

The Mountains/Hills and Dry Streambeds are moderate to highly sensitive habitats as they support a variety of animal and plant species. The Access Road to the Reko Diq

145 A buffer of 50m is used around the Project facilities to delineate the area of terrestrial habitat that will be disturbed due to construction-related activities (see Figure 7 1).

Mine Site will passing over the Dry Streambeds habitat may disturb the integrity of this habitat type.

There will be a permanent modification of land due to construction of Accommodation Facility and along the Access Road to the proposed Reko Diq Mine Site while the habitat modification along the Fan Sediment Water Supply Pipeline Area will be temporary.

The construction of a water supply pipeline and associated access road will lead to habitat disturbance and fragmentation due to the removal of vegetation and burrows and the presence of barriers to movement such as camps, and laydown areas for terrestrial species. The water supply pipeline routes will not pass through any key water resources of the region, however, there are some mountainous habitats along this water supply pipeline. This pipeline will be buried, and unfenced and once construction activities are completed, thus restoring habitat and removing barriers to movement of wildlife. Therefore, the removal of vegetation or habitat disturbance for water supply pipelines will not have any significant impact on terrestrial biodiversity as the habitat will be restored once the construction activities are completed and the pipeline is buried.

The change in habitat due to the Accommodation Facility and along the Access Road to the proposed Reko Diq Mine Site will be permanent and there will be no habitat restoration at these facilities. The change in habitat will lead to a reduction in food and shelter for mammals and herpetofauna. Surface stripping will result in the removal of vegetation cover and may also cause accidental death of small mammals and reptiles. Small mammal and reptiles' species have small niches occurring only within a smaller area having small home ranges. Most of these species are nocturnal in the area, the construction activities especially the clearance of land will affect their abundance due to disturbance of habitat.

The significance of terrestrial habitat due to the Project's construction activities will be low as the Project footprint is very limited in comparison to the overall habitat available in the Project area, and implementation of mitigation measures provided in the table below.

The need to import machinery, equipment, and other materials, which may have been shipped from international locations, increases the risk of introducing alien and invasive plant and insect species to the site, which in some environments may out-compete native species and cause loss of habitat for the natural flora and fauna. Alien invasive Species (AIS) are unlikely to be an issue for the Project as the harsh environmental conditions such as lack of water and poor soils are difficult to colonize if the plants or insects are not well-adapted to desert conditions.

Solid and liquid waste generated from construction activities may also lead to habitat degradation or loss if not disposed of properly. Solid and liquid waste generated from construction activities must be disposed of according to the measures outlined in the Waste Management Plan.

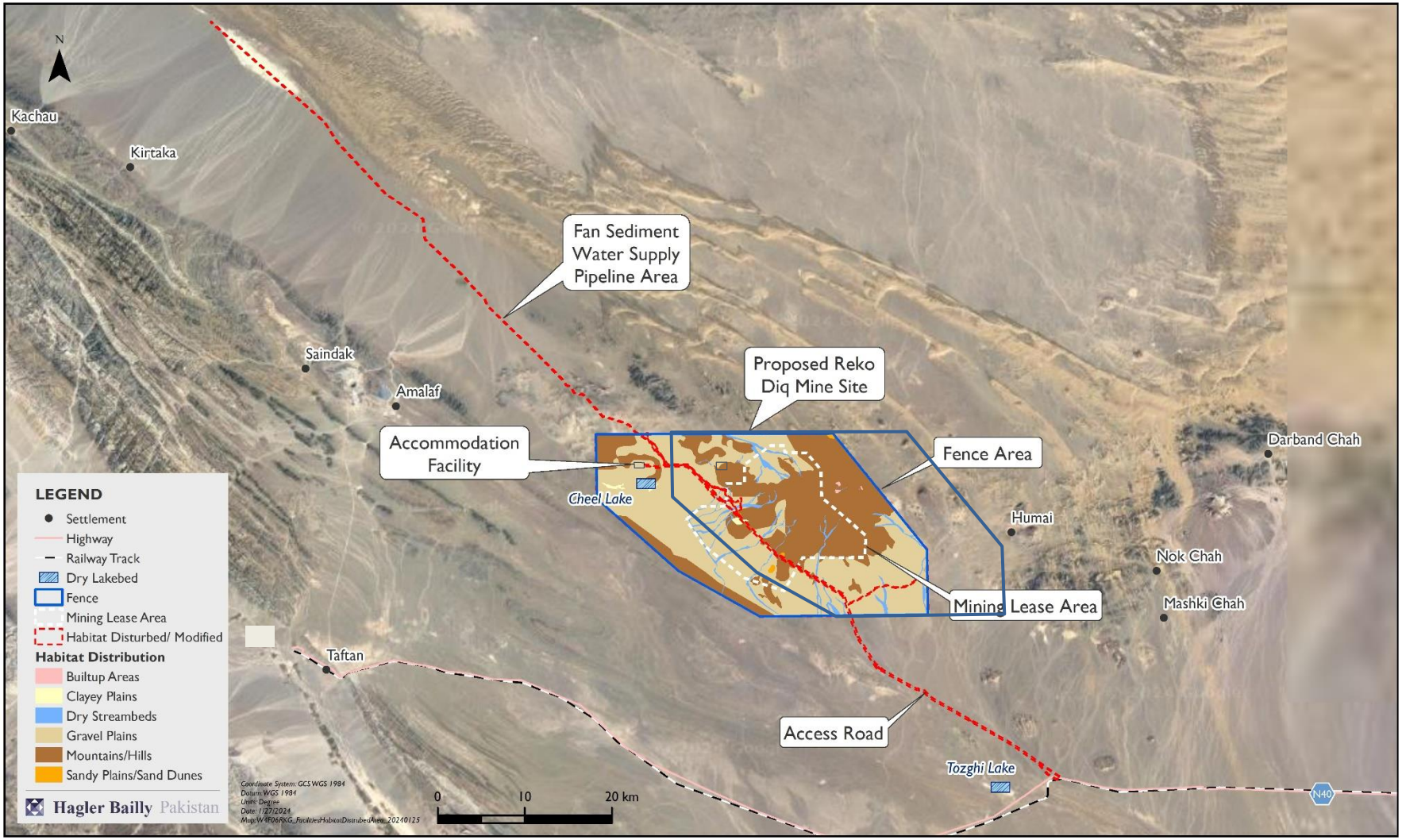


Figure 7-1: Map of Modified/ Disturbed Terrestrial Habitat

Impact 1: Disturbance of terrestrial habitat caused by construction-related activities such as land clearance for the mine's accommodation facility, water supply pipeline, and access road.								
Initial Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Major	Short Term	Small	Medium	Definite	Medium	-	High

Mitigation Measures

- The contractor will ensure that the Project footprint is minimized, and work sites and other areas are delineated and movement outside them is restricted.
- The habitat modification along the Fan Sediment Water Supply Pipeline Area will be temporary and will be restored by the contractors under Habitat Restoration Plan.
- Disturbance or movement of soil and vegetation will be minimized.
- Soil damage and erosion will be prevented, and natural vegetation will be retained as much as possible.
- Use native species for landscaping, reclamation, and restoration efforts to reduce the likelihood of introducing non-native species that could outcompete native flora and fauna.
- Training will be provided, and awareness will be raised regarding AIS among Project staff and contractors.
- The inspections and cleaning of vehicles, equipment, and machinery will be conducted while entering and exiting the Project site to minimize the risk of AIS contamination.
- Establish strict guidelines for the disposal of waste materials and wastewater, ensuring they are managed in a manner that prevents the introduction and spread of AIS.
- Prevent food waste (from the kitchen areas, waste sites, or employees working outside) from being left exposed to attract scavengers.
- Use physical barriers such as fences, netting, or screens to prevent animals and birds from accessing hazardous areas.
- Solid and liquid waste will only be disposed of at designated sites and a Waste Management Plan will be developed and implemented.
- To the extent possible, no additional land clearing for the improvements of the existing Access Road will be done, and all vehicular traffic on the Right of Way of new sections of Access Road will not move out of the defined or marked road boundary to avoid habitat damage.

Residual Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Minor	Short Term	Small	Low	Possible	Low	-	High

7.3.2.2 Impact 2: Impacts on abundance and diversity of terrestrial flora and fauna caused by construction-related activities

The construction of Project facilities will lead to ecological disturbance. The ecological disturbance as a result of land take will include habitat loss and habitat fragmentation. This will result in a temporary loss of food, shelter, and the loss of small mammals and reptiles. Accidental death of individuals may also occur although mobile species such as reptiles and small mammals are expected to move away from the area due to the noise of the machines before surface disturbance. The Project facilities are mostly located in the Gravel Plain habitat where the most dominant plant species were *Salsola stocksii* followed by *Calligonium comosum, Calligonum polygonides,* and *Aeluropus lagopoides*. All these species are common and abundant in the wider area. Habitat loss caused by construction of Project infrastructure will not have any significant impact on the overall population of these vegetation species though individual plants are likely to suffer harm.

The proposed pipeline routes do not pass through any critical habitats or key water resources of the region. Therefore, the removal of vegetation or habitat loss for the pipeline will not have any significant impact on terrestrial biodiversity. The impacted pipeline area shares similar habitat characteristics to the surrounding areas and small

mammals and reptiles are mobile and likely to move away from the disturbed area during construction activities. Larger mammals, such as foxes and jackals, are not likely to be affected due to the high mobility of these species. The loss of smaller fauna that provides prey for these larger species is not considered to critically affect the larger fauna as the area of disturbance is small.

The increase in deposition of dust on vegetation reduces the photosynthetic capacity of plants and may limit growth and reproductive capacity leading to a decrease in population sizes and potential loss of species. However, due to high background dust levels in the receiving environment, and the low density of vegetation in the area, the vegetation is likely to be well-adapted to dust and it is unlikely to represent a significant impact.

The noise, dust, emissions, and vibration during construction will temporarily impact individual receptors. However, no long-term negative impacts on the species and biodiversity are expected. Solid and liquid waste generated from construction activities will be disposed of according to the measures outlined in the Waste Management Plan.

The projected increase in daily traffic will not be significant during the Early Works phase. Accidental road kills may occur as a result of the Project traffic. However, the increase in the occurrence of these road kills is unlikely to be considerable. Improved access to the site as a result of the Project may also indirectly increase the incidence of poaching or trade in animal parts. Project staff and contractors must abide by the hunting regulations.

Air emissions from the Early Works activities may have impacts on the flora and fauna, particularly the birds[146] found in the vicinity. However, there will not be significant emissions, and control measures will be taken. Gaseous emissions will be treated before release to the environment and will be made BEQS compliant. Therefore, the impact of gaseous emissions in the Study Area is not expected to be significant.

The impacts will not be significant and will be further reduced from a medium to a low significance level with the implementation of mitigation measures provided in the table below. These measures primarily include the maintenance of environmental controls, awareness training, and the avoidance of killing or harming any mammal, bird, and reptile species by the Project staff as well as the implementation of a monitoring and reporting system to assess the effectiveness of mitigation measures.

146 S. Llacuna et al, January 1993, Effects of air pollution on passerine birds and small mammals, Archives of Environmental Contamination and Toxicology, Volume 24, Issue 1, pp 59–66

Impact 2: Impacts on abundance and diversity of terrestrial flora and fauna caused by construction-related activities.								
Initial Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Major	Short Term	Small	Medium	Definite	Medium	-	High
Mitigation Measures								
▪ The awareness training to staff and contractors will be provided on the prevention of injury of animals; and identification of likely species found on and near the site (*Echis carinatus multisquamatus*, *Varanus griseus*, *Phrynocephalus maculatus*, Asiatic Jackal, Red Fox, Cape Hare, Goitered Gazelle, Long-eared Hedgehog, Balochistan Gerbil, Indian Jird, Indian Jerbil, and Small Five-toed Jerboa) and identifications of animal hazards (such as venomous snakes); and what to do if dangerous animals are encountered. ▪ Some species of reptiles occupy small refugia and are unable to move out longer distances from their refugia, hence will be affected, or trapped during the Project activities. Examples include Gekkonid Lizards and Scincid Lizards. Awareness training will be provided to rescue and relocate the trapped terrestrial fauna, especially herpetofauna. ▪ Provide adequate knowledge to the workers on relevant government regulations and punishments for illegal poaching; incorporate in contract documents regulations for Project staff and contractors to avoid illegal poaching of wild animals. RDMC will report incidents of poaching to concerned government departments. ▪ Implement strict anti-poaching measures. ▪ Implement a comprehensive monitoring and reporting system to assess the effectiveness of mitigation measures and adapt strategies based on ongoing assessments. ▪ The Project facilities' construction will result in 24-hour illumination of the mine site. Insects may be attracted to the lights at night, and this may attract nighttime insects-eating birds to the area. Large floodlights will not be installed outside 50 m of the Project boundary. The lights will be directed towards Project facilities and not towards the natural habitats. ▪ Equipment under use will be regularly maintained, tuned, and provided with mufflers to minimize noise levels to minimize disturbance to wildlife species. ▪ AIS establishment will be prevented. ▪ The awareness regarding AIS among Project staff and contractors will be raised. ▪ All vehicular traffic on the Access Road will not move out of the defined or marked road boundary or Right of Way to avoid habitat damage.							
Residual Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+/-	Confidence
	Minor	Short Term	Small	Low	Possible	Low	-	High

7.3.3 Socioeconomic Environment

A summary of the possible negative and positive impacts on livelihoods and the well-being of communities in the Socioeconomic Study Area, due to construction and operation of the Project is outlined below.

- Impact 1: Increase in population due to the in-migration of job seekers (in-migrants) leading to pressure on existing social infrastructure and services.
- Impact 2: Disputes over distribution of Project employment within and between the Socioeconomic Study Area inhabitants and the in-migrants resulting in social unrest.
- Impact 3: Employment opportunities inadvertently favoring men as women face barriers in participating in Project jobs, thereby exacerbating their socioeconomic vulnerability.
- Impact 4: Direct, indirect and induced employment at the local level for men and women resulting in increased prosperity and wellbeing due to higher and more stable income sources for the people.

- Impact 5**:** Increase in the stock of skilled human capital due to the transfer of knowledge and skills under the Project resulting in enhanced productivity of local labor.
- Impact 6: Social development projects resulting in improved infrastructure and health and education outcomes.

7.3.3.1 Negative Impacts

7.3.3.1.1 Pressure on Social Infrastructure and Services

There is a risk of influx of job seekers into the Socioeconomic Study Area due to creation of jobs by the Project. The influx will increase pressure on the availability of infrastructure and services, such as those pertaining to education, health care and medication, water, and communication in the Project Area. RDMC has developed a Grievance Redress Mechanism (GRM) to record and address grievances in a timely and appropriate manner. The implementation of a GRM will help to identify any issues at an early stage so that they can be dealt with effectively.

- Impact 1: Increase in population due to the in-migration of job seekers (in-migrants) leading to pressure on existing social infrastructure and services in the Socioeconomic Study Area.

Impact 1: Increase in population due to the in-migration of job seekers (in-migrants) leading to pressure on existing social infrastructure and services in the Socioeconomic Study Area.								
Initial Impact Rating	*Magnitude*	*Duration*	*Scale*	*Consequence*	*Probability*	*Significance*	*+ /-*	*Confidence*
	Moderate	Short Term	Intermediate	Medium	Possible	Medium	-	Medium
Good practice measures: 1. Implementation of GRM. 2. Encourage local communities to use the grievance procedure for concerns related to the deterioration of local services. 3. Support local government in the implementation of infrastructure projects. 4. Support NGOs specializing in the development of local infrastructure. 5. Development of an Influx Management Plan to ensure influx is managed properly from the start.								
Residual Impact Rating	*Magnitude*	*Duration*	*Scale*	*Consequence*	*Probability*	*Significance*	*+ /-*	*Confidence*
	Minor	Short Term	Intermediate	Low	Possible	Low	-	High

7.3.3.1.2 Conflicts due to Provision of Employment to Outsiders

A potential source of conflict is the real or perceived unequal access to Project opportunities such as employment and small contracts. Complaints can be expected from local communities residing in the Socioeconomic Study Area if the distribution of jobs among local communities is perceived to be unfair. Objections can also be expected if people from outside the Socioeconomic Study Area are seen to usurp opportunities created by the Project, as the Socioeconomic Study Area inhabitants may consider themselves as the rightful owners of Project benefits owing to their vicinity to the Project. This increases the need for open communication between project developers and the various community heads, as well as within the community heads themselves.

- Impact 2: Disputes over the distribution of Project employment within and between the Socioeconomic Study Area inhabitants and the in-migrants resulting in social unrest.

Impact 2: Disputes over the distribution of Project employment within and between the Socioeconomic Study Area inhabitants and the in-migrants resulting in social unrest.								
Initial Impact Rating	*Magnitude*	*Duration*	*Scale*	*Consequence*	*Probability*	*Significance*	*+ /-*	*Confidence*
	Moderate	Short Term	Intermediate	Medium	Possible	Medium	-	Medium
Good practice measures: 1. Implement a Stakeholder Engagement Plan including: a. Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities, b. Maintaining a grievance procedure and encouraging and facilitating stakeholders to use the mechanism to express concerns to give everyone a fair and equal chance of voicing their concerns, c. Facilitating community dialogue to encourage open discussions about leadership and decision-making processes to provide a platform to community members to express their opinions and concerns, and d. Providing sufficient resources to the community relations officers to enable them to monitor negative perceptions and associated tensions, and to address them in a timely fashion. 2. Include provisions in the GRM related to stakeholder engagement and encourage and facilitate stakeholders to use the mechanism to express concerns.								
Residual Impact Rating	*Magnitude*	*Duration*	*Scale*	*Consequence*	*Probability*	*Significance*	*+ /-*	*Confidence*
	Minor	Short Term	Intermediate	Low	Possible	Low	-	High

7.3.3.2 Positive Impacts

7.3.3.2.1 Employment Opportunities and Development Initiatives for Women

Considerable gender disparity exists in the Socioeconomic Study Area, as women contend with less exposure and educational opportunities compared to their male counterparts. This inequality influences their autonomy in decision-making processes, particularly regarding participation in job-seeking activities and development initiatives. The prevailing gender dynamics in the area often result in women ceding significant decision-making authority to the men in their families, which limits their participation.

The Project will result in direct and indirect induced employment for the local population and will result in various development initiatives for the uplift of the local communities. However, owing to the gender imbalance in the area, the limitations on women's decision-making autonomy may impede their ability to fully benefit from these opportunities. These opportunities have the potential to increase the socioeconomic vulnerability of women as they will be faced with the challenge of acquiring these opportunities and will have to navigate socio-cultural factors while doing so. Existing socio-cultural norms may inhibit women from capitalizing on these opportunities due to existing power dynamics within their households. Addressing these underlying issues is crucial for fostering a more inclusive environment that empowers women to actively engage in and benefit from the economic opportunities presented by the Project.

The Project will develop a Gender Action Plan (GAP) to address this issue and provide equal opportunities and trainings to women for their economic growth. Moreover, RDMC will include provisions related to women empowerment to its CDP. In this way, the Project will help in favoring women resulting in the positive impact.

- Impact 3: Employment opportunities inadvertently favoring men as women face barriers in participating in project jobs, thereby exacerbating their socioeconomic vulnerability.

Impact 3: Employment opportunities inadvertently favoring men as women face barriers in participating in project jobs, thereby exacerbating their socioeconomic vulnerability.								
Initial Impact Rating	*Magnitude*	*Duration*	*Scale*	*Consequence*	*Probability*	*Significance*	*+ /-*	*Confidence*
	Minor	Short Term	Extensive	Medium	Possible	Medium	-	Medium
Good Practice Measures: 1. Development of a Gender Action Plan including provisions for increasing women's participation in training programs and ensuring equal representation in hiring processes. Ensure preferential recruitment of local candidates provided they have the required skills and qualifications. 2. Provide training for employees responsible for hiring, specifically the Human Resources department on the benefits of a diverse working environment to assure the hiring of more women. 3. Incorporating provisions related to women empowerment and participation in the development initiatives within the RDMC's CDP. 4. Include socio-cultural considerations while providing employment opportunities and planning development initiatives.								
Residual Impact Rating	*Magnitude*	*Duration*	*Scale*	*Consequence*	*Probability*	*Significance*	*+ /-*	*Confidence*
	Major	Short Term	Extensive	High	Definite	High	+	High

7.3.3.2.2 Employment Opportunities

There are few employment opportunities in the Socioeconomic Study Area and most of the people depend on livestock rearing for their livelihood. Unemployment is a common issue reported in the area as there is no industry in the area.

The increased income status of people employed by the Project is likely to lead to improved nutritional status, better housing, access to education, and an improvement in the overall well-being of the locals. Poverty cycles in poor families can be broken if children become more educated and have better livelihood options than their parents.

The Project will employ local people during the construction and operations phases. The Project will directly and through indirect and induced mechanisms (such as more economic activity resulting from improved infrastructure) contribute towards alleviating poverty and vulnerability in the area and increasing the prosperity and well-being of the people employed by the Project.

- Impact 4: Direct, indirect, and induced employment at the local level for men and women, resulting in increased prosperity and wellbeing due to higher and more stable incomes of people.

Impact 4: Direct, indirect and induced employment at the local level for men and women, resulting in increased prosperity and wellbeing due to higher and more stable incomes of people.								
Initial Impact Rating	*Magnitude*	*Duration*	*Scale*	*Consequence*	*Probability*	*Significance*	*+ /-*	*Confidence*
	Minor	Short Term	Extensive	Medium	Possible	Medium	+	High
Enhancement measures: 1. Ensure preferential recruitment of local candidates, especially poor and vulnerable individuals provided they have the required skills and qualifications. 2. Include an assessment of the contractor's demonstrated commitment to local procurement and local hiring in the tender evaluation process. 3. Coordinate recruitment efforts related to non-skilled labor, including for non-skilled labor positions required by contractors. **Good practice measures:** 4. Determine what is 'fair and transparent' in recruitment and in the distribution of jobs between different community groups, in consultation with local communities and their leaders. 5. Provide technical skills training for early works construction in coordination with the Hunar Foundation. 6. Provide skills-training to women to increase their ability to benefit from employment opportunities. 7. Provide schooling and technical education to the youth to boost their capacity for employment opportunities.								
Residual Impact Rating	*Magnitude*	*Duration*	*Scale*	*Consequence*	*Probability*	*Significance*	*+ /-*	*Confidence*
	Moderate	Short Term	Extensive	High	Definite	High	+	High

7.3.3.2.3 Skill Development

The Project will result in training and skill development of local and domestic labor, especially during the construction phase.

The knowledge and skills acquired by the local community will be of value to the labor-force of the country at national and local levels. The creation and injection of highly trained workers, qualified in multiple skills, into the economy will improve the productivity of the workforce. This impact can, therefore, stretch to micro- and macro-economic levels.

Various training programs will be implemented for enhancement of employment benefits at the local and domestic levels. The training programs will focus on the maximization of participation of members of the local community in both the construction and operational phases of the Project.

- Impact 5**:** Increase in the stock of skilled human capital due to the transfer of knowledge and skills under the Project resulting in enhanced productivity of local labor.

Impact 5: Increase in the stock of skilled human capital due to the transfer of knowledge and skills under the Project resulting in enhanced productivity of local labor.								
Initial Impact Rating	*Magnitude*	*Duration*	*Scale*	*Consequence*	*Probability*	*Significance*	*+ /-*	*Confidence*
	Minor	Short Term	Intermediate	Low	Unlikely	Low	+	High
Enhancement measures: 1. Support a 'vocational training program' to assist local people to qualify for semi-skilled positions focusing on issues such as procurement, involvement of vulnerable groups in Project opportunities, and continual professional development of staff. 2. Ensure the active participation of residents and allocation of CDP funds for community empowerment through education and entrepreneurship within the RDMC's CDP. **Good practice measures:** 3. Assist local people, especially vulnerable groups having practical skills but lacking qualifications to obtain certificates and increase their employment opportunities. 4. Support initiatives promoting a culture of learning in local communities. 5. Plan and implement training programs for vulnerable groups to encourage their participation in economic opportunities created by the Project. 6. Assist employees and local communities in improving basic personal financial life skills through training and awareness campaigns.								
Residual Impact Rating	*Magnitude*	*Duration*	*Scale*	*Consequence*	*Probability*	*Significance*	*+ /-*	*Confidence*
	Major	Short Term	Extensive	High	Definite	High	+	High

7.3.3.2.4 Social Development

The Project Company plans to launch social development projects in the vicinity of the Project, aiming to enhance the local infrastructure, particularly focusing on health and education facilities. The anticipated outcome is a significant improvement in the well-being of the communities in the area. By strategically addressing the key aspects of local infrastructure, the initiatives to be undertaken have the potential to bring about a positive transformation in the overall quality of life for the residents, fostering sustainable development and community empowerment.

- Impact 6: Social development projects resulting in improved infrastructure, health and education outcomes.

Impact 6: Social development projects resulting in improved infrastructure, health and education outcomes.								
Initial Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+ /-	Confidence
	Minor	Short Term	Extensive	Medium	Possible	Medium	+	High

Enhancement measures:

1. Involve local community members in the planning and decision-making processes of the social development projects to ensure project outcomes are reflective of community needs.
2. Prioritize sustainable infrastructure development that aligns with the long-term needs of the community.

Good practice measures:

1. Prioritize women and vulnerable groups for planned social development projects.
2. Establish partnerships with educational institutions and local NGOs to enhance the quality of education and promote skill development.
3. Development of the health and educational facilities to improve the well-being of the local communities.
4. Implement a monitoring and evaluation system to track the progress and effectiveness of social development projects.

Residual Impact Rating	Magnitude	Duration	Scale	Consequence	Probability	Significance	+ /-	Confidence
	Major	Short Term	Extensive	High	Definite	High	+	High

8. Environmental and Social Management Plan

This section provides the Environmental and Social Management Plan (ESMP) for the Early Works ESIA. An ESMP is the fundamental tool that ensures that all mitigation measures are consolidated, their implementation responsibilities are identified, and the resources required to implement the measures are provided. Further, the ESMP includes monitoring measures as a feedback mechanism on the implementation and effectiveness of the mitigation measures considering applicable local regulations.

The ESMP is prepared for the identified environmental impacts during the Early Works phase. The methodology followed for preparing the ESMP consists of the following steps:

- Identifying the mitigation and enhancement measures for each of the identified impacts and risks,
- Identifying the organization or person that would be responsible for implementing the measures, and
- Developing a mechanism for monitoring the proposed mitigation measures.

The ESMP will be included in all bid documents of the Project and will become a part of the Contractors' work contract. The strict implementation of the ESMP and project management's strict enforcement of adequate construction practices and standards will greatly reduce the negative impacts of the Project.

The ESMP contains the following elements:

- An institutional framework for effective implementation of the plan.
- The mitigation plan summarizes the mitigation measures to be implemented.
- A monitoring plan with guidelines on reporting and feedback.
- Suggested training programs to build capacity for the implementation of the ESMP.
- A framework for the establishment of a Grievance Redress Mechanism (GRM).
- Guidelines for the development of supplementary, content specific plans including:
  - Waste Management Plan
  - Occupational Health and Safety Plan
  - Emergency Preparedness and Response Plan
  - Stakeholder Engagement Plan
  - Gender Action Plan
  - Influx Management Plan
  - Habitat Restoration Plan
- Guidelines on how changes to the ESMP and Project will be handled.

8.1 Institutional Arrangement

8.1.1 Management Approach

Institutions responsible for executing and monitoring the environmental aspects of this Project will be:

- RDMC management will be ultimately responsible for ensuring that the ESMP is implemented. For this purpose, RDMC will develop and maintain internal institutional capacity for environmental management.
- RDMC will be primarily responsible for the monitoring of the implementation of the ESMP. Contractors hired by RDMC will be responsible for complying with the requirements of the ESMP.
- Each contractor procured for this Project will be responsible for the implementation of the ESMP to the extent that it applies to the contractor's area of work. The contractors will work in close coordination with the environmental staff of RDMC.

8.1.2 Management Responsibilities

The responsibilities of the Client and contractor are briefly described below.

- Primary responsibilities:
  - The RDMC Project Manager will be responsible for environmental assessment and ESMP compliance throughout the Project on behalf of the company itself.
  - The RDMC Environmental Manager will be responsible for monitoring and reporting during the operation phase.
  - The RDMC Environmental Manager will coordinate with the concerned government departments.
- Project management and quality control:
  - Carrying out construction activities in an environmentally sound manner during the Project will be the responsibility of the RDMC Project Manager.
  - RDMC representative will be responsible for the overall environmental soundness of all field operations.

Specific roles and responsibilities for environmental monitoring are provided in Table 8-1.

Table 8-1: Roles and Responsibilities for Environmental Monitoring

Aspect	RDMC's Responsibilities	Contractor's Responsibilities	Relevant Documentation
Contracting	Ensuring that monitoring and mitigation requirements are included in the contract between RDMC and the construction contractor(s)	Understanding the requirements and estimating the required resources	Contract between RDMC and the contractor(s)
Monitoring plan	Ensuring finalization of monitoring plan before construction commences	Prepare a construction management plan	Finalized monitoring plan

Aspect	RDMC's Responsibilities	Contractor's Responsibilities	Relevant Documentation
Resources	Ensuring availability of resources required for environmental monitoring	Ensuring availability of resources required for environmental monitoring	Project budgets
Environmental staff	Designating an Environmental Manager for the Project	Designating an Environmental Manager for the Project (may be combined with health and safety) and adequate team for management of EHS aspects	Job descriptions
Monitoring surveys and inspections	Undertaking regular inspections and carrying out further measurements when necessary	Undertaking regular inspections and collecting data on environmental performance, and carry out surveys	Inspection and survey reports
Environmental audit	Conducting periodic audits of the construction site and commissioning third party audits	Conducting periodic internal audits	Audit reports
Reporting	Producing environmental monitoring reports periodically and distributing those among the RDMC's management and appropriate staff members	Provide environmental performance data as required by RDMC.	Environmental monitoring reports
Corrective actions	Verifying that activities carried out comply with the ESIA/ESMP and identifying corrective actions if needed	Carrying out corrective actions as required	Corrective action record
Maintenance of record	Maintaining monitoring data and recording all incidents of environmental significance and related corrective measures	Maintaining monitoring data and recording all incidents of environmental significance and related corrective measures	Environmental databases

8.2 Mitigation Plan

The list of impacts is provided in Table 8-2. Each impact is given a unique reference number so that, if required, the discussion in **Section 7** (*Environmental Impacts and Mitigation Measures*) can be referred to.

For implementation, the measures are grouped as follows:

- No impacts are anticipated due to the design of the Project.
- Environmental Mitigation and Management Plan (Table 8-3) summarizes the mitigation measure that is required to be implemented during construction activities and responsibilities for implementation.

Table 8-2: Impacts Assessed during the Early Works ESIA

Impact Reference	Impact
Physical Environment	
01	Generation of particulate matter and gaseous emissions from construction activities, vehicular movement, and diesel generators.
02	Increase in noise levels due to operation of construction equipment and movement of construction traffic.

Impact Reference	Impact
03	Increase in traffic volume during the Early Works for the transportation of construction materials.
04	Generation of GHG emissions due to the combustion of fuel in diesel generators to meet energy requirements during Early Works.
05	Contamination of soil and water resources due to accidental spills and releases of fuels, solvents, oils and chemicals, and disposal of waste.
06	Risk of exposing workers to occupational health, safety, and fire hazards during the Early Works.
Ecology	
01	Terrestrial habitat loss caused by construction-related activities.
02	Impacts on abundance and diversity of terrestrial flora and fauna caused by construction related activities.
Social	
01	Increase in population due to the in-migration of job seekers (in-migrants) leading to pressure on existing social infrastructure and services in the Socioeconomic Study Area.
02	Disputes over distribution of Project employment within and between the Socioeconomic Study Area inhabitants and the in-migrants resulting in social unrest.
03	Employment opportunities inadvertently favoring men as women face barriers in participating in Project jobs, thereby exacerbating their socioeconomic vulnerability.
04	Direct, indirect and induced employment at the local level for men and women resulting in increased prosperity and wellbeing due to higher and more stable income sources for the people.
05	Increase in the stock of skilled human capital due to the transfer of knowledge and skills under the Project resulting in enhanced productivity of local labor.
06	Social development projects resulting in improved infrastructure and health and education outcomes.

Table 8-3: Environmental Mitigation and Management Plan

Impact No.	Environmental Aspect	Description	Mitigation Measures	Institutional / Implementation Responsibility
Physical Environment				
01	Ambient Air Quality	Generation of particulate matter and gaseous emissions from construction activities, vehicular movement, and diesel generators.	**Good Practice Measures:** ▪ Dust emissions from the Project activities will be prevented through water sprinkling as appropriate. ▪ Trucks hauling soil, sand, and other loose materials and onsite dirt piles and other stockpiled areas will be covered with tarpaulin sheets. ▪ Use of properly maintained equipment and machinery will be ensured to avoid dust and gaseous emissions. ▪ Emission control measures including adjusting the air-to-fuel ratio, using low-sulfur diesel fuel and additives, and regular maintenance and tuning to control emissions from diesel generators will be investigated and implemented, to the extent feasible.	▪ RDMC ▪ Contractors
02	Noise Levels	Increase in noise levels due to operation of construction equipment and movement of construction traffic.	**Good Practice Measures:** ▪ Noise producing units will be monitored, maintained, and improved to reduce noise where appropriate. If improvement is not possible, then the equipment will be replaced with less noisy equipment as soon as practicable. ▪ Visual alarms will be used in preference to audible alarms where appropriate. ▪ Noise abatement devices such as mufflers and silencers will be investigated and installed on the equipment to reduce noise at the source wherever feasible. ▪ The use of equipment in a poor state of maintenance will be avoided, particularly without effective noise control. ▪ Noisy operations will be combined to occur at the same time where possible. The total noise level produced would not be significantly greater than the level produced if the operations were performed separately. ▪ Periodic noise monitoring will be carried out at the mine site boundary to ensure compliance with applicable standards.	▪ RDMC ▪ Contractors
03	Traffic Volume	Increase in traffic volume during the Early Works for the transportation of construction materials.	**Good Practice Measures:** ▪ Suitable times to transport material and equipment will be identified. ▪ Route planning will be carried out to avoid sensitive areas (mosques, hospitals, schools) during peak public activity hours on N-40. ▪ Speed limits and defensive driving policies will be strictly implemented.	▪ RDMC ▪ Contractors

Impact No.	Environmental Aspect	Description	Mitigation Measures	Institutional / Implementation Responsibility
			▪ Drivers will be trained to reduce the risk of accidents by keeping their vehicle speed within limits and considering traffic signs and boards. ▪ Vehicles, especially brakes, will be maintained. ▪ Use of daily vehicle safety and maintenance checklists completed by the driver/operator before use, to include checks of horn, brakes, lights, etc. will be kept mandatory.	
04	Greenhouse Gas Emissions (GHGs)	Generation of GHG emissions due to the combustion of fuel in diesel generators to meet energy requirements during Early Works.	**Good Practice Measures:** ▪ Low-sulfur diesel fuel or alternative cleaner fuels such as biodiesel or synthetic diesel to reduce carbon emissions will be explored and used to the extent feasible. ▪ Energy efficient practices including optimizing generator loading will be considered to enhance fuel efficiency and reduce overall GHG emissions per unit of energy produced. ▪ Best available high efficiency generators will be used. ▪ A regular maintenance schedule will be established to ensure engines operate at peak efficiency, reducing fuel consumption, and GHG emissions.	▪ RDMC ▪ Contractors
05	Soil and Water Contamination	Contamination of soil and water resources due to accidental spills and releases of fuels, solvents, oils and chemicals, unsafe storage and disposal of waste..	**Leakages and Accidental Discharges:** • An Emergency Preparedness and Response Plan (EPRP) will be developed and implemented. • Appropriate training will be provided to staff to manage onsite generated waste and any incident of spill. • Onsite maintenance of construction vehicles and equipment will be avoided as far as possible, to avoid contamination of soil and groundwater. • Detailed spill response procedures will be developed. Spills will be addressed as per the site spill response procedures. • Appropriate spill control arrangements, including shovels, spill prevention trays, plastic bags, and absorbent materials, near oil and chemical storage areas will be provided. • An inventory of incident records of all moderate and major spills will be maintained. The record will include the location of spill; estimated quantity; spill material; restoration measures; photographs; description of any damage to vegetation, water resource, or community asset; and corrective measures taken. • Appropriate bunding and lining of the storage facilities will be provided. • Secondary containment around storage tanks of fuels and oils and other chemicals will be constructed.	▪ RDMC ▪ Contractors

Impact No.	Environmental Aspect	Description	Mitigation Measures	Institutional / Implementation Responsibility
			Disposal of Waste: • A Waste Management Plan will be implemented that will include identification, categorization, storage/handling, and disposal of generated waste. • An onsite Wastewater Treatment Plant will be constructed to treat the generated wastewater. • Cleanup of any littering will be monitored to avoid solid waste scattering. • The amount of generated waste will be reduced by considering reuse and recycle options, to the extent feasible. • Hazmat (hazardous materials) will be stored and used only over impermeable surfaces. • Records of all waste generated during the Early Works activities will be maintained to the extent possible. Track and log the quantities of waste disposed of, recycled, or reused on a Waste Tracking Register. • Recycling and sale to commercial users will be considered where feasible to reduce the amount of waste generated. • The waste disposal methods including incineration and disposal to approved facilities will be investigated and implemented to the extent feasible. The waste will be treated and appropriately disposed of according to standard practices, such as to an approved landfill site or vendor. • Training will be provided to personnel for identification, segregation, and management of waste.	
06	Occupational Health and Safety	Risk of exposing workers to occupational health, safety, and fire hazards during the Early Works phase.	▪ An Occupational Health and Safety Plan will be developed and implemented during Early Works. The Plan will include the measures mentioned below. ▪ Workers' exposure to high noise levels will be reduced by keeping moving workers away from the noise source; restricting access to areas; rotating workers performing noisy tasks and shutting down noisy equipment when not needed. ▪ Earplugs/earmuffs will be used to reduce workers' exposure to high noise levels. ▪ Pressure vessels and piping will be regularly inspected and maintained. ▪ Fire and smoke detectors and early warning systems will be provided. ▪ Workers will be trained in the identification and management of operational hazards. ▪ Hazard analysis of processes will be conducted to prevent and avoid any emergency. ▪ Fire drills will be conducted to make workers aware of the sirens, fire exits, and the assembly point in case of any fire emergency.	▪ RDMC ▪ Contractors

Impact No.	Environmental Aspect	Description	Mitigation Measures	Institutional / Implementation Responsibility
			▪ Safe containment of any combustible sources such as dry wood and fuels will be ensured. ▪ Surfaces where workers come in close contact with hot equipment, including generating equipment, pipes etc. will be shielded. ▪ Warning signs near high-temperature surfaces and Personal Protective Equipment (PPE) as appropriate, including insulated gloves and shoes, will be used. ▪ Permissible exposure noise limits will be set and implemented for workers working in noisy environments. ▪ The Project will utilize the procedures/system for process safety and occupational hygiene and industrial hygiene, as an enhancement measure, to protect workers from occupational hazards. ▪ Protective respiratory equipment will be used by employees when the exposure levels to welding fumes, solvents and other materials present in the working area are likely to exceed acceptable limits. ▪ Personnel will use eye protection equipment when undertaking welding work.	
Ecology				
01	Terrestrial Habitat Loss	Terrestrial habitat loss caused by construction related activities.	▪ Project footprint will be minimized, and work sites and other areas will be delineated and restricted. ▪ Disturbance or movement of soil and vegetation will be minimized. ▪ Soil damage and erosion will be prevented, and natural vegetation will be retained as much as possible. ▪ Use native species for landscaping, reclamation, and restoration efforts to reduce the likelihood of introducing non-native species that could outcompete native flora and fauna. ▪ Training will be provided, and awareness will be raised regarding AIS among Project staff and contractors. ▪ The inspections and cleaning of vehicles, equipment, and machinery will be conducted while entering and exiting the Project site to minimize the risk of AIS contamination. ▪ Establish strict guidelines for the disposal of waste materials and wastewater, ensuring they are managed in a manner that prevents the introduction and spread of AIS. ▪ Prevent food waste (from the kitchen areas, waste sites, or employees working outside) from being left exposed to attract scavengers. ▪ The causeway or watercourses will be installed in the access road to facilitate the movement of water during the rainy or flood season in the Dry Streambeds habitat.	▪ RDMC ▪ Contractors

Impact No.	Environmental Aspect	Description	Mitigation Measures	Institutional / Implementation Responsibility
			▪ Use physical barriers such as fences, netting, or screens to prevent animals and birds from accessing hazardous areas. ▪ Solid and liquid wastes will only be disposed of at designated sites and a Waste Management Plan will be developed and implemented.	
02	Impacts on abundance and diversity of terrestrial flora and fauna	Impacts on abundance and diversity of terrestrial flora and fauna caused by construction related activities.	▪ The awareness training to staff and contractors will be provided on prevention of injury of animals; identification of likely species found on and near site (*Echis carinatus multisquamatus, Varanus griseus, Phrynocephalus maculatus*, Asiatic Jackal, Red Fox, Cape Hare, Goitered Gazelle, Long-eared Hedgehog, Balochistan Gerbil, Indian Jird, Indian Jerbil and Small Five-toed Jerboa) and identifications of animal hazards (such as venomous snakes); and what to do if dangerous animals are encountered. ▪ Some species of reptiles occupy small refugia and are unable to move out longer distances from their refugia, hence will be affected or trapped during the Project activities. Examples include Gekkonid Lizards and Scincid Lizards. Awareness training will be provided to rescue and relocate the trapped terrestrial fauna especially herpetofauna. ▪ Provide adequate knowledge to the workers on relevant government regulations and punishments for illegal poaching; incorporate in contract documents regulations for Project staff and contractors to avoid illegal poaching of wild animals. RDMC will report incidents of poaching to concerned government departments. ▪ Implement strict anti-poaching measures. ▪ Implement a comprehensive monitoring and reporting system to assess the effectiveness of mitigation measures and adapt strategies based on ongoing assessments. ▪ The Project facilities construction will result in 24-hour illumination of the mine site. Insects may be attracted to the lights at night, and this may attract nighttime insects eating birds to the area. Large flood lights will not be installed outside 50 m of the Project boundary. The lights will be directed towards Project facilities and not towards the natural habitats. ▪ Equipment under use will be regularly maintained, tuned, and provided with mufflers to minimize noise levels so that to minimize disturbance to wildlife species. ▪ AIS establishment will be prevented. ▪ The awareness regarding AIS among Project staff and contractors will be raised.	▪ RDMC ▪ Contractors

Impact No.	Environmental Aspect	Description	Mitigation Measures	Institutional / Implementation Responsibility
Social				
01	Socio-cultural Impacts	Increase in population due to the in-migration of job seekers (in-migrants) leading to pressure on existing social infrastructure and services.	▪ Implementation of a GRM. ▪ Encourage local communities to use the grievance procedure for concerns related to the deterioration of local services. ▪ Support local government in the implementation of infrastructure projects. ▪ Support NGOs specializing in the development of local infrastructure. ▪ Development of an Influx Management Plan to ensure influx is managed properly from the start.	▪ RDMC
02	Socio-Cultural Impacts	Disputes over distribution of Project employment within and between the Socioeconomic Study Area inhabitants and the in-migrants resulting in social unrest.	▪ Implement a Stakeholder Engagement Plan including: a. Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities. b. Maintaining a grievance procedure and encouraging and facilitating stakeholders to use the mechanism to express concerns to give everyone a fair and equal chance of voicing their concerns. c. Facilitating community dialogue to encourage open discussions about leadership and decision-making processes to provide a platform to community members to express their opinions and concerns. d. Providing sufficient resources to the community relations officers to enable them to monitor negative perceptions and associated tensions, and to address them in a timely fashion. ▪ Include provisions in the GRM related to stakeholder engagement and encourage and facilitate stakeholders to use the mechanism to express concerns.	▪ RDMC

Impact No.	Environmental Aspect	Description	Mitigation Measures	Institutional / Implementation Responsibility
03	Employment Opportunities and Development Initiatives for Women	Employment opportunities inadvertently favoring men as women face barriers in participating in project jobs, thereby exacerbating their socioeconomic vulnerability.	▪ Development of a Gender Action Plan including provisions for increasing women's participation in training programs and ensuring equal representation in hiring processes. Ensure preferential recruitment of local candidates provided they have the required skills and qualifications. ▪ Incorporating provisions related to women empowerment and participation in the development initiatives within the RDMC's CDP. ▪ Provide training for employees responsible for hiring, specifically the Human Resources department on the benefits of a diverse working environment to assure the hiring of more women. ▪ Include socio-cultural considerations while providing employment opportunities and planning development initiatives.	▪ RDMC
04	Employment Opportunities	Direct, indirect, and induced employment at the local level for men and women resulting in increased prosperity and wellbeing due to higher and more stable income sources for the people.	▪ Ensure preferential recruitment of local candidates, especially poor and vulnerable individuals provided they have the required skills and qualifications. ▪ Include an assessment of the contractor's demonstrated commitment to local procurement and local hiring in the tender evaluation process. ▪ Coordinate recruitment efforts related to non-skilled labor, including for non-skilled labor positions required by contractors. ▪ Determine what is 'fair and transparent' in recruitment and in the distribution of jobs between different community groups, in consultation with local communities and their leaders. ▪ Provide skills-training to women to increase their ability to benefit from employment opportunities. ▪ Provide schooling and technical education to the youth to boost their capacity for employment opportunities.	▪ RDMC ▪ Contractors
05	Skill Development	Increase in the stock of skilled human capital due to the transfer of knowledge and skill under the Project	▪ Support a 'vocational training program' to assist local people to qualify for semi-skilled positions focusing on issues such as procurement, involvement of vulnerable groups in Project opportunities, and continual professional development of staff. ▪ Ensure the active participation of residents and allocation of CDP funds for community empowerment through education and entrepreneurship within the RDMC's CDP.	▪ RDMC ▪ Contractors

Impact No.	Environmental Aspect	Description	Mitigation Measures	Institutional / Implementation Responsibility
		resulting in enhanced productivity of local labor.	▪ Assist local people, especially vulnerable groups having practical skills but lacking qualifications to obtain certificates and increase their employment opportunities. ▪ Support initiatives promoting a culture of learning in local communities. ▪ Plan and implement training programs for vulnerable groups to encourage their participation in economic opportunities created by the Project. ▪ Assist employees and local communities in improving basic personal financial life skills through training and awareness campaigns.	
06	Social Development	Social development projects resulting in improved infrastructure and health and education outcomes.	▪ Involve local community members in the planning and decision-making processes of the social development projects to ensure project outcomes are reflective of community needs. ▪ Prioritize sustainable infrastructure development that aligns with the long-term needs of the community. ▪ Prioritize women and vulnerable groups for planned social development projects. ▪ Establish partnerships with educational institutions and local NGOs to enhance the quality of education and promote skill development. ▪ Development of the health and educational facilities to improve the well being of the local communities. ▪ Implement a monitoring and evaluation system to track the progress and effectiveness of social development projects.	▪ RDMC

8.3 Monitoring Mechanism

Environmental monitoring is a vital component of an ESMP. It is the mechanism through which the effectiveness of the ESMP is gauged. The feedback provided by environmental monitoring is instrumental in identifying any problems, determining trends and planning corrective actions.

8.3.1 Monitoring Plan

Monitoring of environmental components and mitigation measures during implementation and operation stages is a key component of the ESMP to safeguard the protection of the environment. The objectives of the monitoring are to:

- Monitor changes in the environment during various stages of the project life cycle with respect to baseline conditions.
- Manage environmental issues arising from construction works by closely monitoring environmental compliances.

A monitoring mechanism is developed for each identified impact, and it includes:

- Location of the monitoring (at sensitive receptors, Project facilities);
- Type of monitoring, i.e. parameters of monitoring and methods of monitoring (visual inspection, consultations, interviews, surveys, field measurements, or sampling and analysis);
- Frequency of monitoring and reporting (daily, weekly, monthly, seasonally, annually or during the implementation of an activity);
- Responsibility for monitoring, implementation, and reporting; and
- Authority for receiving and reviewing monitoring reports.

The proposed monitoring plan is provided in Table 8-4. The proposed monitoring program includes regular monitoring of Early Works activities for their compliance with the environmental requirements as per relevant standards, specifications, and ESMP. The purpose of the proposed monitoring is to assess the performance of the undertaken mitigation measures and to immediately formulate additional mitigation measures and/or modify the existing ones aimed at meeting the environmental compliance as appropriate during construction.

Table 8-4: Environmental Monitoring Program for Early Works

Aspect	Type of Monitoring	Frequency of Monitoring	Location/s	Reporting Frequency	Monitoring and Implementation Responsibility	Report Preparation Responsibility	Report Receiving and Reviewing Authority
Accidental Spills	Visual inspection of storage facilities and for any oil, lubricant and chemical spills and leakages during construction activities	Monthly	Construction and accommodation sites, transportation routes and storage areas	Quarterly	RDMC	RDMC	RDMC and EPAs
Water Resources	Record of water used and source of water supply for construction, sprinkling and accommodation facility.	Daily	Construction sites, truck filling points and water tanks at accommodation facility	Quarterly	Contractors and RDMC	RDMC	RDMC and EPAs
Occupational Health and Safety	Visual inspection of construction activities through multiple indicators (number of hazards identified, reported, and resolved, number of incidents and non-conformances reported and resolved, number of lost work injuries, use of PPEs)	Daily	Construction site, accommodation facility	Monthly to RDMC Quarterly to EPA	Contractors and RDMC	RDMC	RDMC and EPAs
Security Issues	Number of grievances from community.	When a complaint is received	Construction site, accommodation facility	Quarterly	RDMC	RDMC	RDMC and EPAs
Stakeholder engagement	Record all engagements.	Bi-annually	Accommodation facility and nearby communities	Bi-annually	RDMC	RDMC	RDMC and EPAs
Equitable distribution of employment opportunities and development initiatives for locals	Number of local people employed through the Project as a percentage of total.	Bi-annually	Construction site, accommodation facility	Bi-annually	Contractors and RDMC	RDMC	RDMC and EPAs

Aspect	Type of Monitoring	Frequency of Monitoring	Location/s	Reporting Frequency	Monitoring and Implementation Responsibility	Report Preparation Responsibility	Report Receiving and Reviewing Authority
Pressure on social infrastructure and services and social unrest due to in-migration	When a complaint is received, or an issue observed.	When a complaint is received	Accommodation facility and nearby communities	Monthly to RDMC Quarterly to EPA	RDMC	RDMC	RDMC and EPAs
Air Quality	Monitoring of NOx at diesel generator exhausts.	Quarterly	At diesel generator exhausts within accommodation camp	Quarterly	RDMC	RDMC	RDMC and EPAs
Risk of Alien Invasive Species (AIP)	Visual inspection to detect presence of alien invasive plant species	Quarterly	Project site and water supply pipeline area	Annually	RDMC	RDMC	RDMC and EPAs
Wildlife hunting and killing	Awareness and consultation with project staff	Monthly	Project site and water supply pipeline area	Annually	Contractors and RDMC	RDMC	RDMC and EPAs
Liquid Effluent	Effluent quality monitoring for BOD and COD after treatment.	Quarterly	Effluent treatment plant	Monthly to RDMC Quarterly to EPA	RDMC	RDMC	RDMC and EPAs
Drinking water (Groundwater well monitoring)	Drinking water quality monitoring (as per BEQS in Section 2, *Legal and Institutional Framework*) of drinking water used at camp. Water used and recycled at the camp	Quarterly	Drinking water provided for site staff	Quarterly to RDMC Annually to EPA	RDMC	RDMC	RDMC and EPAs

8.3.2 *Reporting and Feedback Mechanism*

RDMC will prepare periodic (not more than once every three months as a Good Practice) status reports on the ESMP implementation. Such reports will carry information on the main types of activities carried out within the reporting period, the status of any clearances/permits/licenses which are required for carrying out such activities, mitigation measures applied, and any environmental issues emerged in relation with suppliers, local authorities, affected communities.

The reports will highlight any cases of non-compliance with ESMPs, detail any acute issues and propose corrective actions.

The adequacy of the ESMP will be continually assessed and modified as appropriate so as not to contravene the conditions of the environmental approval.

8.3.3 *Meetings*

An effective mechanism to communicate and record environmental information during the Project is an essential requirement of an ESMP.

Two kinds of environmental meetings will take place during the project:

- Kick-off meetings
- Fortnightly meetings

The purpose of the kick-off meeting will be to present the ESMP to Project staff and discuss its implementation.

A fortnightly meeting will be held during the construction phase at the site. The purpose of this meeting will be to discuss environmental issues and their management. The proceedings of the meeting, the required actions, and responsibilities will be recorded in the form of meeting minutes and an action register will be maintained.

8.3.4 *Change-Record Register*

A change-record register will be maintained at the site, to document any changes in the ESMP and procedures related to changes in the project design, construction plan or external environmental changes affecting the EMP. These changes will be handled through the change management mechanism discussed later in this chapter.

8.4 Grievance Redress Mechanism

Due to the complex and personal nature of the project the Company are committed to ensuring an easy to use and well-structured grievance process for affected parties. The grievance process will be communicated through a number of forums and through general community engagement and discussions. Figure 8-1 presents the grievance mechanism flowchart.

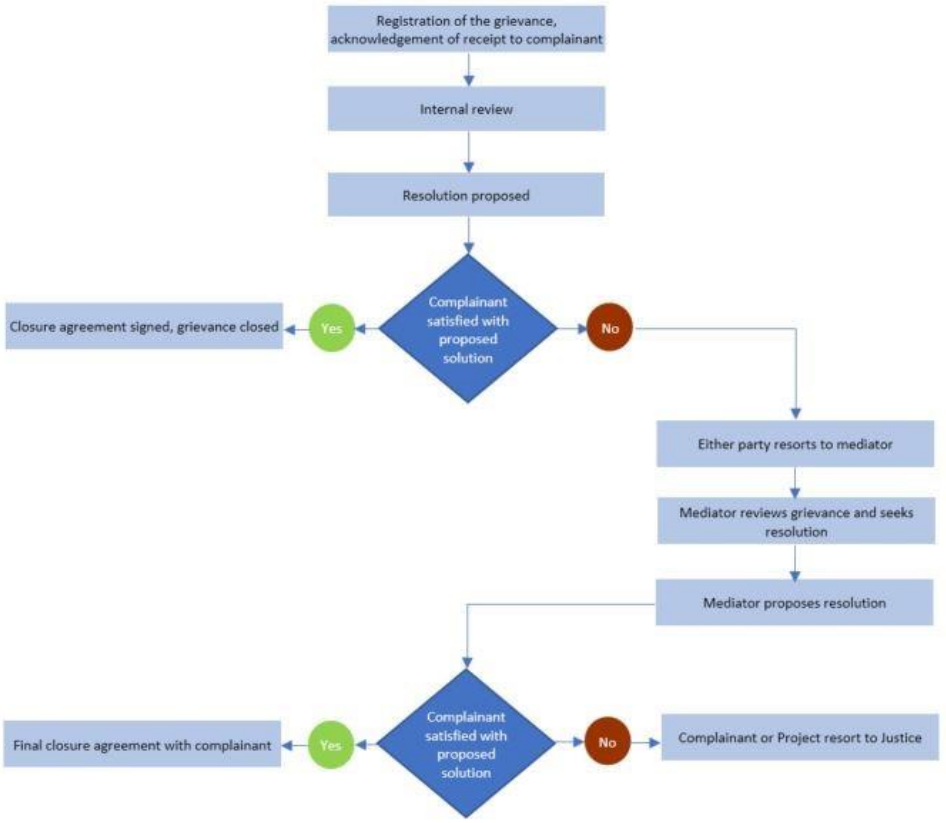


Figure 8-1: Grievance Mechanism Flowchart

8.4.1 Responsibilities

Table 8-5: Responsibilities

Position	Key Responsibilities
Community Relations Manager	Approval of the Grievance Process and ensuring adequate resources for implementation.
Project Director/Site Manager	Responsible for ensuring compliance with the Grievance Process.
Community Relations Lead / Grievance Officer	Management and administration of the grievance process.
All departments	Providing adequate and timely responses where grievances are referred.
Legal Officer/External Lawyer	Provide timely legal advice and assistance in all legal cases.

8.4.2 Receiving Grievances

Community members will have two main avenues with which to express a grievance including:

- At an RDMC office (e.g. at Nok Kundi or Quetta);
- Through members of the Community Relations team or through other senior staff members (i.e. through the site manager).

Grievances must be in writing for record keeping purposes. Should the person require assistance with recording the grievance in writing, the RDMC staff member will assist with

this. On receipt, the grievance will be re-read and explained to the person to ensure agreement on the facts of the grievance.

8.4.3 *Recording, Acknowledgement and Registration*

All grievances will be recorded using the Complaint/Grievance Form (see Appendix T) and logged in the Grievance Register. A copy of the completed Form will be provided to the person raising the grievance at the time, or within 7 days of the grievance being raised. Both copies of the form will include a unique registration number.

8.4.4 *Assessment*

Grievances will be initially assessed by the Community Relations team using all available information to enable the grievance to be directed to the most appropriate staff member/department. It may be possible for the RDMC staff member to address the grievance immediately if it is in relation to simply providing or clarifying information. If the grievance is considered particularly urgent, it will be raised immediately to the Community Relations Manager or Site Manager as appropriate.

8.4.5 *Management and Response*

Depending on the nature of the grievance, the Community Relations team will assign the grievance to the appropriate staff member/department for action and resolution. The assigned staff member/department will review and investigate the grievance and provide a response (with a resolution and if necessary, a schedule of corrective actions) to the Community Relations Manager. The Community Relations Manager will ensure that a written and verbal response is be provided as soon as possible and not more than 30 days after receiving the grievance. If, however, more time is required for resolution, the Community Relations team will keep the person who raised the grievance informed.

In addition, complainants will be updated where possible during routine engagement activities (i.e. community visits).

If a grievance cannot be resolved by the relevant department or the Community Relations team the following will occur:

5. The grievance will be escalated to the Site Manager or Project Director for consideration. If the grievance is associated with human rights, it will be escalated within 24 hours to the Sustainability Executive and Risk and Assurance Executive.
6. If the grievance still cannot be resolved, mediation through an appropriate third party will be recommended (i.e. community leader(s)).
7. As a last resort, grievances may be referred to an appropriate Court of Justice by either the complainant or RDMC.
    i) The complainant has the right of appeal to any recognized institution open to any citizen as stipulated by the laws of Pakistan if still not satisfied with the outcome and explanation of the third-party mediation.
    ii) RDMC has the right to appeal to any recognized institution if not satisfied with a ruling given in any case or can act in accordance with the dispute resolution clause as stipulated in the investment agreement.

iii) In the event that a case is presented by the aggrieved person's legal counsel, or in case an unresolved complaint is forwarded to RDMC's Legal Advisor for further action, all correspondence with regard to the case is forwarded to the Legal Advisor for further action.

iv) Upon request of the Legal Advisor, the Grievance officer or someone with delegated authority will attend court anytime a legal issue is to be heard.

v) In the event the investigation confirms the grievance is legitimate, the Grievance Officer ensures that the administrative process for redressing the grievance is immediately initiated.

8.4.6 Monitoring and Evaluation

The Community Relations team will monitor progress of each respective grievance and keep the person raising the grievance informed of its status. Updates will be given on a regular basis and information sharing will not exceed 30 days and will continue until the grievance is resolved. All grievances will be endeavoured to be closed out within 30 days. However, this must not come at the expense of following process and adequate investigation. The Community Affairs Manager will monitor implementation of the response and corrective actions taken. Within a month of the response being provided to the person raising the grievance, a Community Relations team member will make a visit to verify that the situation has been resolved to the satisfaction of all involved. If required, monitoring will be made on a regular basis, which will be determined on a case-by-case basis.

8.5 Guidelines for Preparation of Supporting Plans

Specific management plans will be developed by RDMC or contractors as specified. The framework, outline and requirements for each plan are discussed in this section as a guideline.

8.5.1 Waste Management Plan

A Waste Management Plan will be developed for the Early Works activities. The Plan will include the measures presented in Section 7.3.1.6, *Soil and Water Contamination*. In addition to these measures, the following general management level mitigation measures will be taken:

1. On-site handling

   i) Recyclable material will be separated at the source to the extent possible. Separate bins will be placed at each site for the different types of materials—plastic, paper, metal, glass, wood, and cotton etc. The recyclable waste will be delivered to approved waste contractors.

   ii) All hazardous waste will be separated from other wastes.

   iii) Hazardous waste that cannot be disposed of through acceptable means will be stored in an on-site storage facility until an off-site hazardous waste disposal facility is available.

2. Audits

   i) On-site audits of waste management will be undertaken on a regular basis.

ii) Audits of the waste disposal contractors and waste disposal facilities will be undertaken on a regular basis to check that procedures are being followed.

3. Records

i) Records of all waste generated will be maintained. Quantities of waste disposed of, recycled, or reused will be logged on a Waste Tracking Register.

4. Disposal

i) All non-hazardous waste material that cannot be recycled or reused will be stored at a designated area with appropriate lining and bunding until an onsite incinerator will be installed.

ii) Depending on the nature and quantity of the hazardous waste, it will either be disposed of by licensed hazardous waste contractors or to approved landfill sites in Karachi as an interim solution until an incineration facility equipped to handle hazardous waste is developed onsite.

iii) The possibility of returning the packaging to the manufacturers for reuse will be explored.

iv) Recyclable waste will be disposed of via approved waste contractors where possible.

v) Chemical containers (including partially full containers) will be returned to vendors.

8.5.2 Occupational Health and Safety Plan

Occupational Health and Safety (OHS) Plan which includes the OHS Management System, OHS Procedures and OHS Training Procedures will be prepared in accordance with the client's requirement, ISO45001:2018[147], other Good International Industry Practices (GIIP) (e.g. Performance Standards by IFC and associated EHS guidelines). The purpose of the plan is to identify, assess and effectively respond to risks arising from the day-to-day activity and protect the health and safety of workers.

This plan will address all aspects of occupational health and safety on the Project, with emphasis on identifying the required safety behaviors, preventive/protective measures, and the routine implementation of Standard Operating Procedures (SOPs) to minimize the potential for accidents, injuries, and illness within the workforce. The measures mentioned in Section 7.3.1.7, *Occupation Health and Safety* will be incorporated in this plan.

RDMC and its contractors will prepare the Plan for the Early Works activities and make it available to employees. The Plan will identify and describe the responsibilities of all parties, including RDMC, contractors, and competent authorities. The Plan will also include details on the requirements and schedule for periodic safety audits, revision, and improvements to improve health and safety conditions.

147 ISO 45001:2018 is an international standard that specifies the requirements for an occupational health and safety (OH&S) management system. Published by the International Organization for Standardization (ISO), ISO 45001 provides a framework for organizations to establish, implement, maintain, and continually improve their occupational health and safety performance.

8.5.3 Emergency Preparedness and Response Plan

Emergency Preparedness and Response Plan (EPRP) is intended to guide RDMC and its contractors to be prepared for emergency situations and respond effectively should they arise. RDMC will prepare this plan for natural and man-made emergencies. For each stage of Early Works life cycle, RDMC and/or its contractors will develop and implement an EPRP that meets the requirements of national/local law and the Mitigation Plan (see Section 8.2), Occupational Health and Safety Plan (see Section 8.5.2).

EPRPs for the construction phase will be developed before construction begins and will be implemented throughout construction.

The Plan will include the following:

- Identification of various emergency situations that could realistically occur and close coordination with local authorities regarding preparing and responding to emergencies that could affect the stakeholders.
- Inclusion of root-cause analysis following any emergency or near-emergency situation to identify improvements in future preparedness or response.
- Description of records that will be kept to document various activities required to maintain emergency preparedness, and the person(s) responsible for maintaining the records.
- Periodic inspection/monitoring of the Project site(s) and records, with a focus on areas where accidents or other occurrences could lead to emergency situations.
- Description of how remedial actions will be identified and implemented if monitoring reveals shortcomings in emergency preparedness or in recordkeeping, and how follow-up monitoring will be implemented until the requirements of the EPRP are fully met.
- Description of how the results of monitoring will be reported to RDMC management where monitoring identifies flaws in emergency preparedness.
- Periodic review and revision of the plan, when necessary, to update or improve health and safety conditions and reduce risks to the lowest practical level.

8.5.3.1 Risk Assessment and Management Plan

The Risk Assessment and Management Plan will provide the policies, procedures and organizational arrangements that will guide RDMC and its contractors to ensure that risks are identified, mitigated, and managed proactively to reduce the chance of occurrence.

RDMC and/or its contractors will develop and implement Risk Assessment and Management Plan that meets the requirements of national and provincial legislation related to safety and risk management, and occupational health and safety.

8.5.3.2 Spill Prevention and Mitigation Plan

Liquid waste spills that are not appropriately managed have the potential to harm the environment. By taking certain actions, the likelihood of spills can be reduced, and their effect minimized.

To avoid spills and to help the cleanup process of any spills, the Contractors and the management and staff of RDMC will be trained and aware of spill procedures. By

formalizing these procedures in writing, staff members can refer to them when required thus avoiding undertaking incorrect spill procedures.

8.5.3.3 *Fire Emergency Response Plan*

A firefighting system will be installed with a standard operating procedure considering the potential fire from the sparks in material/fuel storage and handling.

8.5.3.4 *Other Emergencies*

Response plans for other emergencies, including but not limited to the following, will also be developed:

- Vehicle accident
- Earthquake
- Heavy downpour and consequent flooding
- Electrical hazards
- Equipment Failure

8.5.4 Stakeholder Engagement Plan

A Stakeholder Engagement Plan (SEP) will be implemented, incorporating the measures mentioned in Section 7.4.5, *Socio-cultural Impacts*. Appendix T includes a pre-construction SEP prepared for the main Project ESIA. This plan includes the process of stakeholder engagement applicable to the Early Works.

8.5.5 Gender Action Plan

A Gender Action Plan (GAP) is a strategic document that outlines specific measures and strategies to promote gender equality and address gender-related issues within an organization or a project. Some general guidelines to be considered while developing a GAP for the Project are as follows:

- Needs Assessment: Conducting a gender analysis to identify existing gender disparities and understand the specific needs and concerns of different genders.
- Set Clear Objectives: Clearly defining the goals and objectives of the GAP, ensuring they are measurable, realistic, and time-bound.
- Inclusive Participation: Involving all stakeholders, including women and men from diverse backgrounds, in the development and implementation of the GAP.
- Mainstreaming Gender: Integrating gender considerations into all aspects of the Project, rather than treating it as a separate issue.
- Policy Alignment: Ensuring that the GAP aligns with existing gender policies and relevant national and international frameworks.
- Capacity Building: Providing training and implementing capacity-building activities to enhance the knowledge and skills of staff and stakeholders on gender equality issues.
- Data Collection and Monitoring: Establishing mechanisms for collecting sex-disaggregated data to monitor progress and identify areas for improvement.

- Resource Allocation: Allocating sufficient resources (financial, human, and technical) to effectively implement the GAP.
- Addressing Stereotypes and Discrimination: Developing strategies to challenge and change gender stereotypes and discriminatory practices within the Project.
- Promoting Equal Opportunities: Ensuring that women and men have equal opportunities for participation, decision-making, and access to resources.
- Flexible Working Arrangements: Implementing flexible working arrangements to accommodate diverse needs and responsibilities, especially those related to caregiving.
- Safety and Security: Addressing issues related to the safety and security of women and other marginalized groups.
- Communication and Awareness: Developing a communication strategy to raise awareness about gender equality issues and the organization's commitment to address them.
- Regular Review and Evaluation: Establishing a system for regular review and evaluation of the GAP to ensure its effectiveness and relevance over time.

8.5.6 Influx Management Plan

An Influx Management Plan (IMP) refers to a set of guidelines and procedures to manage an unexpected surge in the number of people, such as employees, visitors, or customers, at a given location. Some general guidelines to be considered while developing an IMP for the Project are as follows:

- Define Triggers and Thresholds: Clearly outline the conditions that will trigger the need for an influx management response. Set specific thresholds, such as maximum occupancy levels or staffing ratios, that will not be exceeded.
- Capacity Assessment: Regularly assess the physical and logistical capacity of the facility or organization to handle increased personnel. Consider factors such as available workspace, seating, parking, and other relevant resources.
- Communication Protocols: Establishing clear communication protocols to notify personnel about the influx situation and defining communication channels, emergency contact information, and the chain of command.
- Evacuation and Assembly Points: Developing evacuation plans in case of emergencies or situations where personnel need to exit the premises quickly and identifying assembly points where personnel can gather safely outside the facility.
- Personnel Roles and Responsibilities: Defining roles and responsibilities for personnel during an influx and assigning specific tasks to designated individuals or teams to ensure an organized response.
- Training and Drills: Conducting regular training sessions and drills to familiarize personnel with the IMP.
- Access Control Measures: Implementing access control measures to regulate the entry and exit of personnel during influx situations by using identification badges, security checks, or other relevant measures.

- Resource Mobilization: Having a plan for quickly mobilizing additional resources, such as security personnel, medical assistance, or support staff and establishing agreements with external organizations that can provide assistance during influx events.
- Health and Safety Considerations: Prioritizing health and safety measures to prevent overcrowding and ensure the well-being of personnel and providing guidance on social distancing, hygiene practices, and other relevant health protocols.
- Communication with External Agencies: Establishing communication channels with external agencies, such as emergency services or local authorities.
- Documentation and Reporting: Maintaining documentation of all influx events, responses, and lessons learned and implementing a reporting system to analyze and improve the effectiveness of the IMP.
- Regular Review and Updates: Scheduling regular reviews of the IMP to incorporate any changes in personnel or facility layout.

8.5.7 Habitat Restoration Plan

A Habitat Restoration Plan will be developed by the contractor. This plan is intended to guide the Contractor in restoration of terrestrial habitat that will be disturbed or modified due to Project activities. The details on the disturbed or modified terrestrial habitat are provided in **Section 7.3.2**, Ecological Environment.

Some of the key objectives of the plan are provided below.

- Identify the current state and threats to the habitat in the landscape and site of interest.
- Identify the general restoration actions that can be undertaken to reach the desired state.
- Ensure fair and consistent application of national and international policies and guidelines.
- Provide a structure to strengthen project assessment and monitoring.

A comprehensive framework is provided below that can guide habitat restoration efforts.

8.5.7.1 Pre-Construction Assessment and Planning

8.5.7.1.1 Baseline Assessment

- Conduct a thorough ecological assessment of the site before project activities commence.
- Identify key habitats, biodiversity hotspots, and species of concern.
- Evaluate the extent of ecological disturbance and identify critical areas for restoration.

8.5.7.1.2 *Legal* Compliance

- Ensure compliance with local, national, and international environmental laws and regulations.
- Obtain necessary permits for habitat restoration activities.

8.5.7.1.3 Stakeholder Engagement

- Engage with local communities, environmental organizations, and government agencies.
- Incorporate local knowledge into the restoration plan.

8.5.7.1.4 Ecosystem Mapping
Create a map of the site, highlighting different ecosystems, soil types, and topographical features.

8.5.7.1.5 Soil Analysis
Perform soil tests to determine nutrient levels, pH, and composition to guide soil restoration efforts.

8.5.7.2 During Construction Assessment and Planning

8.5.7.2.1 Mitigation Measures
- Implement best practices to minimize habitat disruption.
- Monitor and control pollution, dust, and noise levels to protect surrounding ecosystems.

8.5.7.2.2 Buffer Zone
Establish buffer zones around sensitive habitats to reduce the direct impact of project activities.

8.5.7.2.3 Define Restoration Goals
Establish clear objectives for habitat restoration, considering the pre-project ecological conditions and local biodiversity targets.

8.5.7.2.4 Biodiversity Enhancement
Identify target species for reintroduction or habitat improvement.

8.5.7.3 Restoration Plan

8.5.7.3.1 Site Rehabilitation
- Develop a comprehensive rehabilitation plan for the disturbed/modified areas.
- Use appropriate soil amendments to restore fertility and structure.

8.5.7.3.2 Revegetation
- Select native plant species based on the site's original flora.
- Implement a phased approach for planting, considering seasonal and climatic factors.

8.5.7.3.3 Wildlife Reintroduction
- Incorporate features such as nesting boxes, rock piles, and water sources to enhance habitat suitability for wildlife.
- Consider the needs and requirements of specific species identified during the baseline assessment.

8.5.7.3.4 Monitoring and Adaptive Management
- Establish a monitoring program to track the progress of habitat restoration.
- Implement adaptive management strategies based on monitoring results to refine restoration techniques.

8.5.7.3.5 Ecosystem Design
- Develop a detailed ecological design that outlines the target ecosystem structure and function.
- Consider the spatial arrangement of habitat features, connectivity, and potential corridors.

8.5.7.4 Long-Term Management

8.5.7.4.1 Invasive Species Control

- Implement measures to control and prevent the spread of invasive species that may hinder native vegetation under AISMP.

8.5.7.4.2 Erosion Control

- Implement erosion control measures to prevent soil degradation and runoff.

8.5.7.4.3 Monitoring Protocols

- Develop a monitoring plan to assess the progress of the restoration efforts.
- Monitor key indicators, including plant growth, wildlife presence, and soil quality.
- Use monitoring data to adjust restoration strategies as needed.
- Implement adaptive management practices to respond to unforeseen challenges.

8.5.7.4.4 Emergency Preparedness and Response Plan

- Develop a plan to address any unforeseen environmental emergencies as per Section 8.5.3
- Establish a rapid response team trained in habitat restoration techniques.

8.5.7.5 Reporting and Transparency

- Maintain detailed records of restoration activities, monitoring results, and any modifications made to the original plan.
- Provide regular reports on the progress of habitat restoration to regulatory bodies, stakeholders, and the concern government departments.
- Conduct periodic reviews of the restoration program to assess its overall effectiveness.
- Adjust goals and strategies based on evolving ecological conditions and new knowledge.

8.6 Change Management

An environmental assessment of the proposed project has been made based on the project description available at the time the environmental assessment report was prepared. However, changes in project design may be required at the time of project implementation. This section describes the mechanism that will be put into place to manage changes that might affect the project's environmental impacts.

Potential changes in project design have been categorized as first-order, second order, and third-order changes. These are defined below.

8.6.1 First Order

A first-order change is one that leads to a significant departure from the project described in the environmental assessment report and consequently requires a reassessment of the environmental impacts associated with the change.

In such an instance, the environmental impacts of the proposed change will be reassessed, and the results sent to the Balochistan-EPA for approval.

8.6.2 Second Order

A second-order change is one that entails project activities not significantly different from those described in the environmental assessment report, and which may result in project impacts whose overall magnitude would be like the assessment made in this report.

In case of such changes, the environmental impact of the activity will be reassessed, additional mitigation measures specified if necessary, and the changes reported to the Balochistan-EPA, at least a month before undertaking the change.

8.6.3 Third Order

A third-order change is one that is of little consequence to the environmental assessment reports' findings. This type of change does not result in impact levels exceeding those already discussed in the environmental assessment; rather these may be made onsite to minimize the impact of an activity. The only action required in this case will be to record the change in the change record register.

To illustrate the magnitude of changes within these orders, examples are presented in Table 8-6. The types of changes presented encompass a range of scenarios for illustration purposes only, and by no means reflect any intention on the part of RDMC to make these changes. The list is also not meant to be comprehensive, i.e. inclusive of all possible changes that may potentially take place in the design or operation of the plant as described in the ESIA. For any change not described in Table 8-6, the definition of the first, second, and third order changes will be used to determine its category.

Table 8-6: Generic Examples of Changes in the Project Design – Power Plant Case

Change	First Order	Second Order	Third Order
Power plant location	Relocated such that the villages in influence change	Relocated such that the villages in influence do not change	
Power plant capacity	If increased significantly (for example, by more than 33%) from the proposed capacity.	If increased but not significantly (for example, by more than 20% but less than 33%) from the proposed capacity.	If increased by a small amount (for example, by less than 20%) from the proposed capacity.
Technology	A different technology or process for power generation resulting in altogether different environmental impacts.	A different technology or process for power generation, resulting in environmental impacts of similar nature or magnitude.	

Changes in Project design may necessitate changes in the ESMP. In this case, the following actions will be taken:

- A meeting will be held to discuss and agree upon the proposed addition/change to the ESMP.
- Based on the discussion during the meeting, a change report will be produced collectively, which will include the additional ESMP clause and the reasons for its addition.
- A copy of the report will be sent to the head offices of RDMC contractors.
- All relevant Project personnel will be informed of the change.

8.7 Training

Environmental training will help to ensure that the requirements of the environmental assessment and ESMP are clearly understood and followed by all Project personnel in the course of the Project. RDMC will initiate a training program to ensure that its employees and that of its contractors have the required knowledge and skill to manage the environmental aspects of their respective jobs. The proposed environmental trainings are listed in Table 8-7, which will be finalized before the commencement of the project.

Table 8-7: Proposed Environmental Trainings

No	Type of Training	Personnel to be Trained	Training Description
1	Occupational Health and Safety	EHS Manager Plant managers and supervisors	Awareness to conform to safety codes Mandatory use of PPE by the senior administration during all plant visits
2	Occupational Health and Safety	Workers Staff	Health, safety, and hygiene Proper usage of PPE Precautions to be taken for working in confined areas
3	Health, Safety and Environmental Auditing	Staff responsible for inspection/audits	Procedures to carry out Health, Safety and Environmental Audits Reporting requirements
4	Waste Disposal and Handling	Relevant Workers Relevant Staff	Segregation, identification of hazardous waste, use of PPEs, waste handling
5	Social and environmental laws & regulations, norms, procedures, and guidelines of Government	EHS staff Managers and supervisors	Environmental standards and their compliance
6	Implementation of environmental management and monitoring plan	EHS staff Responsible supervisory staff Management	Concepts of environmental management and monitoring plan
7	Defensive driving	All drivers and their supervisors	Safe driving and handling of vehicles

9. Conclusion

This study was carried out to assess the environmental and socioeconomic impacts of the Early Works activities for the Reko Diq Mining Project. The assessment was carried out to meet the Balochistan-EPA regulatory requirements as discussed in **Section 2**, *Legal and Institutional Framework*.

Early Works for the Mining Project are required to maintain the Mining Project delivery schedule and will consist of construction of an accommodation facility at the proposed Reko Diq Mine Site, a water supply pipeline from the Fan Sediments area to the accommodation facility, and minor earthworks. The expected duration of the Early Works phase will be nine months. A separate ESIA will be submitted at a later date to seek approval for full construction works and operations of the Reko Diq Mining Project.

The Fan Sediments will be used as a water source for the Early Works and the Mining Project. There are no doorstep communities to the proposed Reko Diq Mine Site, with the nearest being Humai approximately 20 km away. No private land acquisition will be required for the Early Works activities. Details of the Project activities are provided in **Section 3**, *Project Description*.

Alternatives were considered for water supply source, water supply pipeline material and layout, and project routes/sites and the selection of the alternatives for the Project design was based on technical, economic as discussed in **Section 4**, *Analysis of Alternatives*.

Baseline environmental and socioeconomic information was collected from the field surveys and secondary sources where required, including reports of previous studies, and published literature. The information collected was used to establish profiles of the physical, ecological, and socioeconomic environments likely to be affected by the Early Works activities as discussed in **Section 5**, *Description of Environment*. A summary of each aspect is presented below.

- **Physical Environment:** The climate of the Project Area is hyper-arid. Gravel plains, sandy plains and shifting sand dunes are the dominant topographic features of the Project Area. There are no surface water resources available at Fan Sediments and the proposed Reko Diq Mine Site. The proposed Project will rely on groundwater from boreholes in the Fan Sediments area, drilled by Barrick in 2010. The surveys showed that the settlements use water from different sources including dug wells, boreholes, and springs. The water sample collected from Fan Sediments showed twice the hardness of the community water resources, with Total Dissolved Solids (TDS) levels approximately four times higher than those of the community water resources. The measured concentrations of NO_2, SO_2, PM_{10} and $PM_{2.5}$ at proposed Project site, Humai settlements, and at Nok Kundi were within the air quality limits prescribed in the BEQS for Ambient Air Quality. The daytime noise levels observed at Nok Kundi and at the access road to the proposed Reko Diq Mine Site were within the daytime noise limits prescribed in the BEQS for commercial areas. However, they exceed the nighttime noise limits.
- **Ecological Environment:** The most abundant habitat type in the Ecological Study Area was Gravel Plains (53.8%), followed by Mountains/Hills (24.7%), Sandy Plains/Sand Dunes (13.2%), Clayey Plains (4.5%), Dry Streambed (3.8%),

Agricultural Areas/Date Palms (0.001%) and Built-up Areas (0.013%). No impacts on ecological environment are expected to occur on any species of conservation concern or sensitive environments. There are no protected forests or game reserves within a 100 km radius from the proposed Reko Diq Mine Site. The Project facilities are located in areas that have low to moderate sensitivity. Threats due to existing anthropogenic factors and extreme dry conditions are observed for biodiversity in the area. Some conservation concerns and restricted-range species are reported/observed in the area. However, most of these species have a wide distribution range, and very rare occurrences in the area, and Project activities will not directly affect any of these species. Considering this, Critical Habitat is not triggered for any of the criteria of IFC PS6.

- **Socioeconomic Environment:** The surveyed settlements located east of the Reko Diq Mine Site are in a rural setting, with adobe (Katcha) housing construction. These settlements rely mainly on dug wells to meet their water needs. Primary sources of income include cross-border trading and livestock rearing. The locals rely on range land as fuel, while agricultural activities are limited due to water scarcity. The settlements located west of the Reko Diq Mine Site near Fan Sediments water supply area are connected by sealed roads to Taftan, and onwards to Nok Kundi, and Dalbandin. The residents of the Saindak settlement are predominantly employed at the Saindak Copper-Gold Project. In the settlements of Amalaf, Kachau, and Saindak, inhabitants access the health facility located within the Saindak Copper-Gold Project. These settlements receive their drinking water supply from the Saindak Copper-Gold Project, which pumps water from an aquifer source in Upper Tahlab near the Iran border. In the Kachau settlement, the locals used spring (local name Karez) water for both irrigation and domestic purposes. Nok Kundi and Dalbandin towns are located along the Road Route that will be used for Project-related transportation. Nok Kundi is the town nearest to the Reko Diq Mine Site, while Dalbandin is the tehsil headquarters of the Chagai District. The areas adjacent to the N-40 highway display more urbanized development.

The stakeholder consultations were carried out with the community and institutions to record their views, concerns, and suggestions about the proposed activities as discussed in **Section 6**, *Information Disclosure and Public Consultation*. A consultation process for the future consultations is also discussed in this section.

- First round of stakeholder engagement and consultations was carried out between September and October 2022 for a larger extent as part of the ESIA of the proposed Reko Diq Mining Project including the discussion on the Early Works activities. Keeping local norms in view, male and female consultations were held separately by male and female experts in nine communities. Separate meetings with institutional stakeholders including government departments, environmental regulatory departments and NGOs were arranged in Dalbandin and Quetta. A summary of the concerns expressed by the communities and institutions is presented in **Section 6**, *Information Disclosure and Public Consultation*.
- Second round of engagement and further awareness sessions specific to the Early Works is currently being undertaken by RDMC supported by Hagler Bailly as a Good Practice Measure to inform the stakeholders.

- Further engagement will be ongoing ahead of and following the public forum.

The proposed activities were reviewed, and an assessment made of the potential impact of these activities on the area's physical, ecological, and socioeconomic environments, using both qualitative and quantitative assessment methods as described in **Section 7**, *Environmental Impacts and Mitigation Measures*. Where appropriate, mitigation measures were recommended to keep the adverse environmental impact within acceptable limits.

- **Design Related Impacts:**
    - The Project will be in an open desert area with no protected areas in the vicinity and no nearby settlements.
    - No significant impacts on physical, ecology, and social aspects are anticipated from the design of the Project.
    - The Project will not involve private land acquisition as it will be constructed on land leased or purchased from the Government of Balochistan.
    - No impacts are anticipated from the pipeline leakages because the design of the pipeline incorporates protective measures.
    - No impacts are anticipated from the extraction of water to meet the water requirements of the Early Works activities. The proposed Project will not utilize the community's water resources; rather, the water will be sourced from the Fan Sediments.
- **Early Works Phase Impacts:**
    - The Early Works Phase impacts were assessed for the physical, ecological, and socioeconomic environments.
    - For impacts relating to air quality, noise levels, traffic volume and GHG emissions, the initial and residual ratings will remain same considering the negligible impact and low significance. Good Practice Measures will be adopted during the Early Works for such impacts.
    - No impacts on ecological environment are expected to occur on any species of conservation concern or sensitive environments.
    - The proposed Project is expected to result in positive socioeconomic impacts that will benefit the local community.

Based on the comprehensive analysis conducted as part of this ESIA, it can be concluded that the proposed Early Works activities are expected to have minimal adverse impacts on the environment and local communities. The design-related impacts, as well as those specific to the Early Works phase, have been thoroughly assessed, and appropriate measures have been recommended to mitigate any potential negative effects. It is therefore concluded that if the field activities, including the implementation of the mitigation and monitoring measures, are carried out as described in **Section 8**, *Environmental and Social Management Plan*, the anticipated impacts of the Project on the environment will be well within acceptable limits.

The proposed Project offers significant socioeconomic opportunities by creating jobs, stimulating local business development, and enhancing infrastructure. Through skill development and capacity building, it contributes to the long-term human capital growth of the region. Moreover, initiatives undertaken by the RDMC to support the socioeconomic conditions of the Project Area as part of its Community Development Program including establishing educational facilities, healthcare centers, water wells, and other community development projects, further contribute to the overall positive impact of the Project.

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REV	Date	Reason For Issue	Prepared By	Checked By (Discipline Lead)	Approved By (Functional Manager)
	2024-02-23	Review	Sadia Asghar	Vaqar Zakaria	Barbara Wessels

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Appendix A
Balochistan Environmental Protection Act (BEPA) 2012

BALOCHISTAN PROVINCIAL ASSEMBLY SECRETARIAT

NOTIFICATION.

Dated Quetta, the 15th January, 2013.

No. PAB/Legis: V (9)/ 2013. The Balochistan Environment protection Bill, 2012 Bill No.9 of 2012 having been passed by the Provincial Assembly of Balochistan on 24th December, 2012 and assented to by the Governor, Balochistan on **9th January, 2013** is hereby published as an Act of the Provincial Assembly of Balochistan.

THE BALOCHISTAN ENVIRONMENT PROTECTION ACT 2012,

ACT NO. VIII OF 2012.

(First published after having received the assent of the governor of Balochistan in the Balochistan Gazette (Extra Ordinary) dated the 9th January, 2013.

AN

ACT

to provide for the protection, conservation, rehabilitation and improvement of the environment, for the prevention and control of pollution, and promotion of sustainable development

Preamble

Whereas, it is expedient to provide for the protection, conservation, rehabilitation and improvement of the environment, prevention and control of pollution, promotion of sustainable development, and for matters connected therewith and incidental thereto;

Short title, extent and commencement

1. It is enacted as follows:-

(1) *This Act shall be called the Balochistan Environmental Protection Act, 2012.*

(2) *It extends to the whole Province of Balochistan except Tribal Areas.*

(3) It shall come into force at once.

Definitions

2. In this Act, unless there is anything repugnant in the subject or context,

(a) adverse environmental effect" means impairment of, or damage to, the environment and includes—

(i) human health and property or biodiversity, coast, beaches and ecosystem;

(ii) pollution; and

(iii) any adverse environmental effect on Land, Air and Water;

(b) "Agricultural waste" means waste from farm and agricultural Activities including poultry, cattle farming, animal husbandry residues from the use of fertilizers, pesticides and other farm. chemicals;

(c) "Air pollutant" means any substance that causes pollution of air and includes soot, smoke, dust particles, odour, light, electro-magnetic, radiation, heat, fumes, combustion exhaust, exhaust gases, noxious gases, hazardous substances and radioActive substances;

(d) *"Alien species" means a species that does not occur naturally in Balochistan.*

(e) *"Balochistan coastline or coastal zone" means the territorial jurisdiction of the coastline of the Province of Balochistan.*

(f) *"Best prActicable environmental option" means the best method for preventing or minimizing adverse effects on the environment, having regard to, among other things:*
(i) the nature of the discharge and the sensitivity of the receiving environment to adverse effects;
(ii) the financial implications, and the effect on the environment, of that option when compared with other options; and
(iii) the current state of technical knowledge and the likelihood that the option can be successfully applied.

(g) "Biodiversity" or "biological diversity" means the variability among living organisms from all sources, including inter alia terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, including diversity within species, between species and of ecosystems;

(h) *"Clinical waste" means any waste produced by hospitals, clinics, nursing homes, doctor's offices, medical laboratories, medical research facilities and veterinarians which is infectious or potentially infectious.*

(i) "Council" means the Balochistan Environmental Protection Council established under section 3;

(j) "Discharge" includes spilling, leaking, pumping, depositing, seeping, releasing, flowing out, pouring, emitting, emptying or dumping;

(k) "Ecosystem" means a dynamic complex of plant, animal and micro-organism communities and their non- living environment interActing as a functional unit;

(l) "Effluent" means any material in solid, liquid or gaseous form or combination thereof being discharged from industrial Activity or any other source and includes a slurry, suspension or vapor;

(m) "Electronic waste" means discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets, Cathode ray tubes (CRT) and refrigerator, VCRs, stereos, copiers, and fax machines. It also includes used electronics which are destined for reuse, resale, salvage, recycling, or disposal and electronic products nearing the end of their "useful life."

(n) "Emission standards" means the permissible standards established by the Provincial Agency for emission of air pollutants and noise and for discharge of effluent and waste;

(o) "Endemic and indigenous species" means a species which occurs naturally in the wild only in Balochistan, or a species which only breeds in the wild in Balochistan.

(p) "Environment" means—

(i) air, water and land;

(ii) all layers of the atmosphere;

(iii) all organic and inorganic matter and living organisms;

(iv) the ecosystem and ecological relationships;

(v) buildings, structures, roads, facilities and works;

(vi) all social and economic conditions affecting community life; and

(vii) the inter-relationships between any of the fActors specified in sub-clauses (i) to (vi);

(q) "Environmental impAct assessment" means an environmental study comprising collection of data, prediction of qualitative and quantitative impActs, comparison of alternatives, evaluation of preventive, mitigation and compensatory measures, formulation of environmental management and training plans and monitoring arrangements, and framing of recommendations and such other components as may be prescribed;

(r) "Environmental Magistrate" means the Magistrate of the First Class appointed under Section 32 ;

(s) "Environmental Tribunal" means the Balochistan Environmental Protection Tribunal constituted under section 28;

(t) "Exclusive Economic Zone" shall have the same meaning as in the Territorial Waters and Maritime Zones Act, 1976 (LXXXII of 1976);

(u) "FActory" means any premises in which industrial Activity is being undertaken;

(v) "Genetic Resource" means any material of plant, animal, microbial or other origin containing functional units of heredity of Actual or potential value.

(w)"Government" means the Government of Balochistan.

(x) "Government Agency" includes—

(i) a department, attached department, bureau, section, commission, board, office or unit of the Provincial Government;

(ii) a developmental or a local authority, company or corporation established or controlled by the Provincial Government; and

(iii) the Balochistan Environmental Protection Agency. ; and

(iv) any other body defined and listed in the Rules of Business of the Provincial Government.

(y) "Handling", in relation to any substance, means the manufActure, processing, treatment, package, storage, transportation, collection, destruction, conversion, offering for sale, transfer or the like of such substance;

(z) "Hazardous substance" means—

(i) a substance or mixture of substances, other than a pesticide as defined in the Agricultural Pesticides Ordinance, 1971 (II of 1971), which, by reason of its chemical Activity or toxic, explosive, flammable, corrosive, radioActive or other charActeristics, causes, or is likely to cause, directly or in combination with other matters an adverse environmental effect; and

(ii) any substance which may be prescribed as a hazardous substance;

(aa) "Hazardous waste" means waste which is or which contains a hazardous substance or which may be prescribed as hazardous waste and includes hospital waste and nuclear waste;

(bb) "Historic waters" means such limits of the waters adjacent to the land territory of Pakistan as may be specified by notification under section 7 of the Territorial Waters and Maritime Zones Act, 1976 (LXXXII of 1976);

(cc) "Hospital waste" includes waste medical supplies and materials of all kinds, and waste blood, tissue, organs and other parts of the human and animal bodies, from hospitals, clinics and laboratories;

(dd) "Industrial Activity" means any operation or process for manufActuring, making, formulating, synthesizing, altering, repairing, ornamenting, finishing, packing or otherwise treating any article or substance with a view to its use, sale, transport, delivery or disposal, or for mining, for oil and gas exploration and development, or for pumping water or sewage, or for generating, transforming or transmitting power or for any other industrial or commercial purpose;

(ee) "Industrial waste" means waste resulting from an industrial Activity;

(ff) "Initial Environmental Examination" means a preliminary environmental review of the reasonably foreseeable qualitative and quantitative impActs on the environment of a proposed project to determine whether it is likely to cause an adverse environmental effect for requiring preparation of an environmental impAct assessment;

(gg) "Integrated pollution control" means the holistic system aimed at pollution prevention and minimization at source, managing the impAct of pollution and waste on the receiving environment and remediation of damaged and polluted environments.

(hh) "Living modified organism" means any living organism that possesses a novel combination of genetic material obtained through the use of modern technology.

(ii) "local authority" means regional or district set up of EPA or any Agency designated by the Provincial Government, by notification in the official Gazette, to be a local authority for the purposes of this Act;

(jj) "Local council" means a local council constituted or established under a law relating to local Government;

(kk) "Motor vehicle" means any mechanically propelled vehicle adapted for use upon land whether its power of propulsion is transmitted thereto from an external or internal source, and includes a chassis to which a body has not been attached, and a trailer. but does not include a vehicle running upon fixed rails;

(ll) "Municipal waste" includes sewage, refuse, garbage, waste from abattoirs, sludge and human excreta and the like;

(mm) "Environmental Quality Standards" means standards established by the Federal/Provincial Agencies under clause (e) of sub-section (1) of section 6 and approved by the Council under clause (c) of sub -

section (1) of section 4;

(nn) "Noise" means the intensity, duration and charActer of sounds from all sources, and includes vibration;

(oo) "Nuclear waste" means waste from any nuclear reActor or nuclear plant or other nuclear energy system, whether or not such waste is radioActive;

(pp) "Person" means any natural person or legal entity and includes an individual, firm, association, partnership, society, group, company, corporation, co-operative society, Government Agency, non-governmental organization, community-based organization, village organization, local council or local authority and, in the case of a vessel, the master or other person having for the time being the charge or control of the vessel;

(qq) "Pollution" means the contamination of air, land or water by the discharge or emission of effluent or wastes or air pollutants or noise or other matter which either directly or indirectly or in combination with other discharges or substances alters unfavorably the chemical, physical, biological, radiation, thermal or radiological or aesthetic properties of the air, land or water or which may, or is likely to make the air, land or water unclean, noxious or impure or injurious, disagreeable or detrimental to the health, safety, welfare or property of persons or harmful to biodiversity;

(rr) "Prescribed" means prescribed by rules made under this Act;

(ss) "Project" means any Activity, plan, scheme, proposal or undertaking involving any change in the environment and includes—

(i) construction or use of buildings or other works;

(ii) construction or use of roads or other transport systems;

(iii) construction or operation of fActories or other installations;

(iv) mineral prospecting, mining, quarrying, stone-crushing, drilling and the like;

(v) any change of land use or water use; and

(vi) alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems, fActories or other installations;

(tt) "Protection of environment" means the qualitative and quantitative improvement of the different components of the environment and prevention of the deterioration of qualitative and quantitative standards;

(uu) "Proponent" means the person who proposes or intends to undertake a project;

(vv)"Provincial Agency" means the Balochistan Environmental Protection Agency established under section 5, or any Government Agency, local council or local authority exercising the powers and functions of the Provincial Agency;

(ww) "Rules &Regulations" means rules and regulation made under this Act;

(xx) "Sewage" means liquid or semi-solid wastes and sludge from sanitary conveniences, kitchens, laundries, washing and similar Activities and from any sewerage system or sewage disposal works;

(yy) "Ship breaking" means breaking up of various types of ship for recycling.

(zz) "Standards" means qualitative and quantitative standards for discharge of effluent and wastes and for emission of air pollutants and noise either for general applicability or for a particular area, or from a particular production process, or for a particular product, and includes the Environmental Quality Standards, emission standards and other standards established under this Act and the rules and regulations;

(aaa) "Strategic Environmental Assessment" Strategic environmental assessment (SEA) is a system of incorporating environmental considerations into policies, plans, programmes and strategies. It is sometimes referred to as strategic environmental impAct assessment.

(bbb) "Sustainable Development" means development that meets the needs of the present generation without compromising the ability of future generations to meet their needs;

(ccc) "Sustainable Management" means management of the use of natural resources to provide for the health, safety and social, cultural and economic well-being of people and communities taking into account the following:

(i) safeguarding the life-supporting capacity of natural resources and ecosystems;

(ii) ensuring the maintenance of the life-supporting capacity and quality of natural resources and ecosystems to meet the reasonably foreseeable needs of future generations;

(iii) avoiding the creation of adverse effects and, where adverse effects cannot be avoided, mitigates and remedies adverse effects.

(ddd) *"Territorial waters" shall have the same meaning as in the Territorial Waters and Maritime Zones Act, I 976 (LXXXII of 1976);*

(eee) "Vessel" includes anything made for the conveyance by water of human beings or of goods; and

(fff) "Waste" means any substance or object which has been, is being or is intended to be, discarded or disposed of, and includes liquid waste, solid waste, waste gases, suspended waste, industrial waste, agricultural waste, nuclear waste, municipal waste, hospital waste, used polyethylene bags and residues from the incineration of all types of waste.

(ggg) "Water resource" includes surface water, an aquifer or ground water , a river or spring, a natural channel in which water flows regularly or intermittently, and a wetland, lake or dam into which, or from which, water flows.

Establishment of the Balochistan Environmental Protection Council.—

3. (1) The Provincial Government shall, by notification in the official Gazette, establish a Council to be known as the Balochistan Environmental Protection Council consisting of—

(a) Chief Minister or such other person as the Chief Chairperson Minister may nominate in this behalf.

(b) Minister for Environment Vice chairperson

(c) Chief Secretary Balochistan Member

(d) Secretary Environment Member/Secretary

(e) Secretary Finance Member

(f) Secretary Industries — Member

(g) Secretary Agriculture — Member

(h) Secretary Forest — Member

(i) Secretary P&D — Member

(j) Secretary S&GAD — Member

(k) Director General EPA — Member

(l) Such other persons not exceeding six (6) as the Provincial Government may appoint, with the following representation:

One from the Balochistan Chamber of Commerce & Industries and one from the Balochistan Chamber of Agriculture, Two Environment experts/Scientist, One Educationist and One from Non Governmental Organization.

(2) The Members of the Council, other than ex-officio members, shall be appointed in accordance with the prescribed procedure and shall hold office for a term of two years.

(3) The Council may constitute committees of its members and entrust them with such functions as it may deem fit, and the recommendations of the committees shall be submitted to the Council for approval. The council or any of such committee may seek assistance from any Government Department or expert in the relevant environmental field in performance of its functions.

Functions and powers of the Council.—

4. (1) The Council shall:-

(a) co-ordinate and supervise enforcement of the provisions of this Act; and

(b) approve comprehensive environmental policies and ensure their implementation within the framework of a National /Balochistan conservation strategy as may be approved by the Federal/Provincial Government from time to time;

(c) approve the Environmental Quality Standards;

(d) provide guidelines for the protection and conservation of species, habitats, and biodiversity in general, and for the conservation of renewable and non-renewable resources.

(e) co-ordinate integration of the principles and concerns of sustainable development into development plans and policies;

(f) The Council shall frame its own rules of procedure.

(g) The Council shall hold meetings, as and when necessary, but not less than two meetings, shall be held in a year.

(2) The Council may direct the Provincial Agency or any Government Agency to prepare, submit or implement projects for the protection, conservation, rehabilitation and improvement of the environment and the sustainable development of resources or to undertake research in any aspect of environment.

Establishment of the Balochistan Environmental Protection Agency.

5. (1) The Government of Balochistan shall by a notification in the official Gazette established Balochistan Environmental Protection Agency to exercise the powers and perform the functions assigned to it under this Act and the rules and regulations made there under.

(2) The Balochistan Environmental Protection Agency shall be headed by a Director-General who shall be appointed by the Government of Balochistan on such terms and conditions as it may determine.

(3) The Balochistan Environmental Protection Agency shall have such administrative, technical and legal staff, as the Government of Balochistan may specify, to be appointed in accordance with Balochistan Civil Servant Act 1974.

(4) The powers and functions of the Balochistan Environmental Protection Agency shall be exercised and performed by the Director-General.

(5) The Director-General may, by general or special order, delegate any of the powers and functions to staff appointed under sub-section (3).

(6) For assisting the Balochistan Environmental Protection Agency in the discharge of its functions the Government of Balochistan shall establish Advisory Committees for various sectors and appoint as members thereof representatives of the relevant sector, educational institutions and non- governmental organizations.

Functions of the Balochistan Environmental Protection Agency

6. (1) The Balochistan Environmental Protection Agency shall—

(a) administer and implement this Act and the rules and regulations made; thereunder;

(b) prepare, in co-ordination with the relevant Government Agency and in consultation with the concerned sectors Advisory Committees, environmental policies for approval by the Council;

(c) take all necessary measures for the implementation of the national environmental policies approved by the Council;

(d) prepare and publish an Annual Environment Report on the state of the environment;

(e) establish standards for the quality of the ambient air, water and land, by notification in the official Gazette in consultation with the other relevant Government Departments/ Agencies.

(f) Revise the Environmental Quality Standards with approval of the Council:

Provided that

(i) before seeking approval of the Council, the Balochistan Environmental Protection Agency shall publish the proposed Environmental Quality Standards for public opinion in accordance with the prescribed procedure; and

(ii) different standards for discharge or emission from different sources and for different areas and conditions may be specified; where standards are less stringent than the Environmental Quality Standards prior approval of the Council shall be obtained;

(iii) certain areas, with the approval of the Council, may exclude from carrying out specific Activities, projects from the application of such standards;

(g) co-ordinate environmental policies and programmes;

(h) establish systems and procedures for surveys, monitoring, measurement, examination, investigation, research, inspection and audit to prevent and control pollution, and to estimate the costs of cleaning up pollution and rehabilitating the environment in various sectors;

(i) take measures to promote research and the development of science and technology which may contribute to the protection of the environment, and sustainable development;

(j) certify one or more laboratories as approved laboratories for conducting tests and analysis and one or more research institutes as environmental research institutes for conducting research and investigation for the purposes of this Act.

(k) initiate legislation in various sectors of the environment;

(l) render advice and assistance in environmental matters including such information and data available with it as may be required for carrying out the purposes of this Act:

Provided that the disclosure of such information shall be subject to the restrictions contained in the proviso to sub-section (3) of section 15;

(m) assist the local councils, local authorities, Government Agencies and other persons to implement schemes for the proper disposal of wastes so as to ensure compliance with the standards established by it;

(n) provide information and guidance to the public on environmental matters;

(o) recommend environmental courses, topics, literature and books for incorporation in the curricula and syllabi of educational institutions;

(p) promote public education and awareness of environmental issues through mass media and other means including seminars and workshops;

(q) specify safeguards for the prevention of accidents and disasters which may cause pollution, collaborate with the concerned person in the preparation of contingency plans for control of such accidents and disasters, and co-ordinate implementation of such plans;

(r) encourage the formation and working of non-governmental organizations, community organizations and village organizations to prevent and control pollution and promote sustainable development;

(s) perform any function which the Council may assign to it.

(2) The Balochistan Environmental Protection Agency may—

(a) undertake inquiries or investigation into environmental issues, either of its own accord or upon complaint from any person or organization;

(b) request any person to furnish any information or data relevant to its functions;

(c) initiate with the approval of the ***Provincial/Federal Government,*** requests for foreign assistance in support of the purposes of this Act and enter into arrangements with foreign agencies or organizations for the exchange of material or information and participate in international seminars or meetings;

(d) recommend to the Government of Balochistan the adoption of financial and fiscal programmes, schemes or measures for achieving environmental objectives and goals and the purposes of this Act, including—

(i) incentives, prizes awards, subsidies, tax exemptions, rebates and depreciation allowances; and

(ii) taxes, duties and other levies;

(e) establish and maintain laboratories to help in the performance of its functions under this Act and to conduct research in various aspects of the environment and provide or arrange necessary assistance for establishment of similar laboratories in the private sector;

(f) provide or arrange, in accordance with such procedure as may be prescribed, financial assistance for projects designed to facilitate the discharge of its functions.

Powers of the Balochistan Environmental Protection Agency

7. Subject to the provisions of this Act, *the Balochistan Environmental Protection Agency may*

(a) lease, purchase, acquire property both moveable and immovable;

(b) fix and realize fees, rates and charges for rendering any service or providing any facility, information or data under this Act or the rules and regulations;

(c) enter into contrActs, execute instruments subject to approval of the Provincial Government, necessary for proper management and conduct of its business made thereunder;

(d) subject to approval of the Provincial Government appoint in accordance with prescribed procedures such experts and consultants as it considers necessary for the efficient performance of its functions on appropriate terms and conditions;

(e) summon and enforce the attendance of any person and require him to supply any information or document needed for the conduct of any enquiry or investigation into any environmental issue;

(f) The Director General Balochistan EPA or any other Regional officer specifically authorized in this behalf by the Director

General shall have the power to impose fine/administrative penalty up to rupees one hundred thousand from case to case basis.

(i) the fine/administrative penalty shall be recovered as per land revenue Act.

(ii) the fine/administrative penalty initially or for an interim period shall be placed with the Balochistan EPA till the decision of the Environmental Tribunal or Magistrate; and

(iii) the fine/administrative penalty after the final decision shall be deposited in the public exchequer.

(g) enter and inspect and under the authority of a search warrant issued by the Environmental Court or Environmental Magistrate, search at any reasonable time, any land, building, premises, vehicle or vessel or other place where or in which. there are reasonable grounds to believe that an offence under this Act has been, or is being, committed;

(i) Subject to the provisions of this Act, any person generally or specifically authorized in this behalf by the Director General shall be entitled to enter, at all reasonable times, with such assistance as he considers necessary, any building or place for the following purposes, namely:-

a) to perform duties conferred on him under this Act or rules;

b) to inspect any Activity in such building or place in accordance with this Act, the rules or any notice, order or direction issued thereunder;

c) to examine or test any equipment, industrial plant, record, register or any other important matter relating thereto;

d) to conduct a search of any building or place which the said person has reason to believe to have been the place of occurrence of any offence in contravention of any notice, order or direction issued under this Act or the rules;

e) to seize/close any equipment, industrial plant, record, register, document or other matter which may serve as evidence of the commission of any offence punishable under this Act or the rules.

(ii) The provisions of the Code of Criminal Procedure shall be applicable in respect of any search or seizure under this Act.

(a) take samples of any materials, products, articles or substances or of the effluent, wastes or air pollutants being discharged or emitted or of air, water or land in the vicinity of the discharge or emission;

(b) arrange for test and analysis of the samples at a certified laboratory;

(i) Every person authorized in this behalf by the Director General may, in such manner as may be prescribed by rules, collect from any fActory, premises or place samples of air, water,

soil or of any other substance for the purpose of analysis.

(ii) The results of the analysis of samples collected under clause (i) shall not be admissible in evidence in any legal proceeding unless the provisions of the clauses (iii) and (iv) have been complied with.

(iii) Subject to the provisions of sub-section (4), the officer collecting a sample under clause (i) shall-

(a) serve notice on the owner or proponent or agent of the said place, in such manner as may be prescribed by rules, of his intention to collect such sample;

(b) collect the sample in the presence of the said occupier or agent;

(c) put the sample into a container and affix on it a seal bearing the signatures of himself and of the occupier or agent;

(d) prepare a report of the sample collected and sign it himself and take the signature of the occupier or agent;

(e) send without any delay, the said container to the laboratory specified by the Director General EPA.

(iv) Where a sample is collected under clause (i) and a notice is served by the collecting officer under sub clause a) of clause (iii), the collecting officer shall, if the occupier or agent willfully absents himself at the time of the collection of the sample or, though being present, refuses to sign the sample or report, in the presence of two witnesses, give his signature and attest and seal it and shall send it without any delay to the laboratory specified by the Director General, mentioning that the occupier or agent had not been present or, as the case may be, refused to give his signature.

(i) confiscate any article used in the commission of the offence where the offender is not known or cannot be found within a reasonable time:

Provided that the power under clauses (f), (h), (I) and (j) shall be exercised in accordance with the provisions of the Code of Criminal Procedure, 1898 (Act V of 1898). or the rules made under this Act and under the direction of the Environmental Tribunal or Environmental Magistrate; and

(j) establish an Environmental Co-ordination Committee comprising the Director-General as its chairman and the heads of relevant Government Agencies and such other persons as the Government of Balochistan may appoint as its members to exercise such powers and perform such functions as may be delegated or assigned to it by the Government of Balochistan for carrying out the purposes of this Act and for ensuring inter departmental co-ordination in environmental policies.

Establishment, powers and functions of the Regional or District Environmental Protection Agencies.—

8. (1) Government of Balochistan shall, by notification in the official Gazette, establish the Regional or District Environmental Protection Agency, to exercise such powers and perform such functions as may be delegated to it by the Government of Balochistan under sub-section (2) of section 34.

(2) The Regional or District Environmental Protection Agency shall be headed by an officer at least of the rank of regional Director or Deputy Director who shall be appointed by the Provincial Government on such terms and conditions as prescribed in the Balochistan Civil Servant Act 1974.

(3) The Regional or District Environmental Protection Agency shall have such administrative, technical and legal staff as the Government of Balochistan may specify, to be appointed in accordance with the Balochistan Civil Servants Appointment, Promotion and Transfers Rules 2009 such procedure as may be prescribed.

(4) The powers and functions of the Regional or District Environmental Protection Agency shall be exercised and performed by an Officer of the rank of regional Director or Deputy Director appointed as head.

(4) The Director General may, by general or special order, delegate any of the powers and functions to staff appointed under sub-section (3).

Establishment of the Balochistan Sustainable Development Funds.—

9. (1) There shall be established in the Province a Balochistan Sustainable Development Fund.

(2) The Balochistan Sustainable Development Fund shall be derived from the following sources, namely:—

(a) grants made or loans advanced by the Federal Government or the Provincial Government;

(b) aid and assistance, grants, advances, donations and other non-obligatory funds received from foreign governments, national or international agencies, and non-governmental organizations; and

(c) contributions from private organizations and other persons.

(3) The Balochistan Sustainable Development Fund shall be utilized in accordance with such procedure as may be prescribed for—

(a) providing financial assistance to the projects in the public/private sector designed for the protection, conservation, rehabilitation and improvement of the environment, the prevention and control of pollution, the sustainable development of resources and for research in any aspect of environment; and

(b) any other purpose which in the opinion of the Board shall help to achieve environmental objectives and the purposes of this Act.

Management of the Balochistan Sustainable Development Fund.—

10. (1) The Balochistan Sustainable Development Fund shall be managed by a Board known as the Sustainable Development Fund Board consisting of:-

(i) Secretary Environment Department — Chairperson

(ii) Secretary Industries Department — Member

(iii) Secretary Social welfare Department — Member

(iv) Secretary Finance Department — Member

(v) Secretary Forest Department — Member

(vi) Secretary Agriculture Department — Member

(vii) such non-official persons not exceeding six (6) as the Members Government of Balochistan may appoint including two (2)representatives of the Balochistan Chamber of Commerce and Industry, two (2) representatives of the Balochistan Chamber of Agriculture and two (2) representative of leading non-governmental organizations/donors.

(viii) Director General, Balochistan Environmental Protection Agency — Member/Secretary

(2) the Board shall have the power to—

(a) sanction financial assistance for eligible projects; as specified in section 9(3) of this Act

(b) invest moneys held in the Balochistan Sustainable Development Fund in such profit - bearing Government bonds, savings schemes and securities as it may deem suitable; and

(3) The Board shall constitute committees of its members to undertake regular monitoring of projects financed from the Balochistan Sustainable Development Fund and to submit progress reports to the Board which shall publish an Annual Report incorporating its annual audited accounts and performance evaluation based on the progress reports.

(4) Audit of the fund shall be conducted on annual basis.

Inter-Provincial Environmental issues:-

11. (1) The project falling within the geographical jurisdiction of two or more Provinces, the IEE or EIA may be submitted by the proponent to each Provincial Environmental Agencies for review and approval.

(2) In case of any dispute or concerns the matter shall be settled through mutual consultation of the Provinces to avoid any inconveniences or future litigation.

(3) The concerned Provinces may constitute a joint technical or review committee including a representative of the concerned Federal Ministry dealing with Environment and coordination.

Multilateral Environmental Agreements:-

12. (1) The obligation of the International Conventions, Treaties and Protocols shall be observed as before devolution of the subject of Environment to the Province on Environment or climate change. In case of any international/ bilateral cooperation, the matter shall be proceeded with consultation with the concerned

Federal Ministries.

(2) The Government of Balochistan/ Environmental Protection Agency shall extend support to those obligation of the International Conventions, Treaties and Protocols where adequate assistance provided by the Federal Government.

Strategic Environment Assessment (SEA):-

13. (1) This section regulates the conditions, methods and procedure according to which the assessment of impAct of certain plans and programmes on the environment (hereinafter referred to as: strategic assessment) shall be carried out in order to provide for the environmental protection and improvement of sustainable development through integration of basic principles of environmental protection into the procedure of preparation and adoption of plans and programmes.

(2) The Government at all levels of administration and in every sector shall incorporate environmental considerations into policies, plans, programmes and strategies.

Prohibition of certain discharges or emissions and potential harmful items or materials .—

14. (1) Subject to the provisions of this Act and the rules and regulations no person shall discharge or emit or allow the discharge or emission of any effluent or waste or air pollutant or noise in an amount, concentration or level or is likely to cause, a significant adverse effect on the environment or human health which is in excess of the Environmental Quality Standards or, where applicable, the standards established under sub -clause (ii) of clause (f) of section 6.

(2) The Government of Balochistan shall not allow any imported or locally made commodities or items or materials or equipment or instruments or automobile or pesticides etc, into its provincial jurisdiction which may have any potential of causing Environmental problems.

(3) No person or company related to public and private sector shall introduce any of the imported or locally made items or materials or equipment or instruments or automobile or pesticides etc as per subsection (2) for any purpose unless it has filed an application to the Balochistan Environmental Protection Agency, as the case may be, and has obtained approval from the Government Agency in respect thereof.

(4) The Government of Balochistan may levy a pollution charge on any person who contravenes or fails to comply with the provisions of sub-section (1), to be calculated at such rate, and collected in accordance with such procedure as may be prescribed.

(5) Any person who pays the pollution charge levied under sub-section (2) shall not be charged with an offence with respect to that contravention or failure.

(6) The approved license in terms of section 15 of this Act does not affect the applicant's duty to obtain any other authorization required in order to undertake the Activity or implement the project concerned, whether in terms of this Act or any other legislation

(7) A person /firm causing discharge of pollutants shall take all reasonable measures to ensure that the best prActicable environmental option is adopted in relation to the discharge of emission and conservation of the environment.

Initial Environmental Examination and Environmental ImpAct Assessment.—

15. (1) No proponent of a project of public and private sector shall commence construction or operation unless he has filed an Initial Environmental Examination with the Government Agency designated by Balochistan Environmental Protection Agency, as the case may be, or, where the project is likely to cause an adverse

environmental effects an environmental impAct assessment, and has obtained from the Government Agency approval in respect thereof.

(2) The Government Agency shall subject to standards fixed by the Balochistan Environmental Protection Agency—

(a) review the initial environmental examination and accord its approval, or require submission of an environmental impAct assessme by the proponent; or

(b) review the environmental impAct assessment and accord its approval subject to such conditions as it may deem fit to impose, require that the environmental impAct assessment be re-submitted aft such modifications as may be stipulated or reject the project as being contrary to environmental objectives.

(3) Every review of an environmental impAct assessment shall be carried out with public participation and no information will be disclosed during the course of such public participation which relates to—

(i) trade, manufActuring or business Activities, processes or techniques of a proprietary nature, or financial, commercial, scientific or technical matters which the proponent has requested should remain confidential, unless for reasons to be recorded in writing, the Director General of the Balochistan Environmental Protection Agency is of the opinion that the request for confidentiality is not well- founded or the public interest in the disclosure outweighs the possible prejudice to the competitive position of the project or its proponent; or

(ii) international relations, national security or maintenance of law and order, except with the consent of the Government of Balochistan; or

(iii) matters covered by legal professional privilege.

(4) The Government Agency shall communicate its approval or otherwise within a period of four months from the date the initial environmental examination or environmental impAct assessment is filed complete in all respects in accordance with the prescribed procedure, failing which the initial environmental examination or, as the case may be, the environmental impAct assessment shall be deemed to have been approved, to the extent to which it does not contravene the provisions of this Act and the rules and regulations.

(5) Subject to sub-section (4) the appropriate Government may in a particular case extend the aforementioned period of four months if the nature of the project so warrants.

(6) The provisions of sub-sections (1), (2), (3), (4) and (5) shall apply to such categories of projects and in such manner as may be prescribed.

(7) The Government Agency shall maintain separate registers for initial environmental examination and environmental impAct assessment projects, which shall contain brief particulars of each project and a summary of decisions taken thereon, and which shall be open to inspection by the public at all reasonable hours and the disclosure of information in such registers shall be subject to the

restrictions specified in sub-section (3).

(8) No concession areas for any developmental Activities shall be awarded to any International/National groups or firms without consultation and concurrence of the Government of Balochistan/Environmental Protection Agency.

(9) The prospect licenses for mining, quarrying, crushing etc. shall only be awarded/ granted in compliance with the sub section (1), (2), (3), (4) and (5) .

(10) The cellular companies shall obtain environmental approval from the Balochistan EPA before installing Base Transceivers Station (BTS).

(11) BTS Stations should be required to undergo routine evaluation for Compliance. Whenever an application is submitted to the Balochistan EPA for construction or modification of a transmitting facility. EPA shall have the authority to take Action if a cellular base station antenna does not comply with the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Guidelines and recommendations of the report titled `Environmental and Health Related Effects of the Cellular Base Station Antennas' carried out by IT and Telecom Division, Ministry of Information Technology.

(12) No person or company related to public and private sector shall commence construction or operation unless the concerned building authority accord approval under the provisions of the in vogue Building Code.

(13) after fulfilling the sub section (12) an Action plan shall be submitted to the concerned municipal/town/union council to carry out the Activities for a specific time period as to provide the general public or road users an alternative corridor.

(14) the waste generated during the construction or maintenance or repair of any building shall be appropriately disposed of or transported or collected to a designated place allocated for the purpose like any land fill site to avoid public nuisance.

(15) the construction or repair Activities especially in the main city area shall be carried out in a manner to minimize the road congestion or blockage.

(16) the proponent of the project shall remit fifty thousand rupees as review fee of an Initial Environmental Examination (IEE) and one hundred thousand as review fee for Environmental ImpAct Assessment (EIA).

(17) the person or company in public or private sector intend to commence any scheme or project do not falling under schedule I and II of this Act shall remit twenty five thousand rupees as an Environmental approval fee to the Balochistan Environmental Protection Agency.

Prohibition of import of hazardous waste.—

16. No person shall import hazardous waste into Balochistan and its jurisdiction limits.

Handling of hazardous substances and License:-

17. (1) Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle or import any hazardous substance except—

(a) under a license issued by the Government of Balochistan and in such manner as may be prescribed; or

(b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party.

(2) Every owner or proponent of any land or premises on which hazardous waste is kept, treated or disposed of shall make a written application to the Balochistan Environmental Protection Agency for a hazardous waste management license, which shall at least include details of:

a) the chemical composition, nature and volume of the waste which is being, or will be, produced;

b) the industrial process, trade or Activity giving rise to the waste;

c) the way in which the applicant proposes to keep, treat or dispose of the hazardous waste, including storage and handling procedures;

d) the precautions which will be taken to avoid any adverse effects on the environment being caused by the hazardous waste.

(3). the Balochistan Environmental Protection Agency shall evaluate each application for a license under this Article in the following manner:

a) grant a hazardous waste management license, with or without conditions, if satisfied that the proposed method of keeping, treating and disposing of the hazardous waste will not cause any adverse effects; or

b) refuse to grant a license giving reasons for the refusal in writing to the applicant.

(4). the Balochistan Environmental Protection Agency would take a decision in regard to subsection 2 within thirty (30) days of the date of lodging of the application for a license.

(5) The license shall be granted for a reasonable period not exceeding five years. On expiry of the license for renewal same procedure shall be followed.

Electronic Wastes:-

18. (1) Every producer, distributer, collection centre, refurbisher, dismantler or recyclers shall store the electronic waste for a period not exceeding six months and shall maintain a record of collection, sale, transfer, storage and segregation of wastes and make these records available for inspection:

Provided that the Balochistan Environmental Protection Agency may extend the said period in following cases, namely:

(a) Dismantlers and Recyclers up to six months of their annual storage capacity of the owner; or

(b) Collection centers who do not have access to any registered dismantling or recycling facility; or

(c). the waste which needs to be specifically stored for development of a process for its recycling, reuse.

(2) Every producer, distributer, collection centre, refurbisher, dismantler or recyclers shall make arrangements for the environmentally sound management and disposal of electronic waste.

(3) the 'environmentally sound management of electronic waste' as "taking all steps required to ensure that electronic waste are managed in a manner which shall protect health and environment against any adverse effects, which may result from hazardous substance contained in such wastes."

(4) the provisions of this section shall apply to every producer, consumer and bulk consumer involved in manufActure, sale,

purchase and processing of electronic equipment or components.

(5) information dissemination on electronic waste and the environmentally sound management of electronic waste is also mandated from producers.

(6) to regulate the provisions of this section all the relevant international conventions, protocols and treaties collectively called as multilateral environmental agreements (MEAs) shall be applicable where Pakistan is signatory or ratified the MEAs.

(7) any person or company or unit who contravenes or fails to comply with the provisions of the above subsections shall be imposed penalty under section 25 of this Act.

General Prohibition in relation to Solid and Hospital Waste management and Waste Management License:-

19. (1) No person may collect, transport, sort, recover, store, dispose of or otherwise manage waste in a manner that results in a significant adverse effect.

(2) Every person who imports, produces, collects, recovers, transports, keeps, treats or disposes of waste shall take all reasonable measures to prevent a significant adverse effect on the environment from occurring.

(3) The owner or proponent of every premises upon which solid and hazardous hospital waste is produced shall ensure that all hazardous waste whether solid or hospital waste is separated from other waste, and is stored in separate containers pending disposal, in accordance with the requirements of the Balochistan Environmental Protection Agency as set out in regulations, published guidelines or license conditions.

(4) A person shall not dispose of solid and hazardous hospital waste in such a manner that it becomes litter or is likely to become litter.

(5) Unless in possession of a valid waste management license issued by the Balochistan Environmental Protection Agency, no person may construct, own or operate a landfill site, incinerator or other facility at which waste is permanently disposed of or is stored indefinitely.

(6). The Balochistan Environmental Protection Agency shall evaluate each application for a license and shall do the following:

a) grant a license if the Balochistan Environmental Protection Agency is satisfied that the applicant has sufficient expertise to undertake the Activity in question in accordance with the law and in a manner that will not have significant adverse effects; or

b) refuse to grant a license giving reasons for the refusal in writing to the applicant.

(7). The Balochistan Environmental Protection Agency shall reach a decision in regard to subsection 2 within thirty (30) days of the date of lodging of the application for a license with the Balochistan Environmental Protection Agency.

(8). If there are reasonable grounds to grant license, and those grounds are communicated to the license holder in writing, the Balochistan Environmental Protection Agency may amend, revoke or impose new conditions in an existing waste management license.

(9). The license granted under subsection (6) shall be subject to review if condition of license granted are not fulfilled.

Management of Water Resources:-

20. (1) All persons, for the purpose of protection, conservation, development, use, control and management of water resources, would take into account the following measures:

a) protecting aquatic and associated ecosystems and their biological diversity;

b) reducing and preventing pollution and degradation of water resources.

(2) When preparing water resource management plans, Departments and other relevant institutions shall at least take the following into account:

a) provisions for integrated watershed management;
b) regulation of sustainable abstrAction of groundwater;
c) regulation of the use of ground or surface water for agricultural, industrial, mining, and urban purposes;
d) measures to protect human health and ecosystems;
e) measures to protect wetlands and their associated ecosystems;
f) any other provision necessary for the sustainable use and management of water resources.

(3) An owner of land or a person who uses the land on which any Activity or process is performed or undertaken which causes or is likely to cause significant pollution of a water resource must take measures to prevent any such pollution.

Regulation of motor vehicles.

21. (1) Subject to the provisions of this Act, and the rules and regulations, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the Environmental Quality Standards, or where applicable the standards established under clause (e) of section 6 (1).

(2) For ensuring compliance with the standards mentioned in sub-section (1), the Balochistan Environmental Protection Agency may direct that any motor vehicle or class of vehicles shall install such pollution control devices or other equipment or use such fuels or undergo such maintenance or testing as may be prescribed.

(3) Where a direction has been issued by the Government Agency under subsection (2) in respect of any motor vehicles or class of motor vehicles, no person shall operate any such vehicle till such direction has been complied with.

(4) To regulate the provision of this Act a green squad comprising of representative of Traffic Police, Motor Vehicle Examiner, Excise & Taxation and EPA Balochistan shall be in place to monitor and inspect the automobiles running on the road as per the Environment Quality Standard.

(5) The inspection or monitoring shall be carried out at least once in a month wherein a mechanism be chalked out for issuance of warning tickets (red: Highly polluted, Blue: less polluted) on a prominent on the vehicle, as the case may be for specific period of time not exceeding 30 days to maintain the vehicle in order .

(6) Whoever contravenes or fails to comply with the provision of subsection (5) such vehicle should be made off road or punishable with fine at least twenty thousand rupees which may be extended to one hundred thousand rupees. In the case of continuing contravention or failure the vehicle shall be impounded.

Alien Species and Living Modified Organisms:-

22. (1) The import into Balochistan of alien species and of living modified organisms is prohibited without a permit issued by the relevant authority under any law enforce in Balochistan. The Balochistan Environmental Protection Agency in consultation with the Departments of Agriculture, Livestock and Animal Husbandry and Food shall monitor the matter.

(2) No permit for the introduction of an alien species or of a living modified organism shall be issued unless the environmental impAct indicates that there is a reasonable certainty that no harm

proposed introduction.

(3) Subsection 1 and 2 of this Section shall apply equally to introductions of alien species and living modified organisms into the Province of Balochistan and to introductions from one ecosystem to another within the province.

(4) The introduction of alien species and living modified organisms into protected areas shall not be allowed.

Coastal Zone:-

23. (1) Subject to the provisions of this Act the Activities or concentration or level of discharges of the following units established on onshore and offshore shall be monitored strictly to prevent the pollution and environmental degradation caused by the following multi-magnitude and multidisciplinary units.

a) Ports and shipping
b) Fisheries
c) Ship dismantling
d) Shipping Traffic (Oil Tankers & Vessels) & dredging.
e) Oil and gas mineral exploration.
f) Coastal power plants and Energy sector.
g) Oil refineries and Industries

(2) The ship breaking at Gaddani or anywhere else in the coastal belt/zone of this province shall be subject to fulfilling all the relevant obligations under the Basel Convention "on the Control of Trans-boundary Movements of Hazardous Waste and their Disposal", Rotterdam Convention "on the prior Informed Consent(PIC) Procedure for certain Hazardous Chemicals and Pesticides in International Trade" and other relevant Treaties/Protocols and provisions of this Act.

(3) During the process of ship breaking/dismantling the waste, hazardous waste or sludge or Polychlorinated biphenyls or asbestos etc, shall be disposed of in a manner to ensure Protection of Terrestrial and Marine environment.

(4) The Activities of ship breaking/dismantling Activities on shore or offshore within territorial limit of Balochistan shall be monitored at least biannually to ensure environmental protection and prevent degradation and pollution.

(5) The disposal of untreated sewage and domestic wastes and untreated disposal of industrial effluents into the sea is an offence any person or company or unit who contravenes or fails to comply with the provisions of this Act shall face to penalty under section 25.

Environmental protection order.

24. (1) Where the Balochistan Environmental Protection Agency is satisfied that the discharge or emission of any effluent, waste, air pollutant or noise, or the disposal of waste, or the handling of hazardous substances, or any other Act or omission is likely to occur, or is occurring, or has occurred, in violation of the provisions of this Act, rules or regulations or of the conditions of a license, and is likely to cause, or is causing or has caused an adverse environmental effect, the Balochistan Environmental Protection Agency may, after giving the person responsible for such discharge, emission, disposal, handling, Act or omission an opportunity of being heard, by order direct such person to take such measures that the Balochistan Environmental Protection Agency may consider necessary within such period as may be specified in the order.

(2) In particular and without prejudice to the generality of the foregoing power, such measures may include—

(a) immediate stoppage, preventing, lessening or controlling the discharge, emission, disposal, handling, Act or omission, or to minimize or remedy the adverse environmental effect;

(b) installation, replacement or alteration of any equipment or thing to eliminate, control or abate on a permanent or temporary basis, such discharge, emission, disposal, handling, Act or omission;

(c) Action to remove or otherwise dispose of the effluent, waste, air pollutant, noise, or hazardous substances; and

(d) Action to restore the environment to the condition existing prior to such discharge, disposal, handling, Act or omission, or as close to such condition as may be reasonable in the circumstances, to the satisfAction of the Balochistan Environmental Protection Agency.

(3) Where the person, to whom directions under sub-section (1) are given, does not comply therewith, the Balochistan Environmental Protection Agency may, in addition to the proceedings initiated against him under this Act, the rules and regulations, itself take or cause to be taken such measures specified in the order as it may deem necessary and may recover the reasonable costs of taking such measures from such person as arrears of land revenue.

Penalties

25. (1) Whoever contravenes or fails to comply with the provisions of sections 14, 15, 16, 18 or section 24 or any order issued there-under shall be punishable with fine which may extend to one million rupees, and in the case of a continuing contravention or failure, with an additional fine which may extend to one hundred thousand rupees for every day during which such contravention or failure continues:

Provided that if contravention of the provisions of section 14 also constitutes contravention of the provisions of section 21, such contravention shall be punishable under sub-section (2) only.

(2) Whoever contravenes or fails to comply with the provisions of section 17, 19, 21, 22 or 23 or any rule or regulation or conditions of any license, any order or direction, issued by the Council or the Balochistan Environmental Protection Agency, shall be punishable with fine which may extend to one hundred thousand rupees, and in case of continuing contravention or failure with an additional fine which extend to one thousand rupees for every day during which such contravention continues.

(3) Where an accused has been convicted of an offence under sub-sections (1) and (2), the Environmental Court and Environmental Magistrate, as the case may be, shall, in passing sentence, take into account the extent and duration of the contravention or failure constituting the offence and the attendant circumstances.

(4) Where an accused has been convicted of an offence under sub-section (1) and the Environmental Court is satisfied that as a result of the commission of the offence monetary benefits have accrued to the offender, the Environmental Court may order the offender to pay, in addition to the fines under sub-section (1), further additional fine commensurate with the amount of the monetary benefits.

(5) Where a person convicted under sub-sections (1) or sub-section (2) had been previously convicted for any contravention under this Act, the Environmental Court or, as the case may be, Environmental Magistrate may, in addition to the punishment awarded thereunder—

(a) endorse a copy of the order of conviction to the concerned trade or industrial association, if any, or the concerned Provincial Chamber of Commerce and Industry or the Federation of Pakistan Chambers of Commerce and Industry;

(b) sentence him to imprisonment for a term which may extend to two years;

(c) order the closure of the fActory;

(d) order confiscation of the fActory, machinery, and equipment, vehicle, material or substance, record or document or other object used or involved in contravention of the provisions of the Act:

Provided that for a period of three years from the date of commencement of this Act the sentence of imprisonment shall be passed only in respect of persons who have been previously convicted for more than once for any contravention of sections 14, 16, 17, 18,19 or 24 involving hazardous waste;

(e) order such person to restore the environment at his own cost, to the conditions existing prior to such contravention or as close to such conditions as may be reasonable in the circumstances to the satisfAction of the Balochistan Environmental Protection Agency; and

(f) order that such sum be paid to any person as compensation for any loss, bodily injury, damage to his health or property suffered by such contravention.

(6) The Director-General of the Balochistan Environmental Protection Agency or an officer generally or specially authorized by him in this behalf may, on the application of the accused compound an offence under this Act with the permission of the Environmental Tribunals or Environmental Magistrate in accordance with such procedure as may be prescribed.

(7) Where the Director-General of the Balochistan Environmental Protection Agency is of the opinion that a person has contravened any provision of Act he may, subject to the rules, by notice in writing to that person require him to pay to the Balochistan Environmental Protection Agency an administrative penalty in the amount set out in the notice for each day the contravention continues; and a person who pays an administrative penalty for a contravention shall not be charged under this Act with an offence in respect of such contravention.

(8) The provisions of sub-sections (6) and (7) shall not apply to a person who has been previously convicted of offence or who has compounded an offence under this Act who has paid an administrative penalty for a contravention of any provision of this Act.

Offences by bodies corporate

26. Where any contravention of this Act has been committed by a body corporate, and it is proved that such offence has been

committed with the consent or connivance of, or is attributed to any negligence on the part of, any director, partner, manager, secretary or other Officer of the body corporate, such director, partner, manager, secretary or other officer of the body corporate, shall be deemed guilty of such contravention along with the body corporate and shall be punished accordingly:

Provided that in the case of a company as defined under the Companies Ordinance, 1984 (XLVII of 1984), only the Chief Executive as defined in the said Ordinance shall be liable under this section.

Explanation.— For the purposes of this section, "body corporate" includes a firm, association of persons and a society registered under the Societies Registration Act, 1860 (XXI of 1860), or under the Co-operative Societies Act, 1925 (VII of 1925).

Offences by Government Agencies, local authorities or local councils.

27. Where any contravention of this Act has been committed by any Government Agency, local authority or local council, and it is proved that such contravention has been committed with the consent or connivance of, or is attributable to any negligence on the part of, the Head or any other officer of the Government Agency, local authority or local council, such Head or other officer shall also be deemed guilty of such contravention along with the Government Agency, local authority or local council and shall be liable to be proceeded against and punished accordingly.

Balochistan Environmental Tribunals.—

28. (1) The Government of Balochistan may, by notification in the official gazette establish Balochistan Environmental Protection Tribunals which shall exercise jurisdiction under this Act.

(2) The Balochistan Environmental Protection Tribunal shall consist of a Chairperson who is, or has been, or is qualified for appointment as, a judge of the High Court to be appointed after consultation with the Chief Justice of the High Court and two members to be appointed by the Government of Balochistan which at least one shall be a technical member with suitable professional qualifications and experience; in the environmental field as may be prescribed. For every sitting of the Balochistan Environmental Protection Tribunal the presence of the Chairperson and not less than one Member shall be necessary.

(3) A decision of Balochistan Environmental Protection Tribunal shall be expressed in terms of the opinion of the majority or if the case has been decided by the Chairperson and only one of the members and a there is a difference of opinion between them, the ;decision of the Balochistan Environmental Protection Tribunal shall be expressed in terms of the opinion of the Chairperson.

(4) Balochistan Environmental Protection Tribunal shall not, merely by reason of a change in its composition, or the absence of any member from any sitting, be bound to recall and rehear any witness who has given evidence, and may Act on the evidence already ;recorded by, or produced, before it.

(5) Balochistan Environmental Protection Tribunal may hold its sittings at such places within its territorial jurisdiction as the Chairperson may decide.

(6) No Act or proceeding of Balochistan Environmental Protection Tribunal shall be invalid by reason only of the existence

of a vacancy in, or defect in the constitution, of, the Balochistan Environmental Protection Tribunal.

(7) The terms and conditions of service of the Chairperson and members of the Balochistan Environmental Protection Tribunal shall be such as may be prescribed.

Jurisdiction and powers of Balochistan Environmental Tribunals.

29. (1) Balochistan Environmental Protection Tribunal shall exercise such powers and perform such functions as are, or may be, conferred upon or assigned to it by or under this Act or the rules and regulations made there under.

(2) All contravention punishable under sub-section (1) of section 25 shall exclusively be triable by Balochistan Environmental Protection Tribunal.

(3) Balochistan Environmental Protection Tribunal shall not take cognizance of any offence triable under sub-section (2) except on a complaint in writing by- -

(a) the Government Agency or local council; and

(b) any aggrieved person, who has given notice of not less than thirty days to the Provincial Agency concerned, of the alleged contravention and of his intention to make a complaint to the Environment Tribunal.

(4) In exercise of its criminal jurisdiction, the Balochistan Environmental Protection Tribunal shall have the same powers as are vested in Court of Session under the Code of Criminal Procedure, 1898 (Act V of 1898).

(5) In exercise of the appellate jurisdiction under section 22 the Balochistan Environmental Protection Tribunal shall have the same powers and shall follow the same procedure as an appellate court in the Code of Civil Procedure, 1908 (Act V of 1908).

(6) In all matters with respect to which no procedure has been provided for in this Act, the Balochistan Environmental Protection Tribunal shall follow the procedure laid down in the Code of Civil Procedure, 1908 (Act V of 1908).

(7) Balochistan Environmental Protection Tribunal may, on application filed by any officer duly authorized in this behalf by the Director-General of the Balochistan Environmental Protection Agency, issue bail able warrant for the arrest of any person against whom reasonable suspicion exist, of his having been involved in contravention punishable under sub-section (1) of Section 25:

Provided that such warrant shall be applied for, issued, and executed in accordance with the provisions of the Code of Criminal Procedure, 1898 (Act V of 1898):

Provided further that if the person arrested executes a bond with sufficient sureties in accordance with the endorsement on the warrant he shall be released from custody, failing which he shall be taken or sent without delay to the officer in-charge of the nearest police station.

(8) All proceedings before the Balochistan Environmental

Protection Tribunal shall be deemed to be judicial proceedings within the meaning of section 193 and 228 of the Pakistan Penal Code (Act XLV of 1860), and the Balochistan Environmental Protection Tribunal shall be deemed to be a court for the purpose of section 480 and 482 of the Code of Criminal Procedure, 1898 (Act V of 1898).

(9) No court other than Balochistan Environmental Protection Tribunal shall have or exercise any jurisdiction with respect to any matter to which the jurisdiction of Balochistan Environmental Protection Tribunal extends under this Act, the rules and regulations made thereunder.

(10) Where the Balochistan Environmental Protection Tribunal is satisfied that a complaint made to it under sub-section (3) is false and vexatious to the knowledge of the complainant, it may, by an order, direct the complainant to pay to the person complained against such compensatory costs which may extend to five hundred thousand rupees.

Appeals to the Environmental Tribunal.—

30. (1) Any person aggrieved by any order or direction of the Balochistan Environmental Protection Agency under any provision of this Act, and rules or regulations may prefer an appeal with the Balochistan Environmental Protection Tribunal within thirty days of the date of communication of the impugned order or direction to such person.

(2) An appeal to the Balochistan Environmental Protection Tribunal shall be in such form, contain such particulars and be accompanied by such fees as may be prescribed.

Appeals from orders of the Environmental Tribunal

31. (1) Any person aggrieved by any final order or by any sentence of the Balochistan Environmental Protection Tribunal passed under this Act may, within thirty days of communication of such order or sentence, prefer an appeal to the High Court.

(2) An appeal under sub-section (I) shall be heard by a Bench of not less than two Judges.

Jurisdiction of Environmental Magistrates.

32. (1) Notwithstanding anything contained in the Code of Criminal Procedure, 1898 (Act V of 1898), or any other law for the time being in force, but subject to the provisions of this Act, all contravention punishable under sub-section (2) of section 25 shall exclusively be trial-able by Environmental Magistrate especially empowered in this behalf under section 14 of the Code of Criminal Procedure, 185(Act No. V of 1898).

(2) An Environmental Magistrate shall be competent to impose any punishment specified in sub-sections (2) and (4) of section 25.

(3) An Environmental Magistrate shall not take cognizance of an offence trial able under sub-section (I) except on a complaint in writing by—

(a) the Balochistan Environmental Protection Agency, or Government Agency or a local council; and

(b) any aggrieved person.

Appeals from orders of Environmental Magistrates.

33. Any person convicted of any contravention of this Act or the rules or regulations by an Environmental Magistrate may, within thirty days from the date of his conviction, appeal to the Court of Sessions whose decision thereon shall be final.

Power to delegate.

34. *(1)* The Government of Balochistan may, by notification in the official Gazette, delegate any of its or of the Balochistan Environmental Protection Agency powers and functions under this Act and the rules and regulations to any Government Agency, local council or local authority.

(2) The Balochistan Environmental Protection Agency may also by notification in the official Gazette, delegate any of its powers or functions under this Act and the rules and regulations to EPA Regional or sub-offices. In case of nonexistence of its Regional/Sub-offices may delegate its powers or functions to any local council or local authority in the Province.

Power to give directions.

35. In the performance of its functions the Provincial Agency shall be bound by the direction given to it in writing by the Government.

Indemnity.

36. No suit, prosecution or other legal proceedings shall lie against the Government , the Council, the Balochistan Environmental Protection Agency, the Director-Generals of the Balochistan Environmental Protection Agency, members, officers, employees, experts, advisers, committees or consultants of the Balochistan Environmental Protection Agency or the Environmental Tribunal or Environmental Magistrates or any other person for anything which is in good faith done or intended to be done under this Act or the rules or regulations made thereunder.

Dues recoverable as arrears of land revenue.

37. Any dues recoverable by the Balochistan Environmental Protection Agency under this Act, or the rules or regulations shall be recoverable as arrears of land revenue.

Act to override other laws.

38. The provisions of this Act shall have effect notwithstanding anything inconsistent therewith contained in any other law for the time being in force.

Power to make rules.

39. The Government of Balochistan may, by notification in the official Gazette, make rules for carrying out the purposes of this Act including rules for implementing the provisions of the international environmental Agreements, specified in the Schedule to this Act.

Power to amend the Schedule

40. The Government of Balochistan may, by notification in the official Gazette, amend the Schedule so as to add any entry thereato or modify or omit any entry therein.

Power to make regulations.

41. (1) For carrying out the purposes of this Act, the Balochistan Environmental Protection Agency may, by notification in the official Gazette and with the approval of the Government of Balochistan, make regulations not inconsistent with the provisions of this Act or the rules made thereunder.

(2) In particular and without prejudice to the generality of the foregoing power, such regulations may provide for

(a) submission of periodical reports, data or information by any Government agency, local authority or local council in respect

of environmental matters;

(b) preparation of emergency contingency plans for coping with environmental hazards and pollution caused by accidents, natural disasters and calamities;

(c) appointment of officers, advisers, experts, consultants and employees;

(d) levy of fees, rates and charges in respect of services rendered, Actions taken and schemes implemented;

(e) monitoring and measurement of discharges and emissions;

(f) categorization of projects to which, and the manner in which, section 15 applies;

(g) laying down of guidelines for preparation of initial environmental examination and environmental impAct assessment and Development of procedures for their filing, review and approval;

(h) providing procedures for handling hazardous substances; and

(i) installation of devices in, use of fuels by, and maintenance and testing of motor vehicles for control of air and noise pollution.

Repeal, savings and succession.

42. (1) The provision of Pakistan Environmental Protection Act 1997 (Act No.XXXIV of 1997) applicable to the Province of Balochistan are hereby repealed.

(2) Notwithstanding the repeal of the Pakistan Environmental Protection Act 1997 hereinafter called the repealed Act, any rules or regulations or appointments made, orders passed, notifications issued, powers delegated, contrActs entered into, proceedings commenced, rights acquired liabilities incurred, penalties, rates, fees or charges levied, things done or Action taken under any provisions of the repealed Act shall, so far as they are not inconsistent with the provisions of this Act be deemed to have been made, passed, issued, delegated, entered into, commenced, acquired, incurred, levied, done or taken under this Act, until they are repealed, rescind, withdrawn, cancelled, replaced or modified in accordance with the provisions of this Act.

(3) On the establishment of the Balochistan Environmental Protection Agency under this Act, all properties, assets and liabilities pertaining to the Balochistan Environmental Protection Agency established under repealed Act shall vest in and be the properties, assets and liabilities, as the case may be, of the Balochistan Environmental Protection Agency established under this Act.

(4) The Balochistan Environmental Protection Agency constituted under the repealed Act and existing immediately before the commencement of this Act shall be deemed to have been constituted under section 5 and the Director General and other officers and employees appointed in the said Agency shall be deemed to be Director General, officers and employees appointed under the Balochistan Civil Servant Act 1974.

(5) Notwithstanding the repeal of the Pakistan Environmental Protection Act 1997(Act No.XXXIV of 1997), all proceeding pending immediately before commencement of this Act, against any person under the repealed Act and rules, regulation or order made thereunder, or any other Law or rules shall continue under that Law and rules, in the manner proceeded thereunder.

SCHEDULE
(See section 39)

1. International Plant Protection Convention, Rome, 1951.

2. Plant Protection Agreement for the South-East Asia and Pacific Region (as amended), Rome, 1956.

3. Agreement for the Establishment of a Commission for Controlling the Desert Locust in the Eastern Region of its Distribution Area in South-West Asia (as amended), Rome, 1963.

4. Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, 1971 and its amending Protocol, Paris, 1982.

5. London Convention on Ocean Dumping 1972.

6. Convention Concerning the Protection of World Cultural and Natural Heritage (World Heritage Convention), 1972.

7. MARPOL Convention on Prevention of Pollution from Ship, 1973/78

8. Convention on International Trade in Endangered Species of Wild Funa and Flora (CITES), Washington, 1973.

9. Convention on the Conservation of Migratory Species of Wild Animals, Bonn, 1979.

10. Convention on the Law of the Sea, Montego Bay, 1982.

11. Vienna Convention for the Protection of the Ozone Layer, Vienna, 1985.

12. Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal, 1987 and amendments thereto.

13. Agreement on the Network of Agriculture Centres in Asia and the Pacific, Bangkok, 1988.

14. Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposal, Basel, 1989.

15. Convention on Biological Diversity, Rio de Janeiro, 1992.

16. United Nations Framework Convention on Climate Change, Rio De Janeiro, 1992.

17. Convention on the Protection and Use of Transboundary Watercourses and International Lakes, 17 March 1992.

18. The Rio Declaration on Environment and Development, 13 June 1992

19. London Amendment to Montreal Protocol on Substances that deplete the ozone layer, 10 Aug 1992

20. United Nations Convention on the Law of the Sea, 16 Nov 1994

21. Washington Declaration on Land Based Marine Pollution 1995.

22. UN Convention on Non-Navigational Uses of International Watercourses, 1995

23. Ban Amendment to the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, 22 Sept 1995.

24. The Kyoto Protocol, 11 Dec 1997

25. The Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, 11 Sept 1998.

26. The Beijing Amendment to the Montreal Protocol on Substances that deplete the ozone layer, 1 Jan 2000

27. The Cartagena Protocol on Biosafety to the Convention on Biological Diversity, 29 Jan 2000.

28. Stockholm Convention on Persistent Organic Pollutants (POPs), 23 May 2001.

29. International Treaty on Plant Genetic Resources for Food and Agriculture, 3 Nov 2001.

30. Hong Kong International Convention For The Safe And Environmentally Sound Recycling Of Ships, 2009

SECRETARY

Balochistan Provincial Assembly

NO EVEN DATED EVEN.

A copy is forwarded to the Controller, Government Printing, Press, Balochistan, Quetta for favour of publication in an extra-ordinary issue of Gazette of Balochistan dated 15th January, 2013.

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(SHAMS UDDIN)
Additional Secretary (Legis :)
Balochistan Provincial Assembly

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Additional Secretary (Legis :)

REKO DIQ
MINING COMPANY

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Document Title:	**Appendix B - Physical Environment Survey Plan**		
Issue Date:	**2024-02-23**		

Supplier/Contractor Details

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Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix B - Physical Environment Survey Plan**	**Rev:**	**B**

	2024-02-23	**Review**			
			Sadia Asghar	**Vaqar Zakaria**	**Barbara Wessels**
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix B
Physical Environment Survey Plan

Reko Diq Mining Company (RDMC or the 'Client'), a subsidiary of Barrick Gold Corporation (Barrick), intends to commence the Early Works (the 'Project') for the Reko Diq Mining Project (the 'Mining Project'), in the western part of Balochistan province of Pakistan. The Early Works for the Project will consist of construction of an accommodation facility at the proposed Reko Diq Mine Site and water supply pipeline from the Fan Sediments area to the accommodation facility and minor earthworks.

The Mining Project will result in the production of copper and gold and is expected to have a life of at least 40 years as a truck-and-shovel open pit operation with processing facilities producing a high-quality copper-gold concentrate. As per the Reko Diq 2022 Conceptual Design, the construction is expected in two phases. Phase 1 is expected to have a capacity of 40 million tonnes per annum (MTPA) and Phase 2 with a combined process capacity of 80 MTPA.

The Client acquired the services of Digby Wells Environmental (Digby Wells) and Hagler Bailly Pakistan Pvt. Ltd (HBP or the 'in-country ESIA Consultant') to carry out the Environmental and Social Impact Assessment (ESIA) of the Early Works to comply with the regulatory requirements of the Balochistan Environmental Protection Agency (Balochistan-EPA) (the 'Study').

This document is the Physical Environment Survey Plan which was prepared for the Early Works ESIA.

B.1. Objectives

The objective of the survey was to collect baseline information on the physical environment aspects which are likely to be affected during the Early Works phase of the proposed Project. The following physical environment aspects were included:

- Ambient Air Quality
- Water Quality
- Hydrocensus
- Noise Levels
- Traffic
- Soil Quality

B.2. Study Area

An area of ~ 5 kilometers (km) around the proposed Reko Diq Mine Site consists of a an accommodation facility and 1 km along the water pipeline route from Fan Sediments to the accommodation facility. This accounts for an area in which the physical environment may be impacted by the Project related activities. The sampling locations of the physical environment surveys conducted in August 2020 and reported in 2020 ESIA are also included in this survey plan.

Figure 1 shows the Study Area.

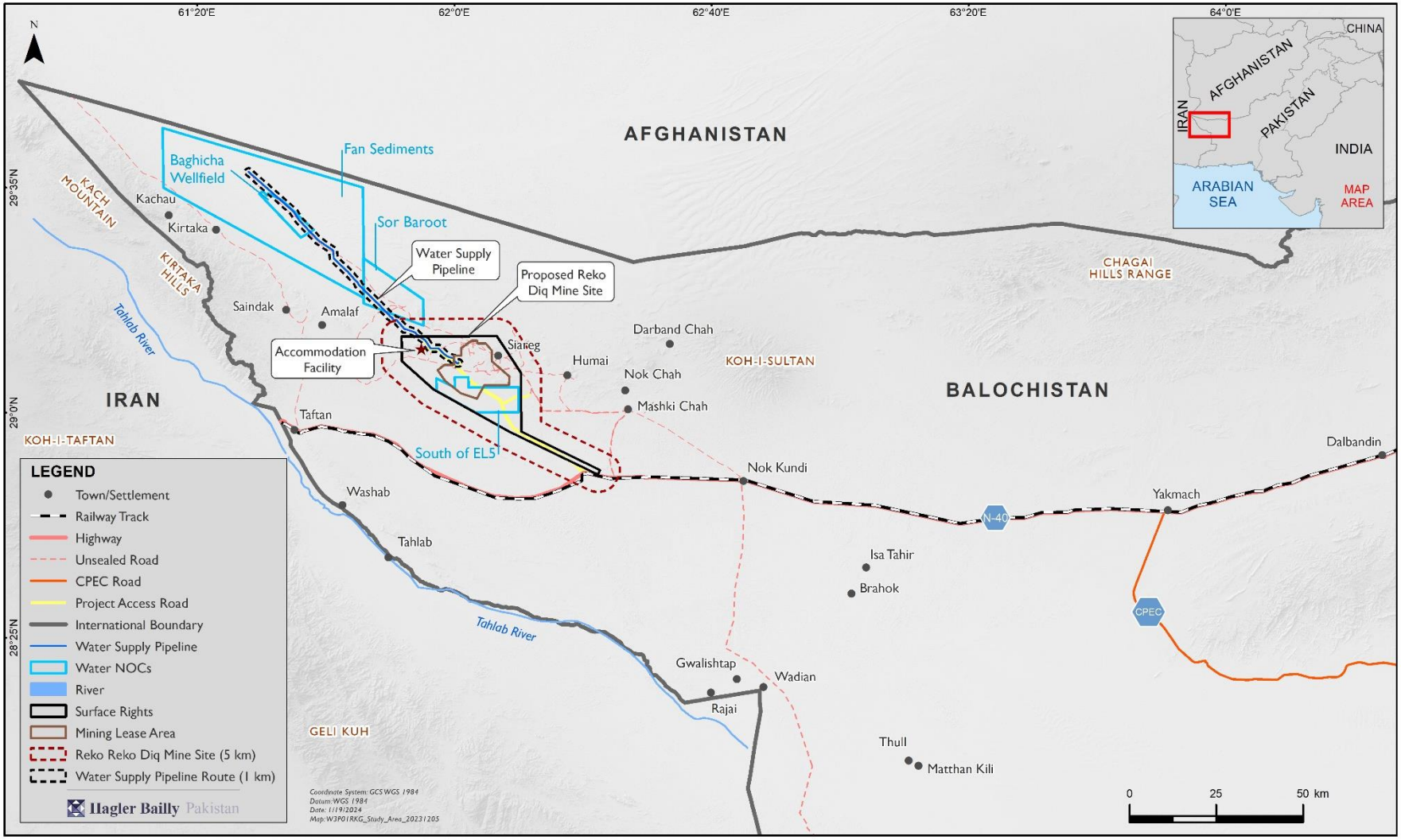


Figure 1: Physical Environment Study Area

B.3. Ambient Air Quality

An ambient air quality survey was carried out to establish the baseline conditions at the Project site. The air quality sampling locations during the physical surveys in 2020 and reported in 2020 ESIA are also included in establishing baseline air quality. The pollutants selected for the survey were NO_2, SO_2, PM_{10} and $PM_{2.5}$. The selection of pollutants for evaluation was based on the level of risk to human health posed by these pollutants.

Table 1 provides the sampling locations for air quality and rationale for selection, and Figure 2 shows the sampling locations.

Table 1: Air Quality Sampling Locations and Rationale of Selection

Sample ID	Coordinates	Dates and Duration of Sampling	Location	Rationale for Site Selection
Sampling in 2023				
A1-23	29°08'21.60" N 62°06'47.20" E	**SO_2 and NO_2 sampling:** October 24 to November 19, 2023 (~4 weeks)	Reko Diq Mine Site	To assess the baseline ambient air quality at the proposed Reko Diq Mine Site.
A2-23	29°05'44.00" N 62°17'37.80" E	**SO_2 and NO_2 sampling:** October 24 to November 19, 2023 (~4 weeks)	Humai settlement	To assess the baseline ambient air quality of the settlement east of the Reko Diq Mine Site before Project activities (downwind of Project facilities).
Sampling in 2020 (from 2020 ESIA)				
A1-20	29°08'52.40" N 62°06'49.00" E	**PM_{10}** and **$PM_{2.5}$ sampling:** August 24, 2020, to August 25, 2020 (24 hours) **SO_2/NO_2 sampling:** October 06 to October 22, 2020 (~2 weeks)	Siareg Settlement	To assess the baseline ambient air quality of the settlement north of Reko Diq Mine Site before Project activities. This settlement has now moved to Humai and only abandoned structures are left there (upwind of Project facilities).
A2-20	28°49'23.00" N 62°44'25.30" E	**PM_{10}** and **$PM_{2.5}$ sampling:** August 26, 2020, to August 27, 2020 (24 hours) **SO_2** and **NO_2 sampling:** October 06 to October 22, 2020 (~2 weeks)	FC Camp in Nok Kundi	To assess the baseline of the nearest major town. Moreover, all the construction machinery and transportation will be done through this road.
A3-20	29°04'58.80" N 62°18'35.90" E	**SO_2** and **NO_2 sampling:** October 06 to October 22, 2020 (~2 weeks)	Humai settlement	To assess the baseline ambient air quality of the settlement before Project (downwind of Project facilities)

Particulate matter (PM_{10} and $PM_{2.5}$) was sampled using Airmetrics MiniVol Portable Air Samplers. This equipment draws an air sample through an inlet by a vacuum pump at a fixed flow rate (~5.0 L/min). The sampling is normally carried out for a 24-hours duration. The particulates are filtered using an impactor and collected on filter paper, which is dried and weighed after the sampling to obtain the weight of particulates in the sampled volume

of air. The analysis of PM_{10} and $PM_{2.5}$ was conducted at HBP Lab, Islamabad by gravimetric method.

Passive diffusion tubes were used for the measurement of gaseous pollutants NO_2, and SO_2. The diffusion tubes passively uptake pollutants via diffusion and are typically installed for two to four weeks. The diffusion tubes were provided and analyzed by Gradko International, an internationally recognized and United Kingdom Accreditation Service (UKAS) accredited laboratory (referred to here as Gradko Lab). NO_2 was analyzed using ultraviolet/visible spectroscopy (UKAS Number: GLM7), whereas SO_2 was analyzed using ion chromatography (UKAS: Number GLM1).

The following materials and equipment were utilized:

- Low-volume air sampler
- Survey form (see **Particulate Matter Form** in **Annexure A**)
- Diffusion tubes and associated cable ties
- Tripod

Diffusion Tubes: One field blank and one field duplicate were taken during sampling in 2020 and 2023 along with the air quality sampling (SO_2 and NO_2) to

- ensure the absence of any contaminants in diffusion tubes that can affect the results.
- ensure that consistent and unbiased procedures are used for analysis.

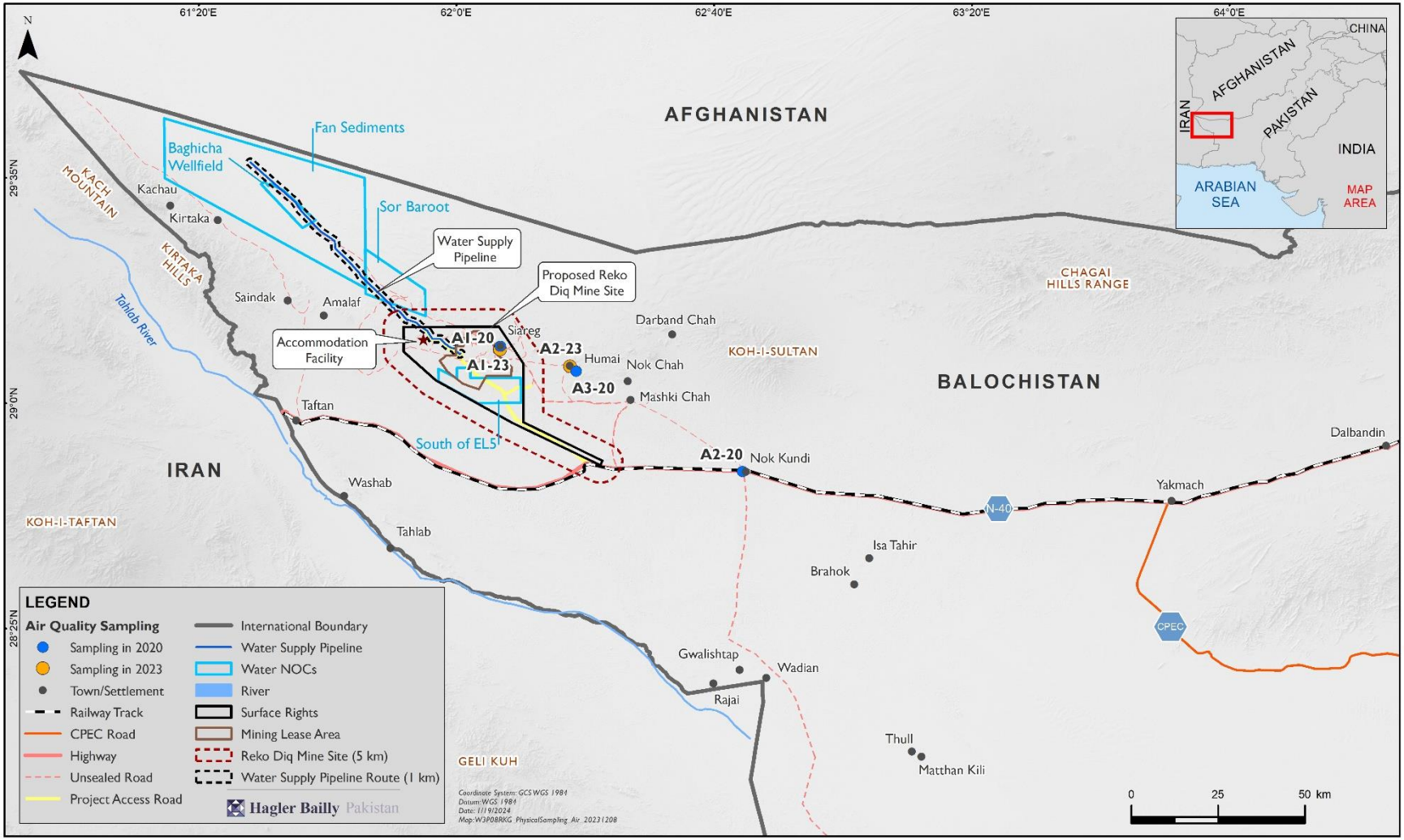


Figure 2: Air Quality Sampling Locations

B.4. Noise

A noise monitoring survey was carried out to document the baseline noise levels before the start of the Project activities. The noise monitoring locations during the physical surveys in 2020 and reported in 2020 ESIA are also included in this plan. Table 2 provides the details of sampling locations. Figure 3 shows the noise sampling locations map.

Table 2: Noise Sampling Locations and Rationale of Selection

ID	Coordinate	Date of Survey	Location	Rationale for Site Selection
Sampling in 2022				
N1-22	28°49'06.32" N 62°46'21.54" E	September 24, 2022, to September 25, 2022 (24 hours)	Nok Kundi	At N-40 near Nok Kundi to assess the baseline noise levels from the traffic movement along the road that will be used for the Project–related transportation. The point was monitored simultaneously with a traffic count.
Sampling in 2020 (from 2020 ESIA)				
N1-20	29°08'52.4" N 62°06'49.0" E	August 24, 2020, to August 25, 2020, (24 hours)	Siareg	To assess the baseline noise conditions of the nearest settlement (Siareg) before Project (upwind of Project facilities).
N2-20	28°49'23.0" N 62°44'25.3" E	August 26, 2020, to August 27, 2020, (24 hours)	Nok Kundi	To assess the baseline of the nearest town (Nok Kundi). Moreover, all the construction machinery and transportation will be done through this road.
N3-20	28°50'35.2" N 62°24'57.9" E	August 25, 2020, to August 26, 2020, (24 hours)	Access road to the proposed Reko Diq Mine Site	At the access road to the proposed Reko Diq Mine Site from N-40 to assess the baseline noise.

Notes:
N1-22 means sampling location N1 monitored in 2022.
N1-20 means sampling location N1 monitored in 2020.

Cirrus Research plc.'s sound level meter, Model CR: 1720, was used for recording noise levels. The instrument meets the International standards IEC 61672-1:2002, IEC 660651:1979, IEC 60804:2001, IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986, ANSI S1.43-1997 where applicable. The instrument has a resolution of 0.1 dB. A calibrator was used each time before use to ensure calibration of the instrument. A wind shield was used for all measurements. Noise levels were recorded for 24-hours duration at each location.

The following materials and equipment were utilized:

- Noise meter
- Tripod
- Calibrator
- Wind shield

- Survey form (see **Noise Monitoring Form** in **Annexure B**)

The following were carried out as part of QA/QC procedures:

- Calibration of noise meter was carried out prior to each noise sampling.
- The noise monitoring form (included in survey forms) was filled prior to installation of equipment at each site.
- MS Excel files shared by HBP personnel and actual files downloaded from Noise Tools, a software used to download noise data, were cross checked to look for any discrepancy.

B.5. Traffic

A traffic baseline survey was undertaken to evaluate the existing traffic levels on the road route that will be used for Project-related transportation. A traffic count conducted in 2020 and reported in 2020 ESIA is also included in this plan.

Figure 3 shows the traffic count locations, whereas Table 3 provides details of the traffic count locations. At each traffic count location, two persons were stationed to count the traffic in all directions and the survey was carried out for 24 hours on a typical weekday. The traffic survey form (see **Traffic Survey Forms** in **Annexure C**) was utilized to note the type and number of vehicles.

Table 3: Traffic Count Locations and their Rationale for Selection

Sample ID	Coordinates	Date of Sampling	Monitoring Directions	Rationale for Selection
Sampling in 2022				
T1-22	28°49'06.32" N 62°46'21.54" E	September 24 to 25, 2022 (24 hours)	1. traffic flow from Mashkel to Nok Kundi, or vice versa 2. traffic flow from Mashkel to Dalbandin, or vice versa 3. traffic flow from Nok Kundi to Dalbandin, or vice versa	At the access road to Reko Diq from the National Highway (N–40) near Nok Kundi to assess the current load of the road. The location can be used to assess the increase in existing traffic volume due to Project related activities.
Sampling in 2020 (from 2020 ESIA)				
T1-20	28°50'35.2" N 62°24'57.9" E	August 25 to 26, 2020 (24 hours)	1. traffic flow from Nok Kundi to Taftan, or vice versa 2. traffic flow from Reko Diq to Nok Kundi, or vice versa 3. traffic flow from Reko Diq to Taftan, or vice versa	At the access road to Reko Diq from the N-40 to assess the current load of the road. The location will be used to assess the increase in traffic due to Project activities.

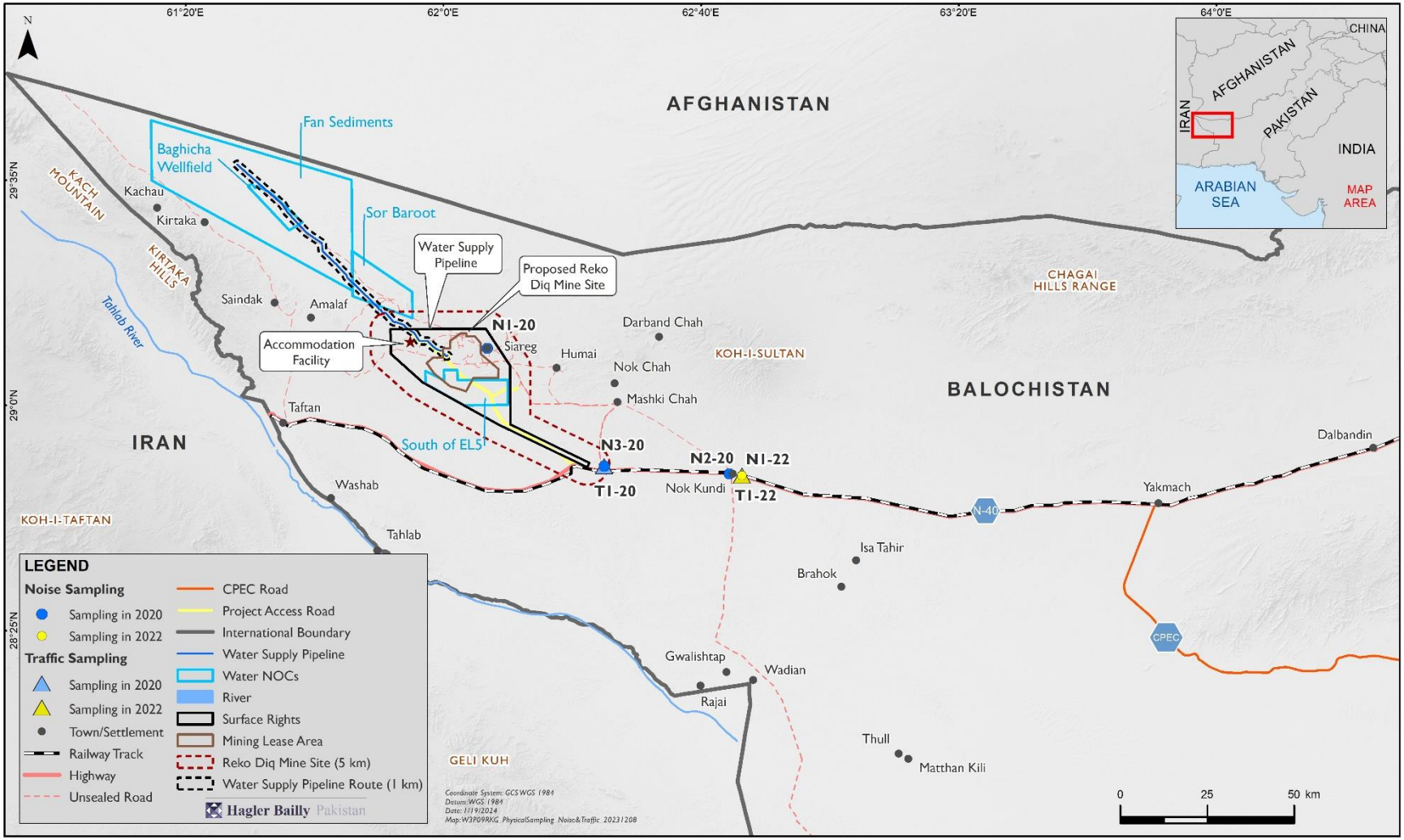


Figure 3: Noise Sampling and Traffic Count Locations

B.6. Hydrocensus

A hydrocensus survey was carried out to map the community water resources within the Hydrocensus Study Area, covering a 40 km radius around the Reko Diq Mine Site, encompassing the accommodation facility. Additionally, it extends 30 km along the water supply pipeline route from Fan Sediment boreholes to the accommodation facility, designated for workers' accommodation. The Hydrocensus Study Area aligns with the Socioeconomic Study Area facilitating the evaluation of the water resources utilized by the communities that are residing near the mine site and its facilities and that may be positively or negatively impacted by Project activities.

The hydrocensus was conducted in the settlements located east and west of the Reko Diq Mine Site in parallel with the socioeconomic survey. These include:

- Settlements east of the Reko Diq Mine Site: Humai, Mashki Chah, Nok Chah, and Darband Chah.
- Settlements west of the Reko Diq Mine Site: Kachau, Bore Chah, Kirtaka, Maki, Beeduk, Maskin, Amalaf, and Saindak.

Table 4 provides the geographical coordinates of the surveyed water resources in the settlements in the Hydrocensus Study Area. Figure 4 shows the location of the surveyed water resources in the Hydrocensus Study Area.

Table 4: Surveyed Water Resources

Hydrocensus Location ID	Coordinates	Settlement	Type of Water Resource
Settlements east of the Reko Diq Mine Site			
W1	29°05’59.50” N 62°17’25.50” E	Humai	Borehole
W2	29º05’44.60’’ N 62º17’34.70’’ E		Dug Well
W3	29º05’45.10’’ N 62º17’37.10’’ E		Dug Well
W4	29º05’50.40’’ N 62º17’29.80’’ E		Dug Well
W5	29°05’47.10” N 62°17’30.50” E		Reverse Osmosis (RO) Plant
W6	29º06’02.30’’ N 62º16’47.20’’ E		Dug Well
W7	29°06’25.20” N 62°16’52.00” E		Dug Well
W8	29°05’59.60” N 62°16’49.70” E		Dug Well
W9	29º06’34.70’’ N 62º16’51.40’’ E		Dug Well
W10	29º06’29.21’’ N		Dug Well

Hydrocensus Location ID	Coordinates	Settlement	Type of Water Resource
	62º16’52.50’’ E		
W11	29º06’08.60’’ N 62º17’20.40’’ E		Dug Well
NW1	29°05’49.00” N 62°17’39.70” E		Borehole
NW2	29º06’01.10’’ N 62º17’26.30’’ E		Dug Well
NW3	29º06’04.40’’ N 62º16’47.80’’ E		Dug Well
NW4	29º06’03.10’’ N 62º16’47.50’’ E		Dug Well
W12	29º00’32.50’’ N 62º27’32.00’’ E	Mashki Chah	Dug Well
W13	29º00’37.80’’ N 62º27’08.60’’ E		Dug Well
W14	29º00’27.70’’ N 62º27’30.30’’ E		Dug Well
W15	29º00’30.90’’ N 62º26’57.80’’ E		Dug Well
W16	29º03’29.40’’ N 62º26’29.60’’ E	Nok Chah	Dug Well
W17	29º10’44.70’’ N 62º33’37.70’’ E	Darband Chah	Dug Well
W18	29º10’46.80’’ N 62º33’32.90’’ E		Dug Well
W19	29º10’42.60’’ N 62º33’28.20’’ E		Dug Well
W20	29º10’39.40’’ N 62º33’26.60’’ E		Dug Well
W21	29º10’24.60’’ N 62º33’31.80’’ E		Dug Well
W22	29º10’19.50’’ N 62º33’27.50’’ E		Dug Well
W23	29º10’18.10’’ N 62º33’32.10’’ E		Dug Well
W24	29º10’13.80’’ N 62º33’34.40’’ E		Dug Well
W25	29º10’18.50’’ N 62º33’34.50’’ E		Dug Well
W26	29º10’31.20’’ N 62º33’37.20’’ E		Dug Well

Hydrocensus Location ID	Coordinates	Settlement	Type of Water Resource
W27	29º10'32.90'' N 62º33'37.20'' E		Dug Well
W28	29º10'33.60'' N 62º33'37.70'' E		Dug Well
NDW1	29º10'36.60'' N 62º33'21.20'' E		Dug Well
NDW2	29º10'29.20'' N 62º33'19.30'' E		Dug Well
NDW3	29º10'32.70'' N 62º33'34.10'' E		Dug Well
Settlements west of the Reko Diq Mine Site			
W32	29°29'58.17" N 61°15'29.99" E	Kachau	Spring/Karez
W33	29°30'38.84" N 61°15'35.21" E		Spring/Karez
Bore Chah	29°31'46.50" N 61°19'25.80" E	Bore Chah	Spring/Karez
Multiple Springs	29°30'18.80" N 61°20'50.50" E		Spring/Karez
Kirtaka	29°28'11.50" N 61°23'25.20" E	Kirtaka	Spring/Karez
Maki	29°28'00.60" N 61°19'30.50" E	Maki	Spring/Karez
Beeduk	29°24'29.80" N 61°25'08.40" E	Beeduk	Spring/Karez
Maskin	29°21'54.10" N 61°26'26.00" E	Maskin	Spring/Karez
W29	61º39'30.90'' E 29º13'46.30'' N	Amalaf	Dug Well
W30	61º39'07.10'' E 29º13'29.00'' N		Dug Well
W31	61º36'07.30'' E 29º12'13.50'' N	Saindak	Borehole

Note: W is for water resource surveyed in 2022 (Round 1) and 2023 (Round 2)
NW is for new water resource found and surveyed in 2023 (Round 2) in Humai settlement.
NDW is for new water resource found and surveyed in 2023 (Round 2) in Darband Chah settlement.

The location and water quality at the origin of the water resource were recorded. The following key information was collected at each water source:

- Well location (village name, neighborhood (if applicable), and geographical coordinates,

- Well usage:
- Approximate water extraction rate,
- Approximate number of users,
- Water extraction method.
- Basic chemical parameters (measured on site): pH, DO, Electrical Conductivity (EC), Total Dissolved Solids (TDS), turbidity and temperature,
- Time and date of measurement,
- Pictures.

All the above information was recorded on a pre-designed form provided in **Annexure D**.

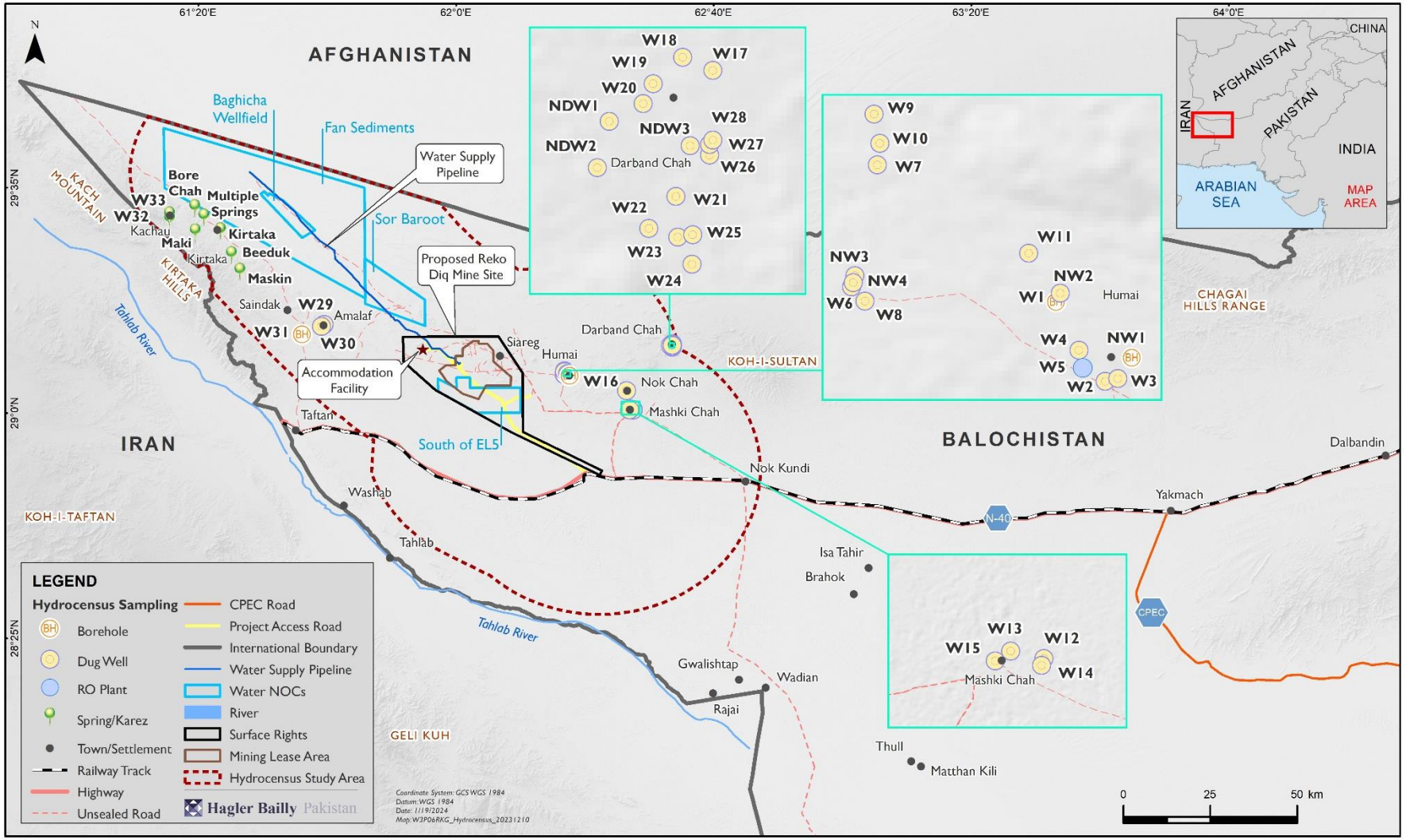


Figure 4: Location of Surveyed Community Water Resources within the Hydrocensus Study Area

B.7. Water Quality

A baseline survey was carried out to establish the water quality of the community water resources before the Project. The survey included collecting water samples not only from the community water resources but also from the boreholes in the Fan Sediments area that will be used to supply water to the accommodation facility during the Early Works.

Table 5 provides the sampling locations of surveyed water resources and Figure 5 shows the sampling locations.

Table 5: Surveyed Water Resources

Sample ID	Coordinates	Location	Rationale for Selection
Sampling in 2023			
W13-23	29º00'37.80" N 62º27'08.60" E	Mashki Chah	At Mashki Chah (settlement), to assess the water quality of the dug well in use by the settlement.
FS13-PB-23	29°29'58.29" N 61°35'51.84" E	Fan Sediment	To assess the water quality of the borehole to be used to supply water during Early Works.
FS20-PB-23	29°36'51.91" N 61°28'34.35" E	Fan Sediment	To assess the water quality of the borehole to be used to supply water during Early Works.
Bore Chah-23	29°31'46.50"N 61°19'25.80"E	Bore Chah	At Bore Chah (settlement), to assess the water quality of the spring water used by the locals.
Kirtaka-23	29°28'11.50"N 61°23'25.20"E	Kirtaka	At Kirtaka (settlement), to assess the water quality of the spring water used by the locals.
Maskin-23	29°21'54.10"N 61°26'26.00"E	Maskin	At Maskin (settlement), to assess the water quality of the spring water used by the locals.

Note: W13-23: water sample collected from W13 sampling location during 2023 survey.

Grab sampling technique was carried out in which an individual sample is collected from a single location at a specific time or period. Water from deep wells was collected using bailer and rope. The bailer was properly washed with distilled water, cleaned, and dried before the field mobilization. Moreover, before taking samples, water was initially extracted four to five times with a bailer, to minimize any cross contamination and then the desired sample was collected.

The following materials and equipment were utilized:

- Water sampling containers
- Hand handled, pH, DO turbidity and EC meter
- Field parameters record form
- Packing and handling materials
- Survey form (see **Water Quality Survey Forms** in **Annexure E**)

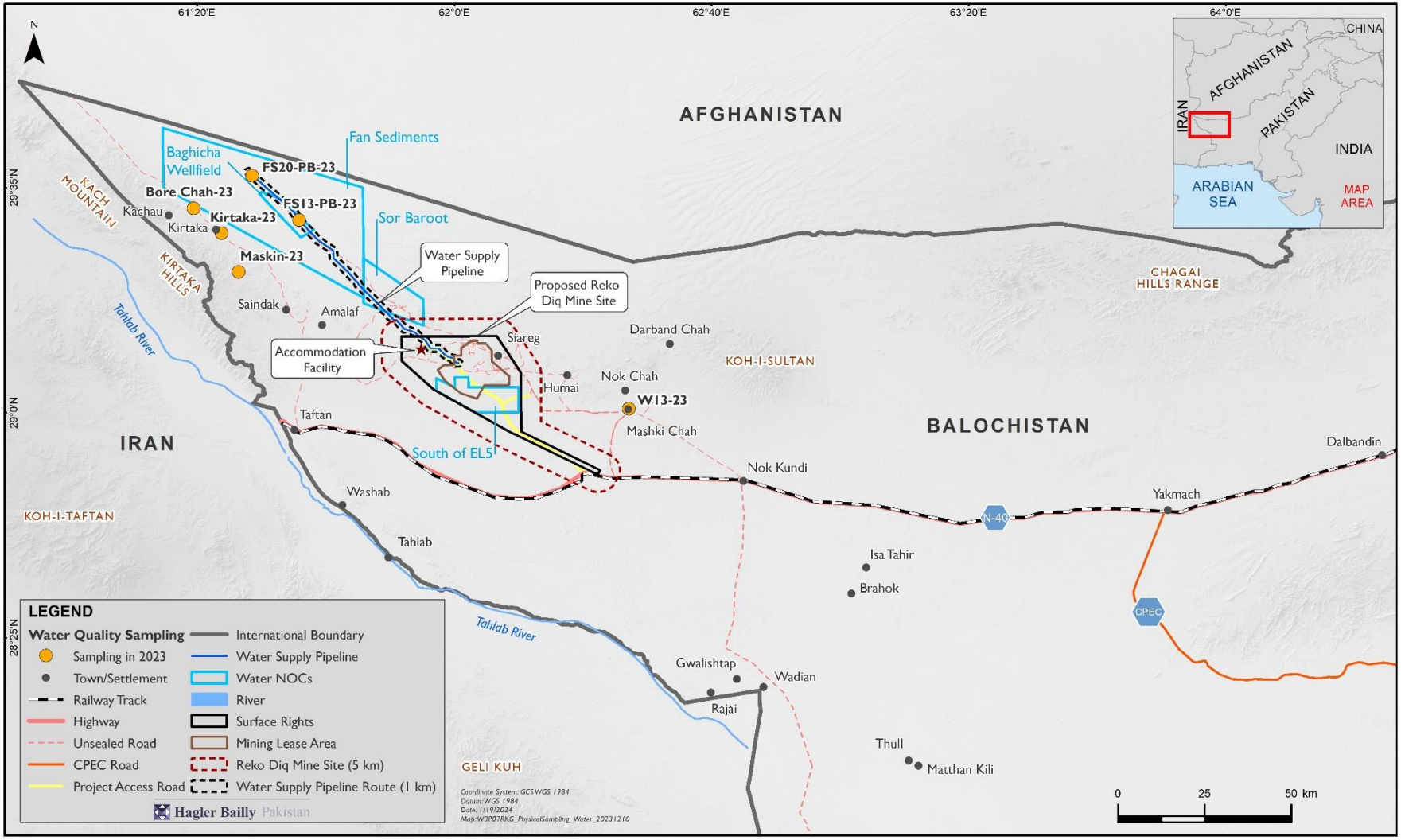


Figure 5: Location of Surveyed Community Water Resources

B.8. Soil

A soil quality survey was carried out in August 2020 as part of 2020 ESIA. No new sampling was carried out considering that the soil sampling conducted as part of 2020 ESIA will be sufficient. Table 6 provides the soil sampling locations and the rationale of selection. The location map is given in Figure 6.

Table 6: Soil Sampling Locations and Rationale of Selection

Sample ID	Coordinates	Location	Rationale for Selection
Sampling in 2020 (from 2020 ESIA)			
S1-20	29°31'13.40" N 61°34'33.60" E	Project Site	At the source of water pipeline to evaluate the soil quality at the water extraction point.
S6-20	29°08'47.70" N 62°06'52.90" E	Project Site	At Siareg (settlement) with indirect impact of the Project.
S7-20	29°08'47.70" N 62°06'52.90" E	Project Site	Duplicate of S6, as a QC sample.

The following materials and equipment were utilized:

- Soil sampling containers/plastic bags
- Packing and handling materials
- Survey forms (see **Soil Survey Form** in **Annexure F**)

One field duplicate was collected as part of QA/QC procedures.

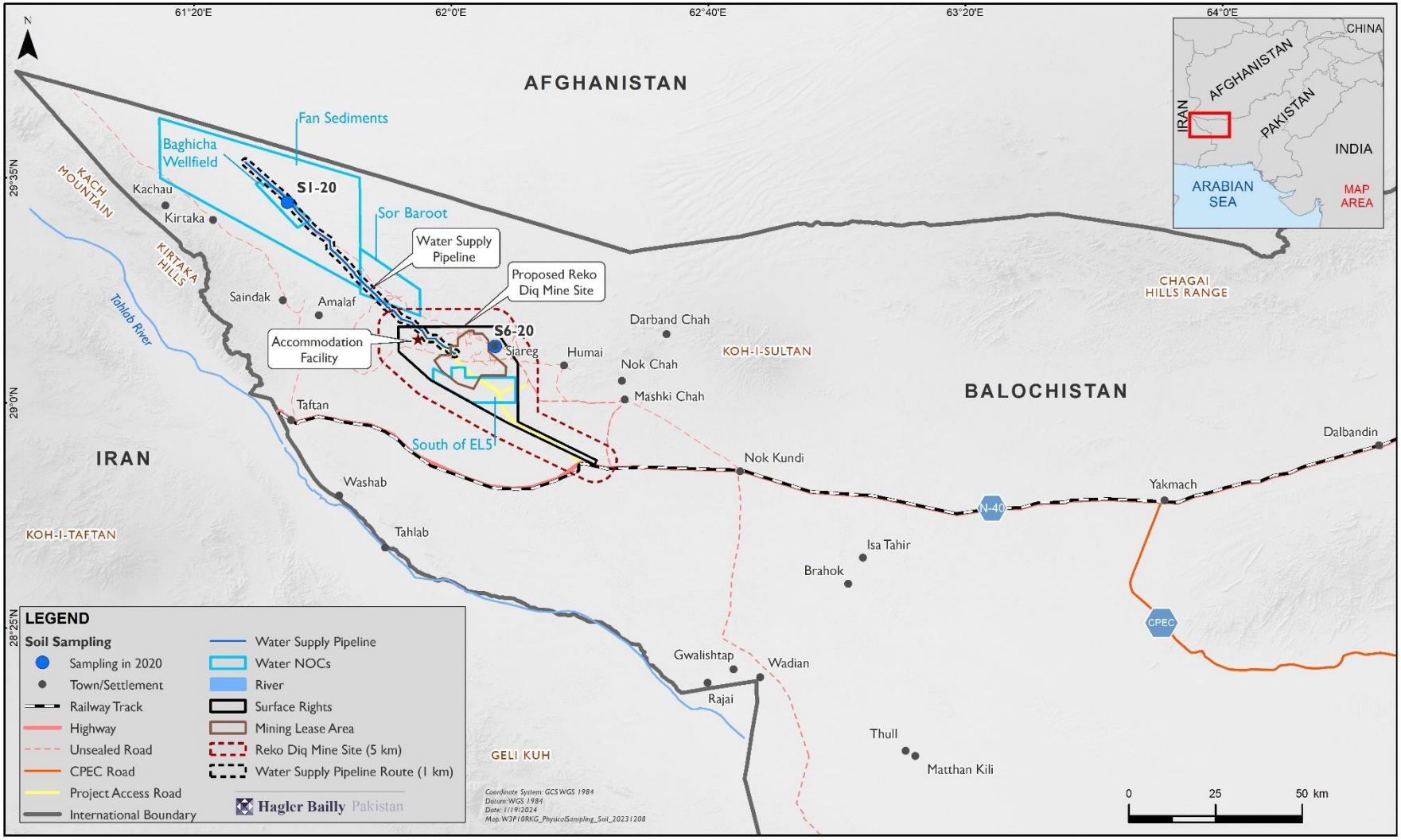


Figure 6: Soil Quality Sampling Locations

B.9. Survey Team

The following personnel from Hagler Bailly Pakistan were involved in the field surveys and management – all are Pakistani Nationals:

- Vaqar Zakaria, Technical Advisor
- Sadia Asghar, Project Manager
- Muhammad Tahir, Specialist Environmental Engineer
- Noor Alam, Field Chemist

B.10. Survey Forms

Survey forms are as follows:

Annexure A – Particulate Matter Monitoring Form

Project Code		**SOP Code**			
Sampler(s)		**Location ID**			
Start Date		**End Date**	dd/mm/yyyy		
Start Time		**End Time**	dd/mm/yyyy		
Start Reading		**Stop Reading**			
Latitude		**Longitude**		**Waypoint**	
Photo ID(s)					
Weather	☐ Sunny ☐ Cloudy ☐ Rainy ☐Other conditions _____				
Antecedent	Specify if known				
Wind Speed (m/s)	☐ Light breeze (1.6-3.3) ☐ Gentle breeze (3.4-5.4) ☐ Moderate breeze (5.5-7.9) ☐ Strong breeze (10.8-13.8) ☐ Other (Specify) _____				
Sampling Type	☐ Grab ☐ Short-term Exposure Sampling ☐ Particulate Matter Sampling				
Matrix	☐ PM_{10} Filter ☐ $PM_{2.5}$ Filter ☐ TSP Filter				
Equipment Used:					
Equipment Guide:	See Manual				

Ambient Conditions											
No	Filter Paper Number	Start Filter Paper Weight (g)	End Filter Paper Weight (g)	Avg. Temperature (°C)	Avg. Wind Speed (m/s)	Avg. Wind Direction (°)	Avg. Humidity (%)	Avg. Pressure (in mmHg)			Notes including locations and times if any. Where spatially or temporally integrated sampling is used, specify a new sample ID where needed (e.g., as suffix added after location ID for each sub-sample along with latitude, longitude, distance from pollution source and time in 24-hour format).

Sampler (s) Notes including deviations from sampling plan (if any), antecedent conditions, site conditions, special transport for chain of custody, etc.:	**Sampler(s)**	
	Name	
	Sign	
	Name	
	Sign	

Annexure B - Noise Monitoring Form

| | | |

Annexure C – Traffic Survey Form

Project Code		**SOP Code**			
Operator(s)		**Location ID:**			
Date	dd/mm/yyyy	**Monitoring Period**	Start Time: HH:MM am/pm		
Photo ID(s)			End Time: HH:MM am/pm		
Latitude		**Longitude**		**Waypoint**	

Cars																			
Pick-ups																			
Bikes																			
Buses																			
Trucks	Truck (2 AX)																		
	Truck (3 AX)																		
	Truck (4 AX)																		
	Truck (5 AX)																		
	Truck (6 AX)																		
Tractors																			
Trailor																			
Other																			

Annexure D – Hydro Census Form

DIGBY WELLS HYDROCENSUS SHEET
Reko Diq - BAR7212

Bore ID	Alt. Name	Xcoord	Ycoord	Zcoord	Date surveyed	Village	BH Owner	Date drilled	Bore depth (m bgl)	Water level (m bgl)	Casing height (m)	No of people accessing the bore	Bore usage rate (L/s)	Bore yield (L/s)	Bore usage (domestic, etc.)	Equipment type installed (if any)	Bore status (good condition, etc.)	Field EC (mS/m)	Field pH	Field TDS (ppm)	Field T C	Sampled (yes/no)	Comment

Remark:

Annexure E – Water Quality Survey Form

| | | |

Annexure F – Soil Survey Form

Project Code		**SOP Code**	
Sampler(s)		**Location ID**	
Start Date		**End Date**	dd/mm/yyyy
Start Time		**End Time**	dd/mm/yyyy
Start Reading		**Stop Reading**	
Latitude		**Longitude**	**Waypoint**

Sample ID	*Date*	*Location*	*Description (dunes, Plains, agriculture)*	*Depth of sample (m)*	*Color*

REKO DIQ
MINING COMPANY

RDMC Authorized Supplier/Contractor's document.
The document is NOT approved until an RDMC Approval stamp has been affixed.

Document No.:	**6105AK023-S411-HD27-0034**	**Rev:**	**A**
Document Title:	**Appendix C – Hydrocensus Data**		
Issue Date:	**2024-02-23**		

Supplier/Contractor Details

Package/Contract No:	**K023**		
Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix C – Hydrocensus Data**	**Rev:**	**A**

	2024-02-23	Review			
			Sadia Asghar	Vaqar Zakaria	Barbara Wessels
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
CONFIDENTIALITY NOTE:		***This document contains intellectual property of Barrick Gold Corporation and shall not be copied, used or distributed in whole or in part without the prior written consent from Barrick Gold Corporation.***			

Appendix C
Hydrocensus Data

DIGBY WELLS HYDROCENSUS SHEET
Reko Diq - BAR7212

Bore/ Well ID	Alt. Name	Xcoord	Ycoord	Zcoord	Date surveyed	Village	BH Owner	Date drilled	Bore/ Well depth (m bgl)	Water level (m bgl)	Casing height (m)	No of people accessing the bore	Bore/ well usage rate (L/s)	Bore yield (L/s)	Bore/ well usage (domestic, etc.)	Equipment type installed (if any)	Bore status (good condition, etc.)	Field EC (mS/m)	Field pH	Field TDS (ppm)	Field T °C	DO (ppm)	Turbidity (NTU)	Sampled (yes/no)	Comment
Settlements east of the Reko Diq Mine Site																									
W12	Chah	29°00'32.50'' N	62°27'32.00'' E	-	4/29/2023	Mashki Chah	Sharbat Khan	1972	2.440	1.100	0.645	Limited	0.0012	NA	Domestic, drinking and livestock	None	Good condition	390.9	7.59	1,955	24.54	7.22	50.5	Yes	Well was built 33 years ago by the owner. Well type is dug well. Well casing is made of concrete and bricks. A hand pump was also installed which is non-functional since 20 years. Overall well condition is good and usage is very limited. Weather was sunny with high wind speed. Water is extracted manually using a bucket and rope system by residents of village and some locals for livestock and drinking purposes.
W13	Chah	29°00'37.80'' N	62°27'08.60'' E	-	4/29/2023	Mashki Chah	Muhammad Arif	1950	4.738	1.454	0.557	25 houses	0.0579	NA	Domestic, drinking and livestock	None	Good condition	379.9	7.13	1,899	25.95	6.19	6.93	Yes	Well was built 73 years ago by the owner. Well type is dug well. Well casing is made of concrete and bricks. Well is in good condition and water stays and remain available all the time. Weather was sunny with high wind speed. Water is extracted using gravity. Submerisible pump was installed before but motor is removed 20 days ago as it got rusted. Water is extracted via pipeline and stored in a tank near the settlement and then distributed to the houses via pipeline system.
W14	Chah	29°00'27.70'' N	62°27'30.30'' E	-	4/29/2023	Mashki Chah	Haji Babu	1995	2.970	2.910	0.165	Animals only (particularly camels)	0.0000	NA	Only for animals	None	Good condition	417.3	7.23	2,087	27.00	6.16	17.3	Yes	Well was built 28 years ago by the owner. Well type is dug well. Well casing is made of concrete and stones. Well is in good condition and water is very limited in the well. Water is extracted via rope and bucket system only for animals particularly for camels. Weather was sunny.
W15	Chah	29°00'30.90'' N	62°26'57.80'' E	-	4/29/2023	Mashki Chah	Shahbaz Khan	1900	5.880	5.006	0.415	Mining companies only (Barrick + MCC)	1.1574	NA	Some passing locals and mining companies such as RDMC in rekodiq, MCC in Saindak and Chegnidiq Iron Mining .	Diesel engine	Good condition	396.5	7.07	1,982	25.15	6.64	2.74	Yes	Well was built 123 years ago by the owner. Well type is dug well. Well casing is made of concrete and bricks. Well is in good condition but locals report that water is reducing rapidly due to excessive extraction. Water is being extracted using engine motor and pipe system. Water is extracted by mining companies such as RDMC working in rekodiq, MCC in Saindak and Chegnidiq Iron Mining company. Weather was sunny with high wind speed.
W16	Chah	29°03'29.40'' N	62°26'29.60'' E	-	4/29/2023	Nok Chah	Mullah Ibrahim	1992	14.290	13.940	0.6	20 houses	0.1157	NA	Domestic, drinking and livestock	Submersible pump operating on soalr system	Good condition	370.5	8.51	1,852	33.33	9.16	2.92	Yes	Well was built 31 years ago by the owner. Well type is dug well. Well casing is made of concrete and stones. Weather was sunny with high wind speed. Water is extracted using submersible pump operated on solar system, stored in a tank and then distributed to the residents of the village via taps installed near the well.
W17	Chah	29°10'44.70'' N	62°33'37.70'' E	-	4/30/2023	Darband Chah	Muhammad Karim	2014	24.389	23.715	0.320	10 houses	0.0058	NA	Domestic, drinking and livestock	None	Good condition	431.5	7.14	2,175	25.83	5.66	2.99	No	Well type is dug well. Well casing is made of concrete and bricks. Overall well condition is good and usage is very limited. Well was built 8 years ago by the owner. Weather was cloudy with high wind speed. Water is extracted manually using a bucket and rope system by residents of village and some locals for livestock and drinking purposes.
W18	Chah	29°10'46.80'' N	62°33'32.90'' E	-	4/30/2023	Darband Chah	Abdul Karim	2020	67.881	25.752	0.903	25 houses	0.1157	NA	Domestic, drinking and livestock	Submersible pump	Good condition	226.9	6.8	1,135	26.64	6.06	3.23	No	Well was built 30 years ago by the owner. Well type is dug well. Well casing is made of 12 inches steel pipe with concrete finishing. Well is in good condition. Water is extracted using submersible pump operated on solar system, stored in a tank and then distributed to the residents of the village via taps installed near the well. Water is also extracted by some locals passing near the well. Weather was cloudy with high wind speed.
W19	Chah	29°10'42.60'' N	62°33'28.20'' E	-	4/30/2023	Darband Chah	Mullah Usman	2000	23.446	22.274	0.675	1 house	0.0023	NA	Domestic, drinking and livestock	Submersible pump	Good condition	434.0	7.31	2,170	32.87	4.82	8.95	No	Well was built 22 years ago by the owner. Well type is dug well. Well casing is made of concrete and stones. Well is in good condition. Water is extracted using submersible pump operated on solar system. Weather was cloudy with high wind speed.
W20	Chah	29°10'39.40'' N	62°33'26.60'' E	-	4/30/2023	Darband Chah	Haji Tawakul	1990	21.453	20.883	0.632	10 houses	0.0035	NA	Domestic, drinking and livestock	None	Good condition	390.8	7.23	1,954	25.84	5.99	9.99	No	Well was built 32 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Water is extracted manually using a bucket and rope system by residents of nearby 10 houses and some locals for livestock and drinking purposes. Weather was cloudy with high wind speed.
W21	Chah	29°10'24.60'' N	62°33'31.80'' E	-	4/30/2023	Darband Chah	Malik Qadir	1990	20.349	18.163	0.592	8 houses	0.0023	NA	Domestic, drinking and livestock	Submersible pump	Good condition	550.9	7.04	2,754	25.08	8.34	4.52	No	Well was built 32 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Water is extracted using submersible pump operated on solar system by nearby 10 houses and some locals for livestock and drinking purposes. Weather was cloudy with high wind speed.

Bore/ Well ID	Alt. Name	Xcoord	Ycoord	Zcoord	Date surveyed	Village	BH Owner	Date drilled	Bore/ Well depth (m bgl)	Water level (m bgl)	Casing height (m)	No of people accessing the bore	Bore/ well usage rate (L/s)	Bore yield (L/s)	Bore/ well usage (domestic, etc.)	Equipment type installed (if any)	Bore status (good condition, etc.)	Field EC (mS/m)	Field pH	Field TDS (ppm)	Field T ^{o}C	DO (ppm)	Turbidity (NTU)	Sampled (yes/no)	Comment
W22	Chah	29°10'19.50'' N	62°33'27.50'' E	-	4/30/2023	Darband Chah	Jangi Khan	1972	20.633	20.379	0.514	10 houses	0.0046	NA	Domestic, drinking and livestock	Submersible pump	Good condition	434.4	6.79	2,172	26.65	5.44	0.57	No	Well was built 50 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Water is extracted using submersible pump operated on solar system by nearby 10 houses and some locals for livestock and drinking purposes. Weather was cloudy with high wind speed.
W23	Chah	29°10'18.10'' N	62°33'32.10'' E	-	4/30/2023	Darband Chah	Shah Nazar	2016	18.335	17.342	0.602	10 houses	0.0046	NA	Domestic, drinking and livestock	Submersible pump	Good condition	534.2	7.48	2,671	24.78	8.05	1.92	No	Well was built 6 years ago by the owner. Well type is dug well and casing is made of concrete and bricks. Well is in good condition. Weather was cloudy with high wind speed. Water is extracted using submersible pump operated on solar system by nearby 10 houses and some locals for livestock and drinking purposes.
W24	Chah	29°10'13.80'' N	62°33'34.40'' E	-	4/30/2023	Darband Chah	Shah Bashir	1962	17.967	16.054	0.398	5 houses	0.0023	NA	Domestic, drinking and livestock	Submersible pump	Good condition	508.0	6.5	2,540	28.16	4.87	1.75	No	Well was built 60 years ago by the owner. Well type is dug well and casing is made of concrete and bricks. Well is in good condition. Weather was cloudy with high wind speed. Water is extracted using submersible pump operated on solar system by nearby 5 houses and some locals for livestock and drinking purposes.
W25	Chah	29°10'18.50'' N	62°33'34.50'' E	-	4/30/2023	Darband Chah	Government	1962	19.604	16.497	0.854	Nearby houses and FC	0.0035	NA	Domestic, drinking and livestock	None	Good condition	425.8	7.26	2,129	24.74	5.04	9.99	No	Well was built 60 years ago by the Government. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Weather was cloudy with high wind speed. Water is extracted using a bucket and rope system by residents of nearby houses and some locals for livestock and drinking purposes. Water is extracted also by FC for drinking purposes.
W26	Chah	29°10'31.20'' N	62°33'37.20'' E	-	4/30/2023	Darband Chah	Allah Dad	1972	20.558	18.468	0.367	5 houses	0.0035	NA	Domestic, drinking and livestock	None	Good condition	389.9	7.18	1,949	26.12	4.48	9.99	No	Well was built 50 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Earlier, water was extracted using submersible pump operated on solar system but nowadays water is extracted using rope and bucket system due to the submersible pump failure 2 MONTHS AGO. Weather was cloudy with high wind speed.
W27	Chah	29°10'32.90'' N	62°33'37.20'' E	-	4/30/2023	Darband Chah	Malik Mahmood	2020	20.685	19.220	0.502	6 houses	0.0035	NA	Domestic, drinking and livestock	Submersible pump	Good condition	477.5	6.52	2,388	27.12	4.86	1.59	No	Well was built 50 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Water is extracted using submersible pump operated on solar system by nearby houses and some locals for livestock and drinking purposes. Weather was cloudy with high wind speed.
W28	Chah	29°10'33.60'' N	62°33'37.70'' E	-	4/30/2023	Darband Chah	Malik Mahmood	2010	20.974	20.493	0.482	30 houses	0.0579	NA	Domestic, drinking and livestock	Submersible pump	Good condition	326.9	7.76	1,634	32.08	5.73	1.2	No	Well was built 12 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Water is extracted using submersible pump operated on solar system, stored in a tank and then distributed to the residents of the village via taps installed near the well. Water is also extracted by some locals passing near the well. Weather was cloudy with high wind speed.
NDW1	Chah	29°10'36.60'' N	62°33'21.20'' E	-	4/30/2023	Darband Chah	Haji Esa	1973	21.451	20.686	0.325	20 houses	0.0116	NA	Domestic, drinking and livestock	Submersible pump	Good condition	528.6	6.51	2,643	26.88	5.06	3.56	No	Well was built 50 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Water is extracted using submersible pump operated on solar system. Water is also extracted by some locals passing near the well. Weather was cloudy with high wind speed.
NDW2	Chah	29°10'29.20'' N	62°33'19.30'' E	-	4/30/2023	Darband Chah	Jangi Khan	1998	22.023	21.600	0.451	10 houses	0.0035	NA	Domestic, drinking and livestock	None	Good condition	484.4	6.55	2,422	26.43	4.22	9.99	No	Well was built 25 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Water is extracted using rope and bucket system. Weather was cloudy with high wind speed.
NDW3	Chah	29°10'32.70'' N	62°33'34.10'' E	-	4/30/2023	Darband Chah	Malik Nasir	1983	22.380	18.497	1.167	15 houses	0.0058	NA	Domestic, drinking and livestock	None	Good condition	421.5	7.39	2,107	25.94	5.19	5.97	No	Well was built 40 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Water is extracted using submersible pump operating on solar system but currently this system is non-functional since 2 months therefore water is extracted using rope and bucket system. Weather was cloudy with high wind speed.
W1	Chah	29°05'59.5" N	62°17'25.5" E	-	4/28/2023	Humai	RDMC - Reko Diq Mining Company	2007	79.397	8.011	0.603	RO Plant and nearby 10 houses	0.0463	NA	Domestic, drinking, livestock and RO Plant	Submersible pump	Good condition	637.0	6.75	3,185	28.91	3.95	0.63	No	Well was built 16 years ago by TCC. Well type is boring well. Well casing is made of 8 inches steel pipe with concrete finishing. Water is extracted using submersible pump operated on solar system and feed to the RO Plant. Water is extracted also by some locals passing near the settlement. Overall well condition is good Weather was sunny with high wind speed. Well depth needs to be confirmed from Barrick as after 80 meters, depth measurement was not possible due to blockage by submersible pump.
W2	Chah	29°05'44.6'' N	62°17'34.7'' E	-	4/28/2023	Humai	Ghulam Muhammad	2017	10.568	10.337	0.221	3 houses	0.0046	NA	Domestic, drinking and livestock	Submersible pump	Good condition	343.6	7.23	1,718	26.62	5.49	1.85	No	Well was built 6 years ago by the owner. Well type is dug well. Well casing is made of bricks and concrete. Well is in good condition. Water is extracted using submersible pump operated on solar system. Weather was sunny with high wind speed.
W3	Chah	29°05'45.1'' N	62°17'37.1'' E	-	4/28/2023	Humai	Abdul Wahid	2017	13.028	12.670	0.165	10 houses	0.0231	NA	Domestic, drinking and livestock	Submersible pump	Good condition	327.6	7.23	1,638	27.60	5.24	20.0	No	Well was built 6 years ago by the owner. Well type is dug well. Well casing is made of concrete and stones. Well is in good condition. Water is extracted using submersible pump operated on solar system. Weather was sunny with high wind speed.
W4	Chah	29°05'50.4'' N	62°17'29.8'' E	-	4/28/2023	Humai	Anayatullah	1990	9.182	8.278	0.399	Residents, livestock of village and passing locals	0.0035	NA	Domestic and livestock	None	Good condition	373.2	7.27	1,867	24.03	6.15	225.0	No	Well was built 33 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition.Water is only extracted for washing and livestock only as this well is near to the RO Plant so pepole rely on RO for drinking water. Weather was sunny with high wind speed.

Bore/ Well ID	Alt. Name	Xcoord	Ycoord	Zcoord	Date surveyed	Village	BH Owner	Date drilled	Bore/ Well depth (m bgl)	Water level (m bgl)	Casing height (m)	No of people accessing the bore	Bore/ well usage rate (L/s)	Bore yield (L/s)	Bore/ well usage (domestic, etc.)	Equipment type installed (if any)	Bore status (good condition, etc.)	Field EC (mS/m)	Field pH	Field TDS (ppm)	Field T ^{0}C	DO (ppm)	Turbidity (NTU)	Sampled (yes/no)	Comment
W5	Chah	29°05'47.1'' N	62°17'30.5'' E	-	4/28/2023	Humai	RDMC	2019	RO Plant	RO Plant	RO Plant	30 houses	0.0347	NA	Drinking	RO Plant	Good condition	17.8	7.75	89	29.97	6.11	0.99	No	RO Plant was built 4 years ago by National Resources Limited. Raw water is obtained from the W1 Well via pipeline. After purification, water is stored in a tank and then distributed in the village by pipeline system. Weather was cloudy with high wind speed.
W6	Chah	29°06'02.3'' N	62°16'47.2'' E	-	4/28/2023	Humai	Sakhi Jamal Din	1960	5.358	4.517	0.118	Some residents of the village, passing locals, FC and Army	0.0463	NA	Domestic, drinking and livestock	None	Good condition	427.4	7.65	2,137	24.32	7.41	3.63	Yes	Well was built 73 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Water is extracted manually using a bucket and rope system by locals while FC and Army used engine system to extract the water. Water is extracted also by some locals passing near the well. Weather was sunny with high wind speed.
W7	Chah	29°06'25.2"N	62°16'52.0" E	-	4/28/2023	Humai	Malik Mahmood	1990	NA								Non-Functional since 2020	NA							Well was built 33 years ago by the owner and used for domestic, drinking and livestock purposes. However, it is non-functional since 2020. It is now filled with sand and closed by steel sheets by the owner. It was a dug well.
W8	Chah	29°05'59.6" N	62°16'49.7" E	-	4/28/2023	Humai	Ghulam Muhammad	1990	NA								Non-Functional since 2021	NA							Well was built 33 years ago by the owner and used for domestic, drinking and livestock purposes. However, it is non-functional since 2021. It is now filled with sand and closed by steel sheets by the owner. It was a dug well.
W9	Chah	29°06'34.7'' N	62°16'51.4'' E	-	4/28/2023	Humai	Malik Mahmood	1992	2.884	2.387	0.490	Some residents of the village and passing locals.	0.001736	NA	Drinking and livestock	None	Good condition	495.3	7.81	2,477	22.71	6.54	4.05	No	Well was built 31 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Weather was sunny with high wind speed. Water is extracted manually using a bucket and rope system by some residents and locals only for livestock and drinking purposes.
W10	Chah	29°06'29.21'' N	62°16'52.5'' E	-	4/28/2023	Humai	Juma Khan	1992	2.956	2.630	0.115	Some residents of the village and passing locals.	0.001157	NA	Domestic, drinking and livestock	None	Good condition	504.0	7.46	2,520	28.98	5.66	5.41	No	Well was built 31 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Weather was sunny with high wind speed. Water is extracted manually using a bucket and rope system by some residents and passing locals for livestock and drinking purposes.
W11	Chah	29°06'08.6'' N	62°17'20.4'' E	-	4/28/2023	Humai	Muhammad	2020	8.202	7.805	0.291	5 houses and passing locals.	0.002315	NA	Domestic, drinking and livestock	None	Good condition	405.3	7.81	2,026	21.71	7.27	120	No	Well was built 3 years ago by the owner. Well type is dug well and casing is made of concrete and stones. Well is in good condition. Water is extracted manually using a bucket and rope system by residents of nearby houses and some locals for livestock and drinking purposes. Weather was sunny with high wind speed.
NW1	Chah	29°05'49.0" N	62°17'39.7" E	-	5/1/2023	Humai	Saeed Ahmad	2020	33.251	15.571	0.840	20 houses	0.017361	NA	Domestic, drinking and livestock	Submersible pump	Good condition	327.8	7.19	1,639	27.65	5.27	1.96	No	Well was built 3 years ago by the owner. Well type is drilled well and casing is made 12 inches steel pipe with concrete finishing. Water is extracted using submersible pump operated on solar system. Weather was sunny with high wind speed.
NW2	Chah	29°06'01.1'' N	62°17'26.3'' E	-	5/1/2023	Humai	Gul Muhamamd	2017	NA								Non-Functional since 2021	NA							Well was built 06 years ago by the owner and used for domestic, drinking and livestock purposes. However, it is non-functional since 2021. It is now filled with sand and closed by steel sheets by the owner. It was a dug well.
NW3	Chah	29°06'04.4'' N	62°16'47.8'' E	-	5/1/2023	Humai	Rustam	1990	NA								Non-Functional since 2022	NA							Well was built 33 years ago by the owner and used for domestic, drinking and livestock purposes. However, it is non-functional since 2022. It is now filled with sand and closed by steel sheets by the owner. It was a dug well.
NW4	Chah	29°06'03.1'' N	62°16'47.5'' E	-	5/1/2023	Humai	Juma Khan	1992	NA								Non-Functional since 2022	NA							Well was built 31 years ago by the owner and used for domestic, drinking and livestock purposes. However, it is non-functional since 2022. It is now filled with sand and closed by steel sheets by the owner. It was a dug well.
Settlements west of the Reko Diq Mine Site																									
Tung Catcaw	NA	29°30'38.84"N	61°15'35.21"E	-	22/5/2023	Kachau	Haji Abdullah	1900	NA	0.000	0.000	Whole village	0.231481	NA	Domestic, drinking and livestock	None	Good condition	83.8	7.63	419	32.17	3.23	3.84	Yes	Spring was identified 122 years ago by the owner. Water is extracted using a small plastic pipe, stored in the tank and then carried by the households to meet their needs. Spring water is used for domestic, drinking and livestock.
Notizai	NA	29°29'58.17"N	61°15'29.99"E	-	22/5/2023	Kachau	Notizai	1900	NA	0.000	0.000	1 house	NA	NA	Agriculture only	None	Good condition	277.7	7.68	1,388	25.28	3.59	5.09	Yes	Spring was identified 122 years ago by the owner. Water is extracted using 6 inches plastic pipe to irrigate the 20 acres fields only. Spring water is only used for agricultural purposes.
Bore Chah	NA	29°31'46.50"N	61°19'25.80"E	-	22/5/2023	Bore Chah	NA	NA	NA	0.000	0.000	NA	NA	NA	NA	None	Good condition	287.5	7.93	1,438	26.67	3.58	3.99	Yes	Spring/Kareez was found near the road from Kirtaka to Rabat. Water is stored in square type ponds using a small plastic pipe. Spring/kareez water is used for drinking and livestock purposes. Some nearby passing locals also use spring/kareez water for drinking purposes.
Multiple Springs	NA	29°30'18.80"N	61°20'50.50"E	-	22/5/2023	Near Bore Chah	NA	NA	NA	0.000	0.000	NA	NA	NA	NA	None	Good condition	494.5	7.58	2,473	28.90	3.43	3.19	Yes	Multiple springs were found near the road from Kirtaka to Rabat. Water is stored in circular type ponds using a small plastic pipe. Springs water is used for drinking and livestock purposes. Some nearby passing locals also use springs water for drinking purposes.
Kirtaka	NA	29°28'11.50"N	61°23'25.20"E	-	22/5/2023	Kirtaka	NA	NA	5.211	4.841	1.031	NA	NA	NA	NA	None	Good condition	457.1	8	2,285	27.35	3.5	54.3	Yes	Kareez was found near the road from Saindak to Kirtaka. Kareez water is used for drinking and livestock purposes. Some nearby passing locals also use kareez water for drinking purposes.
Maki	NA	29°28'00.60"N	61°19'30.50"E	-	23/5/2023	Maki	NA	NA	NA	NA	NA	NA	NA	NA	NA	None	NA	NA	NA	NA	NA	NA	NA	NA	There was no spring found at the provided coordinates but 500 meters before the actual location, a dense vegitation was found which was looking healthy. When the soil surface was digged, wet soil was observed whch means that at some time, this was a water source which is dry now.
Beeduk	NA	29°24'29.80"N	61°25'08.40"E	-	23/5/2023	Beeduk	NA	2020	NA	0.000	0.000	4 houses	Unlimited	NA	Garden, drinking and livestock	None	Good condition	147.1	7.55	735	27.12	3.48	2.94	Yes	Spring was identified 3 years ago by the owner. Water is extracted using a small plastic pip. Spring water is used drinking and gardening purposes. A garden was also there near the spring.

Bore/ Well ID	Alt. Name	Xcoord	Ycoord	Zcoord	Date surveyed	Village	BH Owner	Date drilled	Bore/ Well depth (m bgl)	Water level (m bgl)	Casing height (m)	No of people accessing the bore	Bore/ well usage rate (L/s)	Bore yield (L/s)	Bore/ well usage (domestic, etc.)	Equipment type installed (if any)	Bore status (good condition, etc.)	Field EC (mS/m)	Field pH	Field TDS (ppm)	Field T ^{0}C	DO (ppm)	Turbidity (NTU)	Sampled (yes/no)	Comment
Maskin	NA	29°21'54.10"N	61°26'26.00"E	-	23/5/2023	Maskin	Abdul Haq	1983	4.956	4.826	0.000	1 house	Unlimited	NA	Garden, drinking and livestock	None	Good condition	294.7	8.07	1,473	26.13	3.51	1.35	Yes	Kareez was identified 40 years ago by the owner. Water is extracted in a small channel and ditributed to the garden which is near the kareez. Kareez water is used drinking and gardening purposes. A garden was also there near the kareez.
W29	Chah	29°13'46.30'' N	61°39'30.90'' E	-	9/17/2022	Amalaf	Malik Shah Mureed	2022	24	4	0.000	2 houses	0.000578	NA	Livestock	None	Good condition	728.0	7.94	5,180	27.70	NA	9.99	No	Well was built 1 year ago by the owner. Water is extracted manually using a bucket and rope system by nearby 2 houses only for livestock purposes.
W30	Chah	29°13'29.00'' N	61°39'07.10'' E	-	9/17/2022	Amalaf	Malik Shah Mureed	2022	Sheet 2	30	10.000	Some scattered animals and passing locals	NA	NA	Garden, drinking and livestock	None	Good condition	552.0	7.97	3,920	28.80	NA	9.99	No	Well was built 1 year ago by the owner. Water is extracted manually using a bucket and rope system by some passing locals for drinking and livestock purposes.
W31	Chah	29°12'13.50'' N	61°36'07.30'' E	-	9/17/2022	Killi Malik Abdul Samad	Haji Qadir	2019	Sheet 2	55	43.000	4 houses	0.00347	NA	Garden, drinking and livestock	None	Good condition	237.0	8.2	1,680	26.50	NA	3.82	No	Well was built 3 years ago by the owner. Water is extracted using submersible pump operated on solar system, distributed to the residents of the houses via pipe.

REKO DIQ
MINING COMPANY

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The document is NOT approved until an RDMC Approval stamp has been affixed.

Document No.:	**6105AK023-S411-HD27-0034**	**Rev:**	**A**
Document Title:	**Appendix D – Water Quality Data**		
Issue Date:	**2024-02-23**		

Supplier/Contractor Details

Package/Contract No:	**K023**		
Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix D – Water Quality Data**	**Rev:**	**A**

	2024-02-23	**Review**			
			Sadia Asghar	**Vaqar Zakaria**	**Barbara Wessels**
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix D
Water Quality Data

Sadia Asghar
Hagler Bailly Pakistan
Block 1 Comercial Area
Steet 21 f8/2
44000 Islamabad

t: 925128572007

e: akarim@haglerbailly.com.pk

i2 Analytical Ltd.
ul.Pionierów 39,
41-711 Ruda Slaska,
Poland
NR BDO: 000039239

t: 004832 3426011
f: 004832 3426012
e: contact@i2analytical.com

Analytical Report Number : 23-36349

Replaces Analytical Report Number: 23-36349, issue no. 1; Changed the language of the disclaimer.

Project / Site name:	RKG	**Samples received on:**	30/05/2023
Your job number:		**Sample instructed on/ Analysis started on:**	31/05/2023
Your order number:	4429V3	**Analysis completed by:**	07/06/2023
Report Issue Number:	2	**Report issued on:**	19.06.2023
Samples Analysed:	6 water samples		

i2 Analytical Limited Sp. z o.o.
Oddział w Polsce
ul. Pionierów 39
41-711 Ruda Śląska
NIP: 2050000782

Dominika Warjan
Specjalista
Działu Analiz Raportów

Signed:

Dominika Warjan
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Other office located at: 7 Woodshots Meadow Croxley Green Business Park Watford Herts WD18 8YS UK

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Sampling and delivery by client.

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number: 23-36349
Project / Site name: RKG

Your Order No: 4429V3

Lab Sample Number				2694607	2694618	2694606
Sample Reference				W13	FS13	FS20-PB
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				21/05/2023	19/05/2023	20/05/2023
Time Taken				0945	1210	1250
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
General Inorganics						
pH	pH Units	N/A	ISO 17025	7.8	7.7	7.7
Electrical Conductivity	µS/cm	10	ISO 17025	3900	11000	5600
Turbidity	NTU	1	NONE	< 1.0	13	1.6
Sulphate as SO4	µg/l	45	ISO 17025	662000	1290000	1250000
Chloride	mg/l	0.15	ISO 17025	930	2400	410
Phosphate as PO4	µg/l	62	ISO 17025	< 62	< 62	< 62
Fluoride	µg/l	50	ISO 17025	1500	310	370
Ammonium as NH4	µg/l	15	ISO 17025	110	< 15	16
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	1.05	U/S	1.49
Nitrate as N	mg/l	0.01	ISO 17025	4.31	13.4	8.72
Nitrite as N	µg/l	1	ISO 17025	3.2	< 1.0	10
Alkalinity	mg/l	3	ISO 17025	250	38	25
Bicarbonate Alkalinity (as CaCO3)	mg/l	3	NONE	250	38	35
Carbonate Alkalinity as CO3	mg/l	3	NONE	< 3.0	< 3.0	< 3.0
Total Suspended Solids	mg/l	2	ISO 17025	6	45	9
Total Dissolved Solids	mg/l	4	ISO 17025	2700	8000	4100
Hardness - Total	mgCaCO3/l	1	ISO 17025	514	2680	1120
Calcium Hardness	mg/l	0.03	NONE	334	1980	1040
Magnesium Hardness	mg/l	0.08	NONE	180	690	76.4
Heavy Metals / Metalloids ICP-MS						
Aluminium (dissolved)	mg/l	0.001	ISO 17025	0.0012	0.002	0.0026
Antimony (dissolved)	µg/l	0.4	ISO 17025	0.6	0.7	0.5
Arsenic (dissolved)	µg/l	0.15	ISO 17025	7.43	0.62	9.38
Barium (dissolved)	µg/l	0.06	ISO 17025	16	15	16
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.09	0.11	0.03
Chromium (dissolved)	µg/l	0.2	ISO 17025	1.4	28	52
Cobalt (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	3.5	1.6	2.4
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2
Lithium (dissolved)	µg/l	1	NONE	300	140	63
Manganese (dissolved)	µg/l	0.05	ISO 17025	0.33	2.5	6.4
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	18	5.9	14
Nickel (dissolved)	µg/l	0.5	ISO 17025	0.8	2.8	0.8
Silver (dissolved)	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Silicon (dissolved)	µg/l	50	NONE	12000*	9800	9400
Selenium (dissolved)	µg/l	0.6	ISO 17025	3.9	30	16
Vanadium (dissolved)	µg/l	0.2	ISO 17025	19	2.7	24
Zinc (dissolved)	µg/l	0.5	ISO 17025	12	8.2	5.9
Thallium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0

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Analytical Report Number: 23-36349
Project / Site name: RKG

Your Order No: 4429V3

Lab Sample Number				2694607	2694618	2694606
Sample Reference				W13	FS13	FS20-PB
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				21/05/2023	19/05/2023	20/05/2023
Time Taken				0945	1210	1250
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Titanium (dissolved)	µg/l	1	NONE	1.4	< 1.0	< 1.0
Tungsten (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Strontium (dissolved)	µg/l	1	NONE	850	18000*	8400
Rubidium (dissolved)	µg/l	5	NONE	8.3	1.4	1.04
Ruthenium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Iridium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Osmium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Palladium (dissolved)	µg/l	1	NONE	< 1.0	4.8	2.5
Platinum (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Zirconium (dissolved)	µg/l	5	NONE	< 5.0	< 5.0	< 5.0
Bismuth (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Nobium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Tin (dissolved)	µg/l	0.2	ISO 17025	< 0.20	< 0.20	< 0.20

Heavy Metals / Metalloids ICP-OES

Calcium (dissolved)	mg/l	0.012	ISO 17025	130	790*	420
Magnesium (dissolved)	mg/l	0.005	ISO 17025	44	170	19
Potassium (dissolved)	mg/l	0.025	ISO 17025	7.4	12	4
Sodium (dissolved)	mg/l	0.01	ISO 17025	870*	1300*	1200*
Phosphorus (dissolved)	µg/l	20	ISO 17025	275	308	279
Boron (dissolved)	µg/l	10	ISO 17025	1700	2500	5800
Iron (dissolved)	mg/l	0.004	ISO 17025	< 0.004	< 0.004	< 0.004
Gold (dissolved)	µg/l	50	NONE	< 50	< 50	< 50
Indium (dissolved)	µg/l	5	NONE	33	55	41
Uranium (dissolved)	µg/l	50	NONE	< 50	< 50	< 50
Gallium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Germanium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Neodymium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Scandium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Samarium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Yttrium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Nickel (dissolved)	µg/l	0.3	ISO 17025	-	-	-
Selenium (dissolved)	µg/l	4	ISO 17025	-	-	-
Phosphorus (total)	µg/l	20	ISO 17025	330	390	360

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Analytical Report Number: 23-36349
Project / Site name: RKG

Your Order No: 4429V3

Lab Sample Number				2694622	2694623	2694624
Sample Reference				kirtaka	Bore Chan	Maskin
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				22/05/2023	22/05/2023	23/05/2023
Time Taken				1625	1410	1325
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
General Inorganics						
pH	pH Units	N/A	ISO 17025	7.7	8.1	8.4
Electrical Conductivity	µS/cm	10	ISO 17025	5000	3000	3100
Turbidity	NTU	1	NONE	13	2.6	2.6
Sulphate as SO4	µg/l	45	ISO 17025	1120000	1110000	714000
Chloride	mg/l	0.15	ISO 17025	1200	430	580
Phosphate as PO4	µg/l	62	ISO 17025	64	< 62	< 62
Fluoride	µg/l	50	ISO 17025	520	560	1800
Ammonium as NH4	µg/l	15	ISO 17025	< 15	< 15	< 15
Total Organic Carbon (TOC)	mg/l	0.1	ISO 17025	6.97	1.05	1.29
Nitrate as N	mg/l	0.01	ISO 17025	0.09	1.03	5.62
Nitrite as N	µg/l	1	ISO 17025	370	< 1.0	5
Alkalinity	mg/l	3	ISO 17025	41	88	150
Bicarbonate Alkalinity (as CaCO3)	mg/l	3	NONE	50	79	130
Carbonate Alkalinity as CO3	mg/l	3	NONE	< 3.0	9.1	14
Total Suspended Solids	mg/l	2	ISO 17025	35	< 2.0	13
Total Dissolved Solids	mg/l	4	ISO 17025	3600	2400	2100
Hardness - Total	mgCaCO3/l	1	ISO 17025	1080	818	485
Calcium Hardness	mg/l	0.03	NONE	1050	690	360
Magnesium Hardness	mg/l	0.08	NONE	31.3	129	126
Heavy Metals / Metalloids ICP-MS						
Aluminium (dissolved)	mg/l	0.001	ISO 17025	0.0027	0.0037	0.0023
Antimony (dissolved)	µg/l	0.4	ISO 17025	0.6	0.7	0.7
Arsenic (dissolved)	µg/l	0.15	ISO 17025	347	1.63	7.86
Barium (dissolved)	µg/l	0.06	ISO 17025	20	16	14
Beryllium (dissolved)	µg/l	0.1	ISO 17025	< 0.1	< 0.1	< 0.1
Cadmium (dissolved)	µg/l	0.02	ISO 17025	0.08	0.05	< 0.02
Chromium (dissolved)	µg/l	0.2	ISO 17025	0.3	0.4	1.4
Cobalt (dissolved)	µg/l	0.2	ISO 17025	< 0.2	< 0.2	< 0.2
Copper (dissolved)	µg/l	0.5	ISO 17025	4.1	3.2	2.2
Lead (dissolved)	µg/l	0.2	ISO 17025	< 0.2	0.2	< 0.2
Lithium (dissolved)	µg/l	1	NONE	140	66	85
Manganese (dissolved)	µg/l	0.05	ISO 17025	16	7.9	0.53
Mercury (dissolved)	µg/l	0.05	ISO 17025	< 0.05	< 0.05	< 0.05
Molybdenum (dissolved)	µg/l	0.05	ISO 17025	23	16	35
Nickel (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5
Silver (dissolved)	µg/l	0.05	NONE	< 0.05	< 0.05	< 0.05
Silicon (dissolved)	µg/l	50	NONE	12000*	5600	5400
Selenium (dissolved)	µg/l	0.6	ISO 17025	4	8.2	7.1
Vanadium (dissolved)	µg/l	0.2	ISO 17025	3.7	1.8	2.3
Zinc (dissolved)	µg/l	0.5	ISO 17025	8.3	9.6	4.7
Thallium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0

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Analytical Report Number: 23-36349
Project / Site name: RKG

Your Order No: 4429V3

Lab Sample Number				2694622	2694623	2694624
Sample Reference				kirtaka	Bore Chan	Maskin
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied
Date Sampled				22/05/2023	22/05/2023	23/05/2023
Time Taken				1625	1410	1325
Analytical Parameter (Water Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Titanium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Tungsten (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Strontium (dissolved)	µg/l	1	NONE	6200	1100	1700
Rubidium (dissolved)	µg/l	5	NONE	2.0	1.4	1.8
Ruthenium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Iridium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Osmium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Palladium (dissolved)	µg/l	1	NONE	2.5	1.2	1.8
Platinum (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Zirconium (dissolved)	µg/l	5	NONE	< 5.0	< 5.0	< 5.0
Bismuth (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Nobium (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0
Tin (dissolved)	µg/l	0.2	ISO 17025	< 0.20	< 0.20	0.32

Heavy Metals / Metalloids ICP-OES

Calcium (dissolved)	mg/l	0.012	ISO 17025	420	280	140
Magnesium (dissolved)	mg/l	0.005	ISO 17025	7.6	31	30
Potassium (dissolved)	mg/l	0.025	ISO 17025	4.5	2.6	4.2
Sodium (dissolved)	mg/l	0.01	ISO 17025	930*	560*	670*
Phosphorus (dissolved)	µg/l	20	ISO 17025	327	316	309
Boron (dissolved)	µg/l	10	ISO 17025	12000	13000	1800
Iron (dissolved)	mg/l	0.004	ISO 17025	< 0.004	< 0.004	< 0.004
Gold (dissolved)	µg/l	50	NONE	< 50	< 50	< 50
Indium (dissolved)	µg/l	5	NONE	45	38	36
Uranium (dissolved)	µg/l	50	NONE	< 50	< 50	< 50
Gallium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Germanium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Neodymium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Scandium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Samarium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Yttrium (dissolved)	µg/l	5	NONE	< 5	< 5	< 5
Nickel (dissolved)	µg/l	0.3	ISO 17025	-	-	-
Selenium (dissolved)	µg/l	4	ISO 17025	-	-	-
Phosphorus (total)	µg/l	20	ISO 17025	350	340	320

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Analytical Report Number : 23-36349
Project / Site name: RKG

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in water by ICP-OES (dissolved)	Determination of metals in water by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW, PrW.(Al, Cu,Fe,Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in water by ICP-MS (dissolved)	Determination of metals in water by acidification followed by ICP-MS. Accredited Matrices: SW, GW, PW except B=SW,GW, Hg=SW,PW, Al=SW,PW.	In-house method based on USEPA Method 6020 & 200.8 "for the determination of trace elements in water by ICP-MS.	L012-PL	W	ISO 17025
Metals in water by ICP-OES (total)	Determination of metals in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW, PrW (Al, Fe, Cu, Zn).	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Boron in water	Determination of boron in water by acidification followed by ICP-OES. Accredited matrices: SW PW GW	In-house method based on MEWAM	L039-PL	W	ISO 17025
Electrical conductivity at 20oC of water	Determination of electrical conductivity in water by electrometric measurement. Accredited Matrices SW, GW, PW	In-house method	L031-PL	W	ISO 17025
Fluoride in water	Determination of fluoride in water by 1:1 ratio with a buffer solution followed by Ion Selective Electrode. Accredited matrices: SW, PW, GW.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033B-PL	W	ISO 17025
Total Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium. Accredited Matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	ISO 17025
Total Phosphate in water	Determination of ortho phosphate in water by addition of ammonium molybdate, potassium antimonyl tartrate and ascorbic acid followed by discrete analyser (colorimetry). Accredited matrices: SW, PW, GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton, analysis by discreet analyser.	L082-PL	W	ISO 17025
Sulphate in water	Determination of sulphate in water after filtration by acidification followed by ICP-OES. Accredited Matrices SW, GW, PW.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Suspended solids in water	Determined gravimetrically with GFC filtration papers.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L004-PL	W	ISO 17025
Total organic carbon in water	Determination of dissolved organic carbon in water by TOC/DOC NDIR analyser. Accredited matrices: SW PW GW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L037-PL	W	ISO 17025
Ammonium as NH4 in water	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrite as N in water	Determination of nitrite in water by addition of sulphanilamide and NED followed by discrete analyser (colorimetry). Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	ISO 17025
Nitrate as N in water	Determination of nitrate by reaction with sodium salicylate and colorimetry. Accredited matrices SW, GW, PW.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	ISO 17025
pH at 20oC in water (automated)	Determination of pH in water by electrometric measurement. Accredited matrices: SW PW GW	In house method.	L099-PL	W	ISO 17025
Calcium Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	NONE

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The results included within the report are representative of the samples submitted for analysis.

Analytical Report Number : 23-36349
Project / Site name: RKG

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Magnesium Hardness of water	Determination of hardness in waters by calculation from calcium and magnesium.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	NONE
Chloride in water	Determination of Chloride (diissolved) colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260. Accredited matrices: SW, PW, GW.	L082-PL	W	ISO 17025
Alkalinity in Water (by titration)	Determination of Alkalinity by titration (colorimetry).	In house method based on MEWAM & USEPA Method 310.2.	L025-PL	W	NONE
Turbidity of in water	Determination of sample turbidity by colorimeter and comparison with standard reference samples.	In-house method based on Standard Method 8237	L083-PL	W	NONE
Total dissolved solids in water (Gravimetric)	Determination of total dissolved solids in water by gravimetry.	In house method based on BSEN 15216:2007	L004-PL	W	ISO 17025
Alkalinity in Water (by discreet analyser)	Determination of Alkalinity by discreet analyser (colorimetry). Accredited matrices: SW, PW, GW.	In house method based on MEWAM & USEPA Method 310.2.	L082-PL	W	ISO 17025

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

*Over range data, sample was diluted and results are estimated from an extrapolated calibration. Results should be interpreted with care.

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The results included within the report are representative of the samples submitted for analysis.

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Document No.:	**6105AK023-S411-HD27-0034**	**Rev:**	**A**
Document Title:	**Appendix E – Air Quality Data**		
Issue Date:	**2024-02-23**		

Supplier/Contractor Details

Package/Contract No:	**K023**		
Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix E – Air Quality Data**	**Rev:**	**A**

	2024-02-23	**Review**			
			Sadia Asghar	**Vaqar Zakaria**	**Barbara Wessels**
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix E
Air Quality Data

Test Report Air Pollution Measurement

passam ag

air quality monitoring

NOx (NO+NO2) Nitrogen oxides measurement by means of passive sampler

customer information		passive samplers		analysis		test report	
customer:	Gradko	date received:	29.11.2023	method:	SP12-S photometer, Salzmann	created on:	09.12.2023
customer ID:	GDK	type:	tube (Palms)	analyte:	[NO]-	created by:	U. Kunz
contact person:	Andy Poole	pollutant:	NOx (NO+NO2)	date:	07.12.2023	checked on:	13.12.2023
project:	104018 / Q1213	protective filter:	yes	place:	passam ag	checked by:	T. Hangartner
reference:		limit of detection:	NO: 2.5 ug/m3 (14 days)			file name:	GDK12-S-2329-3
			NO2: 0.7 ug/m3 (14 days)			pages:	1

note: applies to the sample as received; results below the detection limit are indicated with "<" and the associated value; this method is accredited to ISO/IEC 17025 measurement uncertainty <30%; sampling rate related to 20 °C; further information at www.passam.ch

measuring site	passive sampler				measuring period			result						Comment on the analysis
	label		lot no.		start		exp. time	m / sampler			Conc			
	NO2	NOx	NO2	NOx	date	time	h	NO ug	NO2 ug	NOx ug	NO ug/m3	NO2 ug/m3	NOx ug/m3	
A1	961	973	45132	45146	24/10/2023	14:50	621.0	0.15	0.02	0.17	4.2	0.7	4.9	
A2	976	990	45132	45146	24/10/2023	16:50	622.9	< 0.05	0.14	0.14	< 1.3	5.0	5.0	

Test Report Air Pollution Measurement

passam ag

air quality monitoring

NOx (NO+NO2) Nitrogen oxides measurement by means of passive sampler

customer information

customer: Gradko
customer ID: GDK
contact person: Andy Poole
project:
reference: 80982 / S1163

passive samplers

date received: 06.11.2020
type: tube (Palms)
pollutant: NOx (NO+NO2)
protective filter: yes

analysis

method: SP12-S photometer, Salzmann
analyte: [NO]-
date: 12.11.2020
place: passam ag

test report

created on: 13.11.2020
created by: U. Kunz
checked on: 13.11.2020
checked by: S. Huber
file name: GDK12-S-2026-2
pages: 1

note: applies to the sample as received; for information on measurement uncertainty, detection limit and sampling rates, see data sheet: www.passam.ch
concentration calculated assuming: T = 20°C; p = 1013 hPa; this method is accredited to ISO 17025

measuring site	passive sampler				measuring period			result						Comment on the analysis
	label		lot no.		start		exp. time	m / sampler			Conc			
	NO2	NOx	NO2	NOx	date	time	h	NO ug	NO2 ug	NOx ug	NO ug/m3	NO2 ug/m3	NOx ug/m3	*Comment on sampling*
A 1-Siareg	467	417	43949	43984	06/10/2020	9:00	362.5	< 0.04	< 0.01	< 0.04	< 1.9	< 0.6	< 2.4	Protocol bad to read.
A 2 -Humai	475	404	43949	43984	06/10/2020	12:30	360.5	< 0.04	0.03	< 0.04	< 1.9	1.7	< 2.4	
A 3 - Nok Kundi	488	395	43949	43984	07/10/2020	9:00	343.5	< 0.04	0.07	0.07	< 2	4.4	4.4	

Sampling information

Annex: Test Report Air Pollution Measurement GDK12-S-2026-2

passam ag

air quality monitoring

NOx (NO+NO2) Nitrogen oxides measurement by means of passive sampler

measuring site	passive sampler		measuring period				Optional information		
			start		end		Temp	air pressure	Comment on sampling
	label	label							
	NO2	NOx	date	time	date	time	[°C]	[hPa]	
A 1-Siareg	467	417	10/6/2020	9:00	10/21/2020	11:30			N-29 08 52.4, E 062 06 52.6
A 2 -Humai	475	404	10/6/2020	12:30	10/21/2020	13:00			N 29 05 45.2, E 062 17 34.5
A 3 - Nok Kundi	488	395	10/7/2020	9:00	10/21/2020	16:30			N 28 49 18.7, E 062 45 13.2

gradko environmental
(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

2187

LABORATORY ANALYSIS REPORT

DETERMINATION OF SULPHUR DIOXIDE IN DIFFUSION TUBES BY ION CHROMATOGRAPHY

REPORT NUMBER R08447R

BOOKING IN REFERENCE No R08447

DESPATCH NOTE No 104018

CUSTOMER Hagler Bailly Pakistan Ltd Attn: Muhammad Tahir
39, Street 3, E7
Islamabad 44000

Pakistan

DATE SAMPLES RECEIVED 23/11/2023

JOB NUMBER

Location	Sample Number	Date Exposed*	Date Finished*	Exposure Hours*	SO_4^{2-} µg on tube	SO_2 µg/m³*	SO_2 ppb*
A1	2325483	24/10/2023	19/11/2023	621.17	<0.09	<1.71	<0.64
A2	2325484	24/10/2023	19/11/2023	623.08	<0.09	<1.70	<0.64
A3	2325485	24/10/2023	19/11/2023	621.75	<0.09	<1.70	<0.64
F.B	2235820			623.08	0.01	0.18	0.07
Laboratory Blank				623.08	0.02	0.37	0.14

Comment: Results are not blank subtracted
A tube was received without a bar code. Bar code 2235820 was assigned at booking in. Maximum exposure time used.
Results reported as <0.09 on tube are below the reporting limit.

Overall M.U. ±11% **Reporting Limit** 0.09µg SO_4^{2-}

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Analysed on Dionex ICS1100 ICU11

Analyst Name Avneet Buttar **Report Checked By** Andy Poole

Date of Analysis 30/11/2023 **Date of Report** 05/12/2023

Analysis has been carried out in accordance with in-house method GLM1

Samples have been tested within the scope of Gradko International Ltd. Laboratory Quality Procedures. Results within this report relate only to samples as received. Data provided by the client and any subsequent calculations shall be indicated by an asterisk (*), these calculations and results are not within the scope of our UKAS accreditation. Any queries concerning data in this report should be directed to the Laboratory Manager Gradko International Ltd. This report is not to be reproduced, except in full, without the written permission of Gradko International Ltd.

REPORT OFFICIALLY CHECKED

Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....
L. Gates, Laboratory Manager

gradko environmental
(A division of Gradko International Ltd.)
St. Martins House, 77 Wales Street Winchester, Hampshire SO23 0RH
tel.: 01962 860331 fax: 01962 841339 e-mail:diffusion@gradko.co.uk

ilac-MRA UKAS TESTING 2187

LABORATORY ANALYSIS REPORT

DETERMINATION OF SULPHUR DIOXIDE IN DIFFUSION TUBES BY ION CHROMATOGRAPHY

REPORT NUMBER O06156R
BOOKING IN REFERENCE No O06156
DESPATCH NOTE No 80982
CUSTOMER Hagler Bailly Pakistan Ltd Attn: Sadia Asghar
39, Street 3, E7
Islamabad 44000
Pakistan
DATE SAMPLES RECEIVED 02/11/2020
JOB NUMBER

Location	Sample Number	Date Exposed*	Date Finished*	Exposure Hours*	SO_4^{2-} µg/ml	µgSO_4^{2-} - Blank	SO_2 µg/m³*	SO_2 ppb*
A1 -Siareg	1630048	06/10/2020	21/10/2020	362.50	<0.09	<0.07	<2.32	<0.87
A4 - Siareg	1630049	06/10/2020	21/10/2020	362.50	<0.09	<0.07	<2.32	<0.87
A2 - Human	1630050	06/10/2020	21/10/2020	360.50	0.87	0.85	28.78	10.79
A3 - Nok Kumdi	1630051	06/10/2020	21/10/2020	367.50	0.13	0.11	3.62	1.36
A5	1630052	06/10/2020	21/10/2020	367.50	<0.09	<0.07	<2.29	<0.86
Laboratory Blank					0.02			

Comment: Results are blank subtracted

Results reported as < 0.09 µg SO_4^{2-} are below the reporting limit.

Overall M.U. ±9.6% **Reporting Limit** 0.09µg SO_4^{2-}

The reported expanded uncertainty is based on a standard uncertainty multiplied by a factor of *k*=2, providing a level of confidence of approximately 95%. Uncertainty of measurement has not been applied to the reported results.

Analysed on Dionex ICS1100 ICU11

Analyst Name Alison Wright **Report Checked By** Katya Paldamova

Date of Analysis 12/11/2020 **Date of Report** 13/11/2020

Analysis has been carried out in accordance with in-house method GLM1

Samples have been tested within the scope of Gradko International Ltd. Laboratory Quality Procedures. Results within this report relate only to samples as received. Data provided by the client and any subsequent calculations shall be indicated by an asterisk (*), these calculations and results are not within the scope of our UKAS accreditation. Any queries concerning data in this report should be directed to the Laboratory Manager Gradko International Ltd. This report is not to be reproduced, except in full, without the written permission of Gradko International Ltd.

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Gradko International Ltd
This signature confirms the authenticity of these results
Signed.....
L. Gates, Laboratory Manager

Laboratory Test Report

Attention:	Sadia Asghar	**Client Name:**	Hagler Bailly Pakistan
Project Code:	TCD	**Client Address:**	Block 1، Street 21, F-8/2 Commercial Area Islamabad
Sampling Location:	Siareg, Nok Kundi	**Contact Details:**	03450044469 sasghar@haglerbailly.com.pk
Report Reference:	S0069LAB	**Date of Reporting:**	10 September 2020
Sampling Plan or Notes Reference	Sampling was performed by the client in accordance with their sampling procedures.		
Notes:	Four filter samples were received from HBP for particulate matter analysis. Please find attached our test report which should be read with notes and should include all sections if reproduced. Interpretations and opinions are outside the scope of this report, and all results relate only to samples supplied.		
Disclaimers	This report shall not be reproduced except in full.		

Dr Sheherzad Akhtar
Technical Manager, Analytic Services

Abbreviations and Acronyms

APHA	American Public Health Association
BOD-5	Biochemical Oxygen Demand – 5 Day
COD	Chemical Oxygen Demand
MDL	Method Detection Limit
ND	None Detected
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
US-EPA	United Stated Environmental Protection Agency
SMEW	Standard Method for the Examination of Water and Wastewater, 19th Edition

Hagler Bailly Pakistan EMA Laboratory
5, 1st Floor, Venus Aracde, St 149, Punjab Market
G13/4, Islamabad, 44000, Pakistan
T (92 51) 843 2908, F (92 51) 843 2909
ema@haglerbailly.com.pk

Hagler Bailly Pakistan (Pvt.) Ltd.
Block 1, Commercial Area, Street 21, F8/2
Islamabad 44000, Pakistan
Tel: (92 51) 285 7200-07, Fax: (92 51) 285 7208-09
mail@haglerbailly.com.pk, www.haglerbailly.com.pk

Particulate Matter Results

Sampling ID	Sampling Location	*Sampling Date*		*PM Type*	*Total PM (µg/m^3)*
		From	*To*		
A1	Siareg	Aug 24th 2020	Aug 25th 2020	PM_{10}	136
		Aug 24th 2020	Aug 25th 2020	$PM_{2.5}$	22
A2	FC Camp Nok Kundi	Aug 26th 2020	Aug 27th 2020	PM_{10}	143
		Aug 26th 2020	Aug 27th 2020	$PM_{2.5}$	33

HBP Sample ID	*Sample ID*	*Depth*	*Analysis*	*Reason*

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses are recorded as deviating if set criteria are not met.

Hagler Bailly Pakistan EMA Laboratory
5, 1st Floor, Venus Aracde, St 149, Punjab Market
G13/4, Islamabad, 44000, Pakistan
T (92 51) 843 2908, F (92 51) 843 2909
ema@haglerbailly.com.pk

Hagler Bailly Pakistan (Pvt.) Ltd.
Block 1, Commercial Area, Street 21, F8/2
Islamabad 44000, Pakistan
Tel: (92 51) 285 7200-07, Fax: (92 51) 285 7208-09
mail@haglerbailly.com.pk, www.haglerbailly.com.pk

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Document No.:	**6105AK023-S411-HD27-0034**	**Rev:**	**A**
Document Title:	**Appendix F – Noise and Traffic Data**		
Issue Date:	**2024-02-23**		

Supplier/Contractor Details

Package/Contract No:	**K023**		
Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix F – Noise and Traffic Data**	**Rev:**	**A**

	2024-02-23	Review			
			Sadia Asghar	Vaqar Zakaria	Barbara Wessels
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix F
Noise and Traffic Data

F.1. Noise Data

N1 - Nok Kundi	
Time	*Noise Level (dBA)*
Start Date	*9/24/2022*
End Date	*9/25/2022*
Start Time	*11:09:57 AM*
End Time	*11:09:59 AM*
11:09:00 AM	62.87
11:10:00 AM	63.43
11:11:00 AM	59.20
11:12:00 AM	58.34
11:13:00 AM	66.14
11:14:00 AM	65.12
11:15:00 AM	64.89
11:16:00 AM	66.00
11:17:00 AM	54.97
11:18:00 AM	60.03
11:19:00 AM	60.25
11:20:00 AM	56.48
11:21:00 AM	59.72
11:22:00 AM	64.98
11:23:00 AM	58.16
11:24:00 AM	64.13
11:25:00 AM	63.39
11:26:00 AM	54.81
11:27:00 AM	64.89
11:28:00 AM	62.35
11:29:00 AM	61.27
11:30:00 AM	59.25
11:31:00 AM	59.03
11:32:00 AM	63.86
11:33:00 AM	62.40
11:34:00 AM	51.89
11:35:00 AM	52.69
11:36:00 AM	50.67
11:37:00 AM	64.91
11:38:00 AM	68.36
11:39:00 AM	63.49
11:40:00 AM	49.18
11:41:00 AM	61.41
11:42:00 AM	47.87
11:43:00 AM	67.40
11:44:00 AM	62.47
11:45:00 AM	67.26
11:46:00 AM	55.76
11:47:00 AM	51.62
11:48:00 AM	64.98
11:49:00 AM	61.65

N1 - Nok Kundi	
Time	*Noise Level (dBA)*
11:50:00 AM	66.89
11:51:00 AM	61.77
11:52:00 AM	47.98
11:53:00 AM	60.79
11:54:00 AM	59.60
11:55:00 AM	59.98
11:56:00 AM	61.78
11:57:00 AM	67.87
11:58:00 AM	65.71
11:59:00 AM	66.14
12:00:00 PM	67.40
12:01:00 PM	58.64
12:02:00 PM	52.47
12:03:00 PM	63.25
12:04:00 PM	69.44
12:05:00 PM	63.82
12:06:00 PM	65.52
12:07:00 PM	62.54
12:08:00 PM	61.69
12:09:00 PM	75.10
12:10:00 PM	64.61
12:11:00 PM	49.67
12:12:00 PM	60.20
12:13:00 PM	56.60
12:14:00 PM	65.06
12:15:00 PM	48.15
12:16:00 PM	68.19
12:17:00 PM	50.69
12:18:00 PM	52.02
12:19:00 PM	60.76
12:20:00 PM	62.76
12:21:00 PM	67.57
12:22:00 PM	48.12
12:23:00 PM	67.13
12:24:00 PM	54.15
12:25:00 PM	54.08
12:26:00 PM	48.24
12:27:00 PM	63.87
12:28:00 PM	60.10
12:29:00 PM	58.26
12:30:00 PM	66.02
12:31:00 PM	60.14
12:32:00 PM	63.85
12:33:00 PM	63.05
12:34:00 PM	53.11

N1 - Nok Kundi	
Time	*Noise Level (dBA)*
12:35:00 PM	67.41
12:36:00 PM	57.03
12:37:00 PM	54.71
12:38:00 PM	45.29
12:39:00 PM	56.71
12:40:00 PM	56.52
12:41:00 PM	54.96
12:42:00 PM	64.95
12:43:00 PM	52.29
12:44:00 PM	65.41
12:45:00 PM	61.95
12:46:00 PM	64.81
12:47:00 PM	67.24
12:48:00 PM	66.26
12:49:00 PM	53.66
12:50:00 PM	59.03
12:51:00 PM	47.63
12:52:00 PM	49.01
12:53:00 PM	53.04
12:54:00 PM	55.04
12:55:00 PM	67.52
12:56:00 PM	68.82
12:57:00 PM	47.67
12:58:00 PM	65.80
12:59:00 PM	67.83
1:00:00 PM	48.14
1:01:00 PM	50.54
1:02:00 PM	65.77
1:03:00 PM	59.87
1:04:00 PM	65.82
1:05:00 PM	50.10
1:06:00 PM	56.41
1:07:00 PM	67.50
1:08:00 PM	57.96
1:09:00 PM	63.54
1:10:00 PM	61.25
1:11:00 PM	48.28
1:12:00 PM	69.06
1:13:00 PM	54.35
1:14:00 PM	43.98
1:15:00 PM	63.90
1:16:00 PM	57.76
1:17:00 PM	64.35
1:18:00 PM	67.98
1:19:00 PM	41.88

N1 - Nok Kundi	
Time	Noise Level (dBA)
1:20:00 PM	57.22
1:21:00 PM	62.24
1:22:00 PM	62.61
1:23:00 PM	53.99
1:24:00 PM	45.34
1:25:00 PM	59.98
1:26:00 PM	63.50
1:27:00 PM	58.43
1:28:00 PM	68.77
1:29:00 PM	59.49
1:30:00 PM	67.58
1:31:00 PM	49.90
1:32:00 PM	64.56
1:33:00 PM	57.93
1:34:00 PM	67.95
1:35:00 PM	54.66
1:36:00 PM	63.81
1:37:00 PM	57.05
1:38:00 PM	58.57
1:39:00 PM	63.45
1:40:00 PM	53.34
1:41:00 PM	47.10
1:42:00 PM	68.45
1:43:00 PM	66.01
1:44:00 PM	44.73
1:45:00 PM	48.28
1:46:00 PM	65.53
1:47:00 PM	51.78
1:48:00 PM	59.90
1:49:00 PM	58.50
1:50:00 PM	48.32
1:51:00 PM	62.50
1:52:00 PM	63.49
1:53:00 PM	47.44
1:54:00 PM	60.98
1:55:00 PM	59.93
1:56:00 PM	60.75
1:57:00 PM	49.47
1:58:00 PM	61.30
1:59:00 PM	57.08
2:00:00 PM	54.55
2:01:00 PM	52.86
2:02:00 PM	55.58
2:03:00 PM	62.50
2:04:00 PM	42.40
2:05:00 PM	56.70
2:06:00 PM	51.68

N1 - Nok Kundi	
Time	Noise Level (dBA)
2:07:00 PM	60.86
2:08:00 PM	47.69
2:09:00 PM	51.23
2:10:00 PM	59.51
2:11:00 PM	65.07
2:12:00 PM	61.19
2:13:00 PM	63.26
2:14:00 PM	58.31
2:15:00 PM	61.66
2:16:00 PM	61.03
2:17:00 PM	46.49
2:18:00 PM	64.44
2:19:00 PM	58.26
2:20:00 PM	59.51
2:21:00 PM	63.76
2:22:00 PM	48.92
2:23:00 PM	50.57
2:24:00 PM	57.30
2:25:00 PM	58.27
2:26:00 PM	63.65
2:27:00 PM	52.17
2:28:00 PM	65.71
2:29:00 PM	66.31
2:30:00 PM	61.20
2:31:00 PM	49.21
2:32:00 PM	63.68
2:33:00 PM	64.48
2:34:00 PM	64.01
2:35:00 PM	57.86
2:36:00 PM	62.21
2:37:00 PM	53.12
2:38:00 PM	62.64
2:39:00 PM	58.36
2:40:00 PM	54.01
2:41:00 PM	63.19
2:42:00 PM	63.81
2:43:00 PM	68.11
2:44:00 PM	62.61
2:45:00 PM	62.40
2:46:00 PM	65.56
2:47:00 PM	64.11
2:48:00 PM	62.61
2:49:00 PM	46.28
2:50:00 PM	58.31
2:51:00 PM	49.65
2:52:00 PM	60.99
2:53:00 PM	51.46

N1 - Nok Kundi	
Time	Noise Level (dBA)
2:54:00 PM	57.39
2:55:00 PM	68.85
2:56:00 PM	66.90
2:57:00 PM	70.08
2:58:00 PM	63.71
2:59:00 PM	62.03
3:00:00 PM	55.50
3:01:00 PM	64.64
3:02:00 PM	64.46
3:03:00 PM	71.24
3:04:00 PM	65.92
3:05:00 PM	57.53
3:06:00 PM	52.40
3:07:00 PM	58.14
3:08:00 PM	62.06
3:09:00 PM	50.48
3:10:00 PM	66.66
3:11:00 PM	62.31
3:12:00 PM	63.84
3:13:00 PM	53.99
3:14:00 PM	49.52
3:15:00 PM	58.13
3:16:00 PM	57.28
3:17:00 PM	52.26
3:18:00 PM	49.09
3:19:00 PM	64.14
3:20:00 PM	51.82
3:21:00 PM	62.56
3:22:00 PM	63.99
3:23:00 PM	50.33
3:24:00 PM	61.31
3:25:00 PM	67.05
3:26:00 PM	65.49
3:27:00 PM	65.41
3:28:00 PM	60.85
3:29:00 PM	55.41
3:30:00 PM	62.74
3:31:00 PM	66.29
3:32:00 PM	56.18
3:33:00 PM	62.26
3:34:00 PM	51.57
3:35:00 PM	66.37
3:36:00 PM	59.51
3:37:00 PM	51.51
3:38:00 PM	66.77
3:39:00 PM	59.13
3:40:00 PM	53.98

N1 - Nok Kundi	
Time	Noise Level (dBA)
3:41:00 PM	68.34
3:42:00 PM	66.19
3:43:00 PM	65.85
3:44:00 PM	56.46
3:45:00 PM	60.02
3:46:00 PM	64.44
3:47:00 PM	65.21
3:48:00 PM	60.77
3:49:00 PM	59.54
3:50:00 PM	53.57
3:51:00 PM	57.45
3:52:00 PM	61.61
3:53:00 PM	58.27
3:54:00 PM	63.11
3:55:00 PM	66.34
3:56:00 PM	61.78
3:57:00 PM	48.66
3:58:00 PM	65.27
3:59:00 PM	60.83
4:00:00 PM	57.55
4:01:00 PM	54.53
4:02:00 PM	64.72
4:03:00 PM	66.71
4:04:00 PM	49.16
4:05:00 PM	59.32
4:06:00 PM	69.56
4:07:00 PM	60.37
4:08:00 PM	60.76
4:09:00 PM	64.12
4:10:00 PM	65.91
4:11:00 PM	65.28
4:12:00 PM	64.81
4:13:00 PM	66.83
4:14:00 PM	58.44
4:15:00 PM	56.64
4:16:00 PM	50.61
4:17:00 PM	64.32
4:18:00 PM	60.72
4:19:00 PM	59.60
4:20:00 PM	65.30
4:21:00 PM	64.02
4:22:00 PM	60.11
4:23:00 PM	53.40
4:24:00 PM	62.83
4:25:00 PM	62.31
4:26:00 PM	54.17
4:27:00 PM	65.38

N1 - Nok Kundi	
Time	Noise Level (dBA)
4:28:00 PM	50.69
4:29:00 PM	58.53
4:30:00 PM	57.17
4:31:00 PM	59.95
4:32:00 PM	63.86
4:33:00 PM	61.46
4:34:00 PM	63.92
4:35:00 PM	45.37
4:36:00 PM	65.04
4:37:00 PM	66.44
4:38:00 PM	57.21
4:39:00 PM	60.08
4:40:00 PM	57.65
4:41:00 PM	53.04
4:42:00 PM	62.60
4:43:00 PM	62.20
4:44:00 PM	56.45
4:45:00 PM	66.71
4:46:00 PM	70.13
4:47:00 PM	61.99
4:48:00 PM	59.30
4:49:00 PM	65.68
4:50:00 PM	66.78
4:51:00 PM	56.57
4:52:00 PM	64.29
4:53:00 PM	60.56
4:54:00 PM	61.41
4:55:00 PM	59.18
4:56:00 PM	46.50
4:57:00 PM	66.59
4:58:00 PM	63.10
4:59:00 PM	62.20
5:00:00 PM	65.94
5:01:00 PM	64.90
5:02:00 PM	64.46
5:03:00 PM	65.86
5:04:00 PM	68.89
5:05:00 PM	54.50
5:06:00 PM	62.79
5:07:00 PM	67.17
5:08:00 PM	62.24
5:09:00 PM	59.49
5:10:00 PM	60.31
5:11:00 PM	62.41
5:12:00 PM	67.16
5:13:00 PM	64.75
5:14:00 PM	67.93

N1 - Nok Kundi	
Time	Noise Level (dBA)
5:15:00 PM	62.95
5:16:00 PM	63.11
5:17:00 PM	56.13
5:18:00 PM	63.98
5:19:00 PM	58.49
5:20:00 PM	59.64
5:21:00 PM	62.58
5:22:00 PM	58.54
5:23:00 PM	59.87
5:24:00 PM	67.45
5:25:00 PM	45.98
5:26:00 PM	53.65
5:27:00 PM	55.83
5:28:00 PM	65.04
5:29:00 PM	65.20
5:30:00 PM	65.88
5:31:00 PM	61.93
5:32:00 PM	66.40
5:33:00 PM	61.95
5:34:00 PM	66.25
5:35:00 PM	67.77
5:36:00 PM	63.92
5:37:00 PM	65.91
5:38:00 PM	61.62
5:39:00 PM	47.47
5:40:00 PM	58.40
5:41:00 PM	64.47
5:42:00 PM	57.75
5:43:00 PM	52.63
5:44:00 PM	58.97
5:45:00 PM	65.57
5:46:00 PM	50.63
5:47:00 PM	52.51
5:48:00 PM	51.44
5:49:00 PM	53.53
5:50:00 PM	69.06
5:51:00 PM	67.84
5:52:00 PM	64.24
5:53:00 PM	50.18
5:54:00 PM	68.28
5:55:00 PM	66.36
5:56:00 PM	65.51
5:57:00 PM	61.61
5:58:00 PM	60.41
5:59:00 PM	63.91
6:00:00 PM	70.00
6:01:00 PM	64.36

N1 - Nok Kundi	
Time	Noise Level (dBA)
6:02:00 PM	66.79
6:03:00 PM	63.70
6:04:00 PM	67.26
6:05:00 PM	44.76
6:06:00 PM	42.95
6:07:00 PM	68.14
6:08:00 PM	59.95
6:09:00 PM	59.32
6:10:00 PM	48.04
6:11:00 PM	57.65
6:12:00 PM	67.30
6:13:00 PM	64.30
6:14:00 PM	65.93
6:15:00 PM	62.55
6:16:00 PM	65.02
6:17:00 PM	58.07
6:18:00 PM	60.25
6:19:00 PM	69.52
6:20:00 PM	54.25
6:21:00 PM	63.43
6:22:00 PM	65.16
6:23:00 PM	55.18
6:24:00 PM	69.17
6:25:00 PM	61.67
6:26:00 PM	62.16
6:27:00 PM	62.51
6:28:00 PM	60.05
6:29:00 PM	66.12
6:30:00 PM	65.08
6:31:00 PM	58.19
6:32:00 PM	48.38
6:33:00 PM	53.88
6:34:00 PM	59.48
6:35:00 PM	56.86
6:36:00 PM	48.53
6:37:00 PM	72.54
6:38:00 PM	68.24
6:39:00 PM	64.18
6:40:00 PM	65.84
6:41:00 PM	57.02
6:42:00 PM	70.20
6:43:00 PM	70.03
6:44:00 PM	61.60
6:45:00 PM	65.67
6:46:00 PM	61.52
6:47:00 PM	63.53
6:48:00 PM	56.62

N1 - Nok Kundi	
Time	Noise Level (dBA)
6:49:00 PM	58.69
6:50:00 PM	67.29
6:51:00 PM	62.99
6:52:00 PM	61.52
6:53:00 PM	61.38
6:54:00 PM	66.22
6:55:00 PM	64.33
6:56:00 PM	65.08
6:57:00 PM	62.09
6:58:00 PM	65.43
6:59:00 PM	63.61
7:00:00 PM	63.25
7:01:00 PM	66.33
7:02:00 PM	56.82
7:03:00 PM	57.98
7:04:00 PM	59.49
7:05:00 PM	44.91
7:06:00 PM	59.64
7:07:00 PM	61.74
7:08:00 PM	64.07
7:09:00 PM	65.92
7:10:00 PM	58.90
7:11:00 PM	61.64
7:12:00 PM	57.40
7:13:00 PM	53.27
7:14:00 PM	64.28
7:15:00 PM	67.58
7:16:00 PM	66.78
7:17:00 PM	68.34
7:18:00 PM	53.33
7:19:00 PM	64.84
7:20:00 PM	63.29
7:21:00 PM	66.50
7:22:00 PM	62.19
7:23:00 PM	62.11
7:24:00 PM	62.16
7:25:00 PM	58.86
7:26:00 PM	56.75
7:27:00 PM	65.63
7:28:00 PM	41.00
7:29:00 PM	64.38
7:30:00 PM	60.43
7:31:00 PM	59.74
7:32:00 PM	63.06
7:33:00 PM	68.78
7:34:00 PM	68.26
7:35:00 PM	44.44

N1 - Nok Kundi	
Time	Noise Level (dBA)
7:36:00 PM	56.37
7:37:00 PM	52.70
7:38:00 PM	43.89
7:39:00 PM	58.83
7:40:00 PM	37.46
7:41:00 PM	43.87
7:42:00 PM	59.62
7:43:00 PM	43.47
7:44:00 PM	66.85
7:45:00 PM	65.67
7:46:00 PM	43.19
7:47:00 PM	54.65
7:48:00 PM	63.32
7:49:00 PM	57.50
7:50:00 PM	54.50
7:51:00 PM	56.23
7:52:00 PM	65.14
7:53:00 PM	59.33
7:54:00 PM	63.31
7:55:00 PM	53.56
7:56:00 PM	53.03
7:57:00 PM	58.45
7:58:00 PM	56.02
7:59:00 PM	64.46
8:00:00 PM	44.23
8:01:00 PM	41.27
8:02:00 PM	62.90
8:03:00 PM	59.35
8:04:00 PM	53.58
8:05:00 PM	50.17
8:06:00 PM	64.41
8:07:00 PM	63.28
8:08:00 PM	55.95
8:09:00 PM	42.65
8:10:00 PM	49.42
8:11:00 PM	63.73
8:12:00 PM	63.02
8:13:00 PM	46.05
8:14:00 PM	43.76
8:15:00 PM	63.40
8:16:00 PM	61.03
8:17:00 PM	64.70
8:18:00 PM	41.94
8:19:00 PM	58.76
8:20:00 PM	63.19
8:21:00 PM	64.61
8:22:00 PM	54.85

N1 - Nok Kundi	
Time	Noise Level (dBA)
8:23:00 PM	40.37
8:24:00 PM	55.00
8:25:00 PM	67.72
8:26:00 PM	61.01
8:27:00 PM	54.89
8:28:00 PM	60.78
8:29:00 PM	62.14
8:30:00 PM	45.37
8:31:00 PM	56.25
8:32:00 PM	57.92
8:33:00 PM	46.14
8:34:00 PM	58.96
8:35:00 PM	46.41
8:36:00 PM	55.48
8:37:00 PM	63.88
8:38:00 PM	56.54
8:39:00 PM	60.70
8:40:00 PM	62.53
8:41:00 PM	46.52
8:42:00 PM	42.68
8:43:00 PM	42.56
8:44:00 PM	65.67
8:45:00 PM	56.42
8:46:00 PM	52.55
8:47:00 PM	70.05
8:48:00 PM	48.75
8:49:00 PM	61.99
8:50:00 PM	46.59
8:51:00 PM	57.60
8:52:00 PM	63.75
8:53:00 PM	50.87
8:54:00 PM	43.74
8:55:00 PM	41.81
8:56:00 PM	60.04
8:57:00 PM	61.17
8:58:00 PM	62.24
8:59:00 PM	71.37
9:00:00 PM	59.17
9:01:00 PM	47.97
9:02:00 PM	52.70
9:03:00 PM	62.79
9:04:00 PM	58.29
9:05:00 PM	44.11
9:06:00 PM	42.75
9:07:00 PM	42.55
9:08:00 PM	44.30
9:09:00 PM	62.14

N1 - Nok Kundi	
Time	Noise Level (dBA)
9:10:00 PM	60.61
9:11:00 PM	67.01
9:12:00 PM	63.34
9:13:00 PM	61.54
9:14:00 PM	53.27
9:15:00 PM	55.65
9:16:00 PM	63.20
9:17:00 PM	59.18
9:18:00 PM	52.53
9:19:00 PM	57.71
9:20:00 PM	62.57
9:21:00 PM	55.71
9:22:00 PM	57.25
9:23:00 PM	44.04
9:24:00 PM	44.10
9:25:00 PM	61.88
9:26:00 PM	57.07
9:27:00 PM	64.43
9:28:00 PM	50.25
9:29:00 PM	47.19
9:30:00 PM	53.24
9:31:00 PM	57.28
9:32:00 PM	50.82
9:33:00 PM	45.82
9:34:00 PM	41.34
9:35:00 PM	60.44
9:36:00 PM	63.45
9:37:00 PM	43.42
9:38:00 PM	47.93
9:39:00 PM	65.50
9:40:00 PM	48.25
9:41:00 PM	53.12
9:42:00 PM	67.95
9:43:00 PM	63.07
9:44:00 PM	54.93
9:45:00 PM	57.25
9:46:00 PM	58.94
9:47:00 PM	52.76
9:48:00 PM	60.56
9:49:00 PM	49.41
9:50:00 PM	49.31
9:51:00 PM	66.88
9:52:00 PM	53.97
9:53:00 PM	49.59
9:54:00 PM	67.14
9:55:00 PM	63.35
9:56:00 PM	48.30

N1 - Nok Kundi	
Time	Noise Level (dBA)
9:57:00 PM	49.08
9:58:00 PM	63.58
9:59:00 PM	44.92
10:00:00 PM	50.71
10:01:00 PM	56.66
10:02:00 PM	59.77
10:03:00 PM	67.14
10:04:00 PM	65.46
10:05:00 PM	58.13
10:06:00 PM	64.79
10:07:00 PM	42.27
10:08:00 PM	41.51
10:09:00 PM	43.08
10:10:00 PM	42.09
10:11:00 PM	67.37
10:12:00 PM	50.71
10:13:00 PM	46.35
10:14:00 PM	63.19
10:15:00 PM	60.49
10:16:00 PM	47.34
10:17:00 PM	43.53
10:18:00 PM	57.34
10:19:00 PM	53.39
10:20:00 PM	53.62
10:21:00 PM	61.91
10:22:00 PM	64.44
10:23:00 PM	44.56
10:24:00 PM	46.73
10:25:00 PM	65.82
10:26:00 PM	47.55
10:27:00 PM	60.95
10:28:00 PM	63.97
10:29:00 PM	50.20
10:30:00 PM	60.60
10:31:00 PM	64.49
10:32:00 PM	62.31
10:33:00 PM	65.25
10:34:00 PM	62.86
10:35:00 PM	64.54
10:36:00 PM	61.49
10:37:00 PM	56.58
10:38:00 PM	51.42
10:39:00 PM	52.13
10:40:00 PM	57.21
10:41:00 PM	50.95
10:42:00 PM	53.08
10:43:00 PM	52.40

N1 - Nok Kundi	
Time	Noise Level (dBA)
10:44:00 PM	57.61
10:45:00 PM	48.31
10:46:00 PM	61.90
10:47:00 PM	48.69
10:48:00 PM	48.07
10:49:00 PM	44.81
10:50:00 PM	66.22
10:51:00 PM	60.98
10:52:00 PM	42.91
10:53:00 PM	57.17
10:54:00 PM	44.05
10:55:00 PM	42.54
10:56:00 PM	48.10
10:57:00 PM	65.07
10:58:00 PM	62.89
10:59:00 PM	46.74
11:00:00 PM	41.51
11:01:00 PM	64.21
11:02:00 PM	40.55
11:03:00 PM	44.59
11:04:00 PM	42.44
11:05:00 PM	56.34
11:06:00 PM	43.46
11:07:00 PM	64.49
11:08:00 PM	49.99
11:09:00 PM	62.75
11:10:00 PM	62.74
11:11:00 PM	41.08
11:12:00 PM	41.15
11:13:00 PM	41.07
11:14:00 PM	49.84
11:15:00 PM	65.15
11:16:00 PM	54.54
11:17:00 PM	64.25
11:18:00 PM	44.88
11:19:00 PM	59.58
11:20:00 PM	41.77
11:21:00 PM	46.67
11:22:00 PM	57.15
11:23:00 PM	42.98
11:24:00 PM	60.14
11:25:00 PM	46.54
11:26:00 PM	44.20
11:27:00 PM	46.67
11:28:00 PM	66.05
11:29:00 PM	45.42
11:30:00 PM	44.98

N1 - Nok Kundi	
Time	Noise Level (dBA)
11:31:00 PM	50.14
11:32:00 PM	44.90
11:33:00 PM	62.30
11:34:00 PM	44.46
11:35:00 PM	63.92
11:36:00 PM	50.19
11:37:00 PM	46.61
11:38:00 PM	45.03
11:39:00 PM	47.23
11:40:00 PM	46.64
11:41:00 PM	47.52
11:42:00 PM	65.69
11:43:00 PM	49.14
11:44:00 PM	63.59
11:45:00 PM	44.65
11:46:00 PM	46.80
11:47:00 PM	46.23
11:48:00 PM	59.70
11:49:00 PM	59.81
11:50:00 PM	59.20
11:51:00 PM	50.25
11:52:00 PM	58.29
11:53:00 PM	67.25
11:54:00 PM	49.17
11:55:00 PM	48.97
11:56:00 PM	61.58
11:57:00 PM	46.69
11:58:00 PM	58.14
11:59:00 PM	48.79
12:00:00 AM	53.22
12:01:00 AM	66.84
12:02:00 AM	53.41
12:03:00 AM	48.54
12:04:00 AM	47.64
12:05:00 AM	49.63
12:06:00 AM	53.43
12:07:00 AM	50.09
12:08:00 AM	57.88
12:09:00 AM	66.23
12:10:00 AM	48.25
12:11:00 AM	45.25
12:12:00 AM	48.98
12:13:00 AM	50.20
12:14:00 AM	50.74
12:15:00 AM	55.78
12:16:00 AM	53.49
12:17:00 AM	48.75

N1 - Nok Kundi	
Time	Noise Level (dBA)
12:18:00 AM	48.12
12:19:00 AM	48.06
12:20:00 AM	65.30
12:21:00 AM	47.50
12:22:00 AM	55.52
12:23:00 AM	49.52
12:24:00 AM	50.65
12:25:00 AM	52.01
12:26:00 AM	49.84
12:27:00 AM	58.48
12:28:00 AM	47.92
12:29:00 AM	46.44
12:30:00 AM	43.33
12:31:00 AM	47.75
12:32:00 AM	51.77
12:33:00 AM	53.31
12:34:00 AM	51.17
12:35:00 AM	49.57
12:36:00 AM	60.29
12:37:00 AM	48.52
12:38:00 AM	49.32
12:39:00 AM	59.45
12:40:00 AM	57.66
12:41:00 AM	67.48
12:42:00 AM	58.69
12:43:00 AM	48.50
12:44:00 AM	66.01
12:45:00 AM	62.13
12:46:00 AM	62.14
12:47:00 AM	68.03
12:48:00 AM	48.29
12:49:00 AM	46.23
12:50:00 AM	46.02
12:51:00 AM	46.24
12:52:00 AM	48.89
12:53:00 AM	61.39
12:54:00 AM	61.92
12:55:00 AM	48.90
12:56:00 AM	49.41
12:57:00 AM	61.63
12:58:00 AM	56.03
12:59:00 AM	62.25
1:00:00 AM	51.82
1:01:00 AM	62.96
1:02:00 AM	59.69
1:03:00 AM	57.03
1:04:00 AM	65.23

N1 - Nok Kundi	
Time	Noise Level (dBA)
1:05:00 AM	57.51
1:06:00 AM	50.38
1:07:00 AM	50.68
1:08:00 AM	51.33
1:09:00 AM	61.91
1:10:00 AM	49.46
1:11:00 AM	54.34
1:12:00 AM	62.86
1:13:00 AM	59.08
1:14:00 AM	52.52
1:15:00 AM	49.99
1:16:00 AM	50.74
1:17:00 AM	51.27
1:18:00 AM	51.21
1:19:00 AM	49.17
1:20:00 AM	47.68
1:21:00 AM	46.41
1:22:00 AM	45.49
1:23:00 AM	46.54
1:24:00 AM	48.03
1:25:00 AM	47.82
1:26:00 AM	46.98
1:27:00 AM	46.21
1:28:00 AM	49.15
1:29:00 AM	63.48
1:30:00 AM	67.87
1:31:00 AM	50.77
1:32:00 AM	50.10
1:33:00 AM	49.12
1:34:00 AM	49.55
1:35:00 AM	49.81
1:36:00 AM	48.02
1:37:00 AM	48.63
1:38:00 AM	60.93
1:39:00 AM	63.38
1:40:00 AM	48.06
1:41:00 AM	44.89
1:42:00 AM	48.28
1:43:00 AM	45.89
1:44:00 AM	46.30
1:45:00 AM	47.85
1:46:00 AM	44.80
1:47:00 AM	49.74
1:48:00 AM	50.69
1:49:00 AM	48.79
1:50:00 AM	48.35
1:51:00 AM	46.13

N1 - Nok Kundi	
Time	Noise Level (dBA)
1:52:00 AM	46.04
1:53:00 AM	58.97
1:54:00 AM	58.33
1:55:00 AM	49.02
1:56:00 AM	48.07
1:57:00 AM	57.88
1:58:00 AM	48.78
1:59:00 AM	58.79
2:00:00 AM	46.82
2:01:00 AM	49.93
2:02:00 AM	55.17
2:03:00 AM	48.56
2:04:00 AM	48.09
2:05:00 AM	48.82
2:06:00 AM	47.70
2:07:00 AM	49.10
2:08:00 AM	49.01
2:09:00 AM	60.71
2:10:00 AM	47.59
2:11:00 AM	46.58
2:12:00 AM	47.56
2:13:00 AM	47.37
2:14:00 AM	63.72
2:15:00 AM	47.48
2:16:00 AM	47.84
2:17:00 AM	46.85
2:18:00 AM	45.73
2:19:00 AM	55.71
2:20:00 AM	54.65
2:21:00 AM	44.38
2:22:00 AM	41.98
2:23:00 AM	41.67
2:24:00 AM	42.40
2:25:00 AM	56.51
2:26:00 AM	67.10
2:27:00 AM	43.00
2:28:00 AM	41.49
2:29:00 AM	66.04
2:30:00 AM	48.41
2:31:00 AM	39.77
2:32:00 AM	41.07
2:33:00 AM	41.30
2:34:00 AM	38.39
2:35:00 AM	39.81
2:36:00 AM	41.23
2:37:00 AM	41.59
2:38:00 AM	41.70

N1 - Nok Kundi	
Time	Noise Level (dBA)
2:39:00 AM	40.68
2:40:00 AM	39.40
2:41:00 AM	39.44
2:42:00 AM	42.31
2:43:00 AM	41.44
2:44:00 AM	42.72
2:45:00 AM	43.61
2:46:00 AM	45.82
2:47:00 AM	45.35
2:48:00 AM	49.00
2:49:00 AM	54.28
2:50:00 AM	44.95
2:51:00 AM	43.58
2:52:00 AM	54.71
2:53:00 AM	38.54
2:54:00 AM	39.14
2:55:00 AM	56.44
2:56:00 AM	41.23
2:57:00 AM	57.32
2:58:00 AM	38.24
2:59:00 AM	37.99
3:00:00 AM	37.35
3:01:00 AM	37.03
3:02:00 AM	36.94
3:03:00 AM	36.19
3:04:00 AM	37.68
3:05:00 AM	37.31
3:06:00 AM	36.42
3:07:00 AM	37.79
3:08:00 AM	36.46
3:09:00 AM	37.07
3:10:00 AM	37.98
3:11:00 AM	38.35
3:12:00 AM	48.13
3:13:00 AM	59.15
3:14:00 AM	62.32
3:15:00 AM	45.39
3:16:00 AM	41.40
3:17:00 AM	38.39
3:18:00 AM	56.26
3:19:00 AM	39.95
3:20:00 AM	40.27
3:21:00 AM	38.48
3:22:00 AM	57.85
3:23:00 AM	63.69
3:24:00 AM	35.74
3:25:00 AM	60.60

N1 - Nok Kundi	
Time	Noise Level (dBA)
3:26:00 AM	35.90
3:27:00 AM	54.90
3:28:00 AM	45.28
3:29:00 AM	36.44
3:30:00 AM	37.08
3:31:00 AM	33.15
3:32:00 AM	45.89
3:33:00 AM	63.47
3:34:00 AM	70.63
3:35:00 AM	40.82
3:36:00 AM	37.83
3:37:00 AM	35.88
3:38:00 AM	35.70
3:39:00 AM	39.12
3:40:00 AM	35.43
3:41:00 AM	35.64
3:42:00 AM	37.35
3:43:00 AM	36.64
3:44:00 AM	35.92
3:45:00 AM	69.62
3:46:00 AM	40.29
3:47:00 AM	40.84
3:48:00 AM	39.20
3:49:00 AM	40.29
3:50:00 AM	39.46
3:51:00 AM	40.03
3:52:00 AM	39.43
3:53:00 AM	66.20
3:54:00 AM	41.92
3:55:00 AM	41.15
3:56:00 AM	43.58
3:57:00 AM	42.19
3:58:00 AM	46.79
3:59:00 AM	44.62
4:00:00 AM	46.86
4:01:00 AM	47.32
4:02:00 AM	46.66
4:03:00 AM	49.64
4:04:00 AM	49.13
4:05:00 AM	50.33
4:06:00 AM	49.32
4:07:00 AM	51.81
4:08:00 AM	50.75
4:09:00 AM	51.89
4:10:00 AM	49.75
4:11:00 AM	52.02
4:12:00 AM	54.05

N1 - Nok Kundi	
Time	Noise Level (dBA)
4:13:00 AM	52.87
4:14:00 AM	51.38
4:15:00 AM	52.03
4:16:00 AM	53.14
4:17:00 AM	57.56
4:18:00 AM	62.74
4:19:00 AM	54.31
4:20:00 AM	51.29
4:21:00 AM	50.00
4:22:00 AM	61.71
4:23:00 AM	51.71
4:24:00 AM	50.74
4:25:00 AM	49.58
4:26:00 AM	50.97
4:27:00 AM	58.98
4:28:00 AM	50.85
4:29:00 AM	49.20
4:30:00 AM	48.19
4:31:00 AM	63.01
4:32:00 AM	48.88
4:33:00 AM	55.85
4:34:00 AM	46.08
4:35:00 AM	44.70
4:36:00 AM	44.57
4:37:00 AM	60.07
4:38:00 AM	44.75
4:39:00 AM	46.70
4:40:00 AM	45.53
4:41:00 AM	44.54
4:42:00 AM	45.41
4:43:00 AM	63.13
4:44:00 AM	43.33
4:45:00 AM	40.03
4:46:00 AM	46.47
4:47:00 AM	43.73
4:48:00 AM	44.89
4:49:00 AM	43.03
4:50:00 AM	46.15
4:51:00 AM	46.89
4:52:00 AM	45.78
4:53:00 AM	46.18
4:54:00 AM	46.23
4:55:00 AM	50.71
4:56:00 AM	51.67
4:57:00 AM	51.50
4:58:00 AM	47.20
4:59:00 AM	47.27

N1 - Nok Kundi	
Time	Noise Level (dBA)
5:00:00 AM	48.85
5:01:00 AM	48.54
5:02:00 AM	48.55
5:03:00 AM	46.83
5:04:00 AM	48.78
5:05:00 AM	49.57
5:06:00 AM	46.05
5:07:00 AM	63.51
5:08:00 AM	49.31
5:09:00 AM	60.23
5:10:00 AM	47.15
5:11:00 AM	47.55
5:12:00 AM	60.07
5:13:00 AM	47.93
5:14:00 AM	61.01
5:15:00 AM	59.94
5:16:00 AM	65.13
5:17:00 AM	49.28
5:18:00 AM	43.51
5:19:00 AM	39.40
5:20:00 AM	40.28
5:21:00 AM	40.38
5:22:00 AM	42.01
5:23:00 AM	62.41
5:24:00 AM	40.19
5:25:00 AM	42.17
5:26:00 AM	42.06
5:27:00 AM	60.01
5:28:00 AM	44.06
5:29:00 AM	42.21
5:30:00 AM	39.40
5:31:00 AM	40.83
5:32:00 AM	41.04
5:33:00 AM	37.10
5:34:00 AM	39.17
5:35:00 AM	65.37
5:36:00 AM	42.68
5:37:00 AM	37.27
5:38:00 AM	37.79
5:39:00 AM	62.84
5:40:00 AM	39.01
5:41:00 AM	38.92
5:42:00 AM	42.57
5:43:00 AM	39.49
5:44:00 AM	40.10
5:45:00 AM	42.75
5:46:00 AM	40.69

N1 - Nok Kundi	
Time	Noise Level (dBA)
5:47:00 AM	41.32
5:48:00 AM	39.17
5:49:00 AM	38.73
5:50:00 AM	37.85
5:51:00 AM	41.44
5:52:00 AM	36.96
5:53:00 AM	39.20
5:54:00 AM	39.53
5:55:00 AM	40.72
5:56:00 AM	39.55
5:57:00 AM	40.89
5:58:00 AM	38.20
5:59:00 AM	40.88
6:00:00 AM	44.03
6:01:00 AM	42.69
6:02:00 AM	42.19
6:03:00 AM	60.05
6:04:00 AM	58.80
6:05:00 AM	45.00
6:06:00 AM	62.45
6:07:00 AM	46.24
6:08:00 AM	43.53
6:09:00 AM	57.83
6:10:00 AM	63.14
6:11:00 AM	61.15
6:12:00 AM	62.18
6:13:00 AM	62.36
6:14:00 AM	53.56
6:15:00 AM	50.40
6:16:00 AM	51.64
6:17:00 AM	61.51
6:18:00 AM	52.77
6:19:00 AM	60.70
6:20:00 AM	52.38
6:21:00 AM	48.52
6:22:00 AM	49.07
6:23:00 AM	49.80
6:24:00 AM	54.17
6:25:00 AM	54.14
6:26:00 AM	55.00
6:27:00 AM	55.83
6:28:00 AM	53.02
6:29:00 AM	53.70
6:30:00 AM	54.06
6:31:00 AM	53.27
6:32:00 AM	53.53
6:33:00 AM	56.88

N1 - Nok Kundi	
Time	Noise Level (dBA)
6:34:00 AM	54.18
6:35:00 AM	63.26
6:36:00 AM	64.66
6:37:00 AM	57.42
6:38:00 AM	63.67
6:39:00 AM	51.27
6:40:00 AM	57.82
6:41:00 AM	66.48
6:42:00 AM	57.00
6:43:00 AM	60.79
6:44:00 AM	55.72
6:45:00 AM	50.77
6:46:00 AM	65.13
6:47:00 AM	51.77
6:48:00 AM	48.50
6:49:00 AM	48.44
6:50:00 AM	61.44
6:51:00 AM	48.67
6:52:00 AM	63.84
6:53:00 AM	51.60
6:54:00 AM	50.95
6:55:00 AM	55.06
6:56:00 AM	57.70
6:57:00 AM	48.92
6:58:00 AM	51.43
6:59:00 AM	63.05
7:00:00 AM	64.70
7:01:00 AM	49.28
7:02:00 AM	64.24
7:03:00 AM	62.12
7:04:00 AM	46.84
7:05:00 AM	44.68
7:06:00 AM	47.23
7:07:00 AM	64.04
7:08:00 AM	47.88
7:09:00 AM	48.72
7:10:00 AM	55.57
7:11:00 AM	48.58
7:12:00 AM	48.71
7:13:00 AM	61.96
7:14:00 AM	55.76
7:15:00 AM	58.51
7:16:00 AM	65.58
7:17:00 AM	53.05
7:18:00 AM	63.70
7:19:00 AM	62.25
7:20:00 AM	65.62

N1 - Nok Kundi	
Time	Noise Level (dBA)
7:21:00 AM	62.03
7:22:00 AM	65.18
7:23:00 AM	64.16
7:24:00 AM	67.54
7:25:00 AM	70.25
7:26:00 AM	53.54
7:27:00 AM	65.79
7:28:00 AM	51.83
7:29:00 AM	60.58
7:30:00 AM	62.54
7:31:00 AM	53.33
7:32:00 AM	59.92
7:33:00 AM	62.09
7:34:00 AM	71.38
7:35:00 AM	71.54
7:36:00 AM	63.87
7:37:00 AM	48.33
7:38:00 AM	52.87
7:39:00 AM	63.20
7:40:00 AM	50.11
7:41:00 AM	50.76
7:42:00 AM	65.77
7:43:00 AM	48.49
7:44:00 AM	46.94
7:45:00 AM	52.60
7:46:00 AM	58.56
7:47:00 AM	60.35
7:48:00 AM	45.67
7:49:00 AM	51.94
7:50:00 AM	48.79
7:51:00 AM	64.53
7:52:00 AM	59.55
7:53:00 AM	48.55
7:54:00 AM	46.48
7:55:00 AM	56.52
7:56:00 AM	58.67
7:57:00 AM	68.40
7:58:00 AM	59.21
7:59:00 AM	67.49
8:00:00 AM	63.79
8:01:00 AM	62.95
8:02:00 AM	50.45
8:03:00 AM	66.87
8:04:00 AM	67.83
8:05:00 AM	67.24
8:06:00 AM	61.03
8:07:00 AM	68.25

N1 - Nok Kundi	
Time	Noise Level (dBA)
8:08:00 AM	55.34
8:09:00 AM	53.39
8:10:00 AM	53.59
8:11:00 AM	53.31
8:12:00 AM	63.73
8:13:00 AM	54.66
8:14:00 AM	53.67
8:15:00 AM	67.63
8:16:00 AM	65.70
8:17:00 AM	61.13
8:18:00 AM	70.92
8:19:00 AM	62.35
8:20:00 AM	50.87
8:21:00 AM	66.52
8:22:00 AM	60.65
8:23:00 AM	67.57
8:24:00 AM	62.78
8:25:00 AM	59.29
8:26:00 AM	65.89
8:27:00 AM	65.32
8:28:00 AM	64.13
8:29:00 AM	63.04
8:30:00 AM	63.42
8:31:00 AM	63.21
8:32:00 AM	52.36
8:33:00 AM	53.37
8:34:00 AM	63.12
8:35:00 AM	66.07
8:36:00 AM	66.09
8:37:00 AM	52.85
8:38:00 AM	41.58
8:39:00 AM	40.32
8:40:00 AM	54.37
8:41:00 AM	56.67
8:42:00 AM	64.81
8:43:00 AM	62.95
8:44:00 AM	64.02
8:45:00 AM	40.94
8:46:00 AM	39.13
8:47:00 AM	36.64
8:48:00 AM	45.94
8:49:00 AM	62.01
8:50:00 AM	34.04
8:51:00 AM	56.42
8:52:00 AM	60.22
8:53:00 AM	63.20
8:54:00 AM	38.30

N1 - Nok Kundi	
Time	Noise Level (dBA)
8:55:00 AM	36.31
8:56:00 AM	60.69
8:57:00 AM	65.54
8:58:00 AM	66.69
8:59:00 AM	66.41
9:00:00 AM	54.84
9:01:00 AM	66.02
9:02:00 AM	69.19
9:03:00 AM	69.91
9:04:00 AM	64.09
9:05:00 AM	66.07
9:06:00 AM	46.27
9:07:00 AM	65.11
9:08:00 AM	67.20
9:09:00 AM	70.24
9:10:00 AM	65.37
9:11:00 AM	58.05
9:12:00 AM	60.86
9:13:00 AM	36.39
9:14:00 AM	61.15
9:15:00 AM	55.82
9:16:00 AM	57.41
9:17:00 AM	68.13
9:18:00 AM	69.26
9:19:00 AM	60.20
9:20:00 AM	60.19
9:21:00 AM	61.20
9:22:00 AM	55.27
9:23:00 AM	62.87
9:24:00 AM	57.87
9:25:00 AM	39.29
9:26:00 AM	59.18
9:27:00 AM	64.69
9:28:00 AM	61.62
9:29:00 AM	59.28
9:30:00 AM	61.58
9:31:00 AM	63.18
9:32:00 AM	53.60
9:33:00 AM	61.82
9:34:00 AM	36.55
9:35:00 AM	65.01
9:36:00 AM	62.31
9:37:00 AM	43.90
9:38:00 AM	49.67
9:39:00 AM	61.14
9:40:00 AM	64.48
9:41:00 AM	40.04

N1 - Nok Kundi	
Time	Noise Level (dBA)
9:42:00 AM	59.34
9:43:00 AM	60.23
9:44:00 AM	59.33
9:45:00 AM	41.96
9:46:00 AM	69.17
9:47:00 AM	59.10
9:48:00 AM	65.14
9:49:00 AM	67.46
9:50:00 AM	66.33
9:51:00 AM	61.22
9:52:00 AM	66.03
9:53:00 AM	65.79
9:54:00 AM	62.50
9:55:00 AM	59.34
9:56:00 AM	56.83
9:57:00 AM	51.37
9:58:00 AM	63.84
9:59:00 AM	64.17
10:00:00 AM	63.03
10:01:00 AM	63.20
10:02:00 AM	64.06
10:03:00 AM	54.66
10:04:00 AM	61.78
10:05:00 AM	55.60
10:06:00 AM	62.53
10:07:00 AM	61.67
10:08:00 AM	39.24
10:09:00 AM	34.20
10:10:00 AM	34.99
10:11:00 AM	53.76
10:12:00 AM	60.93
10:13:00 AM	32.16
10:14:00 AM	27.98
10:15:00 AM	57.68
10:16:00 AM	31.59
10:17:00 AM	58.26
10:18:00 AM	65.07
10:19:00 AM	55.71
10:20:00 AM	51.48
10:21:00 AM	51.17
10:22:00 AM	51.47
10:23:00 AM	65.51
10:24:00 AM	66.79
10:25:00 AM	63.91
10:26:00 AM	64.92
10:27:00 AM	56.60
10:28:00 AM	62.58

N1 - Nok Kundi	
Time	*Noise Level (dBA)*
10:29:00 AM	64.10
10:30:00 AM	60.15
10:31:00 AM	64.25
10:32:00 AM	41.53
10:33:00 AM	38.37
10:34:00 AM	67.09
10:35:00 AM	60.50
10:36:00 AM	73.41
10:37:00 AM	60.25
10:38:00 AM	43.62
10:39:00 AM	59.28
10:40:00 AM	66.63
10:41:00 AM	60.26
10:42:00 AM	63.34
10:43:00 AM	57.97
10:44:00 AM	64.48
10:45:00 AM	60.90
10:46:00 AM	61.44
10:47:00 AM	62.92
10:48:00 AM	65.66
10:49:00 AM	54.57
10:50:00 AM	61.87
10:51:00 AM	38.63
10:52:00 AM	58.57
10:53:00 AM	61.34
10:54:00 AM	51.83
10:55:00 AM	64.05
10:56:00 AM	63.43
10:57:00 AM	66.10
10:58:00 AM	58.46
10:59:00 AM	33.82
11:00:00 AM	68.64
11:01:00 AM	62.14
11:02:00 AM	55.72
11:03:00 AM	65.51
11:04:00 AM	59.80
11:05:00 AM	59.03
11:06:00 AM	66.80
11:07:00 AM	60.98
11:08:00 AM	65.93

N1		N2		N3	
Time	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*
Start Date	*8/24/2020*	*Start Date*	*8/26/2020*	*Start Date*	*8/25/2020*
End Date	*8/25/2020*	*End Date*	*8/27/2020*	*End Date*	*8/26/2020*
Start Time	*7:24:44 PM*	*Start Time*	*3:54:54 PM*	*Start Time*	*8:33:51 AM*
End Time	*6:56:32 PM*	*End Time*	*3:55:21 PM*	*End Time*	*8:40:29 AM*
12:32:00 PM	52.43	9:35:00 AM	53.34	11:44:00 AM	56.28
12:33:00 PM	56.19	9:36:00 AM	56.10	11:45:00 AM	56.81
12:34:00 PM	57.11	9:37:00 AM	51.51	11:46:00 AM	57.03
12:35:00 PM	61.16	9:38:00 AM	56.48	11:47:00 AM	54.15
12:36:00 PM	55.06	9:39:00 AM	54.60	11:48:00 AM	56.27
12:37:00 PM	55.57	9:40:00 AM	51.98	11:49:00 AM	51.75
12:38:00 PM	62.07	9:41:00 AM	55.25	11:50:00 AM	52.39
12:39:00 PM	58.90	9:42:00 AM	57.28	11:51:00 AM	54.00
12:40:00 PM	61.38	9:43:00 AM	53.24	11:52:00 AM	57.73
12:41:00 PM	55.41	9:44:00 AM	51.14	11:53:00 AM	63.80
12:42:00 PM	59.47	9:45:00 AM	55.60	11:54:00 AM	58.37
12:43:00 PM	60.57	9:46:00 AM	54.60	11:55:00 AM	52.25
12:44:00 PM	59.82	9:47:00 AM	48.06	11:56:00 AM	58.85
12:45:00 PM	60.49	9:48:00 AM	58.61	11:57:00 AM	58.57
12:46:00 PM	56.62	9:49:00 AM	52.46	11:58:00 AM	57.25
12:47:00 PM	53.23	9:50:00 AM	51.12	11:59:00 AM	62.09
12:48:00 PM	52.69	9:51:00 AM	53.46	12:00:00 PM	57.98
12:49:00 PM	53.84	9:52:00 AM	53.84	12:01:00 PM	55.06
12:50:00 PM	60.51	9:53:00 AM	53.11	12:02:00 PM	58.21
12:51:00 PM	57.69	9:54:00 AM	57.31	12:03:00 PM	52.30
12:52:00 PM	58.48	9:55:00 AM	55.55	12:04:00 PM	54.49
12:53:00 PM	59.76	9:56:00 AM	50.89	12:05:00 PM	54.75
12:54:00 PM	58.83	9:57:00 AM	57.51	12:06:00 PM	56.23
12:55:00 PM	53.03	9:58:00 AM	54.03	12:07:00 PM	56.53
12:56:00 PM	56.85	9:59:00 AM	51.45	12:08:00 PM	61.61
12:57:00 PM	53.16	10:00:00 AM	54.12	12:09:00 PM	57.36
12:58:00 PM	58.94	10:01:00 AM	48.76	12:10:00 PM	54.83
12:59:00 PM	58.84	10:02:00 AM	53.23	12:11:00 PM	56.56
1:00:00 PM	57.10	10:03:00 AM	49.77	12:12:00 PM	53.27
1:01:00 PM	60.62	10:04:00 AM	57.16	12:13:00 PM	59.35
1:02:00 PM	55.19	10:05:00 AM	51.59	12:14:00 PM	55.12
1:03:00 PM	60.26	10:06:00 AM	52.04	12:15:00 PM	48.25
1:04:00 PM	57.60	10:07:00 AM	46.38	12:16:00 PM	54.03
1:05:00 PM	58.48	10:08:00 AM	51.91	12:17:00 PM	54.30
1:06:00 PM	59.02	10:09:00 AM	49.43	12:18:00 PM	58.81
1:07:00 PM	57.20	10:10:00 AM	59.98	12:19:00 PM	57.63
1:08:00 PM	56.07	10:11:00 AM	58.18	12:20:00 PM	61.63
1:09:00 PM	57.45	10:12:00 AM	56.26	12:21:00 PM	59.11
1:10:00 PM	52.91	10:13:00 AM	64.87	12:22:00 PM	51.51
1:11:00 PM	53.83	10:14:00 AM	64.55	12:23:00 PM	59.01
1:12:00 PM	57.64	10:15:00 AM	73.92	12:24:00 PM	59.11
1:13:00 PM	55.14	10:16:00 AM	67.61	12:25:00 PM	56.53

N1		N2		N3	
Time	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*
1:14:00 PM	58.68	10:17:00 AM	70.63	12:26:00 PM	58.16
1:15:00 PM	60.52	10:18:00 AM	71.03	12:27:00 PM	53.67
1:16:00 PM	59.13	10:19:00 AM	71.95	12:28:00 PM	60.96
1:17:00 PM	57.71	10:20:00 AM	70.13	12:29:00 PM	60.74
1:18:00 PM	61.25	10:21:00 AM	70.19	12:30:00 PM	59.80
1:19:00 PM	62.90	10:22:00 AM	72.27	12:31:00 PM	57.14
1:20:00 PM	59.79	10:23:00 AM	72.76	12:32:00 PM	58.97
1:21:00 PM	60.51	10:24:00 AM	69.42	12:33:00 PM	57.81
1:22:00 PM	58.02	10:25:00 AM	71.59	12:34:00 PM	55.30
1:23:00 PM	62.99	10:26:00 AM	66.50	12:35:00 PM	58.35
1:24:00 PM	51.41	10:27:00 AM	67.84	12:36:00 PM	58.59
1:25:00 PM	54.53	10:28:00 AM	65.69	12:37:00 PM	60.56
1:26:00 PM	57.60	10:29:00 AM	65.79	12:38:00 PM	60.11
1:27:00 PM	60.54	10:30:00 AM	71.49	12:39:00 PM	63.02
1:28:00 PM	61.45	10:31:00 AM	71.45	12:40:00 PM	60.69
1:29:00 PM	62.55	10:32:00 AM	72.16	12:41:00 PM	59.38
1:30:00 PM	61.16	10:33:00 AM	73.26	12:42:00 PM	58.56
1:31:00 PM	58.62	10:34:00 AM	68.95	12:43:00 PM	67.35
1:32:00 PM	58.39	10:35:00 AM	67.37	12:44:00 PM	60.52
1:33:00 PM	53.57	10:36:00 AM	63.61	12:45:00 PM	59.49
1:34:00 PM	52.88	10:37:00 AM	67.98	12:46:00 PM	59.35
1:35:00 PM	50.23	10:38:00 AM	71.43	12:47:00 PM	57.07
1:36:00 PM	54.70	10:39:00 AM	67.63	12:48:00 PM	60.72
1:37:00 PM	56.02	10:40:00 AM	63.89	12:49:00 PM	61.28
1:38:00 PM	54.65	10:41:00 AM	61.76	12:50:00 PM	59.51
1:39:00 PM	57.27	10:42:00 AM	56.45	12:51:00 PM	59.41
1:40:00 PM	59.09	10:43:00 AM	63.56	12:52:00 PM	59.98
1:41:00 PM	57.81	10:44:00 AM	65.87	12:53:00 PM	58.96
1:42:00 PM	57.82	10:45:00 AM	64.65	12:54:00 PM	55.13
1:43:00 PM	62.08	10:46:00 AM	69.06	12:55:00 PM	55.02
1:44:00 PM	60.92	10:47:00 AM	70.46	12:56:00 PM	60.28
1:45:00 PM	57.13	10:48:00 AM	61.03	12:57:00 PM	61.40
1:46:00 PM	57.61	10:49:00 AM	65.56	12:58:00 PM	61.10
1:47:00 PM	57.32	10:50:00 AM	64.83	12:59:00 PM	61.77
1:48:00 PM	59.30	10:51:00 AM	61.31	1:00:00 PM	60.43
1:49:00 PM	59.12	10:52:00 AM	63.28	1:01:00 PM	59.96
1:50:00 PM	53.01	10:53:00 AM	67.51	1:02:00 PM	57.61
1:51:00 PM	46.08	10:54:00 AM	70.06	1:03:00 PM	57.91
1:52:00 PM	52.48	10:55:00 AM	67.94	1:04:00 PM	57.57
1:53:00 PM	56.09	10:56:00 AM	65.53	1:05:00 PM	58.88
1:54:00 PM	53.66	10:57:00 AM	68.05	1:06:00 PM	60.08
1:55:00 PM	59.07	10:58:00 AM	68.35	1:07:00 PM	60.46
1:56:00 PM	61.13	10:59:00 AM	72.14	1:08:00 PM	61.16
1:57:00 PM	53.45	11:00:00 AM	67.46	1:09:00 PM	61.44
1:58:00 PM	50.93	11:01:00 AM	64.63	1:10:00 PM	64.84
1:59:00 PM	54.36	11:02:00 AM	63.05	1:11:00 PM	63.49
2:00:00 PM	54.57	11:03:00 AM	69.00	1:12:00 PM	59.55

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
2:01:00 PM	58.70	11:04:00 AM	71.36	1:13:00 PM	57.45
2:02:00 PM	59.28	11:05:00 AM	69.32	1:14:00 PM	62.36
2:03:00 PM	57.45	11:06:00 AM	65.01	1:15:00 PM	61.06
2:04:00 PM	52.89	11:07:00 AM	71.83	1:16:00 PM	60.60
2:05:00 PM	56.66	11:08:00 AM	72.16	1:17:00 PM	58.58
2:06:00 PM	57.22	11:09:00 AM	70.77	1:18:00 PM	62.07
2:07:00 PM	52.53	11:10:00 AM	67.66	1:19:00 PM	60.32
2:08:00 PM	52.85	11:11:00 AM	59.85	1:20:00 PM	60.38
2:09:00 PM	57.62	11:12:00 AM	64.21	1:21:00 PM	62.12
2:10:00 PM	55.45	11:13:00 AM	67.71	1:22:00 PM	59.48
2:11:00 PM	59.98	11:14:00 AM	63.06	1:23:00 PM	57.69
2:12:00 PM	52.25	11:15:00 AM	67.84	1:24:00 PM	64.83
2:13:00 PM	50.51	11:16:00 AM	71.30	1:25:00 PM	63.74
2:14:00 PM	44.91	11:17:00 AM	67.29	1:26:00 PM	62.53
2:15:00 PM	54.84	11:18:00 AM	71.24	1:27:00 PM	64.92
2:16:00 PM	54.82	11:19:00 AM	65.69	1:28:00 PM	61.61
2:17:00 PM	52.30	11:20:00 AM	70.36	1:29:00 PM	62.66
2:18:00 PM	54.59	11:21:00 AM	73.24	1:30:00 PM	59.76
2:19:00 PM	55.15	11:22:00 AM	72.26	1:31:00 PM	60.02
2:20:00 PM	55.68	11:23:00 AM	66.65	1:32:00 PM	62.92
2:21:00 PM	58.83	11:24:00 AM	67.06	1:33:00 PM	61.26
2:22:00 PM	47.18	11:25:00 AM	69.55	1:34:00 PM	57.31
2:23:00 PM	51.52	11:26:00 AM	70.21	1:35:00 PM	56.80
2:24:00 PM	52.17	11:27:00 AM	63.26	1:36:00 PM	58.91
2:25:00 PM	56.34	11:28:00 AM	67.26	1:37:00 PM	57.44
2:26:00 PM	54.62	11:29:00 AM	69.42	1:38:00 PM	59.78
2:27:00 PM	56.01	11:30:00 AM	67.28	1:39:00 PM	60.43
2:28:00 PM	57.49	11:31:00 AM	70.37	1:40:00 PM	57.11
2:29:00 PM	55.92	11:32:00 AM	70.01	1:41:00 PM	55.29
2:30:00 PM	55.48	11:33:00 AM	68.21	1:42:00 PM	67.80
2:31:00 PM	59.38	11:34:00 AM	68.64	1:43:00 PM	60.61
2:32:00 PM	57.42	11:35:00 AM	65.61	1:44:00 PM	60.07
2:33:00 PM	57.21	11:36:00 AM	71.06	1:45:00 PM	57.83
2:34:00 PM	55.68	11:37:00 AM	67.80	1:46:00 PM	59.64
2:35:00 PM	59.81	11:38:00 AM	67.66	1:47:00 PM	58.69
2:36:00 PM	52.18	11:39:00 AM	65.01	1:48:00 PM	62.21
2:37:00 PM	51.44	11:40:00 AM	64.79	1:49:00 PM	58.28
2:38:00 PM	53.47	11:41:00 AM	69.99	1:50:00 PM	62.70
2:39:00 PM	52.88	11:42:00 AM	68.20	1:51:00 PM	58.41
2:40:00 PM	53.31	11:43:00 AM	66.57	1:52:00 PM	59.49
2:41:00 PM	51.15	11:44:00 AM	62.00	1:53:00 PM	56.21
2:42:00 PM	55.36	11:45:00 AM	73.41	1:54:00 PM	61.16
2:43:00 PM	47.94	11:46:00 AM	67.82	1:55:00 PM	59.11
2:44:00 PM	45.78	11:47:00 AM	66.64	1:56:00 PM	58.57
2:45:00 PM	47.09	11:48:00 AM	65.27	1:57:00 PM	59.86
2:46:00 PM	55.54	11:49:00 AM	64.20	1:58:00 PM	58.09
2:47:00 PM	51.98	11:50:00 AM	61.53	1:59:00 PM	59.97

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
2:48:00 PM	58.02	11:51:00 AM	64.12	2:00:00 PM	61.42
2:49:00 PM	55.41	11:52:00 AM	63.35	2:01:00 PM	54.56
2:50:00 PM	57.82	11:53:00 AM	65.48	2:02:00 PM	58.85
2:51:00 PM	56.76	11:54:00 AM	65.91	2:03:00 PM	55.07
2:52:00 PM	50.50	11:55:00 AM	65.84	2:04:00 PM	58.17
2:53:00 PM	54.43	11:56:00 AM	68.52	2:05:00 PM	57.33
2:54:00 PM	55.33	11:57:00 AM	61.18	2:06:00 PM	58.32
2:55:00 PM	52.03	11:58:00 AM	65.52	2:07:00 PM	55.93
2:56:00 PM	56.53	11:59:00 AM	63.76	2:08:00 PM	62.24
2:57:00 PM	53.28	12:00:00 PM	66.75	2:09:00 PM	55.92
2:58:00 PM	59.19	12:01:00 PM	65.88	2:10:00 PM	58.57
2:59:00 PM	52.79	12:02:00 PM	67.62	2:11:00 PM	58.43
3:00:00 PM	50.57	12:03:00 PM	66.55	2:12:00 PM	60.00
3:01:00 PM	50.30	12:04:00 PM	65.85	2:13:00 PM	55.73
3:02:00 PM	49.40	12:05:00 PM	62.22	2:14:00 PM	61.10
3:03:00 PM	51.60	12:06:00 PM	60.20	2:15:00 PM	63.37
3:04:00 PM	55.41	12:07:00 PM	63.17	2:16:00 PM	60.64
3:05:00 PM	55.94	12:08:00 PM	65.87	2:17:00 PM	53.36
3:06:00 PM	60.37	12:09:00 PM	63.83	2:18:00 PM	60.61
3:07:00 PM	56.69	12:10:00 PM	69.11	2:19:00 PM	56.83
3:08:00 PM	57.91	12:11:00 PM	72.26	2:20:00 PM	58.11
3:09:00 PM	55.49	12:12:00 PM	63.46	2:21:00 PM	62.69
3:10:00 PM	58.15	12:13:00 PM	65.00	2:22:00 PM	60.94
3:11:00 PM	62.15	12:14:00 PM	65.92	2:23:00 PM	56.57
3:12:00 PM	52.41	12:15:00 PM	61.71	2:24:00 PM	60.41
3:13:00 PM	53.89	12:16:00 PM	68.14	2:25:00 PM	59.62
3:14:00 PM	55.35	12:17:00 PM	64.96	2:26:00 PM	58.91
3:15:00 PM	59.93	12:18:00 PM	68.48	2:27:00 PM	54.93
3:16:00 PM	59.99	12:19:00 PM	67.82	2:28:00 PM	60.44
3:17:00 PM	59.58	12:20:00 PM	70.03	2:29:00 PM	57.14
3:18:00 PM	54.96	12:21:00 PM	68.21	2:30:00 PM	54.66
3:19:00 PM	54.10	12:22:00 PM	67.27	2:31:00 PM	55.41
3:20:00 PM	50.85	12:23:00 PM	66.83	2:32:00 PM	56.49
3:21:00 PM	52.80	12:24:00 PM	64.88	2:33:00 PM	56.57
3:22:00 PM	57.14	12:25:00 PM	69.42	2:34:00 PM	59.91
3:23:00 PM	51.75	12:26:00 PM	68.54	2:35:00 PM	51.98
3:24:00 PM	55.14	12:27:00 PM	65.90	2:36:00 PM	57.32
3:25:00 PM	60.22	12:28:00 PM	68.32	2:37:00 PM	53.09
3:26:00 PM	56.29	12:29:00 PM	61.34	2:38:00 PM	52.87
3:27:00 PM	56.87	12:30:00 PM	67.78	2:39:00 PM	54.68
3:28:00 PM	53.75	12:31:00 PM	64.78	2:40:00 PM	54.51
3:29:00 PM	51.47	12:32:00 PM	69.41	2:41:00 PM	58.48
3:30:00 PM	47.22	12:33:00 PM	66.03	2:42:00 PM	61.33
3:31:00 PM	50.00	12:34:00 PM	67.11	2:43:00 PM	55.62
3:32:00 PM	56.39	12:35:00 PM	66.51	2:44:00 PM	58.83
3:33:00 PM	56.79	12:36:00 PM	71.32	2:45:00 PM	57.02
3:34:00 PM	59.42	12:37:00 PM	66.97	2:46:00 PM	62.47

N1		N2		N3	
Time	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*
3:35:00 PM	58.17	12:38:00 PM	68.42	2:47:00 PM	59.29
3:36:00 PM	56.87	12:39:00 PM	67.45	2:48:00 PM	59.63
3:37:00 PM	52.00	12:40:00 PM	67.55	2:49:00 PM	62.63
3:38:00 PM	60.15	12:41:00 PM	70.15	2:50:00 PM	64.52
3:39:00 PM	56.32	12:42:00 PM	69.08	2:51:00 PM	60.95
3:40:00 PM	60.24	12:43:00 PM	68.75	2:52:00 PM	57.65
3:41:00 PM	58.07	12:44:00 PM	62.19	2:53:00 PM	57.31
3:42:00 PM	55.29	12:45:00 PM	69.78	2:54:00 PM	62.58
3:43:00 PM	57.84	12:46:00 PM	68.91	2:55:00 PM	59.81
3:44:00 PM	47.84	12:47:00 PM	71.86	2:56:00 PM	58.55
3:45:00 PM	46.54	12:48:00 PM	67.89	2:57:00 PM	58.00
3:46:00 PM	50.37	12:49:00 PM	68.99	2:58:00 PM	60.23
3:47:00 PM	58.80	12:50:00 PM	64.89	2:59:00 PM	57.96
3:48:00 PM	54.74	12:51:00 PM	65.49	3:00:00 PM	60.39
3:49:00 PM	50.23	12:52:00 PM	62.98	3:01:00 PM	58.42
3:50:00 PM	55.53	12:53:00 PM	70.38	3:02:00 PM	59.27
3:51:00 PM	59.72	12:54:00 PM	65.55	3:03:00 PM	59.79
3:52:00 PM	53.64	12:55:00 PM	67.93	3:04:00 PM	59.99
3:53:00 PM	55.35	12:56:00 PM	66.99	3:05:00 PM	55.53
3:54:00 PM	57.60	12:57:00 PM	71.66	3:06:00 PM	59.93
3:55:00 PM	56.31	12:58:00 PM	61.55	3:07:00 PM	60.31
3:56:00 PM	55.01	12:59:00 PM	68.20	3:08:00 PM	63.09
3:57:00 PM	62.02	1:00:00 PM	71.88	3:09:00 PM	62.72
3:58:00 PM	53.96	1:01:00 PM	73.03	3:10:00 PM	55.75
3:59:00 PM	56.26	1:02:00 PM	70.17	3:11:00 PM	61.20
4:00:00 PM	59.05	1:03:00 PM	64.84	3:12:00 PM	63.15
4:01:00 PM	58.40	1:04:00 PM	69.92	3:13:00 PM	59.11
4:02:00 PM	56.58	1:05:00 PM	67.87	3:14:00 PM	64.74
4:03:00 PM	61.03	1:06:00 PM	65.29	3:15:00 PM	57.81
4:04:00 PM	58.67	1:07:00 PM	66.21	3:16:00 PM	57.83
4:05:00 PM	55.44	1:08:00 PM	64.31	3:17:00 PM	58.92
4:06:00 PM	54.04	1:09:00 PM	66.57	3:18:00 PM	56.54
4:07:00 PM	57.19	1:10:00 PM	66.61	3:19:00 PM	61.93
4:08:00 PM	54.86	1:11:00 PM	69.06	3:20:00 PM	57.99
4:09:00 PM	52.38	1:12:00 PM	68.09	3:21:00 PM	58.27
4:10:00 PM	53.05	1:13:00 PM	64.54	3:22:00 PM	59.33
4:11:00 PM	50.89	1:14:00 PM	65.17	3:23:00 PM	53.80
4:12:00 PM	47.20	1:15:00 PM	67.16	3:24:00 PM	59.25
4:13:00 PM	45.42	1:16:00 PM	70.43	3:25:00 PM	55.23
4:14:00 PM	51.91	1:17:00 PM	64.99	3:26:00 PM	55.62
4:15:00 PM	47.58	1:18:00 PM	68.43	3:27:00 PM	59.49
4:16:00 PM	55.04	1:19:00 PM	64.15	3:28:00 PM	56.72
4:17:00 PM	54.49	1:20:00 PM	61.36	3:29:00 PM	62.54
4:18:00 PM	52.62	1:21:00 PM	65.07	3:30:00 PM	57.89
4:19:00 PM	55.57	1:22:00 PM	61.47	3:31:00 PM	58.95
4:20:00 PM	54.16	1:23:00 PM	63.91	3:32:00 PM	57.81
4:21:00 PM	52.27	1:24:00 PM	62.42	3:33:00 PM	56.46

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
4:22:00 PM	55.96	1:25:00 PM	60.91	3:34:00 PM	53.46
4:23:00 PM	51.57	1:26:00 PM	62.44	3:35:00 PM	56.83
4:24:00 PM	53.23	1:27:00 PM	62.74	3:36:00 PM	59.83
4:25:00 PM	55.65	1:28:00 PM	63.05	3:37:00 PM	65.12
4:26:00 PM	54.79	1:29:00 PM	59.92	3:38:00 PM	59.71
4:27:00 PM	54.71	1:30:00 PM	62.57	3:39:00 PM	54.19
4:28:00 PM	56.52	1:31:00 PM	62.30	3:40:00 PM	58.82
4:29:00 PM	54.85	1:32:00 PM	64.35	3:41:00 PM	58.01
4:30:00 PM	55.64	1:33:00 PM	67.11	3:42:00 PM	54.95
4:31:00 PM	56.05	1:34:00 PM	65.98	3:43:00 PM	62.19
4:32:00 PM	53.86	1:35:00 PM	55.59	3:44:00 PM	59.83
4:33:00 PM	54.57	1:36:00 PM	57.69	3:45:00 PM	58.52
4:34:00 PM	52.37	1:37:00 PM	65.71	3:46:00 PM	59.87
4:35:00 PM	52.91	1:38:00 PM	63.37	3:47:00 PM	57.79
4:36:00 PM	48.82	1:39:00 PM	63.01	3:48:00 PM	61.44
4:37:00 PM	47.87	1:40:00 PM	66.22	3:49:00 PM	60.01
4:38:00 PM	58.07	1:41:00 PM	64.91	3:50:00 PM	59.38
4:39:00 PM	47.97	1:42:00 PM	64.70	3:51:00 PM	58.51
4:40:00 PM	46.65	1:43:00 PM	57.04	3:52:00 PM	64.74
4:41:00 PM	56.81	1:44:00 PM	54.17	3:53:00 PM	59.26
4:42:00 PM	55.56	1:45:00 PM	56.53	3:54:00 PM	63.10
4:43:00 PM	51.58	1:46:00 PM	44.84	3:55:00 PM	58.34
4:44:00 PM	55.41	1:47:00 PM	45.03	3:56:00 PM	62.06
4:45:00 PM	51.99	1:48:00 PM	58.29	3:57:00 PM	58.43
4:46:00 PM	55.78	1:49:00 PM	58.24	3:58:00 PM	56.71
4:47:00 PM	46.80	1:50:00 PM	59.08	3:59:00 PM	58.78
4:48:00 PM	58.46	1:51:00 PM	60.73	4:00:00 PM	57.28
4:49:00 PM	53.20	1:52:00 PM	54.24	4:01:00 PM	61.88
4:50:00 PM	54.73	1:53:00 PM	55.02	4:02:00 PM	60.42
4:51:00 PM	52.90	1:54:00 PM	66.63	4:03:00 PM	59.38
4:52:00 PM	53.75	1:55:00 PM	60.45	4:04:00 PM	56.41
4:53:00 PM	45.55	1:56:00 PM	46.10	4:05:00 PM	57.51
4:54:00 PM	54.32	1:57:00 PM	47.03	4:06:00 PM	57.63
4:55:00 PM	60.82	1:58:00 PM	53.20	4:07:00 PM	59.02
4:56:00 PM	54.43	1:59:00 PM	56.15	4:08:00 PM	63.62
4:57:00 PM	43.70	2:00:00 PM	58.76	4:09:00 PM	57.39
4:58:00 PM	48.33	2:01:00 PM	59.65	4:10:00 PM	55.14
4:59:00 PM	44.88	2:02:00 PM	52.58	4:11:00 PM	60.30
5:00:00 PM	47.80	2:03:00 PM	56.93	4:12:00 PM	57.36
5:01:00 PM	45.96	2:04:00 PM	62.26	4:13:00 PM	56.70
5:02:00 PM	47.15	2:05:00 PM	58.94	4:14:00 PM	57.71
5:03:00 PM	53.23	2:06:00 PM	54.10	4:15:00 PM	56.16
5:04:00 PM	53.15	2:07:00 PM	49.59	4:16:00 PM	60.44
5:05:00 PM	48.19	2:08:00 PM	48.54	4:17:00 PM	59.32
5:06:00 PM	50.63	2:09:00 PM	61.23	4:18:00 PM	60.50
5:07:00 PM	46.97	2:10:00 PM	56.80	4:19:00 PM	61.59
5:08:00 PM	56.99	2:11:00 PM	59.43	4:20:00 PM	58.15

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
5:09:00 PM	56.39	2:12:00 PM	58.79	4:21:00 PM	57.12
5:10:00 PM	51.24	2:13:00 PM	53.18	4:22:00 PM	57.71
5:11:00 PM	51.74	2:14:00 PM	48.91	4:23:00 PM	56.51
5:12:00 PM	48.02	2:15:00 PM	55.32	4:24:00 PM	56.54
5:13:00 PM	49.17	2:16:00 PM	57.71	4:25:00 PM	53.45
5:14:00 PM	54.36	2:17:00 PM	57.53	4:26:00 PM	60.03
5:15:00 PM	54.12	2:18:00 PM	55.21	4:27:00 PM	60.94
5:16:00 PM	50.39	2:19:00 PM	55.53	4:28:00 PM	58.13
5:17:00 PM	52.17	2:20:00 PM	56.71	4:29:00 PM	58.48
5:18:00 PM	58.34	2:21:00 PM	53.91	4:30:00 PM	59.21
5:19:00 PM	48.09	2:22:00 PM	52.03	4:31:00 PM	58.20
5:20:00 PM	45.29	2:23:00 PM	53.76	4:32:00 PM	61.90
5:21:00 PM	52.80	2:24:00 PM	55.14	4:33:00 PM	60.12
5:22:00 PM	53.02	2:25:00 PM	60.64	4:34:00 PM	62.20
5:23:00 PM	52.99	2:26:00 PM	52.89	4:35:00 PM	57.35
5:24:00 PM	48.65	2:27:00 PM	52.33	4:36:00 PM	56.78
5:25:00 PM	48.42	2:28:00 PM	62.23	4:37:00 PM	57.99
5:26:00 PM	52.20	2:29:00 PM	60.10	4:38:00 PM	59.20
5:27:00 PM	55.90	2:30:00 PM	62.13	4:39:00 PM	57.89
5:28:00 PM	51.84	2:31:00 PM	66.79	4:40:00 PM	57.14
5:29:00 PM	52.89	2:32:00 PM	60.02	4:41:00 PM	58.90
5:30:00 PM	55.77	2:33:00 PM	69.46	4:42:00 PM	59.62
5:31:00 PM	55.91	2:34:00 PM	66.83	4:43:00 PM	59.21
5:32:00 PM	49.74	2:35:00 PM	83.61	4:44:00 PM	57.33
5:33:00 PM	51.05	2:36:00 PM	91.70	4:45:00 PM	59.73
5:34:00 PM	51.04	2:37:00 PM	79.24	4:46:00 PM	61.16
5:35:00 PM	56.73	2:38:00 PM	78.75	4:47:00 PM	56.49
5:36:00 PM	48.30	2:39:00 PM	75.00	4:48:00 PM	58.13
5:37:00 PM	52.97	2:40:00 PM	84.57	4:49:00 PM	58.70
5:38:00 PM	49.68	2:41:00 PM	75.24	4:50:00 PM	60.62
5:39:00 PM	50.85	2:42:00 PM	70.69	4:51:00 PM	60.03
5:40:00 PM	51.35	2:43:00 PM	72.97	4:52:00 PM	57.65
5:41:00 PM	52.40	2:44:00 PM	71.83	4:53:00 PM	59.00
5:42:00 PM	49.67	2:45:00 PM	76.62	4:54:00 PM	57.28
5:43:00 PM	46.88	2:46:00 PM	71.97	4:55:00 PM	54.68
5:44:00 PM	54.77	2:47:00 PM	70.50	4:56:00 PM	56.21
5:45:00 PM	55.08	2:48:00 PM	73.33	4:57:00 PM	54.78
5:46:00 PM	49.76	2:49:00 PM	72.71	4:58:00 PM	56.54
5:47:00 PM	45.52	2:50:00 PM	72.81	4:59:00 PM	57.29
5:48:00 PM	52.10	2:51:00 PM	70.07	5:00:00 PM	55.51
5:49:00 PM	49.14	2:52:00 PM	73.72	5:01:00 PM	57.38
5:50:00 PM	54.70	2:53:00 PM	72.85	5:02:00 PM	57.49
5:51:00 PM	43.94	2:54:00 PM	73.48	5:03:00 PM	58.86
5:52:00 PM	46.23	2:55:00 PM	74.44	5:04:00 PM	58.40
5:53:00 PM	41.71	2:56:00 PM	65.51	5:05:00 PM	55.53
5:54:00 PM	54.96	2:57:00 PM	62.20	5:06:00 PM	60.45
5:55:00 PM	47.17	2:58:00 PM	75.41	5:07:00 PM	58.40

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
5:56:00 PM	49.59	2:59:00 PM	71.75	5:08:00 PM	54.68
5:57:00 PM	54.47	3:00:00 PM	70.69	5:09:00 PM	58.81
5:58:00 PM	51.30	3:01:00 PM	65.22	5:10:00 PM	62.25
5:59:00 PM	49.49	3:02:00 PM	68.72	5:11:00 PM	56.61
6:00:00 PM	47.36	3:03:00 PM	71.52	5:12:00 PM	57.39
6:01:00 PM	58.21	3:04:00 PM	69.38	5:13:00 PM	56.26
6:02:00 PM	54.12	3:05:00 PM	73.71	5:14:00 PM	54.95
6:03:00 PM	46.16	3:06:00 PM	73.02	5:15:00 PM	52.81
6:04:00 PM	47.22	3:07:00 PM	71.55	5:16:00 PM	54.42
6:05:00 PM	43.82	3:08:00 PM	70.11	5:17:00 PM	57.15
6:06:00 PM	48.09	3:09:00 PM	66.49	5:18:00 PM	61.32
6:07:00 PM	45.32	3:10:00 PM	73.01	5:19:00 PM	62.07
6:08:00 PM	51.39	3:11:00 PM	68.65	5:20:00 PM	56.55
6:09:00 PM	55.44	3:12:00 PM	70.79	5:21:00 PM	57.47
6:10:00 PM	50.09	3:13:00 PM	69.86	5:22:00 PM	55.85
6:11:00 PM	41.33	3:14:00 PM	73.28	5:23:00 PM	58.05
6:12:00 PM	52.03	3:15:00 PM	72.09	5:24:00 PM	58.78
6:13:00 PM	51.17	3:16:00 PM	68.77	5:25:00 PM	62.70
6:14:00 PM	52.38	3:17:00 PM	75.16	5:26:00 PM	55.63
6:15:00 PM	52.68	3:18:00 PM	74.01	5:27:00 PM	56.82
6:16:00 PM	47.89	3:19:00 PM	71.53	5:28:00 PM	55.56
6:17:00 PM	45.38	3:20:00 PM	70.48	5:29:00 PM	56.04
6:18:00 PM	47.15	3:21:00 PM	68.88	5:30:00 PM	53.66
6:19:00 PM	42.35	3:22:00 PM	76.90	5:31:00 PM	56.10
6:20:00 PM	48.37	3:23:00 PM	68.35	5:32:00 PM	57.38
6:21:00 PM	50.08	3:24:00 PM	67.35	5:33:00 PM	59.17
6:22:00 PM	42.88	3:25:00 PM	67.96	5:34:00 PM	64.48
6:23:00 PM	46.21	3:26:00 PM	63.99	5:35:00 PM	57.49
6:24:00 PM	44.91	3:27:00 PM	66.87	5:36:00 PM	58.60
6:25:00 PM	42.32	3:28:00 PM	72.66	5:37:00 PM	55.84
6:26:00 PM	39.89	3:29:00 PM	70.27	5:38:00 PM	55.35
6:27:00 PM	50.89	3:30:00 PM	71.31	5:39:00 PM	59.12
6:28:00 PM	49.26	3:31:00 PM	68.82	5:40:00 PM	57.51
6:29:00 PM	51.08	3:32:00 PM	70.05	5:41:00 PM	54.61
6:30:00 PM	45.96	3:33:00 PM	72.23	5:42:00 PM	56.46
6:31:00 PM	43.27	3:34:00 PM	69.81	5:43:00 PM	56.71
6:32:00 PM	40.76	3:35:00 PM	68.85	5:44:00 PM	58.67
6:33:00 PM	43.24	3:36:00 PM	67.06	5:45:00 PM	54.46
6:34:00 PM	50.70	3:37:00 PM	71.78	5:46:00 PM	51.50
6:35:00 PM	44.65	3:38:00 PM	75.42	5:47:00 PM	51.59
6:36:00 PM	66.15	3:39:00 PM	74.45	5:48:00 PM	53.90
6:37:00 PM	54.77	3:40:00 PM	69.30	5:49:00 PM	57.48
6:38:00 PM	57.99	3:41:00 PM	68.72	5:50:00 PM	59.33
6:39:00 PM	54.15	3:42:00 PM	66.03	5:51:00 PM	59.17
6:40:00 PM	52.44	3:43:00 PM	69.15	5:52:00 PM	55.57
6:41:00 PM	51.00	3:44:00 PM	69.06	5:53:00 PM	55.98
6:42:00 PM	54.75	3:45:00 PM	72.34	5:54:00 PM	56.19

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
6:43:00 PM	51.49	3:46:00 PM	67.69	5:55:00 PM	57.45
6:44:00 PM	50.99	3:47:00 PM	63.96	5:56:00 PM	57.69
6:45:00 PM	53.63	3:48:00 PM	65.88	5:57:00 PM	55.25
6:46:00 PM	52.18	3:49:00 PM	74.15	5:58:00 PM	55.31
6:47:00 PM	52.22	3:50:00 PM	75.22	5:59:00 PM	54.19
6:48:00 PM	53.12	3:51:00 PM	73.61	6:00:00 PM	55.99
6:49:00 PM	53.08	3:52:00 PM	71.78	6:01:00 PM	60.01
6:50:00 PM	51.28	3:53:00 PM	66.91	6:02:00 PM	57.56
6:51:00 PM	52.98	3:54:00 PM	63.06	6:03:00 PM	59.43
6:52:00 PM	50.96	3:55:00 PM	65.83	6:04:00 PM	55.66
6:53:00 PM	49.09	3:56:00 PM	59.78	6:05:00 PM	53.34
6:54:00 PM	50.05	3:57:00 PM	69.47	6:06:00 PM	57.31
6:55:00 PM	49.82	3:58:00 PM	66.84	6:07:00 PM	55.86
6:56:00 PM	49.23	3:59:00 PM	84.82	6:08:00 PM	51.70
6:57:00 PM	#DIV/0!	4:00:00 PM	91.49	6:09:00 PM	56.07
6:58:00 PM	#DIV/0!	4:01:00 PM	79.16	6:10:00 PM	56.03
6:59:00 PM	#DIV/0!	4:02:00 PM	78.71	6:11:00 PM	53.48
7:00:00 PM	#DIV/0!	4:03:00 PM	75.23	6:12:00 PM	53.19
7:01:00 PM	#DIV/0!	4:04:00 PM	84.56	6:13:00 PM	51.50
7:02:00 PM	#DIV/0!	4:05:00 PM	75.12	6:14:00 PM	50.53
7:03:00 PM	#DIV/0!	4:06:00 PM	70.57	6:15:00 PM	50.04
7:04:00 PM	#DIV/0!	4:07:00 PM	72.97	6:16:00 PM	52.17
7:05:00 PM	#DIV/0!	4:08:00 PM	71.99	6:17:00 PM	50.66
7:06:00 PM	#DIV/0!	4:09:00 PM	76.58	6:18:00 PM	49.96
7:07:00 PM	#DIV/0!	4:10:00 PM	71.93	6:19:00 PM	45.81
7:08:00 PM	#DIV/0!	4:11:00 PM	70.48	6:20:00 PM	57.35
7:09:00 PM	#DIV/0!	4:12:00 PM	73.35	6:21:00 PM	48.83
7:10:00 PM	#DIV/0!	4:13:00 PM	72.89	6:22:00 PM	58.27
7:11:00 PM	#DIV/0!	4:14:00 PM	72.60	6:23:00 PM	59.15
7:12:00 PM	#DIV/0!	4:15:00 PM	70.10	6:24:00 PM	49.03
7:13:00 PM	#DIV/0!	4:16:00 PM	73.92	6:25:00 PM	45.96
7:14:00 PM	#DIV/0!	4:17:00 PM	72.65	6:26:00 PM	50.08
7:15:00 PM	#DIV/0!	4:18:00 PM	73.44	6:27:00 PM	53.82
7:16:00 PM	#DIV/0!	4:19:00 PM	74.45	6:28:00 PM	52.66
7:17:00 PM	#DIV/0!	4:20:00 PM	65.35	6:29:00 PM	51.72
7:18:00 PM	#DIV/0!	4:21:00 PM	62.20	6:30:00 PM	52.98
7:19:00 PM	#DIV/0!	4:22:00 PM	75.43	6:31:00 PM	51.14
7:20:00 PM	#DIV/0!	4:23:00 PM	71.76	6:32:00 PM	49.65
7:21:00 PM	#DIV/0!	4:24:00 PM	70.64	6:33:00 PM	62.79
7:22:00 PM	#DIV/0!	4:25:00 PM	65.53	6:34:00 PM	54.05
7:23:00 PM	#DIV/0!	4:26:00 PM	68.64	6:35:00 PM	52.46
7:24:00 PM	44.45	4:27:00 PM	71.58	6:36:00 PM	54.83
7:25:00 PM	43.15	4:28:00 PM	69.20	6:37:00 PM	51.43
7:26:00 PM	42.20	4:29:00 PM	73.71	6:38:00 PM	51.88
7:27:00 PM	40.37	4:30:00 PM	73.03	6:39:00 PM	51.09
7:28:00 PM	41.12	4:31:00 PM	71.55	6:40:00 PM	49.28
7:29:00 PM	50.39	4:32:00 PM	70.14	6:41:00 PM	52.20

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
7:30:00 PM	44.04	4:33:00 PM	66.40	6:42:00 PM	50.67
7:31:00 PM	46.12	4:34:00 PM	73.02	6:43:00 PM	58.24
7:32:00 PM	37.86	4:35:00 PM	68.72	6:44:00 PM	55.91
7:33:00 PM	42.11	4:36:00 PM	70.74	6:45:00 PM	59.02
7:34:00 PM	41.41	4:37:00 PM	69.86	6:46:00 PM	53.04
7:35:00 PM	44.52	4:38:00 PM	73.46	6:47:00 PM	57.33
7:36:00 PM	47.08	4:39:00 PM	71.84	6:48:00 PM	53.52
7:37:00 PM	44.16	4:40:00 PM	68.92	6:49:00 PM	54.42
7:38:00 PM	66.79	4:41:00 PM	75.28	6:50:00 PM	54.29
7:39:00 PM	50.61	4:42:00 PM	73.79	6:51:00 PM	52.85
7:40:00 PM	48.89	4:43:00 PM	71.55	6:52:00 PM	56.66
7:41:00 PM	60.08	4:44:00 PM	70.48	6:53:00 PM	61.87
7:42:00 PM	53.33	4:45:00 PM	68.87	6:54:00 PM	53.55
7:43:00 PM	48.40	4:46:00 PM	76.90	6:55:00 PM	64.95
7:44:00 PM	49.54	4:47:00 PM	68.38	6:56:00 PM	53.22
7:45:00 PM	54.26	4:48:00 PM	67.29	6:57:00 PM	57.19
7:46:00 PM	60.26	4:49:00 PM	67.94	6:58:00 PM	57.37
7:47:00 PM	36.65	4:50:00 PM	64.00	6:59:00 PM	58.53
7:48:00 PM	36.49	4:51:00 PM	67.63	7:00:00 PM	65.64
7:49:00 PM	36.92	4:52:00 PM	72.46	7:01:00 PM	60.27
7:50:00 PM	36.44	4:53:00 PM	70.57	7:02:00 PM	63.64
7:51:00 PM	36.89	4:54:00 PM	71.04	7:03:00 PM	60.28
7:52:00 PM	36.97	4:55:00 PM	68.78	7:04:00 PM	60.18
7:53:00 PM	37.34	4:56:00 PM	70.07	7:05:00 PM	55.72
7:54:00 PM	37.63	4:57:00 PM	72.22	7:06:00 PM	55.57
7:55:00 PM	37.05	4:58:00 PM	69.82	7:07:00 PM	54.47
7:56:00 PM	36.95	4:59:00 PM	68.85	7:08:00 PM	52.76
7:57:00 PM	37.28	5:00:00 PM	67.04	7:09:00 PM	65.37
7:58:00 PM	37.00	5:01:00 PM	71.97	7:10:00 PM	56.60
7:59:00 PM	36.99	5:02:00 PM	75.35	7:11:00 PM	58.20
8:00:00 PM	36.81	5:03:00 PM	74.44	7:12:00 PM	56.18
8:01:00 PM	36.95	5:04:00 PM	69.30	7:13:00 PM	55.56
8:02:00 PM	36.96	5:05:00 PM	68.68	7:14:00 PM	57.91
8:03:00 PM	37.02	5:06:00 PM	66.19	7:15:00 PM	55.14
8:04:00 PM	37.05	5:07:00 PM	69.36	7:16:00 PM	66.86
8:05:00 PM	37.06	5:08:00 PM	68.96	7:17:00 PM	78.66
8:06:00 PM	37.06	5:09:00 PM	72.24	7:18:00 PM	75.42
8:07:00 PM	37.09	5:10:00 PM	67.67	7:19:00 PM	61.20
8:08:00 PM	37.12	5:11:00 PM	63.97	7:20:00 PM	57.38
8:09:00 PM	37.06	5:12:00 PM	65.88	7:21:00 PM	57.23
8:10:00 PM	37.19	5:13:00 PM	74.21	7:22:00 PM	61.88
8:11:00 PM	37.23	5:14:00 PM	75.18	7:23:00 PM	63.83
8:12:00 PM	37.25	5:15:00 PM	73.62	7:24:00 PM	60.80
8:13:00 PM	37.22	5:16:00 PM	71.80	7:25:00 PM	57.83
8:14:00 PM	37.23	5:17:00 PM	66.84	7:26:00 PM	57.61
8:15:00 PM	37.25	5:18:00 PM	61.83	7:27:00 PM	56.82
8:16:00 PM	37.27	5:19:00 PM	75.39	7:28:00 PM	58.91

N1		N2		N3	
Time	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*
8:17:00 PM	37.35	5:20:00 PM	68.57	7:29:00 PM	60.53
8:18:00 PM	37.43	5:21:00 PM	67.09	7:30:00 PM	61.75
8:19:00 PM	37.31	5:22:00 PM	69.37	7:31:00 PM	60.05
8:20:00 PM	37.34	5:23:00 PM	63.44	7:32:00 PM	61.86
8:21:00 PM	37.33	5:24:00 PM	71.74	7:33:00 PM	60.64
8:22:00 PM	37.34	5:25:00 PM	77.26	7:34:00 PM	59.78
8:23:00 PM	37.39	5:26:00 PM	66.54	7:35:00 PM	57.45
8:24:00 PM	37.42	5:27:00 PM	69.94	7:36:00 PM	60.28
8:25:00 PM	37.46	5:28:00 PM	68.89	7:37:00 PM	63.14
8:26:00 PM	37.41	5:29:00 PM	65.89	7:38:00 PM	59.70
8:27:00 PM	37.49	5:30:00 PM	75.41	7:39:00 PM	56.86
8:28:00 PM	37.44	5:31:00 PM	68.58	7:40:00 PM	61.20
8:29:00 PM	37.43	5:32:00 PM	67.48	7:41:00 PM	61.27
8:30:00 PM	37.34	5:33:00 PM	68.79	7:42:00 PM	56.13
8:31:00 PM	37.39	5:34:00 PM	71.20	7:43:00 PM	59.70
8:32:00 PM	37.49	5:35:00 PM	67.15	7:44:00 PM	55.30
8:33:00 PM	37.58	5:36:00 PM	74.98	7:45:00 PM	57.44
8:34:00 PM	43.74	5:37:00 PM	74.75	7:46:00 PM	61.04
8:35:00 PM	47.28	5:38:00 PM	66.39	7:47:00 PM	58.61
8:36:00 PM	38.01	5:39:00 PM	71.16	7:48:00 PM	59.84
8:37:00 PM	37.46	5:40:00 PM	67.42	7:49:00 PM	61.96
8:38:00 PM	37.46	5:41:00 PM	67.90	7:50:00 PM	58.11
8:39:00 PM	37.43	5:42:00 PM	69.78	7:51:00 PM	63.24
8:40:00 PM	37.40	5:43:00 PM	69.29	7:52:00 PM	63.10
8:41:00 PM	37.38	5:44:00 PM	70.70	7:53:00 PM	63.44
8:42:00 PM	37.35	5:45:00 PM	70.47	7:54:00 PM	62.45
8:43:00 PM	37.34	5:46:00 PM	69.80	7:55:00 PM	62.87
8:44:00 PM	37.35	5:47:00 PM	68.11	7:56:00 PM	64.84
8:45:00 PM	37.36	5:48:00 PM	74.30	7:57:00 PM	63.57
8:46:00 PM	37.36	5:49:00 PM	70.66	7:58:00 PM	65.74
8:47:00 PM	37.37	5:50:00 PM	68.64	7:59:00 PM	62.22
8:48:00 PM	37.36	5:51:00 PM	68.39	8:00:00 PM	64.43
8:49:00 PM	37.40	5:52:00 PM	65.25	8:01:00 PM	64.23
8:50:00 PM	37.44	5:53:00 PM	68.01	8:02:00 PM	66.38
8:51:00 PM	37.39	5:54:00 PM	70.46	8:03:00 PM	65.10
8:52:00 PM	37.39	5:55:00 PM	69.56	8:04:00 PM	59.56
8:53:00 PM	37.35	5:56:00 PM	72.92	8:05:00 PM	61.39
8:54:00 PM	37.30	5:57:00 PM	70.31	8:06:00 PM	62.29
8:55:00 PM	37.26	5:58:00 PM	67.86	8:07:00 PM	62.80
8:56:00 PM	37.19	5:59:00 PM	65.04	8:08:00 PM	63.34
8:57:00 PM	37.15	6:00:00 PM	68.56	8:09:00 PM	59.20
8:58:00 PM	37.19	6:01:00 PM	70.52	8:10:00 PM	63.49
8:59:00 PM	37.16	6:02:00 PM	66.42	8:11:00 PM	62.09
9:00:00 PM	37.12	6:03:00 PM	70.09	8:12:00 PM	63.55
9:01:00 PM	37.17	6:04:00 PM	67.29	8:13:00 PM	65.38
9:02:00 PM	37.18	6:05:00 PM	67.36	8:14:00 PM	62.79
9:03:00 PM	37.23	6:06:00 PM	71.83	8:15:00 PM	66.10

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
9:04:00 PM	37.19	6:07:00 PM	74.26	8:16:00 PM	63.47
9:05:00 PM	37.19	6:08:00 PM	69.45	8:17:00 PM	65.22
9:06:00 PM	37.21	6:09:00 PM	71.61	8:18:00 PM	62.08
9:07:00 PM	37.23	6:10:00 PM	69.33	8:19:00 PM	65.36
9:08:00 PM	37.22	6:11:00 PM	66.14	8:20:00 PM	67.14
9:09:00 PM	37.23	6:12:00 PM	67.41	8:21:00 PM	64.39
9:10:00 PM	37.23	6:13:00 PM	67.51	8:22:00 PM	62.63
9:11:00 PM	37.28	6:14:00 PM	65.78	8:23:00 PM	65.95
9:12:00 PM	37.25	6:15:00 PM	65.69	8:24:00 PM	65.30
9:13:00 PM	37.21	6:16:00 PM	69.91	8:25:00 PM	66.77
9:14:00 PM	37.20	6:17:00 PM	64.76	8:26:00 PM	66.34
9:15:00 PM	37.28	6:18:00 PM	68.02	8:27:00 PM	66.72
9:16:00 PM	37.28	6:19:00 PM	69.35	8:28:00 PM	65.92
9:17:00 PM	37.34	6:20:00 PM	68.24	8:29:00 PM	66.37
9:18:00 PM	37.29	6:21:00 PM	71.83	8:30:00 PM	63.62
9:19:00 PM	37.24	6:22:00 PM	68.11	8:31:00 PM	62.10
9:20:00 PM	37.20	6:23:00 PM	67.37	8:32:00 PM	65.95
9:21:00 PM	37.16	6:24:00 PM	64.50	8:33:00 PM	61.90
9:22:00 PM	37.19	6:25:00 PM	67.13	8:34:00 PM	62.09
9:23:00 PM	37.26	6:26:00 PM	71.52	8:35:00 PM	65.73
9:24:00 PM	37.19	6:27:00 PM	70.23	8:36:00 PM	64.28
9:25:00 PM	37.23	6:28:00 PM	69.56	8:37:00 PM	61.92
9:26:00 PM	37.23	6:29:00 PM	67.53	8:38:00 PM	64.41
9:27:00 PM	37.23	6:30:00 PM	72.34	8:39:00 PM	64.36
9:28:00 PM	37.23	6:31:00 PM	67.16	8:40:00 PM	59.50
9:29:00 PM	37.17	6:32:00 PM	67.21	8:41:00 PM	62.83
9:30:00 PM	37.17	6:33:00 PM	67.42	8:42:00 PM	62.50
9:31:00 PM	37.40	6:34:00 PM	66.25	8:43:00 PM	64.58
9:32:00 PM	37.22	6:35:00 PM	67.80	8:44:00 PM	62.40
9:33:00 PM	37.20	6:36:00 PM	67.70	8:45:00 PM	61.29
9:34:00 PM	37.11	6:37:00 PM	64.42	8:46:00 PM	64.19
9:35:00 PM	37.06	6:38:00 PM	66.47	8:47:00 PM	64.30
9:36:00 PM	37.11	6:39:00 PM	70.25	8:48:00 PM	66.26
9:37:00 PM	37.11	6:40:00 PM	69.59	8:49:00 PM	64.51
9:38:00 PM	37.18	6:41:00 PM	64.87	8:50:00 PM	66.02
9:39:00 PM	37.26	6:42:00 PM	68.11	8:51:00 PM	61.36
9:40:00 PM	37.18	6:43:00 PM	71.76	8:52:00 PM	65.96
9:41:00 PM	37.19	6:44:00 PM	67.78	8:53:00 PM	64.60
9:42:00 PM	37.16	6:45:00 PM	61.30	8:54:00 PM	64.05
9:43:00 PM	37.11	6:46:00 PM	70.48	8:55:00 PM	64.52
9:44:00 PM	37.11	6:47:00 PM	71.25	8:56:00 PM	61.11
9:45:00 PM	37.10	6:48:00 PM	69.74	8:57:00 PM	65.94
9:46:00 PM	37.14	6:49:00 PM	69.63	8:58:00 PM	64.42
9:47:00 PM	37.11	6:50:00 PM	69.43	8:59:00 PM	65.95
9:48:00 PM	37.12	6:51:00 PM	68.79	9:00:00 PM	62.87
9:49:00 PM	37.08	6:52:00 PM	69.71	9:01:00 PM	65.61
9:50:00 PM	37.17	6:53:00 PM	72.46	9:02:00 PM	65.05

N1		N2		N3	
Time	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*
9:51:00 PM	41.42	6:54:00 PM	66.15	9:03:00 PM	67.04
9:52:00 PM	45.35	6:55:00 PM	66.76	9:04:00 PM	66.49
9:53:00 PM	55.49	6:56:00 PM	68.38	9:05:00 PM	66.76
9:54:00 PM	66.56	6:57:00 PM	70.33	9:06:00 PM	68.39
9:55:00 PM	54.35	6:58:00 PM	72.30	9:07:00 PM	66.60
9:56:00 PM	56.00	6:59:00 PM	67.16	9:08:00 PM	67.40
9:57:00 PM	48.30	7:00:00 PM	65.68	9:09:00 PM	67.00
9:58:00 PM	46.28	7:01:00 PM	70.65	9:10:00 PM	66.73
9:59:00 PM	47.63	7:02:00 PM	62.57	9:11:00 PM	66.85
10:00:00 PM	41.12	7:03:00 PM	70.02	9:12:00 PM	64.60
10:01:00 PM	50.60	7:04:00 PM	61.32	9:13:00 PM	66.35
10:02:00 PM	40.67	7:05:00 PM	69.61	9:14:00 PM	64.93
10:03:00 PM	39.56	7:06:00 PM	67.70	9:15:00 PM	65.55
10:04:00 PM	39.05	7:07:00 PM	68.70	9:16:00 PM	67.81
10:05:00 PM	39.40	7:08:00 PM	69.14	9:17:00 PM	66.13
10:06:00 PM	39.80	7:09:00 PM	64.24	9:18:00 PM	64.47
10:07:00 PM	38.85	7:10:00 PM	70.19	9:19:00 PM	65.64
10:08:00 PM	38.21	7:11:00 PM	60.47	9:20:00 PM	65.70
10:09:00 PM	37.86	7:12:00 PM	65.24	9:21:00 PM	65.80
10:10:00 PM	39.01	7:13:00 PM	65.28	9:22:00 PM	64.66
10:11:00 PM	38.78	7:14:00 PM	70.28	9:23:00 PM	62.99
10:12:00 PM	38.38	7:15:00 PM	67.69	9:24:00 PM	64.40
10:13:00 PM	39.43	7:16:00 PM	68.88	9:25:00 PM	62.70
10:14:00 PM	37.92	7:17:00 PM	69.25	9:26:00 PM	61.50
10:15:00 PM	38.00	7:18:00 PM	65.86	9:27:00 PM	60.86
10:16:00 PM	37.98	7:19:00 PM	65.80	9:28:00 PM	63.10
10:17:00 PM	37.14	7:20:00 PM	70.49	9:29:00 PM	62.49
10:18:00 PM	37.08	7:21:00 PM	65.90	9:30:00 PM	66.98
10:19:00 PM	36.96	7:22:00 PM	67.03	9:31:00 PM	64.57
10:20:00 PM	37.03	7:23:00 PM	64.55	9:32:00 PM	60.85
10:21:00 PM	37.02	7:24:00 PM	68.57	9:33:00 PM	64.23
10:22:00 PM	37.08	7:25:00 PM	69.36	9:34:00 PM	64.26
10:23:00 PM	36.96	7:26:00 PM	63.49	9:35:00 PM	65.53
10:24:00 PM	37.00	7:27:00 PM	66.57	9:36:00 PM	65.92
10:25:00 PM	37.01	7:28:00 PM	63.94	9:37:00 PM	66.23
10:26:00 PM	36.99	7:29:00 PM	69.49	9:38:00 PM	62.56
10:27:00 PM	37.02	7:30:00 PM	69.08	9:39:00 PM	64.62
10:28:00 PM	37.00	7:31:00 PM	67.62	9:40:00 PM	63.69
10:29:00 PM	36.96	7:32:00 PM	68.64	9:41:00 PM	65.91
10:30:00 PM	36.98	7:33:00 PM	63.75	9:42:00 PM	62.51
10:31:00 PM	37.43	7:34:00 PM	64.64	9:43:00 PM	61.80
10:32:00 PM	37.56	7:35:00 PM	67.60	9:44:00 PM	63.36
10:33:00 PM	37.06	7:36:00 PM	69.67	9:45:00 PM	65.80
10:34:00 PM	36.92	7:37:00 PM	67.63	9:46:00 PM	65.40
10:35:00 PM	39.15	7:38:00 PM	66.40	9:47:00 PM	63.02
10:36:00 PM	46.62	7:39:00 PM	67.78	9:48:00 PM	63.74
10:37:00 PM	51.38	7:40:00 PM	65.09	9:49:00 PM	65.99

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
10:38:00 PM	47.27	7:41:00 PM	70.52	9:50:00 PM	64.47
10:39:00 PM	39.15	7:42:00 PM	69.97	9:51:00 PM	63.99
10:40:00 PM	37.71	7:43:00 PM	62.95	9:52:00 PM	63.84
10:41:00 PM	38.75	7:44:00 PM	64.86	9:53:00 PM	59.04
10:42:00 PM	38.21	7:45:00 PM	68.13	9:54:00 PM	61.92
10:43:00 PM	39.51	7:46:00 PM	68.19	9:55:00 PM	61.89
10:44:00 PM	37.61	7:47:00 PM	64.95	9:56:00 PM	60.96
10:45:00 PM	37.26	7:48:00 PM	70.39	9:57:00 PM	64.94
10:46:00 PM	36.99	7:49:00 PM	61.73	9:58:00 PM	61.72
10:47:00 PM	37.14	7:50:00 PM	63.27	9:59:00 PM	64.06
10:48:00 PM	38.74	7:51:00 PM	68.93	10:00:00 PM	62.24
10:49:00 PM	38.04	7:52:00 PM	69.62	10:01:00 PM	62.85
10:50:00 PM	38.09	7:53:00 PM	67.66	10:02:00 PM	61.32
10:51:00 PM	38.38	7:54:00 PM	71.87	10:03:00 PM	63.94
10:52:00 PM	37.19	7:55:00 PM	69.84	10:04:00 PM	60.85
10:53:00 PM	37.00	7:56:00 PM	68.53	10:05:00 PM	61.20
10:54:00 PM	36.82	7:57:00 PM	68.99	10:06:00 PM	60.60
10:55:00 PM	36.50	7:58:00 PM	68.70	10:07:00 PM	62.41
10:56:00 PM	36.71	7:59:00 PM	70.08	10:08:00 PM	63.34
10:57:00 PM	36.76	8:00:00 PM	62.95	10:09:00 PM	59.82
10:58:00 PM	36.58	8:01:00 PM	67.33	10:10:00 PM	63.80
10:59:00 PM	37.06	8:02:00 PM	65.42	10:11:00 PM	62.14
11:00:00 PM	37.58	8:03:00 PM	65.40	10:12:00 PM	59.90
11:01:00 PM	42.33	8:04:00 PM	67.10	10:13:00 PM	59.73
11:02:00 PM	43.45	8:05:00 PM	64.80	10:14:00 PM	56.73
11:03:00 PM	44.29	8:06:00 PM	68.75	10:15:00 PM	60.96
11:04:00 PM	41.05	8:07:00 PM	65.21	10:16:00 PM	58.16
11:05:00 PM	41.33	8:08:00 PM	68.75	10:17:00 PM	59.97
11:06:00 PM	40.88	8:09:00 PM	69.01	10:18:00 PM	62.63
11:07:00 PM	41.65	8:10:00 PM	73.26	10:19:00 PM	59.88
11:08:00 PM	43.78	8:11:00 PM	69.61	10:20:00 PM	63.40
11:09:00 PM	43.70	8:12:00 PM	72.10	10:21:00 PM	62.80
11:10:00 PM	43.38	8:13:00 PM	68.57	10:22:00 PM	58.19
11:11:00 PM	43.00	8:14:00 PM	68.90	10:23:00 PM	62.08
11:12:00 PM	43.01	8:15:00 PM	66.83	10:24:00 PM	61.29
11:13:00 PM	44.02	8:16:00 PM	65.98	10:25:00 PM	58.97
11:14:00 PM	44.16	8:17:00 PM	66.84	10:26:00 PM	61.71
11:15:00 PM	43.72	8:18:00 PM	68.82	10:27:00 PM	61.68
11:16:00 PM	41.95	8:19:00 PM	67.02	10:28:00 PM	63.09
11:17:00 PM	43.08	8:20:00 PM	68.98	10:29:00 PM	59.92
11:18:00 PM	41.44	8:21:00 PM	72.16	10:30:00 PM	60.40
11:19:00 PM	42.46	8:22:00 PM	70.47	10:31:00 PM	61.49
11:20:00 PM	42.96	8:23:00 PM	71.53	10:32:00 PM	58.65
11:21:00 PM	41.66	8:24:00 PM	72.02	10:33:00 PM	59.27
11:22:00 PM	42.54	8:25:00 PM	70.08	10:34:00 PM	60.83
11:23:00 PM	44.82	8:26:00 PM	73.43	10:35:00 PM	59.29
11:24:00 PM	39.36	8:27:00 PM	66.88	10:36:00 PM	59.47

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
11:25:00 PM	40.27	8:28:00 PM	70.75	10:37:00 PM	60.60
11:26:00 PM	44.80	8:29:00 PM	71.69	10:38:00 PM	60.17
11:27:00 PM	45.20	8:30:00 PM	66.82	10:39:00 PM	62.33
11:28:00 PM	41.52	8:31:00 PM	67.88	10:40:00 PM	61.21
11:29:00 PM	38.92	8:32:00 PM	71.48	10:41:00 PM	61.96
11:30:00 PM	40.84	8:33:00 PM	77.33	10:42:00 PM	60.79
11:31:00 PM	41.46	8:34:00 PM	70.10	10:43:00 PM	60.79
11:32:00 PM	44.47	8:35:00 PM	72.11	10:44:00 PM	62.94
11:33:00 PM	41.81	8:36:00 PM	70.33	10:45:00 PM	62.36
11:34:00 PM	39.00	8:37:00 PM	65.49	10:46:00 PM	63.22
11:35:00 PM	38.23	8:38:00 PM	73.09	10:47:00 PM	61.50
11:36:00 PM	42.86	8:39:00 PM	69.91	10:48:00 PM	62.28
11:37:00 PM	37.44	8:40:00 PM	69.85	10:49:00 PM	60.86
11:38:00 PM	38.69	8:41:00 PM	68.64	10:50:00 PM	59.68
11:39:00 PM	37.45	8:42:00 PM	66.87	10:51:00 PM	61.89
11:40:00 PM	38.62	8:43:00 PM	68.69	10:52:00 PM	62.80
11:41:00 PM	38.00	8:44:00 PM	75.19	10:53:00 PM	60.59
11:42:00 PM	38.60	8:45:00 PM	73.18	10:54:00 PM	61.66
11:43:00 PM	39.89	8:46:00 PM	67.94	10:55:00 PM	62.33
11:44:00 PM	40.29	8:47:00 PM	69.37	10:56:00 PM	58.85
11:45:00 PM	38.57	8:48:00 PM	74.31	10:57:00 PM	63.15
11:46:00 PM	38.15	8:49:00 PM	69.07	10:58:00 PM	62.48
11:47:00 PM	38.55	8:50:00 PM	59.70	10:59:00 PM	60.99
11:48:00 PM	38.46	8:51:00 PM	64.02	11:00:00 PM	61.14
11:49:00 PM	38.22	8:52:00 PM	65.44	11:01:00 PM	60.54
11:50:00 PM	38.14	8:53:00 PM	75.27	11:02:00 PM	61.53
11:51:00 PM	38.52	8:54:00 PM	66.60	11:03:00 PM	63.10
11:52:00 PM	38.67	8:55:00 PM	70.46	11:04:00 PM	60.59
11:53:00 PM	38.22	8:56:00 PM	70.11	11:05:00 PM	60.43
11:54:00 PM	37.93	8:57:00 PM	69.90	11:06:00 PM	63.70
11:55:00 PM	37.43	8:58:00 PM	68.42	11:07:00 PM	62.95
11:56:00 PM	37.56	8:59:00 PM	70.28	11:08:00 PM	62.64
11:57:00 PM	38.18	9:00:00 PM	69.51	11:09:00 PM	62.81
11:58:00 PM	37.64	9:01:00 PM	70.72	11:10:00 PM	59.76
11:59:00 PM	37.98	9:02:00 PM	72.97	11:11:00 PM	61.86
12:00:00 AM	42.30	9:03:00 PM	73.52	11:12:00 PM	60.01
12:01:00 AM	41.99	9:04:00 PM	67.27	11:13:00 PM	60.50
12:02:00 AM	40.95	9:05:00 PM	69.01	11:14:00 PM	59.62
12:03:00 AM	37.75	9:06:00 PM	71.33	11:15:00 PM	60.38
12:04:00 AM	37.84	9:07:00 PM	71.08	11:16:00 PM	61.55
12:05:00 AM	37.56	9:08:00 PM	68.56	11:17:00 PM	60.23
12:06:00 AM	37.58	9:09:00 PM	63.66	11:18:00 PM	59.71
12:07:00 AM	37.79	9:10:00 PM	71.06	11:19:00 PM	61.34
12:08:00 AM	37.60	9:11:00 PM	71.69	11:20:00 PM	63.79
12:09:00 AM	37.93	9:12:00 PM	66.80	11:21:00 PM	59.19
12:10:00 AM	37.93	9:13:00 PM	70.46	11:22:00 PM	60.84
12:11:00 AM	38.08	9:14:00 PM	67.47	11:23:00 PM	63.45

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
12:12:00 AM	37.82	9:15:00 PM	65.24	11:24:00 PM	61.91
12:13:00 AM	37.52	9:16:00 PM	72.32	11:25:00 PM	63.00
12:14:00 AM	37.47	9:17:00 PM	71.71	11:26:00 PM	62.10
12:15:00 AM	37.38	9:18:00 PM	65.43	11:27:00 PM	60.82
12:16:00 AM	37.13	9:19:00 PM	65.45	11:28:00 PM	60.97
12:17:00 AM	37.86	9:20:00 PM	72.83	11:29:00 PM	61.77
12:18:00 AM	37.14	9:21:00 PM	72.34	11:30:00 PM	62.12
12:19:00 AM	37.20	9:22:00 PM	64.49	11:31:00 PM	59.98
12:20:00 AM	37.15	9:23:00 PM	63.71	11:32:00 PM	61.89
12:21:00 AM	37.09	9:24:00 PM	60.72	11:33:00 PM	63.84
12:22:00 AM	37.23	9:25:00 PM	57.60	11:34:00 PM	64.02
12:23:00 AM	37.18	9:26:00 PM	67.28	11:35:00 PM	64.82
12:24:00 AM	37.14	9:27:00 PM	71.63	11:36:00 PM	63.59
12:25:00 AM	37.11	9:28:00 PM	70.76	11:37:00 PM	64.00
12:26:00 AM	36.97	9:29:00 PM	67.65	11:38:00 PM	64.32
12:27:00 AM	36.92	9:30:00 PM	63.37	11:39:00 PM	60.01
12:28:00 AM	36.84	9:31:00 PM	67.95	11:40:00 PM	59.68
12:29:00 AM	36.85	9:32:00 PM	60.53	11:41:00 PM	61.82
12:30:00 AM	36.81	9:33:00 PM	65.58	11:42:00 PM	56.58
12:31:00 AM	36.76	9:34:00 PM	63.93	11:43:00 PM	58.49
12:32:00 AM	36.69	9:35:00 PM	65.85	11:44:00 PM	58.68
12:33:00 AM	36.77	9:36:00 PM	69.06	11:45:00 PM	57.90
12:34:00 AM	36.72	9:37:00 PM	65.68	11:46:00 PM	60.32
12:35:00 AM	36.71	9:38:00 PM	65.59	11:47:00 PM	57.60
12:36:00 AM	36.71	9:39:00 PM	67.88	11:48:00 PM	56.35
12:37:00 AM	36.72	9:40:00 PM	71.68	11:49:00 PM	53.87
12:38:00 AM	36.62	9:41:00 PM	65.39	11:50:00 PM	52.10
12:39:00 AM	36.55	9:42:00 PM	65.71	11:51:00 PM	53.03
12:40:00 AM	36.46	9:43:00 PM	65.66	11:52:00 PM	57.64
12:41:00 AM	36.60	9:44:00 PM	62.12	11:53:00 PM	52.40
12:42:00 AM	36.59	9:45:00 PM	61.71	11:54:00 PM	52.87
12:43:00 AM	36.59	9:46:00 PM	67.02	11:55:00 PM	59.26
12:44:00 AM	36.57	9:47:00 PM	69.95	11:56:00 PM	50.47
12:45:00 AM	36.56	9:48:00 PM	66.43	11:57:00 PM	50.90
12:46:00 AM	36.53	9:49:00 PM	71.08	11:58:00 PM	61.62
12:47:00 AM	36.58	9:50:00 PM	68.54	11:59:00 PM	39.43
12:48:00 AM	36.62	9:51:00 PM	63.81	12:00:00 AM	37.78
12:49:00 AM	36.55	9:52:00 PM	68.05	12:01:00 AM	40.70
12:50:00 AM	36.61	9:53:00 PM	60.83	12:02:00 AM	55.06
12:51:00 AM	36.60	9:54:00 PM	72.25	12:03:00 AM	57.72
12:52:00 AM	36.56	9:55:00 PM	65.01	12:04:00 AM	46.01
12:53:00 AM	36.59	9:56:00 PM	65.63	12:05:00 AM	44.45
12:54:00 AM	36.53	9:57:00 PM	67.33	12:06:00 AM	43.77
12:55:00 AM	36.44	9:58:00 PM	62.79	12:07:00 AM	44.96
12:56:00 AM	36.61	9:59:00 PM	66.53	12:08:00 AM	44.72
12:57:00 AM	37.48	10:00:00 PM	63.18	12:09:00 AM	41.50
12:58:00 AM	36.53	10:01:00 PM	63.73	12:10:00 AM	41.80

N1		N2		N3	
Time	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*
12:59:00 AM	37.10	10:02:00 PM	67.13	12:11:00 AM	39.16
1:00:00 AM	36.38	10:03:00 PM	70.84	12:12:00 AM	38.90
1:01:00 AM	36.46	10:04:00 PM	67.53	12:13:00 AM	39.98
1:02:00 AM	36.42	10:05:00 PM	69.71	12:14:00 AM	39.34
1:03:00 AM	36.56	10:06:00 PM	66.42	12:15:00 AM	36.41
1:04:00 AM	36.45	10:07:00 PM	67.83	12:16:00 AM	57.79
1:05:00 AM	36.32	10:08:00 PM	65.09	12:17:00 AM	38.52
1:06:00 AM	36.32	10:09:00 PM	66.50	12:18:00 AM	37.70
1:07:00 AM	36.28	10:10:00 PM	64.86	12:19:00 AM	38.66
1:08:00 AM	36.29	10:11:00 PM	68.86	12:20:00 AM	39.47
1:09:00 AM	36.32	10:12:00 PM	62.36	12:21:00 AM	39.18
1:10:00 AM	36.34	10:13:00 PM	73.27	12:22:00 AM	37.20
1:11:00 AM	36.33	10:14:00 PM	68.12	12:23:00 AM	37.21
1:12:00 AM	36.40	10:15:00 PM	63.08	12:24:00 AM	38.51
1:13:00 AM	36.35	10:16:00 PM	68.05	12:25:00 AM	42.70
1:14:00 AM	36.31	10:17:00 PM	64.23	12:26:00 AM	41.73
1:15:00 AM	36.29	10:18:00 PM	67.95	12:27:00 AM	46.11
1:16:00 AM	36.34	10:19:00 PM	66.79	12:28:00 AM	48.44
1:17:00 AM	36.36	10:20:00 PM	66.11	12:29:00 AM	49.36
1:18:00 AM	36.32	10:21:00 PM	65.14	12:30:00 AM	55.42
1:19:00 AM	36.35	10:22:00 PM	63.58	12:31:00 AM	47.62
1:20:00 AM	36.35	10:23:00 PM	68.34	12:32:00 AM	49.12
1:21:00 AM	36.39	10:24:00 PM	67.77	12:33:00 AM	47.27
1:22:00 AM	36.33	10:25:00 PM	65.25	12:34:00 AM	47.90
1:23:00 AM	36.34	10:26:00 PM	67.13	12:35:00 AM	47.53
1:24:00 AM	36.36	10:27:00 PM	66.81	12:36:00 AM	49.30
1:25:00 AM	36.37	10:28:00 PM	60.56	12:37:00 AM	52.11
1:26:00 AM	36.41	10:29:00 PM	62.91	12:38:00 AM	51.74
1:27:00 AM	36.40	10:30:00 PM	67.59	12:39:00 AM	53.55
1:28:00 AM	36.40	10:31:00 PM	65.62	12:40:00 AM	50.48
1:29:00 AM	36.26	10:32:00 PM	63.34	12:41:00 AM	51.26
1:30:00 AM	36.18	10:33:00 PM	64.85	12:42:00 AM	51.99
1:31:00 AM	36.18	10:34:00 PM	62.56	12:43:00 AM	51.32
1:32:00 AM	36.20	10:35:00 PM	64.91	12:44:00 AM	49.95
1:33:00 AM	36.21	10:36:00 PM	68.61	12:45:00 AM	51.39
1:34:00 AM	36.24	10:37:00 PM	66.58	12:46:00 AM	57.69
1:35:00 AM	36.21	10:38:00 PM	64.18	12:47:00 AM	52.00
1:36:00 AM	36.29	10:39:00 PM	69.78	12:48:00 AM	53.79
1:37:00 AM	36.49	10:40:00 PM	71.30	12:49:00 AM	54.15
1:38:00 AM	36.42	10:41:00 PM	66.18	12:50:00 AM	50.73
1:39:00 AM	36.90	10:42:00 PM	66.13	12:51:00 AM	52.85
1:40:00 AM	37.08	10:43:00 PM	63.30	12:52:00 AM	53.45
1:41:00 AM	40.55	10:44:00 PM	66.96	12:53:00 AM	51.44
1:42:00 AM	39.51	10:45:00 PM	63.22	12:54:00 AM	48.83
1:43:00 AM	41.32	10:46:00 PM	63.02	12:55:00 AM	47.87
1:44:00 AM	52.34	10:47:00 PM	68.64	12:56:00 AM	46.55
1:45:00 AM	50.78	10:48:00 PM	70.29	12:57:00 AM	56.44

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
1:46:00 AM	47.29	10:49:00 PM	72.47	12:58:00 AM	49.12
1:47:00 AM	51.03	10:50:00 PM	61.72	12:59:00 AM	49.56
1:48:00 AM	50.66	10:51:00 PM	61.42	1:00:00 AM	50.47
1:49:00 AM	50.95	10:52:00 PM	69.81	1:01:00 AM	48.16
1:50:00 AM	51.89	10:53:00 PM	64.57	1:02:00 AM	50.33
1:51:00 AM	50.58	10:54:00 PM	66.35	1:03:00 AM	51.65
1:52:00 AM	47.97	10:55:00 PM	63.54	1:04:00 AM	48.82
1:53:00 AM	47.20	10:56:00 PM	62.84	1:05:00 AM	50.23
1:54:00 AM	49.87	10:57:00 PM	66.24	1:06:00 AM	51.59
1:55:00 AM	57.78	10:58:00 PM	63.78	1:07:00 AM	51.46
1:56:00 AM	55.04	10:59:00 PM	68.08	1:08:00 AM	51.87
1:57:00 AM	57.17	11:00:00 PM	69.43	1:09:00 AM	51.20
1:58:00 AM	57.92	11:01:00 PM	67.63	1:10:00 AM	51.18
1:59:00 AM	57.33	11:02:00 PM	70.26	1:11:00 AM	54.81
2:00:00 AM	64.37	11:03:00 PM	61.01	1:12:00 AM	61.59
2:01:00 AM	64.56	11:04:00 PM	63.89	1:13:00 AM	54.04
2:02:00 AM	61.32	11:05:00 PM	63.95	1:14:00 AM	53.24
2:03:00 AM	62.33	11:06:00 PM	64.47	1:15:00 AM	52.38
2:04:00 AM	63.90	11:07:00 PM	65.99	1:16:00 AM	53.86
2:05:00 AM	59.67	11:08:00 PM	66.43	1:17:00 AM	51.86
2:06:00 AM	65.88	11:09:00 PM	65.42	1:18:00 AM	55.77
2:07:00 AM	61.47	11:10:00 PM	62.50	1:19:00 AM	56.53
2:08:00 AM	62.14	11:11:00 PM	67.38	1:20:00 AM	54.95
2:09:00 AM	58.83	11:12:00 PM	66.57	1:21:00 AM	54.98
2:10:00 AM	62.23	11:13:00 PM	66.58	1:22:00 AM	54.51
2:11:00 AM	60.16	11:14:00 PM	58.30	1:23:00 AM	54.52
2:12:00 AM	60.13	11:15:00 PM	58.79	1:24:00 AM	54.81
2:13:00 AM	60.99	11:16:00 PM	59.55	1:25:00 AM	55.57
2:14:00 AM	60.34	11:17:00 PM	63.96	1:26:00 AM	55.11
2:15:00 AM	60.44	11:18:00 PM	68.54	1:27:00 AM	56.03
2:16:00 AM	62.43	11:19:00 PM	63.52	1:28:00 AM	55.28
2:17:00 AM	62.84	11:20:00 PM	67.44	1:29:00 AM	55.22
2:18:00 AM	61.13	11:21:00 PM	61.69	1:30:00 AM	53.90
2:19:00 AM	63.02	11:22:00 PM	68.11	1:31:00 AM	54.41
2:20:00 AM	61.50	11:23:00 PM	65.12	1:32:00 AM	56.56
2:21:00 AM	65.88	11:24:00 PM	68.41	1:33:00 AM	55.31
2:22:00 AM	63.16	11:25:00 PM	67.05	1:34:00 AM	55.50
2:23:00 AM	77.81	11:26:00 PM	63.57	1:35:00 AM	54.13
2:24:00 AM	83.98	11:27:00 PM	61.58	1:36:00 AM	55.70
2:25:00 AM	84.76	11:28:00 PM	62.90	1:37:00 AM	54.52
2:26:00 AM	81.56	11:29:00 PM	64.47	1:38:00 AM	55.71
2:27:00 AM	85.55	11:30:00 PM	67.30	1:39:00 AM	54.42
2:28:00 AM	79.47	11:31:00 PM	64.16	1:40:00 AM	57.36
2:29:00 AM	82.92	11:32:00 PM	55.75	1:41:00 AM	54.16
2:30:00 AM	77.99	11:33:00 PM	62.85	1:42:00 AM	53.52
2:31:00 AM	77.85	11:34:00 PM	58.08	1:43:00 AM	53.45
2:32:00 AM	83.89	11:35:00 PM	69.48	1:44:00 AM	53.12

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
2:33:00 AM	85.00	11:36:00 PM	68.34	1:45:00 AM	54.06
2:34:00 AM	84.26	11:37:00 PM	69.18	1:46:00 AM	53.69
2:35:00 AM	82.57	11:38:00 PM	69.17	1:47:00 AM	50.71
2:36:00 AM	83.72	11:39:00 PM	65.11	1:48:00 AM	52.99
2:37:00 AM	84.26	11:40:00 PM	63.53	1:49:00 AM	57.31
2:38:00 AM	83.72	11:41:00 PM	65.51	1:50:00 AM	54.31
2:39:00 AM	87.12	11:42:00 PM	64.60	1:51:00 AM	55.45
2:40:00 AM	81.39	11:43:00 PM	63.07	1:52:00 AM	53.80
2:41:00 AM	79.27	11:44:00 PM	64.45	1:53:00 AM	62.43
2:42:00 AM	81.24	11:45:00 PM	59.91	1:54:00 AM	55.75
2:43:00 AM	83.92	11:46:00 PM	58.18	1:55:00 AM	58.64
2:44:00 AM	85.27	11:47:00 PM	59.68	1:56:00 AM	60.37
2:45:00 AM	86.43	11:48:00 PM	67.88	1:57:00 AM	54.69
2:46:00 AM	81.16	11:49:00 PM	71.35	1:58:00 AM	55.29
2:47:00 AM	81.92	11:50:00 PM	69.18	1:59:00 AM	56.70
2:48:00 AM	79.43	11:51:00 PM	65.28	2:00:00 AM	56.75
2:49:00 AM	80.81	11:52:00 PM	72.61	2:01:00 AM	55.76
2:50:00 AM	83.65	11:53:00 PM	69.33	2:02:00 AM	54.23
2:51:00 AM	85.84	11:54:00 PM	74.77	2:03:00 AM	53.62
2:52:00 AM	84.57	11:55:00 PM	67.86	2:04:00 AM	55.42
2:53:00 AM	80.88	11:56:00 PM	61.73	2:05:00 AM	56.11
2:54:00 AM	83.64	11:57:00 PM	62.68	2:06:00 AM	59.34
2:55:00 AM	82.36	11:58:00 PM	61.62	2:07:00 AM	58.13
2:56:00 AM	82.50	11:59:00 PM	56.52	2:08:00 AM	58.66
2:57:00 AM	82.67	12:00:00 AM	61.10	2:09:00 AM	58.55
2:58:00 AM	85.97	12:01:00 AM	68.25	2:10:00 AM	57.59
2:59:00 AM	89.38	12:02:00 AM	63.57	2:11:00 AM	56.69
3:00:00 AM	85.26	12:03:00 AM	59.88	2:12:00 AM	57.09
3:01:00 AM	89.12	12:04:00 AM	62.41	2:13:00 AM	55.08
3:02:00 AM	86.25	12:05:00 AM	53.99	2:14:00 AM	55.99
3:03:00 AM	85.42	12:06:00 AM	50.24	2:15:00 AM	58.03
3:04:00 AM	86.73	12:07:00 AM	56.64	2:16:00 AM	60.58
3:05:00 AM	83.42	12:08:00 AM	54.09	2:17:00 AM	61.84
3:06:00 AM	86.62	12:09:00 AM	60.04	2:18:00 AM	62.35
3:07:00 AM	87.62	12:10:00 AM	59.53	2:19:00 AM	61.75
3:08:00 AM	88.86	12:11:00 AM	56.88	2:20:00 AM	60.18
3:09:00 AM	84.80	12:12:00 AM	58.65	2:21:00 AM	61.88
3:10:00 AM	85.39	12:13:00 AM	58.14	2:22:00 AM	61.33
3:11:00 AM	88.34	12:14:00 AM	61.26	2:23:00 AM	61.37
3:12:00 AM	87.15	12:15:00 AM	65.15	2:24:00 AM	57.94
3:13:00 AM	86.07	12:16:00 AM	62.44	2:25:00 AM	61.37
3:14:00 AM	85.25	12:17:00 AM	54.87	2:26:00 AM	60.52
3:15:00 AM	88.83	12:18:00 AM	62.13	2:27:00 AM	58.28
3:16:00 AM	88.47	12:19:00 AM	60.83	2:28:00 AM	63.36
3:17:00 AM	89.97	12:20:00 AM	60.48	2:29:00 AM	60.52
3:18:00 AM	86.78	12:21:00 AM	62.06	2:30:00 AM	60.83
3:19:00 AM	89.36	12:22:00 AM	62.99	2:31:00 AM	65.39

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
3:20:00 AM	86.28	12:23:00 AM	66.08	2:32:00 AM	61.25
3:21:00 AM	85.07	12:24:00 AM	60.27	2:33:00 AM	62.33
3:22:00 AM	87.20	12:25:00 AM	69.59	2:34:00 AM	61.53
3:23:00 AM	86.61	12:26:00 AM	68.27	2:35:00 AM	61.98
3:24:00 AM	82.21	12:27:00 AM	67.77	2:36:00 AM	62.99
3:25:00 AM	84.81	12:28:00 AM	67.35	2:37:00 AM	61.17
3:26:00 AM	89.30	12:29:00 AM	68.24	2:38:00 AM	57.86
3:27:00 AM	90.86	12:30:00 AM	60.85	2:39:00 AM	58.10
3:28:00 AM	90.87	12:31:00 AM	66.65	2:40:00 AM	60.04
3:29:00 AM	88.20	12:32:00 AM	63.89	2:41:00 AM	58.10
3:30:00 AM	88.16	12:33:00 AM	63.94	2:42:00 AM	61.23
3:31:00 AM	86.17	12:34:00 AM	62.07	2:43:00 AM	61.86
3:32:00 AM	91.05	12:35:00 AM	60.19	2:44:00 AM	61.41
3:33:00 AM	84.32	12:36:00 AM	62.47	2:45:00 AM	62.68
3:34:00 AM	87.77	12:37:00 AM	63.74	2:46:00 AM	61.98
3:35:00 AM	87.46	12:38:00 AM	67.74	2:47:00 AM	61.14
3:36:00 AM	87.75	12:39:00 AM	61.03	2:48:00 AM	59.89
3:37:00 AM	87.59	12:40:00 AM	63.32	2:49:00 AM	58.78
3:38:00 AM	88.79	12:41:00 AM	59.06	2:50:00 AM	62.33
3:39:00 AM	89.69	12:42:00 AM	60.49	2:51:00 AM	60.96
3:40:00 AM	87.25	12:43:00 AM	62.22	2:52:00 AM	61.73
3:41:00 AM	85.30	12:44:00 AM	61.69	2:53:00 AM	61.63
3:42:00 AM	83.59	12:45:00 AM	59.01	2:54:00 AM	59.34
3:43:00 AM	88.52	12:46:00 AM	59.81	2:55:00 AM	60.23
3:44:00 AM	89.08	12:47:00 AM	55.55	2:56:00 AM	58.74
3:45:00 AM	88.34	12:48:00 AM	63.01	2:57:00 AM	62.30
3:46:00 AM	86.45	12:49:00 AM	64.77	2:58:00 AM	58.75
3:47:00 AM	90.01	12:50:00 AM	61.44	2:59:00 AM	59.33
3:48:00 AM	89.58	12:51:00 AM	61.09	3:00:00 AM	61.32
3:49:00 AM	89.91	12:52:00 AM	62.58	3:01:00 AM	59.58
3:50:00 AM	91.38	12:53:00 AM	63.80	3:02:00 AM	57.46
3:51:00 AM	85.41	12:54:00 AM	65.40	3:03:00 AM	57.08
3:52:00 AM	85.19	12:55:00 AM	63.21	3:04:00 AM	54.34
3:53:00 AM	85.66	12:56:00 AM	65.51	3:05:00 AM	55.59
3:54:00 AM	83.90	12:57:00 AM	65.52	3:06:00 AM	55.03
3:55:00 AM	88.02	12:58:00 AM	65.70	3:07:00 AM	56.72
3:56:00 AM	85.78	12:59:00 AM	66.05	3:08:00 AM	57.02
3:57:00 AM	87.67	1:00:00 AM	67.74	3:09:00 AM	55.81
3:58:00 AM	86.81	1:01:00 AM	68.51	3:10:00 AM	58.67
3:59:00 AM	84.73	1:02:00 AM	63.53	3:11:00 AM	59.56
4:00:00 AM	86.41	1:03:00 AM	66.40	3:12:00 AM	59.32
4:01:00 AM	85.27	1:04:00 AM	69.09	3:13:00 AM	57.87
4:02:00 AM	84.20	1:05:00 AM	69.55	3:14:00 AM	59.12
4:03:00 AM	84.35	1:06:00 AM	70.27	3:15:00 AM	59.31
4:04:00 AM	85.25	1:07:00 AM	64.17	3:16:00 AM	56.75
4:05:00 AM	85.28	1:08:00 AM	67.62	3:17:00 AM	56.13
4:06:00 AM	82.71	1:09:00 AM	66.74	3:18:00 AM	53.99

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
4:07:00 AM	81.63	1:10:00 AM	72.66	3:19:00 AM	56.45
4:08:00 AM	84.11	1:11:00 AM	69.82	3:20:00 AM	55.31
4:09:00 AM	83.18	1:12:00 AM	67.63	3:21:00 AM	57.79
4:10:00 AM	84.85	1:13:00 AM	62.62	3:22:00 AM	56.47
4:11:00 AM	82.75	1:14:00 AM	66.70	3:23:00 AM	57.13
4:12:00 AM	83.63	1:15:00 AM	67.63	3:24:00 AM	59.05
4:13:00 AM	82.21	1:16:00 AM	65.68	3:25:00 AM	56.39
4:14:00 AM	86.06	1:17:00 AM	64.05	3:26:00 AM	55.88
4:15:00 AM	83.00	1:18:00 AM	68.89	3:27:00 AM	56.22
4:16:00 AM	82.05	1:19:00 AM	65.21	3:28:00 AM	56.51
4:17:00 AM	82.12	1:20:00 AM	64.04	3:29:00 AM	57.53
4:18:00 AM	79.93	1:21:00 AM	66.70	3:30:00 AM	58.34
4:19:00 AM	89.12	1:22:00 AM	63.98	3:31:00 AM	56.10
4:20:00 AM	86.17	1:23:00 AM	68.98	3:32:00 AM	57.29
4:21:00 AM	87.25	1:24:00 AM	65.64	3:33:00 AM	56.71
4:22:00 AM	90.61	1:25:00 AM	60.53	3:34:00 AM	58.95
4:23:00 AM	86.09	1:26:00 AM	66.16	3:35:00 AM	56.75
4:24:00 AM	85.70	1:27:00 AM	68.66	3:36:00 AM	56.72
4:25:00 AM	86.21	1:28:00 AM	66.12	3:37:00 AM	56.54
4:26:00 AM	88.24	1:29:00 AM	64.58	3:38:00 AM	53.03
4:27:00 AM	85.75	1:30:00 AM	66.00	3:39:00 AM	53.09
4:28:00 AM	83.58	1:31:00 AM	63.66	3:40:00 AM	58.22
4:29:00 AM	84.19	1:32:00 AM	66.79	3:41:00 AM	54.95
4:30:00 AM	83.02	1:33:00 AM	66.86	3:42:00 AM	56.42
4:31:00 AM	82.66	1:34:00 AM	64.28	3:43:00 AM	56.06
4:32:00 AM	82.06	1:35:00 AM	63.10	3:44:00 AM	57.65
4:33:00 AM	80.38	1:36:00 AM	66.58	3:45:00 AM	57.97
4:34:00 AM	85.89	1:37:00 AM	67.30	3:46:00 AM	57.00
4:35:00 AM	87.55	1:38:00 AM	66.00	3:47:00 AM	55.68
4:36:00 AM	83.51	1:39:00 AM	65.92	3:48:00 AM	56.30
4:37:00 AM	82.60	1:40:00 AM	63.47	3:49:00 AM	57.44
4:38:00 AM	82.17	1:41:00 AM	63.63	3:50:00 AM	57.06
4:39:00 AM	81.37	1:42:00 AM	67.10	3:51:00 AM	59.70
4:40:00 AM	80.03	1:43:00 AM	67.47	3:52:00 AM	55.84
4:41:00 AM	82.32	1:44:00 AM	65.49	3:53:00 AM	59.26
4:42:00 AM	82.99	1:45:00 AM	71.22	3:54:00 AM	56.69
4:43:00 AM	83.20	1:46:00 AM	73.85	3:55:00 AM	56.56
4:44:00 AM	82.39	1:47:00 AM	71.90	3:56:00 AM	56.46
4:45:00 AM	84.67	1:48:00 AM	71.71	3:57:00 AM	55.19
4:46:00 AM	83.61	1:49:00 AM	68.46	3:58:00 AM	51.83
4:47:00 AM	80.52	1:50:00 AM	61.07	3:59:00 AM	51.21
4:48:00 AM	80.55	1:51:00 AM	67.34	4:00:00 AM	51.80
4:49:00 AM	85.68	1:52:00 AM	68.38	4:01:00 AM	53.87
4:50:00 AM	84.01	1:53:00 AM	70.49	4:02:00 AM	54.12
4:51:00 AM	82.50	1:54:00 AM	70.94	4:03:00 AM	52.80
4:52:00 AM	84.92	1:55:00 AM	66.15	4:04:00 AM	53.31
4:53:00 AM	83.69	1:56:00 AM	65.17	4:05:00 AM	56.30

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
4:54:00 AM	84.05	1:57:00 AM	67.29	4:06:00 AM	55.29
4:55:00 AM	83.69	1:58:00 AM	72.90	4:07:00 AM	53.76
4:56:00 AM	83.33	1:59:00 AM	68.64	4:08:00 AM	55.84
4:57:00 AM	85.29	2:00:00 AM	63.65	4:09:00 AM	55.55
4:58:00 AM	83.24	2:01:00 AM	67.34	4:10:00 AM	54.47
4:59:00 AM	81.35	2:02:00 AM	67.18	4:11:00 AM	53.83
5:00:00 AM	79.43	2:03:00 AM	67.29	4:12:00 AM	55.27
5:01:00 AM	78.31	2:04:00 AM	66.83	4:13:00 AM	56.67
5:02:00 AM	82.29	2:05:00 AM	68.14	4:14:00 AM	56.43
5:03:00 AM	84.60	2:06:00 AM	65.00	4:15:00 AM	55.59
5:04:00 AM	86.63	2:07:00 AM	68.04	4:16:00 AM	57.08
5:05:00 AM	81.53	2:08:00 AM	69.72	4:17:00 AM	57.58
5:06:00 AM	83.70	2:09:00 AM	70.62	4:18:00 AM	55.59
5:07:00 AM	87.89	2:10:00 AM	69.13	4:19:00 AM	56.82
5:08:00 AM	85.19	2:11:00 AM	60.57	4:20:00 AM	57.32
5:09:00 AM	86.61	2:12:00 AM	62.93	4:21:00 AM	56.88
5:10:00 AM	88.41	2:13:00 AM	64.14	4:22:00 AM	54.81
5:11:00 AM	89.42	2:14:00 AM	64.36	4:23:00 AM	59.45
5:12:00 AM	85.78	2:15:00 AM	65.09	4:24:00 AM	57.80
5:13:00 AM	84.54	2:16:00 AM	67.45	4:25:00 AM	57.67
5:14:00 AM	88.93	2:17:00 AM	62.32	4:26:00 AM	58.29
5:15:00 AM	87.26	2:18:00 AM	70.56	4:27:00 AM	57.28
5:16:00 AM	84.44	2:19:00 AM	68.19	4:28:00 AM	56.87
5:17:00 AM	88.15	2:20:00 AM	66.37	4:29:00 AM	60.03
5:18:00 AM	86.37	2:21:00 AM	69.35	4:30:00 AM	59.45
5:19:00 AM	86.47	2:22:00 AM	68.73	4:31:00 AM	56.83
5:20:00 AM	86.30	2:23:00 AM	64.26	4:32:00 AM	57.20
5:21:00 AM	86.71	2:24:00 AM	67.91	4:33:00 AM	56.85
5:22:00 AM	84.79	2:25:00 AM	70.25	4:34:00 AM	64.89
5:23:00 AM	85.50	2:26:00 AM	68.24	4:35:00 AM	58.60
5:24:00 AM	83.52	2:27:00 AM	72.47	4:36:00 AM	58.94
5:25:00 AM	83.91	2:28:00 AM	67.58	4:37:00 AM	56.98
5:26:00 AM	85.62	2:29:00 AM	63.11	4:38:00 AM	56.33
5:27:00 AM	87.75	2:30:00 AM	64.63	4:39:00 AM	59.68
5:28:00 AM	87.59	2:31:00 AM	66.20	4:40:00 AM	60.32
5:29:00 AM	88.80	2:32:00 AM	64.49	4:41:00 AM	56.52
5:30:00 AM	87.69	2:33:00 AM	66.49	4:42:00 AM	55.91
5:31:00 AM	85.08	2:34:00 AM	68.77	4:43:00 AM	56.45
5:32:00 AM	84.76	2:35:00 AM	71.82	4:44:00 AM	56.61
5:33:00 AM	87.02	2:36:00 AM	67.03	4:45:00 AM	58.04
5:34:00 AM	81.62	2:37:00 AM	66.04	4:46:00 AM	56.64
5:35:00 AM	86.22	2:38:00 AM	66.38	4:47:00 AM	53.72
5:36:00 AM	85.66	2:39:00 AM	66.90	4:48:00 AM	54.39
5:37:00 AM	84.71	2:40:00 AM	66.27	4:49:00 AM	50.12
5:38:00 AM	85.74	2:41:00 AM	64.23	4:50:00 AM	52.36
5:39:00 AM	85.00	2:42:00 AM	69.69	4:51:00 AM	55.43
5:40:00 AM	86.66	2:43:00 AM	68.57	4:52:00 AM	58.84

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
5:41:00 AM	81.97	2:44:00 AM	61.91	4:53:00 AM	56.18
5:42:00 AM	83.49	2:45:00 AM	69.24	4:54:00 AM	55.60
5:43:00 AM	84.82	2:46:00 AM	66.16	4:55:00 AM	53.81
5:44:00 AM	83.20	2:47:00 AM	64.84	4:56:00 AM	56.32
5:45:00 AM	87.20	2:48:00 AM	67.67	4:57:00 AM	54.51
5:46:00 AM	87.43	2:49:00 AM	67.05	4:58:00 AM	54.43
5:47:00 AM	82.53	2:50:00 AM	65.23	4:59:00 AM	54.20
5:48:00 AM	84.47	2:51:00 AM	69.22	5:00:00 AM	53.60
5:49:00 AM	85.45	2:52:00 AM	67.03	5:01:00 AM	55.45
5:50:00 AM	84.15	2:53:00 AM	67.47	5:02:00 AM	54.89
5:51:00 AM	82.30	2:54:00 AM	68.53	5:03:00 AM	56.40
5:52:00 AM	84.06	2:55:00 AM	67.33	5:04:00 AM	54.95
5:53:00 AM	82.76	2:56:00 AM	66.46	5:05:00 AM	55.99
5:54:00 AM	84.22	2:57:00 AM	68.22	5:06:00 AM	54.13
5:55:00 AM	79.50	2:58:00 AM	70.64	5:07:00 AM	53.05
5:56:00 AM	83.19	2:59:00 AM	67.97	5:08:00 AM	53.53
5:57:00 AM	84.53	3:00:00 AM	68.24	5:09:00 AM	54.54
5:58:00 AM	82.29	3:01:00 AM	74.89	5:10:00 AM	52.27
5:59:00 AM	84.06	3:02:00 AM	71.98	5:11:00 AM	53.23
6:00:00 AM	86.40	3:03:00 AM	70.88	5:12:00 AM	54.33
6:01:00 AM	83.80	3:04:00 AM	65.44	5:13:00 AM	52.09
6:02:00 AM	84.91	3:05:00 AM	71.17	5:14:00 AM	52.78
6:03:00 AM	78.49	3:06:00 AM	71.14	5:15:00 AM	57.41
6:04:00 AM	80.24	3:07:00 AM	70.03	5:16:00 AM	54.26
6:05:00 AM	86.00	3:08:00 AM	70.60	5:17:00 AM	50.98
6:06:00 AM	84.88	3:09:00 AM	72.15	5:18:00 AM	50.33
6:07:00 AM	84.44	3:10:00 AM	71.73	5:19:00 AM	50.74
6:08:00 AM	80.91	3:11:00 AM	73.61	5:20:00 AM	50.42
6:09:00 AM	82.58	3:12:00 AM	74.51	5:21:00 AM	49.31
6:10:00 AM	84.44	3:13:00 AM	74.59	5:22:00 AM	50.03
6:11:00 AM	81.39	3:14:00 AM	72.50	5:23:00 AM	48.79
6:12:00 AM	81.69	3:15:00 AM	73.87	5:24:00 AM	49.64
6:13:00 AM	81.38	3:16:00 AM	74.92	5:25:00 AM	48.90
6:14:00 AM	82.15	3:17:00 AM	73.80	5:26:00 AM	50.10
6:15:00 AM	79.54	3:18:00 AM	73.21	5:27:00 AM	46.47
6:16:00 AM	80.04	3:19:00 AM	74.69	5:28:00 AM	47.65
6:17:00 AM	83.38	3:20:00 AM	75.19	5:29:00 AM	48.72
6:18:00 AM	81.03	3:21:00 AM	69.38	5:30:00 AM	58.44
6:19:00 AM	81.98	3:22:00 AM	70.46	5:31:00 AM	52.08
6:20:00 AM	85.13	3:23:00 AM	73.60	5:32:00 AM	49.19
6:21:00 AM	82.37	3:24:00 AM	73.47	5:33:00 AM	51.55
6:22:00 AM	80.30	3:25:00 AM	73.14	5:34:00 AM	52.87
6:23:00 AM	81.90	3:26:00 AM	73.93	5:35:00 AM	50.37
6:24:00 AM	82.70	3:27:00 AM	70.24	5:36:00 AM	47.68
6:25:00 AM	84.97	3:28:00 AM	65.62	5:37:00 AM	49.50
6:26:00 AM	81.62	3:29:00 AM	74.11	5:38:00 AM	52.91
6:27:00 AM	83.32	3:30:00 AM	73.48	5:39:00 AM	49.74

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
6:28:00 AM	83.87	3:31:00 AM	67.89	5:40:00 AM	52.87
6:29:00 AM	82.66	3:32:00 AM	74.03	5:41:00 AM	53.72
6:30:00 AM	82.80	3:33:00 AM	71.09	5:42:00 AM	52.24
6:31:00 AM	79.67	3:34:00 AM	70.42	5:43:00 AM	53.45
6:32:00 AM	83.20	3:35:00 AM	71.29	5:44:00 AM	56.10
6:33:00 AM	86.86	3:36:00 AM	75.07	5:45:00 AM	57.21
6:34:00 AM	84.82	3:37:00 AM	67.88	5:46:00 AM	54.69
6:35:00 AM	79.66	3:38:00 AM	67.26	5:47:00 AM	55.35
6:36:00 AM	85.58	3:39:00 AM	71.69	5:48:00 AM	57.01
6:37:00 AM	85.53	3:40:00 AM	72.11	5:49:00 AM	54.09
6:38:00 AM	81.54	3:41:00 AM	73.09	5:50:00 AM	54.30
6:39:00 AM	81.79	3:42:00 AM	69.91	5:51:00 AM	57.70
6:40:00 AM	83.76	3:43:00 AM	70.17	5:52:00 AM	59.80
6:41:00 AM	81.86	3:44:00 AM	68.67	5:53:00 AM	56.92
6:42:00 AM	83.70	3:45:00 AM	69.62	5:54:00 AM	52.40
6:43:00 AM	80.62	3:46:00 AM	69.56	5:55:00 AM	53.10
6:44:00 AM	82.86	3:47:00 AM	67.37	5:56:00 AM	62.54
6:45:00 AM	83.02	3:48:00 AM	69.16	5:57:00 AM	56.55
6:46:00 AM	87.47	3:49:00 AM	69.18	5:58:00 AM	50.70
6:47:00 AM	84.51	3:50:00 AM	71.09	5:59:00 AM	58.13
6:48:00 AM	84.44	3:51:00 AM	72.65	6:00:00 AM	56.73
6:49:00 AM	86.50	3:52:00 AM	73.86	6:01:00 AM	58.96
6:50:00 AM	80.65	3:53:00 AM	71.78	6:02:00 AM	55.87
6:51:00 AM	79.98	3:54:00 AM	70.10	6:03:00 AM	56.66
6:52:00 AM	84.17	3:55:00 AM	65.58	6:04:00 AM	62.18
6:53:00 AM	84.78	3:56:00 AM	72.42	6:05:00 AM	61.94
6:54:00 AM	83.96	3:57:00 AM	70.71	6:06:00 AM	60.89
6:55:00 AM	84.44	3:58:00 AM	67.49	6:07:00 AM	60.36
6:56:00 AM	87.52	3:59:00 AM	70.04	6:08:00 AM	62.50
6:57:00 AM	84.87	4:00:00 AM	66.30	6:09:00 AM	60.99
6:58:00 AM	86.21	4:01:00 AM	67.30	6:10:00 AM	60.03
6:59:00 AM	83.86	4:02:00 AM	62.98	6:11:00 AM	58.10
7:00:00 AM	83.56	4:03:00 AM	63.55	6:12:00 AM	62.21
7:01:00 AM	87.94	4:04:00 AM	64.49	6:13:00 AM	63.12
7:02:00 AM	87.93	4:05:00 AM	59.80	6:14:00 AM	64.88
7:03:00 AM	88.01	4:06:00 AM	60.05	6:15:00 AM	62.60
7:04:00 AM	90.18	4:07:00 AM	60.74	6:16:00 AM	64.46
7:05:00 AM	84.98	4:08:00 AM	66.39	6:17:00 AM	62.62
7:06:00 AM	86.06	4:09:00 AM	62.56	6:18:00 AM	64.51
7:07:00 AM	86.24	4:10:00 AM	56.62	6:19:00 AM	59.38
7:08:00 AM	83.94	4:11:00 AM	60.19	6:20:00 AM	62.00
7:09:00 AM	84.07	4:12:00 AM	67.90	6:21:00 AM	61.05
7:10:00 AM	85.72	4:13:00 AM	60.60	6:22:00 AM	59.52
7:11:00 AM	80.96	4:14:00 AM	59.06	6:23:00 AM	60.19
7:12:00 AM	79.92	4:15:00 AM	58.11	6:24:00 AM	65.06
7:13:00 AM	83.34	4:16:00 AM	65.26	6:25:00 AM	64.07
7:14:00 AM	82.63	4:17:00 AM	64.18	6:26:00 AM	61.96

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
7:15:00 AM	83.47	4:18:00 AM	64.94	6:27:00 AM	64.91
7:16:00 AM	85.78	4:19:00 AM	71.20	6:28:00 AM	62.68
7:17:00 AM	88.44	4:20:00 AM	63.79	6:29:00 AM	64.41
7:18:00 AM	87.34	4:21:00 AM	55.41	6:30:00 AM	64.15
7:19:00 AM	84.72	4:22:00 AM	68.18	6:31:00 AM	62.33
7:20:00 AM	86.16	4:23:00 AM	63.80	6:32:00 AM	64.32
7:21:00 AM	88.23	4:24:00 AM	65.36	6:33:00 AM	64.72
7:22:00 AM	87.12	4:25:00 AM	62.85	6:34:00 AM	60.67
7:23:00 AM	86.87	4:26:00 AM	62.34	6:35:00 AM	64.13
7:24:00 AM	86.41	4:27:00 AM	64.59	6:36:00 AM	64.84
7:25:00 AM	86.46	4:28:00 AM	67.67	6:37:00 AM	66.68
7:26:00 AM	90.07	4:29:00 AM	64.07	6:38:00 AM	64.33
7:27:00 AM	87.89	4:30:00 AM	66.70	6:39:00 AM	63.46
7:28:00 AM	90.93	4:31:00 AM	62.28	6:40:00 AM	65.08
7:29:00 AM	87.95	4:32:00 AM	59.17	6:41:00 AM	63.33
7:30:00 AM	88.02	4:33:00 AM	61.78	6:42:00 AM	64.46
7:31:00 AM	91.24	4:34:00 AM	61.26	6:43:00 AM	62.23
7:32:00 AM	88.61	4:35:00 AM	62.81	6:44:00 AM	64.66
7:33:00 AM	87.71	4:36:00 AM	59.53	6:45:00 AM	62.09
7:34:00 AM	86.06	4:37:00 AM	58.43	6:46:00 AM	61.55
7:35:00 AM	87.28	4:38:00 AM	60.38	6:47:00 AM	67.03
7:36:00 AM	88.00	4:39:00 AM	57.39	6:48:00 AM	65.33
7:37:00 AM	84.59	4:40:00 AM	52.05	6:49:00 AM	66.96
7:38:00 AM	87.64	4:41:00 AM	50.44	6:50:00 AM	65.09
7:39:00 AM	84.97	4:42:00 AM	49.60	6:51:00 AM	65.40
7:40:00 AM	89.07	4:43:00 AM	48.84	6:52:00 AM	64.20
7:41:00 AM	88.89	4:44:00 AM	51.50	6:53:00 AM	65.82
7:42:00 AM	88.60	4:45:00 AM	59.06	6:54:00 AM	62.40
7:43:00 AM	89.84	4:46:00 AM	62.25	6:55:00 AM	66.06
7:44:00 AM	88.01	4:47:00 AM	54.76	6:56:00 AM	65.54
7:45:00 AM	86.76	4:48:00 AM	56.71	6:57:00 AM	64.41
7:46:00 AM	87.11	4:49:00 AM	58.95	6:58:00 AM	64.39
7:47:00 AM	86.99	4:50:00 AM	53.87	6:59:00 AM	63.13
7:48:00 AM	86.73	4:51:00 AM	55.47	7:00:00 AM	64.12
7:49:00 AM	89.17	4:52:00 AM	58.72	7:01:00 AM	63.93
7:50:00 AM	81.91	4:53:00 AM	62.32	7:02:00 AM	65.69
7:51:00 AM	89.77	4:54:00 AM	62.47	7:03:00 AM	63.64
7:52:00 AM	87.37	4:55:00 AM	61.83	7:04:00 AM	65.68
7:53:00 AM	87.87	4:56:00 AM	59.93	7:05:00 AM	63.63
7:54:00 AM	84.93	4:57:00 AM	59.58	7:06:00 AM	64.29
7:55:00 AM	88.84	4:58:00 AM	58.78	7:07:00 AM	62.26
7:56:00 AM	87.54	4:59:00 AM	59.94	7:08:00 AM	65.11
7:57:00 AM	84.35	5:00:00 AM	58.44	7:09:00 AM	65.30
7:58:00 AM	85.47	5:01:00 AM	58.91	7:10:00 AM	65.83
7:59:00 AM	85.88	5:02:00 AM	58.84	7:11:00 AM	64.63
8:00:00 AM	84.68	5:03:00 AM	57.74	7:12:00 AM	63.83
8:01:00 AM	81.24	5:04:00 AM	61.12	7:13:00 AM	63.18

N1		N2		N3	
Time	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*
8:02:00 AM	88.30	5:05:00 AM	54.80	7:14:00 AM	64.36
8:03:00 AM	82.92	5:06:00 AM	61.43	7:15:00 AM	63.15
8:04:00 AM	88.74	5:07:00 AM	73.85	7:16:00 AM	61.32
8:05:00 AM	85.21	5:08:00 AM	72.24	7:17:00 AM	64.36
8:06:00 AM	85.35	5:09:00 AM	70.62	7:18:00 AM	65.93
8:07:00 AM	84.89	5:10:00 AM	58.75	7:19:00 AM	67.27
8:08:00 AM	88.46	5:11:00 AM	56.62	7:20:00 AM	65.68
8:09:00 AM	87.46	5:12:00 AM	57.14	7:21:00 AM	65.84
8:10:00 AM	85.09	5:13:00 AM	53.45	7:22:00 AM	65.14
8:11:00 AM	86.47	5:14:00 AM	50.11	7:23:00 AM	65.65
8:12:00 AM	84.43	5:15:00 AM	51.38	7:24:00 AM	65.49
8:13:00 AM	89.27	5:16:00 AM	51.62	7:25:00 AM	63.22
8:14:00 AM	89.65	5:17:00 AM	54.85	7:26:00 AM	64.76
8:15:00 AM	89.32	5:18:00 AM	55.67	7:27:00 AM	68.59
8:16:00 AM	87.63	5:19:00 AM	52.18	7:28:00 AM	65.94
8:17:00 AM	87.84	5:20:00 AM	48.75	7:29:00 AM	67.40
8:18:00 AM	88.58	5:21:00 AM	48.29	7:30:00 AM	67.39
8:19:00 AM	87.32	5:22:00 AM	48.85	7:31:00 AM	65.46
8:20:00 AM	87.18	5:23:00 AM	48.88	7:32:00 AM	66.84
8:21:00 AM	88.68	5:24:00 AM	49.08	7:33:00 AM	67.85
8:22:00 AM	88.39	5:25:00 AM	47.40	7:34:00 AM	67.02
8:23:00 AM	86.29	5:26:00 AM	50.05	7:35:00 AM	64.24
8:24:00 AM	87.59	5:27:00 AM	49.46	7:36:00 AM	64.73
8:25:00 AM	89.48	5:28:00 AM	51.07	7:37:00 AM	64.44
8:26:00 AM	84.78	5:29:00 AM	49.50	7:38:00 AM	65.31
8:27:00 AM	89.86	5:30:00 AM	51.06	7:39:00 AM	64.92
8:28:00 AM	86.74	5:31:00 AM	50.73	7:40:00 AM	63.92
8:29:00 AM	88.07	5:32:00 AM	49.58	7:41:00 AM	66.64
8:30:00 AM	87.40	5:33:00 AM	49.72	7:42:00 AM	68.54
8:31:00 AM	88.61	5:34:00 AM	49.80	7:43:00 AM	68.11
8:32:00 AM	86.87	5:35:00 AM	50.89	7:44:00 AM	68.18
8:33:00 AM	84.43	5:36:00 AM	50.33	7:45:00 AM	71.06
8:34:00 AM	82.97	5:37:00 AM	50.72	7:46:00 AM	67.09
8:35:00 AM	85.82	5:38:00 AM	50.89	7:47:00 AM	68.71
8:36:00 AM	89.09	5:39:00 AM	50.00	7:48:00 AM	70.13
8:37:00 AM	89.42	5:40:00 AM	49.10	7:49:00 AM	67.81
8:38:00 AM	89.72	5:41:00 AM	48.27	7:50:00 AM	68.06
8:39:00 AM	87.40	5:42:00 AM	47.44	7:51:00 AM	69.78
8:40:00 AM	87.54	5:43:00 AM	47.59	7:52:00 AM	68.82
8:41:00 AM	85.72	5:44:00 AM	47.41	7:53:00 AM	68.21
8:42:00 AM	86.63	5:45:00 AM	49.43	7:54:00 AM	68.89
8:43:00 AM	86.68	5:46:00 AM	55.88	7:55:00 AM	66.79
8:44:00 AM	84.67	5:47:00 AM	55.50	7:56:00 AM	66.36
8:45:00 AM	84.35	5:48:00 AM	57.15	7:57:00 AM	68.87
8:46:00 AM	90.03	5:49:00 AM	58.94	7:58:00 AM	66.88
8:47:00 AM	85.53	5:50:00 AM	58.59	7:59:00 AM	69.54
8:48:00 AM	84.86	5:51:00 AM	54.36	8:00:00 AM	73.34

N1		N2		N3	
Time	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*
8:49:00 AM	86.66	5:52:00 AM	57.36	8:01:00 AM	70.06
8:50:00 AM	87.16	5:53:00 AM	57.54	8:02:00 AM	69.02
8:51:00 AM	85.74	5:54:00 AM	59.69	8:03:00 AM	68.66
8:52:00 AM	85.88	5:55:00 AM	55.73	8:04:00 AM	70.26
8:53:00 AM	85.94	5:56:00 AM	59.95	8:05:00 AM	68.93
8:54:00 AM	87.12	5:57:00 AM	62.59	8:06:00 AM	70.37
8:55:00 AM	86.35	5:58:00 AM	62.11	8:07:00 AM	69.89
8:56:00 AM	86.52	5:59:00 AM	59.55	8:08:00 AM	69.70
8:57:00 AM	85.42	6:00:00 AM	53.73	8:09:00 AM	68.60
8:58:00 AM	85.70	6:01:00 AM	56.83	8:10:00 AM	68.94
8:59:00 AM	86.29	6:02:00 AM	56.70	8:11:00 AM	70.16
9:00:00 AM	85.40	6:03:00 AM	54.79	8:12:00 AM	70.62
9:01:00 AM	86.82	6:04:00 AM	54.88	8:13:00 AM	70.01
9:02:00 AM	85.78	6:05:00 AM	59.00	8:14:00 AM	69.97
9:03:00 AM	88.12	6:06:00 AM	57.23	8:15:00 AM	66.37
9:04:00 AM	88.45	6:07:00 AM	53.26	8:16:00 AM	68.64
9:05:00 AM	85.06	6:08:00 AM	53.96	8:17:00 AM	66.73
9:06:00 AM	88.53	6:09:00 AM	54.66	8:18:00 AM	64.80
9:07:00 AM	88.14	6:10:00 AM	54.70	8:19:00 AM	65.53
9:08:00 AM	89.60	6:11:00 AM	52.98	8:20:00 AM	66.63
9:09:00 AM	90.71	6:12:00 AM	62.57	8:21:00 AM	64.57
9:10:00 AM	88.65	6:13:00 AM	61.31	8:22:00 AM	64.34
9:11:00 AM	85.18	6:14:00 AM	57.65	8:23:00 AM	70.06
9:12:00 AM	87.56	6:15:00 AM	59.80	8:24:00 AM	72.09
9:13:00 AM	87.43	6:16:00 AM	58.15	8:25:00 AM	71.73
9:14:00 AM	84.56	6:17:00 AM	58.41	8:26:00 AM	72.11
9:15:00 AM	88.33	6:18:00 AM	55.26	8:27:00 AM	71.07
9:16:00 AM	86.87	6:19:00 AM	53.73	8:28:00 AM	72.13
9:17:00 AM	87.13	6:20:00 AM	54.47	8:29:00 AM	74.80
9:18:00 AM	84.35	6:21:00 AM	57.07	8:30:00 AM	77.32
9:19:00 AM	83.19	6:22:00 AM	54.90	8:31:00 AM	77.24
9:20:00 AM	83.23	6:23:00 AM	55.44	8:32:00 AM	79.27
9:21:00 AM	87.21	6:24:00 AM	56.50	8:33:00 AM	78.77
9:22:00 AM	82.03	6:25:00 AM	55.18	8:34:00 AM	76.34
9:23:00 AM	83.52	6:26:00 AM	53.47	8:35:00 AM	73.25
9:24:00 AM	80.93	6:27:00 AM	57.13	8:36:00 AM	73.64
9:25:00 AM	85.26	6:28:00 AM	59.62	8:37:00 AM	77.92
9:26:00 AM	83.93	6:29:00 AM	54.39	8:38:00 AM	78.77
9:27:00 AM	82.86	6:30:00 AM	57.91	8:39:00 AM	76.35
9:28:00 AM	85.21	6:31:00 AM	57.89	8:40:00 AM	73.13
9:29:00 AM	80.84	6:32:00 AM	59.10	8:41:00 AM	68.67
9:30:00 AM	82.80	6:33:00 AM	58.70	8:42:00 AM	52.72
9:31:00 AM	78.82	6:34:00 AM	58.62	8:43:00 AM	52.97
9:32:00 AM	82.16	6:35:00 AM	59.49	8:44:00 AM	47.11
9:33:00 AM	85.26	6:36:00 AM	55.28	8:45:00 AM	45.53
9:34:00 AM	82.45	6:37:00 AM	53.44	8:46:00 AM	46.31
9:35:00 AM	83.32	6:38:00 AM	61.64	8:47:00 AM	46.74

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
9:36:00 AM	82.44	6:39:00 AM	61.23	8:48:00 AM	47.51
9:37:00 AM	82.34	6:40:00 AM	61.23	8:49:00 AM	47.04
9:38:00 AM	85.62	6:41:00 AM	57.26	8:50:00 AM	47.51
9:39:00 AM	84.81	6:42:00 AM	54.48	8:51:00 AM	49.70
9:40:00 AM	82.24	6:43:00 AM	57.25	8:52:00 AM	57.23
9:41:00 AM	81.57	6:44:00 AM	55.54	8:53:00 AM	48.89
9:42:00 AM	82.04	6:45:00 AM	57.59	8:54:00 AM	61.90
9:43:00 AM	84.11	6:46:00 AM	60.53	8:55:00 AM	49.65
9:44:00 AM	81.49	6:47:00 AM	64.80	8:56:00 AM	46.61
9:45:00 AM	87.60	6:48:00 AM	62.90	8:57:00 AM	43.25
9:46:00 AM	86.08	6:49:00 AM	62.26	8:58:00 AM	53.25
9:47:00 AM	84.58	6:50:00 AM	60.46	8:59:00 AM	53.38
9:48:00 AM	83.68	6:51:00 AM	55.37	9:00:00 AM	54.89
9:49:00 AM	84.49	6:52:00 AM	56.78	9:01:00 AM	57.23
9:50:00 AM	84.87	6:53:00 AM	65.00	9:02:00 AM	57.87
9:51:00 AM	84.44	6:54:00 AM	55.56	9:03:00 AM	60.06
9:52:00 AM	84.97	6:55:00 AM	53.34	9:04:00 AM	48.02
9:53:00 AM	85.15	6:56:00 AM	52.33	9:05:00 AM	46.64
9:54:00 AM	85.18	6:57:00 AM	55.53	9:06:00 AM	44.52
9:55:00 AM	85.10	6:58:00 AM	51.67	9:07:00 AM	44.81
9:56:00 AM	82.68	6:59:00 AM	54.92	9:08:00 AM	45.08
9:57:00 AM	88.77	7:00:00 AM	51.38	9:09:00 AM	53.77
9:58:00 AM	90.35	7:01:00 AM	54.89	9:10:00 AM	45.52
9:59:00 AM	85.09	7:02:00 AM	53.45	9:11:00 AM	43.48
10:00:00 AM	84.05	7:03:00 AM	56.47	9:12:00 AM	47.57
10:01:00 AM	89.30	7:04:00 AM	57.66	9:13:00 AM	56.56
10:02:00 AM	88.18	7:05:00 AM	60.32	9:14:00 AM	47.16
10:03:00 AM	88.14	7:06:00 AM	54.78	9:15:00 AM	52.44
10:04:00 AM	86.27	7:07:00 AM	54.90	9:16:00 AM	50.41
10:05:00 AM	89.11	7:08:00 AM	59.27	9:17:00 AM	51.30
10:06:00 AM	88.55	7:09:00 AM	48.49	9:18:00 AM	51.44
10:07:00 AM	86.02	7:10:00 AM	46.20	9:19:00 AM	45.39
10:08:00 AM	86.99	7:11:00 AM	48.97	9:20:00 AM	46.76
10:09:00 AM	88.47	7:12:00 AM	49.08	9:21:00 AM	46.81
10:10:00 AM	88.03	7:13:00 AM	54.03	9:22:00 AM	65.83
10:11:00 AM	87.27	7:14:00 AM	53.47	9:23:00 AM	46.70
10:12:00 AM	88.96	7:15:00 AM	56.12	9:24:00 AM	48.59
10:13:00 AM	90.26	7:16:00 AM	58.16	9:25:00 AM	52.65
10:14:00 AM	89.61	7:17:00 AM	54.46	9:26:00 AM	56.98
10:15:00 AM	86.88	7:18:00 AM	61.37	9:27:00 AM	51.89
10:16:00 AM	88.83	7:19:00 AM	64.04	9:28:00 AM	65.59
10:17:00 AM	87.14	7:20:00 AM	63.28	9:29:00 AM	47.22
10:18:00 AM	87.80	7:21:00 AM	60.10	9:30:00 AM	53.58
10:19:00 AM	90.11	7:22:00 AM	62.08	9:31:00 AM	48.60
10:20:00 AM	89.40	7:23:00 AM	63.52	9:32:00 AM	53.13
10:21:00 AM	88.30	7:24:00 AM	60.35	9:33:00 AM	47.71
10:22:00 AM	82.12	7:25:00 AM	61.13	9:34:00 AM	47.73

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
10:23:00 AM	84.34	7:26:00 AM	58.23	9:35:00 AM	48.09
10:24:00 AM	88.46	7:27:00 AM	57.67	9:36:00 AM	50.49
10:25:00 AM	88.01	7:28:00 AM	58.43	9:37:00 AM	44.53
10:26:00 AM	85.84	7:29:00 AM	49.18	9:38:00 AM	48.60
10:27:00 AM	86.91	7:30:00 AM	51.94	9:39:00 AM	52.56
10:28:00 AM	81.05	7:31:00 AM	54.38	9:40:00 AM	46.42
10:29:00 AM	88.86	7:32:00 AM	50.79	9:41:00 AM	44.78
10:30:00 AM	86.21	7:33:00 AM	49.20	9:42:00 AM	44.36
10:31:00 AM	89.34	7:34:00 AM	53.96	9:43:00 AM	47.16
10:32:00 AM	87.03	7:35:00 AM	56.57	9:44:00 AM	46.36
10:33:00 AM	88.65	7:36:00 AM	56.02	9:45:00 AM	45.82
10:34:00 AM	84.01	7:37:00 AM	48.37	9:46:00 AM	51.32
10:35:00 AM	83.98	7:38:00 AM	45.67	9:47:00 AM	62.63
10:36:00 AM	86.18	7:39:00 AM	46.62	9:48:00 AM	55.78
10:37:00 AM	84.22	7:40:00 AM	47.01	9:49:00 AM	62.87
10:38:00 AM	84.70	7:41:00 AM	46.83	9:50:00 AM	48.54
10:39:00 AM	84.42	7:42:00 AM	45.88	9:51:00 AM	47.93
10:40:00 AM	84.21	7:43:00 AM	46.60	9:52:00 AM	45.30
10:41:00 AM	86.01	7:44:00 AM	49.55	9:53:00 AM	64.41
10:42:00 AM	83.60	7:45:00 AM	55.54	9:54:00 AM	46.27
10:43:00 AM	87.42	7:46:00 AM	60.07	9:55:00 AM	60.22
10:44:00 AM	86.39	7:47:00 AM	59.73	9:56:00 AM	61.50
10:45:00 AM	88.49	7:48:00 AM	49.82	9:57:00 AM	47.15
10:46:00 AM	88.13	7:49:00 AM	53.52	9:58:00 AM	56.12
10:47:00 AM	87.97	7:50:00 AM	55.24	9:59:00 AM	49.81
10:48:00 AM	85.10	7:51:00 AM	49.25	10:00:00 AM	43.56
10:49:00 AM	87.19	7:52:00 AM	52.65	10:01:00 AM	51.82
10:50:00 AM	87.34	7:53:00 AM	48.55	10:02:00 AM	49.80
10:51:00 AM	85.88	7:54:00 AM	45.47	10:03:00 AM	49.40
10:52:00 AM	81.68	7:55:00 AM	44.45	10:04:00 AM	61.54
10:53:00 AM	78.63	7:56:00 AM	51.00	10:05:00 AM	51.76
10:54:00 AM	84.63	7:57:00 AM	58.01	10:06:00 AM	48.11
10:55:00 AM	87.84	7:58:00 AM	57.42	10:07:00 AM	57.77
10:56:00 AM	87.08	7:59:00 AM	54.28	10:08:00 AM	60.31
10:57:00 AM	86.66	8:00:00 AM	53.11	10:09:00 AM	59.77
10:58:00 AM	88.63	8:01:00 AM	55.36	10:10:00 AM	59.41
10:59:00 AM	81.94	8:02:00 AM	52.04	10:11:00 AM	56.37
11:00:00 AM	79.10	8:03:00 AM	51.11	10:12:00 AM	51.05
11:01:00 AM	78.90	8:04:00 AM	53.02	10:13:00 AM	52.00
11:02:00 AM	81.83	8:05:00 AM	54.75	10:14:00 AM	55.29
11:03:00 AM	86.25	8:06:00 AM	54.19	10:15:00 AM	58.43
11:04:00 AM	85.58	8:07:00 AM	51.53	10:16:00 AM	48.05
11:05:00 AM	89.19	8:08:00 AM	49.72	10:17:00 AM	61.56
11:06:00 AM	85.02	8:09:00 AM	51.17	10:18:00 AM	53.88
11:07:00 AM	83.23	8:10:00 AM	50.37	10:19:00 AM	49.73
11:08:00 AM	84.75	8:11:00 AM	48.62	10:20:00 AM	60.41
11:09:00 AM	86.41	8:12:00 AM	53.33	10:21:00 AM	56.77

N1		N2		N3	
Time	Noise Level (dBA)	Time	Noise Level (dBA)	Time	Noise Level (dBA)
11:10:00 AM	84.48	8:13:00 AM	58.33	10:22:00 AM	49.47
11:11:00 AM	84.77	8:14:00 AM	58.49	10:23:00 AM	46.61
11:12:00 AM	83.67	8:15:00 AM	48.99	10:24:00 AM	51.83
11:13:00 AM	85.24	8:16:00 AM	52.45	10:25:00 AM	53.02
11:14:00 AM	84.31	8:17:00 AM	56.10	10:26:00 AM	59.07
11:15:00 AM	86.50	8:18:00 AM	56.02	10:27:00 AM	52.97
11:16:00 AM	87.62	8:19:00 AM	53.54	10:28:00 AM	55.36
11:17:00 AM	88.47	8:20:00 AM	57.92	10:29:00 AM	57.92
11:18:00 AM	88.01	8:21:00 AM	57.49	10:30:00 AM	58.28
11:19:00 AM	88.20	8:22:00 AM	55.02	10:31:00 AM	56.25
11:20:00 AM	84.37	8:23:00 AM	58.37	10:32:00 AM	61.96
11:21:00 AM	86.80	8:24:00 AM	53.41	10:33:00 AM	53.14
11:22:00 AM	87.47	8:25:00 AM	53.22	10:34:00 AM	59.58
11:23:00 AM	86.38	8:26:00 AM	50.62	10:35:00 AM	58.48
11:24:00 AM	82.36	8:27:00 AM	48.07	10:36:00 AM	52.80
11:25:00 AM	78.73	8:28:00 AM	48.15	10:37:00 AM	54.55
11:26:00 AM	83.49	8:29:00 AM	46.28	10:38:00 AM	52.89
11:27:00 AM	87.53	8:30:00 AM	46.57	10:39:00 AM	59.11
11:28:00 AM	87.85	8:31:00 AM	48.65	10:40:00 AM	49.30
11:29:00 AM	86.44	8:32:00 AM	56.38	10:41:00 AM	50.84
11:30:00 AM	86.82	8:33:00 AM	56.41	10:42:00 AM	52.18
11:31:00 AM	86.42	8:34:00 AM	49.65	10:43:00 AM	57.69
11:32:00 AM	79.74	8:35:00 AM	51.77	10:44:00 AM	56.54
11:33:00 AM	78.19	8:36:00 AM	54.29	10:45:00 AM	54.44
11:34:00 AM	81.54	8:37:00 AM	57.94	10:46:00 AM	53.38
11:35:00 AM	84.68	8:38:00 AM	65.78	10:47:00 AM	49.05
11:36:00 AM	84.82	8:39:00 AM	69.94	10:48:00 AM	55.91
11:37:00 AM	61.07	8:40:00 AM	70.34	10:49:00 AM	50.46
11:38:00 AM	47.64	8:41:00 AM	70.78	10:50:00 AM	49.44
11:39:00 AM	46.90	8:42:00 AM	62.68	10:51:00 AM	53.91
11:40:00 AM	58.51	8:43:00 AM	58.64	10:52:00 AM	54.40
11:41:00 AM	57.04	8:44:00 AM	53.62	10:53:00 AM	50.51
11:42:00 AM	53.27	8:45:00 AM	54.23	10:54:00 AM	60.95
11:43:00 AM	59.26	8:46:00 AM	53.15	10:55:00 AM	55.17
11:44:00 AM	61.34	8:47:00 AM	52.68	10:56:00 AM	50.73
11:45:00 AM	59.68	8:48:00 AM	54.33	10:57:00 AM	52.41
11:46:00 AM	59.91	8:49:00 AM	52.51	10:58:00 AM	55.48
11:47:00 AM	61.84	8:50:00 AM	52.75	10:59:00 AM	51.63
11:48:00 AM	59.47	8:51:00 AM	52.79	11:00:00 AM	57.86
11:49:00 AM	59.81	8:52:00 AM	56.63	11:01:00 AM	54.54
11:50:00 AM	60.04	8:53:00 AM	56.61	11:02:00 AM	54.53
11:51:00 AM	54.45	8:54:00 AM	52.07	11:03:00 AM	48.32
11:52:00 AM	57.44	8:55:00 AM	51.51	11:04:00 AM	54.92
11:53:00 AM	58.45	8:56:00 AM	52.14	11:05:00 AM	57.33
11:54:00 AM	54.87	8:57:00 AM	51.49	11:06:00 AM	55.71
11:55:00 AM	56.82	8:58:00 AM	51.19	11:07:00 AM	53.30
11:56:00 AM	57.93	8:59:00 AM	54.77	11:08:00 AM	53.73

N1		N2		N3	
Time	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*	*Time*	*Noise Level (dBA)*
11:57:00 AM	59.42	9:00:00 AM	52.52	11:09:00 AM	54.42
11:58:00 AM	57.42	9:01:00 AM	51.69	11:10:00 AM	56.41
11:59:00 AM	56.97	9:02:00 AM	56.08	11:11:00 AM	56.90
12:00:00 PM	60.82	9:03:00 AM	57.23	11:12:00 AM	54.69
12:01:00 PM	57.80	9:04:00 AM	51.37	11:13:00 AM	53.99
12:02:00 PM	57.04	9:05:00 AM	52.62	11:14:00 AM	53.83
12:03:00 PM	60.69	9:06:00 AM	55.91	11:15:00 AM	60.88
12:04:00 PM	59.95	9:07:00 AM	55.25	11:16:00 AM	53.92
12:05:00 PM	54.27	9:08:00 AM	56.26	11:17:00 AM	57.71
12:06:00 PM	55.01	9:09:00 AM	51.18	11:18:00 AM	59.22
12:07:00 PM	53.53	9:10:00 AM	50.92	11:19:00 AM	55.10
12:08:00 PM	57.64	9:11:00 AM	52.87	11:20:00 AM	61.67
12:09:00 PM	50.75	9:12:00 AM	50.94	11:21:00 AM	55.24
12:10:00 PM	60.59	9:13:00 AM	53.76	11:22:00 AM	57.06
12:11:00 PM	58.36	9:14:00 AM	52.98	11:23:00 AM	53.54
12:12:00 PM	53.41	9:15:00 AM	51.61	11:24:00 AM	48.86
12:13:00 PM	52.94	9:16:00 AM	54.59	11:25:00 AM	55.10
12:14:00 PM	65.49	9:17:00 AM	53.01	11:26:00 AM	57.05
12:15:00 PM	62.62	9:18:00 AM	55.54	11:27:00 AM	54.16
12:16:00 PM	57.68	9:19:00 AM	52.56	11:28:00 AM	58.09
12:17:00 PM	56.00	9:20:00 AM	53.38	11:29:00 AM	51.13
12:18:00 PM	56.18	9:21:00 AM	51.04	11:30:00 AM	61.97
12:19:00 PM	57.87	9:22:00 AM	48.33	11:31:00 AM	55.62
12:20:00 PM	53.63	9:23:00 AM	48.00	11:32:00 AM	60.49
12:21:00 PM	52.28	9:24:00 AM	49.36	11:33:00 AM	57.77
12:22:00 PM	52.85	9:25:00 AM	51.80	11:34:00 AM	53.46
12:23:00 PM	52.53	9:26:00 AM	50.61	11:35:00 AM	62.00
12:24:00 PM	56.64	9:27:00 AM	48.99	11:36:00 AM	56.53
12:25:00 PM	57.34	9:28:00 AM	51.03	11:37:00 AM	54.53
12:26:00 PM	54.78	9:29:00 AM	52.03	11:38:00 AM	51.81
12:27:00 PM	56.20	9:30:00 AM	56.54	11:39:00 AM	55.94
12:28:00 PM	61.10	9:31:00 AM	51.19	11:40:00 AM	56.46
12:29:00 PM	59.61	9:32:00 AM	53.07	11:41:00 AM	52.86
12:30:00 PM	58.24	9:33:00 AM	55.14	11:42:00 AM	52.37
12:31:00 PM	56.66	9:34:00 AM	59.18	11:43:00 AM	56.03

F.2. Traffic Data

Start Date	24/9/2022	Start time	11:00
End Date	25/9/2022	End time	12:00
Duration of survey	24 hours	Survey location	At T1

					Trucks								
Time	*Cars*	*Pickup*	*Bikes*	*Buses*	*2 axle*	*3 axle*	*4 axle*	*5 axle*	*6 axle*	*Trailer*	*Tractor*	*Other*	***G Total***
Direction 1: Mashkel to Nok kundi													
07:00 to 08:00	0	1	0	0	1	1	0	0	0	0	0	0	**3**
08:00 to 09:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
09:00 to 10:00	0	5	0	0	0	0	0	0	0	0	0	0	**5**
10:00 to 11:00	0	8	1	0	0	0	0	0	0	0	0	0	**9**
11:00 to 12:00	0	4	0	0	0	0	0	0	0	0	0	0	**4**
12:00 to 13:00	1	1	1	0	0	0	0	0	0	0	0	0	**3**
13:00 to 14:00	0	6	1	0	0	0	0	0	0	0	0	0	**7**
14:00 to 15:00	0	7	2	0	0	1	0	0	0	0	0	0	**10**
15:00 to 16:00	0	6	0	0	0	3	0	0	0	0	0	0	**9**
16:00 to 17:00	0	15	0	0	0	0	0	0	0	0	0	0	**15**
17:00 to 18:00	0	11	0	0	0	0	0	0	0	0	0	0	**11**
18:00 to 19:00	0	12	1	0	1	0	0	0	0	0	0	0	**14**
19:00 to 20:00	0	22	3	1	0	0	0	0	0	0	0	0	**26**
20:00 to 21:00	0	10	0	0	0	1	0	0	0	0	0	0	**11**
21:00 to 22:00	0	2	0	0	0	0	0	0	0	0	0	0	**2**

					Trucks								
Time	*Cars*	*Pickup*	*Bikes*	*Buses*	*2 axle*	*3 axle*	*4 axle*	*5 axle*	*6 axle*	*Trailer*	*Tractor*	*Other*	***G Total***
22:00 to 23:00	0	0	0	0	0	1	0	0	0	0	0	0	**1**
23:00 to 00:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
00:00 to 01:00	0	2	0	0	0	0	0	0	0	0	0	0	**2**
01:00 to 02:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
02:00 to 03:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
03:00 to 04:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
04:00 to 05:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
05:00 to 06:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
06:00 to 07:00	1	3	0	0	2	0	0	0	0	0	0	0	**6**
Direction 2: Nok kundi to Mashkel													
07:00 to 08:00	0	3	0	0	0	2	0	0	0	0	0	0	**5**
08:00 to 09:00	2	2	0	0	6	2	0	0	0	0	0	0	**12**
09:00 to 10:00	1	0	0	0	0	0	0	0	0	0	0	0	**1**
10:00 to 11:00	1	4	0	0	0	0	0	0	0	0	0	0	**5**
11:00 to 12:00	1	1	1	0	0	0	0	0	0	0	0	0	**3**
12:00 to 13:00	0	0	0	0	0	2	0	0	0	0	0	0	**2**
13:00 to 14:00	0	4	0	0	0	0	0	0	0	0	0	0	**4**
14:00 to 15:00	2	4	0	0	0	2	0	0	0	0	0	0	**8**
15:00 to 16:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
16:00 to 17:00	0	10	0	0	0	1	0	0	0	0	0	0	**11**
17:00 to 18:00	1	2	0	0	0	0	0	0	0	0	0	0	**3**
18:00 to 19:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**

					Trucks								
Time	*Cars*	*Pickup*	*Bikes*	*Buses*	*2 axle*	*3 axle*	*4 axle*	*5 axle*	*6 axle*	*Trailer*	*Tractor*	*Other*	***G Total***
19:00 to 20:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
20:00 to 21:00	0	4	0	0	0	0	0	0	0	0	0	0	**4**
21:00 to 22:00	0	2	0	0	0	0	0	0	0	0	0	0	**2**
22:00 to 23:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
23:00 to 00:00	0	4	0	0	0	0	0	0	0	0	0	0	**4**
00:00 to 01:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
01:00 to 02:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
02:00 to 03:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
03:00 to 04:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
04:00 to 05:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
05:00 to 06:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
06:00 to 07:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
Direction 3: Mashkel to Dalbandin													
07:00 to 08:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
08:00 to 09:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
09:00 to 10:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
10:00 to 11:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
11:00 to 12:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
12:00 to 13:00	1	1	0	0	0	0	0	0	0	0	0	0	**2**
13:00 to 14:00	0	2	0	0	0	0	0	0	0	0	0	0	**2**
14:00 to 15:00	0	6	0	0	0	0	0	0	0	0	0	0	**6**
15:00 to 16:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**

					Trucks								
Time	*Cars*	*Pickup*	*Bikes*	*Buses*	*2 axle*	*3 axle*	*4 axle*	*5 axle*	*6 axle*	*Trailer*	*Tractor*	*Other*	***G Total***
16:00 to 17:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
17:00 to 18:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
18:00 to 19:00	0	2	0	0	0	0	0	0	0	0	0	0	**2**
19:00 to 20:00	0	7	0	0	1	1	0	0	0	0	0	0	**9**
20:00 to 21:00	0	4	0	0	0	0	0	0	0	0	0	0	**4**
21:00 to 22:00	0	5	0	0	0	0	0	0	0	0	0	0	**5**
22:00 to 23:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
23:00 to 00:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
00:00 to 01:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
01:00 to 02:00	0	4	0	0	0	0	0	0	0	0	0	0	**4**
02:00 to 03:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
03:00 to 04:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
04:00 to 05:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
05:00 to 06:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
06:00 to 07:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Direction 4: Dalbandin to Mashkel													
07:00 to 08:00	0	0	0	0	0	1	0	0	0	0	0	0	**1**
08:00 to 09:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
09:00 to 10:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
10:00 to 11:00	0	0	0	0	0	1	0	0	0	0	0	0	**1**
11:00 to 12:00	0	1	0	0	2	0	0	0	0	0	0	0	**3**
12:00 to 13:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**

					Trucks								
Time	*Cars*	*Pickup*	*Bikes*	*Buses*	*2 axle*	*3 axle*	*4 axle*	*5 axle*	*6 axle*	*Trailer*	*Tractor*	*Other*	***G Total***
13:00 to 14:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
14:00 to 15:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
15:00 to 16:00	0	0	0	0	1	2	0	0	0	0	0	0	**3**
16:00 to 17:00	0	2	0	0	0	0	0	0	0	0	0	0	**2**
17:00 to 18:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
18:00 to 19:00	0	3	0	0	0	0	0	0	0	0	0	0	**3**
19:00 to 20:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
20:00 to 21:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
21:00 to 22:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
22:00 to 23:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
23:00 to 00:00	0	1	0	0	0	0	0	0	0	0	0	0	**1**
00:00 to 01:00	0	2	0	0	0	0	0	0	0	0	0	0	**2**
01:00 to 02:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
02:00 to 03:00	0	0	0	0	0	1	0	0	0	0	0	0	**1**
03:00 to 04:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
04:00 to 05:00	0	2	0	0	0	0	0	0	0	0	0	0	**2**
05:00 to 06:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
06:00 to 07:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Direction 5: Nok kundi to Dalbandin													
07:00 to 08:00	5	12	0	2	3	0	0	0	2	0	0	0	**24**
08:00 to 09:00	6	20	1	3	4	0	0	0	1	0	0	0	**35**
09:00 to 10:00	6	28	0	1	5	0	0	0	5	0	2	0	**47**

					Trucks								
Time	*Cars*	*Pickup*	*Bikes*	*Buses*	*2 axle*	*3 axle*	*4 axle*	*5 axle*	*6 axle*	*Trailer*	*Tractor*	*Other*	***G Total***
10:00 to 11:00	9	24	0	5	2	3	0	0	8	0	0	0	**51**
11:00 to 12:00	33	0	2	4	2	0	0	0	0	0	0	0	**41**
12:00 to 13:00	37	0	5	4	1	1	0	1	5	0	0	0	**54**
13:00 to 14:00	22	0	1	5	0	5	0	0	1	0	0	0	**34**
14:00 to 15:00	23	27	2	4	4	2	1	1	3	0	0	0	**67**
15:00 to 16:00	16	35	3	4	1	0	0	1	1	0	0	0	**61**
16:00 to 17:00	5	40	0	2	1	1	0	1	0	0	0	0	**50**
17:00 to 18:00	8	23	5	6	1	3	0	0	2	0	0	0	**48**
18:00 to 19:00	15	29	15	5	1	6	0	1	4	0	0	0	**76**
19:00 to 20:00	4	24	3	1	3	1	0	0	0	0	0	0	**36**
20:00 to 21:00	4	11	1	2	1	2	0	3	2	0	0	0	**26**
21:00 to 22:00	4	13	2	3	1	2	1	2	0	0	0	0	**28**
22:00 to 23:00	1	5	1	3	0	9	0	4	2	1	0	0	**26**
23:00 to 00:00	0	2	0	2	3	2	0	0	1	1	0	0	**11**
00:00 to 01:00	0	3	0	2	0	0	0	0	0	1	0	0	**6**
01:00 to 02:00	0	1	0	1	0	0	0	0	0	0	0	0	**2**
02:00 to 03:00	1	1	0	0	0	0	0	0	0	0	0	0	**2**
03:00 to 04:00	0	0	0	0	0	0	0	0	0	0	0	0	**0**
04:00 to 05:00	0	1	0	2	0	0	0	0	0	0	0	0	**3**
05:00 to 06:00	0	5	0	0	0	0	0	0	0	0	0	0	**5**
06:00 to 07:00	0	16	0	0	2	0	0	0	1	0	0	0	**19**
Direction 6: Dalbandin to Nok kundi													

					Trucks								
Time	*Cars*	*Pickup*	*Bikes*	*Buses*	*2 axle*	*3 axle*	*4 axle*	*5 axle*	*6 axle*	*Trailer*	*Tractor*	*Other*	***G Total***
07:00 to 08:00	1	18	1	2	6	3	0	4	5	0	0	0	**40**
08:00 to 09:00	1	27	1	2	1	3	1	7	7	0	0	0	**50**
09:00 to 10:00	3	49	0	2	7	2	0	2	11	0	0	0	**76**
10:00 to 11:00	5	9	0	1	5	0	0	0	5	0	0	0	**25**
11:00 to 12:00	24	0	3	5	1	3	0	5	2	0	0	0	**43**
12:00 to 13:00	22	0	8	0	3	0	0	2	4	0	0	0	**39**
13:00 to 14:00	23	0	0	1	1	7	0	4	4	0	0	0	**40**
14:00 to 15:00	13	7	2	2	7	3	0	1	10	0	1	0	**46**
15:00 to 16:00	3	11	1	0	4	0	0	1	1	0	0	0	**21**
16:00 to 17:00	5	41	2	3	1	1	0	1	5	0	0	0	**59**
17:00 to 18:00	9	43	5	4	2	0	0	1	13	0	0	0	**77**
18:00 to 19:00	21	37	11	3	1	0	0	0	7	0	0	0	**80**
19:00 to 20:00	8	29	6	1	1	0	1	1	2	7	0	0	**56**
20:00 to 21:00	3	34	3	0	1	0	0	0	3	1	0	0	**45**
21:00 to 22:00	4	12	1	2	2	0	0	1	0	8	0	0	**30**
22:00 to 23:00	2	15	1	1	2	0	0	2	0	4	0	0	**27**
23:00 to 00:00	5	9	0	0	1	2	0	1	0	2	0	0	**20**
00:00 to 01:00	0	21	0	4	0	1	0	1	0	0	0	0	**27**
01:00 to 02:00	0	26	0	1	0	1	0	5	0	0	0	0	**33**
02:00 to 03:00	1	8	0	1	0	0	0	1	0	0	0	0	**11**
03:00 to 04:00	0	14	0	2	0	0	0	0	1	0	0	0	**17**
04:00 to 05:00	0	6	0	2	0	1	0	0	0	0	0	0	**9**
05:00 to 06:00	0	14	0	1	0	0	0	0	0	0	0	0	**15**
06:00 to 07:00	0	1	13	0	6	1	1	0	2	0	0	0	**24**

Start Date	8/25/2020	**Start time**	8:00pm
End Date	8/26/2020	**End time**	8:00am
Duration of survey	24 hours	**Survey Location**	At access road to Reko Diq from the Highway (N40)

Time	*Cars*	*Pickup*	*Bikes*	*Buses*	*Trucks*					*Trailer*	*Tractor*	*Other*	***G Total***
					2 Axle	*3 Axle*	*4 Axle*	*5 Axle*	*6 Axle*				
Direction 1: Nok Kundi to Taftan, or vice versa													
06:00 to 07:00	3	1	–	3	–	4	–	9	2	–	–	–	**22**
07:00 to 08:00	4	5	–	3	–	5	–	10	8	–	–	–	**35**
08:00 to 09:00	2	2	–	1	–	7	–	4	14	–	–	–	**30**
09:00 to 10:00	7	6	–	1	1	1	1	5	9	–	–	–	**31**
10:00 to 11:00	6	3	–	2	–	3	–	2	11	–	–	–	**27**
11:00 to 12:00	6	7	–	–	–	1	–	4	12	–	–	–	**30**
12:00 to 13:00	9	2	1	1	–	1	1	6	2	–	–	–	**23**
13:00 to 14:00	2	2		1	–	1	1	1	5	–	–	–	**13**
14:00 to 15:00	4	3	1	1	–	1	1	4	8	–	–	–	**23**
15:00 to 16:00	3	9	6	6	1	2	1	2	3	–	–	–	**33**
16:00 to 17:00	6	3	–	2		–	5	2	2	–	–	–	**20**
17:00 to 18:00	3	8	–	3	–	1	3	4	7	–	–	–	**29**
18:00 to 19:00	3	7	–	2	1	–	2	5	3	–	–	–	**23**
19:00 to 20:00	5	2	–	–	1	4	1	1	2	–	–	–	**16**
20:00 to 21:00	2	2	–	6	–	–	–	5	1	–	–	–	**16**

Time	Cars	Pickup	Bikes	Buses	Trucks					Trailer	Tractor	Other	G Total
					2 Axle	3 Axle	4 Axle	5 Axle	6 Axle				
21:00 to 22:00	3	5	–	–	–	5	2	3	2	–	–	–	**20**
22:00 to 23:00	1	2	–	1	–	–	–	1	–	–	–	–	**5**
23:00 to 00:00	–	2	–	–	1	–	–	–	4	–	–	1	**8**
00:00 to 01:00	1	–	–	3	–	3	–	–	1	–	–	–	**8**
01:00 to 02:00	1	–	–	1	–	1	–	1	2	–	–	–	**6**
02:00 to 03:00	–	–	–	–	–	–	–	2	1	–	–	–	**3**
03:00 to 04:00	–	–	–	–	1	–	–	2	1	–	–	–	**4**
04:00 to 05:00	–	1	–	1		–	–	2	1	–	–	–	**5**
05:00 to 06:00	–	1	–	–	–	–	–	2	2	–	–	–	**5**
Direction 2: Tanjeel to Nok Kundi, or vice versa													
06:00 to 07:00	–	5	–	–	–	–	–	–	–	–	–	–	**5**
07:00 to 08:00	–	2	–	–	–	–	–	–	–	–	–	–	**2**
08:00 to 09:00	–	2	–	–	–	–	–	–	–	–	–	–	**2**
09:00 to 10:00	1	3	–	–	–	–	–	–	–	–	–	–	**4**
10:00 to 11:00	–	5	–	–	–	–	–	–	–	–	–	–	**5**
11:00 to 12:00	–	3	–	–	–	–	–	–	–	–	–	–	**3**
12:00 to 13:00	–	1	–	–	–	–	–	–	–	–	–	–	**1**
13:00 to 14:00	–	3	–	–	–	–	–	–	–	–	–	–	**3**
14:00 to 15:00	–	1	–	–	–	–	–	–	–	–	–	–	**1**
15:00 to 16:00	–	2	–	–	–	–	–	–	–	–	–	–	**2**
16:00 to 17:00	–	3	–	–	–	–	–	–	–	–	–	–	**3**
17:00 to 18:00	–	9	–	–	–	–	–	–	–	–	–	–	**9**

Time	*Cars*	*Pickup*	*Bikes*	*Buses*	*Trucks*					*Trailer*	*Tractor*	*Other*	***G Total***
					2 Axle	*3 Axle*	*4 Axle*	*5 Axle*	*6 Axle*				
18:00 to 19:00	–	7	–	–	–	–	–	–	–	–	–	–	**7**
19:00 to 20:00	–	7	–	–	–	–	–	–	–	–	–	–	**7**
20:00 to 21:00	–	1	–	–	–	–	–	–	–	–	–	–	**1**
21:00 to 22:00	–	1	–	–	–	–	–	–	–	–	–	–	**1**
22:00 to 23:00	–	–	–	–	–	–	–	–	–	–	–	–	–
23:00 to 00:00	–	2	–	–	–	–	–	–	–	–	–	–	**2**
00:00 to 01:00	–	–	–	–	–	–	–	–	–	–	–	–	–
01:00 to 02:00	–	–	–	–	–	–	–	–	–	–	–	–	–
02:00 to 03:00	–	2	–	–	–	–	–	–	–	–	–	–	**2**
03:00 to 04:00	–	2	–	–	–	–	–	–	–	–	–	–	**2**
04:00 to 05:00	–	2	–	–	–	–	–	–	–	–	–	–	**2**
05:00 to 06:00	–	5	–	–	–	–	–	–	–	–	–	–	**5**
Direction 3: Tanjeel to Taftan, or vice versa													
06:00 to 07:00	–	–	–	–	–	–	–	–	–	–	–	–	–
07:00 to 08:00	–	–	–	–	–	–	–	–	–	–	–	–	–
08:00 to 09:00	–	–	–	–	–	–	–	–	–	–	–	–	–
09:00 to 10:00	–	–	–	–	–	–	–	–	–	–	–	–	–
10:00 to 11:00	–	–	–	–	–	–	–	–	–	–	–	–	–
11:00 to 12:00	–	1	–	–	–	–	–	–	–	–	–	–	**1**
12:00 to 13:00	–	–	–	–	–	–	–	–	–	–	–	–	–
13:00 to 14:00	–	–	–	–	–	–	–	–	–	–	–	–	–
14:00 to 15:00	–	–	–	–	–	–	–	–	–	–	–	–	–

Time	*Cars*	*Pickup*	*Bikes*	*Buses*	*Trucks*					*Trailer*	*Tractor*	*Other*	***G Total***
					2 Axle	*3 Axle*	*4 Axle*	*5 Axle*	*6 Axle*				
15:00 to 16:00	–	–	–	–	–	–	–	–	–	–	–	–	–
16:00 to 17:00	–	–	–	–	–	–	–	–	–	–	–	–	–
17:00 to 18:00	–	–	–	–	–	–	–	–	–	–	–	–	–
18:00 to 19:00	–	–	–	–	–	–	–	–	–	–	–	–	–
19:00 to 20:00	–	–	–	–	–	–	–	–	–	–	–	–	–
20:00 to 21:00	–	–	–	–	–	–	–	–	–	–	–	–	–
21:00 to 22:00	–	–	–	–	–	–	–	–	–	–	–	–	–
22:00 to 23:00	–	–	–	–	–	–	–	–	–	–	–	–	–
23:00 to 00:00	–	–	–	–	–	–	–	–	–	–	–	–	–
00:00 to 01:00	–	–	–	–	–	–	–	–	–	–	–	–	–
01:00 to 02:00	–	–	–	–	–	–	–	–	–	–	–	–	–
02:00 to 03:00	–	–	–	–	–	–	–	–	–	–	–	–	–
03:00 to 04:00	–	–	–	–	–	–	–	–	–	–	–	–	–
04:00 to 05:00	–	–	–	–	–	–	–	–	–	–	–	–	–
05:00 to 06:00	–	–	–	–	–	–	–	–	–	–	–	–	–

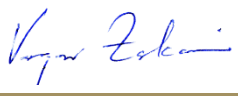
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Document No.:	**6105AK023-S411-HD27-0034**	**Rev:**	**A**
Document Title:	**Appendix G – Soil Quality Data**		
Issue Date:	**2024-02-23**		

Supplier/Contractor Details

Package/Contract No:	**K023**		
Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix G – Soil Quality Data**	**Rev:**	**A**

	2024-02-23	Review			
			Sadia Asghar	Vaqar Zakaria	Barbara Wessels
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix G
Soil Quality Data

Central Analytical Facility Division

ISO 9001:2015 CERTIFIED

Directorate of Systems & Services

Pakistan Institute of Nuclear Science & Technology, Post Office Nilore, Islamabad, Pakistan

Tel.: (051)9248772, Fax: (51)9248808, Email: cafdoffice@yahoo.com

11 September, 2020

ANALYSIS REPORT

Customer Contact: Hagler Bailly Pakistan (Pvt.) Ltd.
Block 1, Commercial Area,
Street 21, F8/2, Islamabad

Customer Reference: F0019LAB
Sample ID: Groundwater, Soil
Submitted By: Dr. Sheherzad Akhtar

CAFD No: 5680
Date Registered: 31-08-2020

Report No: CAFD-5680-2020 4454
No. of Samples: 15
Technique: HGAAS

Concentration (ng/mL or ppb)

Element	E06252	E06253	E06254	E06255	E06256	E06257	E06258	E06259	LOD
Hg	ND	ND	ND	ND	ND	ND	ND	ND	0.67
As	251.0	5.03	6.86	11.35	11.25	ND	ND	ND	0.69
Sb	87.0	56.0	38.0	53.0	50.0	67.0	43.0	49.0	0.72
Se	ND	6.91	8.42	ND	ND	ND	ND	ND	0.68

Concentration (ng/g or ppb)

Element	E06260	E06261	E06262	E06263	E06264	E06265	E06266	LOD
Hg	345.0	510.0	578.0	625.0	565.0	501.0	381.0	28.67
As	1321.0	1639.0	2099.0	1613.0	2172.0	2041.0	1891.0	29.60
Sb	ND	ND	ND	72.0	110.0	ND	ND	30.89
Se	135.0	ND	ND	ND	ND	ND	ND	33.47

RSD ≤ 5.0% ND = Not detected LOD = Limit of determination

Note:
1. These samples were collected by yourself (or your agent) and analyzed as received at this division.
2. This report is not valid for judicial use.
3. The analyzed samples may be collected back within one month of the issuance of this report, if required.

(Analyst) 11/09/2020
Tanveer Ahmad

Lab Incharge 11/09/2020

Group Head 2020.09.11

Head CAFD 11/09/2020

Central Analytical Facility Division

ISO 9001:2015 certified

Directorate of Systems & Services

Pakistan Institute of Nuclear Science & Technology, Post Office Nilore, Islamabad, Pakistan

Tel.: (051)9248772, Fax: (51)9248808, Email: cafdoffice@yahoo.com

September 11, 2020

ANALYSIS REPORT

Customer Contact: Hagler Bailly Pakistan

Customer Reference: F0020LAB
Sample ID: Soil sample
Submitted By: Dr.Sherherzad Akhter

CAFD No: 5680
Date Registered: 31-08-2020
Report No: CAFD-5680-2020/4452
No. of Samples: 07
Technique used: HPLC & Instrumental method

Sr #	Sample ID	pH	Conductivity (mS/cm)	Chloride (mg/L)	Nitrate Nitrogen (mg/L)	Ammonia (mg/L)
1.	E06260	7.46	3.71	1020	27.0	0.54
2.	E06261	7.75	3.62	780	ND	1.22
3.	E06262	7.07	1.17	235	2.84	0.10
4.	E06263	8.02	1.82	602	4.12	2.4
5.	E06264	7.39	5.31	690	11.5	0.20
6.	E06265	7.49	3.31	260	5.64	0.25
7.	E06266	7.53	3.26	310	6.54	0.65
8.	LOD	-	0.001	2.0	4.0	0.02

ND= Not Detected LOD= Limit of Detection

Note:
1. These samples were collected by yourself (or your agent) and analyzed as received at this division.
2. This report is not valid for judicial use.
3. The analyzed samples may be collected back within one months of the issuance of this report, if required.

Analyst
(Irum Noureen) 11/09/2020

Lab Incharge

Group Head 2020.09.11

Head CAFD 11/09/2020

Central Analytical Facility Division
ISO 9001:2015 CERTIFIED
Directorate of Systems & Services
Pakistan Institute of Nuclear Science & Technology, Post Office Nilore, Islamabad, Pakistan
Tel, (051)9248772, Fax: (051)9248808, E-mail: cafdoffice@yahoo.com

September 15, 2020

ANALYSIS REPORT

Customer Contact: Hagler Bailly Pakistan, F-8/2, Islamabad.
Customer Reference: F0019LAB
Sample Type: Soil Samples
Submitted By: Dr. Sheherzad Akhtar

CAFD No: 5680
Date Registered: 31-08-2020
Report No: CAFD-5680-2020/4451
No. of Samples: 15
Technique: ICP-OES

Concentration (µg/g)

Sr. No.	Elements	S# 1 E06260	S# 3 E06261	S# 4 E06262	S# 5 E 06263	S# 6 E06264	S# 7 E 06265	S# 10 E06266
1	Al	16193	18768	10512	9391	12618	14249	15368
2	B	5.78	1.96	ND	ND	ND	ND	ND
3	Ba	49.05	86.49	75.40	57.20	51.91	45.08	39.89
4	Ca	46649	37564	35904	33167	35557	33108	31171
5	Cd	ND	ND	ND	ND	5.08	ND	ND
6	Cr	50.50	79.70	83.38	76.83	65.35	47.10	41.16
7	Cu	17.55	30.46	50.73	31.29	26.70	20.28	25.42
8	Fe	28604	25250	22441	22142	21731	21272	22532
9	K	2262	3864	1358	1251	2567	2193	2239
10	Mg	13441	17054	10279	9950	13162	14359	15549
11	Mn	451	397	747	358	404	438	450
12	Na	2081	2569	1029	1156	1841	1143	1318
13	Ni	28.49	41.47	34.91	34.41	35.54	30.79	28.46
14	P	259	231	253	214	212	252	267
15	Pb	ND	10.42	11.46	ND	21.00	ND	ND
16	SO_4	520	1346	1162	943	16105	3393	2870
17	Sr	116	136	112	93	143	195	210
18	Zn	42.49	59.01	71.63	42.66	216.05	43.62	47.30

RSD ≤ 2.0 % ND = Not detected

Note:
- These samples were collected by yourself (or your agent) and analyzed as received at this division.
- This report is not valid for judicial use
- The analyzed samples may be collected back within one month of the issuance of this report, if required.

Analyst
(Ahmad Naveed Sajid)

Lab Incharge 15/09/2020

Group Head

Head CAFD 15/09/2020

Central Analytical Facility Division
ISO 9001:2015 CERTIFIED
Directorate of Systems & Services
Pakistan Institute of Nuclear Science & Technology, Post Office Nilore, Islamabad, Pakistan
Tel.: (051)9248772, Fax: (51)9248808, Email: cafdoffice@yahoo.com

September 15, 2020

ANALYSIS REPORT

Customer Contact: Hagler Bailly Pakistan Block1 Commercial Area Street 21, F8/2 Islamabad
Customer Reference: Nil
Sample ID: Water/Soil Sample
Submitted By: Dr. Sheherazad Akhtar

CAFD No: 5680
Date Registered: 31-08-2020
Report No: CAFD-5680-2020 4453
No. of Samples: 15
Technique: Titration

Concentration (mg/L)

Parameter	E06252	E06253	E06254	E06255	E06256	E06257	E06258	E06259	LOD
Alkalinity	44	68	60.8	218	220	ND	ND	ND	5

Parameter	E06260	E06261	E06262	E06263	E06264	E06265	E06266	LOD
Carbonate	ND	ND	ND	59.4	ND	ND	ND	5

LOD = Limit of determination ND = Not Detected

Note:
1. The samples were collected by yourself (or your agent) and analyzed as received at this division.
2. This report is not valid for judicial use.
3. The analyzed samples may be collected back within one month of the issuance of this report, if required.

15-09-2020
(Analyst)
Adil Jamil

Lab Incharge
Group Head
2020.09.15

Head CAFD
15/09/2020

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Document No.:	**6105AK023-S411-HD27-0034**	**Rev:**	**A**
Document Title:	**Appendix H - Ecology Field Survey Plan**		
Issue Date:	**2024-02-23**		

Supplier/Contractor Details

Package/Contract No:	**K023**		
Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix H - Ecology Field Survey Plan**	**Rev:**	**B**

	2024-02-23	Review			
			Sadia Asghar	Vaqar Zakaria	Barbara Wessels
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix H
Ecology Field Survey Plan

Reko Diq Mining Company (RDMC or the 'Client'), a subsidiary of Barrick Gold Corporation (Barrick), intends to commence the Early Works (the 'Project') for the Reko Diq Mining Project (the 'Mining Project'), in the western part of Balochistan province of Pakistan. The Early Works for the Project will consist of construction of an accommodation facility at the proposed Reko Diq Mine Site and water supply pipeline from the Fan Sediments area to the accommodation facility and minor earthworks.

The Mining Project will result in the production of copper and gold and is expected to have a life of at least 40 years as a truck-and-shovel open pit operation with processing facilities producing a high-quality copper-gold concentrate. As per the Reko Diq 2022 Conceptual Design, the construction is expected in two phases. Phase 1 is expected to have a capacity of 40 Million tons per annum (Mtpa) and Phase 2 with a combined process capacity of 80 Mtpa.

The Client has engaged Digby Wells Environmental (Digby Wells) and Hagler Bailly Pakistan Pvt. Ltd (HBP or the 'in-country ESIA Consultant') to carry out the Environmental and Social Impact Assessment (ESIA) of the Early Works to comply with the regulatory requirements of the Balochistan Environmental Protection Agency (Balochistan-EPA) (the 'Study').

This document is the Ecology Field Survey Plan which was prepared to collect data on ecological resources for the Early Works ESIA.

H.1. Objectives and Scope

The objective for establishing the ecological baseline of the Study Area includes:

Carrying out desktop assessments based on information obtained from published sources including books, research articles, and information from different databases and websites such as:

- Global Biodiversity Information Facility (GBIF): A global database repository for species, including open access to mapping[1].
- Global Invasive Species Database (GISD): It provides information about Alien Invasive Species. It covers all taxonomic groups from micro-organisms to animals and plants in all ecosystems[2].
- International Union for Conservation of Nature (IUCN): A global database that identifies the species' conservation status, their distribution, and possible threats to these species[3].
- Key Biodiversity Areas (KBAs): KBA supports the identification, mapping, monitoring, and conservation of KBAs to help safeguard the most critical sites for nature on our planet[4].

1 Global Biodiversity Information Facility, Available at: https://www.gbif.org

2 Global Invasive Species Database (GISD), Available at: https://portals.iucn.org/library/node/8912.

3 International Union for Conservation of Nature (IUCN) Red List of Threatened Species, Available at: https://www.iucnredlist.org/

4 Key Biodiversity Area, Available at: https://www.keybiodiversityareas.org/

- Royal Botanic Garden (Kew): It serves as a valuable resource for global plant information, offering comprehensive details on plant names, descriptions, and distribution across the world[5].
- Integrated Biodiversity Assessment Tool (IBAT): IBAT provides authoritative geographic information about global biodiversity[6].
- Reptile Database: The Reptile Database is a scientific database that collects taxonomic information on all living reptile species[7].
- Avibase: Avibase is an online taxonomic database that organizes bird taxonomic and distribution data globally[8].
- Animal Diversity Web: This website is a rich and flexible resource designed as an encyclopedia for exploring biodiversity[9].
- Centre for Agriculture and Biosciences International (CABI): It provides the distribution of animal and plant species worldwide[10].
- Flora of Pakistan (eFlora of Pakistan): It provides the distribution of flora in Pakistan[11].
- World Plants (Complete List): World Plants contains an ever-growing database of plants and plant-related information in the garden and landscape[12].
- Previous ESIA studies[13, 14] within and around the Ecological Study Area.

- Qualitative and quantitative assessment of terrestrial flora and fauna including vegetation, birds, herpetofauna, mammals, small mammals, and invertebrates.
- Microhabitats and species of conservation concern impacted by the Project were identified based on the field surveys and secondary information from different sources including IBAT, KBA, and IUCN databases.
- Sensitive receptors including vegetation units, wetlands or pans, streams, rivers, and rocky outcrops were marked in the field and the land use pattern and land cover map were verified.
- Assessment of Protected Area (s) or area of high conservation importance at the Project Site and its vicinity.

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5 Royal Botanic Garden (Kew), Available at: https://www.kew.org

6 Integrated Biodiversity Assessment Tool, Available at: https://www.ibat–alliance.org/

7 Reptile Database, Available at: http://www.reptile–database.org/

8 Avibase, World's Bird Database, Available at: https://avibase.bsc-eoc.org/avibase.jsp?lang=EN

9 Animal Diversity Web, Available at: https://animaldiversity.org/

10 Centre for Agriculture and Biosciences International, Available at: https://www.cabi.org/

11 Flora of Pakistan, Available at: http://www.efloras.org/flora_page.aspx?flora_id=5

12 World Plants (Complete List) https://www.worldplants.de/world-plants-complete-list/complete-plant-list/?name=Launaea-cornuta#plantUid-367612

13 Hagler Bailly Pakistan April 2010, Environmental Impact Assessment of Reko Diq Copper Mining Operations, Tethyan Copper Company Pty Limited (TCC)

14 Hagler Bailly Pakistan, November 2020, Environmental and Social Impact Assessment of Tanjeel Copper Project, National Resource Limited Pakistan

- A Critical Habitat Assessment (CHA) was carried out to determine if the Project facilities lie in a Critical Habitat and Modified or Natural Habitat as defined by the International Finance Corporation's (IFC) Performance Standard 6 (PS6).
- Reports of wildlife sightings in the Study Area by the resident communities.
- Analysis to further develop the basis for evaluating the potential impacts of Project related activities on biodiversity.

H.2. Ecological Resources

The Ecological Resources that were studied include:

- Vegetation: relative abundance, diversity, frequency, density, and IVI value
- Birds: relative abundance, diversity, and migration behavior
- Herpetofauna: relative abundance and diversity
- Mammals: relative abundance and diversity
- Small Mammals: relative abundance and diversity
- Invertebrates: relative abundance and diversity

H.3. Ecological Study Area, Habitat Types and Sampling Locations

The Ecological Study Area includes the Project facilities with a buffer of 10 km around these facilities and roads that will be used for Project transport. The Project facilities include the proposed Reko Diq Mine Site including the accommodation facility, Fan Sediment Water Supply Pipeline Area, and Access Road to the proposed Reko Diq Mine Site. The Ecological Study Area has been defined keeping in view the direct and indirect impacts of the Project-related activities. The ecological sampling was carried out at and around the proposed Reko Diq Mine Site including accommodation facility, along the proposed Fan Sediment Water Supply Pipeline Area and Access Road to the Project Site.

The Ecological Study Area is further differentiated into different habitat types based on Google Earth™ satellite imagery which include the Agricultural Areas/Date Palms, Built-up Areas, Clayey Plains, Dry Streambed, Gravel Plains, Mountain/Hills, and Sandy Plains/Sand Dunes. A total of 41 sampling locations were selected for sampling ecological resources in the Ecological Study Area for Early Works of the EIA.

The Ecological Study Area is further divided into three small study areas considering the Project facilities and ecological resources that were sampled in each Study Area. These study areas include:

- Proposed Reko Diq Mine Site including the accommodation facility
- Fan Sediment Water Supply Pipeline Area
- Access Road to Project Site

Proposed Reko Diq Mine Site

This Study Area includes the accommodation facility at proposed Reko Diq Mine Site. A total of 20 sampling locations have been selected in the accommodation facility atteh proposed Reko Diq Mine Site to assess the ecological resources.

Fan Sediment Water Supply Pipeline Area

This Study Area includes the Fan Sediment Water Supply Pipeline Area from the dry Baghicha Lake to the proposed Reko Diq Mine Site. A total of 12 sampling locations have been selected in the Fan Sediment Water Supply Pipeline Area to assess the ecological resources. In addition, a microhabitat consisting of Date Palm habitat near the Fan Sediment Water Supply Pipeline Area were sampled.

Access Road

This Study Area includes a stretch of around 58 km from the main N40 highway to the Project Site. A total of eight sampling locations have been selected around the Access Road to assess the ecological resources.

Figure 1 provides the map of the Ecological Study Area.

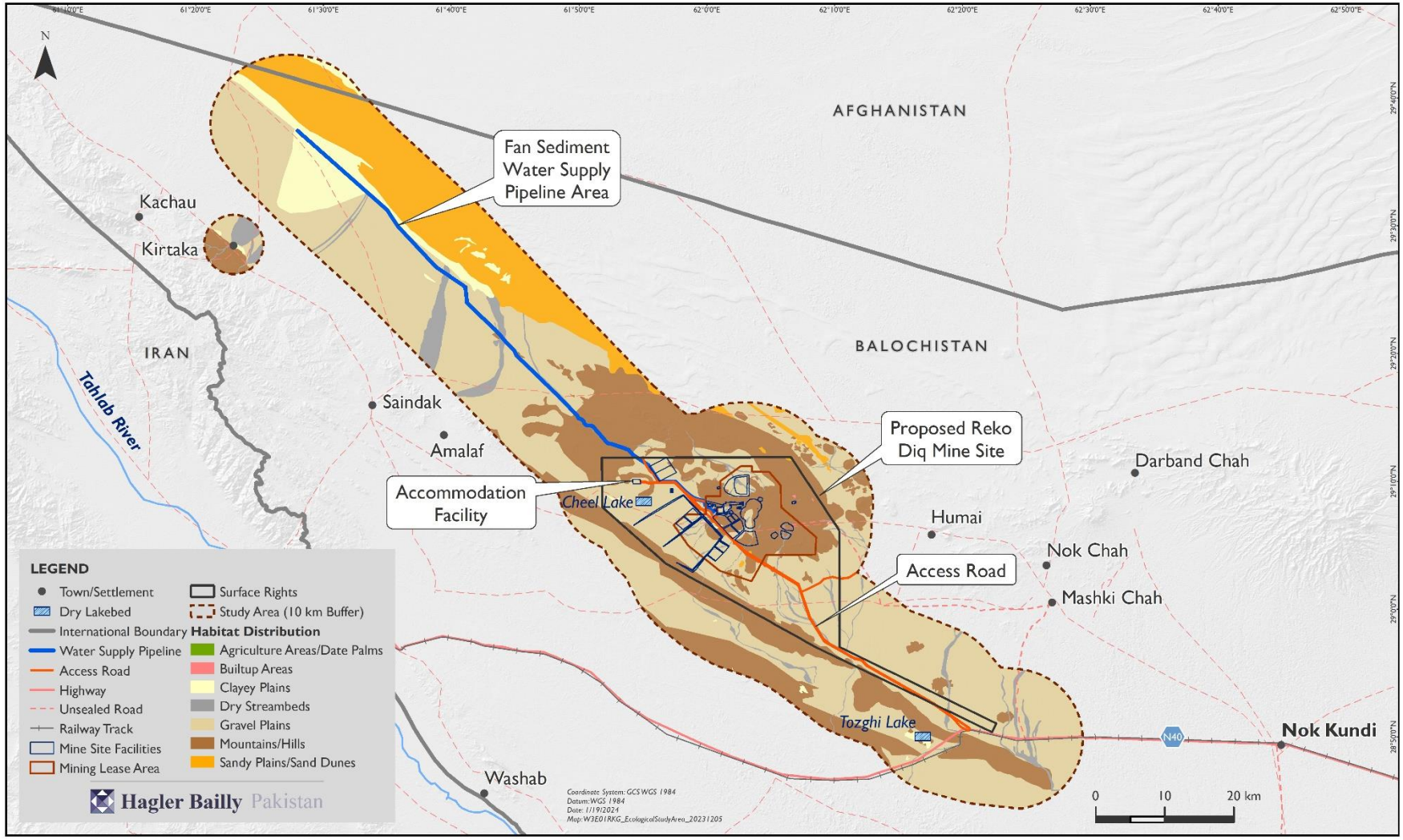


Figure 1:Ecological Study Area

H.4. Methodology

The methodology for the collection of field data is given below.

Terrestrial Vegetation

Methods for Data Collection

The usual means of sampling vegetation for floristic composition is the quadrat. The vegetation in the marginal zone, flood plain, and terrestrial habitats in the Study Area that were sampled by the quadrat method, taking three quadrats of 5 m by 5 m at each sampling location. The first quadrat was taken at the beginning of the transect, the second at a 250 m distance and the third at a 500 m distance. Plants from each quadrat were noted and collected for the identification of the plant species if required. The collected plants were identified following the nomenclature from Flora of Pakistan.[15]

The survey was conducted during the season and time of the year when the plants was in the flowering and fruiting stage as this made the identification easier. Visual observation of the habitat condition was recorded for each site. Additional plant species in the area adjacent to the quadrat were noted down and their locations were recorded. Georeferenced photographs were taken of all the species encountered within the Study Area, including nationally protected species, and ecologically sensitive areas. The georeferenced data were used to generate the maps in Geographic Information System (GIS). The Alien Invasive Plant Species (AIPS) occurring within the Ecological Study Area were recorded. In addition, local people were consulted to gather information about local plant names, uses, and social value and cultural values of the plants of the area.

All the data and auxiliary information was recorded in the field on specifically designed survey forms.

Analysis of Field Data

The data collected from the field were analyzed to know the species richness and other parameters, such as cover, relative cover, density, relative density, frequency, relative frequency percentages, and Importance Value Index (IVI). All these parameters for each species were calculated.

Avifauna

Line Transect Method

The line transects 500 m long and 50 m wide were placed systematically at each sampling location in the Study Area to record all avifauna observed in the surveys. Transects were started as early as possible in the morning and the late afternoon and covered all possible habitats. The start time and coordinates of the starting point were recorded. The bird species were identified using the most recent keys available in the literature. The diversity, abundance, and distribution of birds was calculated at each sampling location.

[15] E. Nasir and S. I. Ali, “Flora of Pakistan,” National Herbarium, NARC, Islamabad, Department of Botany, University of Karachi, Karachi, (Fascicles), 1972-1994.

Analysis of Field Data

The species richness (number of species observed) and abundance (number of individuals of each species observed) at the specified sampling sites were calculated.

Herpetofauna

Line Transect Method

An effective way to survey reptiles is by active searching using the line transect method which is equally applicable to both nocturnal and diurnal species. The line transects 500 m long and 20 m wide were placed systematically at each sampling location in the Study Area. The presence of signs such as an impression of body, tail or footprints, fecal pellets, tracks, dens, or egg-laying excavations were recorded.

The surveys were conducted in the seasons when reptiles are more active, and their sightings are possible e.g., from end-April to start-May and end-September to start-October. The specimens were identified with the help of the most recent keys available in the literature. The samples were collected and preserved for identification purposes where the species cannot be identified in the field for any reason.

The observed bird species were photographed using a digital camera, and relevant field data were recorded. GPS technology was utilized to record coordinates and elevations, while additional information such as habitat type and climate conditions of interest were documented.

Analysis of Field Data

The diversity, abundance, and distribution of herpetofauna were calculated at each sampling location.

Mammals

Line Transect Method

Line transects of 500 m by 20 m were placed at each sampling location to record sightings and signs of mammals. The GPS coordinates of the location and habitat type were documented. Samples of feces and photographs of tracks were taken and conserved for potential subsequent confirmatory analysis. Transects were started as early as possible in the day and covered all possible habitat types to avoid bias of stratification.

In addition, incidental sightings of all mammals, the number of individuals, location, and habitat type were recorded for each sighting. Anecdotal information regarding specific mammals were collected from the local people and relevant literature was also consulted.

Analysis of Field Data

The species richness (number of species observed) and abundance (number of individuals of each species observed) at the specified sampling location was calculated using data obtained from the line transect.

Live Trapping for Small Mammals

Sherman traps were used for small mammals. A mixture of different food grains mixed with fragrant seeds was used as bait. Wheat and rice were used as food grains while

peanuts, butter, coriander, and oats were used for fragrance. Freshly prepared bait was used on every trapping day. The traps were set at selected potential sites in the evening and checked on the next day as early as possible. The species and number of specimens for each species trapped were noted. The trapped specimens were later released back to their habitat. Photographs of the trapped animals were taken.

Analysis of Field Data

The species richness (number of species observed) and abundance (number of individuals of each species observed) at the specified sampling location were calculated using data obtained from the line transect and Sherman Traps.

Invertebrates

Invertebrates were collected by applying two types of sampling techniques i.e., active sampling and passive sampling. Active sampling involves the direct collection of specimens by the collector (observer) i.e., transect line method, hand collecting, beat and sweep sampling. The passive sampling method was conducted without the collector (observer) present, which includes pitfall trapping.

Line Transect Method

Line transects of 100 m by 5 m were used to capture above and below-ground invertebrates. Random quadrats were taken out along the transect. The invertebrate samples were collected using digging techniques at each quadrat along the transect line. In addition, a fine brush, and aspirators (foliage insects) were used to collect tiny creatures e.g., ants, termites, and spiders. GPS coordinates were noted at each quadrate.

Pitfall's Traps

Pitfalls traps were applied for surface active invertebrates and deployed along one flank of the transect at about 5 m to10 m distance from quadrates. The pitfall traps were set at roughly 5 m intervals along one flank of the transect. The traps were placed during the afternoon or early evening and emptied 24 hours later.

Analysis of Field Data

The diversity, abundance, and distribution of invertebrates were calculated at each sampling location.

H.5. Team

Table 1 provides the team for the surveys.

Table 1: Survey Team

Team Member	*Responsibility*
Vaqar Zakaria	Team leader
Ahmad Shoaib	Field logistics and coordination Overall management support, supervision, walkover surveys, developing baseline as well as impact assessment reports
Rafaqat Masroor	Herpetofauna expert
Aziz Khan	Terrestrial vegetation expert
Muhammad Akram	Avifauna Expert
Muhammad Shakil	Mammal Specialist
Mishkatullah	Invertebrates Expert
Muhammad Danish	Field Assistant

Note: Mr. Vaqar Zakaria was not physically join the field team he provided quality controls and back-end support to the team.

RDMC Authorized Supplier/Contractor's document.
The document is NOT approved until an RDMC Approval stamp has been affixed.

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	2024-02-23	**Review**			
			Sadia Asghar	**Vaqar Zakaria**	**Barbara Wessels**
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix I
Literature Based Species List

I.1. List of Plant Species Reported in Literature and Previous ESIA's (2010 and 2020)

No	Scientific Name	Common/Local Name	ESIA 2010	ESIA 2020	IUCN Status
1	*Acacia nilotica*	Babul	✓	–	Least Concern
2	*Acacia senegal*	Gum Arabic Tree	–	–	Not Evaluated
3	*Aeluropus lagopoides*	Rabbit-foot Aeluropus	–	–	Not Evaluated
4	*Alhagi maurorum*	Camel Thorn	✓	✓	Not Evaluated
5	*Anabasis setifera*	Anabasis	–	–	Not Evaluated
6	*Aristida sp.*	Needlegrasses	✓	–	Least Concern
7	*Artemisia scoparia*	Redstem Wormwood	–	–	Not Evaluated
8	*Astragalus sp.*	Milkvetch	–	✓	Not Evaluated
9	*Calligonum comosum*	Fire Bush	–	–	Not Evaluated
10	*Calligonum crinitum*	–	–	✓	Not Evaluated
11	*Calligonum polygonoides*	Phog	–	✓	Not Evaluated
12	*Calotropis procera*	Apple of Sodom	–	–	Not Evaluated
13	*Capparis cartilaginea*	Cartilage Caper	–	–	Least Concern
14	*Capparis decidua*	Kari	–	–	Least Concern
15	*Cassia italica*	Port Royal Senna	–	–	Not Evaluated
16	*Cenchrus cilaris*	Foxtail Buffalo Grass	✓	–	Not Evaluated
17	*Chenopodium glaucum*	Oak-leaved Goosefoot	–	✓	Not Evaluated
18	*Citrullus colocynthis*	Bitter Apple	–	–	Not Evaluated
19	*Commiphora wightii*	Indian Bdellium-tree	–	–	Critically Endangered
20	*Corchorus depressus*	Bahuphali	–	–	Not Evaluated
21	*Corchorus tridens*	Horn-Fruited Jute	–	–	Not Evaluated

No	Scientific Name	Common/Local Name	ESIA 2010	ESIA 2020	IUCN Status
22	*Cornulaca monacantha*	Tahara	–	✓	Not Evaluated
23	*Cressa cretica*	Morning Glory	–	–	Not Evaluated
24	*Crotalaria burhia*	Burhia Rattlepod	✓	–	Not Evaluated
25	*Crotalaria persica*	Rattlepods	–	–	Not Evaluated
26	*Cucumis melo*	Melon	–	–	Not Evaluated
27	*Cymbopogon jwarancusa*	Oilgrass	–	–	Not Evaluated
28	*Desmostachya bipinnata*	Halfa Grass	–	✓	Not Evaluated
29	*Eragrostis cynosuroides*	Love Grass	–	–	Not Evaluated
30	*Euphorbia granulata*	Prostrate Spurge	–	–	Not Evaluated
31	*Fagonia brugieri*	Dhuraymah	–	–	Not Evaluated
32	*Fagonia cretica*	Dhamasa	–	✓	Not Evaluated
33	*Fagonia indica*	Sachi Booti	–	–	Not Evaluated
34	*Fagonia ovalifolia*	Dereima	–	–	Not Evaluated
35	*Ficus johannis*	Afghan Fig	–	–	Least Concern
36	*Gaillonia eriantha*	–	–	–	Not Evaluated
37	*Haloxylon griffithi*	Saxaul	–	–	Not Evaluated
38	*Haloxylon persicum*	White saxaul	✓	✓	Least Concern
39	*Haloxylon salicornicum*	Rimth Saltbush	–	✓	Not Evaluated
40	*Haloxylon stocksii*	Saltwort	–	–	Not Evaluated
41	*Heliotropium crispum*	Salt Heliotrope	✓	–	Not Evaluated
42	*Indigofera articulata*	Scarlet Pea	–	–	Not Evaluated
43	*Indigofera oblongifolia*	Jhiladi	✓	–	Least Concern

No	Scientific Name	Common/Local Name	ESIA 2010	ESIA 2020	IUCN Status
44	*Iphiona grantioides*	Cutch Lnula	–	–	Not Evaluated
45	*Juncellus laevigatus*	Smooth Flatsedge	✓	–	Not Evaluated
46	*Leptadenia pyrotechnica*	Khimp	–	–	Least Concern
47	*Nerium odorum*	White/pink Oleander	–	–	Least Concern
48	*Nannorrhops ritchienana*	Mazari Palm	–	–	Not Evaluated
49	*Neurada procumbens*	Sand Button	–	–	Not Evaluated
50	*Oligomeris linifolia*	Lineleaf Whitepuff	–	–	Not Evaluated
51	*Panicum sp.*	Panic Grass	–	–	Least Concern
52	*Panicum turgidum*	Desert Grass	–	✓	Not Evaluated
53	*Peganum harmala*	Syrian Rue	–	–	Not Evaluated
54	*Pennisetum dichotomum*	–	–	–	Not Evaluated
56	*Phoenix dactylifera*	Date Palm	–	✓	Least Concern
57	*Pistacia khinjuk*	Jangli Pista	–	–	Least Concern
58	*Pluchea arguta*	Toothed Camphor	–	–	Not Evaluated
59	*Prosopis glandulosa*	Honey Mesquite	✓	–	Not Evaluated
60	*Prosopis juliflora*	Mesquite	✓	–	Not Evaluated
61	*Prosopis specigera*	Frangipani	–	–	Not Evaluated
62	*Rhazya stricta*	Senhwar	–	–	Not Evaluated
63	*Salix sp.*	Willow	–	–	Least Concern
64	*Salvadora oleoides*	Bada Peelu	–	–	Data Deficient
65	*Salvadora persica*	Miswak	–	–	Least Concern
66	*Salvia santolinifolia*	Santolina Sage	–	–	Not Evaluated

No	Scientific Name	Common/Local Name	ESIA 2010	ESIA 2020	IUCN Status
67	*Schweinfurthia papilionacea*	Glaucous Dog-flower	–	–	Not Evaluated
68	*Seddera latifolia*	Broad-leaved Seddera	–	–	Not Evaluated
69	*Sonchus aspe*	Spiny Sowthistle	–	–	Not Evaluated
70	*Sporobolus arabicus*	Sacaton Grasses	✓	–	Not Evaluated
71	*Suaeda fruticosa*	Shrubby Seablite	–	–	Not Evaluated
72	*Tamarix aphylla*	Athel Pine	–	–	Not Evaluated
73	*Tamarix articulate*	Salt Cedar	–	–	Not Evaluated
74	*Tamarix dioica*	Ghaz	–	–	Not Evaluated
75	*Tamarix macrocarpa*	Tamarisk	–	–	Not Evaluated
76	*Tamarix stricta*	Tamarisk	✓	✓	Data Deficient
77	*Tephrosia uniflora*	Bhakar Biyani	✓	–	Not Evaluated
78	*Trianthema pentandra*	African Purslane	–	–	Not Evaluated
79	*Tribulus terrestris*	Gokhru	–	✓	Least Concern
80	*Trigonella stocksii*	Fenugreek	–	–	Not Evaluated
81	*Vachellia jacquemontii*	Bhu Banwali	–	–	Least Concern
82	*Verbascum thapsus*	Common Mullein	–	–	Not Evaluated
84	*Ziziphora clinopodioides*	Blue Mint Bush		–	Not Evaluated
85	*Ziziphus mauritiana*	Indian Jujube	–	–	Least Concern
86	*Ziziphus nummularia*	Wild Jujube	–	–	Not Evaluated
87	*Zygophyllum atriplicifolia*	Twinleaf	–	–	Not Evaluated
88	*Zygophyllum simplex*	Simple-leaved Bean Caper	–	✓	Not Evaluated

I.2. List of Bird Species Reported in Literature and Previous ESIA's (2010 and 2020)

No.	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Seasonal Patterns and Residency Status
1.	*Accipiter badius*	Central Asian Shikra	–	–	Least Concern	Winter Visitor
2.	*Accipiter nisus*	Eurasian Sparrow Hawk	–	–	Least Concern	Summer Breeding Visitor
3.	*Acridotheres tristis*	Common Myna	–	✓	Least Concern	–
4.	*Acrocephalus dumetorumn*	Blyth's Reed Warbler	–	–	Least Concern	Winter Visitor
5.	*Acrocephalus stantoreus*	Clamorous Warbler	–	–	Least Concern	Winter Visitor
6.	*Actitis hypoleucos*	Common Sandpiper	–	–	Least Concern	Winter Visitor
7.	*Alaemon alaudipes*	Greater Hoopoe Lark	–	✓	Least Concern	–
8.	*Alauda arvensis*	Sky Lark	✓	–	Least Concern	–
9.	*Alauda gulgula*	Small Sky Lark	–	–	Least Concern	Resident
10.	*Alcedo atthis*	Common Small Blue Kingfisher	–	–	Least Concern	–
11.	*Ammomanes cincturus*	Bar–tailed Lark	✓	✓	Least Concern	–
12.	*Ammomanes deserti*	Indian Desert Finch–lark	✓	✓	Least Concern	Resident
13.	*Ammoperdix griseogularis*	See–see Partridge	–	–	Least Concern	Winter Visitor
14.	*Anthus trivialis*	Tree Pipit	–	–	Least Concern	Resident
15.	*Apus affinis*	House Swift	–	–	Least Concern	Resident
16.	*Apus apus*	Common Swift	–	–	Least Concern	Summer Visitor
17.	*Apus pallidus*	Pale Brown or Pallid Swift	–	–	Least Concern	Winter Visitor
18.	*Aquila heliaca*	Imperial Eagle	✓	–	Vulnerable	–
19.	*Aquila rapax*	Tawny Eagle	–	–	Least Concern	Resident
20.	*Athene brama*	Spotted Owlet	–	–	Least Concern	–
21.	*Bubo bubo*	Indian Great Horned / Eagle Owl	–	–	Least Concern	Resident

No.	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Seasonal Patterns and Residency Status
22.	*Bubulcus ibis*	Cattle Egret	–	–	Least Concern	Resident
23.	*Burhinus oedicnemus*	Stone Curlew/Eurasian	–	–	Least Concern	Resident
24.	*Buteo rufinus*	Longlegged Buzzard	–	–	Least Concern	Winter Visitor
25.	*Calandrella acutirostris*	Hume's Short–toed Lark	–	–	Least Concern	Resident
26.	*Calandrella brachydactyla*	Greater–short Toed Lark	✓	–	Least Concern	–
27.	*Caprimulgus europaeus*	Hume's European Nightjar	–	–	Least Concern	Summer Breeding Visitor
28.	*Caprimulgus mahrattensis*	Syke's or Sind Nightjar	–	–	Least Concern	Resident
29.	*Caprimulugus aegyptius*	Egyptian Nightjar	–	–	Least Concern	Summer Breeding Visitor
30.	*Carpodacus erythrinus*	Common Rose Finch	–	–	Least Concern	Resident
31.	*Casmerodius albus*	Great Egret	–	–	Least Concern	–
32.	*Chlamydotis macqueenii*	Asian Houbara Bustard	✓	–	Vulnerable	–
33.	*Circus aeruginosus*	Marsh Harrier	–	–	Least Concern	Winter Visitor
34.	*Columbia livia*	Blue Rock Pigeon	–	✓	Least Concern	Resident
35.	*Coturnix coturnix*	Common Quail	–	–	Least Concern	Passage Migrant /Winter Visitor
36.	*Coracias benghalensis*	Roller or Blue Jay	–	–	Least Concern	Resident
37.	*Coracias garrulus*	Eurasian Roller	–	–	Least Concern	–
38.	*Corvus corax*	Common Raven	–	✓	Least Concern	Resident
39.	*Corvus ficollis*	Black Naked Raven	–	–	Least Concern	Resident
40.	*Corvus ruficollis*	Desert Raven	–	✓	Least Concern	Winter Visitor
41.	*Corvus splendens*	House Crow	–	–	Least Concern	Resident
42.	*Delichon urbica*	Common House Martin	–	–	Least Concern	Resident

No.	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Seasonal Patterns and Residency Status
43.	*Dicrurus adsimilis*	Black Drongo or King Crow	–	–	Least Concern	Resident /Passage Migrant
44.	*Dicrurus macrocercus*	Black Drongo	–	–	Least Concern	Resident
45.	*Egretta alba*	Great Egret	–	–	Least Concern	Resident
46.	*Egretta garzetta*	Little Egret	✓	–	Least Concern	Year Round Visitor
47.	*Egretta gularis*	Western Reef Egret	✓	–	Least Concern	Resident
48.	*Egretta intermedia*	Smaller or Median Egret	–	–	Least Concern	Resident
49.	*Emberiza cia*	Rock Bunting	–	–	Least Concern	Resident
50.	*Emberiza melanocephala*	Black-headed Bunting	–	–	Least Concern	Passage Migrant
51.	*Emberiza sahari*	House Bunting	–	–	Least Concern	Resident
52.	*Emberiza striolata*	Striped or House Bunting	–	–	Least Concern	Resident
53.	*Eremopterix grisea*	Ashy-crowned Finch Lark	–	–	Least Concern	Resident
54.	*Eremopterix nigriceps*	Black-crowned Finch Lark	–	–	Least Concern	Resident
55.	*Eudynamys scolopacea*	Common Koel	–	–	Least Concern	Resident
56.	*Falco columbarius*	Pallid Merlin	–	–	Least Concern	Winter Visitor
57.	*Falco concolor*	Sooty Falcon	–	–	Least Concern	Resident
58.	*Falco jugger*	Lagger Falcon	–	–	Least Concern	Resident
59.	*Falco naumanni*	Lesser Kestrel	–	–	Least Concern	Vagrant
60.	*Falco peregrinus*	Peregrine Falcon	–	–	Least Concern	Resident
61.	*Falco subbuteo*	Northern Hobby	–	–	Least Concern	Winter Visitor
62.	*Falco tinnunculus*	Common Kestrel	–	✓	Least Concern	–
63.	*Ficedula parva*	Red-throated Flycatcher	–	–	Least Concern	Winter Visitor
64.	*Francolinus pondicerianus*	Grey Partridge	–	–	Least Concern	Resident

No.	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Seasonal Patterns and Residency Status
65.	*Fulica atra*	Common Coot	–	–	Least Concern	Winter Visitor
66.	*Galerida cristata*	Crested Lark	✓	✓	Least Concern	–
67.	*Gypaetus barbatus*	Bearded Vulture	–	–	Least Concern	Resident
68.	*Gyps bengalensis*	Indian White Back Vulture	–	–	Least Concern	Resident
69.	*Gyps fulvus*	Indian Griffon Vulture	–	–	Least Concern	Resident
70.	*Haematopus ostralegus*	Eurasian Oystercatcher	✓	–	Near Threatened	Winter Visitor
71.	*Halcyon smyrnensis*	White Breasted Kingfisher	–	–	Least Concern	Resident
72.	*Haliaeetus lucoryphus*	Pallas's Fishing Eagle	–	–	Least Concern	Resident
73.	*Haliastur indus*	Brahminy Kite	–	–	Least Concern	Resident
74.	*Hieraatus fasciatus*	Slender Hawk Eagle	–	–	Least Concern	Resident
75.	*Himantopus himantopus*	Black Winged Stilt	–	–	Least Concern	Resident
76.	*Hirundo daurica*	Red Rumped Swallow	–	–	Least Concern	Summer Breeding Visitor
77.	*Hirundo rupestris*	Eurasian Crag Martin	–	–	Least Concern	Resident
78.	*Hirundo rustica*	Common Swallow	–	–	Least Concern	Winter Visitor
79.	*Hirundo smithi*	Wire–tailed Swallow	–	–	Least Concern	Resident
80.	*Lanius excubitor*	Grey Shrike	–	✓	Least Concern	Resident /Summer Breeding Visitor
81.	*Lanius isabellinus*	Rufous–tailed or Isabelline Shrike	–	–	Least Concern	Winter Visitor/Summer Breeding Visitor
82.	*Lanius schach*	Rufous–backed Shrike	–	–	Least Concern	Resident
83.	*Lanius vittatus*	Bay- backed Shrike	–	–	Least Concern	Resident
84.	*Limicola falcinellus*	Broad-billed Sandpiper	–	–	Least Concern	Winter Visitor
85.	*Limosa lapponica*	Bar-tailed Godwit	–	–	Least Concern	Winter Visitor

No.	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Seasonal Patterns and Residency Status
86.	*Lonchura malabarica*	Common Silver Bill	–	–	Least Concern	Resident
87.	*Luscinia svecica*	Bluethroat	–	–	Least Concern	Winter Visitor
88.	*Merops orientalis*	Small Green Bee–eater	–	–	Least Concern	Summer Breeding Visitor
89.	*Merops superciliosus*	Blue–cheeked Bee–eater	–	–	Least Concern	Summer Breeding Visitor
90.	*Milvus migrans*	Black Kite	–	–	Least Concern	Resident
91.	*Motacilla alba*	Pied Wagtail	–	✓	Least Concern	Winter Visitor
92.	*Motacilla cinerea*	Grey Wagtail	–	–	Least Concern	Passage Migrant
93.	*Motacilla citreola*	Yellow–headed Wagtail	–	–	Least Concern	Resident / Passage Migrant
94.	*Motacilla flava*	Yellow Wagtail	–	–	Least Concern	Resident
95.	*Muscicapa striata*	Spotted Flycatcher	–	–	Least Concern	–
96.	*Nectarinia asiatica*	Purple Sunbird	–	–	Least Concern	Resident
97.	*Neophron percnopterus*	Egyptian Vulture	–	–	Endangered	Resident
98.	*Oenanthe alboniger*	Hume's Chat or Wheatear	–	–	Least Concern	Winter Visitor
99.	*Oenanthe deserti*	Desert Chat or Desert Wheatear	–	–	Least Concern	Winter Visitor
100.	*Oenanthe isabellina*	Isabelline Wheatear	–	–	Least Concern	Winter Visitor/Summer Breeding Visitor
101.	*Oenanthe monacha*	Hooded Chat or Wheatear	–	–	Least Concern	Winter Visitor
102.	*Oenanthe picata*	Variable Wheatear	–	✓	Least Concern	–
103.	*Oenanthe xanthoprymna*	Rufous-tailed Wheatear	–	–	Least Concern	–
104.	*Orthotomus sutorius*	Tailor bird	–	–	Least Concern	Resident
105.	*Otus brucei*	Striated or Pallid Scops Owl	–	–	Least Concern	Summer Breeding Visitor
106.	*Pandion haliaetus*	Osprey	✓	–	Least Concern	Winter Visitor

No.	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Seasonal Patterns and Residency Status
107.	*Passer domesticus*	House Sparrow	✓	✓	Least Concern	Winter Visitor
108.	*Passer hispaniolensis*	Spanish Sparrow	–	–	Least Concern	Winter Visitor
109.	*Passer pyrrhonotus*	Sind Jungle Sparrow	–	–	Least Concern	Resident
110.	*Passer xanthocollis*	Sind Yellow-throated Sparrow	–	–	Least Concern	Summer Breeding Visitor
111.	*Phalacrocorax fuscicollis*	Indian Shag	–	–	Least Concern	Winter Visitor
112.	*Phoenicurus ochruros*	Black Redstart	–	–	Least Concern	Resident
113.	*Phylloscopus collibita*	Chiffchaff	–	–	Least Concern	Winter Visitor
114.	*Phylloscopus neglectus*	Plain Leaf Warbler	–	–	Least Concern	Summer Breeding Visitor
115.	*Phylloscopus nitidus*	Green Warbler	–	–	Least Concern	–
116.	*Phylloscopus trichiloides*	Greenish Warbler	–	–	Least Concern	Winter Visitor
117.	*Picoides assimilis*	Sind Pied Woodpecker	–	–	Least Concern	Resident
118.	*Ploceus philippinus*	Indian Baya	–	–	Least Concern	Winter Visitor
119.	*Prinia buchanani*	Rufous-fronted Wren Warbler	–	–	Least Concern	Resident
120.	*Psittacula krameri*	Rose Ringed Parakeet	–	–	Least Concern	Resident
121.	*Psuedibis papillosa*	Black Ibis	–	–	Least Concern	Passage Migrant
122.	*Pterocles coronatus*	Coroneted Sandgrouse	–	–	Least Concern	Resident
123.	*Pterocles exustus*	Chestnut–bellied	–	–	Least Concern	Resident
124.	*Pterocles indicus*	Painted Sandgrouse	–	–	Least Concern	Resident
125.	*Pterocles lichtensteinii*	Close–barred Sandgrouse	–	–	Least Concern	Resident
126.	*Pterocles orientalis*	Imperial or Black–bellied Sandgrouse	–	–	Least Concern	Winter Visitor
127.	*Ptyonoprogne fuligula*	Rock Martin	–	✓	Least Concern	Resident
128.	*Ptyonoprogne rupestris*	Eurasian Crag Martin	–	✓	Least Concern	Resident

No.	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Seasonal Patterns and Residency Status
129.	*Pycnonotus cafer*	Red–vented Bulbul	–	–	Least Concern	Resident
130.	*Pycnonotus leucogenys*	White-cheeked Bulbul	–	–	Least Concern	Resident
131.	*Pycnonotus leucotis*	White–eared Bulbul	✓	–	Least Concern	–
132.	*Rhipidura aureola*	White-browed Flycatcher	–	–	Least Concern	Winter Visitor
133.	*Riparia paludicola*	Indian Sand Martin	–	–	Least Concern	Winter Visitor
134.	*Riparia riparia*	Collared Sand Martin	–	–	Least Concern	Winter Visitor
135.	*Saxicola caprata*	Pied Bush Chat	–	✓	Least Concern	–
136.	*Saxicola ferea*	Gray Bush Chat	–	–	Least Concern	Resident
137.	*Saxicola torquata*	Collared Indian Bush Chat	–	–	Least Concern	Passage Migrant/ Summer Breeding Visitor
138.	*Saxicoloidea fulicata*	Indian Chat or Indian Robin	–	–	Least Concern	Resident
139.	*Sptreptopeli senegalensis*	Laughing Dove	–	–	Least Concern	Resident
140.	*Streptopelia decaocto*	Ring Dove	–	–	Least Concern	Resident
141.	*Streptopelia senegalensis*	Little Brown or Senegal Dove	–	–	Least Concern	Resident
142.	*Streptopelia tranquebarica*	Red Turtle Dove	–	–	Least Concern	Vagrant
143.	*Sylvia curruca*	Lesser Whitethroat	–	–	Least Concern	Winter Visitor
144.	*Sylvia nana*	Desert Warbler	–	–	Least Concern	Winter Visitor
145.	*Tetrax tetrax*	Little Bustard	–	–	Least Concern	Winter Visitor
146.	*Tringa glareola*	Spotted Sandpiper	–	–	Least Concern	Passage Migrant
147.	*Tringa hypoleucos*	Common Sandpiper	–	–	Least Concern	Winter Visitor
148.	*Tringa ochropus*	Green Sandpiper	–	–	Least Concern	Passage Migrant
149.	*Tringa stagnatilis*	Marsh Sandpiper	–	–	Least Concern	Passage Migrant
150.	*Tringa terek*	Terek Sandpiper	–	–	Least Concern	Winter Visitor

No.	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Seasonal Patterns and Residency Status
151.	*Turdoides caudatus*	Common Babbler	–	–	Least Concern	Resident
152.	*Upupa epops*	Hoopoe	–	–	Least Concern	Summer Breeding Visitor
153.	*Vanellus gregarius*	Sociable Lapwing	–	–	Least Concern	Winter Visitor
154.	*Vanellus indicus*	Red Wattled Lapwing	–	–	Least Concern	Resident
155.	*Vanellus leucurus*	White–tailed Lapwing	–	–	Least Concern	Resident
156.	*Vanellus malabricus*	Yellow Wattled Lapwing	–	–	Least Concern	Summer Breeding Visitor

Note: **Passage Migrant** (refers to a type of bird that travels through a particular region during its migration, typically between breeding and wintering grounds).

Resident (These birds are likely to stay in the region throughout the year, indicating that they do not migrate significant distances. They reside in the area permanently or for most of the year).

Summer Breeding Visitor (These birds are expected to visit the region specifically for breeding during the summer season. They may migrate from a warmer region or may have a migratory pattern tied to breeding).

Summer Visitor (typically refers to a bird species that migrates to a particular region during the summer months).

Vagrant (Vagrant birds are those that are outside their expected or usual range. They might appear in an area far from their typical habitat, and their presence is considered irregular or accidental).

Winter Visitor (These birds are likely to migrate to the region during the winter season. They might be coming from a colder region where they breed during the summer).

Year–Round Visitor (refers to a bird species that remains in a particular region throughout the entire year, regardless of the seasonal changes).

(–) indicate a lack of data.

I.3. List of Herpetofauna Species Reported in Literature and Previous ESIA's (2010 and 2020)

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITES Status	Global Population Trend	Endemic Species	Feeding Guild/food items	Breading Season
Amphibians											
1.	*Bufo surdus*	Pakistan Toad	–	–	Least Concern	2015	–	Decreasing	–	Insects and worms	Breeds during monsoon
2.	*Bufotes zugmayeri*	Zugmayer's Green Toad	–	–	Least Concern	2010	–	Stable	–	Insects and worms	Breeds during monsoon

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITES Status	Global Population Trend	Endemic Species	Feeding Guild/food items	Breading Season
3.	*Duttaphrynus olivaceous*	Olive Toad	–	–	Least Concern	2009	–	Stable	–	Light attracted insects	At the start of monsoon
4.	*Euphlyctis cyanophlyctis*	Skittering Frog	–	–	Least Concern	2009	–	Stable	–	Aquatic insects, beetles, tadpoles, dragonflies, grasshoppers, fry, etc.	July to September
Lizards and Geckos											
9	*Ablepharus grayanus*	Minor Snake–eyed Skink	–	–	Least Concern	2021	–	Stable	–	They mainly feed on small arthropods, mollusks, and small snails	–
10	*Ablepharus pannonianus*	Easterm Dwarf Skink	–	–	Least Concern	–	–	Unknown	–	They mainly feed on small arthropods, mollusks, and small snails	–
11	*Acanthodactylus blanfordii*	Blanford's Fringe–fingered Lizard	–	–	Least concern	2021	–	Stable	–	Small insects specially ants	–
12	*Acanthodactylus cantoris*	Indian Fringe–fingered Lizard	✓	–	Least Concern	2021	–	Unknown	–	Insectivorous	July to August
13	*Acanthodactylus micropholis*	Yellow tailed fringe fingered lizard	–	–	Least Concern	2021	–	Stable	–	Insectivorous	–
14	*Agamura femoralis*	Kharan Spider Gecko	–	–	Least Concern	–	–	Unknown	✓	Insectivorous	March to May
15	*Agamura persica*	Persian Spider Gecko	✓	–	Least Concern	2021	–	Stable	✓	Worms, crickets, silkworms, and the occasional wax worm	March to May
16	*Bunopus tuberculatus*	Baluch Ground gecko	–	–	Least Concern	2021	–	Stable	✓	Insectivorous	–
17	*Calotes versicolor*	Changeable Lizard	–	–	Least Concern	2021	–	Stable	–	Insectivorous	May to June

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITES Status	Global Population Trend	Endemic Species	Feeding Guild/food items	Breading Season
18	*Cnemidophorus spp.*	Whip–tailed Sand Gecko	–	–	Least Concern	–	–	Unknown	–	Terrestrial invertebrates and occasionally on smaller lizards	Mid May to late July
19	*Coeranoscincus reticulatus*	Three–toad Snake Skink	–	–	Least Concern	2018	–	Stable	–	Feeds on earthworms and beetle grubs	–
20	*Crossobamon eversmanni*	Comb toed Gecko	–	–	Least Concern	2021	–	Stable	–	Feeds on relatively large terrestrial invertebrates	–
21	*Crossobamon lumsden*	Fringe–toed Gecko	✓	–	Not Evaluated	–	–	Unknown	–	–	–
22	*Cyrtopodion kachhense*	Kach Gecko	✓	–	Least Concern	2021	–	Unknown	–	Insectivorous	–
23	*Cyrtopodion scabrum*	rough bent toed Gecko	✓	–	Least Concern	2021	–	Stable	–	Insectivorous	March to August
24	*Cyrtopodion watsoni*	Thin–toed gecko	–	✓	Least Concern	2021	–	Unknown	–	Attracted to light posts to feed on. photophilic insects	–
25	*Eremias acutirostris*	Reticulated Desert Lacerta	✓	–	Least Concern	2021	–	Stable	–	–	–
26	*Eremias aporosceles*	Chagai Desert Lacerta	–	–	Least Concern	2021	–	Unknown	–	–	–
27	*Eremias fasciata*	Seistan Racerunner	–	–	Least Concern	2021	–	Stable	–	–	–
28	*Eremias persica*	Aralo–Caspian Racerunner	✓	–	Least Concern	2021	–	Stable	–	–	–
29	*Eremias scripta*	Eremias Scripta Lacerta	–	–	Least Concern	2017	–	Stable	–	–	–
30	*Eublepharis macularius*	Common Leopard Gecko	–	–	Least Concern	2021	–	Stable	–	Leopard geckos are opportunistic predators that eat a variety of prey	In summer

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITES Status	Global Population Trend	Endemic Species	Feeding Guild/food items	Breading Season
										items Invertebrates are presumed to make up the majority of wild geckos' diets, but in captivity they will also eat small vertebrate prey if given the opportunity, including mouse pups and even hatchling leopard geckos	
31	*Eumeces schneideri blythianus*	Orange–tailed Mole Skink	–	–	Least Concern	2021	–	Unknown	–	Insectivorous	–
32	*Eumeces taeniolatus*	Ribbon sided skink	–	–	Least Concern	2021	–	Stable	–	Insectivorous	–
33	*Eumeces zarudnyi*	Berber skink	–	–			–	Unknown	–	Insectivorous	–
34	*Hemidactylus flaviviridis*	Yellow–bellied House Gecko	–	–	Least Concern	2021	–	Increasing	–	Insects including caterpillars	March to April
35	*Hemidactylus persicus*	Persian leaf toed Gecko,	–	–	Least Concern	2021	–	Increasing	–	Most prey items are winged insects	May to August
36	*Laudakia caucasia*	Caucasian Rock Agama	–	–	Least Concern	2017	–	Stable	–	Eats plant foods (fruits, seeds, flower buds, leaves), spiders, beetles, butterflies	–
37	*Laudakia melanura*	Black Rock Agama	–	–	Least Concern	2021	–	Stable	–	–	–
38	*Laudakia nupta*	Large–scaled Rock Gecko	–	✓	Least Concern	2021	–	Stable	–	Plants are the main source of food for *L. nupta*. *L. nupta* fusca is omnivorous and are known to consume	–

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITES Status	Global Population Trend	Endemic Species	Feeding Guild/food items	Breading Season
										daphne oleoides, beetles, and ants.	
39	*Mesalina watsonana*	Long–tailed Desert Lacerta	✓	✓	Least Concern	2021	–	Stable	–	–	–
40	*Ophiomorus tridactylus*	Indian Three–toed Sand Swimmer	✓	–	Least Concern	2021	–	Stable	–	–	–
41	*Phrynocephalus clarkorum*	Clark's Toad–headed Agama	✓	–	Least Concern	2021	–	Unknown	–	–	March to May
42	*Phrynocephalus euptilopus*	Alcock's Toad –headed Agama	–	–	Least Concern	2017	–	Unknown	–	–	April to July
43	*Phrynocephalus luteoguttatus*	Yellow–speckled Toad–headed Agama	✓	–	Least Concern	2021	–	Stable	–	Terrestrial Invertebrates	April to August
44	*Phrynocephalus maculatus*	Spotted Toad–headed Agama	✓	✓	Least Concern	2021	–	Stable	–	Terrestrial Invertebrates	April to August
45	*Phrynocephalus ornatus*	Striped Toad–Headed Agama	✓	–	Least Concern	2021	–	Stable	–	Terrestrial Invertebrates	April to August
46	*Phrynocephalus scutellatus*	Gray Toad– headed Agama	✓	–	Least Concern	2021	–	Stable	–	Terrestrial Invertebrates	April to August
47	*Rhinogekko femoralis*	Sharp–tailed Spider Gecko	–	–	Least Concern	2021	–	Unknown	–	Food consists primarily of soft–bodied arthropods, larvae	March to May
48	*Saara asmussi*	Baloch Spiny– tailed lizard	–	–	Least Concern	2021	II	Unknown	–	Eats leaves, stems, and seeds of herbaceous plants	March to April
49	*Saara hardwickii*	Indian Spiny–tailed Lizard	–	–	Vulnerable	2022	II	Decreasing	–	Feeds on the vegetation, particularly on grasses	May to June
50	*Teratoscincus microlepis*	Small–scaled Skink Gecko	✓	–	Least Concern	2021	–	Stable	✓	Terrestrial Invertebrates	–

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITES Status	Global Population Trend	Endemic Species	Feeding Guild/food items	Breading Season
51	*Teratoscincus scincus*	Common Wonder Gecko	✓	–	Least Concern	2021	–	Stable	–	Mainly feeds on crickets	–
52	*Trapelus agilis*	Brilliant Ground Agama	✓	✓	Least Concern	2021	–	Stable	–	–	–
53	*Trapelus megalonyx*	Afghan Ground Agama	✓	–	Least Concern	2021	–	Stable	–	Terrestrial Invertebrates	–
54	*Tropiocolotes persicus*	Persian Dwarf Gecko	–	–	Least Concern	2021	–	Unknown	✓	Terrestrial Invertebrates	–
55	*Varanus griseus*	Desert Monitor	✓	–	Least Concern	2021	I	Decreasing	–	The preferred prey of the species is mice, eggs, or fish, but it will also prey on smaller mammals, reptiles, birds, amphibians, insects, or other invertebrates	–
Snakes											
56	*Astrotia stokesii*	Stoke's Sea Snake	–	–	Least Concern	2018	–	Unknown	–	Feeds on fish and eels	–
57	*Boiga trigonata*	Dark headed Gamma Snake	–	–	Least Concern	2021	–	Stable	–	Feeds mainly on lizards. Also feeds on frogs, small rodents, small birds, other snakes	–
58	*Echis carinatus*	Saw–scaled Viper	✓	–	Least Concern	2021	–	Stable	–	Their diet consists of rodents, lizards, frogs, and a variety of arthropods, such as scorpions, centipedes	Winter
59	*Eirenis persicus*	Dark–headed Dwarf Snake	–	–	Least Concern	2021	–	Unknown	–	Feeds on invertebrates and various vertebrates, particularly rodents	–

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITES Status	Global Population Trend	Endemic Species	Feeding Guild/food items	Breading Season
60	*Enhydrina schistose*	Beaked Sea Snake	–	–	Least Concern		–	Unknown	–	Feeds exclusively on fish	–
61	*Eristicophis macmahonii*	McMahon's Viper	✓	–	Least Concern	2021	–	Unknown	–	Feed upon small lizards, small rodents, and sometimes birds.	–
62	*Eryx tataricus*	Tartary Sand Boa	–	–	Least Concern	2021	II	Decreasing	–	–	–
63	*Hydrophis curtus*	Spine–bellied Sea Snake	–	–	Least Concern	2021	–	Unknown	–	Feeds on variety of fishes, gastropods, and crustaceans.	–
64	*Hydrophis cyanocinctus*	Annulated Sea Snake	–	–	Least Concern	2010	–	Unknown	–	Mainly fishes	–
65	*Hydrophis fasciatus*	Spotted Sea Snake	–	–	Least Concern	2010	–	Unknown	–	Feeds mainly on eels	Winter
66	*Hydrophis lapemoides*	Arabian Gulf Sea Snake	–	–	Least Concern	2010	–	Unknown	–	Feeds on fish	–
67	*Hydrophis schistosus*	Hook–nosed Sea Snake	–	–	Least Concern	2018	–	Stable	–	Sea catfishes (fork–tailed catfishes), supplemented by eel–tailed catfishes and puffer fishes	–
68	*Hydrophis spiralis*	Yellow Sea Snake	–	–	Least Concern	2010	–	Unknown	–	Feeds primarily on eels and is found in muddy, sandy ocean bottoms.	–
69	*Lapemis curtus*	Spine Bellied Sea Snake	–	–	Least Concern	2021	–	Unknown	–	Feeding on a Gastropod	Early May and the end of July, and gives birth between March and June

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITES Status	Global Population Trend	Endemic Species	Feeding Guild/food items	Breading Season
70	*Lytorhynchus maynardi*	Maynard's Awl–headed Snake	✓	–	Least Concern	2021	–	Unknown	✓	–	–
71	*Microcephalophis gracilis gracilis*	Common Small–headed Sea Snake	–	–	Least Concern		–	Unknown	–	Feeds on fish, mainly eels.	–
72	*Pelamis platurus*	yellow bellied Sea Snake	–	–	Least Concern	2017	–	Stable	–	Carnivore	–
73	*Platyceps karelini*	Spotted Desert Racer	–	–	Least Concern	2021	–	Unknown	–	Carnivore	April to May
74	*Platyceps rhodorachis*	Braid Snake	✓	–	Least Concern	2021	–	Stable	–	Carnivore	April to May
75	*Praescutata viperine*	Viperine Sea Snake	–	–	Least Concern	–	–	Unknown	–	Reported to feed on eels, frogs and other fish.	Starts in March
76	*Psammophis schokari*	Afro–Asian Sand Snake	–	–	Least Concern	2021	–	Unknown	–	Small vertebrates; namely, rodents, lizards, and passerine birds	During late summer and early autumn
77	*Pseudocerastes persicus*	Persian Horned Viper	–	–	Least Concern	2021	–	Decreasing	–	Birds, mammals, lizards, and occasionally arthropods	–
78	*Spalerosophis arenarius*	Royal Snake	–	–	Least Concern	2021	–	Stable	–	Carnivores	–
79	*Spalerosophis diadema*	Diadem Snake	✓	–	Least Concern	2021	–	Stable	–	Carnivores and only eat meat. In the wild, diadems hunt small mammals, lizards, and birds	In Summer

I.4. List of Mammal Species Reported in Literature and Previous ESIA's (2010 and 2020)

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITIES Status	Golbal Population Trend	Feeding Guild/Food Items	Breeding Season
1.	*Allactaga elater*	Small Five–toad Jerboa	–	✓	Least Concern	2016	–	Decreasing	Feed on seeds, insects, and the succulent parts of plants	Marcsh - May
2.	*Allactaga hotsoni*	Hotson's Five–toad Jerboa	–	–	Least Concern	2016	–	Unknown	feeds on seeds and such desert plants	May to October
3.	*Canis aureus*	Asiatic Jackal	✓	✓	Least Concern	2018	III	Increasing	Young gazelles, rodents, (especially during winter), hares, ground birds and their eggs, reptiles, frogs, fish, insects, and fruit. They take carrion on occasion	February -March
4.	*Canis lupus*	Gray Wolf	–	–	Least Concern	2018	–	Stable	Carnivores	February and March
5.	*Capra aegagrus*	Wild Goat	–	–	Near Threatened	2020	III	Stable	Wild Goat diets consisted of grasses when available but diets shifted to browse during the dry season	November-January
6.	*Capra falconeri*	Chiltan Markhor	–	–	Near Threatened	2014	I	Increasing	Herbivore	December-January
7.	*Caracal caracal*	Caracal	–	–	Least Concern	2014	II	Unknown	Caracals are strictly carnivorous. They prey primarily on birds, rodents and small antelopes	August and December
8.	*Crocidura zarudnyi*	Zarudny's Shrew	–	–	Least Concern	2016	–	Unknown	Insects, slugs, spiders, worms, amphibians and small rodents	March-September
9.	*Eptesicus pachyomus*	Persian Serotine	–	–	Least Concern	2018	–	Unknown	Flies, moths and beetles – particularly chafers and dung beetles	June - July

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITIES Status	Golbal Population Trend	Feeding Guild/Food Items	Breeding Season
10.	*Felis chaus*	Jungle Cat	–	–	Least Concern	2014	II	Decreasing	Prefers small mammals such as gerbils, hares, and rodents. It also hunts birds, fish, frogs, insects and small snakes	January to early February
11.	*Felis margarita*	Sand Cat or Dune Cat	–	–	Least Concern	2014	II	Unknown	Sand cats eat primarily small rodents, occasionally hares, birds, spiders, insects and reptiles. They are fearless snake hunters—their prey can include venomous vipers and other snakes	January- April
12.	*Funambulus pennantii*	Five–striped Palm Squirrel	✓	–	Least Concern	2016	–	Unknown	Omnivore	March - April and July -September
13.	*Gazella bennettii*	Chinkara or Indian Gazelle	–	–	Least Concern	2016	III	Decreasing	Herbivore	Late August to early October
14.	*Gazella subgutturosa*	Goitred Gazelle	–	✓	Vulnerable	2016	–	Decreasing	Herbivore	September- January
15.	*Gerbillus cheesmani*	Cheesman gerbil	✓	–	Not Evaluated	2016	–	Stable	Feed on seeds and grasses	March - May
16.	*Gerbillus gleadowi*	Indian Hairy Footed Gerbil	✓	–	Not Evaluated	2016	–	Decreasing	Feed on seeds and grasses	May - January
17.	*Gerbillus nanus*	Dwarf Gerbil	✓	✓	Least Concern	2016	–	Stable	Feed on seeds and grasses	December- June
18.	*Hemiechinus auritus*	Long Eared Hedgehog	✓	✓	Not Evaluated	2016	–	Unknown	Omnivorous but feeds mainly on small invertebrates and insects	September- July
19.	*Herpestes edwardsii*	India Grey Mongoose	–	–	Least Concern	2015	III	Stable	Feeding on small animals such as rodents, birds,	March and October

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITIES Status	Golbal Population Trend	Feeding Guild/Food Items	Breeding Season
									reptiles, frogs, insects, and worms	
20.	*Hystrix indica*	Indian Crested Porcupine	✓	–	Least Concern	2016	–	Stable	vegetable material of all kinds, including fruits, grains, and roots	February - March
21.	*Jaculus blanfordi*	Three–toed jerboa	✓	–	Not Evaluated	2016	–	Decreasing	The diet consists mainly of leaves and sprouting vegetation in wet seasons and of succulent roots, seeds and grains when rainfall is low or in the summer	March - June
22.	*Lepus capensis*	Cape Hare	–	✓	Least Concern	2018	–	Decreasing	Feeding on grass and various shrubs	January - June
23.	*Mellivora capensis*	Honey Badger	–	–	Least Concern	2015	III	Decreasing	Carnivores; secure most food through active hunting though individuals may scavenge	May - July
24.	*Meriones crassus*	Sundevall's Jird	–	–	Least Concern	2016	–	Unknown	The diet shifts from mainly seeds in the summer to more green vegetation in the winter	May - October
25.	*Meriones hurrianae*	Indian Desert Jird	✓	✓	Least Concern	2016	–	Unknown	Diet is composed essentially of seeds, herbs, and other green food material	March - June
26.	*Meriones libycus*	Liybyan Jird	–	–	Least Concern	2016	–	Stable	Seeds of a wide array of grasses in the wild	March - August
27.	*Meriones persicus*	Persian Jird	–	–	Least Concern	2016	–	Unknown	Seeds of a wide array of grasses in the wild	Late March to early June

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITIES Status	Golbal Population Trend	Feeding Guild/Food Items	Breeding Season
28.	*Mus musculus*	House Mouse	–	–	Least Concern	2016	–	Stable	Insects (beetle larvae, caterpillars, and cockroaches) and meat (carrion) may be taken when available	April -September
29.	*Nesokia indica*	Short–tailed Mole	✓	–	Not Evaluated	2016	–	Unknown	Feeds on leaves and roots of lawn grass	October and November
30.	*Ochotona rufescens*	Afghan Pika	–	–	Least Concern	2016	–	Stable	Eat thistles and other xeric plants	May - June
31.	*Otocolobus manul*	Pallas's Cat	–	–	Least Concern	2019	II	Decreasing	Commonly consume small mammals	December - March
32.	*Ovis vignei*	Afghan Urial	–	–	Vulnerable	2020	I	Decreasing	Herbivore	November - December
33.	*Pipistrellus kuhlii*	Kuhl's Pipistrelle	–	–	Least Concern	2016	–	Unknown	Flies are the main prey of common pipistrelles, with lacewings, mayflies, midges and mosquitoes	March - April
34.	*Rattus norvegicus*	Norway or Brown Rat	–	–	Least Concern	2016	–	Stable	Omnivorous	September - November
35.	*Rattus rattus*	House Rat	–	–	Least Concern	2016	–	Stable	Omnivorous, eating seeds, nuts, vegetables, fruits, insects and invertebrates	April and May
36.	*Salpingotulus michaelis*	Pygmy Jerboa	–	–	Data Deficient	2016	–	Unknown	They feed on wind-blown seeds and succulent leaves of desert-adapted vegetation	Early July to late August
37.	*Sus scrofa*	Wild Boar	–	–	Least Concern	2018	–	Unknown	The majority of their diet is made up of roots, bulbs, seeds, nuts and green plants. However, as opportunistic feeders, they will eat much of what they	November - March

No	Scientific Name	Common Name	ESIA 2010	ESIA 2020	IUCN Status	Published Year	CITIES Status	Golbal Population Trend	Feeding Guild/Food Items	Breeding Season
									come across on the forest floor. This can include carrion, small mammals, birds' eggs, earthworms and other invertebrates	
38.	*Tatera indica*	Indian Gerbil	–	✓	Least Concern		–		Feed on seeds, sprouts, mature plants, ears of corn, and saplings in orchards.	March - May
39.	*Vulpes cana*	Blandford's Fox	–	–	Least Concern	2015	II	Stable	Insectivorous and frugivorous	December and January
40.	*Vulpes rueppellii*	Sand Fox	✓	–	Least Concern	2016	–	Unknown	Rodents, lizards, snakes, birds, and wild fruits	November - January
41.	*Vulpes vulpes*	Red Fox	✓	✓	Least Concern	2016	III	Stable	It is an omnivore and its diet includes fruits, berries and grasses. It also eats birds and small mammals like squirrels, rabbits and mice	Late January or early February

REKO DIQ
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RDMC Authorized Supplier/Contractor's document.
The document is NOT approved until an RDMC Approval stamp has been affixed.

Document No.:	**6105AK023-S411-HD27-0034**	**Rev:**	**A**
Document Title:	**Appendix J - Field Data**		
Issue Date:	**2024-02-23**		

Supplier/Contractor Details

Package/Contract No:	**K023**		
Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix J - Field Data**	**Rev:**	**A**

	2024-02-23	**Review**			
			Sadia Asghar	**Vaqar Zakaria**	**Barbara Wessels**
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix J
Field Data

J.1. Post-Monsoon 2022 Survey

Vegetation

Reko Diq Mine Site

Location ID	Date	Coordinates		Habitat	*Aeluropus lagopoides*		*Anabasis setifera*		*Bromus sp.*		*Calligonum comosum*		*Calligonum polygonide*		*Cenchrus biflorus*		*Citrullus colocynthis*		*Cornulaca monacantha*		*Cynodon dactylon*		*Eleusine compressa*		*Fagonia ovalifolia*	
		Latitude	Longitude		Cover [1]%	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count
E13	9/15/2022	29°9' 30.3"	61°59' 31.2"	Mountain/Hills	0.00	–	0.00	–	0.00	–	157.56	2	0.00	–	0.00	–	0.00	–	216.61	3	0.00	–	0.00	–	2.22	1
E14	9/15/2022	29°8' 54"	61°54' 42.5"	Clayey Plains	0.00	–	9.39	4	0.00	–	0.00	–	0.00	–	0.00	–	13.87	1	0.00	–	0.00	–	0.00	–	0.00	–
E15	9/14/2022	29°10' 12.3"	62°1' 6.7"	Dry Streambeds	3.17	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E16	9/14/2022	29°10' 32.7"	62°2' 8.5"	Gravel Plains	0.00	–	0.00	–	0.00	–	237.20	2	0.00	–	0.25	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E17	9/14/2022	29°12' 47.9"	62°2' 14.1"	Mountain/Hills	0.00	–	0.00	–	0.00	–	94.01	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E18	9/13/2022	29°12' 41.8"	62°8' 1.9"	Sandy Plains/ Sand Dunes	0.00	–	0.00	–	0.00	–	323.99	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.21	1
E19	9/13/2022	29°10' 7.2"	62°6' 16.1"	Mountain/Hills	3.17	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E20	9/14/2022	29°9' 16.3"	62°2' 4.6"	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.50	2	0.00	–	0.00	–	0.00	–	0.00	–	2.74	1
E21	9/15/2022	29°7' 19.9"	62°0' 28.7"	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.29	1	0.00	–	0.00	–	0.29	1

[1] The percentage of plant cover of a sampling location within a selected Study Area is calculated as follows:

- Place three quadrats, each measuring 5m by 5m, along the transect line.
- Estimate the ground covered by live plants within each quadrat.
- Calculate the percentage of plant cover for each individual quadrat.

  To find the average plant cover percentage, use this formula: Average Plant Cover Percentage (%) = (Sum of Individual Percentages) / (Number of Quadrats) X 100

  This formula will give you the average percentage of plant cover based on the estimation within the three quadrats.

Location ID	Date	Coordinates		Habitat	Aeluropus lagopoides		Anabasis setifera		Bromus sp.		Calligonum comosum		Calligonum polygonide		Cenchrus biflorus		Citrullus colocynthis		Cornulaca monacantha		Cynodon dactylon		Eleusine compressa		Fagonia ovalifolia	
		Latitude	Longitude		Cover [1]%	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count
E22	9/14/2022	29°8' 4.4"	62°2' 49.9"	Gravel Plains	0.00	–	2.22	1	0.00	–	24.18	2	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E23	9/13/2022	29°8' 19"	62°6' 3"	Gravel Plains	0.00	–	0.00	–	0.56	2	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.34	3	0.00	–
E24	9/13/2022	29°7' 20.6"	62°7' 5.6"	Gravel Plains	0.00	–	0.00	–	0.00	–	5.96	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.42	2	0.00	–
E25	9/13/2022	29°5' 44.3"	62°6' 19.3"	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.40	3	1.11	4	0.00	–
E26	9/16/2022	29°6' 9.2"	62°5' 4.3"	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E27	9/14/2022	29°6' 46.8"	62°3' 1.3"	Dry Streambeds	0.00	–	0.00	–	0.00	–	60.54	2	0.00	–	0.74	2	0.00	–	0.00	–	0.00	–	0.00	–	1.75	1
E28	9/16/2022	29°6' 36.6"	62°1' 54.9"	Mountain/Hills	0.00	–	0.00	–	0.00	–	140.05	1	0.00	–	0.00	–	0.00	–	2.22	1	0.00	–	0.00	–	0.00	–
E29	9/16/2022	29°5' 15.8"	62°1' 57.1"	Dry Streambeds	0.00	–	0.00	–	0.00	–	14.49	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E30	9/16/2022	29°6' 7"	61°59' 17.1"	Dry Streambeds	0.00	–	0.00	–	0.00	–	148.78	2	7.46	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E31	9/15/2022	29°6' 49.6"	61°57' 50.7"	Gravel Plains	0.00	–	0.00	–	0.00	–	23.04	1	0.00	–	0.42	2	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E32	9/15/2022	29°3' 1"	61°59' 34"	Gravel Plains	0.00	–	14.59	6	0.00	–	5.18	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
Total					**6.33**	**2**	**26.20**	**11**	**0.56**	**2**	**1234.99**	**21**	**7.46**	**1**	**1.90**	**7**	**13.87**	**1**	**219.12**	**5**	**0.40**	**3**	**1.87**	**9**	**7.21**	**5**

Table continue……

Location ID	Date	Coordinates		Habitat	Haloxylon persicum		Haloxylon salcornicom		Haloxylon stocksii		Helitropium zeyloncum		Homoxylon persicum		Panicum turgidum		Tamarix aphylla		Total Cover %	Total count	Species Count
		Latitude	Longitude		Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover%	Count			
E13	9/15/2022	29°9' 30.3"	61°59' 31.2"	Mountain/Hills	69.81	4	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	446.20	10	4
E14	9/15/2022	29°8' 54"	61°54' 42.5"	Clayey Plains	0.00	–	0.00	–	124.82	1	0.00	–	0.00	–	3.73	6	60.50	2	212.31	14	5
E15	9/14/2022	29°10' 12.3"	62°1' 6.7"	Dry Streambeds	11.38	2	3.47	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	18.02	4	3
E16	9/14/2022	29°10' 32.7"	62°2' 8.5"	Gravel Plains	0.00	–	11.80	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	249.25	4	3
E17	9/14/2022	29°12' 47.9"	62°2' 14.1"	Mountain/Hills	209.66	4	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	303.67	7	2
E18	9/13/2022	29°12' 41.8"	62°8' 1.9"	Sandy Plains/ Sand Dunes	0.00	–	28.94	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	353.13	3	3
E19	9/13/2022	29°10' 7.2"	62°6' 16.1"	Mountain/Hills	56.26	12	2.74	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	62.17	14	3
E20	9/14/2022	29°9' 16.3"	62°2' 4.6"	Gravel Plains	107.01	1	3.17	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	113.41	5	4
E21	9/15/2022	29°7' 19.9"	62°0' 28.7"	Dry Streambeds	0.00	–	0.00	–	254.13	4	3.91	2	0.00	–	1.46	10	0.00	–	260.08	18	5
E22	9/14/2022	29°8' 4.4"	62°2' 49.9"	Gravel Plains	26.00	3	14.15	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	66.55	9	4
E23	9/13/2022	29°8' 19"	62°6' 3"	Gravel Plains	55.65	3	0.00	–	6.38	3	0.00	–	0.00	–	0.00	–	0.00	–	62.93	11	4
E24	9/13/2022	29°7' 20.6"	62°7' 5.6"	Gravel Plains	2.74	1	1.54	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	10.66	7	4
E25	9/13/2022	29°5' 44.3"	62°6' 19.3"	Dry Streambeds	0.00	–	0.00	–	23974.37	21	0.00	–	0.00	–	0.00	–	0.00	–	23975.87	28	3
E26	9/16/2022	29°6' 9.2"	62°5' 4.3"	Gravel Plains	0.00	–	61.89	6	8.16	2	0.00	–	0.00	–	0.00	–	0.00	–	70.05	8	2
E27	9/14/2022	29°6' 46.8"	62°3' 1.3"	Dry Streambeds	0.00	–	220.52	9	0.00	–	0.00	–	0.00	–	0.50	2	0.00	–	284.05	16	5
E28	9/16/2022	29°6' 36.6"	62°1' 54.9"	Mountain/Hills	0.00	–	18.16	3	10.15	1	0.00	–	0.00	–	0.00	–	0.00	–	170.58	6	4
E29	9/16/2022	29°5' 15.8"	62°1' 57.1"	Dry Streambeds	0.00	–	0.00	–	193.44	5	0.00	–	0.00	–	0.00	–	0.00	–	207.93	6	2
E30	9/16/2022	29°6' 7"	61°59' 17.1"	Dry Streambeds	0.00	–	0.00	–	54.71	2	0.00	–	0.00	–	0.00	–	0.00	–	210.95	5	3
E31	9/15/2022	29°6' 49.6"	61°57' 50.7"	Gravel Plains	0.00	–	0.00	–	122.73	4	0.00	–	0.00	–	1.33	13	0.00	–	147.52	20	4
E32	9/15/2022	29°3' 1"	61°59' 34"	Gravel Plains	0.00	–	0.00	–	9.89	1	2.22	1	0.00	–	0.00	–	0.00	–	31.88	9	4
Total					**538.53**	**30**	**366.36**	**27**	**24,758.78**	**44**	**6.13**	**3**	**0.00**	**–**	**7.02**	**31**	**60.50**	**2**	**27,257.20**	**204**	**17**

Fan Sediment Water Supply Pipeline Area

Location ID	Date	Coordinates		Habitat	*Aeluropus lapopoides*		*Alhagi maurorum*		*Anabasis setifera*		*Aristida purpurea*		*Azadirachta indica*		*Calligonum comosum*		*Calligonum polygonide*		*Citrullus colocynthis*		*Fagonia ovalifolia*		*Haloxylon persicum*		*Haloxylon salcornicum*	
		Latitude	Longitude		Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count
E1	17/09/20	29°38' 9.1"	61°27' 28"	Clayey Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	165.91	3	0.00	–	0.00	–	0.00	–
E2	17/09/20	29°33' 59.7"	61°31' 30.7"	Clayey Plains	0.00	–	0.61	5	0.00	–	0.00	–	0.00	–	0.00	–	6.13	4	0.23	2	0.00	–	0.00	–	0.00	–
E3	17/09/20	29°31' 43.1"	61°33' 46.2"	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.25	1	0.00	–	0.00	–
E4	17/09/20	29°30' 37.8"	61°31' 26.1"	Dry Streambeds	0.00	–	0.55	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	2.23	3	0.00	–	0.00	–
E5	18/09/20	29°28' 22.7"	61°37' 52.2"	Sandy Plains/ Sand Dunes	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	162.12	5	0.00	–
E6	18/09/20	29°25' 53.7"	61°37' 53.8"	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E7	18/09/20	29°24' 10.4"	61°44' 31.2"	Sandy Plains/ Sand Dunes	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	159.20	2	0.00	–	0.00	–	0.00	–	0.00	–	4.11	1
E8	18/09/20	29°21' 3.4"	61°44' 30.3"	Dry Streambeds	0.39	4	0.00	–	0.00	–	0.00	–	107.01	1	0.00	–	0.00	–	0.00	–	0.00	–	9.31	3	0.00	–
E9	19/09/20	29°19' 20.6"	61°45' 49.6"	Dry Streambeds	0.36	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E10	19/09/20	29°16' 55.3"	61°50' 19.5"	Gravel Plains	0.21	1	0.00	–	0.00	–	1.63	2	0.00	–	0.00	–	0.00	–	0.00	–	6.97	2	262.84	2	0.00	–
E11	19/09/20	29°28' 22.6"	61°23' 15.5"	Mountains/ Hills	0.00	–	0.00	–	32.50	7	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	41.51	7
E12	19/09/20	29°11' 9.3"	61°55' 7.7"	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	32.34	7
MH1	17/09/20	29°28' 22.6"	61°23' 15.5"	Agriculture Areas/ Date Palms	0.00	–	9.00	6	0.00	–	2.53	2	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
Total					**0.96**	**8**	**10.17**	**12**	**32.50**	**7**	**4.16**	**4**	**107.01**	**1**	**159.20**	**2**	**6.13**	**4**	**166.14**	**5**	**9.45**	**6**	**434.27**	**10**	**77.96**	**15**

Table continue……

Location ID	Date	Coordinates		Habitat	Haloxylon stocksii		Helitropium crispum		Panicum turgidum		Peganum harmala		Phoenix dactylifera		Tamarix aphylla		Tribulus terrestris		Vachellia jacquemontii		Zygophyllon sp.		Total Cover %	Total count	Species Count
		Latitude	Longitude		Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count			
E1	17/09/20	29°38' 9.1"	61°27' 28"	Clayey Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	4.36	30	0.00	–	0.00	–	170.28	33	2
E2	17/09/20	29°33' 59.7"	61°31' 30.7"	Clayey Plains	0.00	–	0.51	2	0.00	–	0.00	–	0.00	–	0.00	–	0.63	6	0.00	–	0.00	–	8.11	19	5
E3	17/09/20	29°31' 43.1"	61°33' 46.2"	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.52	3	0.00	–	0.00	–	0.76	4	2
E4	17/09/20	29°30' 37.8"	61°31' 26.1"	Dry Streambeds	0.00	–	0.21	1	0.00	–	0.00	–	0.00	–	0.00	–	0.17	1	0.00	–	0.00	–	3.16	6	6
E5	18/09/20	29°28' 22.7"	61°37' 52.2"	Sandy Plains/ Sand Dunes	24.28	5	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	186.41	10	3
E6	18/09/20	29°25' 53.7"	61°37' 53.8"	Gravel Plains	35.38	10	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	5.23	3	40.61	13	6
E7	18/09/20	29°24' 10.4"	61°44' 31.2"	Sandy Plains/ Sand Dunes	21.57	4	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	4.86	2	0.00	–	0.00	–	189.74	9	0
E8	18/09/20	29°21' 3.4"	61°44' 30.3"	Dry Streambeds	23.33	10	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	140.05	18	4
E9	19/09/20	29°19' 20.6"	61°45' 49.6"	Dry Streambeds	56.02	13	0.00	–	0.79	6	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	57.18	22	3
E10	19/09/20	29°16' 55.3"	61°50' 19.5"	Gravel Plains	4.81	1	0.55	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	277.01	9	6
E11	19/09/20	29°28' 22.6"	61°23' 15.5"	Mountains/Hills	0.00	–	0.00	–	1.07	2	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	75.08	16	3
E12	19/09/20	29°11' 9.3"	61°55' 7.7"	Gravel Plains	73.39	6	0.00	–	2.35	8	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	108.08	21	6
MH1	17/09/20	29°28' 22.6"	61°23' 15.5"	Agriculture Areas/ Date Palms	0.00	–	0.00	–	0.00	–	28.08	6	983.94	2	147.34	4	0.00	–	5.41	6	0.00	–	1176.29	26	6
Total					**238.78**	**49**	**1.27**	**4**	**4.22**	**16**	**28.08**	**6**	**983.94**	**2**	**147.34**	**4**	**10.54**	**42**	**5.41**	**6**	**5.23**	**3**	**2432.8**	**206**	**20**

Access Road to Reko Diq Mine Site

Location ID	Date	Coordinates		Habitat	Aeluropus lagopoides		Aeluropus sp.		Aristida adscensionis		Alhagi maurorum		Anabasis setifera		Calligonium comosum		Calligonum polygonides		Cistanche tubulosa		Cornulaca monacantha		Euphorbiaceae mombasa		Fagonia ovalifolia		Grass sp.		Haloxylon persicum	
		Latitude	Longitude		Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count
E41	9/16/2022	29°0' 22.5"	62°3' 3.8"	Gravel Plains	0.79	8	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E42	9/16/2022	28°58' 53.4"	62°6' 19.9"	Clayey Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E43	9/22/2022	28°57' 43.3"	62°7' 38.4"	Mountain/Hills	0.00	–	0.00	–	0.00	–	0.00	–	5.11	2	0.00	–	5.37	1	0.00	–	16.61	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E44	9/22/2022	28°55' 27.3"	62°11' 32.1"	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	20.15	3	0.00	–	0.00	–	0.00	–	3.17	1	0.00	–	0.00	–	0.00	–
E45	9/23/2022	28°54' 28.5"	62°14' 30"	Gravel Plains	0.00	–	0.00	–	0.92	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E46	9/23/2022	28°51' 34"	62°18' 38.4"	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	78.42	2	0.00	–	0.00	–	0.00	–	0.00	–	2.10	1	0.00	–	0.00	–	0.00	–
E47	9/23/2022	28°50' 27.5"	62°21' 32.7"	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	90.29	7	0.00	–	1.07	1	0.00	–	0.00	–	2.60	1	0.00	–	0.00	–	0.00	–
E48	9/23/2022	28°49' 53"	62°25' 1.7"	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.68	1	0.00	–	9.12	1		
Total					**0.79**	**8**	**0.92**	**3**	**5.11**	**2**	**168.71**	**9**	**25.52**	**4**	**1.07**	**1**	**16.61**	**3**	**8.55**	**4**	**9.12**	**1**	**0.79**	**8**	**0.92**	**3**	**5.11**	**2**	**168.71**	**9**		

Table continue……

Location ID	Date	Coordinates		Habitat	Haloxylon salicornicum		Leptadenia pyrotechnica		Phoenix dactylifera		Salsola stocksii		Stocksia brahuica		Suaeda fruticosa		Tamarix stricta		Tamarix aphylla		Tribulus terrestris		**Total Cover %**	**Total count**	**Species Count**
		Latitude	Longitude		Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count			
E41	9/16/2022	29°0' 22.5"	62°3' 3.8"	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	209.74	1	0.00	–	0.00	–	**210.53**	**9**	**2**
E42	9/16/2022	28°58' 53.4"	62°6' 19.9"	Clayey Plains	18.63	2	0.00	–	0.00	–	141.92	4	0.00	–	0.00	–	25.48	1	83.02	5	0.00	–	**269.05**	**12**	**4**
E43	9/22/2022	28°57' 43.3"	62°7' 38.4"	Mountain/Hills	19.86	2	0.00	–	0.00	–	15.44	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**62.40**	**11**	**5**
E44	9/22/2022	28°55' 27.3"	62°11' 32.1"	Dry Streambeds	0.00	–	0.00	–	0.00	–	78.10	11	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**101.42**	**15**	**3**
E45	9/23/2022	28°54' 28.5"	62°14' 30"	Gravel Plains	0.00	–	0.00	–	0.00	–	39.77	4	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**40.69**	**7**	**2**
E46	9/23/2022	28°51' 34"	62°18' 38.4"	Dry Streambeds	0.00	–	0.00	–	0.00	–	156.41	10	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**236.93**	**13**	**3**
E47	9/23/2022	28°50' 27.5"	62°21' 32.7"	Gravel Plains	0.00	–	0.00	–	0.00	–	53.39	7	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**147.35**	**16**	**4**
E48	9/23/2022	28°49' 53"	62°25' 1.7"	Dry Streambeds	0.00	–	0.00	–	0.00	–	139.74	13	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**149.54**	**15**	**3**
Total					**38.49**	**4**	**624.6**	**52**	**235.23**	**2**	**83.02**	**5**	**38.4**	**4**	**624.76**	**52**	**235.23**	**2**	**83.02**	**5**	**38.49**	**4**	**1217.92**	**98**	**13**

Birds

Reko Diq Mine Site

Location ID	*Date*	*Coordinates*		*Habitat*	*Ammomanes cinctura*	*Iduna caligate*	*Corvus ruficollis*	*Curruca mystacea*	*Ptyonoprogne rupestris*	*Calandrella brachydactyla*	*Alaemon alaudipes*	*Sylvia curruca*	*Athene noctua*	*Cercotrichas galactotes)*	*Ammopardix griseogularis*	*Saxicola maura*	*Anthus trivialis*	***Total***	***Species Count***	***Percentages***
		Latitude	*Longitude*		*Bar–tailed Lark*	*Booted Warbler*	*Brown–necked Raven*	*Menetries's Warbler*	*Crag Martin*	*Greater Short–Toed Lark*	*Hoopoe Lark*	*Lesser Whitethroat*	*Little Owl*	*Rufous–tailed Scrub Robin*	*Seesee Partridge*	*Siberian Stonechat*	*Tree Pipit*			
E13	9/15/2022	29°9' 30.3"	61°59' 31.2"	Mountains/Hills	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E14	9/15/2022	29°8' 54"	61°54' 42.5"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E15	9/14/2022	29°10' 12.3"	62°1' 6.7"	Dry Streambeds	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**	**1**	**1.61**
E16	9/14/2022	29°10' 32.7"	62°2' 8.5"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**	**1**	**1.61**
E17	9/14/2022	29°12' 47.9"	62°2' 14.1"	Mountains/Hills	0	0	0	0	2	0	1	0	1	0	4	0	0	**8**	**4**	**12.90**
E18	9/13/2022	29°12' 41.8"	62°8' 1.9"	Sandy Plains/ Sand Dunes	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E19	9/13/2022	29°10' 7.2"	62°6' 16.1"	Mountains/Hills	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**1.61**
E20	9/14/2022	29°9' 16.3"	62°2' 4.6"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E21	9/15/2022	29°7' 19.9"	62°0' 28.7"	Dry Streambeds	1	0	0	1	0	0	0	1	0	0	0	0	0	**3**	**3**	**4.84**
E22	9/14/2022	29°8' 4.4"	62°2' 49.9"	Mountains/Hills	0	0	4	0	0	0	0	0	0	0	0	0	0	**4**	**1**	**6.45**
E23	9/13/2022	29°8' 19"	62°6' 3"	Gravel Plains	0	0	25	0	0	0	0	0	0	0	0	0	0	**25**	**1**	**40.32**
E24	9/13/2022	29°7' 20.6"	62°7' 5.6"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E25	9/13/2022	29°5' 44.3"	62°6' 19.3"	Dry Streambeds	0	1	0	0	0	0	1	0	0	0	0	0	0	**2**	**2**	**3.23**

Location ID	Date	Coordinates		Habitat	*Ammomanes cinctura*	*Iduna caligate*	*Corvus ruficollis*	*Curruca mystacea*	*Ptyonoprogne rupestris*	*Calandrella brachydactyla*	*Alaemon alaudipes*	*Sylvia curruca*	*Athene noctua*	*Cercotrichas galactotes)*	*Ammopardix griseogularis*	*Saxicola maura*	*Anthus trivialis*	**Total**	**Species Count**	**Percentages**
		Latitude	Longitude		*Bar–tailed Lark*	*Booted Warbler*	*Brown–necked Raven*	*Menetries's Warbler*	*Crag Martin*	*Greater Short–Toed Lark*	*Hoopoe Lark*	*Lesser Whitethroat*	*Little Owl*	*Rufous–tailed Scrub Robin*	*Seesee Partridge*	*Siberian Stonechat*	*Tree Pipit*			
E26	9/16/2022	29°6' 9.2"	62°5' 4.3"	Gravel Plains	0	0	2	0	0	0	0	0	0	0	0	0	0	**2**	**1**	**3.23**
E27	9/14/2022	29°6' 46.8"	62°3' 1.3"	Dry Streambeds	0	0	8	0	0	2	0	2	0	0	0	0	0	**12**	**3**	**19.35**
E28	9/16/2022	29°6' 36.6"	62°1' 54.9"	Mountains/Hills	**0**	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E29	9/16/2022	29°5' 15.8"	62°1' 57.1"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**	**1**	**1.61**
E30	9/16/2022	29°6' 7"	61°59' 17.1"	Dry Streambeds	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**1.61**
E31	9/15/2022	29°6' 49.6"	61°57' 50.7"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E32	9/15/2022	29°3' 1"	61°59' 34"	Gravel Plains	1	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**1.61**
Total					**3**	**1**	**40**	**1**	**2**	**2**	**3**	**3**	**1**	**0**	**4**	**1**	**1**	**62**	**12**	**100**

Fan Sediment Water Supply Pipeline Area

Location ID	Date	Coordinates		Habitat	Curruca nana	Chlamydotis macqueenii	Ammomanes cinctura	Corvus ruficollis	Buteo buteo vulpinus	Ptyonoprogne rupestris	Galerida cristata	Ammomanes deserti	Neophron percnopterus	Caprimulgus aegyptius	Coracias garrulus	Spilopelia senegalensis	Calandrella brachydactyla	Alaemon alaudipes	Oriolus kundoo	Spilopelia senegalensis	Sylvia curruca	Saxicola caprata	Ficedula parva	Pastor roseus	Muscicapa striata	Motacilla alba	Pycnonotus leucotis	Total	Species Count	Percentages2
		Latitude	Longitude		Asian Desert Warbler	Asian Houbara (Macqueen's Bustard)	Bar–tailed Lark	Brown–necked Raven	Common Buzzard	Crag Martin	Crested Lark	Desert Lark	Egyptian Vulture	Eurasian Nightjar	Eurasian Roller	European Bee–eater	Greater Short–Toed Lark	Hoopoe Lark	Indian Golden Oriole	Laughing Dove	Lesser Whitethroat	Pied Bushchat	Red–throated Flycatcher	Rosy Starling	Spotted Flycatcher	White Wagtail	White–eared Bulbul				
E1	9/17/2022	29°38' 9.1"	61°27' 28"	Clayey Plains	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**1.44**
E2	9/17/2022	29°33' 59.7"	61°31' 30.7"	Clayey Plains	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**1.44**
E3	9/17/2022	29°31' 43.1"	61°33' 46.2"	Gravel Plains	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**1.44**
E4	9/17/2022	29°30' 37.8"	61°31' 26.1"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**	**0**
E5	9/18/2022	29°28' 22.7"	61°37' 52.2"	Sandy Plains/ Sand Dunes	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	2	0	0	0	0	0	0	0	**4**	**3**	**5.79**
E6	9/18/2022	29°25' 53.7"	61°37' 53.8"	Gravel Plains	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	**2**	**2**	**2.89**
E7	9/18/2022	29°24' 10.4"	61°44' 31.2"	Sandy Plains/ Sand Dunes	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	**4**	**2**	**5.79**
E8	9/18/2022	29°21' 3.4"	61°44' 30.3"	Dry Streambeds	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**3**	**3**	**4.34**

Location ID	Date	Coordinates		Habitat	Curruca nana	Chlamydotis macqueenii	Ammomanes cinctura	Corvus ruficollis	Buteo buteo vulpinus	Ptyonoprogne rupestris	Galerida cristata	Ammomanes deserti	Neophron percnopterus	Caprimulgus aegyptius	Coracias garrulus	Spilopelia senegalensis	Calandrella brachydactyla	Alaemon alaudipes	Oriolus kundoo	Spilopelia senegalensis	Sylvia curruca	Saxicola caprata	Ficedula parva	Pastor roseus	Muscicapa striata	Motacilla alba	Pycnonotus leucotis	Total	Species Count	Percentages2
		Latitude	Longitude		Asian Desert Warbler	Asian Houbara (Macqueen's Bustard)	Bar–tailed Lark	Brown–necked Raven	Common Buzzard	Crag Martin	Crested Lark	Desert Lark	Egyptian Vulture	Eurasian Nightjar	Eurasian Roller	European Bee–eater	Greater Short–Toed Lark	Hoopoe Lark	Indian Golden Oriole	Laughing Dove	Lesser Whitethroat	Pied Bushchat	Red–throated Flycatcher	Rosy Starling	Spotted Flycatcher	White Wagtail	White–eared Bulbul				
E9	9/19/2022	29°19' 20.6"	61°45' 49.6"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	**1**	**1**	**1.44**
E10	9/19/2022	29°16' 55.3"	61°50' 19.5"	Gravel Plains	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	**4**	**4**	**5.79**
E11	9/19/2022	29°28' 22.6"	61°23' 15.5"	Mountains/Hills	0	0	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**	**2**	**4.34**
E12	9/19/2022	29°11' 9.3"	61°55' 7.7"	Gravel Plains	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**	**2**	**4.34**
MH 1	9/17/2022	29°28' 22.6"	61°23' 15.5"	Agricultural Areas/ Date Palms	0	0	0	0	0	6	1	0	0	0	0	10	0	0	11	2	1	0	1	1	0	1	8	**42**	**10**	**60.8**
Total					**1**	**1**	**1**	**2**	**1**	**6**	**4**	**2**	**2**	**1**	**1**	**10**	**4**	**1**	**11**	**2**	**3**	**1**	**1**	**1**	**3**	**2**	**8**	**69**	**23**	**100**

Access Road to Reko Diq Mine Site

Location ID	Date	Coordinates		Habitat	*Ammomanes cinctura*	*Corvus ruficollis*	*Galerida cristata*	*Caprimulgus europaeus*	*Calandrella brachydactyla*	*Alaemon alaudipes*	Cercotrichas galactotes	Porzana porzana	**Total**	**Species Count**	**Percentages**
		Latitude	*Longitude*		*Bar–tailed Lark*	*Brown–necked Raven*	*Crested Lark*	*Eurasian Nightjar*	*Greater Short–Toed Lark*	*Hoopoe Lark*	*Rufous-tailed Scrub Robin*	*Siberian StoneChat*			
E41	9/16/2022	29°0' 22.5"	62°3' 3.8"	Gravel Plains	0	0	0	0	0	0	0	0	**25**	**2**	**73.53**
E42	9/16/2022	28°58' 53.4"	62°6' 19.9"	Gravel Plains	1	0	0	0	0	0	**1**	**1**	**-**	**-**	**0.00**
E43	9/22/2022	28°57' 43.3"	62°7' 38.4"	Mountain/Hills	0	2	0	0	23	0	0	0	**3**	**3**	**8.82**
E44	9/22/2022	28°55' 27.3"	62°11' 32.1"	Dry Streambeds	0	0	0	0	0	1	0	0	**1**	**1**	**2.94**
E45	9/23/2022	28°54' 28.5"	62°14' 30"	Gravel Plains	0	0	0	0	0	0	0	0	**1**	**1**	**2.94**
E46	9/23/2022	28°51' 34"	62°18' 38.4"	Dry Streambeds	0	0	1	0	0	0	0	0	**1**	**1**	**2.94**
E47	9/23/2022	28°50' 27.5"	62°21' 32.7"	Gravel Plains	0	0	0	0	3	0	0	0	**3**	**1**	**8.82**
E48	9/23/2022	28°49' 53"	62°25' 1.7"	Dry Streambeds	0	0	0	1	0	0	0	0	**-**	**-**	**0.00**
Total					**1**	**2**	**1**	**1**	**26**	**1**	**1**	**1**	**34**	**8**	**100.00**

Herpetofauna

Reko Diq Mine Site

Location ID	*Date*	*Coordinates*		*Habitat*	*Phrynocephalus maculatus*	*Acanthodactylus blanfordii*	*Ophiomorus tridactylus*	*Phrynocephalus ornatus*	*Mesalina watsonana*	*Cyrtopodion scabrum*	*Agamura cruralis*	*Laudakia fusca*	***Total***	***Species Count***	***Percentages***
		Latitude	*Longitude*		*Blacktailed Toad–headed Agama*	*Blanford's Fringe–fingered Lizard*	*Indian Sand–swimmer*	*Ornated Toad–headed Agama*	*Persian Long–tailed Desert Lizard*	*Rough–tailed Bentoed Gecko*	*Spider Gecko*	*Yellow–headed Rock Agama*			
E13	9/15/2022	29°9' 30.3"	61°59' 31.2"	Mountains/Hills	0	0	0	0	0	0	1	0	**1**	**1**	**5.88**
E14	9/15/2022	29°8' 54"	61°54' 42.5"	Gravel Plains	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E15	9/14/2022	29°10' 12.3"	62°1' 6.7"	Dry Streambeds	1	0	0	0	0	0	0	0	**1**	**1**	**5.88**
E16	9/14/2022	29°10' 32.7"	62°2' 8.5"	Gravel Plains	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E17	9/14/2022	29°12' 47.9"	62°2' 14.1"	Mountains/Hills	0	0	0	0	0	1	0	1	**2**	**2**	**11.76**
E18	9/13/2022	29°12' 41.8"	62°8' 1.9"	Sandy Plains/ Sand Dunes	0	0	0	2	0	0	1	0	**3**	**2**	**17.65**
E19	9/13/2022	29°10' 7.2"	62°6' 16.1"	Mountains/Hills	0	0	0	0	0	0	0	1	**1**	**1**	**5.88**
E20	9/14/2022	29°9' 16.3"	62°2' 4.6"	Gravel Plains	2	0	0	0	0	0	0	0	**2**	**1**	**11.76**
E21	9/15/2022	29°7' 19.9"	62°0' 28.7"	Dry Streambeds	1	0	0	0	0	0	0	0	**1**	**1**	**5.88**
E22	9/14/2022	29°8' 4.4"	62°2' 49.9"	Mountains/Hills	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E23	9/13/2022	29°8' 19"	62°6' 3"	Gravel Plains	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E24	9/13/2022	29°7' 20.6"	62°7' 5.6"	Gravel Plains	1	0	0	0	0	0	0	0	**1**	**1**	**5.88**
E25	9/13/2022	29°5' 44.3"	62°6' 19.3"	Dry Streambeds	0	1	0	0	0	0	0	0	**1**	**1**	**5.88**
E26	9/16/2022	29°6' 9.2"	62°5' 4.3"	Gravel Plains	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E27	9/14/2022	29°6' 46.8"	62°3' 1.3"	Dry Streambeds	0	0	0	0	0	0	0	0	**0**	**0**	**–**

Location ID	Date	Coordinates		Habitat	Phrynocephalus maculatus	Acanthodactylus blanfordii	Ophiomorus tridactylus	Phrynocephalus ornatus	Mesalina watsonana	Cyrtopodion scabrum	Agamura cruralis	Laudakia fusca	Total	Species Count	Percentages
		Latitude	Longitude		Blacktailed Toad–headed Agama	Blanford's Fringe–fingered Lizard	Indian Sand–swimmer	Ornated Toad–headed Agama	Persian Long–tailed Desert Lizard	Rough–tailed Bentoed Gecko	Spider Gecko	Yellow–headed Rock Agama			
E28	9/16/2022	29°6' 36.6"	62°1' 54.9"	Mountains/Hills	0	0	0	0	0	0	0	1	**1**	**1**	**5.88**
E29	9/16/2022	29°5' 15.8"	62°1' 57.1"	Dry Streambeds	0	1	0	0	0	0	0	0	**1**	**1**	**5.88**
E30	9/16/2022	29°6' 7"	61°59' 17.1"	Dry Streambeds	1	0	0	0	0	0	0	0	**1**	**1**	**5.88**
E31	9/15/2022	29°6' 49.6"	61°57' 50.7"	Gravel Plains	0	0	0	0	0	0	0	0	**0**	**0**	**–**
E32	9/15/2022	29°3' 1"	61°59' 34"	Gravel Plains	0	0	0	0	1	0	0	0	**1**	**1**	**5.88**
Total					**6**	**2**	**0**	**2**	**1**	**1**	**2**	**3**	**17**	**7**	**100**

Fan Sediment Water Supply Pipeline Area

Location ID	Date	Coordinates		Habitat	Phrynocephalus maculatus	Trapelus agilis	Phrynocephalus euptilopus	Platyceps karelini	Ophiomorus tridactylus	Acanthodactylus micropholis	Eumeces zarudnyi	Psammophis schokari	Phrynocephalus ornatus	Total	Species Count	Percentage
		Latitude	Longitude		Alcoks's/ Chagai Toad–headed Agama	Blacktailed Toad–headed Agama	Brilliant Ground Agama	Gold Skink	Indian Sand–swimmer	Ornated Toad–headed Agama	Schokari Sand Racer	Spotted Desert Racer	Yellowtail Fringe–fingered Lizard			
E1	9/17/2022	29°38' 9.1"	61°27' 28"	Clayey Plains	0	1	0	0	0	0	0	0	0	1	1	4.34
E2	9/17/2022	29°33' 59.7"	61°31' 30.7"	Clayey Plains	0	1	0	0	0	0	0	0	0	1	1	4.34
E3	9/17/2022	29°31' 43.1"	61°33' 46.2"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0
E4	9/17/2022	29°30' 37.8"	61°31' 26.1"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0
E5	9/18/2022	29°28' 22.7"	61°37' 52.2"	Sandy Plains/ Sand Dunes	1	4	0	1	3	0	0	1	1	11	6	47.82
E6	9/18/2022	29°25' 53.7"	61°37' 53.8"	Gravel Plains	0	3	0	0	0	0	0	0	0	3	1	13.04
E7	9/18/2022	29°24' 10.4"	61°44' 31.2"	Sandy Plains/Sand Dunes	0	0	0	0	1	0	0	0	0	1	1	4.34
E8	9/18/2022	29°21' 3.4"	61°44' 30.3"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0
E9	9/19/2022	29°19' 20.6"	61°45' 49.6"	Dry Streambeds	0	0	0	0	0	0	1	0	0	1	1	4.34
E10	9/19/2022	29°16' 55.3"	61°50' 19.5"	Gravel Plains	0	1	0	0	0	0	0	0	0	1	1	4.34
E11	9/19/2022	29°28' 22.6"	61°23' 15.5"	Mountains/Hills	0	0	0	0	0	0	0	0	0	0	0	0
E12	9/19/2022	29°11' 9.3"	61°55' 7.7"	Gravel Plains	0	2	0	0	0	1	0	0	0	3	2	13.04
MH1	9/17/2022	29°28' 22.6"	61°23' 15.5"	Agricultural Areas/ Date Palms	0	0	1	0	0	0	0	0	0	1	1	4.34
Total					**1**	**12**	**1**	**1**	**4**	**1**	**1**	**1**	**1**	**23**	**9**	**100**

Location ID	*Date*	*Coordinates*		*Habitat*	*Phrynocephalus maculatus*	*Acanthodactylus blanfordii*	*Ophiomorus tridactylus*	***Total***	***Species Count***	***Percentages***
		Latitude	*Longitude*		*Blacktailed Toad–headed Agama*	*Blanford's Fringe–fingered Lizard*	*Indian Sand–swimmer*			
E41	9/16/2022	29°0' 22.5"	62°3' 3.8"	Gravel Plains	0	0	0	-	-	0
E42	9/16/2022	28°58' 53.4"	62°6' 19.9"	Gravel Plains	0	0	1	-	-	0
E43	9/22/2022	28°57' 43.3"	62°7' 38.4"	Mountain/Hills	0	0	0	1	1	20
E44	9/22/2022	28°55' 27.3"	62°11' 32.1"	Dry Streambeds	0	1	0	1	1	20
E45	9/23/2022	28°54' 28.5"	62°14' 30"	Gravel Plains	1	0	0	1	1	20
E46	9/23/2022	28°51' 34"	62°18' 38.4"	Dry Streambeds	1	0	0	1	1	20
E47	9/23/2022	28°50' 27.5"	62°21' 32.7"	Gravel Plains	0	0	0	-	-	0
E48	9/23/2022	28°49' 53"	62°25' 1.7"	Dry Streambeds	1	0	0	1	1	20
Total					**3**	**1**	**1**	5	3	100

Access Road to Reko Diq Mine Site

Mammals

Reko Diq Mine Site

Location ID	Date	Coordinates		Habitat	Lepus capensis			Vulpes vulpes			Vulpes rueppellii			Felis margarita			Sighting		Signs		Combine Sighting and Sign	Species Count
					Desert Hare			Red Fox			Ruppell's fox			Sand Cat								
		Latitude	Longitude		Sighting	Signs	Total	Sighting	Signs	Total	Sighting	Signs	Total	Sighting	Signs	Total	Total	Species Count	Total	Species Count	Total	
E13	9/15/2022	29°9' 30.3"	61°59' 31.2"	Mountains/Hills	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
E14	9/15/2022	29°8' 54"	61°54' 42.5"	Gravel Plains	0	0	0	0	3	3	0	0	0	0	0	0	0	1	3	1	3	1
E15	9/14/2022	29°10' 12.3"	62°1' 6.7"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E16	9/14/2022	29°10' 32.7"	62°2' 8.5"	Gravel Plains	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1
E17	9/14/2022	29°12' 47.9"	62°2' 14.1"	Mountains/Hills	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1
E18	9/13/2022	29°12' 41.8"	62°8' 1.9"	Sandy Plains/ Sand Dunes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E19	9/13/2022	29°10' 7.2"	62°6' 16.1"	Mountains/Hills	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1
E20	9/14/2022	29°9' 16.3"	62°2' 4.6"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E21	9/15/2022	29°7' 19.9"	62°0' 28.7"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E22	9/14/2022	29°8' 4.4"	62°2' 49.9"	Mountains/Hills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E23	9/13/2022	29°8' 19"	62°6' 3"	Gravel Plains	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1
E24	9/13/2022	29°7' 20.6"	62°7' 5.6"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E25	9/13/2022	29°5' 44.3"	62°6' 19.3"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E26	9/16/2022	29°6' 9.2"	62°5' 4.3"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E27	9/14/2022	29°6' 46.8"	62°3' 1.3"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E28	9/16/2022	29°6' 36.6"	62°1' 54.9"	Mountains/Hills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Location ID	Date	Coordinates		Habitat	Lepus capensis			Vulpes vulpes			Vulpes rueppellii			Felis margarita			Sighting		Signs		Combine Sighting and Sign	Species Count
					Desert Hare			Red Fox			Ruppell's fox			Sand Cat			Total	Species Count	Total	Species Count	Total	
		Latitude	Longitude		Sighting	Signs	Total	Sighting	Signs	Total	Sighting	Signs	Total	Sighting	Signs	Total						
E29	9/16/2022	29°5' 15.8"	62°1' 57.1"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E30	9/16/2022	29°6' 7"	61°59' 17.1"	Dry Streambeds	0	0	0	0	0	0	1	3	4	0	0	0	1	1	3	1	4	1
E31	9/15/2022	29°6' 49.6"	61°57' 50.7"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E32	9/15/2022	29°3' 1"	61°59' 34"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total					**0**	**1**	**1**	**0**	**5**	**5**	**1**	**4**	**5**	**0**	**1**	**1**	**1**	**7**	**11**	**4**	**12**	**4**

Fan Sediment Water Supply Pipeline Area

Transect ID	Date	Coordinates		Habitat	Vulpus vulpus			Lepus capensis			Vulpes rueppellii			Sighting		Signs		Combine Sighting and Sign	
					Red Fox			Desert Hare			Ruppell's Fox			Total	Species Count	Total	Species Count	Total	Species Count
		Latitude	Longitude		Sighting	Signs	Total	Sighting	Signs	Total	Sighting	Signs	Total						
E1	9/17/2022	29°38' 9.1"	61°27' 28"	Clayey Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E2	9/17/2022	29°33' 59.7"	61°31' 30.7"	Clayey Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E3	9/17/2022	29°31' 43.1"	61°33' 46.2"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E4	9/17/2022	29°30' 37.8"	61°31' 26.1"	Dry Streambeds	0	0	0	0	0	0	0	2	2	0	1	2	1	2	1
E5	9/18/2022	29°28' 22.7"	61°37' 52.2"	Sandy Plains/Sand Dunes	0	2	2	0	0	0	0	0	0	0	1	2	1	2	1
E6	9/18/2022	29°25' 53.7"	61°37' 53.8"	Gravel Plains	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1
E7	9/18/2022	29°24' 10.4"	61°44' 31.2"	Sandy Plains/Sand Dunes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E8	9/18/2022	29°21' 3.4"	61°44' 30.3"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E9	9/19/2022	29°19' 20.6"	61°45' 49.6"	Dry Streambeds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E10	9/19/2022	29°16' 55.3"	61°50' 19.5"	Gravel Plains	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1
E11	9/19/2022	29°28' 22.6"	61°23' 15.5"	Mountains/Hills	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E12	9/19/2022	29°11' 9.3"	61°55' 7.7"	Gravel Plains	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MH1	9/17/2022	29°28' 22.6"	61°23' 15.5"	Agricultural Areas/Date Palms	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total					**0**	**3**	**3**	**0**	**1**	**1**	**0**	**2**	**2**	**0**	**4**	**6**	**3**	**6**	**3**

Access Road to Reko Diq Mine Site

Location ID	Date	Coordinates		Habitat	Lepus capensis			Vulpes vulpes			Sighting		Signs		Combine Sighting and Sign	
					Desert Hare			Red Fox			Total	Species Count	Total	Species Count	Total	Species Count
		Latitude	Longitude		Sighting	Signs	Total	Sighting	Signs	Total						
E41	9/16/2022	29°0' 22.5"	62°3' 3.8"	Gravel Plain	0	0	0	0	0	0	0	0	0	0	0	0
E42	9/16/2022	28°58' 53.4"	62°6' 19.9"	Gravel Plain	0	0	0	0	1	1	0	1	1	1	1	1
E43	9/22/2022	28°57' 43.3"	62°7' 38.4"	Hill/Mountain	0	2	2	0	0	0	0	1	2	1	2	1
E44	9/22/2022	28°55' 27.3"	62°11' 32.1"	Dry Streambed	0	0	0	0	0	0	0	0	0	0	0	0
E45	9/23/2022	28°54' 28.5"	62°14' 30"	Gravel Plain	0	0	0	0	0	0	0	0	0	0	0	0
E46	9/23/2022	28°51' 34"	62°18' 38.4"	Dry Streambed	0	0	0	0	0	0	0	0	0	0	0	0
E47	9/23/2022	28°50' 27.5"	62°21' 32.7"	Gravel Plain	0	0	0	0	0	0	0	0	0	0	0	0
E48	9/23/2022	28°49' 53"	62°25' 1.7"	Dry Streambed	0	0	0	0	0	0	0	0	0	0	0	0
Total					**0**	**2**	**2**	**0**	**1**	**1**	**-**	**2**	**3**	**2**	**3**	**2**

Small Mammals

Location ID	*Date*	*Coordinates*		*Habitat*	*Rhombomys opimus*	*Total*	
		Latitude	*Longitude*		*Great Gerbil*	*Abundance*	*Species Count*
BM1	09/17/22	29°28' 22.7"	61°37' 52.2"	Fan Sediment Water Supply Pipeline Area	-	**-**	**-**
BM2	09/17/22	29°8' 19.0"	62°6' 3.0"	Reko Diq Mine Site	-	**-**	**-**
BM3	09/17/22	29°7' 20.6"	62°7' 5.6"	Reko Diq Mine Site	5	**5**	**1**
BM4	09/17/22	29°5' 44.3"	62°6' 19.3"	Reko Diq Mine Site	2	**2**	**1**
Total					**7**	**7**	**1**

J.2. Spring 2023 Survey

Vegetation

Reko Diq Mine Site

Location ID	Coordinates	Date	Habitat	*Anabasis setifera*		*Aristida adscensionis*		*Calligonum comosum*		*Calligonum polygonoides*		*Cornulaca monacantha*		*Eleusine compressa*		*Haloxylon persicum*		*Haloxylon salicornicum*		*Salsola stocksii*		*Tribulus terrestris*		**Total Cover %**	**Total count**	**Species Count**
				Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count			
E13	29° 9' 31.21" 61° 59' 43.08"	5/2/23	Mountain/Hills	0.00	–	0.00	–	0.00	–	2.10	1	0.00	–	0.00	–	214.53	7	0.00	–	6.20	2	0.00	–	**222.83**	**10**	3
E14	29° 8' 48.03" 61° 54' 48.61"	4/30/23	Clayey Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	104.44	2	151.84	12	0.00	–	**256.28**	**14**	2
E15	29° 10' 4.65" 62° 1' 3.64"	4/30/23	Dry Streambeds	0.00	–	0.14	1	61.16	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	1.11	2	0.00	–	**62.41**	**4**	3
E16	29° 10' 40.22" 62° 1' 55.97"	5/2/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	73.24	4	0.00	–	**73.24**	**4**	4
E17	29° 12' 55.75" 62° 2' 6.3"	5/1/23	Mountain/Hills	0.00	–	0.00	–	0.00	–	0.00	–	0.14	1	0.00	–	150.73	6	0.00	–	0.00	–	0.21	1	**151.08**	**8**	2
E18	29° 12' 32.92" 62° 8' 12.04"	5/1/23	Sandy Plains	0.00	–	0.00	–	72.49	5	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**72.49**	**5**	1
E19	29° 10' 7.17" 62° 6' 3.52"	5/1/23	Mountain/Hills	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	184.96	2	0.00	–	0.67	2	0.00	–	**185.63**	**4**	0
E20	29° 9' 23.55" 62° 1' 56.15"	5/2/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.91	1	0.00	–	**0.91**	**1**	1
E21	29° 7' 17.05" 62° 0' 14.09"	5/3/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	322.12	9	0.00	–	**322.12**	**9**	1
E22	29° 7' 57.42" 62° 2' 12.66"	5/2/23	Mountain/Hills	0.02	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	226.71	2	6.71	4	3.99	4	0.00	–	**237.43**	**11**	4
E23	29° 8' 15.44" 62° 6' 13.9"	5/2/23	Gravel Plains	0.00	–	0.43	11	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.35	2	0.00	–	**0.78**	**13**	2

Location ID	Coordinates	Date	Habitat	*Anabasis setifera*		*Aristida adscensionis*		*Calligonum comosum*		*Calligonum polygonoides*		*Cornulaca monacantha*		*Eleusine compressa*		*Haloxylon persicum*		*Haloxylon salicornicum*		*Salsola stocksii*		*Tribulus terrestris*		**Total Cover %**	**Total count**	**Species Count**
				Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count			
E24	29° 7' 11.89" 62° 7' 1.04"	5/1/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.35	2	0.00	–	0.00	–	0.00	–	0.00	–	**0.35**	**2**	1
E25	29° 5' 37.13" 62° 6' 15.31"	5/2/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	20.72	1	0.00	–	36.34	6	0.00	–	**57.06**	**7**	2
E26	29° 6' 0.83" 62° 5' 10.65"	4/30/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	144.00	1	0.00	–	16.74	6	0.00	–	**160.73**	**7**	2
E27	29° 6' 38.75" 62° 2' 57.56"	5/2/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	382.69	8	0.00	–	**382.69**	**8**	1
E28	29° 6' 24.33" 62° 1' 14.9"	5/2/23	Mountain/Hills	0.00	–	0.00	–	0.00	–	0.00	–	0.67	2	0.00	–	0.00	–	0.73	2	0.00	–	0.00	–	**1.40**	**4**	2
E29	29° 5' 5.42" 62° 1' 15.42"	5/3/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	52.65	7	0.00	–	**52.65**	**7**	1
E30	29° 5' 57.53" 61° 59' 9.88"	5/3/23	Dry Streambeds	0.00	–	0.69	9	0.00	–	221.90	1	0.00	–	0.00	–	0.00	–	0.00	–	52.44	1	0.00	–	**275.03**	**11**	3
E31	29° 6' 44.67" 61° 57' 43.29"	5/3/23	Gravel Plains	0.00	–	0.29	8	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	65.82	4	0.00	–	**66.12**	**12**	2
E32	29° 2' 54.29" 61° 59' 40.47"	5/3/23	Gravel Plains	0.00	–	0.35	2	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	403.49	5	0.00	–	**403.84**	**7**	2
Total				**0.02**	**1**	**1.90**	**31**	**133.65**	**6**	**224.00**	**2**	**0.81**	**3**	**0.35**	**2**	**941.64**	**19**	**111.88**	**8**	**1570.60**	**75**	**0.21**	**1**	**2985.1**	**148**	**10**

Fan Sediment Water Supply Pipeline Area

Location ID	Coordinates	Date	Habitat	Aerva tomentosa		Alhaji maurorum		Aristida adscensionis		Aristida pupurea		Acanthophyllum		Calligonum comosum		Citharelloma lehmannii		Calligonum polygonoides		Citrullus colocynthis		Cornulaca monacantha		Crotalaria burhia		Cynomorium coccineum		Eucalyptus camaldulensis		Fagonia ovalifolia	
				Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count
E1	29° 38' 9.16" 61° 27' 19.43"	4/29/23	Clayey Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.21	1	1.54	1	0.00	–	0.00	–	0.00	–	0.00	–	0.21	1
E2	29° 34' 40.62" 61° 30' 39.88"	4/29/23	Clayey Plains	0.00	–	7.07	12	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	102.07	7	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E3	29° 31' 42.42" 61° 34' 1.09"	4/29/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E4	29° 30' 46.4" 61° 31' 32.53"	4/29/23	Dry Streambeds	0.00	–	0.00	–	0.08	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	2.10	1	0.00	–	0.00	–	0.00	–
E5	29° 28' 30.27" 61° 37' 49.15"	4/29/23	Sandy Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E6	29° 26' 5.3" 61° 37' 59.04"	4/28/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E7	29° 24' 13.57" 61° 44' 26.002"	4/28/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	260.42	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E8	29° 21' 11.35" 61° 44' 26.5"	4/28/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	214.91	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E9	29° 19' 28.11" 61° 45' 47.14"	4/28/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	107.01	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E10	29° 16' 51.46" 61° 50' 27.89"	4/28/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.07	2	0.00	–	252.47	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
E11	29° 14' 42.02" 61° 51' 50.67"	4/30/23	Mountain/Hills	0.00	–	0.00	–	0.14	1	0.00	–	0.44	1	247.29	4	0.55	1	4.99	1	0.00	–	0.94	2	0.00	–	1.07	1	0.00	–	1.40	2
E12	29° 11' 1.26" 61° 55' 11.91"	4/30/23	Gravel Plains	16.99	6	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–
MH1	29° 28' 22.86" 61° 23' 10.34"	4/29/23	Agricultural Area/Date Palms	0.00	–	22.84	12	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	13.87	1	0.00	–	0.00	–	0.00	–	0.00	–	209.74	2	0.00	–
Total				**16.99**	**6**	**29.90**	**24**	**0.22**	**2**	**0.07**	**2**	**0.44**	**1**	**1082.10**	**10**	**0.55**	**1**	**19.07**	**3**	**103.62**	**8**	**0.94**	**2**	**2.10**	**1**	**1.07**	**1**	**209.74**	**2**	**1.61**	**3**

Table continue…….

Location ID	Coordinates	Date	Habitat	Fortuynia bungei		Penicum turgidum		Haloxylon persicum		Haloxylon salicornicum		Heliotropium crispum		Malcolmia scorpioides		Peganum harmala		Phoenix dactylifera		Physorrhynchus chamaeraprostrum		Rumex vasicarius		Salix tetrasperma		Salsola stocksii		Tamarix aphylla		Tribulus terrestris		**Total Cover %**	**Total count**	**Species Count**
				Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count			
E1	29° 38' 9.16" 61° 27' 19.43"	4/29/23	Clayey Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	2.59	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	1.81	9	**6.36**	**15**	5
E2	29° 34' 40.62" 61° 30' 39.88"	4/29/23	Clayey Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.20	2	0.00	–	14.60	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	2.35	2	**126.28**	**26**	5
E3	29° 31' 42.42" 61° 34' 1.09"	4/29/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.06	1	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**0.06**	**1**	1
E4	29° 30' 46.4" 61° 31' 32.53"	4/29/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	1.39	3	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	3.32	3	0.00	–	0.00	–	**6.89**	**8**	4
E5	29° 28' 30.27" 61° 37' 49.15"	4/29/23	Sandy Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	318.16	9	0.00	–	0.00	–	**318.16**	**9**	1
E6	29° 26' 5.3" 61° 37' 59.04"	4/28/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	515.44	13	0.00	–	0.00	–	**515.44**	**13**	1
E7	29° 24' 13.57" 61° 44' 26.002"	4/28/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	58.04	3	0.00	–	0.00	–	**318.46**	**4**	2
E8	29° 21' 11.35" 61° 44' 26.5"	4/28/23	Dry Streambeds	0.00	–	0.00	–	138.69	2	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	322.75	2	0.00	–	0.00	–	**676.34**	**7**	3
E9	29° 19' 28.11" 61° 45' 47.14"	4/28/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	109.51	4	0.00	–	0.00	–	**216.52**	**5**	2
E10	29° 16' 51.46" 61° 50' 27.89"	4/28/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	287.24	2	0.00	–	0.00	–	**539.78**	**5**	3
E11	29° 14' 42.02" 61° 51' 50.67"	4/30/23	Mountain/Hills	1.65	1	0.00	–	0.00	–	134.38	7	0.00	–	0.49	1	0.00	–	0.00	–	0.21	1	0.83	1	0.00	–	0.00	–	0.00	–	0.00	–	**394.38**	**24**	13
E12	29° 11' 1.26" 61° 55' 11.91"	4/30/23	Gravel Plains	0.00	–	0.00	–	0.00	–	7.19	4	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**24.18**	**10**	2
MH1	29° 28' 22.86" 61° 23' 10.34"	4/29/23	Agricultural Area/Date Palms	0.00	–	34.13	4	0.00	–	0.00	–	0.00	–	0.00	–	4.32	2	1573.31	3	0.00	–	0.00	–	20.72	1	0.00	–	80.81	5	0.00	–	**1959.74**	**30**	8
Total				**1.65**	**1**	**34.13**	**4**	**138.69**	**2**	**141.57**	**11**	**1.65**	**6**	**0.49**	**1**	**21.51**	**8**	**1573.31**	**3**	**0.21**	**1**	**0.83**	**1**	**20.72**	**1**	**1614.46**	**36**	**80.81**	**5**	**4.16**	**11**	**5102.6**	**157**	**28**

Access Road to Reko Diq Mine Site

Location ID	Coordinates	Date	Habitat	Aristida adsecensionis		Calligonum polygonoides		Haloxylon persicum		Haloxylon salicornicum		Salsola stocksii		Tamarix aphylla		Tamarix stricta		Total Cover %	Total count	Species Count
				Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count	Cover %	Count			
E41	29° 0' 28.81" 62° 3' 8.65"	5/5/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**0.00**	**5**	**2**
E42	28° 58' 54.75" 62° 6' 19.85"	5/5/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.03	1	0.00	–	0.00	–	**0.00**	**11**	**4**
E43	28° 57' 40.24" 62° 7' 12.06"	5/5/23	Mountain/Hills	0.00	–	0.00	–	0.00	–	0.00	–	0.13	3	0.00	–	0.00	–	**800.00**	**13**	**5**
E44	28° 55' 15.05" 62° 11' 39.22"	5/7/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**200.00**	**8**	**2**
E45	28° 54' 34.44" 62° 14' 23.86"	5/7/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**1100.00**	**2**	**1**
E46	28° 51' 39.99" 62° 18' 41.52"	5/6/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**500.00**	**11**	**2**
E47	28° 50' 32.34" 62° 21' 25.27"	5/7/23	Gravel Plains	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**1200.00**	**5**	**2**
E48	28° 50' 1.13" 62° 25' 0.88"	5/7/23	Dry Streambeds	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	0.00	–	**3800.0**	**12**	**2**
Total				**1529.70**	**2**	**2.45**	**3**	**74.55**	**7**	**2.23**	**7**	**6.80**	**50**	**50.30**	**10**	**303.61**	**2**	**0.00**	**67**	**7**

Birds

Reko Diq Mine Site

Location ID	*Coordinates*	*Date*	*Habitat*	*Sylvia nana*	*Ammomanes cinctura*	*Iduna caligate*	*Corvus ruficollis*	*Corvus corax*	*Ammomanes deserti*	*Calandrella brachydactyla*	*Alaemon alaudipes*	*Acrocephalus melanopogon*	*Cercotrchas galactotes*	***Total***	***Species Count***	***Percentages***
				Asian Desert Warbler	*Bar–tailed Lark*	*Booted Warbler*	*Brown–necked Raven*	*Common Raven*	*Desert Lark*	*Greater Short–toed Lark*	*Hoopoe Lark*	*Moustached Warbler*	*Rufous–tailed Scrub Robin*			
E13	29° 9' 31.21" 61° 59' 43.08"	5/2/2023	Mountain/ Hills	1	–	–	7	–	–	–	–	–	–	**8**	2	**32.00**
E14	29° 8' 48.03" 61° 54' 48.61"	4/30/2023	Clayey Plains	1	–	–	–	–	–	–	–	–	2	**3**	2	**12.00**
E15	29° 10' 4.65" 62° 1' 3.64"	4/30/2023	Dry Streambeds	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
E16	29° 10' 40.22" 62° 1' 55.97"	5/2/2023	Gravel Plains	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
E17	29° 12' 55.75" 62° 2' 6.3"	5/1/2023	Mountain/ Hills	–	–	–	4	–	–	1	–	2	–	**7**	3	**28.00**
E18	29° 12' 32.92" 62° 8' 12.04"	5/1/2023	Sandy Plains	–	–	–	–	3	–	–	–	–	–	**3**	1	**12.00**
E19	29° 10' 7.17" 62° 6' 3.52"	5/1/2023	Mountain/ Hills	–	–	1	–	–	1	–	–	–	–	**2**	2	**8.00**
E20	29° 9' 23.55" 62° 1' 56.15"	5/2/2023	Gravel Plains	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
E21	29° 7' 17.05" 62° 0' 14.09"	5/3/2023	Dry Streambeds	–	–	–	–	–	–	–	1	–	–	**1**	1	**4.00**
E22	29° 7' 57.42" 62° 2' 12.66"	5/2/2023	Mountain/ Hills	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
E23	29° 8' 15.44" 62° 6' 13.9"	5/2/2023	Gravel Plains	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
E24	29° 7' 11.89" 62° 7' 1.04"	5/1/2023	Gravel Plains	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**

Location ID	Coordinates	Date	Habitat	Sylvia nana Asian Desert Warbler	Ammomanes cinctura Bar–tailed Lark	Iduna caligate Booted Warbler	Corvus ruficollis Brown–necked Raven	Corvus corax Common Raven	Ammomanes deserti Desert Lark	Calandrella brachydactyla Greater Short–toed Lark	Alaemon alaudipes Hoopoe Lark	Acrocephalus melanopogon Moustached Warbler	Cercotrchas galactotes Rufous–tailed Scrub Robin	Total	Species Count	Percentages
E25	29° 5' 37.13" 62° 6' 15.31"	5/1/2023	Dry Streambeds	–	–	–	–	–	–	–	–	–	–	–	–	0.00
E26	29° 6' 0.83" 62° 5' 10.65"	4/30/2023	Gravel Plains	–	–	–	–	–	–	–	–	–	–	–	–	0.00
E27	29° 6' 38.75" 62° 2' 57.56"	5/2/2023	Dry Streambeds	–	1	–	–	–	–	–	–	–	–	1	1	4.00
E28	29° 6' 24.33" 62° 1' 14.9"	5/3/2023	Mountain/ Hills	–	–	–	–	–	–	–	–	–	–	–	–	0.00
E29	29° 5' 5.42" 62° 1' 15.42"	5/3/2023	Dry Streambeds	–	–	–	–	–	–	–	–	–	–	–	–	0.00
E30	29° 5' 57.53" 61° 59' 9.88"	5/3/2023	Dry Streambeds	–	–	–	–	–	–	–	–	–	–	–	–	0.00
E31	29° 6' 44.67" 61° 57' 43.29"	5/3/2023	Gravel Plains	–	–	–	–	–	–	–	–	–	–	–	–	0.00
E32	29° 2' 54.29" 61° 59' 40.47"	5/3/2023	Gravel Plains	–	–	–	–	–	–	–	–	–	–	–	–	0.00
Total				**2**	**1**	**1**	**11**	**3**	**1**	**1**	**1**	**2**	**2**	**25**	**10**	**100.00**

Fan Sediment Water Supply Pipeline Area

Location ID	*Coordinates*	*Date*	*Habitat*	*Sylvia nana*	*Hirundo rustica*	*Corvus ruficollis*	*Acrocephalus stentoreus*	*Streptopelia decaocto*	*Ammomanes deserti*	*Coracias garrulus*	*Calandrella brachydactyla*	*Progne chalybea*	*Oenanthe monacha*	*Alaemon alaudipes*	*Oriolus kundoo*	*Acrocephalus melanopogon*	*Pycnonotus cafer*	*Pastor roseus*	*Monticola saxatilis*	*Pycnonotus leucotis*	**Total**	**Species Count**	**Percentages**
				Asian Desert Warbler	*Barn Swallow*	*Brown–necked Raven*	*Clamorous Reed Warbler*	*Collared Dove*	*Desert Lark*	*European Roller*	*Greater Short–toed Lark*	*Grey–breasted Martin*	*Hooded Wheatear*	*Hoopoe Lark*	*Indian Golden Oriole*	*Moustached Warbler*	*Red Vented Bulbul*	*Rosy Starling*	*Rufous–tailed Rock Thrush*	*White–eared Bulbul*			
E1	29° 38' 9.16" 61° 27' 19.43"	4/29/2023	Clayey Plains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
E2	29° 34' 40.62" 61° 30' 39.88"	4/29/2023	Clayey Plains	–	–	–	1	–	–	–	–	–	–	5	–	–	–	–	–	–	**6**	2	**12.00**
E3	29° 31' 42.42" 61° 34' 1.09"	4/29/2023	Gravel Plains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
E4	29° 30' 46.4" 61° 31' 32.53"	4/29/2023	Dry Streambeds	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
E5	29° 28' 30.27" 61° 37' 49.15"	4/29/2023	Sandy Plains	–	–	–	–	–	–	–	–	1	–	1	–	–	–	–	–	–	**2**	2	**4.00**
E6	29° 26' 5.3" 61° 37' 59.04"	4/28/2023	Dry Streambeds	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
E7	29° 24' 13.57" 61° 44' 26.002"	4/28/2023	Gravel Plains	–	–	–	–	–	–	4	1	–	–	–	–	–	–	–	–	–	**5**	2	**10.00**
E8	29° 21' 11.35" 61° 44' 26.5"	4/28/2023	Dry Streambeds	–	–	1	–	–	4	–	–	–	–	–	–	–	–	–	–	–	**5**	2	**10.00**

Location ID	Coordinates	Date	Habitat	Sylvia nana / Asian Desert Warbler	Hirundo rustica / Barn Swallow	Corvus ruficollis / Brown–necked Raven	Acrocephalus stentoreus / Clamorous Reed Warbler	Streptopelia decaocto / Collared Dove	Ammomanes deserti / Desert Lark	Coracias garrulus / European Roller	Calandrella brachydactyla / Greater Short–toed Lark	Progne chalybea / Grey–breasted Martin	Oenanthe monacha / Hooded Wheatear	Alaemon alaudipes / Hoopoe Lark	Oriolus kundoo / Indian Golden Oriole	Acrocephalus melanopogon / Moustached Warbler	Pycnonotus cafer / Red Vented Bulbul	Pastor roseus / Rosy Starling	Monticola saxatilis / Rufous–tailed Rock Thrush	Pycnonotus leucotis / White–eared Bulbul	**Total**	**Species Count**	**Percentages**
E9	29° 19' 28.11" 61° 45' 47.14"	4/28/2023	Dry Streambeds	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
E10	29° 16' 51.46" 61° 50' 27.89"	4/28/2023	Gravel Plains	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**2**	1	**4.00**
E11	29° 14' 42.02" 61° 51' 50.67"	4/30/2023	Mountain/Hills	2	–	2	–	–	1	–	–	–	1	–	–	–	–	–	1	–	**7**	5	**14.00**
E12	29° 11' 1.26" 61° 55' 11.91"	4/30/2023	Gravel Plains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	**–**	–	**0.00**
MH1	29° 28' 22.86" 61° 23' 10.34"	4/29/2023	Agricultural Area/ Date Palms	1	3	–	–	4	–	–	–	–	–	5	1	1	4	1	–	3	**23**	9	**46.00**
Total				**3**	**3**	**5**	**1**	**4**	**5**	**4**	**1**	**1**	**1**	**11**	**1**	**1**	**4**	**1**	**1**	**3**	**50**	**17**	**100.00**

Access Road to Reko Diq Mine Site

Location ID	*Coordinates*	*Date*	*Habitat*	*Hirundo rustica*	*Calandrella brachydactyla*	*Oriolus kundoo*	*Cercotrchas galactotes*	***Total***	***Species Count***	***Percentages***
				Barn Swallow	*Greater Short–toed Lark*	*Indian Golden Oriole*	*Rufous–tailed Scrub Robin*			
E41	29° 0' 28.81" 62° 3' 8.65"	5/5/2023	Dry Streambeds	–	–	–	–	**-**	**-**	**0**
E42	28° 58' 54.75" 62° 6' 19.85"	5/5/2023	Dry Streambeds	–	1	–	–	**1**	**1**	**25**
E43	28° 57' 40.24" 62° 7' 12.06"	5/5/2023	Mountain/Hills	–	–	–	–	**-**	**-**	**0**
E44	28° 55' 15.05" 62° 11' 39.22"	5/7/2023	Dry Streambeds	–	–	1	–	**1**	**1**	**25**
E45	28° 54' 34.44" 62° 14' 23.86"	5/7/2023	Gravel Plains	–	–	–	–	**-**	**-**	**0**
E46	28° 51' 39.99" 62° 18' 41.52"	5/7/2023	Dry Streambeds	–	–	–	–	**-**	**-**	**0**
E47	28° 50' 32.34" 62° 21' 25.27"	5/7/2023	Gravel Plains	–	–	–	–	**-**	**-**	**0**
E48	28° 50' 1.13" 62° 25' 0.88"	5/7/2023	Dry Streambeds	1	–	–	1	**2**	**2**	**50**
Total				**1**	**1**	**1**	**1**	**4**	**4**	**100**

Herpetofauna

Reko Diq Mine Site

Location ID	*Coordinates*	*Date*	*Habitat*	*Eremias sp.*	*Phrynocephalus clarkorum*	*Phrynocephalus luteoguttatus*	*Phrynocephalus maculatus*	***Total***	***Species Count***
				Racerunner	*Clark's Toad–headed Agama*	*Yellow–speckled Toad–headed Agama*	*Black–tailed Toadheaded Agama*		
E13	29° 9' 31.21" 61° 59' 43.08"	5/2/2023	Mountain/Hills	–	–	–	–	**–**	–
E14	29° 8' 48.03" 61° 54' 48.61"	4/30/2023	Clayey Plains	1	–	–	–	**1**	1
E15	29° 10' 4.65" 62° 1' 3.64"	4/30/2023	Dry Streambeds	–	–	–	–	**–**	–
E16	29° 10' 40.22" 62° 1' 55.97"	5/2/2023	Gravel Plains	–	–	–	–	**–**	–
E17	29° 12' 55.75" 62° 2' 6.3"	5/1/2023	Mountain/Hills	–	3	1	–	**4**	2
E18	29° 12' 32.92" 62° 8' 12.04"	5/1/2023	Sandy Plains	–	–	–	–	**–**	–
E19	29° 10' 7.17" 62° 6' 3.52"	5/1/2023	Mountain/Hills	–	–	–	–	**–**	–
E20	29° 9' 23.55" 62° 1' 56.15"	5/2/2023	Gravel Plains	–	–	–	–	**–**	–
E21	29° 7' 17.05" 62° 0' 14.09"	5/3/2023	Dry Streambeds	–	–	–	–	**–**	–
E22	29° 7' 57.42" 62° 2' 12.66"	5/2/2023	Mountain/Hills	–	1	–	–	**1**	1
E23	29° 8' 15.44" 62° 6' 13.9"	5/2/2023	Gravel Plains	–	–	–	–	**–**	–

Location ID	*Coordinates*	*Date*	*Habitat*	*Eremias sp.*	*Phrynocephalus clarkorum*	*Phrynocephalus luteoguttatus*	*Phrynocephalus maculatus*	***Total***	***Species Count***
				Racerunner	*Clark's Toad–headed Agama*	*Yellow–speckled Toad–headed Agama*	*Black–tailed Toadheaded Agama*		
E24	29° 7' 11.89" 62° 7' 1.04"	5/1/2023	Gravel Plains	–	–	–	–	**–**	–
E25	29° 5' 37.13" 62° 6' 15.31"	5/1/2023	Dry Streambeds	–	–	–	–	**–**	–
E26	29° 6' 0.83" 62° 5' 10.65"	4/30/2023	Gravel Plains	–	–	–	–	**–**	–
E27	29° 6' 38.75" 62° 2' 57.56"	5/2/2023	Dry Streambeds	–	–	–	–	**–**	–
E28	29° 6' 24.33" 62° 1' 14.9"	5/3/2023	Mountain/Hills	–	–	–	–	**–**	–
E29	29° 5' 5.42" 62° 1' 15.42"	5/3/2023	Dry Streambeds	1	–	–	–	**1**	1
E30	29° 5' 57.53" 61° 59' 9.88"	5/3/2023	Dry Streambeds	–	–	–	1	**1**	1
E31	29° 6' 44.67" 61° 57' 43.29"	5/3/2023	Gravel Plains	–	–	–	–	**–**	–
E32	29° 2' 54.29" 61° 59' 40.47"	5/3/2023	Gravel Plains	–	–	–	–	**–**	–
Total				**2**	**4**	**1**	**1**	**8**	**4**

Fan Sediment Water Supply Pipeline Area

Location ID	Coordinates	Date	Habitat	*Phrynocephalus maculatus*	*Psammophis schokari*	*Eremias cf. scripta*	*Ophiomorus tridactylus*	*Echis carinatus multisquamatus*	*Phrynocephalus ornatus*	Total	Species Count	Percentages
				Blacktailed Toadheaded Agama	*Schokari Sand Racer*	*Sand Racerunner*	*Indian Sandswimmer*	*Saw–scaled Viper*	*Ornated Toadheaded Agama*			
E1	29° 38' 9.16" 61° 27' 19.43"	4/29/2023	Clayey Plains	1	–	–	–	–	–	**1**	1	**5.00**
E2	29° 34' 40.62" 61° 30' 39.88"	4/29/2023	Clayey Plains	2	–	–	–	–	–	**2**	1	**10.00**
E3	29° 31' 42.42" 61° 34' 1.09"	4/29/2023	Gravel Plains	–	–	–	–	–	–	**–**	–	**0.00**
E4	29° 30' 46.4" 61° 31' 32.53"	4/29/2023	Dry Streambeds	–	–	–	–	–	–	**–**	–	**0.00**
E5	29° 28' 30.27" 61° 37' 49.15"	4/29/2023	Sandy Plains	3	–	–	2	–	–	**5**	2	**25.00**
E6	29° 26' 5.3" 61° 37' 59.04"	4/28/2023	Dry Streambeds	1	–	–	–	–	–	**1**	1	**5.00**
E7	29° 24' 13.57" 61° 44' 26.002"	4/28/2023	Gravel Plains	1	–	–	–	–	–	**1**	1	**5.00**
E8	29° 21' 11.35" 61° 44' 26.5"	4/28/2023	Dry Streambeds	2	–	1	–	–	–	**3**	2	**15.00**
E9	29° 19' 28.11" 61° 45' 47.14"	4/28/2023	Dry Streambeds	2	–	–	–	–	–	**2**	1	**10.00**
E10	29° 16' 51.46" 61° 50' 27.89"	4/28/2023	Gravel Plains	1	1	–	–	–	–	**2**	2	**10.00**
E11	29° 14' 42.02" 61° 51' 50.67"	4/30/2023	Mountain/Hills	–	–	–	–	–	–	**–**	–	**0.00**
E12	29° 11' 1.26" 61° 55' 11.91"	4/30/2023	Gravel Plains	1	–	–	–	–	1	**2**	2	**10.00**
MH1	29° 28' 22.86" 61° 23' 10.34"	4/29/2023	Agricultural Area/ Date Palms	–	–	–	–	1	–	**1**	1	**5.00**
Total				**14**	**1**	**1**	**2**	**1**	**1**	**20**	**6**	**85.00**

Access Road to Reko Diq Mine Site

Location ID	*Coordinates*	*Date*	*Habitat*	*Phrynocephalus maculatus*	*Acanthodactylus blanfordii*	*Phrynocephalus clarkorum*	*Ophiomorus tridactylus*	*Eremias sp.*	***Total***	***Species Count***	***Percentages***
				Blacktailed Toadheaded Agama	*Blanford's Fringefingered Lizard*	*Clark's Toad–headed Agama*	*Indian Sandswimmer*	*Racerunner*			
E41	29° 0' 28.81" 62° 3' 8.65"	5/5/2023	Dry Streambeds	2	–	–	–	–	2	1	20
E42	28° 58' 54.75" 62° 6' 19.85"	5/5/2023	Dry Streambeds	–	–	–	–	–	–	–	0
E43	28° 57' 40.24" 62° 7' 12.06"	5/5/2023	Mountain/Hills	–	–	1	1	–	2	2	20
E44	28° 55' 15.05" 62° 11' 39.22"	5/7/2023	Dry Streambeds	–	–	–	–	–	–	–	0
E45	28° 54' 34.44" 62° 14' 23.86"	5/7/2023	Gravel Plains	–	–	–	–	–	–	–	0
E46	28° 51' 39.99" 62° 18' 41.52"	5/7/2023	Dry Streambeds	–	–	–	–	3	3	1	30
E47	28° 50' 32.34" 62° 21' 25.27"	5/7/2023	Gravel Plains	–	–	–	–	–	–	–	0
E48	28° 50' 1.13" 62° 25' 0.88"	5/7/2023	Dry Streambeds	–	2	–	–	1	3	2	30
Total				**2**	**2**	**1**	**1**	**4**	10	5	100

Mammals

Reko Diq Mine Site

Location ID	*Coordinates*	*Date*	*Habitat*	*Lepus capensis*			*Vulpes vulpes*			*Felis margarita*			***Sighting***		***Signs***		***Combine Sighting and Sign***	
				Cape Hare			*Red Fox*			*Sand Cat*			***Total***	***Species Count***	***Total***	***Species Count***	***Total***	***Species Count***
				Sighting	*Signs*	***Total***	*Sighting*	*Signs*	***Total***	*Sighting*	*Signs*	***Total***						
E13	29° 9' 31.21" 61° 59' 43.08"	05/02/23	Mountain/ Hills	–	2	**2**	–	1	**1**	–	–	**–**	–	**–**	**3**	**2**	**3**	**2**
E14	29° 8' 48.03" 61° 54' 48.61"	04/30/23	Clayey Plains	–	–	**–**	–	–	**–**	–	1	**1**	–	**–**	**1**	**1**	**1**	**1**
E15	29° 10' 4.65" 62° 1' 3.64"	04/30/23	Dry Streambeds	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E16	29° 10' 40.22" 62° 1' 55.97"	05/02/23	Gravel Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E17	29° 12' 55.75" 62° 2' 6.3"	05/01/23	Mountain/Hills	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E18	29° 12' 32.92" 62° 8' 12.04"	05/01/23	Sandy Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E19	29° 10' 7.17" 62° 6' 3.52"	05/01/23	Mountain/Hills	–	3	**3**	–	1	**1**	–	1	**1**	–	**–**	**5**	**3**	**5**	**3**
E20	29° 9' 23.55" 62° 1' 56.15"	05/02/23	Gravel Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E21	29° 7' 17.05" 62° 0' 14.09"	05/03/23	Dry Streambeds	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E22	29° 7' 57.42" 62° 2' 12.66"	05/02/23	Mountain/Hills	–	1	**1**	–	–	**–**	–	–	**–**	–	**–**	**1**	**1**	**1**	**1**
E23	29° 8' 15.44" 62° 6' 13.9"	05/02/23	Gravel Plains	–	–	**–**	–	1	**1**	–	–	**–**	–	**–**	**1**	**1**	**1**	**1**
E24	29° 7' 11.89" 62° 7' 1.04"	05/01/23	Gravel Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E25	29° 5' 37.13" 62° 6' 15.31"	05/01/23	Dry Streambeds	–	–	**–**	–	1	**1**	–	–	**–**	–	**–**	**1**	**1**	**1**	**1**

Location ID	Coordinates	Date	Habitat	Lepus capensis			Vulpes vulpes			Felis margarita			Sighting		Signs		Combine Sighting and Sign	
				Cape Hare			Red Fox			Sand Cat			Total	Species Count	Total	Species Count	Total	Species Count
				Sighting	Signs	Total	Sighting	Signs	Total	Sighting	Signs	Total						
E26	29° 6' 0.83" 62° 5' 10.65"	04/30/23	Gravel Plains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E27	29° 6' 38.75" 62° 2' 57.56"	05/02/23	Dry Streambeds	–	1	1	–	–	–	–	–	–	–	–	1	1	1	1
E28	29° 6' 24.33" 62° 1' 14.9"	05/03/23	Mountain/Hills	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E29	29° 5' 5.42" 62° 1' 15.42"	05/03/23	Dry Streambeds	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E30	29° 5' 57.53" 61° 59' 9.88"	05/03/23	Dry Streambeds	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E31	29° 6' 44.67" 61° 57' 43.29"	05/03/23	Gravel Plains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
E32	29° 2' 54.29" 61° 59' 40.47"	05/03/23	Gravel Plains	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Total				–	7	7	–	4	4	–	2	2	–	–	13	3	13	3

Fan Sediment Water Supply Pipeline Area

Location ID	Coordinates	Date	Habitat	*Lepus capensis*			*Gazella subgutturosa*			*Hemiechinus auritus*			*Vulpes vulpes*			*Vulpes rueppellii*			*Felis margarita*			**Sighting**		**Signs**		**Combine Sighting and Sign**	
				Cape Hare			Goitered Gazelle			Long Eared Hedgehoge			Red Fox			Ruppel Fox			Sand Cat								
				Sighting	*Signs*	**Total**	*Sighting*	*Signs*	**Total**	*Sighting*	*Signs*	**Total**	*Sighting*	*Signs*	**Total**	*Sighting*	*Signs*	**Total**	*Sighting*	*Signs*	**Total**	**Total**	**Species Count**	**Total**	**Species Count**	**Total**	**Species Count**
E1	29° 38' 9.16" 61° 27' 19.43"	04/29/23	Clayey Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E2	29° 34' 40.62" 61° 30' 39.88"	04/29/23	Clayey Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E3	29° 31' 42.42" 61° 34' 1.09"	04/29/23	Gravel Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E4	29° 30' 46.4" 61° 31' 32.53"	04/29/23	Dry Streambeds	–	–	**–**	–	2	**2**	–	–	**–**	–	–	**–**	–	1	**1**	–	–	**–**	–	**–**	**3**	**2**	**3**	**2**
E5	29° 28' 30.27" 61° 37' 49.15"	04/29/23	Sandy Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	1	**1**	–	–	**–**	–	–	**–**	–	**–**	**1**	**1**	**1**	**1**
E6	29° 26' 5.3" 61° 37' 59.04"	04/28/23	Dry Streambeds	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	**–**	**–**	**–**	**–**	**–**
E7	29° 24' 13.57" 61° 44' 26.002"	04/28/23	Gravel Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	1	**1**	–	–	**–**	–	–	**–**	–	**–**	**1**	**1**	**1**	**1**
E8	29° 21' 11.35" 61° 44' 26.5"	04/28/23	Dry Streambeds	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	1	**1**	–	**–**	**1**	**1**	**1**	**1**
E9	29° 19' 28.11" 61° 45' 47.14"	04/28/23	Dry Streambeds	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	–	**–**	–	1	**1**	–	**–**	**1**	**1**	**1**	**1**
E10	29° 16' 51.46" 61° 50' 27.89"	04/28/23	Gravel Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	1	**1**	–	–	**–**	–	–	**–**	–	**–**	**1**	**1**	**1**	**1**

Location ID	Coordinates	Date	Habitat	*Lepus capensis*			*Gazella subgutturosa*			*Hemiechinus auritus*			*Vulpes vulpes*			*Vulpes rueppellii*			*Felis margarita*			**Sighting**		**Signs**		**Combine Sighting and Sign**	
				Cape Hare			Goitered Gazelle			Long Eared Hedgehoge			Red Fox			Ruppel Fox			Sand Cat								
				Sighting	*Signs*	**Total**	*Sighting*	*Signs*	**Total**	*Sighting*	*Signs*	**Total**	*Sighting*	*Signs*	**Total**	*Sighting*	*Signs*	**Total**	*Sighting*	*Signs*	**Total**	**Total**	**Species Count**	**Total**	**Species Count**	**Total**	**Species Count**
E11	29° 14' 42.02" 61° 51' 50.67"	04/30/23	Mountain/ Hills	–	2	**2**	–	–	**–**	–	–	**–**	–	–	**–**	–	1	**1**	–	1	**1**	–	**–**	**4**	**3**	**4**	**3**
E12	29° 11' 1.26" 61° 55' 11.91"	04/30/23	Gravel Plains	–	–	**–**	–	–	**–**	–	–	**–**	–	1	**1**	–	–	**–**	–	–	**–**	–	**–**	**1**	**1**	**1**	**1**
MH1	29° 28' 22.86" 61° 23' 10.34"	04/29/23	Agricultural Area/ Date Palms	–	–	**–**	–	–	**–**	–	1	**1**	–	1	**1**	–	–	**–**	–	–	**–**	–	**–**	**2**	**2**	**2**	**2**
Total				**–**	**2**	**2**	**–**	**2**	**2**	**–**	**1**	**1**	**–**	**5**	**5**	**–**	**2**	**2**	**–**	**3**	**3**	**–**	**–**	**15**	**6**	**15**	**6**

Access Road to Reko Diq Mine Site

Location ID	Coordinates	Date	Habitat	Lepus capensis			Vulpes vulpes			Felis margarita			Sighting		Signs		Combine Sighting and Sign	
				Cape Hare			Red Fox			Sand Cat			Total	Species Count	Total	Species Count	Total	Species Count
				Sighting	Signs	Total	Sighting	Signs	Total	Sighting	Signs	Total						
E41	29° 0' 28.81" 62° 3' 8.65"	05/05/23	Dry Streambeds	–	1	1	–	–	–	–	1	1	-	-	2	2	2	2
E42	28° 58' 54.75" 62° 6' 19.85"	05/05/23	Dry Streambeds	–	–	–	–	1	1	–	–	–	-	-	1	1	1	1
E43	28° 57' 40.24" 62° 7' 12.06"	05/05/23	Mountain/Hills	–	1	1	–	–	–	–	–	–	-	-	1	1	1	1
E44	28° 55' 15.05" 62° 11' 39.22"	05/07/23	Dry Streambeds	–	–	–	–	1	1	–	–	–	-	-	1	1	1	1
E45	28° 54' 34.44" 62° 14' 23.86"	05/07/23	Gravel Plains	–	–	–	–	–	–	–	–	–	-	-	-	-	-	-
E46	28° 51' 39.99" 62° 18' 41.52"	05/07/23	Dry Streambeds	–	–	–	–	–	–	–	–	–	-	-	-	-	-	-
E47	28° 50' 32.34" 62° 21' 25.27"	05/07/23	Gravel Plains	–	–	–	–	–	–	–	–	–	-	-	-	-	-	-
E48	28° 50' 1.13" 62° 25' 0.88"	05/07/23	Dry Streambeds	–	–	–	–	–	–	–	–	–	-	-	-	-	-	-
Total				-	2	2	-	2	2	-	1	1	-	0	5	3	5	3

Small Mammals

Location ID	*Coordinates*	*Date*	*Habitat*	*Rhombomys opimus*			***Total***	
				Great Gerbil			***Abundance***	***Species Count***
				Sighting	*Signs*	***Total***		
BM1	29°28' 22.7" 61°37' 52.2"	04/28/23	Built-up Areas	5	–	**5**	**5**	**1**
BM2	29°5' 44.3" 62°6' 19.3"	05/02/23	Built-up Areas	1	–	**1**	**1**	**1**
BM3	29° 6'55.04” 62° 6'34.87"	05/01/23	Clayey Plains	2	–	**2**	**2**	**1**
BM4	29° 8'23.29" 62° 6'49.29"	05/03/23	Built-up Areas	1	–	**1**	**1**	**1**
Total				**9**	**–**	**9**	**11**	**1**

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REV	Date	Reason For Issue	Prepared By	Checked By (Discipline Lead)	Approved By (Functional Manager)
	2024-02-23	Review	Sadia Asghar	Vaqar Zakaria	Barbara Wessels
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Appendix K
Results of Post-Monsoon 2022 and Spring 2023 Surveys and their Comparison with Previous Surveys

K.1. Results of Post-Monsoon 2022 Survey and its Comparison with Previous Surveys

This appendix presents the comparisons of the results of Post-Monsoon 2022 Survey with surveys conducted in November 2008, September 2009 and August 2020 referred to as Previous Surveys.

The results of the Post-Monsoon 2022 Survey (conducted in September-October 2022) for common sampling locations are compared with Previous Surveys that were carried out in similar seasons i.e., November 2008, September 2009, and August 2020 surveys. The weather conditions were almost comparable with the current survey season, therefore, the results for common sampling locations using common sampling method were used for the comparison with these surveys. Results for terrestrial ecological resources are only compared for these surveys. The comparison is based on the line transect sampling method for vegetation, birds, mammals, and herpetofauna while the comparison for small mammals is based on the results of Sherman Trapping.

A total of 41 sampling locations were sampled during the Post-Monsoon 2022 Survey. Of these, 27 sampling locations are common with Previous Surveys, and the results of these sampling locations are used for comparison.

Ecological resources that were sampled include terrestrial flora, mammals, birds, herpetofauna, small mammals, and invertebrates. The survey for vegetation, birds, mammals, herpetofauna, and small mammals was conducted in November 2008 and September 2009. In the August 2020 Survey, the vegetation, birds, mammals, and herpetofauna survey was conducted at two project facilities i.e., The proposed Reko Diq Mine Site and Fan Sediment Water Supply Pipeline Area.

Table 1 provides comparisons of the total number of common sampling locations for each area/site where sampling was conducted during the Previous Surveys and Post-Monsoon 2022 Survey.

Table 2 provides sampled ecological resources in each survey, along with common and total sampling locations.

Figure 1 provides a total of 27 common sampling locations on the map.

Table 1: Common Sampling Locations Between Post-Monsoon 2022 and Previous Surveys

Project Facilities	*Total Sampling Locations in Previous Surveys*			*Post-Monsoon 2022 Survey*	*Common Location for the two Surveys*
	November 2008	*September 2009*	*August 2020*		
Fan Sediment Water Supply Pipeline Area	15	6	6	13	10
Proposed Reko Diq Mine Site	6	4	7	20	10
Access Road to the proposed Reko Diq Mine Site	27	11	-	8	7
Total	**48**	**21**	**13**	**41**	**27**

Table 2: Number of Total and Common Sampling Locations for Ecological Resources

Survey	*Ecological Resources*	*Project Facilities Sampled*	*Total Sampling Locations*	*Common Sampling Locations*
November 2008 Survey	Vegetation, birds, mammals, herpetofauna, and small mammals	Fan Sediment Water Supply Pipeline Area, Proposed Reko Diq Mine Site, and Access Road to Mine Site	48	17
September 2009 Survey	Birds, mammals, herpetofauna, and small mammals	Fan Sediment Water Supply Pipeline Area, Proposed Reko Diq Mine Site, and Access Road to Mine Site	21	9
August 2020 Survey	Vegetation, birds, mammals, and herpetofauna	Fan Sediment Water Supply Pipeline Area and Proposed Reko Diq Mine Site	13	8
Post-Monsoon 2022 Survey	Flora, mammals, birds, herpetofauna, small mammals, invertebrates, freshwater fish, and macroinvertebrates.	Fan Sediment Water Supply Pipeline Area, Proposed Reko Diq Mine Site, and Access Road to Mine Site	41	27

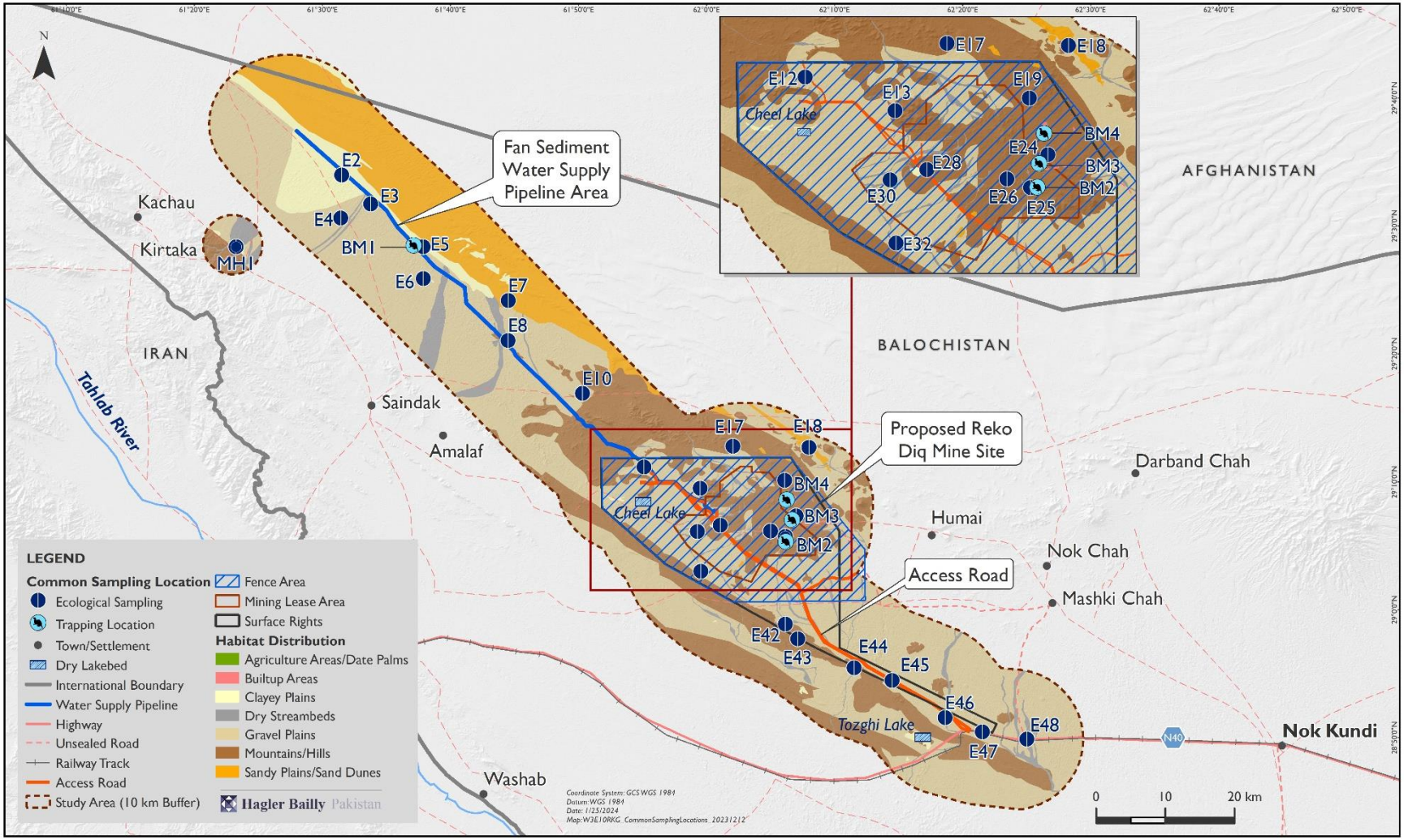


Figure 1:Common Sampling Locations Sampled in Previous Surveys and Post-Monsoon 2022 Survey

Vegetation

A comparison of species density and diversity was carried out for common sampling locations sampled during the Previous Surveys (November 2008, and August 2020) and Post-Monsoon 2022 Survey where sampling was conducted in a comparable season. A total of 28 plant species were observed from common sampling locations during the Post-Monsoon 2022 Survey compared to 19 plant species observed during the Previous Surveys, from the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and Access Road to the proposed Reko Diq Mine Site. Overall, species richness during the Post-Monsoon 2022 Survey was higher compared to Previous Surveys.

Table 3 provides the list of plant species observed during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Table 3: Comparison of Plant Species Observed in Previous Surveys and Post-Monsoon 2022 Survey

Scientific Name	*Previous Surveys*		*Post-Monsoon 2022 Survey*
	November 2008 Survey	*August 2020 Survey*	
Aeluropus lagopoides	-	-	✓
Alhagi maurorum	✓	✓	✓
Anabasis setifera	-	-	✓
Aristida adscensionis	-	-	✓
Aristida purpurea	-	-	✓
Aristida sp.	✓	-	-
Azadirachta indica	-	-	✓
Bromus sp.	-	-	✓
Calligonum comosum	-	-	✓
Calligonum polygonoides	-	✓	✓
Cenchrus biflorus	-	-	✓
Cistanche tubulosa	-	-	✓
Citrullus colocynthis	✓	-	✓
Cornulaca monacantha	-	✓	✓
Cynodon dactylon	-		✓
Chenopodium glaucum	-	✓	-
Desmostachya bipinnata	-	✓	-
Eleusine compressa	-	-	✓
Fagonia ovalifolia	✓	-	✓
Fagonia cretica		✓	

Scientific Name	*Previous Surveys*		*Post-Monsoon 2022 Survey*
	November 2008 Survey	*August 2020 Survey*	
Haloxylon persicum	✓	✓	✓
Haloxylon salcornicom	-	✓	✓
Haloxylon stocksii	✓	-	✓
Heliotropium crispum	✓	-	✓
Helitropium zeyloncum	-	-	✓
Panicum turgidum		✓	✓
Peganum harmala		✓	✓
Phoenix dactylifera	✓		✓
Tamarix aphylla	-	-	✓
Tamarix stricta	✓	✓	-
Tribulus terrestris	✓	✓	✓
Vachellia jacquemontii	-	-	✓
Zygophyllum simplex	✓	✓	-
Zygophylon sp.	-	-	✓
Total	**11**	**13**	**28**
Total (combined total for Previous Surveys)	**19**		**28**

Proposed Reko Diq Mine Site

A total of 10 common sampling locations were selected for comparison of the Post-Monsoon 2022 Survey with the Previous Surveys. The average diversity observed during the Post-Monsoon 2022 Survey was 2.4 compared to 0.1 in Previous Surveys. Similarly, the average density observed during the Post-Monsoon 2022 Survey was 9.2 compared to 7.0 in Previous Surveys. This comparison shows that both the diversity and density of vegetation in the Post-Monsoon 2022 Surveys are higher compared to Previous Surveys.

For comparison based on the habitat types for the proposed Reko Diq Mine Site, the highest average diversity was recorded in Sandy Plains (3.0) followed by Dry Streambeds (2.5), Gravel Plains (2.3), and Mountain/Hills (1.8) during the Post-Monsoon 2022 Survey, whereas during the Previous Surveys this pattern was different i.e., highest diversity was recorded from Mountain/Hills (2.3) followed by Dry Streambeds (1.0), Gravel Plains (0.7) and Sandy Plains (0.0).

In Sandy Plains, no species was observed during the Previous Surveys however, during the Post-Monsoon 2022 Survey highest diversity was observed which can be attributed to a decline in disturbance due to the fence along the border with Iran and Afghanistan. Due

to this fence, the movement of vehicles is restricted to a specific route, so the habitat is more intact.

The highest average density during the Post-Monsoon 2022 Survey was recorded in Dry Streambeds (16.5) followed by Mountain/Hills (9.25), Gravel Plains (8.0), and Sandy Plains (3.0) whereas during the Previous Surveys this pattern was recorded as; the highest density was observed in Mountain/Hills (12.0) followed by Gravel Plains (4.3), Dry Streambeds (4.0) and no species of plant was observed in Sandy Plains. Overall, the density of plant species is slightly higher compared to Previous Surveys. Due to drought and dry season for a long period, the vegetation is only restricted to Dry Streambeds where the water availability (as soil moisture) is comparatively high compared to other habitats.

Table 4 provides a comparison of habitat-wise average density and diversity of plant species observed at the proposed Reko Diq Mine Site during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Figure 2 provides a sampling locations-wise comparison of species abundance at the proposed Reko Diq Mine Site during the both Previous Surveys and Post-Monsoon 2022 Survey.

Figure 3 provides a sampling locations-wise comparison of species richness at the proposed Reko Diq Mine Site during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Table 4: Comparison of Average Diversity and Average Density by Habitat Observed at the proposed Reko Diq Mine Site for Previous Surveys and Post-Monsoon 2022 Survey

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Dry Streambeds	1.0	2.5	4.0	16.5
Gravel Plains	0.7	2.3	4.3	8.0
Mountains/Hills	2.3	1.8	12.0	9.3
Sandy Plains	-	3.0	0.0	3.0

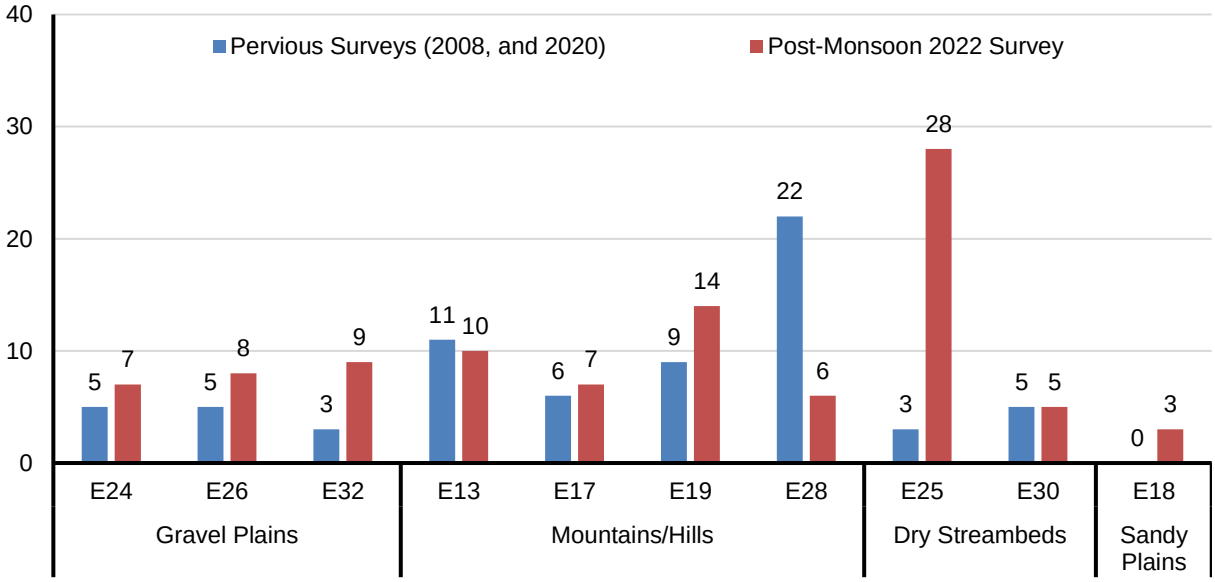


Figure 2 Comparison of Species Abundance by Sampling Location Observed at the proposed Reko Diq Mine Site in Previous Surveys and Post-Monsoon 2022 Survey

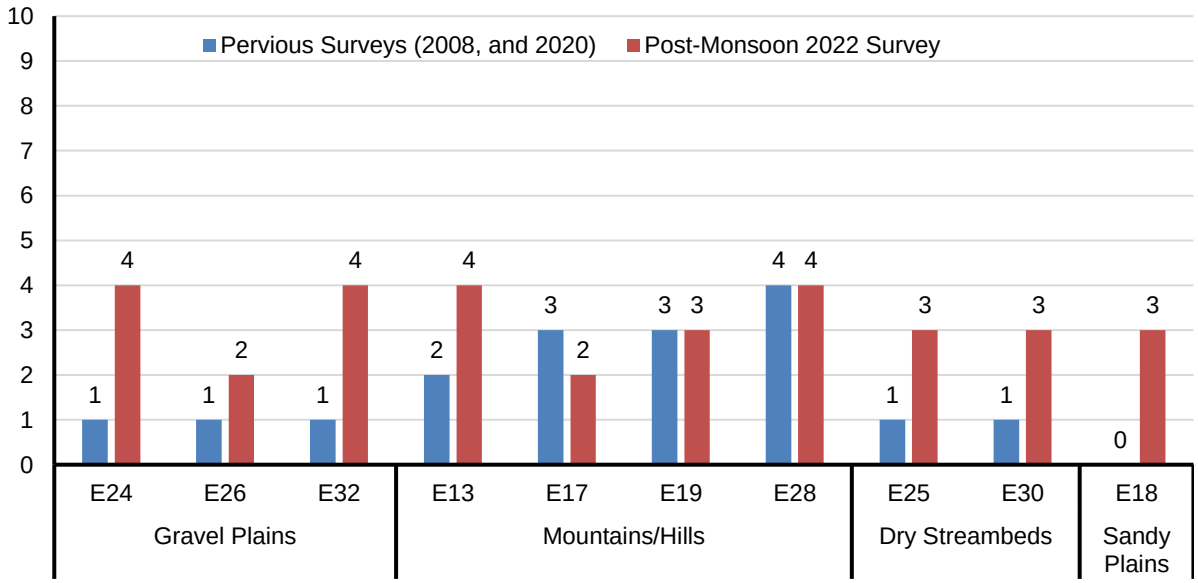


Figure 3: Comparison of Species Richness by Sampling Location Observed at the proposed Reko Diq Mine Site in Previous Surveys and Post-Monsoon 2022 Survey

Fan Sediment Water Supply Pipeline Area

Along the Fan Sediment Water Supply Pipeline Area, a total of 10 common sampling locations were selected for comparison of Previous Surveys with the Post-Monsoon 2022 Survey. The average diversity during the Post-Monsoon 2022 Survey was 2.0 compared to 1.3 in Previous Surveys. Similarly, the average density observed during the Post-Monsoon 2022 Survey was 13.5 compared to 16.0. The comparison shows that the diversity of the plant species is higher whereas density is slightly lower compared to Previous Surveys due to dry seasons and long drought periods.

For comparison based on the habitat types along Fan Sediment Water Supply Pipeline Area, the highest average diversity was recorded in Date Palms, a microhabitat, (6.0),

followed by Clayey Plains (5.0), Dry Streambeds (4.0) Sandy Plains (3.0) and Gravel Plains (2.3) in Post-Monsoon 2022 Survey, whereas during the Previous Surveys this pattern was largely similar with slight difference from current survey i.e., highest diversity observed at Date Palms (4.0), followed by Clayey Plains (3.0), Dry Streambeds (3.0), Sandy Plains (1.5) and Gravel Plains (1.5). The diversity of plant species in different habitats is higher comparatively due to a decrease in anthropogenic activities and disturbances as the fencing along the border has reduced the cross-border trade in that area particularly.

The highest average density during the Post-Monsoon 2022 Survey was recorded in Date Palm (26.0) followed by Clayey Plains (19.0), Dry Streambeds (12.0), Gravel Plains (11.8), and Sandy Plains (9.50) whereas, during the Previous Surveys, the trend was almost similar as; highest density was observed in Clayey Plains (26.0) followed by Date Palm (21.0), Sandy Plains (16.0), Dry Streambeds (14.5) and Gravel Plains (13.0). The density and diversity in Date Palm are significantly higher as compared to Previous Surveys due to the availability of water well as it was declared as a restricted area for cross-border trade by security forces, which resulted in a decrease in disturbance and an increase in biodiversity.

Table 5 provides a comparison of habitat-wise average density and diversity of plant species observed along the Fan Sediment Water Supply Pipeline Area during the both Previous Surveys and Post-Monsoon 2022 Survey.

Figure 4 provides a sampling locations-wise comparison of species abundance along the Fan Sediment Water Supply Pipeline Area during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Figure 5 provides a comparison of sampling locations-wise species richness along the Fan Sediment Water Supply Pipeline Area during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Table 5: Habitat-Wise Average Diversity and Average Density along Fan Sediment Water Supply Pipeline Area Observed in Previous Surveys and Post-Monsoon 2022 Survey

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Dry Streambeds	3.0	4.0	14.5	12.0
Date Palm	4.0	6.0	21.0	26.0
Gravel Plains	1.3	2.5	13.0	11.8
Clayey Plains	3.0	5.0	26.0	19.0
Sandy Plains	1.5	2.5	16.0	9.5

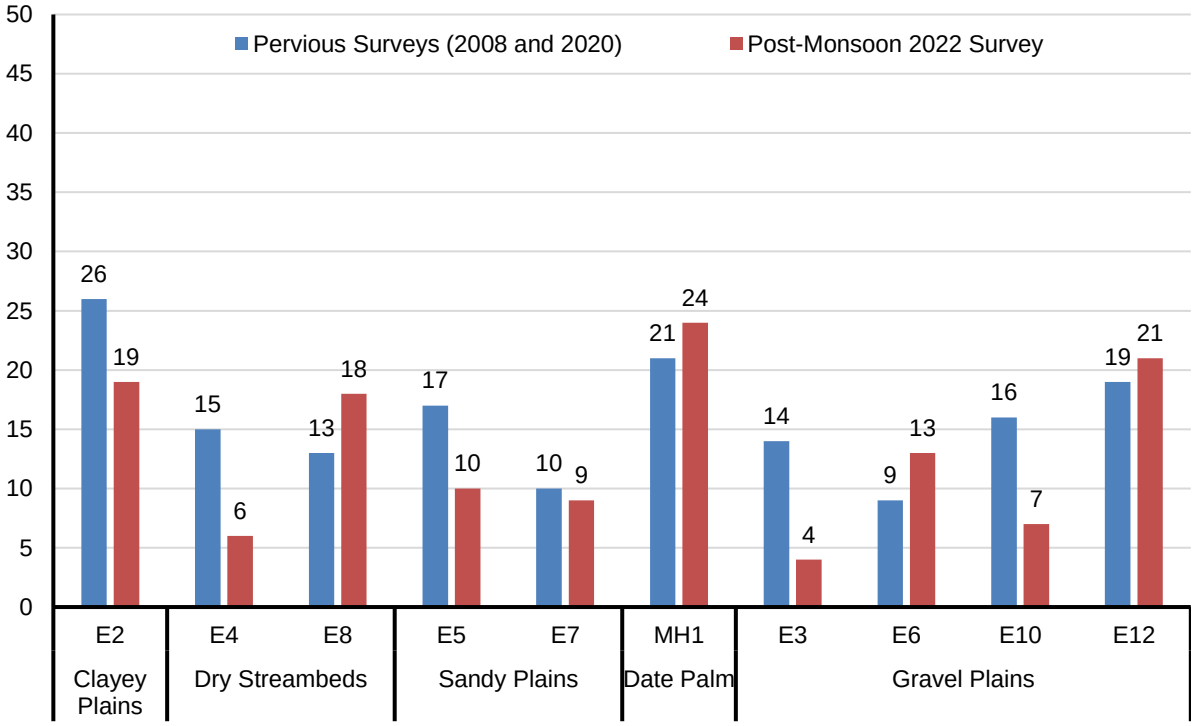


Figure 4: Species Abundance along Fan Sediment Water Supply Pipeline Area Observed in Previous Surveys and Post-Monsoon 2022 Survey

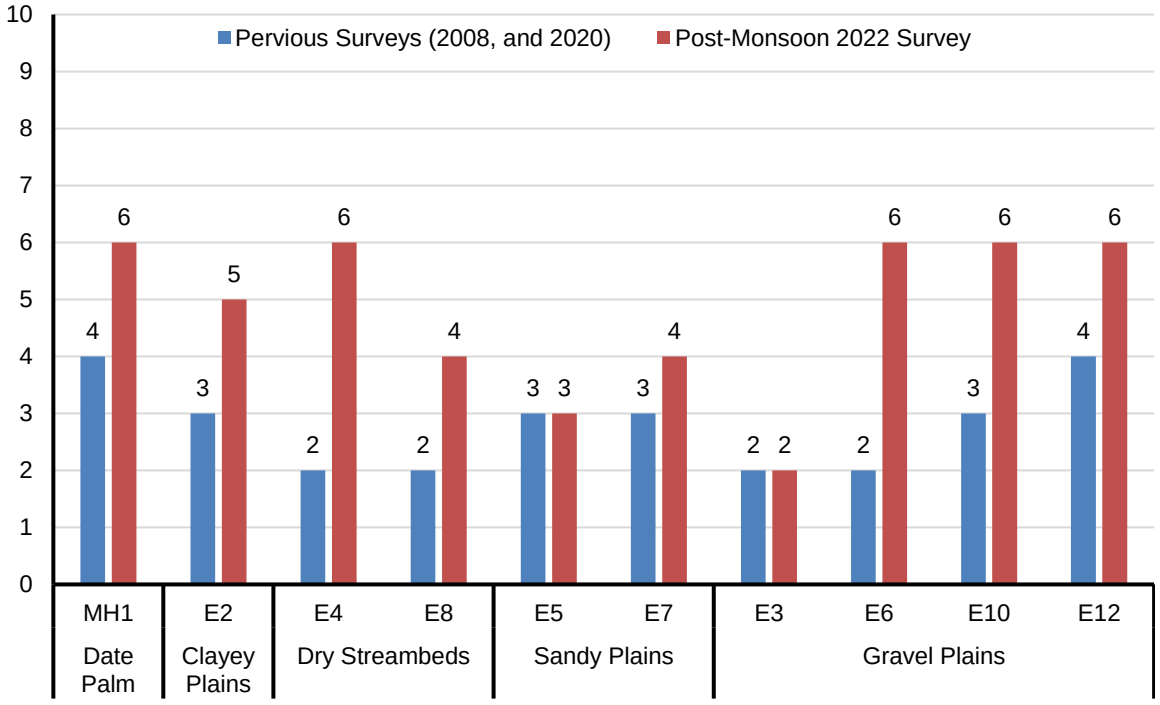


Figure 5: Species Richness along Fan Sediment Water Supply Pipeline Area Observed in Previous Surveys and Post-Monsoon 2022 Survey

Access Road to the proposed Reko Diq Mine Site

A total of seven common sampling locations were selected for comparison of the Post-Monsoon 2022 Survey with the Previous Surveys along the Access Road to the proposed

Reko Diq Mine Site. The average diversity observed during the Post-Monsoon 2022 Survey was 1.1 compared to 0.5 in Previous Surveys. Similarly, the average density observed during the Post-Monsoon 2022 Survey was 5.3 as compared to 3.3 in Previous Surveys. This comparison shows that both diversity and density of vegetation are higher in Post-Monsoon 2022 Surveys in comparison with Previous Surveys.

For comparison based on the habitat types along the Access Road to the proposed Reko Diq Mine Site, the highest average diversity was recorded in Mountain/Hills (5.0) followed by Dry Streambeds (1.3) and Gravel Plains (0.8). During the Previous Surveys, high average diversity was recorded in Dry Streambeds (1.3) followed by Mountain/Hills (1.0), and Gravel Plains (1.0)

Overall, the diversity during the Post-Monsoon 2022 Survey was higher as compared to the Previous Surveys in all habitats except Gravel Plains. In Gravel Plains, the average diversity is slightly lower than the Previous Surveys, which can be attributed to the fact that the Gravel Plains during the Post-Monsoon 2022 Survey were barren and dry with very little vegetation.

The highest average density during the Post-Monsoon 2022 Survey was recorded in Dry Streambeds (14.3) followed by Gravel Plains (11.7), and Mountain/Hills (11.0) whereas, in Previous Surveys, the trend was almost similar to the highest density in Dry Streambeds (15.0) followed by Gravel Plains (5.3), and Mountain/Hills (3.0). Overall, the density was higher during the Post-Monsoon 2022 Survey compared to Previous Surveys except in Dry Streambeds due to very high disturbance from the vehicles for the cross-border trade and human trafficking. These activities have badly disturbed the habitat.

Table 6 provides a comparison of habitat-wise average diversity and density of plant species observed along the Access Road to the proposed Reko Diq Mine Site during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Figure 6 provides a comparison of species abundance by sampling locations along the Access Road to the proposed Reko Diq Mine Site during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Figure 7 provides a comparison of species richness by sampling locations along the Access Road to the proposed Reko Diq Mine Site during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Table 6: Comparison of Average Diversity and Average Density by Habitat Type Along Access Road to the proposed Reko Diq Mine Site Observed in Previous Surveys and Post-Monsoon 2022 Survey

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Dry Streambeds	1.3	1.7	15.0	14.3
Gravel Plains	1.0	0.8	5.3	11.7
Mountains/Hills	1.0	5.0	3.0	11.0

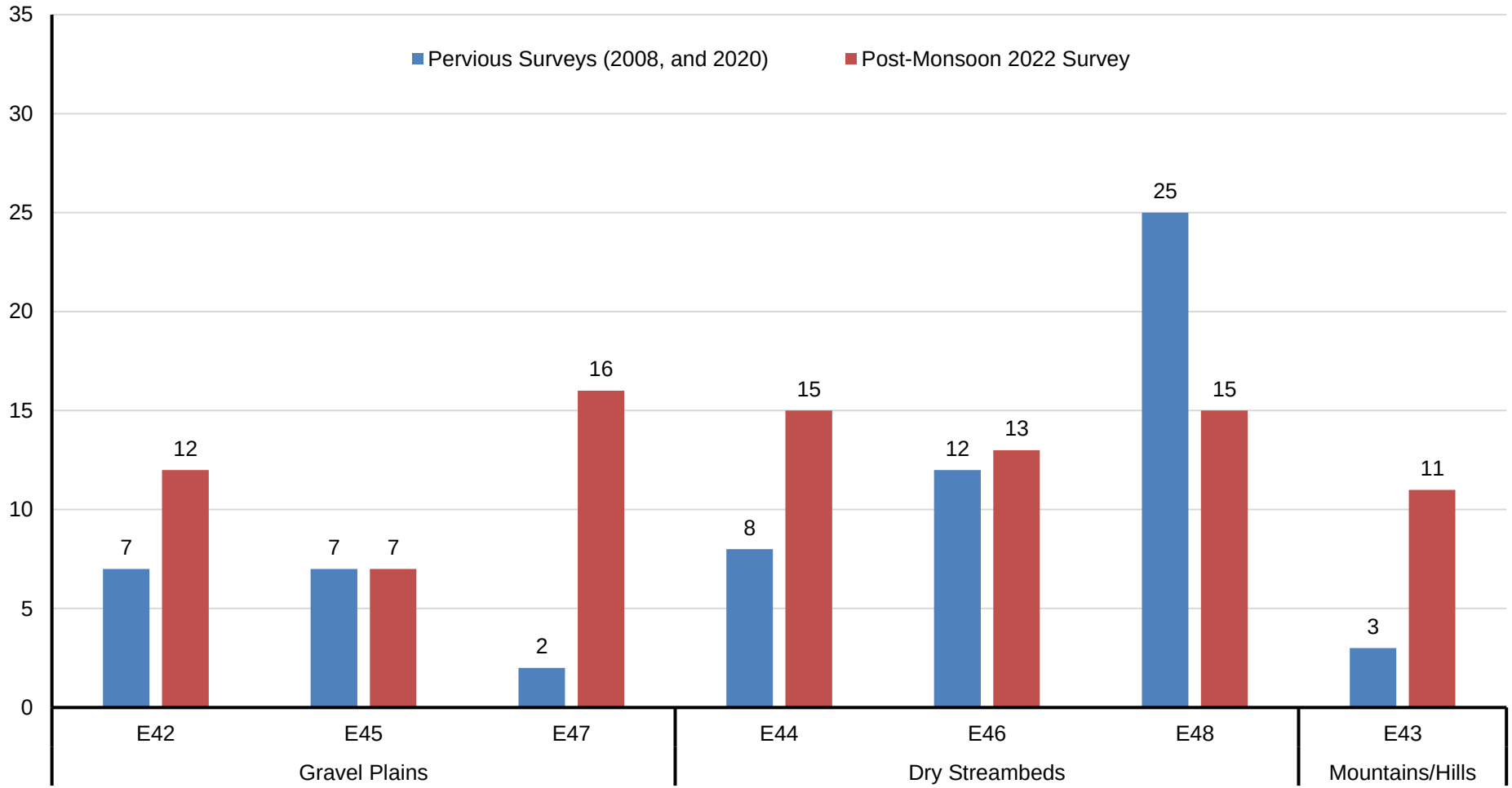


Figure 6: Comparison of Species Abundance by Sampling Location Observed along Access Road to Reko Diq Mine Site in Previous Surveys and Post-Monsoon 2022 Survey

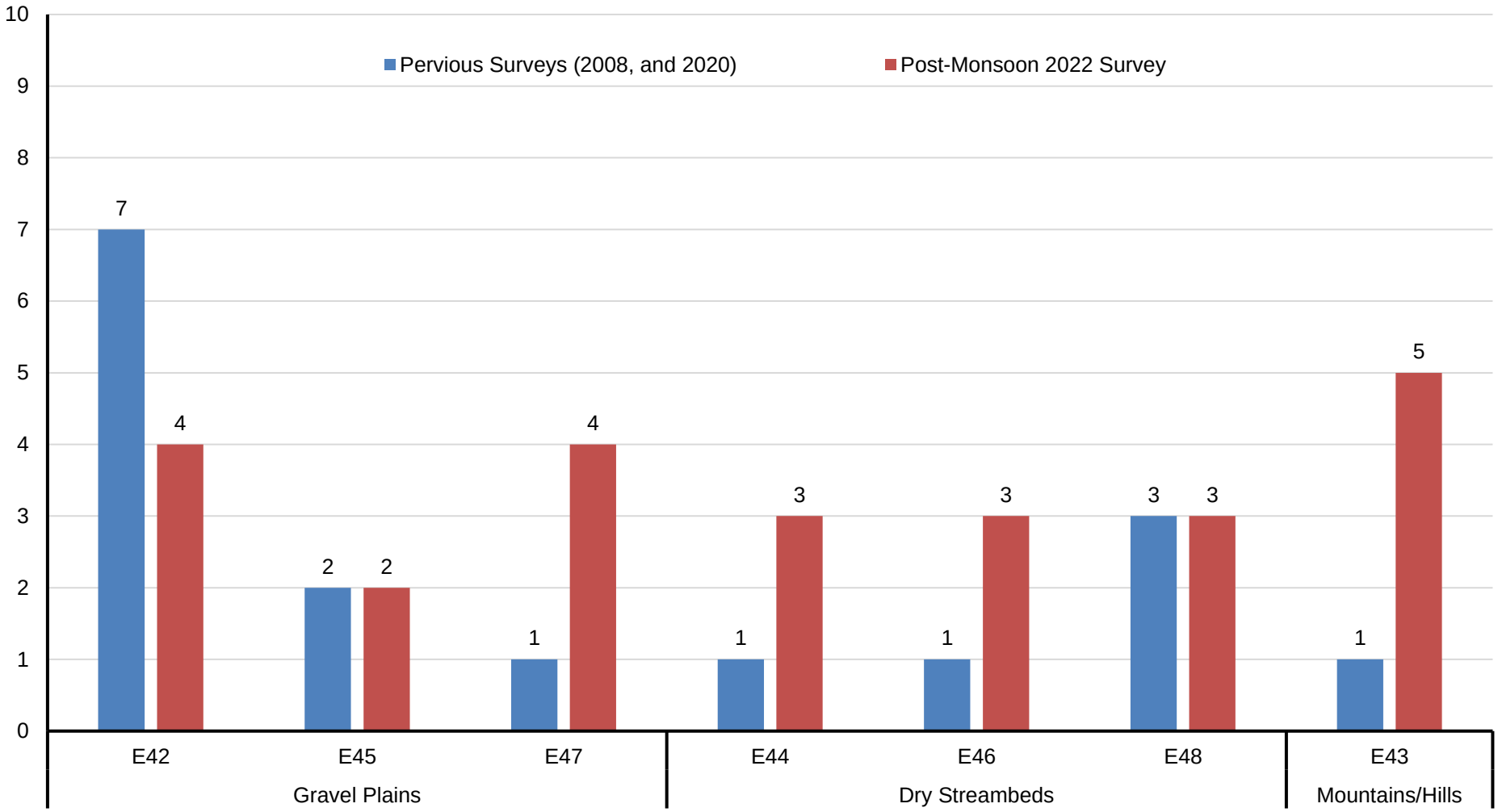


Figure 7:Comparison of Species Richness by Sampling Location Observed along Access Road to proposed Reko Diq Mine Site in Previous Surveys and Post-Monsoon 2022 Survey

Avifauna

A comparison of bird abundance and richness observed during the Post-Monsoon 2022 Survey was made with Previous Surveys conducted in November 2008, September 2009, and August 2020 (collectively referred to as Previous Surveys). The comparison is only given for common sampling locations which were sampled in Post-Monsson 2022 and Previous Surveys.

A total of 33 bird species were observed from the common sampling locations during the Previous Surveys compared to 29 species observed during the Post-Monsoon 2022 Survey. This shows higher species richness in Previous Surveys as compared to the Post-Monsoon 2022 Survey.

Table 7 provides the list of bird species reported in different surveys conducted during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Table 7: Bird Species Observed in Previous Surveys (2008, 2009, 2020) and Post-Monsoon 2022 Survey

No.	*Scientific Name*	*Common Name*	*Previous Surveys*			*Post-Monsoon 2022 Survey*
			November 2008 Survey	*September 2009 Survey*	*August 2020 Survey*	
1	*Acridotheres tristis*	Common Myna	-	-	✓	-
2	*Alaemon alaudipes*	Hoopoe Lark	✓	-	✓	✓
3	*Ammomanes cinctura*	Bar-tailed Lark	✓	✓	✓	✓
4	*Ammomanes deserti*	Desert Lark	-	-	✓	✓
5	*Ammopardix griseogularis*	See-see Partridge	✓	-	-	✓
6	*Anthus trivialis*	Tree Pipit	-	-	-	✓
7	*Athene noctua*	Little Owl	-	-	-	✓
8	*Buteo vulpinus*	Common Buzzard	-	-	-	✓
9	*Calandrella brachydactyla*	Greater Short-Toed Lark	-	✓	-	✓
10	*Calandrella rufescens*	Lesser Short-toed Lark	✓	-	-	
11	*Caprimulgus europaeus*	Eurasian Nightjar	-	-		✓
12	*Cercotrichas galactotes*	Rufous-tailed Scrub Robin	-	-	-	✓
13	*Chlamydotis macqueenii*	Asian Houbara (Macqueen`s Bustard)	-	-	-	✓
14	*Circus cyaneus*	Hen Harrier	✓	-	-	-
15	*Columba livia*	Rock Pigeon	-	-	✓	-
16	*Coracias garrulus*	Eurasian Roller	-	-	-	✓
17	*Corvus corax*	Common Raven	-	-	✓	-
18	*Corvus ruficollis*	Brown-necked Raven	✓	✓	✓	✓
19	*Coturnix coturnix*	Common Quail	-	✓	-	-

No.	Scientific Name	Common Name	Previous Surveys			Post-Monsoon 2022 Survey
			November 2008 Survey	September 2009 Survey	August 2020 Survey	
20	*Falco tinnunculus*	Common Kestrel	✓	-	✓	-
21	*Ficedula parva*	Red-throated Flycatcher	-	-	-	✓
22	*Galerida cristata*	Crested Lark	✓	-	✓	✓
23	*Hirundo rustica*	Barn Swallow	-	-	✓	-
24	*Hydroprogne caspia*	Caspian Tern	✓	-	-	-
25	*Iduna caligate*	Booted Warbler	✓			✓
26	*Lanius excubitor*	Great Grey Shrike	-	-	✓	-
27	*Melanocorypha calandra*	Calandra Lark	✓	-	-	-
28	*Motacilla alba*	White Wagtail	-	-		✓
29	*Motacilla cinerea*	Grey Wagtail	-	-	✓	-
30	*Motacilla citreola*	Citrine Wagtail	-	-		-
31	*Muscicapa striata*	Spotted Flycatcher	-		-	✓
32	*Neophron percnopterus*	Egyptian Vulture	-	-	-	✓
33	*Oenanthe picata*	Variable Wheatear	✓	-	✓	-
34	*Oenanthe pleschanka*	Pied Wheatear	-	-	✓	-
35	*Oriolus kundoo*	Indian Golden Oriole	-	-		✓
36	*Passer domesticus*	House Sparrow	-	-	✓	-
37	*Passer montanus*	Tree Sparrow	✓	-	-	-
38	*Pastor roseus*	Rosy Starling	-	-	-	✓
39	*Phylloscopus collybita*	Commomn Chiffchaff	✓	-	-	-
40	*Phylloscopus trochiloides*	Greenish Warbler	✓	-	-	-
41	*Phylloscopus trochilus*	Willow Warbler	✓	-	-	-
42	*Porzana porzana*	Spotted Crake	-	-	-	✓
43	*Prinia socialis*	Ashy Prinia	✓	-	-	-
44	*Progne chalybea*	Grey-breasted Martin	-	-	✓	-
45	*Pterocles coronatus*	Crowned Sandgrouse	✓	-	-	-
46	*Ptyonoprogne rupestris*	Crag Martin	-	-	-	✓
47	*Pycnonotus leucotis*	White-eared Bulbul	✓	-	-	✓
48	*Saxicola caprata*	Pied Bushchat	-	-	✓	✓
49	*Saxicola maurus*	Siberian Stonechat	-	-	-	✓
50	*Spilopelia senegalensis*	European Bee-eater	-	-	-	✓
51	*Spilopelia senegalensis*	Laughing Dove	-	-	-	✓

No.	*Scientific Name*	*Common Name*	*Previous Surveys*			*Post-Monsoon 2022 Survey*
			November 2008 Survey	*September 2009 Survey*	*August 2020 Survey*	
52	*Sylvia curruca*	Lesser Whitethroat	✓	-	-	✓
53	*Sylvia nana*	Asian Desert Warbler	-	-	-	-
54	*Upapa epops*	Eurasian Hoopoe	-	-	-	-
Total			**20**	**4**	**17**	**29**
Total (combined total for Previous Surveys)			**33**			**29**

Proposed Reko Diq Mine Site

Birds' abundance and richness for 14 common sampling locations sampled in Previous Surveys and the Post-Monsoon 2022 Survey are compared. A total of 15 bird specimens belonging to four species were observed during the Previous Surveys compared to 62 bird specimens of 12 species during the Post-Monsoon 2022 Survey. This shows both bird abundance and species richness are higher during the Post-Monsoon 2022 Survey. This can be attributed to the availability of food and shelter at the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey compared to Previous Surveys as some Project accommodation facilities and camps of security forces are established in the area which is the source of food for these species.

During the Previous Surveys, maximum bird abundance was observed at Sampling Location E17 (seven specimens) followed by E19 (four specimens), and E18 (three specimens). During the Post-Monsoon 2022 Survey, maximum bird abundance was also observed at the same Sampling Locations i.e., E17 (eight specimens) followed by E26 and E25 (two specimens each). Bird species richness was also highest in both surveys at Sampling Location E17, i.e., four species each in both of these surveys.

During the Previous Surveys, the highest bird diversity was observed in Mountain/Hills and Sandy Plains habitats (1.0 each), followed by Gravel plains (0.2), while during the Post Monsoon 2022 Survey, the highest bird diversity was observed in Dry Streambeds (1.3) followed by Mountain/Hills (1.0) and Gravel Plains (0.4).

During the Previous Surveys, the highest bird density was observed in Sandy Plains (3.0) followed by Mountain/Hills (2.8) and Gravel Plains (0.2), while during the Post-Monsoon 2022 Survey, the highest density of birds was observed in the Gravel Plains habitat (3.6) followed by Dry Streambeds (3.3) and Mountain/Hills (2.6).

Table 8 provides a comparison of the average diversity and density of bird species observed during the both Previous Surveys and the Post-Monsoon 2022 Survey at the proposed Reko Diq Mine Site.

Figure 8 provides a comparison of bird abundance for Previous Surveys and the Post-Monsoon 2022 Survey for common sampling locations sampled at the proposed Reko Diq Mine Site.

Figure 9 provides a comparison of bird species for Previous Surveys and the Post-Monsoon 2022 Survey for common sampling locations sampled at the proposed Reko Diq Mine Site.

Table 8: Average Diversity and Density of Birds Observed in Previous Surveys and Post-Monsoon 2022 Survey at proposed Reko Diq Mine Site

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Dry Streambeds	-	1.3	0.0	3.3
Gravel Plains	0.2	0.4	0.2	3.6
Mountains/Hills	1.0	1.0	2.8	2.6
Sandy Plains	1.0	0.0	3.0	0.0

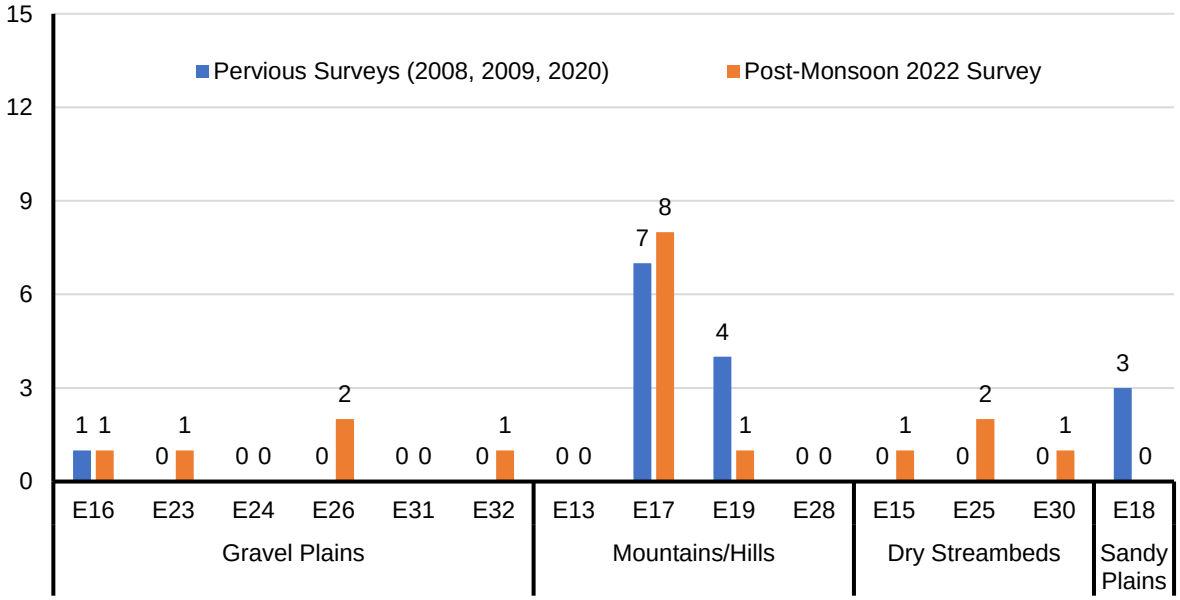


Figure 8: Comparison of Bird's Abundance for Previous Surveys and Post-Monsoon 2022 Survey at proposed Reko Diq Mine Site

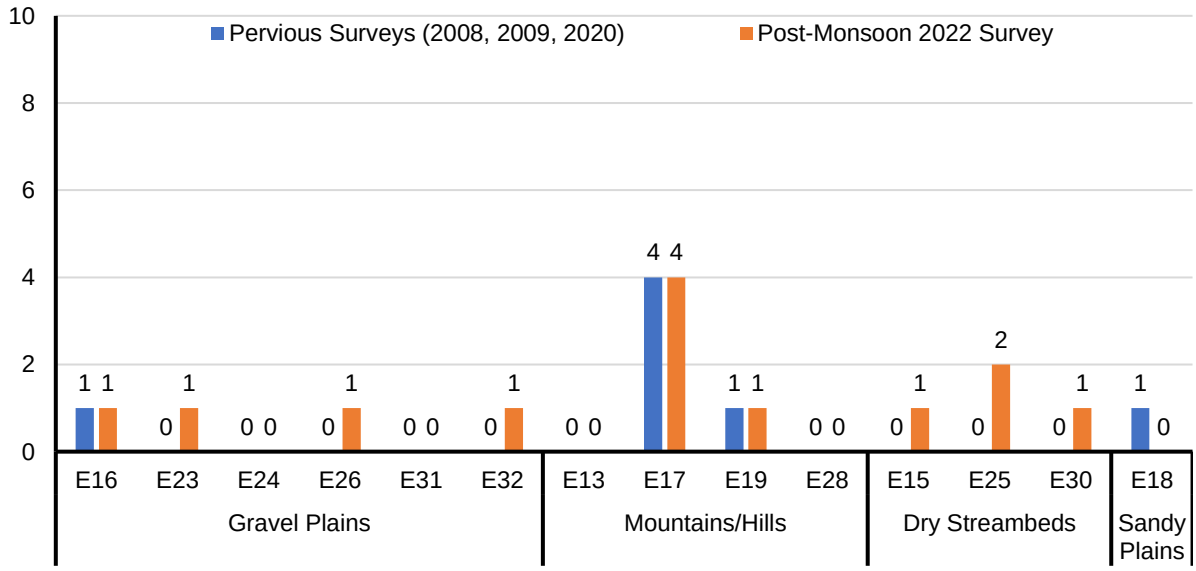


Figure 9: Comparison of Bird's Species Richness for Previous Surveys and Post-Monsoon 2022 Survey at proposed Reko Diq Mine Site

Fan Sediment Water Supply Pipeline Area

Birds' abundance and richness at 13 common sampling locations along the Fan Sediment Water Supply Pipeline Area are compared for Post-Monsoon 2022 and Previous Surveys.

A total of 33 bird specimens belonging to 13 species were observed during the Previous Surveys compared to 69 bird specimens of 23 species during the Post-Monsoon 2022 Survey. The higher bird abundance and species richness can be attributed to the lower level of disturbance and comparatively better vegetation along the Fan Sediment Water Supply Pipeline Area compared to other facilities.

During the Previous Surveys, maximum bird abundance was observed at Sampling Location MH1 (25 specimens) followed by E12 (four specimens) and E1 (two specimens). In the Post-Monsoon 2022 Survey, maximum abundance was also observed at Sampling Location MH1 (42 specimens) followed by E5, E7, and E10 with four specimens at each sampling location. Bird species richness was highest at MH1 (nine species) during the both surveys (Previous Surveys and Post-Monsoon 2022 Survey). During the Previous Surveys, the highest bird diversity was observed in Agricultural Areas/Date Palms (9.0) followed by Dry Streambeds (1.0), Mountains/Hills (1.0), and Gravel Plains (0.3). Similarly, during the Post-Monsoon 2022 Survey, the highest diversity of birds was also observed in the Date Palms habitat (10.0) followed by Sandy Plains/Sand Dunes (2.5), Mountains/Hills (2.0), Gravel Plains (1.8), Dry Streambeds (1.3), and Clayey Plains (1.0).

During the Previous Surveys, the highest bird density was observed in Date Palms (25.0) followed by Mountains/Hills (2.0), Dry Streambeds (1.3), and Gravel Plains (0.3). Similarly,during the Post-Monsoon 2022 Survey, the highest density of birds was also observed in the Date Palms habitat (42.0) followed by Sandy Plains/Sand Dunes (4.0), Mountains/Hills (3.0), Gravel Plains (2.5), Dry Streambeds (1.3), and Clayey Plains (1.0) habitat.

Table 9 provides a comparison of the average diversity and density of bird species observed during the both Previous Surveys and the Post-Monsoon 2022 Survey along the Fan Sediment Water Supply Pipeline Area.

Figure 10 provides the graph of bird abundance and its comparisons for Previous Surveys and the Post-Monsoon 2022 Survey along the Fan Sediment Water Supply Pipeline Area.

Figure 11 provides the graph of bird richness and its comparisons for Previous Surveys and the Post-Monsoon 2022 Survey along the Fan Sediment Water Supply Pipeline Area.

Table 9: Average Diversity and Density Observed in Previous Surveys and Post-Monsoon 2022 Survey Along Fan Sediment Water Supply Pipeline Area

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Clayey Plains	0.0	1.0	-	1.0
Dry Streambeds	1.0	1.3	1.3	1.3
Agricultural Areas/Date Palm	9.0	10.0	25.0	42.0
Gravel Plains	0.3	1.8	0.3	2.5

Mountains/Hills	1.0	2.0	2.0	3.0
Sandy Plains/Sand Dunes	0.0	2.5	0.0	4.0

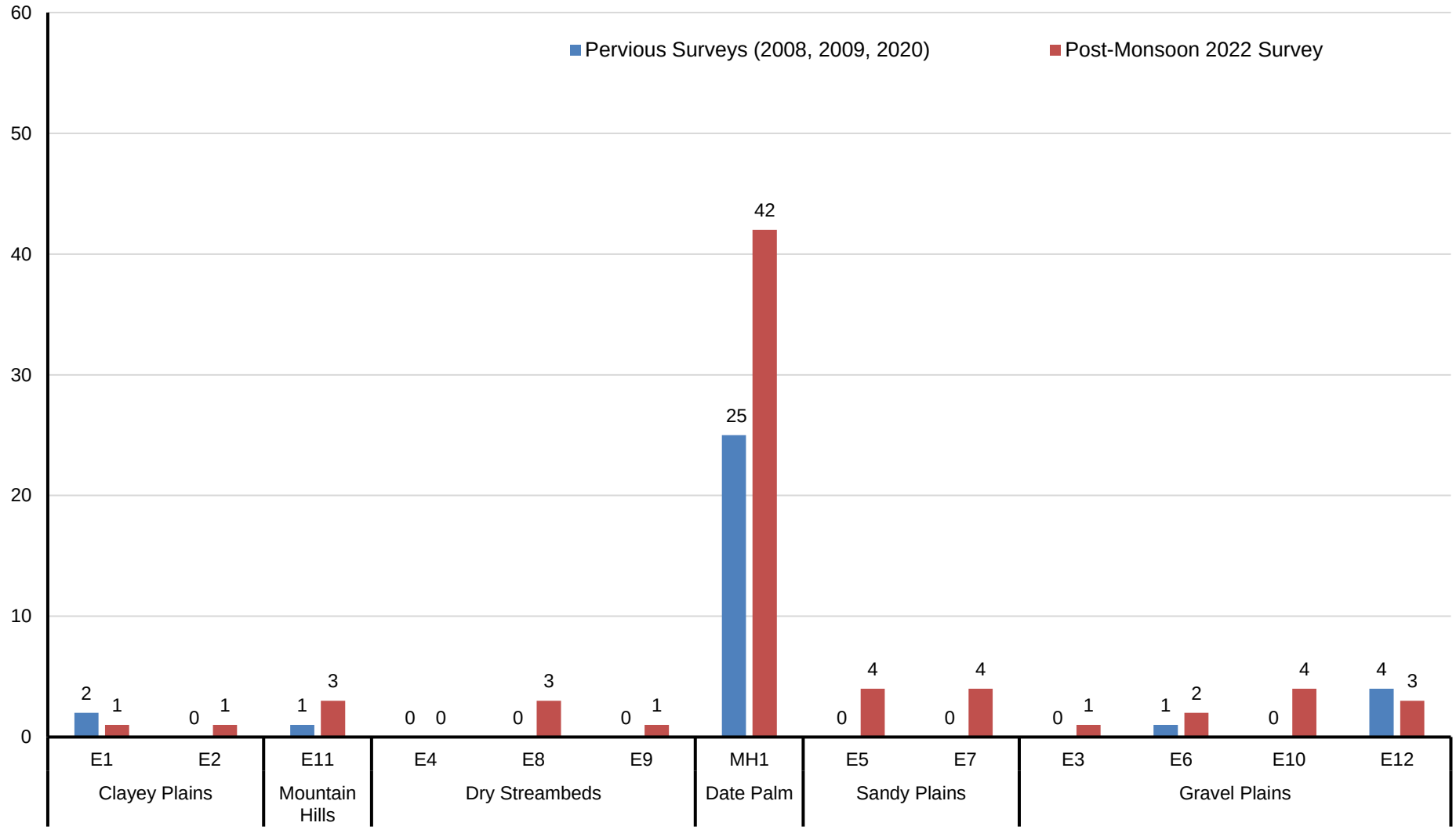


Figure 10: Bird's Abundance Comparison for Previous Surveys and Post-Monsoon 2022 along Fan Sediment Water Supply Pipeline Area

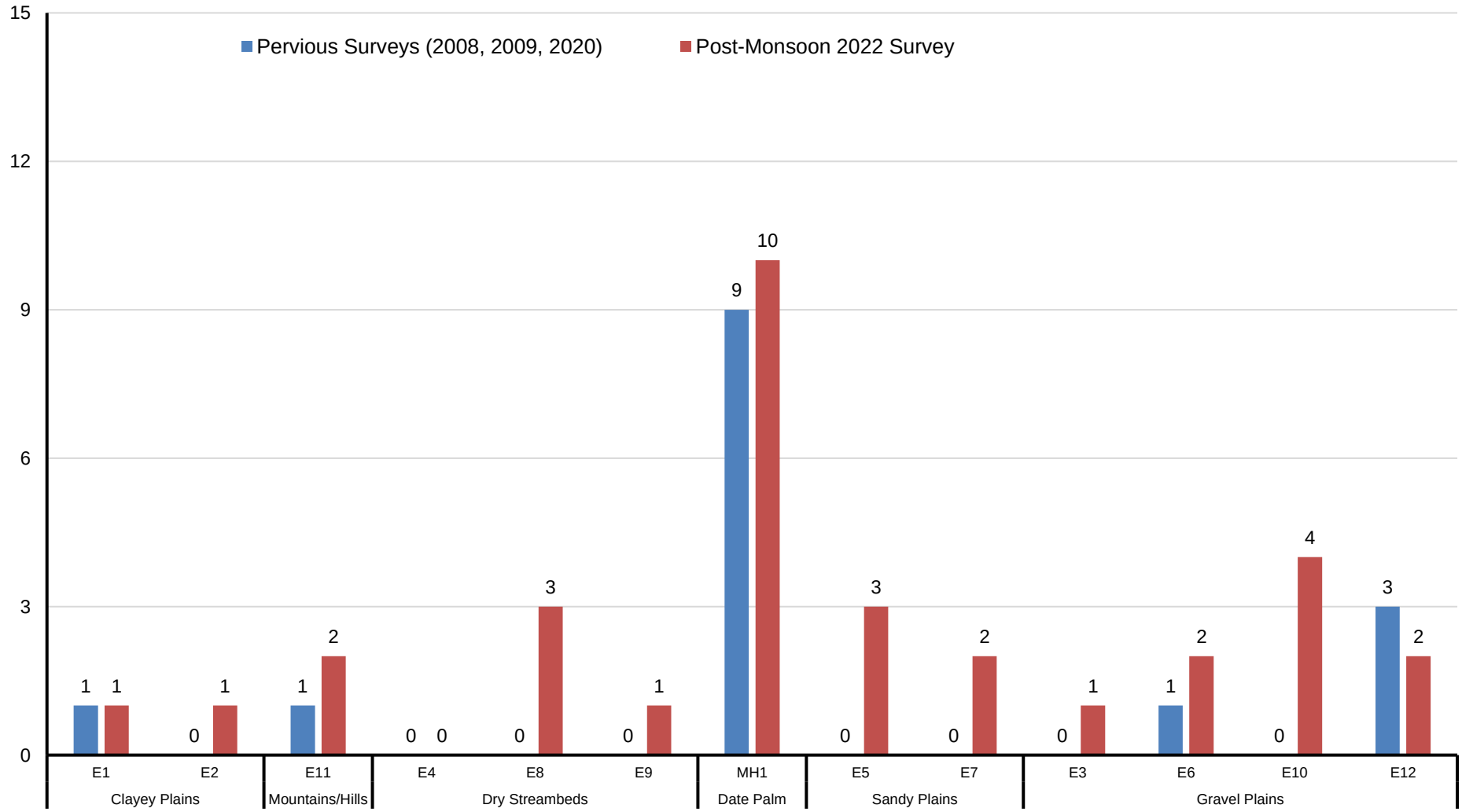


Figure 11: Bird's Richness Comparison between Previous Surveys and Post-Monsoon 2022 Survey along Fan Sediment Water Supply Pipeline Area

Access Road to proposed Reko Diq Mine Site

Birds' abundance and species richness at a total of eight common sampling locations along the Access Road to the proposed Reko Diq Mine Site are compared for Previous Surveys and Post-Monsoon 2022. A total of five bird specimens belonging to one species were observed during the Previous Surveys from common sampling locations compared to 34 specimens of eight species during the Post-Monsoon 2022 Survey. Bird abundance and richness are significantly higher during the Post-Monsoon 2022 Survey in comparison with Previous Surveys.

During the Previous Surveys, maximum bird abundance was observed at Sampling Location E46 (five specimens) along the Access Road to the proposed Reko Diq Mine Site. During the Post-Monsoon 2022 Survey, maximum bird abundance was observed at Sampling Location E43 (25 specimens) followed by E43 and E47 (three specimens each).

Similarly, during the Previous Surveys, bird species were only observed at Sampling Location E46. During the Post-Monsoon 2022 Survey, the highest bird species richness was observed at Sampling Location E42 (three species) followed by E43 (two species) while at the rest of the sampling locations, only one species each was observed.

During the Previous Surveys, the highest bird diversity was observed in Dry Streambeds (0.3), while during the Post-Monsoon 2022 Survey, the highest bird diversity was observed in Mountains/Hills (2.0), followed by Dry Streambeds and Gravel Plains (1.0 each).

During the Previous Surveys, the highest bird density was observed in Dry Streambeds (1.7), while during the Post-Monsoon 2022 Survey, the highest density of birds was observed in Mountains/Hills (25.0) followed by Gravel Plains (1.5) and Dry Streambeds (1.0).

Table 10 provides a comparison of the average diversity and density of bird species observed during the both Previous Surveys and the Post-Monsoon 2022 Survey along the Access Road to the proposed Reko Diq Mine Site.

Figure 12 provides a comparison of bird abundance for Previous Surveys and the Post-Monsoon 2022 Survey along the Access Road to the proposed Reko Diq Mine Site.

Figure 13 provides a comparison of bird species richness for Previous Surveys and the Post-Monsoon 2022 Survey along the Access Road to the proposed Reko Diq Mine Site.

Table 10: Average Birds Diversity and Density Observed in Previous Surveys and Post-Monsoon 2022 Survey Along Access Road to proposed Reko Diq Mine Site

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Dry Streambeds	0.3	1.0	1.7	1.0
Gravel Plains	0.0	1.0	0.0	1.5
Mountains/Hills	0.0	2.0	0.0	25.0

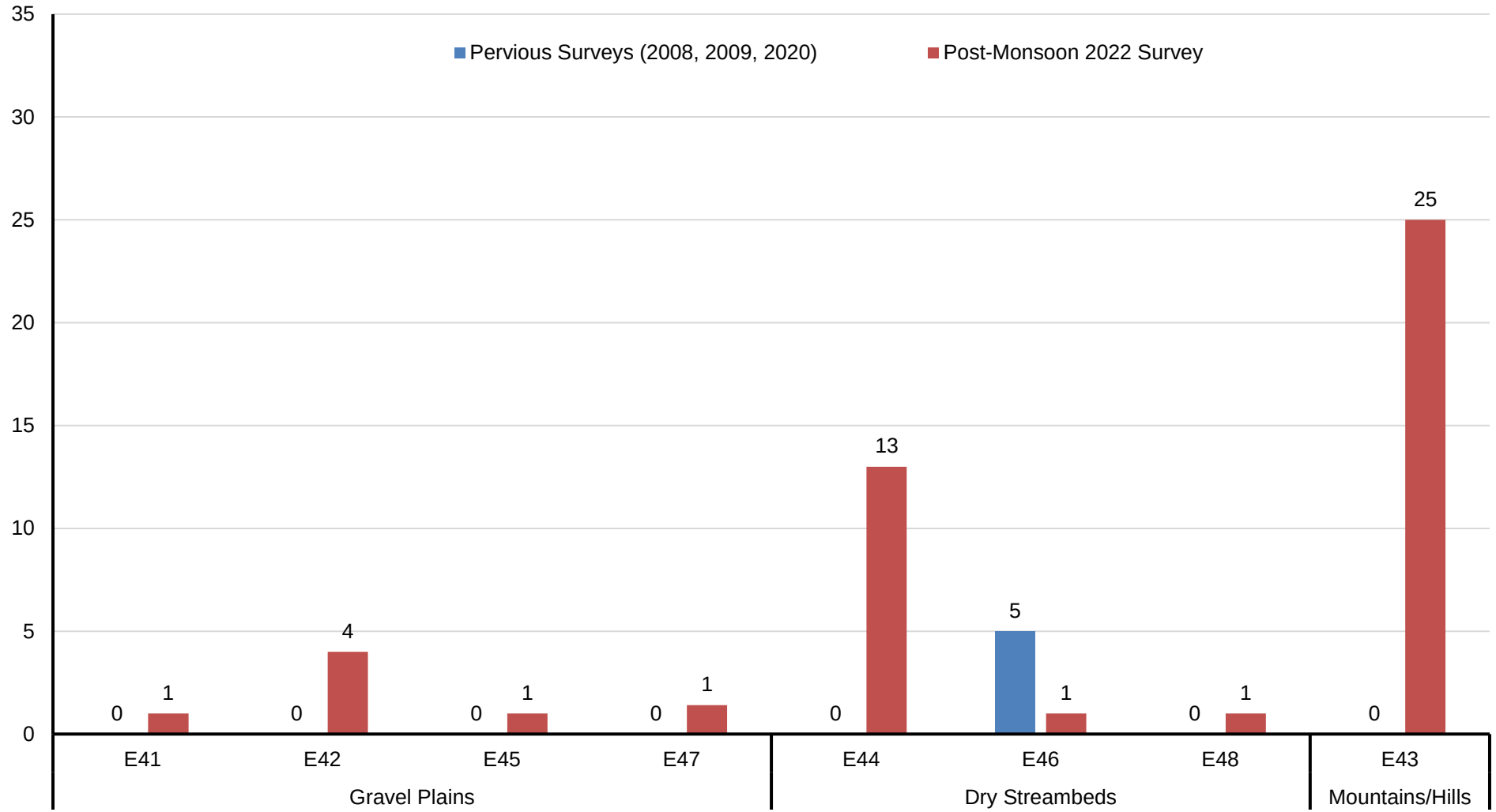


Figure 12: Comparison of Bird's Abundance for Previous Surveys and Post-Monsoon 2022 Survey Along Access Road to the proposed Reko Diq Mine Site

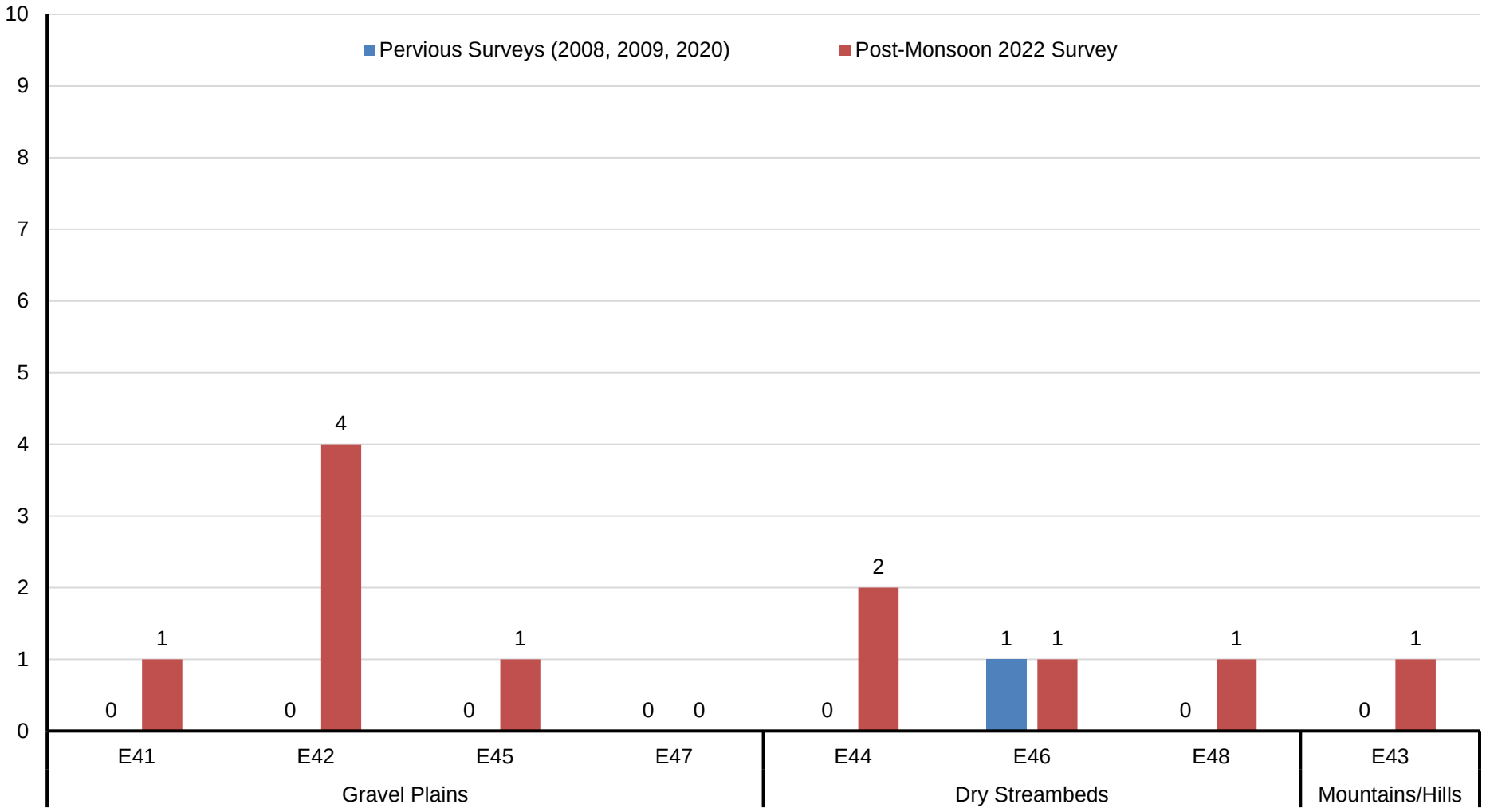


Figure 13: Comparison of Bird Species Richness for Previous Surveys and Post-Monsoon 2022 Survey along Access Road to the proposed Reko Diq Mine Site

Herpetofauna

Herpetofauna abundance and species richness for Previous Surveys (November 2008, September 2009, and August 2020) and Post-Monsoon 2022 Survey are compared based on the common sampling locations. A total of 15 herpetofauna species were observed from common sampling locations during the Post-Monsoon 2022 Survey, whereas during the Previous Surveys, 19 species were recorded from the proposed Reko Diq Mine Site, Fan Sediment Water Supply Pipeline Area, and along Access Road to Mine Site. The lower species richness during the Post-Monsoon 2022 Survey can be attributed to a survey limitation, as a previously nocturnal survey was also conducted which was not feasible during the Post-Monsoon 2022 Survey.

Table 11 provides a list of herpetofauna observed in Previous Surveys and the Post-Monsoon 2022 Survey.

Table 11: Comparison of Herpetofauna Species Observed in Previous Surveys and Post-Monsoon 2022 Survey

Scientific Name	*Common Name*	*Previous Surveys*			*Post-Monsoon 2022 Survey*
		September 2009 Survey	*November 2008 Survey*	*August 2020 Survey*	
Acanthodactylus cantoris	Indian fringe-fingered Lizard	✓	✓	-	-
Agamura persica	Persian Spider Gecko	✓	✓	-	-
Acanthodactylus blanfordii	Blanford's Fringe-fingered Lizard			-	✓
Acanthodactylus micropholis	Ornated Toad-headed Agama	-	-	-	✓
Agamura cruralis	Spider Gecko	-	-	-	✓
Cyrtopodion scabrum	Rough-tailed Bentoed Gecko	-	✓	-	✓
Echis carinatus sochureki	Saw-scaled Viper	✓	-	-	-
Eremias scripta	Sand Racerunner	✓	✓	-	-
Eristicophis macmahonii	Asian Sand Viper	✓	✓	-	-
Eumeces zarudnyi	Schokari Sand Racer	-	-	-	✓
Laudakia fusca	Yellow-headed Rock Agama	-	-	-	✓
Lytorhynchus maynardi	Long Nosed Snake	✓	-	-	-
Mesalina watsonana	Persian long-tailed Desert Lizard	-	✓	✓	✓
Ophiomorus tridactylus	Three-toed Snake Skink	✓	-	-	✓
Phrynocephalus clarkorum		-	✓	-	
Phrynocephalus euptilopus		-	-	-	✓

Scientific Name	*Common Name*	*Previous Surveys*			*Post-Monsoon 2022 Survey*
		September 2009 Survey	*November 2008 Survey*	*August 2020 Survey*	
Phrynocephalus luteoguttatus	Yellow-speckled Toad-headed Agama	✓	✓	-	-
Phrynocephalus maculatus	Blacktail Toadhead Agama	✓	✓	✓	✓
Phrynocephalus ornatus	Ornated Toad-headed Agama	✓	✓	-	✓
Platyceps karelini		-	-	-	✓
Psammophis schokari	Schokari Sand Racer	✓	✓	✓	✓
Spalerosophis diadema	Diadem Snake	✓	-	-	-
Teratoscincus microlepis	Small-scaled Wonder Gecko	✓	-	-	-
Trapelus agilis	Brilliant Ground Agama	✓	✓	✓	✓
Trapelus megalonyx	Afghan Ground Agama	✓	✓	-	-
Varanus griseus caspius	Caspian Monitor	✓	-	-	-
Total		**16**	**13**	**4**	**14**
Grand Total (combined total for Previous Surveys)		**19**			**15**

Proposed Reko Diq Mine Site

A total of 14 common sampling locations were selected for comparison of the Post-Monsoon 2022 Survey with the Previous Surveys. Average diversity and density of 0.5 and 0.9 were recorded during the Post-Monsoon 2022 Survey whereas, it was 0.5 and 1.1 during the Previous Surveys respectively. This indicates that the density of herpetofauna species is lower than during the Previous Surveys while the average diversity is the same as observed during the Previous Surveys. Lower density during the Post-Monsoon 2022 Survey can be attributed to the long drought period which affected the overall fauna and flora of the Terrestrial Ecological Study Area.

Among different habitat types, the highest average diversity was recorded in Sandy Plains (2.0) followed by Mountain/Hills (2.0), Dry Streambeds (0.7), and Gravel Plains (0.3) during the Post-Monsoon 2022 Survey, whereas during the Previous Surveys this pattern was different i.e., highest diversity at Dry Streambeds was 0.7 while it was 0.5 in both Gravel Plains and Mountain/Hills. In Sandy Plains, no species was observed during the Previous Surveys, but higher diversity was observed during the Post-Monsoon Survey which can be attributed to the installation of a fence across the borders of Pakistan with Iran and Afghanistan which in turn reduced the disturbance due to human and vehicle movement.

During the Post-Monsoon 2022 Survey, the highest average density was observed in Sandy Plains (3.0), followed by Mountain/Hills (1.3), Dry Streambeds (1.0), and Gravel Plains (0.3), whereas, during the Previous Surveys, this pattern was recorded as; highest density at Mountain/Hills (2.3) followed by Dry Streambeds (1.0), Gravel Plains (0.5). No

sighting or signs of herpetofauna was observed in Sandy Plains during the Previous Surveys.

Table 12 provides a comparison of the average diversity and density of herpetofauna species observed during the both Post-Monsoon 2022 Survey and Previous Surveys.

Figure 14 provides a comparison of species abundance observed during the both Post-Monsoon 2022 Survey and Previous Surveys.

Figure 15 provides a comparison of species richness observed during the both Post-Monsoon 2022 Survey and Previous Surveys.

Table 12: Average Diversity and Density of Herpetofauna Observed in Previous Surveys and Post-Monsoon 2022 Survey

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Dry Streambeds	0.7	0.7	1.0	1.0
Gravel Plains	0.5	0.3	0.5	0.3
Mountains/Hills	0.5	0.7	2.3	1.3
Sandy Plains	0.0	2.0	0.0	3.0

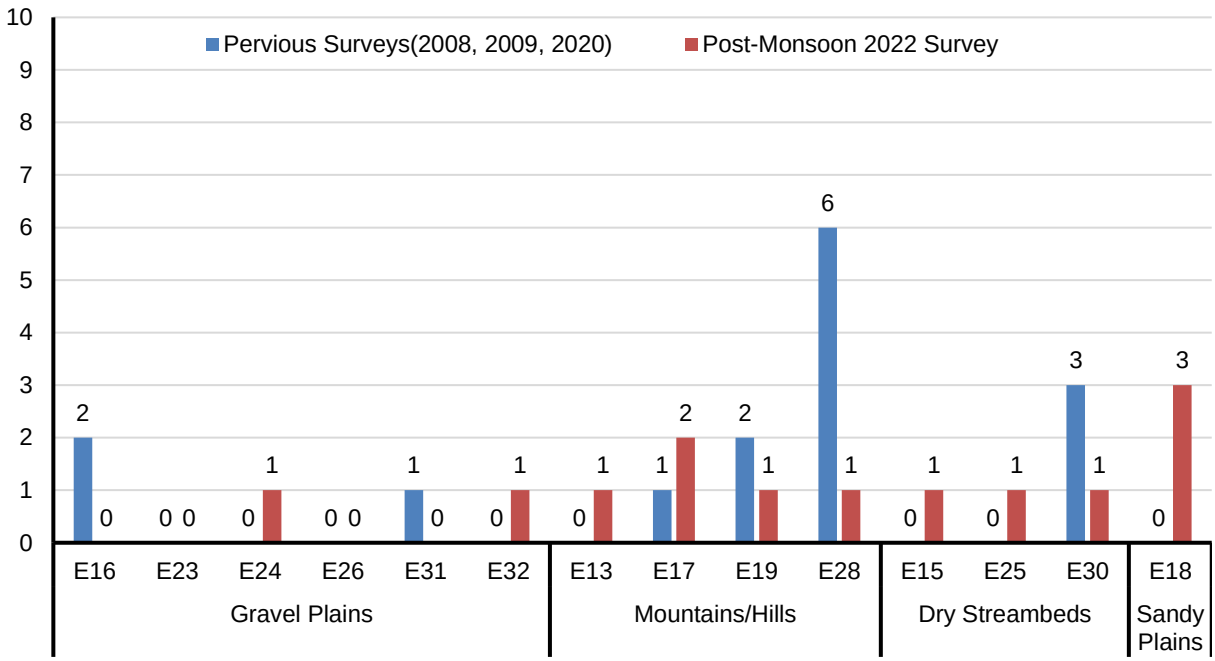


Figure 14: Comparison of Species Abundance Observed in Previous Surveys and Post-Monsoon 2022 Survey

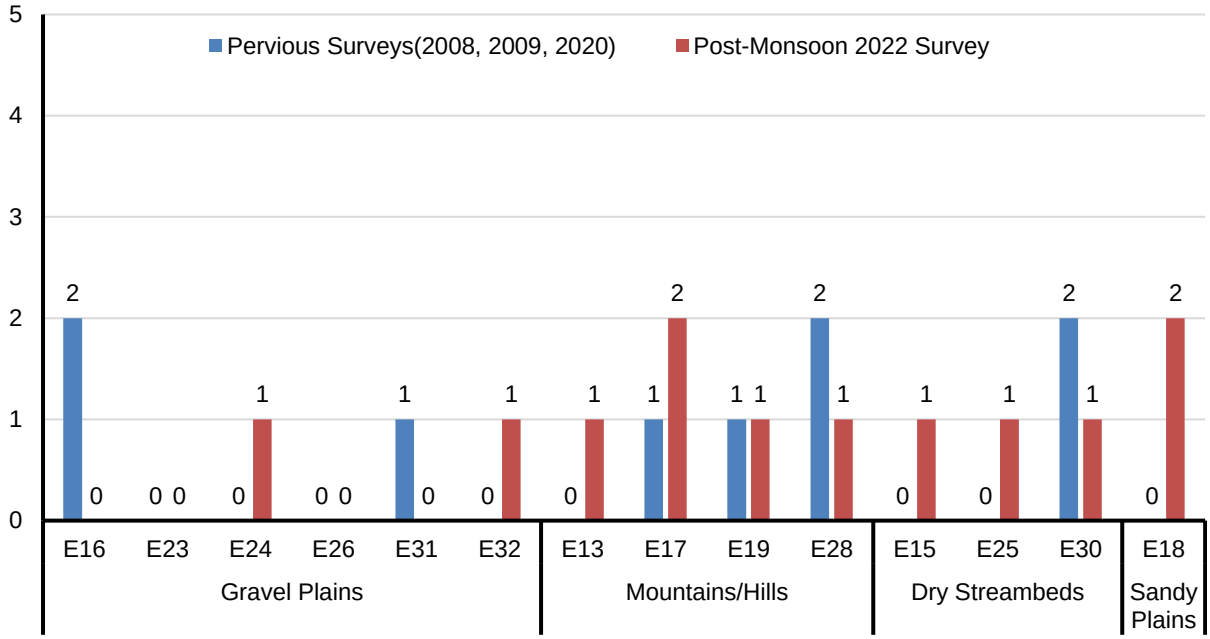


Figure 15: Comparison of Species Richness Observed in Previous Surveys and Post-Monsoon 2022 Survey

Fan Sediment Water Supply Pipeline Area

A total of 13 common sampling locations were selected for comparison of the Post-Monsoon 2022 Survey with the Previous Surveys. During the Previous Surveys, average diversity and density were observed as 0.9 and 3.4 compared to 0.7 and 1.8 during the Post-Monsoon 2022 Survey. This shows a significantly lower density and diversity of herpetofauna species during the Post-Monsoon 2022 Survey in comparison with Previous Surveys. It can be attributed to the extreme dry season due to lack of rain which affected the flora and fauna of the Ecological Study Area.

During the Previous Surveys, the highest diversity was observed in Clayey Plains (3.0), followed by Dry Streambeds (1.5) however in Post-Monsoon 2022 Survey, the highest average diversity was observed in Sandy Plains (1.0) followed by Date Palm (1.0). No specimen was observed in Mountain/Hills in any survey.

The highest average density for herpetofauna during the Previous Surveys was observed in Dry Streambeds (6.8), followed by Clayey Plains (4.0), and Gravel Plains (1.3), however during the Post-Monsoon 2022 Survey, the highest average density was observed in Sandy Plains (6.0) followed by Gravel Plains (1.8), Date Palms (1.0), Clayey Plains (1.0) and Dry Streambeds (0.3). No specimens were observed in Mountains/Hills during the both Previous Surveys and Post-Monsoon 2022 Survey.

Table 13 provides a comparison of the average diversity and density of herpetofauna species observed during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Figure 16 provides a comparison of species abundance observed during the both Previous Surveys and Post-Monsoon 2022 Survey.

Figure 17 provides a comparison of species richness, observed during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Table 13: Average Diversity and Density of Herpetofauna Species Observed in Previous Surveys and Post-Monsoon 2022 Survey along Fan Sediment Water Supply Pipeline Area

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Clayey Plains	3.0	0.5	4.0	1.0
Dry Streambeds	1.5	0.3	6.8	0.3
Date Palm	0.0	1.0	0.0	1.0
Gravel Plains	0.8	0.5	1.3	1.8
Mountains/Hills	0.0	0.0	0.0	0.0
Sandy Plains	0.5	3.0	4.0	6.0

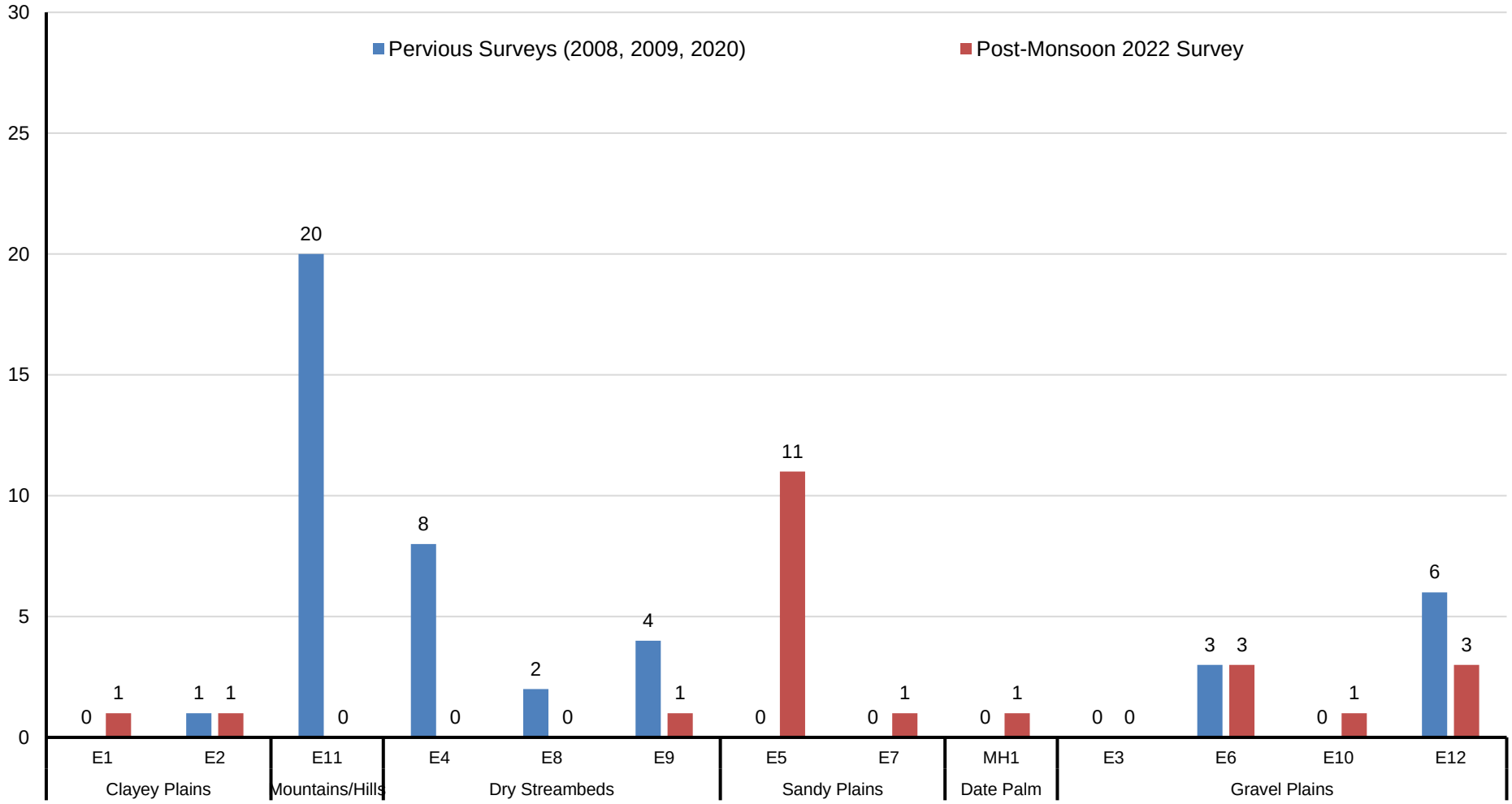


Figure 16: Comparison of Herpetofauna Abundance Observed in Previous Surveys and Post-Monsoon 2022 Survey along Fan Sediment Water Supply Pipeline Area

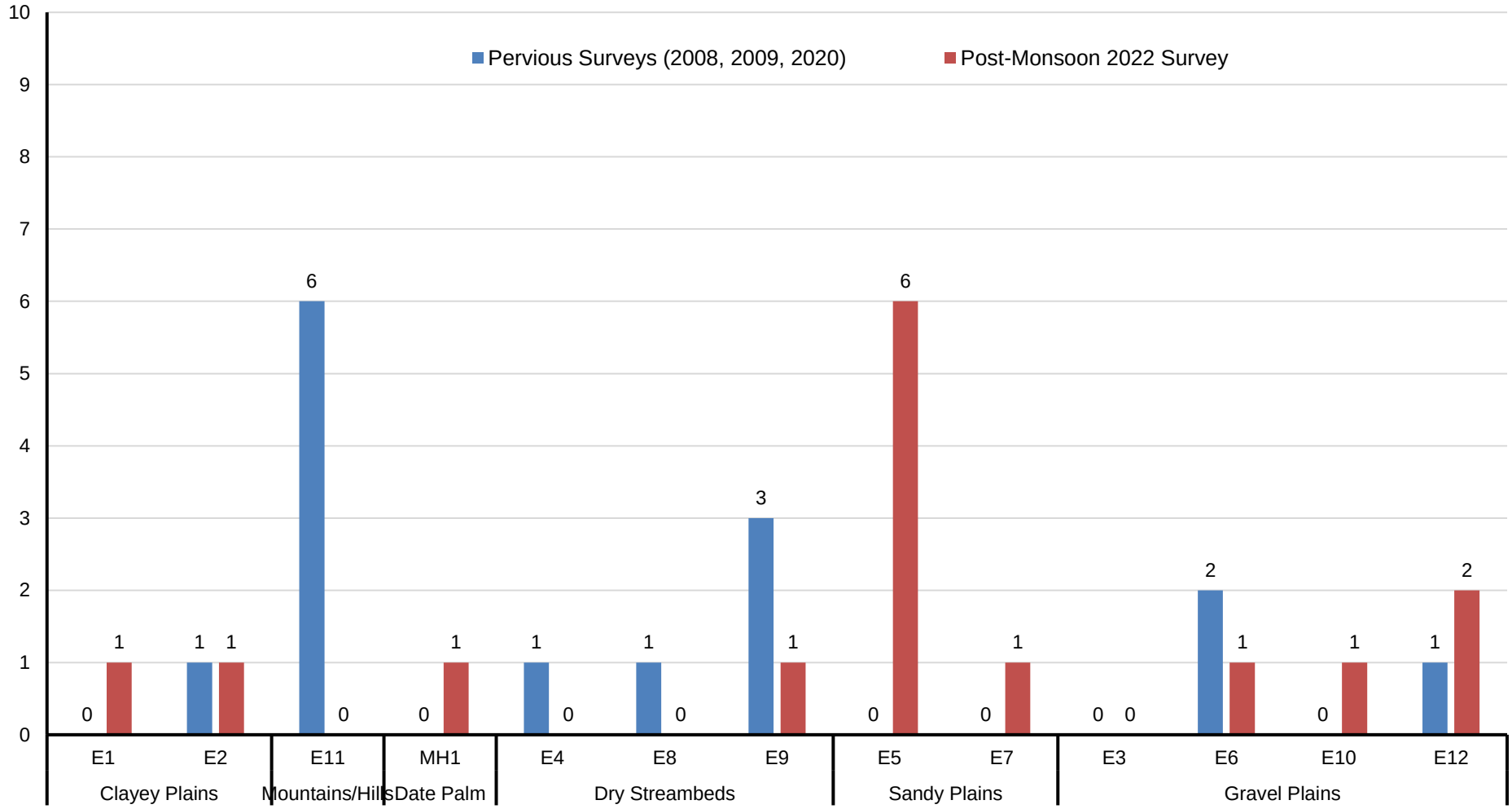


Figure 17: Comparison of Herpetofauna Species Richness Observed in Previous Surveys and Post-Monsoon 2022 Survey along Fan Sediment Water Supply Pipeline Area

Access Road to the proposed Reko Diq Mine Site

A total of eight common sampling locations were selected for comparison of the Post-Monsoon 2022 Survey with the Previous Surveys. Average diversity and density of 0.4 and 0.6 were recorded during the Post-Monsoon 2022 Survey along the Access Road to the proposed Reko Diq Mine Site whereas, during the Previous Surveys, it was recorded as 0.6 and 0.4 respectively. This shows that the diversity of herpetofauna species is lower during the Post-Monsoon 2022 Survey in comparison with Previous Surveys, however, the density is comparatively higher than in Previous Surveys.

Among different habitat types, the highest average diversity during the Post-Monsoon 2022 Survey was recorded in Dry Streambeds (0.7) followed by Gravel Plains (0.5), and no specimen was observed in Mountains/Hills, whereas, during the Previous Surveys, this distribution pattern was slightly different i.e., the highest diversity at Mountain/Hills (3.0) followed by Gravel Plains (0.8) and Dry Streambeds (0.3).

During the Post-Monsoon 2022 Survey, the highest average density was recorded in Dry Streambeds (1.0) followed by Gravel Plains (0.5), whereas, during the Previous Surveys, this pattern was recorded as; the highest density in Mountains/Hills (4.0) followed by Gravel Plains (1.3), and Dry Streambeds (0.3). No sighting of herpetofauna in Mountain/Hills was recorded during the Post-Monsoon 2022 Survey.

Table 14 provides a comparison of the average diversity and density of herpetofauna species observed during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Figure 18 provides a comparison of species abundance observed during the both Previous Surveys and Post-Monsoon 2022 Survey.

Figure 19 provides a comparison of species richness observed during the both Previous Surveys and Post-Monsoon 2022 Survey.

Table 14: Comparison of Average Diversity and Density Observed in Previous Surveys and Post-Monsoon 2022 Survey

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Dry Streambeds	0.3	0.7	0.3	1.0
Gravel Plains	0.8	0.5	1.3	0.5
Mountains/Hills	3.0	0.0	4.0	0.0

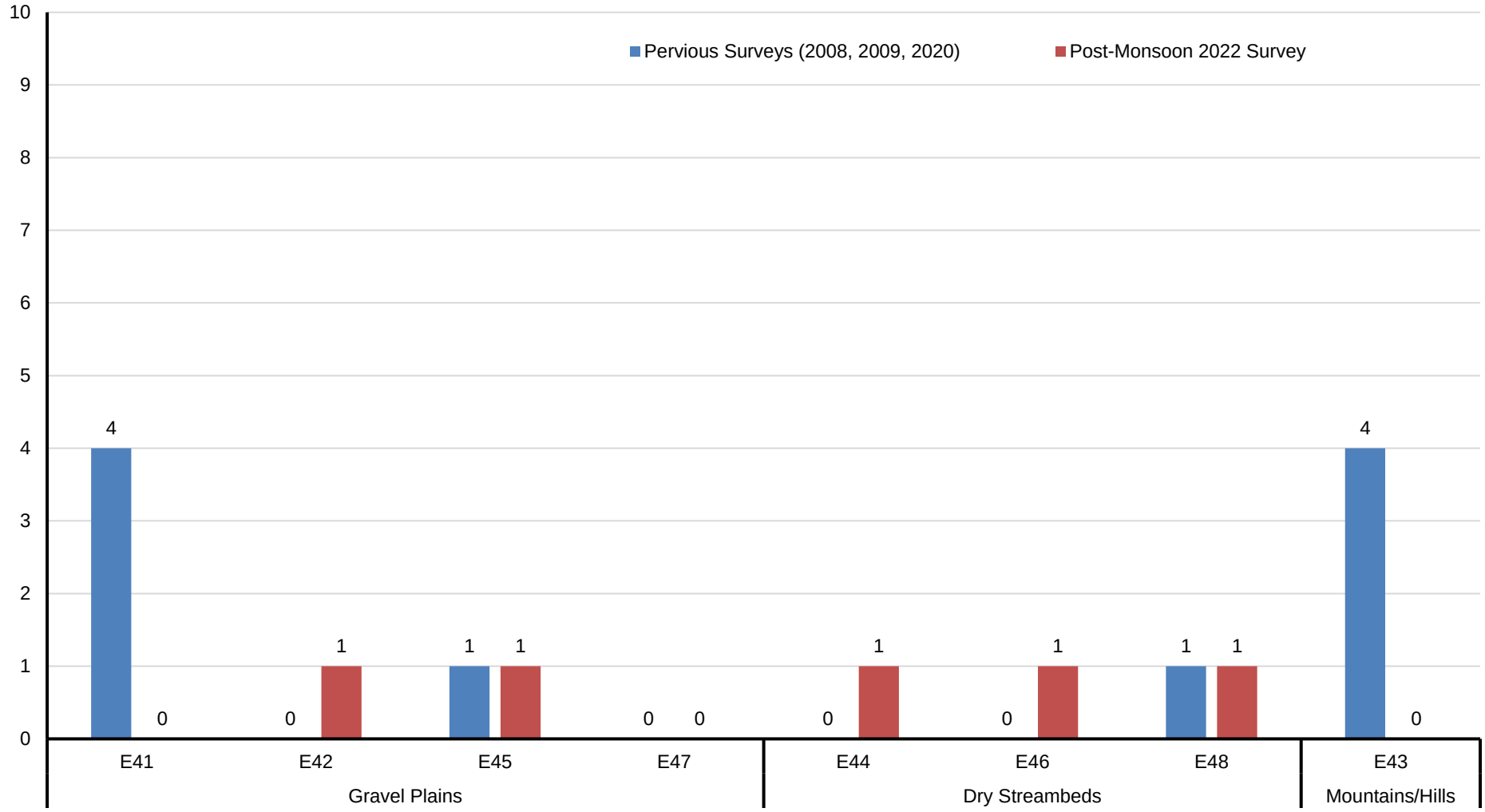


Figure 18: Comparison of Species Abundance Observed in Previous Surveys and Post-Monsoon 2022 Survey

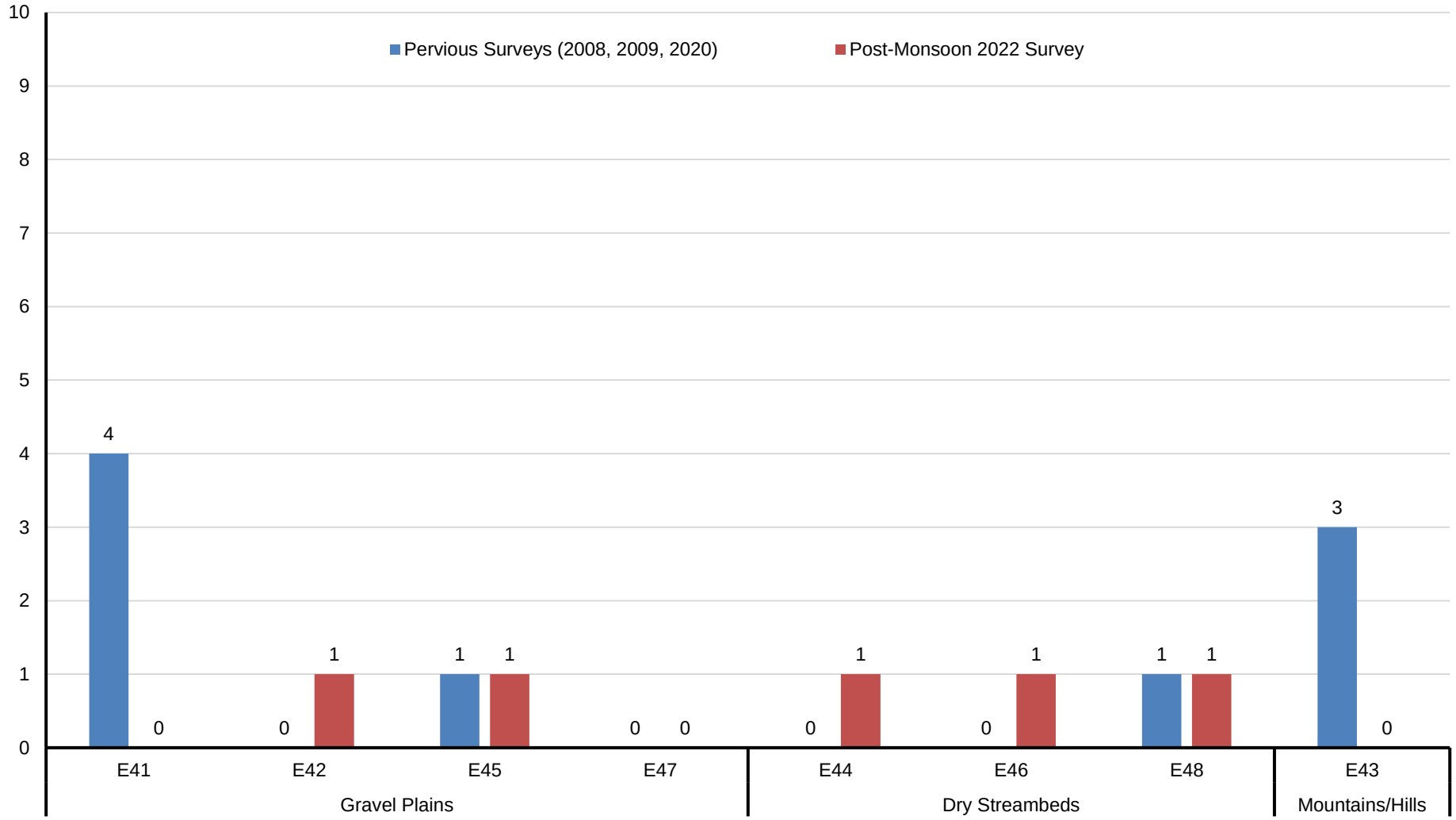


Figure 19: Comparison of Species richness Observed in Previous Surveys and Post-Monsoon 2022 Survey

Mammals

A comparison of mammals' abundance and species richness observed during the both Previous Surveys (November 2008, September 2009, and August 2020) and the Post-Monsoon 2022 Survey is given for common sampling locations that were sampled in both surveys.

A total of nine mammalian species were observed during the Previous Surveys compared to seven species during the Post-Monsoon 2022 Survey. Goitered Gazelle which was observed during the Previous Surveys was not observed during the Post-Monsoon 2022 Survey. Similarly, Sand Cat which was recorded during the Post-Monsoon 2022 Survey, was not observed during the Previous Surveys. The reason for the disappearance of the Goitered Gazelle during the Post-Monsoon 2022 Survey may be fencing along the border and hunting of this species as discussed in the previous section.

Table 15 provides a comparison of mammalian species observed during the both Previous Surveys and the Post-Monsoon 2022 Survey.

Table 15: Mammalian Species Observed in Previous Surveys and Post-Monsoon 2022 Survey

Common Name	*Scientific Name*	*September 2008 Survey*	*November 2009 Survey*	*August 2020 Survey*	*Post-Monsoon 2022 Survey*
Asiatic Jackal	*Canis aureus*	✓	✓	✓	✓
Baluchistan Gerbil	*Gerbillus nanus*	-	-	✓	-
Cape Hare	*Lepus capensis*	-	-	✓	✓
Indian Jird	*Meriones hurrianae*	-	-	✓	✓
Indian Gerbil	*Tatera indica*	-	-	✓	-
Long Eared Hedgehog	*Hemiechinus auritus*	✓	✓	✓	✓
Red Fox	*Vulpes vulpes*	✓	✓	✓	✓
Ruppell's Fox	*Vulpes rueppellii*	-	-	-	✓
Goitered Gazelle	*Gazella subgutturosa*	-	-	✓	-
Small five-toed Jerboa	*Scarturus elater*	-	-	✓	-
Sand Cat	*Felis margarita*	-	-	-	✓
Total		**3**	**3**	**9**	**7**
Total (combined total for Previous Surveys)		**9**			**7**

Proposed Reko Diq Mine Site

Mammals' abundance and richness at the proposed Reko Diq Mine Site for Previous Surveys are compared with the Post-Monsoon 2022 Survey. The comparison is given for a total of 14 common sampling locations which were sampled in both surveys. A total of three mammalian species were observed from Reko Diq Mine during the Previous Surveys which includes Asiatic Jackal, Red Fox, and Small Five-toed Jerboa. However, during the Post-Monsoon 2022 Survey, a total of five mammalian species were observed

which include Desert Hare, Red Fox, Ruppell's Fox, Sand Cat, and Great Gerbil. During the Previous Surveys, the Red Fox was the most sighted mammalian species whilst, the highest signs and sightings of Red Fox and Ruppell's Fox were observed in the Post-Monsoon 2022 Survey.

During the Previous Surveys, the highest mammal diversity was observed in Dry Streambeds (0.7) followed by Gravel Plains (0.3) and Mountains/Hills (0.3), while during thw Post-Monsoon 2022 Survey, the highest diversity of mammals was observed in Mountains/Hills (0.8) followed by Gravel Plains (0.3) and Dry Streambeds (0.3). During the Previous Surveys, the highest mammal density was recorded in Gravel Plains (0.8) followed by Dry Streambeds (0.7) and Mountains/Hills (0.5), while during the Post-Monsoon 2022 Survey, the highest density was observed in Dry Streambeds that was (1.3) followed by Mountains/Hills (0.8) and Gravel Plains (0.3).

Table 16 provides a comparison of the average diversity and density of mammalian species by habitat type observed during the both Previous Surveys and the Post-Monsoon 2022 Survey at the proposed Reko Diq Mine Site.

The maximum abundance of mammalian species was observed at Sampling Location E31 (five signs/sightings) followed by E25 (two signs/sightings) during the Previous Surveys while during the Post-Monsoon 2022 Survey, the highest abundance was observed at Sampling Location E30, located in Dry Streambeds. Similarly, during the Previous Surveys, the highest richness was observed (two species) at sampling locations E31 and E25. During the Post-Monsoon 2022 Survey, only one species each was observed at sampling locations E13, E17, E19, and E30 located in Mountains/Hills and Dry Streambeds.

Figure 20 provides the graph of mammal abundance by sampling location for Previous Surveys and the Post-Monsoon 2022 Survey at the proposed Reko Diq Mine Site.

Figure 21 provides the graph of mammal species richness by sampling locations for Previous Surveys and the Post-Monsoon 2022 Survey at the proposed Reko Diq Mine Site.

Table 16: Average Diversity and Density by Habitat Type Observed in Previous Surveys and Post-Monsoon 2022 Survey at the proposed Reko Diq Mine Site

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Dry Streambeds	0.7	0.3	0.7	1.3
Gravel Plains	0.3	0.3	0.8	0.3
Mountains/Hills	0.3	0.8	0.5	0.8
Sandy Plains	0.0	0.0	0.0	0.0

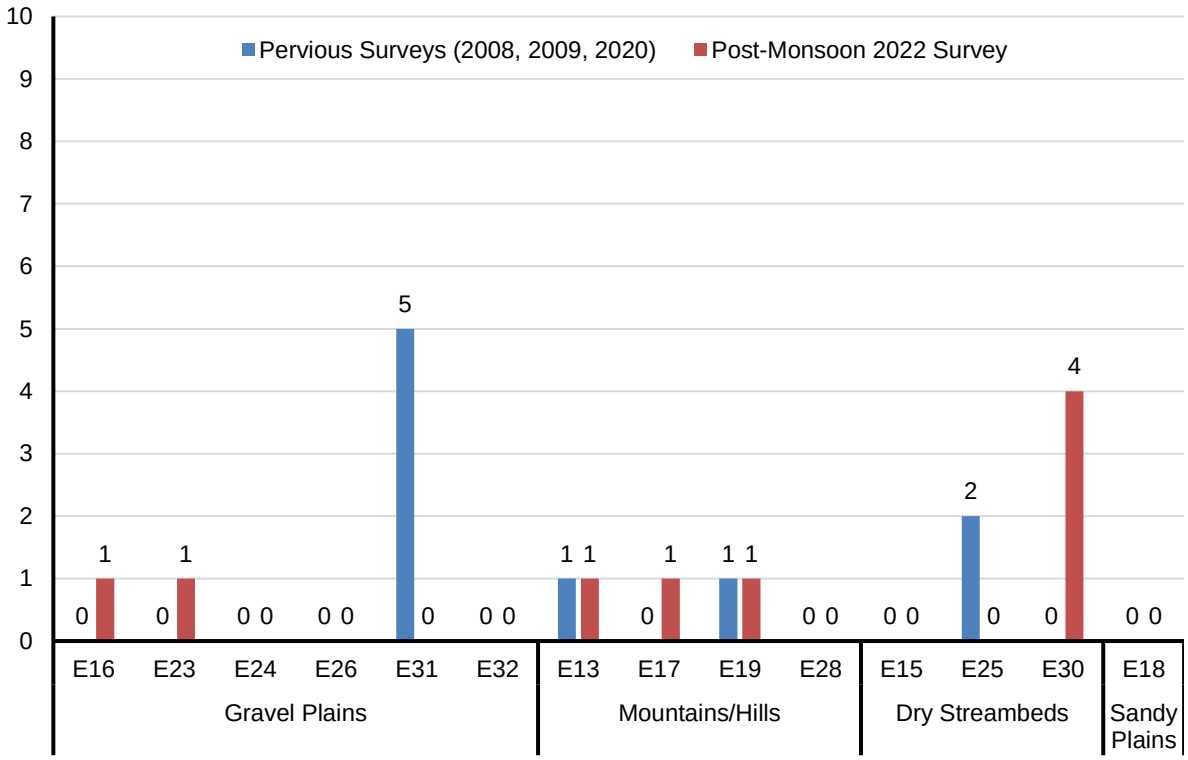


Figure 20: Comparison of Mammals Abundance by Sampling Location for Previous Surveys and Post-Monsoon 2022 Survey at the proposed Reko Diq Mine Site

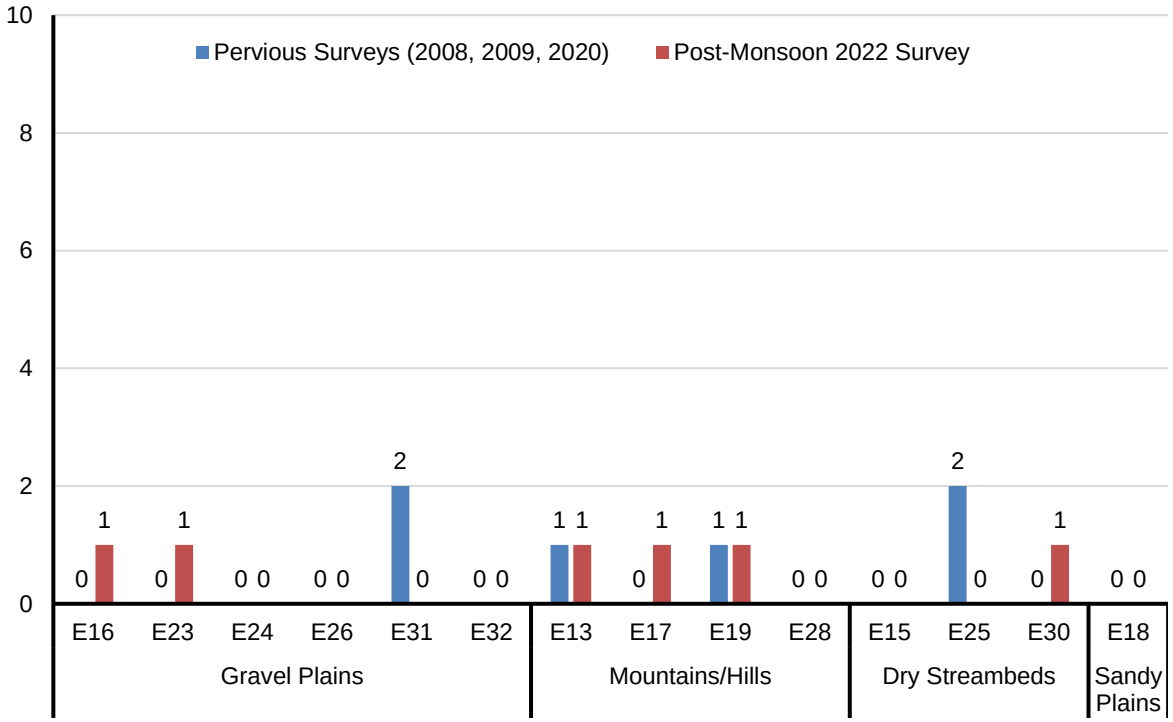


Figure 21: Comparison of Mammals Richness by Sampling Location for Previous Surveys and Post-Monsoon 2022 Survey at the Reko Diq Mine Site

Fan Sediment Water Supply Pipeline Area

Mammal abundance and richness at a total of 13 common sampling locations along the Fan Sediment Water Supply Pipeline Area are compared for Previous Surveys and the Post-Monsoon 2022 Survey. A total of nine mammalian species were observed along the Fan Sediment Water Supply Pipeline Area during the Previous Surveys which includes Asiatic Jackal, Red Fox, Small Five-toed Jerboa, Indian Gerbil, Goitered Gazelle, Cape Hare, Long-eared Hedgehog, Balochistan Gerbil, and Indian Jird, however, in Post-Monsoon 2022 Survey, a total of three mammalian species were observed which include Desert Hare, Red Fox, and Ruppell's Fox. Red Fox was the most abundant species observed in both surveys.

During the Previous Surveys, the highest mammal diversity was observed in Date Palm (6.0) followed by Dry Streambeds (2.0), Gravel Plains (1.5), Mountains/Hills (1.0), and Clayey Plains (1.0) however during the Post Monsoon 2022 Survey, the highest diversity of mammals was observed in Sandy Plains (0.5) and Gravel Plains (0.5) followed by Dry Streambeds (0.3). During the Previous Surveys, the maximum density was observed in Date Palm (29.0) followed by Dry Streambeds (10.5), Gravel Plains (8.0), Clayey Pains (3.0), and Mountain/Hills (2.0), however, during the Post-Monsoon 2022 Survey the highest density was observed in Sandy Plains (1.0) followed by Dry Streambeds (0.7) and Gravel Plains (0.5).

Table 17 provides a comparison of the average diversity and density of mammalian species observed during the both Previous Surveys and the Post-Monsoon 2022 Survey along the Fan Sediment Water Supply Pipeline Area.

During the Previous Surveys, maximum signs and sightings were observed at Sampling Location MH1 (29 signs and sightings) followed by E12 (24 signs and sightings), and E3 (22 signs and sightings). However, maximum signs and sightings were observed at sampling locations E4 and E5 (two signs each at both locations) during the Post-Monsoon 2022 Survey. Maximum richness was observed at Sampling Location E12 (eight species) followed by MH1 (six species) during the Previous Surveys. In contrast, only one species each was observed at sampling locations E4, E5, E6, and E10 during the Post-Monsoon 2022 Survey. These results indicate that both the abundance and species richness of mammals are lower during the Post-Monsoon 2022 Survey. This can be attributed to the extreme arid conditions due to prolonged drought as well as fencing along the border which has restricted the species' migration route.

Figure 22 provides the graph for mammal abundance by sampling location and its comparisons for Previous Surveys and Post-Monsoon 2022 Survey along the Fan Sediment Water Supply Pipeline Area.

Figure 23 provides the graph for mammal richness by sampling location and its comparisons for Previous Surveys and Post-Monsoon 2022 Survey along the Fan Sediment Water Supply Pipeline Area.

Table 17: Comparison of Average Diversity and Density of Mammalian Species Observed in Previous Surveys and Post-Monsoon 2022 Survey Along Fan Sediment Water Supply Pipeline Area

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Clayey Plains	1.0	0.0	3.0	0.0
Dry Streambeds	2.0	0.3	10.5	0.7
Agricultural Area/Date Palm	6.0	0.0	29.0	0.0
Gravel Plains	1.5	0.5	8.0	0.5
Mountains/Hills	1.0	0.0	2.0	0.0
Sandy Plains	0.0	0.5	0.0	1.0

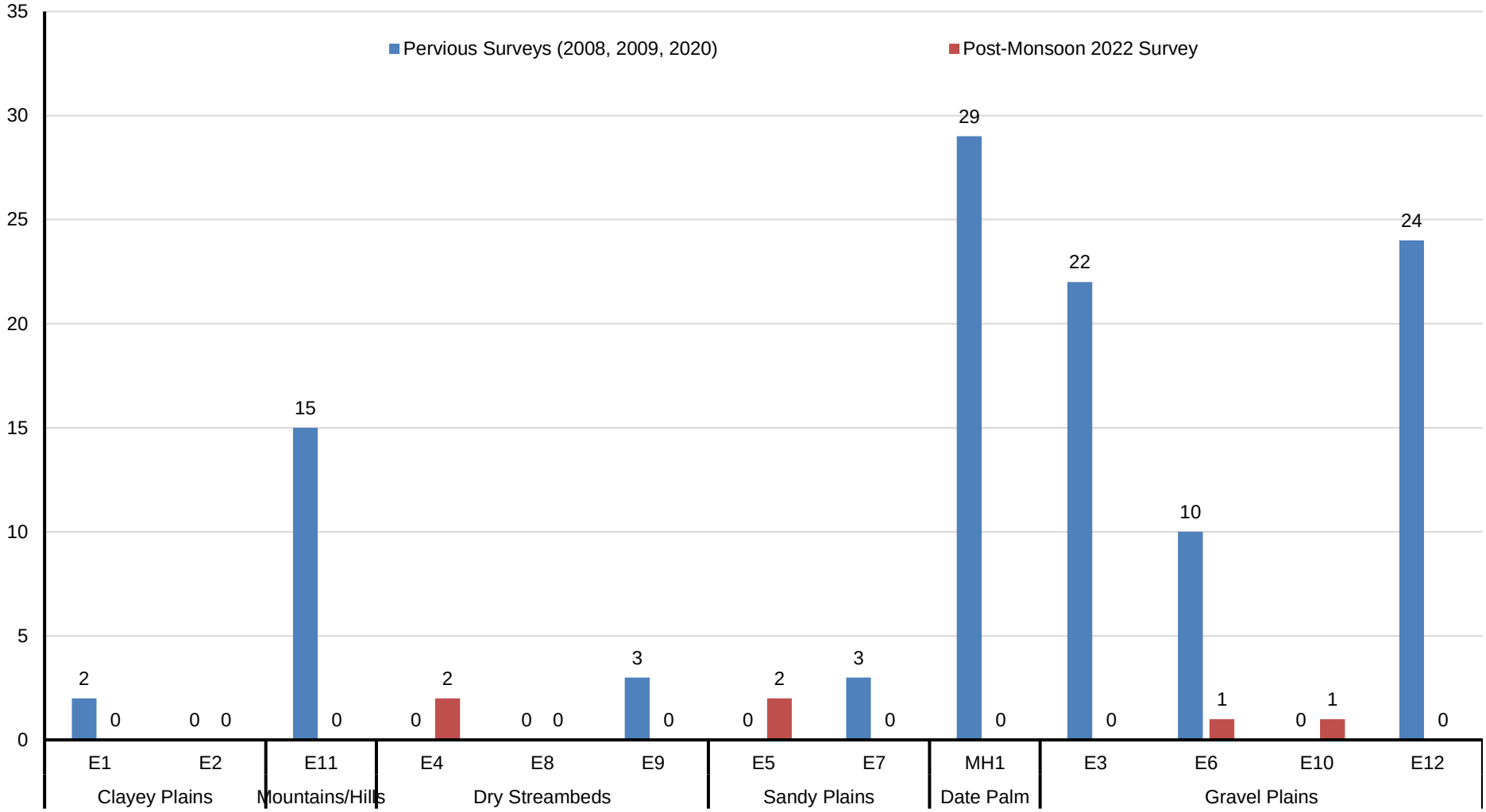


Figure 22: Comparison of Mammals Abundance by Sampling Location for Previous Surveys and Post-Monsoon 2022 Survey Along Fan Sediment Water Supply Pipeline Area

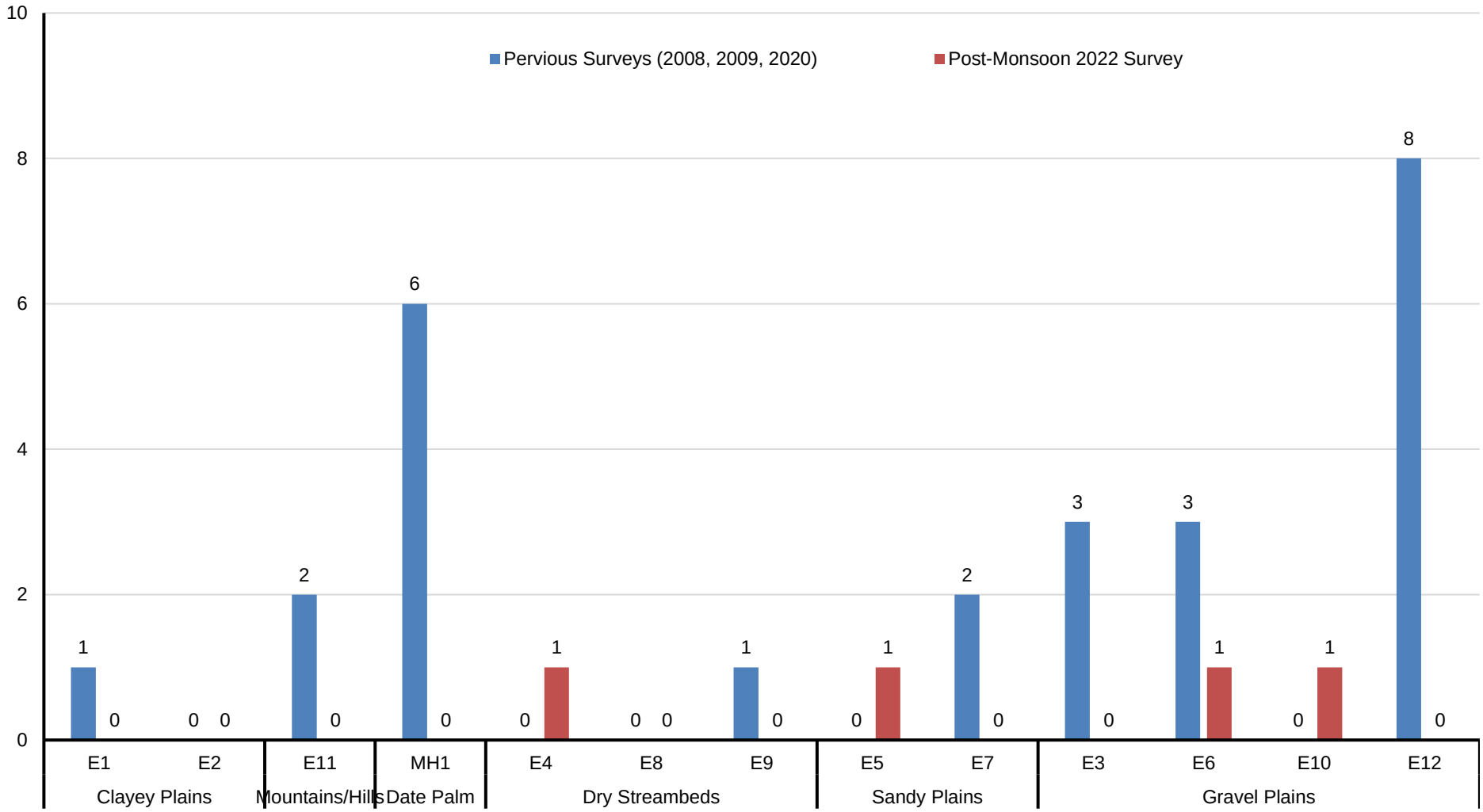


Figure 23: Comparison of Mammals Richness by Sampling Location for Previous Surveys and Post-Monsoon 2022 Survey Along Fan Sediment Water Supply Pipeline Area

Access Road to the proposed Reko Diq Mine Site

Mammal abundance and richness for a total of eight common sampling locations along the Access Road to the proposed Reko Diq Mine Site are compared for Previous Surveys and the Post-Monsoon 2022 Survey. A total of two mammalian species were observed along the Access Road to the proposed Reko Diq Mine Site during the Previous Surveys which include Red Fox and Long-eared Hedgehog. Whereas, during the Post-Monsoon 2022 Survey, a total of three mammalian species were observed along the Access Road to the Mine Site include Desert Hare, Long-eared Hedgehog, and Red Fox. Red Fox was the most sighted mammalian species during the Previous Surveys, however, the Desert Hare was the most sighted mammalian species observed from the Access Road to the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey.

During the Previous Surveys, the highest mammal diversity was recorded in Mountains/Hills (1.0), followed by Gravel Plains (0.5) and Dry Streambeds (0.33), while during the Post-Monsoon 2022 Survey the highest diversity of mammals was observed in Mountains/Hills (1.0), followed by Gravel Plains (0.3). During the Previous Surveys, the highest mammal density was recorded in Gravel Plains that was (3.3) followed by Mountains/Hills (2.0) and Dry Streambeds (1.7), while during the Post-Monsoon 2022 Survey, the highest density was observed in Mountains/Hills (2.0), followed by Gravel Plains (0.3). No specimens of any mammalian species were recorded from Dry Streambeds along the Access Road to the proposed Reko Diq Mine Site during the Post-Monsoon 2022 Survey.

Table 18 provides the average diversity and density of mammals by habitat type observed during the both Previous Surveys and Post-Monsoon 2022 Survey along the Access Road to the proposed Reko Diq Mine Site.

During the Previous Surveys, the highest abundance was observed at Sampling Location E47 (nine signs/sightings) followed by E42 and E48 (four signs/sightings each). Whereas, during the Post-Monsoon 2022 Survey, maximum signs were observed at sampling locations E42 (two signs/sightings). Similarly, during the Previous Surveys, the highest species richness was observed at sampling locations E42 and E47 (two species each), while during the Post-Monsoon 2022 Survey only one species was observed from sampling locations E42, and E43. Figure 24 provides the graph of mammal's abundance by sampling location for Previous Surveys and Post-Monsoon 2022 Survey along Access Road to the proposed Reko Diq Mine Site. Figure 25 provides the graph of mammal's species richness by sampling location for Previous Surveys and Post-Monsoon 2022 Survey along the Access Road to the proposed Reko Diq Mine Site.

Table 18: Average Diversity and Density of Mammals Observed in Previous Surveys and Post-Monsoon 2022 Survey Along Access Road to the proposed Reko Diq Mine Site

Habitat	*Average Diversity*		*Average Density*	
	Previous Surveys	*Post-Monsoon 2022 Survey*	*Previous Surveys*	*Post-Monsoon 2022 Survey*
Dry Streambeds	0.3	0.0	1.7	0.0
Gravel Plains	0.5	0.3	3.3	0.3
Mountains/Hills	1.0	1.0	2.0	2.0

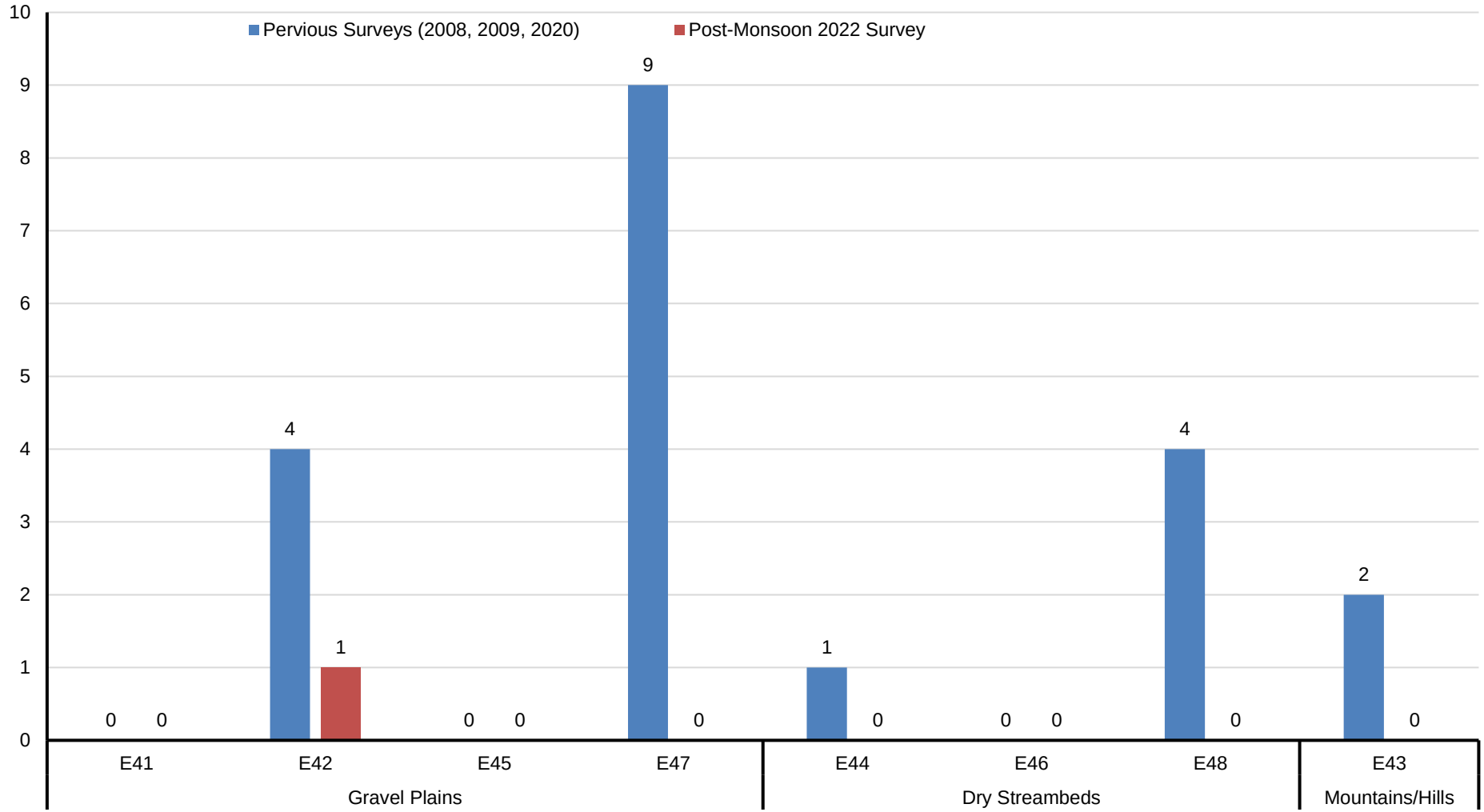


Figure 24: Comparison of Mammals Abundance by Sampling Location for Previous Surveys and Post-Monsoon 2022 Survey Along Access Road to the proposed Reko Diq Mine Site

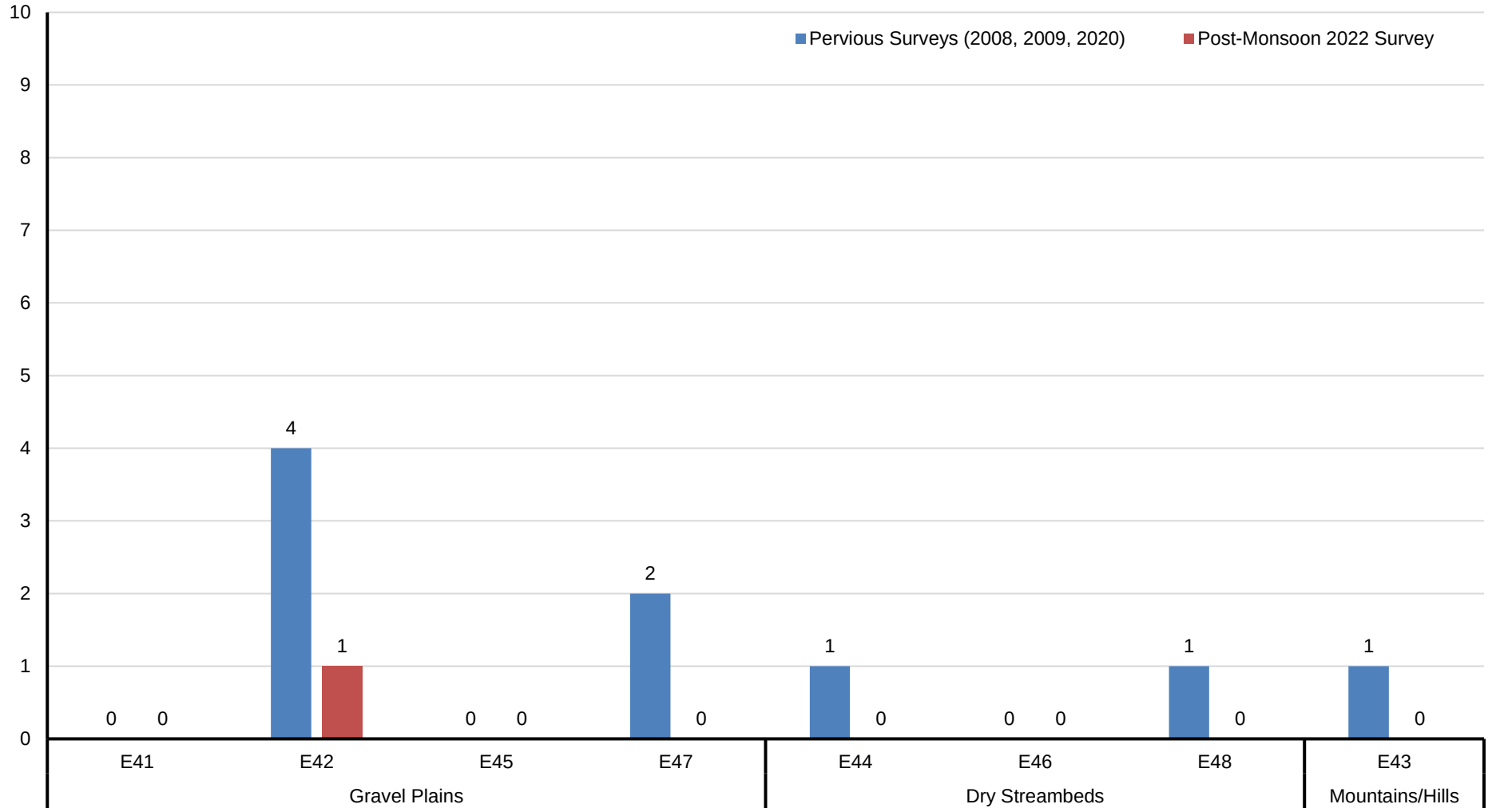


Figure 25: Comparison of Mammals Species Richness by Sampling Location for Previous Surveys and Post-Monsoon 2022 Survey Along Access Road to the proposed Reko Diq Mine Site

Small Mammals

The live trapping for small mammals was also conducted during the Previous Surveys such as in November 2008, and September 2009 at the proposed Reko Diq Mine Site and along the Access Road to the proposed Reko Diq Mine Site. A comparison of abundance and richness for the Post-Monsoon 2022 Survey with Previous Surveys is provided in this section. A comparison of small mammals is given for the proposed Reko Diq Mine Site only.

In the November 2008 Survey, a higher abundance and richness of small mammals were observed compared to the September 2009 and Post-Monsoon 2022 Survey. A total of 12 specimens belonging to five species of small mammals were captured in the November 2008 Survey compared to three specimens of three species captured in the September 2009 Survey, however, six specimens of only one species were captured during the Post-Monsoon 2022 Survey.

During the Previous Surveys, small mammals were captured from Gravel Plains and Clayey Plains however, they were captured only from the Built-up Area during the Post-Monsoon 2022 Survey. This can be attributed to the availability of food and shelter in these habitats as the conditions were not that dry at that time (November 2008 and September 2009) however currently due to prolonged drought these habitats (Gravel Plains and Clayey Plains) were completely dry with little or no vegetation. In Built-up Areas, a little bit of vegetation is available for these species which supports the survival of these species.

The species observed during the both Previous Surveys (2008 and 2009) and Post-Monsoon 2022 Survey were the Cheesman's Gerbil *Gerbillus cheesmani,* Blanford's Jerboa *Jaculus blanfordi,* Balochistan Gerbil *Gerbillus nanus,* Libyan Jird *Meriones libycus,* Indian Hairy Footed Gerbil *Gerbillus gleadowi* and Great Gerbil *Rhombomys opimus.* Only one species captured during the Post-Monsoon 2022 Survey.

Table 19 provides small mammal species, habitat, abundance, and richness observed during the both Previous Surveys (November 2008, September 2009) and Post-Monsoon 2022 Survey.

Figure 26 provides the abundance of small mammals for Previous Surveys and Post-Monsoon 2022 Survey.

Table 19: Small Mammals Captured in November 2008, September 2009, and Post-Monsoon 2022 Survey from the proposed Reko Diq Mine Site

Surveys Years	*Common Name*	*Scientific Name*	*No. of Sampling Locations*	*Habitat*	*Abundance*	*Total Abundance*	*Total Species Richness*
November 2008 Survey	Cheesman's Gerbil	*Gerbillus cheesmani*	7	Gravel Plain	2	12	5
	Blanford's Jerboa	*Jaculus blanfordi*		Gravel Plain	3		
	Libyan Jird	*Meriones libycus*		Clayey Plain	3		
	Balochistan Gerbil	*Gerbillus nanus*		Clayey Plain	3		
	Indian Hairy Footed Gerbil	*Gerbillus gleadowi*		Clayey Plain	1		
September 2009 Survey	Blanford's Jerboa	*Jaculus blanfordi*	6	Gravel Plain	1	3	3
	Balochistan Gerbil	*Gerbillus nanus*		Gravel Plain	1		
	Cheesman's Gerbil	*Gerbillus cheesmani*		Gravel Plain	1		
Post-Monsoon 2022 Survey	Great Gerbil	*Rhombomys opimus*	4	Built up Areas	7	7	1

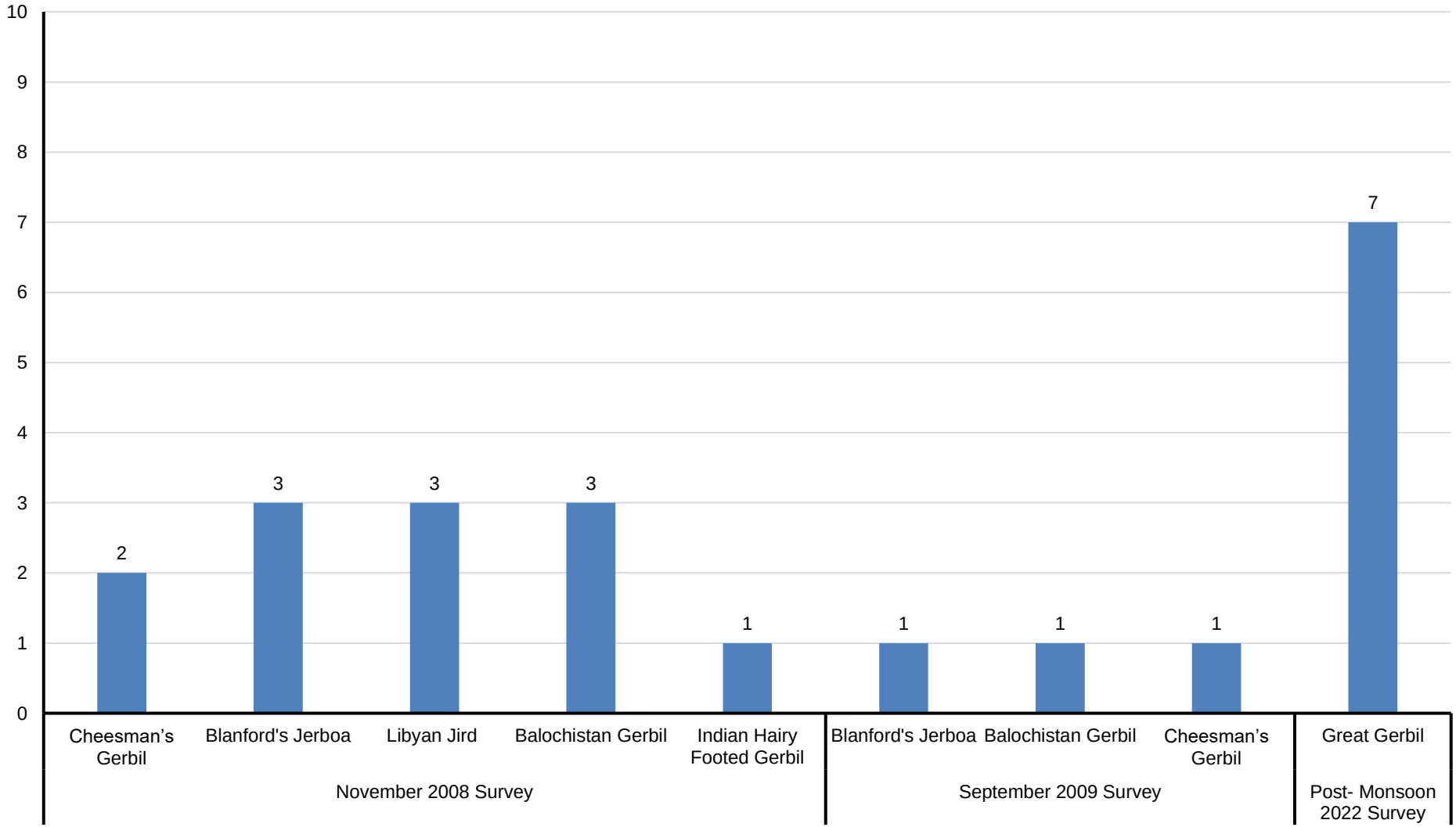


Figure 26: Abundance of Small Mammal Observed in Previous Surveys (November 2008, September 2009) and Post-Monsoon 2022 Survey

K.2. Results of Spring 2023 Survey and its Comparison with Previous Survey (May 2008)

This appendix presents the comparisons of the results of Spring 2023 Survey with the Previous Survey conducted in May 2008.

The results of the Spring 2023 Survey (conducted in April-May 2023) for common sampling locations are compared with Previous Surveys which were carried out in similar seasons i.e., May 2008. The weather conditions were almost comparable with the current survey season, therefore, the results for common sampling locations using common sampling method were used for the comparison with these surveys. Results for terrestrial ecological resources are only compared for these surveys. The comparison is made for only four common sampling locations at the proposed Reko Diq Mine Site. The comparison is based on the line transect sampling method for vegetation, birds, mammals, and herpetofauna.

Vegetation

A comparison of plant diversity and density observed during the both Previous Survey (May 2008) and Spring 2023 Survey is given for common sampling locations that were sampled during the Spring 2023 Survey and Previous Survey. Comparison is only provided for the proposed Reko Diq Mine Site while for the rest of the facilities, sampling was not conducted during the Previous Survey. During the Spring 2023 Survey, 16 plant species were observed compared to only eight species during the Previous Survey.

Table 20 provides a list of plant species observed from common sampling locations during the both Spring 2023 Survey and Previous Survey.

Table 20: Plant Species Observed in Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

No.	*Scientific Name*	*Common Name*	*Previous Survey*	*Spring 2023 Survey*
1	*Alhaji maurorum*	Camel Thorn	-	✓
2	*Anabasis setifera*	Anabasis	-	✓
3	*Aristida adscensionis*	Sixweeks Threeawn	✓	✓
4	*Arundo donax*	Giant Reed	-	✓
5	*Calligonum polygonoides*	Phog	-	✓
6	*Citrullus colocynthis*	Bitter Apple	-	✓
7	*Cornulaca monacantha*	Djouri	-	✓
8	*Fagonia ovalifolia*	Dereima	✓	-
9	*Haloxylon persicum*	Persian Salt Tree	✓	✓
10	*Haloxylon salicornicum*	Rimth Saltbush	-	✓
11	*Heliotropium crispum*	Salt Heliotrope	✓	✓
12	*Peganum harmala*	Mountain-rue	-	✓
13	*Salix tetrasperma*	Indian Willow	-	✓

No.	Scientific Name	Common Name	Previous Survey	Spring 2023 Survey
14	*Salsola stocksii*	Saltwort	✓	✓
15	*Tamarix aphylla*	Athel Tamarisk	-	✓
16	*Tamarix stricta*	Salt Cedar	✓	✓
17	*Tribulus terrestris*	Yellow Vine	✓	✓
18	*Zygophyllum simplex*	Simple-leaved Bean Caper	✓	-
Total			**8**	**16**

Only four common sampling locations were sampled in both the Spring 2023 and Previous Survey. Among these, three sampling locations are located in Gravel Plains and one in Mountain/Hills.

The average diversity in Gravel Plains during the Previous Survey (1.3) was higher than during the Spring 2023 Survey (0.7). Similarly average density in Gravel Plain in the Spring 2023 Survey (33.0) was higher than Spring 2023 Survey (7.7). Similarly, the highest density in the Mountain/Hills was observed during the Previous Survey (27.0) compared to the Spring 2023 Survey (11.0), although the diversity remained consistent between the two surveys.

This significant change in diversity and density over 15 years can be attributed to climate change and prevailing drought conditions. These factors have contributed to decreased plant diversity and density during the Spring 2023 Survey. The impacts of climate change such as altered precipitation patterns and increased aridity are major factors.

Table 21 provides the average diversity and density of vegetation species observed from common sampling locations during the both Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site.

Figure 27 provides an abundance of plant species observed at common sampling locations during the both Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site.

Figure 28 provides the richness of plant species observed at common sampling locations during the both Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site.

Table 21:Average Diversity and Density of Vegetation Observed in the Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

Habitat	Average Diversity		Average Density	
	Previous Survey	Spring 2023 Survey	Previous Survey	Spring 2023 Survey
Gravel Plains	1.3	0.7	33.0	7.7
Mountains/Hills	4.0	4.0	27.0	11.0

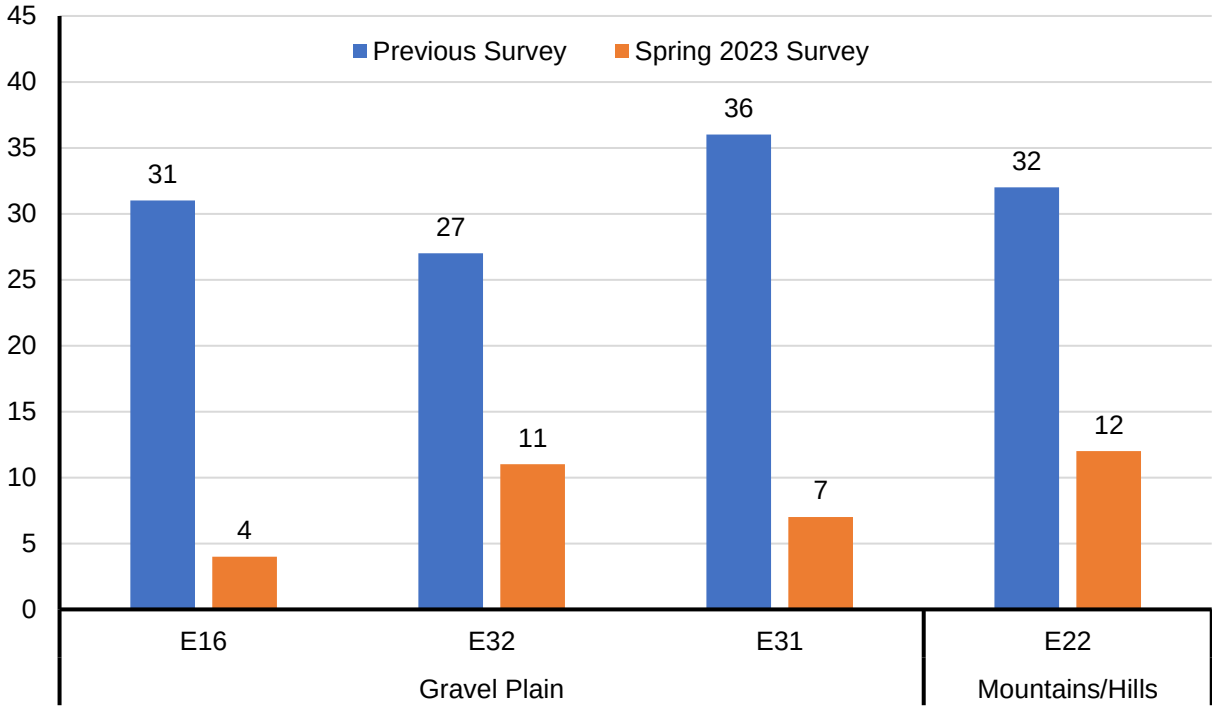


Figure 27: Abundance of Plant Species in Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

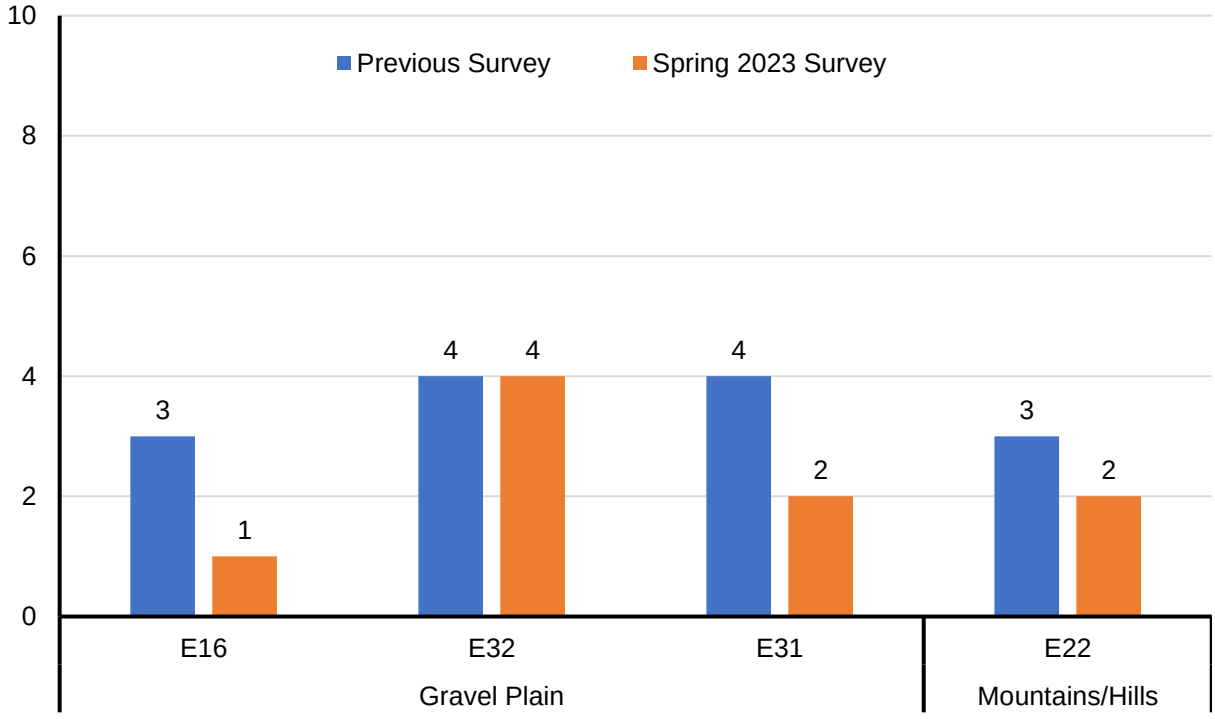


Figure 28: Richness of Plant Species Observed in Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

Avifauna

The comparison of bird abundance and species richness between the Spring 2023 Survey and the May 2008 Survey (referred to as the Previous Survey) focused on the

proposed Reko Diq Mine Site. Since the previous survey was conducted exclusively at the proposed Reko Diq Mine Site, the comparison was limited to the common sampling locations of E16, E22, E31, and E32 within the mine site for both surveys. Overall, the species richness was higher during the Previous Survey as compared to the Spring 2023 Survey. Four species of birds were observed during the Previous Survey while, no species was observed during the Spring 2023 Survey.

Table 22 provides a list of bird species observed at the proposed Reko Diq Mine Site during the both Previous Survey and Spring 2023 Survey.

Table 22: Bird Species Observed in Previous Survey and Spring 2023 Survey at proposed Reko Diq Mine Site

No.	*Scientific Name*	*Common Name*	*Previous Survey*	*Spring 2023 Survey*
1	*Ammomanes deserti*	Desert Lark	✓	-
2	*Emberiza sahari*	House Bunting	✓	-
3	*Oenanthe deserti*	Desert Wheatear	✓	-
4	*Passer domesticus*	House Sparrow	✓	-

A total of 10 bird specimens belonging to four species Desert Lark, House Bunting, Desert Wheatear, and House Sparrow were observed during the Previous Survey which shows that abundance and richness were higher as compared to Spring 2023 Survey. This can be attributed to the extreme dry and hot climatic conditions at the proposed Reko Diq Mine Site during the Spring 2023 Survey. These factors are responsible for the halting of bird activities. Similarly, anthropogenic activities may also be the reason for no bird activities in Spring 2023 Survey. During the Previous Survey, maximum bird abundance was observed at Sampling Location E32 (four specimens) followed by E16, and E31 (three specimens each). Highest bird richness was observed at Sampling Locations E16, E31 and E32 (two species each), followed by E22 (one species). However, no specimen of any species was observed from any common sampling locations during the Spring 2023 Survey.

During the Previous Survey, highest diversity was observed in Gravel Plains (1.3) followed by Mountains/Hills (1.0), similarly, the highest density was observed in Gravel Plains (3.3) followed by Mountains/Hills (2.0).

Table 23 provides a comparison of the average diversity and density of bird species observed during the both Previous Survey and Spring 2023 Survey at the proposed Reko Diq Mine Site.Error! Reference source not found.Figure 29 provides a comparison of bird abundance for the Previous Survey and the Spring 2023 Survey for common sampling locations sampled at the proposed Reko Diq Mine Site.

Figure 30 provides a comparison of bird species for the Previous Survey and the Spring 2023 Survey for common sampling locations sampled at the proposed Reko Diq Mine Site.

Table 23: Average Diversity and Density of Birds Observed in Previous Survey and Spring 2023 Survey at the proposed Reko Diq Mine Site

Habitat	*Average Diversity*		*Average Density*	
	Previous Survey	*Spring 2023 Survey*	*Previous Survey*	*Spring 2023 Survey*
Gravel Plains	1.3	0.0	3.3	0.0
Mountains/Hills	1.0	0.0	2.0	0.0

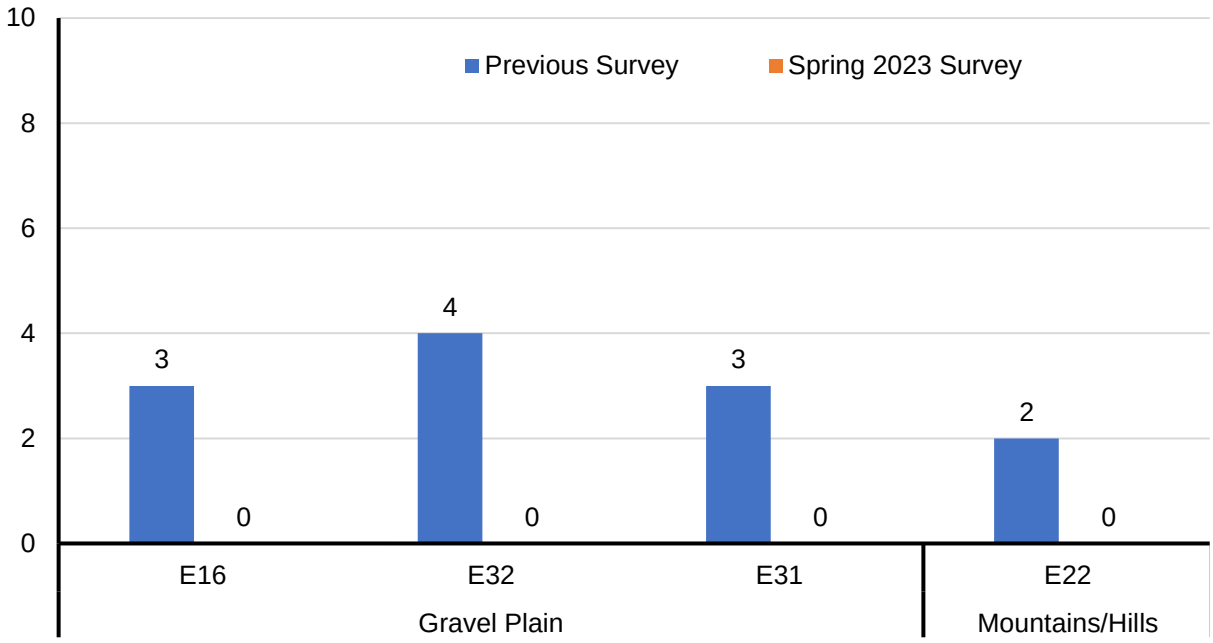


Figure 29: Comparison of Bird's Abundance for Previous Survey and Spring 2023 Survey at the proposed Reko Diq Mine Site

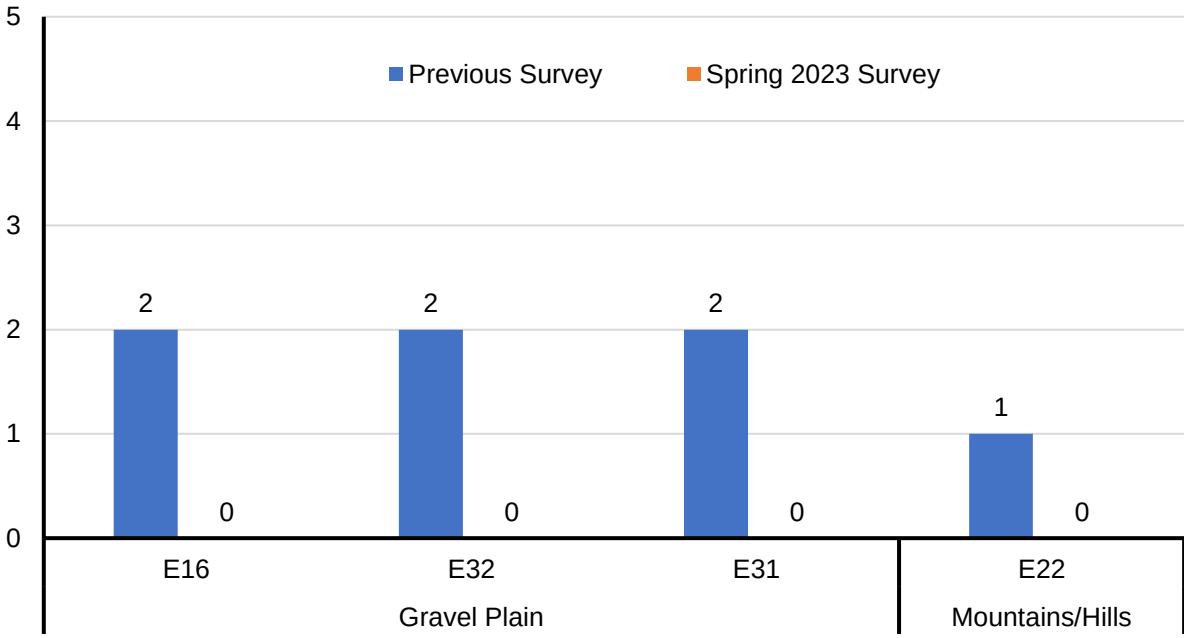


Figure 30: Comparison of Bird's Species Richness for Previous Survey and Spring 2023 Survey at the proposed Reko Diq Mine Site

Herpetofauna

The comparison of herpetofauna abundance and richness was made between the Spring 2023 Survey and the May 2008 Survey (referred to as Previous Survey). As the previous sampling was only carried out in the proposed Reko Diq Mine Site, this comparison is only given for common sampling locations (E16, E22, E31, and E32) of the proposed Reko Diq Mine Site for both surveys.

Table 24 provides a list of herpetofauna species observed from common sampling locations during the both Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site.

Table 24:Herpetofauna Species Observed in Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

No.	*Scientific Name*	*Common Name*	*Previous Survey*	*Spring 2023 Survey*
1	*Acanthodactylus micropholis*	Fringe-fingered Lizard	✓	-
2	*Acanthodactylus cantoris*	Indian Fringe-toed Lizard	✓	-
3	*Phrynocephalus clarkorum*	Clark's Toad-headed Agama	-	✓

At the proposed Reko Diq Mine Site, out of 20 sampling locations, only four sampling locations were common between the Spring 2023 Survey and the Previous Survey. Among these locations, three were located in the Gravel Plains, while one was located in the Mountain/Hills.

During the Previous Survey, the highest average diversity (0.7) and density (2.0) of herpetofauna were observed in the Gravel Plains while, only one species of herpetofauna was observed during the Spring 2023 Survey. No specimen of herpetofauna was observed in Gravel Plains and Mountain/Hills during the both Spring 2023 Survey and Previous Survey respectively.

Overall, the abundance of herpetofauna was higher (six specimens) during the Previous Survey compared to the Spring 2023 Survey (only one specimen). This decline in herpetofauna abundance can be attributed to a decrease in plant cover over a long period, as evidenced by the comparison of plant data between the Spring 2023 and the Previous Survey.

Table 25 provides the average diversity and density of herpetofauna species observed in each habitat type at common sampling locations during the both Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site.

Figure 31 provides an abundance of herpetofauna species observed from common sampling locations during the both Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site.

Figure 32 provides the richness of herpetofauna species observed from common sampling locations during the both Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site.

Table 25: Average Diversity and Density of Herpetofauna in Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

Habitat	*Average Diversity*		*Average Density*	
	Previous Survey	*Spring 2023 Survey*	*Previous Survey*	*Spring 2023 Survey*
Gravel Plains	0.7	0.0	2.0	0.0
Mountains/Hills	0.0	1.0	0.0	1.0

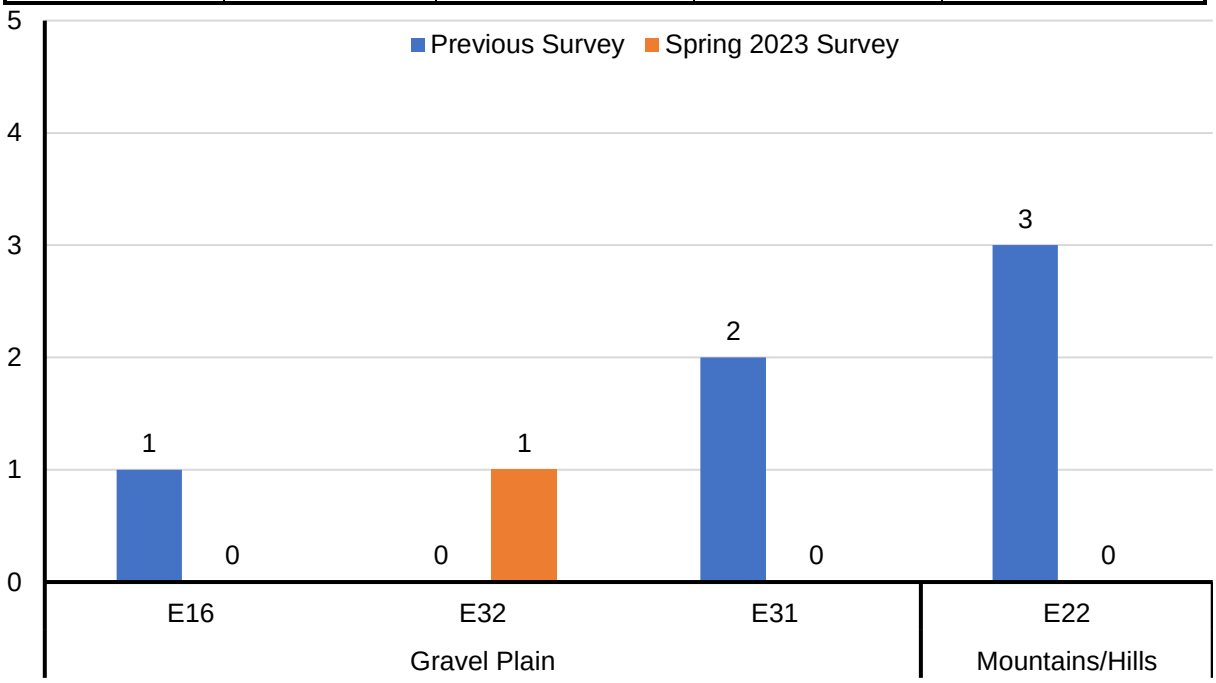


Figure 31: Abundance of Herpetofauna Species in Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

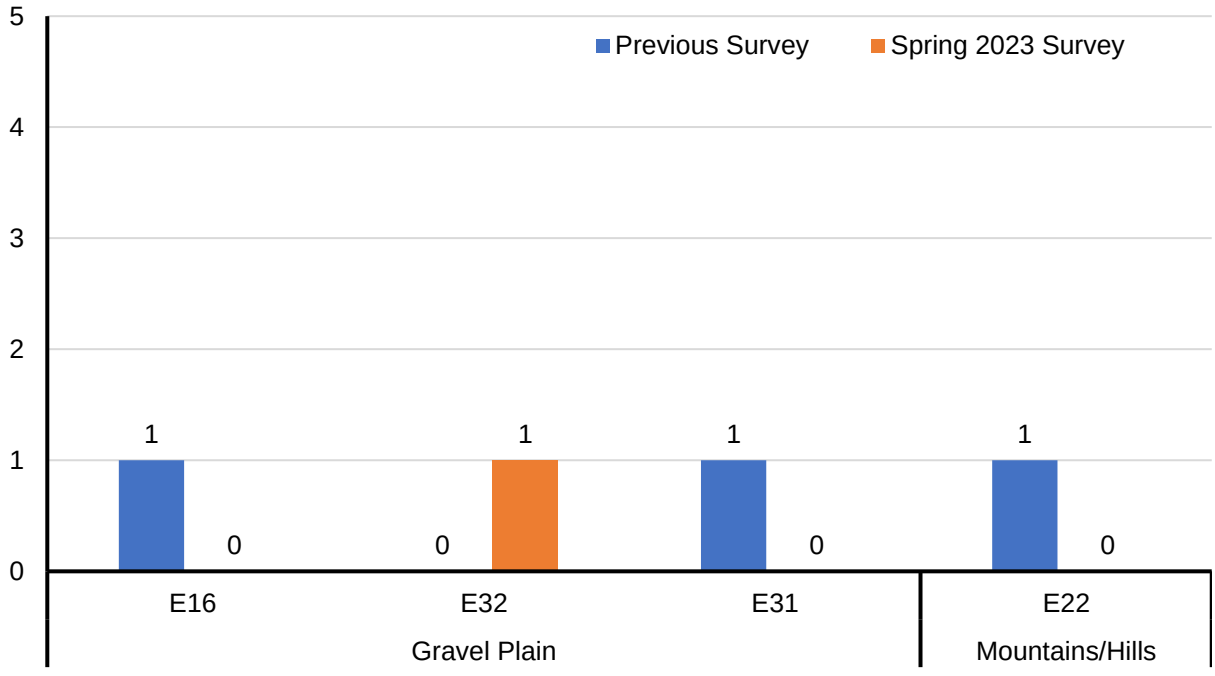


Figure 32: Richness of Herpetofauna Species in Spring 2023 Survey and Previous Survey at the Reko Diq Mine Site

Mammals

A comparison of mammals' abundance and species richness observed during the both Previous Survey (May 2008) and the Spring 2023 Survey is given for common sampling locations that were sampled in both surveys.

Table 26 provides a list of mammal species observed during the both Spring 2023 Survey and Previous Survey at common sampling locations at the proposed Reko Diq Mine Site.

Table 26:List of Mammals Species Observed in Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

No.	*Scientific Name*	*Common Name*	*Previous Survey*	*Spring 2023 Survey*
1	*Canis aureus*	Asiatic Jackal	✓	-
2	*Vulpes rueppellii*	Rupppell's Fox	✓	-
3	*Lepus capensis*	Cape Hare	-	✓

At the proposed Reko Diq Mine Site, out of 20 sampling locations only four sampling locations were found to be common between the Spring 2023 Survey and the Previous Survey. Among these locations, three were located in the Gravel Plains habitat, while one was located in the Mountain/Hills habitat.

During the Previous Survey, the average diversity (0.7) and average density (1.2) were higher compared to the Spring 2023 Survey (0.5 and 0.5) respectively. The decrease in mammal diversity and density during the Spring 2023 Survey can be attributed to a decline in plant cover, as mentioned in the vegetation section of the Terrestrial Ecological Resources. Plant cover plays a crucial role in providing food and shelter to various species of mammals within the study area.

Table 27 provides a comparison of the average diversity and density of mammal species observed during the both Spring 2023 Survey and the Previous Survey at the proposed Reko Diq Mine Site.

Figure 33 provides the abundance of mammal species observed during the both Spring 2023 Survey and the Previous Survey at the proposed Reko Diq Mine Site.

Figure 34 provides the richness of mammal species observed during the both Spring 2023 Survey and the Previous Survey at the proposed Reko Diq Mine Site.

Table 27: Average Diversity and Density of Mammals Observed in Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

Habitat	*Average Diversity*		*Average Density*	
	Previous Survey	*Spring 2023 Survey*	*Previous Survey*	*Spring 2023 Survey*
Gravel Plains	0.3	0.0	0.3	0.0
Mountains/Hills	1.0	1.0	2.0	1.0

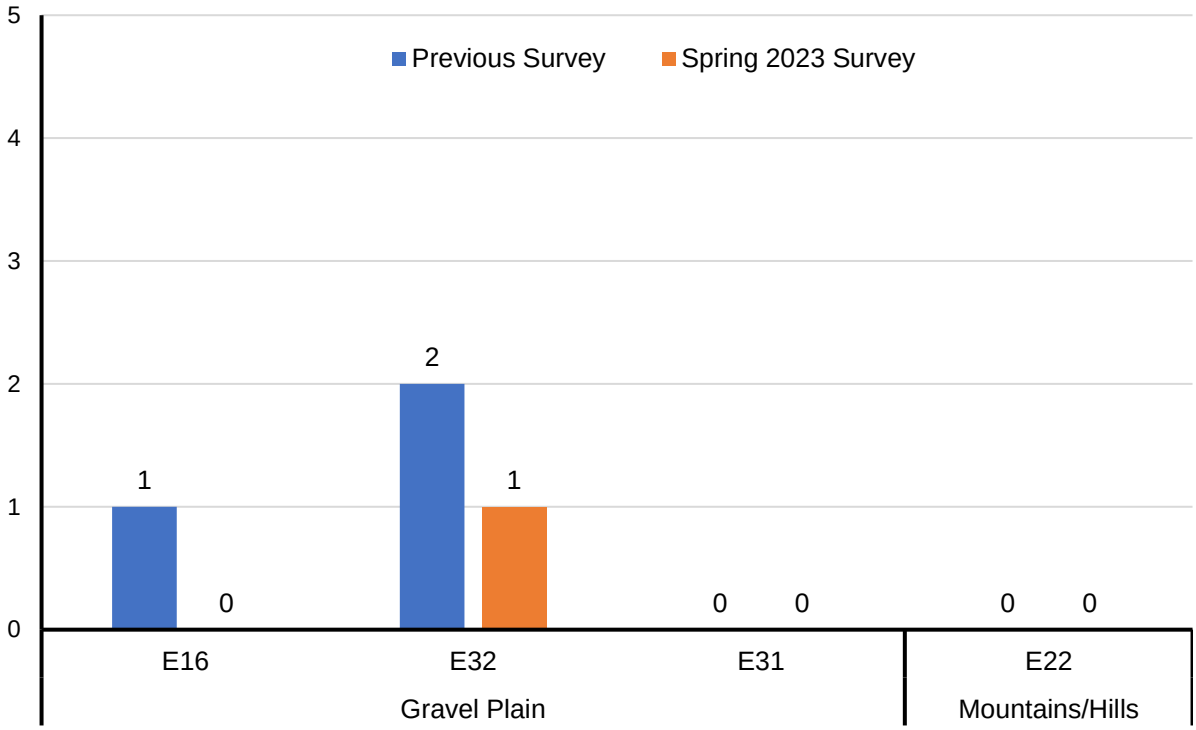


Figure 33: Abundance of Mammals Species Observed in Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

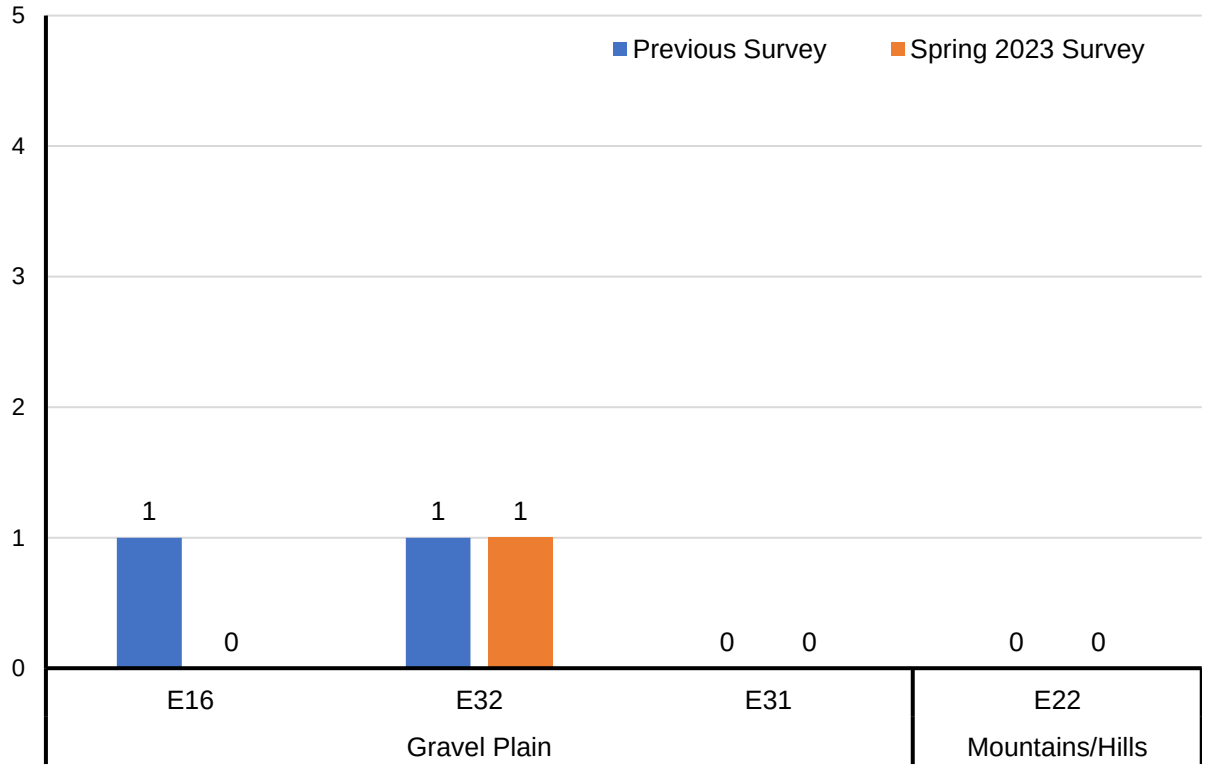


Figure 34: Richness of Mammals Species Observed in Spring 2023 Survey and Previous Survey at the proposed Reko Diq Mine Site

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Document Title:	**Appendix L - Ethnobotanical Uses and Description of Plant Species**		
Issue Date:	**2024-02-23**		

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	2024-02-23	Review			
			Sadia Asghar	Vaqar Zakaria	Barbara Wessels
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix L
Results of Post-Monsoon 2022 and Spring 2023 Surveys and their Comparison with Previous Surveys

L.1. Ethnobotanical Uses of Plants[1]

No.	Scientific Name	Common Name	Fodder or Grazing value (High, Medium, Low, None)	Origin	Uses
1.	*Acanthophyllum sp.,*	Spiny Head	None	Native	It is used for the treatments of cough, colds, and asthma, to liquefy sputum, as a bronchodilator, bronchial catarrh, bronchitis, and tuberculosis.
2.	*Aeluropus lagopoides*	Mangrove Grass	High	Native	Employed for wound healing, anti-diabetic, and also as a pain-remover.
3.	*Aerva tomentosa*	Kapok Bush	Medium	Native	Rheumatism, headache, diarrhea, chronic chest pain.
4.	*Alhagi maurorum*	Camel Thorn	Medium	Native	Used in folk medicine, as a purgative, diaphoretic, expectorant, and diuretic used to treat piles, migraine, warts, and rheumatism.
5.	*Anabasis setifera*	Anabasis	Low	Native	To treat diabetes, fever, headache, and skin disease
6.	*Aristida adscensionis*	Sixweeks Threeawn	Medium	Native	It is used in ethno-medicine as a lactation stimulant for women and to prevent itch and ringworm.
7.	*Aristida sp*	Purple Threeawn	Medium	Native	Same as *Aristida adscensionis.*
8.	*Azadirachta indica*	Neem	High	Native	The fruit is used for hemorrhoids, intestinal worms, urinary tract disorders, bloody nose, phlegm, eye disorders, diabetes, wounds, and leprosy.
9.	*Bromus sp*	Cheat Grasses	High	Native	Used as fodder for cattle.
10.	*Calligonum comosum*	Fire Bush	High	Native	Local use as a food, medicine, and source of materials.
11.	*Calligonum polygonoides*	Phog	Medium	Native	Stomach ailments and toothache.
12.	*Cenchrus biflorus*	Sandbur	High	Native	Locally used as a food.
13.	*Cistanche tubulosa*	Desert hyacinth	High	Native	Treat diabetes, liver problems, and weak bowel movements.
14.	*Cithareloma lehmannii*	None	-	-	It is also used in traditional medicine for its anti-inflammatory and antiseptic properties.

[1] Ethnobotanical use of the plants species include the use of plant for food, medicine, environmental, material and shelter uses etc. This description is provided for the major plant species of the desert ecosystem including the native and the Alien-Invasive Plant Species.

No.	Scientific Name	Common Name	Fodder or Grazing value (High, Medium, Low, None)	Origin	Uses
15.	*Citrullus colocynthis*	Bitter apple	None	Native	To treat colds, diarrhea, parasitic worms, the expulsion of wind, tumors, ascites, leukoplakia, ulcers, asthma, bronchitis, and diabetes.
16.	*Cornulaca monacantha*	Djouri	Low	Native	Applied as laxative, hepatoprotective, and antiparasitic medicine.
17.	*Crotalaria burhia*	Kharshan	Medium	Native	The leaves, branches, and roots can be used as a cooling medicine. Plant juice is useful for treatments of gout, eczema, hydrophobia, pain, and swelling.
18.	*Cynodon dactylon*	Bermuda Grass	High	Alien Invasive	Used as a laxative, expectorant, emetic, emmenagogue, carminative, coolant, brain and heart tonic.
19.	*Cynomorium coccineum*	Maltese Fungus	None	-	*Cynomorium coccineum* is widely used as an anti-aging,anti-epilepsy and anti–stress medicine.
20.	*Eleusine compressa*	Sandbur	High	Native	Used for medicinal purposes like for healing, stomach problems, and blood pressure.
21.	*Eucalyptus camaldulensis*	Red river gum	Low	Alien	The wood has been used for heavy construction, railway sleepers, flooring, framing, fencing, plywood and veneer manufacture, wood turning, firewood and charcoal
22.	*Fagonia ovalifolia*	Dereima or shaki	None	Native	Antidiabetic, anticancer, anti-leishmanial.
23.	*Fortuynia bungei*	-	-	Native	It is used for the treatment of foot pain, heartburn, anorexia, hypertension, scorpion and insect bites.
24.	*Haloxylon persicum*	-	High	Native	It is used as a substitute for soap for cleansing clothes and is also taken with water against internal ulcers.
25.	*Haloxylon salicornicum*	Hammada Elegance	High	Native	Utilized for therapeutic purposes.
26.	*Haloxylon stocksii*	Salt Tree	High	Native	It is used to treat various inflammatory disorders traditionally.
27.	*Heliotropium crispum*	Salt Heliotrope	Low	Native	Used as a laxative and for pain in limbs, sore eyes, foils, ulcers, and wounds.
28.	*Heliotropium zeylanicum*	Salt Heliotrope	Low	Native	Traditional drugs provide remedies for gout, inflammation, skin disorders, menstrual dysfunction, rheumatism, and noxious bites.
29.	*Malcolmia scorpioides*	Virginia Stock	-	Native	Palatable to animals.

No.	Scientific Name	Common Name	Fodder or Grazing value (High, Medium, Low, None)	Origin	Uses
30.	*Panicum turgidum*	Desert Grass	High	Native	Old culms, dried and powdered, are used as a dressing.
31.	*Peganum harmala*	African-rue	Low	Native	The most important traditional uses of *P. harmala* are cardiovascular, gastrointestinal, nervous, endocrine, neoplasm and tumors, pain relieving.
32.	*Phoenix dactylifera*	Date Palm	None	Native	The Date Palm has a lot of medicinal uses which include cold, fever, cystitis, edema, sore throat, bronchial catarrh, liver cancer, and low sperm.
33.	*Physorrhynchus chamaerapistrum*	Bladder-seed	-	-	Leaves and stems are used for treating earache and the seeds are used for removing warts.
34.	*Rumex vasicarius*	Bladder Dock	None	Native	*Rumex vesicarius* is an edible wild annual plant, and it is reported that it contains a good source of minerals, protein, and ascorbic acid.
35.	*Salix tetrasperma*	Indian Willow	Medium	Native	Used to treat diseases such as epilepsy, diabetes, fever, rheumatism, piles, swellings, stones in the bladder,
36.	*Salsola stocksii*	Saltwort	Medium	Native	Saltwort is used in various ways to treat toothache, constipation, and hair problems.
37.	*Tamarix aphylla*	Athel Tamarisk	Medium	Native	Traditionally used for gastrointestinal disorders, wounds, diabetes, and dental problems.
38.	*Tamarix stricta*	Salt Cedar	Medium	Native	It is used for gastrointestinal disorders, wounds, diabetes, and dental problems.
39.	*Tribulus terrestris*	Puncture Vine, Caltrop, Yellow Vine, and Goathead	Medium	Native	*Tribulus terrestris* is used as a diuretic, pain reliever, and appetite stimulant, as well as a treatment for kidney stones.
40.	*Vachellia jacquemontii*	-	Low	Native	Treatment of diarrhea and dysentery Shrub, the bark of the tree is used to induce spontaneous abortion in women in any stage of pregnancy.
41.	*Zygophyllum simplex*	Simple-leaved Bean Caper	High	Native	Traditionally, it is used for diabetes, eczema, and liver and stomach pain and is a hemostat. The dried flower heads are used to make a refreshing drink or added to tea. Forming extensive pastures, it is appreciated by herds of goats and camels.

L.2. Description of Plant Species

Species Name	*Description*
Aeluropus lagopoides	*Aeluropus lagopoides*, is a perennial grass species found in arid and semiarid regions of Europe, Asia, and Africa. This grass is well-adapted to thrive in saline and alkaline soils, making it a valuable species for land reclamation and erosion control in coastal areas.
Aerva tomentosa	The plant is herbaceous, multi-stemmed, and grows well in sandy soils near drainage lines. It has a native distribution incorporating much of Africa (including Madagascar), and the south-west and south of Asia, and it has become adventitious in northern Australia.
Alhagi maurorum	This shrub is native to the region extending from the Mediterranean to Russia however, it has been introduced to many other areas of the world, including Australia, southern Africa, and the western United States. The perennial plant grows from a massive rhizome system that may extend over six feet into the ground.
Anabasis articulata	*Anabasis articulata*, also known as Jointed Anabasis, is a small, perennial shrub found in arid regions of Asia and North Africa. It is characterized by its segmented, fleshy stems and tiny, scale-like leaves. Jointed Anabasis is well-adapted to survive in harsh desert environments, often growing in sandy or rocky soils, and is known for its ability to store water in its succulent tissues.
Anabasis setifera	This species is an annual or perennial herb or subshrub. It survives well in the subtropical biome. The native range of this species is Egypt to North-West- India, and it is also recorded from Afghanistan, Egypt, Gulf States, India, Iran, Iraq, Kuwait, Lebanon-Syria, Oman, Pakistan, Palestine, Saudi Arabia, Sinai, and Sudan.
Aristida adscensionis	The native range of this species is Tropics and Subtropics. It is an annual or perennial herb and grows primarily in the seasonally dry tropical biomes. It is used as fodder for animals and also as a medicine.
Calligonum comosum	It is a shrubby plant that grows in dry habitats like deserts and shrublands. Its native range extends from North Africa to the Sahara, Socotra (Abd al Kuri), West Asia to Pakistan, and the Arabian Peninsula.
Calligonum polygonoides	*Calligonum polygonoides*, also known as Polygonum-leaved Calligonum, is a desert shrub belonging to the Polygonaceae family. This resilient plant is well-adapted to arid environments, often found in sandy or rocky desert regions. Its foliage and ability to withstand harsh conditions make it an important ecological component in desert ecosystems
Cistanche tubulosa	It is a holophytic perennial and grows mainly in clayey habitat near *Tamarix* species. It is native to Afghanistan, Chad, Djibouti, Egypt, Eritrea, Ethiopia, Gulf States, India, Iran, Iraq, Kazakhstan, Kenya, Kuwait, Lebanon-Syria, Libya, Mozambique, Oman, Pakistan, Palestine, Saudi Arabia, Sinai, Socotra, Somalia, Sudan, Tanzania, Turkmenistan, and Yemen.
Citrullus colocynthis	The native range of this species is Macaronesia, Mediterranean to Myanmar, Northeast Tropical Africa to Northern Kenya. It is a perennial or subshrub and grows primarily in subtropical areas. It is also introduced in some parts of the world.
Convolvulus arvensis	It is a climbing or creeping herbaceous perennial plant found in grassland, roadsides, and along the stream sides. It is native to the Temperate and Subtropical Old World.

Species Name	*Description*
Cornulaca monacantha	The native range of this species is Sahara to Western and South-Western Pakistan. It is a subshrub or shrub and grows primarily in the desert or dry shrubland biome.
Crotalaria burhia	*Crotalaria burhia* is native to the western part of India as well as in the deserts of Pakistan, Afghanistan, and Iran. This plant is a good soil binder and has medicinal value. It is also used to make sheds for animals in the desert and used to make desert huts. It serves as fodder for livestock.
Cynodon dactylon	*Cynodon dactylon* was observed at different Project facilities. It is not native to all parts of the world but has been widely introduced and can exhibit invasive characteristics in some environments.
Eleusine compressa	It is a perennial herb, likely to grow in dry habitat. It is native to Afghanistan, Algeria, Chad, Egypt, Eritrea, Ethiopia, Gulf States, India, Iran, Libya, Niger, Oman, Pakistan, Saudi Arabia, Somalia, Sudan, West Himalayas, and Yemen.
Eucalyptus camaldulensis	*Eucalyptus camaldulensis*, commonly known as the River Red Gum, is a tree that was endemic to Australia. It is now introduced into different countries around the globe including Pakistan, due to its high adaptation property in any environmental conditions. In Pakistan, it is spreading quickly replacing native vegetation, and is marked as a threat to biodiversity by ecologists.
Fagonia ovalifolia	It is an indigenous plant species found in warm, arid, and semi-arid areas. It's distributed in Pakistan, Afghanistan, Iran, and Oman. It is a slow-growing shrub-to-tree type of plant.
Haloxylon persicum	The native range of this species is Egypt to Northern Xinjiang and Western Pakistan, Arabian Peninsula. It is a shrub or tree and grows primarily in the subtropical biome.
Haloxylon salicornicum	*Haloxylon salicornicum* is a desert shrub and is reported from Israel, Jordan, Egypt, Saudi Arabia, Kuwait, Oman, the United Arab Emirates, Afghanistan, and Pakistan.
Heliotropium crispum	*Heliotropium crispum* is native to western Africa, from the Canary Islands, Mauritania, and Senegal to Nigeria, Egypt, and Sudan, and to Saudi Arabia, Afghanistan, and Pakistan. It is a halophytic plant, that thrives well in dry places around the islands.
Malcolmia scorpioides	*Malcolmia scorpioides*, commonly known as Virginia Stock, is a delicate annual plant native to Europe and Asia. The plant's foliage consists of narrow, lance-shaped leaves.
Panicum turgidum	It is a perennial shrub and grows in dry conditions. It is native to Algeria, Benin, Burkina, Chad, Congo, Cyprus, Djibouti, Egypt, Eritrea, Ethiopia, Gulf States, India, Iran, Iraq, Kuwait, Lebanon-Syria, Libya, Mali, Mauritania, Morocco, Niger, Oman, Pakistan, Palestine, Saudi Arabia, Senegal, Sinai, Socotra, Somalia, Sudan, Tunisia, Western Sahara, and Yemen.
Peganum harmala	*Peganum harmala* is a perennial, herbaceous plant, with a woody underground rootstock, usually growing in saline soils in temperate desert and Mediterranean regions. It is native to the Mediterranean to Mongolia and India whereas it is introduced into different other countries due to its medicinal uses in cardiovascular, gastrointestinal, nervous, endocrine, neoplasm tumors, and pain relieving.

Species Name	*Description*
Phoenix dactylifera	It is a tree and grows in subtropical dry and semi-arid areas. It has been used as animal food, as a medicine, and for fuel and food. Its native range includes the Gulf States, Iran, Iraq, Oman, Pakistan, and Saudi Arabia, and introduced everywhere around the world where the habitat is suitable.
Physorrhynchus chamaerapistrum	*Physorrhynchus chamaerapistrum*, also known as Bladder-seed, is an annual herbaceous plant. This plant is adapted to dry and rocky habitats, showcasing its resilience in harsh environments.
Rumex vasicarius	*Rumex vasicarius*, commonly known as Desert Dock, is a resilient perennial plant found in arid regions. With its deep taproot and tolerance for drought, *Rumex vasicarius* thrives in desert habitats, playing a vital role in stabilizing soil and providing forage for wildlife in these challenging ecosystems.
Salix tetrasperma	*Salix tetrasperma*, commonly known as the Indian Willow, is a deciduous tree found in India, Nepal, Pakistan, and Bhutan. *Salix tetrasperma* has various traditional uses, including the production of baskets, mats, and furniture due to its flexible wood. Additionally, the bark and leaves of this species have been used in herbal medicine for their potential anti-inflammatory and analgesic properties.
Salsola stocksii	It is a shrub or subshrub plant species adapted to warm dry habitats and is native to Afghanistan, India, Pakistan, and West Himalayas.
Tamarix aphylla	It is a tree species found mainly in the clayey habitat of the subtropical biome. It is native to Afghanistan, Algeria, Chad, Egypt, Ethiopia, Gulf States, India, Iran, Iraq, Kenya, Kuwait, Libya, Mauritania, Morocco, Niger, Oman, Pakistan, Palestine, Saudi Arabia, Senegal, Sinai, Socotra, Somalia, Sudan, Tunisia, and Yemen.
Tamarix stricta	It is a tree species with a high tolerance to saline habitats. It grows in desert riparian habitats such as desert washes, seeps, and springs and is native to Iran and Pakistan.
Tribulus terrestris	*Tribulus terrestris* is an annual plant in the caltrop family widely distributed around the world. It is adapted to thrive in dry climatic locations in which few other plants can survive. It is native to warm temperate and tropical regions in southern Eurasia and Africa.

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			Sadia Asghar	Vaqar Zakaria	Barbara Wessels
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Appendix M
Site Assessment

M.1. Proposed Reko Diq Mine Site

Post- Monsoon 2022 Survey

The habitat at the proposed Reko Diq Mine Site was intact habitat with a moderate level of disturbance having sparse vegetation with lower density and diversity of fauna, as the faunal population is directly related to vegetation for food and shelter. The scarcity of vegetation can be attributed to a lack of precipitation and different anthropogenic activities such as camel grazing and frequent vehicle movement for cross-border trade.

The Dry Streambed and Mountains/Hills were the habitats that have the potential for harboring diverse flora and fauna. This is evident from the range of faunal and floral species observed in these habitats. This can be attributed to the uniform distribution of vegetation in these habitat types providing promising habitats for small mammals, reptiles, and large mammals. A lower diversity of birds was observed due to extreme dry conditions and the absence of food. The invertebrate diversity (food of birds) was also very low which is another reason for low bird diversity in this area.

Spring 2023 Survey

The habitat at the proposed Reko Diq Mine Site was characterized by barren flat land with sparse vegetation dominated by xerophytic plants. Greater abundancy of flora and fauna were observed at Clayey Plains, Dry Streambeds, Mountain/Hills, and Gravel Plains while the minimal abundance of species was observed at Sandy Plains/Sand Dunes habitats. The dominant floral species at the proposed Reko Diq Mine Site was the *Salsola stocksii* followed by *Aristida adscensionis, Haloxylon persicum, Haloxylon salicornicum,* and *Calligonum comosum*. These dominant floral species at the proposed Reko Diq Mine Site provide important food resources for the local wildlife community and contributes to the ecological functioning and food web dynamics of the site, supporting the survival and population dynamics of these animals in this ecosystem.

The findings of the Spring 2023 Survey showed that the proposed Reko Diq Mine Site did not support abundant flora and fauna due to natural condition and a high level of disturbance in the form of frequent movement of vehicles for cross-border trade. Continuous vehicle movement and associated noise can disturb the natural behaviors of wildlife which can limit their access to essential resources such as food, water, and shelter. The present plant species may also be destroyed due to this disturbance, leading to a decrease in food sources for herbivorous animals. This can result in a decline in herbivore populations, which, in turn, can affect predator populations dependent on them.

M.2. Fan Sediment Water Supply Pipeline Area

Post-Monsoon 2022 Survey

A moderate level of disturbance was observed along the Fan Sediment Water Supply Pipeline Area due to livestock grazing and security forces camps. However, specialized species of flora and fauna were observed. Sandy Plains/Sand Dunes were dominated by *Haloxylon stocksii, Haloxylon salsola,* and *Haloxylon persicum*, providing food and refugia to many invertebrates, herpetofauna, and avifauna species. Clayey plains supported specialized herbaceous plants such as *Tribulus terestris* and *Citrullus colocynthis*, whereas Gravel Plains was observed as a habitat have low potential due to a lack of

enough food and refugia. Dry Streambeds also offer a moderate level of food and shelter for species in the area.

Agricultural Area/Date Palm was a unique microhabitat identified near the Fan Sediment Water Supply Pipeline Area supporting a unique range of faunal and floral species. This habitat is located at the transition between Mountains/Hills and Gravel Plains. This habitat comprised of larger trees of Date Palm (Phoenix dactylifera) in addition to some species like *Tamarax aphyllya, Peganum harmala, Alhagi maurorum,* and *Vachellia jacquemontii.* Some unique bird species were observed in this habitat including Laughing Dove, White-eared Bulbul, Indian Golden Oriole, Crested Lark, Eurasian Crag Martin, Lesser White Throat, European Bee-eater, and Red-throated Flycatcher. Herpetofauna species observed in this habitat was the Blacktailed Toad-headed Agama *Trapelus agilis*. Signs of small mammals were also observed. Recently established Frontier Corps (FC) check post in this habitat has modified the natural integrity of this site. Overall, the Fan Sediment Water Supply Pipeline Area was a preferred habitat for herpetofauna with slight potential for mammals and birds.

Spring 2023 Survey

The habitat at the Fan Sediment Water Supply Pipeline Area was categorized with different habitat types including Agricultural Areas/Date Palms, Clayey Plains, Dry Streambeds, Gravel Plains, Mountains/Hills, and Sandy Plains/Sand Dunes. Of these habitats, Agricultural Areas/Date Palm was the more productive habitat having higher abundance and richness of vegetation and birds. However, the mammals were more prevalent in Mountains/Hills and herpetofauna were more abundant in Sandy Plains/Sand Dunes followed by Gravel Plains and Dry Streambeds habitats. The activities of small mammals were observed in Clayey Plains areas.

This shows that habitat selection is directly dependent on animal behavior and adaptation. The Agricultural Areas/Date Palms have a dense canopy that provides shade and retains moisture in the soil, creating a more favorable environment for plant growth. This leads to increased vegetation abundance compared to other natural habitats. The abundant vegetation in this habitat provides food resources, nesting sites, and water availability for a wide range of bird species. Therefore, the abundance of birds was higher in Agricultural Areas/Date Palms.

In addition, Mountains/Hills were more suitable for mammals because the topography of this habitat often includes caves, crevices, and rocky outcrops, which provide natural shelters and protection for mammals. These features can serve as denning sites for carnivores, hibernation spots for certain species, or safe resting places away from predators. The rugged terrain also offers opportunities for mammals to escape or evade potential threats.

However, the small mammals prefer to live in the Clayey Plains area. This habitat supports a variety of plant species, including grasses and forbs, and can provide seeds, fruits, leaves, or stems that are consumed by different small mammal species. Additionally, clayey soils may retain a higher abundance of invertebrates, such as insects and earthworms, which can be important food resources for small mammals.

The Sandy Plains/Sand Dunes and Gravel Plains provide a unique substrate for herpetofauna. These habitats typically have loose, well-drained soils that reptiles and amphibians can burrow into or hide beneath to regulate their body temperature and seek refuge from predators. However, Dry Streambeds also offer food resources (insects) and suitable habitat for herpetofauna. During the Spring 2023 Survey, minimal disturbance was also observed from these habitats which allows herpetofauna to thrive without significant habitat loss or disruption.

The findings of the Spring 2023 Survey showed that the vegetation was sparse in all habitats except Agricultural Areas/Date Palms. The Clayey Plains habitat of Fan Sediment Water Supply Pipeline Areas supports the minimal abundance of flora and fauna while, the choice of habitat selection by each species is dependent on the availability of food and water resources, low disturbance, and breeding and hiding places from predators.

M.3. Access Road to the proposed Reko Diq Mine Site

Post-Monsoon 2022 Survey

Habitat along the Access Road to the proposed Reko Diq Mine Site was largely disturbed being a main route for cross-border trade, and camps for security agencies. Only specialized, or xeric plant species were observed which are dominated by *Aristida sp. Haloxylon stocksii Alhagi marorum, Sueda fruticose, Aloropus sp.,* and *Phoenix dactylifera*.

The Gravels Plains and Sandy Plains in this area were the most dominant habitats, although very small refugia and food were available for different biodiversity groups like avifauna, mammals, and herpetofauna. The signs of the specialist mammalian species like Desert Hare and Red Fox were observed. Similarly, herpetofauna species like the Black tailed Toad-headed Agama, Blandford's Fringe-fingered Lizard, and Indian Sand swimmer were observed, which indicates that these herpetofauna species are very well adapted to the arid environment in the Study Area.

Spring 2023 Survey

The habitats along the Access Road to the proposed Reko Diq Mine Site were dominated by Clayey Plains, Dry Streambeds, Gravel Plains, and Mountains/Hills. This Study Area was characterized by better vegetation conditions mainly consisting of *Aristida adsecensionis, Calligonum polygonoides, Haloxylon persicum, Haloxylon salicornicum, Salsola stocksii, Tamarix aphylla,* and *Tamarix stricta* during the Spring 2023 Survey as compared to the Post-Monsoon Survey, however, this was not enough to support a variety of faunal species. Only a few species of herpetofauna which include Racerunner, Clark's Toad-headed Agama, Indian Sand swimmer, Black tailed Toad-headed Agama, and *Balandford's Firinge-fingered Lizard*, few species of mammals such as Cape Hare, Red Fox and Sand Cat were recorded from the Study Area. In addition, the habitat is largely disturbed due to frequent movement of vehicles for cross-border trade as well as security forces patrolling.

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			Sadia Asghar	**Vaqar Zakaria**	**Barbara Wessels**
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Appendix N
Senstivity Mapping

N.1. Habitat Sensitivity Score and Sensitivity Maps for Project Facilities - Post-Monsoon 2022 and Spring 2023 Surveys

The season-wise sensitivity score and sensitivity maps prepared for each Project facility for Post-Monsoon 2022 are provided in Table 1 to Table 3 and Figure 1 to Figure.3 below while the season-wise sensitivity score and sensitivity maps prepared for each Project facility for Spring 2023 surveys are provided in Table 4 to Table 6 and Figure 4 to Figure 6 below.

Table 1: Score for Sensitivity Mapping for Reko Diq Mine Site, Post Monsoon 2022 Survey

Sampling Location	Species Diversity	Economic Importance	Conservation Importance	Protected Area	Selected Species-related Indicators		Habitat characteristics		Total Sensitivity Score
					Number of Rare/ Unique Species	Restricted Range/ Endemic Species	Microhabitat or Unique Habitat	Level of Disturbance	
E13	3	9	0	0	1	1	2	3	19
E14	3	9	0	0	1	0	2	2	17
E15	3	7	0	0	1	0	2	2	15
E16	3	9	0	0	1	0	1	2	16
E17	3	6	0	0	1	0	2	3	15
E18	3	3	0	0	1	1	2	3	13
E19	3	9	0	0	1	0	2	3	18
E20	3	9	0	0	1	0	1	2	16
E21	4	8	0	0	1	0	2	2	17
E22	3	9	0	0	1	0	2	3	18
E23	5	12	0	0	2	1	1	2	23
E24	3	12	0	0	1	0	1	2	19
E25	5	9	0	0	1	0	1	1	17
E26	2	6	0	0	1	0	1	1	11
E27	4	12	0	0	1	0	2	2	21
E28	3	10	0	0	1	0	1	2	17
E29	2	6	0	0	1	1	2	2	14
E30	3	8	0	0	1	1	2	2	17
E31	3	12	0	0	1	0	1	1	18
E32	3	8	0	0	1	0	1	2	15

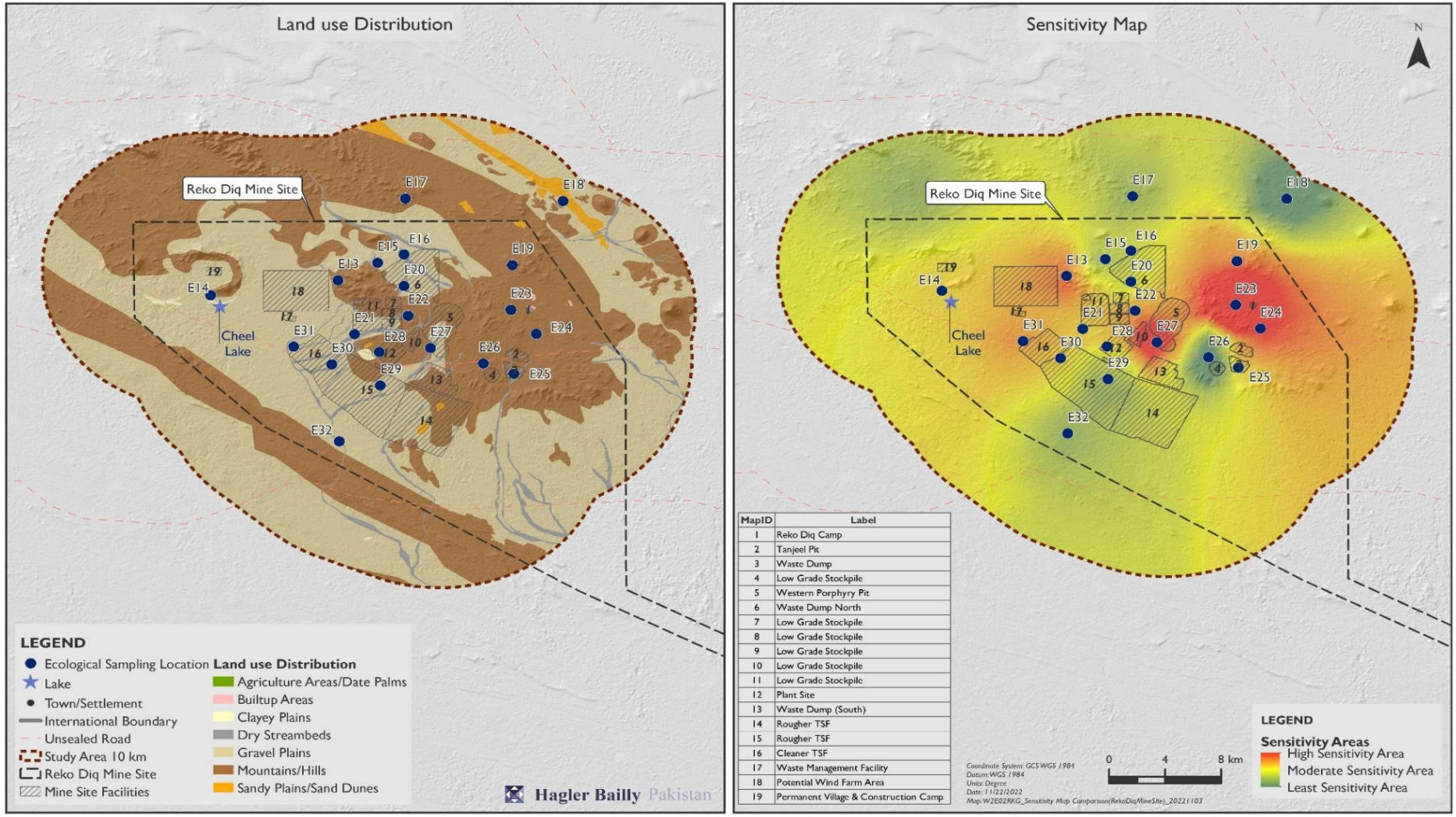


Figure 1: Sensitivity Map for Reko Diq Mine Site, Post Monsoon 2022 Survey

Table 2: Score for Sensitivity Mapping for Fan Sediment Water Supply Pipeline Area, Post Monsoon 2022 Survey

Sampling Location	Species Diversity	Economic Importance	Conservation Importance	Protected Area	Selected species related Criteria		Habitat characteristics		Total Sensitivity Score
					Number of Rare/ unique species	Restricted Range/ Endemic Species	Microhabitat or Unique Habitat	Level of Disturbance	
E1	4	2	0	0	0	0	2	2	10
E2	4	10	2	0	1	0	2	2	21
E3	2	2	0	0	1	0	1	2	8
E4	2	6	0	0	1	1	2	2	14
E5	5	3	0	0	2	1	3	2	16
E6	5	3	3	0	1	0	2	2	16
E7	2	10	0	0	1	0	2	2	17
E8	4	11	0	0	1	0	2	2	20
E9	4	9	0	0	1	0	1	2	17
E10	4	13	0	0	2	0	1	1	21
E11	4	8	0	0	1	0	3	3	19
E12	5	9	0	0	1	0	2	2	19
MH1	6	9	0	0	0	0	3	2	20

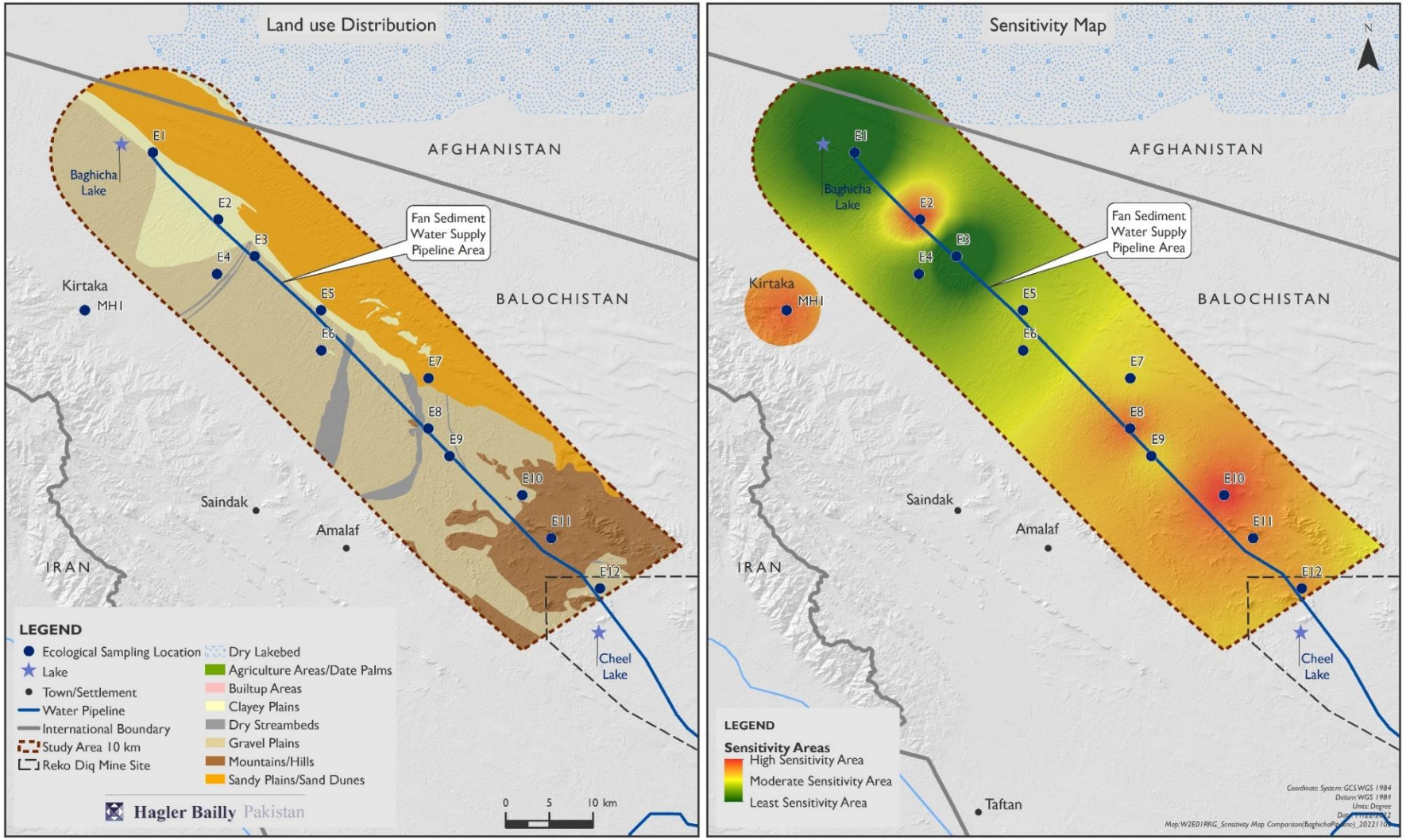


Figure 2: Sensitivity Map, Fan Sediment Water Supply Pipeline Area, Post Monsoon 2022 Survey

Table 3: Score for Sensitivity Map for Access Road to Project Site, Post Monsoon 2022 Survey

Sampling Location	*Species Diversity*	*Economic Importance*	*Conservation Importance*	*Protected Area*	*Selected species related indicators*		*Habitat characteristics*		*Total Sensitivity Score*
					Number of Rare/unique species	*Restricted Range/ Endemic Species*	*Microhabitat or Unique Habitat*	*Level of Disturbance*	
E41	2	5	0	0	0	0	1	1	9
E42	3	4	0	0	1	0	1	1	10
E43	5	13	0	0	1	0	2	1	22
E44	3	5	0	0	1	1	1	1	12
E45	2	5	0	0	1	0	1	0	9
E46	2	5	0	0	1	0	1	0	9
E47	3	9	0	0	1	0	1	0	14
E48	3	6	0	0	1	0	1	0	11

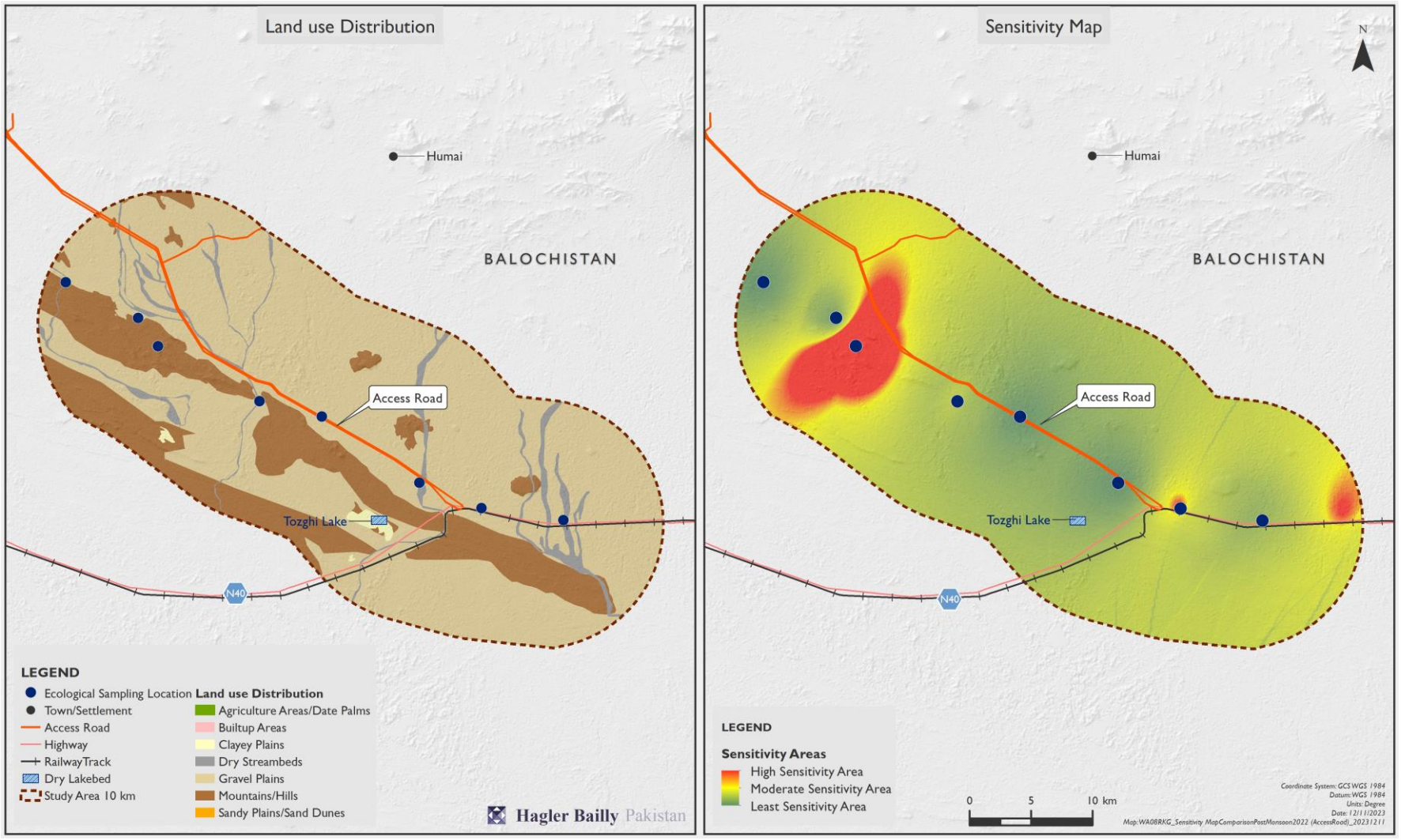


Figure.3: Sensitivity Map for Access Road to Project Site, Post Monsoon 2022 Survey

Table 4: Score for Sensitivity Mapping for Reko Diq Mine Site, Spring 2023 Survey

Sampling Location	Species Diversity	Economic Importance	Conservation Importance	Protected Area	Selected species-related indicators		Habitat characteristics		Total Sensitivity Score
					Number of Rare or unique species selected	Restricted range species or Endemic species	Microhabitat or unique habitat	Level of disturbance	
E13	3	9	0	0	1	0	0	3	16
E14	3	5	0	0	1	1	1	2	13
E15	2	7	0	0	1	0	0	2	12
E16	2	2	0	0	1	0	0	2	7
E17	3	6	0	0	1	1	2	2	15
E18	2	3	0	0	0	0	0	2	7
E19	3	7	0	0	1	0	2	2	15
E20	2	2	0	0	1	0	0	2	7
E21	2	2	0	0	1	0	0	2	7
E22	3	9	0	0	2	1	1	2	18
E23	2	4	0	0	1	0	0	1	8
E24	2	3	0	0	0	0	0	2	7
E25	2	5	0	0	1	0	0	2	10
E26	2	5	0	0	1	0	0	2	10
E27	2	2	0	0	1	0	1	2	8
E28	2	4	0	0	1	0	0	1	8
E29	2	2	0	0	1	1	0	3	9
E30	2	6	0	0	1	1	1	2	13
E31	2	4	0	0	1	0	0	2	9
E32	2	4	0	0	1	0	0	2	9

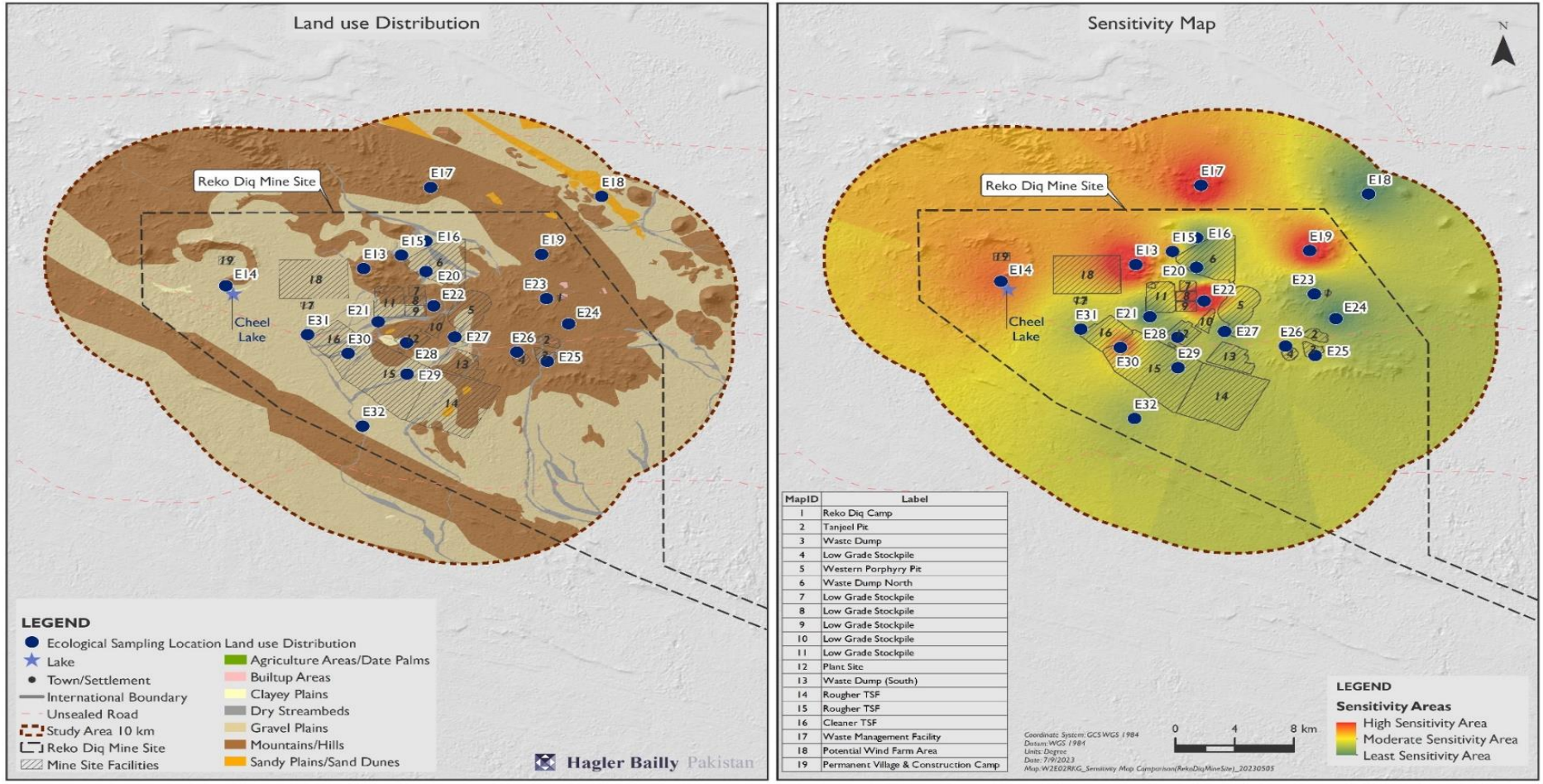


Figure 4: Sensitivity Map for Reko Diq Mine Site, Spring 2023 Survey

Table 5: Score for Sensitivity Mapping for Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

Sampling Location	Species Diversity	Economic Importance	Conservation Importance	Protected Area	Selected species-related indicators		Habitat characteristics		Total Sensitivity Score
					Number of Rare or unique species selected	Restricted range species or Endemic species	Microhabitat or unique habitat	Level of disturbance	
E1	3	5	0	0	0	1	0	2	11
E2	5	6	0	0	1	1	2	2	17
E3	2	1	0	0	1	0	0	3	7
E4	3	10	2	0	2	1	1	3	22
E5	3	2	0	0	1	2	1	2	11
E6	2	2	0	0	1	1	1	2	9
E7	5	5	0	0	1	1	1	3	16
E8	8	8	0	0	1	1	1	2	21
E9	5	5	0	0	1	1	0	2	14
E10	8	8	0	0	1	1	1	2	21
E11	11	13	0	0	1	0	2	3	30
E12	5	5	0	0	0	1	0	3	14
MH1	10	10	0	0	0	1	3	1	25

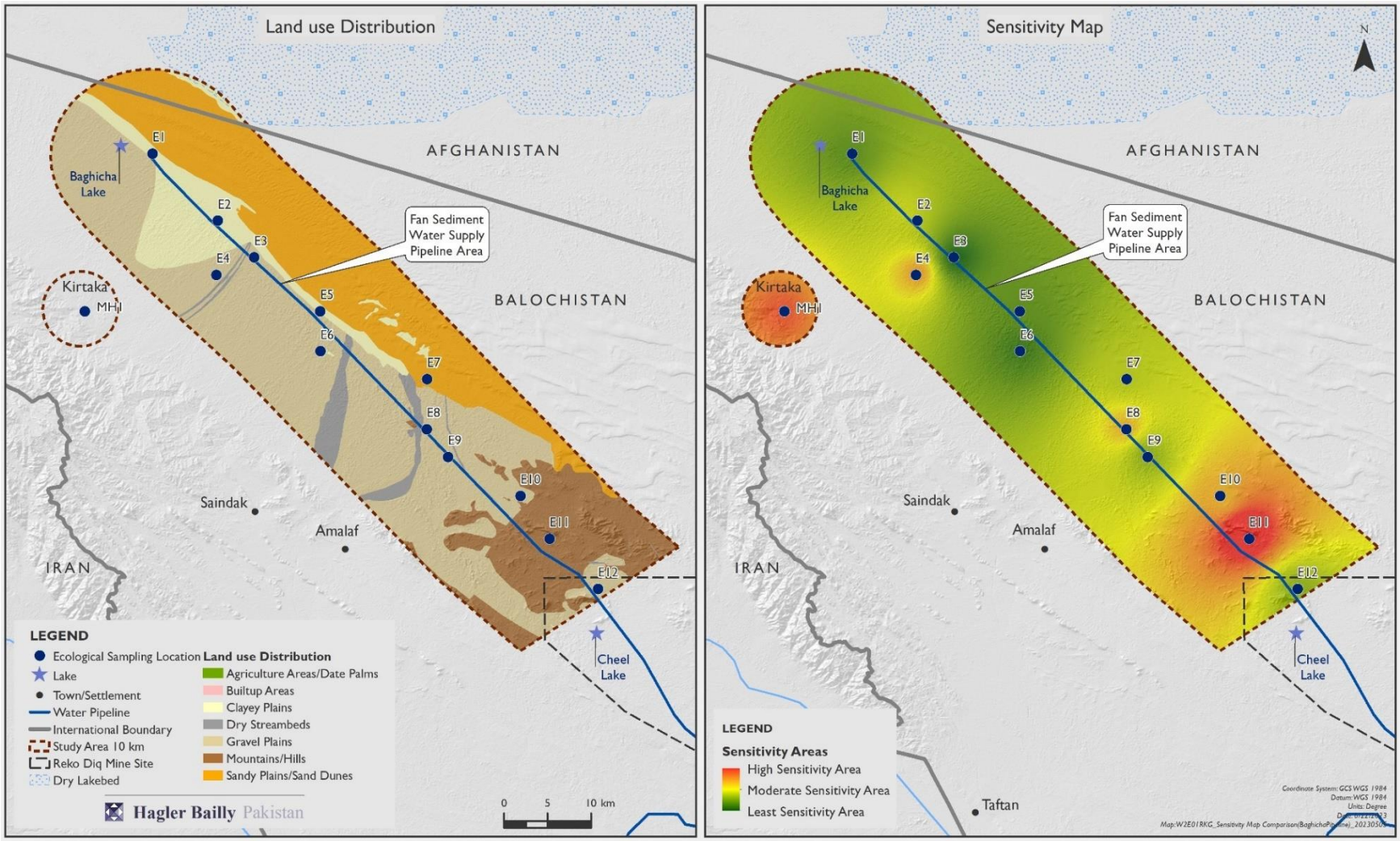


Figure.5: Sensitivity Map, Fan Sediment Water Supply Pipeline Area, Spring 2023 Survey

Table 6: Score for Sensitivity Map for Access Road to Reko Diq Mine Site, Spring 2023 Survey

Sampling Location	*Species Diversity*	*Economic Importance*	*Conservation Importance*	*Protected Area*	*Selected species-related indicators*		*Habitat characteristics*		*Total Sensitivity Score*
					Number of Rare or unique species selected	*Restricted range species or Endemic species*	*Microhabitat or unique habitat*	*Level of disturbance*	
E41	3	6	0	0	1	1	0	2	13
E42	3	8	0	0	1	0	2	2	16
E43	3	13	0	0	2	1	1	2	22
E44	2	4	0	0	1	0	1	2	10
E45	2	2	0	0	1	0	0	2	7
E46	2	4	0	0	1	1	0	2	10
E47	2	4	0	0	1	0	0	2	9
E48	3	4	0	0	1	1	1	2	12

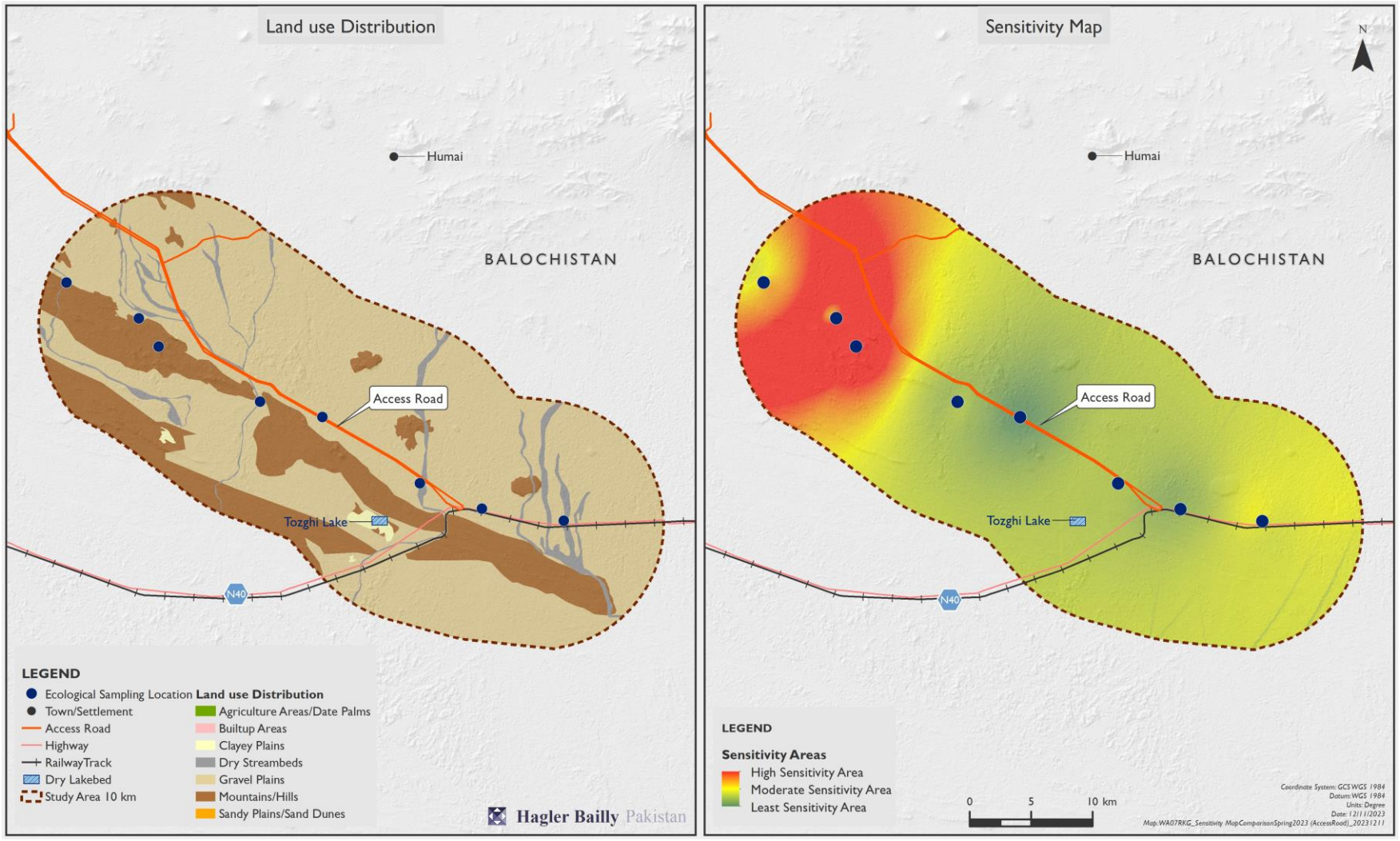


Figure 6: Sensitivity Map for Access Road to Reko Diq Mine Site, Spring 2023 Survey

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Appendix O
Socioeconomic Survey Plan

Reko Diq Mining Company (RDMC or the 'Client'), a subsidiary of Barrick Gold Corporation (Barrick), intends to commence the Early Works (the 'Project') for the Reko Diq Mining Project (the 'Mining Project'), in the western part of Balochistan province of Pakistan. The Early Works for the Project will consist of construction of an accommodation facility at the Reko Diq Mine Site and water supply pipeline from the Fan Sediments area to the accommodation facility and minor earthworks.

The Mining Project will result in the production of copper and gold and is expected to have a life of at least 40 years as a truck-and-shovel open pit operation with processing facilities producing a high-quality copper-gold concentrate. As per the Reko Diq 2022 Conceptual Design, the construction is expected in two phases. Phase 1 is expected to have a capacity of 40 Million tonnes per annum (Mtpa) and Phase 2 with a combined process capacity of 80 Mtpa.

The Client has engaged Digby Wells Environmental (Digby Wells) and Hagler Bailly Pakistan Pvt. Ltd (HBP or the 'in-country ESIA Consultant') to carry out the Environmental and Social Impact Assessment (ESIA) of the Early Works to comply with the regulatory requirements of the Balochistan Environmental Protection Agency (Balochistan-EPA) (the 'Study').

This document is socioeconomic survey plan which was prepared for the socioeconomic surveys and community consultations carried out for the Early Works phase.

O.1. Objectives of Socioeconomic Surveys and Stakeholder Consultations

- Inform the stakeholders, including local communities about the planned Project activities,
- Profile the communities at the settlement level, such that an impact assessment may be carried out for the Project,
- Aid in the identification of impacts associated with the Project activities,
- Seek input to increase the positive outcomes and avoid or mitigate negative impacts, and
- Identify appropriate grievance mechanisms.

O.2. Socioeconomic Study Area

The Socioeconomic Study Area includes an area of 40 km around the Reko Diq Mine Site and 30 km along the water supply pipeline route from Fan Sediment boreholes to the accommodation facility for workers' accommodation. The Socioeconomic Study Area was selected to assess the Project impacts on the communities residing near the mine site and its facilities including accommodation facility, and access road, that may be positively or negatively impacted by its activities.

Figure 1 shows the Socioeconomic Study Area and location of the settlements that were surveyed and consulted.

O.3. Selection of Settlements for the Survey

- **Settlements east of the Reko Diq Mine Site** – Humai, Mashki Chah, Nok Chah, and Darband Chah
- **Settlements west of the Reko Diq Mine Site** – Kachau, Amalaf, and Saindak

  Settlements along the Road Route – Nok Kundi and Dalbandin

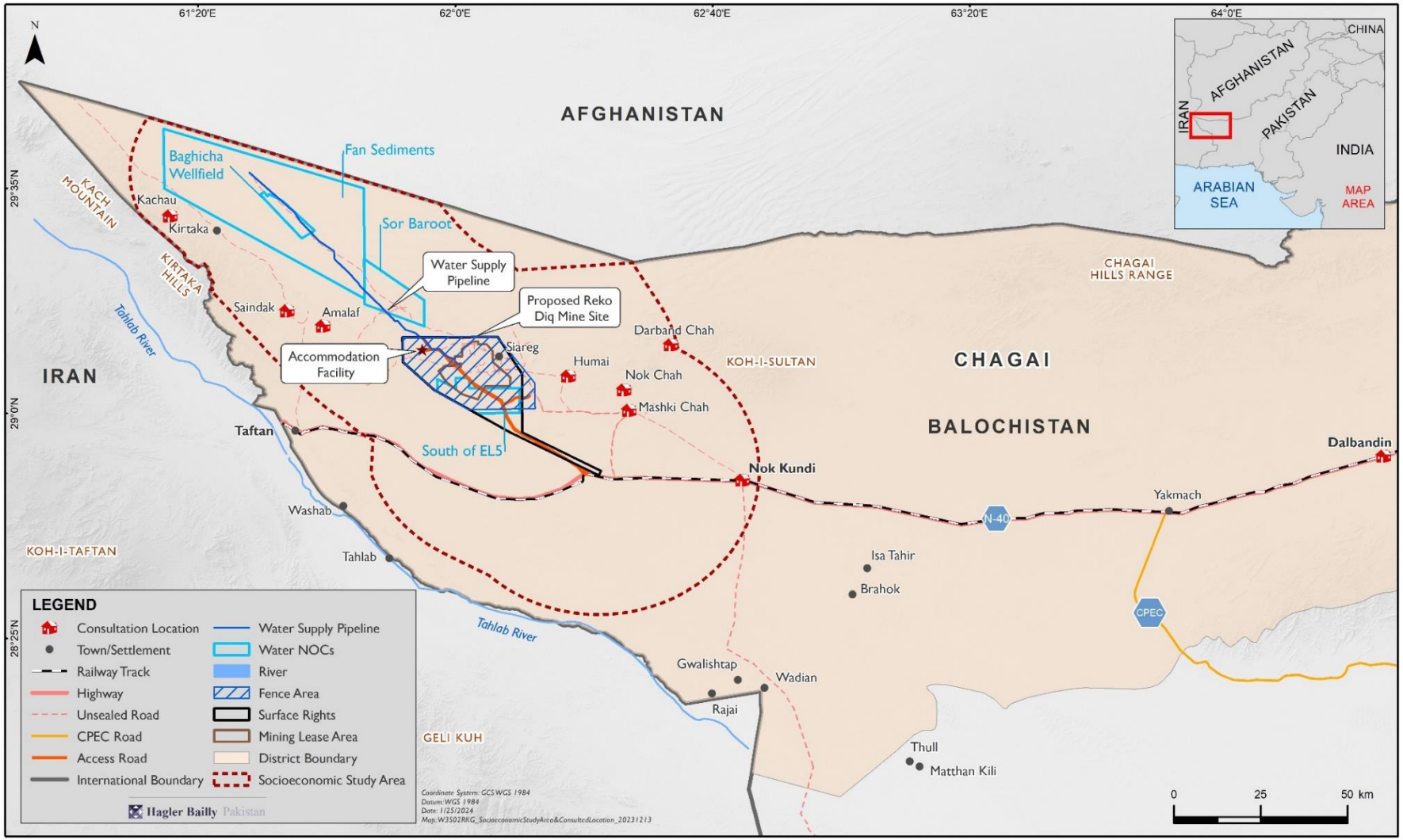


Figure 1: Socioeconomic Study Area and Consultation Locations

O.4. Methodology for the Socioeconomic Surveys and Stakeholder Consultations

The socioeconomic surveys and community consultations were conducted using the following methodology.

O.5. Socioeconomic Surveys

The required socioeconomic information was collected through socioeconomic surveys using both settlement level survey and Household level survey. In addition, community consultation was also conducted to collect information on the social and economic setup, physical infrastructure and livelihood dependence of the local communities.

Pilot Survey

A one-day pilot survey was conducted prior to the main socioeconomic survey to ensure that the designed survey forms are appropriate for collecting the required data and that the survey team is trained to collect data effectively and efficiently.

Settlement-level Survey

The data on the socioeconomic conditions was collected through field surveys to develop a profile of the communities residing within the Socioeconomic Study Area. The primary data was collected by conducting a socioeconomic survey at the settlement level using Participatory Rapid Appraisal methods, including Focus Group Discussions (FGDs), Key Informant Interviews (KIIs), and a pre-designed socioeconomic survey form.

To ensure accuracy and efficiency, the survey forms were programmed on the ONA.io application[1] in Urdu and English and the survey was conducted on Android phones and tablets using the Open Data Kit (ODK). This application permits online data entry and enables a supervisor to review the database daily and guide the survey team as needed.

Household-level Survey

A household-level survey was conducted followed by a settlement-level survey. A separate form was utilized for the household level survey to collect the information from the individual households. **Appendix P** provides the socioeconomic survey questionnaires. The socioeconomic aspects of interest include the following:

- **Demography:** a description of the sample population and its characteristics, such as dependency ratio, population pyramid, and sex ratio.
- **Infrastructure:** information on existing social and physical infrastructure, such as roads, police facilities, electricity availability, water, sanitation, and postal services.
- **Health:** information on key health issues prevailing in the area and access to health facilities.
- **Education:** information on education levels in the area, educational institutions, and their accessibility.
- **Livelihood:** information on key occupations and income sources.

[1] https://ona.io/home/ accessed on September 8, 2022.

- **Income and poverty:** discussion on incomes, expenditures, debts, and identification of poor and vulnerable households.
- **Dependence on natural resources:** such as dependence on ecological/natural resources of the area as a source of livelihood, enjoyment or to meet day-to-day requirements.
- **Project impacts:** such as loss of land, built-up structures, trees, crops, and infrastructure.
- **Gender:** all the socioeconomic information was gathered disaggregated by gender and vulnerability.
- **Ecosystem services:** information on river dependence including sediment mining, fishing, water users and recreational activities.

Sample Size

A total of nine settlements including four settlements located east of the Reko Diq Mine Site and three located west of the Reko Diq Mine Site were surveyed and consulted. Additionally, Nok Kundi – nearest main town, and Dalbandin – headquarters of Chagai District were also surveyed and consulted to access the transportation impacts. These two settlements are located along the Road Route.

The percentage of HHs included in the surveys generally ranged from 10% to 30% with a minimum of five HHs and a maximum of 50 HHs per settlement:

- 30% in the settlements with estimated HHs ≤200
- 10% in the settlements with estimated HHs >200

For the household-level surveys, the HHs were selected using a random sampling technique i.e., selecting every fourth household for the survey.

Health Assessment

Through socioeconomic surveys and stakeholder consultations with local communities and nearest health facilities in the socioeconomic study area like Basic Health Units, Rural Health Centers, and Hospitals, the following information was collected to establish the baselines for health status and associated impact assessment.

- Common diseases in the Socioeconomic Study Area
- Risk of diseases in the Socioeconomic Study Area through project activities
- Existing health institutions and infrastructure in the Socioeconomic Study Area

Community Consultations

Community consultations were conducted with the potentially affected communities located east and west of the Reko Diq Mite Site and along the Road Route to record their concerns and opinions. Potential impacts of the Project on the local environment include disturbances and changes to the physical and biological environment, such as land transformation, noise disturbances, and air and water quality issues, and restrictions on land use. The potentially affected communities were visited, and consultations were conducted with the community members within their settlements to encourage and facilitate their participation. Representatives, notables, and other interested groups from

the communities were invited for the discussion before the consultation sessions. A female consultation specialist conducted separate consultations with the women of the potentially affected communities. All the consultations were recorded, attendance was recorded, and pictures of the consultation sections were taken as evidence of the meetings. However, keeping in view the local norms, pictures of women groups may not be possible.

Male and female enumerators were hired for data collection considering their proficiency in the local (Balochi) language and their ability to communicate in the local language. Information was obtained in discussion with a group of four to five key informants including the following:

- Union Council (local government) heads;
- Educated persons (with a Higher School Certificate as the minimum level of education attained);
- School teachers;
- Local government representatives and leaders; and
- Community-based organizations active in the area.

Detailed interviews were conducted with key informants (male and female) to gather information on social and economic setups including gender issues, with a focus on infrastructure and livelihoods. The data was segregated by gender.

Institutional Consultations

In addition to the potentially affected communities', consultations were held with institutional stakeholders. The consultations with institutions included Balochistan Environment Protection Agency, District Administration, Education Department, Health Department, and Non-Government Organizations.

O.6. Socioeconomic Survey Team

The survey team comprised the following members.

- One male socioeconomic and consultation specialist
- One female gender and consultation specialist
- Two male enumerators

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Appendix P
Socioeconomic Questionnaire

P.1. Questionnaire for Household Profile

Investigator Information

Name of Investigator(s): _____

Date: __ Start Time: ___ End Time: ____

Note any pause in interview shall be noted in the Comments section on Page 10

Location Information

Form No.: _____ Settlement: ___ Mauza: _____

Village Name: _____ Cluster Name: _

UC: ___ Tehsil: _ District: _____

GPS Coordinate: _____º _____' _____" N, ___º _____ '_____" E

1. Structure ID should be the same as that on the area map. If the family has more than one structures, list the remaining IDs in the second row with explanation in brackets.
2. GPS coordinate to be provided only where GPS is available
3. Settlement is the name by which the village is identified by the residents
4. Mauza is the revenue village.

Respondent and Head of Household (HHH) Information

	Respondent	Head of Household
Name		
Father/Husband Name		
Mobile Number		
Gender	☐ Male ☐ Female	☐ Male ☐ Female
Age (Response)		
Relation to HHH	☐ Self ☐ Father ☐ Brother ☐ Son ☐ Other _____	
Education	☐ Illiterate ☐ Madrassah ☐ No or less than Primary ☐ Primary (Class 5 to Class 9) ☐ Matric (Class 10) ☐ Intermediate (FA/ FSc) ☐ Graduate (BA/BSc) ☐ Other _____	☐ Illiterate ☐ Madrassah ☐ No or less than Primary ☐ Primary (Class 5 to Class 9) ☐ Matric (Class 10) ☐ Intermediate (FA/ FSc) ☐ Graduate (BA/BSc) ☐ Other _____

If respondent is the head of household, the third column should be left blank

Demographic Profile

Total Number of Persons in the Family (including HHH)

Age Limits	Male	Female
Under 2 years		
2 to 5 years		
6 to 18 years		
19 to 60		
Above 60		

Age Limits	Male		Female	
	Male literate/ school going	Constraints to literacy for male members	Female literate/ school going	Constraints to literacy for female members
Under 2 years				
2 to 5 years				
6 to 18 years				
19 to 60				
Above 60				

Housing

Ownership Status? ☐ Owned ☐ Rented ☐ Free ☐ Others _____

Construction ☐ Pucca (Bricks/blocks/stones) ☐ Semi Pucca ☐ Katcha ☐ Others _____

Approximate plot size of the house (State units) _

Approximate covered area (State units) _

When was the house constructed? _____

Covered area is the area of all floors in the house. Plot size is the size of land on which the house is built and includes the court yard, out houses, driveway etc.

Available Facilities in the House

Do you have Telephone Connection (landline)? ☐ Yes ☐ No If "Yes", when connected (Year)? _____

Do you have electricity connection? ☐ Yes ☐ No If "Yes", when connected (Year)? _____

Do you have Sewerage System? ☐ Yes ☐ No

Sewerage system includes constructed septic tanks and soak pit

Drinking Water Source

☐ Spring ☐ Groundwater ☐ Water Supply ☐ Open Pond

Water Supply System from the source

☐ Pipe ☐ Electric Pump ☐ Hand pump ☐ Carried on Animals

☐ Carried by Family ☐ Tankers ☐ Open channel ☐ Other _____

P.2. Fuel Sources and Consumption

Type	Y/N	Uses			
		L	SH	WH	C
Electricity					
Fuel wood (Gathered)					
Fuel wood (Market)					
LPG					
Kerosene					
Other					

L: Lighting SH: Space Heating WH: Water Heating C: Cooking

Social Profile

Religion _____ Caste _ Mother Tongue _____

Do you marry children outside your tribe/clan? ☐ Yes ☐ No

How many of the married members of the HH are married to their first cousins? _____

Decision Making

Who takes decision in the family on the following issues, and how?

Issue	How the decision is taken	If unilateral who takes the decision? (Indicate member no) If consultative, list the members consulted
Household budget management	☐ Unilateral ☐ Consultative	
Family conflicts	☐ Unilateral ☐ Consultative	
Matrimonial decisions	☐ Unilateral ☐ Consultative	
Property and asset management and inheritance	☐ Unilateral ☐ Consultative	

Migration Patterns

Years since settled in settlement:

If less than 10 years, then previous location:

Purpose of relocation from previous place:

Family Health

Births and Deaths

Number of births in the family in last 2 years Live___ Stillbirth_____

Deaths in the family in the last 2 years

No	Age	Cause
1		
2		
3		
4		

Serious illnesses

Did any of your family members suffered from any serious illnesses during the past 2 years?

Person (Relation with HH	Age	Illness	Outcome	Treatment Location

Illness:	Tuberculosis, Hepatitis, Asthma, Jaundice, Tetanus, Paralysis, Diabetes, Cancer, Heart disease, Others (specify)
Outcome:	Treated, Persisting, Disability, Lost job or occupation, Death
Treatment type:	Hospitalization, OPD/Clinic, Herbal/Hakeem, Faith healer, Homeopath, Other (specify)

Accidents

Did any of your family members suffered met an accident during the past 2 years?

Person (Relation with HH	Age	Accident	Outcome	Treatment Location

Accidents:	Fall from height, Snake bite, Road accident, Burns, Electrocution, Accident at work, Other (specify)
Outcome:	Treated, Persisting, Disability, Lost job or occupation, Death
Treatment type:	Hospitalization, OPD/Clinic, Herbal/Hakeem, Faith healer, Homeopath, Other (specify)

Common illnesses

Are the following illnesses common in your family in the specified category (Yes/ No)?

Common Diseases (عام بیماریاں)		Men (مرد)	Women (خواتین)	Adult-Children (6 to 14) (بالغ بچے)	Children (0 to 5) (بچے)
Tuberculosis	تپ دق				
Diarrhea	اسہال				
Breathing Problems	دمہ				
Jaundice	پیلیا				
Skin Diseases	جلد کے امراض				
Cold and Flu	بخار اورفلو				
Stomach Diseases	پیٹ کے امراض				
Joint Aches	جوڑوں کا درد				
Tetanus	تشنج				
Paralysis	فالج				
Diabetes	ذیابیطس				
Cancer	کینسر				
Heart Problems	دل کے مسائل				
Other (specify)	دیگر				

Family Assets

Appliances

If you own any of the following in your house, please give the quantity.
(Write quantity in figures in front of each item)

Television _____	Radio _	Elec Room Heater _____	Elec water heater _____
Refrigerator ___	Freezer _____	Washing Machine _____	Elec Iron _____
Electric Fan ___	Sewing Machine _____	Generator _____	Computer _____

Vehicles

If you own any vehicles, please provide the details:

Car ___	Jeep __	Truck _	Pick-Up
Motorcycle ____	Other _	Description ____	

Livestock

Number of Livestock heads of each type owned by you.

Type	Camel	Cow	Buffalo	Goat/ Sheep	Oxen	Donkey	Horse	Chicken	Others (specify)
Number									
Use									

Number:	If the family does not own any animal, enter “Nil”. Do not leave blank.
Use:	**S**: Self **C**: Commercial **B**: Both

Are the animals sent for grazing? ☐ Yes ☐ No. If yes, where? __

Land holding

Serial	Land Use	Overall Land (mention units)
1	Cultivated area	
2	Uncultivated area	

Agriculture – Cultivated Area

Details on the cultivated area owned by you as a source of income from agriculture (this field will be filled if the area is mentioned in the above table of land holding).

Details of Crops					
Name					
Area with units					
Arrangement (Coops, individual)					

Details of Crops					
Name					
Height (How much large)					
Use					
Water source and amount required					

Number: If the family does not own any crops, enter “Nil” in front of the Details of Crops. Do not leave blank.
Use: **S**: Self **C**: Commercial **B**: Both

Details of Trees (e.g., palm trees)					
Name					
Type (Fruit/ non-fruit)					
Number					
Arrangement (Coops, individual)					
Height (How much large)					
Use					
Water source and amount required					

Number: If the family does not own any trees, enter “Nil” in front of the Details of Trees. Do not leave blank.
Use: **S**: Self **C**: Commercial **B**: Both

If the number exceeds than the columns above use a separate sheet.

Family Economics

Household Income (Average over last year)

Source	Number of persons	Average (Rs.)	Monthly/Annual
Salaried Jobs including remittances and pensions			
1.			
2.			
3.			
Family Sources			
Farming			
Livestock			
Business – Local			
Business – International, including cross-border trade			
Rent			

Source	Number of persons	Average (Rs.)	Monthly/Annual
Arts and Craft Making			
Labour – Construction			
Labour – Aggregate			
Labour – Mining			
Labour – Quarrying			
Drivers/ Guards			
Other (please specify)			

Expenditures (Average over last year)

Heads of Expenditure	Average (Rs.)	Monthly/Annual
Food		
Clothing		
Combustion fuel (gas, kerosene, firewood, etc.)		
Rent or expenditure on dwelling		
Electricity charges		
Medical		
Education		
Communication		
Transportation		
Livestock		
Other expenditures (Please specify heads below)		

Indebtedness

Do you owe any money to others or institutions? ☐ Yes ☐ No

If “Yes”, from whom

Bank___ Friend _ Relative _____ Other__

Comments and Notes

P.3. Questionnaire for Rural Settlement

Background Information

Settlement	A settlement is a cluster of houses where residents share a geographic area, and commute with the resources through a cultured pattern that they have developed in due course of time for the purpose.
Village	A village is a small administrative region with defined borders locally called “Mouza”. One village may contain one or more settlements.
Union Council	Union council is a comparatively bigger administrative area comprising 3 to 4 villages.

Name of Investigator(s) _____

Settlement Name _____ Village Name _____

Union Council (UC) _____ Tehsil Name _____

Coordinates N _____ E _____

Respondent Information

Name(s)	Role/Title/Responsibility	Phone Number

Note: This will be focused group and the group should involve village elders, farmers, school teachers, community representatives etc.

Demography, Ethnicity and Language

Household:	A household may be either a single person or a multi-person household. Household members may be related or unrelated and essentially include people who make common provisions for food and other essentials of living and have no usual place of residence elsewhere.
Masonry:	Houses with brick walls and concrete or tin roof.
Adobe:	Houses made of mud or unbaked bricks of clay and straw.

Total Households _____ Estimated Population _____

Male Population % _____ Female Population % _____

Proportion of Houses Adobe (%) _____ Proportion of Houses Masonry (%) _____

No.	Ethnic Groups	% Share in population
1		
2		
3		
4		
5		

List of languages spoken in the communities

Language	Percentage
Balochi	%
Brohvi	%
Pashto	%
Urdu	%
Other (specify)	%
Other (specify)	%

Marginalized Groups

Number of mentally/physically challenged people in the settlement/colony

Number of widows in the settlement/colony:

Occupational and Income Profile

Approximate number of persons involved in income earning activities? Male_____ Female_____

Occupation	Share in employed population		Average Income (PKR) /Person/ Month	
	Male	Female	Male	Female
Govt. Jobs				
Private Jobs				
Agriculture				
Livestock				
Own Business				
Labor				
Others _____				
Others _____				

Average Household Income

Average monthly income (PKR) of the Household	Proportion of Households (%)
Less than 20,000*	
20,000 – 30,000	
30,000 – 50,000	
50,000 – 75,000	
More than 75,000	

*Approximate Poverty Line PKR 20,000 per month per HH with average HH size 6.6 (Per capita national poverty line per month is 3,030)

Livestock

Provide information on livestock rearing

Items	Total no. in settlement	No sold, bartered or consumed in last 12 months	Value per unit (PKR)
Bullock/Buffalo			
Cow			
Goat			
Sheep			
Donkey			
Horse			
Camel			
Poultry			
Other, specify below			

Educational Facilities

Access and Enrolment

Facility Level	Enrolment		Provider (Government, Private, NGO)	Distance if outside settlement	Location if outside settlement
	Male	Female			

Health Facilities

Facility	Provider (Government, Private, NGO, Other)	Distance if outside settlement	Location if outside settlement
Dispensary			
BHU			
Health Center			
Rural Health Center (RHC)			
Hospital			
Immunization (e.g., Polio drops)			
LHV/LHW			
Trained Midwife (dai)			
Untrained Midwife (dai)			

Facility	Provider (Government, Private, NGO, Other)	Distance if outside settlement	Location if outside settlement
Pharmacy			
Other			

Water Supply and Sanitation

Water Supply (tick all that apply)

☐ Public water supply (government/municipal) ☐ Well/s

☐ Spring/s ☐ Ground Water

☐ Other

Typical Sanitation (tick all that apply)

Pit Latrine ☐ Pit Latrine with Slabs ☐ Septic Tanks ☐ Open Latrine ☐

Municipal Sewage System ☐ Open Drains ☐

Others (please mention): _____

Fuel Sources and Consumption

Electricity _____ Fuel wood _____ Shrubs _ LPG___

Kerosene _____ Diesel__ Other__ Other __

Infrastructure

Infrastructure	Access (Y/N)	Location if out of settlement
Electricity		
Telephone		
Mobile Phone Service		
Post Office		
Police Station		
Police Check post		
Blacktop Road		
Unsealed Road		
Regular Public Transport Service (Bus, Pick-up, Jeep, Car)		
Bank		
Market		

Migration Patterns

Out-migration:

Has any household migrated from the settlement in the last 7 years? Yes ☐ No ☐

If yes, how many: _____ Migrated to:___

What is the purpose of out-migration?

_____

_____

_____

_____

In-migration:

Has any household settled in the settlement during the last 7 years? Yes ☐ No ☐

If yes, how many:_____ Migrated from:_

What are the reasons for in-migration?

_____

_____

_____

_____

_____

Tangible Cultural Heritage

Are there any archaeological sites, shrines, graveyards, or other areas of cultural significance in the zone? If so, please specify location and significance:

_____

_____

_____

_____

_____

_____

Needs Assessment

(In order of importance)

_____

_____

_____

_____

_____

_____

REKO DIQ
MINING COMPANY

RDMC Authorized Supplier/Contractor's document.
The document is NOT approved until an RDMC Approval stamp has been affixed.

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Document Title:	**Appendix Q – Background Information Document**		
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Supplier/Contractor Details

Package/Contract No:	**K023**		
Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix Q – Background Information Document**	**Rev:**	**A**

	2024-02-23	**Review**			
			Sadia Asghar	**Vaqar Zakaria**	**Barbara Wessels**
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix Q
Background Information Document

BACKGROUND INFORMATION DOCUMENT

Reko Diq Mining Project

Introduction

Barrick Gold Corporation (hereafter Barrick), in a Joint Venture partnership with the Government of Pakistan and the Government of Balochistan, intends to commence a feasibility study for the Reko Diq mining project (also referred to as the 'Project') in the western part of Balochistan Province of Pakistan. As part of the feasibility study, an Environmental and Social Impact Assessment (ESIA) will be conducted, including specialist studies. The ESIA will be a part of the environmental permitting process and will provide a basis for the integration of environmental and social considerations into the project design. Barrick has appointed Digby Wells Environmental (hereafter Digby Wells) and Hagler Bailly Pakistan Pvt. Ltd (hereafter HBP) to carry out the proposed environmental and social studies and permitting process for the Project.

Stakeholder engagement is an essential part of any environmental and social study. A stakeholder is defined as an individual or a group of people that may have an interest in the Project (also referred to as the 'Interested Parties') or may get affected by the Project (also referred to as the 'Affected Parties'). These may consist of the local and nearby communities and institutions. The engagement of stakeholders or consultation with them requires consultation material as a pre-requisite that will make stakeholders aware of the Project, the ESIA Process, and the governing legal requirements.

This Background Information Document (BID) has been prepared to inform the stakeholders about the key aspects of the project design and the anticipated environmental and social impacts of the Project. This BID will support the engagement and consultation with the stakeholders to identify and record their concerns, suggestions, and recommendations to assist Barrick in the development of a project in an environmentally and socially responsible manner.

History of the Project

Exploration of the Reko Diq crater porphyry systems started in 1993 when the Chagai Hills Exploration Joint Venture Agreement (CHEJVA) between the Government of Balochistan (GoB) and the Australian Mining Company BHP Billiton (BHP) was executed. In April 2006, BHP's 75% interest was transferred to the Tethyan Copper Company (TCCA) and they replaced BHP as a party to the joint venture.

Exploration drilling of the Tanjeel and Western Porphyries started in 1996 and in 2004, a feasibility study to mine Tanjeel was performed by TCCA. An ESIA was undertaken and the ESIA report was approved by the Balochistan Environmental Protection Agency in 2006.

TCCA was acquired by Barrick and Antofagasta in September 2006 and the exploration programme was extended, with the focus on a copper-gold porphyry system located on the western margin of the Reko Diq crater. An ESIA was performed on Reko Diq in 2010 as part of the feasibility study and a second ESIA was performed on the Tanjeel Copper Project in 2020. However, the Project entered into dispute resulting in a period of care and maintenance during international arbitration.

In 2022, a new joint venture was established whereby 50% of shares are owned by Barrick, 25% by the Government of Pakistan (GoP) federal state-owned enterprises (SOE), and 25% by the Government of Balochistan; 10% free carried and 15% holding entity.

This is a new partnership, with a new joint venture operating company and, given the time lapse since the previous studies were completed, a new feasibility study and ESIA will need to be undertaken for the project.

Project Overview

The proposed Project will be an open-pit copper and gold mine that will be developed in phases to process an annual amount of about 40 – 80 million tonnes (Mt) of ore. The open-pit mining, a surface mining technique, will use drill and blast methods to remove rock from an open pit in the ground for ore processing. The mined rock will be transported to the Run of Mine (RoM) pad via truck, where it will be crushed and ground before being fed into the process plant to extract copper and gold from the rock.

The proposed mine site is in the Nok Kundi tehsil, which is in the Chagai district of Balochistan province. It resides in the western stretch of the Chagai district between the Iran and Afghanistan borders. Nok Kundi is the nearest town to the Project at about 80 km and is about 128 km away from the Iran border and 64 km from the Afghanistan border. Figure 2 shows the location of the Project.

The terrain of the district consists of highlands, plains, and deserts with an average ground elevation of 900 meters above sea level (masl)ranging between 486 and 2,800 masl. The highlands comprise the Chagai and Koh-i-Sultan Ranges in the north, the Sarlath Range in the east, and the Mir-Jawa, Kachau, and Ras-Koh Hills (the highest mountain in the district) in the southwest. Gravel plains, sandy plains, and shifting sand dunes are the dominant topographic features of the proposed mine site.

The Project will spatially be distributed in three components:

- Mine site – location of open pits, process plant, mine accommodation, waste disposal facilities, and waste rock dumps (Figure 4);
- Transport corridor – initially a road network to be used to transport the ore to Gwadar for export and a pipeline to transport water from fan sediments to the mine site (Figure 3); and
- Concentrate dewatering and storage at Gwadar Port (Figure 5).

The Project consists of three types of licences, the Exploration Licence (EL5), the Mining Licence and the surface rights area. The exploration licence is an area of 374 km^2 and can only be used for exploration activities. The mine site will be located within the Mining Licence which is an area of 164 km^2. The open pits, process plant, tailings storage facility (TSF), waste rock dumps and ore stockpiles will all be constructed within this area. The Reko Diq Project includes the mineral deposits known as the Western Porphyries and Tanjeel.

The Project is a greenfield project with no construction having yet taken place. The Reko Diq camp housing exploration geologists is the only infrastructure currently on site. Once the project has been permitted the photographs below (Figure 1) are examples of the type of infrastructure and open pits that will form part of the Project.



Example of an open pit mine



Example of a copper concentrator plant



Example of a haul truck



Example of a gyratory crusher

Figure 1: Examples of what the Project activities could look like

The ancillary infrastructure includes the road network and ore concentrate pipeline to Gwadar Port. Water is needed during ore processing, and for other uses on the mine site including wash facilities. The available water within Reko Diq is insufficient and water will need to be sourced from elsewhere. The source of water is not yet determined and will be subject to studies during the ESIA and feasibility study, and will be supplied to the mine site through a pipeline. Current water source options and associated pipelines include the fan sediments, the Upper or Lower Tahlab, and Patangaz, amongst other locations.

Once the ore has been processed, a concentrate will be produced for export. The Project is expected to utilise Gwadar Port on the Arabian Sea for the export of concentrate. During the initial stages of production, it is expected that this concentrate will be transported by road while a pipeline is developed between the mine site and the Gwadar Port. Once established, it is expected that the concentrate will be piped to the port for export.

Similarly, the import of construction and operational materials will also use the Gwadar Port, Karachi Port, and Port Qasim. The consumables, materials, and equipment received at the port will be transported to the mine site via existing road networks. The roads used for the transport of these items (“Road Routes”), and the concentrate pipeline route (“Pipeline Route”), are together referred to as the “Transport Corridor” for the proposed feasibility study. The concentrate pipeline for the Project is estimated to be 650 km in length, while the road route from the mining site to the Gwadar Port will be approximately 870 km. All transport corridors will remain entirely within the borders of Pakistan.

Figure 3 provides an overview of the infrastructure associated with the Project including the transport corridor, port facility and the locations being considered for the provision of water for the Project. Figure 4 shows the preliminary mine site and proposed infrastructure layout be constructed within this area. The location of Gwadar Port is shown in Figure 5.

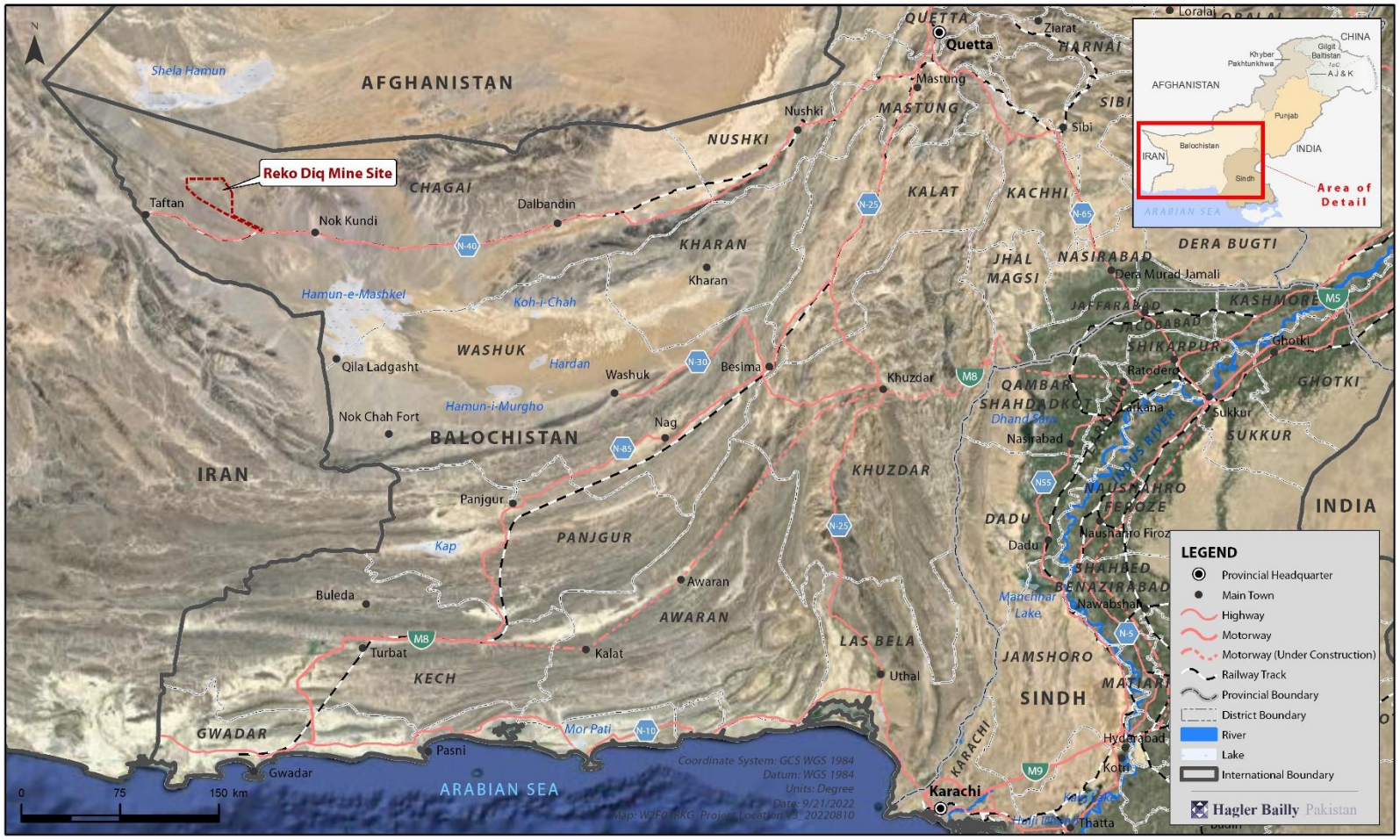


Figure 2: Project location

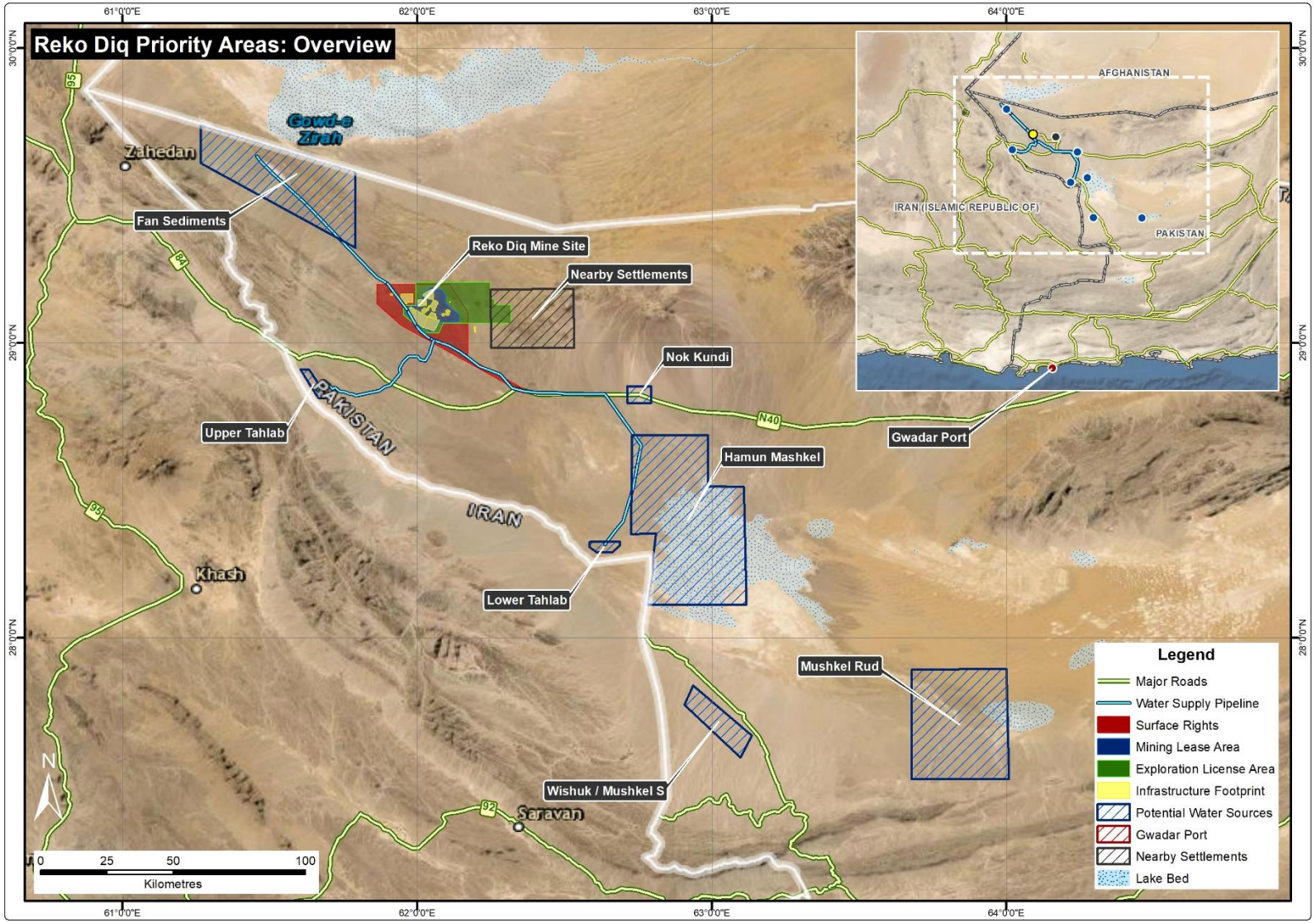


Figure 3: Project Area Overview

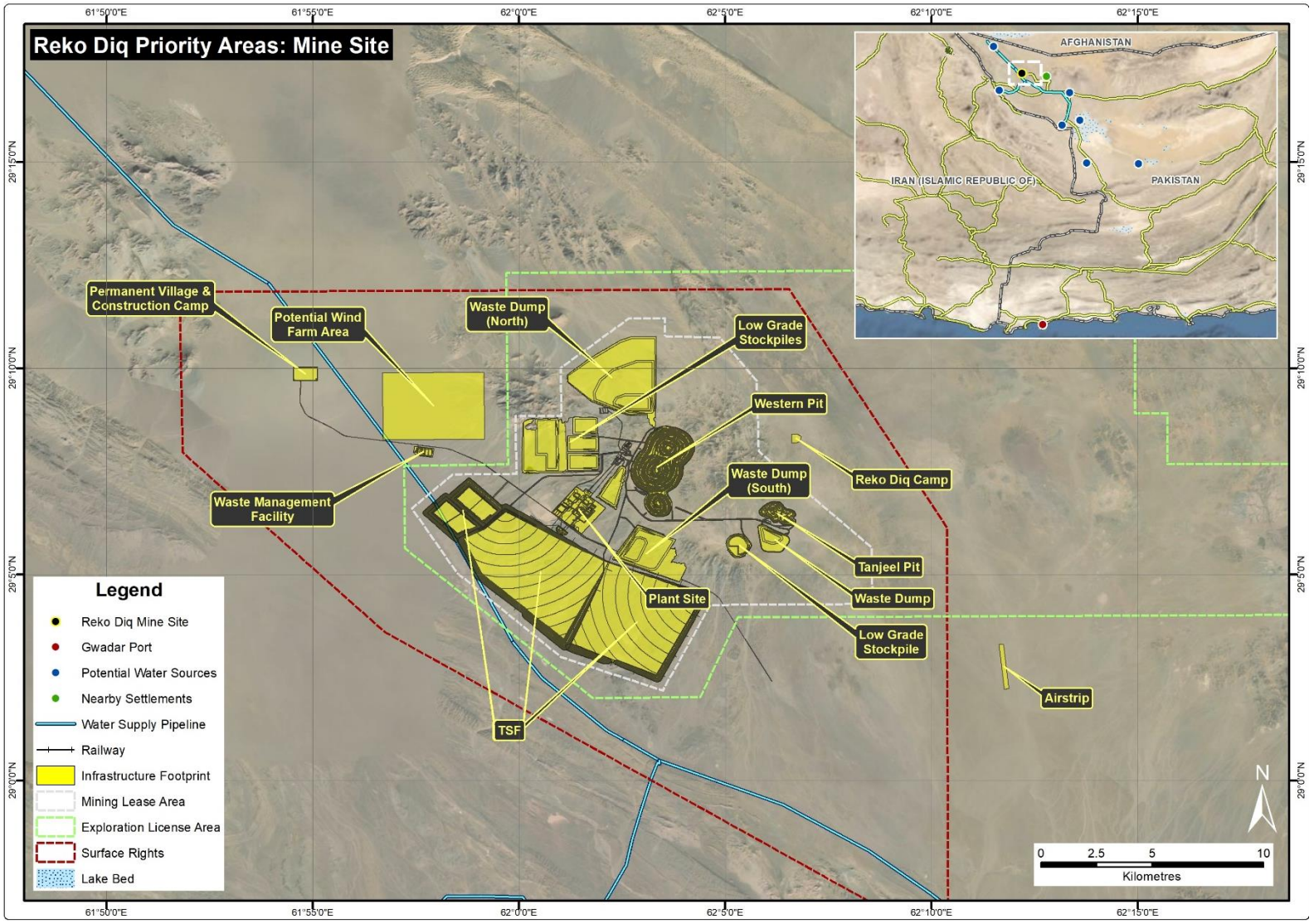


Figure 4: Preliminary Mine Site Layout



Figure 5: Gwadar Port

Approach to the ESIA

The ESIA will be undertaken in compliance with national legislation and the safeguarding polices of international lenders specifically the International Finance Corporation's Performance Standards on Environmental and Social Sustainability of January 2012 (IFC PS). The major components of the study will include:

- Baseline studies to characterise the existing physical, ecological and socioeconomic environment of the different components of the Project;
- Public consultation process to ensure that Project stakeholders are informed of the Project development plan and have an opportunity to influence or get benefit from it;
- Analysis of the physical, ecological and socioeconomic impacts of the project,both negative and positive; and
- Provision of mitigation and management measures through an Environmental and Social Management Plan (ESMP) to address the identified negative and positive impacts.

ESIA Process

A summary of the Conceptual Framework of the ESIA Process is provided in Table 1.

Table 1: Conceptual Framework of the ESIA Process

Component	Main purpose	Activities related to Stakeholder Consultations
Scoping	• Identify the issues on which the ESIA should focus. • Identify project alternatives that should be evaluated during the course of the ESIA.	• Identify institutional and community stakeholders • Engage stakeholders and record issues raised • Provide feedback to the ESIA team to incorporate stakeholders' concerns in baseline investigations and impact assessment as well as the project design
Baseline investigations	• Collect background information on the biophysical and social setting of the Project.	• Incorporate additional issues raised during the baseline surveys
Impact assessment studies	• Define the potential impacts of the Project • Undertake specialist investigations to predict changes to the environment due to the Project • Determine the significance of the potential impacts • Identify measures for the management of the impacts • Determine the residual impacts of the Project after incorporation of the management measures • Evaluate the overall acceptability of the Project (from environmental and social perspectives).	• Assess issues raised by stakeholders

Component	Main purpose	Activities related to Stakeholder Consultations
Mitigation measures and management plan	• Environmental mitigation and monitoring plan will describe the measures proposed to ensure implementation of the mitigation measures identified during the impact assessment. It will include, for example, specific designs and plans, training requirements, resource requirements, monitoring details (sampling locations, methodology and frequency), review and reporting requirements and budgets	• Assess the acceptability and practicability of the proposed mitigation and management measures
ESIA report preparation	• After the studies, the ESIA team will pull together the detailed assessment of impacts and mitigation measures. This may involve liaison with various specialists to ensure correct interpretation of information to compile the ESIA report.	• Provide stakeholders with feedback on the ESIA specifically communicate how the project proponent proposes to address the issues raised by stakeholders.
ESIA submission to regulatory authorities and decision making	• Submission and review of the ESIA report by regulatory authorities and other interested stakeholders. The reviewers will provide their decision on the acceptability of the Project from environmental and social perspectives and the conditions of approval for the development.	• Attend the public hearings and respond to the issues raised during the public hearings.

Specialist Assessments

The following are the specialist assessments that will form part of the ESIA Process:

- Air Quality and Climate;
- Greenhouse Gas (GHG) Emissions;
- Noise;
- Traffic;
- Soil, Land Use and Land Capability;
- Visual Impact;
- Oceanographic Survey;
- Surface Water;
- Groundwater;
- Geochemistry;
- Ecological Biodiversity (Terrestrial and Aquatics and Wetlands);
- Ecosystem Services Assessment;
- Socioeconomic and Health;
- Heritage and Archaeology;
- Cumulative Impact Assessment;
- Climate Risk Assessment; and
- Closure Plan and Cost Assessment.

Potential Project Impacts

The environmental and social studies to be undertaken will determine the expected impacts, positive and negative, resulting from the Project, as well as determining the significance of such impacts. These findings will be shared during the ESIA process, as well as the mitigation and management measures to be implemented. However, the following is a preliminary list of potential environmental and social impacts of the Project:

- Provision of direct jobs, employment and training opportunities to locals.
- Direct procurement opportunities with the mine which will boost the local economy.
- Creation of indirect service sector jobs from the presence of the mine including from suppliers and services to the local and regional economy.
- Increase in social infrastructure and development programmes through committed investment in the community and development initiatives.
- Provision of royalties and taxes to the GoP and GoB.
- Mining profits being received directly into Balochistan through the joint venture agreement with state owned enterprises.

- Mining will increase the surface area of exposed soils which may increase the already high levels of wind erosion.
- Further wind-blown dust may be contributed from the TSF and understanding around the distances dust is mobilised from the mine site.
- The TSF is a waste facility containing contaminants. These contaminants can be mobilised and may seep into the groundwater, if not managed.
- A decrease in groundwater table and impact on water supply from abstraction.
- Increase in traffic volume due to Project-related movement of vehicles during construction and operation phases.
- Occupational health, safety and fire hazards exposure to employees and workforce due to extreme temperatures (-15 to 50˚C), dust, brightness intensity, amongst other Project operations and local environmental conditions.
- GHG emissions due to the combustion of fuel in power plant and mining activities.
- Pressure on existing social infrastructure due to influx of job seekers.
- Disturbance to cultural sites and heritage resources.
- Changes to existing social and cultural norms.
- Disturbance to natural flora and fauna and loss of terrestrial habitat.
- Impact to any archaeological or historical sites.

.1 ریکوڈک مائننگ پراجیکٹ

ریکوڈیک مائننگ کمپنی(RDMC یا کمپنی)ضلع چاغی، بلوچستان میں نوک کنڈی کے قریب ایک تانبے اور سونے کی کان (یا پراجیکٹ) تعمیر کرنے کا ارادہ رکھتی ہے۔پراجیکٹ کے ابتدائی مرحلے میں ریکوڈک کے مقام پر ایک رہائشی کالونی اور پانی کی فراہمی کے لئے ایک پائپ لائن بچھائی جائے گی۔ پانی ریکوڈک کے مغرب کی جانب تقریباً78 کلو میٹر کے فاصلے پر افغانستان کی سرحد سے قریب ایک زیرِ زمین آبی ذخیرے سے حاصل کیا جائے گا۔ پائپ لائن جس راستے سے گزرے گی وہاں کوئی مقامی آبادی موجود نہیں ہے اور اس علاقے میں اس وقت پانی کا کوئی استعمال نہیں ہے۔ ریکوڈک سے سب سے قریبی گاؤں ہمائی ہے جو کہ پراجیکٹ سے تقریباً 20 کلو میٹر مشرق کی جانب واقع ہے۔

جیسا کہ نیچے دئے گئے نقشے میں دیکھا جا سکتا ہے، پراجیکٹ کی رہائشی کالونی اور پانی کی پائپ لائن کے لئے درکار رقبہ 0.6 مربع کلو میٹر (60 ہیکٹر) ہے جو حکومتی قانون کی مطابق حاصل کیا جائے گا۔اس پراجیکٹ کی تکمیل کے لئے تقریباً 11 مہینے لگیں گے۔

1.1 گردونواح کی معلومات

پراجیکٹ کے محل وقوع میں 9 گاؤں موجود ہیں جو کہ منصوبے کی سرگرمیوں سے متاثر یا فائدہ اٹھا سکتے ہیں۔ان آبادیوں میں گھرانوں کی تعداد تقریباً 40,000 ہے جبکہ کل آبادی تقریباً 300,000 پر مشتمل ہے۔

- ریکوڈیک مائن سائٹ کی مشرق میں واقع آبادیاں:

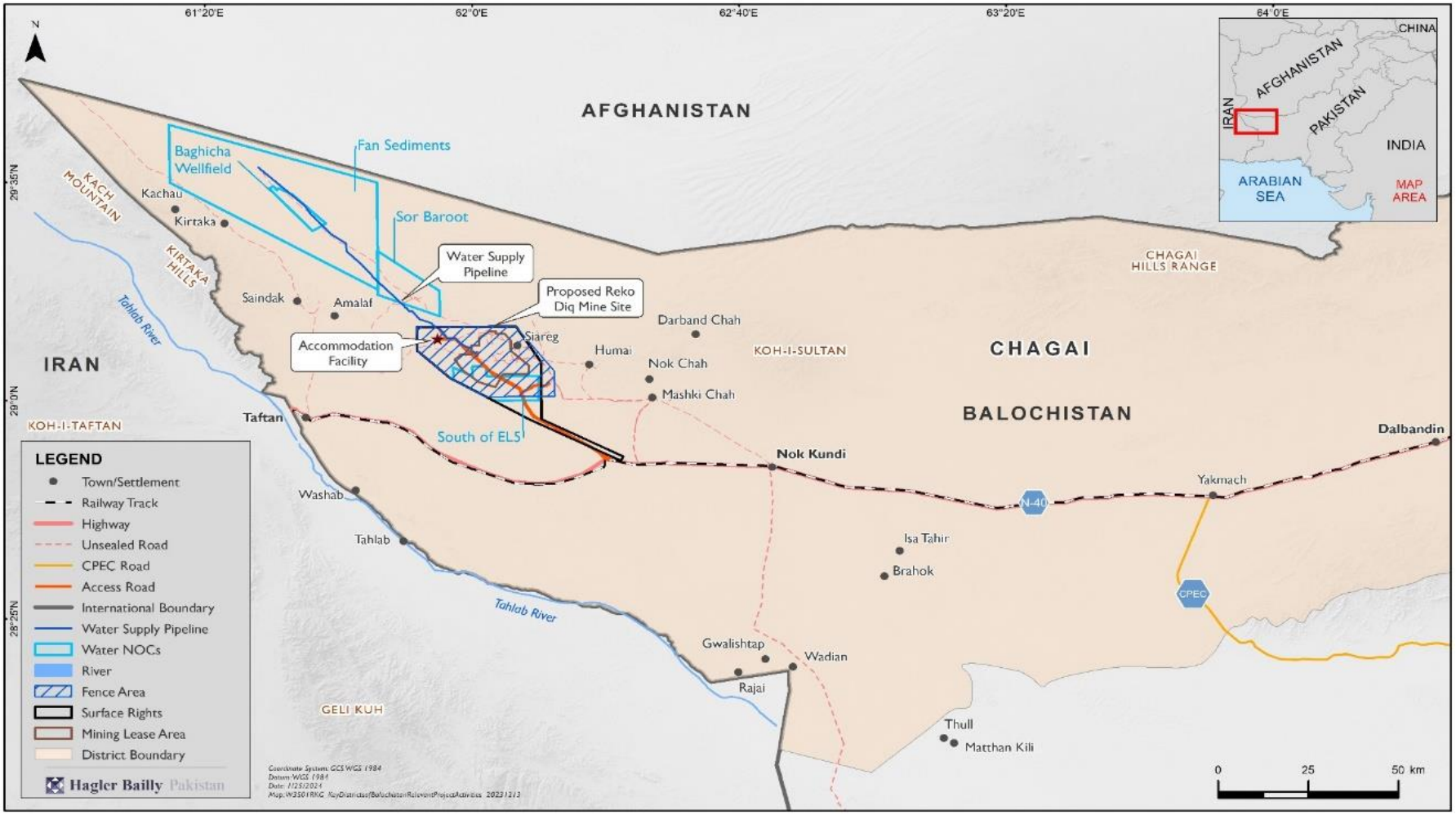
ہمائی نوک چاہ ماشکی چاہ دربند چاہ

- ریکوڈیک مائن سائٹ کی مغرب میں واقع آبادیاں

امالاف سینڈک

- بڑے قصبے

نوک کنڈی دالبندین



شکل نمبر 1: چاگائی ضلع میں منصوبے کا مقام

1.2 پراجیکٹ کے ممکنہ اثرات اوران کاازالہ

کمپنی نے اس منصوبے کی ماحولیاتی اور سماجی اثرات کے جائزے کے لئے ہیگلر بیلی پاکستان کو منتخب کیا ہے جس نے اس علاقے کا مطالعہ کرنے کے بعد پروجیکٹ کے ممکنہ اثرات کاازالہ کرنے کے لئے تجاویز دی ہیں جو کہ درج ذیل ہیں:

- پروجیکٹ کی تعمیر کے لئے علاقے کے باہر سے آکر کام کرنے والوں کے مقامی آبادی پر اثرات
- کمپنی اس بات کو یقینی بنائے گی کہ جو کام کرنے والے باہر کے علاقوں سے آئیں گے وہ صرف رہائشی کالونی تک ہی محدود رہیں گے
- اس منصوبے کی وجہ سے علاقے میں روزگار کے مواقع
- کمپنی اس پراجیکٹ کے لئے زیادہ سے زیادہ لوگ مقامی آبادیوں سے حاصل کرے گی اور مقامی آبادیوں سے پیشہ ور لوگوں کی عدم دستیابی کی صورت میں بلوچستان کے عوام کو ترجیح دی جائے گی۔ کمپنی نوک کنڈی میں ایک ٹریننگ سنٹر قائم کرے گی جس میں مقامی لوگوں کو پراجیکٹ کی ضروریات کے مطابق تربیت دی جائے گی
- سماجی اور معاشرتی اقدار کی وجہ سے عورتوں کو پراجیکٹ میں ملازمت حاصل کرنے میں مشکلات
- مقامی آبادیوں کے مردوں کے علاوہ عورتوں کو بھی پراجیکٹ میں ملازمت کے لئے ٹریننگ دی جائے گی اور ساتھ ساتھ خواتین کے لئے فلاح وبہبود کے کام بھی کئے جائیں گے جس میں سے تعلیم اور ہنر کو ترجیح دی جائے گی
- پراجیکٹ کی وجہ سے ماحولیاتی آلودگی اور گرد وغبار میں اضافہ
- کمپنی اس بات کو یقینی بنائے گی کہ منصوبے میں چلنے والی گاڑیاں اچھے معیار کا ایندھن استعمال کریں اور کم سے کم دھواں اور گرد پیدا کریں
- پراجیکٹ کی وجہ سے شاہراؤں اور سڑکوں پر ٹریفک میں اضافہ
- پراجیکٹ کی مشینری N40 شاہراہ سے آئے گی اور تجزیے کے مطابق پراجیکٹ کی وجہ سے N40 شاہراہ کی ٹریفک پر معمولی اضافہ ہوگا
- پراجیکٹ میں استعمال ہونے والے تیل اور کیمیائی اجزاء کی وجہ سے زمینی آلودگی کا خدشہ
- کمپنی اس بات کا خاص خیال رکھے گی کی کسی قسم کا تیل یا کیمیائی اجزاء زمین پر نہ گریں
- پراجیکٹ پر کام کے دوران پیش آنے والے حادثات کی روک تھام
- کمپنی ملازمین کی حفاظت کو اولین ترجیح دیتی ہے جس کے لئے پراجیکٹ میں کام کرنے والوں کو ممکنہ خطرات سے محفوظ رکھنے کے لئے ایک جامع منصوبہ بھی تیار کیا گیا ہے
- تعمیراتی کاموں کی وجہ سے جنگلی حیات کو ممکنہ نقصان
- پراجیکٹ کے لئے کم سے کم زمین استعمال کی جائے گی اور ٹریفک کو بھی مخصوص راستوں تک محدود کیا جائے گا تاکہ جنگلی حیات کو غیر ضروری نقصان سے محفوظ رکھا جاسکے۔

1.3 مفادِ عامہ کے پراجیکٹس

اگرچہ کمپنی کا بنیادی مقصد کان کنی ہے لیکن کمپنی آس پاس کی آبادیوں کی فلاح وبہبود میں بھی خاص دلچسپی رکھتی ہے۔ اس ضمن میں کمپنی بیشتر فلاح وبہبود کے پراجیکٹ مکمل کر چکی ہے اور مزید منصوبوں پر کام کرنے کا ارادہ رکھتی ہے۔ کمپنی نے مندرجہ ذیل فلاح وبہبود کے کام سرانجام دیئے ہیں۔

تعلیمی سہولیات کی عدم دستیابی کو مدِ نظر رکھتے ہوئے کمپنی نے ہمائی، دربند چاہ اور ماشکی چاہ میں 2023 میں پرائمری سکولز قائم کئے۔



ہمائی محلہ میں قائم پرائمری سکول



دربند چاہ محلہ میں قائم پرائمری سکول



ماشکی چاہ محلہ میں قائم پرائمری سکول

ہمائی گاؤں میں ابتدائی طبّی مرکز 2023 میں قائم کیا گیا۔ اس مرکز میں ایک ڈاکٹر اور ایک لیڈی ڈاکٹر، پیرامیڈیکل سٹاف اور فارمیسی سٹاف کام کر رہے ہیں۔ انشاءاللہ کمپنی اس قسم کے طبّی مرکز مزید گاؤں میں قائم کرے گی۔



ہمائی محلہ میں قائم کمیونٹی مرکزِ صحت

نوک کنڈی میں صحت کی بنیادی سہولت (ہسپتال) انڈس ہسپتال اور ہیلتھ کیئر نیٹ ورک (IHNN) کے باہمی اشتراک سے بنایا جا رہا ہے۔

نوک کنڈی میں موبائل میڈیکل یونٹ قائم کیا جا چکا ہے جو کہ جدید لیبارٹری، ادویات اور آلات مہیا کئے گئے ہیں۔ یہ سنٹر کمیونٹی ورکرز اور ڈاکٹروں کی ایک ٹیم کے ہمراہ لوگوں کو بنیادی صحت کی سہولت فراہم کر رہا ہے۔ یہ سہولت عارضی ہے اور نوک کنڈی میں مستقبل میں IHNN-RDMC ہسپتال تعمیر کیا جائے گا جس میں مزید طبّی سہولیات فراہم کی جائیں گی۔



RDMC-IHNN کی طرف سے نوک کنڈی محلہ میں قائم موبائل میڈکل یونٹ

- مقامی آبادیوں میں پانی کی قلت کو پورا کرنے کے لئے دربند چاہ اور نوک چاہ میں پانی کے کنویں بنائے گئے ہیں
- ہمائی گاؤں میں پانی کو صاف کرنے والا پلانٹ قائم کیا جا چکا ہے اور اسی طرح کے پلانٹ ریکوڈیک مائن کے مشرق میں واقع دوسری آبادیوں میں بھی قائم کئے جائیں گے۔

REKO DIQ
MINING COMPANY

RDMC Authorized Supplier/Contractor's document.
The document is NOT approved until an RDMC Approval stamp has been affixed.

Document No.:	**6105AK023-S411-HD27-0034**	**Rev:**	**A**
Document Title:	**Appendix R – Community Consultation Logs**		
Issue Date:	**2024-02-23**		

Supplier/Contractor Details

Package/Contract No:	**K023**		
Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix R – Community Consultation Logs**	**Rev:**	**A**

	2024-02-23	**Review**			
			Sadia Asghar	**Vaqar Zakaria**	**Barbara Wessels**
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix R
Community Consultation Logs

R.1. Community Consultation Logs (Men)

The consultations were carried out for a larger extent as part of the ESIA of the Reko Diq Mining Project that will be comprehensively discussed in that ESIA and will be submitted to the Balochistan-EPA at a later stage. The consultations included the details of the Reko Diq Mining Project, its facilities and activities during the construction and operational phases. The discussion on the construction activities also included the Early Works phase. These consultation logs present information about the proposed development from the communities identified as potential stakeholders as part of the Early Works ESIA.

Stakeholder/s:	Local community residents from Humai Settlement		
Consultation:	Consultation with men		
Date:	September 13, 2022		
Time:	10:00 am		
Meeting venue:	Humai Settlement		
Attended by:	*Name*	*Occupation*	*Contact*
	Malik Liaqat Khan	Social Activist	+92 336 1809509
	Malik Muhammad Khan	Social Activist	+92 333 3369705
	Fazal Khan	Imam Masjid	NA
	Ghulam Muhammad	Watch Man	+92 825 509257
	Malik Ali	Notable	+92 330 6711395
	Taj Muhammad	Notable	+92 323 6426441
	Malik Mehmood	Notable	+92 333 3347469
	Moosa Khan	Unemployed	NA
	Allah Nazar	Unemployed	NA
	Atta Ullah	Business	NA
	Muhammad Akbar	Business	NA
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) • Kashif Afzaal (HBP Representative)		
Recorded by:	Kashif Afzaal		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		

Picture:	
Stakeholder views, concerns, and suggestions:	**Concerns:** ▪ Dependency on border trading as the main livelihood, with fears of potential closure due to the Project. ▪ Livestock rearing, labor, and agriculture as secondary sources of income, with concerns about restricted livestock movement. ▪ Lack of health and educational facilities in the settlement, with nearby facilities located 80 km away in Nok Kundi. ▪ Non-drinkable groundwater causing waterborne diseases. ▪ Previous NGO functions suspended, impacting water, sanitation, hygiene, and livelihood initiatives. ▪ Limited employment opportunities for women, with restrictions on their involvement in income-generating activities. ▪ Low literacy rate due to the non-functional school in the settlement. ▪ Non-functional health center and RO plant installed by National Resources Limited (NRL). ▪ Absence of road infrastructure and non-operational cellular network in the settlement **Proposed CSR Initiative:** ▪ Provide alternate routes for cross-border trading to minimize the impact on locals. ▪ Ensure locals receive preference in hiring and employment opportunities during Project construction and operation. ▪ Establish functional health and educational facilities within the settlement. ▪ Address water quality issues by implementing water purification measures. ▪ Implement programs to empower women, enabling their participation in income-generating activities. ▪ Support and revive the handicraft business, providing women with economic opportunities. ▪ Invest in road infrastructure to improve connectivity. ▪ Work towards making the cellular network operational in the settlement. **Gender-Specific Concerns:** ▪ Limited employment opportunities and income generation for women. ▪ Women excluded from decision-making processes. **Recommendations:** ▪ Provide alternatives for cross-border trading and ensure locals receive preference in employment. ▪ Revive and support livelihood initiatives impacted by the suspension of NGO functions. ▪ Establish functional health and educational facilities within the settlement. ▪ Implement water purification measures to address waterborne diseases. ▪ Implement programs to empower women, enabling their participation in income-generating activities. ▪ Support and revive the handicraft business, providing economic opportunities for women. ▪ Invest in road infrastructure and ensure operational cellular networks in the settlement.

Stakeholder/s:	Local community residents from Nok Chah Settlement		
Consultation:	Consultation with men		
Date:	September 14, 2022		
Time:	10:00 am		
Meeting venue:	Nok Chah Settlement		
Attended by:	*Name*	*Occupation*	*Mobile*
	Haji M Hassan	Retired form Govt. Service	+92 337 3218455
	Naib Khan	Student	+92 333 3222716
	Abdul Salam	Labor	+92 333 3168393
	Salah ud Din	Govt. Employee	+92 333 6043664
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) ▪ Kashif Afzaal (HBP Representative)		
Recorded by:	Kashif Afzaal		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			

Stakeholders, views, concerns, and suggestions:	**Concerns:** ▪ Small settlement with 14 households, lacking health and educational facilities. ▪ Main sources of livelihood are labor and cross-border trade. ▪ Anticipation of dust storms exacerbating due to the Project's construction and operation. ▪ Concerns about increased asthma disease due to air pollution. ▪ Potential impact on women's free mobility within the settlement during consultation activities. ▪ Fear of outside labor influx impacting local culture, norms, and values. ▪ Anticipation of mining activities affecting groundwater sources, lowering the water table, and drying wells. ▪ Absence of roads and other infrastructure in the settlement. **Proposed CSR Initiative:** ▪ Implement measures to mitigate dust storms' impact on air quality. ▪ Introduce health awareness programs, focusing on respiratory issues. ▪ Develop strategies to preserve and protect local culture, norms, and values during the Project. ▪ Facilitate community engagement activities to address concerns about outside labor influx. ▪ Implement responsible mining practices to minimize the impact on groundwater sources. ▪ Monitor and manage the water table to prevent wells from drying. ▪ Advocate for the development of roads and essential infrastructure in the settlement. **Gender-Specific Concerns:** ▪ Potential impact on women's mobility during consultation activities. ▪ Consideration of gender-specific health concerns, especially regarding asthma. **Recommendations:** ▪ Implement technologies or practices to minimize dust storm impacts on air quality. ▪ Conduct health awareness programs, with a focus on respiratory health. ▪ Develop strategies to ensure the preservation of local culture, norms, and values. ▪ Facilitate community engagement to address concerns about potential cultural impacts. ▪ Implement responsible mining practices to protect groundwater sources. ▪ Monitor and manage the water table to prevent wells from drying. ▪ Advocate for the development of roads and essential infrastructure in the settlement.

Stakeholder/s:	Local community residents from Mashki Chah Settlement		
Consultation:	Consultation with men		
Date:	September 14, 2022		
Time:	10:00 am		
Meeting venue:	Mashki Chah Settlement		
Attended by:	*Name*	*Occupation*	*Mobile*
	Khalil Ahmed	Govt Employee (Levies Force)	+92 334 2797176
	M Tahir	Govt Employee (School Teacher)	+92 335 0278557
	Shahzaman	Self Employed	+92 331 8028557
	Abdul Rehman	Private Job	NA
	Jamal Nasir	Driver	NA
	Muhammad Arif	Govt Employee (Levies Force)	+92 334 2267007
	Abdul Zahir	Retired From Steel Mill	+92 333 7961299
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) ▪ Kashif Afzaal (HBP Representative)		
Recorded by:	Kashif Afzaal		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			

Stakeholder views, concerns, and suggestions:	**Concerns:** ▪ Most of the households have migrated to Nok Kundi for children's education and employment in the Mashki Chah settlement. Currently, only 21 households are present in the settlement. ▪ The settlement did not have electricity, health, or educational facilities available. Only primary school is available in the settlement. ▪ Wells are a source of water in the settlement and according to the locals, water is not drinkable and causes water-borne diseases. ▪ During the consultation locals said their area is rich in minerals, gold, and copper deposits. ▪ There are no agricultural activities in the settlement due to the non-availability of water sources. ▪ No cultural heritage site is located near the settlement. ▪ Basic amenities, education, health, road network, safe drinking water, and electricity are the major needs for the settlement. **Proposed CSR Initiative:** ▪ Introduce programs to improve education facilities and create employment opportunities to reduce migration. ▪ Explore initiatives to provide vocational training for skills development. ▪ Implement water purification projects to improve the drinkability of well water. ▪ Initiate awareness programs on water hygiene and sanitation. ▪ Establish basic amenities, including health facilities, in the settlement. ▪ Work towards developing a road network for better connectivity. ▪ Implement responsible mining practices to preserve the rich minerals, gold, and copper deposits. ▪ Promote sustainable water management to support agricultural activities. **Gender-Specific Concerns:** ▪ Consideration of gender-specific needs related to education, employment, and healthcare. **Recommendations:** ▪ Develop strategies to improve education facilities and reduce the need for migration. ▪ Introduce vocational training programs for skills development and employment. ▪ Implement water purification projects to ensure safe drinking water. ▪ Conduct awareness programs on water hygiene, particularly focusing on women. ▪ Establish basic amenities, including health facilities, to meet the community's needs. ▪ Advocate for the development of a road network for improved accessibility. ▪ Implement responsible mining practices to preserve natural resources. ▪ Support initiatives for sustainable water management to encourage agricultural activities.

Stakeholder/s:	Local community residents from Darband Chah Settlement		
Consultation:	Consultation with men		
Date:	September 15, 2022		
Time:	11:00 am		
Meeting venue:	Darband Chah Settlement		
Attended by:	*Name*	*Occupation*	*Contact*
	Syed Abdul Basit	Student	+92 332 2580129
	Syed Bashir	Notable	+92 332 2580129
	Araz Muhammad	Labor	NA
	Meer Zah	Private Job	+92 335 2081412
	Mirza	Notable	+92 335 2081412
	Shah Amad	Business	NA
	Feroz Shah	Business	NA
	Naik Muhammad	Labor	NA
	Badin	Labor	NA
	Nabi Buksh	Driver	NA
	Peer Dad	Labor	NA
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) ▪ Kashif Afzaal (HBP Representative)		
Recorded by:	Kashif Afzaal		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		

Picture:	
Stakeholder views, concerns, and suggestions:	**Concerns:** ▪ Two mining companies (Bolan Mining Enterprises) and (Popic) are working near the settlement and approximately 100 community members including men and women are working there. ▪ The main cross-border trade route passes through the settlement and most locals are involved in this business. ▪ Darband Chah is located approximately 70 km away from the Project location and the Project may not have any direct impact on this settlement. ▪ A few tribes have relatives on the other side of the border and due to the Project, the border may be sealed, and it will be an adverse impact on their social ties. ▪ The drinking water is brackish and causes kidney and stomach diseases in the settlement. ▪ Islamic Relief and Muslim Hands were two NGOs that previously worked in this settlement on WASH and safe drinking water, now their functions have been suspended. Two male members who are especially abled (mentally) are categorized as vulnerable. ▪ Most of the women are limited to their housework and not involved in decision-making. however, family conflicts are discussed with women. ▪ The community suggested that the Reko Diq project should be initiated at the earliest so that the employment opportunities increase because when the Project starts the border will be sealed. ▪ Skill enhancement training programs for local women should be provided by the project. ▪ Outside labor influxes may be impacted by the local culture, norms, and values. ▪ Groundwater is not drinkable, and it's a cause of water-bound borne diseases in the settlement. **Proposed CSR Initiative:** ▪ Implement water purification projects to address brackish water issues. ▪ Reinstate or initiate programs focusing on WASH and safe drinking water. ▪ Develop strategies to preserve local culture, norms, and values in the face of outside labor influx. ▪ Facilitate community engagement activities to address concerns about cultural impacts. ▪ Expedite the Reko Diq project to increase employment opportunities. ▪ Provide skill enhancement training programs, particularly for local women. ▪ Empower women by involving them in decision-making processes. ▪ Tailor skill enhancement programs to address the specific needs of women.

	Recommendations: ▪ Implement water purification projects to ensure access to safe drinking water. ▪ Collaborate with relevant organizations to reinstate or initiate programs focusing on WASH. ▪ Develop strategies to preserve and protect local culture, norms, and values. ▪ Facilitate community engagement activities to address concerns about cultural impacts. ▪ Advocate for the expedited functioning of the Reko Diq project to increase employment opportunities. ▪ Implement skill enhancement training programs, with a focus on local women. ▪ Promote the active involvement of women in decision-making processes. ▪ Tailor initiatives to empower women economically and socially.

Stakeholder/s:	Local community residents from Amalaf Settlement		
Consultation:	Consultation with men		
Date:	September 17, 2022		
Time:	10:00 am		
Meeting venue:	Amalaf Settlement		
Attended by:	*Name*	*Occupation*	*Contact*
	Malik Shah Mureed	Notable	+92 334 2466736
	Rahim Buksh	Retired from Govt job	+92 331 8306025
	Ahmad Buksh	Notable	+92 331 2904853
	Mubarik shah	Retired from Govt job	+92 334 5725674
	Moosa Khan	Retired from Govt job	NA
	Din Muhammad	Retired from Govt job	+92 342 7062071
	Abdul Rahim	Retired from Govt job	+90 333 7888402
	Rehmat	Private Employee	+92 333 3700726
	Sardar Gull Muhammad	Retired from Govt job	NA
	Mola Buksh	Private employee	+92 335 3110390
	Nawab Khan	Ex-UC Chairman	+92 333 7809951
	Barkat Ali	Private Employee	+92 333 7039283
	Muhammad Hussain	Private Employee	+92 334 2936919
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) ▪ Kashif Afzaal (HBP Representative)		
Recorded by:	Kashif Afzaal		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		

Picture:	
Stakeholder views, concerns, and suggestions:	**Concerns**: ▪ Majority of locals working at Saindak Project, limited economic diversification. ▪ Air pollution from the project causing increased lung diseases. ▪ Brackish water from wells impacting water quality. ▪ Lack of road infrastructure and partial cellular network coverage. ▪ Limited opportunities for women, with households categorized as vulnerable. ▪ Women restricted to household activities and excluded from decision-making. **Proposed CSR Initiative:** ▪ Implement measures to address air pollution and its health impacts. ▪ Explore water quality improvement initiatives for wells and alternative sources. ▪ Advocate for road infrastructure development to enhance connectivity. ▪ Work towards improving the reliability and coverage of the cellular network. ▪ Introduce programs empowering women and providing income-generating opportunities. ▪ Promote discussions within the community to expand women's roles beyond households. ▪ Enhance community involvement in decision-making related to the Saindak Project. ▪ Collaborate to identify and create sustainable livelihood opportunities for the community. **Gender-Specific Concerns:** ▪ Women limited to household activities and excluded from decision-making. **Recommendations:** ▪ Introduce health awareness programs to address the impact of air pollution. ▪ Investigate and implement solutions for improving water quality. ▪ Advocate for government and corporate support to develop road infrastructure. ▪ Collaborate with telecommunication providers to enhance cellular network coverage. ▪ Develop and implement initiatives promoting women's involvement in decision-making. ▪ Facilitate vocational training programs for women to enhance their skills and income opportunities. ▪ Establish a platform for regular community consultations and feedback. ▪ Encourage community participation in identifying and implementing development projects.

Stakeholder/s:	Local community residents from Kachau Settlement		
Consultation:	Consultation with men		
Date:	September 18, 2022		
Time:	3:00 pm		
Meeting venue:	Kachau Settlement		
Attended by:	*Name*	*Occupation*	*Mobile*
	Sher Ali	Govt Employee	+920333 7822407
	Haji Abdullah	Farmer	+92 347 2330181
	Haji Abdul Qadir	Businessman	+92 336 6992284
	Muhammad Khan	Businessman	NA
	Abdul Ghani	Labor	+92 333 3570105
	Fakhar Ullah	Govt Employee	+92 332 8820961
	Abdul Basir	Labor	NA
	Ghulam Haider	Livestock Business	NA
	Allah Dad	Govt Employee	+92 334 1369512
	Qalandar	Livestock Business	NA
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) ▪ Kashif Afzaal (HBP Representative)		
Recorded by:	Kashif Afzaal		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			

Stakeholder, views, concerns, and suggestions:	**Concerns:** ▪ Air pollution from the Saindak Project causing lung issues among locals. ▪ Dependence on livestock business due to limited job opportunities. ▪ Absence of NGOs in the remote settlement. ▪ Brackish water leading to kidney and stomach issues. ▪ Lack of a school and health facility in the village. ▪ Inadequate roads and infrastructure. **Proposed CSR Initiative:** ▪ Implement measures to mitigate air pollution from the Saindak Project. ▪ Engage with the Environmental Protection Agency (EPA) to address the issue. ▪ Explore and create alternative job opportunities to reduce dependence on livestock. ▪ Support vocational training programs for skill development and diversification. ▪ Establish a health center/BHU with a lady doctor. ▪ Build a middle school for both boys and girls. ▪ Install a Reverse Osmosis (RO) plant to improve water quality. **Gender-Specific Concerns:** ▪ Limited job opportunities for women. ▪ Absence of a health center/BHU with a lady doctor impacting women's health. **Recommendations:** ▪ Collaborate with relevant authorities for air pollution mitigation. ▪ Advocate for the EPA to address the impact of the Saindak Project on air quality. ▪ Establish essential facilities like a health center/BHU and a middle school. ▪ Advocate for the development of roads and infrastructure to improve accessibility. ▪ Install an RO plant to enhance water quality and reduce waterborne diseases. ▪ Promote alternative livelihood options to reduce dependency on livestock business. ▪ Implement vocational training programs that cater to both men and women. ▪ Advocate for women's involvement in employment opportunities and decision-making processes.

<table>
<tr><td>Stakeholder/s:</td><td colspan="3">Local community residents from Saindak Settlement</td></tr>
<tr><td>Consultation:</td><td colspan="3">Consultation with men</td></tr>
<tr><td>Date:</td><td colspan="3">September 17, 2022</td></tr>
<tr><td>Time:</td><td colspan="3">3:00 am</td></tr>
<tr><td>Meeting venue:</td><td colspan="3">Killi Malik Abdul Samad, Saindak Settlement</td></tr>
<tr><td rowspan="7">Attended by:</td><td>Name</td><td>Occupation</td><td>Contact</td></tr>
<tr><td>Haji Qadar shah</td><td>Businessman</td><td>+92 331 8311077</td></tr>
<tr><td>Bipak shah</td><td>Labor</td><td>+92 333 7720790</td></tr>
<tr><td>Haji gul Muhammad</td><td>Government job</td><td>+92 331 7918804</td></tr>
<tr><td>Hamid shah</td><td>Businessman</td><td>+92 332 3890536</td></tr>
<tr><td>Ameen Ullah</td><td>Private job at Saindak project</td><td>+92 335 2271526</td></tr>
<tr><td>Ali Dost</td><td>RDMC Representative</td><td>+92 344 8022511</td></tr>
<tr><td>Conducted by:</td><td colspan="3">• Yasir Asad (HBP Representative)
▪ Kashif Afzaal (HBP Representative)</td></tr>
<tr><td>Recorded by:</td><td colspan="3">Kashif Afzaal</td></tr>
<tr><td>Language:</td><td colspan="3">Balochi and Urdu</td></tr>
<tr><td>Preamble:</td><td colspan="3">The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.</td></tr>
<tr><td>Picture:</td><td colspan="3">  </td></tr>
<tr><td>Stakeholder views, concerns, and suggestions:</td><td colspan="3">Concerns:
▪ Increasing air pollution from the Saindak Project impacting local residents and contributing to a rise in lung diseases.
▪ Dependency of most locals on employment at the Saindak Project.
▪ Limited road infrastructure in the settlement.
▪ Partially operational cellular network affecting communication.
▪ Women restricted to housework with no opportunities for external employment.</td></tr>
</table>

	▪ Exclusion of women from decision-making processes, though family conflicts are discussed with them. **Proposed CSR Initiative:** ▪ Implement measures to control and reduce air pollution from the Saindak Project. ▪ Invest in technologies or practices to minimize environmental impact. ▪ Advocate for the development of road infrastructure for improved connectivity. ▪ Collaborate with telecommunication providers to enhance the cellular network. ▪ Launch programs promoting women's participation in decision-making. ▪ Introduce initiatives encouraging women's participation in income-generating activities. ▪ Enhance community involvement in decision-making related to the Saindak Project. ▪ Collaborate with the community to identify and create sustainable livelihood opportunities. **Gender-Specific Concerns:** ▪ Limited roles for women, confined to housework. ▪ Women excluded from decision-making processes. **Recommendations:** ▪ Collaborate with relevant authorities to monitor and address air pollution concerns. ▪ Invest in sustainable practices to minimize the environmental impact of the Saindak Project. ▪ Advocate for road infrastructure development for better connectivity. ▪ Work towards enhancing the reliability and coverage of the cellular network. ▪ Promote awareness and campaigns encouraging women's participation in decision-making. ▪ Establish training programs and initiatives to empower women economically. ▪ Foster community engagement to ensure the community's active participation in the project's development. ▪ Facilitate discussions to align project goals with the community's needs and aspirations.

<table>
<tr><td>Stakeholder/s:</td><td colspan="3">Local community residents from Dalbandin Town</td></tr>
<tr><td>Consultation:</td><td colspan="3">Consultation with men</td></tr>
<tr><td>Date:</td><td colspan="3">September 26, 2022</td></tr>
<tr><td>Time:</td><td colspan="3">11:00 am</td></tr>
<tr><td>Meeting venue:</td><td colspan="3">Dalbandin Settlement</td></tr>
<tr><td rowspan="11">Attended by:</td><td>Name</td><td>Occupation</td><td>Contact</td></tr>
<tr><td>Zafar Ullah</td><td>Business</td><td>+92 331 4711468</td></tr>
<tr><td>Hameed Ullah</td><td>Business</td><td>+92 335 2208541</td></tr>
<tr><td>Faisal Khan</td><td>Business</td><td>+92 332 2768349</td></tr>
<tr><td>Hafeez Ullah</td><td>Private Employee</td><td>NA</td></tr>
<tr><td>Meer Jamshed</td><td>Government Employee</td><td>NA</td></tr>
<tr><td>Sikandar</td><td>Government Employee</td><td>NA</td></tr>
<tr><td>Hassan</td><td>Labor</td><td>NA</td></tr>
<tr><td>Saad Ullah</td><td>Government Employee</td><td>NA</td></tr>
<tr><td>Shabbir</td><td>Government Employee</td><td>NA</td></tr>
<tr><td>Ali Dost</td><td>RDMC Representative</td><td>+92 344 8022511</td></tr>
<tr><td>Conducted by:</td><td colspan="3">• Yasir Asad (HBP Representative)
▪ Kashif Afzaal (HBP Representative)</td></tr>
<tr><td>Recorded by:</td><td colspan="3">Kashif Afzaal</td></tr>
<tr><td>Language:</td><td colspan="3">Balochi and Urdu</td></tr>
<tr><td>Preamble:</td><td colspan="3">The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.</td></tr>
<tr><td>Picture:</td><td colspan="3">  </td></tr>
<tr><td>Stakeholder views, concerns, and suggestions:</td><td colspan="3">Concerns:
▪ Declining living standards due to restriction in cross border trade.
▪ Health issues from brackish ground water affecting the local population.</td></tr>
</table>

	▪ Lack of government support for agricultural activities. ▪ Restriction in cross border trade forcing local community resident into low-wage labor. ▪ Poor waste management in the area. ▪ Limited employment opportunities for women, with some restricted to housework. ▪ Women excluded from decision-making, though family conflicts are discussed with them. ▪ Shortage of qualified lady doctors in the DHQ. **Developmental Priorities / Proposed CSR Initiatives**: ▪ Initiate programs to enhance skills and employability. ▪ Collaborate with local businesses to create job opportunities. ▪ Implement health awareness campaigns and medical assistance programs. ▪ Invest in improving solid waste management services. ▪ Establish initiatives promoting women's participation in the workforce. ▪ Support education and training for women in non-traditional roles. **Gender-Specific Concerns:** ▪ Women limited to housework, with few opportunities for employment. ▪ Exclusion of women from decision-making processes. ▪ Limited representation of women in professions like healthcare and teaching. **Recommendations:** ▪ Advocate for policies promoting private sector growth. ▪ Engage in dialogue with the government to address border trading restrictions. ▪ Collaborate with health authorities to address water-related health issues. ▪ Lobby for government support in improving agricultural practices. ▪ Advocate for fair wages and better working conditions for laborers. ▪ Encourage companies to adopt responsible labor practices. ▪ Promote gender-inclusive policies and practices. ▪ Encourage the inclusion of women in decision-making processes. ▪ Lobby for the placement of qualified lady doctors in the DHQ. ▪ Support initiatives to improve healthcare infrastructure in the region.

Stakeholder/s:	Local community residents from Nok Kundi Town		
Consultation:	Consultation with men		
Date:	September 24, 2022		
Time:	14:45 pm		
Meeting venue:	Nok Kundi Settlement		
Attended by:	*Name*	*Occupation*	*Mobile*
	Shahbaz Khan	Business	+92 3334 737256
	Muhammad Umer	Business Imam Masjid	+92 332 2433253
	Ali Dost	Labor	+92 333 7781055
	Ghulam Haider	Business	+92 3351032750
	Jalal Khan	Farmer	+92 335 3876855
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) ▪ Kashif Afzaal (HBP Representative)		
Recorded by:	Kashif Afzaal		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			

Stakeholder, views, concerns, and suggestions:	**Concerns:** ▪ Nonfunctional primary school due to a lack of teachers. ▪ Deteriorating road network conditions. ▪ Absence of NGOs in the area. ▪ Declining opportunities for date sales. ▪ Slow progress in the construction of a water supply scheme. ▪ Health issues from brackish water. ▪ No local health facility, requiring travel for emergencies. **Developmental Priorities / Proposed CSR Initiatives**: ▪ Recruitment of teachers for the nonfunctional primary school. ▪ Establishment of a functional middle school for both boys and girls. ▪ Improvement of the road network conditions. ▪ Development of link roads along the CEPC route for better connectivity. ▪ Acceleration of labor work on the water supply scheme. ▪ Installation of a Reverse Osmosis (RO) plant to improve water quality. ▪ Establishment of a health center/BHU with a lady doctor. ▪ Exploration of alternative livelihood options in case of border trading restrictions. ▪ Priority for local employment in the project to provide sustainable livelihoods. ▪ Support for vocational training to empower the local youth. **Gender-Specific Concern:** ▪ Limited opportunities for women in education and employment. ▪ Potential gender-specific health issues due to inadequate healthcare facilities. **Recommendations:** ▪ Encourage women's participation in teaching and other employment opportunities. ▪ Implement gender-inclusive policies in education and vocational training. ▪ Ensure the availability of healthcare services specifically catering to women's health needs. ▪ Involve the community in decision-making processes for sustainable development. ▪ Raise awareness about the importance of women's involvement in various sectors. ▪ Advocate for the installation of the RO plant to improve water quality and reduce health issues. ▪ Collaborate with CSR initiatives for environmental sustainability and health improvement.

R.2. Second Round of Community Consultation Logs (Men)

Stakeholder/s:	Local Community Members from Humai Settlement
Consultation:	Consultation with men
Date:	February 15, 2024
Time:	12 pm
Meeting venue:	Saeed Ullah House
Attended by:	**Name** / **Occupation** / **Contact** Saeed Ullah / Labor / 0825-516269 Gul Muhammad / Labor / 0825-508456 Iman Ullah / Labor / 0348-1295273 Hidayat Ullah / Health Worker / 0330-246448 Nazim / Labor / 0346-3190864 Naeem / Watchman / 0344-8099074 Maqsood / Student / 0342-8002964 Shoukat Aziz / Labor / NA Mir Ahmed / Labor / NA Najeeb Ullah / Labor / 0349-4372740
Conducted by:	• Ahmad Shoaib (HBP Representative) • Hafeez Ullah (RDMC Representative)
Recorded by:	Ahmad Shoaib
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Picture:	
Stakeholder concerns, issues and suggestions:	▪ The community was happy with the Project CSR activities that had been taken to facilitate the local community members of the Humai settlement. ▪ The primary school constructed by RDMC is fully functional and managed by the two teachers. **Concerns:** ▪ Community members said that they got employment in the Project on temporary or daily basis, but desired permanent or long-term positions.

	▪ Community members have some non-technical skills, lack of formal certification or qualifications. The Project could assist in acquiring these credentials, thus enhancing livelihood opportunities. ▪ The water plant installed by the Project is beneficial, concerns were raised about potential water level fluctuations during the summer months. ▪ They were also appreciative of the health center developed for their community, but the facility does not have emergency medical support in place which the Project should support. **Suggestions:** ▪ Project should prioritize providing permanent and long-term employment opportunities for the local community members. ▪ Accommodation facilities should be provided in Nok Kundi for participants attending training courses. **Proposed CSR Initiatives:** ▪ Community members suggested that the roads leading up to the community be paved or their condition improved.

Stakeholder/s:	Local Community Members from Darband Chah Settlement
Consultation:	Consultation with men
Date:	February 16, 2024
Time:	11:30 am
Meeting venue:	Abdul Basit House
Attended by:	**Name** / **Occupation** / **Contact** Abdul Basit / Operater / 0332-2580129 Shakir Ali / Halper / 0343-2863217 Abdul Razzak / Driver / 0341-1861425 Hafeez Ullah / Driver / 0342-0771567 Ghulam Haidar / Labor / 0341-0289877 Sultan Aziz / Labor / 0344-8266788 Israr Ahmed / Driver / 0344-8158137 Asad Khan / Student / 0342-8224515 Muhammad Karim / Government Servant / 0343-8118305 Syed Bashir / Labor / NA Nabi Baksh / Watchman / 0348-3212519 Jehangir Khan / Labor / 0349-2963143
Conducted by:	• Ahmad Shoaib (HBP Representative) • Hafeez Ullah (RDMC Representative)
Recorded by:	Ahmad Shoaib
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Picture:	
Stakeholder concerns, issues and suggestions:	▪ The community did not encounter any issues with the Project's Early Works activities. ▪ The primary school constructed by RDMC is fully functional and the community is satisfied with it. ▪ **Concerns:** ▪ The Project has installed a new borewell to the settlement, the water was still unavailable for the community use.

	▪ The proposed training center by RDMC is located too far for the community. ▪ The roads leading to the community was not suitable for travel. **Suggestions:** ▪ Project should offer permanent and long-term jobs to the local community residents. ▪ Accommodation facilities should be provided by the Project at Nok Kundi for participants attending training courses there. **Proposed CSR Initiatives:** ▪ It was suggested by the community members that a medical center be constructed for the community to address emergency and gynecology cases. ▪ Improving or paving the roads leading to the community was also suggested by the community members.

Stakeholder/s:	Local Community Members from Nok Chah Settlement
Consultation:	Consultation with men
Date:	February 16, 2024
Time:	2 pm
Meeting venue:	Haji Muhammad Hassan House
Attended by:	**Name** / **Occupation** / **Contact** Haji M Hassan / Retd. Government Servant / 0337-3218455 Qadir Baksh / Watchman / 0333-3387232
Conducted by:	• Ahmad Shoaib (HBP Representative) • Hafeez Ullah (RDMC Representative)
Recorded by:	Ahmad Shoaib
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Picture:	
Stakeholder concerns, issues and suggestions:	▪ The community did not encounter any issues with the Project's Early Works activities. **Concerns:** ▪ No school or medical center was constructed for Nok Chah settlement by the Project. ▪ The community lacks a nearby medical center or hospital, leading to difficulties in emergencies, particularly for pregnant women who must travel to Quetta and Nok Kundi for medical care. Additionally, the roads are unsuitable for patient travel. ▪ Community members were not offered any employment opportunities by the Project. ▪ The training center being proposed by Project is too far for the community. **Suggestions:** ▪ They suggested that a joint community center should be made for Humai, Nok Chah, Mashki Chah and Darband Chah. **Proposed CSR Activities:** ▪ A primary school and medical center should be built near the community. ▪ A RO plant should also be installed. ▪ Water storage tank should be constructed as the borewell provided by the Project is approximately a km away from the settlement.

Stakeholder/s:	Local Community Members from Mashki Chah Settlement
Consultation:	Consultation with women
Date:	February 16, 2024
Time:	3 pm
Meeting venue:	Abdul Rehman House
Attended by:	**Name** / **Occupation** / **Contact** Abdul Rehman / Watchman / 0333-7905418 Muhammad Tahir / Government Teacher / 0333-5027934 Abdul Qadir / Imam Masjid / 0333-6326120 Kia Khan / Watchman / 0333-7866256
Conducted by:	• Ahmad Shoaib (HBP Representative) • Hafeez Ullah (RDMC Representative)
Recorded by:	Ahmad Shoaib
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Picture:	
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. **Concerns** ▪ Community members are only being offered to work as laborer although they have some other skills which can be utilized by the Project. ▪ The community does not have a medical center or hospital close to it which causes problems in emergency cases and especially for women during pregnancy as they have to travel to Quetta and Taftan to access medical care; roads are not suitable for patients to travel as well. ▪ The training center should be built near the Mashki Chah settlement to facilitate the settlements located near east of the proposed Mine Site as the local community member cannot travel daily to Nok Kundi due to limited resources. ▪ The roads leading to the community was not suitable for travel. **Suggestions:** ▪ The project has developed a primary school, but an upgrade to a higher secondary school was needed, as there was no higher secondary school nearby for locals except in Nok Kundi.

	▪ They appreciated the training center being developed by the Project at Nok Kundi, but what will be the criteria for enrollment in these trainings? Will locals be prioritized or not? Also, would it be possible for the Project to establish a sub-center nearby. **Proposed CSR Initiatives:** ▪ They suggested building a higher secondary school near the Mashki Chah settlement to facilitate the settlements located east of the proposed Mine Site. ▪ They recommended constructing a medical center capable of handling emergency and gynecology cases for the community. ▪ They suggested paving the roads leading up to the community or improving their condition.

Stakeholder/s:	Local Community Members from Amalaf Settlement
Consultation:	Consultation with men
Date:	February 17, 2024
Time:	12 pm
Meeting venue:	Rahim Baksh House
Attended by:	**Name** / ***Occupation*** / ***Contact*** Rahim Baksh / Driver / 0331-6036025 Din Muhammad / Storekeeper / 0342-7062071 Musa Khan / Private Job / 0348-2115622 Muhammad Ramzan / Labor / 0332-0768940 Haji Gul Muhammad / Unemployed / 0332-8372216 Rahmat Ullah / Security Incharge / 0333-3700726
Conducted by:	• Ahmad Shoaib (HBP Representative) • Hafeez Ullah (RDMC Representative)
Recorded by:	Ahmad Shoaib
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Picture:	
Stakeholder concerns, issues and suggestions:	The community expressed satisfaction with the Project and encountered no issues with its Early Works activities. **Concerns** ▪ There was an education facility (a middle school) in the settlement, but the teachers do not come to school. They said they would be appreciative of the Project if the Project could provide a schoolteacher. ▪ The community members anticipated employment opportunities during the early works construction phase of the Project. ▪ Saindak Project has a fully equipped hospital; however, a lady female doctor was not available in the hospital which causes problems in emergency cases and especially for women during pregnancy as they have to travel to Quetta and Taftan to access medical care; roads were not suitable for patients to travel as well.

	Suggestions: ▪ The Project should provide employment to the community members in the upcoming Project activities as only 2 community members are currently employed at the Project and the area lacks employment opportunities otherwise. **Proposed CSR Initiatives:** ▪ The community members said that construction of a medical center that can address emergency and gynecological cases for the community, thereby reducing the need for extensive travel. ▪ They suggested that a middle and higher-secondary school be provided for them.

Stakeholder/s:	Local Community Members from Saindak Settlement
Consultation:	Consultation with men
Date:	February 17, 2024
Time:	2 pm
Meeting venue:	Khalil Khan House

Attended by:

Name	Occupation	Contact
Khalil Khan	Farmer	0332-6673199
Raza Hassan	Driver	0333-3329208
Abid	Private Job	0332-8153179
Muhammad Idrees	Unemployed	0333-7846502
Imam Baksh	Unemployed	0335-2373135
Muhammad Asif	Unemployed	0333-7481173
Shoaib Ahmad	Student	0332-7803468
Shams Ullah	Mason	0333-2298408
Jalal Khan	Unemployed	0331-1326971
Ibrahim	Labor	0336-6090754

Conducted by:

- Ahmad Shoaib (HBP Representative)
- Hafeez Ullah (RDMC Representative)

Recorded by: Ahamd Shoaib

Language: Balochi and Urdu

Preamble: The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.

Picture:



Stakeholder concerns, issues and suggestions:

- Community members were pleased with the Project and had no issues with its Early Works activities.

Concerns

- Saindak Project has a fully equipped hospital; however, a lady female doctor is not available in the hospital which causes problems in emergency cases and especially for women during pregnancy as they have to travel to Quetta and Taftan to access medical care; roads are not suitable for patients to travel as well.

	▪ A primary school was being run by the Saindak Project, however, a secondary school and college is also needed by the community ▪ The training center being proposed by RDMC is too far for the Saindak settlement. **Suggestions:** ▪ Community members suggested that Project should prioritize local community members for jobs in the upcoming Project activities. ▪ They want RDMC to prioritize the Saindak community for their CSR activities and other planned activities. **Proposed CSR Initiatives:** ▪ They said that a middle and higher-secondary school be provided for them. ▪ They requested that a training center should be made near the community as Nok Kundi is too far from the Saindak settlement.

Stakeholder/s:	Local Community Members from Kachau Settlement
Consultation:	Consultation with men
Date:	February 18, 2024
Time:	1:45 pm
Meeting venue:	Haji Abdullah House

Attended by:

Name	*Occupation*	*Contact*
Haji Abdullah	Unemployed	0347-2330181
Abdul Majid	Farmer	0342-8138316
Ghulam Haidar	Farmer	0341-1827825
Khuda Nazar	Driver	0346-2262199
Abdul Ghafoor	Driver	0345-2338619
Abdul Rehman	Farmer	0347-9816864
Obaid Ullah	Farmer	0341-1829070
Abdul Wali	Driver	0341-0221964
Majeeb ul Rehman	Farmer	0340-2195209
Muhammad Ismail	Farmer	0348-2712731
Atta Ullah	Farmer	0344-3803369
Muhammad Yasir	Unemployed	0336-2579056
Muhammad Ismail	Student	0341-3567350
Muhammad Samair	Student	0343-1207918

Conducted by:
- Ahmad Shoaib (HBP Representative)
- Hafeez Ullah (RDMC Representative)

Recorded by: Ahmad Shoaib

Language: Balochi and Urdu

Preamble: The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.

Picture:



Stakeholder concerns, issues and suggestions:
- The community had no problems with the Project's Early Works activities.

Concerns:

	▪ The community members expressed their desire for the Project to initiate CSR activities in their settlement, similar to Humai and other settlements located east of the proposed Mine Site. ▪ They highlighted the absence of a nearby medical center or hospital, which poses challenges in emergency situations, particularly for pregnant women who must travel long distances for medical care. Additionally, the roads are not suitable for patient transportation. ▪ A primary school was being run by the Frontier Corps; however, a middle and higher-secondary school is also needed for the community. **Suggestions:** ▪ Permanent employment opportunities within the Project. ▪ Establishment of a medical center equipped with staff to serve the community. **Proposed CSR Initiatives:** ▪ They suggested that a medical center, which can cater to emergency and gynecology cases, be constructed for the community. ▪ They suggested that a middle and higher-secondary school be provided for them. ▪ They requested that a training center should be made near the community, which should facilitate this community.

Stakeholder/s:	Local Community Members from Humai Settlement
Consultation:	Consultation with men
Date:	February 11, 2024
Time:	12 pm
Meeting venue:	Humai settlement
Attended by:	**Name** Wali Muhammad Ghulam Hussain Abdul Qadus Manzoor Ahmed Hasan Khan Hidayat Ullah Baksh Ahmed Taj Muhammad Fazal Kareem Muhammad Naeem Faiz Ullah Abdul Aziz Najeeb Ullah Khair Ullah
Conducted by:	▪ Essa Tahir (Community Investments Team Leader) ▪ Abdul Khaliq (Assistant Community Relations Officer)
Recorded by:	Abdul Khaliq
Language:	Balochi and Urdu
Preamble:	An awareness session was conducted to raise awareness on the project's early work planning. The session featured engaging slides and vivid pictures to provide detailed information on the topic. This included: ▪ The construction of new accommodation. ▪ The installation of a 250mm steel water pipeline from Baghicha to ensure water supply for project construction. ▪ Fencing around the future mining area.
Picture:	

	
Stakeholder concerns, issues and suggestions:	▪ The community was effectively and comprehensively briefed on the environmental consequences of the project., including: ▪ Expected noise levels on site, with assurance that it would not disrupt any nearby communities. ▪ Potential dust generation during earthworks, with minimal impact expected on both communities and the environment. ▪ Predicted moderate increase in traffic on main road and highway N-40 and only minor ecological disturbances due to ground disturbance activities. **Concerns and Suggestion:** ▪ The community of Humai village was grateful of the RDMC's efforts to educate them on the environmental impacts and studies associated with mining operations. They were surprised to see a mining company taking practical steps to engage with and inform the local population about these important issues. The community expressed their trust in RDMC's ability to conduct mining in a sustainable manner. Additionally, they praised RDMC for fulfilling their commitment to beneficial projects such as building a school and hospital in the village. However, the community is eagerly awaiting job opportunities to participate in the projects. Women in the community are particularly enthusiastic about the upcoming job openings and are keen to be a part of the RDMC project

Stakeholder/s:	Local Community Members from Kachau Settlement
Consultation:	Consultation with men
Date:	February 10, 2024
Time:	3 pm
Meeting venue:	Kachau settlement
Attended by:	**Name** Malik Dad Muhammad Ilyass Aman Ullah Shafi Muhammad Ghaus Baksh
Conducted by:	▪ Essa Tahir (Community Investments Team Leader) ▪ Abdul Khaliq (Assistant Community Relations Officer)
Recorded by:	Abdul Khaliq
Language:	Balochi and Urdu
Preamble:	An awareness session was conducted to raise awareness on the project's early work planning. The session featured engaging slides and vivid pictures to provide detailed information on the topic. This included: ▪ The construction of new accommodation. ▪ The installation of a 250mm steel water pipeline from Baghicha to ensure water supply for project construction. ▪ Fencing around the future mining area.
Picture:	

	
Stakeholder concerns, issues and suggestions:	▪ The community was effectively and comprehensively briefed on the environmental consequences of the project., including: ▪ Expected noise levels on site, with assurance that it would not disrupt any nearby communities. ▪ Potential dust generation during earthworks, with minimal impact expected on both communities and the environment. ▪ Predicted moderate increase in traffic on main road and highway N-40 and only minor ecological disturbances due to ground disturbance activities. **Concerns and Suggestion:** ▪ The community greatly admired the RDMC's innovative approach of educating them about the environmental effects of their operations. It was a refreshing change for them to see a mining company taking such practical steps to engage with and inform the local population about the environmental impacts of the projects. ▪ The community also deeply appreciated the RDMC's commitment to long-term beneficial projects such as building schools and hospitals in nearby communities. However, there was a strong call for the company to introduce a monthly stipend program at least specifically for women. ▪ There was also a growing expectation for the company to implement a special stipend program for individuals with unique challenges, such as the two dwarf members in the community, or for women over the age of 60. ▪ Women in the community were enthusiastic about the idea of a skill-learning program that could provide them with a source of income. ▪ The community has been experiencing significant soil erosion because of frequent floods, leading to concerns about the long-term impact on the local landscape and infrastructure. In response to this pressing issue, residents have put forth a request for the development of a comprehensive flood protection plan. ▪ This plan would not only address the immediate threat of erosion caused by flooding but also aim to protect the community from future disasters. ▪ It was heartening to learn that two young boys from the village were in their final year of studies in mining in Quetta, and the community eagerly anticipated their return upon completion of their studies.

Stakeholder/s:	Local Community Members from Nok Kundi Town
Consultation:	Consultation with men
Date:	February 19, 2024
Time:	12:30 pm
Meeting venue:	RDMC Nok Kundi Office
Attended by:	**Name** / **Occupation** / **Contact** Jehangeer Khan / Teacher / 0333-3307989 Mobeen Khan / Student / 0347-2670877 Ghulam Nabi / Youth Activist / 0334-3062582 Israr Ahmed / Youth Activist / 0336-8802843 Asghar Ali / Youth Activist / 0333-3369415 Safeer Ahmed / Youth Activist / 0333-3369415 Asmat Ullah / Youth Activist / 0333-3329397 Zahid Ali / Youth Activist / 0333-8354459 Ali Ahmed / UC Councilor / 0333-3556081 Fareed Ahmed / Sportsman / 0319-1399409 Abdul Baqi / Semi Govt Employee / 0333-3397345 Mohammad Zaki / Sportsman / 0332-7839870 Gul Ahmed / Sportsman / 0333-1251533 Zubair Ahmed / Sportsman / 0334-7039782 Abdul Mannan / Sportsman / 0332-8816313 Gul Hassan / Sportsman / 0336-4741155 Mehboob Ali / Sportsman / 0333-7446905 Naseeb Ullah / CDC Member / 0334-2465194
Conducted by:	• Hafeez Ullah (RDMC Community Investment Specialist)
Recorded by:	Hafeez Ullah
Language:	Balochi
Preamble:	The meeting started with an introduction between the RDMC representative and the community. Following this, they were briefed about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, the participants were encouraged to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.

Picture:	
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. **Concerns:** ▪ The community had concerns about the number of people who would be trained at the Training Centre and whether there will be a quota system for the nearby communities; they were informed that at present no such decision has been made and they will be informed accordingly once the Training Centre opens for admissions. ▪ They had concerns about the environmental impacts about the Project; they were informed that the expected impacts have been identified in the ESIA and RDMC has committed to mitigate these impacts as much as possible. They were also informed that the impacts on the communities are expected to be minimal and that all RDMC employees will be trained to deal with environmental and social impacts. ▪ They had concerns about the increase in traffic, however they were informed that a Traffic Management Plan has been made by RDMC to mitigate the impact of increase in traffic. ▪ **Suggestions:** ▪ They suggested that locals from Nok Kundi should be prioritized by RDMC for jobs; they were informed that preference will be given to nearby community members depending on their qualifications once construction work begins. ▪ **Proposed CSR Initiatives:** ▪ They requested that the Futsal Stadium in Nok Kundi should be upgraded as there are several community members interested in the sport.

Stakeholder/s:	Local Community Members from Dalbandin House
Consultation:	Consultation with men
Date:	February 20, 2024
Time:	12 pm
Meeting venue:	Circuit House Dalbandin
Attended by:	**Name** / ***Occupation*** / ***Contact***
	Asfand Yar Khan — District Vice Chairman — 0332-7950158
	Haji Abdul Bari — Political Party Representative — 03328065585
	Zahoor Ahmed — Sportsman — 03338320045
	Sadiq Majeed — Govt Employee — 0333-7919325
	Mohammad Asif — Govt Employee — N/A
	Mohammad Hashim — Unemployed — N/A
	Raza Mohammad — Social Activist — N/A
	Abdul Wahid — District Sports Coach — 0332-7894842
	Zafar Ahmed — Govt Employee — N/A
	Haji Abdul Sattar — Media Personnel — 0334-2483208
	Faiz Ullah — Teacher — N/A
	Ali Ahmed Mengal — Media Reporter — 0332-7950211
	Ali Dost — Teacher — N/A
	Malik Saad Ullah — Notable — N/A
	Altaf Hussain — General Secretary Futsal Association Chagai — 0342-8024044
Conducted by:	• Hafeez Ullah (RDMC Community Investment Specialist)
Recorded by:	Hafeez Ullah
Language:	Balochi
Preamble:	The meeting started with an introduction between the RDMC representative and the community. Following this, they were briefed about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, the participants were encouraged to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.

Picture:	
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. ▪ **Concerns:** ▪ The community does not have a fully equipped hospital which causes problems in emergency cases as patients have to travel to Quetta to access medical care. ▪ There are no sports facilities in Dalbandin. **Suggestions:** ▪ They suggested that stakeholder consultations should also be held with notables in the community as they carry the influence on impact decision making. ▪ There should be a criterion for becoming a member of the CDC – notables should be included in this as well. ▪ They said that it was good that RDMC has given education scholarships, however, according to them none of these have been given to Baloch students and hence, Baloch students should be prioritized. ▪ They want RDMC to prioritize locals from Dalbandin for jobs in the upcoming Project activities. **Proposed CSR Initiatives:** ▪ They suggested that capacity building initiatives for local teachers should be undertaken in the district of Chagai. ▪ They also requested that the sports facilities in Dalbandin should be upgraded such as the cricket stadium and Football ground. ▪ They also requested that a Futsal team should be made which should be sponsored by RDMC and which can represent the district at the national level. ▪ They suggested that a Trauma Center should be constructed in Dalbandin as the local DHQ does not have the necessary facilities and patients have to travel to Quetta, which is too far. Such Trauma Centers should also be made in Taftan and Nok Kundi.

R.3. Community Consultation Logs (Women)

Stakeholder/s:	Local community residents from Humai Settlement		
Consultation:	Consultation with women		
Date:	September 16, 2022		
Time:	11:00 am		
Meeting venue:	Humai Settlement at Malik Taj Muhammad House		
Attended by:	*Name*	*Occupation*	*Mobile*
	Sabz Pari	Housewife	NA
	Zeenat	Housewife	NA
	Amna	Housewife	NA
	Gull Bibi	Housewife	NA
	Zarina	Housewife	NA
	Hajira	Housewife	NA
	Gull Bahar	Housewife	NA
	Mariyam	Housewife	NA
	Naseema	Housewife	NA
	Amna	Housewife	NA
	Garan Jan	Housewife	NA
Conducted by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Recorded by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Language:	Balochi		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). HBP shared details of the Project, its components, and activities including the Early Works activities and encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:	Not allowed		
Stakeholder views, concerns, and suggestions:	**Concerns:** ▪ Nonfunctional school in the settlement. ▪ Nonfunctional health facility, resulting in women with maternal issues having to travel to Nok Kundi or Dalbandin. ▪ Absence of a grocery shop, requiring men to travel 70 km to Nok Kundi. ▪ Limited storage for fruits and vegetables due to the lack of electricity from the government or the Project. ▪ Issues with safe drinking water, including brackish water and a nonfunctional RO plant installed by NRL. ▪ Women not permitted to work outside the home. ▪ Women engaged in handicraft work limited to family needs. ▪ Request for the functionalization of the RO plant for safe drinking water.		

	▪ Need for a committee to support widows in managing financial matters for their children. ▪ Demand for a female teacher for the children in the settlement. ▪ Call for skill development programs to enhance job opportunities for men. ▪ Urgency for a functional health facility and the development of road networks and public utilities **Proposed CSR Initiative:** ▪ Support the functionalization of the school and provide resources for a female teacher. ▪ Initiate skill development programs for men to enhance employment opportunities. ▪ Revive or establish a functional health facility in the settlement. ▪ Repair or replace the nonfunctional RO plant to address water quality issues. ▪ Facilitate initiatives to empower women economically, encouraging work opportunities. ▪ Establish a committee to support widows in managing financial matters. ▪ Advocate for the development of road networks and ensure access to electricity and cellular services. **Gender-Specific Concerns:** ▪ Limited economic opportunities for women due to restrictions on work outside the home. ▪ The need for a female teacher and initiatives to empower women economically. **Recommendations:** ▪ Provide resources for the functionalization of the school and the appointment of a female teacher. ▪ Implement skill development programs for men to enhance employment opportunities. ▪ Establish or revive a functional health facility within the settlement. ▪ Repair or replace the nonfunctional RO plant to ensure safe drinking water. ▪ Facilitate initiatives to empower women economically, encouraging work opportunities. ▪ Establish a committee to support widows in managing financial matters. ▪ Advocate for the development of road networks and ensure access to electricity and cellular services.

Stakeholder/s:	Local community residents from Nok Chah Settlement		
Consultation:	Consultation with women		
Date:	September 14, 2022		
Time:	2:00 pm		
Meeting venue:	Nok Chah Settlement at Abdul Salam House		
Attended by:	*Name*	*Occupation*	*Mobile*
	Gunj Khatoon	Housewife	+92 334 0257503
	Saira	Housewife	+92 332 2393937
	Shaista	Housewife	+92 335 4327122
	Sahib Khatoon	Housewife	NA
	Fareeda	Housewife	+92 335 3908895
	Naik Bakht	Housewife	+92 336 0348576
	Zarr Gull	Housewife	+92 335 0219559
	Nazia	Housewife	+92 347 3828988
	Rahima	Housewife	+92 332 2131672
	Ruqia	Housewife	+92 336 8300991
Conducted by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Recorded by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Language:	Balochi		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). HBP shared details of the Project, its components, and activities including the Early Works activities and encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:	Not allowed		
Stakeholder views, concerns, and suggestions:	**Concerns:** ▪ Absence of a school for boys and girls in the settlement. ▪ Lack of health facilities, particularly impacting women with maternal and related issues. ▪ Drinking water issues due to brackish water. ▪ Women not permitted to work outside the home, engaging only in handicraft work for family needs. ▪ Concerns about children being addicted to various drugs. ▪ Request for the installation of an RO plant for safe drinking water. ▪ Urgent need for school and health facilities, as well as road networks and other public utilities. **Proposed CSR Initiative:** ▪ Establish a school for boys and girls in the settlement.		

	▪ Introduce health facilities to address maternal and related issues. ▪ Install an RO plant to ensure a safe and reliable drinking water source. ▪ Promote initiatives to empower women economically and socially. ▪ Implement programs to address drug addiction among children. ▪ Advocate for the development of road networks and other essential public utilities. **Gender-Specific Concerns:** ▪ Limited opportunities for women due to restrictions on work outside the home **Recommendations:** ▪ Establish a school for both boys and girls. ▪ Introduce health facilities to cater to maternal and related health needs. ▪ Install an RO plant to ensure access to safe drinking water. ▪ Implement initiatives to empower women economically and socially. ▪ Develop programs to address and prevent drug addiction among children. ▪ Advocate for the development of road networks and other essential public utilities.

Stakeholder/s:	Local community residents from Mashki Chah Settlement		
Consultation:	Consultation with women		
Date:	September 14, 2022		
Time:	10:00 am		
Meeting venue:	Mashki Chah Settlement at Abdul Salam House		
Attended by:	*Name*	*Occupation*	*Contact*
	Shazia	Housewife	+92 333 347340
	Dar Khatoon	Housewife	NA
	Saleema	Housewife	+92 336 0350829
	Sidra	Housewife	+92 335 2921075
	Baseera	Housewife	+92 336 0349148
	Farida	Housewife	+92 336 8184039
	Murad Bibi	Housewife	+92 334 2633736
	Haseena	Housewife	+92 333 3547625
	Asma	Housewife	+92 336 3083520
	Sadia	Housewife	+92 331 8321058
	Ruqia	Housewife	NA
Conducted by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Recorded by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Language:	Balochi		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). HBP shared details of the Project, its components, and activities including the Early Works activities and encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:	Not allowed		
Stakeholder views, concerns, and suggestions:	**Concerns:** ▪ Sole operation of only one school for both boys and girls in the settlement. ▪ Women facing restrictions on going outside for work, engaging only in handicraft work for family needs. ▪ Lack of a health facility in the settlement, impacting women with maternal and other health-related issues. ▪ Presence of brackish water causing stomach problems in the community. **Proposed CSR Initiative:** ▪ Support the existing school and consider upgrading it to a high school for children's education. ▪ Initiate skill development programs for both youth and adults to enhance employment opportunities.		

	▪ Promote initiatives to empower women economically and socially, enabling them to work outside the home. ▪ Establish a health facility within the settlement to address maternal and health-related issues. ▪ Install a RO plant to provide access to safe drinking water. ▪ Advocate for the development of road networks for better transportation. **Gender-Specific Concerns:** ▪ Restricted opportunities for women to work outside the home. **Recommendations:** ▪ Enhance support for the existing school and explore the possibility of upgrading it to a high school. ▪ Introduce skill development programs for women to empower them economically. ▪ Promote initiatives that allow women to work outside the home and contribute to the family income. ▪ Establish a health facility to address maternal and other health-related issues. ▪ Install a RO plant to ensure access to safe drinking water. ▪ Advocate for the development of road networks for improved transportation.

Stakeholder/s:	Local community residents from Darband Chah Settlement		
Consultation:	Consultation with women		
Date:	September 15, 2022		
Time:	11:00 am		
Meeting venue:	Darband Chah Settlement at Malik Mehmood House		
Attended by:	*Name*	*Occupation*	*Mobile*
	Murad Jan	Housewife	NA
	Gull Bibi	Housewife	NA
	Zaar Jan	Housewife	NA
	Ghul Bibi	Housewife	NA
	Gull Begum	Housewife	NA
	Zaar Bano	Housewife	NA
	Farzana	Housewife	NA
	Hameeda	Housewife	NA
	Sultana	Housewife	NA
Conducted by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Recorded by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Language:	Balochi		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). HBP shared details of the Project, its components, and activities including the Early Works activities and encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:	Not allowed		
Stakeholder views, concerns, and suggestions:	**Concern:** ▪ Lack of community benefits, including schools, hospitals, and infrastructure, from TCC (presumably a company or organization). ▪ Absence of a health facility in the settlement, impacting women with maternal and related health issues. ▪ Drinking water issues, with brackish water causing kidney and stomach problems, particularly in women. ▪ Limited opportunities for women to work outside the home, with a few allowed to work near the mining site for stone packing. **Proposed CSR Initiative:** ▪ Engage with TCC or other relevant organizations to ensure community benefits, including schools and hospitals. ▪ Install an RO plant for safe drinking water. ▪ Establish a water supply network for doorstep delivery.		

	▪ Expand opportunities for women to work outside the home, promoting economic empowerment. ▪ Support women in enhancing their handicraft work for wider economic impact. ▪ Establish a higher secondary school with female teachers for better educational opportunities. ▪ Initiate skill development programs for both youth and adults. ▪ Upgrade the health facility to meet the community's health needs. ▪ Advocate for the development of road networks and other essential public utilities. **Gender-Specific Concerns:** ▪ Limited opportunities for women to work outside the home. **Recommendations:** ▪ Engage with TCC or relevant entities to ensure community benefits, including schools and hospitals. ▪ Install an RO plant and establish a water supply network for safe and accessible drinking water. ▪ Promote economic empowerment by expanding opportunities for women to work outside the home. ▪ Establish a higher secondary school with female teachers for improved education. ▪ Initiate skill development programs to enhance job opportunities. ▪ Upgrade the health facility to meet the community's health needs. ▪ Advocate for the development of road networks and other essential public utilities.

Stakeholder/s:	Local community residents from Amalaf Settlement		
Consultation:	Consultation with women		
Date:	September 17, 2022		
Time:	10:50 am		
Meeting venue:	Amalaf Settlement at Shah Mureed House		
Attended by:	*Name*	*Occupation*	*Mobile*
	Gull Bibi	Housewife	+92 335 1124154
	Nazia Bibi	Housewife	+92 331 7524816
	Noor Jan	Housewife	+92 348 0635647
	Shahida	Housewife	+92 331 0290086
	Mah Jan	Housewife	+92 332 3040353
	Sanobar	Housewife	+92 332 7807888
	Gul Misa	Housewife	+92 336 8019637
	Noor Malik	Housewife	+92 331 8321883
	Saleema	Housewife	+92 332 3956320
	Zaitoon	Housewife	+90 330 1295374
	Noor Bakht	Housewife	
Conducted by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Recorded by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Language:	Balochi		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). HBP shared details of the Project, its components, and activities including the Early Works activities and encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:	Not allowed		
Stakeholder views, concerns, and suggestions:	**Concerns**: ▪ Low wages for the labor class resulting in some locals having to take debts. ▪ Limited facilities in the functional health facility; reliance on Nok Kundi or Dalbandin for serious health issues. ▪ Air pollution from the Saindak Project contributing to increased lung diseases. ▪ Despite water tankers from the Saindak Project, safe drinking water remains an issue due to brackish water. ▪ Restricted opportunities for women to work outside, with only a few employed in the Saindak Project. ▪ Limited involvement of women in income-generating activities, primarily focused on handicrafts. ▪ Lack of a committee for widows to handle financial matters and care for their children.		

	Proposed CSR Initiative: ▪ Implement initiatives to improve wages for the labor class. ▪ Introduce programs to alleviate debt burdens on locals. ▪ Upgrade facilities in the local health center for comprehensive healthcare. ▪ Conduct awareness programs on health issues, especially related to air pollution. ▪ Invest in water quality improvement projects to provide safe drinking water. ▪ Collaborate with local authorities to address brackish water issues. ▪ Establish skill development programs for both women and men to enhance job opportunities. ▪ Promote women's participation in income-generating activities beyond handicrafts. ▪ Form a committee to support widows in handling financial matters and caring for their children. ▪ Advocate for the development of road networks and other public utilities. **Gender-Specific Concerns:** ▪ Limited opportunities for women to work outside their homes. ▪ Limited involvement of women in income-generating activities. **Recommendations:** ▪ Implement measures to improve wages and reduce debt burdens. ▪ Facilitate programs that empower widows to manage their financial affairs. ▪ Conduct health awareness programs, especially focusing on the impact of air pollution. ▪ Upgrade local health facilities to provide comprehensive healthcare services. ▪ Initiate projects to improve the quality of drinking water. ▪ Collaborate with local authorities to address brackish water issues. ▪ Introduce skill development programs for both women and men to enhance job opportunities. ▪ Encourage women to diversify their income-generating activities. ▪ Advocate for the development of road networks and other essential public utilities.

Stakeholder/s:	Local community residents from Kachau Settlement		
Consultation:	Consultation with women		
Date:	September 18, 2022		
Time:	4:00 pm		
Meeting venue:	Kachau Settlement		
Attended by:	*Name*	*Occupation*	*Mobile*
	Bagam	Housewife	NA
	Bibi Rashda	Housewife	NA
	Farishta	Housewife	NA
	Gull Bibi	Housewife	NA
	Aziz Bakht	Housewife	NA
	Gull Pari	Housewife	NA
	Noor Bibi	Housewife	NA
	Samina	Housewife	NA
	Pari Naz	Housewife	NA
	Jan Bibi	Housewife	NA
Conducted by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Recorded by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Language:	Balochi		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). HBP shared details of the Project, its components, and activities including the Early Works activities and encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Stakeholder views, concerns, and suggestions:	**Concerns:** ▪ Only one school for boys and girls operated by Saindak project, located far away from the settlement. ▪ Lack of health facilities, requiring women with maternal issues to travel to Nok kundi or Dalbandin. ▪ Brackish drinking water causing kidney stones and stomach issues. ▪ Closure of operations by Islamic Relief (INGO) that previously provided solar systems. ▪ Air pollution from the Saindak project leading to respiratory issues for some locals. ▪ Restriction on women going outside for work, limiting them to household handicrafts. **Proposed CSR Initiative:** ▪ Establish schools and health facilities in or near the settlement. ▪ Provide a qualified lady doctor for women's health. ▪ Install a Reverse Osmosis (RO) plant for safe drinking water.		

	▪ Reinitiate INGO support or engage with others for community development. ▪ Provide vocational training, especially in handicraft sewing, for women. ▪ Develop road networks and essential public utilities. **Gender-Specific Concerns:** ▪ Women restricted to household handicraft work, limited opportunities for external employment. ▪ Advocacy for the installation of an RO plant for safe drinking water. **Recommendations:** ▪ Establish schools and health facilities within or near the settlement. ▪ Ensure access to a qualified lady doctor for women's health needs. ▪ Implement a project for the installation of an RO plant to improve drinking water quality. ▪ Explore opportunities for collaboration with NGOs or INGOs to support community development. ▪ Provide vocational training programs, with a focus on handicraft sewing, for women. ▪ Advocate for the development of road networks and essential public utilities.

Stakeholder/s:	Local community residents from Saindak Settlement		
Consultation:	Consultation with women		
Date:	September 17, 2022		
Time:	02:56 pm		
Meeting venue:	Saindak Settlement at Haji Qadir House		
Attended by:	*Name*	*Occupation*	*Mobile*
	Nagar	Housewife	NA
	Shakila	Housewife	NA
	Gull Jamal	Housewife	NA
	Lal Bibi	Housewife	NA
	Zubaida	Housewife	NA
	Gul Esra	Housewife	NA
	Sabira	Housewife	NA
	Amna	Housewife	NA
	Asiya	Housewife	NA
Conducted by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Recorded by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Language:	Balochi		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). HBP shared details of the Project, its components, and activities including the Early Works activities and encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Stakeholder views, concerns, and suggestions:	**Concerns:** ▪ Increasing air pollution from the Saindak Project leading to a rise in lung diseases. ▪ Limited facilities in the functional health facility, requiring travel to Nok Kundi or Dalbandin for serious issues. ▪ Absence of a school in the village. ▪ Low wages for the labor class at the Saindak Project. ▪ Lack of grocery shops in the area. ▪ Brackish water remains an issue, causing health problems for women. ▪ Women not allowed to work outside the home, limiting opportunities. ▪ Limited skills development opportunities for both men and women. ▪ Lack of road network in the area. **Proposed CSR Initiative:** ▪ Implement measures to control and reduce air pollution from the Saindak Project. ▪ Invest in technologies or practices to minimize environmental impact. ▪ Upgrade facilities in the local health center for comprehensive healthcare.		

	▪ Conduct awareness programs on health issues, especially related to air pollution. ▪ Establish a school in the village to improve access to education. ▪ Implement initiatives to improve wages for the labor class. ▪ Introduce programs to alleviate financial burdens on locals. ▪ Introduce grocery shops in the area for better access to daily necessities. ▪ Initiate skill development programs for both men and women. ▪ Invest in water quality improvement projects to provide safe drinking water. ▪ Collaborate with local authorities to address brackish water issues. ▪ Advocate for the empowerment of women, allowing them opportunities to work outside. ▪ Promote initiatives to expand women's roles beyond household handicrafts. ▪ Advocate for the development of road networks to improve connectivity. **Gender-Specific Concerns:** ▪ Women restricted to household handicraft work, limiting opportunities for external employment. ▪ Limited skills development opportunities for women. **Recommendations:** ▪ Collaborate with relevant authorities to monitor and address air pollution concerns. ▪ Invest in sustainable practices to minimize the environmental impact of the Saindak Project. ▪ Establish essential facilities like schools and grocery shops. ▪ Advocate for the development of road networks and other essential public utilities. ▪ Initiate projects to improve the quality of drinking water. ▪ Collaborate with local authorities to address brackish water issues. ▪ Promote awareness and campaigns encouraging women's participation in decision-making. ▪ Establish training programs and initiatives to empower women economically. ▪ Advocate for the development of road networks and other essential public utilities.

Stakeholder/s:	Local community residents from Dalbandin Town		
Consultation:	Consultation with women		
Date:	September 26, 2022		
Time:	6:00 pm		
Meeting venue:	House in Dalbandin Town		
Attended by:	*Name*	*Occupation*	*Mobile*
	Sara	Housewife	NA
	Parveen	Housewife	NA
	Dar Gull	Housewife	+92 332 7973830
	Naila	Housewife	NA
	Maria	Housewife	NA
	Zaar Jan	Housewife	+92 333 2064468
	Saima	Housewife	NA
Conducted by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Recorded by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Language:	Balochi		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). HBP shared details of the Project, its components, and activities including the Early Works activities and encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Stakeholder views, concerns, and suggestions:	**Concerns:** ▪ Poor education system leading to even educated individuals having to engage in labor work. ▪ Adequate water supply system but poor water quality. ▪ Limited access to affordable healthcare, with a few private lady doctors. ▪ Increasing prevalence of stomach, hepatitis, and kidney diseases in women. ▪ Lack of opportunities for women in livelihood or income-generating activities. ▪ Limited women in professions such as LHVs and teachers. **Proposed CSR Initiative:** ▪ Implement educational reforms to improve the quality of the education system. ▪ Introduce vocational training programs, especially in handicrafts, for women empowerment. ▪ Collaborate with NGOs and the Project to provide comprehensive healthcare services. ▪ Establish affordable healthcare initiatives, particularly for women. ▪ Create income-generating opportunities for women. ▪ Support initiatives that empower women in various professions. **Gender-Specific Concerns:** ▪ Need for a qualified team of lady doctors for maternity and women-related health issues.		

	▪ Limited opportunities for women's livelihood or income generation. **Recommendations:** ▪ Recruit qualified lady doctors to address women's health issues. ▪ Encourage the active participation of women in income-generating activities. ▪ Advocate for reforms to enhance the education system's quality. ▪ Promote initiatives to prevent educated individuals from resorting to labor work. ▪ Prioritize local youth employment based on qualifications and skills. ▪ Advocate for the provision of a school bus system for improved educational access.

Stakeholder/s:	Local community residents from Nok Kundi Town		
Consultation:	Consultation with women		
Date:	September 28, 2022		
Time:	4:00 pm		
Meeting venue:	House in Nok Kundi Town		
Attended by:	*Name*	*Occupation*	*Mobile*
	Khair ul Banat Bibi	Housewife	+92 332 2855163
	Shah Gull Rehan Bibi	Housewife	NA
	Shakina Bibi	Housewife	NA
	Zarmak Gul Bibi	Housewife	NA
	Malok Khatoon Bibi	Housewife	NA
	Zaar Naz Begum	Housewife	NA
	Mehnaz Bibi	Housewife	NA
Conducted by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Recorded by:	• Ms. Sabira Khan (HBP Representative) • Ms. Shaheena Shah (HBP Representative)		
Language:	Balochi		
Preamble:	The meeting started with an introduction between the HBP representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations and provided information about the proposed development and the Client (RDMC). HBP shared details of the Project, its components, and activities including the Early Works activities and encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:	Not allowed		
Stakeholder views, concerns, and suggestions:	**Concerns:** ▪ Non-operational school for both boys and girls in the settlement. ▪ Dependency on solar systems due to the unavailability and high cost of electricity from WAPDA. ▪ Increasing poverty due to a decline in border trade. ▪ Lack of health facilities, leading to maternal health issues and high mortality during travel for critical cases. ▪ Brackish drinking water causing kidney stones and stomach issues. ▪ Rise in common childhood illnesses like diarrhea and appendix diseases. ▪ Restrictions on women going outside for work, limiting them to household handicrafts. ▪ Lack of safe drinking water, prompting a suggestion for an RO plant. ▪ Insufficient infrastructure, including schools, health facilities, road networks, and public utilities. **Proposed CSR Initiative:** ▪ Rehabilitation of the non-operational school and provision of adequate educational facilities. ▪ Development of road networks and other essential public utilities.		

	▪ Establishment of health facilities, including the recruitment of a qualified lady doctor. ▪ Installation of an RO plant to provide safe drinking water. ▪ Implementation of vocational training programs, especially in handicrafts, for women. ▪ Conducting awareness sessions on kitchen gardening to empower the community. **Gender-Specific Concerns:** ▪ Restriction on women's mobility and employment opportunities. ▪ Women limited to household handicraft work. **Recommendations:** ▪ Immediate attention to the operational status of the school. ▪ Provision of accessible health facilities, particularly for maternal health. ▪ Implementation of an RO plant for improved water quality. ▪ Conducting awareness sessions on common health issues, especially for children. ▪ Encouraging women's participation in vocational training for skill development. ▪ Advocating for opportunities for women to work outside their homes. ▪ Collaboration with the community for the installation of the suggested RO plant. ▪ Conducting awareness sessions on kitchen gardening to enhance self-sustainability.

R.4. Second Round of Community Consultation Logs (Women)

Stakeholder/s:	Local Community Members from Humai Settlement
Consultation:	Consultation with women
Date:	February 15, 2024
Time:	12 pm
Meeting venue:	Graam Bibi's House
Attended by:	**Name** / **Occupation** / **Contact** Shah Pari – Housewife – - Zarina – Housewife – - Gulbar – Housewife – - Ur Bibi – Housewife – - Maryam – Housewife – - Pari – Housewife – - Noor Jamal – Housewife – - Amina – Housewife – - Graam Bibi – Housewife – - Shahnaz – Housewife – - Gulbahar – Housewife – -
Conducted by:	• Aamna Abid (HBP Representative) • Gul Bano (HBP Representative) • Sania Hasan (RDMC CRO) • Sadia Bibi (RDMC CRO)
Recorded by:	Aamna Abid
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. ▪ The primary school constructed by RDMC was fully functional and has two teachers which was competent according to the community's women. **Concerns:** ▪ Medical center made by RDMC was also functional; however, all the women informed the team that medicines was not available, and the doctors present there give fever medicines for every illness. ▪ They said that RMDC funds the center, but even then, medicine was not available. ▪ They also had concerns about female-centric medical care and aid not being available at the medical center. **Suggestions:** ▪ They suggested that an ultrasound machine should be installed, and a gynecologist should be present at the medical center as women have to travel to Saindak, Taftan and Nok Kundi which are too far - they reported cases of pregnant women dying on the way.

	▪ They also added the doctors to provide them with medicines relevant to their illness. ▪ They also requested that medicines should be available at the center. **Proposed CSR Initiatives:** ▪ They requested that a training center should be made near the community, which should provide different courses for women as well. ▪ They suggested that the roads leading up to the community be paved or their condition improved.

Stakeholder/s:	Local Community Members from Darband Chah Settlement
Consultation:	Consultation with women
Date:	February 16, 2024
Time:	11:30 am
Meeting venue:	Ayesha's House
Attended by:	**Name** — ***Occupation*** — ***Contact*** Ayesha — Housewife — - Saleema — Housewife — - Dur Bibi — Housewife — - Shah Pari — Housewife — - Fareeda — Housewife — - Dur Khatoon — Housewife — - Fatima — Housewife — - Nazi Gul — CDC Member[1] — - Buzirg — Housewife — - Khadija — Housewife — - Zareena — Housewife — - Jamaiti — Housewife — - Gul Beda — Housewife — - Kalam Bibi — Housewife — - Abida — Housewife — - Madari — Housewife — - Gul Naz — Housewife — - Gul Seema — Housewife — - Noor Khatoon — Housewife — - Sangeen — Housewife — - Shehnaz — Housewife — - Qamar Gul
Conducted by:	• Aamna Abid (HBP Representative) • Gul Bano (HBP Representative) • Sania Hasan (RDMC CRO) • Sadia Bibi (RDMC CRO)
Recorded by:	Aamna Abid
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. ▪ The primary school constructed by RDMC was fully functional and the community was satisfied with it.

[1] RDMC Community Development Centre

	▪ **Concerns:** ▪ The community did not have a medical center or hospital close to it which causes problems in emergency cases and especially for women during pregnancy as they have to travel to Quetta and Taftan to access medical care; roads was not suitable for patients to travel as well. ▪ The training center being proposed by RDMC is too far for the community. ▪ The roads leading to the community were not suitable for travel. ▪ The CDC member was not being paid anything: this concern was not raised by the member, but the CRO informed the HBP team that this has been raised before and has not been resolved **Suggestions:** ▪ They wanted RDMC to prioritize their male family members for jobs in the upcoming Project activities. **Proposed CSR Initiatives:** ▪ They suggested that a medical center, which can cater to emergency and gynecology cases, be constructed for the community. ▪ They requested that a training center should be made near the community, which should provide different courses for women as well which should also include nursing courses. ▪ They suggested that the roads leading up to the community be paved or their condition improved.

Stakeholder/s:	Local Community Members from Nok Chah Settlement
Consultation:	Consultation with women
Date:	February 16, 2024
Time:	2 pm
Meeting venue:	Farida's House
Attended by:	▪ **Name** ▪ **Occupation** ▪ **Contact** Farida – Housewife – - Sara – Housewife – - Saib Khatoon – Housewife – - Arifa – Housewife – - Mahgul – Housewife – - Zargul – Housewife – - Shehzadi – Housewife – - Waeden – Housewife – - Naik Bakht – Housewife – -
Conducted by:	• Aamna Abid (HBP Representative) • Gul Bano (HBP Representative) • Sania Hasan (RDMC CRO) • Sadia Bibi (RDMC CRO)
Recorded by:	Aamna Abid
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. **Concerns:** ▪ They suggested that they have not benefitted much from the Project in comparison to other communities such as Humai. ▪ No school or medical center has been built as was committed by RDMC and a RO plant has also not been built. ▪ Map of an intended medical Center has been installed but no progress has been made. ▪ The community did not have a medical center or hospital close to it which causes problems in emergency cases and especially for women during pregnancy as they have to travel to Quetta and Taftan to access medical care; roads were not suitable for patients to travel as well. ▪ Their male family members have also not been given any jobs by RDMC – they could have been employed as drivers as some have licenses. ▪ The training center being proposed by RDMC is too far for the community to travel to ▪ A government teacher has been assigned by the provincial govt for the community, however, he has not shown up for 2 months. **Suggestions:**

	▪ They suggested that a joint community centre should be made for Humai, Nok Chah, Mashki Chah and Darband Chah **Proposed CSR Activities:** ▪ A primary school and medical center should be built near the community. ▪ A RO plant should also be installed. ▪ They wanted RDMC to prioritize their male family members for jobs in the upcoming Project activities. ▪ They suggested that a medical center, which can cater to emergency and gynecology cases, be constructed for the community. ▪ They requested that a training center should be made near the community, which should provide different courses for women as well

Stakeholder/s:	Local Community Members from Mashki Chah Settlement
Consultation:	Consultation with women
Date:	February 16, 2024
Time:	3 pm
Meeting venue:	Shazia's House
Attended by:	**Name** / ***Occupation*** / ***Contact*** Shazia – Housewife – - Basra – Housewife – - Taj Begum – Housewife – - Ruqqaiyah – Housewife – - Dur Khatoon – Housewife – - Sameena – Housewife – - Fareeda – Housewife – - Saleema – Housewife – - Izzat Khatoon – Housewife – -
Conducted by:	• Aamna Abid (HBP Representative) • Gul Bano (HBP Representative) • Sania Hasan (RDMC CRO) • Sadia Bibi (RDMC CRO)
Recorded by:	Aamna Abid
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. ▪ The primary school constructed by RDMC was fully functional and the community was satisfied with it. **Concerns** ▪ The community did not have access to clean drinking water, however the RDMC CRO informed the community that a RO plant is soon going to be installed in the community. ▪ The community did not have a medical center or hospital close to it which causes problems in emergency cases and especially for women during pregnancy as they have to travel to Quetta and Taftan to access medical care; roads are not suitable for patients to travel as well. ▪ The training center being proposed by RDMC is too far for the community to travel to ▪ Women also did not have much to do because of lack of opportunities and education in the community. ▪ The roads leading to the community were not suitable for travel. **Suggestions:** ▪ They want RDMC to prioritize their male family members for jobs in the upcoming Project activities. **Proposed CSR Initiatives:**

	▪ They suggested that a medical center, which can cater to emergency and gynecology cases, be constructed for the community. ▪ They requested that a training center should be made near the community, which should provide different courses for women as well. ▪ They suggested that the roads leading up to the community be paved or their condition improved.

Stakeholder/s:	Local Community Members from Amalaf Settlement
Consultation:	Consultation with women
Date:	February 17, 2024
Time:	12 pm
Meeting venue:	Habiba's House
Attended by:	**Name** / **Occupation** / **Contact** Habiba – Housewife – - Nur Jahan – Housewife – - Zaitoon – Housewife – - Sanober – Housewife – - Hania – Housewife – - Zeenat – Housewife – - Gul Bakht – Housewife – - Saleema – Housewife – - Noor Bibi – Housewife – -
Conducted by:	• Aamna Abid (HBP Representative) • Gul Bano (HBP Representative) • Sadia Bibi (RDMC CRO)
Recorded by:	Aamna Abid
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Picture:	Not Allowed
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. **Concerns** ▪ Saindak Mining Project has a fully equipped hospital; however, a lady female doctor was not available in the hospital which causes problems in emergency cases and especially for women during pregnancy as they have to travel to Quetta and Taftan to access medical care; roads were not suitable for patients to travel as well. ▪ A primary school was being run by the Saindak Mining Project, however, a secondary school and college is also needed by the community ▪ The training center being proposed by RDMC is too far for the community to travel to **Suggestions:** ▪ They want RDMC to prioritize their male family members for jobs in the upcoming Project activities as only 2 community members are currently employed at the Project and the area lacks employment opportunities otherwise. **Proposed CSR Initiatives:** ▪ They suggested that a medical center, which can cater to emergency and gynecology cases, be constructed for the community. ▪ They suggested that a middle and higher-secondary school be provided for them. They requested that a training center should be made near the community, which should provide different courses for women as well, such as sewing and nursing.

	▪ They requested that the company do something about the poor network coverage in the area.

Stakeholder/s:	Local Community Members from Saindak Settlement
Consultation:	Consultation with women
Date:	February 17, 2024
Time:	2 pm
Meeting venue:	Khadija's House
Attended by:	**Name** / ***Occupation*** / ***Contact*** Khadija – Housewife – - Saba – Housewife – - Zubiya – Housewife – - Keemiya – Housewife – - Muniba – Housewife – - Bibi Buzurg – Housewife – - Jannat Khatoon – Housewife – -
Conducted by:	• Aamna Abid (HBP Representative) • Gul Bano (HBP Representative) • Sadia Bibi (RDMC CRO)
Recorded by:	Aamna Abid
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Picture:	Not Allowed
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. **Concerns** ▪ Saindak Mining Project has a fully equipped hospital; however, a lady female doctor was not available in the hospital which causes problems in emergency cases and especially for women during pregnancy as they have to travel to Quetta and Taftan to access medical care; roads were not suitable for patients to travel as well. ▪ A primary school was being run by the Saindak Mining Project, however, a secondary school and college is also needed by the community ▪ The training center being proposed by RDMC is too far for the community to travel to **Suggestions:** ▪ They wanted Project to prioritize their male family members for jobs in the upcoming Project activities. ▪ They also suggested RDMC to prioritize the Saindak community for their CSR activities and other planned activities. **Proposed CSR Initiatives:** ▪ They suggested that a medical center, which can cater to emergency and gynecology cases, be constructed for the community. ▪ They suggested that a middle and higher-secondary school be provided for them. They requested that a training center should be made near the community, which should provide different courses for women as well, such as sewing and nursing. ▪ They requested that the company do something about the poor network coverage in the area.

Stakeholder/s:	Local Community Members from Kachau Settlement
Consultation:	Consultation with women
Date:	February 18, 2024
Time:	1:45 pm
Meeting venue:	Murad Khatoon's House
Attended by:	**Name** — ***Occupation*** — ***Contact*** Murad Khatoon — Housewife — - Parinaz — Housewife — - Asma — Housewife — - Siddiqa — Housewife — - Farishta — Housewife — - Khan Bibi — Housewife — - Ruqqaiyyah — Housewife — - Maria — Housewife — - Summaiya — Housewife — - Safoora — Housewife — - Farzana — Housewife — - Zulekha — Housewife — - Noor Bibi — Housewife — - Rabbiya — Housewife — - Rubeena — Housewife — - Zainab — Housewife — - Jamal Khatoon — Housewife — - Shahlida — Housewife — - Sultan Pari — Housewife — - Fazeela — Housewife — - Majida — Housewife — - Nigar — Housewife — - Malzia — Housewife — - Husna — Housewife — - Sabira — Housewife — - Sara — Housewife — - Gul Pari — Housewife — - Iqra — Housewife — - Nazaneen — Housewife — - Shah Pari — Housewife — -
Conducted by:	• Aamna Abid (HBP Representative) • Sania Hasan (RDMC CRO)
Recorded by:	Aamna Abid
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed

	development and its activities. HBP also explained the positive impact of active participation in these meetings.
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. **Concerns:** ▪ They raised concerns about the water level as water will be extracted by the Project company; however, they were informed that the water extraction will not impact the water being used by them. ▪ There was no medical center or hospital close to the community, which causes problems in emergency cases and especially for women during pregnancy as they have to travel long distances to reach medical care; roads were not suitable for patients to travel as well. ▪ A primary school was being run by the Frontier Corps; however, a middle and higher-secondary school is also needed for the community. ▪ Most of the male family members did not have jobs and were idle at home; this also impacts the level of income of their families. **Suggestions:** ▪ They wanted RDMC to prioritize their male family members for jobs in the upcoming Project activities. **Proposed CSR Initiatives:** ▪ They suggested that a medical center, which can cater to emergency and gynecology cases, be constructed for the community. ▪ They suggested that a middle and higher-secondary school be provided for them. ▪ They requested that a training center should be made near the community, which should provide different courses for women as well.

Stakeholder/s:	Local Community Members from Humai Settlement
Consultation:	Consultation with women
Date:	February 11, 2024
Time:	12 pm
Meeting venue:	Humai settlement
Attended by:	**Name** — **Name** Amina — Shanaz Bibi Pari Bibi — Khan Bibi Bibi Gul — Zareena Mariam — Shazia Gul Badur — Gul Naseem Bibi Rubina — Dur Bibi Bibi Rubina — Gul Babar Noor Jamil — Dur Bibi Saeeda Bibi — Bibi Humaria Rubina — Zahra Bibi Sab Bibi — Bibi Garhar
Conducted by:	▪ Sania Hassan (Community Relations Officer) ▪ Tanzeel Khan (Environmental Officer)
Recorded by:	Tanzeel Khan
Language:	Balochi and Urdu
Preamble:	An awareness session was conducted to raise awareness on the project's early work planning. The session featured engaging slides and vivid pictures to provide detailed information on the topic. This included: ▪ The construction of new accommodation. ▪ The installation of a 250mm steel water pipeline from Baghicha to ensure water supply for project construction. ▪ Fencing around the future mining area.
Stakeholder concerns, issues and suggestions:	▪ The community was effectively and comprehensively briefed on the environmental consequences of the project., including: ▪ Expected noise levels on site, with assurance that it would not disrupt any nearby communities. ▪ Potential dust generation during earthworks, with minimal impact expected on both communities and the environment. ▪ Predicted moderate increase in traffic on main road and highway N-40 and only minor ecological disturbances due to ground disturbance activities. **Concerns and Suggestion:** The community of Humai village was grateful of the RDMC's efforts to educate them on the environmental impacts and studies associated with mining operations. They were surprised to see a mining company taking practical steps to engage with and inform the local population about these important issues. The community expressed their trust in RDMC's ability to conduct mining in a sustainable manner. Additionally, they praised RDMC for fulfilling their commitment to beneficial projects such as building a school and hospital in the village. However, the community is eagerly awaiting job opportunities to participate in the projects. Women in the community are particularly enthusiastic about the upcoming job openings and are keen to be a part of the RDMC project

Stakeholder/s:	Local Community Members from Kachau Settlement
Consultation:	Consultation with women
Date:	February 10, 2024
Time:	3 pm
Meeting venue:	Kachau settlement
Attended by:	**Name** / **Name** Gul Nisa / Sabz pari Bibi Hoor / Noor Jamal Zahra / Mah Pari Gul Jamal / Hajira Shamsatoon / Sultan Baksh Mehnaz / Jamtoon Buzarg / Fatima Sara / Bibi Safia Fazila / Bibi Naseema Gulzar / Gul Bakt Parigul / Bibi Masooma Nazanin / Sanober Shakeela / Gulson Nazeela / Maryum Sonia / Marwa Gul Pari / Maryum Bibi Haseena / Asis Meena
Conducted by:	▪ Sania Hassan (Community Relations Officer) ▪ Tanzeel Khan (Environmental Officer)
Recorded by:	Tanzeel Khan
Language:	Balochi and Urdu
Preamble:	An awareness session was conducted to raise awareness on the project's early work planning. The session featured engaging slides and vivid pictures to provide detailed information on the topic. This included: ▪ The construction of new accommodation. ▪ The installation of a 250mm steel water pipeline from Baghicha to ensure water supply for project construction. ▪ Fencing around the future mining area.
Stakeholder concerns, issues and suggestions:	▪ The community was effectively and comprehensively briefed on the environmental consequences of the project., including: ▪ Expected noise levels on site, with assurance that it would not disrupt any nearby communities. ▪ Potential dust generation during earthworks, with minimal impact expected on both communities and the environment. ▪ Predicted moderate increase in traffic on main road and highway N-40 and only minor ecological disturbances due to ground disturbance activities. **Concerns and Suggestion:** ▪ The community greatly admired the RDMC's innovative approach of educating them about the environmental effects of their operations. It was a refreshing change for them to see a mining company taking such practical steps to engage with and inform the local population about the environmental impacts of the projects.

	▪ The community also deeply appreciated the RDMC's commitment to long-term beneficial projects such as building schools and hospitals in nearby communities. However, there was a strong call for the company to introduce a monthly stipend program at least specifically for women. ▪ There was also a growing expectation for the company to implement a special stipend program for individuals with unique challenges, such as the two dwarf members in the community, or for women over the age of 60. ▪ Women in the community were enthusiastic about the idea of a skill-learning program that could provide them with a source of income. ▪ The community has been experiencing significant soil erosion because of frequent floods, leading to concerns about the long-term impact on the local landscape and infrastructure. In response to this pressing issue, residents have put forth a request for the development of a comprehensive flood protection plan. ▪ This plan would not only address the immediate threat of erosion caused by flooding but also aim to protect the community from future disasters. ▪ It was heartening to learn that two young boys from the village were in their final year of studies in mining in Quetta, and the community eagerly anticipated their return upon completion of their studies.

Stakeholder/s:	Local Community Members from Nok Kundi Town
Consultation:	Consultation with women
Date:	February 19, 2024
Time:	12:30 pm
Meeting venue:	Fazeela's House
Attended by:	▪ **Name** ▪ **Occupation** ▪ **Contact** Amna — CDC Member — - Zar Khatoon — Housewife — - Gul Bano — Housewife — - Shah Bibi — Housewife — - Farzana — Housewife — - Fazeela — Housewife — - Fareeda — Housewife — - Afsana — Housewife — - Fatima — Housewife — - Sultan Pari — Housewife — - Asma — Housewife — -
Conducted by:	▪ Aamna Abid (HBP Representative) ▪ Gul Bani (HBP Representative) ▪ Sania Hasan (RDMC CRO) ▪ Sadia Bibi (RDMC CRO)
Recorded by:	Aamna Abid
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. ▪ They were happy about the Training Centre being made in Nok Kundi. ▪ They were also happy about the medical center being made by RDMC. **Concerns:** ▪ They raised concerns about the lack of availability of clean drinking water, due to which they have purchase water tanker water which costs well over Rs. 3000 per tanker. ▪ They also complained that there is no waste management system in place in Nok Kundi town. ▪ Male family members of the women do not have jobs, which causes problems for their families as well. ▪ The CDC members are not getting any salaries. **Suggestions:** ▪ They want RDMC to prioritize their male family members for jobs in the upcoming Project activities. ▪ They also suggested that the CDC members should be paid. ▪ They want the training center to have classes for sewing.

	▪ One community member, Amna has certification for sewing, crochet, and embroidery and wants to get employment at the training center as an instructor. **Proposed CSR Initiatives:** ▪ They suggested that a waste management system should be introduced for Nok Kundi. ▪ They also want the Project company to help the community in regard to clean drinking water.

Stakeholder/s:	Local Community Members from Dalbandin Town
Consultation:	Consultation with women
Date:	February 20, 2024
Time:	12 pm
Meeting venue:	Saima's House
Attended by:	**Name** / ***Occupation*** / ***Contact*** Ganj Bibi – Housewife – - Sakina – Housewife – - Daulat Khatoon – Housewife – - Zarjaan – Housewife – - Madina – Housewife – - Khansa – Housewife – - Waeeda – Housewife – - Perveen – Housewife – - Sameera – Housewife – - Saima – Housewife – - Fazeela – Housewife – - Zakiya – Housewife – -
Conducted by:	▪ Aamna Abid (HBP Representative) ▪ Gul Bano (HBP Representative) ▪ Sadia Bibi (RDMC CRO)
Recorded by:	Aamna Abid
Language:	Balochi and Urdu
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the community. Following this, HBP briefed the community members about the purpose of community consultations. This included information about the expected Early Works Project activities, its public hearing, and RDMC's GRM. Subsequently, the RDMC representative also shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.
Stakeholder concerns, issues and suggestions:	▪ The community had no problems with the Project's Early Works activities. **Concerns:** ▪ The training center being proposed by RDMC is too far for the community to travel to. ▪ Male family members of the women do not have jobs and are idle at home; this also impacts the level of income of their families. ▪ There are no schools close to the Sorgil community, which is a cause of concern. ▪ There is a lack of availability of clean drinking water. **Suggestions:** ▪ They want RDMC to prioritize their male family members for jobs in the upcoming Project activities. **Proposed CSR Initiatives:** ▪ They suggested that a primary, middle and higher-secondary school be provided for them. ▪ They requested that a training center should be made near the community, which should provide different courses for women as well. ▪ They also requested that something be done for the community for access to clean drinking water.

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RDMC Authorized Supplier/Contractor's document.
The document is NOT approved until an RDMC Approval stamp has been affixed.

Document No.:	**6105AK023-S411-HD27-0034**	**Rev:**	**A**
Document Title:	**Appendix S - Institutional Consultation Logs**		
Issue Date:	**2024-02-23**		

Supplier/Contractor Details

Package/Contract No:	**K023**		
Package/Contract Name:	**Early Works ESIA**		
Supplier/Contractor Doc. No:	**Appendix S - Institutional Consultation Logs**	**Rev:**	**A**

	2024-02-23	**Review**			
			Sadia Asghar	**Vaqar Zakaria**	**Barbara Wessels**
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix S
Institutional Consultation Logs

Stakeholder/s:	District Administration		
Consultation:	Consultation with Deputy Commissioner, Chagai		
Date:	September 27, 2022		
Time:	1:00 pm		
Meeting venue:	Deputy Commissioner Office, Dalbandin		
Attended by:	**Name**	**Designation**	**Contact**
	Hussain Jan Baloch	Government Employee	+92 334 3251747
	Abdul Basit	Government Employee	+92 300 3013398
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) • Kashif Afzaal (HBP Representative)		
Recorded by:	Kashif Afzaal		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the Hagler Bailly Pakistan (HBP) representatives and the Deputy Commissioner, Dalbandin. Following this, HBP briefed about the purpose of the stakeholder consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			
Stakeholder, views, concerns, and suggestions:	**Concerns:** ▪ It was emphasized that the Reko Diq Project should serve as a beacon of Corporate Social Responsibility, setting industry standards for ethical practices, community welfare, and environmental stewardship. ▪ The necessity of organizing a series of awareness sessions and seminars before the operational phase to educate local communities and stakeholders		

	about the project's goals, potential benefits, and potential challenges was highlighted. ▪ The idea of establishing a centralized panel of experts with diverse skill sets to enhance decision-making, resource allocation, and problem-solving capabilities was discussed. ▪ The importance of continuous and meaningful stakeholder consultation throughout the project's lifecycle to foster transparency, trust, and collaboration was recognized. ▪ It was suggested that the project should prioritize employing members of local communities, thereby contributing to their economic well-being and creating a sense of ownership. ▪ The establishment of vocational training institutes was proposed to equip local residents with practical skills relevant to the project's requirements, ensuring sustainable employment opportunities. ▪ The significance of garnering unified support from local notables, politicians, and political parties to ensure the project's success and its transformational impact on the region was discussed. ▪ The commitment of the government administration to collaborate and provide assistance throughout the project's various phases was acknowledged as a valuable resource. **Recommendations:** ▪ Implement comprehensive Corporate Social Responsibility initiatives that serve as a model for responsible and sustainable development. ▪ Conduct proactive awareness sessions and seminars to inform local communities and stakeholders about the project's objectives, potential impacts, and mitigation strategies. ▪ Establish a centralized panel of experts with diverse skill sets to enhance decision-making and project management efficiency. ▪ Maintain an ongoing process of stakeholder consultation to ensure transparent communication, build trust, and address concerns effectively. ▪ Prioritize the employment of local community members in various project-related roles to foster local economic growth and engagement. ▪ Collaborate with local vocational training institutes to create skill development programs that align with the project's needs and contribute to workforce readiness. ▪ Foster unity among community notables, politicians, and political parties to strengthen the project's national significance and transformative potential. ▪ Leverage the government administration's commitment to provide assistance and support at every stage of the project to streamline processes and overcome challenges.

Stakeholder/s:	Education Department, Dalbandin		
Consultation:	Consultation with District Officer Education (DOE), Dalbandin		
Date:	September 26, 2022		
Time:	12:00 pm		
Meeting venue:	Education Office Dalbandin		
Attended by:	**Name**	**Designation**	**Contact**
	Sher Agha Sanjrani	DOE	+92 333 3871104
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) • Kashif Afzaal (HBP Representative)		
Recorded by:	Kashif Afzaal		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the HBP representatives and the DOE. Following this, HBP briefed about the purpose of the institutional consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			
Stakeholder, views, concerns, and suggestions:	**Concerns:** ▪ The district's literacy rate is lower compared to other regions of Baluchistan, which poses a significant developmental challenge. ▪ Scattered populations and lack of road networks to school hinder students' access to education, especially in remote settlements. ▪ Despite the establishment of primary schools in many settlements, teacher availability is limited due to reluctance to serve in remote areas. ▪ Ensuring the sustainability of school buildings is a concern, affecting the quality of education. ▪ Lack of awareness and financial constraints prevent children from attending school, contributing to the low literacy rate. ▪ Many schools, including 85 that are closed, are mostly single-teacher schools, impacting overall enrollment rates.		

	▪ Cultural norms and traditions restrict girls' access to education, leading to significant gender disparities. ▪ The absence of teacher training programs on syllabus changes hampers educational quality. ▪ The Saindak Project stands as a notable example of providing educational facilities. **Recommendations:** ▪ Provide bus services to school children to ensure better access and attendance, especially for those in remote areas. ▪ Collaborate with relevant stakeholders to establish vocational training institutes for both boys and girls, enhancing skill development and employability. ▪ Recruit subject specialist teachers to ensure higher quality education and enhance students' understanding of various subjects. ▪ Launch awareness campaigns to promote girl's education, challenging cultural norms and encouraging families to send their daughters to school. ▪ Adopt and upgrade schools in faraway settlements, making them exemplary models of quality education, infrastructure, and learning outcomes. ▪ Initiate regular teacher training programs to equip educators with the necessary skills and knowledge, especially with regard to syllabus changes. ▪ Work in collaboration with projects like the Saindak Project to expand educational facilities and opportunities in the region. ▪ Develop strategies to ensure the long-term sustainability of school buildings, including maintenance and repair plans.

Stakeholder/s:	Health Department, Dalbandin		
Consultation:	Consultation with District Health Officer (DHO), Dalbandin		
Date:	September 26, 2022		
Time:	1:00 pm		
Meeting venue:	DHQ Dalbandin		
Attended by:	**Name**	**Designation**	**Contact**
	Dr. Kahur Khan Baloch	District Health Officer	NA
	Mr. Irshad	General Surgeon	NA
	Ali Raza	Consultant	+92 333 7942799
	Taj Muhammad	Assistant	+92 333 7961201
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) • Kashif Afzaal (HBP Representative)		
Recorded by:	Kashif Afzaal		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the HBP representatives and the District Health Officer. Following this, HBP briefed about the purpose of the institutional consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			
Stakeholder, views, concerns, and suggestions:	**Concerns:** ▪ Many small settlements lack proper healthcare facilities, leaving residents without access to essential medical care. ▪ Doctors are often unwilling to serve in remote areas, resulting in inadequate healthcare coverage.		

	▪ Air pollution generated by projects is causing respiratory issues and lung problems among locals. ▪ Project-generated solid waste is degrading water quality, adversely affecting both human and animal populations. ▪ Locals near the Project site suffer from kidney, stomach, and hepatitis issues, while common diseases like cold, flu, diarrhea, and malaria prevail in settlements. ▪ Limited access to Basic Health Units (BHUs) is a challenge due to lack of roads, hindering timely medical care. ▪ DHQs and BHUs face shortages of human resources and medical equipment, particularly doctors. ▪ Government and donor remuneration for medical personnel is below expectations. **Recommendations:** ▪ Collaborate with relevant stakeholders to establish mobile clinics or satellite health centers in underserved settlements, ensuring that medical services are brought closer to the communities in need. ▪ Implement a comprehensive incentive program to attract doctors to serve in remote areas, offering competitive salaries, housing, and other benefits to motivate medical professionals to practice in these locations. ▪ Introduce strict environmental regulations and implement pollution control measures to minimize air pollutants, safeguarding the respiratory health of local residents. ▪ Collaborate with environmental agencies and local communities to establish proper waste management systems, including waste disposal and recycling initiatives, to prevent contamination of water sources. ▪ Implement disease prevention and health promotion campaigns, including vaccination drives and public health education, to reduce the prevalence of common diseases and improve overall community health. ▪ Develop and maintain road infrastructure connecting remote settlements to BHUs, ensuring that residents can access medical services promptly and efficiently. ▪ Collaborate with medical associations and professional organizations to recruit and train medical personnel, ensuring a sufficient and skilled healthcare workforce. ▪ Advocate for increased funding for healthcare services and personnel, ensuring competitive salaries and benefits that attract and retain qualified healthcare professionals

Stakeholder/s:	Balochistan Environmental Protection Agency		
Consultation:	Consultation with Deputy Director EPA		
Date:	October 05, 2022		
Time:	12:00 pm		
Meeting venue:	EPA Office Quetta		
Attended by:	**Name**	**Designation**	**Contact**
	Mr. Abdul Wali	Government Employee	+92 312 8920046
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	Yasir Asad (HBP Representative)		
Recorded by:	Yasir Asad		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the HBP representative and the Deputy Director, EPA. Following this, HBP briefed about the purpose of the institutional consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			
Stakeholder, views, concerns, and suggestions:	**Recommendations:** ▪ The study should incorporate mining percentages specific to Baluchistan and outline the social benefits that will directly contribute to the local communities. ▪ CSR activities should be tailored to benefit both local communities and Baluchistan at large, focusing on sustainable development, education, healthcare, and livelihood enhancement. ▪ Priority for employment opportunities should be given to local residents to ensure equitable socio-economic growth and involvement in the project. ▪ Consider transitioning ownership or management roles to locals, facilitating smooth project operations and fostering a sense of ownership and responsibility.		

	▪ Ensure the protection of vital natural resources, including underground water, biodiversity, and human population, through rigorous environmental safeguards. ▪ Emphasize avoidance of environmental impact wherever possible; if not feasible, focus on thorough rehabilitation measures to restore affected areas. ▪ Prioritize the protection and relocation of affected species, safeguarding biodiversity during project activities. ▪ Develop CSR committees involving local representatives to actively guide and monitor CSR initiatives, fostering community participation and accountability. ▪ Conduct regular awareness sessions to educate communities about the project's environmental and social implications and engage them in sustainable practices. ▪ Develop a comprehensive GRM outlining grievance submission, handling, and resolution procedures, involving relevant government departments and agencies. ▪ The ESIA should provide detailed mitigation measures for both environmental and social impacts, ensuring a holistic approach to sustainability. ▪ Integrate the Environmental Protection Agency (EPA) into GRM and CSR activities to ensure continuous oversight and regulatory compliance. ▪ Make it a clear responsibility of the Project developer to restore the Project Area to its original state upon completion, minimizing lasting environmental impact.

Stakeholder/s:	Islamic Relief (NGO)		
Consultation:	Consultation with Area Program Manager Balochistan		
Date:	October 05, 2022		
Time:	4:30 pm		
Meeting venue:	Islamic Relief Office		
Attended by:	***Name***	***Occupation***	***Mobile***
	Essa Tahir	Area Manager	+92 081 2823996 +92 334 0099340
	Ali Dost	Ex-Employee Islamic Relief	+92 331 8491980
	Ali Dost	RDMC Representative	+92 344 8022511
Conducted by:	Yasir Asad (HBP Representative)		
Recorded by:	Yasir Asad		
Language:	Balochi and Urdu		
Preamble:	The meeting started with an introduction between the HBP representative and the Area Manager, Islamic Relief. Following this, HBP briefed about the purpose of the institutional consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			
Stakeholder, views, concerns, and suggestions:	▪ The following points highlight Islamic Relief's core areas and initiatives, as well as potential collaborative opportunities for community development: **Islamic Relief Initiatives:** ▪ Islamic Relief is actively engaged in Water, Sanitation, and Hygiene (WASH) projects and has provided solar panels to 1,000 households, enhancing access to clean energy. ▪ Islamic Relief's efforts extend to education and health, contributing to improved well-being and access to essential services.		

	▪ Islamic Relief has successfully implemented water source schemes, bolstering water accessibility in targeted settlements. ▪ Islamic Relief is currently engaged in flood relief activities, providing vital assistance during emergencies. ▪ The organization has made a positive impact in settlements including Humai, Nok Chah, Mashki Chah, and Darband Chah, addressing various developmental needs. ▪ Islamic Relief has undertaken projects related to water drainage, ground-level water, seeds, and drip irrigation in Nok Kundi. ▪ Extracting water from the ground could lower the water table in settlements like Humai, Mashki Chah, and Nok Chah, potentially affecting local communities. ▪ Considering the potential impact, exploring alternative water sources like Baghicha Bore field, Tahlab Wetlands and supplying water to local communities is essential. **Recommendations:** ▪ The organization emphasizes livelihood improvement, including agriculture, livestock, and skill training to empower local communities. ▪ Collaborating organizations should prioritize providing basic amenities and employment opportunities to uplift local communities. ▪ Proper wastewater management is crucial. Robust mitigation measures should be implemented to address untreated wastewater concerns. ▪ Treated water from wastewater management can be repurposed for plantation, supporting sustainable agricultural practices. ▪ Companies should actively engage in capacity building and awareness sessions for local communities, empowering them with knowledge. ▪ Mechanized and eco-friendly systems should be employed, optimizing labor management and minimizing environmental impact. ▪ Islamic Relief can play a significant role in Corporate Social Responsibility (CSR) activities alongside Barrick Gold. ▪ Collaboratively sharing costs and resources between Islamic Relief and Barrick Gold can maximize the positive impact on local communities.

Stakeholder/s:	Public Health Engineering (PHE) and Water and Sanitation Agency (WASA)		
Consultation:	Consultation with PHE & WASA Officials.		
Date:	September 04, 2023		
Time:	16:48 pm		
Meeting venue:	Serena Hotel		
Attended by:	***Name***	***Occupation***	***Mobile***
	Mazhar Ali	Senior Hydrologist	+92 300 3815908
	Zahid Ullah	Senior Hydrologist	+92 312 6868324
	Col (R) Ahmer Iqbal	RDMC Representative	+92 322 2851111
Conducted by:	• Yasir Asad (HBP Representative) • Muhammad Arshad (HBP Representative)		
Recorded by:	Muhammad Arshad		
Language:	Urdu/English		
Preamble:	The meeting started with an introduction between the HBP representatives and the PHE & WASA Officials. Following this, HBP briefed about the purpose of the institutional consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			
Stakeholder concerns, issues and suggestions:	**Concerns:** ▪ Concerns have been raised that the topsoil might be influenced during Reko Diq project activities, potentially leading to increased erosion, especially during stormy conditions. ▪ It is feared that surface pollution may be induced by the extraction of waste materials during mining. ▪ The loss of topsoil could result in the production of dust in the surrounding area, potentially causing respiratory diseases among the local population.		

	▪ Mining activities may disturb the groundwater aquifer, either through water depletion or pollution. This is a significant concern as the local community relies on groundwater for drinking purposes. ▪ Groundwater is used for irrigation by the local community, and its depletion could have adverse effects on local crops. **Recommendations:** ▪ It is recommended that sewerage treatment measures be implemented based on the quantity of waste produced during mining to mitigate pollution. ▪ Water harvesting structures, such as ponds and check dams, should be constructed to conserve rainwater and enhance groundwater recharge. ▪ Consideration is recommended for sourcing water from Hamun-e-Maskel wetland for project-related needs after assessing water requirements. ▪ Installation of a Reverse Osmosis (RO) Plant at Hamun-e-Maskel wetland is recommended to provide clean water to the local community for household purposes from CSR Fund. ▪ Proper utilization of CSR funds, either through local community organizations or by organizing local institutions, is recommended to address water-related issues. ▪ A comprehensive watershed management plan should be developed, encompassing activities like the construction of check dams and the planting of vegetation to align with landscape needs. ▪ Construction of check dams and the promotion of plant growth along these dams are recommended to support local ecological balance and effective water resource management

Stakeholder/s:	District Vice Chairman Local Government and Rural Development Chagai		
Consultation:	Consultation with Vice Chairman, Chagai District		
Date:	September 01, 2023		
Time:	13:20 pm		
Meeting venue:	Vice Chairman Office Dalbandin		
Attended by:	***Name***	***Occupation***	***Mobile***
	Sardar Ahmed Buxh	President TMC	+92 332 3314415
	Mir Asfand	District Vice Chairman	+92 332 1915158
	Pir Muhammad	Vice Chairman UC	+92 333 1396464
	Muhammad Shan	Office Superintendent	+92 334 2168635
	Abdul Khaliq	RDMC Representative	+92 344 8022511
Conducted by:	• Yasir Asad (HBP Representative) • Muhammad Arshad (HBP Representative)		
Recorded by:	Muhammad Arshad		
Language:	Urdu		
Preamble:	The meeting started with an introduction between the HBP representatives and the Vice Chairman, Chagai District. Following this, HBP briefed about the purpose of the institutional consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also explained the positive impact of active participation in these meetings.		
Picture:			
Stakeholder concerns, issues and suggestions:	At the start of the consultation, the vice chairman extended a warm welcome to all participants. He emphasized that the elected representatives are connected to the grassroots level, being elected by the local people. As public representatives, they assured full cooperation with the project developers during the project execution. **Concerns:** ▪ Concerns were raised about the high unemployment and poverty levels among the local population, requiring the company's attention to improve their livelihoods.		

	▪ The majority of people in the area are engaged in cross-border trade, and once the project becomes operational, their businesses may be negatively impacted, affecting the local population. ▪ Worries were expressed about potential disruptions to the local culture due to project activities, as the community values its social norms. ▪ Increased noise, dust, and traffic resulting from the project were identified as factors that could affect the lives of the local people. ▪ Concerns were voiced regarding the invasion of privacy when outsiders enter the community. ▪ The reallocation of land during the project's land acquisition phase was seen as a potential disturbance to the social fabric of the community. ▪ Temperature changes in the project area due to increased traffic and heavy machinery operations were noted as a concern. ▪ The stakeholder expressed concerns about the potential for project activities to raise hopes and expectations within the local community. It was recommended that the management of these expectations should be handled wisely, with local community involvement. **Recommendations:** ▪ Cross-border trade should be regularized with the involvement of district local administration and local bodies. Better alternatives should be provided if their businesses are affected. ▪ Jobs in project activities should be provided to locals by a ratio of 90:10, with 90% being locals and 10% outsiders to build confidence within the local community. ▪ It is recommended to involve local bodies' members, such as local councilors and chairpersons, in decision-making when project implementation begins. ▪ Control measures should be implemented to manage dust, traffic, and noise during project execution. ▪ Groundwater should not be exploited during mining, and groundwater pollution should be controlled. ▪ Initiatives, such as vocational centers and women's welfare activities, should be initiated using CSR funds. ▪ Healthcare and education facilities in the area should be provided with necessary staff and medicines. ▪ To ensure the safety of working staff in the mining project, the best HR policy should be implemented, including insurance for local staff. ▪ A Worker Welfare Fund, equivalent to 2% of the employee's income, should be established and properly maintained by the company, focusing on the well-being of project workers. ▪ Active involvement of the local community in project planning and decision-making should be ensured, promoting a sense of ownership and accountability among community members. ▪ The community's needs should be assessed at the grassroots level, and interventions should be carried out through community participation. ▪ Efforts should be made to change local perceptions regarding the acceptance of the company's activities, achievable through social mobilization and capacity building

Stakeholder/s:	Irrigation Department		
Consultation:	Consultation with Irrigation Department Official.		
Date:	September 04, 2023		
Time:	15:30 pm		
Meeting venue:	Serena Hotel		
Attended by:	***Name***	***Occupation***	***Mobile***
	Gulam Sarwar	Superintending Engineer	+92 334 2493758
	Col (R) Ahmer Iqbal	RDMC Representative	+92 322 2851111
Conducted by:	• Yasir Asad (HBP Representative) • Muhammad Arshad (HBP Representative)		
Recorded by:	Muhammad Arshad		
Language:	Urdu/English		
Preamble:	The meeting started with an introduction between the HBP representatives and the Irrigation Department Official. Following this, HBP briefed about the purpose of the institutional consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. They also emphasized the positive impact of active participation in these meetings.		
Picture:			
Stakeholder concerns, issues and suggestions:	The consultation team was briefed by the Superintending Engineer about the Irrigation Department and its functioning hierarchy. Comprehensive information about the Irrigation Department's background and its role in Balochistan was provided. Balochistan, being a vast province heavily dependent on agriculture and livestock, must have its water resources sagaciously augmented through the construction of weirs, canals, channels, and delay-action dams for these goals to be achieved. Monitoring and improving the depleting water table in 18 river basins across Balochistan is also part of the Irrigation Department's mandate. The present government is making strenuous efforts to achieve these goals, either through donor agencies or its own meagre resources. With the grace of Allah, there will be a considerable impact on the livelihood of the people living in this province. It was also emphasized that Karezes, underground galleries that tap		

	groundwater from aquifers of alluvial fans, serve as the main source of irrigation and drinking water needs in Balochistan. Regarding the Reko Diq Mining Project and its impact on the Chagai and other districts, which surrounds the Project Area, it was mentioned that the area falls within an arid zone with low precipitation levels. No small or large dams are available in the vicinity of the Project Area. The details of the community wells located at the Pak-Iran border were promised to provide via email. **Concerns:** ▪ There is a concern that RDMC needs to conduct a thorough assessment of water utilization demand. This is crucial to understand how the project might affect the groundwater in the area. Without this assessment, it's challenging to predict the project's impact on the local water resources accurately. ▪ There is a concern that the mining activities associated with the project could lead to the depletion of groundwater. This depletion could disrupt the groundwater aquifer, which serves as a critical water source for the region. Such disruption can have far-reaching consequences for both drinking water and irrigation. ▪ With the implementation of project-related activities, there is an expected increase in water demand. This heightened demand could strain the current existing water resources used by the local community. If not properly managed, it may lead to water scarcity issues and affect the livelihoods of the residents. ▪ The concerns extend to the environmental impact of the project. It's anticipated that the project's activities, including noise, increased traffic, and pollution, may have adverse effects on the local environment. These concerns revolve around preserving the ecological balance and the quality of life in the area. **Recommendations:** ▪ To address concerns about water scarcity and groundwater depth, it's recommended that the project company collaborates closely with the Government of Balochistan. By working together, they can develop sustainable solutions to ensure adequate access to water resources, especially considering that groundwater is relatively deep in the area. ▪ Corporate Social Responsibility (CSR) funds can be effectively used to improve the irrigation system in the area. This can lead to more efficient water use in agriculture, which is vital for the livelihoods of the local community. It's a practical way for the project to contribute positively to the region. ▪ The commitment to share innovative ideas and proposals regarding irrigation system improvements via email demonstrates a willingness to engage in dialogue and problem-solving. This exchange of ideas can lead to innovative solutions that benefit both the project and the community. ▪ Implementing groundwater recharge strategies through native plantation and constructing check dams are recommended. These strategies can help maintain the water table and ensure a sustainable source of groundwater. Rain harvesting techniques can also be employed to capture and store rainwater for various uses, reducing the overall demand on groundwater.

Stakeholder/s:	Balochistan Rural Support Program (BRSP)		
Consultation:	Consultation with Youth Manager, BRSP		
Date:	September 05, 2023		
Time:	12:20 pm		
Meeting venue:	Serena Hotel		
Attended by:	***Name***	***Occupation***	***Mobile***
	Gulam Muhammad Muhammadi	Youth Manager	+92 300 0181475
	Col (R) Ahmer Iqbal	RDMC Representative	+92 322 2851111
Conducted by:	• Yasir Asad (HBP Representative) • Muhammad Arshad (HBP Representative)		
Recorded by:	Muhammad Arshad		
Language:	Urdu/English		
Preamble:	The meeting started with an introduction between the HBP representatives and the Youth Manager, BRSP. Following this, HBP briefed about the purpose of the institutional consultations and provided information about the proposed development and the Client (RDMC). Subsequently, the RDMC representative shared details of the Project, its components, and activities including the Early Works activities. In the end, HBP encouraged participants to share their perspectives, concerns, and recommendations regarding the proposed development and its activities. HBP also emphasized the positive impact of active participation in these meetings.		
Picture:			
Stakeholder concerns, issues and suggestions:	At the start of the consultation, the stakeholder provided an overview of Balochistan Rural Support Program (BRSP), highlighting its significant role as one of the largest organizations in Balochistan and a member of a broader network of Rural Support Programs in Pakistan. BRSP has been dedicated to improving the living conditions of rural communities in Balochistan for over three decades. Its mission is to create a prosperous Balochistan, ensuring equal livelihood opportunities for all, particularly the marginalized, and eliminating social and economic exclusion. BRSP operates in 32 districts of Balochistan, focusing on various areas, including health, education, capacity building, social mobilization, community infrastructure, social services, poverty alleviation, nutrition, and women's empowerment.		

	Concerns: ▪ The stakeholder expressed concerns about the potential for project activities to raise hopes and expectations within the local community. It was recommended that the management of these expectations should be handled wisely, with local community involvement. ▪ Concerns were raised about the high levels of unemployment and poverty among the local population, necessitating the company's attention to improve their livelihoods. ▪ The majority of people in the area are engaged in cross-border trade, and once the project becomes operational, their businesses may be negatively impacted, affecting the local population. ▪ Increased noise, dust, and traffic resulting from the project were identified as factors that could affect the lives of the local people. **Recommendations:** ▪ All CSR activities should be assessed through BRSP and implemented through it, leveraging its strong grassroots presence and extensive experience in community welfare projects. ▪ Development of endowment funds at each community organization to attract matching grants from other donor organizations. These endowment funds would be used for the welfare of the community. ▪ Regularize cross-border trade with the involvement of district local administration and local bodies, and provide better alternatives to affected businesses. ▪ Provide jobs to local residents in project activities. ▪ Involve local village-level community organizations that serve as local representatives in project planning and execution. ▪ Implement community welfare schemes to address the local population's issues. ▪ Focus on providing health and education facilities with adequate staff and medicines from CSR funds through local organized institutions organized by BRSP. ▪ Facilitate access to drinking water from groundwater sources and provide financial support to the local people for this valuable initiative. ▪ Undertake community physical infrastructure projects for the welfare of the local people. ▪ Actively involve the local community in project planning and decision-making to promote a sense of ownership and accountability. ▪ Conduct needs assessments at the grassroots level and implement interventions through community participation. ▪ Efforts should be made to change local perceptions regarding the acceptance of the company's activities, which can be achieved through social mobilization and capacity building

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Document Title:	**Appendix T – Pre-construction Stakeholder Engagement Plan**		
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Supplier/Contractor Details

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Package/Contract Name:	**Early Works ESIA**		
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	2024-02-23	**Review**			
			Sadia Asghar	**Vaqar Zakaria**	**Barbara Wessels**
REV	**Date**	**Reason For Issue**	**Prepared By**	**Checked By (Discipline Lead)**	**Approved By (Functional Manager)**
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Appendix T
Pre-construction Stakeholder Engagement Plan

REKO DIQ COPPER PROJECT

PRE-CONSTRUCTION STAKEHOLDER ENGAGEMENT PLAN



Version	Detail	Date	Name
1.0			
	e.g. Annual Review		
	e.g. Review due to project moving to operation phase		

Notes:

1. Any change to the document should be detailed in the above table. If the change is minor then the document can be saved as a sub version (i.e. 1.1, 1.2 etc.) if the change is major, following a major review for example, then the document should be saved as a new version (i.e. 2.0, 3.0 etc.).
2. Please ensure any previous versions are transferred to the archive folder.
3. If a change is material, please ensure that the updated version is distributed as appropriate.

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1. INTRODUCTION

Reko Diq Mining Company (RDMC), a subsidiary of Barrick Gold Corporation (Barrick), is seeking to develop the Reko Diq Project (the Project), located in north-western Pakistan. The Project is one of the largest undeveloped copper-gold projects in the world and is owned 50% by RDMC, 25% by three federal state-owned enterprises, 15% by the Province of Balochistan on a fully funded basis and 10% by the Province of Balochistan on a free carried basis.

The Project is expected to have a life of at least 40 years as a truck-and-shovel open pit operation with processing facilities producing a high-quality copper-gold concentrate.

This Stakeholder Engagement Plan (SEP, or the Plan) describes the RDMC approach to stakeholder engagement and the steps it intends to take during the development and operation of the Project, including its grievance mechanism. This Plan has been developed, and will be implemented, in accordance with Barrick policy and, the International Finance Corporation (IFC) Performance Standards and will form a component of the Reko Diq Environmental and Social Management System.

2. PRINCIPLES

The key principles adopted by this Plan, and as outlined in the IFC Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets, are to:

- Provide meaningful information in a format and language that is readily understandable and tailored to the needs of the target stakeholder group(s);
- Provide information early in decision-making processes;
- Disseminate information in ways and locations that make it easy for stakeholders to access it;
- Respect local traditions, languages, timeframes, and decision-making processes;
- Establish two-way dialogue that gives both sides the opportunity to exchange views and information, to listen, and to have their issues heard and addressed;
- Seek inclusiveness in representation of views, including women, vulnerable and/or minority groups;
- Adopt processes free of intimidation or coercion;
- Develop clear mechanisms for responding to people's concerns, suggestions and grievances;
- Incorporate feedback into program design, and report back to stakeholders.

3. OBJECTIVES

Based on the principles and the Barrick Community Relations Policy, the overall objectives of this stakeholder engagement activities are to:

- Identify key stakeholders that may have an interest or will be affected by the proposed Project, including communities, government departments, regulatory authorities, non-governmental organisations and any nearby industries;
- Keep all stakeholders informed with respect to their specific interests;
- Engage people in decisions that directly affect them; and
- Maintain stakeholder confidence and trust in the company and its activities through open, informative, inclusive and timely communications.

The expectation is that these objectives will be achieved by building on the relationships established over time and making appropriate adjustments as the project evolves, including changes in activities, affected communities, stakeholder perceptions and interests, and reporting needs.

4. LEGAL AND OTHER REQUIREMENTS

4.1. PAKISTAN REQUIREMENTS

The Balochistan Environmental Protection Agency Review of the Initial Environmental Examination and Environmental Impact Assessment Regulations 2020 (IEE-EIA Regulations) provide the necessary details on the preparation, submission and review of the IEE and EIA in Balochistan Province of Pakistan. Under Regulation 11 of the IEE-EIA Regulations, a set of guidelines have been issued indicating specific assessment requirements. This includes the Guidelines for Public Consultation, 1997 (the 'Guidelines') which are summarised as follows:

- Objectives of Public Involvement: To inform stakeholders about the proposed Project, to provide an opportunity for those otherwise unrepresented to present their views and values, providing better transparency and accountability in decision making, creating a sense of ownership by the stakeholders.
- Stakeholders: 'people who may be directly or indirectly affected by a proposal will be the focus of public involvement. Those who are directly affected may be Project beneficiaries, those likely to be adversely affected, or other stakeholders. The identification of those indirectly affected is more difficult, and to some extent, it will be a subjective judgement. For this reason, it is good practice to have a very wide definition of who should be involved and to include any person or group who believes that they have an interest. Sometimes it may be necessary to consult with a representative from a particular interest group. In such cases, the choice of representative should be left to the group itself. Consultation should include not only those likely to be affected, positively or negatively, by the outcome of a proposal, but should also include those who can affect the outcome of a proposal. The range of stakeholders typically includes local people, other affected communities, proponents, government agencies and local councils, NGOs and other influential people.
- Mechanism: provide sufficient relevant information in a form that is easily understood by non-experts (without being simplistic or insulting); allow sufficient time for stakeholders to read, discuss and consider the information and its implications and to present their views. Responses should be provided to issues and problems raised or comments made by stakeholders. Selection of venues and timings of events should encourage maximum attendance.
- Timing and Frequency: planning for the public consultation program needs to begin at a very early stage; ideally, it should commence at the screening stage of the proposal and continue throughout the ESIA Process.
- Consultation Tools: some specific consultation tools that can be used for conducting consultations include focus group meetings, needs assessment, semi- structured interviews, village meetings and workshops.
- Important Considerations: The development of a public involvement program would typically involve consideration of the following issues:
    - Objectives of the proposal and the study;
    - Identification of stakeholders;
    - Identification of appropriate techniques to consult with the stakeholders;
    - Identification of approaches to ensure feedback to involved stakeholders; and
    - Mechanisms to ensure stakeholders' consideration are taken into account.

Pakistan's national environmental laws require only one round of consultation to be conducted during ESIA phase of the Project.

4.2. INTERNATIONAL STANDARDS

4.2.1. IFC PERFORMANCE STANDARDS

The IFC Performance Standards, along with the IFC sustainability and information access policies form the IFC Sustainability Framework. The Performance Standards outline the IFC client responsibilities for assessing and managing their environmental and social risks and applies to all projects which go through the IFC review process. The Performance Standards are also considered applicable to private finance organisations which adopt the Equator Principles risk management framework. Key principles of stakeholder engagement outlined in the Performance Standards include:

- Community engagement and timely disclosure of information should be an ongoing process across all project stages, particularly for local communities who may be affected by the project. The nature and frequency of community engagement will reflect the project risks to, and adverse impacts on, the affected communities;
- Community engagement will be free of external manipulation, interference, or coercion, and intimidation, and conducted on the basis of timely, relevant, understandable and accessible information;
- Consultation should be conducted in a manner that provides the affected communities with opportunities to express their views on project risks, impacts and mitigation measures, and allows the company to consider and respond to them;
- Community engagement should ensure the free, prior and informed consent of impacted communities and facilitate informed participation. Informed participation involves organised and iterative consultation to ensure that the decision-making processes of the company incorporate the views of affected parties, particularly in relation to proposed mitigation measures, the sharing of development benefits and opportunities, and implementation issues. The company will document the process, in particular the measures taken to avoid or minimise risks to and adverse impacts on the affected communities;
- The company will respond to stakeholder concerns. Where ongoing risks to or adverse impacts on affected parties are likely, the company will establish a grievance mechanism to receive and facilitate resolution of concerns in relation to the project. The grievance mechanism should be scaled appropriately and should address concerns promptly, using an understandable and transparent process that is culturally appropriate and readily accessible to all segments of affected communities, and at no cost and without retribution. The mechanism should not impede access to judicial or administrative remedies. The company will inform the affected communities about the mechanism in the course of its community engagement process.

4.2.2. EQUATOR PRINCIPLES

The Equator Principles is a "risk management framework, adopted by financial institutions, for determining, assessing and managing environmental and social risk in projects." Financial Institutions (referred to as Equator Principles Financial Institutions, or EFPIs) who adopt the Equator Principles commit to financing projects which meet the requirements of all 10 principles to ensure that projects are developed in a socially and environmentally responsible manner. The principles state that

impacts to project affected communities and environments are avoided where possible, and where impacts are unavoidable, that they should be "minimised, mitigated and/or offset". The latest version of the principles (EP4 - 2020) lists out 10 principles which are described in the following sub-sections with comment as to how they apply to the project.

Principle 5 states:

> *"For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation."*

Principle 5 requires the project proponent to ensure that:

- The level of engagement is commensurate to the risks and potential impacts of the project;
- Appropriate information and documentation is readily available to affected parties and other relevant stakeholders;
- That engagement is conducted in a culturally appropriate manner and in the local language;
- The stakeholder engagement process is documented, including any agreed actions which result;
- Disclosure of environmental and social risks associated with the project, both prior to construction and on an ongoing basis;
- Projects with adverse impacts on indigenous people demonstrate free, prior and informed consent (FPIC).

Principle 7 requires the implementation of an appropriately scaled grievance mechanism that:

- Seeks to resolve concerns in a timely manner;
- Is easily understandable, transparent and culturally appropriate;
- Is readily accessible at no cost;
- Ensures there is no retribution to the concerned party;
- Is adequately socialised to affected communities and other relevant stakeholders.

4.3. GOOD PRACTICE PRINCIPLES

Stakeholder consultations will be undertaken in good faith while remaining impartial. The following practice principles will be observed during the consultations:

- Cultural sensitivity – this requires respect, understanding and appreciation for the customs, institutions, values and norms of the communities being consulted;

- Interactive approach – stakeholder engagement should not be limited to the one- way dissemination of information by the Project proponent but should include stakeholder input into decision-making processes for the proposed Project;
- Open, transparent and informative – Project stakeholders should have access to relevant information, in a simple and understandable format;
- Inclusive and equitable – ensure all stakeholder groups are represented, including less represented groups such as women, children, elderly, and vulnerable groups;
- Appropriateness and flexibility – stakeholder engagement techniques (surveys, interviews, workshops, etc.) must be appropriate to the specific phase of the ESIA study (scoping consultations, feedback consultations) and the stakeholder groups identified; and
- Capacity building – capacity should be built as part of the interaction with stakeholders, wherever appropriate and practicable.

5. PROJECT STAKEHOLDERS

Project stakeholders are defined as groups or individuals that *'are directly or indirectly affected, positively or negatively, by the Project and can contribute to or hinder the Project's success'*. The identification of stakeholders is an ongoing and iterative process and additional stakeholders are continuously identified as the Project develops.

5.1. LOCAL COMMUNITIES

A key focus for the project are those communities which may be directly impacted (negatively and positively). Maintaining open and honest dialogue with communities proximal to the project will be critical for success.

5.2. VULNERABLE GROUPS

The Project will consult specifically with people representing potentially vulnerable or marginalised groups such as women, young people, landless people, the sick and disabled, internally displaced people, ethnic minorities and in-migrants. In-migrants may be defined broadly as people who originate from outside the Project area and who are motivated to move to the Project area by perceived economic opportunities or benefits associated with the development of the Project. Within this category, specific attention will be paid only to those who may be considered vulnerable.

5.3. GOVERNMENT INSTITUTIONS

There are a range of Government departments and other Government bodies at district, provincial and federal level who will need to be engaged through the pre-construction phase of the project in relation to approvals processes as well as for general information purposes. Engagement with Government officials will need to be carefully controlled and recorded as per Barrick policy.

5.4. CIVIL SOCIETY AND NON-GOVERNMENTAL ORGANISATIONS (NGOs)

This group includes all other people in society who may have an interest in the Project and its social and environmental aspects and non-governmental organisations representing their interests. It includes members of the wider general public in Pakistan and further afield, civil society organisations such as religious groups, cooperatives, professional associations, cultural groups and citizens associations and environmental and social groups. It also includes universities and other academic and research institutions undertaking work relevant to the Project (e.g. on mining, sustainability, social and environmental issues, local and regional development, etc.) who may have views on the Project or information that will be useful for the assessment of Project impacts.

5.5. COMMERCE AND INDUSTRY

A range of different types of commercial organisations may be interested in the project including:

- Local entrepreneurs (both companies and individual farmers, traders, merchants etc) who may be adversely affected by displacement and other social and environmental impacts, or who may gain benefit by providing goods and services to the project;
- Entrepreneurs and businesses from elsewhere in Pakistan who may gain benefits by providing goods and services to the Project;

- Other mining companies working in the local area and elsewhere in Pakistan.

As the Project develops and new contractors and service providers are identified, it is likely that these businesses will become important stakeholders as they establish contractual relationships with the Project. Contacts with the mining sector will be engaged through industry bodies or through direct contact.

5.6. STAKEHOLDER IDENTIFICATION

Error! Reference source not found. presents an initial list of identified stakeholders and their relevance to the Project. A more detailed Stakeholder List with details of representative individuals is maintained in a separate spreadsheet. Community stakeholders and key government institutions relevant to the planning and implementation of the current project phase have been identified through the following measures:

- Review of legislation and institutional mandates; and
- Analysis of available land use maps and satellite imagery of the wider Project area.

Table 1 – Identified Stakeholders

Stakeholder / Groups	Stakeholder Details	Relevance to the Project
Regulatory Authorities (also includes the governing and monitoring authorities)	Balochistan Environmental Protection Agency (BEPA)	Regulatory authority for environmental issues and approvals.
	Gwadar Port Authority and China Overseas Port Handling Company (COPHC)	Responsible for managing the port activities and operations.
	National Highway Authority (NHA)	Responsible for monitoring how the traffic (i.e., trucks) is regulated on highways.
	Karachi Port Authority	Responsible for managing the port activities and operations.
Government Departments	District Administration	Responsible for district management and security issues at the Project sites.
	Forest and Wildlife Department	Responsible for the protection of forests and wildlife. Interested in the impact of Project impacts on the forest resources and wildlife of the area.
	Education Department	Responsible to provide educational facilities to the children of the area.
	Health Department	Responsible for the treatment of health-related issues at the district level including any health issues caused by the Project.
	Balochistan Revenue Authority	Responsible for managing the revenues generated by the Project,

Stakeholder / Groups	Stakeholder Details	Relevance to the Project
		optimizing therevenues by providing quality service to the locals and promoting the compliance with taxes and related laws.
	Mines and Minerals Department	Responsible for the development of Balochistan resources in a way to support the economy and public.
	Balochistan Water and Sanitation Authority	Responsible for the supply of water and provision of water permits.
	Irrigation Department	Relevant in providing input, and suggestions on how the Project may affect or benefit the livestock, irrigation and agricultural activities.
	Livestock Department	
	Agriculture Department	
Non-Governmental Organisations/ Non-Profit Organizations	Worldwide Fund for Nature (WWF)	Working on the protection of wildlife inthe Chagai District.
	International Union for the Conservation of Nature (IUCN)	Working on environmental conservationand ecosystem development in the Chagai District.
	Islamic Relief	Working on water supply in the Chagai District.
	Balochistan Rural Support Programme (BRSP)	Working on improving the quality of life of the rural poor by harnessing the potential of the community.
	Nok Kundi Development Foundation	Working in Nok Kundi on education and social infrastructure development in the area.
Communities at Mine Site	Humai, Nok Chah, Mashki Chah, Darband Chah, Kirtaka, Saindak, Amalaf	Communities residing in proximity to the mine site, along the transport corridor, and at the marine terminal at Gwadar Port may influence the Project activities and be affected (positively and/ or negatively) by the Project operations.
Communities along Transport Corridor	Nok Kundi, Taftan, Dalbadin, Qila Ladghat, Hok Chah, Hur Ab, Dashtak, Punjgur, Katagari, Chib, Kalatuk, Pui Wani, Barambah, Chhabbawari, Wadian, and Gowalistop	
Communities at Marine Terminal	Gwadar	
Other – Security and Military Officials	Frontier Corps	Security agencies working with the Client; its staff, consultants and contractors and any locals hired for the implementation of the Project activities.
	Levies	

The list of stakeholders will continue to be updated following any updates to the Project design and activities as well as identification of additional stakeholders once the team enters the field.

6. STAKEHOLDER ENGAGEMENT PROGRAM

6.1. FORMS OF ENGAGEMENT

Forms of engagement with stakeholders will vary considerably depending on the stakeholder group. RDMC will continue with existing engagement techniques and develop new ones as necessary, to ensure effective and culturally appropriate interaction with stakeholders. Participatory tools and methodologies such as community updates with Q&A sessions will continue to be utilised, as they are more likely to increase stakeholder involvement in the process and elicit alternative responses, especially if there is controversy or complexity, or a need to build a consensus around possible solutions.

Specific tools and tactics will be developed, where needed, to engage sub-groups within communities, including women, vulnerable groups and minority groups. Given the nature of engagement, the process will always be context-specific. This means that techniques, methods, approaches and timetables will be tailored for the local situation and the various types of stakeholders being consulted. Engagement practices and processes will determine appropriate engagement methods and tools based on:

- Location and sensitivity of the project or activity – locally and internationally;
- Number and interest of stakeholders;
- Complexity of the issue to be discussed;
- Significance of potential impacts;
- Expected or targeted outcomes of engagement.

It is expected that the type of engagement and targeted stakeholders will change throughout the Project lifecycle. However, in general, the more a particular stakeholder group is materially affected by a component of the Project, the more important it is for them to be properly informed and encouraged to participate in matters that directly affect them.

Five general formats for stakeholder engagement have been developed taking into account of the type of information and issue being discussed or communicated, as well the intended audience or target of the engagement. Variations of these will continue to form the basis of engagements, recognising that all will be open to change as needs and circumstances dictate. These formats are:

- Bringing people together into productive dialogue through:
    - Communication events to deliver key messages or specific studies, reports or data;
    - Public meetings to deliver regular updates to the general public (e.g. regular meetings in affected villages).
- Sharing information through:
    - Newsletters, which are a useful tool for enabling regular feedback and updates for stakeholders;
    - Community notice boards to announce upcoming events and for general updates;
    - Websites that provide information to stakeholders who have internet access.
- Direct meetings with representative individuals/groups and perception surveys such as:
    - Individual meetings for direct discussions with individuals or small groups, that enable sharing of specific information to a narrow audience;

  - Focus groups to collect data or gain feedback on specific actions or programs; or for weekly meetings with respected groups of community leaders. Focus group discussions are a useful way to engage women, minority and youth groups;
  - Periodic perception surveys to monitor the opinions or perspectives of different stakeholder groups;
  - Topic-specific panels, working groups and committees to discuss often complex and scientific topics, e.g. biodiversity.
- The grievance redress process (see Section 6.2).

An engagement record template is provided in Appendix A.

6.2. CONSULTATION SCHEDULE

The proposed schedule for consultation with communities and institutions is developed and maintained in a separate document, and includes:

- Monthly Community Development Committee meetings (Par-e-Koh and Nokkundi CDCs)
- Monthly project update sessions at nearby communities.
- Monthly engagement with local political organisations.
- Monthly engagement with local youth groups.
- Monthly engagement with key religious leaders.
- Monthly meeting with district administration.
- Monthly engagement with key Government agencies.
- Bi-monthly (once every two months) meeting with key divisional level stakeholders.

6.3. CONSULTATION REGISTER

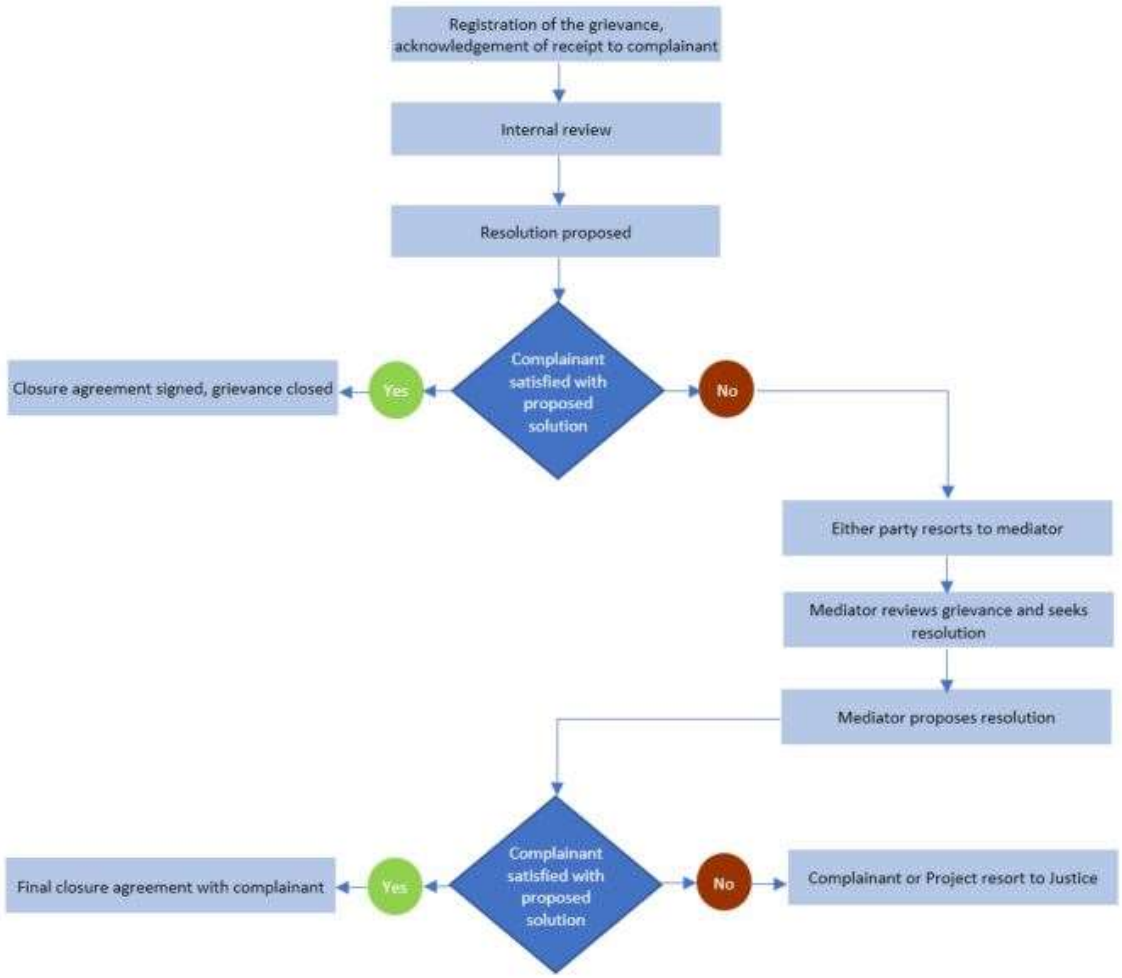
A consultation register will be maintained which will record:

- Date of engagement;
- Nature/type of engagement method;
- Stakeholder(s) involved;
- Names of Reko Diq representatives involved;
- Location of engagement;
- Link to detailed engagement record.

7. GRIEVANCE REDRESS

Due to the complex and personal nature of the project the Company are committed to ensuring an easy to use and well-structured grievance process for affected parties. The grievance process will be communicated through a number of forums and through general community engagement and discussions. Figure 1 presents the grievance mechanism flowchart.

Figure 1 - Grievance Mechanism Flowcharti



7.1.1. RESPONSIBILITIES

Table 2 – Responsibilities

Position	Key Responsibilities
Community Relations Manager	Approval of the Grievance Process and ensuring adequate resources for implementation.
Project Director/Site Manager	Responsible for ensuring compliance with the Grievance Process.
Community Relations Lead / Grievance Officer	Management and administration of the grievance process.
All departments	Providing adequate and timely responses where grievances are referred.
Legal Officer/External Lawyer	Provide timely legal advice and assistance in all legal cases.

7.1.2. RECEIVING GRIEVANCES

Community members will have two main avenues with which to express a grievance including:

- At an RDMC office (e.g. at Nokkundi or Quetta);
- Through members of the Community Relations team or through other senior staff members (i.e. through the site manager).

Grievances must be in writing. Should the person require assistance with recording the grievance in writing, the RDMC staff member will assist with this. On receipt, the grievance will be re-read and explained to the person to ensure agreement on the facts of the grievance.

7.1.3. RECORDING, ACKNOWLEDGEMENT AND REGISTRATION

All grievances will be recorded using the Complaint/Grievance Form (see Appendix B) and logged in the Grievance Register. A copy of the completed Form will be provided to the person raising the grievance at the time, or within 7 days of the grievance being raised. Both copies of the form will include a unique registration number.

7.1.4. ASSESSMENT

Grievances will be initially assessed by the Community Relations team using all available information to enable the grievance to be directed to the most appropriate staff member/department. It may be possible for the RDMC staff member to address the grievance immediately if it is in relation to simply providing or clarifying information. If the grievance is considered particularly urgent, it will be raised immediately to the Community Relations Manager or Site Manager as appropriate.

7.1.5. MANAGEMENT AND RESPONSE

Depending on the nature of the grievance, the Community Relations team will assign the grievance to the appropriate staff member/department for action and resolution. The assigned staff member/department will review and investigate the grievance and provide a response (with a resolution and if necessary a schedule of corrective actions) to the Community Relations Manager. The Community Relations Manager will ensure that a written and verbal response is be provided as soon

as possible and not more than 30 days after receiving the grievance. If, however, more time is required for resolution, the Community Relations team will keep the person who raised the grievance informed.

In addition, complainants will be updated where possible during routine engagement activities (i.e. community visits).

If a grievance cannot be resolved by the relevant department or the Community Relations team the following will occur:

1. The grievance will be escalated to the Site Manager or Project Director for consideration. ***If the grievance is associated with human rights it will be escalated within 24 hours to the Sustainability Executive and Risk and Assurance Executive.***
2. If the grievance still cannot be resolved, mediation through an appropriate third party will be recommended (i.e. community leader(s)).
3. As a last resort, grievances may be referred to an appropriate Court of Justice by either the complainant or RDMC.
    a. The complainant has the right of appeal to any recognized institution open to any citizen as stipulated by the laws of Pakistan if still not satisfied with the outcome and explanation of the third party mediation.
    b. RDMC has the right to appeal to any recognized institution if not satisfied with a ruling given in any case or can act in accordance with the dispute resolution clause as stipulated in the investment agreement.
    c. In the event that a case is presented by the aggrieved person's legal counsel, or in case an unresolved complaint is forwarded to RDMC's Legal Advisor for further action, all correspondence with regard to the case is forwarded to the Legal Advisor for further action.
    d. Upon request of the Legal Advisor, the Grievance officer or someone with delegated authority will attend court anytime a legal issue is to be heard.
    e. In the event the investigation confirms the grievance is legitimate, the Grievance Officer ensures that the administrative process for redressing the grievance is immediately initiated.

7.1.6. MONITORING AND EVALUATION

The Community Relations team will monitor progress of each respective grievance and keep the person raising the grievance informed of its status. Updates will be given on a regular basis and information sharing will not exceed 30 days and will continue until the grievance is resolved. All grievances will be endeavoured to be closed out within 30 days, however this must not come at the expense of following process and adequate investigation. The Community Affairs Manager will monitor implementation of the response and corrective actions taken. Within a month of the response being provided to the person raising the grievance, a Community Relations team member will make a visit to verify that the situation has been resolved to the satisfaction of all involved. If required, monitoring will be made on a regular basis, which will be determined on a case-by-case basis.

8. MONITORING

The stakeholder engagement program is monitored through the use of a stakeholder engagement register. The register is used to manage and monitor stakeholder engagement activities linked to community relations and communications, and enables RDMC to:

- Plan, record and track all the formal interactive sessions with various stakeholders such as planned meetings with individuals, town-hall meetings, information sessions, focus groups, public consultations, workshops, liaison committees or negotiation sessions;
- Record participants' attendance, questions and answers, decisions and information disclosure, as well as management of actions and commitments;
- Collect and manage daily informal interactions with community members who share their concerns and mention problems or issues to the company. These interactions can take the form of phone calls, email messages or informal meetings on site or within surrounding communities.

The register system is also used to capture, track and manage grievances received by RDMC and its contractors to enable:

- Issues to be recorded, screened and assessed;
- Stakeholders to be registered and their interests/concerns/perceptions recorded;
- Identification of areas where RDMC needs to improve its performance or skills and equally, where it is achieving positive results;
- Mapping and monitoring of trends, patterns and emerging issues;
- Assessment the overall effectiveness of the stakeholder engagement program with adjustments made where appropriate.

9. REPORTING

Performance will be reviewed and reported quarterly against the Stakeholder Engagement Plan. The report will include, but not be limited to:

- Materials disseminated: types, frequency, and location;
- Place and time of formal engagement events and level of participation including by specific stakeholder groups (e.g. women);
- Numbers of visitors to the Project, and comments received by other routes (website, mail, phone etc);
- Numbers and type of stakeholders who come into contact with the Project team by mail, webpage and any other means of communication;
- Comments received by government authorities, community leaders and other parties and passed to the Project;
- Number of comments by topic and type of stakeholder, and details of feedback provided;
- Surveys of community attitudes and perceptions; and
- Numbers and types of grievances and the nature and timing of their resolution.

Quarterly reports will outline all activity for the period and provide a summary of issues raised and how they have been addressed, including timeliness of responses and remedial, compensation and mitigation measures to address grievances, and analysis of trends in key performance indicators (KPIs). These will include:

- Total numbers of stakeholders engaged in each group;
- Geographic location of stakeholders across the Project footprint and elsewhere;
- Numbers of comments and queries received, and responses given;
- Issues raised and levels of support for and opposition to the Project;
- Numbers of grievances lodged;
- Time to resolution of grievances.

Appendix A – Engagement Record Form

Reference ID		
Stakeholder/s or Settlement		
Consultation		
Date:		
Time:		
Meeting Venue/Means of Contact:		
Attended by and contact details:	Name	Phone Number
Conducted by:		
Recorded by:		
Language:		
Issues, Concerns, and Suggestions:		

Appendix B – Grievance Form

REKO DIQ GRIEVANCE FORM

REFERENCE NUMBER (TAKEN FROM GRIEVANCE REGISTER):

NAME OF PERSON RECEIVING CONCERN:

Date:

Name

First name _____

Surname _____

Contact Information (house location or other contact method)

_____

_____

_____

_____

Description of Concern (include dates and locations if applicable)

_____

_____

_____

_____

_____

_____

What would you like to see happen?

_____

_____

_____

_____

_____

_____

Signature

_____

Resolution Notes (to be completed in conjunction with complainant following investigation)

_____

_____

_____

_____

_____

_____

_____

_____

Grievance Process Checklist (to be completed by complainant – please circle Yes or No)

Have you received a copy of your Concern Form? (Yes / No)

Does your Form have a Reference Number? (Yes / No)

Were you happy with the process to address your concern? (Yes / No)

Was your concern adequately addressed? (Yes / No)

Comments (do you have any other concerns/ideas?)

_____

_____

_____

_____

_____

_____

_____

Signature (to be signed by complainant to indicate closure of the concern)

_____